

# Fine-scale abundance estimates from the 2000/2001 aerial survey of Hector's dolphins on the South Island West Coast

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# Fine-scale abundance estimates from the 2000/2001 aerial survey of Hector's dolphins on the South Island West Coast

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## ABSTRACT

This report presents further analyses of data from an aerial survey of Hector's dolphins in order to provide estimates of abundance in specific zones identified by DOC staff. Maximum allowable limit of fishing-related mortality (MALFIRM) values are also calculated for each of these zones.

Keywords: Hector's dolphins, *Cephalorhynchus hectori*, aerial survey, abundance estimates, South Island West Coast, New Zealand.

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# 1. Introduction

In the 2000/2001 summer an aerial survey was conducted to estimate Hector's dolphin abundance on the South Island West Coast (Slooten et al. unpubl. report 2001). Details of survey design, field protocol, and analysis methods are given in Slooten et al. (unpubl. report 2001). The purpose of the current report is to present further analyses of those data in order to provide estimates of Hector's dolphin abundance in specific zones (strata) identified by DOC staff. As requested, for each stratum I have also calculated maximum allowable limit of fishing-related mortality (MALFIRM) values using the US National Marine Fisheries Service (NMFS) guidelines (Wade & Angliss 1997; NMFS 2000).

## 2. Calculation

The MALFIRM formula is:

$$\text{MALFIRM} = N_{\min} \times (R_{\max}/2) \times R_f$$

Where:

$N_{\min}$  = the lower 60% log-normal confidence interval of the abundance estimate

$R_{\max}$  = the maximum net productivity level

$R_f$  = recovery factor (NMFS guidelines specify use of 0.1 for populations considered to be endangered by the IUCN [IUCN 2000])

A full explanation of this model, and simulations testing its performance, are available in Wade (1998). It should be noted that the  $R_{\max}$  value used for dolphin populations (4%) is supported by data from Hector's dolphins which, if anything, appear to have an  $R_{\max}$  below 4% (Slooten & Lad 1991).

The abundance estimates presented here were achieved by post-stratification of the survey data into the zones requested by DOC, followed by re-analysis in Distance 3.5 (Thomas et al. 1998). As in the original report, effective strip width, and group size are estimated globally (across strata, using all sightings after truncation at 330 m), and are hence unchanged from the previous analysis. Encounter rate and abundance are estimated according to the new strata. This involved measurement of the area of each of the new strata, calculation of the transect line length within each, and correct allocation of the sightings according to the new stratum divisions. Variance was estimated as described in Slooten et al. (unpubl. report 2001). All estimates are corrected for availability bias and the fraction of animals missed on the trackline, as in the previous report.

Stratum divisions were drawn directly offshore from the coastal point specified by DOC.

### 3. Results

The results are presented in Tables 1-3.

TABLE 1. ZONES (STRATA), EFFORT AND AREA.

STRATUM (to 4 n.m. offshore)	TRANSECT SPACING (n.m.)	AREA (km <sup>2</sup> )	EFFORT (km)	SIGHTINGS
1. Farewell Spit-Kahurangi Pt	4	683.2	94.7	1
2. Kahurangi Pt-Kongahu Pt	2	449.6	183.5	16
3. Kongahu Pt-Cape Foulwind	2	606	111.3	29
4. C Foulwind-Barrytown (42° 15' S)	2	466	116.3	17
5. Barrytown-Abut Hd (43° 07' S)	2	1023.8	279.9	36
6. Abut Hd-Makawhio Pt (43° 34' S)	2	572.4	134.0	34
7. Makawhio Pt-Jackson Hd (44° 01' S)	2	814.5	192.8	2
8. Jackson Hd-Milford Sd	4	937.8	114.3	1

TABLE 2. PARAMETERS ESTIMATED ACROSS STRATA.

PARAMETER	POINT ESTIMATE	CV (%)
Effective strip width (m)	240.5	5.98
Group size	2.184	5.64
Availability bias	0.463	4.23
Visibility bias	0.962	2.26

TABLE 3 ESTIMATES WITHIN STRATA, CORRECTED FOR AVAILABILITY AND G(0)

	POINT ESTIMATE	CV (%)	LOWER 95%CI (bootstrap)	UPPER 95%CI (bootstrap)
<b>Farewell spit–Kahurangi Pt</b>				
Number of sightings (after truncation @ 330 m)	1			
Dolphins/km <sup>2</sup>	0.108	97.69	0	0.35
Abundance	74	97.15	0	237
N <sub>min</sub> (lower 60% log-normal CI <sup>1</sup> )	38			
MALFIRM (R <sub>max</sub> = 0.2, R <sub>f</sub> = 0.1)	0.08			
<b>Kahurangi Pt–Kongahu Pt</b>				
Number of sightings	16			
Dolphins/km <sup>2</sup>	0.89	30.17	0.45	1.49
Abundance	400	30.16	200	672
N <sub>min</sub>	312			
MALFIRM	0.62			
<b>Kongahu Pt–Cape Foulwind</b>				
Number of sightings	29			
Dolphins/km <sup>2</sup>	2.66	64.26	0.38	6.93
Abundance	1195	64.27	172	3116
N <sub>min</sub>	728			
MALFIRM	1.46			
<b>Cape Foulwind–Barrytown</b>				
Number of sightings (after truncation @ 330 m)	17			
Dolphins/km <sup>2</sup>	1.49	24.17	0.85	2.26
Abundance	695	24.16	397	1055
N <sub>min</sub>	569			
MALFIRM	1.14			
<b>Barrytown–Abut Head</b>				
Number of sightings (after truncation @ 330 m)	36			
Dolphins/km <sup>2</sup>	1.31	32.98	0.56	2.26
Abundance	1343	32.99	576	2310
N <sub>min</sub>	1024			
MALFIRM	2.05			
<b>Abut Head–Makawhio Pt</b>				
Number of sightings (after truncation @ 330 m)	34			
Dolphins/km <sup>2</sup>	2.59	26.22	1.45	4.06
Abundance	1481	26.22	827	2326
N <sub>min</sub>	1192			
MALFIRM	2.38			
<b>Makawhio Pt–Jackson Head</b>				
Number of sightings (after truncation @ 330 m)	2			
Dolphins/km <sup>2</sup>	0.11	75.67	0	0.31
Abundance	86	75.84	0	251
N <sub>min</sub>	49			
MALFIRM	0.10			
<b>Jackson Head–Milford Sound</b>				
Number of sightings (after truncation @ 330 m)	1			
Dolphins/km <sup>2</sup>	0.09	109.37	0	0.33
Abundance	84	108.99	0	307
N <sub>min</sub>	40			
MALFIRM	0.08			

<sup>1</sup>For calculation method see Buckland et al. (1993, p. 118).

## 4. Discussion

The total of the estimates presented here, 5358, is very similar to that of 5388 given in Slooten et al. (unpubl. report 2001), and hence indicates that the post-stratification of these data has not resulted in appreciable bias. Bias is possible in any post-stratification that is based wholly or in part on observed densities seen in different areas. The earlier report should be preferred (and cited) wherever the need is for an estimate of Hector's dolphin abundance on this coast.

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