Analysis of at sea distribution of juvenile New Zealand sea lions in a fisheries context, Auckland Islands 2008

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June 2009

This report outlines work completed under Conservation Services Programme project POP2007/01 and supplements the 2008 Auckland Islands NZ sea lion trip report 2008 (Chilvers 2008).

The aim was to analyse data collected on the at-sea distribution of poorly known age and sex classes of NZ sea lions in a fisheries context.

Analyses of the overlap between 2008 juvenile NZ sea lions satellite locations and 2008 Auckland Island fishing activities are shown in Figure 1.

Methods

Ten juvenile NZ sea lions were captured at Sandy Bay, Enderby Island during January 2008. A satellite-linked platform transmitting terminal (PTTS) (Telonics 300 mW ST6, potted in epoxy, 130 mm × 35 mm × 15 mm, 175g, Telonics Mesa, Arizona, U.S.A.) and VHF transmitter (70 mm × 30 mm × 15 mm, Sirtrack, Havelock North, New Zealand) was deployed on each juvenile NZ sea lion for between two and 49 days (see Chilvers 2008 for further details). At sea locations of juvenile NZ sea lions were calculated for each sea lion by reference to three satellites and were assigned to one of six classes by Argos on the basis of their accuracy. The accuracy of locations provided by Argos is classified as follows: class 3 accurate to 150m, class 2 accurate to 350m, class 1 to accurate to 1km, class 0 accurate to ≥ 1 km and classes A and B have limited accuracy assigned. Only the four most accurate classes (0, 1, 2, 3) were included in these analyses (as in Boyd et al. 1998, Bonadonna et al. 2000, Chilvers et al. 2005). Data on all commercial trawl fishing between 1/7/07 to 30/6/08 in the 6T area surrounding the Auckland Islands were supplied by the Research Data Management (RDM) section of the Ministry of Fisheries, New Zealand. Trawls targeting arrow squid and scampi accounted for 89% of fishing effort in this area during this time. Start locations for all trawl shoots targeting arrow squid and scampi undertaken during this period are used in this analysis (Fig. 1). A separate figure showing the location of all tows targeting other species is supplied but not compared with juvenile NZ seal lion distribution as there was only overlap in one NE 10 x 10km area (Fig. 2).

The overlap of distribution of satellite locations of juvenile NZ sea lions and fishing effort (using trawl tow start location) for each fishery was estimated. First, the number of juvenile sea lion locations within each 10 x 10 km area was summed. This was then compared with the total number of trawl start locations within each 10 x 10 km area. This gave a relative interaction scale. The estimated level of interaction will be highest in regions with high NZ sea lion foraging and high commercial fishing effort and zero

where there is no active of either or where sea lions forage but no fishing occurs or vice versa.

Results

The distribution of the 1634 satellite locations of juvenile NZ sea lions around the Auckland Islands during January and February 2008 is given in Fig. 1a. Not surprisingly, the greatest density occurs in waters adjacent to Enderby Island.

The spatial distribution of fishing effort (trawl start locations / 10 x 10 km area) for arrow squid (February to May 2008) and scampi (July 2007 to June 2008) fisheries are given in Fig. 1b and c. Over this period, there were a total of 1241 tows targeting squid and 1297 tows targeting scampi recorded by RDM. The scale for Fig. 1a, b & c is represented as 1-10 locations or tows per area (Low-light grey), 11-20, 21-30 (Med-medium grey), 31-40, 40+(High-black)). An additional 319 tows targeted other species (July 2007 and June 2008, Fig 2).

The estimated spatial overlap between juvenile NZ sea lion satellite locations and the distribution of fishing effort in arrow squid and scampi fisheries around Auckland Islands is given in Fig. 1d–e. These figures show the estimated spatial distribution of NZ sea lion-fishery operation interactions. This assumes that the probability or risk of interaction is proportional to the extent of overlap of NZ sea lion distribution and commercial fishing effort distribution at any location. However, the overlay is at the seasonal level, i.e. tow start positions and satellite locations are not linked on a finer (e.g. daily) temporal scale. The estimated level of interaction will be highest in regions with high NZ sea lion foraging and high commercial fishing effort (Fig. 1d and e). The scale for Fig. 1d & e is represented as 1 (Low interaction - light grey), 2, 3-4 (Medium interaction – medium grey), 5-6, 7 (High interaction - black)).

References

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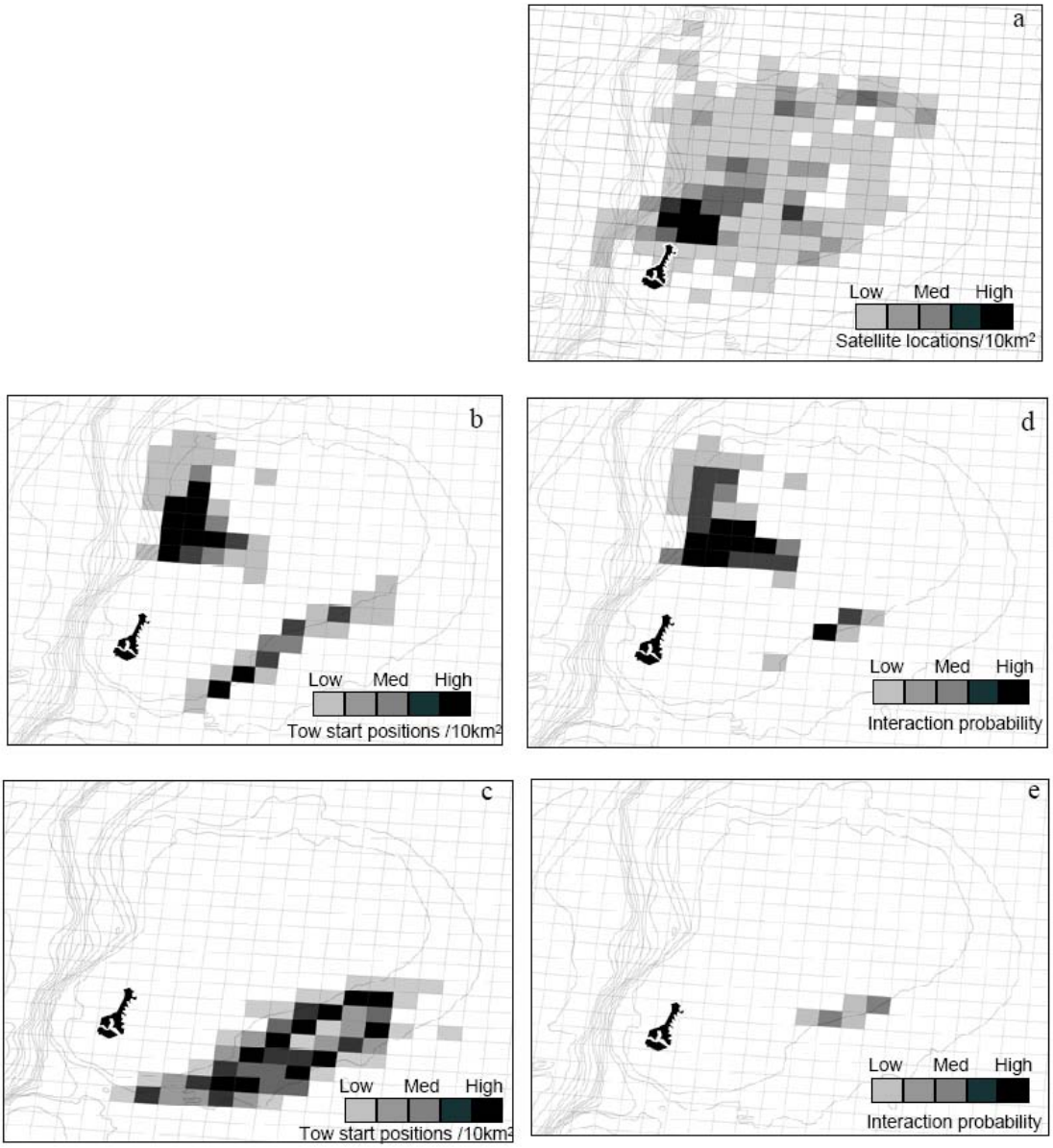

Figure 1. (a) Estimated distribution of 10 juvenile NZ sea lions (satellite locations/10 x 10 km area January & February 2008) and (b) the distribution of fishing effort in the 6T squid trawl fishery (tow start positions/10 x 10 km area, February to May 2008) and (c) the 6T scampi trawl fishery (tow start positions/10 x 10 km area, Nov 2007 and June 2008) in the Auckland Islands 6T area (Scale 1-10 locations or tows per area (Low), 11-20, 21-30 (Med), 31-40, 40+ (High)). The estimated interaction probability between juvenile NZ sea lion distribution and fishing activities for each fishery are presented in (d) and (e) (Scale 1 (Low), 2, 3-4 (Med), 5-6, 7 (High)).

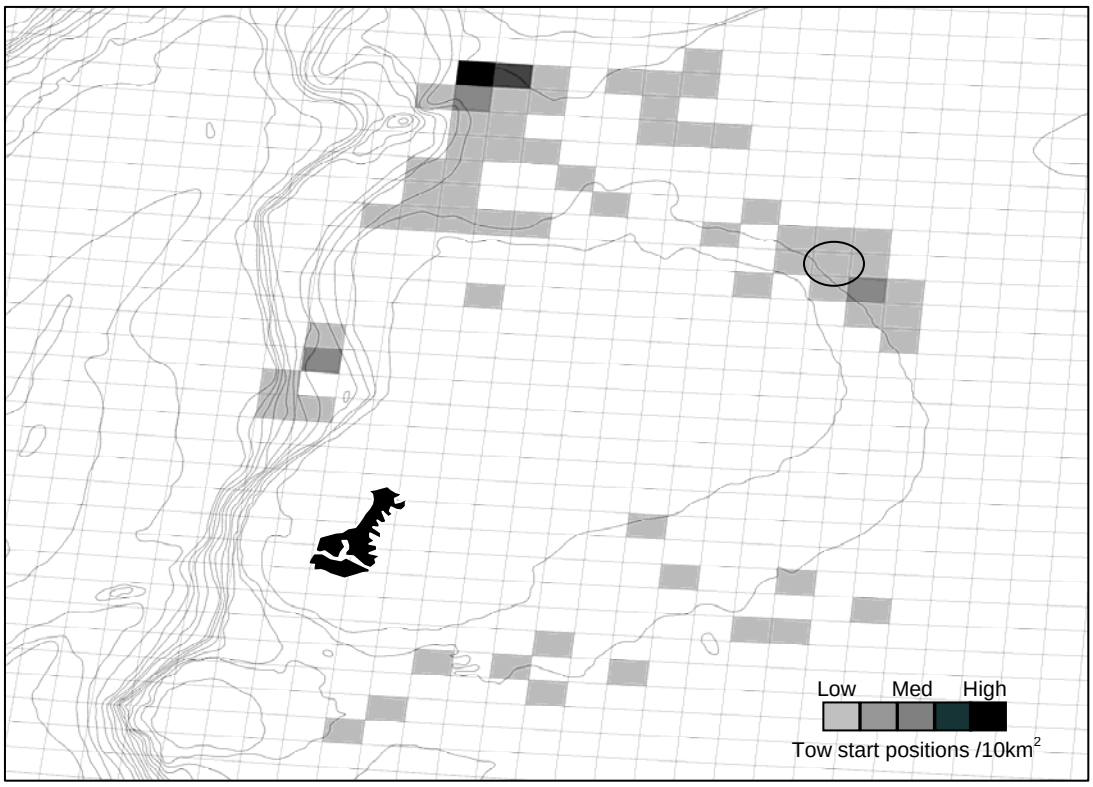

Figure 2. The distribution of fishing effort for all other species targeted (other than squid and scampi)(tow start positions/10 x 10 km area, July 2007 to June 2008) around the Auckland Islands 6T area (Scale 1-10 locations or tows per area (Low), 11-20, 21-30 (Med), 31-40, 40+ (High)). ⬭ Only area with overlap with juvenile NZ sea lion foraging area.