

Dynamics and age structure of wintering Mute Swans *Cygnus olor* in south-eastern Poland

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This paper deals with number and distribution of Mute Swans during four consecutive autumn-winter seasons (October-March 1985-1989) in south-eastern Poland. The number of wintering Mute Swans is still increasing. In 1989, 2,497 swans were recorded, about 13% of all Mute Swans wintering in Poland. Two important winter haunts are described which contain about 80% of all swans. They differ in the pattern of arrival and percentage of young birds. The urban winter sites have more young birds than the rural ones. The duration of stay at the urban winter site is also much shorter. The percentage of young birds in south-eastern Poland is similar to that in Great Britain and Sweden but it is distinctly lower than values reported in USA and southern USSR. Most swans come to these winter haunts from other parts of Poland but birds from East Germany, Czechoslovakia and Denmark were also noted. Percentage of Polish morph is very low (1-3%), similar to the rest of Poland.

The programme of January winter waterfowl counts started in Poland in 1967 (Krzyskowiak & Dobrowolski 1977) and has been continued to the present (Kot *et al.* 1987). The growing number of amateur ornithologists and the division of Poland into ornithological regions in the early 1980s caused intensification of field work. It led us to introduce autumn-winter counts in 1985 (Walasz 1985a, b): but this programme has been undertaken only in our ornithological region of south-eastern Poland. The aim of the programme is to obtain data about the number and distribution of all species during autumn-winter season. All work is done by volunteer observers, members of Malopolska Ornithological Club. Because most of the places visited were sections of rivers, reservoirs and fish pond complexes we obtained a great amount of data about waterfowl.

Methods

Every month from October to March we checked sections of rivers, fish pond complexes and reservoirs within the area of about 60,000 square kilometres. All rivers were divided into 5 km sections and numbered. Most counts were undertaken at the weekend nearest to the fifteenth of each month. Every month during four year period (1985-89) we obtained data from 59 to

168 places. In all we checked data from 2,266 places. About 70% of them were 5 km divisions of rivers. Grey swans and white birds with grey patches were noted as young birds in the first year of life. Older birds with only a few grey feathers were more difficult to distinguish for most observers and were counted as adults. We used January counts to compare numbers in the four different years.

Results

Number and distribution

Mute swans *Cygnus olor* were recorded on 24.47% of all places visited. Most counts were done in January (Table 1), but it did not bias our data because the percentage of places with swans did not increase in this month and most swans were concentrated in only two places, Krakow and Laczany, which contained about 80% of swans.

During the four years the number of wintering swans increased by 96% to 2,497 (Table 2), but the number of wintering places remained constant. Most birds wintered on the Vistula river, the largest river in Poland. It is heavily polluted by numerous factories and as a result it is frozen for only a short time during the most frosty winters. Both the main winter places are

Table 1. Numbers of places visited during four year autumn-winter seasons in south-eastern Poland. The percentage of young birds is also given. The total number of sites visited is given as the top figure, and the number of sites with swans below it. # no data.

	Oct	Nov	Dec	Month Jan	Feb	Mar	summ
85/86 places with swans	# #	90 22 24.4%	117 27 23.0%	168 30 17.8%	157 39 24.8%	72 31 43.0%	604 149 24.6%
86/87 places with swans	68 23 33.8%	101 16 15.8%	87 21 24.1%	108 34 31.4%	123 42 34.1%	97 35 36.0%	584 171 29.2%
87/88 places with swans	108 14 12.9%	94 24 25.5%	76 14 18.4%	130 23 17.6%	73 18 24.6%	65 18 27.6%	546 111 20.3%
88/89 places with swans	96 19 19.7%	71 17 23.9%	84 22 26.1%	133 33 24.8%	90 28 31.1%	59 11 18.6%	533 130 24.4%
						all places with swans	2267 561 24.7%

Table 2. Numbers of Mute Swans wintering in S.E. Poland by year, month and age class. The sum of wintering Mute Swans in south-eastern Poland. Adult = completely white birds; immature = young, with at least some grey feathers; unidentified - age was not recorded. # no data * = no data from Laczany.

	Oct	Nov	Dec	Month Jan	Feb	Mar
85/86 all swans	#	425	917	1280	1351	689
adult	#	319	638	965	1075	391
immature	#	101 24.0%	178 21.8%	308 24.1%	271 20.1%	145 27.0%
unidentified	#	5	101	7	5	153
86/87 all swans	347	956	848	1309	1081	958
adult	311	727	592	880	669	678
immature	36 10.3%	229 24.0%	230 27.9%	414 31.9%	225 25.1%	280 29.2%
unidentified	0	0	26	15	187	0
87/88 all swans	231	1118	*333	1565	*488	279
adult	175	873	169	1105	301	156
immature	44 20.0%	233 20.8%	130 43.4%	435 27.7%	185 38.0%	94 37.6%
unidentified	12	0	34	25	2	29
88/89 all swans	550	1592	1973	2497	1008	263
adult	418	1278	1364	1915	640	111
immatur	112 21.1%	297 18.6%	605 30.7%	576 23.1%	305 32.2%	152 57.7%
unidentified	20	14	4	6	63	0

on the Vistula river. The first is a rural section on a 12 km extension of the river called Laczany which emerged at the end of the 1960s. This stretch includes a reservoir. The second is an urban site on the same river in Krakow city (called Krakow) which swans suddenly started to use in December 1983. The number of wintering birds in Krakow increased four times during the four years of study reaching 809 birds. While on the Laczany it doubled (1,394 birds) (Table 3).

Outside these two places most birds wintered at other points on the Vistula river. Their distribution was not related to urban areas along the river, but on other smaller rivers and on reservoirs swans were also associated with urban sites.

Age structure

Age structure was quite different in the two

Table 3. Numbers of Mute Swan in two main winter places in south-eastern Poland on the Vistula river. Rural site = Laczany; urban site = Krakow. # = no data.

85/86											
Laczany	#	273		613		651		605		460	
adult		221		509		533		524		215	
immature		52	19.0%	104	16.9%	118	18.1%	81	13.3%	94	20.4%
unidentified		0		0		0		0		151	
Krakow											
adult	#	50		101		179		149		4	
immature		36		65		125		104		3	
unidentified		14	28.0%	36	35.5%	54	30.1%	45	30.2%	1	25.0%
86/87											
Laczany	178	533		622		654		342		345	
adult	171	443		457		518		288		304	
immature	7	90	16.8%	165	26.5%	136	20.7%	54	15.7%	41	11.8%
unidentified											
Krakow											
adult	0	0		7		411		245		300	
immature	0	0		6		240		198		167	
unidentified	0	0		1	14.2%	171	41.6%	47	19.1%	133	44.3%
87/88											
Laczany	0	648		#		1035		#		124	
adult	0	542				777				31	
immature	0	104	16.0%			258	24.9%			93	75.0%
unidentified											
Krakow											
adult	0	0		188		257		16		1	
immature	0	0		105		159		9		1	
unidentified	0	0		83	44.1%	98	38.1%	7	43.7%	0	0.0%
88/89											
Laczany	372	1064		894		1300		522		77	
adult	308	940		757		1203		422		35	
immature	64	124	11.6%	137	15.3%	97	7.4%	100	19.1%	42	54.5%
unidentified											
Krakow											
adult	0	257		760		809		159		24	
immature	0	156		439		466		24		2	
unidentified	0	101	39.2%	321	42.2%	343	42.3%	82	77.3%	22	91.6%
								53			

main winter quarters. In Laczany there were between 13.46 and 24.92% young but in Krakow from 30.16 to 42.39% (Table 3). In small flocks in other places the percentage of young birds was similar to Krakow. In Krakow swans are fed by people. Competition for food is extremely reduced because the food is supplied in excess.

Pattern of settlement on winter quarters

Arrival patterns at the two sites were consistently different every year. In Laczany the swans were often present at the beginning of October but in Krakow they usually arrived two months later. It is possible that the birds came to Laczany from adjacent areas where they breed on fish pond complexes. Accord-

ingly, the time of stay on the wintering site place was visibly shorter in Krakow than in Laczany. The number of immatures was more stable than the adults. It seems that the young stay at these locations throughout the winter whereas the adults continually try to move back to their breeding areas: they leave the winter quarters every time the weather gets better. This is supported by the fact that when the weather gets worse the number of adult swans at these wintering sites rapidly increases. In the spring adult birds fly off earlier than the young ones. The number of swans on Laczany decreases relatively slowly. This pattern may be a result of the turnover of migrating birds making a stopover on the reservoir. As a result we register a slower decrease than expected. In Krakow swans depart very fast, in a few days. It is noted that young birds stay longer in

Krakow: in 1989 a small flock of 16 first year birds stayed here until May.

Origin of wintering birds

We have data from 40 ringed birds. Most of them, 31, are from Poland, five from East Germany, four from Czechoslovakia and one from Denmark.

Polish morph

We have no comprehensive data, but in most cases flocks in Krakow and many small flocks were checked, as was the greater part of swans on Laczany. In places where counting of two morphs was possible the percentage of Polish swans was very low, only 1-3%. These findings for Poland are consistent with data presented by Czupulak & Wieloch (1988).

Discussion

In January 1985, 7,583 swans were noted on the remaining areas of Pland (Kot *et al.* 1987). In our region 1,212 Mute Swans wintered (Walasz 1985a), this is 13.78% of the 1985 total in Poland. The two main winter sites at Laczany and Krakow are among the largest winter flocks of swans in Poland.

The earliest observations of wintering swans in south-eastern Poland are from the end of the 1960s (J. Weiner, pers. comm.), also at Laczany reservoir and on the Vistula river. From that time the number of wintering swans continually increased.

We have very scarce data in the literature about age structure of swans outside the breeding season. Data from the mouth of the Varta river (Slonsk Reservoir) indicate a lower percentage of young birds than in our area (Beszterda *et al.* 1983). It ranged from 12 to 26%. In Great Britain and Sweden the percentage of young birds is generally similar to Poland (Church

1956, Minton 1971, Owen & Cadbury 1975, Jenkins *et al.* 1976, Nilsson 1979). The highest values were noted at the urban haunt in Krakow. Quite different data are presented in USA and USSR. On Rhode Island 52% of wintering swans were young (Willey & Hall 1972) and in Chesapeake Bay between 45 and 55% (Reese 1960). Near the Sea of Azov there were 45% young (Lisenko 1987) and on the Caspian Sea between 58.9% and 71.4% (Karavajev 1987). These values are very high: the highest must be the result of swans of different age groups wintering in different areas. In hard winters on the Black and Caspian Seas, grey birds may comprise 80-90% of flocks (2nd USSR Swan Congress) so adults *must* go elsewhere sometimes.

We could imagine that swans come to Krakow from adjacent areas when the weather conditions worsen. If this rule operated, we would expect that the overall number of wintering swans in our region would be similar during all winter months and swans would move from Laczany and other places into Krakow when the winter conditions get worse. However, when the number of swans increases at Krakow the total number of swans in our region also increases. This indicates that swans move in from outside our region, probably mainly from the north.

It would be evident if many came from Czechoslovakia. The Czechoslovak population contains very high percentages of Polish morph (Hora 1985). About 40% of families have white nestlings and about 20% of them are white. However, we noted a very low percentage of this leucistic morph in south east Poland (although some birds from Czechoslovakia were recorded in our area).

There is no evident relationship between weather conditions in our winter haunts and time of arrival and departure of swans. It seems that it may be explained by freezing conditions on breeding grounds and the strategy of delayed autumn migration (Haila 1983, Haila *et al.* 1986).

Changes in numbers and age structure at the two main winter places seem independent.

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