



IN THIS NUMBER

IFOP scientists participate in an international cruise to investigate Harmful Algal Blooms (FANs) in Chilean Magellan and Antarctic region **1**

IFOP participated at ecosystemic project meeting led by CSIRO from Australia **3**

Aquaculture environmental performance study in Chile and its effect on ecosystems site **3**

IFOP researchers attend workshop at Instituto del Mar de Perú **4**

Training workshop on marine mammals abundance estimation **5**

Abate Molina Scientific Vessel sailed off in a trip to evaluate Anchovy **5**

IFOP collaborated with the proposal strengthening to create Peru's Nazca Dorsal National Reserve **6**

Dr. Jaime Letelier from IFOP presents in "Strategies for adaptation to climate change and public-private collaboration role" workshop **7**

IFOP scientists participate in an international cruise to investigate Harmful Algal Blooms (FANs) in Chilean Magellan and Antarctic region

Between November 13th and 24th, a team of 23 researchers embarked on Cabo de Hornos AGS-61 Oceanographic vessel, on the cruise called, "Magallanes and Chilean Antarctic region Glacier-Oceanic Prospecting of Harmful Algal Blooms Platform (PROFAN Magallanes)", with the objective of studying in an integral way harmful algal blooms in the Magallanes region, specifically toxin producing species, which have affected southern Chile coasts, in the Magallanes region fjord system and northern channels.

It was carried out by a multidisciplinary team of scientists belonging to different institutions, among them we can mention: Fisheries Development Institute, Universidad de Magallanes, Universidad Austral de Chile, Universidad de Concepción, Universidad del Bío-Bío, Universidad Católica de



César Alarcón, Pablo Salgado, Jorge Mardones and Gemita Pizarro are part of this unpublished study

Chile, Alfred-Wegener Institute of Germany, Stirling University from Scotland, Chilean Antarctic Institute, and Research in Ecosystems of Patagonia Center (CIEP). The Scientific Officer Chief of the cruise was Dr. José Luis Iriarte (Ideal Center – Universidad Austral). The study included 18 sampling stations located in the ocean and in the canals and fjords of the Province of Last Hope of the Magallanes Region.

Fisheries Development Institute experts on the participation in this expedition explained; César Alarcón "My participation in the cruise consisted mainly of obtaining qualitative phytoplankton samples with a net, up to 20 meters, for community identification, isolation and subsequent laboratory culture, in addition to quantitative phytoplankton samples obtained with oceanogra-



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phic bottles at up to 30 meters depths, for phytoplankton quantification, together with obtaining total chlorophyll by filtration, to later determine it with a spectrophotometer and HPLC pigments analysis, and to obtain mollusks from the intertidal for existing toxins identification ”.

Pablo Salgado added “The opportunity to tour fjords, canals and some more oceanic stations in the Cabo de Hornos Chilean Navy oceanographic vessel allowed, in my case, to obtain sediment samples that in another type of vessel would have been very difficult, Here we achieve depths of 545 meters.

My main task was to obtain superficial sediments by means of a dredge to see recent presence of dinoflagellates cysts, and also to obtain sediment witnesses through a HAPS Core to observe the record that microalgae have left over the past decades.”

Dr. Jorge Mardones highlighted “IFOP team valuable participation, which had a multidisciplinary nature. My work, in particular, was focused on a line of research that I just started, which mixes phytoplankton photosynthetic properties and allelopathic / cytotoxic substances produced by toxic microalgae. The experiments on Cabo de Hornos board were carried out using a bio-optical measuring device called “Fast Repetition Rate Fluorometer or FRRf3” kindly provided by Plancton Andino SpA, environmental consulting company, which allows to determinate in real time toxic substances effect released by certain species of microalgae on



the phytoplankton community present at a particular sampling point. The results, a priori, showed an intense toxic activity of *Alexandrium catenella* and *Karenia selliformis* dinoflagellates on the photosynthetic efficiency of the phytoplankton community in the northern part of the Magallanes region. These results have a great implication in the way we understand the appearance of these toxic species in the area of the Patagonian canals ”.

Dr. Gemita Pizarro concluded “This campaign has been a success in itself by complying with the planned and also for being the first time we achieved an interdisciplinary and inter-institutional oceanographic expedition around a problem such as harmful algal blooms, commonly known to people as “red tides.” Recall that in Chile it was in the Magallanes region where the first toxic and flowering event of *A. catenella* associated with its production, with socio-economic and public health effects, occurred more than 40 years ago.

In my case, although I did not participate in this international expedition because I was embarking on another of the international institutional expeditions also carried out in our region, I did have to organize it together with the leading colleagues of the joint project, UMAG, UACH and IFOP. The campaign was possible in one of the best equipped ships we have in our country, the AGS 61 Cabo de Hornos, in addition to the cutting-edge technology in some research lines of the participants in the expedition. I highlight the institutional support represented by the Department of Oceanography in Valparaíso and Puerto Montt through the Environment Department and the Harmful Algae Studies Center, CREAN. I feel that this particular campaign has left a good impression on everyone, the ability to work together, expectations of achieving greater progress and satisfaction in what we have to do.



IFOP participated at ecosystemic project meeting led by CSIRO from Australia

THE ACTIVITY WAS CARRIED OUT IN INDIA AND WAS ATTENDED BY SCIENTISTS FROM SEVERAL RESEARCH CENTERS, FROM UNITED STATES, THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION-NATIONAL MARINE FISHERIES SERVICE (NOAA), FROM INDIA, INDIA'S CENTRAL MARINE FISHERIES RESEARCH INSTITUTE (CMFRI), FROM CHILE, FISHERIES DEVELOPMENT INSTITUTE (IFOP) AND FISHERIES OF CHILE UNDERSECRETARIAT AND THE COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION (CSIRO) OF AUSTRALIA

Between October 29th and November 1st, the third Lenfest project working group meeting was held at Central Marine Fisheries Research Institute (CMFRI) in India: "Reference points for ecosystemic evaluation: practical management of ecosystem-based fisheries indicators and guidelines"

The meeting brought together representatives of international research teams from Chile, Australia, the United States and India, to examine historical time series of specific indicators, based on science, of the structure and function of selected ecosystems as a case study in each country, (being the ecological system associated with anchovy fishery in Atacama and Coquimbo regions for Chile) and to develop landmarks or ranges for a variety of ecosystem types. The meeting also considered a discussion on working group's final stages activities, particularly around various indicators simulation tests.

On Chile's behalf, Dr. Carlos Montenegro, participated as representative of the project Scientific Committee and Head of IFOP's Fisheries Evaluation Department. In addition, Alejandra Hernández and Nicole Mermoud attended Subsecretariat of Fisheries and Aquaculture.

Dr. Montenegro presented ecosystemic modeling advances developed by IFOP's in collaboration with other research centers in the country. He said "We have been working hard to generate advanced human capital to use tools such as Ecopath with Ecosim, Size Spectra and Multispecies Production Models. These modeling approaches



allow us to study systems of different degrees of complexity and their results allow us to have an integral vision of the system under study".

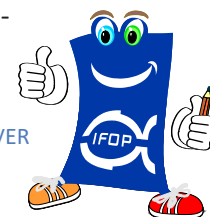
Aquaculture environmental performance study in Chile and its effect on ecosystems site

On November 22, at Universidad de los Lagos, Puerto Montt campus, the XIII seminar science technology and aquatic environments will be held, organized by the I ~ Mar center. In the activity, Dr. Heraldo Contreras of Fisheries Development Institute (IFOP) will make a presentation of ASIPA Project "ENVIRONMENTAL PERFORMANCE OF AQUACULTURE IN CHILE AND ITS EFFECT ON THE PLACEMENT ECOSYSTEMS STUDY".

Dr. Contreras explained "the conclusions obtained during the last 5 years of this study will be shown, and the results associated with the environmental quality of sedimentary funds are presented both in their physical and chemical characteristics and in the macrofauna communities. Also, results will be exhibited to validate the use of bioecological indicators to assess organic enrichment in sedimentary funds associated with aquaculture. Organic enrichment is understood as the environmental alteration produced by the pouring of large quantities of organic matter particles into marine sediments resulting from anthropic action. Finally, results of the advances obtained in the modeling of the benthic ecosystem associated with aquaculture will be presented, this in order to understand and predict the benthic effects of aquaculture activities".

Dr. Heraldo Contreras Cifuentes is a Marine Biologist and a Doctor of Science, Systematic Mention and Ecology. He currently serves as Senior Researcher and Chief of the Technological Center for Aquaculture of Putemún (Castro) of IFOP Aquaculture Department of Environment Research Division.

His research interests have been focused on ecology of sedimentary fund communities, including aspects of their natural history, population dynamics, effects



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of environmental impact, etc. During the last years 2008-2019, he has participated in studies aimed at assessing the environmental changes associated with aquaculture activities, mainly focused on the communities associated with sedimentary funds. In this area, he has developed research aimed at the use of bio-ecological indices for the evaluation of the environmental performance of aquaculture, participating as an exhibitor in various workshops and seminars. As of 2014, he participates in the Technical Scientific Committee of Aquaculture in the environmental field of Fisheries and Aquaculture Undersecretariat .

IFOP researchers attend workshop at Instituto del Mar de Perú

In Lima, the “ MONITORING AND EVALUATION OF BENTONIC RESOURCES METHODOLOGIES ” was held. The activity was organized by the Institute of the Sea from Peru (IMARPE) with sup workshop port of The Nature Conservancy (TNC) resea-



chers from the Institute for Fisheries Development (IFOP), Nancy Barahona Toledo, Mauricio Mardones and Carlos Techeira were invited together with presentations on benthic resource monitoring system in Chile in areas of free access and evaluation methods in current application, they actively participated in different working groups.

The workshop's objective was to strengthen coastal laboratories professionals and researchers capacities and of IMARPE headquarters staff. Mainly addressing issues of: monitoring, spatial scales and evaluation methods, and their application in benthic resources fisheries management, to provide Ministry of Production scientific advice – PRODUCE and Regional Governments of Peru.

IFOP researchers were invited given their experience in the discussed topics, the implementation in Chile of Benthic Management Plans and IFOP's historical experience in the topics. For all it was an enriching experience especially for what was learned as well as for the opportunity to socialize with researchers from our work area and learn about works developed both in Peru and other invited countries.



Training workshop on marine mammals abundance estimation

Between October 22nd and 24th, a training workshop on marine mammals abundance was held in Valparaíso, organized by the South Pacific Permanent Commission (CPPS), in conjunction with the Latin American Society of Aquatic Mammals Specialists (SOLAMAC) and for Fisheries Development Institute (IFOP).

Carlos Montenegro Fisheries Evaluation Department Chief, referred to this workshop importance: "We believe that these type of activities will substantially help to know marine mammal populations status in Chile. To address this highly complex issue, research designs, data collection and estimation methodologies that incorporate uncertainty are required."

Maritza Sepúlveda, Universidad de Valparaíso Faculty of Sciences professor, and SOLAMAC current president, also stressed that this is a great opportunity for researchers from different countries to address these issues with similar methodologies, in order to compare estimates of abundance of marine mammal species shared among our countries.

This workshop objectives were:

- To strengthen the region technical capacities on the most used methodologies to estimate marine mammals abundance with aims to fill knowledge gaps of Southeast Pacific fisheries affected populations.
- To promote technical cooperation and experiences exchange with national and international institutions on development of national monitoring programs progress, facing United States requirements for trade in fishery products.

The Workshop was aimed at researchers from institutions in Panama, Colombia, Ecuador, Peru and Chile that are responsible for fisheries management and / or conservation of marine biodiversity, as well as academics and researchers working in partnership with these institutions in related subjects. This training was led by Dr. Philip Hammond, a specialist with extensive experience in modeling marine mammal populations and University of St. Andrews, Scotland professor.

From CPPS they affirmed "The Executive Secretariat has been developing marine mammals and fisheries interaction related activities in the last two years due



to United States Marine Mammal Protection Act enforcement (MMPA) which, among other things, demands that countries that export fishery products to that market after 2022 must comply with international standards for incidental mortality of marine mammals, so that fishing activities do not compromise natural populations viability of these species. As part of the requirements to access authorization, countries must technically demonstrate that marine mammal mortality levels in their fisheries are below the permissible biological clearance level (NRBP). To estimate NRBP of different species of marine mammals affected by fisheries, reliable information and standardized methodologies are required to estimate parameters such as abundance, reproduction and level of mortality in each fishery".

Source CPPS / IFOP

<http://cpps-int.org/index.php/actividades-pda-m/2019/519-taller-de-entrenamiento-sobre-estimacion-de-la-abundancia-de-mamiferos-marinos-del-22-al-24-de-octubre-de-2019-valparaíso-chile>

Abate Molina Scientific Vessel sailed off in a trip to evaluate Anchovy

BETWEEN ARICA PARINACOTA AND ANTOFAGASTA REGIONS

On Saturday, November 23rd at 10 pm, Abate Molinascientific ship, with 28 professionals, sailed from Valparaíso's port, the captain of the ship is Enrique Quiero and head of the cruise is the fishing engineer Francisco Leiva

The general objective is; to characterize and evaluate anchovy resource stock between the Arica and Parinacota and Antofagasta Regions, by hydroacoustic methods, during the maximum recruitment period.



Specific objectives are:

- To estimate anchovy resource stock size and its spatial distribution in the fishery maximum recruitment period .
- To characterize and analyze in a spatio-temporal context, the stock demographic composition and interannual variation evaluated through biological indicators.
- To characterize and analyze oceanographic conditions present in the study area and its relationship with the spatial distribution of anchovy.
- To characterize anchovy aggregations in the area and period of study.
- To determinate stomach content and to characterize anchovy specimens trophic behavior in the area and period of study.
- Survey of ecological information to advance fisheries management based on the ecosystem. Analysis in the temporal and spatial context of the main groups of species, present in the acoustic echograms from 2003 to date

IFOP collaborated with the proposal strengthening to create Peru's Nazca Dorsal National Reserve

The neighboring country, through its State Natural Protected Areas National Service (Sernanp), an agency which belongs to the Environment Ministry, is implementing the creation of a Marine Protected Area process, in the National Reserve category in its Nazca submarine dorsal jurisdictional water area ; equivalent to the Nazca-Desventuradas Marine Park area created by Chile in 2015.



Between November 20th and 21st, "Proposal of the Nazca Dorsal National Reserve" technical workshop was held in Lima, Peru, which was organized by State Protected Natural Areas National Service (Sernanp) under Environment Ministry, and the Instituto del Mar del Perú (Imarpe), sponsored by Oceana Perú NGO. The objective was to reinforce the technical background for Nazca-Peru Dorsal National Reserve creation.

The workshop was attended by the Ministry of Production, Ministry of Foreign Affairs, Ministry of Defense, Ingemmet and Hidronav representatives. Mauricio Gálvez, Head of the Technical Specialties Division of the Institute for Fisheries Development was also invited as a guest expert,, together with Matthias Gorny (Oceana Chile) and Ariadna Mecho (Pure Ocean of Spain), who shared their research experiences and the creation process of Nazca-Desventuradas marine protected area, in the underwater mounts of



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Nazca Dorsal that is in Chilean jurisdictional waters. Also invited to this event were marine geologist Néstor Tevez, Luis Cerpa de Ingemmet, Jorge Quispe and Yesica Debo, oceanographers from Imarpe and DHN respectively, who presented oceanographic, biological and geological issues of the Nazca Dorsal.

The IFOP professional commented that “the process of creating the Marine Protected Area of the Peruvian component of the Nazca Ridge is well advanced, although as it is a poorly researched area there are several scientific information gaps. This workshop served to provide knowledge and information to partially fill those gaps.” Asked about his presentation specific contribution, Galvez commented: “in 2009, I published a scientific article that was a complete review of the oceanographic, Nazca dorsal geological and fishing aspects and that of Salas y Gómez; Then in 2014 and 2015 I had to actively participate in the Nazca-Desventuradas Marine Park creation process in Chile with professionals from the Fisheries Undersecretariat and the Foreign Affairs Ministry. That is the experience that I was going to share with Peruvian colleagues, which was very well received and opened the possibility to future joint investigations throughout the Nazca Ridge, whether in its component of Peruvian, Chilean or international waters. The process we developed in Chile is very similar to what researchers are implementing in Peru, therefore, the lessons we learned in Chile when creating the Nazca-Desventuradas Marine Park are important to consider so that the Peru process is also successful.”

IFOP maintains an active exchange and scientific collaboration in the marine sciences area, and particularly in fisheries sciences, with its counterpart the Peru Sea Institute (IMARPE). The collaboration relationship between both institutions was formalized 27 years ago through a collaboration agreement that has allowed northern Chile and southern Peru anchovy stock joint study. Recently, this agreement was extended to other areas of marine sciences in which they had already been collaborating as a result of the constant visits, internships and training courses for their respective researchers and that both institutions have been sharing.

More information on Nazca Dorsal Reserve National Reserve can be found at:

www.sernanp.gob.pe/reserva-nacional-dorsal-de-nasca

Dr. Jaime Letelier from IFOP presents in “Strategies for adaptation to climate change and public-private collaboration role” workshop

On November 4th and 6th, the “strategies for adaptation to climate change and public-private collaboration role” workshop was funded by the Asia-Pacific Economic Cooperation Forum (APEC) and organized by Chilean Maritime and Merchant Marine Territory General Directorate (DIRECTEMAR).



In the activity, the Department of Oceanography and Environment of the Institute of Fisheries Development head, Dr. Jaime Letelier, spoke on the GEF-FAO project design and progress “Information system that systematizes and integrates data on fisheries, aquaculture and climate change” that Fisheries Development Institute is running. Representatives from Japan, Indonesia, Mexico, Australia, Peru and Chile presented representatives from Papua New Guinea, Malaysia and Vietnam.

Among this workshop main results are the integrated scientific information need at the national level and at the Asia Pacific level to determine Climate Change local impacts on coastal infrastructure, economic activities and coastal areas in general. This information, environmental, biological, fishery and social, should improve adaptation plans and actions, especially associated with coastal edge activities and investments, the necessary participation of communities in adaptation actions and in the revision of laws and policies that govern fishing and aquaculture.

Enrique Vargas Ship Captain LT, DIRECTEMAR Aquatic Environment Preservation and Pollution Control Department head and workshop organizer, highlighted the attendees active participation including representatives from Environment Ministry and SERNAPESCA director Alicia Gallardo

