

BIRDS AS PREY OF THE GREAT GREY SHRIKE (*Lanius excubitor*)

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ABSTRACT

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We collected 659 avian prey remains of the Great Grey Shrike during April 1990 to April 1993 on two study plots in Silesia (western Poland). The remains included plucked, impaled prey, or the fragments of it, at 68 butchering sites in 15 territories. Most prey was found in thorny bushes (73.3%), 7.9% – in other bushes and 7.1 % – on barbed wire fences. The prey belonged to at least 39 passerine species. The three bird species predominant in the diet were Yellowhammer (*Emberiza citrinella*) – 16.5%, Tree Sparrow (*Passer montanus*) – 12.7% and Skylark (*Alauda arvensis*) – 12.0%. The number of avian prey varied seasonally with two peaks: one in winter (December-January – 24.9% of prey) and another one in late spring (May – 13.8%). Three main tactics were used to hunt birds: „sit, wait and attack by surprise”, „avoid recognition”, and „attack by surprise in flight”.

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INTRODUCTION

Food of the Great Grey Shrike, the largest of the European species of true shrike family (*Laniidae*), consists mainly of various invertebrates (chiefly insects), small birds, mammals, sometimes amphibians and reptiles (Cramp and Perrins 1993). Although the literature on Great Grey Shrike food is comprehensive, the subject of the birds in the diet of this species is rarely touched upon and the bulk of the literature consist mainly of notes concerning observations of single incidents (e.g. Harrison 1961, Stokoe 1961, Pell and Hodson 1970, Krimmholz 1984) or pellet analysis (e.g. Grönlund *et al.* 1970, Wagner and Hölker 1995). Exceptions are papers by Cade (1967), Bergmann and Haberkorn (1971) and Olsson (1986).

Butchering and impaling prey on pointed objects is characteristic for true shrikes (Cade 1967) and their fidelity to these sites (Olsson 1985) offer a good opportunity to study their feeding habits and diet preferences.

Here we present results of our studies on birds in the diet of the Great Grey Shrike in a population in southwestern Poland with a high breeding density.

STUDY AREA AND METHODS

The material was collected on two study sites: „Widawa” and „Swiniary” in Silesia. „Widawa” (48 km²) is located 1 km E of Wrocław town administrative boundaries and includes the valley of the river Widawa and adjacent cultivated fields. „Swiniary” is mostly in the administrative boundaries of Wrocław at the Odra and Widawa river junction (see Lorek 1995). „Widawa” is a 1.5-2 km wide valley of a small river where 40% of the area is meadows and pastures with scattered fragments of arable land. Many pastures are fenced with barbed wire. The area includes numerous small mid-field forested areas and rows of poplar trees along roads and paths. The valley is surrounded by arable land. „Swiniary” (23.5 km²) is covered mostly by irrigation fields and is a mosaic of habitats: Odra river banks, irrigation fields, small mid-field forested areas, and numerous small water bodies.

During our study, „Widawa” had 11-16 breeding pairs of the Great Grey Shrike and Swiniary – 3-4 pairs (Lorek 1995). At both sites, most breeding territories were also occupied during the winter.

The data presented were collected from 1 April 1990 to 1 April 1993. We searched a radius of several metres under nests and places where shrikes regularly handled, impaled, plucked and ate their prey. Because the number of regularly sampled places stabilised in each territory after a few months, the data from 1990 breeding season may be underestimated.

Each territory was sampled twice a month, except for July and August when only one sample was obtained. In the course of research activities, some territories were checked more frequently.

The bird prey-remnants found comprised of plucked feathers, corpses, decapitated bodies, heads or others part of body (*e.g.* intestines, legs, bills and wings).

During each search, we carefully removed all prey remains as well as plucked feathers to avoid double counting between visits. We made our species identification based on Svensson (1984), März (1987) and Brown *et al.* (1987). In some cases, identification to species level was impossible due to excessive body fragmentation and/or decomposition. All data are presented as mean \pm SD.

RESULTS

In 15 territories we sampled 68 butchering sites (4.5 ± 3.8 , range 1-17). Most butchering sites (60.3%) were situated in thorny bushes (*Crataegus* sp., *Prunus spinosa*, *P. insititia*), other bushes (*Salix* sp., *Sambucus nigra*) and barbed wire fences (Table 1).

Table 1
Places used by the Great Grey Shrike to handle avian prey

Type of place	Number of places		Number of prey	
	<i>N</i>	%	<i>N</i>	%
Thorny bushes				
<i>Crataegus</i> sp.	35	51.5	391	59.4
<i>Prunus spinosa</i>	5	7.4	64	9.7
<i>Prunus insititia</i>	1	1.5	28	4.3
Not thorny bushes				
<i>Salix</i> sp.	7	10.3	36	5.5
<i>Sambucus nigra</i>	2	2.9	16	2.4
Barbed wire fences	6	8.8	47	7.1
Trees higher than 2.5 m				
<i>Pirus communis</i>	3	4.4	21	3.2
<i>Pinus sylvestris</i>	1	1.5	5	0.8
<i>Picea excelsa</i>	1	1.5	2	0.3
<i>Salix</i> sp.	1	1.5	4	0.6
<i>Populus nigra</i>	1	1.5	2	0.3
<i>Alnus glutinosa</i>	1	1.5	1	0.2
Trees up to 2.5 m				
<i>Acer platanoides</i>	1	1.5	4	0.6
Poles	2	2.9	6	0.9
Electric poles	1	1.5	2	0.3
?			30	4.6
Total	68	100.0	659	100.0

In cases, when a whole corpse was found, 89% ($n = 82$) were impaled, 4.9% of preys were wedged into forks, 4.9% were loosely among branches and 1 corpse was placed on the ground.

During three years, at both study plots, we found 659 avian items of the Great Grey Shrike that belonged to at least 39 species. We were unable to determine the species of 70 prey items. All were passerines. Three bird species that predominated were: Yellowhammer (*Emberiza citrinella*), Tree Sparrow (*Passer montanus*) and Skylark (*Alauda arvensis*) (Table 2). Each of these comprised more than 10% of all items recorded and together comprised about 41% of all avian prey found. In addition, Chaffinch (*Fringilla coelebs*), Goldfinch (*Carduelis carduelis*), Greenfinch (*C. chloris*), Siskin (*C. spinus*) and Great Tit (*Parus major*) were also found among the most abundant prey.

The number of avian prey found varied seasonally with two peaks. The first occurred in winter (December-January – 29%) and the other – in late spring (May – 13.8%). July and August had the lowest number of avian prey recorded (Table 2).

In 6 out of 10 observations of Great Grey Shrike's attacks on birds, the attacks were successful.

Table 2
 Avian prey of the Great Grey Shrike in different months of the year.
 Only prey identified to the species level is presented.

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Total N	%
<i>Emberiza citrinella</i>	19	14	12	10	11	5	-	-	4	8	13	13	109	18.5
<i>Passer montanus</i>	14	16	12	4	4	2	1	-	7	3	12	9	84	14.3
<i>Alauda arvensis</i>	-	3	9	5	29	19	3	3	7	1	-	-	79	13.4
<i>Fringilla coelebs</i>	14	6	6	2	5	1	-	-	-	1	3	12	50	8.5
<i>Carduelis carduelis</i>	2	7	2	2	2	3	-	-	3	5	3	4	33	5.6
<i>Carduelis chloris</i>	9	5	4	2	1	1	-	-	1	-	1	3	27	4.6
<i>Carduelis spinus</i>	5	7	6	-	-	-	-	-	-	-	4	3	25	4.2
<i>Parus major</i>	3	3	3	1	4	2	-	1	2	2	1	2	24	4.1
<i>Hirundo rustica</i>	-	-	-	-	3	5	3	-	2	1	-	-	14	2.4
<i>Sturnus vulgaris</i>	2	-	2	2	-	-	-	-	-	4	1	2	13	2.2
<i>Motacilla flava</i>	-	-	-	-	5	5	1	2	-	-	-	-	13	2.2
<i>Anthus pratensis</i>	1	1	1	1	4	3	-	1	1	-	-	-	13	2.2
<i>Miliaria calandra</i>	2	3	1	-	-	1	-	-	1	1	1	2	12	2.0
<i>Fringilla montifringilla</i>	5	-	-	-	-	-	-	-	-	-	3	4	12	2.0
<i>Riparia riparia</i>	-	-	-	-	1	5	3	2	-	-	-	-	11	1.9
<i>Parus caeruleus</i>	-	1	1	1	2	2	-	-	-	1	-	3	11	1.9
<i>Carduelis cannabina</i>	-	-	1	-	2	3	1	1	1	1	-	1	11	1.9
<i>Emberiza schoeniclus</i>	-	1	1	2	1	2	1	-	1	-	-	-	9	1.5
<i>Sylvia communis</i>	-	-	-	-	2	1	1	-	-	-	-	-	4	0.7
<i>Saxicola rubetra</i>	-	-	-	1	-	1	1	-	-	-	-	-	3	0.5
<i>Pyrrhula pyrrhula</i>	2	-	-	-	-	-	-	-	-	-	-	1	3	0.5
<i>Passer domesticus</i>	1	1	-	-	-	-	-	-	-	-	1	-	3	0.5
<i>Sylvia curruca</i>	-	-	-	-	2	-	-	1	-	-	-	-	3	0.5
<i>Turdus iliacus</i>	-	-	3	-	-	-	-	-	-	-	-	-	3	0.5
<i>Prunella modularis</i>	-	-	-	-	2	-	-	-	-	-	-	-	2	0.3
<i>Erithacus rubecula</i>	-	-	1	1	-	-	-	-	-	-	-	-	2	0.3
<i>Aegithalos caudatus</i>	1	-	-	-	-	-	-	-	-	-	-	1	2	0.3
<i>Acrocephalus palustris</i>	-	-	-	-	1	1	-	-	-	-	-	-	2	0.3
<i>Motacilla alba</i>	-	-	-	1	1	-	-	-	-	-	-	-	2	0.3
<i>Muscicapa striata</i>	-	-	-	-	1	-	-	-	-	-	-	-	1	0.2
<i>Anthus campestris</i>	-	-	-	-	-	1	-	-	-	-	-	-	1	0.2

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Total N	%
<i>Delichon urbica</i>	-	-	-	-	1	-	-	-	-	-	-	-	1	0.2
<i>Lanius collurio</i>	-	-	-	-	-	1	-	-	-	-	-	-	1	0.2
<i>Sylvia atricapilla</i>	-	-	-	-	-	1	-	-	-	-	-	-	1	0.2
<i>Plectrophenax nivalis</i>	1	-	-	-	-	-	-	-	-	-	-	-	1	0.2
<i>Parus palustris</i>	-	-	-	-	-	-	-	-	1	-	-	-	1	0.2
<i>Acrocephalus schoenobaenus</i>	-	-	-	-	-	1	-	-	-	-	-	-	1	0.2
<i>Phoenicurus ochruros</i>	-	-	-	-	-	-	1	-	-	-	-	-	1	0.2
<i>Eremophila alpestris</i>	-	-	-	-	-	-	-	-	-	-	-	1	1	0.2
N	81	68	65	35	84	66	16	11	31	28	43	61	589	100
Total %	13.8	11.5	11.0	5.9	14.2	11.2	2.7	1.9	5.3	4.8	7.3	10.4		

Three main hunting tactics were observed (species preyed upon and the number of observed cases/successful cases are given in brackets):

- (1) „Sit, wait and attack by surprise” (Skylark – 3/2, Meadow Pipit *Anthus pratensis* – 1/0, mixed flock – 1/0). The Great Grey Shrike perched, watching from a high vantage point and attacked the foraging or flying birds, sometimes using vegetation as a cover. In three cases, such attacks ended in long aerial pursuits.
- (2) „Avoid recognition” (Blue Tit – 1/1, Goldfinch – 1/1, Tree Sparrow – 1/1, mixed flock – 1/1). Shrikes flew very close to the birds or a small flock sometimes in the same bush or tree, approaching at a distance allowing a quick attack. Birds approached in this manner were not observed to react. Then the Great Grey Shrike rushed the prey and usually caught them at a very short distance.
- (3) „Attack by surprise in flight” (Barn Swallow *Hirundo rustica* – 1/0). The Shrike flew very close to the Barn Swallow, at a distance of 3-4 m suddenly turned and followed the bird.

In addition, in 3 cases we observed Great Grey Shrikes in aerial chases after Fieldfare (*Turdus pilaris*), Yellowhammer and Blackbird (*T. merula*) but without success.

In 8 cases we observed the transport of prey: (1) in the beak – 1 Goldfinch and 1 Tree Sparrow, (2) in the feet – 2 Skylarks and 1 Redwing (*T. iliacus*), (3) first in the beak then in the feet – 1 Tree Sparrow, 1 Goldfinch, and 1 Red-backed Shrike (*L. collurio*) was transported first in the feet aided by the beak.

DISCUSSION

Although Cramp and Perrins (1993) regarded predation on birds as exceptional in Great Grey Shrikes, our results suggest that it is probably the only European passerine species, other than the corvids, which regularly hunts birds almost entire

year. Unfortunately, most research on this subject is based on stomach contents or pellets analysis and may give underestimated results as a shrike rarely eats all of its prey and some parts are not represented in pellets (Olsson 1986).

Most prey species recorded in our study occupy open or semi-open habitats and are mainly ground feeders. Similarly, in Germany, Bergmann and Haberkorn (1971) found that among the three most commonly taken species were Skylarks (29.3%) and Tree Sparrows (28.6%). Friemann (1975) also found Tree Sparrows to be a major species among the avian prey. In Sweden, tits and finches dominated among 166 avian winter prey items (Olsson 1986).

The high number of avian prey in winter in our study may be related to the food shortage during that time (lack of insects and rodents under snow) which forces shrikes to forage on birds. Similarly, in Sweden, more birds were captured during hard winters when small mammals were inaccessible under deep snow (Olson 1986).

The peak in spring may be a result of the shrikes' higher frequency of attacks on fledglings of passerines nesting in their territories (Bergmann and Haberkorn 1971). The low number of avian prey during July and August may be the result of fewer observations upon our part or brood division during post-fledglings period (Schön 1994), which results in changes in the impaling sites within a territory. However, it may also be the result of seasonal change in the diet. At this time microtine rodents are more accessible due to harvest practices and also more *Orthoptera* spp. are accessible.

Yellowhammer, Goldfinch, Tree Sparrow, Chaffinch, Greenfinch and Corn Bunting (*Miliaria calandra*) represented similar seasonal distribution among prey of Great Grey Shrike (with maximum numbers in autumn, winter and early spring) probably due to their flocking behaviour in open habitats during their non-breeding season. Skylarks, Meadow Pipits, Yellow Wagtails (*Motacilla flava*) and Barn Swallows were found in the highest numbers from May to July, what was probably connected with a greater proportion of inexperienced, newly fledged young birds in Great Grey Shrike territories. The Siskins' remnants were found from November to March, when their flocking behaviour in open habitats is most conspicuous. All Bramblings (*Fringilla montifringilla*), Horned Lark (*Eremophila alpestris*) and Snow Bunting (*Plectrophenax nivalis*) were found in winter, the only period when they regularly occur in Poland.

We found that the mass of 32 (82.1%) prey species was < 30 g (mass from Hudec 1983). However, we also found heavier prey species such as Corn Bunting, Redwing and Starling (*Sturnus vulgaris*). An adult Great Grey Shrike weighs between 67-70 g (Cramp and Perrins 1993) and raises questions as to how shrikes are able to kill such heavy prey? Great Grey Shrikes have attacked Spruce Grouse (*Dendragapus canadensis*) (Ellison 1971) and Blackbirds were recorded among the prey taken by them (Wagner and Hölker 1995). A possibility exists that some carcasses we found may have been the prey of other predators. The elimination of mammalian predators was based on fact that mammalian predators bite through

feather and pull them out in mouthfuls such that most of the quill is broken or missing and the plumage is damaged. Feathers are often matted together with dried saliva and carcasses left by a mammalian predator show crushed bones and teeth marks (Brown *et al.* 1987, März 1987). An opposite problem is also possible, wherein mammals forage on the remnants of the Great Grey Shrike meals. We excluded such material and treated them as not killed by the Great Grey Shrike. In general, few cases of feathers were found broken or missing quills on the study plots. There are several species of raptors and owls, which overlap in their food spectrum with the Great Grey Shrike: Sparrowhawk (*Accipiter nisus*), Goshawk (*A. gentilis*), Kestrel (*Falco tinnunculus*), Buzzard (*Buteo buteo*), Tawny Owl (*Strix aluco*) and Long-eared Owl (*Asio otus*) (Cramp and Simmons 1980, 1985). This situation may create confusion about which predator was involved. We neither observed these raptors at the Great Grey Shrike plucking post nor did we find their pellets. Only Buzzard and Kestrels bred regularly in the study plots and were observed regularly. Moreover, Sparrowhawk plucking is different from that of the Great Grey Shrike and feathers are thrown outwards in a larger radius. In small prey, a raptor eats all parts of the carcass and leaves only feathers, whereas the Great Grey Shrike regularly leaves some of the remnants impaled. Moreover, most Sparrowhawk pluckings are conducted near their nest (Newton 1984, März 1987).

Our observations about the mode of prey transport coincide with those described by Yosef (1993) for Loggerhead Shrike (*L. ludovicianus*), wherein small prey are transported in the beak, intermediate size prey – in beak and then feet, and heavy prey – only in the feet.

It is interesting that in few cases we observed Great Grey Shrike giving calls imitating that of Skylark what may suggest cases of prey luring (*cf.* Atkinson 1997). Possessing a great variety of different hunting techniques enables the Great Grey Shrike to feed opportunistically on a wide range of avian prey (Cade 1995).

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