Chapter 8
Southern and Eastern Scalefish and Shark Fishery

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FIGURE 8.1 Area and sectors of the Southern and Eastern Scalefish and Shark Fishery
8.1 Description of the fishery

The Southern and Eastern Scalefish and Shark Fishery (SESSF) is a multisector, multigear and multispecies fishery, targeting a variety of fish, squid and shark stocks. The management area covers almost half the area of the Australian Fishing Zone (Figure 8.1), and spans both Commonwealth waters and the waters of several Australian states under Offshore Constitutional Settlement arrangements. A number of the reserves within the Commonwealth marine reserve network established by the Australian Government fall within the SESSF management area (AFMA 2014a).

The SESSF remained the largest Commonwealth fishery in terms of volume produced in the 2015–16 fishing season. In 2014–15, the SESSF was the second-largest Commonwealth fishery in terms of production value, accounting for 20 per cent of the gross value of production (GVP) of Commonwealth fisheries.

The primary mechanism for controlling the harvest of stocks in the SESSF is through the allocation of annual total allowable catches (TACs). TACs are determined for all key commercial stocks and several byproduct species. The TAC for each stock is distributed among fishers as individual transferable quotas for the fishing season. In addition to TACs, management arrangements in the SESSF include limited entry, gear restrictions (for example, restrictions on mesh size, setting depth, number of hooks and trap dimensions), spatial closures, prohibited species (for example, black cod—Epinephelus daemelii), trip limits for certain species (for example, snapper—Chrysophrys auratus), codes of conduct, and requirements for observer or video camera coverage and vessel monitoring systems.

The SESSF was established in 2003 by amalgamating four fisheries—the South East Trawl, Great Australian Bight Trawl, Southern Shark Non-trawl and South East Non-trawl fisheries—under common management objectives. The 2003 management plan for the SESSF came into operation on 1 January 2005 (amended in 2009). Originally, each of the four fisheries had its own management advisory committee. In 2009, the Australian Fisheries Management Authority (AFMA) created the South East Management Advisory Committee (SEMAC) to provide advice to the AFMA Commission on management measures for the entire SESSF. The Small Pelagic Fishery Management Advisory Committee and the Squid Management Advisory Committee became part of SEMAC in 2010, whereas the Great Australian Bight Trawl Sector Management Advisory Committee remains separate.

Landings in the SESSF have generally decreased over time as a result of reductions in fishing effort. In 2015–16, landings in the Commonwealth Trawl Sector (CTS) and the Scalefish Hook Sector (SHS) were 9,025 t, representing around 43 per cent of available quota. Landed catches for other sectors of the SESSF are reported in the relevant chapters. The SESSF GVP was $68 million in the 2014–15 financial year, a decrease from $72.2 million in 2013–14.

The SESSF was one of the fisheries targeted by the Securing our Fishing Future structural adjustment package (2006–07), which was intended to halt overfishing, improve the economic conditions and efficiency of fishers, and recover overfished stocks. The package reduced the number of fishing vessels by purchasing fishing endorsements. Although this contributed to lower landings and GVP, net economic returns (NER) improved for the remaining participants in the fishery (Vieira et al. 2010).
8.2 Sectors of the fishery

Current management arrangements are structured around the four primary sectors of the fishery: the CTS; the East Coast Deepwater Trawl Sector (ECDTS); the Great Australian Bight Trawl Sector (GABTS); and the Gillnet, Hook and Trap Sector (GHTS).

The status of the stocks taken in these sectors is presented in Chapters 9, 10, 11 and 12, respectively. The GHTS includes the SHS, the Shark Gillnet and Shark Hook sectors (SGSHS), and the Trap Sector. In this report, the SHS is reported with the CTS (Chapter 9) because most of their target species are shared. The SGSHS is reported separately (Chapter 12). The Trap Sector is not reported in detail because of its low fishing effort and landings.

8.3 Harvest strategy performance

A tiered harvest strategy framework (HSF) has been applied in the SESSF since 2005. The framework has evolved since its introduction, particularly after the release of the Commonwealth Fisheries Harvest Strategy Policy (HSP; DAFF 2007). The current SESSF HSF applies to all sectors and all species under quota, and is described in AFMA (2014b). The HSF uses three tiers (1, 3 and 4; tier 2 has been phased out), which have been developed to accommodate different levels of data quality or knowledge about stocks (AFMA 2014b). Tier 1 assessments are quantitative, model-based stock assessments that are conducted for stocks with the highest quality of data or information. The tier 3 assessment methodology primarily involves catch-curve analyses of age (or size) composition data, and information on size at maturity and selectivity to estimate fishing mortality rates. Tier 4 involves an assessment of trends in standardised catch rates, and is undertaken for stocks for which only catch-and-effort data are available.

The target and limit reference points for each tier reflect those prescribed by the HSP. All tier levels generate a recommended biological catch (RBC) through associated harvest control rules that are intended to move stock biomass towards the target reference point (AFMA 2014b). RBCs provided by resource assessment groups are translated into TACs through a set of predetermined rules, which include deductions for discarding, recreational catches and state catches. The level of precaution applied in RBCs is intended to increase from tier 1 to tier 4, reflecting the increasing level of uncertainty in assessments. Therefore, TACs are reduced using discount factors of 5 per cent for species assessed using the tier 3 harvest control rules and 15 per cent for tier 4 harvest control rules, unless other management arrangements are considered to have introduced an equivalent level of precaution. The SESSF Resource Assessment Group (SESSFRAG) has also produced guidelines on the implementation of various post-assessment ‘meta-rules’ (for example, the large change–limiting rule and discount factors). Since 2009, there has also been a move towards greater recommendation and implementation of multiyear TACs in the SESSF, whereby an RBC (incorporating appropriate precaution) is estimated for a period longer than one year—typically three or five years. This provides a basis for setting TACs for longer periods, which provides greater stability for industry, and reduces the number of annual assessments and therefore the assessment cost. In 2014, the HSF was amended to remove the catch-per-unit-effort multiplier rule and to provide further guidance on multiyear TACs, the deduction of discards from TACs and the application of discount factors.
The SESSF includes several stocks that are classified as overfished (that is, the current biomass is estimated to be below the limit reference point). These overfished stocks are blue warehou (*Seriolella brama*), eastern gemfish (*Rexea solandri*), gulper sharks (*Centrophorus harrissoni, C. moluccensis, C. zeehaant*), school shark (*Galeorhinus galeus*), redfish (*Centroberyx affinis*), and orange roughy (*Hoplostethus atlanticus*) in two zones (southern and western).

For overfished stocks, the harvest control rules in the SESSF HSF, in line with the HSP, recommend a zero RBC. AFMA typically allocates incidental catch allowances to cover catches when fishers are targeting other species. Although the SESSF HSF does not provide guidelines for setting these catch allowances, the SESSFRAG-agreed process uses companion species analysis or quantitative stock assessment models to estimate the quantities of species taken as bycatch when fishing for other species. These data feed into advice on the appropriate setting of incidental catch allowances. In some cases, the level of fishing mortality that would allow a stock to recover within stipulated rebuilding time frames is uncertain. In other cases, even with zero catch, stocks may not rebuild within stipulated rebuilding time frames because of their low natural productivity at low stock size (Ward et al. 2013), shifts in the ecological relationships between stocks and their environment (‘regime shifts’), or changes in other environmental variables.

The performance of the SESSF HSF against the economic objective of maximum economic yield (MEY) has improved. Indications are that NER increased in the CTS and the GHTS in the years immediately after implementation of the SESSF HSF and the Securing our Fishing Future structural adjustment package (George & New 2013; Ward et al. 2013).

Most quota species caught in the CTS and the GHTS are currently managed towards a $B_{MEY}$ (biomass at MEY) target, although these targets are not estimated using a bio-economic model because of the data requirements and complexity of these models. For species that have had a maximum sustainable yield (MSY) estimated, a $1.2B_{MSY}$ proxy for $B_{MEY}$ is used as the target. For other species, a target that is equivalent to the proxy $0.48B_{48}$ (48 per cent of the unfished biomass) is applied. Economic performance of the fishery could possibly be improved by optimising targets for a combination of the more valuable quota species, rather than the default proxy applied to individual species. Consideration is also being given to alternative approaches to setting targets for secondary species (that is, those that are not targeted and contribute a small proportion of the NER). Following guidance from SESSFRAG, the Slope Resource Assessment Group (which is responsible for monitoring, assessment and reporting of upper continental slope and deepwater species) and the Shelf Resource Assessment Group (which is responsible for monitoring, assessment and reporting of species associated with the shallow areas of the continental shelf) have recommended targets at $B_{MSY}$ levels, below the $B_{MEY}$ proxy, for several secondary species. AFMA has agreed to adopt these alternative targets (SEMAC 2014). Secondary species managed to the $B_{MSY}$ proxy target include john dory (*Zeus faber*), ocean perch (*Helicolenus barathri, H. percoides*), ribaldo (*Mora moro*), sawshark (*Pristiophorus cirratus, P. nudipinnis*) and elephantfish (*Callorhinchus milii*).
Differences in the profitability of the various fishing methods, and species that are caught together in the CTS and the GHTS complicate the optimisation of harvests to obtain MEY at the fishery level. Augmenting current stock assessments with available economic survey data may provide a cost-effective means of estimating MEY targets for a broader range of species. Recent research (Pascoe et al. 2015) noted that, because detailed bio-economic models for many fisheries are unavailable, some form of cost-effective proxy measure is required to estimate approximate target reference points. The research recommended that the designation of a simple default proxy target reference point needs to be reconsidered, particularly in the case of multispecies fisheries. The research also noted that the benefits of identifying an appropriate set of criteria for determining how many and which species should be managed at different targets could result in lower costs and lower discards, and potentially higher profits. This work presented a framework that may inform future research to develop target reference points that are consistent with the HSP in multispecies and mixed fisheries, such as the SESSF.

For the GABTS, the development of a bio-economic model (Kompas et al. 2012) for the sector’s two key target species (deepwater flathead—*Platycephalus conatus*, and bight redfish—*Centroberyx gerrardi*) has allowed TACs to be set in line with achieving estimated $B_{\text{MEY}}$ targets. Given that the models were published in 2012, the Great Australian Bight Resource Assessment Group has noted that $B_{\text{MEY}}$ targets set for the GABTS fishery may need updating to better reflect changes to cost and profit input parameters.

### 8.4 Biological status

The number of stocks assessed for status in the SESSF increased from 24 in 2004 to 37 from 2009 to the present. The number and percentage of stocks classified in each status are presented below.

With regard to fishing mortality status, of the 37 stocks (34 under quota) assessed across the SESSF in 2015:

- 32 stocks (86 per cent) were classified as not subject to overfishing
- 0 stocks (0 per cent) were classified as subject to overfishing
- 5 stocks (14 per cent) were classified as uncertain with regard to the level of fishing mortality.

For biomass status:

- 27 stocks (73 per cent) were classified as not overfished
- 7 stocks (19 per cent) were classified as overfished
- 3 stocks (8 per cent) were classified as uncertain if overfished (Figures 8.2 and 8.3).

Controlling fishing mortality is the primary management lever for AFMA. The year 2013 was the first year since 2006 that no stocks had been classified as subject to overfishing. This has continued for subsequent years. However, several stocks that are classified as overfished remain classified as uncertain if subject to overfishing, meaning that it is currently unclear whether the current level of fishing mortality will allow the stocks to rebuild to the limit reference point within a biologically reasonable time frame, as required by the HSP.
Overfished stocks are stocks that are estimated to be below the limit reference point of 20 per cent of unfished levels (0.2B₀). The stocks classified as overfished in 2015 are blue warehou, eastern gemfish, gulper sharks, orange roughy (southern and western zones), redfish and school shark. AFMA continues to work with stakeholders to control the level of fishing mortality of these stocks. Overfished stocks with an uncertain fishing mortality status in 2015 are blue warehou, eastern gemfish, gulper sharks, redfish and school shark.

**FIGURE 8.2** Fishing mortality status for all stocks in the SESSF, 2004 to 2015

**FIGURE 8.3** Biomass status for all stocks in the SESSF, 2004 to 2015
8.5 Economic status

The SESSF HSF provides a framework to assess the economic status of the fishery. Indicators of stock biomass are used to assess the current biomass of species relative to their $B_{MEY}$ target (or its proxy, $0.48B_0$). When this information is combined with indicators of profitability and efficiency, the economic status of SESSF sectors can be assessed in terms of whether they are moving towards or away from MEY.

Scalefish catches in the CTS and the SHS accounted for 55 per cent of SESSF GVP in 2014–15 (Figure 8.4). These sectors are therefore key drivers of economic performance in the SESSF. Of these two sectors, only the CTS is surveyed as an individual sector by ABARES as part of its fishery economic surveys programme; the SHS is surveyed as part of the GHTS. The NER for the CTS followed a positive trend from 2004–05 to a peak in 2010–11 of $7.3$ million. NER declined in 2011–12 and 2012–13, but remained positive. The estimated biomass of three of the sector’s most valuable species (blue grenadier—$Macrouronus novaezelandiae$, silver warehou—$Seriola punctata$, and tiger flathead—$Neoplatycephalus richardsoni$) remained above or close to their $B_{MEY}$ targets (Chapter 9). This indicates that the economic status of the CTS is positive and has improved substantially since 2004–05. However, it could be further improved if catches approached TACs for other species. This may require some adjustment to proxy target reference points or cost-effective estimates of $B_{MEY}$ for some of the more valuable species in the sector. Based on preliminary estimates, NER for the sector declined in 2013–14. This result is probably driven by lower GVP generated in the CTS as a result of declines in beach prices of some key species caught in the sector, including blue grenadier and tiger flathead, and lower volumes landed of tiger flathead.

Historically, orange roughy has contributed substantially to the CTS GVP. The rebuilding of orange roughy stocks over the longer term should improve the sector’s economic status, although sustainable harvests of this species are likely to be lower than peak historical levels. The recommencement of fishing for orange roughy in the eastern zone will boost GVP in 2015–16. Likewise, the blue grenadier catch was substantially lower than the allowed TAC in 2013–14 and 2014–15, suggesting that increased catch of this species could increase the GVP of the sector in future seasons.

Economic indicators for the GHTS were used to assess the economic status of the SGSHS, which accounted for 75 per cent of GVP in the GHTS in 2014–15. For the decade preceding 2009–10, estimates of NER in the GHTS had been positive. Estimates became negative (−$0.5$ million) in 2009–10 and have remained negative since then. This is despite biomass levels of gummy shark ($Mustelus antarcticus$), the sector’s main target species, being close to or above the stock’s target reference point (Chapter 12). Recent spatial closures aimed at reducing marine mammal interactions in the sector are likely to have contributed to this change, as have school shark controls and their impacts on gummy shark catches. A key challenge for the sector is rebuilding of the school shark stock; this could lead to increases in NER in the future but is associated with adjustment costs to avoid the species in the rebuilding phase.
The development of a bio-economic model for the two key species targeted in the GABTS (deepwater flathead and bight redfish) has improved the ability of fishery managers to target $B_{\text{MEY}}$ (Kompas et al. 2012). The most recent stock assessments for bight redfish projected biomass levels at the start of 2013–14 to be above the $B_{\text{MEY}}$ target (Klaer 2012, 2011, 2010), potentially allowing increased profits from the species as it is fished down to its MEY target reference point. The most recent stock assessment for deepwater flathead suggests that biomass has rebuilt towards the $B_{\text{MEY}}$ target (Chapter 11). Hence, fishery profitability is unlikely to be constrained by stock status.

In the ECDTS, levels of fishing effort have been low in recent years. Low expected profit in the sector appears to have discouraged activity in the fishery. As a result, the sector has generated minimal NER.

**FIGURE 8.4 Real GVP in the SESSF by sector, 2004–05 to 2014–15**

![Graph showing the real GVP in the SESSF by sector, 2004–05 to 2014–15](image)

Notes: CTS Commonwealth Trawl Sector. GABTS Great Australian Bight Trawl Sector. GVP Gross value of production. SGSHS Shark Gillnet and Shark Hook sectors. SHS Scalefish Hook Sector. GVP for the SGSHS includes only gummy shark, school shark and sawshark, and elephantfish caught in the gillnet and hook sectors. GVP for other sectors includes non-scalefish product caught in the CTS and the SHS, non-shark product caught in the SGSHS, and product caught in the Victorian Inshore Trawl and East Coast Deepwater Trawl sectors of the SESSF.

Overall, the current economic status of the SESSF is mixed. The negative change in economic performance in the GHTS has occurred at the same time as positive NER in the CTS, while the GABTS now pursues estimated $B_{\text{MEY}}$ targets for its key species. The deterioration in economic performance in the GHTS demonstrates that management of bycatch and other environmental issues (for example, interactions with protected species) can have significant implications for a fishery’s economic performance, and such factors should be taken into account when attempting to meet bycatch management objectives. The SESSF HSF will continue to make an important contribution to the fishery’s economic performance by guiding management decisions that explicitly aim to maximise NER. The HSF also offers the opportunity to adjust management settings—for example, to re-examine proxy settings where TACs are continually not met, to move the fishery closer to its economic potential.
8.6 Environmental status

General bycatch and discards

Bycatch is defined in the HSP as ‘species taken incidentally in a fishery where other species are the target, and which are always discarded’ (DAFF 2007). Tuck et al. (2013) evaluated bycatch and discards (including target and byproduct species) in six Commonwealth fisheries, including the SESSF, and concluded that trawling in the South East Trawl (SET) fishery and the GABTS, and Danish-seining account for the greatest volume of bycatch in the Commonwealth fisheries examined. This largely reflects the high level of fishing activity in these sectors and fisheries. Bycatch and discards largely comprise small fish species with little or no commercial value, but also include crustaceans, sharks, molluscs and, more rarely, marine mammals, reptiles and seabirds.

Data collected by the Integrated Scientific Monitoring Program (ISMP) over 20 years have shown a reduction in the volume of trawl discards since the mid 2000s. A one-third decrease in trawling effort in the SESSF during this time, combined with changes in mesh types and increased mesh sizes used in trawl net codends, probably explains much of the reduction in the volume of discards. Tuck et al. (2013) found that discard rates for quota species have been variable, and dependent on market prices, availability of quota and sporadic influxes of small fish, particularly blue grenadier. However, data for bycatch and discards of rarer commercial species are often lacking, because observer coverage is often focused on key commercial species.

A distinction can be made between highly targeted shots on single-species aggregations (such as orange roughy or blue grenadier) and general shots for multiple species in the SET and GABT sectors of the SESSF. General shots are often referred to as ‘market fishing’, and are associated with higher levels of byproduct and discarding of target and non-target species (Tuck et al. 2013). ISMP data show that up to 50 per cent of catch weight is caught and discarded in the ‘market fishery’ of the SET fishery, and 40–60 per cent in the GABTS (Tuck et al. 2013). Commercial species are discarded for various reasons, but the majority of discards are small fish species with little or no commercial value. In comparison, bycatch in more targeted fishing can be extremely low. For example, bycatch levels were less than 1 per cent when orange roughy was targeted in the GABTS.

A key change in the SET fishery was setting the minimum codend mesh size at 90 mm; this was introduced in 1965 to reduce the catch of small tiger flathead (Tuck et al. 2013). Studies have shown an escapement rate of around 70 per cent of all species swept into the codend that are able to fit through the mesh, equating to around 30 per cent of the catch weight (Tuck et al. 2013). Animals passing through this mesh size were mainly small finfish. Other changes that have helped reduce bycatch in both the SET fishery and the GABTS include the use of ‘T-90 panels’ or ‘T-90 lengtheners’. Trials of mesh size and type led to mandatory requirements for bycatch reduction in the SET fishery in 2006 and the GABTS in 2007. Tuck et al. (2013) reported that the level of bycatch reduction achieved through these measures has not been formally tested.
Introduction of new bycatch mitigation measures in the Danish-seine component of the fishery has been limited, despite trials showing that a change from 75 mm mesh to T-90 in codends did not affect the catch weight of targeted species but reduced the catch weight of non-commercial species by around 27 per cent (across the study). Reasons for the lack of uptake include limited spatial and temporal coverage of the trials, and concern from industry about the use of the T-90 codend at certain times of the year (Tuck et al. 2013).

In the GHTS, which includes the SGSHS, discarding of target species is minimal, with 2 per cent of teleosts and 3 per cent of chondrichthysans discarded (Walker et al. 2005). Trials to estimate discards for non-target species have reported that discards can account for more than 30 per cent of catch weight in commercial nets (6 inch mesh). The most commonly discarded species were draughtboard shark (Cephaloscyllium laticeps), Port Jackson shark (Heterodontus portusjacksoni) and spikey dogfish (Squalus megalops). Discards in the trials increased to 40 per cent, on average, for 5 inch mesh and almost 80 per cent for 4 inch mesh (Braccini et al. 2009).

**Trawling impacts**

Pitcher et al. (2015) used modelling to quantify and assess cumulative threats, risks to benthic biodiversity and the effects of management actions in the south-east marine region, which covers a large part of the SESSF management zone. The research indicated that, from around 1985, when consistent logbook records were available, all 10 benthos taxa types declined in abundance in trawled areas until the mid 2000s. Around this time, fishing effort decreased as a result of economic conditions and the Securing our Fishing Future structural adjustment package, and large areas were closed to trawling.

The lowest total regional abundance of benthic taxa types across the south-east marine region was around 80–93 per cent of pre-trawl abundance after the peak in fishing effort between 2000 and 2005. After this time, all taxa were predicted to recover by between 1 and 3 per cent in the following decade.

The research indicated that the reduction in fishing effort was the main factor influencing the magnitude of recovery. In some cases, spatial management that excluded trawling led to improved abundance of some benthos taxa types. Most fishery closures and Commonwealth marine reserves had little detectable influence on abundance. In other cases, closures reduced the abundance of some taxa in some areas because trawling was displaced to areas where such taxa were more abundant (Pitcher et al. 2015).

**Protected species**

The SESSF interacts with various species listed as protected or conservation dependent under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Six former target species in the SESSF are listed as conservation dependent: orange roughy, eastern gemfish, Harrisson’s dogfish (*Centrophorus harrissoni*), southern dogfish (*C. zeehaani*), school shark and, most recently, blue warehou. These species, discussed in Chapters 9 and 12, are under rebuilding or recovery strategies. They are currently managed under incidental catch allowances, closed areas and trip limits, to allow for incidental catch when fishers are targeting other species.
Recent reductions in interactions with protected species have been observed, to varying degrees. However, the reductions are difficult to attribute to recent mitigation measures because of a lack of data. These measures have included fishery closures to protect Australian sea lions (*Neophoca cinerea*) and gulper sharks; seabird mitigation measures for longline and trawl fisheries; seal, turtle and other bycatch excluder devices; and gear modifications (Tuck et al. 2013). Trends in protected species interactions are also difficult to interpret with confidence because the ISMP was originally designed only to provide estimates of the retained and discarded proportions of fish catch in the SESSF. A review of the ISMP in 2009 sought to facilitate better estimates of protected species interactions and bycatch of major non-quota species.

Fishers are required to take all reasonable steps to avoid interactions with protected species (other than those listed as ‘conservation dependent’) and are required to report all interactions in their logbooks. An interaction is defined as any physical contact that a person, boat or gear has with a protected species, including catching and colliding with any of these species. Every three months, AFMA reports all interactions with protected species recorded in logbooks to the Australian Government Department of the Environment. These reports (which are published on the AFMA website) provide the basis for reports of the number of interactions with protected species within the SESSF in 2015. Interactions are known to occur with species groups protected under the EPBC Act, including marine mammals (cetaceans and pinnipeds), seabirds, sharks (white shark—*Carcharodon carcharias*, grey nurse shark—*Carcharias taurus*, shortfin mako shark—*Isurus oxyrinchus*, porbeagle shark—*Lamna nasus*) and syngnathids (seahorses and pipefish). Although these interactions are rare, they can have a significant impact on some species that have small populations. However, it is difficult to obtain robust estimates of total interactions or interaction rates at low levels of observer coverage or monitoring, especially when such interactions are rare. The introduction of electronic monitoring of all fishing activity in the GHTS is expected to improve estimates of interactions with protected species.

**Pinnipeds (seals and sea lions)**

The areas fished by the SESSF overlap with the distributions of the Australian fur seal (*Arctocephalus pusillus doriferus*), New Zealand fur seal (*A. forsteri*), Antarctic fur seal (*A. gazella*) and Australian sea lion. Fur seal populations have recovered substantially following heavy harvesting in the 18th and 19th centuries, but sea lions are currently listed under the EPBC Act as vulnerable. The CTS and the Shark Gillnet Sector, in particular, are known to interact with these species, whereas interactions with the hook sectors are much rarer. Between 1993 and 2000, data collected by the ISMP and its precursor (the Scientific Monitoring Program) indicated that an average of 720 fur seals might be caught incidentally by small trawlers operating in the CTS each year (Knuckey et al. 2002). Because of their smaller vessel size and net sizes, wet-boat trawlers have reduced ability to apply mitigation methods such as seal excluder devices (SEDs), which are designed for larger nets. Trials of a flexible SED design suitable for use in smaller nets have been reasonably successful (Knuckey 2009), but reliably estimating and reducing the level of interactions between seals and wet-boats remain difficult. A trial using a shortened codend to reduce seal bycatch was completed in late 2014. The trial found no definitive proof that short trawl nets had lower interaction rates with seals, caught fewer seals or resulted in lower mortality rates of caught seals (Koopman et al. 2014).
Minimising seal interactions has been a focus for the winter trawl fishery for blue grenadier off western Tasmania. SEDs have been compulsory for freezer boats in this component of the SESSF since 2005, and modifications to fishing practices seem to have substantially reduced the incidence of seal bycatch in the midwater nets of factory vessels. Observers have been deployed on factory trawlers to verify interaction rates. In 2007, the South East Trawl Fishing Industry Association (SETFIA) released an updated trawl industry code of conduct for responsible fishing. It also released an industry code of practice that aims to minimise interactions with fur seals, as well as addressing the environmental impacts of the fishery more generally.

The Australian sea lion is endemic and listed as vulnerable under the EPBC Act. Sea lion populations were reduced substantially by sealing between the 18th and early 20th centuries, and recovery has been slow (DEWHA 2010). Australian sea lions show high genetic differentiation because of the high fidelity of female sea lions to their natal sites, indicating that animals lost from a colony are unlikely to be replaced by immigrants from other colonies (DEWHA 2010). The small size of some colonies suggests that the loss of a few breeding females from a population can significantly reduce the long-term recovery prospects of that population (Goldsworthy et al. 2010).

In 2003, closures were introduced around the Pages Islands (the largest sea lion colony) and around Kangaroo Island in South Australia. In December 2009, interim voluntary closures of 4 nautical miles were introduced around all colonies. The current declaration of the SESSF as an approved Wildlife Trade Operation under the EPBC Act includes a requirement to implement long-term management measures, including formal fisheries closures, which should significantly reduce the impact of fishing on Australian sea lions and facilitate the recovery of subpopulations.

There have been concerns about the mortality of Australian sea lions caught as bycatch in shark gillnets. However, implementation of the Australian sea lion management strategy (AFMA 2010) reduced sea lion interactions in gillnets to close to zero. Measures taken by AFMA included spatial closures around colonies, increased observer coverage and trigger limits, with observed levels of bycatch above the trigger limits resulting in the closure of larger areas (AFMA 2010).
AFMA lowered the trigger limit for sea lion mortalities in December 2011, following advice from marine mammal experts regarding risks to some sea lion subcolonies. The trigger limit was reduced from 52 animals to 15 animals across seven management zones in the Australian sea lion management area (AFMA 2011a). There were two sea lion mortalities in the gillnet sector in the 2015–16 fishing season. As a result, Zone C, which is in waters off South Australia, was closed on 14 January 2016 because the trigger limit for mortalities for Australian sea lions for that zone was reached. This closure will remain in place until 18 June 2017.

Increased onboard observer coverage or camera monitoring is important for obtaining reliable data on interaction rates. In the first six months of the sea lion management strategy, the prescribed level of observer coverage was not achieved. Consequently, the Australian Government funded a trial of onboard cameras to monitor Australian sea lion bycatch in 2010–11. In 2011, an expert review of the management strategy resulted in AFMA introducing a Temporary Order (six months, effective 1 May) that increased the size of closed areas around 31 colonies and required 100 per cent observer coverage on gillnet vessels off South Australia in the Australian sea lion management area. This area consists of several zones, each with an interaction limit that triggers closure of the zone if the limit is reached. Onboard cameras have been deployed in the fishery and are used instead of a scientific observer. The Temporary Order was replaced by a Closure Direction, which extended protection to 50 known Australian sea lion colonies. The existing closures around Australian sea lion colonies will be retained, and were incorporated into the permanent Closure Direction for the SESSF from the beginning of the 2015–16 fishing season. Observer requirements in the Australian sea lion management area off South Australia, including 100 per cent onboard observers or electronic monitoring, have been continued under conditions attached to permits and statutory fishing rights.

Comparisons between logbook and observer data suggest that there is still some level of under-reporting of pinniped interactions. In 2015, 134 pinniped interactions were reported in CTS and GHTS logbooks: 1 with an Antarctic fur seal, 2 with Australian sea lions, 3 with New Zealand fur seals, 88 with Australian fur seals and 40 with seals of unknown species. This is a decrease from the 167 interactions reported in 2014 and the 259 interactions reported in 2013. Of the 134 reported pinniped interactions, the Antarctic fur seal, the 2 Australian sea lions, 2 of the 3 New Zealand fur seals, 74 of the 88 Australian fur seals and 25 of the 40 unspecified seals were reported to be dead.

In the CTS, 87 per cent of all pinniped interactions in 2015 were reported from bottom-trawling operations, and the remainder of interactions (14) were reported from Danish-seine or midwater trawl operations. Of the 30 pinniped interactions reported in logbooks or by observers in the GHTS in 2014, 27 (90 per cent) were reported from gillnet operations and 3 from longline operations.
Dolphins

All cetaceans are protected species under the EPBC Act. Increased observer coverage in the SGSHS in 2011 highlighted interactions with dolphins and potential under-reporting in logbooks (AFMA 2011a). Two dolphin mortalities were reported in logbooks between January and September 2010 (AFMA 2011b), and 52 interactions with dolphins were reported from September 2010 to September 2011 (AFMA 2011b). In response, AFMA closed to gillnet fishing an area of about 27,239 km² south-west of Kangaroo Island, where most of the interactions had been reported (dolphin gillnet closure). Observer coverage was increased to 100 per cent (onboard observer or camera) in the area adjacent to the dolphin gillnet closure, and 10 per cent onboard observer coverage was required across the eastern part of the fishery in Bass Strait and around Tasmania.

In 2014, AFMA worked with experts in the marine mammal working group and the fishing industry to implement the first stage of a dolphin management strategy. The objectives of the dolphin strategy are to reduce dolphin interactions in gillnets to near zero, and strengthen responsible fishing practices through electronic monitoring and individual accountability. On 8 September 2015, AFMA reopened the dolphin gillnet closure to limited gillnet fishing, with 100 per cent electronic monitoring and individual boat-level performance standards. Under the dolphin strategy, fishers that do not have interactions with dolphins may continue fishing responsibly. However, there are now management responses for any dolphin bycatch in the gillnet fishery, and individual operators fishing in the former dolphin gillnet closure (Coorong Dolphin Zone) incur escalating management responses if they catch dolphins. This culminates in a six-month closure to gillnet fishing in the Coorong Dolphin Zone if fishers exceed performance standards specified in the dolphin strategy.

In 2015, interactions were reported with 29 dolphins in the GHTS fishery, all of which were reported to be dead. This is an increase from the 19 interactions reported in 2014 and the 10 interactions reported in 2013. The increase in 2015 is likely to reflect the introduction of electronic monitoring in the GHTS. No dolphin interactions were reported in the CTS in 2015.

Seabirds

In 1998, in accordance with EPBC Act requirements, the Australian Government developed a threat abatement plan for the incidental bycatch of seabirds during oceanic longline fishing operations. The plan, which was revised in 2006 and in 2014 (Department of the Environment 2014), applies to longline operations in all Commonwealth fisheries, including the SESSF, and is the main guide to mitigating seabird bycatch in this sector. The levels of seabird bycatch recorded by auto-longline, demersal longline, dropline and trotline operators in the SESSF are low compared with those in other pelagic longline fisheries that target tuna and billfish (Brothers 1991; Brothers et al. 2010; CCAMLR 2002).
Seabirds also interact with trawling activities—they are vulnerable to injury as a result of striking the trawl warps (the trawling cables) during fishing operations, predominantly when catches are being processed and offal is discarded into the water. Analysis of observer data suggests that the number of interactions may be high, but further work is needed to understand their scale and significance (Phillips et al. 2010). Given the difficulty in documenting these interactions (birds suffering warp strike are not landed and are not easily observed), obtaining reliable estimates of seabird mortalities is difficult, even with onboard observers. The issue was investigated by a research project between AFMA and the Tasmanian Department of Primary Industries, Parks, Water and Environment. Mitigation measures, such as offal management and bird-scaring devices, have been effective in reducing seabird bycatch elsewhere. During 2011, AFMA worked with SETFIA to develop tailored seabird management plans for individual vessels, to address this issue.

As part of their boat-specific seabird management plans, vessels are required to use effective seabird mitigation devices. In late 2014, AFMA completed a trial using observers to test the effect of seabird mitigation devices on seabird interactions with otter trawlers. The trial showed that the use of warp deflectors (large floats attached in front of trawl warps to scare birds away—often called ‘pinkies’) reduced heavy contact between actively feeding seabirds and warp wires by around 75 per cent (Pierre et al. 2014). Based on the outcomes of the trial, AFMA mandated a minimum requirement in seabird management plans of 600 mm pinkies. SETFIA has also introduced a code of conduct and training programme to improve seabird avoidance measures, and undertook a trial of alternative seabird mitigation devices, including water sprayers and bird bafflers. The trial was completed in June 2016, but the report is not yet publicly available. SETFIA has reported that water sprayers and bird bafflers used in the trial reduced interactions between seabirds and the warp by 90 per cent and 96 per cent, respectively.

Seabird interactions are probably under-reported for numerous reasons, including that it may be difficult to constantly observe seabirds interacting with fishing gear and vessels, and that seabirds may not have visible injury after interactions such as warp strikes. During 2015, 49 seabird interactions were reported in logbooks or by observers in the SESSF: 45 in the GHTS fishery and 4 in the CTS. This is an increase from 41 seabird interactions reported in 2014 but significantly lower than the 90 seabird interactions reported in 2013. Of the 49 interactions, 26 were reported as unclassified petrels, prions and shearwaters, 22 of which were reported to be dead; 9 were with white-chinned petrels (Procellaria aequinoctialis), 5 of which were reported to be dead; 6 were with shy albatross (Thalassarche cauta), 4 of which were reported to be dead; 4 were with unclassified albatrosses, 2 of which were reported to be dead; 2 were with Wilson’s storm petrels (Oceanites oceanicus), both of which were reported to be alive; and 2 were with cormorants, both of which were reported to be dead.
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Sharks

In 2015, 166 interactions with protected sharks were reported in logbooks: 153 in the GHTS (143 of which were dead) and 13 in the CTS (all of which were dead). The most prevalent shark was shortfin mako, with 90 interactions reported. Of these, all were reported to be dead. The second most prevalent was longfin mako (Isurus paucus), with 57 interactions reported. Of these, all were reported to be dead. Fifteen white sharks were reported—all in the GHTS; 10 were released alive, and 5 were reported to be dead. Three porbeagle sharks were reported, all of which were dead, and one basking shark (Cetorhinus maximus) was reported in the CTS, which was reported to be dead. The EPBC Act requires all white sharks and grey nurse sharks to be released alive, if possible.

During 2012, in view of their overfished status, a proposal was made to list Harrisson’s dogfish and southern dogfish as threatened species under the EPBC Act. On 30 May 2013, the then Minister for Sustainability, Environment, Water, Population and Communities decided to list Harrisson’s dogfish and southern dogfish in the conservation dependent category, noting that both species have experienced severe historical declines after being overfished. These species are subject to recovery plans that specify management actions to stop their decline and support their recovery.

Syngnathids (seahorses and pipefish)

Syngnathids are taken as bycatch in the CTS in otter-trawl and Danish-seine nets, but they are often small and difficult to observe among large catches of fish. No interactions with syngnathids were reported in 2015.

8.7 References

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