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Migration routes of waders using stopover sites in the Azov-Black Sea region, Ukraine

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Abstract: DIADICHEVA E., & N. MATSIEVSKAYA (2000): Migration routes of waders using stopover sites in the Azov-Black Sea region, Ukraine. Vogelwarte 40:161–178.

The Azov-Black Sea region and particularly the Sivash is an important stopover site for waders during their spring and autumn migration. A total of 24,477 waders of 33 species have been ringed by the Azov-Black Sea Ornithological Station between 1986 and 1995 in these areas, mainly during the migration period. In total 1298 recoveries of 21 species were analysed including 490 long-distance and 808 local recoveries. Although preliminary, these analyses give insight in migration patterns of species like Dunlin, Curlew Sandpiper, Little Stint, Broad-billed Sandpiper, Ruff, Wood Sandpiper, Redshank and Lapwing including the connections between the East Atlantic and Mediterranean flyways. The Azov-Black Sea region is a staging site of major importance on the Mediterranean flyway for fattening and moulting of waders during autumn migration on the way to their Mediterranean and African wintering grounds as well as for putting up fat reserves for their spring migration towards the arctic breeding grounds.

Key words: Sivash/Ukraine, migration, Mediterranean flyway, Dunlin, Curlew Sandpiper, Little Stint, Broad-billed Sandpiper, Ruff, Wood Sandpiper, Redshank, Lapwing.

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1. Introduction

Wader migration (patterns, timing, numbers, energetics) have been studied extensively in Western Europe and along the East-Atlantic coast, especially for *Calidris* species (e.g. SOIKKELI 1966, PIENKOWSKI & DICK 1975, PIERSMA 1984, 1988, OAG Münster 1987, GROMADZKA 1985, 1988, 1989, GOEDE et al. 1990). Much less information is available from more eastern migratory routes and staging sites (CHERNICHKO 1982, GROMADZKA 1989). Hundred thousands of waders use the Azov-Black Sea region, Ukraine and particularly the Sivash as a stopover site for foraging and moulting during spring as well as autumn migration (CHERNICHKO et al. 1991, 1993, VAN DER HAVE et al. 1993). Because of these high numbers, this area is recognised as a major staging site along the Mediterranean flyway. The whole Sivash is recognised as an Important Bird Area (IBA) and Ramsar site, with large numbers of migrating and breeding waders. In total, 37 wader species occurred in the Sivash on migration during the study period. Total wader numbers there were estimated up to 850,000–1,300,000 during spring and 1,000,000–1,200,000 during autumn passage (CHERNICHKO et al. 1991). So far little information is available on the breeding grounds of birds using this area, their ratios of different age classes and possible subpopulations (subspecies). Moreover it needs to be analysed more in detail which flyways are used by birds using the Azov-Black Sea region.

Regular investigations of spring and autumn wader migration by the Azov-Black Sea Ornithological Station (Melitopol, Ukraine) in the years 1986–1995 included bird-catching and ringing, analysis of number dynamics, age distribution, biometry and moult. This paper summarises available recovery data for different wader species, ringed or controlled in the south of Ukraine area and discusses their migration patterns, mainly across the Azov-Black Sea region (Fig.1). For Dunlin (*Calidris alpina*) as model species in wader migration studies, most numerous among the *Calidris* group in the Sivash, most data are available and more detailed analyses are presented including age

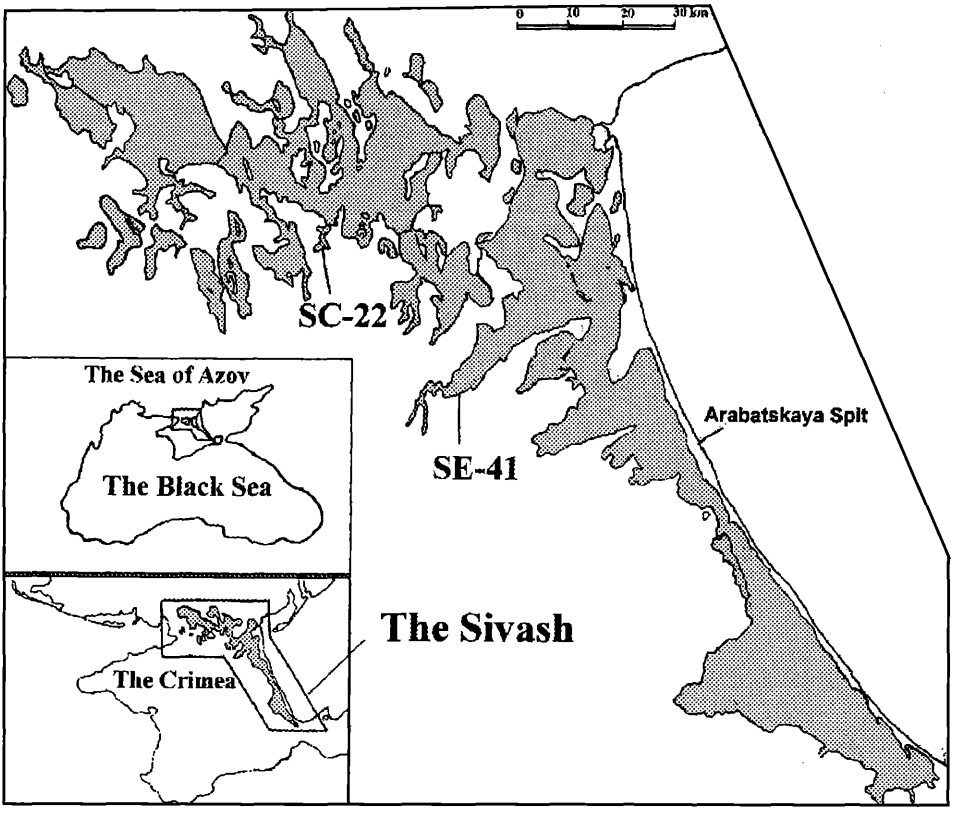

Fig. 1: Map of the Southern Ukraine. Location of the Sivash in the Azov-Black Sea region. Main sites of wader catches are indicated.

Abb. 1: Karte der südlichen Ukraine mit „Sivash" in der „Azov-Black Sea region" und den Hauptgebieten der Limikolenfänge.

composition and discussion of three migratory strategies of birds using the Azov-Black Sea region. For species like Curlew Sandpiper (*Calidris ferruginea*), Little Stint (*Calidris minuta*), Broad-billed Sandpiper (*Limicola falcinellus*), Ruff (*Philomachus pugnax*), Wood Sandpiper (*Tringa glareola*), Redshank (*Tringa totanus*) and Lapwing (*Vanellus vanellus*) available recovery data sets are used to present new information on there migration patterns across the Southern Ukraine. Other species are not analysed, as data on the recoveries are too scarce.

Although preliminary, the recovery data can be used to illustrate the importance of the Azov-Black Sea region and especially the Sivash area as a staging site for waders on spring and autumn migration and they can help to understand the general migration patterns of the species and their possible connections between the East Atlantic and Mediterranean flyways. Similar to the other wetlands in the Azov-Black Sea region the Sivash is a very vulnerable ecosystem, and its biodiversity and productivity depend completely on water quality (salinity, pollution) and water management (drainage, irrigation). Changes in water management, salinity, industrial and agricultural pollution are the main threats of the area. Apart from that intensive fishery, hunting, tourism and sheep grazing are of conservation concern. Nowadays, only less than 1 % of the total area is under protection as a strict nature reserve (WILSON & MOSER 1994). The presented data on wader migration and distribution can contribute to a better protection of the area.

2. Study Area

Between 1986 and 1995, waders have been ringed in the Eastern Sivash (SE, Fig.1) near Chongar and Jankoy (45.47'N 34.31'E, code SE41), in the Central Sivash (SC) near Tselinnoe (46.01'N 34.15'E, code SC22, Fig.1) and at the Azov Sea coast near Molochniy Liman (46.30'N 35.25'E). In the Black Sea region near Tiligul Liman (46.38'N 31.11'E) this work has been started earlier from 1975 under the leadership of J. CHERNICHKO on the field station of Odessa University (CHERNICHKO 1984) and since the foundation of Melitopol Ornithological Station in 1986 it was continued jointly (KORZUKOV 1991). The wetlands of Tiligul Liman and Molochniy Liman are elongated non-tidal lagoons in the mouth zones of small rivers perpendicular to the sea coast.

The Sivash is a large non-tidal lagoon system with extensive windflats between the Crimea and the Sea of Azov divided from the sea by the Arabatskaya Spit. At only one point the lagoon system is connected with the Sea of Azov (Fig.1). Its total area about 2500 km ^{2} includes open water, mudflats and salt marshes. Steppe landscape and agricultural fields surround it. Most lagoons are very shallow, with hypersaline lagoons in the western part of the Sivash and brackish lagoons in the eastern part. The Eastern Sivash has due to the more fresh water input rich macrozoobenthos communities, comparable to those found at the Atlantic coast in Western Europe. Areas with hypersaline characteristics show a low diversity in macrozoobenthos. Because of the high salinity, most lagoons of the Central Sivash contain only Brine shrimps *Artemia salina* (VERKUIL et al. 1993). A considerable increase of fresh water input since 1970s due to agricultural intensification has resulted in extension of suitable feeding habitats for waders.

3. Material and Methods

From 1986 to 1995 annual catching periods of waders were mainly concentrated during end April-May and during September-October (Fig.2). Until 1990, wire mesh walk-in traps were used for wader catching during daylight and night. Since 1990 mist-nets became the main instruments of the night catches. Measurements, plumage and moult scores were taken in accordance with the „Manual for ageing, sexing and description of moult in waders during the WIWO Eastern Mediterranean Project 1990" (by H. SCHEKKERMAN, pre-print). All wader species were aged and sexed by PRATER et al. (1977).

In total 24,477 waders of 33 species (Tab.1) have been ringed, mainly during migration, between 1986 and 1995 in the Southern part of Ukraine. Ringing totals for the Odessa station before 1989 were published earlier – about 18,200 waders of 34 species (KORZUKOV 1991).

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4. Results and Discussion

In total 1298 recoveries of 21 species are available including 159 long-distance recoveries of waders ringed in the Southern Ukraine and controlled abroad. Additionally, 331 birds were ringed abroad and controlled in the Southern Ukraine. The remaining 808 recoveries are local, from birds ringed in the Azov-Black Sea region and controlled there in later seasons. Most long-distance recoveries (52.7%) are Dunlin.

4.1. Species Account

4.1.1. Dunlin (*Calidris alpina*)

In spring, migrating Dunlins arrive in the Sivash from the second half of March, onwards numbers show 2 peaks during half April and half May. They confirm the double-wave pattern of spring migration found in the Sivash (VAN DER WINDEN et al. 1993a). In autumn, Dunlins use the Sivash area in August-November, with peaks in the second decade of September and in October. The proportion

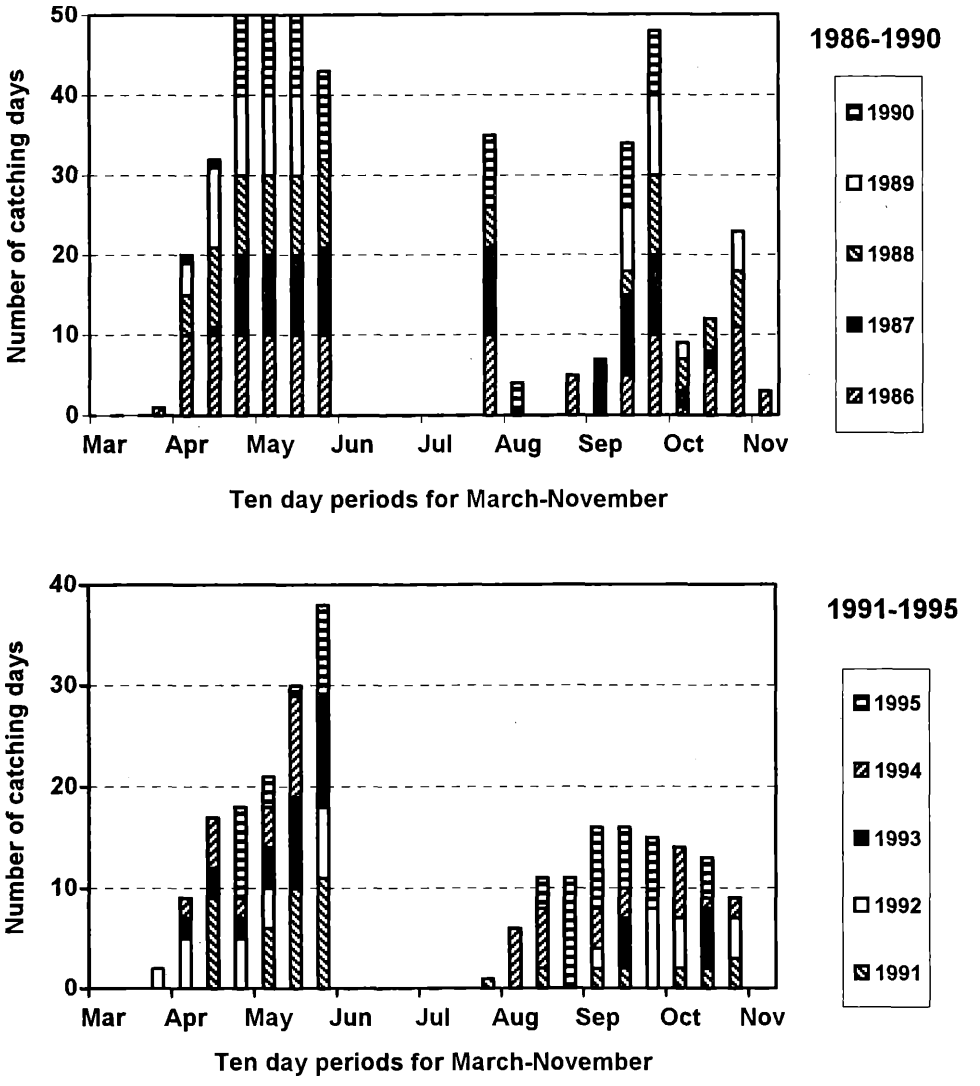

Fig. 2: Seasonal distribution of wader catching efforts in the Azov-Black Sea region in 1986–1995.
Abb. 2: Jahreszeitliche Verteilung der Fangtage in der „Azov-Black Sea region" von 1986–1995.

of juveniles (first calendar-year birds) increased during autumn migration. They were completely absent in mist-net catches in the first part of August, and the proportion steadily increased from 2–3% in late August, to 8–31% in different years in the middle-late September up to 17–71% in October.

The annual changes of the proportion of juveniles, in autumn in the Azov-Black Sea region can be related to the breeding success in the Siberian tundras. Mean yearly percentages of juveniles during autumn migration varied between 13.1–82% in the 1980-ies years, 6.3–28.2% – in 1990-ies (Fig.3). The high percentage of juveniles in 1988, 1991, 1993 (21.6–82%) corresponds to years

Table 1: Totals of waders ringed by the Melitopol Ornithological Station in the Azov-Black Sea region between 1986–1995. Numbers marked * include chicks.Totals of recoveries include birds ringed or recovered in the south of Ukraine: date before1986 came from works at the Odessa station (KORZUKOV 1991) and from computer bank.

Tab. 1: Gesamtzahl aller von der „Melitopol Ornithological Station" in der „Azov-Black Sea region" zwischen 1986–1995 beringten Limikolen. Zahlen mit * beinhalten Pulli. Die Gesamtzahlen der Wiederfunde beinhalten alle in der südlichen Ukraine beringten oder kontrollierten Vögel: Daten vor 1986 stammen aus Arbeiten an der „Odessa-Station" (KORZUKOV 1991) und von der Computerbank.

Species	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	Ringing totals	Number of long-distance recoveries	
												in 1986-95	before 1986
Glareola pratincola	1	-	-	-	1	-	-	*12	-	-	14	-	-
Pluvialis squatarola	6	2	3	1	16	26	17	43	28	78	220	1	4
Charadrius hiaticula	1	3	-	-	-	6	6	3	8	19	46	-	2
Charadrius dubius	-	4	1	3	*13	-	2	-	2	2	27	1	-
Charadrius alexandrinus	65	*73	*47	6	*96	24	9	11	16	91	438	-	-
Vanellus vanellus	2	1	1	1	-	*5	-	-	1	-	11	1	17
Himantopus himantopus	1	-	7	-	-	-	1	-	1	2	12	-	-
Recurvirostra avosetta	3	*66	*51	14	*28	14	3	2	7	4	192	1	3
Haematopus ostralegus	3	-	*3	-	1	3	-	2	1	2	15	-	2
Tringa glareola	21	4	1	8	5	21	2	1	1	10	74	-	24
Tringa nebularia	-	1	-	-	2	1	8	2	9	13	36	-	-
Tringa totanus	378	27	208	32	105	19	17	15	57	24	882	6	6
Tringa erythropus	-	1	-	-	1	-	-	-	-	2	4	-	1
Tringa stagnatilis	6	1	4	2	-	11	1	1	2	11	39	-	1
Actitis hypoleucos	-	3	4	-	1	2	-	1	1	3	15	-	-
Xenus cinereus	-	1	5	-	-	-	-	-	1	2	9	-	-
Phalaropus lobatus	-	-	-	-	2	5	-	12	2	3	24	-	-
Arenaria interpres	4	40	4	-	27	2	-	4	-	2	83	1	1
Philomachus pugnax	31	10	8	19	14	103	513	51	123	50	922	7	42
Calidris minuta	108	130	83	7	335	458	167	206	291	218	2003	7	5
Calidris temminckii	-	-	-	-	-	-	2	-	1	-	3	-	1
Calidris ferruginea	89	94	59	7	358	870	229	1628	1242	316	4892	37	31
Calidris alpina	1155	683	848	596	1588	955	1650	1769	1252	1790	12286	204	54
Calidris alba	1	56	-	-	-	8	-	12	2	1	80	1	-
Calidris canutus	-	-	-	2	-	-	-	-	-	-	2	-	-
Limicola falcinellus	35	36	7	5	26	337	335	507	229	591	2108	15	1
Lymnocryptes minimus	-	1	3	-	-	-	-	-	-	1	5	-	-
Gallinago gallinago	3	-	-	-	-	-	-	1	-	1	5	-	4
Scolopax rusticola	-	-	-	5	7	5	3	-	-	-	20	2	3
Numenius arquata	-	-	-	-	1	-	-	-	-	-	1	-	-
Numenius phaeopus	1	1	1	-	-	-	-	-	-	-	3	-	-
Limosa limosa	4	-	-	-	-	-	-	-	-	-	4	-	4
Limosa lapponica	-	-	-	-	2	-	-	-	-	-	2	-	-
Total	1918	1238	1348	708	2629	2875	2965	4283	3277	3236	24477	284	206

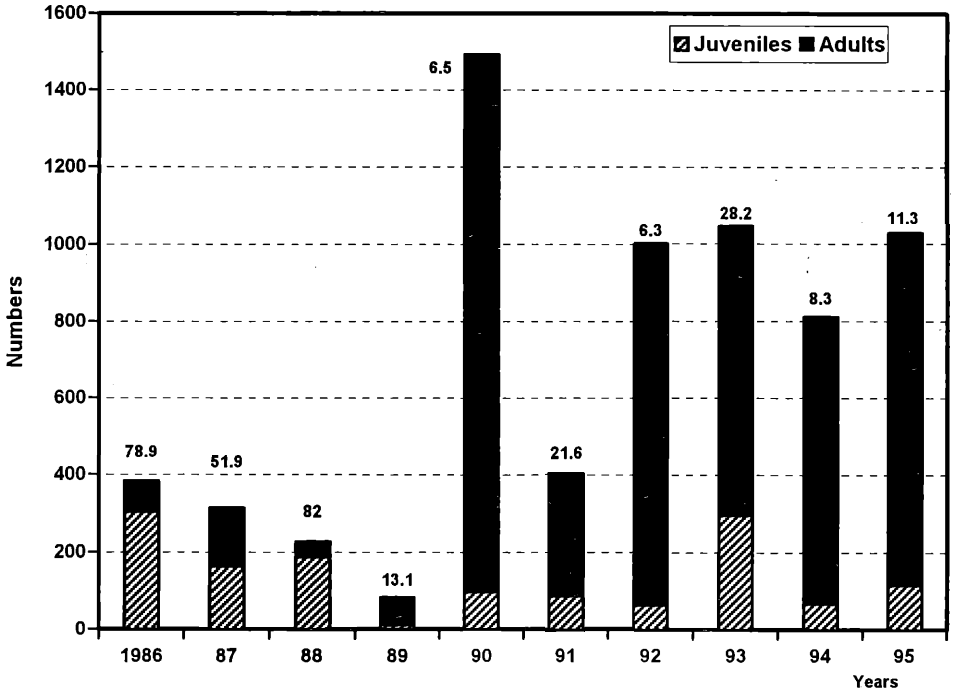

Fig. 3: Age composition of Dunlins caught in the Sivash during autumn migration 1986–1995. Numbers show annual % of juveniles caught by walk-in traps in 1986–1989 and by nets in 1990–1995.

Abb. 3: Alterszusammensetzung von Alpenstrandläufern, die auf dem Wegzug zwischen 1986–1995 in „Sivash" gefangen wurden. Zahlen geben den jährlichen Prozentsatz entweder in Reusen (1986–1989) oder in Netzen (1990–1995) gefangener Jungvögel an.

with comparatively high breeding success in the Western Siberian tundra up to Taimyr (TOMKOVICH 1989, 1992b, 1994). On the contrary, 1989, 1992 were extremely unfavourable years and 1994/95 – not favourable or medium in breeding conditions (TOMKOVICH 1988, 1990, 1993, 1995, 1996) and show low proportions of juveniles in the Sivash (Fig.3). The only exception is 1990 when breeding was relatively successful (TOMKOVICH 1992a) while the proportion of juveniles in the Sivash was low (6.5%). This may be caused by the early catching period this year and the absence of October data (when juveniles are most numerous on migration). In 1986/87 the proportion of juveniles in the Sivash was high, but breeding success data from the breeding grounds are lacking.

Dunlin age composition estimations in Poland at the Vistula mouth in autumn 1991–1993, during catches by walk-in traps (GROMADZKA 1994a, 1994b) confirm the tendency of a correlation between the mean yearly proportion of juveniles on migration and breeding success figures, though fractions of trapped juveniles in Poland were larger than in the Sivash in the same years (i.e. 56, 17, 72% – in Poland and 22, 6, 28% – in the Sivash respectively). Percentages of juvenile Dunlins in the Sivash in the 1980-ies (when walk-in traps have been used) were also higher then in recent years (Fig.3). One of the explanations may be that walk-in traps are more selective for young birds than mist-nets. It is also worthwhile to note that the Sivash in autumn is a very important moulting place for Dunlins where most adults change primaries (up to 3–7 primaries at the same time may be in moult in mid September). So their flight ability is lower than in juveniles (KOZLOVA 1961) and they therefore are possibly more easy to catch with nets. Some dependence of juvenile proportion from

catching site location (most waders in the 1980-ies were captured in Chongar region) also is possible (RÖSNER 1997), but we don't expect major differences caused by this.

The relation between breeding success figures and age composition during autumn migration suggests that at least a considerable part of the juveniles and adults use the same migratory routes. Our data confirm the conclusion that juveniles start their first autumn migration later than adults do (RÖSNER 1997).

In contrast to West European recovery samples most of our recoveries were obtained from Dunlins ringed as adults, after first calendar year (60 %) or from birds of unknown age (29 %). Only 11 % of all recoveries consisted of Dunlins ringed as juveniles but they are all indirect, i.e. recovered few years later after ringing and thus do not reflect specifically migration of juveniles. Only 46 direct recoveries (during 1st year after ringing) of adult Dunlins are available, including 19 ones from birds ringed in Europe or Africa and recovered during the same season in the Azov-Black Sea region and 27 – from birds ringed in the Azov-Black Sea region in spring/summer and recovered in Europe or Africa in autumn/winter of the same year (Fig.4).

On the basis of our recovery data, three strategies of Dunlin migration across the Southern Ukraine may be supposed. Most of Dunlins ringed or recovered in the Southern Ukraine pass Scandinavia, Poland and Germany in autumn in July-August (Fig.5), including breeding birds of Western Siberia at least up to Taimyr (GROMADZKA 1989). They have been recovered in Ukraine (Azov-Black Sea region) not only in spring (n = 95) but in autumn as well (n = 57), involving 15 direct recoveries. Winter records of Dunlins migrating through the Ukraine are mainly from Italy, Tunisia and Egypt in November-March (Fig.4, 5). In that case they may deviate in autumn from their direct route between Scandinavia, Wadden Sea countries and Mediterranean wintering grounds in the southeastern direction to the Azov-Black Sea region – in late August-September (70 % of autumn recoveries) during intensive moult and much less in October (28 %). There are also some continental recoveries in August from Czechia, Hungary, former Yugoslavia. These birds (ringed or recovered in autumn in Scandinavia, the Wadden Sea or continental European countries) have been controlled in the south of Ukraine mainly in May (72 % of spring recoveries), but very few spring recoveries from Western Europe are known (Fig.5). Thus Dunlins migrating across Scandinavia, the Wadden Sea and Azov-Black Sea region to the Mediterranean in autumn perhaps migrate in spring from their wintering grounds across the Azov-Black Sea region directly to Siberian breeding grounds (European continental migration, CHERNICHKO 1982). High numbers of autumn recoveries between Scandinavia, the Wadden Sea and Ukraine, only single spring recovery from Western Europe and numerous spring recoveries from the Azov-Black Sea region support this view. These Dunlins occur in the Azov-Black Sea region twice per year – in spring and in autumn.

At the same time there is another but less numerous group of recoveries from Dunlins migrating in autumn along the Atlantic coast of Europe, recovered in Denmark, Western Germany, the Netherlands, Spain and wintering there (England, the Netherlands, France, Spain). They have been controlled in the Ukraine only in spring (Fig.5a), in April-May (when they return to their breeding grounds) and obviously they do not pass the Azov-Black Sea region during autumn (loop migration). J.GROMADZKA (1985) has already supposed this migration pattern. Generally, for Dunlins controlled abroad there are 1.7 times more spring records in the Ukraine than autumn ones (1.4 times for the Azov-Black Sea region and Poland and more than 2 times for Sweden and Germany). Perhaps in autumn both bird groups pass Scandinavia, Poland, Germany (spring and autumn recoveries in Ukraine are available) and later they use different migration routes: across the Azov-Black Sea region or along the Atlantic coast. The proportion between both strategies is difficult to estimate due to different ringing activities in European countries.

Taking into account that Dunlins wintering in Tunisia and Italy have been recovered in the Ukraine mainly in spring, they most probably reach their wintering grounds by both ways: from the west along the Atlantic coast and partly from the east across the Ukraine area. As for Egypt and

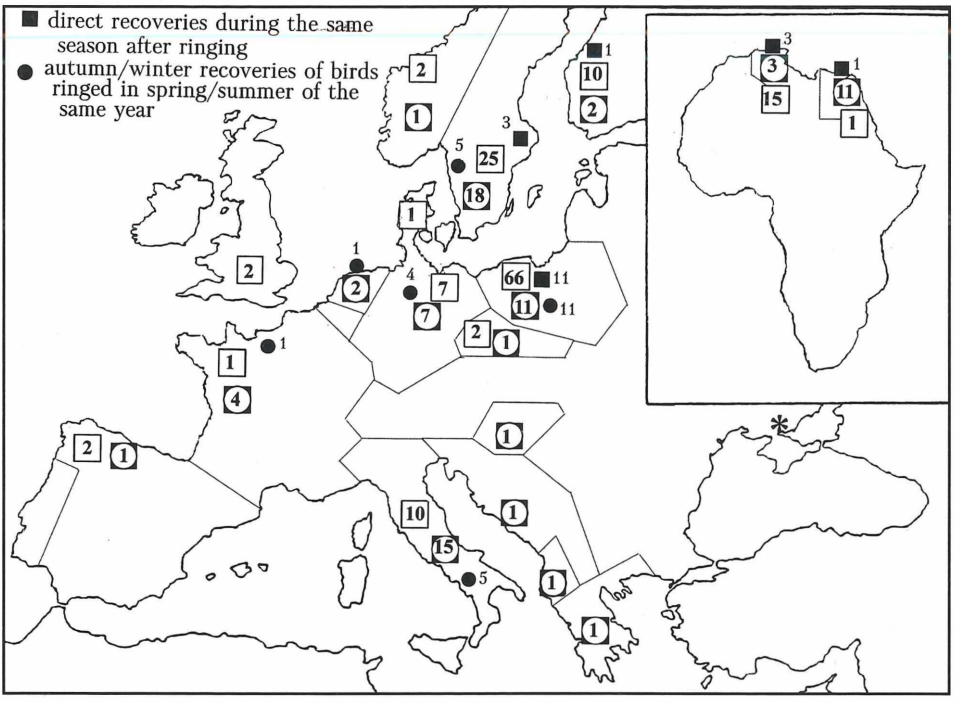

Fig. 4: Numbers and distribution in Euro-African countries of recoveries from Dunlins ringed or controlled in the Azov-Black Sea region *. Squares indicate birds recovered in the Azov-Black Sea region, circles in squares indicate birds ringed in the Azov-Black Sea region.

Abb. 4: Anzahl und Verteilung von Wiederfunden des Alpenstrandläufers in verschiedenen Staaten Europas und Nordafrikas. Alle Vögel wurden in der „Azov-Blach Sea region" * entweder beringt (Quadrate mit offenem Kreis) oder kontrolliert (geschlossene Quadrate).

Greece autumn recoveries in Southern Ukraine are prevalent, Dunlins obviously get there mainly through the Azov-Black Sea region.

Judging from biometry and moult data, at least the vast majority of recoveries mentioned above belong to nominate subspecies *C.a.alpina*, in agreement with previous assumptions (GROMADZKA 1987).

Moreover there are two autumn recoveries from Russia to the east (56.58'N 35.59'E and 53.01'N 32.22'E) of the above mentioned routes. We suppose that they may belong to central Siberian populations migrating to wintering grounds straight across continental Russia area and Ukraine, mainly in October-November when recoveries of Western European migrants are not numerous or absent but some peaks of Dunlin numbers in the Sivash do exist and some characteristics of birds in catches (moult, measurements) differ from earlier patterns. However, recoveries from central Siberia are lacking because of low ringing activities in this area.

4.1.2. Curlew Sandpiper (*Calidris ferruginea*)

Maximum numbers of Curlew Sandpipers were captured and observed in the Sivash in the second half of May and in August up to the first decade of September.

Recovery data (68 in total) for this species come from a vast geographic area, and they show no clear concentrations in any country (Fig.6). Most recoveries were obtained from adults; there are

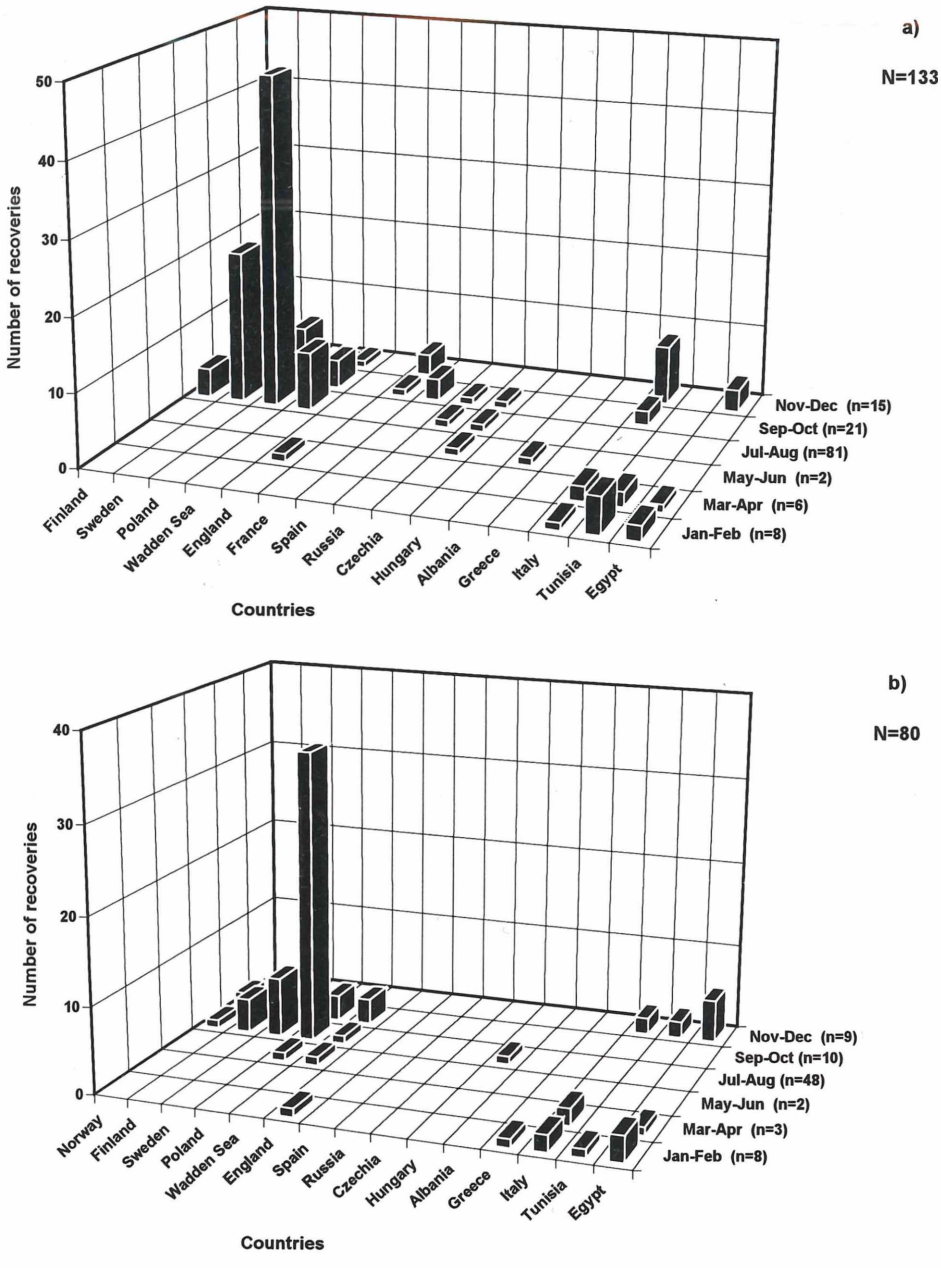

Fig. 5 a-b: Seasonal distribution of recoveries from Dunlins ringed or recovered in the south of Ukraine: a) in spring, b) in autumn.

Abb. 5 a-b: Jahreszeitliche Verteilung der Wiederfänge von in der südlichen Ukraine beringten oder kontrollierten Alpenstrandläufern; a) im Frühjahr, b) im Herbst.

only 6 indirect ones from juveniles. In autumn, Curlew Sandpipers were recovered in Scandinavia, Poland, Germany, England and Spain mainly in July-August (Fig.7). For all these countries there are autumn retraps in the Azov-Black Sea region but only during a short period in August. There was only one retrap in Ukraine from the breeding grounds in Russia (Taimyr). At least part of the Curlew Sandpipers migrating across the Azov-Black Sea region belongs to the birds that use East-Atlantic flyway in autumn. They turn to a southeastern direction and visit the Azov-Black Sea area in August before they continue for their wintering grounds. They only stopover shortly, as most Curlew Sandpipers (about 88 %) do not start to moult their flight feathers in Ukraine. Because relative small numbers of Curlew Sandpipers use the East-Atlantic flyway (GROMADZKA 1985), but high numbers stopover in autumn in the Azov-Black Sea region (more than 70,000 in August, WIWO in prep.) it is likely that the Mediterranean flyway is most important for this species (WILSON et al. 1980). Loop migration pattern of Curlew Sandpipers that follow the East-Atlantic flyway in autumn and continental migration routes in spring also is known (WILSON et al. 1980), but some birds were recovered in the Sivash both in autumn and in spring.

All spring recoveries from the Ukraine were obtained in May. May recoveries from France, Italy and Greece can belong to wintering birds or, more likely, to birds on their way to the breeding grounds. Other spring recoveries from Western and Central Europe are absent but they are available in the Azov-Black Sea region. Though the total number of spring recoveries is not sufficient to prove the direct migration across the Azov-Black Sea region to Siberian breeding without a stopover in Western Europe, they support the assumption of GROMADZKA (1985) that Curlew Sandpipers migrating in autumn along the East Atlantic Flyway, follow the Mediterranean and Black Sea flyway in spring (loop migration).

Winter records of Curlew Sandpipers passing the Ukraine are mainly from all over Africa (Tunisia, Morocco, the Sudan, Senegal, Mali, Namibia, Republic of South Africa). Some Curlew Sandpipers stay in Africa at least up to mid May. Migratory birds show wide dispersal appearing in its northern regions in August-September and from October-November to December are registrated in different regions from north-eastern to Western and Southern Africa. An important wintering area of these birds seems to be in the Southern Africa because Curlew Sandpipers were recorded there during a long period from October to January and most winter recoveries come from this area.

4.1.3. Little Stint (*Calidris minuta*)

Peak numbers of Little Stints were counted and captured during half May and during half August up to early September.

Recovery data from Europe and Africa (Fig.8a) are scarce (12 in total): Little Stints migrating across Scandinavia in July-September were controlled in the Azov-Black Sea region of Ukraine in autumn (September) and in spring (May); birds migrating in August-September through Bulgaria or Italy were controlled in the Ukraine in spring. One Little Stint ringed in Greece was also recovered in the Sivash in spring. In contrary, spring recoveries from Western and Central Europe are absent.

Birds ringed in the Ukraine in autumn, were recorded from Northern Africa (Tunisia, Morocco) in winter.

From the few Little Stint recoveries we may assume that at least part of birds use the Azov-Black Sea region twice each year. E.g., autumn ringed birds from Scandinavia were recovered in the Azov-Black Sea region in spring as well as in autumn. Little Stints recovered in Italy and in Bulgaria in autumn were recorded in the Azov-Black Sea region in spring whereas birds from African wintering grounds were recorded in the Azov-Black Sea region in autumn. Little Stints originating from the same breeding area may migrate in completely different directions (GROMADZKA & KANIA 1985). Because autumn recoveries from Western and Central Europe are lacking, it is difficult to estimate the importance of southeastern direction and more western migration routes on the way between Scandinavia and Azov-Black Sea area. However, autumn recoveries of Scandinavian birds

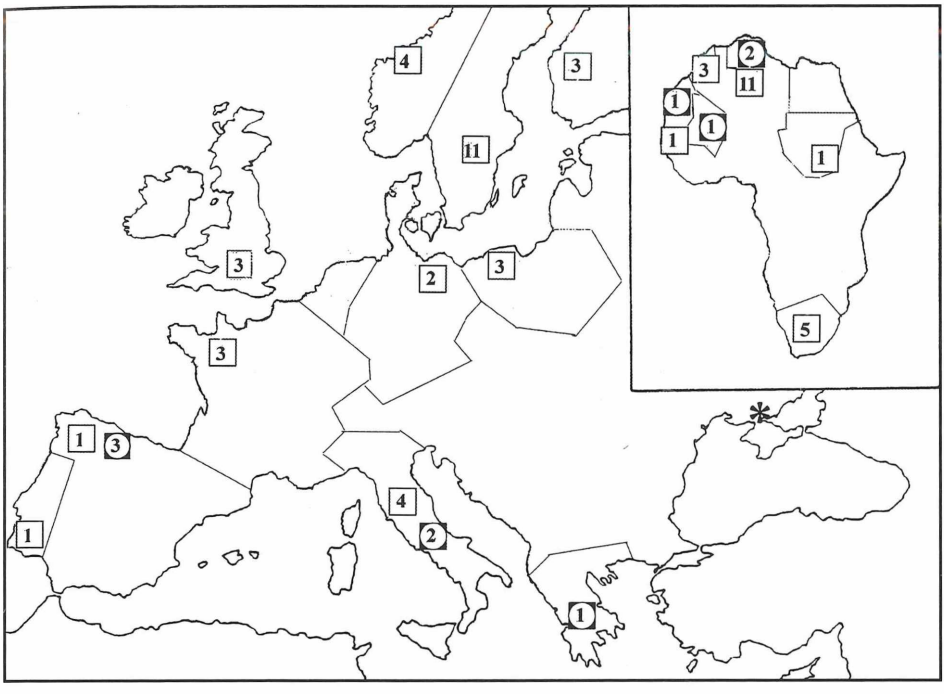

Fig. 6: Distribution in Euro-African countries of recoveries from Curlew Sandpipers ringed or controlled in the Azov-Black Sea region *. Squares indicate birds recovered in the Azov-Black Sea region, circles in squares indicate birds ringed in the Azov-Black Sea region.

Abb. 6: Verteilung der Wiederfunde des Sichelstrandläufers in verschiedenen Staaten Europas und Afrikas. Alle Vögel wurden in der „Azov-Black Sea region" entweder beringt (Quadrate mit offenem Kreis) oder kontrolliert (geschlossene Quadrate).

in the Azov-Black Sea region, total absence of recoveries in the Wadden Sea countries and southwards along the Atlantic coast and some recoveries from Bulgaria and Greece assume the use of continental migration ways in south-southeastern directions in autumn. Autumn recoveries in Italy may belong to Little Stints that headed south-westwards in autumn and returned to their breeding grounds across the Azov-Black Sea region in spring, but the data are too scarce to confirm this possibility. North African (Tunisia and Marocco) records of birds migrating in the Azov-Black Sea area in autumn support the possibility that birds can follow southwestern directions after leaving the Azov-Black Sea area.

Although Little Stints are only recovered in autumn and spring from North-Africa, the species might winter in North Africa as well as in its more southern areas. Large numbers of wintering Little Stints are known from the North African Atlantic coast as well as from areas south of the Sahara (GROMADZKA & KANIA 1985).

4.1.4. Broad-billed Sandpiper (*Limicola falcinellus*)

Peak numbers of Broad-billed Sandpipers in the Sivash were observed in spring in the second half of May (up to 6000–7500) and less (up to 2,200) – in autumn, in August (VAN DER WINDEN et al. 1993b, WIWO in prep.).

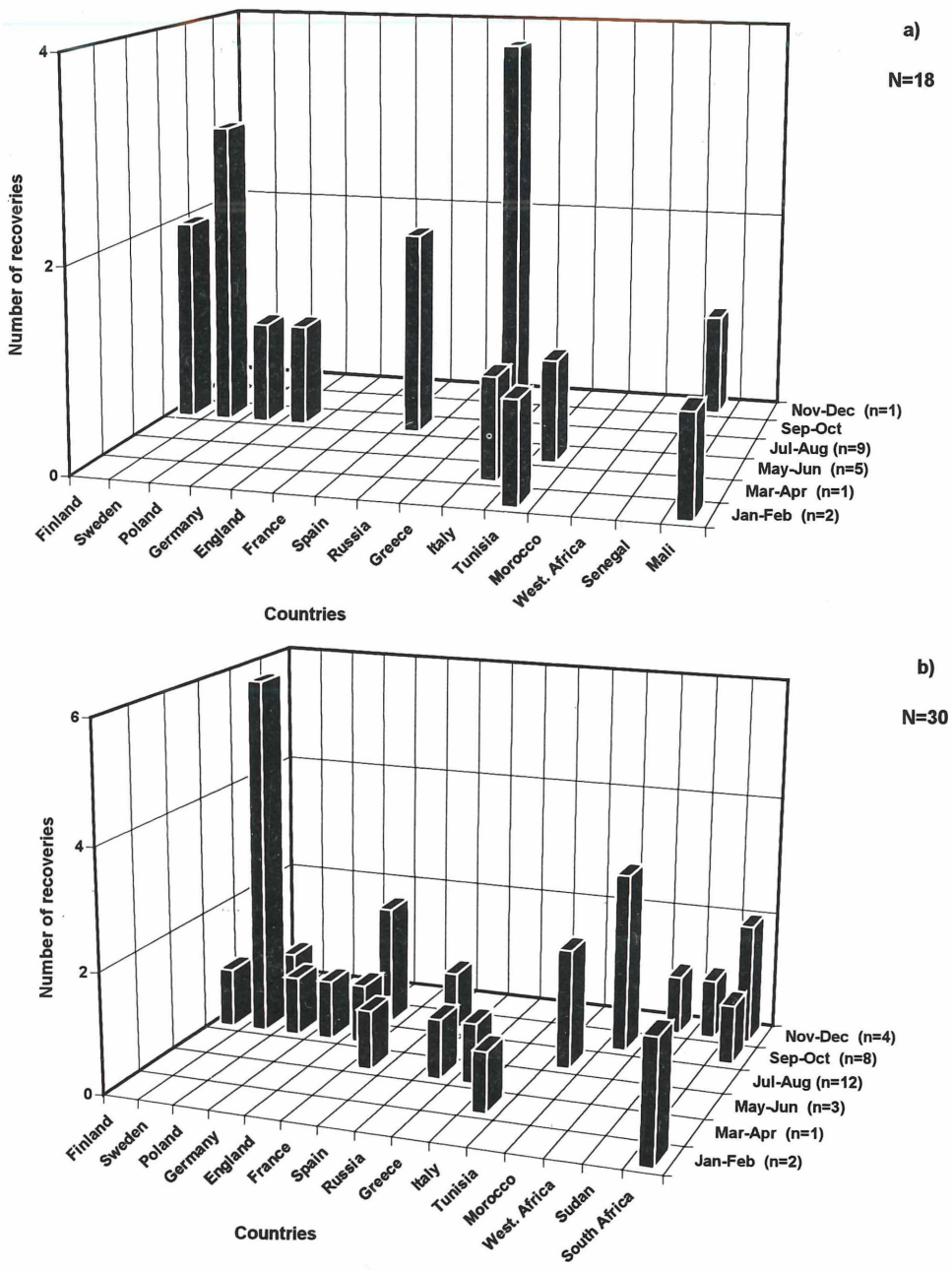

Fig. 7 a-b: Seasonal distribution of recoveries from Curlew Sandpipers ringed or recovered in the south of Ukraine: a) in spring, b) in autumn.

Abb. 7 a-b: Jahreszeitliche Verteilung der Wiederfänge von in der südlichen Ukraine beringten oder kontrollierten Sichelstrandläufern; a) im Frühjahr, b) im Herbst.

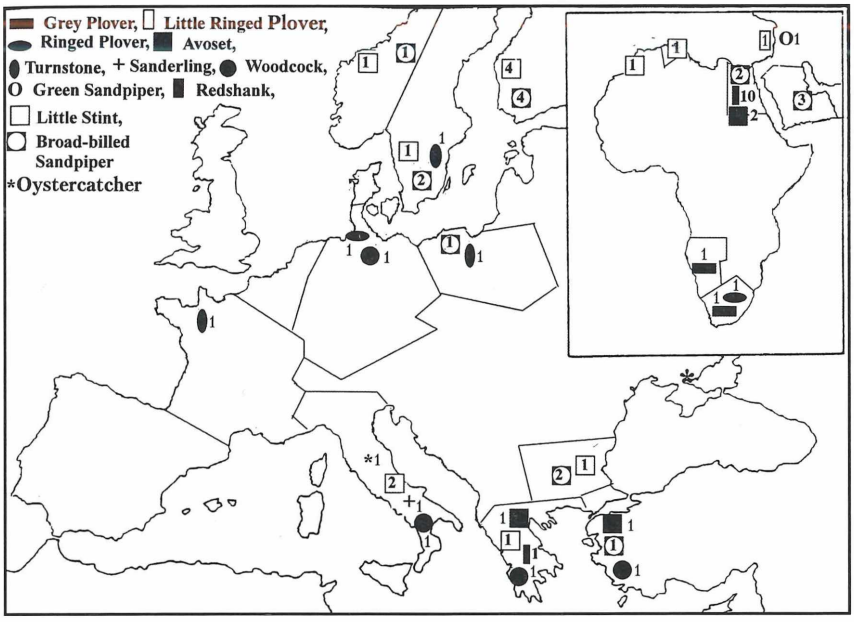

Fig. 8 a: Recoveries of some waders ringed or controlled in the Azov-Black Sea region.
Abb. 8a: Wiederfänge einiger in der „Azov-Black Sea region" beringter oder kontrollierter Limikolen.

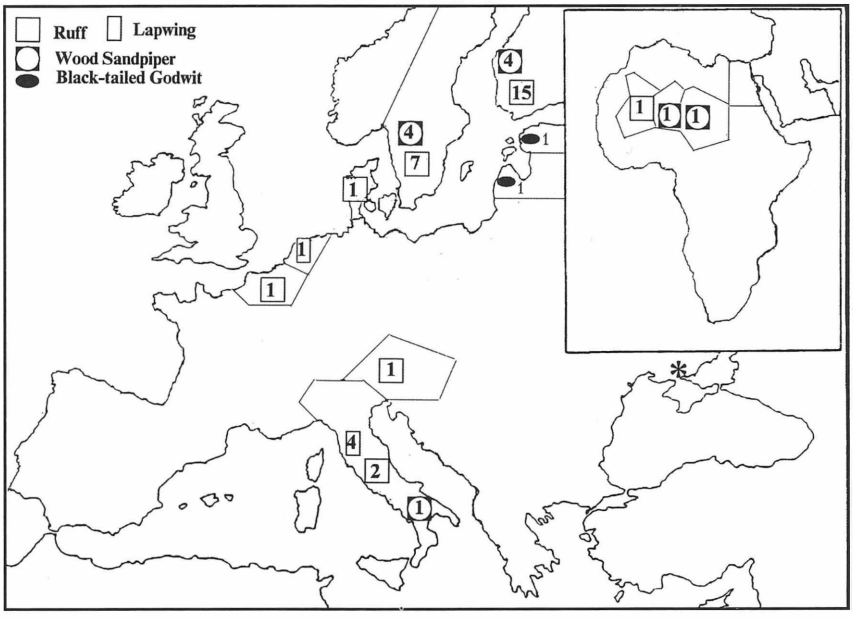

Fig. 8 b: Recoveries of some waders ringed or controlled in the south of Ukraine.
Abb. 8b: Wiederfänge einiger in der südlichen Ukraine beringter oder kontrollierter Limikolen.

All recoveries of this species in the Azov-Black Sea region of Ukraine (16 in total) and retraps in the Sivash between years were obtained in May (autumn recoveries are completely absent). Recovery data came mostly from birds ringed as adults; there is only one indirect recovery of a bird ringed on migration in Sweden as a juvenile. Birds using the Azov-Black Sea region in spring were recorded in autumn mainly in Scandinavia (Fig.8a) in July-August (n=6) and also in Poland (1 bird). There is also one recovery of a Broad-billed Sandpiper ringed in spring in the Sivash from its breeding site in northern Norway.

Winter recoveries of Broad-billed Sandpipers using the Ukraine as a stopover site are absent but they were controlled in late autumn in the United Arab Emirates (October-November) and during spring in Egypt and Turkey (May).

Recent studies (CHERNICHKO et al. 1991, VAN DER WINDEN et al. 1993b) showed that the Sivash is the most important spring stopover site for Broad-billed Sandpipers with at least 30 % of the whole European breeding population present in May. Only spring recoveries in the Sivash from birds ringed in summer or autumn in Scandinavia and the absence of recoveries from more southern areas along the Atlantic coast support the theory that most Broad-billed Sandpipers using the Azov-Black Sea region, use a continental flyway to their Scandinavian breeding grounds.

Southwestern direction of autumn migration is not typical for Broad-billed Sandpipers in Europe (LIEDEL 1985), but autumn recoveries in Ukraine are lacking to discuss this.

Recoveries from May in Egypt and Turkey obviously belong to birds already returning to their breeding grounds and do not clear up the exact location of their wintering area. However recent studies prove the most important wintering areas to be at the Arabian Peninsula (SUMMERS et al. 1987, ZWARTS et al. 1991, VAN DER WINDEN et al. 1993b, HIRSCHFELD 1994, ROSE 1995) and late autumn recoveries from the United Arab Emirates of birds caught in spring in the Azov-Black Sea region are in conformity with this.

4.1.5. Ruff (*Philomachus pugnax*)

Peak numbers of Ruffs were observed and captured in the Sivash in early-half April, the first decade of May and during half August.

Of all Ruff recoveries, 21 were obtained from the Azov-Black Sea region, 18 from the other regions of Ukraine, located more north along the Dnieper River and only 10 recoveries came from the western or eastern regions. Most Ruffs recovered in Southern Ukraine, particularly in the Azov-Black Sea region, in autumn (August-September) were ringed in Scandinavia (Fig.8b), i.e. in Finland and Sweden (n=22) or in northwestern Russia (n=2) mainly on autumn migration (end July-September). Ruffs migrating across the Ukraine in autumn (August-September) were recovered in spring in Italy (March-April) and in Czechia, Belgium and Denmark (May).

Few birds ringed or controlled in spring in the Azov-Black Sea region were recovered. One adult bird ringed in April in the Sivash was recorded on autumn migration in the northwestern area of Russia (Arkhangelsk region). There is also one recovery of an adult male ringed in April in the Sivash and recorded in its wintering grounds in the West Africa (Mali) in December.

Autumn recovery data are in accordance with the migratory pattern described by LEBEDEVA & DOBRYNINA (1985) for Ruffs ringed in Finland and migrating to the southeast along Dnieper River across the Crimea to the Mediterranean countries (Italy). The spring migration route is not so clear because spring recoveries in Ukraine and Central Europe are lacking. Scarce spring recoveries from the northern parts of Ukraine suggest some Ruffs use the same route as they do in spring in opposite direction. The presence of some recoveries from Western Europe along the Atlantic coast show that some Ruffs head northwest during spring migration.

Other recoveries show a link between the Southern Ukraine and West Siberian tundras of Russia (Komi and Tyumen areas). An adult male ringed in the Sivash in spring was recovered in the following breeding season in the Tyumen region. Another one ringed on autumn migration in the

Azov-Black Sea region was recovered in spring in the Komi area in Russia.

Birds originating from the West Siberian breeding areas, obviously pass Southern Ukraine and Russia over land, along the Siberian rivers in spring and perhaps in autumn. There are no autumn recoveries from Western Europe of Ruffs, which used the Azov-Blask Sea Region. However, birds from West Siberia can migrate through Western Europe along the Atlantic coast southwards (LEBEDEVA, DOBRYNINA 1985).

Only one winter recovery from Mali points to wintering grounds in the Western Africa of Ruffs using the Sivash as stopover site.

4.1.6. Wood Sandpiper (*Tringa glareola*)

Maximum numbers in the Sivash were registrated from the end of April up to the first decade of May and in the first half of August.

All recovery data (n = 24) belong to birds that used the Ukraine as stopover site in autumn (July-October). Of these, 5 Wood Sandpipers (adults and juveniles) were ringed in Scandinavia (Fig.8b), i.e. in Finland and Sweden in late July-August on autumn migration. They were recovered in August-September in the Azov-Black Sea region and 18 Wood Sandpipers were recovered in the other regions of the Ukraine. Autumn recoveries from wintering grounds of birds migrating in July-August through Southern Ukraine were obtained from West Africa (Nigeria, Chad). Spring recoveries have been obtained only from Italy.

These data belongs to Wood Sandpipers that follow a southeastern direction in autumn, starting in Scandinavia and then migrating along Dnieper river area, across the Azov-Black Sea region to the wintering grounds in the West Africa (LEBEDEVA et al. 1985). The bird caught in Italy, likely was on spring passage to the breeding grounds.

4.1.7. Redshank (*Tringa totanus*)

Most of foreign Redshank recoveries (n = 12) were obtained in Egypt (83%; Fig.8a) in the period November-March from birds ringed in the Black Sea region in April-June. All recoveries originated from adult birds breeding in the Black Sea region or from their offspring. There is also one direct autumn recovery in Greece (November) from a juvenile bird ringed in the Black Sea region. Available recoveries suggest that the main wintering areas of Redshanks breeding in the Black Sea region are along the East African Mediterranean coast.

4.1.8. Lapwing (*Vanellus vanellus*)

Part of the Lapwing recoveries, of (mainly) adults that used the Ukraine as stopover site in the period August-October, were obtained in autumn (November), winter (December-February) or spring (March) from the Netherlands; in spring (March) – from UK (England); in winter and spring (December-March) – from Italy. There is also one spring recovery from Central Russia. Birds ringed during winter-spring in the Netherlands and in autumn in England were recovered in the Ukraine in spring.

Lapwing recoveries came from different regions of Ukraine. Only one autumn recovery was received in the Azov-Black Sea area from a bird ringed in spring in Hungary, 5 others (Fig.8b) were obtained from adjacent southern regions and 11 from western and northern regions of the Ukraine.

On the basis of the scarce available recoveries, it can be concluded that birds that use the Ukraine as stopover site in autumn and spring, migrate in western and southwestern directions in the post summer period for their winter quarters at the Atlantic coast of Western Europe or in the Mediterranean. Birds on spring migration may follow the same routes in opposite direction, an important migratory route starts with Italy. Likely part of the Lapwing population migrates in spring from the Mediterranean across Eastern Europe and Southern Ukraine over land to the breeding grounds in Russia.

4.2. Conclusions

The results of this and other studies clearly show the important role of the Azov-Black Sea region and especially the Sivash Lagoon system for migrating waders (*e.g.* CHERNICHKO 1982, CHERNICHKO et al. 1991, CHERNICHKO et al. 1993, KORZUKOV 1991 & VAN DER WINDEN et al. 1993a). At least 37 species use the area, usually in international important numbers, as stopover site on their migration between North, West Europe, the Baltic and their wintering grounds in Mediterranean or Africa.

It is clear that a considerable part of wader population that pass Scandinavia or the Baltic in autumn use the Azov-Black Sea region both in autumn and spring (*e.g.* Curlew Sandpipers, Dunlins and Little Stints with south-eastern autumn migration) or only in spring (Dunlins, Curlew Sandpipers with loop migration that follow in autumn along the Atlantic coast of Europe).

Because of low ringing activities in the Siberian tundras, still little is known about migration routes between the breeding areas and the Northern Black Sea especially about possible stopover sites on the continent.

The Sivash is the largest and the most important area for waders in the Northern Black Sea. In autumn this staging site is used for „refuelling" and usually for completing or developing moult. In spring the Sivash seems to be the most important stopover site for many Siberian wader species, particularly for Ruffs and *Calidris* species on route to their breeding grounds.

Unfortunately, the protection of the Sivash is still insufficient. The increase in illegal hunting on birds during migration, tourism , sheep grazing and especially industrial and agricultural pollution and salinization are the main threats for the area. These activities may diminish the available habitat surface, but change habitat quality at the same time. About 457 km² are included to the Azovo-Sivash national park but less than 1% of this area is under strict reserve protection (WILSON & MOSER 1994). An area of 950 km² was reserved by a Crimea Supreme Soviet decree in April 1994 for the future inclusion into the nature reserve fund of Crimea Republic as the Sivash national Nature Park but means for realization of protection were not found. Establishment of the Sivash National Park including areas of Central and Eastern Sivash is under consideration urgently needed in order to protect the area as most important stopover site for waders during migration.

5. Zusammenfassung

Die Schwarzmeer-Region (inkl. Asowsches Meer) und insbesondere der „Sivash" (Ukraine) ist ein bedeutendes Limikolenrastgebiet, sowohl auf dem Heim-, als auch auf dem Wegzug.

Zwischen 1986 und 1995 wurden insgesamt 24 477 Limikolen aus 33 Arten von der „Azov-Black Sea Ornithological Station" beringt, größtenteils während der Zugperioden. Insgesamt wurden 1298 Wiederfunde, 21 Arten betreffend, analysiert (490 Fern- und 808 Nahfunde). Die Analysen liefern einen ersten, vorläufigen Einblick in die Zugmuster (einschließlich der Verbindungen zwischen ostatlantischen und mediterranen Zugrouten) bei Alpenstrandläufer, Sichelstrandläufer, Zwergstrandläufer, Sumpfläufer, Kampfläufer, Bruchwasserläufer, Rotschenkel und Kiebitz.

Der Region Schwarzes-/Asowsches Meer kommt für Limikolen auf der Mittelmeer-Zugroute größte Bedeutung zu, sowohl auf dem Wegzug in die mediterranen und afrikanischen Ruheziele (Mauserrastplatz; Anlegen von Depotfett), als auch auf dem Heimzug in die arktischen Brutgebiete (Auffüllen von Fettreserven).

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