Australian Government
Australian Fisheries Management Authority

Ecological Risk Management

REPORT FOR THE WESTERN DEEPWATER TRAWL FISHERY

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Summary of priority issues for managing the ecological effects of fishing in the Western Deepwater Trawl Fishery

A range of risk assessment methods have been applied to the Western Deepwater Trawl Fishery and the outcome from each of these assessments (which are further expanded on later in this report) follows:

- **Under the Level 2 PSA 22 species (or species groups) which were assessed as being at high risk;**
- **After the application of the Residual Risk Guidelines 22 species remained at high risk;**
- **125 threatened, endangered or protected species are also theoretically found within the waters of the fishery. These include 3 species of sharks/rays, 18 species of seabirds, 44 species of marine mammals, 20 species of marine reptiles and 40 species of bony fish. Although none of these species were assessed as being at high risk (and were eliminated at Level 1), all reasonable steps will be taken to minimise future interactions with these species.**

Description of the Western Deepwater Trawl Fishery

Fishery Description

Gear:	**Otter trawl (minimum 90mm cod-end)**
	Crustacean trawl (45 mm cod-end)
Area:	**Cape Leeuwin to North West Cape**
Depth range:	**200 to 1300m**
Fleet size:	**11 vessels**
Effort:	**Approximately 1,000 shots per year**
Landings:	**Approximately 200 t per year**
Discard rate:	**unknown**
Main target species:	**orange roughy, mirror dory, gemfish, deepwater flathead, ruby snapper, Tang's snapper, scampi and bugs**
Management:	**11 transferable fishing permits issued**
Observer program:	**1 trip 2006**

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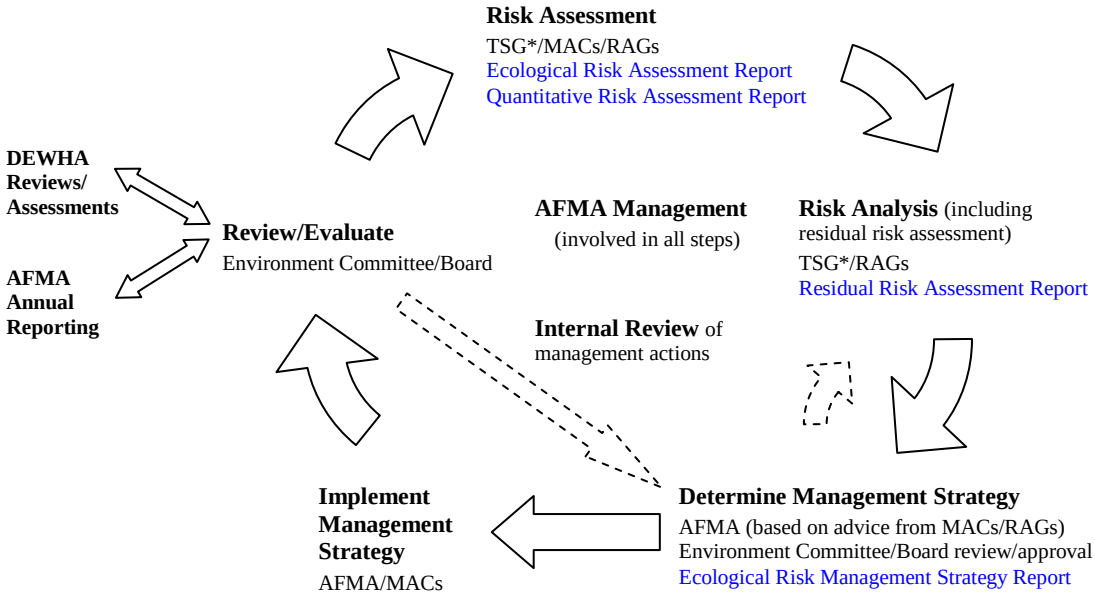
1. OVERVIEW

1.1. Implementing ecological risk management in Commonwealth managed fisheries

Through an approach known as ecosystem based fisheries management (EBFM), AFMA aims to minimise the impacts of Commonwealth managed fisheries on all aspects of the marine ecosystem. AFMA's adoption of EBFM 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, threatened, endangered and protected (TEP) species, habitats, and communities.

Key to AFMA's implementation of EBFM 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



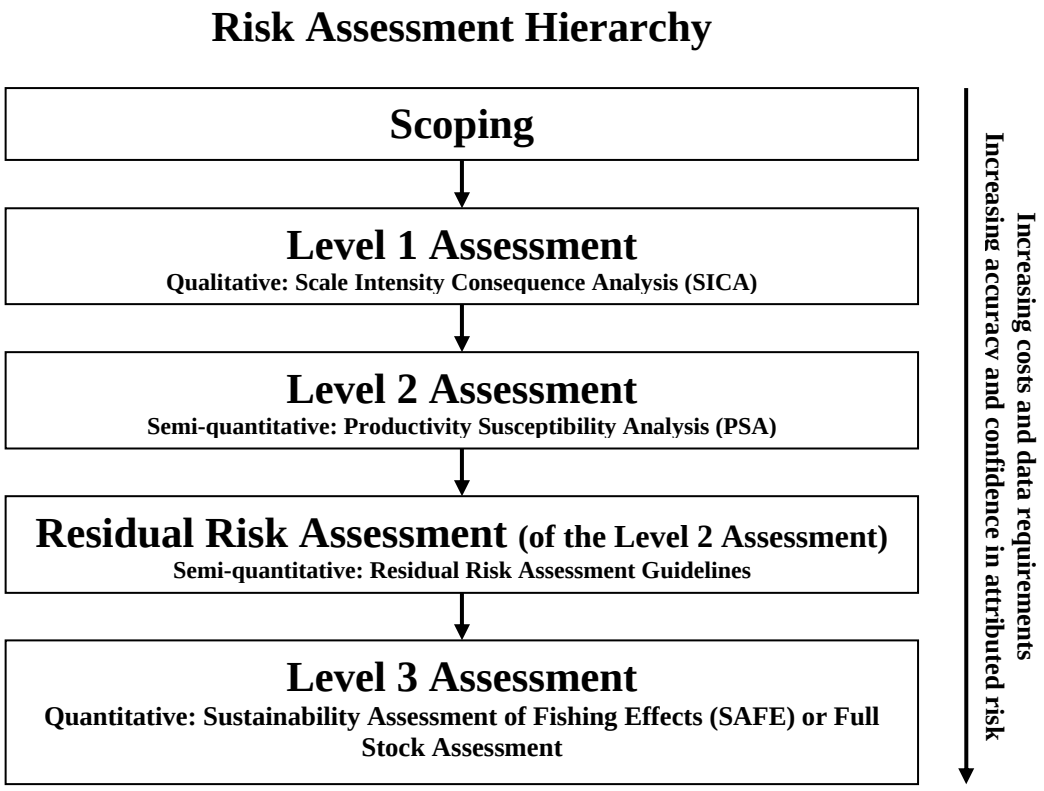
*TSG – Technical Support Group – currently provided by CSIRO

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 cost and time efficient 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 Australia's fisheries.

The initial assessment stage involves the development of an ecological risk assessment (ERA) for each individual fishery. ERAs assess the impact, direct and indirect, 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 or 2) for all major Commonwealth managed fisheries.

The next stage of the assessment process involves the development of a residual risk assessment for each individual fishery. Residual risk assessments evaluate and refine ERA high risk outcomes by taking into account additional information not considered through the ERA process, in particular the mitigating effects of current management arrangements. In addition to residual risk process, a number of fisheries have also undergone further quantitative risk assessment (Level 3 assessment).

Figure 2: Risk assessment hierarchy



The results of the risk assessments for each fishery will be consolidated to form a priority list which will be the focus for the next step in the process – the development and implementation of an ERM strategy. Further information on the risk assessment process and methodologies applied can be found on AFMA's website.

1.2. Developing an ecological risk management strategy

The result of the risk assessment process is a priority list identifying the key ecological areas in the fishery that require management attention. A fishery's priority list will be comprised of:

- those species identified as precautionary high risk, extreme high risk or precautionary extreme high risk through a quantitative risk assessment; and
- those species that have not undergone a quantitative risk assessment and are identified as high risk through the application of the residual risk assessment methodology; and,
- all TEP species identified through the ERA.

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 Working Group; and
- TEP species under various international plans of action, recovery plans etc.

A detailed ERM strategy for each Commonwealth fishery will be prepared which clearly identifies how each species or group of species will be managed under the policies or measures described above.

ERM strategies to address those remaining species identified as at medium or low risk will be implemented at a later date. 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.

1.3. Measuring individual mitigation strategies

Management of the priority species identified in each fishery under the five key policies and measures will include the preparation of reports with clear performance measures which address both long and short term goals and aims. Ongoing monitoring and review of the specified mitigation measures effectiveness in lowering the risk to priority species is a fundamental requirement of any proposed strategy, with reporting timeframes being fixed for the life of the strategy. In the medium to longer term these results will also be used when assessing any change of status of a species i.e. where a bycatch or byproduct species moves to become a target 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 three year basis in line with the review of any Wildlife Trade Operation (WTO) in place in the fishery.

2. ECOLOGICAL RISK MANAGEMENT PRIORITY LIST

The risks that the Western Deepwater Trawl Fishery poses to the sustainability of the marine ecosystem have been assessed through the application of a progression of risk assessment methodologies as listed below:

- an individual ERA completed to Level 2 in June 2007;
- a residual risk assessment completed in December 2007; and,
- a rapid quantitative risk assessment has yet to be completed

Table 1a details the results at each level of assessment for finfish gear. 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	TEP Species
Level 1 SICA Assessment				
Consequence score (for each species component)	4	4	4	2
Proceeded to Level 2 PSA Assessment (scores ≧ 3)	17	100	12	0
Level 2 PSA Assessment				
High Risk	3	16	1	0
Medium Risk	4	27	6	0
Low Risk	10	57	5	0
Level 2 PSA Residual Risk Assessment				
High Risk	3	16	1	0
Medium Risk	4	27	6	0
Low Risk	10	57	5	0
Level 3 SAFE Assessment (yet to be completed)				
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				

Table 1b details the results at each level of assessment for crustacean gear. 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	TEP Species
Level 1 SICA Assessment				
Consequence score (for each species component)	4	4	4	2
Proceeded to Level 2 PSA Assessment (scores ≧ 3)	17	100	12	0
Level 2 PSA Assessment				
High Risk	4	17	1	0
Medium Risk	5	30	5	0
Low Risk	8	54	5	0
Level 2 PSA Residual Risk Assessment				
High Risk	4	17	1	0
Medium Risk	5	30	5	0
Low Risk	8	54	5	0
Level 3 SAFE Assessment (yet to be completed)				

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 these risk assessments have been consolidated to form a priority list for the fishery comprised of:

- 22 total species that have not undergone a further rapid quantitative risk assessment and are identified as high risk through the application of the residual risk assessment methodology; and,
- 125 TEP species identified through the ERA, however these species were eliminated at Level 1 due to the offshore nature of the fishery and the low level of fishing effort.

Table 2 details the priority species list for the Western Deepwater Trawl Fishery on which AFMA will focus ERM efforts. Overall 22 species were identified: 4 target, 17 byproduct, 1 bycatch (discard), and 0 TEP species.

Table 2: Priority species list for the Western Deepwater Trawl Fishery. Species identified as high risk from only the crustacean gear analysis are identified with an "*".

Taxonomic Group	Scientific Name	Common Name	Role in Fishery	Highest Level of Assessment	Risk Score
Chondrichthyan	*Deania quadrispinosa*	Platypus shark	BP	PSA Level 2	3.58
Chondrichthyan	*Carcharhinus obscurus*	Dusky shark	BP	PSA Level 2	3.43
Chondrichthyan	*Deania calcea*	Brier shark	BP	PSA Level 2	3.19
Chondrichthyan	*Hydrolagus lemures*	Bight ghost shark	BP	PSA Level 2	3.61
Chondrichthyan	*Galeorhinus galeus*	School shark	BP	PSA Level 2	3.95
Chondrichthyan	*Squatina tergocellata*	Ornate angel shark	BP	PSA Level 2	3.86
Chondrichthyan	*Squalus mitsukurii*	Green-eyed dogfish	BP	PSA Level 2	3.86
Chondrichthyan	*Squalus megalops*	Piked dogfish	BP	PSA Level 2	3.77
Chondrichthyan	*Centrophorus moluccensis*	Endeavour dogfish	BP	PSA Level 2	3.95
Chondrichthyan	*Chimaera sp. C*	Longspine chimaera	BP	PSA Level 2	3.37
Chondrichthyan	*Chimaera sp. E*	Whitefin chimaera	BP	PSA Level 2	3.77
Teleost	*Dannevigia tusca*	Australian tusk	BP	PSA Level 2	3.19
Teleost	*Nelusetta ayraudi*	Chinaman-Leatherjacket	BP	PSA Level 2	3.26
Teleost	*Rexea solandri*	Gemfish	TA	PSA Level 2	3.46
Teleost	*Nemadactylus macropterus*	Jackass morwong	BP	PSA Level 2	3.32
Teleost	*Zenopsis nebulosus*	Mirror dory	TA	PSA Level 2	3.32

Teleost	*Paristiopterus gallipavo*	Yellow-spotted boarfish	BP	PSA Level 2	3.27
Teleost	*Plagiogeneion macrolepis*	Bigscale rubyfish	BP	PSA Level 2	3.61
Invertebrate	*Hypthalassia acerba*	Champagne crab	BP	PSA Level 2	3.27
Teleost	*Lipocheilus carnolabrum*	Tang snapper	TA	PSA Level 2	3.32
*Teleost	*Pentaceros decacanthus*	Big-spined boarfish	TA	PSA Level 2	3.07
*Teleost	*Dentex tumifrons*	Yellowback bream	DI	PSA Level 2	2.66

In addition to the above 22 species that were identified as priorities on ecological grounds, the risk assessments also identified that 125 TEP species are theoretically found within the waters of the fishery (**Table 3**). None of these 125 TEP species were assessed as being at high ecological risk. 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 TEP species are minimised.

Table 3: TEP species identified through the risk assessment process.

Taxonomic Group	Scientific Name	Common Name	Role in Fishery	Highest Level of	Risk Score
Chondrichthyan	*Carcharodon carcharias*	white shark	TEP	SICA	NA
Chondrichthyan	*Carcharias taurus*	grey nurse shark	TEP	SICA	NA
Chondrichthyan	*Rhincodon typus*	whale shark	TEP	SICA	NA
Marine bird	*Diomedea amsterdamensis*	Amsterdam Albatross	TEP	SICA	NA
Marine bird	*Diomedea dabbenena*	Tristan Albatross	TEP	SICA	NA
Marine bird	*Diomedea epomophora*	Southern Royal Albatross	TEP	SICA	NA
Marine bird	*Diomedea exulans*	Wandering Albatross	TEP	SICA	NA
Marine bird	*Diomedea gibsoni*	Gibson's Albatross	TEP	SICA	NA
Marine bird	*Diomedea sanfordi*	Northern Royal Albatross	TEP	SICA	NA
Marine bird	*Phoebetria fusca*	Sooty Albatross	TEP	SICA	NA
Marine bird	*Thalassarche carteri*	Indian Yellow-nosed Albatross	TEP	SICA	NA
Marine bird	*Thalassarche cauta*	Shy Albatross	TEP	SICA	NA
Marine bird	*Thalassarche chlororhynchos*	Yellow-nosed Albatross	TEP	SICA	NA
Marine bird	*Thalassarche chrysostoma*	Grey-headed Albatross	TEP	SICA	NA
Marine bird	*Thalassarche melanophrys*	Black-browed Albatross	TEP	SICA	NA
Marine bird	*Anous tenuirostris melanops*	Australian Lesser Noddy	TEP	SICA	NA
Marine bird	*Catharacta skua*	Great Skua	TEP	SICA	NA
Marine bird	*Halobaena caerulea*	Blue Petrel	TEP	SICA	NA
Marine bird	*Macronectes giganteus*	Southern Giant-Petrel	TEP	SICA	NA
Marine bird	*Macronectes halli*	Northern Giant-Petrel	TEP	SICA	NA
Marine bird	*Pterodroma mollis*	Soft-plumaged Petrel	TEP	SICA	NA
Marine mammal	*Balaenoptera bonaerensis*	Antarctic Minke Whale	TEP	SICA	NA
Marine mammal	*Caperea marginata*	Pygmy Right Whale	TEP	SICA	NA
Marine mammal	*Eubalaena australis*	Southern Right Whale	TEP	SICA	NA
Marine mammal	*Balaenoptera acutorostrata*	Minke Whale	TEP	SICA	NA

Marine mammal	*Balaenoptera borealis*	Sei Whale	TEP	SICA	NA
Marine mammal	*Balaenoptera edeni*	Bryde's Whale	TEP	SICA	NA
Marine mammal	*Balaenoptera musculus*	Blue Whale	TEP	SICA	NA
Marine mammal	*Balaenoptera physalus*	Fin Whale	TEP	SICA	NA
Marine mammal	*Megaptera novaeangliae*	Humpback Whale	TEP	SICA	NA
Marine mammal	*Delphinus delphis*	Common Dolphin	TEP	SICA	NA
Marine mammal	*Feresa attenuata*	Pygmy Killer Whale	TEP	SICA	NA
Marine mammal	*Globicephala macrorhynchus*	Short-finned Pilot Whale	TEP	SICA	NA
Marine mammal	*Globicephala melas*	Long-finned Pilot Whale	TEP	SICA	NA
Marine mammal	*Grampus griseus*	Risso's Dolphin	TEP	SICA	NA
Marine mammal	*Lagenodelphis hosei*	Fraser's Dolphin	TEP	SICA	NA
Marine mammal	*Lagenorhynchus obscurus*	Dusky Dolphin	TEP	SICA	NA
Marine mammal	*Lissodelphis peronii*	Southern Right Whale Dolphin	TEP	SICA	NA
Marine mammal	*Orcinus orca*	Killer Whale	TEP	SICA	NA
Marine mammal	*Peponocephala electra*	Melon-headed Whale	TEP	SICA	NA
Marine mammal	*Pseudorca crassidens*	False Killer Whale	TEP	SICA	NA
Marine mammal	*Sousa chinensis*	Indo-Pacific Humpback Dolphin	TEP	SICA	NA
Marine mammal	*Stenella attenuata*	Spotted Dolphin	TEP	SICA	NA
Marine mammal	*Stenella coeruleoalba*	Striped Dolphin	TEP	SICA	NA
Marine mammal	*Stenella longirostris*	Long-snouted Spinner Dolphin	TEP	SICA	NA
Marine mammal	*Steno bredanensis*	Rough-toothed Dolphin	TEP	SICA	NA
Marine mammal	*Tursiops aduncus*	Indian Ocean bottlenose dolphin	TEP	SICA	NA
Marine mammal	*Tursiops truncatus*	Bottlenose Dolphin	TEP	SICA	NA
Marine mammal	*Dugong dugon*	Dugong	TEP	SICA	NA
Marine mammal	*Neophoca cinerea*	Australian Sea-lion	TEP	SICA	NA
Marine mammal	*Kogia breviceps*	Pygmy Sperm Whale	TEP	SICA	NA
Marine mammal	*Kogia simus*	Dwarf Sperm Whale	TEP	SICA	NA
Marine mammal	*Physeter catodon*	Sperm Whale	TEP	SICA	NA
Marine mammal	*Berardius arnuxii*	Arnoux's Beaked Whale	TEP	SICA	NA
Marine mammal	*Hyperoodon planifrons*	Southern Bottlenose Whale	TEP	SICA	NA
Marine mammal	*Indopacetus pacificus*	Longman's Beaked Whale	TEP	SICA	NA
Marine mammal	*Mesoplodon bowdoini*	Andrew's Beaked Whale	TEP	SICA	NA
Marine mammal	*Mesoplodon densirostris*	Blainville's Beaked Whale	TEP	SICA	NA
Marine mammal	*Mesoplodon gingkodens*	Gingko Beaked Whale	TEP	SICA	NA
Marine mammal	*Mesoplodon grayi*	Gray's Beaked Whale	TEP	SICA	NA
Marine mammal	*Mesoplodon hectori*	Hector's Beaked Whale	TEP	SICA	NA
Marine mammal	*Mesoplodon layardii*	Strap-toothed Beaked Whale	TEP	SICA	NA
Marine mammal	*Mesoplodon mirus*	True's Beaked Whale	TEP	SICA	NA
Marine mammal	*Tasmacetus shepherdi*	Tasman Beaked Whale	TEP	SICA	NA
Marine mammal	*Ziphius cavirostris*	Cuvier's Beaked Whale	TEP	SICA	NA
Marine reptile	*Caretta caretta*	Loggerhead	TEP	SICA	NA
Marine reptile	*Chelonia mydas*	Green turtle	TEP	SICA	NA
Marine reptile	*Eretmochelys imbricata*	Hawksbill turtle	TEP	SICA	NA
Marine reptile	*Natator depressus*	Flatback turtle	TEP	SICA	NA
Marine reptile	*Dermochelys coriacea*	Leathery turtle	TEP	SICA	NA
Marine reptile	*Acalyptophis peronii*	Horned Seasnake	TEP	SICA	NA

Marine reptile	*Aipysurus apraefrontalis*	Short-nosed Seasnake	TEP	SICA	NA
Marine reptile	*Aipysurus duboisii*	Dubois' Seasnake	TEP	SICA	NA
Marine reptile	*Aipysurus eydouxii*	Spine-tailed Seasnake	TEP	SICA	NA
Marine reptile	*Aipysurus laevis*	Olive Seasnake	TEP	SICA	NA
Marine reptile	*Aipysurus pooleorum*	Shark Bay Seasnake	TEP	SICA	NA
Marine reptile	*Astrotia stokesii*	Stokes' seasnake	TEP	SICA	NA
Marine reptile	*Disteira kingii*	spectacled seasnake	TEP	SICA	NA
Marine reptile	*Disteira major*	Olive-headed Seasnake	TEP	SICA	NA
Marine reptile	*Emydocephalus annulatus*	Turtle-headed Seasnake	TEP	SICA	NA
Marine reptile	*Ephalophis greyi*	NW Mangrove Seasnake	TEP	SICA	NA
Marine reptile	*Hydrophis czeblukovi*	fine-spined seasnake	TEP	SICA	NA
Marine reptile	*Hydrophis elegans*	Elegant seasnake	TEP	SICA	NA
Marine reptile	*Hydrophis ornatus*	seasnake	TEP	SICA	NA
Marine reptile	*Pelamis platurus*	yellow-bellied seasnake	TEP	SICA	NA
Teleost	*Solenostomus cyanopterus*	Blue-finned Ghost Pipefish	TEP	SICA	NA
Teleost	*Acentronura australe*	Southern Pygmy Pipehorse	TEP	SICA	NA
Teleost	*Bulbonaricus brauni*	Braun's Pughead Pipefish	TEP	SICA	NA
Teleost	*Campichthys galei*	Gale's Pipefish	TEP	SICA	NA
Teleost	*Choeroichthys brachysoma*	Pacific Short-bodied Pipefish	TEP	SICA	NA
Teleost	*Choeroichthys suillus*	Pig-snouted Pipefish	TEP	SICA	NA
Teleost	*Doryrhamphus malus*	Flagtail Pipefish	TEP	SICA	NA
Teleost	*Festucalex scalaris*	Ladder Pipefish	TEP	SICA	NA
Teleost	*Filicampus tigris*	Tiger Pipefish	TEP	SICA	NA
Teleost	*Halicampus brocki*	Brock's Pipefish	TEP	SICA	NA
Teleost	*Halicampus spinirostris*	Spiny-snout Pipefish	TEP	SICA	NA
Teleost	*Haliichthys taeniophorus*	Ribboned Seadragon	TEP	SICA	NA
Teleost	*Heraldia nocturna*	Upside-down Pipefish	TEP	SICA	NA
Teleost	*Hippocampus angustus*	Western Spiny Seahorse	TEP	SICA	NA
Teleost	*Hippocampus breviceps*	Short-head Seahorse	TEP	SICA	NA
Teleost	*Hippocampus jugumus*	Spiny Seahorse	TEP	SICA	NA
Teleost	*Hippocampus planifrons*	Flat-face Seahorse	TEP	SICA	NA
Teleost	*Hippocampus subelongatus*	West Australian Seahorse	TEP	SICA	NA
Teleost	*Histiogamphelus cristatus*	Rhino Pipefish	TEP	SICA	NA
Teleost	*Lissocampus caudalis*	Australian Smooth Pipefish	TEP	SICA	NA
Teleost	*Lissocampus fatiloquus*	Prophet's Pipefish	TEP	SICA	NA
Teleost	*Lissocampus runa*	Javelin Pipefish	TEP	SICA	NA
Teleost	*Maroubra perserrata*	Sawtooth Pipefish	TEP	SICA	NA
Teleost	*Micrognathus micronotopterus*	Tidepool Pipefish	TEP	SICA	NA
Teleost	*Mitotichthys meraculus*	Western Crested Pipefish	TEP	SICA	NA
Teleost	*Nannocampus subosseus*	Bony-headed Pipefish	TEP	SICA	NA
Teleost	*Phycodurus eques*	Leafy Seadragon	TEP	SICA	NA
Teleost	*Phyllopteryx taeniolatus*	Weedy Seadragon	TEP	SICA	NA
Teleost	*Pugnaso curtirostris*	Pug-nosed Pipefish	TEP	SICA	NA
Teleost	*Solegnathus guentheri*	Indonesian Pipefish	TEP	SICA	NA
Teleost	*Stigmatopora argus*	Spotted Pipefish	TEP	SICA	NA
Teleost	*Stigmatopora nigra*	Wide-bodied Pipefish	TEP	SICA	NA

Teleost	*Syngnathoides biaculeatus*	Double-ended Pipehorse	TEP	SICA	NA
Teleost	*Trachyrhamphus bicoarctatus*	Bend Stick Pipefish	TEP	SICA	NA
Teleost	*Trachyrhamphus longirostris*	Long-nosed Pipefish	TEP	SICA	NA
Teleost	*Urocampus carinirostris*	Hairy Pipefish	TEP	SICA	NA
Teleost	*Vanacampus margaritifer*	Mother-of-pearl Pipefish	TEP	SICA	NA
Teleost	*Vanacampus phillipi*	Port Phillip Pipefish	TEP	SICA	NA
Teleost	*Vanacampus poecilolaemus*	Australian Long-snout Pipefish	TEP	SICA	NA

3. ECOLOGICAL RISK MANAGEMENT STRATEGY

Currently, the Western Deepwater Trawl Fishery is managed through Management Arrangements and permit conditions, as well as the Harvest Strategy, that all contribute to the management of ecological risk. The fishery has a daily trip limit of 100 kg for several deepwater dogfish species including: Harrison's dogfish (*Centrophorus harrisoni*), endeavour dogfish (*C. moluccensis*) and southern dogfish (*C. uyato*). In addition, there is limited entry into the fishery, with only 11 permits issued. Effort in the fishery is currently very low, and has been so for several years, thus limiting the impact of the fishery on the priority species. Should effort increase dramatically (i.e. 50% or more), the management strategy will be reviewed and reassessed. Finally, all the priority species are included in the Harvest Strategy.

The ERM strategy for the Western Deepwater Trawl Fishery will address the 22 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.

3.1. 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 Harvest Strategies will set out clear decision rules to manage fisheries in an environmentally sustainable manner while also ensuring maximum economic returns.

The Western Deepwater Trawl Fishery has developed a Harvest Strategy which addresses all high priority species listed in Table 2.

3.2. Management of non-key commercial (byproduct) species

AFMA is currently developing a policy to address a gap in the management of byproduct species in Commonwealth fisheries. A number of priority species will fall under this policy once developed.

Table 5: Priority species to be addressed under Non-key Commercial Species Policy once developed.

Taxonomic Group	Scientific Name	Common Name	Role in Fishery	Highest Level of Assessment	Risk Score
Chondrichthyan	*Deania quadrispinosa*	Platypus shark	BP	PSA Level 2	3.58
Chondrichthyan	*Carcharhinus obscurus*	Dusky shark	BP	PSA Level 2	3.43
Chondrichthyan	*Deania calcea*	Brier shark	BP	PSA Level 2	3.19
Chondrichthyan	*Hydrolagus lemures*	Bight ghost shark	BP	PSA Level 2	3.61
Chondrichthyan	*Galeorhinus galeus*	School shark	BP	PSA Level 2	3.95
Chondrichthyan	*Squatina tergocellata*	Ornate angel shark	BP	PSA Level 2	3.86
Chondrichthyan	*Squalus mitsukurii*	Green-eyed dogfish	BP	PSA Level 2	3.86
Chondrichthyan	*Squalus megalops*	Piked dogfish	BP	PSA Level 2	3.77
Chondrichthyan	*Centrophorus moluccensis*	Endeavour dogfish	BP	PSA Level 2	3.95
Chondrichthyan	*Chimaera sp. C*	Longspine chimaera	BP	PSA Level 2	3.37
Chondrichthyan	*Chimaera sp. E*	Whitefin chimaera	BP	PSA Level 2	3.77
Teleost	*Dannevigia tusca*	Australian tusk	BP	PSA Level 2	3.19
Teleost	*Nelusetta ayraudi*	Chinaman-Leatherjacket	BP	PSA Level 2	3.26
Teleost	*Nemadactylus macropterus*	Jackass morwong	BP	PSA Level 2	3.32
Teleost	*Paristiopterus gallipavo*	Yellow-spotted boarfish	BP	PSA Level 2	3.27
Teleost	*Plagiogeneion macrolepis*	Bigscale rubyfish	BP	PSA Level 2	3.61
Invertebrate	*Hypthalassia acerba*	Champagne crab	BP	PSA Level 2	3.27

3.3. Managing bycatch and discarding

AFMA's program for addressing bycatch and discarding in Commonwealth managed fisheries was released in March 2008. The program implements a two streamed approach for minimising and mitigating against capture of bycatch and TEP species as well as strategies to minimise the discarding of target and quota species.

The Western Deepwater Trawl Fishery is developing a work plan to address measures which can reduce bycatch and discard. There is only a single species that is classified as bycatch on the priority list.

Table 6: Priority species to be addressed under the Bycatch and Discard Program.

Taxonomic Group	Scientific Name	Common Name	Role in Fishery	Highest Level of Assessment	Risk Score
Teleost	*Dentex tumifrons*	Yellowback bream	DI	PSA Level 2	

3.4. Chondrichthyan Working Group

A policy is currently under development to provide guidance to fishery managers and stakeholders in the adoption and implementation of management responses to mitigate those Chondrichthyan species identified at high risk under either the ERA or Rapid Quantitative Risk Assessment methodology. The Chondrichthyan Working Group will utilise expert based advice to develop effective mitigation strategies and to identify gaps in research and data.

Table 7: Priority species to be addressed through the Chondrichthyan Working Group and associated policies.

Taxonomic Group	Scientific Name	Common Name	Role in Fishery	Highest Level of Assessment	Risk Score
Chondrichthyan	*Deania quadrispinosa*	Platypus shark	BP	PSA Level 2	3.58
Chondrichthyan	*Carcharhinus obscurus*	Dusky shark	BP	PSA Level 2	3.43
Chondrichthyan	*Deania calcea*	Brier shark	BP	PSA Level 2	3.19
Chondrichthyan	*Hydrolagus lemures*	Bight ghost shark	BP	PSA Level 2	3.61
Chondrichthyan	*Galeorhinus galeus*	School shark	BP	PSA Level 2	3.95
Chondrichthyan	*Squatina tergocellata*	Ornate angel shark	BP	PSA Level 2	3.86
Chondrichthyan	*Squalus mitsukurii*	Green-eyed dogfish	BP	PSA Level 2	3.86
Chondrichthyan	*Squalus megalops*	Piked dogfish	BP	PSA Level 2	3.77
Chondrichthyan	*Centrophorus moluccensis*	Endeavour dogfish	BP	PSA Level 2	3.95
Chondrichthyan	*Chimaera sp. C*	Longspine chimaera	BP	PSA Level 2	3.37
Chondrichthyan	*Chimaera sp. E*	Whitefin chimaera	BP	PSA Level 2	3.77

3.5. TEP species

All species listed as threatened, endangered and protected and identified through the ERA process 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:

- Threat Abatement Plan 2006: for the incidental catch (or bycatch) of seabirds during oceanic longline fishing operations;
- National Strategy to Address Interactions between Humans and Seals: Fisheries, Aquaculture and Tourism;
- Recovery Plan for Marine Turtles in Australia; and,
- Recovery Plan for the Australian Sea Lion.

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 as well as 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 every 3 years. This reporting timeframe corresponds with reviews of any applicable Harvest Strategies and the Export Approval Assessment for each fishery.

References

Hobday, A.J., Smith, A, Webb, H., Daley, R., Wayte, S., Bulman, C., Dowdney, J., Williams, A., Sporcic, M., Dambacher, J., Fuller, M., Walker, T. (2007) Ecological Risk Assessment for the Effects of Fishing: Methodology. Report R04/1072 for the Australian Fisheries Management Authority, Canberra, Australia.

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