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The Ecology of Bottlenose Dolphins
Tursiops truncatus in Montrose Bay, North
East Scotland.

Summary based on a Wildlife Management BSc Hons Dissertation
2008/9: School of Biological Sciences, University of Aberdeen.



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The ecology of bottlenose dolphins *Tursiops truncatus* in Montrose Bay, North East Scotland

**Summary based on a Wildlife Management BSC Honours Dissertation
by Kelly Ann Dempsey 2008/2009
School of Biological Sciences, University of Aberdeen**



Bottlenose dolphins in North Angus waters

In Europe, the distribution of the bottlenose dolphin (*Tursiops truncatus*) is believed to have contracted during the last century, particularly in the North Sea. The last remaining population of bottlenose dolphins in the North Sea is small (~130) and isolated. Its distribution has generally been centred in the Moray Firth, Scotland's largest firth ¹.

This population of bottlenose dolphins is considered to be of international importance. It is sensitive to population fluctuation because it is isolated from other populations and is small creating low levels of genetic diversity ^{2,3}. As a species listed under Annex II of the European Unions Habitats Directive, member states are legally required to undertake area-based management for bottlenose dolphins and in 2005 the Moray Firth was designated as a Special Area of Conservation (SAC) specifically for the conservation of this population.

Long range movements observed outside the inner and outer Moray Firth especially on the Aberdeenshire coastline suggest that the population are exploiting prey resources in a more widely dispersed area and perhaps even in a different manner. Sightings have occurred more frequently and more widespread along the Aberdeenshire coast from March to August. Although there has been little dedicated survey effort during the winter months of November to January casual sightings suggest that members of the population remain present throughout the winter months ⁴.

On the coast of North East Angus approximately 180 miles south of the inner Moray Firth SAC lies Montrose Bay which exhibits both a deep narrow channel subject to tidal fronts and a large shallow sandy estuary. The Bay is large, concave and East-facing, comprising of a 9km sandy beach which sits between two rocky headlands – Scurdierness to the south and Milton Ness to the north. The spring tidal range is 4.2m, with the 1 in 100 year water level being identified as 1.42m higher than MHWS.

Anecdotal evidence is that bottlenose dolphins travel through the area and use it for foraging. A detailed study of bottlenose dolphins in Montrose Bay had never been carried out. The southward expansion of the population's home range means that areas along the Grampian and North Angus coastline are becoming increasingly important for the population. It is therefore crucial to establish likely important areas along this coastline in order to continue providing information necessary for the management of the population. I will establish the frequency with which bottlenose dolphins visit Montrose Bay in summer, what factors influence their presence and whether they come to this area predominantly to forage.



How do we establish if dolphins are present?

Land based observations were carried out at two sites within the bay area, between 14th July and 28th September 2008 at the South Esk site and from the 5th August to 28th September 2008 at the North Esk site. Both sites had elevated view points and data was collected over three-hour periods, weather permitting i.e. harr not present and Beaufort scale <3. Observations were carried out between 8am and 8pm and through a whole range of tidal states.

I adopted a sampling regime for consistency in data collection. Two scan types were taken using the naked eye and binoculars and the presence of bottlenose dolphins, other cetacean species and boats were recorded. This process was carried out every 15 minutes and every 2 minutes if dolphins were present. During the 2-minute scans I recorded the number of dolphins present and their location using quadrants.

I also recorded the behavioural state of the school (table 1), school spread (table 2) and dive types observed (table 3). I determined the behaviour of the whole school of dolphins in the study areas using scan sampling. This technique is more effective for identifying changes in the behavioural state of schools.



The North & South Esk survey sites

Table1. Group Behavioural State Categories and their descriptors used to differentiate between the four recorded behaviour states chosen for the study

Behaviour	Description
Foraging	Prey capture behaviours i.e. fish tossing, feeding lunges, prey visible, bird congregation
Travelling	Individuals or group moving in relatively straight line at a constant speed
Socialising	Socialising behaviours such as touching between individuals, orientation towards other individuals, chasing each other
Other	Behaviours which don't fall into above categories i.e. bow-riding, interacting with boats, interacting with other species

How do we establish if dolphins are present?

Table 2. Classification of group formation

Group formation	Description
Tight	1 body width
Loose	1-3 body lengths
Dispersed	3-5 body lengths
Widely dispersed	5+ body lengths

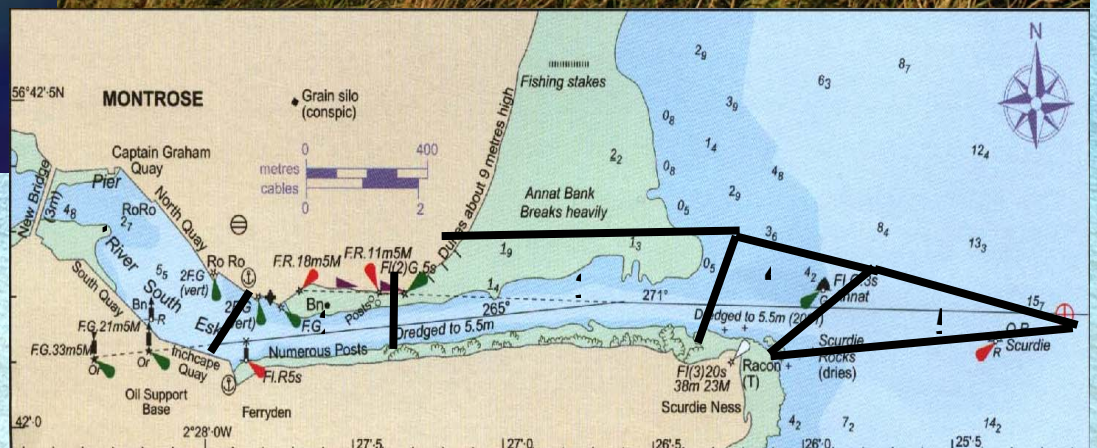
Table 3. Definition of dive type categories

Dive types	Description
Regular	No arching, blowhole and dorsal fin exposed
Porpoising	Fast Lunges, more than back clears the water, spray associated
Tailstocks	Arched back, caudal peduncle exposed
Flukes	Flukes exposed, arched back

There was 97.31hrs of observation in total for the whole Montrose Bay area, 77.28 of these hours were at the River South Esk and 20.03hrs at the River North Esk. Of the 97.31hrs of observation for the whole Montrose Bay area, dolphins were present for 8.31hrs (9%) of this time. During the 77.28 hours at the River South Esk, dolphins were present for 2.31 hrs (3%) and during the 20.03hrs at the River North Esk where dolphins were present for 6.05hrs (30%).



River North & South Esk observational quadrants

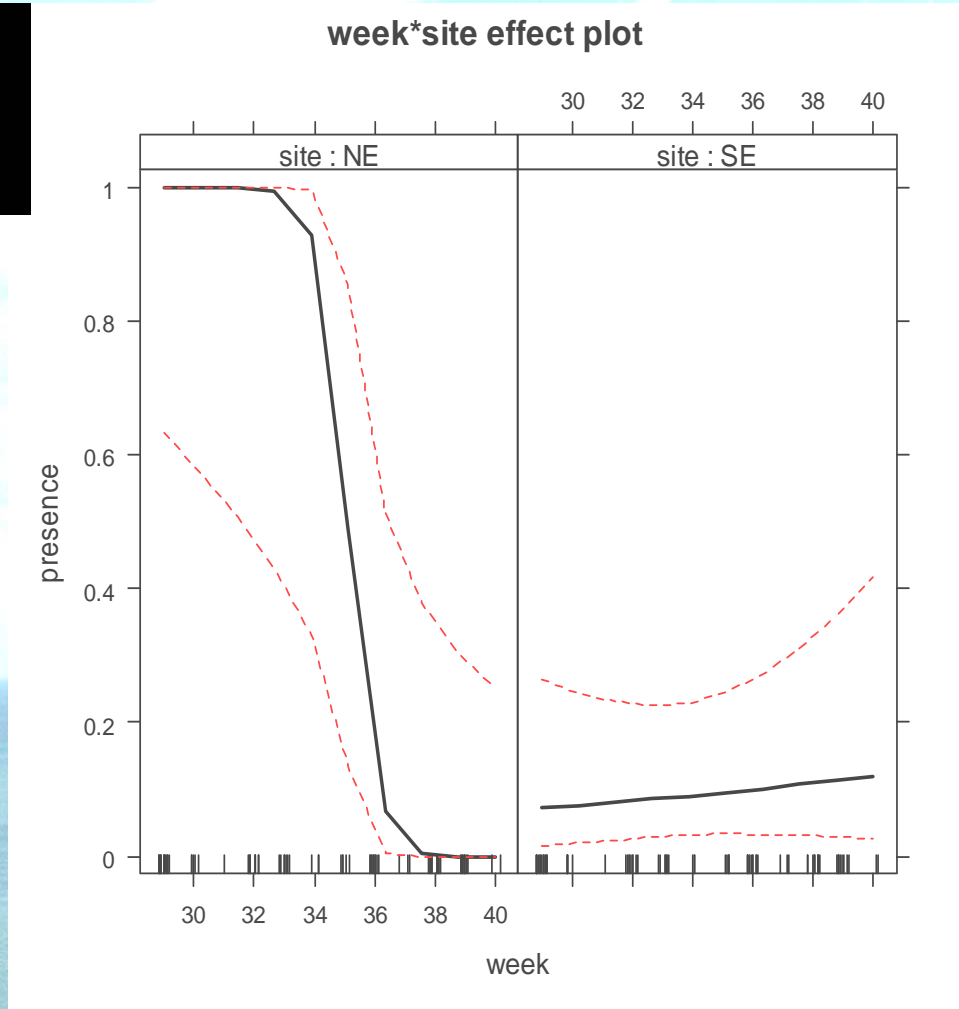


Dolphin behaviour in Montrose Bay

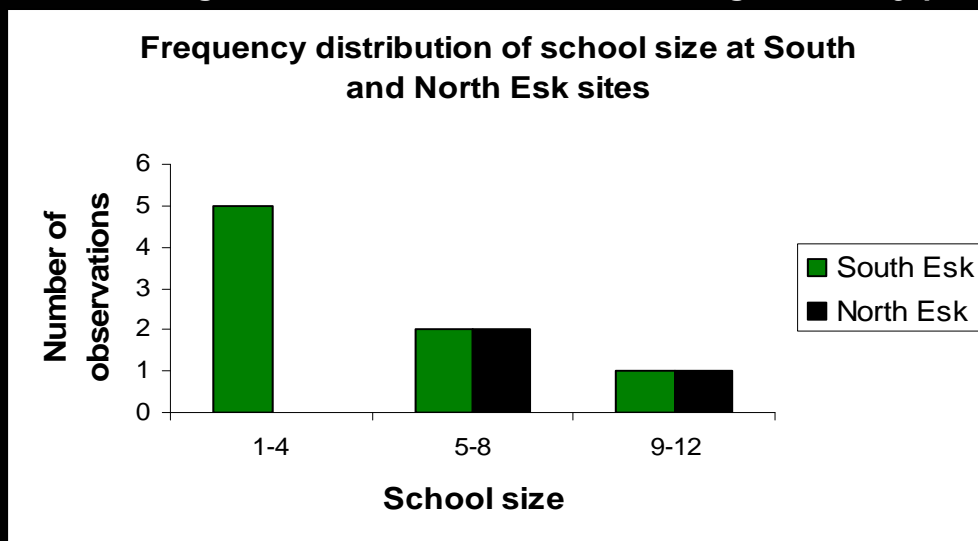
How do dolphins spend their time in Montrose Bay?

Bottlenose dolphin presence varied throughout the study period (figure 1) shows this variation on a weekly basis. The effect of the interaction between site and week on presence is shown

The North Esk site shows a much higher proportion of positive sightings in relation to the weekly survey effort.



School size ranged from 1 -12 individuals during the study period



Dolphin behaviour in Montrose Bay

Foraging was predominant at both sites, slightly more frequently at the North Esk site. Travelling was observed more often at the South Esk site as dolphins would pass through the site on journeys up and down the coastline, at times avoiding the South Esk river channel. Socializing was rarely observed at either site, more so at the North Esk, most occurrences involved two individuals simultaneously leaping from the water repeatedly. observed at either site, more so at the North Esk, most occurrences involved two individuals simultaneously leaping from the water repeatedly.

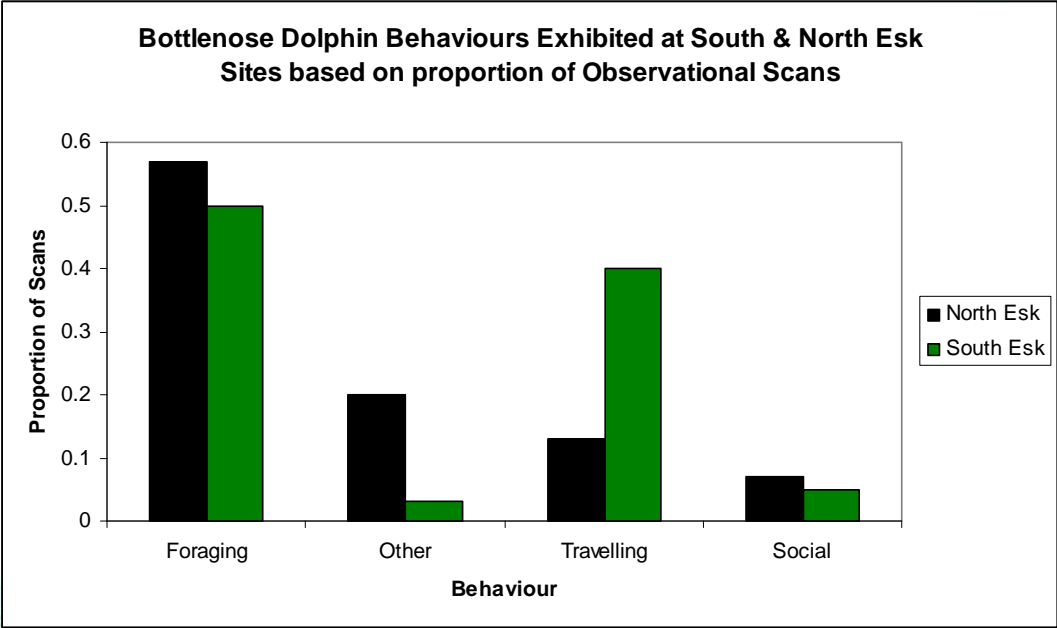
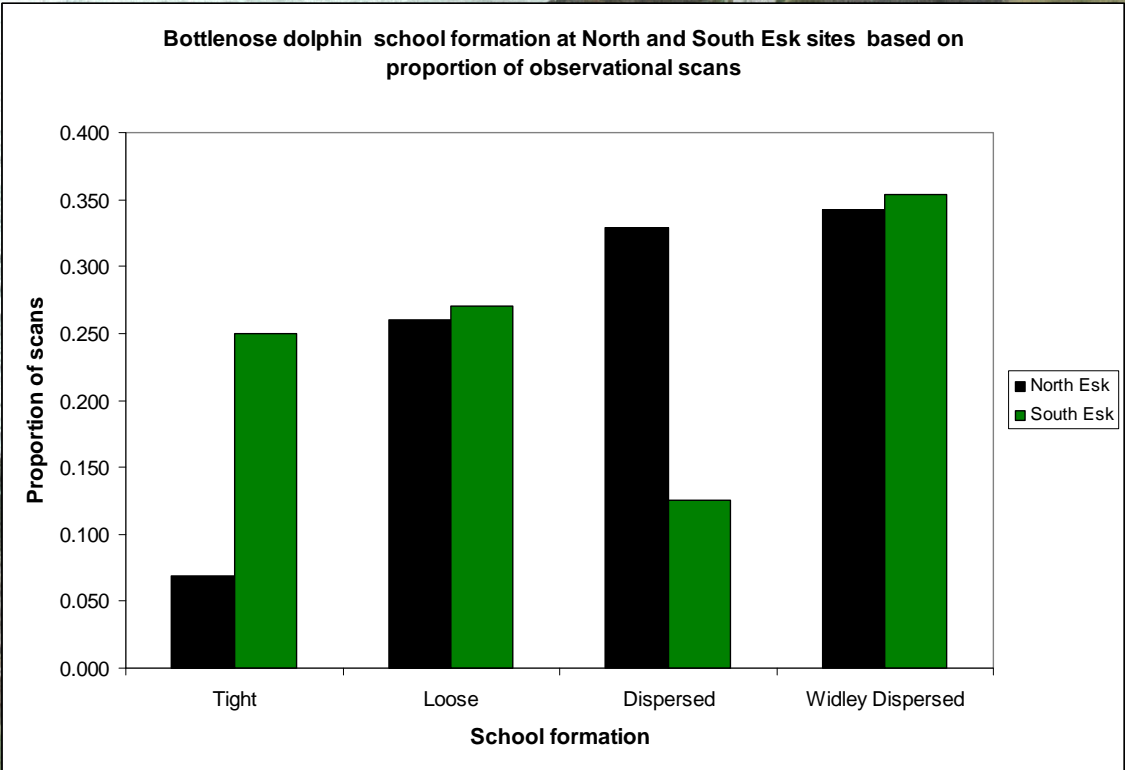


Figure 3. Bottlenose dolphin behaviour showing both the North and South Esk study sites highlighting the proportion of behaviours for the whole observational period

Figure 4. Bottlenose dolphin school formation over the entire study period broken down into the North and South Esk study site based on the proportion of observational scans observed in over the study period.



Dolphin behaviour in Montrose Bay

Dive types associated with foraging such as porpoising and the showing of tail stocks were more common at the South Esk site. Tail fluke dives were far more abundant at the North Esk site (see figure 4). This can be due to different prey types or different seashore topography which force the dolphins to hunt in a different manner.

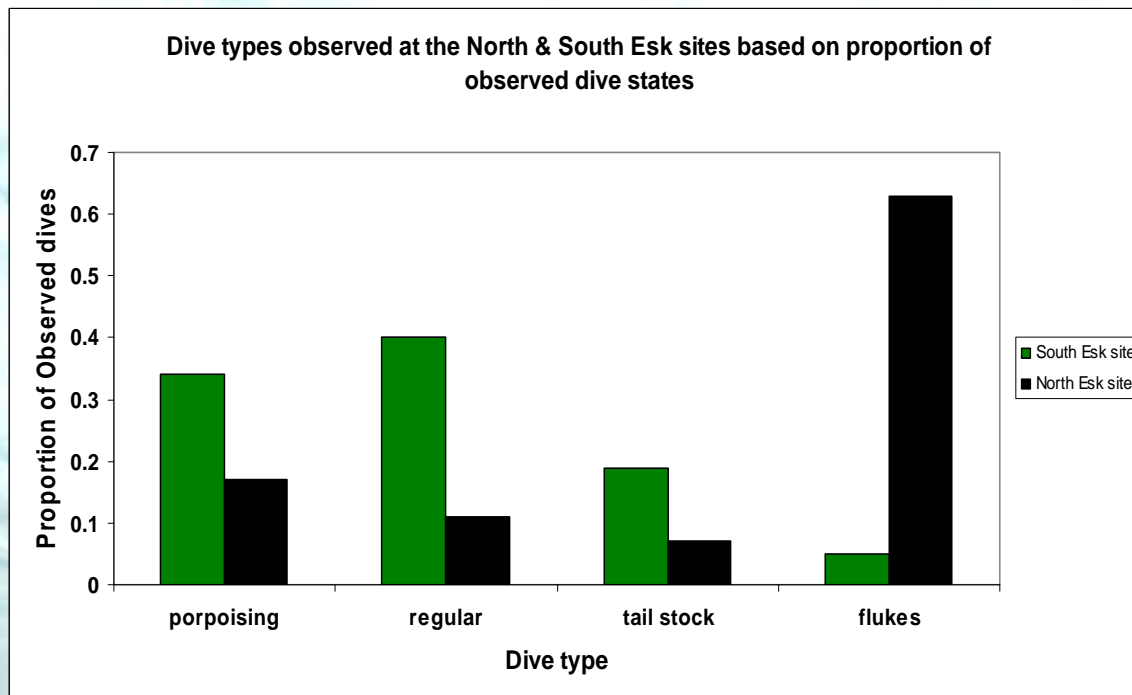
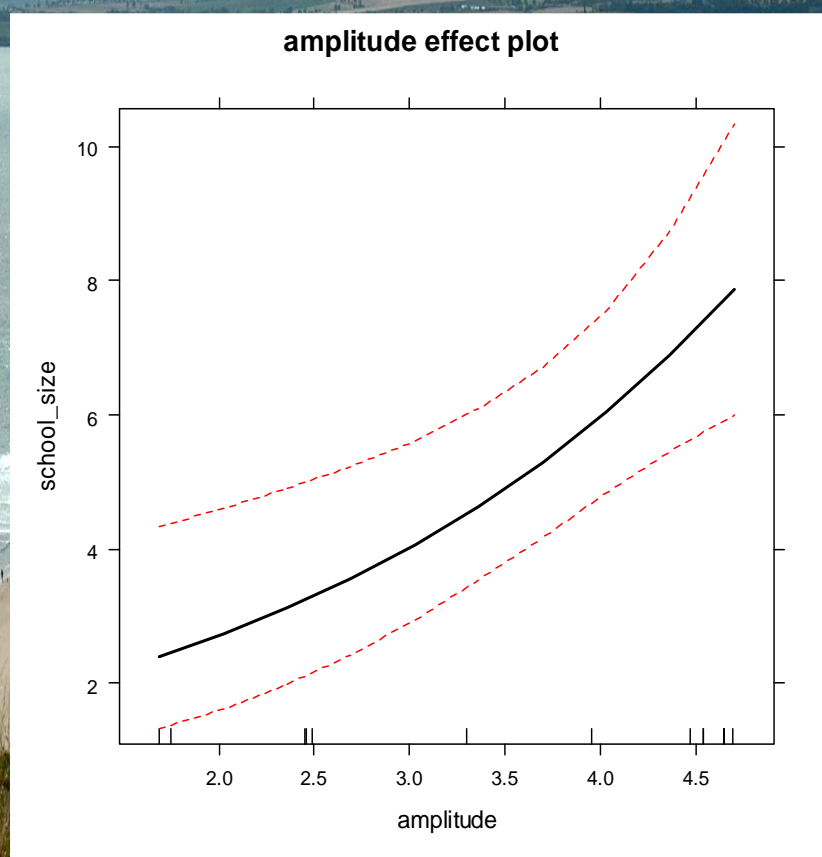


Figure 4. Bottlenose dolphin dive types over the entire study period broken down into the North and South Esk study site based on the proportion of each dive type throughout observations.

Tidal influences (either daily and spring-neap cycles) had no effect on dolphin presence. The time into study period (week) effect is visible at both sites (figure 1) and seems to be the only significant variable influencing presence at both sites. However, while the North Esk site sees a sharp decline in presence from week 34, the South Esk sees a more constant presence throughout the study period.

Tidal amplitude showed to be a highly significant factor influencing school size (figure 5), the greater the tide amplitude (spring tides) the larger school size.



What does this mean?



This study investigated the presence and behaviour of bottlenose dolphins (*Tursiops truncatus*) in Montrose Bay, North East Scotland.

Studies of the Moray Firth population have shown that in recent years, their distribution range has expanded south along the Aberdeenshire coast and we know little of their behaviour in the area or why it has become increasingly important to them.

Land based observations used to study the distribution and movements of bottlenose dolphin schools in the area from July to September 2008 highlighted that dolphins were seen in all three months, but there were differences in the intensity with which dolphins used the Rivers South and North Esk.

Dolphin's primary activity at both sites was foraging showing a preference for the North Esk. Differences in dive types were observed perhaps due to the different topographic features at each site. Foraging activity peaked in August at the North Esk and then declined sharply while at the South Esk foraging bouts were shorter but more consistent throughout the study period.

Salmonids are thought to be a driver in presence but this was not confirmed by relationships between daily salmon run information and dolphin presence. Site influenced behaviours such as school formation, dive types and at each site there were preferences for particular habitats.

A week effect was the only factor influencing presence and tide amplitude the only factor affecting school size, dolphin school size increased with tide amplitude, again perhaps due to topographical features and tidal fronts that formed at both sites and appeared to be used as an aid to foraging.

To fully understand the ecology of bottlenose dolphins in the area further prolonged studies need to be carried out to establish biological factors influencing dolphin presence, concentrating in particular on the North Esk site.

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All photographs and data is the property of Kelly Ann Dempsey.

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