

Marine Turtle Conservation in the Mediterranean

A Follow Up Report Concerning the Impacts of Recent and Planned Development on Mounda Nesting Beach (Kaminia and Potamakia), in Kefallonia, Greece.

Report for the 19th Meeting of the Standing Committee of the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention).

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Section A

1. Introduction

This report will identify mechanisms and factors that are important for the ecological stability of the beach. It will present a picture of the importance of the interactions between biotic and abiotic elements in the Mounda ecosystem. The report will outline the impacts of tourism on the beach and discuss ways in which these impact could be alleviated. This will then give an understanding as to why this unique area should have statutory protection at a local, national and international level.

2. Location (maps No.1 & 2, p.11)

Mounda Beach is situated on the island of Kefallonia in the Ionian sea to the west of mainland Greece, 38.09° N and 20.33° E. It is the largest of the seven Ionian islands, reaching approximately 688 Square Kilometres and sustaining an estimated population of 30,000 people.

Mounda Beach is located at the SouthEastern most tip of the island between the village of Katelios to the West and the peninsula of Cape Mounda to the East. The western end is classified as Kaminia and the eastern end is classified as Potamakia.

3. Background (maps No.3 & 4, p.12)

This present report is the result of an existing on-site environmental assessment, which is currently taking place at Mounda Beach for MEDASSET by Naomi A. Roche from the department of conservation sciences at Bournemouth University, UK.

Sandy beaches dominate the southern part of Kefallonia. These are less frequent in the northern part of the island. As such the south is host to an important habitat for the Loggerhead Turtle *Caretta caretta*, which utilises the beaches for nesting activities. The main nesting site is the entire 2.8Km stretch of beach at Mounda, although other sites along the coast have been identified, this one has the greatest abundance of nests every year between June and October. This year there have been 56 nests, hatching is not yet complete, so evidence of any disturbance can not yet be analysed. However, there is concern for a few of the nests. The area of the beach with the highest number of nests, is the Potamakia region to the east of the new apartments and below the sand dune line.

Mounda Beach also supports the most extensive Mediterranean coastal sand dune system in Kefallonia. The Potamakia dunes being more established than others on the beach. This is an extremely important habitat that maintains the intricate ecological balance within this particular environmental niche. As well as providing the beach system with a natural defense against erosional processes, the dunes characteristically are dynamic habitats of significant ecological value. They also support diverse animal and plant communities.

Consequently many conservation issues arise from concern for the protection of the beach habitats and species. Especially as the economy of the area becomes more reliant on tourism, threats to the aesthetic and ecological value of the area become increasingly apparent every year. Over the past decade tourism in nearby villages (particularly Skala 8Km to the North East of the beach) has put pressure on Mounda and because of its location and long sandy beach it has become a prime target for the tourism market. The development of hotels, apartments and cantina's began six years ago at Mounda and although relatively small scale such development has a great impact on the fragile nature of the ecology. Especially as there is no effective legislation in place to control planning in the area which implies that possible future development could be of serious consequence.

4. Relevance to International Law

4.1 Loggerhead Turtle

The Loggerhead Turtle *Caretta caretta* is a species listed in the IUCN Red data book 1982 as vulnerable. It is also listed in Appendix I of CITES (The Convention on International Trade in Endangered Species). This species is also listed in Appendix II of the Bern Convention as a strictly protected species.

4.2 Protected Plants

The sand dunes of Mounda beach support flora species that are internationally protected. The Madonna Lily *Lilium candidum* is listed under CITES where it is stated that it is illegal to harm or transport the plant without a permit. This also applies to the Sea Daffodil *Pancratium maritimum* that is found at many places within the sand dunes.

4.3 Important Habitats

Coastal sand dunes are listed as priority habitats in the Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora, 92/43/EEC. Sand dune systems are recognised as areas of high biological productivity.

The Eastern Cape of Mounda (Potamakia) beach possesses a cave system. Law for potential breeding areas for the highly endangered Monk Seals *Monachus monachus* protects all caves in Kefallonia.

The marine area around Mounda hosts a considerable variety of marine ecosystems. These include sandbanks, reefs and large meadows of Sea Grass *Posidonia oceanica*. Sea Grass is included in the list of priority habitats of the European Union Directive 92/43/EEC.

4.4 Bern Convention

All member states have an international responsibility to protect and ensure the biodiversity of recognised habitats and species.

Such international laws have relevance to certain habitats and species in the subject area. Despite this, legislation does not seem to be implemented at all in Mounda as **no statutory laws exist** for the conservation of this unique ecosystem. This is extremely concerning as tourist development is continuing and yet **no management plan has been established** to keep the economy and the environment in equilibrium.

The Bern Convention states:

According to article 4, paragraph 1: “each contracting party shall take appropriate and necessary legislative and administrative measures to ensure the conservation of habitats of wild flora and fauna species, especially those listed in appendix II.”

It seems that **the Greek government have not recognised the significance and importance of Mounda beach** as a nesting ground for the Loggerhead Turtles *Caretta caretta* (KMTP/MEDASSET, T-PVS (98) 79). They have **overlooked the fact that the sand dune habitats at Mounda are an interrelated aspect of the overall ecology** and without them internationally protected species would disappear, including the turtles. They must provide the necessary framework to implement and enforce the protection of the habitats and species found at Mounda to honor their signing of the Bern Convention.

Section B

5. The Present State of Development at Mounda.

Along the 2.8Km stretch of coastline from East to West at Mounda there are five developments that have immediate impact on the flora and fauna of the area.

5.1 Mounda Beach Apartments (photo 1, p.13)

This is a large apartment complex at Potamakia, finished in 1996, consisting of three main two-storey buildings. Many apartments have balconies overlooking the beach, **the lights from these can be seen all along the beach in the evenings** (see section 6.1). These apartments are approximately 170m from observed high water mark and are set into the cliff 50m behind the dune system.

5.2 New Private Apartments (photo 2, p.13)

These apartments are just to the East of the main complex but reside parallel to the beach approximately 120m away from observed high water mark. They are approximately 5m behind the dune system. Development started here in 1997 and is still not complete, as the legal permit was not granted until 1998. This construction comprises three buildings that are all at the same level and at least 10m above sea level. **An area of approximately 250m by 40m has been excavated into the cliff** to accommodate these buildings although they only constitute half of this area. The structure is of particular concern as it is behind the potamakia sand dune system.

5.3 Cantina

This building is located at the Kaminia end of the beach to the West and is approximately 60m from the observed high water mark. It is slightly elevated and overlooks the beach. There have been **observed problems with lighting from this building during this and previous turtle nesting seasons** (KMTP/MEDASSET, T-PVS (98) 79). (Discussed in section 6.1)

5.4 Small Private Building (photo 3, p.13)

This is **located actually on the beach** 40-50m from the observed high water mark. It is in front of the Mounda beach apartments. The area in front **has been landscaped with shrubs and flowering plants**, which will have an impact on the indigenous plants in the area as they pollinate changing the flora in the vicinity. A shelter has extended the building in order to accommodate a boat. The area of this site is approximately 20m by 10m.

5.5 Small Building

This is situated quite a way West of the main apartments and is elevated approximately 30m above sea level on a small hill facing the beach. **Lights from this building can be seen all along the beach and from the sea approach.**

6. Problems Associated with Developments at Mounda

6.1 Artificial Lighting

All of the developments on Mounda have artificial lighting that can be seen from either end of the beach in the evenings. The cantina turns the lights off by midnight but it has been observed this year that **the Mounda Beach Apartments and lights from the Private Apartments have been on long after one in the morning** (personal observation).

Loggerhead Turtles *Caretta caretta* are known to approach the beach for nesting between 10 p.m. and 6 a.m.

Artificial light visible on the nesting beach discourages female turtles from coming ashore to lay eggs (Witherington, 1992; Mortimer, 1982) and disorients hatchling turtles on their journey to the sea after they emerge from their nests (Witherington and Bjørndal, 1991a, 1991b; Witherington, 1991; Venizelos, 1995). Often these disorientated hatchlings die from exhaustion, desiccation, predation or other factors. This is an obvious impact on the conservation of the species at Mounda. The concern lies not just with the present development but with the possibility of an increase of unmanaged development in the future.

6.2 Loss of Important Sand Dune Habitats (photo 4, p.14)

The new private apartments (see section 5.2) built at Potamakia, Mounda, have had an immediate and devastating effect on the sand dune habitat.

The sand dune system that was directly in front of the construction has been bulldozed and removed to provide a patio area for these apartments. The area has been artificially elevated and a large wall has been erected to keep the structure in place. Materials from the construction have spilt on to the nearby dunes; these materials include constituents of cement, brick and concrete. **The approximate area of dune system that has been destroyed is 225 square metres.** This figure incorporates the dune system lost to the construction of the small development on the beach (see section 5.4) as well as that of the new apartments.

In order to construct these apartments a large area of the cliff face (approximately 250m by 40m) has been excavated to provide an elevated platform. Only half of this area has actually been built on. This suggests that **more development is planned for the future.** The formation of the escarpment has mobilised the unstable rock type of the cliff and increased siltation rates that are accelerated further by rainfall. The impact of this increased siltation will be at its maximum in winter when the rainfall is higher. Therefore **increasing sediment runoff from the bare cliff face on to the nesting beach.**

6.3 Accelerated Siltation

The silt from the excavated cliff has a high clay marl content (personal observation from recent geology survey) which contains many more nutrients and minerals than the sand on the dune system. Evidence of this can also be seen from the lush Mediterranean Maquis and Phryganic vegetation found on the cliffs, which thrive on these nutrient rich sediments. It is obvious that siltation has a prominent and altering impact on the sand dune habitat (personal observation from a recent floral survey). The excavation has brought a large quantity of silt down to the beach from the cliffs covering a large area of the existing sand dunes. These lie to the East of the development.

The material has formed **a flat, hard clay screen over the top of the dune system, altering its topography and floral composition extensively.** The primary impact is the encroachment of cliff phryganic vegetation on the unique halophytic and ammophilic flora of the sand dunes. This in turn has led to the loss of endangered and protected individual species of plants such as the Sea Daffodil *Pancretium maritimum*. Also, the loss and degradation of a habitat of high biodiversity that is listed as a priority ecosystem for conservation (see section 4.3).

The concentration of development at the Potamakia site will have a long term effect on the aeolian transport of sand from the dunes to the beach and will therefore reduce the average beach width, slope, dry sand availability and sediment composition. These factors play an important role in nest site selection for the Loggerhead Turtle *Caretta caretta* as discussed in related studies on the eight species of marine turtles; (Talbert *et al*, 1980; Mortimer, 1982 and Mortimer, 1990; Johannes and Rimmer, 1984). This is true of the area at Mounda directly in front of the hotels, apartments and small building. The length of the area is approximately 185m and **no nesting activity has taken place on this part of the beach this year**. Comparative data shows that two nests were located in this area in 1996, before the new apartments had been built. The beach here is void of the dune system. It is therefore extremely flat and the sand is very compact, as there is no mechanism by which sand can be replenished and kept within this zone.

7. Alterations to the Hydrological Regime

7.1 The Importance of Sediment Transport

There are two main streams present at Potamakia, Mounda. Both flow directly to the beach, one in front of the new apartments and one slightly further to the East. Their natural route to the sea is very important, as they constitute main channels through which sediment is transported to the coastal system. Sand on the beach has resulted from the action of many factors, which may to a certain extent cancel each other out, but overall a dynamic equilibrium is maintained. Sediment originally from the erosion of this catchment basin which is deposited through wave action and sea currents on the beach, all contribute positively to the state of the sediment budget.

7.2 Alterations of River Channel

At Potamakia the two streams have been artificially narrowed and deepened and a concrete bridge has been built over them to provide an access road to the beach. Such works change the flow of water to the beach and decrease the amount of sediment in transport, changing the physical catchment area of the streams and in turn the profile of the beach. "Healthy beaches are subject to regular cycles of erosion and accretion of sand" (Nordstrom *et al*, 1990). This will also affect tourism in the area, as **the sand becomes compact and full of clay**, making the beach much less attractive to tourists.

8. Impact of Increased Tourism on Mounda

The following sections describe the direct impact of tourists on the beach. Tourism in this area is at its highest from the end of July to the middle of August, which also coincides with the turtle nesting season and the start of incubation for the hatchlings. At Mounda tourism does pose a threat to the ecology, even though it is not always intentional. "Construction work and tourism commonly disturb hatching, nesting and emerging loggerheads, incurs noise and photopollution and easily degrades their habitat"(Poland *et al*, 1996).

8.1 Disturbance to Loggerhead Turtles *Caretta caretta*

"At their nesting beaches, marine turtles are extremely sensitive to many forms of disturbance caused by people" (Mortimer, 1989).

This year has seen many tourists on Mounda beach averaging approximately 250 people a day from beginning of July to the end of August. "Nesting site requirements are very specific and easily damaged by building, road construction and beach use that is associated with tourism"(Poland *et al*, 1995).

a) Placement of Umbrellas and Sunbeds on the Beach

There are relatively low numbers of sunbeds and umbrellas on the beach. They are in three main groups spread along the beach near the waterfront. Umbrellas are often moved further to the back of the beach where the turtles nest. The placement of umbrellas in the sand away

from the shoreline can easily pierce and destroy turtle nest chambers and eggs. A future increase in the number of tourists on the beach will raise the chances of nest destruction. Shade produced by unnatural structures (i.e. umbrellas, buildings and sunbeds) can lower the incubation temperature of nests thus altering the sex ratio of the offspring. "The temperature at which egg clutches are incubated determines the sex ratio of the offspring produced" (Mrosovsky and Yntema, 1980).

b) Noise and Illegal Camping on the Beach

During the turtle nesting period this year there were **many tourists camping on the beach** (personal observation). These people all contributed to noise on the beach. This disturbed some of the turtles attempting to nest between the hours of 10pm and 6am. Loud noises in the low frequency range can frighten nesting turtles back into the water or discourage them from coming ashore at all.

This year during the months of July and August there were at least five illegal campers at any one time residing on the beach and the back of the beach, in the Kaminia area. These bring with them many problems of light and (see section 6.1) noise pollution. **They also drive along the beach**, which compacts the sand and prevents the formation of new sand dunes.

c) Cleaning and Vehicles on the Beach

This year authorisation was given by the council of the local community for a bulldozer to clear rubbish from the beach. **Despite being told about the abundance of nests 10m above the shoreline, the machine drove all across the width of parts of the beach.** The impact of this action on the turtle nests is not yet clear. There are at least two nests out of the fifty six laid this year that have far surpassed their sixty day incubation period. These nests may have been destroyed by compaction of the sand above the chamber causing the collapse of the nests, or an extreme change in the diurnal temperature range within the chamber, increasing the chances of embryo mortality. **Many other vehicles have been seen on the beach this year including motorbikes and jeeps.**

Beach cleaning at Mounda by vehicles is unnecessary as volunteers from the local conservation group clean the beach regularly during the nesting season. They patrol the beach in the morning and remove the previous days litter by hand.

The ruts produced by the tracks of vehicles or by objects dragged over the surface of the sand have diverted hatchlings during their migration from the nest to the sea, often forcing them to walk at least 10m parallel to the sea before resuming their course.

"Human and animal foot traffic and vehicular traffic can cause sand cave-ins that suffocate hatchlings trying to make their way from the nest to the surface of the sand" (Mortimer, 1990; Mann, 1978).

d) Litter (photo 5, p.14)

Unfortunately with the number of visitors to Mounda comes an increase in litter. Litter on the beach can cause problems with the orientation of hatchlings from nests to the sea. An impact much more problematic to this is the fact that when litter is on the beach it encourages predators such as the Sand Martens. These animals will excavate nests to eat the turtle eggs and kill hatchlings on their way to the sea.

Sand Marten tracks have been seen around several of the nests this year. There has been no evidence of predation, although some hatchlings were found dead near their nests. In the future, an increase in tourism will increase the amount of litter on the beach, which may lead to high levels of predation of the hatchlings.

8.2 Disturbance to the Sand Dune Habitat

“The structure of the sand dunes and their vegetation will quickly be destroyed by human visitors walking and playing on them” (Nordstrom *et al*, 1990).

a) Trampling of Sand Dunes

Visitors to the beach can walk freely over the dune system as there are no fences and no information available to tell people about the habitat’s necessity for the stability of the beach and the unique flora it possesses. **Trampling on dunes can cause the removal of vegetation that keeps the mobile sand structure in place.** This inevitably leads to erosion by wind, leaving large areas open to further erosion. Once the profile of the sand dune system starts to change the whole physical nature of the habitat will be impaired. Visitors need to be informed about the sensitivity of such a fragile habitat.

b) Removal of Flowers

The Sea Daffodil *Pancratium maritimum* and the Sea Lilly *Lilium candidum* are extremely beautiful flowers. Visitors to the area should be informed about the fact that these plants are endangered species protected by international law.

c) Development

This has the most devastating impact at Mounda beach as discussed in sections 6.2 and 6.3. The immediate impacts are evident but development of such a sensitive ecosystem will have far reaching implications in the future.

According to articles 3 and 5 of the European Community directive 85/ 337 a developer is first obliged to perform an environmental impact assessment to identify the effects of future development on the environment.

Such **legislation has not been adhered to at Mounda.** Development in the area has taken place without any formal impact assessment, which should have been granted by the Local Administration who are responsible for issuing building permits. Such negligence on the part of the Local Administration and landowners will lead to an imbalance in the needs of the economy and environment. Without compliance to legislation, sustainable development in the future will be impossible and the needs of both the landowners and the ecology will be compromised severely.

Section C

9. Public Awareness

The conservation of the natural habitats and species found at Mounda can only be achieved with the support and help of the public and the Local Administration. The Local Administration should respect protection laws and make sure that they are being adhered to. They have a responsibility to inform the public about legislation and to enforce laws effectively.

A Comprehensive public education and awareness program is needed for tourists and local people. A local conservation group, “Katelios group” has set up an environmental education center in Katelios. This is operated by foreign volunteers who provide information for tourists on the protection of the *Caretta caretta* population at Mounda. Their efforts are also important in the protection and population study of turtles. They collect valuable data on the number of turtles sighted during the nesting season, the numbers of nests and the numbers of successful emergences.

Information is not effectively disseminated to the local community and local businesses who reside permanently in the area. This is mostly due to conflicts arising between these different interested parties. A problem that could be alleviated by a regular public forum which could be used to air opinions and give solutions to the protection of Mounda.

Information in the form of leaflets and signposts should be made readily available in the area. These should include information on the important habitats and species in the area as well as a code of conduct for visitors to the beach. This will also help to minimise impacts of tourists on the turtles and sand dunes.

Organised talks should continue to be given in schools to increase awareness about the local environment and the reasons behind the necessity for its protection.

10. Summary

Due to the steady rise in tourism in Kefallonia over the last decade and the increase in illegal and uncontrolled tourist related developments, the central Administration Council in Argostoli is preparing a physical land use plan for Kefalonia. The main function of this is to endorse habitat and species conservation in sensitive areas and to control development.

This plan has been still under review since 1995 and consultations with the Greek government, NGO's, local councils, field specialists, and other groups, are still taking place. The plan at present does not make any mention of protection for the sand dune habitat at Mounda neither does it recognise that **the entire 2.8Km stretch of Mounda beach is used by the turtles as a nesting site**. Only a section at the Potamakia side of the beach has been selected as a potential site for the protection of *Caretta caretta*. Further negotiations with the relevant groups may and should change this.

Awareness of the Loggerhead Turtle *Caretta caretta* population at Mounda is very high and through the interest of tourists, the public and the work of the local conservation group, support for their protection is increasing. However, **no statutory protection has been given so far to this unique Kefallonian population**.

The fact that the Mounda area possesses a biologically diverse sand dune system, a priority habitat listed in the EC Habitats Directive (92/43/EEC), has been completely ignored so far. Its importance to the fauna and flora of Mounda has not been recognised and no protection measures implemented. **Already a large area of the sand dune system has been lost to development in the area**.

No attention has been paid to the protection of endangered flora such as the Sea Daffodil *Pancratium maritimum*.

Buildings in the area do not always comply with planning legislation and **no formal assessment is made** to measure their present and future impacts on this ecologically sensitive beach. Development in the area has been primarily for short-term economic gain with no concern for future degradation of the environment.

Tourists enjoy the area of Mounda as it possesses an aesthetically pleasing landscape as well as being the nesting site for marine turtles. Many foreign holiday companies often use this as an attraction to the area without mentioning the need for conservation. If protection measures are not implemented soon, **uncontrolled development could alter Mounda's habitats**, thus affecting nesting turtle populations. The beach will be destroyed through human intervention making it unsuitable for tourists and turtles alike. This will have a negative effect on the tourism in the area, in turn affecting the local economy.

11. Recommendations

- a) Implementation and enforcement of international, national and local legislation EC Directives and international conventions to ensure the protection of *Caretta caretta* in Kefalonia.
- b) The development and implementation of a management plan for Mounda to ensure the direct, long-term protection and enhancement of sensitive areas.
- c) Designation of the sand dunes at Potamakia as a Special Area of Conservation (SAC) under the EC Habitats Directive (93/43/EEC).

- d) Recognition by the Greek Ministry of Planning, Environmental and Public works and the Standing Committee of the Bern Convention of Mounda as:
 - 1) An important site for *Caretta caretta* in need of immediate protection.
 - 2) An important area supporting a dynamic sand dune system in need of immediate protection.
- e) The setting up of a management body to organise the dissemination of information through a public forum.
- f) To employ a warden to monitor and enforce beach codes of conduct for tourists. To help in the protection of *Caretta caretta* and to prevent people trampling on the sand dunes.
- g) The continual assessment and monitoring of the turtle population and of the sand dune habitats is imperative for the effective protection of the area.
- h) An exclusion of tourists and public from the beach at night during the nesting season.
- i) Prevention of any further developments at Mounda beach now and in the future.
- j) Effective enforcement of planning and development legislation to prevent illegal building and to control development in surrounding villages.
- k) Designations of a specific area of beach exclusively for tourists use. To limit tourist use in all other areas to the 5m zone from the waters edge. This is necessary to control tourist movements on the beach, in order to prevent damage to nests and to the sand dunes.

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T-PVS (96) 85: *Caretta caretta* in Kaminia (Greece), p.p. 6.

T-PVS (97) 43: The Kefalonia Marine Turtle Project and the Katelios Group for the Research and Protection of Marine and Terrestrial Life, p.p. 15.

T-PVS (98) 79: The Kefalonia Marine Turtle Project and MEDASSET, p.p. 5.



1. Mounda Beach Apartments



2. New Private Apartments



3. Small Private Building



4. Loss of Important Sand Dunes Habitats



5. Litter