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The breeding population of the Great Grey Shrike (*Lanius excubitor*) in Austria, 1995–2003

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Abstract: Since the 1980s, the breeding range of the Great Grey Shrike in Austria has been restricted to the northern part of Lower Austria. Since 1995, this breeding population has been fully censused to obtain base-line population levels. Every breeding locality was examined 6-8 times each season. In 1995 at least 38 occupied territories were found and 32 breeding pairs confirmed. In 1997, after the two harshest winters in the study period, only 18 occupied territories and 9 breeding pairs were confirmed. But since 1998, the breeding population has increased again. In 2002, the population reached a maximum of 50 occupied territories with 47 confirmed breeding pairs. In 2003, 46 pairs bred. The nests were built in deciduous trees at lower elevations of the Weinviertel and in coniferous trees at higher elevations. Most nest trees are in small woodlots or in forest edges. In 1998–2003, the portion of successful breeding pairs ranged from 57% in 2003 (n = 46) to 80% in 2001 (n = 40). On average, 3.4 (SD = 1.1, n = 129) fledglings per successful brood were recorded.

Key words: Great Grey Shrike, *Lanius excubitor*, breeding distribution, population dynamics, habitat, breeding success, Lower Austria

INTRODUCTION

Since the 1980s, the breeding area of the Great Grey Shrike (*Lanius excubitor*) in Austria has been restricted to the northern part of Lower Austria, but previously this species bred in most of the federal states (DVORAK et al. 1993, GLUTZ & BAUER 1993). The existing small breeding populations in the central and northern parts of the Waldviertel of Lower Austria are the last remnants of the former Great Grey Shrike breeding distribution in Austria (SACKL & LAUERMANN 1990, SACHSLEHNER et al. 1994). While the breeding in the Waldviertel has been known for a longer time (at least since the 1950s), an additional small population in the northeastern Weinviertel was established in the late 1980s, which probably came from the adjacent southern Moravia (ZUNA-KRATKY 1998).

The Great Grey Shrike is one of the rarest and most critically endangered songbird species in Austria, and especially in Lower Austria, where it still suffers from loss of habitat through agricultural intensification (KRAUS 1988, SACHSLEHNER et al. 1994, BERG & RANNER 1997). Because of this, a conservation programme was started in 1995. Since then, the breeding population has been fully censused to measure breeding biology parameters and demographic trends. These data will help us develop protection and management programs. Below we characterise the breeding population in Austria (Lower Austria) after 9 years (1995–2003) of research.

STUDY SITES AND METHODS

The study sites are located in the northern parts of Lower Austria in the central and northern Waldviertel (in the districts of Gmünd, Horn, Waidhofen/Thaya and Zwettl) and in the northeastern Weinviertel (in the districts of Gänserndorf and Mistelbach) (Fig. 1). The Waldviertel is a part of the Bohemian Massif, and its plateaus are mainly 400–600 m above sea level. The Waldviertel usually has a harsh winter climate (SACHSLEHNER et al. 1994). At the weather station of Allentsteig (48°41'N; 15°19'E; altitude 550 m), an average of 81 days with snow was registered in the

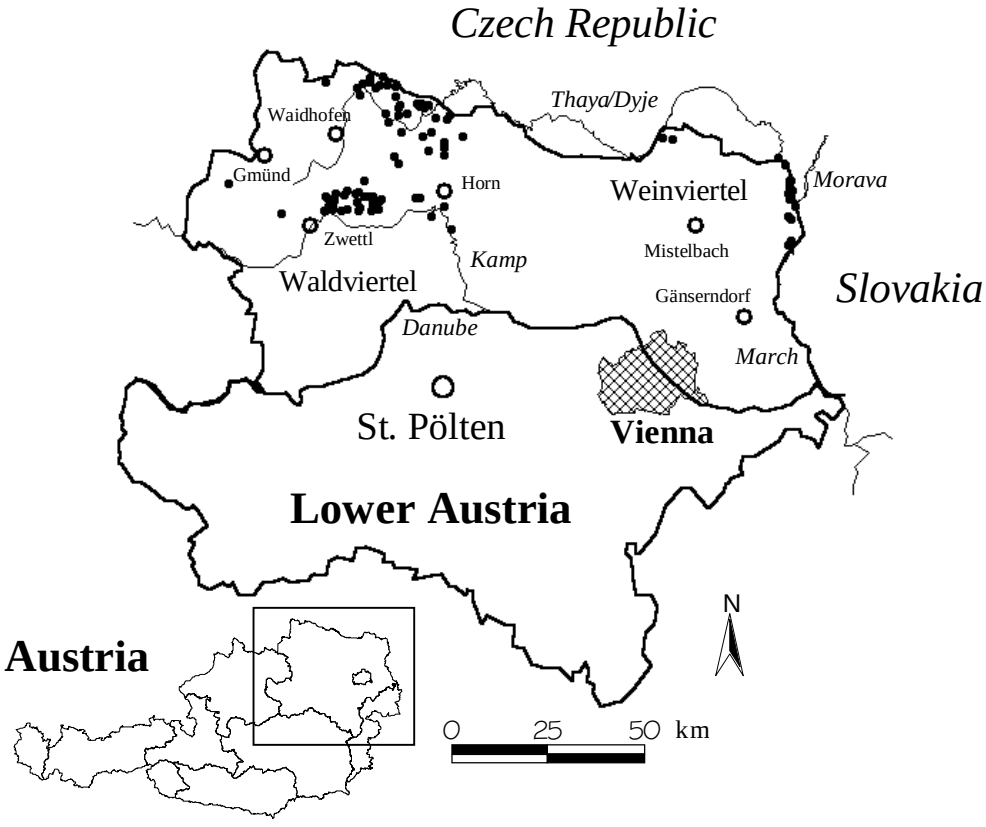

Fig. 1. Breeding distribution (solid black dots) of the Great Grey Shrike in Lower Austria in 1995–2003

winters between 1994 and 2003. The Weinviertel is situated lower, especially in the floodplain of the March-Thaya Valley in the frontier areas of the Czech Republic and Slovakia at 147–155 m above sea level (ZUNA-KRATKY 1998, ZUNA-KRATKY et al. 2000). At the weather station of Hohenau/March (48°36'N; 16°54'E; altitude 155 m), a mean of only 37 days with snow was measured in the winters between 1994 and 2003.

Every known breeding locality of the Great Grey Shrike in Lower Austria was usually examined 6–8 times each breeding season in 1995–2003. We recorded: (1) occupancy, (2) pair status, (3) breeding status, (4) breeding success (by the number of fledged juveniles), and (5) general habitat parameters. We measured breeding success for all of the Lower Austrian breeding regions starting from 1998, and for the northern Waldviertel from 1995. This study includes one case of successful bigamy in the northern Waldviertel (PROBST 2001), which is counted as two breeding pairs.

RESULTS

Distribution

The entire Austrian breeding range of the Great Grey Shrike is restricted to the northern parts of Lower Austria (Fig. 1) where we can distinguish three populations: (1) in the northeastern Weinviertel (lowland population), (2) in the central Waldviertel, and (3) in the northern Waldviertel.

Of 91 breeding localities recorded in 1995–2003, 18 (20%) were found in the northeastern Weinviertel at 150–200 m above sea level (Fig. 2). Two nests were in

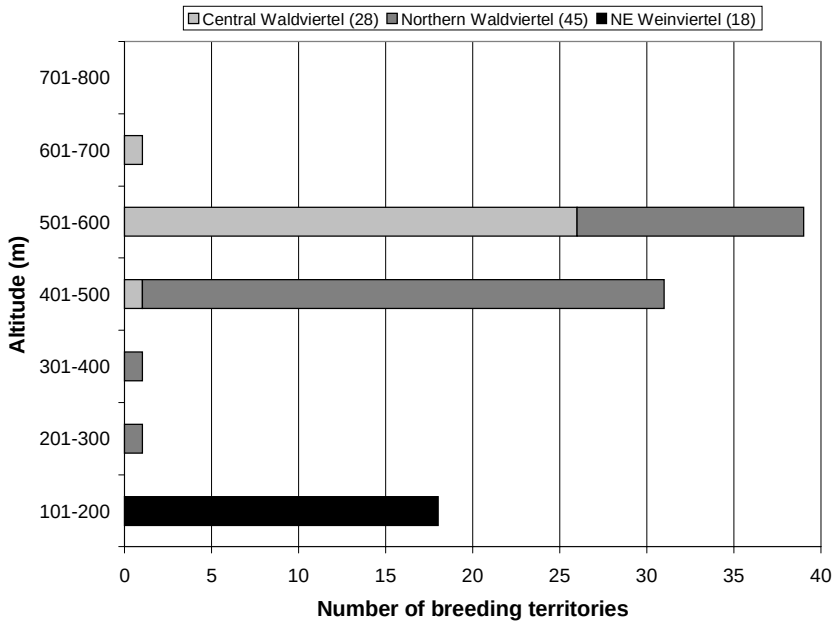

Fig. 2. Breeding distribution of the Great Grey Shrike depending on altitude in three regions of Lower Austria (total n=91 breeding localities, 1995–2003)

the basin near Laa/Thaya in the north of Mistelbach, while all other 16 territories of this lowland population are in the March-Thaya Valley in the frontier areas of the Czech Republic and Slovakia (Fig. 1; see also ZUNA-KRATKY 1998).

Twenty-eight (31%) of the 91 recorded breeding localities are concentrated in the central Waldviertel in the near northeast of the town of Zwettl (Fig. 1). These sites are almost all on a plateau 500–600 m above sea level (Fig. 2). Almost half of the Austrian breeding territories are found in the northern Waldviertel, with 45 (49%) of the total 91 breeding localities. The centre of distribution is located around the town of Raabs/Thaya, northwest of the town of Horn (Fig. 1). Nesting sites in the northern Waldviertel are mainly found on plateaus around 500 m above sea level (Fig. 2).

Habitats

All breeding territories occur in semi-open landscapes with scattered shrubs, trees and/or (small) woodlots, but the main habitat-matrix is different (Fig. 3). The breeding territories in the lower situated northeastern Weinviertel are mainly adja-

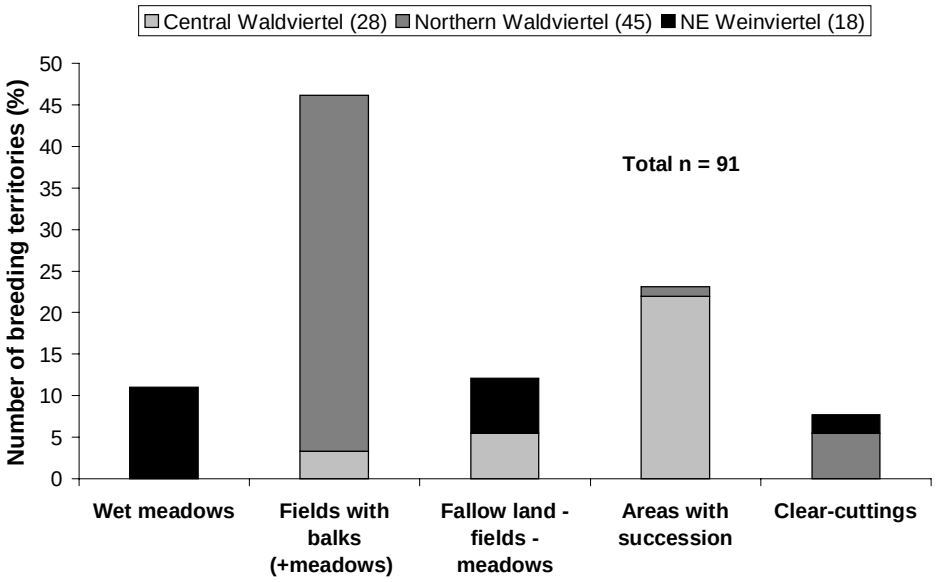

Fig. 3. Main habitat-matrix at the 91 breeding localities of the Great Grey Shrike in Lower Austria (1995–2003)

cent to wet hay meadows and fallow land in floodplain forests. Areas along the rivers Thaya and March are frequently flooded in early spring. A large portion of temporarily flooded fields was set aside in the 1990s, when the European Union started to co-finance agricultural and environmental programmes (ZUNA-KRATKY 1998).

The breeding territories in the central Waldviertel are mainly in areas of military use with disturbance and fires. A few breeding territories in this region are still associated with the traditional agricultural field-balk landscapes, fallow land, or meadows (Fig. 3).

Most breeding territories (73% of 40 cases) in the northern Waldviertel are in agricultural field-balk landscapes (Fig. 3) with a small portion of hay meadows. The centres of 5 breeding territories were found on clear-cuttings (Fig. 3) of secondary or man-made coniferous woods, which are also in the area of the field-balk landscape.

In the lower warmer localities of the northeastern Weinviertel, nests are usually built in deciduous trees parasitised by mistletoes (e.g. *Populus* spp., *Quercus* spp., *Salix* spp., *Tilia* spp.; see also PROBST 1999). In the higher situated Waldviertel (SACHSLEHNER & SCHMALZER in press), nests are in coniferous trees (*Pinus sylvestris*, *Picea abies*). Most of the nest trees are located in small woodlots or in forest edges or, infrequently, in tree lines. Solitary trees are also used infrequently.

Population dynamics

Fig. 4 shows the number of occupied breeding territories and confirmed breeding pairs in 1990–2003 for the entire Austrian Great Grey Shrike population. In 1990, its size was estimated at 12–15 breeding pairs (SACKL & LAUERMANN 1990, see also LEFRANC & WORFOLK 1997). We have had the exact data since 1995.

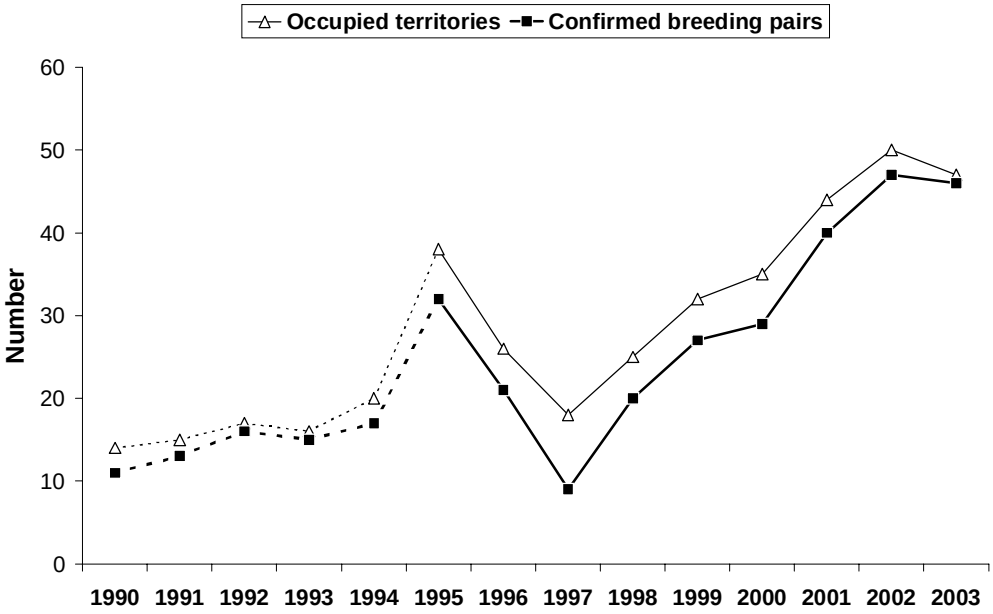

Fig. 4. Population dynamics of the Great Grey Shrike in Lower Austria in 1990–2003 (exact numbers of occupied breeding territories and confirmed breeding pairs start in 1995)

In 1995 at least 38 occupied territories were found and 32 breeding attempts were confirmed. In 1997, after two harsh winters, the number of occupied territories decreased to 18 and only 9 breeding pairs were confirmed. From 1998, the breeding population clearly increased again. By 2002, maximum values of 50 occupied terri-

tories and 47 confirmed breeding pairs were recorded. In 2003, population size decreased to 46 breeding pairs (Fig. 4).

A regional consideration of the population dynamics since 1995 (Fig. 5) shows a stable or a slight increase in the population in the northeastern Weinviertel, as well as – to some extent – two similarly fluctuating populations in the Waldviertel. But since 1999 the size of the central Waldviertel population has doubled (Fig. 5).

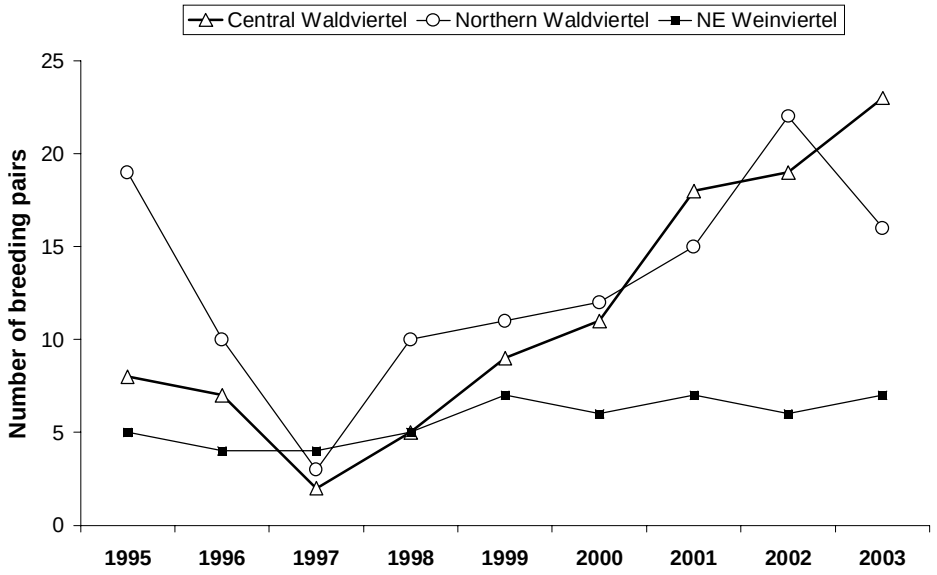

Fig. 5. Regional breeding population dynamics of the Great Grey Shrike in three parts of Lower Austria

We analysed the influence of winter harshness on the annual regional population change by using number of days with snow per winter. For the lowland population in the northeastern Weinviertel we found no significant correlation (Pearson, r=-0.34, n.s., n=8). For the higher elevated Waldviertel, which has much more snow than the northeastern Weinviertel, we found a significant negative correlation (Pearson, r=-0.80, $P<0.05$, n=8; Fig. 6).

Breeding success

In 1998–2003, from 57% (n=46, 2003) to 80% (n=40, 2001) of the Austrian breeding pairs were successful during a breeding season (Fig. 7). Breeding success always exceeded 50% in all three regions.

In 1998–2003, in the entire Lower Austrian breeding population, successful pairs fledged on average 3.4 ± 1.1 SD (n=129) juvenile birds (Fig. 8). Most often 3 or 4 juveniles fledged. Overall, the mean number of fledged young birds did not differ between broods in the Weinviertel and Waldviertel (Mann-Whitney U-test, Z=-1.44, p=0.15, n.s.). Broods with a very high breeding success of 6 (n=5) or 7 (n=1) fledged juveniles were only observed in the Waldviertel (Fig. 8) when there

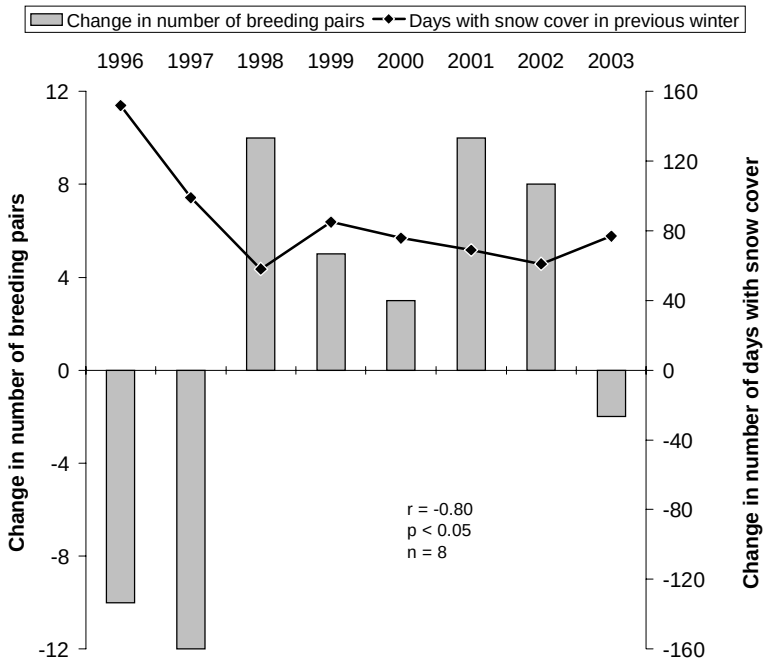

Fig. 6. Annual change in the number of Great Grey Shrike breeding pairs (columns) in the Waldviertel (Lower Austria) and of days with snow in the previous winter (line)

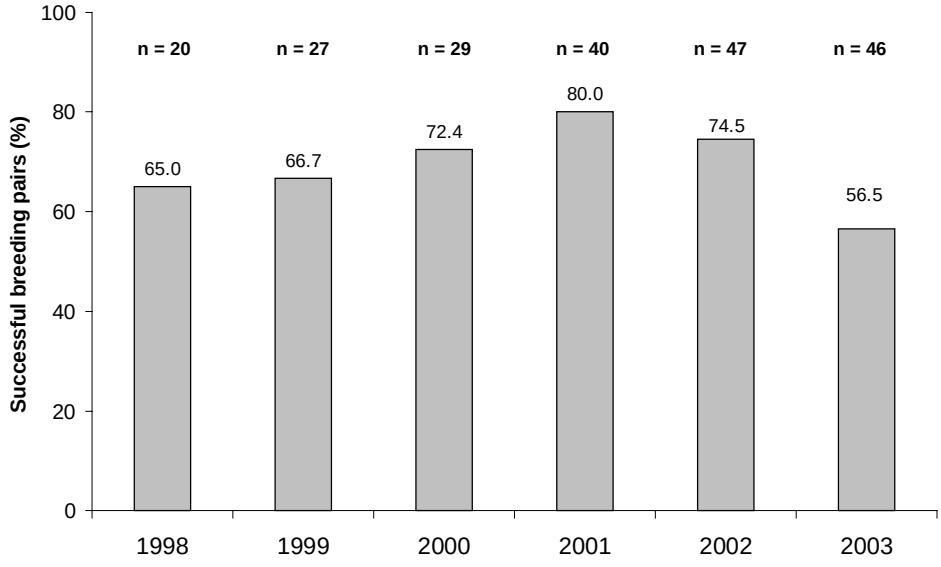

Fig. 7. The portion of successful breeding pairs of the Great Grey Shrike in Lower Austria (1998–2003). The total number of breeding pairs is given above the columns.

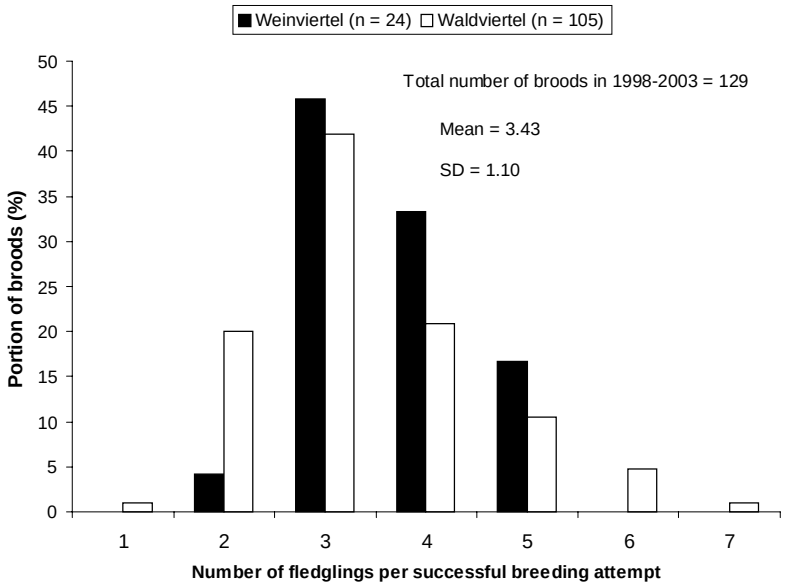

Fig. 8. The number of fledglings per successful brood of the Great Grey Shrike in Lower Austria (1998–2003)

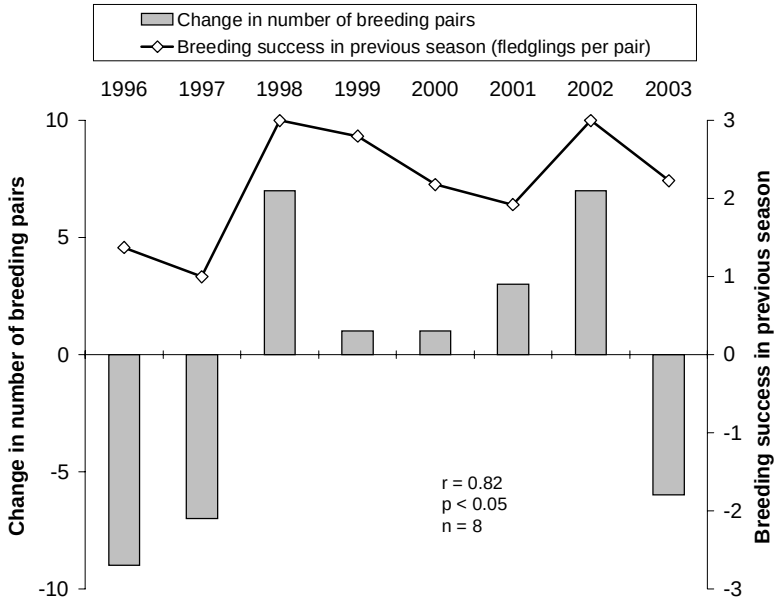

Fig. 9. Annual change in the number of Great Grey Shrike breeding pairs (columns) in the northern Waldviertel (Lower Austria) and breeding success in the previous season, expressed by the mean number of fledglings per pair (line)

was a high supply of voles for food. Local outbreaks of *Microtus arvalis* populations were observed in 1998 and 2001 in the northern Waldviertel and 1999 in the central Waldviertel (authors' unpublished results).

In the northern Waldviertel we have Great Grey Shrike breeding success data for the entire period 1995–2003. In this region the annual change in the number of breeding pairs shows a high positive correlation with breeding success (fledglings per pair) in the previous year (Pearson, r=0.81, $P<0.05$, n=8; Fig. 9).

DISCUSSION

The Austrian Great Grey Shrike population, which fluctuated between 9 and 47 breeding pairs in the last 10 years (Fig. 4), occurs at the southern boundary of its breeding range. This population is probably a continuation of the much larger nearby Czech population (STASTNY & BEJCEK 1993, STASTNY et al. 1997). The breeding range of the Great Grey Shrike in Lower Austria seemed to be stable in 1995–2003. Nevertheless, there were large fluctuations from year to year. For example, breeding localities near the towns of Horn and Laa/Thaya (north of Mistelbach; Fig. 1) were not occupied every year (SACHSLEHNER et al. 2003), perhaps because of their marginal position at the boundary of the breeding range. A large portion of breeding territories, which were not occupied for one or more breeding seasons, were re-occupied again later (after a median of 3 years, n = 24; SACHSLEHNER & SCHMALZER in press), which could indicate a shortage of nesting sites (SCHÖN 1994a). But re-occupation is impossible if the breeding habitats were destroyed in the meantime. In the past few years, two breeding localities were completely lost and at least 6 breeding areas were severely degraded because of consolidation of farmland by official and private procedure in the northern Waldviertel. Therefore, the Austrian Great Grey Shrike population could be more and more limited by a decline of suitable habitats (SCHÖN 1994b, ROTHAUPT 1997), especially in the increasingly intensive agricultural landscape of the northern Waldviertel. In this region, high-quality territories contain a certain portion of hay meadows and many small-sized fields bordered by balks with shrubs and hedges. Breeding territories with continuous high habitat quality are very infrequent (ROTHAUPT 1997, SACHSLEHNER & SCHMALZER in press).

Consequently, preservation of field balks and meadows, as well as setting fields aside, is important for Austrian Great Grey Shrikes (SACHSLEHNER et al. 2003). Especially because of the clumped nesting (i.e. formation of groups) of the Great Grey Shrike (SCHÖN 1994b), increasing isolation and reduction of favourable habitats would increase the risk of local and regional permanent extinction (ROTHAUPT 1997). This risk could be higher at the boundary of the breeding range than in its centre.

TEMPLE (1995) mentioned that the non-breeding season could be very important for the limitation of shrike populations. The role of snow and the significance of severe winters are often discussed as important parameters for negative population dynamics in the Great Grey Shrike (GLUTZ & BAUER 1993, SCHÖN 1994b). On the other hand, a series of mild winters can favour Great Grey Shrike populations (LOREK 1995). In our study the annual change in the breeding population size in the Waldviertel shows a significant negative correlation with the number of days with

snow in the previous winter (Fig. 6). The heavy decrease in the number of Great Grey Shrike breeding pairs in the central and northern Waldviertel from 1995 to 1997 (Fig. 5) is obviously related to the two harshest winters 1995/96 and 1996/97 in the investigated period. After mild winters we usually found an increase in the size of the breeding population in the Waldviertel (Fig. 6). The small population of the Great Grey Shrike in the March-Thaya Valley is not as exposed to harsh winters as the populations in the central and northern Waldviertel. Therefore, there could be regional differences in the migration behaviour of Great Grey Shrikes, which are usually partially migrant in Central Europe (GLUTZ & BAUER 1993, SCHÖN 1994b). However, we do not have ringing data to verify if there is a significantly higher portion of overwintering birds of the breeding population in the March-Thaya Valley as compared to the Waldviertel.

Differences in the regional population dynamics in Lower Austria (Fig. 5) are most likely due to the regional and local differences in the food supply, as discussed in general for Central Europe by SCHÖN (1994b). Voles are a significant part of the shrike diet in the central and northern Waldviertel, as is usual in Central Europe (GLUTZ & BAUER 1993, SCHÖN 1994b). When vole populations increased, some shrike pairs fledged 6 or (in one case) 7 fledglings, and in one case successful polygyny was recorded (PROBST 2001). In contrast, there were never population fluctuations of voles in the floodplain of the March-Thaya Valley in the northeastern Weinviertel (authors' unpublished results). There the Great Grey Shrike breeding pairs almost exclusively exploited the outstandingly high supply of insect food (PROBST unpubl. data), but they never produced more than 5 fledglings (Fig. 8).

Breeding success is a key parameter in the population dynamics of birds. In our study Great Grey Shrikes had a mean breeding success of 3.4 ± 1.1 SD (n=129) fledged juvenile birds per successful breeding. In a long-term study of Great Grey Shrikes in France, LEFRANC (pers. comm.) obtained almost the same value as ours. In other Great Grey Shrike studies, a higher breeding success was often found (for review, see GLUTZ & BAUER 1993); e.g. SCHÖN (1994c) observed a mean number of 4.5 (n=35) fledged juveniles per successful breeding attempt in southwestern Germany. The variation in the size of fledged broods (Fig. 8) may be caused by adaptations to rapid changes in food supply (SCHÖN 1994c), as discussed above.

In the northern Waldviertel, where we have breeding success data since 1995, the annual population growth is highly correlated with the breeding success in the previous year (Fig. 9). Therefore, a high breeding success and a following mild winter seem to be the best conditions for a short-term increase in Great Grey Shrike numbers in the northern Waldviertel.

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REFERENCES

BERG H.-M., RANNER A. 1997. Rote Listen ausgewählter Tiergruppen Niederösterreichs – Vögel (Aves), 1. Fassung 1995, 184 pp., NÖ Landesregierung, Abteilung Naturschutz, Wien.

DVORAK M., RANNER A., BERG H.-M. 1993. Atlas der Brutvögel Österreichs. Ergebnisse der Brutvogelkartierung 1981–1985 der Österreichischen Gesellschaft für Vogelkunde. 527 pp., Umweltbundesamt und Österr. Ges. f. Vogelkunde, Wien.

GLUTZ VON BLOTZHEIM U. N., BAUER K. M. 1993. Handbuch der Vögel Mitteleuropas, Bd. 13/II, Passeriformes (4. Teil): Sittidae – Laniidae. 1365 pp., Aula-Verlag, Wiesbaden.

KRAUS E. 1988. Raubwürger (*Lanius excubitor*). In: Artenschutz in Österreich (SPITZENBERGER F., ed.), Grüne Reihe Bd. 8, pp. 300–301, Bundesministerium f. Umwelt, Jugend u. Familie, Wien.

LEFRANC N., WORFOLK T. 1997. Shrikes. A Guide to the Shrikes of the World. 192 pp., Pica Press, Sussex.

LOREK G. 1995. Breeding status of the Great Grey Shrike in Poland. Proc. West. Found. Vertebr. Zool. 6: 98–104.

PROBST R. 1999. Brutverbreitung, Bruterfolg und Nestplätze des Raubwürgers (*Lanius excubitor*) in den March-Thaya-Auen 1998 und 1999. Unpubl. report to the Provincial Government of Lower Austria, Department for Conservation of Nature, 10 pp.

PROBST R. 2001. Successful bigamy in the Great Grey Shrike *Lanius e. excubitor*. Ornis Fenn. 78: 93–96.

ROTHAUPT G. 1997. Populationsgefährdungsanalyse am Raubwürger (*Lanius excubitor* L.). 150 pp., Cuvillier Verlag, Göttingen.

SACHSLEHNER L., SCHMALZER A. (in press). Die Brutpopulation des Raubwürgers (*Lanius excubitor*) im nördlichen Waldviertel (Niederösterreich) – Bestandsschwankungen, Revier-Besetzungskonstanz und Bruterfolg 1995–2003.

SACHSLEHNER L., SCHMALZER A., PROBST R., SCHMID R., EISNER J., TRAUTTMANSDORFF J. 2003. Artenschutzprogramm Raubwürger 2002: Bestandsmonitoring in Österreich & Waldviertler Kleinschlägigkeit & Biotopverbund nördliches Mühlviertel. Unpubl. report, 41 pp., Forschungsgemeinschaft Wilhelminenberg, Stockerau.

SACHSLEHNER L., SCHMALZER A., SACKL P. 1994. Einfluß von Landschaftsveränderungen auf die Avifauna des Waldviertels anhand ausgewählter Leitarten. In: Das Waldviertel als Natur- und Kulturraum, Festschrift aus Anlaß des 10-jährigen Bestandsjubiläums des Instituts für angewandte Öko-Ethologie in Rosenburg (DICK G., ed.), pp. 59–95, Beiträge zur Waldviertel-Forschung 1994.

SACKL P., LAUERMANN H. 1990. Zur Verbreitung und Bestandsentwicklung des Raubwürgers (*Lanius excubitor*) im Waldviertel – Ein Zwischenbericht. Vogelkundl. Nachr. Ostösterr. 1(4): 1–5.

SCHÖN M. 1994a. Zur Struktur der Nestplätze des Raubwürgers (*Lanius e. excubitor*): Typen, Umgebung und Schutz, Wechsel und Wiederbenutzung von Nestern. Ökol. Vögel 16: 497–566.

SCHÖN M. 1994b. Bestandsdichte und -entwicklung, Geschlechts-, Altersverteilung und Gruppen-Bildung in einer Raubwürger-Population (*Lanius e. excubitor*) im Gebiet der südwestlichen Schwäbischen Alb. Ökol. Vögel 16: 219–252.

SCHÖN M. 1994c. Zur Brutbiologie des Raubwürgers (*Lanius e. excubitor*): Gelege-, Brut-Grösse und Bruterfolg im Gebiet der Südwestlichen Schwäbischen Alb im Vergleich mit anderen Populationen. Ökol. Vögel 16: 173–217.

STASTNY K., BEJCEK V. 1993. Breeding bird population sizes in the Czech Republic. Sylvia 29: 72–81 [in Czech with an English summary].

STASTNY K., BEJCEK V., HUDEC K. 1997. The atlas of breeding birds in the Czech Republic, 1985–1989. 457 pp., H & H, Praha [in Czech with an English summary].

TEMPLE S. A. 1995. When and where are shrike populations limited? Proc. West. Found. Vertebr. Zool. 6: 6–10.

ZUNA-KRATKY T. 1998. Zur Ansiedlung des Raubwürgers (*Lanius excubitor*) im nordöstlichen Weinviertel (Niederösterreich). Egretta 41: 111–116.

ZUNA-KRATKY T., KALIVODOVA E., KÜRTHY A., HORAL D., HORAK P. (eds.) 2000. Die Vögel der March-Thaya-Auen im österreichisch-slowakisch-tschechischen Grenzraum. 258 pp., Distelverein, Deutsch-Wagram.