SEASONAL ACTIVITY OF LARVAE AND NYMPHS OF IxODES PERSULCATUS P. SCH. IN THE EASTERN PART OF THE RUSSIAN PLAIN

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Abstract. In the southern taiga forests of the eastern part of the Russian Plain the infestation with I. persulcatus larvae and nymphs lasts about 50 days on the average (from May to August). The larval and nymphal peak activities are almost coinciding. This period falls on June, i.e. the time when there are additions of young animals to the populations of most small mammal species and the ticks feed both on the animals which have overwintered and those born in the current year. Thus, in June the most favourable conditions are created in the TBE focus for the transmission of the causative agent to small mammals.

Consistent patterns in the seasonal activity of larvae and nymphs affect the rhythm and duration of developmental cycle of ticks. Changes of the seasonal activity of immature stages of Ixodes persulcatus also affect the degree of intensity of the epizootic process in different periods of the spring-summer season. The tick population inhabiting different parts of the nosoarea of tick-borne encephalitis (TBE) may apparently differ in the periods of first appearance of larvae and nymphs, in the duration of infestation of vertebrates and in the character of the curve reflecting the seasonal changes in the number of immatures on their hosts. The objective of the present communication is to characterize the indices in the populations of I. persulcatus in the eastern part of the Russian Plain according to long-term data.

MATERIAL AND METHODS

In order to elucidate the changes in the seasonal activity of I. persulcatus larvae and nymphs regular collecting of these parasites from animals on which they were feeding, was necessary. For this purpose the standard ditches, each 50 m long and provided with five cylinders, were in operation in different most typical biotopes. The animals captured in cylinders were collected daily early in the morning; each animal was placed in a linen bag, transported to laboratory where the parasites were removed from them. Between 5 and 50 animals were examined daily. The studies were carried out in the southern taiga forests of the Kirov Region during five years (1960–1964) from May to August (in 1961 until September) and one season in the Udmurt ASSR (from June to August 1968). During the five seasons 10,155 small mammals were captured from which 17,497 larvae and 2,165 nymphs of I. persulcatus were removed.

RESULTS

In the region studied the ratio between the number of larvae and nymphs is rather changeable and considerably differed in years. A minimum difference in the numbers of larvae and nymphs was observed in 1963 (4 : 1), the maximum difference in 1964 (24 : 1). Especially notable were the two years – 1960 (15 : 1) and 1964 (24 : 1).

The beginning of larval activity fell on the second ten-day period of May. First larvae attacked animals between May 14 and 19. In 1961 first larvae were observed on animals on May 19; in 1962 on May 14; in 1963 on May 10 and in 1964 also on May 16.
Due to the fact that nymphs appeared on small mammals as early as the beginning of May, nymphal activity may be considered to start earlier than the larval activity.

Larvae and nymphs were most numerous in June (in different years 699–2982 larvae and 134–415 nymphs were collected from animals in one month), when high mean infestation per host (3.13 larvae, 0.67 nymphs) could be also observed. In July, the immatures of *I. persulatus* occurred less frequently and mean larval and nymphal infestation per one small mammal diminished. In August the activity of larvae and nymphs declines. In the first ten-day period of that month 6–337 larvae and 0–27 nymphs were removed from animals in different years, the mean infestation per host being 0.33 and 0.03 respectively. In the second ten-day period of August in both years (1961 and 1964) larvae occurred on animals regularly (44–147 per ten-day period). In September 1961 only 5 larvae were collected from more than 300 animals (Table 1, 2). An analogous regularity was also observed in 1965 in the second part of this region, in the Malaya Purga district of the Udmurt ASSR (Table 3).

**Table 2. Changes in the mean larval and nymphal infestation per host in different 10-day periods in the Kirov Region**

<table>
<thead>
<tr>
<th>10-day periods</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developmental stages</td>
<td>3rd</td>
<td>1st</td>
<td>2nd</td>
<td>3rd</td>
</tr>
<tr>
<td>Larvae</td>
<td>1.50</td>
<td>3.03</td>
<td>3.13</td>
<td>2.16</td>
</tr>
<tr>
<td>Nymphs</td>
<td>0.63</td>
<td>0.67</td>
<td>0.33</td>
<td>0.23</td>
</tr>
</tbody>
</table>

Note: The data given were obtained in two-year studies (1961 and 1964).

**Table 3. Changes in the mean larval and nymphal infestation per host in different 10-day periods in 1968. Data from the Udmurt ASSR**

<table>
<thead>
<tr>
<th>Developmental stages</th>
<th>June</th>
<th>July</th>
<th>10-day periods</th>
<th>August</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st</td>
<td>2nd</td>
<td>3rd</td>
<td>1st</td>
</tr>
<tr>
<td>Larvae</td>
<td>8.2</td>
<td>6.5</td>
<td>5.3</td>
<td>3.1</td>
</tr>
<tr>
<td>Nymphs</td>
<td>0.3</td>
<td>0.18</td>
<td>0.4</td>
<td>0.11</td>
</tr>
</tbody>
</table>

The character of seasonal changes in the numbers of nymphs was similar to that of seasonal changes in the numbers of larvae, but the nymphal infestation was considerably lower, and in September no nymphs were found on animals. In 1969 the nymphal infestation terminated in the last ten days of July, in 1961 in the last ten days of August and in 1964 in the first ten-day period of that month.

In late autumn months (November-beginning of December) 277 animals were captured (81 in ditches, 196 in live traps) in 1962; 118 animals (18 in ditches, 100 in live traps) in 1963. No larvae and nymphs were found on the animals.

In the region studied the main hosts of *I. persulatus* immatures are *Clethrionomys glareolus* and *Sorex araneus*. In this particular case it is interesting to trace the seasonal
changes in the larval and nymphal mean infestation per animal (Tables 4 and 5). Changes in larval and nymphal numbers parasitizing these species of small mammals are analogous to the changes in their numbers infesting all host species occurring in the region. These data demonstrate the same consistent patterns in seasonal activity of *I. persulcatus* immatures. Even in the years of maximum and minimum numbers of these parasites the curves of their seasonal activity are of the same character as is the average long-term curve in both larvae and nymphs.

Thus, the highest larval numbers were observed in the first-second ten-day periods of June, while in the last ten days of that month a slight decline of their numbers, especially since the beginning of July, was recorded. The gradual decline of their numbers continued during July and the first ten-day period of August. In the second half of August the mean infestations per host approached zero, and in September only single larvae were found on the animals.

An analogous regularity was observed during nymphal activity with the only difference that their activity started and terminated somewhat earlier.

Deviations of meteorological values from the average long-term ones did not determine the changes of seasonal activity of larvae and nymphs, except for the cold spring of 1961 which caused a delay in massive tick infestation (but not the beginning of tick activity) by about ten days, the infestation later being more simultaneous. The host numbers also notably influenced the progress of activity of *I. persulcatus* immatures. In 1961, however, when the host numbers were the lowest, the period of maximum activity of parasites was somewhat extended, including not only June, but July as well. In 1960 the numbers of small mammals were the highest in all years of studies. In that year larvae and nymphs infested their hosts simultaneously, the peak in their numbers falling on the first two ten-day periods of June, but the activity of tick immatures terminated towards August. Consequently, the seasonal activity of *I. persulcatus* larvae and nymphs had its own rhythm and a definite duration, while the environmental conditions (weather, host numbers) exerted no considerable influence on it.

**DISCUSSION**

A comparison of our data with those obtained in the studies carried out in other parts of the *I. persulcatus* range, indicates a particular character of seasonal changes of larval and nymphal activity of that tick occurring in the eastern part of the Russian Plain. In contrast to the Tatar ASSR situated south of the region studied and the Primorye Territory, the easternmost part of the tick range, the period of activity of *I. persulcatus* immatures begins somewhat later here and is by 10—20 days shorter (Gilmanova et al., 1959; Soldatov and Vavilova 1959).

The period of tick infestation and the course of seasonal activity of *I. persulcatus* immatures are most similar in the region studied and in the Krasnoyarsk Territory (Vasilyeva and Nikiforov 1968). A less extended period of larval and nymphal activity promotes a synchronization of separate stages of the tick developmental cycle.

**СЕЗОНИННАЯ АКТИВНОСТЬ ЛИЧНИКОВ И НИМФ IXODES PERSULCATUS Р. ВСИ НА ВОСТОКЕ РУССКОЙ ГАВАНИ**

Л. Г. Суворова

Резюме. В восточно-тундровых лесах востока Русской равнины паразитирование личинок и нимф *I. persulcatus* длится в среднем около 90 дней (с мая по август). Некоторые активности личинок и нимф постепенно свяжены. Этот период наступает на шесть—восемь недель раньше в сравнении с другими видами, а также кормится как на зимующих животных, так и на сеголетках. Таким образом, это время в целом сводит наиболее благоприятные условия для передачи возбудителей мелкоземных инфекций.
O. M. Butenko: Kleschhi-rinissidnyi nevarohyinykh pitis SSSR. (Rhinonyssid mites of non-passeriform birds of the USSR). Publ. House of the Moscow University, Moscow 1984, 188 pp., 29 Figs. Price 0.55 R.

The book is the first complex treatment of the family Rhinonyssidae, the parasites of non-passeriform birds in the territory of the USSR. It includes the results obtained in the examination of 9,500 hosts belonging to 175 species from 16 orders. The systematic part presents the characterization of the family and the ten individual genera recognized by the author, accompanied by keys to genera and species. The passages devoted to species include relevant literature, if used be synonymy, commentary, description of female and male and data on the material studied. A total of 70 species is presented and depicted. A new genus Charadriemyssus and 8 new species are described. At the end there is a list of species found in the USSR, as well as species with potential occurrence in that territory, and a survey of hosts, their rhinonyssids and regions where they have been found.

This is a very useful publication, indispensable not only to acarologists in the USSR, but in other European countries as well. It is only to be regretted that the whole number of copies issued is low.

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