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The potential for using flower-visiting insects for assessing site quality: hoverfly visitors to the flowers of *Caltha* in the Far East region of Russia

Valeri Mutin [1]*, Francis Gilbert [2] & Denis Gritzkevich [3]

1 Department of Biology, Amurskii Humanitarian-Pedagogical State University, Komsomolsk-na-Amure, Khabarovsky Krai, 681000 Russia
2 School of Biology, University Park, University of Nottingham, Nottingham NG7 2RD, UK.
3 Department of Ecology, Komsomolsk-na-Amure State Technical University, Komsomolsk-na-Amure, Khabarovsky Krai, 681013 Russia

Abstract

Hoverfly (Diptera: Syrphidae) assemblages visiting *Caltha palustris* in 12 sites in the Far East were analysed using partitioning of Simpson diversity and Canonical Coordinates Analysis (CCA). 154 species of hoverfly were recorded as visitors to *Caltha*, an extraordinarily high species richness. The main environmental gradient affecting syrphid communities identified by CCA was human disturbance and variables correlated with it. CCA is proposed as the first step in a method of site assessment.

Keywords: Syrphidae, site assessment for conservation, multivariate analysis

Introduction

It is widely agreed amongst practising ecologists that a reliable quantitative measure of habitat quality is badly needed, both for short-term decision making and for long-term monitoring. Many planning and conservation decisions are taken on the basis of very sketchy qualitative information about how valuable any particular habitat is for wildlife; in addition, managers of nature reserves need quantitative tools for monitoring changes in quality.

Insects are very useful for rapid quantitative surveys because they can be easily sampled, are numerous enough to provide good estimates of abundance and community structure, and have varied life histories which respond to different elements of the habitat. Speight (1986) provides a set of criteria for choosing appropriate insect taxa for bio-monitoring and site assessment: taxonomic - the groups should have stable nomenclature and an accessible literature; biogeographic - they should have reliable national lists, and the species should have known distributions both nationally and internationally; biological - the biology of the species should be sufficiently well-known so that their habitats are definable; diverse - the group as a whole should occupy a wide range of habitats, with many species being confined to some particular habitats; logistic - it should be possible to sample the species in a uniform way, and there should be fewer than 1000 species.

Speight recommends three 'foundation' groups that fulfil these criteria, and are usable on all types of sites. Each has about 600 species in Europe: the ground beetles (Coleoptera: Carabidae), the hoverflies (Diptera: Syrphidae) and the sawflies (Hymenoptera: Symphyta). Ground beetles are mostly predatory, and sawflies are phytophagous; in contrast, larval hoverflies are more or less equally divided between predatory, phytophagous and saprophagous (including aquatic) forms (see Rotheray & Gilbert 1999). Assessments that use hoverfly species will reflect the richness of the habitat better than one based on an exclusively plant-feeding or predatory group (Disney 1986). The group is taxonomically rather well known in the Palaearctic with 1590 species (Pek 1988; Mutin & Barkalov 1999). It is known that certain syrphid species can be excellent qualitative indicators of ancient woodland (Stubbs 1982), and there is already a qualitative method for using syrphid assemblages to predict site quality (Syrph the Net, see Speight *et al* 2001).

Here we explore the potential of using hoverfly visitors to a single plant species, *Caltha palustris* L. (Ranunculaceae) as a tool for assessing the nature of a habitat, using the

* Author for correspondence: email: valerimutin@mail.ru

quantitative method of Canonical Correspondence Analysis to link environmental variables with the relative abundances of syrphid species.

Materials & Methods

The genus *Caltha* has a peculiar intercontinental distribution pattern in both hemispheres; one section is Holarctic, whereas the other is confined to mountains of South America, Australia and New Zealand (Hoffmann 1999). The main study species here, *Caltha palustris*, is a Holarctic species, distributed widely in the Palaearctic in lowland temperate boreal forests. It grows in wet places near streams, and road and bog margins, flowering at the end of spring and early summer. Its large yellow flowers offer pollen and nectar to insect visitors, and it attracts the largest diversity of visitors of all flowers that appear at the same time. It is the main *Caltha* species over much of the Far East region of Russia; it occurs together with *C. membranacea* (Turcz.) Schipcz. in Khabarovsky Krai (Amurland) and Northern Primorye (to the Sikhote-Alin Reserve), and with *C. silvestris* Worosch. in southern Primorye, this division reflecting almost exactly the separation between the northern and southern types of mixed forest.

The Syrphidae are the most important group of flower-visiting Diptera. Identification of species was from the collections and experience of the senior author (see Mutin & Barkalov 1999); some of the raw data from some samples have been published already (Mutin 1983, 1987). Plant names follow Kharkevicz (1996).

Study sites were the following: **Sedanka** River (near Vladivostok: 43° 15' N, 132° E) originally contained the southern type of mixed forest, but has been altered by man so that the coniferous component has been reduced. Common trees are *Fraxinus mandschurica, Fraxinus rhynchophylla*, *Quercus mongolica*, *Acer mono*, *Phellodendron amurensis*, and *Kalopanax septemlobus*. *Alnus hirsuta* grows in the wetter places and is associated with *Caltha* plants. *Caltha* grows along streams in steep-sided small ravines leading into the Sedanka river. The site was visited five times in 1982 (27th and 30th April, 5th May) and 1983 (27th and 30th May). **Kamenushka** (43° 45' N 132° 30' E) is a small village near the Ussuri Reserve, also in the subzone of the southern type of mixed forest. It contains a similar but richer complement of trees, but also has small coniferous trees (*Pinus koraiensis, Abies holophylla*). *Caltha* plants grow in wet peat along forest streams. The site was visited once (29th April 1981). **Kavalerovo** (44° 15' N 135° 10' E) is in typical Ussuriland mixed forest, dominated by *Pinus koraiensis* and *Quercus mongolica*. *Caltha* grows in wet forest glades on gentle sloping ground near the village, and suffers from trampling by people. The site was visited twice in 1982 (22nd and 23rd May). The **Zabolochenaya** River (45° 10' N, 136° 30' E) is about 30 m wide at the study site, in the Sikhote-Alin Reserve in the typical mixed forest zone. *Caltha* grows along the low banks of the river, under *Salix* spp. The site was visited three times (27th 28th and 31st May 1982). **Myaochan** is in a moderately mountainous region near the the mining village of Gornyi (51° N 136° 20' E), covered with taiga of the beringian type (Kurentsov 1959), dominated by *Picea ajanensis, Abies nephrolepis, Pinus pumila*. The study site is in the valley of the Silinka river, where *Populus maximowiczii* is dominant together with conifers. *Caltha* forms dense stands along the banks of small tributaries under the canopy of coniferous trees, *Alnus hirsuta*, and young trees of *Populus* and *Chosenia arbutifolia*. The site was visited five times (24-25th June 1982, 9th June 1983, 13th June 1984, 20th June 1999).

Seven sites were situated in and near the city of Komsomolsk-na-Amure (50° 30' N 137° E) in the Kharabovsky region, on the bank of the Amur river. **Silinski Park** is a large forest park within the city boundary. The forest contains typical valley mixed forest of *Ulmus japonica* and *Fraxinus manschurica*, under strong anthropogenic influences. The study site lies on a natural border between mixed forest and larch-dominated forest, along a small slowflowing stream whose banks support *Betula platyphylla*, *Alnus hirsuta*, and some *Larix cajanderi*. *Caltha* grows in the water among dense *Carex angustinowiczii* and *Calla palustris*. The park was visited many times over several years (24th May 1984, 22/23/29th May and 4th June 1985, 2nd June 1986, 29th May 1993, 14/16/24th May 1994, 19th May and 2nd June 1995, 19th May 1996, 21st and 26th May 1998, 6th June 1999, 28th May and 1st June 2000). **Snezhinka** is a forest on hills near Komsomolsk, consisting partly of the typical northern type of mixed forest (with dominants *Pinus koraiensis*, *Picea sibirica*, *Larix cajanderi*, *Quercus mongolica*, *Acer mono* and *Tilia amurensis*), and partly of secondary forest after fire (with *Betula platyphylla* and *Populus tremula*). The *Caltha* grows here along a small stream cutting a deep ravine on the slope of a hill, with *Alnus hirsuta* and *Betula platyphylla*. The site was visited twice (31st May 1989, 5th June 1999).

A stream named Sixth Stream runs down the hills to **Pivan** village, on the opposite side of the Amur from Komsomolsk. The habitat is again the northern type of mixed forest. The valley is reasonably wide, with dominants *Alnus hirsuta*, *Acer ukurunduensis*, *Padus maackii*, and *Abiens nephrolepis*. *Caltha* grows along the banks and along wet forest grassy paths. The site was visited eight times (20th, 24th & 28th May 1979, 11th June 1983, 20th May 1993, 19th and 22nd May 1998, and 3rd June 1998).

Chalvasi River is a small river in a fairly large forest *Sphagnum* bog with *Larix cajanderi* trees and bushes of *Ledum hypoleucum* and *Betula middendorffii*. The forest is northern mixed forest, but of the "angarica" type of "pale" conifer forest based on *Larix*. Along the banks of the river grows a dense forest of *Larix*, *Fraxinus manschurica*, *Alnus hirsuta* and *Padus asiatica*, under whose canopy the *Caltha* grows in wet depressions. The site was visited twice in 1983 (10th & 13th June).

Kamennaya Pad is a valley near the Komsomolsk Reserve and contains northern mixed forest similar to that of Pivan. *Caltha* grows along a small stream bordering a clearing where there are forestry buildings. The site was visited once (18th May 1995).

Khummi is at the marshy boundary between the terrace of mature lowland northern mixed forest (of *Larix*, *Betula* and *Quercus*) and the water meadows of the Amur flood plain; it contains sparse and unusual woodland dominated by species of *Salix* and *Alnus hirsuta*. It was visited once on 11th May 1996. **Tsirkul** is a very marshy terrace in the valley of the Silinka river 20 km above its mouth at the Amur. It is a similar habitat of northern mixed forest dominated by *Larix*, *Betula platyphylla* and *Alnus hirsuta*, with some *Fraxinus mandschurica*, *Populus maximowiczii* and *Picea sibirica*. It was visited twice (1st and 11th June 1996).

We used modifications of Pesenko's (1972) method of recording. There were three sampling methods: the first involved 1-4 10-minute sample periods during times of high activity; the second used one 10-minute sample per hour over the day; finally there were all-day watches when all syrphids were collected during periods of high insect activity. Capture was by continuous sweep-netting through *Caltha* flowers, except during 1979, when hour-long collections by netting of individual flies was interspersed by 30-min gaps. Sampling effort was measured in minutes of collecting time.

Following the advice of Lande (1996), we calculated Simpson diversities for each sample, since this is the only unbiassed measure of diversity (compared with species richness and Shannon-Wiener indices) and has the smallest estimation error. It has the further advantages of having a simple interpretation (the probability that two randomly chosen individuals belong to different species), and being itself a variance, and hence usable straightforwardly in measuring variance components and similarities among sites. We use Simpson diversities here (henceforth called simply 'diversity').

We then included the data for individual species, rather than losing this detail by reduction to the single number entailed in calculating diversity. This was done by analysing the data using Canonical Correspondence Analysis, implemented by the software package Canoco

3.1 (ter Braak 1986, 1988) and MVSP (MultiVariate Statistical Package version 3.01a, published by Kovach Computing Services). This analysis is a combination of regression and ordination, and fits niche-like unimodal species-abundance curves to environmental gradients, ordinating species and sites in the same ordination space. It is specifically designed to look at the species composition of communities (Jongman *et al* 1987), choosing gradients that are linear combinations of environmental variables so as to maximise the dispersion of species along each gradient. We used the detrended version in order to minimise distortion.

There were five environmental variables considered as possibly affecting the species composition of syrphid communities, all scored on a rank scale: degree of human influence (0=low, 1=some, 2=high), presence of honeybees as competitors (0=none, 1=distant hives, 2=nearby hives), rivers (0=none, 1=small, 2=large), forest types (1=southern mixed forest, 2=northern mixed forest, 3=taiga), and the occurrence of wet dead wood (0=a little, 1=a great deal).

Results

A total of 154 species was caught on *Caltha* in the various sites (Appendix 1), a quite extraordinarily high species richness for the visitors to a single plant. By far the most abundant was *Cheilosia primoriensis*, 3.7 times as abundant as the next commonest species, *Parasyrphus punctulatus*. Also noteworthy are the eleven species of *Sphegina*, and the single specimen of *Microdon latifrons*, a species from a tribe almost never recorded from flowers; some have doubted that *Microdon* feed at all as adults.

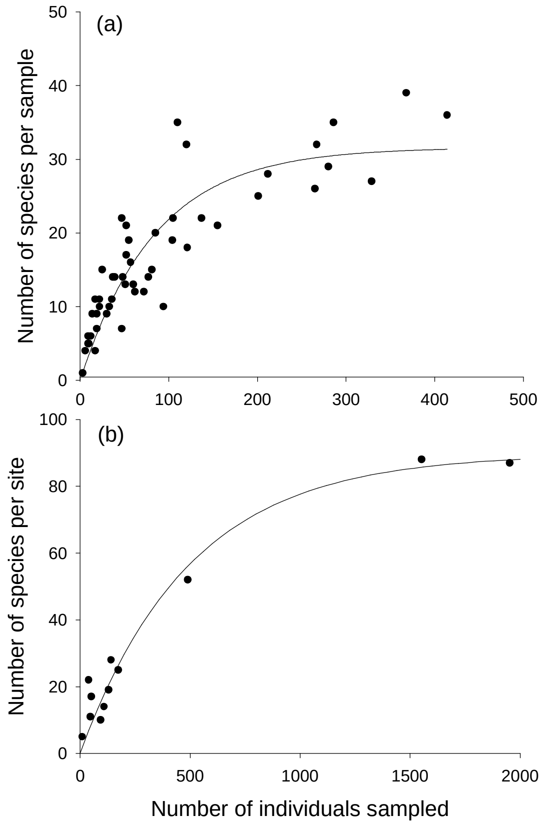

Fig 1: Relationships between sampling effort and the number of species recorded for (a) individual samples taken during a single session (usually a day) at a site; and (b) pooled samples for an individual site. The fitted curves are asymptotic exponential functions of the form $a(1 - e^{-bx})$. In (a) the parameters are a = 31.6 and b = 0.0118, and in (b) the parameters are a = 89.7 and b = 0.002

The number of species recorded in any one sample (Fig 1a) or in pooled samples at one site (Fig 1b) was a decelerating exponential function of sample size; the asymptotes suggest that on any one day there were approximately 30 species present to be caught; with a large enough sample size, the range is approximately 27-39. At any one site there are approximately 85 species overall. In sharp contrast to these patterns of species richness, the diversity of samples was unrelated to sampling effort (r_s = -0.08, n=50, n.s.), which makes us confident that on most sampling occasions adequate effort was made to estimate the diversity with reasonable accuracy. Apart from one small sample with only a few individuals of one species (diversity = 0.0), the diversity of samples varied from 0.537 to 0.945, while species richness ranged from 4 to 39 species. Table 1 gives the summary statistics for pooled samples at each site, showing that diversity was lowest in Tsirkul and highest in Kavalerovo. Hoverflies overall form two-thirds of the visitors to *Caltha* flowers, 7.5-8 times more abundant than other Diptera or honeybees, with other taxa being much less frequent.

Table 1: Summary of the collections at each site, together with the environmental variables scored for each site. "% similarity" is the similarity in assemblages among samples within sites (see Lande 1996), absent for cases where only a single sample was taken at a site. Sampling effort was measured as the total number of minutes spent collecting. "% syrphids" is the percentage of the total number of flower visitors that were hoverflies. The actual numbers of each taxon of other flower visitors are given (unavailable for three sites).

	Syrphidae				samples			Other flower visitors							Environment						CCA axis mean scores			
Site	Diversity	individuals	species	% syrphids	samples	% similarity	effort (minutes)	other Diptera	honeybees	bumblebees	other bees	other Hymenoptera	Coleoptera	Lepidoptera	forest types	rivers	terrain	deadwood	human influence	honeybees	Axis 1	Axis 2	Axis 3	Axis 4
Pivan	0.88 ± 0.01	1954	87	61	8	89	1680	300	225	19	40	16	41	11	2	2	2	2	2	2	2.042	1.007	1.249	0.716
Myaochan	0.89 ± 0.01	490	52	81	5	86	170	63	0	0	0	5	10	2	1	2	3	2	1	1	0.210	0.000	1.489	1.108
Chalvasi	0.89 ± 0.01	174	25	71	2	98	40	50	0	0	0	10	5	0	2	3	1	2	1	1	1.840	1.294	3.539	1.654
Snezhinka	0.78 ± 0.06	47	11	75	2	97	50	3	0	0	0	13	0	0	2	2	2	2	2	1	2.457	0.763	1.018	0.670
Kamenushka	0.80 ± 0.08	10	5	9	1	*	30	21	85	0	0	2	0	0	3	3	2	1	3	3	1.049	1.581	0.905	0.737
Sedanka	0.88 ± 0.02	109	14	24	5	89	110	21	243	0	1	7	2	6	3	2	2	1	3	3	1.804	1.216	0.000	0.000
Kavalerovo	0.96 ± 0.02	39	22	58	2	97	30	2	8	0	0	0	0	0	3	1	2	1	3	2	2.228	0.920	0.088	2.279
Zabolochenaya	0.79 ± 0.02	130	19	65	3	97	110	41	14	0	0	4	6	1	3	3	2	2	1	2	0.000	3.104	1.988	1.168
Kamennaya Pad	0.89 ± 0.02	52	17		1	*	80								2	2	2	2	2	2	1.887	0.790	1.169	1.212
Khummi	0.76 ± 0.02	94	10		1	*	100								2	1	1	2	2	2	4.722	1.107	1.367	1.195
Tsirkul	0.59 ± 0.05	141	28		2	99	90								2	3	1	2	2	2	2.685	1.272	1.450	0.007
Silinski Park	0.91 ± 0.01	1553	88	81	15	97	980	96	68	0	31	46	21	0	2	2	1	1	3	2	3.001	1.198	1.607	0.909
overall	0.94 ± 0.00	4793	154	66	50	94	3470	597	643	19	72	103	85	20										

Following Lande (1996) we partitioned the variance of the diversity of the samples among the categories of the variables (Table 2). The assemblages of each site pooled across samples show small standard errors because of the resulting large sample sizes. Pooling implies that samples taken in different years and at slightly different times in the phenology are added together, and gaps in the species recorded in one sample are then filled in by the results from other samples. These pooled diversities are probably more realistic than individual samples in terms of the true diversity of visitors to *Caltha* in particular sites, since chance coincidences of the sampling date with year-to-year and day-to-day variation in species composition are ironed out. The patterns displayed show (a) increasing diversity in more southern mixed-forest sites; (b) increased diversity close to water sources; (c) decreasing diversity in more mountainous areas; (d) decreased diversity with moderate as opposed to low or high degrees of human disturbance; (e) decreasing diversity with increasing competition from honeybees. The overall diversity of sites in the lower Amur was not different from sites in Primorye.

Table 2: Partitioning of the among-sample diversity between groupings of the environmental variables

Factor	**Groups**	**mean D of samples**	**pooled D**	**number of samples**	**number of individuals**	**among groups**	**among samples within groups**	**% among groups**
Forest type	taiga	0.89 ± 0.00	0.89 ± 0.01	1	490	0.021	0.038	35.6
	northern mixed	0.82 ± 0.07	0.92 ± 0.00	7	4015			
	southern mixed	0.86 ± 0.07	0.93 ± 0.01	4	288			
Rivers	none nearby	0.86 ± 0.17	0.87 ± 0.02	2	133	0.008	0.051	13.6
	small river nearby	0.87 ± 0.03	0.93 ± 0.00	6	4205			
	large river nearby	0.77 ± 0.09	0.91 ± 0.01	4	455			
Terrain	plain	0.79 ± 0.11	0.92 ± 0.00	4	1962	0.025	0.034	42.4
	hills	0.85 ± 0.04	0.91 ± 0.00	7	2341			
	mountains	0.89 ± 0.00	0.89 ± 0.01	1	490			
Wet dead trees	infrequent	0.89 ± 0.06	0.93 ± 0.00	4	1711	0.009	0.05	15.3
	frequent	0.81 ± 0.06	0.93 ± 0.00	8	3082			
human disturbance	low	0.86 ± 0.06	0.94 ± 0.00	3	794	0.027	0.032	45.8
	moderate	0.78 ± 0.08	0.89 ± 0.01	5	2288			
	high	0.89 ± 0.06	0.93 ± 0.00	4	1711			
Honeybee hives	none	0.85 ± 0.06	0.94 ± 0.01	3	711	0.018	0.041	30.5
	distant	0.83 ± 0.07	0.92 ± 0.00	7	3963			
	nearby	0.84 ± 0.07	0.89 ± 0.01	2	119			
Region	lower Amur basin	0.82 ± 0.06	0.93 ± 0.00	8	4505	0.005	0.054	8.5
	Primorye	0.86 ± 0.07	0.93 ± 0.01	4	288			

The results of the CCA analysis for individual samples and for pooled data from sites (Fig 2) are very similar, and hence we only show the results from the pooled site data. They show that the first environmental gradient (eigenvalue 0.572) contains about 17% of the variation, and is mainly associated with human disturbance, extent of dead wood, the occurrence of rivers and the terrain. The directions of the environmental variables is reasonable here, since the occurrence of dead wood and mountainous terrain is obviously negatively associated with human disturbance. The second axis (eigenvalue 0.449) contains 13% of the variation, and is associated with forest type, the presence of honeybees and to a lesser extent the occurrence of rivers. Two of the variables are strongly associated: honeybees are clearly more frequent in southern mixed forest than in boreal coniferous forest. The third axis (eigenvalue 0.160) contains only 5% of the variation, and is associated with the occurrence of rivers.

The species are positioned mostly on the positive side of the first axis (Fig 2), implying that most species still occur in sites influenced by man; some are particularly associated with such sites (e.g. *Sphaerophoria chongjini*, *Eristalis (Eoseristalis) abusiva, Cheilosia pollinata*, *Eristalinus sepulchralis* and *Cheilosia vernalis*). However, a few species are associated with undisturbed sites (e.g. some of the *Sphegina* species: see Appendix 1), and are probably sensitive to human disturbance. Most species also have positive scores along axis 2, with the most extreme species being several of the *Sphegina* species; these are therefore associated with large rivers and more southern sites, presumably the wetter sites where their larvae develop. Along the third axis, again most species have positive scores; the most extreme negative score belongs to *Rhingia laevigata*, associated with the driest sites well away from rivers.

Fig 2: Plot of the first two axes of a Canonical Correspondence Analysis of hoverfly assemblages from 50 samples taken from 12 sites in the Far East region of Russia. The analysis is of the pooled samples for each site, but the results using the individual sites is very little different. These two axes together account for 30% of the variation in the species data.

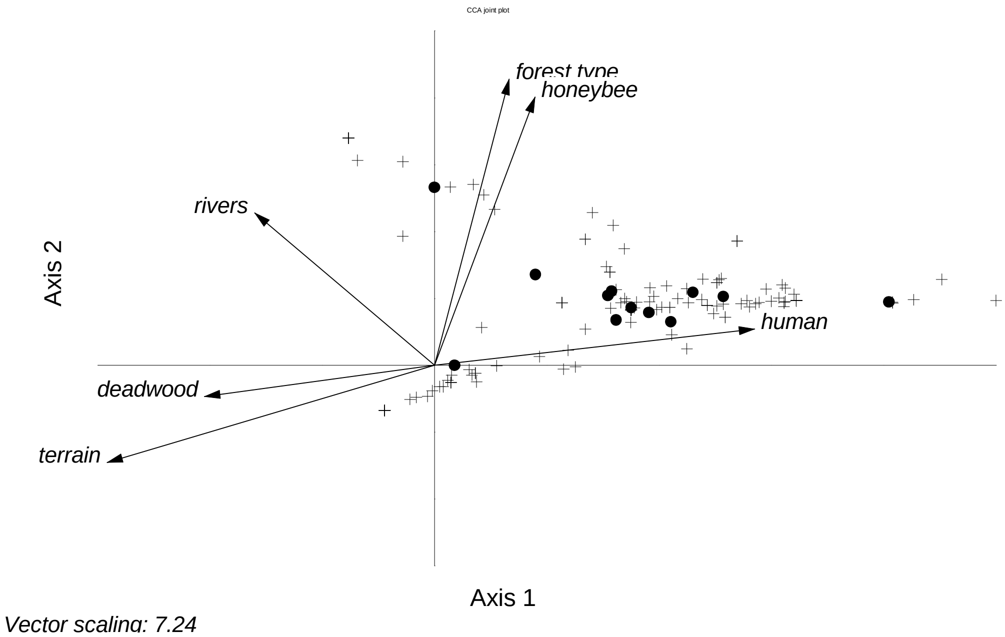

Table 3: Number of species of the main genera of Syrphidae recorded from *Caltha palustris* in three studies. This study is from the Far East region of Russia; Kormann (1985) was collecting near Karlsruhe in Germany; Bradescu (1994) collected from the Domogled National Park in Rumania.

	this study	Kormann 1985	Bradescu 1994
GENERA			
Dasysyrphus	3	1	4
Epistrophe	7	2	1
Eupeodes	5	1	1
Melangyna	7	0	2
Parasyrphus	7	2	1
Sphaerophoria	5	0	0
Syrphus	5	3	1
Melanostoma	4	1	2
Platycheirus	16	1	2
Pipizini	9	3	6
Cheilosia	18	8	12
Rhingia	1	0	1
Brachyopa	2	0	0
Chrysosyrphus	2	0	0
Orthonevra	3	0	0
Neoascia	5	2	0
Sphegina	11	0	0
Eristalis	8	3	1
Chalcosyrphus	12	1	1
Xylota	4	1	0

Discussion

The species total recorded visiting this single species of flower represents an extraordinarily high diversity when compared to species diversity in entire sites in western Europe, as noted by Mutin (1983). In the UK, for example, this sort of total for an entire site over the whole season would be noteworthy.

Similar patterns of visitors have been recorded elsewhere, although with much lower species richness than the Far Eastern sites. In Germany, Kormann (1985) recorded a mere 38 species visiting *Caltha* over four years of collecting near Karlsruhe, but syrphids made up 80% of the visitors, comparable to several of the Russian sites. Kormann's list is broadly similar in generic composition (Table 3) yet very depauperate in comparison. Bradescu (1994) also recorded a syrphid assemblage on *Caltha* from Rumania, but his collection was from a single week of one year. He collected about 300 specimens of 39 species during the total of 24 hours of collecting that he made. His collection (Table 3) is remarkable for the number of species of *Cheilosia* and Pipizini, but again overall it is very poor in many genera. It does compare well with a single sample from Russia, however.

The sensitivity of the assemblage to human disturbance is the main feature of the results of our analysis. The most obviously disturbed site to our thinking is Silinski Park, within the boundary of the city. By European standards it is not a very disturbed site, however, but nevertheless the impact of its disturbance shows up clearly in the hoverfly assemblage. Interestingly, according to the CCA analysis Silinski Park is not the most extreme of the sites along the disturbance axis; this position is occupied by Khummi. This site is the least afforested of all the sites, and thus has the more open spaces characteristic of habitats strongly affected by man, preferred by species such as *Eristalis abusiva* and *Eristalinus* species. The high association of *Cheilosia pollinata* with this axis is due to its abundance in more open sites, on *Salix* catkins in the Amur flood plain and woodland edges such as the boundary of Silinski Park. Thus the Khummi assemblage represents what happens to the syrphid visitors to *Caltha* in sites completely altered by human influence, the extreme end of a a sequence of habitat change from mountain taiga via valley mixed forests to open flood plain. The extraordinary diversity of visitors coupled with the way in which the relative abundances change under habitat differences and human disturbance makes *Caltha* a very suitable plant with which to assess site quality.

The procedure we have used here is the first step in developing a usable index of site quality. We envisage a method rather like the freshwater technique of RIVPACS (Armitage *et al* 1987, Wright *et al* 1989, British Ecological Society 1990), which uses environmental data to predict the occurrence of species at an unpolluted site: comparing this with the species actually found at the site leads to a quantitative index of water quality. Thus important environmental gradients identified by CCA could be used in a calibration to predict via logistic regression (Hill 1991) the probability that each species will be a member of syrphid assemblages along a known gradient of human disturbance or of site quality. These relationships could then be used with new data to compare predicted with observed assemblages, allowing these assemblages to be placed along the gradients, exactly as CCA did here. This approach is opposite to that developed in palaeoecology (Birks *et al* 1990) where calibration models use species optima estimated by CCA to infer the value of some unmeasurable environmental variables at one site and at particular times in the past using the composition of the fossil assemblage (Birks *et al* 1990). Our proposed method would predict the probability of occurrence of each species given the measured environmental variables at the site of interest.

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الملخص العربى

إمكانية استخدام الحشرات الزائرة للنباتات لتقييم كفاءة المناطق: حشرات الذباب الراقص الزائرة لنبات الكالثا فى منطقة الشرق الأقصى فى روسيا

فاليرى موتين[1] – فرانسيس جلبرت[2] – دينيس جريتزكيفيش[1]

1- قسم علم الحيوان – معهد كومسومولسك – خاباروفسكى – كراى – روسيا

2- قسم العلوم البيولوجية – جامعة نوتنجهام – المملكة المتحدة

تم خلال هذا البحث دراسة حشرات الذباب الراقص (رتبة ثنائية الأجنحة – ذباب السرفيس) ومعدل زيارتها لنبات كالثا باليستريس فى 12 منطقة فى أقصى شرق روسيا. تم تحليل معدل الزيارات باستخدم معدل سمبسون للتنوع وايضا باستخدام تحليل كانونيكال الإحصائى. أظهرت النتائج زيارة 154 نوعا من الذباب الراقص لازهار نبات الكالثا، ويشكل هذا تنوعا عاليا من حيث كثافة الأنواع الزائرة لهذا النبات. وباستخدام طريقة كانونيكال الإحصائية أمكن التعرف على المخاطر التى تهدد تواجد تلك الحشرات وتعوق زيارتها للنبات ومن بين تلك المخاطر: النشاط الإنسانى والانشطة المصاحبة لوجوده. ولذا يمكن القول بأن طريقة تحليل كانونيكال الإحصائية قد أثبتت كفاءة عالية لاول مرة فى تقييم كفاءة المناطق والنظم البيئية.

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Appendix 1: Raw data from each sampling date. Locations are Pivan (Piv), Maochan (Mao), Chalvasi (Cha), Snezhinka (Sne), Kamenushka (Kam), Sedanka (Sed), Kavalerovo (Kav), Zabolochenaya (Zab), Kamennaya Pad (KaP), Khummi (Khu), Tsirkul (Tsi), Silinski Park (Sil)

	date	20/05/1979	24/05/1979	28/05/1979	11/06/1983	20/05/1993	19/05/1998	22/05/1998	03/06/1998	24 /06/1982	25/06/1982	09/06/1983	13/06/1984	20/06/1999	10/06/1983	13/06/1983	31/05/1989	05/06/1999	29/04/1981	27/04/1982	30/04/1982	05/05/1982	27/05/1983	30/05/1983	22/05/1982	23/05/1982	27/05/1982	28/05/1982	31/05/1982	18/05/1995	11/05/1996	01/06/1996	11/06/1996	24/05/1984	22/05/1985	23/05/1985	29/05/1985	04/06/1985	02/06/1986	29/05/1993	14/05/1994	16/05/1994	24/05/1994	19/05/1995	02/06/1995	19/05/1996	21/05/1998	26/05/1998	06/06/1999	28/06/2000	01/06/2000	total	CCA analysis			
	location	Piv	Piv	Piv	Piv	Piv	Piv	Piv	Piv	Mao	Mao	Mao	Mao	Mao	Cha	Cha	Sne	Sne	Kam	Sed	Sed	Sed	Sed	Sed	Kav	Kav	Zab	Zab	Zab	KaP	Khu	Tsi	Tsi	Sil	Sil	Sil	Sil	Sil	Sil	Sil	Sil	Sil	Sil	Sil	Sil	Sil	Sil	Sil	Sil	Sil	Sil					
	Simpson diversity * 1000	748	717	814	775	758	786	781	868	867	805	779	857	699	879	848	768	743	800	807	922	682	833	848	913	945	778	800	0	894	759	537	708	941	860	903	866	889	867	871	918	929	896	884	854	889	657	791	816	912	907					
	spp richness	27	29	35	14	14	25	36	39	19	13	14	11	26	21	9	9	4	5	7	10	7	5	6	15	9	18	4	1	17	10	22	11	11	13	28	12	22	32	10	32	35	20	16	21	6	14	12	15	19	22					
	individuals	329	280	286	37	39	201	414	368	104	51	48	22	265	155	19	30	17	10	19	22	47	9	12	25	14	121	6	3	52	94	105	36	17	60	212	72	137	267	33	120	110	85	57	52	9	77	62	81	55	47	4793	Axis 1	Axis 2	Axis 3	Axis 4
1	Dasysyrphus bilineatus (Matsumura 1917)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2.833	1.050	1.011	0.866
2	Dasysyrphus lenensis Bagatshanova 1980	0	0	0	0	0	0	0	0	13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	-0.519	-0.788	1.776	1.156
3	Dasysyrphus venustus (Meigen 1822)	48	13	19	2	0	4	15	8	0	0	1	1	0	0	0	2	0	0	0	2	25	0	1	0	2	2	0	0	1	0	1	0	0	0	0	0	1	0	0	3	2	0	0	0	0	0	0	0	0	1	154	1.886	1.320	0.150	0.565
4	Epistrophe (Epistrophe) cryptica Doczkal & Schmid 1994 (melanostoma sensu Mutin)	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	4	0	0	0	0	0	0	0	0	0	0	0	0	10	2.935	1.037	0.201	2.175
5	Epistrophe (Epistrophe) flava Doczkal & Schmid 1994	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.041	0.970	0.545	0.601
6	Epistrophe (Epistrophe) melanostoma (Zetterstedt 1843)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	1	0	0	0	0	0	0	5	3.371	1.099	1.458	1.043
7	Epistrophe (Epistrophe) nitidicollis (Meigen 1822)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3.759	1.131	1.776	1.156
8	Epistrophe (Epistrophe) ochrostoma (Zetterstedt 1849)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2.233	1.107	-0.466	-1.356
9	Epistrophe (Epistrophe) olgae Mutin 1990	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3.759	1.131	1.776	1.156
10	Epistrophe (Epistrophella) euchromus (Kowarz 1885)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	3.759	1.131	1.776	1.156
11	Episyrphus balteatus (De Geer 1776)	8	5	0	0	0	0	0	1	0	0	0	0	1	1	0	1	3	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	4	3	7	0	1	13	6	0	0	1	0	0	0	29	7	4	96	3.272	1.020	1.742	1.093
12	Eupeodes (Eupeodes) corollae (Fabricius 1794)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	4	2.833	1.050	1.011	0.866
13	Eupeodes (Eupeodes) latifasciatus (Macquart 1829)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	3.759	1.131	1.776	1.156
14	Eupeodes (Eupeodes) lundbecki (Soot-Ryen 1946)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2.041	0.970	0.545	0.601
15	Eupeodes (Eupeodes) luniger (Meigen 1822)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	2	0	0	1	0	0	0	0	0	0	5	3.643	1.349	2.457	-0.463
16	Eupeodes (Eupeodes) nitens (Zetterstedt 1843)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2.979	1.516	3.779	1.791
17	Melangyna (Melangyna) barbifrons (Fallen 1817)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.041	0.970	0.545	0.601
18	Melangyna (Melangyna) lasiophthalma (Zetterstedt 1843)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	11	2.100	1.105	-0.574	-1.564
19	Melangyna (Melangyna) lucifera Nielsen 1980	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	7	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	16	1.938	1.094	-0.632	-1.666
20	Melangyna (Melangyna) pavlovskyi (Violovitsh 1956)	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2.041	0.970	0.545	0.601
21	Melangyna (Melangyna) quadrimaculata (Verrall 1873)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	3.759	1.131	1.776	1.156
22	Melangyna (Meligramma) cingulata (Egger 1860)	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0.423	-0.135	0.807	0.776
23	Melangyna (Meligramma) triangulifera (Zetterstedt 1843)	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	2.833	1.050	1.011	0.866
24	Meliscaeva cinctella (Zetterstedt 1843)	0	0	0	1	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0.137	-0.262	3.525	1.673
25	Parasyrphus annulatus (Zetterstedt 1838)	0	0	0	17	0	0	1	0	0	10	21	2	3	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	2	0	0	0	0	0	0	0	62	0.089	-0.371	1.795	1.662
26	Parasyrphus lineolus (Zetterstedt 1843)	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.041	0.970	0.545	0.601
27	Parasyrphus macularis (Zetterstedt 1843)	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	-0.519	-0.788	1.776	1.156
28	Parasyrphus malinellus (Collin 1952)	6	0	2	0	1	8	0	0	24	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47	0.054	-0.371	1.120	0.910
29	Parasyrphus nigritarsis (Zetterstedt 1843)	4	3	8	0	0	4	3	0	2	0	0	0	0	0	0	0	0	0	0	2	4	0	0	2	0	5	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38	0.624	2.719	0.057	1.881
30	Parasyrphus proximus Mutin 1990	6	0	0	0	0	6	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	2.075	1.005	0.609	0.374
31	Parasyrphus punctulatus (Verrall 1873)	0	0	0	0	0	87	182	6	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	280	2.046	0.971	0.537	0.589
32	Sphaerophoria chongjini Bankowska 1964	3	3	0	0	0	3	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	34	0	0	0	0	0	0	0	2	2	1	1	3	3	0	0	0	1	1	0	1	64	4.757	1.089	0.807	1.838
33	Sphaerophoria indiana Bigot 1884	4	3	1	0	2	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	3	11	1	0	3	0	1	2	0	0	2	0	2	0	3	9	2	54	3.247	1.129	1.570	1.911
34	Sphaerophoria rueppelli (Wiedemann 1830)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	3.759	1.131	1.776	1.156
35	Sphaerophoria scripta (Linnaeus 1758)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	2	0	0	0	1	0	4	0	0	12	3.759	1.131	1.776	1.156
36	Sphaerophoria shirchan Violovitsh 1957	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.170	-0.298	1.011	0.866
37	Syrphus annulifemur (Mutin ex Mutin & Barkalov 1997)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.041	0.970	0.545	0.601
38	Syrphus attenuatus Hine 1922	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	-0.519	-0.788	1.776	1.156
39	Syrphus ribesii (Linnaeus 1758)	0	0	1	0	0	0	0	1	0	0	0	0	5	0	0	14	7	0	0	0	8	0	0	0	0	0	0	0	0	0	1	0	1	0	5	0	0	12	0	0	0	0	0	0	1	0	0	13	2	1	72	2.464	0.534	0.551	0.343
40	Syrphus torvus Osten Sacken 1875	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	-0.072	-0.539	1.776	1.156
41	Syrphus vitripennis Meigen 1822	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	1	0	0	0	0	0	0	14	0	0	26	2.622	0.291	1.471	1.048
42	Melanostoma boreomontanum Mutin 1986	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	-0.519	-0.788	1.776	1.156
43	Melanostoma mellinum (Linnaeus 1758)	0	2	5	0	1	1	1	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	1	0	0	1	8	2	1	2	2	0	0	0	2	0	2	1	39	2.362	1.016	0.812	1.766
44	Melanostoma orientale (Wiedemann 1824)	0	0	0	0	0	0	1	0	0	0	0	0	0	9	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	20	1.971	2.032	4.979	2.021

* Author for correspondence: email: valerimutin@mail.ru

45	Melanostoma scalare (Fabricius 1794)	0	0	0	0	0	0	0	1	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	-0.330	2.254	1.458	1.043
46	Platycheirus (Platycheirus) albimanus (Fabricius 1781)	0	0	2	1	0	0	0	2	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	17	-0.023	-0.441	1.315	0.988
47	Platycheirus (Platycheirus) angustatus (Zetterstedt 1843)	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	-0.519	-0.788	1.776	1.156
48	Platycheirus (Platycheirus) clypeatus (Meigen 1822)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	9	0	0	0	0	0	0	0	1	2	0	0	0	1	0	1	0	0	0	0	1	0	17	2.636	1.094	1.137	2.014
49	Platycheirus (Platycheirus) complicatus (Becker 1889)	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	-0.519	-0.788	1.776	1.156
50	Platycheirus (Platycheirus) discimanus (Loew 1871)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	-0.894	3.964	1.776	1.156
51	Platycheirus (Platycheirus) europaeus Goeldlin Maibach & Speight 1990	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	-0.519	-0.788	1.776	1.156
52	Platycheirus (Platycheirus) nielseni Vockeroth 1990	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	-0.519	-0.788	1.776	1.156
53	Platycheirus (Platycheirus) parmatus Rondani 1857	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.041	0.970	0.545	0.601
54	Platycheirus (Platycheirus) peckae Bagatshanova 1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	3.759	1.131	1.776	1.156
55	Platycheirus (Platycheirus) peltatus (Meigen 1822)	0	0	1	0	0	0	0	35	0	0	1	1	141	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	5	0	0	0	0	0	0	0	0	0	0	0	1	1	187	-0.189	-0.557	1.471	1.048
56	Platycheirus (Platycheirus) scutatus (Meigen 1822)	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2	0	0	0	0	0	0	0	0	0	15	0.512	2.975	1.458	1.043
57	Platycheirus (Platycheirus) urakawensis (Matsumura 1919)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	4	2.445	1.010	0.718	0.731
58	Platycheirus (Pachysphyria) ambiguus (Fallen 1817)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3.759	1.131	1.776	1.156
59	Platycheirus (Pachysphyria) barkalovi Mutin ex Mutin & Barkalov 1999	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3.145	2.168	3.349	-6.052
60	Platycheirus (Pachysphyria) brunnifrons Nielsen 2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3.759	1.131	1.776	1.156
61	Platycheirus (Pachysphyria) immaculatus Ohara 1980	0	4	2	0	0	3	12	0	0	0	0	0	19	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	41	0.178	-0.172	0.994	0.860
62	Heringia (Neocnemodon) eugenei (Mutin 1988)	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	-0.519	-0.788	1.776	1.156
63	Heringia (Neocnemodon) pubescens (Delucchi et Pschorn-Walcher 1955)	1	0	0	0	0	0	5	0	0	1	0	0	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	-0.255	-0.592	1.458	1.043
64	Heringia (Neocnemodon) simplicipes (Stackelberg 1952)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3.020	0.840	-3.431	6.021
65	Heringia (Neocnemodon) vitripennis (Meigen 1822)	5	1	0	1	0	0	4	1	4	1	4	0	9	2	0	1	0	0	0	0	0	0	0	0	2	0	0	0	11	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	48	0.389	-0.167	1.218	1.901
66	Pipiza accola Violovitsh 1985	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	4	3.759	1.131	1.776	1.156
67	Pipiza bimaculata Meigen 1822	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	3	2.933	1.442	2.500	-1.524
68	Pipiza magnomaculata Violovish, 1985	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	3.759	1.131	1.776	1.156
69	Pipiza quadrimaculata (Panzer 1804)	0	0	2	5	0	0	2	0	0	0	8	0	5	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38	0.359	-0.076	3.970	1.841
70	Pipiza *aff.* signata (Meigen 1822)	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2.409	1.386	2.169	-1.653
71	Cheilosia angustigena (Becker 1894)	0	4	1	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	10	2.307	0.973	0.088	2.159
72	Cheilosia annulifemur (Stackelberg 1930)	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	3	16	4	2	11	0	20	12	9	5	0	1	0	1	0	0	0	89	3.631	1.026	1.476	1.576
73	Cheilosia nuda (Shiraki 1930)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1.323	1.095	-1.062	-2.501
74	Cheilosia gigantea (Zetterstedt 1838)	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	4	0.437	-0.289	1.776	1.156
75	Cheilosia longula (Zetterstedt 1838)	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.041	0.970	0.545	0.601
76	Cheilosia mutini Barkalov 1984	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	2.833	1.050	1.011	0.866
77	Cheilosia nigripes (Meigen 1822)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	-0.894	3.964	1.776	1.156
78	Cheilosia occulta Barkalov 1988	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1.323	1.095	-1.062	-2.501
79	Cheilosia pagana (Meigen 1822)	2	4	1	0	0	1	3	0	3	2	2	0	1	0	0	0	0	4	1	1	4	0	0	0	0	1	0	0	2	0	0	0	0	0	1	0	0	0	0	1	0	0	0	3	0	0	1	0	0	0	38	0.488	0.658	0.374	0.263
80	Cheilosia parafasciata Barkalov 1990	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	-0.894	3.964	1.776	1.156
81	Cheilosia pollinata Barkalov 1982	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	17	5.834	1.131	1.776	1.156
82	Cheilosia primoriensis Barkalov 1990	148	145	107	1	2	17	40	89	3	2	0	1	0	0	0	0	2	0	2	3	0	3	4	1	1	8	0	0	3	1	71	19	0	17	45	19	34	81	7	21	22	22	16	3	0	44	26	4	1	1	1036	2.621	1.339	1.174	0.162
83	Cheilosia reniformis (Hellen 1930)	0	0	0	0	19	8	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	10	2	0	0	0	0	0	0	0	0	1	4	0	0	0	0	0	0	0	0	0	54	2.899	0.904	0.930	0.440
84	Cheilosia urbana (Meigen 1822)	0	0	0	0	0	0	1	2	0	0	0	0	0	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	11	2.237	1.352	3.538	1.656
85	Cheilosia sapporensis (Shiraki 1930)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	3	1.857	2.442	1.776	1.156
86	Cheilosia morio (Zetterstedt 1838)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.041	0.970	0.545	0.601
87	Cheilosia sichotana (Stackelberg 1930)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	2	0	2	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	1.641	2.663	-0.999	2.440
88	Cheilosia vernalis (Fallen 1817)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	6	4.757	1.104	1.513	1.063
89	Rhingia laevigata Loew 1858	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3.020	0.840	-3.431	6.021
90	Brachyopa dorsata Zetterstedt 1837	54	7	8	0	0	3	16	0	25	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	133	0.427	-0.133	0.804	0.774
91	Brachyopa testacea (Fallen 1817)	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1.822	1.627	4.133	1.876
92	Chrysosyrphus alaskensis (Shannon 1922)	0	0	0	0	0	0	0	9	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	1.787	1.724	4.329	1.920
93	Chrysosyrphus niger (Zetterstedt 1843)	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	5	2.789	1.506	2.598	-2.015
94	Hammerschmidtia ingrica Stackelberg 1952	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.041	0.970	0.545	0.601
95	Orthonevra geniculata (Meigen 1830)	1	0	0	0	2	1	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	4	7	4	3	1	2	0	0	0	0	0	35	3.185	1.076	0.760	1.799
96	Orthonevra subincisa (Violovitsh 1979)	1	0	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0.170	-0.298	1.011	0.866
97	Orthonevra stackelbergi Thompson & Torp 1982	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3.759	1.131	1.776	1.156
98	Neoascia (Neoascia) tenur (Harris 1780)	0	0	0	0	0	0	0	55	2	0	0	0	0	31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	3	0	0	2	7	4	0	0	0	0	0	4	0	1	0	0	5	1	116	2.278	1.206	3.535	1.660
99	Neoascia (Neoasciella) amurensis Mutin 1990	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	3	0	3	0	3	18	0	0	0	2	1	19	0	3	7	1	11	12	90	3.577	1.178	1.426	1.565
100	Neoascia (Neoasciella) confusa Mutin 1990	3	2	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	7	26	2	4	23	4	4	1	10	7	2	1	4	0	1	1	1	109	3.645	1.116	1.443	1.514
101	Neoascia (Neoasciella) subchalybea Curran 1925	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	1	1	0	10	25	12	19	38	2	7	6	4	1	5	1	9	2	3	2	3	158	3.632	1.100	2.088	1.071
102	Neoascia (Neoasciella) tuberculifera Violovitsh 1957	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	3.759	1.131	1.776	1.156
103	Sphegina (Sphegina) amurensis Mutin 1984	6	5	3	0	0	0	0	0	0	0	0	0	3	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	8	10	0	3	2	0	0	2	7	6	0	0	0	0	0	2	0	85	2.527	1.167	3.718	1.730
104	Sphegina (Sphegina) carbonaria Mutin 1998	0	0	0	0	0	0	0	0	0	1	2	0	10	0	0	0	0	0	0	0	0	0	0	0	0	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	52	-0.800	3.575	1.776	1.156
105	Sphegina (Sphegina) calthae Mutin 1984	2	13	40	3	0	13	26	68	0	0	0	0	0	27	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	195	1.977	1.168	3.078	1.349
106	Sphegina (Sphegina) claviventris Stackelberg 1956	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0.402	3.156	2.500	-1.524
107	Sphegina (Sphegina) kurenzovi Mutin 1984	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	-0.519	-0.788	1.776	1.156
108	Sphegina (Sphegina) melancholica Stackelberg 1956	0	0	1	1	0	1	0	0	4	8	1	8	0	9	2	0	0	0	0	0	0	0	0	0	0	40	1	3	2	0	1	0	0	5	2	6	11	10	2	0	1	2	1	0	0	1	0	2	0	0	125	0.164	3.108	2.981	1.400

109	Sphegina (Sphegina) montana Becker 1921	0	9	11	0	0	0	0	8	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	2.041	0.748	0.044	2.351
110	Sphegina (Sphegina) obscurifacies Stackelberg 1956	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	1	0	0	0	0	2	1	11	3.338	1.075	0.313	2.145
111	Sphegina (Sphegina) spheginea (Zetterstedt 1838)	0	1	0	0	0	0	0	1	2	1	0	2	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	1	1	0	0	0	0	0	0	18	1.340	-0.067	-0.645	3.140
112	Sphegina (Sphegina) tuvinica Violovitsh 1980	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	-0.519	-0.788	1.776	1.156
113	Sphegina (Sphegina) verae Mutin 1984	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	-0.894	3.964	1.776	1.156
114	Sericomyia lappona (Linnaeus 1758)	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2.041	0.970	0.545	0.601
115	Eristalinus (Eristalinus) sepulchralis (Linnaeus 1758)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	5.271	1.499	2.740	-1.395
116	Eristalis (Eoseristalis) abusiva Collin 1931	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27	1	0	0	0	0	0	0	0	0	11	11	0	0	1	0	0	0	0	0	0	53	4.978	1.145	1.801	0.938
117	Eristalis (Eoseristalis) alpina (Panzer 1798)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	3.759	1.131	1.776	1.156
118	Eristalis (Eoseristalis) arbustorum (Linnaeus 1758)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	0	15	1	0	3	1	2	0	0	0	0	0	1	0	0	0	0	28	3.734	1.242	2.148	0.174
119	Eristalis (Eoseristalis) cerialis Fabricius 1805	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	4	3.611	1.405	2.577	-0.813
120	Eristalis (Eoseristalis) interrupta (Poda 1761)	0	0	0	0	2	22	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	9	1	2	2	11	4	0	12	0	3	2	1	1	1	0	0	3	0	0	1	107	2.778	1.150	1.402	0.086
121	Eristalis (Eoseristalis) rabida Violovitsh 1977	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	3.759	1.131	1.776	1.156
122	Eristalis (Eoseristalis) rossica Stackelberg 1958	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	10	1.465	-0.026	2.837	-1.861
123	Eristalis (Eoseristalis) obscura Loew 1866	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	6	3.759	1.131	1.776	1.156
124	Anasimyia lineata (Fabricius 1787)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	5	1	0	0	0	0	0	0	0	0	0	0	1	0	10	3.443	1.332	2.367	-0.502
125	Anasimyia lunulata (Meigen 1822)	0	0	3	1	0	2	0	2	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	4	1	0	17	10	16	13	0	0	3	6	5	2	0	4	8	2	1	7	112	3.498	1.119	2.132	0.537
126	Helophilus continuus Loew 1854	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	3.759	1.131	1.776	1.156
127	Helophilus lapponicus Wahlberg 1844	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.041	0.970	0.545	0.601
128	Helophilus trivittatus (Fabricius, 1805)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	6	3.759	1.131	1.776	1.156
129	Helophilus sapporensis Matsumura 1911	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	5	3.000	1.066	1.158	0.925
130	Mallota megilliformis (Fallen 1817)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3.759	1.131	1.776	1.156
131	Myathropa florea (Linnaeus 1758)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	3.759	1.131	1.776	1.156
132	Criorhina sichotana (Stackelberg 1955)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1.323	1.095	-1.062	-2.501
133	Lejota (Lejota) ruficornis (Zetterstedt 1843)	0	23	40	0	2	6	19	30	8	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	4	4	0	2	1	148	1.831	0.998	1.222	0.816
134	Lejota (Blerina) korsakovi (Stackelberg 1955)	0	10	5	0	0	2	2	14	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37	1.388	0.265	0.607	0.655
135	Syritta pipiens (Linnaeus 1758)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	3	3.759	1.131	1.776	1.156
136	Brachypalpus nipponicus Shiraki 1952	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	4	0	0	0	0	0	0	0	0	0	6	3.759	1.131	1.776	1.156
137	Chalcosyrphus (Chalcosyrphus) admirabilis Mutin 1984	0	1	3	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	1.090	0.155	0.631	0.672
138	Chalcosyrphus (Chalcosyrphus) tuberculifemur (Stackelberg 1963)	0	6	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0.646	-0.009	0.691	0.715
139	Spheginoides obscurus (Szilady 1939)	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2.041	0.970	0.545	0.601
140	Chalcosyrphus (Xylotina) eugenei Mutin 1987	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1.564	2.201	5.504	2.087
141	Chalcosyrphus (Xylotina) nemorum (Fabricius 1805)	5	7	6	0	3	1	2	4	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	2	0	0	8	11	9	5	0	0	3	2	0	0	0	5	2	2	3	85	2.957	1.489	1.586	0.883
142	Chalcosyrphus (Xylotina) nigripes (Zetterstedt 1838)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.041	0.970	0.545	0.601
143	Chalcosyrphus (Xylotina) nitidus (Portschinsky 1879)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	-0.330	3.553	1.256	0.965
144	Chalcosyrphus (Xylotina) violovitshi (Bagatshanova 1984)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	3.759	1.131	1.776	1.156
145	Chalcosyrphus (Xylotodes) jacobsoni (Stackelberg 1921)	6	0	1	0	0	3	8	6	2	1	0	0	0	0	0	0	0	1	2	3	3	3	3	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	0	47	1.567	0.630	-0.020	0.469
146	Chalcosyrphus (Xylotodes) piger (Fabricius 1794)	2	2	3	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	1.995	1.112	2.754	1.161
147	Chalcosyrphus (Xylotomima) femoratus (Linnaeus 1758)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	2	3.759	1.131	1.776	1.156
148	Chalcosyrphus (Xylotomima) rufipes (Loew 1873)	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2.041	0.970	0.545	0.601
149	Chalcosyrphus (Xylotomima) valgus (Gmelin 1790)	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	4	2.445	1.010	0.718	0.731
150	Xylota (Xylota) pseudoignava Mutin 1984	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1.564	2.201	5.504	2.087
151	Xylota (Xylota) ignava (Panzer 1798)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	2.933	1.442	2.500	-1.524
152	Xylota (Xylota) nartshukae Bagatshanova 1984	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.170	-0.298	1.011	0.866
153	Xylota (Xylota) triangularis Zetterstedt 1838	0	0	1	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1.822	1.627	4.133	1.876
154	Microdon latifrons Loew 1856	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3.145	2.168	3.349	-6.052
	other Diptera					0	20	53	227		9		40	14	50		3	0	21	7	7	7				2	38		3						3	29	10	4		0	6	13		1		0	3	8	14	2	3	597				
	Apis mellifera					45	93	87	0		0		0	0	0		0	0	85	0	7	236				8	11		3						7	14	0	2		0	15	10		0		0	15	0	0	5	0	643				
	Bombus					0	0	19	0		0		0	0	0		0	0	0	0	0	0				0	0		0						0	0	0	0		0	0	0		0		0	0	0	0	0	0	19				
	other bees					0	5	16	19		0		0	0	0		0	0	0	0	1	0				0	0		0						0	0	0	0		0	0	0		0		0	0	0	1	21	9	72				
	other Hymenoptera					2	5	9	0		5		0	0	10		13	0	2	1	0	6				0	4		0						2	8	0	1		0	6	5		14		0	6	0	0	3	1	103				
	Coleoptera					0	0	1	40		0		10	0	5		0	0	0	0	0	2				0	6		0						0	0	0	0		0	0	0		0		0	1	2	10	5	3	85				
	Lepidoptera					0	7	4	0		2		0	0	0		0	0	0	1	2	3				0	1		0						0	0	0	0		0	0	0		0		0	0	0	0	0	0	20				