Ten years of farmland bird monitoring in Latvia: population changes 1995 – 2004

Ainars Aunins & Janis Priednieks

This study analyses the differences in bird species richness in Latvian farmland between regions with different landscape structure, habitat composition and farming intensity. As well as analysing changes in species richness and abundance of common birds in Latvian farmland during the last ten years. Bird counts were performed twice annually each season since 1995 in 160 permanent count points, located in four study areas representing different regions, landscapes and agricultural practices. Two more study areas, with additional 80 count points were established in 2003 to ensure better spatial coverage and to cover landscapes that were previously underrepresented. Habitats and landscape characteristics within a radius of 200m around each bird count point were described annually while general landscape measures were obtained from CORINE Landcover GIS layers. Species richness (number of species recorded per point) differed significantly between the regions, as did landscape structure, farming intensity and the dominating habitat types. Although species richness in Latvian farmland increased during the last 10 years, there were regional differences. The most pronounced increase in species richness was observed in the study area with the lowest farming intensity and abandonment of crop fields, while the most intensive study area with increasing area of arable lands experienced a decline in species richness. Trends and indices of the 34 most frequently recorded species show that there is a general tendency of increase for most of the shrub and forest generalist species due to overgrowing of farmland with bushes. Among farmland specialist species only those associated with abandoned lands increased while those associated with meadows and wetlands declined.

Key words: farmland birds, species richness, population trends, population changes, point counts, monitoring, Latvia.

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Much attention during the last decade has been paid to decline of biodiversity in agricultural farmland in the Western Europe, especially in the UK, due to intensification of farming (e.g. Flade & Steiof 1990, Saris *et al.* 1994, Siriwardena *et al.* 1998, Chamberlain *et al.* 2000, Svensson 2000). Since the late 1980s Eastern Europe has experienced the opposite processes –abandonment of farmland and decrease of farming intensity. Although long-term common bird monitoring schemes exist in several East European countries (Voříšek & Marchant 2003), the impact of this agricultural change on birds has not been well described in ornithological literature and mostly in the context of Europe-wide comparisons with the situation in Western Europe (Schifferli 2000, Donald *et al.* 2001).

This study analyses the differences in bird species richness in Latvian farmland between regions with different landscape structure, habitat composition and farming intensity as well as analysing changes in species richness and abundance of common birds in Latvian farmland during the last ten years.

Materials and methods

Study areas and bird count points

The current farmland bird monitoring scheme in Latvia consists of 6 100 km^2 study areas, located in different regions of the country (Figure 1), Each representing different habitat compositions, landscape structures and dominant farmland practices. Combined they represent the range of farmland types currently present in Latvia. Four of the study areas (Blidene, Jelgava, Skulte and Teichi) were established and monitoring started in 1995, while the other two (Durbe and Malta) were established in 2003 to cover wider range of habitats, both geographically and in terms of landscape. Corine Landcover 2000 GIS dataset was used at its finest classification level (level 3) to obtain proportions of general habitat classes and main landscape measures (mean patch size, edge density and Shannon's diversity index) of the landscape level and agricultural class level for each study area (Table 1). Official statistics from the Latvian Central Statistician bureau were used to calculate mean yields for the districts corresponding to the study areas (Table 1).

There were 40 bird count points located in each of the study areas. A combination of random and systematic approaches was used for selection of their positions. First, a square was chosen randomly using a 1 x 1 km grid and then a predefined position within a square was selected. Minor adjustments can be applied during the first visit to the point to avoid its location in inaccessible places. The method of choosing the bird count locations has been given in detail earlier (Aunins *et al.* 2001, Priednieks *et al.* 1999).

Figure 1. The location of the six study areas.
Localització de les sis àrees d'estudi.

Bird counts

Five minute long standardised bird counts are conducted in each point twice per season (mid May and mid June). Initially birds were counted without any distance limitation. Since 1998 and 2001, division lines were introduced at

Table 1. Main characteristics of the study areas in landscape level obtained from CORINE Landcover 2000 (habitat composition and landscape structure) and official agricultural statistics (yields).
Principals característiques de les àrees d'estudi a nivell de paisatge obtingudes a partir de CORINE Landcover 2000 (composició d'hàbitat i estructura del paisatge) i estadístiques oficials agrícoles (camps de conreu).

	Blidene	Jelgava	Skulte	Teichi	Malta	Durbe
Habitat composition						
Farmland (%)	54.6	93.7	56.6	69.0	76.9	80.3
Forests and shrubs (%)	43.5	6.0	41.9	29.0	23.0	19.2
Wetlands (%)	0.4	0.0	0.4	0.7	0.0	0.2
Streams and waterbodies (%)	1.4	0.0	0.0	0.4	0.2	0.0
Residential/Urban (%)	0.0	0.4	1.1	0.9	0.0	0.3
Landscape structure						
Mean Patch Size (ha)	76.0	169.5	75.1	75.7	90.1	85.5
Edge density (m/ha)	74.2	39.4	77.5	70.5	67.1	68.3
Shannon's Diversity index	4.48	3.19	4.45	4.42	4.34	4.36
Mean farming intensity 1995-2003						
Winter cereal yields (qnt/ha)	31.9	32.7	20.4	17.4	16.5	22.9
Summer cereal yields (qnt/ha)	23.0	24.3	15.0	13.2	15.1	18.3
Grass yields (qnt/ha)	39.8	35.8	30.5	26.0	25.1	30.9

200m and 50 m accordingly, still keeping full compatibility with the earlier data.

Breeders and non-breeders were separated. Breeders were interpreted in pairs while non-breeders were recorded as individuals (see details in Aunins *et al.* 2001). The maximum of the two counts was used in the analyses. The total number of species recorded per point was used as a measure of species richness.

Habitat descriptions

Habitat descriptions were made annually (late June – early July) within a radius of 200m around

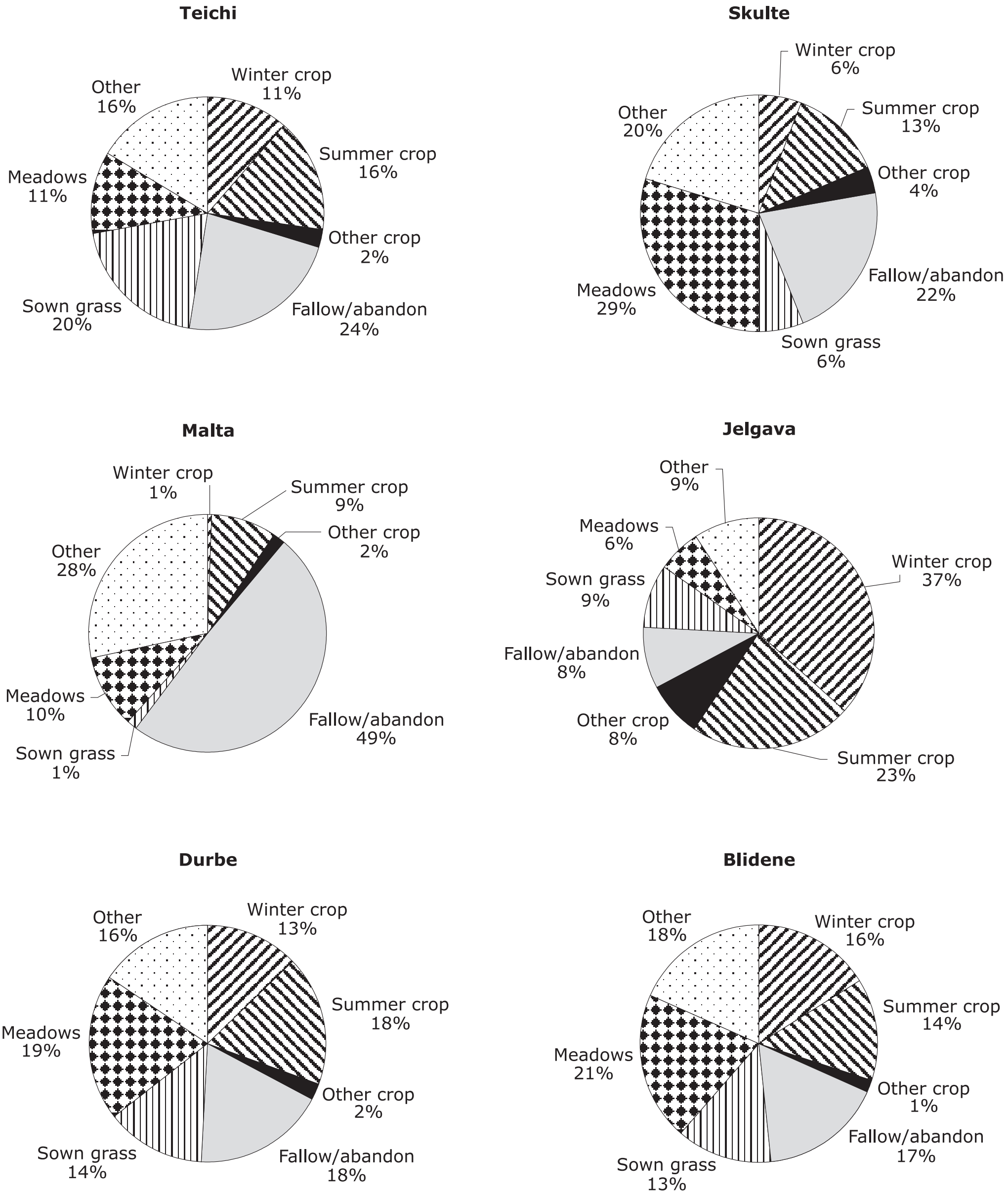

Figure 2. Proportions of the main agricultural and other habitat groups in the six study areas in 2004.
Proporcions dels principals hàbitats agrícoles i d'altres categories a les sis àrees d'estudi.

each bird count point. Hierarchical classification of habitats and landscape elements was used (see details in Aunins *et al.* 2001 and Aunins & Priednieks 2003). Proportions of the main agricultural and other habitat groups within the description zones varied between areas (Figure 2). This depended upon the general landscape structure, farming intensity and other regional factors, although taking into account that the points were located in agricultural lands only.

Data analyses

TRIM software (version 3.3; Pannekoek & van Strien 2001) was used to calculate indices and trends of bird populations, and species richness. A time effects model (model 3) was applied to species richness and individual species datasets with the study area (region) as a covariate. Only data from the four study areas where counts have been performed since 1995 were included in this analysis. Species whose occurrence is very dependent on meteorological conditions (Swifts *Apus apus* and swallows *Hirundidae*) as well as corvids *Corvus spp*. were omitted from the single species analyses. The trends were classified according to the procedure suggested by Pannekoek & van Strien (2001): according to the significance of the trend, the calculated magnitude of change in a 20-year period and its significance, the trends were classified as substantial decrease or decline, decrease or decline, non-substantial decrease or decline, stable or poorly known.

Patch Analyst (version 3.1) for ArcView (Rempel & Carr 2003) was used to obtain landscape measures from the CORINE Landcover 2000 GIS dataset.

SPSS software version 12 (SPSS Inc., 2003) was used for the other statistical tests. Name of the test used, main test statistics and its significance level are given whenever appropriate.

Results

Differences and changes in habitats and landscape elements

Jelgava and Malta were extremes regarding agricultural intensity, with 68% and 12% of active arable land and 8% and 49% of fallows and abandoned lands in 2004 respectively. Shrubby areas increased significantly in all four long-term study areas during the 10 monitoring years, as did the fallows/abandoned lands and ruderal areas, except in the Skulte region (Table 2).

A significant increase in active arable lands was observed in Jelgava area, while an increase in area of summer crops was significant in Blidene. The only area where a possible decline was observed for all kinds of arable lands was Teichi, because only the trend for summer crops was significant (Table 2). There was a tendency for the number of meadows to decline except at the Skulte study site, where due to introduction of mowing in former abandoned lands and continuous mowing of old sown grasslands this trend was reversed. Sown grasslands declined at Skulte, due to the reasons above, and the conversion to arable in the decline at Jelgava was chiefly due to conversion in arable lands. Increase of sown grasslands was observed in Blidene (Table 2).

Linear shrub features (shrub belts along roads and in ditches) did not show any relation with time (Table 2) as clearing of roadsides and ditches was done on a rare but regular basis, covering different parts of the study areas every year, except Skulte where linear bushes increased significantly.

There was a general tendency for mean winter and summer cereal yields (annually published by the Latvian Central Statistician Bureau, available 1995 - 2003) to increase in the country as a whole. Yields increased in the related districts of all study areas, except Teichi (winter cereals only) and Jelgava (summer cereals only). However, the correlation with time was significant only for winter cereals in Jelgava (Spearman rank correlation: $r_s = 0.783$, $n=9$, $p<0.05$).

Differences and changes in species richness

The species richness obtained from unlimited distance counts differed between the study areas every year (ANOVA: $F=7.4$ to 89.6, $p<0.001$) as did the species richness within 200m radius zones (ANOVA: $F=3.1$ to 14.3, $p < 0.01$ to $p<0.001$).

The lowest species richness, both without distance limitations and within 200m zones in 2004 was recorded in Jelgava, this study area had been poorest in all other years of the study (Figure 3). The Teichi study area had the highest species richness measured from counts without distance limitations, while it was on an average level if calculated from 200 m zone counts. The opposite was found in Durbe study area, which had average species richness in unlimited distance counts, though this was slightly higher species richness than the other study areas within 200m zones.

During the 10 years of monitoring species diversity has increased in Latvian farmland in general, from both measured and unlimited distance counts ("substantial increase") and within 200m zones ("increase", Table 3). However, the regional differences are prominent: species diversity without distance limitation declined in Jelgava, was stable in Skulte and increased in Blidene and especially Teichi ("substantial increase"). Within 200m zones, the trends were not as clear (classified as "poorly known") and the only area where changes were statistically significant was Teichi ("substantial increase", Table 3).

Table 2. Trends of abundance of main agricultural and other habitat categories and landscape elements within 200m zones around bird count points represented as correlation of abundance with time from 1995 to 2004 (Spearman rank correlation coefficient and its significance given).
Evolució de l'abundància dels principals hàbitats agrícoles i d'altres categories i els elements del paisatge dins de les zones de 200 m al voltant de punts de comptatge d'ocells representats com una correlació de l'abundància amb el temps de 1995 a 2004 (coeficient de correlació de Spearman i la seva significació).

Habitat categories	Description	Blidene	Jelgava	Skulte	Teichi	All areas
Winter cereals	Winter rye, wheat, barley or triticale	-0.016	0.052	0.096	-0.026	0.019
Summer cereals	Summer wheat, barley, triticale or outs	0.139**	0.053	0.027	-0.102*	0.019
Other crops	Potatoes, beets, rape and various other crops except cereals and fodder crops	0.026	0.094	0.079	-0.073	0.032
All arable lands pooled	Winter and summer cereals and other crops pooled	0.034	0.192**	0.080	-0.054	0.048
Fallows and abandoned lands	Previous arable land with annual and perennial weeds as the dominant vegetation	0.122*	0.128*	0.033	0.222**	0.124**
Sown grasslands	Fields with fodder crops such as grasses and legumes	0.138**	-0.244**	-0.262**	0.046	-0.094**
Improved and unimproved meadows and pastures	Semi-natural grasslands including those improved by either use of fertilisers or sowing additional grasses	-0.085	-0.048	0.119*	-0.198**	-0.045
Shrubby areas	Abandoned fields or overgrowing wetlands reaching the stage of natural succession where shrubs or young trees cover more than 60% of the area	0.130**	0.105*	0.130**	0.248**	0.152**
Ruderal areas	Open areas significantly affected by human activities that are not falling into any of the other categories	0.164**	0.109*	0.001	0.117*	0.092**
Linear shrub features	Shrub belts along roads, ditches and other watercourses	0.054	0.053	0.140**	0.023	0.065*
Fences	Cattle enclosures and other fences	0.184*	-0.132	-0.049	-0.053	-0.022
Separate trees	Single trees not belonging to shrubby areas or forests	0.048	0.053	0.076	0.056	0.057*
Separate bushes	Single bushes not belonging to shrubby areas or linear shrub belts	-0.074	-0.132**	-0.042	-0.083	-0.094**

* p<0.05 ** p<0.01

Table 3. Trends of bird species richness in the four long-term study areas.
Tendències de les espècies d'ocells a les quatre zones d'estudi a llarg termini.

Study areas	Trend	S.E.	Description of trend
Obtained from unlimited distance counts (1995-2004)			
Jelgava	0.9920	0.0036	Decline
Skulte	0.9988	0.0029	Stable
Teichi	1.0485	0.0026	Substantial increase
Blidene	1.0138	0.0032	Increase
All areas pooled	1.0165	0.0015	Substantial increase
Within 200m zones around bird count points (1998-2004)			
Jelgava	1.0103	0.0077	Poorly known
Skulte	0.9909	0.0056	Poorly known
Teichi	1.0277	0.0061	Substantial increase
Blidene	1.0017	0.0062	Poorly known
All areas pooled	1.0073	0.0032	Increase

Table 4. Trends of the most common bird species in Latvian farmland (1995 – 2004).
Tendències de les espècies d'ocells més comunes a les zones agrícoles de Letònia.

Species	Trend	S. E.	Description of trend
Skylark *Alauda arvensis*	0.9989	0.0027	Stable
Whitethroat *Sylvia communis*	1.0883	0.0066	Substantial increase
Thrush Nigtingale *Luscinia luscinia*	1.0817	0.0079	Substantial increase
Yellowhammer *Emberiza citrinella*	0.9993	0.0065	Poorly known
Chaffinch *Fringilla coelebs*	1.0299	0.0074	Substantial increase
Whinchat *Saxicola rubetra*	1.0540	0.0081	Substantial increase
Marsh Warbler *Acrocephalus palustris*	1.0372	0.0084	Substantial increase
Starling *Sturnus vulgaris*	0.9949	0.0125	Poorly known
Meadow Pipit *Anthus pratensis*	0.9247	0.0094	Substantial decline
Cuckoo *Cuculus canorus*	1.1330	0.0125	Substantial increase
Golden Oriole *Oriolus oriolus*	1.1316	0.0142	Substantial increase
Lapwing *Vanellus vanellus*	1.0530	0.0183	Substantial increase
Tree Pipit *Anthus trivialis*	1.0660	0.0116	Substantial increase
White Stork *Ciconia ciconia*	0.9978	0.0106	Poorly known
Blackbird *Turdus merula*	1.0150	0.0101	Poorly known
Scarlet Rosefinch *Carpodacus erythrinus*	0.9712	0.0116	Decline
Song Thrush *Turdus philomelos*	1.0713	0.0125	Substantial increase
Garden Warbler *Sylvia borin*	1.0145	0.0134	Poorly known
Corncrake *Crex crex*	1.0167	0.0169	Poorly known
Woodpigeon *Columba palumbus*	1.0757	0.0162	Substantial increase
Willow Warbler *Phylloscopus trochilus*	0.9831	0.0130	Poorly known
Common Buzzard *Buteo buteo*	0.8725	0.0178	Substantial decline
White Wagtail *Motacilla alba*	0.9401	0.0146	Substantial decline
Grasshopper warbler *Locustella naevia*	1.1359	0.0243	Substantial increase
Fieldfare *Turdus pilaris*	1.0426	0.0237	Poorly known
Sedge Warbler *Acrocephalus schoenobaenus*	0.9881	0.0180	Poorly known
Great Tit *Parus major*	1.0778	0.0225	Substantial increase
Chiffchaff *Phylloscopus collybita*	1.1298	0.0231	Substantial increase
Magpie *Pica pica*	1.0260	0.0186	Poorly known
Goldfinch *Carduelis carduelis*	0.9826	0.0223	Poorly known
River Warbler *Locustella fluviatilis*	0.9637	0.0229	Poorly known
Reed Bunting *Emberiza schoeniclus*	0.9543	0.0206	Decline
Blackcap *Sylvia atricapilla*	1.1397	0.0235	Substantial increase
Red-backed Shrike *Lanius collurio*	0.9906	0.0245	Poorly known

Changes in species populations

Out of the 34 bird species analysed (Table 4), 15 species increased substantially, one was stable, two declined and three species declined substantially. The trend for the remaining 13 species was classified as "poorly known". If we group the species according their primary habitat groups, this being based on both the general knowledge of individual species ecology and the study of species-habitats associations in Latvia (Aunins *et al.* 2001), the species with increasing populations are found mainly in the forests group (Table 5). In addition, the habitat groups of bushes and shrubberies, abandoned lands and arable lands hold species with increasing populations. None of species in these groups declined, except Buzzard *Buteo buteo*, which belonged to the forest group. The declining species were found in the meadow, wetland and farmstead groups, and these groups did not hold any of the increasing species (Table 5).

Discussion

We assume that the measured species richness was affected by bird detectability, which differed between the study areas, due to their differences in landscape structure. In open homogenous areas, birds can be more easily seen or heard, while in structurally diverse areas, the field of view is more limited and distant or soft sounds are likely to be suppressed. The complexity and volume of bird chorus, especially numbers of loud singers in close proximity may also negatively affect the audial detectability of birds too. Therefore, it may be expected that a higher risk of underestimating the actual species richness in structurally diverse, species rich areas than in open and homogenous areas, especially using data from unlimited distance counts.

Table 5. Classification of bird population trends according to species associations with main habitat groups. Numbers in brackets represent the species that are breeding in forest but feeding in farmland habitats (i.e. Woodpigeon *Columba palumbus* and Buzzard *Buteo buteo*).
Classificació de les tendències poblacionals d'ocells amb grups d'hàbitats principals. Els nombres entre parèntesi representen les espècies que crien al bosc però que s'alimenten en hàbitats agrícoles (p. ex. Tudó Columba palumbus *i l'Aligot comú* Buteo buteo*).*

	Trend		
Habitat group	Increase	Stable/ Poorly known	Decline
Forests	8 + (1)	3	0 + (1)
Bushes and shrubberies	3	5	0
Abandoned farmland	2	0	0
Arable lands	1	1	0
Farmsteads	0	3	1
Wetlands	0	1	1
Meadows	0	1	2
All species	15	14	5

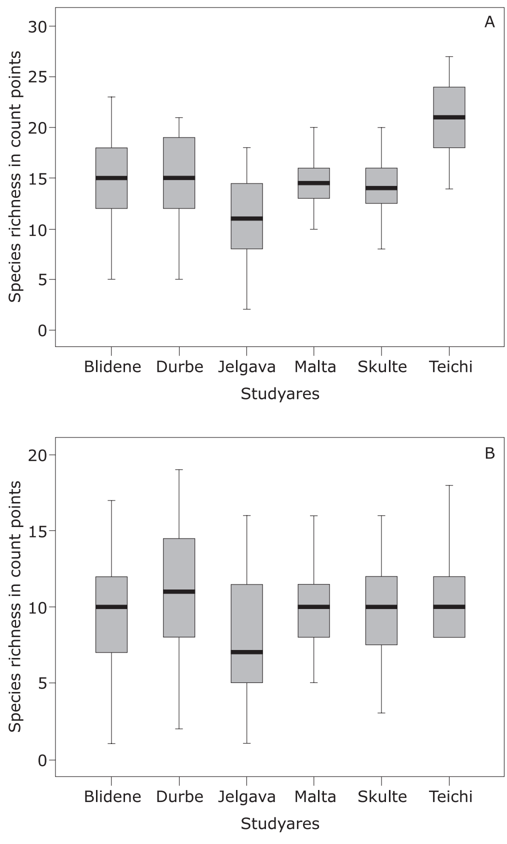

Figure 3. Species richness in the six study areas in 2004: median (black line into the box), quartiles (box area) and outlier range (bars): A – obtained from unlimited distance counts, B – within 200m zones around bird count points.
Riquesa d'espècies en les sis àrees d'estudi el 2004. Mitjana (línia negra dins de la caixa), quartils (àrea de la caixa) i rang dels punt fora de mostratge (barres). A- obtingut dels comptatges sense limitació de distància, B- zones de 200 m al voltant dels punts de comptatge.

Regional differences in species richness between the study areas are not particularly pronounced and only two regions (Jelgava and Teichi) stand out (Figure 3).

The lower species richness in the Jelgava study area (Figure 3) was expected. This study area had the lowest percentage of species rich habitats (e.g. forests, shrubberies and meadows) both on point counts and at the landscape level (Figure 2 and Table 1). This area has a uniform landscape dominated by different kinds of arable lands, and had the highest agricultural intensity compared to the other areas. This is the only long-term study area where species richness declined during the monitoring period. This decline can be attributed to the significant increase of arable lands and decline of grasslands (Table 2) as well as the increase of farming intensity.

In Teichi study area, the difference between the species diversity levels calculated from unlimited distance and 200m zone counts if compared to other areas (Figure 3) this suggests that these are mainly species recorded outside the 200m zones that contribute to the high species richness values of unlimited distance counts. This study area has rather low proportion of agricultural lands, an average proportion of forests/shrubs on the landscape level, a larger proportion of other habitat groups and high landscape diversity (Table 1). Thus, there is a higher chance of important features being both inside and outside the 200m zone, contributing to species richness during the count. This study area experienced substantial increase in species richness measured from both unlimited distance and 200 m zone counts (Table 3). This is the result of the steep increase in the area of shrubby areas and abandoned lands, accompanied with declines in arable lands, especially summer cereals (Table 2).

Although mean species diversity both without distance limitations and within 200m zones is similar for other study areas, they differ in terms of variance and range. Malta has the lowest variance and range of mean species diversity compared to the other areas. This is caused by more uniform habitats on the point level. 49% of the description zones are fallows and abandoned lands (Figure 2). As monitoring of this study area was started in 2003, we do not have information on how the trends of species richness and habitat occurrence have changed during the last decade, and if the species richness is benefiting from current level of lands abandonment. It is obvious, however, that diversity of farmland birds will decline in near future due areas overgrowing with bushes, and a reduction in open areas, if no changes in land use (re-establishment of farming in abandoned areas) occur.

It could be predicted that the Blidene study area, having the highest forest proportion, a large proportion of other non-agricultural habitats and high habitat fragmentation at a landscape level (Table 1), will have higher species richness. However, it was at an average level, although it had a high variance and range of the mean species diversity value (Figure 3). This can be explained by the location of this study area within the zone of intensive agriculture (Table 1) having a fairly large number of both species-poor (intensive arable land) and species rich (high habitat diversity) count points. Nevertheless, the overall species richness increased in this study area (Table 3), as did the area of scrub habitats (Table 2).

The pronounced increase of generalist species associated with forest and shrub habitats (Tables 4 and 5) was expected, as was the increase in species associated with abandoned lands, taking into account that areas of scrub habitats and abandoned lands have increased in all 4 long-term study areas (Table 2).

The only declining species in the forest group, Buzzard *Buteo buteo*, can only partly be attributed to forest group when it is breeding, as this species mainly forages in open farmland habitats, preferring grasslands and abandoned lands (A. Petrins, unpublished data). As there have been no marked declines in availability or quality of such foraging habitats, the only obvious reason for the observed decline of this species might be human activities in the forest. Most of the small forest clusters and edges of larger forest tracts, which are the preferred species breeding places, are privately owned. According to statistics from the Latvian State Forest Service these areas are more affected by intensive forest management than state owned forests. Therefore, the species may be suffering from loss of breeding habitats at forest edges and from disturbance during the start of breeding period. As a result, birds may retreat further in the forest for breeding (where possible) and a larger proportion of their feeding habitat may become clear-cuts and the species to become less frequently observed in farmland. Similar patterns occurring in all study areas (Figure 4 A) suggest that this may be a countrywide process. Note that declines for the corresponding period have not been found in Buzzards at a European scale (Vorišek 2003; but note the wide confidence intervals for European data). A change in forestry practices in Latvian private forests would allow a possible reversal of the trend of this species.

The increase of shrub areas is among the factors causing a decline in meadow species, as this is a result of overgrowing meadows and abandoned lands with bushes. This process of the overgrowing of the grassland dominated abandoned lands and meadows is best characterised by conflicting population changes in two pipit species: in all study areas, except Blidene, the Meadow Pipit *Anthus pratensis* is declining and Tree Pipit *Anthus trivialis* is increasing (Figure 4, B and C). In Blidene, where there is no pronounced decline in Meadow Pipit, no increase is observed in Tree Pipit.

Although overall bird species richness is increasing in Latvian farmland, the diversity of the farmland specialists is not, because the recorded increase is due to the non-farmland generalist species that have little or no conservation value at the present time. In fact, farmland bird diversity is declining, as almost all observed declines are in species either directly connected to agricultural lands or species connected to habitat diversity within a farmland

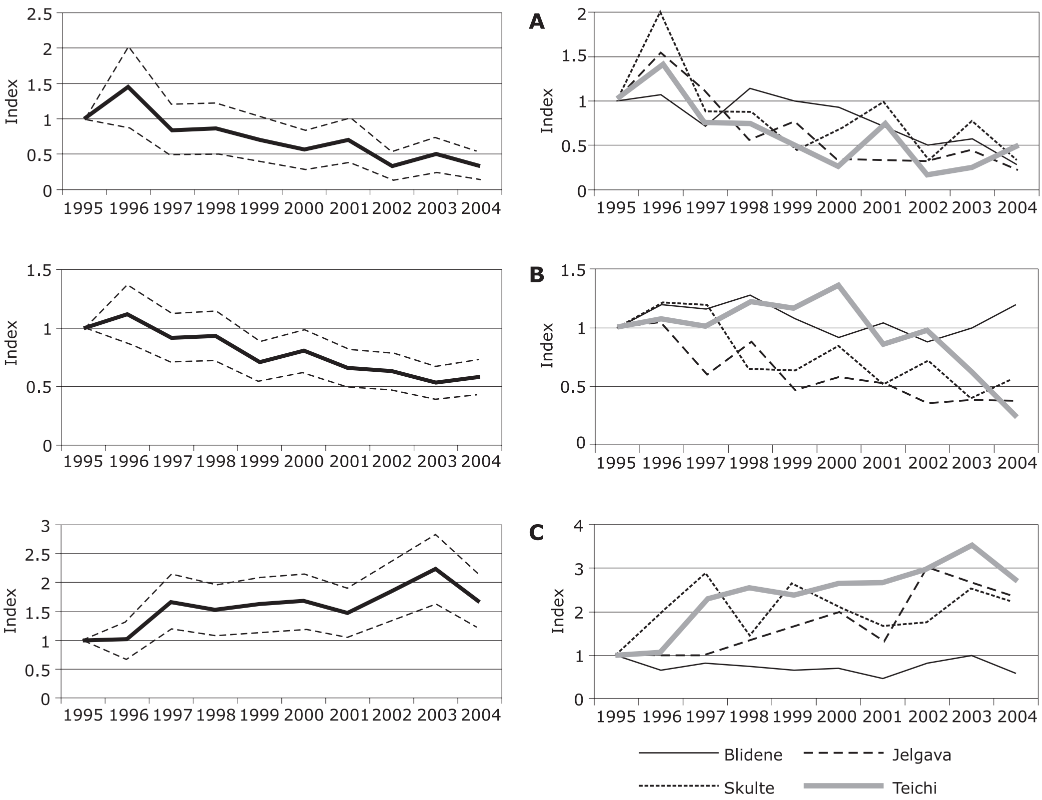

Figure 4. Changes of population indices (solid lines) and their 95% confidence limits (dashed lines; all areas pooled only) of selected species for all study areas pooled and separately. A - Buzzard *Buteo buteo*, B - Meadow Pipit *Anthus pratensis*, C - Tree Pipit *Anthus trivialis*.
Canvis dels índexs poblacionals (línies sòlides) i el seus límits de confiança del 95% (línies puntejades) d'algunes espècies seleccionades per a totes les zones d'estudi i de forma separada. A- Aligot comú Buteo buteo*, B- Titella* Anthus pratensis*, C- Piula dels arbres* Anthus trivialis.

landscape. The trend of increase shown by species connected with abandoned lands will soon reverse due to the temporary nature of these habitats. There is already evidence of this: although the Corncrake *Crex crex* primarily is a meadow species, its population growth during 1990s was connected with increased areas of abandoned land (Aunins *et al.* 2001, Keiss 2001). However, since 2000 the species show a tendency to decline. We might expect similar 'peak-shaped' population responses from other species too.

Latvian farmland is on the verge of rapid changes, due to country's accession to EU. This will cause a significant increase of funds invested into the intensification of agriculture. It will mean a possible reduction in the areas of abandoned lands with the reversion of these areas back into arable lands or into managed grassland, depending on which type of farming will become dominant, although afforestation also is possible. It can be forecasted that these changes will have different effects on farmland bird populations in different regions in Latvia. The two south central study areas (Jelgava and Blidene), are likely to experience further declines in farmland bird populations with further agricultural intensification, and conversion of abandoned lands into intensive arable farmland, as these areas have the most fertile soils in Latvia. It would be important to promote cattle farming in this area, to ensure a sufficient proportion of grasslands in this region. Farmland bird populations in other regions of Latvia may benefit from the intensification of the agriculture in the short term, as currently there is a risk of large open areas being converted into forestry. Arable farming is considerably less profitable in most of the other territories in Latvia, compared to the south central region giving preferences for cattle farming in these regions. The introduction of agri-environmental schemes should become an important instrument for ensuring appropriate management of farmland in different regions of Latvia.

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Resum

Deu anys de seguiment d'ocells en zones agrícoles de Letònia: canvis poblacionals 1995-2004

Aquest estudi analitza les diferències de riquesa d'espècies d'ocells en zones agrícoles de Letònia amb diferent estructura del paisatge, composició d'hàbitats i intensitat d'explotació, així com els canvis en la riquesa d'espècies i abundància d'ocells comuns en zones agrícoles de Letònia durant els darrers deu anys. Els comptatges d'ocells es van realitzar dues vegades per temporada des de 1995 en 160 punts de comptatge permanents situats en quatre àrees d'estudi que representen diferents regions, paisatges i pràctiques agrícoles. Es van establir dues àrees d'estudi amb uns altres 80 punts de comptatge en 2003 per garantir una millor cobertura espacial i per cobrir els paisatges que abans estaven insuficientment representats. Es van analitzar també els tipus d'hàbitats i els elements del paisatge en una zona circular amb un radi de 200 metres al voltant del punt de comptatge mentre que les variables de paisatge general es van obtenir a partir de capes de SIG amb CORINE Landcover. La riquesa d'espècies (nombre d'espècies registrades per punt) va diferir significativament entre les regions així com l'estructura del paisatge, la intensificació agrícola i els tipus d'hàbitat dominant. Encara que la riquesa d'espècies a les zones agrícoles de Letònia va augmentar durant els últims 10 anys, hi va haver diferències regionals. L'augment més pronunciat en la riquesa d'espècies es va observar a l'àrea d'estudi amb la menor intensitat d'explotació i abandonament dels camps de cultiu, mentre que l'àrea d'estudi amb un major augment de superfície de terres cultivables va experimentar una disminució en la riquesa d'espècies. Les tendències i els índexs de més de 34 espècies registrades amb freqüència mostren que hi ha una tendència general d'augment per a la majoria de les espècies forestals i arbustives generalistes a causa de l'augment de terres de cultiu amb arbust. En el

cas de les zones que no eren estrictament zones agrícoles només aquelles espècies associades a les zones de guaret van augmentar la seva riquesa mentre que aquelles associades a pastures i zones humides es van reduir.

Resumen

Diez años de seguimiento de aves en zonas agrícolas de Letonia: cambios poblacionales 1995-2004

Este estudio analiza las diferencias de riqueza de especies de aves en zonas agrícolas de Letonia con diferente estructura del paisaje, composición de hábitats e intensidad de explotación, así como los cambios en la riqueza de especies y abundancia de aves comunes en zonas agrícolas de Letonia durante los últimos diez años. Los conteos de aves se realizaron dos veces por temporada desde 1995 en 160 puntos de conteo permanentes situados en cuatro áreas de estudio que representan diferentes regiones, paisajes y prácticas agrícolas. Se establecieron dos áreas de estudio con otros 80 puntos de conteo en 2003 para garantizar una mejor cobertura espacial y para cubrir los paisajes que antes estaban insuficientemente representados. Se analizaron también los tipos de hábitats y elementos del paisaje en una zona circular con un radio de 200 metros alrededor del punto de conteo mientras que las variables de paisaje general se obtuvieron a partir de capas de SIG con CORINE Landcover. La riqueza de especies (número de especies registradas por punto) difirió significativamente entre las regiones así como la estructura del paisaje, la intensificación agrícola y los tipos de hábitat dominante. Aunque la riqueza de especies en las zonas agrícolas de Letonia aumentó durante los últimos 10 años, hubo diferencias regionales. El aumento más pronunciado en la riqueza de especies se observó en el área de estudio con la menor intensidad de explotación y abandono de los campos de cultivo, mientras que el área de estudio con un mayor aumento de superficie de tierras cultivables experimentó una disminución en la riqueza de especies. Las tendencias y los índices de más de 34 especies registradas con frecuencia muestran que hay una tendencia general de aumento para la mayoría de las especies forestales y arbustives generalistas debido al aumento de tierras de cultivo con arbusto. En el caso de las zonas que no eran estrictamente zonas agrícolas sólo aquellas especies asociadas a las zonas de barbecho aumentaron su riqueza mientras que aquellas asociadas a pastos y zonas húmedas se redujeron.

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