

# Sustainable Fisheries Strategy

2017–2027

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## Fisheries Queensland Ecological Risk Assessment Guideline

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# 1 Introduction

Managing the impacts of fishing activities on non-target species and the broader marine ecosystem is one of the foundations of sustainable fisheries management. The significance of this issue is reflected in its inclusion in a range of international fisheries guidelines (e.g. FAO Code of Conduct for Responsible Fishing, 1995) and Australian fishing acts. Managing the risk of interactions with threatened, endangered or protected species is also a requirement for all fisheries that interact with species listed under the federal *Environment Protection and Biodiversity Conservation Act 1999*.

The impacts of fishing activities is better understood for target species where sustainability assessments are undertaken with more regularity. However, information gaps for many non-target species do not permit assessment using the same tools or methodology. In these instances, risk assessments are widely used for data-poor species and provide advice on the relative levels of risk associated with a fishery or fishing activity. This in turn can be used to prioritise management actions or further monitoring and research.

Ecological risk assessments or ERAs are accepted best practice in many Australian fishery jurisdictions. The primary objective of an ERA is to quantify the level of risk fishing activities pose to key species, species groups, marine habitats and ecosystem processes. This is done through a detailed examination of the current fishing activities, the areas being fished and the life history constraints of key species. As part of this process, ERAs take into consideration information from a wide range of sources including biological studies (e.g. longevity, size at maturity, fecundity), fisheries specific data (e.g. catch and effort, number of licences, management arrangements) and expert advice from members of the scientific community, fisheries management agencies, conservation groups and the commercial and recreational fishing sectors. The methods used must be transparent, repeatable, and the rationale behind each decision well documented (Standards Australia, 2009).

ERAs will be particularly important to understand the potential risks from fishing to some of Queensland's most sensitive and iconic places like the Great Barrier Reef World Heritage Area and the range of threatened and protected species in Queensland like turtles, dugongs, cetaceans and certain sharks. In this regard, the Department of Agriculture and Fisheries (DAF) will work closely with other agencies like the Great Barrier Reef Marine Park Authority (GBRMPA), Queensland Department of Environment and Science (DES) and Commonwealth Department of Environment and Energy (DoEE) that have responsibilities for marine park management and threatened species conservation.

Through a series of multi-parameter assessments, ERAs are able to identify at-risk species or marine habitats along with the characteristics that make them more susceptible to fishing pressures. To this extent, ERAs are a valuable tool for fisheries managers as they help to differentiate between 'real' and 'potential risks, contribute to discussions about the fisheries reforms needed and prioritise research and monitoring strategies.

The Sustainable Fisheries Strategy includes two action items that relate specifically to the development of ERAs in Queensland:

*Action 4.1 – Publish a guideline on assessing the ecosystem impact of fishing activities including the process for prioritising and undertaking ERAs. At a minimum, this should include:*

- *Principles for prioritising ERAs according to risk and linked to national standards*

- *A formal approach for identifying and prioritising management actions to address ERA outcomes*

*Action 4.2 – ERAs to be undertaken for priority fisheries or species by the end of 2020 (including for example the East Coast Inshore Fin Fish Fishery, Gulf of Carpentaria Fin Fish Fishery and Crab Fisheries), followed by the remaining fisheries.*

This guideline addresses action item 4.1 and provides an overview of Queensland's ERA framework including the risk prioritisation process, methodology and timeframes. They also provide an overview of how ERAs will connect and contribute to other reform areas outlined in the strategy.

The guideline will be used by Fisheries Queensland and other stakeholders when undertaking ERAs. It builds upon national approaches and previous ERAs undertaken in Queensland.

## 1.1 Objectives of this guideline

Fisheries in Queensland are managed in accordance with the *Fisheries Act 1994*. The main purpose of the *Fisheries Act 1994* is to provide for the use, conservation and enhancement of the community's fisheries resources and fish habitats in a way that seeks to –

- apply and balance the principles of ecologically sustainable development
- promote ecologically sustainable development.

In order to achieve this, DAF requires a strong understanding of both the risks posed by fishing activities and the characteristics that increase the likelihood of an undesirable event occurring for a species, species group or marine environment e.g. failure to meet a key management objective or a significant, negative and irreversible change to the fishery resources or habitats. Under the strategy this will be achieved through the use of ERAs. In line with this approach, this guideline outlines the process that will be used to:

- estimate or quantify the level of risk associated with fishing activities and the likelihood that it will impact negatively on the conservation status of key species, species groups, marine habitats or ecosystem processes
- identify the biological constraints, fishing activities and risk factors associated with high risk ratings
- distinguish between 'real' and 'potential' risks
- ascertain the most appropriate course of action for at risk species, species groups, marine habitat or ecosystem process including the need to collect additional data, the need to review current management and the need to mitigate risk through additional management reforms.

## 1.2 Scope

The ERA guideline provides insight into how risk assessments will be constructed for the following ecological components.

- *Target and by-product species*: species that are permitted to be retained for sale under the *Fisheries Act 1994* and the Fisheries Regulation 2008.
- *Species of conservation interest*: species that are afforded additional protections under State and Commonwealth legislation including those considered to be threatened and endangered and/or species where there are ongoing concerns about their long-term sustainability.

- *Bycatch*: species that are not retained for sale and are not protected.
- *Marine habitats*: the biological and physical environments in which the organism lives and/or where a fishery operates.
- *Ecosystem processes*: the mechanisms which influence the distribution and abundance of organisms, the habitats in which they occur and by which components of an ecosystem are linked or interact (Pears *et al.*, 2012).

Of the above, *ecosystem processes* represent the biggest challenge for management response as the viability of these processes will be influenced by factors outside of the control of fisheries management e.g. climate change, pollution, extractive use of the marine resources and urban, port and agricultural development. From an ERA perspective, this makes it difficult to quantify the level of impact an individual fishery is having on these processes and by extension the accurate assignment of risk ratings. This problem is compounded by the fact that it is often difficult to identify measurable indicators of marine ecosystem processes (Pears *et al.*, 2012; Evans *et al.*, 2016). For example, what parameters need to be measured to determine if a) an ecosystem process is in decline, stable or improving and b) how much of this change can be attributed to fishing activities or lack thereof?

Similarly, the scope of the marine habitat ERAs will be limited by the amount of available data. This is of particular relevance to areas outside the Great Barrier Reef Marine Park (GBMRP) where information on the distribution of regional habitat assemblages is comparatively poor. This again has important implications for the assignment of risk ratings and for the fisheries working groups who are responsible for determining if risk mitigation measures are required.

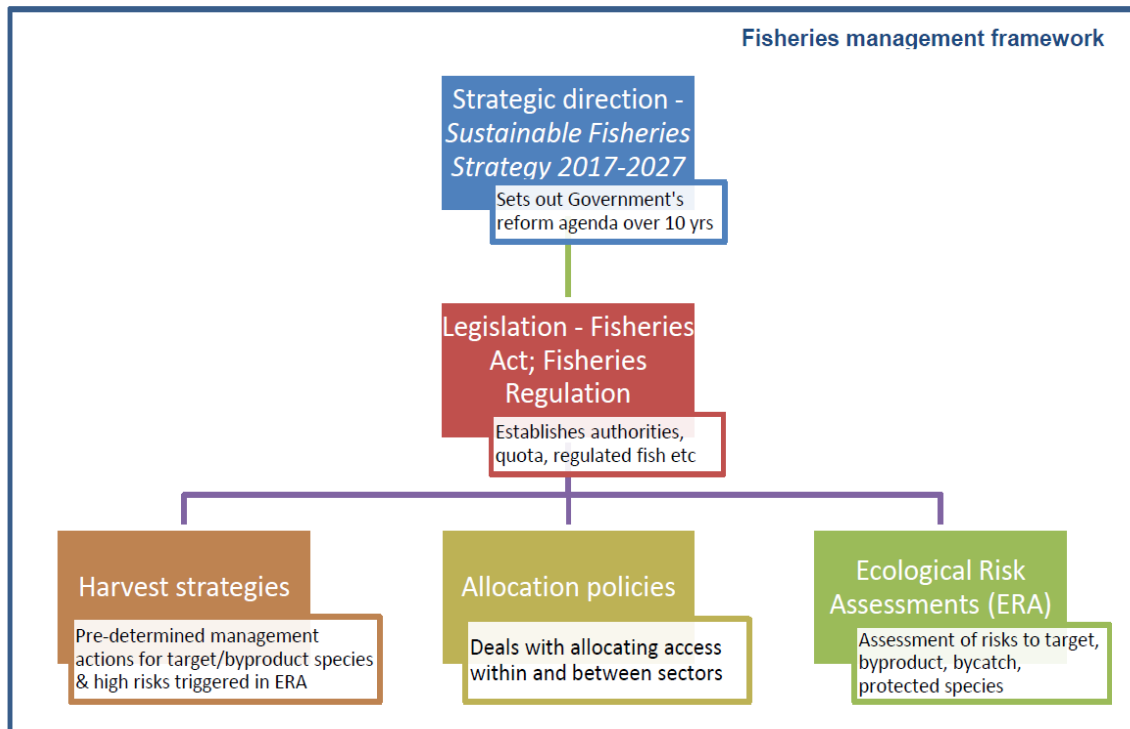
DAF recognises the importance of developing accurate and reliable risk assessments for both ecosystem processes and marine habitats. It is therefore prudent that ecosystem processes and marine habitats be assessed as part of the first ERA cycle. However, the above complexities will restrict these evaluations to higher level (level 1 – qualitative) assessments identifying activities with the potential to impact on these components, the key sources of risk (e.g. increased sediment suspension, predation etc.) and key information gaps (refer section 3). The ability to expand on these initial assessments will be dependent on the adequacy of the available information and the capacity to deliver evidence-based outcomes within a fisheries framework.

## 2 Where do ERAs fit?

ERAs in Queensland fit within a broader fisheries management context (Fig. 1).

The Sustainable Fisheries Strategy sets out the government's strategic direction and reform agenda. The *Fisheries Act 1994* and Fisheries Regulation 2008 (the Regulation) set out the overarching objectives and guidance for managing fisheries. The Regulation includes the authorities to take fish, as well as mechanisms for managing bycatch and protected species interactions. Harvest strategies will set out the pre-determined management actions that will be given effect through the Regulation. For example, quota declarations are made under the Regulation, in accordance with decision rules set out in the harvest strategy.

The assessment of fishing related risks to target, byproduct and bycatch species, threatened, endangered and protected species, and on habitats and will be undertaken through an ERA and addressed through a risk management framework. Harvest strategies will be used to address high risks generated out of ERA processes. Risk management actions could be a control on fishing



**Figure 1.** How ecological risk assessments will contribute to the management of fisheries in Queensland under the contribution and the broader Queensland Sustainable Fisheries Strategy 2017–2027.

through the harvest strategy decision rules (e.g. catch or effort quota), or through other regulatory mechanisms (e.g. spatial closures, gear restrictions). In other instances, increased data collection may be viewed as a more appropriate management response, particularly when data gaps resulted in precautionary risk evaluation. In such cases, the time for this information to be gathered should be specified to prevent continual deferment of action.

ERAs also fit with some of the other actions in the strategy, including the *Monitoring and research plan* which will help better align monitoring and research with management needs and known information gaps. Risk profiles developed through ERAs will assist in this process by identifying areas where more information is required, and/or areas where additional monitoring can contribute to our understanding of the impacts of fishing activities. In some instances, high risk ratings may be addressed through the *Monitoring and research plan* e.g. high risk ratings that have been heavily influenced by data deficiencies. Conversely, initiatives undertaken as part of the *Monitoring and research plan* will improve the accuracy of the risk profiles through the collation of information (e.g. species compositions, catch levels etc.) and the commissioning of research targeted at data-poor species or fisheries.

Fisheries working groups established as part of the Strategy will play a significant role in the ERA process. Incorporating stakeholders from the scientific community, management agencies, conservation groups and the commercial and recreational fishing sectors, fisheries working groups will provide direct input into the identification of priority species and in the development of risk profiles for individual species, species groups and marine habitats. The outputs from each of the respective ERA phases will be used by the fisheries working groups to inform discussions surrounding the development of harvest strategies, risk minimisation strategies and areas where further information or management reforms may be required. The decisions of these groups form part of the reported

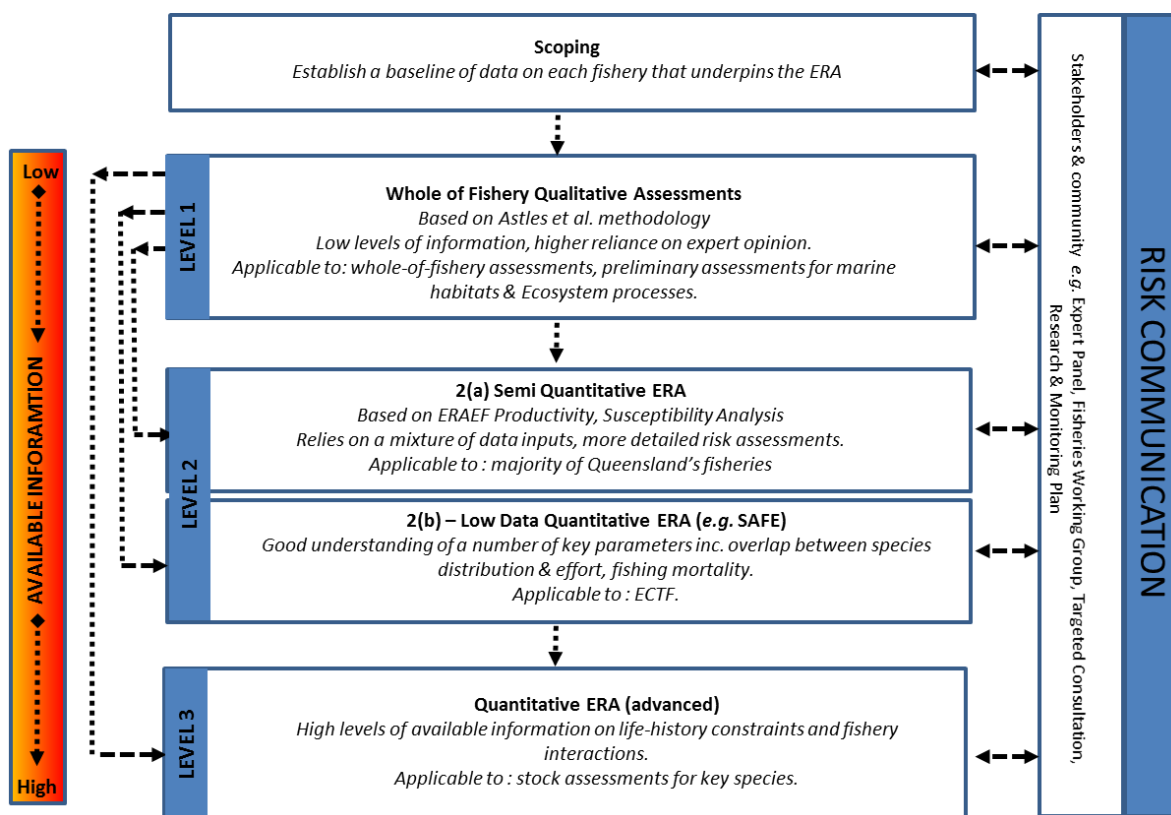
actions from the ERA process. Fisheries Queensland will also work with other agencies like GBRMPA, DES and DoEE, as well as other stakeholders.

### 3 ERA framework

Queensland’s ERA process has been broadly aligned with the national risk assessment framework; otherwise known as the *Ecological Risk Assessment for the Effects of Fishing* (ERAEF) (Hobday *et al.*, 2007; 2011; AFMA, 2017). This framework is based on a hierarchical approach and describes how a fishery will move from a qualitative assessment (level 1) through to a quantitative assessment (level 3). This approach is designed to allow efficient use of data and screens out low risks at each level. It involves use of a qualitative, semi-quantitative and quantitative ERA tool at each level. Tools used at each level may be improved and modified over time.

Queensland’s ERA framework has been modified to accommodate regional differences in the amount of available data and the timeframes outlined in the strategy. However, the broader structure of the ERAEF framework (Fig. 2) has been retained and includes the following phases:

- **Scoping** – The scoping phase will be used to establish a baseline of information on the key characteristics of each fishery e.g. information on the broader management regime, key species, spatial distribution, catch and effort trends, gear configurations etc.
- **Level 1** – A comprehensive but qualitative assessment where the results have a variable degree of reliance on expert opinion. In Queensland, the level 1 assessment will include a whole-of-fishery ERA examining the broader impacts of fishing activities on each ecological component



**Figure 2.** Schematic representation of the ERA framework adopted by Queensland detailing the hierarchical risk assessment approach and relevant feedback loops.



(e.g. target and by-product; bycatch, threatened, endangered and protected; marine habitats; ecosystem processes) using the methods outlined by Astles *et al.*, (2006; 2009).

- **Level 2** – More complex ERAs requiring higher levels of information on the life-history constraints of each ecological subcomponent (e.g. species, species groupings, marine habitats) and the fisheries that they interact with. In Queensland, level 2 assessments will consist of semi-quantitative assessments (*i.e.* Productivity – susceptibility analyses or PSA) and, if data permits, low-data quantitative risk assessments (e.g. *Sustainability assessment for fishing effects or SAFE*).
- **Level 3** – A comprehensive risk assessment requiring well developed data sets and measurable risk parameters. Unlike the qualitative (level 1) and semi-quantitative (level 2) assessments which provide a relative measure of risk, level 3 assessments provide an absolute value of risk. The data requirements for a level 3 assessment often limit its use and applicability in a fisheries context, particularly for lesser known bycatch species. In such cases, monitoring can still be used as part of a harvest strategy for managing risk.

Additional information on the ERAEF including a detailed overview of the methodology is contained in Hobday *et al.* (2007; 2011). Further information on the SAFE method can be found in Zhou & Griffiths (2008) and Zhou *et al.* (2011).

## 4 Ecological risk assessments

### 4.1 Level 1 ERA (qualitative)

Qualitative ERAs are often employed for data poor species or fisheries and use descriptive scales (e.g. low, medium or high) to describe the magnitude of a potential negative consequence and the likelihood that it will occur (Scandol *et al.*, 2009). Data thresholds for a qualitative assessment are lower with expert opinion often forming part or all of the assessment. These limitations are frequently countered through the adoption of a precautionary risk assessment approach which, on occasion, leads to more conservative outputs. An incentive thus exists to collect additional information in cases where the precautionary approach might restrict fishing activities.

In Queensland, qualitative ERAs will be used to assess risk at the whole-of-fishery level with the primary objective being to establish a broader risk profile for each fishery. This profile will be constructed using an assessment method that incorporates four distinct steps (Astles *et al.*, 2006):

1. *Risk context* – defines the broader parameters of the assessment including the risk that is to be analysed (*i.e.* the management objective trying to be achieved or undesirable event trying to be avoided), the spatial extent of the analysis, the management regimes and the timeframes of the assessment.
2. *Risk identification* – identifies the aspects of each fishery or the sources of risk that have the potential to contribute to the occurrence of an undesirable event.
3. *Risk characterisation* – provides an estimate (low, medium, high) of the likelihood that one or more of the identified sources of risk will result in an undesirable event occurring. Used as part of a level 1 assessment, this stage will focus on the key fishing activities and the risk that they pose to each of the respective ecological components. In some instances, this stage will include a finer-scale assessment involving key species groupings.

4. *Issues arising* – examines the assigned risk levels and the issues or characteristics that contributed to the overall classifications.

While viewed as a higher-level assessment, the level 1 analysis will provide important information on activities driving risk in a fishery, the ecological components at risk and areas within the fisheries management system that contribute to the risk of an undesirable event occurring. Level 1 assessments will be undertaken for all ecological components including marine habitats and ecosystem processes which have the least amount of available data. These results will be used to inform the level 2 assessments and refine the scope of subsequent ERAs.

## **4.2 Level 2 ERA (Semi-quantitative/low-data quantitative)**

Level 2 ERAs will retain options for undertaking both a semi-quantitative and low-data/low tier quantitative assessment. The suitability and applicability of each method will be largely dependent of the fishery and the amount of available data.

### *4.2.1 Semi-quantitative ERA*

The accuracy of qualitative ERAs are frequently improved through the inclusion of additional scientific analyses. This type of analysis is often referred to as a semi-quantitative ERA and it is used to increase the sensitivity of the assessment, therefore providing additional context to the risk prioritisation process. Data requirements for a semi-quantitative ERA are higher than a level 1 assessment and it requires a pre-defined mechanism for dealing with information gaps.

In most instances, data limitations are addressed through precautionary elements which assign the highest risk score to any parameter that has significant information gaps. The inherent trade-off with this approach is that the final risk ratings may include a number of 'false positives' or species that have been classified as 'high risk' due to the conservative nature of the assessment. As the outputs are based on more detailed data sets, semi-quantitative ERAs tend to have fewer 'false positives'. However, it does not produce an absolute value of risk (Scandol *et al.* 2009; AFMA, 2017) and the descriptor of risk remains the same as a level 1 assessment (e.g. low, medium, high).

Over the years, Queensland has used a range of methods to construct semi-quantitative ERAs including those preferred for Commonwealth fisheries (the ERAEF – Hobday *et al.*, 2007; 2011) and those outlined in the National Ecologically Sustainability Framework (National ESF – Fletcher, 2005, 2015; Fletcher *et al.*, 2005). In one of the more recent examples, a four-stage qualitative/semi-quantitative assessment (Astles *et al.*, 2006; 2009) was used to examine the level of risk associated with trawl fishing activities in the Great Barrier Reef Marine Park (Pears *et al.*, 2012) and in southern Queensland (Jacobsen *et al.*, 2018). This diversity in methodologies is partly attributed to the absence of an overarching ERA guideline and Queensland adopting a single-fishery approach to the development of risk assessments.

The suitability and applicability of each ERA methodology depends on a range of factors including the management jurisdiction, time and resource constraints, the fishery being assessed and the amount of available data. As action item 4.2 requires Queensland to undertake multiple ERAs, the adopted methodology needs to be easily replicated and contain a robust set of parameters that can be assessed across a range of fisheries. The *Productivity – susceptibility analysis* or PSA utilises a set of pre-defined assessment criteria and produces risk profiles based on a) the ability of an ecological subcomponent (e.g. a species or species groupings) to rebound after potential decline and b) the level of impact a fishery may have on an ecological subcomponent. This is done through a detailed assessment of seven biological parameters (productivity) and four fishing attributes (susceptibility); all

of which have wide-applicability within a fisheries management context (Table 1). This was considered to be of significant importance given the timeframes outlined in the strategy, the need to simultaneously develop multiple ERAs and Queensland's move away from a fishery-by-fishery approach (see section 5).

The vast majority of assessments at level 2 will consist of a PSA; although there is sufficient flexibility within the guidelines to apply a low-tier quantitative assessment when appropriate (refer section 4.2.2). Level 2 assessments will be done on completion of the level 1 assessments and include most ecological subcomponents. As marine habitats and ecosystem processes have significant data limitations, a PSA may be less suitable for these ecological components (see Williams *et al.*, 2011). Given this and in the event that they are progressed to a level 2 assessment, alternate methods may need to be investigated including use of the four-stage qualitative ERA (Astles *et al.*, 2006; 2009) employed for the *East Coast Trawl Fishery* (ECTF).

**Table 1.** Key attributes used in assess the productivity and susceptibility of an ecological subcomponent as part of a level 2 assessment. \*Attributes table represents an excerpt from Hobday *et al.* (2007).

<b>Characteristic</b>	<b>Attribute</b>
<b>Productivity</b>	Average age at maturity
	Average size at maturity
	Average maximum age
	Average maximum size
	Fecundity
	Reproductive strategy
	Trophic level
<b>Susceptibility</b>	Availability – overlap of fishing effort with the distribution of the ecological subcomponent (e.g. a species or species grouping).
	Encounterability – the likelihood that a species will encounter fishing gear that is deployed within the geographic range of the ecological subcomponent.
	Selectivity – the potential for the gear to capture or retain an ecological component.
	Post capture mortality – the condition and subsequent survival of an ecological subcomponent that is captured and subsequently released / discarded.

#### 4.2.2 Low-data/low-tier quantitative ERA

An alternative to semi-quantitative ERA tools such as the PSA are more quantitative tools that can still be applied to species with lower levels of information. One tool is the *Sustainability analysis for fishing effects* or SAFE (Zhou & Griffiths, 2008; Zhou *et al.*, 2011). While quantitative in nature, this approach is still considered to be a low-data or low-tier quantitative approach as it retains a number of the PSA's precautionary elements (AFMA, 2017). This is done to account for data deficiencies and

ensures that there is a higher probability of the results containing ‘false positives (i.e. an overestimate of the risk due to the precautionary nature of the assessment) instead of false negatives (i.e. an underestimate of the risk posed to a particular species).

The SAFE tool can be applied to a fishery in its base form (bSAFE) (Zhou *et al.*, 2011) or as an enhanced assessment (eSAFE) (Zhou *et al.*, 2013a,b). The bSAFE approach assumes that fish are randomly or homogeneously distributed with their range, and their probability of being caught is fixed at one of three levels (0.33, 0.67 or 1) depending on their body size and shape (Zhou *et al.*, 2016). The eSAFE approach relaxes these assumptions and attempts to estimate fish density across their distribution and the catch efficiency (species- and gear-specific) for each species (Zhou *et al.*, 2016). To this extent, eSAFE requires more data and can be more difficult to apply in a fisheries environment.

The main advantage of the SAFE tool is that risk is estimated relative to reference points (e.g. F-based reference points as used in stock assessments), rather than the low, medium or high scale used in the PSA. In Queensland, the applicability of both the bSAFE and eSAFE will be dependent on the fishery and the amount of available data. The SAFE tool will be first used in the ECTF which has already been the subject of a substantive qualitative ERA (Pears *et al.*, 2012; Jacobsen *et al.*, 2018) and a restricted low-data quantitative assessment (Campbell *et al.*, 2017). A fishery with well-developed catch and effort data sets, it is arguably best suited for this type of assessment. The scope of the trawl assessment will be informed by previous ERAs (Pears *et al.*; Jacobsen *et al.*, 2018; Campbell *et al.*, 2017; Pitcher *et al.*, 2017) and will be done in conjunction with the Level 2 assessments for the remaining fisheries (Fig. 2).

Going forward, the available information may allow for the PSA in some fisheries to be replaced with a bSAFE or eSAFE assessment. The ability of DAF to substitute the PSA with SAFE will be dependent of both the fishery and the ecological component being assessed. Over time, it is envisaged that more fisheries will be transitioned from a PSA to SAFE as the quantity and accuracy of the catch and effort data improves. This transition will occur more rapidly with the continued implementation of the strategy and the introduction of measures aimed at improving the quantity and quality of catch and effort data e.g. the expansion of the vessel monitoring system (VMS) to all commercial fisheries, improved catch reporting and monitoring. The SAFE method is also being further developed to allow applicability to protected seabird and marine mammal species, which have complicated distribution patterns and behaviours.

### **4.3 Level 3 – Quantitative assessment**

Level 3 or a fully quantitative assessment is the highest form of ERA within Queensland’s framework. Quantitative ERAs provide an absolute value of risk, rely on in-depth scientific analysis (Hobday *et al.*, 2007) and require access to well established and well developed datasets. In a fisheries context, level 3 assessments can be difficult to achieve; particularly for multi-species fisheries. As a consequence, in-depth quantitative analyses tend to be more synonymous with stock assessments for target species.

In Queensland, the majority of Level 3 assessments will involve stock assessments for key species. These will be developed as part of the harvest strategy process which was established as part of the broader strategy. A species that already has a formal stock assessment may not need to be included in the ERA at all.

## 5 Priorities

The primary objective of the ERA guidelines is to establish a process that will facilitate the transition of fishery from having no ERA through to a qualitative assessment and, when the data permits, onto a quantitative assessment. In some instances, it may not be possible to progress a fishery or ecological component beyond a level 1 assessment without collation of additional data. In other instances, the data may enable a level 2 assessment to be completed and in a small number of instances a level 3 assessment for those species identified at high risk under level 2.

### 5.1 Scoping and level 1

The first priority of the ERA guidelines will be to complete a scoping analysis and level 1 assessment for key fisheries and species sub-groups. Larger multi-species fisheries will be prioritised over smaller fisheries and single-species fisheries with stock assessments. Where possible, level 1 assessments will include all ecological components and the results will form the basis of the level 2 assessments.

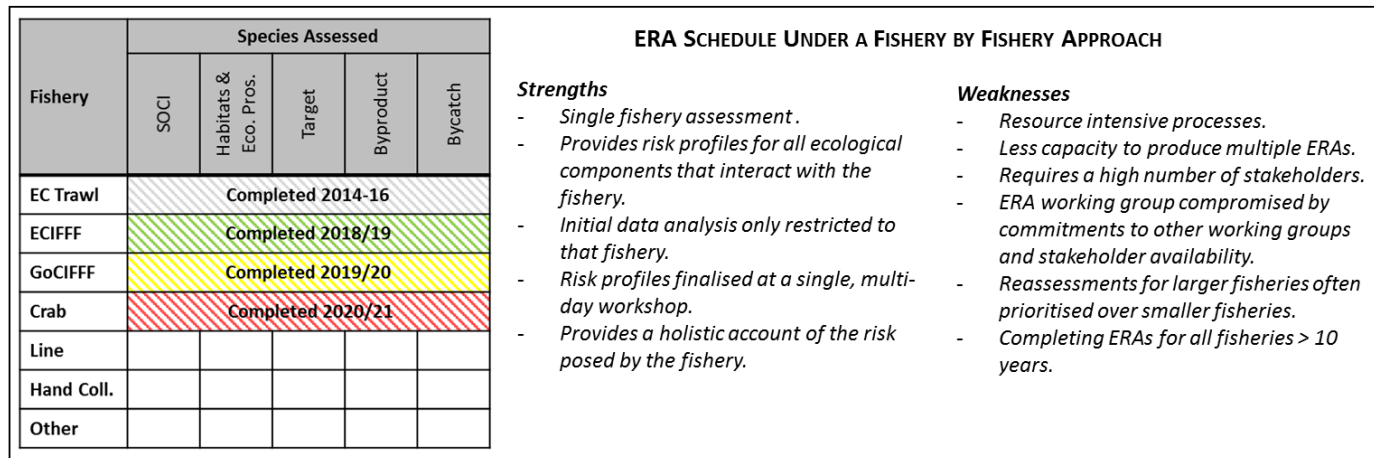
### 5.2 Level 2

Queensland has previously adopted a fishery-by-fishery approach to the development of semi-quantitative (level 2) ERAs (Fig. 3a) where priorities were heavily influenced by conditions imposed on export approvals granted under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). While a fishery-by-fishery approach is effective, it provides only a partial overview of how fishing activities impact marine species (target and non-target) and marine ecosystems. As ERAs are resource intensive processes, this approach also restricts capacity to simultaneously develop ERAs for multiple fisheries. This in turn has resulted in delays in the development of ERAs for fisheries that were not considered to be high assessment priorities at that point in time.

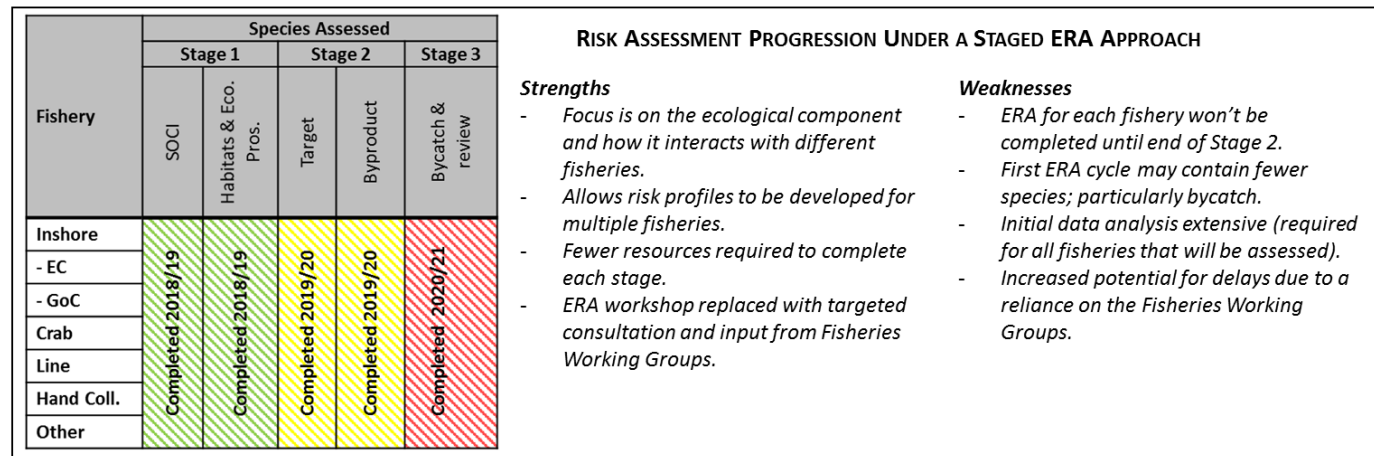
To address these challenges, Queensland will move away from a fishery-by-fishery approach and develop ERAs (Level 2a) across multiple fisheries. This will be done in three stages (Table 2; Fig. 3b) with each stage focusing on a specific set of ecological subcomponents e.g. target species, by-product, bycatch, threatened, endangered and protected species. At this point in time, the tool suggested for use in the level 2 assessment is a PSA. This will enable the same methodology to be applied across a wide range of fisheries; therefore providing a higher level of consistency in how risk is assessed and greater insight into the cumulative effects of fishing.

Ecological components assessed at level 2 have been prioritised based on their conservation status, and their relevance to fisheries in Queensland (Table 2). Within each ecological component there will be a range of subcomponents representing the species, species complexes and marine habitats that interact with these fisheries. The number of subcomponents assessed in each stage will be dependent on a range of factors including the outcomes of the level 1 (qualitative) assessment, the level of protection afforded under State or Commonwealth legislation, the cumulative fishing impacts, advice from the fishery working groups and the relevance of ancillary projects including quantitative stock assessments, *Wildlife Trade Operation* approvals under the EPBC Act and the *National Status of Australian Fish Stocks*.

(a)



(b)



**Figure 3.** A visual representation of the ERA schedule if Queensland a) continued to adopt a fishery by fishery approach and b) how ERAs will be developed as part of the staged approach. Under the staged approach the trawl fishery would be subject to a separate quantitative assessment using the SAFE methodology as it has already has a detailed qualitative assessment (Pears et al., 2012; Jacobsen et al., 2018). \*Fisheries and timeframes provided as examples.

Under this framework, PSAs for key fisheries will not near completion until the end of the second stage of the ERA cycle (Table 2). At this point, key fisheries will have a level 2 assessment for key target, byproduct and bycatch species and (as a minimum) a level 1 assessment for a number of marine habitats and ecosystem processes. Information will then be used by DAF and the fisheries working groups to identify the need for additional risk assessments (stage 3 / additional PSA), the information gaps needing to be filled and the steps required to mitigate the risk of an undesirable event occurring. For the majority of threatened, endangered and protected species, this process will occur after the completion of the stage 1 PSA (Table 2).

**Table 2.** Overview of the phased ERA approach being adopted by Queensland including a list of the ecological components and subcomponents assessed to be assessed in each stage of the level 2 PSA.

ERA	Focus	Priority/Ecological sub-components	Expected completion	
<b>Scoping</b>	Whole of fishery	Multi-species, multi-gear fisheries	2018	
<b>Level 1</b>	Whole of fishery	Multi-species, multi-gear fisheries	2018	
<b>Level 2</b>	<u>Stage 1</u>	Level 2(a) - PSA - threatened, endangered, protected species, species of conservation interest.	Species afforded additional protections under state and commonwealth legislation, and a select range of target, byproduct and bycatch species. Examples include but are not limited to seabirds, marine turtles, sea snakes, syngnathids and select species of elasmobranchs	2018/19
		Level 2(b) - SAFE - ECTF	Species identified as high risk in previous semi-quantitative analyses. Any additional species of relevance.	2018/19
	<u>Stage 2</u>	Target species, byproduct, and key species of bycatch and ecosystem processes.	Target and byproduct species permitted to be retained for sale under Fisheries Regulations 2008 that do not have a stock assessment, harvest strategy or managed under a quota. Additional bycatch species not assessed in stage 1.	2019/2020
	<u>Stage 3</u>	Bycatch species + review, marine habitats (if applicable), ecosystem processes (if applicable)	Species, species groupings or marine habitats with additional information and/or fisheries where the fishing environment or management regime has undergone significant change. Additional species of bycatch that were not assessed in stage 1 or 2 and warrant further investigation.	2020/21
<b>Level 3</b>	TBD	TBD	TBD	

## 6 Management of risk

ERAs constructed as part of level 1 and level 2 incorporate precautionary elements to account for missing or imprecise data. These elements, in essence, decrease the likelihood of underestimating the risk posed to an ecological subcomponent due to data inadequacies. The trade-off with this approach is that the risk assigned to some ecological subcomponents may be overestimated. As high risk ratings can lead to management change, it is important to determine if they represent a **real** or **potential** risk.

The term **potential risk** will be most applicable to species, species groups and marine habitats with lower levels of information. Potential risks should not be discounted as they highlight areas where further monitoring and assessment are required. However, triggering management changes using a data-limited risk assessment may be unnecessary. Potential risks, while still important, are not viewed as immediate priorities and will be addressed through the *Monitoring and research plan* (Fig. 4). This plan has been enacted under the strategy and outlines the research priorities for Queensland's fisheries. From an ERA perspective, this plan will play a significant role in improving the accuracy of the risk assessments through the collection of information on the data-poor parameters contributing to high risk ratings.

While not universal, assessments classified as a **real risk** have less reliance on expert opinions and proxies. Data sets for these ecological subcomponents tend to be more robust and provide a more accurate representation of the likelihood that an undesirable event will occur e.g. the likelihood of biomass reducing below a target reference point or the fishery affecting the long-term viability of regional populations. When compared to potential risks, real risks require further attention and in some instances will require additional management or monitoring. Unlike potential risks, real risks will be addressed through harvest strategies and the fisheries working groups will play a significant role in this process. These groups among others will consider the factors contributing to high risk ratings, the adequacy of current management regime and, if applicable, strategies to reduce and mitigate the risk of ecological subcomponent experiencing an undesirable event.

The need to differentiate between 'real' and 'potential' risks will diminish through time as a) the level of information improves and b) fisheries are transitioned to a level 2b (SAFE) or a level 3 assessment (Fig. 2). This is because these methods estimate risk relative to fixed and known reference points (rather than high/medium/low); therefore provide an estimate of the **actual** or **absolute** risk. These estimates are considered to be more representative of what is occurring in the fishing environment and will be addressed through harvest strategies and the fisheries working groups.

## 7 ERA progression and consultation

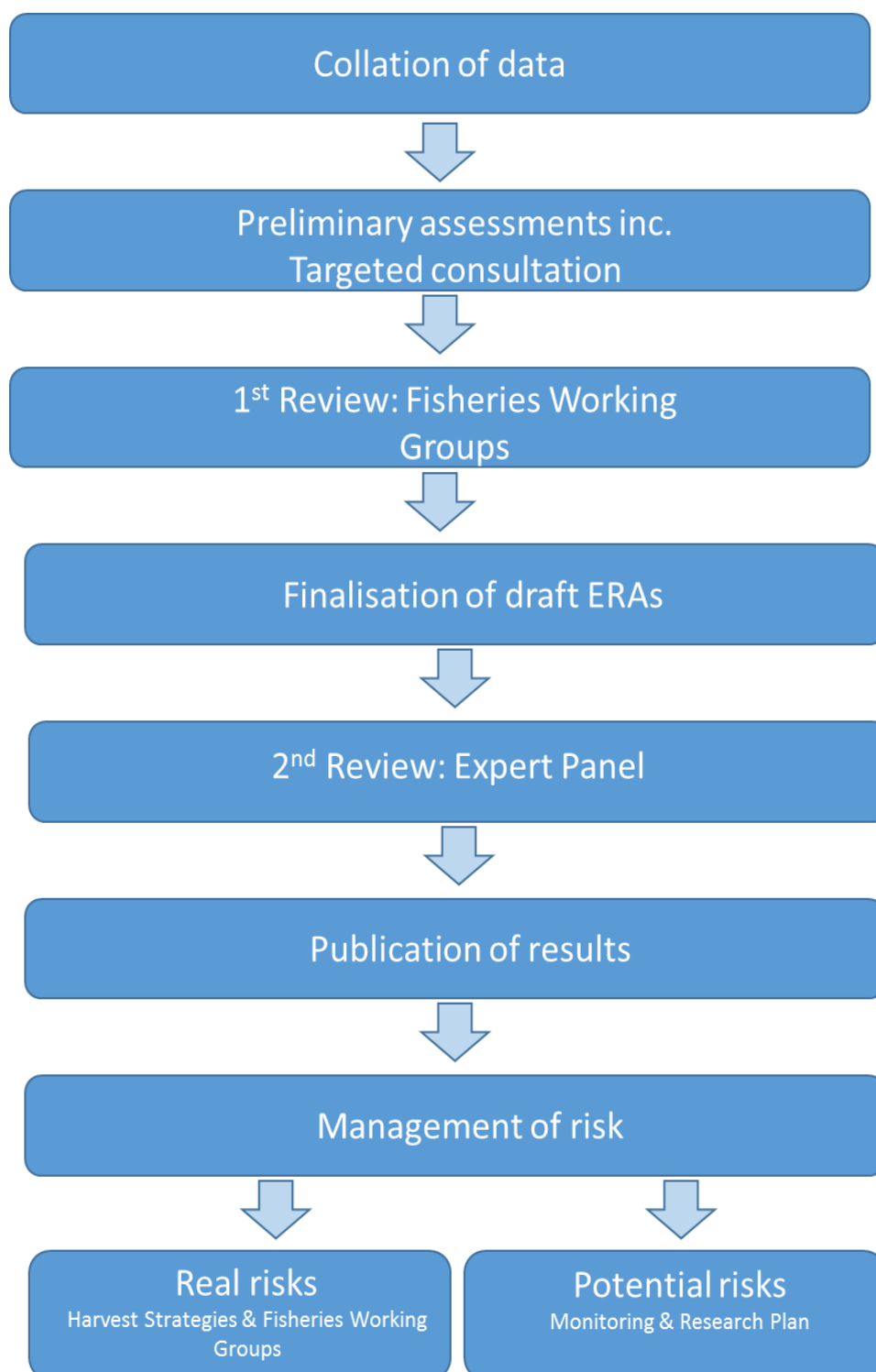
Risk assessments will be progressed through a series of steps designed to maximise the input from key stakeholders and improve the efficiency of the ERA process (Fig. 4).

### 7.1 Draft ERAs

One of the first priorities will be to establish a baseline of data that will be used to underpin each ERA. Where possible, biological data will be collated from published research and reports that have been made available to the public. In some instances, this information will need to be supplemented through targeted consultation with experts and key stakeholders. 2017 and 2018 will be used as the reference points for catch and effort data and to evaluate the effectiveness of management



arrangements in each fishery. This information will again be supplemented with historical catch and effort data in order to provide the risk assessments with further context.



**Figure 4.** ERA progression strategy that will be employed by Queensland under the guidelines

Draft risk assessments (level 1 and level 2) will be developed by DAF in consultation with key stakeholders. The draft assessment will provide a preliminary evaluation of the type and level of risk posed by each fishery to each ecological component or subcomponent. Stakeholders will contribute to the draft assessment process through targeted consultation, third party reviews and, when and where appropriate, smaller workshops focused on a specific ecological component e.g. the species of conservation interest. The main objective of this consultation will be to improve the accuracy of the draft assessments before they are progressed to the fisheries working group for further consideration, review and discussion.

## **7.2 First review: fisheries working groups**

Once completed, draft risk assessments will be progressed to the relevant fisheries working groups for review and comment. Established as part of the strategy, fisheries working groups include a wide range of stakeholders and have the expertise needed to assess the veracity of the data inputs.

Participants will be provided with the background information used to conduct the assessment and the risk profiles of each subcomponent assessed in their fishery. These profiles will include a full account of the level 1 assessments and (if applicable) the scores assigned to parameters in a level 2 assessment.

The primary responsibility of the fisheries working groups will be to provide advice to DAF on the accuracy of the draft assessments, avenues warranting further consideration and any additional sources of information.

## **7.3 Finalisation of draft ERAs**

Feedback obtained from the fisheries working groups will be taken into account and, when supported by evidence, will be incorporated into the draft assessments.

## **7.4 Second review: Sustainable Fisheries Expert Panel**

Once finalised, draft ERAs (Level 1, 2 or 3) along with a summary of comments from the fisheries working groups will be progressed to the *Sustainable Fisheries Expert Panel* for review. The *Sustainable Fisheries Expert Panel* was established as part of the broader Strategy and provides the ERA process with another level of oversight.

## **7.5 Publication of results**

Outcomes from each stage of the ERA process (Fig 2; Table 2) will be made available to the public. ERAs will initially be published using processes developed by DAF to distribute information on recently completed stock assessments and other technical reports. Publication of final reports will occur once they have been endorsed by the *Sustainable Fisheries Expert Panel*.

# **8 Review of this guideline**

This guideline concentrates primarily on the 2020 objectives and therefore only covers the first cycle of the ERA process. Once completed, the ERA Guideline will be reviewed to ensure that this process remains relevant and that assessments continue to evolve and improve through time.

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