SOUTH PACIFIC ALBACORE ROADMAP INTERSESSIONAL WORKING GROUP (SPA-RM-IWG05)

ELECTRONIC MEETING

09:00 – 13:00 Pohnpei Time, Friday, 2 August 2024

South Pacific Albacore: Science, Data and Climate Change Workshop Report

SPA-RM-IWG05-2024-04

SHOU, ANCORS, and SPC

South Pacific Albacore:

Science, Data and Climate Change Workshop

Monday 29 – Tuesday 30 April 2024

Wollongong

Summary Record

The Australian National Centre for Ocean Resources and Security (ANCORS) of the University of Wollongong (UOW), in collaboration with the Shanghai Ocean University (SHOU) and the Pacific Community (SPC), hosted an informal workshop on 29 – 30 April 2024 in Wollongong to discuss current issues in science, data and climate change with respect to the management and conservation of South Pacific Albacore (SPA). The workshop was also attended in-person or virtually by participants representing the Pacific Islands Forum Fisheries Agency (FFA), South Pacific Group (SPG), Western and Central Pacific Fisheries Commission (WCPFC), Inter-American Tropical Tuna Commission (IATTC), Commonwealth Scientific and Industrial Research Organisation (CSIRO), Institute of Oceanography of the National Taiwan University (NTU), Japan Fisheries Research and Education Agency (FRA), the National Oceanic and Atmospheric Administration (NOAA), Fisheries New Zealand (FNZ) and Dragonfly. The workshop was chaired by Glenn Hurry, MRAG Asia Pacific. A full list of participants is at Annex 1. The workshop program is at Annex 2.

Prof Quentin Hanich, ANCORS, opened the workshop by outlining recent developments in management of SPA in the Western and Central Pacific Ocean (WCPO). Prof Hanich emphasised that, while this was primarily a science-focused workshop, cooperation was also essential to the effective management of SPA. He noted that the WCPFC had, at its 20th Regular Session in 2023, adopted an interim target reference point (iTRP) for SPA of 4% below the average spawning potential over 2017-2019. Following the completion of the 2024 SPA stock assessment, the Commission will review the iTRP and develop candidate management procedures with a view to revising the iTRP. Prof Hanich recalled that the WCPFC had also agreed to hold a science-management dialogue (SMD) on SPA, likely to be held virtually on 10-12 September, and had acknowledged that management of SPA, the range of which extended across the Pacific, would be enhanced by cooperation with the IATTC.

Dr Alex da Silva, IATTC, noted that the IATTC had similarly committed to working with the WCPFC, including by ensuring that EPO stocks were included in future stock assessments for SPA. To that end, Dr Haikun Xu led IATTC's participation in SPC's first Pacific-wide SPA stock assessment in 2021. That assessment had concluded that the status of SPA was healthy. Mortality was much lower than MSY but in the EPO, the spawning biomass (SB) ratio had decreased to <50% in 2019. IATTC scientific staff had therefore recommended that the Commission continue collaborating with SPC to monitor stock status. A recent uptick in catch and effort in the EPO was also potentially a cause for concern. For projection analyses using the 2024 stock assessment, for example, participants noted that account would need to be taken of the treatment of EPO catches, including and excluding those in the overlap area.

Dr Xu outlined the current state of SPA in the EPO, noting that it was caught predominantly by longline vessels between 10 and 20 degS. Catches by Chinese vessels had increased rapidly since 2012, following a period dominated by catches by Chinese Taipei vessels and, to a lesser extent, Japan and Korea. Trends in CPUE had varied, with that of Chinese Taipei declining over time while that of China had been increasing. CPUE variability was difficult to explain, although Dr Xu noted some gaps in the IATTC's data may also be constraining CPUE analyses.

The workshop welcomed the prospect of deeper collaboration between the IATTC and the WCPFC, including on harvest strategies. Dr James Larcombe observed that it would be ideal to have common harvest strategies. But the conversation was just starting so even joint evaluations would be a positive early step. Dr da Silva noted that Ms Yang Shiyu, PhD candidate, SHOU, would be joining IATTC for 18 months from July this year to collaborate on modelling methods and possibly management strategy evaluations. He also noted that the IATTC had passed a resolution on climate change, which called for collaboration with WCPFC in the context of stock assessments and MSE.

Updates on the operations of various fleets were provided by FFA, Dragonfly and Taiwan National University (NTU). Mr Ueta Junior Faasili, FFA, outlined trends in WCPO fleets' recent catch and areas of operation, noting that Pacific Island countries' fleets had seen a general decline in vessel numbers. Unlike other PICs, areas of activity of Vanuatu's vessels extended beyond the WCPO. CPUE had overall declined over time but had seen a small reversal in 2022 compared to 2021.

Dr Neubauer, Dragonfly, summarised activity in the New Zealand troll fishery for SPA, noting the SP troll fishery is the only fishery to mainly take juveniles. These catches are therefore potentially informative for SPA stock assessments. Catches had declined since around 2003, and 2023 had recorded the lowest catches in 30 years. There is no quota required to fish SPA in New Zealand and the species was targeted both opportunistically and on specific SPA troll trips. Dragonfly had been modelling climate drivers of CPUE and length compositions in the NZ troll fishery and found no strong influence of SST in CPUE data or models but that a monthly ENSO index provides a standardisation effect. A strong El Niño had a negative effect on CPUE but intermediate values had limited impact. Dr Neubauer said that, as only three strong El Niño events were present in the data, the results should be treated with caution. There also was some indication that La Niña conditions led to increased proportions of small (age 0/1) fish. It was however unclear how much of the signal is due to recruitment/abundance of cohorts vs. movement of fish.

Dr Yi-Jay Chang and Ms Jhen Hsu, NTU, presented a summary of CPUE estimates for Chinese Taipei vessels. Catches by Chinese Taipei vessels had averaged 5000mt since 1964. Since 2000, CPUE had decreased in the northern Pacific but increased in the south. Ms Hsu outlined research conducted to define fisheries using year, season, latitude and longitude. The results had recently been published in a paper in Frontiers in Marine Science.

The workshop then discussed the impacts of climate change on SPA stocks. Dr Pilling, SPC, presented on short term climate impacts on SPA CPUE. This work aimed to look at variables that might influence catch rates in EEZs and factors that members could control or at least monitor to predict future catch rates. The research had been conducted in 2014 and was summarised by Patrick Lehodey[1]. Across EEZs, vessels had the biggest explanatory power of catch rates while oceanographic

[1] Lehodey, P., Bertrand, A., Hobday, A.J, Kiyofuji, H., McClatchie, S., Menkès, C.E., Pilling, G., Polovina, J. and Tommasi, D. (2021). Chapter 19. ENSO impact on fisheries and ecosystems. p 429-451 *In* McPhaden, M.J., Santoso, A. and Cai, W. (Eds) El Nino Southern Oscillation in a Changing Climate. Geophysical Monograph 253. John Wiley and Sons.

variables tended to also be significant explanatory variables for presence or absence of a catch and/or the level of a positive CPUE. A rule of thumb emerging from the research was that a strong El Niño was observed to have a strong negative impact on catch rates in the east and that a strong La Niña had a positive influence on CPUE in the east. The reverse was true in the west. Dr Nicol, SPC, noted that no ENSO event was the same in a spatial sense so caution should be exercised in interpreting results. Dr Chang also noted that oxygen levels also appeared to have a strong impact on the South Pacific Albacore stock.

Two presentations by PhD candidates showcased current research at SHOU. Mr Lu Dongqi presented his research on a test for spatial heterogeneity of growth by southern albacore. Dr Nicol noted that CSIRO had just mapped the SPA genome and suggested that Mr Lu could use that data and join a collaboration between SPC and CSIRO and other institutes in the Americas. Their results were consistent with Mr Lu's results so this would be an opportunity to expand the sample size. Mr Lin Hongyu presented the results of his analysis of the impacts of ENSO on SPA distribution. The main conclusion was that ENSO was causing an eastward shift in distribution during El Niño periods and over the longer term.

Ms Paige Eveson and Dr Ashley Williams, CSIRO, discussed previous collaborative work on the biology of SPA. The research drew on samples collected in 2008-2011 in a large collaboration with SPC across the South Pacific. The samples were now part of the Pacific Marine Specimen Bank. Analysis had revealed differences in growth between sexes, with males growing larger on average than females, and also some differences between longitudes for both sexes, with slightly larger sized individuals in the east compared to west[2] [3]. A range of other analyses were conducted using a variety of methods, including reproduction and maturity analysis[4] [5], conventional tagging of juveniles, PSAT tagging, stomach content analysis[6] and genetic analysis to analyse stock structure[7]. Subsequent discussion noted that further work was required to understand important oceanographic processes in the South Pacific and North Pacific Tropical Gyres, which bring juveniles to the New Zealand troll fishery. In terms of analysis of the EPO, Dr Williams said that, while some samples were available, they have been difficult to obtain from the EPO as fishing activity was considerably lower there.

Dr Nicol presented on research using SEAPODYM modelling of drivers, patterns and uncertainties of climate impacts on SPA, led by Inna Senina and Romain Forrestier. The model had performed well in predictive capability in several areas. On connectivity between the eastern Pacific and central Pacific, only about 6% of population showed any exchange between the EPO and WCPO and this was mostly

[2] Farley JH, Williams AJ, Clear NP, Davies CR, Nicol SJ (2013) Age estimation and validation for South Pacific albacore tuna (*Thunnus alalunga*). J Fish Biol 82: 1523-1544. doi:10.1111/jfb.12077

[3] Farley J, Krusic-Golub K, Eveson P. (2020)Updating age and growth parameters for South Pacific albacore (Project 106). WCPFC-SC17-2021/SA-IP-10

[4] Farley JH, Williams AJ, Hoyle SP, Davies CR, Nicol SJ (2013) Reproductive dynamics and potential annual fecundity of South Pacific albacore tuna (*Thunnus alalunga*). PLoS ONE 8(4): e60577. doi:10.1371/journal.pone.0060577.

[5] Farley JH, Hoyle SD, Eveson JP, Williams AJ, Davies CR, Nicol, SJ (2014) Maturity ogives for South Pacific albacore tuna (*Thunnus alalunga*) that account for spatial and seasonal variation in the distributions of mature and immature fish. PLoS ONE 9(1): e83017. doi:10.1371/journal.pone.0083017

[6] William AJ, Allain V, Nicol SJ, Evans KJ, Hoyle SD, Dupoux C, Vourey E, Dubosc J (2015) Vertical behavior and diet of albacore tuna (*Thunnus alalunga*) vary with latitude in the South Pacific Ocean. Deep Sea Research II 113: 154-169. doi:10.1016/j.dsr2.2014.03.010

[7] Macdonald JI, Farley JH, Clear NP, Williams AJ, Carter TI, Davies CR, Nicol SJ. (2013) Insights into mixing and movement of South Pacific albacore Thunnus alalunga derived from trace elements in otoliths. Fish. Res. 148: 56-63. doi:10.1016/j.fishres.2013.08.004

in adult age classes moving west to east, with juveniles and larvae seen to move east to west. In presenting the results of redistribution modelling, he noted that "redistribution" should be understood to mean an increase in density in one area (east) and a decrease in another (west) rather than the movement of the stock from one area to another. In response to a question from Dr Fan, Dr Nicol said it was unclear whether there was an SPA spawning ground in the EPO and that he would welcome any larval tow data. Dr Fan said SHOU might have some maturity data that could be shared. Dr Nicol concluded by welcoming contributions to the next update to the SEAPODYM model.

Ms Laura Tremblay-Boyer, CSIRO, presented on sampling design for close kin mark recapture (CKMR) for the SPA population[8] [9] [10]. Ms Tremblay-Boyer outlined some of the key benefits of CKMR, notably its ability to measure usually difficult-to-measure variables, such as total abundance and total mortality. CKMR is also fisheries-independent so avoids many of the issues common to traditional inputs to stock assessments. It can also provide valuable information on stock structure and fecundity at age. She emphasised the importance of the logistics aspects of study design, noting that the 2021 Pacific-wide stock assessment would require adjustments to the design for the 2018 assessment, which only extended to French Polynesia. Ms Tremblay-Boyer said juvenile samples from the EPO were minimal and that she would welcome more to supplement those from New Zealand (although the latter were representative of a wider area due to the South Pacific Gyre). Dr Hampton noted that SPA might not be abundant in the Southern EPO.

Two presentations focussed on North Pacific Albacore (NPA), with findings that could be of relevance to SPA. Dr Yoshinori Aoki, FRA, outlined research entitled *Lower thermal tolerance restricts vertical distributions for juvenile albacore tuna (Thunnus alalunga) in the northern limit of their habitats*[11]. The research focused on NPA and used tags that track swimming depth, water temperature, body temperature and light intensity. The findings were consistent with fishing patterns by longline and pole and line vessels. Catches by the former targeted stocks south of 40 degN, where the study had found swimming depths of between 100 and 300m. The latter targeted stocks primarily north of 40 degN where fish stayed close to the surface and therefore accessible to pole and line gear. The study had found NPA minimum sea temperature (T_{min}) to be 13 degrees C. Areas with waters below 13 degrees at accessible depths could therefore be eliminated from stock assessments and CPUE analyses.

The second, by Dr Donald Kobayashi, NOAA, considered the characterization of pelagic food web structure supporting tuna fisheries in the Central North Pacific based on research conducted through tuna fishery oceanographic research cruises and cooperative research with tuna longliners. The former looked at the aggregation of pelagic forage around anticyclonic eddies while the latter used sensors on longline gear to record depth – which had revealed a creep toward shallower sets over time – while stomach samples were yet to be analysed. Dr Kobayashi said fishers were interested in the data as they were likely not aware of the depths at which they were setting their lines. He was

[8] Bravington, M. V., Grewe, P. M., & Davies, C. R. (2016). Absolute abundance of southern bluefin tuna estimated by close-kin mark-recapture. *Nature communications*, *7*(1), 13162.
[9] Hillary, R. M., et al. "Genetic relatedness reveals total population size of white sharks in eastern Australia and New Zealand." Scientific reports 8.1 (2018): 2661.
[10] Bravington, M.V., Nicol, S., Anderson, G., Farley, J., Hampton, J., Castillo-Jordan, C., Macdonald, J. (2021). South Pacific Albacore Close-kin mark-recapture: update on design. Information paper presented to the 17th Regular Scientific Committee of the Western and Central Pacific Commission, 11 to 19 August 2021, online meeting.
[11] Matsubara, N., Aoki, Y., Aoki, A., & Kiyofuji, H. (2024). Lower thermal tolerance restricts vertical distributions for juvenile albacore tuna (Thunnus alalunga) in the northern limit of their habitats. Frontiers in Marine Science, 11, 1353918.

keen to partner with others on similar research and suggested that NOAA could send a research vessel from American Samoa to study SPA habitat and forage.

Dr Tim Frawley, NOAA, presented two papers describing Pacific longline fisheries using machine learning approaches to summarise and classify large, publicly accessible data sources. The first used AIS data from Global Fishing Watch to identify functional longline fleets (i.e. groups of vessels with similar behavioural patterns and physical characteristics) across the Pacific[12]. This study found 11 clusters, including some fleets that operated in both the hemispheres and many fleets that spanned existing management areas (i.e. IATTC and WCPFC) convention areas. The results of the second study, *Dynamic human and oceanographic and ecological factors mediate transboundary fishery overlap across the Pacific high seas*,[13] supported Dr Aoki's findings regarding differences in vertical behaviour, thermal tolerance and habitat preferences between juvenile and adult albacore in the North Pacific. The study described variation in overlap between species (i.e. size age class) and vessel (i.e. functional fishing fleet) distribution models, and noted that some fleets overlap significantly with juvenile albacore habitat while targeting the same range of SST. More broadly, the study concluded that additional consideration of how overlap, catchability and size selectivity parameters vary over time and space may be required to ensure the development of robust, equitable and climate resilient harvest control rules.

Dr Wang Yang, SHOU, presented a paper on recruitment forecasting in stock assessment under climate change, based on the scenario SSP585 (similar to RCP 8.5). Using the LASSO regression model, Dr Wang tested five scenarios with different regions of environmental variables (SPO, spawning area, recruitment area, both spawning and recruitment area) to predict recruitment. Different models yielded different results, with mixed layer depth, sea surface temperature and sea surface height emerging as the most important variables overall. The participants discussed whether using an annual, rather than seasonal, recruitment model would work, noting that this would be the approach used for the 2024 stock assessment. Dr Wang added that future work could incorporate uncertainty into the models.

Ms Yang Shiyu, SHOU, outlined her work on stock assessment of SPA using JABBA by integrating potential environmental effects. Ms Yang discussed some of the differences between the current stock assessment model, MULTIFAN_CL, and JABBA. She highlighted a major improvement in using JABBA, which resulted from incorporating anomalous sea surface temperature change, which was underscored as a critical driving factor in variability of SPA stocks. Subsequent discussion considered symmetrical and asymmetrical surplus production models in the study and their influence on B/B_{MSY}.

Dr Hampton, SPC, outlined the approach to SPC's WCPFC stock assessment models and uncertainties. Several improvements and simplifications have been proposed for the 2024 SPA assessment, including a reduction in the number of regions from four to two, which substantially reduced the number of parameters and, with other key changes, had reduced model run times from around 12 hours per run to just 15 minutes. As noted earlier, the assessment would use an annual recruitment model rather than seasonal. The model was likely to incorporate uncertainty due to natural mortality, steepness and estimation error as a minimum and a series of diagnostics would be used to test model results. In response to a question from Dr Wang, Dr Hampton said that, while the

[12] Frawley, T.H., Muhling, B., Welch, H., Seto, K.L., Chang, S.K., Blaha, F., Hanich, Q., Jung, M., Hazen, E.L., Jacox, M.G. and Brodie, S., 2022. Clustering of disaggregated fisheries data reveals functional longline fleets across the Pacific. *One Earth*, *5*(9), pp.1002-1018.

[13] Frawley, T.H., Muhling, B., Brodie, S., Blondin, H., Welch, H., Arostegui, M.C., Bograd, S.J., Braun, C.D., Cimino, M.A., Farchadi, N. and Hazen, E.L., 2024. Dynamic human, oceanographic, and ecological factors mediate transboundary fishery overlap across the Pacific high seas. *Fish and Fisheries*, *25*(1), pp.60-81.

model was not constrained by climate change and environmental factors, it could be done and would be an interesting area for collaboration.

Dr Graham Pilling, SPC, discussed the provision of scientific advice for management decision making in the WCPFC in the face of climate change. He reviewed the evolution of the approach of the Scientific Committee over time, noting the move to depletion-based reference points. Dr Pilling said that while $SB_{F=0}$ was not explicitly robust to climate change, it was likely to be more so when compared to MSY-based calculations with respect to climate change's impact on the stock-recruitment relationship. Once MSE frameworks were in place, it would be possible to test for robustness to climate change. He noted that the healthy stock status is likely to provide a buffer in which to incorporate climate change impacts. Dr Nicol observed that climate models were better at predicting long term change than short term. In response to a question from Dr Bell, Dr Pilling acknowledged that the impacts of climate change on recruitment remained unclear and recommended caution. The workshop then discussed the pros and cons of using dynamic reference points and how the harvest control rule should be able to account for a change in spawning biomass.

Dr Pia Bessell-Browne, CSIRO, then presented on evaluating the performance of 'dynamic B_0' harvest control rules under time varying productivity. Dynamic B_0 (or $SB_{F=0}$) HCRs accounted for expected changes, including as a result of climate change, in the parameters that were traditionally treated as static in stock assessments. The study tested static vs dynamic B_0 HCRs under time varying productivity, resulting in a number of conclusions, including that dynamic B_0 HCRs consistently produced a higher probability of breaching B_{LIM}. Dr Bessell-Browne recommended that dynamic B_0 trends should be routinely reported in stock assessments[14] [15].

Dr Paul Hamer, SPC, then gave a presentation on the WCPFC's harvest strategy process for SPA – past present and future. He described the iterative development of the SPA harvest strategy to the current fully specified management procedure with depletion-based reference points. He noted some challenges, such as the difficulty in using CPUE trends to obtain a reliable estimate of stock status and drive an HCR. The shift to a simpler, age-structured production model was performing well but some work was still needed on this estimation method. Dr Hamer noted that new operating models would need to be developed following the 2024 stock assessment and ahead of the Scientific Committee and Science-Management Dialogue. He also welcomed IATTC's interest in collaborating on the harvest strategy. The presentation was followed by a discussion focusing mainly on the optimum number of candidate management procedures to present to managers, noting that several had already been presented to the WCPFC.

In the final presentation, Dr Rob Scott, SPC, discussed integrating climate change into management strategy evaluations (MSE). Dr Scott said it would be a challenge to conduct both a stock assessment and MSE for SPA this year. He discussed the potential areas in which climate change might impact on biological processes of the stock, noting the importance of considering spatio-temporal trends in key environmental variables and commented that the two-region approach to the stock assessment in 2024 would limit opportunities for additional spatial analyses. Consideration was being given to a nine-region model that would, in future, allow further uncertainty hypotheses to be developed.

[14] Bessell-Browne, P., Punt, A.E., Tuck, G.N., Burch, P., Penney, A., 2024. Management strategy evaluation of static and dynamic harvest control rules under long-term changes in stock productivity: A case study from the SESSF. Fisheries Research 273, 106972

[15] Bessell-Browne, P., Punt, A.E., Tuck, G.N., Day, J., Klaer, N., Penney, A., 2022. The effects of implementing a 'dynamic B_0' harvest control rule in Australia's Southern and Eastern Scalefish and Shark Fishery. Fisheries Research 252, 106306

Following the presentations, participants held a broad discussion on the development and use of models that incorporate climate change and opportunities for research collaboration between WCPFC and IATTC. On the former, discussion centred on the optimum frequency of stock assessments, spatial modelling, differences between the detection and utility of short-term impacts compared to long term impacts, and future data requirements, among others. Participants noted that both climate change impacts and fisheries were spatial in nature so models needed to be more spatially tuned than they are now. Scientists and managers also needed to understand the mechanisms through which climate change affected fish biology and behaviour. Some emphasised the importance of robust monitoring and robust management strategies and that complex models still needed data, the availability of which was often a constraint. It was also noted the stock assessments were, in effect, becoming a monitoring tool and so they needed to consider climate influences.

There was broad agreement that there were many opportunities for WCPFC-IATTC collaboration. It was noted that some collaboration was already occurring and that perhaps a gap analysis to identify where potentially useful collaboration was not presently occurring would be useful. IATTC members were increasingly interested in SPA, particularly those looking for MSC certification. IATTC had some ground to make up in relation to harvest strategies and was constrained by limited financial and human resources. Dr da Silva suggested that, as a first step, SPC could present to the IATTC Scientific Advisory Committee (SAC) on MSE in 2024. IATTC staff and members would also likely be interested in attending the SMD. Participants agreed that the IATTC would benefit from learning more about WCPFC's experience in developing harvest strategies. SPC representatives said an exchange of scientists between IATTC and SPC would also be worthwhile. Dr da Silva would report back to the Commission on this meeting and noted that the two RFMO secretariats had recently been in contact to propose a meeting on potential collaboration.

In concluding, participants agreed to develop a short perspective article on some of the key insights from the workshop, focusing on what RFMOs needed to do in the next 10-15 years to "get their house in order" to prepare their scientific programs for the impacts of climate change on highly migratory species. The paper could draw on the SPA discussions but be pitched to an audience with broader interests, perhaps with some suggestions or a framework for RFMOs in developing climate-robust science. Dr Pilling suggested some elements of the paper could include: understanding changes in biology; the need for monitoring and collection of data; assessments incorporating CPUE and climate change; and how advice needs to adapt and be robust to climate change, including through harvest strategies. Dr Hanich would circulate PDFs of all the presentations and this meeting record and Dr Azmi would circulate a draft structure for the perspective paper shortly.

Participants — Annex 1

Facilitator

- Glenn Hurry (MRAG) — ghurry@mragasiapacific.com.au

Shanghai Oceans University

- Prof. Fan Zhang — f-zhang@shou.edu.cn
- Prof. Jiangfeng Zhu — jfzhu@shou.edu.cn
- Dr Yang Wang — yan-wang@shou.edu.cn
- Mr Hongyu Lin — linbojun99@gmail.com
- Ms Shiyu Yang — yangshiyu_shou@163.com
- Mr Dongqi Lu — ldq1336206908@163.com

SPC Oceanic Fisheries Program

- Dr Graham Pilling — grahamp@spc.int
- Dr Paul Hamer — paulh@spc.int
- Dr John Hampton — JohnH@spc.int
- Dr Robert Scott — robertsc@spc.int
- Dr Simon Nicol — simonn@spc.int

Australian National Centre for Ocean Resources and Security (ANCORS)

- Prof. Quentin Hanich — hanich@uow.edu.au
- Prof. Johann Bell (Conservation International) — jbell@conservation.org
- Dr Bianca Haas — bhaas@uow.edu.au
- Dr Ina Tessnow-von Wysocki — inatvw@uow.edu.au
- Constance Rambourg — crambourg@uow.edu.au
- Adam Ziyad — adam.ziyad@gmail.com
- Dr Kamal Azmi (rapporteur) — kamala@uow.edu.au

Pacific Islands Forum Fisheries Agency

- Adele Dutiloy (virtual) — adele.dutilloy@ffa.int
- Ueta Junior Faasili (virtual) — uetajunior.faasili@ffa.int
- Marina Abas (virtual) — marina.abas@ffa.int

South Pacific Group

- Lars Olsen (virtual) — olsenpacific@gmail.com
- Dr. James Larcombe — jwp.larcombe@gmail.com

Western and Central Pacific Fisheries Commission (WCPFC)

- Dr. SungKwon Soh (virtual) — SungKwon.Soh@wcpfc.int
- Elaine Garvilles (virtual) — Elaine.Garvilles@wcpfc.int

CSIRO

- Paige Eveson (virtual) Paige.Eveson@csiro.au
- Dr Ashley Williams (virtual) Ashley.Williams@csiro.au
- Dr Pia Bessell-Browne (virtual) Pia.Bessell-Browne@csiro.au
- Laura Tremblay-Boyer (virtual) Laura.Tremblay-Boyer@csiro.au

Institute of Oceanography, National Taiwan University

- A/Prof. Yi-Jay Chang (virtual) yijay.chang@gmail.com
- Jhen Hsu (virtual)

Japan Fisheries Research and Education Agency

- Dr. Yoshinori Aoki aoki_yoshinori04@fra.go.jp
- Dr. Hidetaka Kiyofuji (virtual) kiyofuji_hidetada20@fra.go.jp

Inter-American Tropical Tuna Commission (IATTC)

- Dr Mark Maunder (virtual) mmaunder@iattc.org
- Dr Alex da Silva (virtual) alexdasilva@iattc.org
- Dr Haikun Xu (virtual) hkxu@iattc.org
- Dr Juan Valero (virtual) dcrear@iattc.org
- Dr Dan Crear (virtual) jvalero@iattc.org -

NOAA

- Dr Ryan Rykaczewski (virtual) ryan.rykaczewski@noaa.gov
- Dr Donald Kobayashi (virtual) donald.kobayashi@noaa.gov
- Dr Tim Frawley (virtual) tim.frawley@noaa.gov

New Zealand

- Dr Leyla Knittweis (virtual) Leyla.Knittweis@mpi.govt.nz
- Dr Philipp Neubauer (virtual) philipp@dragonfly.co.nz
- Tyla Hill (virtual) tyla@dragonfly.co.nz

South Pacific Albacore:

Science, Data and Climate Change Workshop

Monday 29th April 2024

9am – 930am

- Welcome to country, workshop purpose, introductions

930am – 1045am

- WCPFC and the conservation and management of south pacific albacore
  - Quentin Hanich ANCORS
- IATTC and the conservation and management of south pacific albacore
  - *Alex da Silva IATTC virtual*
- Southern albacore fishing fleets and characteristics
  - *Ueta Junior Faasili virtual FFA*
- A summary of IATTC's fishery data for albacore in the southern EPO
  - *Haikun Xu IATTC virtual*
- Discussion and questions

1045 – 11am

- Morning tea

11am – 1230pm

- CPUE of Chinese fishing fleets for southern albacore
  - Hongyu Lin SHOU
- New Zealand albacore troll fishery CPUE and length composition
  - *Philipp Neubauer DRAGONFLY virtual*
- Estimating CPUE for Chinese Taipei fishing for southern albacore
  - *Yi-Jay Chang National Taiwan University virtual*
- Short term climate impacts on SP albacore CPUE
  - Graham Pilling, SPC
- Discussion and questions

1230pm – 130pm

- Lunch

130pm – 3pm

- Test for spatial heterogeneity of growth by southern albacore
    - Dongqi Lu SHOU
- Overview of South Pacific albacore biology
    - *Ashley Williams and Paige Eveson CSIRO virtual*
- SEAPODYM modelling climate impacts on SP albacore – drivers, patterns and uncertainties
    - Simon Nicol, SPC
- Discussion and questions

3pm – 320pm

- Afternoon tea

320pm – 5pm

- Sampling design and benefits of CKMR for Sth Pac ALB stock assessment
    - *Laura Tremblay-Boyer CSIRO virtual*
- Lower thermal tolerance restricts vertical distributions for juvenile albacore tuna (Thunnus alalunga) in the northern limit of their habitats
    - Yoshinori Aoki FRA
- Characterisation of Pacific longline fisheries
    - *Timothy Frawley virtual*
- Discussion on the effects of climate change on the biology and ecology of southern albacore, possible including growth, distribution, movement, etc.

6:30pm

- Workshop dinner

Tuesday 30th April 2024

9am – 1030am

- Recruitment forecasting in stock assessment under climate change
    - Yang Wang, SHOU
- Stock assessment of SPA using JABBA by integrating potential environmental effects
    - Shiyu Yang, SHOU
- Current WCPFC SP albacore assessment models and uncertainties
    - John Hampton, SPC
- Characterization of pelagic food web structure supporting tuna fisheries in Central Nth Pacific
    - *Don Kobayashi, NOAA virtual*
- Discussion and questions

1030 – 1050am

- Morning tea

11am – 1230pm

- Scientific advice for management decision making in the face of climate change
    - Graham Pilling, SPC
- Evaluating the performance of 'dynamic B0' harvest control rules under time varying productivity.
    - *Pia Bessell-Brown CSIRO virtual*
- Discussion on integrating climate change considerations into the southern albacore stock assessment model in a practical and effective way

1230pm – 130pm

- Lunch

130pm – 3pm

- WCPFC harvest strategy process for SP albacore
    - Paul Hamer, SPC
- Integrating climate change into MSE – current plans
    - Rob Scott, SPC
- Discussion on research opportunities and needs

3pm – 320pm

- Afternoon tea

320pm – 5pm

- Broad discussion on WCPFC/IATTC research opportunities and needs, as well as potential deliverables from the workshop.