**INTER-AMERICAN TROPICAL TUNA COMMISSION**

**SCIENTIFIC ADVISORY COMMITTEE**

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**La Jolla, California (USA)**
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# DOCUMENT SAC-17 INF-U

Subject to change and approval by the ISC26 Plenary

**Attachment 5**

## Science advice on interpreting historical impacts of fleets fishing for north Pacific albacore tuna in terms of fishing intensity

**BACKGROUND**

The Western and Central Pacific Fisheries Commission (WCPFC) Northern Committee (NC) and the Inter-American Tropical Tuna Commission (IATTC) harvest strategies for north Pacific albacore (NPALB; WCPFC NC Harvest Strategy 2023-01; IATTC Resolution C-23-02) include harvest control rules that mandate reductions in fishing intensity ($F_{\%SPR}$) if the female spawning stock biomass (SSB) falls below the adopted reference points. The Albacore Working Group (ALBWG) of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC) provided scientific advice translating fishing intensity into traditional management controls, such as catch and effort (ISC/25/ANNEX/10). The analyses supporting this advice separated the annual total fishing intensity estimated in the 2023 stock assessment into fleet-specific fishing intensities, and demonstrated strong relationships between fleet-specific fishing intensities and catch, and moderate relationships with effort for some fleet groups, indicating that fishing intensity can be managed by these traditional measures. In order for this advice to be implemented, the ALBWG recognized that allocation rules needed to be provided by the WCPFC and IATTC to guide the calculations of fleet-specific fishing intensities according to the harvest strategies. In response, WCPFC NC members requested that the ISC provide estimates of the historical impact of each fleet group on the North Pacific albacore tuna (NPALB) stock expressed in terms of fishing intensity ($F_{\%SPR}$). Specifically, the NC requested that these estimates be calculated for the historical reference periods: 2002–2004 and 1999–2015. It was also requested by NC that the fleet groupings used in the previous advice for translating fishing intensity into catch and effort be reevaluated and slightly altered to accommodate requests from some countries.

Overall, the purpose of this request is to ensure that, should the NPALB stock decline below the threshold reference point, management bodies have the necessary information to support

potential fleet-specific allocation of reductions in fishing intensity, and to inform harvest strategy implementation discussions.

**SUMMARY OF ANALYSES**

The ALBWG applied analytical methods previously developed to estimate the annual proportional historical impacts of each fleet group on the NPALB stock. The annual fleet-specific spawning potential ratios (SPRs) for each fleet group were first estimated using outputs from the updated 2026 NPALB stock assessment (ALBWG 2026) and applying the methods from Teo et al., 2024 (Table 2). The annual proportional impact of each fleet group was then calculated using the annual fleet-specific SPRs and the annual total SPR from the stock assessment, applying methods in Teo and Kuriyama (2025; Table 3). The average proportional impact of each fleet group during the 2002 – 2004 and 1999 – 2015 time periods was then calculated using the arithmetic means of the fleet-specific SPRs and the total SPR for the two time periods (Tables 4).

**SCIENTIFIC ADVICE AND RECOMMENDATIONS**

The ALBWG advises that the fleet-specific fishing intensity estimates presented in this document provide a biologically consistent and transparent characterization of the historical impacts of major NPALB fleet groups on the stock. By expressing fleet-specific impacts in terms of spawning potential ratio ($F_{\%SPR}$), these estimates account for differences in selectivity, age composition, and biological contribution to female SSB, allowing impacts across diverse gears and fisheries to be compared on a common scale. These metrics are therefore more appropriate than catch or effort alone for evaluating relative historical fishing impacts and informing harvest strategy implementation.

The average fleet-specific proportional impacts estimated for the requested historical reference periods, 2002–2004 and 1999–2015 (Table 4) represent suitable indicators of each fleet group's relative contribution to total fishing pressure during those periods. These averaged values are particularly appropriate for informing discussions on proportional reductions in fishing intensity, should the harvest control rules be triggered by the stock falling below the threshold reference point. However, the interpretation and use of these estimates should recognize that fleet-specific fishing intensity is conditional on historical stock and fishery conditions, including recruitment, availability, and selectivity patterns.

The ALBWG therefore notes that the historical fleet-specific proportional impact estimate values are likely to change slightly with updated stock assessment outputs. The ALBWG recommends using the 2026 stock assessment results to inform the upcoming discussions around allocation rules required should the SSB fall below the threshold reference point. The ALBWG does not recommend recalculating the fleet specific proportional impacts for the historical periods for subsequent stock assessments unless there is a specific need related to an identified exceptional circumstance.

The ALBWG reiterates that while this scientific advice provides quantitative estimates of historical fleet-specific fishing intensity, the development and application of explicit allocation rules for translating total fishing intensity targets into fleet-specific fishing intensities remain the responsibility of the RFMOs.

Once allocation rules are agreed upon, the ALBWG's previous scientific advice on interpreting fleet-specific fishing intensity in terms of catch and effort management measures can be applied. The ALBWG is prepared to provide further technical support or updated analyses as requested to facilitate transparent and effective implementation of the NPALB harvest strategy.

**ADDITIONAL RESOURCES**

In addition, the ALBWG has also developed an online tool to help discussions by the WCPFC NC and IATTC on allocation rules and harvest strategies for north Pacific albacore (https://connect.fisheries.noaa.gov/NPALB_harvest_strategy_tool).

**REFERENCES**

Teo, S. L. H., H.-H. Lee, D. Tommasi, S. Hawkshaw, Y.-J. Chang, Y. Tsuda, and Y. Kwon. 2024. Relationships between fleet-specific spawning potential ratios and measures of catch and effort for North Pacific albacore tuna. ISC/24/ALBWG-01/07. Working document submitted to the ISC ALBWG, 11-18 March, 2024, Institute of Ocean Sciences, Fisheries and Oceans Canada, Sidney, British Columbia, Canada.

Teo, S. L. H. and Kuriyama, P. 2025. Estimating fleet-specific allocations of spawning potential ratios. ISC/25/ALBWG-01/11. Working document submitted to the ISC ALBWG, 10-14 March 2025, held at the National Taiwan University, Institute of Oceanography in Taipei, Taiwan.

**TABLES**

Table 1. Fleet groups are from the 2026 North Pacific albacore (NPALB) stock assessment.

| Fleet Group | Fleet Group Name | Fleet ID | Units of Effort | Fleet Group Description |
|---|---|---|---|---|
| **1** | JPLLalbtgt (NPALB targeting) | F1/F2/F9/F12/ F13/F16 | Hooks, Vessels, Days | Japan longline; targeting NPALB (A13_Q1/2 & A2_Q1/4) |
| **2** | JPLLnontgt (NPALB Non-targeting) | F3 to F8 & F10/F11 & F14/F15 & F17/F18 | Hooks, Vessels, Days | Japan longline; all areas; all seasons; (except A13_Q1/2 and A2_Q1/4) |

| | | | | |
|---|---|---|---|---|
| **3** | JPPL | F19 to F23 | Vessels, Days, Poledays, Avg poles, SKJ catch | Japan pole-and-line; all areas; all seasons |
| **4** | USLL | F24/F25 | Hooks, Vessels, Sets | US longline; all areas; all seasons |
| **5** | TWLL | F26/F27 | Hooks, Vessels, Days | Taiwan longline; all areas; all seasons |
| **6** | KRLL | F28 | Hooks | Korea longline; all areas; all seasons |
| **7** | CNLL | F29/F30 | Hooks | China longline; all areas; all seasons |
| **8** | VULL | F31/F32 | Hooks | Vanuatu longline; all areas & seasons |
| **9** | OTHLL | F33 | Hooks | Others longline; all areas & seasons |
| **10** | EPOSF | F34 | Vessels, Days | EPO Surface fleet (primarily US and Canada); all seasons |
| **11** | PSDNMISC | F35 | NA | Purse seine and miscellaneous fleets from Japan and Taiwan |

Table 2. Estimated fleet-specific spawning potential ratios (SPRs) for each fleet group described in Table 1 using estimates from the 2026 North Pacific albacore (NPALB) stock assessment.

| Year | Fleet Group Name | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | JPLL albtgt | JPLL nontgt | JPPL | USLL | TWLL | KRLL | CNLL | VULL | OTHLL | EPOSF | PSDN Misc |
| 1994 | 0.861 | 0.867 | 0.814 | 0.994 | 0.999 | 1.000 | 1.000 | 1.000 | 1.000 | 0.903 | 0.985 |
| 1995 | 0.866 | 0.878 | 0.866 | 0.993 | 0.963 | 1.000 | 1.000 | 1.000 | 1.000 | 0.921 | 0.978 |
| 1996 | 0.849 | 0.874 | 0.827 | 0.991 | 0.931 | 0.999 | 1.000 | 1.000 | 1.000 | 0.875 | 0.990 |
| 1997 | 0.801 | 0.862 | 0.750 | 0.989 | 0.918 | 0.997 | 1.000 | 1.000 | 1.000 | 0.859 | 0.982 |
| 1998 | 0.817 | 0.861 | 0.833 | 0.993 | 0.916 | 0.998 | 1.000 | 1.000 | 1.000 | 0.861 | 0.977 |
| 1999 | 0.840 | 0.844 | 0.557 | 0.989 | 0.910 | 0.999 | 0.998 | 1.000 | 1.000 | 0.839 | 0.955 |
| 2000 | 0.819 | 0.882 | 0.835 | 0.993 | 0.900 | 1.000 | 1.000 | 1.000 | 1.000 | 0.848 | 0.972 |
| 2001 | 0.831 | 0.868 | 0.746 | 0.990 | 0.902 | 0.999 | 0.994 | 1.000 | 0.999 | 0.866 | 0.988 |
| 2002 | 0.817 | 0.904 | 0.666 | 0.996 | 0.902 | 0.999 | 0.995 | 0.979 | 0.993 | 0.862 | 0.974 |
| 2003 | 0.833 | 0.927 | 0.694 | 0.996 | 0.914 | 0.998 | 0.989 | 0.975 | 0.998 | 0.800 | 0.984 |
| 2004 | 0.866 | 0.920 | 0.611 | 0.997 | 0.934 | 0.999 | 0.988 | 0.936 | 1.000 | 0.742 | 0.924 |
| 2005 | 0.807 | 0.916 | 0.834 | 0.997 | 0.933 | 0.995 | 0.992 | 0.946 | 1.000 | 0.807 | 0.977 |
| 2006 | 0.807 | 0.895 | 0.786 | 0.998 | 0.933 | 0.998 | 0.981 | 0.942 | 1.000 | 0.864 | 0.992 |
| 2007 | 0.806 | 0.881 | 0.661 | 0.997 | 0.957 | 0.998 | 0.998 | 0.947 | 0.999 | 0.836 | 0.962 |
| 2008 | 0.844 | 0.896 | 0.843 | 0.996 | 0.956 | 0.994 | 0.997 | 0.957 | 0.999 | 0.842 | 0.975 |
| 2009 | 0.822 | 0.886 | 0.667 | 0.997 | 0.964 | 0.999 | 0.998 | 0.976 | 0.999 | 0.828 | 0.977 |
| 2010 | 0.820 | 0.893 | 0.786 | 0.995 | 0.958 | 0.998 | 0.986 | 0.962 | 0.998 | 0.820 | 0.992 |
| 2011 | 0.841 | 0.875 | 0.761 | 0.991 | 0.951 | 0.999 | 0.956 | 0.942 | 0.999 | 0.857 | 0.993 |
| 2012 | 0.800 | 0.899 | 0.727 | 0.990 | 0.963 | 0.998 | 0.921 | 0.967 | 0.993 | 0.864 | 0.966 |
| 2013 | 0.848 | 0.889 | 0.734 | 0.996 | 0.940 | 0.998 | 0.952 | 0.956 | 0.992 | 0.824 | 0.984 |
| 2014 | 0.854 | 0.884 | 0.745 | 0.997 | 0.964 | 0.998 | 0.975 | 0.959 | 0.996 | 0.792 | 0.978 |
| 2015 | 0.806 | 0.899 | 0.744 | 0.997 | 0.955 | 0.999 | 0.974 | 0.951 | 0.996 | 0.823 | 0.983 |
| 2016 | 0.843 | 0.917 | 0.767 | 0.997 | 0.949 | 0.999 | 0.988 | 0.978 | 0.997 | 0.818 | 0.962 |
| 2017 | 0.813 | 0.929 | 0.725 | 0.998 | 0.939 | 0.997 | 0.981 | 0.965 | 0.994 | 0.839 | 0.979 |
| 2018 | 0.855 | 0.925 | 0.691 | 0.999 | 0.931 | 0.999 | 0.981 | 0.965 | 0.992 | 0.886 | 0.965 |
| 2019 | 0.871 | 0.920 | 0.890 | 0.999 | 0.922 | 0.999 | 0.969 | 0.961 | 0.994 | 0.933 | 0.990 |
| 2020 | 0.880 | 0.928 | 0.762 | 0.998 | 0.946 | 0.999 | 0.976 | 0.970 | 0.998 | 0.913 | 0.967 |
| 2021 | 0.839 | 0.920 | 0.931 | 0.997 | 0.921 | 0.996 | 0.990 | 0.958 | 0.997 | 0.952 | 0.993 |
| 2022 | 0.928 | 0.945 | 0.944 | 0.998 | 0.944 | 0.998 | 0.989 | 0.962 | 0.995 | 0.915 | 0.995 |
| 2023 | 0.908 | 0.941 | 0.920 | 0.995 | 0.934 | 0.999 | 0.992 | 0.979 | 0.998 | 0.956 | 0.969 |
| 2024 | 0.904 | 0.951 | 0.962 | 0.998 | 0.922 | 0.996 | 0.997 | 0.983 | 0.995 | 0.954 | 0.994 |

Table 3. Estimated annual historical fleet-specific proportional impact (%) on North Pacific albacore (NPALB) stock using estimates from the 2026 North Pacific albacore (NPALB) stock assessment. Fleet groups described in Table 1. The proportional impact can also be thought of as the fleet-specific share of the SPR shown in Table 2. Each row sums to approximately 100%.

| Year | Fleet Group Name | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | JPLL albtgt | JPLL nontgt | JPPL | USLL | TWLL | KRLL | CNLL | VULL | OTHLL | EPOSF | PSDN Misc |
| 1994 | 24.1 | 23.0 | 33.0 | 0.9 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 16.5 | 2.4 |
| 1995 | 25.3 | 22.8 | 25.4 | 1.3 | 6.8 | 0.0 | 0.0 | 0.0 | 0.0 | 14.5 | 3.9 |
| 1996 | 22.9 | 18.9 | 26.5 | 1.2 | 10.1 | 0.2 | 0.0 | 0.0 | 0.0 | 18.8 | 1.4 |
| 1997 | 23.8 | 16.0 | 30.8 | 1.2 | 9.3 | 0.4 | 0.0 | 0.0 | 0.0 | 16.4 | 2.0 |
| 1998 | 25.1 | 18.6 | 22.7 | 0.9 | 11.0 | 0.2 | 0.0 | 0.0 | 0.0 | 18.5 | 2.9 |
| 1999 | 14.1 | 13.8 | 45.4 | 0.9 | 7.7 | 0.1 | 0.1 | 0.0 | 0.0 | 14.2 | 3.8 |
| 2000 | 24.5 | 15.5 | 22.2 | 0.9 | 13.0 | 0.0 | 0.0 | 0.0 | 0.0 | 20.3 | 3.5 |
| 2001 | 20.7 | 15.8 | 32.4 | 1.1 | 11.6 | 0.1 | 0.7 | 0.0 | 0.1 | 16.1 | 1.4 |
| 2002 | 19.7 | 9.9 | 39.1 | 0.4 | 10.2 | 0.1 | 0.5 | 2.1 | 0.7 | 14.6 | 2.6 |
| 2003 | 18.4 | 7.7 | 36.2 | 0.4 | 9.1 | 0.2 | 1.1 | 2.5 | 0.2 | 22.5 | 1.7 |
| 2004 | 11.7 | 6.9 | 38.7 | 0.2 | 5.6 | 0.1 | 1.0 | 5.4 | 0.0 | 23.9 | 6.5 |
| 2005 | 24.8 | 10.3 | 21.1 | 0.3 | 8.1 | 0.6 | 0.9 | 6.5 | 0.0 | 24.8 | 2.7 |
| 2006 | 24.5 | 12.8 | 27.4 | 0.3 | 8.0 | 0.2 | 2.3 | 6.9 | 0.0 | 16.8 | 1.0 |
| 2007 | 20.1 | 11.8 | 37.8 | 0.3 | 4.1 | 0.2 | 0.2 | 5.1 | 0.1 | 16.6 | 3.7 |
| 2008 | 22.6 | 14.7 | 22.7 | 0.6 | 6.0 | 0.8 | 0.4 | 5.9 | 0.1 | 22.9 | 3.4 |
| 2009 | 19.7 | 12.2 | 39.9 | 0.3 | 3.7 | 0.1 | 0.2 | 2.5 | 0.1 | 18.9 | 2.4 |
| 2010 | 22.9 | 13.1 | 27.8 | 0.6 | 5.0 | 0.2 | 1.7 | 4.6 | 0.2 | 22.9 | 0.9 |
| 2011 | 19.0 | 14.8 | 29.9 | 1.0 | 5.6 | 0.1 | 5.0 | 6.6 | 0.1 | 17.0 | 0.8 |
| 2012 | 22.2 | 10.7 | 31.5 | 1.0 | 3.8 | 0.2 | 8.3 | 3.4 | 0.7 | 14.7 | 3.5 |
| 2013 | 17.0 | 12.2 | 31.5 | 0.4 | 6.5 | 0.3 | 5.1 | 4.6 | 0.8 | 19.9 | 1.7 |
| 2014 | 16.8 | 13.1 | 31.0 | 0.3 | 3.9 | 0.2 | 2.8 | 4.5 | 0.4 | 24.7 | 2.4 |
| 2015 | 22.4 | 11.2 | 30.5 | 0.3 | 4.8 | 0.1 | 2.8 | 5.2 | 0.4 | 20.3 | 1.9 |
| 2016 | 20.0 | 10.2 | 30.8 | 0.3 | 6.2 | 0.1 | 1.5 | 2.6 | 0.3 | 23.4 | 4.6 |
| 2017 | 22.3 | 8.0 | 34.4 | 0.2 | 6.9 | 0.3 | 2.1 | 3.9 | 0.7 | 19.0 | 2.3 |
| 2018 | 17.5 | 8.8 | 40.7 | 0.2 | 8.1 | 0.2 | 2.1 | 4.0 | 1.0 | 13.6 | 4.0 |
| 2019 | 23.9 | 14.4 | 20.1 | 0.2 | 14.0 | 0.2 | 5.4 | 7.0 | 1.1 | 12.0 | 1.7 |
| 2020 | 17.9 | 10.5 | 37.9 | 0.3 | 7.8 | 0.1 | 3.4 | 4.4 | 0.3 | 12.8 | 4.7 |
| 2021 | 32.8 | 15.7 | 13.5 | 0.5 | 15.5 | 0.8 | 2.0 | 8.0 | 0.5 | 9.3 | 1.4 |
| 2022 | 18.8 | 14.1 | 14.5 | 0.6 | 14.3 | 0.6 | 2.8 | 9.7 | 1.1 | 22.2 | 1.3 |
| 2023 | 22.7 | 14.4 | 19.8 | 1.1 | 16.0 | 0.3 | 1.9 | 5.1 | 0.4 | 10.7 | 7.5 |
| 2024 | 28.4 | 14.3 | 11.0 | 0.6 | 22.8 | 1.2 | 1.0 | 4.7 | 1.3 | 13.1 | 1.6 |

Table 4. Estimated average historical fleet-specific spawning potential ratio (SPR) and proportional impact (%) on North Pacific albacore (NPALB) stock for the requested historical time periods 2002-2004 and 1999-2015. Estimates are from the 2026 stock assessment and fleet groups are described in Table 1. The proportional impact can also be thought of as the fleet-specific share of the SPRs. The total SPR is the product of the fleet-specific SPRs.

| Fleet Group | Average SPR 2002-2004 | Average proportion of SPR 2002-2004 (%) | Average SPR 1999-2015 | Average proportion of SPR 1999-2015 (%) |
|---|---|---|---|---|
| JPLLalbtgt | 0.839 | 16.3 | 0.827 | 19.8 |
| JPLLnontgt | 0.917 | 8.1 | 0.892 | 12.0 |
| JPPL | 0.657 | 38.1 | 0.729 | 32.6 |
| USLL | 0.996 | 0.4 | 0.995 | 0.6 |
| TWLL | 0.917 | 8.1 | 0.938 | 6.8 |
| KRLL | 0.999 | 0.1 | 0.998 | 0.2 |
| CNLL | 0.990 | 0.9 | 0.982 | 1.9 |
| VULL | 0.964 | 3.5 | 0.965 | 3.8 |
| OTHLL | 0.997 | 0.3 | 0.998 | 0.2 |
| EPOSF | 0.801 | 20.5 | 0.830 | 19.4 |
| PSDNMisc | 0.961 | 3.8 | 0.975 | 2.7 |
| **Total** | 0.337 | 100.0 | 0.383 | 100.0 |