

First Observations of Parturition and Postpartum Behavior in the Mediterranean monk seal (*Monachus monachus*) in the Eastern Mediterranean



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Abstract

Understanding reproductive behavior, especially the circumstances surrounding parturition and the events following the first days postpartum is essential in defining effective conservation strategies for endangered pinnipeds. In the case of the critically endangered Mediterranean monk seal (*Monachus monachus*), difficulties in documenting events, such as parturition, are compounded by the very low population numbers and the inaccessibility of the habitat occupied by the species. In this study the authors report the first observations of parturition for the species from the central Aegean Sea, Greece in the eastern Mediterranean Sea. Using a state-of-the-art infrared remote-monitoring system two parturitions were documented and important information on the total duration of the events, the total duration of suckling, as well as, information on the presentation of the pups, their sex and habitat use were recorded. This new information on the reproductive biology of the species in this part of its range outline the importance of suitable reproductive caves for the conservation of the species and the urgency of protecting them. In addition, considering the high cost and logistics of the study, monitoring the species on a large scale in order to effectively protect it, will require the development of new, low-cost and time-efficient methodologies.

Introduction

Understanding reproductive behavior is essential in defining effective conservation strategies for endangered pinnipeds. Information on the reproductive behavior of the critically endangered Mediterranean monk seal is scarce and consists mainly of information from the Cabo Blanco region in Mauritania (Layna *et al.* 1999, Gazo *et al.* 2000). This information, however, might not necessarily be directly applicable to the other areas of the species distribution, due to significant differences in habitat occupied (Karamanlidis *et al.* 2004), female reproductive strategies and population structure (Dendrinou *et al.* 2007).

In 2007 a study was carried out in Greece aiming to collect information on the parturition and postpartum behavior of the Mediterranean monk seal. A parturition event was defined as the time span between the last entry of a parturient female into the cave before giving birth, the actual parturition until the first (unforced) departure, with or without the newborn pup.

Materials & Methods

A monitoring system was installed in one of the main reproductive caves of the species at the island of Kimolos, at the southwestern Cyclades islands (Figure 1a). The monitoring system was installed in a cave at the northeastern part of the island (Cave code: KIM1, Figure 1b), with an entrance facing to the east that led through a 35m-long corridor and an approximately 100 m² pool to two beaches with sand, pebbles and boulders. The total size of the beaches varied between the beaches being totally washed out by the sea during storms and a maximum of approximately 50 m² of dry surface during calm weather conditions (Figure 1c).

The monitoring system consisted of one remote-controlled and one standard digital video cameras, supported by two infrared light beams, which provided 24-hour monitoring coverage. The system was powered by twelve solar panels, which generated power also for charging up a set of four car batteries which ensured system operation during night and in the winter.

Results

- Over a six-month monitoring period **two parturition** events were recorded.
- The first parturient female entered the cave on the 18th of September 2007 at 2211 and positioned herself on the left beach, parallel to the shore, lying on her belly. A summary of the events is presented in Table 1, Fig. 2 and in more detail in the accompanying DVD.
- The second parturition event started on the left beach on the 2nd of October 2007 and lasted 109 hours. A summary of the events is presented in Table 1, Fig. 2 and in more detail in the accompanying DVD.
- The second parturition event was **interrupted** by an unidentified human who entered the cave and scared Fem2 away, leaving Pup2 alone in the cave. In her attempt to get into the water Fem2 trampled over her newborn pup.
- Throughout both parturition events females remained close to their pups, mostly in body contact. They prevented their pups from moving beyond their reach by "restaining" them and resting their head on the pups' hindflippers.

Discussion

It has been suggested that human disturbance during parturition or the lactation period might lead to the abortion or abandonment of unweaned Mediterranean monk seal pups (Johnson & Lavigne, 1999). While this was not the case in our study, the temporary abandonment of the pup in conjunction with bad weather conditions could lead to mother-pup separation and the eventual death of the pup. Natural mortality related to bad weather conditions has been the main cause of death recorded for this age class for the species in Greece (Androukaki *et al.*, 1999).

Identifying the most important pupping sites of the species in the country and effectively protecting them is considered therefore one of the outstanding conservation priorities for *Monachus monachus* in Greece (Notarbartolo di Sciara *et al.*, 2009).

The general pattern of the parturition events recorded is consistent with the information available from the species (Layna *et al.*, 1999) and the closely related Hawaiian monk seal (Eliason *et al.*, 1990).

Some **differences** were however recorded, such as the **cephalic presentation** of one pup, the **lack of aggressive interactions** between adult females and the **presence of aggressive interactions between parturient females and non-filial pups**.

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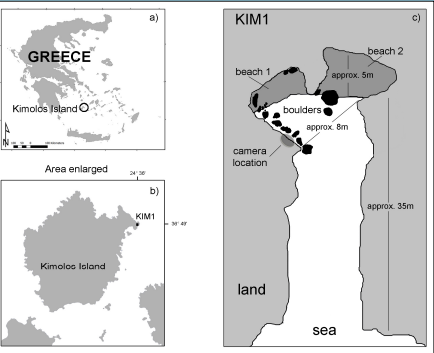


Figure 1: a) Map of Greece indicating the study area. b) Map of the island of Kimolos indicating the location of the study site. c) Drawing of cave KIM1, indicating the main topographic features of the cave – the drawing is not to scale.

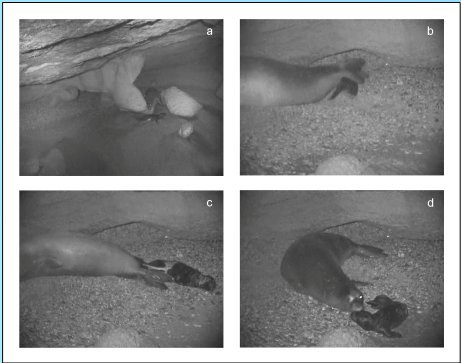


Figure 2: Sequence of images from a monitoring system installed in order to monitor Mediterranean monk seals. a) While trying to prevent her pup from being washed away by waves a female seal climbs over a 1.2m high bolder. b) Presentation of the second pup was head first. c) Moments after the birth of a male pup, the umbilicus cord was ruptured. d) The mother-pup pair engages in intense nuzzling.