



Temporal residency patterns of Risso's dolphins, *Grampus griseus*, off Pico Island, Azores



Hartman, Karin L. 1,2; Geelhoed, Steve C. V. 1,3; Visser, Fleur 4; Azevedo, José M. N. 2

(1) Nova Atlantis Foundation, Pico Island, Portugal, (2) University of the Azores and CIRN-FCT, Portugal, (3) IMARES, The Netherlands (4) University of Amsterdam, The Netherlands

Corresponding author: karinlousehartman@gmail.com

INTRODUCTION

The Risso's dolphin is a pelagic species present in tropical, warm and temperate waters (1). Although widely distributed, they are relatively difficult to observe due to their occurrence in deep offshore waters (2). *G. griseus* is a deep diver feeding mainly on deep-water cephalopods (3,4). A long-term research project on Risso's dolphins occurring off Pico Island, was set up in 2000 by the Nova Atlantis Foundation. The aim of the present study was to obtain information on the residency pattern of Risso's dolphins around Pico Island.

STUDY AREA

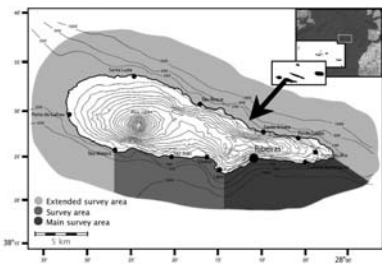


Figure 1. Location and detailed map of Pico Island, showing the survey areas. Out of all surveys, 83 % were carried out in the main survey area, 16% in the survey areas and less than 1% in the extended survey area.

METHODS

EFFORT

Boat-based surveys were conducted from May 2004 to January 2007. A total of 368 survey-days, spread over 25 sampling months, were spent in the field. Highest effort was obtained in summer (54% of all surveys) and spring (34 %). Autumn (8%) and winter (4%) seasons were less sampled due to adverse weather conditions (no surveys were conducted in March), but were included for further analyses nonetheless.

PHOTO ID

Risso's dolphins were individually identified using photo identification methodologies. Analyses of sightings were restricted to one sighting per day, per pod or individual. Sightings of which >75% of the members of defined cluster pods (5) could be identified, were treated as 1 full pod sighting, and used for temporal analysis.

SEX AND AGE CLASS

The scarification pattern on the body was used as an indicator of age. Six age classes representing several stages of scarification (Table 2 & figure 2) were distinguished. Within the adult age classes, the animals with at least one identified calf were defined as females, while adult males were defined based on the long-term absence of accompanying calves. Additionally, behavioural and genital area observations, severity of scarification on the skin and body build were used to determine sex.

Age class	Estimated age	% Scarification
1 Calf	0-3 year	0-5%
2 Juvenile	>3-6 year	0-10 %
3 Sub Adult	>6-10 year	10-25%
4 Adult	>10-15 year	25-50%
5 Adult marbled	>15-20 year	50-75%
6 Adult white	> 20 year	>75%

Table 2. Six age classes and estimation of age, based on scarification pattern.



Figure 2. Distinctive scarification patterns of the six age classes.

RESIDENCY CLASSES

Risso's dolphins were defined as resident, partial resident or non resident according to the criteria shown in table 3. Seasonal presence was used to analyze the residency in order to exclude the bias caused by differences in effort amongst seasons.

Residency category	n years present	n seasons present	n months present
Resident	3	4 -11	8-25
Partial resident	2	>1- 3	4-7
Non resident	1	1	1-3

Table 3. Criteria used to categorize residency (calves born after 2004 were excluded from further analyses).

RESULTS

INDIVIDUAL ID

Risso's dolphins were sighted off Pico Island during all months surveyed. A total of 1102 dolphins were identified, of which 113 were not resighted. Of all resighted animals 26% was resighted once, 29% from 2 to 5 times, 34% from 6 to 25 times and 11% more than 25 times. The total number of resightings per individual within the research period ranged from 1 to 63 (Figure 3).

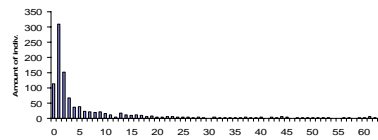


Figure 3. The amount of individuals per number of resightings.

DISTRIBUTION

Using the seasonal presence of animals from all age classes, 173 individuals are considered resident (17% of the total amount of identified animals) represented mainly by sub-adults and adult males.

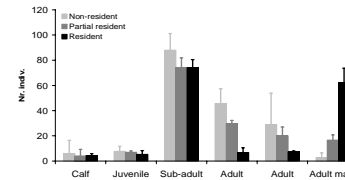
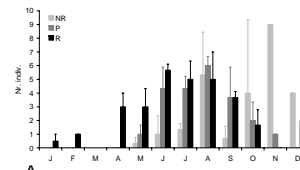


Figure 4. Average number of individuals (+SE) of each residency category for all age classes based on the seasonal presence.

Figure 4 shows the distribution for all age and sex classes amongst the three categories of residency. Calves (3% of the restricted population), juveniles (4%) and sub-adults (48%) are evenly distributed amongst the three residency categories. The distribution of the adult groups show a visible difference within and amongst the residency categories. The majority of as well the adults of unknown sex as the adult females are defined as non-residents or partial residents, opposite to the adult males, which are mainly identified as residents (Figure 4).

TEMPORAL PRESENCE



Additional to the differences described above, figure 5 shows the difference in the monthly distribution of the three residency categories for the adult females (a), sub-adults (b) and adult males (c).

Individual adult females defined as resident were present within the months surveyed apart from the month November, in which a large amount of non-resident individuals were observed.

For the class sub-adults it is shown that in every month surveyed at least one individual of each residency class is represented.

Concerning the presence of adult males categorized as resident, it can be extrapolated that they are present year round.

Despite the variable seasonal effort figure 5 results in the indisputable appearance of all sex and age classes during all months surveyed.

Figure 5. Monthly patterns for three residency classes: adult females (A), sub-adults (B) and adult males (C), based on the seasonal presence using the average number of individuals (+ SE) and one sighting per month per identified individual.

CLUSTER PODS

A more detailed illustration of the temporal presence of different sex and age classes is shown in figure 6. Here several cluster pods, representing a specific sex and age class, are shown to be present over the years.

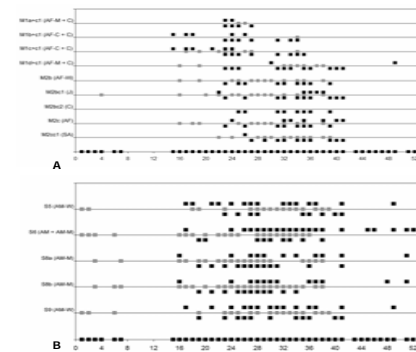


Figure 6. Weekly occurrence of several cluster pods. The central line represents all sightings made from April 2005 to March 2006 (grey rectangles), April 2006 to January 2007 are illustrated above the line, and sightings from May 2004 to October 2004 below. A: Females and calves (n = 13). B: Adult-male and marbled pods (n = 29).

CONCLUSIONS

* Risso's dolphins are present off Pico Island during all months surveyed within this study, indicating that this is an important area for the species.

* There is a resident population in the study area, which is mainly formed by adult males and sub-adults.

Our recommendation, following these results, would be to strongly consider conservation measures to protect the population of Risso's dolphins off Pico Island.

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