



SPRFMO SC ECOSYSTEMS WORKING GROUP

First Ecosystems Workshop on Species Distribution Modelling and Environmental Data Harmonisation for Ecosystem and Climate Applications in the South Pacific Ocean (SCW19)

Shanghai, China, 3 to 5 August 2026

Summary

1. This is the working draft report for the SPRFMO SC First Ecosystems Workshop (SCW19), focused on Species Distribution Modelling and Environmental Data Harmonisation for Ecosystem and Climate Applications in the South Pacific Ocean.
2. The workshop was focused on two complementary components: advancing the development and application of species distribution models (SDMs) for habitat characterisation, ecosystem monitoring, and the generation of spatio-temporal abundance indices; and advancing the harmonisation of biological, fisheries, environmental, and metadata standards to establish a coordinated SDM framework supporting climate-ready ecosystem applications across the SPRFMO Convention Area.

Meeting Details

3. The SPRFMO SC First Ecosystems Workshop (SCW19) was held in person in Shanghai, China, from 3-5 August 2026. The workshop focused on Species Distribution Modelling and Environmental Data Harmonisation for Ecosystem and Climate Applications in the South Pacific Ocean and was conducted under the auspices of the South Pacific Regional Fisheries Management Organisation through the Ecosystems Working Group (EWG), chaired by Mr Sebastián Vásquez.

Opening of the Meeting

4. The first Ecosystems Workshop (SCW19) opened on 3 August 2026 in Shanghai, China, with welcoming remarks and introductions by the participants. The Workshop brought together representatives of SPRFMO Members, Observers and an invited expert to advance the application of Species Distribution Models (SDMs) and the harmonisation of biological, fisheries and environmental data in support of ecosystem monitoring, climate-related analyses, and Ecosystem-Based Fisheries Management (EBFM) within the SPRFMO Convention Area.



Adoption of the agenda

5. The Workshop adopted the agenda contained in SCW19-Doc00. The agenda was structured to bring together available biological, fisheries and environmental data, existing modelling experience, and regional expertise to support collaborative Species Distribution Modelling (SDM) applications within SPRFMO. The Workshop further confirmed that its expected outputs would include: (i) a review of available data, modelling approaches and case studies; (ii) the identification of common scientific principles and priorities for biological, fisheries and environmental data harmonisation; and (iii) the development of collaborative mechanisms and a roadmap to guide future SDM applications and ecosystem-related work within SPRFMO.

Workshop objectives

6. The Workshop aimed to advance the scientific basis for the development and application of Species Distribution Models (SDMs) and the harmonisation of environmental, biological, and fisheries data in the South Pacific, and to support ecosystem- and climate-informed scientific advice, following the guidance provided by the Commission and the Scientific Committee.

7. The main objectives were to:

- a. Review and discuss the outcomes of the Species Distribution Metadata Task Team (SDMTT), including the availability, characteristics, limitations, and accessibility of species distribution data and metadata across SPRFMO Members and CNCPs.
- b. Evaluate the feasibility of collaborative species distribution modelling initiatives for key SPRFMO species, including the identification of priority applications, methodological considerations, data requirements, technical limitations, and research needs.
- c. Discuss opportunities for harmonisation of biological, environmental and oceanographic datasets, interoperability, and collaborative analytical approaches to support SDMs, ecosystem analyses, climate change assessments, and ecosystem-based fisheries management initiatives.
- d. Develop recommendations and a preliminary roadmap for future collaborative activities related to species distribution modelling, environmental data harmonisation, ecosystem modelling, climate change assessments, and ecosystem-informed analyses within the SPRFMO framework.



Key Discussion Summary

Session 1. Opening and Workshop Context

8. The EWG Chairperson, Mr Sebastián Vásquez, introduced the Workshop by outlining its objective of advancing the collaborative development and application of Species Distribution Models (SDMs) within SPRFMO through the harmonisation of biological, fisheries and environmental data. He noted that improving the understanding of species–environment relationships is increasingly important to support ecosystem-informed scientific advice and the implementation of Ecosystem-Based Fisheries Management (EBFM).

9. The Workshop recognised that SPRFMO already possesses the key components required to advance regional SDM applications, including biological observations, environmental datasets, existing modelling experience and complementary scientific expertise. Participants agreed that the principal challenge was not the lack of data or modelling expertise, but their fragmentation across Member economies and institutions. Accordingly, discussions focused on identifying common scientific principles and practical steps towards establishing a regional framework to improve harmonisation, interoperability, collaboration and data sharing for future SDM applications.

10. The Workshop recognised that environmental datasets are generally accessible through international services, whereas biological and fisheries datasets vary considerably in their availability, spatial resolution and temporal coverage across fisheries, institutions and Member economies.

11. The Workshop agreed that, while a regional inventory of available datasets is valuable, the selection of biological, fisheries and environmental information should be driven by the specific scientific or management objective, recognising that different SDM applications require different data types, spatial and temporal scales, and modelling approaches.

12. Participants emphasised the value of adopting harmonised environmental datasets and deriving consistent regional indicators for use across SPRFMO working groups, while recognising the importance of incorporating lagged environmental effects, climate indices and complementary data sources where appropriate.

13. To support future regional SDM applications, the Workshop identified the following priorities:

- a. clarify the biological, fisheries, operational and observer information already held by the Secretariat;
- b. determine whether current data templates contain the fields required for ecosystem applications;
- c. define spatial and temporal requirements according to the intended application;
- d. coordinate SDM development with climate-related work within the Scientific Committee;



- e. identify harmonised environmental datasets and derived regional indicators; and
- f. translate the Workshop outcomes into an implementable EWG roadmap.

Session 2. Outcomes of the SDMTT and Available Data Resources

14. The Chairperson of the Ecosystems Working Group (EWG), Mr Sebastián Vásquez, presented the work of the Species Distribution Modelling Task Team (SDMTT). The Task Team developed a bilingual regional survey and compiled the first SPRFMO inventory of species distribution metadata to document available biological, fisheries and environmental datasets, their characteristics, accessibility and associated metadata.

15. The presentation summarised responses received from six Member economies covering more than five species. The inventory demonstrated that long-term datasets already exist across several regions of the SPRFMO Convention Area, including biological, fisheries and operational information, and highlighted a strong willingness among participants to support future regional collaboration.

16. Separate inventories were presented for jack mackerel and jumbo flying squid. Participants noted that the inventories represent metadata describing available datasets and their spatial domains, rather than harmonised occurrence databases or maps of species distribution.

17. The Workshop recognised that the inventory provides an important foundation for future SDM applications but remains incomplete. Participants identified additional historical surveys, bycatch information, observations collected during surveys targeting other species, and coastal artisanal fisheries as examples of information that could further strengthen the regional inventory.

18. Participants emphasised that dataset identification and data accessibility are distinct issues. The Workshop recognised that future regional applications will require clear documentation of data ownership, access conditions, metadata standards and institutional responsibilities, while ensuring the continued involvement of the scientists and organisations responsible for generating and maintaining the datasets.

19. The Workshop agreed that continued maintenance and expansion of the inventory should proceed in parallel with the development of practical mechanisms for regional data sharing and collaborative SDM applications. Fishery-dependent and fishery-independent observations were recognised as complementary sources of information that, when integrated, would substantially strengthen ecosystem and climate-related analyses within SPRFMO.



Session 3. SDM Applications and Case Studies Relevant to SPRFMO

20. The Workshop reviewed the following case studies and technical presentations relevant to Species Distribution Modelling (SDM) applications:

- a. Modeling spatial and temporal distribution of *Dosidicus gigas* habitat under different climate scenarios – Yidan Zhang (China).
- b. Distribution areas of jack mackerel in the South Pacific – Ricardo Oliveros-Ramos (SC Chairperson).
- c. Towards a species distribution model for Chilean jack mackerel – Sebastián Vásquez (EWG Chairperson).
- d. Potential uses of Global Fishing Watch information – Rocío Joo (Global Fishing Watch).
- e. Modeling the Geographic Distribution of Jumbo Squid – Christian Ibáñez (Invited expert).

21. The Workshop reviewed a series of case studies on species distribution modelling (SDM) for jumbo flying squid and jack mackerel, together with emerging applications based on Global Fishing Watch products. The objective was to identify transferable methodological approaches, common limitations and opportunities for collaborative SDM development within SPRFMO.

22. **Jumbo flying squid:** case studies on jumbo flying squid demonstrated the application of SDMs to evaluate habitat suitability under present and future environmental conditions. Environmental drivers differed among regions, reflecting contrasting oceanographic conditions, while climate projections suggested potential shifts in habitat distribution under future emission scenarios. Participants noted that these models provide information on habitat suitability rather than confirmed species distribution and emphasised the importance of independent validation and explicit uncertainty assessment when projecting future distributions.

23. **Jack mackerel:** Case studies on jack mackerel illustrated the use of SDMs to investigate habitat variability, spawning habitat, seasonal dynamics and spatial population structure. Discussions highlighted the influence of preferential sampling, regional data coverage, life-stage structure and pseudo-absence assumptions on model performance. Participants agreed that ecological realism and independent validation should complement statistical model evaluation.

24. **Global fishing watch:** The Workshop reviewed potential applications of Global Fishing Watch products derived from AIS, VMS and satellite observations. Participants recognised their value for describing fishing effort, fleet dynamics and monitoring activities, while noting that fishing activity should not be interpreted as a proxy for species occurrence without additional biological information and validation.

25. Despite addressing different scientific questions and using different modelling approaches, the case studies relied on common scientific components, including biological observations, environmental predictors, spatial modelling, model validation and clearly defined management



objectives. Participants agreed that future regional SDM applications should promote reproducible workflows, transparent documentation and harmonised environmental information.

26. The Workshop identified several common challenges across all case studies, including differences in environmental products and spatial resolution, preferential sampling, pseudo-absence assumptions, biological aggregation, validation standards and interpretation of SDM outputs. Participants emphasised that habitat suitability, realised distribution and abundance represent different ecological concepts and should be clearly distinguished in both model development and reporting.

27. The Workshop recognised opportunities to strengthen regional SDM applications through harmonised environmental information, common modelling and validation practices, shared analytical workflows, capacity building and collaborative development of regional indicators. Priority areas for future work included defining minimum data and metadata standards, improving access to biological observations, harmonising environmental products and strengthening collaborative governance for regional SDM applications.

28. The Workshop concluded that the principal differences among the case studies lay in the scientific questions being addressed rather than in the modelling techniques themselves, reinforcing the need for harmonised data, transparent workflows and application-driven SDM development.

Session 4. Towards a SPRFMO SDM Framework

29. The Chairperson of the EWG, Mr Sebastián Vásquez, presented a conceptual framework describing progressive applications of Species Distribution Models (SDMs) within SPRFMO. The framework linked different SDM applications with their principal biological and environmental information requirements, typical outputs and potential management applications, ranging from operational fisheries applications to ecosystem-based fisheries management (see Table 1).



Table 1. Conceptual framework for progressive SDM applications within SPRFMO.

Level	SDM stage	Biological data	Environmental data	Typical outputs	Management questions	EBFM contribution
1. Operational SDMs	Fishery-based SDMs	Fishery-dependent observations	Basic environmental variables	Fishing hotspots, relative habitat	Where is fishing most likely to be successful?	Support fishing operations and interpret fleet
	Survey-based SDMs	Fishery-independent surveys	Environmental observations	Species distribution, occupancy,	Where is the stock during the survey?	Stock monitoring and assessment
2. Monitoring SDMs	Population SDMs	Fishery-dependent + fishery-independent integrated biological observations	Multi-variable environmental datasets	Habitat suitability, abundance, forecast habitat suitability, expected	How is the population distribution?	Ecosystem indicators and population
3. Integrated SDMs	Predictive SDMs	Multi-species observations	Near-real-time observations and coupled physical, biogeochemical	Community distribution, species overlap,	Where is the stock likely to occur in the ecosystem?	Adaptive management and survey
4. Forecast SDMs	Ecosystem SDMs				How will ecosystem change affect	Ecosystem-Based Fisheries Management
5. Ecosystem SDMs						

30. The Workshop recognised the framework as a useful conceptual tool for organising future SDM development within SPRFMO. Participants agreed that the framework should not be interpreted as a mandatory sequence, but rather as a flexible guide in which model selection is driven by the scientific or management question, data availability and intended application.

31. Participants emphasised that SDM development should distinguish habitat suitability, realised distribution, abundance and ecosystem indicators, as well as operational and strategic applications. They further noted that implementation effort depends not only on data availability, but also on the resources required for data harmonisation, model development, validation and long-term maintenance.

32. The Workshop recognised the importance of incorporating biological structure into future SDM applications where appropriate, including life stages, phenotypes and population structure. Ongoing genetic studies of jumbo flying squid were identified as potentially relevant for defining biologically meaningful modelling units.

33. The Workshop agreed that the proposed framework provides a suitable basis for future EWG activities and should be further refined in consultation with the Scientific Committee. Participants considered that jack mackerel and jumbo flying squid represent appropriate priority species for progressive regional SDM implementation, supported by harmonised datasets, common technical standards and collaborative governance arrangements.



Session 5. Future Applications of SDMs for Ecosystem and Climate Analyses

34. Dr. Ricardo Oliveros-Ramos presented a multi-model approach for statistical downscaling and bias correction of Earth System Model outputs to support future SDM applications. The presentation highlighted the importance of reducing systematic biases and improving the spatial resolution of climate products to ensure compatibility with SDMs calibrated using historical environmental datasets. It also emphasised the need to compare alternative correction models using indicators that assess historical performance, spatial patterns, extremes and the potential introduction of additional biases when extrapolating to future conditions.

35. The Workshop recognised that statistical downscaling and bias correction represent practical approaches for generating environmental products for regional SDM applications. Participants noted that corrected datasets should preserve realistic spatial patterns, temporal variability, extremes, and long-term environmental trends, while avoiding implausible future projections introduced by the correction process. They further noted that model performance may differ among regions and variables, requiring case-specific model selection and validation procedures.

36. The Workshop further noted that the proposed methodology was designed to improve the representation of the extremes of environmental distributions, which is particularly relevant where events such as El Niño strongly influence species distribution and ecosystem dynamics. In this context, short-term applications aimed at reproducing the effects of individual El Niño events and long-term applications aimed at assessing climate-change trends may require different downscaling and bias-correction approaches, or different validation and model-selection procedures within the same methodological framework.

37. Participants agreed that developing harmonised, bias-corrected environmental datasets for the SPRFMO Convention Area and adjacent coastal waters should be considered a regional collaborative priority. The resulting products should support SDMs, climate projections, ecosystem assessments and other Scientific Committee activities.

38. The Workshop further recognised the importance of adopting common protocols for downscaling, bias correction, quality control and documentation. Participants noted that implementation would require coordinated contributions among Members, including shared methodologies, computational resources and collaborative development of regional environmental products.

39. The Workshop discussed future SDM applications ranging from habitat suitability and ecological niche models to spatio-temporal, forecast, mechanistic and hybrid approaches. Participants recognised that these applications differ substantially in their biological and environmental data requirements, implementation effort and expected development timelines.



40. Participants also noted the close relationship between spatio-temporal SDMs and fisheries standardisation methods, identifying regional abundance indices for priority species, including jack mackerel and jumbo flying squid, as promising collaborative applications subject to harmonised datasets, agreed methodologies and appropriate data-access arrangements.

41. The Workshop recognised that bias-corrected and downscaled environmental datasets should be developed as shared regional resources rather than project-specific products. Participants supported making these datasets, together with the associated methodologies and documentation, available for collaborative SDM development and other ecosystem and climate-related applications within SPRFMO.

Session 6. Harmonisation of Biological, Fisheries, and Metadata Standards

42. The chairperson of the EWG, Mr Sebastián Vásquez, introduced the principles of biological, fisheries and metadata harmonisation for regional SDM applications. The Workshop recognised that the objective of harmonisation is to improve interoperability among datasets while preserving scientifically meaningful differences where appropriate, rather than achieving complete standardisation.

43. Participants distinguished three complementary approaches to data integration: standardisation of common definitions and formats, harmonisation of comparable variables through agreed procedures, and documentation of methodological differences through comprehensive metadata (Table 2). The Workshop agreed that all three approaches are required to support regional SDM applications.

Table 2. Conceptual approaches to integrating biological, fisheries and metadata information for regional SDM applications.

Treatment	Purpose	Examples
Standardise	Use common definitions, units or formats	Taxonomy, species codes, length units and date formats
Harmonise	Translate different observations into comparable information through agreed procedures	Catch, effort, abundance and spatial aggregation
Document	Retain legitimate context-specific differences while describing them explicitly	Survey design, sampling methods, quality and limitations

44. The Workshop recognised that appropriate spatial and temporal resolution depends on the intended scientific or management application. While fine-scale information provides the greatest analytical flexibility, aggregated datasets may remain suitable provided that their spatial assumptions, temporal resolution and associated uncertainty are clearly documented.



45. Participants emphasised the importance of documenting sampling design, observation methods, fleet characteristics and other metadata required to evaluate preferential sampling, data quality and model interpretation. The Workshop agreed that minimum metadata standards should accompany future regional biological and fisheries datasets.

46. The Workshop recognised the need to clarify the biological, fisheries, operational and observer information currently held by the Secretariat, together with its temporal coverage, spatial resolution and access conditions. Participants supported incorporating Secretariat-held datasets into the regional SDMTT metadata inventory and continuing technical discussions with the Secretariat to improve data discoverability and interoperability.

47. Participants recognised that collaborative SDM applications require practical mechanisms to balance scientific accessibility with confidentiality and data ownership. The Workshop supported approaches based on appropriate aggregation, anonymisation where required, transparent access arrangements and continued involvement of data providers in the interpretation and application of their datasets.

48. The Workshop agreed that requests for biological and fisheries information should be application-driven and limited to the information demonstrably required to address the scientific or management objective. This approach was considered essential for reducing unnecessary reporting requirements while facilitating efficient regional collaboration.

Session 7. Harmonisation of Environmental and Oceanographic Data

49. Ecosystems WG chairperson, Mr Sebastián Vásquez, introduced environmental information as the link between biological observations and the interpretation, prediction and forecasting of species distributions. The Workshop recognised that harmonised environmental information is fundamental for collaborative SDM applications and should include physical, chemical and biological variables selected according to the scientific or management objective.

50. The Workshop agreed that the selection of reference environmental products should consider spatial and temporal resolution, time-series continuity, variable availability, regional performance, interoperability, accessibility, documentation and long-term stability. These criteria provide a common basis for evaluating candidate products for future regional applications.

51. The preliminary list of candidate products agreed during the Workshop is presented in Table 3. GLORYS, OSTIA, Copernicus GlobColour, ERA5, AVISO/DUACS and GEBCO were recognised as suitable initial reference products for several variables. However, the Workshop agreed that dissolved oxygen and other biogeochemical variables (i.e., pH) require further regional evaluation before common reference products can be adopted.



Table 3. Preliminary reference environmental products and derived variables identified by the Workshop for collaborative SDM applications within SPRFMO.

Variable	Product	Spatial resolution	Temporal resolution	Period	Agency	Type	Repository
Sea Surface Temperature	Glorys version 12	9km	daily	1993-	Copernicus Marine Service	Reanalysis	https://data.marine.copernicus.eu/
Sea Surface Temperature	Ostia	4km	daily	1985-	Copernicus Marine Service	Satellite	https://data.marine.copernicus.eu/
Subsurface Temperature	Glorys version 12	9km	daily	1993-	Copernicus Marine Service	Reanalysis	https://data.marine.copernicus.eu/
Surface Salinity	Glorys version 12	9km	daily	1993-	Copernicus Marine Service	Reanalysis	https://data.marine.copernicus.eu/
Current velocities	Glorys version 12	9km	daily	1993-	Copernicus Marine Service	Reanalysis	https://data.marine.copernicus.eu/
Oxygen concentration	further analysis is needed for selection						
Chlorophyll-a	Globcolour	4km	daily	1997-	Copernicus Marine Service	Satellite	https://data.marine.copernicus.eu/
Primary productivity	Globcolour	4km	daily	1997-	Copernicus Marine Service	Satellite	https://data.marine.copernicus.eu/
Wind velocity and direction	ERA5	25km	daily	1940-	Copernicus Climate Data Store	Reanalysis	https://cds.climate.copernicus.eu/
Sea Level Height	Sealevel	1/4°	daily	1993-	Copernicus Marine Service	Satellite	https://data.marine.copernicus.eu/
Mixed Layer Depth	Glorys version 12	9km	daily	1993-	Copernicus Marine Service	Reanalysis	https://data.marine.copernicus.eu/
pH	PISCES-Mercator	1/4°	daily	1997-	Copernicus Marine Service	Reanalysis	https://data.marine.copernicus.eu/
Derived products	Source						
Thermal fronts	Sea Surface Temperature						
Lagrangian structures (Lyapunov)	Sea Level Height						
Eddy Kinetic Energy	Current velocities						
Sea Surface Temperature Anomaly	Sea Surface Temperature						
Wind induced Turbulence	Wind velocity and direction						
Distance from the coast							
Distance from the shelfbreak							
Static fields							
Bathymetry	GEBCO	gebco.net/data-products					https://www.gebco.net/data-products

52. The Workshop recognised that vertical environmental structure may be important for several SPRFMO species, particularly jumbo flying squid and jack mackerel. Participants agreed that environmental layers should be selected according to ecological relevance and observation methods rather than statistical significance alone.

53. Participants emphasised that candidate environmental products should undergo regional validation before adoption for collaborative SDM applications. Validation should consider agreement with independent observations, representation of spatial gradients, seasonal and interannual variability, and long-term temporal consistency.

54. The Workshop supported the development of common workflows for accessing, processing and documenting environmental information. Rather than duplicating large external environmental archives, participants considered that shared scripts, harmonised processing procedures, derived-variable calculations and version-controlled documentation would provide a more practical and sustainable regional solution.

55. The Workshop agreed that harmonised environmental datasets should be regarded as shared regional resources supporting SDMs, ecosystem analyses and climate applications. Participants identified continued evaluation of candidate products, development of common processing workflows and preparation of technical guidance as priority activities for the EWG.



Decisions and agreements

The Workshop agreed on the following:

56. **Regional capacity for collaborative SDMs:** i) SPRFMO already possesses the scientific expertise, datasets and technical capacity required to support collaborative Species Distribution Modelling (SDM) applications. ii) The principal challenge is not the lack of information, but its fragmentation across Member economies, institutions and disciplines. Future efforts should therefore prioritise harmonisation, interoperability and collaborative implementation.

57. **Regional SDM framework:** A flexible, question-driven framework should be used to guide future collaborative SDM applications within SPRFMO, recognising that different scientific questions require different modelling approaches.

58. **Biological and fisheries harmonisation:** i) The objective of data harmonisation should be interoperability rather than uniformity; ii) Biological, fisheries and metadata information should be treated through a combination of standardisation, harmonisation and documentation, depending on the variable.

59. **Metadata inventory:** i) The SDMTT inventory should be maintained as a living metadata catalogue describing available datasets rather than as a harmonised modelling database; ii) Secretariat-held datasets should be incorporated into the same metadata framework following a joint review with the Secretariat.

60. **Environmental reference products:** i) A preliminary set of reference environmental products was identified for regional SDM applications, including GLORYS, OSTIA, GlobColour, ERA5, Copernicus Sea Level and GEBCO; ii) Selection of a common dissolved oxygen product remains pending further regional evaluation.

61. **Environmental processing:** i) Shared scripts, processing workflows and technical guidance should be preferred over duplicating large environmental data archives; ii) Common methodologies should be developed for derived environmental variables.

62. **SDM best practices:** i) SDM outputs should clearly distinguish habitat suitability, realised distribution, abundance and fishing ground dynamics; ii) Ecological validation should complement statistical model evaluation; iii) Model complexity should be determined by the scientific or management objective rather than by methodological preference.

63. **Priority collaborative applications:** i) Jack mackerel and jumbo flying squid were recognised as priority species for collaborative regional SDM development; ii) Regional abundance indices were identified as promising pilot applications, subject to data availability and agreement among Members.



64. **Climate-ready environmental products:** i) Statistical downscaling and bias correction were recognised as priority activities for developing harmonised environmental datasets covering the SPRFMO Convention Area and adjacent coastal waters; ii) These products should be developed as shared regional resources to support SDMs, ecosystem analyses and climate-related scientific applications.

65. **Future coordination:** i) The outcomes of the Workshop should be incorporated into the EWG multi-annual workplan; ii) A future technical workshop focused on the practical implementation of collaborative SDMs was supported following completion of the initial harmonisation activities.

Conclusions

Recommendations to SC14

66. **Develop a regional SDM framework.** The Workshop recommended developing a regional framework for collaborative Species Distribution Modelling (SDM) within SPRFMO membership. The framework should be question-driven, promote interoperability of biological, fisheries and environmental information, and provide common scientific principles while remaining sufficiently flexible to accommodate different species, applications and modelling approaches.

67. **Strengthen data inventories and metadata.** The Workshop recommended working jointly with the Secretariat to review the biological, fisheries, operational and observer information currently available within the SPRFMO database and incorporating these datasets into the SDMTT regional metadata inventory. The inventory should be maintained by the Secretariat as a living catalogue documenting dataset characteristics and metadata (e.g. ownership, accessibility and responsible institutions), while establishing minimum metadata standards for future regional SDM applications.

68. **Harmonise biological, fisheries and environmental information.** The Workshop recommended developing common approaches for harmonising biological, fisheries and environmental information, recognising that interoperability rather than uniformity should be the primary objective. This includes harmonisation of biological and fisheries variables, adoption of common physical, chemical and biological data products where appropriate, and clear documentation of methodological differences among datasets.

69. **Develop common environmental workflows.** The Workshop recommended preparing technical guidance describing recommended environmental variables, reference products, derived indicators, preprocessing procedures and version control. Scripts and reproducible workflows should be shared within the EWG. The Workshop also recommended undertaking further regional validation of dissolved oxygen and other biogeochemical data products (e.g. pH) before adopting common reference datasets.



70. **Promote SDM best practices.** The Workshop recommended developing common guidance for regional SDM applications covering model selection, validation, uncertainty assessment, preferential sampling, pseudo-absence treatment, ecological interpretation and reproducibility. Model selection should be driven by the scientific or management question rather than by methodological complexity, and SDM products should clearly distinguish habitat suitability, realised distribution, abundance, productivity and fishing ground dynamics.

71. **Develop collaborative pilot applications.** The Workshop recommended initiating collaborative preliminary SDM applications for priority SPRFMO species, particularly jack mackerel and jumbo flying squid, to evaluate common datasets, environmental products, modelling workflows and regional indicators. These activities should be undertaken in close collaboration with the corresponding species working groups and should strengthen collaboration with scientists from Australia and New Zealand to facilitate the integration of Vulnerable Marine Ecosystem (VME) data into future regional SDM applications.

72. **Developing regional bias-corrected environmental datasets.** The Workshop recommended continuing the collaborative development of statistically downscaled and bias-corrected environmental datasets for the entire SPRFMO Convention Area and adjacent coastal waters. Priority should be given to key environmental variables relevant to SDM and ecosystem applications, using common methodologies and quality-control procedures. The resulting datasets should be made available as shared regional products to support SDMs, climate-change studies, ecosystem assessments and other Scientific Committee activities.

73. **Incorporate the outcomes into the EWG workplan.** The Workshop recommended incorporating the outcomes of this Workshop into the EWG multi-annual workplan through a phased implementation roadmap. Activities should include completion of the regional metadata inventory, harmonisation of biological, fisheries and environmental information, preparation of technical guidance, development of regional environmental products, implementation of collaborative SDM applications, and periodic review of progress by the Scientific Committee.

74. **Develop regional repositories and recover previous EWG products.** The Workshop recommended developing regional repositories to support collaborative SDM applications by facilitating access to harmonised biological, fisheries and environmental datasets, shared analytical workflows and associated documentation. The Workshop further recommended working with the SPRFMO Secretariat to identify, recover and integrate datasets, metadata and technical products generated through previous EWG initiatives, including the Habitat Monitoring Working Group, into this regional information infrastructure.

75. **Convene a second technical SDM workshop.** The Workshop recommended convening a second technical workshop dedicated to the implementation of collaborative SDM applications within SPRFMO, including the participation of other SC Working Groups. Building on the outcomes of the present Workshop, the proposed meeting should focus on applying harmonised biological,



fisheries and environmental datasets, testing common modelling workflows, evaluating preliminary applications for priority species, and developing regional SDM products with the participation of invited international experts.

Meeting closure

76. The meeting was closed at 16:44 on 5 August 2026.



APPENDICES

Agenda

Day 1 – Data Availability and Opportunities for SDMs

08:30 – 10:00. Session 1. Morning. Opening and Workshop Context

10:00 – 10:30. Coffee Break

10:30 – 12:00. Session 2. Morning. Outcomes of the SDMTT and Available Data Resources

12:00 – 13:30. Lunch Break

13:30 – 15:00. Session 3. Afternoon. Environmental and Oceanographic Data Available for SDM Applications

15:30 – 16:00. Coffee Break

16:00 – 17:30. Session 4. Afternoon. SDM Applications and Case Studies Relevant to SPRFMO (jack mackerel, jumbo flying squid and other species)

Day 2 – Data Sharing and Harmonisation

08:30 – 10:00. Session 5. Morning. Data Accessibility and Collaborative Approaches for Regional SDM Applications

10:00 – 10:30. Coffee Break

10:30 – 12:00. Session 6. Morning. Harmonisation of Biological, Fisheries, and Metadata Standards

12:00 – 13:30. Lunch

13:30 – 15:00. Session 7. Afternoon. Harmonisation of Environmental and Oceanographic Data

15:30 – 16:00. Coffee Break

16:00 – 17:30. Session 8. Afternoon. Breakout Discussions and Synthesis



Day 3 – Roadmap for SDM Development in SPRFMO

08:30 – 10:00. Session 9. Morning. Future Applications of SDMs for Ecosystem and Climate Analyses

10:00 – 10:30. Coffee Break

10:30 – 12:00. Session 10. Morning. Towards a SPRFMO SDM Framework

12:00 – 13:30. Lunch

13:30 – 15:00. Session 11. Afternoon. Roadmap and Future Intersessional Activities

15:30 – 16:00. Coffee Break

16:00 – 17:30. Session 12. Afternoon. Recommendations to the Scientific Committee and Workshop Closure



Participants

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Workshop documents

01. Terms of Reference Species Distribution Models (SDMs) Ecosystems Workshop (01-ToRs_SDMs_Workshop_EWG_SPRFMO.pdf)
02. Session objectives and expected outputs SDMs Workshop (02-Session_objectives_and_expected_outputs_SDMs_Workshop_EWG.pdf)
03. Presentation 1. Christian Ibañez (Invited expert): Modeling the Geographic Distribution of Jumbo Squid (01-Ibañez_Modeling_the_Geographic_Distribution_of_Jumbo_Squid.pdf)
04. Presentation 2. Yidan Zhang (China). Modeling spatial and temporal distribution of *Dosidicus gigas* habitat in the eastern Pacific Ocean under different climate scenarios (02-Modeling spatial and temporal distribution of *Dosidicus gigas* habitat in the eastern Pacific Ocean under different climate scenarios-20260803.pdf)
05. Presentation 3. Ricardo Oliveros-Ramos (SC Chairperson). Distribution areas of Jack Mackerel (*Trachurus murphyi*) in the South Pacific (03-260803-oliveros-SPRFMO-JackMackerelAreas.pdf).
06. Presentation 4. Sebastián I. Vásquez (EWG Chairperson). Towards a Species Distribution Model for Chilean Jack Mackerel (*Trachurus murphyi*) in the Southeastern Pacific (04-Vasquez_SDMs_for_CJM_in_the_Southeastern_Pacific.pdf)
07. Presentation 5. Ricardo Oliveros-Ramos (SC Chairperson). Statistical downscaling and bias correction of Earth System Model outputs for habitat modelling applications (05-260804-oliveros-SPRFMO-ecosystems_workshop.pdf)
08. Presentation 6. Rocío Joo (Global Fishing Watch). Global Fishing Watch data potential for SPRFMO ecosystem workshop (06_GFW_data_potential_for_SPRFMO_ecosystem_workshop.pdf).



List of Acronyms

Acronym	Meaning
AIS	Automatic Identification System
CMIP	Coupled Model Intercomparison Project
CNCP	Cooperating non-Contracting Party
CPUE	Catch per unit effort
EBFM	Ecosystem-based fisheries management
EEZ	Exclusive Economic Zone
EWG	Ecosystems Working Group
GLORYS	Global Ocean Reanalysis and Simulation
INLA	Integrated nested Laplace approximation
MaxEnt	Maximum entropy
NPP	Net primary productivity
SDM	Species distribution model
SDMTT	Species Distribution Metadata Task Team
SPRFMO	South Pacific Regional Fisheries Management Organisation
SST	Sea-surface temperature
VMS	Vessel monitoring system