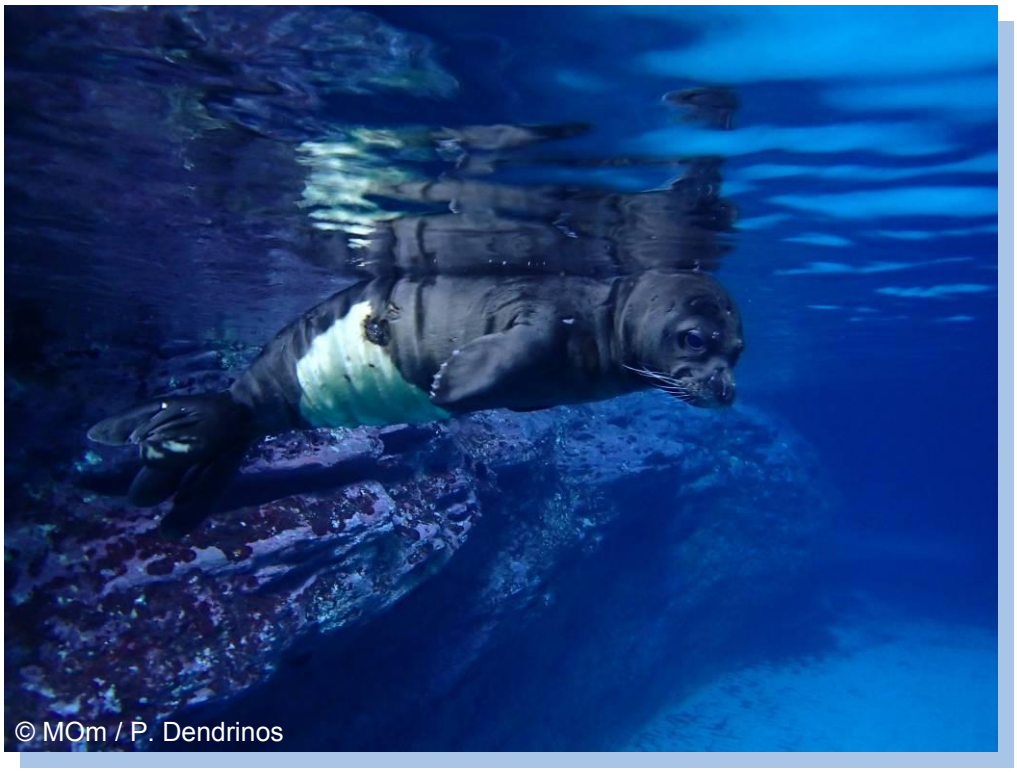
LIFE-Nature Project LIFE12 NAT/GR/000688

CYCLADES Life: Integrated monk seal conservation of Northern Cyclades

1st Annual Conservation

STATUS REPORT

OF THE MEDITERRANEAN MONK SEAL POPULATION AT THE ISLAND OF GYAROS



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June 2014

Important Note:

The present report has been prepared within the framework of the LIFE-Nature program: "CYCLADES Life: Integrated monk seal conservation of Northern Cyclades". Although titled as the first annual report, it was considered important to include in this document all the scientific information on Mediterranean monk seals that has been collected by MOm throughout the years (2001 – 2014) at the island of Gyaros. This has been done so that the reader can obtain a more complete picture of the status of the species in the area. This report has been prepared with the aim of becoming the baseline for evaluating the trend of the status of the species during the project but also after it, in order to support effective management and conservation of the critically endangered Mediterranean monk seal.

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INTRODUCTION

The Mediterranean monk seal (*Monachus monachus*) is the rarest extant member of the Phocidae family and one of the rarest marine mammals in the world. It has been classified as “Critically Endangered” by the International Union for the Conservation of Nature (IUCN 2010) and is strictly protected by the Council of European Communities Directive 92/43/EEC, the Bonn, Bern, CITES, Barcelona and Rio Conventions, as well as by the Greek law.

Mediterranean monk seals were once widely and continuously distributed in the Mediterranean and Black Seas, and in the North Atlantic waters from Morocco to Cap Blanc, including the Canary Islands, Madeira Islands and the Azores (Johnson et al. 2006). A few individuals, have been recorded in Senegal, the Gambia and the Cape Verde Islands in the southern end, as well as in Portugal and Atlantic France in the northern end of the species distribution (Johnson et al. 2006). Today the distribution of the Mediterranean monk seal is highly fragmented and consists of three to four isolated subpopulations. In the Mediterranean Sea, the stronghold of the species is on islands in the Ionian and Aegean Seas, and along the coasts of Greece and western and southern Turkey (Güçlüsoy et al. 2004;Guçu et al. 2004; MOm 2007). In the North Atlantic, two subpopulations exist: one at Cabo Blanco (also known as Cap Blanc) at the border of Mauritania and Western Sahara (Gonzales & Fernandez de Larrinoa 2012; Martínez-Jauregui et al. 2012), and one at the Archipelago of Madeira (Pires et al. 2008). An unknown number of monk seals might still survive at the Mediterranean coasts of eastern Morocco (and perhaps Algeria) (Mo et al. 2011), but without ongoing systematic conservation actions the fate of this subpopulation is in danger.

A number of threats jeopardise the survival of the Mediterranean monk seal (Johnson et al. 2006). The most important are:

- **Habitat deterioration and loss** by coastal development, including disturbance by tourism and leisure boating (Johnson & Lavigne 1999).

- **Deliberate killing** by fishermen, who consider the animal a pest that damages their nets and 'steals' their fish (Androukaki et al. 1999; Androukaki et al. 2006).
- **Accidental entanglement** in fishing gear leading to death by drowning (Karamanlidis et al. 2008).
- **Other stochastic events**, such as disease outbreaks.

The Mediterranean monk seal is particularly sensitive to human disturbance, with coastal development and tourism pressures driving the species to inhabit increasingly marginal and unsuitable habitat. In some pupping caves, pups are vulnerable to storm surges and may be washed away and drowned.

Although rather slow and patchy, conservation of the Mediterranean monk seal has been underway since the late 1970s (Johnson & Lavigne 1998) and has focused mainly on the *in situ* protection of the species. *In situ* conservation efforts include the establishment of marine protected areas, rescue and rehabilitation of orphaned and wounded seals, environmental education and public awareness. Scientific research, by providing additional knowledge into little understood aspects of the monk seal's biology and behaviour, plays also a key role in furthering *in situ* conservation efforts. Taking into consideration the feeding and breeding movements of monk seals between remnant colonies, there is a consensus of scientific opinion that a network of well-managed and guarded reserves are essential for the survival of the species (Adamantopoulou et al. 2000). To date, marine protected areas for the species have been established in only a fraction of areas throughout the current species distribution. The most important of them are: a) in the Atlantic: the Desertas Islands of Madeira (Pires et al. 2008) and along the Côte des Phoques in the western Sahara (Martínez-Jauregui et al. 2012); and b) in the Mediterranean: the National Marine Park of Alonnisos, N. Sporades (Dendrinos 2011) and the Northern Karpathos and Saria protected area (MOm 2007), in Greece, and the Phoça protected area at the Aegean coasts of Turkey (Güçlüsoy & Savas 2003).

Status and legal protection of Monachus monachus in Greece

Greece has been traditionally one of the species strongholds in the eastern Mediterranean and a focal point of monk seal research and conservation. The first studies on the species started in the 1970's and focused mainly on the assessment of the size of the population and geographical distribution of the species in the country (Marchessaux & Duguy 1977; Marchessaux 1979; Vamvakas et al. 1979). Since then, several studies have been carried out (Verriopoulos 1985; Vlachoutsikou & Lazaridis 1990; Panou et al. 1993; Adamantopoulou et al. 1999; Panou et al. 1999), giving us a good picture of the status of the species in the country in the past 30 years. A common conclusion of all these studies has been that despite the significant decrease and the reduction of some subpopulations, the Mediterranean monk seal is still widely distributed throughout the country and that small, actively-reproducing groups, remain scattered throughout the Ionian and Aegean Seas. In recent years encouraging signs of population recovery have been observed throughout the country, including areas where the species was thought to be extinct and areas with increased human activities. Rough population estimates indicate that the country hosts more than 50% of the world's population of the species (MOm 2007).

The Mediterranean monk seal *Monachus monachus* is included in the Red Data Book of Greece (Δενδρινός et al. 2009) and is strictly protected by the Presidential Decree 67/1981. The creation in 1992 of the National Marine Park of Alonnisos, Northern Sporades, which is the first Marine Protected Area established in Greece, was a milestone in monk seal conservation history in the country. Following the identification of additional important areas for the species in the country, two more (marine) protected areas have been/are being established for the Mediterranean monk seal in Greece. A marine protected area (MPA) has been established at Northern Karpathos and the island of Saria in the Dodecanese Islands and its management body is already fully operational. A second MPA has been proposed for the islands of Kimolos and Polyaigos in the southwestern Cyclades Islands, however its establishment is still being delayed by the Hellenic Government.

Based on concrete scientific evidence (see chapters following), MOm proposed in 2008 to the national and European authorities to include the island of Gyaros and a marine area of 3 nautical miles around it in the European network of protected areas NATURA 2000. Finally, following the dedicated efforts of MOm in cooperation with the national and local competent authorities (i.e., Hellenic Ministry of Environment, Energy and Climate Change, Ministry of Mercantile Marine, Aegean and Island Policy, Prefecture of the Southern Aegean, Port Police Authorities of Syros), the area around Gyaros was declared in December 2013 off-limits to fishing activities (Syros Port Police authority regulation 32).

The Mediterranean monk seal at the Island of Gyaros

Most Mediterranean monk seals survive nowadays in Greece. With an extensive coastline of approximately 15,000 km and roughly 4,000 islands, the country has potentially large stretches of suitable coastal habitat. Since the initiation of efforts to protect the species, habitat availability and suitability has been investigated in several areas within the country (Marchessaux & Duguy 1977; Harwood 1987; Panou et al. 1993; MOm 2007), but large areas remain unexplored. In 1991, MOm initiated, and has continually operated since, the national Rescue and Information Network (RINT).

Figure 1 A Mediterranean monk seal pup at the island of Gyaros.

The RINT is notified by its members, distributed throughout Greece, whenever live or dead monk seals are sighted (Adamantopoulou et al. 1999). From 2000 – 2004 the RINT received several reports of Mediterranean monk seals from the island of Gyaros; two reports, in 2001 and 2004 (Figure 2), included unique photographic documentation of females and their pups resting on open beaches. Considering how little was known about the presence of the species in the area, MOm initiated in 2004 efforts to monitor the status of the species at the island of Gyaros.

Figure 2 Observations of Mediterranean monk seals on open beaches at the island of Gyaros; a) four Mediterranean monk seals resting on an open beach (Photo: courtesy of Mr. G. Dounavis), and b) a female Mediterranean monk seal nursing her pup on an open beach (Photo: MOm/A.A. Karamanlidis).

The specific aims of these efforts have been to:

- Evaluate habitat availability and suitability for the Mediterranean monk seal at Gyaros.
- Verify the existence of a colony and collect information regarding the demographic parameters (i.e. pup production, pup mortality, colony structure etc.) and behaviour of the species in the area.

In pursuing these aims, MOm's research team has used an array of methods, all of which have as foremost priority the minimisation of disturbance to this critically endangered species. The methods applied were based on:

- The international practice for the study of pinnipeds,

- The existing scientific knowledge on the biology and ecology of the species, and
- The long experience of MOm's research team in monitoring and studying this species throughout the Greek coastline.

METHODOLOGY

Study Area

Gyaros is an arid, deserted island in the northern Cyclades, in the central Aegean Sea (37˚ 37N, 24˚ 43E) with a total area of 17.76 square km (Figure 3 & 4). The island was used from the end of World War II until 1974 as an exile island for political dissidents and up until 2000 as a target for the Hellenic Navy. Since then, Gyaros has been open to the public, but due to the presence of unexploded ammunition human activity on the island has remained limited.

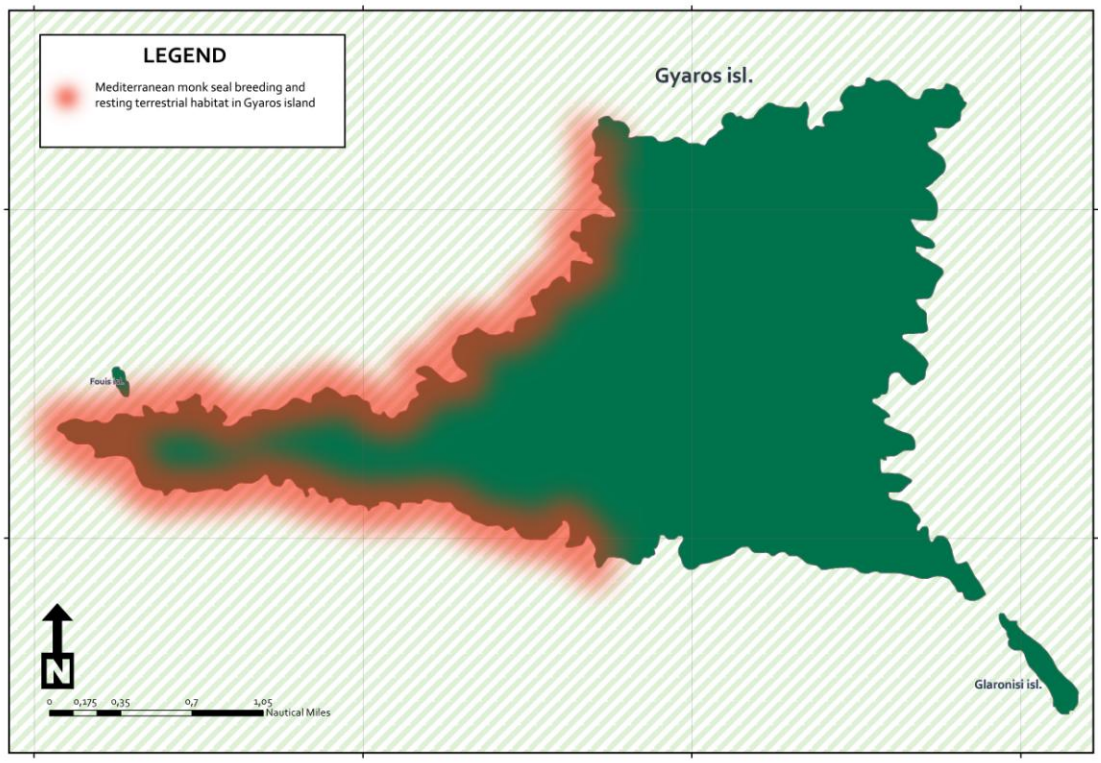

Figure 3 Map of the Island of Gyaros, indicating the area important for the local Mediterranean monk seal population.

Figure 4 Aerial photo of the island of Gyaros.

Evaluating Habitat Availability and Suitability

To evaluate habitat availability and suitability for Mediterranean monk seals at the island of Gyaros the entire coastline of the island was circumnavigated with a small inflatable boat, at a distance of 40 m from the shoreline to locate all potentially suitable coastal caves for resting and/or pupping. Once a cave was located, its GPS position was recorded and its suitability evaluated, based on a set of physical and environmental features (Dendrinos et al. 2007). Mediterranean monk seals tend to be more selective in their choice of caves used for pupping than for resting (Karamanlidis et al. 2004).

Previous research has indicated that the physical and environmental features used in this study are the most important predictors for the selection of a coastal cave as a pupping site by monk seals in Greece. Suitable pupping sites tend to have among other, multiple entrances, beaches in their interior with a soft substrate, a low risk of pup washout and are not easily accessible to humans (Dendrinos et al. 2007). To minimize disturbance to the species, the caves were inspected and their morphological features recorded in early summer, when in-cave seal activity in Greece is lowest (Dendrinos et al. 1994).

Demographic parameters and behaviour of the species in the area

The demographic composition of the Mediterranean monk seal population in the area has been assessed through cave inspections during the pupping season [i.e. September – November, (Dendrinos et al. 1999)]. Swimmers entered the caves and searched for the presence of recent signs of cave use, such as tracks, scats, pieces of fur or blood. If a seal was encountered in the cave, photographs or video were taken in order to enable future individual identification. Adults were identified based on the natural pelage scarring and their stage of development (Samaranch & Gonzalez 2000). Pups were identified based on their stage of development, as well as the presence of the sexually dimorphic patch of fur on their ventral side (Samaranch & Gonzalez 2000; Dendrinos 2011). Behavioural data have been collected during the inspection of the caves in the pupping season and while conducting the habitat survey and the circumnavigation of the island. Behavioural and demographic data have also been collected through the deployment of heat- and motion-triggered infrared cameras. The combination of these two detection stimuli leads to minimal energy consumption and a minimal need to visit the cameras to change the power source.

Figure 5 Installation of infrared cameras at the island of Gyaros.

Similar projects have been successfully carried out by the researchers of MOm in the Northern Sporades, the island of Kimolos and the island of Karpathos in the Dodecanese islands (Dendrinos et al. 2007; MOm 2008; Karamanlidis et al. 2010). Five infrared cameras have been installed so far (3 X Reconyx HC600, 2 X Moultrie I60); two in the main pupping cave and three at two open beaches that have been used by the seals.

Collection of reports on Mediterranean monk seal sightings

Apart from performing visits to the seal shelters the research team of MOm has collected reports of seal sightings conducted by other observers (mainly professional and amateur fishermen visiting the island). Location, date and time of the observation, behaviour of the animal, as well as, visible characteristics (i.e., size, developmental stage, coloration, external pelage marks or scars, overall status of the animal) were recorded. This method of data collection is based on the methodology of the operation of the National Rescue and Information Network (Adamantopoulou et al. 1999). Although this information originates from non-scientists, it forms a considerable source of relevant data, which, upon careful evaluation and analysis, complements the work conducted directly in the field. In addition, the collection of data by non-scientists in combination with the data collected by researchers allows for the immediate reaction of the field team of MOm in cases of emergency, such as animals needing aid or dead animals.

RESULTS

Mediterranean monk seal habitat availability, density and suitability

Throughout the 37.05 km coastline of Gyaros twelve suitable coastal caves have been identified (cave density: one suitable cave per 3.08 km of coastline); considering the findings of Dendrinos et al. (2007), four of the caves have been evaluated as suitable for resting and pupping, while the other eight have been evaluated as suitable only for resting.

However, in view of unique observations of females and their pups using seven open beaches (Figure 6) as resting, and possibly pupping sites, suitable cave/beach density on the island increased, to one suitable cave and/or beach per 1.95 km of coastline.

Figure 6 A male and a female adult monk seal lying on a beach.

Most monk seal shelters at the island of Gyaros have entrances above water surface (Figure 7) that lead through long entrance corridors to the main cave chamber, which include one or more dry surfaces (internal beaches) for resting and/or breeding. The resting/pupping area is either a rocky platform or a beach consisting of sand, pebbles or boulders.

Figure 7 The entrance and the interior of the main pupping cave at the island of Gyaros.

Mediterranean monk seal habitat use

The images of the infrared cameras that have been used in the monitoring of the Mediterranean monk seal population at Gyaros in 2011 have indicated that the use of the main pupping cave at the island throughout the entire monitoring period has been consistent and high. During this monitoring period seals were observed using all parts of the beach in the cave; even during bad sea conditions there was a dry part of the beach that provided safe refuge to the seals in the cave. However, during severe stormy conditions the seals of the colony at Gyaros appeared to move out of the main reproductive cave and seek refuge elsewhere. During one of the field surveys in November 2011 the research team of MOm followed a female monk seal and her pup in what seemed to be a submerged cave. Closer inspection however revealed a hitherto unknown monk seal cave with a very small entrance, a very long entrance corridor and a beach surface area almost three times bigger than the main pupping cave of the island. Upon inspection, the research team found several haul out depressions of monk seals on the beach inside, indicating the extensive use of this cave as well by the local monk seal population. Unfortunately, the beaches of both, the newly discovered cave, as well as the main pupping cave at the island of Gyaros, where often covered with trash and marine debris (Figure 8), which have made parts of them unsuitable for resting and reproduction.

Regarding the resting and pupping of Mediterranean monk seals on open beaches at the island of Gyaros the monitoring efforts of MOm so far

have managed to document the presence of the species on open beaches with the automatic infrared cameras on two occasions - these involved an adult male spending a night on an open beach and a molted pup that climbed up an open beach to find refuge from a severe southerly storm. Use of open beaches for resting and possibly also for pupping was documented through direct observations on several occasions during field surveys; it has been possible to observe mothers and their pups and adult females and males interacting on open beaches on several occasions.

Figure 8 Marine debris and trash accumulated on the beach of the main resting and pupping cave of the Mediterranean monk seal population at the island of Gyaros.

Demographic parameters of the Mediterranean monk seal population at the island of Gyaros

Annual birth rate and pup mortality

The sexually dimorphic, highly distinctive and individually characteristic ventral patch of the pups of the species have enabled the identification of 62 different newborn pups at the island of Gyaros during the period 2004 – 2013 (Figure 9). These values were used to calculate a mean value of 7.75 for the annual pup production across the monitoring years.

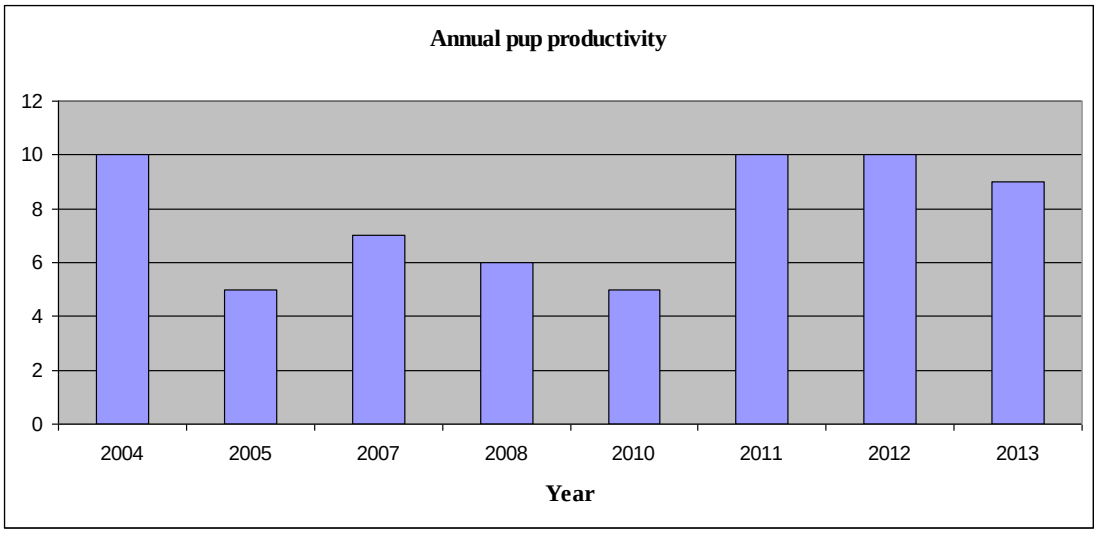

Figure 9 Numbers of newborn pups recorded annually at the island of Gyaros (2004 - 2013).

During the monitoring period only one pup has been found dead within the first two months of its life (Figure 10).

Figure 10 A necropsy performed at a Mediterranean monk seal pup at the Island of Gyaros in 2011

Adult monk seal mortality

So far, during the monitoring efforts of MOm seal no adult monk seals have been found dead at the Island of Gyaros.

Monk seal population estimation

A number of factors, such as the cryptic behaviour and the scarcity of the species, the inaccessibility of its habitat and the limited knowledge on individual home ranges and travel distances, make Mediterranean monk seal population estimates an extremely difficult task. This applies even to areas, such as the Cabo Blanco region in Mauritania, where the morphology of the habitat and the different behaviour of the seals have allowed the use of standard mark-recapture methodologies for population estimation (Forcada & Aguilar 2000). The photographs and/or video footage obtained during the visits to the monk seal shelters at the island of Gyaros and the application of the pre-programmed photo-cameras have so far enabled the individual identification of 17 individuals [excluding newborn pups; i.e., 10 adult females, 3 adult males (Figure 11), 4 unknown sex]. In one occasion, 10 animals were recorded on a single image (Figure 12). Based on the mean value of the annual pup production it is expected that a number of about **55** animals of different age categories (excluding pups) comprise the monk seal population at the island of Gyaros.

Figure 11 An adult male Mediterranean monk seal resting between two adult females

Figure 12 Ten Mediterranean monk seals resting

Monk seal sightings collected by non-specialists

Since 1990 the RINT of MOm has received 34 accounts of monk seal observations reported by non-specialists from the Island of Gyaros. The majority of the reports have came from amateur fishermen, who occasionally visit the island (i.e. mainly for spear gun fishing) and from parts of the island that have been identified by the researchers of MOm as important for the survival of the species in the area.

Behavioural observations

During the field surveys in 2004 and 2005, females and their pups were encountered resting on three open beaches at the south-western coast of the island. On one occasion in 2004, eight of the ten pups observed during that survey were recorded swimming along a 150 m long stretch of coastline and evidence was recorded that suggested that at least one of the pups was born on an open beach (i.e. absence of suitable pupping caves nearby, healing

wounds in the umbilicus region of the pup). In 2005, a female suckling her pup was observed on one of the open beaches (Figure 2). Upon inspection of the main pupping cave at the island of Gyaros in 2007 six newborn pups were recorded. In November 2010, five seals were observed resting on an open beach at the south side of the island.

The use of the automatic infrared cameras has also provided valuable insights into several aspects of the poorly-understood behaviour of the Mediterranean monk seal, especially regarding the social structure and behaviour of the species during the pupping season. Among the most important findings have been the recording of two births (Figure 13), fostering behaviour, aggressive interactions between adult females (Figure 14) and the nursing activity of adult females (Figure 15).

Figure 13 Image of a Mediterranean monk seal pup being born - the newborn pup is still attached to its mother at the umbilicus cord.

Figure 14 Aggressive interactions between two adult female Mediterranean monk seals**.**

Figure 15 A newborn Mediterranean monk seal suckling.

DISCUSSION

Human disturbance affects the behaviour and the abundance and distribution of pinnipeds (Mattlin, 1978; Mathews & Pendleton, 2006; Orsini et al., 2006). Depending on the level of human disturbance, reactions of endangered seal species have varied, ranging from no significant effect by New Zealand sea lions (*Phocarctos hookeri*) (Childerhouse & Gales, 1998) to the abandonment of pupping sites and the active search for new breeding locations away from human activities by southern fur seals (*Arctocephalus australis*) (Stevens & Boness, 2003). In the genus *Monachus* and *Neomonachus*, human disturbance affected the hauling behaviour of the now extinct Caribbean monk seal (*Neomonachus tropicalis*) (Adam, 2004) and has a current negative effect on the pupping and hauling behaviour and abundance of the critically endangered Hawaiian (*Neomonachus schauinslandi*) and Mediterranean monk seals (Gerrodette & Gilmartin, 1990; Johnson & Lavigne, 1999a; 1999b). In Greece, Mediterranean monk seals seek-out pupping sites that offer them the best protection against human disturbance (Dendrinos et al., 2007). Thus, such habitat may progressively become a limiting factor for this species as human density increases. Identifying and protecting such locations, in an environment increasingly under pressure from human development and fishing activities (Karamanlidis et al., 2008) is considered one of the highest conservation priorities for the survival of the species (Johnson & Lavigne, 1998).

Habitat quality in the area

The coastal caves suitable for Mediterranean monk seals identified at the island of Gyaros are of similar quality to caves used by the species at the already known pupping areas in the Northern Sporades in the northern Aegean (Dendrinos et al., 1994), Kimolos & Polyaigos, and Karpathos & Saria in the southern and southeastern Aegean, respectively (MOm, 2005) (Figure 3). Two of the pupping caves at Gyaros, possess ideal morphological characteristics and the main pupping cave has had one of the highest number of pups (n = 6) ever recorded simultaneously in a cave in the eastern

Mediterranean. In addition, Gyaros Island has the highest known to date density of suitable caves/open beaches documented in Greece; one suitable cave/open beach per 1.95 km of coastline, compared to one suitable cave and/or beach per 9.36, 3.73, 9.83 km of coastline in the Northern Sporades, Kimolos & Polyaigos, and Karpathos & Saria, respectively (MOm, 2007).

Annual pup productivity

The minimum mean annual number of births (n = 7.75) recorded at the island of Gyaros is one of the highest recorded for the species in the Mediterranean Sea and could be higher if systematic assessments of natality were conducted throughout the breeding season at each site in the years 2004 - 2011. Systematic surveys of annual pup production at Cabo Blanco in the Western Sahara (González et al., 2002), the Northern Sporades, Kimolos & Polyaigos, and at Karpathos & Saria (MOm, 2007) yielded counts of 25.0, 8.4, 7.9, and 3.7, respectively.

Species behaviour

Human disturbance in the area until now appears to have been minimal. Resting, suckling, and possibly even pupping, on several different open beaches are behaviours which are considered indicative of low levels of human disturbance, never reported from the eastern Mediterranean within the past fifty years. Use of open beaches by mother - pup pairs has been reported only from the strictly protected core zone of the Desertas Islands Nature Reserve in the Archipelago of Madeira (Pires et al., 2008). Giving birth to pups, nursing pups, and resting on open beaches is characteristic of other monachids, like the Hawaiian monk seal and the Weddell seal (*Leptonychotes weddelli*), both species that have had little disturbance by humans or land predators. Perhaps the observation of open beach rearing of Mediterranean monk seal pups reflects the minimal disturbance at the island of Gyaros and is an indicator of suitable habitat and a healthy population.

Conservation Implications

The present findings in respect to habitat quality and density, annual pup productivity and, most importantly, the fact that the species uses in the area open beaches as pupping sites, show clearly that the island of Gyaros represents an area of outstanding importance for the survival of the Mediterranean monk seal, despite the fact that long-term monitoring efforts have not yet been carried out in the area. Considering the unique value of the area, the critically endangered status of the species, and the increasing environmental pressures in the Mediterranean (Karamanlidis et al., 2008), it is obvious that effective protection of this important Mediterranean monk seal colony is of utmost importance for the conservation of the species.

The creation of a network of marine protected areas for the conservation of the Mediterranean monk seal in Greece has been identified for more than a decade as a conservation priority within the Strategy for the Protection of the Mediterranean monk seal in Greece (Archipelagos & MOm, 1996)(Notarbartolo di Sciara et al. 2009), but also internationally (Ronald & Duguy, 1979; 1984; Johnson & Lavigne, 1998). The fact that the island of Gyaros is so remote, uninhabited and state-owned makes it an ideal candidate for carrying out targeted conservation measures for the critically endangered Mediterranean monk seal.

Actions that will be implemented throughout the duration of LIFE CYCLADES, will ensure that the status of the species on the island will be improved and secured. Not only the establishment of a Marine Protected Area surrounding the island (by its establishment through Actions C.1 an C.2), but also the implementation of concrete conservation actions (Actions C.4, C.5 and C.6) will ensure that pressures currently threatening the population of Gyaros will be dealt with.

CONCLUSIONS

The Mediterranean monk seal is a species whose behaviour has been severely affected by human activity; millennia of persecution and habitat destruction and fragmentation have led the species to seek inaccessible marine caves for resting and reproduction, thus making it almost impossible to study. In addition, the ongoing persecution by humans has reduced populations to such an extent, that only one population, the one at Cabo Blanco / Mauritania has retained the social structure of a colony (Gazo et al. 2000; Martínez-Jauregui et al. 2012). All other populations throughout the distribution of the species are considered to be composed of loosely associated, small family units (Johnson et al. 2006).

Due to the high pupping rate of the population, the importance of the monk seal population at the island of Gyaros was recognized early on (Dendrinos et al. 2008). However, only the recent application of the combined approach of infrared cameras and field surveys has enabled us to fully evaluate the importance of the Gyaros island monk seal population. The results of the monitoring efforts so far indicate the existence of a monk seal population that has retained the social structure of a colony (Karamanlidis et al. 2013), such as the one in Cabo Blanco. This is only the first case of a monk seal "colony" in the eastern Mediterranean Sea and exemplifies the importance of Greece in the effective conservation of the species. It has been possible to document demographic parameters and a social structure similar to the one observed in Cabo Blanco. The monk seal colony at Gyaros however has the advantage of being able to use two suitable caves for resting and reproduction that lay in exact opposite directions, thus offering protection under all weather circumstances and reducing pup mortality. High pup mortality has been identified as one of the main factors affecting the slow recovery of the monk seal colony at Cabo Blanco (Forcada et al. 1999; Gazo et al. 2000; Gonzalez et al. 2002).

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1st Annual Conservation

STATUS REPORT

OF THE MEDITERRANEAN MONK SEAL POPULATION

AT THE ISLAND OF GYAROS

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CYCLADES Life: Integrated monk seal conservation of Northern Cyclades