ARTICLE XX.—THE GENUS SCAPHOIDEUS.*

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The genus *Scaphoideus* was founded by Uhler in 1889, and made at that time to include the *immistus* of Say, and the newly described species *intricatus*, *jucundus*, and *consors*. During the same year Provancher described *auronitens*, and the number has been further increased by descriptions by Van Duzee and the writer.

As material is in hand for the characterization of several new forms, it seems a suitable time to bring together a short resumé of the species heretofore described, and attempt a synopsis that shall indicate the affinities in the group. Doubtless additional species will come to light, but it is believed that a sufficient number are in hand to give a basis for a natural grouping, and to indicate the character of the fauna in the genus.

The generic characters, as given by Uhler, are "Form of Phlepsius lacerdæ Sigt. Head triangular, flat above, vertex almost as long as the width between the eyes, subacuminate at tip, the base deeply sinuated; front longer than wide, deltoid, with the sides near the tip moderately curved, tylus liguliform; cheeks broad, curved, expanded to behind the middle of the eye, acutely tapering at tip and hardly enclosing the entire lora, the lora diagonal, acute at each end. Antennæ long and slender. Pronotum sublunate, more curved anteriorly than sinuated posteriorly. Wing-covers moderately narrow, longer than the abdomen, curved, valvate, the costal areole long, narrow, destitute of cross veins, followed by a gradually widening cell, beyond this are four apical cells of large size and mostly broad triangular figure; wings with the two apical middle areoles long and narrow, narrowing at base towards the cross-vein. Abdomen moderately long and narrow."

As so defined the genus may include species which approach quite closely to *Deltocephalus*, or, as suggested by

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Uhler, to *Platymetopius* of the forms with short vertex. Indeed it seems probable that the genus is an offshoot of *Deltocephalus*, which view is further strengthened by the fact that it is strictly American in its distribution, and has a much more restricted distribution than Deltocephalus.

On the other hand some of the species show affinities with *Paramesus*, *Eutettix*, and *Phlepsius*.

As used in this paper the characters of most importance are the deeply sinuate occiput, the long antennæ, the large loræ, approximate to margin of cheeks (except in *sanctus* group), the narrow vertex, the width and length of which are usually about equal, and the recurved nodal or costal veins. The clypeus is usually widened at tip, and for the more typical members of the genus the outer ante-apical cell is narrowed behind, becoming pointed, and, in some species, stylate.

The characters found to be most available in separating the species are in the genitalia, the elytral veins, especially those of the nodal region, and the shape of the vertex. The latter are perhaps most constant, and have been relied on where other characters have seemed too variable to afford definite results. The separations into the principal divisions are easily made, and the affinities indicated seem well fixed. Not so much can be said regarding the minor divisions, especially the species grouped together in the *immistus* division. The use of the claval veins, though affording the best basis apparent in material in hand, may be found insufficient in larger series. It is hoped that they may at least serve a useful purpose in facilitating the recognition of several species, the precise limits of which are rather difficult to define.

It appears to me that the affinities of the genus are more nearly with Deltocephalus and Platymetopius than with the *Athysanini* of Van Duzee, for while the second cross vein is usually wanting, the eyes are placed near together, so the vertex is but little wider than long, and in some cases even longer than wide.

The species occur in wooded places, and probably occur for the most part on trees or shrubs, as those species for which

any record of food plant is given include Cratægus, oak, grape, spice bush, witch hazel, etc., but in very few cases have food plants been carefully determined, especially for the larvæ.

I have had for study collections from the National Museum, the Iowa State College, and some fine series of specimens from Mr. E. D. Ball, Mr. E. P. Van Duzee, Mr. Otto Heideman, and Prof. R. H. Pettit, for all of which I take the opportunity to express my obligations. This, with the material in my own and the Ohio State University collections, forms an aggregation of several hundred specimens.

The genus is strictly American, and the more typical members, *immistus* and allies, are found mainly east of the Rocky Mountains; *scalaris* and allies cover a wider range, and with *fasciatus* extends the range of the genus into subtropical region.

SYNOPSIS OF THE SPECIES.

A Loræ remote from the margin of the cheeks; common elytral picture cruciate; claval vein straight, meeting suture at acute angle.
  a Face with two dark fasciæ, beside frontal arcs, vertex obtuse.
    b Length 4mm. vertex obtuse ..... *fasciatus* n. sp.
    bb Length 5mm. vertex subacute ..... *sanctus* Say
  aa Face yellow without cross bands, vertex acute.... *picturatus* Osb.
AA Loræ contiguous to, or merging with, border of cheeks, elytral picture not cruciate, outer claval vein curved or hooked at distal end.
  a post nodal cell slightly widened posteriorly, outer ante-apical cell with nearly parallel sides, nodal vein or veins not reflexed.
    b Post-nodal cell without cross veins, ♂ plates prolonged into long flaccid or filamentous tips.
      c Nodal vein arising from discal cell..... *auronitens* Prov.
      cc Nodal vein arising from ante-apical cell.
        d Vertex flat with transverse impressed line, edges acute..... *jucundus* Uhl.
        dd Vertex convex, no impressed line, edges rounded.
          e Vertex wider than long, obtuse or rounded.
            f Vertex sub-acute, size large..... *consors* Uhl.
            ff Vertex obtuse or rounded, size small.. *mexicanus* n. sp.
          ee Vertex as long or longer than wide, acute.. *scalaris* Van D.
    bb Post-nodal and costal cells with cross veinlets, elytra with numerous ramose lines in the cells ..... *lobatus* Van D.
  aa Post-nodal cell much widened at distal end, outer anteapical narrowed posteriorly acute or stylate, ♂ plates not prolonged in flaccid tips.

b Outer claval not strongly hooked at distal end; cross nervure to claval suture indistinct or wanting.
  c Outer claval sinuate approaching inner near its middle.
    d Light ochreous, ♀ ultimate ventral segment truncate or slightly notched..... .....*ochraceus* Osb.
    dd Marked with fuscous, ♀ ultimate ventral segment produced..... .*productus* n. sp.
  cc Outer claval nearly straight and parallel to inner, curved at tip.
    d ♀ ultimate ventral segment carinate toothed at middle, *carinatus* n. sp.
    dd ♀ ultimate ventral segment not carinate or toothed.
      e Head and pronotum ivory white or yellowish, *intricatus* Uhl.
      ee Head and pronotum with darker areas luteous or fulvous, *luteolus* Van D.
bb Outer claval strongly hooked at distal end usually with distinct cross nervure from outer claval to claval suture.
  c No distinct cross vein between claval veins; colors gray or brown marked with fuscous .....*immistus* Say
  cc Usually a distinct cross vein between the clavals.
    d Outer claval approximating claval suture posteriorly; face black.....*melanotus* n. sp.
    dd Outer claval remote from claval suture posteriorly.
      e Vertex obtusely angulate; apex of elytra fuscous or black, *obtusus* n. sp.
      ee Vertex more produced, sub acute; elytra entirely gray, *cinerosus* n. sp.

SCAPHOIDEUS FASCIATUS n. sp. (Plate X, Fig. 1).

Elytral picture similar to that of *sanctus* and *picturatus*. Face with two conspicuous transverse fuscous bands continued on sides. Length to tip of elytra, ♀ and ♂ 4 mm.

Vertex impressed, rounded in front, the margin obtuse, length three fourths of width, space between eyes and eye on pronotum equal; front at apex equaling base of clypeus; clypeus elongate, scarcely widened at tip; loræ distant from margin of cheeks, oval, the border touching clypeus and front, evenly but slightly convex. Pronotum very convex in front, truncate behind, lateral margins very short. Elytra with narrow appendix, the post-nodal cell widening rather sharply behind.

Color: Vertex white, two dark points near apex and two lighter quadrate or transverse fuscous spots midway from

base to apex. Face white, two marginal bands above and two broad fuscous fascia across, one including antennal pits and continued below eyes across pleural pieces of thorax, the other including apical half of clypeus, lower part of cheeks and continued on anterior coxae. Pronotum white with faint infuscation, scutellum white, basal angles dark; elytra when closed with a common fuscous cruciate mark as in *sanctus*, but the hinder bars extend only to the middle of the disk, from whence a fuscous band runs to the suture at apex of clavus, the entire cross bordered with dark fuscous or black; the white base of the clavus parallels the edge of the scutellum, a white bar crosses the clavus obliquely near tip, and hyaline discal and apical spots are bordered with white; post-nodal and two or three apical cells fuscous. Beneath whitish ventral segments bordered with fuscous, and with a fuscous median line.

Genitalia: ♀ last ventral segment concavely excavated; pygofer and ovipositor short, pygofer embrowned at base. ♂ valve short; plates oval, short, half as long as pygofer, bluntly rounded at apex with a discal brown fascia.

Four specimens from Port au Prince, Haiti, through the kindness of Mr. E. D. Ball. One specimen ♂, Frontera, Mexico (C. H. T. Townsend) is also referred here.

While the material in hand presents differences that have been thought sufficient to separate this form from the *sanctus* Say as referred by Van Duzee, it is possible that additional material may connect them, when the range of the species would cover the Gulf States, Atlantic coast of Mexico, and West Indies. However, the vertex is much more obtuse than in Florida specimens, especially of males, and the size averages much smaller.

SCAPHOIDEUS SANCTUS Say.

Jassus sanctus Say. Jour. Acad. Nat. Sci. Phila., Vol. VI., p. 306 (1831).
Complete writings ed. by Le Conte, Vol. II. p. 383 (1869).
Walker, Homop. Vol. IV. p. 1164 (1852).
Scaphoideus sanctus, Van Duzee. Cat. Trans. Am. Ent. Soc., Vol. XXI., p. 300.

"5. J. sanctus—Hemelytra white, with a common brown cruciate mark. Inhabits Indiana. Body yellowish white;

head sub-acute, with two minute fuscous points near the tip, and an undulated line on the anterior edge; thorax dusky across the middle; hemelytra white, somewhat opalescent, with a common large cruciform mark on the middle composed of brownish spots with blackish edges, and including a whitish common spot; tip with large spots; venter with a dusky band and small lateral spots; feet immaculate. Length to tip of hemelytra nearly one-fifth of an inch." (Say.)

The form which Van Duzee has referred to *sanctus* Say occurs in Florida, Mississippi, and Texas, but I know of no specimens from the latitude of Indiana, the type locality. The specimens which formed the basis of Van Duzee's reference agree in most respects with Say's description, but possess two dark fasciæ across the face, a point not mentioned in Say's description. There are also fuscous annulations on the legs, which would seem to be excluded by the "feet immaculate" of Say's description. On the other hand my *picturatus* occurring nearer the type locality agrees very well in these respects, but has the vertex entirely too prominent and sharp to be called "sub-acute." It seems, therefore, the better plan to follow Van Duzee's reference until sufficient material is available to determine positively that it should be changed. A change, if not supported by future collecting in the type locality of Say's species, would only add greater confusion, which should be avoided if possible.

The specimens of this form in hand, and which include the Florida specimen of Van Duzee's reference, have the head sub-acute with four distinct transverse spots on the vertex behind the transverse impression, and in some there is a trace of a minute pair of apical dots. The band on prothorax is finely transversely irrorate in female, and broken into four oval black spots in the male. The last ventral segment of female is very short, bisinuate, and with an elevated polished black area at middle. The male vertex is slightly more produced, and the genital valve is very small, oval, the plates short and oval with a dark submargin. As compared with the Haitian species, *fasciatus*, the vertex is much more acute, and the marks on head and pronotum more distinct. Specimens from Texas show some tendency to vary between

these forms, and it is possible intergrades may be found in the Mexican fauna.

One specimen from Florida in the Van Duzee collection, three from Texas, collected by Aaron, in collection of Iowa State College, one male from Florida from Prof. H. A. Gossard, and one male from Jacksonville, Fla., from Mr. Heidemann, represent the material in hand.

SCAPHOIDEUS PICTURATUS Osborn (Plate IX, Fig. I)

Scaphoideus picturatus Osb. Proc. Iowa Acad. Sci., V., p. 243 (1898).

Color pattern very similar to *sanctus*. Head more sharply angular, reflexed veins less oblique or indistinct. Length to tips of elytra, female 5 mm., male 4 mm.

Vertex sharply angulate at the tip, as long as width between the eyes, and nearly twice as long at middle as next eye. Front very slightly widening next antennæ, tapering uniformly to base of clypeus; clypeus with sides parallel, base and apex convex; loræ small, suboval; genæ roundingly angulate below the eyes. Pronotum sharply arcuate in front, truncate behind, lateral margin extremely short; scutellum small, the elytra with the post-nodal veinlets irregular, the first either absent or not reflexed, the second strongly reflexed, the middle and inner anteapical cells with distinct or obsolete cross nervures.

Color: Vertex, anterior part of pronotum, scutellum, face, pectus, venter and margin of abdomen above, yellow or greenish-yellow; two minute points next each eye, two short oblique lines near tip, and a very slender median line on vertex, three or four strongly curved arcs on the front, the margins of the olivaceous areas, an oblique band near the tip, and a submarginal border on the elytra, fuscous. The elytra are fusco-olivaceous, interrupted with ivory white as follows; a broad oblique band on the base of corium and clavus paralleling the sides of the scutellum, a discal spot at forking of the first sector, a commisural spot and a broad band across the base of the anteapical cells. The nervures are white on the white portions and also in the fuscous part at apex.

Genitalia: Female, ultimate ventral segment short, slightly notched on the median line; pygofers thickly set towards tip

with rather fine bristles; male, valve small; plates long, tapering gradually to the obtuse tip, exceeding the short pygofers. Both plates and pygofers are finely ciliate with pale hairs.

One female was received from Prof. H. Garman, Lexington, Ky., and one male was collected at Burlington, Iowa, September 5, 1897. Specimens are in hand from St. Louis, Mo., and West Virginia.

I have noted under *sanctus* the possibility that this form, since it comes nearer the type locality and agrees better in some points, may in reality be the form to which Say's description applies.

SCAPHOIDEUS AURONITENS Prov. (Plate X, Fig. 2).

Scaphoideus auronitens Provancher. Petite Faune Canadienne, III, p. 277 (1889)
Van Duzee Catalogue. Trans. Am. Ent. Soc., XXI., p. 301.
Osborn and Ball. Proc. Ia. Acad. Sci., IV., p. 232 (record).

Nodal vein arising from discal cell. Last ventral segment of female deeply cleft. Length to tip of elytra, ♀, 4.50–5 mm; ♂, 4.50 mm.

Vertex slightly wider than long, sub-acute. Front narrowing uniformly, clypeus long, loræ reaching margin of cheeks. Nodal vein arising usually well in front of outer anteapical cell and from the discal cell.

Color light yellow, the vertex and front margin of pronotum with prominent orange red transverse spots. A short transverse line and a broader line parallel to margin on upper margin of vertex, black.

Genitalia: Last ventral segment of female cleft to near its base, each lobe long, rounded at tip; pygofer scarcely exceeded by the ovipositor with short, brown bristles. Male valve small, short, plates elongate triangular, an impressed line parallel to outer margin, and with a long, slender filament finely ciliated reaching far beyond tip of pygofers.

This species was described from Canada, and Van Duzee gives Canada, New York, and Mississippi for its distribution. It occurs abundantly at Ames, Iowa, during July and August, and I have it from Columbus, Ohio. Specimens are also in hand from Washington, D. C. (Heidemann), so that it may be expected to occur generally from Canada to the gulf, and

west to the plains region. It is a well marked species, and apparently subject to very little variation. While in some respects similar to *jucundus*, and apparently referred to by Uhler as a variety of that species, the striking orange marks, the deeply cleft female segment, and the point of origin of the nodal vein make it easily separable.

SCAPHOIDEUS JUCUNDUS Uhler

(Plate IX, Fig. 2; Plate X, Fig. 3),

Scaphoideus jucundus Uhler. Trans. Md. Acad. Sci., I, p. 34 (1889), Van Duzee, Can. Ent. XXI, p. 11, 1889 (mention).
Van Duzee. Trans. Am. Ent. Soc., XXI, p. 300.

Fulvous, elytra with numerous milky oval spots. Nodal vein arising from the anteapical cell. Length to tip of elytra, ♀, 6–6.25 mm., ♂, 5–5.25 mm.

Vertex flat, slightly depressed, acute, edges thin; front narrowing uniformly to clypeus. Elytra with claval veins but slightly curved apically, and the transverse vein between outer claval and claval suture indistinct.

Color: Head, thorax and elytra rich, tawny yellow, a central line on vertex, on pronotum, and oval spots on elytra, milky white. An obscure line bordering anterior margin of vertex, and a more distinct one bordering the upper margin of front, black.

Genitalia: ♀, last ventral segment longer at middle than at sides, nearly uniformly curved; pygofers short, with scattered brown bristles a little thicker toward the tip. ♂, valve narrow, short; plates slender, acuminate, about half as long as pygofers, with flaccid prolongations which reach about to tip of pygofers.

Uhler does not state locality, but his description was probably from specimens collected in Maryland. Van Duzee gives records for Canada and New York. It was taken abundantly at Ames, Iowa, in August and July. Specimens in hand from the National Museum are marked "St. Agnes," "Sept.," "Oct.," and "Nov.," on "Oak." One from Washington, D. C., Oct. (Heidemann).

The vividly colored variety mentioned by Uhler would seem to correspond with *auronitens* Prov., the different structural characters of which have been noted.

SCAPHOIDEUS CONSORS Uhler. (Plate X, Fig. 4).

Scaphoideus consors Uhler. Trans. Md. Acad. Sci., I, p. 36 (1889), Van Duzee, Catalogue Jassoidea, Trans. Am. Ent. Soc., Vol. XXI, p. 300.

Ochreous brown, marked with white and fuscous. Vertex wider than long, angulate. Length to tip of elytra 5.25–5.75 mm.

Head rather obtusely angulate in front; vertex, length five-sixths of width, front with sides nearly parallel, narrowing sharply to apex; clypeus widening at tip; loræ broad, outer border semi-circular, reaching to or merging with border of cheek. Nodal vein of elytra arising from outer anteapical cell.

Color: "Dull, pale, clay brown inscribed with white and fuscous."

Genitalia: ♀, last ventral segment long, hind margin sinuate, scarcely notched at center, lateral angles rounded; pygofers moderately robust, with light brown bristles scattered over the surface, and more numerous near tip.

Specimens referred to this species are in hand from New York (Southwick), Washington, D. C. (Mally), and from National Museum, "Relay Station, Md.," and "Texas (Belfrage)."

While it is difficult to locate very positive characters, there seems to be, as stated by Van Duzee, sufficient reason to separate it from *scalaris*. However, my material of typical *consors*, or of specimens that would show its affinities with other forms, is too scanty to permit of definite conclusions.

Var. unicolor. n. var. (Plate X, Fig. 5, 5*a*), similar in size and shape to *consors*, but of a dense brown color with markings nearly or entirely obliterated. Face uniform brown, pectus and venter dark brown or fuscous. Ocelli red. Elytra dark brown, nodal vein broadly and densely marked with fuscous. The last ventral segment of female is shorter, more truncate, and the pygofers short, more robust, and bristles confined more to margin and tip. The ♂ valve is large, rather narrow, plates elongate triangular, outer margin slightly convex, the flaccid tips rufous and reaching to beyond tip of pygofers.

One specimen, Berkeley Springs, W. Va., and three, Decatur, Ala., received from Mr. E. D. Ball.

The specimens in hand taken alone might be considered a distinct species, but while there is a decided difference in genitalia from what I conceive to be typical *consors*, the shape of the head, and the probability that absence of markings is due to suffusion of color, makes it seem best to consider it, for the present at least, as a variety.

SCAPHOIDEUS MEXICANUS n. sp. (Plate X, Fig. 6, 6a, 6b.)

Resembles *scalaris*, but with vertex more rounded in front and the genitalia elongate. Length to tip of elytra ♀, 5.25 mm; ♂ 5 mm.

Vertex wider than long, length five-sixths of width, rounded in front, and margins rounded over to cheeks. Front narrow; clypeus elongate and widened at tip; loræ long, reaching almost to margin of cheek. Pronotum wide, twice as wide as long, lateral margin rather short, rounded, hind margin truncate or scarcely emarginate. Clavus with cross veins from the outer vein to claval suture conspicuous, apical ends of the claval veins distinctly bent, nodal vein arising from outer anteapical cell.

Color and markings like *scalaris;* vertex yellow with fuscous lines in front and two rather prominent spots near center, curved light bands less distinct than in *scalaris;* front yellowish with suture and the semi-arcs of front fuscous. Elytra subhyaline with elongate whitish spots on clavus, discal and inner anteapical, which alternate with fuscous fasciæ. Apical cells with fuscous spots and margin.

Genitalia: ♀, last ventral segment long, lateral angles rounded, apex truncate; pygofers long, slender, a few light bristles along the margins, and larger darker ones near the tip. ♂, valve short but distinct, hind border with obtuse process at center; plates narrow, elongate, triangular, outer border straight, reaching about three-fourths the length of the pygofers before becoming flaccid, the flaccid tips extending beyond the tip of pygofer.

Four specimens collected at Orizaba Mex. (H. O.), January, 1892, and one specimen Frontera, Tobasco, Mex. (Townsend).

In shape of vertex this comes nearer *consors*, but in other points it more closely resembles *scalaris*. *Consors*, *scalaris*, this form, and the var. *unicolor* of *consors* form a closely related

group, and very likely may prove to be geographical forms. This may be determined by comparisons of full series of material for the intermediate territory or by breeding, but until so proven it will be more satisfactory to retain their distinctions.

SCAPHOIDEUS SCALARIS VanDuzee. (Plate X, Fig. 7, 7a, 7b).

Scaphoideus scalaris VanDuzee. Entomologica Americana, VI, p. 51, 1890. Catalogue Trans. Am. Ent. Soc., XXI., p. 300. Osborn & Ball. Proc. Iowa Acad. Sci., IV, 232 (Record).

More slender than *consors*, vertex as long or longer than wide, apex prominent, though obtuse at tip. Length to tip of elytra 5 mm.

Vertex long; as long as width, and in some cases one-fifth longer; front narrow, sides nearly straight and parallel; clypeus widening gradually to tip; loræ long, reaching margin of cheek. Pronotum half as long as wide, hind border slightly concave. Cross veins between outer claval and suture obscure.

Color, light testaceous, intricately marked with fuscous, ocelli white.

Genitalia: ♀, last ventral segment long, narrowed toward tip, lateral angles rounded, apex truncate or slightly excised; pygofer rather broad at base. ♂, valve very small or hidden, plates slender, triangular, reaching to middle of pygofers, their flaccid tips ciliate at end and reaching to tip of pygofers.

A very abundant species in Iowa and west to the Pacific coast. Numerous specimens collected at Ames, Iowa, July, August, September and October. One Burlington, Iowa. One Columbus, Ohio; Phoenix, Ariz., May 9, Mex., Pullman, Wash. (from E. D. Ball), California (VanDuzee), Los Angeles, Cal. (Coquillett), Santa Cruz, Cal. (Koebele), Clinic Mts., Ariz. (Hubbard).

While there appear to be some slight variations, I am unable to fix upon any distinctive and permanent character to separate the representatives from Mississippi valley and Pacific region. The specimens from Pullman, Wash., are a little larger, and, perhaps, more brightly marked than the average from Pacific coast, but not more so than many individuals that can be selected either from California or Iowa.

SCAPHOIDEUS LOBATUS VanDuzee. (Plate X, Fix. 8.)

Scaphoideus lobatus VanDuzee. Bul. Buffalo Soc. Nat. Hist, V, No. 4, p. 211 (1894).

Catalogue Trans. Am. Ent. Soc., XXI, p. 300.

Osborn & Ball. Proc. Iowa Acad. Sci., IV, p. 232 (Record).

Light yellow or white, with black spots and lines. Length, ♀, 6 mm.

Vertex considerably wider than long, very obtusely angulated in front, with scattered black, dark spots, the marginal line broken into spots, or forming a curved line on either side. Costal cell with numerous dark cross veinlets.

Genitalia: ♀, last ventral segment long at middle, nearly truncate, very slightly notched. ♂, valve "small, brown; plates narrow, their slender recurved tips brown and fringed with long white hairs."

This species was described from two specimens from Lancaster, N. Y., and two from New York City. It was taken at Ames, Iowa, by Mr. E. D. Ball, August 7, 1897, and August 13, 1897. I have one specimen from Madison, N. J., taken August 6, 1898, and one from Mr. VanDuzee, taken at Gowanda, N. Y., August 18, 1898.

This species occupies a position by itself, and appears to have affinities with either Eutettix or Paramesus. The postnodal cell is narrow, and the presence of cross veinlets in the costal cell are exceptional. However, the shape of vertex and front scarcely permit its reference to a different genus, unless one be created for its reception.

SCAPHOIDEUS OCHRACEUS Osborn. (Plate IX, Fig 3.)

Scaphoideus ochraceus Osborn. Proc. Iowa Acad. Sci., V, p. 242, 1898.

Tawny ochraceous and pallid with most of the elytral nervures fuscous. Length to tip of elytra, ♀ 6 mm., ♂ 5 mm.

Vertex as long as width between the eyes, nearly as long as pronotum, the margin angularly rounded; front, narrow; margins slightly concave next the antennæ, tapering uniformly to base of clypeus, which it equals in width. Clypeus twice as long as width at base, broadening to the apex, which is distinctly truncate; loræ oval, sub-angulate at tips, twice as long as wide; genæ broad, slightly concave below eyes

and sub-angulate on margin, forming a narrow margin below loræ. Elytra with costal veinlets very oblique, as in *immistus*, the first originating at or just in front of the transverse veinlet; the second near the middle of the outer anteapical cell; the third at the end of the anteapical cell, but not touching the apical veinlet. In one specimen an extra oblique vein occurs between first and second. Claval vein curved, no cross vein to suture.

Color: Vertex yellow with a broad ochraceous or ochraceous-rufus band across the disk, the median portion forming a short curve and reaching the width of the band toward the apex, sometimes almost interrupted; pronotum with two large spots on the anterior margin near the middle; the posterior half, except narrow median line, two large lateral spots and a slightly fainter median stripe, a wide border to nearly all the nervures and the apex of elytra, ochraceous; a spot at end of inner claval nerve, a short line at end of outer claval nerve, an elongate spot at end of clavus, a spot in inner discal area, interrupted lines on the nervures most conspicuous on the reflexed veinlets and next the costa and a subapical border, fuscous; the elytral cells whitish hyaline.

Genitalia: ♀, ultimate ventral segment long, the posterior border straight or very slightly produced at the middle. Pygofers full, polished, with marginal and terminal bristles, the latter strong; ♂, valve very short, transverse; plates broad, roundingly narrowing to obtuse tip with weak marginal bristles; pygofers rather broad, extending half their length beyond the plates and set with long, stiff bristles.

Collected at Ames, Iowa, from July 29 to August 13.

Specimens have also been examined from Gowanda, N. Y. (VanDuzee) and western Pennsylvania (Wirtner).

While this species has the general color of *jucundus* it differs from that species very distinctly in the oblique reflexed veinlets, and in having the transverse band on the vertex, instead of the two parallel spots. From *immistus*, *intricatus*, and *luteolus*, which it resembles in venation, it differs in color and size.

SCAPHOIDEUS PRODUCTUS n. sp. (Plate X, Fig. 9, 9 a, 9 b.)

Gray brown, vertex with heavy fuscous crossband produced

at center. Female ventral segment produced. Length: ♀, 6 mm.; ♂, 5.50 mm. to tip of elytra.

Vertex rather acute, its length nearly equal to its width, front with margins slightly sinuous, apex narrowing slightly but abruptly to clypeus, clypeus narrow, widening abruptly at apex; loræ narrower than in *carinatus*, touching margin of cheek. Pronotum lunate, hind border slightly concave. Elytra with claval veins strongly curved at tip, outer anteapical cell pointed, scarcely stylate, usually three recurved veins arising from anterior part of anteapical cell.

Color: Vertex yellowish, a broad fuscous band produced at middle to nearly meet the broken marginal band and shading to light brown posteriorly; face dark above, lighter on lower half; the marginal band, and submarginal arc black, the frontal semi-arcs fuscous and lower part of front lighter, the cheeks under antennæ and the apices of loræ fuscous, as also the sutures; pronotum yellowish, with fuscous lateral patches; elytra whitish or hyaline, with fulvous areas on discal and apical cells, and fuscous patches on clavus inner discal cell, on nodal and apical veins and apical submargin.

Genitalia: ♀, last ventral segment long, produced at middle, lateral angles rounded, pygofers reaching about to tip of ovipositor, with a patch of black bristles near tip and whitish bristles near middle; ♂, valve short; plates broad short, obliquely truncate, flat, lateral margin reflexed, less than half the length of the large pygofers.

Described from seven ♀s and two ♂s of which three females were taken at Ames, Iowa, August 3, 1896, August 7, 1897, and October 14, 1896. One at Sioux City, July 7, 1897. Three ♀s and one ♂ Onaga Kans. (Crevecour) and one ♂ from Kentucky (Garman).

While this species approaches *carinatus* in size and general appearance, it is quite distinct from it in the genitalia, and also differs in the shape and markings on vertex and clavus.

SCAPHOIDEUS CARINATUS n. sp. (Plate X, Fig. 10, 10 a, 10 b.)

Large, light gray with a heavy cross band on vertex; last ventral segment of female, with a strong carina and projecting tooth. Length: ♀, 6.50 mm. to tip of elytra.

Vertex subangulate. Length, five-sixths of width, one-half longer at middle than next the eye; front narrow, margins nearly straight; clypeus widening at tip; loræ large, broad, scarcely reaching border of cheeks; pronotum a little more than twice as wide as long, the hind border scarcely emarginate; elytra broad, the cross vein between outer claval vein and suture obsolete, first anteapical triangular, pointed behind, scarcely stylate.

Color: Dark gray for head and prothorax, light gray for elytra; vertex with a conspicuous transverse fuscous band projected forward at middle, and a heavy fuscous line parallel to the anterior margin each side; face whitish with fuscous borders to the sutures; pronotum grayish brown with fuscous spots; elytra whitish, with fuscous veins, the nodal and apical broadly bordered, the claval veins at the strong apical curve crossed by a dark dash, the apex fulvous with a broad marginal fuscous border; legs whitish, with anterior femora blackish, and the usual points on posterior tibiæ and tarsi; abdomen whitish, with blackish washes on segments.

Genitalia: Last ventral segment of ♀ broad, with a strong carina on median line produced into a sharp spur beyond the hind margin.

This large and quite distinct species apparently belongs to the eastern part of the country, as of the three specimens, all of which are females; one is from Hanover, N. H. (C. M. Weed); one from New Jersey (C. W. Johnson); and one from Hamburg, N. Y. (E. P. VanDuzee), the last collected July 31, 1898.

SCAPHOIDEUS INTRICATUS Uhler.

Scaphoideus intricatus Uhler. Trans. Md. Acad. Sci., I, p. 34, 1889.

VanDuzee Catalogue, Trans. Am. Ent. Soc., XXI, p. 300, 1894.

Osborn and Ball. Proc. Iowa Acad. Sci., IV, 232 (Record).

Vertex scarcely as wide as long, with very faint transverse band and marginal line. Beneath white, except a series of dots on lateral margin of abdomen and a central patch on last ventral segment of female.

♀, last ventral segment truncate; pygofers rather long with small dusky patches near the tip each side, a few small

scattered white bristles, sometimes embrowned; coxæ and pleural pieces sometimes with fuscous spots.

Females of this species are in hand from Ames, Iowa, taken July 30, 1896, "Onaga Kans," received from Mr. E. D. Ball. "Albion, N. Y., August 27, 1898," from Mr. VanDuzee; Columbus, Ohio, October 10, 1898; and West Point, Neb. (Bruner).

Uhler does not describe the male, but specimens which seem to belong here, and one of which has been so placed by Mr. VanDuzee, may be characterized in this connection.

♂, Length to tip of elytra 4 mm. Very light, apparently immature; vertex borders tinged with fulvous; valve short; plates elongate, nearly as long as pygofers; outer margins subangulate, sides somewhat reflexed near base, with long white cilia on margin, and a bunch of black hairs beyond their tip on pygofers.

One specimen, Agricultural College, Michigan, having date August 3, 1892, kindly loaned me by Prof. Pettit, and four specimens from Ames, Iowa, bearing dates in July and August of 1896 and 1897, collected by Mr. E. D. Ball. These specimens have a peculiarly immature look, but agree so exactly that they can hardly be considered as such. Their very small size, as compared with ♀ *intricatus*, raises the question whether they are actually males of this species, but the color and markings agree better here than with any other species and the specimens mentioned by Van Duzee from the Agricultural College, Michigan, may have been taken together.

According to Uhler, *intricatus* occurs on Crataegus bushes from early August to late October in Maryland, Virginia, and New Jersey.

SCAPHOIDEUS LUTEOLUS Van Duzee. (Plate X, Fig. 11, a, b, c.)

Scaphoideus luteolus VanDuzee, Bull. Buffalo Soc. Nat. Hist., Vol. V, p. 210. Catalogue Trans. Am. Ent. Soc., XXI, p. 300.

Osborn & Ball. Proc. Iowa Acad. Sci., IV, p. 232 (Record).

"Form and size of *auronitens*: Length, 4 mm."

Vertex scarcely as long as wide, subangulate at apex, margined with a fine line and with a brown transverse band

between the eyes, which fades out only at hind border of the head.

♀, last ventral segment produced, angles retreating, pygofers long and slender, not reaching the tip of the ovipositor. ♂, valve broad, short; plates large, tapering to a sharp point and reaching about three-fourths the length of the pygofers.

Described from Anglesea, N. J. (Smith), and New York City (Southwick).

Specimens also referred to this species from Ames, Iowa, (Iowa State College collection), and from Urbana, Ill. (McElfresh). While the types which have been in hand for examination and some of the other specimens seem quite distinct, there are others evidently belonging here, which vary toward *immistus*. The male plates, however, seem to furnish a good character. One specimen (Baker collection) is labeled "Willow, September 8."

SCAPHOIDEUS IMMISTUS Say. (Plate IX, Fig. 4; Plate X, Fig. 12.)

Jassus immistus Say. Jour. Acad. Nat. Sci., Phila., VI, p. 306 (1831).

Jassus immistus Harris. Geology of Mass., 2d Ed., p. 580 (1835).

Jassus immistus Walker. Homop., IV, p. 1163 (1852).

Jassus immistus Say. Complete writings edited by Leconte, Vol. II, p. 382 (1869).

Jassus immistus VanDuzee. Canadian Entomologist, XXI, p. 11, (1889).

Scaphoideus immistus Uhler. Trans. Md. Acad. Sci., I, p. 33, (1889).

Scaphoideus immistus Provancher. Pet. Faune. Ent. Can., III, p. 276, (1889).

Scaphoideus immistus VanDuzee. Psyche., V., p. 389 (1890).

Scaphoideus immistus Harrington. Ottawa Naturalist, VI, p. 32, (1892).

Scaphoideus immistus Osborn. Proc. Iowa Acad. Sci., I, Part 2, p. 125, (1892).

Scaphoideus immistus Southwick. Science, XIX, p. 288, (1892).

Scaphoideus immistus VanDuzee. Bull. Buffalo Soc. Nat. Sci., V, p. 190, (1894).

Scaphoideus immistus VanDuzee. (Catalogue) Trans. Am. Ent. Soc., XXI, p. 300, (1894).

Usually light brown or fulvous with fuscous markings.

Length to tip of elytra 5.50–6 mm, ♂ 4.75–5 mm.

Vertex as long as broad, sub-acute, a narrow, unbroken black line on anterior margin, and a transverse brown or fus-

cous band between the eyes with a projecting tooth at center, base and anterior part white or yellowish white. Face white, two black lines on upper part. Pronotum more than twice wider than long, brown with transverse whitish band in front of the middle, often with light median stripe back from this to posterior margin. Elytra cupreous brown with whitish hyaline spots; two to four oblique reflexed veins from outer anteapical cell or tip of discal cell.

Genitalia: ♀, ultimate ventral segment truncate or very slightly produced at center, sometimes barely notched at middle on hind border, black patch covering central part about half way to base; ♂, valve short; plates short, outer margin curved or sub-angular. Widely distributed in United States. Specimens are in hand from Vermont, New York, New Jersey, Pennsylvania, Ohio, Illinois, Iowa, Kansas, Colorado, Michigan, District of Columbia, Alabama, Texas, and California.

This species presents great variability, and many of the variations seem to defy limitation, passing by such insensible grades as to make precise definition impossible. The following forms seem to be fairly well defined, and are characterized as a step toward the designation of limits, which may be possible when food plants and larval characters are known.

Some, indeed, seem so different in size and other characters as to be worthy of specific distinction, but these differences seem to me to be too inconstant to fully warrant other than varietal distinction.

Var. minor, n. var. Length ♀, 5 mm; ♂, 4.25–4.50 mm. Vertex slightly more obtuse than typical *immistus*, face often deeply infuscated. ♀, last ventral segment usually slightly produced, and generally appearing somewhat carinate, due to compression against ovipositor. ♂ plates folded at sides and apparently longer than in typical *immistus*. Ames, Iowa; July and August. Abundant.

Var. major, n. var. Length to tip of elytra, ♀ 7 mm, ♂, 6mm. Vertex with dark fuscous cross band with a liguliform projection at middle, marginal line broad and broken at apex. Face infuscated, especially at sutures. ♀, ultimate ventral segment very slightly produced, pygofers long. ♂ plates broad, scarcely reflexed at sides, sub-angulate at outer mar-

gin, almost truncate at tip, a little more than half the length of pygofers. Ames, Iowa; Urbana, Ill., (McElfresh); West Virginia (Heideman).

This variety, as compared with *minor*, is very different, and it is only as they are compared with typical *immistus* that they can be conceived to have any specific relationship.

Var. incisus n. var. Size of typical *immistus*, but with markings very distinct, and with the last ventral segment of the female distinctly incised at center, and the male plates broad.

SCAPHOIDEUS MELANOTUS n. sp. (Plate X, Fig. 13).

General aspect of *immistus* above, face intensely black, female genital segment strongly produced and notched. Length ♀, to tip of elytra, 5 mm.

Vertex, three fourths as long as wide, anterior margins slightly curved, apex obtuse; front narrow; clypeus long, widening at apex; loræ large, reaching nearly to tip of clypeus, and leaving only a very narrow margin of cheek. Pronotum short, lateral margin short, posterior margin emarginate. Elytra with post-nodal cell very wide behind, two or three very oblique nodal veins, outer claval vein very strong, strongly hooked distally, approximating claval suture, and with the cross vein to suture near base.

Color: Vertex whitish with a rather faint brownish narrow band with darker dot at center, a narrow line parallel to the anterior margin. Face jet black except white point just below apex and on tip of clypeus. Pronotum whitish with large fuscous patch each side, fulvous band broken in front, and fulvous broken band behind. Elytra with marginal lobes on clavus, oblique spots either side of transverse vein, costal and post-nodal cells, white or pale yellowish; claval suture, margin of veins, part of discal anteapical and apical cells, fulvous; base and interlobular spots of clavus, lines on the veins and spots in discal, anteapical, and apical band, dark fuscous or black. Dorsum black with yellow border; below, pectus soiled white with spots on legs, base of abdomen, bands on ventral segments and large spot on last ventral segment, black.

Genitalia: Ultimate ventral segment ♀, long, much produced, notched medially.

Except for very different shape of genital segment this might be considered an extreme melanotic variety of *immistus*, but it is smaller, and the points noted seem so well marked that until intermediate forms are found it must be considered as distinct.

Described from three specimens, all females, two of which are from Texas (U. S. N. M.), and one from Hyattsville, Md., collected by Mr. J. S. Hine, July 9, 1899.

SCAPHOIDEUS OBTUSUS n. sp. (Plate X, Fig. 14).

A broad gray band from pronotum to anteapical cells. Length, ♀, to tip of elytra, 5 mm.

Vertex depressed, obtuse, nearly twice as wide as long, anterior margins curved, minutely carinate; front narrow, sutures converging but slightly till near the tip; clypeus long, slightly enlarging to apex; loræ large, almost reaching tip of clypeus and outer margin of cheek. Pronotum short, lateral margins flaring, posterior margin evenly concave. Elytra, appendix wide; post-nodal cell widening to apex and sharply angular within, post-nodal vein slightly curved and oblique; outer claval vein hooked, remote from suture distally, with distinct cross veins at base to suture and to inner vein.

Color: Head and thorax nearly white or light yellow; vertex cream white with a broad fuscous band between the eyes enlarged at center to form a blunt point before and behind, anterior margin showing a narrow black line; face black, the disk less dense and the frontal arcs not entirely hidden. Pronotum fuscous or black with a milky median cross and posterior border and some fulvous dots on anterior margin; scutellum fuscous with the usual picture in white. Elytra white except lines on the nervures, a basal spot next costa, the anteapical cells and a terminal band, which are fuscous or black. Abdomen below black with white margins. Below, pectus black with white markings, legs white, venter white, black at base and on discs of segments and apex of last ventral segment.

Genitalia: ♀, ultimate ventral segment long, produced in middle, apex rounded. ♂ last ventral segment narrow bordered with black, valve, plates and pygofer broken off.

Described from one ♀ and one ♂ from Ames, Iowa, and two ♀s from Urbana, Ill., collected by Mr. F. M. McElfresh, and kindly sent to me by Mr. E. D. Ball.

This species belongs in the group with melanotus, but is easily separated from that species by the broad gray band and position of the claval vein.

SCAPHOIDEUS CINEROSUS n. sp.

Ashy gray with dark bands or lines on vertex, pronotum and elytra. Resembles obtusus but vertex more acute, and the apical portion of elytra is not fuscous or black. Length, ♀, 4–4.50 mm.

Vertex nearly as long as wide, sub-acute; front tapering uniformly; clypeus widening but slightly at tip; loræ long, reaching margin of cheek. Pronotum longer than the vertex, hind border barely emarginate. Claval veins hooked, outer bent somewhat toward the suture, but not fusing with it, cross veins from suture to outer claval and between the clavals near the base.

Color: Light ashy gray; vertex almost white with a light brown crossband between the eyes, and a fine black line, sometimes obsolete, next the anterior margin; face more or less infuscated, the lower part of cheek usually whitish; clypeus with a whitish disc. Pronotum light gray with dark patches near lateral hind margin and along anterior border, and two light brown spots near the middle of hinder portion. Elytra ashy gray or whitish, veins infuscated, and faint traces of brownish spots on discal, inner anteapical and apical cells.

Genitalia: ♀ last ventral segment longest at middle, rounded slightly carinate on the middle line toward the apex; pygofers long, slender, with a dark spot near the apex, and scattering white bristles on base and disk, and two brushes of black hairs each side near the apex.

Described from specimens collected at Ames, Iowa, by Mr. E. D. Ball, and Urbana, Ill., (F. M. E.)

Explanation of Plates.

Figures 2, 3, 4, of Plate IX, were drawn for the Iowa Experiment Station by Miss Charlotte M. King, and are used here by the kind permission of Prof. H. E. Summers, Entomologist of the Station. All other figures are by the author.

Plate IX.

Fig. 1. *Scaphoideus picturatus* Osb. *a*, imago dorsal view; *b*, face; *c*, elytron; *d*, ♀, *e*, ♂, genitalia, ... p. 193

Fig. 2. *Scaphoideus jucundus* Uh. *a*, imago dorsal view; *b*, face; *c*, vertex and pronotum; *d*, elytron; *e*, ♀, *f*, ♂, genitalia, ... p. 195

Fig 3. *Scaphoideus ochraceus* Osb. *a*, imago dorsal view; *b*, face; *c*, vertex and pronotum; *d*, elytron; *e*, ♀, *f*, ♂, genitalia, ... p. 199

Fig. 4. *Scaphoideus immistus* Say. *a*, dorsal view imago of var. major; *b*, face; *c*, vertex of typical *immistus*; *d*, elytron; *e*, ♀, *f*, ♂, genitalia, ... p. 204

Plate X.

Fig. 1. *Scaphoideus fasciatus* n sp. *a*, vertex and pronotum; *b*, face; *c*, ♂ genitalia, ... p. 190

Fig. 2. *Scaphoideus auronitens* Prov. *a*, elytron; *b*, wing, . . . p. 194

Fig. 3. *Scaphoideus jucundus* Uh. elytron, ... p. 195

Fig. 4. *Scaphoideus consors* Uh. vertex and pronotum; 4 *a*, ♂ genitalia, ... p. 196

Fig. 5. *Scaphoideus consors*, var. unicolor face, *a*, ♀, *b*, ♂ genitalia, ... p. 196

Fig. 6. *Scaphoideus mexicanus* n sp. vertex and pronotum; *a*, ♀, *b*, ♂ genitalia, ... p. 197

Fig. 7. *Scaphoideus scalaris* Van D. vertex and pronotum, *a*, ♀, *b*, ♂ genitalia . . . . . p. 198

Fig. 8. *Scaphoideus lobatus* Van D. elytron, ... p. 199

Fig 9. *Scaphoideus productus* n sp. vertex and pronotum; *a*, face; *b*, elytron; *c*, ♀ genitalia, ... p. 200

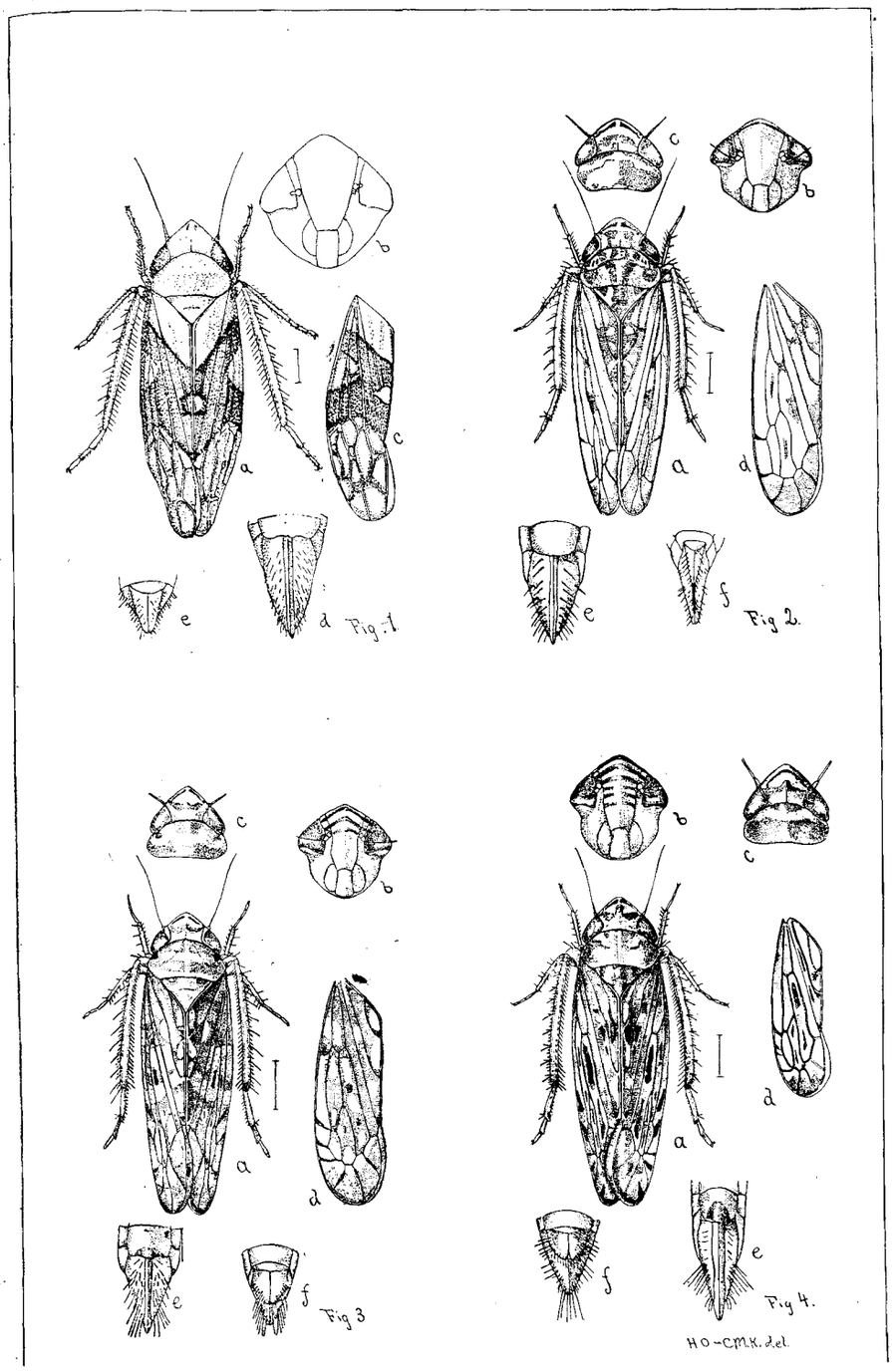
Fig. 10. *Scaphoideus carinatus* n sp. *a*, elytron; b, ♀ genitalia, . p. 201

Fig. 11. *Scaphoideus luteolus* Van D. *a*, elytron; b, ♀, *c*, ♂ geni, talia, ... p. 203

Fig. 12. *Scaphoideus immistus* Say. elytron, ... p. 204

Fig. 13. *Scaphoideus melanotus* n sp. elytron, ... p. 206

Fig. 14. *Scaphoideus obtusus* n sp. elytron, ... p. 207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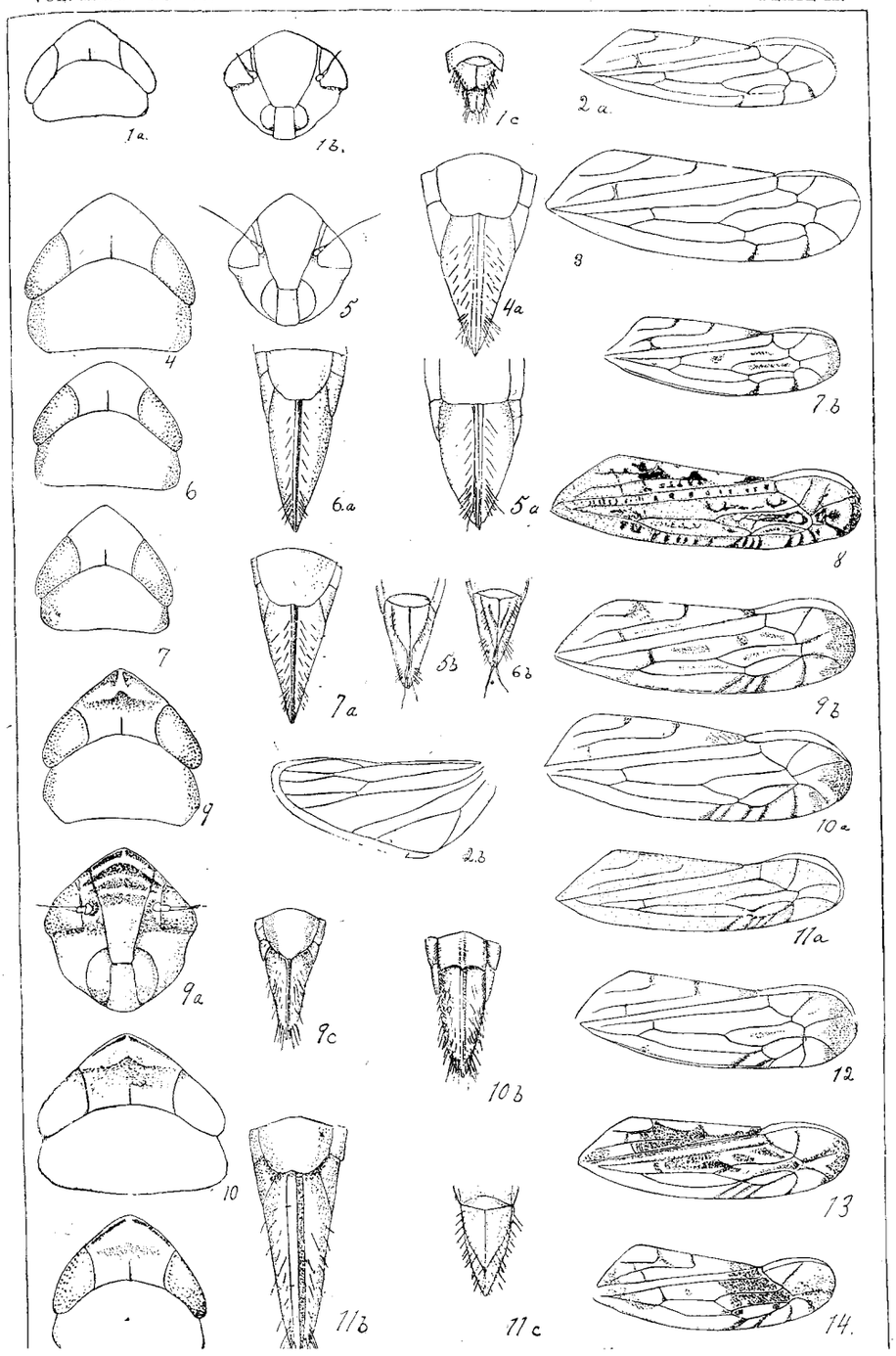
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