To What Extent can Distance Sampling be Combined with Photo Identification as a Monitoring Tool for *Tursiops truncatus*

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Introduction :

Photo identification and **distance sampling** are both common techniques for monitoring marine mammal populations, but are rarely both used on the same population.

AIM: To investigate whether the 2 techniques could be used **in synchrony** on bottlenose dolphins, using abundance estimates derived from distance sampling and photo ID carried out in the **Cardigan Bay** Special Area of Conservation (SAC) (Figure 1), an area where there is significant bottlenose dolphin presence and human activity (Figure 2).

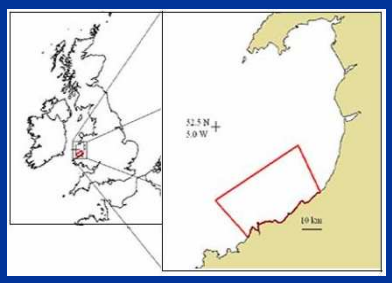

Figure 1: Cardigan Bay SAC

Methodology :

From May to November 2005, line transect surveys were completed, comprising **1490km of effort** evenly distributed throughout the SAC. Photo ID was carried out opportunistically during these surveys.

We used 3 techniques to estimate abundance :

- **Distance sampling**, using Distance 4.1 software based on 47 encounters and a g(0) of 0.93 (Reay, 2005)
- **Mark Recapture**, using the CAPTURE application runner with the programme MARK, then applying to the CHAO(th) model, assuming a closed population
- Based on the **proportion of well marked individuals** per encounter, not a true abundance estimate, more a measure of the number of individuals that have ever used the area.

Figure 2: 'An area where there is significant bottlenose dolphin presence and human activity'.

Figure 3: Our research vessel with 3.5m observation platform / garden bench.

Results and Discussion :

2005 Abundance Estimates:

- **150** (80-280, %CV 32.53) using Distance 4.1
- **170** using Mark Recapture
- **175** based on the average proportion of well-marked individuals.

Figure 4 shows abundance estimates derived using the 3 techniques between 2003 and 2005.

The inconsistency found within Distance sampling is attributable to a low sample size in 2004 (n=18).

Photo ID estimates may be higher than those from Distance sampling as they measure the TOTAL number of individuals that have used the area over the 3 years as opposed to the AVERAGE number in the area during each survey.

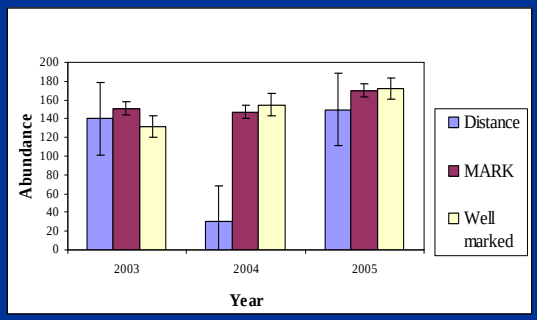

Figure 4: Abundance estimates from 2003 to 2005

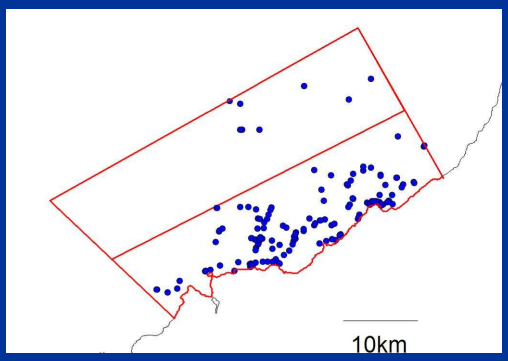

Figure 5: Distribution of bottlenose dolphin sightings in 2005.

Concluding remarks :

- Distance sampling and photo ID techniques **can be used synergistically** to monitor bottlenose dolphins. Both techniques however require **significantly more effort** to increase precision, accuracy and reliability.

- The **heavily skewed** nature of the population towards the inshore sector of the SAC reinforces the need to increase effort. (See Figure 5.)

- Distance sampling allows **other techniques**, such as acoustic sampling, to be carried out opportunistically and can also be used to **derive abundance estimates for other marine mammals**, further increasing its value as a monitoring tool.

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References: Reay, N. (2005). Estimation of g(0) for bottlenose dolphin, harbour porpoise and grey seal in Cardigan Bay SAC. MSc Thesis, University of Wales Bangor.

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