

THE SPECIES OF ZETES (ORIBATOIDEA-ACARINA) OF THE NORTHEASTERN UNITED STATES.

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This is the largest genus of the subfamily of large-winged mites (Galumninæ), being found throughout the world except the northernmost regions. The species are common under old boards, bark, stones, in leaf mould and on vegetation. The primitive species of the Galumninæ of this region have already been treated (7) as also the most specialized genus *Galumna* (8). A key to the genera will be found in the former work. *Zetes* differs from *Galumna* by the presence of the anterior edge of the notogaster (midthoracic suture) as a distinct, external rim, and by the slenderly clavate pseudostigmatic organs.

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Genus *ZETES* (10, p. 99)

Characters: Galumninæ having lamellæ reduced to closely appressed bands or straps curving down to anterior end of ventral plate wings; tectopodia I chiefly ental; pteromorphæ with transverse groove and deep, well formed notch in ventral edge; midthoracic suture distinct; tectopodia without bristles; bristles of parasterna I gular in position; genital covers each with at least two marginal bristles; preanal bristles paranal in position; color usually deep horsechestnut (mahogany).

Type: *Zetes elimatus* (10, pl. 11, fig. 55).

“Die Gattungsbezeichnungen beschäftigen sich nur mit den äusserlich sichtbaren Merkmalen, auch geben die, solchen beige-fügten Figuren, als **Typus** dienend, bloss ein getreues Bild irgend einer Art der betreffenden Gattungen und der mit einfachem Microscop zu erkennenden Charaktere.” Karl Ludwig Koch.

(Ubersicht des Arachnidensystems, Drittes Heft, *Vorwort*, p. 6)

Zetes elimatus (9, fasc. 31: 5 text only; 10, pl. 11, fig. 55)
As already pointed out (6, p. 4) Carl Ludwig Koch's description

is based on two species. For instance (1) the pseudostigmatic organs are described (in Latin) as long, slender, hardly fusiform, subclavate, (in German) as: "zu kaum ein wenig verdickt." This fits *Z. obvius* exactly and not the *Z. elimatus* of European authors. (2) It is one of the largest of the genus. *Z. obvius* is 830 microns (13, p. 178), *Z. elimatus* of authors is 650, *G. longipluma* is 700. (3) There is no midthoracic suture (which would make it *G. longipluma*. (4) The cephalothorax has two short and two long bristles. This is a total of four and therefore is *Z. obvius*, certainly not *Z. elimatus* (of authors) which has six distinct ones. Thus according to the description, it fits *Z. obvius* closest. The only discrepancy is the lack of midthoracic suture.

The figure which accompanies the text shows the interlamellar bristles and is therefore another species. Now turning to Koch's second figure of *Z. elimatus* which he gives as "type" of his genus *Zetes*, one finds the midthoracic suture clearly indicated, and no interlamellar bristles (only the pseudostigmatic organs). Thus there is overwhelming evidence that *Oribates obvius* of Berlese is a synonym of *Oribates elimatus* of Koch. This condition was clearly recognized by Oudemans in 1913 (pub. 1914), page 27, last paragraph and overpage. Later, unfortunately, Oudemans followed Berlese, not Koch!

Of twenty-two moss lots from Regensburg six contained this species, most of them from sides of drainage ditches in the meadows and marshy places. On the other hand, out of a total of forty lots secured from Regensburg city and its environs, to and including the Schwaighausen woodlands, no *Z. elimatus* of authors were found. Therefore if *Z. elimatus* of authors occurs in and about Regensburg it is so rare that Koch, with his slow and crude collecting methods, did not come across it, at least not to recognize it, while *Z. elimatus* **Koch** is common "in etwas feuchten Wiesen." The other species he got mixed with this one evidently came from "in Waldungen unter Moos," but it is not the species figured as genotype of *Zetes*. At any rate the one found "in Waldungen unter Moos" is not *Z. elimatus* of authors as I did not find it, out of ten lots of moss from woods, both evergreen and deciduous (or forty lots from Regensburg).

The pseudostigmatic organs in this species are flattened with the barbs arranged sparingly along both edges. When it is seen on edge it is equally thick throughout its length and appears quite smooth; when turned so that it is seen in all its breadth, it appears lanceolate, with the barbs distinct. It may also be seen with the distal half turned over so that it looks more suddenly clavate.

Material examined: from Bavaria, Regensburg and vicinity: Seventy-six specimens from moss, sides of drainage ditch along side of Pürkelgut farm, draining Pürkelgut meadows (barely a mile beyond the Kasern of Regensburg); taken July 25, slides 3115o1, 3115n4, 3117o3. One specimen from moss from stump in Dechbetten woods (the tract nearest Ziegetsdorf); taken July 27, slide 3119o2. A female from stick on ground in fairly heavy woods at Walhalla; taken August 6, slide 3131o5. Two specimens from moss, side of three foot ditch, meadows between Unter-Isling and Bergweinting; taken August 12, slide 3135o1. Two specimens from moss from bottom of shallow ditch, north and west of alder row, meadows of preceding locality; taken August 15, slide 3136o4. Eight specimens from moss from meadow and brookside in midst of woodland near Ziegelhütte; taken August 30, slide 3151o6. Four specimens from moss from meadow below dam of pond near auto road near Ziegelhütte, dried September 2, slide 3152o3.

•*Zetes elimatus ithacensis* (6, p. 28)

Figures 1-5

Diagnostic characters: Lamellar bristles peripherofrontal (figures 1 and 5), not reaching insertion of rostral (as seen in dorsal aspect); interlamellar bristles very short, inconspicuous, curved; pseudostigmatic organs fairly long, slender, without distinct head, pencil-like to slightly flattened, pointed, typically smooth (figure 2, right of numeral) occasionally with a few barbs (below numeral); pteromorphæ with pivot considerably anterior to angle; anterior porose areas rather slender, usually broadest at mesal end, barely overlapping shadow of tectopodia I; adalar porose areas elongate, rather stout, ventral end somewhat widened, occasionally extended posteriorly (figures 1 and

5); mesonotal fairly large, angularly circular, the lateral one smaller; ventral edge of leg cupboards joined to ventral plate by a broad suture; bristles of genital covers aligned along longitudinal center of covers, bristles 1 distant from anterior edge, bristles 2 more mesad than 1 and 3, bristles 4 very close to posterior edge; paranal bristles posteriad of pseudofissura; anterior pair of anal cover bristles close to anterior edge, more remote than posterior pair.

Description: Size fairly large (0.7×0.5 mm.); shape broadly ovate, somewhat depressed; cephaloprothorax relatively long, broad, conical, outline interrupted only by slight protrusion of lamellæ; rostrum narrow but not prominent, (figure 1), rim projecting (figure 3) though not visible from above; lamellæ not usually reaching up onto vertex; insertion of interlamellar bristles small, as distant from shadow of tectopedia I as from edge of notogaster; rostral bristles inserted beneath overhang of rostrum (figure 3, in which the line above the bristle demarks a differentiated band); pseudostigmatic organs dipping down under pteromorphal pivot; pseudostigmata and pivot insertion bulging out from sides of body; midthoracic suture distinct.

Notogaster broad, dense; mandible retractor muscle scars distinct, elongate; pteromorphæ rather smooth in outline, groove very slender at mesal end, the ribs broad but short, rather close to groove, veining very sparse, not anastomosing or branching. I have seen one individual with adalar porose areas divided to form one at each end (two). Two insertions posterior to adalar porose areas (figure 5). There is a pair of elongate posterior porose areas (not figured).

Ventral plate (figure 1) with wings quite broad but the posterior corners cut off to broadly expose tectopedia II; tectopedia III very short and broad; tectopedia IV as usual; sides of abdomen quite vertical, not rounded onto ventral face as in many species; apodemata I and II-III quite long, slender, with long ceriphs, apodemata IV very close to II-III but strongly bent so that the ceriph, which is longer than the body (as seen in ventral aspect) forms a wide angle with it; bristles inserted as in figure 1. In some individuals the insertion of sternal bristles 1 is present; parasternal lacunæ small; genital aperture with corners

well rounded, sides somewhat converging, anterior edge quite straight, posterior edge somewhat undulate; paramesal bristles as distant from genital aperture as diameter of a genital cover, more remote than diameter of aperture; subanal muscle plate oval; anal aperture with sides strongly converging, anterior end narrow, posterior angle marked; pseudofissuræ short, well separated from aperture, the anterior end much more prominent; paranal bristles distant from pseudofissuræ. I have one specimen in which the anterior *pair* of cover bristles are supplanted by two, distant from each other as the anterior one is from anterior edge of cover, which seems to signify that it is the posterior half of the cover which is the most stable; the four post-anal bristles subequally spaced; mesal postanal bristles as approximate as posterior cover bristles.

I have included a figure of the mouth parts in position to show more particularly a thin membrane extending from the labium dorsad, covering the angle of the mouth opening. The distal edge of this membrane is indicated by means of a shaded line in figure 3. I know of no earlier mention of this structure. It seems to be braced by sclerotized stays with stout proximal ends for articulation near angle of opening. In figure 3 two bristles spring from its dorsal portion.

Figure 4 illustrates tarsi I in dorsal aspect, showing the extent and position of the mesal bristle of the tibia. These bristles nearly meet over the cephaloprothorax. Similarly the dorsal bristle extends to distal edge of the pteromorphæ. Note the small size of one of the bristles of the dorsoproximal quartette of the tarsi, and the minute size of the insertion of the lost bristle.

This subspecies differs from the species in its relatively smoother, pencil-like or strap-like pseudostigmatic organs (the European species has them usually burred and the distal end is slightly club-shaped); the shorter, smooth (not burred) rostral and lamellar bristles, and the more posterior paranal bristles (in the species the paranal bristles are usually on transverse plane of the pseudofissuræ).

Dimensions: The smallest male, average of six males, average of five females, largest female, all from Ithaca, are given, respectively:

| | | | | |
|-----------------------------------|-----|-----|-----|-----|
| Total length of body | 720 | 735 | 770 | 800 |
| L. of notogastral plate | 580 | 588 | 592 | 620 |
| Breadth of same | 530 | 550 | 578 | 595 |
| Length of pteromorphæ | 390 | 400 | 405 | 425 |
| Interlamellar bristle span | 140 | 144 | 145 | 152 |
| Median l. of ventral plate | 535 | 556 | 575 | 604 |
| Camerostome to genit. apert. ... | 103 | 117 | 115 | 123 |
| Length of genital aperture | 102 | 102 | 107 | 117 |
| Breadth of same | 115 | 116 | 125 | 127 |
| Genit. apert. to anal apert. | 131 | 139 | 150 | 156 |
| Length of anal aperture | 143 | 152 | 160 | 172 |
| Breadth of same | 164 | 168 | 175 | 176 |

✓ *Material examined: New York:* Fifteen specimens from twigs and/or under surface of stones, Cayuga Heights, Ithaca; taken April 1, 1917, slide 173o1 (*cotypes*). Five specimens from among fallen leaves, more especially twigs among them, brush pile, Cayuga Heights, Ithaca; taken March 31, 1917, slide 172o1. One specimen from under face of stone, bark of twig or board, Six Mile valley, south of Ithaca; taken April 14, 1917, slide 176o4. Four specimens from twigs, bark and stones, between Danby and West Danby; taken May 19, 1917, slide 1710o3. An ovigerous female, Fall Creek, Ithaca; taken May 18, by N. Banks, slide 26B94. A female (4 eggs), Buttermilk Creek, Ithaca; taken May 21 by Banks, slide 26B81. An ovigerous female from upper layer of beech, rock maple and red-oak leaves, from pocket in northwest slope of Arnot Forest, up Jackson Hollow, Cayuta; taken November 29, 1927, by Robert Harwood, slide 41A1 (Cornell Univ. lot 845). Two specimens from lower half of five inch layer of wet chestnut oak, basswood, mountain maple leaf mould from steep, southern, rocky slope of glen two miles north of Ithaca; taken June 8, 1928, by Harwood, slide 87B1 (Cor. Univ. lot 845). Forty-seven specimens from upper half of preceeding layer; slide 87B3. Three specimens from leaf mould, small gully along road up from lake between Myers and Norton (near Ithaca); taken December 5, 1932, by C. R. Crosby, slide 32111o1. Two specimens from Sea Cliff, Long Id.; taken by Banks, slide 26B39b. *Connecticut:* One specimen from

moss on rocks along trickle (probably also rotten roots), Calhoun Pines, Cornwall; taken August 26, 1932, slide 3253o4. Two specimens from deep layer of old leaves, Plummer's Id., *Maryland*; taken by H. S. Barber, slides 307o1 and -o2. An eggless female from Great Falls, *Virginia*; taken October 21 by Banks, slide 26B92. One specimen from under walnut bark on ground, Chillicothe, *Ohio*; taken September 24, 1923, by A. E. Miller, slide 374 (Miller coll.). One specimen from Putnam Co., *Indiana*; taken March 22, by Blatchley, slide 26B102. Two specimens from under loose, moist bark on fallen tree, Brownfield's woods, Urbana, *Illinois*; taken May day, 1926, by A. E. Miller, slide 0-20-26 (Miller coll.).

Distribution is therefore eastern transitional.

Habitat: Decaying wood and especially leaves of forest floor. Absent from most moss lots and swamp tussocks.

Eggs: The maximum number of eggs was eight.

Zetes arboreus (6, p. 26)

Figures 6-8

Diagnostic characters: Size rather large (0.8×0.6 mm.); cephaloprothorax fairly long, conical; lamellæ prominent, rostral bristles the longest, closely appressed, lamellar and interlamellar bristles very fine, rather short, about as long as the very slender anterior porose areas, lamellar peripheral (figure 8); pseudostigmatic organs (figure 7) fairly long, slightly curved at proximal end of head, head clavate, slender, much shorter than pedicel, bluntly pointed to rounded, minutely burred to barbed, these barbules appearing in concentric lines, the figures are taken from four specimens, showing amount of variation and different aspects; pteromorphæ smooth, veining sparse, coarse, groove very narrow, anterior rib thinly chitinized, pivot distant from angle; anterior porose areas unusually long and slender, adalar elongate triangular, often unsymmetrical (in one specimen broken to form a short triangular and a small oval one at mesal end), mesonotal small; posterior edge of notogaster with a median groove.

Ventral plate (figure 6) joined to sides of cupboards by a fine line only, wings as in *Z. elimatus* but slightly narrower

distally (figure 6); posterior corner of tectopedia II exposed; tectopedia III not extending as far laterad as tectopedia II; apodemata distinct, apodemata IV sharply bent (see figure) quite close to apodemata II-III; gular bristles fairly long, rather approximate; genital aperture fairly large, anterior edge nearly straight, bristles nearer median than lateral edge, bristles 1 distant from anterior edge, bristles 4 very close to posterior edge, the bristles progressively spaced; paramesal bristles nearer aperture than narrowest diameter of a genital cover; subanal muscle plate elongate oval; anal aperture distant from posterior edge of plate, sides strongly converging, anterior corners rounded; pseudofissuræ anteriorad of center of aperture; paranal bristles posteriorad of pseudofissuræ, distant from them by length of fissuræ; mesal pair of postanal bristles as approximate as posterior cover bristles; anterior pair of cover bristles more remote than posterior pair, near anterior edge.

Thus closely related to *Z. elimatus* but with longer interlamellar bristles; less extremely modified pseudostigmatic organs; more projecting lamellæ; and triangular adalar porose areas.

Material examined: Connecticut: Nine specimens from under the bark-scales of branches of apple tree, East Village, Monroe; taken June 16, 1926, slide 26502 (*cotypes*). Ten specimens from moss on and scrapings from fallen and well rotted tree trunk in hemlock gorge, Sandy Hook; taken June 25, 1926, slide 261403.

Zetes niger (5, p. 119)

Figures 10-17

Diagnostic characters: Cephaloprothorax well marked off, with very steep front (figure 13); rostrum small, prominently set off, midthoracic suture distinct; bristles well developed; pseudostigmatic organs (figure 12) relatively small, head slender, gradually merging into pedicel, finely, sparsely barbed, pointed; adalar porose area elongate, grub-like, lateral end turned posteriorad (figures 10 and 13); mesal mesonotal porose areas large, roundish, the lateral elongate; surface of pteromorphæ strongly angled by an outfolding posteriorad of notch (figure 10); genital aperture fairly large, sides only slightly converging, cover

bristles nearly equidistant between lateral and median edges; ventral edge of leg cupboards heavily chitinized; anal aperture with sides strongly converging, bristles subequally distant from mesal edge; paranal bristles distant from pseudofissuræ; mesal pair of postanal bristles more remote than cover bristles, lateral pair more approximate than diameter of aperture.

Description: Size fairly large (0.8×0.6 mm.); shape broadly pyriform, high, with bulging vertex (figure 10); dark; cephaloprothorax broad and short; rostrum prominently protruding when seen from sides or from above, though less so when seen somewhat from in front and above (figure 13); lamellæ broad, forming a fairly distinct ridge along cephaloprothorax (figures 10, 11, 13), not retuse (figure 13), the bristles peripheral, rather appressed; rostral bristles inserted on ventral surface close to edge of camerostome, closely appressed; edge of camerostome projecting as a rim beyond face of rostrum (figure 13); interlamellar bristles about length of lamellar, inserted close to shadow of tectopedia I, caducous, insertion minute; anterior porose areas very slender, elongate, as seen from above broadly overlapping shadow of tectopedia I; pseudostigmatic organs as above described (figures 10 and 12), not extending across pteromorphæ when these are fairly well outspread.

Notogaster extending well down onto ventral plate behind (figure 13); porose areas as above described, toe of adalar touching posterior insertion; pteromorphæ with pivot below angle (dorsal aspect of figure 10), veining sparse, groove deep, clean cut, with strongly developed ribs, insertion distinct, pseudofissura short.

Ventral plate deep, giving the animal considerable height (figure 13), sternal area convex, channeled anterior to aperture, truncately infolded midway between anterior edge and genital aperture then bulging to fit about base of labium (figures 10, 13 and 14, edge of fold represented by a solid line), lateral edge heavily sclerotized (figure 10 and 14 which shows how closely it fits edge of pteromorphæ (upper line), heavy line is edge of ventral plate), wings broad, covering tectopedia II more than in *Z. elimatus*; tectopedia II long (figure 10), posterior end only exposed, tectopedia III slender, short, truncate; tectopedia IV

elongate triangular, the apex well marked; camerostome broad; apodemata with long ceriphs (figure 10), apodemata IV quite short, almost all ceriph; the three sternal bristles as in figure 10, bristle of parasterna III inserted on thickened rim of cupboard, the bristle quite long; anterior edge of genital cover almost at right angles to median plane; marginal bristles inserted closer together than to median plane; bristles 1 distant from anterior edge, bristles 2 and 3 unusually near each other, bristles 4 very near posterior edge of cover; paramesal bristles distinct, inserted less than diameter of a genital cover from aperture; subanal muscle plate oval; anal aperture close to posterior edge; details above described.

Legs 1 (figure 16) with rather widely differentiated bristles. Tarsi quite slender, with triheterohamate ungues; dorsal face with a cluster of five proximal bristles: three dorsal, one lateral and a mesal; of the three dorsal, the proximal is inserted greatest diameter of the segment from proximal end, not extending to distal end of segment when appressed, smooth, second bristle minute, only a little longer than the thickness of the wall from which it springs, inserted close to third which is longer than proximal, smooth, with distal half more bent; mesal bristle as long as third dorsal, very fine, distal end curved, inserted on transverse plane of second; lateral bristle shorter than proximal, barbed, inserted slightly more distad than transverse plane of third dorsal; fourth dorsal removed from third by an interspace as great as between dorsoproximal and proximal end of segment, nearly as long as dorsoproximal, slightly burred on dorsoproximal edge; fifth dorsal as long as dorsoproximal, separated from fourth by an interspace slightly less than between third and fourth; a dorsolateral bristle inserted on transverse plane just proximad of fifth dorsal, burred (figure 19) or barbed (figure 20), nearly as long as fifth, these last two constituting a pair (the dorsoproximal pair); sixth dorsal bristle much shorter, reaching outer edge of extended hooks, inserted halfway between fifth and distal end of segment, a similar dorsolateral inserted on transverse plane slightly proximad of sixth dorsal, the two comprising the dorsodistal pair; the four distal bristles as usual, that is the two ventrodistal with broad spoon-like base (rather

drawn out in this species), the dorsodistal straight and fine; ventral face with four, subequally spaced, strongly ciliate (figure 18) bristles on proximal half of segment, of these, the second (from proximal end) is the major and inserted on ventral face, the proximal and fourth are ventromesal, the third is ventrolateral; distal half of segment with a pair of rather long, barbed (figure 20) bristles inserted on transverse plane slightly proximad of dorsoproximal pair which are slightly longer than this ventroproximal pair; slightly more than half way to distal end is inserted another bristle corresponding to the sixth dorsal. I find no mesal one at this node, so that there are but three about this plane. Tibiæ stoutly clavate; major bristle inserted rather far from distal end, not on a boss-like outgrowth of the segment, reaching to distal end of unguis; dorsodistal bristle inserted halfway between major and distal end of segment, about half length of major bristle, smooth; dorsomesal bristle inserted more proximad than major, considerably longer than dorsodistal; ventral bristle inserted on transverse plane of dorsomesal, reaching to beyond base of second ventral of tarsus, pauciciliate; ventrolateral bristle inserted on transverse plane of major bristle, pauciciliate, the shortest of its segment; ventromesal bristle inserted on transverse plane of major bristle, as long as ventral, strongly ciliate. Genuals slightly sinuous; dorsal bristle inserted at distal third, extending slightly more than half its length beyond its segment, strongly depressed, tetragonal, burred (figure 19); mesal bristle inserted close to distal edge, rather short, stout, straight, multiserially coarsely burred; lateral bristle inserted close to distal edge, very long, extending to base of tarsus, smooth. Femora elongate ovate, slightly keeled; a dorsoproximal bristle inserted at center of segment; a dorsodistal pair of bristles inserted close together, the mesal inserted a short distance from distal end of segment, rather short, depressed, seven barbed, the lateral twice as long, extending to base of lateral bristle of genuals, with a few, fine cilia; ventral bristle inserted proximad of transverse plane of dorsoproximal.

Legs II similar, shorter. Tarsi with dorsal bristles relatively shorter, proximal cluster comprising two, smooth, subequal

bristles inserted on dorsal face, and two similar, barbed bristles: a lateral inserted on transverse plane closely proximad of second dorsal, a mesal inserted on transverse plane closely distad of dorsoproximal, both longer than the two dorsal bristles; dorso-proximal pair barbed, as long as lateral of proximal quartette, reaching nearly to end of extended hooks, not inserted on same transverse plane; dorsodistal pair, smooth, finely drawn out, not reaching ends of hooks, distal quartette longer than in tarsi I; ventral face bristles longer, the proximal three more elegantly ten-ciliate, proximal inserted on transverse plane distad of dorso-proximal; fourth ventral bristle inserted close to third, short ciliate, with finely drawn out tip; fifth bristle similar, inserted on transverse plane midway between fourth bristle and dorsodistal pair. Tibiæ shorter, less stout (high); major bristle inserted quite close to distal edge; dorsomesal bristle inserted nearly diameter of tarsus from distal end of segment, as long as tarsus, short ciliate; ventral bristle very similar to that of tarsus I; ventromesal bristle inserted almost as distad as major bristle, long ciliate; ventrolateral bristle short ciliate. Genuals shorter than genuals I; lateral bristle inserted at center, smooth, reaching distal end of segment; dorsal bristle inserted close to distal edge of segment, very long, reaching middle of tarsus, smooth; lateral bristle inserted proximad of center of segment, reaching to beyond center of tibia, strongly barbed, stiff. Femora longer than femora I, strongly curved (figure 15) to extend laterad and parallel to femora I; dorsoproximal bristle inserted proximad of center of segment, decurved, not reaching insertion or dorsodistal, strongly barbed; dorsodistal pair inserted more proximad than in femora I, separated by width of segment, the lateral one reaching to insertion of lateral bristle of genual, the mesal one shorter, both weakly barbed; ventral bristle inserted more proximad than dorsoproximal, long and slender, reaching genual if depressed, sparsely barbed; pedicel with a short, fine bristle on ventral face (which makes me suspect it is a fused trochanter).

Legs IV (figure 17) quite slender. Tarsi with dorsoproximal bristle barely reaching base of claws, slightly barbed on dorso-proximal edge; a pair of dorsodistal bristles inserted at distal

fourth of segment, reaching nearly as far as extended hooks, finely burred on two sides; the four distal bristles not extending as far as dorsodistal, subequal except the dorsomesal which is somewhat longer; the ventral bristles long, ciliate (about seven cilia), the distal pair inserted on transverse plane of the dorsodistal pair, each bristle of the same side not on the same transverse plane; a ventrolateral bristle inserted slightly proximad of dorsoproximal, extending nearly to end of tarsus, long ciliate. Tibiæ slightly shorter, dorsal face somewhat wrinkled; major bristle inserted greatest diameter of segment from distal end, almost as long as its segment, smooth; ventral bristle inserted slightly more proximad than major, ciliate in at least three ranks, not extending to insertion of ventroproximal of tarsus; distoventral inserted on extreme distal edge of segment, closely appressed (not so figured), extending to slightly distad of insertion of dorsoproximal, long ciliate; a ventrolateral bristle inserted slightly distad of ventral, extending to insertion of ventrolateral of tarsus, long ciliate. Genuals straight, long, longer than tarsus distad of dorsoproximal bristle; with two dorsal bristles, the proximal inserted at distal third, extending more than half its length beyond its segment, barbed; the distal one inserted close to distal end, strongly decurved, reaching to angle of pedicel and body of tibia, strongly nine- to ten-ciliate. Femora broad, with a very slight ventral keel; dorsal bristle inserted slightly distad of center, strongly decurved, reaching well beyond proximal end of genual, stout, apparently tetragonal, burred in two to three ranks; ventral bristle inserted on transverse plane distad of dorsal bristle, slightly shorter than genual, straight, with two to three rows of fine barbs. Trochanters somewhat oblique.

Legs III similar. Tarsi shorter and stouter, with all bristles relatively longer; dorsoproximal bristle inserted more proximally, loosely ciliate on dorsoproximal edge; the dorsodistal pair more proximally inserted than at distal fourth, an extra pair half way between the last pair and distal end; these last two and the distal four have the distal end slightly thickened as a very minute knob! This extra dorsal pair thus throws the proximal ones more proximad while the bristles of the ventral

surface keep the same relative positions as in legs IV. Finally there is also a lateral bristle inserted more proximad than the ventroproximal, as long as dorsoproximal and similarly ciliate. Tibiæ shorter, bowed; major bristle not erect, more distally inserted, thus the ventral bristle is more proximally inserted than the major, the distal bristle less distally inserted, the ventrolateral bristle inserted on same plane as ventral; ventrodistal bristle somewhat longer. Genuals very much shorter, strongly curved; dorsodistal bristle smooth, nearly straight, shorter; proximal bristle on lateral side, inserted in center, short, ciliate on two sides. Femora elongate triangular; dorsal bristle inserted at proximal fourth, extending to distal end of genual when pressed down, thus much longer than that of legs IV. Trochanters more oblique; ventral bristle inserted near distal end, extending to insertion of ventral bristle of femur, barely burred, drawn out to an unusually long point.

Dimensions: The smallest male, average of three males, average of six females, largest female of Illinois material are given respectively:

| | | | | |
|------------------------------------|-----|-----|-----|-----|
| Total length of body | 782 | 822 | 871 | 900 |
| L. of notogastral plate | 595 | 663 | 685 | 715 |
| Breadth of same | 638 | 651 | 697 | 714 |
| Length of pteromorphæ | 433 | 454 | 470 | 485 |
| Interlamellar bristle span | 196 | 201 | 214 | 230 |
| Median l. of ventral plate | 578 | 616 | 652 | 682 |
| Camerostome to genital apert. | 102 | 120 | 124 | 132 |
| L. of genital aperture | 111 | 117 | 117 | 131 |
| Breadth of same | 127 | 133 | 143 | 145 |
| Gen. apert. to anal apert. | 153 | 163 | 180 | 196 |
| Length of anal aperture | 161 | 170 | 180 | 182 |
| Breadth of same | 170 | 185 | 199 | 203 |

Material examined: Nine specimens from Ottawa, Canada; Banks, slide 26B43. Two specimens from rootlets and well rotted material on sides of *Carex stricta* clump, in old, uncut, meadow with much fern, Monroe, Connecticut; taken September 5, 1925, slide 2537o1. *New York:* Two specimens from Butter-milk Creek, Ithaca; taken May 21, by N. Banks, slide 26B81b.

Eleven specimens from under old boards, possibly under face of stones and bark, Enfield Gorge; taken April 5, 1917, slide 174o1. Three specimens from Putnam Co., *Indiana*; taken by Blatchley, March 22, slide 26B102. Six specimens from under stone, Batavia, *Illinois*; taken by H. E. Ewing, April 27, 1907, slides 26EwB98a and -b.

Geographical Distribution: As far as known, eastern transitional.

Habitat: Also a species of decayed vegetation though its scant numbers may indicate that its true habitat has not yet been determined. It may well be arboreal, sheltering under wood and stones when estranged from its normal habitat. The two specimens in the sedge tussock, compared to all the sedge tussock material examined, look accidental.

Eggs: The maximum number of eggs found was six.

***Zetes graminetum* sp. nov.**

Figures 21-23

Diagnostic characters: Fairly large (0.8 x 0.6 mm.), high and broad for its length; cephaloprothorax very short with very steep front (figures 21 and 23); rostrum projecting prominently as a small nubbin (figures 21 and 23); lamellæ with lateral edge developed laterad to form a prominent, rounded rim at each side of cephaloprothorax (shaded lines in figure 23), the bristle inserted on mesal edge, longer than rostral (figure 23) though appearing shorter in dorso/ventral aspect; interlamellar bristles rather short, quite fine, inserted close to shadow of tectopedia I; anterior porose areas very slender; midthoracic suture distinct, strong; pseudostigmatic organs (figures 22) rather long, slender, with short, slender, distinct, burred, pointed head, pedicel bent at juncture with head, in some aspects there seem to be two distal points; adalar porose areas elongate, lateral end bent posteriad (figure 23); mesonotal oval and elongate; ventral plate wings short and broad, truncate behind; apodemata IV nearly at right angles to apodemata II-III and nearly touching them; genital aperture with sides only slightly converging, anterior edge simply curved; bristles 4 of genital covers represented by a channel at the angle, other bristles nearer median than lateral edge, separated from median edge by a ridge; pseudofissuræ of anal aperture short, very oblique, with a pseudoforamen; paranal bristles on transverse plane posteriad of pseudofissuræ; posterior pair of cover bristles more approximate than mesal pair of postanal bristles.

Dimensions: Smallest male, average of three males, average of six females and largest female from Ohio are given respectively.

| | | | | |
|-----------------------------|-----|-----|-----|-----|
| Total length of body | 752 | 759 | 815 | 832 |
| Breadth of notogaster | 587 | 587 | 631 | 658 |

Material examined: *Ohio:* Four specimens from beneath and among dead leaves of Kentucky bluegrass, Chillicothe; taken August 27, 1922, by A. E. Miller, slide 32 (Miller coll.), (*co-types*). Five specimens from under side of railroad tie in timothy meadow, Chillicothe; taken April 11, 1924, by Miller, slide 18 (Miller coll.). Three, twenty-two, six, three and eleven specimens from bluegrass sod, Mt. Logan, Chillicothe; taken April 20, 27, July 13, August 3, 1925, by Miller, slides 30M9o1 and -2, 30M7o1, 30M15o and 30M18o1, respectively. Four specimens from under walnut bark on ground, Chillicothe; taken September 24, 1923, by Miller, slide 374 (Miller coll.). *Illinois:* One specimen from dying roots of Benen roses, Shelbyville; taken July 1, 1923, by C. L. Metcalf, slide 32M16o. Ten specimens from Urbana; taken July 21, 1924, by Miller, slides 32M99o1 and -o2.

Habitat: From the above it seems evident that *Z. graminetum* is a sod dweller and, judging from the amount of earth piled up about its snout or rostrum, in many balsam mounts, it must be a great rooter about in the soil. A further adaptation or result is the depressed lamellar bristles and smaller interlamellar bristles. This habit, accompanied by the broad, strong front and stubby snout makes it the pig among the Galumninæ.

Eggs: The largest number of eggs found per individual was eight.

Zetes graminetum, *Z. niger*, *Z. arboreus* and *Z. elimatus* form a closely related group by their large size, bulging pseudostigmatic area, and posteriorly exposed tectopodia II. They show three steps in reduction of their interlamellar bristles, and three steps in development of lamellar rim. They are the four largest species of the northeastern States. *Z. graminetum* and *Z. niger* are the most specialized and both have steep, vertical fronts. *Z. graminetum* may at once be recognized by its large, prominent lamellar rim which makes the animal look like an invalid perambulator, as seen from above, the lamellar rim representing the rubber tired wheels and the rostrum the invalid's toes. *Z. niger* is easily recognized by the peculiar angle in the sides of the pteromorphæ and the dark band at the juncture of the ventral plate with the leg cupboards. *Z. elimatus* and *Z.*

arborea have conically sloping cephaloprothorax but reduced interlamellar bristles.

As to habitat, *Z. graminetum* is strictly a prairie-sod species. The other three species seem to prefer woodland.

***Zetes minutus* (5, p. 121)**

Diagnostic characters: The smallest known North American *Zetes* (0.32×0.2 mm.); pale amber yellow; all bristles relatively short, rostral quite distinct; lamellar bristles lateral; pseudostigmatic organs with a broad, decurrent, round-ended head fringed on anterior edge and distal end by long, fine, somewhat crowded cilia; adalar porose areas short; genital covers each with but two bristles on the disc; anal aperture without pseudofissuræ; paranal bristles slightly posterior to center of sides; postanal bristles grouped in two pairs.

Description: Shape elongate-oval, rather slender; cephaloprothorax rather broad, lamellæ not forming a sharp ridge but a gentle swelling on sides; rostrum not conspicuously set off; rostral bristles inserted well down on sides, short, fine; lamellar bristles inserted well back from edge of lamellæ, short, fine; interlamellar bristles inserted as far from shadow of tectopedia I as from notogaster; anterior porose areas slender, rather short; pseudostigmatic organs stiff, with rather stout pedicel directed forward, bent at juncture with head which crosses over anterior end of pteromorphæ, compressed, blade-like; midthoracic suture distinct, faint, often undulate.

Notogaster without median pseudoforamen, adalar porose areas short, fusiform (long axis parallel to edge of pteromorphæ); mesonotal porose areas small, angularly round-oval; pteromorphæ smooth, practically no veining, groove open anteriorly, that is, without the anterior rib well developed, pivot well below angle, pseudofissura fine, insertion small.

Ventral plate wings broad, exposing tectopedia as a narrow edge beyond posterior angle, tectopedia III semicrescentic, easily confounded with what appears to be a suture between trochanter and femur on legs II; apodemata I quite bent, with stout distal end and short cerifs; apodemata II-III with long ceriphs; apodemata IV short, strongly curved posteriad; a well defined

lacuna between anterior two apodemata, the anterior one developed chiefly on posterior edge; gular bristles unusually approximate; other bristles as usual; genital aperture with a broad frame, anterior edge slightly undulate, posterior edge strongly undulate; cover bristles 1 and 4 represented by channels, bristles 3 more remote than bristles 2, fairly close to lateral edge of covers; paramesal bristles more remote than diameter of aperture, as distant from aperture as smallest diameter of a cover; anal aperture with strongly converging sides and rather sharp posterior angles, with fairly broad frame on anterior and lateral sides; paranal bristles distant from aperture; lateral postanal bristles near corner of aperture; mesal postanals more remote than cover bristles; anterior cover bristles more approximate than posterior.

Tarsi with very slender lateral and mesal hooks. Tarsi I with all bristles rather short, the four dorsoproximal bristles reduced to two, inserted close to each other; ciliate bristles of ventral face with only three to four stout, long, widely spaced, cilia; femora I with the ciliate, ventral face bristle similar to the tarsal, otherwise normal.

The reductions that have taken place in this smallest species are not specializations but harmonic changes that take place in dwarfing. Dwarfism has affected not only total size but length of bristles. It also mechanically brings about concentration. For example, by the shortening of the genital covers their twelve bristles are brought closer together, making it less necessary to have so many in so small a space. Outstanding are the lateral lamellar bristles. The pseudostigmatic organs are the most distinctive and highly developed of the now recognized American species of this genus.

Dimensions: The smallest male, average of nine females (the males seem to be quite rare) and the largest female, all from Florida are given:

| | | | |
|-----------------------------------|------|-----|-----|
| Total length of body | 311 | 320 | 328 |
| Length of notogastral plate | 246 | 256 | 263 |
| Breadth of same | 209 | 215 | 217 |
| Length of pteromorphæ | 168 | 171 | 178 |
| Interlamellar bristle span | 54.5 | 57 | 60 |

| | | | |
|------------------------------------|------|------|------|
| Median l. of ventral plate | 230 | 238 | 246 |
| Camerostome to genital apert. ... | 59 | 63 | 65 |
| Length of genital aperture | 41 | 43.6 | 46.8 |
| Breadth of same | 49.5 | 50 | 51 |
| Genital apert. to anal apert. | 66 | 67.7 | 70 |
| Length of anal aperture | 64 | 65 | 68 |
| Breadth of same | 75 | 76 | 78 |

Eggs: The largest number of eggs found is two, each one quite filling up its own half of the abdomen.

Material examined: Twelve specimens from shore bay debris, Vero Beach, *Florida*; taken April 6, 1928, by Erdman West, slides G67G1, -G2, -G6, -G9, -G15, -G16. A female from under board, garden of Mrs. Allison, Arcola, *Illinois*; taken June 20, 1906, by H. E. Ewing, slide EwB138 (Banks coll.).

***Zetes corrugis* (6, p. 28)**

Figures 37-45

Diagnostic characters: No median pseudoforamen; cephaloprothorax bristles long, lamellar bristles frontal; ventral edge of pteromorphæ sculptured by conchoidal corrugations posterior to notch; pseudostigmatic organs slenderly clavate with few, short barbs (figures 37 and 38); adalar porose areas long, L-shaped; bristles 4 of genital covers visible as channels; anterior bristle of anal covers much more remote than posterior pair; paranal bristles posterior to reduced pseudofissuræ.

Description: Size medium large (0.8×0.53 mm.); shape (figure 37) broad-ovate; cephaloprothorax conical, the lateral outline only slightly interrupted by lamellæ and insertion of rostral bristles; rostrum somewhat prominent, rounded; rostral bristles well developed, touching or nearly so; lamellar bristles quite long, as seen from above crossing rostral, undulate, insertion not far from lamellæ; interlamellar bristles fairly long (figure 38, foreshortened in figure 37), inserted as far from shadow of tectopedia I as from notogaster; anterior porose areas cuneate, the broad end mesad of interlamellar bristles; pseudostigmatic organs of medium length, bluntly pointed, with few barbs (figures 37 and 38).

Notogaster with anterior edge quite distinct; adalar porose areas quite long, extending to within their own diameter from mesal adalar pseudoforamen (figure 37) ventral end bent posteriad; mesonotal porose areas angularly roundish, fairly large, the lateral one more elongate; pteromorphæ (figure 40) with pivot near angle, groove distinct, slender (figure 37), insertion distinct, close to edge, veining distinct, broad, simple, sculpturing extending well up towards posterior angle, fine and close.

Ventral plate (figure 37) with wings narrow at anterior end, posterior corner broadly cut off considerably exposing tectopedia II; tectopedia III well developed, without posterior angle; apodemata I curved, with a fairly long posterior ceriph; apodemata II-III straight with a long anterior ceriph and a short posterior one; apodemata IV curved, almost touching II-III!; sternal bristles 1 represented by a small pseudoforamen; insertions of sternal bristles also present; genital aperture with anterior and posterior edges only slightly sinuous, surrounded on anterior and lateral sides by a slender frame; covers with bristles much as usual, inserted subequally distant from lateral and median edges; bristles 4 represented by a curved channel, paramesal bristles more remote than diameter of genital aperture, distant from aperture the diameter of a cover; subanal muscle plate triangular, the point directed posteriad; anal aperture with prominent anterior and posterior angles, cover and paranal bristles as above mentioned, lateral postanal bristles some distance from corners of aperture, the four subequally spaced.

Trochanters III (figure 41) and IV (figure 43) are figured to show the two articulation pivots. Femora II (figure 42) are illustrated to show the bow-like curve needed to get around femora I (note the trochanteral end).

Figures 38 and 39 have been included to show the shape and position of tectopedia I. In figure 38 they are shown by means of broken lines, their edges are thickened and therefore shown by double lines. In some species they project from surface of cephaloprothorax at about the height of the lamellar bristles and pass down sides of cephaloprothorax to the ventral plate as a slight ridge. Above the lamellæ they do not project, but curve

posteriad then ventrad at a more posterior plane. Their ental position seems to be due to pull by the mandible retractors and adductors which are in part attached to these tectopodia (figure 39). The object between the short triangular muscle and the right coxa is a hyaline plate. The tracheal tube on the left side is quite distinct. There seem to be other fine tracheal (?) tubes between and above the mandibles, one of them running along the proximolateral edge of one of the mandibles.

Figures 44 and 45 are included to show the structures within the acetabulæ, the coxa of legs II, the membranes about the edges of the insertions, and the attachments of the tracheæ. In figure 44 the lobe at the upper angle of the gular collar, often seen projecting under edge of camerostome at its posterior angles, is here shown to be a plate-like lobe of the collar (shown by double broken lines). Tectopodium IV is shown as a dark rim circling up to tectopodium II and enclosing the lighter tectopodium III. Note: (1) that femur II is separated from the trochanter (broad line), and (2) the trochanter is joined to the coxa, while (3) its upper edge is held by a socket membrane. A similar membrane encircles base of trochanter IV. The thickened rims (enclosed by shaded lines) on ventral plate wing, are seen to fade out on its surface. Acetabulum III lies open and vacant. In figure 45 between the trochanters (upper lobes in figure) stands out tectopodium III while the hump on its left side is tectopodium IV very much foreshortened. The ventral plate is broken across and shown in section enclosed by shaded line. To the right of numeral III is the trachea. The black figure above the same numeral is the toe or ridge which probably acts as a guide to the coxa. In coxa IV this toe is likewise black. To its right is the opening of the trachea on the surface of the acetabulum, while to its left is the hatchet- or halberdlike coxa. The upper part of this hatchet bears a spiral collar (double line in figure). There seems to be a cushion of chitin under trochanter IV.

Material examined: Two specimens from Middlesex Fells, Mass.; collected by Nathan Banks, slides 26B4 and 26B5 (*co-types*).

***Zetes corrugis milleri* subsp. nov.**

Figures 9

Diagnostic characters: Pseudostigmatic organs more heavily barbed, showing a tendency to divide at distal end (figures 9); lamellar bristles inserted in angle at base of lamellæ; adalar porose areas often quite slender, half width of those of the species; sculpturing of pteromorphæ more extensive, reaching well over to posterior end of pteromorphæ, anteriorly curving dorsad, as many corrugations reaching much further dorsad than in the species; ventral plate bristles not different.

Material examined: Six specimens from under dry bark of fallen Silver Maple branch under its tree, in open, grassy, very dry pasture, Brettendorf, Iowa; taken July 8, 1927, by August E. Miller, slide 32M114o3 (*cotypes*). Two specimens from Galesburg, Illinois; taken October 16, 1905, by H. E. Ewing, slides EwB15 and EwB15-4.

***Zetes emarginatus* (1, p. 7)**

Figures 24-33

Diagnostic characters: Size medium (about 0.5 mm. long); shape somewhat slender and high; cephaloprothorax narrow, the three pairs of bristles well developed, nearly smooth; lamellar bristles frontal; pseudostigmatic organs fairly long, slightly curved, with slender, asymmetrical head (figures 29-31); pteromorphæ with ventral edge finely vermiculate-granular; notogaster with median pseudoforamen; adalar porose areas stout-cuneate.

Description: Shape seen from above, ovate (figure 26, which is seen slightly from in front and figure 28 from behind, both being foreshortened from different directions); cephaloprothorax seen from above (figures 24 and 27) conical, broadening ventrad (cf. figures 26 and 28), lamellæ forming a slight emargination, seen from the side, with high slightly bulging vertex; rostrum slender, tapering insensibly into sides of cephaloprothorax, with ventral half constricted, the edge flaring out as a thin chitinous lip (figures 24 and 27), but not far enough to be visible from above, being hidden by bulge of rostrum (figures 26 and 28). The lip is furnished with a strong, median mucro with a subordinate point on each side, making the edge three angled though the lateral angles are often very poorly developed. Figure 25

illustrates the tip of the rostrum, the dotted lines outlining the thickened area, the heavy line delimiting the thin area (pseudo-fenestration) just above the rim and on the inside. The point is formed by the median mucro. Lamellar bristles inserted considerably mesad of lamellæ which are sinuously emarginate opposite the bristles. Figure 24 is as viewed from below so that the bulge of the vertex is beyond the plane of sight and the lamella has risen to the horizon of vision. Lamellæ protruding as a slight rim from face of cephaloprothorax (figures 26 and 28). Interlamellar bristles the longest. Pseudostigmatic organs (figure 30) medium long (94 microns), shaft somewhat slender, widening gradually into head which is bilaterally unsymmetrical, variously but shallowly notched, the notches never opposite, apex blunt.

Notogaster much narrower than long, broadly overlapping ventral plate (figure 28), roughened by fine granulations; adalar porose areas tapering toward median line; one specimen found has this area nearly constricted in the middle, another with the division complete forming two areas, each circular and widely separated; mesonotal porose areas circular; pteromorphæ with crenulate veining, groove curved, slender, ribs well developed, preceded by a sinuous, much more shallow one which is terminated distally by a distinct but hairless insertion, ventral area roughened by fine granulations (figure 27). These granulations leave a narrow, smooth band along the rim and are followed proximad (or dorsad) by fine more or less parallel ridges. This granulation of the pteromorphæ, notogaster and parts of the venter might place this species in the subgenus *Stictozetes* which I am unable to recognize for reasons set forth elsewhere (6, p. 6). Moreover I now find that at least two species with or without pteromorphal sculpturing have subspecies with the opposite condition.

Ventral plate (figure 28) broad anteriorly and finely granular, anterior ends of wings narrow, posterior ends broader than tectopedia II, but truncate to broadly expose the tectopedia behind only; tectopedia III broad, short, oblique; apodemata I straight, at right angles with median plane, with long posterior cerif; apodemata II-III straight, long, extending almost to geni-

tal aperture with short anterior and long posterior cerif; apodemata IV short, parallel to the preceding, with a long posterior to posterolateral ceriph; sternal bristle 1 occasionally present (upper half of figure 28), insertion between apodemata II-III and genital aperture lies over mesal end of the apodeme; genital aperture with anterior edge straight, posterior edge undulate, sides strongly converging, cover bristles subequally spaced though 2 and 3 are more distant from each other than the others, bristles 1 nearer lateral than median edge, bristles 2 equally distant from both edges, bristles 3 and 4 nearer median than lateral edge, bristles 4 not very near posterior margin, the bristle discerned with difficulty in ventral aspect; these bristle insertions all seem double; paramesal bristles more remote than diameter of genital aperture, diameter of a genital cover distant from genital aperture; anal aperture slightly more than its length from genital, anterior and posterior edges undulate, sides strongly converging; anterior cover bristles nearer lateral than median edges of covers, posterior cover bristles near posterior edge, also near median edge; pseudofissuræ very short, parallel to sides, at center of sides; paranal bristles posterior to pseudofissuræ; postanal bristles almost subequally spaced, mesal pair slightly more remote than their distance from the lateral.

Camerostome (figure 28) broad. Labium with bristles well developed (usually difficult to see). Palps (figure 33a) five segmented; basal segment very short, subtriangular; second segment longer than next two, with three slender bristles, the distal one inserted on ventral edge; third segment half the length of second, rapidly tapering, with a dorsal bristle inserted at center of segment; fourth segment still shorter, subcylindrical, with a recurved bristle on anteroventral edge and a long, stiff bristle on dorsal face; distal segment nearly as long as second but slender and irregular, dorsal face with a prominence from which springs a curved spine, two short, erect bristles distad of this spine (figure 76), distal bristles recurved. Mandibles strong; each ramus with three well-developed teeth; free ramus with distal tooth bifid.

Legs with triheterohamate unguis; tibiæ I the broadest tibiæ, tibiæ IV the longest and slenderest; genuals III the smallest

genuals; femora I the widest femora, femora II slightly longer than the others, femora III the smallest. Legs I (figure 32) the most specialized; tarsi with three pauciciliate bristles on ventral face, the cilia long and strong; distal end of segment with four or five slender bristles; dorsal face with three heavier, decurved bristles; lateral face with two fine bristles. Tibiæ broad, compressed at distal end, pedunculate at proximal end; major bristle well developed, dorsal face with a strong, distal bristle at distal end; ventral face with a short, ciliate bristle at distal end, a long, slender, curved, barbed bristle proximad of it; lateral side with a strong, distal bristle; mesal side with a more slender bristle inserted near center of the article. Genuals long, cylindrical, with three distal bristles: a short one on ventral face, a long one on dorsal face and a shorter recurved one (foreshortened in figure 32) proximad of it. Femora gourd-like in outline but compressed; dorsal face with a slender, curved bristle at distal end, a barbed bristle at center, ventral face with a fine bristle inserted proximad of center. Legs II similar to legs I but less highly specialized. Tibiæ not nearly as broad.

Legs IV (figure 33) quite slender. Tarsi with three pauciciliate bristles on ventral face; ventrodistal bristles broad at base, bract-like; dorsal face with two prominent bristles, the proximal inserted slightly proximad of center of segment. Tibiæ shorter, ventral face with a long, ciliate bristle at distal end, another short one proximad of it; lateral side with a smooth bristle; dorsal face with a poorly developed major bristle. Genuals much broader at distal end; dorsal face with two curved bristles near distal end. Femora very broad, compressed, sub-rectangular, the genual attached to dorsal edge; ventral edge with a long bristle near distal end; dorsal edge with a shorter bristle inserted anterior to center of segment. Trochanters wider than long, compressed, ventral edge straight, with a strong bristle at distal end.

Legs III similar to legs IV but less highly modified. Tarsi with three pauciciliate bristles on ventral face; dorsal face with three smooth bristles; lateral side with a long bristle inserted near proximal end; distal end with four or five short bristles. Tibiæ curved, cuneate; major bristle subequal to tibiæ, held erect

nearly at right angles to segment, gently recurved at center, inserted fairly close to distal end of article; ventral face with two long bristles inserted quite close to apex, the other somewhat posterior to it and more lateral, at least the posterior one multiciliate. Genuals quite short, with two fairly stout, medium long, straight bristles, one inserted on dorsal face, the other on side, both between center and distal end. Femora with a long, oblique dorsal slope, and a sharply truncate proximal end which meets the dorsal face by a short curve, keel poorly if at all developed; dorsal bristle far proximad of center, long and stout; ventral face bristle long, fairly stout, barbed, inserted at center of segment; lateral bristle inserted just above ventral bristle. Trochanters similar to trochanters IV but more oblique, the bristle quite long and slender, keel poorly developed.

Color: In life, nearly black; in mounts, mahogany red, the anterior end of abdomen appearing amber yellow.

Dimensions: Twelve specimens were measured, a male from Falls Church, Va., a male from Cliff Id., Casco Bay, Me., three males from Monroe, Conn., and seven females from various localities. The averages for the three Connecticut males and for the seven females is presented. These averages with the measurements for the males from Virginia and Maine are also given in the following table. This species is so high (compared to its breadth) that it is rare when a specimen is found mounted so as to present a true dorsoventral aspect.

| | <i>Va.</i> <i>Male</i> | <i>Conn.</i> <i>Males</i> | <i>Me.</i> <i>Male</i> | <i>Fe-</i> <i>males</i> |
|-----------------------------------|---------------------------|------------------------------|---------------------------|----------------------------|
| Total length of body | 540 | 586 | 605 | 617 |
| Length of notogastral plate ... | 420 | 462 | 470 | 468* |
| Breadth of same | 375 | 410 | 430 | 429 |
| Length of pteromorphæ | 290 | 308 | 330 | 321 |
| Interlamellar bristle span | 105 | 118 | 120 | 123 |
| Median l. of ventral plate | 390 | 435 | 450 | 445 |
| Camerostome of genit. apert. | 85 | 84 | 80 | 82* |
| Length of genital aperture | 50 | 74 | 75 | 74* |
| Breadth of same | 70 | 80 | 85 | 83 |
| Genit. apert. to anal apert. | 105 | 123 | 125 | 125 |
| Length of anal aperture | 100 | 115 | 120 | 120 |
| Breadth of same | 125 | 130 | 135 | 133 |

From this table three things are evident: (1) the species averages larger from south to north (as in vertebrates); (2) the females average larger than males; (3) although there is a slight sexual differentiation (see items with asterisk) these differences are so slight and so swamped out by individual variation as to be rendered valueless for practical purposes.

The Virginian specimens, although averaging smaller, and more often with spiny pseudostigmatic organ head, cannot be considered as a distinct race because of the inconstancy of these characters and their appearance (though less frequently) in other parts of the known range of the species. Isolation would undoubtedly establish the form.

Material examined: One specimen from Ottawa, *Canada*: Banks coll., slide 26B43. A male from epigeous moss from spruce-balsam woods, Cliff Id., Casco Bay, *Maine*; taken August 15, 1919, slide 1933o1.

Massachusetts: Six specimens from leaf mould from top (north side) Wachusett Mt.; taken October 29, 1932, by C. R. Crosby, slide 3297o1. One specimen from Middlesex Fells; Banks coll., slide 26B4.

Connecticut: Twenty-seven specimens from well decayed stump of white cedar, epigeous moss, and litter under small white cedars surrounding open bog, Bethany; taken June 22, 1932, slide 3223o1. Four specimens from under boards, Experiment Station grounds, New Haven; taken September 25, 1932, by P. Garman, slide 3268o. Four specimens from oak leaves in Hemlock Gorge, Sandy Hook; taken June 21, 1926, slide 2612o2. Two females from moss on and scrapings from old log, from hemlock gorge below road, Sandy Hook; taken June 21, 1926, slide 2614o3. One specimen from fallen hickory shag, dump lot, Coscob headland; taken April 12, 1932, slide 3210o1. East Village, Monroe: Seven specimens from cushion moss, upland swamp; taken March 23, 1913, slide 1913o2. Twenty specimens from cushion moss, upland swamp; taken May 31, 1919, slides 1931o4, 1932o1. Twenty-seven specimens from cushion moss (grey-green and hair cap) growing on earth clumps, stones, etc. (no wood), woods, edge of upland swamp; taken July 9, 1932, slides 3227o1 and -o2. Thirty-eight specimens from lower sides

of stones standing in wet meadow. They were on the stones just above the wet area in a "tide-line." An algal film greened the wet area. Thus they were following down this algal film as the water level fell. Taken April 23, 1920, slide 204o3. One specimen from short moss on north side of boulder, upland swamp; taken May 30, 1920, slide 2014o1. Three specimens from lower face of old rail in orchard, a few millimeters in the wood or between the crevices; taken August 22, 1925, slide 2527o1. Forty specimens from interior of soft, moist, rotted rail, foot of old wall in old orchard; taken June 17, 1926, slide 266o1. Fourteen specimens from under surface of old boards, edge of woods; taken June 18, 1926, slide 268o1. Three specimens picked from oak and maple leaves from a rift on the ground in dry upland woods; taken June 19, 1926, slides 2610o1, 2611o1. Five specimens from pile of very much decayed fence rails and posts, young woodland, formerly pasture; taken July 12, 1932, slide 3228o1. Twenty specimens from old rails, branches and wood chips, old orchard; taken August 4, 1932, slide 3229o3. Forty-three specimens from under face of boards, edge of upland swamp woods; taken August 4, 1932, slide 3230o2. Five specimens from moss clump, thicket, edge of swampy woods; taken January 18, 1932, slides 322o2 and -o3. Five specimens from *Selaginella apus* and epigeous moss, earth clumps, upland swamp; taken July 7, 1932, slide 3226o2. Four specimens from bole rot pocket of yellow birch, felled two years previously, woodpile; taken November 6, 1933, slide 3175o1.

✓ *New York*: Three specimens from leaf mould, old hemlock grove, west slope of Miamus ravine; taken in April, slide 261o1. Long Island: Ten specimens from Sea Cliff; taken by Nathan Banks, slide 26B39 (*types*). Four specimens from subaquatic sphagnum, sphagnum swamp, Roslyn; taken by Banks, slide 26B41. Twenty-two specimens from rotten wood and under side of bark slabs, Glen Cove; taken May 8, 1920, slides 208o3 and 209o1. Three specimens from decaying logs and sticks from among dead leaves, dry woodland, Queens Woods; taken May 3, 1919, slide 1928o2. Eleven specimens from decaying and charred sticks from among dead leaves, recently burned over ground, Hollis Hills; taken April 28, 1919, slide 1927o1. A male from

stick in hollow behind golf links, Forest Park, Brooklyn; taken March 8, 1919, slide 194o1. Four females from old sticks under leaves, Cypress Hills Cemetery, Brooklyn; taken February 23, 1919, slide 194o1. Central New York: Five specimens from Gloversville; taken April 2, 1926, by C. P. Alexander, slide 26B72. A female from marsh, Freeville; taken May 20, by Nathan Banks, slide 26B75. Thirty-one specimens from under surface of twigs, bark and stones, Six Mile valley, Ithaca; taken April 14, 1917, slides 176o1, 176o4. One specimen from Butter-milk ravine, Ithaca; taken May 21, by Banks, slide 26B81d. Four specimens from sphagnum about stump in swale below road below wooded ridge, Connecticut Hill, Newfield, Tompkins Co.; taken November 25, 1932, slide 32106o1. Two specimens from epigeous moss and stump lichens, wooded ridge of Connecticut Hill; same date, slide 32110o1. Nine specimens from under surface of twigs, bark and stones, Danby to West Danby; taken May 13, 1917, slides 179o2, 179n1. As last but taken May 19, one specimen, slide 1710o3.

Ohio: Two specimens under walnut bark on ground, Chillicothe; taken September 24, 1923, by A. E. Miller, slide 374 (Miller coll.). Six specimens from rotting stump of *Acer saccharum* near river, Chillicothe; taken August 8, 1922, by Miller, slide 16 (Miller coll.).

Illinois: One specimen from Chicago!; September, Banks coll., slide 26B87. Two specimens from under side of board lying on ground in open woods; taken June 25, 1926, by Miller, slides 32M5o1 and 32M5ho. Fifty-two specimens from lower side of 2" by 6" piece of walnut in open bluegrass pasture, three miles north of Rossville; taken August 18, 1927, by Miller, slides 0-15.1-27 and 0-15.2-27 (Miller coll.). Twenty specimens from lower side of cut fence post in open sandy woods, five miles south of Watseka; taken August 18, 1927, by Miller, slides 0-12.1-27 and 0-12.2-27 (Miller coll.). Four specimens from moist, under side of newly cut fence post lying on ground, Mt. Vernon; taken August 6, 1927, by Miller, slide 0-22-27 (Miller coll.). Three specimens from moist under side of board in thick bluegrass, Arthur; taken September 14, 1927, by Miller, slide 0-6-27 (Miller coll.). Two specimens from gallery walls of

Aphaenogaster tennesseensis in rotten oak log, Homer Park; taken May 30, 1926, by Miller, slide 0-5-26 (Miller coll.). Two specimens from under dry boards and logs in open, well drained, pastured woods, Denrock; taken July 9, 1927, by Miller, slide 32M115a. One female from under bark or log, three miles west of Arcola; taken July 9, by Ewing, slide EwB151. Urbana: Three specimens from under bark on pine stump, University Forest; taken January 18, by J. Douglas Hood and G. H. Coons, slide 26B73. A male from under bark on maple log in yard; taken October 20, by Hood, slide 26B74. A female from under heavy pieces of lumber, near University campus; taken October 23, by H. E. Ewing, slide EwB25. Two specimens from under loose bark of log, Dodson's Woods; taken June 7, 1926, by Miller, slides 0-2.1-26 and 0-2.2-26 (Miller coll.). A male from under loose bark of untopped, fallen white oak in north-east corner of Dodson's Woods, sunny exposure, two feet from ground; taken June 6, 1927, by Miller, slide 32M125o. A female from lower side of board or log lying on ground in more open part of Dodson's Woods; taken May 24, 1927, by Miller, slide 32M122o. One specimen from under side of fallen log, Dodson's Woods; taken August 18, 1928, by Miller, slide 32M2o. Three specimens from under loose, moist bark on fallen basswood log in Dodson's Woods; taken April 30, 1926, by Mrs. Miller, slide 0-7-26 (Miller coll.). Three specimens from walls of galleries in nest of *Aphaenogaster tennesseensis* Mayr. in rotten log, Dodson's Woods; taken June 7, 1926, by Miller, slide 0-1-26 (Miller coll.). One specimen from woody fungus on under side of fallen branch in shade, University Woods; taken August 29, 1927, by Miller, slide 0-11.4-27 (Miller coll.). Twenty-two specimens from under loose, moist bark on fallen tree, Brownfield's Woods; taken May 1, 1927, by Miller, slides 0-21.1-26, 0-21.2-26, and 18 specimens taken by Mrs. Miller, slides 0-14-26, and 0-15-26 (Miller coll.).

District of Columbia: Fifteen specimens from under bark of rotten log, Somerset; taken in April by Banks, slide 26B65.

Maryland: Thirty-nine specimens from deep layer of old leaves, Plummer's Id.; taken by H. S. Barber, slide 307o1 and -o2.

Virginia: Falls Church: Nine specimens from under rotten bark; taken April 9, by Banks, slide 26B68. Eight specimens from under loose bark of dead pine stick; taken in April by Banks, slide 26B84. Also two females taken May 2, by Banks, slide 26B67. Three specimens from under board; taken August 11, by Banks, slide 26B76. Seven specimens from under stick on ground; taken September 13, by Banks, slide 26B70. Also two females taken October 10, by Banks, slide 26B71.

Tennessee: Two specimens from moss, New Found Gap, elev. 5000 feet; taken September 1, 1930, by Banks, slide 3286o3.

Florida: One specimen from lichens on oak trunk, Sugarfoot Hammock, Gainesville; taken September 8, 1929, by J. R. Watson, slide 29W9/8. Two specimens from true moss, Sugarfoot Hammock, Gainesville; taken June 10, 1928, by J. R. Watson, slides G109G1 and -G2. Two specimens from *Daedalia ambigua* on rotten log, Worthington; taken January 13, 1929, by Watson, slide 29W1/13.

Other material: An examination of the type material shows that Banks included under this designation what is now recognized as three or four species. In choosing from among these species, which should be *Z. emarginatus*, the writer was guided by two principles, (1) to choose the species which most closely fits the original description, (2) to choose the species which was represented by the greatest number of individuals. Fortunately these two principles leave no doubt as to which species was intended, and the above description and figures are based on that species, which also happens to be the commonest species of the northeastern United States.

The remainder of Banks material has likewise been studied, so that the above list should be substituted for previous records.

Ewing (4, p. 355) described as *O. emarginata* some other large (0.89 mm.) species. Thus his records of *Z. emarginatus* must be disregarded until restudied. Two of his specimens labeled "Galesburg, Ill. 10/16/05; B.15; *Oribata emarginata* Banks" now before me, are clearly of a very different species, not even having the median pseudoforamen.

Berlese (2, p. 125, pl. 1, fig. 14) described and figured *Galumna lanceatum octopunctatum* as *O. emarginatus* from material fur-

nished him by Ewing. Oudemans (12, p. 23) recognized the inconsistency.

For such reasons all previous records must be disregarded. How much more then should identifications of *Oribata geniculata*, and such, by early writers from various countries, be disregarded?

Oribates emarginatus columbianus (3, p. 306) characterized in 1914 (2, p. 125, osservazione) is this this species. This is the only positive record of this species known to me. It was from Columbia, Missouri.

Habitat: Primarily soft, moist, decaying wood. This species is negatively heliotropic but shows a tendency to ascend. No individuals were taken by sweeping, either day or night. Secondarily occurring in moss. They belong primarily to the forest floor but may also be found on under surface of wood and stones in moist meadows and pastures. By far our commonest species of Zetes or Galumninae.

Distribution: Maine and Ottawa west at least to Illinois and Missouri and south through New England and Long Island to Florida.

Eggs: A maximum of six eggs was found at one time. The dates when well developed eggs were found range from March 23 to July 9 and August 11. Thus oviposition extends through the three spring months and early summer. It is difficult to say which sex is most abundant until one knows if the two sexes have different habitat habits.

***Zetes emarginatus bidens* mut. nov.**

Figure 34

Diagnostic characters: As the species but anterior rim of camerostome with two vertical ridges forming two, rather short, approximate, blunt teeth, projecting beyond the rim (figure 34).

Cotypes: two specimens from lot 268o1, from under surface of boards, edge of woods of upland swamp, one mile west of East Village, Monroe, Conn.; taken June 18, 1926, slide 268o1.

I have found such specimens in various lots (3229o3, 3230o2, 261o1, see under species) usually on the average of one in fifteen. It should be remembered, however, that this character can only be recognized in lateral aspect and as many specimens

are mounted on their dorsal or ventral face various individuals are taken for the species. The long single tooth of the species (a character found in other species also, though not usually so highly developed) can often be discriminated in ventral aspect but I cannot affirm that it can always be so detected.

With this interesting modification I frequently find associated the following: Size of body smaller; more densely chitinized; sculpturing of pteromorphæ more rugged; pseudostigmatic organ head pointed (figure 29); lamellar bristles more mesal.

Thus the species, in specimens from the type locality and surrounding region, is paler in color; larger; with weaker sculpturing on pteromorphæ; with blunt pseudostigmatic organ head; lamellar bristles not so far from lamellæ.

***Zetes emarginatus coscobensis* var. nov.**

Diagnostic characters: As the species but pseudostigmatic organ head very slender, pointed; sculpturing on pteromorphæ very restricted; anterior bristle of genital covers almost on anterior edge; paranal bristles anterior to pseudofissuræ.

Cotypes: From lower face of stones and boards, near high tide level, shore of Indian Harbor, Coscob headland, Conn.; taken April 12, 1932, three specimens, slide 3290.

***Zetes nervosus* (2, p. 127, pl. 1, fig. 15)**

Figures 35-36

Diagnostic characters: Pteromorphæ strongly reticulate by fine ridges along ventral half; median pseudofoamen present; lamellar bristles frontal; labium and gular area sculptured by raised granules and vermiculations; interlamellar bristles long; adalar porose areas stout cuneiform; paranal bristles at sides of pseudofissuræ; ventral edge of leg cupboards passing diagonally over center of apodemata IV and II-III.

As this species was originally inadequately described and figured, as Oudemans's figures (12, pp. 32-37, figs. 41-52) are not quite complete in all specific characters, and as Willmann's caricature (13, p. 176) leaves nearly everything to the imagination, I here include a redescription and more complete figures.

Description: Size averaging 0.58×0.46 mm., fairly high; body broadly oval (figure 35), cephaloprothorax very broad, short,

with steep front, outline, seen from above, interrupted by lamellæ and a vertical groove, rostrum somewhat set off, somewhat prominent, short; rostral bristles inserted close to edge of camerostome some distance from anterior end, projecting well beyond rostrum; lamellar bristles much longer, curved, inserted a fair distance from lamellæ (figure 35), curved, reaching anteriorly of rostrum; interlamellar bristles long, curved, inserted near shadow of tectopedia I; lamellæ with mesal edge sharply drawn out, rather prominent, extending dorsad nearly to interlamellar bristles; anterior porose areas slender, tapering a little laterad; pseudostigmatic organs long, curved, head slender, markedly decurrent, sparsely barbed (figures 36).

Notogaster with anterior end distinct, adalar porose areas stout-cuneiform (figure 35), with two posterior pseudoforamina, mesal mesonotal porose areas large, roundish, the lateral and posterior ones elongate; a pseudofissura between mesal adalar pseudoforamina and mesal mesonotal; pteromorphæ with sparse, weak veining, groove slender, well formed but its ribs short, pseudofissuræ very fine, insertion distinct, pivot distant from angle, sculpturing projecting prominently from surface when seen in dorsoventral aspect, the ridges fine, crowded on ventral half, more widely spaced, anastomosing net-like on anterior lobe, crossing the veining at various angles.

Ventral plate wings small and slender, pointed at anterior end, broadly exposing tectopedia II laterad and posteriad, as well as lateral end of acetabuli I (see rim anterior to tectopedia II in figure 35); tectopedia II broadening posteriad, posterior corner quite sharp; tectopedia III long, slender; tectopedia IV short, broad; apodemata long, undulate even more strongly than in figure 35, mesal end of apodemata I with small knob, mesal end of apodemata II-III with short anterior and quite long posterior ceriph; apodemata IV with long, oblique, posterior ceriph, a short, anterior ceriph is sometimes developed as a continuation of the posterior; gular bristles remote, insertion of sternal bristles 1 sometimes present, other bristles much as usual (see figure 35); anterior edge of genital aperture slightly undulate, posterior edge more so, sides rather sharply converging, cover bristles 1 inserted somewhat near anterior margin, slightly

nearer median than lateral edge, bristles 4 inserted on posterior edge, quite close to median edge, bristles 2 and 3 decidedly nearer median than lateral edge; paramesal bristles slightly less than narrowest diameter of a genital cover from the aperture; anal aperture much as in *Z. emarginatus*; anterior cover bristles very near anterior and median edge!, posterior cover bristles as approximate as anterior; pseudofissuræ medium long, at center of sides of aperture; paranal bristles laterad of pseudofissuræ; postanal bristles subequally spaced.

The surface sculpturing is more highly developed in this species than in any other known to me from the United States. This type of sculpturing has been so carefully depicted (12, figures 46, 48 and 52) that it is needless to repeat it. The granules on the sternal region merge into long, fine, ridges over the parasterna.

Type locality: Norway. It is also recorded on the next line as from Washington, D. C., with a length of 320 ($\times 380$), which is obviously meant for 520, a 5 and a 3 being easily confounded in cursory proofreading.

Material examined: From *Regensburg, Bavaria*: Seven specimens from moss from stumps, Dechbetten woods; taken July 27, slides 3119o2 and 3121o4. One specimen from chip of wood or dead branch on cliffy slope overhanging the Danube above Kelheim; taken August 3, slide 3127o2. One specimen from stick (or stone), fairly heavy oak, pine and spruce woods, near Walhalla; taken August 6, slide 3131o5. Two specimens from moss from sides of drainage ditch and water holes in marsh with scattered spruces, Hoher Gebraching woods; taken August 24, slide 3147o1.

America: Five specimens from rotten wood, New Canaan, *Connecticut*; taken September 20, 1919, by Philip Garman, slide 27G10. Formerly described by me as *Zetes emarginatus garmani*. Nineteen specimens from under face of wood, wood margin, foot of Indian Hill along Forest Road, New Haven, Conn.; taken August 25, 1932, slide 3247o2. Three specimens from under face of boards, Experiment Station grounds, New Haven, Conn.; taken September 25, 1932, by P. Garman, slide 3268o. Seven specimens from fungus, Santa Barbara, *Cali-*

fornia; taken in October by Brown!, slides 26B91b and -c. As these were found in company with fifty-seven *Z. elimatus* Koch (both European species) one may get a good idea of the ease with which these mites may be disseminated by man.

KEY TO SPECIES

1. Ventral and/or anterior area of pteromorphæ sculptured by granulations and/or corrugations or ridges running more or less parallel to ventral edge7
1. Pteromorphæ unsculptured (not to be confounded with veining)2
2. Size minute (0.3 mm. long); pseudostigmatic organ head broad, short, fringed on anterior edge and distal end with cilia longer than diameter of head *Z. minutus*
2. Body longer than 0.4 mm.; pseudostigmatic organ head slender, clavate or, at most, with short barbs; notogaster without posterior, median, light spot or pseudoforamen3
3. Lateral rim of lamellæ raised and projecting laterad to form a prominent rounded rim on each side of the cephaloprothorax *Z. graminetum*
3. Lateral rim of lamellæ appressed to surface of cephaloprothorax, but mesal edge projecting as a low, sharp rim4
4. Ventral half of pteromorphæ folded outward behind notch to form an elbowlike projection; ventral edge of leg cupboards heavily chitinized as a dark band *Z. niger*
4. Ventral half of pteromorphæ uniformly curved; ventral edge of leg cupboards represented by a line at most5
5. Interlamellar bristles longer than diameter of genuals *Z. arboreus*
5. Interlamellar bristles shorter than diameter of genuals6
6. Paranal bristles posterior to pseudofissuræ; lamellar bristles not extending beyond insertion of rostral bristles *Z. elimatus ithacensis*
6. Paranal bristles on transverse plane cutting pseudofissuræ; lamellar bristles seeming to cross rostral bristles in dorsoventral aspect *Z. elimatus*
7. Notogaster with a single median pseudoforamen or small porose area posterior to transverse plane of mesonotal porose areas9
7. Notogaster without posterior, median, light spot8
8. Corrugations extending onto distal lobe of pteromorphæ *Z. corrugis*
8. Corrugations not extending onto distal lobe of pteromorphæ *Z. c. milleri*
9. Sculpturing on pteromorphæ granular and of very fine, crowded lines10
9. Sculpturing on pteromorphæ approximating a coarse network *Z. nervosus*
10. Paranal bristles anterior to pseudofissuræ; pseudostigmatic organ head very slender, distal end acicular *Z. emarginatus coscobensis*
10. Paranal bristles posterior to pseudofissuræ, pseudostigmatic organ head clavate, blunt to bluntly pointed11

11. Anterior rim of camerostome drawn out into a strong, triangular cusp, flanked (each side) by an inconspicuous angular projection (seen in lateral view only) *Z. emarginatus*
11. Anterior rim of camerostome with two vertical ridges forming two, rather short, approximate, blunt teeth, projecting beyond the rim (seen in lateral view only) *Z. e. bidens*

LITERATURE CITED

1. BANKS, NATHAN, 1895 (Jan.), On the Oribatoidea of the United States, Trans. Am. Ent. Soc., vol. 22, pp. 1-16.
2. BERLESE, ANTONIO, 1914 (Dec. 31), Acari nuovi, Manipulus IX; Redia, vol. 10, pp. 113-150, pls. 1-4.
3. *Same*, 1916 (Dec.), Centuria Terza di Acari nuovi, Redia, vol. 12, pp. 289-338.
4. EWING, HENRY ELLSWORTH, 1909 (Sept.), The Oribatoidea of Illinois, Bull. Ill. State Lab. Nat. Hist., vol. 7, pp. 337-390, pls. 33-35, 5 txt. figs.
5. *Same*, 1909 (Oct. 8), New American Oribatoidea, Jour. N. Y. Ent. Soc., vol. 17, pp. 116-136, pls. 2-6.
6. JACOT, A. P., 1929 (Jan.), American Oribatid Mites of the Subfamily Galumninae, Bull. Mus. Comparative Zool., vol. 69, pp. 3-37, pls. 1-6, 1 txt. fig.
7. *Same*, 1933 (Nov.), The Primitive Galumninae (Oribatoidea-Acarina) of the Middle West, The Am. Midland Nat., vol. 14, pp. 680-703, pls. 13-14.
8. *Same*, 1934 (March), The Galumnas (Oribatoidea-Acarina) of the Northeastern United States, Jour. N. Y. Ent. Soc., vol. 42, pp. 87-124, pls. 10-12.
9. KOCH, CARL LUDWIG, 1835-44, Deutschlands Crustaceen, Myriapoden und Arachniden, Regensburg.
10. *Same*, 1842, Uebersicht des Arachnidensystems, vol. 3, Abt. 1.
11. OUDEMANS, ANTHONIE CORNELIS, 1914 (March 20), Acarologisches aus Maulwurfsnestern (Cont.), Archiv f. Naturg., vol. 79, Abt. A. Heft 10, pp. 1-69, pls. 15-18.
12. *Same*, 1919 (June), Notizen über Acari, 26 Reihe (Oribatidea, Gruppe der Galumnæ), Archiv. f. Naturg., vol. 83. Abt. A., Heft 4, pp. 1-84, 114 txt. figs.
13. WILLMANN, CARL, 1931, Moosmilben oder Oribatiden (Oribatei), in: Dahl, Friedrich, Die Tierwelt Deutschlands, Teil 22, pp. 80-200, 364 txt. figs.

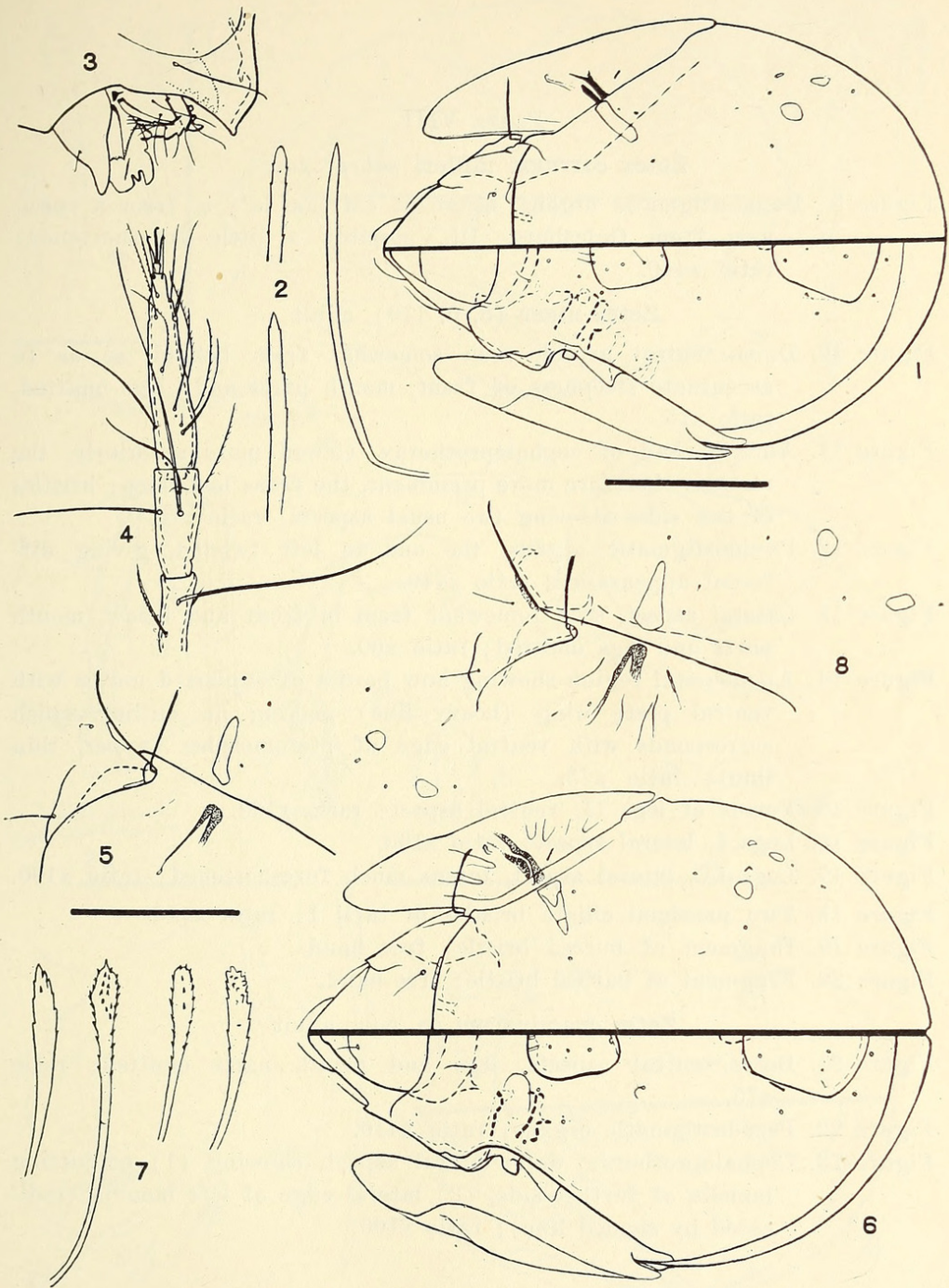
PLATE VII

Zetes elimatus ithacensis (6, p. 28), adult

- Figure 1. Dorso/ventral aspects, legs and mouth parts omitted; ratio x100.
Figure 2. Pseudostigmatic organs, typical above numeral; from a Californian specimen to left of numeral; ratio x440.
Figure 3. Mouth open, showing mouth parts *in situ*; ratio x150.
Figure 4. Legs I, dorsal aspect (slightly warped laterad), lateral side uppermost, showing position of mesal tibial bristle reaching halfway across cephaloprothorax or before it, and dorsal bristle of genual reaching laterad to apex of pteromorphæ or before them.
Figure 5. Dorsolateral aspect of side of notogaster, showing lamella, tectopedia I, and porose areas; ratio x100.

Zetes arboreus (6, p. 26), adult

- Figure 6. Dorso/ventral aspects, legs and mouth parts omitted; ratio x100.
Figure 7. Pseudostigmatic organs, various aspects, from four individuals; ratio x440.
Figure 8. Side view showing lamella, tectopedium and porose areas; ratio x100.



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PLATE VIII

Zetes corrugis milleri *subsp. nov.*

Figure 9. Pseudostigmatic organs, figure at extreme left is from a specimen from Galesburg, Ill., possibly a little foreshortened; ratio x440.

Zetes niger (5, p. 119), adult

Figure 10. Dorso/ventral aspect, seen somewhat from behind, so as to accentuate steepness of front, mouth parts and legs omitted, ratio x75.

Figure 11. Anterior end of cephaloprothorax, viewed more anteriorly, the rostrum therefore more prominent, the frons less steep; bristles of two sides showing two usual aspects; ratio x75.

Figure 12. Pseudostigmatic organs, the one to left twisted, giving different appearance; ratio x440.

Figure 13. Lateral aspect, seen somewhat from in front and below, mouth parts and legs omitted; ratio x60.

Figure 14. Apodematal region showing how border of cupboard unites with ventral plate wing (heavy line) making an outline which corresponds with ventral edge of pteromorphæ (upper, thin line); ratio x75.

Figure 15. Femur of legs II, ventral aspect; ratio x100.

Figure 16. Legs I, lateral aspect; ratio x100.

Figure 17. Legs IV, lateral aspect, tarsus much foreshortened; ratio x100.

Figure 18. Two proximal ciliate bristles of tarsi I; ratio x440.

Figure 19. Fragment of burred bristle; free hand.

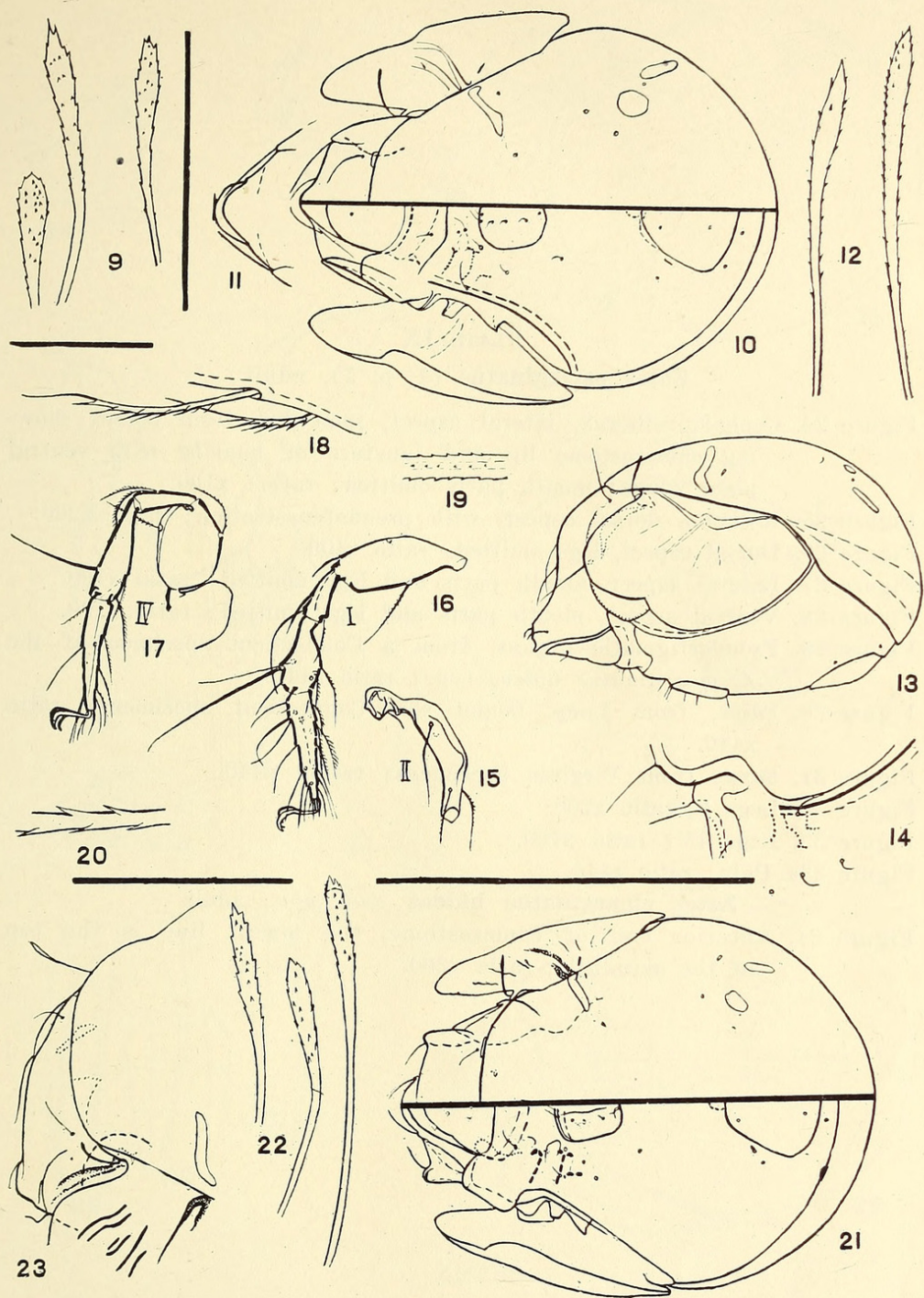
Figure 20. Fragment of barbed bristle; free hand.

Zetes graminetum *sp. nov.*, adult

Figure 21. Dorso/ventral aspects, legs and mouth parts omitted; ratio x75.

Figure 22. Pseudostigmatic organs; ratio x440.

Figure 23. Cephaloprothorax, dorso-lateral aspect, showing (1) outjutting lamella of further side, (2) lateral edge of left lamella (indicated by shaded line); ratio x100.



ZETES

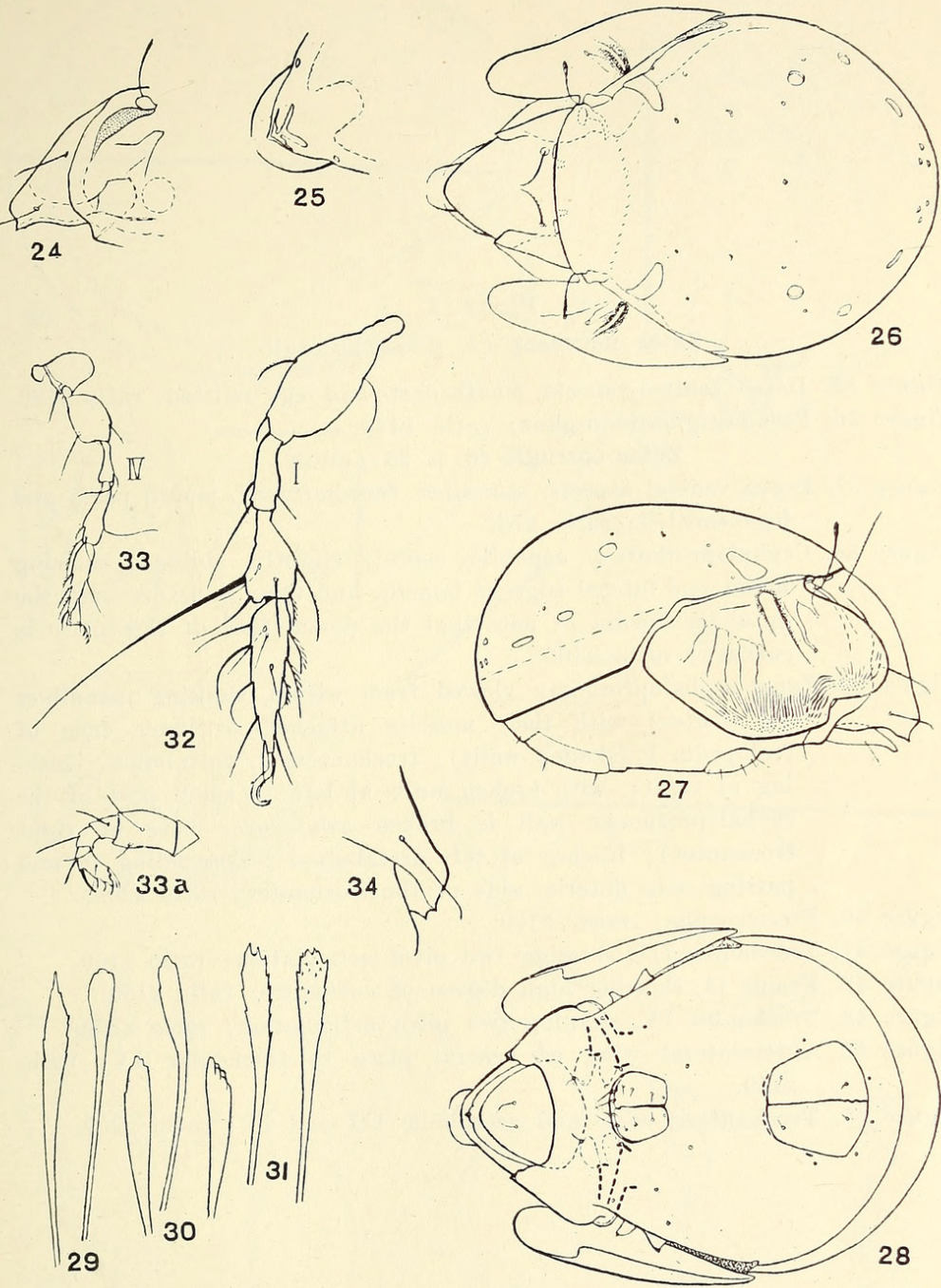
PLATE IX

Zetes emarginatus (1, p. 7), adult

- Figure 24. Cephaloprothorax, lateral aspect, somewhat from below, showing camerostome lip and juncture of lamellæ with ventral plate wings; mouth parts omitted; ratio x100.
- Figure 25. Rostrum, dorsal aspect, with pseudofenestration; ratio x200.
- Figure 26. Dorsal aspect, legs omitted; ratio x100.
- Figure 27. Lateral aspect, mouth parts and legs omitted; ratio x100.
- Figure 28. Ventral aspect, mouth parts and legs omitted; ratio x100.
- Figure 29. Pseudostigmatic organs, from a Connecticut specimen of the *Z. emarginatus bidens* type; ratio x440.
- Figure 30. *Same*, from Long Island and Connecticut specimens; ratio x440.
- Figure 31. *Same*, from Virginia specimens; ratio x440.
- Figure 32. Legs I; ratio x200.
- Figure 33. Legs IV; ratio x100.
- Figure 33a. Palp; ratio x440.

Zetes emarginatus bidens *mut. nov.*, adult

- Figure 34. Anterior end of camerostome, the lowest line is the top of the mandible; ratio x200.



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PLATE X

Zetes nervosus (2, p. 127), adult

Figure 35. Dorso/ventral aspects, mouth parts and legs omitted; ratio x100.

Figure 36. Pseudostigmatic organs; ratio x440.

Zetes corrugis (6, p. 28), adult

Figure 37. Dorso/ventral aspects, somewhat foreshortened, mouth parts and legs omitted; ratio x75.

Figure 38. Cephaloprothorax, cephalic aspect, slightly oblique, showing mesal and lateral edge of lamellæ and their puncture with the ental tectopedia I; note that the dorsal face of this plate is concave; ratio x100.

Figure 39. Same cephaloprothorax viewed from within, showing mandibles (in center) with their muscles attached to inner face of tectopedia I (shaded walls); trochanters I, acetabulum (lacking at right), with broken walls at left (a small part of the cephaloprothorax wall is broken away over base of right trochanter); trachea of left acetabulum I descending to and passing onto anterior side of the trochanter; ratio x200.

Figure 40. Pteromorpha; ratio x100.

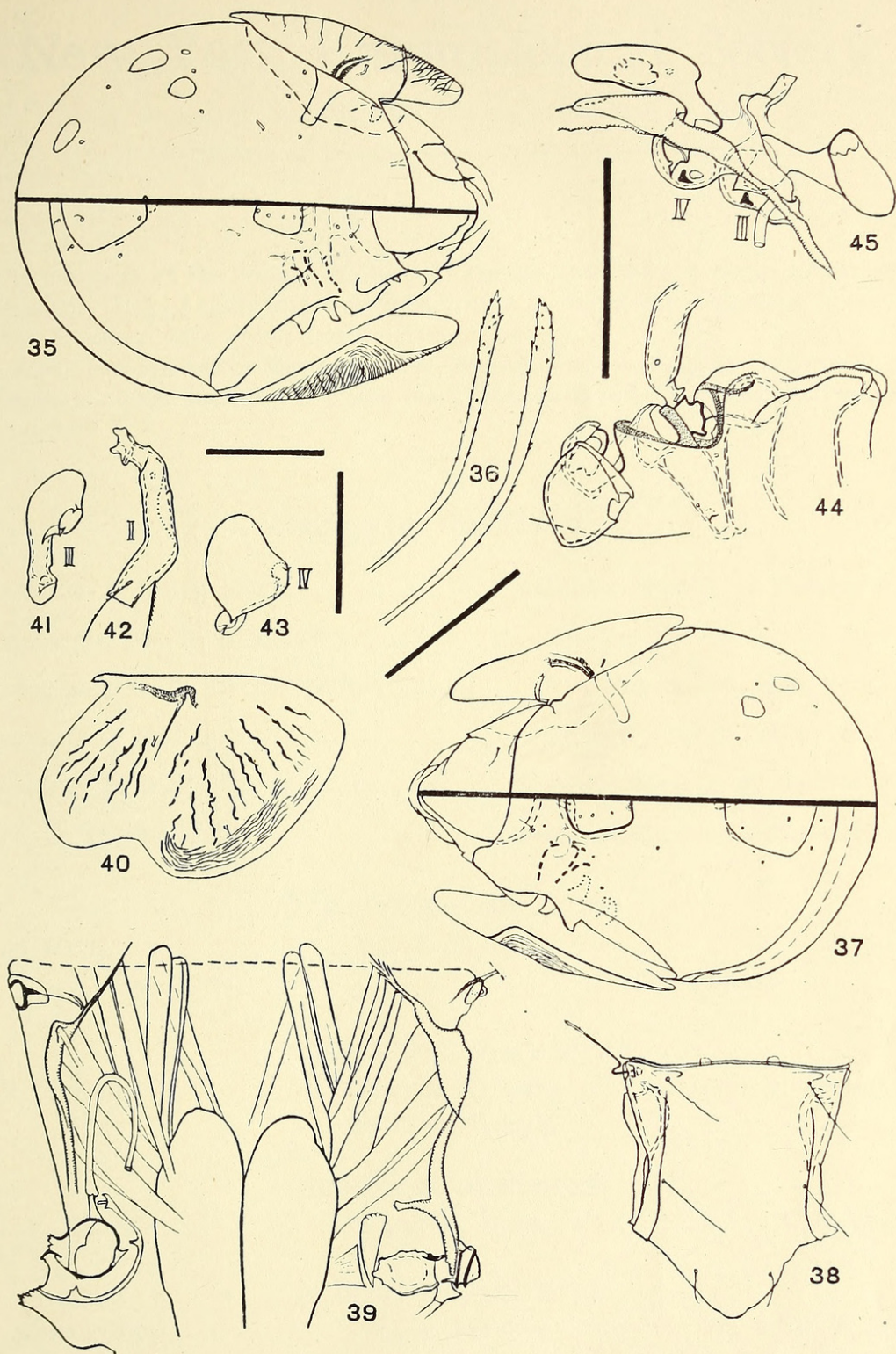
Figure 41. Trochanter III, showing two pivot articulation; ratio x150.

Figure 42. Femur II, showing high degree of curvature; ratio x150.

Figure 43. Trochanter IV, showing two pivot articulation; ratio x150.

Figure 44. Anterolateral wing of ventral plate to trochanter IV; ratio x140.

Figure 45. Trochanters, coxæ and acetabulæ III and IV; ratio x200.



ZETES



Jacot, Arthur Paul. 1935. "The Species of Zetes (Oribatoidea-Acarina) of the Northeastern United States." *Journal of the New York Entomological Society* 43, 51–95.

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