

PROTECTED SPECIES BYCATCH IN ZONE 1 OF THE SOUTH COAST PURSE-SEINE FISHERY 2007 / 08

INTRODUCTION

The South Coast Purse Seine protected species bycatch mitigation program which commenced with an Honours project in 2006 completed its second observer season in March / April 2008. The project remains focused on reducing the incidental mortality of Fleshy-footed Shearwaters *Puffinus carneipes* in Zone 1 of the fishery, but also monitors other potential protected species interactions (eg. with dolphins).

During the 2006 /07 season the fishery undertook a range of voluntary measures to monitor and mitigate shearwater bycatch during fishing operations between 1 March and 15 April, which from earlier work was thought to encompass the high risk period. These measures included the submission of by-catch report forms (which was not implemented in this season), diurnal closures for the two hours after sunrise, an observer program, three 4 day fishing pauses, satellite tracking (not implemented in this season) and a research project using shark oil as a potential deterrent.

It was estimated that under this program achieved a reduction in the probable annual shearwater mortality from perhaps 900-1000 to 200-300 individuals (Dunlop 2007). After considering the results of the 2006 /07 the program was revised in an attempt to further reduce shearwater mortality in the fishing operations. In this program the period for monitoring / mitigation measures was extended to include all of April, bycatch reporting from vessels was implemented and the dawn closure was retained. The fishing pauses and the ban on night fishing were removed.

In 2008 all vessels fishing during daylight hours between 1 March and 30 April were required to have three crew members (including the skipper) and to utilize the extra hand to either tow-off the net with the dinghy to maintain net tension or to train a constant water spray over the lifted stern third of the net during hauling. Five satellite transmitters were attached to Shearwaters captured either on Breaksea Island (3) or during fishing operations (2).

Two observers were engaged to record the outcomes of fishing operations during the monitoring / mitigation period.

BYCATCH RECORDING & OBSERVER COVERAGE

This year the vessel-based bycatch reporting record sheets were made available and were utilized in the fishery. Access was also provided to individual quota record (catch record) sheets that allowed cross referencing to estimate reporting compliance. Some vessels do not appear to have submitted catch reporting sheets but did submit bycatch reporting sheets for those trips. Some vessels with observers on board did not put in bycatch record sheets but these were considered as compliant. The cross-checking indicates that 89.1% of fishing trips presented bycatch record sheets (and /or observer logs). One vessel did at

least 12 trips without reporting on any. Another vessel made 27 trips and failed to report on 7 (26 %) of them. There was only minor non-reporting in the rest of the fleet. Seven (7), of the nine vessels, carried observers on at least some trips. Coverage in complying vessels ranged from 9 to 43 % observed trips. A proportion of trips involved multiple shots. The vessel that failed to report also neglected to carry observers.

The catch and bycatch record sheets indicate that there were 264 fishing trips in this fishery between 1 March & 30 April of which 64 (24.2%) were observed. The number of trips undertaken last year was probably under-estimated due to the non-vessel specific catch record data made available. Noel Chambers of DoF has indicated that there were 161 trips in 2007. Forty-eight trips were observed in this season giving an observer rate of 29.8 %, slightly higher than 2008. The relative reduction in coverage is the result of a 31% increase in effort in 2008.

Fishers reported a shearwater entanglement rate of 1.54 / trip compared to 6.17 / trip by observers a difference which is statistically significant ($\text{Chi}^2 = 900, p < 0.001$). For mortalities, the comparative rates were 0.29 / trip for fishers and 0.84 / trip for observers and this was again statistically significant ($\text{Chi}^2 = 53.36, P < 0.001$). The requirement to retain the corpses will have increased the reporting of mortalities compared to capture-release interactions but these reports were nevertheless at variance to those of the observers. These results do not necessarily imply that fishers are deliberately under-reporting. Fishers are intensively occupied in net recovery and catch management and are therefore not able to systematically observe and record all interactions.

SHEARWATER INTERACTIONS

1. Entanglement & mortality rates

The Table below summarizes comparative measures of shearwater interactions between the 2007 / 2008 seasons.

Season	No. of observed trips	Number entangled	Entanglement Rate (% birds / trip)	Number of mortalities	Mortality rate (% birds / trip)	% mortalities per entanglement
2006/07	48	512	10.66	54	1.12	10.5
2007/08	64	395	6.17	54	0.84	13.6

NB. Entanglements includes live release plus mortalities.

These results indicate a 4% reduction in entanglements but the drop in the mortality rate was less than 1%. This appears to be related to an increase in mortalities per entanglement of 3.1%. The 3 crew –tow off strategy has apparently reduced overall mortality per trip by preventing some entanglements but has certainly not improved the survivorship of shearwaters that are caught.

The overall mortality for the fleet in March / April 2008 was calculated as the

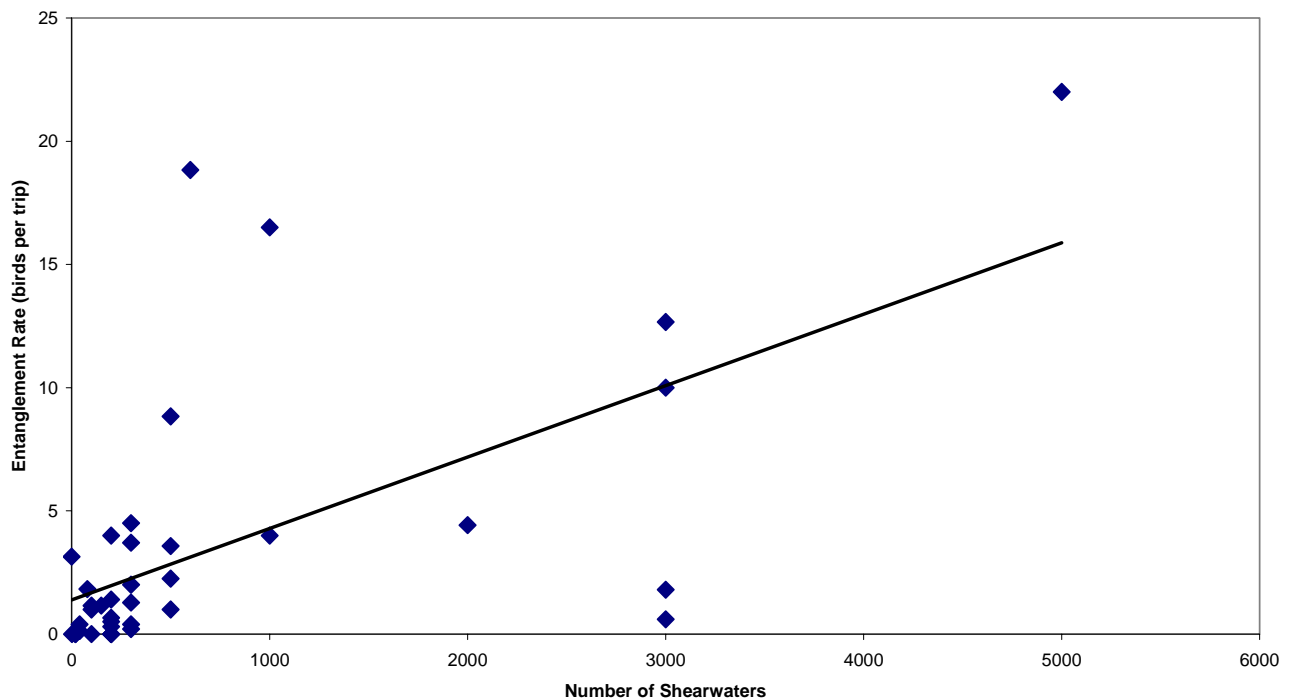
(observed mortality) + (reported mortality • under-reporting factor of 2.89) + (non-reported • observed mortality rate of 0.84 / trip).

The 2008 shearwater mortality was estimated at 203 individuals. This was at the lower end of the range of the less reliable estimate of 200-300 individuals for the same period in 2007. Despite the reduced mortality rate per trip in 2008 there was not a detectable reduction in overall mortality due probably to a significant increase in fishing effort.

Nearly all the shots observed or reported elected to use the tow-off technique in an attempt to prevent folds developing in the net. Too few fishers chose to exercise the night fishing or water spray techniques and as such there is insufficient data to test the relative effectiveness of the proposed mitigation options. This year's outcomes are effectively the result of three-crew, daylight fishing and using the tow-off method.

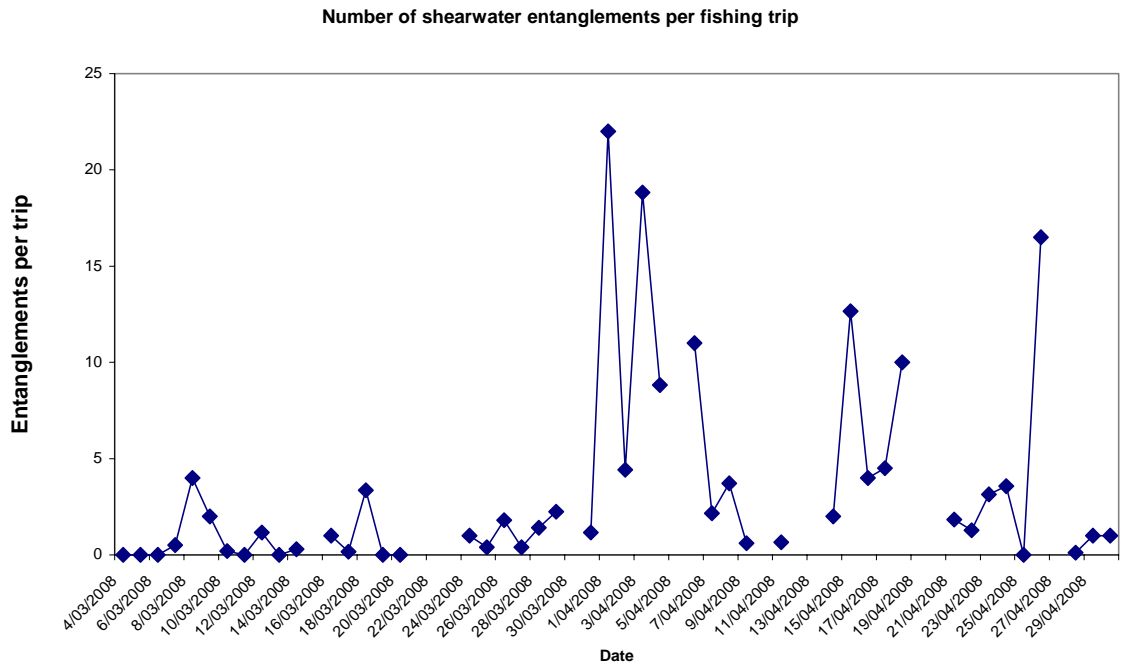
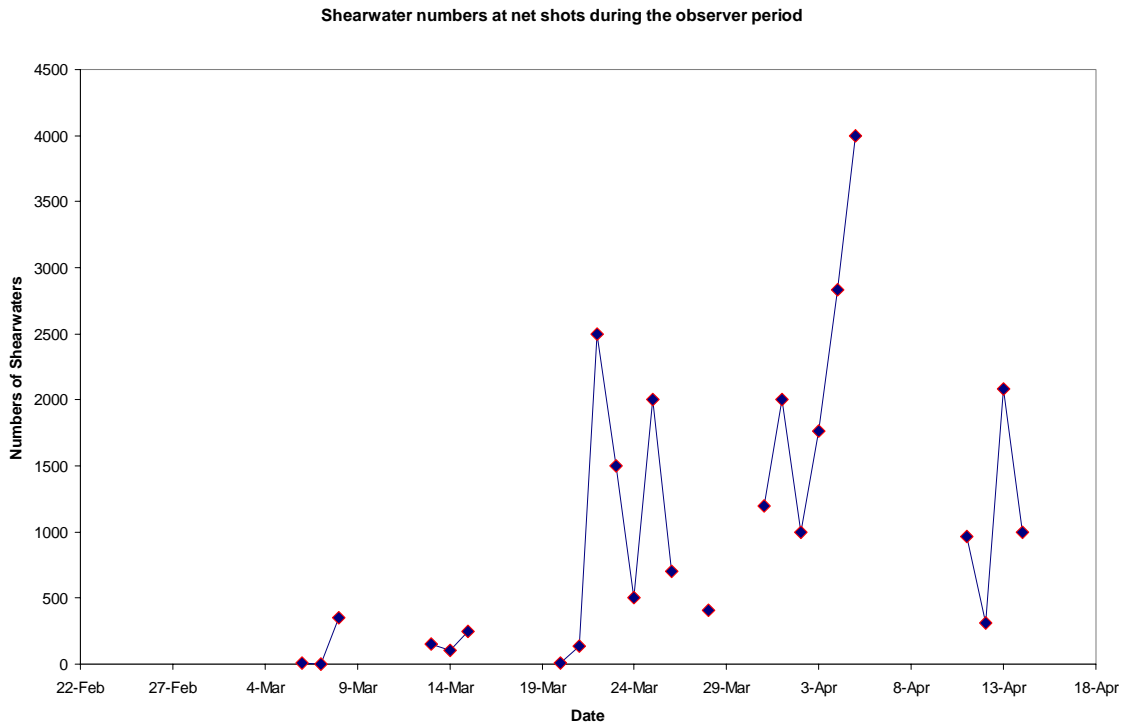
The Figure below shows that, as in the previous season, the risk of shearwater entanglement was correlated with the number of shearwaters present around the fishing operations at purse closure ($R^2=0.610$, $p<0.01$). Thus understanding the temporal pattern of foraging shearwater abundance in King George Sound is an important element in developing the mitigation strategy.

The relationship between the number of shearwaters and the entanglement rate per trip



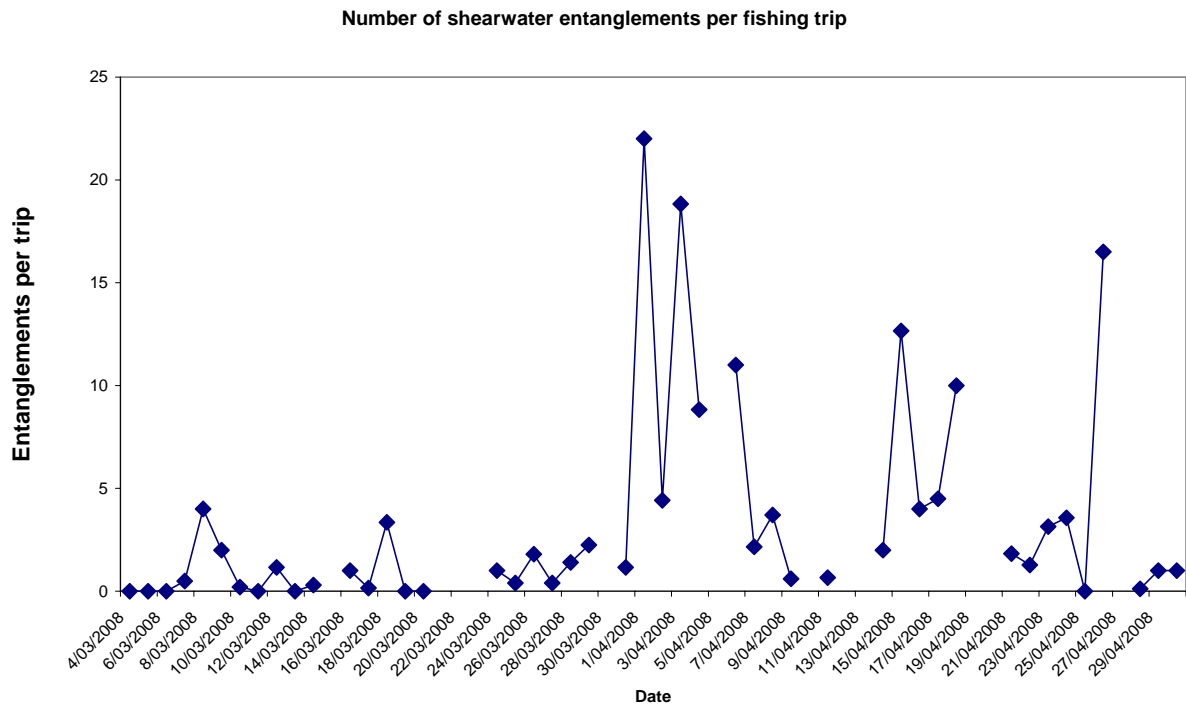
2. Temporal patterns in shearwater interactions

The temporal pattern of Shearwater abundance around purse-seining operations in King George Sound was fairly consistent between the March – April period of 2007 and 2008. The figure below shows the temporal pattern in both seasons based on the observer data.



Previous investigations have indicated that shearwater interactions with the fishing operations start to increase post hatching in early February and become significant in March. However the numbers around the vessels in early to mid-March are relatively low compared with the spikes in abundance that occur in late March and most of April. The largest peak occurred at the beginning of April in both seasons. The spikes in shearwater abundance produce most of the entanglements and mortalities and gaining information that may help predict them would improve the bycatch mitigation strategy.

The plotting of the temporal pattern was refined this year with a more continuous coverage obtained by combining the observer and vessel records of shearwater entanglements per fishing trip (Figure below). The entanglement data mirror the temporal pattern observed in shearwater abundance (with the exception on one spike in late April), i.e. most of the entanglements occurred when the birds were present in high densities. However some entanglements did occur during relatively low shearwater abundance periods in early to mid-March.



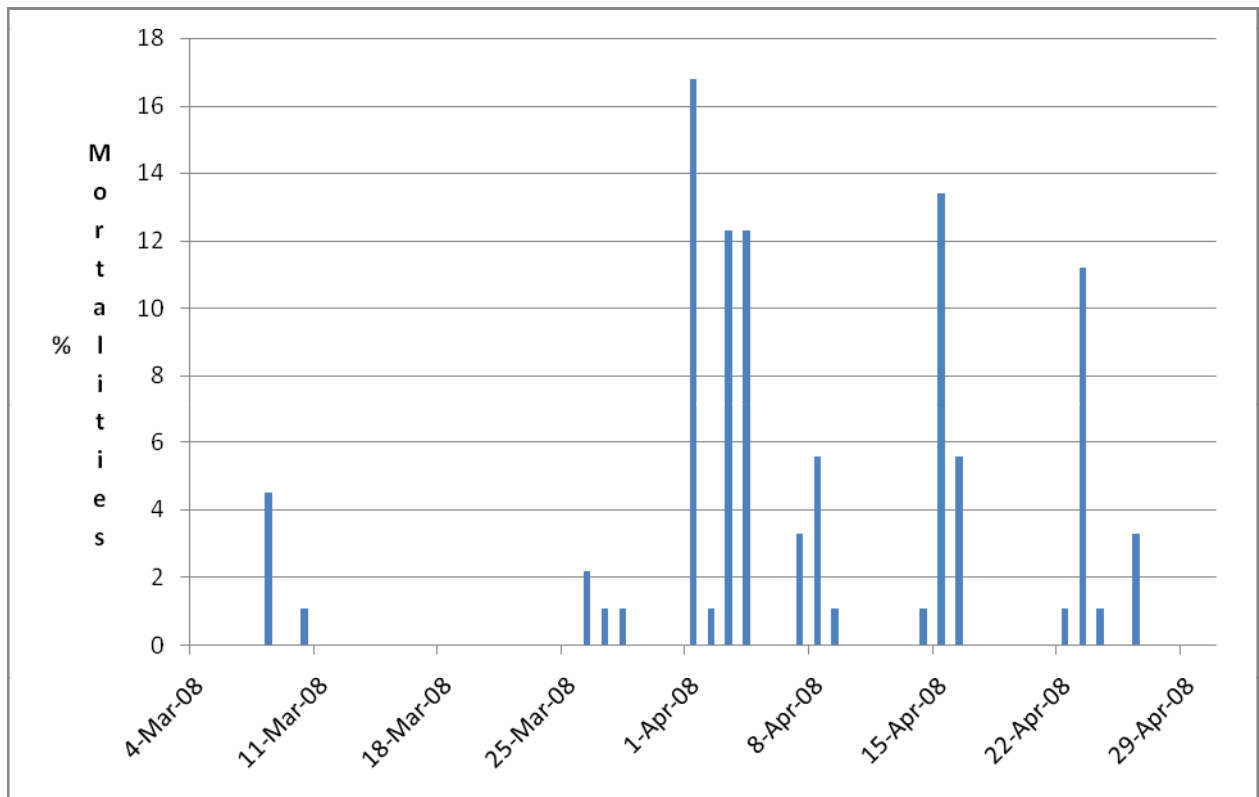
In undertaking this analysis the investigators have explored possible correlations with the passage of cold fronts, wind-speed and lunar cycles. No relationships have been detected with these variables. The spikes in shearwater abundance and related interactions occur with a fairly regular periodicity of around 10-15 days at this may reflect the rhythm of nest changeovers entrained from a reasonably synchronous time of hatching. Increasing food requirements as the chicks grow may explain the build-up in interactions from hatching in early February, to increasing chick size in March and then April with some decline in provisioning rates close to fledging in late April. The 10-15 day periodicity would reflect a bi-modal foraging pattern (identified in a number of shearwater species / populations) where one parent forages locally for an extended period feeding the chick nearly every night whilst the other parent forages for itself at productive areas further

afield. The spikes in our temporal pattern may reflect the mean return dates of the off-duty component of the population with an increasing interactions with the fishing fleet resulting from the release of starving on-duty individuals, i.e. not only are there more birds present but they are particularly hungry. Observers have noted marked differences in the intensity of competitive foraging interactions in flocks of similar density around the fishing operations. Unfortunately the satellite tracking data could not confirm a complete bi-model foraging cycle but time away and distances traveled by tracked birds suggest that this pattern may exist (Chris Powell pers.com).

3. Further mitigation of bycatch

Progress in further reducing shearwater bycatch from 2006 / 07 levels have been limited. On a per vessel basis the entanglements / mortalities per trip have shown a modest reduction using the 2007 /08 prescription. However this appears to have been more than offset by an increase in overall effort, a trend that is likely to continue as the stock rebuilds from the Herpes virus fish kills of the 1990s.

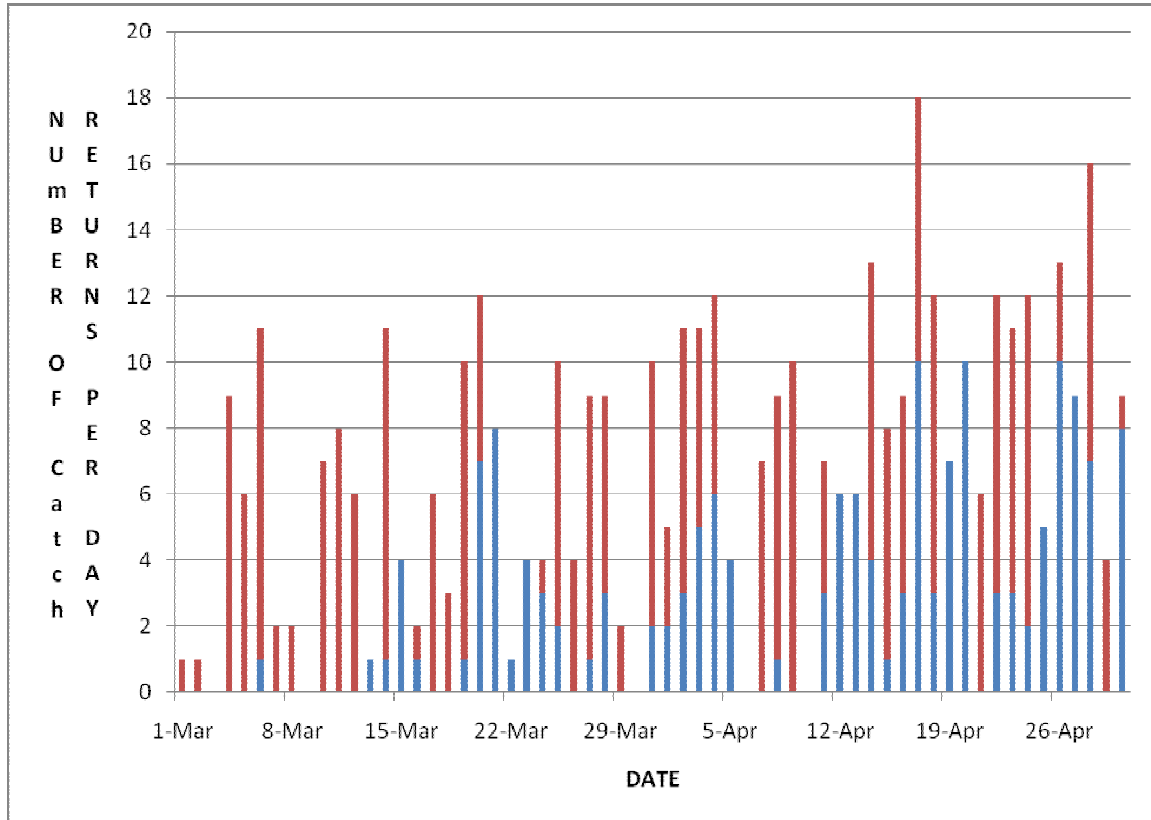
One opportunity lies in the introduction of a closure in early April, a period of consistently high shearwater abundance, interaction and mortality. The Figure below shows the seasonal distribution of shearwater mortalities in March and April 2008.



Fifty-seven (57) percent of the mortalities occurred in this consistently problematic period between from 1-10 April. Overall 89 % of mortalities occurred in April and the

remainder in two periods during March. Closure of the period between 1 and 10 April inclusive should remove over half the residual mortality in one measure.

The Figure below shows the number of fishing trips per day over the March / April period in 2007 (blue) and 2008 (red).



There is more effort in late March and April compared to early March. Mid to late April is particularly active. Thus the period in early April doesn't coincide with a peak period in fishing activity, at least in these years. However the investigator has been advised that all of April is important because of the size and quality of the fish available at this time (earning perhaps 35-40 % of the income from purse-seining). Nevertheless an early April closure could be considered for the ongoing mitigation strategy.

4. The current state of play

There is probably not much more we can learn from observer programs in the absence of new mitigation techniques. Observers cannot be used as instruments for compliance monitoring in a minor fishery in the longer term. It is therefore time for the fishery to take full responsibility for bycatch reporting and for managing the mitigation strategy and compliance.

At this stage the fishery cannot identify any additional mitigation strategies that could be employed other than further diurnal closure periods. In the absence of longer term data on

the inter-annual variations in the apparently periodic spikes in interactions the fishery is reluctant to introduce further temporal closures. Research is needed to identify the ecological / behavioural drivers producing these spikes to refine their prediction. Whilst the fishery is unable to fund research programs it is hoped resources will be found elsewhere to investigate the observed temporal pattern in interactions.

The impact on the shearwater meta-population of an annual mortality of *circa* 200 birds in King George Sound is unknown, although the circumstantial evidence would suggest that it is sustainable. A mass banding project at the colonies around Albany is suggested as a way of estimating colony-specific mortality rates – given that the fishers are required to collect and return all birds drowned during fishing operations. Although such a project could utilize trained volunteers it would still require paid coordination and logistical support. Resources for such a project are not currently available.

The South Coast Purse-seine Fishery's bycatch reduction performance will need to be auditable by both Commonwealth Department of Environment & Water and State DoF and DEC regulators in the coming years. Mechanisms for this have been suggested to the State Departments.

The 2008 data suggest that one vessel was not complying in any way with the voluntary bycatch mitigation program and at least one other is significantly under-performing. Added to that the WA Fisheries legislation does not provide directly for regulations related to non-fish (protected species), such as bycatch limits, and the WA Wildlife Conservation Act (1950) cannot (or will not) be utilized to authorize the take of protected fauna by fisheries operations. These legislative issues present significant challenges for the effective long-term regulation of protected species bycatch in State managed fisheries within State waters.

Reference

Dunlop, J.N. (2007). Protected species bycatch in zone 1 of the South Coast Purse Seine Fishery 2006 /07. Unpublished report for the SCPS Bycatch Working Group.