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THE TICKS PARASITIC ON CATTLE AND HORSES IN HOKKAIDO, JAPAN.

BY

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In various parts of Hokkaido a kind of cattle piroplasmiasis has been prevalent among cattle pastured in summer, causing a great damage to the cattle-industry every year. Accordingly, for several years we have been studying about this disease¹⁾ and the ticks which may transmit it. Our studies about the ticks have not yet arrived to a conclusive result, so that a thorough report can not be given here, but the taxonomic contributions about the ticks which were collected in different parts of Hokkaido will be given in this paper. About 7,000 ticks infesting cattle, horses and hares were collected, a half of this number being sent to us by several stock-breeders, and the other half being consisted of the authors' collection. After investigating these specimens minutely, five different kinds of ticks have been recognized, two of which belong to the genus *Ixodes* and the remaining three to *Haemaphysalis*, two of them proving to be new species. In spite of many detailed contributions in this field, we have here described these species somewhat in detail, because up to the present date there has been no printed account concerning the ticks in Hokkaido. The following descriptions were made after the diagnosis of Nuttall, Warburton and others²⁾ for convenience of comparisons.

We wish here to express our indebtedness to Prof. K. Kasai for the facilities he has afforded us in this work.

1. *Ixodes ricinus* L.*

Plate XI.

Male. Scutum dark-brown, long-oval; cervical grooves usually super-

1) Kohanawa and Ogura: On a Piroplasmiasis-like Disease of Cattle in Sapporo and its Neighbourhood. Journ. Jap. Soc. Vet. Sci. Vol. 4, p. 301-326, (1925).

2) Nuttall, Warburton, Cooper and Robinson; Ticks—A Monograph of the Ixodoidea. Cambridge University Press (1908-1915).

L. G. Neumann; Ixodidae. Berlin (1911).

* L. G. Neumann; Mém. Soc. Zool. France, V. 12, p. 116 (1899).

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ficial and faint, but a few individuals indicate fairly deep cervical grooves attaining the median third of scutum; lateral grooves absent or showing only a trace; scapulae blunt; marginal body-fold well defined.

Capitulum.—Basis capituli without cornua and sharp dorsal ridge. Palps broad; article 2 as long as broad; articles 2 and 3 nearly in the same size, the distal end of article 3 broad and round.

Hypostome with 6–8 sharp and stout lateral teeth (connecting with crenulations ventrally) and one large blunt basal tooth on each side.

Venter.—Genital orifice large, between coxae 3. Pregenital plate nearly twice as long as broad. Anal plate with rounded sides divergent. Adanal plate longer than broad and wider anteriorly. Spiracles large, elliptical.

Legs.—Coxa 1 with a long sharp internal spur reaching coxa 2 and a short spur externally. Coxae 2 and 3 respectively with a short, blunt, external spur and a slight tubercle or a sharp ridge at the postero-internal corner. Coxa 4 with a short blunt spur externally. Tarsi long, tapering gradually towards the end.

Measurements of size.

Scutum		Capitulum	Basis capituli	
Length	Width	Length	Length	Width
2,0	1,1	0,54	0,21	0,35
2,0	1,1	0,60	0,21	0,33
2,0	1,1	0,54	0,21	0,37
2,0	1,0	0,58	0,25	0,33
1,9	1,1	0,55	0,21	0,37

Unit = m. m.

Female. Scutum dark-brown, roundly elliptical; cervical grooves shallow and usually reaching the border; lateral grooves shallow and indicated for about half the length of scutum; punctations fine, denser on the marginal portion; scapulae sharp.

Capitulum.—Basis capituli without cornua, on the ventral surface with slight auricular ridges; porose areas large, piriform, broader in front. Palps long; article 2 long, article 3 shorter than 2 and its distal end being round. Hypostome: long, dentition 3 | 3, the external being stronger and sharper.

Venter.—Genital orifice between coxae 4. Genital grooves somewhat convex and slightly divergent. Anal grooves behind anus almost parallel. Spiracles nearly circular, macula anterior.

Legs.—As in the male.

Measurements of size.

Scutum		Capitulum	Basis capituli	
Length	Width	Length	Length	Width
1,3	1,2	0,92	0,31	0,52
1,3	1,2	0,92	0,31	0,56
1,4	1,2	0,90	0,31	0,53
1,5	1,3	1,00	0,31	0,58
1,6	1,4	1,00	0,32	0,60

The specimens were taken from cattle, horses and human bodies.

Hab.—Hokkaido (common), Honshu (Aomori), Karafuto (Konuma).

2. *Ixodes frequens* n. sp.

Plates XII and XIII.

Male. Scutum brown, elongate-oval; cervical grooves superficial and indicated for one third of the scutal length; lateral grooves absent; punctations fine, numerous; scapulae blunt; marginal body-fold fairly well defined.

Capitulum.—Basis capituli small, with auricular ridges ventrally. Palps somewhat short; articles 2 and 3 broad and large, the latter being slightly larger. Hypostome: dentition 3 | 3, the outer-most teeth the strongest, with a blunt, large, basal tooth on each side.

Venter.—Genital orifice between coxae 3. Pregenital plate triangular in shape, having its base posteriorly. Spiracles white, long-oval, broader in front.

Legs.—Coxa 1 with a short, blunt, internal spur, and also a thick posterior margin on which are provided numerous, fine, parallel, transverse lines (like a finger-print). Coxae 2 and 3 without any spur, but with the finger-print-like markings indicated on their posterior halves. Coxa 4 with a short, blunt, external spur. Tarsi long and tapering gradually towards the end.

Measurements of size.

Scutum		Capitulum	Basis capituli	
Length	Width	Length	Length	Width
1,7	1,0	0,42	0,21	0,38
1,7	1,0	0,46	0,21	0,28

Female.—Scutum brown, nearly circular; lateral grooves well marked and narrow, running straight to the lateral sides of the scutum, and parallel to the cervical grooves visible for $\frac{2}{3}$ of the scutal length, at first running parallel to each other for $\frac{1}{4}$ of the length of scutum and then straight postero-externally, approaching or reaching the posterior border of scutum; punctations fine, denser posteriorly; scapulae blunt.

Capitulum.—Long; basis capituli without any spine or with very short cornua, slight auricular ridges ventrally, porose areas large, elliptical in shape; palps long, article 2 longer than 3. Hypostome: 2 | 2, with subequal teeth.

Venter.—Genital orifice between coxae 4. Genital grooves almost straight or slightly concave, divergent posteriorly. Anal grooves slightly divergent. Spiracles nearly circular.

Legs.—Coxae 1 and 2 as in the male, coxae 3 and 4 with each a short external spine; tarsi long, tapering gradually towards the end.

Measurements of size.

Scutum		Capitulum	Basis capituli	
Length	Width	Length	Length	Width
1,0	1,0	0,70	0,20	0,40
1,2	1,2	0,80	0,23	0,50
1,0	1,0	0,70	0,20	0,40
1,2	1,2	0,84	0,20	0,50
1,2	1,2	0,81	0,23	0,44

The specimens were taken from cattle, horses and human bodies.

Hab.—Hokkaido (Hakodate, Sapporo, Muroran, Atsunai).

This species closely allied to *I. ovatus* Neum.,* but differs from it in having different hypostome and first 2 coxae.

3. *Haemaphysalis concinna* Kocui** (1844).

Plate XIII.

Male.—Scutum dark-brown or brown, oval; only the beginning of cervical grooves detected; lateral grooves long and well marked, including or not including a festoon; festoons long and well defined.

* L. G. Neumann: Mém. Soc. Zool. France, V. 12, p. 116, (1899).

** Nuttall, Warburton, Cooper, and Robinson: Ticks—A Monograph of the Ixodoidea, p. 452, (1915).

Capitulum.—Basis capituli with strong sharp cornua. Palps rather strongly salient; article 2 broad and large; article 3 with a retrograde spine on the ventral surface, the distal end distinctly elongated and incurving in such a way that the palps give a chelate appearance when closed. Hypostome with a large corona, dentition 6 | 6, with uniformly strong teeth.

Venter.—Spiracles white, large and rectangular, with round corners.

Legs.—Coxa I with a long sharp spine; coxae 2, 3, 4 with each a short blunt spur; tarsi moderate, tapering gradually towards the end.

Measurements of size.

Scutum		Capitulum	Basis capituli	
Length	Width	Length	Length	Width
2,3	1,7	0,47	0,17	0,42
2,2	1,6	0,46	0,17	0,38

Female. Scutum nearly circular, with somewhat angular contour; cervical grooves well marked, visible for 2 thirds of the scutal length, concave externally, the interval (median field) at the narrowest part so broad as the lateral field of the scutum; punctations fine and inconspicuous.

Capitulum.—Basis capituli with short blunt cornua; porose areas large, elliptical, ill-defined: palps moderately salient; article 3 not elongated, its distal end blunt, giving no chelate appearance when closed, armed with a short blunt spur on the ventral surface. Hypostome: dentition 4 | 4.

Venter.—Spiracles fairly small, subcircular.

Legs.—As in the male.

Measurements of size.

Scutum		Capitulum	Basis capituli	
Length	Width	Length	Length	Width
1,10	1,1	0,52	0,17	0,50
1,00	1,1	0,52	0,17	0,48
0,98	1,0	0,50	0,16	0,48
1,10	1,2	0,54	0,17	0,54
0,94	1,1	0,54	0,19	0,48

This collection was made from cattle and horses.

Hab.—Hokkaido (Tokachi, Kushiro, Nemuro, Kitami).

The male is not known in the scientific world except in Europe.

4. *Haemaphysalis bispinosa* NEUMANN* (1897).

Plate. XIV.

Male. Scutum brown, oval, uniformly with numerous small punctations; cervical grooves short and shallow, beginning as the oval pits situated rather behind the anterior margin of scutum; lateral grooves long and well marked, including one festoon each; festoons long and well defined; in some specimens dorsal, median and postero-lateral grooves present and fairly well marked.

Capitulum.—Basis capituli broadly rectangular, with long and sharp cornua. Palps slightly salient; article 2 a little longer than 3 and without any spine; article 3 armed with a short retrograde spine at the middle of its dorsal and ventral borders respectively, the distal end of this article being blunt. Hypostome: 5 | 5 or 6 | 6, with equal teeth.

Venter.—Spiracle white and fairly elongated comma-shaped.

Legs.—Coxa 1 with a fairly long and sharp spine; coxae 2, 3, 4 with each a short blunt spine; tarsi moderate, tapering gradually towards the end.

Measurements of size.

Scutum		Capitulum	Basis capituli	
Length	Width	Length	Length	Width
2,45	1,7	0,42	0,20	0,38
2,45	1,7	0,42	0,20	0,39
2,30	1,8	0,48	0,20	0,37
2,40	1,6	0,43	0,17	0,38
2,40	1,6	0,42	0,17	0,36

Female. Scutum yellow, or brown (in well-chitinized individuals), nearly circular, with more or less angular contour; cervical grooves rather well defined, a little concave externally, attaining the posterior third; lateral grooves usually invisible, but in a few specimens being faintly seen at the beginning.

* Nuttall, Warburton, Cooper and Robinson: Ticks—A Monograph of the Ixodoidea, p. 426, (1915).

Capitulum.—Basis capituli with short and blunt cornua; porose areas rather ill-defined, elliptical and far apart; palps as in the male. Hypostome: dentition 5 | 5, with equal teeth.

Venter.—Spiracles white and short-comma-shaped.

Legs.—As in the male.

Measurements of size.

Scutum		Capitulum	Basis capituli	
Length	Width	Length	Length	Width
1,10	1,24	0,57	0,19	0,52
1,00	1,15	0,54	0,17	0,46
1,00	1,15	0,57	0,17	0,46
1,00	1,15	0,52	0,17	0,46
1,00	1,20	0,54	0,17	0,52

The specimens were collected from cattle, horses and hares.

Hab.—Hokkaido (Hakodate, Sapporo, Muroran, Asahikawa, Abashiri), Honshu (Aomori, Iwate), Kyushu (Kumamoto), Chosen (Fusan).

5. *Haemaphysalis jezoensis* n. sp.

Plate XV.

Male. Scutum blackish-brown, long-oval, the broadest at the stigmatal portion; cervical gooves faint, short and shallow; lateral grooves well marked, including no festoon; festoons long and well defined; punctations fine, inconspicuous.

Capitulum.—Basis capituli with strong, sharp cornua. Palps moderately salient, longer than broad; article 2 the largest; 3 with a short spine ventrally, its distal end elongated and incurved somewhat, giving the palps a more or less chelate appearance when closed. Hypostome: dentition 5 | 5, with equal teeth.

Venter.—Spiracles white, large and fairly elongated comma-shaped.

Legs.—Coxa 1 with a long sharp internal spur; coxae 2, 3, 4 with each a short spur; tarsi moderate, tapering gradually towards the end.

Measurements of size.

Scutum		Capitulum	Basis capituli	
Length	Width	Length	Length	Width
2,6	1,7	0,42	0,20	0,35

Female.—Scutum brown, nearly circular; cervical grooves fairly well marked and visible for 2 thirds of the scutal length, the interval rather narrow; lateral grooves absent.

Capitulum.—Basis capituli with short, sharp cornua; porose areas large, elliptical, oblique, slightly converging in front. Palps moderately salient, article 3 not elongated, with a short spur ventrally, its distal end being blunt. Hypostome: dentition 4 | 4, with equal teeth.

Venter.—Spiracles white, subcircular, with each a slight dorsal process.

Legs.—Coxae and tarsi as in the male.

Measurements of size.

Scutum		Capitulum	Basis capituli	
Length	Width	Length	Length	Width
1,0	1,1	0,48	0,17	0,45
1,0	1,1	0,52	0,17	0,52
1,2	1,1	0,52	0,15	0,44
1,1	1,1	0,54	0,15	0,46
1,0	1,0	0,52	0,17	0,50

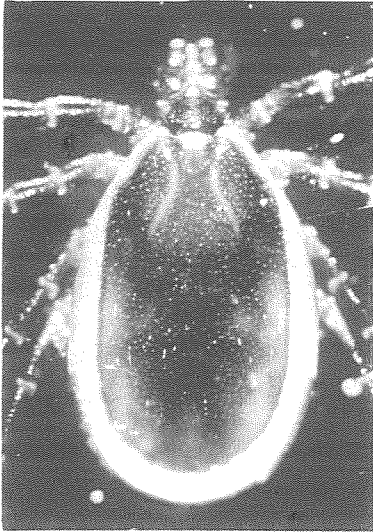
This collection was made from cattle and horses.

Hab.—Hokkaido (Sapporo, Kushiro).

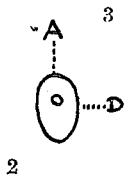
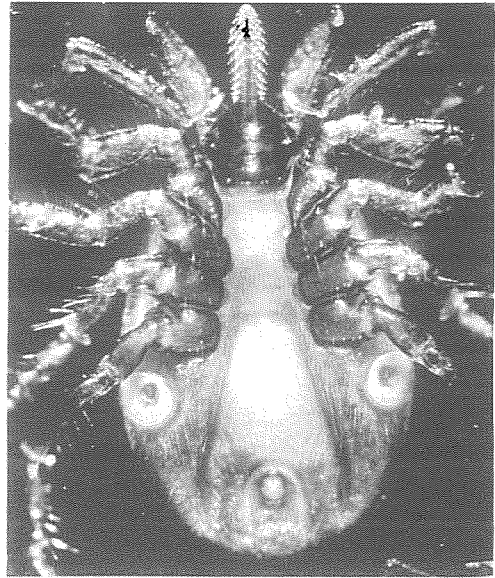
Explanation of Plate XI.

1. Dorsal view of the male *Ixodes ricinus* L. × 23.
2. Ventral view of the same. × 23.
3. Spiracle of the same. × 23.
4. Dorsal view of the female *Ixodes ricinus* L. × 23.
5. Ventral view of the same. × 23.

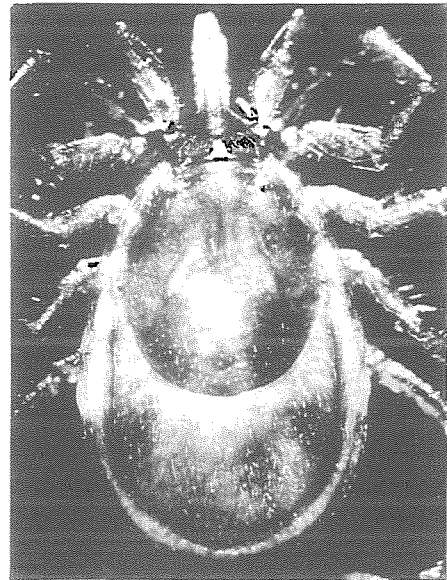
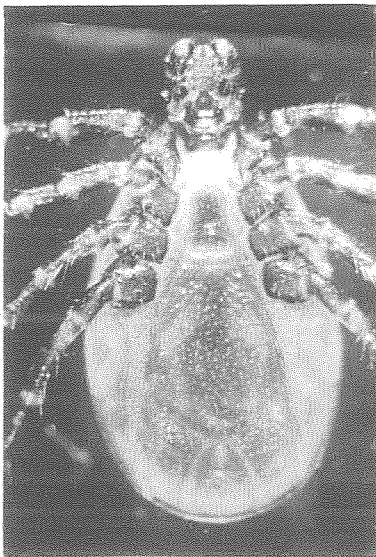
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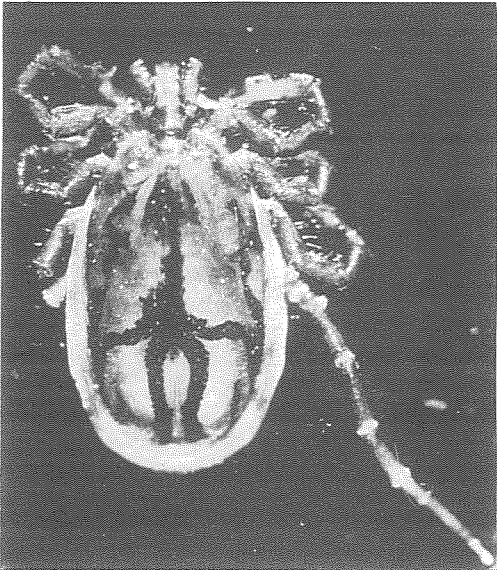
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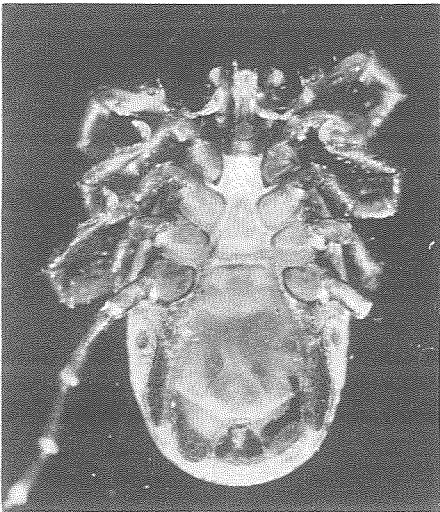
Explanation of Plate XII.

1. Dorsal view of the male *Ixodes frequens* n. sp. × 23.
2. Ventral view of the same. × 23.
3. Spiracle of the same. × 45.
4. Dorsal view of the female *Ixodes frequens*. × 30.
5. Ventral view of the same. × 30.

1



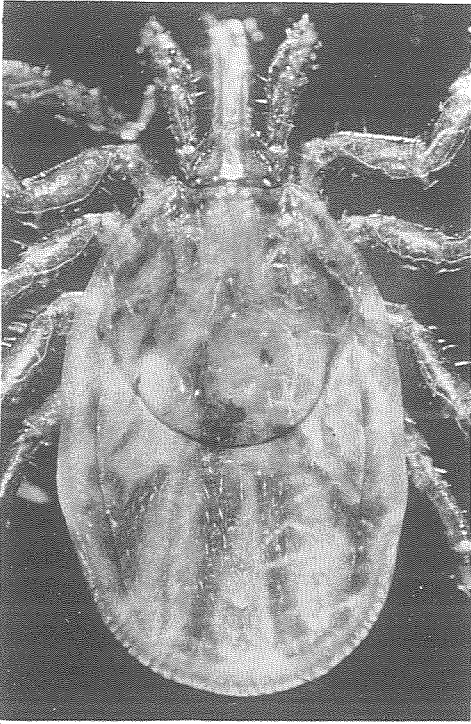
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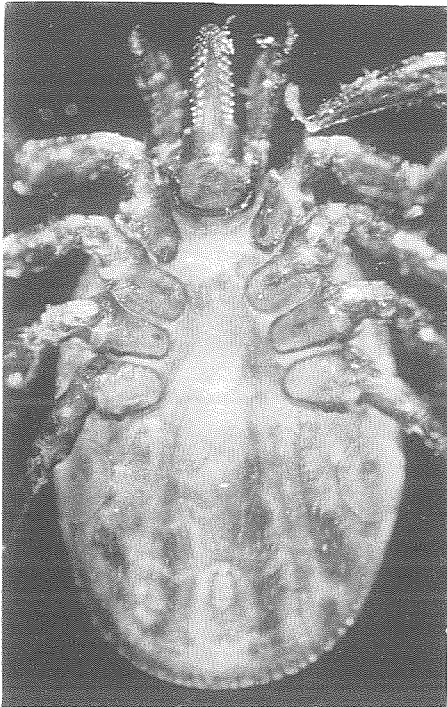
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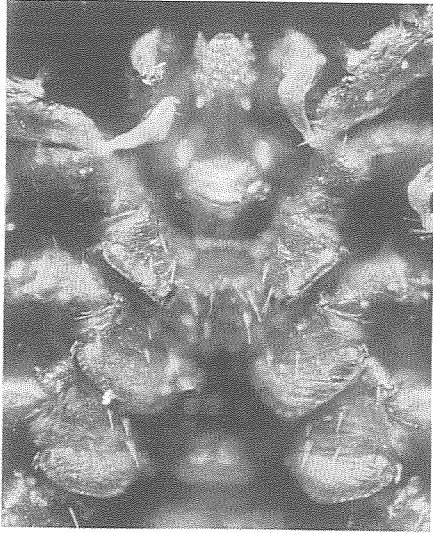
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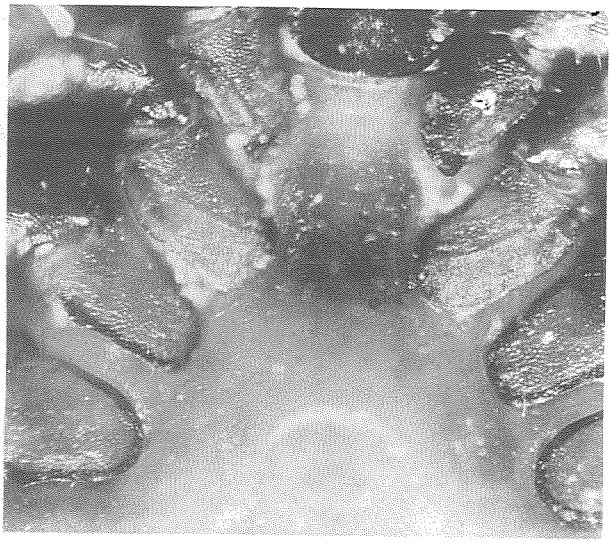
Explanation of Plate XIII.

1. Male coxae of *Ixodes frequens* n. sp. × 55.
2. Female coxae of the same. × 55.
3. Ventral view of the male *Haemaphysalis concinna* KOCH × 23.
4. Capitulum of the same (ventral aspect). × 35.
5. Spiracle of the same. × 45.
6. Ventral view of the female *Haemaphysalis concinna* KOCH × 23.
7. Spiracle of the same. × 45.

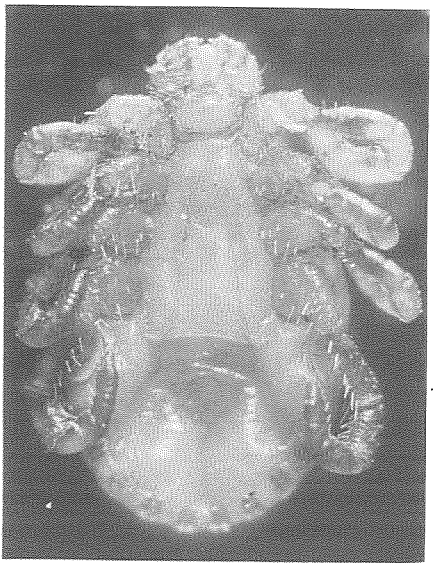
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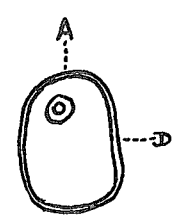
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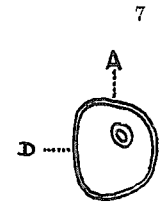
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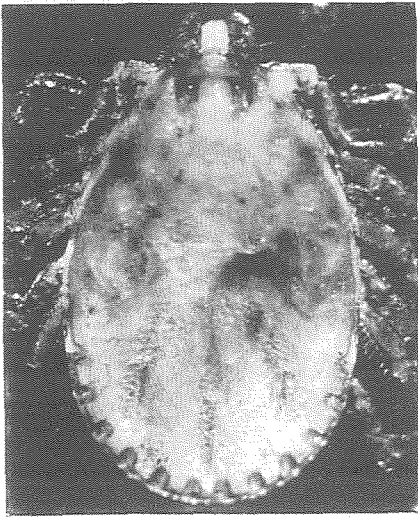
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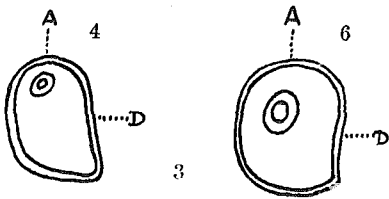
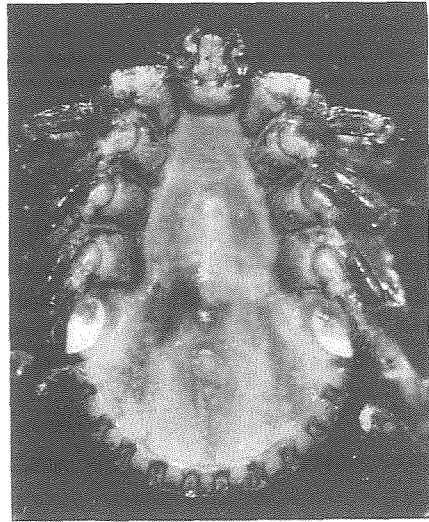
Explanation of Plate XIV.

1. Dorsal view of the male *Haemaphysalis bispinosa* NEUM. × 23.
2. Ventral view of the same. × 23.
3. Capitulum of the same (ventral aspect). × 45.
4. Spiracle of the same. × 45.
5. Ventral view of the female *Haemaphysalis bispinosa* NEUM. × 23.
6. Spiracle of the same. × 45.

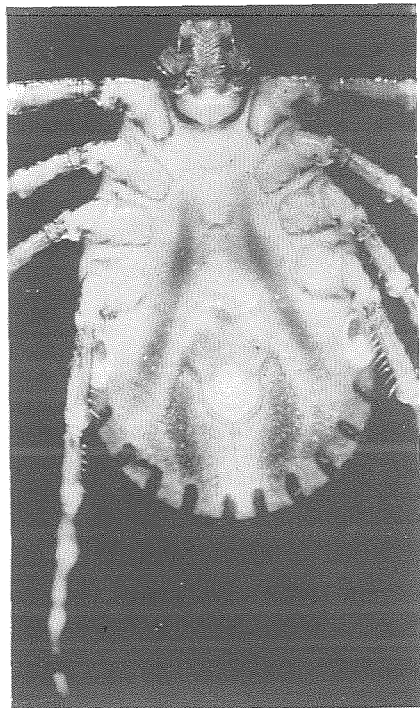
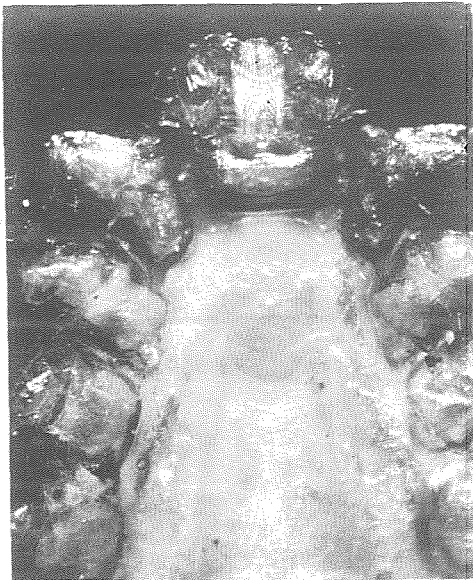
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2



5



Explanation of Plate XV.

1. Dorsal view of the male *Haemaphysalis jezoensis* n. sp. × 23.
2. Ventral view of the same. × 30.
3. Capitulum of the same (dorsal aspect). × 35.
4. Capitulum of the same (ventral aspect). × 35.
5. Spiracle of the same. × 45.
6. Dorsal view of the female *Haemaphysalis jezoensis*. × 16.
7. Ventral view of the same. × 16.
8. Spiracle of the same. × 55.

