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## IFOP jointly with Data Observatory will create a data platform for fishery resources in the north of Chile

THE PROJECT CORRESPONDS TO FISHERIES DEVELOPMENT INSTITUTE (IFOP), WHICH HAS 57 YEARS OF HISTORICAL DATA ON FISHING AND AQUACULTURE, COLLECTED THROUGHOUT CHILE BY ITS RESEARCH TEAMS AND SCIENTIFIC OBSERVERS. THROUGH THE AGREEMENT WITH UNIVERSIDAD ADOLFO IBÁÑEZ, THROUGH DATA OBSERVATORY, PART OF THESE FISHING DATA WILL BEGIN TO BE MADE AVAILABLE FOR RESEARCH, INNOVATION AND ENTREPRENEURSHIP PURPOSES

The project corresponds to Fisheries Development Institute (IFOP), which has 57 years of historical data on fishing and aquaculture, collected throughout Chile by its research teams and scientific observers. Through the agreement with Universidad Adolfo Ibáñez, through Data Observa-



tory, part of these fishing data will begin to be made available for research, innovation and entrepreneurship purposes.

During 2022 first semester, Fisheries Development Institute (IFOP) in alliance with Universidad Adolfo Ibáñez, through Data Observatory, will develop a historical data platform, corresponding to northern zone of Chile. The success of this proof of concept will allow all IFOP data to be stored, processed and made available for



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research, innovation and entrepreneurship purposes.

Fisheries Development Institute (IFOP) generates, develops and transfers useful knowledge, so that the State and national industry position themselves, compete and develop in a sustainable manner, contributing to research in the aquaculture and fishing sector. Thanks to IFOP, a CORFO body, the State has the necessary information to manage and regulate resources capture, establish an integrated management of fisheries, deploy a management and technical assistance model, develop sustainable aquaculture and fishing with the aim to protect the resources, the environment and its ecosystems, and safeguard the documentary scientific heritage.

The proof of concept of this fishery data project will integrate information with more than 40 years of history, distributed in various points and formats, to later process and make it available on an open platform, with certain access criteria.

Luis Parot, executive director of IFOP, pointed out that: "the Law assigns IFOP the responsibility of registering and protecting biological-fisheries data, which constitute an invaluable heritage for understanding phenomena such as climate change and its impacts on availability and abundance. of resources and their ecosystems. This year 2022, we will start two projects in this direction: the scanner of water samples that we have stored and that will provide very relevant information to understand and to know climatic phenomenon impacts, and this effort with UAI/DO that addresses biological-fisheries data protection and availability"

Jorge Miranda, IFOP Administration and Finance Division head and IT area head, explains that: "This project will be a reference that will allow us to develop our institutional roadmap, which, although it currently mainly serves the State in its of decisions related to fishing and aquaculture, in the future it could also be useful for research projects development, innovation, entrepreneurship and ecosystems preservation. We have a large volume of data series from more than 50 years of history, and the main objectives that we have set for ourselves today are to preserve it according to current data security standards and improve access to this valuable heritage of information to all who access it. require".



In order to preserve the information and make it available, the project will initially include data on main fishery resources from the country extreme north to Coquimbo. Graciela Manquehual, IFOP database administrator, explains that in 2021 a survey and validation of data hosted outside the institutional infrastructure was carried out, which will now be analyzed

to later be made available to the various audiences. “We seek to generate public data and at the same time protect their security, having control of those who request them and the declared purposes,” she maintains.

The fishing resources between Arica and Antofagasta are mainly anchoveta, horse mackerel, mackerel and Spanish sardine, while between Caldera and Coquimbo, anchoveta and horse mackerel stand out. The historical series of data that IFOP maintains include variables from various areas of the systems under study, such as fishing data, for example, catch volumes of fishing resources, as well as biological variables such as size, weight and age between others. “To the extent that we have a robust data platform, we will undoubtedly be able to interact with other actors who need access to our information and together develop research and innovation, preserving our ecosystems and making quality information available,” adds Manquehual.

For his part, Mauricio Leiva, project manager of Data Observatory (DO), pointed out that this is the second serverless project of the DO that involves relational databases, that is, that it has a dynamic tool that is automatically activated and scaled, in as user demand and data volume increase. “We will create a self-managed platform that in the future will not require manual interaction to extract information, and in this case in particular, it is the first time that we will work with marine species with such diverse variables, which is an interesting challenge for our team. which will define criteria for filters and search engines.

Likewise, Álvaro Paredes, DO developer and data scientist, highlighted that “ new open access fisheries data platform will

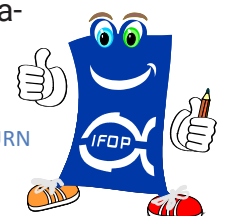
allow the current relational database to be adapted and transferred to another database that does not require a server in constant operation, which that presents cost benefits and facilitates scaling. Later we will work on the development of an efficient, dynamic and friendly infrastructure for users, which allows us to centralize the information and then make it available”.

Data Observatory is a non-profit public-private-academic collaboration led by the Ministry of Science, Technology, Innovation and Knowledge and the Ministry of Economy, Development and Tourism, created together with Amazon Web Services (AWS) and the Universidad Adolfo Ibanez (UAI). Its mission is to acquire, store, process, analyze and make available large volume and quality data sets, to contribute to the development of knowledge, science, technology and innovation, thanks to data science and AI.

## Leonardo Guzmán, from IFOP: The importance of water bodies carrying capacity determination

Leonardo Guzmán IFOP Aquaculture Division’s head has closely followed the national aquaculture industry evolution. In conversations with AQUA, he analyzed its challenges and the potential that can be seen in the future for this dynamic activity.

Leonardo Guzmán current head of Fisheries Development Institute (IFOP) Aquaculture Division has witnessed the evolution of aquaculture in



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official industry for broad sectors. Review here the reflections of this professional long linked to the sector.

## What role did IFOP play in the first years of aquaculture in the country?

Salmon farming in Chile dates back to the 1980s, but initially there were projects run by Fundación Chile and projects financed by Japan in Aysén, with an open circuit system. These initiatives were not successful because the returns were not of the expected magnitude. But those were the first steps towards developing the salmon industry. In the case of Aysén, the fish farm of Dr. Yoshikazu Shirahishi remained, where IFOP spent several years working after they (the Japanese) withdrew from the country.

Chile, an activity that has been taking place in the country for around 50 years – first with salmon and later with mussels and other species– and one of its main challenges today is to move towards a more sustainable operation that is adapted to challenges imposed by situations such as, for example, climatic change.

The well-known researcher highlights progress reached by national aquaculture, positioning itself as one of the country main economic branches and with enormous importance for far southern regions economy but stresses that in order to continue advancing, it is necessary to advance in crucial issues, such as determining water bodies carrying capacity where production occurs, and in greater proximity to the communities.

In any case, IFOP representative is optimistic about the activity's future. In 50 more years he envisions a much more diverse sector, with some 10 to 15 new crops and large and small companies coexisting in a dynamic and bene-

The work we did at Dr. Sirahishi was more focused on genetic management of coho salmon, tending to manage families that allowed us to see issues such as meat quality and development time. This was done for several years through FAO projects and also with resources from Japan. We did that kind of work for a few years, then we quitted.

Since 2002, during the government of former President Ricardo Lagos, there has been a change in the IFOP's work orientation. That year, it was decided that the institute should carry out public studies aimed at knowing the effects that aquaculture causes on environmental and sanitary heritage. This is how, since 2002, gradually, and since 2013, formally, we stopped promoting. Today we do not do anything aimed at developing technologies or knowledge of cultivation of aquatic organisms, but we do try to understand the externalities that the development of aquaculture can generate. In this



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sense, we are currently linked to effects that occur due to salmon farming in the marine environment and we also follow what happens with the availability of mytilid seeds.

## What is your vision about aquaculture development, and especially salmon farming, in the country?

Salmon farming occurred at a time when the country had an economic system that left investors open to the possibility of entering and risking capital in businesses that could be prosperous. In addition, it had professionals trained to adapt and venture into the field of salmon farming. Similarly, waters quality was excellent and facilities were available to prepare feed for salmon. In summary, geographical, human and economic conditions favored the development of this industry. When democracy began, there was also a scenario that made the growth of activity feasible. The changes to the Fishing Law came at the beginning of the '90s and this explosive growth was generated that later had some stumbles due to the difficulties that the State had to regulate the activity.

A relevant point is that it was possible to appreciate that the figure that the investor could self-regulate because he is protecting his capital worked in theory, but not in practice. Nature has limitations and this is how health issues began to appear that began to complica-

te the activity. The coup de grace was in 2007, when the ISA virus emerged. Then came the rearrangement and the neighborhoods appeared, with a series of legislative changes that in some aspects continue to be seen.

## Are there still some issues pending from that reorganization?

For example, since 2010 it had been legislated that all farming centers have oceanographic buoys to obtain environmental information. That has not been implemented to this day. It's just starting now. Here, the State has considered that it is necessary for the centers to have buoys to monitor environmental variables such as temperature, salinity and chlorophyll, among others, but implementing it is a long and complex process. That is why it is only becoming effective, gradually. This shows the complexity that the State has had to generate regulations that make it possible to balance the pressures of the activity with respect to nature's capacity.

## What do you think are the biggest challenges in salmon farming?

First, keep in mind that any activity will always have effects. Any activity is carried out in the environment, so it will have effects on it. What has not happened so far is the development of a strategy that allows communities to understand this activity as something integrated to them. In a first stage, the economic success that salmon farming began to develop caused divergences between riverside communities and productive activity. Notwithstanding the fact that people were offered jobs, they did not feel the activity as their own and there are still many communities that do not feel it as their own. We have to move forward on that.



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You have spoken quite a bit about the need to assess the carrying capacity of water bodies where aquaculture takes place. **Could you explain this point?**

In both salmon farming and mussel farming, we do not have a good background to know the load capacities of the systems, in the sense of knowing how many salmon one can have in a particular fjord or knowing how many mussels the Chiloé inland sea supports. Today, said sea has a production of more than 350,000 tons of the mollusk, but it is taking them longer to fatten it. The point is, why does it take longer? Basically because there are more mouths in the water and there is not so much food to gain weight in less time. That is a reality. We are not responding to the load capacities that our natural systems have, but we are moving towards it.

Not all fjords have the same vulnerability. Some are more vulnerable than others. We know that all the systems that have a lower renewal rate, such as the Comau fjord, are more sensitive. In Aysén is the Puyuhuapi. The fjords with the highest renewal rate, on the other hand, which in a week have renewed the entire mass of water, have their own dynamics that make it possible to better adjust the interaction between productive activity and the response made by nature.

When working with natural ecosystems, one has to keep in mind that, since nature has a natural capacity for renewal, one can work long-term in these systems, but that rate cannot be exceeded. If we exceed it, the system may not collapse, but it may enter a state of degradation. You have to have knowledge. Science is key.

**Is it possible to get close to a good carrying capacity model?**

Of course. There are basic pillars of information in the Lagos and Aysén, because today we have the modeling of what happens with the oceanographic processes. We know how water moves, where it enters, when it stays in one place, etc. There are highly reliable models. What needs to be done is to incorporate biological processes, that is, to see how the availability of nutrients is also being modeled and, therefore, little by little, we can imitate what happens in nature quite well.

But in order to respond to the carrying capacity, we cannot start with a project that tries to answer about the carrying capacity of all Chilean fjords; we won't be able to do it. But we can respond with focused studies. See, for example, the carrying capacity of the Reloncaví estuary, which is already a tremendous body of water. Certain sectors must be taken and, to the extent that we work in these estuaries, we will be able to see at the same time the heterogeneity of these systems.

**In the case of the IFOP, is more investment perhaps required to be able to advance on these and other issues?**

What we are trying to find out today, as IFOP, is how local deterioration can be mitigated and, when one adds up local effects, what impact this has on large ecosystems. That supposes things like having human capital advancing, infrastructure and the necessary equipment. All this requires financial resources. Chile is a power in fishing and aquaculture, but IFOP does not have the conditions of a re-



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search center in aquaculture; we work in houses that do not have such functionality. We are struggling to see if we can resolve this. If we compare ourselves with Norway, which is the main producer of salmon, their capacities to generate knowledge are different in terms of infrastructure and advanced human capital. We have a lot of human capital, but that or being able to pay them is not enough, we must have financial flows for infrastructure and equipment. We are moving there, but there is a long way to go.

## How do you imagine Chilean aquaculture in 50 more years?

First of all, we should increase aquatic proteins that we consume internally. We should be increasing the per capita consumption of seafood because we are a country with a huge coastline. That goes together with an accessible value of the products for anyone. We should also make better use of ecosystems, have much more diverse systems based on native resources. Now, diversification does not mean doing everything, but it does mean having more resources and depending only on salmon and mussels. In the mussel there could also be a broader geographical sector dedicated to production. In 50 more years we should have at least ten to fifteen additional crop species inserted in the markets.

In 50 more years, perhaps they will not be just large companies, but there will be many small, small-scale aquaculture companies, complying with sanitary and environmental regulations and supporting family groups or associations. Finally, I imagine consolidated research groups throughout the country.

## IFOP jointly with Biobío Regional Government developed a project that will hold a research on common sardine and anchoveta

Fisheries Development Institute, with funding from Biobío Regional Government, will develop a research program that will last two years and will improve about common sardine and anchoveta resources knowledge. Specifically, this project will be focused on studying reproductive and recruitment bans in the fishing reserve area where Biobío region artisanal fleet operates, to evaluate and characterize stock resources biomass and spatial distribution through hydroacoustic cruises. and biological sampling.

Prospected achievements ending the project are; to strengthen and reinforce weekly monitoring and expand temporary coverage of recruitment and reproductive ban variable periods and include areas that, for logistical or financial reasons, have not been incorporated into this research program that, based on these same resources, It is carried out within the annual regular agreement between Subpesca and IFOP framework.

Jorge Cornejo, project head, pointed out that "the study is of regional and national importance, since it seeks to strengthen biomass estimates that are considered for fishing quotas definition. This would specifically contribute to these resources fishing activity economic and social sustainability, thereby improving sector confidence in its results and reducing potential social conflicts due to fishing quotas questioning.

Additionally, collaborative work between the institutions in charge managing resources and artisanal fishing

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sector would be reinforced, which is essential to advance the governance and sustainability of fisheries in Chile”

Luis Parot IFOP Executive Director, referred to the project “It is an example of the importance of the integration of IFOP with regional interests and joint work with authorities and local artisanal fishermen’s organizations”

## IFOP makes available an interesting Farming Manual for small-scale fish farmers

IFOP Restocking and Farming Department team, with illustrations by María Ester Chapa and design by Leticia Baeza, developed “Farming System for Small-Scale Aquaculturists” Manual. Its creation is part of “Comprehensive Aquaculture Development Program for Artisanal Fishermen and Small-Scale Aquaculturists” research outreach activities, which is part of for regulation of Fisheries and Aquaculture Research Program which is carried out under the agreement signed between the Undersecretary of Economy and Smaller Size Companies and IFOP, Undersecretary of Fisheries and Aquaculture being its scientific-technical counterpart.

According to its main author’s words marine biologist and semi-senior researcher, Francisco Galleguillos: “The purpose of the manual is to show in a friendly and graphic way the preparation, materiality and de-



sign of 10 farming systems that could be incorporated into Small Scale Aquaculture (APE). This material was made, seeking that artisanal fishermen who are developing APE, can incorporate these techniques and/or expand their resources according to their possibilities”

The researcher from IFOP concluded by indicating: Manual contents show a simple language and very elaborate illustrations, which help to easily understand systems operation.

Manual can be reviewed at:

<https://sembrandoelmar.cl/manual-sistema-de-cultivo-para-acuicultores-de-pequena-escala/>

Download at :

<https://sembrandoelmar.cl/web/wp-content/uploads/2022/02/Manual-Sistemas-Cultivo-APE-comprimido.pdf>

