

First Report on the Fauna and Ecology of Predatory Dolichopodid Flies (Diptera, Dolichopodidae) of Pskov Province

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Abstract—The fauna and ecology of predatory flies of the family Dolichopodidae were studied in natural habitats and agrocenoses around Velikie Luki City in May–August. Eighty-seven species of dolichopodids are recorded from Pskov Province, including 3 species previously known there from. *Achalcus melanotrichus*, *Lamprochromus strobli*, *Hercostomus nanus*, and *Argyra hoffmeisteri* are newly recorded from Russia. Complexes of hygrophilous and dendrophilous species are distinguished. New data on the emergence terms and habitat preferences of adults are reported. *Medetera tristis*, *Neurigona abdominalis*, *Systemus bipartitus*, *S. pallipes*, *Chrysotus gramineus*, and some other species live on apple trees near Velikie Luki.

INTRODUCTION

In recent years, the research on biodiversity has passed from the descriptive phase to that of scientific generalizations and theoretical analysis (Hoffman and van der Veken, 1994). Since the UN Congress on Protection of the Environment (Rio De Janeiro, 1992), at which the International Convention on the Conservation of Biological Diversity was signed, integration activities of scientists studying the biodiversity in different countries have been growing. An electronic information network for monitoring of biological diversity and nature conservation has been established and is functioning. The concept of conservation of the biological diversity, which dominated during many years, has now given way to the strategy of protection of the biodiversity of natural ecosystems, including plant and animal communities. Meanwhile, many insect taxa playing an important role in faunal assemblages appeared to be nearly untouched by ecological studies. This particularly concerns predatory flies of the family Dolichopodidae of the fauna of Russia, which are of interest for comprehending the formation of faunal assemblages and predicting changes in the biological diversity of ecosystems (Grootaert, 1994). It was not until the recent years that intensive studies of the ecology of species of this family in Voronezh Province (Silina and Chalaya, 1996; Golubtsov and Negrobov, 1997; etc.) and a number of other regions of Russia (Grichanov and Shamshev, 1993; Grichanov, 1997; Malozemov *et al.*, 1997) were started. There are only a few examples of detailed ecological studies of this taxon in the world literature; among

which studies of Belgian scientists (Pollet and Grootaert, 1987–1996) stand out. The fauna of Leningrad Province is the best studied fauna of the former Soviet Union, which includes nearly 230 species of the family Dolichopodidae (Stackelberg, 1962; Grichanov and Negrobov, 1979), whereas no faunal lists of the superfamily Empidoidea have been compiled for Pskov Province. It is in the above review of A.A. Stackelberg alone that this province is indicated as the region of distribution of 3 species of the genus *Dolichopus* Latreille, 1796: *D. lepidus lepidus* (Staeger, 1842), *D. pennatus* (Meigen, 1824), *D. picipes* (Meigen, 1824). Nevertheless, already the first field collections in Pskov Province revealed more than 80 species of dolichopodids. The occurrence of *Achalcus cinereus* (Haliday, 1851) and *Hercostomus* (*Hercostomus*) *chalybeus* (Wiedemann, 1817) in Sebezh District of Pskov Province has been noted recently (Przhiboro). In collections of A.A. Przhiboro (Lake Anninskoye), a male *Achalcus thalhammeri* Lichtwardt, 1913 has also been found, earlier unknown in the Russian fauna. The identification of the species was confirmed by I.Ya. Grichanov.

MATERIALS AND METHOD

The research was conducted in the environs of Velikie Luki from early June through late August 1997, and also from the middle of May through late August 1998, using the method of route survey of ecosystems suitable for habitation of dolichopodids. Material was collected in nearly all major biotopes in the suburban zone of Velikie Luki within the limits of approxi-

mately 8 km and at a distance of 20 km south of the city (near Lake Psovoye). Natural ecosystems included coniferous, broad-leaved, mixed, and flood-plain small-leaved forest, flood-plain (along banks of the Lovat River) and plain meadows, swampy meadow lowlands overgrown with willows, etc. Agroecosystems, such as apple gardens, hayfields, pastures, forest zones, banks of ponds and other artificial water-bodies were also studied. Among the elements of the urban landscape, we can mention parks, cemetery, and the recreation zone along banks of the Lovat River. The major methods of collection were mowing (in the lower storey of plant communities) and individual catch (as a rule on tree trunks) with a net 25 cm in diameter. Horizontal glue traps were used in an apple garden and flood plain forest. These traps had the form of sheets of white Tetrapak paper (size 10 × 15 cm) with entomological glue (Flora firm, Estonia) rendering the trap yellow. Trapped flies were mounted on pins immediately after collecting trips. Part of females of species difficult to distinguish by morphological characters remained unidentified. Therefore, data on catch given below do not always reflect correctly the sex ratio in nature. The major part of the collection is deposited at the All-Russia Research Institute of Plant Protection (VIZR), Russian Academy of Agricultural Sciences (Pushkin).

RESULTS AND DISCUSSION

The weather conditions of the field season of 1997 in Velikie Luki can be named anomalous. Indices of May were on the level of the average pluriannual data. Even though the temperature was slightly lower than normal, the beginning of mass emergence of flies occurred within the period normal for the northwestern region or somewhat later. June in Velikie Luki was warm and rainy, particularly in the middle of the month, when, during two days (June 16–17), the level of rainfall exceeded the average pluriannual monthly norm as a result of heavy rains. July and August were also warm, but with deficit of rainfall, particularly in August. By contrast, the summer of 1998 was characterized mostly by rainy and cold weather with temperatures below the average pluriannual.

Trophic Relations of Dolichopodids

Dolichopodids and their larvae are mostly predators in humid habitats. Larvae of species of the genus *Thrypticus* are phytophages of riparian monocotyledons; adult flies of the genus *Dolichopus* and many

other genera exterminate great numbers of larvae and adults of small Nematocera, Collembola and other insects, and Oligochaeta extracted by them from moist sand and silt. Dendrophilous flies of the genus *Medetera* can feed on larvae of bark-eating beetles, aphids, thrips, and mites occasionally playing an essential beneficial role in agricultural and forest ecosystems by hampering the development and reproduction of noxious pests (Negrobov, 1971; Meuffels *et al.*, 1988; Rathman *et al.*, 1988; Brunel *et al.*, 1989; Grichanov, 1991; Grichanov, Shamshev, 1993).

Habitats of Dolichopodidae

The majority of hydrophilous species of the family Dolichopodidae occur along banks of widely diverse water-bodies (from ephemeral pools and swamps to ponds, lakes, and rivers) on soil or coastal and floating vegetation (see table). Some flies of the genus *Dolichopus* often rest and feed on the surface film of water near a bank. Adults of many species of the genus *Hydrophorus* probably spend most part of their life on the water surface, where they are conspicuous. Females frequently carry smaller males. *Hydrophorus litoreus* and *H. pectinatus* were collected on banks of a pond situated in the middle of a pasture where they moved fast over the surface of the water-body in the bank zone or over the surface of small pools. *H. pectinatus* also occurred on river bank. The fauna of Dolichopodidae along the bank of the Lovat River is the most abundant and varied, particularly outside the urban area. Many species of the genera *Dolichopus*, *Hercostrabus*, *Rhaphium*, and *Syntormon*, and all species of the genera *Sympycnus* and *Teuchophorus* were collected in a thick overgrowth of tall grass, on leaves or on humid soil, mostly on swampy bank areas. A female of *Thrypticus atomus* was caught between tall stems of canes. Areas situated close to the river, trumped out and, devoid of grass, and humid sandy and clayey small shallows near water level are preferred by some species of the genera *Argyra*, *Campsicnemus* and *Rhaphium*. In a coniferous forest, nearly all the collected species of dolichopodids appeared to be associated with streams, ditches filled with water, pools and swamps. Near a pool, on the boundary of a meadow and a small forest, species *Diaphorus disjunctus* and *D. oculatus* were caught. Swampy lower parts of meadows covered with willow stands (without running water) turned out to be poor in abundance and species diversity as compared with river banks. This is apparently related to periodic drying out of these bio-

Faunal assemblage of the family Dolichopodidae in the environs of Velikie Luki

No.	Species	Total number of specimens, including		Collection dates	Biotores
		males	females		
1	<i>Achalcus cinereus</i> (Haliday, 1851)	2	1	June 9-29	In grass near water
2	<i>A. flavicollis</i> (Meigen, 1824)	0	1	July 25	In grass near water
3	<i>A. melanotrichus</i> Mik, 1878	1	0	June 13	On hollow maple trunk (cemetery)
4	<i>Argyra (Argyra) argentina</i> (Meigen, 1824)	3	4	June 24-29	Near river
5	<i>A. (Argyra) argyria</i> (Meigen, 1824)	1	2	June 29-August 11	Near river
6	<i>A. (Argyra) diaphana</i> (Fabricius, 1775)	7	1	June 15-20	Coniferous forest (near stream)
7	<i>A. (Argyra) grata</i> Loew, 1857	1	2	June 14-July 22	Apple garden
8	<i>A. (Argyra) hoffmeisteri</i> (Loew, 1850)	3	1	June 24-29	Near river
9	<i>A. (Argyra) leucocephala</i> (Meigen, 1824)	1	0	July 22	Near river
10	<i>A. (Argyra) setimana</i> Loew, 1859	1	0	June 29	Near river
11	<i>A. (Argyra) setulipes</i> Becker, 1918	1	0	June 10	Near river
12	<i>Campsicnemus curvipes</i> (Fallén, 1823)	16	?2	June 20-August 17	Near river; lake bank; near water
13	<i>C. articulatus</i> (Zetterstedt, 1843)	1	0	June 26	Near river
14	<i>C. lumbatus</i> Loew, 1857	7	?2	June 7-August 19	Near river; near lake; near water (including apple garden)
15	<i>C. marginatus</i> Loew, 1857	1	1	July 5-August 13	Near lake; near water
16	<i>C. pusillus</i> (Meigen, 1824)	6	?1	June 25-30	Near water-bodies; on apple tree
17	<i>C. scambus</i> (Fallén, 1823)	9	9	May 20-August 11	Near river; near lake; humid meadow; near water
18	<i>Chrysotus cilipes</i> (Meigen, 1824)	3	3	June 30-July 19	On grass near water
19	<i>Ch. femoratus</i> Zetterstedt, 1843	1	2	June 22-August 19	On grass near water; humid meadow; on boulders
20	<i>Ch. gramineus</i> (Fallén, 1823)	37	31	June 12-August 17	On poplar tree, on trees, on grass and near water (apple garden); in lake, in river; humid meadow, on boulders
21	<i>Ch. neglectus</i> (Wiedemann, 1817)	1	2	August 13	In grass near lake
22	<i>Ch. suavis</i> Loew, 1857	1	2	June 22	Near river
23	<i>Diaphorus disjunctus</i> Loew, 1857	2	1	June 24	In pool near deciduous forest
24	<i>D. oculatus</i> (Fallén, 1823)	1	0	June 24	In pool near deciduous forest
25	<i>Dolichopus acuticornis</i> (Wiedemann, 1817)	1	0	June 24	Near river
26	<i>D. arbustorum</i> Stannius, 1831	4	2	23 July-20 August	Near water, near pond
27	<i>D. argyrotarsis</i> Wahlberg, 1850	5	1	9-24 June	Near river
28	<i>D. brevipennis</i> (Meigen, 1824)	5	1	14-30 June	Near water (including apple garden)
29	<i>D. cilifemoratus</i> Macquart, 1827	8	1	June 20-August 18	On river bank; near water; apple garden
30	<i>D. claviger</i> Stannius, 1831	5	1	June 24-July 21	Including deciduous forest
31	<i>D. festivus</i> Haliday, 1832	5	?	July 23-26	Near river

Table (Contd.)

No.	Species	Total number of specimens, including		Collection dates	Biotores
		males	females		
32	<i>D. lepidus lepidus</i> Staeger, 1842	2	2	June 20	Near stream (coniferous forest)
33	<i>D. linearis</i> Meigen, 1824	2	0	June 24	Near river
34	<i>D. lineatocornis</i> Zetterstedt, 1843	6	?	June 7–July 3	Near pond, on grass; near water (including park, apple garden)
35	<i>D. longicornis</i> Stannius, 1831	2	1	July 21	Near river, near lake
36	<i>D. longitarsis</i> Stannius, 1831	1	0	August 1	Near bog
37	<i>D. nigripes</i> Fallén, 1823	2	2	June 7–26	Near river
38	<i>D. pennatus</i> Meigen, 1824	10	14	June 9–29	Near water, near stream (in coniferous forest)
39	<i>D. picipes</i> (Meigen, 1824)				Stackelberg, 1962: 287
40	<i>D. plumipes</i> (Scopoli, 1763)	22	3	June 9–August 13	Near pond; near stream (including coniferous forest); near river; on bog; near water; apple garden
41	<i>D. popularis</i> (Wiedemann, 1817)	2	1	June 24–July 3	Apple garden (on glue trap); on grass
42	<i>D. simplex</i> Meigen, 1824	33	8	June 9–August 20	Near pond; near water; apple garden, river bank
43	<i>D. unguatus</i> (Linnaeus, 1758)	29	7	June 14–August 9	Near stream (including coniferous forest); near river; near water (including park)
44	<i>Hercostomus</i> (<i>Gymnopternus</i>) <i>aerosus</i> (Fallén, 1823)	63	22	June 9–July 3	Near water; on grass
45	<i>H.</i> (<i>Gymnopternus</i>) <i>angustifrons</i> (Staeger, 1842)	13	11	June 9–30	Near water (apple garden, coniferous forest)
46	<i>H.</i> (<i>Gymnopternus</i>) <i>assimilis</i> (Staeger, 1842)	2	0	June 14–30	Near water (park)
47	<i>H.</i> (<i>Gymnopternus</i>) <i>celer</i> (Meigen, 1824)	20	16	May 19–June 30	Near water; humid meadow
48	<i>H.</i> (<i>Hercostomus</i>) <i>chalybeus</i> (Wiedemann, 1817)				Przhiboro, 2001
49	<i>H.</i> (<i>Hercostomus</i>) <i>germanus</i> (Wiedemann, 1817)	5	1	July 22–23	
50	<i>H.</i> (<i>Gymnopternus</i>) <i>metallicus</i> (Stannius, 1831)	40	15	June 9–30	Near water
51	<i>H.</i> (<i>Hercostomus</i>) <i>nanus</i> (Macquart, 1827)	0	1	August 8	Near lake
52	<i>Hydrophorus litoreus</i> Fallén, 1823	2	11	June 7	Near pond
53	<i>H. pectinatus</i> Gerstaecker, 1864	3	3	June 7, August 11	Near pond; near river
54	<i>Lamprochromus strobli</i> Parent, 1924	6	4	June 7–30	Near water (including apple garden)
55	<i>Medetera jacula</i> (Fallén, 1823)	21	25	June 11–August 19	On trunks of poplar tree, aspen, lime tree; on posts, wooden houses

Table (Contd.)

No.	Species	Total number of specimens, including		Collection dates	Biotores
		males	females		
56	<i>M. pallipes</i> (Zetterstedt, 1843)	2	5	June 26, August 7	On posts; on apple trees
57	<i>M. tristis</i> (Zetterstedt, 1838)	5	7	June 12-25, August 7	On trunks of poplar tree, birch-tree, maple, apple tree
58	<i>Medetera</i> sp.	0	1	June 29	On aspen trunk
59	<i>Neurigona abdominalis</i> (Fallén, 1823)	2	0	June 14	Apple tree trunk (garden)
60	<i>N. quadrifasciata</i> (Fabricius, 1781)	9	7	June 13-20	On trunks of oak, willow, lime tree, maple (forest, forest zone, park, cemetery)
61	<i>Rhaphium appendiculatum</i> Zetterstedt, 1849	2	?	June 20	Near stream (coniferous forest)
62	<i>Rh. commune</i> (Meigen, 1824)	9	4	May 18-June 9 August 17-19	Near water; humid meadow
63	<i>Rh. disicigerum</i> Stenhammer, 1850	1	0	August 17	Near water
64	<i>Rh. fasciatum</i> Meigen, 1824	6	5	June 4-July 26	Near river
65	<i>Rh. fascipes</i> (Meigen, 1824)	2	1	June 14-July 24	Near water (including apple garden)
66	<i>Rh. laticorne</i> (Fallén, 1823)	3	?	June 10	Near river
67	<i>Rh. micans</i> (Meigen, 1824)	1	1	August 9-13	On shore of lake, river
68	<i>Rh. monotrichum</i> Loew, 1850	21	?	May 18-June 29	Near water (park), near stream (coniferous forest); humid meadow
69	<i>Rh. nigribarbatum</i> (Becker, 1900)	1	?	June 29	Near river
70	<i>Rh. penicillatum</i> Loew, 1850	6	?	June 6-29	Near river
71	<i>Rh. rivale</i> (Loew, 1869)	1	?	June 9	Near river
72	<i>Rh. zetterstedti</i> (Parent, 1925)	18	26	June 9-August 9	Near water (park); near stream
73	<i>Sciapus albifrons</i> (Meigen, 1824)	0	1	August 13	Edge of low forest
74	<i>S. platypterus</i> (Fabricius, 1805)	4	4	June 19-August 14	On trunks of oak, maple
75	<i>Sympycnus aeneicoxa</i> (Meigen, 1824)	40	12	June 29-July 23	Near bog; near river; humid meadow; on grass, near water
76	<i>S. pulicarius</i> (Fallén, 1823)	61	28	June 10-August 19	Near river; on grass; near water
77	<i>Syntormon pallipes</i> (Fabricius, 1794)	13	?	June 9-August 17	Near water
78	<i>S. pumilus</i> (Meigen, 1824)	13	?	June 6-29	Near river
79	<i>S. subinermis subinermis</i> (Loew, 1869)	1	?	June 30	Near river
80	<i>Systemus bipartitus</i> (Loew, 1850)	0	3	June 12-14	On trunks of maple tree, apple tree
81	<i>S. pallipes</i> (von Roser, 1840)	0	1	June 14	On apple tree trunk
82	<i>Telmaturgus tumidulus</i> (Raddatz, 1873)	1	3	August 8	Lake shore
83	<i>Teuchophorus calcaratus</i> (Macquart, 1827)	19	?	June 24-July 11	Bogged meadow near river; near water
84	<i>T. nigricosta</i> (von Roser, 1840)	9	?	June 24-July 26	Bogged meadow near river
85	<i>T. spinigerellus</i> (Zetterstedt, 1843)	6	?	June 29-30	Bogged meadow near river
86	<i>Thrypticus atomus</i> Frey, 1915	0	1	June 26	On grains on river bank
87	<i>Xanthochlorus tenellus</i> (Wiedemann, 1817)	0	3	July 23-August 13	Edge of spruce forest; edge of low forest

opes in summer. Nevertheless, common species of the genera *Syntormon*, *Rhaphium*, *Sympycnus*, *Campsicnemus* and others occur there regularly. It should be noted that such hollows near apple gardens, were foci of emergence of a number of species of Dolichopodidae over the entire garden area (*Dolichopus brevipennis*, *D. plumipes*, *D. popularis*, *D. simplex* and others). Some species of the genera *Chrysotus* and *Campsicnemus* (in particular, *Ch. gramineus* and *C. pusillus*), which occur not only near water, but also on leaves of shrubs and tree trunks at a long distance from waterbodies, appeared to be eurytopic. Species of the subgenus *Gymnopternus* (genus *Hercostomus*) attained great abundance in the second half of June 1997 near streams and pools in a deciduous low forest.

Many species of the family are associated with trunks of deciduous trees. The faunal assemblage of an apple tree in Velikie Luki is represented by species *Medetera tristis*, *M. pallipes*, *Neurigona abdominalis*, *Systemus bipartitus*, *S. pallipes*, *Chrysotus microcerus*, etc. A male of *Achalculus melanotrichus* was collected on a trunk of a hollow maple. According to published data, adults of this species occur mostly in tree hollows and are found in rearing from decaying wood. The majority of dendrophilous species of dolichopodids (including *Sciapus platypterus*) was found on two or more subgenera of deciduous trees, but not on coniferous trees. Wooden poles of power lines were favorite place of rest for adults of *Medetera pallipes* and *A. jacula*. *M. pallipes* has been noticed earlier on birch tree trunk (Stackelberg, 1962).

Fauna of Dolichopodids of Pskov Province

The species composition of dolichopodids of Pskov Province was revealed to include 87 species. Comparison of the faunal assemblage of the family Dolichopodidae of Pskov Province (environs of Velikie Luki, see above) and Leningrad Province (Grichanov and Nerozov, 1979) shows that 75 out of the 85 species identified occur in both the regions. *Dolichopus picipes* (Stackelberg, 1962) was also discovered within their limits. Among rare species, four have been reported for the fauna of Russia for the first time. For *Achalculus melanotrichus* this is the easternmost locality where the species has been collected. Until recently it has been known from Great Britain, Ireland, the Netherlands, Belgium, Germany, Austria and Romania (Pollet, 1996). European species *Argyra hoffmeisteri* and *Hercostomus nanus* have not been reported east of the Transcarpathian region. *Lamprochromus strobili* has been known from western Europe. Parent (1938) included Russia in its distribution range. The present

report is the first reliable report of the species from the territory of Russia. Among other species that have not been found in Leningrad Province, *Argyra setulipes* has been known from the original description from Orenburg Province. Relatively rare, but widespread European *Dolichopus arbustorum*, *D. lineatocornis* and *D. nigripes* have been indicated earlier from Estonia. Of interest are findings of *Rhaphium nigribarbatum* (male!) having a circum-Arctic range (Scandinavia, northern part of European of Russia, Siberia, North America) and also *Dolichopus flavipes* and *Syntormon subinermis* normally occurring further southwards (moderate zone and southern-European part of Russia). It should be noted, however, that the dolichopodid fauna of Russia and neighboring countries has been studied insufficiently. Therefore, the patchiness of the known ranges of some species can be attributed to difficulties in collecting them and in identification of adults (small flies of genera *Achalculus* and *Teuchophorus*, actively flying *Argyra* and *Diaphorus*, difficultly distinguishable species of *Chrysotus* and *Neurigona*).

Periods of Emergence of Dolichopodids

The phenological periods of emergence for the majority of species of Dolichopodidae were the same as indicated by Stackelberg (1962) for Leningrad Province. However, seven species (*Hercostomus celer*, *Rhaphium commune*, *Rh. monotrichum* (May), *Campsicnemus pusillus*, *Chrysotus suavis*, *Systemus bipartitus*, and *Teuchophorus spinigerellus* (middle and late June) were collected by us in earlier periods, and *Sciapus albifrons*, in later periods (August) than those reported by Stackelberg. For the majority of species of dolichopodids, our data also conform to the evaluation of abundance by Stackelberg. At the same time, although indicated as rare, species *Medetera tristis*, *Teuchophorus calcaratus*, and particularly *Hercostomus metallicus*, occurred in large amounts in most different biotopes. Of interest is the absence in our collections, made in the environs of Velikie Luki, of approximately 25 species of dolichopodids that are common or not infrequent on the entire territory of Leningrad Province or in its southern part.

CONCLUSIONS

For Pskov Province, 87 species of dolichopodids were indicated (including 3 previously known species). *Achalculus melanotrichus*, *Lamprochromus strobili*, *Hercostomus nanus*, and *Argyra hoffmeisteri* were reported for the fauna of Russia for the first time. Assemblages of hydrophilous and dendrophilous doli-

chopodids were revealed. Inhabitants of apple tree were represented in Velikie Luki by *Medetera tristis*, *M. pallipes*, *Neurigona abdominalis*, *Systemus bipartitus*, *S. pallipes*, *Chrysotus microcerus*, and others.

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