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Results Dissemination Workshop: Comprehensive algae aquaculture development program for artisanal fishermen. Stage III

On Tuesday, September 29th, through Meet platform, Fisheries Development Institute held a Workshop to show its results for "INTEGRAL ALGAE AQUACULTURE DEVELOPMENT PROGRAM FOR ARTISAN FISHERMEN. STAGE III "

It has been carried out since 2017 within the framework of the agreement between Undersecretariat of Economy and Smaller Companies and IFOP, the scientific-technical counterpart being in this case Undersecretariat of Fisheries and Aquaculture. It is directed by IFOP researcher, Dr. Francisco Cárcamo, and made up of a working group made up of researchers and technicians based in Coquimbo, Puerto Montt and Hueihue (Chiloé).

Its general objective is to establish strategies for algae aquaculture development in Management Areas and aquaculture concessions. To achieve a better understanding of complexity of sustaina-



bly developing macroalgae aquaculture under a Small-Scale Aquaculture (SPA) scheme, this study proposes a systemic approach in its execution, considering, among others, the following work lines:

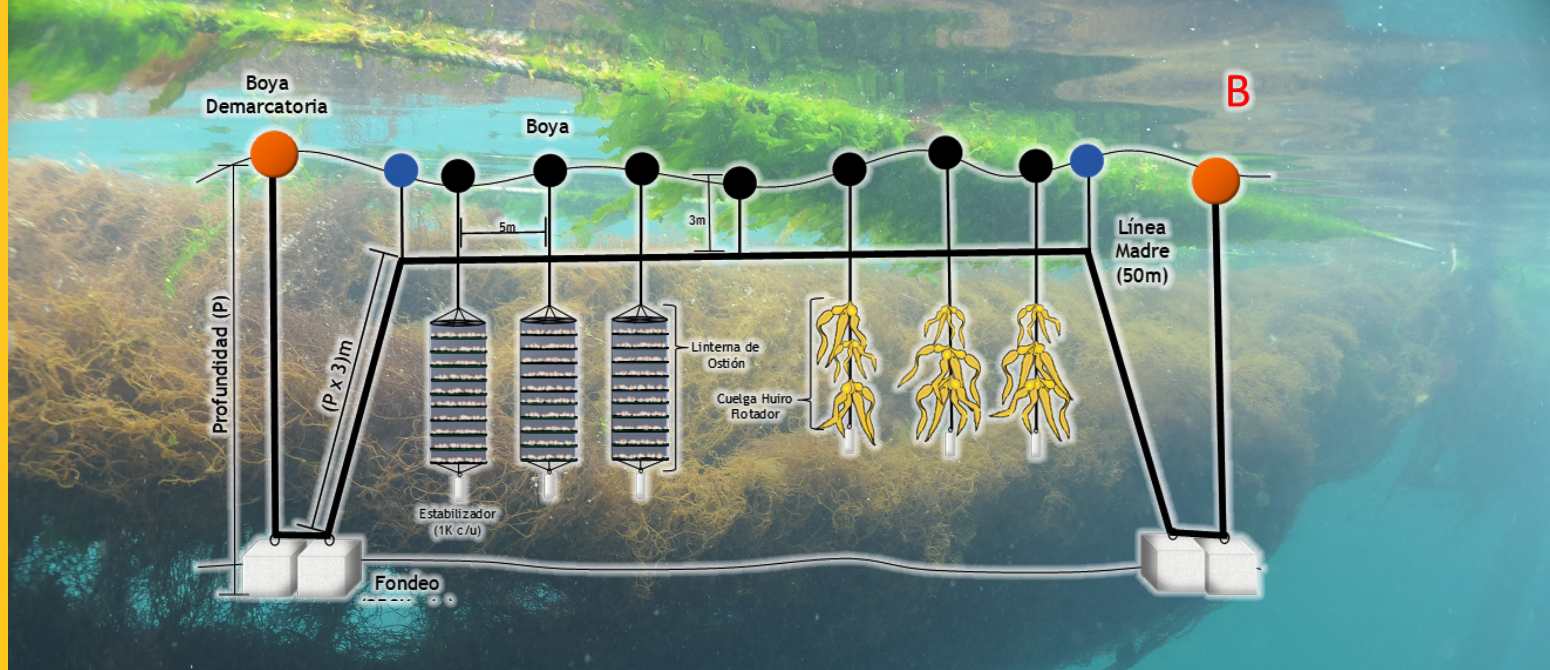


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- Cultures of macroalgae and multi-species pilot development in collaboration with artisanal fishermen and aquaculturists
- Various cultivation models Bio-economic evaluation
- Methodologies to identify optimal sites for APE development
- Socio-organizational dynamics studies that determine APE adoption
- Physiological-productive performance of macroalgae and co-cultivated bivalves evaluation
- Environmental interactions of macroalgae aquaculture and APE assessment
- Dissemination, training and transfer.

At the Workshop, part of the obtained results were presented, including the presentations of:

Francisco Galleguillos (Marine Biologist-IFOP Researcher) referred to technical-economic-normative feasibility of implementing multi-species crops as a productive model to develop EPA in Chile.

Sebastián Cook (Marine Biologist-IFOP Researcher), presented main productive and environmental results of macroalgae crops (pelillo *Agarophyton chilense*, chicorea de mar *Chondracanthus chamissoi*, huiro *Macrocystis pyrifera*) and co-cultures (pelillo with oyster *Crassostrea gigas* and chicorea with mussel *Mytilus chilensis*) executed at the Pudeto, Quinchao and Dalcahue sites on the island of Chiloe.

Dr. Eduardo Pérez (IFOP Consultant), explained the advances and challenges for the bio-economic analysis of small-scale macroalgae cultivation in Chile.

Dr. Pablo Leal (IFOP Researcher) showed laboratory results aimed at evaluating macroalgae under co-culture conditions physiological-productive performance (*M. pyrifera* with *M. chilensis*) and the temperature tolerance of early stages of *M. pyrifera*.

Dr. Luis Henríquez (IFOP Researcher) presented the progress in qualitative trophic models development as a method for studying potential ecosystemic impacts of small-scale aquaculture.

Finally, Daisy Carreño (Undersecretariat of Fisheries and Aquaculture Professional) presented normative and regulatory proposals for the development of APE in Chile.

IFOP professional staff member Dr. Patricia Zárate participated in “Marine Protected Areas Role for Migratory Species Conservation” talk.

Virtually, Universidad San Francisco de Quito (Ecuador) organized “Marine Protected Areas Role for Migratory



Las tortugas marinas son objetos conservación en algunas de las A



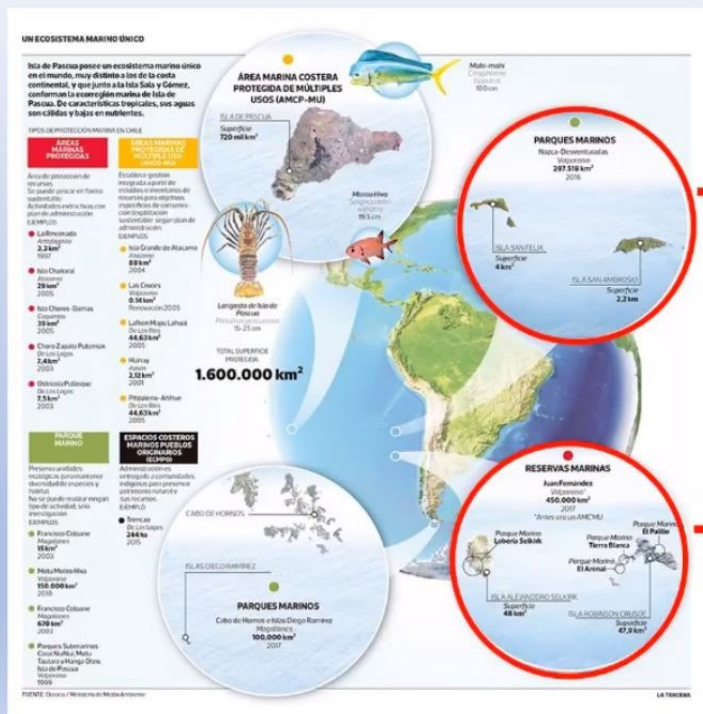
Patricia Zárate...

Parques oceánicos

Parque Marino Nazca – Desventuradas



Parque Marino Mar de Juan Fernández



Species Conservation” talk., it was attended by approximately 250 people, from various countries worldwide, from Chile, Fisheries Development Institute Oceanography and Environment Department also member of Migramar Dr. Patricia Zárate was Invited to contribute with the talk “How sea turtles benefit from Marine Protected Areas”.

Dr. Zárate’s presentation focused on the leatherback turtle, a highly migratory species in decline in the Pacific Ocean, currently considered under “Critically Endangered” category by the Nature Conservation International Union (IUCN) and for which important efforts have been made for its populations recovery and protection, some of which have been related to marine protected areas establishment. Dr. Zárate focused on marine areas created by US National Fisheries Service on the United States west coast, such as the approximately 552,000 km2 California-Oregon Conservation Area, which is closed to fishing every year. for a 6 months period due to the leatherback turtle presence .

Subsequently, she reported on IFOP investigations that she has been carrying out for several

years with respect of sea turtles connectivity present in exclusive economic waters zone, particularly, nesting beaches identification from which these species come. She indicated “sea turtles migrate from these areas and travel thousands of kilometers to reach Chile where they feed and develop until they reach adulthood.”

Dr. Zárate also referred to how Nazca-Desventuradas and Mar de Juan Fernández Marine Parks creation have benefited sea turtles, providing approximately 500,000 m2 of free fishing area that protects the oceanic feeding area and part of the migratory route of turtles that reach Chile. She also spoke about a critical habitat for green turtle, located in the north of Chile, off Arica, which has already been requested for the creation of a Marine Protected Area. This area would protect not only the green turtle, but also the other species of turtles present in the area and other migratory species such as birds, marine mammals and sharks.

Finally, Dr. Zárate indicated that, “given the migratory nature of sea turtles, international collaboration is essential, the turtles do not re-





cognize the borders of the countries and in their migration they pass through different exclusive economic zones. The creation of marine protected areas will ensure the protection of critical habitats and the most vulnerable stages of development of these and other species threatened with extinction ”.

“Surveillance of the resistance of *Caligus rogercresseyi* to antiparasitics applied in national salmon farming (Stage III)” Program Results

Caligus rogercresseyi is a marine ectoparasitic copepod that affects Chilean salmon farming. It parasitizes salmon’s skin, as well as several wild fish species, such as snook *Eleginops maclovinus*, the parasite natural reservoir, and silverside *Odonthestes regia*. The life cycle of *C. rogercresseyi* presents 8 development stages, 3 planktonic (free-life phase) and 5 parasites (the phase attached to the host). It causes negative effects to salmon farming from two main points of view, on one hand, it affects fish condition, decreasing carcass quality, causing weight loss, inducing stress, among others, and, on the other hand, it generates high economic costs due to antiparasitic treatments used for its control, among others. It is on this last point where Fisheries Development Institute has developed the Monitoring *Caligus rogercresseyi* resistance program to antiparasitics applied in national salmon farming with the aim of monitoring antiparasitics resistance in or-

der to avoid excessive currently authorized products use or misuse.

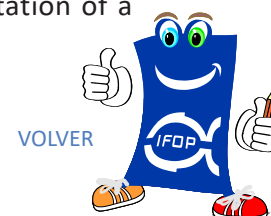
This project is part of IFOP permanent strategic research programs developed for the State, in the search for a sustainable aquaculture activity development. It started in 2017 and recently just completed its third stage. However, there are two more stages (4 and 5) that are expected to end with a deadline of 2022. “The final objective is to establish a caligus resistance to antiparasitics surveillance program”



The program is directed by researcher, doctor in Aquaculture Sciences and marine biologist, Margarita González Gómez, who explained that “the program was created because it is known that, when treatments are applied, there are constantly parasites variations in terms of their sensitivity to drugs, with some appearing hypersensitive and others very resistant, for which it is necessary to increase dosage to have a good response ”. During this program, a series of studies and trials are carried out, despite complications caused by Covid-19 pandemic in recent months, which has made it difficult to visit cultivation centers.



Dr. Margarita González declared that progress could be made in terms of sampling, integrating new criteria for greater precision. Progress was also made in a simplified technique application for centers that are geographically very distant. This technique was standardized in IFOP for its use under certain conditions. The information criteria were also constantly revised, so that the data is fluid and traceable, and the report that is delivered to farming centers was modified, with the presentation of a third, friendlier version.



Scientific Information Literacy Workshops Cycle

Between October 5th and 9th, remotely, the Scientific Information Literacy workshops Cycle was held, organized by the Marine Information Management Group (GIM) – CONA, of which Ghislaine Barría González Fisheries Development Institute librarian is a member. Representatives from Universidad de Valparaíso, Universidad de Concepción, Universidad Austral, Universidad Católica del Norte, Universidad de Magallanes, Shoa, Sernageomin, Museum of Natural History, researchers and the general public also attended.

The activity objective was to provide useful tools to support scientific and applied research, such as bibliographic managers, databases, bibliometric analysis, among others.

The IFOP professional explained that the workshops were relevant, both for Fisheries Development Institute, and for the general public, since it was the opportunity to transfer information, regarding science and technology, the so-called “Scientific Literacy”, is an essential bridge in this knowledge society, to have critical thinking.

The specialist in charge of the workshop was Morella Belén Rodríguez, from La universidad Santísima Concepción and addressed topics during five days were the following:



- Bibliographic Managers: Zotero, Mendeley, End-Note.
- How to enhance our scientific production visibility? Creation of ORCID profiles, academic Google and Researchgate.
- Bibliometrics and Science Assessment Workshop.
- Scientific social networks: How to achieve visibility and impact of our research?
- Predatory magazines and borderline magazines; What are they and how to identify them so as not to damage our research and reputation as a researcher?
- Strengthening our research: How to get the most out of databases

Women on board “Female majority on IFOP international oceanographic research cruise”

Between September 20th and October 15th, IFOP is carrying out “2020 Spawning stock of anchovy bio-oceanographic conditions and evaluation between Arica and Antofagasta regions” annual project. This cruise called MOBIO-MPH is in charge of Dr. Jessica Bonicelli and is part of the projects carried out by the Oceanography and Environment Fisheries Research Division Department.

Luis Parot Donoso IFOP Executive Director, highlighted “of the seven cruises that Fisheries Development Institute carries out per year on Abate Molina East research vessel, it is developed in parallel with Colombia, Ecuador and Peru, coordinated by



VOLVER



the Pacific South Permanent Commission (<http://cpps-int.org/>).

The team of researchers on this important International Cruise has a marked women's majority. In fishing science field carried out on board this is not something usual, mainly because of lacks of commodities presented in old ships which were not designed with women's stay requirements in mind. However, current reality and progress in gender policies facilitate integration, with everyone winning with the contribution of highly specialized researchers. For IFOP, without any doubt, it is a source of pride to open and consolidate these spaces and strengthen our institutional spirit ”.

For her side, Dr. Bonicelli pointed out that every year there are numerous research cruises on scientific vessels and the number of women on board has been increasing. In 2019 she served as cruise ship leader aboard Abate Molina research vessel, with an excellent group of 10 male researchers and 8 female researchers. This research cruise sailed for 33 days in Chilean North Sea, collecting samples and recording data throughout an extensive grid, in order to evaluate anchovy reproductive status and its environment oceanographic and meteorological conditions. The entire team work was excellent and highly professional, and thanks to their work all the project objectives were achieved. This year, now as project manager, she points out that “I am pleased to lead a research and technical team composed mainly of professional women in the field of biology, chemistry and oceanography, since years ago women participated much less on board of oceanographic research vessels.

The professionalism of each members on the 2019 and 2020 cruise team has been outstanding and I am proud that my first experience as a cruise ship leader and project leader was in an environment of increasing participation of women researchers and marine technicians.

I am happy to say that my gender has never been an impediment to developing myself as a scientist, but, that is only thanks to women who fought for equal treatment. Thanks to them, I am now a biologist and a doctor in oceanography, I was able to be a cruise ship leader, and work with other professional women on research vessels.

