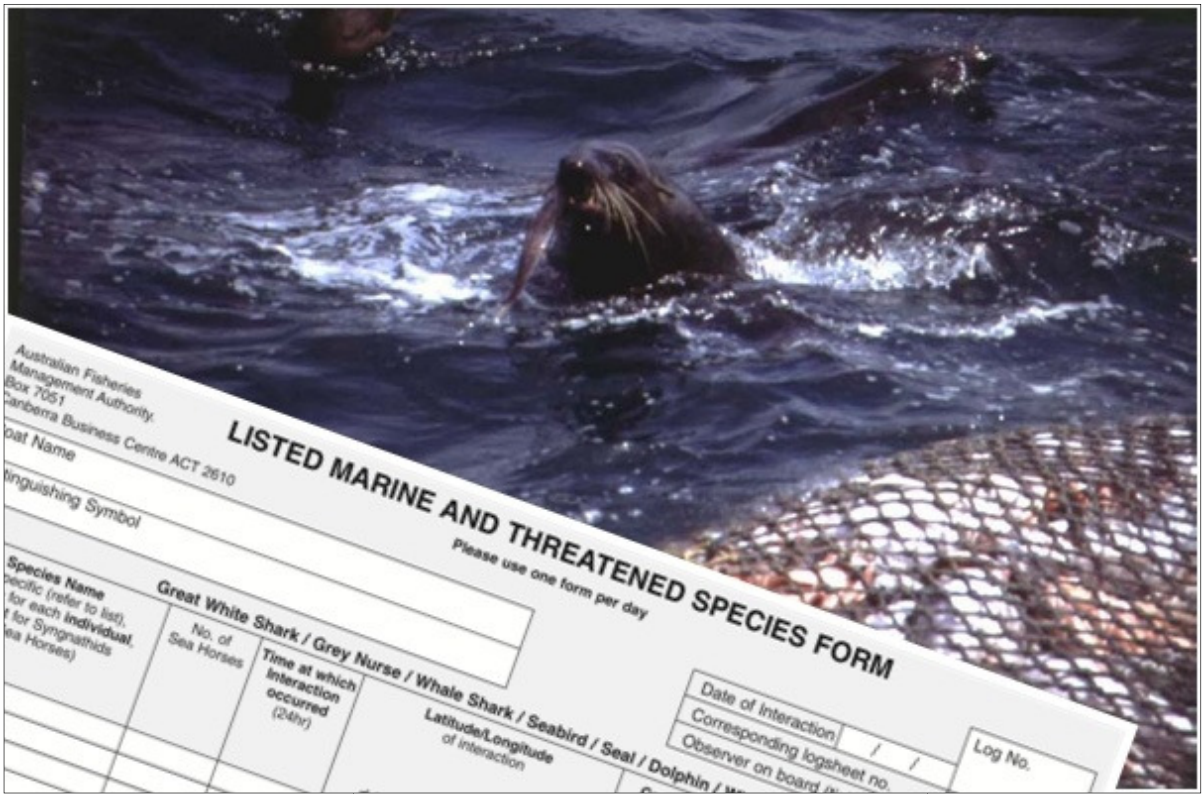
Evaluation of an industry-based program to monitor seal interactions in the Commonwealth Trawl Sector of the Southern and Eastern Scalefish and Shark Fishery



Ian Knuckey and Matt Koopman

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FRDC Project 2005/049.20

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2005/049.20 Evaluation of an industry-based program to monitor seal interactions in the Commonwealth Trawl Sector of the Southern and Eastern Scalefish and Shark Fishery

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Non-technical Summary

The Southern and Eastern Scalefish and Shark Fishery (SESSF) is a multi-species, multi-gear fishery situated off the south-east coast of Australia. The Commonwealth Trawl Sector (CTS) is a major component of this fishery comprised largely of 'wet boats' (vessels that store fresh fish on ice or brine) using demersal otter board trawls or Danish seine methods. This report only relates to the "wet-boat" sector of the CTS and does not report any interaction rates or reporting from factory vessels.

During commercial operations by CTS wet-boats, there are occasional interactions with Australian fur seals, *Arctocephalus pusillus doriferus*, and New Zealand fur seals, *A. forsteri*. Since the mid 1990s, such interactions have been monitored by the Integrated Scientific Monitoring Program (ISMP) and more recently by Australian Fisheries Management Authority (AFMA) observers. Provided an operator is fishing in accordance with the SESSF Management Plan, it is not an offence to have an interaction with a Protected Species. It is illegal, however, for industry not to report these interactions in their logbooks.

During 2005, FRDC Project 2005/049 "An industry-based program to monitor seal interactions in the Commonwealth Trawl sector of the Southern and Eastern Scalefish and Shark Fishery" (Knuckey and Stewardson 2008) was initiated to: provide fishers with relevant information on the biology and conservation of seals; ensure they were familiar with and applied the Code of Practice to Minimise Interactions with Seals; establish a robust industry-based monitoring program; and, validate the data collection and reporting system with respect to its effectiveness in meeting the relevant strategic assessment requirements of the EPBC Act.

That targeted education program dramatically improved reporting rates during the late 2000s, but there remain concerns that reporting rates in logbooks have been typically lower than those reported by observers.

In this study (a sub-project of 2005/049), we analysed seal interactions by otter trawl and Danish seine vessels as reported by industry members and AFMA observers during the period July 2007 to December 2010.

The intensity and coverage of the ISMP and AFMA observer programs were not designed to provide robust estimates of seal interaction rates. It is very difficult, therefore, to make definitive quantitative statements about the actual and expected seal interaction reporting rates, particularly at fine spatial / temporal scales or at the vessel level. Nevertheless, analysis of the data revealed widespread under-reporting of seal interactions by the majority of the CTS fleet particularly when observers are not on-board. This is more pronounced in the otter board trawl fleet than the Danish seine vessels, but interaction rates in the latter also appear to be lower. Less than half of the active otter trawlers reported seal interactions during 2007–10 and of those vessels that did record interactions, most were below the average rate recorded by observers. This is a significant issue that needs to be addressed urgently by industry, and its peak body SETFIA, if they are to build and maintain a credible reputation as stakeholders with a stewardship role in marine resource management.

There are other potential benefits from improved industry-reporting of seal interactions. Apart from the actual seal mortality levels that result from these interactions with CTS vessels, it is unclear what the implications of current interaction rates are for seal populations around southeast Australia. More accurate information on the number, demographics and spatial / temporal dynamics of seal mortality will provide a better understanding of the impacts of seal interactions. Stakeholders are demanding improved certainty of the level of interaction and unless there is more accurate reporting of actual interaction rates by industry, this will only be able to be achieved through significantly higher observer coverage of the fleet, which would come at considerable cost to industry.

On a positive note, industry is making continuous efforts to address this issue. The number of seal interactions reported by industry members has continued to rise each year since FRDC Project 2005/049 was completed. During 2010, there was a large increase in reported interactions that can be directly attributed to FRDC Project 2009/330 “SETFIA accreditation of Commonwealth Trawl Sector skippers toward improved environmental operation in the fishery”.

It is critically important that at least a sub-sample of vessels accurately reports every interaction. There are already a number of vessel/skippers within the fleet that provide

interaction reporting either of, or close to, this quality and these people should be encouraged by SETFIA and AFMA to formally fill this role. This is more valuable in terms of data quality, (not necessarily perception) than having a large proportion of the fleet reporting, but either under-reporting or reporting inaccurately – which is illegal. Further, it could provide better information on the spatial and temporal variability in interaction rates than is presently achieved – even using on-board observers – although there will always be a need for independent validation of industry reporting rates. Importantly, such information can be used to further modify and improve management and fishing practices to reduce seal interaction rates.

Two versions of a final report have been produced. The confidential version contains tables and text that relate to individual vessels. By analysing and presenting information at the vessel level, the confidential report provides SETFIA and AFMA not only with the ability to identify and utilise information from vessels that appear to be largely compliant with the reporting requirements, but to also identify and address vessels that are consistently under-reporting or not reporting at all. A priority list of criteria and vessels based on different degrees of seal interaction reporting is provided to assist this process.

All confidential vessel-specific information has been removed from this version of the Final Report to enable wider distribution.

Acknowledgments

We appreciate the cooperation of AFMA data section, particularly Thim Skousen for supplying industry and observer data. Carolyn Stewardson (FRDC), Beth Gibson (AFMA) and Simon Boag (SETFIA) provided valuable feedback on the report.

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Background

The Southern and Eastern Scalefish and Shark Fishery (SESSF) is a multi-species, multi-gear fishery situated off the south-east coast of Australia, and comprises the Commonwealth Trawl, East Coast Deepwater Trawl, Great Australian Bight Trawl and Gillnet, Hook and Trap sectors. The Commonwealth Trawl Sector (CTS) of the SESSF is Australia's largest scalefish fishery, landing around 15,000 tonnes of fish annually, which mostly provides fresh fish to domestic markets. In 2008/09, the CTS landed 15,239 tonne worth AUD$54.3 million (Wilson *et al.* 2010).

Most of the vessels in the CTS are 'wet boats' (fishing vessels that store fresh fish on ice or brine), the majority being demersal otter board trawl vessels with a small Danish seine fleet operating predominantly out of Lakes Entrance. There are a small number of factory boats using midwater trawls that operate during the winter blue grenadier spawning season off the west coast of Tasmania, but separate observer and reporting arrangements are in place for these factory vessels. This report only relates to the 'wet boat' sector of the CTS and does not report any interaction rates or reporting from the factory vessels.

During commercial operations by CTS 'wet boats', there are occasional interactions with Australian fur seals, *Arctocephalus pusillus doriferus*, and New Zealand fur seals, *A forsteri*, (Knuckey *et al.* 2002; Knuckey and Stewardson 2008). This occurs because of the fishery's geographical overlap with the seals' distribution and foraging (Arnould and Hindell 2001, Arnould and Kirkwood 2008; Kirkwood *et al.* 2006), and because fish species in the trawl catch overlap with the seals' diet (Hume *et al*. 2004, Littnan *et al*. 2007) and attract seals to the vessels. Since the mid 1990s, such interactions have been monitored by the Integrated Scientific Monitoring Program (ISMP) and more recently by Australian Fisheries Management Authority (AFMA) observers. While most seal foraging around fishing nets results in no harm to seals, they sometimes become caught in the nets, which can result in injury or death (Knuckey and Stewardson 2008). AFMA defines such interactions as "*any physical contact an individual (person, boat or gear) has with a protected species that causes death, injury or stress to the individual directly resulting from fishing activities*".

Interactions between the CTS and seals became an increasingly recognized issue throughout the 2000s (e.g. Wilson *et al*. 2010, Tilzey *et al*. 2006, Hamer 2004, Goldsworthy *et al*. 2003, Knuckey *et al.* 2002). Knuckey *et al.* (2002) conducted the first quantitative analysis of the issue and found that seals were caught in shelf waters throughout all regions of the SESSF

during all months of the year. Recognising the significant problems in extrapolating ISMP interaction rates to total fishery catch, they nevertheless found that annual seal capture rates averaged about 720 across the fishery, but varied considerably. This equated to about 1 seal every 50 shots (2%) in most zones of the fishery, although slightly higher catch rates were recorded in western Tasmania and western Victoria. Of these, the data indicated that about one third of these captured seals were released alive.

During 2005, a seal education project (FRDC Project 2005/049) was initiated with the following four objectives (Knuckey and Stewardson 2008):

1. To provide fishers with relevant information on the biology and conservation of seals, to help raise industry awareness and encourage increased reporting of seal/fishery interactions;
2. To ensure that industry is familiar with and applies its Code of Practice to Minimise Interactions with Seals (2007) especially in relation to the mitigation of incidental seal bycatch and seal mortality;
3. To establish a robust industry-based monitoring program that provides spatial and temporal information on the level of seal/fishery interactions of SESSF trawl vessels; and,
4. To develop and trial options to validate the robustness/reasonableness of the data collection and reporting system to quantify the extent of seal interactions and report on the potential uptake by fishers of each option and the extent of effectiveness of each option in meeting the relevant strategic assessment requirements of the EPBC Act.

That project was successful in educating the fishing industry on the role of seals in the ecosystem, the potential impact of seal-fishery interactions and the importance and need to record any interactions. It also established an industry-based seal monitoring and data collection program, but there were questions about how robust these were. Although the project was attributed with increasing the number of seal interactions that were reported in fishery logbooks and thereby improving the industry compliance with the EPBC Act 1999 (Knuckey and Stewardson 2008), it finished before the full uptake of the reporting could be examined. Reporting rates by industry members have not been assessed since the completion of this project (which examined data up until June 2007).

Need

Based on the work of Knuckey and Stewardson (2008) and the South East Trawl Fishing Industry Association (SETFIA), fishers in the 'wet boat' component of the CTS became well informed about: the identification, biology and conservation of seals; the potential impact of seal-fishery interactions; the importance and need to record seal interactions; and, the correct way to fill in the appropriate forms in their AFMA logbooks when they interact with seals. SETFIA provided a copy of the *Industry Code of Practice to Minimise Interactions with Seals* to ensure that skippers and crew had information on how to minimise seal bycatch and seal mortalities and the need to report all interactions.

Despite the improved level of logbook reporting that initially resulted from Knuckey and Stewardson (2008), there remained doubts as to whether the CTS skippers were fully complying with the reporting requirements across the 'wet boat' fleet. Although not quantified, there were concerns about whether the interaction rates recorded in the logbooks by industry members were lower than the seal interaction rates previously recorded by independent observers. Although, there may be a number of reasons to explain this, such as: continued under-reporting either on specific vessels or widely across the fleet; reduced seal interactions from a smaller and better educated fleet; or, some specific observer effects; the actual situation could not be assessed or addressed without further work. Using unspent funds from 2005/049, this small additional project (2005/049.20) was approved to closely examine the vessel-level reporting of interactions in the logbooks, analyse between vessel variations in reporting, and compare these results with the interaction rates recorded by on-board observers. It was hoped that this information could assist AFMA and SETFIA to improve compliance of this aspect of logbook reporting.

Objectives

1. Describe current seal interaction reporting rates by fishers in the wet-boat fleet of the Commonwealth Trawl Sector.
2. Compare Industry reporting rates to observer reporting rates.
3. List reports by individual vessel to determine priorities for one-on-one meetings with skippers to improve reporting rates.

Methods

Industry reporting

Industry has been educated to report an interaction defined as "*any physical contact an individual (person, boat or gear) has with a protected species that causes death, injury or stress to the individual directly resulting from fishing activities*". While classification of the stress level of an animal is not something that fishermen are trained in, it is known by industry through the education project (Knuckey and Stewardson 2008) that a seal caught in the net and released on deck counts as an interaction and should be reported. If such an interaction occurs, they are required to record that an interaction has occurred on the EFT01B logbook and then fill out a "Listed Marine and Threatened Species Interaction Form" (Appendix 3). Details of interactions are recorded on this form including the date, time and position of the interaction and the life status, recorded as "Alive", "Dead" or "Injured". These logbook sheets and forms get sent to AFMA at the end of a fishing trip.

Observer reporting

AFMA observers are present on a subset of commercial fishing trips to monitor and record a variety of detailed information on fishing activities and catches – including interactions with listed marine and threatened species. Far more detail is able to be collected on these interactions than is generally recorded by fishermen. A copy of the AFMA observer wildlife interaction sheet is shown in Appendix 4.

AFMA observer categorisation of seal interactions can be reasonably well defined by combining the data on 'contact type' and 'life status'. Contact codes used by AFMA observers to categorise interactions with Threatened, Endangered or Protected species are shown in Table 1. The life status of seals following interactions is recorded by observers into six categories ranging from "Dead and damaged" to "Alive and vigorous" (Table 2).

Seal interactions with a contact type of "Wildlife Chasing, Diving for Baits or Target Species" or "Wildlife On/In Water, Light Contact" were usually associated with seals feeding from and around the codend and all resulted in a life status of "alive and vigorous". They therefore did not coincide with the industry classification of an interaction that causes "death, injury or stress". Interactions from these two categories were therefore excluded from comparisons of interaction rates.

Seal interactions with a contact type of "Wildlife Hooked, Caught or Entangled in Net" or "Wildlife Snagged or Entangled, Not Hooked" on the other hand, often resulted in one of the

"dead" life status categories. These contact types were therefore considered to be the equivalent of an industry recording of an "interaction". These observer contact types were used for the comparison of interactions rates.

Observer data contained two different count fields "Count" and "Contact Count". These are defined as (Keryn O'Regan, AFMA, pers. comm.):

- Count – the number of animals being observed in a particular interaction; and
- Contact Count – the number of times that species made such contact.

These two fields generally contained identical entries, however they were sometimes different, and the "Contact Count" field was often not completed. For the purpose of this report, "Count" was used to describe the number of interactions.

Data and Analysis

Fishery logbook and on-board observer data were obtained for the period July 2007 to December 2010 to enable calculation of the number of seal interactions by vessel, geographical area and date. To calculate reporting rates, details of all shots conducted by the CTS and all shots conducted with an AFMA observer onboard were also obtained.

Acknowledging that there is spatial variation in seal interactions in the fishery, and that there is also a difference in interaction rates between otter trawl gear and Danish seine gear, data were categorised by gear type and zone. Zones were based on the previous SEF management zones (Figure 1) to enable comparison with previous work. Because this report is focussed solely on 'wet boats', data from factory vessels were omitted.

To enable comparisons between industry data and observer data, interaction rates were presented as the percentage of the total shots conducted for which an interaction was reported. Interactions with more than one seal were reported during some shots, and numbers of seals involved in such interactions is presented where appropriate. $Interaction\ rate = \frac{number\ of\ shots\ with\ an\ interaction}{total\ number\ of\ shots} x\ \frac{100}{1}$

Logbook and observer data are continuously being sent to AFMA and key-punched into their databases. The results presented in this report are based on the available data provided by AFMA at the time of writing this report.

Results and Discussion

Data quality

As noted above, care has been taken when defining interactions, and filtering and analysing the data used in this report to ensure valid comparisons of interactions reported by observers with those reported by industry due to differences in.

Comments on data quality from commercial logbooks relate not only to the information recorded by fishers on logsheets (Appendix 3), but also to the data entry and capacity of the AFMA database to receive the reported data. Data were generally good with most fields regularly being completed. The "Observer On Board" field of the logbook was supplied with the data request, but no entries were made. It is unclear whether this is because the tick box on the interaction logsheet was never completed by skippers, or because data entry is not enabled. Similarly, the field from the Daily Fishing Logs titled "Did you have an interaction with a Listed Marine or Threatened Species" was not available as there is no facility in the data entry interface for keying this field. This would be useful for verification of Interaction records, and also for merging Interaction records with Daily Fishing Logs. Shot time was missing from 11 of the 225 recorded shots where reported seal interactions occurred, while geographical position was missing from 4 records. Where geographical position was reported, it was in a text format in the "Catch Affected Comments" field. This required re-keying latitude and longitude providing opportunities for generating errors. It appears that there is no facility in the data entry interface for keying this field. There were 36 records in the commercial data where a single shot had interactions with multiple seals. AFMA require a single line entry for each individual Listed Marine and Threatened animal for which an interaction has occurred. The only exception is for Syngnathids, for which there is a separate field titled "No. of Sea Horses" to allow for the reporting of interactions with multiple Syngnathids in a single shot, all on one line. The requirement to use a single line for each individual seal is described under the title of the "Species Name" field on the Interaction form (Appendix 1), and states "Be specific (refer to list), one line for each **individual**, except for Syngnathids (Sea Horses)".

Observer data contained numerous records with missing values for fields including "Life Status", Contact Count", and "Contact Code", and one missing value for latitude and longitude.

Industry reporting

Seal interaction rates of otter board trawlers calculated from logbook data was consistent at about 0.32% during 2007–09 inclusive and increased to 0.54% during 2010 (Table 3). Number of shots from which seal interactions were reported in each year during 2007–10 was 25, 54, 46 and 75 respectively (only 6 months data included for 2007).

Seal interaction rates by Danish seine vessels were much lower ranging from 0.06% during 2009 to 0.13% during 2007 (Table 4). Seal interactions were reported for 5, 8, 4 and 8 different Danish seine shots during 2007–10 respectively.

The number of interactions reported each year has continued to increase since last examined by Knuckey and Stewardson (2008), with a combined 83 shots (otter trawl and Danish seine) reported as having seal interactions during 2010 (Figure 2). The large increase in reporting during 2010 is likely a result of FRDC Project 2009/330, which educated CTS skippers on requirements for reporting interactions with Threatened, Endangered and Protected species during three workshops in Lakes Entrance (26 – 27 October), Eden (23–24 November) and Portland (30 November to 1 December). Consequently, reports of seal interactions during the last quarter of 2010 were 41% higher than for any other quarter during July 2007 to December 2010. Reports of seal interactions during the first and second quarters of 2011 are expected to be even higher, with a further workshop being held in Wollongong during March 2011.

Only in 21% of interactions reported during 2007–10 by otter trawl fishers were seals categorised as being alive (Table 5). The percentage of seals reported alive ranged 18 – 25% over that time. These figures are lower than the historic ISMP average of 32% of seals captured alive and then released alive reported by Knuckey *et al.* (2002). In comparison, a higher percentage of seals interacting with Danish seine gear survived, averaging 40% (Table 6).

Observer reporting

Observer-reported seal interaction rates from otter trawler vessels were much higher than industry-reported rates, ranging 1.94 – 4.83% during 2010 and 2008 respectively (Table 3). Only one seal interaction was reported by observers on Danish seine vessels over the time period examined (Table 4). This interaction occurred during 2007, and resulted in an interaction rate of 3.85%.

Observer-reported interaction rates are generally greater than those described by Knuckey *et al.* (2002), who found about one seal interaction per 50 shots (about 2%) on average in data

from the ISMP. There are a number of possible reasons for higher observer-reported interaction rates since 2001. In recent decades, seal numbers have been increasing markedly in southeast Australia. A 2005 study estimated the Australian population of Australian fur seals to be about 90,000 individuals (Kirkwood *et al.* 2005), but the population had doubled in size since 1986. Likewise, sympatric populations of New Zealand fur seals are increasing at a rate of about 11% per annum (McKenzie, 2006). The increased observer reporting of interactions could at least in part be due to increasing population sizes of these two species since the 2002 study. In addition, re-examination of historic ISMP data reveals that after a major change in the design and staffing of the observer program in 1999, observer-reported seal interaction rates were higher during 2000 (2.4%) and 2001 (2.6%) compared with those from the 1990s. It is important to note that, historically, the ISMP was not designed to provide statistically robust estimates of seal interaction rates. Therefore, extrapolation of observer-reported interactions to the entire fleet is highly uncertain and subject to biases caused by spatial and temporal effects, or vessel bias caused by more observer coverage on some vessel, and less on others. The effect of vessels used was demonstrated in the 2008 data for otter trawlers. During that year, 19 of the 21 seal interactions reported were observed on only 4 of the 19 vessels sampled in that year. Another factor that may have resulted in lower seal interaction rates in the earlier study is that the data from Danish seine vessels were not separated from otter trawl vessels. Interaction rates for Danish seine vessels are lower than for otter trawl (and Table 4), and inclusion of Danish seine shots in analyses would deflate interaction rates to some extent. This is likely to be only a minor factor as, for example, Danish seine shots made up only 7.4% of shots observed during 2001 in the Eden / Lakes Entrance port group (similar to the East Vic zone used in this report).

Seal interactions were placed in four different contact types during 2007–10, with the most common being "Wildlife Chasing, Diving for Baits or Target Species" for otter trawlers (Table 7), and "Wildlife On/In Water, Light Contact" for Danish seiners (Table 8). Interactions from these two categories were excluded from analyses calculating interaction rates, as they fall outside of AFMA's definition of an interaction. This is justified by the life status categorisation of "alive and vigorous" for all interactions of these "contact types" (Table 9 and Table 10). About 62% of seals with interactions classified as "Wildlife Hooked, Caught or Entangled in Net" from otter trawlers were reported dead (either "dead and damaged", "dead and in rigour" or "dead and flexible"), about 10% were reported alive (either "alive, sluggish" or "alive and vigorous"), while the life status was not recorded for the

remaining 28% of interactions (Table 9). The difference between the average industry-reported estimates of seals released alive (21%) and that from observers (10%) may reflect a bias in industry preference of reporting interactions from which the seals survived.

Seal interactions by zone

Overall, average industry-reported seal interaction rates for otter trawl and Danish seine gears were 0.38% (Table 11) and 0.10% (Table 12) respectively during 2007–10.

Highest interaction rates by otter trawlers (Table 11) were reported from Eastern Victoria (0.68%), Eastern Tasmania (0.67%) and Western Tasmania (0.47%), while lower than average seal interaction rates were reported from NSW (0.10%) and Western Victoria (0.13%). In comparison, seal interaction rates reported by observers were much higher in all zones except Eastern Tasmania, from which no interactions were reported from the 106 shots observed. Average observer-reported interaction rate across all zones was 3.82%, with the highest interaction rates observed in Western Tasmania (8.00%) and Eastern Victoria (5.99%). Like industry-reported interactions, NSW (1.71%) had the lowest interaction rate of the main zones in the fishery. There were large inter-annual differences in interaction rates within zones, particularly for observer data. For example, the observer-reported interaction rate was 4.58% in NSW during 2008, but there were no seal interactions observed during 2010 despite a similar level of observer coverage on similar vessels to those sampled during 2008. Likewise, interaction rates in Western Victoria ranged 0.98% in 2008 to 9.86% in 2009 from the 102 and 71 shots observed respectively. This variability reflects the rarity of these interactions, and highlights the caution that should be used when extrapolating and interpreting results.

Seal interaction rates reported by Danish seine industry members in the three main zones fished were 0.08% in Eastern Victoria, 0.07% in Western Victoria, and 0.12% in Bass Strait (Table 12). Observers reported only one seal interaction, and that was from Eastern Victoria during 2007. Because of the low observer coverage of the Danish seine fishery, this one interaction resulted in an interaction rate of 4.17% in that zone for that year, and of 0.56% overall. The low sampling intensity and rarity of interactions make it inappropriate to quantitatively compare the industry and observer interactions rates for the Danish seine fishery.

Seal interactions by vessel

Only 19 of the 41 different otter trawl vessels active during 2007–10 reported seal interactions during that time, and only seven of those reported interactions during three or more different years. Of those that did report seal interactions, interaction rates over the four years ranged 0.05 – 1.92%. The highest of these interaction rates is close to that reported from ISMP data in Knuckey *et al.* (2002), and half of the fishery-wide interaction rate reported by observers in Table 11. Despite relatively high rates of reporting of seal interactions by five vessels[1], observer-reported interaction rates on those vessels were noticeably higher. There was another six other vessels whose industry-reported interaction rates were higher than observer-reported rates. These vessels nevertheless, still had lower industry-reported interaction rates than would be expected based on overall observer-reported seal interaction rates across the fishery. There were two otter trawl vessels that failed to report interactions despite interactions being reported by observers that were on the vessels at the time.

During 2007–10, seal interactions were reported in 204 shots by otter trawl fishers when no observer was present, and in 45 shots when observers were present. Considering 51,923 shots were conducted with no observer present, and 1,491 shots were observed, reporting of seal interactions was about 6.9 times more likely when an observer was present. Industry reporting with no observer on-board appeared to improve during 2010, with reporting of seal interactions only about 3 times more likely when an observer was present. Given that observer coverage is only 2–3.5% of shots conducted by the otter trawl fleet, it can be expected that, on average, any vessel accurately reporting seal interactions would report more interactions when there was no observer on-board – eight vessels did this, but their interaction rates were still lower than those reported by observers. Four vessels reported seal interactions only when an observer was on-board during 2010. For the period 2007–10, five vessels reported more seal interactions when an observer was on-board than when an observer was not on-board.

Only two seal interactions were reported by Danish seine vessels during 2007–10 when an observer was on-board, and 23 with no observer on-board. One interaction reported by a Danish seine vessel when an observer was on-board was different to the AFMA database because the interaction type was categorized by the observer as “Wildlife On/In Water, Light Contact”, and so does not fall under AFMA’s definition of an interaction. This record should

[1] Note that interactions reported by some vessels occurred during Fishery Independent Surveys when independent observers were onboard, but not AFMA observers. These are not recorded in the AFMA observer database.

not have been reported by the fisherman unless he considered the interaction to have caused death, injury or stress (the observer categories the life status of the animal involved in this interaction as "alive and vigorous"). There was only one other vessel from which an interaction was reported when an observer was on-board. That vessel made no reports of interactions when there was no observer on-board during 2007–10. There were seven Danish seine vessels that reported seal interactions with no observer on-board during 2007–10. There were no seal interactions reported with an observer on-board during 2010. Five vessels reported interaction with no observers on-board during 2010.

Interpretation of uncertain results

When interpreting the results of this study, it is critical to understand that the intensity and coverage of the ISMP and AFMA observer programs were not designed to provide robust estimates of seal interaction rates. It is very difficult, therefore, to make definitive quantitative statements about the actual and expected seal interaction reporting rates, particularly at fine spatial / temporal scales or at the vessel level. While there is no doubt that industry reporting of seal interaction rates across the fishery is considerably lower than the actual or observed interaction rates – and this is of major concern – it is more difficult to attribute this in a quantitative manner to any one particular reason or to any vessel or group of vessels. The main difficulty is that interaction rates are not high and appear to vary considerably across various spatial and temporal scales within the fishery and between different fishing operations. This is further exacerbated by the high uncertainty around interaction rates under the current level of observer coverage.

An example of the above is apparent in the halving of observer-recorded interaction rates from ~ 4% during 2009 to ~ 2% during 2010. There is very little that can explain this – except if there has been a change in the way the observers were sighting and/or reporting interactions. The observer coverage is similar in space, time and extent, and similar vessels were covered. Although the authors have no seal census data available for 2010, it is unlikely that this reduction reflects a population abundance change. So, this level of variation may simply represent the accumulated variability in interaction rates associated with time, space and fleet dynamics when sampled under a level of observer coverage that was not designed to give robust estimates of interaction rates. Importantly, this highlights that specific *quantitative* statements about whether the fleet or individual vessels are "accurately" reporting interaction rates are extremely difficult to make.

Value of accurate industry reporting

There are substantial benefits to improve industry-reporting of seal interactions. Of these, one of the most important to industry is stakeholder perception of their stewardship role in marine resource management. It is illegal under the EPBC Act not to report an interaction with a seal. Industry, through its peak body SETFIA, endeavour to be (and be perceived as) responsible stewards of our marine resources and significant under-reporting of seal interactions erodes this endeavour. This must be addressed if industry expects to be considered as credible stakeholders. SETFIA fully recognises this issue and during 2010 they ran a number of nationally accredited training courses called Improved Environmental Work Practices. Funded by the FRDC (Project 2009/330), SETFIA, in partnership with Fishwell Consulting and the South East Australian Maritime Education Centre ran the courses in the major CTS ports of Wollongong, Eden, Lakes Entrance and Portland, which were attended by more than 70 skippers and crew. The curriculum included information on society's expectations of the industry, stock assessments, reducing marine pollution, stopping the spread of foreign aquatic organisms, improving reporting, mitigating threatened, endangered and protected species integrations, reducing upper-slope dogfish catches, closures and rebuilding strategies.

With regard to seals, industry would prefer there were no interactions, but apart from the actual individual seal mortality that result from these interactions with CTS vessels, it is unclear what the implications of current interaction rates are for seal populations around south-east Australia. More accurate information on the number, demographics and spatial / temporal dynamics of seal mortality will provide a better understanding of the impacts of seal interactions.

Stakeholders are demanding improved certainty of the level of interaction and unless there is more accurate reporting of actual interaction rates by industry, this will only be able to be achieved through significantly higher observer coverage of the fleet, which would come at considerable cost to industry. To this end, it is important that at least a sub-sample of vessels accurately reports every interaction – such as the “port leaders” encouraged to “lead by example” in Knuckey and Stewardson (2008). It is apparent that there are already more than six vessels/skippers within the fleet that provide interaction reporting either of, or close to, this quality and these skippers should be nurtured and encouraged by SETFIA and AFMA to formally fill this role. This is more valuable in terms of data quality, (not necessarily perception) than having a large proportion of the fleet reporting, but either under-reporting or

reporting inaccurately – which is illegal. With a representative group of accurately reporting "port leaders" in place, better information on the spatial and temporal variability in interaction rates will be available than is presently achieved – even using on-board observers. It then also becomes easier to target compliance or other management actions[2] towards those vessels which, on average, appear to be consistently under-reporting or not reporting at all.

Benefits and adoption

The main flow of benefits from this project is to the wet boat vessels of the Commonwealth Trawl Sector of the SESSF. In the longer term it is hoped that this project will also benefit stakeholders wanting better information on the seal interaction rates of the CTS.

The preliminary non-confidential results of this project were made available to the organisers of the SETFIA Skipper Accreditation Course recently run in all of the major ports of the CTS. Although it is too early to judge the full impact of this, it is already clearly evident that the combination of the information from this project and the education method offered by the Accreditation Course has resulted in a significant and immediate increase in reporting rates.

This combination may be able to be applied to the reporting of interactions with other threatened, endangered or protected species in the SESSF and other fisheries.

Further development

It is expected that this project will lead to the ongoing and improved reporting and monitoring of seal interactions by CTS vessels through their peak body – SETFIA. From a stakeholder perspective, one of SETFIA's strategic objectives is to manage interactions with Threatened / Endangered / Protected species to world's best practice. The recent success of the Skipper Accreditation Courses is a positive step in this direction. The process used in the current study to provide quantitative results on the reporting of interaction rates can be easily repeated in the future to provide the information from which SETFIA can measure its success in achieving this particular objective. Potentially, similar analyses can also be used to determine the effectiveness of mitigation measures in reducing interaction rates or the mortality rate associated with interactions. SETFIA members are already trialling the effectiveness of seal exclusion devices (SEDs) on wet boats in the CTS (SETFIA 2009).

[2] A possible alternative to compliance, where costs are recovered back from the entire fleet, is the option of increasing observer coverage on those vessels expected of under-reporting – at the vessel's cost. The feasibility, legality and implications for observers of this option needs to be investigated further. It may lead to an increased observer effect, where vessels deliberately alter their fishing behaviour when observers are on board to minimise interactions with seals, thereby undermining the value of the data collected.

Planned outcomes

This small project provided a snapshot of the current performance of industry in the reporting of seal interactions. Industry reporting rates have improved since the initial education project (Knuckey and Stewardson 2008) but based on comparisons with observer data made during the current project, there remains significant room for improvement across the fleet. Subsequent to the SETFIA Skipper Accreditation Courses held during late 2010 and early 2011, it appears that further improvements are already being made.

Ultimately, the desired outcome from the current project would be a change in industry reporting of interaction rates in the CTS such that they are not significantly different to observer reporting rates. Industry data alone could then be used to more accurately estimate overall interaction rates with observer data only required as an independent validation.

Conclusions

- There is widespread under-reporting of seal interactions by the majority of the CTS fleet particularly when observers are not on-board. Observer-reported seal interaction rates on otter trawlers during 2007–10 (ranging 1.94– 4.83%) were much higher than industry-reported rates (ranging 0.32– 0.54%). Seal interaction rates by Danish seine vessels were much lower ranging from 0.06% during 2009 to 0.13% during 2007, with observer-reported interactions of zero during 2008–10 inclusive and one (3.85%) in 2007.
- Less than half of the active otter trawlers reported seal interactions during 2007–10. Of those vessels that did record interactions, most industry-recorded interaction rates were below the average rate recorded by observers.
- An average of 21% and 40% of seals reported by industry from interactions with otter trawl and Danish seine gear respectively, were alive when caught and released alive, while only 10% of interacted seals reported by observers were either “alive, sluggish” or “alive and vigorous”. The difference between the average industry- and observer-reported estimates of seals released alive from otter trawls may reflect a bias in industry preference to report interactions from which the seals survived.
- Highest seal interaction rates reported by industry were from Eastern Victoria, Eastern Tasmania and Western Tasmania, while highest rates reported by observers were from Western Tasmania and Eastern Victoria.

- Considerable spatial, temporal and between-vessel variation in seal interaction rates was observed. This highlights the caution that should be used when extrapolating and interpreting results.
- The intensity and coverage of the ISMP and AFMA observer programs were not designed to provide robust estimates of seal interaction rates. It is very difficult, therefore, to make definitive quantitative statements about the actual and expected seal interaction reporting rates, particularly at fine spatial / temporal scales or at the vessel level. The halving of observer-reported interaction rates during 2010 is evidence of this and is difficult to explain.
- Some vessels in the fleet regularly record interactions with seals regardless of the presence of an observer and sometimes at higher rates than recorded when observers are on-board. If these vessels provide accurate reports and are representative of the fishery, the information they provide may be the best data from which to extrapolate the extent of seal interactions in the fishery.
- The number of seal interactions reported by industry members each year has continued to rise since FRDC Project 2005/049. The large rise in reported interactions during the last quarter of 2010 is likely due to FRDC Project 2009/330 titled "SETFIA Accreditation of Commonwealth Trawl Sector skippers toward improved environmental operation in the fishery".
- There appears to be different definitions for industry and observers of what constitutes as an "interaction". Without being able to identify observer recording of "Contact Type", this could potentially lead to incorrect interpretation of results.
- Observer-reported interaction rates for otter trawl vessels during 2007–10 were higher than interaction rates from historical ISMP data (Knuckey *et al.,* 2002). This was likely caused by a combination of a number of factors including: increasing seal populations leading to an increase in frequency of interactions, high observer coverage on some vessels that have high numbers of seal interactions (19 of the 21 seal interactions reported were observed on only 4 of the 19 vessels sampled during 2008) and the separation of Danish seine data from otter trawl data which has a higher incident of seal interactions.
- Incomplete entries were received in both observer and industry-reported data, and were caused by lack of capacity to enter data from into AFMA databases, and possibly also from incomplete reporting.

- Some industry reports failed to follow AFMA's instructions of reporting a single entry of each animal for which there was an interaction (except Syngnathids).
- Disaggregating data by year and zone results in too small a sample size for observer data given the infrequency of interactions. It is more stable for industry-reported data where the sample size is much larger.
- Seal interactions by Danish seine vessels are particularly rare events and data from those vessels should be separated from otter trawl data for analyses.
- Priorities for SETFIA to approach vessels to discuss improved reporting of seal interactions should be (vessels attributed to each of these priorities are listed in the Confidential version of the Final Report):

    1. Vessels which failed to report interactions despite observers reporting interactions during 2007–10. *Justification: It is known from independent observers that these vessels have interacted with seals, but failed to report them.*
    2. Otter trawl vessels that only reported interactions when observers were on-board during 2007–10 or in 2010. *Justification: It is known from independent observers that these vessels have interacted with seals, and given the low level of observer coverage, the probability that they only interacted with seals when an observer is on-board is very low. The inclusion of meeting this condition in 2010 was because by that year, skippers have had enough time to adjust to interaction reporting requirements communicated by FRDC Project 2005/049.*
    3. Otter trawl vessels which operate in zones with high interaction rates (Eastern Victoria, Eastern Tasmania, and Western Tasmania) but have not reported seal interactions during 2007–10 or during 2010. *Justification: Probability of a seal interaction in those zones is high, and it would seem unusual that a vessel did not have at least one interaction during 2007–10 or during 2010.*
    4. Otter trawl vessels which operate in zones with high interaction rates (Eastern Victoria, Eastern Tasmania, Western Tasmania), but have reported seal interactions less than the average for that zone during 2007–10 (this priority does not use 2010, as the temporal scale is too small). *Justification: Probability of a seal interaction in those zones is high, and it could be expected that most vessels would have at least moderate levels of seal interactions during 2007–10.*

5. Otter trawl vessels which operate in zones with low interaction rates (NSW, Western Victoria, Bass Strait), but have reported seal interactions less than the average for that zone during 2007–10 (this priority does not use 2010, as the temporal scale is too small). *Justification: Probability of a seal interaction in those zones is low, but it could be considered likely that at least one seal interaction would have occurred during 2007– 10.*

6. Danish seine vessels which have reported seal interactions less than the average for that zone during 2007–10 (this priority does not use 2010, as the temporal scale is too small). *Justification: Danish seine vessels have a low rate of seal interactions, but it is probable that at least one seal interaction would have occurred during 2007–10.*

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Figures and Tables

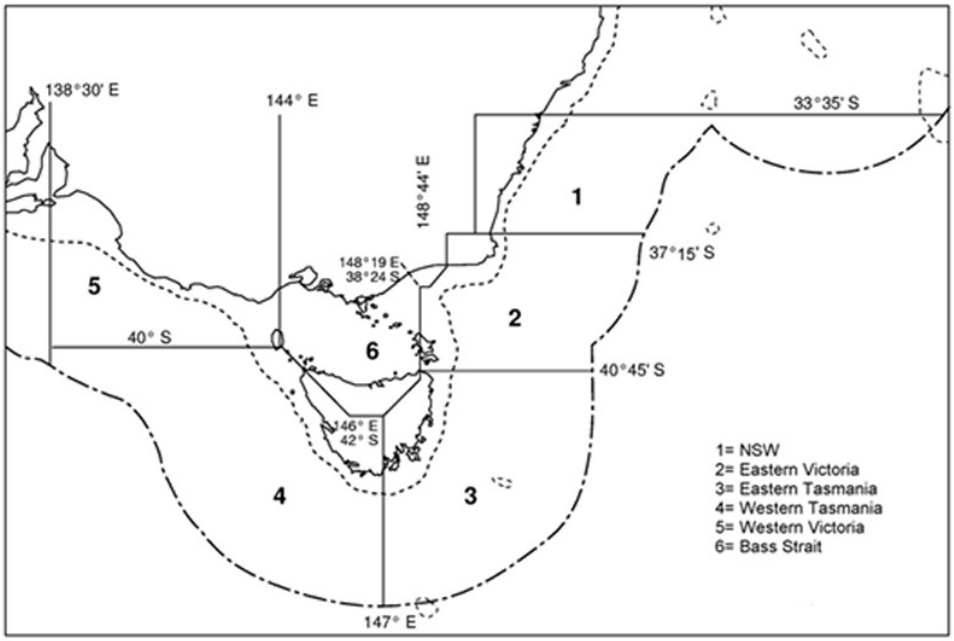

Figure 1. Geographical area of the Commonwealth Trawl Sector of the Southern and Eastern Scalefish and Shark Fishery showing the zones of the fishery used for analyses.

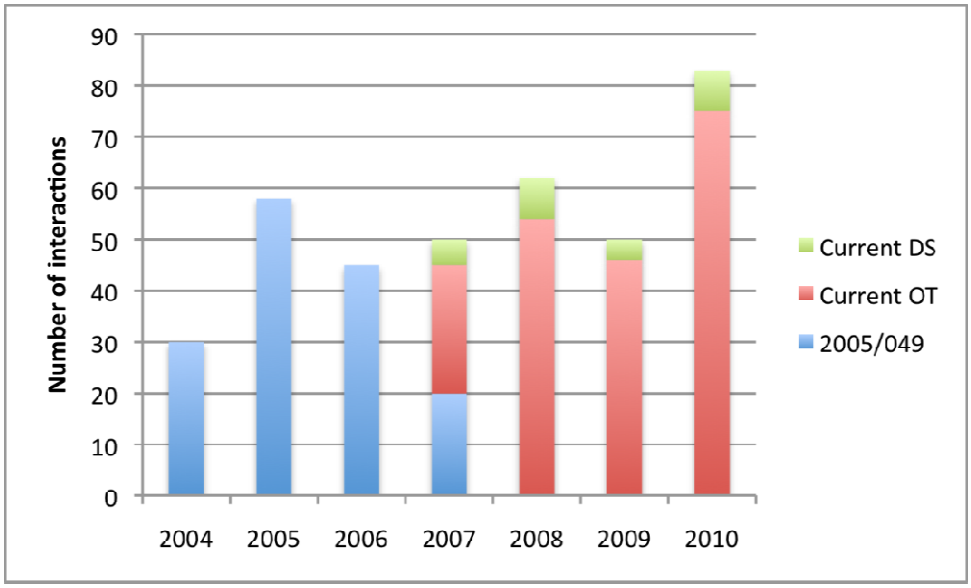

Figure 2. Annual summary of reports of seal interactions in the wet boat component of the CTS of the SESSF during 2004–10 showing interactions reported in Project 2005/049 for otter trawl and Danish seine combined, and interactions since separated into the two gear types.

Table 1. Contact codes used by AFMA observers to categorise interactions with Threatened, Endangered or Protected species.

Contact Code	Contact description
OWL	wildlife on / in water, very light contact with vessel or gear
OWH	wildlife on / in water , heavy contact with vessel or gear, wildlife; may be dragged under for a moment but reappears
OWS	heavy contact with vessel or gear (including warp wires) wildlife dragged under does not reappear
BFC	bird flying, light contact with vessel or gear (including warp wires)
BFH	bird flying, heavy contact with vessel or gear (including warp wires); bird deviates from its flight path (no control)
WSN	wildlife snagged or entangled in lines, not hooked .
WCF	wildlife hooked or caught / entangled in net
WCT	wildlife chasing / diving for baits or target species
WCN	wildlife chasing / diving for non target species
DIV	dived and took bait

Table 2. Life status codes used by AFMA observers to categorise results of interactions with Threatened, Endangered or Protected species.

Life Status Code	Life Status Description
0	Dead and damaged
1	Dead, in rigour
2	Dead and flexible
3	Alive, just
4	Alive sluggish
5	Alive and vigorous
6	Unknown

Table 3. Summary of fishing effort and observer coverage of otter trawl gear in the Commonwealth Trawl Sector from July 2007–10 showing seal interaction reporting rates. Note that observer interactions included were those reported as "Wildlife Hooked, Caught or Entangled in Net" or "Wildlife Snagged or Entangled Not Hooked".

Year	2007*	2008	2009	2010^
No. of boats active	34	36	34	34
No. of shots	7778	16275	14523	14006
No. of shots with seal interactions reported by fishers	25	54	46	75
Seal interaction rate reported by fishers	0.32%	0.33%	0.32%	0.54%
No. of shots observed	174	435	497	413
% observer coverage	2.24%	2.67%	3.42%	2.95%
No. of shots with seal interactions reported by observers	8	21	20	8
Seal interaction rate reported by observers	4.60%	4.83%	4.02%	1.94%

* Includes records from July 2007 onwards

^ Includes fishery logbook records up to December 2010, and observer records up to October 2010, but data from these months may not be complete

Table 4. Summary of fishing effort and observer coverage of Danish seine gear in the Commonwealth Trawl Sector from July 2007–10 showing seal interaction reporting rates. Note that observer interactions included were those reported as "Wildlife Hooked, Caught or Entangled in Net" or "Wildlife Snagged or Entangled Not Hooked".

Year	2007*	2008	2009	2010^
No. of boats active	15	15	15	15
No. of shots	3717	7515	6786	7122
No. of shots with seal interactions reported by fishers	5	8	4	8
Seal interaction rate reported by fishers	0.13%	0.11%	0.06%	0.11%
No. of shots observed	26	41	32	81
% observer coverage	0.70%	0.55%	0.47%	1.14%
No. of shots with seal interactions reported by observers	1	0	0	0
Seal interaction rate reported by observers	3.85%	0.00%	0.00%	0.00%

* Includes records from July 2007 onwards

^ Includes fishery logbook records up to December 2010, and observer records up to October 2010, but data from these months may not be complete

Table 5. Live status of seal from interactions reported by fishers using otter trawl gear in the Commonwealth Trawl Sector from July 2007–10. *Note that the sum of the number alive and number dead differ due to either a reporting or data entry error.

Data	2007	2008	2009	2010	Total
No. of seal reported alive	8 (25%)	16 (25%)	10 (18%)	19 (20%)	53 (21%)
No. of seal reported dead	24 (75%)	49 (75%)	46 (82%)	76 (80%)	195 (79%)
No. of seal interactions	32	65	56	96*	249*

Table 6. Live status of seal from interactions reported by fishers using Danish seine gear in the Commonwealth Trawl Sector from July 2007–10.

Data	2007	2008	2009	2010	Total
No. of seal reported alive	4 (80%)	4 (50%)	0 (0%)	2 (25%)	10 (40%)
No. of seal reported dead	1 (20%)	4 (50%)	4 (100%)	6 (75%)	15 (60%)
No. of seal interactions	5	8	4	8	25

Table 7. Number of seal interactions reported by observers from otter trawlers during 2007–10 by contact type.

Contact type	2007	2008	2009	2010	Total
Wildlife Chasing, Diving for Baits or Target Species			142		142
Wildlife Hooked, Caught or Entangled in Net	6	24	27	11	68
Wildlife On/In Water, Light Contact	61				61
Wildlife Snagged or Entangled Not Hooked				3	3
Unknown	7				7
Total	74	28	169	14	281

Table 8. Number of seal interactions reported by observers from Danish seiners during 2007–10 by contact type.

Contact type	2007	2008	2009	2010	Total
Wildlife Chasing, Diving for Baits or Target Species					
Wildlife Hooked, Caught or Entangled in Net	1				1
Wildlife On/In Water, Light Contact		4			4
Wildlife Snagged or Entangled Not Hooked					
Unknown					
Total	1	4			5

Table 9. Life status of seals involved in interactions reported by observers from otter trawlers during 2007–10 by contact type. Life status codes are as follows: 0=dead and damaged; 1=dead, in rigour; 2=dead and flexible; 3=alive, just; 4=alive, sluggish; 5=alive and vigorous.

	Life Status						
Contact type	0	1	2	4	5	Unknown	Total
Wildlife Chasing, Diving for Baits or Target Species					142		142
Wildlife Hooked, Caught or Entangled in Net	11	18	13	1	6	19	68
Wildlife On/In Water, Light Contact						61	61
Wildlife Snagged or Entangled Not Hooked		3					3
Unknown						7	7
Total	11	21	13	1	148	87	281

Table 10. Life status of seals involved in interactions reported by observers from Danish seiners during 2007–10 by contact type. Life status codes are as follows: 0=dead and damaged; 1=dead, in rigour; 2=dead and flexible; 3=alive, just; 4=alive, sluggish; 5=alive and vigorous.

	Life Status						
Contact type	0	1	2	4	5	Unknown	Total
Wildlife Chasing, Diving for Baits or Target Species							
Wildlife Hooked, Caught or Entangled in Net		1					1
Wildlife On/In Water, Light Contact					4		4
Wildlife Snagged or Entangled Not Hooked							
Unknown							
Total		1			4		5

Table 11. Number of otter trawl shots observed and conducted, and seal interaction rates reported by observers and fishers in each zone during 2007–10. The number in parentheses is the number of seals for which there were interactions.

Zone	Year	Observer Coverage		CTS Reporting	
		No. Shots	% Interaction	No. Shots	% Interaction
NSW	2007	34	0 (0)	2133	0.14 (5)
	2008	153	4.58 (10)	4751	0.04 (5)
	2009	129	0.78 (1)	4386	0.14 (6)
	2010	152	0 (0)	4155	0.10 (6)
	Total	468	1.71 (11)	15425	0.10 (22)
East Vic	2007	86	6.98 (5)	2662	0.68 (22)
	2008	143	6.99 (10)	5342	0.58 (32)
	2009	138	5.07 (7)	4700	0.47 (29)
	2010	84	4.76 (6)	4723	1.02 (61)
	Total	451	5.99 (28)	17427	0.68 (144)
East Tas	2007	0		384	0.26 (1)
	2008	16	0 (0)	1711	0.70 (16)
	2009	62	0 (0)	1361	0.59 (9)
	2010	28	0 (0)	1052	0.86 (10)
	Total	106	0 (0)	4508	0.67 (36)
West Tas	2007	27	7.41 (2)	952	0.21 (3)
	2008	3	33.33 (1)	1361	0.44 (9)
	2009	62	8.06 (5)	1445	0.42 (8)
	2010	33	6.06 (6)	1305	0.77 (15)
	Total	125	8.00 (14)	5063	0.47 (35)
West Vic	2007	17	5.88 (1)	1494	0.07 (1)
	2008	102	0.98 (1)	2643	0.11 (3)
	2009	71	9.86 (14)	2468	0.16 (4)
	2010	97	2.06 (2)	2586	0.15 (4)
	Total	287	3.83 (18)	9191	0.13 (12)
Bass Strait	2007	1	0 (0)	26	0 (0)
	2008	2	100.00 (2)	35	0 (0)
	2009	2	0 (0)	36	0 (0)
	2010	0		42	0 (0)
	Total	5	40.00 (2)	139	0 (0)
Other zones	2007	9	0 (0)	127	0 (0)
	2008	16	0 (0)	432	0 (0)
	2009	33	0 (0)	127	0 (0)
	2010	19	0 (0)	143	0 (0)
	Total	77	0 (0)	829	0 (0)
TOTAL	2007	174	4.60 (8)	7778	0.32 (32)
	2008	435	4.83 (24)	16275	0.33 (65)
	2009	497	4.02 (27)	14523	0.32 (56)
	2010	413	1.94 (14)	14006	0.54 (96)
	Total	1519	3.82 (73)	52582	0.38 (249)

Table 12. Number of Danish seine shots observed and conducted, and seal interaction rates reported by observers and fishers in each zone during 2007–10. The number in parentheses is the number of seals for which there were interactions.

Zone	Year	Observer Coverage		CTS Reporting	
		No. Shots	% Interaction	No. Shots	% Interaction
East Vic	2007	24	4.17 (1)	1645	0.12 (2)
	2008	30	0 (0)	3381	0.09 (3)
	2009	18	0 (0)	2423	0.04 (1)
	2010	55	0 (0)	3495	0.09 (3)
	Total	127	0.79 (1)	10944	0.08 (9)
West Vic	2007	0		140	0 (0)
	2008	0		317	0 (0)
	2009	0		384	0 (0)
	2010	1	0 (0)	505	0.20 (1)
	Total	1	0 (0)	1346	0.07 (1)
Bass Strait	2007	0		1928	0.16 (3)
	2008	9	0 (0)	3759	0.13 (5)
	2009	14	0 (0)	3966	0.08 (3)
	2010	23	0 (0)	3082	0.13 (4)
	Total	46	0 (0)	12735	0.12 (15)
Other zones	2007	2	0 (0)	4	0 (0)
	2008	2	0 (0)	58	0 (0)
	2009	0		13	0 (0)
	2010	2	0 (0)	40	0 (0)
	Total	6	0 (0)	115	0 (0)
TOTAL	2007	26	3.85 (1)	3717	0.13 (5)
	2008	41	0 (0)	7515	0.11 (8)
	2009	32	0 (0)	6786	0.06 (4)
	2010	81	0 (0)	7122	0.11 (8)
	Total	180	0.56 (1)	25140	0.10 (25)

Appendix 1 – Intellectual Property

Data contained in the "Confidential" version of the Final Report contains information that can be related back to individual vessels. As such, it contravenes AFMA's Confidentiality Policy and should not be distributed. This data has been removed from this version of the Final report to enable wider distribution.

Appendix 2 – Staff

Dr. Ian Knuckey: Principal Investigator

Dr. Matt Koopman: Co-Investigator

Appendix 3 – Listed Marine and Threatened Species interaction form in logbook EFT01B.

Australian Fisheries Management Authority.
Box 7051
Canberra Business Centre ACT 2610

LISTED MARINE AND THREATENED SPECIES FORM

Please use one form per day

Log No.

Boat Name

Distinguishing Symbol

Date of Interaction / /

Corresponding logsheet no.

Observer on board (tick box) Yes No

Great White Shark / Grey Nurse / Whale Shark / Seabird / Seal / Dolphin / Whale / Dugong

Species Name Be specific (refer to list), one line for each **individual**, except for Syngnathids (Sea Horses)	No. of Sea Horses	**Time at which Interaction occurred** (24hr)	**Latitude/Longitude** of interaction		**Caught During Fishing Operation** (tick one box only)			**Band or Tag Number**	**Life Status** (tick one box only)		
			dd mm	ddd mm	Haul	Set	Other		Alive	Dead	Injured

Comments

Is there anything else that you believe to be important information, for example: Female, male, adult, juvenile?
Where was the animal tangled (flipper, mouth, wing, etc.)?
Where in the gear was the animal tangled (codend, wingend, warps, BRDs, etc.)?
How was the animal released (lowered by hand, lowered with a net into the water, cut out net, etc.)?

I certify the information, which I have provided on this form to be a complete and accurate record.

Concession Holder/Authorised Person **Signature and Date:** / /

Concession Holder/Authorised Person **Printed Name:**

WHITE - Original - Send to AFMA

Please provide an estimate of the time taken to complete this form min.

Appendix 4 – AFMA observer wildlife interaction sheet.

Australian Government
Australian Fisheries Management Authority

OBSERVER PROGRAM
Fields marked with an * must be filled in
WILDLIFE INTERACTION DATA

*OBSERVER NAME		*VESSEL NAME		*OBSERVER VOYAGE ID	

* Date DD/MM/YY	* Time hh/mm	* Vessel Activity	Shot Number	Observer Position	* Species Code	Sex M - F - I - U	Age Class	Distance (metres)	*Count	*Count Method	*Contact Code	*Contact Count	*Contact Point	*Interaction Successful - Bait Seized?	Fate	*Life Status	Comments
														Y N U			
														Y N U			
														Y N U			
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Observer Position:
1 - starboard bow
2 - port bow
3 - port stern
4 - starboard stern

Count Method:
AC - accurate count
EC - estimated count
XC - extrapolated count
LN - extracted from logbook observer not present
LP - extracted from logbook observer present
OC - other method

Vessel Activity Codes:
DO - dodging
DR - drifting
SE - setting
HA - hauling
ST - steaming
SR - searching
AN - anchor
CT - cage towing
OT - other
PR - processing
JI - jigging
TL - trolling
PL - poling
IP - in port
BW - bad weather
BD - broken down

Fate Codes:
C - cut free without landing
D - discarded, landed and not retained
E - escaped - bitten off
J - jerked free - crew jerked free, cut free without landing
R - retained, kept for commercial or crew consumption
T - tagged fish and returned to sea alive
U - unknown - did not observe

Age Class Codes:
UNK - unknown
ADT - adult
JUV - juvenile
SUB - sub adult

Contact Codes:
OWL - wildlife on / in water, very light contact with vessel or gear
OWH - wildlife on / in water, heavy contact with vessel or gear, wildlife may be dragged under for a moment but reappears
OWS - heavy contact with vessel or gear (including warp wires) wildlife dragged under does not reappear
BFC - bird flying, light contact with vessel or gear (including warp wires)
BFH - bird flying, heavy contact with vessel or gear (including warp wires) bird deviates from its flight path (no control)
WSN - wildlife snagged or entangled in lines, not hooked.
WCF - wildlife hooked or caught / entangled in net
WCT - wildlife chasing / diving for baits or target species
WCN - wildlife chasing / diving for non target species
DIV - dived and took bait

Contact Points:
1 - warp wire
2 - trawl doors
3 - vessel
4 - net
5 - backstop, bridles, sweep
6 - paravanes
7 - branchlines
8 - mainline / rope
9 - buoys / beacons
10 - jigs
11 - trap

Life status Codes:
0 - dead and damaged
1 - dead, in rigour
2 - dead and flexible
3 - alive, just
4 - alive sluggish
5 - alive and vigorous
6 - unknown

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