



# Ecological Risk Management

REPORT FOR THE SOUTHERN BLUEFIN TUNA FISHERY

**DECEMBER 2009**

## Summary of priority issues for managing the ecological effects of fishing in the SBTF

The Ecological Risk Assessment (ERA) process was designed to assess and rank the ecological effects of fishing in Commonwealth fisheries. The process provided a list of species, habitats and ecological communities that are at risk of ecological damage from the effects of fishing. This Ecological Risk Management (ERM) report provides how AFMA will respond to these high risk environmental components.

The ecological effects of fishing in the Southern Bluefin Tuna Fishery (SBTF) are very minimal and are largely due to the small incidental capture of non-target species (including the capture of protected species). The method of fishing employed in the SBTF (purse seining) was found to have no direct impact on the physical marine environment.

The SBTF is a fishery which targets SBT only; historical logbook and observer data shows that the only other species taken in the fishery are Skipjack Tuna and Albacore Tuna, both of which are taken in very small amounts. AFMA aims to implement measures which ensure that the take of commercial species is sustainable and minimises the interactions and mortality of species that are not commercially utilised.

The ERA process analysed the effect of commercial fishing in the SBTF, based on the effects on all organisms (protected species, bycatch, byproduct and target species), habitats and ecological communities that occur in the area of the fishery. The highest level of assessment conducted on the SBTF was a quantitative Level 3 assessment.

The level 3 SAFE assessment on chondrichthyans and teleosts identified no non-target species to be at high risk to the effects of fishing. The level 2 PSA identified three species at high risk (Dusky Shark, White Shark and Southern Bluefin Tuna) all of which were reduced to either low or medium risk through the level 2 Residual Risk process.

182 threatened, endangered or protected (TEP) species are assessed as occurring in the area of the fishery. Of these 56 are teleosts, 3 are reptiles, 47 marine mammals, 73 are seabirds and 3 are chondrichthyans. No TEP species were found to be at high risk through the ERA process, however consistent with AFMA's objectives and good fisheries management practices all steps will be taken to minimise interactions with these species within the fishery.

The priority for the SBTF is to maintain and build on the monitoring already conducted in the fishery. By continuing to monitor aspects of the fishery such as bycatch, discarding and interactions with TEP species AFMA will be able to adequately respond to issues in the fishery in an adequate and timely manner.

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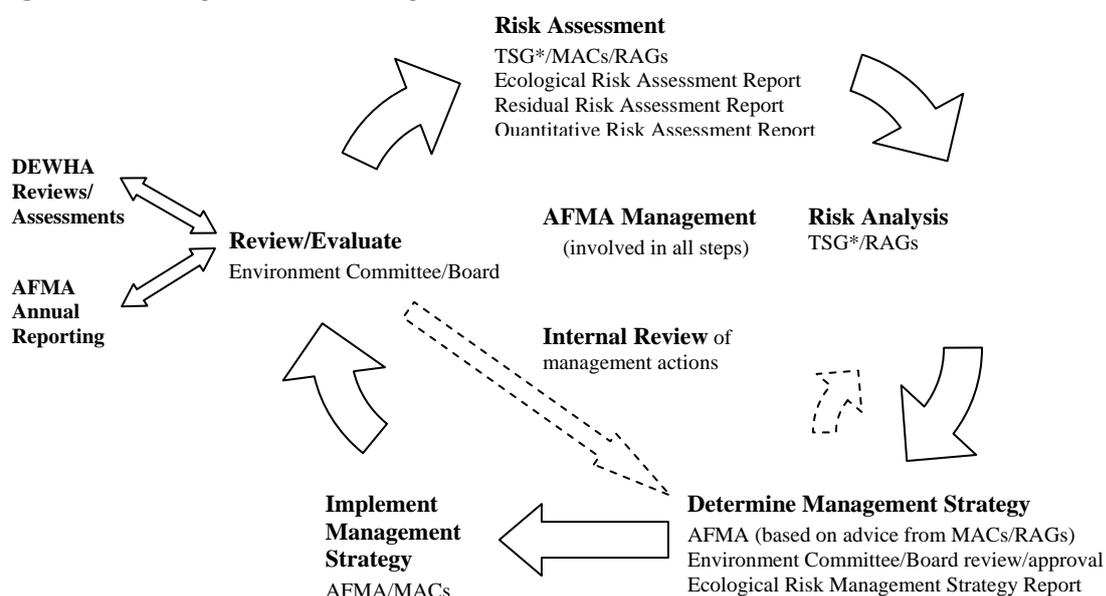
## 2. OVERVIEW OF THE ERA PROCESS

- **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

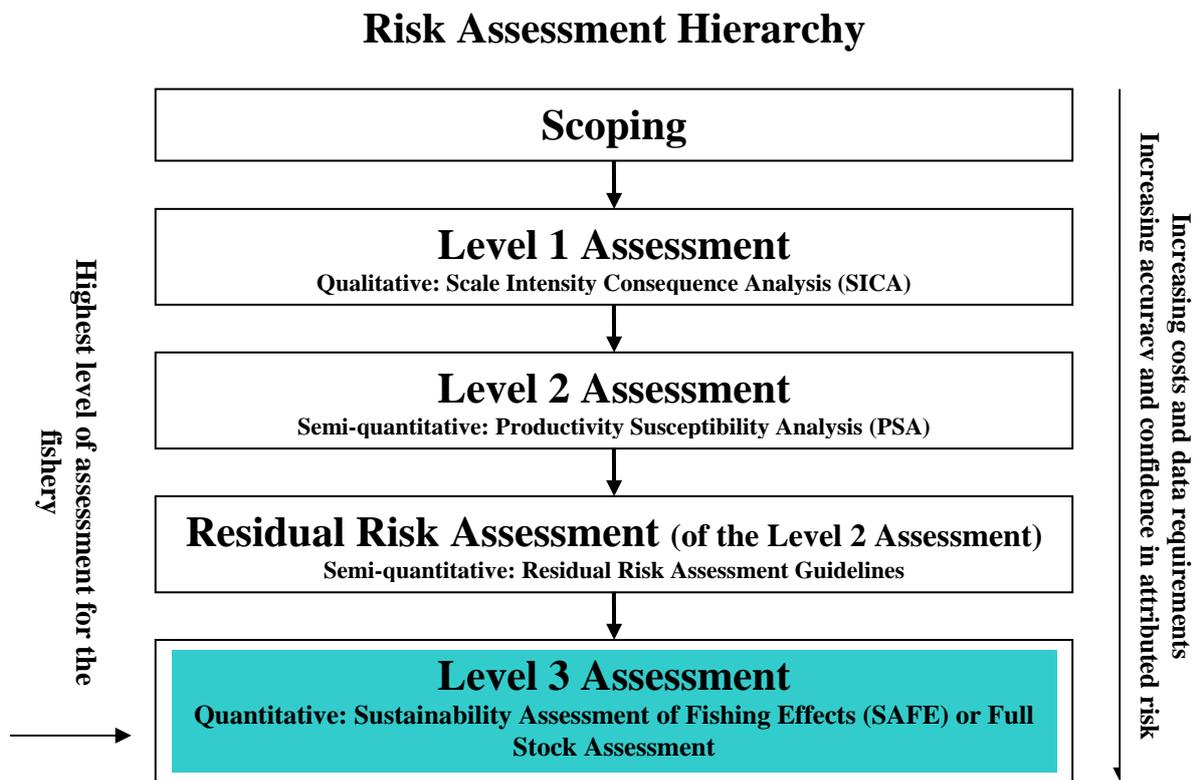


\*TSG – Technical Support Group – currently provided by CSIRO

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 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 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 the SBTF was developed using:

- The SAFE methodology for any teleost or chondrichthyan species identified as precautionary high risk or higher risk category; and
- Level 2 PSA Residual Risk for all other non protected species identified as high risk.

In addition, all reasonable steps will be taken to minimise interactions with TEP species which have been identified through the ERA process.

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

- Non-key Commercial Species (byproduct) Policy;
- Shark Policy and the Chondrichthyan Guide for Fisheries Managers; and
- Protected species under various international plans of action, and recovery plans including;
  - the Threat Abatement Plan (2006) for the incidental catch (or bycatch) of seabirds during oceanic longline fishing operations (TAP),
  - Recovery Plans for the Grey Nurse and White Sharks

The SBTF ERM strategy clearly identifies how each species or group of species may be managed under the policies or measures described above.

ERM strategies to address those remaining species identified as at medium or low risk may 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.

### 3. DESCRIPTION OF THE SOUTHERN BLUEFIN TUNA FISHERY

#### Area of the fishery

The SBTF includes all Commonwealth waters (Appendix 1, Figure 1) with fishing effort predominantly focused in the Great Australian Bight (GAB). There is also some catch of Southern Blue Fin Tuna (SBT) in the Eastern Tuna and Billfish Fishery (ETBF) during pelagic longline operations, however, this is dealt with in the Australian Longline Tuna and Billfish Fishery (ALTBF) workplan. For the purpose of this report we deal specifically with SBT caught by purse seine in the SBTF.

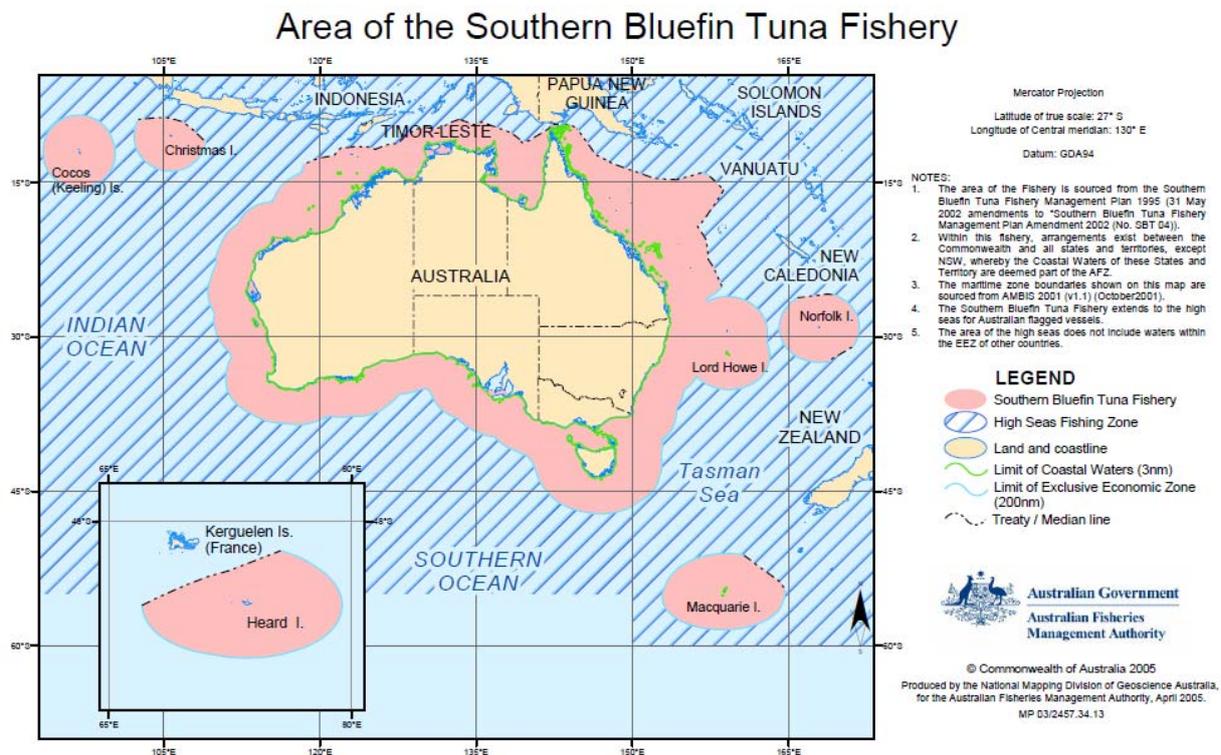
#### Fishing Methods

SBT are caught by purse seine nets out at sea in the Great Australian Bight and then placed in tow cages for live transport to holding pens located near shore off Port Lincoln, South Australia. SBT are kept within sea pens for 4-6 months and fattened up prior to export.

#### Management arrangements

The Australian SBTF is managed through output controls outlined in the *Southern Bluefin Tuna Fishery Management Plan, 1995*. Under this plan Individually Transferable Quotas (ITQ) are allocated as Statutory Fishing Rights (SFR). These represent a portion of the national Total Allowable Catch (TAC) allocated to Australia by the Commission for the Conservation of Southern Bluefin Tuna (CCSBT). The CCSBT is responsible for setting global TAC and allocating this between member nations.

**Figure 1** Map of the area of the SBTF



#### ○ International context and obligations

The Convention for the Conservation of Southern Bluefin Tuna came into force on 20 May 1993 which created the Commission for the Conservation of Southern Bluefin Tuna. The Convention was created in response to rapid decreases in catch rates of SBT since the

1980's. As a signatory to this convention Australia is obliged to abide by the conditions that the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) place on SBT fisheries. CCSBT aims at sustainably managing and conserving the migratory fish stocks of SBT throughout their entire southern hemisphere range.

CCSBT is tasked with implementing management regimes for the sustainable management of SBT on a global scale. The management arrangements/measures that CCSBT produce are required to be adopted and regulated by member nations. The measures created by CCSBT can be found at the CCSBT website (<http://www.ccsbt.org/>).

In relation to TEP species CCSBT does not implement strict conservation measures but states that Members should implement national plans of action to reduce the interactions between the fishery and non-target species.

Management plans and other policy measures for Commonwealth fisheries incorporate the management measures adopted by CCSBT.

#### **4. ECOLOGICAL RISK MANAGEMENT PRIORITY LIST**

The risks that the SBT 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:

- a Level 2 PSA Risk Assessment completed in June 2007;
- a Level 2 PSA Residual Risk assessment completed in August 2009 for all species occurring in the fishery; and,
- a rapid quantitative risk assessment completed in April 2009 for teleost and chondrichthyan species.

The results of these risk assessments have been consolidated and there are no species listed as being a priority for management from the ERA process.

The risk assessment identified 182 TEP species occur within the area of the fishery (Level 2 PSA). There have been little to no interactions reported with protected species in the SBT fishery. Of the TEP species; 56 are teleosts, 3 are reptiles, 47 marine mammals, 73 are seabirds and 3 are chondrichthyans. No TEP species were found to be at high risk through the ERA process, however consistent with AFMA's objectives and good fisheries management practices all steps will be taken to minimise interactions between these species and the fishery.

The priority for the ERM is to maintain monitoring of the fishery and respond to any interactions with TEP species that occur.

**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
<b>Level 1 SICA Assessment</b>				
Consequence score (for each species component)	4	3	3	4
Proceeded to Level 2 PSA Assessment (scores $\geq 3$ )	Y	Y	Y	Y
<b>Level 2 PSA Assessment</b>				
High Risk	1		1	1
Medium Risk	1*	4	4	87
Low Risk	9*	2	3	94
<b>Level 2 PSA Residual Risk Assessment</b>				
High Risk	0	0	0	0
Medium Risk	2*	4	4	87
Low Risk	9	2	4	95
<b>Level 3 SAFE Assessment</b>				
$F_{cur} > F_{msm}$	0	0	0	0
$F_{cur} < F_{msm}$	10*	6	8	59

\*There were 10 targeted bait species included in the assessment which have here been classified as target species. Note under the residual risk assessment the target species of SBT moved into the medium category with one of the bait species, under the SAFE assessment all 10 species included are targeted bait species.

## 5. ECOLOGICAL RISK MANAGEMENT STRATEGY

The SBT is managed under quota Statutory Fishing Right's (SFR's) granted under the *Southern Bluefin Tuna Fishery Management Plan 1995*. Once nominated to a boat these SFRs allow fisher's to catch a proportion of the national allocation of SBT, relative to the number of SFR's they hold. A national allocation of SBT is assigned to Australia by CCSBT, with the TAC is set every year at the annually. Subsequent to this the TAC is divided into national allocations based on pre-determined percentages for member nations.

SBT are mainly taken by purse seine vessels fishing out of South Australia in the waters of the Great Australian Bight. The purse seine method is a very selective method of fishing where largely single species schools are targeted.

Small amounts of SBT are also taken in other fisheries, namely the pelagic longline sector of the Eastern Tuna and Billfish Fishery (ETBF). Management arrangements are employed in this fishery to minimize the level of interaction between ETBF fisher's and SBT. Any SBT that are taken in the ETBF or any other fishery are required to be covered by quota and must be taken under the provisions of the *Southern Bluefin Tuna Management Plan 1995*.

The ERM strategy for the SBT Fishery will address the 184 protected (TEP) species identified as occurring within the area of the fishery, with no associated risk.

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

In the case of fisheries that are managed under joint authority of the Australian Government and another Australian jurisdiction or international management body/arrangement, the Commonwealth Fisheries Harvest Strategy Policy (the Policy) does not prescribe

management arrangements. However, the Australian Government will negotiate with the relevant body with an aim of ensuring sustainable fisheries by advocating the policy as an example of best practice in setting sustainable catch levels.

The Australian Government's position taken to regional fisheries management/arrangement negotiations is underpinned by Australia's domestic legislation obligations. Therefore it is Australian Government policy to support catch level decisions taken by these organisations and arrangements. In the absence of agreement, Australia's domestic catch allocation decision would be consistent with the agreed whole of government position.

The SBTF is managed under quota SFR's which are based on a national quota allocation. The national quota allocation is decided upon by CCSBT at their annual international meetings. Consistent with the Policy, the harvest of SBT in this fishery is determined by an international Regional Fisheries Management Organisation (RFMO) and as such the SBTF will not have a Harvest Strategy developed for the management of SBT catch.

- **Management of non-key commercial (byproduct) species**

AFMA is currently developing a policy to address any gaps in the management of byproduct species in Commonwealth fisheries. As there are no byproduct species taken in the SBTF and any other species taken must be covered by a separate fishing permit, the management of non-key commercial species is not an issue in this fishery.

- **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 stream approach for minimising and mitigating against capture of bycatch and protected (TEP) species as well as strategies to minimise the discarding of target and quota species.

A bycatch and discarding workplan has not been developed for the SBTF as there is generally, no bycatch taken by the purse seine method. There is however the potential for issues relating to the discarding of quota species or higher grading to occur and this risk is addressed through the observer monitoring work conducted by AFMA.

An important measure in managing bycatch is to be able to adequately monitor the interaction rate through data collection. In doing this AFMA maintains a level of observer coverage to validate the data collected by industry. Currently the rate of observer coverage in the SBTF is 10% on both the catch and the towing operation. This level of coverage is stipulated in the observer program standards agreed to by CCSBT.

Purse seining is a relatively clean method of fishing, which in the case of the SBTF is conducted in conjunction with a large degree of real-time intelligence on the target species, such as size of schools of fish and size of individual fish being pursued. This means that there is rarely any bycatch, or discarding of target species.

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**Action:** AFMA will maintain the prescribed level of observer coverage in the fishery to continue to monitor the impacts of the fishery on bycatch and TEP species, and any discarding of target species. By continuing to monitor the fishery AFMA will be able to implement management responses should issues with bycatch or discarding arise.

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- **Chondrichthyan Guide for Fisheries Managers**

A practical guide is currently being developed to assist fishery managers and stakeholders to adopt and implement management arrangements for Chondrichthyan species. The

Chondrichthyan Working Group will utilise expert based advice to develop effective mitigation strategies and to identify gaps in research and data.

○ **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:

- 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,
- Draft Recovery Plan for the Australian Sea Lion.

There are very few interactions reported between the SBTF and protected species, however consistent with AFMA's objectives and obligations all steps will be taken to minimise the chance of interactions occurring. 182 TEP species have been identified as occurring in the area of the fishery under the level 2 PSA ERA analysis (Table 2).

**Table 2** 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.

<b>Taxonomic Group</b>	<b>Scientific Name</b>	<b>Common Name</b>	<b>Role in Fishery</b>	<b>Highest Level of Assessment</b>	<b>Risk Score</b>
Chondrichthyan	<i>Carcharias taurus</i>	Grey Nurse Shark	TEP	Level 3 SAFE	Low
Chondrichthyan	<i>Carcharodon carcharias</i>	White Shark	TEP	Level 3 SAFE	Low
Chondrichthyan	<i>Rhincodon typus</i>	Whale Shark	TEP	Level 3 SAFE	Low
Marine bird	<i>Anous stolidus</i>	Common Noddy	TEP	Level 2 PSA	Low
Marine bird	<i>Anous tenuirostris</i>	Lesser Noddy	TEP	Level 2 PSA	Low
Marine bird	<i>Calonectris leucomelas</i>	Streaked Shearwater	TEP	Level 2 PSA	Med
Marine bird	<i>Catharacta skua</i>	Great Skua	TEP	Level 2 PSA	Med
Marine bird	<i>Daption capense</i>	Cape Petrel	TEP	Level 2 PSA	Low
Marine bird	<i>Diomedea amsterdamensis</i>	Amsterdam Albatross	TEP	Level 2 PSA	Med
Marine bird	<i>Diomedea antipodensis</i>	Antipodean Albatross	TEP	Level 2 PSA	Med

Marine bird	<i>Diomedea dabbenena</i>	Tristan Albatross	TEP	Level 2 PSA	Med
Marine bird	<i>Diomedea epomophora</i>	Southern Royal Albatross	TEP	Level 2 PSA	Med
Marine bird	<i>Diomedea exulans</i>	Wandering Albatross	TEP	Level 2 PSA	Med
Marine bird	<i>Diomedea gibsoni</i>	Gibson's Albatross	TEP	Level 2 PSA	Med
Marine bird	<i>Diomedea sanfordi</i>	Northern Royal Albatross	TEP	Level 2 PSA	Med
Marine bird	<i>Eudyptula minor</i>	Little Penguin	TEP	Level 2 PSA	Low
Marine bird	<i>Fregetta grallaria</i>	White-bellied Storm-Petrel (Tasman Sea),	TEP	Level 2 PSA	Med
Marine bird	<i>Fregetta tropica</i>	Black-bellied Storm-Petrel	TEP	Level 2 PSA	Med
Marine bird	<i>Fulmarus glacialis</i>	Southern Fulmar	TEP	Level 2 PSA	Med
Marine bird	<i>Garrodia nereis</i>	Grey-backed Storm Petrel	TEP	Level 2 PSA	Med
Marine bird	<i>Halobaena caerulea</i>	Blue Petrel	TEP	Level 2 PSA	Med
Marine bird	<i>Larus dominicanus</i>	Kelp Gull	TEP	Level 2 PSA	Low
Marine bird	<i>Larus novaehollandiae</i>	Silver Gull	TEP	Level 2 PSA	Low
Marine bird	<i>Larus pacificus</i>	Pacific Gull	TEP	Level 2 PSA	Low
Marine bird	<i>Lugensa brevirostris</i>	Kerguelen Petrel	TEP	Level 2 PSA	Med
Marine bird	<i>Macronectes giganteus</i>	Southern Giant-Petrel	TEP	Level 2 PSA	Low
Marine bird	<i>Macronectes halli</i>	Northern Giant-Petrel	TEP	Level 2 PSA	Low
Marine bird	<i>Morus serrator</i>	Australasian Gannet	TEP	Level 2 PSA	Low
Marine bird	<i>Oceanites oceanicus</i>	Wilson's Storm Petrel (subantarctic)	TEP	Level 2 PSA	Low
Marine bird	<i>Pachyptila turtur</i>	Fairy Prion	TEP	Level 2 PSA	Med
Marine bird	<i>Pelagodroma marina</i>	White-faced Storm-Petrel	TEP	Level 2 PSA	Low

Marine bird	<i>Pelecanoides urinatrix</i>	Common Diving-Petrel	TEP	Level 2 PSA	Low
Marine bird	<i>Phalacrocorax carbo</i>	Black Cormorant	TEP	Level 2 PSA	Low
Marine bird	<i>Phalacrocorax fuscescens</i>	Black Faced Cormorant	TEP	Level 2 PSA	Med
Marine bird	<i>Phalacrocorax melanoleucos</i>	Little Pied Cormorant	TEP	Level 2 PSA	Low
Marine bird	<i>Phalacrocorax sulcirostris</i>	Little black cormorant	TEP	Level 2 PSA	Low
Marine bird	<i>Phoebetria fusca</i>	Sooty Albatross	TEP	Level 2 PSA	Low
Marine bird	<i>Phoebetria palpebrata</i>	Light-mantled Albatross	TEP	Level 2 PSA	Med
Marine bird	<i>Procellaria aequinoctialis</i>	White-chinned Petrel	TEP	Level 2 PSA	Low
Marine bird	<i>Procellaria cinerea</i>	Grey Petrel	TEP	Level 2 PSA	Low
Marine bird	<i>Procellaria parkinsoni</i>	Black Petrel	TEP	Level 2 PSA	Med
Marine bird	<i>Procellaria westlandica</i>	Westland Petrel	TEP	Level 2 PSA	Med
Marine bird	<i>Pseudobulweria rostrata</i>	Tahiti Petrel	TEP	Level 2 PSA	Low
Marine bird	<i>Pterodroma cervicalis</i>	White-necked Petrel	TEP	Level 2 PSA	Med
Marine bird	<i>Pterodroma lessoni</i>	White-headed Petrel	TEP	Level 2 PSA	Low
Marine bird	<i>Pterodroma leucoptera</i>	Gould's Petrel	TEP	Level 2 PSA	Med
Marine bird	<i>Pterodroma macroptera</i>	Great-winged Petrel	TEP	Level 2 PSA	Med
Marine bird	<i>Pterodroma mollis</i>	Soft-plumaged Petrel	TEP	Level 2 PSA	Med
Marine bird	<i>Pterodroma neglecta</i>	Kermadec Petrel (western)	TEP	Level 2 PSA	Low
Marine bird	<i>Pterodroma nigripennis</i>	Black-winged Petrel	TEP	Level 2 PSA	Med
Marine bird	<i>Pterodroma solandri</i>	Providence Petrel	TEP	Level 2 PSA	Med
Marine bird	<i>Puffinus assimilis</i>	Little Shearwater (Tasman Sea)	TEP	Level 2 PSA	Med
Marine bird	<i>Puffinus bulleri</i>	Buller's Shearwater	TEP	Level 2 PSA	Med

Marine bird	<i>Puffinus carneipes</i>	Flesh-footed Shearwater	TEP	Level 2 PSA	Med
Marine bird	<i>Puffinus gavia</i>	Fluttering Shearwater	TEP	Level 2 PSA	Low
Marine bird	<i>Puffinus griseus</i>	Sooty Shearwater	TEP	Level 2 PSA	Low
Marine bird	<i>Puffinus huttoni</i>	Hutton's Shearwater	TEP	Level 2 PSA	Low
Marine bird	<i>Puffinus pacificus</i>	Wedge-tailed Shearwater	TEP	Level 2 PSA	Med
Marine bird	<i>Puffinus tenuirostris</i>	Short-tailed Shearwater	TEP	Level 2 PSA	Med
Marine bird	<i>Sterna albifrons</i>	Little tern	TEP	Level 2 PSA	Low
Marine bird	<i>Sterna bergii</i>	Crested Tern	TEP	Level 2 PSA	Low
Marine bird	<i>Sterna caspia</i>	Caspian Tern	TEP	Level 2 PSA	Low
Marine bird	<i>Sterna fuscata</i>	Sooty Tern	TEP	Level 2 PSA	Low
Marine bird	<i>Sterna hirundo</i>	Common Tern	TEP	Level 2 PSA	Low
Marine bird	<i>Sterna paradisaea</i>	Arctic Tern	TEP	Level 2 PSA	Low
Marine bird	<i>Sterna striata</i>	White-fronted Tern	TEP	Level 2 PSA	Low
Marine bird	<i>Thalassarche bulleri</i>	Buller's Albatross	TEP	Level 2 PSA	Med
Marine bird	<i>Thalassarche carteri</i>	Indian Yellow-nosed Albatross	TEP	Level 2 PSA	Low
Marine bird	<i>Thalassarche cauta</i>	Shy Albatross	TEP	Level 2 PSA	Med
Marine bird	<i>Thalassarche chlororhynchos</i>	Yellow-nosed Albatross, Atlantic Yellow-nosed Albatross	TEP	Level 2 PSA	Low
Marine bird	<i>Thalassarche chrysostoma</i>	Grey-headed Albatross	TEP	Level 2 PSA	Med
Marine bird	<i>Thalassarche eremita</i>	Chatham Albatross	TEP	Level 2 PSA	Med
Marine bird	<i>Thalassarche impavida</i>	Campbell Albatross	TEP	Level 2 PSA	Med
Marine bird	<i>Thalassarche melanophrys</i>	Black-browed Albatross	TEP	Level 2 PSA	Med

Marine bird	<i>Thalassarche nov. sp.</i>	Pacific Albatross	TEP	Level 2 PSA	Med
Marine bird	<i>Thalassarche salvini</i>	Salvin's Albatross	TEP	Level 2 PSA	Med
Marine mammal	<i>Arctocephalus forsteri</i>	New Zealand Fur Seal	TEP	Level 2 PSA	Med
Marine mammal	<i>Arctocephalus pusillus doriferus</i>	Australian Fur Seal	TEP	Level 2 PSA	Low
Marine mammal	<i>Arctocephalus tropicalis</i>	Subantarctic Fur Seal	TEP	Level 2 PSA	Low
Marine mammal	<i>Balaenoptera acutorostrata</i>	Minke Whale	TEP	Level 2 PSA	Med
Marine mammal	<i>Balaenoptera bonaerensis</i>	Antarctic Minke Whale	TEP	Level 2 PSA	Med
Marine mammal	<i>Balaenoptera borealis</i>	Sei Whale	TEP	Level 2 PSA	Med
Marine mammal	<i>Balaenoptera edeni</i>	Bryde's Whale	TEP	Level 2 PSA	Med
Marine mammal	<i>Balaenoptera musculus</i>	Blue Whale	TEP	Level 2 PSA	Med
Marine mammal	<i>Balaenoptera physalus</i>	Fin Whale	TEP	Level 2 PSA	Med
Marine mammal	<i>Berardius arnuxii</i>	Arnoux's Beaked Whale	TEP	Level 2 PSA	Med
Marine mammal	<i>Caperea marginata</i>	Pygmy Right Whale	TEP	Level 2 PSA	Med
Marine mammal	<i>Delphinus delphis</i>	Common Dolphin	TEP	Level 2 PSA	Low
Marine mammal	<i>Eubalaena australis</i>	Southern Right Whale	TEP	Level 2 PSA	Med
Marine mammal	<i>Feresa attenuata</i>	Pygmy Killer Whale	TEP	Level 2 PSA	Med
Marine mammal	<i>Globicephala macrorhynchus</i>	Short-finned Pilot Whale	TEP	Level 2 PSA	Med
Marine mammal	<i>Globicephala melas</i>	Long-finned Pilot Whale	TEP	Level 2 PSA	Med
Marine mammal	<i>Grampus griseus</i>	Risso's Dolphin	TEP	Level 2 PSA	Med
Marine mammal	<i>Hydrurga leptonyx</i>	Leopard Seal	TEP	Level 2 PSA	Med
Marine mammal	<i>Hyperoodon planifrons</i>	Southern Bottlenose Whale	TEP	Level 2 PSA	Med
Marine mammal	<i>Kogia breviceps</i>	Pygmy Sperm Whale	TEP	Level 2 PSA	Med

Marine mammal	<i>Kogia simus</i>	Dwarf Sperm Whale	TEP	Level 2 PSA	Med
Marine mammal	<i>Lagenodelphis hosei</i>	Fraser's Dolphin	TEP	Level 2 PSA	Med
Marine mammal	<i>Lagenorhynchus cruciger</i>	Hourglass Dolphin	TEP	Level 2 PSA	Med
Marine mammal	<i>Lagenorhynchus obscurus</i>	Dusky Dolphin	TEP	Level 2 PSA	Low
Marine mammal	<i>Lissodelphis peronii</i>	Southern Right Whale Dolphin	TEP	Level 2 PSA	Med
Marine mammal	<i>Megaptera novaeangliae</i>	Humpback Whale	TEP	Level 2 PSA	Med
Marine mammal	<i>Mesoplodon bowdoini</i>	Andrew's Beaked Whale	TEP	Level 2 PSA	Med
Marine mammal	<i>Mesoplodon densirostris</i>	Blainville's Beaked Whale	TEP	Level 2 PSA	Med
Marine mammal	<i>Mesoplodon ginkgodens</i>	Ginkgo Beaked Whale	TEP	Level 2 PSA	Med
Marine mammal	<i>Mesoplodon grayi</i>	Gray's Beaked Whale	TEP	Level 2 PSA	Med
Marine mammal	<i>Mesoplodon hectori</i>	Hector's Beaked Whale	TEP	Level 2 PSA	Med
Marine mammal	<i>Mesoplodon layardii</i>	Strap-toothed Beaked Whale	TEP	Level 2 PSA	Med
Marine mammal	<i>Mesoplodon mirus</i>	True's Beaked Whale	TEP	Level 2 PSA	Med
Marine mammal	<i>Mirounga leonina</i>	Elephant Seal	TEP	Level 2 PSA	Med
Marine mammal	<i>Neophoca cinerea</i>	Australian Sea-lion	TEP	Level 2 PSA	Med
Marine mammal	<i>Orcinus orca</i>	Killer Whale	TEP	Level 2 PSA	Med
Marine mammal	<i>Peponocephala electra</i>	Melon-headed Whale	TEP	Level 2 PSA	Med
Marine mammal	<i>Physeter catodon</i>	Sperm Whale	TEP	Level 2 PSA	Med
Marine mammal	<i>Pseudorca crassidens</i>	False Killer Whale	TEP	Level 2 PSA	Med
Marine mammal	<i>Stenella attenuata</i>	Spotted Dolphin	TEP	Level 2 PSA	Med
Marine mammal	<i>Stenella coeruleoalba</i>	Striped Dolphin	TEP	Level 2 PSA	Med
Marine mammal	<i>Stenella longirostris</i>	Long-snouted Spinner	TEP	Level 2 PSA	Med

		Dolphin			
Marine mammal	<i>Steno bredanensis</i>	Rough-toothed Dolphin	TEP	Level 2 PSA	Med
Marine mammal	<i>Tasmacetus shepherdi</i>	Tasman Beaked Whale	TEP	Level 2 PSA	Med
Marine mammal	<i>Tursiops aduncus</i>	Indian Ocean Bottlenose Dolphin	TEP	Level 2 PSA	Med
Marine mammal	<i>Tursiops truncatus</i>	Bottlenose Dolphin	TEP	Level 2 PSA	Med
Marine mammal	<i>Ziphius cavirostris</i>	Cuvier's Beaked Whale	TEP	Level 2 PSA	Med
Marine reptile	<i>Chelonia mydas</i>	Green turtle	TEP	Level 2 PSA	Med
Marine reptile	<i>Dermochelys coriacea</i>	Leathery turtle	TEP	Level 2 PSA	Med
Marine reptile	<i>Pelamis platurus</i>	Yellow-bellied Seasnake	TEP	Level 2 PSA	Med
Teleost	<i>Acentronura australe</i>	Southern Pygmy Pipehorse	TEP	Level 3 SAFE	Low
Teleost	<i>Acentronura breviperula</i>	Hairy Pygmy Pipehorse	TEP	Level 3 SAFE	Low
Teleost	<i>Campichthys galei</i>	Gale's Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Cosmocampus howensis</i>	Lord Howe Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Festucalex cinctus</i>	Girdled Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Filicampus tigris</i>	Tiger Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Halicampus boothae</i>	[a pipefish]	TEP	Level 3 SAFE	Low
Teleost	<i>Heraldia nocturna</i>	Upside-down Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Heraldia sp. 1 [in Kuitert, 2000]</i>	Western Upside-down Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Heteroclinus perspicillatus</i>	Common Weedfish	TEP	Level 3 SAFE	Low
Teleost	<i>Hippichthys heptagonus</i>	Madura Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Hippichthys penicillus</i>	Beady Pipefish, Steep-nosed Pipefish	TEP	Level 3 SAFE	Low

Teleost	<i>Hippocampus abdominalis</i>	Big-bellied / Southern Potbellied Seahorse	TEP	Level 3 SAFE	Low
Teleost	<i>Hippocampus bleekeri</i>	Pot Bellied Seahorse	TEP	Level 3 SAFE	Low
Teleost	<i>Hippocampus breviceps</i>	Short-head Seahorse, Short-snouted Seahorse	TEP	Level 3 SAFE	Low
Teleost	<i>Hippocampus minotaur</i>	Bullneck Seahorse	TEP	Level 3 SAFE	Low
Teleost	<i>Hippocampus subelongatus</i>	West Australian Seahorse	TEP	Level 3 SAFE	Low
Teleost	<i>Hippocampus tristis</i>	[a pipefish]	TEP	Level 3 SAFE	Low
Teleost	<i>Hippocampus whitei</i>	White's Seahorse	TEP	Level 3 SAFE	Low
Teleost	<i>Histiogamphelus briggsii</i>	Briggs' Crested Pipefish, Briggs' Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Histiogamphelus cristatus</i>	Rhino Pipefish, Macleay's Crested Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Hypselognathus horridus</i>	Shaggy Pipefish, Prickly Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Hypselognathus rostratus</i>	Knife-snouted Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Idiotropiscis australe</i>	Southern Pygmy Pipehorse	TEP	Level 3 SAFE	Low
Teleost	<i>Kaupus costatus</i>	Deep-bodied Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Kimblaeus bassensis</i>	Trawl Pipefish, Kimbla Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Leptoichthys fistularius</i>	Brushtail Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Lissocampus caudalis</i>	Australian Smooth Pipefish, Smooth Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Lissocampus fatiloquus</i>	Prophet's Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Lissocampus runa</i>	Javelin Pipefish	TEP	Level 3 SAFE	Low

Teleost	<i>Maroubra perserrata</i>	Sawtooth Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Mitotichthys meraculus</i>	Western Crested Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Mitotichthys mollisoni</i>	Mollison's Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Mitotichthys semistriatus</i>	Half-banded Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Mitotichthys tuckeri</i>	Tucker's Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Nannocampus subosseus</i>	Bony-headed Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Notiocampus ruber</i>	Red Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Phycodurus eques</i>	Leafy Seadragon	TEP	Level 3 SAFE	Low
Teleost	<i>Phyllopteryx taeniolatus</i>	Weedy Seadragon, Common Seadragon	TEP	Level 3 SAFE	Low
Teleost	<i>Pugnaso curtirostris</i>	Pug-nosed Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Solegnathus dunckeri</i>	Duncker's Pipehorse	TEP	Level 3 SAFE	Low
Teleost	<i>Solegnathus guentheri</i>	Indonesian Pipefish, Gunther's Pipehorse	TEP	Level 3 SAFE	Low
Teleost	<i>Solegnathus robustus</i>	Robust Spiny Pipehorse, Robust Pipehorse	TEP	Level 3 SAFE	Low
Teleost	<i>Solegnathus spinosissimus</i>	Spiny Pipehorse	TEP	Level 3 SAFE	Low
Teleost	<i>Solenostomus cyanopterus</i>	Blue-finned Ghost Pipefish, Robust Ghost	TEP	Level 3 SAFE	Low
Teleost	<i>Solenostomus paradoxus</i>	Harlequin Ghost Pipefish, Ornate Ghost Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Stigmatopora argus</i>	Spotted Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Stigmatopora nigra</i>	Wide-bodied Pipefish, Black Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Stipecampus cristatus</i>	Ring-backed Pipefish	TEP	Level 3 SAFE	Low

Teleost	<i>Syngnathoides biaculeatus</i>	Double-ended Pipehorse, Alligator Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Trachyrhamphus bicoarctatus</i>	Bend Stick Pipefish, Short-tailed Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Urocampus carinirostris</i>	Hairy Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Vanacampus margaritifer</i>	Mother-of-pearl Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Vanacampus phillipi</i>	Port Phillip Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Vanacampus poecilolaemus</i>	Australian Long-snout Pipefish, Long-snouted Pipefish	TEP	Level 3 SAFE	Low
Teleost	<i>Vanacampus vercoi</i>	Verco's Pipefish	TEP	Level 3 SAFE	Low

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**Action:** AFMA will maintain the prescribed level of observer coverage in the fishery to continue to monitor the impacts of the fishery on TEP species.

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## 6. 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. Review of the ERM policy will be based around review of the above documents, including review of the ERA.

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.

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.

## 7. 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 species; habitats; and ecological communities.
ESD	Ecologically Sustainable Development is the ecological component of the development of a resource, based around the precautionary principle. In implementing the ecological component of ESD AFMA considers the impact that fishing has on the following ecosystem elements; target and byproduct species, bycatch, protected species, and community and habitat interactions.
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.
TEP	Threatened, Endangered and Protected species
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>

### Level 3 SAFE risk categories

$F_{msm}$	“instantaneous fishing mortality corresponding to the maximum sustainable death due to fishing (maximum sustainable mortality of fishing, $MSM$ ) at $B_{msm}$ (biomass that supports $MSM$ ). This is similar to the $F_{msy}$ that supports a maximum sustainable yield for target species. For simplicity we call $F_{msm}$ “maximum sustainable (instantaneous) fishing mortality (rate)”.” (Zhou <i>et al</i> 2009)
$F_{lim}$	“instantaneous fishing mortality corresponding to limit biomass $B_{lim}$ , where $B_{lim}$ is defined as half of the biomass that supports a maximum sustainable fishing mortality ( $0.5B_{msm}$ ). We refer $F_{lim}$ as “limit fishing mortality (rate)”” (Zhou <i>et al</i> 2009)
$F_{rash}$	“minimum unsustainable fishing mortality that, in theory, will lead to population extinction in the longer term.” (Zhou <i>et al</i> 2009)
$F_{cur}$	estimated current fishing mortality (Zhou <i>et al</i> 2009)

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.

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