

14th MEETING OF THE SCIENTIFIC COMMITTEE

7 to 12 September 2026, Tórshavn, Faroe Islands

SC14 - Eco 03

**Habitat Conditions of Jack Mackerel and Mackerel in the Peru Current Species in
the Humboldt System during 2024 to 2026**

Peru



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SPRFMO
South Pacific Regional Fisheries Management Organisation



**INSTITUTO
HUMBOLDT**
INVESTIGACIÓN MARINA Y ACUÍCOLA



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14th Meeting of the Scientific Committee
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Current Species in the Humboldt System during 2024 to 2026**

Lima, July 2026

Base report as a contribution to the Scientific Committee of the
Regional Fisheries Management Agency for the South Pacific.

This report contains information on the Jack mackerel fish stock and fishery in Peruvian jurisdictional waters that, we reiterate, the delegation of Peru, in use of its discretionary powers, voluntarily provides for the purpose of information and support to the scientific research work within the Scientific Committee of the SPRFMO. In doing so, while referring to Article 5 of the Convention on the Conservation and Management of High Seas Fishery Resources in the South Pacific Ocean and reiterating that Peru has not given the express consent contemplated in Article 20 (4) (a) (iii) of the Convention, Peru reaffirms that the decisions and conservation and management measures adopted by the SPRFMO Commission are not applicable within Peruvian jurisdictional waters.

**South Pacific Regional Fisheries Management Organization
14th Meeting of the Scientific Committee
September 2026**

NATIONAL FISHERIES SOCIETY – SCIENTIFIC RESEARCH COMMITTEE
HUMBOLDT INSTITUTE OF MARINE AND AQUACULTURE RESEARCH
PERUVIAN SEA RESEARCH INSTITUTE



Habitat Conditions of Jack mackerel and Mackerel in the Peru Current Species in the Humboldt System during 2024 to 2026

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REPORT

INDEX

Summary	2
1. Introduction	2
2. Description of the habitat of Jack mackerel and mackerel using Sources of oceanographic, satellite and fisheries information	3
3. Conclusions	11
4. Recommendations	11
5. Bibliography	11

Lima, July 2026

Summary

An update has been made to the analysis of changes in the habitat of Jack mackerel and mackerel, with emphasis on what was observed between 2023 and 2026.

The summer of 2026 has been characterized by being dominated by positive temperature anomalies until the beginning of March, when the beginning of an El Niño event with a weak to moderate magnitude was declared. In this context, and with respect to habitat, it was observed that during the summer of 2026 the presence of Jack mackerel was limited to the first weeks of January. The catches of Jack mackerel and mackerel obtained between August and September 2025 have been included in the analyses carried out, which were not included in the analyses of the previous year. In summary, the presence of Jack mackerel and mackerel has occurred in an atypical way, that is, far south between oceanic and coastal waters, unlike previous years.

From the analysis of the various variables analyzed regarding the habitat of Jack mackerel and mackerel, it is concluded that there have been changing conditions in recent years, that is, with high variability, where the only parameter analyzed that remained within a narrow range is salinity. Another striking fact is that both species have been available for fishing in areas with low chlorophyll concentration and with relatively high values of altimetry and negative anomaly of sea surface temperature. In the case of both species, their southern distribution is remarkable.

In the habitat reports submitted in previous years (2019 to 2025) to the Habitat Monitoring Working Group, since last year called the SPRFMO Ecosystems Working Group (GTE), as well as in the present case (2026), it should be specified that what has generally been mapped and modeled are the ideal environmental conditions (habitat) for the fishing of adult fish of the Jack mackerel. A similar type of study is pending for the early stages of Jack mackerel and mackerel, including the reproductive process and recruitment, in addition to the larval and post-larval stages.

1. Introduction

The Scientific Research Committee (CIC) of the National Fisheries Society (SNP), in cooperation with the Humboldt Institute for Marine and Aquaculture Research (IHMA) and the Peruvian Sea Research Institute (IMARPE) organized the **Fourteenth SNP-IHMA-IMARPE Workshop on the habitat conditions of jack mackerel and other species of the Peru Current in the Humboldt System**, which was held virtually from June 8 to 12, 2026. This activity is a contribution to the national and international effort to investigate and diagnose the current population situation of Jack mackerel, as well as other important fishing species of the South Pacific, with special emphasis on aspects related to their habitats, which has been developed since the first workshop in 2011.

Within the framework of the above described, the development of the workshop has generated contributions to the National Report that will be presented in September 2026 during the fourteenth meeting of the CC to be held in the Faroe Islands during September 2026. as well as an opportunity to present national progress in Habitat Monitoring, with an emphasis on the most important fishery resources.

2. Description of the habitat of Jack mackerel and mackerel using oceanographic, satellite and fisheries information sources

Various oceanographic parameters are presented for some months where fishing operations took place during years 2024, 2025 and 2026, with an indication of the fishing sets of Jack mackerel and mackerel (represented by symbols). In Figures 2.1.1 to 2.1.5. The oceanographic parameters of the 15th of each

month of each year are presented, from left to right, in order to appreciate the changes that have occurred in the last three years and their relationship with the relative distribution of Jack mackerel and mackerel.

2.1. Sea surface temperature (SST, °C) between 2024 and 2026

In the period described, the presence of Jack mackerel and mackerel has been observed on the thermal fronts; Jack mackerel fishing sets were carried out outside the continental shelf. It is considered that, in general, the moderate thermal conditions of the last seven years (since 2019, with the exception of the warm year 2023) have led to a higher concentration of Jack mackerel, especially in the southern area. Mackerel has also tended to be distributed in the south, unlike previous years where it was found further north as in January 2026. (Figure 2.1.1).

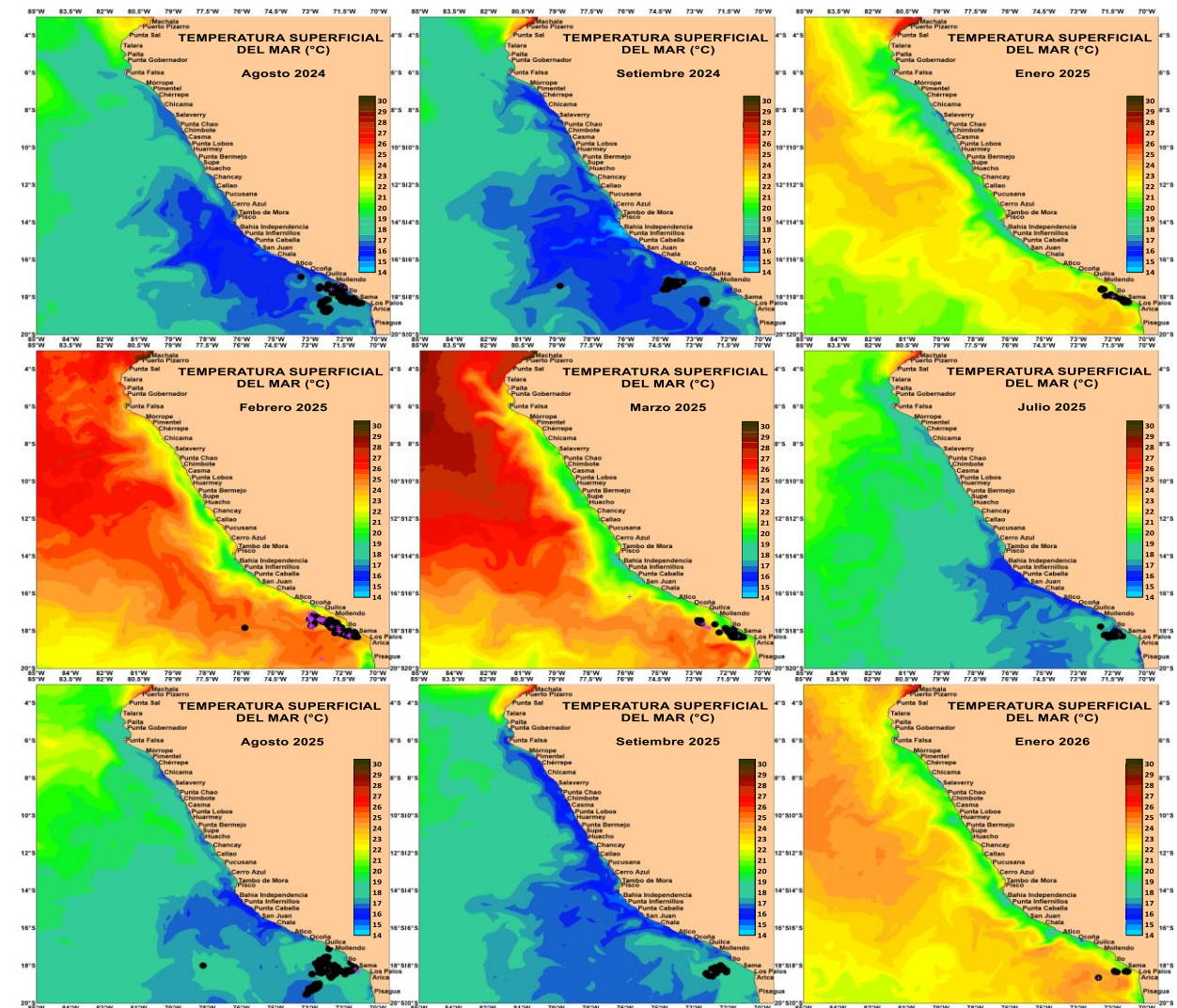


Figure 2.1.1. Sea surface temperature (SST, °C) during years 2024, 2025 and 2026, during months when fishing operations took place. Jack mackerel fishing sets are indicated by black circles, and mackerel fishing sets are indicated by purple crosses.

2.2. Sea surface temperature anomaly (ATSM, °C) between 2024 and 2026

From August 2024 to January 2026, neutral and cold conditions were present, where the main jack mackerel fishing areas were distributed in the southern zone, with the exception of February, March and August 2025 when warm and neutral conditions were developed. Mackerel also had distribution areas in the south. (Figure 2.2.1).

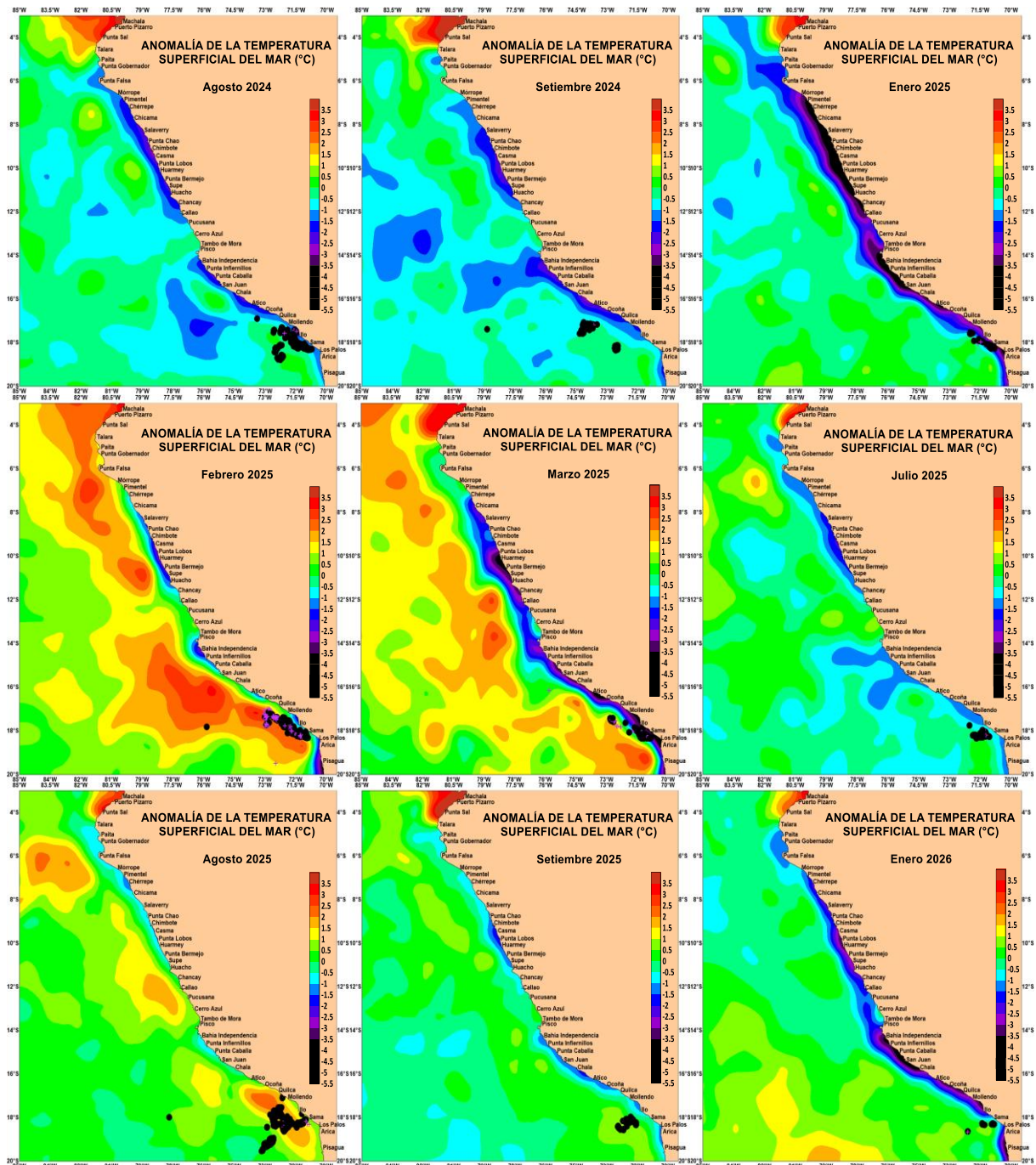


Figure 2.2.1. Sea surface temperature anomaly (ATSM, °C) during years 2024, 2025 and 2026, during months when fishing operations took place. Fishing sets for jack mackerel are indicated by black circles, and mackerel fishing sets are indicated by purple crosses

2.3. Sea surface salinity (SSM, ups) between 2024 and 2026

Between 2024 and 2026, mackerel and Jack mackerel fishing areas were distributed in the south along the front between cold coastal waters (CCW) and surface subtropical waters (SSW). (Figure 2.3.1).

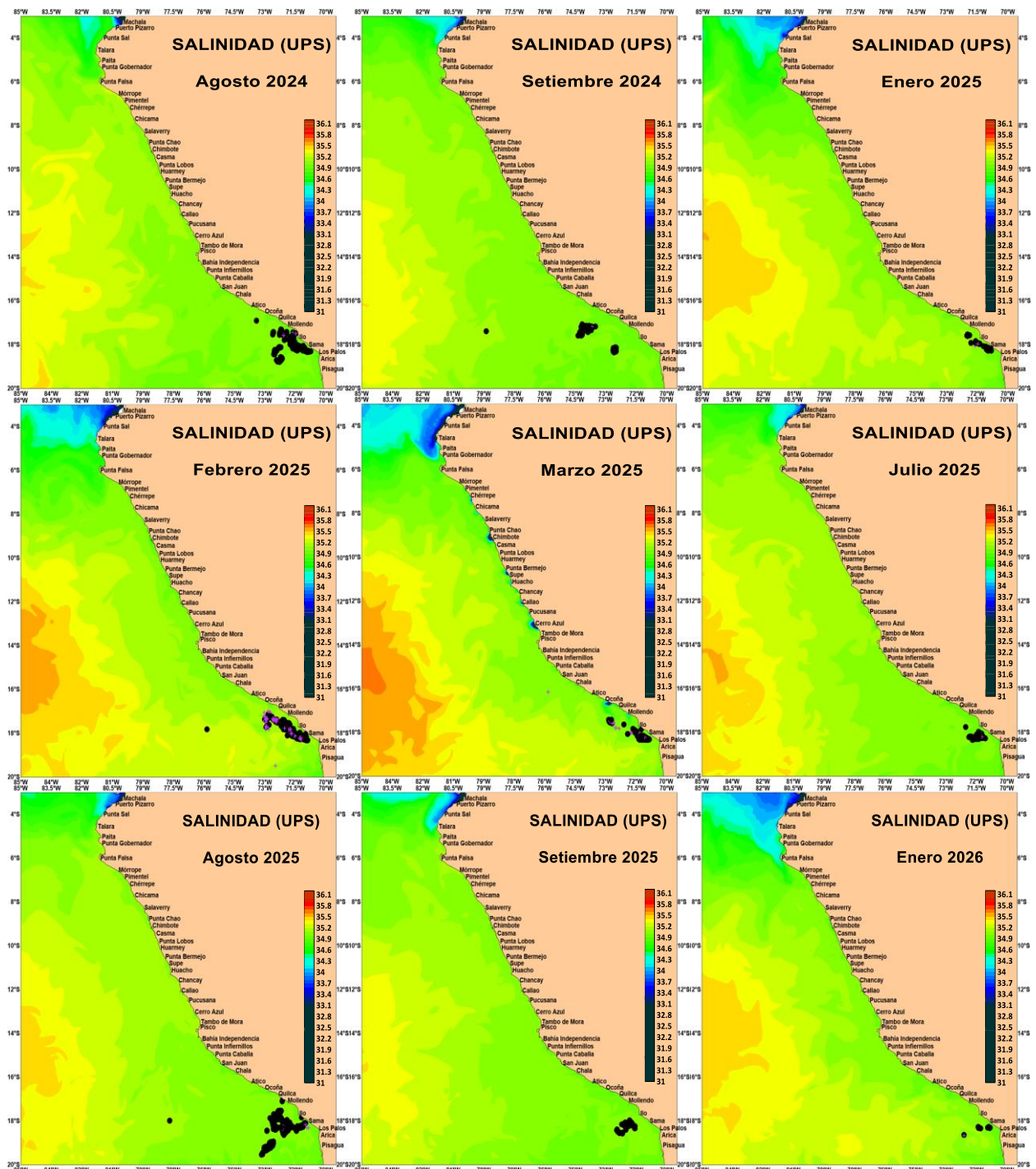


Figure 2.3.1 Sea surface salinity (SSM, ups) during years 2024, 2025 and 2026, during months when fishing operations took place. Jack mackerel fishing sets are indicated by black circles, and mackerel fishing sets are indicated by purple crosses.

2.4. Sea surface chlorophyll (ug/Lt) between the years 2024 and 2026

Between 2024 and 2026, Jack mackerel and mackerel were found on the outer edges of the highest concentration of chlorophyll in the southern zone. (Figure 2.4.1).

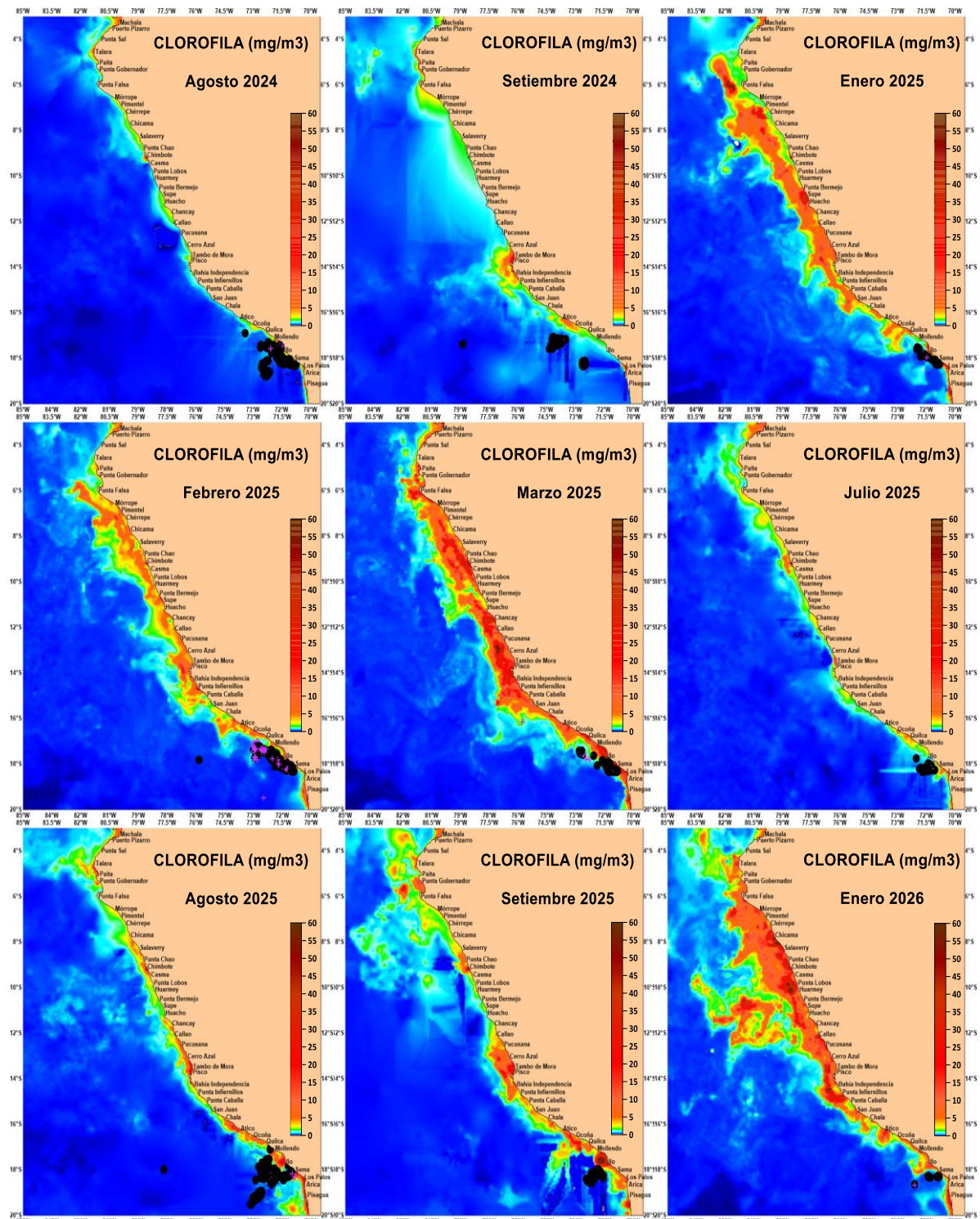


Figure 2.4.1. Sea surface chlorophyll (ug/Lt) during years 2024, 2025 and 2026, during months when fishing operations took place. Jack mackerel fishing sets are indicated by black circles, and mackerel fishing sets are indicated by purple crosses.

2.5. Sea Surface Anomaly (SLA, cm) between the years 2024 and 2026

The presence of Jack mackerel and mackerel during 2024 and 2026, was observed mainly in the southern zone, and related to intermediate to high SLA values, unlike August 2025. (Figure 2.5.1).

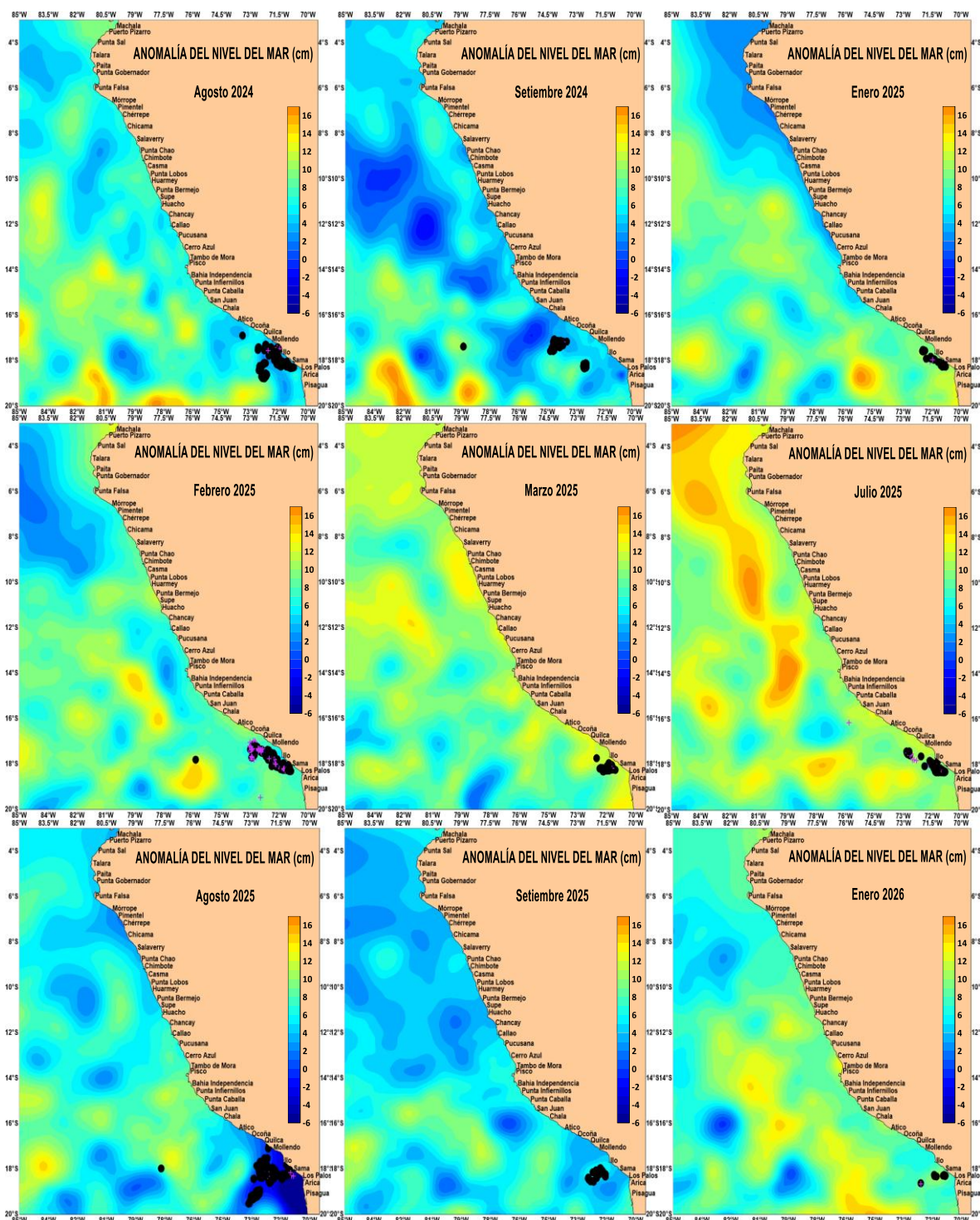


Figure 2.5.1. Sea level anomaly (SLA, cm) during years 2024, 2025 and 2026, during months when fishing operations took place. Jack mackerel fishing sets are indicated by black circles, and mackerel fishing sets are indicated by purple crosses.

2.6. Analysis of variability of parameters for Jack mackerel and mackerel species according to fishing sets carried out between 2019 and 2026 in relation to satellite oceanography variables.

Figures 2.6.1 and 2.6.2 present the comparative results of the analysis of variability of parameters relevant to the distribution of Jack mackerel and mackerel species between 2019 and 2026. The parameters analyzed are: Sea Surface Temperature (SST, °C), Sea Surface Temperature Anomaly (ATSM, °C), Sea Surface Salinity (SALINITY, ups), Chlorophyll (ug/Lt), Sea Surface Anomaly (SLA, cm), Sea Surface Altimetry (ALT, cm), latitude (LAT), distance from the coast (DC) and month of the year (MONTHS).

2.6.1 Variability in the case of Jack mackerel

In the case of Jack mackerel, Figure 2.6.1 shows notable differences between several parameters for the years 2019 to 2026. For the SST, a wide range of thermal values (between 16 and 26°C) is appreciated, with a preference for relatively high temperatures during the years 2019, 2020, 2023 (February), 2024 (January and April), 2025 (February) and 2026; in the years 2021, 2022, 2023 (June-September), 2024 (June-September) and 2025 the thermal values have been below average. As for the ATSM (in a range between -4 to +3°C), there has been a higher presence of Jack mackerel in neutral and slightly positive values with the exception of 2021 in which all Jack mackerel catches were made in the middle of negative values. On the other hand, salinity remained in a discrete range of values (34.9 to 35.4 ups) and low chlorophyll concentration values (< 4 ug/Lt) with the exception of 2021 when the highest values were observed. As for SLA and ALT, the presence of Jack mackerel is almost entirely limited to positive values, but not beyond values of 10 cm, with the exception of 2025 and 2026 where they were also presented in negative values. Latitudinally, the distribution of Jack mackerel presented a range restricted to the central-southern zone. As for its distribution according to its distance from the coast, the Jack mackerel was at relatively close distances, around 50 nm from the coast on average between 2019 and 2026, with the exception of 2020 and 2023 when it was located at more than 100 nm on average. Finally, the timing of the distribution of mackerel is usually limited to the summer months, when the fishing quota has been completed (Figure 2.6.1.1.) with the exception of 2023, 2024 and 2025.

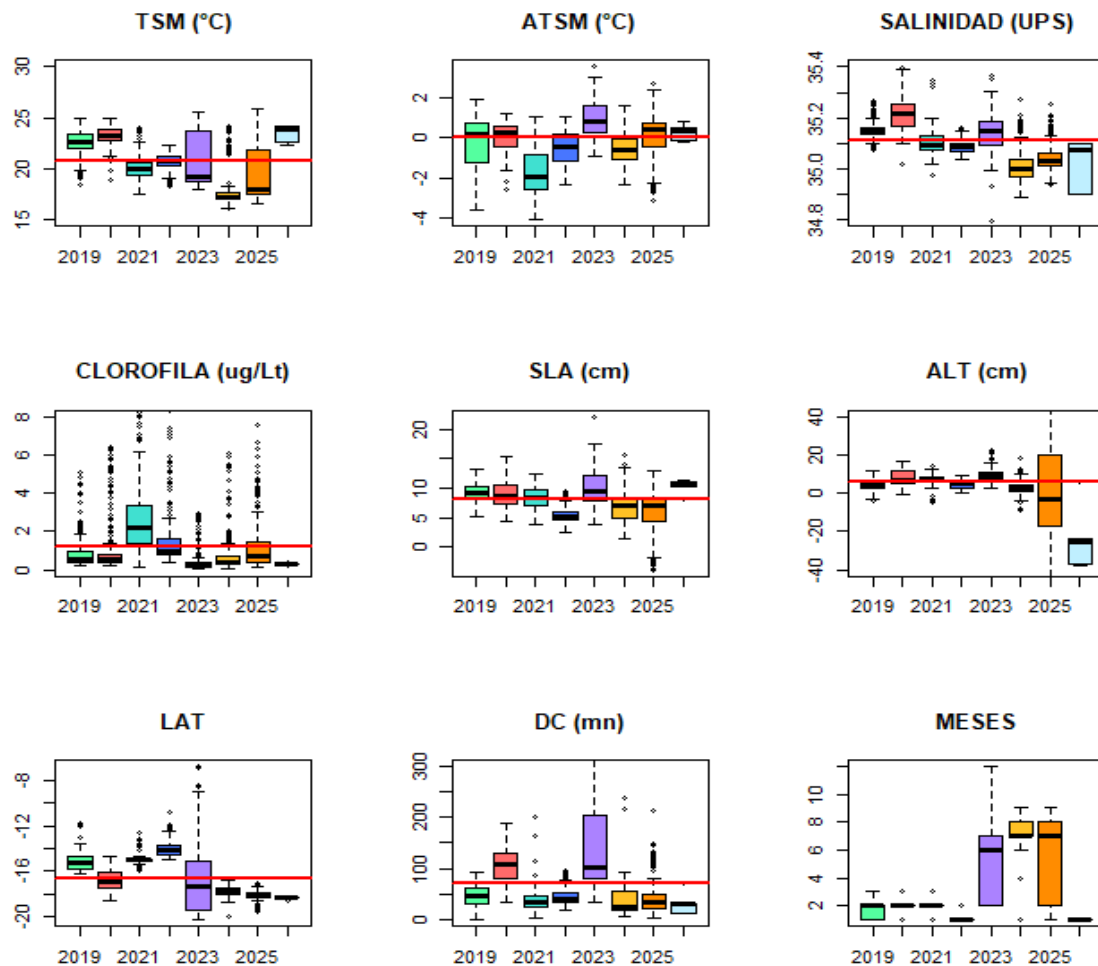


Figure 2.6.1.1. Box plot on the variability of parameters in the case of Jack mackerel between the years 2019 to 2026: Sea Surface Temperature in °C (TSM), Sea Surface Temperature Anomaly in °C (ATSM), Sea Surface Salinity in ups (salinity), Chlorophyll, Sea Surface Anomaly (SLA), Altimetry (ALT), latitude (LAT), distance from the coast (DC) and months. The red line on each box indicates the average value of all measurements.

2.6.2 Variability in the case of mackerel

For the SST, different ranges of thermal values can be seen (between 16 and 26°C), having been distributed in warmer conditions in the years 2019, 2020, part of 2023, 2024 and 2025, and 2026, and colder during 2021, 2022 and part of 2023 and 2025. Likewise, the distribution of mackerel is related to a rather wide range of ATSM (between -4 to +4°C), but discrete in the case of SSM (34.9 to 35.4 ups), and with low chlorophyll concentration values (< 4 ug/Lt) with the exception of 2021 when the highest values are observed. As for SLA and ALT, the presence of mackerel is almost entirely limited to positive values, but not beyond values of 10 cm, with the exception of 2025 where they were also presented in negative values. Latitudinally, the distribution of mackerel was wide during 2019 and 2023, with a southward trend in 2020, 2024, 2025 and 2026, and with a higher presence in the center zone of the coast during 2021 and 2022. In terms of its distribution according to its distance from the coast, mackerel was relatively close to the coast during 2019, 2021, 2022, 2024, 2025 and 2026, and further away from it in 2020 and 2023. Finally, the seasonality of the mackerel distribution, as it is the same fleet that fishes for Jack mackerel, indicates that, during 2023, 2024 and 2025, fishing was also carried out in the months of June-September.

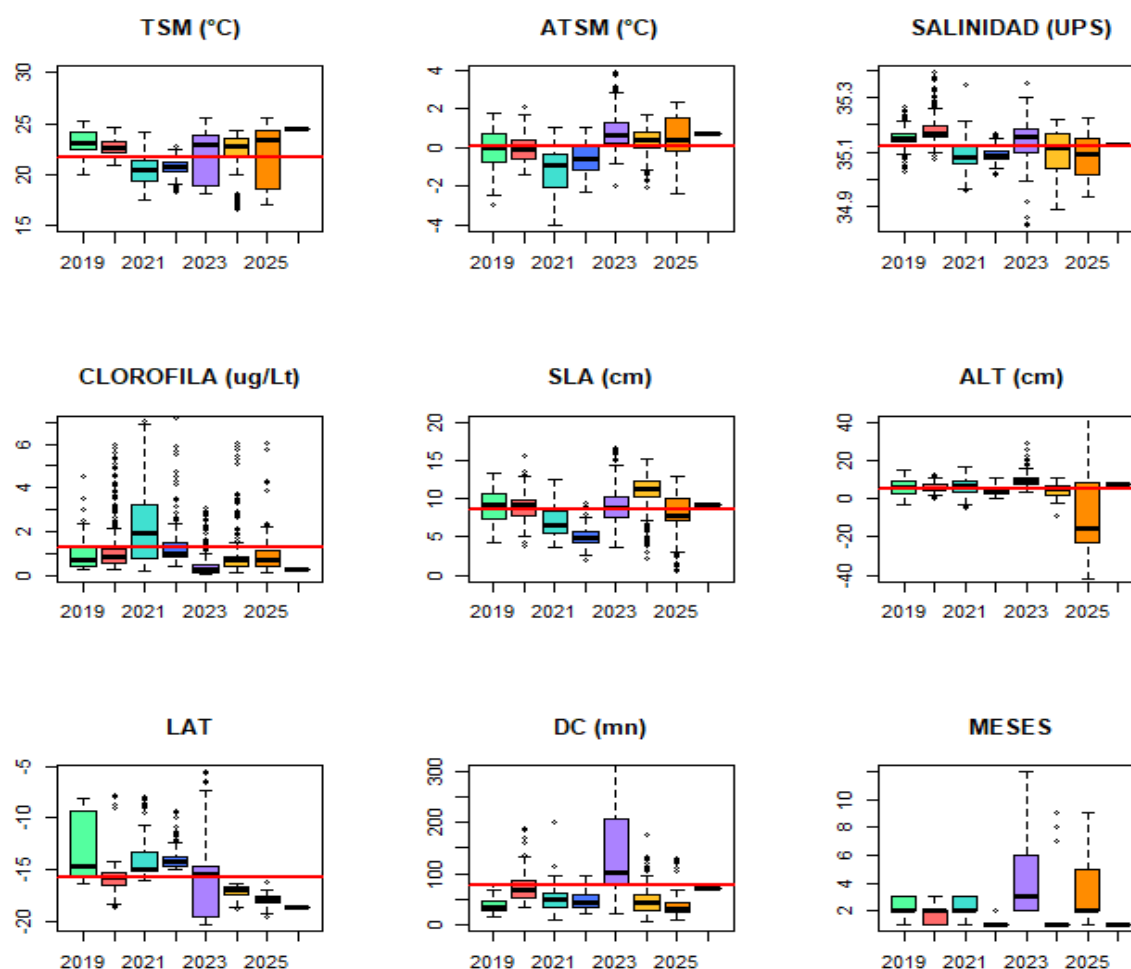


Figure 2.6.2.1. Analysis of variability of parameters (box plot) related to the presence of mackerel between 2019 and 2026. Sea Surface Temperature in °C (TSM), Sea Surface Temperature Anomaly in °C (ATSM), Sea Surface Salinity in ups (salinity), Chlorophyll, Sea Surface Anomaly (SLA), Altimetry (ALT), latitude (LAT), distance to coast (DC) and months. The red line on each box indicates the average value of all measurements.

2.7. Potential Habitat Model for Mackerel (MHPJ)

In order to identify the spatio-temporal distribution of the potential habitat model of jack mackerel (*Trachurus murphyi*) during the period analyzed, a predictive habitat model based on oceanographic and positional variables was applied, generating weekly maps of probability of occurrence on a normalized scale from 0 to 1 (Valdez *et al.*, 2015). Values close to 1 represent highly favorable conditions for the presence of the species, while values close to 0 indicate unsuitable conditions. The model was run for six consecutive weeks, allowing to evaluate the persistence and variability of potential habitat along the Peruvian coast. The satellite oceanographic parameters used, including salinity and temperature, were obtained from the HYCOM platform. Thermal anomalies from an annual pattern were also incorporated. The MHPJ model was run weekly, only during periods with confirmed catches of jack mackerel, using monthly averages of oceanographic variables. This analysis was done on a weekly basis for the period 2025 (five weeks between the end of July and the first week of September) and 2026 (one week in the fortnight of January)

The results are presented in Figure 2.7.1. with respect to the areas represented by the model, between July-September (Week 1 - 5) of 2026, a wide extension with a high density (> 0.6) between degree 5 and 15 south latitude is constantly represented. It occurs constantly between 50-70 nm. On the other hand, the fishing sets were located in the southern zone coinciding with the suitable habitat (for values greater

than 0.6). For the last week by early January 2026 the probability of the habitat increased, especially for the area between 7-16°S, it should be noted that for this season fishing sets were also found in the southern zone. The average probability value of fishing sets was calculated, finding a high assertiveness (~ 0.5).

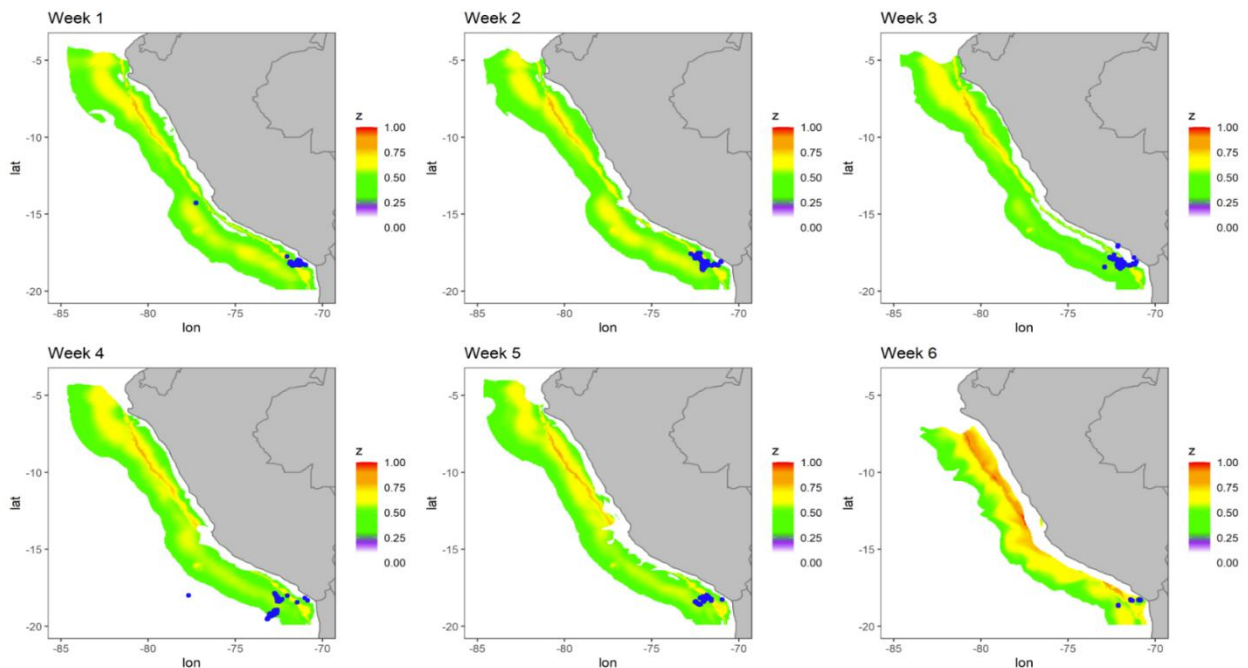


Figure 2.7.1. Results of six fortnights of the MHPJ between July-September 2025 and January 2026. The blue dots marked on the maps indicate the catches of Jack mackerel made by industrial vessels. The color scale indicates probability of finding Jack mackerel (values from 0 to 1).

3. Conclusions

- Thermal conditions over the past five years have led to increased availability of Jack mackerel, except during 2026 due to the developing El Niño. Catches of adult jack mackerel have occurred, especially in the southern zone, even during the warm year 2023. Mackerel has also tended in recent years to be distributed predominantly in the southern zone.
- What has been observed since the first workshop held in 2011 shows us a changing habitat that conditions the distribution and concentration of Jack mackerel, mackerel and other species in the Peruvian sea.

4. Recommendations

- The proposal to carry out a small-scale multidisciplinary survey to deepen the study of the behavior of jack mackerel in the area south of Pisco in order to characterize the habitat of the Jack mackerel in high resolution including the study of the habitat of the ichthyoplankton is reiterated.
- Perform comparative analyses with in situ data against satellite oceanography variables, e.g., to validate oxycline depth measurements.
- Continue to promote studies on changes in the trophic ecology of Jack mackerel, mackerel and other important species such as mesopelagic fishes and euphausiid micronecton.
- Continue sampling of eggs and larvae with biological nets, in order to detail the habitat of the early stages of Jack mackerel and mackerel among other species.

- Develop Jack mackerel habitat models using Machine Learning techniques, integrating historical catch information and satellite oceanographic variables, to improve the identification of potential areas of concentration of the resource.
- Reiterate the recommendation to carry out retrospective acoustic analyses of the Centre of Mass Concentration Index and to know the evolution of the density indices of the presence of Jack mackerel and mackerel since the 1980s.
- It is recommended that all companies record sightings and interactions of top predators during Jack mackerel and mackerel seasons, in order to identify relationships between marine megafauna species and fisheries intended for direct human consumption.

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