



**SCIENTIFIC COMMITTEE
FOURTEENTH REGULAR SESSION**

Busan, Republic of Korea
8-16 August 2018

**FRAMEWORK FOR HARVEST STRATEGIES FOR TROPICAL TUNA IN
ARCHIPELAGIC WATERS OF INDONESIA**

WCPFC-SC14-2018/MI-IP-06

INDONESIA

1. Interim harvest strategies for tropical tuna in archipelagic waters of Indonesia

1.1. Fishery Policy and regulatory context

As part of a range of initiatives aimed at achieving sustainable social and economic benefits from the harvest of tuna resources in Indonesian archipelagic waters, Indonesia intends to develop and implement scientifically-tested harvest strategies to manage the level of targeted fishing on these tuna resources. The development and implementation of this harvest strategy framework is a priority action of the National Tuna Management Plan (NTMP) for tuna and neritic species and associated action plans, which has been set out in the Ministerial Decree of Marine Affairs and Fisheries of the Republic of Indonesia Number 107/KEPMEN-KP/2015. The harvest strategy framework is an important step in the process of development, testing and implementation of harvest strategies for yellowfin tuna, skipjack tuna and bigeye tuna fisheries in Indonesian archipelagic waters (Indonesia Fisheries Management Areas/IFMA number 713, 714 and 715).

The development of harvest strategies for major tuna species is also consistent with Indonesia's rights and obligations as a member of the Regional Fisheries Management Organizations (RFMOs) responsible for governance of these highly migratory stocks: Western Central Pacific Fisheries Commission, Indian Ocean Tuna Commission and Commission for the Conservation of Southern Bluefin Tuna. Importantly, implementation of the monitoring, assessment, harvest control rules and management measures, which are essential elements of a harvest strategy, are central to achieving Marine Stewardship Council (MSC)-certification for Indonesian tuna fisheries.

The NTMP sets out a five-year plan for implementing action plans including development and implementation of harvest strategies, and to gain MSC certification. This addendum to the NTMP describes the management objectives and harvest strategy framework (Appendix 1) developed through a two-year technical and consultative processes (Appendix 2). The harvest strategy framework details the forms of harvest strategy developed through these processes, that will be refined and implemented for the management of fishing effort targeting tropical tuna in Indonesian Archipelagic Waters. It includes an updated action plan (Appendix 3 and 4) of specific information requirements, consultation processes and institutional arrangements required for the implementation of harvest strategies for each species.

1.2. Management Objectives

From the nine management objectives for capture fisheries, as stipulated in Article 3 Law No. 31 Year 2004 on Fisheries, and amended by Law No. 45 year 2009 on Fisheries, it was agreed by series of stakeholder workshops that the management objective for yellowfin tuna, bigeye tuna and skipjack tuna is:

“to ensure the sustainability of yellowfin tuna, bigeye tuna and skipjack tuna resources” through harvest strategy implementation.

1.3. Operational Objectives

To maintain spawning stock biomass (SSB) above the limit reference point (LRP) of 0.2 of the unfished level with the probability of 90%.

1.3.1. Reference Points

A reference point is the benchmark that scientists and managers use to compare the current status of a stock or fishery to a desirable state (Target Reference Point) or a state to be avoided (Limit Reference Point), due to an increased probability of undesirable consequences.

1.3.1.1. Limit Reference Point

The default limit reference point for tuna in archipelagic waters is to maintain spawning stock biomass above 0.2 of the unfished level with a probability of 90%.

The rationale for this Limit Reference point is to avoid the stock being reduced to a level that average recruitment declines, which would result in reductions in long-term sustainable catches from the fishery.

The appropriateness of this limit reference point will be examined as part of the harvest strategy testing and selection process (Appendix 3 and 4).

1.3.1.2. Target Reference Point

A target reference point for tuna in archipelagic waters has not been decided as it requires more detailed consideration of implications for social and economic objectives for the fishery.

The current WCPFC target reference point for skipjack is that the spawning biomass should be 50 percent of the unfished spawning biomass on average (CMM 2017-01), while current IOTC Target Reference Point for skipjack is that the spawning biomass should be forty percent of the estimated unfished spawning biomass on average (IOTC Resolution 2016-02).

Alternative target reference points for skipjack tuna, yellowfin tuna and bigeye tuna will be investigated, based on stakeholder surveys and using Management Strategy Evaluation (MSE) testing as part of the Action Plan for harvest strategy implementation (Appendix 3 and 4).

1.3.2. Stock Status

Assessment of stock status of highly migratory tunas is provided through regional stock assessments. In the case of stock assessments for IFMA 713, 714 and 715, these assessments are conducted by the Ocean Fisheries Program of the SPC as part of the regular regional stock assessment process for each species and reviewed and agreed by the Scientific Committee of the WCPFC. This harvest strategy framework uses these regional stock assessments as the best source of scientific advice on stock status for skipjack, yellowfin tuna and bigeye tuna.

1.3.3. Performance measures for HS selection

The aim of a harvest strategy is to achieve an appropriate balance of the social, economic and stock conservation objectives for the fishery. Performance measures are more detailed summary statistics generated during the testing and selection of harvest strategies that relate to the performance of the harvest strategy with respect to stock, fishery, economic and social objectives. It is desirable to have a wide range of performance measures that relate directly to the important components of the fishery and wider community and economy. This allows government and stakeholder to make judgements about the trade-offs among social and economic benefits for alternative harvest strategies and select a final form of harvest strategy that is most likely to provide the best compromise among multiple objectives and acceptable performance overall. This is done as part of the Management Strategy Evaluation process (see Figure 1 and (Appendix 3 and 4).

Initial input for the development of performance measures was obtained from stakeholder using a structured survey at the 4th stakeholder workshop in 14-16 November 2016¹.

2. Harvest Strategy Framework for skipjack, yellowfin tuna and bigeye tuna in Archipelagic waters

A harvest strategy is a carefully considered and agreed plan for **monitoring** and **assessing** a fishery and adjusting the level of fishing (relative to the previous year) using a specified **management measure** according to the **harvest control rule** to meet the specific objectives *for the fishery* (Figure 1).

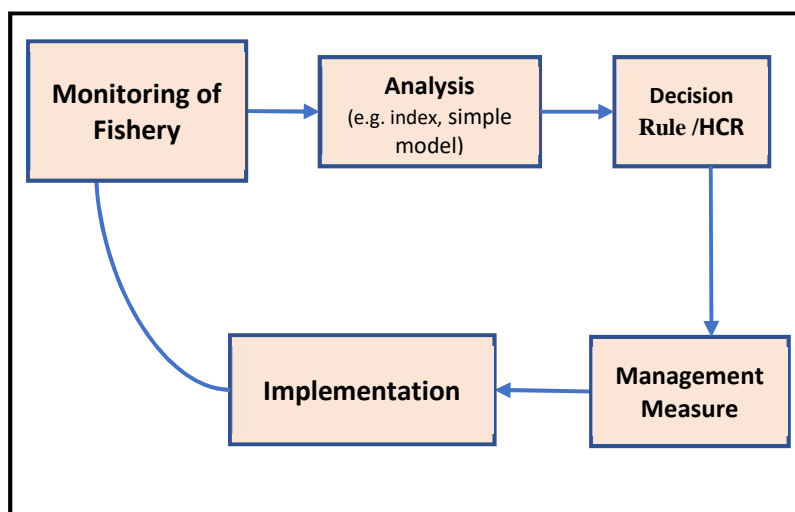


Figure 1: Conceptual illustration of the components of a harvest strategy. It is the combination of components that define an individual harvest strategy and determine its likely performance. Hence, if one, or more component(s) is (are) changed, this is considered a different harvest strategy. As part of the harvest strategy development and evaluation process, each component is specified in detail. This allows the relative performance of different harvest strategies to be tested through simulation modelling. The harvest strategy considered to have the most appropriate balance of performance across stock, social and economic objectives can then be selected for implementation in the fishery.

¹ Anon 2016. Survey Report: Questionnaire analysis on tuna fisheries in relation with the harvest strategy development of tuna in WPPNRI 713, 714, 715.DGCF November, 2016.

2.1. Empirical harvest strategy

In the case of tuna in WPP 713, 714 and 715, it was considered that empirical harvest strategies were most appropriate. Empirical harvest strategies are based on indices of relative abundance, such as standardised catch rates, and/or average size in the catch, and relatively simple analysis methods, rather than the population dynamics/stock assessment models used in model-based harvest strategies. Empirical harvest strategies have the advantages of being more transparent and more easily explained to non-technical audience and being more straightforward to implement and, hence, requiring less technical expertise. Experience in other fisheries and modelling studies comparing empirical and model-based harvest strategies indicate that it is possible to achieve comparable management outcomes from empirical harvest strategies.

2.2. Management Measures

From the fifteen management measures stipulated in Article 3, Law No. 31 Year 2004, on Fisheries, and amended by Law No. 45 Year 2009, on Fisheries, 8 (eight) management measures were selected through selection processes at the 4th and 5th Stakeholder Workshop. Subsequently a risk-assessment process was completed at the 6th Stakeholder Workshop, and the following five priority selected management measures were selected:

- a. Limit on use of Fish Aggregating Device.
- b. Spatial closure (of important spawning or nursery grounds) and temporal closure (during important events, such as spawning).
- c. Number of fishing days (per gear, for semi industrial and industrial vessels).
- d. Number of vessels – limited entry (per gear; for semi industrial and industrial vessels through licensing, permits, taxing, royalties).
- e. Total Allowable Catch (TAC) limits per Fishery Management Area.

2.3. Management Strategy Evaluation

In order to examine, to the extent possible, that a harvest strategy is likely to a) meet the specified objectives for the fishery; and b) be robust to major uncertainties in the status and dynamics of the stock and the fishery and effectiveness of monitoring and management, it is considered best practice to develop a range of alternative, practically feasible harvest strategies and compare their relative performance is using a simulation modelling approach known as Management Strategy Evaluation (MSE)².

Within the MSE framework, prototype operating models (OMs) consisting of a biological component of the system, the fisheries that operate on the modelled population in region 4 (skipjack) and region 7 (yellowfin) of the WCPO statistical areas, and a feedback loop which enables feedback of data and management actions to simulated fish population were developed³, and conditioned using the WCPO stock assessment outputs as well as Indonesian port-sampling data. The prototype OMs are used to

² Punt and Donovan 2007, Developing management procedures that are robust to uncertainty: lessons from the International

³ Hoshino, E. R. Hillary, C. Davies and C. Proctor, 2018. Development of prototype operating models for exploring harvest strategies for tropical tuna in the Indonesian archipelagic waters: case studies for skipjack and yellowfin tuna. Draft report to the Western Central Pacific Fisheries Commission, 2018.

simulate the stock and fishery into the future. The harvest strategies are tested using them to set the future catch or effort levels in the fishery from simulated sampling of the data. Adaptive effort management strategies, which adapt the effort levels of the Indonesian fisheries (excluding domestic miscellaneous gear fisheries) based on harvest control rules (HCRs) using two abundance indices of mature fish, namely standardized catch-per-unit-effort (CPUE), and mean length in catch from pole-and-line (skipjack) and large handline fishery (yellowfin) were developed, and their performance to meet specific management objectives were tested using the simulated population and the fisheries from the OMs.

These MSE models also provide the basis for testing the performance of a specific alternative harvest strategies and providing government and stakeholders with results to refine and select the most appropriate harvest strategy for implementation for each species. This will be completed as part of the MSE technical and consultation process (see Action Plan, appendix 3).

2.4. Consultation

The process for development of the framework for harvest strategies for tropical tuna has been conducted in a consultative, collaborative and multi-stakeholder approach.

Lead government departments were the Directorate of Fish Resources Management - Directorate General of Capture Fisheries and the Centre for Fisheries Research both under the Ministry of Marine Affairs and Fisheries. Under the direction of the Directorate of Fish Resources Management and by instruction from the Director General for Capture Fisheries a steering committee was established.

Additionally, a technical group was established and led by the Centre for Fisheries research, which included technical guidance and input from Commonwealth Science and Industrial Research Organization (CSIRO), with extensive experience in harvest strategies and MSE, and supported by various stakeholders, including NGOs and academics.

Thirdly, coordinated again by the Directorate for Fish Resources Management, the progress was regularly communicated to and input sought from a wider stakeholder group including government officials and scientists, provincial governments, NGOs and industry (Appendix 2).

3. Relationship between harvest strategy for archipelagic waters and relevant Regional Fisheries Management Organizations.

Indonesian archipelagic waters (IFMA 713, 714, and 715) are Indonesia's sovereignty. These waters are well-known for the abundance of tuna resources such as skipjack tuna, yellowfin tuna, and bigeye tuna. These species are categorized as highly migratory species.

According to UNCLOS (1982) which has been ratified by Indonesia through Act No. 17 Year 1985 that highly migratory species are managed by international or regional agreement, in this case is tuna Regional Fisheries Management Organization (tRFMO). . The results of a large tuna tagging study conducted by SPC (2009-2010) indicates that while the majority of these tunas are recaptured within the archipelagic waters, there is exchange other IFMAs and with the wider WCPO.. However,

Indonesia has a strong commitment to managing tuna resources within its archipelagic waters in a sustainable manner and consistent with the intent of measures adopted by RFMOs, such as through the implementation of harvest strategy. This includes the use of the most recent WCPFC stock assessments in the MSE models used to develop and test the harvest strategies for skipjack and yellowfin tuna (See Appendix 1 and 2).

4. Action plan for refinement, testing and selection of harvest strategies and operational implementation for tropical tuna fisheries in 713, 714 and 715

Implementation of harvest strategies for tuna in IAW requires the following priority activities to be completed:

1. Maintenance, extension and improvement of fisheries monitoring and data collection programs
2. Targeted research
 - a. Representative age, growth and reproductive biology parameters for archipelagic waters
 - b. Operational catch and effort data for pole and line and hand line fisheries to improve CPUE standardisation
 - c. Review and design of port monitoring programs to improve estimation of total catch and effort in archipelagic waters
3. Testing, refinement and selection of operational objectives and harvest strategy
 - a. Technical work program
 - b. Stakeholder consultation
4. Specification and implementation of management measures
 - a. Refine detail of preferred management measure(s) which are considered operationally feasible to implement, monitor and enforce.
 - b. Determine necessary regulatory and monitoring requirements for implementation
5. Confirmation of regulatory and institutional arrangements required for harvest strategy implementation
 - a. Regulations
 - b. Institutional roles and responsibilities
 - c. Consultative and advisory forums
6. Policy, stakeholder and science capacity development for harvest strategy implementation

The action plan for implementation (Appendix 3) provides an overview of activities, schedule, responsible agency and contributing partners. A draft of a more detailed action plan is at Appendix 4.

This framework has been developed through consultative stakeholder processes since 2014. Support and sustained cooperation from the relevant domestic tuna stakeholders and also international fisheries experts from Commonwealth Scientific and Industrial Research Organization (CSIRO) and WCPFC – WPEA have made significant contribution to the development of this harvest strategy framework and are very much appreciated

APPENDIX 1. Framework for Harvest Strategy for Skipjack, Yellowfin Tuna, and Bigeye Tuna in Archipelagic Waters of Indonesia

1. Management Objectives

Ensure the sustainability of tuna resources in archipelagic waters of Indonesia through harvest strategy implementation.

a. Reference Points

i. Limit Reference Point

The default limit reference point for skipjack, yellowfin and bigeye tuna in archipelagic waters is to maintain spawning stock biomass above 0.2 of the unfished level with a 90% probability.

This is consistent with the default limit reference points recommended by the WCPFC Scientific Committee and adopted by WCPFC⁴.

ii. Target Reference Point

A target reference point for tuna in archipelagic waters has not been decided. The issue of target reference points requires more detailed consideration of the implications of species specific target reference points for the broader social and economic objectives for the fishery.

The WCPFC adopted target reference point for skipjack tuna of 0.5 of unfished spawning biomass on average⁵, while the IOTC has adopted Target Reference Point for skipjack of 0.4 estimated unfished spawning biomass on average⁶.

Alternative target reference points for skipjack tuna, yellowfin tuna and bigeye tuna in the Indonesian archipelagic water will be investigated, based on stakeholder consultation, as a part of technical and consultative work program for harvest strategy implementation.

2. Harvest Strategy Framework

a. Potential Monitoring Data Series

The potential monitoring data series that could be used as an input to harvest strategies were identified during the technical consultation process during 2016⁷. These are:

- i. Catch and effort data from pole and line fishery for skipjack tuna, deep hand line fishery (and potentially longline fishery) for yellowfin and bigeye tuna sourced from port sampling, logbook, and observer on board data] used to calculate CPUE.

⁴ Report of the 7th meeting of the Scientific Committee of the WCPFC (<https://www.wcpfc.int/meetings/7th-regular-session-scientific-committee>) and adopted at WCPFC8, based on Preece et al 2012 (<https://www.wcpfc.int/node/2745>).

⁵ WCPFC14, CMM 2015-06, <https://www.wcpfc.int/system/files/CMM%202015-06%20CMM%20on%20a%20Target%20Reference%20point%20for%20WCPO%20Skipjack%20Tuna.pdf>

⁶ IOTC Resolution 2016-02, <http://iotc.org/cmm/resolution-1602-harvest-control-rules-skipjack-tuna-iotc-area-competence>.

⁷ Exploratory analysis of the Indonesian port-sampling data, Hobart, July 2016; 1st Technical Workshop, Bogor, April 2016.

- ii. Size distribution of catch from pole and line fishery for skipjack tuna, deep hand line fishery (and potentially longline fisher) for yellowfin tuna and bigeye tuna sourced from port-based sampling programs (CFR-WCPFC- WPEA project, MDPI, etc.).
- b. Analysis Method
- i. CPUE standardization to provide a relative abundance index.
 - ii. Calculation of trend in average size of fish in catch from pole and line fishery (skipjack) and deep hand line or longline fishery (yellowfin, bigeye).
- c. Forms of Harvest Control Rule
- i. Empirical harvest control rule. Preliminary MSE testing considered a weighted combination of standardized CPUE and average mean length of fish in catch from the selected fishery⁸.
- d. Management Measures
- i. Effort controls
 - ii. Specific details of management measures and implementation requirements need to be specified and will be determined through consultation and technical work plan (Appendix 3 and 4).

3. Priority Information Needs

- a. Operational, disaggregated catch and effort information for the Indonesian fisheries to improve the accuracy of estimating CPUE index from the monitoring data series identified.
- b. Continuation and expansion of coverage of port-based monitoring (e.g. through increasing the sample sizes or sampling locations) for estimation of total catch and size distribution of catch.
- c. Population biology of skipjack, yellowfin and bigeye tuna in archipelagic waters (age, growth, reproduction) in order to better understand the productivity of those species in the Indonesian archipelagic waters.
- d. Given that social and economic objectives which have been identified as important during the Stakeholder consultations, social and economic data and indicators need to be collected.
- e. Improve the data collection for small scale fisheries.
- f. Feasibility assessment for implementation of alternative forms of effort management measures.

⁸ Hoshino, E. R. Hillary, C. Davies and C. Proctor, 2018. Development of prototype operating models for exploring harvest strategies for tropical tuna in the Indonesian archipelagic waters: case studies for skipjack and yellowfin tuna. Draft report to the Western Central Pacific Fisheries Commission, 2018.

APPENDIX 2. Summary of Technical and Consultative Process for Development of Framework for Harvest Strategy for Skipjack, Yellowfin Tuna and Bigeye Tuna in Indonesian Archipelagic Waters

Multiple stakeholder consultations and technical workshops have taken place over the last 2 years, fostering a transparent and participative environment for harvest strategy development.

| Date | Meeting type | Location |
|----------------------|--|-----------------|
| October 30 -31, 2014 | Preparation meeting | Bogor, Java |
| March 25-27, 2015 | Harvest strategy preparation and introduction meeting | Bogor, Java |
| May 18-22, 2015 | Stakeholder consultation and expert meeting | Bogor, Java |
| August 10, 2015 | Pre-workshop for data analysis | Bogor, Java |
| November 16-18, 2015 | Stakeholder consultation | Kuta, Bali |
| November 19-20 | Baseline data to develop harvest strategies | Kuta, Bali |
| April 4-7, 2016 | 1 st Technical meeting for harvest strategy development | Bogor, Java |
| November 10-11, 2016 | 2 nd Technical meeting for harvest strategy development | Denpasar, Bali |
| November 14-16, 2016 | Stakeholder consultation | Bogor, Java |
| March 6-7, 2017 | 3 rd technical meeting for harvest strategy development | Jakarta, Java |
| March 8-10, 2017 | 5 th Stakeholder consultation | Jakarta, Java |
| July 12-13, 2017 | 6 th Stakeholder consultation | Loka Tuna, Bali |
| October 2017 | 4 th Technical Meeting | Bogor, Java |
| November 2017 | 7 th Stakeholder consultation | Bogor, Java |

APPENDIX 3. Summary Action Plan for Indonesian Archipelagic Water Tuna Harvest Strategy 2018-2023

| HS Component | | Progress to date as per May 2018 | | Required Action | Lead Agency | Time frame |
|--------------------------------|------------------|----------------------------------|---|---|--|--|
| Management Strategy Evaluation | Harvest Strategy | Management Objectives | To ensure the sustainability of yellowfin tuna, bigeye tuna and skipjack tuna resources | familiarize the agreed Management objectives at national levels (Province and district) | DGCF | 2018-2019 |
| | | Operational Objectives | To maintain spawning stock biomass (SSB) above the limit reference point (LRP) of 0.2 SSBF=0, <i>with the probability of 90% during the 10 years projection period</i> | take into account in the determination of MM to the OM and tested; Consider TRP in light of results of MSE testing | DGCF, AMFRHR | 2018 |
| | | Monitoring | MAINTAIN Port sampling data collection Bitung, Kendari, Sodohoa, Sorong, Majene (since 2011). Review existing government, industry and NGO programs and design and prioritise long-term monitoring requirements for harvest strategy implementation | Increase Data collection program by X % from the 2018 base line through strong collaboration with industry, fishing association and NGOs, log book, observer, RVIA, SIMKADA | DGCF, AMFRHR, MDPI, AP2HI, SFP, ATLI, ASTUIN | 2018-end (Long term continues program) |
| | | Analysis | CPUE Standardization and Mean Length from Pole and Line (SKJ) and Hand Line (YFT). | Conduct annual analysis, Data maintenance, handling and exploration, consulting, reporting and refine CPUE | AMFRHR, CSIRO | |

| | | | | | | |
|--|-------------------|--|---|---|--------------------------------|-----------|
| | | Harvest Control Rule (HCR) | Empirical harvest strategy indices of relative abundance (standardized catch rates), and/or size structure of the catch | Complete MSE testing of final HCRs; Adopt and implement the HCR | AMFRHR, CSIRO AMFRHR, CSIRO | 2018-2019 |
| | | Management Measure (MM) | 1. Limit on use of Fish Aggregating Devices, 2. Spatial closures (of important spawning or nursery grounds) and temporal closures (during important events such as spawning). 3. Number of fishing days (per gear, for semi industrial and industrial vessels). 4. Number of vessels – limited entry (per gear; for semi industrial and industrial vessels through licensing, permits, taxing, royalties). | Issue the HS management measures through MMAF Decree/regulation, familiarize and enforce the measure to Province and District as well as Industry; Register All Fishing Boat/gear through RVIA and SIMKADA | DGCF, PROVINCE, DISTRICT | 2018-2019 |
| | | | 5. Total Allowable Catch (TAC) limits per Fishery Management Area. | Evaluate the compliance and Effectiveness of the MM | DGCF | 2020 |
| | MSE testing | OM has been developed and updated | | Update OMs with most recent SPC stock assessment and new biology and fishery parameters; Complete MSE testing of final HSs | DGCF, AMFRHR, CSIRO | 2019-2020 |
| | Targeted Research | Biology and fishery parameters has been defined for IAW | | age, growth and reproductive biology to estimate productivity, operational catch and effort data for CPUE indices | AMFRHR, CSIRO | 2018-2023 |

Note: AMFRHR: Agency for Marine and Fisheries Research and Human Resource; CSIRO: Commonwealth Scientific and Industrial Research Organisation; DGCF: Directorate General for Capture Fisheries; MDPI: Masyarakat dan Perikanan Indonesia; NGO: Non-Government Organization; RVIA: Record of Vessels Authorized to fish for tuna skipjack tuna and neritic tuna; SIMKADA: Sistem Informasi Kapal Ijin Daerah.

APPENDIX 4. Draft detail action Plan for a five-year implementing the IAW tuna Harvest strategy (2018-2023)

| No | Technical Activity | Rational for activity | Location | WPP | Gear | Species | Project/ Management Organization | Implementing Organization | Timeline Proposed |
|-------------------|-------------------------------|--|---|-----------------------------------|---------------|---|---|---------------------------|--|
| MONITORING | | | | | | | | | |
| 1 | Port side enumeration | Gathering information on tuna for submission to Indonesian research and stock assessments. Monitoring to gather length, CPUE and other data for the HS OM. | Lombok, Kupang, Seram Utara, Seram Selatan, Buru Utara, Buru Selatan, Ambon, Bisa, Manado, Sangihe, Bitung, Sorong, Toli-Toli, Bone | 713, 714, 715, 716, 717, 572, 573 | HL, PL, TL | YFT, BET, SKJ, ALB | MDPI, SEA USAID, Oceans USAID | MDPI | Ongoing |
| 15 | Port side enumeration | Gathering information on all aspects of the tuna FAD-based fisheries. Hopefully to assist HS development process. | Padang, Palabuhanratu, Kendari, Sorong | 572, 573, 714, 715, 717 | HL/TL, PL, PS | Main focus YFT, SKJ, BET but also non-target species (i.e. characterisation of all catch on tuna FADS). | ACIAR Project FIS/2009/059, CSIRO in partnership with CFR | CFR-CSIRO | Oct 2013 - present (at Kendari and Palabuhanratu). Oct 2013 - March 2015 (at Padang and Sorong). |
| 16 | Landing/port site enumeration | Monitoring to gather length, CPUE and | Bandaneira, Ambon | 714 | HL | YFT, BET | SFP-LINI | SFP-LINI | Ongoing |

| | | | | | | | | | |
|------------------------|---|---|---|-------------------------|------------------------|--------------------|----------------------------------|--------------------------|----------------------------|
| | | other data for the HS OM | | | | | | | |
| 19 | Port side enumeration | Monitoring to gather length, CPUE and other data for the HS OM | Bandaneira | 714 | HL | YFT | PT Intimas Surya; PT KML | PT Intimas Surya; PT KML | Ongoing |
| 20 | Port side enumeration | Monitoring to gather length, CPUE and other data for the HS OM | Ambon | 714 | LL | YFT, BET | PT MPM/PT KML | PT MPM/PT KML | yearly, starting 2017 data |
| 23 | Port side enumeration | Monitoring to gather length, CPUE and other data for the HS OM | Bitung, Kendari, Sodohoa, Sorong, Majene, Gorontalo | 713, 714, 715, 716, 717 | PL, PS, HL, TL, LL, GN | YFT, BET, SKJ | WCPFC (WPEA project) | CFR | Starting 2010 |
| 24 | Observer onboard | Collect operational CPUE and fishing position, length in catch | | All 11 areas | PL, PS, HL, LL | YFT, BET, SKJ, ALB | DGCF (National Observer Program) | DGCF | Starting 2013 |
| 25 | Logbook filled by captains onboard | Collect operational CPUE and fishing position | | All 11 areas | | YFT, BET, SKJ, ALB | DGCF (National Logbook Program) | DGCF | Starting 2013 |
| DATA MANAGEMENT | | | | | | | | | |
| 26 | E-BRPL (E-national stock assessment data) | One gate stock assessment data from Port sampling and Scientific observer | Indonesia | All | All | all species | BRPL-CFR, KOMNAS, | BRPL | On Going |

| | | | | | | | | | |
|----|---|--|-----------|------------------------------|-----------|---|----------|----------|----------------|
| 27 | Production data (One Data) | Contribute to National Statistical data, One Data | Indonesia | All | All | all species | One Data | One data | Ongoing |
| 28 | Logbook | CPUE for the HS | Indonesia | All | All | all species | DGCF | DGCF | Continuing |
| 29 | Database- I-Fish for fisheries data management. Protocols developed to meet RFMO and national government standards. | To create template for industry-oriented data collection in the supply chain to contribute to high level data, especially for small scale fisheries where a current gap exists. Support data needs towards eco-certification | Indonesia | 573, 713, 714, 715, 716, 717 | HL/TL, PL | Main focus YFT, SKJ, BET but also non-target species and encounters with Endangered, threatened and protected species | MDPI | MDPI | 2012-present |
| 30 | IDAPAR- Indonesian data coordination platform. | Aiming to create one door into Indonesian government for 'external' data. Aim to create coordination amongst industry, NGOs and others creating data and wishing to share with government- type of coordination platform. | Indonesia | All | all | all species | MDPI | MDPI | In development |

TARGETED RESEARCH

| | | | | | | | | | |
|----|---|---|--|-------------|--|-------------|---|-------|----------------------------|
| 31 | <ul style="list-style-type: none"> • Complete biological sampling of yellowfin, bigeye and skipjack tuna across the Indonesian archipelago; • Analyse biological samples and model the resulting data to estimate life-history parameters. | Determine the productivity of skipjack, yellowfin and bigeye tuna in Indonesia by estimating relevant life-history parameters (age, growth, reproduction) | | 713.714.715 | | BET,SKJ,YFT | ACIAR Project FIS/2016/116, CSIRO in partnership with CFR | CSIRO | 2014- 2020 |
| 32 | <ul style="list-style-type: none"> • Socio-economic analyses and bio-economic modelling of tuna fisheries sectors and relevant communities; • Propose potential social and economic performance measures or indicators that can be incorporated in to the simulation evaluation framework (Management Strategy Evaluation); • Examine the potential trade-offs | Examine the potential social and economic impacts of alternative management measures through surveys and bio-economic modelling | | 713.714.715 | | BET,SKJ,YFT | ACIAR Project FIS/2016/116, CSIRO in partnership with CFR | CSIRO | Ongoing until minimum 2019 |

| | | | | | | | | | |
|----|---|---|-------|-----|-----|----------------------------|--------------------------|-----------------------------------|------------------|
| | among social, economic and stock conservation objectives of various harvest strategies. | | | | | | | | |
| 33 | Observer onboard | Fishing activities, CPUE, Biological Data, ETP inventory | Ambon | 714 | LL | YFT, BET and other pelagic | Loka Tuna Benoa and RIMF | Loka Tuna Benoa and RIMF Cibinong | starting in 2018 |
| 34 | Marine and fisheries Survey | Exploratory, Ground check, sampling (Hydro acoustics, experimental fishing) | All | All | all | All | RIMF | Cibinong | Continuing |

Fisheries management

| | | | | | | | | | |
|----|---|--|--|-------------|--|-------------|---|-------|------------|
| 35 | Provide expert advice to DGCF and CFRDCFR on the development and selection of operation harvest strategies, consistent with the National Tuna Harvest Strategy Framework (see Objective 1); | Evaluate operational harvest strategies for tropical tuna in Indonesia's Fisheries Management Areas 713 – 715 and provide technical advice to MMAF on selection and implementation of trial harvest strategies | | 713.714.715 | | BET,SKJ,YFT | ACIAR Project FIS/2016/116, CSIRO in partnership with CFR | CSIRO | |
| 36 | Supporting HS process at National government for Indonesian | Evaluate operational harvest strategies for tropical tuna in Indonesia's Fisheries | | 713.714.715 | | BET,SKJ,YFT | MDPI- Various donors | MDPI | 2017- 2018 |

| | | | | | | | | | |
|----|---|---|--|------------------------------|------------|-------------|--------------------------|--------------------------|---------|
| | Archipelagic waters- 713, 714, 715 for SKJ, BET and YFT | Management Areas 713 – 715 and provide technical advice to MMAF on selection and implementation of trial harvest strategies | | | | | | | |
| 37 | Supporting implementation of the NPOA Tuna on various topics | Certification, FIP implementation | Indonesia general | | | BET,SKJ,YFT | MDPI- Various donors | MDPI | |
| 38 | Support provincial level co-management initiatives- DMC/KPDP- data Management committees. | To support provincial level capacity building, to create multi stakeholder for a on fisheries management and to create data improvements to lead to better management on provincial levels. | Maluku, Maluku Utara, Sulawesi Utara, Sulawesi Selatan, NTT, NTB | 573, 713, 714, 715, 716, 717 | HL, TL, PL | BET,SKJ,YFT | MDPI- Various donors | MDPI | |
| 39 | Boat registration | Compliance to traceability | Ambon and Banda | 714 | HL | YFT | PT Intimas Surya; PT KML | PT Intimas Surya; PT KML | Ongoing |
| 40 | Vessel tracking | Understanding fishing grounds | Banda Sea | 714 | HL | YFT | SFP - LINI | SFP - LINI | ongoing |

| LEGISLATION | | | | | | | | | |
|-------------|---|---|----------|----------|----------------|----------|--------------------------|--------------------------|-----------------------------|
| 41 | Development of Fads Regulation | | | | | | DGCF, Bureau of Law MMAF | DGCF, Bureau of Law MMAF | 2019 |
| 42 | Develop Ministerial decree for Harvest Strategy | Current regulation related to tuna management are scattered and aim to have a single regulation for tuna fisheries | | ALL | ALL | ALL | DGCF, Bureau of Law MMAF | DGCF, Bureau of Law MMAF | 2019 |
| 43 | Supporting development of FAD regulatory update | Current FAD regulation has not been adequate in reaching FAD management objectives. Increasing pressure has created a need for an update to FAD regulation initiated by a proposed FAD amnesty to get an initial understanding on FAD density | National | National | HL, TL, PL, PS | all Tuna | MDPI- Various donors | MDPI | January 2018- December 2021 |

CAPACITY BUILDING

| | | | | | | | | | |
|----|---|---|--|--|--|--|--|-------|----------------------------|
| 44 | <ul style="list-style-type: none"> • Review of current and proposed tuna research and monitoring activities and staff capabilities across CFRDCFR and DGCF, where appropriate, and institutional mechanisms for scientific advice and engagement in tuna RFMOs; • Develop a 5-10 year capability plan for tuna research and management and tuna RFMO engagement. • Provide targeted support for individual participation in formal and informal tuna RFMO technical meetings, for example through small grant proposals for capacity development funding from CCSBT. | Develop an operational capability plan for Indonesian tuna fisheries science and engagement in the relevant | | | | | ACIAR Project FIS/2016/11 6, CSIRO in partnership with CFR | CSIRO | January 2018-December 2021 |
|----|---|---|--|--|--|--|--|-------|----------------------------|

| | | | | | | | | | |
|----|---|---|------------|-------------|-----|-------------|---|------------------|--------|
| 45 | Conduct training workshops for Indonesian scientists to build capacity in contemporary population biology laboratory and analysis methods | Determine the productivity of skipjack, yellowfin and bigeye tuna in Indonesia by estimating relevant life-history parameters (age, growth, reproduction) | | 713.714.715 | | BET,SKJ,YFT | ACIAR Project FIS/2016/116, CSIRO in partnership with CFR | CSIRO | |
| | Supporting capacity building of HS technical team through funding for capacity building | To ensure the HS process developed for Tuna can be multiplied to other Indonesian fisheries by creating a strong base and understanding for HS methodology within the wider Indonesian government scientific and management team. | Indonesian | all | all | all | MDPI-Various donors | MDPI | |
| 46 | Safety at sea | Support fishers safety knowledge | Banda | 714 | HL | YFT | SFP-LINI | SFP-LINI | yearly |
| 47 | Best practice in post-harvest | Support fishers' knowledge in maintaining quality | Banda | 714 | HL | YFT | PT Intimas Surya | PT Intimas Surya | yearly |

| CONSULTATION | | | | | | | | | |
|--------------|--|---|--|-------------|--|-------------|---|-------|----------------------|
| 48 | Conduct policy, management and research training workshops on harvest strategy development and implementation with Department of Agriculture and Water Resources (DAWR), Australian Fisheries Management Authority (AFMA) and CSIRO. These will focus on practical experience with the Commonwealth Harvest Strategy Policy and providing concrete examples of the interaction between fisheries policy, management and science. | Facilitate policy and technical consultative processes for Harvest Strategy development | | 713.714.715 | | BET,SKJ,YFT | ACIAR Project FIS/2016/116, CSIRO in partnership with CFR | CSIRO | Ongoing-minimum 2020 |

| OTHER | | | | | | | | | |
|--------------|---|--|----------|-----|-----|------------|----------|----------|---------|
| 49 | Certification- FT and FIP work focused on MSC | These approaches create strong motivation for HS development and create a framework for moving towards good management | National | all | all | HL, TL, PL | MDPI | MDPI | |
| 50 | social economy survey | understanding the socio-economic aspects | Banda | 714 | HL | YFT | SFP-LINI | SFP-LINI | ongoing |