

PROCEEDINGS  
OF THE  
BIOLOGICAL SOCIETY OF WASHINGTON

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A NEW SPECIES OF DERMACENTOR AND NOTES ON  
OTHER NORTH AMERICAN IXODIDÆ.

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In connection with the work conducted by the Bureau of Entomology in determining the distribution of the Rocky Mountain spotted-fever tick, *Dermacentor venustus*, a large amount of interesting material has been accumulated. Among the thousands of specimens of ticks sent in by agents of the Bureau and several hundred correspondents throughout the western United States, but two new forms were discovered, one of these a new variety (*rugosus*) of *Ixodes cookei*, has been previously described by the author; the other, a new species of *Dermacentor*, is described herein. Specimens of an *Ixodes*, recently described as *I. kingi*, were also collected. Representatives of this form were, however, in the National Museum before the investigation of the spotted-fever tick began.

It seems surprising that more undescribed ticks were not found among this large amount of material from a region which has not been carefully worked over especially with reference to its tick fauna. A total of about 1500 lots of ticks were collected in 225 localities in the Rocky Mountain and Pacific States. It should be noted, however, that the majority of the specimens were taken on domestic animals. Systematic collecting of the wild animals and birds throughout this region would no doubt reveal the presence of many more new forms.

It is thought best to publish occasional short articles containing certain systematic and biologic notes such as are here pre-

sented rather than to accumulate this information to be used in connection with results of life history studies.

I desire to thank Mr. W. D. Hunter for the interest he has shown in my work, and to gratefully acknowledge the assistance of Mr. J. F. Strauss, to whom I am indebted for the illustrations herewith presented.

#### ***Ixodes diversifossus* Neum.**

Prior to the collection of a number of specimens of *Ixodes diversifossus* by Mr. Vernon Bailey on September 2, 1909, in the Bitter Root Valley, near Hamilton, Montana, but two females of this species were known. The above mentioned collection contained 7 ♂, 16 ♀ and 2 nymphs, one partially and one fully engorged, taken on a cotton-tail rabbit, *Sylvilagus nuttalli*.

None of the females deposited eggs although some lived for a considerable length of time. One of the more engorged specimens being alive after seven months. The fully engorged nymph molted to a female 39 days after the date of collection.

The male of this species has not been described heretofore.

*Male*.—Capitulum (Figs. 8, 10, 11): length, 402 $\mu$  (from tip of hypostome to tips of postero-lateral angles); basis capituli very dark reddish brown, darkest around edges; greatest width (251 $\mu$ ) at base of palpi; postero-lateral angles pronounced, rather acute, slightly incurved so that the width between their centers is about 187 $\mu$ : dorsal edge straight; ventrally basis capituli with an angular tubercle (not a spine as in the female) below the base of each palpus; palpi short and rather broad, 294 to 316 $\mu$  in length; slightly impressed on dorsal side near inner edge; hypostome short, stout, with four files of teeth, two teeth at base ventrally very large, basal teeth of lateral files also large; tip of hypostome slightly lobed at apex; chelicerae large, about 172 $\mu$  long; external article with five teeth, basal one very stout.

Scutum 1.31 mm. long by .68 mm. wide to 1.39 mm. long by .65 mm. wide, reddish brown; pseudo-scutum darker and slightly raised; capitular emargination not deep, scapular angles short and blunt; cervical grooves short, rather deep, first converging, then diverging posteriorly and ending abruptly opposite space between coxae II and III; scutum punctate, on pseudo-scutum punctures very small and scattered, punctures large and less scattered behind pseudo-scutum in middle.

Legs (Figs. 7, 10) fairly long and stout, yellowish brown; all tarsi tapering to tips, tarsi I 351 to 387 $\mu$  in length; coxae I with a long sharp basal spine, II and III bear a suggestion of basal tubercles, IV with no basal prominence; coxae I with a small apical tubercle, II, III and IV with short, broad apical spines, shortest on IV; long yellowish hairs on all coxae and on legs.

Stigmal plates nearly circular, about 151 $\mu$  in diameter; goblets of medium size, about five rows at widest and one row at narrowed point

between macula and marginal cells; macula nearly circular, slightly elevated.

Body (Fig. 10) elongate-oval, marginal strip yellowish brown, punctate and bearing numerous long pale hairs; venter, pregenital plate nearly rectangular with rather large punctures; median plate fully twice as long as broad, sparsely covered with small punctures and long yellowish hairs; anal plate in form of truncate cone, height but little greater than width of base, sides slightly convex, with a few small punctures; adanal plate longer than width along median plate, which is greater than width along posterior margin, bearing a very few shallow punctures and long hairs; lateral plates sparsely punctate, punctures medial of stigmal plates very large; scattered large punctures between coxae and ventral plates.

As the original description of this species by Prof. Neumann and the description by Mr. Banks were based upon but two females, and these mutilated, a few additional descriptive notes on the female are here presented. The species is easily identified, however, by either of the above mentioned descriptions.

*Female*.—Capitulum (Figs. 9, 12): length from 717 to 731 $\mu$  (from tip on hypostome to a line drawn between tip of postero-lateral angles); basis capituli 416 to 438 $\mu$  wide, smooth dorsally; ventrally, with two stout sharp spines, 64 to 86 $\mu$  in length, curved ventro-posteriorly; porose areas shallow and quite uniform in shape in all specimens; palpi 567 to 603 $\mu$  in length; hypostome long, moderately stout and fairly acute at apex; two files of teeth on basal half, three files apically and four files near tip.

Scutum from 1 mm. long by .947 mm. wide to 1.2 mm. long by .938 mm. wide, dark reddish brown in unfed specimens, almost black in some fed individuals; the punctures are quite similar in all specimens, very small and sometimes almost absent anteriorly, rather large and more numerous toward tip; with long, yellowish, scattered hairs; lateral carinae distinct but rounded, running to margin of scutum at its posterior fourth; cervical grooves distinct, first converging, then diverging widely and disappearing near lateral carinae behind the middle of the scutum.

Legs very dark reddish brown, lighter in unfed specimens; a considerable number of long pale hairs on legs and coxae; length of tarsi I 560 to 574 $\mu$ ; length of metatarsi I 287 to 330 $\mu$ .

Stigmal plates small (not large as stated by others), from 237 x 172 $\mu$  to 215 x 172 $\mu$ ; transversely oval; 74 to 87 goblets, of medium size, to each plate, set close together; four rows of goblets at widest and one row at narrowest point between macula and marginal cells; macula near the center of plate dorso-ventrally but much nearer the anterior than the posterior side.

Body, margin on dorsum more hairy than scutum and lighter colored; a considerable number of long pale hairs on venter.

The single unfed female in hand measures 1.74 mm. long (from scapular angles to posterior tip of body) by 1.21 mm. wide. The partially engorged females are elongate and are much darker in color than the unfed one.

Material in Bureau of Entomology collection in Washington, D. C., and at Dallas laboratory under Dallas Acc. No. 683.

As Banks has pointed out (Rev. of Ixodoidea, 1908, p. 27) Neumann's *I. bicornis* is very close to this species if not identical with it. The larger scutum of *bicornis* and the greater length of article II as compared with article III of the palpi, the larger external spine in coxae I, and the three files of teeth on the base of the hypostome (in *diversifossus* there are two files at base, three in middle and four at tip of hypostome) indicate that *bicornis* may be entitled to varietal rank. The discovery of the male of *bicornis* would undoubtedly aid materially in determining the proper standing of this species.

The dentition of the hypostome of the male of *diversifossus* is of a type similar to that of *I. ricinus*. The dentition of the hypostome in both sexes, the great length of tarsi I as compared with metatarsi I, the oval scutum of the female and other points, suggest a relationship to the *ricinus* group.

#### ***Ixodes texanus* Banks.**

Until recently but two lots of specimens of this species had been collected, other than the type material. One of these lots, as recorded by Nuttall and Warburton, was collected by V. L. Kellogg on gray squirrel, July, 1896, at King's River, Calif. The other is a single well engorged female in Mr. Banks' collection. This specimen was taken on *Mustela pennanti* at Trout Lake, Wash., March 8, 1901. Nuttall and Warburton also record a collection consisting of a single female taken on *Procyon lotor* at Mt. Lehman, B. C., by Dr. S. Hadwen during January, 1910. During the past two years, however, the agents of the Bureau of Entomology have collected a considerable amount of material, thus adding much to our knowledge of the distribution, hosts and seasonal occurrence of this species. The collection from which the type material was selected consisted of 9 ♀, unengorged to one-fourth engorged, and a few larvae, taken on raccoon at Oakville, Texas, November 30, 1908, by Mitchell and Bishopp. In south Texas, Messrs. F. C. Pratt and C. T. Atkinson, during 1910, made collections of this species as follows: 9 ♀ on raccoon, Sabinal, February 4; 1 ♀ on squirrel, Sabinal, April 5; 1 ♀ on civit cat, Utopia, September 11; 7 ♀, 24 nymphs, on raccoon, Sabinal, November 12. In the Bitter Root Valley of Montana near Florence, Messrs. W. V. King and C. Birdseye have collected a considerable amount of material. During 1910 the following collections were made in that vicinity: 2 ♀ on marten (*Mustela c. origenes*), March 13; 3 ♀ on weasel (*Putorius arizonensis*), June 16; 2 ♀, 11 larvae on pine squirrel (*Sciurus h. richardsoni*), July 16; 2 ♀, 6 nymphs and some larvae on pine squirrel, July 16; 16 ♀, 1 nymph, 19 larvae, on pine squirrel, August 16. During 1911 the following collections were made: 3 ♀ on marten, Lo Lo Hot Springs, Mont., March; 23 ♀, 13 nymphs on pine squirrel, Florence, Mont., July 26; 3 ♀, 8 nymphs on pine squirrel, Florence, Mont., August 20. Mr. C. Birdseye obtained 2 females (one-half and one-third

engorged) which were collected January 18, 1912, on a marten near Woodman, Mont.  $\pi\pi$

It is worthy of note that no males were taken although 61 females, in all stages of engorgement, were collected. Females were taken upon hosts during every month of the year except May, October and December. The immature stages, however, were taken on hosts from July to November only.

A few notes have been made on the type specimens. Width of basis capituli,  $541\mu$ ; length of palpi,  $467\mu$ . The porose areas are not well defined, being surrounded by the roughened surface of the basis capituli; the palpi are also roughened dorsally. The stigmal plates are broadly oval, the greatest length at right angles to the axis of the body. They measure about  $196 \times 152\mu$ . The goblets are rather large, apparently three rows at widest and one row at narrowest point between macula and marginal cells. Among the paratypes the width of the basis capituli ranges from  $488$  to  $517\mu$  and the length of the capitulum from  $646$  to  $717\mu$ . In general the paratypes agree closely with the type; some, however, have the shield rugose over nearly the entire surface.

The specimens studied show a considerable variation in certain points. The size of individuals even from the same locality varies much. The ticks from the Northwest usually have larger porose areas than are exhibited by material from Texas. The porose areas in some of the specimens from Washington and Montana are not more than one-half as long as broad. All specimens show rugosity on the scutum and basis capituli though the extent of roughness varies considerably. The length of the capitulum in the series studied has been found to vary from  $459$  to  $717\mu$  and its width from  $373$  to  $541\mu$ . The length of tarsi I varies from  $402$  to  $631\mu$  and tarsi IV from  $373$  to  $660\mu$ . The stigmal plates range from  $222 \times 301$  to  $125 \times 143\mu$ .

#### *Dermacentor hunteri* sp. nov.

*Male* (Fig. 1).—Length, not including capitulum, 4.42 mm.; width, 2.98 mm.

Capitulum (Figs. 1, 3): length,  $875\mu$  (from tip of hypostome to end of postero-lateral angles); basis capituli reddish brown with considerable white on dorsal surface; sides about parallel; width,  $560\mu$ ; postero-lateral angles long (shorter than in *D. occidentalis*); ventrally, basis capituli is quite narrow and slightly roughened along posterior border; length of palpi (dorsally),  $474\mu$ ; extreme length of article II (dorsally),  $244\mu$ ; of article III,  $201\mu$ ; some white on basal portions of articles II and III, also a few pits and short hairs; article I prominent ventrally; bearing fine bristles along its internal edge, article II has six such bristles and article III one bristle; hypostome very broad at apex, narrowed toward base; three rows of rounded teeth on either side, nine large teeth per row, smaller teeth toward base where the three rows converge, the teeth gradually becoming smaller until they disappear at base; chelicerae rather small; length of internal article  $130\mu$ , with a small external subterminal

tooth, and an internal subterminal ridge; dorsal process with two small teeth; external article with a large basal tooth, a smaller tooth toward the apex and apparently two minute apical teeth.

Scutum (Fig. 1) dark reddish brown with an extensive white pattern; oval, slightly constricted at eyes; capitular emargination moderately deep; scapular angles narrowly rounded; cervical grooves distinct, but not deep, first converging then diverging posteriorly, not reaching to edge of pseudo-scutum; marginal groove shallow, marked by a row of large punctures, a very few rather small punctures elsewhere on scutum; festoons prominent; pseudo-scutum outlined with a broad white band, white between cervical grooves, more broken on postero-median part of pseudo-scutum; two submarginal stripes running from pseudo-scutum to third festoon on either side, these are joined to an interrupted marginal band which becomes continuous, though narrow, posteriorly, running around entire posterior margin of festoons; two submedian stripes run backward from pseudo-scutum, these diverge posteriorly and join the submarginal stripes at the first festoon, they are also connected with the submarginal stripe anteriorly; two submedian loops of white extend from the point where the submedian stripes begin to diverge to the fifth and seventh festoons; all white markings are interrupted by numerous small red points.

Legs (Figs. 1, 4) dark reddish brown with much white dorsally, tarsi with but a trace of white; coxae and basal joints of legs with numerous rather short pale hairs; coxae I with internal spur slightly longer than external; coxae II and III with inner posterior angles upturned; apical spines on coxae II, III and IV about equal in length, those on coxae IV slightly more slender than on any of others; trochanter I rather long, much enlarged distally, forming a postero-ventral knob, produced antero-dorsally into a broad sharp spur; trochanter II less enlarged distally, III not noticeably enlarged and IV with a slight flaring internal rim; femur IV with a long sharp anterior projection at its articulation with the trochanter, also a shorter less sharp posterior prominence; narrowed toward articulation with trochanter, this narrowed portion of femur  $144\mu$  long, total length 1.088 mm.; femora with five ventral teeth, three of these small, apical one long and sharp; length of tibia  $932\mu$ , with two rows of ventral teeth, three moderately sharp teeth in anterior row and four less sharp ones in posterior row; metatarsi  $775\mu$  long, with four rather blunt teeth ventrally, two along the median line near the middle of the segment and two opposite each other at its distal end; tarsi IV  $731\mu$  long, tapering to tip, with a subapical ventral spur and a long recurved apical spine; pulvilli elongate oval; total length of pulvilli IV  $273\mu$ ; claws long and slender.

Stigmal plates (Fig. 5) oval with a very long narrow postero-dorsal prolongation; greatest dimension from antero-ventral angle to extreme tip of prolongation  $617\mu$ ; entire plate narrowed toward the prolongation; the chitinized margin is wide, especially along the external lateral angle and near the tip of the prolongation where the margin widens to form a small boss; goblets rather large, widely separated, covering most of the surface

except on the prolongation, about 41 per plate; the supporting cells are rather large around each goblet and around the margin of the plate where they form a scalloped border, bending slightly outward opposite each goblet; the supporting cells extend out on the prolongation in a very narrow strip; the sides of this cellular area are nearly parallel; macula ovate, broadest anteriorly, about  $215\mu$  long; aperture elongate, slightly curved.

Body, genital pore situated between coxae II, genital groove moderately distinct; anus broadly oval, transverse, about  $215 \times 187\mu$ , soft portions of venter transversely striate, with numerous short pale hairs.

*Female*.—Capitulum (Fig. 2)  $832\mu$  in length; basis capituli dark reddish brown, with considerable white on dorsal surface;  $588\mu$  wide; postero-lateral angles moderately long; porose areas broadly elliptical, oblique, rather close together at base; ventrally, basis capituli is rather long and narrowed at posterior ridge, which is prominent; palpi  $488\mu$  in length; article II  $301\mu$  in length along internal margin, article III  $172\mu$  along internal margin; article I prominent ventrally, bearing four bristles along internal edge, article II with seven such bristles, and article III with three bristles; hypostome broad at tip narrowed proximally, with six rows of teeth ventrally; the three rows of teeth on either side converge toward base and diverge from the median line, the outer row is the longest having about thirteen teeth; internal article of chelicerae  $151\mu$  long, slender, with small external subterminal tooth, basal tooth on external article large.

Scutum (Fig. 2) 1.71 mm. long, 1.53 mm. wide, widest at eyes which are moderately prominent, margin posteriorly is almost a regular curve, there being no marked constriction behind eyes; capitular emargination rather deep, scapular angles narrow but rounded; cervical grooves rather deep anteriorly, converging, then diverging posteriorly, the divergent portion very shallow, and disappearing one-third of the length of the scutum from its posterior tip; most of surface of scutum covered with white which has a distinct greenish metallic lustre; red streaks along cervical grooves, on scapular angles and around eyes, white is somewhat broken with red on anterior portion between cervical grooves; rather numerous small red points or minute punctures scattered over entire scutum, a few somewhat larger punctures on scapular angles.

Legs and coxae dark reddish brown, a strip of white along the dorsal sides of legs except on tarsi; scattering pale hairs on coxae and legs; coxae I with long spurs, internal slightly longer than external; coxae II and III with postero-internal angles slightly raised from body; coxae II, III and IV with long, stout apical spines, trochanter I with short but rather sharp subterminal dorsal prolongation; all tarsi tapering at tips.

Stigmal plates (Fig. 6) of medium size, greatest dimension  $502\mu$ , from anterior internal angle to tip of prolongation; broadly oval with a rather long postero-dorsal prolongation extending at about right angles to a line through the macula; plate with a highly chitinized slightly raised border, widest in the external lateral angle where the border widens into a boss

near the tip of the prolongation and rather below the general surface of the plate; goblets rather large, 50 per plate, scattered over surface except in the prolongation; supporting cells larger around goblets and around margin of plate where they form a scalloped border, being slightly bulged opposite each marginal goblet; macula oval about  $208\mu$  long, aperture elongate.

Body dark reddish brown; marginal groove and festoons prominent; postero-medial and accessory grooves distinct, of about equal length, reaching nearly to foveae, a number of short pale hairs ventrally; genital aperture opposite the space between coxae II and III, genital groove distinct; anus transversely oval, about 230 by  $194\mu$ .

*Type Cat. No.* 14575, U. S. National Museum.

*Type host.*—Mountain sheep (*Ovis mexicanus* Merriam).

*Type locality.*—Quartzsite, Arizona.

A male and a female described from a lot of 23 males and 12 females taken on a female mountain sheep September 2, 1911, by Mr. George Hutson. The type female after being described was darkened considerably and the white made less intense by boiling dry during the process of softening it. Paratypes in Bureau of Entomology collection at Washington, D. C., and at Dallas, Texas, under Dallas acc. No. 2352.

I take pleasure in naming this pretty *Dermacentor* in honor of my associate, Mr. W. D. Hunter.

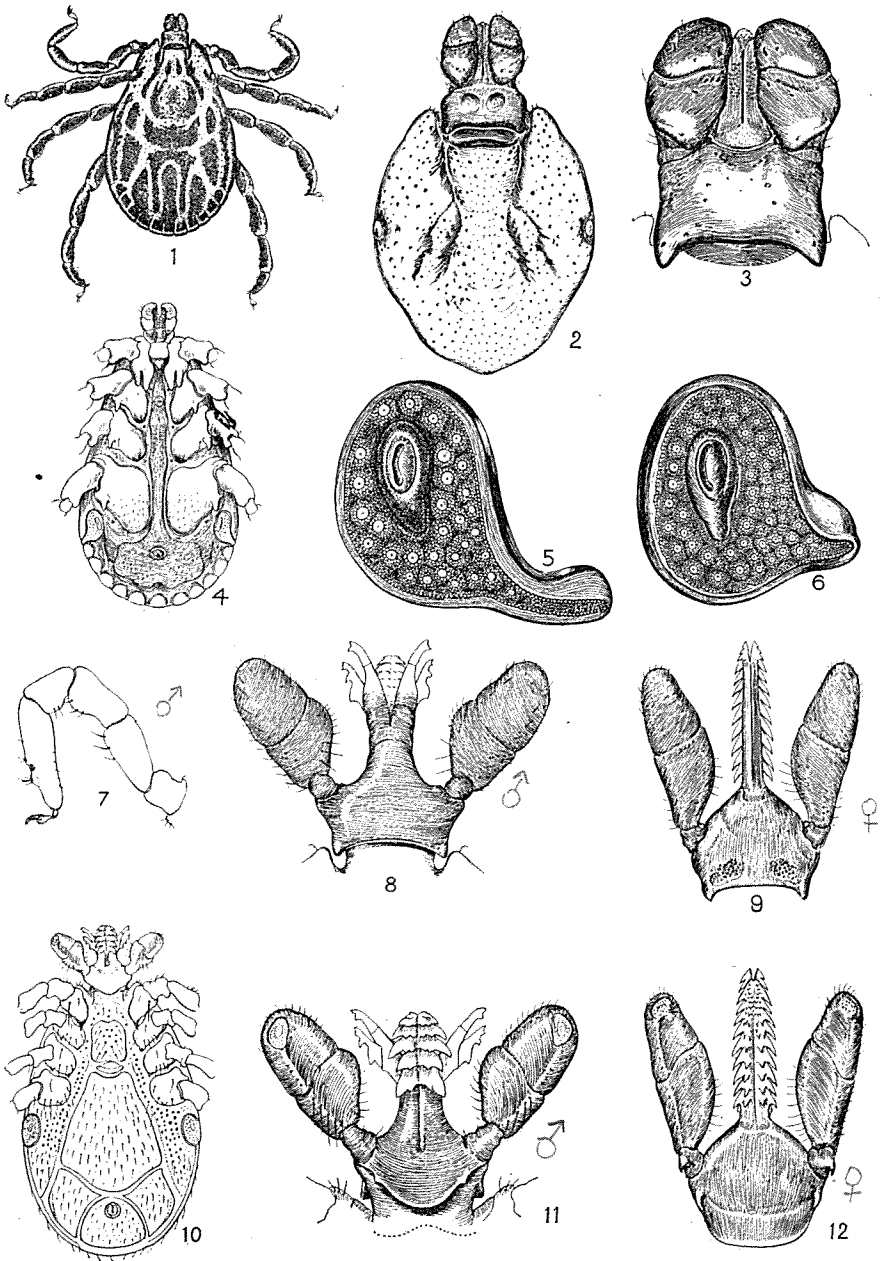
Mr. Hutson made a special effort to secure an abundance of material of this species and it is to him that I am indebted for the following records of collections: 3 ♂ (a dozen or more were collected but not sent in as they were dead), July 8, 1910; 16 ♂, 1 ♀ (unengorged), August 10, 1910; 5 ♂, 2 ♀ (unengorged to  $\frac{2}{3}$  engorged), August 20, 1910; 18 ♂, 13 ♀ (unengorged to fully engorged), December 1, 1910; 23 ♂, 12 ♀ (unengorged to  $\frac{1}{2}$  engorged), September 2, 1911. Several specimens, mostly males, escaped when the last collection was made. All of these lots were collected on mountain sheep near Quartzsite, Arizona, at an altitude of from 1500 to 2000 feet.

All specimens collected agree closely with the types; the males are all of good size and the color markings quite uniform. The number of goblets on the male stigmatal plates varies from 31 to 45 and on the female plates from 34 to 50.

The species runs to *D. venustus* in Mr. Banks' table. It appears to be most closely related to *venustus* but is easily distinguished from that species by many characters, some of which are the much smaller number of goblets on the stigmatal plates; stigmatal plates not so broad near their posterior ends and in the male with more narrow and longer prolongations; the scutum in each sex with much fewer large punctures, and the white marking are quite different; in the female the scutum is much less constricted behind the eyes; the porose areas are not pointed anteriorly; postero-lateral angles of basis capituli are longer; the dorsal portion of trochanter I is produced into a moderately sharp angle, not broadly rounded as in *venustus*.

The largest female collected measured  $12.9 \times 7.5 \times 4.2$  mm., length





EXPLANATION OF PLATE.

*Dermacentor hanteri*.—Fig. 1, dorsum of male; Fig. 2, seutum and capitulum of female; Fig. 3, capitulum of male; Fig. 4, venter of male; Fig. 5, sternal plate of male; Fig. 6, sternal plate of female.

*Ixodes diversifossus*.—Fig. 7, fore leg of male; Fig. 8, capitulum of male, dorsal; Fig. 9, capitulum of female, dorsal; Fig. 10, venter of male; Fig. 11, capitulum of male, ventral; Fig. 12, capitulum of female, ventral.

Drawn by J. F. Strauss. (Original.)

including palpi in normal position. A female engorged to repletion on a guinea pig measured 11.2 x 6.3 x 4.0 mm., length including palpi.

The larvæ and nymphs drop from the host for molting. Notes on the life history of the species and descriptions of the immature stages will be published later.

### ***Amblyomma maculatum* Koch.**

In examining a number of collections of immature specimens of ticks, several lots of *Amblyomma maculatum* were found. Previously these had been confused with *Aponomma inornata* Banks, but they are quite easily distinguished in the nymphal stage, from that species, by two prominent spines on the ventral side of the basis capituli. These spines point backward and are located near the posterior margin of the basis capituli behind the base of the palpi. The palpi are longer and more slender than in *Aponomma inornata*, article II being much narrowed basally and article I not bearing the internal prolongation found in that species. The lateral angles on the dorsal side of the basis capituli are sharp while in *inornata* they are rounded.

In the material examined the following lots were found: 1 nymph on meadowlark (*Sturnella magna*), December 16, 1908; 1 nymph on one, 2 on another and 3 on still another meadowlark, January 5, 1909; 5 nymphs on meadowlark, January 26, 1909; 1 nymph on meadowlark, January 27, 1909; 2 nymphs on red-winged blackbird (*Agelaius phoeniceus*), January 28, 1909; 1 nymph on Brewer's blackbird (*Euphagus cyanocephalus*), January 6, 1909; 1 nymph on jack rabbit (*Lepus californicus merriami*), March 28, 1909. All of these collections were made by Mr. J. D. Mitchell near Victoria, Texas, except the lot on jack rabbit which was collected in Refugio Co., Texas. Five other lots of nymphs of this species were collected by Mr. Mitchell. Some specimens in each of these lots were bred to adults as well as a careful determination being made of the nymphs. The records on these collections are as follows: 9 nymphs on meadowlark, February 20, 1909; 6 nymphs on meadowlark, March 23, 1910; 1 nymph on quail, March 24, 1910; 4 nymphs on meadowlark, March 25, 1910. The last lot was collected in Calhoun Co., Texas, all of the others were taken in Victoria Co., Texas.

The specimens obtained were in all states of engorgement. The fact that all of the collections were made during the winter and early spring does not preclude the likelihood of the occurrence of the immature stages on hosts during the summer months as well, as few hosts were examined in other than the winter season in the region where this species is common.