Potential fecundity and lifespan of adult reindeer warble flies (*Oedemagena tarandi* L. and *Cephenomyia trompe* Modeer) in the tundra zone of the Republic of Sakha (Yakutia) of the Russian Federation

Biology and Medicine

Research Article
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Russian Federation

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Abstract
The average potential fecundity of *Oedemagenia tarandi* L. and *Cephenomyia trompe* Modeer females bred in cages is higher than that of the females caught in the wild. The potential fecundity of the first species is 564.8 ± 16.4 against 336 ± 64.5 eggs, and the potential fecundity of the second species is 692 ± 12.8 against 96.7 ± 77.1 larvae, respectively. Females *C. trompe* Modeer live from 7 to 27 days (17.2 days upon the average) at the average air temperature 7.1°C, males live from 4 to 24 days, 12.2 upon the average. *Oe. tarandi* L. females lifespan is from 1 to 17 days, 9.57 ± 2.32 days upon the average (average value of three samples), males – from 2 to 19 days, 9.53 ± 0.9 upon the average. Warble flies remained alive after being in the snow at the temperature of −12°C for 12 h, and when the cages were brought in a warm place they began moving actively after 20-30 min.

Keywords: *Oedemagenia tarandi* L.; *Cephenomyia trompe* Modeer; fecundity; lifespan; adults.

Introduction

Reindeers are bred in many countries, but they are parasitized by warble flies *Oedemagenia tarandi* L. and *Cephenomyia trompe* Modeer [1-5]. There are about 2.5 million reindeers in the Russian Federation which is 80% of the reindeer world population. Large reindeer farms are concentrated in the tundra and forest-tundra region of Magadan, Yamal-Nenets Autonomous Okrug, and the Republic of Sakha (Yakutia). Reindeer husbandry is one of the leading branches of farming in these regions [6,7]. However, the development of reindeer husbandry in our country is largely constrained by a variety of infectious and parasitic diseases of reindeers. The greatest harm is caused by warble flies: subepidermal (*Oe. tarandi* L.) and nasopharyngeal (*C. trompe* Modeer). The wide spread of warble flies and their high abundance violate summer pasture-animal regime [8-11].
flies in the tundra zone of the Republic of Sakha (Yakutia) of the Russian Federation.

**Materials and Methods**

Yakutia is located in the north-east of Asia between the 76°3′ and 55°29′ north latitude and 105°3′ and 162°51′ east longitude. The area of Yakutia (3,103.2 thousand km²) occupies 18% or almost one-fifth of the Russian Federation territory. This is the area of the northern hemisphere cold pole which is characterized by wide temperature fluctuations. The January long-term mean air temperature in Oymyakon and Verkhoyansk is minus 49-50°C, low reach minus 68-71°C. The summer is short, but relatively hot (in most of the republic the maximum temperature is plus 36-38°C, on the Laptev Sea coasts it is plus 29-32°C), with a long sunshine duration (a continuous polar day). The number of domesticated reindeer in Yakutia in the research period was 190.15 thousand animals.

The experimental part of the work was carried out in the 2003-2013 in Allaikhovsky and Anabarsky regions of Yakutia located in the tundra on the Laptev and East Siberian sea coasts, in the Archaeoentomology Laboratory of the State Scientific Institution of the Yakutsk Agricultural Research Institute (Figure 1). The dynamics of larvae drop was observed in a group of riding reindeer. We collected 1,395 *Oe. tarandi* larvae and 66 *C. trompe* Modeer larvae. In this case, a thorough inspection of places of

![Figure 1: The Republic of Yakutia (Sakha) of the Russian Federation.](image-url)
The total number of dissected females caught on turnbuckle was 69 *Oe. tarandi* L. and 8 *C. trompe* Modeer, and the number of females bred in cages was 51 *Oe. tarandi* L. and 2 *C. trompe* Modeer.

**Results and Discussion**

The average potential fecundity of *Oe. tarandi* L. and *C. trompe* Modeer females bred in cages is higher than that of those captured on the turnbuckle, the fecundity of the first species is $564.8 \pm 16.4$ against $336 \pm 64.5$ eggs and that of the second is $692 \pm 12.8$ against $96.7 \pm 77.1$ ($p < 0.05$) larvae, respectively. The maximum and the minimum fecundity of *Oe. tarandi* L. and *C. trompe* Modeer females bred in cages is also higher than that of the collected in nature, the maximum fecundity of the first species is 853 against 786 eggs, for the second it is 795 against 209 larvae, the lowest fecundity of the first species is 315 to 55, for the second it is 539 against 0 larvae (Table 1).

Warble flies lifespan in the adult stage varies greatly (from 1 to 27 days). The most long-living were the adults of nasopharyngeal warble flies. At the average air temperature of 7.1°C, the *C. trompe* Modeer females lived from 7 to 27 days, on average – 17.2; males – from 4 to 24 days, on average – 12.2 days. The lifespan of *Oe. tarandi* L. females is from 1 to 17 days, on average – 9.57 ± 2.32 days (the average value of three samples), males – from 2 to 19 days, on average – 9.53 ± 0.9, $p < 0.05$.

With an increase in the average daily temperature to 16.2°C and relative humidity of 45-55%, the lifespan of *Oe. tarandi* females is 7.5 days, males – 11.3 days. When analyzing the dependence of warble flies viability on sexual characters, it was found that there was no considerable difference between the lifespan of

**Table 1: Data on the potential fecundity of reindeer warble flies females.**

<table>
<thead>
<tr>
<th></th>
<th><em>Oe. tarandi</em> L.</th>
<th><em>C. trompe</em> Modeer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Caught in the</td>
<td>Bred in cages</td>
</tr>
<tr>
<td></td>
<td>nature</td>
<td></td>
</tr>
<tr>
<td>The number of dissected insects</td>
<td>69</td>
<td>51</td>
</tr>
<tr>
<td>The maximum number of eggs or larvae</td>
<td>786</td>
<td>853</td>
</tr>
<tr>
<td>The minimum number of eggs or larvae</td>
<td>55</td>
<td>315</td>
</tr>
<tr>
<td>Average fecundity</td>
<td>$336 \pm 64.5$</td>
<td>$564.8 \pm 16.4$</td>
</tr>
</tbody>
</table>

For determining the potential fecundity of *Oe. tarandi* L. and *C. trompe* Modeer females, we used the technique by Pavlovsky [13]. The number of eggs in the female gonads and larva in the warble flies female uterus was counted using the MBS-2 microscope. The specimens collected for the experiment were caught at the beginning and at the end of the flight time, as well as the ones hatched from pupae in the cages.
Table 2: The lifespan of *Oe. tarandi* L. and *C. trompe* Modeer adults.

<table>
<thead>
<tr>
<th>Times of breeding flies, the number of flies</th>
<th>The males lifespan (days)</th>
<th>The females lifespan (days)</th>
<th>Air temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimal</td>
<td>Maximal</td>
<td>Average</td>
</tr>
<tr>
<td><em>Oe. tarandi</em> L.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13-30 June, 15 adult specimen</td>
<td>2</td>
<td>17</td>
<td>9</td>
</tr>
<tr>
<td>1-5 July, 74 adult specimen</td>
<td>3</td>
<td>19</td>
<td>11.3</td>
</tr>
<tr>
<td>18-28 July, 28 adult specimen</td>
<td>7</td>
<td>9</td>
<td>8.3</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td>19</td>
<td>9.53 ± 0.9</td>
</tr>
<tr>
<td><em>C. trompe</em> Modeer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 July-4 August, 10 adult specimen</td>
<td>4</td>
<td>24</td>
<td>12.2</td>
</tr>
</tbody>
</table>

*Oe. tarandi* L. males and females, while the lifespan of *C. trompe* Modeer of males is 5 days shorter (Table 2).

Warble flies are cold-resistant. We have recorded them flying after night frosts from –2°C to –7°C. Warble flies remained alive after being in the snow at a temperature of –12°C for 12 h. They began moving actively after being brought in a warm place and staying there for 20-30 min.

References


