

THE DISTRIBUTION OF THE WADERS (CHARADRII) IN THE EVROS DELTA (GREECE) DURING THE BREEDING SEASON

By

V. GOUTNER

*Department of Zoology, University of Thessaloniki,
Thessaloniki, Greece*

Abstract: *In the Evros delta 31 species of waders were observed to come during the breeding seasons of the years 1979-1982. Nine of these species were breeding whereas the least passed during spring migration or came for molting in the summer. The migration movements took place between mid-March to mid-May. Some species were seen more frequently at the coastal region whereas others more at the mud-flats. The distribution of the waders was readily related to feeding and the pattern of distribution was affected by human interference on the biotops. The food organisms were mainly bivalve molluscs, annelid worms, amphipods and insects.*

INTRODUCTION

Despite the fact that the Evros delta is one of the most famous birding places all over the world, very few ornithological studies have been carried out. The only significant reports about the waders are given in Bauer & Müller (1969) and Bauer et al. (1969).

This paper constitutes a part of the results obtained during our general ecological study of the delta. Its purpose is to provide detailed data on the existence and distribution of the waders from March to August.

STUDY AREA

The Evros delta (Fig. 1) extends about 15.000 ha. The river Evros is divided close to the village Poros into two branches. Because of its floods the freshwater lakes Gala (in Turkey) and Nimphon were formed. The heavy load of silting materials brought to the estuary has been the reason of the shallowness and the multifarious formation of the coastal region. The sweet and salty waters and also the geo-

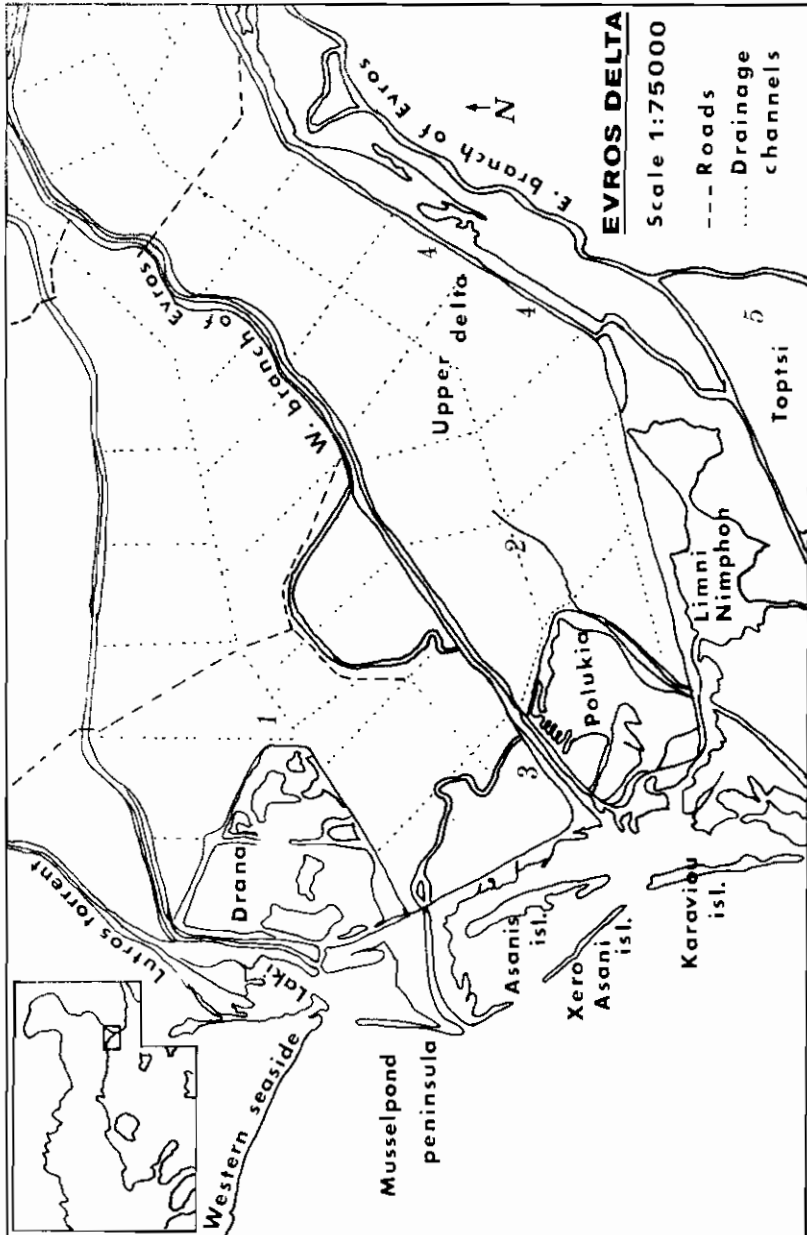


Fig. 1. Map of the Evros delta.

graphical position of the delta are the reason for the development of its characteristic vegetation (Babalonas 1979). The high variety of the delta biotops are described in detail elsewhere (Goutner 1983). For the present study the fishpond areas of Drana and Palukia were of special significance. So were the surrounding mudflats and the coastal islets.

Drana and Palukia

Their extension is about 400 ha and 300 ha respectively and both are enclosed by dykes. They are connected with the sea by narrow openings constructed at their western sides. At the interior of Drana there are islets covered by halophytic vegetation. Some of these have very low height from sea level.

Coastal islets

They constitute low sand dunes stabilized by ammophile plant species. Halophytic vegetation exists there, as well. Similar biotops are also found at the western coastal region of the delta.

Mudflats

They are level areas covered by shallow rainwaters and seawaters gathered there mainly from channels. These waters are more or less brackish depending on the proximity and connection with the sea.

Biotop alterations

Agriculture and grazing mainly affected the biotops of the delta. The draining works with the purpose of obtaining land for agriculture started between 1950 and 1960. However, they were continued in increasing degree in the recent years, especially in 1980. This resulted in the lowering of the water level in many areas (3, 4 and 5 in Figure 1). After April 1980, the drainage of the waters were not under control as it was during the other years. So, some areas were flooded (1 and 2 in Figure 1) and the waters remained there until mid - August whereas they evaporated at any other mudflat.

The main unfavourable results of grazing in delta are the degradation of the vegetation and destruction of the nests of ground nesters due to trampling.

MATERIALS AND METHODS

Field visits were made almost daily from the beginning of March up to the end of August from 1979 to 1981 and partly in 1982. Obser-



Fig. 2. Distribution of the Oystercatcher *Haematopus ostralegus*.

vations were made mainly from the dykes with the use of 10 x 50 binoculars and a 20 - 60 x 80 telescope. Data were collected on the numbers and movements of the waders at each area. The number of the pairs of the breeding waders was found from frequent visits at the nesting sites. During these visits notes were also kept on the reasons of egg and chick losses. A research programme was made including combination of observations on feeding behaviour with sampling of foods at sites of intensive feeding. Samples were taken at the mudflats scraping the bottom with the use of an appropriate net (similar to that shown in Dowdeswell 1967, page 75). At the coastal region for the same purpose, cores with 10cm height and 10cm base diameter were used. Digging of the substrate was sometimes used in 10cm depth in areas 25 x 25cm. The organisms were separated by shifting and preserved in formalin 10 % until identification.

RESULTS

Distribution of the waders

Haematopus ostralegus Στρειδοφάγος, *Oystercatcher*

The activities of the Oystercatchers were localized only at the coastal region and not inland as it happens in other areas (Bubnov 1959, Heppleston 1972) (Fig. 2). The breeding population of the delta consisted of about 30 pairs. Most of these were breeding on the coastal islets. A few were breeding at the surroundings of Drana and Palukia. A small non-breeding population remained in the delta during the breeding season. The grouping of these birds, indicating the end of the breeding season, started in the first fortnight of June. At that time bird gatherings were seen at the mudflats which still had waters and at the coastal region as well. In this period the population of the delta increased with birds coming from elsewhere.

Charadrius hiaticula Αμμοσφουριχτής, *Ringed Plover*

Few Ringed Plovers were observed from April to June at the coastal region and at the mudflats of the upper delta (Fig. 3). Possibly, they were vagrants. Larger numbers were encountered in September during the autumn migration.

Charadrius dubius Ποταμοσφουριχτής, *Little Ringed Plover*

Few Little Ringed Plovers were seen mainly in April and May.

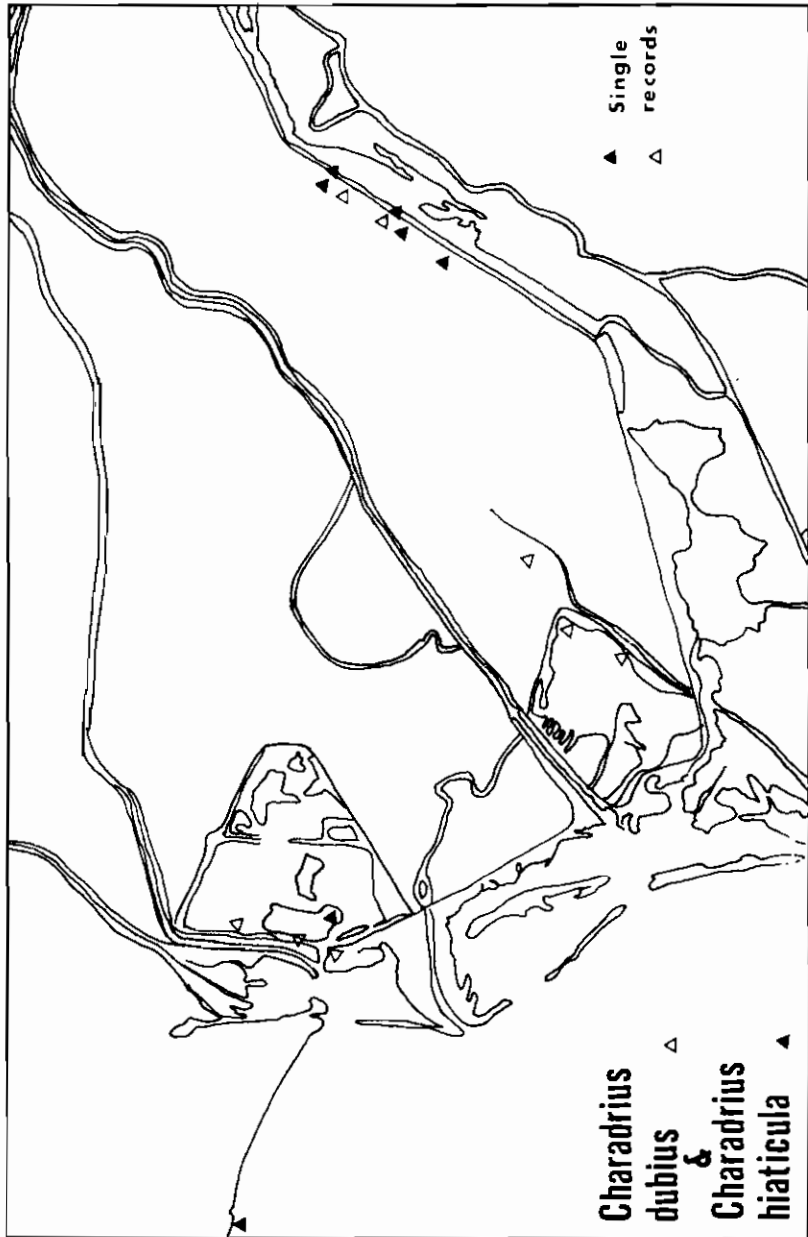


Fig. 3. Distributions of the Little Ringed Plover *Charadrius dubius* and Ringed Plover *Charadrius hiaticula*.



Fig. 4. Distribution of the Kentish Plover *Charadrius alexandrinus*.

More frequently they were noticed at the mudflats around Drana and Palukia (Fig. 3). However, no nests of this species were found although it is stated as a breeding one of the delta (Bauer & Müller 1969).

Charadrius alexandrinus Θαλασσοσφουριχτής, Kentish Plover

Good numbers of Kentish Plovers were already present at the end of March at the western coastal region and at some sites around Drana and Palukia, too (Fig. 4). These gatherings rarely remained after April and seemed to constitute migrating birds. A population of 30-40 pairs remained for breeding. A small non-breeding population remained as well. The most important breeding sites were the islets of Drana and these of the coastal region. The first eggs were found in mid-April. The breeding peak happened in the first fortnight of May whereas solitary laying was observed until mid-July (in 1980). After mid-June until August, small flocks of these birds were noticed in the areas mentioned above and at the upper delta.

Pluvialis squatarola Αργυροπούλι, Grey Plover

Large numbers of Grey Plovers were observed at intervals from mid-March up to the end of April. They gathered in flocks at the coastal region especially between Drana and Palukia (Fig. 5). After this period their numbers reduced suddenly due to departure for migration. Almost none of these birds was seen at the end of May except the case of delay of the migration, as happened in 1982. Birds of this species were observed to come after mid-June. They frequented mainly at the coastal region and less around Drana and Palukia. Perhaps they constituted the population part of which remained in delta for wintering.

Vanellus vanellus Καλημάνα, Lapwing

The Lapwings wintered in good numbers in the delta but only a small population remained to breed (did not exceed 35 pairs). This was mainly fact due to two factors: The first was the hunting pressure which was still in action when pairing started. The second was the increasing enstrangement of the delta areas for agriculture and grazing. However, some pairs bred at the peripheries of cultivations at the upper delta. A few pairs bred on the islets of Drana and at Palukia where grazing was less intensive (Fig. 6). The first eggs of the season



Fig. 5. Distribution of the Grey Plover *Pluvialis squatarola*. The arrow indicates the main routes followed by the birds during their movements in March and April.



Fig. 6. Distribution of the Lapwing *Vanellus vanellus*.

were found at the beginning of March. After the fledging of the chicks the Lapwings gathered at mudflats where the waters were preserved during the summer. In the opposite case they left quickly.

Vanellus spinosus Αγκαθοκαλημάνα, Spur-winged Plover

The Spur-winged Plovers came after mid-March in the delta area (Table 1). These birds arrived in small numbers and they were

TABLE 1

The first and last records of some migrating and breeding waders in the Evros delta

Year	First records				Last records			
	1979	1980	1981	1982	1979	1980	1981	1982
<i>Vanellus spinosus</i> *	16/3	27/3	18/3	n.d	11/8	10/8	25/7	n.d
<i>Arenaria interpres</i>	8/5	17/5	2/5	5/5	26/5	31/5	25/5	n.d
<i>Calidris minuta</i>	8/5	11/5	29/4	7/5	2/6	7/6	15/5	n.d
<i>Calidris ferruginea</i>	23/4	1/5	29/4	n.d	25/5	18/6	28/5	n.d
<i>Tringa stagnatilis</i>	25/4	30/4	8/4	n.d	—	—	—	n.d
<i>Tringa hypoleucos</i>	29/3	6/4	21/3	n.d	—	—	—	n.d
<i>Numenius tenuirostris</i>	23/4	27/3	4/4	n.d	19/5	3/5	15/4	7/5
<i>Himantopus himantopus</i> *	24/4	17/4	11/4	n.d	11/8	—	10/8	n.d
<i>Burhinus oedicephalus</i> *	10/4	1/4	27/3	n.d	13/7	8/8	13/7	n.d
<i>Glareola pratincola</i> *	11/4	17/4	18/4	n.d	—	—	—	n.d

* breeding in delta

u.d no data

— did not happen concrete departure

TABLE 2

The number and distribution of successful *Vanellus spinosus* pairs

Year	1979	1980	1981	1982
No of pairs	10	7	9	6
Drana	2	1	1	—
Upper delta	8	5	8	6
Western seaside	—	1	—	—

directed almost in the same areas every year (Fig. 7). The number of the breeding pairs was small and continuously reduced (Table 2). This seemed to relate to the increasing human interference on the breeding areas and this rare species is at the stage of extinction from the delta. The Spur-winged Plovers bred on the bare ground frequently beside halophytic vegetation. The egg laying started from the 8th to 15th of May but on occasion it happened until the beginning of June. The first chicks appeared in the beginning of June and fledged in 25-30 days. Gradual departure of the population happened in the first fifteen days in July. The last birds were observed in mid - August.

Arenaria interpres Χαλινοκυλιστής, Turnstone

The Turnstones were observed during the spring migration (Table 1). They gathered mainly at the western coastal region in small flocks along the coast (Fig. 8). Less frequently they were seen at the regions of Drana and Palukia. The largest numbers were encountered at about mid - May. Afterwards they reduced rapidly and the birds had left up to the end of this month.

Calidris minuta Ναυσοκαλίδορα, Little Stint

A relatively large population of Little Stints was present in March and constituted of birds wintering in the delta. They were seen only at the coastal region frequently in mixed flocks with Grey Plovers. These birds left by April. The migratory birds started to come at the beginning of May (Table 1). Large increase of the population was usually observed in about mid - May. The largest congregations of this period occurred at the regions of Drana and Palukia (Fig. 9). The preference of the mudflats of the upper delta was confined in a great degree after 1979. All migratory birds left at the beginning of June. Arrival of Little Stints in July was observed only in 1980. This was rather due to the preservation of water at some mudflats as it has already been mentioned. At that time the coming population was large enough and remained for moulting until mid - August.

Calidris temminckii Σταχτοκαλίδορα, Temminck's Stint

A few Temminck's Stints were seen only during the periods of 1980 and 1982 in the flocks of other *Calidris* spp. especially among Little Stints.

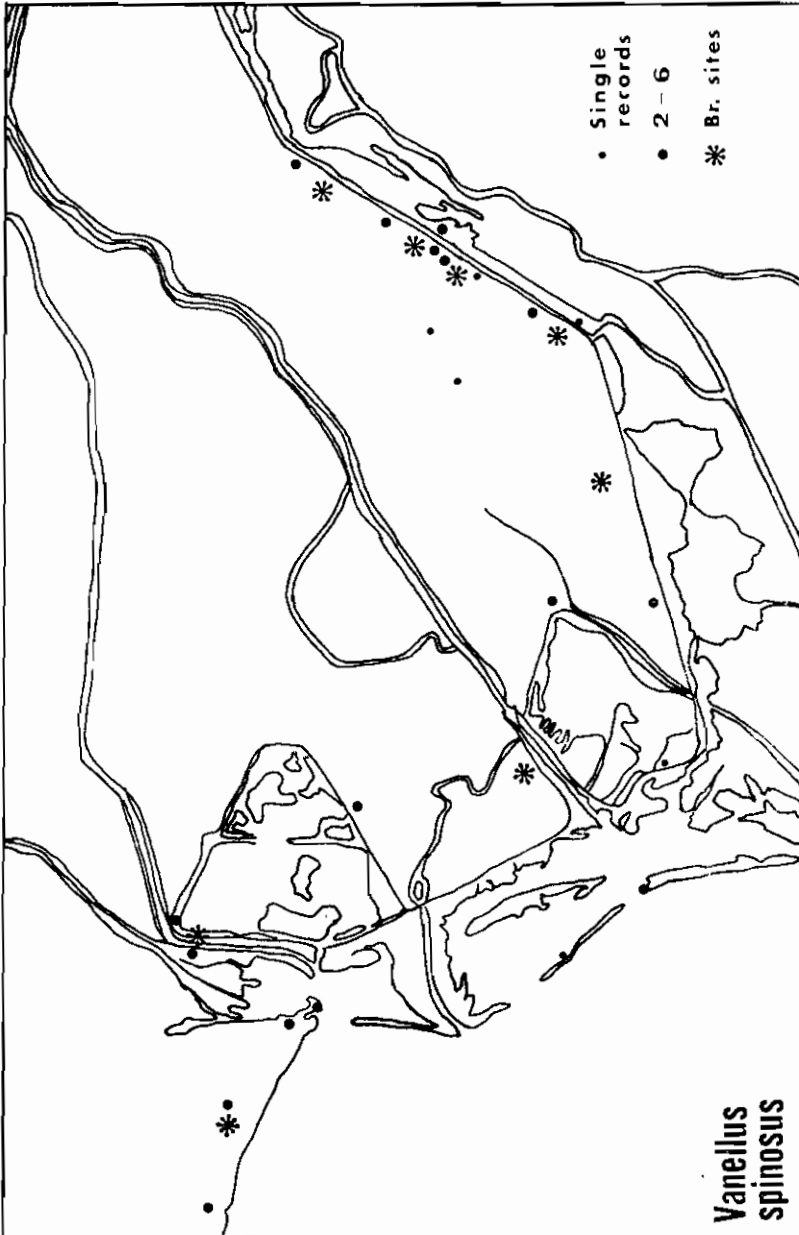


Fig. 7. Distribution of the Spur-winged Plover, *Vanellus spinosus*.



Fig. 8. Distribution of the Turnstone, *Arenaria interpres*.

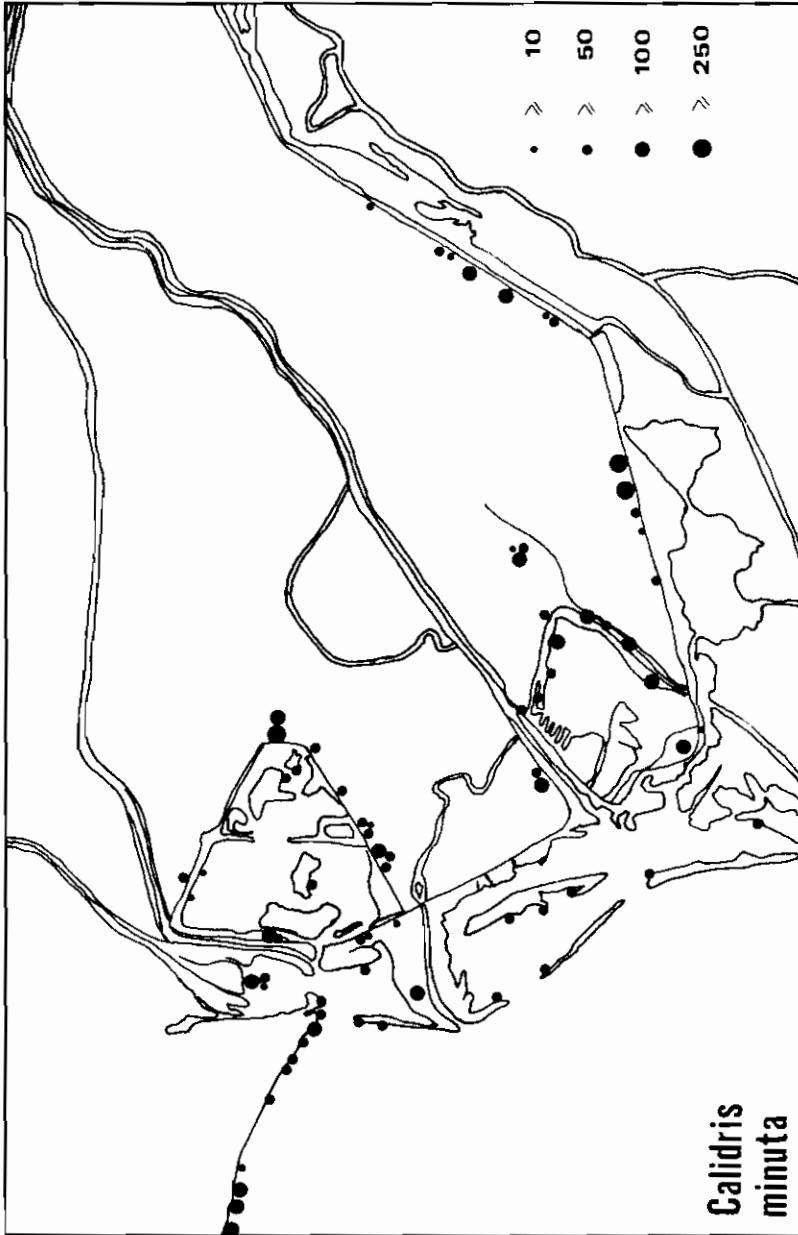


Fig. 9. Distribution of the Little Stint Calidris minuta.

Calidris alpina Λασποσκαλίδρα, Dunlin

Large numbers of wintering Dunlins were seen in March and at the beginning of April. Moreover, a good number of migrants arrived at mid - April. Most of the Dunlins left up to the end of this month and very few remained until mid - May the latest. However there was an important exception in 1982: At the beginning of May there was still a very large population which left up to the middle of the same month. The largest numbers were observed at the coastal region (Fig. 10). Dunlins usually participated in mixed flocks with other *Calidris* spp. These birds were not seen in the delta during the summer months.

Calidris ferruginea Δρεπονοσκαλίδρα, Curlew sandpiper

These birds started to appear migrating between the end of April and the beginning of May (Table 1). Their numbers increased until mid - May and they all usually left up to the end of this month. Big enough flocks were observed at the mudflats around Drana, Palukia and those of the upper delta (Fig. 11). Impressive decrease happened in the numbers of the Curlew Sandpipers visiting the last mentioned area after 1980. The birds usually formed mixed flocks with other *Calidris* spp. and especially with Little Stints. The largest numbers were encountered in similar aggregations at the beginning of May in 1982. Arrival of Curlew Sandpipers in the summer months was observed only in July of 1980 at the mudflats which retained waters. In that case their numbers gradually increased in this month and the birds remained until mid - August.

Calidris alba Λευκοσκαλίδρα, Sanderling

A few Sanderlings were seen in March and during the largest part of April. They were rather wintering birds. Significant population increase happened at about the end of April. These migratory birds remained until about mid - May and all left up to the end of the same month. The Sanderlings aggregated preferably at the coastal region especially at the western part of the delta (Fig. 12). Large congregations were observed together with other *Calidris* spp. as participants and especially Dunlins.

Philomachus pugnax Ψευτομαχητής, Ruff

A part of the population of these birds which were observed at the beginning of March possibly constituted wintering birds. During



Fig. 10. Distribution of the Dunlin *Calidris alpina*. The arrow indicates the main routes followed by these birds during their movements in March and April.

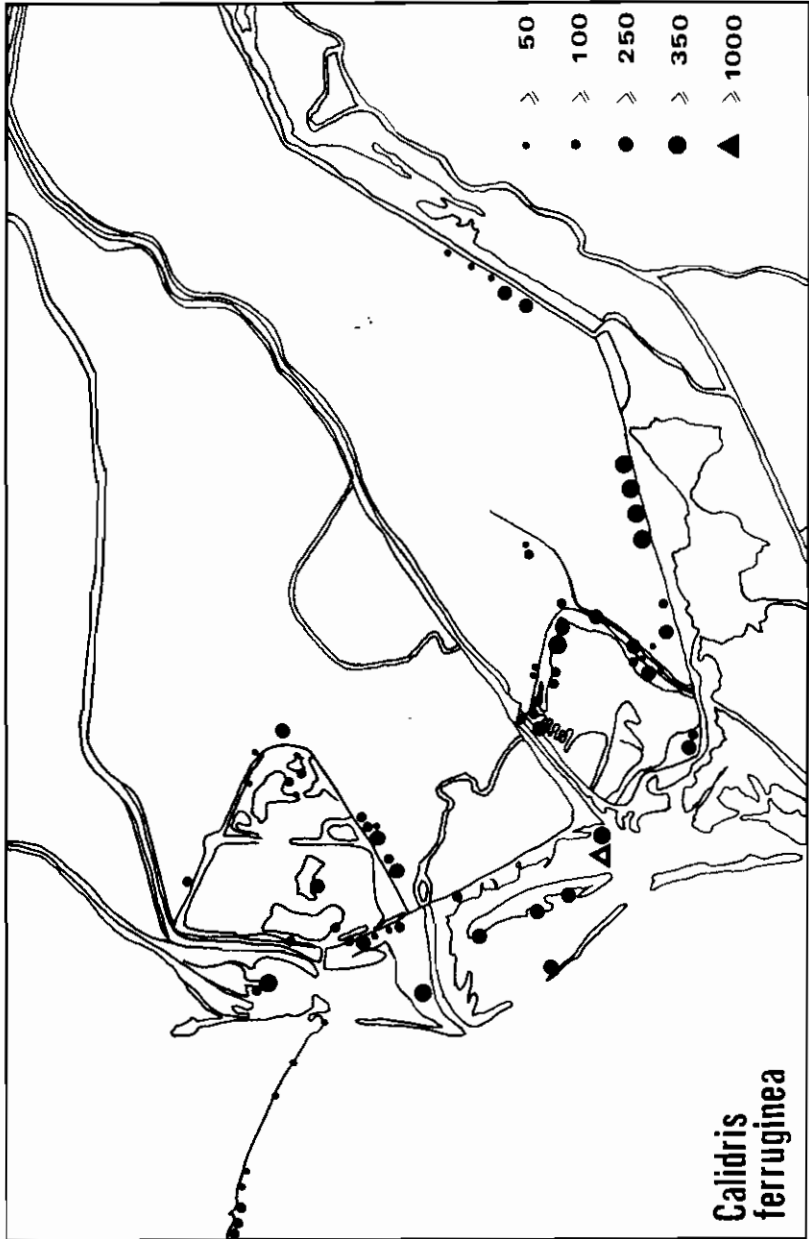


Fig. 11. Distribution of the Curlew sandpiper, *Calidris ferruginea*.



Fig. 12. Distribution of the Sanderling, *Calidris alba*.

the second fortnight of this month significant numbers of ruffs were seen daily. They came to the delta through the western coastal region flying along the coast (Fig. 13). Good numbers were also seen in the whole April which gradually decreased at about the end of this month. All the birds had left until mid - May. The largest gatherings were encountered at Laki, Drana and Pumps (area 3 in Figure 1) before the last area was drained during 1980. Enough of them were observed at the upper delta only in 1979. A few ruffs appeared at the mudflats with waters only in July and August of 1980.

Tringa erythropus Μανρότρωνγας, *Spotted Redshank*

Small numbers of Spotted Redshanks were seen until about mid - April. They basically consisted of wintering birds. After this period their numbers increased significantly because of migration movements. These movements continued up to the end of May when most birds had left. Their presence at the coastal region in the period mentioned above, appeared to be related with the water level of the sea. At low waters aggregations were seen mainly at the coastal region of Palukia (Fig. 14). During high waters dispersion of the population happened at the upper delta, Palukia and Drana. Very few birds remained in June. In about the middle of this month arrival of large numbers of Spotted Redshanks was observed. However, their dispersion in delta did not have the relatively strict pattern observed during the spring migration. A wider dispersion occurred at the mudflats of the delta. This was possibly due to the lower availability of the feeding grounds in this part of the season. Generally, a lowering of the population levels arriving at the delta was encountered after 1980. Also, clearly reduced preference was seen for the mudflats of the upper delta.

Tringa totanus Κοκκινοσκέλης, *Redshank*

The redshank was the commonest wader of the delta. Good numbers existed at the coastal region and at the upper delta in March and April. The highest percentage of these were rather wintering birds. Significant decrease of the population was observed in May. In this month the population levels were the lowest of all the others. Only the breeding pairs and a small non - breeding population remained. The pairs did not exceeded number 40. The most important breeding sites were the islets of Drana and — in limited degree — those of the coastal region (Fig. 15). After mid - June a very large increase in num-

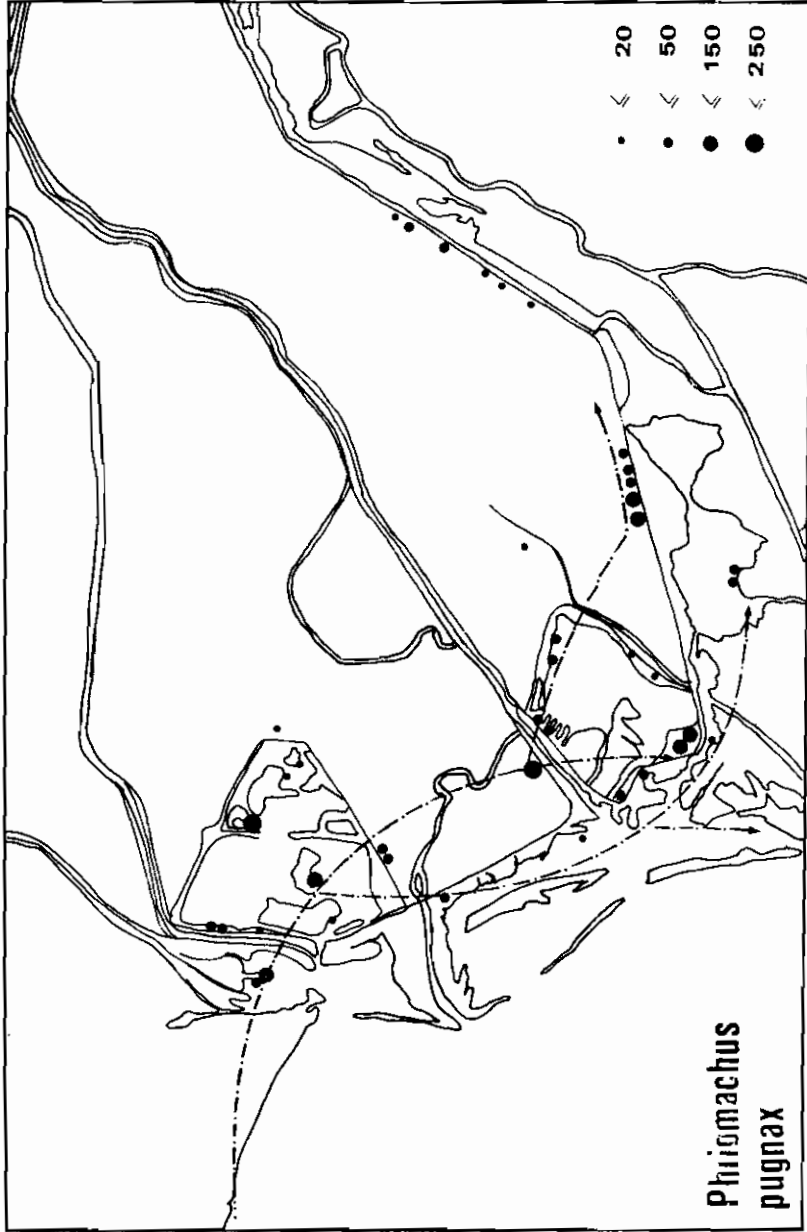


Fig. 13. Distribution of the Ruff *Philomachus pugnax*. The arrow indicates the main routes followed by the flocks of these birds during their movements.

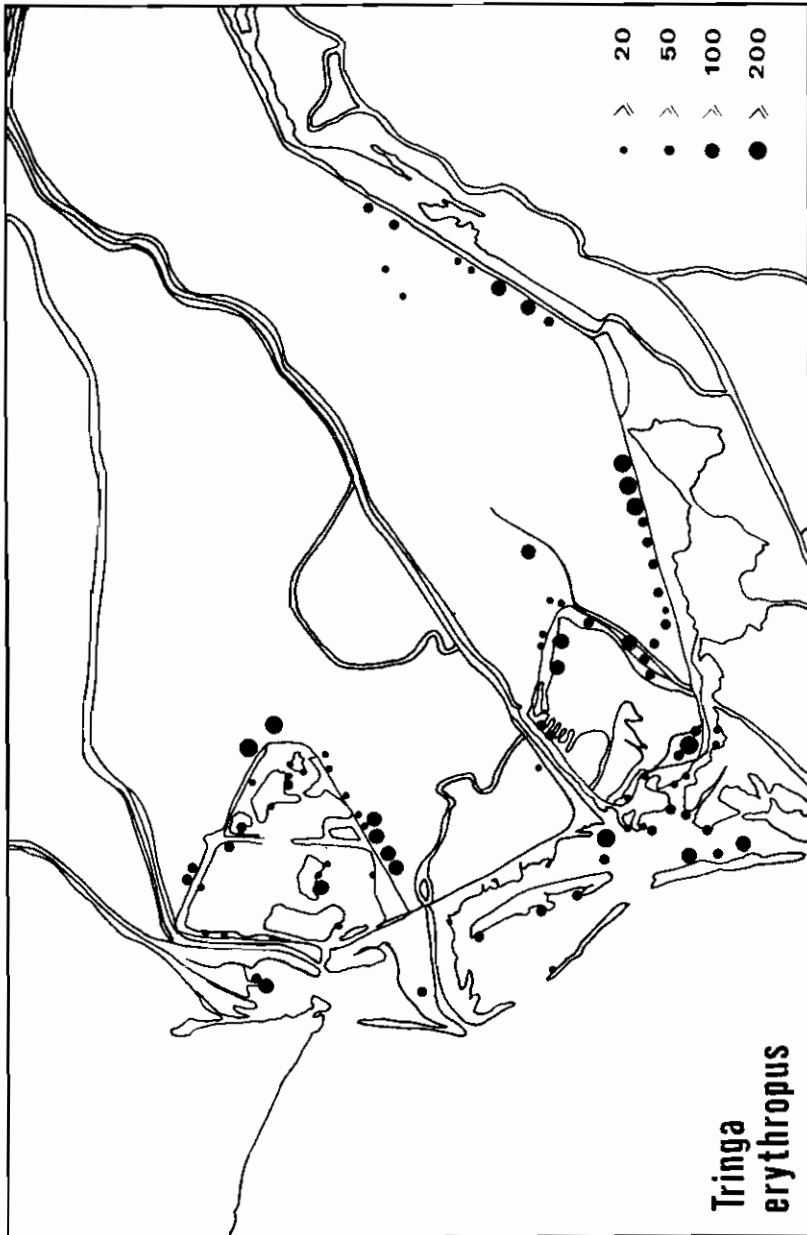


Fig. 14. Distribution of the Spotted redshank *Tringa erythropus*.

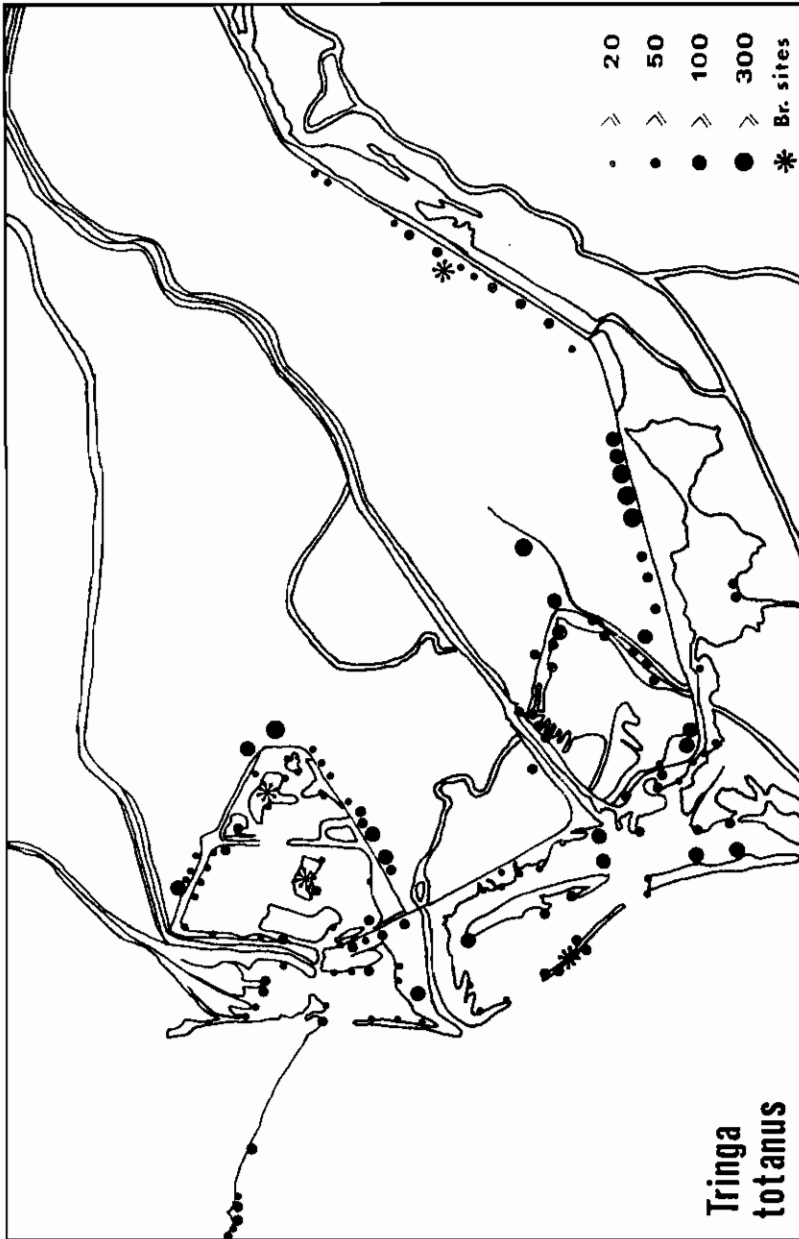


Fig. 15. Distribution of the Redshank *Tringa totanus*.

bers was observed due to the arrival of birds from elsewhere. These Redshanks dispersed at all the existing mudflats and at the coast, as well. A part of this population left after July because of the drying of the mudflats due to the evaporation. The remaining part gathered at the lower delta. Gradual decrease through years was observed to the preference of the mudflats of the upper delta.

Tringa stagnatilis *Νανοπρασινοσκέλης, Marsh Sandpiper*

The Marsh Sandpipers came in small numbers in April (Table 1). It seemed that they passed from the delta migrating but this appearance was irregular. They were observed mainly at Drana and Palukia (Fig. 16). A few birds were also seen in summer.

Tringa glareola *Δασπότρυγγας, Wood Sandpiper*

This bird was a relatively scarce visitor of the delta. The largest numbers were observed at about mid - April during the spring migration. They rarely reached a level of 50 individuals per day. Most frequently they were seen at the region of Palukia (Fig. 16). Few birds were encountered at Limni Nimphon at the beginning of July but not during the intermediate intervals.

Tringa nebularia *Πρασινοσκέλης, Greenshank*

The population of the Greenshanks visiting the delta was generally small. In March there was present a part of the wintering population. The migratory birds passed mainly at about mid - April. All of these birds left almost until the end of this month. Rarely few individuals were observed up to mid - May. A small population came at about the end of June but rarely remained after July. Most Greenshanks were encountered around Drana. Fewer were seen around Palukia, at the muddy banks of the channels and at the mudflats of the upper delta (Fig. 17).

Tringa ochropus *Δασότρυγγας, Green Sandpiper*

A few Green Sandpipers were generally seen. The largest numbers were encountered from the end of March to mid - April. Whereas, few individuals were only observed at intervals until mid - June. The largest gatherings occurred at freshwater sites such as Lutros torrent and at the eastern region of Drana (Fig. 17). Arrival of a few birds was observed from mid - June to the beginning of July. Most of these Green



Fig. 16. Distribution of the Marsh Sandpiper *Tringa stagnatilis* and Wood Sandpiper *Tringa glareola*.

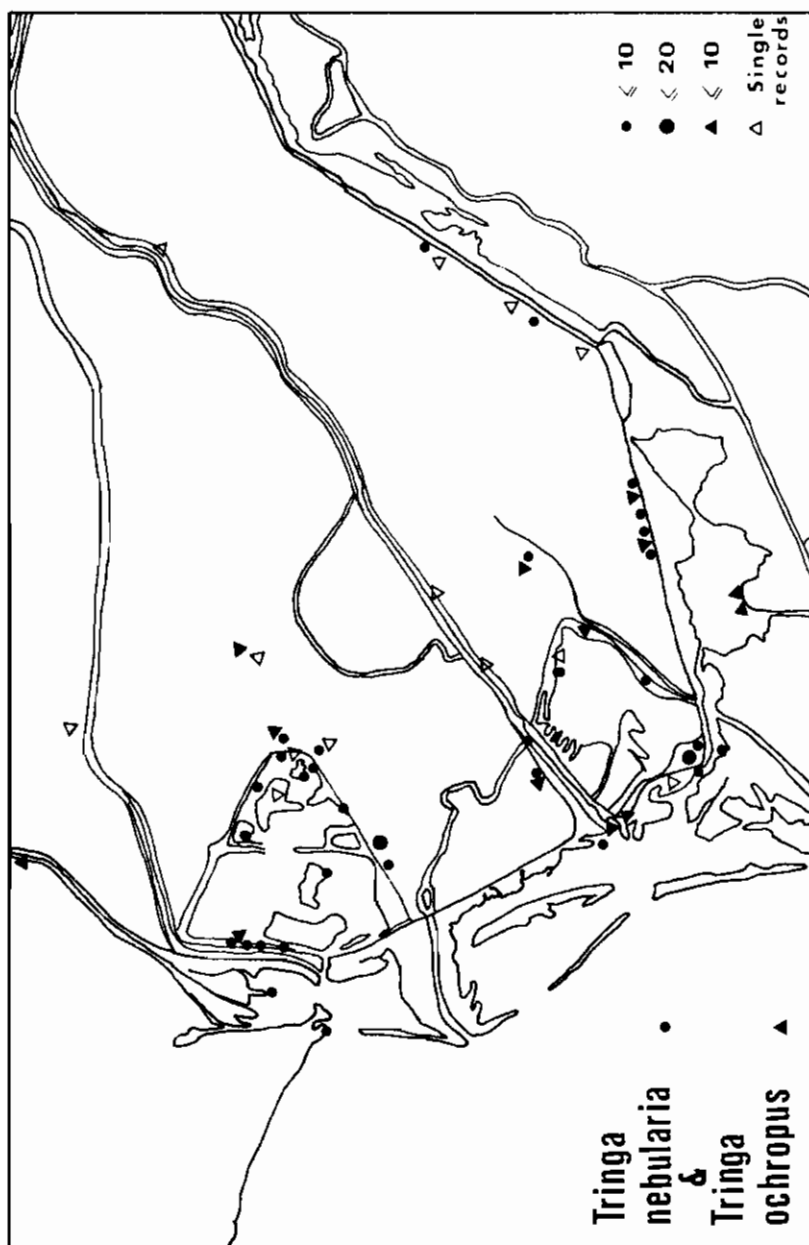


Fig. 17. Distribution of the Greenshank *Tringa nebularia* and Green Sandpiper *Tringa ochropus*.

Sandpipers gathered at the south periphery of Limni Nimphon and at the mudflats. In this case few individuals remained up to mid - August.

Tringa hypoleucos Ποταμότρογγας, Common Sandpiper

Limited numbers of Common Sandpipers were generally present in the delta. A small population passed migrating early in spring (Table 1). These movements finished in the second fortnight of April. Most frequently these birds were encountered at the banks of the channel crossing the interior of Drana peripherally (Fig. 18). Few solitary birds were seen at intervals up to the end of June. A small population came after the first fifteen days of July and was gathered mainly at Drana. This one remained until mid - August.

Xenus cinereus Τερεκότρογγας, Terek Sandpiper

One individual was only seen on 9th of May 1979 at Drana. This bird was rather vagrant.

Limosa limosa Οχθοτούρλι, Black - tailed Godwit

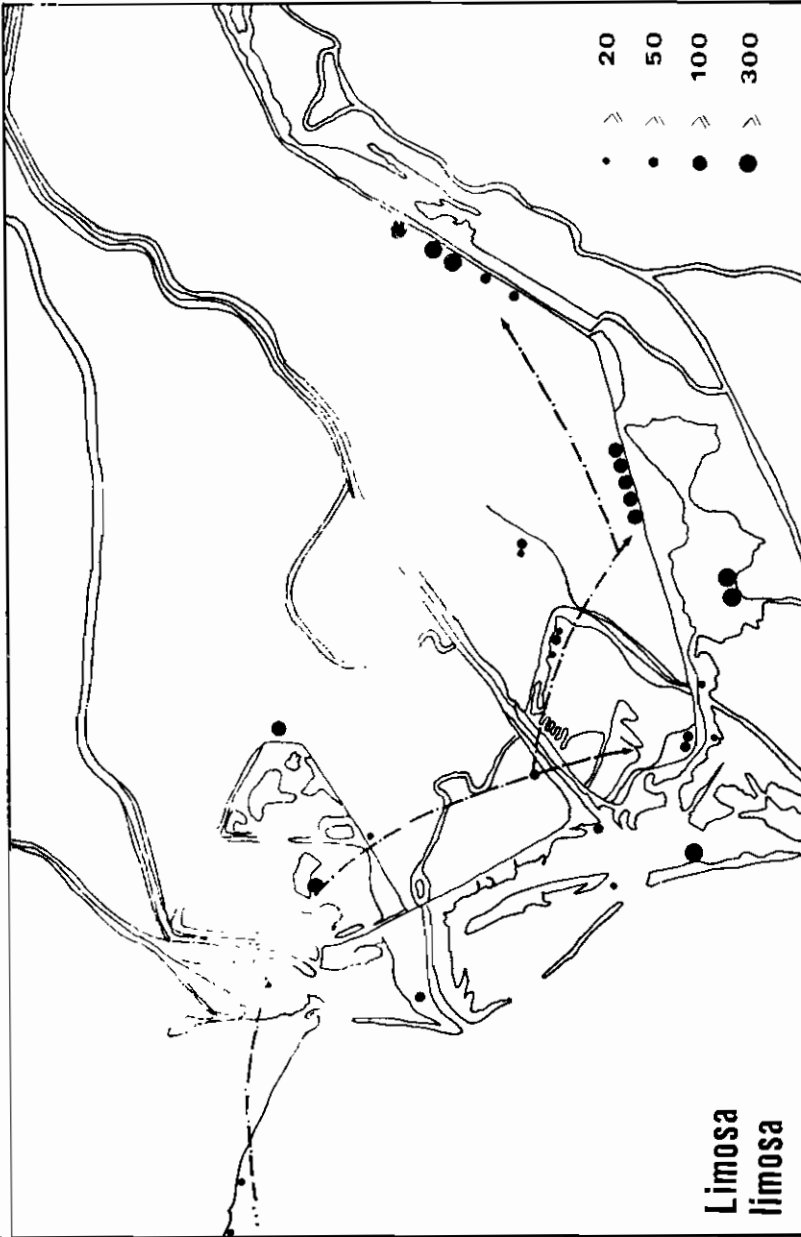
These birds were frequently observed arriving at the delta in small flocks through the western seaside at about mid - March. Then they dispersed to various areas with preference to Laki, Palukia and especially to the mudflats of the upper delta (Fig. 19). These birds rarely remained more than the beginning of April. Until mid - June only few birds were seen on occasion. After mid - June large numbers were encountered at some sites (Limini Nimphon, upper delta mudflats). Most of them remained until about the end of July. Only in 1980 Black - tailed Godwits were seen in August at mudflats with waters (area 1 in Figure 1).

Numenius arquata Τουρλίδα, Curlew

A large part of the wintering population was present in March and April in the delta. The Curlews were observed in flocks and solitary individuals along the coastal region and especially from Laki to Palukia (Fig. 20). From the end of April up to mid - June there were relatively small numbers because of the departure of the largest part of the population. Exceptionally, during 1982 a great part remained until mid - May. After mid - June and in the whole July the numbers increased. Big flocks gathered between the Musselpond penin-



Fig. 18. Distribution of the Common Sandpiper *Tringa hypoleucos*.



*Fig. 19. Distribution of the Black-tailed Godwit *Limosa limosa*. The arrow indicates the main routes followed by the flocks of this species during the movements in the delta.*

sula and the coastal islets and also among these islet and the coast of the delta. Other gatherings at the remaining coastal region were small. The population levels were high in August. Possibly, a part remained for wintering.

Numenius tenuirostris Λεπτομότα, *Slender-billed Curlew*

The Slender-billed Curlews were observed only during the spring migration from the end of March up to the end of May and generally in small numbers (Table 1). More frequently they were encountered at the region of Drana (Fig. 21). Significant exception regarding the numbers and preferred area was observed in April 1981. At that month (in the 4th) an uncommonly high population was seen at mudflats of the NW areas of the delta.

Gallinago gallinago Μπεκασίσι, *Snipe*

A few of these birds were seen very early in the season in the delta mainly at Drana and Laki regions. In the summer months only once (9/8/1980) was observed a single bird at the area 2 (Fig. 1).

Himantopus himantopus Καλαμοκανάς, *Black-winged Stilt*

These birds came to the delta for breeding. The first ones appeared in about mid-April and the most of them at the end of the same month (Table 1). They bred in intraspecific colonies including up to 15 pairs or together with Avocets *Recurvirostra avosetta* on the islets of Drana (Fig. 22); also solitarily at the upper delta. However, their establishment at the breeding grounds was not regular after 1979. This was due to the increasing alterations of the biotops and grazing at that sites. The egg laying started in the first week of May but this extended irregularly in the rest of May and in June. The number of pairs was small (Table 3). The first chicks were found at the beginning of June but hatching was frequently observed until July. The last birds were encountered in about mid-August. Exceptionally, gradual in-

TABLE 3

The numbers of Himantopus himantopus pairs

Year	1979	1980	1981
No of pairs	30	16	12



Fig. 20. Distribution of the Curlew *Numenius arquata*.



*Fig. 21. Distribution of the Slender-billed Curlew *Numenius tenuirostris*.*



Fig. 22. Distribution of the Black-winged Stilt *Himantopus himantopus*.

crease of the population was observed from the end of June up to mid-July in 1980. At that time the population reached a level of about 500 birds which remained at the mudflats with waters until mid - August

Recurvirostra avosetta Αβοκέτα, Avocet

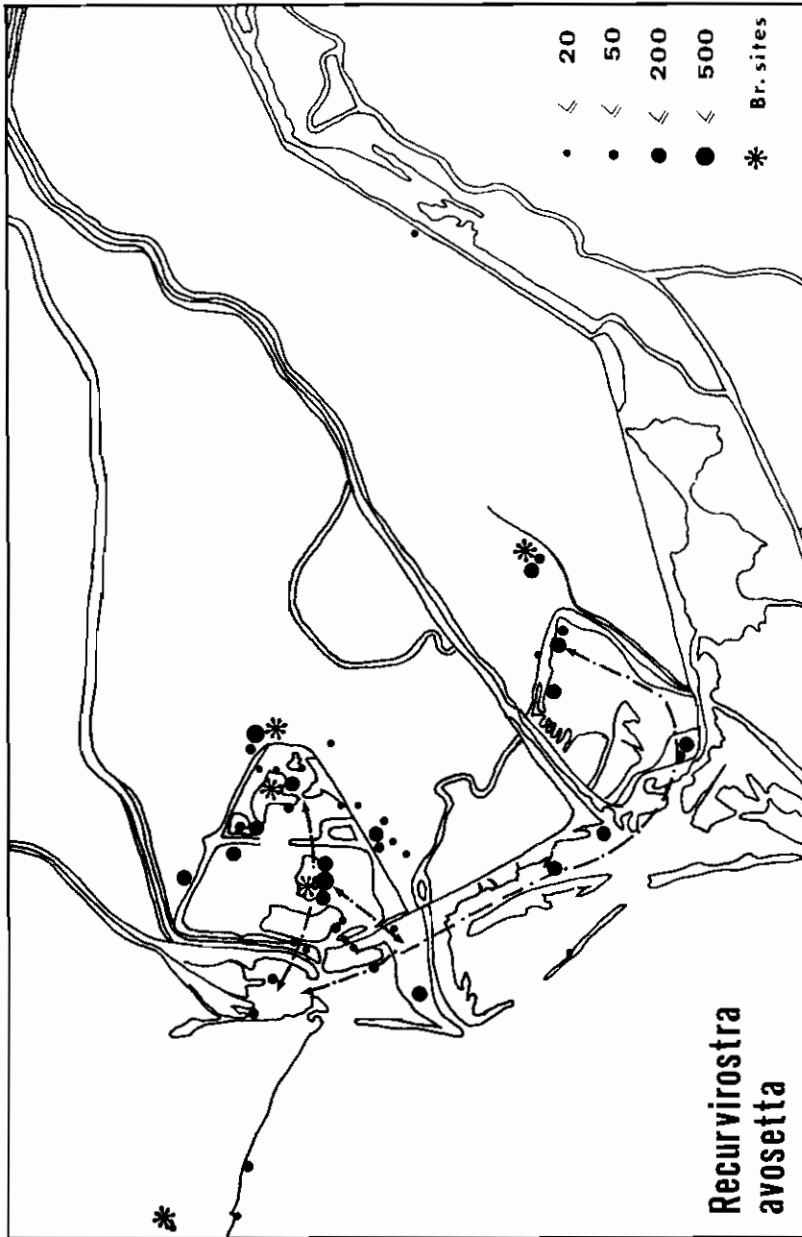
Arrival of a large population of avocets was observed at about the end of February. The largest numbers of any other month were encountered in March. The movements of these birds were intensive in this period and were confined in the estuarine area (Fig. 23). This was possibly due to the fact that hunting is forbidden there. The population decreased after the beginning of April. The breeding part constituting 70-120 pairs and a small non - breeding part remained. The avocets bred colonially on the islets of Drana. The egg laying started at the end of April and continued massively at the beginning of May. Under certain conditions (Goutner 1983) this happened until mid - June. The avocets usually left at about the end of July together with their young ones. In the case of water preservation at the feeding grounds (as happened in 1980) not only the population remained but more birds came from elsewhere after mid - June. The breeding success of the avocets was very low. It was mainly due to nest trampling by grazing herds and egg predation by corvids.

Phalaropus fulicarius Σταχτοκολυμπότρογγας, Grey Phalarope

A few birds of this species were observed from 1st to 20th of August 1980. These birds were encountered only at the mudflats with waters in that period (1 and 2 in Figure 1).

Burhinus oedicnemus Πετροστρίλιδα, Stone Curlew

The Stone Curlew is a breeding bird of the delta. The first birds arrived between the end of March and the beginning of April (Table 1). The pairs were observed at approximately the same sites every year (Fig. 24). The breeding population did not exceed 15 pairs. They bred at dry mudflats bare from vegetation. They laid solitarily but frequently close to some territorial birds such as Oystercatchers, Redshanks and Spur - winged Plovers. These birds seemed to play the role of alarmer. The first eggs were found at the end of April but most pairs laid after mid - May. The last birds were seen in early August.



*Fig. 23. Distribution of the Avocet *Recurvirostra avoetia*. The arrow indicates the routes followed by the birds during their movements mainly in February and March.*

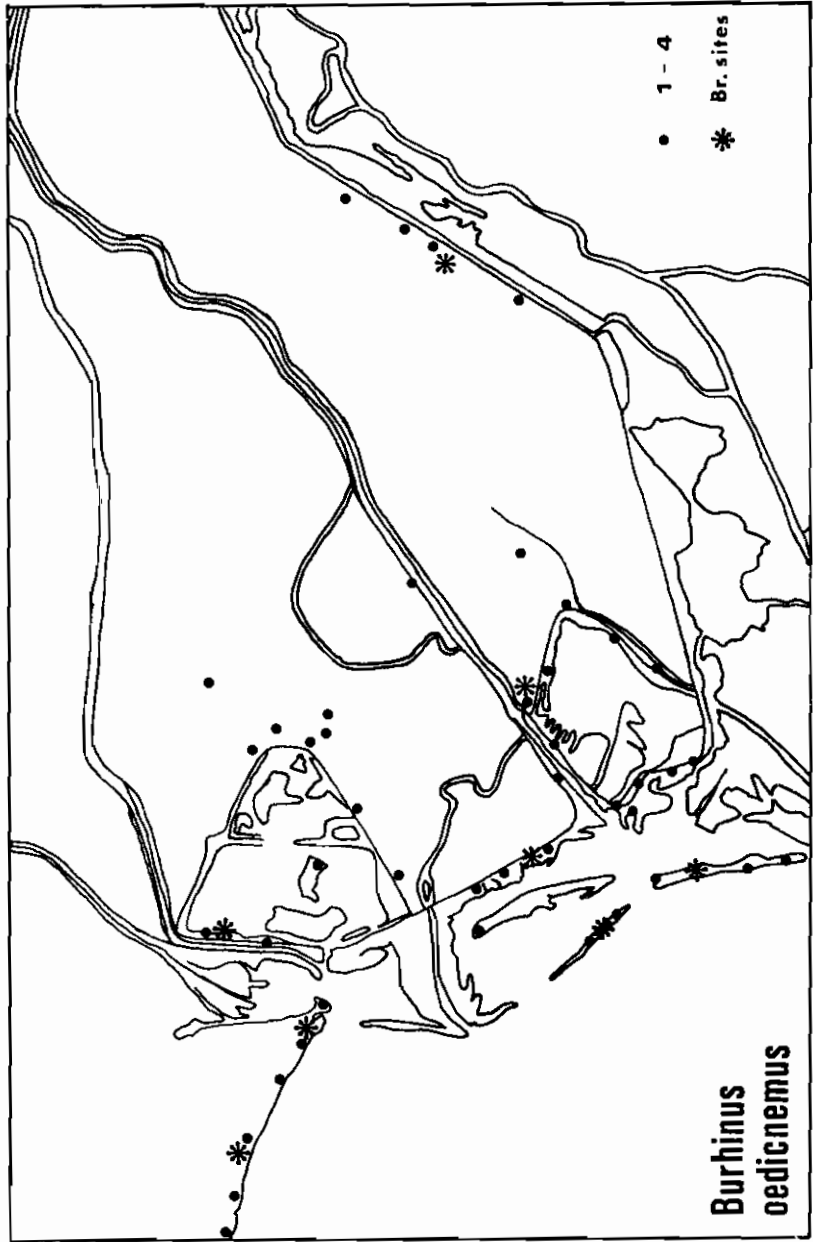


Fig. 24. Distribution of the Stone Curlew *Burhinus oedicnemus*.

Glareola pratincola Νεγοχελίδου, *Pratincole*

The birds of this species came to the delta for breeding. The first of them were seen in about mid - April and most came from the beginning to the middle of May. The most important breeding sites were the islets of Drana and those of the coastal region (Fig. 25). Significant breeding areas were the western plains of the delta even those close to the airport of Alexandroupolis and also the upper delta but before 1980. These sites have become useless for breeding purpose because of the intensive human interference. The first laying happened in early May in the colonies of the coastal islets. Laying at Drana usually started after mid - May and continued until mid - June. The breeding population was 150-200 pairs. The egg losses were extensive in Drana due to high water flooding and herd trampling. After such kinds of destructions a part of the population was observed to move to the Turkish region in April and May. Relatively few Pratincoles were encountered in July and August. However, non breeding congregations occurred at some sites such as Toptsi.

Foods of the waders

The most important food organisms of the waders in our area are given in Table 4.

TABLE 4

The most important food organisms of the waders in the Evros delta

Bivalvia	Annelida	Amrhipoda
Ensis ensis	Nereis diversicolor	Corophinm orientale
Ensis siliqua	Glycera convoluta	Gammarus aequicauda
Cerastoderma glaucum	Nerinides tridentata	Talorchestia desayesei
	Owenia spp.	Other amrhipods
Insecta		Decapoda
Coleoptera (Cicindellidae, Hydrophilidae)		Carcuius aestuarii
Diptera (Tabanidae, Ephydriidae)		Upogebia litoralis
Heteroptera (Gerridae, Corixidae)		

Species such as *Vanellus vanellus* and *Vanellus spinosus* received mainly insects (especially Diptera and Heteroptera) which were plentiful in places where these birds fed. Others like *Burhinus oedic-*

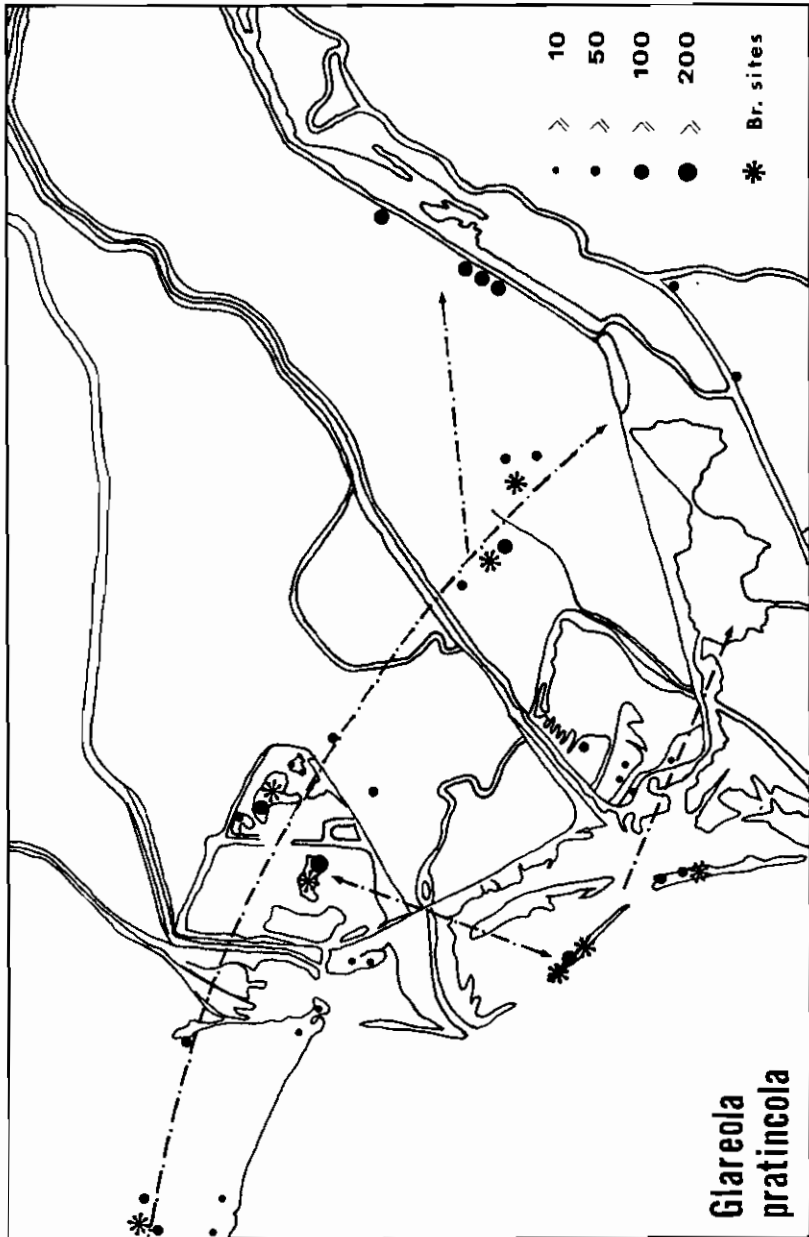


Fig. 25. Distribution of the *Pratincole Glareola pratincola*. The arrow indicates the main movements followed by the birds during their movements.

nemus and *Glareola pratincola* also fed on insects (especially those of the family Cicindellidae) which were abundant at the coastal region. *Himantopus himantopus* received almost exclusively aquatic insects (Coleoptera, Diptera, Heteroptera) at sites with brackish waters. The species *Haematopus ostralegus*, *Charadrius alexandrinus*, *Pluvialis squatarola*, *Arenaria interpres*, *Numenius arquata*, *Numenius tenuirostris*, *Calidris alpina* and *Calidris alba* confined their feeding activities almost exclusively at the coastal region. Their food constituted of various amounts of nereid worms, amphipods and rarely of insects. Among the above mentioned species *Haematopus ostralegus* and *Numenius arquata* received *Carcinus aestuarii* very frequently. They also fed on small amounts of *Cerastoderma glaucum* and rarely on *Ensis sp.* and *Upogebia litoralis*. The last mentioned foods occurred in depths where they were rarely available to the birds. These foods constituted larger part of the birds' diet in summer months when they came to the surface of the shallow coasts due to high water temperature.

Species like *Calidris minuta*, *Calidris ferruginea*, all *Tringa spp.*, *Philomachus pugnax* and *Limosa limosa* fed on annelid worms amphipods and insects. For the *Tringa spp.* the level of sea waters appeared to play more important role than the others.

There were few opportunities on the feeding behaviour of birds like *Charadrius hiaticula*, *Charadrius dubius*, *Phalaropus fulicarius*. From these it appeared that they fed mainly on insects. Because of the rare appearance of *Xenus cinereus* and *Gallinago gallinago* no opportunities of similar observations occurred.

DISCUSSION

The numbers of the migratory, breeding and molting waders clearly reduced each year. From all mentioned above it becomes clear that it was due to the unscheduled human interference on the biotops resulting their degradation. The falling of water level at some areas in combination with the intensified use of pesticides rather resulted in the reduction of food organisms. This was very characteristic at the mudflats of the upper delta constituted the best feeding grounds for many waders in the past. The inexistence of feeding grounds in the summer months because of earlier drainage prevented large populations of waders to remain in the delta. The exception of 1980 when large populations of waders gathered, indicated the value of water arrangement for wader preservation. Anyway, the reduction of the numbers

of waders belongs to the general phenomenon of reduction of the water-fowl populations visiting the delta. This reduction was confirmed by I.W.R.B. missions (Hafner & Walmsley 1971, Carp & Johnson 1973). Moreover, grazing on the breeding grounds in spring proved to be destructive to the waders (Goutner 1983). Such kind of interference is of special significance for endangered species like *Vanellus spinosus*, *Recurvirostra avosetta* and *Himantopus himantopus* (listed by Kanellis 1977). Especially *Vanellus spinosus*, which occupies a very limited breeding distribution (Makatsch 1969) is in danger of extinction from the delta under the present scale of grazing. The unfavorable influence of grazing on the breeding waders is also known by other studies (Heppleston 1972, Wilson 1978).

The presence of some wader species in the delta such as *Eudromias morinellus*, *Numenius phaeopus*, *Limosa lapponica*, *Calidris canutus*, *Limicola falcinellus* and *Glareola nordmannii* has been mentioned (Bauer & Müller 1969). During our research none of these birds was noticed.

The foods received by some waders at least in the Evros delta are similar to those found during studies in other countries (Wolff 1969, Heppleston 1972, Goss - Custard & Jones 1976). The differences are rather due to the presence of different food species at each area and to their availability because of absolutely different tide cycles. It seems that the birds are forced to be adapted at the conditions of food availability at each area they visit.

From the present study it appears that the numbers of the waders visiting the delta may increase after appropriate management of the biotops including arrangement of the waters especially after spring. The management must also include confining of grazing at only definite areas and of course, out of the breeding ones. More study is needed on the wader nest predators of the area like corvids. Extermination methods applied to gulls (Olney 1967, Duncan 1978) and corvids (Goutner 1983) need application on a year basis. A more realistic encounter should rather aim to eliminate the reasons of the predators' overpopulation that is disbalance of the ecosystem caused mainly by the unscheduled application of grazing and increasing construction of herd fences providing food to corvids. The favourable effects on the correct biotop management on bird populations have been shown experimentally (Fog 1980).

ACKNOWLEDGEMENTS

I am grateful to Prof. M.E. Kattoulas for providing me equipment from the Laboratory of Zoology, to Dr D. Babalonas for his help on plant identification, to Dr A. Koukouras, H. Hindiroglou and N. Gouvis for the help on the identification of the marine organisms. Also to Dr Dlabola and Dr Jezek at the National Museum of Natural History in Praha - Czechoslovakia for the identification of the insect material. Special thanks to Christos and Sotiris Goutner for their participation at the research in the field and to Prof. I. Tsekos and Dr P.S. Ekonomidis for the corrections on the manuscript.

REFERENCES

- BABALONAS, D. 1979. Pflanzensoziologisches studium der vegetation des Evros delta (Aenision delta). Thesis. Thessaloniki (Griech.).
- BAUER, W. & MÜLLER, G. 1969. Zur avifauna des Evros delta. Beitr., Naturk. Forsch. Süd - Dtl 28: 33-52.
- BAUER, W., HELVERSEN, O.V., HODGE, M. & MARTENS, J. 1969. Catalogus Faunae Graeciae. Pars II, Aves. Kanellis (ed.), Thessaloniki.
- BUBNOV, M.A. 1959. On the ecology of *Haematopus ostralegus ostralegus* L. Zool. Zh. 38: 1270-1271.
- GOUTNER, V. 1983. Ecology of breeding of the avocet (*Recurvirostra avosetta* L.) and oystercatcher (*Haematopus ostralegus* L.) (AVES), in the Evros delta. Doctoral dissertation. Univ. of Thessaloniki.
- CARP, E. & JOHNSON, A.R. 1973. I.W.R.B. mid-winter waterfowl census in Greece, with observations in Italy and Yugoslavia, January 1973. I.W.R.B. report 1: 47-57.
- DOWDESWELL, W.H. 1967. Practical animal ecology. Latimer Trend Ltd, London.
- DUNCAN, N. 1978. The effects of culling herring gulls (*Larus argentatus*) on recruitment and population dynamics. J. Appl. Ecol. 15: 697-713.
- FOG, J. 1980. Methods and results of wetland management for waterfowl. Acta ornith. 17: 147-160.
- GOSS - CUSTARD, J.T. & JONES, R.E. 1976. The diets of redshank and curlew. Bird study 23: 233-243.
- HAFNER, H. & WALMSLEY, J.G. 1971. I.W.R.B. mission to Greece and southern Italy, January 1971. I.W.R.B. report 9 pp.
- HEPPLESTON, P.B. 1972. The comparative breeding ecology of oystercatchers (*Haematopus ostralegus* L.) in inland and coastal habitats. J. Anim. Ecol. 41(1): 23-51.
- KANELIS, A. 1977. List of threatened birds. Nature (Hel. Soc. Prot. Nat.) 9: 4-5.
- MAKATSCH, W. 1969. Der spornkiebitz, einer der jungsteu brutvögel Europas. Natur und Museum 99(8): 379-385.
- OLNEY, P.J.S. 1967. Avocets - Their prey and predators. Ibis 109: 474.
- WILSON, J.R. 1978. Agricultural influences on waders nesting on the South Uist Machair. Bird Study 25: 198-206.
- WOLFF, W.J. 1969. Distribution of non-breeding waders in an estuarine area in relation to the distribution of their food organisms. Ardea 57 (1-2): 1-28.

ΠΕΡΙΛΗΨΗ

Η ΚΑΤΑΝΟΜΗ ΤΩΝ ΠΑΡΥΔΑΤΙΩΝ ΠΟΥΛΙΩΝ (Charadrii) ΣΤΟ ΔΕΛΤΑ ΤΟΥ ΠΟΤΑΜΟΥ ΕΒΡΟΥ ΚΑΤΑ ΤΗΝ ΑΝΑΠΑΡΑΓΩΓΙΚΗ ΠΕΡΙΟΔΟ

Από τον

ΒΑΣΙΛΗ Χ. ΓΚΟΥΤΝΕΡ

(Εργαστήριο Ζωολογίας, Πανεπιστημίου Θεσσαλονίκης)

Στο δέλτα του ποταμού Έβρου παρατηρήθηκαν 31 είδη παρυδατίων πουλιών κατά τη διάρκεια των αναπαραγωγικών περιόδων των χρόνων 1979-1982. Από τα είδη αυτά τα εννέα αναπαράγονταν στην περιοχή. Τα είδη αυτά είναι ο στρειδοφάγος (*Haematorpus ostralegus*), ο θαλασσοσφυριχτής (*Charadrius alexandrinus*), η καλημάνα (*Vanellus vanellus*), η αγκαθοκαλημάνα (*Vanellus spinosus*), ο κοκκινοσκέλης (*Tringa totanus*), ο καλαμοκανάς (*Himantopus himantopus*), η αβοκέτα (*Recurvirostra avosetta*), η πετροτριλίδα (*Burhinus oedipnemus*) και το νεροχελίδονο (*Glareola pratincola*). Τα υπόλοιπα είκοσι δύο είδη περνούσαν κατά την εαρινή μετανάστευση ή έρχονταν για αλλαγή πτερώματος μέσα στην περίοδο από τα μέσα Ιουνίου μέχρι τα τέλη Ιουλίου. Οι κινήσεις κατά την εαρινή μετανάστευση γίνονταν ανάμεσα στα μέσα Μαρτίου και στα μέσα Μαΐου. Ιδιαίτερα έντονες ήταν από τα μέσα Απριλίου ως τις αρχές Μαΐου.

Ορισμένα είδη κατά την παραμονή τους παρατηρήθηκαν συχνότερα στην παράλια περιοχή του δέλτα ενώ άλλα στα ιλυώδη πλατώματα. Η κατανομή των πουλιών είχε άμεση σχέση με την ύπαρξη των οργανισμών διατροφής τους σε κάθε περιοχή. Οι οργανισμοί αυτοί ήταν κυρίως δίθυρα, πολύχαιτοι, αμφίποδα, δεκάποδα και έντομα.

Η κατανομή και η παρουσία των παρυδατίων πουλιών στο δέλτα επηρεάζονταν πολύ από τις μεταβολές της στάθμης των νερών στα ιλυώδη πλατώματα. Οι μεταβολές αυτές πρόκυπταν τόσο από την ανθρώπινη επέμβαση πάνω στους βιότοπους (αποστράγγιση) όσο και από την εξάτμιση κατά τους θερινούς μήνες. Για τα είδη που αναπαράγονταν ιδιαίτερη επίδραση είχε η βόσκηση των βοοειδών στα πεδία αναπαραγωγής. Με τις κτηνοτροφικές δραστηριότητες καταστρέφονταν τα αυγά των πουλιών. Το ίδιο συνέβαινε μερικές φορές και εξαιτίας θήρευσης από κορακοειδή και πλημμύρες από ψηλές παλίρροιες.