DOI: 10.19136/ta.a1n2.5727
Editorial

History and Perspectives of Mariculture in Mexico

Rodrigo Martínez Moreno[1]

[1] Instituto Nacional de Pesca y Acuacultura, Centro Regional de Investigación en Pesca y Acuacultura en Manzanillo

Corresponding author. Rodrigo Martínez Moreno. Instituto Nacional de Pesca y Acuacultura, Centro Regional de Investigación en Pesca y Acuacultura en Manzanillo, rodrigo.martinez@inapesca.gob.mx.

Cite: Martínez-Moreno R (2023) History and Perspectives of Mariculture in Mexico. Tropical Aquaculture 1 (2): e5727. DOI 10.19136/ta.a1n2.5727

Editorial Received: 13 September 2023
Editorial Accepted: 14 Sepember 2023

Aquaculture directly and indirectly impacts at least 15 of the 17 United Nations Sustainable Development Goals (Troell M *et al.* 2023). According to FAO (2022), globally, mariculture produces 35.1 million tons of seaweed (both for food and non-food use), 8.3 million tons of farmed marine fish, 17.7 million tons of mollusks and 11.2 million tons of crustaceans, among other products. In Latin America, 2.6 million metric tons are produced, with Chile contributing 1.3 million metric tons due to its extensive maritime area of 2.6 million square kilometers. On the other hand, Mexico has 61.7% of its territory composed of maritime waters, with 3.1 million square kilometers of ocean, demonstrating a significant potential for mariculture in the country (Figure 1).

Figura 1.- Territorial extension of Mexico showing the territorial distribution in the Pacific and Atlantic oceans. (Image taken from Vázquez et al., 2022).

The practice of mariculture in Mexico dates back to 1915 with the pioneering cultivation of pearls worldwide. In the 1970s, advances in shrimp and oyster farming were observed, and in the 1980s, the development of techniques and biotechnologies for the cultivation of abalone (*Haliotis* spp.), mussels (*Mytilus* spp.), clams (*Argopecten* spp.) and hatchet callus (*Atrina* spp.) were boosted. Later, the 1990s marked the beginning of marine fish farming with snappers (*Lutjanus* spp.) and totoaba (*Cynoscion macdonaldi*) (Valdez 2018).

Throughout history, advances in Mexico have been remarkable, with mariculture practiced at different scales, depending on the oceanographic conditions of each region of the country. Productive activities were observed in the social sector, with medium-scale producers and companies using state-of-the-art technology, mainly in the northwestern states of Mexico (Table 1). The diversification of marine fish farming is noteworthy, including species such as bluefin tuna (*Thunnus orientalis*), striped bass (Morone saxatilis), jack mackerel (Seriola spp), totoaba (C. macdonaldi) and red snapper (*Lutjanus peru*). It is important to highlight that the CONAHCYT research centers, as well as the private sector, have contributed substantially to the technification of the farming of species such as snook (*Centropomus viridis*) and spotted rose snapper (*Lutjanus guttatus*) (CIAD, AC-Mazatlán, Maricultura del Pacífico, Mar y Cultura de C. V.), sole (*Paralichthys californicus*) (CICESE), red drum (*Sciaenops ocellatus*) (CINVESTAV, IMPESMAR), red snapper (*Ocyurus chrysurus*) (UNAM-SISAL) and others (INAPESCA, 2022a).

In the mollusk group, cultivation has been led mainly by the Japanese oyster (*Crassostrea gigas*), followed by other species such as the pleasure oyster, (*Crassostrea corteziensis*), eastern oyster (*C. virginica*), the mussel (*Mytilus galloprovincialis*), the Catarina clam (*Argopecten ventricosus*), the abalone (*Haliotis rufescens*), the chiluda and generous clams (*Panopea generosa* and *P. globosa*), lion's hand clam (*Nodipecten subnodosus*), pearl oyster (*Pteria sterna*), and scallop (*Atrina maura*) (Maeda-Martínez 2008). In terms of crustaceans, shrimp (*Litopenaeus vannamei*) is the main crustacean crop in terms of production in Mexico. Lobster (*Panulirus interruptus*) and soft crabs (*Callinectes arcuatus* in the Pacific and *Callinectes sapidus* in the Gulf of Mexico) have made incipient progress, as have protected species such as the blue crab (*Cardisoma guanhumi*) and ornamental crab (*Lysmata* sp). In other crops, such as sea cucumber (*Isostichopus fuscus* and *I. badionotus*), significant growth has been observed with investments in cultivation by the private sector (Acuacultura Dos Mil, S.A. de C.V. and Grupo Agua Marina A.C.) since the beginning of 2009. In the particular case of macroalgae cultivation, this began in the early 1920s, including green algae (*Ulva clathrata*) promoted by private initiative (Aqua Consult International) in coastal lagoons, brown algae (*Macrocystis pyrifera* and *Ecklonia arborea*) cultivated in the sea (Algas Marinas S. A. de C.V), green algae (*Ulva lactuca*) in a commercial pilot culture in earthen ponds (IIO-UABC), and experimental cultures of red algae (*Kappaphycus alvarezii*, *Pyropia perforata*, *Chondrus crispus*) carried out by IIO-UABC and CINVESTAV-IPN (INAPESCA 2022b). Together, developing cultures are focusing on the conservation and sustainable use of species such as seahorses (*H. erectus* and *H. ingens*), jellyfish (*Aurelia aurita*, *Cassiopeia* sp. and *Stomolophus meleagris*) and corals (*Pocillopora* sp. in the Pacific and *Acropora* sp. in the Caribbean).

Table 1.- Main resources produced by mariculture in Mexico.

Resource	Metric Tonnes
Shrimp	214,456
oyster	15,602
tuna	4,556
red snapper	107
snook	101
abalone	52
*CONAPESCA, 2021.	

Despite advances in research, it has been observed that there has not been a significant impact on the productive growth of mariculture in Mexico (Chong-Carrillo et al., 2023). In 2016, consolidated companies in marine fish farming in the northwest and southeast of the country disappeared completely, resulting in a shortage of hatchery production laboratories and offshore grow-out ranches. This event created an environment of uncertainty for investment and decreased domestic inputs, such as feed, equipment, and infrastructure, necessary for mariculture. Public policy plays a fundamental role in providing stability to investments and consolidating the development of a high-risk primary activity such as mariculture. Currently, the bureaucratic process to invest in mariculture in Mexico involves a series of procedures in various government entities, which can take 1.5 to 2.5 years to initiate a project in this sector (Martínez-Moreno 2022). On the other hand, the federal government has presented the National Fisheries and Aquaculture Program 2020-2024, which includes a Strategic Aquaculture Program to increase production by 20% in shrimp, freshwater fish, and bivalve mollusks. However, the methodology, indicators, and institutions responsible for this program have not yet been clearly defined. Furthermore, mariculture has not been specifically addressed or adequately differentiated from inland aquaculture (SADER 2020).

In summary, considering the fundamental importance of mariculture in Mexico's aquaculture production, it is imperative to develop a comprehensive strategy that addresses the main challenges, such as seed supply, national food production, the creation of national genetic lines, and the implementation of public policies that promote sustainable growth in production. In addition, it is essential to strengthen the capacities of the personnel involved and foster collaboration between academia and the private sector to meet short- and medium-term production needs.

Literature cited

Chong-Carrillo O, Peña Almaraz OA, Aréchiga-Palomera MA, Vega-Villasante F (2023). Aquaculture research with funding from CONAHCYT in three public research centers in Mexico. AgroProductividad, https://doi.org/10.32854/agrop.v16i7.2656

CONAPESCA (2021) Anuario estadístico de pesca y acuacultura, 290p.

FAO (2020) El estado mundial de la pesca y la acuicultura 2020. La sostenibilidad en acción. Roma. https://doi.org/10.4060/ca9229es.

FAO. (2022). El estado mundial de la pesca y la acuicultura 2022. Hacia la transformación azul. Roma, FAO. https://doi.org/10.4060/cc0461es.

INAPESCA (2022a). Foro Nacional del Cultivo de Peces Marinos. Realizado en la WAS 2021.

INAPESCA. (2022b). Foro Nacional del Cultivo de Algas. Realizado en la WAS 2021.

Maeda-Martínez AN (2008) Estado actual del cultivo de bivalvos en México. En A. Lovatelli, A. Farías e I. Uriarte (eds). Estado actual del cultivo y manejo de moluscos bivalvos y su proyección futura: factores que afectan su sustentabilidad en América Latina. Taller Técnico Regional de la FAO. 20–24 de agosto de 2007, Puerto Montt, Chile. FAO Actas de Pesca y Acuicultura, No. 12. Roma, FAO. pp. 91–100.

Martínez-Moreno R (2023). ¿Cómo iniciar un negocio de maricultura en México? Panorama Acuícola Magazine. https://panoramaacuicola.com/2022/06/06/como-iniciar-un-negocio-de-maricultura-en-mexico/. Fecha de consulta 31 de agosto de 2023.

SADER (2020) Programa Nacional de Pesca y Acuacultura 2020-2024, 73p.

Troell M, Costa-Pierce B, Stead S, Cottrell R S, Brugere C, Farmery AK, Barg U (2023) Perspectives on aquaculture's contribution to the sustainable development goals for improved human and planetary health. Journal of the World Aquaculture Society 54(2): 251-342.

Valdez MMC, Díaz GP (2018) Estudio del potencial pesquero y acuícola de Baja California Sur, 350p.

Vázquez-Vera L, Chávez-Carreño P (2022) Diagnóstico de la acuacultura en México. Fondo Mexicano para la Conservación de la Naturaleza, A.C. México, 348p.