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## SOME NEW AND LITTLE-KNOWN AMERICAN HEMIPTERA

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THE descriptions and notes which follow are based upon specimens in the University of Michigan Museum of Zoology, where the types of the new species are deposited.

Throughout these descriptions all micrometer measurements have been converted into hundredths of a millimeter, so that actual lengths or widths can be read directly from the ratios given here. Thus, if the head is stated to be "very nearly as long as wide (75:78)," this signifies that the head measures 0.75 mm. in length and 0.78 mm. in width. This descriptive technique seems to me far more satisfactory than the customary one of expressing such ratios in arbitrary units of an ocular micrometer scale. The values of such units are seldom stated, and the reader is thus unable to interpret them in terms of actual dimensions.

## FAMILY ARADIDAE

*Aradus subruficeps*, new species

(Figs. 1-3)

Length, ♂, 3.75 mm., width of pronotum 1.20 mm., greatest width across hemelytra 1.28 mm. Small, oblong, parallel, the connexivum entirely covered by the hemelytra, the latter attaining the apex of the abdomen.

Sordid testaceous; head, anterior lobe of pronotum laterad of the median carinae, and base of scutellum reddish brown. Explanate lateral margins of pronotum, narrow reflexed costal margin of corium, narrow corial cells adjacent to costa on apical two-thirds, and membrane colorless, hyaline, or translucent, finely wrinkled transversely. Dark gray beneath, strongly tinged with reddish, apical half of seventh segment and all of genital segment pale yellowish brown; connexival segments with a pale spot above and below in the apical angles. Abdominal segments three to seven with the spiracles set at the tips of small oblique

tubercles. Legs and antennae testaceous, fourth antennal segment fuscous except at tip. Rostrum yellowish, the last two segments fuscous. Head above with a narrow, pale, oblique, calloused line at either side behind the depressions of the vertex.

Head very nearly as long as wide (75:78); interocular space more than three times as wide as an eye (48:15); preocular length to tip of antenniferous tubercle about one-half greater than the length of an eye (25:17), preocular margin minutely denticulate; tylus distinctly less than twice as long as thick (31:19), not at all constricted near base. Lengths of antennal segments I-IV, 15:56:35:30, their greatest thicknesses 8:8:9:10; second segment gradually and uniformly thickened from base to apex (excluding the minute basal stalk). Rostrum reaching middle of mesosternum, its third segment attaining middle of fore coxae. Head rather sparsely granulate above, except in the rather distinct smooth depressions on the vertex; tylus becoming more closely granulated at about the middle of its length. Preocular and postocular tubercles obsolete.

Pronotum about twice as wide as long (119:56), nearly one-third shorter than head (56:75); lateral margins rather widely explanate (0.10 mm. at widest point), but not distinctly reflexed, subparallel on basal half, converging and distinctly sinuate on anterior half, minutely denticulate, more distinctly so anteriorly. Anterior lobe laterad of the median carina with a transverse, oval, smooth, reddish brown area; other parts of pronotum (except the explanate margin), also the scutellum, clavus, and corium, transversely rugulose, the transverse direction of the rugulae becoming more irregular in apical cells of corium. Scutellum as long as head (74:75), two-thirds longer than its own width (74:44), triangular, its sides subparallel for a very short distance (0.13 mm.) from base, thence straight and converging to the tips; lateral margins thin, vertically reflexed, distinctly higher (except at very base) than the rather obsolete median discal tubercle. Sides of abdomen parallel as far as seventh segment; median lobule of venter rather strongly convex, nearly three times as wide (70:24) as the flattened and depressed lateral margins; mid-ventral line canaliculate as far as middle of sixth ventral segment. Male genital segment cleft for about half its vertical height as seen from behind, its depth about half its maximum width (excluding explanate margins); dorsal and apical margins broadly (0.20 mm.) explanate, horizontal. Apical angles of sixth connexival segment very slightly protruding, obtusely rounded.

HOLOTYPE, ♂.—Charlevoix County, Michigan, two miles south of Boyne Falls, July 31, 1923 (T. H. Hubbell). Dr. Hubbell's notes state

that this specimen, probably attracted by light, was found on a table in the farmhouse where he had his field headquarters. The nearest hardwoods were about a half mile distant, but within 200 yards there was a swamp, cut and burned over some years earlier, where black spruce and tamarack second growth had attained a height of 25 to 30 feet.

This species runs to *Aradus falleni* Stål in the keys of Parshley (1921: 23), Blatchley (1926: 306), and Torre-Bueno (1939: 258). It agrees in size with smaller individuals of that species, but is at once distinct by reason of its color, the very different proportions of head and pronotum, the nonfenestrate ventral genital segment of the male, and so forth. It is more nearly allied to *A. abbas* Bergroth, from which it is easily separable by the parallel sides of the basal half of the pronotum, the general color, and the nonannulate antennae; also, in the present species the sixth and seventh ventral segments are not angularly produced anteriorly, and the head is much longer than the pronotum.

#### FAMILY NABIDAE

#### *Pagasa*, subgenus ***Parapagasa***, new subgenus

(Figs. 4, 5)

Differs from subgenera *Pagasa* Stein and *Lampropagasa* Reuter in the structure of the fore tibiae, which are quite gradually expanded ventrally from base to middle, thence with the apical half nearly uniform in depth until just before the apex, the spongy fossa with its surface parallel (not oblique) to the long axis of the tibia. Subgenotype: *Pagasa (Parapagasa) insperata*, new species. From the description it appears that *P. fasciventris* Harris may also belong in this subgenus, but this species is unknown to me in nature.

#### ***Pagasa (Parapagasa) insperata***, new species

BRACHYPTEROUS ♂.—Length 5.7 mm., width of pronotum 1.4 mm., width of abdomen at fifth segment 1.95 mm. Smooth, shining, black; coxae yellowish; trochanters, legs, antennae, and rostrum honey yellow to testaceous. Head, pronotum (toward sides), scutellum, and venter with long, erect, sparse, black setae; dorsum of abdomen glabrous; fore and middle trochanters and femora with sparse, long, pale hairs.

Head, seen from side, about as long (from tip of tylus to hind margin of eye) as its dorsal width across eyes (93:96); eyes, seen from side, longer

than high (58:50), their width in dorsal view slightly more than the minimum interocular width of vertex (33:30). Lengths of antennal segments I-IV, 40:25:100:100 (fifth segment missing). Rostrum attaining middle of fore coxae, its second segment distinctly shorter than third (58:65), not reaching hind margin of eye.

Pronotum a little longer than its basal width (150:141), anterior lobe five times as long as posterior lobe; sides scarcely constricted between lobes; transverse interlobular sulcus practically obsolete on disk, largely represented by a series of punctures; lateral margins obsoletely subcarinate, the carinulae evanescent anteriorly. Scutellum dull, its sparse setae shorter than those of head and pronotum. Hemelytra shining; corium and clavus each with two rows of punctures, inner row on clavus indistinct; veins and rows of punctures evanescent posteriorly. Membrane scarcely distinct, reaching basal fourth of second abdominal segment. Dorsum of abdomen with a transverse band of nearly obsolete punctures before the middle of each segment. Venter with very fine, very sparse, prostrate hairs in addition to the erect setae; submarginal fossula of third segment small but distinct, transverse, ovoid (23 by 14), scarcely depressed, its surface finely granular, its margins not ciliated. Male clasper (Fig. 5) narrow, sickle-shaped, its tip acute.

Fore femora (Fig. 4) nearly two and one-half times as long on ventral edge as their dorsoventral thickness (123:51); ventral edge distinctly but very obtusely angulate at about the middle, with irregular rows of spinules starting shortly before the angle and continuing nearly to apex; also with six to eight long setae on anteroventral face, about evenly spaced from base to apex, and with several somewhat shorter hairs on the dorsal side. Fore tibia as long as fore femur, its dorsal edge practically straight; tibia as seen from dorsal aspect scarcely or not at all thickened apically; ventral edge as seen from the front rather gradually curved downward from base to middle of tibia, thence straight and parallel with dorsal edge nearly to apex; expanded apical half about one-sixth as deep as the tibia is long (20:123); spongy fossa extending from middle to apex of tibia, its surface parallel to long axis of tibia; basal half of tibia with a row of short setae below, posterior face with a single very long seta near the base. Middle and hind tibiae normal, with several rows of spinules on their distal two-thirds, those on posteroventral face of hind tibiae more numerous and uniform in length.

HOLOTYPE, ♂.—Oceana County, Michigan, Silver Lake State Park, July 26, 1934 (Ada L. Olson and Leonora K. Gloyd).

As noted above, this species differs from all other members of the genus, except *P. fasciventris* Harris, in the structure of the front tibiae.

It seems closely related to *P. fasciventris* but separable by the absence of any red markings, the presence of long hairs on the fore and middle femora and trochanters, and the narrower clasper of the male. At first glance it might be mistaken for *P. fusca* (Stein), but its tibial structure is very different.

The Michigan collection has an early instar nymph of a *Pagasa* which shows nearly the same structure of the front tibia as that found in *P. insperata*, but which possibly may not belong to any of the species named above. It is red above and below, with the dorsal surface of head and prothorax, disk of mesonotum and metanotum (except a percurrent broad transverse band on the latter), an abbreviated transverse fascia on the first abdominal segment, and disk of segments three to seven, both above and below, black; its femora are reddish, the tibiae and antennae yellowish. This nymph was taken on Twelve Mile Road in Oakland County, Michigan, October 23, 1921, by Sherman Moore.

*Nabis (Hoplistoscelis) hubbelli*, new species

(Fig. 6)

BRACHYPTEROUS ♂.—Length 5.00 mm., width of pronotum 0.95 mm., width of abdomen 1.8 mm. Ground color pale brown; an elongated spot on vertex dark brown, as also the median line and other (irregular) markings on pronotum, the entire scutellum, and the abdomen above and below. Posterior lobe of pronotum grayish yellow toward the sides, with a small yellowish spot each side of middle line. Hemelytra and connexivum brownish yellow; corium clouded with dark color along the inner vein and in a curved band across the apex; connexival segments broadly banded with fuscous anteriorly, the dark color narrowly invading the preceding segment in each case. Abdomen above with large, vague yellowish spots which tend to form two longitudinal rows, one on either side of median line, these spots partly concealed beneath the fine prostrate silvery pile which occurs not only on dorsum of abdomen but also on hemelytra, meso- and metapleura, venter, and head behind the eyes. Legs honey yellow; fore and middle femora dotted and barred with pale brownish; hind femora with a subapical brown ring and one or two very faint bands near the middle; fore and middle tibiae faintly banded with brown; hind tibiae embrowned only at base and apex.

Head somewhat longer (from collum to tip of tylus) than its width across eyes (95:82), a little shorter than median length of pronotum (95:108). Ratios of length to width to height of eyes, 36:24:38, each eye about one-fourth narrower than interocular width of vertex (24:33).

Lengths of antennal segments I–IV, 65:108:104:81 (fourth segment mutilated?). Ocelli slightly farther from each other than from eyes (13:11). Second and third rostral segments equally long, each about one-fourth longer than first antennal segment (81:65).

Pronotum a little longer than its basal width (108:95), about one-third narrower in front than behind (63:95); basal margin truncate, lateral margins very feebly sinuate between the lobes; posterior lobe very finely but visibly punctate, especially toward the sides. Hemelytra distinctly less than twice as long as scutellum (65:38), not contiguous behind it, but with their hind margins diverging from its tip, their apices subangularly rounded, barely surpassing base of second abdominal segment. Abdomen ovate, more than two-thirds as wide as long (178:250), much wider than pronotum. Male clasper distinctive (Fig. 6).

Fore femur about four times as long as its greatest depth (144:35); fore tibia about as long as fore femur. Hind tibia with a conspicuous row of uniformly spaced setae on lower side, starting near base and extending almost to apex, these setae longer than the diameter of the tibia.

BRACHYPTEROUS ♀.—Length (allotype) 5.7 mm., (paratype) 5.33 mm., width (allotype) of pronotum 1.06 mm., width of abdomen 2.13 mm. Lengths of antennal segments I–IV (allotype), 65:113:105:119. Length of pronotum 1.13 mm. Fore femur less than four times as long as deep (141:38). Hemelytra about one-half longer than scutellum (76:50). Pale markings of dorsum less evident than in the male; tibiae with only basal and apical infuscation; posterior lobe of pronotum without visible punctures.

HOLOTYPE, ♂.—Allardt, Fentress County, Tennessee, elevation 1600 feet, August 17, 1924. *Allotype*, ♀: same locality, June 14, 1924. *Paratype*, ♀: same locality, August 17, 1924, in my collection. The holotype and the paratype were taken by sweeping sedges and herbage in moist open glades in second-growth upland forest; the allotype was among numerous insects beaten from shrubbery in a bushy pasture bordered by oak-hickory-pine woods. All were collected by T. H. Hubbell.

This is the smallest species of *Nabis* recorded from North America. It has undoubtedly been confused in the past with *Nabis sordidus* Reuter, which it closely resembles; apart from the difference in size, it is distinguished from that species by the form of the hemelytra, the connexival markings, the noticeably shorter antennae, and the form of the male clasper. In all the brachypterous individuals of *N. sordidus* that I have seen, the hemelytra are longer and are contiguous (often

for some distance) behind the scutellum; the fuscous bands anteriorly on the connexival segments do not pass the intersegmental incisures. Mexican specimens of *N. sordidus* before me have the connexival markings reduced to small dark spots in the anterolateral corners of the segments, but Michigan specimens and those from Florida display dark bands extending entirely across the connexivum. The male clasper of *Nabis sordidus* (Fig. 7) has the blade attached to the base by a shaft which is about as long as the blade itself, but the clasper of *Nabis hubbelli* (Fig. 6) has no such shaft, and its blade is attached directly to the base.

## FAMILY PHYMATIDAE

*Macrocephalus vorax*, new species

Length, ♀, 10.5 mm., width of pronotum 3.9 mm., width of abdomen 4.3 mm. Ground color brownish testaceous; head above (except at base), fore coxae (except at base), fore femora (except apical part and dorsal edge), front lobe of pronotum and hind lobe between carinae, connexiva of fourth, fifth, and basal part of sixth abdominal segments, also some small spots on middle and hind femora, dark brownish gray. Body above and below, also middle and hind femora and tibiae, thickly but unevenly covered with minute yellow granules, these somewhat larger on posterior lobe of pronotum, scutellum at level of third abdominal segment, sides of thorax, middle and hind legs, and sides of venter; broad median band on venter smooth, nongranulose.

Head (from tip of antenniferous tubercle to hind margin of granulose part) about one-half longer than its width across eyes (190:123); pre-ocular part somewhat shorter than postocular (65:75). Eyes small, hardly prominent, one-third as wide as dorsal interocular space (25:75), the latter one-fourth narrower than postocular part of head (75:103); eyes, seen from side, higher than long (63:53). Lengths of antennal segments I-IV, 64:31:38:75, their maximum thicknesses 20:15:19:30; third segment thickest near apex, fourth segment thickest at about the apical third, where the granulations end abruptly. Posteroventral margin of head with one or two large dentiform granules.

Pronotum one-fifth shorter than wide (310:392); anterior lobe not much narrowed in front, shorter than posterior lobe (136:174), its greatest width less than half the basal width of posterior lobe (163:392). Anterior lobe rather flat, with a small, deep, oval fovea at center of disk; granulations on anterior lobe tending to form irregular vittae;

lateral margins subcarinate, lightly indented at anterior third; front margin deeply but obtusely sinuate; anterior angles subacute, directed forward. Propleura anteriorly with a tumid longitudinal ridge, visible from above, about midway between acetabulum and dorsolateral margin. Principal carinae of pronotum arising before the hind margin of anterior lobe, crossing the interlobular sulcus, and curving outward and backward across posterior lobe to end at the posterior angles. Posterior lobe transversely rugulose on disk between carinae, and with a deep triangular impression outside the carina just before the hind margin, the impression distinctly punctate but not granulose; anterolateral margins of hind lobe strongly oblique, very lightly sinuate; humeral angles almost rectangularly notched, the tips not acute; posterolateral margins short, straight; hind margin lightly convex before the scutellum.

Scutellum about twice as long as its maximum width (571:283), its surface uneven, the slight depressions lightly punctate, not granulose like the rest of the surface; basal sixth of scutellum depressed on either side of a broad, rounded, median ridge which is nearly one-fifth as wide as the scutellum at this level (54:245), and with an oblique inclined ridge running outward and downward at each side from base of scutellum to end on floor of the depressed area, this area very distinctly punctate. Scutellum without trace of basal callosity or of median carina, but with a narrow, median, longitudinal smooth line, free from granulations but not at all elevated, extending from posterior part of basal median ridge to apex of scutellum. Sides of scutellum not strongly sinuate near base.

Connexivum widened from its base to apex of third abdominal segment, thence narrowed to the sixth segment, where it disappears beneath the scutellum, its greatest exposed width one-fourth (71:283) that of the scutellum at same level; all visible segments longer than wide, their apical angles lightly prominent and marked with fuscous on the hind margin, angles of the first two segments subnodose; first two incisures curved forward outwardly, the others straight. Connexiva of the second and third segments with larger, whiter, more closely set granules than the others.

Prosternal carina high, truncate apically, its anterior edge almost vertical, the margin strongly granulose. Fore coxae somewhat granulose; fore femora two and one-half times as long as thick, smooth except for a few widely spaced setigerous granules on dorsal margin. Middle femora densely granulose; ventral side with some setigerous granules and with two or three larger, dentiform granules before the apex. Hind

femora pale, with two or three fuscous spots; granules of lower side becoming larger and more dentiform toward apex, some of them setigerous. Middle and hind tibiae with a conspicuous apical brush of moderately long hairs beneath, the middle ones pilose below on the basal half; hind tibiae thickened at the middle and constricted at the apical fifth, just before the apical brush, and densely pilose beneath on their apical two-thirds. Middle tarsi about one-sixth shorter than their tibiae (103:120); hind tarsi nearly one-fourth shorter than hind tibiae (103:133).

All pleura densely and finely granulose; venter finely granulose toward the sides, more coarsely so toward the center, segments three to seven with a broad, smooth, median band free from granules; all ventral segments with their hind margins concave except the last, which is truncate or lightly convex before the genital segment; seventh segment very little shorter on the median line than fifth and sixth segments together (109:114). Depressed oval sides of female genital plates granulose, the triangular median part smooth, subshining; anal lid granulated along the edges and with a few granules on its somewhat tumid disk.

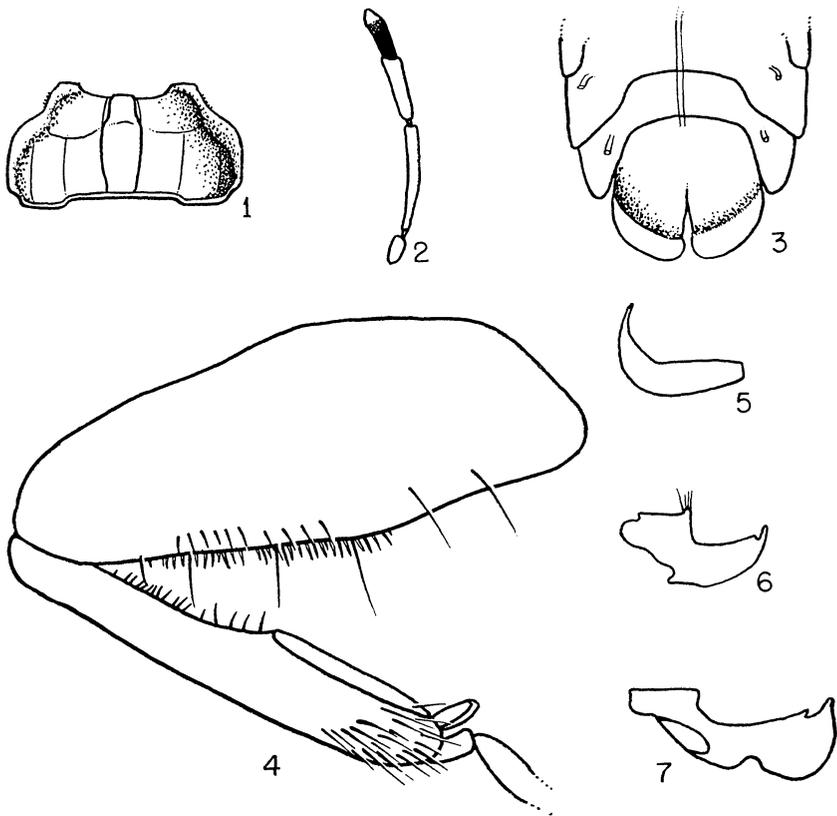
HOLOTYPE, ♀.—Tela, Guaimas District, Honduras, May 9, 1923 (T. H. Hubbell). The T-shaped elevation at the anterior end of the scutellum, dividing the depressed basal part into two lateral parts, appears to be peculiar to this species. *M. vorax* is about as long as *M. notatus* Westwood, but is somewhat more slender, with the connexiva less widely expanded. The outline of the pronotum is quite similar to that of *M. notatus*, but the anterolateral margin of the hind lobe is straight instead of convex behind the sinus, and the carinae are continued to the hind margin as dense bands of white granules. Other characters which differentiate this species from *M. notatus* are: the presence of abundant granulations on the body, the less strongly sinuate margins of the scutellum near the base, and the absence of reticulate punctuation on thorax and scutellum.

In Handlirsch's key (1897:182), this species runs to *Macrocephalus crassimanus* (Fabr.), from which it is at once distinguishable by the granulations of the body, the shorter and thicker head, the form of the prothorax with emarginate humeral angles, the coloration, and other characters.

#### FAMILY REDUVIIDAE

*Zelus (Pindus) angustatus* Hussey.—The antennae of the female holotype were incorrectly described both in my original description (1925:

66) and in Blatchley's redescription (1926:572) of this specimen. Re-measurement of the type gives the proportionate lengths of segments I-IV as 729:190:598:201, the first segment being nearly four times as



FIGS. 1-3. *Aradus subruficeps*, new species. Fig. 1, pronotum. Fig. 2, antenna. Fig. 3, apex of male abdomen, ventral aspect.

FIGS. 4-5. *Pagasa (Parapagasa) insperata*, new species. Fig. 4, fore femur and tibia, inner (anterior) aspect. Fig. 5, male paramere.

FIG. 6. *Nabis (Hoplistoscelis) hubbelli*, new species. Male paramere.

FIG. 7. *Nabis (Hoplistoscelis) sordidus* Reuter. Male paramere of specimen from Berrien County, Michigan.

long as the second, and about one-third longer than the combined length of head and pronotum (729:533).

The University of Michigan collection now contains four males which I assign to this species. One of them, here designated as male plesiotype

of the species, was collected at Monticello, Jefferson County, Florida, June 3, 1932, by F. W. Walker. It is 12.6 mm. long and 2.0 mm. wide across the pronotum. The proportions of antennal segments I-IV are 571:172:500:141, the first segment being a little less than one-fifth longer than head and pronotum combined (571:481), and three and one-third times as long as the second segment. The third segment is distinctly thicker at its base than the second and gradually becomes thinner throughout its length. The margin of the male hypopygium is produced in a short triangle at the middle, and this process in turn bears a short, blunt median tubercle, directed upward and somewhat forward.

The other three males in the Michigan collection are from the "Big Scrub," 10 miles southwest of Ocala, Marion County, Florida, and were taken September 3, 1938, by T. H. Hubbell and J. J. Friauf. Their lengths range from 10.5 to 11.8 mm., and their widths from 1.6 to 1.9 mm. Their ground color is distinctly reddish, with the basal half or more of the second antennal segment sometimes yellowish. These specimens are only sparsely tomentose, and they do not show the conspicuously pale calloused thickening of the apical vein of the corium at either side of its union with the vein that separates the cells of the membrane. On one of them the tubercles of the posterior pronotal lobe are very small and inconspicuous.

In both sexes the front femora, measured on the ventral edge, are distinctly shorter than the hind ones (533:615, ♂; 593:664, ♀). This is at variance with the diagnostic characters which Stål (1872:67-70) and more recent writers have employed for the genus *Zelus*, but the very long second segment of the rostrum makes it impossible to place this species elsewhere.

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