

# MIGRATION OF WADERS (*Charadrii*) AT THE SEDIMENT-PONDS AND FLOODS OF COAL-MINES IN JASTRZĘBIE ZDRÓJ

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## ABSTRACT

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The study was conducted in years 1987-2001 at the sediment-ponds and floods of coal-mines in Jastrzębie Zdrój (southern Poland). Most observations were made at the sediment-pond of the "Zofiówka" coal-mine (10 ha). During the study, 442 observations were done throughout the whole year. Consequently, 23 species of waders were found. The domination structure of wader assemblies did not differ considerably from that found in other inland sites in Poland. In spring the dominants were: Lapwing (*Vanellus vanellus*), Wood Sandpiper (*Tringa glareola*), Little Ringed Plover (*Charadrius dubius*), Redshank (*Tringa totanus*), Ruff (*Philomachus pugnax*). A relatively high participation of Little Ringed Plover (ca 12% of all birds observed in spring) and Redshank (9%) was stated. Applying the flushing method improved the detectability of Jack Snipe (*Lymnocyptes minimus*) especially in spring, and Common Snipe (*Gallinago gallinago*) both in spring and autumn. During autumn migration the most numerous species (except for Lapwing) were: Wood Sandpiper, Little Ringed Plover and Ruff. Common Sandpiper (*Actitis hypoleucos*) and Common Snipe were also observed quite frequently.

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**Key words:** waders, spring migration, autumn migration, migration dynamics, coal-mine sediment-ponds

## INTRODUCTION

The majority of long-term studies concerning waders' inland passage dealt with large reservoirs (Kuźniak and Lorek 1993, Stawarczyk *et al.* 1996, Dyrz *et al.* 1998, Janiszewski *et al.* 1998) and fish ponds (Witkowski and Ranoszek 1998, Wiehle 1999). So far no papers describing migration of waders at sediment-ponds and floods of coal-mines have been published in Poland. The present work is an attempt to fill in this gap.

## STUDY AREA

The study was conducted at coal-mine sediment-ponds in the town of Jastrzębie Zdrój in southern Poland (Fig. 1). Areas of the studied sediment-ponds were as follows: the “Zofiówka” coal-mine (former “Manifest Lipcowy”) – 10 ha, the “Jastrzębie” coal-mine – 4 ha, three setting-ponds of the “Moszczenica” coal-mine – 12 ha. The total area of the controlled ponds was 26 ha. The sediment-ponds constitute the final element of the external water-sludge management of coal-mines. They are designed to condition periodically a part of technological water. Moreover, sediment-ponds are used as emergency flotation refuse reservoirs. Most observations were made at the sediment-pond of the “Zofiówka” coal-mine. This sediment-pond had the capacity of 650 000 m<sup>3</sup> and the depth of 6 m. About 30% of the total area was covered with vegetation, mainly the Reed (*Phragmites communis*). The remaining area was sludge and water. Water level varied occasionally, especially after heavy and prolonged rainfalls, but most of the time it remained stable. The sludge stripe was 1-10 m wide in different spots (ca 2 m on average). 76.2% of observations of all waders were made at the sediment-ponds (with 97% of those observations at the sediment-pond of “Zofiówka”).



Fig. 1. Location of the study area in Poland

Waders were also observed (23.8%) at the collapse sinks and floods resulting from mining damages. They were situated on fields and meadows between sediment-ponds and mining dumps. The collapse sinks tended to be rapidly overgrown with vegetation. Main species at all stages of overgrowth were: Reed-mace (*Typha latifolia*) and Reed. The Reed predominated only at one of the collapse sinks. Gradually, willows (*Salix* sp.) and various representatives of weeds appeared in the area, for example: Golden Rod (*Solidago virgaurea*) and Tansy (*Tanacetum vulgare*). The collapse sinks were often accompanied by moor meadows constituted of rush *Juncus effusus* and sedges (*Carex* sp.), and they periodically dried in summer

as a result of low water level. The area of collapse sinks spread every year, thus contributing to the increase of the overall acreage. In 1999, the total area of the water-surface of 12 collapse sinks amounted to 62 ha (Bujok 1999), but it is larger now. The area of individual floods varied from 0.15 to 20 ha.

The floods were frequented by anglers who scared away the waders feeding on the bank. At the sediment-ponds human penetration was less considerable and people were walking on the dam.

## METHODS

The data were collected in 1987-2001 (except for 1993), but the majority of regular observations were made in 1999-2001 (71% of observations). In total, within the whole study period, material from 442 days of observation was collected (Table 1). The observations were carried out during walks along the banks of the sediment-ponds and floods. Observations were made with the use of binoculars 15 × 50 and 16 × 50. In 2000 and 2001, within the area of the collapse sinks and floods, the flushing method was adopted in order to increase the detectability of snipes. It was applied by systematic walk penetration of suitable places from late February to mid-May and from June to early November. Consequently, it increased the detectability of the Common Snipe (*Gallinago gallinago*) and brought about the discovery of regular spring migration of the Jack Snipe (*Lymnocyrtus minimus*). In case of certain species, the age of birds was also determined (young or adult). These include (percentage of aged birds given): Dunlin (*Calidris alpina*) – 80%, Ruff (*Philomachus pugnax*) – 57%, Greenshank (*Tringa nebularia*) – 40% and Wood Sandpiper (*Tringa glareola*) – 50%. Migration dynamics graphs were drawn for regularly

Table 1  
Number of controls in subsequent months

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1987				2	1	2							5
1988		1	1								1		3
1989			2	2	3	2				2		2	13
1990	3	2	1	2	1	1		1			2	2	15
1991	1	3	5		4			1				1	15
1992	2												2
1994								7		1		1	9
1995	2		1	4	1	4	6	1					19
1996	1		2	1	2	1				1			8
1997			1		1	7		1		1			11
1998			1	2	6		1	6	1		1		18
1999			2	8	9	4	4	16	14	7		1	65
2000	5	11	11	20	13	9	8	20	16	7	9	8	137
2001	4	12	13	14	12	5	23	7	15	10	7		122
Total	18	29	40	55	53	35	42	60	46	29	20	15	442

passing species, and they were presented in the pentade system (Busse 1973). Following the recommendations for long-term data (Borowiec *et al.* 1981) histograms were used, illustrating long-term average and the maximum number of birds in pentade.

## RESULTS

In the period 1987-2001, 23 species of waders were found in the study area. The dominant one (both in spring and autumn) was Lapwing (*Vanellus vanellus*) – see Table 2. In spring, the proportion of the Lapwing in assemblages was 55%, and in autumn – almost 64%. The second most numerous species in spring was Wood Sandpiper – 13.6 %, followed by Little Ringed Plover (*Charadrius dubius*) – 12.2%, Redshank (*Tringa totanus*) – 8.7% and Ruff – 5%. In autumn, besides Lapwing, Wood Sandpiper – 14.9%, Little Ringed Plover – 5% and Ruff – 4.7% were also relatively numerous. Other species did not exceeded 3% of the whole group.

Table 2

Domination structure of waders assemblages in spring and autumn migration periods in the sediment-ponds and floods of coal-mines in Jastrzębie Zdrój in years 1987–2001.  $N_o$  – number of observations,  $N_i$  – number of individuals, % – dominance according to the number of individuals observed; + – percent share less than 0.1%.

	Spring			Autumn			Total		
	$N_o$	$N_i$	%	$N_o$	$N_i$	%	$N_o$	$N_i$	%
<i>Vanellus vanellus</i>	91	2472	55.0	126	7232	63.9	217	9704	61.4
<i>Tringa glareola</i>	64	610	13.6	127	1684	14.9	191	2294	14.5
<i>Charadrius dubius</i>	129	550	12.2	74	564	5.0	203	1114	7.0
<i>Philomachus pugnax</i>	37	226	5.0	84	531	4.7	121	757	4.8
<i>Tringa totanus</i>	104	393	8.7	20	28	0.2	124	421	2.7
<i>Actitis hypoleucos</i>	30	48	1.1	89	323	2.9	119	371	2.3
<i>Gallinago gallinago</i>	18	63	1.4	70	266	2.4	88	329	2.1
<i>Calidris alpina</i>	2	2	+	40	190	1.7	42	192	1.2
<i>Tringa nebularia</i>	16	28	0.6	51	134	1.2	67	162	1.0
<i>Tringa ochropus</i>	5	8	0.2	66	136	1.2	71	144	0.9
<i>Calidris minuta</i>	1	4	0.1	19	68	0.6	20	72	0.5
<i>Tringa erythropus</i>	5	8	0.2	29	61	0.5	34	69	0.4
<i>Lymnocyptes minimus</i>	24	57	1.3	4	4	+	28	61	0.4
<i>Charadrius hiaticula</i>	2	3	0.1	13	31	0.3	15	34	0.2
<i>Calidris temminckii</i>	3	6	0.1	19	24	0.2	22	30	0.2
<i>Numenius arquata</i>	0	0	0	6	17	0.2	6	17	0.1
<i>Calidris ferruginea</i>	0	0	0	12	15	0.1	12	15	0.1
<i>Tringa stagnatilis</i>	4	6	0.1	3	3	+	7	9	0.1
<i>Scolopax rusticola</i>	1	1	+	1	1	+	2	2	+
<i>Pluvialis squatarola</i>	0	0	0	2	2	+	2	2	+
<i>Phalaropus lobatus</i>	0	0	0	2	2	+	2	2	+
<i>Limosa limosa</i>	2	6	0.1	0	0	0	2	6	+
<i>Gallinago media</i>	2	2	+	0	0	0	2	2	+
Total	540	4493	100	857	11316	100	1397	15809	100

### Little Ringed Plover (*Charadrius dubius*)

It was observed 203 times, in the total number of 1114 birds. In spring the first birds were seen in mid-March and the regular passage began at the end of the month (Fig. 2). At that time, mostly small groups up to four birds were observed, only exceptionally larger (24 Mar. 2001 – 8 *ad.*, 29 Mar. 2001 – 11 *ad.*, 31 Mar. 2001 – 8 *ad.*). The spring migration lasted throughout April (with two peaks, in early and late April) to early May. From 4 to 6 pairs bred on the study area in different years.

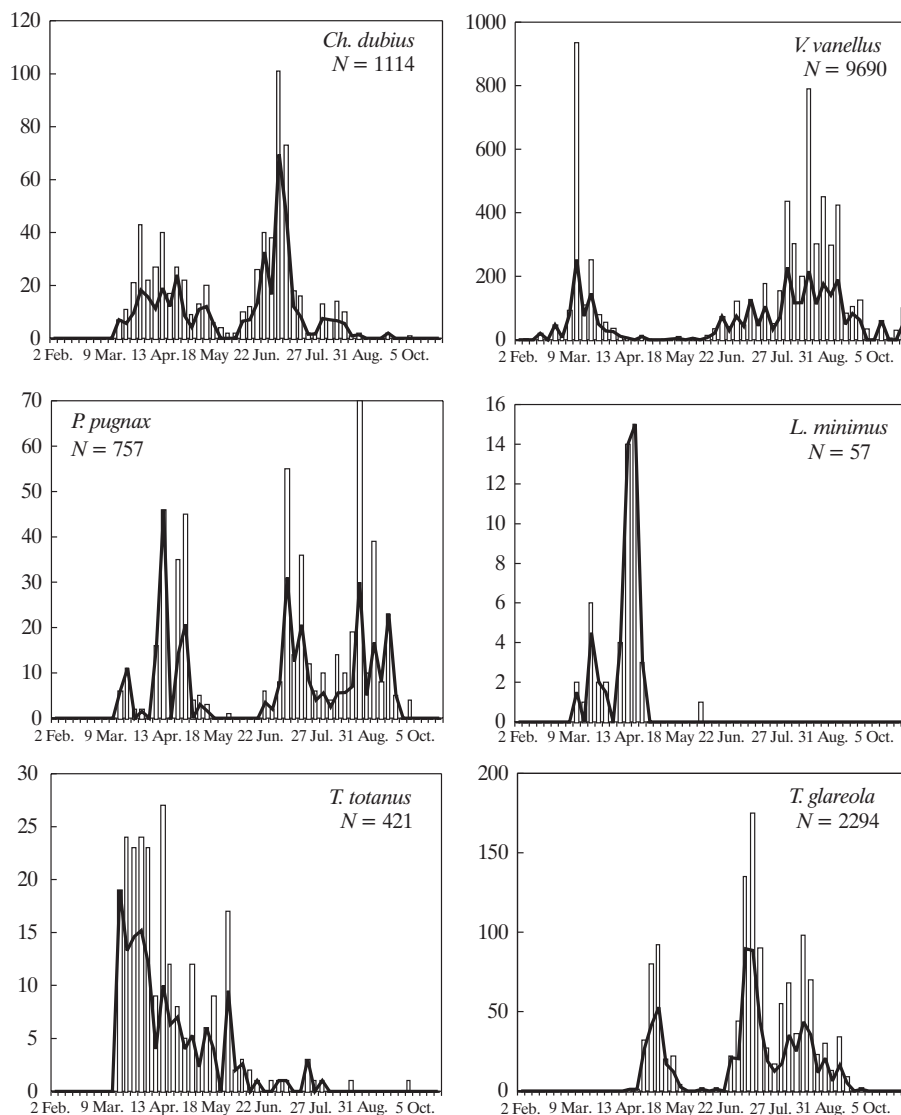


Fig. 2. Seasonal number dynamics of some waders in Jastrzębie Zdrój in 1987-2001. Black line – average number of birds in pentade; white bars – maximum number of birds in pentade.

The autumn migration started in June, and it was particularly intensive at the end of the month (28 Jun. 2000 – 34 indiv.). The breeding birds along with the migrants constituted the peak in the first half of July. In July and August the passage was not intensive, and it finished in early September. The latest individuals were observed in late September and October: 19 and 20 Sept. 2001 – 1 bird, 3 Oct. 1999 – 1 bird. An exceptionally late observation of 7 birds comes from 15 Nov. 1998. It was one of the latest observations of this species in Poland.

**Ringed Plover (*Charadrius hiaticula*)**

Observed 15 times (34 indiv.). Only two observations in spring (20 Mar. 2001 – 2 *ad.*, 29 Mar. 2001 – 1 *ad.*). The autumn migration started in mid-July: 16 Jul. 1994 – 4 indiv. In August, especially in the second half, the birds were observed 9 times – 1 to 5 indiv. (mainly adults). In September were noted on: 10 Sept. 1998 – 2 *imm.*, 11-14 Sept. 2000 – 1 *imm.* The latest observation of one young bird was made on 7 Oct. 2001.

**Grey Plover (*Pluvialis squatarola*)**

Two observations of single young birds come from 22 Sept. 1999 and 30 Sept. 2001.

**Lapwing (*Vanellus vanellus*)**

Observed 217 times, in the total number of 9704 birds. The spring passage started in the third decade of February, although first birds were observed already on 8 Feb. 2001 – 3 indiv. and 17 Feb. 2000 – 20 indiv. The peak of the spring migration occurred in the second decade of March, when the largest two flocks of 400 and 496 birds were observed on the same day – 12 Mar. 2000 (Fig. 2). In the second half of March, the passage was less intensive but still large flocks were recorded on: 23 Mar. 1988 – 200 indiv., 22 Mar. 2000 – 150 indiv. The spring migration finished in the first decade of April. 20-26 pairs remained in the study area for breeding.

The autumn migration started in mid-June, when flocks of 10-35 birds were regularly observed. The autumn passage was characterised by several peaks and was most intensive from early August to mid-September with the highest peak in the third decade of August. From the second decade of September, the passage was less intensive and lasted until the end of October. The latest observation of 13 birds was done on 27 Nov. 2001.

**Little Stint (*Calidris minuta*)**

It was observed almost exclusively in autumn and only once in spring – 4 indiv. on 21 May 1999. In total, it was seen 20 times (72 indiv.). The autumn passage started in mid-August (11 observations of 33 indiv. in August), although the earliest observation of a single bird was done on 30 Jul. 1999. The autumn passage lasted until mid-September (7 observations of 30 indiv. in September). The birds occurred

in flocks of 1-8 indiv. The largest flocks were observed on: 31 Aug. 1998 – 12 indiv., 10 Sept. 1998 – 14 indiv.

**Temminck's Stint (*Calidris temminckii*)**

Observed 22 times (30 indiv.). Three spring observations in May: 11 May 1997 – 1 *ad.*, 11 May 2000 – 1 *ad.*, 12 May 2000 – 4 *ad.* In the autumn, 1-2 birds were observed in July (4 times), August (12 times) and September (4 times). The earliest and the latest single birds were observed on 23 Jul. 2001 and 14 Sept. 2001, respectively.

**Curlew Sandpiper (*Calidris ferruginea*)**

Observed 12 times (15 indiv.). In August, 1-2 birds were observed 10 times (4 times – adults). The first observation of a single adult was done on 24 Jul. 1995. The latest observation was done on 1 Sept. 2000 – 2 *imm.*

**Dunlin (*Calidris alpina*)**

Recorded 42 times (in total – 192 indiv.). In spring, noted only twice – single adults on 6 and 8 Apr. 2000. The autumn migration started in the third decade of July, the first observations were made on: 20 Jul. 2000 – 1 *ad.*, 29 Jul. 2000 – 3 *ad.* In early August, small groups of 2-4 adults were observed. They began to appear in higher numbers on the turn of August, when flocks composed of up to ten individuals were observed (adult and young birds). The autumn passage was most numerous in the second decade of September, when the largest flock of 23 indiv. was observed (12 Sept. 1999). The regular passage lasted until late September and ended rapidly. The latest observation of three young birds was made on 14 Oct. 1996.

**Ruff (*Philomachus pugnax*)**

Noted 121 times, with the total number of 757 individuals. The spring passage started in the third decade of March (Fig. 2). First observations were made on: 20 Mar. 2001 – 4 indiv., 21 Mar. 2001 – 3 indiv. The most numerous passage took place from mid-April to early May (the peak in numbers occurred in the second decade of April). The largest concentrations of 23 and 29 birds were observed on 30 Apr. 1999 and 1 May 1999. The spring migration finished in the first decade of May, when groups of up to 6 birds were observed. The latest observation of a single bird was made on 2 Jun. 2000.

The autumn migration started at the end of June (26 Jun. 2001 – 3 indiv., 28 Jun. 2000 – 1 indiv., 28 Jun. 2001 – 3 indiv.) and the first peak was recorded in the second and the third decade of July. In this period the flocks consisted mainly of adult males, still in the breeding plumage. The most numerous flock of 29 birds was observed on 29 Jul. 2001. The second, much more numerous peak, consisting mainly of young birds, occurred on the turn of August. The most numerous flocks: 30 Aug. 1998 – 30 indiv., 31 Aug. 1998 – 40 indiv., 10 Sept. 1998 – 25 indiv. The autumn migration finished on the turn of September and the latest observation of 4 birds was made on 3 Oct. 1999.

**Jack Snipe (*Lymnecryptes minimus*)**

Recorded mainly in spring, exclusively on floods between the fields. Recorded 28 times, 61 birds in total. The spring passage started in March, the first two birds were observed on 12 Mar. 2000. In March, the number of birds varied and fluctuated from 1 to 4 birds. The peak of passage occurred in the second and the third decade of April (Fig. 2). The largest concentrations were observed on: 19 Apr. 2001 – 10 indiv., 23 Apr. 2001 – 7 indiv. In June, one single bird was recorded on 6 Jun. 2001. In autumn, although the spot was penetrated in the same manner as in spring, only four times single birds were observed on: 18 Sept. 2000, 12 Oct. 2000, 19 Oct. 2001 and 21 Oct. 2001.

**Common Snipe (*Gallinago gallinago*)**

It was seen 88 times, in the total number of 329 indiv., especially in autumn. In spring, it was often observed at the floods (77% records and 84% indiv.), then at the sediment-ponds. First single birds appeared in mid-March (14 Mar. 2001 and 18 Mar. 2000). In spring, most individuals of this species were noted in the second decade of April, when the largest concentrations were observed: 14 Apr. 2001 – 10 birds, 19 Apr. 2001 – 13 birds. The spring passage finished in the first decade of May. The latest spring records of 3 birds fell on 4 and 7 May 1998.

The autumn passage started in mid-July. The first observation of 4 birds was made on 16 Jul. 2001. The passage finished at the end of October. The latest observation was made on 31 Oct. 2001: 8 indiv. at the flood and 3 indiv. at the sediment-pond. The most numerous flocks in the autumn migration were noted on: 18 Aug. 2000 – 10 indiv., 10 Sept. 1999 – 13 indiv., 18 Sept. 2000 – 10 indiv., 5 Oct. 2000 – 10 indiv., 13 Oct. 2001 – 12 indiv., 21 Oct. 2001 – 10 indiv., 27 Oct. 2001 – 16 indiv. The Common Snipes were observed at the floods – 47.7% of observations as well as at the setting-ponds – 52.3% of observations.

**Great Snipe (*Gallinago media*)**

Two observations of single birds were made on 12 May 2000 and 23 May 2001.

**Woodcock (*Scolopax rusticola*)**

Single birds were seen twice: on 5 Apr. 1995 at the sediment-pond of the “Zofiówka” coal-mine and on 23 Oct. 1994 in a grove near the “Zofiówka” coal-mine.

**Bar-tailed Godwit (*Limosa limosa*)**

Two observations were made on 5 Apr. 1995 – 1 *ad.* and on 28 Mar. 2001 – 5 *ad.*

**Curlew (*Numenius arquata*)**

It was seen 6 times in autumn: 20 Aug. 1998 – 1 bird, 5 and 9 Aug. 1999 – 3 birds (probably the same), 26 Aug. 1999 – 1 bird, 27 Aug. 2000 – 2 birds and 1 Sept. 2001 – 7 fleeting birds.



**Spotted Redshank (*Tringa erythropus*)**

In total 69 individuals were seen on 34 occasions. In spring, five observations of 1-2 birds were made from 12 April to 7 May. In June, it was seen once – a bird was observed on 19 Jun. 1997.

In autumn the first observation was made on 11 Jul. 2001 – one bird still in the breeding plumage. The autumn distribution of records in separate months is as follows: July – 3 records (3 indiv.), August – 15 records (35 indiv.), September – 10 records (22 indiv.). The largest flock consisted of 7 birds (24 Aug. 1999). The latest observation of a single bird was done on 20 Sept. 2001.

**Redshank (*Tringa totanus*)**

In highest numbers it occurred in spring (Table 2). The spring migration started in the last decade of March (the earliest observations: 20 Mar. 2001 – 6 *ad.*, 21 Mar. 2001 – 13 *ad.*). The passage continued through April (Fig. 2). The largest flocks were observed in late March: 24 Mar. 2001 – 13 *ad.*, 29 Mar. 2000 – 13 *ad.*, and at the beginning of April. In this period, flocks of 11 birds were noted several times (3 Apr. 1999, 4 Apr. 2000, 6 Apr. 2000, 7 Apr. 1995). In mid-May the passage stopped and only breeding birds were observed (1-2 pairs), which were breeding in the study area in some years (1995, 1997, 2000, 2001).

At the beginning of June the number of observations of adult birds increased and the largest concentration of 9 indiv. was spotted on 3 Jun. 2000. The autumn passage was hardly noticeable. In July and August 1-3 birds were noted. The latest observation of a single bird was made on 5 Oct. 1997.

**Marsh Sandpiper (*Tringa stagnatilis*)**

In spring, it was seen twice: on 14 and 16 Apr. 2000 two adults in breeding plumage were spotted, on 29 Apr. 2000 – one adult. In autumn, two records of single birds were made: 20-22 Aug. 1998 and 23 Jul. 2001.

**Greenshank (*Tringa nebularia*)**

Observed 67 times (162 indiv.). In spring, the first bird was observed on 7 Apr. 1995, but regular observations were made on the turn of April. The largest group of 6 birds was seen on 1 May 1999. The latest bird in spring was noted on 23 May 2001.

The autumn passage was much more intensive. The first bird was found on 17 Jun. 1995. The regular passage began in early July, when flocks of 3-5 birds were observed. In July, the first peak, formed by adult birds (maximum 13 indiv.) occurred on 23 Jul. 2000. The second (less numerous) peak of migration, consisting mainly of young birds, occurred in the second decade of August. The largest concentration composed of 11 birds was seen on 18 Aug. 1999. The autumn passage stopped in mid-September and the latest two individuals were observed on 18 Sept. 2001.

**Green Sandpiper (*Tringa ochropus*)**

It was observed 71 times (144 indiv.). In spring it was spotted four times: 14 Apr. 1989 – 3 *ad.*, 29 Mar. 2000 – 1 *ad.*, 30 Mar. 2000 – 2 *ad.*, 11 Apr. 2001 – 1 *ad.*

The first birds on autumn passage were observed as early as in mid-June (the earliest observations: 13 Jun. 1997 – 2 *ad.*, 16 Jun. 2001 – 2 *ad.*). In July, the passage was not intensive but regular, with small groups of 1-4 birds in most cases (12 indiv. on 5 Jul. 2001 as an exception). In August, especially in the third decade, it occurred in highest numbers – flocks of 3-6 birds were spotted, and maximum 7 indiv. were seen on 24 Aug. 1997. In September, the number of birds decreased and mainly single birds were observed. The latest observation of one individual was done on 20 Sept. 2001.

#### **Wood Sandpiper (*Tringa glareola*)**

The Wood Sandpiper appeared the most numerous wader species (except for the Lapwing) in the area with 191 observations of 2294 indiv. in total (Table 2). The first record of a single bird was made on 19 Apr. 1995. The spring migration started in the third decade of April and the peak of passage occurred in the first decade of May (Fig. 2). The most numerous flocks were spotted on: 5 May 1997 – 37 *ad.*, 5 May 1998 – 40 *ad.*, 7 May 1998 – 30 *ad.* The spring migration finished in the second decade of May. The latest observation of four birds was made on 23 May 2001.

The autumn migration started in the third decade of June, although the earliest observations of two birds were made on 6 Jun. 2001 and 16 Jun. 2001. In this period, the most numerous flocks were observed on 28 Jun. 2000 – 16 *ad.*, 28 Jun. 2001 – 13 *ad.* The autumn migration had two waves. The first one consisted of adult birds, with the peak falling in the first decade of July (5 Jul. 2001 – 44 *ad.*, 11 Jul. 2001 – 40 *ad.*, 13 Jul. 2001 – 70 *ad.*, 14 Jul. 2001 – 65 *ad.*). From mid-July to the end of this month, the passage was gradually becoming less intensive, although the largest flock of 90 birds was observed on 18 Jul. 1998. The second, less numerous migration wave, composed mainly of young birds, started on the first days of August and peaked in the second decade of the month. It reached maximum 32 birds on 15 Aug. 2000 and 19 Aug. 1999. The regular passage lasted until mid-September (maximum 11 birds on 11 Sept. 1999). The latest observation was made on 27 Sept. 2000 – 2 indiv.

#### **Common Sandpiper (*Actitis hypoleucos*)**

It was spotted 119 times, with the total of 371 birds. It appeared occasionally in spring and the spring passage lasted from 14 April to 15 May. Most birds were seen on the turn of April. During the spring migration 1-4 birds were observed.

The autumn passage started in early July (the first observation: 5 Jul. 2000 – 2 indiv.). The distribution of autumn records in subsequent months was as follows: July – 29 records (96 indiv.), August – 52 records (215 indiv.), September – 8 records (11 indiv.). Most birds were spotted in the first half of August. The following largest flocks were observed at that time: 3 Aug. 1999 – 10 indiv., 5 Aug. 1999 – 10 indiv., 5 Aug. 2000 – 17 indiv. The autumn passage finished in the second decade of September (17 Sept. 2001 – 1 indiv.). The latest observation of a single bird was recorded on 8 Oct. 1989.

**Red-necked Phalarope (*Phalaropus lobatus*)**

Two observations of single young birds were done on 25 Sept. 1999 and 22 Aug. 2000.

**DISCUSSION**

In the study area, 23 species of waders were noted. A similar number of waders was found in some big complexes of fishponds (Czapulak *et al.* 1998, Szlama and Majewski 1998) – 21 species. In the other complex of fishponds a lower (11-17) number of species was noted (Cempulik 1985, Kruszyk *et al.* 1995, Kopij 2001). In the inland, the largest number of wader species were recorded: at the sewage farms – 25-30 species (Lontkowski *et al.* 1988, Słychan 1996, Wysocki 1996), at the fishponds – 31-35 species (Cieślak *et al.* 1991, Wiehle 1999, Witkowski and Ranoszek 1998), 33 species on Lake Rakutowskie (Zieliński and Studziński 1996) and from 36 to 39 species at the large inland reservoirs (Kuźniak and Lorek 1993, Stawarczyk *et al.* 1996, Dyrz *et al.* 1998, Janiszewski *et al.* 1998). On the Baltic coast, 36-40 species were recorded (Gromadzka 1993, Meissner and Sikora 1995). The higher number of species in these areas in comparison to our study area was probably caused by various factors, such as: the longer duration of study (in terms of years) or the larger study area with more varied habitats. At the seashore, the higher number of observed species might have resulted from the course of the migration route and the occurrence of other rare species. As for such a limited area, a relatively large number of species was spotted in Jastrzębie, the more so as the majority of observations come from the 10-ha sediment-pond of the “Zofiówka” coal-mine.

The Lapwing was obviously dominant species in the spring passage as well as in autumn. Such situation was also the case in many other inland areas where it proved dominant (Lontkowski *et al.* 1988, Kunysz and Hordowski 1992, Stawarczyk *et al.* 1996, Zieliński and Studziński 1996, Janiszewski *et al.* 1998, Wiehle 1999, Bednorz *et al.* 2000). On the Baltic coast it was different – the Lapwing occurred in higher numbers only in suitable open wetlands, mainly in river mouths, while in other places it was less numerous than other waders (Meissner and Sikora 1995, Meissner and Włodarczak 1998).

For most species the spring migration was less intensive than the autumn one (Table 2). Only two species: Reedshank and Jack Snipe were more numerous in the spring passage. Similarly, the Reedshank was more numerous in spring at the Spytkowice fishponds (Wiehle 1999) and on Lake Rakutowskie (Zieliński and Studziński 1996). The low number of the Jack Snipe in the majority of other areas was probably caused by difficulties in its detection. The more numerous records of the Jack Snipe in the study area in spring than in autumn were probably caused by a decreased attractiveness of feeding areas, due to the fact that the floods were overgrown by vegetation in late summer. Similarly, the species was more often observed in spring near Jastarnia (Meissner and Sikora 1995) and in the Barycz valley

(Witkowski *et al.* 1995). In other areas, it was often observed in autumn (Stawarczyk *et al.* 1996, Cenian and Sikora 1997, Dyrz *et al.* 1998, Janiszewski *et al.* 1998).

The analysis of the spring migration data indicated that the structure of domination noted in Jastrzębie was similar to that at the Spytkowice fishponds (Wiehle 1999), where the dominants (except for Lapwing) were: Ruff, Redshank and Wood Sandpiper. Also in other inland areas, except for Redshank, dominants were Wood Sandpiper and Ruff (Lontkowski *et al.* 1988, Kunysz and Hordowski 1992, Stawarczyk *et al.* 1996, Zieliński and Studziński 1996, Dyrz *et al.* 1998), similarly as on the seashore (Meissner and Sikora 1995, Meissner and Włodarczak 1998). In spring, the Common Snipe was recorded oftener in other sites, for example at the Turawski reservoir as well as on the seashore (Meissner and Sikora 1995, Stawarczyk *et al.* 1996, Meissner and Włodarczak 1998) and the Bar-tailed Godwit – up-country (Cieślak *et al.* 1991, Zieliński and Studziński 1996, Witkowski and Ranoszek 1998, Wiehle 1999). In no other published data the Little Ringed Plover was stated among the dominants, whereas in Jastrzębie Zdrój in spring passage it was the third most numerous species.

On autumn migration, the most numerous species (except for Lapwing) in Jastrzębie Zdrój were: Wood Sandpiper, Little Ringed Plover and Ruff. Common Sandpiper and Ruff proved dominants in other inland sites (Lontkowski *et al.* 1988, Kuźniak and Lorek 1993, Stawarczyk *et al.* 1996, Janiszewski *et al.* 1998, Wiehle 1999) as well as on the coast (Gromadzka 1993, Meissner and Sikora 1995). Moreover, the dominants in other sites were: Common Snipe and Dunlin (Gromadzka 1993, Kuźniak and Lorek 1993, Meissner and Sikora 1995, Stawarczyk *et al.* 1996, Janiszewski *et al.* 1998, Witkowski and Ranoszek 1998, Wiehle 1999) and Green-shank and Common Sandpiper (Stawarczyk *et al.* 1996). The Little Ringed Plover did not prove dominant in other sites.

In spring, in the study area the peak of the Lapwing's passage occurred in the second decade of March. Possibly, this wave of migrants, passing north occurred in early April on the Baltic coast constituting the migration peak (Meissner and Włodarczak 1998). However, in northern Poland in optimal habitats this species arrived as early as in southern Poland (Wójcik *et al.* 1999). Slightly earlier, it passed on the reservoirs in south-western Poland (Dyrz *et al.* 1998, Stawarczyk *et al.* 1996). It was difficult to compare the found autumn migration dynamics with that in other regions, as it varied considerably among different areas, which might result from different access to suitable feeding and resting grounds.

In spring, the peak of the Wood Sandpiper migration occurred on the turn of April. Somewhat later, it was noted in northern Poland (Meissner and Sikora 1995, Zieliński and Studziński 1996, Meissner and Włodarczak 1998). In autumn, in Jastrzębie Zdrój the migration had two waves, and it was more intensive in July (when adult birds were passing) than in August. A similar pattern was recorded in south-western and western Poland – at the Mietkowski reservoir (Dyrz *et al.* 1998), at the Spytkowice fishponds (Wiehle 1999) and in Wielkopolska region (Bednorz *et al.* 2000). The contrary pattern was recorded in other regions of the country when the

second wave in August (mainly with young birds) was more intensive than the first wave in July (Lontkowski *et al.* 1988, Kuźniak and Lorek 1993, Meissner and Sikora 1995, Stawarczyk *et al.* 1996, Janiszewski *et al.* 1998).

In the case of the Ruff, the spring migration peak was noted in the second half of April. The species was passing somewhat later on the coast and in northern Poland (Meissner and Sikora 1995, Zieliński and Studziński 1996, Meissner and Włodarczyk 1998). A similar migration pattern, with the most pronounced second peak was noted near Jastarnia (Meissner and Sikora 1995). The contrary pattern was observed at the Wrocław sewage farm, where the first peak in July was more numerous than the second one (Lontkowski *et al.* 1988). Later passage was observed at the Nyski reservoir, with the first peak occurring on the turn of July and the second, less intensive, in the first half of September (Stawarczyk *et al.* 1996).

The Little Ringed Plover was observed in Jastrzębie Zdrój most frequently in autumn in the first half of July, similarly as at the Nyski reservoir (Stawarczyk *et al.* 1996) and Spytkowice fishponds (Wiehle 1999). In other sites in Poland the peak of migration was noted later in the season: on Lake Rakutowskie it occurred on the turn of July (Zieliński and Studziński 1996), on the Baltic coast near Jastarnia – in the first half of August (Meissner and Sikora 1995), at the Mietkowski reservoir – in the third decade of August (Dyrz *et al.* 1998).

During autumn migration, the Common Sandpiper was observed quite often in Jastrzębie Zdrój (almost 3% in the structure domination) and in its passage three peaks occurred. They were about ten days later in comparison to the Bug valley near Mołożew (Mitrus *et al.* 1998). Patterns similar to those recorded in Jastrzębie come from the Nyski and Turawski reservoir (Stawarczyk *et al.* 1996) and the sea-shore near Jastarnia (Meissner and Sikora 1995).

Differences in migration dynamics of waders between Jastrzębie Zdrój and other areas in Poland were probably influenced by various factors, such as: terms of migration, access and variability of suitable resting and feeding grounds, size of study area, localisation within the territory of Poland or method of detection of some species, especially in the case of snipes. During the study, several species rarely recorded inland were spotted: Ringed Plover, Grey Plover, Curlew Sandpiper, Great Snipe, and Red-necked Phalarope. The Marsh Sandpiper, noted in the study area, is a species seldom recorded in Poland. The reason for collecting a relatively limited material for some species (Ringed Plover, Grey Plover, stints and Curlew) could be the fact that the sediment-ponds and floods of coal-mines probably do not provide suitable resting and feeding conditions for these species during migration. It is difficult to estimate the importance of the sediment-ponds and floods of coal-mines for passing waders. The data from small (130-270 ha) complexes of fishponds near Jastrzębie Zdrój (Kruszyk *et al.* 1995, own unpublished data), where migration of waders was less pronounced, could lead to the conclusion that the sediment-ponds and floods of coal-mine play an important role for the passing waders in the region.

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## REFERENCES

- Bednorz J., Kupczyk M., Kuźniak S., Winiecki A. 2000. *Ptaki Wielkopolski – monografia faunistyczna*. Poznań.
- Borowiec M., Stawarczyk T., Witkowski J. 1981. *Attempt of giving of more exact methods of waterfowl quantity estimation*. Not. Orn. 22: 47-61.
- Bujok R. (Ed.). 1999. *Wykorzystanie zalewisk tworzących się w dolinie Szotkówki do rewitalizacji wód powierzchniowych i odzyskiwania terenów ekologicznie zniszczonych*. Instytut Ekologii Terenów Uprzemysłowionych, Katowice.
- Busse P. 1973. *Presentation of migration dynamics data*. Not. Orn. 14: 68-75.
- Cempulik P. 1985. *Waterfowl breeding on the Wielką fish-pond (Upper Silesia, Poland)*. Acta orn. 21: 115-134.
- Cenian Z., Sikora A. 1997. *Autumn migration of the Jack Snipe *Lymnocyptes minimus* in the north-western Warmia and Gdańsk coastland in 1996*. Not. Orn. 38, 3: 215-222.
- Cieślak M., Czapulak A., Krogulec J. 1991. *Birds of nature reserve "Przemków Ponds" and its surroundings*. Ptaki Śląska 8: 54-100.
- Czapulak A., Adamski A., Cieślak M., Zawadzki L. 1998. *Waterfowl of the reserve "Przemków Ponds" in the 1990s*. Ptaki Śląska 12: 81-112.
- Dyrz A., Kołodziejczyk P., Martini K., Martini M. 1998. *Birds of the Mietków Reservoir*. Ptaki Śląska 12: 17-80.
- Gromadzka J. 1993. *Ptaki ujścia Wisły*. Unpublished study prepared for the IUCN-Poland.
- Janiszewski T., Włodarczyk R., Bargiel R., Grzybek J., Kaliński A., Lesner B., Mielczarek S. 1998. *Birds of the Jeziersko reservoir in 1986-1996*. Not. Orn. 39, 3: 121-150.
- Kopij G. 2001. *Avifauna of the Niemodlin Ponds, Opole Silesia, SSW Poland*. Chrońmy Przyr. ojcz. 57, 1: 46-80.
- Kruszyk R., Śmietana A., Karetta M. 1995. *Avifauna of forest-pond complex near Żory*. Scripta Rudensia 4: 85-97.
- Kunysz P., Hordowski J. 1992. *Migration of water-and-marsh birds in the Valley of the Middle San (South-eastern Poland)*. Acta zool. cracov. 35: 285-313.
- Kuźniak S., Lorek G. 1993. *Birds of Wonieść Reservoir and surrounding areas (Western Poland)*. Pr. Zakł. Biol. i Ekol. Ptaków UAM. vol. 2. Poznań.
- Lontkowski J., Okulewicz J., Drazny T. 1988. *Birds (Non-Passeriformes) of sewage farms and neighbouring areas in North-West part Wrocław*. Ptaki Śląska 6: 43-96.
- Meissner W., Sikora A. 1995. *Spring and autumn migration of waders Charadrii on the Hel peninsula*. Not. Orn. 36: 205-237.
- Meissner W., Włodarczyk A. 1998. *Spring migration of waders Charadrii in the area of the projected "Rzeczne Łąki" reserve at the Bay of Puck*. Not. Orn. 39: 219-229.
- Mitrus C., Kuczborski R., Słupek J. 1998. *Autumn passage of the Common Sandpiper *Actitis hypoleucos* in the Bug River valley – dynamics and biometry*. Not. Orn. 39: 13-25.
- Słychan M. 1996. *Birds of Wrocław sewage farm*. Ptaki Śląska 11: 133-150.
- Stawarczyk T., Grabiński W., Karnaś A. 1996. *Migration of Charadriiformes at Nyski and Turawski Reservoir in 1976-94*. Ptaki Śląska 11: 39-80.

- Szlama D., Majewski P. 1998. *Birds of the "Łęczzak" reserve near Racibórz*. Not. Orn. 39: 1-12.
- Wiehle D. 1999. *Migration of waders (Charadrii) in the fishponds in Spytkowice in years 1995-1999*. Ring 21, 2: 91-105.
- Witkowski J., Orłowska B., Ranozek E., Stawarczyk T. 1995. *The avifauna of the Barycz River valley*. Not. Orn. 36: 5-74.
- Witkowski J., Ranozek E. 1998. *Migration of waders in the fish-ponds of the Barycz valley*. Ptaki Śląska 12: 113-125.
- Wójcik C., Rydzkowski P., Ściborski M. 1999. *The spring migration of waders (Charadrii) in the lower Vistula valley*. Ring 21: 79-90.
- Wysocki D. 1996. *Waterfowl of the sewage water reservoirs of the Chemical Plant "Police"*. Not. Orn. 37: 55-70.
- Zieliński M., Studziński S. 1996. *Avifauna of the marshland of Błota Rakutowskie near Włocławek*. Not. Orn. 37: 259-300.