Seasonal occurrence of larval trombiculid mites by Tullgren’s funnel method in Kagoshima Prefecture for three years, with a few references to morphological variations

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(Received: 5 October 2012; Accepted: 12 February 2013)

Abstract: Seasonal occurrence of larval trombiculid mites was surveyed at two adjacent areas using Tullgren’s funnel method for three years. Larval trombiculid mites were collected every month from April 2004 to March 2007 at two Aira City, Kagoshima Prefecture. Twenty trombiculid species were collected from soil samples: Leptotrombidium scutellare, L. kuroshio, L. murotoense, L. kitasaitoi, L. himitsu, L. fuji, L. miyajimai, L. kansai, Neotrombicula mitamuraui, Eltonella ichikawai, Miyatrombicula kochiensis, Cheladonta ikaoensis, Doloisia uchikawai, Helenicula miyagawai, Mackiena todai, Neoschoengastia shiraii, Schoutedenichia nagasakiensis, Walchia koshikiensis, W. ogatai and Gahrerpia saduski. Almost all species were collected in February and March, and only seven species were collected in June and July. L. scutellare was the most abundant in number, followed by L. fuji. Therefore, L. scutellare and L. fuji seemed to be the dominant species in the survey areas. The morphological variation of C. ikaoensis was also observed. The scutum of C. ikaoensis was very wide, especially PW much wider than AW, and variable in the number of first post humeral row of dorsal setae.

Key words: Leptotrombidium scutellare, Cheladonta ikaoensis, trombiculid mites, seasonal occurrence, Kagoshima Prefecture

Introduction

The seasonal occurrence is one of the important ecological features. In many investigations, the seasonal occurrence of larval trombiculid mites is examined by collecting them from captured small mammals, especially small rodents (Yamamoto, 1961; Tamiya et al., 1962; Nakata, 1976; Uchikawa et al, 1984; Yamasaki, 1987; Kitazawa, 1993; Nakajima et al, 1998). The unfed larval trombiculid mites are collected directly from the soil by the Tullgren’s funnel method. Suzuki (1973) pointed out that the method of collecting larval trombiculid mites directly from the soil can reveal more species than collecting from animal hosts. Uchikawa et al. (1984) looked for the presence of trombiculid mites by using the modified Tullgren’s funnel method. Larval trombiculid mites obtained from the soil by using Tullgren’s funnel method differed to some extent in the species composition from those found on the large Japanese field mouse, Apodemus speciosus (Temminck). The number of larval trombiculid mites collected from the soil is usually smaller than those from animal hosts. However, in a collection by using the Tullgren’s funnel method, the influence of the seasonal variation of host animals and the exceptional large number parasitism can be eliminated. It was pointed out that soil samples seem to give better epidemiological information.

We examined the distribution of Leptotrombidium scutellare (Nagayo, Miyagawa, Mitamura, Tamiya et Tenjin) larvae using the black cloth method (Suzuki, 1986; Uchikawa et al., 1993) along roads passing through hilly and mountainous areas of Kagoshima Prefecture, and found out several L. scutellare larvae abundant areas (Noda et al., 2002). We visited such areas for several years to collect L. scutellare larvae for further study, and sometimes only a few larvae were collected. The occurrence of larval trombiculid mites may differ from year to year. The seasonal occurrence of unfed larvae of trombiculid mites was surveyed using Tullgren’s funnel method in Nagano Prefecture and Kagoshima Prefecture (Uchikawa and Kumada, 1987; Noda et al., 1996), but few investigations were carried for over one year.

In the present study, the fauna and seasonal occurrence of trombiculid mites was examined using Tullgren’s funnel method in endemic areas of tsutsugamu-
shi disease for three years.

Materials and Methods

Seasonal occurrence of larval trombiculid mites was surveyed at two adjacent areas using Tullgren’s funnel method for three years. Larval trombiculid mites were collected every month from April 2004 to March 2007 at seven points of Shirakanesaka (N 31°42′04″, E 130°36′42″, 20 m above sea level) and four points of Nuno-bikinotaki (N 31°42′08″, E 130°36′35″, 50 m above sea level), Kamihazeyama, Aira City, Kagoshima Prefecture. These sites were situated in a narrow place surrounded by sharp mountains. The study area was predominantly covered with Japanese willow leaf oak (Japanese name: urajirogashi), Phyllostachys (Japanese name: hatakobashi), Quercus dominantly covered with Japanese willow leaf oak rounded by sharp mountains. The study area was persecuted for three years. 

Larval trombiculid mites were collected from soil samples at four points of Nuno-bikinotaki: L. scutellare, L. kuroshio, L. murotoense, L. kitasatoi, L. himizu, L. fuji, L. miyajima, L. kansai, N. mitamurai, M. kochiensis, C. ikaoensis, M. todai, N. shiraii, S. nagasakiensis, W. ogatai, W. koshihikien and G. saduski (Table 1).

Seventeen trombiculid species were collected from soil toromoniculid mites studied over three years are shown in Table 3. Almost all species were collected in February and March, and only seven species were collected in the summer season (June and July). Leptotrombidium scutellare was the most abundant in number, followed by L. fuji. Therefore, L. scutellare seemed to be the dominant species in the survey areas. Leptotrombidium scutellare occurred from October to April with a peak in January. Leptotrombidium fuji was collected throughout the year, though it was collected mostly in April. Leptotrombidium kitasatoi, C. ikaoensis, W. ogatai and G. saduski were relatively abundant in number, though these species were not often collected in the summer season (June-August).

2. Annual occurrence of larval trombiculid mites

The collected number of larval trombiculid mites changed over the three years. The number of mites in the second year was 79.7% (969 individuals) of the first year (1,216), and the number in the third year was 52.8% (624) of the first year. Six species (L. murotoense, L. kitasatoi, L. fuji, L. miyajima, C. ikaoensis and G. saduski) out of nine species which were collected more than 50 for over three years were most abundant in the first year, and three other species (L. scutellare, L. himizu and W. ogatai) were abundant in the second year (Table 4).

Of the trombiculid species collected, morphological variations of C. ikaoensis were noticeable. Scutal measurements are shown in Table 5. Scutum was very wide, and PW (66.0±1.4 μm) was much wider than AW (53.0±1.9 μm). The number of first line dorsal setae is shown in Table 6. There was variation in the number of first post humeral row of dorsal setae, the range of which was 10 to 17, and the most frequent was 12 (Fig. 1).

Discussion

Tamiya et al. (1962) grouped the types of seasonal occurrence of larval trombiculid mites into three groups: the first group could be collected throughout the year, the second found only in summer, and the
### Table 1. Seasonal occurrence of larval trombiculid mites from soil samples in Shirakanezaka.

| Species                  | 2004 | 2005 | 2006 | 2007 |
|--------------------------|------|------|------|------|
|                          | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar |
| *Leptotrombidium scutellare* | 2   | 48  | 53  | 79  | 38  | 11  | 1   | 9   | 73  | 177 | 96  | 14  | 1   | 36  | 70  | 60  | 63  | 28  |
| *L. kuroshio*            | 1   | 2   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 2   |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *L. murotoense*          | 2   | 3   | 2   | 2   | 2   | 3   | 2   | 1   | 1   | 4   | 2   |     |     |     |     |     |     |     |     |     |     |     |     |
| *L. kitsatari*           | 3   | 1   | 6   | 2   | 1   | 20  | 3   | 2   | 8   | 2   | 2   | 1   | 1   |     |     |     |     |     |     |     |     |     |     |
| *L. himizu*              | 1   | 1   | 2   | 1   | 2   | 3   | 4   | 1   | 1   | 1   | 7   | 3   | 8   | 8   | 9   | 4   | 9   | 1   |     |     |     |     |
| *L. fujii*               | 155 | 21  | 3   | 11  | 10  | 3   | 2   | 1   | 11  | 15  | 13  | 6   | 5   | 1   | 11  | 19  | 10  | 6   | 1   | 8   | 1   | 17  | 1   |
| *L. miyajima*            | 1   | 2   | 8   | 2   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *L. kansai*              |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *Neotrombicula mitamurai*|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *Eltonella ichikawai*    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *Miyatrombiculaka kohiensis* | 1 | 6 | 8 | 1 | 4 | 3 | 1 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *Cheladonta ikaoensis*   | 2   | 2   | 1   | 3   | 3   | 8   | 6   | 1   | 3   | 1   | 1   | 57  | 3   | 18  | 8   | 1   |     |     |     |     |     |     |
| *Dolostia uchikawai*     | 1   | 2   | 1   | 1   | 1   | 2   | 1   | 1   | 3   |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *Helentricula miyagawai* |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *Mackienatodai*          |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *Neoschoengastia shirai* |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *Schoutedenichia nagasakensis* |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *Walchia koshikiensis*   | 3   | 1   | 5   | 4   | 5   | 2   | 3   | 1   | 1   | 2   | 1   | 1   | 2   | 1   | 1   | 1   | 1   | 1   | 2   | 1   |     |     |
| *W. ogatai*              | 2   | 1   | 1   | 2   | 1   | 3   | 3   | 2   | 1   | 11  | 13  | 4   | 3   | 3   | 2   | 3   | 2   | 1   | 3   | 4   | 1   | 1   |
| *Gahrliepia saduski*     | 22  | 1   | 1   | 2   | 1   | 3   | 7   | 16  | 11  | 14  | 3   |     |     |     |     |     |     |     |     |     |     |     |

### Table 2. Seasonal occurrence of larval trombiculid mites from soil samples in Nunobikinotaki.

| Species                  | 2004 | 2005 | 2006 | 2007 |
|--------------------------|------|------|------|------|
|                          | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar |
| *Leptotrombidium scutellare* | 3   | 2   | 6   | 20  | 13  | 3   | 1   | 1   | 1   | 1   | 2   |     |     |     |     |     |     |     |     |     |     |     |     |
| *L. kuroshio*            | 1   | 1   | 3   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *L. murotoense*          | 2   | 2   | 2   | 2   | 2   | 1   | 4   | 5   | 2   | 3   |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *L. kitsatari*           | 7   | 5   | 10  | 6   | 4   | 21  | 6   | 2   | 18  | 6   |     |     |     |     |     |     |     |     |     |     |     |     |
| *L. himizu*              | 1   | 1   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *L. fujii*               | 34  | 1   | 1   | 7   | 9   | 4   | 9   | 13  | 6   | 16  | 20  | 20  | 4   | 6   | 2   | 1   | 8   | 2   | 2   | 4   | 1   | 3   | 3   | 19  | 2   |
| *L. miyajima*            | 1   |     | 9   | 22  | 4   | 1   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *L. kansai*              |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *Neotrombicula mitamurai*|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *Miyatrombiculaka kohiensis* | 2 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *Cheladonta ikaoensis*   | 2   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *Mackienatodai*          |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *Neoschoengastia shirai* |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *Schoutedenichia nagasakensis* |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *Walchia koshikiensis*   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *W. ogatai*              | 2   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *Gahrliepia saduski*     | 7   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
### Table 3. Monthly occurrence of larval trombiculid mites (total number in Shirakanezaka and Nunobikinotaki) from soil samples.

| Species                      | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| Leptotrombidium scutellare   | 411 | 234 | 69  | 3   |     | 55  | 314 | 1,185 |     |     |     |     |       |
| L. kuroshio                  | 2   | 7   | 4   | 1   | 1   | 1   | 149 | 32  | 7   | 5   | 9   | 59  |       |
| L. murotoense                | 9   | 6   | 2   | 8   |     | 3   | 5   | 9   | 7   | 5   | 9   |     |       |
| L. kitasatoi                 | 31  | 9   | 21  | 18  | 2   | 5   | 20  | 10  | 6   | 32  | 154 |     |       |
| L. hinizu                   | 11  | 16  | 5   | 11  | 1   | 3   | 11  | 5   | 12  | 82  |     |     |       |
| L. fuji                      | 50  | 34  | 39  | 227 | 29  | 4   | 18  | 24  | 52  | 15  | 28  | 521 |     |
| L. miyajimai                 | 16  | 45  | 15  | 4   |     |     |     |     |     |     |     | 2   | 82  |
| L. kansai                    | 3   | 1   | 2   | 2   |     |     |     |     |     |     |     |     | 11  |
| Neotrombicula mitamurai      | 3   | 9   |     |     |     |     |     |     |     |     |     |     | 20  |
| Eltonella ichikawai         |     |     |     |     |     |     |     |     |     |     |     |     | 2    |
| Miyatrombicula kochiensis   | 10  | 14  | 2   |     |     |     |     |     |     |     |     | 27  |     |
| Cheladonta ikaoensis         | 11  | 10  | 135 | 10  | 22  | 13  | 1   | 1   | 12  | 216 |     |     |     |
| Dolosisa uchikawai          | 5   | 1   | 1   | 1   | 2   | 1   | 2   | 1   | 2   | 14  |     |     |     |
| Helenicula miyagewa         |     |     |     |     |     |     |     |     |     |     |     |     | 3    |
| Mackiena todai              | 3   | 1   |     |     |     |     |     |     |     |     |     |     | 4    |
| Neoschoengastia shirai      | 5   | 7   | 4   | 8   | 2   | 3   | 2   | 1   | 32  |     |     |     |     |
| Schoutedenichia nagasaksiensis | 1  | 2   |     |     |     |     |     |     |     |     |     |     | 11 |
| Walchia koshikiensis        | 2   | 2   | 6   | 2   | 3   | 1   | 5   | 2   | 7   | 5   | 8   | 44  |     |
| W. ogatai                   | 16  | 9   | 19  | 10  | 1   | 7   | 6   | 17  | 10  | 7   | 15  | 122 |     |
| Gahrliepia saduski          | 54  | 17  | 32  | 40  | 3   | 2   | 1   | 5   | 2   | 38  | 198 |     |     |
| **Number of species**        | 14  | 18  | 19  | 14  | 10  | 7   | 7   | 11  | 13  | 15  | 13  | 20  |     |

### Table 4. Annual number of larval trombiculid mites (total number in Shirakanezaka and Nunobikinotaki) from soil samples.

| Species                      | April 2004–March 2005 | April 2005–March 2006 | April 2006–March 2007 |
|------------------------------|-----------------------|-----------------------|-----------------------|
| Leptotrombidium scutellare   | 278                   | 521                   | 386                   |
| L. kuroshio                  | 17                    | 5                     | 2                     |
| L. murotoense                | 38                    | 12                    | 9                     |
| L. kitasatoi                 | 115                   | 31                    | 8                     |
| L. hinizu                   | 17                    | 42                    | 23                    |
| L. fuji                      | 365                   | 97                    | 59                    |
| L. miyajimai                 | 50                    | 22                    | 10                    |
| L. kansai                    | 1                     | 6                     | 4                     |
| Neotrombicula mitamurai      | 9                     | 8                     | 3                     |
| Eltonella ichikawai         | 1                     | 1                     | 1                     |
| Miyatrombicula kochiensis   | 18                    | 8                     | 1                     |
| Cheladonta ikaoensis         | 95                    | 84                    | 37                    |
| Dolosisa uchikawai          | 5                     | 4                     | 5                     |
| Helenicula miyagewa         | 2                     | 1                     | 1                     |
| Mackiena todai              | 1                     | 3                     | 3                     |
| Neoschoengastia shirai      | 9                     | 17                    | 6                     |
| Schoutedenichia nagasaksiensis | 5    | 6                     | 6                     |
| Walchia koshikiensis        | 24                    | 8                     | 12                    |
| W. ogatai                   | 39                    | 46                    | 35                    |
| Gahrliepia saduski          | 134                   | 50                    | 14                    |
| **Total number**             | 1,216                 | 969                   | 624                   |

### Table 5. Measurements of scutum of *Cheladonta ikaoensis* (*N* = 20, μm).

| Measurements | AW | PW | AP | SB | ASB | PSB | SD |
|--------------|----|----|----|----|-----|-----|----|
| Maximum size | 49.7 | 64.7 | 19.0 | 19.6 | 12.4 | 13.7 | 26.8 |
| Minimum size | 55.6 | 69.3 | 22.9 | 24.8 | 15.0 | 16.3 | 30.7 |
| Average size | 53.0 | 66.0 | 20.9 | 22.2 | 14.1 | 15.0 | 29.1 |
| Standard deviation | 1.9 | 1.4 | 1.0 | 0.7 | 1.0 | 1.0 | 1.0 |

### Table 6. The number of first post humeral row of doral setae of *Cheladonta ikaoensis*.

| Number of *C. ikaoensis* (*N* = 50) | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 1 |
|-------------------------------------|----|----|----|----|----|----|----|----|--|
| Number of first humeral row          | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 1 |

### Table 7. Monthly average temperature and precipitation (from web site of Japan Metrological Agency).

| Month | Temperature (°C) | Precipitation (mm) |
|-------|------------------|---------------------|
|       | 2004             | 2005                | 2006                | 2007                |
|       | 2004             | 2005                | 2006                | 2007                |
| Jan   | 8.0              | 9.1                 | 9.5                 | 59.5                |
| Feb   | 9.2              | 11.1                | 11.6                | 250.0               |
| Mar   | 10.9             | 11.8                | 13.3                | 143.5               |
| Apr   | 17.7             | 17.5                | 16.5                | 140.5               |
| May   | 21.4             | 21.0                | 21.1                | 352.0               |
| Jun   | 25.0             | 24.7                | 24.2                | 197.0               |
| Jul   | 28.8             | 28.4                | 28.9                | 107.0               |
| Aug   | 29.3             | 28.8                | 29.3                | 92.0                |
| Sep   | 26.6             | 27.3                | 26.1                | 332.5               |
| Oct   | 21.2             | 22.3                | 23.2                | 112.0               |
| Nov   | 16.6             | 15.9                | 17.0                | 169.5               |
| Dec   | 12.9             | 7.5                 | 11.6                | 154.5               |
third disappearing completely in the middle of summer.

In the present study, nine out of 20 species seemed to belong to the first group: \textit{L. kuroshio}, \textit{L. murotoense}, \textit{L. fuji}, \textit{C. ikaoensis}, \textit{D. uchikawai}, \textit{L. kitasatoi}, \textit{L. miyajimai}, \textit{C. ikaoensis} and \textit{G. saduski}. Eight species seemed to belong to the third group: \textit{L. scutellare}, \textit{L. kitasatoi}, \textit{L. himizu}, \textit{L. miyajimai}, \textit{L. kansai}, \textit{N. mitamura}, \textit{M. kochiensis} and \textit{S. nagasakiensis}. And seasonal occurrence of three species was not clear because of the low numbers collected: \textit{E. ichikawai}, \textit{H. miyagawai} and \textit{M. todai}.

Takada (1990) summarized the morphological and ecological findings of 119 species, however three species (\textit{D. uchikawai}, \textit{S. nagasakiensis} and \textit{W. koshikienensis}) collected in this study were not listed because of a new description of species provided after publication, or for other reasons. The seasonal occurrence of these species also became clear according to the present study.

The total number of collected larval trombiculid mites was reduced during the study period and also changed over the three years. Six species (\textit{L. murotoense}, \textit{L. kitasatoi}, \textit{L. fuji}, \textit{L. miyajimai}, \textit{C. ikaoensis} and \textit{G. saduski}) out of nine species which were collected more than 50 over three years were most abundant in the first year, and three other species (\textit{L. scutellare}, \textit{L. himizu} and \textit{W. ogatai}) were abundant in the second year. Environmental factors such as vegetation and topography are important in addition to the geographic location of the study area (Uchikawa et al., 1984; Kitazawa, 1999). Annual occurrence of larval trombiculid mites may relate the climatic factors such as the temperature and precipitation, and the activity of host animals also may be an important factor. In the present study, there was no big change of vegetation and topography in the study area. One of the main factors which affected the annual occurrence of larval trombiculid mites is considered to be the precipitation. The temperature and precipitation in Kagoshima City is shown in Table 7 (Web site of Japan Metrological Agency). The total precipitation between September and December in the first, second and third year is 1,004.5 mm, 572.5 mm and 342.5 mm, respectively. However, more information is needed when considering the relationship between annual occurrence and precipitation.

In our survey, the scutum of \textit{C. ikaoensis} was very wide, and PW was much wider than AW (PW/AW = 1.26). \textit{Cheladonta ikaoensis} is described by Sasa et al. (1951). In the type specimen isolated from \textit{A. speciosus} captured at Ikaho, Gunma Prefecture, PW and AW are 67.0 \(\mu\text{m}\) and 61.5 \(\mu\text{m}\) (PW/AW = 1.09), respectively. In the same paper, scutal measurements of two other \textit{C. ikaoensis} larvae isolated from \textit{A. speciosus} captured at Lake Yamanaka, Yamanashi Prefecture were also shown; PW/AW = 1.20 and PW/AW = 1.26. In Sasa (1956), a different figure for scutum was used, and the PW/AW was 1.30. Therefore, a standard ratio of PW/AW is considered to be 1.2–1.3.

In our survey, the number of first post humeral row of dorsal setae was 12 by Sasa et al. (1951) and Sasa (1956). In our survey, there was variation in the number of first line dorsal setae. Only 36% of \textit{C. ikaoensis} larvae isolated from \textit{A. speciosus} captured at Lake Yamanaka, Yamanashi Prefecture were also shown; PW/AW = 1.20 and PW/AW = 1.26. In Sasa (1956), a different figure for scutum was used, and the PW/AW was 1.30. Therefore, a standard ratio of PW/AW is considered to be 1.2–1.3.

The number of first post humeral row of dorsal setae was 12 by Sasa et al. (1951) and Sasa (1956). In our survey, there was variation in the number of first line dorsal setae. Only 36% of \textit{C. ikaoensis} larvae had 12 dorsal setae on the first post humeral row. Fourteen percent of larvae had less than 12, and 50% of larvae had more than 12.
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