

PRELIMINARY LIST OF THE HYDRACARINA OF WISCONSIN

PART IV

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Parts I, II and III of the *Preliminary List of the Hydracarina of Wisconsin* recorded fifty-three species belonging to eighteen genera. The present paper adds fourteen species representing four genera of the family *Hygrobatidae*. None of these are new but additional data are given for several of them. As in the preceding Parts, drawings and some of the outstanding characters of each species are given, together with distribution data as far as known. For complete descriptions of the species, the student of the group is referred to the titles in the bibliography.

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Following the system of Viets, the Koenikeas are included with the Unionicolas and the Neumanias in the subfamily *Unionicolinae*; superficially they resemble the Mideopsinae. The genus *Koenikea* was set up by Wolcott (1900) with one species, *K. concava*; in reality, two species were here included, as was noted by other investigators and pointed out by Koenike and Lundblad. Dr. Wolcott also erected another genus, *Tanaognathus*, with one species, *T. spinipes*, now regarded as a *Koenikea*. It was evident that other species were also present and this led to further confusion in identifications, of which the present author was also guilty. Viets (1930), after the examination of a small amount of North American material, reviewed the literature and established three new species and more clearly defined the original two. These five species are all present in Wisconsin; the present paper adds data on the differentiation of the sexes. The Koenikeas are small mites, usually less than one millimeter in length; the body is greatly compressed and concave dorsally; the skin is heavily chitinized and pierced with fine pores and the

dorsal exoskeleton shows a furrow near the margin which thus encloses a large circular area. The genus appears to be most abundant in the New World.

The Pionas form one of the largest genera of the water mites, both in numbers of species and in individuals. They are soft bodied, with striated skin, often brightly colored, usually elliptical in form and of medium size, although a few attain a length of two millimeters. The shape of the large fourth spimera, each with a prominent posterior angle, together with the presence of two or more hair papillae on the fourth segment of the palpus, will usually serve to identify the genus. The genital openings lie close to the epimera; sexual dimorphism is marked, shown especially in the peculiarities of the third and fourth legs in the male, the latter always showing a large concavity in the fourth segment. This paper lists only six of the several species of Pionas in the state; it is hoped to include the remainder in the next Part.

The Forelias, a small group, closely resemble the Pionas from which they are readily distinguished by the shape of the fourth epimera; in this plate the anterior and posterior margins meet in the median line to form an acute angle. The Huitfeldtias are rare; they resemble the female Pionas in the form of the epimera but lack the other distinctive features of that genus.

Koenike concava Wol.

Pl. VI, fig. 3-5

The original account of the species (Wolcott, 1900) gave the male and female; both forms described, however, were obviously females. Dr. Wolcott deposited co-types in the National Museum and these have been examined by the author. Little can be determined from them, since the preservation is poor, but it is evident that two species are present. Dr. Viets (1930) designated Wolcott's male (in reality a female) as *K. concava* and called the other female *K. wolcotti* n. nom. The true male is now known and here described. The body is nearly circular in the male and measures from 0.60 to 0.69 mm. in length. The females are more elongated and vary in length from 0.70 to 0.93 mm, depending upon the age. A lyre-shaped dark marking is seen on the dorsal side, over which is a broadly U-shaped red mass. (The mark shown in Wolcott's fig. 15 was not observed.) The epi-

mera are united in one plate, their places of union marked by heavy lines. The genital plates are large and close to the fourth epimera; their small and scattered acetabula, set into the body wall, form indistinct wing-shaped areas, narrow in the male. The legs are weak. The rostrum of the maxillary organ is a little prolonged and is seen as a rounded body in ventral view. In the palpus the second segment is nearly as wide as the first leg; the fourth segment is distinguished by the presence of a hair-bearing papilla near the distal end.

Specimens have been found in Michigan, Indiana, Illinois, Iowa, Florida and Louisiana. In Wisconsin they have been found in ponds in Adams county and in lakes Wingra and Green, in the latter to a depth of six meters.

Koenikea haldemani Viets

Pl. VI, fig. 1, 2

A species closely related to *K. concava*, with which it has been confused, the female was recognized and separated from it by Viets (1930). The male is now known. The body in both sexes is nearly circular. Males measure from 0.525 to 0.575 mm. in length; females, 0.62 to 0.72 mm. The center of the body shows a large magenta or violet blotch. The epimera are fused, the divisions between them shown by heavy lines; the fourth pair are wider than in *K. concava*. The genital regions are at some distance from the epimera; the genital cleft and plates are large in the female, much smaller in the male. The scattered and indistinct acetabula cover a narrow and widely extended area. The second segment of the palpus is wider than the legs, which are weak; the fourth segment lacks a papilla. The rostrum is but little projected.

Specimens have been found in ponds in Adams county, in Green lake and lakes in Iowa.

Koenikea wolcottii Viets

Pl. VI, fig. 6, 7

First described by Wolcott (1900) as the female of *K. concava*, it was separated as a distinct species by Viets (1930), the male of which is still unknown. The body of the female is nearly circular, 0.75 to 0.90 mm. in length. The body covering is very heavy; blotches of red show anteriorly and posteriorly. The epi-

meral plates join except for a considerable space between the third and fourth of either side; the first pair have projecting rounded anterior ends. A distinctive feature of this species is the large curved snout or rostral spine, with two long curved bristles near its base. The palpi are more slender than the legs and resemble those of *K. haldemani*. The fourth pair of legs bear several scattered pectinated spines. Genital acetabula are few, scattered and indistinct; they lie in the body wall in a narrow area extending outward from the large genital plates.

Individuals were collected in lake Wingra; they have also been found in Michigan, Indiana and Illinois.

Koenikea marshallae Viets

Pl. VII, fig. 8-11

The male is from 0.55 to 0.65 mm. in length, the width being only slightly less; the anterior region projects conspicuously and there is a protuberance over each eye. The female is from 0.675 to 0.775 mm. in length, relatively slimmer than the male, with anterior projections not so large. Blue green and red blotches are conspicuous on both surfaces. The epimeral groups are separated, with a wide space between the third and fourth of each side in the female; the first pair have projecting rounded anterior ends. The genital clefts are long and near the last epimera; the plates are very large in the female. The genital acetabula are irregular and indistinct and form broad wing-shaped areas. The rostrum of the maxillary organ is greatly drawn out and prolonged into a very conspicuous slim sickle-shaped spine; this bears two large hairs at its base. The palpi bear numerous hairs but no papillae. The legs are weak, scarcely wider than the palpi.

Material has been found in Ontario, Michigan, Illinois and Louisiana; in Wisconsin in ponds in Adams county, in Spooner, Allequash, Twin and Green lakes, in the latter to a depth of six meters.

Koenikea spinipes (Wol.)

Pl. VII, fig. 12-15

Originally described and set aside in a new genus, *Tanaognathus*, by Wolcott (1900) from the study of one specimen, a male, this species was placed with the *Koenikeas* by Viets (1930).

While this is probably its place, nevertheless the peculiarities of the palpi and legs set it apart from other described species. In the character of the rostral snout it resembles *K. wolcotti*. The female is now known. The male is from 0.625 to 0.70 mm. in length; the female, 0.90 to 1.10 mm. The body is nearly circular in form with an anterior projection, or slightly wider than long in the male. The skin is very thick and blue blotches show on this in life. The epimera in the male come close together except for a space in the center of the field; in the female the third and fourth of each side are separated from the others by a small space. The genital areas lie close to the last epimera; in the female the cleft is long and the plates are large, while in the male the reverse is true. The genital acetabula lie in the body wall in an area which is broad but not laterally extensive. The rostrum of the maxillary organ is drawn out to form a heavy greatly curved snout, broad at the base, with a conical tip; dorsal to this are two long heavy curved hairs. The palpus is very small; the basal segment is the broadest, while the second is longer than succeeding ones; the fourth segment has a large projection on its distal end projecting parallel to the fifth. The legs are rather stout and bear pectinate hairs; the fifth segment in each is enlarged in the center, while the sixth is slightly curved. The first leg ends in an expanded tip which bears a pair of large sickle-shaped claws.

Specimens were collected in lakes Wingra and Allequash. They have also been found in Michigan and Illinois.

Huitfeldtia rectipes Thor

Pl. VIII, fig. 16-18

An uncommon species, the only one in the genus, a few specimens, all males, have been found in northern lakes. The body is oval, thin-skinned, with brown blotches. Males measure up to 1.25 mm. in length; females are a little longer. The epimera resemble those of the female *Pionas* but are smaller and the groups are well separated. The genital areas are removed from the epimera and have lunate plates, united at the ends in the male, which bear a small number of conspicuous acetabula. Palpi are slender; the third segment bears a long hair and the fourth exceeds the others in length.

The species has been reported from northern Europe and Germany. It has been found in Ontario, Saskatchewan and in four lakes in Vilas county. In two collections individuals were found at a depth of about fourteen meters.

Forelia liliacea (Müll.)

Pl. VIII, fig. 22-25

This cosmopolitan species measures in the largest males nearly 0.70 mm., and in the females up to 0.80 mm. The posterior end of the body is elongated, especially in the male; the general color is brown. The epimeral groups are close together in the male, well separated in the female; the genital area lies almost entirely within the bay formed by the large triangular last pair. In the female the genital plates, well removed from the long aperture, are broad and bear from fifteen to thirty acetabula each; in the male the plates are narrower, joined at either end of the short aperture, and lie close to the last epimera, scarcely extending beyond their sharp posterior angles. The palpi are stouter than the first pair of legs. The fourth pair of legs are a little longer than the body; in the male the sixth segment is bent strongly dorsally and bears ten or more blunt spines on the inner surface.

The species is found throughout Europe and is reported for Africa. It has been found in Ontario, Wyoming, Washington and Michigan. In Wisconsin collections have been made in Spooner and Bass (Waupaca) lakes and in several lakes in Vilas county, in one case to a depth of eight meters.

Forelia ovalis Mar.

Pl. VIII, fig. 19-21

Closely related to *F. liliacea*, this species is a little larger with stouter legs and shows a red trident-shaped dorsal mark. The genital plates extend laterally beyond the posterior blunter angles of the fourth epimera and bear many small acetabula; in the male the plates meet for a short space below the short genital opening. The fourth leg in the male is a little shorter than the body and all of the segments are stout; the sixth segment, lying nearly in the same plane as the fifth, has a broad proximal part

which is extended into a finger-shaped process bearing a row of short blade-like bristles.

Collections have been made in Ontario and Illinois. In Wisconsin the species has been found in the Madison and Jordan lake regions, in Green lake and in eight lakes in Vilas county, in one case to a depth of thirteen meters.

Piona crassa (Wol.)

Pl. X, fig. 37-42

This is an unusual *Piona*, being heavily built and chitinized. The entire dorsal surface of the male is thinly chitinized and somewhat flattened, while the female has a small anterior dorsal plate, characters not given in the original description of the species. The remainder of the cuticula is thick, with heavy ridges. Living specimens show the usual brown blotches on the dorsal side; a faint pink shows in the center of these, while the edges of the ventral plates are tinged with red and the appendages are deep blue. Males are about 0.65 mm. in length; females, from 0.80 to 1.00 mm. The posterior angle of the fourth epimera is especially sharp; all of the plates are united in the male. The conspicuous genital tongue-shaped plates, bearing a large number of acetabula, are strongly curved and extend far out beyond the lateral boundaries of the epimera. In the male these plates meet medially below the small opening to form an oblong area devoid of acetabula to which the anal plate is fused. The short stout flattened palpi are very unusual in that the fourth segment has eight small papillae arranged in two rows on the projecting distal margin. The author has not observed any marked difference in the palpi in the two sexes; Wolcott (1902, fig. 60) in a description based upon a single individual gives a much slimmer palpus for the female. The legs are stout, with short terminal segments in the first three pairs. The third leg has a truncated sixth segment, while the long fifth segment bears distally several heavy spines and one very long hair, the last character not given in the original description. The fourth leg has unusually stout proximal segments with the characteristic concavity on the fourth.

Specimens have been found in Montana, Michigan, Illinois and in Wisconsin in lake Wingra and in three regions in Adams and Vilas counties.

Piona rotunda (Kram.)

Pl. IX, fig. 26-31

A cosmopolitan species and widely distributed, its variability and the lack of very distinctive characters make the identification of *P. rotunda* difficult, especially in the case of the female. Confusion in this matter is evident in some of the older literature. The body is broadly elliptical and shows brown blotches under a finely ridged surface. Largest males measure about 0.80 mm., females, 1.10 mm. The genital areas in both sexes extend laterally hardly beyond the posterior angles of the moderately concave borders of the fourth epimera. The fused genital plates of the male show a broad concavity on the posterior border; there are from fifteen to thirty acetabula on either side, with a large shallow free area under the genital opening. The anal plate lies well back of the genital plates. In the female there are about the same number of acetabula placed on a sickle-shaped plate on either side, arranged in an irregular crowded row, with a few others embedded in the wall on the concave side. The palpi are wider than the first pair of legs, with a slim fourth segment bearing two small papillae. The sixth segment of the third leg is about half of the length of the fifth, a little expanded at the end; one of its claws bears a long straight tip.

This species has been found all over Europe and in parts of Asia and Africa. It has been collected in Alaska, British Columbia, Ontario, Montana, Michigan and Nebraska. In Wisconsin there are records for lakes Wingra, Coma, Mason, ponds near Cable, Wisconsin Dells, Green Bay and waters of Adams and Vilas counties.

Piona reighardi (Wol.)

Pl. IX, fig. 32-36

The females of this species closely resemble *P. rotunda*, from which it is separated with difficulty, since both species show great variability in the genital plates. Co-types of both species, deposited in the National Museum by Dr. Wolcott, and examined by the author, are not well preserved; there appears, however, to have been some confusion of the two forms. Living material, believed by the author to be the true *P. reighardi*, usually shows a bright red spot ventrally at the meeting of the

epimeral groups; dorsally there is a yellowish or white T-shaped mark surrounded by dark brown blotches; the eyes are dark red and the appendages deep blue. Ventral plates are rather heavy, often blue tinged. The body is broadly oval with little or no indentation anteriorly; the average length is about 0.90 mm. The fourth epimera show a greater concavity on the posterior border than in the related species, and the sickle-shaped genital plates (rarely broken) are more elongated and may extend a little farther laterally than the posterior angle of the epimera. The genital acetabula are highly variable in number; they are usually larger and more irregularly arranged than in the related species, and bunched at both ends of the plates, while in the body wall are from two to four more on either side. The palpi are much like those of *P. rotunda*, but the second segment is a little stouter.

The original description of the species (Wolcott, 1902, p. 235) gave an incomplete and inaccurate description of the male, since only one specimen, poorly preserved, was known. Males in the present collection are abundant; they are often much smaller than the females, averaging about 0.63 mm. in length, and showing the same coloration. Small spaces separate the epimeral groups, which cover the greater part of the ventral surface. The united genital plates are much like those of *P. rotunda*, but they extend laterally beyond the angle of the fourth epimera (rather than "about even with the tip of the process in the posterior margin"), and the genital opening extends through about half of the length of the plate (instead of "throughout the entire length of this genital area"). There are from twenty to twenty-five acetabula on each side. The posterior concavity of the united plates is deeper than in the related species, with the anal plate well within it. The third leg has a shorter terminal segment, with a shorter claw, and the fourth segment of the last leg is likewise shorter and stouter bristles than in *P. rotunda*.

Dr. Wolcott in the same paper (p. 240) identified as *P. obturbans* (Piers.) two females in a collection from Louisiana. In the author's opinion these were probably *P. reighardi*, since the females of the two species are much alike and the specimens were believed to have shown some red color when alive.

This species appears to be the most abundant Piona in central North America. It has been found in Ontario, Michigan, Minnesota, Montana, Indiana, Illinois, Iowa, Louisiana and

Georgia. In Wisconsin it has been collected in nearly all regions visited, often in large numbers, from the surface to a depth of 12 M. The author's record for Alaska is probably wrong; in a re-examination the specimens (females) appear to be *P. rotunda*. Likewise the record of the Canadian Arctic Expedition (1913-18, v. III: 13H) is in doubt; some of the specimens, deposited in Ottawa, have been examined by the author.

Piona media (Wol.)

Pl. XI, fig. 49-53

Described originally from one preserved female, this species, including the male, can now be fully characterized. The body is broadly oval; the dorsal side shows a yellowish T-shaped figure surrounded by brown blotches on a pale yellow or bluish background, while the plates and appendages are blue. The eyes are very large and the antenniform bristles are small. Males average about 0.57 mm. in length, females nearly 1.00 mm. Plates and legs are heavy. The posterior margin of the fourth epimera shows only a moderate concavity. The genital areas resemble those of *P. rotunda* and *P. reighardi* but they are of greater extent and carry more acetabula. In the female the broadly sickle-shaped plates extend laterally beyond the posterior angle of the fourth epimera and carry each some thirty-five or more acetabula arranged in two irregular rows with some bunching, together with a few more embedded in the wall. In the male the tongue-shaped plates reach laterally to the margin of the body and bear each about thirty-five acetabula; the genital opening is large and the margin of the united genital plates below it shows a deep concavity in which lies the anal plate. The palpi are unusually large, especially in the male; the second segment is nearly twice the width of the first leg and the fourth segment bears two large slim papillae nearly opposite each other. The pectination on the spines of the palpi described by Wolcott was not observed by the author. The third and fourth legs of the male resemble those of *P. reighardi*.

Specimens have been found in Ontario, Michigan, Illinois and Indiana. In Wisconsin collections have been made in lakes Winnebago, Starr, Wingra, Twin, Little John, in ponds near Burlington and in five bodies of water in Adams county.

Dr. Walter* has described a single female found in a Swiss lake which bears a close resemblance to *P. media*; its identification is in doubt.

Piona inconstans (Wol.)

Pl. XI, fig. 54-57

The body is elliptical, covered with fine wavy lines, often showing a faint red T-shaped dorsal mark in the center of the dark brown blotches. Females are from 0.75 to 1.10 mm. in length, males a little smaller. The females closely resemble *P. rotunda* and *P. reighardi*, from which they are distinguished by peculiarities of the genital plate. Here the ten to twenty acetabula of each side lie on a broken sickle-shaped plate, a small anterior piece with a few acetabula and hairs and a posterior piece (sometimes again broken) carrying the others in an irregular row, while two or more lie free in the body wall or on small plates. Great variability is seen in this matter; even the two sides of the same individuals are unlike. The genital plates do not extend laterally farther than the posterior angles of the last epimera. The palpi are slim, much like those of the related species.

The male, not included in the original description of the species, is now known. It is relatively large, measuring about 0.90 mm. The epimeral groups are separated by unusually wide spaces for males of this group of Pionas, and they occupy only about two-thirds of the ventral surface. The genital plates are small, in form like those of *P. rotunda*, with a small and variable number of acetabula, about fifteen on each side, and they do not extend laterally quite as far as the posterior angle of the last epimera. The sixth segment of the third leg is broadened near the proximal end and again distally where it ends in two curved claws, one of them very long. The fourth segment of the fourth leg has a large concavity and the proximal border bears a bunch of long slim bristles.

Specimens have been found in Alaska, Ontario, Maine, Massachusetts, Michigan, Illinois, Missouri, Nebraska, Louisiana and Florida. In Wisconsin they have been collected in lakes Winnebago, Mendota, Mason and Twin and in ponds near Wisconsin Dells.

* Die Hydracarina der Schweiz. Rev. Suis de Zool., v. 15, 1907, p. 533-5, fig. 40, 41.

Piona conglobata (Koch)

Pl. X, fig. 43-47

This cosmopolitan species has already been reported from Wisconsin. The females collected conform closely to identified material; unfortunately the author has no specimens with which to compare the one male so far found and published accounts are not in agreement as to certain details of the genital plates. However, as the palpi and details of other parts of both sexes conform, it is believed that these individuals represent the true *P. conglobata*. The body is oval, the surface coarsely ridged. Antenniform bristles are long. The dorsal surface shows brown blotches on a dull yellow background with sometimes faint red showing in the center. Largest females measure 0.90 mm. in length, the single male, 0.45 mm. The epimera are well separated in the female, closely approximated in the male; the fourth pair show a moderate posterior medial concavity. The genital areas in both sexes are extensive and extend laterally beyond the posterior angle of the last epimera. Acetabula are few, scattered and very irregularly placed; in the female these are embedded directly in the body wall except for a few on two small plates near either end of the long genital opening. In the male the united genital plates are not very clearly outlined; there is a deep concavity where they meet and the anal plate does not join them. The genital opening is small and the markings near it are complex and difficult to make out. The palpi are large, a little stouter in the male than in the female; the fourth segment bears three large hair papillae in the center of the flexor surface. In the male the first two pairs of legs have the terminal segment much thickened distally; the last segment of the third leg is moderately long and has a reduced claw, while the fourth leg has a very large concavity on the fourth segment.

The species is found over all of Europe and there are records for Turkestan and Mongolia. In Wisconsin material has been found in a mill pond at Oxford and in lakes Spooner and Little John.

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Sept. 1, 1933

* Since the completion of this manuscript the author has received identified specimens from Germany through the kindness of Dr. K. Viets. It is now clear that the American form is not identical with the European; consequently it will be designated as *P. conglobata wisconsinensis* nov. var. It is distinguished from the parent species chiefly by the presence of a greater number of genital acetabula and by the form of the male genital plates; the latter show an upturned margin where they meet the posterior angle of the fourth epimera.

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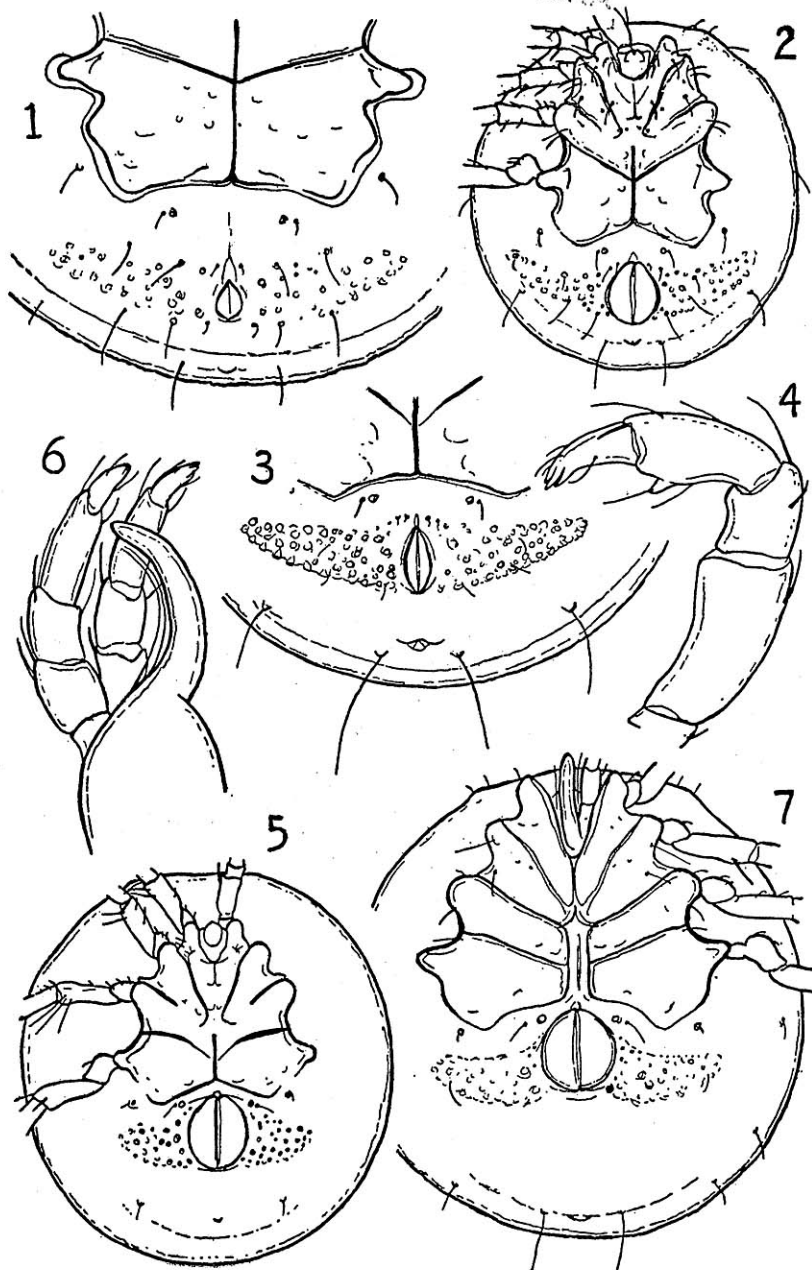
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EXPLANATION OF THE PLATES

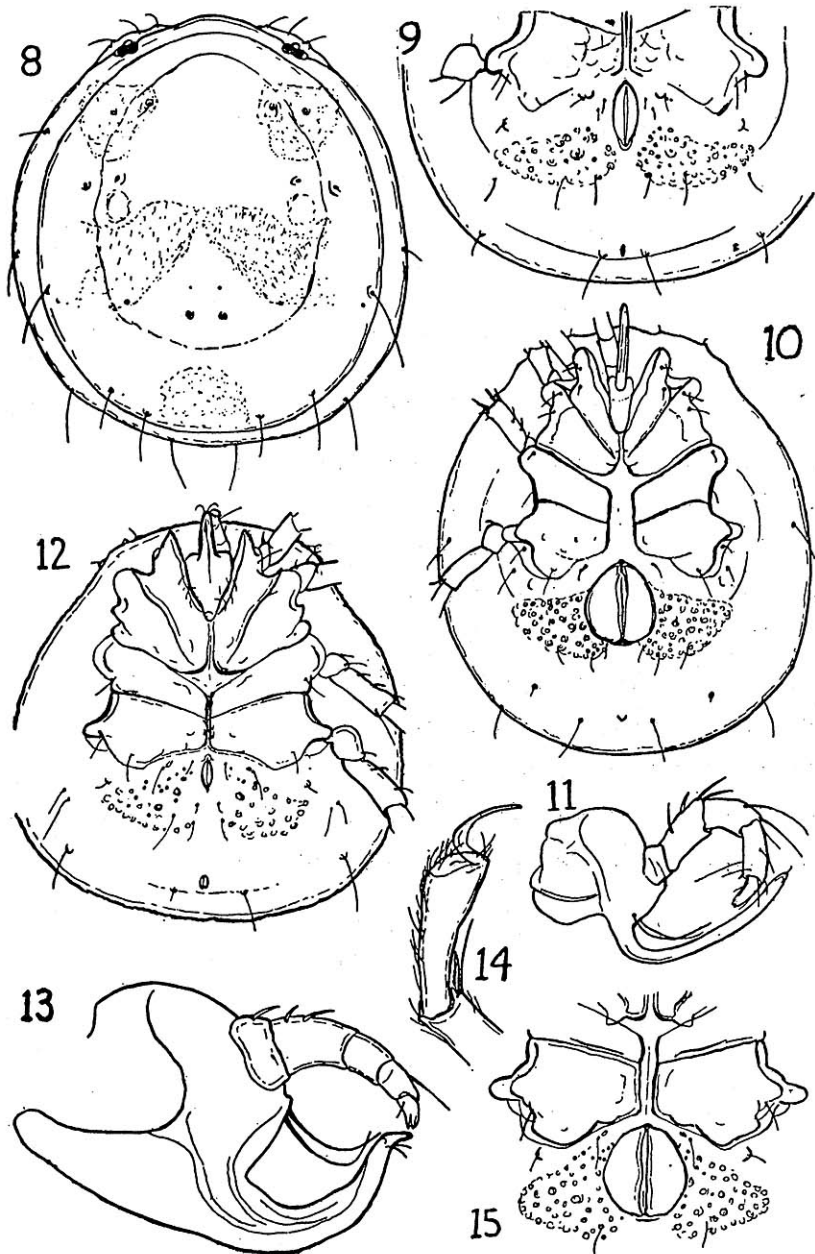
VI

1. *Koenikea haldemani*, genital area, male
2. *Koenikea haldemani*, ventral side, female
3. *Koenikea concava*, genital area, male
4. *Koenikea concava*, right palpus, female, inner side
5. *Koenikea concava*, ventral side, female
6. *Koenikea wolcotti*, rostral spine and palpi, female
7. *Koenikea wolcotti*, ventral side, female



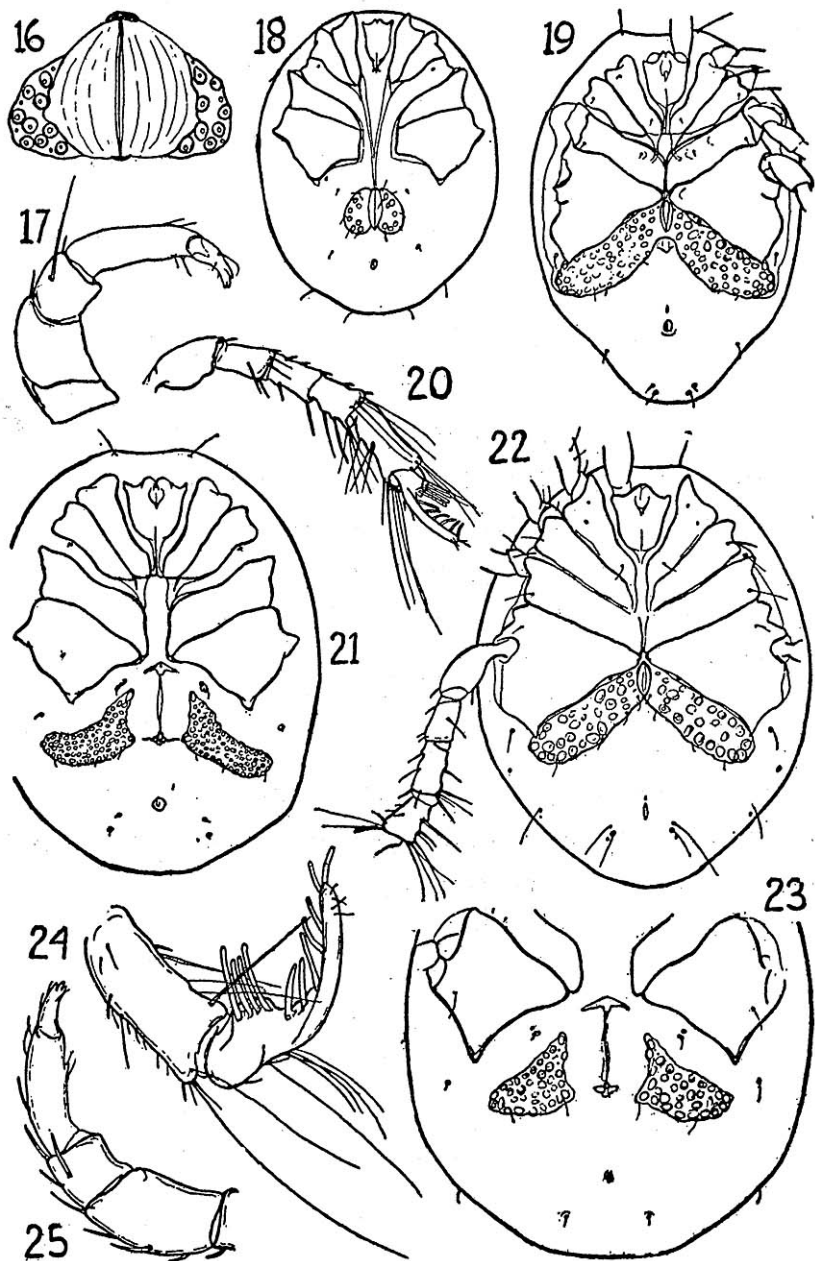
VII

8. *Koenikea marshallae*, dorsal side, female
9. *Koenikea marshallae*, genital region, male
10. *Koenikea marshallae*, ventral side, female
11. *Koenikea marshallae*, rostrum and right palpus, female
12. *Koenikea spinipes*, ventral side, male
13. *Koenikea spinipes*, rostrum and right palpus, female
14. *Koenikea spinipes*, end of leg I, male (one claw omitted)
15. *Koenikea spinipes*, genital region, female



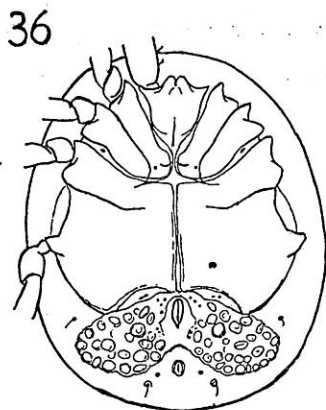
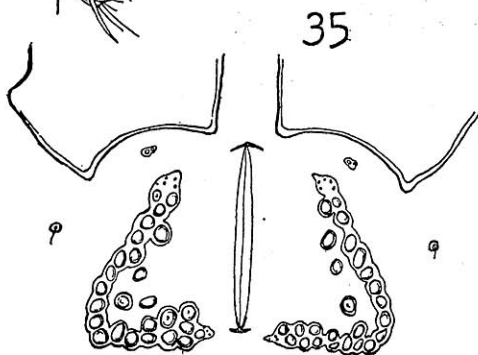
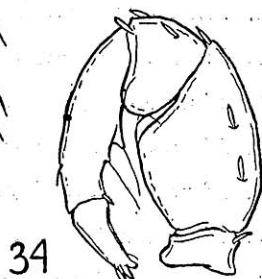
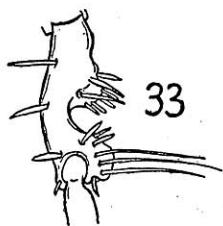
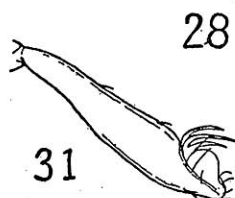
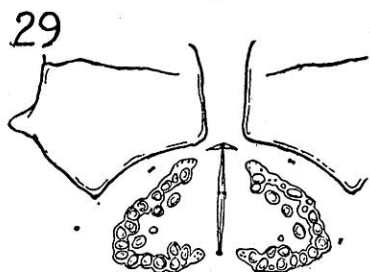
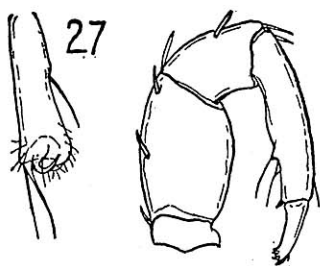
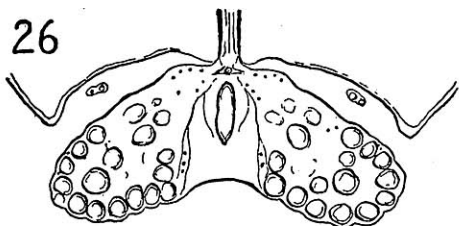
VIII

16. *Huitfeldtia rectipes*, genital plates, female (after Thor)
17. *Huitfeldtia rectipes*, right palpus
18. *Huitfeldtia rectipes*, ventral side, male
19. *Forelia ovalis*, ventral side, male
20. *Forelia ovalis*, leg IV, male
21. *Forelia ovalis*, ventral side, female
22. *Forelia liliacea*, ventral side, male
23. *Forelia liliacea*, genital area, female
24. *Forelia liliacea*, 5th and 6th segments, leg IV, male (foreshortened)
25. *Forelia liliacea*, right palpus, female, outer side



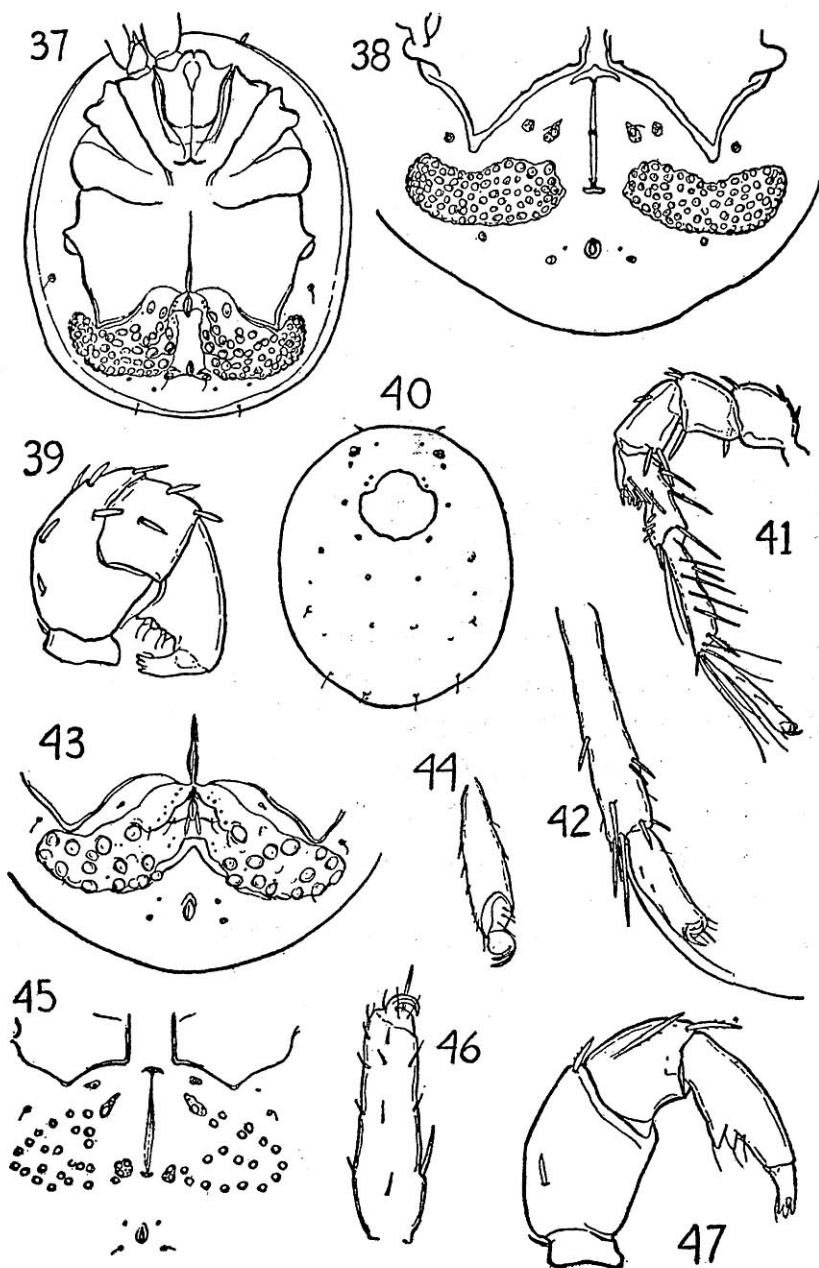
IX

26. *Piona rotunda*, genital area, male
27. *Piona rotunda*, end of leg III, male
28. *Piona rotunda*, right palpus, male, outer side
29. *Piona rotunda*, genital area, female
30. *Piona rotunda*, 4th segment, leg IV, male
31. *Piona rotunda*, 6th segment, leg II, male
32. *Piona reighardi*, 5th and 6th segments, leg III, male
33. *Piona reighardi*, 4th segment, leg IV, male
34. *Piona reighardi*, right palpus, male, inner side
35. *Piona reighardi*, female, genital area
36. *Piona reighardi*, ventral side, male



X

37. *Piona crassa*, ventral side, male
38. *Piona crassa*, genital area, female
39. *Piona crassa*, right palpus, female, outer side
40. *Piona crassa*, dorsal side, female
41. *Piona crassa*, leg IV, male
42. *Piona crassa*, 5th and 6th segments, leg III, male
43. *Piona conglobata*, genital area, male
44. *Piona conglobata*, 6th segment, leg II, male
45. *Piona conglobata*, genital area, female
46. *Piona conglobata*, 6th segment, leg III, male
47. *Piona conglobata*, right palpus, male, outer side



XI

- 49. *Piona media*, left palpus, male, inner side
- 50. *Piona media*, genital area, female
- 51. *Piona media*, ventral side, male
- 52. *Piona media*, 6th segment, leg III, male
- 53. *Piona media*, 4th segment, leg IV, male
- 54. *Piona inconstans*, ventral side, male
- 55. *Piona inconstans*, left palpus, female, outer side
- 56. *Piona inconstans*, 6th segment, leg III, male
- 57. *Piona inconstans*, genital area, female

