

Mediterranean Marine Avifauna

Population Studies and Conservation

Edited by

MEDMARAVIS

20, Rue Saint Martin, F-75004 Paris, France
and
96, Via S. Satta, I-07041 Alghero, Sardinia



Associazione Mediterranea per l'Avifauna Marina
Asociación Mediterránea para la Avifauna marina
Mediterranean Marine Bird Association
ASSOCIATION MEDITERRAENNE POUR L'AVIFAUNE MARINE
جمعية البحر الأبيض المتوسط للطيور البحرية

MEDMARAVIS is a non-profit scientific Association dealing with research and conservation of the Mediterranean Marine Avifauna

and

Xaver Monbailliu

20, Rue Saint Martin, F-75004 Paris, France



Springer-Verlag
Berlin Heidelberg New York London Paris Tokyo
Published in cooperation with NATO Scientific Affairs Division

Proceedings of the NATO Advanced Workshop on Population Dynamics and Conservation of the Mediterranean Marine Avifauna held at Alghero, Sardinia, March 26–30, 1986

ISBN 3-540-16092-2 Springer-Verlag Berlin Heidelberg New York Tokyo
ISBN 0-387-16092-2 Springer-Verlag New York Heidelberg Berlin Tokyo

Library of Congress Cataloging in Publication Data. NATO Advanced Research Workshop on "Population Dynamics and Conservation of the Mediterranean Marine Avifauna" (1986 : Alghero, Sardinia) Mediterranean marine avifauna. (NATO ASI series. Series G, Ecological sciences ; vol. 12) "Proceedings of the NATO Advanced Research Workshop on Population Dynamics and Conservation of the Mediterranean Marine Avifauna held at Alghero, Sardinia, March 26–30, 1986"—T.p. verso. "Published in cooperation with NATO Scientific Affairs Division." 1. Bird populations—Mediterranean Region—Congresses. 2. Birds, Protection of—Mediterranean Region—Congresses. 3. Birds—Mediterranean Region—Congresses. I. MEDMARAVIS (Association) II. Monbailliu, Xaver, 1948-. III. North Atlantic Treaty Organization. Scientific Affairs Division. IV. Title. V. Series: NATO ASI series. Series G, Ecological sciences ; no. 12. QL690.M43N38 1986 598.29'24'091822 86-28025
ISBN 0-387-16092-2 (U.S.)

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically those of translating, reprinting, re-use of illustrations, broadcastings, reproduction by photocopying machine or similar means, and storage in data banks. Under § 54 of the German Copyright Law where copies are made for other than private use, a fee is payable to "Verwertungsgesellschaft Wort", Munich.

© Springer-Verlag Berlin Heidelberg 1986
Printed in Germany

Printing: Druckhaus Beltz, Hemsbach; Bookbinding: J. Schäffer OHG, Grünstadt
2131/3140-543210

DISTRIBUTION, STATUS AND CONSERVATION OF THE MEDITERRANEAN GULL (*LARUS MELANOCEPHALUS*) IN GREECE

By Vassilis Goutner, Department of Zoology,
University of Thessaloniki, 540 06 Thessaloniki, Greece

Introduction

The Mediterranean gull is a species with relatively limited breeding distribution in Europe. Greece lies within the eastern European region where the species enjoys high breeding concentrations (Cramp & Simmons, 1983). Literature relevant to these birds in Greece is limited.

This paper was written in order to provide original data from recent field research with the purpose to contribute to our knowledge of this species and to promote its conservation.

Methods

Data on the breeding biology of the Mediterranean gulls were collected at two presently known northern Greek colonies: in the Evros delta from 1981 to 1985 and at Alyki in the 1985 breeding season. In the Evros delta the data are related to site selection (especially vegetation preferences), breeding population numbers, phenology and breeding success. Similar data were also taken at Alyki but to a lesser extent since much effort was put in ringing chicks just before flying: a total of 371 young ones were ringed using metal rings.

For diet analysis, regurgitations were collected during 1984 and 1985 from the Evros delta colonies. The availability of fish species in the lagoon where the colonies are located was studied with the help of local fishermen using several sampling techniques and appropriate nets. The fish material was identified at the Laboratory of Zoology in Thessaloniki and the insect material at the Department of Entomology of the National Museum in Prague, Czechoslovakia. Data on the distribution of the species in Greece are based upon various published and unpublished papers.

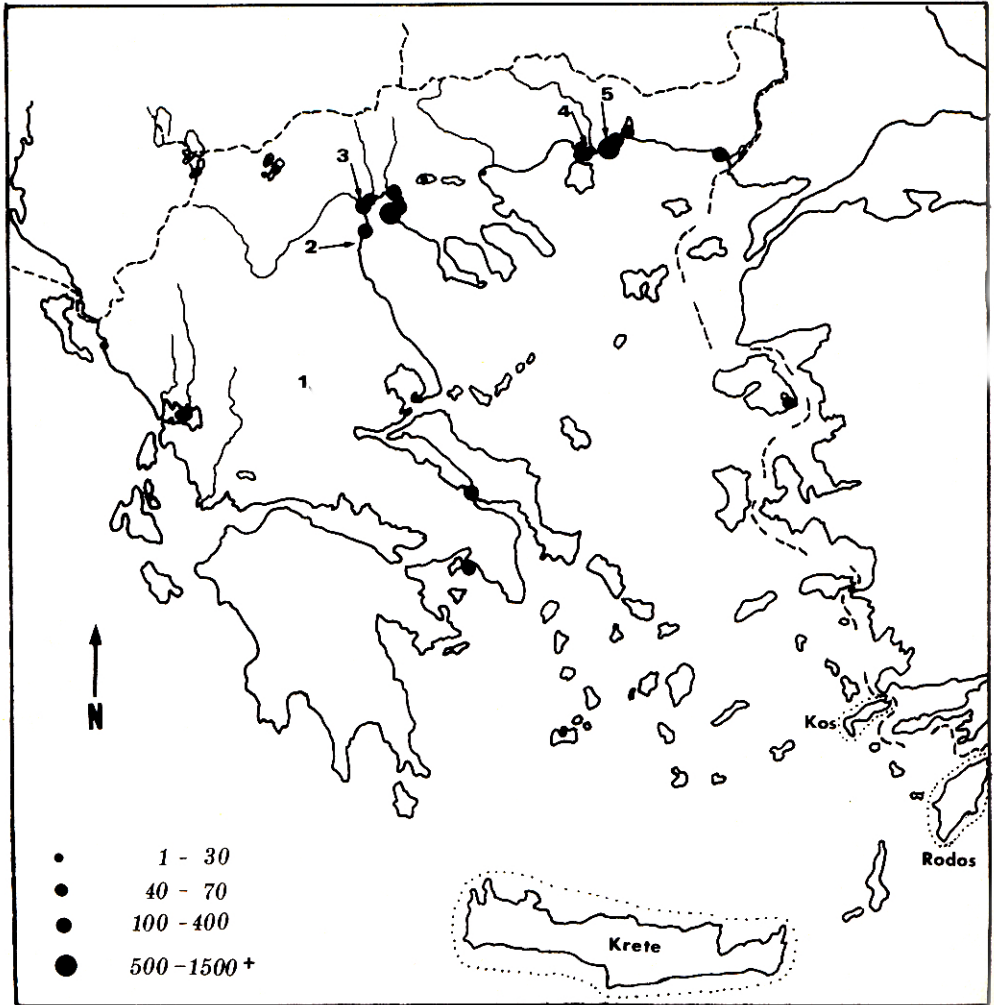


Fig. 1: Non breeding distribution (black dots) and former breeding sites (numbered indicators) of Mediterranean gulls in Greece. 1: Karla region, 2: Korinos, 3: Axios-Loudias delta, 4: Nestos delta region, 5: Porto Lago. Dotted line: southern limit of wintering areas.

Results and discussion

1. Distribution

1.1. Non breeding population

The areas in Greece where the Mediterranean gulls have been recorded during migration and winter are indicated in fig. 1. The early record by Kumerloeve (1957) refers to relatively small numbers of birds observed during early April and mid-September in the Gulf of Thessaloniki during 1953 and 1956 respectively. Nisbet & Smout (1956) state major movements through Bosphorus, Dardanelles and Aegean especially in September and according to Bauer et al. (1969), the Greek islands across the Turkish coast (up to Kos and Rhodos) are generally normal migrating and wintering areas whereas relatively small numbers winter in Crete. The zone along the Turkish coast coincides with one of the three well known migration routes through Greece. Other islands like Northern Sporades and Kyklades are rather accidentally visited by these gulls (Bauer et al., 1969).

Some unpublished manuscripts and some published literature (Schuster et al., 1959; Makatsch, 1963; Stubbs et al., 1980) as well as several personal observations, indicate that northern Greece and especially the regions of the Gulf of Thessaloniki, the Nestos delta and Porto Lago attract the main bulk of the migrating and wintering population (fig. 1). Within this region, most records in winter (mainly unpublished I.W.R.B. mid-winter counts) come from the Axios delta, whereas during the same period of the year limited numbers have been observed in western Greece (Joensen & Madsen, 1985).

Most reports indicate that bird movements are more intensive in April and these congregations in northern Greece may well relate to the arrival at the traditional breeding grounds. After the end of the breeding season (within the first fortnight of August) the largest groups have been observed at Porto Lago (Stubbs et al., 1980). However, their origin and destination are not yet known. Although it appears that the highest numbers of Mediterranean gulls have been observed in northern Greece, we must notice that the availability of records from the Aegean islands is very limited and more research must be done within this region.

1.2. Breeding population

The first breeding record of Mediterranean gulls in Greece is by Reiser 1905 (in Makatsch, 1963), according to which the birds were breeding at lake Karla, close to Lamia (fig. 1). This lake was drained in 1962 and lost forever as a breeding habitat for these gulls which however continued appearing there (Makatsch, 1968). The areas of Axios-Loudias delta, Korinos (Gulf of Thessaloniki), Porto Lago and Nestos delta constituted the only known breeding areas of these birds in Greece for at least the past 20-25 years (tab. 1, fig. 1). All of these colony sites were deserted due to habitat loss by agricultural development

Site Name	Number of pairs	Year	Literature
A. <u>DESERTED</u>			
Karla Lake	no data	1903	Reiser in Makatsch, 1963 Makatsch, 1968
Axios-Loudias delta	104	1966	Conradty & Hohlt, 1967
	no data	1967	Makatsch, 1978
	4,000	1973	Conradty, in lit.
	400	1976	Sterbetz, 1980
Korinos	no data	1961	Makatsch, 1963
Porto Lago	no data	1966	Conradty & Hohlt, 1967
	several hundreds	1982	Centre Ornithologique Rhône, in lit.
Nestos delta	104	1966	Conradty & Hohlt, 1967
	c. 1,000	1968	Bauer et al., in Cramp & Simmons, 1983
Macedonia (exact site not stated)	c. 250	1966	Makatsch, 1968
B. <u>PRESENT</u>			
Alyki	356	1975	Isenmann, 1975
	1,000	1980	Stubbs et al., 1980
	6,000	1981	Müller, in lit.
	2,500	1985	Personal observation
Evros delta	c. 845	1981	Goutner & Kattoulas, 1984
	c. 160	1983	Goutner & Kattoulas, 1984
	c. 220	1984	Goutner in press, b
	c. 1,000	1985	Goutner in press, b

Tab. 1: Recorded breeding sites and numbers of Mediterranean gull pairs in Greece.

including drainage and alterations of the flow of rivers. At Porto Lago, birds formed a large colony in 1983 at a site South West of Vistonis lake. It is possible that this region may still be used as a breeding area.

Nowadays, there are two well known breeding areas of the Mediterranean gulls. The first one, at Alyki, was established

in 1974 constituted of 356 pairs (Isenmann, 1975). Within the same year, the breeding site at the closeby Axios area was deserted. It is possible that a part of the population moved to Alyki. Despite the annual fluctuations in numbers of breeding pairs (tab. 1), this colony is today the largest one in the Mediterranean basin. The second colony in the Evros delta was established for the first time in 1981 (Goutner in press, a) and since 1983 its population has been increasing continuously (tab. 1).

2. Breeding Ecology

2.1. Colony site selection

- Alyki is a shallow saline lake of approximately 10 km² including saltmarshes and lagoons. A part of the lagoons is used for salt extraction, which has expanded ever since. The area is fully described in Stubbs et al. (1980). The Mediterranean gull colony was made on isolated islets within the lagoon during 1974 (Isenmann, 1975), 1980 (Stubbs et al., 1980) and 1985 (pers. observation). In 1979 the colony was established in the salt pans (Stubbs et al., 1980). The nests were built with the vegetation available on the islets. In 1974 this vegetation consisted of Salicornia sp., Hordeum maritimum and Aeluropus litoralis (Isenmann, 1975) whilst in 1985 this was Haloctenium strobilaceum.

- For the first time, during 1981, the birds in the Evros Delta bred on a part of an isolated coastal islet including low sand dunes covered by ammophilous and halophytic vegetation. The birds used this vegetation as well as dry plant material for nesting. This colony site was deserted in 1982 due to vegetation growth (Goutner, in press, a). Since 1983 the colony was established on an isolated islet in a delta lagoon used by local people as a fishpond (Goutner & Kattoulas, 1984 (photo 1). Here, during 1984 and 1985 the colonies were made with preference for high cover (>31%) halophytic vegetation clearly avoiding uncovered sites (Goutner in press, b). In 1985, a small colony of about 50 pairs started breeding at another site of the coastal islet where breeding took place in 1981. The birds also here preferred breeding in high cover vegetation (Goutner in press, b).

2.2. Heterospecifics

- We only dispose of recent data at the Alyki colony. During the 1985 breeding season we found 30 nests of Gull-billed terns (Sterna nilotica) and 23 of Slender-billed gulls (Larus genei) at a distance of c. 150 m away of the Mediterranean gull colony. These birds bred on the closest to the Mediterranean gull colony available islet. During summer, when the water level in the lagoon falls due to evaporation, the two islets form one island as they are separated by a very shallow strait of water in winter. However, these two species breed much later than the Mediterranean gull so that all the chicks of the latter are



Phot. 1: Colony of Mediterranean gulls in the Evros delta, 1985.

fledging whereas at the same time hatching of the former just started (end of June). No nests of Gull-billed terns and Slender-billed gulls were found in or around the Mediterranean gull colony.

● In the Evros delta, both islets (coastal and lagoon) where the gulls bred are very important sites for breeding of many hundreds of other larids and waders (Goutner, 1983, Goutner & Kattoulas, 1984). During the course of our study since 1981, we have seen that the change of colony sites by Mediterranean gulls was generally followed by most of other breeding larids (Goutner & Kattoulas, 1984). The establishment of the gull colony on the lagoon islet directly displaced breeding waders like avocet (Recurvirostra avosetta, Goutner, 1985) and rather indirectly other larids (Goutner & Kattoulas, 1984). We have never found nests of other larids within the colonies of Mediterranean gulls and their colonies were distinctly separated (Goutner & Kattoulas, 1984; Goutner in press a, b). During 1985 we found a nest of Mallard (Anas platyrhynchos) and two nests of Redshanks (Tringa totanus) made within the Mediterranean gull colony and very close to gull nests. Makatsch (1968) and Bauer et al. in Cramp & Simmons (1983) also recorded waders and larids breeding with Mediterranean gulls in the same locality.

Food	Dry weight (gr)	% on total food weight (323.3 gr)	Number in the sample
PISCES			
<u>Sea species</u>			
Cepola rubescens	65.4	20.2	23
Diplodus annularis	19.3	6.0	5
Sardin. a pilchardus	16.8	5.2	13
Pagellus acarne	15.8	4.9	5
Trachurus mediterraneus	9.2	2.8	3
Trigla sp.	3.4	1.0	1
Spiraca smaris	2.5	0.8	1
Symphodus sp.	1.8	0.5	1
Engraulis engrasiolus	1.3	0.4	2
<u>Brackish water species</u>			
Gobius jazo	51.9	16.0	17
Gobius sp.	24.4	7.5	26
Atherina sp.	2.9	0.9	2
Pomatoschistus sp.	1.5	0.5	1
Mugil sp.	1.4	0.4	1
<u>Fresh water species</u>			
Esox lucius	24.5	7.6	5
Leuciscus cephalus	6.5	2.0	1
Hypophthalmichthys sp.	6.0	1.8	2
Abramis brama	3.2	1.0	1
Cyprinus carpio	1.3	0.4	1
Perca fluviatilis	0.5	0.1	1
Unidentified fish	49.5	15.3	-
MOLLUSCA			
Sepia sp. (shells)	10.4	3.2	23
AMPHIBIA			
Rana ridibunda	3.8	1.2	2

Tab. 2: Diet of Mediterranean gull in the Evros delta colony during the 1984 breeding season.

2.3. Food

Data on the diet of the Mediterranean gull from the Alyki colony have been published by Isenmann (1975) indicating that these birds received a variety of terrestrial and marine food. The food analysis in the Evros delta indicates that:

Food	Frequency in sample	% Frequency	Range of number
<u>Aranea</u>	4	19.0	1 - 2
<u>Isopoda</u>	1	4.8	30
<u>Orthoptera</u>			
Gryllidae			
Gryllidae sp.	1	4.8	1
Tartarogryllus bur- digalensis	2	9.5	? - 20
Melanogryllus desertus	1	4.8	25
Acrididae	1	4.8	1
Tetrigidae	1	4.8	1
<u>Dermaptera</u>			
Dermaptera sp.	2	9.5	1 - 2
Labiduna riparia	1	4.8	2
<u>Heteroptera</u>			
Scutelleridae	3	14.3	1
Pentatomidae	3	14.3	1 - 2
Coreidae	2	9.5	1
<u>Lepidoptera</u>			
Noctuidae (larvae)	1	4.8	40
<u>Hymenoptera</u>			
Ichneumonidae	1	4.8	1
<u>Coleoptera</u>			
Carabidae	11	52.4	2 - 38
Dytiscidae	4	19.0	1 - 2
Hydrophilidae	4	19.0	1 - 2
Staphylinidae	2	9.5	1 - 5
Dynastidae			
Pentodon sp.	3	14.3	1 - 3
Oryctes nasicornis	1	4.8	1
Scarabaeidae	2	9.5	3 - 7
Elateridae			
Elateridae sp.	1	4.8	1
Agriotes sp.	1	4.8	1
Tenebrionidae	1	4.8	1
Cerambycidae			
Dorcadion sp.	2	9.5	1
Curculionidae	10	47.6	3 - 50
<u>Unidentified insects</u>	3	14.3	-

Tab. 4: Food items of Mediterranean gulls identified in 21 regurgitations during the breeding season of 1985 in the Evros delta colony.

- during the 1984 breeding season the gulls mainly received fish, constituting 95.6% of the weight of all food consumed. Nine sea water species, five brackish water and six freshwater species were identified (tab. 2). During 1985, the only fish found in the colony was: one specimen of *Atherina* sp. (1.5 gr dry weight), one of *Aphanius fasciatus* (l = 49.5 mm, w = 1.3 gr) and a piece of *Sardina pilchardus* (10 gr).
- The most numerous fish species collected by the gulls were *Gobius* spp., *Cepola rubescens* and *Sardina pilchardus* (tab. 2). *Cepola rubescens* is a species thrown back to sea from trawlers. We observed that groups of gulls from the colony frequently follow fishing boats. In tab. 3 are indicated the fish species available in the lagoon where the gull colony is located. Of these species, only the first five are of commercial value. A comparison with tab. 2 shows that no fish of commercial value forms part of the gulls' diet. Some of the gulls' food species are found in the lagoon. Especially *Gobius* spp. may well be taken from the lagoon. Observations indicate that the gulls sometimes feed in the lagoon but these cases are rare.
- Insects constituted the diet of the gulls during 1985 (tab. 4). The birds covered long routes to feed on insects, leaving the colony in the morning in North eastern direction and returning at dusk. The only record of birds (a flock of c. 150 gulls) feeding on insects in the delta area was in mid-May 1985 at a distance of c. 3,800 m from the colony in a cotton field. It was not possible to follow the flocks but a part of the birds may well feed in turkish territory.

<i>Dicentrarchus labrax</i>
<i>Sparus auratus</i>
<i>Mugil cephalus</i>
<i>Mugil ramada</i>
<i>Anguilla anguilla</i>
<i>Engraulis engrasiolus</i>
<i>Atherina boyerii</i>
<i>Sardina pilchardus</i>
<i>Aphanius fasciatus</i>
<i>Gobius</i> spp.

ab. 3: Fish species available in the Evros delta lagoon where the Mediterranean gull colony is located.

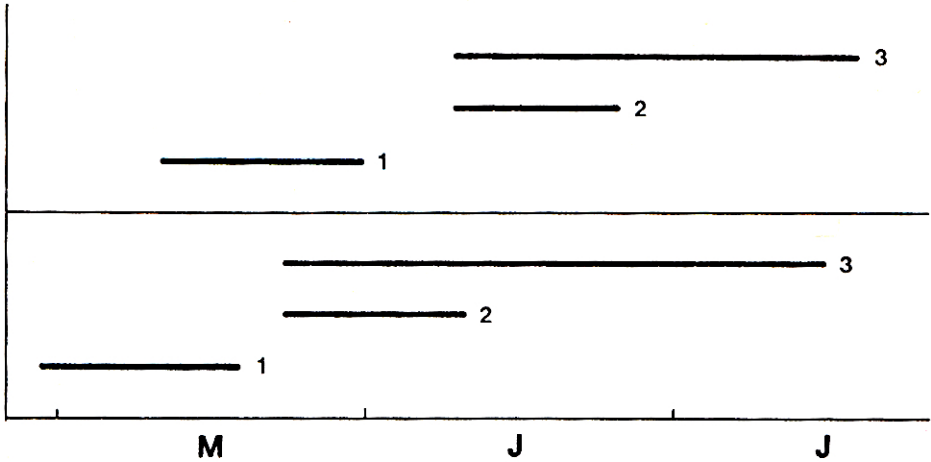


Fig. 2: Timing of breeding at Alyki (lower diagram) and Evros delta (upper diagram) colonies. 1: Laying, 2: Hatching, 3: Fledging period. Data: 1985 for Alyki and 1983-1985 for Evros delta.

Year	Clutch size	S.D.	No. of clutches	P
1981 (*)	2.24	0.73	835	0.05
1983	2.38	0.59	58	0.01
1984	2.62	0.53	217	0.001
1985	2.38	0.72	937	

(*) By Goutner in press, a.

Tab. 6: Clutch size of Mediterranean gulls in the Evros delta

	April	May	June	July
Alyki	14.12 (1.15)	19.93 (1.27)	23.50 (0.67)	25.81 (0.54)
Evros delta	13.40 (1.42)	18.42 (1.20)	22.95 (0.75)	25.95 (0.79)
t	1.89	4.14	2.62	0.70
Significance				
P	0.05	0.001	0.02	0.30

Tab. 5: Mean air temperatures (C°) during the breeding season at Alyki and Evros delta regions. Data for 24 years by Balafoutis (1977). Figures in parenthesis are standard deviations.

2.4. Timing of breeding

In 1985 the Alyki colony started laying at the end of April, considerably earlier than that in the Evros delta, generally starting at mid-May (fig. 2). These differences may be partly due to different temperature levels between the two areas especially in May (tab. 5).

In 1981 the gulls in the Evros delta started breeding exceptionally earlier: within the first week of May (Goutner in press, a). Makatsch (1968) recorded that during 1966 and 1967 in northern greek colonies these gulls started breeding by mid-May. The fledging period finishes almost simultaneously at both colonies (mid-July, fig. 2). This is mainly due to the fact that the Evros colony suffers many losses by predation late in season.

2.5. Breeding success

Data of clutch size are only available for the Evros delta colonies. The difference in clutch size is considerable from year to year. Tab. 6 indicates similar clutch size in 1983 and 1985. The differences between 1984 and 1985 may be partly due to different diets in these years (tab. 2 and 4).

Of the two colonies, the Alyki one is the most successful. There are no data for previous years but during 1985 we found that c. 2,500 breeding pairs produced c. 4,000 flying chicks: a success of c. 1.6 chicks per pair. Very few destroyed and/or addled eggs and dead chicks were found at the colony.

The Evros delta colony is less successful. Reasons for failure during the breeding season in 1981 have been described (Goutner in press, a) and it appeared that most losses took place in the egg stage during incubation due to predation. In 1981 the success was 0.8 chicks per pair. This success was lower during 1983 and 1984 being between 0.3 - 0.5 chicks per pair in both years. Like 1981, most eggs were predated and/or pecked open during interactions among gulls. In 1983 two very heavy storms took place during incubation resulting in many eggs rolling out of nests. In the lagoon colony predation of adult birds by foxes and jackals is very important. Their droppings and footprints were found among nests. In 1983, 35 adults were found decapitated on or beside their nests, thus preventing hatching of the eggs. One of these adults had been ringed in the Soviet Union (phot. 2). Similarly in 1984 and 1985, 6 and 11 adult gulls were found killed by mammal predators. These predators were able to reach the colony in summer when due to evaporation the water level fell considerably in the lagoon.

In 1985 the two colonies in the delta were absolutely unsuccessful. No young fledged. The small colony at the coastal islet was predated by Yellow-legged gulls (Larus cachinnans) at the beginning of the breeding season. The large lagoon colony was deserted at the end of June; of a total 937 nests made, 20 (2%) hatched, 100 (11%) disappeared and 816 (87%) were found and examined. The results are in tab. 7. Most eggs were again destroyed during interactions among gulls. Predation by other bird predators of the region (gulls, corvids) was unimportant.



Phot. 2: A nest, destroyed eggs, a dead chick and a decapitated adult of Mediterranean gull in the Evros delta colony, 1983. Note the ring on the leg of the bird.

Reasons of failure	No. of eggs	% on failed	% on laid
Pecked open or predated	742	42.6	33.2
Addled (liquid feel when handled)	290	16.6	13.0
Cracked	447	25.7	20.0
Failed to hatch with developed embryo	19	1.1	0.8
Deserted	236	13.6	10.6
Destroyed for unknown reason	7	0.4	0.3
Eggs total	1,741		2,231

Tab. 7: Reasons of failure of Mediterranean gull eggs during the breeding season of 1985 in the Evros delta colony.

Several eggs were "cracked" showing a long crevice between the two poles. It seemed that these eggs broke when the birds sat on them for incubation. 11 freshly hatched chicks were found dead in the nests.

There is no apparent explanation for such a failure. The proportion of eggs, other than predated, which did not hatch (45% of the total) was very great. The hatching failure may be due to pesticides as almost all of the gulls' food in 1985 constituted of insects. The closeby Gull-billed terns suffered from a similar breeding failure. Pesticides are also here the most probable cause as these birds also ate insects, while following the gulls at the feeding grounds. There may be a threshold after incubation: if no chicks are produced or if no massive hatching occurs, the birds desert the colony.

In case chemicals like PCB interferes during egg production through the food chain, deformities of the bill are frequent. Such deformity is the "cross bill" which has been observed in larids (Gilbertson, 1975). No similar deformity was observed till now in the Evros delta colonies but in Alyki a young Mediterranean gull was found having an upper bill deformity (phot. 3). Anyway breeding failure in the Evros delta colony will be better understood after analysis of some of the eggs which were collected after the desertion of the colony.



Phot. 3: Upper bill deformity of a young Mediterranean gull at Alyki colony, 1985.

3. Conservation

The above presented data indicate that at least five well known breeding habitats including the stronghold of the Mediterranean population have been deserted during the last 35 years. Nevertheless, the two colonies at Alyki and in the Evros delta are still constituting the main Mediterranean population with a total of 3,500 pairs in 1985. Agriculture is the main human activity that affects the greek population of Mediterranean gulls. Agriculture is not only directly responsible for habitat destruction but it seems also that pesticides cause breeding failure since an important part of these birds' diet is constituted of insects. Beside pesticides which will be a continuous threat in the next years, the existing colonies will also be threatened by further habitat loss.

The Alyki colony, situated on lagoon islets is threatened by expansion of the salt extraction pans within the lagoon. This expansion was intensified during 1985 and still continues. New dykes are being constructed across the lagoon. If these approach or cross the colony site, the birds will desert their islets. The expansion of the salinas is unauthorized and does not examine the effects on wildlife of the region. In 1980 the

surrounding scrub vegetation was destroyed by bulldozer and fire by local people since they want to use the area for housing purposes. This led to the destruction of a rare habitat and killed at least 10,000 tortoises (Testudo hermanni) (Stubbs et al., 1980). Thanks to governmental measures this destruction stopped but control must also be enacted to halt the salt work expansion. We submitted a proposal to World Wildlife Fund to study whether the Alyki should be included in the greek list of Ramsar wetlands if no serious protection measures are put into action immediately. The desertion of this site frequented by Mediterranean gulls, Slender-billed gulls, Gull-billed terns, Little terns, Avocets, Pratincoles and other rare wildlife will be rather a matter of time.

The Evros delta colony is now situated on an isolated islet within a very productive area for fish farming. It is quite possible that this use of the lagoon will continue, thus preserving the natural habitat. Additionally, this islet is not grazed by herds during the breeding season in contrast to all the other islets of the same lagoon, an activity resulting in massive destruction of many hundreds of rare wader nests like avocets and pratincoles (Goutner, 1983, 1985). However, there are propositions by local people to cease this use of the lagoon as, due to bad management, sea salt affects the surrounding cultivations. Other propositions by local fishing authorities suggest pouring brackish water in the lagoon and simultaneously closing its entrance off from the sea, an action that should lead to flooding of the islets in the lagoon and loss of the gulls' habitat.

The potential breeding area of the gulls at the coastal islets of the delta, which is also a breeding habitat for many hundreds of other larids and waders, is seriously endangered. This is due to the proposed construction of a huge fishpond by connecting the coastal islets with the mainland. In 1978 biologists from the biological station of Tour de Valat invited by the government to propose conservation measures for the Evros delta, clearly expressed the opinion that such a construction would not only result into an inefficient fishpond but also destroy the few remaining wildlife refuges in the delta. In 1984, during a governmental project for boundary delimitation of national Ramsar wetlands we proposed that a fishpond - if constructed - should be made in such a way that free recycling of sea water will preserve the hydrological conditions within the delta without disrupting the isolation of the coastal islets. However, we are afraid that the project will finally be constructed by the same developer who has already provided many examples of unnecessary destruction of the Evros delta. Despite the fact that the local authorities are increasingly aware of the conservation interests of the wetlands, in a few years the previously famous Evros delta will be transformed into a dry desert without wildlife.

Acknowledgements

I am grateful to Sotiris and Christos Goutner, Yannis Pouloupoulos, Dimitris Goutsouras, Alexis Mehtidis and George Mihalakakis for valuable aid in field work. Also to Mr. Byron Antipas and the Hellenic Society for the Protection of Nature for permitting me staying at the Biological Station in the Evros delta. I am especially obliged to Prof. Dr. P.S. Economides for identification of fish material and to Dr. A. Cejchan, Dr. J. Jezek, Dr. S. Bily, Dr. Jelinek, Dr. I. Kovar, Dr. J. Macek and Dr. V. Svihla (National Museum in Prague, Department of Entomology) for identification of insect material. Special thanks to Dr. Jan Jezek for kindly facilitating my stay in Prague and to George Handrinos (Hellenic Ornithological Society) for providing me many published and unpublished articles. Finally many thanks to the local fishermen in the Evros delta for their collaboration.

References

- Balafoutis, H.I. (1977). The climate of Macedonia and Western Thrace. Doctoral dissertation, Univ. of Thessaloniki.
- Bauer, W.; Helversen, O.v.; Hodge, M. & Martens, J. (1969). Catalogus faunae Graeciae. Paris II, AVES. Kanellis, Thessaloniki.
- Conradty, P. & Hohlt, G. (1967). Zur Kenntnis der Vogelwelt Nordgriechenlands. II. Anz. Orn. Ges. Bayern 8: 45-51.
- Cramp, I. & Simmons, K.E.L. (eds.) (1983). The birds of the Western Palearctic. Vol. III. Oxford Univ. Press.
- Gilbertson, M. (1975). A Great Lakes tragedy. Nature Canada 4 (1): 22-25.
- Goutner, V. (1983). The distribution of the waders (Charadrii) in the Evros delta (Greece) during the breeding season. Sci. Annals. Fac. Sciences, Univ. Thessaloniki 23: 37-78.
- Goutner, V. & Kattoulas, M. (1984). Breeding distribution of Gulls and Terns (Laridae, Sternidae) in the Evros delta (Greece). Seevögel 5 (3): 40-41.
- Goutner, V. (1985). Breeding ecology of the avocet (Recurvirostra avosetta L.) in the Evros delta (Greece). Bonn. Zool. Beitr. 36 (1/2): 37-50.
- Goutner, V. (in press a). The ecology of the first breeding of the Mediterranean gull (Larus melanocephalus, Temminck, 1820) in the Evros delta (Greece). Ökologie der Vögel.
- Goutner, V. (in press b). Vegetation preferences by colonies of Mediterranean gulls (Larus melanocephalus) and Gull-

billed terns (*Sterna nilotica*) in the Evros delta. See-vögel.

- Isenmann, P. (1975). Contribution à l'étude de la biologie de reproduction de la Mouette mélanocéphale Larus melanocephalus. Nos Oiseaux 33: 66-73.
- Joensen, A.H. & Madsen, J. (1985). Waterfowl and raptors wintering in wetlands of western Greece, 1983-1985. *Natura Jutl.* 21 (11): 169-200.
- Kumerloeve, H. (1957). Séjour et passage de la Mouette mélanocéphale (Larus melanocephalus Temminck) en Mer Egée, dans les Dardanelles et le Bosphore. *Alauda* 25 (2): 143-145.
- Makatsch, W. (1963). Ornithologische Beobachtungen in Griechenland. *Zool. Abh.* 26 (8): 135-186.
- Makatsch, W. (1968). Die Möwen Griechenlands. *Natur und Museum* 98 (6): 221-230.
- Makatsch, W. (1978). Zur augenblicklichen Situation der Vogelwelt Griechenlands. *Nature (Hel. Soc. Prot. Nature)* 13: 29-33.
- Nisbet, I.C.T. & Smout, T.C. (1956). Observations de la migration d'automne de Larus melanocephalus en Grèce et Turquie. *Alauda* 24: 306-307.
- Schuster, S.v.; Knötzsch, G. & Jacoby, H. (1959). Ornithologische Beobachtungen in Macedonien, Thrazien und Mittelgriechenland. *Vogelwelt* 12: 170-179.
- Sterbetz, I. (1980). Notes from Macedonia and Greece. *Larus* 31/32: 427-439.
- Stubbs, D.; Hailey, A.; Tyler, W. & Pulford, E. (1980). Expedition to Greece, 1980. *Univ. of London, Nat. Hist. Society.*