Adult craneflies (Diptera: Nematocera) around springs in southern Finland

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Adult craneflies were collected along 27 springs and springbrooks in 1999 and 2000 in southern Finland (biogeographical provinces of Ab, N, St and Ta). A total of 95 species (24 Tipulidae, 2 Cylindrotomidae, 54 Limoniidae, 12 Pediciidae and 3 Ptychopteridae) and 2714 individuals were identified. The material was collected by Malaise and window traps and by sweep netting. *Tricyphona immaculata* (Meigen), *Pedicia rivosa* (Linnaeus), *P. straminea* (Meigen) and *Paradelphomyia fuscula* (Loew) were the most common and often most abundant species. *Erioptera pederi* Tjeder, *Molophilus bifidus* Goetghebuer, *M. bihamatus* de Meijere, *M. corniger* de Meijere, *Lipsothrix ecucullata* Edwards, *Dicranota pavida* (Haliday) and *Ula mixta* Starý are reported for the first time from Finland.

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1. Introduction

In temperate regions springs are summer cool and winter warm habitats and they provide a relatively stable environment: constant flow and temperature regime. Northern, cold stenothermic species might have relict populations in springs in southern latitudes and southern species, which are not able to tolerate below 0 °C winter temperatures, are able to survive in springs in northern latitudes (e.g. Nielsen 1950). Perhaps no aquatic insect is strictly confined to spring habitats, but in some parts of their range they may occur exclusively in springs (Lindegaard 1995, Wagner *et. al*. 1998).

In this study the major spring types are classified as in Smith (1991): (1) Helocrene: habitat in which emergent groundwater continuously percolates through a layer of detritus or a mat of vegetation; (2) Rheocrene: habitat in which emergent groundwater flows over a substrate consisting primarily of gravel or sand; (3) Limnocrene: habitat in which emergent groundwater forms a stenothermic pool. Often the types co-occur, for instance when a spring has both helocrene and rheocrene characteristics (Table 1). Emergent groundwater flows downstream in a springbrook, and with increased distance from a spring source, the physical characteristics of the springbrook change and become more like the characteristics of surface-fed streams in the same area (e.g. McCabe 1998).

The dipteran families Tipulidae, Cylindrotomidae, Limoniidae, Pediciidae and Ptychopteridae are found througout the Palaearctic region and their larvae inhabit a diverse array of habitats like moist or dry soil, decaying wood, fungi and terrestrial plants. However, a majority of limoniid, pediciid and ptychopterid species and some genera of Tipulidae and Cylindrotomidae are considered to be aquatic/semiaquatic or their larvae dwell in thin films of running water (madicolous or hygropetric habitats) (e.g. Mendl 1978,

Table 1. Location of the study springs and their environmental data. Surroundings: NAT = Naturalness (0 = natural state lost, e.g. surroundings partly clearcut or inlet/outlet brooks built; 2 = small scale disturbance, e.g. surroundings with slight silvacultural treatments, small or old constructions; 3 = almost or totally undisturbed); FOR = % Forest; CT = % Clearcut or thicket; BOG = % Open or semi-open bog; TREE = Dominating tree species (D = deciduous tree; P = pine; S = spruce). Spring: AREA = Spring area (0 = <10 m^2; 1 = 10–100 m^2; 2 = 101–1000 m^2; 3 = >1000 m^2); HEL = Helocrene (= vegetation cover, %); RHEO = Rheocrene (emergent groundwater flowing over a sandy substrate, %); LIM = Limnocrene (= pool area, %); POV = Pool volume (0 = no spring pool; 1 = <1 m^3; 2 = 1–10 m^3; 3 = >10 m^3); BROw = Springbrook width (1 = 0.1–0.5 m; 2 = 0.6–1 m; 3 = >1 m); BROb = dominating bottom material in springbrook (1 = coarse detritus; 2 = mud; 3 = silt-sand; 4 = mosses (esp. *Fontinalis*).

	Surroundings (about 50 m radius)					Spring						
	NAT	FOR	CT	BOG	TREE	AREA	RHEO	HEL	LIM	POV	BROw	BROb
1. Prästkärret, Karjaa (Ab)	3	100	0	0	S	0	0	0	100	2	1	2, 4
2. Varvarinsuo, Karjaa (Ab)	1	0	70	30	D	1	0	100	0	0	2	1, 2
3. Källviken, Parainen (Ab)	2	80	20	0	P	0	80	0	20	1	1	3, 2
4. Ruostelähde, Parainen (Ab)	2	80	20	0	S, D	1	0	0	100	3	2	2
5. Lähdesuo, Perniö (Ab)	3	40	0	60	P, D	2	0	80	20	2	1	2, 1
6. Puolakanlähde, Perniö	3	100	0	0	S	2	0	100	0	0	2	2
7. Yrjännummi, Perniö (Ab)	2	90	10	0	S	1	0	100	0	0	1	2, 4
8. Lohioja, Perniö (Ab)	3	30	0	70	P, S	1	0	80	20	1	2	2, 4
9. Lähteensuo, Perniö (Ab)	3	50	0	50	P	2	0	10	90	3	2	2
10. Kiehuvalähde, Kiikala (Ab)	2	80	20	0	D, S	1	100	0	0	0	2	3
11. Varesjoki Kiikala (Ab)	3	80	0	20	S	3	0	100	0	0	1	1, 2
12. Kultalähde, Kiikala (Ab)	3	90	0	10	S, D	3	0	50	50	3	3	2, 4
13. Lamminlähde, Kiikala (Ab)	1	80	20	0	S, D	2	0	50	50	2	2	2, 4
14. Pyykorpi, Espoo (N)	2	100	0	0	D	2	0	100	0	0	1	1, 2
15. Isosuo, Espoo (N)	2	80	20	0	S	1	0	0	100	2	2	2, 4
16. Kiljava, Nurmijärvi (N)	3	100	0	0	S	3	0	100	0	0	2	3, 1
17. Petkelsuo, Hyvinkää (N)	3	80	0	20	S, D	3	0	80	20	3	2	2, 4
18. Hossojanlähde, Kiikala, Somero (Ab, Ta)	2	80	0	20	P	1	0	0	100	2	3	2
19. Yrttikorpi, Somero (Ta)	2	90	10	0	S, D	3	0	95	5	2	2	2, 1
20. Hirviniemenlähde, Tampere (Ta)	2	90	10	0	S, D	0	0	0	100	2	2	2
21. Katajajärventie, Ruovesi (Ta)	3	100	0	0	S	0	0	100	0	0	1	2
22. Viinikka, Ruovesi (Ta)	2	60	40	0	S	2	0	100	0	0	3	3, 4
23. Ryövärinkuoppa, Ruovesi	3	100	0	0	S	2	100	0	0	0	3	3, 4
24. Runeberginlähde, Ruovesi (Ta)	2	100	0	0	D	2	0	0	100	3	3	3, 4
25. Narvin uhrilähde, Jämijärvi (St)	3	100	0	0	S, D	3	0	30	70	3	3	2, 4
26. Konkanneva, Ikaalinen (St)	3	30	0	70	P	1	100	0	0	0	2	3, 2
27. Kivistönlähde, Ikaalinen (St)	1	60	40	0	S, D	2	0	90	10	2	2	2, 3

Theowald 1978). Some members of the family Tipulidae are important in detritus processing (Caspers 1980a) and pediciids may be the top invertebrate predators in small and shallow water bodies, like springs (Iversen 1988).

The Finnish cranefly fauna, especially families Limoniidae and Pediciidae, is relatively poorly known; both faunistic and ecological notes are scarce. Only two recent papers dealing with the cranefly fauna of northern Finland are available (Siitonen 1984, Viramo 1992).

In northern Europe invertebrates of springs have been studied mainly in Denmark (e.g. Lindegaard *et. al*. 1998). However, the methods used in these studies, including only benthic samples, have not made it possible to identify craneflies to species level due to the poor knowledge of the immature stages. In contrast, many emergence or larval breeding studies have been performed in Central Europe and the cranefly fauna of springs and springbrooks is relatively well known in these areas (Dittmar 1955, Gümbel 1976, Maiworm 1984, Fischer *et al*. 1998, Sternberg 1998, Wagner *et al*. 1998). These studies show that craneflies can be abundant and species diversity can be high in springs.

2. Material and methods

Adult craneflies were collected in 1999 and 2000 by Malaise or window traps or by sweeping adult insects among vegetation with a sweep net. Ethylene glycol or formaldehyde was used as preservative in the traps and the insects were preserved in 70% alcohol. The collecting intervals varied between two weeks and two months. The material collected by the sweep net was immediately stored in alcohol. The sampling intensity varied between springs: some were sweepnetted only once and others were very intensively sampled, using several Malaise and window traps and sweepnetting on multiple occasions (Table 2.). The samples were taken within a 30 m radius from the groundwater discharge area. Locations of the study springs and their environmental data are given in Table 1.

Most craneflies could be identified with a dissecting microscope, but some species of *Paradelphomyia*, *Pilaria*, *Lipsothrix*, *Dicranota* and *Ula* were mounted on microscope slides and studied later under a higher magnification. Identifications are based mainly on male genitalia. Species and their abundances in each spring are given in the Appendix. Nomenclature and order for Tipulidae is after Oosterbroek and Theowald (1992), for Cylindrotomidae after Soós and Oosterbroek (1992), for Limoniidae and Pediciidae after Reusch and Oosterbroek (1997) and for Ptychopteridae after Rozkosný (1992).

3. Observations on the occurence of some species and comments on their ecology

3.1. Tipulidae

Altogether 24 (27% of the Finnish species) tipulid species were recorded. A majority of the species were caught only once and in low numbers of individuals. Along with these occasional species, *Tipula fulvipennis*, *T. variicornis* and *T. grisescens* occured in eight or more springs, but never in large numbers of individuals. *Tipula fulvipennis* and *T. variicornis* have a wide distribution in Europe (Oosterbroek & Theowald 1992) and are only occasionally reported in springs or springbrooks (Dittmar 1955, Maiworm 1984); their larvae may dwell in terrestrial, semiaquatic or hygropetric

Table 2. Sampling methods in springs in southern Finland. Malaise = number of Malaise traps; window = number of window traps; sweepnet = times when visited to sweep net flies.

Spring	Malaise	Window	Sweepnet
1. Prästkärret	1	–	–
2. Varvarinsuo	1	–	–
3. Källvik	–	1	7
4. Ruostelähde	–	–	4
5. Lähdesuo	–	–	4
6. Puolakanlähde	–	–	5
7. Yrjännummi	–	–	1
8. Lohioja	–	–	4
9. Lähteensuo	–	–	4
10. Kiehuvalähde	–	–	2
11. Varesjoki	2	–	–
12. Kultalähde	1	3	4
13. Lamminlähde	–	2	2
14. Pyykorpi	2	–	–
15. Isosuo	1	–	–
16. Kiljava	2	–	1
17. Petkelsuo	–	–	1
18. Hossojanlähde	–	–	1
19. Yrttikorpi	3	4	5
20. Hirviniemenlähde	–	–	3
21. Katajajärventie	–	–	2
22. Viinikka	–	–	2
23. Ryövärinkuoppa	–	4	4
24. Runeberginlähde	–	3	4
25. Narvin uhrilähde	–	2	1
26. Konkanneva	–	2	2
27. Kivistönlähde	–	2	2

habitats (Theowald 1978, Brinkmann 1991). *Tipula grisescens* has a boreo-alpine distribution (Theowald & Oosterbroek 1985) and it is reported from subalpine elevations in Norway (Hofsvang *et al*. 1987) and Switzerland (Dufour 1992) and rarely from springs (Dittmar 1955). The larvae of the subgenus *Satshenkia*, like *T. grisescens* and five other *Savtshenkia* species collected in this study, are found near water margins or in wet moss (Hofsvang & Hågvar 1976, Dufour 1992).

Dolichopeza albipes and *Tipula maxima* are typical species in springs in Central Europe (Wagner *et al*. 1998), but in this study they both were only collected in a single locality, Varesjoki, Kiikala. *Tipula alpium,* collected in Pyykorpi spring, has earlier been recorded only once in Finland, Turku (Ab) (Rautio 1986).

Flight periods of the family Tipulidae are given in Table 3. A great part of the adult tipulids were caught in June and July, but *T. subnodicornis* and *T. grisescens* seem to be vernal and *T. interserta*, *T. pagana* and *T. limbata* autumnal species (*see* Hofsvang *et al*. 1993).

3.2. Cylindrotomidae

Two cylindrotomids, *Phalacrocera replicata* (aquatic) and *Cylidrotoma distinctissima* (terrestrial), were recorded in this study. Adult flies of *Cylindrotoma distinctissima* were recorded from June till September and *P. replicata* in June. *Phalacrocera replicata*, whose larvae live within mosses in lentic and slowly flowing waters (Peus 1952), was trapped only from one spring. Brodo (1995) noted *P. replicata* from a small pond above the tree line in South Norway.

3.3. Limoniidae

Altogether 54 species of the family Limoniidae

Table 3. Temporal succession of Tipulidae around springs in southern Finland. I = first two weeks of the month and II = the latter part of the month. 1 = 1–10 individuals; 2 = 11–30 ind. and 3 = >30 ind.

Species	May		June/July			Aug	Sep		Oct	
	I	II	I	II–I	II	I–II	I	II	I	II
Tipula subnodicornis	1	1	1	–	–	–	–	–	–	–
Tipula grisescens	1	2	–	–	–	–	–	–	–	–
Tipula variipennis	–	1	1	–	–	–	–	–	–	–
Tipula nubeculosa	–	1	2	1	–	–	–	–	–	–
Dictenidia bimaculata	–	1	–	1	–	–	–	–	–	–
Tipula variicornis	–	–	1	3	1	–	–	–	–	–
Tanyptera nigricornis	–	–	1	–	–	–	–	–	–	–
Tanyptera atrata	–	–	1	–	–	–	–	–	–	–
Tipula fulvipennis	–	–	1	1	1	–	–	–	–	–
Tipula irrorata	–	–	1	1	–	–	–	–	–	–
Tipula lateralis	–	–		1	–	–	–	–	–	–
Tipula lunata	–	–	1	1	–	–	–	–	–	–
Tipula scripta	–	–	1	1	–	–	–	–	–	–
Tipula unga	–	–	–	1	–	–	–	–	–	–
Nephrotoma flavescens	–	–	–	1	–	–	–	–	–	–
Tipula fascipennis	–	–	–	1	–	–	–	–	–	–
Tipula limitata	–	–	–	1	–	–	–	–	–	–
Tipula alpium	–	–	–	1	–	–	–	–	–	–
Dolichopeza albipes	–	–	–	1	–	–	–	–	–	–
Tipula maxima	–	–	–	1	–	–	–	–	–	–
Tipula paludosa	–	–	–	–	–	1	–	–	–	–
Tipula interserta	–	–	–	–	–	–	–	1	–	–
Tipula pagana	–	–	–	–	–	–	–	1	–	–
Tipula limbata	–	–	–	–	–	–	–	1	–	–

were identified in this material, which comprises 34% of the Finnish limoniids. *Neolimnomyia nemoralis*, *Paradelphomyia fuscula*, *Erioptera lutea*, *Molophilus flavus*, *Ormosia depilata*, *Scleroprocta sororcula* and *Limonia macrostigma* were the most common species, with nine or more records. *Neolimnomyia nemoralis*, *E. lutea* and *L. macrostigma* are ubiquitous species, which can be found in a wide range of habitats, both terrestrial and aquatic (Brinkmann 1991). They have also been reported to attain relatively high densities in spring habitats (Gümbel 1976, Maiworm 1984, Sternberg 1998). According to Wagner *et al*. (1998) *P. fuscula* is a common shredder in Central European springs, but also occurs in small brooks (Mendl 1978). *Paradelphomyia fuscula* was the most abundant limoniid in Yrttikorpi and *M. flavus* in Varesjoki and Pyykorpi localities. *Molophilus flavus* inhabits small lotic waters (Mendl 1978), spring-fed brooks (Maiworm 1984) and it is classified as an alpine/subalpine species in Norway (Solem & Mendl 1989). *Ormosia depilata* and *S. sororcula* are both reported from spring brooks and brooks (Mendl 1973, Caspers 1980b, Maiworm 1984, Fischer *et al*. 1998, Sternberg 1998), but perhaps *O. depilata* is more eurytopic in relation to moisture and discharge than *S. sororcula* (Mendl 1978, Brinkmann 1991).

Flight periods of the Limoniidae are given in Table 4. Some species with long flight periods (e.g. *E. lutea*, *Metalimnobia quadrinotata* and *Dicranomyia modesta*) had obviously two generations per year (*see* Brinkmann 1991). *Scleroprocta sororcula* and *O. depilata* had their maximal occurence in May, *M. flavus* in June and July, *P. fuscula* and *Rhypholophus haemorrhoidalis* in August.

Five of the limoniids reported here are new to the Finnish fauna: *Erioptera pederi*, *Molophilus bifidus*, *M. bihamatus*, *M. corniger* and *Lipsothrix ecucullata*. Tjeder (1969) described *E. pederi* from Skåne, Sweden and the type locality was "a small, cold brook". In addition to the type locality *E. pederi* is reported from Central Europe, Rumania and from Asia, Taijikistan and Kirgisia (Savchenko *et al*. 1992). Mendl (1973) and Mendl (1976) observed *E. pederi* from brooks in Germany. *Molophilus bifidus* was collected only from Varesjoki spring-fed brook. It seems to be a typical brook and springbrook species (Mendl 1973, Caspers 1980b, Maiworm 1984, Sternberg 1998) with semiaquatic larvae (Mendl 1978, Brinkmann 1991). *Molophilus bihamatus* was collected from a single locality, Runebergin lähde limnocrene spring and springbrook with herb-rich forest surroundings; its larvae are semiaquatic or terrestrial (Mendl 1978, Brinkmann 1991). The third new *Molophilus* species, *M. corniger*, was more common than the preceeding ones: it was trapped from Kultalähde, Yrttikorpi and Kiljava springs. *Molophilus corniger* has earlier been reported from brooks and springbrooks (Maiworm 1984, Sternberg 1998), and the larvae are probably aquatic or semiaquatic (Mendl 1978). *Lipsothrix ecucullata* was collected altogether from four springs. The genus *Lipsothrix* is not included in Limnofauna Europea (Mendl 1978), but according to Dudley and Anderson (1987) and Ward (1992) the larvae of *Lipsothrix* dwell in logs in running waters. Three species of *Lipsothrix* are known to occur in North Europe and this is the first record of this genus in Finland (Savchenko *et al*. 1992).

3.4. Pediciidae

The twelve species of Pediciidae found cover 71% of the known Finnish pediciid species. *Pedicia straminea*, *P. rivosa*, *Tricyphona immaculata* and *T. livida* were the most common and often the most abundant pediciids. These four species coexisted in seven springs and they comprised 44% of all collected individuals.

Pedicia straminea and *P. rivosa* are very common predators in springs in Europe (Dittmar 1955, Lindegaard & Thorup 1975, Gümbel 1976, Maiworm 1984, Iversen 1988, Fischer *et al*. 1998, Lindegaard *et al*. 1998, Sternberg 1998, Wagner *et al*. 1998), but they both live also in other habitats (Mendl 1978).

Tricyphona immaculata was the most common and abundant species in this study: it was recorded from 21 springs, and it was the most numerous species at six localities. Like *P. straminea* and *P. rivosa*, it is a common spring dweller in Europe, and it also occurs in a wide area and many kind of biotopes in North Europe (Mannheims 1972, Solem & Mendl 1989, Viramo 1992, Brodo 1995). Brinkmann (1991) found it to inhabit all gradients between terrestrial and aquatic.

Table 4. Temporal succession of Limoniidae around springs in southern Finland. I = first two weeks of the month and II = the latter part of the month. 1 = 1–10 individuals; 2 = 11–30 ind. and 3 = >30 ind.

Species	May		June/July			Aug	Sep		Oct	
	I	II	I	II–I	II	I–II	I	II	I	II
Ormosia lineata	1	1	–	–	–	–	–	–	–	–
Hoplolabis vicina	1	–	–	–	–	–	–	–	–	–
Scleroprocta sororcula	–	2	1	1	–	–	–	–	–	–
Idioptera macropteryx	–	1	1	–	–	–	–	–	–	–
Erioptera pederi	–	1	–	–	–	–	–	–	–	–
Austrolimnophila unica	–	1	–	–	–	–	–	–	–	–
Ormosia depilata	–	3	2	1	–	–	–	–	–	–
Cheilotrichia cinerascens	–	1	–	–	–	–	–	–	–	–
Erioptera sordida	–	1	–	–	–	–	–	–	–	–
Erioptera lutea	–	2	1	2	1	1	–	–	–	–
Dicranomyia fusca	–	1	–	1	–	–	–	–	–	–
Molophilus ater	–	1	–	–	–	–	–	–	–	–
Lipsothrix sp.	–	–	1	–	–	–	–	–	–	–
Neolimnomyia nemoralis	–	–	1	2	1	–	–	–	–	–
Molophilus flavus	–	–	3	3	1	1	–	–	–	–
Dicranomyia distendens	–	–	1	–	–	–	–	–	–	–
Metalimnobia zetterstedti	–	–	1	1	1	–	–	–	–	–
Metalimnobia quadrinotata	–	–	1	3	1	1	1	–	–	–
Eloeophila maculata	–	–	1	1	–	–	–	–	–	–
Limonia nubeculosa	–	–	1	1	–	–	–	–	–	–
Euphylidorea phaeostigma	–	–	1	1	–	–	–	–	–	–
Euphylidorea fulvonervosa	–	–	1	1	1	1	–	–	–	–
Epiphragma ocellare	–	–	1	1	–	–	–	–	–	–
Tasiocera murina	–	–	1	1	–	–	–	–	–	–
Dicranomyia modesta	–	–	1	1	–	1	–	–	1	–
Limonia stigma	–	–	1	–	1	–	–	–	–	–
Helius longirostris	–	–	–	1	–	–	–	–	–	–
Molophilus medius	–	–	–	1	–	–	–	–	–	–
Erioptera flavata	–	–	–	1	–	–	–	–	–	–
Neolimonia dumetorum	–	–	–	1	–	–	–	–	–	–
Phylidorea squalens	–	–	–	1	–	–	–	–	–	–
Molophilus appendiculatus	–	–	–	1	1	1	–	–	–	–
Molophilus bihamatus	–	–	–	–	1	–	–	–	–	–
Limonia macrostigma	–	–	1	1	2	1	1	–	–	–
Dicranomyia frontalis	–	–	–	–	–	1	–	–	–	–
Pilaria scutellata	–	–	–	–	–	1	–	–	–	–
Limonia quadrimaculata	–	–	–	1	1	1	–	–	–	–
Ormosia ruficauda	–	–	–	1	–	–	–	–	–	–
Molophilus bifidus	–	–	–	2	–	–	–	–	–	–
Rhipidia maculata	–	–	–	1	–	1	–	–	1	–
Dicranomyia didyma	–	–	–	–	–	1	–	–	–	–
Metalimnobia bifasciata	–	–	–	1	1	1	1	–	–	–
Lipsothrix ecucullata	–	–	–	1	–	–	–	–	–	–
Molophilus corniger	–	–	–	2	1	–	–	–	–	–
Dicranomyia terranovae	–	–	–	–	–	1	–	–	–	–
Paradelphomyia fuscula	–	–	–	1	2	3	–	–	1	–
Limonia phragmitidis	–	–	–	1	1	–	–	–	–	–
Dicranomyia rufiventris	–	–	–	–	–	1	–	–	–	–
Rhypholophus haemorrhoidalis	–	–	–	–	–	2	–	–	–	–
Discobola annulata	–	–	–	–	–	1	1	–	–	–
Rhypholophus varius	–	–	–	–	–	2	–	–	–	–
Dicranomyia halterella	–	–	–	–	–	2	1	–	–	–
Dicranomyia stigmatica	–	–	–	–	–	–	1	1	–	–
Dicranomyia autumnalis	–	–	–	–	–	–	–	–	1	–
Chionea lutescens	–	–	–	–	–	–	–	–	–	1

Table 5. Temporal succession of Pediciidae around springs in southern Finland. I = first two weeks of the month and II = the latter part of the month. 1 = 1–10 individuals; 2 = 11–30 ind. and 3 = >30 ind.

Species	May		June/July			Aug	Sep		Oct	
	I	II	I	II–I	II	I–II	I	II	I	II
Dicranota guerini	1	–	–	–	–	–	–	–	–	–
Ula sylvatica	1	–	1	–	–	–	–	–	–	–
Ula mixta	–	1	–	–	–	1	–	–	–	–
Tricyphona unicolor	–	1	–	–	–	–	–	–	–	–
Tricyphona immaculata	–	3	3	–	–	–	–	–	–	–
Dicranota bimaculata	–	1	–	–	–	1	–	–	–	–
Pedicia rivosa	–	1	3	3	2	2	1	–	1	–
Dicranota pavida	–	–	–	1	1	1	–	–	–	–
Dicranota exclusa	–	–	–	1	1	–	–	–	–	–
Tricyphona schummeli	–	–	–	1	–	1	–	–	–	–
Tricyphona livida	–	–	–	1	3	2	–	–	–	–
Pedicia straminea	–	–	1	2	2	3	3	1	2	–

Tricyphona livida was found to inhabit 10 springs, though earlier it has been found from Finland only once, from Kuusamo (Ks) (Viramo 1992). This species has a wide distribution, but it is not reported from other Nordic countries (Savchenko *et al*. 1992). It is apparently a rare species in Central Europe: the only ecologicgal information concerning *T. livida*, brook and small lotic water species, is given by Mendl (1978).

Tricyphona schummeli occured in Lamminlähde, Lähdesuo and Pyykorpi springs. Mendl (1978) regarded it as a spring species, Dittmar (1955) mentioned a muddy spring area as a larval habitat. *Tricyphona schummeli* is widely distributed in Europe (Savchenko *et al*. 1992), but ecological notes are scarce (Noll 1985) and it often occurs in low numbers of individuals (e.g. Sandrock 1978, Noll 1985).

The adults of *T. immaculata* were caught in May and June (Table 5). The species may have two generations in North Germany (Brinkmann 1991) and South Sweden (Tjeder 1959), but apparently only one around springs in southern Finland. *Pedicia rivosa* had a long flight period, from May till October, but maximum occurence in June and July. *Tricyphona livida* and *P. straminea* flew in late summer and autumn.

Dicranota pavida was collected from Varesjoki, Runebergin lähde and Uhrilähde springs. *Dicranota pavida* is widely distributed in Europe, but it has not been found earlier from Finland (Savchenko *et al*. 1992). The species is quite frequently reported along brooks and springbrooks (Mendl 1973, Gümbel 1976, Sandrock 1978, Caspers 1980b, Maiworm 1984, Mendl *et al*. 1987). The other new pediciid, *Ula mixta*, was described from Slovakia by Starý (1983), and in addition to the type localities, is known only from Germany and Norway (Savchenko *et al*. 1992). Immature stages of *Ula* inhabit woody or fleshy fungi.

3.5 Ptychopteridae

Three species of the family Ptychopteridae were identified. *Ptychoptera scutellaris* was caught in May and *P. lacustris* and *P. minuta* in June–July. Ptychopterids were trapped only occasionally; larval development occurs perhaps rarely in springs. However, *Ptychoptera lacustris* is regularly found in Central European springs (Wagner *et al*. 1998).

4. Discussion

The present study gives a noticeable contribution to the knowledge of the distribution and phenology of adult craneflies in southern Finland. However, further studies are needed to clarify the distribution and status of certain species: are they, for example, confined to the spring areas only. In this study no larvae were investigated and the

microdistribution of immature stages remains unknown, but Brinkmann (1991) noted, in his study from a lowland brook in North Germany, that that cranefly community mainly developed in the banks of the brook. Brinkmann (1991) grouped the craneflies with regard to humidity in the following way (the species listed after the groups were found in this study): (1) eurytopic species in relation to the water level (*Cheilotrichia cinerascens*, *Erioptera lutea*, *Tricyphona immaculata*), (2) terrestrial species of the dryest locations (*Limonia nubeculosa*, *Neolimonia dumetorum*, *Rhypholophus varius*, *Tipula irrorata*, *Tipula scripta*), (3) terrestrial species of the more humid locations (potential semiaquatic species) (*Limonia macrostigma*, *Limonia tripunctata* (syn. *phragmitidis*), *Molophilus appendiculatus*, *M. bihamatus*, *Ormosia depilata*, *Tipula variicornis*), (4) potential aquatic species: a) species which inhabit moist sand or mud at the waters edge (*Tipula maxima*), b) species which inhabit marshes and swamps (*Erioptera gemina* (syn. *flavata*), *Erioptera sordida*, *Euphylidorea fulvonervosa*, *Helius longirostris*), (5) aquatic species (in general, running water species) (*Dicranota bimaculata*, *Eloeophila maculata*).

Fischer *et al*. (1998) classified four zones in relation to the spring fauna: (1) groundwater, spring and springbrook fauna, (2) hygropetric fauna, (3) limnic-terrestrial interface fauna, and (4) terrestrial-hydrophilous fauna. The order Diptera comprised 32%, 69% and 95% of the community in these zones, respectively (terrestrial-hydrophilous fauna excluded). The importance of semiaquatic area for limoniids and pediciids is also discussed in Caspers (1980b).

In a review of the family Chironomidae in European cold springs Lindegaard (1995) separated seven groups: (1) crenobiontic species restricted to the spring area, (2) crenophilous species with maximum abundance in springs, (3) lotic species also living in spring area, (4) lentic species occuring mostly in limnocrenes, (5) ubiquitous species, (6) madicolous species, and (7) terrestrial species. As stated by Lindegaard (1995), apparently no chironomid species is exclusively dependent on the spring biotope. Although Mendl (1978) noted six limoniids and pediciids as spring species, the same conclusion probably applies to craneflies too (*see* Wagner *et al*. 1998). One of these spring Limoniidae species classified by Mendl (1978) is represented in the present paper, *Tricyphona schummeli*. Some limoniids and pediciids, collected around springs in southern Finland, might fit Lindegaard's (1995) second, third or even fifth category: *Paradelphomyia fuscula*, *Molophilus flavus*, *Pedicia straminea*, *P. rivosa*, *Tricyphona immaculata* and *T. livida*. Three common limoniids, *Neolimnomyia nemoralis*, *Erioptera lutea* and *Limonia macrostigma* are obviously ubiquitous species. Perhaps after further studies in North Europe in springs and in other biotopes a classification similar to Lindegaard (1995) can be created for craneflies.

To the author's knowledge, this is the first paper dealing with adult craneflies collected in the immediate vicinity of springs in North Europe, and thus meaningful faunistic or ecological comparisons with other Nordic countries cannot be made. However, many papers treating the Limoniidae and Pediciidae fauna of Central European springs and spring brooks are available (Dittmar 1955, Gümbel 1976, Maiworm 1984, Fischer *et al.* 1998, Sternberg 1998). The total number of species reported in these studies is 72 (66 Limoniidae and Pediciidae in this study) and 30 species are the same as in the present study. It must be remembered that Central European studies are mainly based on emergence catches. It is likely that Malaise traps and window traps and sweepnetting collect insects from a wider area. Because the methods in collecting the material in this study varied so much, differences in the cranefly fauna between springs have not been analysed. However, Lindegaard *et al*. (1998) found a positive correlation between the area of the spring and species richness. They also noted that spring size and substrate diversity are more important than the amount of groundwater discharge in maintaining high species richness, and the absence/presence of a springbrook influences significantly the faunal composition. In addition to these factors, the madicolous and semiaquatic conditions in the bank area are perhaps the most important factors influencing cranefly species diversity and abundance in springs.

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Appendix. The number of craneflies collected at each of the studied springs in southern Finland. 1. Prästkärret; 2. Varvarinsuo; 3. Källvik; 4. Ruostelähde; 5. Lähdesuo; 6. Puolakanlähde; 7. Yrjännummi; 8. Lohioja; 9. Lähteensuo; 10, Kiehuvalähde; 11. Varesjoki; 12. Kultalähde; 13. Lamminlähde; 14. Pyykorpi; 15. Isosuo; 16. Kiljava; 17. Petkelsuo; 18. Hossojanlähde; 19. Yrttikorpi; 20. Hirviniemi; 21. Katajajärventie; 22. Viinikka; 23. Ryövärinkuoppa; 24. Runeberg; 25. Uhrilähde; 26. Konkanneva; 27. Kivistönlähde. freq. % = frequency %.

Species	Springs																											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	freq. %
Tipulidae:																												
Dictenidia bimaculata (Linnaeus)	–	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4
Dolichopeza albipes (Ström)	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4
Nephrotoma flavescens (Linnaeus)	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4
Tanyptera atrata (Linnaeus)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	4
Tanyptera nigricornis Meigen	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4
Tipula (Beringotipula) unga Wiedeman	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4
Tipula (Acutipula) fulvipennis De Geer	–	–	2	–	1	–	–	–	–	–	–	1	–	2	–	–	–	–	1	–	–	–	1	1	–	–	2	30
Tipula (A.) maxima Poda	–	–	–	–	–	–	–	–	–	–	7	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4
Tipula (Lunatipula) fascipennis Meigen	1	1	–	2	–	–	–	–	–	–	–	–	1	2	–	–	–	–	–	–	–	–	–	–	–	–	–	19
Tipula (L.) limitata Schummel	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	–	–	7
Tipula (L.) lunata Linnaeus	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4
Tipula (Pterelachisus) irrorata Macquart	1	1	–	–	–	–	–	–	–	–	2	–	–	2	1	–	–	–	–	–	–	–	–	–	–	–	–	19
Tipula (P.) varipennis Meigen	1	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7
Tipula (Savtshenkia) alpium Bergroth	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	4
Tipula (S.) grisescens Zetterstedt	–	–	1	–	1	2	–	–	1	–	–	2	3	–	–	–	–	–	8	–	–	1	1	–	7	–	2	41
Tipula (S.) interserta Riedel	–	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4
Tipula (S.) limbata Zetterstedt	2	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	7
Tipula (S.) pagana Meigen	–	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4
Tipula (S.) subnodicornis Zetterstedt	–	2	–	–	–	–	–	2	2	–	–	–	–	–	–	–	–	–	–	–	1	1	–	–	2	–	–	22
Tipula (Schummelia) variicornis Schummel	3	5	2	–	1	2	–	2	–	–	6	–	–	4	11	2	–	–	1	–	–	–	–	–	1	–	1	48
Tipula (Vestiplex) nubeculosa Meigen	3	–	1	–	–	–	–	–	–	–	3	–	–	25	3	–	–	–	2	–	–	–	–	–	–	–	–	22
Tipula (V.) scripta Meigen	–	–	–	–	–	–	–	–	–	–	1	–	–	–	1	–	–	–	1	–	–	–	–	–	–	–	–	11
Tipula (T.) paludosa Meigen	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4
Tipula (Yamatotipula) lateralis Meigen	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4

Continued

Appendix. Continued.

Species	Springs																											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	freq. %
Cylindrotomidae:																												
Cylindrotoma distinctissima Meigen	–	–	–	–	–	–	–	–	–	–	8	4	–	–	–	–	–	–	20	–	–	–	1	–	–	–	–	15
Phalacrocera replicata Linnaeus	–	–	–	–	–	–	–	–	–	–	–	–	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4
Limoniidae:																												
Austrolimnophila (Archilimnophila) unica (Osten-Sacken)	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	–	
Eloeophila maculata (Meigen)	4	–	–	–	1	–	–	–	1	–	11	–	–	–	–	3	–	–	–	–	–	–	–	–	–	1	–	22
Epiphragma ocellare (Linnaeus)	–	–	–	1	–	–	–	–	–	–	2	–	–	1	–	1	–	–	–	–	–	–	–	–	–	–	–	15
Euphylidorea phaeostigma (Schummel)	1	–	–	–	1	–	–	–	1	–	–	–	1	–	2	–	–	–	–	–	–	–	–	–	–	1	–	22
Idioptera macropteryx (Tjeder)	–	2	–	–	–	–	–	–	–	–	–	–	–	2	1	–	–	–	–	–	–	–	–	–	–	–	1	15
Neolimnomyia (Brachylimnophila) nemoralis (Meigen)	3	3	–	–	8	–	–	–	–	–	38	–	–	5	–	24	–	–	4	–	–	–	–	1	–	–	1	33
Paradelphomyia (Oxyrhiza) fuscula (Loew)	–	9	–	3	20	5	6	–	2	28	1	5	14	–	–	5	6	2	65	–	–	–	8	30	–	–	–	59
Phylidorea (Paraphylidorea) fulvonervosa (Schummel)	2	–	9	1	–	–	–	–	–	–	–	–	–	–	3	–	–	–	–	3	–	–	–	–	–	–	–	19
Phylidorea (P.) squalens (Zetterstedt)	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	7
Pilaria scutellata (Staeger)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	4
Cheilotrichia (Empeda) cinerascens (Meigen)	–	–	1	–	1	–	–	–	–	–	–	1	–	1	–	–	–	–	–	–	–	–	–	–	1	–	–	19
Chionea (Sphaeconophilus) lutescens Lundström	–	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4
Erioptera (E.) flavata (Westhoff)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	–	4
Erioptera (E.) lutea Meigen	–	–	9	1	–	7	–	4	2	–	8	7	–	–	–	–	–	–	5	2	–	–	–	11	–	–	–	37
Erioptera (E.) pederi Tjeder	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	4
Erioptera (E.) sordida Zetterstedt	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4
Hoplolabis (Parilisia) vicina (Tonnoir)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	4
Molophilus (M.) appendiculatus (Staeger)	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	7
Molophilus (M.) ater (Meigen)	–	–	–	–	–	–	–	6	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7
Molophilus (M.) bifidus Goetghebuer	–	–	–	–	–	–	–	–	–	–	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4
Molophilus (M.) bihamatus de Meijere	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	–	–	–	4

Molophilus (M.) corniger de Meijere	–	–	–	–	–	–	–	–	–	–	–	3	–	–	–	17	–	–	5	–	–	–	–	–	–	–	–	11
Molophilus (M.) flavus Goetghebuer	–	3	5	–		14	–	15	3	–	100	2	–	95	–	34	–	–	19	–	–	–	–	7	–	–	–	41
Molophilus (M.) medius de Meijere	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4
Ormosia (O.) depilata Edwards	3	–	14	–	32	17	–	–	–	1	2	2	1	11	2	1	–	–	9	–	–	–	–	–	–	–	–	41
Ormosia (O.) lineata (Meigen)	–	–	–	10	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7
Ormosia (O.) ruficauda (Zetterstedt)	–	–	–	–	–	–	–	6	–	–	1	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	11
Rhypholophus haemorrhoidalis (Zetterstedt)	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6	–	–	–	–	–	–	–	–	7
Rhypholophus varius (Meigen)	–	3	–	–	9	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7
Scleroprocta sororcula (Zetterstedt)	4	2	3	2	–	1	–	–	12	5	3	–	–	22	–	–	–	–	5	–	–	–	–	–	6	–	–	41
Tasiocera (Dasymolophilus) murina (Meigen)	–	–	–	–	–	–	–	–	–	–	1	–	–	2	–	5	–	–	2	–	–	–	–	–	–	–	–	15
Dicranomyia (D.) autumnalis (Staeger)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	4
Dicranomyia (D.) didyma (Meigen)	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4
Dicranomyia (D.) distendens Lundström	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	4
Dicranomyia (D.) frontalis (Staeger)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	4
Dicranomyia (D.) modesta (Meigen)	–	–	–	1	–	–	–	–	–	–	2	–	–	1	–	–	–	–	1	–	–	–	–	12	–	–	–	19
Dicranomyia (D.) terranovae Alexander	–	–	–	–	–	–	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4
Dicranomyia (Idiopyga) halterella Edwards	–	–	–	–	–	–	4	–	–	3	–	–	4	–	–	5	1	–	3	–	–	1	–	–	–	–	–	26
Dicranomyia (I.) stigmatica (Meigen)	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	7
Dicranomyia (Melanolimonia) rufiventris (Strobl)	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4
Dicranomyia (Numantia) fusca (Meigen)	–	–	–	–	2	1	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	11
Discobola annulata (Linnaeus)	–	–	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	7	–	–	–	–	–	–	–	–	11
Helius (H.) longirostris (Meigen)	–	–	–	3	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	11
Limonia macrostigma (Schummel)	–	5	–	–	–	–	–	–	–	–	3	6	–	3	5	–	–	–	5	–	–	–	12	20	6	–	–	33
Limonia nubeculosa Meigen	2	–	–	–	–	2	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	11
Limonia stigma (Meigen)	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	7
Limonia phragmitidis (Schrank)	1	–	–	1	–	–	–	–	–	–	–	1	–	–	–	1	–	–	–	–	–	–	–	–	–	1	–	19
Lipsothrix ecucullata Edwards	–	–	–	–	–	–	–	–	–	–	3	–	–	–	–	5	–	–	2	1	–	–	–	–	–	–	–	15
Lipsothrix sp.	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4
Metalimnobia bifasciata (Schranck)	–	2	–	–	–	–	–	–	–	–	1	–	–	–	3	–	–	–	1	–	–	–	3	8	–	–	–	22
Metalimnobia quadrimaculata (Linnaeus)	1	4	–	–	–	–	–	–	–	–	–	–	1	2	5	–	–	–	–	–	–	–	5	–	–	–	–	22
Metalimnobia quadrinotata (Meigen)	4	35	1	–	–	–	–	–	–	–	–	–	–	4	7	1	–	–	2	–	–	–	2	–	–	–	–	30
Metalimnobia zetterstedti (Tjeder)	2	2	–	–	–	–	–	–	–	–	1	2	1	1	3	5	–	–	–	–	–	–	–	–	–	–	–	30
Neolimonia dumetorum (Meigen)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	4
Rhipidia (R.) maculata Meigen	–	3	–	–	1	–	–	–	–	–	1	–	–	–	–	–	–	1	–	–	–	–	1	–	–	–	–	19

Continued

Appendix. Continued.

Species	Springs																											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	freq. %
Pediciidae:																												
Dicranota (D.) bimaculata (Schummel)	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	2	3	–	–	15
Dicranota (D.) guerini Zetterstedt	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	–	4
Dicranota (Paradicranota) pavida (Haliday)	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	4	1	–	–	11
Dicranota (Rhaphidolabis) exclusa (Walker)	–	–	1	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	1	–	–	–	–	15
Pedicia (Crunobia) straminea (Meigen)	2	38	7	2	8	16	13	–	–	8	7	32	7	14	–	23	3	–	77	–	–	–	9	8	–	2	–	67
Pedicia (P.) rivosa (Linneaus)	6	15	7	2	–	–	–	4	4	1	50	13	6	20	33	5	–	–	24	–	1	–	5	1	5	1	–	70
Tricyphona immaculata (Meigen)	18	6	12	12	7	3	–	18	14	20	–	67	8	108	7	1	–	–	222	–	2	–	2	8	79	1	6	78
Tricyphona livida Madarassy	–	2	2	–	2	1	–	–	1	3	–	–	–	–	–	6	–	–	29	–	–	–	38	4	–	–	–	37
Tricyphona schummeli Edwards	–	–	–	–	1	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	11
Tricyphona unicolor (Schummel)	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	10	–	–	7
Ula mixta Starý	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	7
Ula sylvatica (Meigen)	1	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	11
Ptychopteridae:	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Ptychoptera lacustris Meigen	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	–	–	–	–	–	–	–	–	–	–	–	4
Ptychoptera minuta Tonnoir	–	–	–	2	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	–	–	–	11
Ptychoptera scutellaris Meigen	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	4
Number of individuals	67	168	81	47	97	76	26	58	47	69	268	154	52	331	93	148	10	3	532	8	4	6	92	127	122	14	14	2714
Number of species	22	32	18	17	17	16	4	9	14	8	27	19	14	24	19	19	3	2	31	5	4	4	17	21	12	8	7	96