

# Data and Assessment Plan 2017-20

Gillnet, Hook and Trap Fishery

March 2017



Australian Government

Australian Fisheries Management Authority

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## Acronyms

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AFMA	Australian Fisheries Management Authority
CDR	Catch Disposal Record
CPUE	Catch per unit effort
ERA	Ecological Risk Assessment
ERM	Ecological Risk Management
FIS	Fishery Independent Survey
GABRAG	Great Australian Bight Resource Assessment Group
GABMAC	Great Australian Bight Trawl Sector Management Advisory Committee
GHAT	Gillnet Hook and Trap sector
HSF	Harvest Strategy Framework
MAC	Management Advisory Committee
MYTAC	Multi-year total allowable catch
RAG	Resource Assessment Group
RBC	Recommended biological catch
SEMAC	South East Management Advisory Committee
SERAG	South East Resource Assessment Group
SESSF	Southern and Eastern Scalefish and Shark Fishery
SESSFRAG	Southern and Eastern Scalefish and Shark Fishery Resource Assessment Group
SharkRAG	Shark Resource Assessment Group
TAC	Total allowable catch
TEP	Threatened, Endangered and Protected
VMS	Vessel Monitoring System

# 1 Introduction

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The purpose of this document is to provide a clear plan for collecting data needed to support fishery management decisions and assessments in the gillnet, hook and trap (GHAT) sector of the Southern and Eastern Scalefish and Shark Fishery (SESSF).

The *Fisheries Management Act 1991* sets out the broad objectives for AFMA to manage fisheries and ensure that fisheries are ecologically sustainable and economically efficient. Each year the AFMA Commission makes decisions on sustainable catch limits for the key commercial species and AFMA implements management arrangements to keep catch of commercial species within these limits and minimise impacts on protected species, other bycatch and habitats.

In order to make management decisions in pursuit of its objectives, AFMA needs an accurate measure of what is being caught (total fishing mortality and impacts) and an assessment of what is an acceptable catch and impact. These two questions provide the basis for AFMA's data collection and scientific assessment processes.

The core data collected includes a measure of what is caught (catch) and how it has been caught (effort). This data is primarily collected and reported by fishers directly through daily fishing logbooks and catch disposal records (CDRs). Independent verification of catch reports is extremely important to ensure accurate data collection and AFMA is increasingly investing in cost effective data verifications tools. This includes the use of vessel monitoring systems (VMS) that verify boat location as well as electronic monitoring (e-monitoring) systems that include cameras and sensors to enable independent verification of catch and effort.

Catch and effort data is used to support ecological risk assessments (ERAs) for all species and habitats that interact with fishing gear as well as scientific stock assessments for commercial species. At a minimum AFMA needs catch and effort data to be collected in a fishery to provide a measure of what is caught and support assessments of what is ecologically sustainable.

The AFMA Ecosystem Based Fisheries Management Framework (Figure 1) provides high level guidance on what data and information is needed and what assessments are conducted. Commercial species are assessed and managed in accordance with the Commonwealth Harvest Strategy Policy and broader impacts on the marine environment are assessed through ERAs and managed in accordance with AFMA environmental objectives.

The SESSF Harvest Strategy includes a tiered framework for assessing commercial species with assessments ranked according to the amount of data that is required and how the assessments measure abundance. Data needs for specific species depend on what stock assessment tier is used (Table 2) and there are trade-offs between what data is available (cost of collection), the amount that is caught (catch) and the risk of not keeping the catch sustainable.

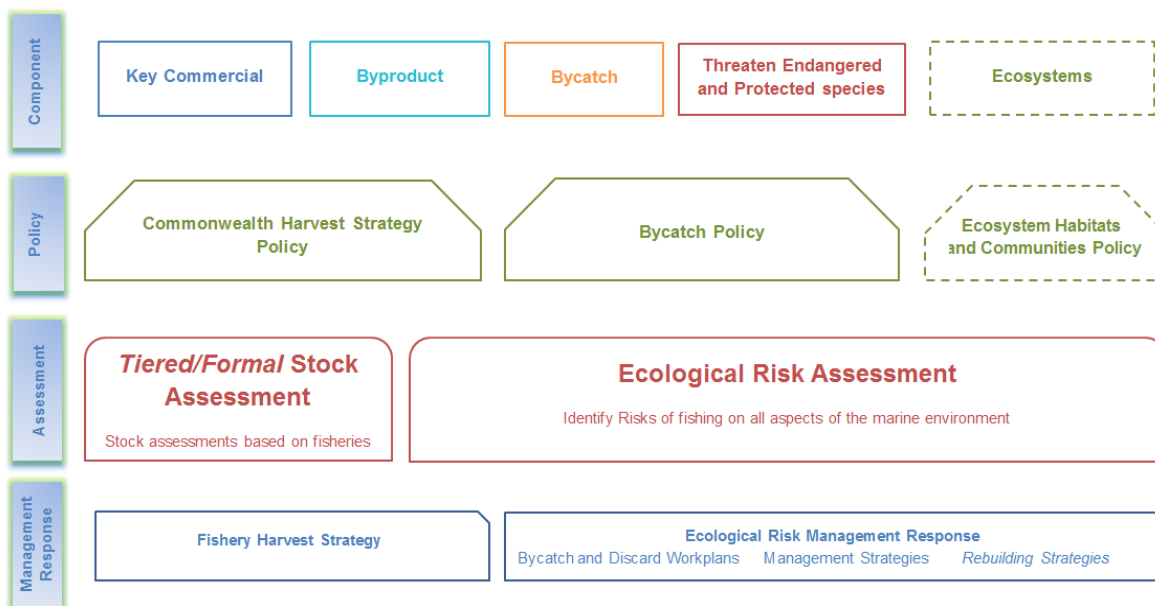


Figure 1. AFMA's Ecosystem Based Fisheries Management Framework

## 1.1 Objectives of the data and assessment plan

- Define information needed to set catch limits for commercial species in the GHaT to levels that support the objectives of the harvest strategy.
- Define data and monitoring needs to support the management of threatened, endangered and protected (TEP) species interactions.
- Define data needs to support ecological risk management for non-commercial species, protected species and habitat.
- Develop and maintain an up to date plan on how fishery data is collected and managed, considering frequency, quantity, representativeness, reliability, auditing, risk, collection method and value for money.

The new data plan should also compliment the Southern and Eastern Scalefish and Shark Fishery five year strategic research plan 2016-20, to ensure future priority research can be supported with data.

Section 2 of this plan outlines the general data needs for commercial species managed by quota in the SESSF. Section 3 outlines the data needs for bycatch and threatened, endangered and protected species (TEPs). For further details for each quota species including data collection targets and timeframes, refer to Appendices 1 to 7.

## 2 Information and data needs for commercial species

The GHAT is managed in accordance with the *SESSF Harvest Strategy Framework* (HSF; AFMA 2015b) under which stock assessments are conducted for all quota species. Stock assessment models are mathematical descriptions of fish populations and their interaction with the fisheries that target them. AFMA's ability to meet the objectives of the HSF relies on obtaining the required data in time for stock assessments to be carried out. For stock

assessment models to produce reliable estimates, the data must be accurate, representative and of sufficient quantity. If the data does not meet the above criteria, poor model estimates may result in poor management decisions.

The HSF uses a tiered approach designed to apply different types of assessments and cater for different amounts of data available for different stocks. The HSF adopts increased levels of precaution that correspond to increasing levels of uncertainty about stock status, in order to reduce the level of risk associated with uncertainty. Each commercial stock is assessed depending on the amount and type of information available to assess stock status and also what level of assessment is needed. Each stock assessment tier has its own harvest control rule that is used to determine the recommended biological catch (RBC) of species. The RBCs provide the best scientific advice on what the total fishing mortality (landings from all sectors plus discards) should be for each species. A recommended total allowable catch (TAC) is then calculated using rules outlined in the HSF.

Historically all quota species have been assessed at a tier one, three or four level, but tier five assessments are now being considered for some quota species.

Commercial species include any species that are landed and sold. There is increasing focus on the by-product species that currently do not have formal stock assessments and are managed through catch limits or other triggers. All of these species are captured in the ERAs for a fishery but specific assessment measures and triggers have not been clearly documented.

This plan summarises the data needs for all quota species and assessments that are conducted. Information needs for quota species management are summarised as follows:

- What is the stock structure (one stock or more than one)?
- What is the abundance of the stock?
  - Measure through stock assessment; fishery independent survey (FIS); alternative index of abundance.
- How much can be sustainably harvested?
  - Stock assessment in accordance with Harvest Strategy.

## **2.1 Information requirements for stock assessments**

Figure 2 illustrates the information that should be considered to estimate biomass for stock assessments. This includes information on factors that add biomass to the population including recruitment and growth, and factors that remove biomass including natural and fishing mortality.



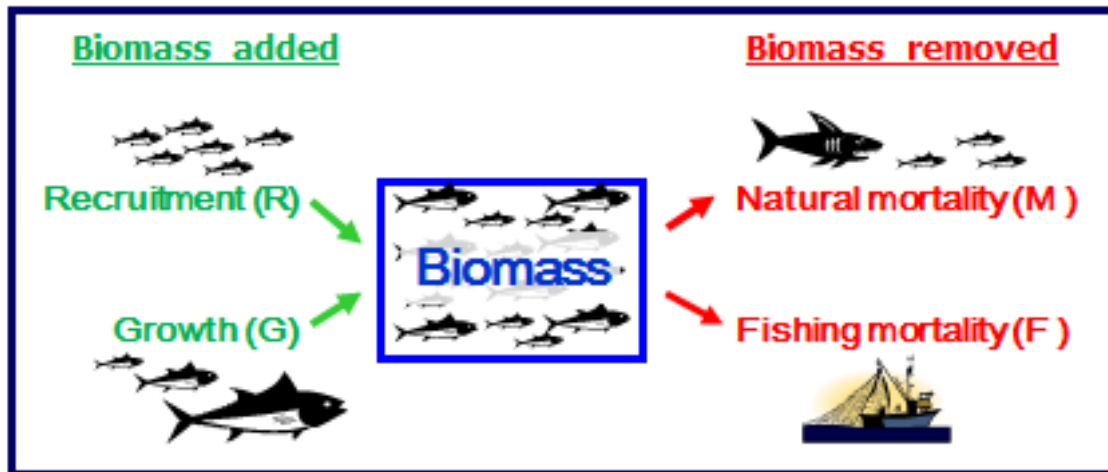


Figure 2. Factors affecting fish stock biomass.

Table 1 outlines data that can be collected to meet stock assessment information requirements. ‘Catch composition’, ‘vessel activity’, ‘shot details’, ‘biological data’ and ‘gear details’ refers to logbook data collection categories, further details of what each category consists of is at [Attachment 1](#).

Table 1. Information requirements for stock assessments and data that can be used to meet the requirements.

Information requirement	Data collected
Recruitment	Length-frequency
Growth	Otoliths (fish) or vertebrae (sharks) Length-frequency Tagging (e.g. mark-recapture)
CPUE	Catch composition Vessel activity Shot details
Fishing mortality	Catch composition Vessel activity Shot details Biological data Discards Catch from other fisheries Predator mortality
Stock Structure	Otoliths (fish) or vertebrae (sharks) Length-frequency Tagging (e.g. mark-recapture)
Selectivity	Length-frequency
Catchability	Area Season Vessel Oceanography CPUE standardisation

Information requirement	Data collected
	Gear details Vessel activity Shot details Catch composition Biological data
Natural mortality	Tagging (e.g. mark-recapture) Sex ratio Estimates from other regions Otoliths (fish) or vertebrae (sharks) Length-frequency
Movement	Tagging (mark recapture, satellite tags etc.)
Age at maturity	Otoliths (fish) or vertebrae (sharks) Biological samples (gonads)

## 2.2 Stock assessment tiers

The SESSF HSF uses a tiered approach designed to apply different types of assessments and cater for different amounts of data available for different stocks. Data requirements for commercial species are determined by the type of stock assessment (tier level) which is used.

A Tier 1 stock assessment uses an integrated biological and statistical approach that combines a wide variety of data inputs, generally including catch per unit effort (CPUE), other indices of abundance and size and age composition. Tier 3 and Tier 4 assessments use other indicators (relating to fishing mortality and catch rates respectively) and reference points which are taken as proxies for the biomass reference points for Tier 1.

Table 2 summarises the data requirements and collection methods for each stock assessment tier, and which tier the SESSF commercial species are assessed under.

**Table 2. Stock assessment tier descriptions, data requirements, collection methods and quota species.**

Tier	Tier description	Data requirements	Current data collection method	Commercial species (SESSF)
1	Robust assessment of fishing mortality and biomass based on fishery dependent data ONLY	<ul style="list-style-type: none"> <li>- Length-frequency</li> <li>- Catch composition</li> <li>- Vessel activity</li> <li>- Shot details</li> <li>- Otoliths or vertebrae</li> <li>- Sex ratio</li> <li>- CPUE</li> <li>- Pup production</li> </ul>	<ul style="list-style-type: none"> <li>- Logbook</li> <li>- Catch disposal records</li> <li>- E-monitoring</li> <li>- AFMA Observer Program</li> </ul>	<ul style="list-style-type: none"> <li>- Flathead</li> <li>- Jackass morwong</li> <li>- Pink ling</li> <li>- Gemfish (east and west)</li> <li>- Gummy shark</li> <li>- Silver warehou</li> <li>- Bight redfish</li> <li>- Blue grenadier</li> <li>- Deepwater flathead</li> <li>- Orange roughy (east)</li> <li>- Redfish</li> <li>- School shark</li> </ul>
3	Empirical estimates of fishing mortality based on size and/or age data	<ul style="list-style-type: none"> <li>- Length-frequency</li> <li>- Catch composition</li> <li>- Vessel activity</li> <li>- Shot details</li> <li>- Otoliths or vertebrae</li> </ul>	<ul style="list-style-type: none"> <li>- Logbook</li> <li>- Catch disposal records</li> <li>- E-monitoring</li> <li>- AFMA Observer Program</li> </ul>	<ul style="list-style-type: none"> <li>- Alfonsino</li> <li>- John dory</li> </ul>
4	Empirical estimates of relative biomass based on <ul style="list-style-type: none"> <li>• fishery dependent data</li> <li>• fishery independent surveys</li> </ul>	<ul style="list-style-type: none"> <li>- Catch composition</li> <li>- Vessel activity</li> <li>- Shot details</li> </ul>	<ul style="list-style-type: none"> <li>- Logbook</li> <li>- Catch disposal records</li> <li>- AFMA Observer Program</li> </ul>	<ul style="list-style-type: none"> <li>- Blue-eye trevalla*</li> <li>- Deepwater shark (east and west)</li> <li>- Elephant fish</li> <li>- Mirror dory</li> <li>- Ocean perch</li> <li>- Oreo basket</li> <li>- Ribaldo</li> <li>- Royal red prawn</li> <li>- Sawshark</li> <li>- Silver trevally</li> </ul>
5	Tier method used for data poor fisheries.	Weight of evidence approach, may estimate the central tendency of sustainable catches (such as the median catch, average catch, or 3rd highest catch) when catch data is not available.		Non quota commercial species

\*Proposed move to tier 1.

### 3 Data needs for bycatch and TEPs

AFMA needs a reliable measure of catch and discards of bycatch and TEPs. AFMA monitors TEP interactions to ensure that management triggers set for TEP species are not exceeded. AFMA needs to be able to monitor boat level performance in some fisheries (e.g. the longline sector for the *Threat Abatement Plan 2014 for the incidental catch (or bycatch) of seabirds during oceanic longline fishing operations*, and the gillnet sector for the AFMA Dolphin Strategy and Australian Sea Lion Management Strategy).

The Department of Agriculture and Water Resources is currently reviewing the Commonwealth Policy on Fisheries Bycatch. This policy deals with those aspects of bycatch that are not currently subject to commercial fishery management provisions, outlined in the Commonwealth Harvest Strategy Policy and Guidelines 2007. In addition to the policy on fisheries bycatch, AFMA is currently finalising the Ecological Risk Management (ERM) Guide. AFMA has been working to progress the ERA/ERM Revitalisation Project with the aim of finalising it in time for the AFMA Commission to endorse it at its April 2017 meeting. There are a range of supporting documents to sit alongside the ERM Guide, including a policy paper.

The new ERM and bycatch policy papers will outline the need to avoid and minimise bycatch, and encourage industry led solutions to minimise bycatch of protected species. The policies will require greater accuracy in bycatch reporting within Australian fisheries in order to progress the ecologically sustainable development of fisheries and ensure the sustainability of the species, populations and ecosystems with which fisheries interact. Improvement in the data collected will allow fisheries management to better predict the impact of commercial fishing operations on the environment and account for the cumulative impact of Commonwealth fisheries on protected species. Accurate reporting in fisheries logbooks will greatly aid in achieving the data needs set out in these policies.

### 4 Data collection

Table 3 outlines fishery dependent and fishery independent data collection methods for target and non-target species.

Table 3. Fishery dependent and independent data collection methods

Data type	Data collection methods
Fishery dependent data (self-reported)	Logbooks
	Catch Disposal Records
Fishery dependent data (independent verification)	Observers
	Port sampling
	E-monitoring
	Vessel Monitoring System
Fishery independent data	Fishery Independent Survey
	Independent research projects

## 4.1 Data collection methods

Current methods of data collection in the SESSF are fishery logbooks, CDRs, the observer program, e-monitoring, transit forms, fish receiver permits, VMS, vessel inspections, licensing and quota management information and research projects and surveys.

### 4.1.1 Logbooks and CDRs

AFMA requires fishers to record catch and effort information in logbooks at sea, and in CDRs which record the landed catch at port. CDRs are more accurate than logbook records as fish are weighed in port whereas logbook weights are often estimates.

The following data is recorded for each fishing operation: the port and date of departure and return; gear type and fishing method; weight of fish kept and discarded; and resultant catch including what is included in the weight (e.g. trunked, gutted, filleted, whole).

Catch and effort data from commercial logbooks is the main data source used for an index of abundance in stock assessments for most SESSF commercial species. Logbook data is also used to monitor catch and effort trends, to standardise effort for CPUE analyses, for quota management, reference points for bycatch and by-product species, input into gross value of production estimates and monitoring and reporting of TEP interactions to the Department of the Environment.

CDR data is used to monitor quota species, verify logbook weight data for stock assessments, verify logbook recorded catch and input into gross value of production.

Data collected in logbooks is further detailed at [Attachment 1](#).

### 4.1.2 E-monitoring

E-monitoring integrates video, sensors and programmable loggers to record data that can be used to independently verify logbook catch. A typical e-monitoring system uses sensors to detect and record fishing activity. An on-board computer takes this information from the sensors and GPS to record video and other information about fishing activities. Information is stored on the system for detailed analysis and some information is transmitted to AFMA for real-time monitoring.

E-monitoring is currently implemented in the GHAT to validate logbook catch and effort data, verify catch composition, and reporting of TEP species interactions. E-monitoring is not capable of collecting important biological data such as length, sex and age data for fish.

### 4.1.3 Vessel Monitoring Systems

VMS are employed by AFMA for the delivery of near real time vessel information in order to effectively monitor the movements of all Commonwealth endorsed fishing vessels. Each VMS unit routinely produce positional reports which contain information such as the vessel's current location, course and speed for the purpose of domestic compliance, fisheries management and research.

The VMS system is a vital tool in assisting fisheries managers to achieve compliance with fishery management arrangements, particularly where fishing activity needs to be

restricted to certain areas or zones. VMS data can also be used for fine-scale position data for stock assessments.

#### **4.1.4 Observer program and port sampling**

The Integrated Scientific Monitoring Program (ISMP; observer program) provides fisheries managers, research organisations, environmental agencies, the fishing industry and the wider community with independent, reliable, verified and accurate information on the fishing catch, effort and practice of Commonwealth vessels.

Each year the requirements and priorities for the observer program are determined by AFMA after consultation with the relevant management advisory committees (MACs) and RAGs, so that timing and area of observer coverage is proportional to fishing effort within and across fisheries. RAGs review individual species targets annually. Data collected as part of the observer program is done by on-board observers or port sampling. Refer to Bergh et al. (2009) for further details on the ISMP sampling regime in the SESSF.

The observer program is used to:

- verify logbook information and assist compliance;
- determine levels of interaction with TEP species;
- quantify levels of bycatch and status of discards (mortality rates);
- collect biological data for stock assessments and research projects on-board or at port (e.g. collection of otoliths – fish ear bones – to age fish, and collect sex and length data of fish);
- record environmental observations;
- collect anecdotal information (qualitative data) for research;
- quantify level of depredation (if high coverage);
- educate fishers (e.g. data collection, species identification, handling TEP species, tag recovery, compliance regulations).

#### **4.1.5 Fishery independent surveys**

A FIS provides a time-series of relative abundance indices for key target species. Most of the SESSF stock assessments use some form of CPUE time series data from logbooks as the main index of stock abundance. The FIS provides a time series of abundance indices that can be used in addition to, or instead of, commercial CPUE data.

Various biological and environmental data are collected by scientific observers on-board including: target species; catch rate (kg/shot); fishing method; and fishing depth. Information which provides a relative abundance index of other main by-product and bycatch species is also obtained.

#### **4.1.6 Research projects relevant to data collection**

Research projects are used to collect and assess additional data required for scientific or management purposes where significant data gaps are identified. In the past this has included the following.

- Tagging programs for migration and stock structure studies.
- Oceanographic data for the study of environmental determinants of fishery production.
- Genetic data for studies of stock structure.
- Otolith ring counts for growth studies and stock assessments.
- Stomach contents data for food-web and predation studies.
- Ecosystem information for modelling food web structures.
- Environmental and oceanographic data for use in stock dynamics, migrations and production models.
- Survivorship of discard species.
- Economic data in conjunction with scientific assessments to assess economic performance of fisheries.
- Sustainability of biodiversity (abundance, distribution, composition).
- Identify and quantify bycatch and by-product.
- Biological characteristics of target and non-target species.
- Additional data required for management purposes.
- Fishery responses to alternative management measures.
- Marketing data used to inform assessments of the sources of variation not accounted for in stock assessments.

## 4.2 Cost effective data collection

One of the objectives of this plan is to support managers and scientists to define what data is needed and then identify cost effective data collection methods. The basic premise is that the data required for stock assessments and to support management can be collected or verified in different ways.

## 5 Data management

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AFMA oversees the collection of large amounts of fishery data that are collected through multiple methods outlined in section 4. This section outlines the stages in the data lifecycle and specifies roles, responsibilities and performance measures for each stage to ensure that data is collected to the required standards. Figure 3 outlines the data lifecycle and AFMA's business requirements.

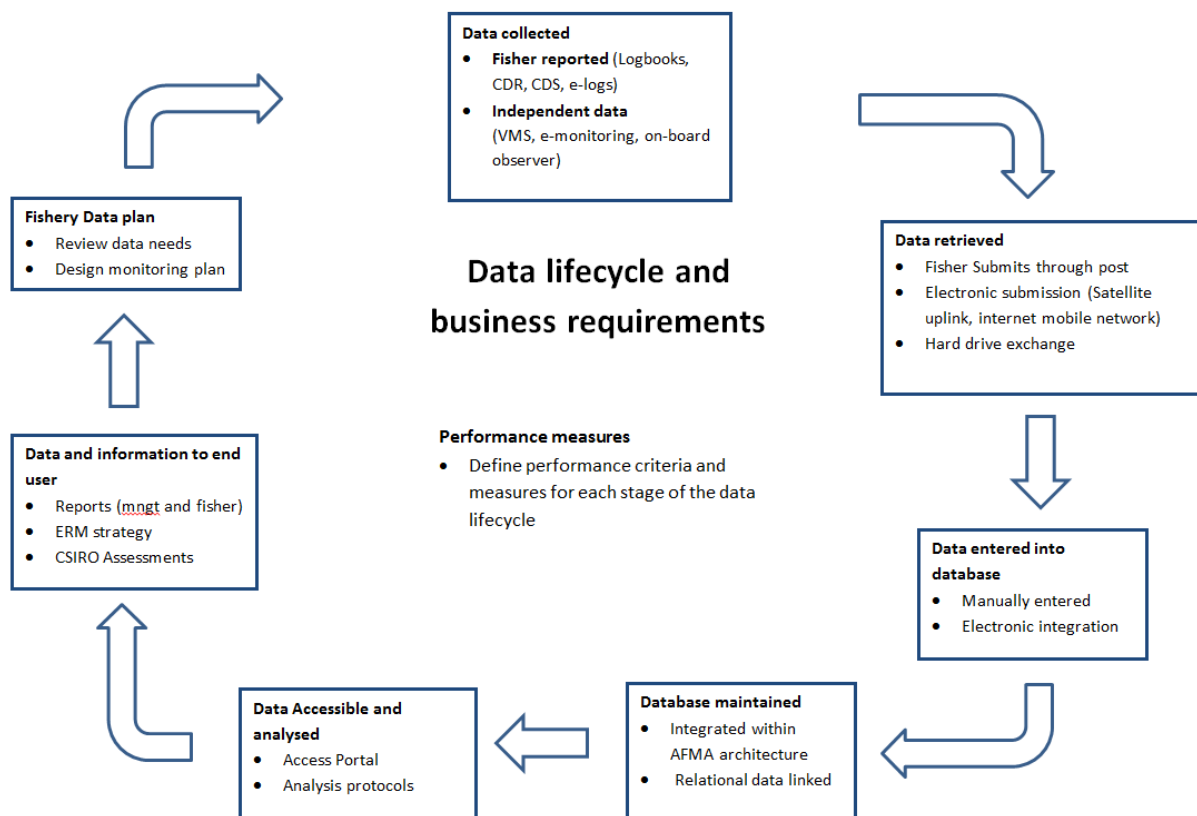


Figure 3. Summary diagram depicting the stages in the fisheries data lifecycle.

## 5.1 Data storage

Logbook, CDR, VMS and observer program data is currently stored on the AFMA database for internal use, and is also provided to research organisations for data analysis services.

E-monitoring footage is analysed by an AFMA contractor and annotated catch data is stored in AFMA databases. Annotated e-monitoring data is compared to logbook data for the same shots and comparison reports are sent to fishers and stored by AFMA.

There is currently no process for incorporating and storing FIS data on the AFMA database.

## 5.2 Data access

AFMA accesses data through the Oracle Business Intelligence Enterprise Edition (OBIEE). The data is from logbooks, CDRs and observer trips.

# 6 Review

SharkRAG will annually review this plan and prioritise data needs and gaps for the species they assess. RAGs and SEMAC should consider these data needs and priorities when assessing research proposals and other information relative to the GHAT. Fishery managers must consider the balance between the risk of accepting the current state of data collection against cost of further investment required to improve data and fill the data gaps.



SESSFRAG currently holds an annual data meeting to review data summaries and strategic data issues. Outcomes of this review will then be addressed through each RAG's work plan for that year. Annual reviews will focus on ensuring that data is collected and managed within defined quality standards throughout the full data lifecycle. This includes data collection and recording, data submissions, data entry, data storage, data access, data analysis, reporting, review and planning.

## **7 Stock assessment process**

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AFMA provides the data needed for stock assessments to scientists for analysis and reporting. The analyses are then discussed by RAGs (SESSFRAG, SharkRAG, SERAG and GABRAG), which produce final stock assessment reports for quota species in the SESSF during October and November each year. AFMA produces a report in mid-December with recommended TACs and this is distributed for public comment. In February SEMAC and GABMAC have a TAC meeting and recommend TAC settings. The outcomes of the RAGs, SEMAC and GABMAC meetings as well as AFMA's report are provided to the AFMA Commission to determine TACs for the upcoming fishing season which starts 1 May each year.

### **7.1 Stock assessment timeline**

Table 4 outlines the schedule of stock assessments for each GHAT commercial species and the tier level of that stock assessment.

**Table 4. Stock assessment schedule for the 34 commercial species in the Southern and Eastern Scalefish and Shark Fishery for 2016-20\*.**

Species	MYTAC in 2016-17 season	Last Assessed	2016	2017	2018	2019	2020	AFMA management comment
Alfonsino	3rd year of a three year MYTAC	2013			3			Push back because of low catches
Bight Redfish	1st year of 5 year MYTAC	2015					1	5-year MYTAC, due 2020
Blue-Eye Trevalla	Single year TAC	2015	4					
Blue Grenadier	3rd year of a three year MYTAC	2013			1			Undercaught and above target
Blue Warehou	N/A	2014						
Deepwater Flathead	3rd year of a three year MYTAC	2013	1					
Deepwater shark east	3rd year of a three year MYTAC	2013		4				
Deepwater shark west	3rd year of a three year MYTAC	2013		4				
Elephant Fish	1 <sup>st</sup> year of a three year MYTAC	2013		4				Run Tier 4 assessments in 2017
Flathead	3 <sup>rd</sup> year of a three year MYTAC	2016	1					
Gemfish - East	N/A	2010		1				SESSFRAG recommended postponing the eastern gemfish assessment until 2017
Gemfish - west	3rd year of a three year MYTAC	2011	1/4					Reliant on stock structure report from ABARES and ability of data to inform the assessment
Gummy Shark	3rd year of a three year MYTAC	2013	1					
Jackass Morwong	1st year of a three year MYTAC	2015			1			
John Dory	2nd year of a three year MYTAC	2013		3				
Mirror Dory	Single year TAC	2015	4					
Ocean Perch	3rd year of a three year MYTAC	2013		4				SESSRAG recommended moving 'batch' Tier 4 in 2017.
Orange Roughy - south	N/A	2000						
Orange Roughy - east	N/A	2006		1				
Orange Roughy - west	N/A	2002						Limited effort, bycatch TAC
Orange Roughy - Cascade Plateau	N/A	2009						Limited data

Orange Roughy - Albany & Esp	N/A	N/A						Limited effort, bycatch TAC
Oreo Smooth - Cascade	Long term TAC (catch dependent)	2010						Limited data
Oreo Smooth - other	Long term TAC (catch dependent)	2010						Limited data
Oreo Basket	2nd year of a three year MYTAC	2013		4				Push back to 2017
Pink Ling	2nd year of a three year MYTAC	2015			1			
Redfish	N/A, bycatch TAC	2013		1				
Ribaldo	3 <sup>rd</sup> year of a three year MYTAC	2013		4				Push back to 'batch Tier 4'
Royal Red Prawn	3 <sup>rd</sup> year of a three year MYTAC	2013		4				Move back to 'batch' Tier 4
Saw Shark	Seek advice from SEMAC/stakeholders	2013		4				Run Tier 4 assessments in 2017
School Shark	N/A (Index of Abundance start 14/15)	2012			1			Potential for 2018 depending on close kin
School Whiting	Long term TAC	2009		1				Data work in 2016 including ageing issues and NSW data catch rate standardisation and ageing data
Silver Trevally	3 <sup>rd</sup> year of a three year MYTAC	2013		4				
Silver Warehou	1st year of three year MYTAC	2015			1			
			2016	2017	2018	2019		

\*Multi-year total allowable catch (MYTAC); Tier 1 stock assessment; Tier 3 stock assessment; Tier 4 stock assessment. Key GHAT species included are gummy shark, school shark, saw shark, elephant fish, blue-eye trevalla, pink ling and ribaldo.

## References

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Bergh, M., Knuckey, I., Gaylard, J., Martens, K. and Koopman, M., 2009. A revised sampling regime for the Southern and Eastern Scalefish and Shark Fishery – Final Report. AFMA Project F2008/0627. OLRAC and Fishwell Consulting. Available at: [www.afma.gov.au/wp-content/uploads/2010/07/ismp\\_sessf.pdf](http://www.afma.gov.au/wp-content/uploads/2010/07/ismp_sessf.pdf).

## Attachment 1 – Logbook data collection and methods of verification

Table 5. Gillnet Fishing Daily Fishing Log NT01B

Logbook data collected	Data verified or collected independently				
	E-monitoring	Observers	VMS	Port Sampling	Fishery Independent Surveys
<b>Logbook NT01B</b>					
<b>Fishing vessel &amp; crew details</b>					
Vessel name	✓	✓	✓	✓	✓
Voyage start date	✓	✓	✓	✓	✓
<b>Gear details</b>					
Gear type/method	✓	✓		✓*	✓
Mesh size		✓			✓
No. meshes in net drop		✓			✓
Net length		✓			✓
Net height		✓			✓
<b>Vessel activity</b>					
Inshore/Offshore		✓	✓		✓
Shot date	✓	✓	✓		✓
Start fishing time	✓	✓			✓

Start fishing position	✓	✓	✓		✓
End fishing position	✓	✓	✓		✓
Start haul time	✓	✓			✓
End haul time	✓	✓			✓
Offal discharge		✓			✓
Minimum depth	✓	✓			✓
Maximum depth	✓	✓			✓
<b>Shot details</b>					
Shot date / number	✓	✓			✓
Total gear lost (mainline length, # hooks)		✓			✓
<b>Catch Composition</b>					
Vessel name	✓	✓	✓		✓
Shot number	✓	✓			✓
Voyage ID	✓	✓			✓
Retained species weight		✓		✓	✓
Retained species piece count	✓	✓		✓	✓
Discard species weight		✓			✓
Discard species piece count	✓	✓			✓
Life status of discards		✓			✓
<b>Biological Data</b>					
Date	✓	✓			✓
Time	✓	✓			✓
Species identification	✓	✓			✓
Catch location	✓	✓	✓		✓
Life status	✓	✓			✓
Fate	✓	✓			✓
Retained species length/weight		✓		✓	✓
Discard species length/weight		✓			✓
Otolith/vertebrae		✓		✓	✓

Wildlife interactions					
Species name	✓	✓			
Number of species interacted with	✓	✓			
Date	✓	✓			
Time	✓	✓			✓
Shot number	✓	✓			✓
Latitude/Longitude	✓	✓			✓
Caught during set/haul/other	✓	✓			✓
Band or tag number		✓			✓
Life status	✓	✓			✓

\*Where only a single gear type is used in a trip.

Table 6. Line Fishing Daily Fishing Log LN01B

Logbook data collected	Data verified or collected independently				
Logbook LN01B	E-monitoring	Observers	VMS	Port Sampling	Fishery Independent Surveys
<b>Fishing vessel &amp; crew details</b>					
Vessel name	✓	✓	✓	✓	✓
Voyage start date	✓	✓	✓	✓	✓
<b>Gear details</b>					
Gear type/method	✓	✓		✓*	✓
Mainline length on drum		✓			✓
IWL (grams/metre)		✓			✓
Mainline diameter		✓			✓
Mainline type of connector		✓			✓
Branchline length		✓			✓

Logbook data collected	Data verified or collected independently				
Branchline type of connector		✓			✓
Snood length		✓			✓
Snood diameter		✓			✓
Snood type of connector		✓			✓
Hook type		✓			✓
Hook size		✓			✓
Tori pole height above sea level		✓			✓
Tori line length		✓			✓
Diameter of tori line		✓			✓
No. of streamer pairs		✓			✓
Tori pole alternatives		✓			✓
<b>Vessel activity</b>					
Inshore/Offshore		✓	✓		✓
Shot date	✓	✓	✓		✓
Start fishing time	✓	✓			✓
End fishing time	✓	✓			✓
Start fishing position	✓	✓	✓		✓
End fishing position	✓	✓	✓		✓
Start haul time	✓	✓			✓
End haul time	✓	✓			✓
Offal discharge		✓			✓
Minimum depth	✓	✓			✓
Maximum depth	✓	✓			✓
<b>Shot details</b>					
Shot date / number	✓	✓			✓
Mainline length used		✓			✓
Total hooks per shot		✓			✓

Logbook data collected	Data verified or collected independently				
Number of bubbles set		✓			✓
Number of beacons set		✓			✓
Seabird mitigation devices used	✓	✓			✓
Tori line deployment	✓	✓			✓
Bait type		✓			✓
Bait amount		✓			✓
Number of line lifts (dropline only)		✓			✓
Average hooks per line (dropline only)		✓			✓
Total gear lost (mainline length, # hooks)		✓			✓
<b>Catch Composition</b>					
Vessel name	✓	✓	✓	✓	✓
Shot number	✓	✓			✓
Voyage ID	✓	✓			✓
Retained species weight		✓		✓	✓
Retained species piece count	✓	✓		✓	✓
Discard species weight		✓			✓
Discard species piece count	✓	✓			✓
Life status of discards		✓			✓
<b>Biological Data</b>					
Date	✓	✓			✓
Time	✓	✓			✓
Species identification	✓	✓			✓
Catch location	✓	✓	✓		✓
Life status	✓	✓			✓
Fate	✓	✓			✓
Retained species length/weight		✓		✓	✓
Discard species length/weight		✓			✓



Logbook data collected	Data verified or collected independently				
Otolith/vertebrae		✓		✓	✓
<b>Wildlife interactions</b>					
Species name	✓	✓			✓
Number of species interacted with	✓	✓			✓
Date	✓	✓			✓
Time	✓	✓			✓
Shot number	✓	✓			✓
Latitude/Longitude	✓	✓			✓
Caught during set/haul/other	✓	✓			✓
Band or tag number		✓			✓
Life status	✓	✓			✓

## Appendix 1 – Blue-eye trevalla data summary

Table 7. Blue eye trevalla data summary

<b>Stock assessment &amp; indicator of abundance</b>	Tier 1, last assessed 2015, <u>previously tier 4</u>	
	The stock assessment requires catch and effort data, and length and age data (from otoliths) for both male and female fish. Estimates of the size and numbers of discards are required to calculate a discard rate	
<b>Data needed for stock assessment</b>	<b>Data input</b>	<b>Current collection method</b>
	Length-frequency	AFMA Observer Program
	Otoliths	AFMA Observer Program
	Sex ratio	AFMA Observer Program
	Catch composition	Logbooks/E-monitoring
	Vessel activity	Logbooks
	Shot details	Logbooks
	Gear details	Logbooks

Table 8. Blue eye trevalla data requirements for stock assessments. ✓ = all data for that year is monitored and collected.

Data required	2015	2016	2017	2018	2019	2020
Catch	✓	✓	✓	✓	✓	✓
Effort	✓	✓	✓	✓	✓	✓
Length & sex			1200	1200	1200	1200
Otolith			750	750	750	750
Stock assessment schedule	Tier 4	TBC	TBC	TBC	TBC	TBC

**Table 9. Proposed sampling regime for blue-eye trevalla caught by auto-longline in the Gillnet, Hook and Trap sector.**

Time	Collection zone	Length sample size
Jul-Sep	20	75
	30	75
	40	75
	50	75
Oct-Dec	20	75
	30	75
	40	75
	50	75
Jan-Mar	20	75
	30	75
	40	75
	50	75
Apr-Jun	20	75
	30	75
	40	75
	50	75
<b>TOTAL (per year)</b>	<b>4 collection zones (20, 30, 40 &amp; 50)</b>	<b>1200</b>

**Table 10. Blue eye trevalla research needs and projects; multi-year TAC, MAC, RAG and logbook information.**

<b>Research needs</b>	<i>Southern and Eastern Scalefish and Shark Fishery 2016-17 Annual Research Plan</i>
<b>Research projects</b>	<p><u>Blue eye trevalla catch per unit effort standardisation</u></p> <p>The project will improve understanding of the CPUE variation for blue eye trevalla in the SESSF, and this information will be used to inform stock assessments.</p> <p>(Project number: RR2015/0820; principle investigator: Dr Malcom Haddon, CSIRO; completion date: 15/09/15)</p>
<b>Multi-year TAC</b>	No
<b>SESSF sector</b>	Gillnet, Hook and Trap Sector (primary sector) Commonwealth Trawl Sector
<b>RAG</b>	SERAG
<b>MAC</b>	SEMAC
<b>Logbook</b>	<p>Line Fishing Daily Fishing Log LN01B</p> <p>Gillnet Fishing Daily Fishing Log NT01B</p> <p>Eastern Finfish Trawl Daily Fishing Log EFT01B</p> <p>Eastern Finfish Trawl Daily Fishing Log EFT01C</p>

## Appendix 2 – Elephant fish data summary

Table 11. Elephant fish data summary

<b>Stock assessment &amp; indicator of abundance</b>	Tier 4, last assessed 2015 The stock assessment uses CPUE as an indicator of stock status relevant to a reference period.	
<b>Data needed for stock assessment</b>	<b>Data needed</b>	<b>Current collection method</b>
	Catch composition	Logbooks/E-monitoring
	Vessel activity	Logbooks
	Shot details	Logbooks
	Biological data	Logbooks
	Gear details	Logbooks

Table 12. Elephant fish data requirements for stock assessments. ✓ = all data in that year is monitored and collected for the Tier 4 stock assessment.

Data required	2015	2016	2017	2018	2019	2020
<b>Catch</b>	✓	✓	✓	✓	✓	✓
<b>Effort</b>	✓	✓	✓	✓	✓	✓
<b>Stock assessment schedule</b>	Tier 4	TBC	TBC	TBC	TBC	TBC

Table 13. Elephant fish research needs and projects; multi-year TAC and MAC, RAG and logbook information.

<b>Research needs</b>	<i>Southern and Eastern Scalefish and Shark Fishery 2016-17 Annual Research Plan</i>
<b>Research projects</b>	N/A
<b>Multi-year TAC</b>	Yes, 3 years
<b>SESSF sector</b>	Gillnet, Hook and Trap sector
<b>RAG</b>	SharkRAG
<b>MAC</b>	SEMAC
<b>Logbook</b>	Gillnet Fishing Daily Fishing Log NT01B Line Fishing Daily Fishing Log LN01B

## Appendix 3 – Gummy shark data summary

Table 14. Gummy shark data summary

<b>Stock assessment &amp; indicator of abundance</b>	Tier 1, last assessed 2013	
	The stock assessment requires length and age data (from vertebrate samples) that needs to have temporal and spatial variability and samples need to be collected from both gillnet and longline methods. The indicator of abundance is pup production.	
<b>Data needed for stock assessment</b>	<b>Data needed</b>	<b>Current collection method</b>
	Length-frequency	AFMA Observer Program
	Vertebrae	AFMA Observer Program
	Catch composition	Logbooks/E-monitoring
	Vessel activity	Logbooks
	Shot details	Logbooks
	Biological data	Logbooks
	Gear details	Logbooks
Sex ratio	AFMA Observer Program	

Table 15. Gummy shark stock assessment data requirements and data collection schedule and the target sample for the observer program. ✓ = all data in that year is monitored and collected for the Tier 1 stock assessment; F = female; M = male.

Data required	2015	2016	2017	2018	2019	2020
<b>Catch</b>	✓	✓	✓	✓	✓	✓
<b>Effort</b>	✓	✓	✓	✓	✓	✓
<b>Location</b>	✓	✓	✓	✓	✓	✓
<b>Length &amp; sex</b>			2700	2700	2700	2700
<b>Vertebrate sample size</b>			700	700	700	700
<b>Stock assessment schedule</b>	x	Tier 1	x	x	TBC	TBC

**Table 16. Proposed gummy shark yearly sampling schedule for length and vertebrae data collection. (SA = South Australia; TAS = Tasmania; BS = Bass Strait).**

Time of year (Quarter)	Zone (stocks)	Port	Length samples	Vertebrae samples	# trips to target
Jul - Sep	SA	Adelaide/Robe	150 gillnet 100 longline	50	1 gillnet trip 1 longline trip
	Bass Strait	Lakes/San Remo	200 gillnet 0 longline	75	1 gillnet trip
	TAS	Triabunna/Hobart	125 gillnet 100 longline	50	1 gillnet trip 1 longline trip
Oct - Dec	SA	Adelaide/Robe	150 gillnet 100 longline	50	1 gillnet trip 1 longline trip
	Bass Strait	Lakes/San Remo	200 gillnet 0 longline	75	1 gillnet trip
	TAS	Triabunna/Hobart	125 gillnet 100 longline	50	1 gillnet trip 1 longline trip
Jan - Mar	SA	Adelaide/Robe	150 gillnet 100 longline	50	1 gillnet trip 1 longline trip
	Bass Strait	Lakes/San Remo	200 gillnet 0 longline	75	1 gillnet trip
	TAS	Triabunna/Hobart	125 gillnet 100 longline	50	1 gillnet trip 1 longline trip
Apr - Jun	SA	Adelaide/Robe	150 gillnet 100 longline	50	1 gillnet trip 1 longline trip
	Bass Strait	Lakes/San Remo	200 gillnet 0 longline	75	1 gillnet trip
	TAS	Triabunna/Hobart	125 gillnet 100 longline	50	1 gillnet trip 1 longline trip
<b>Total per year</b>	3 collection zones (SA, Bass Strait, TAS)		2700 total - 1900 gillnet - 800 longline	700	24 trips - 16 gillnet trips - 8 longline trips

Note this sampling regime is linked to the sampling regime for School shark.

**Table 17. Gummy shark research needs and projects; multi-year TAC and MAC, RAG and logbook information.**

<b>Research needs</b>	<i>Southern and Eastern Scalefish and Shark Fishery 2016-17 Annual Research Plan</i>
<b>Research projects</b>	N/A
<b>Multi-year TAC</b>	Yes, 3 years
<b>SESSF sector</b>	Gillnet, Hook and Trap Sector (primary sector) Commonwealth Trawl Sector Great Australian Bight Trawl Sector
<b>RAG</b>	SharkRAG
<b>MAC</b>	SEMAC
<b>Logbook</b>	Gillnet Fishing Daily Fishing Log NT01B Line Fishing Daily Fishing Log LN01B

## Appendix 4 – Pink ling data summary

Table 18. Pink ling data summary

<b>Stock assessment &amp; indicator of abundance</b>	Tier 1, last assessed 2013	
	The stock assessment requires catch and effort data, and length and age data (from otoliths) for both male and female fish. The current assessment for pink ling assumes that fish caught west of Bass Strait are a separate stock to those caught east of Bass Strait. Estimates of the size and numbers of discards are required to calculate a discard rate.	
<b>Data needed for stock assessment</b>	<b>Data needed</b>	<b>Current collection method</b>
	Length-frequency	AFMA Observer Program
	Otoliths	AFMA Observer Program
	Sex ratio	AFMA Observer Program
	Catch composition	Logbooks/E-monitoring
	Vessel activity	Logbooks
	Shot details	Logbooks
	Gear details	Logbooks

Table 19. Pink ling data requirements and stock assessment schedule. ✓ = all data in that year is monitored and collected for the Tier 1 stock assessment.

Data required	2015	2016	2017	2018	2019	2020
Catch	✓	✓	✓	✓	✓	✓
Effort	✓	✓	✓	✓	✓	✓
Length & sex			700	700	700	700
Otolith			400	400	400	400
Stock assessment schedule	x	Tier 1	x	x	TBC	TBC

Table 20. Proposed sampling regime for pink ling caught by auto-longline in the Gillnet, Hook and Trap sector.

Time	Collection zone	Length sample size
Jul-Sep	20	45
	30	45
	40	45
	50	45
Oct-Dec	20	45
	30	45
	40	45
	50	45
Jan-Mar	20	45
	30	45
	40	45
	50	45
Apr-Jun	20	45
	30	45
	40	45
	50	45
<b>TOTAL (per year)</b>	<b>4 collection zones (20, 30, 40 &amp; 50)</b>	<b>720</b>

**Table 21. Pink ling research needs and projects; multi-year TAC and MAC, RAG and logbook information.**

<b>Research needs</b>	<i>Southern and Eastern Scalefish and Shark Fishery 2016-17 Annual Research Plan</i>
<b>Research projects</b>	N/A
<b>Multi-year TAC</b>	Yes, 3 years
<b>SESSF sector</b>	Commonwealth Trawl Sector (primary sector) Gillnet, Hook and Trap Sector
<b>RAG</b>	SERAG
<b>MAC</b>	SEMAC
<b>Logbook</b>	Line Fishing Daily Fishing Log LN01B Gillnet Fishing Daily Fishing Log NT01B Eastern Finfish Trawl Daily Fishing Log EFT01B Eastern Finfish Trawl Daily Fishing Log EFT01C



## Appendix 5 – Sawshark data summary

Table 22. Sawshark data summary

<b>Stock assessment &amp; indicator of abundance</b>	Tier 4, last assessed 2013 The stock assessment uses CPUE as an indicator of stock status relevant to a reference period.	
<b>Data needed for stock assessment</b>	<b>Data needed</b>	<b>Current collection method</b>
	Catch composition	Logbooks/E-monitoring
	Vessel activity	Logbooks
	Shot details	Logbooks
	Biological data	Logbooks
	Gear details	Logbooks

Table 23. Sawshark stock assessment data requirements and schedule. ✓ = all data is required.

Data required	2015	2016	2017	2018	2019	2020
Catch	✓	✓	✓	✓	✓	✓
Effort	✓	✓	✓	✓	✓	✓
Stock assessment schedule	TBC	TBC	TBC	TBC	TBC	TBC

Table 24. Sawshark research needs and projects; multi-year TAC and MAC, RAG and logbook information.

<b>Research needs</b>	<i>Southern and Eastern Scalefish and Shark Fishery 2016-17 Annual Research Plan</i>
<b>Research projects</b>	N/A
<b>Multi-year TAC</b>	Seeking advice
<b>SESSF sector</b>	Gillnet, Hook and Trap Sector (primary sector) Commonwealth Trawl Sector Great Australian Bight Trawl Sector
<b>RAG</b>	SharkRAG
<b>MAC</b>	SEMAC
<b>Logbook</b>	Gillnet Fishing Daily Fishing Log NT01B Line Fishing Daily Fishing Log LN01B Eastern Finfish Trawl Daily Fishing Log EFT01B Eastern Finfish Trawl Daily Fishing Log EFT01C

## Appendix 6 – School shark data summary

AFMA implemented a rebuilding strategy for school shark in 2008 that limits fishing mortality to levels that support rebuilding. This includes measures preventing targeted fishing, an incidental bycatch TAC and measures requiring the release of all school shark caught alive.

Table 25. School shark data summary

<b>Stock assessment &amp; indicator of abundance</b>	Tier 1, last assessed 2012	
	The stock assessment requires all catch and effort data, and length and age data from vertebrate samples. The length and age data needs to have temporal and spatial variability and samples need to be collected from both gillnet and longline methods.	
Currently pup production is the indicator of abundance, however, in the future close kin genetics may be used as the indicator of abundance.		
<b>Data needed for stock assessment</b>	<b>Data needed</b>	<b>Current collection method</b>
	Length-frequency	AFMA Observer Program
	Vertebrae	AFMA Observer Program
	Catch composition	Logbooks/E-monitoring
	Vessel activity	Logbooks
	Shot details	Logbooks
	Gear details	Logbooks
Sex ratio	AFMA Observer Program	

Table 26. School shark data requirements and stock assessment schedule

Data required	2015	2016	2017	2018	2019	2020
Catch	✓	✓	✓	✓	✓	✓
Effort	✓	✓	✓	✓	✓	✓
Location	✓	✓	✓	✓	✓	✓
Length & sex			2700	2700	2700	2700
Vertebrate sample size			700	700	700	700
Stock assessment schedule	x	x	x	Tier 1	x	x

**Table 27. School shark yearly sampling schedule for length and vertebrae data collection. (SA = South Australia; TAS = Tasmania; BS = Bass Strait).**

Time (Quarter)	Zone	Port	Length samples	Vertebrae samples	# trips to target
Jul - Sep	SA	Adelaide/Robe	100 Gillnet 100 Longline	50	1 gillnet trip 1 longline trip
	Bass Strait	Lakes/San Remo	250 Gillnet 0 Longline	75	1 gillnet trip
	TAS	Devonport/Triabunna	125 Gillnet 100 Longline	50	1 gillnet trip 1 longline trip
Oct - Dec	SA	Adelaide/Robe	100 Gillnet 100 Longline	50	1 gillnet trip 1 longline trip
	Bass Strait	Lakes/San Remo	250 Gillnet 0 Longline	75	1 gillnet trip
	TAS	Devonport/Triabunna	125 Gillnet 100 Longline	50	1 gillnet trip 1 longline trip
Jan - Mar	SA	Adelaide/Robe	100 Gillnet 100 Longline	50	1 gillnet trip 1 longline trip
	Bass Strait	Lakes/San Remo	250 Gillnet 0 Longline	75	1 gillnet trip
	TAS	Devonport/Triabunna	125 Gillnet 100 Longline	50	1 gillnet trip 1 longline trip
Apr - Jun	SA	Adelaide/Robe	100 Gillnet 100 Longline	50	1 gillnet trip 1 longline trip
	Bass Strait	Lakes/San Remo	250 Gillnet 0 Longline	75	1 gillnet trip
	TAS	Devonport/Triabunna	125 Gillnet 100 Longline	50	1 gillnet trip 1 longline trip
<b>Total per year</b>	3 collection zones (SA, Bass Strait, TAS)		2700 total - 1900 gillnet - 800 longline	700	16 gillnet trips 8 longline trips

Note this sampling regime is linked to the sampling regime for Gummy shark.

**Table 28. School shark research needs and projects; multi-year TAC and MAC, RAG and logbook information.**

<b>Research needs</b>	<i>Southern and Eastern Scalefish and Shark Fishery 2016-17 Annual Research Plan</i>
<b>Research projects</b>	<p><u>Close kin genetic project</u></p> <p>CSIRO has commenced a project to independently measure the abundance of school shark and results are due in 2017 and will support a new Tier 1 stock assessment scheduled for 2018.</p> <p>Since 1997 operators have actively avoided catching school shark. This means that the CPUE is no longer a robust index of abundance for school shark, and the stock assessment model is projecting the population into the future after 1997.</p>
<b>Multi-year TAC</b>	No
<b>SESSF sector</b>	Gillnet, Hook and Trap Sector (primary sector)
<b>RAG</b>	SharkRAG
<b>MAC</b>	SEMAC
<b>Logbook</b>	Gillnet Fishing Daily Fishing Log NT01B Line Fishing Daily Fishing Log LN01B

## Appendix 7 – Ribaldo summary

Table 29. Ribaldo data summary

<b>Stock assessment &amp; indicator of abundance</b>	Teir 4, last assessed 2013. The length and age data needs to have temporal and spatial variability.	
<b>Data needed for stock assessment</b>	<b>Data needed</b>	<b>Current collection method</b>
	Length-frequency	AFMA Observer Program
	Otoliths	AFMA Observer Program
	Sex Ratio	AFMA Observer Program
	Catch composition	Logbooks/E-monitoring
	Vessel activity	Logbooks
	Shot details	Logbooks
	Biological data	Logbooks
	Gear details	Logbooks

Table 30. Ribaldo stock assessment data requirements and data collection schedule and the target sample for the observer program. ✓ = all data in that year is monitored and collected for the Tier [X] stock assessment.

Data required	2015	2016	2017	2018	2019	2020
Catch	✓	✓	✓	✓	✓	✓
Effort	✓	✓	✓	✓	✓	✓
Length & sex			1000	1000	1000	1000
Otolith			300	300	300	300
Stock assessment schedule	TBC	TBC	TBC	TBC	TBC	TBC

Table 31. Proposed sampling regime for ribaldo caught by auto-longline in the Gillnet, Hook and Trap sector.

Time	Collection zone	Length sample size
Jul-Sep	20	63
	30	63
	40	63
	50	63
Oct-Dec	20	63
	30	63
	40	63
	50	63
Jan-Mar	20	63
	30	63
	40	63
	50	63
Apr-Jun	20	63
	30	63
	40	63
	50	63
<b>TOTAL (per year)</b>	<b>4 collection zones (20, 30, 40 &amp; 50)</b>	<b>1000</b>

**Table 32. [Species] research needs and projects; multi-year TAC and MAC, RAG and logbook information.**

<b>Research needs</b>	<i>Southern and Eastern Scalefish and Shark Fishery 2016-17 Annual Research Plan</i>
<b>Research projects</b>	N/A
<b>Multi-year TAC</b>	Yes, 3 years
<b>SESSF sector</b>	Commonwealth Trawl Sector (primary sector) Gillnet, Hook and Trap Sector
<b>RAG</b>	SERAG
<b>MAC</b>	SEMAC
<b>Logbook</b>	Line Fishing Daily Fishing Log LN01B Gillnet Fishing Daily Fishing Log NT01B Eastern Finfish Trawl Daily Fishing Log EFT01B Eastern Finfish Trawl Daily Fishing Log EFT01C