

Comparing catches of anchovy and sardine around penguin breeding colonies at different spatial scales

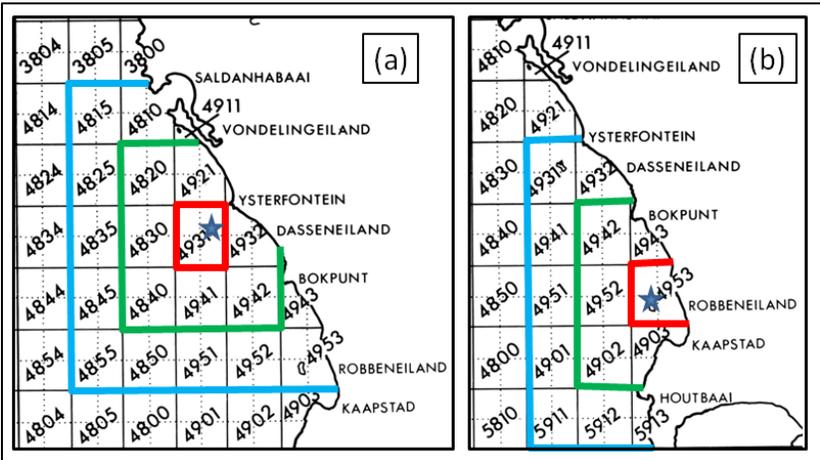
CD van der Lingen and JJ van der Westhuizen

Offshore Resources Research, DAFF

Information on catches of anchovy and sardine around penguin breeding colonies on four islands off the SA coast has been used in the feasibility study conducted by the Island Closure Task Team (ICTT) to inform on possible future experimental closures to purse-seine fishing around these islands. Catch data have historically been reported per 10 x 10 minute (roughly 10 x 10 nautical miles) pelagic fishing block (PFB) by vessel skippers, and these data have been collated at three spatial scales around each island (see Fig. 1; van der Lingen and van der Westhuizen 2012):

- Catches in the PFB within which the island occurs are taken to represent the removal of fish within 10 n.miles of that island;
- Catches from PFBs that are the immediate neighbours of the PFB containing the island, plus catches from the “island-PFB”, are taken to represent the removal of fish within 20 n.miles of that island; and
- Catches from PFBs that are the immediate neighbours of PFBs in the 20 n.mile group plus catches from the previous two groups, are taken to represent the removal of fish within 30 n.miles of that island.

Figure 1: Maps showing the location of penguin breeding islands (blue stars) and surrounding pelagic fishing blocks (PFBs; numbered squares) off the West Coast within which catches of anchovy and sardine were collated to represent three spatial categories (10 [= red], 20 [= green] and 30 [= blue] n.mile radii) around the islands for (a) Dassen Island and (b) Robben Island (from van der Lingen and van der Westhuizen 2012).



A list of the PFB numbers per island at the three spatial scales, and catches made within these groups of PFBs from 1987 to 2013, are given in Coetzee (2014). None of these three spatial scales exactly match the exclusion area (of 20km radius) around each island, which fall between the PFBs approximating the 10 n.mile and 20 n.mile spatial scales. Since 2011, however, the location (latitude and longitude) of pelagic catches have been recorded on a per set basis by the vessel skippers, enabling a comparison of catches made in the exclusion area (when it was open) with those previously reported at the three spatial scales described above.

Note that the precise catch location is not recorded by skippers for all sets (compliance with this requirement was poor in 2011) and that data on precise catch locations have not yet been completely verified. Nonetheless data for 2012, 2013 and to end-November 2014 are available for this comparison. Due to constraints we were not able to accurately map the exclusion area and instead approximated this using a square of 40km by 40km centered on the exclusion area and termed the exclusion square (Fig. 2).

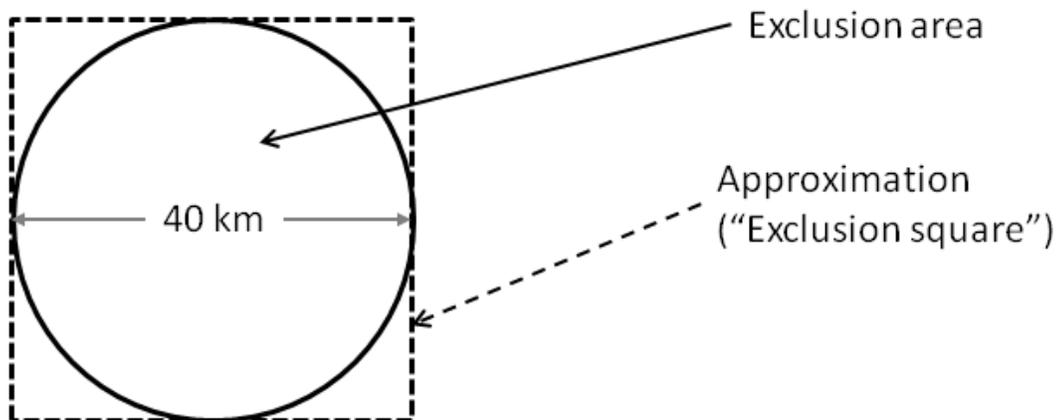


Figure 2: Schematic showing how the exclusion area around penguin breeding islands was approximated for this analysis.

Catches of anchovy and sardine in the 10, 20 and 30 (nominal) n.mile spatial categories and those taken within the exclusion square for each of the islands (Dassen, Robben, St Croix and Bird Islands) for 2012-14 are shown in Figures 3 and 4. Note that negligible quantities of anchovy are caught in Algoa Bay (eastern islands) so plots for St Croix and Bird Island are for sardine catches only.

The effect of the closure is evident in the 10 n.mile PFB, with zero catch of either species taken in the in years of closure (2014 for Dassen; 2012 and 2013 for Robben; none of the years for St Croix; and 2012-2014 for Bird Island). For all islands, catches in the exclusion square were between catches in the 10 n.mile (when such occurred) and 20 n.mile spatial scales, as anticipated.

Catches of both species off Dassen Island were higher for all spatial categories in 2012 compared to 2013 or 2014, and catch increased markedly with spatial extent in 2012 but not in 2013 or 2014. For Robben Island only catches in the 30 n.mile category were markedly higher than in previous years. For Dassen Island catches of both species in the exclusion square were closer to those in the 20 n.mile category than those in the 10 n.mile category in 2012 but not in 2013 (both open years), whereas catches of both species were similar in the 10 n.mile, exclusion square and the 20 n.mile category both species off Robben Island in 2014 (open year).

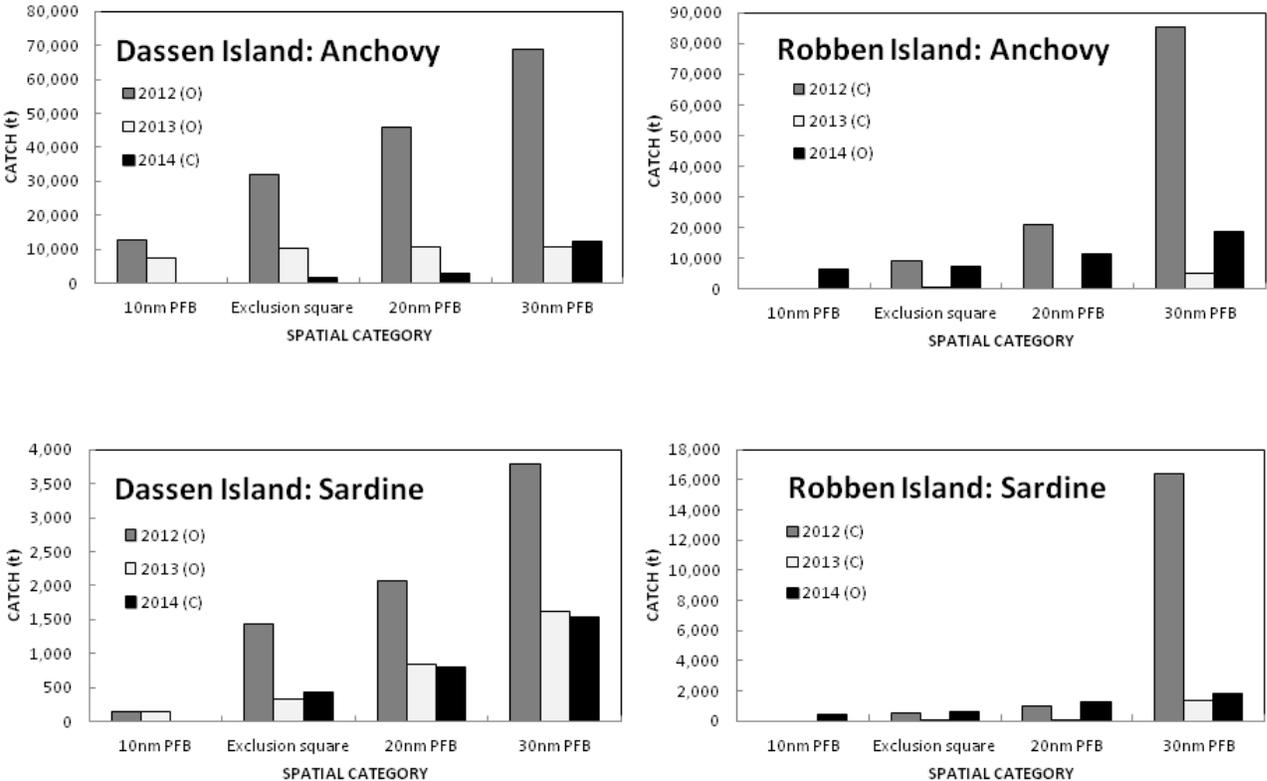
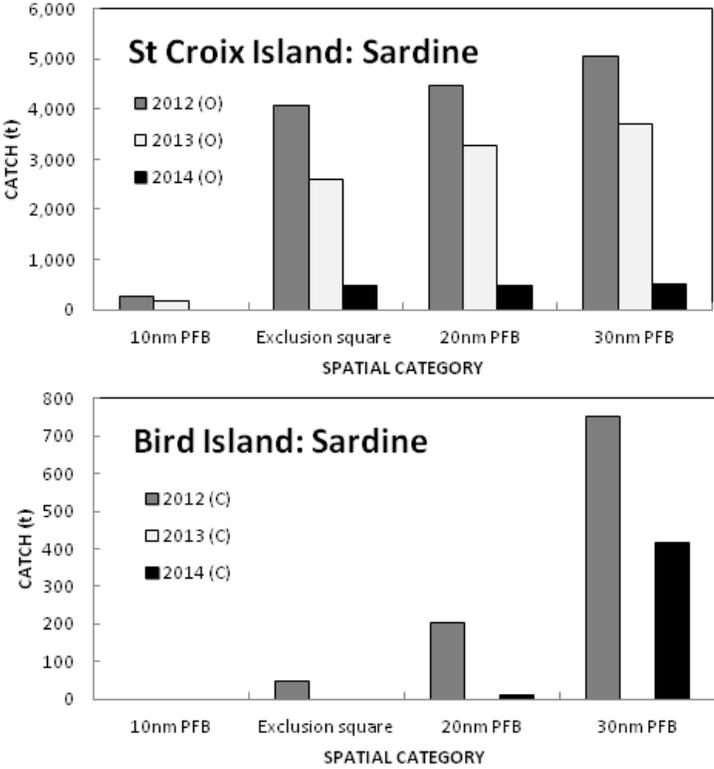


Figure 3: Catches of anchovy (upper panel) and sardine (lower panel) in the 10 n.mile, exclusion square, 20 n.mile and 30 n.mile spatial scales around Dassen (left panel) and Robben (right panel) in 2012 (grey histograms), 2013 (light histograms) and 2014 (to end-November; dark histograms); (O) indicates that the exclusion area (circle) was open to purse-seine fishing and (C) indicates that the exclusion area (circle) was closed to purse-seine fishing in a given year.

Catches of sardine off St Croix within the 10 n.mile category were low in 2012 and 2013 (open) and zero in 2014 (closed), and were substantially lower than catches in the exclusion square which were similar to catches in the 20 n.mile category. Sardine catches at St Croix were substantially lower in 2014 than in 2012 and 2013. Catches in the 10 n.mile category were zero in all three years (closed) for Bird Island, and catches

increased with increasing spatial extent in 2012 and were only taken within the 30 n.mile category in 2014.

Figure 4: Catches of sardine in the 10 n.mile, exclusion square, 20 n.mile and 30 n.mile spatial scales around St Croix (upper panel) and Bird (lower panel) in 2012 (grey histograms), 2013 (light histograms) and 2014 (to end-November; dark histograms); (O) indicates that the exclusion area (circle) was open to purse-seine fishing and (C) indicates that the exclusion area (circle) was closed to purse-seine fishing in a given year.



References

Coetzee, J. 2014. The current set of available data for evaluation of the Island Closure Feasibility study - incorporating sample size and correcting the recruit survey time series. MARAM/IWS/DEC14/Peng/C4.

van der Lingen, C.D. and J.J. van der Westhuizen. 2012. Catches of sardine and anchovy around four penguin-breeding colonies, 2009-2012. FISHERIES/2012/NOV/SWG-PEL/ICTT/10