Karyotype of *Latibulus argiolus* (Rossi, 1790) (Hymenoptera: Ichneumonidae)

Кариотип *Latibulus argiolus* (Rossi, 1790) (Hymenoptera: Ichneumonidae)

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**ABSTRACT.** Karyotype of *Latibulus argiolus* (Rossi, 1790) (Ichneumonidae), a widespread parasitoid of the wasp genus *Polistes* Latreille, 1802 (Vespidae), was studied for the first time using chromosome morphometrics. In this species, $n = 9$ and $2n = 18$ were found. No karyotypic difference between the examined populations of *L. argiolus* from different host species and geographical regions was detected.

**REЗЮМЕ.** С использованием морфометрии хромосом впервые изучен кариотип *Latibulus argiolus* (Rossi, 1790) (Ichneumonidae), широко распространённого паразитоида ос рода *Polistes* Latreille, 1802 (Vespidae). Обнаружено $n = 9$ и $2n = 18$. Кариотипические различия между исследованными популяциями *L. argiolus*, связанными с разными видами хозяев и географическими регионами, не обнаружены.

**Introduction**

Parasitoid Hymenoptera are one of the most speciose, taxonomically complicated and economically important insect groups, with their estimated number of species in the world fauna far exceeding one million [Quicke, 1997; Bebber et al., 2014; Forbes et al., 2018]. Among parasitic wasps, Ichneumonidae represent the most diverse family that harbors more than 24 thousand described species [Huber, 2017]. The subfamily Cryptinae is the largest group of the Ichneumonidae which includes about 400 genera and 4500 described species [Quicke, 2015]. However, chromosomes of only nine cryptine ichneumonids are examined up to now, as opposed to more than 150 karyotypically studied members of the family that belong to other subfamilies of the Ichneumonidae [Gokhman, 2009]. We have studied for the first time chromosome sets of two populations of *Latibulus argiolus* (Rossi, 1790), a well-known parasitoid of the wasp genus *Polistes* Latreille, 1802 (Vespidae) [Makino, 1983; Rusina, 2013]. The results of this study are given below.

**Material and methods**

Nests of *Polistes nimpha* (Christ, 1791) and *P. gallicus* (Linnaeus, 1761) used in the present study were respectively collected by A.Y. Kosyakova and A.I. Rusin on *Pinus sylvestris* Linnaeus (Snokhino, Klepikovsky District, Ryazan Province, Russia: 55°08´N; 40°35´E) and *Grindelia squarrosa* (Pursh) (outskirts of Kherson, Kherson Province, Ukraine: 46°40´N; 32°37´E) in August and September 2019. Cocoons containing last-instar larvae of the overwintering second generation of *L. argiolus* were extracted from the nests, kept at 5 to 7 °C for a few weeks, and then kept at room temperature either for obtaining prepupa for the karyotypic analysis or for rearing adult individuals. Reared specimens of *L. argiolus* were identified by the first author using the key provided by Oh et al. [2012].

Chromosome preparations were made from cerebral ganglia and developing testes of five parasitoid prepupae and early pupae using a modified version of the technique described by Imai et al. [1988]. Wasps were dissected in 0.5% hypotonic sodium citrate solution containing 0.005% colchicine, and the tissues were incubated in fresh solution for 30 minutes at room temperature. The material was transferred to a pre-cleaned microscope slide using a Pasteur pipette and gently flushed with...
with Fixative I (glacial acetic acid: absolute ethanol: distilled water 3:3:4). Tissues were disrupted in an additional drop of Fixative I using dissecting needles. Another drop of Fixative II (glacial acetic acid: absolute ethanol 1:1) was then applied to the center of the area and blotted off the edges of the slide. The slide was air dried at room temperature. Preparations were stained with freshly prepared 3% Giemsa solution in 0.05M Sorensen’s phosphate buffer (Na2HPO4 + KH2PO4, pH 6.8).

Twenty-eight mitotic divisions were studied and photographed using an optic microscope Zeiss Axioskop 40 FL fitted with a digital camera Axiocam 208 color (Carl Zeiss, Germany). To obtain karyograms, the resulting images were handled with image processing programs ZEN version 3.0 (blue edition) and GIMP version 2.10. Chromosomes from the best four haploid metaphase plates were measured using KaryoType software version 2.0 to identify relative lengths (RLs) and centromeric indices (CIs) of chromosomes (Table 1) which were then classified using criteria provided by Levan et al. [1964].

### Results and discussion

The haploid karyotype of *L. argiolus* contains nine chromosomes (n = 9) (Fig. 1). Among them, there are three long bi-armed chromosomes, i.e. two metacentrics and a submetacentric, three substantially shorter chromosomes (two acrocentrics and a metacentric/submetacentric), and another three apparently metacentric or submetacentric chromosomes (Table 1). Analogously, the diploid karyotype of this species harbors nine chromosome pairs (2n = 18; image not shown).

*L. argiolus* became the second karyotypically studied member of the tribe Cryptini (= Mesostenini) [Gokhman, 2009]. However, the chromosome set of another species within *L. argiolus* that belongs to this group, *Mesostenus gracilis* Cresson, 1864 with n = 10, strongly differs from that of *mesostenus gracilis*. The present work is partly supported by a research grant from the Russian Foundation for Basic Research no. 18-04-00611 to VEG.

### Table 1. Relative lengths and centromeric indices of chromosomes of *L. argiolus* (mean ± SD).

<table>
<thead>
<tr>
<th>Chromosome no.</th>
<th>RL</th>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>19.75 ± 0.89</td>
<td>46.31 ± 2.03</td>
</tr>
<tr>
<td>2</td>
<td>15.51 ± 1.10</td>
<td>45.48 ± 4.22</td>
</tr>
<tr>
<td>3</td>
<td>13.78 ± 0.68</td>
<td>31.42 ± 3.78</td>
</tr>
<tr>
<td>4</td>
<td>10.49 ± 0.47</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>9.57 ± 0.63</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>9.12 ± 0.34</td>
<td>38.47 ± 5.34</td>
</tr>
<tr>
<td>7</td>
<td>7.97 ± 0.30</td>
<td>30.24 ± 6.76</td>
</tr>
<tr>
<td>8</td>
<td>7.39 ± 0.35</td>
<td>36.00 ± 6.20</td>
</tr>
<tr>
<td>9</td>
<td>6.42 ± 1.03</td>
<td>32.18 ± 3.54</td>
</tr>
</tbody>
</table>

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### References


Fig. 1. Karyogram of haploid chromosome set of *L. argiolus*. Scale bar: 5 µm.