Operational interactions between the South Australian Sardine Fishery and Common Dolphins in 2006/07: assessing the effectiveness of the industry Code of Practice

D.J. Hamer, and T.M. Ward.

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Operational interactions between the South Australian Sardine Fishery and Common Dolphins in 2006/07: assessing the effectiveness of the industry Code of Practice

South Australian Research and Development Institute (SARDI)
Aquatic Sciences Division
2 Hamra Avenue
West Beach
South Australia 5024

Telephone: (08) 8207 5400
Faxsimile: (08) 8207 5406
Email: http://www.sardi.sa.gov.au

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Authors: Derek J. Hamer, and Dr Timothy M. Ward.

Reviewers: Dr Simon D. Goldsworthy and Paul. J. Rogers

Approved by: Dr Qifeng Ye

Signed:

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EXECUTIVE SUMMARY

1. This report summarises the operational interactions of the South Australian Sardine Fishery (SASF) with common dolphins (*Delphinus delphis*) in 2006-07.

2. The objectives of this study were to: i) determine the rate and nature of interactions in 2006-07 based on observer and logbook data and compare these with rates recorded in 2004-05 and 2005-06; ii) measure the effectiveness of the seven guidelines of the industry Code of Practice; and iii) identify options for improving the effectiveness of the CoP.

3. Observers spent 68 nights at sea in 2006-07 and observed 88 of the 801 net-sets (11.0% coverage). A total of 58 common dolphins were encircled (0.6591 per net-set) in 14 encirclement events. Seven dolphins died (0.0795 per net-set) in four mortality events.

4. Logbook data for the entire fishery during 2006-07 recorded that 101 common dolphins were encircled (0.1261 per net-set) in 43 encirclement events and that 10 died (0.0125 per net-set) in five mortality events.

5. The interactions rates in 2006-07 were significantly higher than in 2005-06, with the encirclement rate increasing by a factor of 2.93 from 0.2247 to 0.6591 dolphins per net-set and the mortality rate increasing by a factor of 7.10 from 0.0112 to 0.0795 dolphins per net-set.

6. The encirclement rate calculated from observer data during 2006-07 was 5.23 times higher than the rate calculated from logbook records. Similarly, the observed mortality rate was 6.36 times higher than the rate calculated from logbooks.

7. In 2006-07, 57.4% (58) of the 101 dolphin encirclements and 70.0% (7) of the 10 mortalities recorded in logbooks occurred when an observer was aboard a vessel, even though observers only monitored 11.0% of all net-sets.

8. The percentage of encircled dolphins that subsequently died increased from 5.2% in 2005-06 to 12.1% in 2006-07.

9. Encirclements were avoided 85.4% of the time when crews searched for dolphins prior to shooting the net and 89.5% of the time when fishing was delayed or relocated in response to the presence of dolphins.

10. Release procedures were successful on 71.4% of occasions when they were undertaken as soon as possible, 100% of the occasions when the TEPS gate was opened, 71.4% of occasions when there was sufficient time for encircled animals to escape and 100% of the time that encircled animals were physically removed. Dolphins were successfully released alive on 83.3% of the occasions that the net-set was aborted.

11. Several apparent limitations were identified in the current CoP. Adjustments that may be required to increase the effectiveness of the CoP include: i) stipulating the minimum level of searching effort prior to the commencement of fishing; ii) indicating that release procedures should be implemented as soon an encircled dolphin is detected and that fishing cannot proceed until dolphins are released successfully; iii) requiring fishers to abort a fishing operation if the encircled dolphin(s) have not been released within a specified period of time after the beginning of the net-set or as soon as the encircled dolphins begin to exhibit ‘passive behaviour’.

12. The results of this study highlight the need for induction and ongoing training of all SASF participants in the application of the CoP. This could be done by appropriately trained observers during their frequent interactions with fishers. There is also a need to introduce measures to ensure that operational interactions of the SASF with common dolphins are reported accurately in logbooks.
ACKNOWLEDGEMENTS

We sincerely thank the following organisations and individuals for their assistance with this study: licence holders, skippers and crews of the South Australian Sardine Fishery (SASF) who provided access to vessels and volunteered information; Craig Noell (SASF Manager – PIRSA Fisheries) for providing assistance and advice; Protec Marine Pty. Ltd. for providing observers and collecting data; and Simon Goldsworthy and Paul Rogers (SARDI Aquatic Sciences) for reviewing a draft of the report. The report was approved for release by Dr Qifeng Ye.
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1. INTRODUCTION

1.1 Background

Recommendations by the Commonwealth Department of the Environment and Water Resources (DEWR) relating to operational interactions of the South Australian Sardine Fishery (SASF) with threatened, endangered and protected species (TEPS) provided the impetus for this study (DEWR, 2004). These recommendations were made in response to an ecological assessment of the South Australian Sardine Fisheries, pursuant to Part 10 of the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act; Shanks, 2004). The ongoing operation of all commercial fisheries in Australia is now contingent on satisfactorily addressing DEWR recommendations in order to receive exemptions to harvest and conduct trade in native species (Part 13, EPBC Act).

A report by Hamer et al. (2007) documented the effectiveness of the industry Code of Practice (CoP) in mitigating interactions of the SASF with TEPS, especially common dolphins (*Delphinus delphis*). The CoP comprises seven guidelines that include a combination of dolphin avoidance measures and release procedures (SAPFA, 2005; Hamer et al., 2007). There were significant declines in rates of encirclement (87%) and mortality (97%) following the introduction of the CoP. There were also reductions in the time that fishers took to respond to encirclements (88%) and the number of encircled dolphins that subsequently died (76%).

1.2 Focus of this study

This is the second report to PIRSA Fisheries on the operational interactions of the SASF with common dolphins. This report is based on observer and logbook data collected from July 2006 to June 2007, but also uses data presented in the report by Hamer et al. (2007). The report includes an assessment of the effectiveness of the industry CoP in mitigating interactions of the SASF with common dolphins.

The objectives of this study were:

i. to quantify the rates and describe the patterns of dolphin encirclement and mortality from observer and logbook data collected during 2006-07 and compare these results with those from 2004-05 and 2005-06;

ii. to measure the effectiveness of the seven guidelines of the CoP in mitigating the rates of encirclement and mortality of dolphins; and

iii. to identify options for improving the effectiveness of the CoP and reducing future operational interactions with common dolphins.
Figure 1. Location of the study and important sites mentioned in the text.
2. METHODS

2.1 Data collection

Results and summaries of the rates of encirclements and mortalities during the 2004-05 and 2005-06 periods were obtained from Hamer et al. (2007). Observers supplied by Protec Marine Pty. Ltd. monitored fishing activity on SASF licensed purse-seiners during 2006-07 under a contract with Primary Industries and Resources South Australia (PIRSA) Fisheries Division that required a minimum of 10% coverage. Observer and logbook data was supplied to the South Australian Research and Development Institute (SARDI) for analysis and reporting. All vessels carried observers during 2006-07 program and there was an attempt to distribute observer effort evenly among vessels.

Data were collected in a similar manner to that described in Hamer et al. (2007). Fishing activities were monitored from a high, unobstructed vantage point such as the wheelhouse, wheelhouse roof or bow, depending on the vessel and prevailing weather conditions. Observers searched for dolphins in the illuminated areas around the vessel, immediately prior to shooting the net and within the circumference of the corkline during fishing operations. The distance of observations was typically restricted to within the range of the floodlights on the vessel (<100 metres), although binoculars were sometimes used during calm and moonlit periods.

The performance of the CoP during 2006-07 was assessed against the CoP guidelines. A flowchart summarizing these guidelines was distributed to all licence holders, fishers and observers between September and October 2005 (Figure 2). The primary purpose of the flowchart was to i) guide fishers during operational interactions with dolphins and ii) provide a basis for observers to assess the effectiveness of the CoP. Observers recorded several other parameters associated with operational interactions with dolphins, including:

i. date and location of operational interactions;
ii. presence and number of dolphins prior to commencement of fishing;
iii. success rate of avoidance measures and release procedures;
iv. number of dolphins that became encircled or died during fishing; and
v. response time during encirclements.

2.2 Data analysis

Rates of encirclement and mortality for 2006-07 were calculated and compared with results from 2004-05 and 2005-06. One-tailed Student’s t-tests were used to determine if there was a significant increase in the number of encirclement and mortalities recorded by observers in 2006-
07 compared with 2005-06. The power analysis model developed by Hamer et al. (2007) was used to determine the number of observations required to detect changes in encirclements or mortalities of a given magnitude with at least 95% confidence (Figure 3). The percentage of encircled dolphins that subsequently died during 2006-07 was also calculated and compared with results from 2004-05 and 2005-06.

Monthly distribution of observer and fishing effort, and the total number of encirclements and mortalities recorded by observers and in logbooks in 2006-07 were compared with data from 2004-05 and 2005-06. Linear regressions were used to determine if there was a relationship between the observed level of fishing effort and number of encirclements in each month during 2006-07. Similarly, linear regression was used to determine if there was a relationship between fishing effort and the number of encirclements in logbook data.

Effort data from logbooks were recorded in 5 x 5 km grid squares. Observer effort, plus the location of encirclement and mortality events were overlayed as points. Linear regression was used to determine if there was a relationship between the level of fishing effort and the number of encircled dolphins in a grid square.

2.3 CoP assessment

Observers monitored the occurrence and nature of dolphin avoidance measures (Guidelines 1 and 2) and release process (Guidelines 3 to 7) during 2006-07. The success with which each guideline was followed was calculated as a percentage of the total number of observations. Specific actions used by fishers to release encircled dolphins were also monitored and their success rates were expressed as a percentage and compared with 2004-05 and 2005-06.

The average time taken for the fisher to respond once an encircled dolphin had been detected was calculated. A two-tailed t-test was used to determine if there was a significant change in response time between 2005-06 and 2006-07. A t-test was also used to determine if response times during successful releases differed from those where one or more dolphins had died.
Figure 2. Flow diagram depicting scenarios associated with operational interactions of the SASF with TEPS, particularly common dolphins.
Figure 3. Power analysis indicating (a) the number of observed net-sets required to reliably detect various increases in encirclement and mortality rates and (b) the statistical power to detect various changes. Internationally accepted standards of power ($\Phi = 80\%$) and significance ($\alpha = 0.05$) were used in the model.
3. RESULTS

3.1 2006-07 program

Observer data

The 2006-07 observer program was conducted between 3 July 2006 and 25 June 2007. Observers spent 68 nights at sea and recorded information during 88 net-sets (Table 1). Observations were made from all vessels in the SASF fleet, although the number of observations varied among vessels. Mean observer coverage was 11.0% of overall fishing effort (Figure 4).

Observers recorded a total of 58 encircled common dolphins (Delphinus delphis) and 7 subsequent mortalities (Table 1; Figure 5). No other dolphin species were observed. The overall encirclement and mortality rates were 0.6591 and 0.0795 animals per net-set, respectively. The percentage of encircled dolphins that subsequently died was 12.1%.

The number of observed dolphin encirclements and mortalities varied between months (Figure 6). Encirclements were observed in October and November 2006, February, April, May and June 2007, with most occurring in April 2007. Mortalities occurred in February, April and May 2007. There was no relationship between the number of fishing events observed and the number of encirclements observed per month during 2006-07 ($R^2 = 0.41; P = 0.06$).

Fishing effort was concentrated in southern Spencer Gulf between Thistle, Wedge and Spilsby Islands and Buffalo Reef (Figure 7). Less effort occurred between Spilsby Island and Arno Bay, around Althorpe Island, along north and southwest coasts of Kangaroo Island, around Greenly Island and in Coffin Bay. Fishing activities were observed in all these areas.

Most of the encircled dolphins recorded by observers in 2006-07 occurred where fishing effort was high (linear regression: $R^2 = 0.44, P < 0.01$), although some were also observed west and northwest of Spilsby Island and southeast of Althorpe Island, where minimal fishing activity occurred. All mortalities recorded by observers occurred in the region of highest fishing effort, near Dangerous Reef and southwest of Spilsby Island (Figure 7).

Logbook data

Logbook data indicated that 801 net-sets were conducted in 2006-07 (i.e. 9.1 times the number of net-sets recorded by observers) and that 101 encirclements and 10 mortalities occurred during this period (Table 1; Figure 5). The rates of encirclement (0.1261 dolphins per net-set) and mortality (0.0125 dolphins per net-set) calculated from observer data were 5.23 and 6.36 times higher, respectively, than the estimates calculated from logbook records. A total of 58 (57.4%) of the 101 encirclements and 14 (32.6%) of 43 encirclement events recorded in logbooks occurred
when an observer was aboard a vessel. Similarly, 7 (70.0%) of the 10 mortalities and 4 (80.0%) of
the 5 mortality events occurred when an observer was present. The rates of encirclement and
mortality recorded by observers were significantly higher than those recorded in logbooks
(encirclements, one-tail t-test: t = 2.88, P < 0.01; mortalities, one-tail t-test: t = 3.34, P < 0.01).
However, observers were only present for 11.0% of the net-sets undertaken by the fishery in
2006-07. Only one licence holder reported mortalities in the absence of an observer, during one
event when 3 dolphins died. The temporal patterns of encirclements from logbook data were
similar to those from observer data, with encirclements occurring across most months (Figure 8).

CoP assessment

Observer data collected during 2006-07 were assessed against the seven guidelines of the CoP
(Table 2). Dolphin avoidance measures were carried out each time that fishers considered fishing
activities to be imminent (i.e. when a target school of fish had been located). Encirclements were
avoided 85.4% of the time (n = 96) when crews searched for dolphins prior to shooting the net
(Guideline 1) and 89.5% of the time (n = 19) when fishing was delayed or relocated in response
to the presence of dolphins (Guideline 2).

Dolphin release procedures were carried out each time that encirclements occurred. Release
procedures were successful 71.4% of occasions (n = 14) that they were undertaken as soon as
possible (Guideline 3), 100% of the occasions (n = 4) that the TEPS gate was opened (Guideline
4), 71.4% of the occasions (n = 14) that there was sufficient time for encircled animals to escape
(Guideline 5) and 100% of the time (n = 2) that encircled animals were physically removed
(Guideline 6; Table 2). Dolphins were successfully released alive 83.3% of the occasions that the
net-set was aborted (Guideline 7; Table 2).

The success of several actions used by fishers to release dolphins has also been monitored since
the introduction of the CoP in 2005 (Figure 9). During 2006-07, passive actions such as ceasing
fishing activities to see if encircled dolphins would escape of their own accord were used on 3
occasions without success. Proactive dolphin release procedures were more successful, with the
use of corkline weights (n = 6), the TEPS gate (n = 4) and the TEPS cradle (n = 1) resulting in
the successful release of dolphins 100.0% of the time. Opening the front of the net (n = 10)
resulted in successful release of dolphins 87.0% of occasions.

The average response time during 2006-07 (i.e. the period that elapsed between when encircled
dolphins were detected and an action being taken) was 14.6 ± 3.4 minutes (n = 14) and ranged
from 0 to 45 minutes (Figure 10). The average response recorded during successful releases (12.1
± 5.3 minutes) was not significantly different to that recorded during unsuccessful releases (18.8
± 6.3 minutes, one-tail t-test: t = -0.81, P = 0.22).
3.2 Comparisons with 2004-05 and 2005-06 programs

Observer data

The previous observer programs conducted in 2004-05 and 2005-06 (before and after the introduction of the CoP, respectively) were each carried out over a seven month period between November and the following June. In general, trends in fishing effort during these months were consistent across the three comparable periods. The level of observer coverage was 11.0% (88/810) in 2006-07, 11.8% (89/753) in 2005-06 and 5.0% (49/973) in 2004-05 (Table 1).

The rates of interactions in 2006-07 were significantly higher than in 2005-06, with the encirclement rate increasing by a factor of 2.93 from 0.2247 to 0.6591 dolphins per net-set (three fold increase, one-tail t-test: t = 1.96, P = 0.03) and the mortality rate increased by a factor of 7.10 from 0.0112 to 0.0795 dolphins per net-set (one-tail t-test: t = 1.64, P = 0.05) in 2006-07 (Table 1; Figure 5). It should be noted however that encirclement and mortality rates recorded in 2006-07 remained significantly lower than those recorded in 2004-05 (encirclement: one-tail t-test: t = -2.13; P = 0.02; mortality: one-tail t-test: t = -2.32, P = 0.01), before the introduction of the CoP (Table 1, Figure 5). The percentage of encircled dolphins that subsequently died increased by a factor of 2.3 from 5.2% in 2005-06 to 12.1% in 2006-07.

Power analysis indicated that approximately 50 observations would have been required to detect the 193% increase in the encirclement rate that occurred between 2006-07 and 2005-06 with >95% confidence (Figure 3). Similarly, a minimum of approximately 18 observations would have been required to detect the 610% increase in the mortality rate that occurred between 2006-07 and 2005-06 with >95% confidence. Therefore, the number of net-sets observed during 2006-07 (88) was sufficiently large to detect the increases in encirclement and mortality rates since 2005-06 with a high degree of statistical confidence.

The average response time during 2006-07 (14.6 ± 3.4 minutes, n = 14) was not significantly different to the average response times recorded during 2005-06 (16.3 ± 4.3 minutes, n = 20, one-tail t-test: t = -0.21, P = 0.42).

Logbook data

The encirclement rate calculated from observer data in 2006-07 was 5.23 times higher than that calculated from observer data, whereas in 2005-06 observed rate of encirclement was only 1.73 times the logbook rate. Similarly, the mortality rate calculated from observer data in 2006-07 was 6.36 times higher than that calculated from observer data, compared with 1.70 times in 2005-06.
Table 1. Summary of the number of net-sets, encircled dolphins, encirclement events, mortality events and rates of encirclement, and mortality recorded by observers and in logbooks in the SASF during 2006-07. Data are compared with 2005-06 after the introduction of the CoP and 2004-05 before the introduction of the CoP. (In 2004-05 some observed interactions were not recorded in logbooks).

<table>
<thead>
<tr>
<th>Period</th>
<th># of records</th>
<th>Encirclements</th>
<th>Mortalities</th>
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<td></td>
<td># of records</td>
<td>total</td>
<td>events</td>
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<td>Independent Observer Programs</td>
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<td>58</td>
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<tr>
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<td>05 – 06</td>
<td>89</td>
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</tr>
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<td></td>
<td>04 – 05</td>
<td>49</td>
<td>87</td>
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<tr>
<td>Logbook records</td>
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<td>101</td>
</tr>
<tr>
<td></td>
<td>05 – 06</td>
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Table 2. Effectiveness of the individual guidelines in the industry CoP during the observer program in 2006-07.

<table>
<thead>
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<th>CoP Assessment</th>
<th>Guideline</th>
<th># records</th>
<th># successful</th>
<th>success (%)</th>
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<td><strong>Avoidance measures</strong></td>
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<td>1. Search</td>
<td>96</td>
<td>82</td>
<td>85.4</td>
</tr>
<tr>
<td></td>
<td>2. Delay / relocate</td>
<td>19</td>
<td>17</td>
<td>89.5</td>
</tr>
<tr>
<td></td>
<td><strong>Release procedures</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Commence ASAP</td>
<td>14</td>
<td>10</td>
<td>71.4</td>
</tr>
<tr>
<td></td>
<td>4. Open TEPS gate</td>
<td>4</td>
<td>4</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td>5. Sufficient escape time</td>
<td>14</td>
<td>10</td>
<td>71.4</td>
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<td></td>
<td>6. Remove animals</td>
<td>2</td>
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<td></td>
<td>7. Abort fishing</td>
<td>6</td>
<td>5</td>
<td>83.3</td>
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</tbody>
</table>


Figure 4. Fishing effort, observer effort and observer coverage during (a) 2006-07, (b) 2005-06 after the introduction of the CoP and (c) 2004-05 before the introduction of the CoP.
a. Encirclement rates

![Graph of encirclement rates]

- **Observer data**
- **Logbook data**

b. Mortality rates

![Graph of mortality rates]

**Figure 5.** Rates of (a) encirclement and (b) mortality recorded in observer and logbook data for 2006-07, compared with 2004-05 and 2005-06. Error bars = Standard Errors.
Figure 6. Observed fishing effort, encirclements and mortalities by month during (a) 2006-07, (b) 2005-06 after the introduction of the CoP and (c) 2004-05 before the introduction of the CoP.
Figure 7. Spatial distribution of fishing effort, location of observed activities and encirclement and mortality events during (a) 2006-07, (b) 2005-06 after the introduction of the CoP and (c) 2004-05 before the introduction of the CoP.
Figure 8. Logbook fishing effort, encircllements and mortalities by month during (a) 2006-07, (b) 2005-06 after the introduction of the CoP and (c) 2004-05 before the introduction of the CoP.
Success of interaction (%)

Figure 9. Success of avoidance and release procedures used during (a) 2006-07, (b) 2005-06 after the introduction of the CoP and (c) 2004-05 before the introduction of the CoP. Values above bars are number of observations, “_” denotes actions that are no longer permitted and “~” denotes actions that are considered to be a safety hazard.
Figure 10. Response time to encirclements and the incidence of subsequent mortality during (a) 2006-07, (b) 2005-06 after the introduction of the CoP and (c) 2004-05 before the introduction of the CoP.
4. DISCUSSION

4.1 Rates and patterns of dolphin encirclement and mortality

There were statistically significant increases in the rates of encirclement (2.93 times) and mortality (7.1 times) observed in 2006-07 compared to 2005-06. The power analysis showed that the number of net-sets observed during 2006-07 (n = 88) was sufficient to detect these increases in the rates of encirclement and mortality with a high degree of confidence. Encirclements occurred throughout the year (i.e. there was no seasonal pattern) and in areas of high fishing effort (there were no geographical hot-spots), negating the option of using temporal and spatial closures to reduce interactions with common dolphins. The findings of this study show that the CoP was less effective in mitigating interactions with common dolphins in 2006-07 compared to 2005-06, but that rates of interaction in 2006-07 remained below those recorded in 2004-05 before the CoP was introduced.

The discrepancy in the rates of encirclement and mortality recorded by observers and in logbooks increased in 2006-07 compared to 2005-06, but remained lower than the discrepancies recorded before the introduction of the CoP. Over half of the encirclements and more than 70% of the mortalities reported in logbooks by fishers during 2006-07 occurred while an observer was aboard the vessel, even though only about 11% of fishing activity was monitored. These discrepancies suggest that the logbook data do not currently provide a reliable measure of operational interactions of the SASF with common dolphins.

4.2 Effectiveness of the guidelines of the CoP

In general, all of the seven guidelines of the CoP were applied with a reasonable level of success. However, the success rate of individual guidelines ranged from 71.4% for commencing release procedures as soon as possible to 100% for both opening TEPS gates and physically removing dolphins (Table 2). As such, the contribution of the individual guidelines of the CoP to the observed rates of encirclement and mortality need to be considered separately.

Guideline 1 requires crewmembers to search for the presence of dolphins immediately prior to deploying the net. Observer data indicates that this guideline was followed on all occasions (n = 96, including 8 events where fishing did not ultimately occur) and prevented the encirclement of dolphins on 85.4% of occasions. However, several observers commented that the level of effort spent searching for dolphins prior to the commencement fishing varied and was sometimes minimal. Low levels of search effort would be likely to increase the probability that fishing will commence in the presence of undetected dolphins. The current CoP guidelines only require crewmembers to search for dolphins prior to each fishing event, but do not identify the level of effort needed. Furthermore, observers are only required to record whether or not crewmembers
searched for dolphins, but not the amount of effort that was expended (i.e. how many people searched and for how long).

Guideline 2 requires fishers to relocate if dolphins are detected near the vessel immediately prior to the commencement of fishing. Observer data indicates that this guideline was followed on all occasions when dolphins were located near the vessel \( (n = 19) \), and prevented the encirclement of dolphins on 89.5% of occasions. However, the level of searching effort expended prior to the commencement fishing is likely to be a major factor determining the success of Guideline 2.

Guideline 3 requires release procedures to be undertaken as soon as practicable after an encircled dolphin is detected. Observer data indicates that release procedures were implemented on every occasion that a dolphin(s) was encircled \( (n = 14) \) and that this action prevented mortalities on 71.4% of occasions. However, the period between the time that an encircled dolphin is detected and a release procedure is initiated does not reflect the total time that dolphins are encircled, which commences from the beginning of the net-set. This extended period during which encircled dolphins remain undetected is not accounted for in the current CoP and could contribute to the relatively high percentage of encircled dolphins that subsequently died in 2006-07 (12.1%).

Guideline 4 requires the TEPS gate to be opened to allow dolphins to escape from the net. This guideline was implemented on four occasions with 100% success. However, safety issues have been raised by industry regarding the implementation of this guideline.

Guideline 5 requires fishers to ensure that sufficient time is allowed for encircled dolphins to exit the net. When encircled dolphins were observed, release procedures (including the TEPS gate, using corkline weights and opening the front of the net) were successful on 10 of 14 occasions (71.4 %). However, this guideline should not focus on whether sufficient time has been given for encircled dolphins to exit the net. Instead, it would more appropriate to stipulate that fishing should be aborted if encircled dolphins have not been removed from the net within a specified period from the time that fishing commenced. This guideline needs to be reconsidered in relation to the revision of Guideline 3.

Guideline 6 requires fishers to herd or manhandle dolphins out of the net if they have not exited of their own accord. As with Guideline 4, safety concerns have been raised by crewmembers in association with this guideline, particularly when crewmembers are required to enter the water.

Guideline 7 requires fishers to abort fishing operations if all other methods of release fail. This guideline was implemented on five out of six occasions with an 83.3% success rate. Clear indicators are needed to identify when this guideline should be invoked. One option would be to
require fishers to abort a shot if the encircled dolphin(s) have not been removed from the net within a specified time after fishing began (as suggested in Guideline 5). It is also known that encircled dolphins commonly exhibit a ‘passive behaviour’ that involves floating vertically and motionless at the surface soon before mortality occurs (Coe and Stuntz, 1980; Hamer et al., 2007). Another option would be to require fishers to abort the shot when this behaviour is exhibited, even if the maximum time period since the commencement of fishing has not been exceeded.

4.3 Options for improving the effectiveness of the CoP

This study identified a number of apparent limitations in the current CoP. Adjustments may be required to several guidelines in order to increase the effectiveness of the CoP in mitigating interactions with dolphins.

Guideline 1 may need to be amended to ensure that a stipulated minimum level of effort (i.e. a specified number of crew and total search time) is devoted to searching for dolphins prior to the commencement of fishing operations.

Guideline 3 may need to be amended to indicate that release procedures (i.e. TEPS gate, corkline weights and/or other procedures) should be implemented as soon an encircled dolphin is detected. This guideline may also need to be amended to indicate that fishing cannot proceed until dolphins are released. Therefore, Guidelines 4 and 6 may no longer need to be separated and would be improved by being combined with Guideline 3.

Guideline 7 should be amended to include one or more clear indicators that identify when it should be invoked. One option is to require fishers to abort a shot if the encircled dolphin(s) have not been released within a specified period of time after the beginning of the net-set. Another option is to require fishers to abort a shot as soon as encircled dolphins begin to exhibit ‘passive behaviour’. Therefore, Guidelines 5 and 7 could be combined.

4.4 Concluding remarks

Encirclement and mortality rates recorded in 2006-07 were significantly higher than those recorded shortly after the introduction of the CoP in 2005-06. There was also an increase in the discrepancy between the encirclement and mortality rates calculated from observer and logbook data in 2006-07 compared with 2005-06. Recommendations are provided to simplify and improve the CoP and assist fishers to more effectively mitigate operational interactions with common dolphins. There is also a need to conduct inductions and ongoing training to ensure that participants in the SASF have the appropriate training, knowledge and skills to the CoP. Induction and ongoing training could potentially be provided by observers who interact.
frequently with fishers on all vessels. However, this may require observers to be provided with additional training and to have a more proactive role in promoting the CoP. There is also a need to introduce measures to ensure that operational interactions of the SASF with common dolphins are reported accurately in logbooks.
5. REFERENCES


