



4th World Small-Scale Fisheries Congress

Proceedings

4WSFC Latin America and The Caribbean:

Stronger Together

October 24-27, 2022

Merida, Mexico

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CONGRESS PROGRAM

MONDAY, OCTOBER 25th – DAY 1

OPENING REMARKS/WELCOME SPEECH

Tuesday, October 25th, 9:00– 9:40

PLENARY SESSION #1 – Strengthening Communities & Voices

Tuesday, October 25th, 10:00 AM– 12:00 PM

Location: CIC Salon 25

Organizers:

- Maria Pena, University of West Indies, Barbados, Caribbean
- Eric Wade, Department of Coastal Studies at East Carolina University, Belize

Small-scale fisheries and aquaculture are challenged by diverse and complex issues. These include weak collective action and leadership, poor organizational management, barriers to gender equality and equity, and poor/no social protection. They also face external threats from climate, market dynamics, price fluctuations, new technologies, overexploitation, habitat degradation and more recently, COVID-19. These threats are amplified by pressures from the Blue Economy, coastal development, the international private sector, and little government support. Most challenges require time and perseverance to be solved or managed with support from government policies and administrative and legal institutions, but this can only happen if fishing communities' voices are heard and prioritized by decision-makers. The plenary will explore the following questions: How are aquatic resource communities articulating their issues and using their voices? How have these voices been heard by the appropriate social, political and economic actors? And Why and where are voices silent or unheard and how can this situation be remedied?

- Ainka Granderson, CANARI, Eastern Caribbean
- Emi Koch, Coast 2 Coast, Peru
- Vivienne Solis, CoopeSoliDar R.L., Costa Rica
- Melina Guadalupe Colorado Dapa, Ecoave, Mexico

- Henry Espinoza Panta, WAVES Lobitos, Peru

LUNCH (12:00-14.30)

Book celebrations & Plenary session #2 - Strengthening capacity & Assets

Tuesday, October 25th, 14:30 – 17:00

Location: CIC Salon 25

Chairs:

- Eric Wade, Department of Coastal Studies at East Carolina University, Belize
- Maria Pena, University of West Indies, Barbados, Caribbean
- Alejandro Acosta, Gulf and Caribbean Fisheries Institute

Small-scale fishing communities are undergoing rapid change brought on by coupled social, environmental, economic, and political drivers. In response, communities are racing to adapt to these changes while safeguarding their livelihoods. To adequately respond to these changes, there are increased calls for a re-examination and broader conceptualization of how we define the assets and capacities of communities. In this session, we discuss how the consideration of non-monetary assets such as local and traditional knowledge, social capital, cultural values, peer-to-peer capacity development can strengthen the capacities of communities to adapt to socio-ecological changes. Our speakers will discuss how these non-monetary assets may reinforce their capabilities and how and in what ways they can contribute to a more holistic approach to small-scale fisheries management.

Panel #1: Identifying policy and practice gaps in strengthening capacities and assets of small-scale fishing communities

Speakers:

- Milena Arias-Schreiber, University of Gothenburg/ University of Santiago de Compostela, Spain - Sweden/Peru

- Mateja Nenadovic, Duke University, USA
- Neyra Solano, COBI, Mexico
- Carlos Villamil, Integrated Coastal Marine Management Project & Participatory Fisheries Management Process, Colombia

Panel #2: Institutional responses to strengthening capacities and assets of small-scale fishing communities

Speakers:

- Daylin Muñoz Nuñez, Walton Family Foundation, Mexico
- Peter A. Murray, Secretariat of the Caribbean Regional Fisheries Mechanism, Belize
- Hoyt Pecka, Wildlife Conservation Society, Spain
- Eduardo Boné Morón, Environmental Defense Fund, Mexico

BREAK (17:00 – 17:30)

PARALLEL SESSION #1.1- Youth in small-scale fisheries as agents of change for fishery sustainability [SPANISH]

Organizers:

- Francisco J. Fernández Rivera Melo, Comunidad y Biodiversidad A.C., Mexico
- Antonio Saldívar Moren, El Colegio de la Frontera Sur, Mexico

The path towards small-scale fisheries (SSF) sustainability is developed through multiple and complicated learning processes that transcend generations. For this reason, the hopes for achieving long-term sustainability reside in the youth and their participation in decision-making, since they will be responsible for and benefit from the resources that are used sustainably. In Latin America and the Caribbean (LAC), there is a strong movement promoting human rights and sustainable fishing practices for SSF. However, complex economic, social and environmental challenges persist in fisheries. To generate a generational change in the fishing communities, we must know the youth, their context, their dynamics, aspirations, motivations and provide them with the necessary tools to strengthen their capacities and abilities, in addition, to provide spaces for

them to be heard and considered in fisheries decision-making. The session will focus on presenting the most recent research on the topic of youth in LAC, identifying those factors that have forged the character of the youths determined to exert an influence positive differential within their communities to through leadership.

Speakers:

- Romana Gabriela Ehuan Noh
- Francisco J. Fernández Rivera Melo
- Ulises Becerra Lamadrid
- Alma Oliveto Andrade
- Rodolfo Mondragón Ríos
- Marvin Fonseca Borrás
- Aron Chaco

Parallel session #1.2: Co-management experiences in the Latin American region [SPANISH]

Organizers:

- Minerva Alonso Alemán, CeDePesca, Mexico
- Ernesto Godelman, CeDePesca, Argentina

Sharing the responsibility of fishing resource management with users in small-scale fisheries can be a decisive factor in the search for fishery sustainability. We will talk with small-scale fishing leaders about their experience in co-management initiatives, and about the main challenges and improvement opportunities they face.

Speakers:

- Minerva Pérez, Atenea en el Mar, Mexico
- Ana María Frías, Cooperativa La Pobre de Dios, Mexico
- María José Romero, Pesmar, Mexico
- Araceli Ramón Martínez, Pescadora independiente, Mexico
- Ernesto Vargas, FENAPESCA, Panama

Parallel session #1.3: Management/Governance [SPANISH/PORTUGUESE] - Contributed papers

Contributions from individual papers.

Chair: Joanna Alfaro

Speaker	Title
Daniela Font	Towards a co-designed conservation program to reduce sea turtle bycatch in artisanal fisheries from Buenos Aires
Tránsito González Medina	Community-based marine reserves: implementation and development of Fisheries Refuge Zones
Daily Hernández Pérez de Corcho	Economic benefits of sportfishing tournaments in Bahía de La Paz and Bahía de La Ventana, an application of the trip cost method
Alexis Nakandakari	A development perspective on sustainable fisheries in Latin America
Christhian Gustavo Miranda Gutiérrez	Impacts of fishing activities in Los Arcos de Mismaloya, conservation and protection zone, Mexico
Adriel Castaneda	Políticas públicas para fortalecer la pesca artesanal

Parallel session #1.4: Management challenges & solutions - Contributed papers

Contributions from individual papers.

Chair: Emi Koch

Speakers	Title
Jimena Eyzaguirre	How does international development finance support delivery on global

	commitments to securing sustainable small-scale fisheries?
Nicolás Landa Tami	Participatory Storytelling with Small-Scale Fisheries
Liliana Sierra Castillo	Community based compliance and enforcement (CBCE) in small-scale fisheries- A review
Anastasia Quintana	Four cases for moving beyond binary metrics of compliance in small-scale fisheries
Claudia María Fumero-Andreu	Structural patterns that condition the resilience of the governance system of two MSC certified fisheries: red lobster in Baja California and small pelagics in Sonora
Iván Oribe-Pérez	Factors affecting Catch per Unit Effort of red grouper registered by the small-scale fleet of 2013-2019 on the Campeche Bank (Yucatan, Mexico)

Parallel session #1.5: Performing to transform artisanal fisheries and aquaculture: Women rock in Popular Theatre [with summarised translation/interpretation] [VIRTUAL]

Organizers:

- Maria Pena, University of West Indies, Barbados, Caribbean

Speakers:

- Maria Pena, The University of the West Indies, Barbados
- Michelle Barrow, Social Justice Team, Regenerate Barbados
- Sheena Griifith, Central Fish Processors Association, Barbados
- Sylvia White, Central Fish Processors Association, Barbados
- Margaret Harding, Central Fish Processors Association
- Denise Noel De-Bique

Objectives of this session include:

- Introduction to Popular Theatre for empowerment, agency and collective expression.
- Demonstration of formulation of actions to bring about positive changes.
- Exploring the subject of social justice by focusing on examples that the fisherfolk community can recognise from their daily lives.

The session is linked to three UWI-CERMES areas of work and focus areas for the International Year of Artisanal Fisheries and Aquaculture (IYAFA 2022).

- Gender In Fisheries Team (GIFT) initiative,
- Regenerate Barbados Social Justice Team, and
- UWI-CERMES IYAFA focal area: Gender and youth

This virtual interactive session introduces Popular Theatre - a form of theatre that uses individual and community participation to highlight social issues and promote transformation. It combines entertainment with exploring issues and attitudes, sharing knowledge and ultimately initiating action for positive social change. Methodologies such as movement poetry, storytelling, drawing games, role play and dyads or group discussions are integral to the approach. Popular Theatre has been used to address several issues within the Caribbean including gender and decent work, women's (gynaecological) health, intimate partner violence, HIV and AIDS, and community building. The application of Popular Theatre to SSF and SSA is underutilised. The session will be co-led by a core group of women fisherfolk in Barbados whose capacity in the use and application of this approach is being developed by The University of the West Indies Centre for Resource Management and Environmental Studies (UWI-CERMES) Gender In Fisheries Team (GIFT) and the Social Justice Team of Regenerate Barbados, a national environmental network.

Parallel session #1.6: What do we need to change to achieve the gender equality in Latin America fisheries? [Virtual/Spanish]

Organizers:

- Neyra Solano, Comunidad y Biodiversidad A.C., Mexico
- Violeta Reina, Dirección Regional SICA/OSPESCA, El Salvador

Speakers:

- Rosario Espinosa, independent consultant, Mexico [moderator]

- Mario Gonzale, independent consultant, El Salvador:
 - Regional Gender Policy as a strategy for fishing communities in Central America
- Alejandra Salguero, Universidad Nacional Autonoma de Mexico, Mexico
 - Possibilities for gender equality from masculinities
- Neyra Solano, Comunidad y Biodiversidad, A.C., Mexico
 - Conditions that favor gender equality in Mexican fishing communities
- Jackie Siles, International Union for Conservation of Nature, USA
 - Gender in fisheries - A Sea of Opportunities

Round table, three people from fishing communities in Latin America:

- Esmeralda Albañez, Sirenas de Natividad, Mexico
- Julián Medina, ASOPARGOLMO, Colombia
- Norberto Romero, CONFEPESCA, El Salvador

In recent years the visibility of the role of women in Latin American small-scale fisheries has made significant progress. The recognizing of the participation of women on the value network, mainly in pre and post-capture activities; the promotion and empowerment of women in decision making in their communities and organizations; the recognizing of the efforts of women to promote marine conservation and the creation of economic solutions to cope crises are examples of this. The efforts of diverse organizations to unveil this work, connect initiatives and create safe spaces to share and learn, have been continuously providing tools to change the unequal conditions and improve the quality of the life of fishing communities. Despite these achievements, there is a long way to go; the absence of support, the double working day, the unpaid work, and the need for women's autonomy, among other things, is still a reality in a large number of fishery communities. There are still things to understand and processes to go through. Aiming to contribute to these efforts, we propose an exercise to reflect on the conditions that allow or hinder the incorporation of gender equality initiatives in small-scale fishing communities. We will start a dialogue between actors of different areas involved in the fishery around a core question, what do we need to change to achieve gender equality in Latin America fisheries? This panel is an invitation to continue building tools to promote and generate actions to achieve gender equality in fisheries.

PLENARY SESSION #3 – Strengthening Socio-Ecological Resilience

Wednesday, October 26th, 09:30 – 11:30

Location: CIC Salon 25

Chairs:

- Francisco Arreguín Sanchez, CICIMAR, Mexico
- Alejandro Espinoza-Tenorio, ECOSUR Campeche, Mexico

Socio-ecological resilience is a critical dimension for viability of the small-scale fisheries in LAC. Yet, traditionally, small-scale fisheries have been looked at through the ecological lenses only. We highlight the role social features play within small-scale fisheries capacity to resist to shocks (either anthropogenic or naturally driven) by understanding the timeframe, the scale and the implications of the social elements in how small-scale fisheries are conducted, where, by whom. Additionally, the ecological attribute directly links to how the natural element is perceived, utilized and taken care of (or damaged), by those people who depend upon its health, to survive. In this plenary we will highlight and illustrate the mutual dependency of both sides of this equation for small-scale fisheries in LAC to resist to pressure and to strong changes, under uncertain circumstances. We try to integrate varied perspectives, approaches, end knowledges to articulate both, the social-and-ecological as one unified segment where to set the small-scale fisheries in order to address the challenges they face.

Speakers:

- Kendra Karr, EDF, USA
- Manuel J. Zetina-Rejón, Instituto Politécnico Nacional, Centro Interdisciplinario de Ciencias Marinas, Mexico
- Natascia Tamburello, Canada
- Cesar Viteri Mejia, Charles Darwin Foundation, Ecuador
- Adriana Santos, National University of Colombia – Caribbean Campus, Colombia
- Michael Kriegl, Leibniz Centre for Tropical Marine Research (ZMT) / Center for Ocean and Society (CeOS), Germany

LUNCH (11:30 – 12:00)

PLENARY SESSION #4– Strengthening Socio-Economic Viability

Wednesday, October 26th, 12:00 – 14:00

Location: CIC Salon 25

Organizers

- Sergio Macedo Gomes de Mattos, Instituto Maramar, Brazil
- Edgar Torres-Irineo, Escuela Nacional de Estudios Profesionales-Mérida (ENES-UNAM), Mexico.
- María José Barragán Paladines, Charles Darwin Foundation, Ecuador

Speakers

- Lina Saavedra Diaz, University of Magdalena, Colombia
- Juan Carlos Seijo, Universidad Marista de Mérida, Mexico
- Tony Charles, Saint Mary's University, Canada
- Beatriz Mesquita Pedrosa Ferreira, Joaquim Nabuco Foundation (Fundaj), Brazil
- Edgar Torres-Irineo, Escuela Nacional de Estudios Profesionales-Mérida (ENES-UNAM), Mexico

Panel

- María José Romero Herrera, Pescados y Mariscos del Caribe S.A. de C.V., Mexico
- Joaquín Madrigal Olán, Sociedad Cooperativa Pesquera de Escama marina "La Divina Misericordia" & Federación de Sociedad Cooperativas Pesqueras y Acuicolas "El Faro", Mexico

The COVID19 pandemic taught us, human beings how closely connected the social and economic features of the world system, are. The viability of the small-scale fisheries during the pre- and the post-pandemic time have been in question, within the uncertain scenario we currently have. We will explore how, this already vulnerable sector, could become more resilient and viable under the great number of challenges, at national and global scale, that greatly affect the economic realities fishers live with. This plenary will present some reflections and ideas for this sector to adapt to the large and small-changes the world is exposed to, and that could help the small-scale fisheries sector to explore, find, negotiate and appropriate strategies to be viable in the context of LAC.

BREAK (14:00 – 15:30)

Parallel session #2.1 - La innovación en el sector pesquero para lograr pesquerías sostenibles y comunidades pesqueras resilientes [SPANISH]

Wednesday, October 26th, 15:30 – 17:00

Innovation in the fishing sector to achieve sustainable fisheries and resilient fishing communities

Organizer:

- Gabriela Alejandra Cuevas Gómez, Comunidad y Biodiversidad, A. C. Mexico
- Kenya Atenas Lizárraga Morales, Comunidad y Biodiversidad, A. C. Mexico

Information and Communication Technologies (ICT) have the potential to improve the lives of people engaged in small-scale fisheries (SSF). These can have a positive influence by providing financial information and services. ICTs reduce the time and cost of communication, which improves the speed and flow of information between actors within formal and informal networks. These can create equal opportunities for fishers to access and benefit from information and services. E.g. information about market prices, potential buyers, the weather, good fishing practices, marine conservation, fisheries governance, microcredits, etc. Information access and sharing through ICTs can empower fishers by putting data and information in their hands to make decisions about their own livelihood activities, decisions that can help reduce their vulnerability and improve their opportunities. The sector understands the urgency of proper technology use, as well as the necessity to quickly adapt to the digital world so they are not left behind. This encourages the development of technologies to achieve sustainable fishing and resilient communities. The digital tools that are designed in collaboration with the communities have a greater potential for impact; there are initiatives that have already set this vision in motion. This session seeks to share different innovations and technologies that are being implemented in SSF.

Speakers:

- Gabriela Alejandra Cuevas Gómez, Comunidad y Biodiversidad, A. C. Mexico
- Jaime Rafael Ruiz Blanco, El Colegio de la Frontera Sur, Mexico

- Vanesa Herrera Gutiérrez
- Ricardo Axayacatl Juárez Salas, Pronatura Noroeste A. C. Mexico
- Sara Chávez Sánchez, Causa Natura, Mexico

Parallel session #2.2: Collaborative development of climate resilient multispecies fisheries management across the Caribbean and Latin America

Organizers:

- Kendra Karr, EDF, USA [moderator]
- Eduardo Boné Morón, EDF, Cuba
- Layla Osman, EDF, Chile

Speakers:

- Rafael Ortiz, EDF Mexico
- Ofelia Morales Fadrugas, Center for Fisheries Research (CIP), Cuba
- Julio Chamorro Solis, Juan Fernandez Archipelago Fisher Association, Chile
- Nic Requena, EDF Belize
- Chris Cusack, EDF

Fisheries are critically important for the nutrition, food security, and livelihoods of hundreds of millions of people. Many of the world's fisheries catch multiple species or stocks. These multispecies fisheries tend to be complex, as they may involve commercial, artisanal, and recreational sectors and can be large, medium, and small-scale, using multiple gear types with many disparate. This complexity hinders monitoring and assessment to establish adaptive science-based management for resilient multispecies fisheries and puts at risk food sources, jobs, profits, and coastal community livelihoods and culture. Furthermore, climate change is impacting marine systems and fisheries, altering existing fishing patterns and threatening access to fish stocks in some areas that include some of the most vulnerable fishing communities. The reality is that climate change impacts on fisheries require new solutions and ways of thinking. How can small-scale multispecies fisheries transition to science-based, climate-resilient fishery management, while meeting stakeholders needs and incorporating their local knowledge? First and foremost, stakeholders must be engaged and empowered to be part of the process of managing marine resources. Participatory processes and community engagement are essential for supplementing scientific knowledge with traditional/local ecological knowledge and generating transparency and buy-in to the management

process. We will share lessons learned from practitioners and fishery stakeholders, including fishers, cooperatives leaders, government scientists on the development and implementation of collaborative tools, approaches, and technologies to move forward climate resilient multispecies fisheries in Latin America.

Parallel session #2.3: Ecological Resilience - Contributed papers
[Multilanguage]

Contributions from individual papers.

Chair: Joanna Alfaro

Speaker	Title
Antonio Gomez Gomez	Performance and opportunities of Fishery Improvement Projects in Latin America and the Caribbean to support sustainable fisheries
Melisa Vázquez-Garcés	Social impacts of the implementation of a no-take zone
Kelly Anahí Campos Novelo	Effects of cold surge events on small-scale fisheries and adaptive responses of fishers in Yucatan, Mexico
Abril Retana Hernández	Effects of mangrove coverage change rate on small-scale fisheries' landings from Yucatan, Mexico
María Teresa Tavera	Drivers and implications of the red sea urchin translocation in kelp forests ecosystems in Baja California, Mexico
Jairo Altamar López	Evaluation of mesh sizes in Colombian Caribbean artisanal gillnets: A Fuzzy-AHP approach

Parallel session #2.4: Risk, vulnerability, and adaptive capacity in small-scale fisheries: lessons learned to strengthening capacities under uncertain environment

Organizers:

- Silvia Salas, CINVESTAV del IPN- Mérida, Mexico
- Francisco Arreguín-Sánchez, CICIMAR, Mexico

Speakers:

- Oswaldo Huchim
- D.V.P. Prasada
- Ana Isabel Márquez
- Juan Carlos Hernández
- Francisco Arreguín-Sánchez

It has been documented that fishing communities are particularly vulnerable to different sources of risk, such as access to resources, fleet and human overcapacity, weak governance, changes in markets, urban development, and climatic phenomena; these impacts have social and economic effects on communities. Understanding the factors that generate vulnerability and the capacity of response of those exposed to risk can facilitate an expeditious response of institutional and community support, as well as strategic planning to reduce the vulnerability of communities. Currently, we are facing a mega-contingency (Covid-19) and are just beginning to assess its effects on the fishing sector. Fishing communities and government agencies must adapt their objectives and available resources to meet short and long-term needs. Research on risk assessment and vulnerability in fisheries and fishing communities has been increasing, but there is still a long way to go. In this session, concepts related to risk and vulnerability in social, economic, and environmental terms are discussed in relation to small-scale fisheries, presenting case studies that includes: i) fishermen's health risk given their fishing strategies; ii) social and economic risk in the face of extreme contingencies; iii) income risks in the face of disruption of productive chains and impact on wellbeing; iv) environmental, social, and economic risks competing with other sectors; vi) post-disaster damage in the face of environmental contingencies and adaptive response. The required conditions to improve resilience of fishing communities to develop contingency plans to maintaining their fisheries and livelihoods are discussed.

**Parallel session #2.5: Ecosystem/Sustainability - Contributed papers
[VIRTUAL]**

Contributions from individual papers.

Chair: Nova Almine

Speaker	Title
Acacio Tomas	A case study between small-scale and industrial fisheries in restricted-use coastal protected areas
Andrés Jaureguizar	Impact of environmental stressors on the inter-annual small scale fishery yield: a trans ecosystem gillnet fishery under the Rio de la Plata forcing, South America
Renato Silvano	A review on the sustainability of small-scale fisheries in Latin America: socioecological challenges and opportunities
Jorge A. López-Rocha	Maximum sustainable yield of fish species associated with the Red Grouper fishery in the Campeche Bank, Mexico
Luis A. Rincón-Sandoval	The fishery performance indicators for red grouper (<i>Epinephelus morio</i>) fishery, Yucatan, Mexico
Fabian Blanchard	Addressing the sustainability of small-scale fisheries in French Guiana through collaborative and multidisciplinary work

Parallel session #2.6: El papel del Estado Inductor en el orden y gestión del desarrollo de la pesca artesanal [SPANISH/PORTUGUESE]

Organizers

- Fabrício Gandini Caldeira
- Sergio Mattos

Speakers:

- Gonzalo Garrido
- Gabriela Arenas
- Pedro Romero
- José Carlos Diniz
- Fabrício Gandini Caldeira
- Sergio Mattos
- Eliana Diniz
- Maria do Socorro dos Santos Tavares

Políticas públicas requieren estudios sobre la biodiversidad pesquera en conjunto con las necesidades humanas, una combinación de medidas políticas y técnicas de asesoría y apoyo comunitario, y otros temas complejos. Implementar políticas públicas requiere, también, un estado inductor hacia un desarrollo sostenible. Conlleva a proponer soluciones de manejo a un problema o situación, las diferencias en su intensidad y cómo cambia la demanda de solución según el contexto, permitiéndoles prever necesidades futuras. Eso porque las políticas públicas reproducen continuamente el conocimiento existente en cada momento para crear instrumentos adecuados hacia las comunidades pesqueras más lejanas y a los grupos vulnerables y marginados. El sector pesquero artesanal costero de Brasil es responsable alrededor del 60% de la producción pesquera marina. En virtud de su enorme extensión en cientos de playas y costas a lo largo de 8.500 km de extensión, las inversiones y la provisión de infraestructura para apoyar la pesca son dispares y aleatorias. Con la idea de aprovechar la capacidad estatal brasileña y sus entendimientos federativos para promover una cualificación de esa infraestructura que signifique reducción de los costos de producción y valorización del producto, invitamos disertantes de Brasil y Chile para ilustrarnos con ejemplos sobre cómo puede actuar el estado estructural y funcionalmente. Al traer el ejemplo de Chile sobre la aplicación de la Ley de las Calletas, se espera garantizar una pesca artesanal organizada y estructurada teniendo como "ejes de pesca" sus territorios, la propiedad de la faena pesquera y implicaciones en la agenda de desarrollo local.

PARALLEL SESSION #3.1 – Dialogues between fishers from the Yucatan Peninsula. The challenges and opportunities of the Fishing Refuge Zones [SPANISH]

Wednesday, October 26th, 17:00 – 18:30

Organizer:

- Victoria Jimenez, Kanan Kay Alliance, Mexico

Speakers:

- Erik Leonel Xicum Mendoza, Fishing Cooperative “Langosteros del Caribe”, Mexico
- Manuel Jesús Mendoza Arguez, Fishing Cooperative “Vigía Chico”, Mexico
- José Ángel Canto Noh, Fishing Cooperative “Cozumel”, Mexico
- Josué Canul Reyes, Celestún Fishing Refuge Zone Management Committee, Mexico
- Mariela Alejandra Gómez Dzib, Tourist Cooperative “Mujeres de la Bahía de Punta Herrero”, Mexico
- Emilio Perez Mendoza

The 4WSFC LAC Congress is an opportunity for artisanal fishers to share their experience and perception of fishing management tools such as Fishing Refuge Zones. The theme of the congress is “Stronger Together: Building a Path Toward Sustainable Resources and Viable Communities” and the first thing that civil society, non-governmental and governmental organizations, decision-makers, professionals, and researchers need to do is listen to the fishermen.

This session is proposed as a discussion panel where fishers can share their experiences on the process of designing and implementing the Fishing Refuge Zones in their communities. Delve into the significant challenges that the management of these ZRP implies for them as cooperatives and understand the essential differences in needs that the communities have. Opening this dialogue between fishers and stakeholders will allow learning from the past and improve processes in the future to contribute to having a well-organized and participatory productive fishing sector, more resilient

communities committed to sustainable fishing, and biodiversity conservation and multi-sector collaboration to guarantee to manage and optimize available resources.

The panel will consist of questions focused on understanding how the process of designing the Fishing Refuge Zones was, the main challenges they have faced over time, the training and strengthening needs that the fishing cooperatives have detected, and the opportunities they see in the future (example: diversification of economic activities).

**PARALLEL SESSION #3.2 – Viability - Contributed papers
[SPANISH/PORTUGUESE]**

Contributions from individual papers.

Chair: Ana Cinti

Speaker	Title
Nicolas Gomez Andujar	Social cohesion varies between associated and independent small-scale commercial fishers in Puerto Rico
Antonio Corgos Lopez-Prado	Seasonal fleet dynamics of the artisanal fishery of Jalisco, Mexico, using fishermen’s traditional knowledge.
Jorge Emiliano Gerónimo Salaya	State of the food security in the small-scale fishing sector of the Gulf of Ulloa, in the Baja California peninsula, Mexico
Deysi Guadalupe Cupido Santamaria	Mapping fishers’ perception in a complex seascape where oil and artisanal fisheries coexist
Carlos Villamil	Towards participatory fisheries management of an ethnic territory in northern Colombia

Brandon Escárcega Miranda	Competitive advantages of fish slaughter by brain puncture (ike jime) in the Mexican market
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Parallel session #3.3: Ecological Resilience/Modeling/MGMT - Contributed papers [SPANISH/PORTUGUESE]

Contributions from individual papers.

Chair: Alejandro Espinoza-Tenorio

Speaker	Title
Aketzalli Arriaga Velasco	Impacts of harmful algal blooms on small-scale fisheries from Yucatan, Mexico
Yesid de los Angeles González Ruiz	Characterization of a community of inland fishermen and the effect of the introduction of an exotic species on the sustainability of their fisheries in an Andean ecosystem of Colombia
Miguel Angel Osnaya Miranda	Pesquería Artesanal del Camarón en Chiapas, Una Aproximación Desde un Enfoque Reticular
Jaime Mendo/Ivan Danilo Gomez Ore	Evaluando el impacto del COVID-19 sobre la resiliencia en las cadenas de valor de pesquerías artesanales en Perú
Francisco Córdova- Zavaleta	The artisanal fishery of elasmobranchs in Northern-Central Peru, gillnets as case of study
Elsa Noreña-Barroso	The report card of Sisal, Yucatan, Mexico: An approach to study the health status and resilience of this socio- ecosystem in order to protect its resources

Parallel session #3.4: Strengthening fishing organizations: from a national diagnostic to the beginning of a pilot program [SPANISH]

Organizer:

- Amy Hudson Weaver, Duke University / Programa Nacional de Fortalecimiento de Organizaciones Pesqueras, Mexico

Speakers:

- Amy Hudson Weaver
- José Luis Carrillo Galaz
- Sofia Lopez
- Lorena Ortiz
- Bibiana Ruiz
- Juan Esteban Rincon
- Jose Manual Pech Tabasco

Organization in the coastal fishing sector in Mexico has been intimately linked to the cooperative figure since the early 19th century. Healthy natural resources are widely recognized as necessary for sustainability, alongside of this is the importance of strong and functional organizations. Many examples, from Mexico and beyond, have shown us that sustainable fisheries depend (in part) on having well organized fishers. Thus, our interest in las cooperativas. Niparajá, the Duke University, and CONMECOOP conducted a nationwide study from 2016 to 2018 to understand the state of the coastal fishing sector in Mexico in terms of its level of organization, as well as their characteristics and needs they have. With this information during 2019-2021 we designed a pilot program which started in May 2022 with the selection 6 cooperatives from three different regions of Mexico: Yucatán, Chiapas, and Baja California Sur. We have the goal to build a strong organizational structure so we can scale-up the National Program to Strengthen Fishing Organizations (PNFOP, by its acronym in Spanish) and have it available for any fishing organization in the country.

The pilot includes besides training to each “cooperative”, a “Plan de Mejora” (improvement plan) built with each organization based on their needs. Accompaniment by PNFOP staff and ongoing evaluation of the cooperatives progress are key components of this program to lead the participants to a more professional, resilient, and effective organizations.

Parallel session #3.5: Gender/Community/Governance - Contributed papers [VIRTUAL]

Chair: Eva Coronado

Speaker	Title
Helouise Costa	Common World Experiences: Social and Environmental Transformations of the Group of Women Decided to Win
Verenice Mosso	Participatory experience for the solution of problems related to fishing in Barra de Tecoaapa, Guerrero, Mexico
María José Marín Meneses	Making visible the women roles in the coastal artisanal fisheries communities Golfo de Salamanca (Caribbean coast of Colombia), within the framework of Human Rights
Julia Mason	Policy options to strengthen nutrition provisioning from small-scale fisheries: case studies from Chile, Peru, Indonesia, and Sierra Leone
Dana Grieco	Impacts of Conservation on Tropical Marine Fisheries
Maria Cruz-Torres	Women, Food Security and Small-scale Fisheries in México

BREAK (19:30 – 20:30)

PARALLEL SESSION #4.1 – Mexico’s path towards inclusive and resilient governance: a tale of two fisheries

Wednesday, October 26th, 19:00 – 20:30

Organizers:

- Causa Natura/EDF

Chair:

- Nadia Olivares

Speakers:

- Alicia Virginia Poot-Salazar
- Rafael Combaluzier
- Martha Román
- C. Claudia Higuera
- Jose Luis Carrillo Galaz
- Ana Harumi Hayashida

Participation in decision-making is a critical factor in achieving sustainability in the use of natural resources. In Mexico, Fishery Management Advisory Committees are governance bodies with a local or regional focus, where government officials, representatives of the fishing sector, researchers and civil society organizations discuss sustainable and profitable fishing, and where the most up-to-date scientific knowledge is disseminated to inform fishery management decisions. During this session, Causa Natura and EDF will facilitate a discussion with members of the Hake Fishery Management Advisory Committee from the Gulf of California and Grouper Fishery Management Advisory Committee in Yucatan to showcase how these spaces have been key to solving problems related to sustainability in these fisheries. We will also reflect on the challenges associated with participation and share useful lessons to integrate a participatory public policy in fisheries management in Mexico that can serve as a model for the region. We will link this discussion with the main findings of an analysis developed by Causa Natura and EDF in which we conclude that Fishery Management Advisory Committees are successful examples of inclusive and resilient governance that foster collaboration, help increase trust among stakeholders, align with Sustainable Development Goals and that they offer an opportunity in the pursuit to achieve blue justice for small-scale fisheries.

PARALLEL SESSION #4.2 – 10 years of fishing refugia in Mexico: achievements and next steps [SPANISH]

Organizers:

- Salvador Rodriguez-Van Dyck, Sociedad de Historia Natural Niparájá A.C., Mexico

Speakers:

- Salvador Rodriguez-Van Dyck [moderator]
- José de Jesús Flores Higuera, Federación Zona Centro BC Sur, Mexico
- Edgar Omar Murillo Talamantes, SCPP Islote, Mexico
- Enrique Moreno Mende

The implementation of fishing refugia in Mexico, as a fisheries management tool, had gained attention from the fishing sector as well as different authorities and organizations. This year we are celebrating the first 10 years of the refugias established for the first time in México by sharing some of the achievements that we have gained particularly in two regions: Sian Ka'an in the Caribbean and the Corridor San Cosme a Punta Coyote, BCS in the Gulf of California. There are ecological, socioeconomic and governance results that now faces novel ways to ensure its continuity. Although the support of local organizations continues to ensure that fishing refugia keeps operational, leadership continues to be strengthened and advocacy with the fisheries authority continue to take place, the challenges around this fisheries management tool are still great. This session will try to share what has been effective in the establishment, renewal, and management of refugias, as well as some actions that we should consider complementing them and continue working for sustainable fisheries.

PARALLEL SESSION #4.3 – Community/Viability/Resilience - Contributed papers [SPANISH/PORTUGUESE]

Contributions from individual papers.

Chair: Adriana Santos

Speaker	Title
Andrea Garay	The fishing sector and the social protection system in Colombia
Fernanda Nava Islas	Can adaptive strategies of commercial and recreational fishers contribute to strengthening capacity and assets?
Miguel Ángel Ojeda Ruiz	Vulnerability, adaptation and diversification of small-scale fishers: Bahía de la Paz, BCS Mexico
Vanessa Oviedo Romero	Fishing strategies' diversification of small-scale fisheries from a social-ecological networks approach
Marie Astrid Garrido Campos	Working and health conditions in small-scale fisheries in Southern Chile and the need for a "One Health" approach
Laura Rodríguez-Cardozo	Condiciones de vida de los pescadores de la Reserva de la Biosfera de las Islas del Pacífico de la Península de Baja California

PARALLEL SESSION #4.4 – Speed presentations

Contributions from individual papers.

Chair: Ratana Chuenpagdee

Speaker	Title
Gerardo Peña	Review of the potential oil rig decommissioning in the southern Gulf of Mexico: legal framework and needed data
Natalia Balzaretta	Impacts of fishing activities in Los Arcos de Mismaloya, conservation and protection zone, Mexico

Niza Contreras Liedtke	Increasing Mexican Fishing Cooperative Resilience to Climate Change
Rosa María Chávez Dagostino	Small-scale fishermen's perceptions about fishing activity and general environment
Monalisa Silva	Co-management of freshwater fisheries in the Amazon reconciles social and ecological benefits
Guillermo Duque	Effect of dredging on artisanal fishing in the Colombian Pacific
Nancy Fabiola Alvarez Velazquez	Analysis of the ex-vessels price and the capture effort of Octopus maya in the artisanal fleet of Campeche
Eva Coronado	Analyzing the governing system and interactions between Small-scale fisheries and the oil industry in the Gulf of Mexico
Olivia Echazabal Salazar	Biomass dynamic model for multiple data series: An improved approach for the management of the red grouper (<i>Epinephelus morio</i>) fishery of the Campeche Bank, Mexico
Ailet Vives	Formulation of balanced feed for the edible sea urchin <i>Tripneustes depressus</i> in Baja California Sur, Mexico
Nova Almine	Emerging marketing opportunities for small-scale fisheries in Latin America and the Caribbean during the COVID-19 crisis

PARALLEL SESSION #4.5 – Low-cost Embedded systems in a construction of transdisciplinary process of marine ecosystems monitoring in the Baía de Todos Os Santos (BTS), Brazil [VIRTUAL]

Sistemas embarcados de baixo custo na construção de um processo transdisciplinar do ecossistema marinho da Baía de Todos os Santos (BTS), Brasil

Sistemas empotrados de bajo coste en la construcción de un proceso transdisciplinar de monitorización do ecossistema marinho de la Baía de Todos os Santos (BTS), Brasil

Organizers:

- Iramaia De Santana, Universidade do Estado da Bahia, Brazil
- José Roberto de Araújo Fontoura, Universidade do Estado da Bahia, Brazil

Speakers:

- Iramaia De Santana
- José Roberto de Araujo Fontoura
- Leiliane Silva dos Santos
- Mônica Arlinda Ramos Vasconcelos
- Patrícia Carla Smith Galvão
- Tailon Carvalho de Cerqueira

In the Brazilian marine ecosystems, long-term environmental and chemistry-physical data logging is scarce. There is a limiting factor in terms of understanding environmental integrity and management strategies. This occurs in Brazil due to the traditional dependency of high-cost property technology, its difficulty integration with different operational systems and its complex acquisition by public research institutions.

In this panel, we will present a low-cost embedded system monitoring marine ecosystems in Brazil, called the Embarcados Project. The aim of this project is to build a device with an open-source interface linkage to Arduino technology. This provides the chemistry and physical data acquisition which will be used in the environmental monitoring of strategic points in the BTS, the second largest bay system in Brazil. The combined use of these technologies is helping to reduce the financial cost of the following water quality parameters: pH, OBD, OD, MPS, salinity, redox potential, turbidity, velocity and temperature of the water, outflow and level of the tide. The device has the capability to achieve unprecedented environmental data which will be continuous through BTS. This data logger set will be

considered as a milestone capable of estimating the magnitude of changes in water quality and environmental integrity. For the people living around the BTS, it will not only grow the community's knowledge, but it may also offer a forecast, according to a coupled vision that is based on a scientific and Traditional Knowledge.

Artificial neural nets will be used to estimate the conservation status of flag-species through a social, economical, and ecological approach. The focus also includes technology transference to the community and a collective construction of educational tools, to cope with the comprehension of the environmental data. There are also strategies of prevention in climate change at the local level to identify distortion gaps in the parameters. This helps us to understand "atypical" and growing cases of food intoxication by sea food and fish consumption.

Thursday, October 27th, 09:30-11:00

PARALLEL SESSION #5.1 – Value Rescue: a collaborative model for unlocking incentives to increase sustainable resource use and benefits to communities [SPANISH]

Rescate de Valor: un modelo colaborativo para incentivar el aprovechamiento sostenible de los recursos pesqueros en beneficio de las comunidades

Organizers:

- Cecilia Blasco, SmartFish Rescate de Valor, AC, Mexico
- Liliana Gutierrez, Iniciativa por los Mares y las Costas de México, Mexico, [moderator]

Speakers:

- Isis Morales, Cooperativa 29 de Agosto (co-op member), Sonora, Mexico
- Francisco Gualguera, Cooperativa Punta Sacrificio (co-op president), Oaxaca, Mexico
- Javier Van Cauwelaert, Comercializadora HealthyFish, SAPI, Mexico
- Cecilia Blasco, SmartFish Rescate de Valor, AC, Mexico
- José Alfonso Chaparro, Confederación Mexicana de Cooperativas Pesqueras y Acuícolas (CONMECOOP), Mexico

As highlighted in FAO's Voluntary Guidelines for Securing Small-scale Fisheries, the capacity of many SSF to provide both livelihoods and nutrition are constrained by limited market access, infrastructure and professional development. However, initiatives to develop SSF without attention to their environmental sustainability frequently yield short term gains that can result in overfishing and marginalization of the most vulnerable in SSF value chains.

The Value Rescue Model (MRV) developed by the SmartFish Group offers an alternative to business-as-usual value-addition. The MRV harnesses new profitability generated from business innovations to explicitly improve the environmental sustainability and social responsibility of SSF cooperatives. Applying the MRV cooperatives can transition from being price-takers to entrepreneurs by developing capacities to: 1) increase the quality and value of their products, 2) strengthen the institutional capacity of their organizations; and 3) internalize fisheries management measures.

By producing higher quality, more sustainable seafood and partnering with a social intermediary that can differentiate their catch into preferential markets, fishers engaging in the MRV can earn more fishing more sustainably with the same or less volume, enabling them to strengthen the social contributions of their cooperatives. Consumers have access to more sustainable seafood, representing triple impact outcomes for Mexico's SSF sector.

In the session fishers will share their experiences implementing the MRV. The CONMECOOP speaker will highlight the importance of equitable market access mechanisms for SSF cooperatives. SmartFish Inc will describe its disruptive "social intermediary" practices including open-books accounting and full traceability, and SmartFish NGO will present its MRV Handbook to empower other organizations to replicate the model, including social and environmental safeguards.

PARALLEL SESSION #5.2 – Accelerating Coastal Community-Led Conservation through Socio- Ecological Resilience of Small-Scale Fisheries

Organizers:

- Marina Gomei
- Ixchel López Olvera

Speakers:

- Ixchel López Olvera, WWF, Mexico
- Arturo González, WWF, Ecuador
- Julián Ricardo Marcial Ponguillo, Asociación de Pescadores Artesanales y Especies Bioacuáticas y Afines Isla Escalante APAREBAFIE, Ecuador
- José Valencia, WWF, Chile
- Sara Garrido, National Corporation of Artisanal Fishing Women, Chile

- Marina Gomei, WWF, Italy

Coastal communities and SSF have served as traditional stewards of coastal ecosystems for hundreds of years. Their survival is inextricably linked to the health of these ecosystems. The sustainable management of coastal ecosystems, essential to the food and livelihood security of people, is severely lacking. Despite SSF accounts for more than 90% of the world's commercial fishery sector, with almost 50% of those employed are women, the contributions of local communities are still undervalued, underreported, and consequently overlooked in fisheries policy. Specifically, access to natural resources and appropriate community-led governance continues to be limited by a lack of resources, ownership, information and enforcement. This session aims to highlight the work of WWF and its partners aiming to empower SSF communities in sustainable fishing. Practical results will be shared, focussing on engaging with local fishers to build trust and understand their needs, strengthen capacity, while advocating for the tools required to support changes in the long-term. Examples of lesson learned from the field will include mangrove conservation and restoration to allow the recovery of small-scale gastrop fisheries carried out by women in Mexico; advancing women rights and incorporating gender approach into policies related to artisanal seaweed collection in Chile; and reducing titi shrimp fishing impact by improving its value-chain process, legal framework, and authority control in Ecuador. Scaling and acceleration of those successes to catalyze national and regional social changes is the next step and will require a small-scale fisher global movement involving CSOs, government, non-profit organizations and local communities.

PARALLEL SESSION #5.3 – Parallel session #5.3 - Economic/Value chain - Contributed papers [SPANISH/PORTUGUESE]

Contributions from individual papers.

Chair: Edgar Torres-Irinea

Speaker	Title
Marian Rodríguez-Fuentes	Resilience of the shrimp fishery supply network of Magdalena-Almeja Bay, Mexico

Jorge Grillo	Indicadores productivos y socioeconómicos de la cadena de valor del sector pesquero de Piura
Sussel Alonso Cabrera	Economic impact of the sanitary contingency caused by Covid-19 on the value chain of blue abalone, <i>Haliotis fulgens</i> (Philipi, 1845), in Baja California Sur, Mexico
Alfonso Medellín-Ortiz	High volume fisheries bias efforts to manage locally important fisheries in Mexico
Mauricio Ramírez-Rodríguez	Small-scale fisheries regions and fleet interactions in Baja California Sur, Mexico
María de Lourdes Jiménez-Badillo	Breaking paradigms in the management of the artisanal fishery for octopus <i>O. insularis</i> in the southwestern Gulf of Mexico

PARALLEL SESSION #5.4 – TD/Knowledge - Contributed papers

Contributions from individual papers.

Chair: Milena Arias-Schreiber

Speaker	Title
Adrian Núñez	Inferring ecosystem impacts of a Mexican small-scale snapper fishery through citizen science and transdisciplinary research
Adán Aranda-Fragoso	Small-scale fisheries on the Southern coast of Jalisco: understanding communication structures to build collaboration networks
José Alberto Zepeda Domínguez	MEXCAL: Moving towards resilient fisheries in northwestern Mexico

Lizbeth Ferrer Miranda	Diversification of fishing strategies of the small-scale fishing fleet operating in Celestún, Yucatán, Mexico
Armando T. Wakida-Kusunoki	The role of traditions, social networks, and women in unregulated artisanal fishing. The case of shrimp fishing in Celestún Yucatán
Bruce Goldstein	The Power of Learning Networks Among Small Scale Fishing Communities

**PARALLEL SESSION #5.5 – Strategies/Management [Multi-language]
[VIRTUAL] contributed paper**

Contributions from individual papers.

Chair: Francisco Arreguín-Sánchez

Speaker	Title
Ainoa Vilalta Navas	Socio-Ecological networks modeling against socio-environmental variations for small scale fisheries in the Mexican Pacific
Vanildo Oliveira	Dispositivo de Exclusión de Capturas Incidentales con Mallas Cuadradas en Redes de Arrastre de Camarón en Sirinhaém/PE, Brasil
Felipe Amezcua	Are the temporal changes observed in the reproductive biology of the estuarine Conguito sea catfish related to increased small-scale fishing effort in the northwestern Pacific coast of Mexico?
Luana Prestrelo	Multidisciplinary assessment of fishing communities vulnerability from the state of Rio de Janeiro: a critical analysis of the fisheries monitoring model for socioeconomic evaluations

Minerva Alonso Alemán	Strengthening the value chain and the scientific knowledge relative to the blue swimming crab <i>Callinectes sapidus</i> in Sabancuy-Isla Aguada, Campeche, Mexico
Mayra Palacios-Cogua	Main results of the Private Onboard Observers Program implemented in the Peruvian anchovy (<i>Engraulis ringens</i>) small-scale fishery for Direct Human Consumption in Peru between 2017 and 2020

BREAK (11:00 – 11:30)

Thursday, October 27th, 11:30-13:00

PARALLEL SESSION #6.1- Knowledge co-production and integration to support sustainable use of marine resources

Organizers:

- Mateja Nenadovic, Duke University, USA
- Heather Leslie, University of Maine, USA
- Kara Pellowe, Stockholm Resilience Center, Sweden
- María José Espinosa Romero, Comunidad y Biodiversidad, A.C., Mexico [moderator]

Speakers:

- Heather Leslie, University of Maine, USA
- Role of interdisciplinary collaborations for promoting sustainable marine management and practice
- Tim Frawley, NOAA, USA
- Local governance structures mediate fishery operations and adaptive response across northwest Mexico
- Amy Hudson Weaver, Mexico
- Strengthening fishing cooperatives through collaborative research approach: lessons learned from a long-term initiative
- Mateja Nenadovic, Duke University, USA
- Social-ecological context influences communities' resource use and outcomes

- Kara Pellowe, Stockholm Resilience Center, Sweden
- Interdisciplinary methods to guide design of sustainable marine management
- María José Espinosa Romero [moderator]

How do we develop policies that promote sustainable use of marine resources in situations where official data are sparse and government capabilities are limited? Through a combination of oral presentations and group discussions, this session will provide a roadmap of and generate discussion about interdisciplinary, collaborative science to support responsible fisheries management and practice in data- and capacity-limited settings.

The session presenters, who will include researchers and practitioners from diverse industry, non-governmental and academic institutions, will highlight work in Baja California Sur, Mexico as an example of how knowledge co-production and integration across multiple disciplines and worldviews at the local to regional scale can support marine policy and management in data-limited settings. During this hour and a half session, attendees will have the opportunity to learn from and engage in an ongoing science-to-policy process and discuss the feasibility of replicating this effort in other social-ecological settings.

We propose a hybrid format, with both in-person and virtual participation options, as it will enable a more inclusive participation and increased accessibility of participants from multiple geographic regions and with diverse expertise. Since registration for virtual attendance is offered free of charge, we will market this session to our Pan-American network of researchers and practitioners focused on governance of coastal social-ecological systems, which we initiated in the fall of 2021 through a series of four seminars (https://dmc.umaine.edu/fall2021_ses_seminars/). With this approach, we expect to facilitate increased participation, not only by researchers, but also by resource managers, conservation practitioners, and other stakeholders.

PARALLEL SESSION #6.2- Learning networks for sustainable fishing: connecting science and conservation with communities in Latin America and the Caribbean

Organizers:

- Erica Cunningham, EDF, USA

- Eduardo Boné Morón, EDF, Cuba
- Layla Osman, EDF, Chile

Speakers:

- Zoila Bustamante, Confederación Nacional de Pescadores Artesanales de Chile (CONAPACH), Chile
- Raidel Borroto Vejerano, Center for Fisheries Research (CIP, Cuba
- Carlos Chapilliquen, Artisanal fisheries guild in Cabo Blanco, Peru
- Erica Cunningham, EDF, USA • Layla Osman, EDF, Chile
- Almendra Mendoza

Learning networks (LN) are groups that voluntarily organize to increase communication, foster collective action, and solve complex problems. Environmental Defense Fund (EDF) has facilitated networks in the LAC region in Chile, Cuba, Peru, and Mexico to amplify the voices of small-scale fishers and strengthen connections with scientists, government managers, buyers, and others to address critical fisheries management challenges. LN spread knowledge and are strategic alliances for sustainable fisheries management, creating channels for communication and collaboration across communities and regions, while building capacity among diverse stakeholders. LN have horizontal structures and spur new ways to work by providing the trust and freedom to experiment and apply innovative solutions. They have shown to empower local leadership and create powerful learning experiences among peers. In Chile, the LN (www.rdapescachile.org) has strengthened capacities through workshops and online seminars, building trust and making the LN an important national platform to support key milestones such as the creation of a Ministry of the Sea and the incorporation of small-scale fisheries as part of Chile's new constitution. In Peru, the LN (www.rdapescaperu.org) has been paramount to connect stakeholders, building trust, make bridges between fishers to authorities, making policy proposals (<https://www.facebook.com/watch/?v=2083785045105926>) and advancing fisheries sustainability even through unprecedented challenges like COVID19 (<https://www.facebook.com/watch/?v=2083785045105926>) empowering fishing communities. In Cuba, the LN will serve as a platform to implement science-based regulations according to the country's new fisheries law. In Mexico, the LN is crucial to support a pioneering recovery plan for priority fisheries as they adapt to climate change and look towards becoming increasingly resilient.

PARALLEL SESSION #6.3 - Ensuring small scale fisheries in Costa Rica and Mexico flourish through the development and implementation of triple impact solutions

Organizers:

- Elena Finkbeiner
- Hoyt Peckham
- Ivan Martinez-Tovar

Speakers:

- Elena Finkbeiner
- Hoyt Peckham
- Ivan Martinez-Tovar
- Jose Quiros
- Carlos Ivan Perez

Ocean Outcomes, Wildlife Conservation Society and Conservation International are leading a new approach to small scale fisheries sustainability that drives improvements in socioeconomic fisheries performance, integrating this work with existing best practice supporting environmental sustainability. This triple impact approach to the challenges facing many of the world's small-scale fishers aims to address underlying human rights and social issues, and harness untapped financing and increase profitability in small scale fishing enterprises to improve both livelihoods and ecosystem health; creating a positive feedback loop for people, planet and profit. Guiding this work is the Triple Impact Fisheries Evaluation Framework, which evaluates needs, plans improvements and reports progress against the environmental, social and financial dimensions of fisheries sustainability. O2, WCS and CI have spent the past three years applying the Framework with local partners across seven countries and with 20 fisheries. As the uptake of a triple impact approach to fisheries improvement continues to grow, the Framework and lessons learned from its application represent an opportunity for all working in seafood. This session will provide an overview of the triple impact approach, insights into addressing socioeconomic and environmental needs in fisheries and then highlight case study examples from Costa Rica and Mexico where local organizations are changing their fisheries through improved business, social and environmental performance.

PARALLEL SESSION #6.4 - Resilience/Viability/Learning - Contributed papers

Contributions from individual papers.

Chair: Eric Wade

Speaker	Title
Prateep Nayak	Many faces of vulnerability to viability transitions: Strengths and powers to small-scale fisheries communities
Fikret Berkes	Why resilience-building is important for fishing communities
Nikita Gaibor	Local knowledge and perceptions of fishermen of Red Crab (<i>Ucides occidentalis</i>) and Concha Prieta (<i>Anadara tuberculosa</i>) in the face of the Custody Areas and Sustainable Use of the Mangrove Ecosystem, in the Gulf of Guayaquil, Ecuador
Nadia Olivares	Embarking upon the integration of recovery plans in Mexican fisheries: the case of the red grouper fishery
Fabian D. Escobar-Toledo	Resilience of the Cienaga Grande de Santa Marta: Incidence of artisanal fishing in the structure of the ecosystem
James Foley	Digital transformations to the Belize lobster fishery that have resulted in the Belize Spiny Lobster Fishery Improvement Project achieving an 'A' rating on FisheryProgress.org

PARALLEL SESSION #6.5- Transdisciplinarity in theory and praxis. What type of collaborative work have we carried out in the fishery and agriculture food systems of LAC [VIRTUAL]

Organizer:

- Minerva Arce Ibarra, El Colegio de la Frontera Sur, Mexico

Speakers:

- Manuel Roberto Parra-Vázquez & Minerva Arce-Ibarra, El Colegio de la Frontera Sur, Mexico
- Addiel Perez, Bonefish and Tarpon Trust, Belize
- Axayácatl Segundo-Cabello, CREN-Bacalar, Mexico
- Ma. Eugenia García-Contreras, Universidad Autónoma Estatal de Quintana Roo, Mexico

Since the late twentieth century, rural and indigenous producers in Latin America and the Caribbean (LAC), including small-scale fishers, agriculturists, and others, have had to resist, cope with, or adapt to a range of neoliberal socio-environmental regimes that impact their territories and associated resources, including production systems and ultimately their cultural traditions. This session draws on collaborative work and transdisciplinary approaches carried out during the last three decades between academics and rural producers from LAC while they are coping with socio-environmental regimes that impact on local fishery and agriculture food systems. The first presenter will introduce the definition of basic concepts including the socio-environmental system and the socio-environmental regime, and will show how they can be addressed in LAC using Max Neef's transdisciplinary framework. The second paper deals with the epistemology of artisanal fishing and its relationship with fishing institutions; that is, the generation, modification and transmission of knowledge in the Macehual Maya institution 'Chuuk Kaay' (catching fish). The third paper analyzes the food security in artisanal fishing and for this purpose contrasts two norms: that of the Mexican legal system and that of the ancestral practice of fishing by the Macehual Mayans. The fourth paper analyzes the key elements that led to changes in the way of conducting research in the community of Trindade (Brazil), going from using conventional academic methods for data collection to an active participation of the community, resulting in the construction of a transdisciplinary approach. Finally, the last presentation introduces the current challenges in Belize's fisheries, mentioning that fisheries management does not take into account the needs of fishers, and that the recent introduction of the Blue economy regime is becoming a threat to

food security, livelihoods, biodiversity conservation, and local and national economy.

LUNCH (13:00 – 14:30)

PLENARY SESSION #5 – Strengthening Value Chain

Thursday, October 27th, 14:30 – 16:30

Location: CIC Salon 25

Organizers:

- Sergio Macedo Gomes de Mattos, Instituto Maramar, Brazil
- Silvia Salas, CINVESTAV del IPN-Mérida, Mexico

Academia & Organizations

- Discussant: Silvia Salas

Speakers

- Jorge R. Ramírez González, Charles Darwin Foundation, Mexico
- Jorge Luis Tordecillas Guillen, Centro ostrícola tecnológico del estado de Tabasco, Mexico
- Sarah de Oliveira, Universidade Estadual Paulista Julio de Mesquita Filho, Brazil
- Tania Mendo, University of St. Andrews, Peru
- Eva Coronado, ENES-UNAM, Mexico

Fishing sector & Organizations

- Discussant: Silvia Salas

Speakers:

- Zoila Bustamante, Confederación nacional de pescadores artesanales de Chile
- Carlos Chapilliquen, Caleta de Cabo Blanco, Peru
- Rudy Joaquin Abad Cetina, CANAIPESCA, Mexico
- Citlalli Gómez Lepe, Consejo Mexicano de promoción de los productos pesqueros y acuícolas, Mexico

Fishery products are among the most traded food worldwide commodities and its demand keep on growing as they integrate into the global economy.

Overall, developing countries export close to 50% of total export value; and small-scale fisheries (SSF) play an important role in this trade. However, the global trade not always can ensure food security of those countries and fishing communities, and the economic benefits are not necessarily balanced across value chains or among countries that trade regularly. Economically, small-scale artisanal fisheries often face power imbalances in value chains, unnecessary barriers to trade, and a lack of the appropriate skills and services to access markets with healthy products at a fair price. Recognizing SSF as an essential player in the value chain and the need to face challenges in the governance of these value chains are essential. It is necessary to ensure strengthen the existing capacity and networks to generate resilient and viable communities that can enhance sustainability in fisheries and their governance, social development, and well-being. Key questions to be addressed are how to generate resilient and viable communities to enhance SSF's value chain sustainability and their governance, and main challenges in trading processes and how to face them.

BREAK (16:00 – 16:15)

PLENARY SESSION #6 – Strengthening Transdisciplinary Knowledge

Thursday, October 27th, 17:00 – 19:00

Location: CIC Salon 25

Organizers:

- Minerva Arce Ibarra, El Colegio de la Frontera Sur (ECOSUR Chetumal), Mexico
- Milena Arias Schreiber, University of Gothenburg, Sweden

Panel #1: Academia

Speakers:

- Eric Wade, Department of Coastal Studies at East Carolina University, Belize
- Ana Cinti, Centro para el Estudio de Sistemas Marinos (CESIMAR), CCT CONICET-CENPAT, Argentina
- Leandro Castello, Virginia Polytechnic Institute and State University, US/ Chile
- Ana Paula Rainho, Brazil

Panel #2: Transdisciplinarity in practice

Speakers:

- Marcelo Cruz, Traditional fisher at Sarteneja, Belize
- Arturo Milán Alonso, Secretaría de Pesca y Acuacultura Sustentables de Yucatán (SEPASY), Mexico
- Alexis Nakandakari, The Nature Conservancy, Oceans Program, Peru
- María José Barragán Paladines, Charles Darwin Foundation, Ecuador

In the last two decades, interest has arisen in applying transdisciplinary approaches in different academic areas and diverse stakeholders' activities. In artisanal fisheries, this type of approach has been used from at least two main perspectives; the first one uses a conceptual framework from systems thinking and governance theories, and the second one, a framework where epistemologies or the ways in which new knowledge is created are in focus. Considering both perspectives, this session offers a stimulating opportunity to take up the arguments of the Chilean Max-Neef, who postulates that transdisciplinarity is both a tool and a "project under construction". This plenary presents and discusses transdisciplinary experiences aimed at integrating practitioners, policymakers, and academic and non-academic stakeholders in the process of co-developing and cooperatively producing transformational solutions in small-scale fisheries. It should evaluate how this tool or project can support the solution of big questions surrounding artisanal fisheries in Latin America and the Caribbean related to their viability and sustainability, including the cohesion of fishing communities where fishermen, as a collective, collaborate and become stronger in the face of the many challenges they face.

FINAL SUMMARY AND CLOSING REMARKS

Thursday, October 27th, 19:00 – 20:00

Location: CIC Salon 25

Moderators:

- Ratana Chuenpagdee & Silvia Salas

Individual abstracts

Emerging marketing opportunities for small-scale fisheries in Latin America and the Caribbean during the COVID-19 crisis

Almine, Nova^{1,2,3} and Ratana Chuenpagdee^{1,2,3}

¹Memorial University of Newfoundland, St. John's, Canada

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In Latin America, between 70-80% of the fish produced by small-scale fisheries is marketed fresh, while the rest is processed for domestic consumption or trade. During the pandemic, health protocols were proposed by the World Health Organization, and markets, fairs, and supermarkets closed their doors or reduced their facility's capacity, thus promoting alternative ways to offer their products using short food supply chain (SFSC). Online commerce has been vital during this time as an adaptation using technology by local traders, even though it is still in its infancy in Latin America. Stimulated by increased use of mobile devices, access, and improvements in Internet connectivity, and accelerated by the pandemic, e-commerce has become popular. Countries in Latin America and the Caribbean implemented various initiatives to increase MSMEs participation in e-commerce. As the COVID-19 pandemic progressed, consumption of processed products increased, probably due to their storability, affordability, and accessibility, thus, becoming the primary option for the population whose purchasing power was severely affected by the COVID-19 crisis. During the pandemic, business-to-consumer (B2C) and business-to-business (B2B) e-commerce platforms have partly addressed access to perishable products such as fruits, vegetables, dairy products, meat, fish, and semi-prepared food products. Processed seafood products such as dried fish have become a healthy option. Overall, expanding the use of e-commerce is a massive opportunity for Latin America and the Caribbean. However, in addition to the challenges faced by traditional trade, other barriers affect online commerce. Moreover, fish marketing, quality improvement of fisheries products, and intermediation processes within the market chain are critical points for developing small-scale fisheries and the value chain.

Strengthening the value chain and the scientific knowledge relative to the blue swimming crab *Callinectes sapidus* in Sabancuy-Isla Aguada, Campeche, Mexico

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Through a fishery improvement project (FIP) with collaboration between fishers, permit holders, members of a fishing plant, and CeDePesca, the growth, mortality, recruitment pattern, and yield-per-recruit of the swimming crab *Callinectes sapidus* exploited in Isla Aguada, Laguna de Términos, Campeche, Mexico were estimated using data collected between May 2019 and March 2020. 99% of the specimens met the legal size. The width of the carapace (Wc) sampled ranged between 90 and 185 mm. The male/female ratio was 1:4,7. From the data, the size of first maturity was estimated to be 132 mm Wc, a value higher than the legal minimum size. Fishing and exploitation mortality rates indicate full exploitation of the resource, but still below the estimated Emax (R/Y). This activity demonstrates how collaboration between different actors in the value chain has the potential to develop processes for the generation of information and capacity building in small communities. The FIP seeks to encourage fishers, permit holders and business owners to reflect on the impact of their actions on the sustainability of the fishery and its benefits for the community.

Are the temporal changes observed in the reproductive biology of the estuarine Conguito sea catfish related to increased small-scale fishing effort in the northwestern Pacific coast of Mexico?

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Biological parameters relating to the reproductive biology of Conguito sea catfish *Cathorops liropus* were investigated from 1979 to 1984 and 2015 to 2018, from an estuarine system in the northwestern Pacific coast of Mexico. In the first period, the spawning season occurred during the dry and warm season (April to June), according to the percentage of mature females and the highest GSI values. Mean TL was 12.3 cm, two cohorts were found, the length at maturity was 18.6 cm, and the fecundity was 24.47 oocytes/organism. In the second period, the spawning season extended to the rainy and warm season (July-October) as reflected by the percentage of mature females and the GSI values. Mean TL was 11.6 cm., length at maturity decreased to 17.1 cm, and the fecundity (oocytes/organism) decreased to 20.67, indicating a reduction in the size-based indicators, and a change in the spawning period and reproductive effort as time passed. The number of skiffs increased from 1,103 in 1980 to 2,434 in 2019, representing a 220% increase, and the landings increased from 400 metric tons to 3,432 metric tons in the same period. Temporal trends in surface water temperature, salinity, and the Oceanic Niño Index do not explain the observed changes between the studied periods. These results suggest that the observed changes in the reproductive potential of Conguito sea catfish have been at least partially due to fishing.

Analysis of the ex-vessels price and the capture effort of *Octopus maya* in the artisanal fleet of Campeche

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Octopus maya represents the most valuable fishery resource throughout its distribution range. Due to this, it influences social, economic, and environmental aspects of local activity. However, it is widely known about the declining trend of fisheries worldwide and how a large portion of artisanal fishermen, has not been able to achieve adequate social and

economic well-being to meet their health and education needs. Hence, this work aims to analyze the bioeconomic situation of artisanal fishermen regarding the ex-vessels price, catch per unit of effort (CPUE), and variable costs. During the octopus fishing season from 2018 to 2021, landings of randomly selected boats from the artisanal fishery of five main capture areas on the coast of Campeche: Isla Arena, Campeche, Seybaplaya, Champoton, and Sabancuy, were analyzed monthly. In each location, a sample size of 300 O. maya organisms per month were registered. An interview was conducted with each boat captain, focusing on the fishing effort, CPUE, variable costs, and ex-vessels price. With this information, the total daily economic revenues and the variable costs per fishing trip were obtained. Using a one-way ANOVA we are going to test for differences in the price during different months. With a Generalized linear model (GLM) we pretend to analyze whether there is a significant effect on the CPUE per location and the ex-vessels price. Using the first sales price in relation to the variables analyzed in this study can contribute to evaluate how the local economies based on small-scale fisheries are behaving toward well-being.

Small-scale fisheries on the Southern coast of Jalisco: understanding communication structures to build collaboration networks

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MEXCAL: Moving towards resilient fisheries in northwestern Mexico

Scientific knowledge is necessary to contribute to the responsible use of fishery resources. However, the generation and communication of scientific knowledge related to fisheries should go beyond what has been carried out until today. Social network analysis (SNA) has been used to study how scientific knowledge is shared. We used SNA to visualize and understand

the information flow between three sectors involved in the small-scale fisheries (SSF) of the Southern Coast of Jalisco, México: fishers, academia, and government. We found that the governmental sector plays a central role and can collect information, yet it has not done enough to share it effectively. On the other hand, while the academic sector is a reliable and constant source of information, it has a peripheral role. There is a lack of communication strategies to share the knowledge generated. We discuss some of the challenges and obstacles faced by research institutions that seek to have more impact on SSF. Also, we examined if the problems and needs of the fishers are important aspects to develop new scientific knowledge. Distrust, language differences, lack of cooperation and leadership within the fishing organizations, and a lack of empathy between the actors are obstacles that add complexity to the discussion of action plans. Finally, to share our work, printed materials with the main results of the research were produced and delivered.

Small-scale fishermen's perceptions about fishing activity and general environment

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Coastal fishing is very important for the livelihoods of coastal populations in Latin American countries, whether commercial or for family consumption. Fishing activity has a strong impact on ecosystems, so analysing these problems and the key actors involved can help to reduce negative impacts. This work tries to understand the perceptions and values of artisanal fishermen in Banderas Bay about fishing and the environment in general. We administered 120 questionnaires to independent and cooperative organized artisanal fishers along the coast of the Bahía de Banderas, on the Pacific Coast of Mexico. The questionnaires asked about demographics, fishery management, fish stocks and, using the new ecological paradigm (NEP scale), environmental values (anthropocentric/ecocentric) with 15 statements. It was found that there is a marked tendency of ageing anglers with a low level of education and more than half of them have another occupation. The future of fishing is perceived as worse. They believe that

fish are disappearing from traditional fishing grounds due to, among other things, the fishing practices of others. Respondents indicated that fishery managers need to do their job (e.g. resource monitoring, enforcement) and apply fisheries laws in order to help improve regional fisheries. Anglers mostly have ecocentric leaning values (<3-5) although some of their practices are not in line with what they believe.

From legal frameworks to practice: challenges for implementing the SSF Guidelines in Argentina

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Argentina has a huge marine wealth associated with its fish resources, which support several high-volume, export-oriented industrial fisheries with total landings close to 800,000 tons. Compared to the industrial sector which expanded greatly over the last 40 years, artisanal fisheries have remained insignificant in terms of landings and value, receiving little attention from governments despite their local importance. Argentina is a federal country with five coastal provinces which have jurisdiction and rule over the marine resources within 12 nautical miles from the shore (also in the gulfs). As each province manages artisanal fisheries within its territorial

waters, the importance assigned to them, the legal frameworks available and their degree of application vary greatly among provinces. In a few cases, municipal governments become involved with small-scale fisheries and have generated policies. Given the complex multilevel governance of small-scale fisheries, we reviewed the main national and provincial laws and policies, and the few cases that were litigated in court, to evaluate the extent of adherence -in written form- to the principles of the SSF guidelines. This review was complemented by a detailed analysis of the legal instruments in use, fishers' knowledge about these instruments, and perceptions of key actors involved in judicialized cases from Buenos Aires and Chubut, two provinces with a long history and large development of small-scale fisheries. These cases illustrate the main limitations and challenges faced by the artisanal sector, and how far the country is from implementing the guidelines.

Increasing Mexican Fishing Cooperative Resilience to Climate Change

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Climate change is already having a diversity of harmful impacts on marine ecosystems around the globe. Not only do these impacts affect marine organisms, but they can have consequences for people living in the coastal communities who depend on marine fisheries for sustenance, income, and to maintain their cultural practices. On the Baja California peninsula, small-scale fisheries (SSF) have historically adapted to natural variability in climate and oceanographic conditions by developing a high diversity of target species, fishing methods, and income activities that complement fishing. Additionally, fishing cooperatives across the peninsula have implemented sustainable co-governance practices for managing their marine resources and have demonstrated successful collective action in response to a range of socioeconomic and ecological problems. Current climate change,

however, challenges the adaptive capacity of these SSF. Some communities already hold the key to designing and implementing adaptive strategies in response to impacts of climate change, but knowledge tends to remain secluded within each community. By increasing the knowledge exchange around adaptive strategies to climate change, we hope to strengthen the collective response of SSF to climate change by allowing communities to take advantage of the knowledge and experience of their peers. We interviewed leaders from ten cooperatives from the Vizcaíno Peninsula to gather preliminary information on the adaptive strategies currently in use in their communities. Using this interview data, we begin identifying the underlying conditions that enable the implementation of adaptation strategies. In doing so, we hope that this knowledge can be more effectively operationalized between communities.

Analyzing the governing system and interactions between small-scale fisheries and the oil industry in the Gulf of Mexico

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In marine regions where small-scale fisheries (SSF) and the oil industry coexist in a common space, the government system is shared by both activities, and unclear limits of structure, functions and socio-ecological responsibilities occur. Through an institutional mapping approach, this paper aims to examine the government sectors linked to the fishing and oil industries in the Southern Gulf of Mexico (SGM) to understand the governance and to answer questions such as, how the governing system looks like? and what are the common responsibilities over environmental and socioeconomic attributes? As a result of the mapping, 40 agencies were classified, each of them clustered in six secretariats (Oil, Natural resources and environmental (SSF), Navy, transportation, and social wellbeing), this result showed the diversity and disbalance of power of the governing system. Secretariats linked to the oil industry promote economic growth, social development, and environmental protection, and they have established exclusion zones for SSF activities. On the other hand, agencies linked to SSF are focused on natural resource protection based on closed season and legal-size; economic growth and social development are poorly

considered as part of their responsibilities. SSF and people from coastal communities face complex new Blue (in) Justice scenarios. This exploration helps to understand the issues and strengths of the government's plans and the lack of linking up between SSF and the oil industry to achieve sustainable development. Also, could contribute to identifying where academia, NGOs, and private sectors, can collaborate with the government to achieve sustainable SSF in the SGM.

Effect of dredging on artisanal fishing in the Colombian Pacific

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Dredging is anthropic activities that can modify the habitat of species and, consequently, affect the ecosystem service associated with artisanal fishing. The objective of the present study was to determine the changes in the density and biomass of fish in Buenaventura Bay in relation to the multiple dredging. For this, fish monitoring was carried out using an artisanal trawl net, from 2015 to 2021, with annual sampling that covered the dry and rainy seasons, in three areas of the bay. Changes in fish community biomass and density were examined by permutational analysis of variance. The general trend was a decrease in fish biomass and density over time. Species density decreased significantly after the 2015 dredging (0.06 ± 0.02 ind/m²). After the 2017 dredging, the density increased, but the biomass decreased significantly (2.01 ± 0.19 g/m²). It was found that from this event, the fish community presented a change towards a high density of low biomass species. As a possible effect of the 2020 dredging, both density (0.02 ± 0.01 ind/m²) and biomass (0.92 ± 0.12 g/m²) decreased significantly, indicating a possible synergistic and cumulative impact of multiple dredging in the bay. The results may indicate a change in the composition and structure of the community, due to the mechanism of species replacement, since the disturbances caused by dredging can affect the bottom habitats and generate the migration of large species, being replaced by pioneer species,

with high density and low biomass, which can affect the yields of artisanal fishing and the food security of fishermen in the region.

Biomass dynamic model for multiple data series: An improved approach for the management of the red grouper (*Epinephelus morio*) fishery of the Campeche Bank, Mexico

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This study analyzed the current status of the population and stock assessment of the red grouper *Epinephelus morio* from the Campeche Bank, Yucatán, based on the Schaefer biomass dynamic model and considering the three fleets that operate in the study area. Thus, five indices of relative abundance were used, expressed as catch-per-unit effort (CPUE). The carrying capacity (K) of the red grouper population was 293,851 t, with an intrinsic growth rate (r) of 0.232. The study indicated that the greatest contribution to the adjustment of the model was due to the CPUE of the industrial Mexican fleet. The catchability values showed differences between the fractions of red grouper caught using trips or hooks. Estimates of maximum sustainable yield (MSY = 17,031 t) and biomass at MSY (B_{MSY} = 146,929 t) indicated that the current catch and the biomass are below their reference points, denoting a marine resource that has been overharvested. Historical analysis of the biomass and harvest ratio for the red grouper estimated from the Kobe diagram showed that the red grouper fishery has transitioned from overfished-overharvested from 1984 to 2014 to overfished-underharvested in 2015. Because the *E. morio* stock is particularly low in abundance, catches must be drastically reduced to allow the stock to recover more quickly. Only low quotas (3,200–4,000 t) or an annual harvest rate of 6% will reach the B_{MSY} in the long term, recognizing that for both management strategies the MSY will not be reached for at least 15 years.

Resilience of the Cienaga Grande de Santa Marta: Incidence of artisanal fishing in the structure of the ecosystem

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The Ciénaga Grande de Santa Marta (CGSM), a coastal estuarine system, provides us with various ecosystem services that have withstood the onslaught of human and environmental impacts. This area is used by more than 3,000 fishermen who annually extract more than 6,000 tons of fishery resources. This landing value showed a decrease since 2006, but in 2017, with interventions to increase the flow of fresh water to the estuary, a recovery in landings was denoted. A stock assessment of the main species shows that all are at a level of maximum sustainable yield, so despite the impacts, the production of the system is maintained. The mean catch length of the fish, at least 50% of the main species, are below the size at maturity, which indicates a possible growth overfishing of these species. Despite this, some species, as a survival strategy, have decreased their size at maturity in recent years. An analysis of the trophic structure including the incidence of fishing, showed that the cienaga, in thermodynamic terms, despite the anthropic and environmental impacts, its "self-organization" makes it a resilient ecosystem. This resilience of the CGSM is due in turn to the complex and varied composition of the food web, which reduces competition and therefore the negative effect of fishing pressure, which can contribute to the response process to disturbance. However, the negative effect would be higher if the amount of removed biomass is increased, affecting the entire ecosystem due to the complexity of its food web.

Diversification of fishing strategies of the small-scale fishing fleet operating in Celestún, Yucatán, Mexico

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Small-scale fisheries are important to food security and employ thousands of people worldwide. However, fisheries are an extractive activity that depends on the availability of fishing resources, climatic variability, management regulations, and processes derived from climate change. To cope with these factors, fishers can diversify their fishing strategies to ensure their income. The aim of this study is to identify the fishing strategies developed by fishers in Celestún, in terms of their zones of operation and their income in each zone and consider regulations in the marine zone and the Ria Celestún Biosphere Reserve. We analyzed data from fishers' interviews performed during 2021, and official landings from 2000 to 2018. Our results showed that some fishers prefer to operate exclusively in the marine zone, other group of fishers only operate within the Reserve, and there are fishers that alternate their operations both, the marine area, and the Reserve. Fishers operating in the marine zone expect high revenues with high risk, fishers within the Reserve expect low revenues but constant, and fishers that alternate their fishing activities operate in the reserve when climate does not allow to fish in the marine zone. We discuss the challenges that represent the diversification of fishing strategies for management.

Digital transformations to the Belize lobster fishery that have resulted in the Belize Spiny Lobster Fishery Improvement Project achieving an 'A' rating

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Belize has a small-scale Caribbean Spiny lobster (*Panulirus argus*) fishery, primarily exporting frozen lobster tails to the USA, and contributing 9.67% towards total national exports. Two fishing cooperatives (National and Northern) account for approximately 70% of lobster exports, and provide significant benefits to their members as well as a mechanism for fishers to participate in fishery management. In recent years, increased competition, climate change and COVID-19 impacts have undermined sustainability of the cooperatives and the lobster industry as a whole. In response, The Nature Conservancy (TNC) partnered with both cooperatives to implement

a combined triple impact Fisheries Improvement Project and Fishery Development Model (FIP+FDM), an internationally recognized mechanism for improved communication and collaboration between industry, government, NGOs and academia to address challenges in the fishery, bringing it closer to eligibility for internationally esteemed certification. Success stories of the FIP so far include installation of an electronic traceability system in both cooperatives, piloting of a Vessel Monitoring System, passing of the 2020 Fisheries Resources Act, and a lobster trap and casita inventory study. These interventions have resulted in the FIP+FDM receiving an 'A' rating on FisheryProgress.org. TNC is now supporting market research and the creation of demand and supply for a new Verified Premium Standard (VPS) storied lobster product from Belize. The aim is to improve access to high-value niche markets seeking verifiably sustainable and premium quality products from well-performing FIPs, thereby creating economic incentives for fishers to transition to ecologically sustainable fishing methods that improve stock health and livelihood resilience. Means of quality and sustainability verification require establishment of data-linkages between various existent digital platforms capturing enforcement and landings data, and making product attribute information accessible to consumers through digitised product labelling. The outputs will provide a replicable and scalable model for expansion nationally and regionally, and contribute to the United Nations Sustainable Development Goal 14.

Towards a co-designed conservation program to reduce sea turtle bycatch in artisanal fisheries from Buenos Aires

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The artisanal fisheries from the Buenos Aires coast of Argentina are highly informal, and as a result, the fishing communities face many challenges, such as not having the proper port infrastructure, competition with bigger fleets for marine resources, and lack of engagement in management or governance by local fishery agencies. Despite not receiving governmental support, these fisheries can be severely sanctioned or even flagged as “anti-ecological” groups if they contribute to accidental capture (bycatch) of

endangered species. Leatherback turtles (*Dermochelys coriacia*), Loggerhead turtles (*Caretta caretta*), and Green turtles (*Chelonia mydas*) are all particularly vulnerable to small-scale fisheries bycatch in Buenos Aires and are of high conservation priority. Spatial overlap in artisanal fishing efforts with seasonal feeding grounds of these species leads to instances of turtle entanglement in fishing gear. Because of the informal nature of the artisanal fishing activity, official catch rates of target and non-target species, types of fishing gear, and seasonal fishing activity are not well documented. To understand why, where, and when bycatch happens in Buenos Aires, this project will estimate the temporal and spatial variation of bycatch numbers between 2004 and 2018 using existing data. Results of this analysis will be shared with the local fisheries in order to initiate dialogue around sea turtle bycatch solutions that are co-produced and led by fishers. This research aims to recognize fishers' critical roles in providing seafood to local communities, accumulating knowledge about their fisheries, and developing management solutions that lead to more sustainable, equitable, and enduring outcomes.

Local knowledge and perceptions of fishermen of Red Crab (*Ucides occidentalis*) and Concha Prieta (*Anadara tuberculosa*) in the face of the Custody Areas and Sustainable Use of the Mangrove Ecosystem, in the Gulf of Guayaquil, Ecuador

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Artisanal fishing is one of the most important economic activities for the coastal region of Ecuador, since this activity provides work and food to millions of its inhabitants. Among the various fishing resources that are part of this activity, the red crab (*Ucides occidentalis*) and the concha prieta (*Anadara tuberculosa*), constitute the economic base of many families settled in the mangrove; however, these resources are being overharvested, which may endanger their livelihoods, as well as the livelihood of the families of these fishermen, in the medium and long term. This study aims to analyze the perceptions and local-ecological knowledge of red crab collectors about the perception they have about the "Agreements and Sustainable Uses for the Custody of the Mangrove Ecosystem" (AUSCEM), as a management tool. Participatory contemplated in the Ecuadorian legal framework, under which the mangrove forests are handed over in custody to ancestral users settled along the coastal profile, in order to conserve and

protect the mangroves. The research follows the approach put forward by Kay Milton, who argues that the way people understand their environment stems from the way they use it and how they live within it. It has a descriptive-qualitative approach, with a participant observation technique, and a semi-structured interview of 21 questions, alternating between open and closed questions. The interviews were conducted with crab and shell collectors who carry out their activities in the provinces of Guayas and El Oro, between January and April 2021. The results of this work contribute to the understanding of the human dimension of *cangrejo rojo* and *concha prieta* collectors to the conservation of the mangrove ecosystem in the provinces of Guayas and El Oro, and to the strengthening of the Mangrove Custody and Sustainable Use Agreements. The fishermen interviewed consider that the AUSCEM legal instrument has helped to protect the mangroves and, consequently, the resources; red crab and brown shell.

The Power of Learning Networks Among Small Scale Fishing Communities

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A team of researchers from the Transformations Community University of Colorado Boulder will present their findings from a comparison of some of the world's leading community learning networks to promote local and traditional small-scale fisheries management practices. Our particular focus is on island nations, with a focus on Latin America and the Caribbean. We focus specifically on 6 dimensions: We will develop and curate a collection of transformations organization exemplars, focusing on six critical dimensions: Organizational structure Process design Leadership Evaluation/Assessment Knowledge practices (particularly decolonization and co-production) Well-being Comparison of networks across these six dimensions will enable us to identify best practices in the design and management of these networks, which are proving to be a powerful way to empower local communities while exploring leverage points for systems change.

Community-based marine reserves: implementation and development of Fisheries Refuge Zones

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Community-based marine reserves arise as a tool to promote community' inclusion in the administration of their own resources, and are useful with regards to centralized management. In Mexico, the Fishing Refuge Zones (FRZ) are non-fishing areas, based on horizontal collaboration, for the purpose of restoring and conserving commercial important fishing resources. The aim of this work is to rebuild the history of the FRZ, from the creation to the development of this community-based fishing management tool. A bibliographic review and semi-structured interviews were carried out with key stakeholders (NGOs, leaders of government institutions and fishers), involved in the definition, development and normalization of the FRZ. The establishment of the first FRZs, in 2012, was the result of fishermen's interest in getting involved in the management of their resources, the involvement of CSOs, and the definition of FRZs in the Fisheries Law. In addition, the fishing authority's interest in establishing no-fishing zones, which would not fall under the jurisdiction of environmental governance, led to their normalization in 2014. The results of the interviews suggest that the FRZs are satisfactory for the fishing communities due to the temporality and flexibility of the instrument, as well as its renewal potential. The full ZRPs are the first Mexican fishing instrument involved in the conservation of marine ecosystems.

Indicadores productivos y socioeconómicos de la cadena de valor del sector pesquero de Piura

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La región Piura representa el principal polo de desarrollo pesquero del Perú. Concentra aproximadamente el 30% de la pesca artesanal nacional y el 50% del procesamiento nacional. Entre 2008-2012 se estimó que la pesca contribuye en 5% del PBI regional de Piura, frente al aporte promedio nacional de 1.2% (Galarza y Kamiche, 2015). A pesar de la importancia de la pesquería de Piura, no existen análisis integrales del aporte productivo y socioeconómico de estas actividades bajo un enfoque de cadena de valor, con el fin de diseñar políticas que favorezcan el desarrollo de la pesca artesanal, el empleo y la seguridad alimentaria. Este trabajo caracteriza la cadena de valor de la actividad pesquera de 13 métiers que operan en Piura durante el año 2014, estimando indicadores de producción, empleo y valor agregado. Se utilizó información estadística y entrevistas a actores claves, los datos fueron analizados utilizando value chain plug-in de Ecopath con Ecosim. Se obtuvo que la pesquería en Piura en 2014 generó US\$ 1,771 millones en ingresos, US\$ 700 millones en valor agregado y 49,000 empleos, la mayor proveniente de pesquerías artesanales. Se discute la necesidad de enfocar las políticas de gestión pesquera hacia el desarrollo de la pesca artesanal y generación de valor agregado, buscando estrategias que incrementen la resiliencia ante shocks ambientales o sociales.

Breaking paradigms in the management of the artisanal fishery for octopus *O. insularis* in the southwestern Gulf of Mexico

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The *O. insularis* octopus fishery in the southwestern Gulf of Mexico has traditionally been managed based on the Official Mexican Norms NOM-009-PESC 1993, NOM-008-SAG/PESC-2015 and the Agreement published in the Official Gazette of the Federation on June 11, 2012. The productive sector of Veracruz in 2006 and 2020 have identified discrepancies based on the knowledge about the species, which led to the evaluation of the stock with the participation of the academic and government sector. In order to scientifically support the modification of the current regulations by identifying the scenario that best balances the viability of the octopus population subject to exploitation and maximizes the economic

performance of the fishery, 6 management scenarios were tested from two time series (2006-2007 and 2017-2018), considering different closure periods and minimum catch sizes, starting from the base scenario (status quo) that represents the current management conditions of the octopus in the Veracruz Reef System. The results indicate that in order to balance the conservation of the octopus resource with acceptable levels of exploitation and well-being for the productive sector, the current management approach must be modified, favoring fishing over large individuals, which means eliminating the current winter closure and concentrating the period of no fishing in the protection of recruitment and its growth during summer-autumn. In addition, it is essential to update the minimum legal catch size and tolerate up to 30% of individuals below this size to facilitate inspection and surveillance tasks. As well as, establish the size of the opening of the pulpero hook to increase the selectivity to large sizes. The participation of the productive sector in the generation of management proposals aims to improve the process of using the octopus resource and compliance with regulations in order to achieve sustainability.

High volume fisheries bias efforts to manage locally important fisheries in Mexico

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Only three fisheries stand out when reviewing Mexican fisheries by volume: sardine, shrimp and tuna. However, this high-volume ranking obscures other fisheries that contribute largely to local, regional and national economy and food security. Present study analyzed the importance of all fisheries based on their social importance using the Standardized Index of Fishery Relative Importance (SIFRI) for each fishery. Results show that the North Pacific region was the most fishery diverse (62 different fisheries in 4 states), compared to the rest of the country (51 in 13 states). The finfish fishery was the most important fishery nationwide with SIFRI = 1, followed by shrimp (0.71), freshwater finfish (0.44), sharks (0.31) and octopus (0.19). Based on the SIFRI, tuna and sardine fall to the 10th and 13th place of importance, respectively, due to the low number of permit holders and vessels involved in those fisheries. Consistently, when observed regionally and locally, finfish

fishery was the most important fishery by region and statewide. In addition, when removing sardine, shrimp and tuna volumes from historical total catch, finfish fishery accounts for 41.4% of total catch, followed by "others" that include shellfish, lobsters, abalones, urchins and sea cucumbers (21%); mojarra, sharks and rays are also important in catch volumes (6% and 2%, respectively). Our results suggest that "volume" approaches to assess the importance of a fishery bias attention, regulation and management efforts and leave important fisheries vulnerable, exposing species and communities to unsustainable practices and poor management.

Fishers' participation in Marine Protected Areas governance in the Brazilian Northeast

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The purpose of this study is to discuss fisheries governance in sustainable use Marine Protected Areas (MPAs) in the Brazilian northeastern, fishers participation and the relationship between fishing and territory, configuring protected areas as safer spaces for the system social reproduction. Three sustainable use marine protected areas were chosen: Extractive Reserve (Resex) Acaú-Goiana, Resex de Canavieiras and Environmental Protection Area (APA) Costa dos Corais. Field trips were carried out between 2017 and 2019, in a total of 91 field days. Initially was discussed how artisanal fishing has been strengthened within the scope of international management in the last 10 years, it goes on to discuss national fishing regulations, developments in environmental policy in relation to endangered species and their impact on artisanal fishing, as well as the regulation of Protected Areas. Finally, we will delve deeper into the relationship between artisanal fisheries and governance in the analyzed protection areas. The objective was to understand social participation in local governance models with the question of whether this model would be a strategy to reconcile environmental conservation, local development, respect for traditional communities and their culture and the strengthening of governance through the participation of fishers in the taking of decision.

Impacts of fishing activities in Los Arcos de Mismaloya, conservation and protection zone, Mexico

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Fishing in conservation areas, breaks regulations that came into force when it was founded as such, Los Arcos de Mismaloya has reefs that contain resources of fishing interest with different conservation status according to IUCN. An investigation was carried out to describe the capture techniques and methods used by fishermen and the impact it generates in the Los Arcos protection zone. Through daytime monitoring with SCUBA diving at different points of the site, photos and videos were taken in order to identify the fish species and the damage caused by fishing. Six main capture methods were detected, with the hook line being the most used by fishermen. 112 species were identified, among them the Lutjanidae, Haemullidae, Serranidae and Carangidae families that have a common commercial fishing interest, four species are in vulnerability status (VU) and the Manta birostris is in danger (EN). Fishing within conservation zones is considered illegal and must be addressed, even if it does not cause damage to the marine ecosystem. Marine biodiversity is vital for the health of people and our planet. Marine protected areas must be managed effectively, as well as their resources, and regulations must be put in place to reduce overfishing practices.

A development perspective on sustainable fisheries in Latin America

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Generally speaking, sustainable fisheries projects have arisen from the premise that healthy ecosystems and stocks will lead to prosperous communities. It is understandable since more fish means more money in fishers' pockets. But, how is so that projects, where conservation efforts have contributed to development outcomes promptly, are more the exception than the rule? This premise may have worked in the context of high-value resources (Tuna, lobster, etc.) or prosperous communities, where recovery gaps or trade-offs have been minimized by economic returns or fishers' financial capacities. Latin America, however, faces development traps that

extend to fishing communities by limiting their success in fulfilling their basic needs, financial stability (living on daily basis), among others. As long as communities face those challenges, regulations and conservation measures (even established at the community level) may not be as effective and resilient as expected. Strengthening enforcement may only raise fishers' voice (ethical questioning) or their exit (more informality). A wider approach to sustainable fisheries is needed in the context of social vulnerability. Conservation efforts, even when recognized as important by communities, may not be a priority to them when their basic needs are not fulfilled. Therefore, community development work may be as needed as fisheries conservation when promoting healthy stocks in the region. Building upon social science and rural development literature, this paper provides insights into how development traps affect communities' ability to engage in sustainable fisheries practices. It also discusses a wider narrative to promote sustainable fisheries and marine conservation in the region.

Inferring ecosystem impacts of a Mexican small-scale snapper fishery through citizen science and transdisciplinary research

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The small-scale snapper fishery in the Mexican Atlantic is data-limited since the best scientific information is insufficient to determine its status. Governmental (regional level) and citizen science (local scale) data were used for fishery characterization, emphasizing the red snapper (*Lutjanus campechanus*). The citizen science data were generated by a fishing cooperative from Nuevo Campechito, Campeche. The cooperative is implementing a Fishery Improvement Project guided by the Marine Stewardship Council principles to achieve sustainability. The fishery characterization, productivity and susceptibility analysis (PSA), and ecosystem modeling (Ecopath), were used to infer fishery impacts on the Campeche and Tabasco coastal ecosystem. In all states, red snapper's official annual landings indicated relative stability after 2000, with the highest average landings in Tabasco. Citizen science data showed that the

fishery is highly selective for snappers due to the use of species-specific gears in areas far from the shore. Although bycatch (n=20 species) included five species with an IUCN risk category and two sharks in CITES Appendix II, they represented a low catch percentage (<2%) of citizen science records. PSA suggests the red snapper had a moderate risk, and three elasmobranchs had a high overexploitation risk. The ecosystem had a simple trophic structure and high resilience, with a strong energy flow exchange between three food web compartments. The overall results suggest that the small-scale fishery has a relatively low ecosystem impact in Tabasco and Campeche. However, for future assessments, systematic fishery monitoring to understand catch composition variations and more information on trophic web interactions is needed.

Main results of the Private Onboard Observers Program implemented in the Peruvian anchovy (*Engraulis ringens*) small-scale fishery for Direct Human Consumption in Peru between 2017 and 2020

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In the context of the Fishery Improvement Project (FIP) of the Peruvian anchovy (*Engraulis ringens*) small-scale fishery for Direct Human Consumption in Peru, a Private Onboard Observers Program is being implemented since 2017. This Program monitors fishing vessels associated to FIP partners in Sechura (Piura) and Chimbote (Ancash). In Sechura, the Program monitored 193 fishing trips and 271 hauls in two fishing periods (September 2018-March 2019, and July 2019-March 2020). An incidental catch of 2.3% and 4.9% in relation to the total catch was estimated, respectively. The incidental catch was composed of 72 and 35 taxa, respectively. The direct interactions of the fishery with seabirds and marine mammals in Sechura were found to be minimal (seabirds: 0.02% and 0.6%, respectively; marine mammals: 0.6% and 4.5%, respectively). The interaction with the habitat was also monitored, with sediments found in the fishing nets on 5% and 4% of the monitored hauls, respectively. In Chimbote, the Program monitored 331 fishing trips and 471 hauls in three fishing periods (May 2017-April 2018, April 2018-March 2019, and November 2019-December 2019). An incidental catch of 2.1%, 1%, and 2.4% in relation to the total catch was estimated for each period. The incidental catch was composed of 11, 14 and three taxa, respectively. The direct interactions with seabirds and marine mammals were also minimal in Chimbote (seabirds: 0.05%, 2.2%, and 0%, respectively; marine mammals: 0%, 0.1%, and 0%, respectively).

respectively). The interaction with the habitat was also monitored, with one haul (6.6%) presenting sediments in the fishing net.

Review of the potential oil rig decommissioning in the southern Gulf of Mexico: legal framework and needed data

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Rigs-to-Reefs, is a successful conservancy program in marine spaces where oil extraction and fisheries coexist. The usage of decommissioned oil rigs as artificial reefs has enhanced and boosted artisanal and sport fishing in the places where those activities were displaced due to oil and gas production. In Mexican waters, there's no clarity about decommissioning plans when the oil and gas extraction is no longer viable. We've analyzed the current legal framework in Mexico that would allow or prevent the establishment of oil rigs as artificial reefs. Also, we analyzed the existing databases that would permit to successfully establish a Rigs-to-Reefs program in the southern Gulf of Mexico. Such effort is the first step to design a reefing viability index to predict where it would be beneficial to reef a decommissioned oil rig.

Embarking upon the integration of recovery plans in Mexican fisheries: the case of the red grouper fishery

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Red grouper (*Epinephelus morio*) fishery is amongst the top 30 mexican fisheries by volume, and within the top 20 regarding value. There are around 12, 000 fisherfolk involved in the fishery in two fishing fleets, artisanal and mid-range, with authorized fishing licences. With the first publication of the National Fisheries Act (2000), the fishery is declared as "depleted" based on

official reference points, and regulations start addressing management of the reproductive season, minimum legal catch size, the use of certain size and type of hooks, etc. However, stock health has not improved; this situation motivates all stakeholders to look for options that promote the recovery of this fishery, quantify and involve all sources of catch and fishing mortality, account for specific data collection, include management strategy evaluations and include a participatory fisheries governance framework.

Multidisciplinary assessment of fishing communities vulnerability from the state of Rio de Janeiro: a critical analysis of the fisheries monitoring model for socioeconomic evaluations

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Brazil lacks a national policy to assess landing records and the socioeconomic profile of fisherfolk. It only exists in States forced by the national environmental agency as part of the licensing processes of companies. In Rio de Janeiro, the Fisheries Monitoring project (FM) covers 22 municipalities comprising 66 localities treated as fishing communities and register fishing landings and assesses vessel characteristics and fisherfolk profiles. The possibility of establishing vulnerability levels using this dataset is being considered. Thus, evaluating their viability as indicators is necessary. We performed a multidisciplinary assessment of fishing communities' vulnerability adapted from the Rappfish methodology. Thirty-one indicators were selected among 5 dimensions (environmental-EN, technological-TC, social-SC, economical-EC, public policies-PP). Only FM's data were used, except for three indicators. Although vulnerability didn't follow regional patterns, low rates were related to common elements: fishing areas in bays/mangroves, few municipal public policies for artisanal fisheries, and low membership in representative bodies. PP and SC indicators didn't distinguish communities with industrial fishing from those restricted to artisanal fishing, while TC and EN did. It shows the difference in vulnerability patterns among industrial fishing and industrial fisherfolk related to working conditions, which can be more precarious than for artisanal fisherfolk. Moreover, indicators used in social analyzes were broken down into three dimensions (SC,EN,PP), diluting the impact on social

vulnerability, while other important elements were lacking in SC dimension (e.g. health and food insecurities, urban violence, territory loss). Brazilian FM needs to continue to be performed from a multidisciplinary perspective embracing all fisheries dimensions

Small-scale fisheries regions and fleet interactions in Baja California Sur, Mexico

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The study of the spatial and temporal distribution of fishing pressure by operative fishery units (OU) has proved useful to understand, first, the multispecific and multigear character of small-scale fisheries and, second, to examine regulation of fishing activities at the regional level. Each OU is integrated by vessels which, through similar forms of operation (gears, seasons, areas), takes advantage of the same species in the same geographic region. The relative importance of each OU depends on their contribution to the total catch, economic value, and the frequency of registration. This study shows the results from 5 different regions in the coasts of Baja California Sur, in the North Pacific of Mexico. Some similarities of the fleet operation patterns include: more than one fishing permit per fishers' economic units, the selection of a specific OU to work, as well as other aspects like abundance, price, distance to the fishing location, and official restrictions. All the OUs are relevant for the fishermen economy in the region, and their interactions involve the presence of competition, economic and social effects at different spatial and temporal scales according to the UO's histories, fishers' organizations, fisheries and climate effects, catch composition, and management measures. Also, different elements are provided to discuss the regionalization of the fishery management.

Resilience of the shrimp fishery supply network of Magdalena-Almeja Bay, Mexico

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The supply network of a socio-ecological fishery system can be defined as a complex system that includes all the elements from the process of capture, processing, distribution and marketing of a fishery product to its final consumption. Our objective is to characterize the shrimp fishery supply network of Magdalena-Almeja Bay, to identify key processes and stakeholders, and to assess resilience to the COVID-19 pandemic and the US shrimp embargo. Based on interviews with key informants, it was identified that the network is made up of different types of actors (suppliers, fishermen, processors, transporters, and retailers and wholesalers), microeconomic relationships, and kinship relationships that create moral commitment between the actors. The system proved to be resilient to the disturbances mentioned above, mainly due to the functional diversity of the actors and the use of alternative channels for the distribution of products to the local and national market. In particular, the shrimp embargo highlighted the need to access other markets (European and Asian markets) as a strategy to reduce the system's vulnerability to future risks. Finally, this study provides an opportunity to understand how the dynamics of the supply network influence the performance of the fishery and learn from the aspects that help build resilience in an increasingly globalized world.

Co-management of freshwater fisheries in the Amazon reconciles social and ecological benefits

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Overfishing is a key problem, reducing fish diversity and abundance, and threatening food security and biodiversity, particularly in freshwater

ecosystems, which are under growing pressures and poor management. However, co-management initiatives led by fishing communities to promote fisheries sustainability have been developed. Yet, the effectiveness of these co-management efforts remains poorly understood. Here, we assessed the efficacy of co-management led by small-scale fishers in the Amazon Basin whereby floodplain lakes are classified for distinct resource uses: more restrictive (protected lakes) and less restrictive (subsistence and open-access) lakes. We analyzed 1,607 fishing trips that took place in 74 lakes distributed inside and outside protected areas (PA) of the Jurua River, a tributary of the Amazon River. Using linear regression models, we assessed the effect of lake classification on fish catch and fishing revenue. We found that protected lakes provided greater fishing yields and revenue for fishers than the less subsistence and open-access lakes. The magnitude of this effect was such that there was no difference on fish catch and revenue across lakes inside and outside PAs, suggesting that fisheries co-management overrides the impact of PAs. Improving support for co-management initiatives can catalyze fisheries sustainability in the region, by providing incentives for conservation and increasing the capacity of community organizations to become government partners. Thus, the effectiveness of co-management reported here points to potentially scalable changes that can smooth the effects of overfishing and reconcile social and ecological benefits in freshwater ecosystems.

Economic impact of the sanitary contingency caused by Covid-19 on the value chain of blue abalone, *Haliotis fulgens* (Philipi, 1845), in Baja California Sur, Mexico

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Currently, abalone remains one of the most highly valued fishery products in the world. Due to the regional importance of abalone trade, it is important to analyze the direct impact of Covid-19 on the value chain. Due to the global economic crisis unleashed by the pandemic, countries focused on promoting key products to increase their exports. Frontier closed and global value chains were interrupted. The objective of this paper is to evaluate the economic impacts of the sanitary contingency in order to identify areas of opportunity and mitigate future negative fluctuations in

the sector. Eleven Notices of Arrival from 2010 to 2021 were reviewed, as well as the Statistical Yearbooks up to 2019, with which relevant information on this fishery was recovered. The Actors that participate in the Value Chain were identified and a Map of Actors was drawn up, consisting mainly of the fishing, processing, marketing and consumption link. The behavior of production was analyzed for each Economic Unit, where the three with the highest production were selected, with values of 74680 kg, 36448.5 kg, and 29236 kg. On the other hand, the behavior of the fishery in the period 2010-2021 was analyzed, showing a drop in the year 2018 and followed by another one in 2020, which does not necessarily indicate that it was caused by the Covid-19 pandemic, but it is a preliminary starting indicator for the present study.

Dispositivo de Exclusión de Capturas Incidentales con Mallas Cuadradas en Redes de Arrastre de Camarón en Sirinhaém/PE, Brasil

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Describimos los resultados de un experimento con dispositivos de exclusión de captura incidental en la pesquería de arrastre de camarón de la flota artesanal con base en Sirinhaém/PE, Brasil. Se utilizó un dispositivo de forma rectangular, tipo ojo-de-pezu, donde se colocó en la abertura una cubeta con mallas cuadradas, para retener los peces de mayor tamaño. Se realizaron 108 experimentos durante pesquerías comerciales de camarón, con el dispositivo colocado al comienzo de la bolsa de arrastre. En cuanto a la captura de camarón blanco, rosado y seabob, no hubo diferencia significativa entre la red con dispositivo y la red control, tanto en kg como en el número de individuos: camarón blanco, entre $p=0,48$ y $p=0,31$; camarón rosado, entre $p=0,73$ y $p=0,49$; y camarones seabob, $p=0,12$. La tasa de exclusión de la captura fortuita osciló entre el 5% y el 82%, lo que muestra una gran aleatoriedad. La tasa de exclusión promedio fue del 35,5% de los peces, mostrando diferencias significativas con relación a la red de control, tanto en kg como en el número de individuos. Considerando el tiempo y número de arrastres por día de actividad de los pescadores, se estima que el uso de dos redes de arrastre con el dispositivo de malla

cuadrada en embarcaciones artesanales puede excluir alrededor de 7.000 kg de captura incidental por año. Los resultados demuestran la probabilidad de mitigar los impactos negativos sobre el ecosistema, manteniendo los ingresos económicos de los pescadores y la sostenibilidad de las poblaciones de camarones y peces.

Socio-Ecological networks modeling against socio-environmental variations for small scale fisheries in the Mexican Pacific

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Coastal marine resources are worldwide essential for the well-being of human communities. Especially small-scale fisheries, which predominate in developing countries and supply almost half of the world's seafood. Comprehending socio-ecological interactions in these ecosystems is clue to understanding how they are actually functioning and how they could function in the future. For this study, we chose a fishing village in the North-East Mexican Pacific as a case study of the Baja California fisheries. The main objective of this study is: 1) built a socio ecological model of the area, 2) simulate nodes removal from social and ecologic nature to identify socio-ecological responses. First, we built a social model interviewing people from the fishing cooperative. Second, we used this social model along with an existing ecological model based in LEK to generate the socio-ecological model of the study area. Finally, we subjected the socio-ecological model to direct impacts, where the nodes disappeared following an importance order based on qualitative indicators; and random failures where nodes were removed in no specific order. Our results showed, first, a centralized social network, with well-defined subgroups and similar connections between subgroup nodes. Second, a less centralized ecological network

with homogeneous connections. Our results showed different patterns when removing nodes in a random or directed way. This indicates that the network is sensitive to different types of changes. In fact, we observed that, when social nodes are affected, they have a greater impact on the socio-ecological system than vice versa.

Formulation of balanced feed for the edible sea urchin *Tripneustes depressus* in Baja California Sur, Mexico

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The sea urchin *Tripneustes depressus* is a potential fishing resource in Baja California Sur, due to the good quality of its gonads. This is extracted from artisanal fishing (permit of fishing promotion), however, the period in which the gonads present the ideal commercialization standards is limited (May-September). An alternative to optimize the period of excellent gonadal quality is to control the nutritional quality of the food, delaying maturation and increasing the proportion of individuals in the initial stages of gonadal development. It is intended to determine if there is selection on different types of algae, and from this to create specific formulated food for the sea urchin *T. depressus*. To determine the specific composition to be used in the formulation of the balanced feed, selectivity experiments were carried out on algae and later on the feed itself. Four species of algae were tested: *Macrocystis pyrifera*, *Ulva lactuca*, *Ecklonia arborea* and *Sargassum sinicola*, the last two being selected by the organisms. Three specific balanced foods for sea urchins were formulated and elaborated, using the selected algae and other necessary ingredients for a good nutritional balance. This food can be patented for sea urchins in the international market. In the balanced feed selection experiments, the organisms showed selection for natural algae and formulated *E. arborea*. It is intended to obtain the maximum growth and the best gonadal quality using different diets, which would increase the exploitation time and the yield of the resource for aquaculture purposes.

The role of traditions, social networks, and women in unregulated artisanal fishing. The case of shrimp fishing in Celestún Yucatán

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Shrimp fishing on the coast of the Yucatan Peninsula has been restricted since 1993, and was considered one of the causes of the deterioration of the pink shrimp population in the area. Despite the above, this activity is carried out in Campeche and Yucatan. In Celestun, this activity takes place throughout the year, with a peak from November to March, with approximately 50 fishermen participating with a fishing gear called the shrimp fishing triangle. This work was based on interviews about processing, sales prices, and marketing channels. It was found that this fishery is a family activity, where men catch and women process the product in two presentations: Cooked whole and cooked whole peeled. It highlights the use of information and communication technologies (ICT) in marketing since the fisherman and his family offer their products on Facebook. A large part of the products are consumed locally, this is because it has traditionally been accepted that the shrimp from this fishery has an exquisite flavor that surpasses any other shrimp regardless of its origin. The prices of shrimp caught in Celestun are higher than the average observed at the regional or national level of shrimp of aquaculture and fishing origin. Based on the results, the added value is motivated by a local tradition that allows an economically profitable activity and helps strengthen family and social ties, It is also necessary to estimate the effect of this activity on shrimp populations and its effect on industrial fishing.