Phare

Karavasta Lagoon -
Wetland Management Project

The importance of the Karavasta Lagoon complex for waterbirds

September 1996

P3
505/9

The Authors

The *"The importance of the Karavasta Lagoon complex for waterbirds"* is the product of a team of foreign and albanian Experts. The major contributors to the work are listed below. The Expert H. Hafner who has prepared the report is shown in boldface.

Foreign Experts : **H. Hafner**
Y. Kayser
M. Fasola
E. Benussi

Albanian Experts : T. Bino

TOUR DU VALAT
Bibliothèque
Le Sambuc - F-13200 Arles

External Consultancy Support
for the Committee of Environmental Protection (CEP)
Albania

Karavasta Lagoon - Wetland Management Project

The importance of the Karavasta Lagoon complex for waterbirds

Introduction 1

Methods used in the field 2
- Inventory of breeding waterbirds 2
- Experimental management of a breeding island 2
- Study of feeding ecology 3
- Inventory of wintering waterfowl 3

Results 3
- The waterbird community during the breeding season 3
- Distribution, population and nesting habitat of waterbirds 6
- Feeding resources of Little and Common terns 11
- Breeding success of terns 11
- Experimental management of a breeding island 17
- The potential nesting areas 17
- The importance of the Karavasta lagoon complex 18

Conclusions and recommendations 22
- The importance of Karavasta for breeding waterbirds 22
- The ornithological importance of Karavasta in winter 26

References 27

Produced in September 1996 by
Station biologique de la Tour du Valat, Le Sambuc, 13200 Arles, France
telephone: +33 (0) 490 972 013 □ fax: +33 (0) 490 972 019
e-mail:_tdvalat@lac.gulliver.fr

Project Management - Technital S.p.A., Italia - 20129 - Milano - Via Caviglia n.11
in association with Tour du Valat (France) and Ecotourism Ltd. (England)

Introduction

It is widely accepted that studies of waterbirds provide valuable information for assessing the conservation value of different wetland habitats (e.g. Kushlan 1976, 1978, 1979, Hafner *et al.* 1982, 1986, 1987, 1993, 1994, Hafner and Fasola 1992, Kushlan 1993, Moser *et al.* 1993, Hoffmann *et al.* 1996). The wetlands of the Mediterranean support internationally important populations of birds and other wildlife. Sadly, however, these river deltas, lakes, marshes and coastal lagoons come under increasing threat from development and are today among the most threatened ecosystems in the world. Although loss of natural and semi-natural bird habitat linked to human activity remains the major conservation issue throughout the Mediterranean region, other anthropogenic factors, not directly involved in habitat loss affect populations of vulnerable birds. In Greece, Italy, southern France and Spain for instance, mass tourism along the coast causes disturbance in potential nesting areas and may prevent establishment of bird colonies. It is expected that by the year 2,000 about 150 million tourists will be crowding the coastlines of the Mediterranean (Hinrichsen 1994). The situation is aggravated by rapid urbanisation and the northern rim of the Mediterranean in particular has already suffered much irreversable damage in the last few decades. To address these threats more effectively the study of specific wetlands leading to a better understanding of conservation priorities is required.

Albania, has always been considered important for waterbirds of the western Palearctic (Bernardzik 1930, Ticehurst and Whistler 1932, Puzanov 1954, Gjiknuri and Peja 1992, Rose and Scott 1994, Bino *et al.* 1996, Vangeluwe *et al.* 1996). This country has so far escaped mass tourism and uncontrolled urbanisation but large scale drainage has undoubtedly been the major problem affecting waterbird populations in this part of the Mediterranean. Since 1940 about 90 percent of the former 250,000 ha of Albanian wetlands have been drained for agricultural development and today, a total surface area of about 27,000 ha of wetlands remain in the country (Vangeluwe *et al.* 1996). The Karavasta lagoon complex (about 4,200 ha of water, Vangeluwe *et al.* 1996) is today considered the most important wetland for waterbirds in Albania (Barbieri *et al.* 1986, Gjiknuri and Peja 1992, Kayser *et al.* 1995, Bino *et al.* 1996)

Terms of reference

- Inventory of breeding waterbirds
- Study of breeding habitat selection and of breeding success for some key species
- Study of feeding ecology for the selected key species
- Synthesis of results to assess the present conservation value and management needs to maintain bird populations

The Dalmation Pelican (*Pelecanus crispus*) is included in the inventory and synthesis but has not been studied in detail by us. This globally endangered species is subject of a research project financed by the Station Biologique de la Tour du Valat, supervised by A. Crivelli and conducted by N. Peja, University of Tirana.

Additional work

Discussions and reflection on the potential conservation value of Karavasta have lead to the following additional work:

Inventory of wintering waterbirds and birds of prey

Although a quantitative survey of **wintering** waterbirds was not foreseen within the context of of the PHARE project Karavasta Ramsar Site Management Plan, the whole of the lagoon complex was included in the 1995 and 1996 mid-winter waterfowl census of Albanian wetlands financed by the Station Biologique de la Tour du Valat. In view of the importance of this wetland both for wintering waterbirds and raptors, the review below includes quantitative data on numbers and distribution of these bird communities during the mid-winters 1995 and 1996.

Inventory of breeding birds of prey

Accipitridae represent a vulnerable bird community. Tucker and Heath (1994) list as many as 29 species under criteria of European conservation concern. Karavasta, with its beautiful forested areas, offers potential breeding sites and the trophic situation for these birds which consume fish, birds, small mammals, amphibians and reptiles

allows them *a priori* to nest successfully. We therefore decided to explore these forests and pay particular attention to birds of prey.

Experimental management of a breeding island

Within the framework of T. Bino's doctoral thesis it was decided to initiate experimental management of potential breeding islands located in the lagoon in order to consolidate more empirical information on habitat selection.[1]

Contract

The ornithological work presented below allows assessment of the following research subjects:

- the conservation value of the Karavasta lagoon and surrounding habitats for birds;
- the parts of the ecosystem which deserve conservation priority;
- how the present situation affects the avifauna and how the situation can be improved through management

Methods used in the field

Inventory of breeding waterbirds and study of breeding success for some key species

The 1995 survey of breeding Charadriiformes concentrated on the coastal zone between the mouth of the Shkumbini River and Sektori i Ri, and on the islands in the Karavasta lagoon. Weekly visits were made to these areas and the breeding colonies mapped. In 1996 surveys were carried out from the beginning of May to the end of July, by visiting all the potential nest sites for Charadriiformes of the Karavasta wetland complex on a weekly basis. Surveys concentrated on all the islands of the lagoon, the beaches, sandspits and dunes, the marshes and saltflats covered with halophytic communities and the cultivated areas between the Shkumbini River from Sulzotaj to the mouth, and the canal of Myzege to Karavasta and from there to Remasi- Guri- Divjaka. In addition all potential nest sites for Herons, Spoonbills and Ibises in the area were checked three times during the breeding season 1995 and 1996. The Pine forest, the riverine White Poplar forest, the extensive area of Tamarisk lowlands in the surroundings of the mouth of the Shkumbini and the reedbeds on the canal of Tërbufi are all potential nest sites for these large wading birds. Nest territories of the solitary species of Charadriiformes *Haematopus ostralegus*, *Charadrius alexandrinus, Tringa totanus and Burhinus oedicnemus* were mapped (the 1995 survey of solitary species was restricted to the islands of the lagoon system and the coastal zone). In 1996 the survey of solitary species was extended to cover the whole of the area. Breeding colonies of *Larus cachinnans*, *Sterna albifrons* and *Sterna hirundo*, once established were checked at ten-day intervals in order to quantify breeding success. In order to avoid disturbance, measures of habitat structure were made in August, after the birds had left the nesting sites. These measures of breeding success and structure of nesting habitat were taken during the two breeding seasons.

Experimental management of a breeding island

In 1996 one of the potential breeding islands in the northern part of the lagoon was submitted to experimental management. In 1995, this island, characterised by almost complete cover of 20-30 cm high halophytic vegetation had been used by 20 pairs of *Sterna hirundo* and 30 pairs of *Sterna albifrons*, all established near the waterfront and therefore exposed to inundation. Vegetation was removed and replaced by sand and fine gravel on one third of the surface area. Another third had its vegetation structure altered by clearing parts of the vegetation and the remaining third remained totally covered by *Salicornia*. These habitat modifications were carried out in the light of present knowledge on requirements by colonial charadriiformes for nesting.

[1] T. Bino is registered for a thesis , funded and supervised by Tour du Valat, at the University of Tirana and the University of Montpellier. Title of thesis: *Utilisation et partage des ressources par les oiseaux d'eau d'un système lagunaire: Karavasta en Albanie*

Study of feeding ecology 1996

1. Numbers and distribution of foraging waterbirds

The total area was divided in to15 sectors in order to obtain a representative sample of the potential feeding area (Figure. 1). Each sample unit was observed during 20 minutes twice a week from 1st May to 31 August. Sample units were chosen randomly according to location and time of day. The number of species, number of individuals and their activities were recorded. Two full days per week were necessary to cover each of 15 sectors twice.

2. Diet of Little and Common terns

Prey brought by the adults to the chicks were observed during 5 spells of 3 h each, from 21 to 30 June 1996. The observations were carried out from hides placed near the nests, in all the colonies with chicks (i.e. the two colonies in the northern part, and in the colony at the SE border, of the Karavasta lagoon). Sample size is small for the Common Tern because most of its nests were still at the incubation stage. When returning to the colony to feed their chicks, terns bring prey in their beak; we identified these prey using binoculars, and we estimated prey size by recording its length (standard length for fish, body length without appendages for invertebrates) in relation to the bird's bill, and by converting this measure to cm (assuming an average bill length of 2.95 cm for the Little and 3.62 cm for the Common terns, averages from Cramp 1985). We collected 106 prey items, abandoned by the terns near the nests. These abandoned prey were later identified and were used to confirm the visual identification of the prey in the bird bill. These prey however were not included into the diet sample, because abandoned prey may provide a biased sample of the actual diet (Bogliani *et al.* 1994).

Inventory of wintering waterfowl

In order to proceed with a long-term study and report new information on wintering waterfowl in Albania, the Biological Station of Tour du Valat, the Museum of Natural Sciences of Tirana, the Albanian Association for the Protection of Birds and Mammals, in collaboration with the Italian League for the Protection of the Birds and BirdLife International, organized the waterfowl census of mid-winter 1995 and 1996 within the framework of Wetland International Census. The census of Karavasta was conducted by three professional ornithologists from the Museum of Natural Sciences of Tirana and the Tour du Valat, equipped with binoculars and telescopes. In order to collect information on the distribution of the different species within the ecosystem, this extensive wetland was divided in 1995 into 13 sectors and two new sectors representing inundated meadows after heavy rain were added in 1996 (Figure 8). Three days were necessary each winter to survey the whole wetland complex.

Results

The waterbird community during the breeding season

A list of all the waterbird species that were observed in the area during the breeding season is given in Table 1. A number of species, in particular the waders, are not breeding at Karavasta but use this wetland as a staging area during their migration between the northern tundras and tropical Africa (the community of **breeding** waterbirds is given in Table 3). For each species, we indicate its "Conservation category"and "Status category" following the categorization by Tucker & Heath (1994), and we present average numbers counted throughout the reproductive season during the standardized surveys in each of 4 main habitat types (Figure 1). A total of 13 species have been observed outside the 15 sample units (Figure 1). Average numbers for these species, present in small numbers, are therefore not given in Table 1.

The richness of this waterbird community (i.e. the number of species) totalled 56, of which 25 are Species of European Conservation Concern (SPECs, see Tucker and Heath 1994). The Karavasta lagoon and the marshes hosted the highest number of species (36 and 33 respectively) and of SPECs (13 and 12), and had the highest bird densities throughout the spring-summer period. The Godulla lagoon and the sea were inferior for all the above parameters. Moreover, no waterbird species used exclusively the Godulla lagoon and the sea.

KARAVASTA

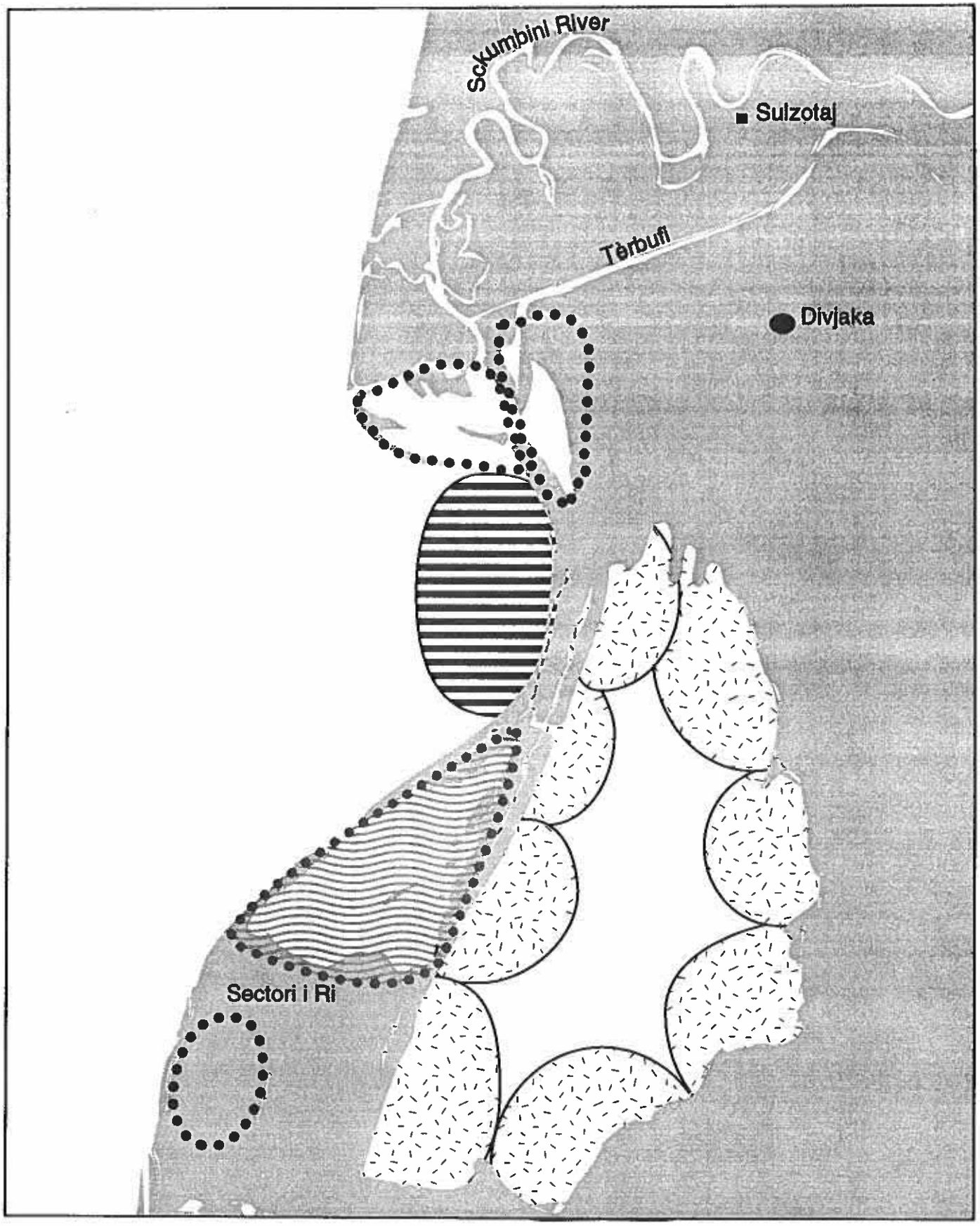


Figure 1 : The 15 sample units observed to assess the feeding distribution and feeding activity of waterbirds

Table 1: Average numbers of birds counted in the four major habitat types of the Karavasta lagoon complex from May-August, 1995 and 1996

SPEC: Species of European Conservation concern; 1=globally threatened; 2=global population concentrated in Europe but unfavourable conservation status; 3=not concentrated in Europe but unfavourable status in Europe; 4=concentrated in Europe with presently favourable conservation status.
Status: European threat status categories; S=Secure; D=Declining; R=Rare; V=Vulnerable; E=Endangered; L=Localised (from Tucker & Heath 1994).
***: Species recorded outside the sample units (average numbers not given).**

Habitat	SPEC-status	Marsh	Karavasta lagoon	Godulla lagoon	Sea
N sample counts		45	169	56	20
Tachibaptus ruficollis *	- S				
Podiceps cristatus	- S		0,24		
Podiceps nigricollis	- S		0,01		
Phalacrocorax carbo	- S		0,07		
Pelecanus crispus	1 V	0,76	1,98		0,7
Ixobrychus minutus *	3 V				
Botaurus stellaris *	3 V				
Egretta alba	- S	0,27	0,06		
Egretta garzetta	- S	8,98	5,3	0,5	
Ardea cinerea	- S	1,87	1,54	0,62	
Plegadis falcinellus	3 D		0,01		
Platalea leucorodia	2 E		0,01		
Phoenicopterus ruber	3 L		0,17		
Anas penelope	- S	0,02			
Anas platyrhynchos	- S	0,11	0,12		
Anas acuta *	3 V				
Anas querquedula *	3 V				
Fulica atra	- S	0,02	0,05		
Haematopus ostralegus	- S	3,24	0,37	0,14	0,45
Himantopus himantopus	- S	0,16	0,05		
Recurvirostra avosetta	4 L	0,22			
Burhinus oedicnemus *	3 V				
Glareola pratincola	3 E	0,56	1,2	0,05	
Charadrius dubius *	- S				
Charadrius hiaticula	- S	0,8	0,04		
Charadrius alaxandrinus	3 D	7,6	1,21	0,4	0,15
Pluvialis squatarola	- S	2,24	0,37	0,02	
Vanellus vanellus *	- S				
Calidris alba	- S	0,07			
Calidris minuta	- S	10,96	0,61	0,03	
Calidris ferruginea	- S	43,3	2,29		
Calidris alpina	3 V	19,9	0,2		0,05
Philomachus pugnax	4 S		0,01		
Gallinago gallinago	- S		0,01		
Limosa limosa	2 V	0,07			
Numenius arquata	3 D	14,6	0,44	0,05	0,05
Tringa erythropus	- S	1,4	0,09		
Tringa totanus	2 D	16,3	7,87	1,59	
Tringa stagnatilis	- S	0,42			
Tringa nebularia	- S	0,8	0,08		
Tringa ochropus	- S		0,02	0,03	
Tringa glareola *	3 D				
Tringa hypoleucos	- S	0,29	0,15	0,19	
Arenaria interpres	- S	0,13	0,01		
Larus melanocephalus	4 S	0,27	0,02		
Larus ridibundus	- S	10	7,27	0,36	0,65
Larus genei *	- S				
Larus cachinnans	- S	2,2	2,78	0,36	0,25
Gelochelidon nilotica *	3 E				
Sterna caspia	3 E		0,01		
Sterna sandvicensis	2 D	0,22			
Sterna hirundo	- S	5,04	2,05	0,43	0,8
Sterna albifrons	3 D	10,82	10	1,09	1,3
Chlidonias hybridus *	3 D				
Chlidonias niger	3 D	0,02	0,09		
Chlidonias leucopterus *	- S				
Species Richness		33	36	15	9

The above information points out that the Karavasta lagoon complex in general hosts a high number of species of European conservation concern. The lagoon and the marshes are the most important areas for the majority of waterbirds, while the Godulla lagoon and the sea are by far less important. The marshes are extremely important staging areas for migrating waders.

Distribution, population and nesting habitat of breeding waterbirds

Breeding waterbirds were distributed in the following zones (Figures 2, 3, 4, 5, 6, 7):

- sand bares and dunes along the sea shore (some waders, particularly *Charadrius alexandrinus* and *Haematopus ostralegus,* and small numbers of terns *Sterna hirundo, Sterna albifrons*)

This coastal zone was used mainly by *Haematopus ostralegus* and *Charadrius alexandrinus,* two non colonial species of waders which had their nesting territories scattered along the sand bars separating the Godulla lagoon from the sea and on the coastal sand spits and islets to the south and north of the mouth of the Shkumbini River (Figures 2, 3 and 4). In relatively undisturbed areas of the eastern Mediterranean (example the Evros delta in northeastern Greece) and the the Black Sea (example the island Sahalin on the coast of the Danube delta) this habitat type is frequently used by nesting gulls and terns. In the western Mediterranean where mass tourism causes problems, colonies of these species will only persist from egg-laying through production of young in relatively undisturbed areas. This was unfortunately not the case of Karavasta during the breeding seasons 1995 and 1996 and, as a result, only a few birds managed to nest in these coastal areas (Figure 6). Human disturbance is critical along the coast, even in the most remote areas north of the mouth of the Shkumbini. In spring-summer 1995 and 1996 the whole of the coast line was regularly visited by small groups of local people. In addition numerous tracks of feral dogs were observed on the sand spits where Little terns had attempted to breed.

- shores of the Karavasta lagoon and low lying plains with halophytic communities between the lagoon and the Semani mouth in the south and north of the lagoon. (some waders, particularly *Burhinus oedicnemus, Charadrius alexandrinus*).

In the Mediterranean region such extensive low-lying areas with halophytic vegetation, near a mosaic of wetland habitats including drainage and irrigation canals, are typical nesting sites for *Glareola pratincola.* These species forage mainly on flying insects, many of which hatch in the fragments of marshland and in the freshwater canals. Grasshoppers which are abundant in these plains are also important prey (Cramp and Simmons 1983). Although pratincoles were regularly seen foraging in these areas, colonies did not establish there. Possibly frequent disturbance by people hinders pratincoles to nest there but the colonies would also be exposed to mammalian predators. The only pratincole colonies found were on islets in the main lagoon which offer relatively safe nesting sites (Figure 6).

- marshes near the mouths of the Semani and of the Skumbini Rivers, and on the low lying plain that lies north of the Karavasta lagoon (many species of waders *Himantopus himantopus, Vanellus vanellus, Tringa totanus, Tringa hypoleucos*, of bitterns, ducks and rails *Ixobrychus minutus, Anas platyrhynchos, Anas querquedula,, Rallus aquaticus, Gallinula chloropus, Fulica atra,* and of grebes *Tachybaptus ruficollis, Podiceps cristatus*)

These marshes are an important complementary habitat to the more brackish and saline lagoons; they play an important role in maintaining biodiversity and attract a high number of interesting species (Figure 5), several of which are listed by Tucker and Heath (1994) under threat status (Table 1). *Ixobrychus minutus* and *Anas querquedula* in particular are considered vulnerable because their populations declined in size or range by at least 20 percent in a minimum of 66 percent of the entire European population (Tucker and Heath, 1994).

- islets in the Karavasta lagoon (pelicans *Pelecanus crispus*, pratincoles *Glareola pratincola,* terns *Gelochelidon nilotica, Sterna hirundo, Sterna albifrons,* and gulls *Larus cachinanns*).

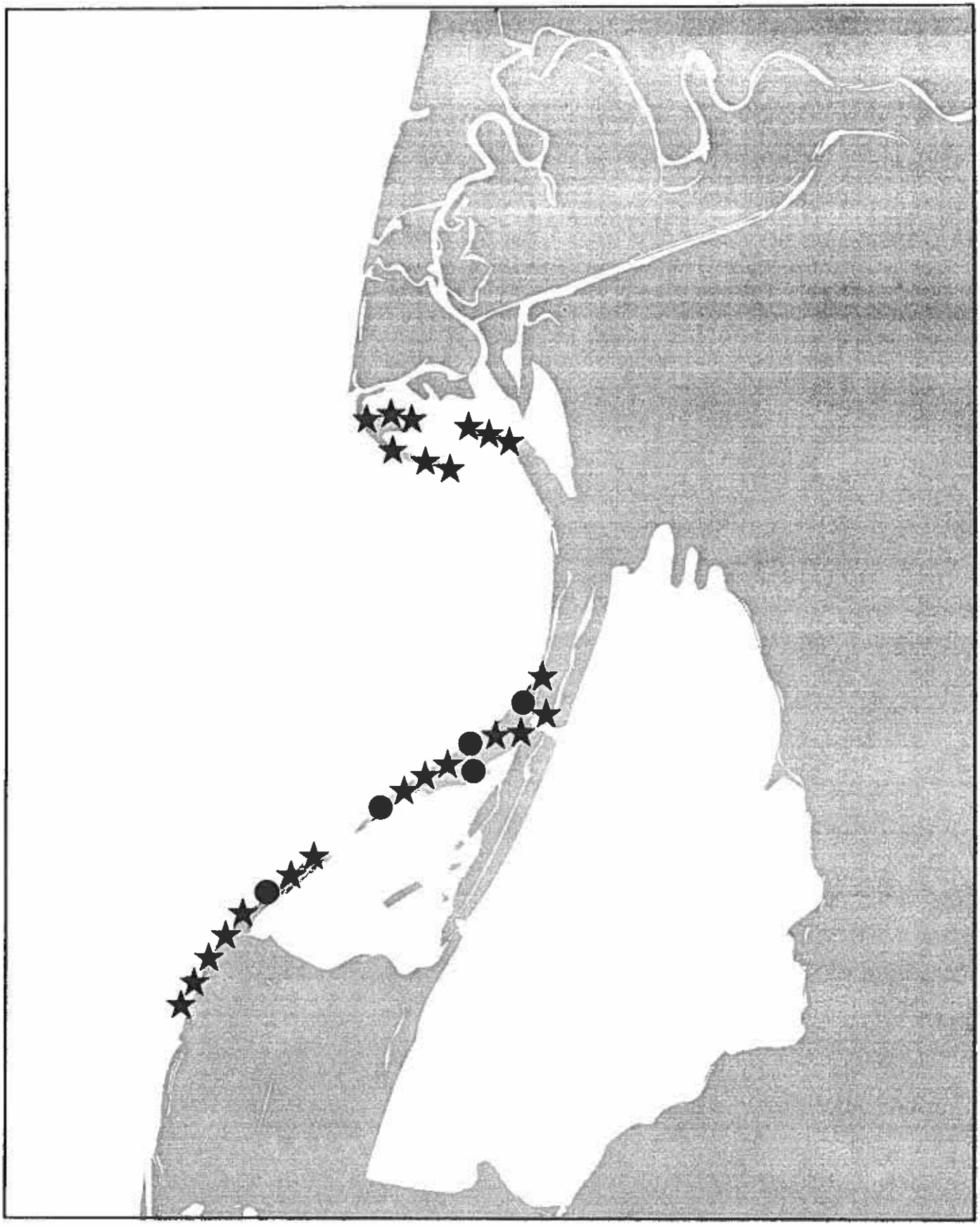


Figure 2 : Distribution of nesting Oystercatchers (*Haematopus ostralegus*) and Kentish plowers (*Charadrius alexandrinus*) in 1995.
Each symbol represents one breeding pair.
Only the coastal aera was explored.

KARAVASTA

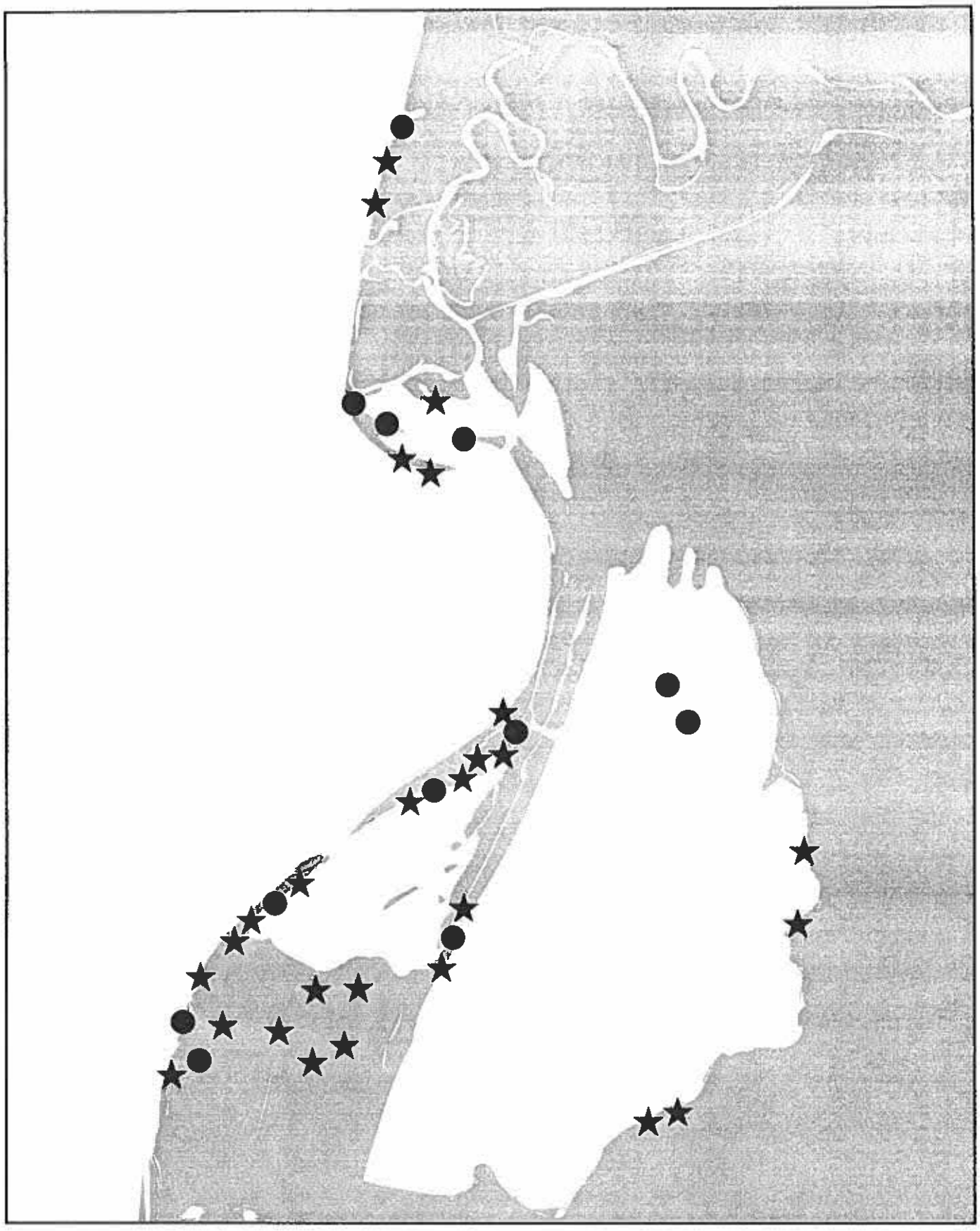
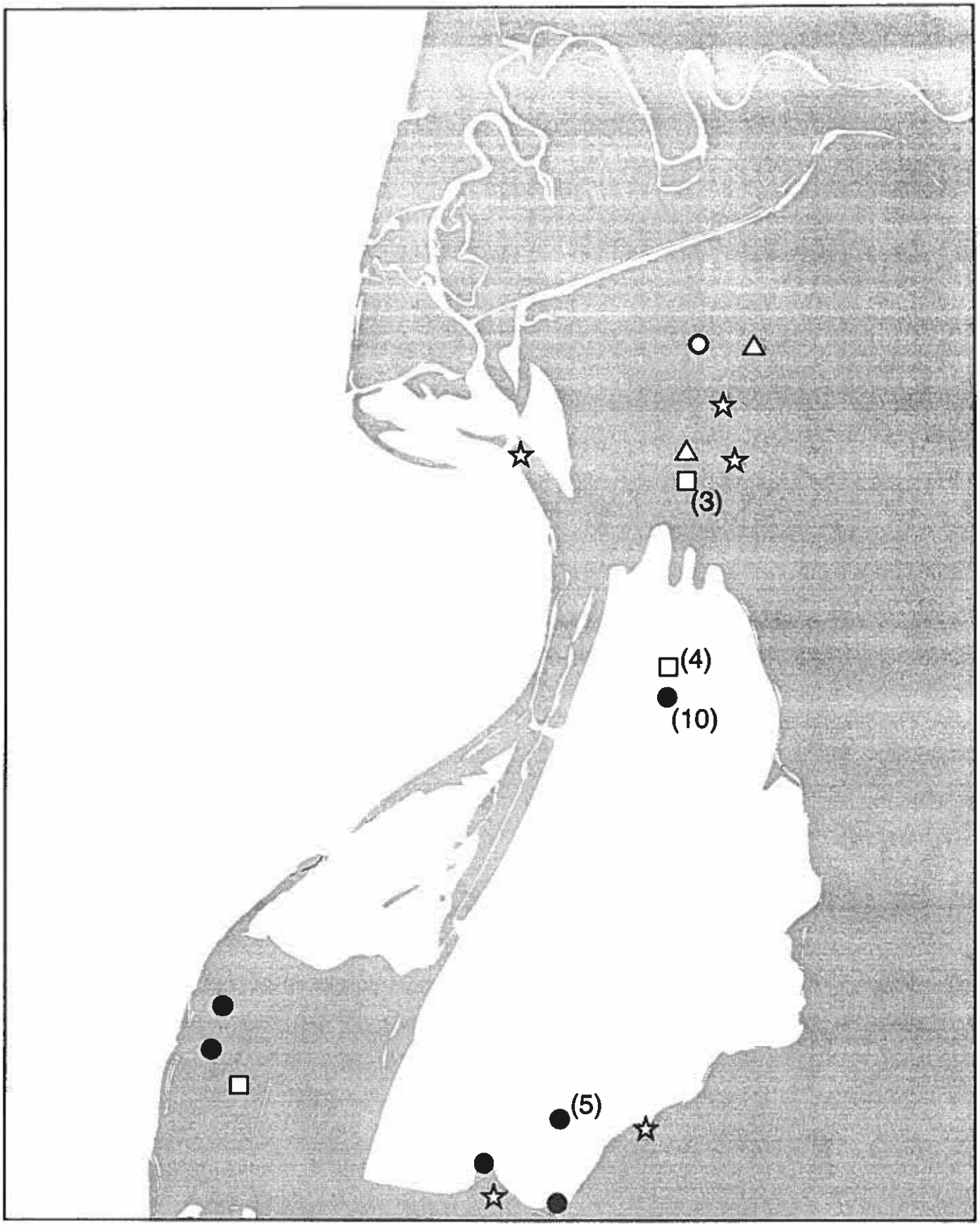


Figure 3 : Distribution of nesting Oystercatchers (*Haematopus ostralegus*) and Kentish Plowers (*Charadrius alexandrinus*) in 1996.
Each symbol represents one breeding pair.
The whole of the Karavasta lagoon system was explored.

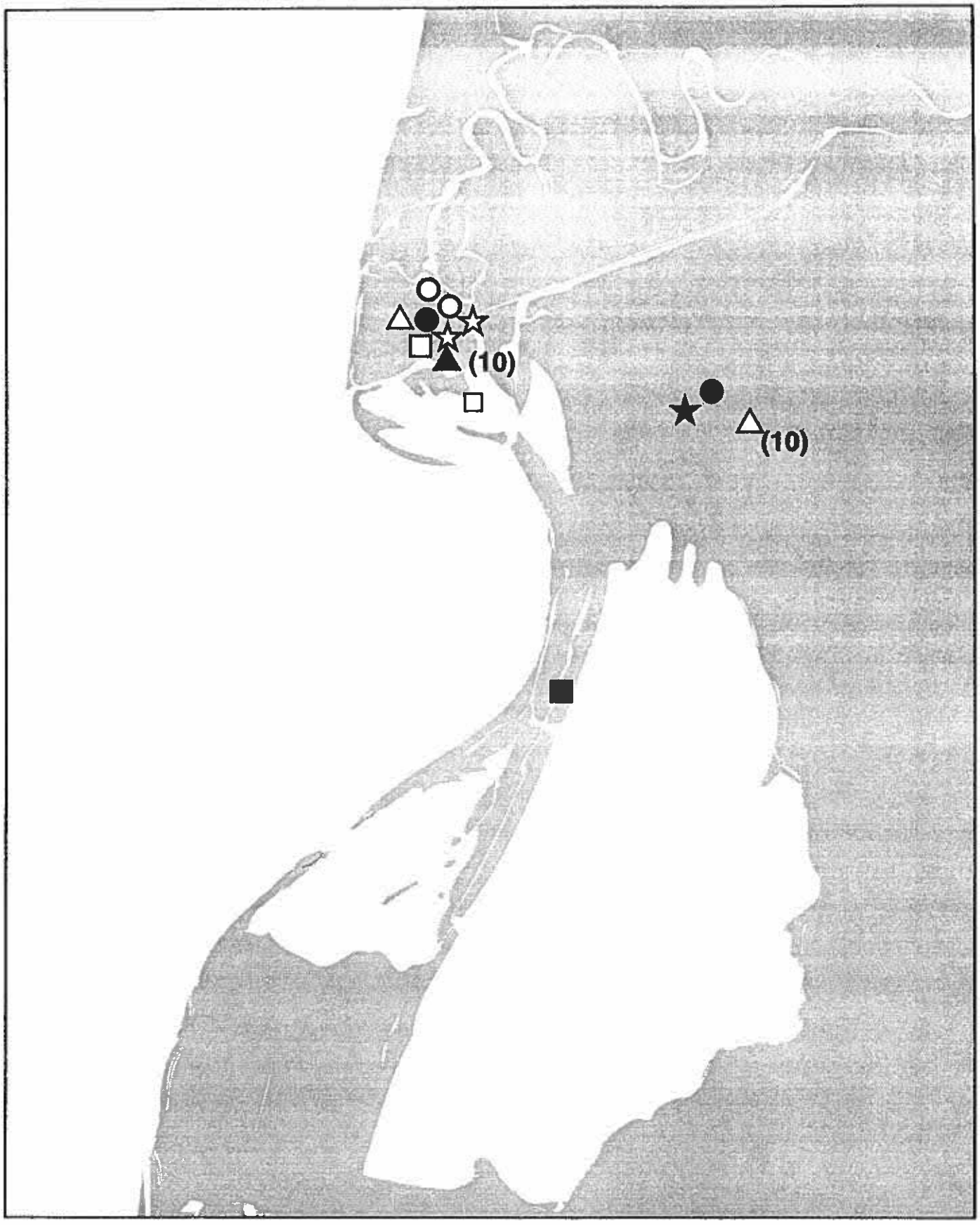
KARAVASTA



○ *Actitis hypoleucos*
● *Tringa totanus*
□ *Himantopus himantopus*
☆ *Burhinus oedicnemus*
△ *Vanellus vanellus*

Figure 4 : Distribution of nesting waders in 1996.
Number of pairs in brackets when >1.

KARAVASTA



○ *Podiceps cristatus*
● *Tachybaptus ruficollis*
★ *Ixobrychus minutus*
☆ *Anas platyrhynchos*
□ *Anas querquedula*
■ *Rallus aquaticus*
△ *Gallinula chloropus*
▲ *Fulica atra*

Figure 5 : Distribution of other species of waterbirds in 1996.
Number of breeding pairs in brackets, when >1.

The islets in the Karavasta lagoon are essential to allow breeding by the pelicans, the terns and the pratincole, all species of conservation concern. These birds are strictly colonial and they can breed only in sites that are safe from animal predators and from human disturbance. Colony sites of pelicans and terns in the Mediterranean are usually islets which are neither too low to be easily flooded, nor too elevated and large to attract mammalian predators such as rats, foxes, feral dogs or cats. In the Karavasta complex, all the tern colonies are on islets located in the main lagoon or in the marshes, with the exception of 2 small *Sterna albifrons* colonies on the sand dunes which were exposed to disturbance. (Figure 6). These 2 colonies were abandoned because of human intrusion after an early breeding attempt, and they later resettled nearby (Figure 7). In the inner lagoon, however, three of the colonies on islets showed site turnover as well during the breeding season 1996..

The nesting habitat used by the terns in the Karavasta complex is typical for the Mediterranean lagoons (Fasola & Canova 1992): the nests of *Sterna hirundo* were placed on the mud close to patches of low vegetation, and those of *Sterna albifrons* in similar places but usually somewhat farther from the vegetation.

The breeding populations (Table 3) qualify the Karavasta complex as "internationally important" under the Ramsar Convention for the breeding pelicans *Pelecanus crispus* and *Sterna albifrons*, since the breeding population of these species exceed 1% of the total population in Western Europe (Rose & Scott 1994). Also very interesting is the breeding of *Vanellus vanellus* (first confirmed breeding for Albania) and of *Anas querquedula, Burhinus oedicnemus, Glareola pratincola, Charadrius alexandrinus, Tringa totanus* and *Gelochelidon nilotica* (all SPECs) although their populations are below the 1% threshold.

Feeding resources of Little and Common terns

The two tern species foraged in all the 4 major habitat types (Table 2). The highest densities of both terns occurred in the marsh, but considering that habitat types differ in surface, most Little Terns foraged within the Karavasta lagoon, while Common Terns probably foraged mainly in the sea.

The prey types exploited by the two species during the chick-raising period include various species of salt-water fish, and a few terrestrial insects (Table 4). The fish taken by Little Terns are mainly species which are abundant in the lagoon (*Atherina, Aphanius, Gobius, Gambusia*), while those taken by Common terns are mainy sea species (*Sardina* and *Engraulis*). The prey types and their size are similar to those recorded in other Adriatic lagoons (Table 4)

In summary, the terns exploited all the available aquatic habitats, but the bulk of the feeding resources came from the lagoon itself for the Little Tern, and from the sea plus the lagoon for the Common Tern. This exploitation system is very similar to that adopted by the two tern species in the other main lagoons of the Adriatic (Fasola & Bogliani 1990). The exploitation of the lagoon by Little Terns may depend partially on its preference for the small fish which are particularly abundant in the lagoon, and partially on the flight range that in this species is restricted to 3 km from the colony (Fasola *et al.* 1989).

Breeding success of terns

To measure breeding success we use an index of productivity i.e. the mean number of young produced per pair. For the two species considered *Sterna albifrons* and *Sterna hirundo* breeding success may be considered poor below 0.5 young/ pair, average between 0.5-0.75 young/pair, and good between 0.75-1 young/pair (Sadoul 1996).

Little tern (*Sterna albifrons*)

In 1995 three Little Tern colonies produced young, all of which were located on islets in the inner lagoon (two colonies on the sand spits separating the Godulla lagoon from the sea had been abandoned because of disturbance). Breeding success on two islands in the northern part of the inner lagoon was average to good: one colony of 10 pairs managed to raise a mean number of 0.56 young/pair, and the second colony of 30 pairs raised 0.7 young/pair. The latter colony was located on the island submitted in 1996 to experimental management (islet a, Figure 6). The third colony in the southwestern part of the lagoon (islet h, Figure 6) was much larger (80 pairs) and had a very high breeding success of 1.35 young raised /pair.

KARAVASTA

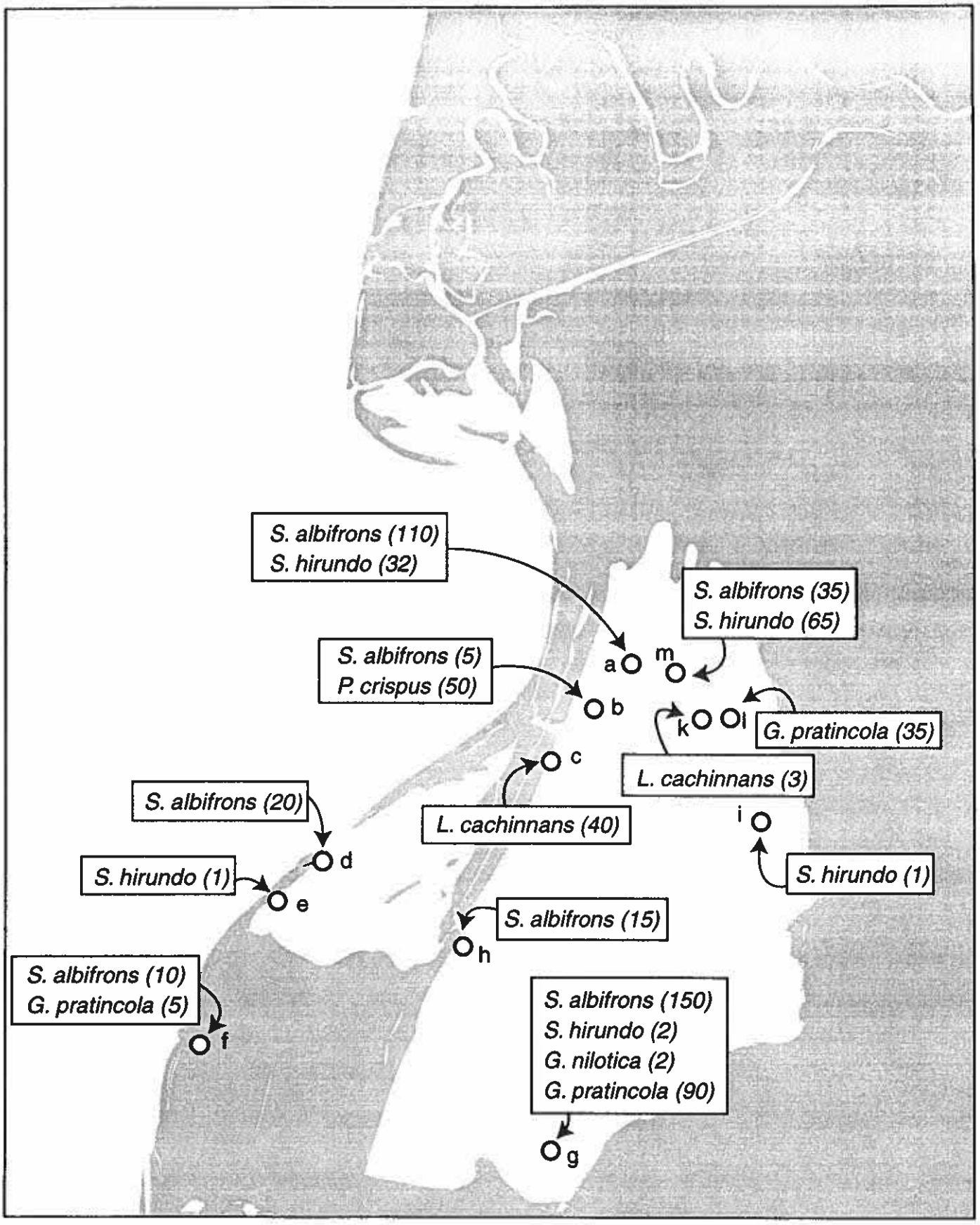
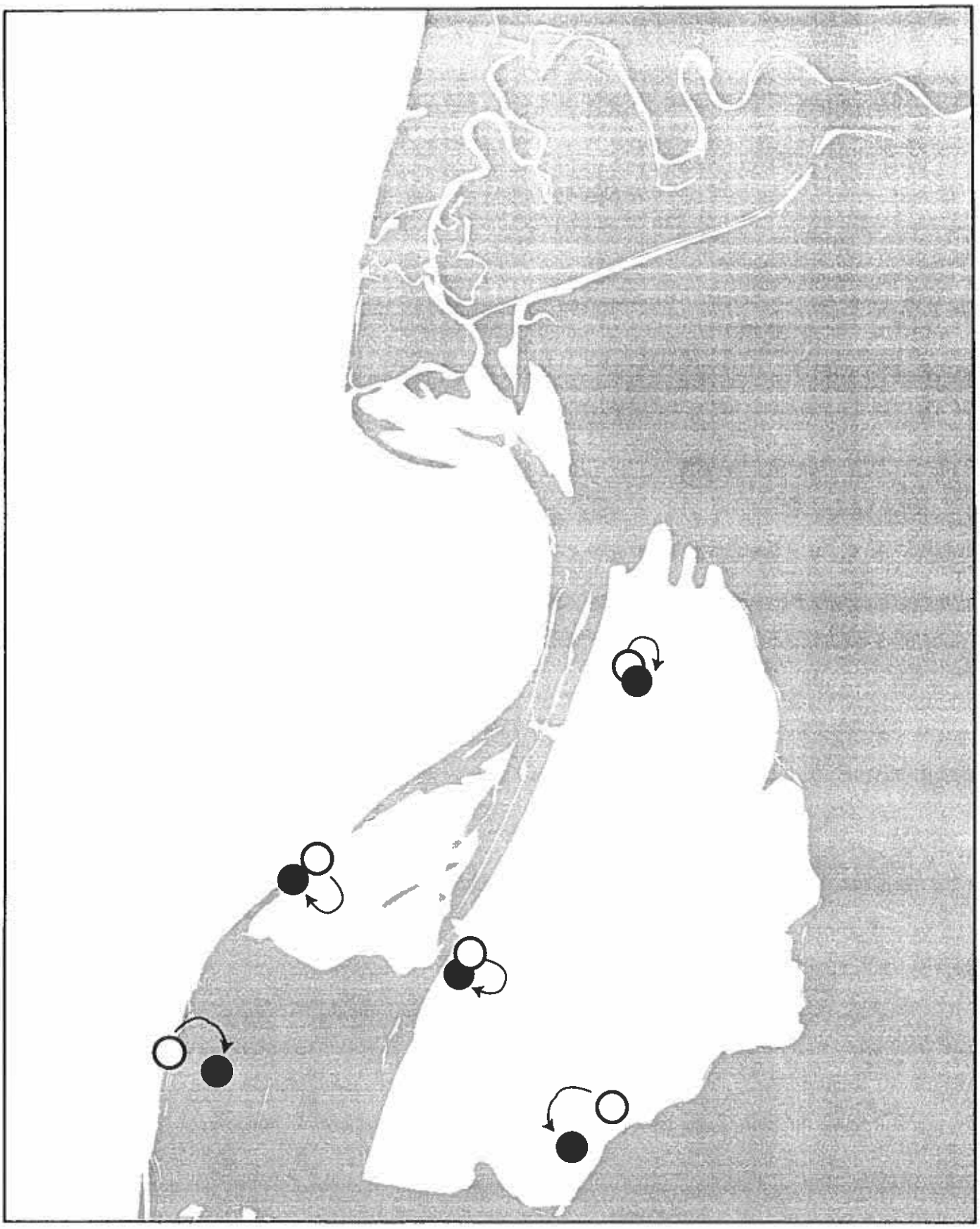


Figure 6 : Waterbirds colony sites (number of nests in brackets) in 1996

KARAVASTA



○ Colony site occupied in April - May and later abandoned

● New colonies (June - July).The arrows indicate the probable displacement

Figure 7 : Terns (*Sterna albifrons* & *Sterna hirundo*) colony turnover in 1996.

Table 2: Average number of birds counted per month in the 15 sample units of the lagoon system (fig 4), 1995 and 1996.

Habitat	Marshes and Saltflats				Karavasta lagoon				Godulia lagoon				Sea			
Month	May	June	July	Aug	May	June	July	Aug	May	June	July	Aug	May	June	July	Aug
N sample counts	6	12	11	16	23	36	44	66	6	10	16	24	3	4	5	8
Podiceps cristatus					0,09	0,08	0,14	0,45								
Podiceps nigricollis					0,04											
Phalacrocorax carbo						0,03	0,02	0,15								
Pelecanus crispus		1,25	0,09	1,13	1,3	1,75	3,14	1,58							2,8	
Egretta alba		0,67		0,25	0,22	0,11		0,02								
Egretta garzetta	0,17	2,75	10	16,3	2,74	5,78	4,57	6,42			0,63	0,79				
Ardea cinerea	0,17	0,17	3,27	2,81	0,61	2,14	1,02	1,89	0,5		0,75	0,83				
Plegadis falcinellus						0,06										
Platalea leucorodia								0,02								
Phoenicopterus ruber							0,27	0,26								
Anas penelope				0,06												
Anas platyrhynchos		0,42			0,22	0,19	0,16	0,02								
Fulica atra				0,06		0,25										
Haematopus ostralegus	3,17	6	1,45	2,44	0,35	0,75	0,27	0,24	0,5	0,2	0,06	0,04	1	1	0,2	0,13
Himantopus himantopus		0,58				0,25										
Recurvirostra avosetta	1,33	0,17														
Glareola pratincola	1	1,17		0,31	0,61	3,97	0,8	0,17	0,13	0,2						
Charadrius hiaticula	0,17		1,45	1,19	0,09		0,02	0,05								
Charadrius alaxandrinus	1,83	3,67	8,36	12,2	0,74	3,22	0,68	0,62	0,25	0,1	0,31	0,63		0,5	0	0,13
Pluvialis squatarola	10,5	0,17	0,73	1,75	2,65			0,02				0,04				
Calidris alba				0,19								0				
Calidris minuta	3,67		1,55	28,4	0,22		1,2	0,68				0,08				
Calidris ferruginea	10,83		33	94,9	5,61		2,8	2,05								
Calidris alpina			8,82	49,9			0,34	0,29								0,13
Philomachus pugnax								0,02								
Gallinago gallinago							0,02									
Limosa limosa		0,08		0,13												
Numenius arquata	11,33	12,3	14,2	17,9	0,7	0,53	0,48	0,27	0,38				0,33			
Tringa erythropus			0,64	3,5		0,03	0,23	0,06	0							
Tringa totanus	2,67	12,6	12	27,1	0,57	4,67	12,1	9,38	0,38		1,38	2,79				
Tringa stagnatilis		0,17	0,27	0,88							0	0				
Tringa nebularia		0,17	0,55	1,75			0,05	0,17			0	0				
Tringa ochropus					0,04		0,02	0,03			0,06	0,04				
Tringa hypoleucos			0,55	0,44			0,27	0,21	0,13		0,06	0,38				
Arenaria interpres	1							0,02								
Larus melanocephalus		0,92		0,06		0,11										
Larus ridibundus	0,5	9,83	15,2	10,1	0,35	3,56	8,09	11,2				0,88			0,4	1,38
Larus cachinnans	4,17	3,42	2,27	0,5	3,09	3,75	2,41	2,39	0,38	0,3	0,31	0,42	1	0,5		
Sterna caspia					0,04											
Sterna sandvicensis		0,83														
Sterna hirundo	3,5	4	7,09	5	2,22	3,11	2,05	1,42	0,75	1,2	0	0,29	2	1,25	0,4	0,38
Sterna albifrons	14,3	9,58	16,5	6,56	8,78	11,7	12,2	8,05	0,5	1	0,38	1,79	4	1,75	1,4	
Chlidonias niger				0,06	0,04	0,11		0,17								
Species Richness	17	22	20	28	23	22	25	30	10	6	9	13	5	5	5	5

Table 3: Population of breeding waterbirds (number of nest for the terns, and number of pairs for the other species).
The 1995 survey was uncomplete (see Methods)

	1995	1996
Tachibaptus ruficollis		2
Podiceps cristatus		1
Pelecanus crispus	52	50
Ixobrychus minutus		1
Botaurus stellaris	1	
Anas platyrhynchos		1
Anas querquedula	9	2
Rallus aquaticus		1
Gallinula chloropus		8
Fulica atra		8
Haematopus ostralegus	15	6
Himantopus himantopus		13
Burhinus oedicnemus	2	5
Glareola pratincola	4	130
Charadrius alaxandrinus	30	14
Vanellus vanellus		2
Tringa totanus	9	7
Tringa hypoleucos		1
Larus cachinnans	56	43
Gelochelidon nilotica		2
Sterna hirundo	39	88
Sterna albifrons	145	335

TOUR DU VALAT Bibliothèque 13200 Arles Le Sambuc - F.

Table 4: Frequency and size of the prey brought to the colony by breeding Little and Common Tern in the Karavasta lagoon, and comparison with similar data for the Commacchio lagoon, North-western Adriatic (data from Saino et al. 1994).

	Karavasta				Commacchio '90-92			
	Little Tern		Common Tern		Little Tern		Common Tern	
	(no. prey = 299)		(no. prey = 20)		(no. prey = 2203)		no. prey = 237	
	%	length (cm)	%	length (cm)	%	length (cm)	%	length (cm)
Insects (flies, grasshoppers)	0		5.0	1.1	0		0.4	0.4
Shrimps	0		0		1.9	2.7	3.0	2.5
Anguilla anguilla	0		0		0		1.3	8.6
Atherina sp.	26.4	3.1	25.0	3.9	44.1	3.0	9.7	3.8
Aphanius, Gobius, Gambusia	36.5	2.4	5.0	2.9	44.4	2.2	3.4	6.7
Mugil sp.	9.4	3.1	0		0.5	4.4	0	
Sardina sp.and Engraulis sp.	24.0	3.0	65.0	5.5	7.5	4.0	74.2	6.5
Lepomis gibbosus	0		0		0	1.3	1.3	
Syngnathidae	0.7	13.3	0		0		0	
Unidentified fish	3.0	2.2	0		2.0	2.3	6.8	5.0
All prey (without Syngnathidae)		2.9		4.6		2.7		6.0

In 1996 five colonies on islets in the inner lagoon and one colony in the coastal area in the south west near Sectori i Ri (f, Figure 6) produced young. As expected, breeding success (mean number of 0.04 young/pair) was very poor in the latter, small colony established in a heavily disturbed area. Another, large colony of 150 pairs in the southern part of the main lagoon (islet g, Figure 6) had also a poor breeding success with 0.27 young/pair. Some fishing activity by people from the close village of Karavasta caused disturbance to this island. The other four colonies in the inner lagoon had a high breeding success: 0.93 young/pair, 1.15 young/pair, 1.16 young/pair and 1.16 young/pair respectively.

Common tern (*Sterna hirundo*)

Successful colonies of this species (3 in 1995 and 2 in 1996) were exclusively on the few islets in the northern part of the inner lagoon where productivity was average to good. Bino (unpubl. data) recorded the following productivity indices for 1995: 0.5 young/pair (N = 20); 0.62 young/pair (N = 35) 0.79 young/pair (N = 20); and for the two colonies in 1996: 0.58 young/pair (N = 32) and 0.92 young/pair (N = 65). In addition to the latter two colonies a few isolated nests and 2 nests in the large Little tern colony in the south of the inner lagoon were found (Figure 6). The fate of these clutches is unknown but they probably failed to produce offspring since they were located in areas vulnerable to disturbance where the Little terns had a poor breeding success.

These data indicate that the Karavasta wetland complex is an important potential breeding area for these two species. Colonies established in relatively undisturbed areas have a good breeding success. For their nutrition these species rely almost exclusively upon fish and successful colonies indicate that the trophic situation is not a limiting factor during the breeding season. The most important limiting factor at present is a safe nest site of optimal habitat structure. These parameters can be improved through appropriate management.

Experimental management of a breeding island

The management focused on the most northerly island (a) of the inner lagoon (Figure 6). In 1995, 30 pairs of Sterna albifrons and 20 pairs of Sterna hirundo nested there along the only narrow strip along the shore where high and dense vegetation did not hinder the establishment of nest territories. Nesting of *Sterna albifrons* occurs only in open areas close to water, preferably on shingle shores, sandy islets or gravel islands in rivers. *Sterna hirundo* nests are more often concealed amongst vegetation. The species is also known to build nest moulds in dense low vegetation similar to nests of Black-headed gulls (*Larus ridibundus*).

In order to provide various types of potential nesting sites the vegetation was completely removed in early spring 1996 on one third of the island and replaced by sand and gravel. Another third had its vegetation structure altered through clearing of vegetation and all the removed vegetation was placed in small heaps in vicinity of the bare sector covered with sand and gravel.

From 1995 to 1996, numbers of breeding terns on this island increased from 30 pairs to 110 pairs for *Sterna albifrons* and from 20 pairs to 32 pairs for *Sterna hirundo*. The mean number of young produced per pair increased from 0.7 to 0.93 for *Sterna albifrons*, but decreased slightly, from 0.79 to 0.58 for *Sterna hirundo*. Breeding success was thus satisfactory. Unfortunately very poor breeding success by these species is not unusual in the Mediterranean region. In a Natural Park in south Portugal for example, a coastal area exposed to high human disturbance, Calado (1996) estimated that several hundreds of breeding *Sterna albifrons* were not able to produce more than 0.1 young per pair on average.

In view of our data on numbers of breeding pairs and reproductive output by the birds nesting on this island the management carried out may be considered successful. But above all the results highlight an important conservation probleme affecting the nesting charadriiformes, namely a lack of safe and optimally structured nesting sites.

The potential nesting areas for Ardeidae, Threskiornithidae and Accipitridae

The Pine forest, the riverine White Poplar forest, the extensive area of Tamarisk lowlands in the surroundings of the mouth of the Shkumbini and the reedbeds on the canal of Tërbufi, all potential nest sites for these birds have been investigated during the two breeding seasons.

Ardeidae and Threskiornithidae

After two complete surveys in 1995 and 1996 of each single ha of woodland in the area we conclude that these birds are not breeding at present in the Karavasta wetland complex. Small numbers of non breeders are seen throughout the breeding season. At the end of May 1996 a night roost of 80-100 Little Egrets *Egretta garzetta* was discovered in dense tamarisks bordering the alluvial forest of the Shkumbini. In the latter, several Night Herons *Nycticorax nycticorax* were present. Surveys of these areas later in the breeding season confirmed that these birds which continued to occupy the roosts were non-breeders. According to Vangeluwe *et al.* (1996) Great Cormorants *Phalacrocorax carbo* and herons were known to breed in this sector in the past. Vangeluwe *et al.* (1996) who had not investigated this part of the wetland thought that the habitat around the mouth of the Shkumbini including the alluvial forest would probably be heavily degraded. This is fortunately not the case. The alluvial forest, although logging of individual trees has been noted here and there, is of outstanding beauty and deserves conservation priority. This is particularly true for the part bordering the river Shkumbini on the left, from the mouth to about 7 km inland. Another part of the woodland, the protected and fenced Divjaka forest north of the road from Divjaka to the beach is of different structure, lower tree density and of equal conservation value.

Accipitridae

In addition to the search of waterbird colonies, particular attention was given to birds of prey during the surveys of the forest areas. Four nests of interesting species were found: 2 of Black Kite *Milvus milvus*, 1 of Common Buzzard *Buteo buteo* and 1 of Goshawk *Accipiter gentilis*. In addition, Booted Eagle *Hieraaetus pennatus*, Short-toed Eagle *Circaëtus gallicus* and Marsh harrier *Circus aeruginosus* (the latter in the tamarisk lowlands and marshes near the moth of the Shkumbini River) were seen on several occasions and breeding strongly suspected. Tucker and Heath (1994) list the Black Kite under species of European conservation concern with the *status* vulnerable and *criteria* large decline, and give an Albanian population of only 0-10 pairs. The first nest was found in the alluvial forest bordering the Shkumbini on the left, some 3 km off the river mouth. The second nest was in the protected and fenced area of the mixed, coniferous and deciduous Divjaka forest. Effective conservation of these forest areas is essential if the present level of biological diversity is to be maintained.

The importance of the Karavasta lagoon complex for wintering waterbirds and bird of prey

The two surveys of Albanian wetlands in January-February 1995 and January 1996 (Figure 8) confirmed the international importance of Karavasta for wintering waterbirds (Figures 9 and 10). During these two mid-winter periods, Karavasta met several of the Ramsar Convention (Convention on Wetlands of International Importance, especially as Waterfowl Habitat) Criteria, necessary to be adjuged as a wetland of international importance. Criteria considered in relation to the waterfowl counts were (i) to support one percent of the biogeographical population of one species of waterfowl or (ii) 10,000 ducks, geese, swans or coots or 20,000 waders (for details of criteria see Grimmet and Jones 1989, Matthews 1993, Rose and Scott 1994). Ramsar Criteria were met for:

- the total number of waterbirds: 38,859 in 1995 and 45,935 in 1996; critical level = 20,000

- numbers of *Pelecanus crispus:* 171 in 1995 and 139 in 1996; critical level of this globally endangered species = 25

- numbers of *Egretta alba*: 151 in 1995 and 120 in 1996; critical level = 120

- numbers of *Anas penelope*: 8,118 in 1995 and 19,072 in 1996; critical level = 6,000

- numbers of *Anas clypeata*: 3097 in 1996; critical level = 2,200 (1987 counted in 1995)

- numbers of *Recurvirostra avocetta*: 1079 in 1995 and 1,469 in 1996 ; critical level = 700

There are not many wetlands in the Mediterranean which meet such an impressive number of Ramsar Criteria. The 1995 and 1996 waterfowl census confirmed the importance of Albanian wetlands for waterbirds wintering in the Western Palearctic (Hagemeijer *et al.* 1994) on the one hand, and the particular importance of Karavasta on the other hand.

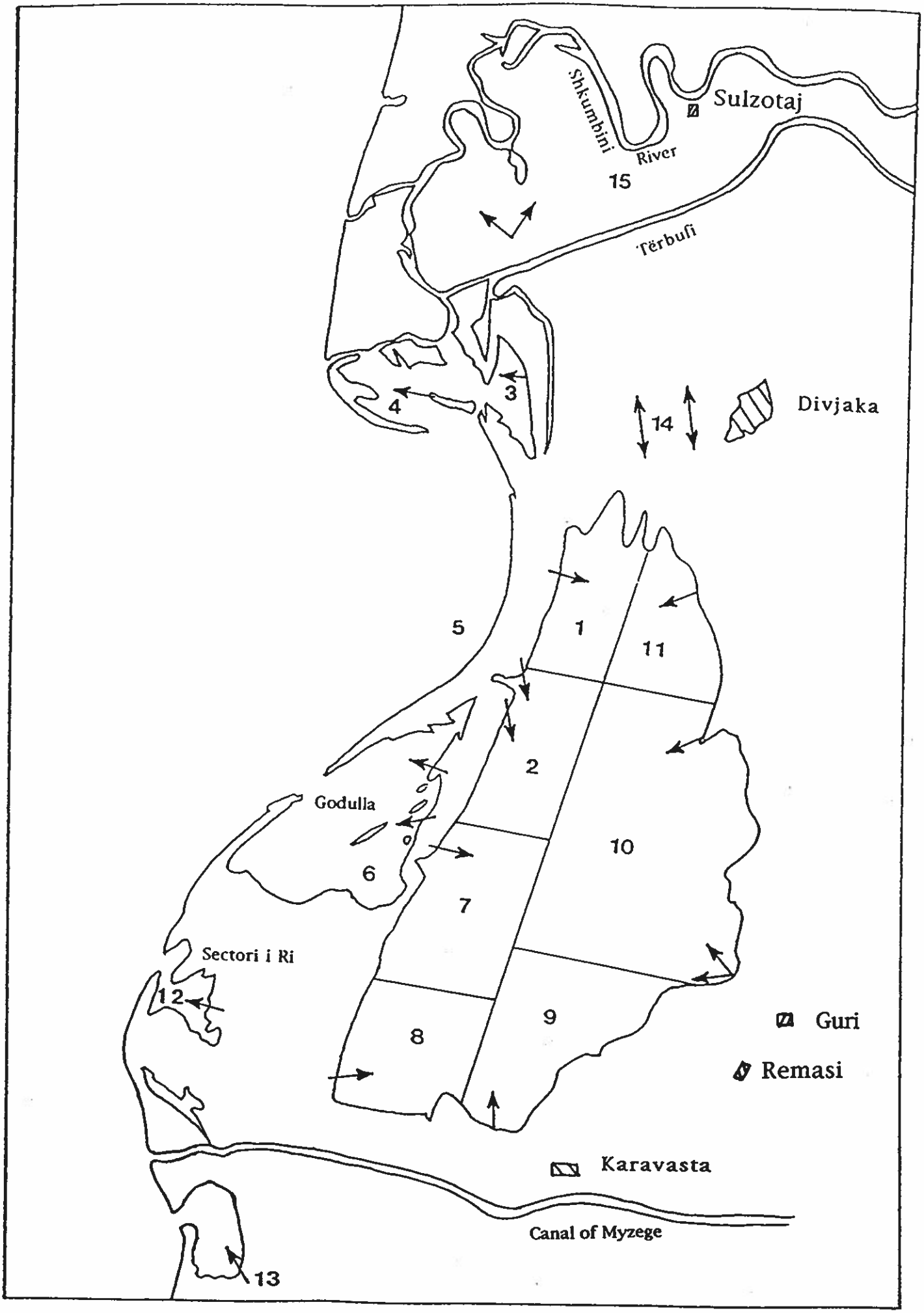


Figure 8 : observation points and census sectors (1-15) used in winters 1995 and 1996

SITES	%
Shkodra	9,6
Marais de Domi	0,1
Velipoja	2,6
Drini	12
Patoku	3,1
Lalzi	2,7
Karavasta	27
Semani	2,6
Poroja	2,2
Narta	10
Orikumi	1,2
Butrinti	5,3
Ohri	21,5

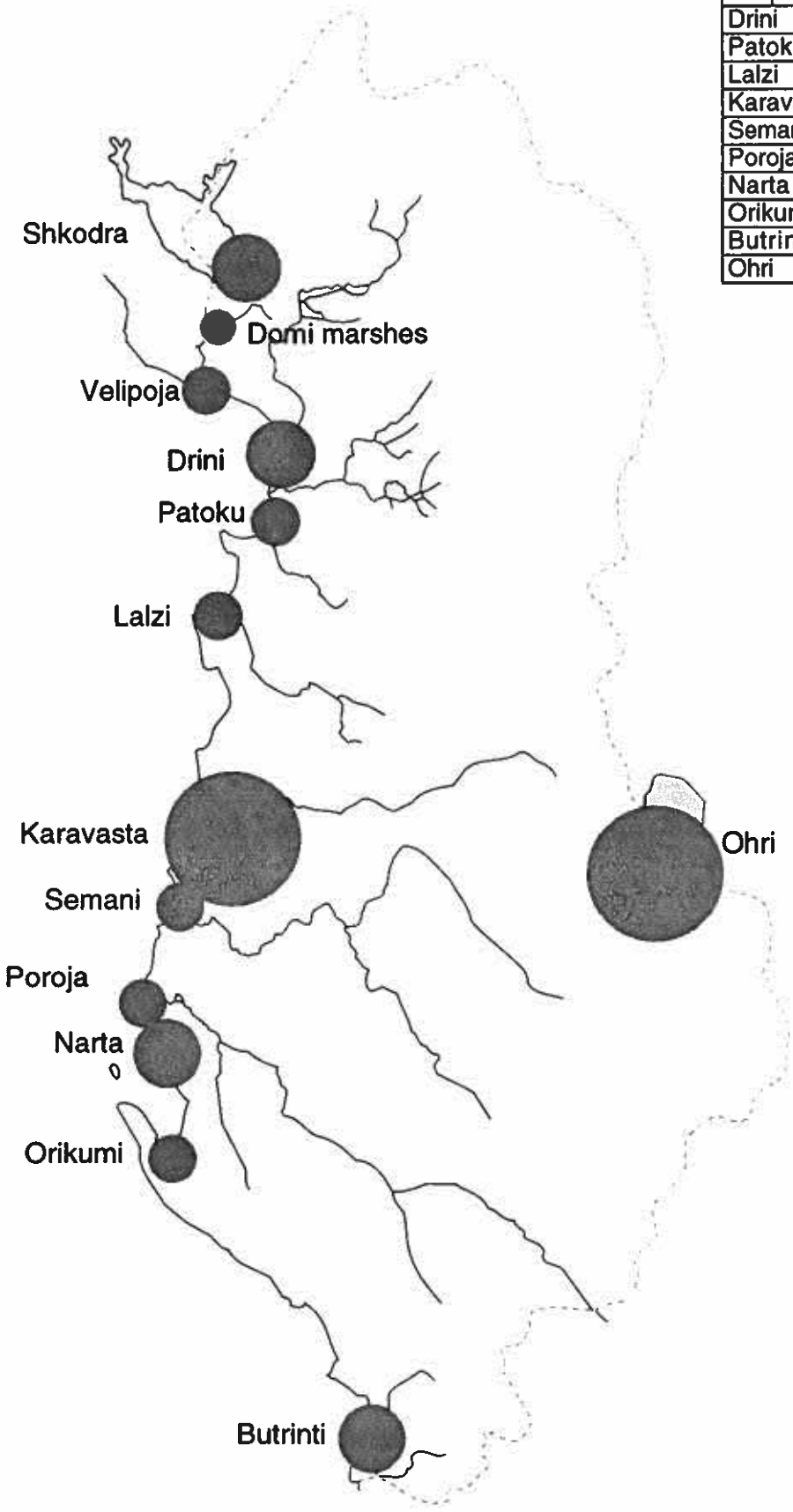


Figure 9 : Distribution of waterbirds wintering in Albania in 1995
After Kayser *et al.* 1995

SITES	%
Shkodra	7,2
Marais de Domi	0,5
Velipoja	1,5
Drini	5,3
Patoku	2,4
Lalzi	5,6
Karavasta	25,4
Semani	2,2
Poroja	0,7
Narta	10,9
Orikumi	1,1
Butrinti	4,6
Ohri	25,7
Megali Prespa	6,6
Mikri Prespa	0,03

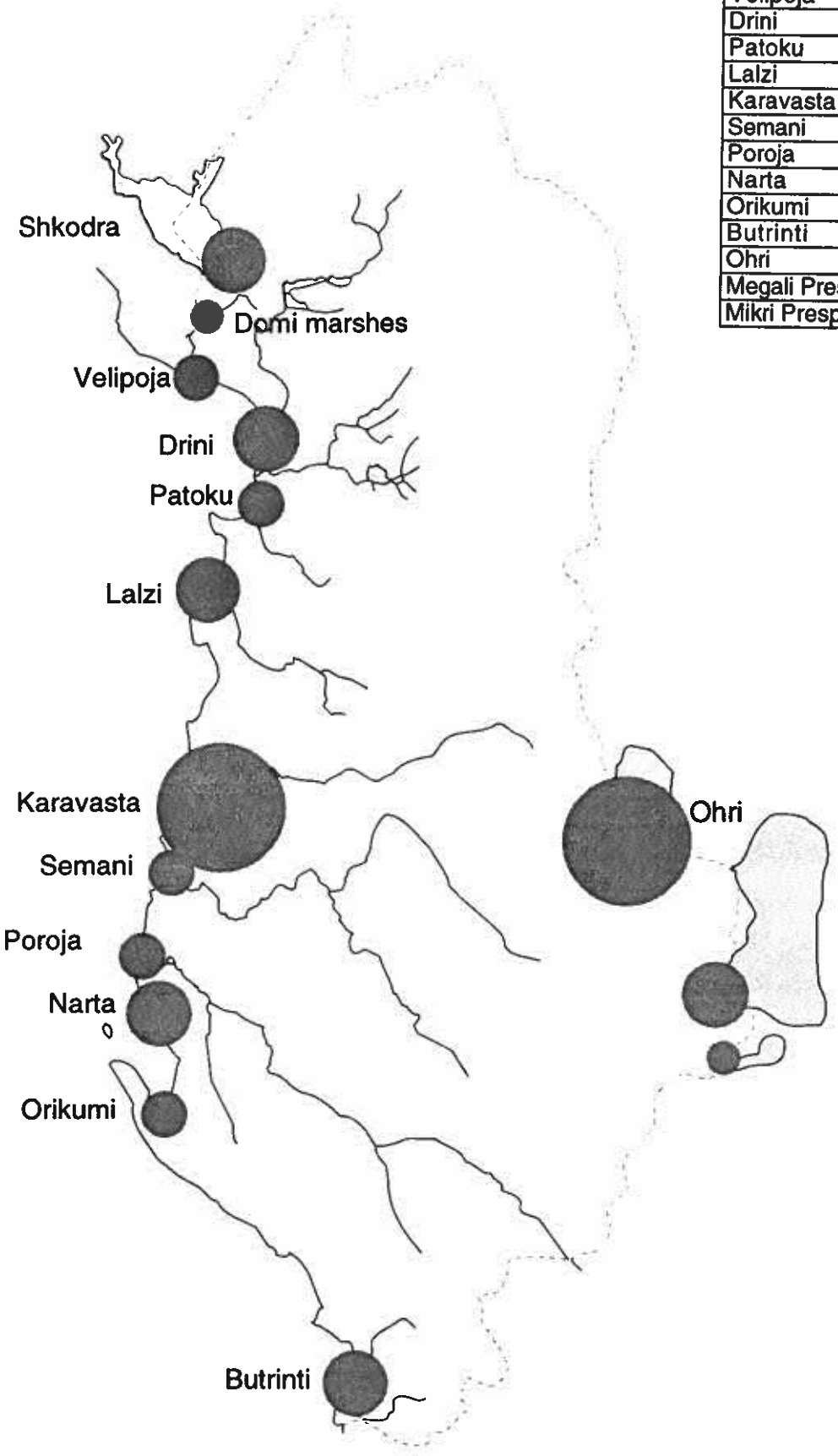


Figure 10 : Distribution of waterbirds wintering in Albania in 1996
After Bino *et al.* 1996

Figure 8 shows the different observation points used in 1995 and 1996 to census the whole of the area. The distribution of the birds was assessed by dividing the lagoon complex into 15 sectors (Figure. 8). Numbers of birds counted in each sector in January 1995 and 1996 are shown in Tables 5 and 6. During these two winters Karavasta was characterised by a outstanding species richness. In addition to waterbirds 49 diurnal raptors (8 species) and 6 nocturnal raptors (3 species) were recorded in 1995 (Table5). The 1996 census confirmed the importance of this area for wintering birds of prey, with a total of 75 diurnal raptors representing 12 species and 4 nocturnal raptors belonging to 4 species (Table 6).

Eight species of diurnal raptors seen wintering at Karavasta are listed by Tucker and Heath (1994) under criteria of European conservation concern: *Haliaëtus albicilla, Circus cyaneus, Circus macrourous, Milvus migrans, Aquila clanga, Falco tinnunculus, Falco peregrinus, Falco columbarius. Aquila clanga* is today considered **globally threatened,** with an estimated European population of only 860-1100 breeding pairs, 90 % of which are in Russia. The major part of the world range of this species extends through north-European Russia and south-central Siberia (Galushin, *in* Tucker and Heath 1994). The observations of up to six individuals wintering at Karavasta (Table 6) underlines the importance of this wetland complex for wintering raptors.

The main lagoon (Karavasta lagoon) is by far the most important habitat for the wintering waterbirds, both as a dayroost for ducks and as a feeding area. 36,643 waterbirds (51 species) were recorded there in 1996, representing more than 80 % of waterbirds counted throughout the Karavasta wetland complex (Bino *et al.* 1996). The Karavasta lagoon is an important feeding area for P*odiceps cristatus, Pelecanus crispus, Egretta alba, Ardea cinerea, Anas penelope, Anas crecca, Anas clypeata, Aythya ferina, Fulica atra, Tringa totanus, Larus ridibundus* and *Larus genei* (Bino *et al.* 1996). Most of these birds were seen in the sectors 1, 7, 8, 9 and 10 (Figure 8).

In the Godulla lagoon, 2190 waterbirds were counted in 1995 (29 species) and 1546 (18 species) in 1996. This shallow part of the ecosystem is an important feeding area for piscivorous birds: *Podiceps cristatus, Podiceps nigricollis, Ardea cinerea* and *Mergus serrator.* In addition this habitat is used by large numbers of wintering waders (775 *Calidris alpina* in 1996).

The shallow lagoons and extensive mudflats south of the mouth of the Shkumbini (sector 4, Figure 8) is another important area for waders. Particularly large numbers of *Pluvialis apricaria, Vanellus vanellus* and *Recurvirostra avosetta* occurred there as well as many other species of waders (Tables 5 and 6).

Conclusions and Recommendations

The importance of Karavasta for breeding waterbirds and birds of prey

22 species of waterbirds have been recorded breeding in the area (Table 3) 9 of which are of European conservation concern . According to the Ramsar population criteria, Karavasta is of international importance for breeding populations of 2 of these: *Pelecanus crispus* (globally threatened) and *Sterna albifrons* (declining in Europe). The remaining 7 species have been classified by (Tucker and Heath 1994) as: **endangered** (*Glareola pratincola, Gelochelidon nilotica*), **vulnerable** (*Ixobrychus minutus, Botaurus stellaris, Anas querquedula, Burhinus oedicnemus*) and **declining** (*Charadrius alexandrinus*).

Karavasta has thus has a community of breeding waterbirds of outstanding conservation interest.

The forest area with its interesting community of birds of prey i.e breeding confirmed for *Milvus migrans, Buteo buteo* and *Accipter gentilis*, and possible breeding of *Hieraaetus pennatus, Circaetus gallicus* and *Circus aeruginosus* (the latter in the tamarisk low-land and marshes), increases the biological diversity of this wetland complex.

The understanding of the status, distribution and needs of these birds helps to define the zones and habitats within this complex ecosystem which deserve conservation priority: the coastal zones with nesting territories of *Haematopus ostralegus* and *Charadrius alexandrinus* (Figures 2 and 3); the shores of the inner lagoon, the low lying plains with halophytic vegetation between the lagoon and the Semani River in the south, and between the lagoon and the Divjaka Road in the north, the marshes near the mouths of the Semani and the Shkumbini Rivers (Figures 4 and 5), the islets in the inner lagoon (Figure 6) and all of the remaining forest area. In order to maintain these diverse breeding populations and in certain cases improve the situation for breeding waterbirds, we recommend the following:

Table 5: Karavasta, January 1995. Numbers of waterbirds and raptors counted in 13 census sectors (Fig.8) after Kayser et al. 1995

Species	Sectors													
	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
Gavia arctica				1			1							2
Podiceps cristatus	6			13	1	73	91	6		3			1	194
Podiceps nigricollis	2			6		70	26	3					2	109
Tachybaptus ruficollis		1												1
Phalacrocorax carbo	43					2	367	13	2	29				456
Phalacrocorax pygmeus	1													1
Pelecanus crispus	56		1						114					171
Egretta garzetta		3	7			8			6					24
Egretta alba	8	59		1		44	9		30					151
Ardea cinerea	13			1		10	68		20					112
Platalea leucorodia		11												11
Phoenicopterus ruber					135				2					137
Tadorna tadorna	2			2		2			200					206
Anas penelope	6335		2			886	460		279	153		3		8118
Anas platyrhynchos	186		2	19		96	2	250	69	14				638
Anas strepera								85				7		92
Anas acuta	20		48					141	14	4	82			309
Anas clypeata	432			18		10	1	563	957	6				1987
Anas crecca	808		730		500	264	3238		4180					9720
Oxyura leucocephala	4													4
Aythya ferina	435			102				12				538	54	1141
Aythya fuligula													1	1
Melanitta fusca						1								1
Bucephala clangula	29			2		13	9	21	5			4	2	85
Mergus serrator	28					73	18	32	35	5				191
Anatidae sp.				2000										2000
Circus cyaneus	1			4			1		1	1		1		9
Circus aeruginosus	1			4		2			1			2	2	12
Accipiter nisus	3					1							1	5
Buteo buteo	2	1	4	1								1	6	15
Haliaetus albicilla			1											1
Aquila clanga	1		1	1										3
Falco columbarius				1							1			2
Falco peregrinus									2					2
Rallus aquaticus					3	1								4
Fulica atra	22		92				2		17				90	223
Haematopus ostralegus			1			4								5
Recurvirostra avosetta	19		170	12					878					1079
Charadrius hiaticula				1										1
Charadrius alexandrinus			12	126	2				33		70			243
Pluvialis apricaria				622										622
Pluvialis squatarola	1		125	15			1		2		10			154
Vanellus vanellus			90	2300		72			905	32		20	1850	5269
Calidris alpina	4		233	378		60			223	10	385		35	1328
Calidris minuta									48		2		164	214
Philomachus pugnax				40										40
Numenius arquata	71		58	26		62	1		32	32	37			319
Limosa limosa			113					12						125
Tringa totanus	31		29	87		41	11	2	74	123	79		1	478
Tringa erythropus			289	2		1			33				71	396
Tringa nebularia				4		13	2							19
Tringa ochropus		1												1
Gallinago gallinago				1					3		2		1	8
Larus melanocephalus				3										3
Larus genei	59		4	42		38	28	19	239		55			484
Larus minutus						1			1					1
Larus ridibundus	60	293	7	52		226	133	75	98	575	140	20	26	1705
Larus canus		2		3	2	5	5	1	4					22
Larus cachinnans	22		1	15	4	35	16	2	6	1	1	3		106
Sterna sandvicensis	11		1			63	59							134
Sterna caspia						12								12
Tyto alba											1			1
Asio otus					1									1
Athene noctua					1						3			4
Total	8716	371	2021	5905	649	2189	4549	1237	8513	988	868	599	2307	38912

Table 6: Karavasta, January 1996. Numbers of waterbirds and raptors counted in 15 census sectors (Fig.8) after Bino et al. 1996

Species	Sectors															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
Tachybaptus ruficollis		1												1		2
Podiceps cristatus	9	120	4	1	4	40	37	5	2		1					223
Podiceps grisegena									1							1
Podiceps nigricollis	2	21	11	1	1	80	20	2								138
Phalacrocorax carbo	30	32				1	80	10	3	1	5		4			166
Pelecanus crispus	93					25	17		1	3						139
Egretta garzetta	14	1				3	56		1					12		87
Egretta alba	47	17		2			28			2		2	22	0		120
Ardea cinerea	3	18		12		17	27	4	2	17	4		2			106
Platalea leucorodia	11			1		7										19
Phoenicopterus ruber										8						8
Cygnus columbianus		2														2
Tadorna tadorna	3			18						160	123					304
Anas penelope	14063	670				1250	156	18	141	635	1940	24	175			19072
Anas strepera								18					6			24
Anas crecca	862		1				755	2	217	4292	245	4	14			6392
Anas platyrhynchos	15			4		3	65	87	217	94	16					501
Anas acuta	74	1		20			1	208	1	28	250	230				813
Anas clypeata	82	2					150	182	111	1420	1150					3097
Netta rufina												1				1
Aythya ferina	28				105	2	1			1160		29				1325
Melanita fusca					1											1
Bucephala clangula	3	8				3					1					15
Mergus serrator	29	14				39	28	18	3	7	1					139
Anatidae sp.					250											250
Haliaetus albicilla				1												1
Circus aeruginosus			2	6			1		1			2	2		3	17
Circus cyaneus							1		2	2	3			2	1	11
Circus macrourus															1	1
Milvus migrans	1															1
Accipiter nisus								1							7	8
Accipiter gentilis				1												1
Buteo buteo	1	2		2				2	4			2	3	2	4	22
Aquila clanga				5											1	6
Falco tinnuculus									1					1	1	3
Falco peregrinus													1			1
Falco columbarius											1	1		1		3
Rallus aquaticus	2			2												4
Galinula chloropus	1															1
Fulica atra	385	3									2200	60				2648
Haematopus ostralegus						10						1				11
Recurvirostra avosetta			219	880						370						1469
Charadrius alexandrinus	1			23			5									29
Pluvialis apricaria															6	6
Pluvialis squatarola		1		128		6	29		1	3	3	3				174
Vanellus vanellus	505			850					7	845	730			309	1250	4496
Calidris minuta				15												15
Calidris alpina			775				12			105	60	175	32		4	1163
Scolopax rusticola	3															3
Gallinago gallinago									7	3	2				1	13
Lymnocryptes minimus										1						1
Limosa limosa			1	14												15
Numenius arquata	1		1	81		50	48			4	8		60	178	130	561
Tringa erythropus	3	1		6			1									11
Tringa totanus	35	10	4	52		6	22	2	15	42	122	10	10			330
Tringa nebularia		5				1	3									9
Tringa ochropus	4								1		1	1				7
Larus melanocephalus										1						1
Larus ridibundus	69	58	1	25			305	100	4	31	267	4	128	18	14	1024
Larus genei	22	1	2	25			50	378		22	189		2			691
Larus canus	1	3					3									7
Larus cachinnans	13	1		50		3	11	2	4	7	7	9	5			112
Sterna caspia				4				1		5						10
Sterna sandvicensis	12						8									20
Strix aluco	1															1
Athene noctua	1											2				3
Total	16429	992	1021	2229	361	1546	1920	1040	747	9268	7329	560	466	524	1423	45855

Minimise human disturbance

During the two spring-summer seasons 1995-1996 human disturbance was a major limiting factor. Concrete examples are several breeding attempts by *Sterna albifrons* in the coastal zone which unvariably failed after human intrusion. Little Terns are sensitive to disturbance (McNicholl 1975, Calado 1996, Fasola and Canova 1996). In 1996 birds started breeding on the sandbars between the Godulla lagoon and the Sea and on the sandy islands between the mouth of the Shkumbini River and the beach. In 1996 breeding attempts were made again on the sandbars and along the coast south of Sectori i Ri . In each case numerous footprints by humans and feral dogs were identified throughout the colonies after their abandonment and dozens of broken eggs found. This is particularly regrettable for this declining species for which Karavasta meets the Ramsar population criteria and it is clear that many other nesting birds suffer from disturbance as well. In fact we were surprised to find people literally everywhere, even in the most remote parts of the lagoon complex (for instance around the mouth of the Shkumbini) which we considered difficult to access. Some people used rudimentary rafts made with wood and plastic bottles to cross canals and other narrow parts of the wetland system. They did not seem to have any precise activity other than exploring the area, maybe to find good spots for fishing or to collect bird eggs for food.

Beside the coastal area, the islets in the inner lagoon are also vulnerable to disturbance. Disturbance can come from licenced fishermen who use the islands for a mid-day brake, particularly dangerous for bird clutches and broods which will then be exposed to the heat. There is also illegal fishing going on and tracks of people can be found throughout the lagoon. People departing after sunset into the lagoon on rudimentary drafts were seen on several occasions. It is clear that this activity by local people affects the nesting birds seriously.

It will not be possible to eliminate this type of disturbance but it can be better controlled. In the coastal zone tern colony sites must be declared temporary protected areas. Protection can be achieved through educational signs, patrolling and control of feral dogs. Because Little terns are characterised by low fidelity to individual colony sites (McNicholl 1975) such temporary protected areas are susceptible to change from year to year according to colony location.

Similarly, all the islets in the inner lagoon must be protected during the breeding season (from March through July), and landing there must be prohibited during this period. This will imply a daily surveillance, particularly at dawn and at dusk.

Finally, the problem affects also all the forested areas and a more efficient surveillance during the breeding season will be essential there as well. In the Kulari sector for instance local people were convinced that the aim of our visit at the end of May (!) was a hunting party. These people seemed to be used to encounters with Italian hunters outside the hunting season. Well protected zones within the forest area, in particular the alluvial forest bordering the Shkumbini on the left from the mouth until 5 km east, and the "protected" and fenced part of the mixte, coniferous and deciduous Divjaka forest, would favour the establishment of nesting territories by these birds which are extremely sensitive to disturbance. Along the Shkumbini this could also favour re-establishment of the formerly known colonies of the Great Cormorant (*Phalacrocorax carbo*), and herons (*Ardeidae*) in this sector (Vangeluwe *et al.* 1996). In other parts of the forest, in particular near the tourist area, illegal logging has become a major problem. Improved surveillance throughout the forest areas is essential.

Continue experimental management on certain islets in the inner lagoon

The rarity of suitable breeding sites, combined with disturbance are the major causes of nesting failure in colonial charadriiformes. The least disturbed sites, the islets of the inner lagoon, are not optimal for nesting terns and partincoles because they are largely covered by high and dense vegetation. The preliminary management carried out by T. Bino on one of the islands was very promising since it attracted high numbers of *Sterna albifrons* and *Sterna hirundo* which managed to nest successfully. We therefore recommend continuation of these management practices. These could focus on two islands in the north and on one in the south of the inner lagoon. Like this was done in 1996, management should aim at satisfying fundamental requirements by different species. Little terns will occupy bare parts covered with sand and gravel. Sand and gravel must be renewed each year in order to avoid that eggs get caught in mud after rain. This would prevent incubating birds to turn the eggs and finally cause abandonment of the clutches. Common Terns and Collared Pratincoles require low and scattered vegetation. The Pratincole likes to hide its eggs beneath vegetation such as Salicornia, protecting them in this way against avian predators. The management carried out in 1996 took into account these specific requirements.

The ornithological importance of Karavasta in winter

The 1995 and 1996 waterfowl census confirmed the international importance of this lagoon complex for wintering waterfowl. Based on bird numbers alone this wetland was found to meet a total of 6 RAMSAR Criteria concerning five species and the total number of wintering waterfowl. Karavasta can be considered as being the most important wintering area of Albania, both from a point of view of numbers of birds and species richness. In addition to waterbirds a diverse and abundant raptor population was observed (Tables 5 and 6).

In view of the extraordinary species diversity the different sectors i.e. inner lagoon, Godulla lagoon and the coastal areas, particularly around the mouths of the rivers Shkumbini and Semani, all have their importance. These habitats are complementary in the sense that many birds use them successively during the course of a 24 hour cycle. For example certain species of duck (*Anas clypeata* and *Anas penelope)* will roost in the main lagoon during daytime and feed on submerged vegetation of the Godulla lagoon at night.

Hunting

The complementary role by each of the different parts of the wetland complex makes it difficult to delineate confidently areas open for hunting. Ideally, hunting should be prohibited in the inner lagoon, the Godulla lagoon, sectors 3 and 4 in Figure 8, and the tamarisk lowlands, marshes and riverine forest around the mouth of the Shkumbini River. In the event that the whole of the inner lagoon cannot be protected from hunting, it will be essential to prohibit at least the use of boats. The inner lagoon is the most important zone for day roosts of ducks. Sector 1 in Figure 8 for instance is a privileged roosting area for *Anas penelope* (Tables 5 and 6). Numbers of this species at Karavasta exceed 1 % of the population in western Europe (Rose and Scott 1994) and this alone classifies Karavasta as a wetland of international importance according to the Ramsar criteria. However, very high numbers of *Pelecanus crispus*, a globally threatened species, were also recorded in this sector during both winters as well as high numbers of *Egretta alba* in 1996 (Tables 5and 6). Total numbers of these two species in the Karavasta complex also satisfy the Ramsar biogeographical population criteria. In addition the near forest area offers roosting sites for the wintering community of birds of prey which is of high conservation interest and without doubt vulnerable to hunting activity. These results and considerations justify a total exclusion of this sector from hunting.

* * * * *

References

Barbieri, F., Bogliani, G. and Prigioni, C. 1986. Note sull'ornitofauna dell'Albania. Rivista Italiana di Ornitologia 56: 53-66.

Bernardzik, H.A. 1930. Riesen Pelikane und ihre Kinder. 54 pp. Wien, Austria.

Bino, T., Tourenq, Ch., Kayser, Y., Busuttil, S.,Crozier, Dore,B.J., Bego, F. 1996. Recensements des oiseaux d'eau hivernants en Albanie (14-31 janvier 1996). Rapport Station Biologique de la Tour du Valat (France) et Museum des Sciences Naturelles de Tirana (Albanie):102 pp.

Bogliani G., Fasola M., Canova, L., Saino, N. 1994. Prey selection by parents and chicks of the Little Tern Sterna albifrons. Avocetta 18:

Calado, M. 1996. Little tern (Sterna albifrons) status and conservation at Ria Formosa Natural Park, Algarve, Portugal. Colonial Waterbirds 19 (Special Publication 1): 78-80.

Cramp, S., Ed. 1985. The Birds of the Western Palearctic, 4. Oxford: Oxford University Press.

Cramp, S. and Simmons, K.E.L., Eds. 1983. The Birds of the Western Palearctic, 3. Oxford: Oxford University Press.

Fasola M., Bogliani G., Saino N., Canova L. 1989. Foraging, feeding and time-activity niches of eight species of seabirds breeding on the coastal wetlands of the Adriatic sea. Boll. Zool. 56: 61-72.

Fasola M., Bogliani G. 1990. Foraging ranges of an assemblage of Mediterranean seabirds. Colonial Waterbirds 13: 72-74.

Fasola M., Canova L. 1992. Nest habitat selection by eight syntopic species of Mediterranean gulls and terns. Colonial Waterbirds 15: 169-178.

Fasola, M. and Canova, L. 1996. Conservation of tern and gull colony sites in northeastern Italy, an internationally important bird area. Colonial Waterbirds 19 (Special Publication 1): 59-67..

Gjiknuri, L. and Peja, N. 1992. Albanian lagoons: their importance and economic development. Pages 130-133 *in* Managing Mediterranean wetlands and their birds. (C.M. Finlayson, G.E. Hollis and T.G. Davis, Eds.) International Waterfowl and Wetlands Research Bureau (IWRB) Special Publication No. 20.

Grimmet, R.F.A. and Jones, T.A. 1989. Important Bird Areas in Europe. ICBP Technical Publication No 9. ICBP/IWRB/RSPB. Cambridge. U.K.

Hafner, H., Boy, V, Gory, G. 1982. Feeding methods, flock size, and feeding success in the Little egret *Egreta garzetta* and the Squacco heron *Ardeola ralloides* in the Camargue, southern France. Ardea 70: 45-54.

Hafner, H., Dugan, P.J., Boy, V. Herons and wetland in the Mediterranean: development of indices for quality assessment and management of Mediterranean wetland ecosystems. Final report to the Third Environment Research Programme of the Commission of the European Communities.

Hafner, H., Dugan, P.J., Boy, V. 1986. Use of artificial and natural wetlands as feeding sites by Little Egrets (Egretta garzetta L.) in the Camargue, southern France. Colonial Waterbirds 9: 149-154.

Hafner, H. and Fasola, M. 1992. The relationship between feeding habitat and colonially nesting Aredidae. Pages 194-201 *in* Managing Mediterranean wetlands and their birds. (C.M. Finlayson, G.E. Hollis and T.G. Davis, Eds.) International Waterfowl and Wetlands Research Bureau (IWRB) Special Publication No. 20.

Hafner, H., Dugan, P.J., Kersten, M. Wallace, J.P. 1993. Flock feeding and food intake in Little Egrets (*Egretta garzetta* L.): the effects on food provisioning and reproductive success. Ibis 135: 25-32.

Hafner, H., Kayser, Y. Pineau, O. 1994. Ecolgical determinants of annual fluctuations in numbers of breeding Little egrets *Egretta garzetta*

Hinrichsen, D. 1994. Coasts under pressure. People and the Planet 3: 6-9.

Hoffmann, L., Hafner, H., Salathé, T. 1996. The contribution of colonial waterbird research to wetland conservation in the Mediterranean region. Colonial Waterbirds 19 (Special Publication 1): 12-30.

Kayser, Y., Bino, T. et Gauthier-Clerc, M. 1995. Recensements des oiseaux d'eau hivernants en Albanie (17 janvier-7 février 1995). Rapport Station Biologique de la Tour du Valat (France) et Museum des Sciences Naturelles de Tirana (Albanie): 79 pp.

Kushlan, J.A. 1976. Site selection for nesting colonies by the American Whie Ibis *Eudocimus albus* in Florida. Ibis 118: 590-593.

Kushlan, J.A. 1978. Feeding Ecology of Wading Birds. Pages 249-297 *in* Wading Birds (A. Sprunt, J.C. Ogden, S. Winckler Eds.). research Report No 7 of the National Audubon Society. New York.

Kushlan, J.A. 1979. Feeding ecology and prey selection in the White ibis. Condor 81: 376-389.

Kushlan, J.A. 1992. Population biology and conservation of of colonial waterbirds. Colonial Waterbirds 15: 1-7.

Kushlan, J.A. 1993. Colonial waterbirds as bioindicators of environmental change. Colonial Waterbirds 16: 223-251.

McNicholl, M.K. 1975. Larid site tenacity and group adherance in relation to habitat. Auk 92: 98-104

Moser, M., Prentice, R.C., Van Vessem J. (Eds.) 1993. Waterfowl and Wetland Conservation in the 1990s- A Global Perspective. Proc. IWRB Symp., St. Petersburg Beach, Florida, U.S.A. International Waterfowl and Wetlands Research Bureau (IWRB) Special Publication No. 26, Slimbridge, UK, 263 pp.

Puzanov,V. 1954. Rendi Anseriformes ne vendin tone. Bul. Shkenc. Nat. 8: 71-72

Rose P.M. & Scott D.A. 1994. Waterfowl population estimates. IWRB Publication 29. International Waterfowl research Bureau, Slimbridge, UK.

Sadoul, N. 1996. Dynamique spatiale et temporelle des colonies de charadriiformes dans les salins de Camargue: implications pour la conservation. Thèse de doctorat de l'Université de Montpellier.

Saino N., Fasola M., Crucicchia E. 1994. Adoption behaviour in Little and Common Terns (Aves; Sternidae): chick benefit and parent's fitness costs. Ethology 97: 294-309.

Ticehurst, C.B. and Whistler, H. 1932. On the ornithology of Albania. Ibis (1932): 40-95.

Vangeluwe, D., Beudels, M.O. and Lamani F. 1996. Conservation status of Albanian coastal wetlands and their colonial waterbird populations. (Pelecaniformes and Ciconiiformes). Colonial Waterbirds 19 (Special Publication 1): 81-90.

