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The non-tetrigid Saltatoria (Insecta) of the Belgian chalk grasslands

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Abstract

An account of the non-tetrigid Saltatoria recorded from Belgian chalk grasslands is presented. The presumed evolution of this fauna, in relation to changes in the vegetational structure of the chalk grasslands since the beginning of the 20th century, is tentatively outlined.
Key-words: Insecta; Saltatoria; chalk grasslands; Belgium.

Résumé

Cet article donne un aperçu des Saltatoria non-tetrigides des pelouses calcaires belges. L'évolution présumée de cette faune, en relation avec des altérations de la végétation des pelouses calcaires depuis le début du 20ème siècle, est brièvement discutée.
Mots-clefs: Insecta; Saltatoria; pelouses calcaires; Belgique.

Introduction

The fauna of the Belgian chalk grasslands is still poorly known and publications on this subject are rather rare. Therefore, we present here an account of the Saltatoria (excluding the Tetrigidae) of these habitats in Belgium. It is based on data from 21 sites scattered over the Belgian limestone regions (fig. 1). For two of these sites (Sint-Pietersberg and Torgny) data were compiled from the literature (GOETGHEBUER, 1953; PETIT & RAMAUT, 1985; DEVRIESE et al., 1987; DEVRIESE, 1988). In all other cases the sites were explored by ourselves. This was done in the period 1984-1987. Each site was visited one to five times. The Saltatoria were primarily identified by their sounds (DUYM & KRUSEMAN, 1983). In addition, however, we also collected specimens by hand or sweepnet, while arbusti- and arboricole species were captured by tapping on branches underneath which an umbrella was hold in order to catch the falling insects. This material was then identified using CHOPARD (1951), HARZ (1960) and DUYM & KRUSEMAN (1983). The collection is kept at the "Centre Marie-Victorin" in Vierves-sur-Viroin.

The chalk grasslands studied

Chalk grasslands are rare in Belgium. Most of them are situated in the valleys of the river Maas and its affluents (fig. 1). In this region the chalk formations are of Devonian and Carboniferous origin. Outside this region, chalk grasslands only occur on the Sint-Pietersberg (Eben-Emael) and in Torgny. In these localities, the chalk formations date from respectively the Cretaceous and the Jurassic. Almost all Belgian chalk grasslands are located in regions characterised by a mean annual precipitation varying between 650 and 850 mm, and mean annual temperatures of approximately 8-9°C. The 21 chalk grasslands treated here, are indicated in fig. 1. They all consist of one or more of the following three vegetational types: *Mesobrometum, Xerobrometum* and thermophilic *Buxus* vegetations.

Faunistic account

In total, 30 non-tetrigid Saltatoria species have been recorded in Belgian chalk grasslands. These species are listed in table 1 (nomenclature after HARZ (1969-1975)). Table 1 also gives an account of the species composition for each of the 21 sites investigated here. Two species, however, viz. *Miramella alpina* and *Platycleis tesselata,* are only known from single specimens (CARPENTIER, 1951; DEVRIESE, 1984). Thus it remains questionable whether they really belong to our fauna. In addition, two other species, viz. *Calliptamus italicus* and *Decticus verrucivorus*, once belonged to our chalk grassland fauna, but seem to have disappeared now (GOETGHEBUER, 1953; DEVRIESE, in litt.). This is probably also true for *Oedipoda germanica*. Hence, the actual non-tetrigid Saltatoria fauna of the Belgian chalk grasslands more likely contains about 25 species, instead of 30. This is still 71% of the recent non- tetrigid Saltatoria fauna of Belgium.
From table 1 it appears that with respect to species numbers (N), there are large differences between the sites investigated. These differences are probably due to factors such as the area, the degree of isolation and the vegetational structure of the chalk grasslands involved. The site in Dion (N=5) (fig. 2) and the Tienne Moseray (N=7), for example, are very small, stronly isolated and monotonous (only *Xero-* or *Mesobrometum*). Most other chalk grasslands, however, are larger, less isolated

Fig. 1. General distribution of chalk grasslands in Belgium (dotted areas) and localisation of those investigated in the present contribution. Names of chalk grasslands, if they exist, are indicated in parentheses. 1. Eben-Emael, FS 83 (Sint-Pietersberg); 2. Seilles, FR 49 (Sclaigneaux); 3. Comblain-au-Pont, FR 89 (Roches Noires, Chession); 4. Barbaux-sur-Ourthe, FR 78 (Hazalles); 5. Yvoir, FR 37 (Champalle); 6. Sosoye, FR 27 (Montagne de Sosoye); 7. Dinant, FR 37 (Fonds de Leffe); 8. Dinant, FR 36; 9. Romedenne, FR 25; 10. Vodelée, FR 25; 11. Han-sur-Lesse, FR 55 (Belvédère); 12. Gimnée-Niverlée, FR 25; 13. Dion, FR 35; 14. Vaucelles, FR 25 (Montagne de la Carrière); 15. Matagne-la-Grande, FR 15 (Hurées); 16. Resteigne, FR 55 (Tienne Moseray); 17. Treignes, FR 15 (Rivelottes); 18. Nismes-Dourbes, FR 14 & 15 (Montagne-aux-Buis); 19. Frasnes-les-Couvin, FR 04 (Tienne d'Arche); 20. Nismes, FR 14 (Tienne Sainte-Anne); 21. Torgny, FQ 78 (Réserve R. Mayné).

and more diverse (usually both *Meso-* and *Xerobrometa*), e.g. the Montagne-aux-Buis (N=19) and the Tienne-Sainte-Anne (N=17) (fig. 3). Besides these factors, also climatic characteristics may influence the species number and composition of chalk grasslands. Table 1 reveals indeed a slight increase of species numbers along a north-south gradient. Thus the northernmost site (Sint-Pietersberg) contains only 10 species, whereas the southernmost one (Torgny) houses 18 species.

Historical aspects

The actual species composition of the Belgian chalk grasslands is in fact the outcome of an evolution which has taken place (and is still going on) since the beginning of this century. In the next sections this evolution is briefly outlined by using informations derived from DUVIGNEAUD et al. (1982) and DUVIGNEAUD (1983). In the beginning of this century, goat and sheep herds grazed on chalk grasslands, keeping in this way the grass vegetation very short and preventing shrubs and trees to grow. Moreover, even if these latter did manage to grow, they were cut off in winter by shepherds. This practice gave our chalk grasslands, which in those times occupied much larger areas than nowadays, more the character of steppes. They indeed consisted of many stony and rocky spots alternating with short grass vegetations, but without (or almost without) trees and shrubs (fig. 4A). Thus they underwent a maximal heating up during summer and so they were well-suited to house xero-thermophilic Saltatoria

Table 1. Composition of the non-tetrigid Saltatoria fauna of the 21 chalk grasslands investigated (ranked according a north-south gradient). The locality numbers refer to those in fig. 1. The total species numbers do not include extinct species or species only known from a single specimen. X. species present. +. species extinct; O. single specimens only.

Species \ Localities	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. *Phaneroptera falcata* (PODA, 1761)																	X				X
2. *Barbitistes serricauda* (FABRICIUS, 1798)																		X			
3. *Leptophyes punctatissima* (BOSC, 1792)	X		X		X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X
4. *Meconema thalassinum* (DEGEER, 1773)	X		X			X			X	X		X	X	X	X		X	X	X	X	
5. *Conocephalus discolor* THUNBERG, 1815																					X
6. *Tettigonia viridissima* LINNAEUS, 1758	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X
7. *Decticus verrucivorus* (LINNAEUS, 1758)																					†
8. *Platycleis albopunctata* (GOEZE, 1778)	†				X		X	X						X			X		X	X	X
9. *Platycleis tessellata* (CHARPENTIER, 1825)																					o
10. *Metrioptera brachyptera* (LINNAEUS, 1761)										X		X		X	X			X		X	
11. *Metrioptera bicolor* (PHILIPPI, 1830)		X		X		X			X			X		X	X	X	X	X	X	X	X
12. *Pholidoptera griseoaptera* (DEGEER, 1773)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
13. *Gryllus campestris* LINNAEUS, 1758	X	X				X															
14. *Nemobius sylvestris* (BOSC, 1792)	X	X	X		X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X
15. *Miramella alpina* (KOLLAR, 1833)																					o
16. *Calliptamus italicus* (LINNAEUS, 1758)																					†
17. *Oedipoda caerulescens* (LINNAEUS, 1758)	†	X			X		X	X			X							X			X
18. *Oedipoda germanica* (LATREILLE, 1804)																		X			
19. *Chrysochraon dispar* (GERMAR, 1831)		X			X		X	X	X	X		X		X	X	X	X	X	X	X	X
20. *Euthystira brachyptera* (OCSKAY, 1826)																					X
21. *Omocestus viridulus* (LINNAEUS, 1758)				X		X		X	X	X		X		X	X	X	X	X	X	X	X
22. *Omocestus ventralis* (ZETTERSTEDT, 1821)	X	X	X		X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X
23. *Stenobothrus lineatus* (PANZER, 1796)	X					X		X			X	X		X	X		X	X	X	X	X
24. *Stenobothrus stigmaticus* (RAMBUR, 1838)		X																			
25. *Myrmeleotettix maculatus* (THUNBERG, 1815)		X				X								X						X	
26. *Gomphocerus rufus* (LINNAEUS, 1758)							X	X		X		X		X	X		X	X	X	X	X
27. *Chorthippus vagans* (EVERSMANN, 1848)			X		X		X	X			X							X			
28. *Chorthippus brunneus* (THUNBERG, 1815)		X	X	X	X	X	X	X	X	X	X	X		X	X		X	X	X	X	X
29. *Chorthippus biguttulus* (LINNAEUS, 1758)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X
30. *Chorthippus parallelus* (ZETTERSTEDT, 1821)	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X
Total	10	13	10	7	12	14	13	15	12	13	11	15	5	17	15	7	16	19	15	17	18

species typical of rocks and *Xerobrometa* (group A in fig. 4C), as well as species living in *Mesobrometa* with short and thin vegetations (group B in fig. 4C). Hence, species of both these groups were probably well-presented in those times. This may be tentatively inferred from the observation that in the beginning of this century, the xerophilic species *Calliptamus italicus* was common in the chalk grassland in Torgny. Afterward, however, when the vegetation started to change (see further), the species decreased steadily and became extinct shortly before 1950 (GOETGHEBUER, 1953).
Saltatoria species living in *Mesobrometa* with high and dense grass vegetations (group C in fig. 4C), were probably also present in the beginning of this century. Indeed, from old photographs it appears as if this vegetation type sometimes prevailed on northern slopes (fig. 4A). Yet, as several species of the C group (e.g. *Conocephalus discolor, Metrioptera bicolor, Chrysochraon dispar, Euthystira brachyptera and Phaneroptera falcata*) were only reported for the first time in Belgium after 1935, we assume that before that time they may have lacked in the Belgian chalk grasslands. Thus before 1935 probably only a small number of C-group species inhabited these biotopes, while obviously arbusti- and arboricole species (group D in fig. 4C) were probably very rare, if not completely absent. Yet, from 1900 onward, the old agricultural and cattle-breeding practices were more and more abandoned,

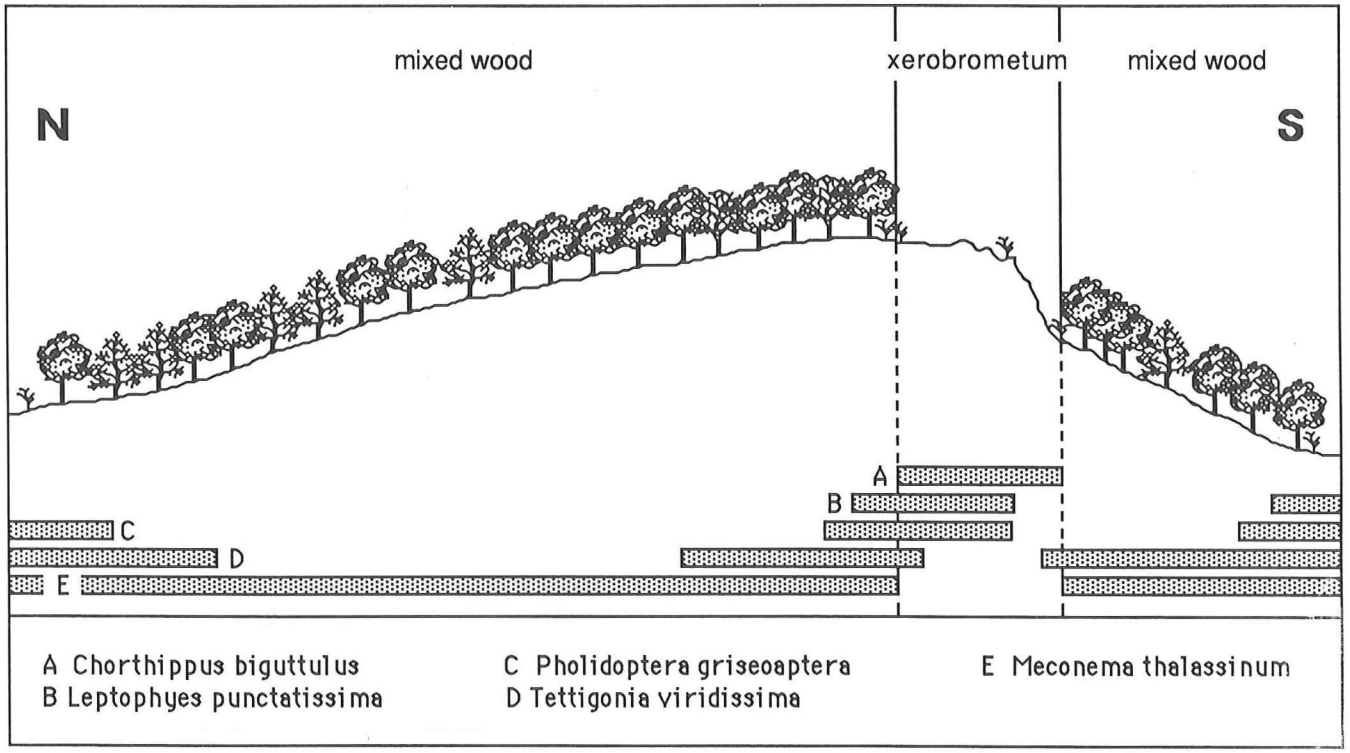


Fig. 2. Composition and distribution of the non-tetrigid Saltatoria fauna and vegetational structure along a north-south transect in a small and isolated chalk grassland in Dion (locality 13). Dotted bars only refer to the range of a given species, not to its abundance.

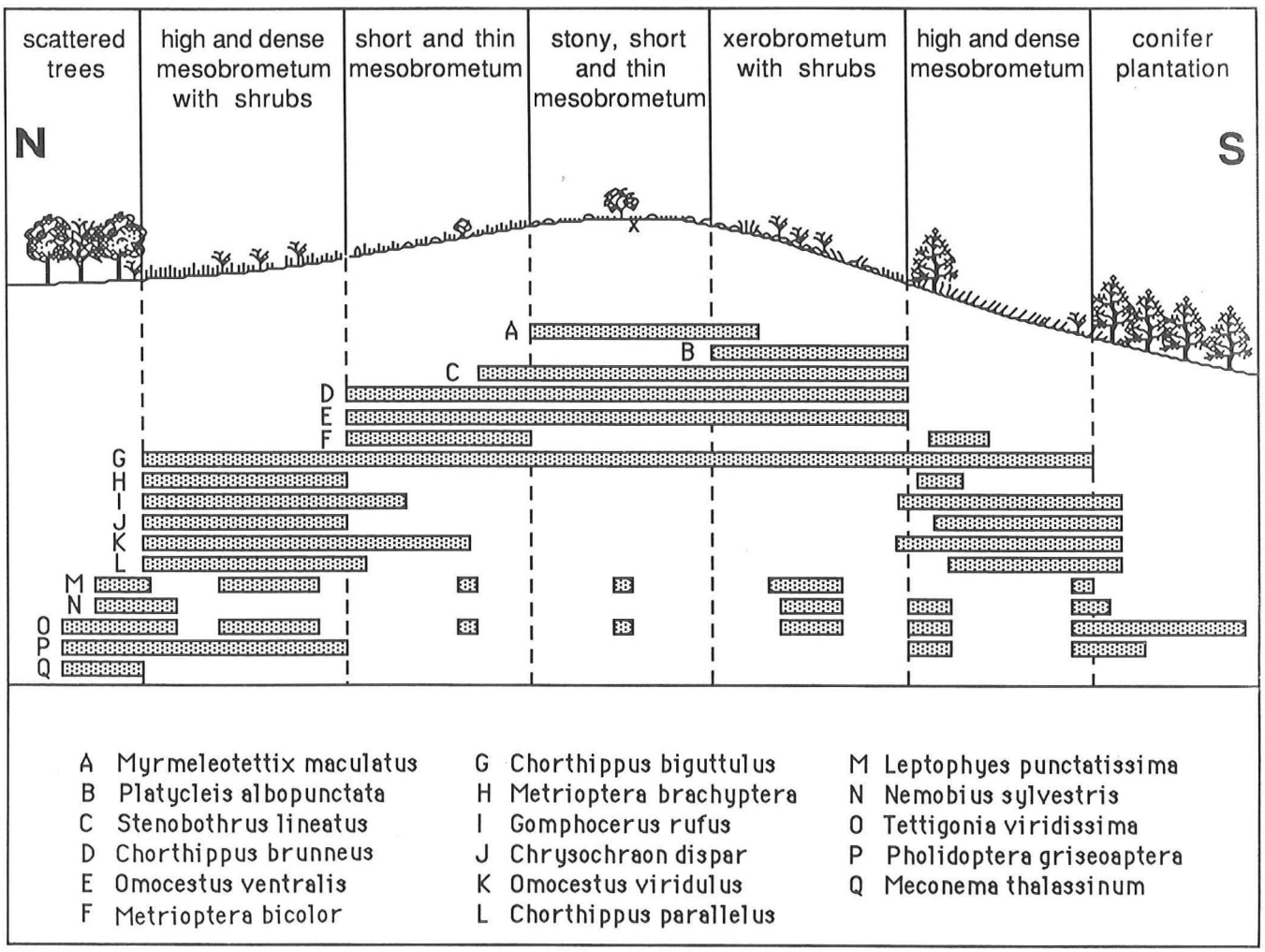
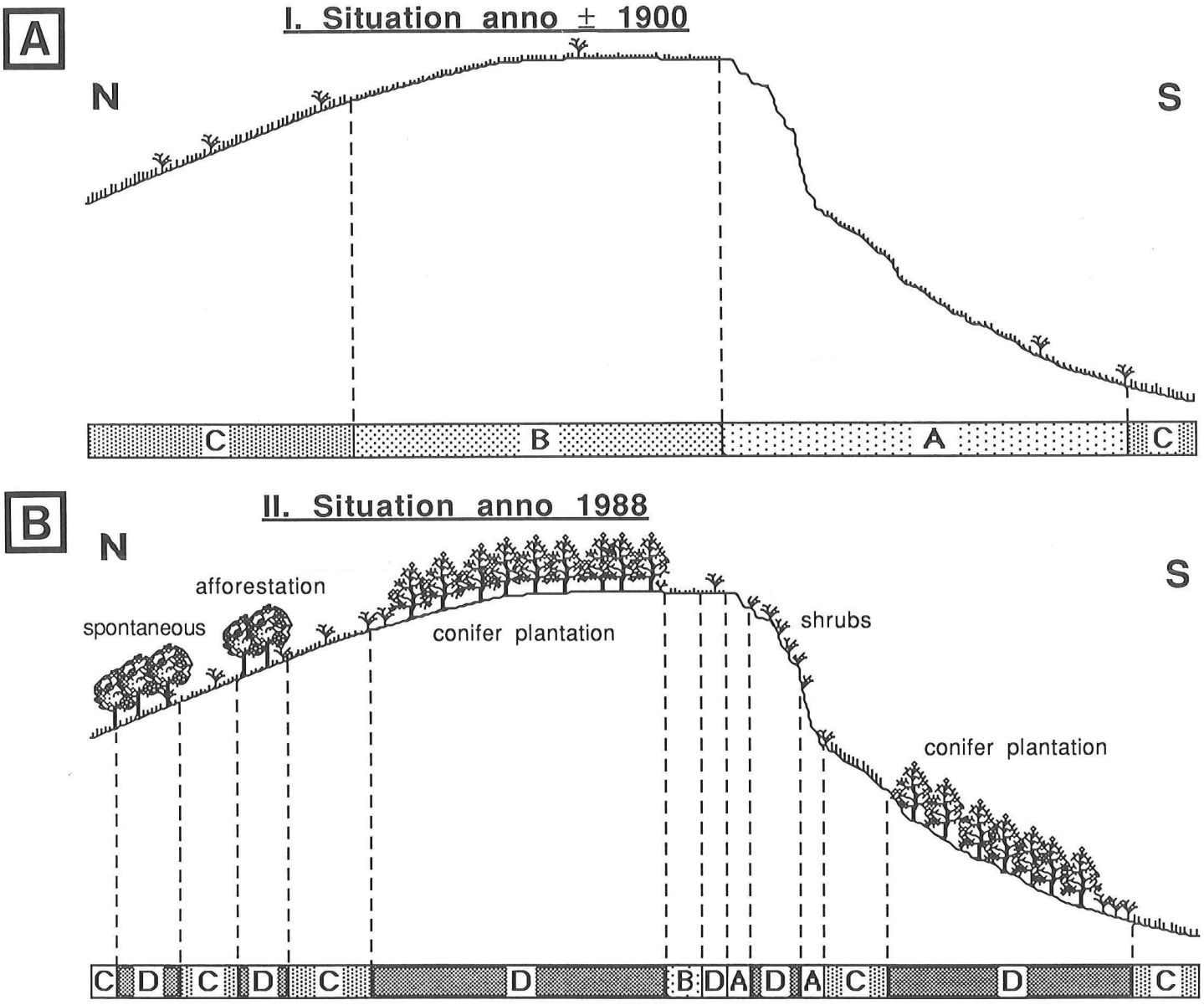


Fig. 3. Composition and distribution of the non-tetrigid Saltatoria fauna and vegetational structure along a north-south transect in a large and well-exposed chalk grassland in Nismes (Tienne Sainte-Anne, locality 20). Dotted bars only refer to the range of a given species, not to its abundance.



C

GROUP A	GROUP B	GROUP C	GROUP D
on rocks and Xerobrometa	in short and thin Mesobrometa	in high and dense Mesobrometa	in or under shrubs and trees
- Calliptamus italicus † - Chorthippus brunneus - C. vagans - Gryllus campestris - Oedipoda caerulescens - O. germanica † - Platycleis albopunctata - Stenobothrus lineatus	- Chorthippus biguttulus - Decticus verrucivorus † - Myrmeleotettix maculatus - Omocestus ventralis - Stenobothrus lineatus - S. stigmaticus	1. xerophilic: - Chorthippus biguttulus - Gomphocerus rufus - Metrioptera bicolor ● - Phaneroptera falcata ●: if shrubs are present 2. mesophilic: - Chorthippus parallelus - Chrysochraon dispar ● - Conocephalus discolor ● - Euthystira brachyptera ● - Metrioptera brachyptera - Omocestus viridulus	- Barbitistes serricauda : in thermophilic Buxus vegetation - Leptophyes punctatissima - Meconema thalassinum - Nemobius sylvestris - Pholidoptera griseoaptera - Tettigonia viridissima

Fig. 4. Presumed evolution of the vegetational structure and Saltatoria fauna of a hypothetical Belgian chalk grassland in the course of the 20th century (±1900-present). A. Situation in the beginning of this century; B. Situation around 1988; C. Subdivision of the investigated Saltatoria species according to their main habitat characteristics. Species indicated with a cross are at present extinct, those indicated with a black dot were for the first time recorded in Belgium after 1935. Dotted bars only refer to the range of a given species group, not to its abundance.

which affected the vegetation of the chalk grasslands considerably. Moreover, man started to plant conifers (*Pinus nigra austriaca* and *P. sylvestris*) on the terraces and southern slopes of the chalk grasslands. Obviously, in the absence of grazing, the grass vegetation in sites were no conifers were planted, became higher and denser, while trees and shrubs could grow freely now. Hence about fourty years ago, the northern slopes of chalk hills may have been covered by a high and dense grass vegetation with some shrubs and young foliage trees. On steep southern slopes probably appeared some shrubs between rocks and stones, while on less steep southern slopes and on the terraces grew conifers and/or high and dense *Mesobrometa* with scattered shrubs.

This presumed change of the vegetation allowed the introduction in Belgium of the C-group Saltatoria mentioned above. The first Belgian record of *Phaneroptera falcata,* for example, dates from 1946 (Torgny) (DEVRIESE, 1988). For the other species, the first reliable records are 1942 for *Metrioptera bicolor* and *Chrysochraon dispar* (DEVRIESE, 1988) and 1951 for *Euthystira brachyptera* (GOETGHEBUER, 1953). Finally, although *Conocephalus discolor* was for the first time reported in Belgium in 1937, its first record in a chalk grassland dates from 1950 (GOETGHEBUER, 1953). In the same way, also species from the D-group began to invade our chalk grasslands, whereas species from groups A and B gradually decreased, until they eventually became extinct (e.g. *Calliptamus italicus*).

This evolution still continued after 1950 and many chalk grasslands disappeared for they were completely overgrown by shrubs and trees. Only a few well exposed chalk grasslands survived this phenomenon, but even in these sites, grew scattered shrubs and trees. At present such sites are rare in Belgium, while *Mesobrometa* with a short and thin vegetation have almost completely disappeared. Yet, in few localities this vegetation type persists as a narrow belt between the conifer plantations and the rocks on top of chalk hills (fig. 4B). In the majority of the remaining Belgian chalk grasslands, however, prevails a *Mesobrometum* with a high and dense vegetation and scattered shrubs and trees (fig. 4B).

This situation is probably responsible for the further decrease of the species in the groups A and B. It may have even caused the extinction in Belgium of *Decticus verrucivorus* and, possibly, of *Oedipoda germanica,* while in several chalk grasslands, the persisting, yet still decreasing, populations of *Chorthippus vagans, Oedipoda caerulescens, Gryllus campestris* and *Platycleis albopunctata* are threatened with extinction too.

Species of the C-group, on the contrary, seem to maintain themselves reasonably well, even though a further covering of the *Mesobrometa* by shrubs and trees eventually may threaten the most thermophilic species such as *Phaneroptera falcata* and *Metrioptera bicolor.*

Finally, it is obvious that the present situation of the Belgian chalk grasslands (fig. 4B) favours the arbusti- and arboricole species of group D. Thus, with the exception of *Barbitistes serricauda,* these species are now common in nearly all our chalk grasslands.

In conclusion, it seems as if in the course of the past hundred years, the non-tetrigid Saltatoria fauna of the Belgian chalk grasslands has undergone major changes. In the beginning of this century, the species of groups A and B were probably the dominant ones. Nowadays, however, the species of the C- and D-groups dominate. Yet, it should be stressed, that the evolution of the Belgian chalk grasslands outlined above, is more or less hypothetical, because we do not know exactly in how far our data on the species composition and vegetation of these habitats before 1950 are indeed representative and reliable. Nevertheless, similar evolutions have been observed in East-Germany (KOHLER, 1987). Moreover, this uncertainty does not impede that we can state safely that if no actions are being taken to protect and manage our chalk grasslands, several interesting Saltatoria species more, will face extinction.

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