



Australian Government
Department of Agriculture
and Water Resources

Senate Environment and Communications References Committee

Inquiry into the environmental, social and economic impacts of large-capacity fishing vessels commonly known as ‘supertrawlers’ operating in Australia’s marine jurisdiction

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Introduction

1. Australia's Commonwealth fisheries are managed for multiple objectives. The *Fisheries Management Act 1991* (FM Act) requires the Minister in the administration of the Act, and the Australian Fisheries Management Authority (AFMA) in the performance of its functions, to ensure that the exploitation of fisheries resources is conducted in a manner consistent with the principles of ecologically sustainable development including the exercise of the precautionary principle. They must also pursue maximising the net economic returns to the Australian community and implement efficient and cost-effective fisheries management.
2. In April 2015, the Australian Government enacted a permanent ban on any boat over 130 metres in length from undertaking fishing related activities within the Australian fishing zone. The Australian Government defines boats over 130 metres as 'super trawlers'.
3. All Commonwealth fisheries are limited entry and have management regimes that use a range of tools to achieve the objectives with respect to the target species, bycatch species (including those protected under the Environment Protection and Biodiversity Conservation Act (EPBC Act)) and economic returns. In terms of the target species, most Commonwealth fisheries are managed with 'output'¹ controls through direct limits (quotas) on the total catch of target species that can be taken in a fishing season. In many other domestic and international fisheries, fishing activity is managed through 'input'² controls, where, for example, fishing days, the number or size of boats, or the type of fishing gear, is controlled with the aim of indirectly managing the volume of fish harvested. Input controls are a less certain method of ensuring a sustainable level of fishing because it does not necessarily manage the amount of fish harvested. In poorly regulated fisheries, particularly those that rely on input controls rather than quota, very large fishing vessels can do significant damage in a short time. This is why 'super trawlers' have a poor reputation worldwide.
4. The application of quota (that are transferable among operators), underpinned by ongoing investment in scientific stock assessments, means that the fishers have greater freedom to determine the most effective method to harvest their portion of the quota. Enabling the fisher to determine the most appropriate size and configuration of the fishing vessel helps maximise the economic returns from the fishery. Regulation and the regulator can focus on minimising the unintended consequences of fishing including interactions with bycatch species.
5. Large trawlers operate extensively in international fisheries – often in fisheries targeting low per unit value, high volume species and where port or market access is limited. The majority of trawlers operating on high sea waters are trawlers with on-board freezing capabilities. Larger vessels are also not uncommon in Australia's fisheries – having operated in Commonwealth fisheries for more than 30 years, particularly in our southern fisheries.
6. New Zealand and Australia have comparable fisheries regulations and management (i.e. quota based management) that take into consideration the impact of fishing on the broader ecosystem. Large vessels have operated in New Zealand fisheries targeting small pelagic species such as jack mackerel, as well as other fish stocks such as blue grenadier and southern blue whiting, for over 10 years. There are currently seven vessels over 90 metres

¹ 'Output' controls are direct limits on how many fish can be taken.

² 'Input' controls are restrictions put on the intensity of use of gear fishers can use for example the number and size of vessels, net size etc.

registered to fish New Zealand waters. The operation of these vessels in New Zealand's fisheries has and continues to be economically and ecologically viable and a socially acceptable model.

7. Australia's south-eastern fisheries, particularly the Small Pelagic Fishery and the Southern and Eastern Scalefish and Shark Fishery, share similarities with New Zealand fisheries and operators often share or exchange vessels across the Tasman Sea to maximise efficiency.
8. In a well-managed, quota-based fishery, the size of the boat or the net is of little relevance to fish stock sustainability, providing that the quotas have been set correctly, and vessel size is not directly correlated to maximum useable net size. Net size can be influenced by other factors, including by characteristics of the target species and fishery. Larger vessels are primarily used for their additional processing, freezing and storage capabilities, which can contribute to the economic viability of fishing. On-board processing and freezing capability optimises the quality and therefore the value of the fish product, allowing it to be used for human consumption rather than lower value uses such as fish meal. This is particularly important in the Small Pelagic Fishery (SPF) which is characterised by small oily fish that readily decompose and as a large volume, low per-unit value fishery. Historically, there has been limited fishing activity in the SPF, primarily driven by economic constraints, including lack of processing capacity.
9. With regard to bycatch species, as well as pursuing the objectives under the FM Act, Commonwealth fisheries are also assessed against the EPBC Act. The EPBC Act provides for the listing of species that are threatened, protected and endangered and for the listing and control of processes that threaten wildlife. The management of all Commonwealth fisheries is assessed against the EPBC Act requirements, including measures to minimise interactions with species listed under the EPBC Act. All Commonwealth fisheries have plans in place that document the management of bycatch species. These plans generally improve over time as data are collected from vessels undertaking fishing activities.
10. All food production activities have some level of impact on the environment. The most visible impacts can be the interaction with non-target species, or bycatch. In many cases bycatch is unavoidable and occurs across all fisheries in Australia and also internationally. The risk to bycatch species, including marine mammals and seabirds, from fishing differs from fishery to fishery, and with changes in locations, methods and time of year. There is no one set of measures or rules that can be used across fisheries to entirely avoid interactions with non-target species. Commonwealth fisheries management and industry has demonstrated its ability to respond to bycatch issues in fisheries, particularly for listed species and effectively reduce interactions; for example reducing interactions with turtles in prawn trawl fisheries and dolphin interactions in the gillnet fishery.
11. A level of risk of interactions with bycatch species remains in all fisheries, despite the best endeavours of fishers and fisheries managers. The level of interactions in any fishery is not necessarily related to boat size. The cumulative impacts across a fishery through the use of multiple smaller vessels may have a larger impact. The only way to completely eliminate interactions with marine mammals is to stop all fishing, which is both unrealistic and would eliminate one of the world's most important sources of protein.
12. Australia has a stable and predictable investment climate for operators. Changing operating rules without significant justification gives rise to concerns about foreign investment and sovereign risk which can in turn undermine investor confidence.

13. The Geelong Star currently the longest fishing vessel in Australia's Fishing Zone, is one of the most highly regulated and closely observed vessel in Australia. The Geelong Star has an individual Vessel Management Plan that is tailored to its specific characteristics. This plan includes requirements to use equipment designed to help marine mammals escape the net, regional and zone based catch limits to reduce the risk of localised depletion, and closure triggers for management zones if a single dolphin is killed. There is also electronic monitoring through cameras and on-board observer/s to conduct scientific sampling, monitor catch limits and interactions with protected species. While not a requirement, an Australian Fisheries Management Authority by-catch officer has also been on board the Geelong Star on five of its trips to monitor bycatch mitigation. The Department of Agriculture and Water Resources welcomes the opportunity to provide a submission to the Senate Standing Environment and Communications references committees' inquiry into *'the environmental, social and economic impacts of large-capacity fishing vessels commonly known as 'super trawlers' operating in Australia's marine jurisdiction'*.

1. Commonwealth's fisheries management regime

1.1 Objectives of the FM Act and the EPBC Act

14. The Australian Government has a comprehensive fisheries management framework that, through both fisheries and environment legislation, manages for the sustainable use of Australia's living marine resources and protection of the marine environment. The Australian Government's approach to fisheries management aims to maintain fish stocks at ecologically sustainable levels and, within this context, maximise the net economic return to the Australian community. It also considers the impact of fishing activities on non-target species and the long-term sustainability of the marine environment.
15. The *Fisheries Management Act 1991* (FM Act) and the *Fisheries Administration Act 1991* (FA Act) set out the roles and responsibilities of the Australian Fisheries Management Authority (AFMA) and provisions related to the optimal utilisation of resources and principles of ecologically sustainable development.
 - a. The FM Act, S3(1)(b), requires that the following objective be pursued by the Minister in the administration of the FM Act and by AFMA in the performance of its functions:

'Ensuring that the exploitation of fisheries resources and the carrying on of any related activities are conducted in a manner consistent with the principles of ecologically sustainable development (which include the exercise of the precautionary principle), in particular the need to have regard to the impact of fishing activities on non-target species and the long term sustainability of the marine environment.'

16. The FM Act includes guidance on the application of the precautionary principle to obtain ecologically sustainable development and the powers to regulate certain fishing activities. The precautionary principle provides that, where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation and decisions should be guided by *"careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and an assessment of the risk-weighted consequences of various options"* (COAG 1992). In particular, Section 14 of the FM Act provides that regulations may prohibit, for the purpose of conserving the marine environment, the engaging in specified activities, or the use of specified practices, or the use of specified fishing equipment.
17. The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) plays an important role in ensuring the ecological sustainability of Australia's fisheries by providing for independent assessment by the Australian Government Department of the Environment of the environmental performance of fisheries management arrangements.
18. Under Part 13 of the EPBC Act it is an offence to harm 'protected species'³, other than conservation dependent species⁴, in Commonwealth waters unless fishers have a permit or the management arrangements for the fishery are accredited by the Environment Minister

³ 'Protected species' means all species listed under Part 13 of the EPBC Act, including whales and other cetaceans and listed threatened, marine and migratory species.

⁴ In relation to the killing or injuring of a member of a listed threatened species, Section 196 of the EPBC Act states that: *"(1) A person is guilty of an offence if: c) the member is a member of a listed threatened species (except a conservation dependent species)..."*

under Part 13 of the EPBC Act. Management arrangements can be accredited if the Environment Minister is satisfied that:

- a. those management arrangements require individual fishers to take all reasonable steps to avoid harming protected species; and
 - b. the fishery does not, or is not likely to, adversely affect the conservation status of protected species or affect the survival and recovery of listed threatened species.
19. Protected species along with other bycatch species and marine habitats and communities are managed by the Commonwealth under an ecological risk assessment and ecological risk management framework. This ensures that identified risks from fishing activities are minimised through appropriate management responses. More detail on bycatch can be found at section 3.7 *Bycatch*.
20. Roles and responsibilities for Commonwealth fisheries are divided between the:
- a. Department of Agriculture and Water Resources
 - b. the Australian Fisheries Management Authority
 - c. the Department of the Environment
 - d. The Fisheries Research and Development Corporation.

More detail on roles and responsibilities can be found at Annex A.

1.2 Ministerial Direction

21. In 2005 a ministerial direction was issued to AFMA to *'implement the long standing government policy of managing Commonwealth fisheries using output controls in the form of individually transferable quotas by 2010 unless there is a strong case that can be made to me (Ian Macdonald), on a fishery by fishery basis, that this would not be cost effective or would be otherwise detrimental.'*
22. The 2005 Ministerial Direction was issued due to the poor biological and economic status of a number of Commonwealth fisheries and long recovery times facing many stocks. It directed AFMA to take a more strategic, science based approach to setting fisheries catch and effort levels through a 'world's best practice Commonwealth Harvest Strategy Policy'. The aim was to manage fish stocks sustainably and profitably, end overfishing and ensure that already overfished stocks were rebuilt within reasonable timeframes. This resulted in the development of the: Commonwealth Harvest Strategy Policy and Guideline (HSP) in 2007. The HSP is complemented by the Commonwealth Policy on Fisheries Bycatch (Bycatch Policy) which was released in 2000 and is currently being reviewed.
23. Since 2005, there has been a significant reduction in the number of fish stocks that have been assessed as subject to overfishing (i.e. current levels of harvest are likely to reduce the population below acceptable levels) and/or are overfished (that is, the populations have been reduced below acceptable levels). There has also been a significant decline in the number of fish stocks whose status is uncertain (that is for which there is not enough information to assess whether the stock is overfished or subject to overfishing).

1.3 Banning of ‘super trawlers’ in Australia

24. For the purpose of regulation the government considers super trawlers to be commercial fishing vessels over 130 metres in length. There are a range of defining characteristics of fishing vessels, including length, storage capacity, processing capacity, fishing method, gear type, net size and engine power. Vessel length is a characteristic that can be reliably and objectively measured and can be a useful surrogate for fishing capacity. Those characteristics made it suitable as a prime parameter for fisheries regulation.
25. Vessels of this size (130m and above) are the very largest vessels of the global fishing fleet and have never previously been used in Australia. While less common in Australia, there is substantial evidence in Australia and the region that vessels between 60 and 100 metres in length have operated sustainably in well-regulated fisheries for a number of years. Such vessels also work in third party certified fisheries including Marine Stewardship Council certified fisheries. This is explored further below in section 2.5 *Australia’s Fishing Fleet*.
26. The *Fisheries Management Amendment (Super Trawlers) Regulation 2015* was registered on 20 April 2015 and amends the *Fisheries Management Regulations 1992* to provide a permanent explicit legal ban on all boats over 130 metres in length from undertaking fishing related activities within the Australian fishing zone.
27. For detailed information on the Super Trawlers regulation, refer to the – *Regulatory Impact Statement Future Status of Super Trawlers* available at:
<http://ris.dpmc.gov.au/2015/06/02/future-status-of-super-trawlers-regulation-impact-statement/>

2. Definitions and economics of fishing

2.1 Maximising economic potential in Commonwealth fisheries

28. Under the FM Act a key objective to be pursued by the Minister responsible for fisheries and AFMA is to maximise the net economic returns to the Australian community from the management of Australian fisheries, that is:
 - a. To enable a sustainable and profitable industry the Government must seek to set an efficient and appropriate regulatory framework that does not unnecessarily restrict business flexibility in accessing their quota.
29. The maximum economic potential of a fishery can generally be expected to be achieved through a rights-based management system, where individual fishers are given the flexibility to choose the best mix of fishing methods, to maximise their efficiency.
30. Under a quota rights-based management system fisheries are managed through output controls, or total allowable catches (TACs) of a stock, individual fishing rights (quotas) can then be traded between quota holders. Additional restrictions can be placed on allowable fishing gear in order to manage risks to bycatch species or the environment.

31. The total allowable catch⁵ is in line with the principles of the Commonwealth Fisheries Harvest Strategy Policy, to ensure they meet the legislative objectives.
32. Outside of these mitigation measures, any further restriction on the types of methods used by the fishing industry (such as vessel size, engine power, net size etc.) can unnecessarily impact on industry profitability. These restrictions impede the operators' potential for economic efficiency and can create perverse incentives for operators to circumvent regulations. These types of measures are used in input controlled fisheries and are generally known to make fisheries less efficient and less profitable.
33. AFMA is required to maximise the net economic return to the community from the management of the fishery. This goal is in addition to the other requirements on the regulator that relate to the sustainability of the fishery, having regard to the impact on non-target species and the requirements of environmental protection legislation. Maximising the economic return to the community encompasses the commercial fishers operating in the fishery and other economic contributions including recreational fishing and other leisure activities. AFMA would be expected to have regard to evidence of any real or likely impact on the economic contribution from these sectors.

2.2 Characteristics of vessels

34. The key management tool in the Commonwealth fisheries is the use of quotas, which restricts the total catch to sustainable levels regardless of the number of operators or the size of their boats or fishing gear.
35. Many factors will contribute to the selection of a fishing vessel, including:
 - a. the nature of the target species, including its value and the required treatment to maintain its value
 - b. distance from processing facilities and markets
 - c. specific management and regulatory restrictions
 - d. physical considerations, such as the distance of the fishery from landing ports, expected weather conditions and crew member safety and accommodation space.
36. Vessel availability can be another consideration. For example, the Australian winter Blue Grenadier fishery has a relatively limited harvest season and require vessels with on-board processing facilities. Outright purchasing of a vessel that is equipped for catching and processing this particular species would likely be prohibitively costly. Therefore, Australian quota holders have in the past chartered New Zealand managed vessels to access this fishery for the local harvesting period.
37. These vessels are generally large vessels to allow access to the remote grounds and on-board processing and freezing of the catch. Although the Blue Grenadier fishery does not operate all year round, it is a significant fishery by Australian standards – in 2012-13 it was worth \$15.9 million (gross value of production).

⁵ For many species AFMA sets total allowable catches (TACs) for each fishing season. A TAC is an output control that aims to keep stock abundance (or biomass) at target levels by limiting the amount of fish that can be removed from a stock. The target biomass levels take into consideration biological sustainability and in most cases also aim to maximize the economic yield from the stock. In some cases other ecosystem outcomes are also considered. TACs may vary from season to season depending on how much fish can be caught while ensuring that stocks remain around their target levels.

38. Large trawlers with on-board processing facilities primarily operate in fisheries targeting low per unit value, high volume species (such as small pelagic fish) and/or where port or market access is limited. This is because they allow their catch to be processed and frozen on-board immediately after catch to avoid product spoilage and maximise the value of the product and to hold and transport large volumes of product.
39. Larger vessels also have advantages in fisheries that may experience more extreme marine weather conditions such as large swells, and provide adequate accommodation space for crew on vessels that may spend a significant time at sea to maximise efficiency.
40. Not all characteristics of a vessel may be directly related, for example vessel size is not directly correlated to maximum useable net size. The limiting factor in being able to operate a larger trawl net effectively, is primarily the power required to pull the net at a high enough speed to maintain the net opening. Vessel engine power is related to some extent to vessel size (larger vessels have larger engines), but larger vessels also provide additional space for on-board processing facilities (filleting and freezer plants) and increased freezer storage and can therefore have a larger displacement with larger engines to compensate for this. Net size can be influenced by other factors, including by characteristics of the target species and fishery.

2.3 On-board processing

41. Processing catch on-board is not a new development in fisheries and is not indicative of the industrialisation of fleets. On-board processing has been practiced over some five hundred years and assists in maintaining the quality of the product, reduces product wastage and increases the product value. Prior to refrigeration fish were typically salted and dried, pickled or smoked.
42. Small pelagic fish rapidly deteriorate in storage which is why the use of on-board processing is important and allows the fish to be used for human consumption (as opposed to fishmeal, fertiliser or fish oil). Using small pelagic fish for human consumption represents a significant improvement in the economic value and the efforts to improve global food security (explored further below in section 4.1 *A food source*).
43. A wide range of fishing sectors rely on on-board processing: prawn trawlers typically pack and snap freeze, most of their catch at sea, larger fin fish caught by long liners are most often gutted and packed with ice before storage, blue grenadier are filleted, packed and frozen, gummy shark caught by gillnets are headed and gutted, and the Geelong Star (a fishing vessel operating in the SPF) processes by sorting, boxing and freezing. On-board fishmeal plants can also process waste product to maximise the utilisation of the catch.
44. Globally, freezing is a commonly used processing method for fish for human consumption, accounting for 54 per cent of total processed fish for human consumption and 25 per cent of total fish production in 2012 (FAO, 2014).
45. In New Zealand for example, Sanford Limited operates a fleet of 11 vessels that have on-board freezing and processing capacity. These vessels operate long-distances from port and freeze catch on-board to maintain quality of product for distribution to overseas markets, and also to prioritise distribution at times of highest demand to maximise profits.
46. Boats on short trips, operating close to ports/markets often choose to store in ice slurry without substantial processing. The South Australian sardine fishery is an example of this practice, however, most of this catch is sold as feed into the farmed tuna industry, not for human consumption.

2.4 Australia's fishing fleet

47. Larger vessels with on-board processing are commonly used in Australia, particularly in the Heard Island and MacDonal Islands Fishery (a fishery with large distances from ports and often adverse weather conditions), the Southern and Eastern Scalefish and Shark Fishery (targeting Blue Grenadier) and the Small Pelagic Fishery (SPF) (target species are high-volume but low per unit value where on-board processing allows for human consumption opposed to fish meal).
48. Larger vessels also operate in different capacities in other fisheries, for example 'reefer' vessels that transport Southern Bluefin Tuna from mariculture facilities in Australian waters to Asian markets, and 'carrier' transshipment boats in the Northern Prawn Fishery that provide fuel and supplies to, and take prawns from, smaller boats operating in the fishery. These vessels can also freeze on-board and be typically 80 to over 100 metres in length.
49. Australia also supports scientific research vessels undertaking 'fishing related activities'. This includes permits routinely given to scientific vessels on an ad-hoc basis to undertake scientific research programmes. For example, the Australian Antarctic Division uses the *Aurora Australis* (95m) and the *Hakuho Maru* (100m), which is being used by an Australia-Japanese collaboration conducting plankton research.

2.5 International context of the use of large trawlers

50. Large trawlers operate extensively in international fisheries – often in fisheries targeting low per unit value, high volume species and where port or market access is limited. The majority of trawlers operating on high sea waters are freezer trawlers⁶.
51. New Zealand and Australia have comparable fisheries regulations and management (i.e. quota based management) that take into consideration the impact of fishing on the broader ecosystem. Large vessels have operated in New Zealand fisheries targeting small pelagic species such as Jack Mackerel (generating exports valued at NZ\$57 million), as well as other fish stocks such as Blue Grenadier and Southern Blue Whiting, for over 10 years. There are currently seven vessels over 90 metres registered to fish New Zealand waters. The operation of these vessels in New Zealand's fisheries has and continues to be economically and ecologically viable and a socially acceptable model.
52. Australia's south-eastern fisheries, particularly the Small Pelagic Fishery and the Southern and Eastern Scalefish and Shark Fishery, share similarities with New Zealand fisheries and some operators have been known to share or exchange vessels across the Tasman Sea to maximise efficiency.
53. In poorly regulated fisheries very large fishing vessels can do significant damage in a short time. This is why 'super trawlers' have a poor reputation worldwide. In a well-managed, quota based fishery, the size of the boat or the net should not be relevant to fish stock sustainability.

2.6 Foreign investment and sovereign risk

54. Strategic alliances and joint ventures between two or more fishing operators are common in the fishing industry. This often includes collaborative ventures between companies from different countries. Australia is internationally recognised for its sustainable fisheries where the rules and regulations are underpinned by rigorous science. This can make Australia attractive to investors because there is certainty and predictability in the operating

⁶ Advice from FAO factsheet <http://www.fao.org/fishery/vesseltype/100/en>

environment. However, changing operating rules and regulations without sufficient evidence or justification gives rise to concerns about sovereign risk which may in turn, undermine investor confidence.

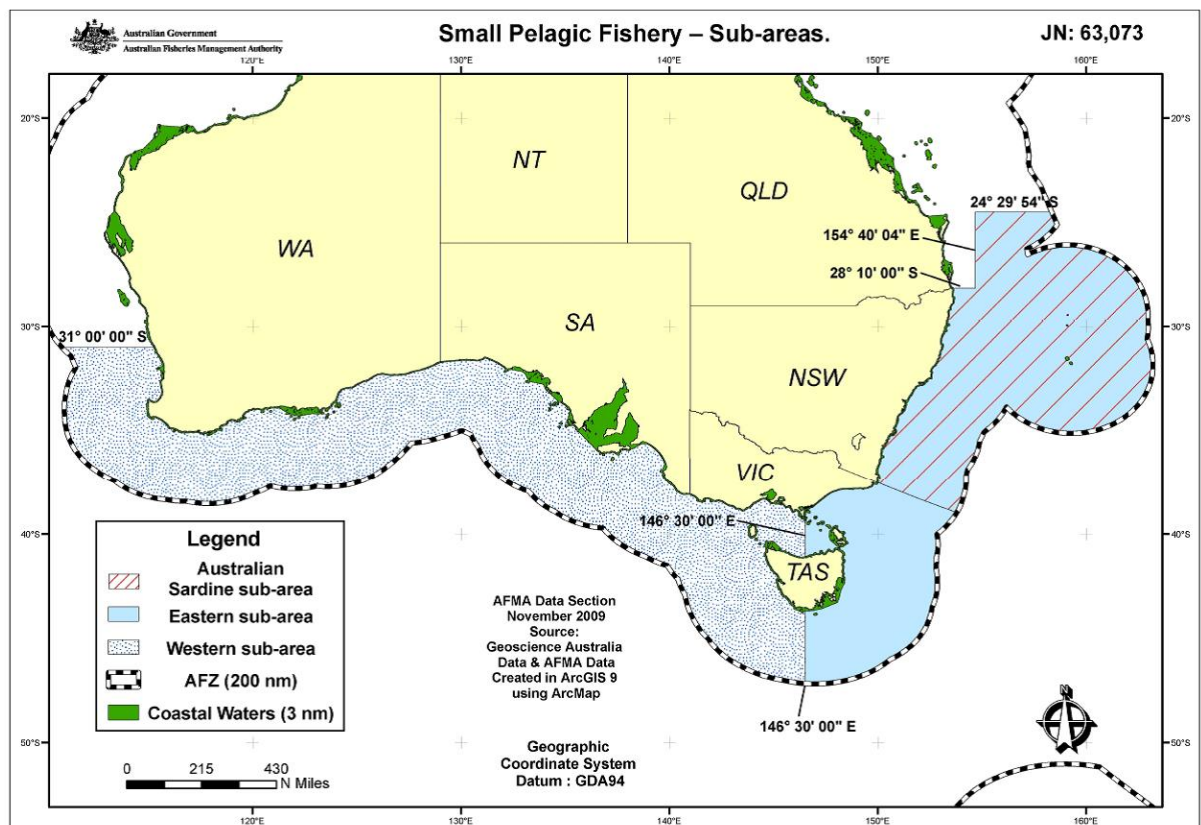
55. In the judgement of the Federal Court case brought by Seafish Tasmania Ltd (handed down 21 February 2014) Honourable Justice Logan noted that the political value of the decision to prohibit the *FV Abel Tasman* in 2012 from fishing may resonate most in “country risk”, or foreign investment decisions, with respect to Australia. In making the judgement his Honour noted that:

‘This risk was highlighted as that in which countries are perceived, without reasonable cause, to change or to be at risk of changing their framework of economic and environmental regulation may either not attract further foreign investment or do so only if higher rates of return over shorter periods are present. Like considerations can govern the decisions of Australian based investors as to whether further to invest in this country or instead to place investments abroad.’

3. What we know about the Small Pelagic Fishery

3.1 History of SPF

56. The Commonwealth Small Pelagic Fishery (SPF) is a wild catch fishery established in 1992, extending from north of Perth, around the Great Australian Bight, up to southern Queensland. The SPF management area measures around 3.2 million square kilometres. The fishery is divided into two sub areas, east and west due to evidence of separate stocks. Key species targeted in the SPF are Blue Mackerel (*Scomber australasicus*), Jack Mackerel (*Trachurus declivis*), Redbait (*Emmelichthys nitidis*) and Australian sardine (*Sardinops sagax*). The SPF is managed in accordance with the *Small Pelagic Fishery Management Plan 2009* established under the FM Act.



57. In order to fish the SPF, operators must hold uncaught Statutory Fishing Rights (SFRs) and use a boat that is nominated to the SFR. All boats in the fishery are subject to strict rules that ensure small pelagic stocks are harvested sustainably. AFMA has applied precautionary regional catch limits to the SPF to distribute the fishing effort widely throughout the fishery to mitigate the already low risk of localised depletion.
58. AFMA tracks all Commonwealth endorsed fishing vessels via global positioning system (GPS) technology using an on-board Vessel Monitoring System and has high levels of monitoring through observers, electronic monitoring and a risk-based compliance program using fisheries officers to ensure that catch limits are not exceeded and other obligations are adhered to.
59. The original Small Pelagic Fishery Harvest Strategy of 2008 and still reflected in the latest version (April 2015) suggests that:
 - a. small pelagic species are caught in high volumes and have relatively low unit value. Additionally, there are high capital costs associated with the large scale catching units and specific processing infrastructure required. As a result, fishing operators need to have heightened efficiency; and
 - b. there are considerable economies of scale in the fishery and the most efficient way to fish may include large scale factory freezer vessels⁷.

3.2 Total Allowable Catch limits

60. In previous years the SPF has been significantly under-fished, for example less than 0.05 per cent of the TAC for 2013-14 fishing season was caught. Catch across the fishery has decreased steadily since 2003-04, driven by economical and logistical limitation rather than any decline in resource abundance.
61. Under the new harvest strategy, the combined TAC is 39 170 tonnes for the 2015-16 season (for more detail see Annex B). The estimated total tonnage of the combined stocks is 511,191 tonnes. This means 92.4 per cent of the combined estimated fish stocks remain uncaught if the entire TAC was caught.
62. Seafish Tasmania, the operators of the Geelong Star currently hold around 18 500 tonnes of quota in the fishery. This means that even at full capacity, they would take less than half of the total allowable 39 170 tonnes of quota available. Given the economic constraints on fishing in the fishery, and the absence of other large scale operators currently fishing, it is likely that total catch in the fishery will remain well below the TAC for the current year.

3.3 Research, science in the Small Pelagic Fishery

63. The management of the SPF is informed by science. The SPF has been the subject of extensive and recent scientific research projects including review of the harvest strategy (i.e. management strategy evaluation) and the broader ecosystem impacts. Data has also been refreshed on the size of a number of Australian small pelagic fish stocks.
64. Two independent expert panels have examined the potential environmental impacts of large mid-water trawlers ('super trawlers') and large vessels capable of transshipping and processing and freezing catch on board in the SPF. The SPF expert panel reports provided

⁷ SPF Harvest Strategy (2008 and last revised in April 2015) <http://www.afma.gov.au/wp-content/uploads/2014/11/Harvest-Strategy-SPF-April-2013.pdf>

advice on potential environmental impacts of mid-water trawling and fish processing activity in the SPF and identified management and operational responses.

65. The recent review of the harvest strategy settings for the SPF conducted by the CSIRO and published by the Fisheries Research and Development Corporation (FRDC) found that harvesting of target species in the SPF have only minor impacts on other parts of the ecosystem, as there are alternative food sources for large predators such as tuna, seals and penguins.
66. The government has also invested approximately \$1.5 million in independent research to refresh our data on the current size of many Australian small pelagic fish stocks. The results confirm the stock of jack mackerel is in a healthy state and the current TAC could be taken without the marine ecosystem being adversely affected. This research assisted in setting TACs for the SPF from 1 May 2015.
67. CSIRO is currently undertaking further testing of the exploitation rates in the SPF Harvest Strategy for consideration by AFMA prior to the 2016-17 fishing season.
68. A full list of past, present and future research project can be found at Annex C.

3.4 State managed species

69. The SPF is a relatively selective fishery with little bycatch and operators may only target SPF species. There is a possibility of catching species that are either not permitted to be taken by Commonwealth operators or are under trip limits in Commonwealth waters (three-200 nautical miles) adjacent to states of New South Wales, Tasmania, South Australian and Victoria. Under agreements with the Commonwealth, some states and Northern Territory fisheries extend into Commonwealth waters. To address the incidental take of these species, the Commonwealth and the states have, in most cases, agreed on trip limits for bycatch species.
70. The South Australian Sardine Fishery covers an area less than 20 per cent of the size of the Commonwealth SPF and has a total allowable catch of 38 000 tonnes, representing 20 per cent of the estimated total spawning biomass. Much of this quota is caught in a small area of the South Australian Sardine Fishery due to the small size of vessels used and limited availability of ports and processing facilities on the South Australian coast.

3.5 Vessel Management Plans

71. Vessel Management Plans (VMPs) are developed by AFMA in consultation with industry and set out individually tailored mitigation measures for the boat to minimise seabird, seal and dolphin interactions. Examples of these measures include using an AFMA approved marine mammal exclusion device to reduce mammal interactions and avoiding the discharge of biological waste from boats to reduce seabird, seal and dolphin attraction. It also includes management arrangement to spread fishing effort across the fishery to reduce the already low risk of localised depletion.
72. Under the SPF Part 13 accreditation under the EPBC Act, mid-water trawl boats must have in place effective mitigation approaches and devices to minimise interactions with seabirds, seals and dolphins. This condition is being addressed through AFMA's management, primarily the development and implementation of VMPs for all SPF mid-water trawl boats.

3.6 The Geelong Star – Vessel Management Plan

73. Seafish Tasmania, operators of the Geelong Star, commenced fishing its quota in the SPF on 2 April 2015. The Geelong Star is fishing under strict management arrangements and has,

and continues to be, compliant with all relevant legislation, regulations and management arrangements.

74. Specific measures in the Geelong Star's VMP include the use of special equipment designed to help marine mammals escape the net, regional and zone based catch limits to reduce the risk of localised depletion. Closure trigger for individual management zones if a single dolphin or Australian sea lion are killed are also implemented through closure directions. There are also identified spatially defined exclusion zones associated for sea lion colonies and haul out points.
75. Additionally, there is a high level of monitoring through electronic monitoring and an on-board observer to conduct scientific sampling, monitor catch limits and interactions with protected species. The Geelong Star is required to carry an AFMA observer on all trips for the first 10 trips or 12 months, whichever is longest. While not a requirement, an AFMA by-catch officer has also been on board the Geelong Star for its first five trips to monitor bycatch mitigation. Any new information which becomes available about the fishing method and interactions with marine mammals can result in the VMP being updated.
76. These measures make the Geelong Star one of the most heavily regulated and closely monitored vessel currently fishing in the Australian Fishing Zone.

3.7 Bycatch

77. All food production activities have some level of impact on the environment. For fishing, one of the most visible impacts is the interaction with non-target species, or 'bycatch'. In many cases bycatch is unavoidable and occurs across all fisheries in Australia and also internationally. Bycatch can be minimised through the application of a range of mitigation measures. Left unmanaged, bycatch may have a negative impact on the status of some marine species such as marine mammals, reptiles, seabirds, sharks and bony fishes the populations of which may not be sustained when subject to additional mortality from fishing and other sources.
78. The Commonwealth Policy on Fisheries Bycatch 2000 (the Bycatch Policy) provides an approach for assessing and minimising the effect of fishing on bycatch species and requires management actions to be undertaken when fishing Commonwealth waters. AFMA's implementation of this policy includes applying management measures take account of the requirements of the EPBC Act particularly as it relates to listed species and the requirements of the Fisheries Management Act in relation to non-target species. Measures aim to minimise bycatch, improve protections for vulnerable species and generally assist in the conservation of marine ecosystems.
79. All AFMA fisheries have been assessed to determine and identify the risk they pose to target, by-product, bycatch, threatened, endangered and protected species, habitats and communities. Ecological risk management plans have been developed for each fishery providing specific mitigation and management strategies to respond to species identified at risk to the effects of fishing. Applying an ecological risk assessment and risk management framework to bycatch is considered the most appropriate approach given the large variation in the biological attributes of bycatch species and the variation in the availability of data on these attributes, as well as the substantial variation in Commonwealth fisheries, in terms of the intensity of fishing, levels of interactions and selectivity of the fishing gear.
80. Management actions can include the use of bycatch mitigation actions (for marine mammals this may involve the mandated use of seal excluder devices, restrictions on offal

discharge and spatial and temporal restrictions on fishing activity) as well as education and training programs.

81. The Department of Agriculture and Water Resources is currently updating the bycatch policy to ensure the management of our marine environment continues to reflect best international practice, including for the minimisation of marine mammal interactions and mortalities.
82. Some level of uncertainty is inherent in all fishing activities; however, neither the FM Act nor the EPBC Act defines a threshold limit for acceptable uncertainty. This means that, in practice, the level of uncertainty that is acceptable is ultimately determined on a case-by-case basis by the government with regard to the available evidence, the application of the precautionary principle and the objectives of relevant legislation.

Marine mammals

83. Interactions with marine mammals occur through a range of on-water activities from fishing to tourism. At times these interactions can lead to incidental mortalities. Other human activities can also cause incidental marine mammal mortalities such as shark nets and pollution. To contextualise, between 2005 and 2009, more than 70 dolphins were killed by shark nets and drum lines placed along Queensland beaches for bather protection⁸.
84. Interactions with marine mammals occur in a number of domestic and international fisheries. To contextualise, reports on the Australian Pilbara Trawl fishery (a West Australian state fishery) indicate that there was over 22 observed dolphin mortalities in 2012⁹. The South Australian Sardine Fishery reports around 10 dolphin mortalities per year having substantially reduced mortality levels in recent years. Gillnet fisheries have also recorded significant levels of dolphin mortalities from drowning in nets. For example the Southern and Eastern Scalefish and Shark Fishery – Gillnet, Hook and Trap Sector reported four dolphin mortalities for the period 1 January to 31 March 2015¹⁰. Seal and Australian sea lion mortalities have also been an ongoing issue in lobster fisheries where animals can be trapped and drowned in lobster pots, however mitigation measures have reduced these.
85. Internationally, in the 2010-11 fishing year, the New Zealand Mackerel Fishery (similar in operation and management to Australia's SPF) experienced an estimated 64 common dolphin captures¹¹. In 2011 the United States' Government released its first national bycatch report¹² intended to estimate bycatch in US commercial fisheries – providing a benchmark for evaluating the effectiveness of their efforts to reduce bycatch. Data from around 2005 indicates that dolphin mortalities or serious injuries was highest in the Northeast region comprising of 355 Atlantic white-sided dolphins and 151 common dolphins. (The Northeast region comprised 63 commercial fisheries for this report valued at US\$1.4 billion).

⁸ Queensland Department of Agriculture and Fisheries, Disclosure log number DL#, Application number: IA000033, retrieved from: https://www.daf.qld.gov.au/data/assets/pdf_file/0004/66316/IA000033-Disclosure-Log-DEEDI.pdf

⁹ Western Australian Fisheries and Marine Research Laboratories (2014) retrieved from: http://www.fish.wa.gov.au/Documents/research_reports/frr244.pdf

¹⁰ AFMA Final Report: protected species interactions reported in Commonwealth Fishery logbooks for the period 1 January to 31 March retrieved from: <http://www.afma.gov.au/wp-content/uploads/2014/12/Quarter-1-2015-final-report-PDF-117-KB.pdf>

¹¹ Common Dolphin Bycatch in New Zealand Commercial Trawl Fisheries retrieved from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3661492/>

¹² U.S. National Bycatch Report First Edition 2011. Retrieved from: http://www.nmfs.noaa.gov/by_catch/bycatch_nationalreport.htm

Marine mammal interactions in the SPF

86. All vessels operating in Commonwealth fisheries must operate in accordance with all applicable legislation and policies—this includes all obligations under the EPBC Act in relation to threatened, endangered and protected species.
87. The EPBC Act requires management arrangements of Commonwealth fisheries to require individual fishers to take all reasonable steps to avoid harming protected species, including marine mammals. It also requires that the fishery does not, or is not likely to, adversely affect the conservation status of protected species (such as marine mammals) or affect the survival and recovery of listed threatened species.
88. AFMA has developed and implemented a bycatch and discarding workplan in the SPF (AFMA 2014). This outlines some practical steps to reduce bycatch and discarding in the fishery. There have been low levels of bycatch and discarding in the SPF. The 2014-2016 workplan and the details for last season's bycatch and discarding are available on AFMA's website.
89. The Geelong Star has reported a total of nine common dolphin mortalities and 14 Australian fur seal mortalities. All Australian marine mammals are protected under the EPBC Act, however neither the common dolphin nor the Australian fur seal are listed as threatened fauna.
90. In response to the death of eight dolphins in the first two trips of the Geelong Star, AFMA issued the *Small Pelagic Fishery (Closures) Direction No.1, 2015* on 8 May 2015 which put new measures in place to protect dolphins. That direction prohibited night time fishing and included zone closures for mid-water trawling for a period of six months if a single dolphin was killed in any of the seven SPF management zones.
91. The trigger was activated by a single dolphin death on 17 June 2015 – in zone 6 of the SPF covering an area from just south of Sydney to Wilsons Promontory in Victoria. This closure applies to all mid-water trawling until 16 December 2015.
92. On 16 September 2015, AFMA announced changes in the fishing conditions for the Geelong Star which included the lifting of the ban on night fishing. AFMA drew on the expert advice from the FRDC hosted workshop (see Annex C) which recommended that AFMA review as soon as possible the need for a ban on night time fishing when a trigger limit on dolphin mortalities is in place.
93. While AFMA lifted the ban on night time fishing, the one dolphin mortality trigger for closures remains in force. This means that one dolphin mortality in any of the seven management zones, will trigger the closure of the respective zone to mid-water trawling for a period of six months.
94. The operator of the Geelong Star, Seafish Tasmania, is also taking additional (voluntary) measures to reduce the risk of marine mammal interactions such as a range of safe setting and hauling procedures to minimise marine mammal interactions and underwater equipment that can detect dolphins near the vessel. The operator expects to be able to steadily reduce interactions with marine mammals and dolphins in particular. Experience in other trawl fisheries suggests that interactions can be dramatically addressed with incremental improvements and changed practices learned with experience in the fishery.

4. The social and economic benefits of small pelagic fish

4.1 A food source

95. On average, Australians now eat 15 kilograms of fish¹³ every year – increasing three per cent per annum over the last decade. Global consumption of seafood has grown by 26 per cent over the past 15 years, driven by increasing populations and the popularity of seafood in diets. Seafood is a major source of animal protein – contributing to global food security alongside other meats including poultry, pork and beef – and consumption is expected to continue to increase, with forecasts suggesting the growth rate is unlikely to slow in the next 10 years.
96. Fishing for small pelagic fish is not a new phenomenon - these fish have been an important source of food in Europe and the Americas for centuries. They are also a key fish for human consumption in less developed regions as it is a more affordable and much needed source of high quality animal protein and essential amino acids, omega -3 fatty acids, vitamins, minerals and trace elements.
97. Human consumption of small pelagic fish is limited by their rapid deterioration in storage and as a result has led to the fish being predominantly used in Australia for feed in aquaculture, fishmeal, fertilizer or fish oil. The use of at-sea factory processing allows improved product quality of small pelagic species to allow direct human consumption of the catch.
98. The change to direct human consumption of the catch is a significant improvement in the economic value and social value of any catch. This change is generally favoured world-wide. Aquatic foods represent an essential component of the global food basket to improve the nutrition and health of all peoples. Small pelagic fish species represent one of the most nutritious aquatic animal foods and should be utilised for direct use as human food in order to benefit poor and developing countries and communities.

4.2 Direct benefits to local communities

99. Commonwealth fisheries have been recognised as a valuable natural asset for the Australian community. The fishing industry makes an important contribution to both national and local economies. The industry provides jobs and infrastructure, particularly in regional areas. Some small coastal regions rely heavily on the fishing industries to contribute to their economies and strengthen communities.
100. The Commonwealth fishing industry creates employment in fisheries production and processing and in downstream industries, including transportation, storage, wholesaling and retailing. The operations of mid-water trawlers have direct and indirect economic and social benefits on local communities. This includes the creation of jobs for local provisioning, fuel supply, cold storage, packaging and transport suppliers. Fishing businesses spend millions per year on wages, goods and services in regional and coastal areas.

4.3 A shared resource

Commercial Fishing

101. The operation of large-trawlers in the SPF do not impact detrimentally on other commercial fishermen in the area. Commercial fishers must hold quota SFRs allocated by AFMA to fish in the SPF. These SFRs are transferable between fishers. Any commercial fishing boat must be

¹³ Edible equivalent, Australian fisheries and aquaculture statistics 2013, ABARES

nominated to an SFR in order to operate in the fishery. As of September 2015 there are 31 SFR holders in the SPF.

102. The Commonwealth Fisheries Association (CFA) is the peak industry body representing the interests of fishers in Commonwealth fisheries, who generate a significant part of Australia's \$2.6 billion gross value of production from fisheries and aquaculture¹⁴. A media release by the CFA on 22 July 2014 stated the CFA's opposition to the banning of any authorised vessel regardless of its size, and supported the use of all types and sizes of processing vessels in Commonwealth waters.
103. The Small Pelagic Fishery Industry Association (SPFIA) has stated that its members support the Geelong Star's operations, due to its potential to open up a new and lucrative industry in the SPF.

Recreational Fishing

104. Oceans are a shared resource with many users. Recreational and game fishing, like commercial fishing, contributes to wider social and economic benefits of the Australian community.
105. Recreational fishers have voiced concerns about commercial fishing in the SPF and in particular the use of freezer factory trawlers. The primary concern is the potential for localised depletion of the key species commercially targeted in the fishery: blue mackerel, jack mackerel, redbait and Australian sardine. These species are thought to be predated on by game fish species targeted by recreational fishers. Secondary concerns include potential broader environmental impacts of fishing activity, and the belief that recreational fishing contribute more economically and socially to the community than does the operation of commercial vessels.
106. CSIRO recently published a report that modelled the ecosystem impacts of fishing in the SPF to assist in the review and update of the harvest strategy settings for the SPF. The modelling confirmed that, in south east Australia, harvesting of commercially targeted SPF species has only minor impacts on other parts of the marine ecosystem and species such as seals, penguins and tunas are not heavily dependent on SPF target species as a food source, and in the absence of availability of these species alternative food sources are available and utilised as required.
107. The SPF has been the subject of other extensive and recent scientific research projects: research has found that localised depletion is evaluated as unlikely under the current management arrangements in the SPF, because most small pelagic species are highly mobile and local areas replenish quickly provided the overall stocks are not depleted (The Commonwealth Small Pelagic Fishery: General background to the scientific issues' 2012).

¹⁴ Australian Bureau of Agricultural and Resource Economics and Sciences' *Fishery status reports 2015* retrieved from:
http://www.agriculture.gov.au/abares/publications/display?url=http://143.188.17.20/anrdl/DAFFService/display.php?fid=pb_fsr15d9abm_20151030.xml

ANNEX

Annex A - Australian Government roles and responsibilities

Department of Agriculture and Water Resources

The Australian Department of Agriculture and Water Resources' broad role is to provide advice to the Australian Government on how to help our primary industries remain competitive, productive and sustainable into the future.

The Department of Agriculture and Water Resources' supports Australia's domestic fisheries through

- a. research
- b. quarantine and biosecurity
- c. fish health and food safety programs
- d. market access and trade negotiations
- e. business development and management assistance
- f. policy development; and
- g. representing Australia in international management forums.

The Fisheries Branch, within the department, works closely with AFMA and assists the Minister responsible for fisheries to set the policy direction for

- a. Commonwealth fisheries management;
- b. progressing operations of joint authorities;
- c. legislative reform and reviews; and
- d. negotiating jurisdictional boundaries and resource sharing arrangements.

The Department of Agriculture and Water Resources, through the Australian Bureau of Agriculture and Resource Economics and Sciences (ABARES) reports on elements of AFMA's performance in managing Commonwealth fisheries through the annual publication of fisheries status reports. The reports provide an independent evaluation of the biological status of fish stocks and the economic status of fisheries managed, or jointly managed by the Commonwealth through AFMA. Status reports assess the biological status of target and key by-product species in each fishery, with respect to their biomass and the level of fishing mortality. ABARES also examines the economic performance of each fishery in terms of AFMA's objective of maximising net economic returns from Commonwealth fisheries to the Australian Community. The status reports also comment on broader environmental aspects.

Australian Fisheries Management Authority

AFMA, as the Commonwealth agency responsible for the management of commercial fisheries, administers these fisheries in a manner consistent with policy, applicable legislation and regulations. AFMA is required to pursue the following objectives set out in both the FA Act and FM Act.

- a. Ensure that the exploitation of fisheries resources is conducted in a manner consistent with the principles of ecologically sustainable development, this includes the exercise of the precautionary principle, in particular the need to have regard to the impact of fishing

activities on non-target species and the long term sustainability of the marine environment.

- b. Implement efficient and cost-effective fisheries management on behalf of the Commonwealth.
- c. Maximise the net economic returns to the Australian community from the management of fisheries.
- d. Ensure the accountability to the fishing industry and to the Australian community in AFMA's management of fisheries resources.

Responsibilities are shared between the AFMA Commission and the Chief Executive Officer (the CEO); with the AFMA Commission responsible for domestic fisheries management and the CEO responsible for foreign compliance, assisting the commission and giving effect to its decisions. The CEO is appointed on a full-time basis and is also a commissioner, while all other commissioners are appointed on a part-time basis. Commissioners are prohibited from holding any executive position in a fishing industry association, or having a controlling interest or executive role in any entity holding a Commonwealth fishing concession. Currently there are seven appointed AFMA Commissioners.

AFMA has also established committees to assist its operations. AFMA's submission to the Environment and Communications committee will cover this in more detail.

Fisheries Research and Development Corporation

The FRDC is a co-funded partnership between its two stakeholders, the Australian Government and the fishing industry. It reports to the minister responsible for Fisheries.

The FRDC's role is to plan and invest in fisheries research, development and extension (RD&E) activities in Australia. This includes providing leadership and coordination of the monitoring, evaluating and reporting on RD&E activities, facilitating dissemination, extension and commercialisation. The FRDC achieves this through coordinating government and industry investment, including stakeholders to establish and address RD&E priorities. In addition the FRDC monitors and evaluates the adoption of RD&E to inform future decisions.

The FRDC has a significant responsibility in ensuring, on behalf of the Australian Government, that research is undertaken to assist in the management of the fisheries and aquaculture resource for ongoing sustainability. This means that a significant proportion of funding is directed at research that has a benefit for the three sectors of the fishing industry: commercial (wild catch and aquaculture), recreational and indigenous and also delivers a public good benefit to the Australian community.

Department of the Environment

The EPBC Act requires the Australian Government to assess the environmental performance of fisheries and promote ecologically sustainable fisheries management. The Department of the Environment is responsible for the assessment of fisheries managed under Commonwealth legislation and state export fisheries in accordance with the EPBC Act.

The primary role is to evaluate the environmental performance of fisheries, including:

- a. The strategic assessment of fisheries under Part 10 of the EPBC Act,
- b. Assessment relating to impacts on protected marine species under Part 13; and
- c. Assessments for the purpose of export approval under Part 13A.

Annex B – Small Pelagic Fishery total allowable catches for 2015-16 season

Small Pelagic Fishery total allowable catches for 2015-16 season				
Species	Eastern Zone Total Allowable Catch (tonnes)	Western Zone Total Allowable Catch (tonnes)	Total Allowable Catch (tonnes)	Total estimated stock (tonnes)
Blue mackerel (<i>Scomber australasicus</i>)	2,630	6,200	8,830	East: 40,000 (estimated in 2008) West: 86,500 (2005 DEPM survey – estimate adjusted by SPFRAG based on survey coverage area)
Redbait (<i>Emmel-ichthys nitidus</i>)	3,310	2,880	6,190	East: 68,886 (2005-06 DEPM surveys) West: 58,000 (lower confidence bound of 2015 Atlantis ecosystem model estimates)
Jack mackerel (<i>Trachurus declivis</i> , <i>T. murphyi</i>)	18,670	3,600	22,270	East: 157,805 (2014 DEPM survey) West: 60,000 (lower confidence bound of 2015 Atlantis ecosystem model estimates)
Australian sardine (<i>Sardinops sagax</i>)	1,880	n/a	1,880	East: 40,000 (2004 DEPM estimate adjusted by SPFRAG based on survey coverage area)
Total	26,490	12,680	39,170	511,191 (includes east and west stocks of four species)

Annex C – Past, present and future research

Completed research

Fishery status reports 2015 (October 2015 - ABARES)

Stock structure, catch history, stock assessment and stock status determination were reported for the four target species within the SPF. All species are managed as separate east and west stocks based on the information available regarding population subdivision. Stock status determination based on estimates of spawning biomass and peak harvest rates was classified as not overfished and not subject to overfishing for Australian sardine, blue mackerel, jack mackerel and eastern stocks of redbait. Western redbait stock status was classified as uncertain with regards to the level of biomass, due to no estimates of biomass being available. Based on catch history in recent years being very low, western stocks of redbait were classified as not subject to overfishing.

Technical workshop to explore options for mitigating marine mammal interactions in the Small Pelagic Fishery (June 2015 - FRDC)

This workshop reviewed current scientific and technical information, management and industry operations, biology and behaviours of key marine mammal species, knowledge and experiences from other fisheries, and options to mitigate marine mammal interactions from mid-water trawl operations in the SPF. High priority recommendations from the workshop included establishing an industry code of practice for documenting mitigation procedures for marine mammal interactions, establishing a Marine Mammal Working Group to provide AFMA with relevant information, and establishing a rigorous process for collating, reporting and analysing marine mammal interaction data. Other recommendations included reviewing current management arrangements for mitigation, establishing an expert group to review current information in order to develop species-specific trigger limits for marine mammal species, using acoustic mitigation devices, and using underwater cameras and hydrophones to assess cryptic mortality. Long term recommendations included a detailed investigation of the population size and genetic structure of short-beaked common dolphin, and encouraging manufacturers of acoustic deterrent devices to conduct research and report on the ongoing operational effectiveness of their products. Relevant organisations and agencies are in the process of implementing recommendations from the findings of this workshop.

Technical workshop to elicit expert knowledge to inform interactions with marine mammal interactions in the Small Pelagic Fishery (October 2015 - FRDC)

This workshop was held based on the recommendations of the above workshop - to establish an expert group to review current information in order to develop species-specific trigger limits for marine mammal species. The workshop identified the current state of knowledge of a number of marine mammal species that overlap with the SPF and attempted to use scientific expertise to develop potential population estimates of these species. A final report on the workshop and outcomes will be published on the FRDC website, likely early in 2016.

Jack mackerel stock structure in the SPF (May 2015 - CSIRO)

This research provided a summary of the information regarding the stock structure of jack mackerel in the SPF. The findings from this report found that while the overall patterns of spawning and egg distributions in the eastern zone of the SPF could be broadly interpreted as a continuum of spawning distribution, the spatial and temporal separation of the peaks of egg and larval abundances might also be indicative of genetically distinct spawning groups as suggested by one of the genetic studies. The report suggested that further genetic studies may be required to confirm the existence of a separate stock.

Importance of SBT diet studies in relation to SPF species (May 2015 - CSIRO)

This research reported on the importance of small pelagic species in the diets of southern bluefin tuna (SBT). The report found that fishing for small pelagic species only has minor impacts on other parts of the ecosystem and that alternative food sources exist for species such as SBT.

Summer spawning patterns and preliminary Daily Egg Production Method survey of Jack Mackerel and Australian Sardine off the East Coast (March 2015 - FRDC)

This study was undertaken to acquire sufficient knowledge to support ecologically sustainable management of jack mackerel and Australian sardine, which are the only two SPF species that have not been subject to dedicated Daily Egg Production Method (DEPM) surveys off eastern Australia. This study established an effective sampling method for adult jack mackerel and provided the first estimates of the adult reproductive parameters required for application of the DEPM. The study also investigated the spawning habitat of the Australian Sardine off eastern Australia during summer. The spawning biomass estimate for jack mackerel was considered robust and suitable for setting recommended biological catches (RBCs) as outlined in the SPF Harvest Strategy. The spawning biomass estimate for Australian sardine had a greater level of uncertainty but may be useful for informing future management of any fishery for the species that may be developed off Tasmania within the next few years. The localised area from which Australian sardine eggs were collected during this study suggests separate sub-populations of this species may occur off eastern Australia.

Review and update of harvest strategy settings for the Commonwealth Small Pelagic Fishery: Single species and ecosystem considerations (January 2015 – CSIRO)

This report investigated aspects of harvest strategy for the four main target species in the SPF and examined alternatives to the harvest strategy in place. The focus was to improve the harvest strategy for the fishery to make it fully compliant with the Commonwealth Harvest Strategy Policy (HSP). Findings on the effects of fishing the four SPF target species on other parts of the food chain concluded that depleting these target species has only minor impacts on other parts of the ecosystem. This suggests that it should not be necessary to alter target or limit reference points for this fishery to take specific account of ecosystem impacts. Results presented in this study also suggest that target exploitation rates (ERs) for the SPF should be species-specific and possibly even stock-specific. The results of this study can help inform the choice of suitable ERs for each species and stock, based on surveys being conducted every 5 years.

Provision of a technical assessment: role for spatial management strategies in mitigating the potential direct and indirect effects of fishing by large mid-water trawl vessels in the small pelagic fishery on protected species (September 2014 - CSIRO)

This study examined the data, information and methods available to inform the design of spatial management measures to mitigate impacts of fisheries operations by large mid-water trawl vessels in the SPF on foraging species including seals and seabirds. The review of available data and information found that there is a general lack of data required to assess and monitor status and trends in the majority of these species in the SPF. There are widespread and large uncertainties in population abundance, spatial distribution, foraging ecology and diet for most species, and many estimates of population size from offshore islands are very dated and therefore of limited value in the context of assessing current status or trends. The research integrated research across state jurisdictions and coordination among responsible agencies and research providers is required to address this lack of data.

Dolphin and seal interactions with mid-water trawling in the Commonwealth Small Pelagic Fishery, including an assessment of bycatch mitigation (February 2008 - FRDC)

This study assessed the nature of operational interactions between marine mammals and mid-trawl vessels using underwater video observations. The study recorded no interactions with dolphins,

suggesting that dolphin interactions in the SPF are rare and unpredictable. Interactions with fur seals were common and unavoidable with relatively high mortality rates in comparison with other trawl fisheries, although the total number of mortalities was low and unlikely to pose a significant threat to fur seal populations. Performance of bottom and top opening seal exclusion devices (SEDs) was examined, with no significant difference in interaction rates. However, increasing the size of the escape opening in SEDs achieved a three-fold reduction in lethal interactions. All seal mortalities fell out of the escape exit prior to the net being brought onboard the vessel, indicating that the majority of mortalities would not have been observed without the camera system. This study indicated that seal bycatch in mid-water trawls in the SPF should be addressed, and the implementation of an exclusion device that increases the probability of animals escaping in a healthy condition is key to a successful mitigation strategy.

Monitoring marine mammal interactions in the Small Pelagic Fishery – Stage One Pilot Study (October 2005 - AFMA)

This research was initiated by the Cetacean Mitigation Working Group, a group formed following the capture of 17 dolphins in the SPF in late 2004. The research used underwater cameras to characterise interactions with marine mammals during mid-water trawl activities and investigate ranges of target and non-target species behaviour in and around the trawl in relation to net geometry. This study recorded no interactions with dolphins, however the video footage revealed that interactions with seals was common. The research identified key aspects of fishing equipment and practice that posed an increased risk of seal and dolphin interactions. An increase in seal footage recorded per shot was recorded over the study period, indicating an increase of seals aggregating and foraging around the vessel during a trip. This indicated that continuous fishing in an area may lead to an increase in seal interactions as seals recognise trawling as an easy food source and become more effective at foraging around the nets.

Expert Panel Reports

The Final (Small Pelagic Fishery) Declaration 2012, prohibited large-scale mid-water trawl operations in the SPF for up to two years while an expert panel undertook an assessment of the potential for the Declared Commercial Fishing Activity (DCFA) to cause adverse environmental impacts including localised depletion of target stocks in the SPF and direct interactions with protected species, including central place foragers that prey on SPF target species. The panel's assessments were based on a likely pattern of fishing, including the target species, areas and times of year fished and fishing intensity when considering the potential adverse effects of localised depletion and interaction with protected species in the SPF.

Report of the Expert Panel on a Declared Commercial Fishing Activity: Final (Small Pelagic Fishery) Declaration 2012 (October 2014)

This expert panel report was undertaken to assess the potential for a DCFA to cause adverse environmental impacts. The activity referred to is in the area of the SPF, uses the mid-water trawl method and uses a vessel greater than 130 m in length with an on-board processing facility and has storage capacity for fish or fish products in excess of 2000 t.

Report of the Expert Panel on a Declared Commercial Fishing Activity: Final (Small Pelagic Fishery) Declaration (No. 2) 2013 (March 2015)

The second expert panel report was undertaken to assess the potential for a DCFA to cause adverse environmental impacts. The activity referred to was commercial mid-water trawl activity in the area of the SPF, using a vessel with a storage capacity for fish or fish products of 1600 t or greater. The fish processing activity assessed was commercial fish processing in the SPF, using a vessel with a storage

capacity for fish or fish products of 1600 t or greater, and consists of receiving or processing fish or fish products that are quota species that have been taken in the SPF.

Findings:

The form of direct interactions and the species most likely to be affected by both direct interactions and localised depletion were identified and the Expert Panel (the Panel) provided specific advice on measures that could be taken to avoid, reduce and mitigate these impacts.

The Panel noted that, given the uncertainties associated with the fishing pattern, it could not detect any meaningful distinction between the likely impact of localised depletion between a 1600 t and 2000 t mid-water trawl vessel. The Panel considered that, given the exploitation rates in place, it was unlikely that localised depletion arising from any of the fishing scenarios considered would affect the overall status of stocks of target species in the fishery. However the Panel maintained that localised depletion from the fish processing activity had the potential to have adverse impacts on the protected species.

The report highlights the uncertainty about the ecological importance of SPF target species due to a lack of dietary information on predators, noting that recent ecosystem modelling indicates that southern Australian marine ecosystems are not as reliant on small pelagic fish species as other ecosystems worldwide.

The report assessed the proposed management measures in place and recommended actions to address the environmental risks, particularly in relation to seals and dolphins, including spatial closures, use of excluder devices to mitigate seal and dolphin bycatch, and changes to trigger limits for fur seal and dolphin species. Further research was recommended to gain information about protected species habitat preferences, identify the impact of fishery-related mortality rates for protected species, validate the reporting of interactions with protected species in the SPF, and clarify the extent of sub-structuring of SPF target species in the east and west zones of the SPF.

Current and future research projects

SPF Strategic Research Plan

Strategic research objectives for the SPF are set out in AFMA's Small Pelagic Fishery Five Year Strategic Research Plan 2012-13 to 2016-17. The Research Plan is developed from discussions between researchers, industry and AFMA regarding issues and knowledge gaps for the Fishery. Operators work with AFMA and external research organisations to undertake scientific monitoring programs. Current high priority research projects for the SPF outlined in the Small Pelagic Fishery Annual Research Statement 2015-16 include:

- **Daily Egg Productions Surveys (DEPM).** This research priority aims to estimate the spawning biomass of SPF species to support the setting of recommended biological catches at Tier 1 and Tier 2 under the fishery's Harvest Strategy. Surveys have currently been funded for all SPF species on the east coast except for redbait. By completing a DEPM survey for redbait on the east coast, all east coast SPF quota species will be able to be managed at Tier 1 under the SPF Harvest Strategy. The timeframe for this research is 2014-2016.
- **Movement and distribution of small pelagic stocks, assessed via acoustic information.** This project will assess the movement and distribution of small pelagic species, based on information gathered through acoustic/sonar equipment on board vessels. This project would provide data regarding escapement from schools to help assess the effectiveness of move on rules used to address the risk of localised depletion. The project may also provide methodologies and/or information on fish movement within and between small pelagic stocks in the SPF. The timeframe for this research is 2015-2017.

- **Effectiveness of seal exclusion devices (SEDs) in reducing marine mammal by-catch in mid-water trawls.** If mid-water trawls resume in the SPF, there is a need to ensure that marine mammal bycatch data collected through observer and camera coverage are formally synthesised to examine how operational and environmental factors influence interaction rates and the effectiveness of SEDs in mitigating lethal interactions with marine mammals are assessed. These analyses will provide a basis on which to recommend modifications to fishing practices and SED design and/or provide confidence that the welfare of marine mammals are not adversely impacted by mid-water trawling. The timeframe for this research is 2015-2017.

Other high priority research projects outlined in the Strategic Research Plan include:

- **Annual Development of the Fishery Assessment Report.** The annual assessment presents fishery statistics and catch at size/age data and synthesises existing stock assessment information for the key target species of the SPF. This project is funded through 2012-17.
- **Establishing improved methods for estimating egg production.** The objective of this study is to identify and establish an international consensus on the application of various statistical approaches to estimating egg production. This study is needed to improve the reliability of estimates of spawning biomass used to set RBCs in the SPF. The timeframe for this project is 2015-16.
- **Develop comprehensive integrated stock assessments that incorporate multiple lines of evidence.** The aim of this project is to develop and test integrated stock assessment models for key SPF species when the fishery develops. The timeframe for this project is 2016-17.

Planned research projects

Egg identification (Anticipated completion August 2017 – FRDC)

This project aims to develop a rapid molecular identification technique to improve egg production based fish biomass assessment. It is currently focussed on tropical species but could be extended to temperate species. Anticipated completion Aug 2017.

Method development (Anticipated completion January 2016 – FRDC)

This research will investigate the robustness and precision of estimates of egg production and spawning biomass obtained using the DEPM. Anticipated completion Jan 2016.

Method workshop (Anticipated completion 2015 – FRDC)

This workshop focused on benchmarking Australia's small pelagic fisheries against world's best practice. The workshop was held in July 2014 with the report due to be completed in 2015.

Annex D – Economic and scientific advice provided by ABARES for the Senate Inquiry

Background to the large-capacity fishing vessels in Australia's marine jurisdiction

The instructions to the Environment and Communications Reference Committee for reporting upon the environmental, social and economic impacts of large-capacity fishing vessels commonly known as “supertrawlers” operating in Australia’s marine jurisdiction do not include a definition of large-capacity. For the purposes of this submission information is provided on Commonwealth Fisheries where mid-water trawlers have been licensed to operate.

Australian Commonwealth fisheries are managed by an Individual Transferable Quota (ITQ) system. This means that species can only be harvested to a fixed limit. This limit is independent of the type and number of vessel operating.

Mid-water trawler vessels have operated in the Coral Sea Fishery, East Coast Deepwater Trawl Sector, Great Australian Bight Trawl Sector, High Seas Trawl Fishery, Commonwealth Trawl Sector, Small Pelagic Fishery, and Western Deepwater Trawl Fishery. Vessel sizes have ranged from 24 m to 95 m in length.

The fishery that has received recent attention with the participation of a factory mid-water trawl vessel is the Commonwealth Pelagic Fishery (SPF). The annual ABARES Fishery status reports (most recently published in October 2015) assess Commonwealth fish stocks in terms of their biomass status (that is, the weight of fish in a stock) and their fishing mortality status (that is, the amount of fish that are removed from a stock due to fishing). The Fishery status reports 2015 assigned the following status classifications for stocks in the SPF:

- Australian sardine – not subject to overfishing and not overfished
- Blue mackerel east and west – not subject to overfishing and not overfished
- Jack mackerel east and west - not subject to overfishing and not overfished
- Redbait east – not subject to overfishing and not overfished
- Redbait west - not subject to overfishing and uncertain with regard to biomass.

These status determinations are assigned based on limit reference points outlined in the Commonwealth HSP. Not subject to overfishing means that the stock is not being fished at a rate that will cause the stock to become overfished. Not overfished refers to a stock that is above the limit reference point. For the SPF the limit reference point is 20 per cent of the unfished biomass. The target reference point is 50 per cent of unfished biomass. The target reference point is the biomass level that maximises economic yield. Uncertain means that the information available was not sufficient or suitable to determine a stock status.

The fishing method that dominates the catch from the SPF has alternated between purse-seine and mid-water trawl since the fishery commenced (ABARES 2015). The catch was initially dominated by purse-seine caught fish, switched to mid-water trawl caught fish between 2003 and 2008, and then returned to predominantly purse-seine catch. The catch in the 2015–16 fishing season has been dominated by mid-water trawl with the introduction of a factory trawler in 2015.

A Management Strategy Evaluation has been undertaken for the SPF (Smith et al 2015) to inform the revision of the SPF Harvest Strategy and ensure that it achieves the objectives of the fishery.

The table below provides a summary of the historical catch, effort and observer coverage. There is a consistent downward trend through time in the percentage of the total allowable catch (TAC) being caught and the number of vessels operating in the fishery.

		2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15
TAC and Catch	TAC (t)	58300	46800	35600	34500	30300	36300	34270	34950
	Catch (t)/%TAC	5063 (9%)	5150 (11%)	2525 (7%)	535 (2%)	153 (1%)	16 (<1%)	77 (<1%)	643 (<2%)
Effort	PS (hrs)	655.5	871.2	517	205	135	65	127	NA
	Trawl (shots)	92	93	29	3	0	0	0	NA
Observer (% Effort)	PS	0	0	12	0	0	14	0	0
	Trawl	16.6	1.4	0	0	0	0	0	100
Vessels	PS	5	3	3	4	3	2	1	0
	Trawl	1	1	2	1	0	0	0	1

The closure of a major processing factory in Eden in December 2010 is likely to have contributed to the decreasing activity in the fishery in the recent past (ABARES 2013).

Factory trawlers, such as the Geelong Star, are primarily used for their additional processing, freezing and storage capabilities. On-board processing and freezing capability can optimise the quality and value of the fish product. This is considered beneficial for the SPF which is characterised by small oily fish that are easily damaged and readily decompose.

The other trawler vessels that have operated in the SPF utilise ice slurries to conserve their catch and need to return to port regularly to avoid degradation of product. The principal difference between a factory trawler and the other vessels is its capacity to stay at sea for longer periods.

A. The effect of large fishing vessels on the marine ecosystem: (i) impacts on fish stocks and the marine food chain.

There has been no empirical study to assess the impact of a large trawler on fish stocks and the marine food chain in the SPF. However there have been three simulation studies that have assessed whether the SPF quota (TAC), if caught, would impact the marine food chain (Smith et al. 2015; Goldsworthy et al. 2013; Bulman et al. 2011).

All three studies reached the same conclusion of no detectable impact on the ecosystem structure or function from the current quantity of harvest of target species (jack mackerel, redbait, blue mackerel and Australian sardine) from the SPF.

The most recent of these studies (Smith et al. 2015) used a 'state of the art' ecosystem model, Atlantis, which was tuned for the SPF. It was commissioned in 2014 and reported the results in January 2015. The tuning parameterises the model on the target species in the SPF and their role in the food web. The Atlantis model also includes physical variables of the environment in addition to trophic relationships to model the ecosystem dynamics.

This model was used to examine the effects on other parts of the food chain of depleting SPF target species to various levels. The model results indicated that whether singly or in combination, depleting these target species in Atlantis-SPF had only minor impacts on other parts of the ecosystem. Consequently, there is no substantive evidence from this analysis that depleting the biomass of the target species in the SPF to the current target reference points of 50 per cent of unfished levels (B50) would result in unacceptable ecosystem impacts. Moreover, there was no evidence to suggest that the limit reference point of 20 per cent of unfished biomass (B20) for the target species needs to be revised to prevent unacceptable ecosystem impacts.

It can be inferred from this analysis that on the basis that a large capacity trawler catches no more than the TAC then the ecosystem impacts would be minimal.

These conclusions however need to be considered with the understanding that: (a) the simulation of harvest did not include the mortality of non-target species that may occur with the harvest of the target species; (b) only one credible parameterisation of Atlantis was possible for the SPF, so testing the robustness of the conclusions to alternative parameterisations was not possible; (c) the diet of the higher trophic level predators in this parameterisation (determined from diet studies), such as seals, penguins and tunas, did not have a high dietary dependence on the target species; and (d) the form of predation modelled in Atlantis allows considerable levels of diet switching by predators which tends to minimise the effects of depleting particular prey species.

An independent review conducted for the Department of Environment to document impacts of localised depletions of small pelagic fishes on predators and ecosystems (Rodgers et al 2013) did not report any evidence for localised depletions generated by mid- water trawl fisheries.

The SPF Harvest Strategy contains provisions to limit catch in defined areas across the fishery to mitigate any possibility or perception of localised depletion. The harvest strategy specifies the requirement for an Annual Fishery Assessment for the Recommended Biological Catch (RBC) setting processes. This assessment is required to determine the likelihood of localised depletion or change in the size/age structure of the catch that cannot be adequately explained by reasons other than a decline in abundance. If, as a result of fishing, there is evidence of localised depletion or a concerning trend/change in age/size structure, then the harvest strategy requires one or more of the following: an appropriate reduction in the RBC, or an appropriate spatial or other management measures.

A. The effect of large fishing vessels on the marine ecosystem: (ii) bycatch and interactions with protected marine species.

Interactions with marine mammals are a key environmental concern for the mid-water trawl fishery. A study commissioned by AFMA (January 2005 to February 2006) to quantify the nature and extent of interactions, and to evaluate potential mitigation strategies, found that fur seals entered the net in more than 50 per cent of mid-water trawl operations during the study. The observed mortality rate was 0.12 seals per shot, using bottom-opening seal excluder devices (Lyle & Willcox 2008). The study concluded that effective, upward-opening seal excluder devices are needed when this type of gear is used. No dolphin interactions were recorded during the study.

In response to these results, AFMA requires all mid-water trawlers to have an AFMA-approved, upward-opening seal excluder device before starting to fish.

Because effort in the Australian small pelagic fishery has been historically low, there is limited data on different rates of marine mammal interactions between smaller mid-water trawl vessels and those that use large capacity vessels employing mid-water trawl fishing methods.

Separate ecological risk assessments using AFMA's risk assessment methods have been done for the mid-water trawl and purse-seine fishing methods used in the fishery.

For purse seine, 235 species were assessed; of these, 108 were assessed as being at high risk (Daley et al. 2007), with 29 remaining at high risk after applying AFMA's residual risk guidelines (AFMA 2010).

For mid-water trawl, 235 species were assessed, with 26 of these assessed as being at high risk (Daley et al. 2007). Most of the high risk protected species were marine mammals (23/26—the remainder were albatross species) and most of these species (20/23) were small whales or dolphins. The remaining TEP species (3) were seals.

No finfish species were assessed as being at high risk from either purse-seine or midwater trawl operations.

AFMA has implemented an Ecological Risk Management Plan for the priority (high risk) species (<http://www.afma.gov.au/wp-content/uploads/2014/11/Ecological-Risk-Management-SPF-midwater-trawl-March-2010.pdf>)

As a proportion of total catch, bycatch and interactions with protected species in the SPF are low when compared with other Australian and international fisheries.

B. Current research and scientific knowledge

Scientific knowledge for the fishery could be strengthened by analysing and improving the precision of biomass estimates.

It will be important to consider interannual variability if recommended biological catches are used to set multi-year total allowable catches. For example, a multi-year total allowable catch that represents 5 per cent of total biomass of the stock in year one could represent a larger percentage of the biomass in year two if the biomass in year two is proportionally lower than it was in year one. This highlights the importance of a harvest strategy that can be reactive to stocks that can exhibit substantial interannual variability. The tiered framework in the harvest strategy appears to be sufficiently precautionary to account for this variability, as well as adequately considering the level of uncertainty around the quality of data or the age of stock assessments.

The estimate of biomass for the Redbait – west stock is currently uncertain due to insufficient availability of information for stock assessment.

C. Social and economic impacts, including effects on other commercial fishing activities and recreational fishing

Until recently, net economic returns in the fishery are likely to have been low, reflecting low levels of effort and high latency (uncaught quota) in the fishery (ABARES 2015).

The closure of the processing factory in Eden in December 2010 is considered to be a contributing factor to the low net economic returns of this fishery (ABARES 2013).

Catches and gross value of production (GVP) are expected to substantially increase as a result of the entry of the Geelong Star in the 2014–15 season.

A meaningful biomass target to provide maximum economic yield is difficult to determine for the SPF because of the variability in biomass levels (Small Pelagic Fishery Management Plan 2009). The absence of an explicit economic target makes it difficult to determine how effectively the fishery's harvest strategy is delivering maximum net economic returns (NER) to the Australian community. However, it is clear from the low catches, high levels of latent effort and high levels of unfished TAC in recent years that this fishery has not been optimising NER (ABARES 2015).

GVP in the SPF was estimated to be \$1.2 million in 2007–08 (2013–14 dollars). This was 65 per cent lower than in 2005–06 (\$3.6 million), primarily as a result of a rapid decline in beach prices and production. GVP has been confidential since 2007–08 because of the low number of vessels operating in the fishery, but is likely to have been low up to and including the 2013–14 season.

D. the effectiveness of the current regulatory framework and compliance arrangements

The SPF is managed in accordance with the Small Pelagic Fishery Management Plan 2009. The management plan for the SPF was accredited under part 13 of the EPBC Act on 26 October 2015. Further, the Wildlife Trade Approval and the list of exempt native specimens for the fishery have been extended until 26 October 2018. Two conditions were placed on the accreditation: to mitigate interactions with protected species and for new mid-water trawl vessels in the fishery to have observer coverage for the first 10 trips.

The Commonwealth SPF industry purse-seine code of practice (SPF Industry 2008) requires fishers to avoid interactions with species, where possible; implement mitigation measures, where necessary; release all captured protected species alive and in good condition; and report all interactions with protected species.

The SPF targets the following species: Blue mackerel (*Scomber australasicus*); Jack mackerel (*Trachurus declivis*, *T. murphyi*); Redbait (*Emmelichthys nitidus*); Australian sardine (*Sardinops sagax*).

This fishery is managed under a quota system that limits the amount of fish that boats can take in the fishery. Under this system, each fisher is limited to catching up to the amount of quota that they hold and the whole fishery is limited to the total allowable catch that is set each season. Setting quotas is one of the principal methods AFMA uses to ensure these fish species remain sustainable. As noted above, the stocks of the target species have been classified as not subject to overfishing and the majority are classified as not overfished (with the Redbait west stock classified as uncertain).

The implementation of the Harvest Strategy Policy for the SPF results in scientific advice for the Recommended Biological Catch, TAC and multi-year TACs. The AFMA Commission then determines the total allowable catch based on this advice. Once the catch limit is set, it does not change regardless of the size or number of the fishing vessels used to catch the fish. Regional catch limits have been applied in the SPF to distribute effort across the fishery and collect representative data on target species. Regional catch limits may also minimise the risk of localised depletion occurring by restricting catches in localised areas of the fishery over time.

The SPF Harvest Strategy adopts a tiered approach of assessment for setting a total allowable catch. These catch limits are set at precautionary and sustainable levels, taking broader ecosystem impacts into consideration. The total catch limits for the 2015–16 fishing season leave 92.4 per cent of the combined estimated biomass of small pelagic fish stocks in the water for the marine environment and other uses such as recreational fishing.

A tiered Harvest Strategy framework (AFMA 2015) is appropriate for the SPF because it accommodates growth of the fishery and the consequent collection of additional information to support stock assessment. Underpinning the tiered approach is the need to balance risk with knowledge by establishing exploitation rates that are initially very conservative and which increase (but remain conservative) as additional information (i.e. quantitative measures of spawning biomass) becomes available. The framework includes four tier levels with different information needs and harvest control rules:

- Tier 1, based on a quantitative stock assessment and an Annual Fishery Assessment, provides the greatest certainty in RBC setting and allows the highest potential harvest rate
- Tier 2 provides a medium level of assessment based on an Annual Fishery Assessment and allows a lower potential harvest rate
- Tier 2(b) – Atlantis provides a lower levels of assessment based on an Annual Fishery Assessment and Atlantis - SPF modelling
- Tier 3 is the lowest level of assessment and applies when the requirements of other Tier levels are not met.