DIVING BEHAVIOUR AND REACTIONS TO TAGGING OF LONG-FINNED PILOT WHALES IN THE CENTRAL MEDITERRANEAN SEA

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INTRODUCTION This study compares the diving behaviour of long-finned pilot whales (*Globicephala melas*), tagged by means of time-depth recorders (TDR) in the Ligurian and Tyrrhenian Seas (Fig. 1). Magnitude and duration of the behavioural response caused by the tagging attempts are also described.

MATERIALS AND METHODS Tagging operations were undertaken in 2000, 2001 and 2002 from two vessels of similar size (about 18m). Four individuals were tagged during three sightings (Table 1). V-TDRs tags (MK6 models produced by Wildlife Computers) were deployed from the boat by means of a 4.5 m long pole, and attached to the whales with a suction cup. Each TDR was coupled with a VHF radio transmitter produced by Advanced Telemetry Systems. The TDRs had a depth range of 0 -1,000 m (accuracy of 3% of the reading +/- 8 m). A total of 271 min of dive data were collected from three of the four tagged individuals. The surfacing intervals of the tagged whales were timed concurrently. One tag was lost at sea.

RESULTS AND DISCUSSION **Dive duration** During the daylight hours, all the tagged whales performed multiple short (<3 min) and shallow (0 -16 m) dives, or rested motionless at the surface. About 2h 30min before sunset (at 18:10 h on July 20th and at 16:24 h on October 11th) two whales tagged in the Ligurian Sea showed an abrupt change of behaviour, and started to perform long dives which ranged between 13min 50sec and 15min 50sec.

Dive depth One of the tagged individuals – an adult male - performed two deep dives of 776 and 824 m (Fig. 2). These are the deepest dives ever recorded for *G. melas* in the Mediterranean Sea. Baird *et al*. (2002) recorded a depth of 648 m for a sub-adult male tagged in the Ligurian Sea, and suggested that deep dives performed by long-finned pilot whales around sunset may be related to feeding towards the Deep Scattering Layer. Further evidence of deep diving in the late afternoon provided by this study sheds light on the feeding behaviour of long-finned pilot whales and on their amazing diving capabilities.

Reaction to tagging As pointed out by Scheneider *et al*. (1998) and White and Garrot (1990), the validity of the data obtained from the tagging can be questionable unless such studies incorporate investigations on the potential impact of tagging. This experience confirms that whale tagging can provide essential information to understand the ecology and behaviour of a poorly known species, disturbance to the animals is an issue that must be carefully considered. The three whales tagged in the Ligurian Sea showed moderate reactions to tag deployment. These included a tail flick followed by a series of "spy-hops" and rolling on their sides. The response of whales A and C (Table 1) lasted 18min and 25min, respectively. After this time the whales apparently resumed their previous behaviour. In whale B the tag was detached after only 4 min by a member of the group (see below). Whale D, a sub-adult male (about 3/4 the length of an adult) tagged in the Tyrrhenian Sea, showed a stronger reaction to tagging, performing vertical and horizontal leaps, high-speed surfacings and fast rollings, following tagging. The reaction lasted for the whole duration of the sample (152 min), until the tag detached. Diving data here were clearly biased by the presence of the tag. It is unknown why the reactions shown by this fourth whale were much stronger than those that had been previously recorded by us and by other researchers (Baird *et al*., 2002). A number of factors should be considered, possibly including small group size and sub-adult size, together with social, environmental and individual variables. Care should be taken in future tagging attempts to evaluate these and other factors before a tag is deployed, and to provide a detailed behavioural record following any tagging attempt. Remarkably, in three cases (whales B, C and D) other group members actively attempted to detach the tag by rubbing their bodies against the tagged individual, and in one instance they succeeded (whale B). This further indicates that the benefits of tagging (including understanding of key ecological needs by the whales) must be weighed against behavioural impact.

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Table 1. Summary of tags deployed on long-finned pilot whales

Whale	Area	Date	Group size	Initial time	Duration	Maximum depth (m)
A	Ligurian Sea	20 July 2000	60	-	Tag lost	-
B	Ligurian Sea	11 October 2001	5	15:00	4 min	8
C	Ligurian Sea	11 October 2001	5	15:17	115 min	824
D	Tyrrhenian Sea	08 October 2002	2	13:57	152 min	24

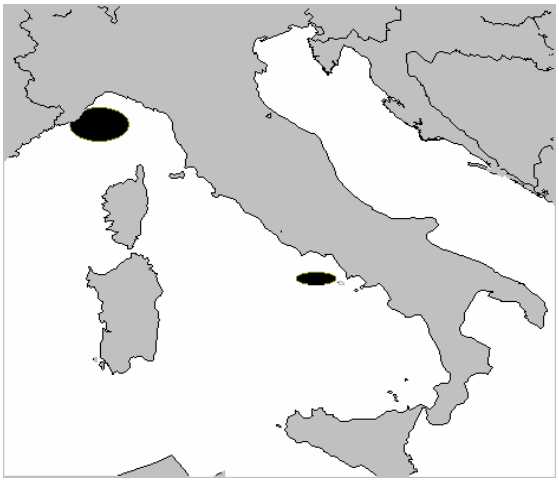

Fig. 1. Map of the study areas

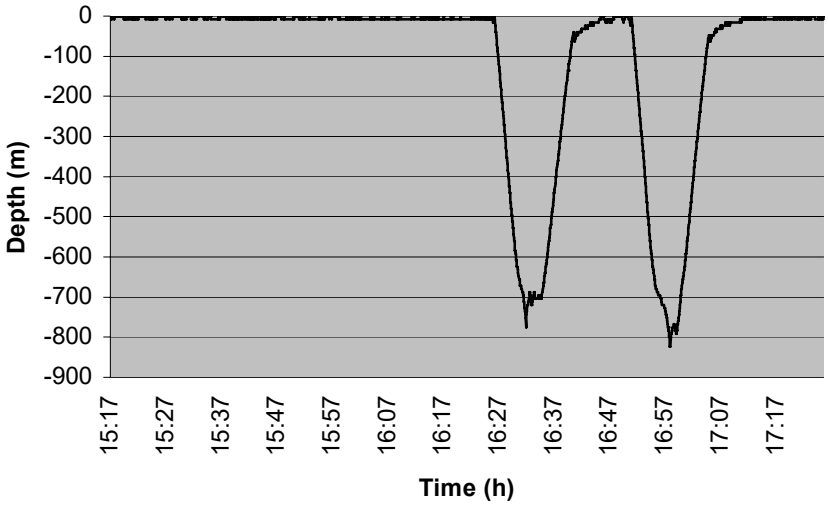

Fig. 2. Dive depth versus time for whale C (see Table 1)