

# Occurrence of the critically endangered Mediterranean Monk Seal, *Monachus monachus*, at Olympos-Beydağları National Park, Turkey

(Mammalia: Phocidae)

Ali Cemal Gucu, Serdar Sakinan, Meltem Ok

**Abstract.** The coast of Antalya, despite being acknowledged as an important Monk Seal (*Monachus monachus* Hermann, 1779) habitat, has never been studied systematically for the occurrence of the species. The rocky cliff-bound coast of Antalya Olympos-Beydağları National Park, where human disturbance appears minimal compared to the rest in the area, was surveyed between June and November 2008. Of the 39 caves discovered, both along mainland and island coasts, only 8 were considered suitable for placing photo-traps and a total of 11 automatic cameras was deployed. The caves were periodically visited to retrieve recorded digital images. 4 individual seals (2 adults, 2 juveniles) were photo-identified in 3 caves. The National Park provides suitable habitat for breeding. Human disturbance was very high throughout the Monk Seal habitats, and the most serious pressure appeared to be the human intruders in the caves. From the conservation point-of-view, three sites in the surveyed area, Üçadalar, Olympos and Adrasan, were noted as significant and so require strict protection.

**Key words.** Mediterranean Monk Seal, Olympos-Beydağları National Park, photo-trapping, endangered species, Antalya, Turkey.

## Introduction

The Mediterranean Monk Seal (*Monachus monachus* Hermann, 1779) has been listed by IUCN as critically endangered since 1996 (IUCN 2007). The north-eastern corner of the Mediterranean, the coast of Mersin in particular, is one of the last segments hosting a continuously breeding Monk Seal colony (GUCU et al. 2004). In the 1990s, a series of conservation measures was applied on the west coast of Mersin and the size of the colony has increased consequently (GUCU 2003). Some of the individuals belonging to the colony were sighted outside their respective area, probably in search of new breeding sites (GUCU & OK 2004). A new-born pup found on the Turkish/Syrian border, 175 km east of Mersin, indicated that the seals of the Eastern Mediterranean have spread over a wider range than was previously believed (GUCU et al. 2007). The studies have been expanded towards the south and a small breeding group composed of at least 5 seals has been identified on northern Cyprus (GUCU et al. in press). One of the seals photographed on the island had been identified earlier on the Mersin coast. This observation confirmed that seals in the northeastern Mediterranean undertake long distance movements. This ability bears risks and advantages in terms of conservation: seals may move beyond those areas where they are protected, but on the other hand, with long distance mobility, the genetic pool of the colony may be broadened. In either case it is important to identify the range of their distribution.

It is very likely that an arm of the north-eastern Mediterranean Monk Seal colony extends towards Antalya province, a tourist area of Turkey. In this study, Olympos-Beydağları National Park, which covers a significant part of the province, has been surveyed in an attempt to gain a wider view on the distribution of the north-eastern Mediterranean Monk Seal population. The tasks of the investigation were i) to explore possible seal habitats, survey caves used by seals, document and classify the caves according to their suitability; ii) to install photo-traps in the most suitable caves; iii) to photo-identify the seals captured by the photo-traps and so assess the size of the group sighted in the National Park.

### Material and methods

The study was carried out on the coastal stretch between Kemer and Finike, which coincides with the coastal border of the Olympos-Beydağları National Park. All islands around the National Park (Üçadalar, Pırasa, Suluada and Beşadalar) were also covered in the study (Fig. 1).

The research is based on a method that has been found appropriate for the region (GUCU et al. 2004, GUCU et al. in press). The field surveys involved a comprehensive survey which was conducted in early summer (June 2008) well before the whelping season, in order not to disturb the seals during their critical reproductive season, and two complementary surveys were conducted in mid summer (August 2008) and autumn (November 2008).

A total of 39 caves matching Monk Seal habitat descriptions (GUCU et al. 2004, KARAMANLIDIS et al. 2004) was discovered and classified according to GUCU et al. (2004). Among them, only those with an underwater entrance or with a surface opening long enough to hide an inner area, and having an inner platform formed by sand, pebble or flat rock, deep and wide enough to haul out on, were selected as suitable for photo-trapping. The height of the ceiling was also taken into consideration. The caves with a ceiling lower than the maximum wave height were disregarded in order to prevent loss of the monitor during storms. 11 photo-traps were installed in the 8 selected caves; paired photo-traps were used in large caves where the haul-out platform was larger than the camera view angle (Table 1).

Non-deterrent photo-traps (Vigil P-Box D-435 Circuitronique Estrie Inc., Canada) were used to photograph the seals (GUCU 2007). The monitored caves are shown in Fig. 1. Warning signs indicating that the cave was being monitored by scientists were placed inside caves that were near to tourist activities. Since these signs may actually attract attention, no sign was placed inside caves which did not have a noticeable entrance and where no boat was sighted in the near surroundings.

The seals captured by the photo-traps were photo-identified and the overall population size was estimated with Lincoln-Petersen mark-recapture index (2 sample closed-population model) and Chapman modification (LANCIA et al. 1994).

### Results

Among the monitored caves, three were used by the seals and photo-traps captured 133 seal images. A total of 4 individual seals was identified on the captured photographs. Two of them were adult females (SAMARANCH & GONZÁLES 2000) and the other two were classified as juveniles (one being a male). Based on individuals identified, the mark-recapture index suggested that there may be 4 to 6 (95% confidence limits) individuals in the surveyed area.

The cave use was intensified through to the end of summer; there was no evidence of cave use in August when tourism in the region reaches its peak (Fig. 2). The time of day when the monitors were activated by a seal (verified with a photo) were analysed to evaluate cave use

Table 1. List of the caves monitored at the Olympos-Beydağları National Park: suitability, disturbance (HD), number of photo-traps deployed, number of seals sighted, tracks and the total number of images obtained during the two successive periods. B = tour boat; S = bathers; F = fisherman; R = dirt road; D = sleeping depression.

Cave Code	Suitability	HD	Traps	Seal	Track	Photo
Üçadalar-1	Active	B, S	1	F2	D	13
Olympos-1	Active	B, S	1	J1	D	114
Olympos-2	Potential	F	2	-	-	-
Adrasan-1	Active	F	1	F1, J2	-	6
Adrasan-2	Active	-	1	-	D	-
Gelidonya-1	Potential	R	1	-	-	-
Karaöz-1	Potential	-	1	-	-	-
Karaöz-2	Potential	-	3	-	-	-

Table 2. Timing and location of seal haul-outs recorded by the monitors during the study

Haul-out date	Time of the first record	Time of the last record	Total haul-out duration (h:m)	Seal	Cave
July 20 <sup>th</sup>	06:05 pm	10:41 am	16:36	J1	Olympos-1
July 22 <sup>nd</sup>	06:23 am	10:50 pm	16:26	J1	Olympos-1
July 23 <sup>rd</sup>	05:29 am	05:29 am	0:10>	J1	Olympos-1
Sept. 6 <sup>th</sup>	01:02 pm	10:34 am	21:32	J1	Olympos-1
Sept. 16 <sup>th</sup>	06:25 am	06:25 am	0:10>	F2	Üçadalar-1
Sept. 16 <sup>th</sup>	09:44 pm	10:35 pm	0:51	F2	Üçadalar-1
Sept. 17 <sup>th</sup>	10:14 pm	03:23 am	5:07	F2	Üçadalar-1
Sept. 25 <sup>th</sup>	09:43 pm	11:49 pm	2:06	F2	Üçadalar-1
Sept. 28 <sup>th</sup>	12:03 pm	03:50 am	3:47	F2	Üçadalar-1
Oct. 7 <sup>th</sup>	10:44 pm	12:58 am	2:14	F2	Üçadalar-1
Sept. 18 <sup>th</sup>	09:55 am	04:41 pm	6:41	J2	Adrasan-1
Sept. 23 <sup>rd</sup>	11:20 am	11:20 am	0:10>	F1	Adrasan-1
Oct. 10 <sup>th</sup>	10:54 am	10:54 am	0:10>	F1	Adrasan-1

pattern by the seal throughout the study period. The in-cave activity pattern of 4 different individuals is given in Fig. 2. Analysis of the photographs indicated that a total of 13 haul-outs was recorded (Table 2). The average haul-out duration is 8:22 h (95% confidence interval; 2:53). J1 represented the longest haul-out (21:32) while no estimate could be given for F1, which was detected only twice.

During the first two surveys (but particularly in August), many boats were sighted very close to the caves. Moreover, the team met people inside the caves on several occasions. As observed from the photographs taken automatically in a cave (Adrasan-1), people regularly visited the cave and up to seven people were counted on one visit. However the seals kept using the cave in the mean time; three seals were identified in the same cave. It may also be worth noting that due to its remote and hidden location, the warning signs used to draw intruders' attention to the fact that the cave was being monitored for seals were not placed at this cave.

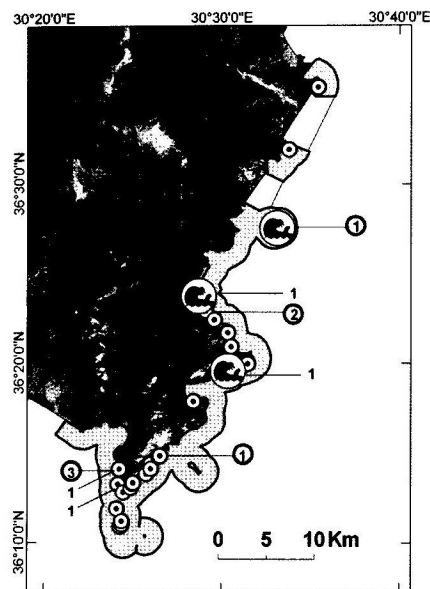


Fig. 1. Map showing the position of all identified caves (small circles), monitored caves and number of monitors (circles with number), and the caves used by seals (large circles with symbol) as well as the survey tracks (grey area).

## Discussion

The seals were not observed regularly in the monitored caves. This may indicate that they use alternative caves for resting, as has been commonly observed (PANOU et al. 1993, KARAMANLIDIS et al. 2003, GUCU et al. 2004). As was observed in the Adrasan-1 cave, seals may rest in a cave where no haul-out platform exists. It is therefore quite possible that they may use the other caves in the area which were not monitored during the study. However it is also possible that their home ranges are not limited to the National Park. Whichever argument is valid, the significance of the National Park is unquestionable since seals were observed there during the breeding season that is defined for the species in the eastern Mediterranean. Whelping was not observed during the study. However, the diving tour operators we interviewed told us about a pup possibly born on Üçadalar in autumn 2007. One of the juveniles photographed in the study (J1) is a yearling. As seals generally tend to remain close to the natal site during their very early life stages, it is very probably that this individual is the pup observed in 2007. All the evidence points to the fact that the Olympos-Beydağları National Park may be a breeding site.

The number of identified seals in the northeastern Mediterranean Sea is given as 38 by GUCU et al. (in press). With the 4 new individuals identified in this study, this figure increases to 42. However the photo-identifications are based mainly on scar marks which may be subject to significant changes with the age of the seal. Some of these marks may remain visible for long time, but some may fade away after moulting or may be masked by new ones. Another important morphological feature used in identification is the discoloration on

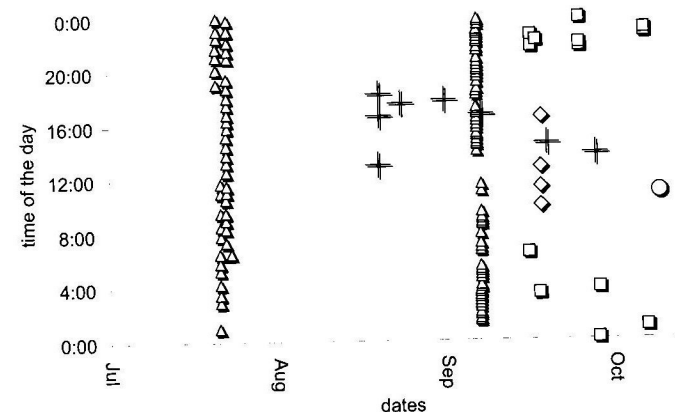


Fig. 2. Cave use pattern by F1 (circle), F2 (square), J1 (rectangle), J2 (diamond) and humans (plus sign).

the belly. This patch, which is conspicuous in the early stages, may also fade away with the age of the animal. It is clear that F1 and F2 are two different individuals; nevertheless, it cannot be guaranteed that F1, which bears rather amalgamated scar marks, is not among the individuals identified during previous studies.

Cave use has two different patterns. The long use over 12h was observed in a cave (Olympos-1) with a hidden, long, underwater entrance reaching to a very small air chamber and a narrow haul-out platform. The structure of the cave and its difficult access is probably not attractive for the tourists; no human intrusion was recorded by the cameras. Long use was only shown by the juvenile (J1).

Short use was observed in two caves, in which visits by tourists were also verified by the photo-traps (Fig. 2). One of these caves (Üçadalar-1) was located on an island. The moorings fixed only 100 metres away from the entrance of the cave indicate that the island is regularly visited by tour and diving boats throughout the tourist season. Contrary to cave Olympos-1, this cave has a very easy access from the sea, which may be what attracts the tourists. As can be seen in Table 2, the seal used this cave exclusively at night when tour-boats had left the area. It is unlikely that seal and tourists will partition the cave in such a manner for long, especially during the very long period of maternal pup care which takes place in the cave. It is more probable that the very few seals still inhabiting the area will eventually abandon the National Park, as is the case in many other sad examples elsewhere in the Mediterranean (JOHNSON & LAVIGNE 1999).

The other cave (Adrasan-1) is located in an area banned for divers. However, as in the rest of the National Park, there is no limitation for tour operators organising daily trips to the coast. The entrance of the cave is not easily recognisable. It opens into a very narrow and long corridor. The photo-trap was placed over a very narrow air chamber (not more than 4 m<sup>2</sup>), located at the far end of the cave. Finding the cave and reaching the air chamber where the photographs were taken is not easy. The times of the visits by tourists are quite regular (Fig. 2). This clearly indicates that tourists are brought and guided into the cave by the tour-operators.

The number of Monk Seals found may be seen very low, but when the critical status of the species all over the Mediterranean Sea is considered, this small group should not be overlooked. Moreover, the cost of conservation efforts for these animals is comparatively low since there are already restrictions on certain human activities in the Park.

**Acknowledgements.** This study was carried out within a project funded by the Turkish Scientific and Technical Research Council, TUBITAK (Project No: TBAG-107T598). We would like to express our deepest gratitude to Mertkan TÜER, Billur CELEBI and Ekin AKOĞLU whose help and contributions made this study possible.

## References

- GUCU, A. C. (2003): The Cilician Monk Seal colony is growing. – The Monachus Guardian: 6 (2) [www.monachus-guardian.org/mguard12/1222infocu.htm](http://www.monachus-guardian.org/mguard12/1222infocu.htm) (accessed 4 August 2008).
- GUCU, A. C. (2007): Response of monk seals to monitoring activities on the Mersin coast. – The Monachus Guardian – Research 10 (2): November 2007 [[www.monachus-guardian.org/mguard20/2024research.htm](http://www.monachus-guardian.org/mguard20/2024research.htm), accessed 4 August 2008].
- GUCU, A. C., E. ERBİL, M. OK, S. SAKINAN & B. CELEBI (2007): Pup rescue in Samandağ. – The Monachus Guardian 10 (1): June 2007. [www.monachus-guardian.org/mguard19/1922infocu.htm](http://www.monachus-guardian.org/mguard19/1922infocu.htm) (accessed 4 August 2008).
- GUCU, A. C., G. GUCU & H. OREK (2004): Habitat use and preliminary demographic evaluation of the critically endangered Mediterranean monk seal (*Monachus monachus*) in the Cilician Basin (Eastern Mediterranean). – Biological Conservation 16: 417–431.
- GUCU, A. C. & M. OK (2004): Arab The Pilgrim. – The Monachus Guardian 7 (1): June 2004 [www.monachus-guardian.org/mguard13/1321covsto.htm](http://www.monachus-guardian.org/mguard13/1321covsto.htm) (accessed 4 August 2008).
- GUCU A. C., M. OK & S. SAKINAN (in press): A survey on the critically endangered Mediterranean monk seal, *Monachus monachus* (Hermann, 1779) inhabiting the coast of Northern Cyprus. – Israel Journal of Ecology and Evolution.
- IUCN (2007): 2006 IUCN Red List of Threatened Species. – The IUCN Species Survival Commission, IUCN, Gland [[www.redlist.org](http://www.redlist.org), accessed 18 July 2007].
- JOHNSON, W. M. & D. M. LAVIGNE (1999): Mass tourism and the Mediterranean monk seal. The role of mass tourism in the decline and possible future extinction of Europe's most endangered marine mammal, *Monachus monachus*. – The Monachus Guardian 2 (2): 1999.
- KARAMANLIDIS, A. A., R. PIRES, H. C. NEVES & C. SANTOS (2003): Habitat of the endangered Mediterranean monk seal (*Monachus monachus*) at São Lourenço-Madeira. – Aquatic Mammals 29: 400–403.
- KARAMANLIDIS, A. A., R. PIRES, N. C. SILVA & H. C. NEVES (2004): The availability of resting and pupping habitat for the critically endangered Mediterranean monk seal *Monachus monachus* in the archipelago of Madeira. – Oryx 38: 180–185.
- LANCIA, R. A., J. D. NICHOLS & K. H. POLLOCK (1994): Estimating the number of animals in wildlife populations. In: T. A. BOOKHOUT (Ed.), Research and management techniques for wildlife and habitats. 5<sup>th</sup> edition. – The Wildlife Society, Bethesda (Md), p. 215–253.
- PANOU, A., J. JACOBS & D. PANOS (1993). The endangered Mediterranean monk seal *Monachus monachus* in the Ionian Sea, Greece. – Biological Conservation 64: 129–140.
- SAMARANCH, R., & L. M. GONZÁLEZ (2000): Changes in morphology with age in Mediterranean monk seals (*Monachus monachus*). – Marine Mammal Science 16: 141–157.

**Authors' address:** Ali Cemal Gucu, Serdar Sakinan, Meltem Ok, Institute of Marine Sciences, Middle East Technical University Mersin, Turkey. – Email contact: [gucu@ims.metu.edu.tr](mailto:gucu@ims.metu.edu.tr).