



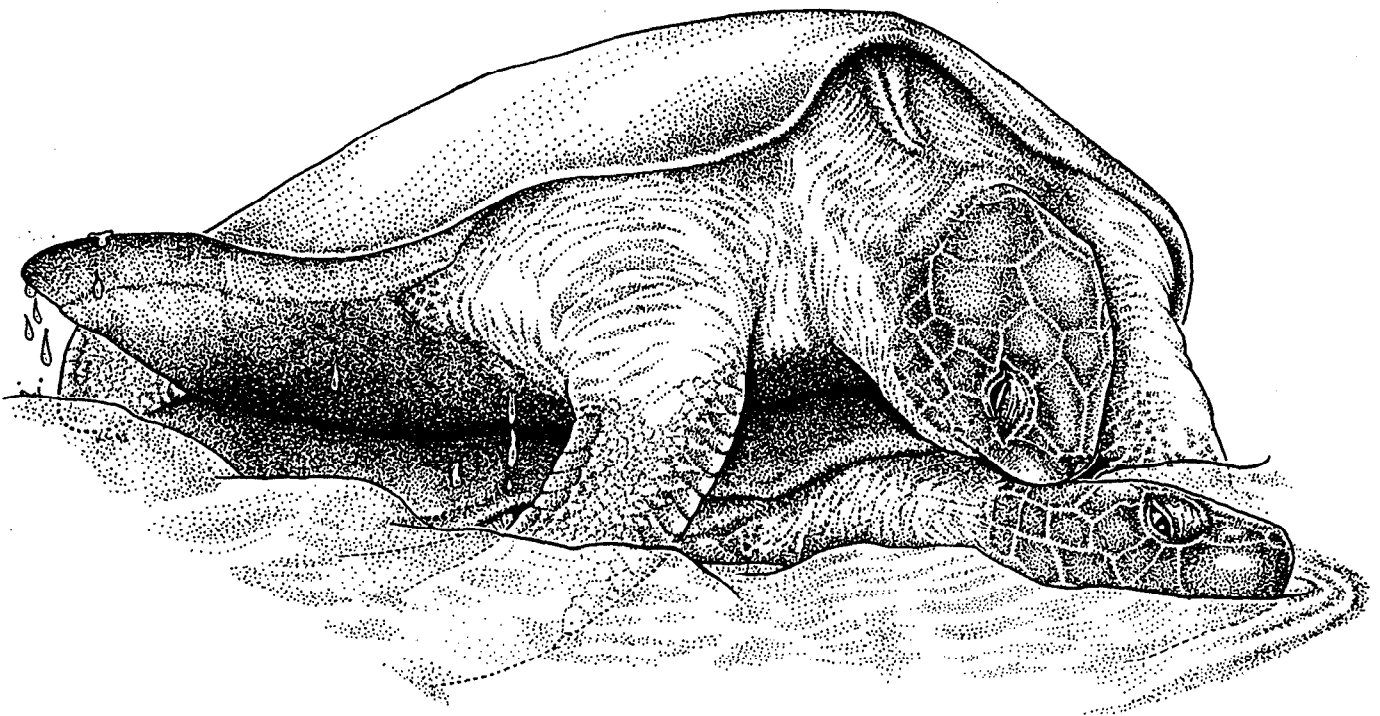
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**PROCEEDINGS OF THE THIRTEENTH ANNUAL SYMPOSIUM
ON SEA TURTLE BIOLOGY AND CONSERVATION**

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SEA TURTLE CONSERVATION AND SUSTAINABLE TOURISM FOR THE PROPOSED MARINE PARK ON ZAKYNTHOS ISLAND, GREECE

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INTRODUCTION

Conservationists are often faced with the task to communicate with planners and decision makers in order to ensure appropriate site management. This task may be a tedious exercise because it requires the application of qualitative and quantitative criteria in order to reconcile existing land uses with conservation.

The island of Zakynthos, W. Greece, hosts the largest nesting population of *Caretta caretta* in the Mediterranean, with a number of nests ranging from about 1,000 to 2,000 each summer (Table 1), on six distinct beaches of Laganas Bay, southern Zakynthos (Figure 1), totalling 3.6 km in length (Margaritoulis, 1985). During the last 15 years, Zakynthos became a major destination for summer tourists. This fact poses an enormous threat to the turtles and their nesting beaches and undermines the future of tourism on the island. The long-standing proposal of conservationists for the establishment of a Marine Park in Zakynthos has recently been accepted by the Greek State. This paper presents an approach to evaluate the potential for conservation and sustainable tourism in the six nesting beaches of Laganas Bay, which can be used as the basis for the planning of the Park.

METHODS

The management potential of nesting sites was assessed by the application of: (a) the ecological and pragmatic criteria for the establishment of marine protected areas as they are proposed by UNEP and IUCN (UNEP/IUCN, 1980), and (b) a set of criteria for mass tourism development which was elaborated for this purpose.

Nesting sites are considered the sandy beaches and their surrounding areas in the coastal zone. Sites are listed on a scale of relative value from 1 to 6 for each criterion. Since sea turtles are the most outstanding feature of the area, the estimation of their dependency on each nesting beach was of great importance. The parameters used to estimate dependency were: (a) percentage of total nests, (b) nesting success, (c) nesting density and (d) hatching success. Comparative data of sea turtle nesting activity over the past 8 years (obtained by the Sea Turtle Protection Society of Greece) were used for these estimations.

Rating of sites according to the remaining criteria was based on significant biological, ecological and geomorphological features. Special attention was paid to the existence of other protected and/or endangered species (*Monachus monachus*, *Falco eleonora*, *Pancratium maritimum*, etc.) as well as important terrestrial and marine habitats (sand dunes, small wetlands, clusters of healthy Mediterranean-type vegetation, underwater meadows of *Posidonia oceanica*, etc.). Elaboration of criteria for tourism value was based on: (a) size of sandy beaches, (b) accessibility, (c) absence of nearby sandy beaches, (d) existing public facilities and (e) potential for establishing of facilities.

RESULTS AND DISCUSSION

Table 2 presents the relative rating of the degree of sea turtle nesting dependency on each of the nesting beaches. Table 3 presents the relative rating of sites according to their ecological importance and their potential for conservation. The beach of Sekania is placed first on the scale, followed by the beaches of Marathonissi, Daphni, Gerakas, East Laganas and Kalamaki.

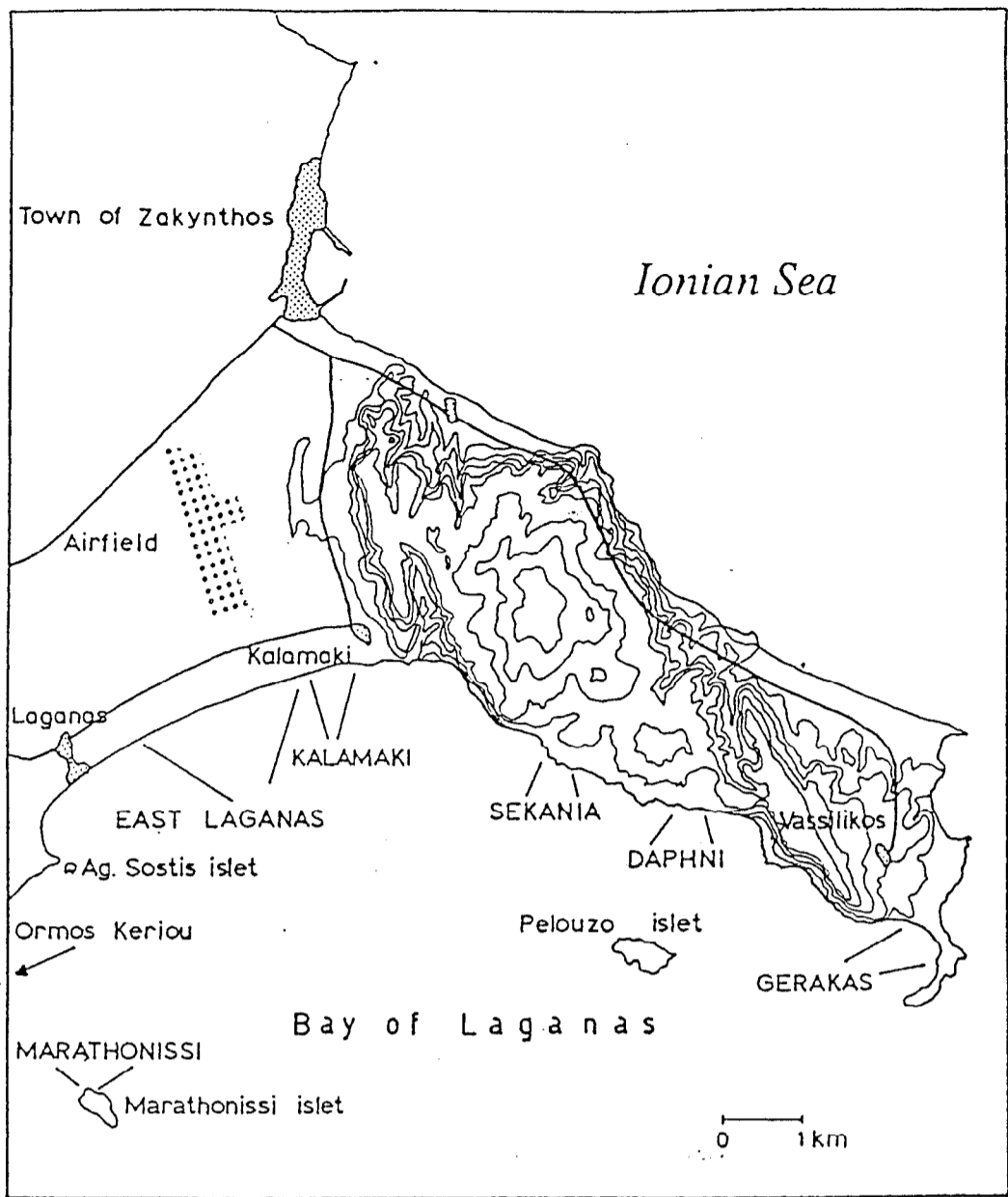
Table 4 presents the relative rating of the same sites on the basis of their potential for tourism development. A reversal of the previous rating is noted here, with the beaches of East Laganas and Kalamaki having the highest scores, followed by the beaches of Gerakas, Daphni, Sekania and Marathonissi.

This inverse relationship between the potential for conservation and that for tourism development of the nesting beaches of Laganas Bay was expected since : (a) there is significantly lower nesting density in the already developed long beaches of Laganas and Kalamaki due to heavy disturbance, and (b) tourism has already been developed at the most suitable areas for it.

It is suggested that the design of the core areas of the Marine Park should follow the site-rating according to the ecological and pragmatic criteria, in order to effectively safeguard the nesting habitats. As a consequence of this, the beach of Sekania with its surrounding area and the whole of Marathonissi islet should serve as "sanctuaries" or "strict natural areas" requiring a very low level of human interference (just for monitoring or other essential research or conservation purposes) and the prohibition of any kind of development (buildings, roads, etc.). Intensive management is required for the beaches of East Laganas and Kalamaki in order to minimize impacts of tourism development and reverse the continuing loss of beach space. As for the remaining two "middle-rating" beaches of Daphni and Gerakas, the suggested management regime requires a very soft human interference (low numbers of visitors and non-disturbing, carefully designed activities).

LITERATURE CITED

- Margaritoulis, D. 1985. Preliminary observations on the breeding behaviour and ecology of *Caretta caretta* in Zakynthos, Greece. *Biologia Gallo-Hellenica* 10: 323-332.
- UNEP/IUCN. 1980. Principles, criteria and guidelines for the selection, establishment and management of Mediterranean marine and coastal protected areas (UNEP/IG.20/3). Gland, Switzerland: IUCN.



MAP 1. SKETCH MAP OF LAGANAS BAY IN ZAKYNTHOS, SHOWING (IN CAPITAL LETTERS) THE NESTING BEACHES OF *CARETTA CARETTA*.

TABLE 1. COMPARATIVE NESTING DATA ON ZAKYNTHOS OVER EIGHT NESTING SEASONS (MARGARITOULIS, 1991)

Nesting season	Number of emergencies (incl. nests)	Number of nests	Nesting success (%)	Nesting density (nests/km)
1984	3,674	1,061	28.9	298.9
1985	3,212	857	26.7	241.4
1986	5,908	1,822	30.8	513.2
1987	5,776	1,110	19.2	312.7
1988	5,682	1,408	24.8	396.6
1989	5,543	1,699	30.7	478.6
1990	3,370	926	27.5	260.8
1991	3,738	1,029	27.5	289.9

TABLE 2. ESTIMATION OF THE RELATIVE DEPENDENCY OF SEA TURTLES ON THE SIX NESTING BEACHES, LAGANAS BAY, ZAKYNTHOS, GREECE

	M	L	K	S	D	G
Percentage of total nests	2	4	3	6	5	1
Nesting success	3	4	2	6	1	5
Nesting density	5	1	3	6	4	2
Hatching success	1	5	4	6	3	2
Total	11	14	12	24	13	10

M:Marathonissi, L:East Laganas, K:Kalamaki, S:Sekania, D:Daphni, G:Gerakas

TABLE 3. RATING OF NESTING BEACHES ACCORDING TO ECOLOGICAL AND PRAGMATIC CRITERIA (UNEP/IUCN)

Ecological criteria	M	L	K	S	D	G
Dependency (see table 2)	11	14	12	24	13	10
Naturalness	5	2	1	6	4	3
Representativeness	5	6	1	4	2	3
Uniqueness	5	2	1	6	3	4
Diversity	6	2	1	5	4	3
Integrity	6	2	1	5	4	3
Sub-total (1)	38	28	17	50	30	26
Pragmatic criteria						
Urgency	5	2	1	4	6	3
Opportunism	5	2	1	6	4	3
Defensibility	5	1	2	6	4	3
Availability	6	3	1	5	2	4
Accessibility	6	1	2	5	4	3
Restorability	5	1	2	6	4	3
Sub-total (2)	32	10	9	32	24	19
Total {(1)+(2)}	70	38	26	82	54	45

TABLE 4. RATING OF NESTING BEACHES ACCORDING TO CRITERIA FOR TOURISM DEVELOPMENT

Tourism criteria	M	L	K	S	D	G
Size	1	6	2	4	3	5
Accessibility (*)	1	6	5	2	3	4
Absence of nearby beaches	1	6	5	2	3	4
Existing public facilities	2	6	5	1	3	4
Potential for establishing of facilities	1	5	6	2	3	4
Total	6	29	23	11	15	21

M:Marathonissi, L:East Laganas, K:Kalamaki, S:Sekania, D:Daphni, G:Gerakas

(*) The application of this criterion in Table 4 is done in an inverse way than in Table 3 (under the pragmatic criteria). This is because "easy" accessibility is an asset for tourism development, but at the same time a burden to conservation.