**Draft Upper-slope Dogfish Strategy Research and Monitoring Plan 2020-2025**

The purpose of the Upper-slope Dogfish Research and Monitoring Plan (the Plan) is to outline the priorities for data collection (Table 1) and how that information will be gathered in order to assess the performance of the Upper-Slope Dogfish Management Strategy (the Strategy) in meeting its primary objective - to promote the rebuilding of Harrisson’s dogfish (*Centrophorus harrissoni*) and southern dogfish (*C. zeehaani*). The Plan also provides a summary of research projects underway (Table 2, none currently funded), and a list of recently completed research projects (Table 3).

The Plan has been directly informed by the outcomes of the project completed by Williams et al*.* (2018), which built on earlier advice from the Southern and Eastern Scalefish and Shark Fishery (SESSF) Resource Assessment Group (RAG). The outcome of these processes identified an increase in the relative abundance as the best indicator of recovery and consequently, this is the key priority for monitoring to assess the performance of the Strategy. Another five prospective indicators of recovery were also agreed (outlined in Table 1).

Williams et al. (2018) developed and assessed a number of survey design options in consultation with stakeholders for monitoring the performance of the Strategy, the outcome of which was identifying a preferred option ‘Option 1a’ in the report. Option 1a is based on fishery independent surveys of six reference sites across the SESSF using the automatic longline method with suitable fishing/handling practices to measure relative abundance (the top ranked priority for monitoring recovery). This methodology also provides the opportunity to collect data to support a level of monitoring of the other agreed indicators. AFMA has adopted a project to execute ‘Option 1a’ as the highest priority for this Plan. AFMA is currently identifying a source of funding to undertake the project.

‘Option 1a’ also directly addresses the first two of five areas initially identified in the Strategy as warranting consideration in the development of a research and monitoring plan, and provides an opportunity to collect data that will go some way to addressing the remaining three areas:

* Identifying reference sites in areas open and closed to fishing, and those of current and historic abundance, to be sampled through time (nominally every 5 years) to monitor population recovery or decline
* Identifying baseline numbers of individuals in reference sites described above to aid in long-term monitoring of upper-slope dogfish populations
* Genetic analysis to define stocks of both southern and Harrisson’s dogfish
* Comprehensive life history analysis, particularly age and growth, to refine generation time and recovery potential
* Defining the extent of Harrisson’s dogfish movements, similar to research conducted to define southern dogfish movement.

Fishery dependent data will continue to be collected via daily fishing logbooks with routine monitoring of commercial fishing activity by on-board observers and electronic monitoring. However, relative abundance is expected to be measured most reliably within closures where there is no fishing and consequently, requires fishery independent surveys. This is because logbook reporting is confounded by challenges in identifying species rapidly under the current handling practices required by the Strategy. For example, dogfish are required to be cut off the line as close to the water as possible by hook operators to maximise their chances of survival but this reduces the opportunity for accurate identification. Further, increases in abundances are expected to be higher within closures and therefore more readily detectable.

***Review***

Research priorities are reviewed annually through the relevant Management Advisory Committees (MACs) and Resource Assessment Groups (RAGs), and are subject to approval by the AFMA Research Committee. This plan will be formally reviewed every five years in conjunction with the Strategy.

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| **Table 1. Indicators and their priority for monitoring the recovery of Harrisson’s and southern dogfish** |
| **Indicator of recovery** | **Expected population response** | **Project identified**  | **Priority and cost** | **Timeframe** |
| 1. Relative index of abundance in reference areas
 | Stable or increasing  | Yes, project scope has been developed closely following the preferred option ‘Option 1a’ identified by Williams et al. (2018). The first survey will be to establish the baseline index of abundance for both Harisson’s and southern dogfish across six reference areas using the auto-longline method. It is also intended that Baited Remote Underwater Video Systems (BRUVS) be used in parallel to enable further study and refinement of this non-extractive technique, and its effectiveness and comparability to auto-longline catches.Follow-up surveys every ten years will underpin a long-term monitoring plan to measure the relative abundance and recovery of these species. The ten year interval for surveys reflects the long time period for recovery and also aims to minimise survey-related mortality. | High priority, high cost at ~ $400 000 (per survey).   | Project scope for the first survey has been submitted for FRDC potential funding in 2021-22. Subsequent surveys will be undertaken every ten years.  |
| 1. Area of occupancy (‘distribution’)
 | Expanding  | No specific project - additional data collection is required to establish a baseline area of occupancy. There is a potential to collect some data as part of the ‘Option 1a’ project.  | Moderate | None specified for a specific project.  |
| 1. Size (age) composition
 | An increasing presence of juveniles  | No specific project - there is a potential to collect some data as part of the ‘Option 1a’ project.  | Moderate | None specified for a specific project. |
| 1. Sex composition
 | Males and females observed together for breeding (the sexes are known to occur separately at other times) | No specific project - there is a potential to collect some data as part of the ‘Option 1a’ project.  | Moderate | None specified for a specific project. |
| 1. Catch and distribution in commercial bycatch
 | Increasing captures and spatial expansion of captures  | This is monitored through fishery dependent data. There are ongoing challenges regarding rapid identification between Harrisson’s and southern dogfish and the rules regarding handling practices aimed at maximising survivability, specified in the Strategy impact the accuracy of fishery dependent data at this point in time.  |  Moderate | Ongoing requirement to report in logbooks and verified via on-board observers/electronic monitoring  |
| 1. Genetic measures of connectivity and stock structure
 | Increasing complexity  | No specific project - there is a potential to collect some data as part of the ‘Option 1a’ project.  | Moderate | None specified for a specific project.  |

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| **Table 2. CURRENT FUNDED PROJECTS**  |
| **Project Title** | **Outputs and Performance Indicators** | **Evaluation** |
| **Alignment with Strategy** | **Total cost (approx. only)** | **Project Completion** |
| NO CURRENT FUNDED PROJECTS |  |  |  |  |

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| **Table 3. COMPLETED RESEARCH PROJECTS**  |
| **Project Title** | **Key Outcomes** | **Date Completed** |
| *“Research to support the upper-slope dogfish management strategy: options for monitoring the recovery of southern dogfish and Harrisson’s dogfish”* (Williams et al. 2018). | * A cost effective methodology developed for measuring relative abundance of dogfish
 | November 2018 (two year project) |
| *“Determining the distribution of gulper sharks on Australia’s eastern seamount chain and the selectivity of power handline fishing in regard to seamount populations of blue-eye trevalla and Harrisson’s dogfish”* (Williams et al. 2013) | * Establish that Harrisson’s dogfish can be avoided during normal power handline fishing operations to harvest blue-eye trevalla on the offshore Taupo and Barcoo seamounts
* Identify environmental factors such as depth and time of day, together with gear/ method characteristics, that determine why the species of interest are captured or avoided by power handline
* Determine the distribution of Harrisson's dogfish on the east Australian seamount chain.
 | 2013 |
| “*Mapping the distribution and movement of gulper sharks, and developing a non-extractive monitoring technique, to mitigate the risk to the species within a multi-sector fishery region off southern and eastern Australia*” (Williams et al. 2012). | * Update distribution maps of gulper sharks in eastern Australia
* Developed techniques to use acoustic telemetry technology in deep ocean
* Development of new DeepBRUVS survey tools to collect data of gulper shark populations
* Used to guide the development of management responses via consultation with South East Management Advisory Committee (SEMAC)
 | 2012 |
| *Industry monitoring and sampling of gulper shark catches in the SESSF* (Koopman et al. 2011) | * Improved skills for identification of gulper sharks by SESSF crews, leading to increased and improved reporting of catch and effort of the species in commercial logbooks.
 | 2011 |
| *Information to support management options for upper-slope gulper sharks (including Harrisson’s dogfish and southern dogfish)* (Wilson et al. 2009).  | * Review of the success of international management arrangements to address the sustainability of fisheries catches involving similar upper-slope low productivity shark species.
* Review of the historical identification of Harrisson’s dogfish including catch statistics and scientific surveys.
* Investigate and improve estimates on the nature and extent of interactions with Harrisson’s dogfish and similar upper-slope gulper sharks in all sectors of Australia’s Southern and Eastern Scalefish and Shark Fishery (SESSF).
* Analysis, with supporting rationale, for alternative management options for reducing the ecological risk to Harrisson’s dogfish and similar upper-slope gulper sharks in Australia’s SESSF.
 | 2009 |

**References**

Koopman, M., Knuckey, I and Daley, R. (2011). Industry monitoring and sampling of gulper shark catches in the SESSF. FRDC Project 2009/023

Williams, A., Althaus, F., Smith, A.D.M., Daley, R., Barker, B.A., Fuller, M (2013). Developing and applying a spatially based seascape analysis (the "habitat proxy" method) to inform management of gulper sharks: compendium of CSIRO discussion papers Hobart, p. 220.

Williams, A., Daley, R., Barker, B.A., Green, M.A.P., Knuckey, I (2012). Mapping the distribution and movement of gulper sharks, and developing a non-extractive monitoring technique, to mitigate the risk to the species within a multi-sector fishery region off southern and eastern Australia. Final report to the Fisheries Research Development Corporation, FRDC Project No 2009/024. CSIRO, Hobart, Tasmania, p. 311.

Williams A, Green M.A, Althus F, Knuckey I, McLean D, Koopman M (2018) Research to support the upper-slope dogfish management strategy: options for monitoring the recovery of southern dogfish and Harrisson’s dogfish. Report to AFMA. CSIRO, Australia.

Wilson D T, Patterson H M, Summerson R and Hobsbawn P I (2009) Information to support management options for upper-slope gulper sharks (including Harrisson’s dogfish and southern dogfish). Final Report to the Fisheries Research and Development Corporation Project No. 2008/65. Bureau of Rural Sciences, Canberra.