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## Artisanal fisheries in Mexico: Specific objectives

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# Strengthening the specific objectives of the white shrimp fishery *Litopenaeus vannamei* in the REBIEN, Chiapas

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### I. Introduction

Shrimp fishing represents one of the most important fisheries in Mexico, with the Mexican Pacific being the region where the largest total shrimp catch (~92%) is extracted in Mexico (SAGARPA, 2021). This fishery ranks third in terms of its fishery production volume, however, in terms of commercial value, it ranks first in Mexico. Shrimp catches in the Mexican Pacific are mainly composed of three species, blue shrimp *Litopenaeus stylirostris* (Stimpson 1871), white shrimp *L. vannamei* (Boone 1931), and brown shrimp *Farfantepenaeus californiensis* (Holmes (1900), as well as other species of penaeid shrimp. Shrimp of the genus *Litopenaeus* spend most of their time in areas influenced by or closely related to river deltas, estuaries or coastal lagoons. Migratory movements are due to the nature of their life cycle, which is dependent on estuaries or coastal lagoons, which are used as protection, feeding and growth areas.

*L. vannamei*, the white shrimp, is distributed from Sonora, Mexico to Peru. In Mexico, the highest catch values in the marine zone and protected waters are obtained in southern Sinaloa, Nayarit and the Gulf of Tehuantepec (Chiapas). It is a species that also inhabits sandy and clayey bottoms (Hendrickx, 1996). Data from the industrial fleet indicate that this species has been caught at depths of up to 50 fathoms, although the greatest abundance is found between 5 and 15 fathoms deep at sea.

Fishing activity in REBIEN is based on the exploitation of four species groups: shrimp, scalefish, crab, and mollusks. Shrimp and scalefish catches are multispecific, because other species not targeted by directed fishing are also caught in fishing gear. However, despite this

high diversity, from an economic standpoint, only a few species are exploited and considered of commercial importance, most notably the white shrimp (*Litopenaeus vannamei*).

Of all the lagoon systems in Chiapas, the Carretas-Pereyra and Chantuto -Panzacola complex constitutes the largest lagoon basin in the state, with a surface area of 21,690 hectares. Both systems are part of the La Encrucijada Biosphere Reserve (REBIEN). Fishing activity in this lagoon complex is primarily based on the exploitation of two major resources: shrimp and shrimp.



**Figure 1.** La Encrucijada Biosphere Reserve, Chiapas, Mexico (Taken from the Fisheries Management Plan: Carretas- Chantuto , REBIEN).

Considering that this Fisheries Management Plan (PMP) will be implemented within the area occupied by the La Encrucijada Biosphere Reserve (REBIEN), Chiapas, the legal instrument that will regulate the sustainable use and preservation of the natural resources found therein, so that they are compatible with obtaining economic benefits derived from the activities carried out for this purpose by the social groups that inhabit it, will be the General Law on Ecological Balance and Environmental Protection (LGEEPA) and its regulations, regarding Protected Natural Areas (ANP).

## II. Fishery management proposal

The artisanal shrimp fishery in REBIEN is carried out in lagoon and estuary systems using smaller vessels (<12 m in length). Shrimp fishing is carried out five to six days a week. Fishermen make an average of 5.7 shrimp trips per week, with an average catch of 8.9 kg per fishing trip. The average crew per fishing trip is two fishermen, the average trip duration is five hours, and the actual fishing time is 3.5 hours.

The cast net is the traditional fishing gear and is made with monofilament nylon thread of 0.20 and 0.25 mm diameter and a maximum height of up to 6 meters (Fig. 2). This is the fishing gear legally authorized for shrimp fishing in lagoon systems and, in accordance with the Mexican Official Standard NOM-002-PESC-93, must work with a mesh opening of 1.5 inches (38.1 mm).



Figure 2. Cast net fishing gear used in the shrimp fishery in the La Encrucijada Biosphere Reserve, Chiapas.

In order to understand the perspectives of fishery resource users on the purpose of the Fisheries Management Plan (PMP), the Ministry of Agriculture and Development, through the Mexican Institute for Sustainable Fisheries and Aquaculture Research (IMIPAS), held four Participatory Fisheries Planning Workshops (PPP). Two of these workshops were held in the communities of Barra de Zacapulco and La Palma, in the municipality of Acapetagua, and in Las Brisas and Ranchería Zapotal, in the municipality of Pijijiapan. These meetings were attended by 294 fishermen from 11 social organizations, which served as a basis for

understanding the proposals of the lagoon users and for initiating a process of reflection that will lead to the appropriation of the PMP itself, so that it can be established as a guiding instrument for the management of the Carretas-Pereyra and Chantuto -Panzacola lagoon systems. These workshops also conducted a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis of the artisanal fishing sector. Problems were identified by resource, and proposals were formulated by the various stakeholders. This represented a fundamental mechanism for integrating the components and actions of the PMP for the Carretas-Pereyra and Chantuto -Panzacola lagoon systems in Chiapas.

The consultation process carried out in the TPPPs involved the fishing community, as well as various government and civil society stakeholders related to fishing, and allowed for the comprehensive assessment of the environmental, social, and economic problems of fishing activity. Based on this assessment, the stakeholders proposed alternative solutions to various aspects related to the fishing problem.

This framework for active user participation established guidelines for action aimed at achieving the objectives of regulating fishing activities, protecting natural resources, and achieving social and economic benefits for users. These guidelines are based on the most reliable scientific data available, and are geared toward:

- a) Promote the coordinated participation of all stakeholders involved in fishing and aquaculture activities (inclusive), under a framework that allows for adapting, modifying, and updating actions and programs according to the needs expressed by users and the conditions established by external factors (flexible).
- b) Ensure that fishing and aquaculture activities are carried out within a regulatory framework that encourages the conservation of natural resources and promotes the productive and commercial competitiveness of the sector to increase the economic and social benefits of fishermen (sustainable).
- c) Promote training in the fishing production sector on administrative, technological, and environmental issues that strengthen users' knowledge and encourage their active participation in fisheries management based on the knowledge acquired (participatory).
- d) Promote scientific and technological research to generate knowledge on biological, environmental, technological, economic, and social aspects, to

support decision-making in fisheries management and enable the sustainable use of fishery resources.

- e) ongoing evaluation of the Fisheries Management Plan for the Carretas-Pereyra and Chantuto -Panzacola Lagoon Systems in Chiapas for its updating and strengthening (updatable).

### *Specific Objectives of the Fishery*

#### **Objectives of the fishery**

**O1:** Contribute to the conservation of the natural resources of the Carretas-Pereyra and Chantuto -Panzacola Lagoon Systems, Chiapas .

**O 2:** Contribute to ensuring the quality and safety of fishery resources for food supply.

**O 3:** Contribute to improving the environment in which the fishing resources of the Carretas-Pereyra and Chantuto -Panzacola Lagoon Systems, Chiapas and its surroundings are developed.

**O4:** Contribute to improving the quality of life of fishermen and their families.

#### **Purpose of the fishery**

The exploitation of the fishery resources of the Carretas-Pereyra and Chantuto - Panzacola Lagoon Systems, Chiapas, is carried out in a sustainable manner.

#### **Components of the fishery**

**C1 :** Environmental and fisheries indicators determined and improved .

**C2:** Increased economic value of production.

**C3:** Strengthened organizational capacity.

**C4:** Healthy Environment

#### **Line of action of the fishery**

**Table 1.** Planning matrix with lines of action by components

<b>Component 1:</b> Environmental and fisheries	1.1. Evaluate the fishery biology of the populations of the exploited resources. 1.2. Determine the environmental quality of aquatic systems. 1.3. Operate a permanent fisheries management program.
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indicators determined and improved.	1.4. Apply legal instruments, regulations and internal agreements.
<b>Component 2:</b> Increased economic value of production.	2.1 Improve the marketing of fishery products. 2.2 Develop and evaluate capture, processing and aquaculture technologies. 2.3 Implement strategies to reduce operating costs.
<b>Component 3:</b> Strengthened organizational capacity.	3.1 Operate the Responsible Fishing Sub-Council . 3.2 Improve links with sectors related to fishing.
<b>Component 4:</b> Healthy environment.	4.1. Operate a permanent environmental management and education program.

## Implementation

In order to strengthen the implementation of the PMP and to ensure that all organizations, individuals, and communities involved in fishing activities in the Carretas-Pereyra and Chantuto -Panzacola Lagoon Systems, including authorities at all three levels of government, have a stake in the PMP, the Sub-Council for Fisheries Management of the Chantuto -Panzacola and Carretas-Pereyra Lagoon Systems, Chiapas (SOP) will be established; in accordance with the provisions of Articles 17 and 24 of the LGEEPA Regulations on ANPs and Article 39, Section III of the LGPAS, with the aim of "being the consultative body which, through the active participation of its members, contributes to strengthening the management of finfish and shrimp fisheries, and to the conservation, recovery, and protection of the environment where they operate."

This Sub-Council shall draw up its own operating regulations and shall be composed as follows:

- ❖ An Executive Secretariat of the Sub-Council , which will be in charge of the Ministry of Environment and Natural Resources (SEMARNAT), through the National Commission of Natural Protected Areas (CONANP), supported by the Undersecretariat of Fisheries of the State Government, to provide timely attention to the integration of the minutes of the meetings and follow-up on the agreements reached within the SOP.

- ❖ An Executive Coordination in charge of the Ministry of Agriculture and Rural Development (SADER), through the National Commission for Aquaculture and Fisheries (CONAPESCA).
- ❖ A Technical Secretariat, headed by the representative of the REBIEN Academic Scientific Sub-Council , made up of technical and scientific specialists from the Mexican Institute for Sustainable Fisheries and Aquaculture Research (IMIPAS) , CONAPESCA, Civil Society Organizations, and national, state, and regional academic and scientific institutions.
- ❖ The Fishing Sector, represented by the Presidents of the Federations of Cooperative Societies and Fishing Permit Holders in the Chantuto -Panzacola and Carretas-Pereyra Lagoon Systems.

The SOP is expected to meet at least every four months and will be chaired by CONANP through REBIEN, with CONAPESCA serving as Executive Coordinator. The Subcouncil 's agreements will be determined by consensus and endorsed by SEMARNAT and CONAPESCA.

## References

- Arriaga, L., J.M. Espinosa, C. Aguilar, E. Martínez, L. Gómez and E. LOA (Coord.), 2000. Priority terrestrial regions of Mexico. National Commission for the Use and Knowledge of Biodiversity in Mexico. Mexico.
- Blais , Y. (Ed.). (2003). Factual record: Aquanova submission (SEM-98-006). Montreal, Quebec: Commission for Environmental Cooperation.
- Branch, TA, Jensen, OP, Ricard, D., Ye, Y., and Hilborn , R. 2011. Contrasting global trends in marine status obtained from catches and from stock assessment. *Conservation Biology* 25(4):777-786.
- Carvajal- Rascom , M.A., Torres-Origel, J.F., Farrell-Campos, S.G., Bolado- Martinez , E., and Martinez -Escalante G. 2017. Fishing in National Marshes 2001-2015. *Redes- SuMar* . November 2017. p. 36
- CONAPESCA 2020. Statistical Information by Species and Entity [https://www.conapesca.gob.mx/wb/cona/informacion\\_estadistica\\_por\\_especie\\_y\\_entidad](https://www.conapesca.gob.mx/wb/cona/informacion_estadistica_por_especie_y_entidad)
- Official Gazette of the Federation 2015. Mexican Official Standard NOM-064-SAG/PESC/SEMARNAT-2013, On prohibited capture systems, methods and techniques in fishing in waters under federal jurisdiction of the United Mexican States.
- Ezcurra, E., Barrios, E., Ezcurra, P., Ezcurra, A., Vanderplank , S, Vidal, O., Villanueva-Almanza, L and Aburto-Oropeza, O. 2019. A natural experiment reveals the impact of hydroelectric dams on the estuaries of tropical rivers. *Science Advances* <https://ezcurralab.ucr.edu/sites/g/files/rcwecm3506/files/2020-05/137.pdf>
- Flores Verdugo, FJ, González Farías, YF, Zamorano, DS, Ramírez García P., 1992. Mangrove ecosystems of the pacific coast of México: distribution, structure, litterfall and detritus dynamics, in U. Seliger (eds) *Towards the rational use of high salinity tolerant plants*. Kluwer Academic Publishers, Netherlands.
- Flores-Verdugo, F., González- Farías , F., Blanco-Correa, M., & Nuñez-Pasten , A 1997. The Teacapán -Agua Brava Marismas Nacionales mangrove ecosystem on the Pacific coast of Mexico. In: B. Kjer - fve , L. Drude , & EH Diop (Eds.). *Mangrove ecosystem studies in Latin America and Africa* (pp. 35–46). France: UNESCO .
- Flores-Verdugo, F., Amezcua, F., Kovacks , JM, Serrano, D., and Blanco-Correa, M. 2014. Changes in the Hydrological Regime 6 of Coastal Lagoons Affect Mangroves and Small-Scale Fisheries: The Case of the Mangrove-Estuarine Complex of Marismas Nacionales (Pacific Coast of Mexico). In: Amezcua , F. and Bellgraph , B (eds), *Fisheries Management of Mexican and Central American Estuaries, 81 Estuaries of the World*, DOI 10.1007 /978-94-017-8917-2\_6,
- Guillet , R. 2008. Global study of shrimp fisheries. *FAO Fisheries Technical Paper* 475.
- Hendrickx ME, 1996. The benthic Penaeoidea shrimps ( Crustacea : Decapoda : Dendobranquiata ) of the Mexican Pacific . National Commission for the Knowledge and Use of Biodiversity. Mexico . 147 p.
- INAPESCA. 2016. Assessment and Management of the Mexican Pacific Shrimp Fishery (catch, reference points, biomass, age, environment, bycatch fauna).

- INAPESCA. 2017. Decision on the start of the fishing ban. Analysis of the behavior of the shrimp fishery on the Mexican Pacific coast during the 2016-2017 season, in preparation for the implementation of the start of the fishing ban in 2017.
- Hernandez-Guzman , R., Ruiz-Luna, A., & Berlanga-Robles, CA 2008. Assessment of runoff response to landscape changes in the San Pedro subbasin (Nayarit, Me´ xico ) using remote sensing data and GIS. *Journal of Environmental Science and Health. Part A, Toxic/Hazardous Substances & Environmental Engineering*, 43, 1471–1482.
- Garcia -Carmona, J., Lopez-Florez , P.L., Fonseca-Morales, M.A. 2014. Sustainable Rural Tourism and Coastal Shrimp Fishing with Tapos, Cultural Heritage of the State of Nayarit. *EDUCATECONCIENCIA Journal*. Volume 4, No. 4. ISSN: 2007-6347 July-December 2014. Tepic, Nayarit. Mexico Pp. 79-92
- Garcia, SM 1989. The management of coastal penaeid shrimp fisheries. In 'Marine Invertebrate Fisheries: their Assessment and Management'. (Ed. JF Caddy.) pp. 281-306. (J. Wiley: New York, Chichester, Brisbane, Toronto, Singapore.)
- García, SM 1996. Stock recruitment relationships and the precautionary approach to management of tropical shrimp fisheries. *Mar Freshwater Res* 47:43-58.
- Berlanga-Robles, CA, & Ruiz-Luna, A. 2002. Land use mapping and change detection in the coastal zone of Northwest Mexico using remote sensing techniques. *Journal of Coastal Research*, 18, 514–522.
- Berlanga -Robles, CA, & Ruiz-Luna, A. 2006. Assessment of landscape changes and their effects on the San Blas estuarine system, Nayarit (Mexico), through Landsat imagery analysis. *Marine Sciences*, 32, 523–538.