

Distribution of Oscinellinae (Diptera: Chloropidae) in the Danish landscape

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Abstract

About 29,700 Oscinellinae were collected by means of sweep net, water traps and pitfalls in a variety of uncultivated habitats in Denmark mainly in Jutland. So far 75 species belonging to 21 genera are recorded from Denmark. Eleven species are new to the Danish fauna. Morphological details of *Aphanotrigonum brachypterum*, *A. hungaricum*, *A. nigripes*, *Conioscinella gallarum*, *Incertella albipalpis*, *I. nigrifrons*, *I. kerteszi*, *I. scotica* and *Oscinella angustipennis* are presented. The distribution of Oscinellinae in the Danish landscape is discussed. In Denmark, farmland dominates, so the two most abundant *Oscinella*-species of arable land, *Oscinella frit* and *O. vastator*, are also predominant in most natural habitats. Small and larger uncultivated areas, however, making up only 25 % of the Danish landscape, contain a rich fauna of Oscinellinae. The advantage of different sampling methods combined is demonstrated.

Sammendrag

Fordelingen af fritfluer (Diptera: Chloropidae) i det danske landskab. De få millimeter lange, sorte eller sort-gule fritfluer (Chloropidae) er nogle af de mest almindelige fluer på græsarealer i Danmark. Et stort materiale indsamlet med ketcher, i fangbakker og nedgravede fangglas på forskellige udyrkede græsarealer er artsbestemt. Hovedparten af materialet, ca. 29.700 individer tilhører underfamilien Oscinellinae, der i Danmark omfatter 21 slægter og 75 arter. Elleve arter er nye for den danske fauna. Alle arter er beskrevet i Nartshuk & Andersson (2013), men supplerende morfologiske detaljer er her tilføjet for 9 af dem: *Aphanotrigonum brachypterum*, *A. hungaricum*, *A. nigripes*, *Conioscinella gallarum*, *Incertella albipalpis*, *I. kerteszi*, *I. nigrifrons*, *I. scotica* og *Oscinella angustipennis*.

Artssammensætningen i forskellige landskabstyper er afbildet og kommenteret. Da Agerland er den mest udbredte landskabstype i Danmark, er det ikke overraskende, at de 2 mest hyppige agerlandsarter, *Oscinella frit* og *O. vastator* også dominerer på de fleste udyrkede græsarealer. Men de små og større udyrkede arealer, der kun optager omkring 25% af Danmarks areal, rummer alligevel en divers fauna af fritfluer. Gevinsten ved at kombinere forskellige indsamlingsmetoder demonstreres

Introduction

Chloropids (frit flies) are among the most abundant flies associated with grasses in Denmark. The common frit fly (*Oscinella frit*) and closely related species (*O. vastator* and *O. pusilla*) are pests of cereals and rye grass (*Lolium* spp.), so they have attracted much attention in many countries. Also in the Danish farmland, their phenology, abundance, population densities, behaviour and parasitoids have been studied (Rostrup, several papers, e.g. 1903, 1907, Nielsen & Nielsen, 1984 and Nielsen, 1985, 1994).

Chloropids of uncultivated grassland in Denmark are, however, mentioned in only five publications: Ardö (1957) and Lyneborg (1965) found 8 and 10 species, respectively, in coastal habitats; Kemner (1937) and Klefbeck (1951) recorded a few species from the island of Anholt; and Nielsen (1962) recorded *Lipara rufitarsis* from North Zealand. Nearly 2,000 Chloropids from Denmark are kept in the collections of Zoological Museum, Copenhagen and Museum of Zoology, Lund, Sweden; most of the material is unpublished, but recently recorded by Nartshuk & Andersson (2013), who count 120 species of chloropids (63 Oscinellinae and 57 Chloropinae) from Denmark and also state their geographical distribution.

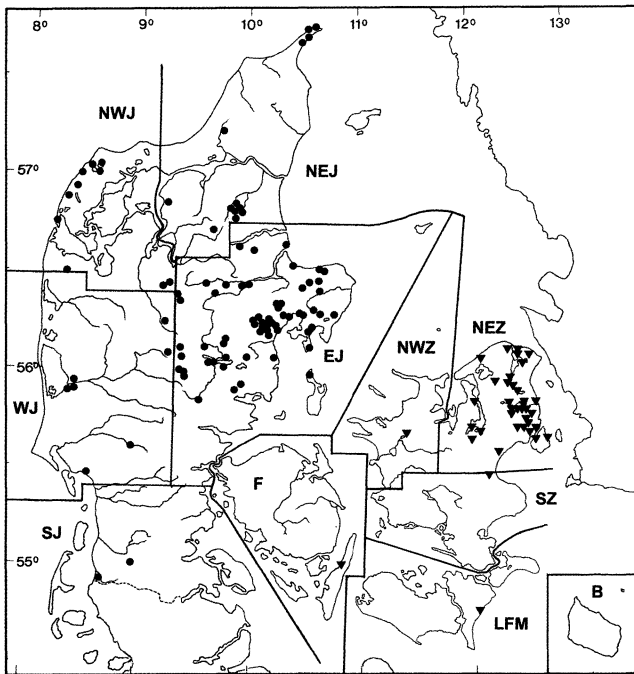


Fig. 1. Map showing sampling localities and Danish provinces. Triangles refer to samplings in 1894-1917 by Carl C. R. Larsen.

Fig. 1. Indsamlingslokaliteter og danske distrikter. Trekanten henviser til Carl C. R. Larsens indsamlinger, 1894-1917.

The distribution of Danish chloropids in relation to habitats is, however, on the whole unknown. The present presentation is primarily based on a large material of chloropids collected in uncultivated grassland; large areas as well as small grass strips in the cultural landscape were investigated. The present paper deals with the subfamily Oscinellinae. In a subsequent paper (in prep.) the subfamily Chloropinae is treated.

Materials and methods

The main material of Oscinellinae consists of 29,687 specimens primarily from Jutland. In 2008-2013, about 16,500 specimens were collected by the author in a wide range of grassy habitats. The sampling was carried out by standardized sweeping, each sample consisting of 50 strokes with the same sweep net (35 cm diameter); 72 localities in Jutland were visited (Fig. 1) and often several different habitats were present. A total of 603 sweep net samples was taken. Further, 197 oscinellines were reared from 182 *Lipara* galls on reed (*Phragmites australis*).

In addition, unpublished material from other investigations was kindly placed at my disposal, viz. 2,932 Oscinellinae collected in blue water traps in the Mols area, 1981 (by P. Gjelstrup, Naturhistorisk Museum, Aarhus and B. Overgaard Nielsen, Aarhus University); 5,358 individuals trapped in pitfalls, white water traps or swept during an investigation on the fauna of woodland edges in Jutland, 1990 (Nielsen (B), 1994); and 455 specimens trapped in pitfalls, 2011-2013 in Nationalpark Thy by S. Toft. Further, 4,482 Oscinellinae collected by means of water traps and sweep net during 3 investigations in the Mols area, Sepstrup Sande and Tønder marshland are included in the actual presentation; the chloropids of the latter investigations were briefly referred to in final reports (Nielsen & Nielsen, 2006; Nielsen & Toft, 1989; Toft et al., 1993).

The flies were stored in alcohol (70 %), and preparations of hypopygia were embedded in Euparal on slides. All specimens were identified by the author.

Further, a material of about 206 dry, pinned oscinellines from Denmark is kept in Naturhistorisk Museum, Aarhus. They were collected in 1894-1917 by the amateur entomologist Carl C. R. Larsen (1846-1920) mainly near Copenhagen and in North Zealand (Fig. 1). The localities, appearing from the date on the label and his diary, are rather inaccurate, and further, in the course of a century many of the localities visited by Carl Larsen have been displaced by urban areas or were otherwise changed. A minor part of his collection is mentioned in a checklist of Danish Diptera (Petersen, 2001) some of the species were, however, misidentified. The identifications are revised by the author, and the material is presented in the present paper (Table 1).

Since large quantities of material, e.g. from ecological investigations, are usually stored in alcohol, it is important to point out differences in identification of wet chloropids contra dry ones. Wet specimens are robust and easy to handle. Hypopygia are easily opened and studied in situ, and dissection for slide mounting is rather straight. An essential disadvantage of wet material is, however, that dusted areas are often difficult to recognize; low side-light may reveal dusting, but a brief, superficial drying on a piece of filterpaper is sometimes necessary. Colours, in return, are always very clear in wet material. In dry specimens the cuticle is unchanged, i.e. dusting, even light so, is easily seen. Colours of hairs and bristles are also distinct, whereas colours of the cuticle of head and legs are often subdued by dusting and hairs. Another disadvantage of dry material is that dissection of hypopygia is rather time consuming.

Results

During the present investigation 62 species of Oscinellinae were collected by the author (Table 1). In the following, all species are presented and their abundance in various habitat types is shown. Eighteen types of habitat are selected: arable land (field borders and fields with cereals or ryegrass), pastures, lawns, paths of short grass (mown or worn), dry grassland, road verges, grass heaths (dominated by *Deschampsia flexuosa*), inland dunes, meadows (wet grassland), fens, bogs, freshwater margins (of lakes and streams), glades (in woods and forests), woodland edges, coastal meadows, epilittoral grass, coastal dunes and galls of *Lipara* species. For each type of habitat, the number of specimens collected is presented in parenthesis. For species few in number or present in a single sample or locality, the localities are presented as well. Abbreviations for districts (EJ, NEJ, WJ etc.) refer to fig. 1. Specimens from the collection of Carl C. R. Larsen are marked: *CRL*; here, the localities are known, but rarely the exact habitat.

Elachiptera brevipennis (Meigen, 1830)

Total number: 6. Habitats: meadow (1♂) (Sletten at Mols, 27.vi.1981). *CRL* (5, unknown sampling method). Regions: EJ, F, NEZ.

One male caught in a water trap; the short-winged imagines probably jump and run on the ground.

Elachiptera cornuta (Fallén, 1820)

Total number: 115. Habitats: arable land (4), lawns (1), grassy paths (1), road verges (5), meadows (9), fens (19), freshwater margins (23), woodland edges (16), glades (2), coastal meadows (2), epilittoral grass (1). *CRL* (32). Regions: SJ, EJ, WJ, NWJ, NEZ.

Swept in moist places and at woodland edges from early April to early September. Hibernating flies were reared from litter samples from woodland edges in October-November and swept near fresh water in April-May.

Elachiptera diastema Collin, 1946

Total number: 26. Habitats: arable land (1), meadows (6), fens (10), freshwater margin (2), glades (6), epilittoral grass (1). Regions: EJ, NWJ.

Collected in humid places from early April to mid August.

Elachiptera tuberculifera (Corti, 1909)

In total 1♂ 1♀. Habitats: glade (1) (Lisbjerg, 19.viii.2009), coastal meadow (1) (Hevring, 28.v.2012). Region: EJ.

Swept in humid sites.

Dicraeus (Dicraeus) raptus (Haliday, 1838)

In total 1♂. Habitat: glade near the coast (Vosnæs Pyntskov, 28.vii.2011). Region: EJ. Swept in a coastal wood.

Dicraeus (Dicraeus) tibialis (Macquart 1835)

Total number: 93. Habitats: meadows (89), glades (4). Region: EJ.

Swept in June in meadows and other humid sites.

Dicraeus (Oedesiella) fennicus (Duda, 1933)

Total number: 454. Habitats: arable land (3), dry grassland (1), road verges (259), meadows (118), freshwater margins (14), glades (2), coastal meadows (57). Region: EJ. Swept in late June to mid July in large numbers from flowering *Elytrigia* spp.

Dicraeus (Paroedesiella) vagans (Meigen, 1830)

Total number: 1,234. Habitats: pastures (3), lawns (2), grassy paths (5), dry grassland (28), road verges (872), inland dune (1), grass heaths (12), meadows (87), fens (25), bog (1), freshwater margins (14), glades (94), woodland edges (2), coastal meadows (57), epilittoral grass (27). *CRL* (4). Regions: EJ, NWJ, NEJ, NEZ.

Swept in inflorescence of *Arrhenaterum elatius* in late April, and from early June to late July. Reared from *A. elatius*.

Lipara lucens Meigen, 1830

Total number: 95. Habitat: reed beds, coastal as well as freshwater (63, reared). *CRL* (32, reared). Regions: EJ, NEJ, NEZ.

Reared in April-May from galls in stems of *Phragmites australis*.

Lipara pullitarsis Doskočil & Chvála, 1971

Total number: 56. Habitat: freshwater reed bed in a glade (56, reared) (Lisbjerg Skov). Region: EJ.

Reared in April-May from galls in stems of *Phragmites australis*.

Calamoncosis (Calamoncosis) aprica (Meigen, 1830)

Total number: 93. Habitats: fens (39), freshwater margins (3), coastal meadows with reed (46). *CRL* (5). Regions: EJ, NEZ.

Swept from a mixed vegetation of *Phragmites australis* and *Phalaris arundinacea* in May-June and early July.

Calamoncosis (Calamoncosis) duinensis (Strobl, 1909)

Total number: 16 (7♂♂ 9♀♀). Habitats: arable land (1), fen (8), coastal reed bed (7). Regions: EJ, WJ.

Swept from vegetation including *Phragmites australis* and *Carex*. Mid June to late August.

Calamoncosis (Calamoncosis) minima (Strobl, 1893)

In total: 1♀. Habitat: fen (1) (Pannerup Mose, 6.vi.2011). Region: EJ.

Swept from a mixed vegetation with *Phalaris arundinacea* and *Phragmites australis* in early June.

Calamoncosis (Rhaphiopyga) glyceriae Nartshuk, 1958.

Total number: 101. Habitats: arable land (1), grassy paths (1), meadows (9), fens (59), freshwater margins (27). *CRL* (7). Regions: EJ, WJ, NEJ, NEZ.

Swept from *Glyceria* and other plants in various humid habitats, early May to early August.

Siphonella oscinina (Fallén, 1820)

Total number: 25. Habitats: grass heath (24) (Mols Bjerger). *CRL* (1). Regions: EJ, NEZ.

Collected late August in water traps in a dry, sandy area dominated by *Deschampsia flexuosa* and *Calluna vulgaris* or *Corynephorus canescens*.

Polyodaspis sulcicollis (Meigen, 1838)

Total number: 18 (2♂♂ 16♀♀). Habitats: arable land (1), grass heaths (16), epilittoral grass (1). Region: EJ.

Particularly caught in water traps in a dry habitat with vegetation of *Deschampsia flexuosa* and *Calluna vulgaris*, June-July.

Lasiambia palposa (Fallén, 1820)

Total number: 106. Habitats: arable land (2), dry grassland (2), grass heaths (98), inland dune (2), glade (1), epilittoral grass (1). Regions: EJ, NWJ, NEJ.

Most specimens are collected in water traps in dry habitats with *Corynephorus canescens*; a few are swept from other dry habitats. Late June to late August. According to Tschirnhaus (1992) it is reared from egg-pods of the grasshoppers *Chorthippus biguttulus* and *Omocestus viridulus*. Both grasshoppers are common in Denmark (Holst, 1986), and especially abundant in Mols Bjerger where most of the specimens of *L. palposa* were collected.

Aphanotrigonom brachypterum (Zetterstedt, 1848)

(syn: *A. griseum* var. *curtipenne* (Collin, 1946), *A. nigripes* (Zetterstedt, 1848), short-winged form).

Total number: 573. Habitats: dry grassland (3), grass heaths (523), fens (7), freshwater margin (1), woodland edges (39). Regions: EJ, WJ, NWJ.

This species was mainly collected by means of pitfalls and water traps rarely by sweep net; it is probably running on the soil surface. It was caught in high numbers in dry localities with vegetation dominated by *Deschampsia flexuosa*, but also in humid patches within dry localities, early June to late August.

Remarks on morphology: Resembling *A. nigripes* and *A. hungaricum*, but wings are shorter than abdomen, only reaching 5. tergite. Surstyli are basally equipped with low, more or less triangular spines with a broad base (Fig. 2a).

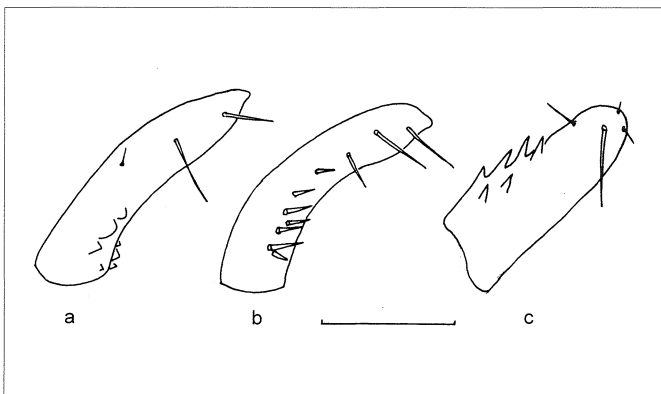


Fig. 2. Surstyli of a: *Aphanotrigonom brachypterum*, b: *A. hungaricum* and c: *A. nigripes*. Scale line 0.05 mm.

Fig. 2. Surstyli hos a: *Aphanotrigonom brachypterum*, b: *A. hungaricum* og c: *A. nigripes*. Skala: 0,05mm.

Aphanotrigonum cincitellum (Zetterstedt, 1848)

In total 3 individuals. Habitats: coast, close to water line (1♂) (Katbjerg Odde, 5.vii.2012). *CRL* (2) (Amagers Østside). Regions: EJ, NEZ.

Swept at the coast. A large number was reared from wreck and from turf samples with grazed *Puccinellia maritima* in the marshland at the North Sea (Tschirnhaus, 1981).

Aphanotrigonum femorellum Collin, 1946

In total 3 individuals. Habitats: coast (1♀) (Vosnæs Pynt, 28.vii.2011), *CRL* (2) (Frederiksholms Lergrav). Regions: EJ, NEZ.

Swept from reed on the coast. Reared from wreck and from turf samples in the marshland at the North Sea (Tschirnhaus, 1981).

Aphanotrigonum hungaricum Dely-Draskovits, 1981

In total 1♂. Habitat: arable land (Kalø, 4.vi.1991). Region: EJ.

One male from an emergence trap in a barley field.

Remarks on morphology: resembling *A. brachypterum* and *A. nigripes*, but surstyli are medially equipped with one or two rows of slender spines on low sockets (Fig. 2b). Wings are longer than abdomen.

Aphanotrigonum nigripes (Zetterstedt, 1848)

Total number: 121. Habitat: coastal dunes (Nationalpark Thy). Region: NWJ.

Trapped in pitfalls in coastal dunes.

Remarks on morphology: resembling *A. brachypterum* and *A. hungaricum*, but the surstyli are laterally equipped with one or two rows of strong spines with broad basis (Fig. 2c). This structure was also described by Dely-Draskovits (1981) and illustrated by Nartshuk & Andersson (2013). Wings are longer than abdomen.

Aphanotrigonum trilineatum (Meigen, 1830)

Total number: 96. Habitats: arable land (8), grassy paths (1), dry grassland (1), road verges (2) grass heaths (38), meadows (3), fens (4), freshwater margins (32), glades (4), coastal meadows (3), epilittoral grass (1), *CRL* (1). Regions: EJ, WJ, NEJ, NEZ.

Collected with sweep net in many habitats. Abundant at the shore of a lake (Hald Sø). A large number was trapped in water traps in a grass heath (Mols Bjerge). Late June to early September.

Tricimba (Nartshukiella) cincta (Meigen, 1830)

Total number: 43 (5♂♂ 38♀♀). Habitats: arable land (7), lawns (1), dry grassland (6), road verges (6), grass heaths (2), meadows (1), fens (3), freshwater margins (4), woodland edge (1), glades (11) coastal dune (1). Regions: EJ, WJ, NWJ, NEJ.

Collected in many habitats, dry as well as humid, cultivated as well as natural sites, late June to late August. Males are rarely seen, probably owing to sexual differences in behaviour; a comparable skewed sex ratio (21♂♂ 160♀♀) was also recorded from Swedish Lapland by Nartshuk (2003).

Trachysiphonella ruficeps (Macquart, 1835)

Total number: 18. Habitats: dry grassland (10), glades (7), epilittoral grass (1). Regions: EJ.

Swept beneath oak trees in dry grassland dominated by *Deschampsia flexuosa* and at the margin of a glade. Late June to mid August.

Remarks on morphology: Anepisternum with a black mark, other pleurae with pale, redbrown marks. Proboscis not particularly elongated.

Trachysiphonella scutellata (von Roser, 1840)

In total 3 individuals. Habitat: road verge (1♀) (Gl. Rye, 28.vii.2012), freshwater margin (1♀) (Hampen Sø, 27.vi.2011). *CRL* (1). Regions: EJ, NEZ.

Swept in short grass near a stream, and from *Carex* at a lake margin, late June to late July.

Remarks on morphology: four pleurae with a black mark. Proboscis clearly elongated.

Oscinimorpha albisetos (Duda, 1932)

Total number: 9. Habitats: coastal meadows (8), epilittoral grass (1). Regions: WJ, NWJ.

Found in coastal sites in May-June. Also recorded from coastal localities in England (Collin, 1946) and reared from turf samples of grazed meadows with *Puccinellia* in marsh sites at the North Sea (Tschirnhaus, 1981). A halobiont species according to Wendt (1993).

Oscinimorpha arcuata (Duda, 1932)

In total 2 individuals. Habitats: dry grassland (1♀, Hyllested Bjerger, 8.vii.2010), road verge (1♀ Egå Engsø, 21.vi.2010). Region: EJ.

Two females with rather long radial veins are referred to this species. They were swept in two dry habitats.

Oscinimorpha minutissima (Strobl, 1900)

Total number: 443. Habitats: arable land (32), lawns (9), grassy paths (13), dry grassland (37), road verges (32), grass heaths (77), meadows (12), fens (3), bogs (17), freshwater margins (51) woodland edges (122), glades (10), coastal meadows (8), epilittoral grass (20). Regions: EJ, WJ, NWJ.

Very abundant in cultivated as well as uncultivated grass. Late June to late August. Collected by means of sweep net as well as water traps and pitfalls. This small species was abundant in water traps situated in fields of rye grass (*Lolium* spp.) (Nielsen & Nielsen,

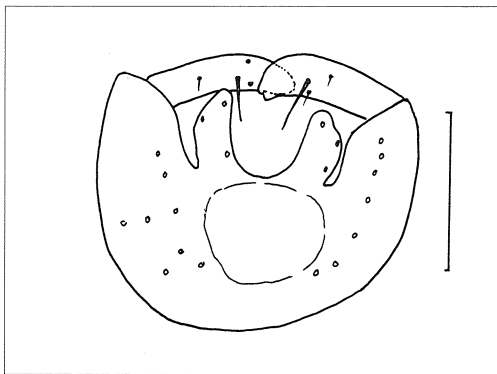


Fig. 3. Male hypopyge of *Conioscinella gallarum*, dorsal view. Scale line 0.1 mm.

Fig. 3. Hypopygium hos *Conioscinella gallarum*, set dorsalt. Skala: 0,1 mm.

1984); it is probably saprophageous in grasses previously attacked by stem-boring larvae of e.g. *Oscinella* spp.

Conioscinella frontella (Fallén, 1820)

Total number: 4,269 individuals. Habitats: arable land (1), grassy paths (4), dry grassland (5), road verges (7), grass heaths (66), meadows (2), fens (16), bogs (1), freshwater margins (45), woodland (537 - in 2 water traps: 436♂♂ 46♀♀), glades (38), woodland edges (3572 - in 2 water traps: 671♂♂ 286♀♀, in 2 pitfalls: 209♂♂ 64♀♀). *CRL* (16, reared). Regions: EJ, WJ, NWJ, NEJ, NEZ.

Regularly swept from a variety of common species of grasses. Very numerous in water traps and pitfalls at woodland edges with *Deschampsia flexuosa*, but also in water traps situated 10-15 meter above ground in a spruce forest and an oak wood. In the latter cases, males were predominant. Late May to late August.

Conioscinella gallarum (Duda, 1933)

In total 2 individuals. Habitats: glades (1♀, Slåensø, 21.v.2009), (1♂, Lisbjerg, 6.vii.2013). Region: EJ.

A female swept in grass beneath oak trees, and a male swept from flowers of *Aegopodium podagraria* in a glade.

Remarks on morphology: Cerci of male hypopyge deviates from other *Conioscinella* species (Fig. 3). Beschowski (1985) figures a similar shape (Fig. 56,11), whereas in Nartshuk & Andersson (2013 - fig 227) the cerci are hidden. A femoral organ is absent.

Conioscinella mimula Collin, 1946

Total number: 4 (1♂ 3♀♀). Habitats: lawn (1♀), grassy path (1♀), spruce forest (1♀), woodland edge (1♂). Regions: EJ, WJ.

Collected June-July in water traps in mown grass, at a woodland edge, and 10 m above the forest floor (Gludsted). Also swept from short grass. June-July.

Conioscinella sordidella (Zetterstedt, 1848)

Total number: 8. (5♂♂ 3♀♀). Habitats: arable land (3), forest (3), glade (1), coastal meadow (1). Regions: EJ, WJ.

Collected in water traps in cultivated grass and 13 m above ground level in a spruce stand (Gludsted). One male swept in flowers of *Aegopodium podagraria* in a glade. Also trapped in emergence traps in a barley field. Early June to mid August.

Conioscinella zetterstedti Andersson, 1966

Total number: 1,332. Habitats: grass heaths (928), woodland edges (62), coastal dunes (338). *CRL* (4). Regions: EJ, WJ, NWJ, NEZ.

Wings reduced, in males to almost half the length of abdomen; in females shorter, often rudimentary with strongly reduced venation. The species was trapped abundantly in pitfalls and water traps in coastal dunes, grass heaths and in an open, dry woodland edge with *Deschampsia flexuosa*, but was rarely caught by sweeping at the same sites. Late June to late August.

Speccafrons halophila (Duda, 1933)

Total number: 4 (2♂♂ 2♀♀). Habitats: meadows (2), freshwater margin (1), coastal dune (1). Regions: EJ, NEJ. Further, Becker (1910) and Duda (1933): »Denmark« 3♂♂ 3♀♀ reared from eggs of a spider (*Epeira cornuta*).

Swept from *Phalaris arundinacea*, *Leymus arenarius* and *Carex* spp. in June-July.

Incertella albipalpis (Meigen, 1830)

Total number: 355. Habitats: arable land (14), lawns (10), dry grassland (110), road verges (47), grass heaths (41), meadows (55), bogs (1), freshwater margins (15), woodland edges (16), glades (1), coastal meadows (27), epilittoral grass (18). Regions: EJ, WJ, NWJ, NEJ.

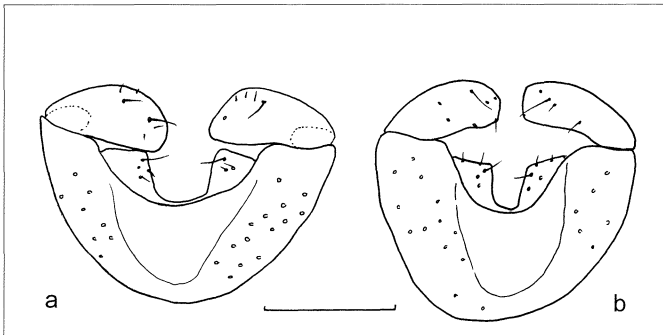


Fig. 4. Male hypopyge of a: *Incertella nigrifrons* and b: *I. kerteszi*, dorsal view. Scale line: 0.1 mm.

Fig. 4. Hypopygium hos a: *Incertella nigrifrons* og b: *I. kerteszi*, set dorsalt. Skala: 0,1 mm.

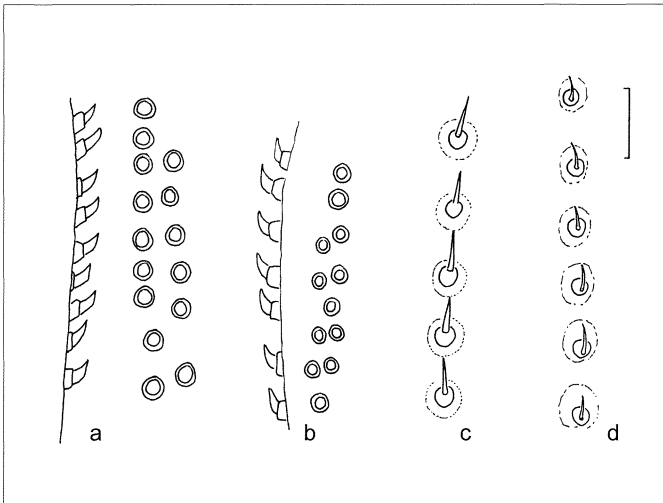


Fig. 5. Male femoral organs on 2. femur of a: *Incertella albipalpis*, b: *I. nigrifrons*, c: *I. scotica* and d: *Oscinella angustipennis*. Scale line 0.01 mm.

Fig. 5. Femoralorgan på låret af 2. benpar hos hanner af a: *Incertella albipalpis*, b: *I. nigrifrons*, c: *I. scotica* og d: *Oscinella angustipennis*. Skala: 0,01 mm.

Swept in a variety of habitats: cultivated as well as wild grass, dry and humid habitats, inland and coastal sites. Trapped in water traps at a woodland edge. The species was also trapped abundantly in water traps situated in fields with heavy attacks by *Oscinella frit* (Nielsen & Nielsen, 1984).

Incertella kerteszi (Becker, 1910)

Total number: 660. Habitats: lawns (4), grassy paths (13), road verges (11), grass heaths (304), meadows (21), fens (24), freshwater margins (9), woodland edges (70), glades (145), epilittoral grass (2). Regions: EJ, WJ, NWJ, NEJ.

Swept in various types of habitat, but especially abundant in shady or humid sites with *Deschampsia flexuosa* and *D. cespitosa*. Found from early June to late August. Trapped in pitfalls at a woodland edge with *D. flexuosa*.

Remarks on morphology: Tip of surstyli almost straight cut (Fig. 4b).

Incertella nigrifrons (Duda, 1933)

Total number: 61. Habitat: coastal meadow (61) (Kalø, strandeng). Region: EJ.

Swept on several occasions in the same grazed, wet coastal meadow with Poaceae and *Juncus gerardii*. Late June to early August.

Remarks on morphology: Some similarity with *I. kerteszi*. Differences are: frons totally black, without yellowish front, genae narrowly pale not clearly yellow, frontal triangle mostly shining, but ocellar callus and adjacent parts dusted. Mesonotum subshining. Hypopyge somewhat similar to that of *I. kerteszi*, but surstyli are more convex and the tip is rounded (Fig. 4a). Femoral organ is typical for *Incertella*: two rows of short, blunt spines (Fig. 5b).

Incertella scotica (Collin, 1946)

Total number: 12. Habitats: fen (1♂), bog (1♂ 2♀♀); material not preserved: fen (Sepstrup Sande) (3♂♂ 5♀♀). Region: EJ.

In wet sites with *Carex* within woodland and heathland.

Remarks on morphology: The male cerci deviate clearly from most *Incertella* species, but have a striking resemblance with those characteristic for the subgenus *Oscinella* (*Cyclocercula*) (Nartshuk & Andersson, 2013 - Figs. 364 and 426). Also other structures point towards *Oscinella*: femoral organ consists of one row of setae (figs. 5c and d) contra two rows of short, blunt spines in most *Incertella* (Figs. 5a and b). Further, the hypandrium is open (closed in most *Incertella*). According to Ismay (1993) and Nartshuk & Andersson (2013) *I. zuercheri* resembles *I. scotica* regarding these structures. The systematic position of *I. scotica* as well as *I. zuercheri* should be considered on basis of a larger material.

Microcercis trigonella (Duda, 1933).

Total number: 312. Habitats: arable land (5), grassy paths (5), road verges (7), grass heaths (8), meadows (150), fens (57), bogs (1), freshwater margins (60), glade (2), coastal meadows (17). Regions: EJ, WJ.

Frequently swept in humid meadows and fens, also collected in water traps in various grass fields (Nielsen & Nielsen, 1984). Early June to late August.

Oscinella (*Oscinella*) *angularis* Collin, 1946

Total number: 406. Habitats: road verge (8), meadows (146), fens (147), freshwater margins (90), coastal meadows (15). Regions: EJ, WJ.

Swept in several wet habitats and close to wet habitats with growth of *Phragmites australis*, *Phalaris arundinacea* and *Glyceria* spp., early May to early August.

Oscinella (Oscinella) cariciphila Collin, 1946

Total number: 147. Habitats: lawns (4), grassy paths (4), road verges (5), meadows (30), fens (81), bogs (1), freshwater margins (12), glades (8), coastal meadows (2). Regions: EJ, WJ.

Swept in many wet sites with *Phalaris arundinacea*, *Phragmites australis* and *Carex* spp., late May to mid August.

Oscinella (Oscinella) maura (Fallén, 1820)

Total number: 137. Habitats: arable land (5), pastures (1), lawns (5), grassy paths (2), dry grassland (10), road verges (23), grass heaths (34), meadows (5), fens (15), freshwater margins (8), woodland edges (5), glades (14), epilittoral grass (6). *CRL* (4). Regions: EJ, WJ, NWJ, NEZ.

Collected by sweeping in a variety of habitats in cultivated as well as uncultivated grassland owing to the wide distribution of its host grass, *Dactylis glomerata*. Also frequently trapped in water traps in farmland (Nielsen & Nielsen, 1984).

Oscinella (Oscinella) nitidissima (Meigen, 1838)

Total number: 1,042. Habitats: arable land (7), pastures (4), lawns (112), grassy paths (81), dry grassland (17), road verges (89), meadows (223), fens (144), bogs (1), freshwater margins (142), glades (111), coastal meadows (106), epilittoral grass (3). *CRL* (2). Regions: EJ, WJ, NEJ, NEZ.

Very abundant in a variety of humid or shady habitats with *Agrostis tenuis* and *A. stolonifera*. Commonly swept in shady lawns.

Oscinella (Oscinella) pusilla (Meigen, 1830)

Total number: 1,309. Habitats: arable land (36), pastures (32), lawns (88), grassy paths (7), dry grassland (84), road verges (234), grass heaths (35), meadows (420), fens (75), freshwater margins (117), woodland edges (5), glades (85), coastal meadows (54), epilittoral grass (30). *CRL* (7). Regions: EJ, WJ, NWJ, NEJ, NEZ.

A common species in perennial grass, but rarely found in annual and biennial fields. Probably a rather stationary species, large populations are particularly recorded from pastures (Nielsen (L), 1994). Two generations per year in Denmark (Nielsen & Nielsen, 1984).

Oscinella (Oscinella) trochanterata (Collin, 1946)

Total number: 187. Habitats: meadows (2), fens (175), freshwater margins (6), coastal meadows (2). *CRL* (2). Regions: EJ, NEZ.

Swept late May to late July in wet places with growth of *Phalaris arundinaceae* and *Phragmites australis*; also swept from *Glyceria*.

The *frit* – complex

The next four species of *Oscinella* are rather uniform in appearance and sometimes difficult to separate. Identification of the four species was primarily based on: 1) width of genae, 2) length ratio arista shaft: filament, 3) colours of tibiae and 4) colour and length of wing. The identification criteria for each species are presented below. Identification is most convenient in wet material.

Oscinella (Oscinella) frit (Linnaeus, 1758)

Total number: 6,423. Habitats: very abundant in all habitats except dunes. *CRL* (30). In all regions.

A highly expansive species and a serious pest in wheat, oats and ryegrass. Very abundant in newly sown grass, newly mown grass, and other habitats with plenty of tillering grasses (Nielsen, 1985). Larvae are found in many species of cultivated and wild grass and also in panicles of oats and wheat. Three generations per year in Denmark (Nielsen & Nielsen, 1984).

Identification criteria: Genae a little narrower than first flagellomere, arista shaft: filament 1: 2, hind tibiae dark, all tarsi pale, wings clear, reaching beyond tip of abdomen.

Oscinella (Oscinella) hortensis Collin, 1946

Total number: 6,619. Habitats: arable land (7), pastures (100), lawns (231), grassy paths (70), dry grassland (131), road verges (277), inland dunes (9), grass heaths (3,355), meadows (252), fens (317), bogs (2), freshwater margins (231), woodland edges (1,423), glades (107), coastal meadows (21), epilittoral grass (77). *CRL* (9). In all regions.

Swept in almost all habitats, but particularly abundant in areas with dense growth of *Deschampsia flexuosa*. Trapped in high numbers in pitfalls and water traps in sites with *D. flexuosa*. Larvae in *Festuca rubra*, *F. ovina* and *Deschampsia flexuosa* (Nielsen (L), 1994)

Identification criteria: Genae narrow, but wider than t_1 , arista shaft: filament 1: 2, front and middle tibiae yellowish with faint median darkening, wings brownish, shorter than abdomen.

Oscinella (Oscinella) nigerrima (Macquart, 1935)

Total number: 25. Habitats: arable land (4), lawns (6), dry grassland (2), road verges (6), meadows (2), freshwater margin (1), woodland edges (1), glades (3). Regions: EJ, NWJ.

Most are swept in spring to early summer generally before activity of the first generation of *O. frit*.

Identification criteria: Genae a little narrower than first flagellomere, all tibiae and tarsi dark, wings clear reaching tip of abdomen. Identification of this species is difficult and was done with some hesitation.

Oscinella (Oscinella) vastator (Curtis, 1845)

Total number: 2,570. Habitats: arable land (32), pastures (60), lawns (276), grassy paths (86), dry grassland (215), road verges (481), grass heaths (115), meadows (523), fens (206), bogs (2), freshwater margins (187), woodland edges (22), glades (231), coastal meadows (63), epilittoral grass (41). *CRL* (30). In all regions.

Found in a variety of habitats, cultivated as well as wild. This species seems to prefer perennial grass. Large populations are found in dry grassland and pastures. Reared from several grass species and also from wheat and barley.

Identification criteria: Genae wider than first flagellomere, arista shaft: filament 1: 3, t_1 and t_2 more or less yellowish, t_3 dark, wings brownish, reaching tip of abdomen. The very broad genae are conspicuous.

Oscinella (Cyclocercula) angustipennis Duda, 1933

Total number: 85. Habitats: road verge (1), meadows (2), fen (2), freshwater margins (2), reared from *Lipara* galls (78), Regions: EJ, NEJ.

Reared from galls of *Lipara lucens* and *L. pullitarsis* in *Phragmites australis*. Up to 10 individuals were reared from one gall. Swept late May to early August from *Phragmites*, *Glyceria*, *Calamagrostis* and other grasses near water.

Morphological comments: In the Danish material, three characters deviate more or less from the descriptions of *O. angustipennis*: 1) curvature of the third wing vein is often very indistinct in females, but distinct in most males, 2) ratios wing length: wing breadth are lower, varying between 2.6:1 and 2.9:1 (3:1 in *O. angustipennis* according to Beschovski, 1978 and Nartshuk & Andersson, 2013), and 3) front and middle tibia are paler, but with a darkening in the middle. Regarding these characters the Danish specimens approach *Oscinella (C.) nartshukiana* (Beschovski, 1978), but the curved third vein in most males and the circular first flagellomere point to *O. angustipennis*. Obviously Civelek (2002) has faced the same problem; in his sketch of a wing of *O. nartshukiana* the ratio length: breadth is 2,68 and the third vein is distinctly curved. Seemingly, the distinction between the two species needs a closer investigation.

Hapleginella laevifrons (Loew, 1858)

Total number: 16. Habitats: dry grassland (1), road verge (2), bog (1), freshwater margin (2), woodland (1), glades (9). Regions: EJ, NEJ.

Swept mid June to mid August from grass vegetation in or near coniferous stands.

Eriobolus danicus Nartshuk & Andersson, 2013

In total 1 ♀. Habitat: coastal meadow (Hevring, 29.v.2012). Region: EJ.

One female swept in a coastal swamp near a reedbed.

Eriobolus gracilior (de Meijere, 1918)

In total 1 ♀. Habitat: fen (Fladbrogården at Gudenå, 20.vii.2011). Region: EJ.

One female swept from a mixed growth of *Glyceria* and *Carex*.

Eriobolus hungaricus Becker, 1910

Total number: 21. Habitats: fens (10), freshwater margin (2), coastal meadows (10). Regions: EJ, SJ.

Swept May-June in humid sites with *Phalaris arundinacea* and *Phragmites australis*.

Eriobolus slesvicensis Becker, 1910

In total 1 ♂. Habitat: coastal meadow (Vosnæs Pynt, 28.vii.2011). Region: EJ.

Swept from a reedbed on the sea coast.

Rhopalopterum anthracinum (Meigen, 1830)

Total number: 6. Habitat: fen (6) (Kasted Mose). Region: EJ.

Swept in a humid habitat with *Glyceria* and *Carex*. June-July and late August.

Rhopalopterum atricorne (Zetterstedt, 1838)

Total number: 29. Habitats: meadows (1), fens (1), bogs (15), freshwater margins (12). Regions: EJ, NEJ.

Swept in wet habitats where *Carex* spp. are dominant. Mid June to late July.

Rhopalopterum fasciola (Meigen, 1830)

In total 2 ♂♂. Habitat: meadow (Lisbjerg Skov, 5.vii.13) Region: EJ.

Swept from *Carex* spp. in a wet meadow.

Oscinisoma cognatum (Meigen, 1830)

Total number: 7. Habitats: fens (6), glade (1). Region: EJ.

Swept from humid vegetation with *Phalaris arundinacea* and *Phragmites australis*, late May to mid July.

Oscinisoma germanicum (Duda, 1932)

In total 1♂. Habitat: freshwater margin (Øje Sø, 17.vi.2013). Region EJ.

Swept from the shore vegetation of a lake.

Oscinisoma gilvipes (Loew, 1858)

In total 1♂ 1♀. Habitat: fen (Lindholm Hoved, 28.vii.2012). Region: EJ.

Swept from *Glyceria*.

Discussion

Species diversity

According to Nartshuk & Andersson (2013) 63 species of Oscinellinae are present in Denmark. During the present investigation, 12 of these have not been found, while 11 are new to the Danish fauna (Table 1). In addition, *Lipara rufitarsis* recorded once from North Zealand (Nielsen, 1962) is not recorded from Denmark by Nartshuk & Andersson (2013) and not found during the actual investigation. So at present, 75 species belonging to 21 genera are now recorded from Denmark. Only two genera, *Gampsocera* and *Gaurax*, present in the rest of Scandinavia are not found in Denmark. They are both associated with coniferous forests. The first one is only recorded from regions north of Denmark, whereas the latter is found in the southern provinces of Sweden as well (SK, BL, HA, SM) and is expected to be found in Denmark, too.

Distribution

The distribution of adult frit flies depends considerably on the larval substratum. Most larvae of Oscinellinae are associated with grasses (Poaceae), sedges (Cyperaceae) or rushes (Juncaceae), and the adults are generally swept from the host plants and the surrounding vegetation. The larvae are herbivores, saprophages, mycetophages or predators, but in many species the exact larval diet is unknown. Some herbivores are utmost host specific, for instance the grain eating species of *Dicraeus* (Nartshuk, 1967), but most are obviously exploiting a spectrum of grass species. Among saprophageous species, many are inquilines associated with stem-boring insect larvae, nourishing on the plant tissue disintegrated by the latter. Many species develop in the large galls of *Lipara* spp. on reed, e.g. *Calamoncosis* spp., *Oscinella angustipennis* and *Eribolus hungaricus*. Larvae of *Hapleginella laevifrons* are found in cones of conifers (Gaidene & Nartshuk, 1963), while *Oscinimorpha minutissima* is reared from many species of Poaceae previously attacked by other chloropids (Nartshuk & Pakalniškis, 2004). The larvae of a few oscinelline species are predatory, but very little is known of their biology.

The species composition of different habitats appears divergent probably owing to host distribution, spreading ability of adults and possibly also microclimate. Further, some adult chloropids are attracted to sweet substrates present in a habitat, e.g. sap of fruits and trees, nectar and honeydew.

The present material of chloropids is provided by means of three different sampling methods: 1) Standardized sweep net catches in the upper part of the vegetation, however, the result is strongly influenced by thickness and height of the vegetation. 2) Water

traps which primarily attract flies from the vegetation above the trap, but also from the air above the vegetation, e.g. *O. frit.* 3) Pitfalls which in particular trap flies active on the soil surface or emerging from winter quarter in the litter layer. The three sampling methods yield different results, but applied together they contribute to a more complete picture of the species composition of a habitat. The different mode of operation of the sampling methods excludes quantitative analysis of the data, but differences in species composition between habitats may indicate different habitat preferences of the species concerned.

The Danish landscape is a mosaic landscape dominated by agricultural and urban areas. Of the total Danish area 57 % is cultivated and about 18 % is occupied by towns and traffic. Thus only about 25 % is left for natural habitats: forests (11.2 %), wet grassland (2.4 %), bogs and fens (2.3 %), heaths (2.3 %), lakes and streams (1.7 %), salt meadows

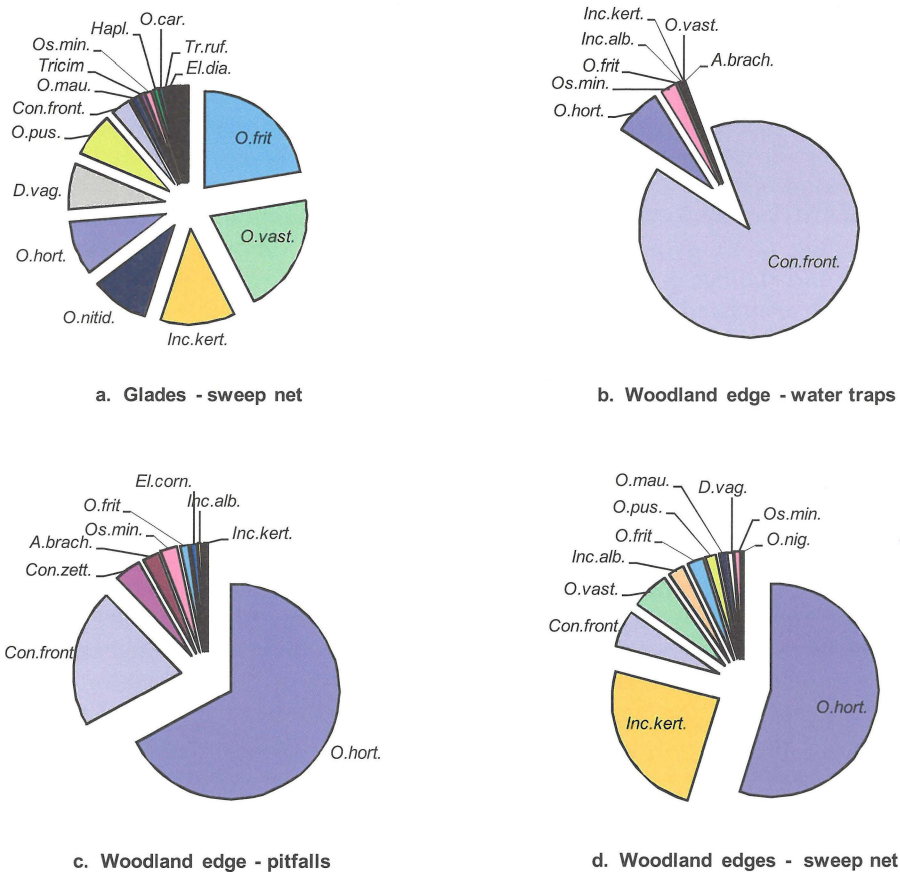


Fig. 6. Species composition of Oscinellinae in woodland. a: glades and roads, sweep net sampling (N = 1,158), b: a woodland edge, water trap sampling (N = 3,606), c: a woodland edge, pitfall sampling (N=1,544) and d: woodland edges, sweep net sampling (N = 250). For abbreviations see Table 2.

Fig. 6. Artssammensætning af Oscinellinae i skovland. a: lysninger og skovveje, ketcherfangst (N=1.158), b: et skovbryn, fangbakkefangst (N=3.606), c: et skovbryn, fangglasfangst (N=1.544) og d: skovbryn, ketcherfangst (N=250). Forkortelser: se Tabel 2.

(1.1 %), dry grassland (0.7 %), dunes and other sandy areas (0.2 %), and various minor habitats (3.0 %) (Levin & Normander, 2008).

Since most of the natural habitats in Denmark are islands in the farmland, it was expected that the most abundant oscinelline species recorded in farmland are also abundant in most natural habitats. According to Nielsen (L) (1994) *O. frit* was the most abundant species in annual grass, amounting to 71 % of all stemboring larvae. It was less abundant in perennial grass fields for hay as well as grazing (17 %) here *O. vastator* was predominant (55 % and 49 % respectively). In all fields *O. pusilla* was present but in lower numbers; the highest number was found in grazed fields (9 % of stemboring larvae). Of *O. frit*, more than 1000 larvae per sqm hibernated in Italian ryegrass (*Lolium multiflorum*) and of *O. vastator*, a similar number did so in perennial ryegrass (*L. perenne*). This high production of *O. frit* and *O. vastator* in farmland is clearly reflected in the present material, the two species together amounting to 41 % of the total number of Oscinellinae swept in natural habitats. Both species develop in a broad spectrum of host grasses which promotes their spreading ability, and in addition *O. frit* is spread by the wind during daily flights above the vegetation (Calnaido et al., 1965).

In woodland, the glades and roads are open for light and more or less covered with grasses, i.e. they are potential habitats for chloropids. In total 28 species of Oscinellinae were swept in glades, but 13 of them in small number ($N < 5$) (Fig. 6a). The ubiquitous herbivores *O. frit* and *O. vastator* were the most abundant species (42 %). Together with *O. nitidissima*, *O. hortensis* and *O. pusilla* they amounted to 69 % of the total number in sweep net catches from glades; *O. nitidissima* was most frequent in moist or shady places, whereas the other *Oscinella* species obviously prefer sunny sites. *Incertella kerteszi* was also common especially in glades near wet habitats.

In two sites, a spruce forest (Gludsted Plantage) and a small oak wood (Mols), several hundreds of *Conioscinella frontella* were trapped in white water traps placed 10-15 m above the forest floor, while it was rather scattered in the vegetation below. According to Wendt (1968) *C. frontella* prefers dry and warm habitats. Since both forests mentioned adjoin open, dry grass heaths, it is assumed that the flies trapped in the water traps were visitors from the open areas, possibly foraging on honeydew in the canopy. In this material males were predominant (90 % of the total). In an open, dry woodland edge with

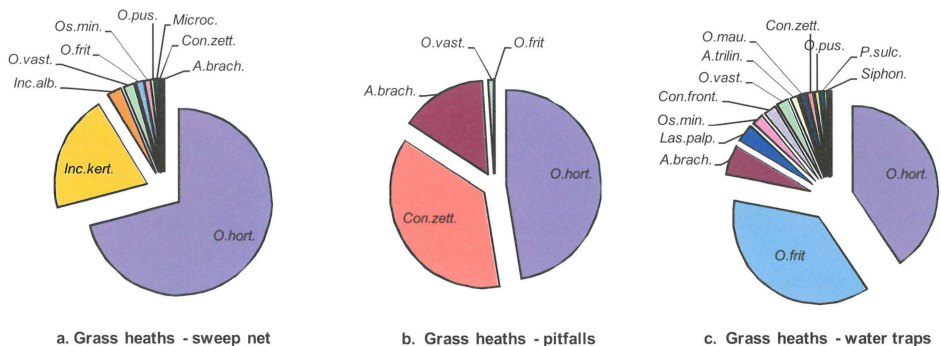


Fig. 7. Species composition of Oscinellinae in grass heaths. a: sweep net sampling ($N = 1,477$), b: pitfall sampling ($N = 2,428$) and c: water trap sampling ($N = 2,854$). For abbreviations see Table 2.

Fig. 7. Arts sammensætning af Oscinellinae på græsheder. a: ketcherfangst ($N=1.477$), b: fangglasfangst ($N=2.428$) og c: fangbakkefangst ($N=2.854$). Forkortelser: se Tabel 2.

Deschampsia flexuosa vegetation (Gludsted Plantage), *C. frontella* was trapped by the thousands, dominating the catch in white water traps situated on the ground (Fig. 6b); it was less abundant in pitfalls at the same site (Fig. 6c). In both cases males were predominant (70 % and 77 % respectively). In sweep net catches in the actual site and in woodland edges as a whole, the species was rather insignificant (Fig. 6d) and the sex ratio almost equal (54 % males). Seemingly, males of *C. frontella* were attracted to the traps, but not settling in the grass on their way between the open area and the forest canopy. A comparable dominance of males is seen in mass occurrences of *Chlorops hypostigma* visiting flowers (Nielsen, in prep.)

In grass heaths situated on dry, sandy soils, the vegetation is often dominated by *Deschampsia flexuosa* which is one of the preferred host grasses of *Oscinella hortensis* (Nielsen (L), 1994). In sweep net catches (fig. 7a) this species was in fact the most abundant herbivorous oscinelline amounting to 71 % of the total. Near humid patches within the heathland, *Incertella kerteszi* was also rather common (21 % of the total). The remaining 8 % counts 10 species, among these *O. vastator* and *O. frit*. In pitfalls too, *O. hortensis* was predominant (48 %, Fig. 7b), while two saprophageous oscinellines rarely swept in the grass were also significant, viz. *Conioscinella zetterstedti* with vestigial wings, and the short-winged *Aphanotrigonum brachypterum* which made up 37 % and 15 % respectively of the total. They were also trapped in pitfalls situated in an open, dry woodland edge (Fig. 6c). In water traps (Fig. 7c), *A. brachypterum* was regularly trapped (6 %), while *C. zetterstedti* was rare. Presumably both species are active on the ground, and *A. brachypterum* also in the lower layers of the vegetation. In the water traps, *O. hortensis* and *O. frit* were predominant; they were almost equally abundant (41 % and 37 % respectively), but since rather few individuals of *O. frit* were swept from the grass (Fig. 7a), this species was probably merely a visitor attracted to the white traps. Three oscinellines with

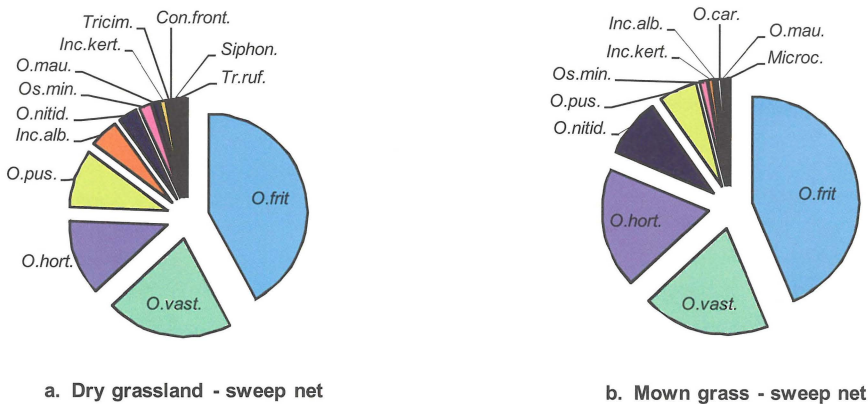


Fig. 8. Species composition of Oscinellinae from sweep net sampling in a: dry grassland and road verges (N = 3,327) and b: lawns and mown grassy paths (N = 2,192). Species of *Dicraeus* are omitted. For abbreviations see Table 2.

Fig. 8. Artsammensætning af Oscinellinae i ketcherfangst på a: tørre græsarealer (overdrev og vejkanter) (N=3.327) og b: plæner og klippede græsstier (N=2.192). Arter af *Dicraeus* er udeladt. Forkortelser: se Ta-

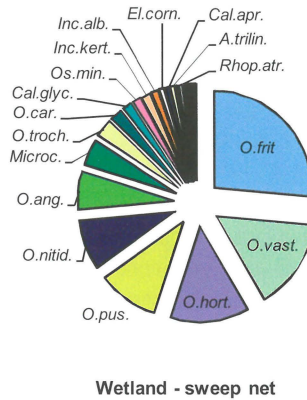


Fig. 9. Species composition of Oscinellinae swept in wetland: meadows, fens, bogs and edges of lakes and streams (N = 6,057). Species of *Dicraeus* are omitted. For abbreviations see Table 2.
 Fig. 9. Arts sammensætning af Oscinellinae i vådt græsland: Enge, moser samt sø- og åbredder, ketcherfangst (N=6.057). Arter af *Dicraeus* er udeladt. Forkortelser: se Tabel 2.

predatory larvae, *Lasiambia palposa*, *Polyodaspis sulcicollis* and *Siphonella oscinina*, were caught in several water traps in a grass heath (Mols). Only a few individuals of the first one was collected by sweeping. Probably the species are mainly active near the ground where the preferred hosts for oviposition may be found (egg pods of grasshoppers, egg cocoons of spiders, and coccoids at grass bases).

Dry grassland and road verges offer somewhat similar conditions: warm, dry, rather sandy soils with a dense sward of many grass species e.g. *Poa pratensis*, *Anthoxanthum odoratum*, *Arrhenaterum elatius*, *Dactylis glomerata*, *Festuca rubra*, *F. ovina*, *Agrostis capillaris* and *Elytrigia repens*. The species richness of Oscinellinae was accordingly high, and a total of 27 species were taken by sweeping (Fig. 8a). The vegetation of dry grassland and road verges is often low owing to shortage of water, extensive grazing or mowing. Grazing and mowing promote tillering of the grass, and about 88 % of the oscinellines in sweep net catches was actually stem-boring herbivores: *Oscinella frit*, *O. vastator*, *O. hortensis*, *O. pusilla* and *O. nitidissima*. *O. frit* was most abundant, but since this species is highly expansive, it is supposed that many individuals were visitors not ovipositing in the actual sites. In contrast, *O. vastator* and *O. pusilla* often establish large, local populations in perennial grass (Nielsen, 1985). The saprophages *Incetella albipalpis* and *Oscinimorpha minutissima* were common, but not abundant; they are both assumed to prefer grass shoots attacked by *Oscinella* species (Nartshuk & Pakalniškis 2004). Where the grasses were undisturbed and allowed to bloom, e.g. along ditches and verges, seed-eating *Dicraeus* species appeared temporarily in large numbers, *D. fennicus* in *Elytrigia repens* and *D. vagans* in *Arrhenaterum elatius*.

Lawns and mown grassy paths are often less dry, but also here the vegetation is held low, promoting tillering which attracts the herbivores (Fig. 8b). The herbivorous *Oscinella* species, *O. frit*, *O. vastator*, *O. hortensis* and *O. pusilla*, amounted to 87 % of the total in sweep net catches. In addition *O. nitidissima* was fairly common in shady, thus moist, places.

In wetlands: wet meadows, fens, bogs and edges of lakes and streams, a total of 39 oscinelline species were found (Fig. 9). In many wetland sites, a special flora of tall

grasses such as *Glyceria maxima*, *Phalaris arundinacea*, and *Phragmites australis* is abundant besides a variety of low meadow grasses like *Deschampsia cespitosa*, *Poa trivialis*, *Agrostis stolonifera* and *Festuca pratensis* together with species of *Eriophorum*, *Carex* and *Juncus*. The high diversity of grasses is reflected in a high proportion of host specific Oscinellines. The tall grasses are exploited by *Oscinella angularis* and *O. trochanterata* in *Phalaris arundinacea*, *Calamoncosis glyceriae* in *Glyceria maxima*, and species of *Lipara* inducing large galls in reed (*Phragmites australis*). In addition, the inquiline *Calamoncosis aprica*, *C. duinensis*, *C. minima*, *Oscinella angustipennis*, *Eribolus hungaricus* and *E. slesvicensis* were present in reed beds. In *Carex* and other Cyperaceae *O. cariciphila*, *Oscinisoma cognatum*, *Rhopalopterum anthracinum* and *R. atricorne* were swept in small numbers. Only little is known about their host preferences, but it is seemingly fairly narrow. In the low meadow grasses several species common in many humid or wet habitats were abundant, e.g. *Oscinella nitidissima* and *Microcercis trigonella* together with the widespread species: *O. frit*, *O. hortensis*, *O. pusilla* and *O. vastator* (Fig. 9). The saprophages *Oscinimorpha minutissima*, *Aphanotrigonum trilineatum*, *Incertella albipalpis*, *I. kerteszi*, *Elachiptera cornuta* and *E. diastema* were present, but in low numbers. The latter two are often hibernating behind leaf sheaths of tall grasses or of *Typha* (Nartshuk, 1962).

Coastal habitats along the outer Danish coasts like salt marshes and salt meadows were less thoroughly studied. In cattle-grazed salt meadows at the Wadden Sea, the ubiquitous *Oscinella* species *O. frit*, *O. vastator* and *O. pusilla* were abundant, while *O. hortensis* was rare. Only *Oscinimorpha albisetosa* seems specific for the salt habitats; it was reared from grazed *Puccinellia* in the North Sea marshes by Tschirnhaus (1981), but also present in inland salt sites in Germany (Wendt, 1993).

To some extent the oscinelline fauna of coastal meadows and epilittoral grassland along the inner Danish coasts resemble that of freshwater meadows and dry grassland respectively, but the only locality for *Incertella nigrifrons* is a coastal meadow with patches of *Juncus gerardii*. Along the inner as well as outer Danish coasts the wreck-layer just above sea level may be exploited by *Aphanotrigonum cinctellum* and *A. femorellum*. (Tschirnhaus, 1981).

Sampling by means of sweep net is a common and simple qualitative method with limitations. Since it is seriously influenced by vegetation height and structure, species living in the lower layer of the vegetation or running on the soil surface are overlooked. From the preceding it appears that supplementary sampling by means of water traps and pitfalls adds important information regarding abundance, level of activity and mobility of such species.

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Table 1. List of Oscinellinae recorded from Denmark. Numbers recorded during the actual investigation and present in the collection of Carl C. R. Larsen (CRL).

– Not found during the actual investigation, but present in Denmark according to Nartshuk & Andersson (2013).

○ Recorded from Denmark (Nielsen, 1962). Not found later, and not recorded from Denmark in Nartshuk & Andersson (2013).

+ New to the Danish fauna.

Tabel 1. Liste over Oscinellinae registreret fra Danmark. Antal fundet i den aktuelle undersøgelse og i Carl C. R. Larsens samling (CRL).

– Ikke fundet i den aktuelle undersøgelse, men registreret for Danmark af Nartshuk & Andersson (2013).

○ Rapporteret fra Danmark (Nielsen, 1962), ikke fundet senere og ikke registreret af Nartshuk & Andersson (2013).

+ Ny for den danske fauna

	Nos	CRL
Elachiptera brevipennis (Meigen, 1830)	1	5
Elachiptera cornuta (Fallén, 1820)	83	32
Elachiptera diastema Collin, 1946	26	
Elachiptera tuberculifera (Corti, 1909)	2	
Dicraeus fennicus Duda, 1933	454	
– Dicraeus ingratus (Loew, 1866)		
– Dicraeus nitidus (Wahlgren, 1913)		
+ Dicraeus raptus (Haliday, 1838)	1	
– Dicraeus styriacus (Strobl, 1898)		
Dicraeus tibialis (Macquart, 1835)	93	
Dicraeus vagans (Meigen, 1838)	1,230	4
Lipara lucens Meigen, 1830	63	32
Lipara pullitarsis Doskocil & Chvála, 1971	56	
○ Lipara rufitarsis Loew, 1858		

	<i>Calamoncosis aprica</i> (Meigen, 1830)	88	
	<i>Calamoncosis duinensis</i> (Strobl, 1909)	16	
	<i>Calamoncosis glyceriae</i> Nartshuk, 1958	97	7
	<i>Calamoncosis minima</i> (Strobl, 1893)	1	
	<i>Siphonella oscinina</i> (Fallén, 1820)	24	1
	<i>Polyodaspis sulcicollis</i> (Meigen, 1838)	18	
-	<i>Lasiambia brevibucca</i> (Duda, 1933)		
	<i>Lasiambia palposa</i> (Fallén, 1820)	106	
	<i>Aphanotrigonum brachypterum</i> (Zetterstedt, 1848)	573	
	<i>Aphanotrigonum cinctellum</i> (Zetterstedt, 1848)	1	2
	<i>Aphanotrigonum femorellum</i> Collin, 1946	1	2
	<i>Aphanotrigonum hungaricum</i> Dely-Draskovits, 1981	1	
-	<i>Aphanotrigonum inerme</i> Collin, 1946		
	<i>Aphanotrigonum nigripes</i> (Zetterstedt, 1848)	121	
	<i>Aphanotrigonum trilineatum</i> (Meigen, 1830)	97	1
-	<i>Colliniella mejeri</i> (Duda, 1933)		
	<i>Tricimba cincta</i> (Meigen, 1830)	43	
-	<i>Tricimba lineella</i> (Fallén, 1820)		
	<i>Trachysiphonella ruficeps</i> (Macquart, 1835)	18	
	<i>Trachysiphonella scutellata</i> (von Roser, 1840)	2	1
	<i>Oscinimorpha albisetosa</i> (Duda, 1932)	9	
+	<i>Oscinimorpha arcuata</i> (Duda, 1932)	2	
	<i>Oscinimorpha minutissima</i> (Strobl, 1900)	443	
	<i>Conioscinella frontella</i> (Fallén, 1820)	4,253	16
	<i>Conioscinella gallarum</i> (Duda, 1933)	2	
	<i>Conioscinella mimula</i> Collin, 1946	4	
	<i>Conioscinella sordidella</i> (Zetterstedt, 1848)	8	
	<i>Conioscinella zetterstedti</i> Andersson, 1966	1,328	4
	<i>Speccafrons halophila</i> (Duda, 1933)	4	
	<i>Incertella albipalpis</i> (Meigen, 1830)	355	
-	<i>Incertella antennata</i> (Collin, 1946)		
	<i>Incertella kerteszi</i> (Becker, 1910)	660	
+	<i>Incertella nigrifrons</i> (Duda, 1933)	61	
	<i>Incertella scotica</i> (Collin, 1946)	12	
-	<i>Incertella zuercheri</i> (Duda, 1933)		
-	<i>Microcercis kroeberi</i> (Duda, 1935)		
	<i>Microcercis trigonella</i> (Duda, 1933)	312	
	<i>Oscinella angularis</i> Collin, 1946	406	
+	<i>Oscinella angustipennis</i> Duda, 1933	85	
-	<i>Oscinella capreolus</i> (Haliday, 1838)		
+	<i>Oscinella cariciphila</i> Collin, 1946	147	
	<i>Oscinella frit</i> (Linnaeus, 1758)	6,458	30
	<i>Oscinella hortensis</i> Collin, 1946	6,610	9
	<i>Oscinella maura</i> (Fallén, 1820)	133	4
	<i>Oscinella nigerrima</i> (Macquart, 1835)	25	
	<i>Oscinella nitidissima</i> (Meigen, 1838)	1,040	2
	<i>Oscinella pusilla</i> (Meigen, 1830)	1,302	7
	<i>Oscinella trochanterata</i> Collin, 1946	185	2
	<i>Oscinella vastator</i> (Curtis, 1845)	2,540	30
+	<i>Hapleginella laevifrons</i> (Loew, 1858)	16	
	<i>Eribolus danicus</i> Nartshuk & Andersson, 2013	1	
+	<i>Eribolus gracilior</i> (de Meijere, 1918)	1	
	<i>Eribolus hungaricus</i> Becker, 1910	21	

-	Eribolus nana (Zetterstedt, 1838)		
+	Eribolus slesvicensis Becker, 1910		1
	Rhopalopterum anthracinum (Meigen, 1830)		6
+	Rhopalopterum atricorne (Zetterstedt, 1838)		29
	Rhopalopterum fasciola (Meigen, 1830)		2
	Oscinisma cognatum (Meigen, 1830)		7
+	Oscinisma germanicum (Duda, 1932)		1
+	Oscinisma gilvipes (Loew, 1858)		2

Table 2. Abbreviations in figs 6-9.

Tabel 2. Forkortelser anvendt i fig. 6-9

<i>A.brach.</i>	<i>Aphanotrigonum brachypterum</i>	<i>O.car.</i>	<i>Oscinella cariciphila</i>
<i>A.trilin.</i>	<i>Aphanotrigonum trilineatum</i>	<i>O.frit</i>	<i>Oscinella frit</i>
<i>Cal.apr.</i>	<i>Calamoncosis aprica</i>	<i>O.hort.</i>	<i>Oscinella hortensis</i>
<i>Cal.glyc.</i>	<i>Calamoncosis glyceriae</i>	<i>O.mau.</i>	<i>Oscinella maura</i>
<i>Con.front.</i>	<i>Conioscinella frontella</i>	<i>O.nig.</i>	<i>Oscinella nigerrima</i>
<i>Con.zett.</i>	<i>Conioscinella. zetterstedti</i>	<i>O.nitid.</i>	<i>Oscinella nitidissima</i>
<i>D.vag.</i>	<i>Dicraeus vagans</i>	<i>O.pus.</i>	<i>Oscinella pusilla</i>
<i>El.corn.</i>	<i>Elachiptera cornuta</i>	<i>O.troch.</i>	<i>Oscinella trochanterata</i>
<i>El.dia.</i>	<i>Elachiptera diadema</i>	<i>O.vast.</i>	<i>Oscinella vastator</i>
<i>Hapl.</i>	<i>Hapleginella laevifrons</i>	<i>Os.min.</i>	<i>Oscinimorpha minutissima</i>
<i>Inc.alb.</i>	<i>Incertella albipalpis</i>	<i>P.sulc.</i>	<i>Polyodaspis sulcicollis</i>
<i>Inc.kert.</i>	<i>Incertella kerteszi</i>	<i>Rhop.atr.</i>	<i>Rhopalopterum atricornis</i>
<i>Las.palp.</i>	<i>Lasiambia palposa</i>	<i>Siphon.</i>	<i>Siphonella oscinina</i>
<i>Microc.</i>	<i>Microcercis trigonella</i>	<i>Tr.ruf.</i>	<i>Trachysiphonella ruficeps</i>
<i>O.ang.</i>	<i>Oscinella angularis</i>	<i>Tricim.</i>	<i>Tricimba cincta</i>