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The Red-backed Shrike *Lanius collurio* in southeastern Sweden: Habitat and territory

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Abstract

The population of Red-backed *Shrike Lanius* collurio in Sweden has declined considerably over the last two decades. Changes in agricultural practices and forestry management have been suggested to be the main reasons for this decline. Territory and habitat of a population of Red-backed Shrikes were studied extensively for four decades, and more intensively during the last 5 years, in Gryt, southeastern Sweden. Territories were fairly small, 0.5–1 ha. Characteristics of the habitat and the shrikes' use of habitat are described. Open sunny areas with plenty of well-spread perches were important. About 1000 prey items were recorded mainly by analysing food remains in nests and in pellets below perches. Hymenoptera (55% by number) and Coleoptera (36%) dominated strongly in the shrikes' diet, vertebrates making up only 2.3%. The studied population appears to have remained stable over the four decades. However, a decline is likely to start soon also in this area, mainly as a consequence of the fact that cattle-grazing of natural, scrub-rich pastures is ceasing at a fast rate. Possible measures to protect different kinds of habitat essential to Red-backed Shrikes are discussed.

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Introduction

Annual counts of Red-backed Shrikes *Lanius collurio* in the Swedish breeding area and at migration sites, have demonstrated a continuous decline of the species from about 1980 onwards (Svensson 1991, Pettersson 1993). Several other bird species also confined to cultivated areas, have shown similar trends. Fast and radical changes have taken place in agriculture and forestry. A connection between these changes and the decline of Red-backed Shrike populations seems likely. However, changes in weather and climatic conditions as well as environmental pollution may also have been important. As the Red-backed Shrike spends much more of the year outside than within the borders of Sweden, detrimental changes along the migration routes and in the wintering areas must also be considered as possible causes for the decrease.

To succeed in the conservation of the Red-backed Shrike, we need more information on its habits and requirements. These topics in particular will be addressed in this paper. In other respects, the general biology of the species has been described in detail (e.g. Schreurs 1941, Durango 1954, 1956, Ash 1970, Lefranc 1979, Jacober & Stauber 1987).

Study area

In Sweden, the Red-backed Shrike is considered a species of the southeastern region, where its densities are highest. This study was done in its stronghold on the east coast, in the parish of Gryt, province of àstergötland (58°10' N, 16° E). The size of the study area, in which most of the observations were made, is about 25 km^2. In a central, typical part (4 km^2) of this larger area, 61% of the land is covered with forest, 6% are clear-cuts, 29% are arable land, and 4% consist of pastures and meadows, the latter mostly in the form of small patches scattered in the landscape. Red-backed Shrike occurrence and breeding were studied in about 80 different shrike territories for four decades in connection with ringing activities, but more intensively during the late 1980s and, especially, from 1990 to 1994.

The higher numbers of Red-backed Shrikes in

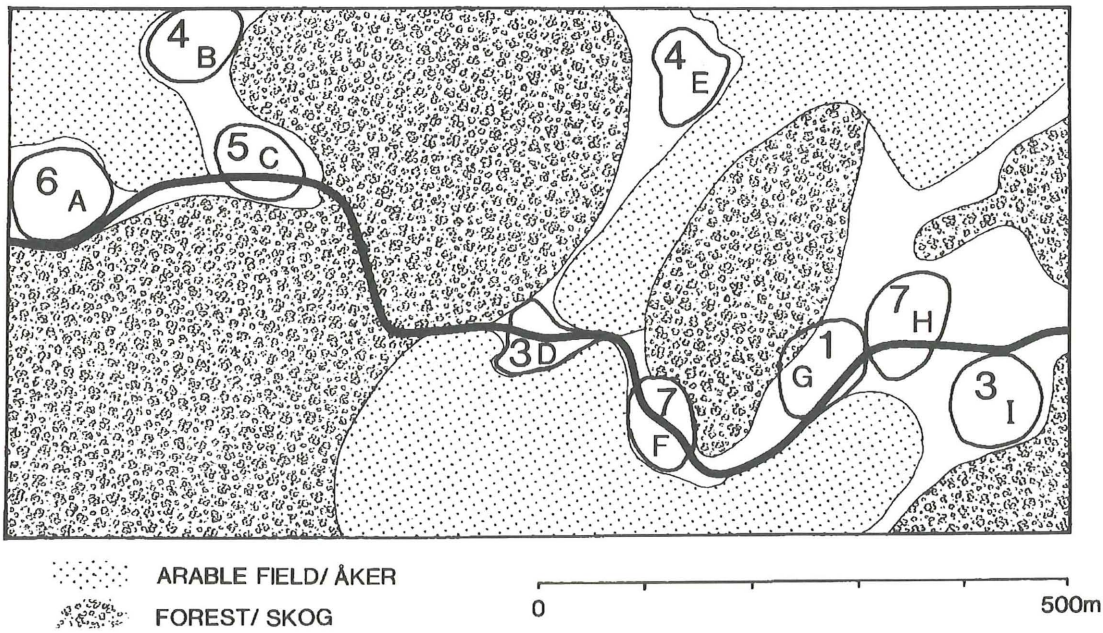

Fig. 1. Red-backed Shrike territories (denoted A–I) in a 0.5 km² well-studied area east of St. Syltvik, Gryt, during 1988-94. Territories were mainly situated in abandoned pastures. Numbers indicate for how many years each territory was occupied by a breeding pair during this period. The continuous line is a small road running across the area.

Törnskaterevir (A–I) inom en yta av 0,5 km² öster om St. Syltvik, Gryt (Ög). Reviren ligger framförallt på hagmark och impediment. Siffror anger hur många år respektive revir varit besatt under perioden 1988-94. Den heldragna linjen är en liten väg som går genom området.

southeastern Sweden is probably due to the climatic conditions of this area. Red-backed Shrikes arrive very late in spring and immediately start breeding. Shortly after the young have fledged, the shrikes start their migration, most of them already in August. Because of this, the weather during just a few months will have a great influence on the shrikes' breeding success. Compared with other parts of southern Sweden, the study area has more hours of sunshine in May and June, and lower precipitation. In both months the former amount to about 280 hours, and the latter to about 40 mm.

A rugged topography makes both agricultural fields and areas of forest small and gives rise to small patches of waste land along forest edges and in the form of small islands in the arable fields. Farmers in this region still practice cattle grazing in open pastures with a few trees and plenty of shrub.

Distribution of territories

In a particularly well-studied part of the larger area (Fig. 1), nearly all small non-cultivated areas without forest were occupied by Red-backed Shrikes for one or more years. However, all the nine territories in Fig.1 were never occupied during the same year, and only two territories had breeding pairs in all of seven years of observation. On the other hand, the area had a stable population of six pairs, except for two years when there were five pairs.

Intervening areas of fields and forests separated the pairs and determined breeding density, and to a certain degree also the size and shape of the territories. This was also the totally dominating spacing pattern of shrike territories within the larger study area. The territory borders of the apparently very favourable territory H (Figs 1 and 2) have remained the same in all years whether the breeding pair had no, one or two neighbours.

A quite different territory pattern, not typical of the Gryt area, was found in the summer of 1993 in meadow habitats along the edges of a vast open area of fallow land with much growing weeds and flowers. Along this 700 m stretch there were seven

breeding pairs, i.e. a mean of 1 pair/100 m. In this case, intraspecific competition probably limited both territory size and population density.

Territory size ranged from 0.5 to 1 ha, exceptionally 1.5 ha. Thus, the territories in Gryt must be looked upon as small, as 1.5 ha has been considered to be a normal size for Red-backed Shrike territories (Durango 1956, Lefranc 1979). Thickets along roads or forest edges often contained linear territories, with the nest placed anywhere within the strip, including close to its end. The smallest distance between the nests of two different pairs was about 40 m, leaving no more than about 20 m between the nest and the territory border.

Choice of habitat

Durango (1954) stated three conditions that are important for the habitat choice of the Red-backed Shrike – the presence of dense shrubs, open sunny areas, and free-standing perches. These three components may occur together in landscapes of otherwise very different character. Data on the habitat preference of Red-backed Shrikes were gathered from 229 breeding events in different territories (Table 1). As the population was not individually colour-marked, some cases may have involved the same bird or birds in different years.

Most of the territories were located in habitats strongly influenced by man. Two such areas can be seen in Figs 2 and 3. Natural pastures rich in shrubs were used about three times as often as clearcuts, even though these two habitats occurred in roughly the same proportions (4% and 6%, respectively). Their importance stands out clearly when one considers that 66.8% of all breeding events took place there, although they comprised only about 10% of the total area (Table 1).

Narrow strip-shaped territories along forest edges and along roads and country lanes with a moderate

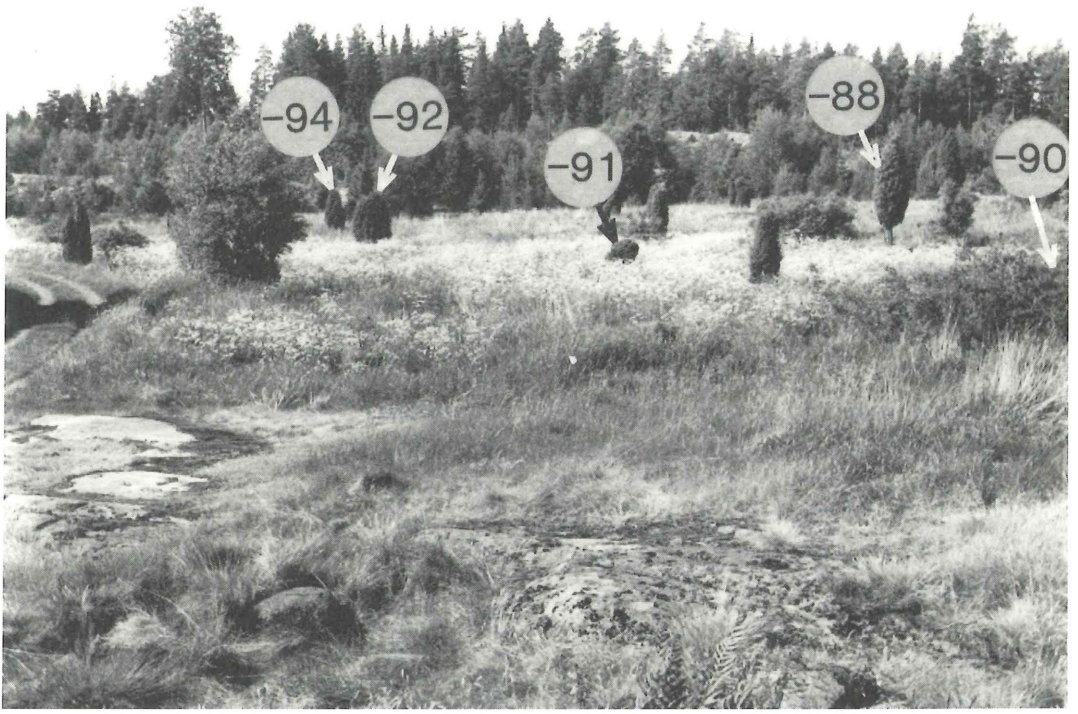

Fig. 2. The central part of territory H in Fig. 1. This is an old pasture where grazing has ceased. Flags with year indicated show the bushes in which nests were placed. Also the nest in 1993 was placed in a Juniper, just outside the right margin of the photo. Photo by the author.

Centralt avsnitt av revir H i Fig. 1. Betesmark med upphört bete. Använd häckningsbuske under olika år markerad med respektive årtal för häckningen. Även boet 1993 låg i en enbuske, strax utanför höger bildkant.

Fig. 3. Red-backed Shrike territories in a growing spruce Picea abies plantation on formerly cultivated ground. One territory was situated in the foreground and another in the background. Photo by the author.

Törnskaterevir i uppväxande granplantering på nedlagd åkermark. Ett revir i förgrunden, ett annat i centrum av den bortre delen.

traffic, were also fairly common. A necessary condition in the former was the presence of a zone of shrubs (*Prunus spinosa, Rosa canina, Juniperus communis*) facing the open areas. Along the roads, bushes were scarcer but still this habitat was much used. Probably fence poles, wires and telegraph lines presented a substitute for bushes as perches.

Perch sites

Sit-and-wait hunting from free-standing perches is the dominating hunting strategy of the Red-backed Shrike. The shape, height and distribution of perches can be seen in Figs 2 and 3 which show two territories of rather different appearance. A majority of the prey taken by Red-backed Shrikes are small and

Table 1. The use by Red-backed Shrikes of different habitats for breeding (n=229), 1966–94.

Antal törnskatehäckningar (n=229) i olika biotoper under åren 1966–94.

	n	%
Pasture *Betesmark*	118	51.5
Pasture with bushes sparsely spread *Beteshage, glest beväxt*	81	35.4
Pasture growing together *Beteshage, igenväxande*	37	16.2
Clearcut *Kalhygge*	35	15.3
Newly cut *Nyupptaget*	14	6.1
Planted *Planterat*	21	9.2
Forest edge along cultivated area *Skogsbryn mot odlad mark*	32	13.9
Roadside, ditches *Vägkant, dike*	17	7.4
Small wasteland area in cultivated field *Impedimentö ute i odlad mark*	16	6.9
Continuous thickets *Sammanhängande snårmark*	10	4.4
Garden *Trädgård*	1	0.4

Table 2. The use by the Red-backed Shrikes in territory H of different habitats for hunting. Observations were made in different weather conditions during six days in July in 1990 and 1991 for a total of 13.5 h. The total number of strikes recorded was 143 in 1990 and 358 in 1991.

Fördelningen av törnskatans jakter mellan olika biotoper inom revir H. Materialet insamlat under 6 dagar i juli månad 1990 och 1991, under 13.5 timmar och under växlande väderförhållanden. Antalet registrerade försök att fånga byten var 143 1990 och 358 1991.

Hunting area *Jaktområde*	1990		1991		Total	
	n	%	n	%	n	%
Air (aerial chases) *I luften (luftjakter)*	40	27.9	188	52.5	228	45.5
Tall grass and herbs, >25 cm *Högt gräs och örter, >25 cm*	45	31.5	113	31.5	158	31.5
Bare ground and low vegetation <25 cm *Bar mark och låg vegetation <25 cm*	49	34.3	36	10.1	85	17.0
Road with wheeltracks *Körväg med hjulspår*	19	13.3	26	7.3	45	9.0
Short grass *Kort gräs*	14	9.8	8	2.2	22	4.4
Flat rocks *Berghällar*	16	11.2	2	0.6	18	3.6
In bushes and trees *I buskar och träd*	9	6.3	19	5.3	28	5.6
Broad-leaved *Lövverk*	9	6.3	14	3.9	23	4.6
Junipers *Enbuskar*	–	–	5	1.4	5	1.0
Fields, cultivated area *Åker, odlad mark*	–	–	2	0.6	2	0.4

move around in the ground vegetation (Table 3 and Appendix). The presence of good look-outs will increase the shrikes' probability of detecting prey and is thus of critical importance in a shrike territory. Low vantage points reduce the area that can be surveyed, and too high perches decrease the possibilities to detect prey. In experiments with hand-reared young Red-backed Shrikes, Carlsson (1985) found that birds hunting from look-outs 1.5 m high, had a higher capture success than birds hunting from points of 0.75 m. These experiments did not, however, include any points higher than 1.5 m.

With plenty of look-outs of different heights in a territory (Fig. 2), the shrikes preferred those between 1.5 and 3 m (Fig. 4). When they had many well-distributed perches available, shrikes caught prey very effectively in their small territories. Immediately after feeding at the nest, the male usually alighted on a bush near the nest. From this point he chose where to go and started his hunting flights to all parts of the territory. In the short time of 1 h 45 min he had visited most parts of his territory (Fig. 5).

To be able to exploit all parts of the territory in an efficient way, shrikes need look-outs distributed throughout the territory. In USA, *Lanius ludovicianus* lives in similar habitats to those of the Red-backed Shrike and hunts much in the same manner. Yosef & Grubb (1994) put out artificial perches, about 1.5–2 m high in parts of territories lacking good look-outs. This enabled the birds better to take advantage of their territory and resulted in smaller territories and an increase in local population size.

Hunting methods

Of about 500 registered hunting strikes in territory H (Figs 1 and 2), 46% were directed at prey in the air at the height of or above the shrike's perch (Table 2). About 32% were aimed at insects in tall grass and herbs (>25 cm high; see centre of Fig. 2). In this territory, grasses (e.g. *Poa trivialis, Phleum pratense, Agropyron repens*) dominated, and flowering herbs (*Anthriscus silvestris, Galium verum, Achillea millefolium and Centaurea jacea*) were common. In

Table 3. Numbers of prey of the Red-backed Shrike, collected in three different ways (see text for details). See also a more detailed, complete list of Coleoptera in Appendix. The total number of prey was 1010.

Anträffade byten insamlade på tre olika sätt och redovisade i antal exemplar. Se även närmare fullständig redovisning av Coleoptera i Appendix. Det totala antalet byten var 1010.

Prey species *Bytesarter*	In stores *I förråd*	In nests *I bon*	In pellets *I spybollar*	Total *Totalt*	%
Coleoptera *Skalbaggar*	–	239	127	366	36.2
Pterostichus niger,					
P. melanarius, P. versicolor	–	60	19	79	
Amara similata	–	18	–	18	
Silpha tristis	–	13	11	24	
Geotrupes stercorarius	–	47	7	54	
Aphodius fossor	–	24	14	38	
Elateridae spp. (7 species)	–	11	7	18	
Cerambycidae (7 species)	–	17	9	26	
Curculionidae (10 species)	–	11	11	2	
Others *Övriga arter*	–	38	49	87	
Hymenoptera *Steklar*	12	347	194	553	54.7
Bumble-bees *Humlor*	12	142	79	233	
Wasps *Getingar*	–	15	92	107	
Bees *Bin*	–	1	2	3	
Ants *Myror*	–	183	17	200	
Others *Övriga arter*	–	6	4	10	
Other invertebrates	14	14	39	67	6.6
Övriga ryggradslösa djur					
Diptera *Tvåvingar*	–	1	–	1	
Lepidoptera *Fjärilar* (incl. larvae)	8	–	1	9	
Heteroptera *Skinnbaggar*	–	7	11	18	
Dermaptera *Tvestjärtar*	–	–	26	26	
Orthoptera *Gräshoppor, Vårtbitare*	5	–	–	5	
Odonata *Sländor*	1	–	1	2	
Diplopoda *Tusenfotingar*	–	6	–	6	
Vertebrata *Ryggradsdjur*	11	6	6	23	2.3
Frogs *Grodor*	3	–	–	3	
Lizards *Ödlor*	4	–	5	9	
Birds *Fåglar*	3	1	–	4	
Rodentia, Soricidae *Gnagare, Näbbmöss*	1	5	1	7	

this type of vegetation, the shrikes most often did not alight but swooped down snatching the prey from the vegetation on the wing.

About 17% of strikes were directed at insects running on the ground in low (<25 cm) vegetation or on bare ground, such as rocks (centre foreground in Fig. 2) or road tracks (extreme left in Fig.2). In these instances the bird mostly landed, sometimes running on the ground for a short while before catching the prey and taking off.

As many flying insects had flowers as their goal, vegetation with flowers had a much greater importance than demonstrated in Table 2. Also dead animals and dung attract several species of flying insects that are important to shrikes.

Compared with other birds living among bushes and trees, the shrikes hunted very little among leaves and needles (Table 2). Also fields, even with crops such as rape or peas, were nearly completely neglected. The shrikes rather crossed such areas without stopping, to hunt along forest edges on the other side. Such fields therefore enlarged the territory, but were rarely used, and only increased the length of hunting trips (Fig. 5).

It is well known that the activity of insects is strongly influenced by weather conditions. Accord-

ing to Jacober & Stauber (1987), aerial hunting in Red-backed Shrikes increases during good weather. Solari & Schudel (1988) found that the proportion of aerial hunting reached 33% in sunny weather but was only 8% when the sky was overcast. In my study, I found no such relationship. The activity of insects is affected not only by sunshine or cloudiness but also by many other factors (e.g. temperature, wind, and whether the ground and vegetation are wet or dry). However, weather conditions did affect the frequency by which young were fed. In favourable weather I found an interval of 4.3 min between feeds during a total of 225 min of observation. However, in strong winds and wet vegetation, the interval was 7.8 min during an observation period of the same length.

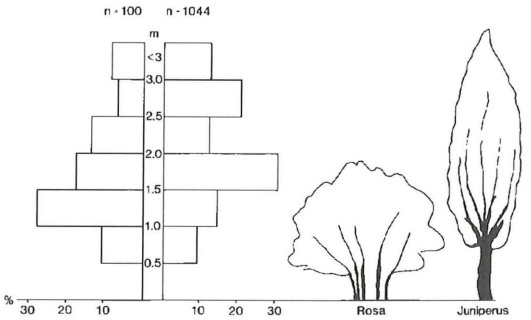

Fig. 4. Heights of look-outs chosen by Red-backed Shrikes (right) compared with the heights of 100 bushes nearest to the centrally situated nest site in territory H (left). As this territory was rather small, most of the perches available to the shrikes were included.

Törnskatornas utnyttjande av utkikar av olika höjd (till höger) jämfört med höjden av de 100 buskarna närmast den centralt belägna boplatsen i revir H (till vänster).

Diet

The mode of hunting and choice of hunting area can

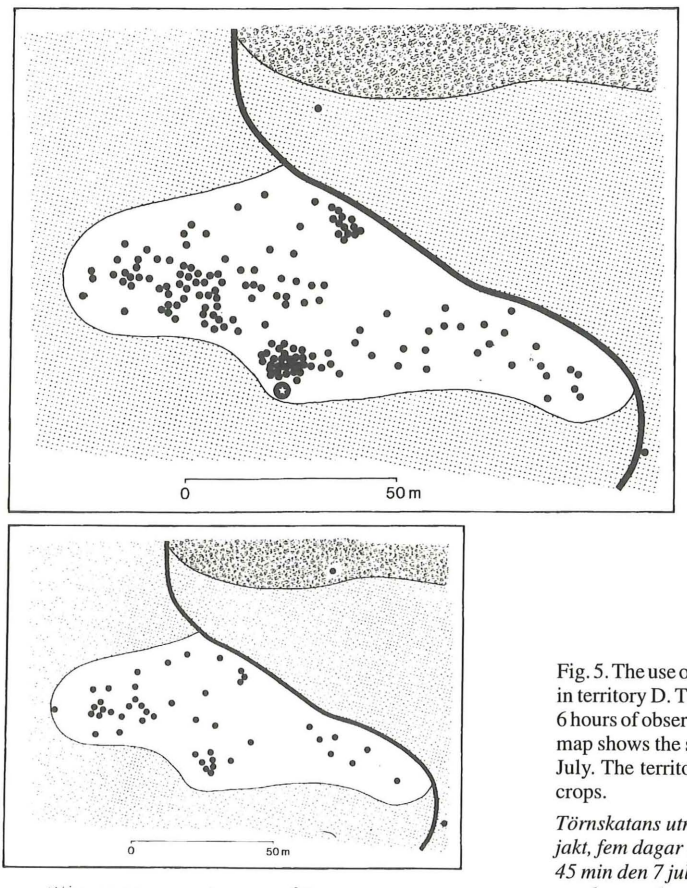

Fig. 5. The use of hunting posts by the male Red-backed Shrike in territory D. The large map shows the perches used during c. 6 hours of observation during five days in July 1990. The small map shows the shrike's use of perches during 1 h 45 min on 7 July. The territory consists mainly of pasture and rocky outcrops.

Törnskatans utnyttjande av utkiksposter under ca. 6 timmars jakt, fem dagar i juli 1990 (stora kartan) respektive under 1 h 45 min den 7 juli (lilla kartan). Biotopen i reviret huvudsakligen hagmark och impediment.

give information on the main types of prey taken. Some information can also be gathered at impaling sites. However, both methods are rather unreliable, the former because the prey usually cannot be identified, the latter because information is biased towards larger prey items.

In 1990, 1991 and 1993, I used two other methods. First, after the young have fledged, nests contain food remains. Most of these probably originate from nestling pellets which have become crushed and trampled into the lining of the nest cup. Such nests (n=17) were collected and dried, and the food remains removed. Second, outside the nest, the adults have specific, frequently used perches below which pellets can be found. When fledged, the young birds stay in the territory and also use these perches where they produce pellets. In both cases, prey remains are strongly dismembered, and in order to identify prey species and count numbers, it is necessary to have assistance from a skilled entomologist; in this study I was lucky to get such help.

Numerically insects dominated strongly, compared with vertebrate prey (Table 3 and Appendix). In nests, as well as in pellets, some species of Hymenoptera were the most common kind of prey (55%). Among beetles (36%), 69 species were identified, and among them three *Pterostichus* species prevailed. Also *Geotrupes* spp. were important. Insects other than Hymenoptera and Coleoptera only made up 6.6% by number.

There may have been some bias owing to the methods the birds used in dismembering and eating different kinds of prey. Butterflies, dragonflies and species of Orthoptera may have been more commonly eaten than demonstrated here. Spiders and caterpillars were totally missing in nests and pellets. The rather low proportion (17%) of strikes recorded for bare ground and very low vegetation, does not correspond well with the high numbers of *Pterostichus, Geotrupes* and *Aphodius*, which are mainly terrestrial. But several species, especially of the latter two genera, are often seen flying, seeking out carrion and dung, respectively, and could thus have been caught in aerial attacks. Still, most of the aerial attacks were probably directed at bumble-bees and wasps. Many bumble-bees may also have been caught in tall flowering herbs. This also applies to the many species of Elateridae, Cerambycidae and Curculionidae found in nests and pellets.

Beetles and bumble-bees were important prey throughout the breeding season in all years. There was, however, a remarkable difference in the numbers of wasps found in nests and pellets. In the food remains found in the nests, wasps only made up 4.3% of the hymenopteran prey, whereas in pellets from outside the nest they constituted 47.4%. Corresponding proportions for bumble-bees were 40.9% and 40.7%. The difference may partly depend on a seasonal change in the choice of prey. In a German study exclusively based on pellet analysis (Wagner 1993), wasps increased towards the end of the summer. However, in the present study, the pellets were collected outside the nests but during the nestling and early fledging periods. The almost total absence of remains of wasps in the nests thus indicates a selection on part of the adults when feeding nestlings.

The other prey species demonstrate an opportunistic choice of prey. The great majority of ants were of the genus *Camponotus*, and more than half of these came from only two of the 17 collected nests. The swarming of these ants usually occurs when the shrikes have young in the nest, and the ants were probably caught in aerial attacks during short swarming incidents. Of a total of 26 earwigs (*Forficula*), 24 were found in the pellets from one single pair of shrikes.

Small bones and teeth in nests and pellets demonstrate the presence of vertebrate prey. Together with animals found at impaling sites, vertebrates numbered 23. All frogs found were very small. One 10 cm long lizard *Lacerta agilis* was found newly caught, decapitated and stored on a spike. All other lizards were of the smaller species, *Lacerta vivipara*. Three of the four birds were identified, one Willow Warbler *Phylloscopus trochilus*, one Robin *Erithacus rubecula* and one Goldcrest *Regulus regulus*. Only one out of seven mammals – a young vole – was found whole, the rest as small remains.

Discussion

The choice of habitat (Table 1), hunting methods (Table 2) and prey (Table 3, Appendix) by Red-backed Shrikes, all demonstrate the importance of protecting open, sunny areas rich in flowers in order to maintain healthy shrike populations. However, a Red-backed Shrike territory must also contain bushes or other perches within a well-defined range of heights, distributed throughout the territory. Extensive clearing of bushes may make an otherwise good area unsuitable. Neither can tall trees act as a substitute for bushes.

It is obvious that long used natural pastures rich in shrubs best correspond to the requirements of the Red-backed Shrike (Table 1). However, a continuing

decline of this habitat has taken place in Sweden for many years (Gerell 1988). Still, in the present study area, no decline in the Red-backed Shrike population has yet been discovered. Neither a careful mapping of territories during the last seven years nor my more general impressions from the last decades have given any indication of a decline. However, a turning point seems to be near. For example, in only one of the nine territories in Fig. 1 cattle grazing is still maintained. It is unrealistic to believe in a return of traditional cattle breeding and grazing, so many now suitable Red-backed Shrike territories will probably very soon become overgrown (Fig. 2). Only here and there will it be possible to maintain such shrike habitats by the positive interest from the landowner, sometimes with governmental support. Therefore, other habitats, less preferred by the Red-backed Shrike (Table 1), will grow in importance.

In contrast to old natural, shrub-rich pastures, clearcuts and former cultivated fields that are turned into forest plantations, will be of only transient character. But such habitats will continuously be created in the future. In the earliest stage, clearcuts well cleaned from branches, etc. are unsuitable for the Red-backed Shrike as they lack the necessary perches. If forestry instructions could include advice to leave occasional bushes and groups of bushes, clearcuts could be occupied sooner and to a greater extent by shrikes. Their duration as good shrike habitat could then be 10–15 years. Some years after the stage illustrated in Fig.3, they will be abandoned by the shrikes.

This study has shown that the Red-backed Shrike only needs small territories if these have perches scattered throughout them, and if they are sunny and contain a flora and insect fauna typical for such locations and not negatively affected by herbicides and insecticides. Cultivated areas with different kinds of crops cannot compensate for losses of original habitat. A thoroughly considered care and management of all small areas of waste land in the countryside, such as those listed in Table 1, are very important for the future survival of the Red-backed Shrike.

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Sammanfattning

Törnskatan i sydöstra Sverige: Biotop och revir

Enligt häckfågeltaxeringar och räkningar vid sträcklokaler har det svenska beståndet av törnskata *Lanius collurio* minskat avsevärt under senare årtionden. För eventuella skyddsåtgärder krävs en bättre kännedom om artens levnadsvanor.

Denna studie har utförts i några av de bästa svenska tillhållen för arten, huvudsakligen i Gryts socken i Östergötland, framför allt under de senaste fem åren. Törnskatan vistas endast kort tid – maj–augusti – i denna trakt och under denna tid är antalet soltimmar högt och nederbördsmängderna små jämfört med i andra delar av Sydsverige. Terrängen i området är starkt sönderbruten, vilket motverkar upp-

komsten av stora sammanhängande odlade ytor eller liknande av skog. Förhållandevis stor del av ytan upptas av naturbetesmarker och impediment.

Fig. 1 visar ett typiskt område med ett antal törnskaterevir som nyttjats under flera och i vissa fall alla undersökningsåren. Som synes är reviren förvånansvärt små – 0,5–1 ha – och ofta naturligt avgränsande både till form, storlek och mot andra par genom mellanliggande ytor av olämpliga biotoper.

Törnskatans biotopkrav kan tillfredställas inom till synes ganska starkt avvikande miljöer (Tabell 1). Dock framgår det tydligt att de gamla, länge brukade beteshagarna är de bästa områdena, och att deras dragningskraft också minskar så fort betningen upphör och en igenväxning kommer igång. Motsatsen kan sägas om hyggena. De helt kala, nyupptagna förbättras då de planterade granarna börjar växa upp och ger de för törnskatans jakter nödvändiga utkikspunkterna. Goda och flerårigt utnyttjade revir kan ses i Fig. 2 och 3. Alltför låga utkikar ger dålig överblick över jaktområdet, för höga försvårar möjligheterna att se små byten i marktäcket. Fig. 4 visar hur törnskatorna i reviret H (Fig. 1 och 2) utnyttjat tillgängliga utkikar med ett val av ganska klart markerade höjdnivåer.

För fångst av insektsbyten utnyttjas revirets skilda delbiotoper i olika hög grad (Tabell 2). Luftjakterna dominerar (45,5%), men gäller naturligtvis ofta insekter på väg till blomfälten eller till döda djur och spillning nere i gräset. I tabell 3 och Appendix ses att många av insektsbytena hör hemma i insektsgrupper som är kända för att söka näring i dessa tre källor. Humlor har en mycket stor betydelse som föda och är eftersökta under hela häckningsperioden. Att ungarna i boet knappast alls matas med getingar, jämfört med en stor tillförsel av humlor, kan tyda på att getingarna av föräldrafåglarna inte klassas som lämpliga till ungarna.

En del ryggradsdjur förekommer också i dieten (Tabell 3) men spelar en mindre roll totalt sett. Jämfört med många andra av buskmarkernas fågelarter har törnskatorna mycket litet intresse av jakt i grenverk med löv och barr. Ej heller tycks odlade områden ha något att erbjuda dem, ens när där växer sådana grödor som raps eller ärtor. Men den förhållandevis lilla revirytan utnyttjas i övrigt ytterst effektivt (Fig. 5). På mycket kort tid har den jagande törnskatan besökt nästan varje del av reviret.

Någon minskning av törnskatestammen inom området har ej kunnat konstateras. På grund av nutida snabba förändringar inom jordbruk och boskapsskötsel ökar dock troligen hoten för varje år. Som exempel kan nämnas att det i de nio reviren i figur 1 nu bara förekommer betande djur i ett enda, och en igenväxning i de övriga kan ske på kort tid. Det är knappast realistiskt att tro på någon återgång till äldre tiders beteskultur, men viktigt att trots allt försöka förmå enskilda markägare att bevara beteshagens natur där så är möjligt.

Kalhyggena tycks vara törnskatans näst viktigaste biotop i dagens landskap (Tabell 1). De skulle snabbare kunna ge tillgång till lämplig miljö, om man vid avverkning sparade mindre grupper av buskar här och var, liksom man idag från skogsvården rekommenderar spridda trädgrupper eller träd kvar ute på hyggesytorna. Granplanteringarna kommer dock alltid att ha en begränsad livslängd (Fig. 3), sedda ur törnskatornas synvinkel. Desto viktigare förefaller det därför vara att spara och väl skydda och vårda den mängd små ytor av impedimentkaraktär i landskapet, som törnskatorna så gärna väljer (Tabell 1). De ligger ofta öppet och soligt och får en för törnskatan lämplig växtlighet och ett rikt insektsliv. Alla former av bekämpningsmedel mot ogräs och insekter bör hållas borta från sådana områden, och buskröjningar ske genomtänkt och i begränsad skala.

I en följande artikel kommer detaljer i törnskatornas häckningsbiologi i området att granskas och beskrivas.

Appendix. A complete list of all species and numbers of Coleoptera found in nests and pellets of Red-backed Shrikes Lanius collurio. Names and taxonomy according to Lundberg (1986).

En fullständig lista över alla arter och antal skalbaggar funna i bon och spybollar av törnskata. Namn och taxonomi enligt Lundberg (1986).

	Nests *Bon*	Pellets *Spy-bollar*	Total *Totalt*
Carabaeide			
Pterostichus lepidus	2	1	3
" *cupreus*	1	–	1
" *versicolor*	9	7	16
" *oblongopunctatus*	1	–	1
" *niger+P. melanarius*	51	12	63
" *gracilis*	–	1	1
Calathus fuscipes	1	5	6
Cicindela campestris	–	1	1
Carabus arvensis	2	–	2
" *nemoralis*	1	–	1
Nebria brevicollis	–	1	1
Blethisa multipunctata	–	1	1
Amara similata	18	–	18
" *fulva*	–	2	2
" *apricaria*	–	1	1
" *aulica*	–	1	1
Ophonus rufibarbis	3	1	4
Harpalus rufipes	2	2	4
" *affinis*	1	–	1
" *tardus*	1	1	2
Amara sp.	1	1	2
Dytiscidae			
Rhantus suturellus	1	1	2
Hydrophilidae			
Sphaeridium sp.	–	1	1
Cercyon haemorrhoidalis	–	1	1
Hydrochara caraboides	1	1	2
Silphidae			
Nicrophorus vespilloi	1	3	4
Sclypea opaca	1	5	6
Silpha tristis	13	11	24
Phosphuga atrata	2	4	6
Thanotophilus rugosus	1	–	1
Oiceoptoma thoracica	–	2	2
Histeridae			
Hister unicolor	1	–	1
Scarabaeidae			
Geotrupes stercorotus + *G. stercorarius*	47	7	54
Aphodius fossor	24	14	38
" *depressus*	–	6	6
Trichius fasciatus	4	1	5
Amphimallon solstitiale	–	1	1
Lucanidae			
Sinodendron cylindricum	6	1	7
Elateridae			
Prosternon tesselatum	–	1	1
Ampedus sanguineus	1	–	1
Agriotes obscurus	–	2	2
Athous niger	2	–	2
" *haemorrhoidalis*	1	1	2
Selatosomus aeneus	5	3	8
Melanotus casanipes	2	–	2
Buprestidae			
Agrilus biguttatus	–	1	1
Byrrhidae			
Byrrhus arietinus	1	–	1
" *pilula*	2	–	2
Dermestidae			
Megatoma undata	1	–	1
Rhiphiphoridae			
Metoecus paradoxus	–	1	1
Cerambycidae			
Spondylis buprestoides	13	4	17
Rhagium inquisitor	2	–	2
" *mordax*	–	1	1
Anoplodera rubra	–	3	3
" *sangvinolenta*	1	–	1
Leptura quadrifasciata	1	–	1
" *melanura*	–	–	1
Chrysomelidae			
Chrysolina geminata	–	1	1
Curculionidae			
Otiorhynchus nodosus	1	1	2
" *tristis*	1	1	2
" *ligustici*	2	1	3
" *desertus*	–	1	1
Phyllobius vivideaeris	–	2	2
" *pyri*	–	3	3
Barypeithes pellucidus	–	1	1
Barynotus obscurus	6	–	6
Hylobius abietis	–	1	1
" *pinastri*	1	–	1
Non det	1	–	1