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CONVENTION ON THE CONSERVATION OF EUROPEAN WILDLIFE  
AND NATURAL HABITATS

**Standing Committee**

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**Follow-up of Recommendation No. 9 (1987)  
on the protection of *Caretta Caretta* in Laganas bay,  
Zakynthos (Greece)**

**- REPORT BY THE GOVERNMENT -**

*Document prepared by  
the Ministry of Environment & Energy, Greece*



## NATIONAL · MARINE · PARK · OF · ZAKYNTHOS ¶

### **CONSERVATION AND MANAGEMENT OF THE LOGGERHEAD SEA TURTLE *Caretta caretta* IN LAGANAS BAY(ZAKYNTHOS – GREECE)**

### **SHORT REPORT TO BE SUBMITTED TO THE STANDING COMMITTEE OF BERN CONVENTION**

Zakynthos, November 27<sup>th</sup> of 2017

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## PROLOGUE

Since the MPA in Zakynthos was the first National Park in Greece managed by a Management Agency (July 2000), it represents the first innovative step for nature conservation in Greece, by setting an example how nature protection can be harmonized with anthropogenic activities by creating sustainable development for the broader region.

In order to cover the management and scientific monitoring needs as well as the environmental education and public awareness needs, specialized staff (such as Biologists, Environmentalists, Agriculturists, Civil Engineers, Environmental Economists) was hired. Furthermore, the wardening of the whole area is ensured by about 20 Park Rangers that are supported, when sufficient funding is provided, by seasonal Park Rangers (an average no of 20) because of the simultaneous intense tourism activity (more than 600.000 visitors) and the sea turtles breeding activity during summertime. Most of the activities developed by the M.A. of the N.M.P.Z. are financed by European Projects such as the Community Structural Funds (CSF), INTERREG, Med, LIFE, the 6<sup>th</sup> and 7<sup>th</sup> Framework Programmes. Basic but very important infrastructure and equipment was acquired such as the Thematic Exhibition Centre of the Sea Turtle *Caretta caretta* (located in Dafni), the Information Center, Warden huts, Cars, Patrol Boats, Scientific equipment and Public awareness material that is constantly updated.

The N.M.P.Z. Management Agency is also involved in Environmental Education Programmes, Volunteers Programmes and has organized several National and International Scientific and Thematic Conferences and Workshops with main themes the protection and management of the environment and the promotion of sustainable development. Its contribution to scientific research related to its area of competence is expressed through the cooperation with Research Centres and Academic Universities (MOU - Memorandum of cooperation, Papers published in Scientific Conferences Books and Scientific Journals with participation of members of the NMPZ in the authorship, Partnerships, Internships, Thesis, Summer Schools). More in particular the NMPZ scientific staff participates to Scientific Conferences (e.g. Annual Sea Turtle Symposium) and the publication of Scientific Papers (e.g. Journal of Experimental Marine Biology and Ecology, Diversity and Distribution, Journal of Animal Ecology, Conservation Biology, Mediterranean Marine Science, Nature Scientific Reports) over the last decade. Furthermore, in order to contribute to the promotion of sustainable development principles, the N.M.P.Z.' Management Agency is also participating to different Committees and Think Tank Organizations, International Tourism Exhibitions (London, Berlin, Amsterdam). Last, the N.M.P.Z. is a founding member of the International Organization MedPAN (Mediterranean Network of Marine Protected Areas) that was established in 2008, and is dedicated, among other activities, to supporting MPAs Managers in the Mediterranean through the know-how and experience exchange.

In the area of NMPZ there is an important biodiversity since as it has been reported above with a variety of Habitats of Community Interest such as Sand Dunes in Kalamaki Beach, extended seagrasses of *Posidonia oceanica* and *Zostera* sp. in the Laganas Bay. Furthermore, a great number of plants (among which is included the endemic species *Limonium zakynthium*), algae, invertebrates and vertebrates have been recorded in the coastal and marine ecosystem of the Park along with a rich avifauna (more than 50 migrating species have been recorded from Zakynthos and Strofadia Islands). The area of the National Marine Park of Zakynthos and in particular the Laganas Bay host one of the most endangered species of the Mediterranean fauna which is the Loggerhead Sea Turtle *Caretta caretta*. This constitutes an 'umbrella species' for the Park since the number of individuals which reach the Laganas Bay for reproduction every year represent the 25% of the Mediterranean population of this species (and more than 50% of the individuals visiting different parts of the Greek Seas). Furthermore, the high productive beds of *Posidonia* meadows covering extensive areas of the Laganas sea bottom offer an ideal habitat not only for *Caretta caretta* but they also host an important number of flora and fauna species (more than 400 algae species and 500 fish and invertebrate species have been recorded to form the *Posidonia* communities in the Mediterranean Sea). Finally, the variety of geomorphological features (e.g. reefs, underwater caves) not only in Laganas Bay (e.g. in Pelouzo and Marathonisi islets) but also in the western parts of the Island of Zakynthos (which are NATURA 2000 sites) provide the perfect habitat for certain individuals (estimated to more than 15 according to a survey conducted in 1994) of the Monk Seal *Monachus monachus*.

The Management Agency of the N.M.P.Z. has a lot of actions not only towards ecosystem conservation but also to the strengthening of sustainable development in the island of Zakynthos. To achieve this the personnel of the MA of the NMPZ has a considerable contribution in a series of activities such as: a) development of Environmental Educational Activities (e.g. collaboration with the Primary, Secondary and High Schools as well as the Environmental Education Centre of Lithakia for the organization of thematic summer schools, eco-friendly activities in the nesting beaches of the Loggerhead Sea Turtle *Caretta caretta*), b) promotion of the Cultural and Traditional characteristics of the Island of Zakynthos (e.g. alive performances of local music and theatre groups, promotion of biological local products – olive oil, wine), c) the enforcement of Eco-touristic activities (e.g. Diving Tourism, Fishing Tourism, Bird Watching) and d) promotion of alternative methods of agriculture (e.g. biological culture of local products).

## 1. HISTORICAL BACKGROUND

1980: The National Council for Spatial Planning and Environment decided to strictly protect the areas: Marathonisi, Sekania and Gerakas (nesting beaches) and assigned to the responsible ministers the conduction of the required actions (Greek Government Gazette - FEK 486/B/20-05-80)

1981: The first efforts to implement the measures for the protection of the sea turtle *Caretta caretta* in Zakynthos started with the installation of informative billboards (explaining the forbidden activities) at the nesting beaches. At the same time, the first measurements of the nesting activity attempts and of the number of nests at the nesting beaches were carried out by the Hellenic Society for the Protection of Nature funded by IUCN.

1982: The issuing of decisions by the Minister of Town Planning and Environment (M.T.P.E.) for the 6 months suspension of issuing and executing building permits in areas that overlap the nesting beaches started. The Monitoring Program of Nesting activity (M.P.Na.) was implemented by the M.T.P.E., which was later assigned to the Society for the Protection of the Sea Turtle (S.P.S.T.), and is still conducted until today.

1984: A Presidential Decree (P.D.) was issued defining the 3 zones at the broader terrestrial area and the North East part of Laganas Bay, setting the conditions and restrictions for construction activity. The gradual formation and implementation of Protection Program (P.P.) by the Prefecture of Zakynthos started with the placement of Park Rangers at the nesting beaches.

1987: A decision by the Minister of Environment, Spatial Planning and Public Works (M.E.S.P.P.W.) was implemented and a Residential Control Zone (R.C.Z./ 86) at the broader area of Laganas Bay was finalized, the P.P. was carried out and the implementation of the Environmental Awareness Program by the S.P.S.T. started. A committee was established in the Prefecture of Zakynthos in order to monitor the implementation of the measures for the protection of the R.C.Z. and for the same reason a visit in Zakynthos was held by MEPs (Members of European Parliament) and experts of European Council.

1988: A Common Ministerial Decision (C.M.D.) was issued defining the measures for the protection of the marine area of Laganas Bay and delimiting with buoys 2 protection areas (A, B). A program for the establishment of an eco-touristic Centre and a biological treatment plant was announced by the M.E.S.P.P.W..

1990: The decision on the designation of the R.C.Z. was changed, with minor modifications to P.D., which was in force until 1999.

1991: A Special Regulation of the Port Police Authority of Zakynthos, No 19, was approved and replaced by the relevant C.M.D. The M.E.S.P.P.W assigned, after an international call of tender, a study for the elaboration of the Special Environmental Study (S.E.S.) for the establishment and management of the National Marine Park of Zakynthos (N.M.P.Z.)

1994: A Special Regulation of the Port Police Authority, No 20, which added to the previous Regulation another marine area (C), was approved and entered into force. WWF-Hellas purchased the terrestrial area above Sekania nesting beach, after the M.E.S.P.P.W assent and the partial funding by the European Economic Community (E.E.C.).

1997: The 2<sup>nd</sup> phase of the Special Environmental Study (S.E.S.) for the N.M.P.Z. was completed and presented in April. At the same time, the M.E.S.P.P.W composed a relevant Programming Contract and suggested its signing, which was finally not accepted. In June, the Prefectural Council of Zakynthos, without accepting the suggested plan, established a Committee of Authorities and Environmental organizations for the editing of an intermediate proposal. The Specific Environmental Study (S.E.S.) for Laganas Bay was completed also in June, by the M.E.S.P.P.W..

1999: The National Marine Park of Zakynthos was established with a Presidential Decree (P.D. 906 D'/21.12.1999), while, at the same time, the Organization of the National Marine Park of Zakynthos, which undertook the management of the protected area of the N.M.P.Z., was established.

2000: The 1<sup>st</sup> Management Board of the Organization of the N.M.P.Z. was created by Ministerial Decision. Until the end of the year, the Organization hired the first four employees. The procedures for the modification of the P.D. 906 D'/1999 for its harmonization to the law 2642/1999 started.

2002: Greece was condemned by the Court of Justice of the European Union [(C.J.E.U., (case C-103/2000)], because until 1999 Greece had not established and implemented an effective framework for strict protection of the sea turtle *Caretta caretta* in Zakynthos.

2003: The amendment of the P.D. 906 D'/1999 was published at the Greek Government Gazette (P.D. 1272/2003). The Organism of the N.M.P.Z was renamed to Management Agency of the N.M.P.Z.

2004: The Regulation for the execution of works and the assignment and conclusion of contracts for supplies, studies and services (Greek Government Gazette – FEK 322/B/2004) as well as the Operating Regulation of the Management Board of the M.A. of the N.M.P.Z. (Greek Government Gazette – FEK 325/B/2004) were published.

2005: The Regulation for Operation, Services and Personnel of the National Marine Park of Zakynthos (Greek Government Gazette FEK 565/B/2005 as well as the Regulation for financial management of the M.A. of the N.M.P.Z. (Greek Government Gazette – FEK 65/B/2005) were published. Despite the establishment of the N.M.P.Z., the establishment of the Management Agency and the positive progress of the implementation of the protection system during the years 2001- 2003, the suspension of operation of the M.A. from April 2014 until August 2005, led the European Committee to send a Reasoned Opinion posing a threat for the imposition of financial penalties.

2006: Pilot management measures were implemented at the N.M.P.Z area which included:

- the implementation of management measures in all the nesting beaches of the sea turtle *Caretta caretta* (including Dafni nesting beach) in Laganas Bay.
- Provision of basic means for the operation of the M.A. (hiring of personnel, surveillance, scientific monitoring, funding of activities).
- Rational setting of priorities by the M.A. of the N.M.P.Z.
- Good collaboration practices with the local authorities
- Signing Memorandum of cooperation with environmental organizations, businessmen/professionals and owners of property.

2007: The full implementation of an integrated protection framework during 2006 led the Authorities of the European Committee to reevaluation of the case. Their evaluation was that Greece has complied to the Decision of the C.J.E.U. and consequently the case was archived in June of 2007. However, as stated at the relevant document, European Committee continues to monitor the effective implementation of the protection measures for the sea turtle *Caretta caretta*, since the protection of this species remains a priority for the Committee. Therefore, if it is found that Greek Authorities are not effectively implementing the existing legal framework, then the

Committee will reopen the infringement procedure under Article 228 of the EC Convention and will bring the case before the C.J.E.U. for the imposition of financial penalties.

2007-217: The N.M.P.Z. Management Agency is operating on the same basis that the one described in 2006, implementing Pilot Management Measures that are assessed every year and improved, taking into account not only the sea turtles' nesting activity variation, but also the human based pressures (mainly tourism) brought to nesting beaches as well as in their vicinity. The Management Measures are also reconsidered and prioritized according to the human (staff) and material resources available, resources that can subsequently vary according to the funding sources of the N.M.P.Z. Management Agency.

## **2. ACTIONS OF THE MANAGEMENT AGENCY OF THE N.M.P.Z. FOR THE PROTECTION OF THE SEA TURTLE *CARETTA CARETTA***

### **2.1 Conservation and Management Actions in the N.M.P.Z. area**

A Presidential Decree, signed in December 1999 (Official Journal of the Hellenic Republic 906D, 22/12/1999), resulted in the establishment of the National Marine Park of Zakynthos (NMPZ) and its Management Agency (2000), with the purpose to protect and conserve the most important loggerhead sea turtle (*Caretta caretta*) nesting beaches in the Mediterranean, the population of Mediterranean monk seals (*Monachus monachus*), resident and migratory bird species and rare and endemic plants. The primary aim of the N.M.P.Z. is to monitor various aspects of the natural environment (e.g. species, habitats and impacts), to capacitate the growth of environmentally compatible activities, such as sustainable tourism and recreation, whilst simultaneously safeguarding the natural and cultural landscape through activities such as environmental education, provision of information and public awareness activities.

The management of the Nesting Beaches aims to optimize the parameters that affect the successful reproduction of the loggerhead sea turtle. Individual objectives are:

- The successful mating of the Loggerhead Sea Turtle
- The successful coming ashore of *C. caretta* to the Nesting Beach
- The successful nest creation
- The successful development of the embryos
- The successful hatching of the eggs and uninhibited emerging of the offspring from the nest to the sea

The management of the nesting process includes three interdependent levels:

- Nesting Beach
- Surrounding terrestrial zone of the Nesting Beach
- Marine area

The main parameters that are estimated in the three levels, in order to achieve successful management are:

- Abiotic factors of the area, such as sand humidity in various depths, beach width and slope, grain size composition of the sand, sand and sea temperature, undulation e.t.c.
- Biotic factors such as the type and density of vegetation, predators of eggs and hatchlings, marine flora and fauna e.t.c.
- Human interventions and activities such as noise and light during night, creation of artificial obstacles at the Nesting Beach area, artificial alterations of the surrounding terrestrial zone of the Nesting Beach, professional and recreational fishing, boat movements, e.t.c.

In the aforementioned framework the Management Agency of the N.M.P.Z. applies a series of Management Measures based on the principles of "adaptive management" on an annual basis aiming to achieve an effective conservation of the Loggerhead Sea Turtle *Caretta caretta* and its habitats (i.e. Laganas Bay and nesting beaches). The Management actions in both the nesting beaches and the marine environment are the synergistic effect of three different but interactive programmes: a) The Wardening of Activities and Public Awareness Programme, b) the Scientific Monitoring Programme and c) the Volunteers Programme.

**a) *Wardening and Public Awareness Programme***

This Programme (which is the application of the legal framework and measurements included in the Presidential Decrees 906/D/1999 and 1272/Δ/2003) has the following major activities: 1) Wardening of the nesting beaches of the Loggerhead Sea Turtle *Caretta caretta* in Laganas Bay, 2) Wardening of the marine environment in Laganas Bay which is the major area for reproduction of the Loggerhead Sea Turtle *Caretta caretta*, 3) Wardening of the Strofadia Islands for monitoring of activities related to fishing and hunting, 4) Public Awareness of the local community and the visitors of the island.

**MARINE ENVIRONMENT**

The marine protection regulations operate from May to October every year whereby:

- in Zone A of the N.M.P.Z. all sea craft are prohibited
- in Zone B of the N.M.P.Z. sea craft are permitted at a speed limit of 6 miles per hour but no anchoring
- in Zone C of the N.M.P.Z. sea craft are permitted at a speed limit of 6 miles per hour and may anchor

**COASTAL ENVIRONMENT**

Laganas Bay encompasses six distinct areas (one area is a 'Strictly Protected Area' – Sekania and other five are 'Nature Protection Areas' – Gerakas, Dafni, Kalamaki, Marathonisi and Keri), including the main nesting beaches for the Loggerhead Sea Turtle, which are separated from each other by rocky outcrops. The National Park also includes the Strophadia Islands, which are located 40 nautical miles south of the island of Zakynthos.

The coastal protection regulations operate through the whole year whereby:

- in the 'Strictly Protected Area' (Sekania) access to the beach is only permitted for research and scientific monitoring activity, after the issuing of a specific permit by the M.A. of the N.M.P.Z.
- in the 'Nature Protection Areas', the following actions are prohibited:

Public access to the nesting beaches from sunset to 7.00 a.m.

- the use of umbrellas, except in the region of 3-5 meters above the waterline
- the digging on the beach, especially where turtle nests are located the disturbance of cages protecting the nests
- the use of any vehicle (bicycle, motorbike, car, etc.) the access to horses
- the access to dogs
- the use of any light source at night

**b) *Scientific Research Monitoring Programme***

The Scientific Research Monitoring Programme aims to establish a standard quantitative method of monitoring the quality of the Loggerhead Sea Turtle *Caretta caretta* nesting beaches with respect to conservation management, and is performed on an annual basis in five (Gerakas, Sekania, Dafni, Kalamaki and Marathonisi), which are important beaches for the nesting activity of the species, in the period from the 15<sup>th</sup> of May till the 15<sup>th</sup> of October every year.

This is achieved through:

- Monitoring sea turtle nesting activity (numbers and spatial distribution), incubation periods, and hatching activity to establish success rates
- Assessing environmental factors (e.g. temperature, sediment type, humidity) that are considered to influence the sea turtle nesting activity, egg incubation and hatchling success
- Quantitative evaluation of the information collected to improve area management with respect to monitoring practices and improving the quality of the nesting environment

In action the following activities are performed:

## ADULT SEA TURTLES

Counting of the total number of emergences and estimation of the total number of nests per nesting beach ('nesting success').

Recording of the nest location with respect to distance from the sea  
Recording of the nest location with respect to elevation above sea

Determination of the spatial distribution of nesting and assess with respect to environmental and anthropogenic factors

Determination of the spatial distribution of failed nesting attempts and assess with respect to environmental and anthropogenic factors

Recording and evaluation of the importance for failed nesting attempts

Recording of the degree of multiple beach use in successful and failed nesting emergences

Pit-tagging of female sea turtles for population and behavior studies

## INCUBATION AND HATCHLING SEA TURTLES

Recording of the location of hatched nests and match up with laid nests for determination of the incubation period

Recording of emergence patterns of hatchlings from nests

Evaluation of the incubation period with respect to environmental parameters (i.e. against date of egg laying, sand depth of egg chamber top eggs at egg laying, total egg chamber depth, distance from sea, beach slope, water table, etc.)

Calculation of the number of laid nests that hatched and determination of the reasons for failure of nests hatching and if changes in beach management procedures could impact this

Determination of the 'hatchling success rate' from nest excavations and determine reasons for failed hatching (i.e. inundation, heavy clay, rocks, roots in nest, etc.)

Determination of the sex ratios of hatchlings produced from the different beaches and influence of environmental factors

## ENVIRONMENTAL FACTORS AFFECTING SEA TURTLES

Beach size (length & width) Beach slope

Natural available nesting area: beach composition i.e. sand/stones, vegetation line, wet sand line, sea line, river beds, etc

Sand composition (particle size, organic content, pH, etc.) Sand compaction

Sand moisture levels

Light pollution (with & without moon)

Noise pollution (taking into account wind direction)

Offshore factors that could affect between beach and on beach spatial nesting distribution (i.e. reefs, sea currents, wind direction, etc.)

## ANTHROPOGENIC FACTORS AFFECTING SEA TURTLES

Total number of visitors on beach each day and at any one time  
Spatial distribution of visitors on the beach

Awareness of visitors of the rules and willingness to comply with

Total number of participants in public awareness activities (e.g. nest' excavation demonstration, schools environmental guided tours)

Obstacles on the beach (i.e. sun beds, humans on the beach, etc)



The aforementioned Scientific Research Monitoring Programme is performed in close collaboration (established via an MOU from 2002 onwards) with the Environmental N.G.O. for the Protection of the Sea Turtle 'ARCHELON'.

Apart the Monitoring Programme targeting the sea turtle there are a lot of other Research Programmes aiming to record flora and fauna species of the beaches and the marine environment as well as the significant Habitats of Community Interest (Habitats Directive EU' 92/43). These scientific activities are performed via collaboration with National (e.g. the Hellenic Centre for Marine Research - HCMR) and International Research Centres and Universities (e.g. the National and Kapodistrian University of Athens, the Aristotleion University of Thessaloniki, the University of the Aegean, the Technical Institute of Ionian Islands in Zakynthos, the University of Nice, the MedPAN Network) as well as Environmental N.G.Os such as the Hellenic Ornithological Society (HOS), the Society for the Protection of the Monk Seal (MOM), the Cetacean Institute (PELAGOS), etc. The results of the Monitoring Programmes on various aspects of marine and terrestrial biodiversity in the area of the Marine Park over the period 2013-2015 have been presented in the International Scientific Conference 'Marine Protected Areas in Greece & the Mediterranean: Designing for the Future by Applying Lessons Learnt from the Past' organized by the M.A. of the N.M.P.Z. in collaboration with the Technical University of Zakynthos and the Greek Ministry of Environment (more than 250 participants) during December 2015 in Zakynthos (Dimitriadis et al., 2016).

### **c) Volunteers Programme**

This Programme aims to support the Wardening/Public Awareness and the Scientific Research Monitoring Programmes performed by the Management Agency of the NMPZ. The activities of this Programme are realized through a considerable number of volunteers from Greece and abroad (an average of 20 people on an annual basis until 2011, an average of 10 people on an annual basis from 2012 onwards). The majority of these volunteers are coming from Universities (mostly undergraduate students) and Social NGOs. An important axis of the Programme, are the activities in collaboration with professionals from the local community (e.g. owners of agro-touristic houses for rent in the vicinity of the nesting beaches, small farmers of biological products).

## **2.2 Assessment of the Conservation status for the sea turtle *Caretta caretta* within the framework of the Habitats Directive 92/43/EEC**

The assessment of the conservation status for the sea turtle *Caretta caretta* within the area of Laganas bay, in the framework of the third report about the progress made with the implementation of the Habitats Directive 92/43/EEC has been achieved through a specific multi-disciplinary sea turtle Monitoring Project (Mazaris et al. 2015) carried out during 2014 by the Biology Department of the Aristoteleion University of Thessaloniki, the N.G.O. Sea Turtle Protection Society in Greece 'ARCHELON' and the Department of Marine Sciences of the University of the Aegean. Three were the main objectives of the Project: a) monitoring of the sea turtle nesting activity, b) recording of the distributional patterns of the species in the coastal area of the National Marine Park and c) proposing of complementary measures towards improving conservation efficiency, including the design of updated monitoring protocols that should be used by the Management Agency of the NMPZ. During the Project period 4.214 turtle emergences were recorded in total, out of which 1.069 resulted in the creation of nest. The first nest was laid on May 21<sup>st</sup>, in the beach of Sekania, and the last two nests on September 3<sup>rd</sup> one in the beach of Dafni and one in the beach of Crystal. Correspondingly, for the nesting period of 2014, the first nest hatched on July 27<sup>th</sup> in the beach of Kalamaki and the last on October 10<sup>th</sup> in the beach of Marathonisi.

Analyses of historical data during this Project showed that the number of nests is declining, although there are several factors which could be related to this downward trend. For example, there is evidence of high by-catch rates in the Mediterranean, causing the death of thousands sea turtles annually. Changes in the climatic conditions could also be related with the energetic requirements of individuals or the suitability of the foraging grounds, leading to a high inter-annual variability in nesting numbers. Still, given the complex life history of this highly migratory species, the identification of the actual factors that drive the downward trends of Zakynthos' nesting population is not a straightforward task.

Interestingly, the analyses demonstrate no strong evidence for a reduction of reproductive performance of females in the nesting sites of Zakynthos, providing further support to the hypothesis that threats operating offshore might be acting as the main drivers for current population trends.

The need for continued conservation and monitoring at both the coastal and offshore habitat of the species is crucial. For long lived organisms like the sea turtles, which are also utilizing a variety of habitats and cover long distances during their migrations, the standard procedures and criteria suggested by the European Environment Agency for ranking populations in situ may be rather limited. A thorough evaluation of the population status requires additional information to fill knowledge gaps on the abundance, age structure, and ecology of the whole Mediterranean population of the loggerhead sea turtle *C. caretta*, as well as, on their survival rates and finally on the conditions and threats that face in the marine habitats.

### **3. CONSERVATION OF THE SEA TURTLE *CARETTA CARETTA* BASED ON AN INTERNATIONAL - MEDITERRANEAN APPROACH**

The marine protected area of the N.M.P.Z., established in 1999, is one of the most important breeding and nesting areas for the sea turtle *Caretta caretta* in the Mediterranean while it forms part of the Natura 2000 network (GR 2210002, GR 2210003, GR 2210004) including marine and terrestrial priority habitats as well as rich flora and fauna. At the same time, this area subjects to intense tourism development (> 900000 visitors/year over the last 4 years) as well as to a wide range of other human activities (e.g. agriculture, fishery). Thereby, the effective management and conservation of the protected area (126km<sup>2</sup>), as a response to the diverse anthropogenic pressure brought to it, is an urgent priority. However, efficient conservation of migrating marine species such as the loggerhead sea turtle is by definition highly complicated since numerous threats must be addressed in terms of various anthropogenic activities in a very large geographical area. Global protection is therefore difficult to reach and any successful protection measures in a given area don't ensure an efficient protection of loggerhead sea turtles during their whole life cycle. Therefore, as a first step, there is an urgent need to move towards the development of an effective Network of small scale Marine Protected Areas not only in the Greek Seas but in the whole Mediterranean (Scofield et al., 2013). For instance, a network of MPAs including the main nesting areas and foraging areas of the loggerhead sea turtle in the Greek Seas (e.g. Kyparissiakos and Laganas Bay host almost 70% of the nesting activity in Greece) could be beneficial for the effective protection of this species.

Furthermore, the operation of the MedPAN Network (N.M.P.Z. is among the founding partners), which main objective is to improve the effectiveness of MPAs management in the Mediterranean, can contribute to a more coordinated and efficient integrated conservation of the loggerhead sea turtle and the MPAs in general. Within the MedPAN network, a "Mediterranean MPAs Sea Turtles Group" was established in 2017, a network that will serve as an effective management tool across the Mediterranean. A basic principle of this Sea Turtles Group is that any planning and design for an effective conservation of the loggerhead sea turtle in the Mediterranean, has to be based on multidisciplinary scientific considerations regarding the biological, oceanographic and socio-economic characteristics of the area of interest according to the established practice worldwide. This approach allows the assessment of current ecological conditions, ensures good representativeness of marine resources in the MPAs, determines the important attributes of the MPA Network (e.g. number, size, spacing, placement and total area of MPAs), enhances the involvement of the local communities, and finally improves the chances of success and the long-term viability of any future development plan in collaboration with the local society.

## **4. MAIN RESULTS OF THE OPERATION OF THE N.M.P.Z. MANAGEMENT AGENCY**

### **4.1 Implementation of protection measures within the area of the National Marine Park of Zakynthos (N.M.P.Z.)**

The implementation of protection measures within the area of responsibility of the National Marine Park of Zakynthos (N.M.P.Z.) by the MA of the Park, which are analytically presented below, and the collected data concerning the population of the sea turtle in the N.M.P.Z. area and the results obtained from the analyses performed indicate an effective protection of the sea turtle *Caretta caretta* over the last 15 years in the area of responsibility of the Management Agency (M.A) of the N.M.P.Z.

Although these data are indicative and, as already explained above the matter of the sea turtle population status is complicated, a trend of stabilization, and in some cases even an improvement, of the state/situation of the species is evident.

***Protection of the sea turtle at each nesting beach and in the marine area***

As far as it concerns the compliance to the rules that aim to an effective protection of the nesting beaches of the sea turtle and taking into account that measures undertaken by the N.M.P.Z. Management Agency are normally implemented (without delays on the recruitments or without gap/delay of funding by the Greek Ministry of the Environment), the high effectiveness percentage (immediate reaction to incidents/infringements) is proved (80% to 90% depending to the areas and the period). This achievement is mainly due to the existence of qualified and experienced Surveillance-Guarding and Environmental awareness staff (in a high percentage the personnel has over 10 years experience) and the continuous operation of the M.A. during the last 14 years.

The effectiveness of the conservation actions is also due to the development of the required infrastructures (Wardening Huts- Information Centers, development of technical infrastructure to prevent access to the nesting beaches by motorized vehicles access – road barriers, fences and stakes, installation of billboards, e.t.c.), acquisition of equipment (means of transport, clothing with distinguishing markings of the M.A. of the N.M.P.Z. for the Park Rangers- responsible staff for the activities control/patrols and environmental awareness), telecommunications, scientific equipment and the constantly improving collaboration with other stakeholders (hoteliers, operators on public domain space for the placement of umbrellas and sunbeds sets, horse owners, e.t.c.)

It has to be mentioned, that human pressures exerted at each nesting beach, may differ mainly in their intensity in relation to the protected object (issues of lighting, noise, and human disturbance, e.t.c.). Therefore, on a yearly basis, additional specific Protection/Management Measures are implemented.

1. In the area of Dafni, the measures that were taken to manage the nesting beach of Dafni and its surrounding area, from 2006 to 2009, resulted in the control of the number of visitors, the involvement of the local businesses and residents, and the effective protection of the nesting beach. A Memorandum for Cooperation and Understanding, as well as a Code for Mild Development of Recreational Activities was also implemented in this area. To date, even if some problems can occur, the main rules established by the NMPZ Management Agency, within the framework of Presidential Decree 906/D/1999, are enforced and there's no scientifically proved indication that nesting activity is directly and severely affected by human based pressures. It should be however stressed that the current situation in the area of Dafni is based on a "status quo" situation and concrete actions should be taken in order to address efficiently this still pending issue. Otherwise, the continuously growing pressure brought to this specific nesting beach could have in the near future a negative impact on the nesting activity.
2. In the area of Gerakas, the implementation of management measures for the control of visitors, the conservation of the natural condition of the nesting beach and the complete absence of light and noise during the night hours, contributes to the smooth procedure of the nesting of *Caretta caretta*. Moreover, the parking arrangements for vehicles in the area were sorted, and measures were taken for the protection of natural formations (glines), contributing to the aesthetical conservation of the landscape.
3. In the Marine area, the conservation of the zone marking system, the constant presence of guards using an M.A. boat, the continuous presence of the Greek Coastguard with the use of a Zakynthos Coastguard boat and the consistent patrolling of the sea area from land, contribute to ensure the safe presence of *Caretta caretta* in the Laganas Bay in Zakynthos, and the protection of the marine ecosystems and fish reserves from illegal activities. The collaboration between the M.A. and the locals working in the sea area of the N.M.P.Z. is significant in achieving the aforementioned results. However, even if a Memorandum of Understanding has been signed with boat operators since 2003 and a special turtle spotting

area with specific watching rules was designated in 2006, the current situation regarding sea turtles' harassment and disturbance within the marine area is far from being favourable. In order to face this situation, official legislation-regulation and efficient enforcement are needed, even if to date the tight cooperation between the N.M.P.Z. Management Agency and the Zakynthos Port Police Authority allow the mitigation of impacts on sea turtles. As an example, feeding of sea turtles for commercial purpose began in 2016 and was efficiently stopped during 2017 period after a specific decision of Zakynthos Port Police Authority.

4. In the area of Marathonisi, managing the numbers of visitors and educating them, as well as managing the coastal natural landscape, contributes to the safe nesting of the sea turtles. However, the increasing number of visitors and boats during the summer period (more than 100.000 visitors), is bringing more and more pressure on Marathonisi nesting beach and special measures should be undertaken (e.g. strict regulation of the number of visitors/boats at the same time, limited length of stay of 1 hour/boat).
5. In the area of Sekania, the guarding of the area by the N.M.P.Z. M.A. by land (during the winter) and sea, is ensuring that no one, apart from persons authorised for scientific purposes, could visit the beach. Specific cooperation between the N.G.O. WWF Hellas since 2015, through the wardening by WWF guards, allows limiting access to the beach by land during the summer season.
6. In the area of Kalamaki, the beaches are protected by N.M.P.Z. M.A. guards on a 24 hours basis during the nesting period and during the day all the year around. This proved to be an effective measure, as it ensured the enforcement of the rules regarding the N.M.P.Z., as defined by the Presidential Degree. Due to the lack of staff, since 2016, complementary patrolling during the night is overtaken by the N.G.O. 'ARCHELON' volunteers for some months during the summer period. Considering that patrolling by volunteers during the night is questionable for safety reasons, the N.M.P.Z. Management Agency should be given in the future the financial means to ensure a 24 hours wardening of the whole Kalamaki area.

#### ***Mortality - Injured sea turtles***

Although the number of dead turtles found in Zakynthos has increased considerably during the years 2010-2011, their number has decreased (-65%) during the years 2012-2014 and particularly in the N.M.P.Z. area (-90%), reaching the lowest levels of the last decade. This positive development can be explained by the effective surveillance of the N.M.P.Z. area and the drastic decrease of the predation phenomenon of the sea turtle that was most likely attributed to a top predator (marine mammal) that caused 50% of the mortality and lasted from 2010 until 2011, according to a relevant study by the Sea Turtle Protection Society "ARCHELON".

#### ***Level of reproduction/nesting activity – population dynamics of the sea turtle *Caretta caretta****

It is well recognized that the level of reproduction and offspring results in all species of living organisms is closely related to the life-cycle of each species and the factors regulating this activity leading to a rather natural variance of the population across the years. Regarding the population dynamics of the loggerhead sea turtle the significant decrease of the number of nests in the N.M.P.Z area that was observed in 2017 (about 650 nests), is a phenomenon which should rather attributed to the crucial parameter of natural variance from year to year of the populations of all species of livebeings referred above. Furthermore, the reduction of sea turtle nests during the current year 2017 seems that does not have a local character (i.e in the beaches of the island of Zakynthos) since a similar low nesting activity (almost 50% below the activity recorded the previous year 2017) has also been recorded in other areas of the Greek Seas (e.g. the areas of the NW coasts of Peloponnese which are under the responsibility of the Management Authority of the Kotychi-Strofilia Park – personal communication) where there are nesting activities of the sea turtle *Caretta caretta*. When considering Zakynthos and Laganas Bay and the nesting activity of the sea turtle in 2016, when the human activities at the marine and coastal area and surveillance by the M.A. of the N.M.P.Z. were at the same level with the summer of this year (2017) a significant increase of the number of nests (1500 nests, the

highest number of nests over the last 20 years at this specific area of Greece, where nesting activity of the sea turtle *Caretta caretta* is recorded) was observed. This fact, combined with the expected decrease (due to natural variance of the population that was before mentioned) that was observed in 2017, gives an average number of nests which correspond to an average that is observed during the last 20 years, i.e. 1.100 nests/year.

Taking into consideration the life-cycle of the sea turtle *Caretta caretta* which is characterized by a slow sexual maturation (20-30 years), it is obvious that reaching to conclusions regarding the conservation status of the particular species by examining just one year, is not in compliance with the well-established scientific approach of the examination of a time-series of data (i.e. data of nesting activity that cover a long term of at least 20 years). When examining the available scientific data of the last 34 years, a slight decrease of the average number of nests of the sea turtle *Caretta caretta* from 1250 nests/year to 1100 nests/year in Zakynthos is revealed, however this fact in no circumstance leads to the conclusion of a non-effective protection of the species in this particular area of the Mediterranean. As it has been mentioned further above the protection of the loggerhead sea turtle population in the Mediterranean is a complicated matter which is not linked with the conservation actions at a specific place of this basin. The protection of the sea turtle in Zakynthos occurs only 5 months each year (i.e. mostly during the nesting period of the species), whilst the sea turtles the remaining 7 months of the year migrate for wintering in other distant Mediterranean regions to the NW (North Adriatic – coasts of Italy and Croatia mainly) to the SW (coasts of Tunisia mainly) of this basin. Therefore, the efficiency of protection of the sea turtle by the M.A. of the N.M.P.Z. throughout the whole year is by definition limited.

Despite these difficulties, the M.A. of the N.M.P.Z. is deeply engaged towards the direction of the integrated protection of the loggerhead sea turtle in the whole Mediterranean Basin through the collaboration that has developed mainly over the last decade with the Management Authorities of Protected Areas in the previously mentioned countries (i.e. Italy, Croatia, Tunisia) as well as the participation of the M.A. of the N.M.P.Z. in the MedPAN Network (Network of Protected Areas in the Mediterranean), through which the presence of the sea turtle in other countries of the Mediterranean is also recorded.

The long-term conservation of the species, in relation to the increasing efforts made to provide a more effective protection of the sea turtle, should include specific initiatives. These initiatives should focus to the reinforcement (through the proper human and material resources, and the available financial resources) of the existing protection by the M.A. in the N.M.P.Z. area, since it is recorded a rapid increase of the human pressures during the last 5 years due to the high touristic activity (from 700.000 visitors in 2012, the number has raised to 1.000.000 in 2017), as well as to the adoption of Specific Legal Regulations for each sector of activity (e.g. Shipping, Fishing, Tourism, infrastructures) aiming at the protection of the species in a broader area of the marine and coastal area of Greece and not limited just in the area of Laganas Bay.

Another point which is worth mentioning is the fact that the last 5 years, a more balanced spatial distribution of the nests in different nesting beaches in Laganas Bay is observed. Thus, the trend of the increasing number of nests in 2 nesting beaches that are mostly visited (Kalamaki, Gerakas) is confirmed. Although the Sekania nesting beach which is the Absolute Nature Reserve Area within the Park, still remains the 1<sup>st</sup> nesting beach in terms of number of nests, it has an average number of nests that tend to steadily decrease (from an average of 50% to 39%), while the exactly opposite trend is observed in the Kalamaki and Gerakas nesting beaches. This fact may be attributed to the constant presence of the M.A. of the N.M.P.Z. during the last 15 years, which ensures a high percentage (90%-99%) of safe coming ashore of the sea turtles, of safe incubation of the eggs and embryos development as well as the safe hatchlings emerging and heading to the sea. Nevertheless, it should be stressed that in percentage units, a decrease of the number of nests is observed in the Marathonisi nesting beach, a fact that has to be faced, since the ecological importance of this particular nesting beach is important for the viability of the population of the sea turtle *Caretta caretta* (in this nesting beach is recorded the majority of male hatchlings due to the dominant/prevaling abiotic environmental factors).

### ***Protection of the hatchlings of the sea turtle *Caretta caretta****

Although in some cases predation of the eggs and hatchlings of the sea turtle is recorded, it does not seem to reach higher levels compared to the past. However, it has to be mentioned that additional measures are taken by the M.A. of N.M.P.Z. in order to lessen the impacts of this phenomenon (e.g. effective control of stray dogs in the Kalamaki nesting beach since 2012).

The concentration of an increased number of seagulls in the Sekania nesting beach, especially since 2014, has been observed – a phenomenon which can be linked to the combination of various factors such as the proximity of this particular nesting beach with the landfill of Zakynthos and the existence of an Absolute Nature Reserve Area regime, which favors the reproduction of this species without any human disturbance. In spite of the fact that from a first, at least, estimation, the available data do not show a higher level of predation of the hatchlings than the scientifically acceptable, this is an issue that should be further monitored and addressed immediately.

Regarding the disorientation and mis-orientation of the hatchlings of the sea turtle towards the sea, various measures have been taken the last years by the MA of the N.M.P.Z. (e.g. sunshades, specific information delivered to the hotels' owners), especially in areas where hatchlings are mostly affected from the hotels lighting, which have significantly reduced this phenomenon.

### ***Protection of the sea turtle *Caretta caretta* in the N.M.P.Z. marine Area***

The issue of disturbance/harassment of the sea turtle during its stay in Laganas Bay, no matter the efforts of the last 15 years of the MA of the N.M.P.Z. - collaboration and endorsement of operators, development of code of conduct for proper observation procedures of the sea turtle *Caretta caretta*, zoning of a specific area for the smooth watching/spotting of the sea turtle *Caretta caretta*, e.t.c. – still is an open matter and there is a need for amelioration of the situation. Towards an effective regulation/application of measures regarding the sea turtle in the marine Area of the Park, efforts should be immediately addressed by the Greek State (i.e. the Greek Ministry of Environment and Ministry of Shipping and Island Policy) through an efficient legal framework regarding turtle watching activity and a proper general legislation regarding boats permits in Laganas Bay.

## **4.2 Environmental awareness of the public and local population**

Besides the on-site environmental information delivered to the visitors by the N.M.P.Z. Eco-guards (each summer, about 50,000 – 70,000 leaflets are distributed, and it is estimated that 300,000 visitors are informed), specialized and thorough information is also given at the Thematic Exhibition Center for the sea turtle *Caretta caretta* (3,000 – 5,000 visitors) in the vicinity of the Dafni nesting beach and since 2014 at the Information Centre in Gerakas nesting beach (10,000 visitors) as well.

Furthermore, contributing to the efforts for further environmental awareness of the public, the M.A. of the N.M.P.Z. implements, on a yearly basis, an Environmental Education Project in collaboration with Primary and Secondary Education schools in Zakynthos (500 - 1,000 pupils) and outside of Zakynthos (300 - 500 pupils).

## **4.3 Operating funds/Operational costs**

Regarding the period 2001-2015, the N.M.P.Z. activities were mainly funded by the European Programmes (e.g. Life Environment, Operational Programme “Environment and Sustainable Development” - O.P.E.S.D.), and to a lesser degree from other resources (participation of the N.M.P.Z. in Research Competitive – e.g. 5th, 6th and 7th FP and Development Transnational Projects – e.g. INTERREG). Finally, a small, but many times crucial, funding (an average of 50.000€/year) was coming from the leasing of portions of the beaches to tourism and leisure related business in certain nesting beaches (Gerakas and Kalamaki beaches) in which light touristic activities are allowed. However, from 2013 onwards this funding does not exist since the MA of the N.M.P.Z. does not have the economic responsibility of these beaches which are now under the auspice of the Zakynthos Municipality and the Public Land Authority, a fact which, apart the economic loss for the Park, has created severe problems for the management of the activities in these areas.

Since the 2016 the N.M.P.Z. Management Agency is mainly funded by the Greek state through the “Green Funds”, however, with a significantly reduced budget (30 to 35% reduction in relation to the funding from 2006 to 2015), that doesn’t allow a proper operation of the MA of the Park (e.g. weakness to hire additional personnel – Park Rangers for the reproduction period May to October, difficulties for coverage of fuel for the vehicles of the Park) regarding the increasing challenges and difficulties encountered over the last years mainly with the increase of the visitors in the island of Zakynthos. This very serious issue should be quickly addressed in order to ensure a sustainable operation and the efficient conservation of sea turtles.

## **5. MAIN ISSUES REGARDING THE RECOMMENDATION NO 9 (1987) OF THE BERN CONVENTION’ STANDING COMMITTEE**

Regarding the main recommendations issued by the Bern Convention’ Standing Convention Standing Committee, and taking into account that the number of tourists in Zakynthos in 2017 is almost the double (about 1 million visitors) that in 1987, it can be considered that obvious progress has been made regarding the conservation and protection of sea turtles *Caretta caretta* in Zakynthos. More specifically (in italics the recommendations of the Bern convention Standing Committee):

### **5.1 Remove the prefabricated houses in Dafni?**

Despite the fact that in 1994-1995 a written order was given by the Zakynthos’ Prefecture to demolish illegal buildings, this order was never implemented and illegal tavernas-accommodations at the rear of the beach are still running. In 2006-2009, specific Memorandum of Understanding were signed with the owners of illegal buildings in order to stop any further impact of their activity on the Dafni nesting beach. To date, even if some problems may occur, the main rules established by the NMPZ Management Agency, within the framework of Presidential Decree 906/D’/1999, are enforced and there’s no scientifically proved indication that nesting activity is directly and severely affected by human based pressures. It should be however stressed that the current situation in the area of Dafni is based on a “status quo” situation and concrete actions should be taken in order to address efficiently this still pending issue. Otherwise, the continuously growing pressure brought to this specific nesting beach could, potentially, have, in the near future, a negative impact on the nesting activity.

### **5.2 Remove walls and concrete platforms built in the optimal sites for turtle nesting at Kalamaki and eastern Laganas beaches unless these are supporting the soil of existing dwelling places?**

No new supporting walls were built in the area of Kalamaki-Lagana east, and at least one of the existing prior the establishment of the NMPZ was destroyed due to weather conditions and physical erosion. In the framework of the P.D. 906/D’/1999 and taking into account the fact that public domain and shoreline has been officially designated and adopted (Official Gazette 974/2005, 232/2004, 94/2011) no walls and/or concrete platforms are located on nesting beaches, other than the one supporting the soil of previously existing dwellings.

### **5.3 As a matter of priority, acquire the hundred-metre band closest to the beach limit, wherever this land is not developed, in Kalamaki and Eastern Laganas, and a band of appropriate land width in Sekania and Dafni?**

The aforementioned areas, included in the National Marine Park of Zakynthos (P.D. 906/D/1999), are officially designated either as Strictly Protected area (i.e. Sekania), Protection of Nature areas (i.e. Kalamaki, Gerakas, Dafni) and Protection of Landscape area (Eastern Laganas). No constructions are allowed (except from landscape protection area but with very strict limitations), no new activity or building were developed within the 100 meters adjoining the beach public domain. Infringements are officially reported to competent Authorities and illegal activities stopped.

### **5.4 Set the legal limits of the public land on all beaches at Laganas Bay?**

Public domain and shoreline has been officially designated and adopted by the Law (Official Gazette 449/2003, 232/2004, 974/2005, 94/2011, 387/2011/ 4504/2013), thus encompassing all nesting beaches of Laganas Bay.

### **5.5 Remove trees and ban and penalise the use of deck chairs, sunshades and pedalos on the nesting beaches of Gerakas, Kalamaki, Eastern Laganas and Marathonis?**

According to the NMPZ legislation, umbrellas and sun beds numbers are regulated in Gerakas (maximum number of 60 and 120 respectively) and Kalamaki (maximum number of 150 and 300 respectively) whilst they are forbidden in Marathonisi, Sekania and Dafni beaches (public domain). Pedalos are only allowed in Kalamaki beach but their number is also restricted (30 pedalos in a distance of 3.5 kilometers). In general the rules concerning beach furniture and pedalos are strictly enforced (removal of umbrellas and sunbeds during the night, maximum number, pedalos moored in the sea during the night, etc.) but, since 2015 more problems are encountered because of changes in the law and the loss of direct competence of the N.M.P.Z. Management Agency in managing tourism activities (see also above in 4.3. section) in the public domain (according to the official designated shoreline).

### **5.6 Close the access of vehicles to the beaches from all roads and effectively enforce this ban?**

The ban of vehicles on nesting beach is strictly enforced since 2006 and many obstacles (barriers-pannels-poles) don't allow the access of vehicles on the beach. Moreover since 2006, wardening of nesting beaches is ensured all the year around by the N.M.P.Z. Eco-guards (Park Rangers), a fact that allows this measure being implemented all the year round and not only during the nesting season. Few infringements are recorded, and in case a vehicle is spotted on nesting beaches, immediate action is undertaken by the N.M.P.Z. Eco-guards on charge of the surveillance.

### **5.7 Replace existing lights shining on the beaches or reorientate them in such a way that their impact on turtles is minimized?**

The impact of lights on the nesting beach is mainly concerning areas such as the Eastern Laganas and Kalamaki. Measures were taken in order to mitigate the impact of lights on nesting activity and especially regarding hatchling emergence, such as the mandatory preparation of a Special Light Survey for any new building in the vicinity of the nesting beaches, the recommendations to the local authorities and hotel owners regarding the use of lights, the protection-shading of nests during hatching period, the control of the ban regarding night flights at Zakynthos International Airport.

### **5.8 Assess the potential of Laganas Bay (except western Laganas beach) to qualify for a stricter protection category, such as Marine Park, Natural Park, Natural Monument or other appropriate legal term?**

In order to protect efficiently the Laganas Bay, the National Marine Park of Zakynthos was established by Presidential Decree in 1999.

### **5.9 Reassess the potential impact of the development of the village of Kalamaki and neighbouring areas on sea turtle nesting.**

In the framework of the principles of adaptive management, as mentioned above, the potential impact of the development of Kalamaki commune as well as Vasilikos commune is continuously monitored and reassessed in order to adapt the management measures undertaken to the increasing pressure brought to the nesting beaches. In this framework, the N.M.P.Z. Management Agency is actively participating to urban and marine planning process conducted either by the Region or the State and emphasis on the concept of carrying capacity of nesting beaches is given.

## **6. FURTHER INITIATIVES AND IMMEDIATE ACTIONS TO BE UNDERTAKEN**

The following subjects have to be faced immediately:

- ***Funding of the M.A. of the N.M.P.Z. after 31/12/2017.***

The Protection Measures that each year are adopted and approved, cannot be effectively implemented to the maximum extent, without the support of the M.A. on human, material and financial resources. The M.A. of the N.M.P.Z., as well as the rest 27 M.A.s in Greece, is financed from 2016 and onwards mainly from the Green Fund, with a limited budget (30-35% reduction) in



relation to the previous Funding Period during the 3rd C.S.F. (Co-financed Development Programmes) and the N.S.R.F. [(2006-2015) (National Strategic Reference Framework)], which in fact provides the capability to cover only the basic needs of both surveillance- guarding of the protected object and rational management of the N.M.P.Z. area. For this reason, the M.A. of the N.M.P.Z. is going to participate for the next period of 3 years in other European Projects (e.g. MED Project Fish MPABlue II, Interreg Greece-Italy 2014-2020 “BlueCoast”, MAVA Foundation “Conservation of Marine Turtles in the Mediterranean region”), which are already approved and are expected to start in 2018. The main objective of the European Projects is the rational management of the sea turtle *Caretta caretta* in the marine and terrestrial areas/sites of the N.M.P.Z. among other Mediterranean areas with similar characteristics.

Although these Projects (to their successful claim of which the qualified scientific staff of the N.M.P.Z. has contributed decisively) will allow a better scientific understanding/knowledge of the life cycle and the breeding/reproductive activity of the sea turtle as well as the promotion of viable/sustainable human activities, they will not allow a more effective surveillance-guarding of the N.M.P.Z. area, since the required financial means (staff, infrastructure, equipment) will have to correspond to the needs arising from the increased pressure exerted during the summer season at the N.M.P.Z. area.

Therefore, the M.A. of the N.M.P.Z. should be able to benefit from European Operational Programmes [(e.g. National Strategic Reference Framework – Transport Infrastructure and Environmental Sustainable Development (N.S.R.F. – T.I.E.S.D.), Regional Operational Programmes of Ionian Islands (R.O.P.I.I.)], in order to be able to hire additional seasonal staff (at least 25 seasonal Park-Rangers to ensure 24h surveillance for 6 months each year during the breeding season) as well as additional equipment (e.g. Required Patrol Boats, 4X4 Cars, Cameras). At the same time, the consistency of the measures and decisions taken at national level with the Special Protection Scheme governing the N.M.P.Z. area, should be ensured, in order to avoid contradictions that do not allow the rational management of the protected object.

An indicative example is the concession of seashore for the development of touristic activities at the area of the nesting beaches, which should be checked by the competent Authorities (e.g. Public Land Authority, Municipality of Zakynthos, Police, Port Police Authority) according to the applicable legislation, while, at the same time, the M.A. of the N.M.P.Z. is not in an institutional position to intervene directly. A similar problem arises from the uncontrolled number of boats and speedboats rental under the Port General Regulation No 38, which has been increased dramatically, especially during the last 5 years, in the marine area of the N.M.P.Z. (with specific decisions of the Greek State) without subsequent marine traffic control which should be ensured by the Ministry of Shipping and Island Policy and despite the efforts towards this direction/a solution by the M.A. of the N.M.P.Z. in collaboration with the Local Port Police Authority.

- ***Immediate closing of Skopos’ landfill:*** The immediate closing and rehabilitation of the landfill site of Zakynthos in the area of Skopos should be ensured.
- ***Official responsibility and competence in the Public domain*** (e.g. nesting beaches) regarding management should be given to the M.A. of the N.M.P.Z.
- ***Institutionalization of a specific zone for the observation of the sea turtle *Caretta caretta* in Laganas Bay.***
- ***Compensatory measures in Nature Protected Areas for land owners*** should be also ensured in order to increase the local consensus toward protections measures undertaken within the N.M.P.Z. area.

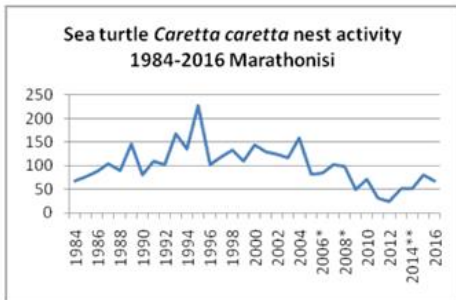
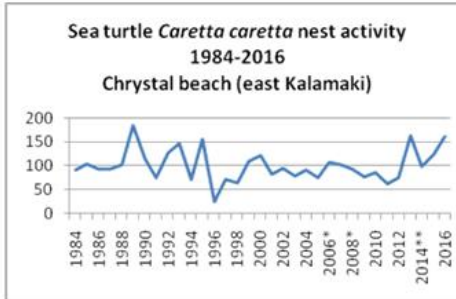
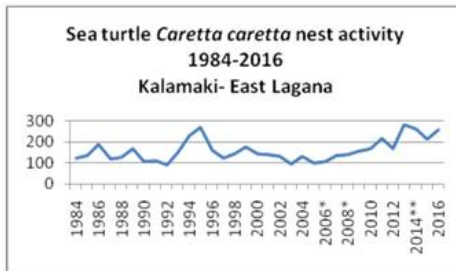
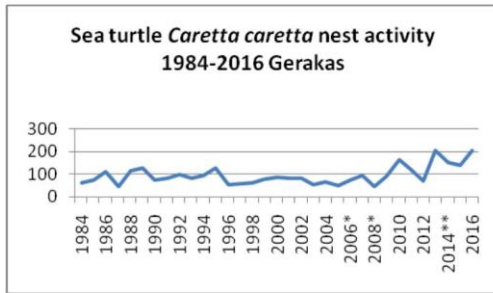
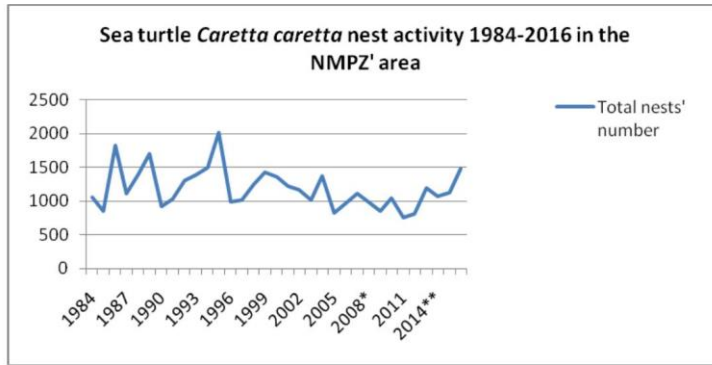
For further information regarding the activities of the N.M.P.Z. Management Agency, the English version of the N.M.P.Z. webpage can be consulted at the following address: <http://www.nmp-zak.org/en>.

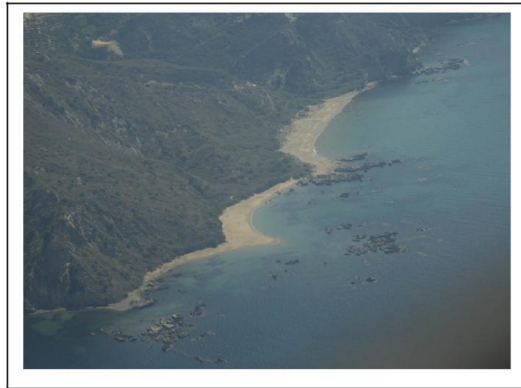
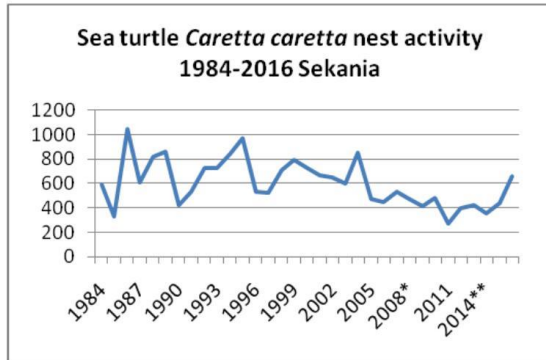
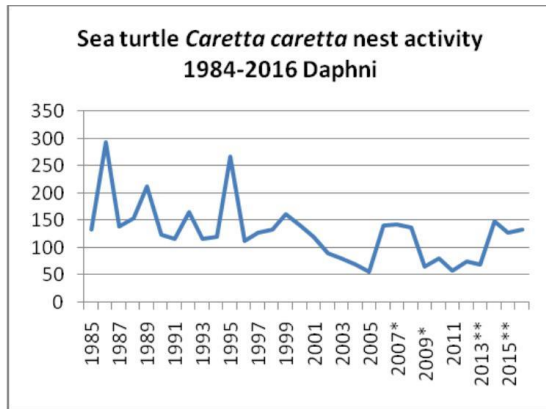
Furthermore, a short documentary about the activities of the N.M.P.Z. Management Agency as well as its social and economic impact on the local society can be found at following link: <https://www.youtube.com/watch?v=S4xiQ3EDtoI&t=525s>

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### Appendix 1: Nesting activity in the different nesting beaches of the Laganas Bay (1984-2016)





**Appendix 2: Map of the N.M.P.Z. area in Laganas Bay and Photos with Activities of the M.A. of the N.M.P.Z.**

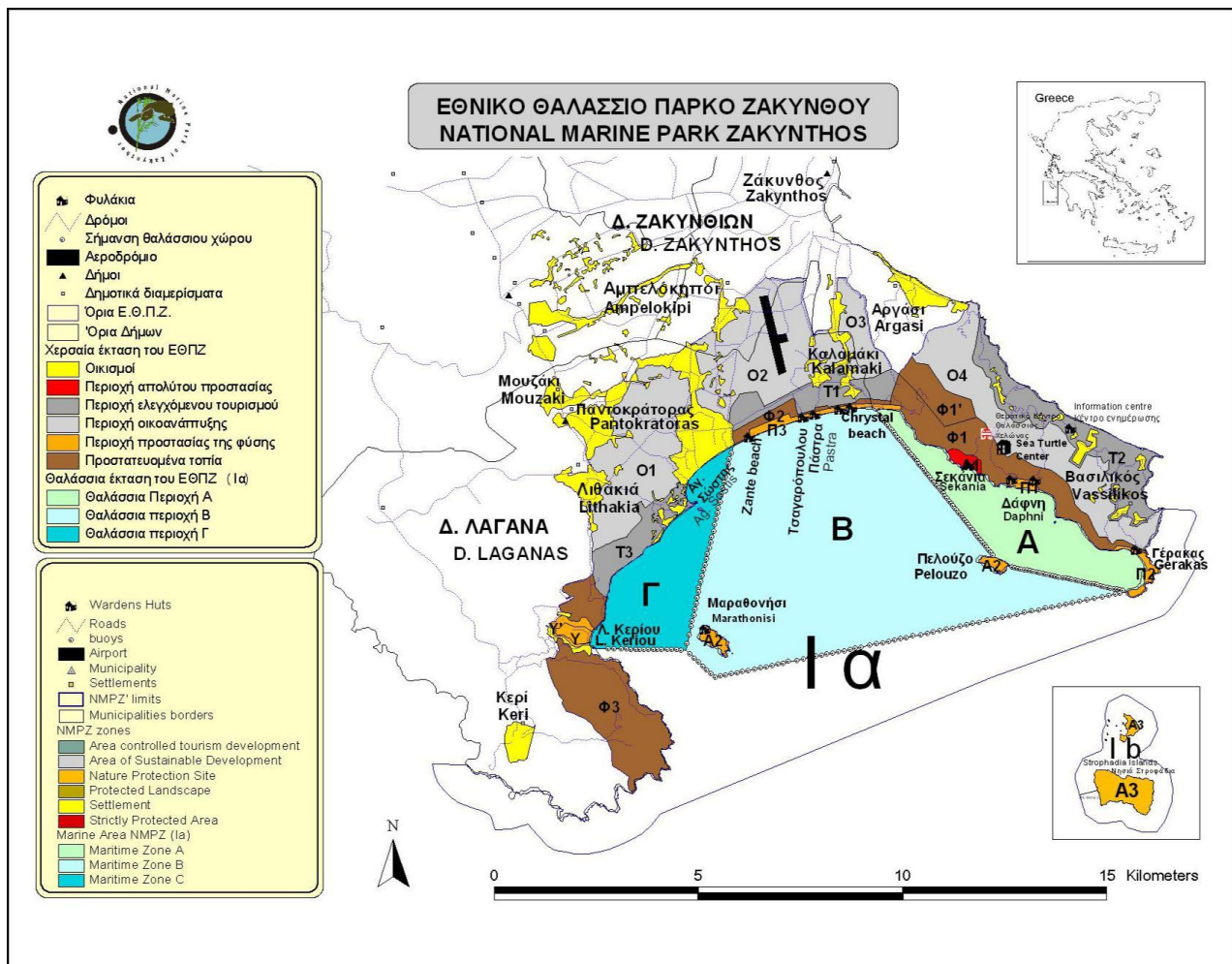




Photo1. Informative billboards set by the N.M.P.Z. in Kalamaki Nesting Beach



Photo2. Informative Billboards and Road Barriers set by the N.M.P.Z. in Kalamaki Nesting Beach



Photo 3. Prohibitive Access Fence set by the N.M.P.Z. for the protection of gorges (geological formations) in Gerakas Nesting Beach



Photo 4. Marine Park Rangers from the M.A. of the N.M.P.Z. informing visitors for the regulation measures in the Marine Area of the Park



Photo 5. Terrestrial Park Rangers from the M.A. of the N.M.P.Z. informing visitors for the regulation measures in an Information Kiosk in the nesting beach of Kalamaki

..... Saut de colonne .....



Photo 6. Arresting of legal spearfisherman by the Marine Park Rangers from the M.A. of the N.M.P.Z. in collaboration with the Zakynthos Port Police Authority



Photo 7. Nesting beach cleaning by the Park Rangers from the M.A. of the N.M.P.Z.

..... Saut de colonne .....



Photo 8. Monitoring of a nest of *C. caretta* by the Park Rangers from the M.A. of the N.M.P.Z. in a nesting beach in the framework of the Environmental Education Programme of the Park



Photo 9. Informing the visitors in the Thematic Exhibition Centre of the M.A. of the N.M.P.Z. in the vicinity of the nesting beach in Dafni

.....Saut de colonne .....



Photo 10. Presentation of the measures taken by the Port Authorities of Zakynthos in the Laganas Bay to visitors in the Thematic Exhibition Centre of the M.A. of the N.M.P.Z. in the vicinity of the nesting beach in Dafni



Photo 11. Implementation of management measures at Gerakas nesting beach regarding visitors' allocation on the beach and on-site nest protection.



Photo 12. Implementation of management measures at Kalamaki nesting beach (i.e. signs and polls) for the information of the visitors. Saut de section (continu)...



Photo 13. Delineation of the acceptable upper limit of beach furniture presence on the nesting beach as a management measure for nest protection.



Photo 14. Sea Platform which is placed at the front of Marathonisi nesting beach and allows a better management of marine traffic and visitors.



Photo 15. Mean density and spatial distribution of human movement on the beach provided by the surveillance camera system at the Gerakas nesting beach. It is evident that the upper parts of the beach where all the sea turtle nests are located is free of human presence.



Photo 16. International Scientific Symposium 'Marine Protected Areas in Greece & the Mediterranean: Designing for the Future by Applying Lessons Learnt from the Past' organised by the M.A. of the N.M.P.Z. in collaboration with the Technical University of Zakynthos and the Greek Ministry of Environment (250 participants – December 2015)