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IXODES CRENU LATUS KOCH, 1844
SYNONYMY WITH I. KAI SERI ARTHUR, 1957
AND REDESCRIPTIONS OF THE MALE, FEMALE, NYMPH, AND LARVA
(ACAR INA: IXODIDAE) 1

BY

Daniel E. Sonenshine 2, Glen M. Kohls 3, and Carleton M. Clifford 3

ABSTRACT.

Specimens of Ixodes kaiseri Arthur, 1957 from Egypt, United Arab Republic, were compared with Ixodes crenulatus Koch, 1844 from Lebanon, U.S.S.R., Afghanistan, and India. The criteria used by Arthur to distinguish I. kaiseri and I. crenulatus were found to be highly variable and therefore invalid. One of the presumed differentiating characters, coxal spurs on the males of I. crenulatus, was not found at all, an observation corroborated by Filippova (1961). Consequently, we regard I. kaiseri as a synonym of I. crenulatus. Descriptions of all stages, with illustrations, of I. crenulatus, including the female and larva of "kaiseri" from Egypt, are given.

INTRODUCTION.

Ixodes kaiseri Arthur, 1957 was described from females collected from Vulpes vulpes aegyptica (Sonnini, 1816) in Egypt, United Arab Republic. Arthur (1965) later noted that this form may be synonymous with Ixodes crenulatus Koch, 1844, though differences were noted by him in the occurrence of external spurs on the coxae of males and nymphs.

Ixodes crenulatus was described by Koch from specimens taken from badger in Germany. However, the types cannot be located and are presumed to be lost. We accept Filippova’s (1961) description of this species as the basis for identification of all other material.

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*Ixodes crenulatus* is widely distributed in the U.S.S.R. and is also present in Afghanistan, India (Kashmir), and Lebanon. Arthur's (1957) record of *I. kaiseri* in Egypt, and (1965) records of *I. kaiseri* in Egypt and Israel actually refer to *I. crenulatus*, sensu Filippova (1961). It occurs in the following districts: Lugansk, North Kazakstankaia, Kokchetavskaiia, Alma-atinskaia, Baldy-Kurgansaia, Issyk-kul'skaia, Oshskaia, and Tian'shanskaia. It is also present in the Transbaikal and Mongolia. Other distribution records for this species are questionable in view of its frequent confusion with *Ixodes hexagonus* Leach, 1815. The reported host range includes a very wide variety of mammals and even birds. However, most of the hosts listed by Anastos (1957) and all of those listed by Arthur (1965) are carnivorous. Marmots are the principal hosts in the U.S.S.R. according to Filippova (1961).

The existence in Egypt and the Levant of populations morphologically similar to *I. crenulatus*, some of which were identified as this species and others as *I. kaiseri*, suggested the need for detailed study of additional material. Comparisons were made between females and sub-adult stages of *I. crenulatus* from localities in the U.S.S.R., Afghanistan, India (Kashmir) and Lebanon with females (types) and larvae of *I. kaiseri* from the type locality.

The purpose of this paper is to present evidence which shows that the morphological differences in adults and nymphs reported by Arthur for populations of *I. kaiseri* from localities in Egypt and Israel (Arthur, 1965) are within the range of variation of *I. crenulatus*.

The procedures for measurements were similar to those used by Cooley and Kohls (1943), except for body length, which was measured from the tip of the hypostome to the posterior end of the body, and the length of the basis capituli, which was measured in ventral aspect from its posterior margin to the toothed portion of the hypostome. All measurements are in millimeters. Asterisk indicates specimens upon which the descriptions and figures are based. Nomenclature of setae of the larval stage follows Clifford and Anastos (1960).

**Material Examined.**

U.S.S.R.: Five* females, 7* nymphs, 5* larvae, taken from *Marmota baibacina*, Kazakhstan, 24-vi-64, courtesy of Dr. N. A. Filippova (and identified by her); 4 females, from *M. baibacina*, central Tian-Shan, Kazakhstan, 24-iv-48 (RML 48939), and 2* females, 2* nymphs, 4* larvae from Kirgizia, host unknown, courtesy of Dr. C. A. Hoare, presented by Drs. Kuklina and Hoogstraal (determined by Dr. Pospelova-Shtrom).

India (Kashmir): 1 female, 2 males, from *Sturnus vulgaris humii*, Srinigar, Kashmir State, 11 and 17-v-59 (RML 35607).

Afghanistan: 1 female, 24 nymphs, from *Vulpes vulpes*, near Termec Road 20-X-65 (RML 46422) (collected by Dr. R. E. Lewis).
Lebanon: 4* females, 2* males, 25* larvae from *Vulpes vulpes*, American University farm. Begga, 5-xi-64; 1 female, 4 nymphs; 1 larva from *Meles meles*, Schumstar, 12-xii-61 (RML 46897); 1 larva from *Meles meles* near Barja, 10-vi-61 (RML 46898); 4 females, 13 nymphs from *Erinaceus europaeus*, near Baalbek, 18-vi-61 (RML 37484); 6 females, 8 nymphs, from *Meles meles*, near Baalbek, 29-xii-61 (RML 37483); 1 nymph, from *Vulpes vulpes*, Basra, 4-vi-61; 7 females, 2 nymphs from *Hystrix indica*, Nebi Shite, 17-xii-62; 4 from *Meles meles*, Kartaba, 5-xii-62; 2 females, 11 nymphs, 2 larvae from *Meles meles*, near Barja, 10-vi-61; 9 nymphs, from *Meles meles*, near Baalbek, 24-xi-61; 2 females from *Meles meles*, near Kartaba, 12-xii-62. All material collected by J. Schacher of R. E. Lewis and identified by Dr. Harry Hoogstraal, U.S.N.A.M.R.U.-3, Cairo, Egypt, U.A.R.

Egypt: 5* paratype females (*kaiseri*), from *Vulpes vulpes aegyptica*, Burg el Arab, Mariut, Western Desert Governorate, 6-v-55; 6 females (1* used for measurements) from *Vulpes v. aegyptica*, Burg el Arab, Bahig, Western Desert Governorate, 29-v-56; 2 females, from *Felis* sp., 20 kilometers southwest of Bahig, Matruh Governorate, 4-v-62; 4 females, 16 nymphs from *Vulpes sp.*, Bahig, Mathugh Governorate, 13-v-62; 33 nymphs from *Vulpes sp.*, Bahig, Matruh Governorate, 11-xiv-62; 3 nymphs from "fox", Bahig, Matruh Governorate, 15-ix-62; 9 females, 196 nymphs, 11 larvae, from *Vulpes vulpes niloticus* Dawakhliya, Mahalla el Kebra, Gharbiya Governorate, 22-v-66 (RML 46893); 2 nymphs, 3 larvae from *Helisson auritus libycus* Ehrenburg, Bahig, Matruh Governorate, 29-xii-62 (RML 46896); 3* females, from *Vulpes v. niloticus* near Bahig, Matruh Governorate, 29-xii-62 (RML 38067); 2 nymphs, from *Vulpes sp.* Burg el Arab, Matruh Governorate, 24-xii-62 (RML 38068); collected by H. Hoogstraal, M. Kaiser, and/or R. Hemstead.

*Ixodes crenulatus* Koch, 1844.

**Female (U.S.S.R.)** (Plate 1, A-G).

*Body.* Elongate, length from 2.50 to 2.68, width 1.44 to 1.59.

*Scutum.* Subtriangular, parallel sided in anterior third, narrowed abruptly and with narrowly rounded posterior margin; strongly developed rugosities in lateral fields, merged with mild lateral carinae; scapulae long, pointed or slightly rounded; cervical grooves shallow, do not reach lateral margins; punctations small, shallow; with few, minute, scattered setae; length from 0.93 to 0.97, width from 0.84 to 0.95.

*Genital aperture.* Between coxae III, subrectangular, with numerous fine parallel ridges oriented posteriorly; length from 0.052 to 0.108, width from 0.09 to 0.14.

*Spiracular plate.* Subcircular with up to 6 rows of tiny goblets in widest part; from 0.17 to 0.19 long by 0.13 to 0.18 wide.
PLATE I: *Ixodes crenulatus*, female and larva, from U.S.S.R.

A. — Female, from Kazakhstan; ventral view. B. — Female, from Kazakhstan; dorsal view of capitulum and scutum. C. — Female, from Kazakhstan; dorsal view, showing variation in shape of porose areas and scutum. D. — Female, from Kazakhstan; dorsal view of capitulum showing variation in shape of porose areas and posterior margin of basis capituli. E. — Female, from Kazakhstan; ventral view of capitulum. F. — Female, from Kirgizia; dorsal view of capitulum and scutum. G. — Female, from Kazakhstan; spiracular plate. H. — Larva, from Kazakhstan; dorsal view, capitulum and scutum. I. — Larva, from Kazakhstan; ventral view, capitulum and coxae.
Anal groove. As figured.

Capitulum. Basis capituli dorsally varies from subrectangular to trapezoidal; posterior margin without cornua, heavily sclerotized, slightly indented medially; porose areas deeply depressed, widely separated, shape varies from sub-circular to sub-oval with narrow anteriorly directed extensions. Ventrally, basis subtriangular, without auriculae, but with strong, heavily sclerotized ridges. Length of basis capituli from 0.34 to 0.37, width from 0.41 to 0.43. Palpi broad, suboval, do not extend beyond hypostome, narrowly constricted at junction of articles I and II, flattened mesially; article I with flattened, ventral surface, spurs absent. Length of palpi from 0.370 to 0.42, width from 0.13 to 0.15. Average length of article I, 0.06; of article II, 0.17; of article III, 0.17. Palpal article I with a single seta on the lateral edge; II with 13 setae, 6 dorsal and 7 ventral; III with 15 setae, 9 dorsal and 6 ventral.

Hypostome. Shape as figured. Denticles present almost to junction with basis capituli; lateral denticles large, prominent, medial denticles smaller. Dentition (excluding corona) 3/3 anteriorly, tending to 4/4 in corona region, 2/2 posteriorly; outermost file (file 1) with 8 or 9 principal denticles, file 2 with 8, and innermost file (file 3) with 2 or 3; corona dentition with at least 1 row of 4/4 near principal denticles. Length from 0.26 to 0.32, width from 0.14 to 0.15.

Legs. Coxa I with salient median edge; external spurs absent but heavily sclerotized ridges evident on some coxae of many specimens. Tarsus I strongly humped, length from 0.46 to 0.55, width from 0.13 to 0.16; tarsus IV mildly humped, length from 0.46 to 0.55, width from 0.12 to 0.16.

Male (Lebanon) (Plate 2).

Body. Elongate, length 2.72 (1 specimen), width from 1.65 to 1.75.

Scutum. Surface punctate, especially in posterior third and with many small, fine setae, shining; cervical grooves short, converging, shallow depressions; scapulae small, mildly pointed; lateral carinae absent; marginal grooves well developed. Length from 2.23 to 2.67, width 1.65.

Genital aperture. Between coxae III, narrow, much wider than long. Average length 0.201.

Spiracular plate. Oval, slightly wider than long; with up to 6 or 7 rows of small, distinct goblets; ostium near median edge; length from 0.25 to 0.26, width from 0.28 to 0.30.

Ventral plates. Pregenital plate small, curved anteriorly, truncated posteriorly, length from 0.26 to 0.28, width from 0.30 to 0.31; median plate truncated anteriorly, pointed posteriorly, length from 1.09 to 1.11, width from 0.30 to 0.38; adanal plates subrectangular and slightly curved, length from 0.91 to 0.95, width from 0.35 to 0.38, anal plate bounded by anal groove, length from 0.75 to 0.88,
width from 0.51 to 0.55; epimeral plates indistinct; all ventral plates moderately to heavily punctate, punctations small, shallow and with numerous fine setae.

**Anal groove.** As figured.

**Capitulum.** Basis capituli rectangular in dorsal view; posterior margin heavily sclerotized, without cornua, slightly indented medially; surface smooth,
shining. Ventrally, the basis is broadly rounded posteriorly; without auriculae, and without ridges. (Occasionally, mild, lightly sclerotized elevations are present.) Length of basis capituli 0.42 (1 specimen), width from 0.26 to 0.27. Palpi broad, bat-like, extend beyond hypostome, and mildly constricted at junction of articles I and II; flattened mesially; article I with flattened ventral surface, spurs absent. Length of palp 0.29 (1 specimen), width 0.10 (1 specimen); average length of article I, 0.05, article II, 0.12, article III, 0.12. Palpal articles with setae as follows: I with 1 seta on the lateral edge; II with 11-13 setae; 5 or 6 setae, 5 or 6 dorsal, 6 or 7 ventral; III with 15-16 setae, 6 or 7 ventral, 8 or 9 dorsal.

_Hypostome._ Shape as figured. Denticles present in all but the posterior-most quarter; dentition 3/3 in the first 4 rows, 2/2 in the remaining 3 rows; denticles of major rows arranged in a crenulated pattern; length, 0.20, width, 0.14 (1 specimen).

_Legs._ Coxa I with sharply salient medial edge; all coxae without spurs or even sclerotized ridges; tarsus I strongly humped, length 0.43, width 0.12 (1 specimen); tarsus IV slightly humped, length 0.46 to 0.52, width 0.13 to 0.14.

_Nymph_ (U.S.S.R.) (Plate 3, C. D.).

_Body._ Unengorged, length from 1.20 to 1.36, width from 0.72 to 0.80. Dorsum with numerous setae, not counted; venter with 50 or 53 pairs of setae as follows: 7 sternal, 14 or 16 pregenital, 2 or 3 anal groove, 3 anal, 14 premarginal, and 9 or 10 marginal.

_Scutum._ Slightly wider than long, length from 0.44 to 0.49, width from 0.49 to 0.53, narrowly rounded posteriorly; cervical grooves faint, convergent, then divergent, terminating near the posterolateral margin; punctations sparse, widely scattered; scapulae small, blunt; with 8 to 10 pairs of short setae.

_Spiracular plate._ Wider than long, approximately 30 to 35 large goblets; length from 0.07 to 0.08, width from 0.08 to 0.09.

_Anal groove._ As figured (Plate 4, C).

_Capitulum._ Basis capituli subtrapezoidal in dorsal view, cornua absent but with rearward curved edges of the posterior margin. Basis in ventral aspect widest anteriorly, posterior margin broadly rounded, lateral margins slightly convergent, auriculae absent, surface smooth and impunctate; with 2 pairs of moderately long posthypostomal setae; distance between setae of pair 1 from 0.10 to 0.12, between setae of pair 2 from 0.07 to 0.10; length of basis from 0.19 to 0.21, width from 0.23 to 0.24. Palpi short and broad, as long hypostome, length from 0.22 to 0.26, width from 0.08 to 0.10; average length of article I, 0.04, average combined length of articles II and III, 0.20; spurs absent; article I with 1 seta ventrally, articles II and III with a total of 16 setae, 8 dorsal and 8 ventral.

_Hypostome._ Shape as figured; denticles present throughout except at junction with basis. Dentition 3/3 anteriorly, with 2 rows of prominent denticles,
PLATE 3: *Ixodes crenulatus*, larva and nymph.
throughout remainder of toothed portion; file 1 with 8 denticles, 2 with 6 or 7, 3 with 3; corona with small to moderate sized denticles, merging with main teeth, in a 4/4 arrangement.

**Legs.** Moderately long, coxa I with median salience, or occasionally, a small blunt internal spur, internal and external coxal spurs absent elsewhere; setae on coxae as follows: I with 4 to 6, II with 4, III with 3 or 4, and IV with 2 or 3. Tarsus I length from 0.26 to 0.27, width from 0.08 to 0.09; tarsus IV length from 0.24 to 0.29, width from 0.07 to 0.08.

**LARVA (U.S.S.R.)** (Plate 1, H, I).

**Body.** Unengorged, length from 0.67 to 0.96, width from 0.43 to 0.60. Dorsum with 13 or 14 pairs of setae (including scutum): 2 central, 7 or 8 marginal, 5 scutal; supplementary setae absent; length of anteriormost marginal seta 0.02, posteriormost marginal seta 0.03, anterior central dorsal seta 0.02, posterior dorsal seta 0.02. Dorsal sensilla hastiformia and auriformia of equal size, with 6 to 8 pairs of the former and 10 pairs of the latter.

**Capitulum.** Basis capituli sub-triangular in dorsal view, with sharply pointed lateral edges, cornua absent; posterior dorsal margin nearly straight, or slightly indented medially; ventral surface lacks auriculae, but broadly curved ridges are present posterior to the palpi; posterior dorsal margin rounded; with 2 pairs of posthypostomal setae, average length of setae of anterior pair 0.02, of posterior pair 0.02; distance between setae of anterior pair 0.07, between setae of posterior pair 0.06; length of basis from 0.10 to 0.12, width from 0.14 to 0.16. Palpi short and broad, not extending beyond hypostome, length from 0.13 to 0.17, width from 0.05 to 0.16; average length of palpal article I, 0.02, combined length of articles II and III, 0.12; spurs absent; article I without setae, II with 7 or 8 setae, III with 6 or 7 setae, and IV with 10 to 12 setae.

**Hypostome.** Bluntly rounded, apex mildly notched, denticles present throughout except near junction with basis capituli; dentition 3/3 anteriorly with 2 or 3 rows (commonly 2), 2/2 posteriorly with 5 or 6 rows (commonly 5); file 1 with 7 or 8 denticles, 2 with 6 to 8, 3 with 2 or 3 (commonly); length from 0.10 to 0.12, width from 0.06 to 0.07.

**Legs.** Coxa I with small, blunt internal spur, internal and external spurs absent elsewhere. Tarsus I humped, length from 0.18 to 0.19, width from 0.06 to 0.07.

**Remarks.**

To facilitate a comparison of specimens with *I. crenulatus*, illustrations of a female and nymph from Lebanon are given in Plate 4, of a larva from Lebanon in Plate 3 (A, B), and of a female and a larva from Egypt in Plate 5; tabulations of morphological features are given in Table 1, A-D.
PLATE 4: *Ixodes crenulatus*, female and nymph, from Begga, Lebanon.
A. — Female, body and capitulum, ventral view. B. — Female, body and capitulum, dorsal view. C. — Nymph, body and capitulum, ventral view. D. — Nymph, body and capitulum, dorsal view.
PLATE 5: *Ixodes crenulatus*, female and larva, from Egypt.

ARTHUR (1965) recognized the similarity of *I. kaiseri* and *I. crenulatus* and noted that, "the differences, if they are really differences, between them are slight". ARTHUR claimed that *I. crenulatus* males possess external spurs on all coxae, whereas these are lacking in *I. kaiseri*; further, that external spurs are present on the coxae of females of *I. kaiseri*, but lacking in females of *I. crenulatus*; and, finally, that external spurs are present on the coxae of the nymphs of *I. kaiseri* (no comparison with the nymphs of *I. crenulatus* was offered). Since all gradations, from individuals without spurs to intermediate types with sclerotized ridges and, finally, to specimens with distinct spurs, are apparent in the material examined, we feel that the maintenance of these 2 species as separate entities is without foundation. In one case, a female from Lebanon (Plate 4, A), external spurs are evident on coxae I and II on one side, but not on the other; in another case, a female from India (Kashmir), external spurs are evident on the coxae of leg IV. Ridges marked by varying degrees of sclerotization are particularly common on the coxae of females of *I. crenulatus* examined by us. However, we did not find external spurs on the males of *I. crenulatus* from Lebanon or from Kashmir. FILIPPOVA (1961) also noted the absence of external spurs on the coxae of the males of this species.

A comparison of the illustrations of the female and larva of *I. kaiseri* from Egypt (Plate 5) with these same stages of *I. crenulatus* from Lebanon (Plate 3 and 4) and U.S.S.R. (Plates 1, 3) does not reveal any essential morphological differences. Morphological variations may be seen in the basis capituli of the females, particularly in the shape of the porose areas, the shape and degree of sclerotization of the posterior dorsal margin, and the extent of development of auricula-like ridges. As seen in Table 1, other differences in body structure are apparent. Females from Egypt tend to be larger than female from U.S.S.R., India and Afghanistan; their longer hypostomes bear 1 or 2 more denticles per file. Males from Lebanon are larger than males from India (Kashmir). However, nymphs and larvae from most of these same localities do not differ in size. Larvae from U.S.S.R. tend to have 7 pairs of marginal dorsal setae, whereas larvae from Egypt and Lebanon tend to have 8 pairs of these setae.

We conclude that the morphological differences between *I. kaiseri* and *I. crenulatus* are not species differences, but only morphological variation characteristic of the latter. Consequently, *Ixodes kaiseri* Arthur, 1957 is a synonym of *Ixodes crenulatus* Koch, 1844.
### Table 1. Morphological variation in populations of *Ixodes crenulatus* from different localities in Africa and Asia.

#### A. Female

<table>
<thead>
<tr>
<th>Locality</th>
<th>No.</th>
<th>Scutum length width</th>
<th>Basis capituli length width</th>
<th>Porose areas length width</th>
<th>Palps length width</th>
<th>Hypostome length width width width width dentition</th>
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<tbody>
<tr>
<td>Kazakhstan (USSR)</td>
<td>5</td>
<td>0.947 0.932</td>
<td>0.349 0.418</td>
<td>0.091 0.081</td>
<td>0.400 0.140</td>
<td>0.293 0.149</td>
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<tr>
<td>Kirgizia (USSR)</td>
<td>2</td>
<td>0.871 0.858</td>
<td>0.389 0.416</td>
<td>0.091 0.117</td>
<td>0.416 0.143</td>
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<tr>
<td>India (Kashmir)</td>
<td>1</td>
<td>0.715 0.715</td>
<td>0.306 0.387</td>
<td>0.081 0.108</td>
<td>0.297 0.108</td>
<td>0.207 0.126</td>
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<tr>
<td>Afghanistan</td>
<td>1</td>
<td>0.845 0.845</td>
<td>0.360 0.403</td>
<td>0.090 0.099</td>
<td>0.414 0.126</td>
<td>0.279 0.156</td>
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<tr>
<td>Lebanon</td>
<td>4</td>
<td>1.036 1.131</td>
<td>0.504 0.500</td>
<td>0.099 0.108</td>
<td>0.444 0.131</td>
<td>0.357 0.185</td>
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<td>Egypt</td>
<td>9</td>
<td>1.135 1.076</td>
<td>0.445 0.444</td>
<td>0.115 0.124</td>
<td>0.484 0.170</td>
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#### B. Male

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<th>Locality</th>
<th>No.</th>
<th>Scutum length width</th>
<th>Basis capituli length width</th>
<th>Palps length width</th>
<th>Hypostome length width width width dentition</th>
<th>Length ventral plates</th>
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<td>2</td>
<td>2.449 1.649</td>
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<td>0.288 0.099</td>
<td>0.198 0.135</td>
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<tr>
<td>India (Kashmir)</td>
<td>2</td>
<td>1.795 1.358</td>
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<td>0.330 0.090</td>
<td>0.140 0.068</td>
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#### C. Nymph

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<th>Locality</th>
<th>No.</th>
<th>Scutum length width</th>
<th>Basis capituli length width</th>
<th>Palps length width</th>
<th>Hypostome length width width width dentition</th>
<th>Scutum St' Preg' Pm' Anal gr'</th>
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<tr>
<td>Kazakhstan (USSR)</td>
<td>7</td>
<td>0.465 0.508</td>
<td>0.204 0.242</td>
<td>0.252 0.093</td>
<td>0.125 0.107</td>
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<tr>
<td>Kirgizia (USSR)</td>
<td>2</td>
<td>0.478 0.499</td>
<td>0.211 0.234</td>
<td>0.229 0.084</td>
<td>0.137 0.113</td>
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<tr>
<td>Lebanon</td>
<td>4</td>
<td>0.472 0.513</td>
<td>0.207 0.247</td>
<td>0.238 0.078</td>
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#### D. Larva

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<th>Basis capituli length width</th>
<th>Palps length width</th>
<th>Hypostome length width width width dentition</th>
<th>Scutum St' Preg' Pm' Anal gr'</th>
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<tr>
<td>Kazakhstan (USSR)</td>
<td>5</td>
<td>0.288 0.334</td>
<td>0.108 0.139</td>
<td>0.128 0.105</td>
<td>0.057 3/3</td>
<td>5 7-8 2 3 2 4 4</td>
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<tr>
<td>Kirgizia (USSR)</td>
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<td>0.294 0.308</td>
<td>0.109 0.158</td>
<td>0.147 0.112</td>
<td>0.060 3/3</td>
<td>5 7-8 2 3 2 4 4</td>
</tr>
<tr>
<td>Lebanon</td>
<td>5</td>
<td>0.274 0.284</td>
<td>0.091 0.140</td>
<td>0.126 0.057</td>
<td>0.111 0.060</td>
<td>3/3 5 7-8 2 3 2 4 4</td>
</tr>
<tr>
<td>Egypt</td>
<td>6</td>
<td>0.288 0.335</td>
<td>0.102 0.146</td>
<td>0.141 0.049</td>
<td>0.112 0.059</td>
<td>3/3 5 7-8 2 3 2 4 5 4</td>
</tr>
</tbody>
</table>

1. Explanation of abbreviations: Anal gr. = anal groove; Cd = central dorsal; Md = marginal dorsal; Mv = marginal ventral; Pa = preanal; Pm = premarginal; Preg. = pregenital; St = sternal.
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REFERENCES


1. According to SHERBORN in Ann. and Mag. Nat. Hist., series 9, volume 11, No. 64, p. 568 (April, 1923), this volume was actually issued in November, 1844. Consequently, the date of publication must be regarded as 1844.