EXPERIMENTATION OF PHOTO – IDENTIFICATION TECHNIQUE ON STRIPED DOLPHIN (*STENELLA COERULEOALBA*, MEYEN 1833) IN LIGURIAN SEA

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INTRODUCTION – Photo-identification technique has been successfully used with different cetacean species in order to assess population parameters such as abundance, spatial behaviour and social relationships. Despite striped dolphin (*Stenella coeruleoalba*) is the most common cetacean in the whole Mediterranean Sea (Forcada *et al.*, 1995), a few attempts have been done to apply this technique to this pelagic dolphin (Rosso *et al.*, 2008). We investigated the possibility to use the photo-identification technique to study the striped dolphins in the Ligurian Sea.

MATERIALS AND METHODS – Data were collected between 2001 and 2009 in central Ligurian Sea and surveys were carried out both offshore (depth >200 meters) and inshore (<200 meters). Boat-based surveys were conducted all around the year, using both semi-rigid inflatable boats (5.1 m) and whale-watching vessels (hereinafter SRIB and WWV respectively). The whole dataset was used to calculate the encounter rate (ER) and group size per bathymetric band (0-100, 100-200, 200-600, 600-1000, >1000). The photographic analysis was carried out on a selection of 4 years (2006→2009) with higher quality of the photographic data. Photo-identification technique was applied considering every kind of natural marks, sorted in four categories: dorsal fin notches (DFN), patches and scrapes (PS, usually on the back side of the animal), colour pattern (CP) and other marks (OM, injuries, scars, etc.). In order to assess weather the field work methodology was appropriated, we calculated the Photo-identification success ($S_{photo\text{-}id}$) as the ratio of the identified animals to the sighted animals (see the formula).

$$S_{photo\text{-}id} = \frac{\Sigma n_{identified\ per\ sighting}}{\Sigma n_{sighted\ per\ sighting}}$$

The result was compared with the same index obtained with bottlenose dolphin (*Tursiops truncatus*) data (Gnone *et al.*, 2003), as an example of successful application of the photo-id technique.

RESULTS – A total of 11087 nm were covered and 163 striped dolphin sightings were reported in the whole study period (2001-2009). Encounter rate (ER) resulted higher in open waters than coastal ones (**Fig 1**). Mean group size in coastal sightings (depth< 100 meters) resulted significantly lower than offshore water ones (>100 meters, ANOVA p<<0.01) (**Fig 2**).

A total of 144 sightings were considered for photo-identification (2006-2009) and about 4000 photographs were analysed; the photographic data analysis produced a photo-id catalogue with 128 individuals identified. PS resulted the most useful identification criterion (55.5% of classified individuals), followed by DFN (35.9%), CP (5.6%) and OM (3.13%). Each criterion (except CP) led to recaptures: 5 individuals were sighted twice and 1 was sighted three times. The largest period between re-sightings of the same individual was 281 days, while the shortest was 11 (**Fig. 3**, **4, 5**).

Three $S_{photo\text{-}id}$ values were calculated for striped dolphin, using three distinct data-set: total data-set, WWV only, and SRIB only; results were 0.10, 0.06 and 0.24 respectively. χ^2-test revealed a significant difference between $S_{photo\text{-}id}$ values belonging to WWV and SRIB data ($p<0.05$). In addition, considering the best data set collected by SRIB (the last 9 sightings in 2008-2009 period), $S_{photo\text{-}id}$ resulted 0.51.

DISCUSSION – In open waters (depth>200 meters), ER shows high sighting probability and groups are generally larger than inshore ones (depth<100 meters). This confirms striped dolphin preference for pelagic domain (Culik, 2003). Furthermore, low number of re-captures (6/128) suggests a high abundance with a high turnover within the study area. Unfortunately these results allow no further considerations about individual strategies in spatial behaviour, so that more effort is needed.

Concerning photo-id analysis, PS and DFN were the most suitable identification criteria and represent the greatest part of classified individuals (91.1%), while CP seems to be useful as a general criterion to carry out a preliminary sorting of individuals, but could not get any re-capture. DFN is supposed to be stable in time, as it is successfully used with other species (i.e. bottlenose dolphin, Defran *et al.*, 1988), while PS allowed re-captures up to 281-days time lapse (about 9 months), so that we can suppose it is stable too.

In relation to the research platform, SRIB sampling reached better results than WWV. However, SRIB effort was focused in inshore waters, where the encounter rate is lower and the group size is smaller. This means that the number of re-captures may increase once SRIB effort is extended to pelagic domain and we could expect a value which is consistent with our best $S_{photo\text{-}id}$ value (0.51), as we consider this result likely to approximate the actual fraction of marked individuals. This fraction is low if compared with the bottlenose dolphin one (0.86), but is higher than expected and may justify the use of the photo-id technique with this species.

CONCLUSIONS – The striped dolphin photoidentification may become a successful tool by improving the photographic techniques and carefully fitting specific classification process. Due to the nomadic behaviour of this species, cooperation between research groups operating in adjacent areas is essential to re-capture marked individuals in order to describe their spatial behaviour and possibly to produce abundance estimates.

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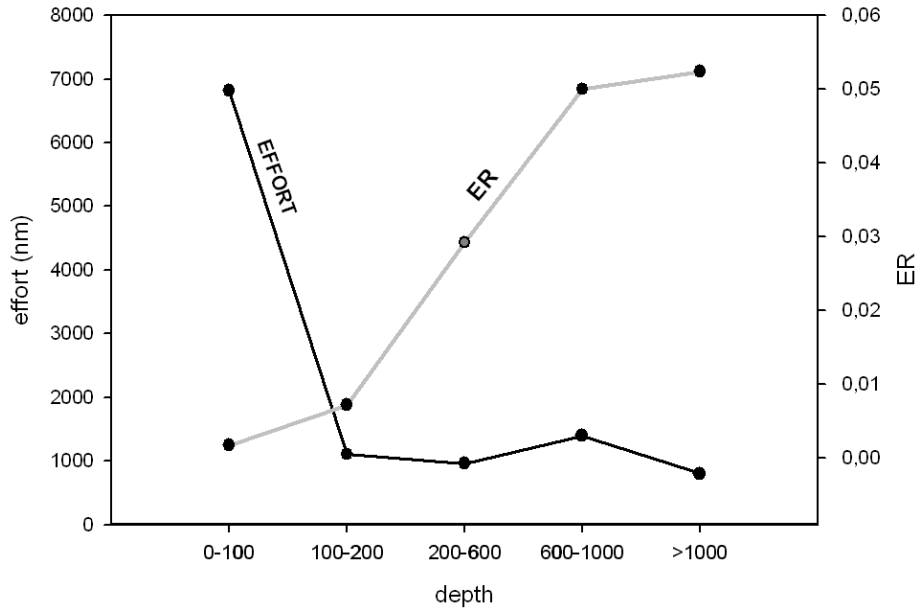

Fig 1 Encounter rate. Sighting probability grows with depth. Effort is calculated in nautical miles

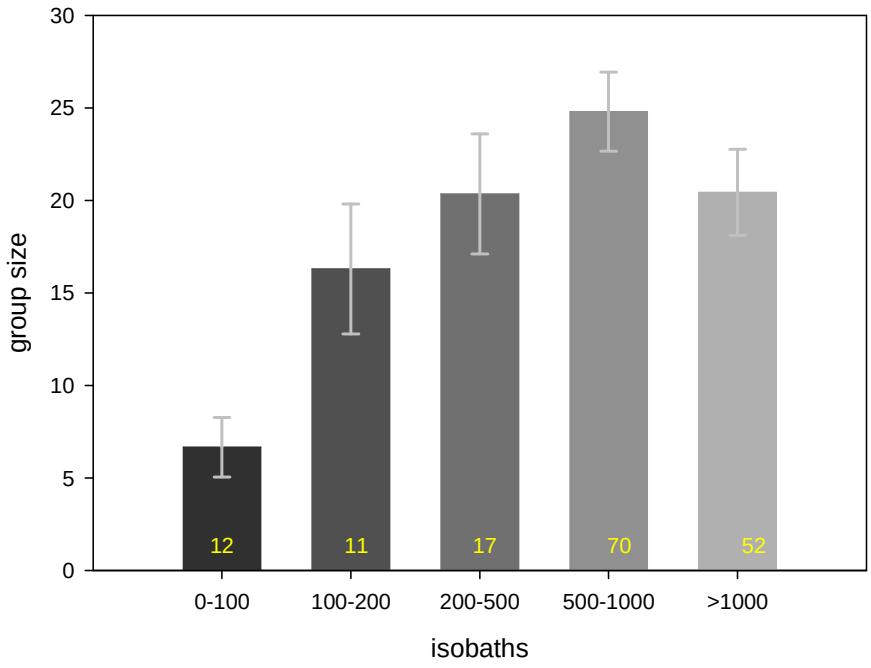

Fig 2 Mean group size per depth. Inshore groups (depth<100m) resulted significantly smaller than others (>100m). Values inside the bars are the number of observations. Values are mean ± se.

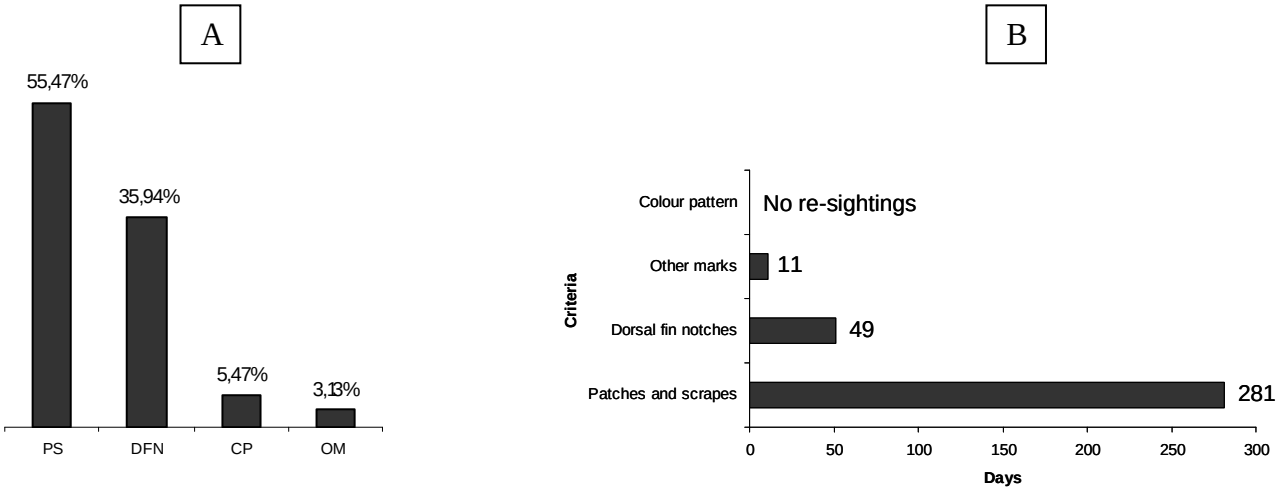

Fig 3 (A) Use of identification criteria, PS and DFN represent the most part of identified individuals (B) Largest time lapse between first and last sightings for each criterion

Fig 4 Examples of pictures of re-captured animals. (A) *patches and scrapes*; (B) *patches and scrapes*; (C) d*orsal fin notches*; (D) *other marks.*

Fig 5 Individual classified by *colour pattern* criterion.