Aspects of the ground-living spider fauna of two barley fields in Denmark: species richness and phenological synchronization

SØREN TOFT

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Spiders were collected by pitfall traps in two neighbouring barley fields, one rotavated, the other ploughed. The fauna showed no substantial differences between the fields, neither regarding species richness, family or species composition, nor dominance structure. However, total species richness (88 species) was very high, comparable to the richest natural Danish biotopes known, though with a few highly dominant species. All the most abundant species showed synchronized activity fluctuations. Possible explanations for these findings are discussed, in particular the role of mechanical soil treatments.

Søren Toft, Zoological Laboratory, University of Aarhus, DK-8000 Århus C, Denmark.

Introduction

The contribution of generalist predators to the limitation of crop pests depends to a large extent on their ability to prey on these pests as soon as possible after the pest's arrival to the crop. This idea has been forwarded and substantiated by Potts and Vickerman (1974), Edwards et al. (1979) and others, as far as aphids of cereal fields are concerned. Being present in an actively feeding phase at the right time is of key importance in the biology of the predator. Furthermore, various predator faunas are likely to incorporate species with a greater variety of feeding strategies and microhabitat preferences and may thus be more effectual than species-poor ones, at least against a multispecies set of potential pests (Riechert and Lockley 1984). Thus, knowledge of faunistic diversity and species phenology are important aspects for the evaluation of predator faunas of crops.

No complete account of the spider fauna of a Danish agricultural ecosystem is available. Roesgaard and Lindhardt (1979) studied the effect of straw-burning on the polyphagous predator fauna but make mention only of the few dominant species. From other parts of Europe the literature is rapidly expanding. Comparison is relevant only to studies using the same collection methods, but fortunately most investigators have agreed on the use of pitfall traps. Sunderland (1987) reviews the literature on cereal spiders, while Nyffeler and Benz (1987) give references to studies of vàrious crops.

Study area and methods

The two barley fields investigated belong to the farm Thorupgaard, situated 4 km west of Bryrup in Central Jutland, Denmark. The material was collected by Sten H. Christensen and Niels Elmegaard and formed part of a project (Christensen & Elmegaard 1982) in which the surface-active faunas of barley fields subjected to two different tillage practices were compared. In the period 1974-78 both fields were treated similarly according to the practice known in Denmark as reduced tillage: After harvest of the main crop in August, the fields are manured with slurry, rotavated and sown with yellow mustard as an aftercrop. This freezes down in winter and the fields are rotavated once again. In April there are a few light harrowings, followed by sowing of the main crop and manuring with urea. Later the fields may be rolled and sprayed with herbicides. In 1979-80 this procedure was continued on one of the fields (Field I), except that the mustard crop had to be dropped in 1979 due to a late harvest. On Field II the farmer returned to the conventional tillage system of Danish agriculture, i.e., this field was harrowed five times in September, manured with slurry and ploughed in November. Treatments were similar for the two fields during the spring of 1980, the year of the investigation, except that Field I was rolled once in early May while Field II was not.

The two fields are separated by a small road running east-west. All collections were made in two 50 x 50 m quadrat's at a distance of 50 m from either side of this road, and 100 m away from a mixed wood adjoining both fields to the east. Fields continued several hundred meters in all other directions. The soil is similar on the two study sites; it is extremely sandy, with a silt fraction below 1%.

Collecting started on 22 April, 1980, following sowing of the barley crop, and were continued until 18 August, after which the fields were harvested. Pitfall traps (diameter 9 cm) were the main collecting method as far as the animal group considered here is concerned. In each of the two study sites there were 15 traps in three rows of five, with 10 m between the traps in a row and 20 m between the rows. A saturated solution of benzoic acid with detergent formed the collecting fluid in the traps which were emptied approximately weekly. Emergence traps (photoeclectors) were operated also, but captured few spiders, and they will not be considered in detail.

Results

Faunal composition and comparison of the fields

In the traps a total of 85 species of spiders were captured (of these 80 were identified to species); three additional species were taken in photoeclectors only (Appendix I). Of the total of 88 species, 51 were common to both fields; Field I had 67 species altogether, while Field II had 72. All species found on only one field were rare ones (cf. Appendix I). As regards the species richness, the two fields are very similar.

As pitfall traps catch mainly adult spiders, and juveniles could not be reliably identified, the analysis will be restricted to the adult catches only. A total of 6,524 adult spiders were taken in traps during the entire study period. Of these, 3,124 were caught on Field I, 3,400 on Field II. Thus, also the number of individuals indicate a great similarity of the faunas. The mean whole-season catch per trap shows no significant differences between the fields (Mann-Whitney U-test, Siegel 1956).

The dominance structure of the fields is very similar, too (Table 1). *Erigone atra* and *E. dentipalpis* are about equally abundant and together make up about 70% of the total catch in both cases. Third in line comes *Oedothorax apicatus* with about 15%, while all remaining species fall below 5%. Differences in species ranks do not turn up until below the 1% level of relative abundance.

In spite of this, some of the species were caught in significantly different numbers on the two fields (Mann-Whitney U-tests on whole-season-catch-per-trap). This was true for the dominant *E. atra* ($p < 0.02$), as well as for *Pachygnatha degeeri* ($p < 0.002$), *Pardosa palustris* ($p < 0.05$) and *Porrhomma pallidum* ($p < 0.002$). In addition,

Table 1. Dominance structure (% of total catch) of the spider communities of two adjacent barley fields. Field I was treated according to a »reduced tillage« practice (involving rotavating), while Field II was treated conventionally (involving ploughing).
Tabel 1. Edderkoppefaunaens dominansforhold (% af totalfangst) på to bygmarker. Mark I blev udsat for »reduceret jordbehandling« (med fræsning), Mark II blev behandlet konventionelt (med pløjning).

	Field I/*Mark I*	%	Field II/*Mark II*	%
1.	*Erigone atra*	36.0	*Erigone atra*	39.6
2.	*Erigone dentipalpis*	32.4	*Erigone dentipalpis*	31.6
3.	*Oedothorax apicatus*	15.4	*Oedothorax apicatus*	13.4
4.	*Meioneta rurestris*	3.8	*Meioneta rurestris*	3.6
5.	*Bathyphantes gracilis*	1.8	*Bathyphantes gracilis*	2.1
6.	*Pardosa monticola*	1.7	*Pardosa monticola*	1.3
7.	*Pachygnatha degeeri*	1.5	*Porrhomma pallidum*	1.0
8.	*Pardosa palustris*	1.2	*Pachygnatha degeeri*	0.7
9.	*Trochosa terricola*	0.5	*Pardosa palustris*	0.6
10.	*Lepthyphantes tenuis*	0.5	*Pardosa agrestis*	0.5
11.	*Pardosa agrestis*	0.4	*Trochosa terricola*	0.4
12.	*Pardosa amentata*	0.4	*Araeoncus humilis*	0.4

Oedothorax apicatus, alone of all species, showed significantly different dispersion patterns on the two fields (Wald-Wolfowitz runs test $p < 0.05$, Siegel 1956). However, these differences were small and may be explained as site differences as well as treatment effects. As the study did not replicate treatments, no definite conclusions can be drawn (cf. Hurlbert 1984). With the exception of *Pardosa* spp., *Trochosa terricola* (all Lycosidae) and *Pachygnatha degeeri* (Tetragnathidae), all species listed in Table 1 are sheet-web spiders (Linyphiidae). Altogether, this family accounts for 93-95% of the total adult catch, Lycosidae only 3.6-4.6% (Table 2). The preponderance of linyphiids is typical for agricultural fields in most of Europe (Tischler 1958, Luczak 1979, Sunderland 1987), though often lycosids are more abundant than found here; for instance, Tischler (1958) ranks *Pardosa amentata* among the dominants (15-22%). Experience from other studies in Denmark (Toft unpublished) indicates that such dominance figures for lycosids are rare (Vangsgaard et al. in press.). The reason for this difference may be that lycosids seem to be more susceptible to mechanical disturbances than linyphiids (Tischler 1965) and thus depend on the presence of grass fields or pastures as reservoir areas from which the cereal fields are invaded. The Danish agricultural landscape contains only a small fraction of such green areas.

Species richness

The most striking faunistic feature of the present study is the huge number of species recorded, surpassing all previously published lists of spiders from European agricultural environments, in spite of the fact that collecting was restricted to two small, adjacent and very similar areas. In fact, the species richness averages what is found in most natural Danish biotopes investigated. Toft (1976) reported 150 species from a 90 year old beech-wood site, but his list was based on two years of collecting in all strata of the wood. Considering only species taken in pitfall traps (30 traps in that study, too) during the same period of time, the appropriate figure is 64 (compared to 85 here). In another study of four Danish heathland habitats (Toft unpublished), each sampled with 12-14 traps, the comparable figures are 73, 74, 74 and 84, respectively, i.e., these richnesses were similar to or only slightly larger than what was found in this study (67 and 72).

One hypothesis might be that the high richness found is due to the fact that the fields (and surrounding ones) have been manipulated according to the reduced soil treatment system over a number of years. This idea is contradicted, however, by the finding of more species as well as individuals on the ploughed field. Actually, a tillage system involving rotavating may have an even heavier impact on the fauna than one with ploughing (Tischler 1955). Also, experience from other Danish agricultural fields (Toft unpublished) indicates that the level of species richness found here is not exceptional.

Phenology

Fig. 1 A-C shows the seasonal activity fluctuations of the five most abundant species in the fields. Two patterns emerge from these graphs. First, for each species and sex there are only minor differences between the fields. Second, the phenological patterns are identical for the five species. All have two main activity peaks, one in spring around 1 June, and one at the end of July. In no case do the peaks differ among species by more than one week.

The reason for this phenological synchronization must be an identity in the species' life cycles rather than a common response to climatic factors. The life cycles of two of the species, *Oedothorax apicatus* and *Bathyphantes gracilis*, have been described by Almquist (1969) and Schaefer (1976), respectively. From these studies it is evident that the animals caught in spring and autumn belong to two different generations. Thus, the decline in the summer period is caused by the disappearance of the spring generation and represents the period during which the generation of autumn adults develops through juvenile instars. Though no data seems to be available on the remaining three species, the situation is likely to be similar for these, since another species of *Erigone*, *E. arctica* (White) conforms to the same pattern, at least in Holland (van Wingerden 1977).

On 19 May the fields were sprayed with herbicides, and at the same time a period with night frosts started, lasting until 27 May. Whatever factor being decisive, most of the species curves show distinct breaks in this period, but the magnitude of the effect is clearly small compared to the seasonal fluctuations.

Table 2. Family distribution of pitfall trap catches from two Danish barley fields (cf. Table 1).

Tabel 2. Familiefordelingen af edderkoppefangsten fra to bygmarker (se Tabel 1).

	Field I/*Mark I*	%	Field II/*Mark II*	%
Gnaphosidae	3	0.1	2	0.1
Thomisidae	8	0.3	7	0.2
Salticidae	1	0.0	0	0.0
Lycosidae	143	4.6	124	3.6
Hahniidae	2	0.1	1	0.0
Theridiidae	11	0.4	8	0.2
Tetragnathidae	47	1.5	25	0.7
Linyphiidae	2909	93.1	3233	95.1
Total	3124		3400	
Non-webspinners* *(Ikke-netspindende*)*		6.5		4.6
Webspinners *(Netspindende)*		93.6		95.3

(* Includes Tetragnathidae (genus *Pachygnatha*)).
(* *Inkluderer Tetragnathidae (slægten Pachygnatha)).*

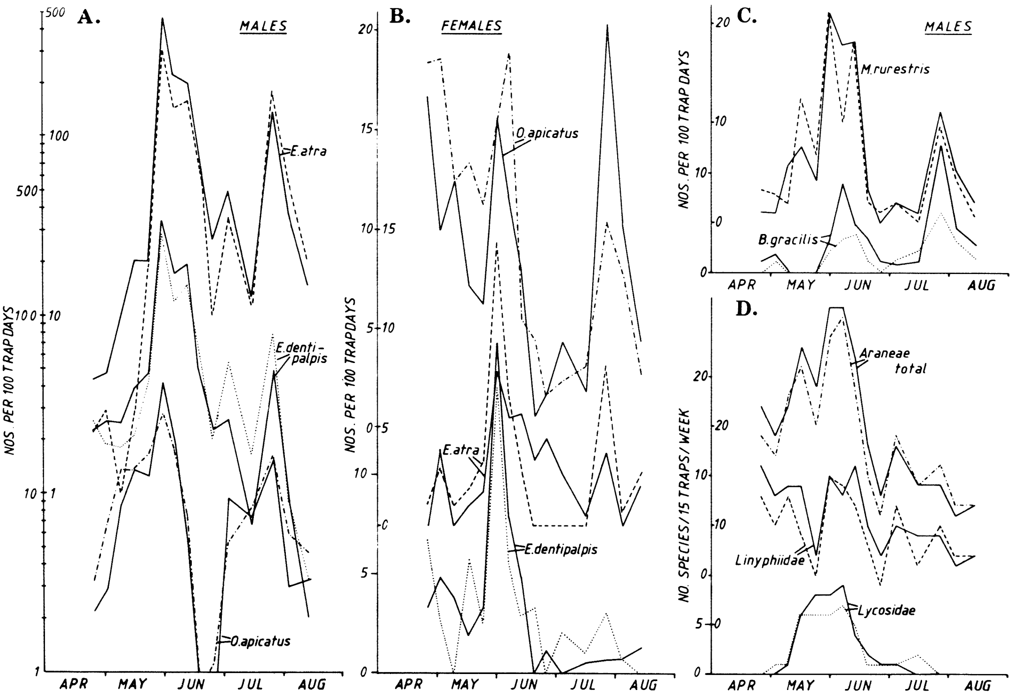

Fig. 1. Fluctuations in the activity of adults of the five most abundant spider species (A to C) and in species numbers (D) during the growing season in two neighbouring Danish barley fields (dotted or broken lines: Field I; full lines: Field II). Explanation: (A) Scale on the outside of ordinate: *Erigone dentipalpis*; scale on the inside of ordinate: *E. atra* and *Oedothorax apicatus.* Note logarithmic scale. (B) Upper outside scale: *O. apicatus*; lower outside scale: *E. dentipalpis*; inside scale: *E. atra.* (C) Outside scale: *Bathyphantes gracilis*; inside scale: *Meioneta rurestris.* (D) Upper outside scale: Araneae total; lower outside scale: Lycosidae; inside scale: Linyphiidae.

Fig. 1. Variationer i aktiviteten (antal pr. 100 fældedage) af voksne individer af de fem hyppigste edderkoppearter (A-C) samt i artsantal (arter pr. 15 fælder pr. uge) (D) gennem vækstsæsonen på to bygmarker (prikkede og stiplede linjer: Mark I; fuldt optrukne linjer: Mark II). Forklaring: (A) ♂♂. Skala på ydersiden af ordinat-aksen: Erigone dentipalpis*; skala på indersiden af ordinat-aksen:* E. atra *og* Oedothorax apicatus. *Bemærk logaritmisk skala. (B) ♀♀.* Øvre, ydre skala: O. apicatus*; nedre, ydre skala:* E. dentipalpis*; indre skala:* E. atra. *(C) Ydre skala:* Bathyphantes gracilis; indre skala: Meioneta rurestris. *(D) Øvre ydre skala: Araneae total; nedre, ydre skala: Lycosidae; indre skala: Linyphiidae.*

Considering changes in the number of species rather than individuals (Fig. 1 D), we see a much heavier response in this period. This falls primarily on the linyphiids, whereas lycosids are not affected.

It is hardly surprising that frost has a relatively more pronounced effect on the number of species than on the activity level of any of the common species. If we assume that a certain level of activity (active density) is necessary for a species to turn up in the traps, and that the activity of the species is suppressed to, say, 50%, then this result will be obtained simply because of the large number of rare species.

Discussion

Phenology

Since the work of Tretzel (1954, 1955), numerous arachnologists have stressed the importance of seasonal segregation of activity periods among spiders of many different habitat types.

In a Danish beech-wood, Toft (1976) found synchronization of life cycles among species of the beech canopy, whereas species of the field and litter layer showed seasonal segregation. This difference was linked to the seasonal distribution of food resources in the different strata. A similar explanation may hold for the cereal fauna, as in monocultures the activity of insects must relate to the growth phases of the crop.

An additional possible explanation is peculiar to the agricultural system. Here the mechanical disturbances of the farming practice imposes a heavy mortality on the fauna at certain times of the year (Duffey 1978, Luczak 1979). Species occurring in less susceptible life stages at these times should be greatly favoured. Available information indicates that all the dominant linyphiids go through a full developmental cycle in the time interval between major disturbances. They are present as adults, i.e., in their most active stages, when ploughing, harrowing, harvesting, etc. are normally done. It might be interesting to see the effects of such treatments at the »wrong« season, to test the above hypothesis that life cycles are predapted to agricultural practices.

Seasonal synchronization may represent a serious limitation of the possibilities for manipulating spider communities for improved pest control. Thus, measures aimed at improving predatory activity at a particular time of the year would probably have to release the constraints now operating on seasonality patterns of spiders.

Diversity

The spider fauna of the barley fields investigated here is rich in species, though at the same time it shows a high dominance index due to a few abundant species. Published figures for spider densities (Nyffeler 1982, Sunderland 1987) or web areas (Sunderland et al. 1986) give no support to the idea of competition for space among the species. The dominance structure rather reflects differences in the various species' adaptations to the conditions of the agricultural systems in terms of immigration rate, reproductive capacity, ability to withstand soil treatments, etc. If this is true, the high number of species present may possibly be explained by the »moderate disturbance hypothesis« proposed by Connell (1975, 1978). Briefly, this hypothesis states that very stable systems develop low species numbers because of the potential for competitive exclusion; very strong disturbances produce the same result, because species are simply wiped out; however, intermediate disturbance regimes may keep densities below competitive levels, thus allowing less well adapted immigrant species continued existence.

We are still far from being able to evaluate this hypothesis as an explanation for the high species richness of Danish agricultural fields. Intuitively, one would consider tillage practices not moderate, but quite heavy disturbances. However, this should be judged against the ecological strategies of the organisms in question. Spiders are known as quite good dispersers (Bristowe 1939), while reproduction is relatively slow. So far, no species with more than one generation a year are known from Denmark (Toft 1976). With usually two major disturbances each year, connected with sowing in spring, and harvest and ploughing in autumn, no species will ever be allowed to increase very far in numbers. At the same time, aeronautic activity over long distances will certainly result in a large number of species descending in agricultural fields. To this should be added species moving in from adjacent hedges, grass strips or other undisturbed habitats. At least along field margins these species must contribute significantly to species richness. Most of the non-linyphiids as well as several larger linyphiids probably belong to this category, though *Pardosa* species are also known as active aeronauts in their juvenile instars (Richter 1970).

Some of the species caught in this investigation were quite unexpected for the habitat type, the extreme case being *Pardosa sphagnicola*. According to Holm and Kronestedt (1970), »this species is exclusively sphagnicolous and will only be found in bogs and mires«. Here both a female and a male was caught. This raises the question whether such species are only occasional rare visitors, or whether they are able to carry through a full generation in the field habitat. To the extent that this is the case, cereal fields may serve as suboptimal but competitor-free habitats. Though of secondary quality, its wide distribution may confer it with a reserve function, particularly for species whose natural habitats have become heavily fragmented and widely spaced.

Though these cereal fields are rich in species, the vast majority of individuals belong to the same family, the Linyphiidae or sheet-web spiders. Very few non-web-building spiders are present (Table 1), and of these the majority, in particular species of *Pardosa*, are known to be mainly sit-and-wait predators on the soil surface (Ford 1978). The plant-climbing searcher strategy, characteristic of at least the Clubionidae, is very poorly represented, which is quite unfortunate, as both aphids and herbivorous insect larvae are probably particularly vulnerable to predators of that kind (cf. the strategies of *Coccinella* and *Chrysopa* larvae). It is probably no accident that one of the most successful cases of pest control by a spider involved a clubionid, *Cheiracanthium mildei* Koch, preying on a caterpillar in apple orchards (Mansour et al. 1980).

Effective predation by spiders on aphids in cereals involves at least two ecological groups of spiders. Web-building spiders are probably the most effective against winged aphids during the early establishment phase; this group is already represented by a huge number of species, though their combined density may be too low for effective control (Sunderland et al. 1986). Wandering spiders with a searching strategy may have a better potential in the population growth phase of the aphids; this group is totally missing in present-day cereal fields. Measures to improve the role of predation from the natural fauna should consider both types.

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Sammendrag

Artsrigdom og fænologisk synkronisering i edderkoppefaunaen på to danske bygmarker

Edderkoppefaunaen på to nabo-bygmarker tilhørende Thorupgaard nær Bryrup blev undersøgt gennem vækstsæsonen 1980. Begge marker var i de forudgående seks år dyrket med såkaldt »reduceret jordbehandling«. Dette indebærer, at de efter høst om efteråret er blevet fræset og tilsået med gul sennep som efterafgrøde; om foråret er de så fræset igen, harvet nogle gange og derefter tilsået. Yderligere behandling har omfattet tilførsel af gylle om efteråret, urea efter såning, samt tromling og sprøjtning efter behov. På Mark I blev denne behandlingsform fortsat, mens Mark II i efteråret 1979 vendte tilbage til »konventionel jordbehandling«, dvs. harvning og pløjning om efteråret. Forårsbehandlingen 1980 var næsten ens for de to marker, kun blev Mark I tromlet i begyndelsen af maj, hvilket Mark II ikke blev. Jordbunden var ekstremt sandet på begge marker.

Edderkopperne blev indsamlet med 15 faldfælder i hver mark mellem 22. april og 18. august. I begge marker var desuden opstillet et antal klækkefælder, men disse fangede kun få edderkopper.

Resultaterne viste, at faunaen på markerne var så ens, at man ikke kan tilskrive den forskellige behandlingsform nogen væsentlig effekt. Det gjaldt både artsrigdom (henholdsvis 67 og 72 arter), dominansstruktur (Tabel 1), familie- (Tabel 2) og artssammensætning (Appendix I). Enkelte arter viste signifikante forskelle i hyppighed, men disse var små og kan også skyldes ikke erkendte forskelle mellem markerne.

Tæppespindere (Linyphiidae) udgjorde 93-95% af den samlede fangst, mens jagtedderkopper (Lycosidae) udgjorde hovedparten af resten. Denne dominans af tæppespindere er noget større, end man normalt finder på europæiske kornmarker. Derimod er de dominerende arter de samme, som også andre steder fra rapporteres som dominante.

Undersøgelsens samlede artsantal (85 i faldfælder + 3 yderligere i klækkefælder) ligger højere end i tidligere publicerede undersøgelser fra europæiske landbrugssystemer. En sammenligning med artsantallet i naturlige danske biotoper (bøgeskov og forskellige hedehabitater) viser, at bygmarksfaunaen ligger tæt på de rigeste af disse. Markfaunaen er dog karakteriseret ved en meget kraftig dominans af nogle få hyppige arter.

Fig. 1 A-C viser sæsonfangster for de fem hyppigste arter. Man ser her, at alle fem har helt identiske forløb, med to aktivitetstoppe henholdsvis omkring 1. juni og ultimo juli; der er tale om forskelle i toppenes placering på maximalt en enkelt uge. En sådan synkronisering må skyldes en identitet i arternes livscyklusmønster, idet de to toppe vides at repræsentere to forskellige generationer: Efterårstoppen udgøres af dyr, som formentlig er afkom af forårstoppens generation.

Man kan tænke sig to forklaringer på arternes synkronisering. Den kan for det første hænge sammen med, at fødetilgængeligheden i en monokultur varierer stærkt med plantens udviklingsfaser, således at kun de arter, hvis mest fødekrævende faser netop er synkroniseret til fødetilgængeligheden, kan opretholde høje bestande. En sådan synkronisering kendes fra edderkoppefaunaen i bøgeskovens kronelag. En anden mulighed er, at faunaen bestemmes af jordbehandlingens mekaniske forstyrrelser. Alle de hyppigste arter befinder sig hovedsageligt i adultstadiet, dvs. det mest aktive stadium, på de tidspunkter, hvor pløjning, fræsning, harvning, høst m.m. normalt bliver udført.

Også den høje artsrigdom kan tænkes begrundet af jordbehandlingens mekaniske forstyrrelser, ved hjælp af Connells »moderate forstyrrelseshypotese«. I følge denne kan regelmæssige forstyrrelser af beskedent omfang føre til en situation, hvor ingen art(er) nogensinde får lov at blive så hyppig(e), at andre, mindre veltilpassede arter holdes borte på grund af konkurrence. Habitaten vil derfor være åben for alle de arter, som blot ikke af klimatiske og lignende grunde er forhindrede i at udnytte pladsen. Det er dog ukendt, hvorvidt de mange sjældne arter reproducerer og i det hele taget kan gennemføre deres livscyklus i landbrugshabitaten.

Ud over at have faunistisk interesse er edderkopperne i landbrugssystemer interessante ud fra et skadedyrskontrol-synspunkt. I bygmarker kan predation på bladlus være af betydning. Det er i den forbindelse værd at bemærke, at langt størsteparten af faunaen udgøres af dyr med samme byttefangstmetode (tæppenet-spindere), i mindre omfang af jordoverfladelevende jagtedderkopper med en stillesiddende, lurende fangstteknik. Edderkopper, der selv aktivt opsøger deres bytte i vegetationen, som det for eksempel findes hos familien Clubionidae, er næsten fraværende fra marksystemet.

Appendix

List of species giving total seasonal catches in 15 pitfall traps in each of two barley fields at Torup in Denmark (UTM coordinates NH 20). Field I is a »reduced tillage« field (involving rotavating). Field II is a conventionally tillaged field (involving ploughing). (*) Caught as juveniles only; (**) caught in photoeclectors only (field indicated by +). Trapping period: 20 April to 18 August,

1980. x designates first Danish record. Nomenclature following Merrett, Locket & Millidge (1985).

Systematisk liste over samtlige arter og deres antal fanget i 15 fangglas i hver af to bygmarker ved Torup, Midtjylland (UTM koordinater NH 20). Mark I er blevet udsat for »reduceret jordbehandling« (med fræsning). Mark II er blevet behandlet konventionelt (med pløjning). (*) Kun juvenile eksemplarer fanget; (**) kun fanget i klækkefælder (fangst angivet ved +). Fangstperiode for begge marker: 20. april til 18. august 1980. x angiver første danske fund. Nomenklatur efter Merrett, Locket & Millidge (1985).

Family/Species *(Familie/Art)*	Field I *(Mark I)*	Field II *(Mark II)*
Gnaphosidae		
Drassodes pubescens (Thor.)	1	1
Haplodrassus sp. (*)	-	+
Drassyllus pusillus (C.L.K.)	1	1
Zelotes petrensis (C.L.K.)	1	0
Clubionidae		
Clubiona sp. (*)	+	+
Thomisidae		
Xysticus cristatus (Cl.)	1	1
Xysticus kochi Thor.	7	6
Salticidae		
Heliophanus flavipes (Hahn)	1	0
Lycosidae		
Pardosa agrestis (Westr.)	14	18
Pardosa monticola (Cl.)	54	43
Pardosa palustris (Linn.)	36	22
Pardosa pullata (Cl.)	3	7
Pardosa prativaga (L.K.)	0	3
Pardosa sphagnicola (Dahl)	0	2
Pardosa amentata (Cl.)	11	4
Pardosa nigriceps (Thor.)	1	3
Pardosa lugubris (Walck.)	0	3
Xerolycosa nemoralis (Westr.)	0	1
Xerolycosa miniata (C.L.K.)	1	1
Alopecosa pulverulenta (Cl.)	6	5
Trochosa terricola Thor.	17	13
Hahniidae		
Hahnia nava (Bl.)	2	1
Theridiidae		
Achaearanea riparia (Bl.)	0	1
Theridion sp. (*)	+	-
Theridion bimaculatum (Linn.) (*)	+	-
Enoplognatha ovata (Cl.)	1	0
Robertus lividus (Bl.)	5	4
x *Robertus heydemanni* Wiehle	5	3
Tetragnathidae		
Pachygnatha degeeri Sund.	47	25
Metidae		
Metallina segmentata (Cl.) (*)	-	+

Family/Species *(Familie/Art)*	Field I *(Mark I)*	Field II *(Mark II)*
Linyphiidae		
Ceratinella brevis (Wid.)	1	0
Walckenaeria antica (Wid.)	4	6
Walckenaeria atrotibialis (O.P.-C.)	0	1
Walckenaeria nudipalpis (Westr.)	1	0
Dicymbium brevisetosum Locket	3	3
Dicymbium tibiale (Bl.)	2	2
Entelecara congenera (O.P.-C.) (**)	-	+
Entelecara erythropus (Westr.) (**)	+	-
Moebelia penicillata (Westr.) (**)	-	+
Hypomma bituberculatum (Wid.)	1	1
Metopobactrus prominulus (O.P.-C.)	0	1
Pocadicnemis pumila (Bl.)	2	1
Oedothorax tuberosus (Bl.)	0	2
Oedothorax fuscus (Bl.)	5	12
Oedothorax apicatus (Bl.)	482	454
Pelecopsis parallela (Wid.)	1	8
Silometopus reussi (Thor.)	1	4
x *Silometopus incurvatus* (O.P.-C.)	1	0
Tiso vagans (Bl.)	2	3
Minyriolus pusillus (Wid.)	4	0
Tapinocyba insecta (L.K.)	2	6
Thyreosthenius biovatus (O.P.-C.)	2	0
Gongylidiellum vivum (O.P.-C.)	1	2
Micrargus herbigradus (Bl.)	7	6
Erigonella hiemalis (Bl.)	1	2
Savignya frontata (Bl.)	2	1
Diplocephalus latifrons (O.P.-C.)	1	0
Diplocephalus picinus (Bl.)	1	0
Araeoncus humilis (Bl.)	7	13
Asthenargus paganus (Simon)	5	10
Typhocrestus digitatus (O.P.-C.)	1	0
Erigone dentipalpis (Wid.)	1012	1076
Erigone atra (Bl.)	1124	1346
Porrhomma pallidum Jackson	8	34
Porrhomma microphthalmum (O.P.-C.)	0	2
Agyneta conigera (O.P.-C.)	0	1
Agyneta decora (O.P.-C.)	0	1
Meioneta rurestris (C.L.K.)	119	121
Meioneta beata (O.P.-C.)	3	1
Centromerus sylvaticus (Bl.)	0	1
Centromerus arcanus (O.P.-C.)	2	7
Centromerus aequalis (Westr.)	0	3
Centromerita bicolor (Bl.)	1	5
Magrargus rufus (Wid.)	0	1
Bathyphantes gracilis (Bl.)	56	71
Bathyphantes parvulus (Westr.)	2	1
Diplostyla concolor (Wid.)	0	2
Drapetisca socialis (Sund) (*)	+	-
Stemonyphantes lineatus (Linn.)	1	0

Family/Species *(Familie/Art)*	Field I *(Mark I)*	Field II *(Mark II)*
Lepthyphantes alacris (Bl.)	0	1
Lepthyphantes tenuis (Bl.)	17	4
Lepthyphantes mengei Kulcz.	7	4
Lepthyphantes ericaeus (Bl.)	3	1
Lepthyphantes pallidus (O.P.-C.)	1	5
Linyphia triangularis (Cl.)	0	2
Linyphia (Neriene) clathrata Sund.	2	1
Microlinyphia pusilla (Sund.)	9	4
Allomengea scopigera (Grube)	2	0

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Anmeldelse

Jensen, Marian Würtz, 1988: Strandengsplejebogen – pleje og drift af strandenge. – Miljøministeriet, Skov- og Naturstyrelsen. Pris kr. 50,00.

I 1984 udgav Fredningsstyrelsen »Plejebogen – en håndbog i pleje af naturområder og kulturlandskaber«. Det har siden været tanken at følge den op med mere detaljerede bøger om pleje af de enkelte danske naturtyper. I 1985 udkom således »Moseplejebogen«, og nu så »Strandengsplejebogen« og »Småvandhuller - bevarelse, pleje og nygravning«.

Strandengsplejebogen retter sig først og fremmest mod amternes medarbejdere ved naturplejeopgaver, men også mod lodsejere og andre forvaltere af strandengsområder.

Og hvis der ikke snart kommer en ny og mere alsidig udgave af bogen, kan man som entomolog blive bekymret, for det er deprimerende læsning. Forfatteren har dog fundet ud af, at der findes gule engmyrer også på strandenge – og de nævnes derefter i tide og utide bogen igennem, og man går endog så vidt som til at prioritere strandenge med gule engmyrer særlig højt. Andre insekter derimod omtales praktisk taget ikke – på side 23 siges dog, at »bevoksningerne kan være tilholdssted for stikkende insekter, som overfører yverbetændelse, også kaldet sommermastitis«, og på side 61, at »Bro Larsen (1951) beskæftiger sig specielt med den insektfauna, som findes i jorden på strandenge«.

Forfatteren har først og fremmest fokuseret på flora og fugle, men det i en sådan grad, at bogen får kraftig slagside. Vel går litteraturlisten kun til og med 1986, og herved udelukkes Ent. Meddr 54(1) (1987), der som bekendt udelukkende handler om Skallingen og dens insektfauna, men der havde været tilgængelige oplysninger om strandengenes lavere dyreliv til rådighed.

Men denne bog understreger det behov, der åbenbart er, for at vi kommer ud til Miljøministeriet og til amterne med vores viden om de forskellige naturtypers og lokaliteters insektfauna – en naturlig opgave for Entomologisk Fredningsudvalg.

Lars Trolle