



Australian Government

Australian Fisheries Management Authority



Ecological Risk Management

REPORT FOR THE TORRES STRAIT TROPICAL ROCK LOBSTER FISHERY

June 2009

Summary of priority issues for managing the ecological effects of fishing in the Torres Strait Tropical Rock Lobster Fishery

Assessment of the Torres Strait Tropical Rock Lobster Fishery (TSTRLF) at Level 1 (SICA – Scale Intensity Consequence Analysis) resulted in no species (target, byproduct, bycatch or protected (TEP)), components, habitats or communities requiring assessment at Level 2 (PSA – Productivity Sustainability Analysis). Two Ecological components, Bycatch-Byproduct components (there is no bycatch in the TSTRLF) and Community components were eliminated at level 1 (SICA), showing minor risk (risk score 2). Fishing capture (impact on Target component) and external components (other fisheries in the region and other anthropogenic activities for both TEP and Habitat components) scored moderate risk (risk score 3).

90 threatened, endangered or protected species are theoretically found within the waters of the fishery. These include 27 species of marine reptiles, 6 species of seabirds, 6 species of marine mammals and 51 species of teleosts. As part of AFMA's Ecological Risk Management process, we will take all reasonable steps to minimise interactions with those protected (TEP) species which are thought to occur in the area of the fishery.



Description of the Torres Strait Tropical Rock Lobster Fishery

The Torres Strait Tropical Rock Lobster Fishery is a hand collection fishery for ornate rock lobster (*Panulirus ornatus*) in West Torres Strait. Lobsters are collected by hand or via the use of short hand spear. Fishers either free dive or use surface supplied air (hookah).

The fishery is divided up into two groups of license holders, Commercial and Traditional fishers. Commercial rock lobster fishing occurs from December to September, with peak effort falling within the period of March to August. Traditional fishers may take lobster at any time of year, though hookah is banned during December and January for both groups of license holders.

As directed by the PZJA, management of the Australian Torres Strait TRL fishery is moving to a quota management system (QMS) under a formal Management Plan from the current input managed system. Under the QMS the fishery sectors will be allocated catches based on the biological sustainability of the stock. The QMS is expected to be implemented before 2011.



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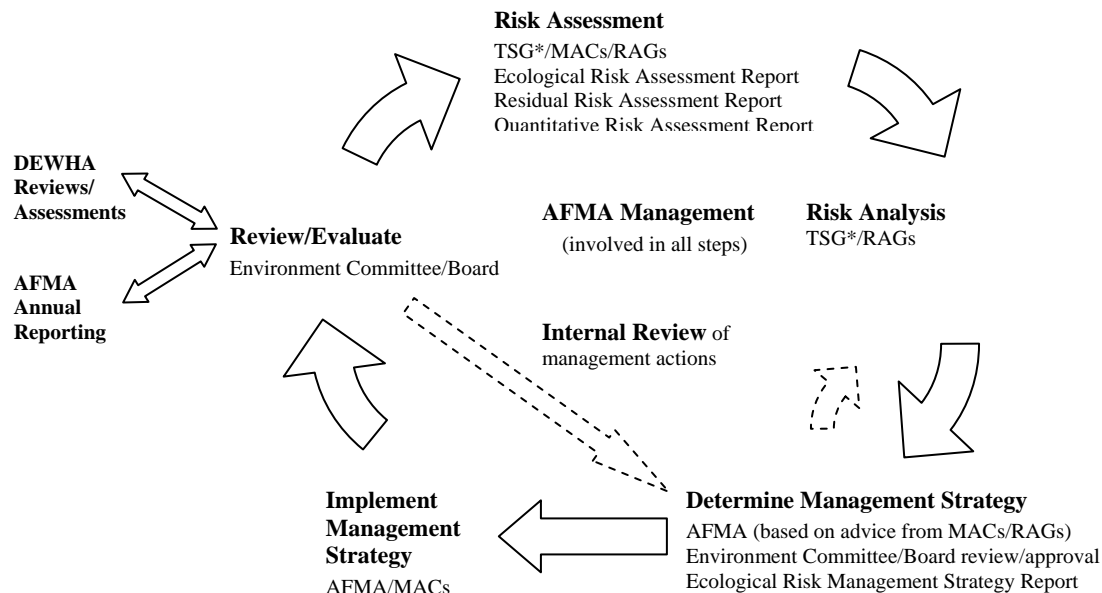
1. OVERVIEW

- **Implementing ecological risk management in Commonwealth managed fisheries**

AFMA aims to minimise the impacts of Commonwealth managed fisheries on all aspects of the marine ecosystem. AFMA’s adoption of the ecological component of Ecologically Sustainable Development (ESD) is a significant departure from traditional fisheries management with the focus shifted from the direct management of target species to also considering the impacts on bycatch species, protected (TEP) species, habitats, and communities.

Key to AFMA’s implementation of the ecological component of ESD has been to develop and implement an ecological risk management (ERM) framework (refer to **Figure 1**). The framework details a robust and transparent process to assess, analyse and respond to the ecological risks posed by Commonwealth managed fisheries.

Figure 1: Ecological Risk Management framework



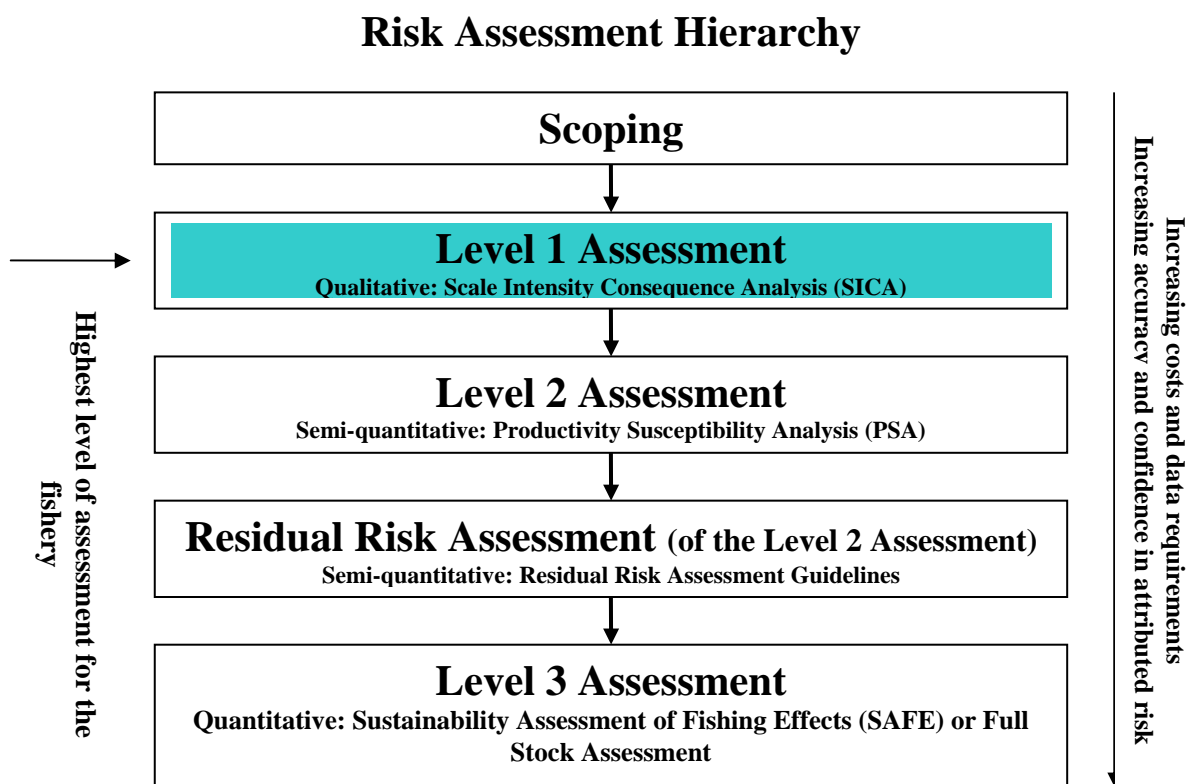
*TSG – Technical Support Group – currently provided by CSIRO

The ERM framework progresses through a number of steps and involves a hierarchy of risk assessment methodologies progressing from a comprehensive but largely qualitative analysis at Level 1 to a quantitative analysis at Level 3 (refer to **Figure 2**). This approach is a means of screening out low risk activities and focusing more intensive and quantitative analyses on those activities assessed as having a greater environmental impact on AFMA managed fisheries.

The initial assessment stage involves the development of a qualitative ecological risk assessment (ERA) for each individual fishery. ERAs assess the impact, direct and indirect, that a fishery’s activities may have on the marine ecosystem. These assessments provide the foundation for further risk assessment and analysis. While it has been a long and complex process, ERAs have now been completed (to varying degrees – either Level 1, 2 or 3) for all major Commonwealth managed fisheries.



Figure 2: Risk assessment hierarchy



The results of the risk assessments are now the focus for the development and implementation of this ERM strategy. Further information on the risk assessment process and methodologies applied can be found on AFMA’s website.

- **Developing an ecological risk management strategy**

The priority list for this fishery was developed using Level 1 SICA analysis.

Once identified, species that form the priority list for each fishery will be managed either through fishery specific arrangements or under one or more of the following policies or measures:

- Harvest Strategy Policy and Guidelines;
- Non-key Commercial Species (byproduct) Policy;
- Bycatch and Discard Program;
- Shark Policy and the Chondrichthyan Guide for Fisheries Managers; and
- Protected (TEP) species under various international plans of action, recovery plans etc.

Due to limitations in the ERA methodology, for assessing the impacts of fishing operations on habitats and communities, AFMA will defer the development of an ERM strategy for these components until more refined and meaningful results become available.



- **Measuring individual mitigation strategies**

In managing the priority species identified in each fishery we will prepare reports with clear performance measures which address both long and short term goals and aims. Ongoing monitoring and review of the mitigation measures will occur. In the medium to longer term these results will also be used when assessing any change of status of a species e.g. where a bycatch or byproduct species moves to become a target species. Mitigation actions can be taken for individual species or groups of species.

Fisheries are encouraged to consider “cross” fishery solutions when implementing measures for species that are identified as at risk across more than one fishery and/or where fishing methods cross fishery boundaries.

Outcomes of the ERM strategies and measures described in each fishery’s various work plans and Harvest Strategies will flow into a number of processes including annual reporting to the Department of the Environment, Water, Heritage and the Arts.

It is expected that each fishery will be reassessed against the ERA methodology on a periodic basis in line with the review of any Wildlife Trade Operation (WTO) accreditation in place in the fishery.

2. ECOLOGICAL RISK MANAGEMENT PRIORITY LIST

The risks that the Torres Strait Rock Lobster Fishery poses to the sustainability of the marine ecosystem have been assessed through the application of an individual ERA completed to Level 1 in April 2007. This is described in the table below.



Table 1 details the results at each level of assessment. Further information and reports for each level of assessment can be found on AFMA’s website.

Level of assessment and risk levels attributed	Target Species	Byproduct Species	Bycatch Species	Protected (TEP) Species
Level 1 SICA Assessment				
Consequence score (for each species component)	3	1	1	2
Proceeded to Level 2 PSA Assessment (scores ≥ 3)	No	No	No	No
Level 2 PSA Assessment (N/A)				
High Risk				
Medium Risk				
Low Risk				
Level 2 PSA Residual Risk Assessment (N/A)				
High Risk				
Medium Risk				
Low Risk				
Level 3 SAFE Assessment (N/A)				
Extreme High Risk				
Precautionary Extreme High Risk				
High Risk				
Precautionary High Risk				
Medium Risk				
Precautionary Medium Risk				
Low Risk				
Overlap with Level 2 PSA Residual Risk Assessment				

The results of the Level 1 SICA risk assessment has been consolidated to form a priority list for the fishery comprised of 90 protected (TEP) species identified through the ERA: 27 species of marine reptiles, 6 species of seabirds, 6 species of marine mammals and 51 species of teleosts (Refer to **table 2**), which have been identified as occurring within the area of the fishery.

None of the 90 protected (TEP) species were assessed as being at high risk from the effects of TSRLF activity. However, consistent with good fisheries management and the specific requirements of the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*, all reasonable steps will be taken to ensure that interactions with these protected (TEP) species are minimised.



Table 2: Protected (TEP) species identified through the risk assessment process.

Taxonomic Group	Scientific Name	Role in Fishery	Highest Level of Assessment	Risk Score
Marine Mammal	6 species of marine mammals	TEP	Level 1 SICA	N/A
Marine Reptile	27 species of marine reptile	TEP	Level 1 SICA	N/A
Marine Bird	6 species of marine bird	TEP	Level 1 SICA	N/A
Teleost	51 species of bony fish	TEP	Level 1 SICA	N/A

3. ECOLOGICAL RISK MANAGEMENT STRATEGY

The Torres Strait Tropical Rock Lobster (TRL) Fishery is one of the most valuable commercial fisheries in the Torres Strait and is very important to many Torres Strait Traditional Inhabitants as well as non-Islander commercial licence holders. The fishery is based on a single species, the ornate tropical rock lobster (*Panulirus ornatus*). Lobsters are taken by hand or a short hand spear by divers working from dinghies. Most divers free dive on shallow reef tops but many others use hookah (surface supplied air) to dive the large areas of “open bottom” in the Torres Strait. Most fishing occurs during neap tides when currents ease and underwater visibility improves. Commercial fishing occurs from December to September inclusive, peaking in March-August.

Traditional Inhabitants fishing for subsistence (traditional catch) can take at any time of the year:

- up to three lobsters per person without the use of a boat, or where there is only one person aboard the boat; or
- up to six per boat where there is more than one person aboard the boat.

The fishery is currently managed through a variety of input controls including a limited number of dinghies in the predominantly non-Islander freezer boat sector, but not in the Traditional Inhabitant Boat sector, and a boat replacement policy for upgrading vessels that aims to control fishing capacity by preventing the introduction of larger more efficient boats in the non-commercial sector. There has also been a ban on trawlers taking lobster since the early 1980s to prevent pressure on the lobster resource from the prawn trawling fleet.

Technical controls include a legal size limit, hookah-gear ban from December to January, a commercial fishing ban in October and November inclusive. Interim measures by way of a week-long spring-tide hookah closure each month and a 30% tender reduction in the Transferable Vessel Holder sector have been in place since 2003 and negotiated each year. Lobsters can only be taken by hand or hand held implements.

The fishery is moving from an input based system to a quota management system which is expected to be implemented before 2011.

The ERM strategy for the TSTRLF will address the 90 protected (TEP) species identified as priorities through the risk assessment process. The strategy will employ a number of fisheries



management policies and measures to deliver appropriate actions to mitigate the risk posed by the fishery. Further details of how individual species will be addressed are provided below.

- **Harvest Strategies for key commercial (target and some byproduct) species**

The implementation of Harvest Strategies for all Commonwealth managed fisheries is a key component of AFMA’s management of key commercial species (target and some byproduct species). Individual fishery specific Harvest Strategies will set out clear decision rules to manage fisheries in an environmentally sustainable manner while also ensuring maximum economic returns.

The TSTRF has developed a Harvest Strategy for one target species (ornate rock lobster, *Panulirus ornatus*). Ornate rock lobster has not been identified as a priority species. **Table 3** details those priority species which are to/will be addressed under this policy.

Table 3: Priority species to be addressed under Harvest Strategies.

Taxonomic Group	Scientific Name	Common Name	Role in Fishery	Highest Level of Assessment	Risk Score
Crustacean	<i>Panulirus ornatus</i>	Ornate rock lobster			

- **Protected (TEP)**

All protected (TEP) species identified through the ERA process (as occurring in the area of the fishery) will automatically be included in the priority list for each fishery. Many of these species are already managed under various international plans of action including the:

- Recovery Plan for Marine Turtles in Australia.

No protected (TEP) species were rated above negligible or minor through the ERA process. Protected (TEP) species considered to overlap with the area of the fishery have been included in this report and all reasonable steps will be taken to minimise interactions with these species (**Table 4**).



Table 4: List of protected (TEP) species which were not found to be at high ecological risk, but which were considered to overlap with the area of the fishery. All reasonable steps will be taken to minimise interactions with these species.

Taxonomic Group	Scientific Name	Common Name	Role in Fishery	Highest Level of Assessment	Risk Score
Marine mammal	<i>Dugong dugon</i>	Dugong	TEP	Level 1 SICA	Negligible or minor
Marine mammal	<i>Tursiops truncatus</i>	Bottlenose Dolphin	TEP	Level 1 SICA	Negligible or minor
Marine mammal	<i>Stenella longirostris</i>	Long-snouted Spinner Dolphin	TEP	Level 1 SICA	Negligible or minor
Marine mammal	<i>Sousa chinensis</i>	Indo-Pacific Humpback Dolphin	TEP	Level 1 SICA	Negligible or minor
Marine mammal	<i>Globicephala macrorhynchus</i>	Short-finned Pilot Whale	TEP	Level 1 SICA	Negligible or minor
Marine mammal	<i>Delphinus delphis</i>	Common Dolphin	TEP	Level 1 SICA	Negligible or minor
Marine bird	<i>Sterna sumatrana</i>	Black-naped tern	TEP	Level 1 SICA	Negligible or minor
Marine bird	<i>Sterna anaethetus</i>	Bridled Tern	TEP	Level 1 SICA	Negligible or minor
Marine bird	<i>Anous minutus</i>	Black Noddy	TEP	Level 1 SICA	Negligible or minor
Marine bird	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	TEP	Level 1 SICA	Negligible or minor
Marine bird	<i>Pterodroma heraldica</i>	Herald Petrel	TEP	Level 1 SICA	Negligible or minor
Marine bird	<i>Calonectris leucomelas</i>	streaked shearwater	TEP	Level 1 SICA	Negligible or minor
Marine reptile	<i>Crocodylus porosus</i>	saltwater crocodile	TEP	Level 1 SICA	Negligible or minor
Marine reptile	<i>Pelamis platurus</i>	yellow-bellied seasnake	TEP	Level 1 SICA	Negligible or minor
Marine reptile	<i>Lapemis hardwickii</i>	Spine-bellied Seasnake	TEP	Level 1 SICA	Negligible or minor
Marine reptile	<i>Hydrophis vorisi</i>	A seasnake	TEP	Level 1 SICA	Negligible or minor
Marine reptile	<i>Hydrophis pacificus</i>	Large-headed Seasnake	TEP	Level 1 SICA	Negligible or minor
Marine reptile	<i>Hydrophis ornatus</i>	seasnake	TEP	Level 1 SICA	Negligible or minor

Marine reptile	<i>Hydrophis melanosoma</i>	Black-banded robust seasnake	TEP	Level 1 SICA	Negligible or minor
Marine reptile	<i>Hydrophis mcdowelli</i>	seasnake	TEP	Level 1 SICA	Negligible or minor
Marine reptile	<i>Hydrophis gracilis</i>	Slender seasnake	TEP	Level 1 SICA	Negligible or minor
Marine reptile	<i>Hydrophis elegans</i>	Elegant seasnake	TEP	Level 1 SICA	Negligible or minor
Marine reptile	<i>Hydrophis atriceps</i>	Black-headed seasnake	TEP	Level 1 SICA	Negligible or minor
Marine reptile	<i>Hydrelaps darwiniensis</i>	Black-ringed Seasnake	TEP	Level 1 SICA	Negligible or minor
Marine reptile	<i>Enhydrina schistosa</i>	Beaked Seasnake	TEP	Level 1 SICA	Negligible or minor
Marine reptile	<i>Disteira major</i>	Olive-headed Seasnake	TEP	Level 1 SICA	Negligible or minor
Marine reptile	<i>Disteira kingii</i>	spectacled seasnake	TEP	Level 1 SICA	Negligible or minor
Marine reptile	<i>Astrotia stokesii</i>	Stokes' seasnake	TEP	Level 1 SICA	Negligible or minor
Marine reptile	<i>Aipysurus laevis</i>	Olive Seasnake, Golden Seasnake	TEP	Level 1 SICA	Negligible or minor
Marine reptile	<i>Aipysurus eydouxii</i>	Spine-tailed Seasnake	TEP	Level 1 SICA	Negligible or minor
Marine reptile	<i>Aipysurus duboisii</i>	Dubois' Seasnake	TEP	Level 1 SICA	Negligible or minor
Marine reptile	<i>Acalyptophis peronii</i>	Horned Seasnake	TEP	Level 1 SICA	Negligible or minor
Marine reptile	<i>Laticauda laticaudata</i>	Large scaled sea krait	TEP	Level 1 SICA	Negligible or minor
Marine reptile	<i>Laticauda colubrina</i>	Banded wide faced Sea krait	TEP	Level 1 SICA	Negligible or minor
Marine reptile	<i>Natator depressus</i>	Flatback turtle	TEP	Level 1 SICA	Negligible or minor
Marine reptile	<i>Lepidochelys olivacea</i>	Olive Ridley turtle	TEP	Level 1 SICA	Negligible or minor
Marine reptile	<i>Eretmochelys imbricata</i>	Hawksbill turtle	TEP	Level 1 SICA	Negligible or minor
Marine reptile	<i>Chelonia mydas</i>	Green turtle	TEP	Level 1 SICA	Negligible or minor
Marine reptile	<i>Caretta caretta</i>	Loggerhead	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Hippocampus jugumus</i>	Spiny Seahorse	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Hippocampus bargibanti</i>	pygmy seahorse	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Trachyrhamphus longirostris</i>	Long-nosed Pipefish, Straight Stick Pipefish	TEP	Level 1 SICA	Negligible or minor

Teleost	<i>Syngnathoides biaculeatus</i>	Double-ended Pipehorse, Alligator Pipefish	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Solegnathus sp. 1</i> [in Kuiter, 2000]	Pipehorse	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Siokunichthys breviceps</i>	[a pipefish]	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Phoxocampus diacanthus</i>	[a pipefish]	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Nannocampus lindemanensis</i>	[a pipefish]	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Microphis brachyurus</i>	[a pipefish]	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Micrognathus natans</i>	[a pipefish]	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Micrognathus pygmaeus</i>	[a pipefish]	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Micrognathus andersonii</i>	Anderson's Pipefish, Shortnose Pipefish	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Hippocampus zebra</i>	[a pipefish]	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Hippocampus planifrons</i>	Flat-face Seahorse	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Hippichthys spicifer</i>	[a pipefish]	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Hippichthys penicillus</i>	Beady Pipefish, Steep-nosed Pipefish	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Hippichthys heptagonus</i>	Madura Pipefish	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Hippichthys cyanospilos</i>	Blue-speckled Pipefish, Blue-spotted Pipefish	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Halicampus spinirostris</i>	Spiny-snout Pipefish	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Halicampus nitidus</i>	Glittering Pipefish	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Halicampus mataafae</i>	[a pipefish]	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Halicampus macrorhynchus</i>	[a pipefish]	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Halicampus dunckeri</i>	Red-hair Pipefish, Duncker's Pipefish	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Halicampus brocki</i>	Brock's Pipefish	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Festucalex gibbsi</i>	[a pipefish]	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Festucalex cinctus</i>	Girdled Pipefish	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Doryrhamphus janssi</i>	Cleaner Pipefish, Janss' Pipefish	TEP	Level 1 SICA	Negligible or minor

Teleost	<i>Doryrhamphus melanopleura</i>	Bluestripe Pipefish	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Dunckerocampus dactyliophorus</i>	Ringed Pipefish	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Cosmocampus maxweberi</i>	[a pipefish]	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Corythoichthys schultzi</i>	Schultz's Pipefish	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Corythoichthys paxtoni</i>	[a pipefish]	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Corythoichthys ocellatus</i>	Orange-spotted Pipefish, Ocellated Pipefish	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Corythoichthys intestinalis</i>	Australian Messmate Pipefish, Banded Pipefish	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Corythoichthys amplexus</i>	Fijian Banded Pipefish, Brown-banded Pipefish	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Choeroichthys suillus</i>	Pig-snouted Pipefish	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Choeroichthys sculptus</i>	[a pipefish]	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Choeroichthys cinctus</i>	[a pipefish]	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Choeroichthys brachysoma</i>	Pacific Short-bodied Pipefish, Short-bodied pipefish	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Campichthys tricarinatus</i>	Three-keel Pipefish	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Bulbonaricus davaoensis</i>	[a pipefish]	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Acentronura breviperula</i>	Hairy Pygmy Pipehorse	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Hippocampus taeniopterus</i>	Spotted Seahorse, Yellow Seahorse	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Corythoichthys conspicillatus</i>	Yellow-banded Pipefish, Network Pipefish	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Halicampus grayi</i>	Mud Pipefish, Gray's Pipefish	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Haliichthys taeniophorus</i>	Ribboned Seadragon, Ribboned Pipefish	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Trachyrhamphus bicoarctatus</i>	Bend Stick Pipefish, Short-tailed Pipefish	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Hippocampus angustus</i>	Western Spiny Seahorse	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Solenostomus paradoxus</i>	Harlequin Ghost Pipefish, Ornate Ghost Pipefish	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Solenostomus cyanopterus</i>	Blue-finned Ghost Pipefish, Robust Ghost	TEP	Level 1 SICA	Negligible or minor
Teleost	<i>Hippocampus spinosissimus</i>	Hedgehog Seahorse	TEP	Level 1 SICA	Negligible or minor

4. REPORTING AND REVIEW

The reporting mechanisms and frameworks that are in place within each of the policies and measures detailed above will form the principal ERM strategy review components for each fishery. They will also be used when providing input to annual reporting requirements for the Department of the Environment, Water, Heritage and the Arts.

A full review of the risk assessments undertaken for each Commonwealth managed fishery will be completed periodically. Outcomes of the ERM strategies and measures described in each fishery's various work plans and Harvest Strategies will flow into a number of processes including annual reporting to the Department of the Environment, Water, Heritage and the Arts. Individual fishery Harvest Strategies and Bycatch and Discard Work Plans contain annual and longer term review timeframes and it is expected that the Non-key Commercial Species Policy will do likewise. The Chondrichthyan Working Group has met once with its goal being to produce a generic guide of mitigation measures suitable for use across all Commonwealth managed fisheries.

On a broader scale the outputs from the annual reviews will be used to form the response to any Wildlife Trade Operation (WTO) accreditation or exemption in place in the fishery.



5. GLOSSARY

Attribute	A general term for a set of properties relating to the productivity or susceptibility of a particular unit of analysis.
Bycatch	That part of fisher's catch which is returned to the sea either because it has no commercial value or regulations preclude it from being retained and; that part of the catch that does not reach the deck of the fishing vessel but is affected by the interaction with the fishing gear.
Byproduct	A non-target species captured in a fishery that has value to the fisher and may be retained for sale.
Component	The marine ecosystem is broken down into five components for the risk assessment: target species (TA); byproduct (BI) and bycatch species (DI); protected (TEP) species; habitats; and ecological communities.
ERA	Ecological risk assessment for the effects of fishing as developed by AFMA and CSIRO.
Gear	The equipment used for fishing, e.g. gillnet, Danish seine, pelagic longline, midwater trawl, purse seine, trap etc.

Level 3 SAFE risk categories

Low risk	where the fishing mortality rate is less than the maximum fishing mortality rate
Medium risk	where the fishing mortality rate is greater than or equal to the maximum fishing mortality rate but less than the minimum biomass limit (where the biomass limit is defined as half of the biomass that supports a maximum sustainable mortality)
Precautionary Medium risk	where the fishing mortality rate is greater than or equal to the minimum sustainable fishing mortality or the fishing mortality rate plus a 90% confidence interval is greater than or equal to maximum fishing mortality
High risk	where the fishing mortality rate is greater than or equal to the minimum biomass limit (where the biomass limit is defined as half of the biomass that supports a maximum sustainable mortality) but less than the minimum unsustainable fishing mortality rate that, in theory, may lead to population extinction



Precautionary High risk	where the fishing mortality rate is greater than or equal to the minimum biomass limit (where the biomass limit is defined as half of the biomass that supports a maximum sustainable mortality) or where the fishing mortality rate plus a 90% confidence interval is greater than or equal to a fishing mortality rate corresponding to limit biomass
Extreme high risk	where the fishing mortality rate is greater than or equal to the minimum unsustainable fishing mortality rate that, in theory, may lead to population extinction
Precautionary Extreme high risk	where the fishing mortality rate is greater than or equal to the minimum unsustainable fishing mortality rate that, in theory, may lead to population extinction or where the fishing rate plus a 90% confidence interval is greater than or equal to the minimum unsustainable fishing mortality rate that, in theory, may lead to population extinction
Level 2 PSA Residual Risk	In the context of this document residual risk means the residual risk after the Level 2 PSA assessment.
Scoping	A general step in an ERA or the first step in the ERAEF involving the identification of the fishery history, management, methods, scope and activities.
Susceptibility	Used in Level 2 PSA assessment to calculate the impact on an ecological component due to a fishing activity. The extent of the impact due to the fishing activity, determined by the affect of the fishing activities on the unit.



References

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