

PROTECTED SPECIES BYCATCH IN ZONE 1 OF THE SOUTH COAST PURSE SEINE FISHERY 2006/07

INTRODUCTION

In recent years protected species by-catch issues have been identified in the South Coast Purse Seine Fishery. This principally involves the entanglement and to a lesser extent mortality of Fleshy-footed Shearwaters and Common Dolphins during the retrieval of purse-seine nets.

Whilst it was clear that protected species by-catch was occurring in the fishery, and receiving some attention in the local media, the scale of the problem was not understood. In 2005 a part time Honours project commenced observing shearwater interactions with fishing operations and conducting experiments on the efficacy of shark oil as a bird deterrent.

During 2006, in response to directives from the Minister for Fisheries, the industry met to develop a strategy to manage by-catch in the South Coast Purse Seine Fishery. The measures proposed focussed on Zone 1 (King George Sound Albany) where most of the identified problems were occurring at the time.

A range of measures were assembled into an experimental by-catch management package for the 2006 / 07 shearwater season (October to April). These measures included:

By-catch reporting – The Department of Fisheries was to develop a by-catch reporting form to be submitted on landing with the catch quota returns.

Diurnal closures – Earlier observations indicated that interactions with shearwaters may be particularly intense early in the morning (Ben Puglisi pers. comm.). No fishing was to occur at night or around dawn (ie. within 2 hours of sunrise) between 1 March and 15 April.

Observer Program – Observers were to be placed on vessels during the estimated peak shearwater interaction period 1 March to 15 April 2007. The objectives of this observer program were to quantify the numbers of protected species (shearwaters & dolphins) captured or drowned by the nets during this period and to investigate the operational factors contributing to the animals becoming entangled. A second observer would be required to get a statistically robust coverage.

Fishing Pauses – Three 4 day fishing pauses were to be introduced at fortnightly intervals during the period 1 March to 15 April to see if the targeting of the fleet by foraging shearwaters could be disrupted and provide some relief from interactions.

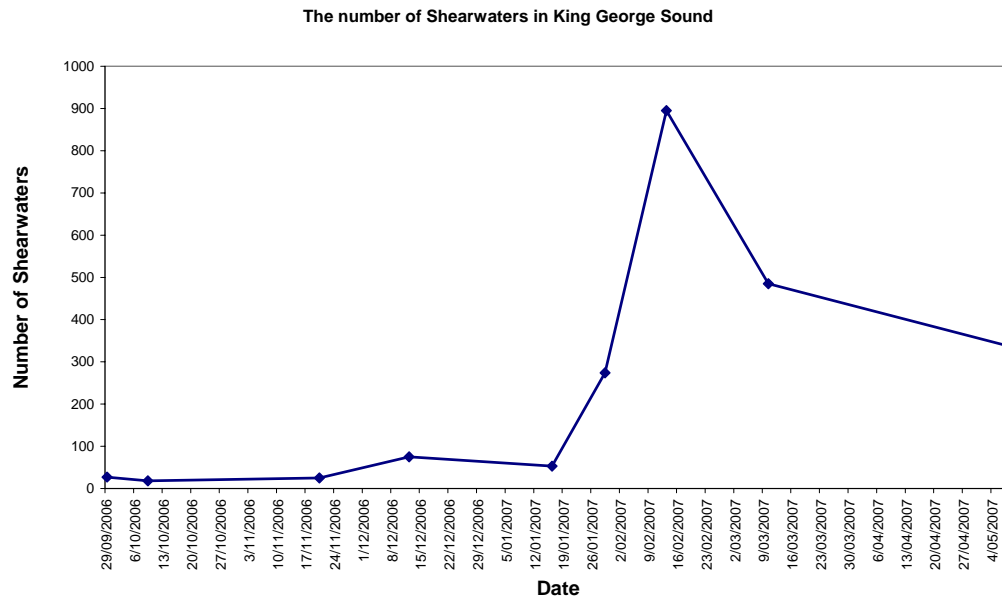
Satellite tracking of shearwaters – Subject to funding some shearwaters from Breaksea Island would be tracked to determine diurnal foraging patterns and responses to the presence / absence of fishing activity in King George Sound.

Research Project – The research project (Ben Puglisi) would continue to carry out on board observations, experimentally evaluate shark oil as a deterrent and characterise the age / sex / reproductive status structure of the shearwater mortality from specimens collected by the fishers.

SHEARWATER INTERACTIONS

The seasonal pattern of shearwater concentration in King George Sound is illustrated in Figure 1 (below) which is based on systematic counts at fixed stations around King George Sound between September 2006 and May 2007 over the period of the bycatch mitigation project (unpublished data courtesy of Ben Puglisi).

Figure 1



As formally predicted the number of shearwaters in King George Sound followed a pattern consistent with “central place foraging” by individuals breeding at local colonies (eg. Breaksea & Michaelmas Island Nature Reserves). The number of Shearwaters in the Sound was relatively low during the pre-laying and incubation periods, when the breeders could forage widely and provisioning demands were low. Numbers increased dramatically in late January / early February following hatching and remained high until the exodus in early May. i.e. during the chick-rearing period when the adults must return on an almost nightly basis to provision their chicks and must forage closer to the colony.

Shearwaters interacted with purse-seining operations in King George Sound over much of the breeding period. The first mortalities were reported by fishers in December (during the incubation period) although the number of birds around net shots at this time is thought to be low compared with the March / April period when the breeding adults are provisioning large chicks.

Two observers (the Honours student and a contactor) boarded for as many fishing trips as possible between 1 March and 15 April. Collectively they covered 48 (67.6%) of fishing trips during the period on days when catch (quota) was landed. There was

an additional 7 trips on days with no reported catches. Some trips involved multiple shots further increasing the sample size.

Observers reported 512 entangled Flesh-footed Shearwaters 54 (10.6%) of which were as mortalities. About 80 dead specimens were collected over the full season including a number from the pre-Christmas period. A further 2 mortalities were recorded on by-catch records (submitted from only one vessel) after 15 April. DEC officers reported 48 wash-ups from beaches inside King George Sound on 29 & 30 April suggesting significant unreported shearwater by-catch in the last 2 weeks of April (ie. after the observer period).

Fifty-two of the shearwaters returned by fishers in the 2006/07 season were examined and dissected at the Department of Agriculture autopsy suite in Albany.

All males had regressed melanic testes and all females had quiescent ovaries (this was expected in individuals collected between March and May following a restricted laying period in late November and early December). At least half of the shearwaters examined were in the last stages of brood-patch re-feathering indicating that these birds had been incubating earlier in the season, i.e. were from the breeding population.

Males outnumbered females in the sample but the difference was not quite significant (Chi squared = 3.74: $P < 0.01$). In a long-lived monogamous species such as a shearwater sex biased mortality would increase the overall impact on the population.

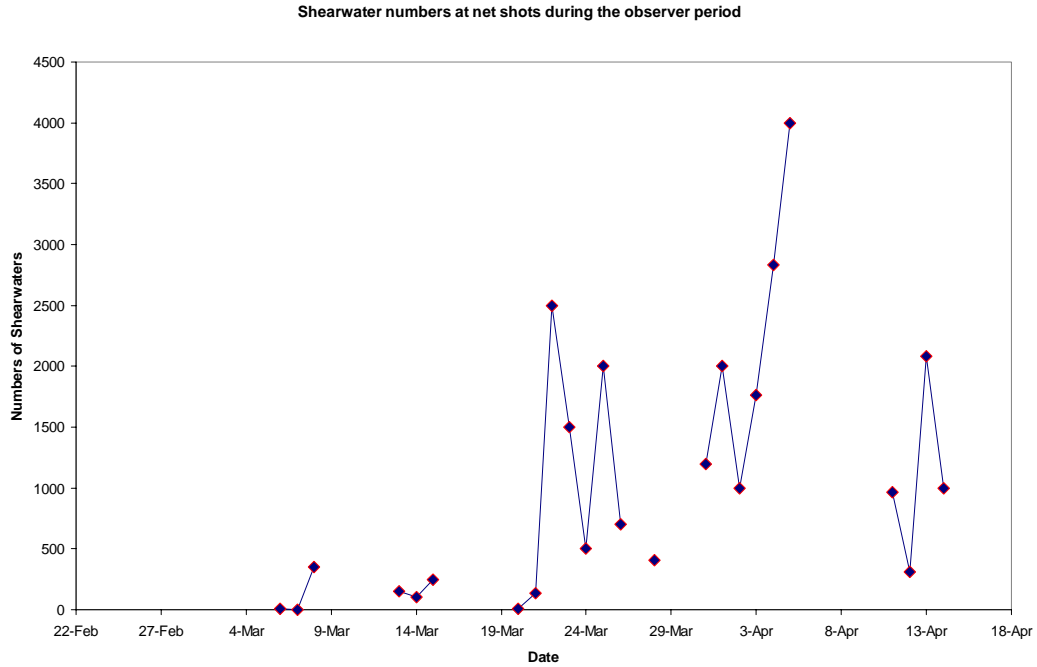
One Common Dolphin calf was entangled and drowned in King George Sound during the observer period.

During the observer period the shearwaters were present around the vessel prior to 59 (92.2%) of shots and 39 (60.9%) shots resulted in entanglements. Shearwaters were present when pilchards were targeted but not associated with herring *Arripis geogianus* (one shot targeting herring at an inshore location was excluded from analysis).

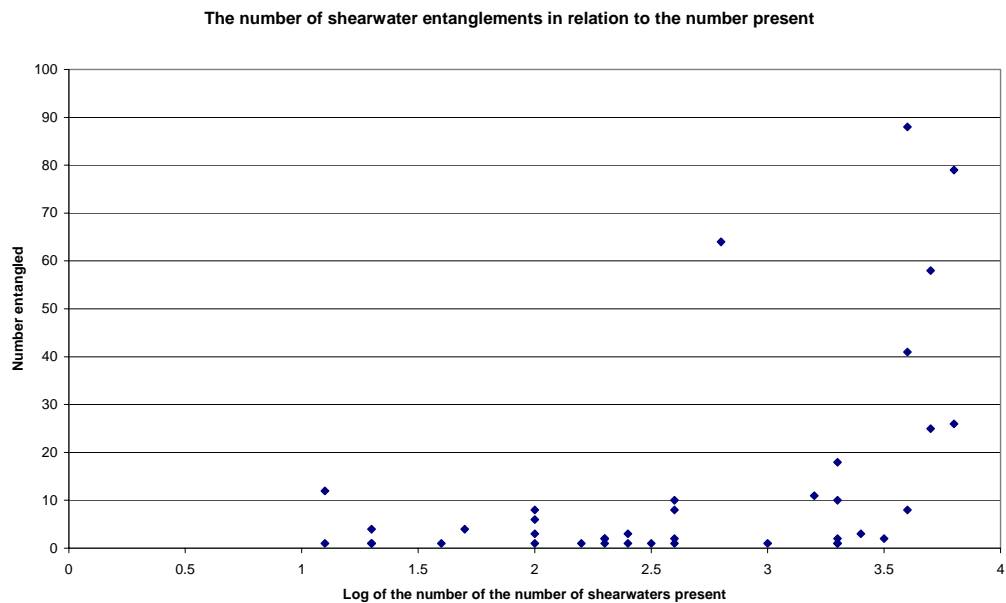
The number of Shearwaters present around fishing operations increased over the observer period peaking in the first half of April and then declining. This peak lagged the peak in the number of shearwaters counted in King George Sound perhaps indicating that the Shearwaters became progressively more entrained on the fishing operations. The number of shearwaters interacting with the fleet remained high during the latter half of April after the observer period. It is noteworthy that the relative number of shearwaters present at the end of each pause was usually lower than in the succeeding days. This may suggest that the pauses caused some short term dispersal of foraging breeders from King George Sound although in the absence of the satellite tracking data it is difficult to be conclusive.

It is now evident that the concentration of Shearwaters in King George Sound from February onwards occurs naturally and is independent of the operations of the fishing fleet. Any period of relief provided by the pauses was clearly not sufficient to produce the desired reduction in interactions.

Figure 2 below shows the trends in Shearwater numbers over the observer period.



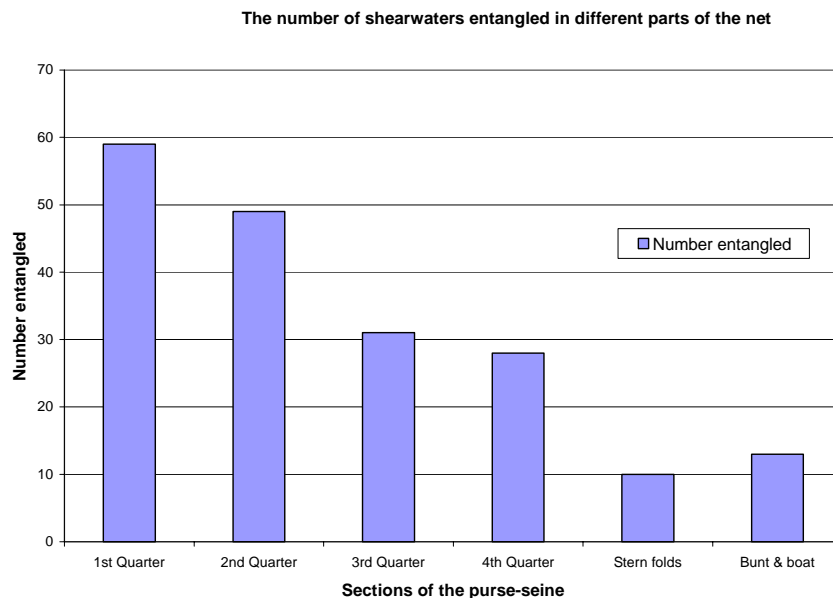
The number of Shearwaters entangled per shot during the observer period was related to the number of shearwaters (on a logarithm scale) present around the vessel when the net was pursued (Figure 3). The risk of causing large mortalities was therefore greatest from mid March to mid April when numbers were an order of magnitude higher than earlier in the season. That said, some shearwaters were entangled with flock sizes as low as 50. Other records for this season show that mortalities occurred as early as December and continued into the second half of April.



The time and location of entanglements was recorded by dividing the surface of the net into quarters, the stern folds and the final bunt. Vertically entanglements were assigned to the top, middle and bottom thirds (see diagrams at Appendix 1).

Most shearwaters were entangled or pocketed in the first quarter, followed by the second, third and fourth quarters (Figure 4). Smaller numbers still were captured in the stern folds or between the bunt and boat after the purse seine had been retrieved.

Figure 4

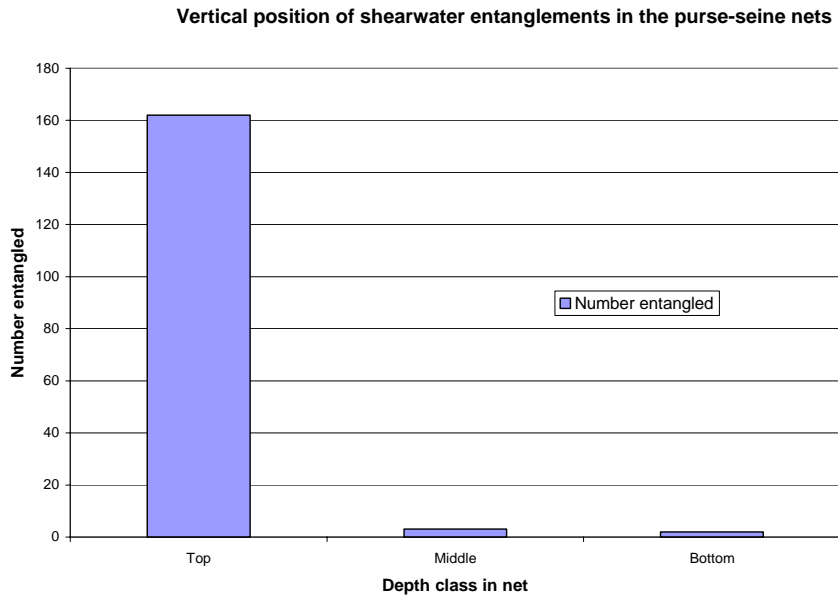


The Shearwaters are attracted to the bait ball, when visible, and to the “stickers” gill-meshed in the net in the area being lifted near the stern (hauling block) during hauling. The higher number of entanglements in the first quarter appears to be related to fish being visible and to the particularly loose folds or shelves in the net in this area. As the net is retrieved it becomes progressively tighter reducing the folds and the number of entanglements. Later on in the haul the shearwaters try to get at the bunted fish by diving under the stern folds or under the boat, leading to their entrapment under these layers of net or under the bunt.

Almost all shearwaters were trapped in the top third of the net, probably under a bulge or shelf that usually develops below the float-line (Figure 5). Shearwaters are very buoyant and tend to bob vertically towards the surface after catching a fish or reaching their respiratory limit. As a consequence they will tend to get caught under any over-arching net.

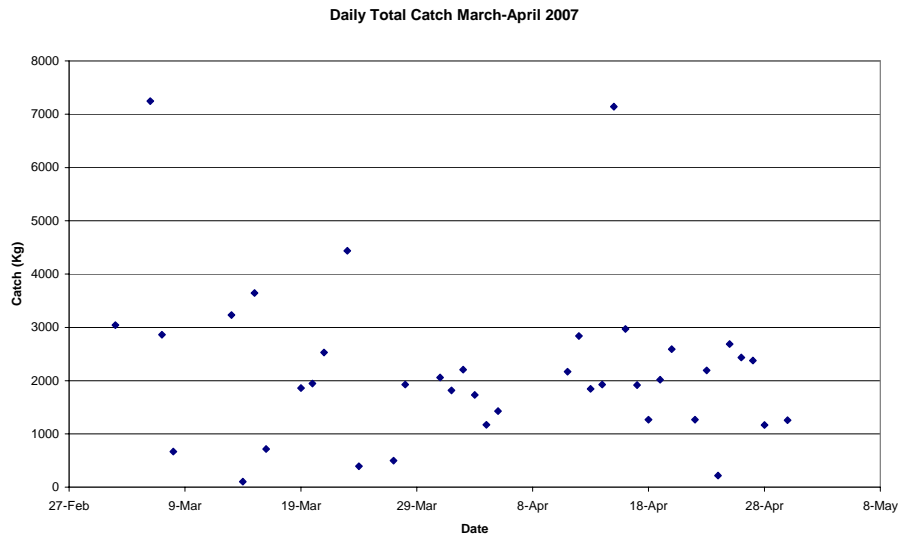
The extent net shelves could, amongst other things, be related in some way to net length and depth, water depth or a combination of these factors. However the analysis of the observer data did not reveal any such relationships.

Figure 5



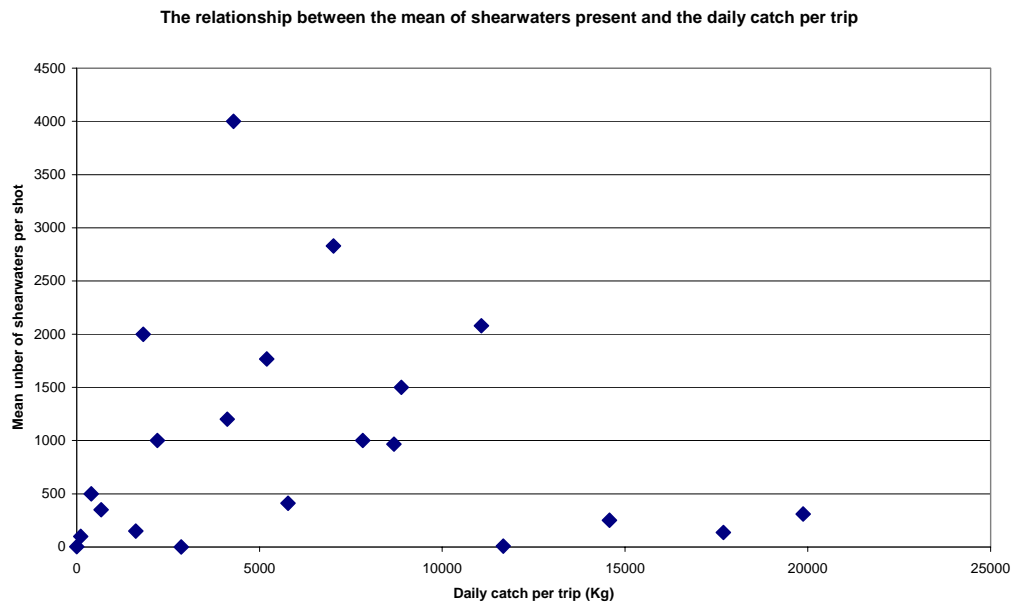
The number of Fleshy-footed Shearwaters associated with fishing operations in King George Sound increased dramatically between mid March and mid-April and probably remained high until the end of April (i.e. the migration begins in early May). This spike could be the result of increased pilchard abundance in the Sound at this time or be a consequence of increased provisioning demands at this stage in the breeding cycle, or both. The fishery data doesn't shed any light on this as catch and effort (trips, vessels fishing) increase together over the period. The catch per trip does not increase across the season presumably because it is limited by vessel storage capacity and directed by demand from the processors (Figure 6).

Figure 6



Similarly the number of shearwaters around fishing operations is not correlated with the mean catch per trip per day over the March / April period (Figure 7). The presence of the shearwaters in large numbers in King George Sound at this time may well be an indicator of local pilchard availability but pilchard abundance cannot be inferred from purse-seine catch per unit effort data.

Figure 7



IMPLICATIONS OF THE 2006 / 07 PROTECTED SPECIES BYCATCH PROGRAM

Proposed Activities

It was proposed that protected species by-catch record sheets would be submitted by fishers along with quota returns after each landing. With the exception of one vessel in the second half of April no such records appear to have been collected. There may be by-catch data for this season on the CAES returns but these are not available yet.

The satellite tracking project did not commence in the March / April period 2007 because it proved impossible to get University animal ethics approval between the time funding was approved in late September and the project start time in late February 2007. The transmitters are still available for the coming season.

The voluntary diurnal closures and fishing pauses for Zone 1 in the March / April 2007 season met with compliance.

The observer program was completed successfully and the research program is ongoing.

Protected Species By-catch Capture & Mortality Rates

During the 6 week observer period 512 shearwaters were recorded entangled in Purse-seine nets in the fishery with a mortality rate of around 10%. If the rate on unobserved trips over the same period was similar a further 170 entanglements would be expected leading to an overall mortality of about 68 shearwaters.

Some mortality occurred early in the season of which we can account for about 30 handed-in corpses but likely an under-estimate. Another 50 birds (by-catch return sheets and reported wash-ups) were known casualties during the second half of April, again almost certainly a significant under-estimate. Overall 148 mortalities were recorded. A realistic estimate of shearwater mortality over this season, with the by-catch mitigation measures in place, would probably be 200 – 300 individuals. This assumes that the morbidity rate in released individuals was negligible.

There is no baseline data for any period preceding the introduction of the 2006/07 by-catch mitigation measures. However it is highly likely that the dawn closure period together with reduced number of fishing days (with some disruption effect) reduced the take possibly from over a thousand to several hundreds.

CONCLUSION

The results of the by-catch research and mitigation through 2006 / 07 provide suggest that different strategies to prevent shearwater by-catch will be necessary in 2007/08. A number of options for future actions can be identified.

- Demonstrate (through a long term population study and modelling) that a fishery imposed mortality of 200-300 individuals in King George Sound would not reduce the size of the shearwater colonies on Breaksea & Michaelmas Islands. **NB. Mortality may still be considered unacceptable for social and animal welfare reasons.**
- Change net or haulage design to remove if practicable the sub-surface fold or shelf beneath the float line.
- Change to night fishing during all of March and April with intensive observer coverage to determine outcomes. Also monitor any resulting changes in foraging behaviour in breeding shearwaters using satellite tracking.
- Trial day fishing using a water-cannon deterrent and 3 crew.