Vegetation Preferences by Colonies of Mediterranean Gulls *(Larus melanocephalus)* and Gull-billed Terns *(Gelochelidon nilotica)* in the Evros Delta

By Vassilis Goutner

1. Introduction

Though within their normal range of distribution, Mediterranean Gulls *(Larus melanocephalus)* first bred in the Evros delta in 1981 (GOUTNER, in press). Since then these birds and the usually breeding Gull-billed Terns *(Gelochelidon nilotica)* have made colonies close together at a saltmarsh (GOUTNER 1984). Habitat preferences of these birds with reference to vegetation are found in the literature (NIETHAMMER 1942, DEMENTIEV & GLADKOV 1951, DE NAUROIS 1959, GLOE 1974, ISENMANN 1975, MØLLER 1981, CRAMP & SIMMONS 1983). However I have not found any quantitative study on how and in what degree these birds use the available vegetation in their colonies. This paper, written to contribute to this direction is based on part of the data obtained during an ecological study of the Evros delta Larids in the 1984 and 1985 breeding seasons.

2. Study area and Methods

The breeding area of both species was an isolated islet in a fishpond area. In 1985 a part of the Mediterranean Gull population also bred at a coastal islet of the delta. Description of these areas is given in GOUTNER & KATTOULAS 1984, GOUTNER 1985, in press.

The colonies of the two species were constructed at the same locality, on a peninsula of the saltmarsh islet (c. 4.2 ha), but they were distinctly separated. No nests of each species were made in the colony of the other. In 1984, 217 pairs of Mediterranean Gulls bred in an area of c. 0.06 acres and 27 pairs of Gull-billed Terns bred scattered around the Gulls' colony. In 1985 937 pairs of Gulls and 66 of Terns bred in such a way that their colonies were separated by an almost uncovered area of c. 0.13 ha where no nests were made. The Gulls totally occupied c. 0.21 acres and the Terns 0.22 acres.

The vegetation around the nests was measured by a 50x50 cm quadrat separated in 25 sub-quadrats 10x10 cm by metal cords. Each nest was placed in the central square and the total cover and plant species were recorded. All the Tern nests and those of Gulls' made at the coastal islet were measured. To sample the dense saltmarsh Gull colonies we worked on representative sample of the nests. We used the above mentioned procedure on nests along parallel transects – within the limits of the colonies – which were perpendicular to the vegetation features (e.g. *Halimione* and *Halocnemum* bunches, uncovered sites etc.) crossing the colonies and were extending along the peninsula.

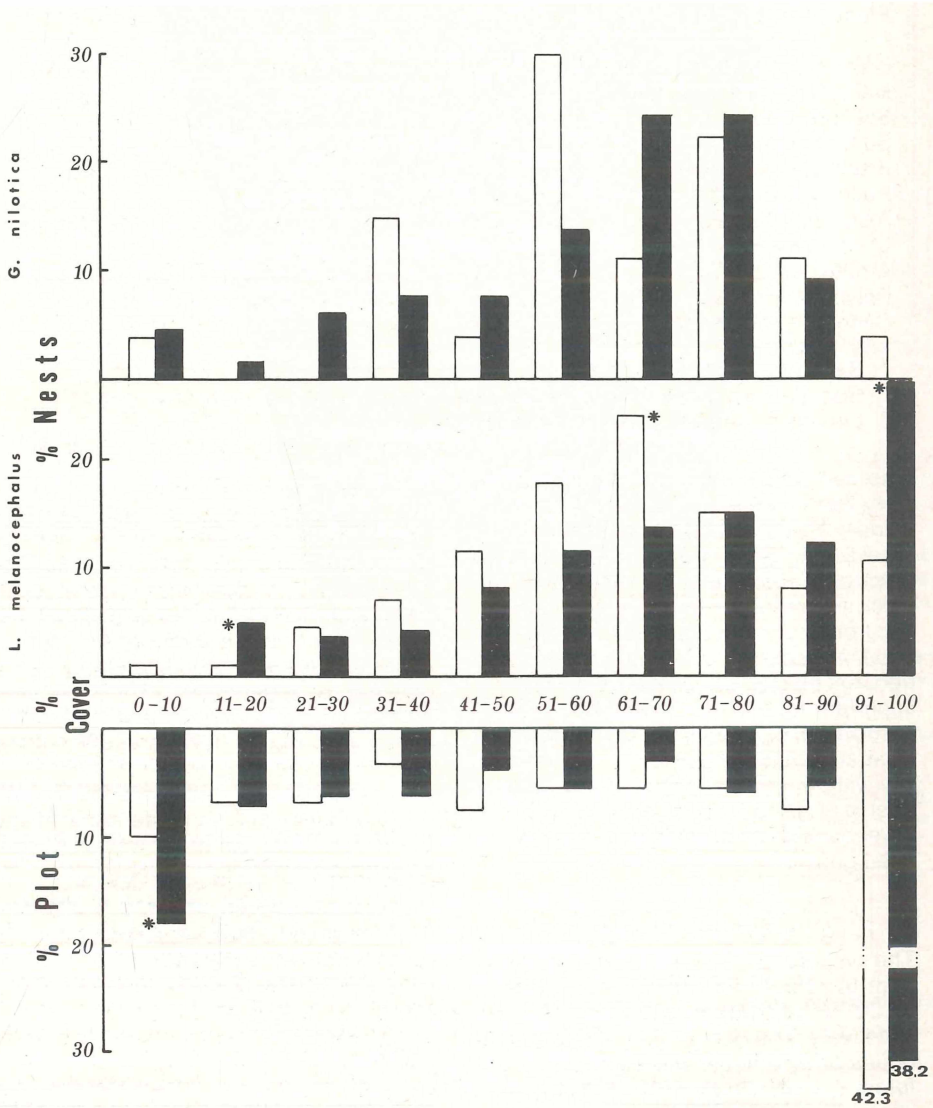

Fig. 1: Percent frequencies of cover categories at *L. melanocephalus* and *G. nilotica* nests in comparison to those in the study plot of the saltmarsh habitat. Open columns: 1984; closed columns: 1985. An asterisk indicates significant difference.
Prozentuale Häufigkeiten der Bedeckungskategorien an den Nestern von Schwarzkopfmöwen *(Larus melanocephalus)* und Lachseeschwalben *(Gelochelidon nilotica)* im Vergleich zu jenen der Brutareale in der Salzwiese. Helle Säulen: 1984; schwarze Säulen: 1985. Ein Stern gibt signifikante Unterschiede an.

This procedure was carried out between 5–25 June, that is after the clutches had been completed. For comparison with the available vegetation we sampled the breeding area where all colonies were included (thereafter called as plot) by the same quadrat making a zigzag way along this. We kept data on total cover, plant species, partial cover of each and their height as well.

Statistic included chi-square tests.

3. Results

3.1. Saltmarsh habitat

3.1.1. Plot

The study plot was 0.40 ha in 1984 and 0.81 ha in 1985. The availability of cover categories (0–100%) was similar each year with exception of the category 0–10% which was significantly larger in 1985 ($P < 0.02$) rather due to change of the plot extension (Fig. 1). The mean cover for the two years was 65.6% and 59.1% respectively.

Tab. 1: Comparison of the vegetation around the Mediterranean Gulls and Gull-billed Terns' nests to that in the breeding area (plot) of the saltmarsh habitat.
Vergleich der Vegetation im Bereich der Nester der Schwarzkopfmöwen und der Lachseeschwalben zu jener im Brutareal der Salzwiese.

	Frequency of occurence (%)				PLOT					
	L. melanocephalus		*G. nilotica*		Freq. of occurence (%)		Mean cover (%)		Range of heights (cm)	
Plant species	1984 n=113	1985 n=357	1984 n=27	1985 n=66	1984 n=149	1985 n=207	1984 n=149	1985 n=207	1984 n=149	1985 n=207
Halocnemum strobilaceum	77.0	44.0	74.1	84.8	49.7	51.2	23.14	21.64	1–38	5–31
Halimione portulacoides	26.5	42.3	11.1	0.0	38.9	31.4	27.02	20.89	12–40	14–57
Salicornia spp.*	60.2	22.1	63.0	10.6	36.2	20.3	11.86	4.46	1–30	5–35
Suaeda spp.**	12.4	3.1	37.0	7.8	6.7	7.7	0.47	1.11	1–18	3–31
Artemisia monogyna	0.0	32.5	0.0	0.0	8.7	12.0	3.93	6.65	20–61	23–60
Puccinellia festuciformis	1.8	0.0	3.7	1.5	0.0	1.4	0.00	0.46	15	12–45
Aeluropus litoralis	0.9	0.0	0.0	7.8	0.0	5.3	0.00	2.83	15	10–26
Limonium spp.***	0.0	0.3	0.0	0.0	0.7	3.9	0.01	0.58	16	22–42
Atriplex tatarica	0.0	0.0	3.7	0.0	0.0	–	0.00	–	15	–
Polypogon monspeliensis	2.6	0.0	0.0	0.0	2.0	–	0.02	–	11–20	–
Cynosurus echinatus	0.0	2.8	0.0	0.0	–	0.9	–	0.21	–	16

* Salicornia europaea & Salicornia fruticosa (Arthrocnemum fruticosum).
** Suaeda maritima & Suaeda splendens.
*** Limonium gmelinii & Limonium bellidifolium.

Fourteen plant species were found within plot (Tab. 1) of which *Halimione portulacoides, Halocnemum strobilaceum, Salicornia spp., Suaeda spp.*, and *Artemisia monogyna* (especially in 1985) were the most important in terms of frequency of occurence and coverage (except *Suaeda spp.*). Although *H. portulacoides* was less frequent than *H. strobilaceum* it was more important for the plot cover. This plant – associated by the high *A. monogyna* – covered extensive stripes of ground usually without spaces among plants in contrast to *H. strobilaceum*, present in form of lower bunches separated by wide unvegetated gaps.

3.1.2. *Larus melanocephalus*

The vegetation around nests covered from 0–10% to 91–100% with means of 63.2% and 69.9% in 1984 and 1985 respectively. The distribution of cover categories around nests was significantly different than this in plot ($P < 0.001$ in both years, Fig. 1). The Gulls nested in generally high cover, the preference starting within 31–40% cover category (Fig. 1). Especially for the 91–100% cover category, which was the mostly available in the plot, there were significantly more gull nests in 1985 ($P < 0.001$) although the availability of this category was similar in both years ($P > 0.3$). However, it is important to notice that the difference in prefence of generally high cover (≧ 31%) was not significant between years ($P > 0.05$).

In terms of frequency of occurrence and coverage *H. strobilaceum, H. portulacoides, Salicornia spp., A. monogyna* (1985) and *Suaeda spp.* (1984) were (like plot) the most important plants. There was an apparent increase to the frequencies of *A. monogyna* and *H. portulacoides* near nests in 1985 and decrease of the rest of the above mentioned plant species.

3.1.3. *Gelochelidon nilotica*

The vegetation around nests covered from 0–10% to 91–100% with means of 60.9% and 59.0% in 1984 and 1985 respectively. The differences within each cover category were not significant between years (in the 0.05 level of significance). There was significantly more vegetation of high cover (31–90%) near nests than in plot in general ($P < 0.001$ in both years, Fig. 1). 93% and 88% of the nests were included within this range of cover in 1984 and 1985 respectively. Almost abolute lack of preference in the 91–100% cover category was very characteristic, especially in 1985 (Fig. 1).

Of the plant species present, *H. strobilaceum* was (like plot) the most frequently encountered plant near nests (Tab. 1). *Salicornia spp.* and *Suaeda spp.* were more important in 1984 and the dense *H. portulacoides* was of limited importance in 1984 and absent in 1985. Similarly, *A. monogyna* was absent around nests and *A. litoralis* was of importance only in 1985 (Tab. 1).

3.2. Coastal habitat

3.2.1. Larus melanocephalus

The study plot was an area 0.46 ha with cover ranging from 0–10% to 91–100% and a mean of 21.2%. Near nests the cover ranged from 0–10% to 81–90% with a mean of 39.5%. High cover (≧ 31%) there occured more frequently in the samples of nests than those of plot ($P < 0.001$, Tab. 2).

Ten plant species were found in the plot. Of these, *Arthrocnemum fruticosum* and *Halimione portulacoides* were by far the most important plants in terms of frequency of occurence and coverage (Tab. 3). *H. portulacoides* was more important near nests rather due to providing better cover than *A. fruticosum* which, although more frequent within plot, was widely dispersed providing less advantages for nest cover.

4. Discussion

In the study plots both Gulls and Terns displayed a distinct preference of nesting in dense vegetation and avoiding of uncovered sites. It is known that these birds may breed in habitats with little or no vegetative cover (DEMENTIEV & GLADKOV 1951, DE NAUROIS 1959, MØLLER 1981) a fact possibly related to the availability of breeding areas within these particular regions. Preference of vegetation and/or other features of the breeding habitat is known to other Larids apparently for egg and young protection (BLOKPOEL et al. 1978, BURGER & GOCHFELD 1981) although frequently enter factors like predation and flooding (BURGER & LESSER 1978, 1980). Although protection from flooding has been observed to be a deciding factor to colony site selection of these birds at the coastal habitat of the delta (GOUTNER, in press), during this study predation on Mediterranean Gulls correlated rather to colony size than vegetative cover (GOUTNER in preparation).

Of the data analysis it appears that the shift of the peak cover category in the Gull saltmarsh colony – from 61–70% in 1984 to 91–100% in 1985 – may simply relate to the considerable (23%) increase of their population at the breeding area. Thus, provided that these birds avoided unvegetated sites, a part of the breeding population moved to the mostly available category (91–100%). At the other side, there was no significant difference to the preference of generally high (≧ 31%) cover between Gulls and Terns at the saltmarsh colony ($P > 0.9$ for both years). There was

important difference to the preference of the 91–100% category avoided by Terns which also avoided particular plant species like *H. portulacoides* and *A. monogyna*. It appears that the type of vegetation was more important to Terns than to Gulls. It is possible such differences to relate with the size of these birds. The Terns are considerably smaller than Gulls and preference of very high and/or dense vegetation should reduce sight among incubating birds. This results in reduction of the social stimulation and group action (PALMER 1941).

Finally it is rather difficult to say in what degree vegetation preferences of the birds at the large saltmarsh colony are true as in many colonies they may be obscured by competition and behavioural factors such as group adherence and site tenacity (AUSTIN 1949, 1951).

5. Summary

Quantitative measurement of vegetation was done on *Larus melanocephalus* and *Gelochelidon nilotica* nests in colonies during the 1984 and 1985 breeding seasons. The Gulls in both saltmarsh and coastal habitats preferred dense vegetation of 31–90% cover categories and, in the saltmarsh habitat, also the 91–100% category especially in 1985. In this colony the use of high cover (≧ 31%) was similar each year. In the same habitat the Terns also preferred high cover however avoiding the 91–100% category. The type of the vegetation present mostly affected the Tern preferences. These preferences are briefly discussed.

6. Zusammenfassung

Vegetationspräferenzen durch Kolonien der Schwarzkopfmöwe *(Larus melanocephalus)* und der Lachseeschwalbe *(Gelochelidon nilotica)* im Evros Delta.

Während der Brutzeit in 1984 und 1985 wurde an Nestern der Schwarzkopfmöwe und der Lachseeschwalbe in Kolonien die Vegetation quantitativ erfaßt. Die Möwen bevorzugten sowohl in der Salzwiese als auch im küstennahen Standort dichte Vegetation mit 31–90-%-Bedeckungskategorien; im Salzwiesen-Standort wurde 1985 besonders die 91–100-%-Kategorie gewählt. Innerhalb dieser Kolonie war die Wahl größerer Bedeckung (größer als 31%) in beiden Jahren ähnlich. In der Salzwiese bevorzugte die Lachseeschwalbe ebenfalls höhere Bedeckung, obwohl die 91–100-%-Kategorie gemieden wird. Die Art der vorhandenen Vegetation beeinflußt weitgehend die Präferenzen der Lachseeschwalbe. Diese Präferenzen werden kurz diskutiert.

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6. Literature

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Tab. 2: Percent frequency of cover categories *L. melanocephalus* nests in comparison to those in the study plot of the coastal habitat, 1985.
Prozentuale Häufigkeit der Bedeckungskategorien der Schwarzkopfmöwen-Nester im Vergleich zu jener des Untersuchungsareales des küstennahen Habitates, 1985.

% Cover Categories	Frequency Nests (n = 35)	Plot (n = 117)
0–10	20.0	49.6
11–20	5.7	20.5
21–30	11.4	9.4
31–40	11.4	5.2
41–50	8.6	1.7
51–60	25.7	3.4
61–70	8.6	0.8
71–80	5.7	0.8
81–90	2.9	0.8
91–100	0.0	7.8

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Tab. 3: Comparison of the vegetation around the *L. melanocephalus* nests to that in the study plot at the coastal habitat, 1985.
Vergleich der Vegetation im Bereich der Nester der Schwarzkopfmöwe zu jener im küstennahen Untersuchungsareal, 1985.

Plant species	Nests % Freq. (n = 35)	PLOT % Freq. (n = 117)	PLOT % part cover	PLOT Range of heights (cm)
Arthrocnemum fruticosum	42.9	64.1	8.99	2–47
Halimione portulacoides	71.4	29.0	10.75	4–60
Artemisia monogyna	2.8	3.4	0.23	16–30
Fragmites communis	14.3	0.8	0.02	35–50
Xanthium strumarium	11.4	3.4	0.21	4–12
Aeluropus litoralis	2.8	1.7	0.08	13–15
Salsola soda	0.0	0.8	0.02	6
Limonium bellidifolium	0.0	6.0	0.85	11–39
Juncus sp.	0.0	0.8	0.03	69
Puccinellia festuciformis	0.0	0.8	0.00	40