

Monitoring Human Activity in an Area Dedicated to the Protection of the Endangered Mediterranean Monk Seal

ALEXANDROS A. KARAMANLIDIS

Department of Biological Sciences
Manchester Metropolitan University
Manchester, United Kingdom

PANAYIOTIS DENDRINOS

ELENI TOUNTA

SPYROS KOTOMATAS

MOM/Hellenic Society for the Study and Protection of the Monk Seal
Athens, Greece

Mediterranean monk seal populations have declined dramatically and survive in subpopulations scattered throughout their original distribution. The National Marine Park of Alonnisos, Northern Sporades is the first marine protected Area dedicated to the protection of the species in the Mediterranean. A Monitoring and Awareness Project has been carried out in the area from 1993 to 2000, the results of which have produced a detailed profile of the human usage pattern of the Park and indicated a significant reduction of illegal activities in the area. The pattern of human usage has enabled the monitoring team to adjust their efforts in the Park over time and provided essential baseline data for future management. The combined monitoring and awareness efforts have contributed significantly to the conservation of the Mediterranean monk seal by successfully protecting pupping sites and reducing human-induced mortality of the species in the area.

Keywords marine protected areas; monitoring; Mediterranean monk seal; National Marine Park of Alonnisos, Northern Sporades; species conservation

Received 30 July 2002; accepted 18 December 2003.

We would like to thank the monitoring team of the National Marine Park of Alonnisos, Northern Sporades and especially S. Argyriou, N. Paneris, M. Stamatiou, and Th. Anagnostou for their efforts to collect the data used in this work. Without the assistance and support of the local Port Police Authority this project would not have been possible. We would also like to express our gratitude to the International Fund for Animal Welfare (IFAW) for their continuous support of the monitoring activities in the park. The project has also been partially funded by the European Commission (Contract Numbers 4-3010(92)7829 and B4-3040/95/009/AO/D2). This study has been conducted by the first author as a partial fulfillment of a Master's Degree in Conservation Biology at the Manchester Metropolitan University. We thank Dr. Martin Jones for his constant encouragement and three anonymous reviewers for their valuable comments, which greatly improved this manuscript.

Address correspondence to Alexandros Karamanlidis, Department of Genetics, School of Biology, Aristotle University of Thessaloniki, 54124 Thessaloniki, Greece. E-mail: alkar@bio.auth.gr

Introduction

The Mediterranean monk seal (*Monachus monachus*) is critically endangered (Hilton-Taylor, 2000), and fewer than 500 individuals are estimated to survive nowadays in the wild (Johnson, 2000). The species has disappeared from most of its original range and can be found only in small isolated subpopulations in the Cabo Blanco Peninsula and the Archipelago of Madeira in the Atlantic Ocean, the western and northeastern Mediterranean Sea, and the Black Sea (Aguilar, 1999). In Greece, the species appears to be widely distributed throughout the Aegean and Ionian Seas (Adamantopoulou, Androukaki, & Kotomatas, 1999) and several breeding subpopulations have been identified (Dendrinis, 1998; MOm, 1999). Numerous threats jeopardize the survival of the species (Johnson & Lavigne, 1998) but habitat loss, human disturbance, and deliberate killings, especially in Greece, are considered to be the most serious among them (Johnson & Lavigne, 1999; Androukaki et al., 1999). The latter two threats appear to have led the species to seek refuge in remote sea caves to rest, give birth, and take care of young (Pires & Neves, 2000). These caves, however, are thought to be unsuitable for the species, especially because pup survival rates within them are low (Gazo et al., 1999). Taking into account the increasing fragmentation and loss of monk seal habitat, protecting the last remaining pupping sites is of paramount importance for the survival of the Mediterranean monk seal.

Marine protected areas (MPAs) are gaining increasing acceptance as a tool in addressing environmental problems in the marine realm. Incentives for establishing MPAs include the protection of nature through the protection of species and habitats, the replenishment of fishery stocks, and the provision of economic revenues through tourism (Badalamenti et al., 2000).

The National Marine Park of Alonnisos, Northern Sporades (NMPANS) is the first MPA in Greece and was established in 1992 by the Hellenic government for the protection of its unique ecosystem and, particularly, the Mediterranean monk seal; it is currently the only MPA in Greece dedicated to this cause. The NMPANS has an area of approximately 2200 km² and is divided into three zones with varying degrees of protection (Figure 1).

Zone A

Zone A includes five large and several smaller uninhabited islands, as well as, the marine area surrounding them. Regulations on all activities vary between the different islands. Special protection measures have been taken for the island of Gioura, where tourists may not approach closer than 400 m. Medium-size commercial fisheries (purse seine and trawler fishing) are not allowed to operate closer than one and a half nautical miles from the coasts of all islands in this zone and recreational fishing by tourists is not allowed except at a distance of 500 m from the island of Skantzoura. Most other areas in Zone A are open to tourism and small-scale commercial fisheries.

Core Zone

The Core Zone is located within Zone A and includes the uninhabited island of Piperi and an area of three nautical miles around it. All human activities, except scientific research and management of the island, are strictly prohibited.

Zone B

This zone includes the only inhabited island of the NMPANS (Alonnisos), several smaller islands, and the marine area around them. In this part of the NMPANS most human

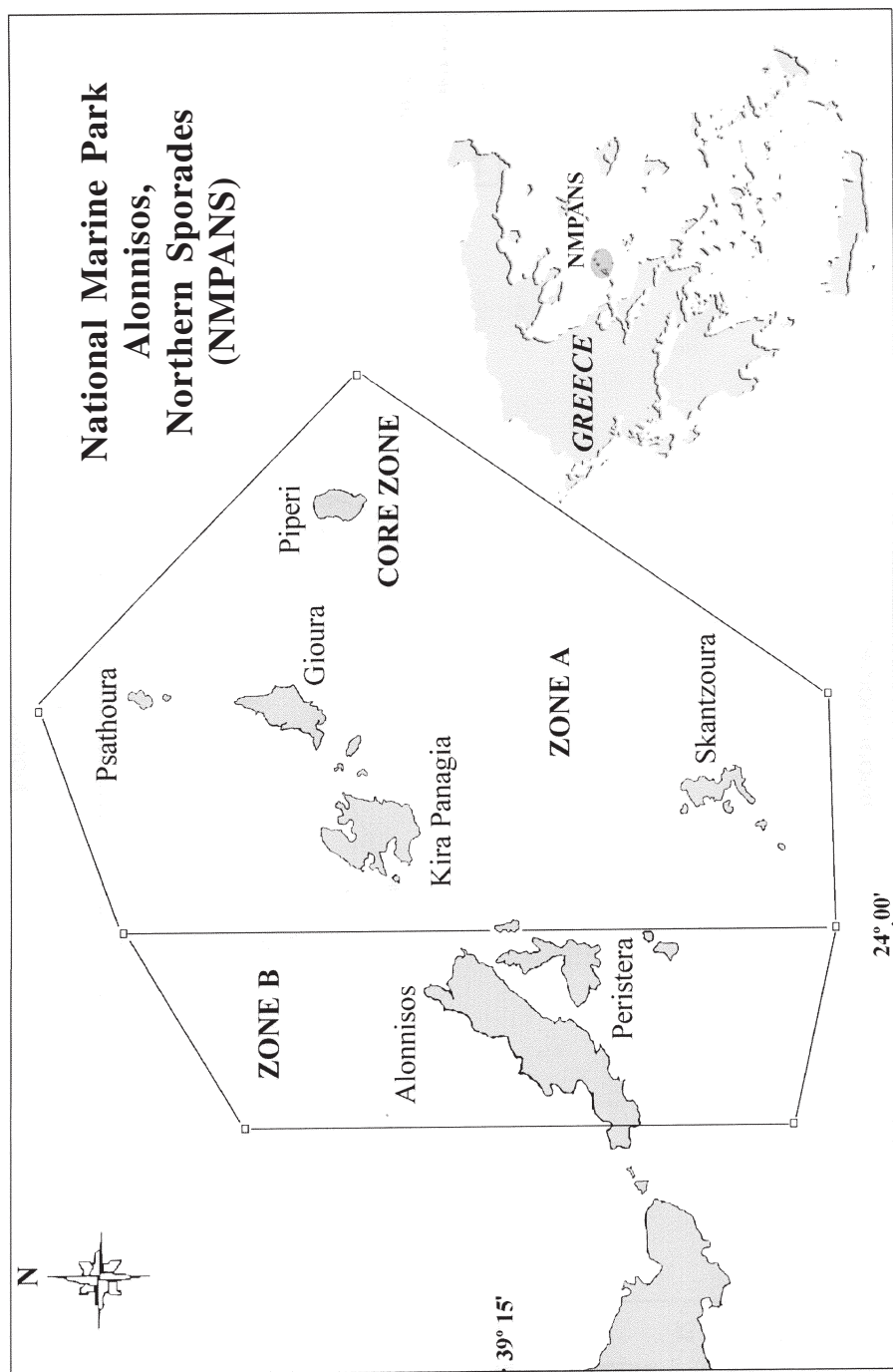


Figure 1. The National Marine Park of Alonnisos, Northern Sporades.

activities are allowed. As in Zone A, however, medium-size commercial fisheries are not allowed to operate closer than one and a half nautical miles from the coasts of the islands of the NMPANS (MOM, 1996).

The effective operation of any protected area as a conservation measure depends greatly on the effective enforcement of the regulations governing the area (Archipelagos & HSSPMS, 1994). However, until recently the Hellenic government has failed to appoint a managing body for the NMPANS. MOM/The Hellenic Society for the Study and Protection of the Monk Seal is a national nongovernmental organization (NGO) with long experience in conducting research on the biology of the species and carrying out monitoring programs and awareness campaigns in the NMPANS (MOM, 1995a, 1996). Recognizing that the effective operation of the NMPANS is important for the survival of the Mediterranean monk seal, MOM initiated a monitoring project in 1993 for the NMPANS that aimed to:

1. assist Port Police authorities, which are responsible for the enforcement of the Park's regulations, by monitoring illegal activities (1993–2000);
2. monitor human activity within the NMPANS, by recording the intensity of human presence in space and time (1995–2000).

There was a similar recognition that any activity targeting the protection of the Mediterranean monk seal in the area should be accompanied by the dissemination of information regarding the importance of the area in the survival of *Monachus monachus* and the regulations governing the operation of the Park. MOM therefore also initiated an Awareness Campaign aimed at the visitors to the NMPANS.

Materials and Methods

Monitoring efforts in the NMPANS started in 1993 and are still in operation. This study is based on the data collected by MOM up to the end of the year 2000.

A 9-m fiberglass speedboat was used for data collection. The NMPANS was divided into numbered quadrants (3.3×2.6 km). Each time a quadrant of the park was visited, the identity, activity, and position of vessels present were recorded. We distinguished between two types of human groups (commercial fishermen and tourists) and three types of human activity (traveling, anchoring, and fishing). Vessels near the coastal areas and harbors of the island of Alonnisos (from column 10 westwards; see Figure 5) were not recorded. The continuous and heavy boat traffic in this area made recording too difficult. In the first two years of the project (1993–1994) the monitoring team became accustomed to the area and the recording technique and started recording illegal activities within the Park. In 1995 the team started also monitoring the intensity of human activity in the NMPANS. In 1998, however, due to changes in the personnel and other obligations of the monitoring team, only illegal activities within the Park were recorded. Monitoring the intensity of human activity was interrupted in 1998 but continued in the following year.

In order to evaluate human activity in relation to the human groups and types of human activity distinguished, average frequency of human activity (vessels encountered/monitoring hour) was calculated.

In addition, levels of intensity of activity in relation to the geographical location within the NMPANS were estimated. Because the monitoring team did not record the position of the monitoring boat continuously, but only the names of the islands visited, we generated a random sample of 100 monitoring surveys (SPSS 9.0 for Windows, SPSS Inc., Chicago, IL, USA) to calculate the times each quadrant of the Park was

visited by the monitoring team. By assuming a straight route between islands and following the normal course of monitoring we reconstructed the monitoring route and created a usage intensity index (vessels encountered/visits to quadrant) for 128 quadrants within the NMPANS. To avoid positive bias due to low numbers of visits, the present analysis will concentrate on the quadrants that were visited more than 10 times.

Finally, in order to investigate the relationship between specific location and human use, quadrants were merged into three distinct groups:

1. harbor areas: the four major natural harbors of the NMPANS;¹
2. coastal areas: all quadrants that contain a part of the coastal strip of the islands of the NMPANS;²
3. noncoastal areas: all remaining quadrants that do not contain any part of the coastal strip of the islands of the NMPANS.³

The awareness component of the project was achieved by approaching vessels fishing, traveling, or anchoring in the Park and informing passengers about the Park's existence, regulations, and the effort to conserve the area. In the context of this activity a printed leaflet with a map and the zonation of the Park, as well as with the regulations of each zone, was given to the crews and passengers of all vessels encountered by the monitoring team. In addition, similar information was provided at information centers at key locations on the island of Alonnisos.

Results

Illegal Activities in the NMPANS

During the project period (1993–2000) the monitoring team conducted 1160 surveys for a total of 11,605 monitoring hours in the wider NMPANS area. It is estimated that during these surveys the boat covered approximately 100,000 nautical miles. As a result of this effort, the team encountered 241 illegal incidents involving a variety of violations of the Park's regulations (Table 1). Fishermen were responsible for 103 illegal incidents that usually involved illegal fishing activities. Tourists accounted for 138 illegal incidents, most commonly violating regulations concerning amateur fishing and

Table 1
Distribution of monitoring efforts, illegal incidents, boat types,
and activity types encountered from 1993 to 2000

Year	S	MH	OII	FII	TII	FB	TB	BT	BA	BF
1993	126	514	59	26	33	Na	Na	Na	Na	Na
1994	108	603	29	11	18	Na	Na	Na	Na	Na
1995	170	1414	42	16	26	359	715	235	652	187
1996	83	861	8	2	6	222	438	92	461	107
1997	155	1900	31	24	7	349	524	151	584	138
1998	165	1989	21	4	17	Na	Na	Na	Na	Na
1999	188	2340	28	12	16	659	889	304	1037	207
2000	165	1982	23	8	15	442	478	148	620	152
Total	1160	11605	241	103	138	2031	3044	930	3354	791

S = surveys; MH = monitoring hours; OII = overall illegal incidents; FII = fisheries-related illegal incidents; TII = tourism-related illegal incidents; FB = fishing boats; TB = tourists' boats; BT = boats traveling; BA = boats at anchor; BF = boats fishing; Na = not available.

access to the restricted areas of the NMPANS. In all cases the monitoring team provided the necessary information to the Alonnisos port police authorities in order for them to take the appropriate action.

Illegal incidents appeared to occur spatially at random within the NMPANS, and their intensity varied significantly between 1993 and 2000, showing the biggest variations in intensity per monitoring hour between 1993 and 1998. Overall illegal activity also differed significantly throughout the year, being highest in summer (Table 2, Figure 2).

Although average intensity of illegal incidents of fishermen and tourists did not differ, differences were found in their occurrence in time. Fisheries-related illegal incidents were significantly different between years, but showed no difference within years. Tourism-related illegal incidents, in contrast, did not differ from year to year but were more intense during summers (Table 2, Figure 2).

Overall Human Activity in the NMPANS

The monitoring team recorded 5075 vessels in 6024 hours while monitoring the intensity of human activity (1995–2000). This number represents a minimum number of vessels present within the different zones of the Park. Most vessels encountered were at anchor (Table 1). The number of fishing and tourists boats encountered performing different activities was compared. Tourist boats were at anchor more often than expected, while fishermen were more likely to be engaged in some form of fishing activity ($\chi^2 = 28.22$, $df = 2$, $P < 0.001$).

Distribution of Human Activity in the NMPANS

Spatially, most activities, such as overall human activity, fishermen's, traveling, and fishing activity occurred at random within the Park. In contrast, tourist (except tourist fishing) and anchoring activities were spatially clumped (Table 2). Tourists remained

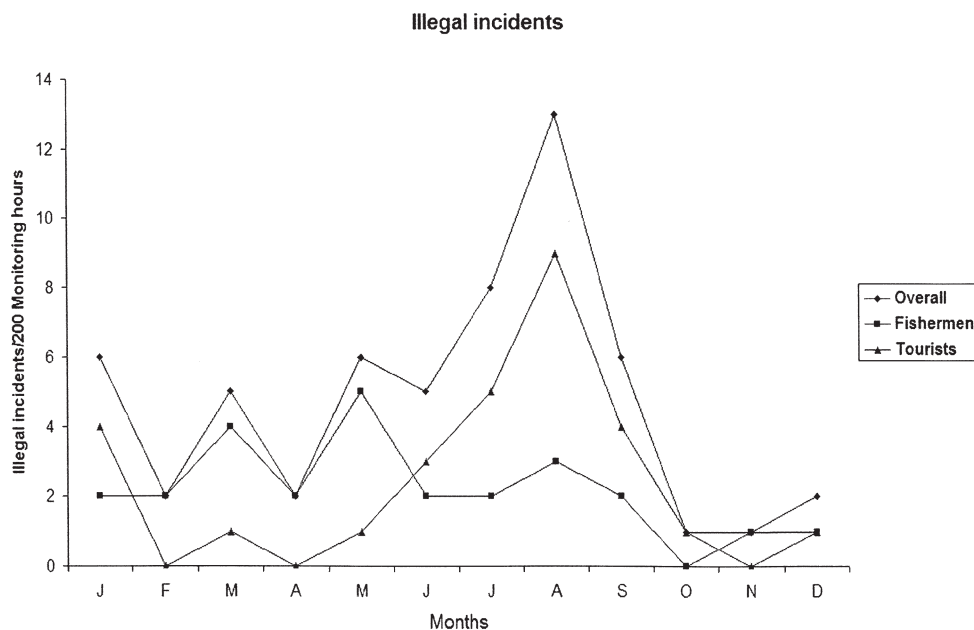


Figure 2. Monthly distribution of illegal activities.

Table 2
Statistical tests carried out in the evaluation of the data collected during the project (1993–2000)

Variate of interest	Null hypothesis	Test statistic	Degrees of freedom	P value
Intensity of illegal activity	Not significantly different between 1993 and 2000	Kruskal Wallis $\chi^2 = 13.864$	7	$P < 0.05$
Intensity of illegal activity	Not significantly different within years	Kruskal Wallis $\chi^2 = 32.887$	11	$P < 0.001$
Intensity of fisheries-related illegal activity	Not significantly different between 1993 and 2000	Kruskal Wallis $\chi^2 = 14.447$	7	$P < 0.05$
Intensity of tourism-related illegal activity	Not significantly different during years	Kruskal Wallis $\chi^2 = 43.536$	11	$P < 0.001$
Average intensity of illegal incidents of fishermen and tourists	Not significantly different	T-test $t = -1.911$	7	$P = 0.1$
Distribution of tourists' activity	Not spatially clumped	Poisson Goodness of fit $\chi^2 = 36.27$	3	$P < 0.0001$
Distribution of anchoring activity	Not spatially clumped	Poisson Goodness of fit $\chi^2 = 56.6$	2	$P < 0.0001$
Frequency of overall usage of the NMPANS	Not significantly different during years	Kruskal Wallis $\chi^2 = 35.86$	11	$P < 0.001$
Frequency of traveling activities	Not significantly different during years	Kruskal Wallis $\chi^2 = 44.1$	11	$P < 0.01$
Frequency of anchoring activities	Not significantly different during years	Kruskal Wallis $\chi^2 = 39.54$	11	$P < 0.001$
Fishermen's usage intensity	Not significantly different within the NMPANS	Chi-square $\chi^2 = 203.51$	40	$P < 0.005$
Tourists usage intensity	Not significantly different within the NMPANS	Chi-square $\chi^2 = 193.66$	26	$P < 0.005$
Anchoring usage intensity	Not significantly different within the NMPANS	Kruskal Wallis $\chi^2 = 188.38$	11	$P < 0.005$
Fishing usage intensity	Not significantly different within the NMPANS	Kruskal Wallis $\chi^2 = 56.77$	25	$P < 0.005$

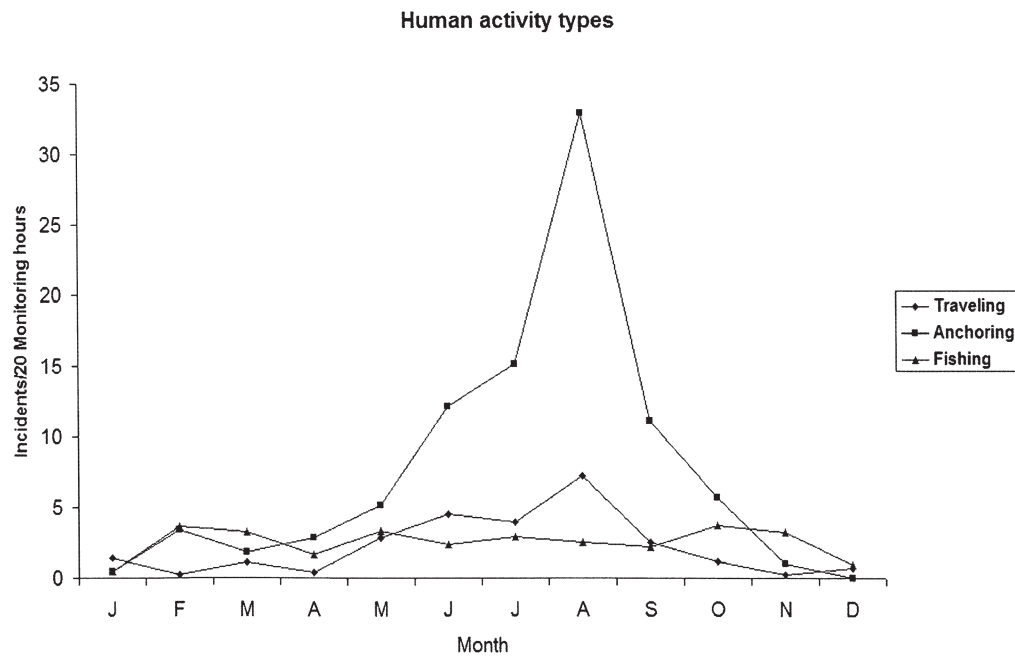


Figure 3. Human activity in the NMPANS throughout the year.

primarily near the coastal areas and passages between the islands of the Park and anchoring activities took place almost exclusively at the natural harbors of the NMPANS, located at quadrants C21, G13, H12, L10, and O13 (Figure 5).

Monthly and Yearly Variation in Human Activity in the NMPANS

During the year, the frequency of overall usage and tourist usage of the Park differed significantly and was highest in August (Table 2). Fishermen, in contrast, used the Park throughout the year with no differences between months (Figure 3). Despite this, average usage frequency of the NMPANS between fishermen and tourists throughout a year did not differ significantly (Paired *t*-test $t = -0.18$, $df = 11$, $P = 0.85$).

Regarding the types of activities carried out, no significant differences in the usage frequency of the NMPANS were found between 1995 and 2000. Traveling and anchoring activities, however, differed throughout the year, being highest in summer, while fishing activities did not (Table 2, Figure 4).

Intensity of Human Activity in the NMPANS

Seventy-seven quadrants were sampled more than 10 times during the project. Thirty-one quadrants were not used at all, 13 had low usage, 28 medium usage, and 5 high usage intensities (Figure 5).

The presence of fishermen and tourists and the intensity of anchoring and fishing activities differed significantly within the Park (Table 2). Traveling activities, in contrast, which were recorded only in coastal areas and passages between islands, did not differ in their intensity. A comparison of the intensity levels between the two human groups and between the three types of activities showed no significant differences (Wilcoxon's signed ranks test $Z = -1.415$, $P = 0.157$, and Kruskal Wallis $\chi^2 = 0.509$, $df = 2$, $P = 0.775$, respectively).

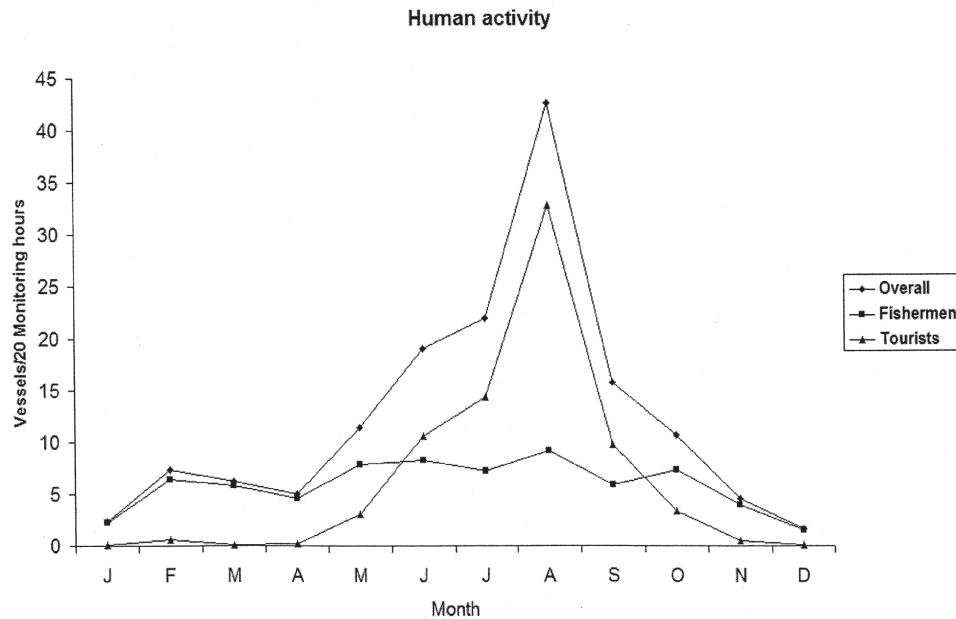


Figure 4. Monthly distribution of traveling, anchoring, and fishing activities.

Finally, a Chi-Square test ($\chi^2 = 13.95$, $df = 2$, $P < 0.05$) showed that fishermen used noncoastal areas, whereas tourists used harbor and coastal areas more often than expected. Fishing activities were thus found to occur more often in noncoastal areas ($\chi^2 = 34.34$, $df = 3$, $P < 0.001$).

Informing Visitors about the NMPANS

During the project, the monitoring team approached 1691 vessels and informed their passengers about the Park's regulations. The team usually encountered these vessels at the two most commonly used mooring bays in G13 and H12 (Figure 5). After an initial period of informing an equal proportion of tourist and fishing vessels (1993–1994), the number of fishing vessels informed sharply decreased, whereas the number of tourist vessels increased (1995–2000) (Figure 6).

Discussion

The National Marine Park of Alonnisos is the largest MPA in the Mediterranean (Badalamenti et al., 2000). This project was the first large-scale monitoring effort carried out in any MPA in Greece. The project monitored human activity in the NMPANS from 1993 to 2000 and created a detailed profile of the usage patterns of the human groups in the Park. The results could contribute to the future management of MPAs in Greece and the Mediterranean in general and could have a bearing on the conservation of the endangered Mediterranean monk seal.

Implications for the Management of the NMPANS

The goal of this project was the active monitoring and protection of the NMPANS, the first MPA dedicated to the protection of the Mediterranean monk seal. The results provide a detailed view of the human activity in the Park, in both time and space:

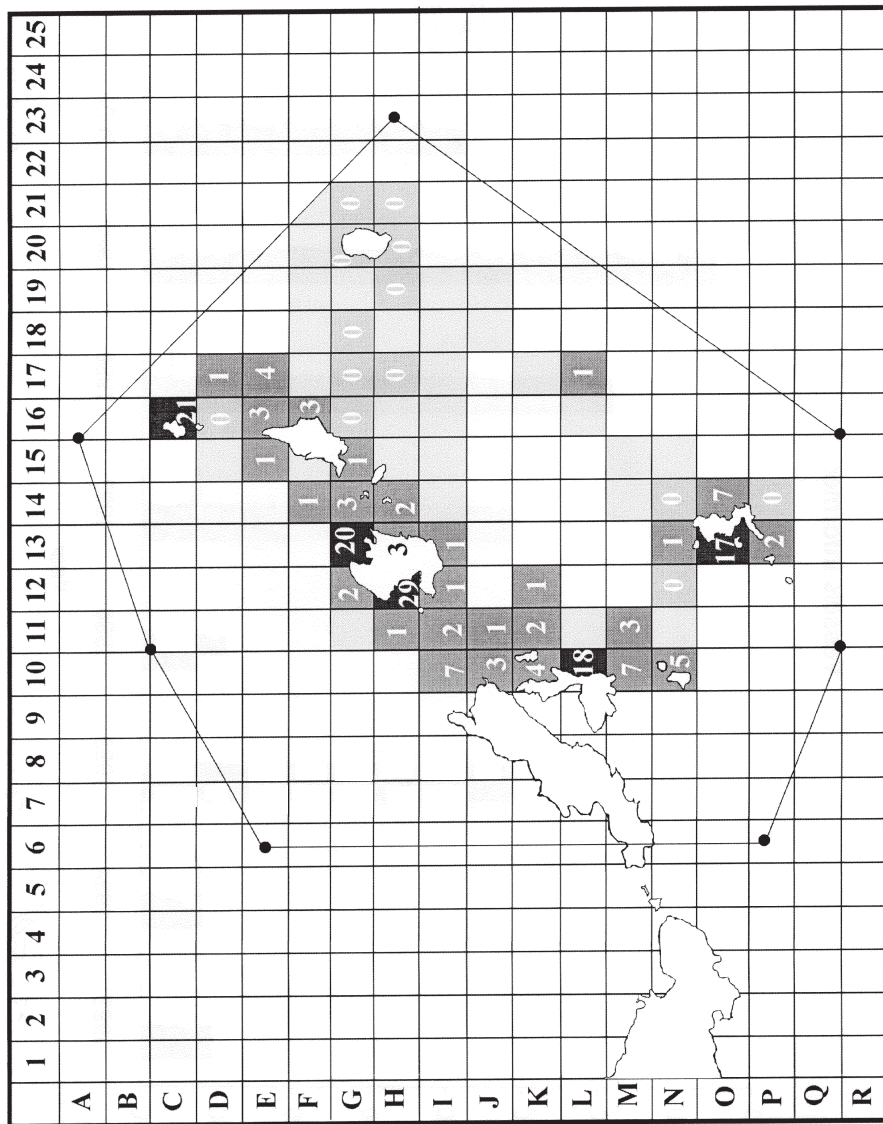


Figure 5. Intensity of use of the NMPANS (boats/10 samples). (Light grey = no usage intensity; medium grey = low usage intensity; dark grey = medium usage intensity; black = high usage intensity.)

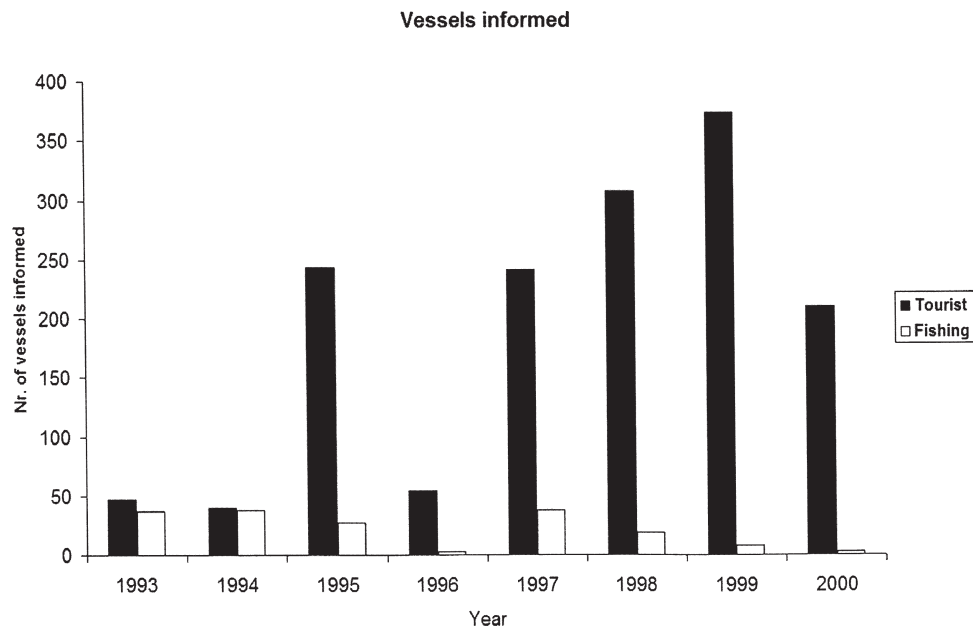


Figure 6. Yearly distribution of vessels informed in the NMPANS.

- Human activity patterns did not change throughout the monitoring period. Human activity was randomly distributed in the NMPANS, increased significantly during summer months, and was more intense in the harbor and coastal areas of the Park. Illegal incidents occurred more often in the summer months and, overall, showed a significant decrease during the project period.
- The activity of fishermen did not change throughout the project period and was randomly distributed. Fishermen visited the Park primarily for fishing and usually used noncoastal areas. While they were present in the Park throughout the year, they showed a preference for winter and spring months. Fisheries-related illegal activities decreased significantly over the eight-year monitoring period, a fact that can be attributed in particular to the decrease in the illegal medium size commercial fishery. This had been a major problem before the creation of the NMPANS and a constant complaint from the local fishermen (MOM, 2001).
- Tourist activity remained constant throughout the monitoring period and was concentrated mainly in the harbor and coastal areas of the NMPANS. Tourist activities, and consequently tourist-related illegal activities, were considerably higher during summer months, reaching a peak in August. Tourists were found mainly at anchor, indicating that they used the Park as a destination for their holidays and justifying the protection of the area for its natural beauty.

The results are consistent with short-term monitoring efforts carried out in the NMPANS in the past (MOM, 1995b; MOM, 1996; Karamanlidis, 2000) and provide essential baseline data for future management. In particular, the results suggest the following actions:

- Extensive coverage of the NMPANS throughout the year is necessary in order to monitor human activity and prevent illegal incidents.
- Increased monitoring effort is required during the summer months in order to deal with the increased presence of tourists in the Park. Monitoring efforts should concentrate on harbor and coastal areas, which are preferred by tourists.

Extensive coverage of the NMPANS requires though substantial logistical support. The human activity patterns in the NMPANS documented here permit planning of monitoring efforts in space and time that are effective and require minimum logistical support.

The aim of the Awareness Campaign was to inform visitors of the regulations of the NMPANS. Results indicate a decrease in the number of fishermen and an increase in the number of tourists informed over time, which can be attributed to the nature of both human groups. Because of the special characteristics of commercial fisheries in this part of the Mediterranean (small-sized fishing boats, short fishing trips) the NMPANS is visited mainly by a small number of fishermen from areas close to the Park. Most of these fishermen were informed during the first years of the campaign and were knowledgeable of the regulations when encountered again. Tourists, on the other hand, arrive from all parts of Greece and abroad. Increasing publicity about the Park in the mass media, and the development of ecotourism in the area could be responsible for the increased presence of new tourists in the area and the constant need to inform them.

Finally, the efforts to enforce the Park's regulations showed that penalties will act as a deterrent to future violations. Results indicate that penalties have had a greater effect on fishermen than tourists. Illegal activity of the latter group remained high during the project period. Local fishermen in the NMPANS are now aware of the Park's regulations and the consequences of a violation, whereas tourists are not. A country wide information campaign at the "home" harbors of tourists could help reduce this problem. Finally, while investing increased monitoring effort in harbor and coastline areas, surveillance and enforcement of Park regulations will likely be most effective in the future if activity patterns of the monitoring team remain unpredictable.

Implications for the Conservation of the Mediterranean Monk Seal

Although comparable data on the intensity of human activity prior to the establishment of the NMPANS are not available, evidence suggests that human activities in the past have had a detrimental effect on the monk seal population in the area (Ministry of Environment, 1987). The extensive monitoring effort since 1993 has resulted in low human activity in the Core Zone and certain areas of Zone A, while monk seal pup production has increased constantly over the past decade (MOM, 2001). Most of the births were recorded in pupping sites within the Core Zone. In addition, seal observations at open beaches, a rare phenomenon in the past, have also been recorded (Karamanlidis, 1997; P. Dendrinos, unpublished data).

Deliberate killing of monk seals, which is not a rare phenomenon in other areas, has not been recorded in the Park since 1990 (Dendrinos, Tounta, & Kotomatas, 1998). Although this cannot be attributed directly to the monitoring efforts, it suggests that the active protection of the NMPANS and the Awareness Campaign have contributed positively to this outcome.

Implications for the Management of MPAs

The National Marine Park of Alonnisos, Northern Sporades is currently one of three existing MPAs with an ongoing project dedicated to the protection of the Mediterranean monk seal. Due to the specific features of the area and the regulations concerning the operation of the Park, this monitoring project might not apply directly to other areas. However, the methods used and the experience gathered during the project may be relevant to similar parks. The effective monitoring of an MPA of this size is only possible when monitoring teams have detailed knowledge of both the protected area and the ecology of the protected species. Securing enough funding may limit the success of monitoring an area of this size. Ultimately, the success of any monitoring effort will depend on the good cooperation between the monitoring team and the local population.

It is clear that legal procedures for the prosecution of violators in the NMPANS should be re-evaluated. Currently a large number of state authorities are involved in these procedures, creating delays in the resolution of cases. It is imperative to simplify these procedures. Ineffective punishment of violators may result in regulations not being respected. A solution is required urgently, as new Special Areas of Conservation for the species are being proposed within the framework of the Natura 2000 Network (Adamantopoulou et al., 2000).

Conclusions

An effective monitoring plan was implemented in the National Marine Park of Alonnisos, Northern Sporades, ensuring effective coverage of the protected area in time and space. The monitoring team used a recording system that collected information on human activity, which will improve current and future management of the NMPANS.

The first MPA of Greece was actively and effectively protected. Illegal activities within the Park have been reduced substantially over the years and currently occur at low levels. This has improved the conservation status of the Mediterranean monk seal population in the area, and the overall condition of the natural environment of the National Marine Park of Alonnisos and Northern Sporades.

Notes

1. Quadrants: C16, G13, H12, O13 (Figure 5).
2. Quadrants: E15, E16, F16, G12, G14, G15, G16, G20, H13, H14, H20, I10, I12, I13, J10, K10, L10, M10, O14, P13, P14 (Figure 5).
3. Quadrants: D16, D17, E17, F14, G17, G18, G21, H11, H17, H19, H21, I11, J11, K11, K12, L17, M11, N10, N12 (Figure 5).

References

- Adamantopoulou, S., E. Androukaki, and S. Kotomatas. 1999. The Distribution of the Mediterranean Monk Seal in Greece based on an information network. *Contributions to the Zoogeography and Ecology of the Eastern Mediterranean Region* 1:399–404.
- Adamantopoulou, S., K. Anagnostopoulou, P. Dendrinos, S. Kotomatas, N. Labadariou, V. Pipinis, G. Stroufliotis, E. Tounta, and V. Zavras 2000. Conserving critical habitats for the Mediterranean monk seal in Greece through the creation of a network of protected areas. In *14th Annual Conference*, European Cetacean Society, Cork, UK, 2–5 April, p. 33.
- Androukaki, E., S. Adamantopoulou, P. Dendrinos, E. Tounta, and S. Kotomatas. 1999. Causes of mortality in the Mediterranean Monk Seal (*Monachus monachus*) in Greece. *Contributions to the Zoogeography and Ecology of the Eastern Mediterranean Region* 1:405–411.
- Aguilar, A. 1999. *Status of Mediterranean monk seal populations*. Tunis: Aloes Editions.
- Archipelagos and HSSPMS. 1994. *Joint proposal for a national strategy for the protection of the Mediterranean Monk Seal in Greece*. Manuscript. Athens, Greece.
- Badalamenti, F., A. A. Ramos, E. Voultziadou, J. L. Sánchez Lizaso, G. D'Anna, C. Pipitone, J. Mas, J. A. Ruiz Fernandez, D. Whitmarsch, and S. Riggio. 2000. Cultural and socio-economic impacts of Mediterranean marine protected areas. *Environmental Conservation* 27:110–125.
- Dendrinos, P. 1998. Status of the populations and implementation of the action plan for the management of the Mediterranean monk seal (*Monachus monachus*) in Greece. In UNEP/MAP Meeting of Experts on the Evaluation of the Implementation of the Action Plan for marine Mammals (Monk seals and cetaceans) adopted within MAP, Arta/Greece, 29–31 October. UNEP. Athens/Greece, Annex 5, pp. 37–48.
- Dendrinos, P., E. Tounta, and S. Kotomatas. 1998. Status and conservation of the Monk seal population in the National Marine Park of Alonnisos-N.Sporades, Greece. In *World Marine Mammal Science Conference*, Monaco, 19–20 January. The Society for Marine Mammalogy & The European Cetacean Society, p. 14.
- Gazo, M., J. F. Layna, F. Aparicio, M. A. Cedenilla, L. M. Gonzalez, and A. Aguilar (1999). Pupping

- season, perinatal sex ratio and natality rates of the Mediterranean monk seal from the Cabo Blanco colony. *Journal of Zoology* 249:393–401.
- Hilton-Taylor, C. (Ed.) 2000. *IUCN red list of threatened species*. Gland and Cambridge: International Union for the Conservation of Nature.
- Johnson, W. M., and D. M. Lavigne. 1998. *The Mediterranean Monk Seal. Conservation guidelines*. Guelph, Canada: International Marine Mammal Association Inc.
- Johnson, W. M., and D. M. Lavigne. 1999. Mass tourism and the Mediterranean monk seal. *The Monachus Guardian* 2:62–81.
- Johnson, W. M. (Ed.) 2000. The numbers game. *The Monachus Guardian* 3:5.
- Karamanlidis, A. A. 1997. *Biologie und Gefährdungssituation der Mönchsrobbe im Mittelmeer—unter Berücksichtigung der Freilandbeobachtungen im Sommer 1996*. B.Sc. Thesis, Free University of Berlin, Berlin, Germany.
- Karamanlidis, A. A. 2000. Monitoring human and Mediterranean monk seal activity in the National Marine Park of Alonnisos and Northern Sporades, Greece. *The Monachus Guardian* 3:31–34.
- Ministry of Environment. 1987. *The National Marine Park of Alonnisos and Northern Sporades*. Report by the University of Athens.
- MOm. 1995a. *Continuation of the monitoring of the Monk Seals in the National Marine Park of the Northern Sporades*. Final Report for the European Commission Project 4-3010(92)7829.
- MOm. 1995b. *Surveillance and safeguarding of the sensitive area of Northern Sporades*. Final Report for the European Commission Project 4-3010(92)7829.
- MOm. 1996. *Monk Seal conservation in Greece. Part 2. Northern Sporades. A Special Area of Conservation (National Marine Park of Alonnisos North Sporades)*. Final Report to the European Commission Project, contract B4-3040/95/009/AO/D2.
- MOm. 1999. *The Mediterranean monk seal in Greece: Conservation in action*. Report LIFE-Nature B4/3200/96/500.
- MOm. 2001. *Conservation on the front line: Guarding critically endangered Mediterranean monk seals in the Sporades Marine Park*. Annual activity report to IFAW.
- Pires, R., and H.C. Neves, 2000. Monk seal sightings on open beaches in Desertas Islands—Madeira Archipelago. In *14th Annual Conference of the European Cetacean Society*, Cork/Ireland, 2–5 April, p. 19.