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IFOP Project "2019 Fisheries Monitoring Program under Management Area Regime", held a dissemination workshop

Via Google Meet, IFOP held "2019 Fisheries Monitoring Program under Management Area Regime, project" dissemination workshop with representatives of Undersecretariat of Fisheries and Aquaculture, SERNAPESCA, Economy Undersecretariat, as well as AMERB organizations technicians in charge of research, and other guests (TNC, UVM) participation. Results of Fisheries Development Institute research develops in the field of Benthic Resource Management and Exploitation Areas (AMERB) were presented, in its role as advisor to the Undersecretary of Fisheries and Aquaculture (SSPA).

AMERBs are a fundamental part of the most important regime of fisheries management in Chilean benthic fisheries, through which exclusive rights of use and exploitation of invertebrate resources and algae are granted to legally constituted artisanal fishermen organizations. They



must report the performance of the AMERB to the Undersecretariat of Fisheries, through periodic monitoring carried out by technical advisory bodies. SERNAPESCA is the institution in charge of controlling fishing activity, compliance with the measure, and related legal procedures.

Luis Ariz, IFOP Management Areas Section head, pointed out that: "The workshop was a good opportunity to show what we are doing on AMERB issues. We have made enormous efforts to generate



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information on different areas that characterize management areas as complex eco-social systems, which makes it necessary to face integration of information taking into account its different dimensions, either in the socio-economic and organizational aspects, ecologically – environmental, quality management of AMERB information, complementary studies that help decision making, such as understanding connectivity of local populations of locust resource. In short, our efforts are aimed at preparing proposals to improve the AMERB regime, under an ecosystem approach”.

Pedro Romero, Project, Researcher spoke of the socio-economic and organizational aspects. He gave an account of AMERB regime economic evaluation, in volume and income, as well as its exports for the five main resources (locust, limpets, hedgehog, macha, brown macroalgae); in addition to projecting international demands for hedgehog and macroalgae resources. In evaluating the performance of the AMERB Regime, information from socio-economic and organizational monitoring was used, focusing its analysis on profitability, contribution to income, vulnerability of users, and organizational aspects. The main results indicate a low expectation of growth in export prices of seaweed and sea urchin, which is added to lower economic results and an increase in fishermen under a situation of economic vulnerability, recommending to incentivize economic development based on generating greater aggregate.

In her side, Eliana Velasco, IFOP biologist, referred to the monitoring of structuring species of benthic communities in AMERB, in areas of south central Chile, with emphasis between the Tarapacá Region and the Coquimbo Region, where higher national landings. In the regions of Atacama and Coquimbo, there has been renewal of forest or seaweed meadow, reflected in population increase (density) and predominance of adult individuals, with a stable population in the medium and long term. On the contrary, the regions of Tarapacá and Antofagasta, where a population decrease is shown with a predominance of juvenile individuals (decrease in the diameter of the disk) with a forest without effective renewal capacity, implying a population in decline in the short and long term.

IFOP Environmental aquaculture engineer Gabriela Arenas, referred to quality management of AMERB information related issues, regar-

ding drafting of standard sampling procedures in management areas, based on proposals for specific sampling designs (which include algorithms of abundance and biomass parameters) estimators, depending on whether they are benthic species of habitat of rocky or soft substrates (be they invertebrates or algae).

On the other hand, Bryan Bularz, IFOP marine biologist, presented IFOP AMERB Database contents, which integrates data from studies carried out by technical organizations, from 1998 to 2019. Likewise, advances in the automation of data analysis processes, in order to optimize the exchange of information and data between IFOP and Fisheries Undersecretariat.

Finally, Catherine González, project researcher, analyzed local populations of the locust resource connectivity between AMERB through biophysical modeling between Antofagasta and Valparaíso, including a high-resolution model in Coquimbo great bay. Regarding locust dispersal and recruitment, considering background information on its larval development provided by experts, a deep phase was incorporated into the biophysical modeling, generating a very conservative scenario in relation to its dispersal potential, compared to a classic dispersal model. In both biophysical models, a diversity of dispersal patterns was observed between Antofagasta and Valparaíso, with exchange practically in all the AMERBs, but with smaller dispersal distances of larvae in the great bay of Coquimbo. Likewise, the presence of an oceanographic filament at 28.8 ° S that would generate a barrier for larval dispersal was determined, which could constitute the limit of two independent population units.

Mario Acevedo, current Fisheries and Aquaculture Undersecretariat Benthic Resources Unit Coordinator, pointed out that: “Within this project framework, the State’s objective is AMERB regime permanent evaluation, considering biological, fishing, ecological, economic and social aspects, under a comprehensive approach, seeking balanced development through evaluation at local and national level, including interaction with other management alternatives of the artisanal benthic fishing sector. In this context, the results presented at the workshop are intended to contribute to this objective and to decision-making, thus contributing to the implementation of sectoral policies according to their development”.



First study about crab fishing increase and expansion in Los Lagos and Aysén Regions is published

FROM 2010 UP TO DATE, THE NUMBER OF INDIVIDUALS AND AREAS OF CRAB CATCHES IN LOS LAGOS AND AYSÉN REGION HAVE INCREASED, REACHING 5 TO 7 TIMES MORE THAN IN PREVIOUS YEARS.

Per kilogram world value increase and other species of Lithodidae stocks decrease in the world, the family to which our spider crab belongs, has promoted its capture in new fishing grounds, such as is the case in Los Lagos and Aysén region, with figures 5-7 times higher since 2010, compared to historical records for the area.

This analysis constitutes the first Fondecyt project (N° 1170507) scientific report, whose name is “Spatial and bathymetric dynamics of *Lithodes santolla* (Decapoda, Lithodidae) (Molina 1782) in southern Chile channels: Bases for fishing management”, which was based on IFOP 2012 to 2017 collected data analysis and Sernapesca’s historical database since 2000.

Carlos Molinet, research and project director, indicates that spider crab capture generated approximately \$ 8,000,000,000 – in 2019 for fishermen in the Aysén and Los Lagos region – in addition to being a resource that is not affected by marine toxins. Therefore, it is a priority that it be well managed so that it continues to benefit the fishermen and industrialists who participate in it. As a reference, it must be taken into account that price on the beach of this species varies around \$ 5000 per kilogram, while in the international market it reaches values of up to US \$ 18 (~ \$ 14000 / kg).

The crustacean that in Chile is called spider crab is internationally known as King crab, Patagonian, austral, Chilean or Magellanic spider crab. Its capture is of importance for the national artisanal fishing and historically it is related to the Magallanes region, hence its names come from this. Since 2010, approximately 100-200 tons per year are captured between the Los Lagos and Aysén regions, to over 1000 thousand tons per year.

Scientists from Universidad Austral de Chile, Fisheries Development Institut and Universidad de Los



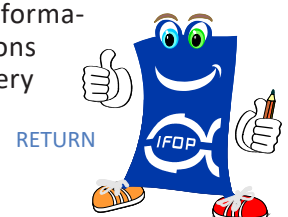
Lagos presented figures in a recent publication in *Regional Studies Marine Science* journal, where they explained fishing spider crab (*Lithodes santolla*) increase and expansion in these two regions.

“Before 2010, figures indicate that up to 200 tons of spider crab were landed, after that year, it increased over 1000 tons per year, thus initiating a second stage of this fishing in both regions, mobilizing a greater number of vessels than their fishing trips increased. Fishery expanded towards both regions more oceanic zones, from where more than 60% of the catches have been reported in recent years” explained Dr. Carlos Molinet.

A worrisome result of the analysis was egg-bearing females low proportion in Chiloé inland sea (less than 25% in the last 5 years), which suggests low reproductive success and therefore a drastic decrease in the numbers is projected. Landings of crab in that specific area. This has set off an alert for possible overfishing due to recruitment in this area.

This type of crab fishery management considers what is known as the 3S rule, sex (only males are caught), season (season in English, has a closed period) and size (size in English, has size minimum capture of 10 cm). Measures that must be continuously fed back from monitoring programs results.

In this context, Fisheries Development Institute (IFOP) collects permanent information on the resource in both regions through benthic crustacean fishery





IFOP:2020 Cruises for spawning anchovy stock evaluation in Atacama and Coquimbo regions

THE DAILY EGG PRODUCTION METHOD HAS BEEN APPLIED IN ATACAMA AND COQUIMBO REGIONS BETWEEN 2015 AND 2020. ALONG WITH BEING A PIECE OF INFORMATION FOR THE ANNUAL EVALUATION OF ANCHOVY STOCK, IT ALLOWS STUDYING TEMPORAL AND SPATIAL VARIATIONS OF REPRODUCTIVE PARAMETERS. COMPLEMENTARILY, ENVIRONMENT STUDY MAKES IT POSSIBLE TO EVALUATE EXOGENOUS FACTORS, SUCH AS AVAILABLE FOOD QUALITY AND ENVIRONMENT CONDITIONS IN WHICH THE RESOURCE SPAWNS.

monitoring program in the regions from Los Lagos to Magallanes, and in which IFOP marine biologists participate, Andrés Olguín and Paulo Mora. The information collected by this program contributed to obtaining this scientific report results.

It should be noted that this study seeks to contribute to fishing management of *Lithodes santolla* in the Los Lagos and Aysén region monitoring and discussion improvement. Researchers anticipate that during upcoming months they will continue to report their findings in order to contribute to improving knowledge of the fishery in the two studied regions.

Work Team: Dr. Carlos Molinet from UACH Aquaculture and Fisheries Research Institute Program; Dr. Patricio Díaz and Dr. Paulina Gebauer from the I-Mar Center Universidad de los Lagos; Dr. Kurt Paschke from Universidad Austral de Chile (IDEAL Center), engineer Manuel Díaz and Marine Biologist Tamara Matamala from Universidad Austral de Chile Fisheries Research Program.

Collaboration: Andrés Olguín and Paulo Mora, Fisheries Development Institute

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Colaboración: Andrés Olguín y Paulo Mora, Instituto de Fomento Pesquero

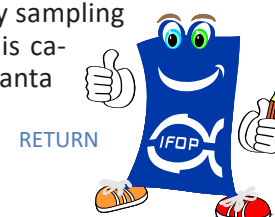
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During maximum anchovy reproductive activity season (*Engraulis ringens*), IFOP executes cruises in Atacama and Coquimbo Regions to carry out annual evaluation of this resource spawning stock.

This evaluation determines anchovy spawning biomass, using statistical analysis of Daily Egg Production Method (MPDH), which considers anchovy reproductive parameters estimation, when related to eggs abundance and coverage released into the environment, provides Spawning biomass as the fraction of fish capable of spawning during spawning period peak. For this, an intensive sampling of anchovy eggs and adults must be carried out. Therefore, between August 31 and September 30, 2020, various ships will be found collecting information on anchovy reproductive status and the area environmental condition.

Anchovy egg collection is carried out in 468 sampling stations using Doña Adriana ship in 21 days of operation, while oceanographic sampling is carried out in 11 days of operation in the Garota III boat, completing 50 stations (temperature, salinity, dissolved oxygen, chlorophyll-a and plankton) to determine environmental condition of maximum reproductive activity season. In these two ships sampling is carried out by IFOP's Oceanography and Environment Department (DOMA) staff.

On the other hand, adult anchovy sampling with 24 days of total operation, is carried out in the Garota V and Santa



IFOP invites to a Workshop to inform about program results of: “Monitoring *Caligus rogercresseyi* resistance to antiparasitics applied in national salmon farming (Stage III)”

LINK TO THE EVENT:

Google Meet: meet.google.com/zvr-brrb-bos

Tomorrow, Tuesday, September 22nd, from 10:00 a.m. to 12:00 p.m. Through Meet platform, Fisheries Development Institute will hold this Workshop in order to inform “Monitoring the resistance of *Caligus rogercresseyi* to antiparasitics applied in national salmon farming (Stage III)” program results.

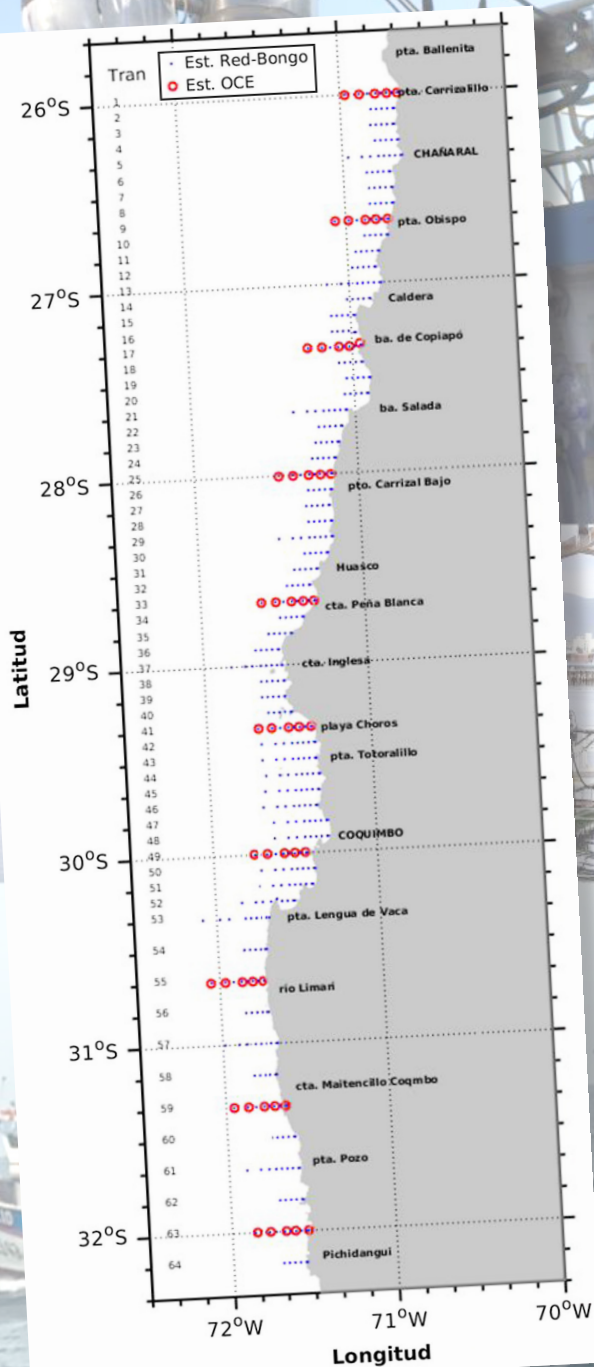
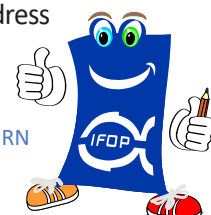
Currently, this program is financed by the Ministry of the Economy, jointly with Fisheries and Aquaculture Undersecretariat actively participating in its development as a technical counterpart. Counting, in addition, with National Fisheries and Aquaculture Service permanent support.

The “*Caligus rogercresseyi* resistance to antiparasitics applied in national salmon farming Surveillance” program is part of permanent strategic research programs developed by Fisheries Development Institute for the State, searching a sustainable aquaculture activity search development.

It is led by researcher, Aquaculture Sciences Doctor and marine biologist, Margarita González Gómez, and made up of a multidisciplinary work group made up of marine biologists, veterinarians and field technicians, all of them IFOP’s Hydrobiological Health Department professionals and technicians.

At the Workshop, MSc. Gladys Asencio will offer a presentation focused on historical background of Caligidosis control use, as well as Carlos Navarro from Sernapesca and Maureen Alcayaga from Subpesca. On the other hand, Margarita González will address of the third stage of the program general results.

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Norma warehouses in Coquimbo Region; and Don Atilio ship in the Atacama region. Sampling of adults is carried out by specialized IFOP staff in each Region. The project leader is Oceanographer Úrsula Cifuentes, DOMA researcher.

Chile participates in Joint Regional Cruise coordinated by South Pacific Permanent Commission

COLOMBIA, ECUADOR, PERU ARE ALSO PART OF THIS.

Between September 20th and October 15th, Chilean Fisheries Development Institute (IFOP) is carrying out the cruise associated to "Spawning stock of anchovy bio-oceanographic conditions and evaluation annual project. between Arica and Antofagasta regions, year 2020". This cruise called MOBIO-MPH is in charge of Dr. Jessica Bonicelli and uses Abate Molina Ship as a scientific platform. It is part of the projects carried out by IFOP Oceanography and Environment of the Fisheries Research Division Department.

The Oceanography and Environment Fisheries Development Institute Department head, Dr. Jaime Letelier, explained that this cruise is part of the

XXIII Chilean Joint Regional Cruise, carried out in parallel in Colombia, Ecuador and Peru, coordinated by Pacific South Permanent Commission (<http://cpps-int.org/>).

Dr. Letelier added that "this cruise is an international commitment to assess El Niño or La Niña phenomenon presence as well as South American coasts anomalies that may affect national ecosystems. The joint cruise has more than 15 years history and has delivered one of the largest oceanographic data collections and Chilean off ocean variability knowledge"

At the same time, and as part of Fisheries and Aquaculture Decision-Making Advisory program (ASIPA), this cruise takes and analyzes samples that allow anchovy spawning stock evaluation between Arica and Antofagasta regions during 2020 spring, which will provide background information for available Anchoveta Biomass estimation during 2021. Information necessary for a sustainable and ecosystemic fishery resources management. In addition, the cruise is a structuring part for Marine Mammal observation information collection program whose objective is northern zone of Chile population estimation.



Capitán BC Abate Molina,
Mauricio Takashi Abe



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Scientific Observers in the field



Bayron Garrido - Ancud Pier



Bayron Garrido - Vivian Pezo - Mauricio Sáez
Huicha Sector Process Plant - Ancud Commune





Pedro Alvarado - Dalcahue Pier



Valeria Guichacoy - Dalcahue Pier



Mauricio Sáez - Viviana Hernández
Huicha Sector Process Plant - Ancud Commune





María Graciela Arias - Queilén Pier



Gabriel Reyes Pudeto Pier





Miguel LLancabure - Queilen Pier



Johanna Vergara - Caleta de Yuste