FISHERY IMPROVEMENT PROJECT

PROGRESS REPORT
- THIRD YEAR -

OCTOBER 2021

Guayaquil - Ecuador

Report prepared by:

Jimmy Anastacio, National Chamber of Fisheries of Ecuador
Viviana Jurado, National Fisheries Institute of Ecuador
Teddy Escarabay, Sustainable Fisheries Partnership
Gabriela Ponce, Small Pelagics Sustainability - Fishery Improvement Project
Karina Solis, Small Pelagics Sustainability - Fishery Improvement Project
Carlos Alemán, Small Pelagics Sustainability - Fishery Improvement Project

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Acronyms

CNP	National Chamber of Fisheries
FAP	Fishery Action Plan
FMP	Fishery Management Plan
HCR	Harvest Control Rules
IPIAP	Public Institute for Aquaculture and Fisheries Research (formerly INP)
GMC	Global Marine Commodities Project
MAE	Ministry of Environment of Ecuador
MCPEIP	Ministry of Production, Foreign Trade, Investment and Fisheries of Ecuador
NPOA	National Plan of Action
SFP	Sustainable Fisheries Partnership
SMCP	Sustainable Marine Commodities Platform
SPFDP	Small Pelagic Fishery Dialogue Platform
SPS-FIP	Small Pelagic Sustainability Fishery Improvement Project
SRP	Undersecretariat of Fisheries Resources
UNDP	United Nations Development Programme
VAP	Vice Ministry of Aquaculture and Fisheries

MarinTrust Improver Programme
Milestone Report

Applicant Overview

Fishery under assessment	Ecuadorian Small Pelagic Fishery
Applicant details	National Chamber of Fisheries
Management authority (Country/State)	Ministry of Production, Foreign Trade, Investment and Fisheries. Ecuador
Species	Pacific chub mackerel (macarela) *Scomber japonicus* Frigate tuna (botellita) *Auxis spp.* Shortfin scad (picudillo) *Decapterus macrosoma* Largedhead hairtail (corbata) *Trichiurus lepturus* Thread herrings (pinchagua) *Opisthonema spp.* Pacific anchoveta (chuhueco) *Cetengraulis mysticetus* Pacific cornetfish (trompeta) *Fistularia corneta* Round herring (sardina redonda) *Etrumeus acuminatus* Yellowstripe grunt (roncador) *Haemulopsis axillaris* Longnose anchovy *Anchoa nasus* Pacific harvestfish (pámpano) *Peprilus medius* Drums (barriga juma) *Larimus spp.* Jack Mackerel (jurel) *Trachurus murphyi*
Fishery location	Ecuador EEZ. FAO87
Gear type(s)	Industrial purse seine
Date of acceptance into MarinTrust IP	October 2018
Original projected IP completion date	October 2023

IP Milestone report

M – Management Framework and Surveillance, Control and Enforcement

FAP Activities 1.1-1.4. Decision making process on fishery management is transparent, inclusive, and participatory

MT clause (if relevant)	M1.5 and M1.6
Progress against milestones	
The milestone was already achieved. This report includes an update of new supporting evidence.	
Outstanding actions and rationale	
Since April 21, 2020 and through official Registry No. 187, the Organic Law for the Development of Aquaculture and Fisheries of Ecuador is in force. In terms of fisheries management, the Organic Law, in its Article 96, states that: "*the fisheries management measures will be established under the principle of governance, and sustainability of hydrobiological resources, with the greater social, economic and environmental benefits, with an ecosystem approach*". Article 97 establishes that: "*For the management of fisheries of hydrobiological resources that are not under the jurisdiction of a regional fisheries management body, the governing body in coordination with the Public Institute for Aquaculture and Fisheries Research, in accordance with the scope of their powers, will establish the management plans*". In these plans, goals, objectives, and terms must be established in the biological, fishing and socioeconomic fields, identifying the strategies and measures, regulation and management of fishing to achieve the proposed objectives, research requirements and consultation mechanisms between the different fishing sectors involved in the fishery, among other elements. The law establishes *governance as a principle*: "*it creates the normative and regulatory frameworks; develops short- and long-term policies through conventional forms of administration or through modern forms with participatory decision-making processes; connects government with civil society, harmonizing individual, sectoral and social perspectives; maintains coherence between jurisdictional, spatial and temporal levels; legitimizes and balances the interaction of stakeholders; enforces decisions and regulations; defines the rules for the allocation of attributions, resources and benefits; and, it maintains the capacity for continuous improvement* ". Based on the principle of Governance, the Ecuadorian Small Pelagic Fishery Dialogue Platform SPFDP was established through Ministerial Agreement No. MPCEIP-SRP-2020-0054-A, "*as an instrument of agreement between the public and private sectors, on issues related to the conservation, management, planning and sustainable use of these bio aquatic resources*". The SPFDP has the character of a cooperative body of the Ministry of Production, Foreign Trade, Investments and Fisheries, in the elaboration of a proposal for a National Action Plan (NPOA) and Fishery Management Plan (FMP). The SPFDP also will play a key role in the implementation, evaluation, adaptation, and update of the NPOA and FMP. As result of several meeting between National Authority, private stakeholders, academy, and NGOs, through SPFDP, the fishery management plan (2021-2025) and the National plan of action for the Ecuadorian Small Pelagic Fishery were established by Ministerial Agreement No. MPCEIP-SRP-2021-0073-A (March 2021). The NPOA stablishes as objective MLG-2.1 "Have a defined governance scheme that establishes procedures that promote stakeholder participation", and the instrument is	

the SPFDP stablished by Ministerial Agreement Nro. MPCEIP-SRP-2020-0054-A. Through the SPFDP the stakeholders of the fishery discussed the control rules included in the FMP.

It's expected that additional regulations about participatory governance will be included by the National Authority in new Regulation of the Law still in elaboration.

Also, the last fishing closure stablished during 2021 from May 23 to June 23, was discussed with the private sector trough SPFDP during a meeting celebrated on May 13 in attention to an extraordinary measure recommend by IPIAP due to the high percentage of juveniles during the fishing season. As result a closure was established by Ministerial Agreement Nro. MPCEIP-SRP-2021-0118-A.

Evidence

Organic Law for the Development of Aquaculture and Fisheries of Ecuador: https://camaradepesqueria.ec/wp-content/uploads/2020/04/Ley-de-Acuicultura-y-Pesca-2019.pdf

Fishery management plan, Ministerial Agreement No. MPCEIP-SRP-2021-0073-A.: https://drive.google.com/file/d/1LguOBlLr5wvxsN7sZdgtIsc5WpotezZZ/view

Ministerial Agreement Nro. MPCEIP-SRP-2020-0054-A (SPFDP)
https://camaradepesqueria.ec/wp-content/uploads/2020/07/ACUERDO-PLATAFORMA-MPCEIP-SRP-2020-0054-A.pdf

Progress report in the implementation of the national plan of action and management plan of the small pelagic fishery in Ecuador:
https://drive.google.com/file/d/16iETdNQcVqfW_IY_aoLfrIgDJBRCuUGz/view?usp=sharing

Ministerial Agreement Nro. MPCEIP-SRP-2021-0118-A
https://drive.google.com/file/d/12kX0gmzbOb4BCFZ-YfSp-WtDqLbiGbNV/view?usp=sharing

Videos about SPFDP
https://drive.google.com/file/d/1_xk7Y59utAVoOVlt3etZMyT9zRnYRIlJ/view?usp=sharing
https://www.facebook.com/globalmarinecommodities/videos/992844211130965
https://youtu.be/nF3jiZNIw8w

Status of action	Completed. Evidence Updated.

A – Category A: Data Collection, Stock Assessment, Harvest Strategy and Stock Status

FAP activity 3.1 Implement electronic logbooks for all the industrial boats targeting small pelagics, including interaction with ETPs.

MT clause (if relevant)	A1.1-1.2

Progress against milestones

The milestone was already achieved. This report includes an update of new supporting evidence.

Outstanding actions and rationale

By 2021, and after compiling the analyses corresponding to the performance of the electronic logbook app (BEP app), new adjustments were made considering fields in the application that improve the interpretation of data. The technical team of the Ministry carried out a process to achieve a robust application that allows it to be highly reliable and immediately available, both for the technical investigation team and for shipowners, whom have the option of viewing the information reported by their own vessels. This last option guaranteed the access of IPIAP technicians to obtain data for fisheries research, based on a specific data exchange agreement between the National Fisheries Authority and the Public Institute for Aquaculture and Fisheries Research.

Thus, in March / 2021, the electronic logbook on board the vessels of the SPS-FIP Program, went from being a pilot to being a commonly used application with incorporated improvements, so for August 2021, a year of use of the app was completed. At that time, the first year of using the BEP app generated:
1. A total of 3,588 logs generated by the SPS-FIP fleet.
2. Incorporates a total of 33 vessels reporting regularly.
3. The record of total catch corresponding to one year (August 2020 to August 2021) was 132 786 tons, composed of: Pacific chub mackerel with 93 397 t (70%), thread herring with 12 574 t (9.5%), frigate tuna with 9 853 t (7.4%), *Prionotus spp* with 7 646 (5.8%), shortfin scad 2 824 (2.2%), pacific anchoveta1 126 (0.8%), round herring 784 (0.6%) and others species with a total of 4 482 (3.4%).

Regarding the benefits that users of the system have perceived (web environment and mobile app), they indicated:
• Quick information search.
• The app is considered another application (software) of the several that are used in fishing work (referring to the existing electronic systems on board of these vessels).
• Information arrives quickly, and you have a backup via email.

In September 2021, as part of the traceability system promoted by the national fishing authority, with the new ACIIS-SIAP system, which incorporates new options like photo registration (i.e bycatch), it was agreed to carry out a test pilot phase that is ongoing and ends on October 17/2021. In this new version of the electronic fishing logbook, there are 25 vessels of SPS-FIP and it is expected to obtain a schedule of the procedures or actions which contributes to the continuous improvement of the fisheries and aquaculture information system (SIAP) as a basis for research and decision making.

As a complementary activity, SPS-FIP trained 185 crew members in the correct identification of species to improve data collection, the project also designed a guide for fish identification and distribute it to fishermen.

Evidence
Electronic logbook (Government of Ecuador): http://bitacora.produccion.gob.ec/bitacora/ http://smallpelagics.org/bitacora-electronica/ http://smallpelagics.org/content/uploads/2021/06/triptico-bitacora-electronica-de-pesca_Brochure-Inside-2048x1447.jpg Photo evidence of new app testing period under ACIIS-SIAP system by National Authority https://twitter.com/PesqueriaEc/status/1440828287102570497 Logbook generated by BEP system https://drive.google.com/file/d/10SvC_w7yUGZCba5OEpnzv8lR9irwc5q9/view?usp=sharing Logbook generated by new ACIIS-SIAP system https://drive.google.com/file/d/1EjAVbyK9jiLSy0JvvBdjsrAUrvP4ZzfW/view?usp=sharing Fish Identification Guide for the small pelagic fishery in Ecuador http://smallpelagics.org/content/uploads/documents/CNP-guia-de-identificacion-de-peces-oseos_compressed.pdf Report of the implementation of a responsible fishery management model in the small pelagic fishery of Ecuador. Training plan implementation: https://docs.google.com/document/d/1tVIfqD07-TvImzjY-GmWERP59_OfqZ98/edit?usp=sharing&ouid=112572111827130877547&rtpof=true&sd=true

Status of action	Completed. Evidence Updated.

FAP activity 4. Establish a biological data gathering system through the observers program. Samples will include, but not limited to, size, maturity, gonads status, stomachs contents, etc. Sampling frequency and size (number of individuals analysed) will be determined by IPIAP. Samplers will be hired by INP.

MT clause (if relevant)	A1.1-1.2

Progress against milestones
The milestone was already achieved. This report includes an update of new supporting evidence.

Outstanding actions and rationale
As detailed in the Progress Report in the implementation of the national plan of action and management plan of the small pelagic fishery in Ecuador in relation with objective "IMO-1.1.2. Monitor the fishing operation (effort, catches, yields, size structure, incidental catch, discard, impact on habitat, among others)", the Undersecretariat of Fisheries Resources carries out permanent tasks related to the monitoring and control of the small pelagic fishery. Although this monitoring is carried out for the purpose of control, the information collected serves as support for the execution of the investigation, since it constitutes a daily information survey of the landings made by the fishery. Likewise, information is generated by the Fisheries Observer Program administered by the SRP, and for which the data is delivered to the Scientific Authority (IPIAP) for its respective analysis.

In this sense, the Scientific Authority in conjunction with the Fisheries Authority and the National Chamber of Fisheries, has improved observer protocols for the fishing of small pelagic fish, as well as strengthened the technical capacities of observers working in the industrial vessels of the small pelagic fishery. The program is integrated by 27 observers (21 on board + 6 for biological sampling) and information collected allow the development of several analysis like stock assessment, ETP interaction evaluation and habitat interactions as indicated in the following sections of this report. Also, Ministerial Agreement Nro. MPCEIP-SRP-2020-0056-A (May 2020) indicates "Article 13.- Establish, through the Undersecretariat of Fisheries Resources, a "Mandatory Program of On-Board Fisheries Observers" for vessels with purse seines that catch small pelagic fish, which shall randomly cover 30% of the fleet, in technical coordination with the Public Institute for Aquaculture and Fisheries Research."
Evidence
Progress report in the implementation of the national plan of action and management plan of the small pelagic fishery in Ecuador: https://drive.google.com/file/d/16iETdNQcVqfW_IY_aoLfrIgDJBRCuUGz/view?usp=sharing Data Collection Protocol for Observer Program https://www.institutopesca.gob.ec/wp-content/uploads/2018/01/PROTOCOLO-DE-OBTENCI%c3%93N-DE-DATOS-DEL-PROGRAMA-DE-OBSERVADORES-DE-LA-FLOTA-INDUSTRIAL-DE-PECES-PEL%c3%81GICOS-PEQUE%c3%91OS.pdf Ministerial Agreement Nro. MPCEIP-SRP-2020-0056-A (May 2020) https://camaradepesqueria.ec/wp-content/uploads/2020/08/REGULACION-PELAGICOS-PEQUENOS-MPCEIP-SRP-2020-0056-A.pdf

Status of action	Completed. Evidence Updated.

FAP Activities 5.1.1 - 5.1.9 / 5.2.1 - 5.2.9 Establish a periodic stock assessments system (every three years) and 2.4 Design a research project in order to define and conduct stocks assessment models , which may take into consideration oceanographic particularities. This project has to determine the stock structure and its distribution and will be the basis of the management strategy.

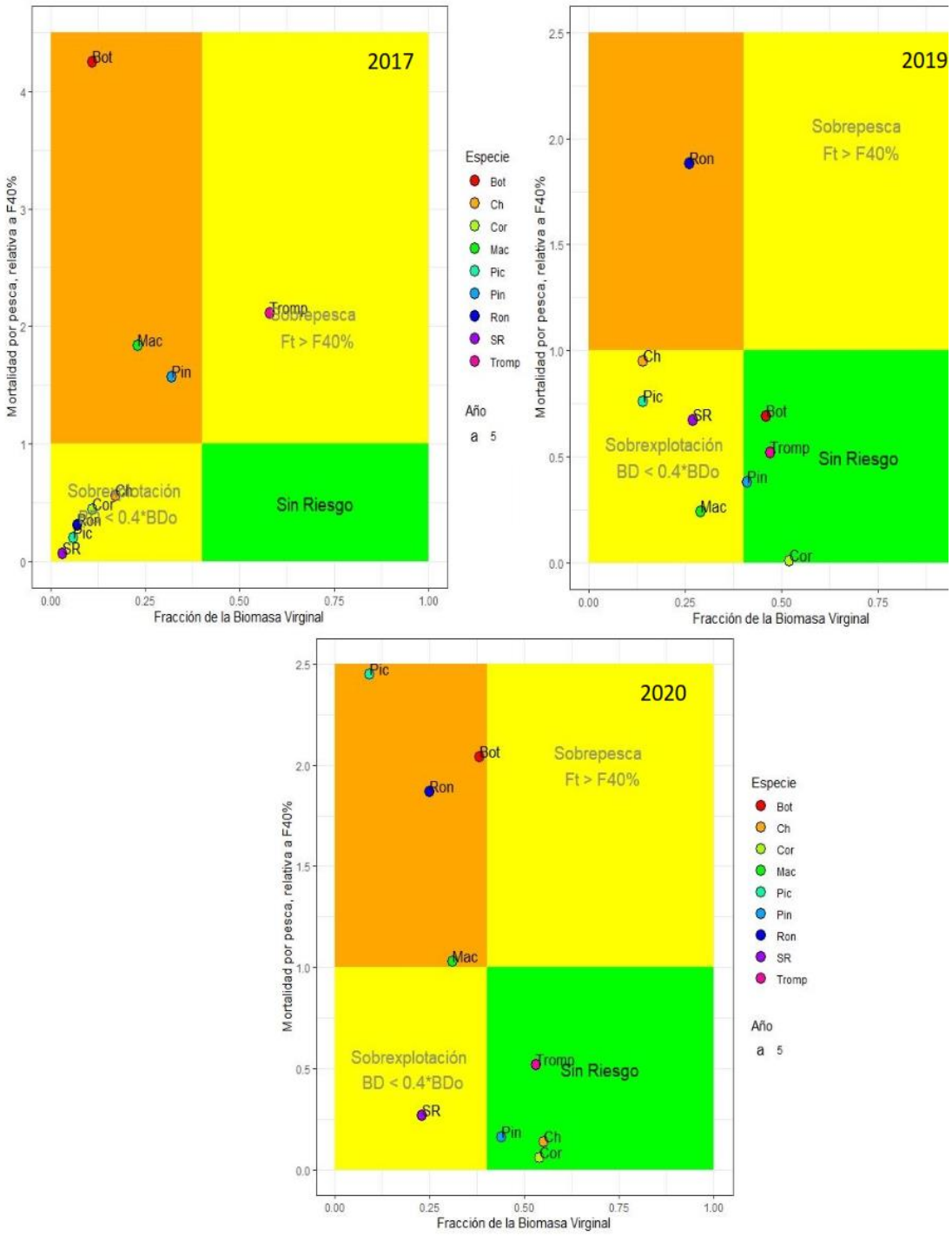
MT clause (if relevant)	A2.1-2.5
Progress against milestones	
The milestone was already achieved. This report includes an update of new supporting data.	
Outstanding actions and rationale	
Under FIP implementation process, IPIAP developed the third stock assessment of species prioritized by SPS-FIP, the assessment evaluate data until 2020 and was published by IPIAP in 2021.	

Canales and Jurado (2021) concluded: The diagnosis and evaluation of the stock of small pelagic fish from Ecuador is carried out with updated biological fishery information to 2020. For all the scenarios and models analyzed, the results showed that the populations of small pelagic fish from Ecuador in general confirm their improvement explained by the increase biomass, and the relative reduction in fishing mortality relative to the reference fishing mortality. This recovery has been due, among others, to the decrease in both catches and the effective number of days of operation of the fleet. Between 2017 and 2020, the small pelagic stocks of Ecuador doubled their biomass and their relative indicator B / B0 increased from 0.18 to 0.37, while the overfishing index F / F40 decreased from 1.26 to 0.94. Notwithstanding this, during 2020 and because of the increase in catches in some species, the F/F40 indicator increased compared to 2019, approaching the limit value on average. In the same way and although 44% of the species did not show evidence of overexploitation (B / B0> 0.4) (Pacific anchoveta, Thread herring, Pacific cornetfish and Largedhead hairtail), a similar proportion of species registered overfishing (F / F40> 1) being the most affected frigate tuna, shortfin scad and Yellowstripe grunt. The most diminished species corresponded to the round herring (B / B0 = 0.23) and the Yellowstripe grunt (B / B0 = 0.25). Finally, and to ensure the recovery of these populations, it is suggested to manage the increases in the level of fishing effort through a control rule and take advantage of the productivity levels of these resources, in this way to ensure stability / recovery in the most diminished species. In this process, the permanent surveillance of population indicators carried out by IPIAP through the monitoring of these fisheries in Ecuador must be reinforced. The recommendation is already a measure under Fishery Management Plan.

Último año de datos	2020		2019		2017	
Especie	B/B0	F/F_{40}	B/B0	F/F_{40}	B/B0	F/F_{40}
Botella	0.38	2.04	**0.46**	0.69	0.11	4.25
Chuhueco	**0.55**	0.14	0.14	0.95	0.17	0.56
Macarela	0.31	1.03	0.29	0.24	0.23	1.84
Pinchagua	**0.44**	0.16	**0.41**	0.38	0.32	1.57
Picudillo	0.09	2.45	0.14	0.76	0.06	0.20
Sardina	0.23	0.27	0.27	0.67	0.03	0.07
Trompeta*	**0.53**	0.52	**0.47**	0.52	**0.58**	2.11
Corbata*	**0.54**	0.06	**0.52**	0.01	0.11	0.44
Roncador*	0.25	1.87	0.26	1.88	0.07	0.31
Promedio	0.37	0.94	0.32	0.67	0.18	1.26

Comparative table of the diagnostic indicators of the small pelagic stocks of Ecuador 2019-2021. B/B0 values greater than 0.4 (* Other non-pelagic species). Source: Canales & Jurado (2021)

On the other hand, for the first time in the region, environmental variables were included as part of the stock assessment process, showing that some population processes could be closely related to environmental conditions. The variability of the sea surface temperature (SST) and Chlorophyll-a (Clo-a) show for the last years, slightly warm anomalies in the SST and notably negative in Clo-a. In this context, the results shown that environmental variability affects the natural mortality of frigate tuna, pacific anchoveta and round herring, generating lower biomass. On the other hand, the same variables would proportionally affect the availability / catchability of the pacific chub mackerel, shortfin scad and thread herring, but without major effects on the state of their populations.



Kobe diagram in which the population status of the small pelagic species is highlighted with respect to the variations in the fraction of the virginal biomass and the relative fishing mortality, in the years 2017, 2019 and 2020. Source: Canales and Jurado (2021)

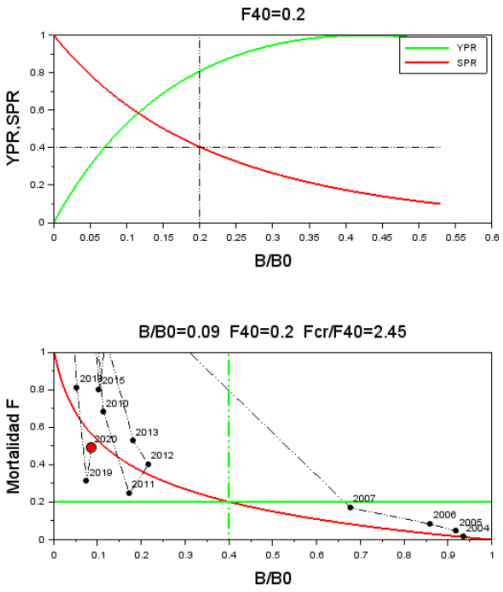


Figura PIC8. Curvas de biomasa y rendimiento por recluta (arriba), Puntos biológico de referencia y diagrama de Kobe (abajo). El círculo rojo representa la condición actual. Recurso **PICUDILLO**.

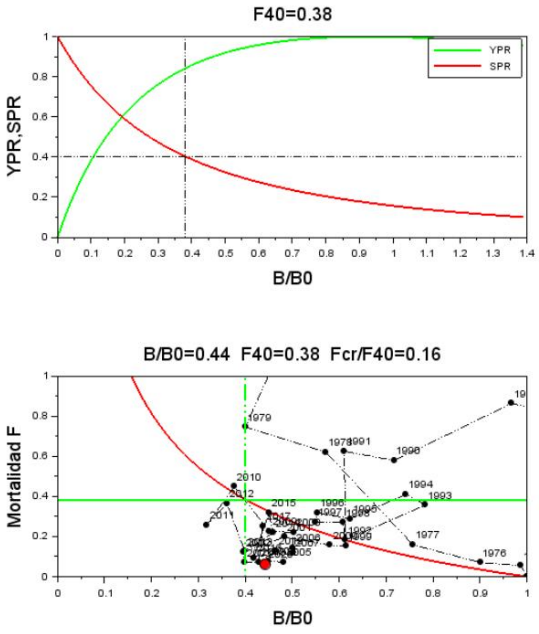


Figura P8. Curvas de biomasa y rendimiento por recluta (arriba), Puntos biológico de referencia y diagrama de Kobe (abajo). El círculo rojo representa la condición actual. Recurso **PINCHAGUA**.

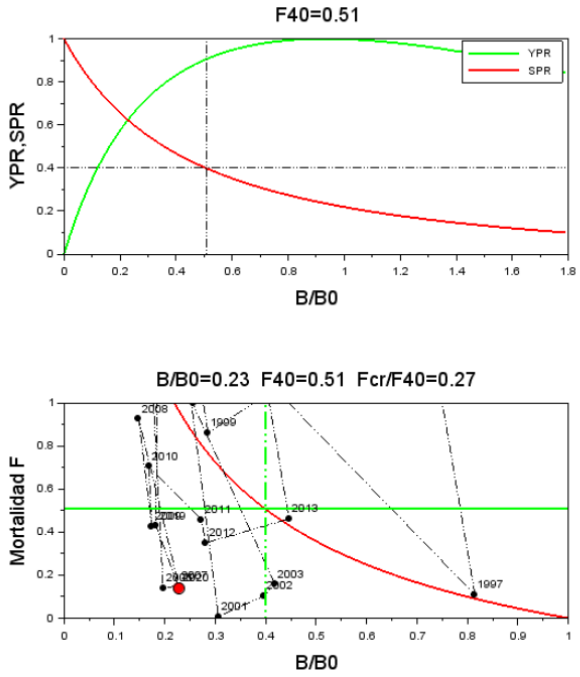


Figura SR8. Curvas de biomasa y rendimiento por recluta (arriba), Puntos biológico de referencia y diagrama de Kobe (abajo). El círculo rojo representa la condición actual. Recurso **SARDINA REDONDA**.

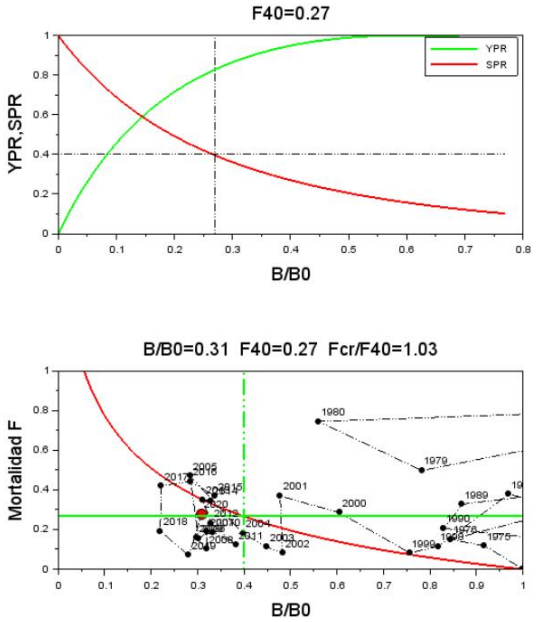


Figura M8. Curvas de biomasa y rendimiento por recluta (arriba), Puntos biológico de referencia y diagrama de Kobe (abajo). El círculo rojo representa la condición actual. Recurso **MACARELA**.

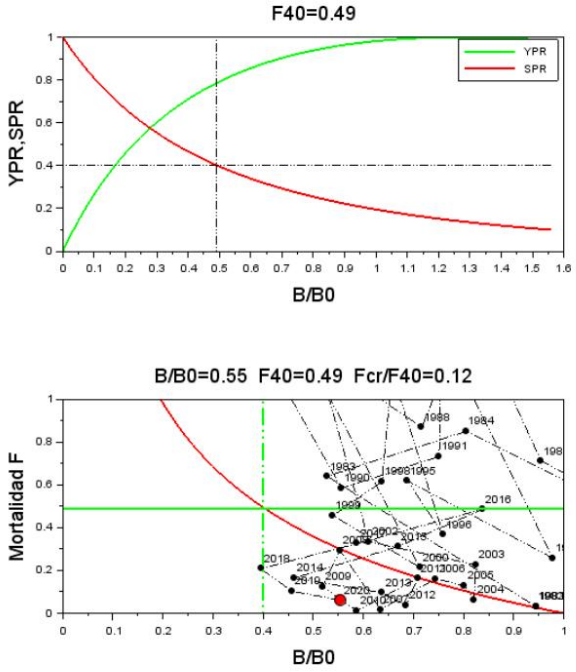


Figura CH8. Curvas de biomasa y rendimiento por recluta (arriba), Puntos biológico de referencia y diagrama de Kobe (abajo). El círculo rojo representa la condición actual. Recurso **CHUHUECO**.

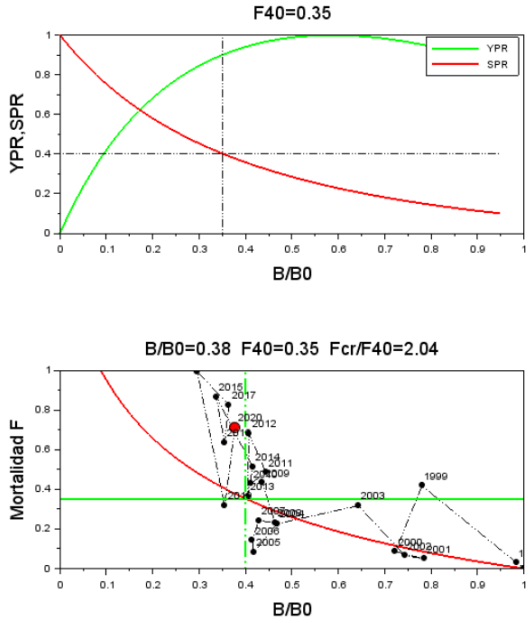


Figura B8. Curvas de biomasa y rendimiento por recluta (arriba), Puntos biológico de referencia y diagrama de Kobe (abajo). El círculo rojo representa la condición actual. Recurso **BOTELLA**.

Evidence

Canales C. M., V. Jurado, 2021. Evaluación del stock de recursos pelágicos pequeños del Ecuador. Año 2021. Informe Técnico. Guayaquil, julio 2021. 123 p https://www.institutopesca.gob.ec/wp-content/uploads/2018/01/IPIAP-Evaluacion-pel%c3%a1gicos-del-Ecuador.pdf

Canales, C. M., Jurado, V., Peralta, M., Chicaiza, D., Elías, E., Romero, A. 2020. Evaluación de stock de peces pelágicos pequeños en la costa continental ecuatoriana. Informe Técnico. Instituto Nacional de Pesca. 102 pp https://www.institutopesca.gob.ec/wp-content/uploads/2018/01/INFORME-EVAL_STOCK_PP_ECUADOR_2020_WEB.pdf Canales, C. M., Jurado, V., Peralta, M., Chicaiza, D., Elías, E., Preciado, M., Hurtado, M., Landívar, E., Alemán, C., Sandoval, G. 2019. Evaluación de stock de peces pelágicos pequeños en la costa continental ecuatoriana. Cadenas Mundiales Sostenibles—Informe Científico No. 1. Honolulu: Sustainable Fisheries Partnership Foundation & Instituto Nacional de Pesca. 82 pp http://www.institutopesca.gob.ec/wp-content/uploads/2018/01/Informe-Evaluaci%C3%B3n-2019.pdf

Status of action	Completed. Evidence Updated.

FAP activities 7.1 -7.9 Identify and establish biological reference points (target and limit) as well as related Harvest Control Rules

MT clause (if relevant)	A3.1 – 3.3
Progress against milestones	
The milestone was already achieved. This report includes an update of new supporting data.	
Outstanding actions and rationale	
Control rules for the fishery was officially established in the fishery management plan (2021-2025) by Ministerial Agreement No. MPCEIP-SRP-2021-0073-A (March 2021). As previous reported, the control rule allows adjusting the effort measured in total fishing days of the season, according to the state of the small pelagic stocks. This is carried out by adjusting the extension of the current monthly extractive closure known as "*clara*" (full moon period), adjusting the days of closure to achieve the CPUERMS of the indicator species. The estimate of the duration of the extractive closure will be established by the SRP through Ministerial Agreement and must be based on the estimate and recommendation made by the IPIAP. Control rules are based on the state of exploitation of the indicator species according to the variation of its Catch per Unit of Effort (CPUE), as a population abundance index, which is estimated annually in the regular data analysis process of fishing activities carried out by IPIAP. At the beginning of each fishing season, the level of effort must be adjusted for the entire fishery, based on the stock status of the indicator species (Pacific chub mackerel and Thread herring), considering its Biological Reference Points. As result of the management strategy evaluation and the dialogue through SPFDP, the prioritization is detailed bellow, an important input for the NPOA and FMP to the execution of control rules (Canales, 2020):	

Prioritization of small pelagic species. Source: Canales (2020)

Species	Vulnerability	Stock Status	Management importance	Ranking
Pacific chub mackerel	4.1	2.5	4.3	3.62
Thread herring	3.5	2.0	4.2	3.23
Shortfin scad	3.2	3.3	3.0	3.16
Pacific anchoveta	2.8	3.0	3.4	3.08
Frigate tuna	3.3	1.5	4.0	2.94
Round herring	3.3	2.0	1.6	2.31

The fishing effort (E) must be adjusted annually (t) considering the variation of the CPUE of the indicator species with respect to the target reference value (CPUERMS):

$$E_t = \rho_t \, E_{t-1}$$

$$\rho_t = 0.5 \frac{(CPUE_{t-1} + CPUE_{t-2})}{CPUE_{RMS}}$$

The rule considers the magnitude of the catches that were made in previous years, that means the effort reduction is only generated when the average catches of the last two years are greater than the MSY (stabilizer).

Conditions with stabilizer to adjust the fishing effort in the small pelagic fishing fleet of Ecuador. Source: Canales (2020).

Condition	Decision
If r>1 but average catches < RMS	Fishing days is increased r times.
If r>1 and average catches > RMS	Fishing days remains constant.
If r<1 but average catches < RMS	Fishing days remains constant.
If r<1 but average catches >RMS	Fishing days is decreased r times.

However, every two years the status of the fishery must be reviewed, to generate changes or maintain the key species that generates the entry into effect of the control rules (actually Pacific chub mackerel and Thread herring) *Once the conditions of the indicator species reach 90% of the management objective ($CPUE_{RMS}$), it will be changed following a prioritization. *

The control rules are part of the FMP which was discussed in the SPFDP.

Evidence

Canales, C. (2020). *Desarrollo de competencias al Instituto Público de Investigación de Acuacultura y Pesca (IPIAP) para el diseño e implementación de reglas de decisión de capturas, acordes con los objetivos de manejo propuestos para la pesquería de peces pelágicos.* Guayaquil:

Proyecto PNUD - Cadenas Mundiales Sostenibles de Suministro de Productos del Mar. https://drive.google.com/file/d/1eJcxKC7IQCBLvXgBq0p-YH5E231Kp130/view?usp=sharing Fishery management plan, Ministerial Agreement No. MPCEIP-SRP-2021-0073-A.: https://drive.google.com/file/d/1LguOBlLr5wvxsN7sZdgtIsc5WpotezZZ/view	
Status of action	Completed. Evidence Updated.

B – Category B Stock Status

Not applicable actions were identified according to pre-assessment. An update of the whole assessment of the fishery under MarinTrust Standard was contracted an expected to finish in December 2021, any update will be reported in the next milestone report.

C – Category C Stock Status

FAP activity 18. Provide evidence from INP showing that catches are negligible (jack mackerel)

MT clause (if relevant)	C
Progress against milestones	
The milestone was already achieved. This report includes an update of new supporting data.	
Outstanding actions and rationale	
Jurado (2019) indicated that the presence of jack mackerel in Ecuador since 2000 became sporadic and associated with the presence of extreme cold conditions (La Niña phenomenon), but even so the catches represented 1% of the total caught until completely disappearing from the landings in the last years. This situation remains the same according to updated landing statistics.	
Evidence	
Jurado, V. (2019). *ASPECTOS BIOLÓGICO PESQUEROS DE JUREL (Trachurus murphyi) EN AGUAS ECUATORIANAS.* Guayaquil: Instituto Nacional de Pesca. https://drive.google.com/file/d/1JUDuLwx7uL3tY3uUA4k-NQLa36JlRhjs/view?usp=sharing Landings 2004-2019 https://www.institutopesca.gob.ec/wp-content/uploads/2021/02/DesembPPP-2004-2019_Desglose-Otros.pdf Landings 2020 https://www.institutopesca.gob.ec/wp-content/uploads/2021/02/DesembPPP-2004-2019_Desglose-Otros.pdf	
Status of action	Completed. Evidence Updated.

D – Impacts On Species Categorised as Vulnerable by D1-D3

Longnose anchovy and Pacific harvestfish were classified as Category D species by the fishery pre-assessment. Not applicable actions were identified according to pre-assessment because PASS condition determined. An update of the whole assessment of the fishery under MarinTrust Standard was contracted an expected to finish in December 2021, any update will be reported in the next milestone report.

F – Impacts on ETP Species, Impacts on Habitats and Ecosystem Impacts

FAP Activity 3.1. Fishery interactions with ETP are registered by concerned fleets and managers adopt CMMs accordingly. Implement electronic logbooks for all the industrial boats targeting small pelagic fish, including interaction with ETPs.

MT clause (if relevant)	F1.1
Progress against milestones	
The milestone was already achieved. This report includes an update of new available research, actions, and regulations.	
Outstanding actions and rationale	
ETP species interaction are registered by on-board observer program and by electronic logbook of the Ecuadorian government and implemented on board SPS-FIP fleet. The observer program started to collect ETP data because of improvement recommendations implemented by SPS-FIP, as detailed in "Data Collection Protocol of the Observer Program of the small pelagic fish industrial fleet" reported in first-year progress report, as result two studies about ETP interactions in the fisheries have been done. Also, as part of the new "Responsible Fishing Programme" launched by CNP in 2021, vessels of firms participating in the SPS-FIP are now recording the interaction and release of marine fauna after a training. This form was done together with the IPIAP and is part of a model for collecting data by the industry to improve the knowledge and decision-making process of the fishery.	
Evidence	
Data Collection Protocol of the Observer Program of the small pelagic fish industrial fleet https://www.institutopesca.gob.ec/wp-content/uploads/2018/01/PROTOCOLO-DE-OBTENCI%c3%93N-DE-DATOS-DEL-PROGRAMA-DE-OBSERVADORES-DE-LA-FLOTA-INDUSTRIAL-DE-PECES-PEL%c3%81GICOS-PEQUE%c3%91OS.pdf Electronic logbook (Government of Ecuador): http://bitacora.produccion.gob.ec/bitacora/ http://smallpelagics.org/bitacora-electronica/ http://smallpelagics.org/content/uploads/2021/06/triptico-bitacora-electronica-de-pesca_Brochure-Inside-2048x1447.jpg	

Logbook generated by BEP system https://drive.google.com/file/d/10SvC_w7yUGZCba5OEpnzv8lR9irwc5q9/view?usp=sharing Logbook generated by new ACIIS-SIAP system https://drive.google.com/file/d/1EjAVbyK9jiLSy0JvvBdjsrAUrvP4ZzfW/view?usp=sharing CNP Record form for the release of marine fauna for the Ecuadorian small pelagic fishery. https://drive.google.com/file/d/18kwwIh6I06KQLQTGzScIsaNcoPrU7AHU/view?usp=sharing	
Status of action	Completed. Evidence Updated.

FAP Activity. 14.1 ETP Assessment developed on yearly bases and available publicly

MT clause (if relevant)	**F1.2**
Progress against milestones	
The milestone was already achieved. This report includes an update of new available research, actions, and regulations.	
Outstanding actions and rationale	
In addition to the studies shared in the Second Year Progress Report, a new report about ETP interactions in the fishery was published by IPIAP in 2021. Ponce, Ayora & Jurado (2021) analyzed a total of 1741 sets corresponding to 774 trips made by 97 vessels belonging to the purse-seine fishing fleet in continental Ecuador during 2020, obtained from the Observer Program of the Undersecretariat of Fisheries Resources (SRP): • The sightings and interactions that existed during the fishing activity carried out by the fleet and the species of seabirds, turtles, marine mammals, and elasmobranchs were identified and spatially distributed, calculating in turn, the interaction rate for each registered species taking into account the trips and the number of registered species. • A total of 23 different species were sighted, of which 16 registered interactions, with 4 of these species categorized as ETP (*Phoebastria albatrus, Lepidochelys olivacea, Chelonia mydas and Myliobatis longirostris*). Although there were interactions, the data analyzed show that their interaction rate was less than 0.1 and mortality reports were minimal (0.02% of all interactions). • However, it was concluded that there was no significant impact of the fleet towards ETP species since their interaction rate was less than 1 and the mortality records were null (0.02% of total interactions). • Other species not categorized as ETP such as *Otaria flasvescens* (South American sea lion) and *Fregata magnificens* (common frigatebird) presented the highest interaction rates (5.68 and 3.01, respectively). So, it is recommended to keep monitoring within observer Program, and in turn, carry out this type of analysis periodically.	
Evidence	
Ponce, G. Ayora, G., Jurado, V. & (2021). *Interacción de aves marinas, tortugas, mamíferos marinos y elasmobranquios con la pesquería de peces pelágicos pequeños en la costa continental de Ecuador durante 2020.* Guayaquil: IPIAP. https://www.institutopesca.gob.ec/wp-	

content/uploads/2018/01/Interaccciones-flota-PPP-con-especies-de-tortugas-aves-mamiferos-elasmobranquios-ETP-2020.pdf

Jurado, V., Gilbert, G., & Ponce, G. (2020). *Interacción de aves marinas, tortugas y mamíferos marinos con la pesquería de peces pelágicos pequeños en la costa continental de Ecuador durante junio-octubre de 2019.* Guayaquil: IPIAP. https://www.institutopesca.gob.ec/wp-content/uploads/2018/01/Interaccciones-flota-PPP-con-especies-de-tortugas-aves-mamiferos-ETP-2019.pdf

Status of action	Completed. Evidence Updated.

FAP Activity. 14.2 CMMs related to ETP based on existing assessment adopted by managers

MT clause (if relevant)	F1.3

Progress against milestones

The milestone was already achieved. This report includes an update of new available research, actions, and regulations.

Outstanding actions and rationale

Although ETP interactions are not an issue in the fishery, it is considered in the management decision-making process, as part of the ecological dimension of the fishery management plan (2021-2025) established by Ministerial Agreement No. MPCEIP-SRP-2021-0073-A (March 2021). The FMP establishes the following objective "*Reduce severe impact interactions with ETP species by 2025*" and stablish the following measures:

- Design a protocol of good practices that considers a categorization of levels of impact on ETP species.
- Implement the protocol in more than 80% of the fleet.
- Monitor protocol coverage and number of severe impacts with ETP species through the electronic logbook and observer program forms.

As part of the "Responsible Fishing Programme" launched by CNP in 2021, SPS-FIP staff together with IPIAP designed several guides of good practices to the identification and release of marine fauna.

These materials were used in the training process, the program started with the fishermen's training in 4 modules:

Module 1: Marine ecosystem, sustainable fishing, and correct identification of target fish

- Understand basic concepts of marine ecology
- Know the concept of sustainable fishing, an ecosystem approach to fishing and how to develop it on board
- Correctly identify the target fish species of the Ecuadorian small pelagic fishery
- Know the importance of monitoring fishing activity and the ecosystem
- Make the correct registration of the capture composition form

Module 2: Biology, ecology, and identification of marine megafauna, especially ETP species

- Learn about the biology and ecology of seabirds, marine mammals, sea turtles and elasmobranchs.
- Develop skills for the correct identification of seabirds, marine mammals, sea turtles and elasmobranchs.
- Identify marine fauna according to its category of extinction risk (List IUCN).
- Make the correct record of the record of marine megafauna sightings.

Module 3: Correct handling and release techniques for marine megafauna

- Know the correct techniques for handling and releasing marine megafauna, bycatch, during fishing.
- Sensitize the crew to reduce bycatch mortality.
- Record each incident on the marine megafauna release form of the Ecuadorian small pelagic fishery.

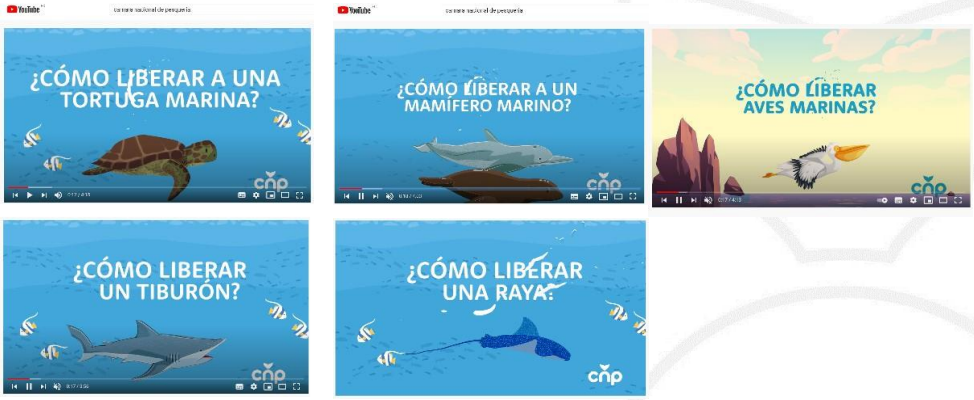
Module 4: Impacts and threats to the marine environment and possible solutions

- Identify and know the main threats in the marine ecosystem.
- Know the types of pollutants and the impacts of pollution on the marine environment.
- Correctly segregate waste on board.
- Raise awareness about the impact of marine pollution and the importance of caring for the marine ecosystem.

Fomento de pesca responsable

Also, SPS-FIP designed didactic videos to reinforce the training process and capabilities of crew about good practices to release marine fauna. Videos can be found at http://smallpelagics.org/en/responsible-fishing/

www.smallpelagics.org/pesca-responsable/



During the months of January to July 2021, the training in sustainable fishing practices on board was developed. The trainings have been coordinated together with the SPS-FIP technical team, prioritizing their development during periods monthly closures. The development of the training for each module was carried out virtually due to the limitations caused by COVID-19, with on-site assistance from the technical staff of the SPS-FIP during the sessions.

From January to July 2021, a total of 29 trainings have been developed covering 290 teaching hours. Between the months of January to March, modules 1 and 2 were prioritized, and from the end of March to July, modules 3 and 4. Due to COVID-19 restrictions, the goal set for this year was to train 5 crew members per vessel in the four modules, adding a total of 185 crew members trained for the entire project. However, due to the pandemic and operations, a total of 163 crew members, 14 participants from the administrative staff, and 4 external participants from UNDP and the SRP have been trained. It is important to mention that only 82 crew members have been trained in the four complete modules.

Regarding module 3 (Correct handling and release techniques for marine fauna), a total of 134 crew members have been trained. An initial and final evaluation was carried out to determine the level of theoretical learning that the crew could acquire; In addition, this module presented a group or individual practical evaluation where the participants had to explain the step by step when releasing a species on board.

After training process, the crew put in practice the techniques to carry out a fishing activity in respect of the ecosystem. As part of the monitoring process, the SPS-FIP and crew of the different members' vessels of the FIP kept in contact.

Fortalecimiento de capacidades por la pesca responsable

As part of the cooperation agreement with the IPIAP and SRP, all the material developed is available to replicate training as part of the FMP objective. The FIP also trained SRP staff.

With respect to regulations as previously reported, fishing of all turtle and whale species are permanently prohibited in Ecuadorian waters. Also it is prohibited to capture giant manta ray (*Manta birostris*), manta rays *Mobula japonica*, *M. thurstoni*, *M. munkiana*, and *M. tarapacana*, whale sharks (*Rhincodon typus*), basking shark (*Cetorhinus maximus*), great white shark (*Carcharodon carcharias*) and sawtooths (*Pristis spp*). There is an extensive National Plan of Action on the Conservation of Marine Turtles, updated for the period 2020-2030, which includes measures intended to reduce the impact of fisheries on the five turtle species present in Ecuadorian waters. There is also a National Plan for Sharks updated in 2020.

Also, there are regulations about marine mammals, sharks, and marine turtles' species:

- The Organic Law for the Development of Aquaculture and Fisheries of Ecuador establish:
    - Article 213 establish as a *serious fishing infraction* the intentionally carry out fishing activities in interaction with a marine mammal, sea turtle or whale shark.
    - Article 152 establish the prohibition of the targeted fishing of sharks, mantas and other elasmobranchs that the governing body determines, as well as the manufacture, transport, import, commercialization of fishing gear used to capture these resources, the mutilation of shark fins and the discard of their body to the sea, the importation, transhipment and internment of whole sharks or shark fins in any state of conservation or processing, even when they have been caught in international waters.
- National Plan for marine turtles' conservation 2020-2030, MAAE-SPN-2021-001.
- Protection of whales: Ministerial Agreement 196 Official Registry 458 of June 14, 1990.
- National plan of action for the conservation, sustainable management, and recovery of the populations of sharks, rays, and chimeras found in the Ecuadorian maritime territory. Also, Executive Decree # 486 prohibits target fishing of sharks, in force since 2007.
- Species around the Galapagos Islands are protected by the 133 thousand square kilometres Galapagos Marine reserve, established in 1998 as an area completely closed to industrial fishing, including the small pelagic fishery. Although the majority of the area is exclusively open to Galapagos artisanal fishing (large pelagic, crustacean and demersal species), there are also several substantial no-take zones. It´s important to mention that small pelagic industrial fleet and catches do not take place in Insular ZEE of Ecuador.

Evidence
Organic Law for the Development of Aquaculture and Fisheries of Ecuador: https://camaradepesqueria.ec/wp-content/uploads/2020/04/Ley-de-Acuicultura-y-Pesca-2019.pdf Fishery management plan, Ministerial Agreement No. MPCEIP-SRP-2021-0073-A.: https://drive.google.com/file/d/1LguOBlLr5wvxsN7sZdgtIsc5WpotezZZ/view National Plan for marine turtles' conservation 2020-2030, MAAE-SPN-2021-001. https://www.ambiente.gob.ec/wp-content/uploads/downloads/2021/01/resolucion_plan-de-accion-tortugas-marinas.pdf Protection of whales: Ministerial Agreement 196 Official Registry 458 of June 14, 1990. **https://www.ambiente.gob.ec/11699/** National plan of action for the conservation, sustainable management and recovery of the populations of sharks, rays, and chimeras found in the Ecuadorian maritime territory https://www.wwf.org.ec/bibliotecavirtual/publicacionesec/?uNewsID=364191 Report of the implementation of a responsible fishery management model in the small pelagic fishery of Ecuador. Training plan implementation: https://docs.google.com/document/d/1tVIfqD07-TvImzjY-GmWERP59_OfqZ98/edit?usp=sharing&ouid=112572111827130877547&rtpof=true&sd=true Executive Decree # 486. Regulation of incidental fishing of shark, its commercialization and exportation in continental Ecuador https://camaradepesqueria.ec/wp-content/uploads/2016/03/DE-486.pdf Guide to the handling and release of marine fauna in the small pelagic fish fishery in Ecuador. http://smallpelagics.org/content/uploads/documents/EDICIO%CC%81N_Guia_Liberacion_Depredadores_Grandes-1_compressed.pdf Poster of main marine fauna in Ecuadorian sea. http://smallpelagics.org/content/uploads/documents/FAUNA_MARINA-scaled.jpg Identification guide for marine fauna of Ecuador. http://smallpelagics.org/content/uploads/documents/guia_identtificacion_fauna_marina_ecuador_compressed.pdf Correct handling and release techniques for marine mammals https://youtu.be/gqNagg4km4U Correct handling and release techniques for marine turtles https://youtu.be/DOwhJkauZtM Correct handling and release techniques for sharks https://youtu.be/DI0HdIWI09k Correct handling and release techniques for rays https://youtu.be/6lTtpQBDMSY Correct handling and release techniques for seabirds https://youtu.be/pq-j8Wg3TR4

Status of action	Completed. Evidence Updated.

FAP Activity. 19. Provide evidence that habitat interactions are minimal

MT clause (if relevant)	F2
Progress against milestones	
The milestone was already achieved. This report includes an update of new available research, actions, and regulations.	
Outstanding actions and rationale	

Although habitat interactions are not an issue in the fishery, it is considered in the management decision-making process, as part of the ecological dimension of the fishery management plan (2021-2025) established by Ministerial Agreement No. MPCEIP-SRP-2021-0073-A (March 2021). The FMP establishes the following objective *"EC-2. Minimize impacts on the habitat in which the fishery operates"*

Also, the Organic Law for the Development of Aquaculture and Fisheries of Ecuador approved in 2020 establish spatial regulation for industrial fishing https://camaradepesqueria.ec/wp-content/uploads/2020/04/Ley-de-Acuicultura-y-Pesca-2019.pdf:

- Article 102 establish the prohibition of fishing from the foreshore up to 1 nautical mile.
- Article 104 establish the prohibition of industrial fishing from the foreshore up to 8 nautical miles.

In addition to FMP strategy other measures are in force, established in the Ministerial Agreement MPCEIP-SRP-2020-0056-A (https://camaradepesqueria.ec/wp-content/uploads/2020/08/REGULACION-PELAGICOS-PEQUENOS-MPCEIP-SRP-2020-0056-A.pdf), among the main prohibitions are:

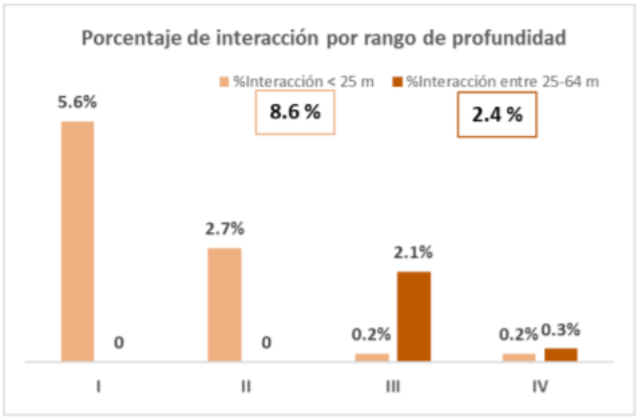
- Prohibition of the use of "double bottom line" in nets that catch small pelagic fish.
- Have a Satellite Positioning Device installed and operational at all times, whose information will be controlled through the control and surveillance system of the SRP Satellite Monitoring Center (CMS.)

Currently there are three studies on the impact of the small pelagic purse seine fishing on habitats (Jurado, Gilbert, Ponce, & Solis, 2019) (Jurado, Ponce, & Gilbert, 2020) (Ponce, Ayora & Jurado, 2021):

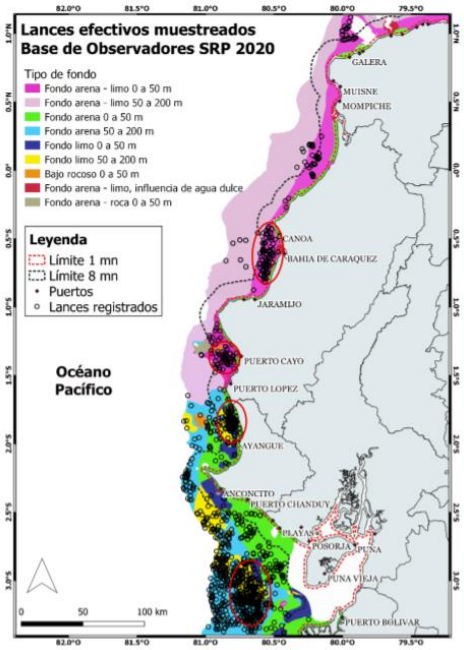
The main conclusions of the last available study are (Ponce, Ayora & Jurado, 2021):

- Interaction with the seabed by class I boats persists, as sets have been found made in zones less than 25 m in the four study areas, which were located within 8 mn, except for the Gulf of Guayaquil where they were located both outside and within 8 mn. Consequently, the interaction calculated for areas less than 25 m deep totaled 8.6%.

- Sets made by class III and IV vessels outside 8 nm were recorded in areas with depths between 25 and 64 m in the area of the Gulf of Guayaquil; which amounted to a total of 2.4%, being an interaction of a lower percentage compared to the interaction in areas smaller than 25 m.
- The interaction percentages for both zones (<25 m and 25 - 64 m) showed a reduction of 50% and 30%, respectively, compared to that reported for 2019.
- The sets analysed were not carried out on fragile bottoms such as coral reefs (part of the Machalilla National Park Reserve), they were mainly carried out on mixed bottoms composed of sand and silt.



Interaction by depth range and ship class (I, II, III and IV). Percentages calculated with respect to the total sets in the sample. Source: Ponce, Ayora & Jurado (2021)



Subtidal systems where most of the fleet activities were carried out during 2020. Source: Ponce, Ayora & Jurado (2021)

Evidence

Ponce, G., Ayora, G., & Jurado, V. (2021). *Análisis de la interacción de la pesquería de red de cerco con jareta de peces pelágicos pequeños y el hábitat físico, durante 2020.* Guayaquil: IPIAP.

https://www.institutopesca.gob.ec/wp-content/uploads/2018/01/Informe-Impactos-HABITAT-2020.pdf

Jurado, V., Ponce, G., & Gilbert, G. (2020). *Análisis exploratorio de la interacción de la pesquería de red de cerco con jareta de peces pelágicos pequeños y el hábitat físico, durante 2019.* . Guayaquil: IPIAP. https://www.institutopesca.gob.ec/wp-content/uploads/2018/01/Informe-Impactos-HABITAT-2019-2.pdf

Jurado, V., Gilbert, G., Ponce, G., & Solis, K. (2019). *INTERACCIÓN DE LA PESQUERÍA DE RED DE CERCO DE PECES PELÁGICOS PEQUEÑOS CON EL HÁBITAT.* Guayaquil: Instituto Nacional de Pesca. https://www.institutopesca.gob.ec/wp-content/uploads/2018/01/5-INTERACCIO%cc%81N-DE-LA-PESQUERI%cc%81A-DE-RED-DE-CERCO-DE-PECES-PELA%cc%81GICOS-PEQUEN%cc%83OS-CON-EL-HA%cc%81BITAT.pdf

Organic Law for the Development of Aquaculture and Fisheries of Ecuador: https://camaradepesqueria.ec/wp-content/uploads/2020/04/Ley-de-Acuicultura-y-Pesca-2019.pdf

Fishery management plan, Ministerial Agreement No. MPCEIP-SRP-2021-0073-A.: https://drive.google.com/file/d/1LguOBlLr5wvxsN7sZdgtIsc5WpotezZZ/view

Ministerial Agreement MPCEIP-SRP-2020-0056-A (https://camaradepesqueria.ec/wp-content/uploads/2020/08/REGULACION-PELAGICOS-PEQUENOS-MPCEIP-SRP-2020-0056-A.pdf),

Status of action	Completed. Evidence Updated.

FAP Activity. 15.1 - 16.1 Ecosystems Impact Assessment developed and available publicly

MT clause (if relevant)	F3
Progress against milestones	

The SPS-FIP together with the IPIAP are carrying out a study of the impacts of the fishery on the species with the greatest interaction with the small pelagic fishery, in particular species called benthopelagic associated with the fishery. These analyses have been carried out through an analysis of the level of vulnerability and susceptibility of the species. Also, an analysis of the Reproductive Potential Ratio (SPR) is carried out, which consists of examining the length compositions and their biological traits to provide an estimate regarding the status of the populations.

The analysis is approached from the ecological risk in relation to the Vulnerability-Susceptibility. The vulnerability (V) of the species is determined from two aspects: productivity (P); characterized by the life history of each of the species, and susceptibility (S); characterized by how they are affected by the fishing gear used in the fishery. Productivity is defined as the capacity of the resources to recover from the pressure given by the fishing activity, while the susceptibility is related to the capture of the species given by the effectiveness of the gear or by the behavior of the species. Productivity (P) was calculated from eight parameters or biological traits. All attributes were scored on a scale of 1-3 (indicating low, medium, and high respectively). The scale is established according to the relative value of the contribution for each of the attributes analyzed following the scoring criteria indicated by Patrick et al. (2009). On the other hand, for the susceptibility analysis (S) eleven attributes related to the exposure of the species to fishing gear were considered. Susceptibility (S) was calculated based

on three criteria: 1) for the entire class of ships that make up the fishing fleet, 2) for class I ships, and 3) for class II, III, IV ships.

Complementary to the vulnerability analysis, the spawning potential index (SPR) of a population is considered, which is defined as the proportion of the unfished reproductive potential that remains after any given level of fishing pressure.

The study determined that the landings of the small pelagic fishery are made up of 26% benthopelagic species, seven of which are the most relevant species, of which the Gallineta (*Prionotus* spp.) (28%), Barriga juma (*Larimus* spp.) (23%) and Chazo (*Peprilus medius*) (19%). However, at the level of fishing sets, the recurrence of species increases to 46%. The analyses showed that the highest probability of incidence of benthopelagic species is mainly determined by the class of vessels I (less than 35 NRT) in the entire distribution of the fishery. It is estimated that this class of vessel has an incidence of these species in 1 in 2 fishing sets (54%), which decreases to 1 in 3 sets in larger vessels (class III and IV). The most recurrent species in fishing sets are the Chazo (*Peprilus medius*), the Gallineta (*Prionotus spp.*) and Hojita (*Chloroscombrus orqueta*). It is estimated that the highest incidence of these species in the sets of smaller vessels is closely related to areas of operation close to the coast.

Of a total record of 180 different species that were observed in the captures, a large majority of these can be considered anecdotal since their record does not exceed 1% of the total sets (151 species). The differences obtained in the composition of species suggest geographic variations in the distribution of the main species and their accompanying fauna. The greatest diversity, species richness and similarity in species composition were recorded in the fishing areas located south of Manta (Zone 1 and Zone 2) in which 27 of the 29 most recurrent species of the entire fishery are concentrated. In these areas, the greatest presence of both pelagic (*Scomber japonicus, Auxis spp. And Opisthonema spp*) and benthopelagic (*Fistularia corneta and Peprilus medius*) species was observed. The zone located north of Manta (Zone 3) presented low values of abundance and diversity, and a greater presence of the pelagic species *Auxis spp., Ophistonema spp. and Decapterus macrosoma*. It is estimated that these spatial differences in biodiversity indices may be closely related to the two environmental Eco-Regions off the Ecuadorian coast. These same analyzes showed that the class of smaller vessels (class I) presents the greatest diversity among the classes analyzed, explained by its higher incidence on the benthopelagic fauna.

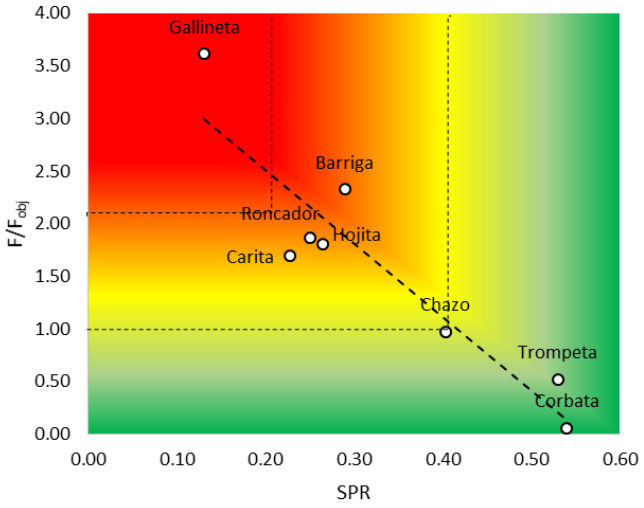
The results of the PSA and SPR analysis are detailed below:

Performance variables of the LBPA analysis model and reproductive potential ratio (SPR) of the 8 main benthopelagic species caught in the small pelagic fishery of Ecuador. In darker color the highest values. In asterisk the species evaluated by Canales and Jurado (2021). S^2 represents the variance of the model to the data

	Mort por pesca (F)	Talla selección (cm)	Talla de reclutas (cm)	F objetivo (Fobj)	Índice de sobrepesca (F/Fobj)	F/M	SPR	S^2	Capturas acumuladas 2018-2020 (t)
Barriga	1.92	20.80	15.91	0.83	2.33	5.19	0.29	14.1	33103
Carita	0.51	16.05	12.15	0.30	1.70	1.04	0.23	6.7	6427
Chazo	0.97	20.27	13.88	1.00	0.97	1.99	0.40	16.0	27177

Gallineta	1.36	15.62	14.06	0.38	3.62	3.39	0.13	61.1	40666
Hojita	0.86	19.39	10.10	0.48	1.81	2.32	0.26	19.5	11012
Corbata(*)	-	-	-	-	0.06		0.54		11986
Trompeta(*)	-	-	-	-	0.52		0.53		12458
Roncador	1.74	22.25	13.72	0.93	1.87	2.55	0.25	43.4	1513

Reproductive Potential Ratio (SPR) vs Relative Fishing Mortality (F / Fobj) for the 8 main benthopelagic species caught in the small pelagic fishery of Ecuador.



Scores relative to the productivity (P), susceptibility (S) and vulnerability (V) of 95% of the species the Ecuadorian small pelagic fishery (class I, II, III and IV vessels). Low vulnerability (V ≤ 1.6), moderate vulnerability (1.6 <V <1.8) and high vulnerability (V≥1.8). Benthopelagic species are highlighted with an asterisk.

Especie	P	S	V
Macarela	2.50	2.22	1.32
Bonito	1.60	2.69	2.19
Botella	2.50	2.33	1.42
Chuhueco	2.57	1.89	0.99
Picudillo	2.38	2.00	1.18
Pinchagua	2.50	2.00	1.12
Sardina	2.57	2.00	1.09
Corbata*	1.57	2.00	1.74
Trompeta*	2.33	2.00	1.20
Barriga Juma*	2.17	2.29	1.53
Gallineta*	2.00	2.38	1.70
Hojita*	2.33	2.44	1.58
Carita*	2.33	2.38	1.53
Chazo*	2.33	2.64	1.77
Pelágicos	2.37	2.16	1.33
Bento-pelágicos	2.15	2.30	1.58

Scores relative to the productivity (P), susceptibility (S) and vulnerability (V) of 95% of the species the Ecuadorian small pelagic fishery for class II, III and IV vessels. (low vulnerability (V ≤ 1.6), moderate vulnerability (1.6 <V <1.8) and high vulnerability (V≥1.8)) Benthopelagic species are highlighted with an asterisk.

Especie	P	S	V
Macarela	2.50	2.22	1.32
Bonito	1.60	2.56	2.10
Botella	2.50	2.22	1.32
Chuhueco	2.60	1.78	0.89
Picudillo	2.40	2.11	1.27
Pinchagua	2.50	1.78	0.92
Sardina	2.60	2.39	1.45
Corbata*	1.60	2.11	1.81
Trompeta*	2.30	2.11	1.30
Barriga Juma*	2.20	2.00	1.30
Gallineta*	2.00	2.38	1.70
Hojita*	2.30	2.19	1.36
Carita*	2.30	2.25	1.42
Chazo*	2.30	2.64	1.77
Pelágicos	2.39	2.15	1.32
Bento-pelágicos	2.14	2.24	1.52

Scores relative to the productivity (P), susceptibility (S) and vulnerability (V) of 95% of the species the Ecuadorian small pelagic fishery for class I vessels. (low vulnerability (V ≤ 1.6), moderate vulnerability (1.6 <V <1.8) and high vulnerability (V≥1.8)) Benthopelagic species are highlighted with an asterisk.

Especie	P	S	V
Macarela	2.50	1.89	1.02
Bonito	1.60	2.31	1.92
Botella	2.50	2.00	1.12
Chuhueco	2.60	2.11	1.19
Picudillo	2.40	1.78	1.00
Pinchagua	2.50	2.22	1.32
Sardina	2.60	2.17	1.24
Corbata*	1.60	1.89	1.68
Trompeta*	2.30	2.11	1.30
Barriga Juma*	2.20	2.29	1.53
Gallineta*	2.00	2.25	1.60
Hojita*	2.30	2.56	1.70
Carita*	2.30	2.63	1.76
Chazo*	2.30	2.79	1.91
Pelágicos	2.39	2.07	1.26
Bento-pelágicos	2.14	2.36	1.64

The ecological risk analysis based on Productivity-Susceptibility (PSA) showed that the highest levels of susceptibility could be explained by the areas where the class I fleet operates together with the height of the nets with respect to depth. Due to this, it is estimated that the fishing activity could be interacting with the bottom and with species that inhabit the proximity of the sandy / muddy substrate. This analysis determined that the benthopelagic species present a range of moderate vulnerability, the most affected being the Chazo (*Peprilus medius*) and the Gallineta (*Prionotus spp.*). The PSA analysis was complemented by the Reproductive Potential Ratio analysis (LBPA-SPR) which provided much more categorical quantitative results regarding the status of these benthopelagic populations. In most of the cases analyzed, the SPR indices were below what is recommended (SPR = 0.4) as a cumulative effect of high levels of fishing mortality, which is why it is concluded that the fishery and in particular the fishing vessels smaller sizes (class I) have affected the benthopelagic community. Among the most affected species is the *Prionotus spp.* (SPR = 0.13) and whose result is consistent with the higher relative catches of this group of species and the greater vulnerability. Equally affected, the species *Larimus spp* stands out, which together with Gallineta, Corbata (*Trichiurus lepturus*) and Chazo (*Peprilus medius*) constitute the most vulnerable according to the PSA analysis.

The trophic level of these species is presented in the attached document.

Outstanding actions and rationale

Evidence
https://docs.google.com/document/d/1cSNORNbKUuZ8v8xGKpaIPqDCp7swCq_r/edit?usp=sharing&ouid=112572111827130877547&rtpof=true&sd=true

Status of action	Completed. Evidence Updated.

FAP Activity. 15.2 - 16.2 CMMs related to Ecosystem Impact based on existing assessment adopted by managers

MT clause (if relevant)	F3

Progress against milestones

Outstanding actions and rationale
The new Organic Law for the Development of Aquaculture and Fisheries of Ecuador establishes in article 1: "*The purpose of the Law is… the protection, conservation, research, exploitation and use of hydrobiological resources and their ecosystems, through the application of the fisheries ecosystem approach in such a way as to achieve sustainable development that guarantees access to food, in harmony with the principles and rights established in the Constitution of the Republic, and respecting traditional and ancestral knowledge and forms of production* ". According to the law, the Fisheries Management and Action Plan was prepared, where the general objective indicates:

"Protect, conserve, research and make sustainable use of the resources of the small pelagic fishery of Ecuador and its ecosystems, through the application of the ecosystem approach."

According to this, both the NPOA and FMP in each of its goals are reflected activities and indicators whose main function is to minimize the impact on the ecosystem, related activities are detailed below:

1. Biological-fishing dimension:
   1.1. Achieve a yield according to the Maximum Sustainable Yield (MSY) of the main species of the Small Pelagic Fishery by 2025.
   1.2. Achieve a sustainable level of spawning biomass of the Small Pelagic fishery stocks by 2025.
2. Ecological dimension:
   2. 1. Reduce the capture of by-catch fauna species by 2025.
   2. 2. Reduce severe impact interactions with ETP species by 2025.
   2. 3. Reduce the interaction of the fishery with the seabed by 2025.
3. Socio-economic dimension:
   3. 1. Maintain or increase the net benefits from the PPP fishery by 2025.
   3. 2. Maintain livelihoods associated with authorized beach hammock fishing by 2025.

In relation with bycatch the FMP and NPOA stablish:

- Establish as companion fauna species that are not considered as species target of the fishery, with a maximum of 20%.
- Strengthen control of current restrictions of fishing areas, specifically the one established in the Organic Law for the Development of Aquaculture and Fisheries (art 104) and in Ministerial Agreement No. 080 of 1990, referring to the exclusive reserve for the artisanal fishing of the first 8 nautical miles.
- Strengthen the control of fishing gear restrictions, specifically what is stipulated in Ministerial Agreement No. MPCEIPSRP-2020-056-A, which prohibits the use of the "double bottom line, skirt or antifango".

Evidence

Organic Law for the Development of Aquaculture and Fisheries of Ecuador: https://camaradepesqueria.ec/wp-content/uploads/2020/04/Ley-de-Acuicultura-y-Pesca-2019.pdf

Fishery management plan, Ministerial Agreement No. MPCEIP-SRP-2021-0073-A.: https://drive.google.com/file/d/1LguOBlLr5wvxsN7sZdgtIsc5WpotezZZ/view

Status of action	Completed. Evidence Updated.

Additional Information

SPS-FIP Technical staff

Under the framework of technical cooperation between IPIAP, SRP, VAP and CNP, the SPS-FIP technical staff in 2021 was integrated by:

- Engineer Gabriela Ponce, fishery and acoustic oceanography research.
- Lcda. Karina Solis, process and datamanager.
- Biologist Gabriela Ayora, MSc, ichthyoplankton research
- Biologist Carlos Aleman, fishery research
- Engineer Gema Camacho, technical assistance on-board eggs and larvae sampling.

The project also had the technical assistance of the following advisors:

- Dr. Cristian Canales. Technical assistance to the IPIAP to carry out the stock assessment of the main small pelagic resources of Ecuador and ecosystem related analysis.
- Engineer, Rosa Vinatea. Design and implement a fleet-based management system, in close coordination with the national research institute IPIAP, that enables: a) the continuous monitoring of the interactions of the for the Small Pelagic fishery with the ecosystems, b) the development of a new responsible fishing behavior and skillsets amongst skippers, crews and vessels owners to engage in responsible fishing operations, and c) mitigating the impact of the fishery on the ecosystems and develop more efficient and less harmful fishing operations. Initially, the system will be designed and adapted to the fleet involved in the Small Pelagics Sustainability-Fishery Improvement Project (SPS-FIP), led by the Cámara Nacional de Pesquería (CNP).

Evidence:
https://drive.google.com/drive/folders/1ttA1dwWJqNc4Xcsie9AGfadNmLroI2xS?usp=sharing

Hydroacoustic research cruises

During January, through SPS-FIP, CNP and IPIAP realized the V research cruise of small pelagic fish. The objective was to estimate the biomass, relative abundance, and spatial distribution of the main small pelagic fish species of the Ecuadorian continental coastal profile and their relationship with physical, chemical and biological oceanographic variables.

Hydroacoustic prospection

- Directly assess the biomass and abundance of the main species of small pelagic fish by hydroacoustic method.
- Determine areas of distribution and concentration of the main species of small pelagic fish.
- Determine biomass, abundance, and spatial distribution of recruits and / or juveniles of small pelagic fish.

Environmental conditions (Physical, Chemical and Biological) in the ocean

- Evaluate thermo-halin anomalies off the Ecuadorian coast, both on the surface and in the water column.

- Determine ocean productivity based on dissolved inorganic nutrients and plankton.
- Analyze the Coastal Pelagic Ecosystem under the presence of the cold phase of the ENSO cycle (La Niña).

Biometric and biological parameters of the main small pelagic species

- Determine the biometric and biological parameters (weight, size, sex, stage of maturity and weight of the gonad) of the main species of small pelagic fish from verifying fishing.

Environment-Resource Relationship

- Determine the Environment-Resource relationship, using multivariate analysis

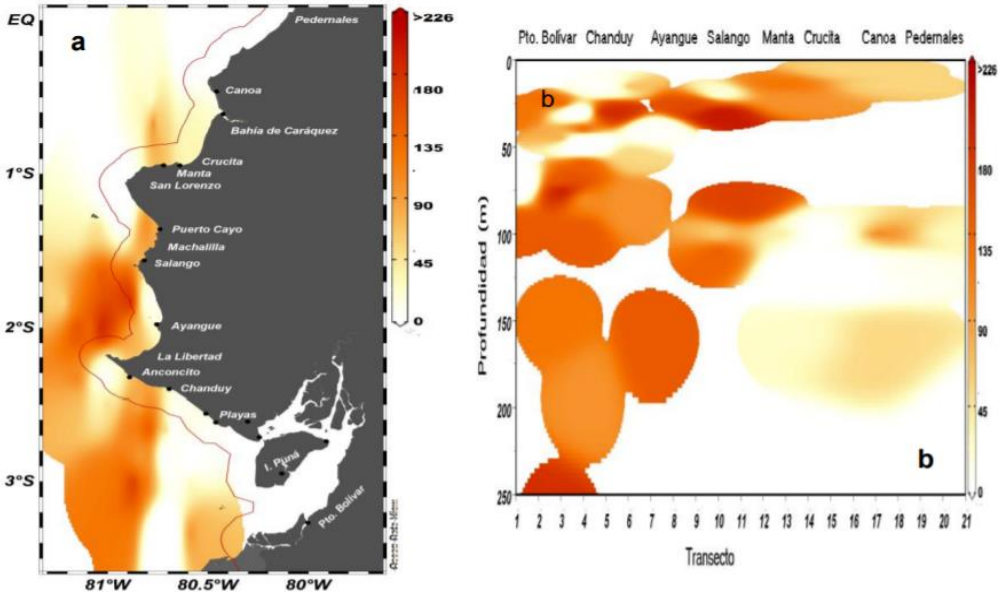
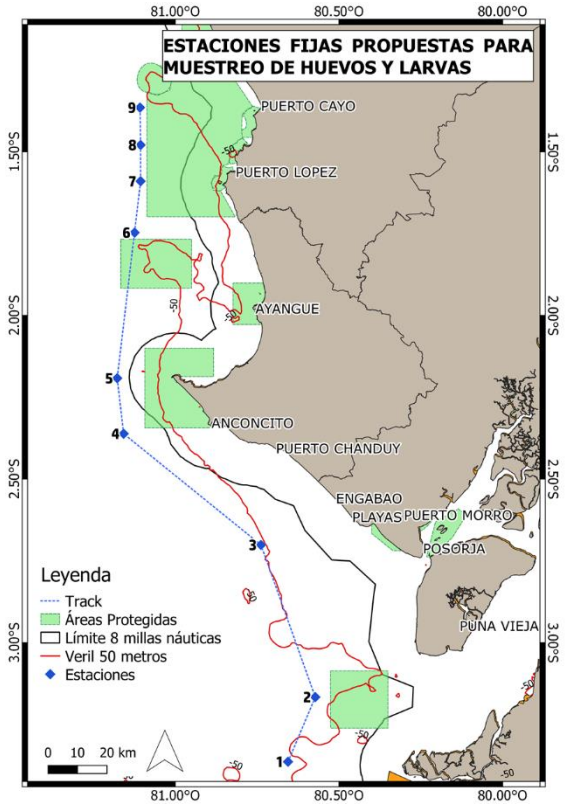


Figura 2. Distribución horizontal (a) y vertical (b) de las principales especies pelágicas pequeñas, durante el Crucero IPIAP 2021-01-01 PV, enero 2021.

Evidence: http://smallpelagics.org/en/events/research-cruises-january-2021/

Data collection of fish eggs and larvae by the SPS-FIP fleet

Together with IPIAP, the Project established a research program for small pelagic eggs and larvae, to determine the abundance and spatio-temporal distribution of fish eggs and larvae, to establish potential spawning and larval rearing areas for the species of small pelagic fish; and associate these abundances with that of the reproductive adults. The collection of samples on board the SPS-FIP began in September 2021 in cooperation with the IPIAP for the analysis of the results.



Evidence: https://drive.google.com/drive/folders/1XPLKuX8E8ActeI2zuU0l-bYY8pm9WQRD?usp=sharing

Characterization of the spawning and larvae area of small pelagic fish on the Ecuadorian coast, during November 2018

SPS-FIP staff together with IPIAP carry out the research "Characterization of the spawning and larvae area of small pelagic fish on the Ecuadorian coast, during November 2018". The abstract: The spawning and rearing areas of *Cetengraulis mysticetus (chuhueco), Engraulis ringens (anchovy), Auxis sp. (Small bottle), Scomber japonicus (morenillo), Etrumeus acuminatus (round sardine) and Opisthonema spp. (pinchagua)* were characterized during November 2018 on the Ecuadorian coast, using trawls near the sea surface with Bongo-type nets, obtained in the hydroacoustic and verifiable fishing cruise (INP-SRP-CNP-18-11-02-PV). The main spawning area for the species was located in the external part of the Gulf of Guayaquil, Punta de Santa Elena and from Pto. Cayo to Canoa. The distribution and abundance of the different larval stages showed that the rearing area was considerably more defined than the spawning area identified from Puntilla de Santa Elena to Puerto. Cayo. The abundance of eggs and early larvae of the species were closely associated with abiotic environmental conditions. Larvae of more advanced development were mainly associated with a greater abundance of diatoms. These results suggest the importance of food availability in the survival and recruitment of small pelagic species.

Amended timeline

Final version of the document “ANALYSIS OF THE IMPACT OF THE COASTAL PURSE SEINE NET FISHERY ON THE COAST DEMERSAL AND BENTOPELAGIC ECOSYSTEM OF ECUADOR ” is expected to be ready at the end of October 2021.