

# ***Nephrotoma* Meigen, 1803 (Diptera, Tipulidae) as potential agricultural pests in Norway**

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Hofsvang, T. 2010. *Nephrotoma* Meigen, 1803 (Diptera, Tipulidae) as potential agricultural pests in Norway. *Norw. J. Entomol.* 57, 12–16.

Two Malaise traps were set up at Ås, Southern Norway, during the growing seasons 1992–1997, one trap in an organic grown barley field and one in its boundary. Totally 23 species of Tipulidae (Diptera) were identified, of these eight species belonged to the genus *Nephrotoma* Meigen, 1803. Of the total specimens collected 93% of the males and 88% of the females belonged to this genus. Comparing the two traps, 80% of the *Nephrotoma* specimens were recorded in the organic field. It is discussed if larvae of *Nephrotoma* spp. in Norway can be potential pests in agricultural crops as reported from other countries.

Key words: *Nephrotoma*, Tipulidae, agricultural pests

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## **Introduction**

Larvae of some species of Tipulidae (Diptera) are considered as agricultural pests in many crops, especially the species in the subgenus *Tipula* Linnaeus, 1758. In Norway, larvae of *Tipula* (*Tipula*) *paludosa* Meigen, 1830 are regarded as the most important pest, especially in cereals and grasslands along the coast of Western Norway (Hofsvang 1981). In other countries larvae of the genus *Nephrotoma* Meigen, 1803 have also been reported as pests in many crops (Forsslund 1954, Chriswell 1956, Theowald 1957, Oosterbroek 1978, 1979, Jones & Jones 1984, Alford 1991, 2007, Blackshaw & Coll 1999). However, plant damage from *Nephrotoma* larvae has never been reported from Norway.

## **Material and methods**

The study was carried out in a 15.5 ha organically grown field and its boundary at the Norwegian University of Life Sciences at Ås, AK (EIS 28)

during six years (1992–1997). Each year one Malaise trap was placed in the spring barley crop (one sixth of the field) 60 m from the wooded boundary. A second Malaise trap was placed along the boundary, except for 1994. Because of crop rotation, the traps changed position every year. The collecting bottles contained 70% alcohol, and the traps were emptied a least once a week during the growing season (May–November). Adult Tipulidae were sorted out and stored at 70% alcohol. More information about the crop rotation, boundary vegetation, and the exact position of the Malaise traps are given in Hågvar et al. (1998), where also the average monthly temperature and precipitation from an automatic weather station 1 km away are given.

## **Results**

Table 1 shows the 23 species of Tipulidae recorded in the barley field or in the boundary during the six years. Only males were identified to species level. Males dominated and constituted 72.5% of the

**Table 1.** Tipulidae species and number of specimens in one Malaise trap in a barley field and in one trap in its boundary, 1992–1997, Ås. No trap was placed in the boundary in 1994.

Trap	Barley field						Boundary					Total
	1992	1993	1994	1995	1996	1997	1992	1993	1995	1996	1997	
Year												
Sampling period (date start-end)	13.05	10.05	16.05	16.05	11.06	08.04	07.05	05.05	02.05	23.04	08.04	
	02.09.	20.08	08.08	25.08	15.10	11.11	29.10	03.11	12.09	15.10	11.11	
MALES												
<i>Nephrotoma aculeata</i> (Loew, 1871)					1					2		3
<i>Nephrotoma analis</i> (Schummel, 1833)				3							1	4
<i>Nephrotoma appendiculata appendiculata</i> (Pierre, 1919)	53	5	1	11	11	14	1		9		6	111
<i>Nephrotoma cornicina cornicina</i> (L., 1758)	1		9	1	11	12						34
<i>Nephrotoma dorsalis</i> (Fabricius, 1781)									1			1
<i>Nephrotoma flavescens</i> (L., 1758)	67	5	95	39	48	74	2		27	2	62	421
<i>Nephrotoma scurra</i> (Meigen, 1818)	2	1	7	34	8	31						83
<i>Nephrotoma tenuipes</i> (Riedel, 1910)											1	1
<i>Nigrotipula nigra nigra</i> (L., 1758)					1							1
<i>Prinocera subserricornis</i> (Zetterstedt, 1851)		1										1
<i>Tipula (Tipula) paludosa</i> Meigen 1830				15	4				1			20
<i>Tipula (Tipula) subcunctans</i> Alexander, 1921					1	1						2
<i>Tipula (Lunatipula) fascipennis</i> Meigen, 1818		1							5		2	8
<i>Tipula (Lunatipula) lunata</i> L., 1758									2			2
<i>Tipula (Pterelachisus) submarmorata</i> Schummel, 1833									1			1
<i>Tipula (Pterelachisus) varipennis</i> Meigen, 1818										1		1
<i>Tipula (Savtshenkia) pagana</i> Meigen, 1818					3							3
<i>Tipula (Savtshenkia) signata</i> Staeger, 1840											2	2
<i>Tipula (Schummelia) variicornis variicornis</i> Schummel, 1833									1			1
<i>Tipula (Vestiplex) nubeculosa</i> Meigen, 1804											1	1

**Table 1.** continued.

Trap	Barley field						Boundary					Total
	1992	1993	1994	1995	1996	1997	1992	1993	1995	1996	1997	
Year	1992	1993	1994	1995	1996	1997	1992	1993	1995	1996	1997	
Sampling period (date start-end)	13.05	10.05	16.05	16.05	11.06	08.04	07.05	05.05	02.05	23.04	08.04	
	02.09.	20.08	08.08	25.08	15.10	11.11	29.10	03.11	12.09	15.10	11.11	
<i>Tipula (Vestiplex) scripta scripta</i> Meigen, 1830								1	1			2
<i>Tipula (Yamatotipula) coeruleascens</i> Lackschewitz, 1923									1			1
<i>Tipula (Yamatotipula) pruinosa</i> <i>pruinosa</i> Wiedemann, 1817											1	1
Total number of specimens	123	13	112	103	88	132	3	1	49	5	76	705
Total number of species	4	5	4	6	9	5	3	1	10	3	8	23
FEMALES												
<i>Nephrotoma</i> spp.	65	13	29	28	26	39	4	2	16	4	11	237
<i>Tipula</i> spp.			1	8	3	11	1	1	4		1	30
<i>Tanyptera</i> spp.	1											1
Total number of specimens	66	13	30	36	29	50	5	3	20	4	12	268

total catches (Table 1). From the boundary trap 17 species were identified compared with 13 species from the barley trap. All species have earlier been reported from the inner part of the Oslofjord area or from Sørlandet with one exception, *Prinocera subsericornis* (Zetterstedt, 1851) has not been reported south of Hardangervidda (Hofsvang 1986, 1993).

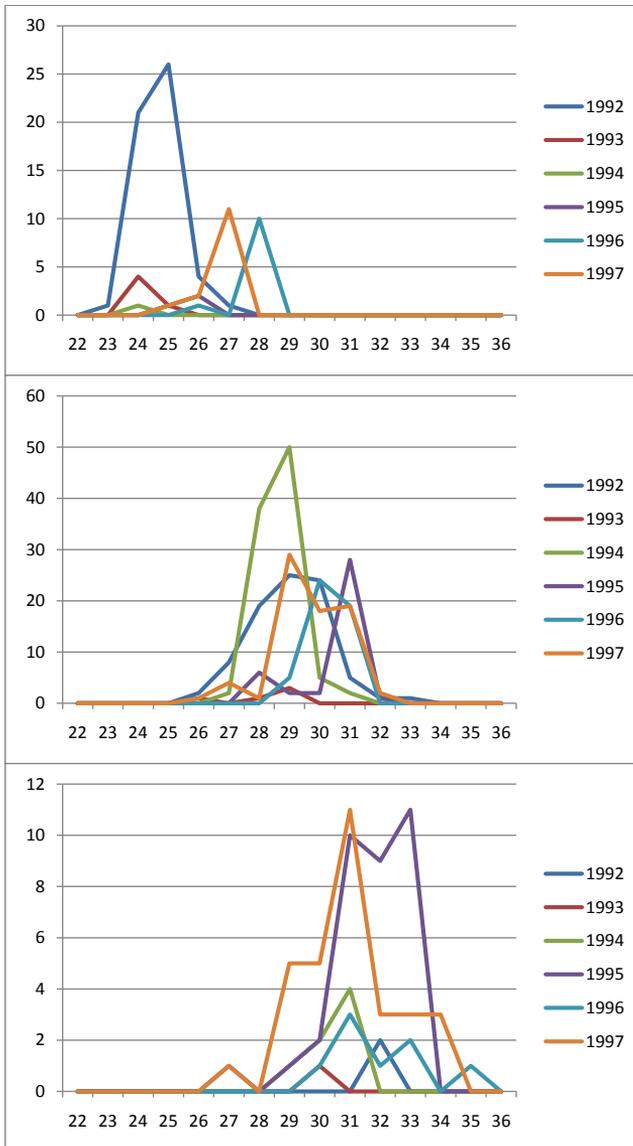
Four species of *Tipula* were collected from the barley field compared with 11 *Tipula* species from the boundary trap. Six species of *Nephrotoma* were observed, both from the barley and boundary trap. Comparing all years where two traps were in operation, both in the barley field and in the boundary (1992–1993 and 1995–1997), 80% of all *Nephrotoma* specimens (males and females) were caught in the barley field. Three of the species were found rather frequently in the barley field, *Nephrotoma appendiculata appendiculata* (Pierre, 1919), *Nephrotoma flavescens* (Linnaeus, 1758) and *Nephrotoma scurra* (Meigen, 1818) (Table 1). The flight period of *N. appendiculata appendiculata* males shows an early peak in June, males of the most abundant species, *N. flavescens*, are observed throughout July, followed by *N. scurra* with a flight period towards the end of July and in August (Figure 1). Two of the four

most abundant *Nephrotoma* species in the barley field, *Nephrotoma cornicina cornicina* (Linnaeus, 1758) and *N. scurra*, were never observed in the boundary trap (Table 1).

The low activity of Tipulidae in 1993 was probably due to low temperature in June–September that year.

## Discussion

Several species of Tipulidae are serious pests in horticultural and agricultural crops. The larvae of both the genera *Tipula* and *Nephrotoma* are soil pests damaging the roots, cutting the stem of young plants or cutting off the lower leaves and dragging them down into the soil. The two most important species in Europe and North America are *T. paludosa* and *Tipula (Tipula) oleracea* Linnaeus, 1758 (Blackshaw & Coll 1999, Peck et al. 2006). The only record of *T. oleracea* from Norway is a single female from Finnøy (Skartveit 2006), while *T. paludosa* is distributed all over Norway north to Bodø and is reported as a serious agricultural pest especially in the coastal areas (Hofsvang 1981). *Tipula (Tipula) subcunctans* Alexander, 1921 which is the third species in the subgenus *Tipula* recorded in Norway, has been



**Figure 1.** Number of specimens of the three most abundant *Nephrotoma* species in the barley field shown as weekly catches in a Malaise trap (week no. indicated). *N. appendiculata* (upper), *N. flavescens* (middle) and *N. scurra* (lower part)

reported as a pest on golf lawns (Hofsvang & Salinas 2001). Several species in the genus *Nephrotoma* are also pests in agricultural and horticultural crops, e.g. in grass crops (Jones & Jones 1984), in oats, rye and sugar beets (Oosterbroek 1978), in strawberries and raspberries (Alford 2007) and in ornamental plants (Alford 1991).

The larvae of the four most abundant *Nephrotoma* species found in the barley field (Table 1) have been recorded from open grassland, meadow or gardens (Forsslund 1954, Chriswell 1956, Theowald 1957, Oosterbroek 1978, 1979). The six year study of the barley field emphasized leaf miner flies (Agromyzidae) as the main pest (Hågvar et al. 1998), so damage of potential soil pests was not investigated. However, on the basis of literature records of *Nephrotoma* larvae as soil pests, one cannot exclude abundant species as *N. flavescens* (Table 1) as “hidden” pest species in Norwegian grassland and cereal fields. This species has been recorded from many localities in the southern part of Norway, but also from Sunndal, Møre og Romsdal county (Hofsvang et al. 1993), an coastal area where tipulid damage is common.

A closer study of tipulid larvae in cereals and grassland should be performed. The collected larvae should preferably be reared as adults to check the species. Larvae of *Tipula* and *Nephrotoma* are also easily identified to genus level (Chriswell 1956, Theowald 1957).

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Received: 27 April 2010

Accepted: 7 June 2010