Humboldt Current Observation, Prediction, and Early Warning System (S.A.P.O.): Sustainable and Resilient Fisheries

Sistema de Alerta, Predicción y Observación Corriente de Humboldt

S.A.P.O.

Observation, Prediction, and Early Warning System (S.A.P.O.) for climate change resilient fisheries in the Humboldt Current Large Marine Ecosystem

The Humboldt Current Large Marine Ecosystem (HCLME) is one of the most productive in the ocean. The upwelling of cold, nutrient-rich waters supports the development of large concentrations of communities of planktonic organisms and as a result, the primary productivity that forms the basis of the food network of this large ecosystem. It is the habitat for a great diversity of marine life, where some of the world's largest fisheries in terms of volume and value are developed: anchovy, tuna, jack mackerel, parrotfish, giant squid, swordfish, common sardine, and kelp fisheries. The fishery has a global reach and is fundamental to food security and socioeconomic prosperity in this region of South America as well as the planet.

HCLME representative figures (Chile, Peru, and Ecuador)

+10%
of global landings

+200 Thousand
artisan fishermen

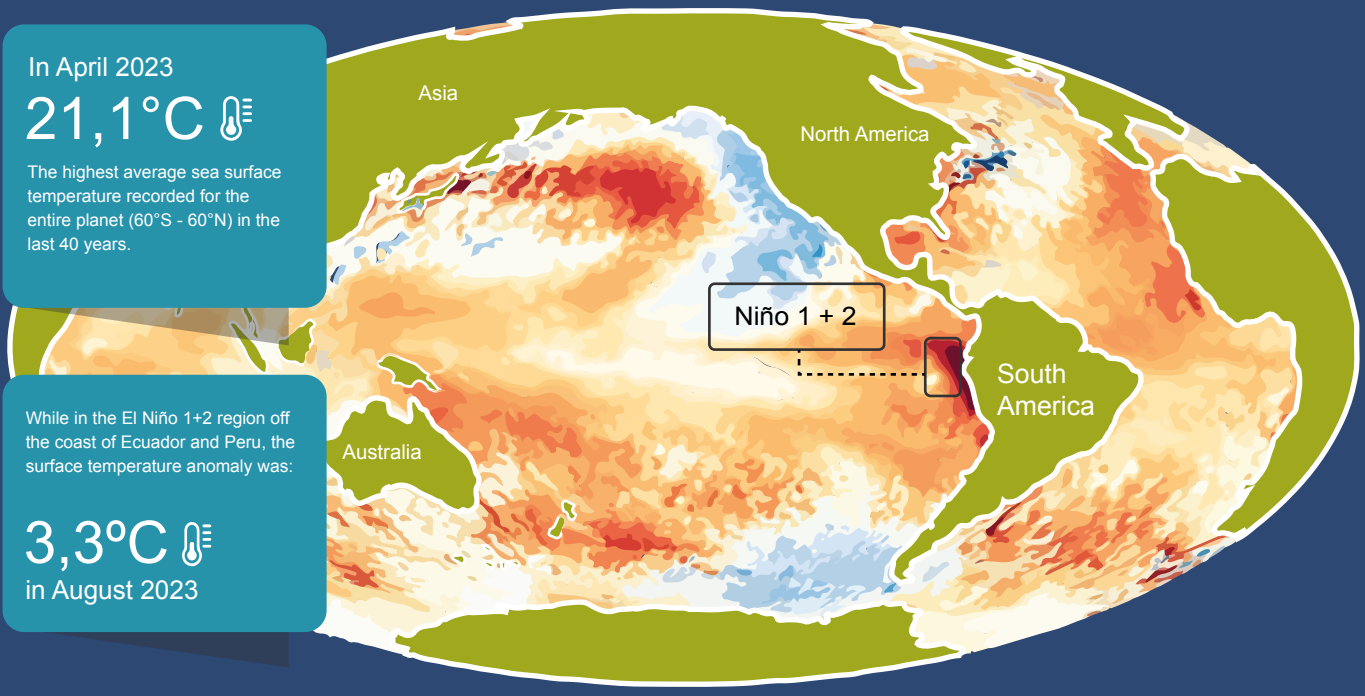
+300 Thousand
direct and indirect jobs

+7 Billon
dollars in annual exports of fishery resources

Sea Surface Temperature Anomalies

The colors on this map show where and how much the monthly sea surface temperature differs from a long-term average (1985-1993). The red and orange areas were warmer than average, and the blue areas were cooler than average. The darker the color, the greater the difference with the long-term average. The white and very light areas were close to average.

In April 2023
21,1°C
The highest average sea surface temperature recorded for the entire planet (60°S - 60°N) in the last 40 years.



While in the El Niño 1+2 region off the coast of Ecuador and Peru, the surface temperature anomaly was:
3,3°C
in August 2023

Difference with respect to average temperature (°C)
-5 0 5

Information obtained from: Climate.gov

HCLME is a highly variable ecosystem, with inter-annual productivity subject to the “El Niño-Southern Oscillation (ENSO)" phenomenon, which causes significant disturbances along the Pacific coast. Climate change is becoming an increasingly significant force, altering the annual cycle of ecosystems, and favoring the presence of ENSO events with greater frequency and intensity, causing changes in ocean chemistry, fishery productivity, species distribution, and other oceanographic conditions that are outside the normal variability patterns.

The challenges of monitoring, predicting, and alerting about these changes are becoming increasingly urgent. Increased global temperatures are having an impact on the frequency of extreme weather events that affect the abundance, distribution, and accessibility of fishery resources, putting global food security at risk.

In order to address these challenges regionally, **Environmental Defense Fund (EDF)** brought together its scientific partners and collaborators in the three countries that share HCMLE **- Chile's Instituto de Fomento Pesquero (IFOP), Peru's Instituto del Mar (IMARPE), and Ecuador's Instituto Público de Investigación de Acuicultura y Pesca (IPIAP)** along with fisheries managers in Chile and Peru (Chile's Subsecretaría de Pesca y Acuicultura and Peru's Ministerio de la Producción, respectively) - and several experts from industry and academia to jointly identify the impacts of climate change on fisheries in the Humboldt Current. This group of key stakeholders has evaluated the various scientific and technological tools, conducted analyses, and built processes to provide timely information on the current conditions in this large ecosystem, and its likely future changes.

In response to this need, the **Observation, Prediction, and Early Warning System (S.A.P.O.)** was created at the **HCMLE** level, combining the efforts of the three countries. Version 1.0 of this system provides integrated scientific information needed by decision-makers in **Chile, Peru, and Ecuador** to effectively address the challenges related to the impact of climate change on fisheries. Version 2.0, currently under development, will increase the of information available and expand its use among artisanal fishermen in the three countries.

Through several workshops and participatory meetings, a tri-national roadmap was created to contribute to achieving resilient fisheries in the Humboldt Current, where S.A.P.O. plays a key role (Figure 1) for the sustainable development of this activity. The System has an Executive Committee and several expert working groups to follow up on this roadmap, improve the design of the System, and update indicators, warnings, and alerts. Some examples of environmental indicators displayed on the System's platform are: Oceanic Niño Index, Coastal El Niño Index (ICEN), Sea Surface Temperature (SST), Sea Surface Temperature Anomaly (SSTA), Sea Level Anomaly, which complements biofishing indicators such as biomass, Gonadosomatic Index (GSI), among others.

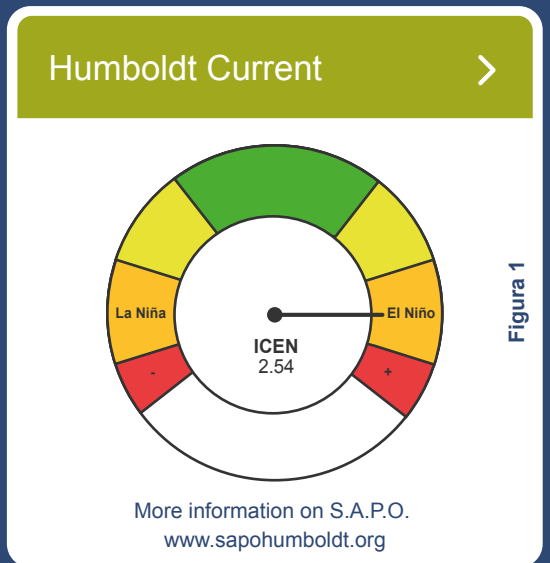
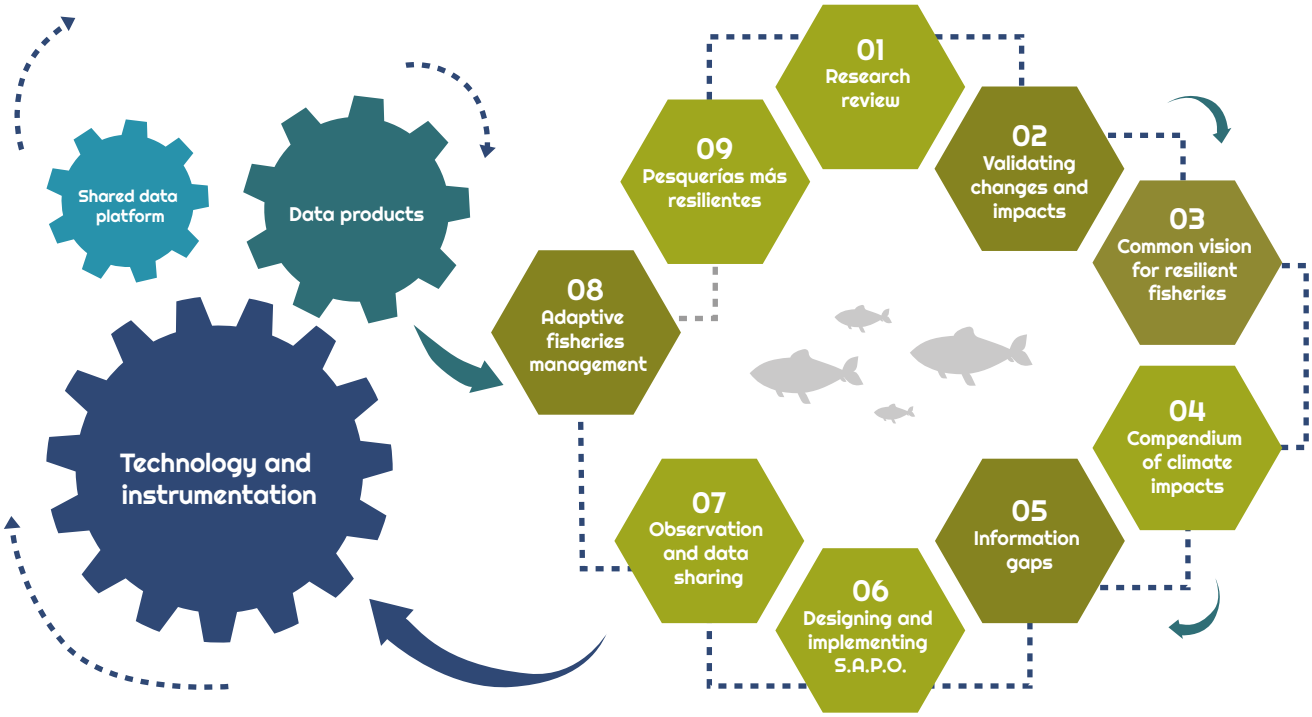


Figura 1

S.A.P.O was launched at the United Nations Ocean Conference (UNOC) in the year 2022.

S.A.P.O. Sistema de Alerta, Predicción y Observación Corriente de Humboldt

The proposed roadmap for achieving climate resilient fisheries in the Humboldt Current, which includes S.A.P.O. between steps 6 to 8.



The key milestones of this tri-national project are:

2018 **First tri-national meeting,** where the idea of creating S.A.P.O. was conceived.

2021 **Detailed design of S.A.P.O.** and approval of the proposed Early Warning indicators by the three countries.

2022 **Implementation and launch** of S.A.P.O. web platform: www.sapohumboldt.org.

- **Launch of S.A.P.O.** at the United Nations Ocean Conference (UNOC) and the Eastern Boundary Upwelling Systems (EBUS) Conference: Past, Present, and Future & Second International Conference on the Humboldt Current System.
- **Monitoring of the 2021-2022** La Niña Event on the South American coast

2023 **Design of a 2.0 version** aimed at the artisan fishing sector, facilitating its accessibility, and improving version 1.0 aimed at decision makers.

- **Radio S.A.P.O.:** Provides timely and easy-to-understand information on weather conditions affecting fishing. It is aimed mainly at artisan fishing communities and broadcast through social networks.
- **Talks S.A.P.O. :** Disseminates and promotes dialogue among the general public on the evolution of climatic conditions in the region, their impact on the ecosystem, and marine resources.
- **Community Climate Monitoring Pilot Program:** Artisan fishing communities in Caleta Río Seco, Chile, are participating.
- **Monitoring of the 2023 El Niño event starting in February 2023,** generated warnings in the form of bulletins to the fishery authorities.

2025 **Implementation of S.A.P.O. 1.0 and 2.0** at scale of the entire HCLME.

S.A.P.O. will be enhanced by the synergies established under the United Nations Decade of Ocean Sciences for Sustainable Development and multi-lateral programs, which allow for increased scientific cooperation, adaptive and sustainable management, promoting a "blue economy" to ensure that fisheries in the HCLME are resilient to climate change.

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