

Sustainable Fisheries Strategy

2017–2027

Fisheries Queensland Monitoring and Research Plan

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Summary

The Queensland Sustainable Fisheries Strategy: 2017-2027 sets out the government's reform agenda for the next ten years. The strategy sets out clear targets to be achieved by 2020 and 2027 and a range of actions to deliver on the vision and targets. There are 33 actions across 10 reform areas.

One of the foundational reforms is a commitment to improve existing programs of fisheries monitoring and research. This commitment recognises the need for accurate and timely data as a foundation of sustainable fisheries management. Stakeholder feedback received during development of the strategy almost universally called for urgent investment in new and improved data collection strategies, to address existing data gaps and improve public confidence in the information being used to manage Queensland's fish stocks. The government is investing an additional \$20 million over three years which will help support additional biological monitoring, trials of novel monitoring technology, new social and economic monitoring programs, improved data validation and ecological risk assessments.

This monitoring and research plan:

1. **Provides a framework** for monitoring and research reforms by:
 - describing the context of existing government monitoring and research programs,
 - explaining how data collected in these programs are subsequently assessed and used to support fishery management,
 - identifying key research themes required to support management reform proposals in the strategy, and
 - identifying the key drivers for monitoring and research.
2. **Guides decisions** about monitoring and research reforms by:
 - formally documenting the processes used to identify information needs,
 - identifying important data gaps, and
 - setting out clear criteria for prioritising investment for improved monitoring and research.

The Monitoring and Research Plan is not a static document. This version of the plan identifies immediate priority needs for investment in monitoring and research for 2017/18. Subsequent annual reviews of this plan will incorporate additional monitoring and research priorities, which will be developed as other deliverables in the strategy (e.g. harvest strategies) are rolled out. This will ensure a comprehensive information base underpins the reforms in the Sustainable Fisheries Strategy.

The development of a comprehensive framework to drive monitoring and research reform supports the commitment for government's monitoring and research priorities to be shared and integrated. Monitoring and research initiatives will be delivered collaboratively with other government agencies, external research providers, industry, and citizen science programs.

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1 Introduction

The Queensland Government is committed to ensuring fisheries resources are managed in a sustainable and responsible manner that recognises the interests of all Queenslanders. In 2016, the government released the Green paper on fisheries management reform in Queensland, which proposed a new vision for sustainable fisheries management, described a range of challenges and proposed key areas for reform. Feedback from the green paper was incorporated into the Queensland Sustainable Fisheries Strategy: 2017-2027, which was released in June 2017 and sets out the government's reform agenda for the next ten years. The strategy includes clear targets to be achieved by 2020 and 2027, and a range of actions to deliver on the vision. There are 33 actions across 10 reform areas.

One of the 10 areas of reform is a commitment to improve existing programs of monitoring and research. This commitment recognises the need for accurate and timely data as a foundation of sustainable fisheries management. The first action to deliver this reform is to:

Develop a fisheries monitoring and research plan to outline standards for improved data collection and guide the identification of data needs resources and priorities to support implementation of the Queensland Sustainable Fisheries Strategy: 2017-2027.

2 Objectives of this Plan

The objectives of this Plan are to:

- Align monitoring and research with management needs and known information gaps;
- Inform investment decisions, including looking for alternative ways to collect information and using new technology to ensure cost-effectiveness;
- Improve communication about Fisheries Queensland's monitoring programs;
- Share information and make data accessible to all stakeholders;
- Develop partnerships and co-investment opportunities with other monitoring and research providers.

3 How this plan will be used?

3.1 Setting monitoring and research priorities

Aligning monitoring and research with management needs and known information gaps is critical to making informed decisions. This plan sets clear priorities for monitoring and research to maximise input into the fishery assessment processes that inform management decisions.

Capitalising on partnerships and co-investment opportunities with other monitoring and research providers, including sharing information, will ensure all available information is considered in the decision making process.

3.2 Informing investment

Maximising outputs from monitoring and research means knowing where to invest. It also means being smarter with the way we do business, look at alternative ways to collect information, and using technology to integrate information collection systems providing seamless, timely, validated and reliable information.

The priorities for monitoring and research, need to be determined for both the short and long term. Initially the plan focuses on short term investment priorities for 2017/2018. These priorities will be reviewed every twelve months to accompany the roll out of other key reforms in the strategy, which will inform long-term monitoring and research needs.

3.3 Communicating the program and collaborating with others

DAF currently collects a significant body of data and other information relating to fisheries, however it is acknowledged that we may not have communicated this well or provided all of this information publically. Additional resources will be invested into developing online reporting tools to provide timely and easy to understand information to everyone.

Clear communication of the monitoring and research program will increase stakeholder awareness of the role monitoring plays in assessing the sustainable use of fisheries resources, in maintaining profitable primary industries and in conservation of biodiversity. Understanding the information DAF collects and how it is used will improve confidence in the management decision making process.

4 Who will use this plan?

This Plan will be used by DAF to inform monitoring and research investment. The plan will assist DAF to consider how improved monitoring and research programs can complement the strategic research plans of key partners, including:

- the Fisheries Research Development Corporation (FRDC), which coordinates fisheries research;
- the Great Barrier Reef Marine Park Authority (GBRMPA), which is leading development of the Reef Integrated Monitoring and Research Program (RimRep);
- the Department of Environment and Heritage Protection and regional waterway partnerships that deliver regional waterway health report cards; and
- universities, that deliver a range of research projects in collaboration with the Department.

It will also be informative in developing strategic operational plans within the areas of data collection, biological monitoring, the collection of social and economic data and recreational fishing information.

Fishery working groups will use this plan to identify the monitoring and research priorities for their fishery of interest and when considering appropriate indicators in the development of harvest strategies.

Other government agencies, external monitoring and research providers and other interested stakeholders will also find this plan useful for targeting their own fisheries management priorities and identifying opportunities for collaboration with DAF.

5 Opportunities

Opportunities for integrating monitoring and research programs, and collaboration with external providers, have grown substantially over the past decade with the development of regional report cards, investment into additional monitoring of the Great Barrier Reef, advances in citizen science and independent recreational fishing organisations collecting biological and social information. Integrating with these other programs and building on these data sources by collecting complementary data will provide fishery managers with a vast array of additional information on which to base decisions.

Recent advancements in technology provide endless possibilities in the monitoring and research space from how information is collected and provided to DAF through to fully automating commercial fishing data collection or the data assessment process. Mobile phone apps, robotic vision and fishing gear or vessel tracking systems can all play a role in providing real time, validated information.

6 Guiding principles

Initially, this plan focuses on guiding investment for 2017/2018, with a focus on delivering better data to underpin evidence based fisheries management by 2020. As delivery of the Strategy evolves through to 2027, so will this Plan to ensure the continued delivery of a robust monitoring and research program that builds stakeholder confidence in management decisions.

The following guiding principles will inform our prioritisation of monitoring and research activities.

Guiding principle	Context
Focus on end user needs	Monitoring and research will provide timely, accurate and reliable information that is outcome focused. Prioritisation should identify what needs to be done, not just what can be done or what we have the funding to do.
Synthesise and integrate information and knowledge	Fisheries data must be integrated with other monitoring and research programs, both internally and externally, to ensure all available information is being used as the basis for management decisions. Likewise, providing fisheries data in an open transparent way will allow other monitoring and reporting organisations to utilise DAF information.
Build partnerships and collaboration	Fisheries information is collected by a number of sources outside of DAF. Building effective partnerships and collaborating with other research providers will deliver cost effective monitoring and research programs that meet a wide range of stakeholder needs.
Promote innovation	To achieve the objectives of this plan, it is necessary to explore innovative and novel ways to collect information. Facilitating innovation pathways for small business and industry to be actively involved in the development of solutions will provide fresh new approaches to addressing old problems.

7 Elements of Queensland's Fisheries Monitoring Program

Fisheries Queensland has been undertaking routine monitoring of Queensland's fisheries for almost 30 years and has collected a significant body of data and information that informs fisheries management. There are a number of elements of the program, as outlined in the conceptual model (Figure 1). Monitoring programs collect a range of data including catch, effort, size and age of fish, social and economic indicators and compliance rates. This information is quality assured and made available for a number of assessment processes ranging from annual stock status reporting to quantitative stock assessment modelling. Assessment and monitoring information is then reported through a number of platforms and informs management decisions, investment, enforcement and compliance.

The monitoring programs in Figure 1 outline the foundational monitoring that has been underway for a number of years, and also highlights the additional investment being made into assessment and monitoring as part of the Sustainable Fisheries Strategy.



7.1 Monitoring and research data

Fisheries monitoring and research data can be categorised into three broad categories:

- **Fishing activity data** – The collection of information regarding the activity of fishing including how and where fish are caught, the number of commercial fishing licences, the amount of catch and effort and fishing location. This includes:
 - For commercial fishers: commercial fisher logbooks, quota reporting, vessel tracking, licensing and compliance data
 - For recreational fishers: charter logbooks, voluntary diary program, state-wide telephone surveys and recreational boat ramp surveys
 - For Traditional fishers: we currently have little understanding of how much is taken for traditional purposes, by which communities, and using which methods.
- **Biological monitoring and research** – The research into and collection of information about the fish themselves, or other animals affected by fishing operations. This includes:
 - biological information on age, length and sex from fish frames that are donated by fishers or processing facilities or collected through boat ramp surveys,
 - fishery independent monitoring.
- **Social and economic data** – The research into and collection of social information such as fisher enjoyment or satisfaction, economic information such as commercial catch prices, employment and flow on benefits to the broader community. This includes:
 - estimates on the level of participation in recreational fishing, fisher satisfaction and a modified travel cost method to gain an understanding of the value of recreational fishing
 - an expanded social and economic data collection program will be designed and rolled out from 17/18

7.2 Assessment and reporting

Fisheries data is used in a number of assessment processes:

Assessment type	Purpose	Output
Stock status reporting	Provides an overall status assessment of key fish stocks using multiple lines of evidence	Classification (e.g. sustainable, depleting, recovering or depleted)
Ecological risk assessments	Assesses the risks the activity of fishing poses to the broader ecosystem, including non-target and protected species	Risk categories
Stock assessments	Uses quantitative stock models to provide an assessment of the stock	Biomass estimates, Maximum sustainable yield, standardised catch rates etc.
Rapid assessments	As per stock assessments, but with regularly updated data without changing the model to better understand trends	Regular updated biomass estimates, Maximum sustainable yield, standardised catch rates etc.

Assessment type	Purpose	Output
Management strategy evaluation	Simulates the impact management changes might have on a fishery to better understand implications of options	Preferred management options
Monitoring program evaluation	Review monitoring program sampling design to ensure data collection is representative and appropriate for the species	Appropriate indices

Reporting of fisheries information is currently in a number of formats including searchable online databases (e.g. Qfish), static online reports (e.g. fisheries summery reports) and hard copy reports, which are prepared to meet specific needs (e.g. Federal government fishery accreditation). However, this does not provide all the data DAF collects to everyone. The development of an online dashboard reporting tool to display up to date information at the fishery and/or species level will be developed to make access to information easy. This tool will be user friendly and informative for both fisheries managers and the general public and other monitoring and reporting programs.

7.3 Integrated monitoring and assessment

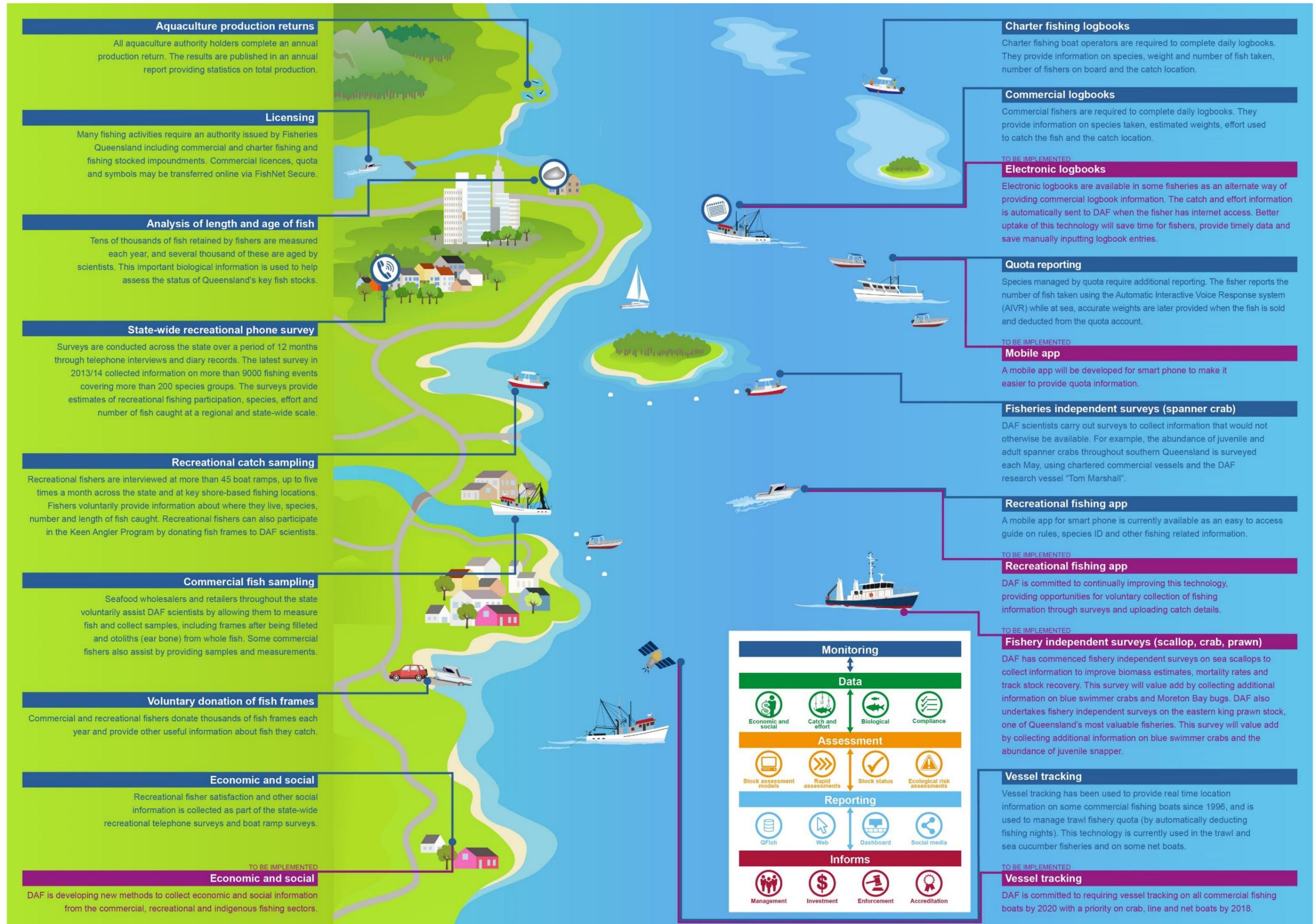
Fisheries data collected by DAF should be integrated with other monitoring and research programs to ensure management decisions are based on all of the available information. Providing fisheries data in a more open and transparent way will also allow other monitoring programs to more readily utilise DAF information. Where possible DAF aims to proactively support external programs and information exchange.

Fisheries data will be made more accessible through online dashboards and more user friendly web material. This data and information can be used for programs such as:

- The Reef Integrated Monitoring and Reporting Program (led by GBRMPA)
- The Great Barrier Reef Outlook Report (led by GBRMPA)
- Regional waterway health report cards (led by EHP)
- State of the environment reporting (led by EHP)
- Universities and other research providers
- Citizen science programs

DAF will only share personal information it collects in accordance with the *Information Privacy Act 2009*.

Figure 1. Fisheries Queensland monitoring program overview



8 Process for identifying monitoring and research priorities

A three stage process has been developed to identify, prioritise and review fisheries monitoring and research priorities. This process will be repeated annually to ensure emerging information needs are incorporated.

8.1 Stage 1: Identifying monitoring and research needs

There are a number of existing processes that have been used to identify priority areas for improved monitoring and research. These processes are described in Table 1 below

Table 1. Processes used to identify priority monitoring and research needs

Process	Description
EPBC Approvals	Fisheries that export product and/or interact with listed threatened species in Commonwealth waters require approval under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> . These approvals are subject to conditions, which can include specific requirements for additional and/or improved monitoring and research.
Status of Fish Stocks (SAFS) reports	The sustainability status of key fish stocks in Queensland are reviewed annually using methods adopted by all states and territories in the Status of Australian Fish Stocks (SAFS) process. The SAFS process includes a formal assessment of all available data and other information to classify the status each stock and highlight stocks with emerging sustainability concerns. DAF conducts an annual review of the SAFS outcomes to identify data gaps and priority information needs for these species.
Ecological Risk Assessments	DAF prepares Ecological Risk Assessments for key fisheries, including risks to target species, by-product species, by-catch and the environment. The Sustainable Fisheries Strategy commits to delivering ERA's for priority fisheries by 2020, followed by the remaining fisheries. The ERA's will clarify risks associated with fishing practices and may identify priority monitoring and research needs to help reduce these risks.
Stock Assessments	Formal stock assessments are already prepared for some key commercial species in Queensland. The Sustainable Fisheries Strategy commits to delivering more regular stock assessments for key stocks. Stock assessment reports usually identify data gaps and include recommendations for improved monitoring and research on the target stock.
DAF workshop	For the 2017/18 year an internal DAF workshop was convened to collate research and monitoring needs identified by the DAF fishery monitoring, assessment, research and data teams and the fishery managers. In recognition of the importance of the Great Barrier Reef, a representative from the Great Barrier Reef Marine Park Authority attended this workshop.
Fishery manager meetings	Separately to the DAF workshop, fishery managers were asked to report on the immediate research and monitoring needs for key fisheries and identify likely information needs for developing harvest strategies.
Fishery working groups	Fishery working groups will be convened for key fisheries in 2017 to provide operational advice and participate in development of harvest strategies. Harvest strategies will define data requirements necessary to set catch limits and develop fishery indicators.

8.2 Stage 2: Prioritise monitoring and research needs

Programs for improving monitoring and research need to be cost-effective and achievable. A benefit versus feasibility analysis has been developed to assist in prioritising the monitoring and research needs that are identified in Stage 1. The criteria aim to deliver on the key objectives, and to follow the guiding principles identified in this plan.

Benefit criteria

High

- The proposed monitoring or research relates to a fish species or stock with immediate sustainability concern (e.g. the species or stock has been classified as depleted, depleting or recovering in the Status of Australian Fish Stock (SAFS) or Queensland stock status process).
- The proposed monitoring or research relates to a key target commercial species that has been assessed as high risk in an Ecological Risk Assessment (ERA).
- The proposed monitoring or research meets three or more medium priority categories described below.

Medium

- The proposed monitoring or research is required to inform immediate management decisions, for the development of a harvest strategy, or for informing a fisheries performance against an indicator in a harvest strategy.
- The proposed monitoring or research is a requirement to address a commonwealth government Wildlife Trade Operation (WTO) condition imposed under the EPBC Act for maintaining accreditation.
- The proposed monitoring and research relates to a species assessed as high risk in an Ecological Risk Assessment, which is not a target species for the fishery.
- The proposed monitoring or research will address a known information gap that is required for informed decision making, or will maximise effective use of information currently collected.
- The proposed monitoring or research offers a high level of public value (e.g. the information is required to satisfy broader stakeholder expectations or information needs and can be done so in a cost effective way).
- The proposed monitoring or research integrates and synthesises current knowledge and information between business groups within DAF or external agencies including (but not limited to) the Great Barrier Reef Marine Park Authority, state Marine Parks and regional report card agencies.
- The proposed monitoring or research will address cross-jurisdictional or multiple jurisdiction needs for informed fisheries management decision making.

Low

- Does not fit this criteria.

Feasibility criteria

High

- The proposed monitoring or research can be conducted within the current budget and resource allocation or is not cost prohibitive to implement.

Medium

- There are identifiable avenues available for co-investment or collaboration to assist in delivering the proposed monitoring or research.
- Monitoring or research methodologies exist and are available to conduct the proposed monitoring or research and the required outputs or results can be delivered in a meaningful format.

Low

- Does not fit this criteria (i.e. there is currently no clear way to progress)

Table 2. Benefit and feasibility matrix

	High	High/Low	High/Medium	High/high
Benefit	Medium	Medium/Low	Medium/Medium	Medium/high
	Low	Low/Low	Low/Medium	Low/High
		Low	Medium	High

Feasibility

DAF high priority

DAF medium priority

DAF low priority



8.3 Stage 3: Evaluate, review and set new priorities

A project team will evaluate, review and report annually on the implementation and effectiveness of the Monitoring and Research Plan.

An evaluation report will be compiled outlining the progress of monitoring and research undertaken, the uptake of priorities by external providers, collaboration and partnerships, and the development of innovation. The evaluation report may also provide recommendations on amendments to this Plan.

The project team will also collate and prioritise the investment needs for the next financial year, with Appendix 1 investment priorities updated and published annually.

9 Appendix 1: Fisheries Queensland monitoring and research priorities 2017/2018

The Sustainable Fisheries Strategy commits to implementing a number of high priority actions to improve the existing program of monitoring and research. Additional monitoring and research needs have also been identified and prioritised for DAF investment. All the projects described in Table 1 may provide opportunity for collaboration and/or partnership with external providers especially where there are common goals and objectives. Projects in the tables below where DAF has been identified in the “who” column, will be undertaken by DAF or with DAF as the lead agency. Projects without anyone identified in the “who” column are seen as a priority need, however DAF is not currently in a position to undertake or lead the project. These may be opportunities for external partners or research providers to collaborate with DAF.

Appendix 1 Table 1. Fishing Activity monitoring and research priorities for 2017/2018.

Project	Description	Who	Priority
Action item 1.3 – Novel technology	Develop partnerships to trial the use of novel technologies for fisheries monitoring, such as apps, robotic vision, spatial interfaces and mapping, social media and citizen science. The first priority here is to develop and trial technology that automatically collects data on fishing location and effort as well as possibly catch, independent of input from the fisher.	DAF, DSITI, technology providers	SFS Priority
Action item 1.4 – Data validation	Develop and implement a data validation plan.	DAF	SFS Priority
Action item 9.6 – Vessel Monitoring	Expand the Vessel Monitoring System to all commercial boats by 2020, with a priority to install VMS on net, line and crab boats by 2018.	DAF, GBRMPA	SFS Priority

Appendix 1 Table 2. Biological monitoring and research priorities for 2017/2018.

Project	Description	Who	Priority
Action 1.2 – Additional biological monitoring	Undertake additional monitoring of key biological stocks to better understand fishery performance and support management actions in a more timely way.	DAF, JCU,	SFS Priority

Project	Description	Who	Priority
Fishery independent surveys – (scallop, Moreton Bay bug, blue swimmer crab)	Scallop stocks were classified as overfished in 2016 stock status. Fishery independent sampling will collect information to improve biomass estimates, mortality rates and track stock recovery. This survey will value add by collecting additional information on blue swimmer crabs and Moreton Bay bugs at the same time. Co-investment opportunity with FRDC.	DAF, FRDC, industry. UQ, EHP, WA Fisheries, JCU	High/High
Red emperor (east coast)	Monitoring aims to collect representative length, sex and possibly age information from commercial and recreational fisher catch. This information will be collected for use in stock assessments and assessing stock status.	DAF, JCU, industry	High/High
Crimson snapper (east coast)	Monitoring aims to collect representative length, sex and possibly age information from commercial and recreational fisher catch. This information will be collected for use in stock assessments and assessing stock status.	DAF, JCU, industry	High/High
Stripey's (east coast)	Monitoring aims to collect representative length, sex and possibly age information from commercial and recreational fisher catch. This information will be collected for use in stock assessments and assessing stock status.	DAF, JCU, industry	High/High
Spangled emperor (east coast)	Monitoring aims to collect representative length, sex and possibly age information from commercial and recreational fisher catch. This information will be collected for use in stock assessments and assessing stock status.	DAF, JCU, industry	High/High
Saddletail snapper (east coast)	Monitoring aims to collect representative length, sex and possibly age information from commercial and recreational fisher catch. This information will be collected for use in stock assessments and assessing stock status.	DAF, JCU, industry	High/High
Mangrove jack (Gulf of Carpentaria)	Mangrove Jack in the GoC were classified as overfished in 2015 and recovering in 2016 stock status. Additional monitoring is required to track the progress of the recovery of this stock.	DAF, industry	High /High

Project	Description	Who	Priority
Develop and implement monitoring strategies for shark species in Queensland's net fisheries	Biological monitoring of shark catch composition (retained and discarded), focusing on targeted at sea monitoring on commercial boats. Information will be collected on catch composition (eg blacktip species and hammerhead species), size, sex and potentially age information as well. This will provide valuable additional information to validate other sources of information and inform future stock assessments. DAF will be seeking partnerships with shark experts to design the program and assist with implementation.	DAF, JCU, industry, CSIRO, other experts.	High/Medium
Fishery independent surveys – (eastern king prawn, snapper, blue swimmer crab, tiger prawn)	Implement fishery independent trawl surveys on the eastern king prawn recruitment. This survey will value add by collecting additional information on blue swimmer crabs and the abundance of juvenile snapper in Moreton Bay and Hervey Bay.	DAF	High/Medium
Research into lifecycle characteristics of pearl perch	Pearl perch were assessed as a depleting stock in Queensland in 2015. A subsequent stock assessment released in 2017 supports this finding, however it identifies a number of challenges in assessing the stock including gaining a better understanding of the spawning dynamics and areas where they may aggregate to spawn.	Opportunity for collaboration, Innovation	High/Medium
Blue Threadfin (east coast)	Monitoring to collect representative length, sex and possibly age information from commercial and recreational fisher catch. This information will be collected for use in stock assessments and assessing stock status.	DAF	Medium/High

Appendix 1 Table 3. Social and economic monitoring and research priorities for 2017/2018.

Project	Description	Who	Priority
Action item 1.5 – Socio-economic data	Develop and implement a practical and cost-effective system for collecting of economic and social data for fisheries management.	DAF, GBRMPA, SELTMP, CSIRO, other experts	SFS Priority

Appendix 1 Table 4. Assessment priorities for 2017/2018.

Project	Description	Who	Priority
Action item 2.2 – Stock assessments	Using improved data, undertake regular stock assessments for key stocks to assess the fisheries status against the sustainable target and limit reference points.	DAF, UQ	SFS Priority
Action item 4.1 – Ecological Risk Assessment guidelines	Publish a guideline on assessing the ecosystem impacts of fishing activities, including the process for prioritising and undertaking ERAs.	DAF	SFS Priority
Action item 4.2 – Ecological Risk Assessment	ERAs to be undertaken for priority fisheries or species by the end of 2020.	DAF, specific experts	SFS Priority
Coral Trout (east coast) monitoring and assessment requirements.	<p>Traditional stock assessment techniques require information on the size and age structure of the landed catch, which is difficult to collect from the live coral trout export component of this fishery. The current stock assessment for this fishery relies on a range of fishery dependent and fishery independent information, but predominantly commercial catch and effort data.</p> <p>By taking a collaborative approach and evaluating existing data, this research priority aims to:</p> <ol style="list-style-type: none"> 1. determine the most appropriate indicators and harvest control rules for the management of the coral trout fishery, and 2. provide advice on any additional monitoring and data required to support these indicators.. 	<p>DAF, CSIRO</p> <p>DAF, AIMS</p> <p><i>DAF, external partners</i></p>	High/High
Analyse and evaluate historic mud crab monitoring data and other available data to develop reliable abundance indices	Evaluate potential for developing and collecting reliable abundance indices to inform stock status by analysing historical research and monitoring data.	DAF	High/Medium

Project	Description	Who	Priority
Analyse fishery independent monitoring survey design for eastern king prawn, snapper, blue swimmer crab and tiger prawn and review abundance indices	The fishery independent trawl surveys for eastern king prawn have been running for ten years. Due to operational constraints, these surveys were ceased in 2016, however it is proposed to re-implement the surveys in 2017. A review of the survey design is required to ensure the survey design remains contemporary with changing fishery characteristics and management needs. Where possible, the survey may be altered to value add by collecting additional information or information on additional species.	DAF	High/Medium
Complete a stock assessment for barramundi that quantifies flow influence on stock dynamics	Flow potentially has a strong influence on barramundi recruitment and catchability due to lifecycle characteristics. Attempts have been made to develop stock assessment models that include flow. However, challenges exist due to spatial and temporal dynamics in rainfall and river flow events. Developing new parameters in the next stock assessment model that better captures this variability is a priority, such as flow-dependent growth and/or mortality parameters.	Opportunity for collaboration, Innovation	High/Medium
Develop estimates of recreational fishing power over time	Recent work has been undertaken to quantify recreational fishing effort in the snapper and pearl perch stock assessment. There is a need to develop reliable estimates of the increase in recreational fishing power over time due to advancements in technology from uptake of GPS and sounders/sonar to locate fish/fishing grounds to the reliability in outboard motors, communications and emergency rescue equipment allowing boats to travel further and stay at sea longer. Understanding real recreational effort will improved stock assessment outputs for numerous recreationally important species.	Opportunity for collaboration	High/Medium

Project	Description	Who	Priority
Evaluate and quantify protection provided by marine park zoning	During stock status discussions, the level of protection afforded by marine park zoning is often raised and discussed. To date, there is little information available to quantify the protection afforded to a species taking into account mobility of the species and dependency of the habitat within the zone during its lifecycle. A robust analysis is required to inform the level of risk mitigation afforded to key marine species by marine parks.	Opportunity for collaboration	Medium/Medium
Develop alternate abundance indices in light of hyper-stability concerns	Standardised catch rate is used as an indicator of abundance for a number of key species in Queensland. However hyper-stability concerns have been raised for many species where there have been changes in fishery dynamics over time or where the fishery targets spawning aggregations. Beginning with key species (e.g. snapper and pearl perch or Spanish mackerel) investigate alternative indices of abundance to inform improved monitoring surveys.	Opportunity for collaboration	Medium/Medium
Impacts of impoundment stocking on barramundi stock assessment outputs	Study the impacts of impoundment stocking, primarily for barramundi, to determine if there is a positive correlation between stocking rates and catch rates outside impoundments, particularly in the event of dam overtopping during floods. This information is required to quantify the contribution of impoundment stocking to wild stocks.	Opportunity for collaboration	Medium/Medium
Evaluation of the Stocked Impoundment Permit (SIP) scheme	The SIP scheme collects and distributes over \$1M annually to enhance recreational fishing in Queensland's freshwater impoundments. To optimise public value, conduct a cost benefit analysis of the impoundment fishery to optimise stocking rates and post stocking survival.	Opportunity for collaboration	Medium/Medium

10 Appendix 2: Species included in Fisheries Queensland monitoring program

Appendix 2 Table 1. Summary of information available from DAF monitoring and assessment programs for key target finfish, crustacean and mollusc species. Note almost 850 individual species have been recorded in commercial logbooks and/or recreational monitoring programs. This table only includes a subset of all permitted species.

Species	Stocks	Commercial data			Commercial catch sampling Length and/or age samples	Recreational catch sampling (boat ramp, keen angler or shore-based surveys)			Recreational phone survey and diary Catch and general effort	Fishery independent surveys		Completed stock assessments	
		Log books	Location / VMS	Quota		Length	Catch and general effort	Age samples		Catch and general effort	Abundance Index	Length	Most recent biomass estimate
Ballot's saucer scallop	EC	√	√							√	√	4-10% (2016)	
Balmain bug	EC	√	√										
Banana prawn	EC	√	√									50-70% (2004)	802t
Barramundi	EC/GOC	√			√	√	√		√				
Barred javelin	EC/GOC	√				√	√		√				
Barred cheek coral trout	EC/GOC	√		√ (OS)		√	√		√				
Black jewfish	EC/GOC	√				√	√		√				
Blackspot cod	EC/GOC	√				√	√		√				
Blackspot tuskfish	EC	√		√ (OS)		√	√		√				
Blacktip shark <i>C. tilstoni</i> <i>C. limbatus</i> <i>C. sorrah</i>	EC/GOC	√		√									143t (EC <i>C. tilstoni</i>) 95t (GOC <i>C. tilstoni</i>) 247t (EC <i>C. limbatus</i>)
Blue swimmer crab	EC	√					√		√	√ (juv)	√ (juv)		
Blue threadfin	EC/GOC	√			√ new	√	√		√				
Brown tiger prawn	EC	√	√							√	√		
Burrowing blackfish	EC	√											
Cobia	EC /GOC	√					√						
Common coral trout	EC/GOC	√		√ (OS)		√	√		√			60% (2015)	2010t
Crimson snapper	EC/GOC	√		√ (OS)	√ new	√	√	√ new	√				155t (GoC)
Dusky flathead	EC/GOC	√			√	√	√	√	√				
Eastern king prawn	EC	√	√							√ (juv)	√ (juv)		3100t (EC) 2010
Endeavour prawns	EC	√	√										865t (nth) 247t (sth) 2013
Garfish sp.	EC	√							√				

		Commercial data			Commercial catch sampling	Recreational catch sampling (boat ramp, keen angler or shore-based surveys)			Recreational phone survey and diary	Fishery independent surveys		Completed stock assessments	
		✓	✓	✓		✓	✓	✓		✓	✓	✓	✓
Giant queenfish	EC/GOC	✓				✓	✓		✓				
Goatfish sp	EC	✓	✓	✓					✓				
Goldband snapper	EC/GOC	✓		✓ (OS)					✓				
Golden snapper	EC/GOC	✓		✓ (OS)		✓	✓		✓				55t (GoC) 2015
Goldenline whiting	EC/GOC	✓			✓	✓	✓		✓				
Goldspot cod	EC/GOC	✓				✓	✓		✓				
Grass emperor	EC/GOC	✓				✓	✓		✓				
Grey mackerel	EC/GOC	✓		✓		✓	✓		✓			74% (GoC 2014)	90t (SEQ) 100t (NEQ)
Hussar	EC	✓		✓ (OS)					✓				
King threadfin	EC/GOC	✓			✓	✓	✓		✓				
Luderick	EC	✓							✓				
Mangrove jack	EC/GOC	✓		✓	✓	✓	✓		✓				27t (GoC) 2015
Moreton Bay Bug	EC	✓								✓	✓		
Mud crab	EC/GOC	✓					✓		✓				
Mulloway	EC	✓				✓	✓	✓	✓				
Pearl perch	EC	✓			✓	✓	✓	✓	✓			10-40% (2014)	100-250t
Pikey bream	EC/GOC	✓				✓	✓		✓				
Prawns (all species)	EC/GOC								✓				
Red emperor	EC/GOC	✓		✓ (OS)	✓ new	✓	✓	✓	✓				23t (GoC)
Red throat emperor	EC/GOC	✓		✓ (OS)		✓	✓		✓			70% (EC 2004)	760-964t (EC) 2004
Redspot king prawn	EC	✓	✓										716t (EC) 2013
Saddletail snapper	EC/GOC	✓		✓ (OS)	✓ new	✓	✓	✓	✓				164t (GoC) 2015
Sand whiting	EC	✓			✓	✓	✓	✓	✓				
School prawn	EC/GOC	✓	✓										
School mackerel	EC/GOC	✓				✓	✓		✓				
Sea mullet	EC	✓			✓				✓			59% (EC 2004)	
Shark sp.	EC/GOC	✓		✓ (EC)			✓		✓				
Silver javelin	EC/GOC	✓				✓	✓		✓				
Silver jewfish	EC/GOC	✓				✓	✓		✓				
Snapper	EC	✓			✓	✓	✓	✓	✓	✓ (juv)	✓ (juv)	15-50% (2009)	
Spangled emperor	EC/GOC	✓		✓ (OS)	✓ new	✓ new	✓ new	✓ new	✓				
Spanish mackerel	EC/GOC	✓		✓	✓	✓	✓	✓	✓			39-51% (EC 2009)	975-1219t

		Commercial data			Commercial catch sampling	Recreational catch sampling (boat ramp, keen angler or shore-based surveys)				Recreational phone survey and diary	Fishery independent surveys		Completed stock assessments	
		✓		✓		✓	✓	✓	✓		✓	✓	✓	
Spanner crab	EC	✓		✓						✓	✓	✓		
Spotted mackerel	EC	✓		✓	✓	✓	✓	✓	✓	✓				296t (EC 2005)
Stripey snapper	EC/GOC	✓		✓ (OS)	✓ new	✓ new	✓ new	✓ new	✓					
Stout whiting	EC	✓	✓						✓					1363t (MSY) 850t (MEY) 2014
Swallowtail dart	EC	✓							✓					
Tailor	EC	✓		✓	✓	✓	✓	✓	✓				>50% (2017)	1000-1350t
Trevally sp	EC/GOC	✓							✓					
Trochus	EC	✓	✓	✓										
Tropical rock lobster	EC	✓	✓	✓				✓	✓				60-70% (2008)	
Tiger prawns	EC	✓	✓											1108t (nth) 728t (sth) 2013
Venus tuskfish	EC	✓		✓ (OS)		✓	✓		✓					
Western king prawns	EC	✓	✓											
Winter whiting	EC	✓					✓		✓					
White teatfish	EC	✓	✓	✓										
Yellowfin bream	EC	✓			✓	✓	✓	✓	✓					
Yellowtail kingfish	EC	✓							✓					
Yellow tail scad	EC	✓	✓	✓ #										
Freshwater eels	EC	✓							✓					
Coral fishery species §	EC	✓		✓										

Explanatory Notes

EC = East Coast, GOC=Gulf of Carpentaria. For some species, specific stocks are recognised within these divisions (e.g. there are seven stocks of barramundi)

New = proposed additional biological monitoring scheduled to commence in 2017/18

Juv = information collected on juveniles only

(OS) = The other species (OS) quota for the Coral Reef Finfish Fishery includes > 300sp, not all of which are listed here

= Quota only applies to T5 fishery

§ = Corals are reported at fishery level only due to large numbers of permitted species in the fishery

Effort data collected in boat ramp surveys and diaries is general effort, not effort specific to any particular species