



## Two new species of *Hurleyella* Runyon & Robinson (Diptera: Dolichopodidae), with the first record from the Neotropics

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### Abstract

Two new species of the long-legged fly genus *Hurleyella* Runyon & Robinson, 2010 are described and illustrated: *Hurleyella belizensis* sp. nov. from Belize and *Hurleyella salina* sp. nov. from alkali areas of the Northern Rockies of the USA (Idaho, Montana, Wyoming). The discovery of these new species greatly extends the known distribution of *Hurleyella* northward in the Nearctic and southward into the Neotropics. Notes, photos of habitats, a distribution map, and a key to the four known species of *Hurleyella* are provided.

**Key words:** Rocky Mountains, Belize, long-legged flies, Dolichopodidae, Medeterinae, micro-dolichopodids, *Hurleyella*, *Microchrysotus*, *Micromedetera*, Neotropics, Nearctic

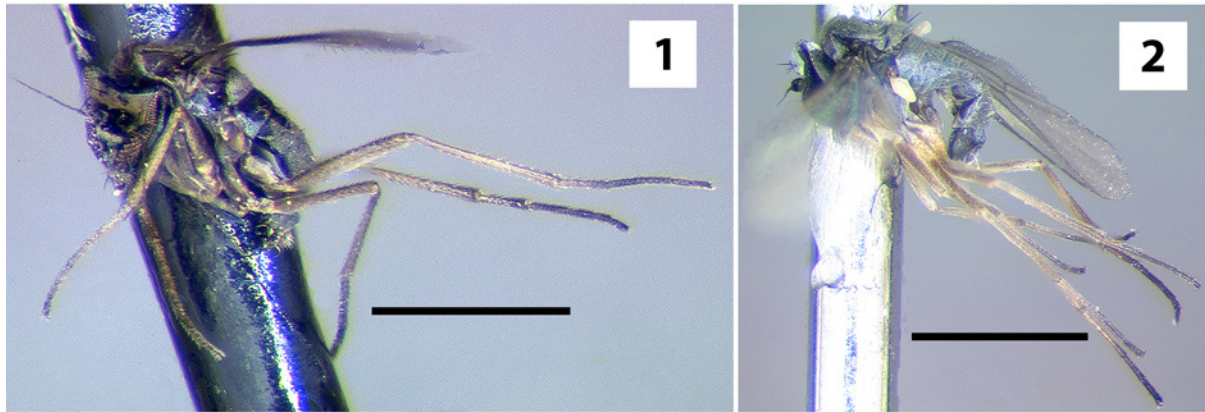
### Introduction

*Hurleyella* Runyon & Robinson, 2010 was established for two Nearctic species, *H. brooksi* Runyon & Robinson from Texas and *H. cumberlandensis* Runyon & Robinson from Virginia. The genus contains miniscule gray to brown flies that have a body length of around 1 mm (Figs 1, 2) and adults occur in sunny, relatively dry habitats. *Hurleyella* belongs to the so-called ‘micro-dolichopodids’, a collection of minute-sized, probably unrelated genera that make up a speciose component of the dolichopodid fauna in the New World (Robinson 1969, 1975; Bickel 2009; Borkent *et al.* 2018; Runyon & Robinson 2010; Runyon 2015; Runyon & Pollet 2018, 2019). *Hurleyella* appears to belong to the subfamily Medeterinae and is probably related to *Microchrysotus* Robinson and *Micromedetera* Robinson, with which it shares a very small body size (ca. 1 mm or less) and distinctive wing venation with vein R<sub>2+3</sub> unusually short (Figs 3, 4). Males of *Hurleyella* lack secondary sexual characters (MSSC) and examination of male genitalia can be required for identification of species.

The purpose of this paper is to describe two new species of *Hurleyella* recently collected by the author. One species was collected in Belize, and represents the first record of *Hurleyella* from the Neotropics. The second species was discovered in saline areas in the Northern Rocky Mountains of the USA.

### Material and methods

Descriptions of the structural terminology follow Cumming & Wood (2009), except for genitalia which follow Cumming *et al.* (1995) and Sinclair & Cumming (2006). Description of density of pruinosity follow Runyon & Hurley (2003). The postabdomen on intact specimens is rotated approximately 180° and lateroflexed to the right, but in descriptions “dorsal” and “ventral” refer to the true morphological positions (e.g., “up” on genitalia of intact specimens is ventral). The abbreviations used in the text include: I, II, and III: pro-, meso-, and metathoracic legs (e.g., coxa III = the metathoracic coxa). Label data for primary types are cited verbatim in quotation marks (lines separated by “[”]), with annotations in square brackets.



**FIGURES 1–2.** Habitus photographs of male holotypes. **1.** *Hurleyella belizensis* sp. nov.; **2.** *Hurleyella salina* sp. nov. Scale bars = 1.0 mm.

To examine specimens using a compound microscope, a male and female of each species were removed from their pins by soaking overnight in an approximately 50:50 mixture of 95% ethanol and ethyl acetate to dissolve shellac gel. These specimens were subsequently macerated in 85% lactic acid by heating in a microwave oven for two to three 20 second intervals, prior to being transferred to glycerine (following Brooks & Cumming 2017). These specimens were then permanently slide mounted using Permount mounting medium (Fisher Scientific, Pittsburgh, Pennsylvania).

Material from this work is housed in the following institutions: CNC = Canadian National Collection of Insects, Ottawa; MTEC = Montana Entomology Collection, Montana State University, Bozeman; USNM = National Museum of Natural History, Smithsonian Institution, Washington, D.C.

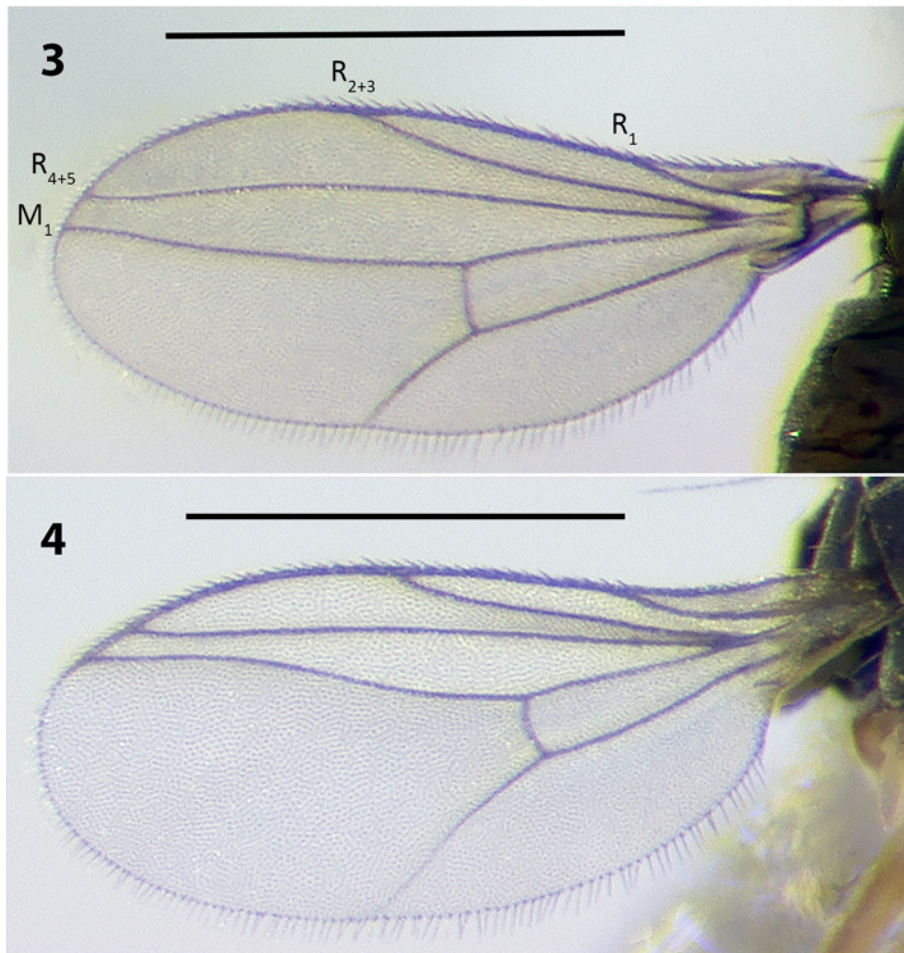
## Systematics

### Genus *Hurleyella* Runyon & Robinson

*Hurleyella* Runyon & Robinson, 2010: 58. Type-species: *Hurleyella cumberlandensis* Runyon & Robinson, by original designation.

**Recognition.** The combination of the following character states will diagnose *Hurleyella* in the Nearctic and Neotropics: Body length approximately 1.0 mm or less. Vertex of head not excavate. Antennal scape without dorsal setae; pedicel without medioapical thumb-like projection. Eyes with short ommatrichia between facets. Palpi not enlarged. Proepisternum with at most a few small hairs; acrostichal setae absent; posterior mesonotum distinctly flattened and slightly depressed. Legs without major setae; femora without preapical setae; legs of males unmodified, lacking male secondary sexual characters. Wing (as in Figs 3, 4) hyaline, with costa continuous to tip of vein  $M_1$ ; vein  $R_{2+3}$  characteristically short, fusing with costa about half way between termination of  $R_1$  and  $R_{4+5}$ ; veins  $R_{4+5}$  and  $M_1$  converging near wing apex, then nearly parallel at apex; crossvein dm-cu shorter than last part of  $CuA_1$ . Hypopygium without ventral projections asymmetrically from one side.

**Remarks.** The distinctive wing venation of *Hurleyella*, with a short vein  $R_{2+3}$  and veins  $R_{4+5}$  and  $M_1$  converging and nearly parallel near wing apex (as in Figs 3, 4), will separate this genus from others except *Microchrysotus* and *Micromedetera* (Robinson 1964b, 1975). Very few other examples of such a short vein  $R_{2+3}$  are documented in the Dolichopodidae. A very short vein  $R_{2+3}$  occurs in males of *Australachaleus edwardsae* (Van Duzee) and *Tachytrechus alatus* (Becker), but this vein is of normal length in the females (Pollet 2005; Brooks & Cumming 2008). Runyon & Robinson (2010) reported occurrence of a short vein  $R_{2+3}$  in *Enlina atrata* (Van Duzee) (as *Achaleus atratus*), based on the original description by Van Duzee (1930) (“First vein very short”, p. 24), but examination of the holotype of *E. atrata* (see Runyon & Pollet 2018) revealed that  $R_{2+3}$  is of normal length and Van Duzee was referring to vein  $R_1$  as the “first vein”.



**FIGURES 3–4.** Photographs of male wings. **3.** *Hurleyella belizensis* sp. nov.; **4.** *Hurleyella salina* sp. nov. Scale bars = 0.5 mm.

In the *Manual of Central America Diptera* (Bickel 2009), *Hurleyella* keys to *Micromedetera*, to which it seems most closely related, but the hypopygium of *Hurleyella* is distinct from that of *Micromedetera* which has ventral projections asymmetrically from one side (Robinson 1975, figs 71, 75, 77). At present, it is not possible to separate females of *Hurleyella* and *Micromedetera*. Habitat might also differ between these genera with *Hurleyella* occurring in relatively drier environments than *Micromedetera* (see Discussion). *Hurleyella* also appears to be related to *Microchrysotus*, but males of *Hurleyella* lack enlarged palpi, modified fore tarsi, and a median darkened wing band found in males of *Microchrysotus* (Robinson 1964b). Females of *Microchrysotus* also have a darkened wing band, which distinguishes them from females of *Hurleyella* and *Micromedetera*.

#### Key to species of *Hurleyella* Runyon & Robinson (males)

- 1 Body length approximately 1 mm; wing with vein  $R_{2+3}$  unusually short and veins  $R_{4+5}$  and  $M_1$  converging to nearly parallel apically (as in Figs 3, 4); palpus and fore tarsus unmodified; wing without median fuscous band; hypopygium without distinct projections from one side; *Hurleyella* . . . . . 2
- Without above combination of characters . . . . . other Dolichopodidae
- 2 Coxa I mostly yellow; face and frons covered with dense silver pruinosity (Fig. 6); wing with vein  $M_1$  arching greatly anteriorly on apical half (Fig. 4); halter bright yellow (Fig. 2); hypandrium nearly symmetrical, hood-like (Figs 9, 10); alkali habitats (Figs 15–20) (Idaho, Montana, Wyoming) . . . . . *H. salina* sp. nov.
- Coxa I brown to black; face and frons covered with brownish pruinosity (as in Fig. 5); wing with  $M_1$  slightly arching anteriorly only near apex (Fig. 3; Runyon & Robinson 2010, fig. 3); halter brown; hypandrium asymmetrical (as in Figs 7, 8), not hood-like; habitat not noticeably alkaline . . . . . 3
- 3 Surstylus apically with large membranous flange (Runyon & Robinson 2010, fig. 5) (Nearctic) . . . . . 4

- Surstylus with very small, inconspicuous membranous flange (Figs 7, 8, fsur) (Belize) . . . . . *H. belizensis* sp. nov.
- 4 First flagellomere of antenna distinctly wider than narrowest part of face; males with flange of surstylus relatively narrow, tapered (Runyon & Robinson 2010, figs 5A–B) (Virginia) . . . . . *H. cumberlandensis* Runyon & Robinson
- Width of first flagellomere of antenna subequal to narrowest part of face; males with flange of surstylus spatulate (Runyon & Robinson 2010, fig. 5C) (Texas). . . . . *H. brooksi* Runyon & Robinson

***Hurleyella belizensis* sp. nov.**

(Figs 1, 3, 5, 7, 8, 11, 12, 21)

**Description. Male.** Body length 0.8–0.9 mm; wing 0.9 mm x 0.4 mm (width). Habitus (Fig. 1). *Head* (Fig. 5): Relatively narrow in anterior view, about twice as long as wide; face covered with dense brown pruinosity darker and felt-like on dorsal half; dorsal half broadly triangular, ventral half very narrow with sides nearly parallel; frontoclypeal suture rather distinct and separating broader upper face from narrow lower face; ommatidia greatly enlarged near face. Frons with dense brown pruinosity. Dorsal postcranium with brown pruinosity. Vertical setae positioned lateral to anterior ocellus and slightly closer to eye margin than anterior ocellus, slightly smaller in size than ocellar setae (subequal in length to first flagellomere); postocular setae present as row of about 10 very short, pale setae along full-length of eye. Palpus gray pruinose, small, ovate, longer than wide, with subapical brown to black seta (with strong pale reflections in certain lights) and dorsal surface with 6–8 additional smaller pale setae and hairs. Proboscis dark brown, somewhat sclerotized, shiny, not enlarged; with short white hairs at apex. Antenna wholly black; first flagellomere conical with broadly rounded apex, about as long as wide, with a few rather long pale hairs near apex; arista-like stylus apical, length slightly longer than height of face. *Thorax*: Scutum dark brown with brown pruinosity, without violet reflections. Setae of thorax rather short, black with pale reflections; 4–5 dorsocentral setae; acrostichal setae absent; 1 notopleural seta; 1 scutellar seta per side, no additional hairs; 1 postpronotal seta; proepisternum with 1 small brown seta. Pleura dark brown with sparse gray-brown pruinosity. *Legs*: Yellow-brown to brown and without major setae. Coxa I dark brown, with very sparse, white anterior hairs, those at apex distinctly longer. Coxa II and III dark brown with sparse gray-brown pruinosity. Coxa II without lateral seta; coxa III with minute lateral hair. Femora yellow-brown, without preapical setae. Tibiae and tarsi yellow-brown, tarsi dark brown from apex of basal tarsomere. Ratios of tibia:tarsomeres for leg I: 16–8–4–4–2–3; for leg II: 22–12–5–4–3–3; for leg III: 22–8–6–4–3–3. *Wing* (Fig. 3): Hyaline, with slight and even brownish tinge, relatively narrow. R<sub>2+3</sub> very short, fused with costa just beyond midpoint of total wing length and about half way between termination of R<sub>1</sub> and R<sub>4+5</sub>. R<sub>4+5</sub> nearly straight, very slightly arched toward M<sub>1</sub> apically. M<sub>1</sub> gradually and slightly arched anteriorly and nearly parallel to R<sub>4+5</sub> near apex of wing. Length of distal section of vein CuA<sub>1</sub> about 2 times longer than crossvein dm-cu. Vein A<sub>1</sub> absent. Halter knob and stem brown. Calypter very small, brown, without evident setae. *Abdomen*: Cylindrical, gradually but only slightly tapered, arched downward on approximately apical half; dark brown with sparse brown pruinosity, tergite 1 with slightly denser brown pruinosity; tergites with very short, sparse, stiff black setae. Hypopygium (Figs 7, 8) bulbous, borne on broad peduncle formed by segment 7; dark brown with rather coarse, sparse gray pruinosity. Hypopygial foramen at left at very base. Epandrium deeply emarginate ventrally, nearly symmetrical at base but slightly indented on left side due to hypopygial foramen; each side with single large finger-like epandrial lobe near 1/2 bearing one large seta near base and one large seta at apex. Hypandrium asymmetrical, bifurcate with broad ventroapically directed right and left lobes; fused basally with epandrium. Surstylus shiny dark brown, very large, complex and loosely attached to epandrium, with many lobes and processes; three large blade-like setae directed medially; very short, rounded lateroapical membranous flange (this flange very large in *H. brooksi* and *H. cumberlandensis*). Phallus abruptly arched and pointed ventrally between hypandrial lobes. Cercus gray-brown, oval, covered with rather dense small pale hairs or setae. Hypoproct large, subquadrate, hyaline in lateral view, arising between cerci. **Female.** Body length 0.8–1.0 mm; wing 0.9–1.0 mm x 0.45 mm (width). Similar to male except: face slightly wider; abdomen often dorsoventrally flattened, tergite 6 with short ventral hairs or small setae along apical margin.

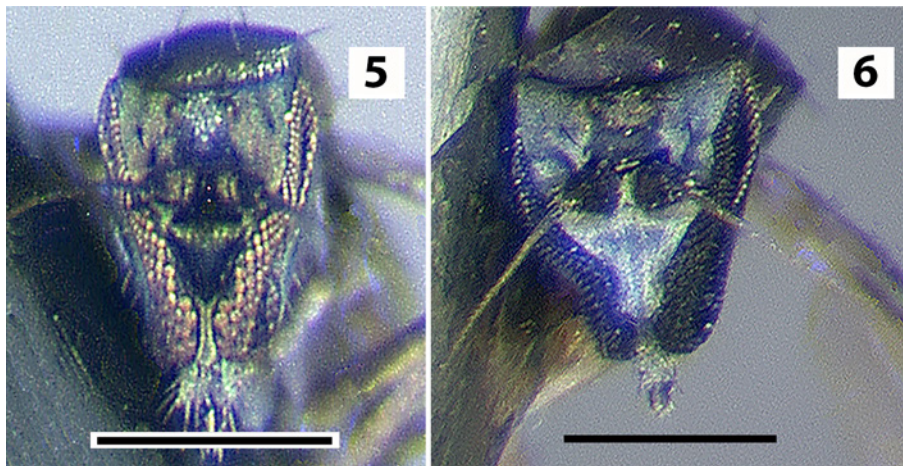
**Etymology.** This species is named for the country of Belize, where it was discovered.

**Type material. HOLOTYPE** ♂, labelled: “BELIZE: Stann Creek Distr. | Mayflower Bocawina NP | trail to Bocawina Falls | 16°55.63'N, 88°23.51'W | 21APR2015, JB Runyon” [USNM, type number USNMENT01519227]. **PARATYPES: BELIZE:** same data as holotype (8 ♂, 1 ♀); same data as holotype, except Bocawina Falls trailhead, 16°55.60'N 88°23.89'W, 20.ii.2017 (3 ♂, 2 ♀); same data as holotype, except Upper

Bocawina Falls, 16°55.25'N 88°24.29'W, 20.ii.2017 (1 ♀); Cayo District, Pook's Hill Lodge, open sandy soil of trail, 17°09.067'N 88°50.843'W, 16.ii.2017, J.B. Runyon (1 ♀); Cayo District, Mountain Pine Ridge, Pinol Creek, 410 m, 17°00.855'N 88°58.824'W, 18.ii.2017, J.B. Runyon (1 ♂). Paratypes deposited in CNC, MTEC, USNM.

**Remarks.** Specimens of *Hurleyella belizensis* sp. nov. have been collected by sweeping open, bare sandy soils at several sites in Belize (Figs 11, 12, 21). This species seems closely related to *H. brooksi* and *H. cumberlandensis* based on similar form of the hypandrium and presence of membranous flange at apex of surstylus, albeit small (fsur, Figs 7, 8).

Specimens of *H. belizensis* were collected at the type locality (Fig. 11) during the dry season in April 2015 and February 2017, but none were found at this location in October 2018, suggesting that occurrence of adults might be limited to the dry season.

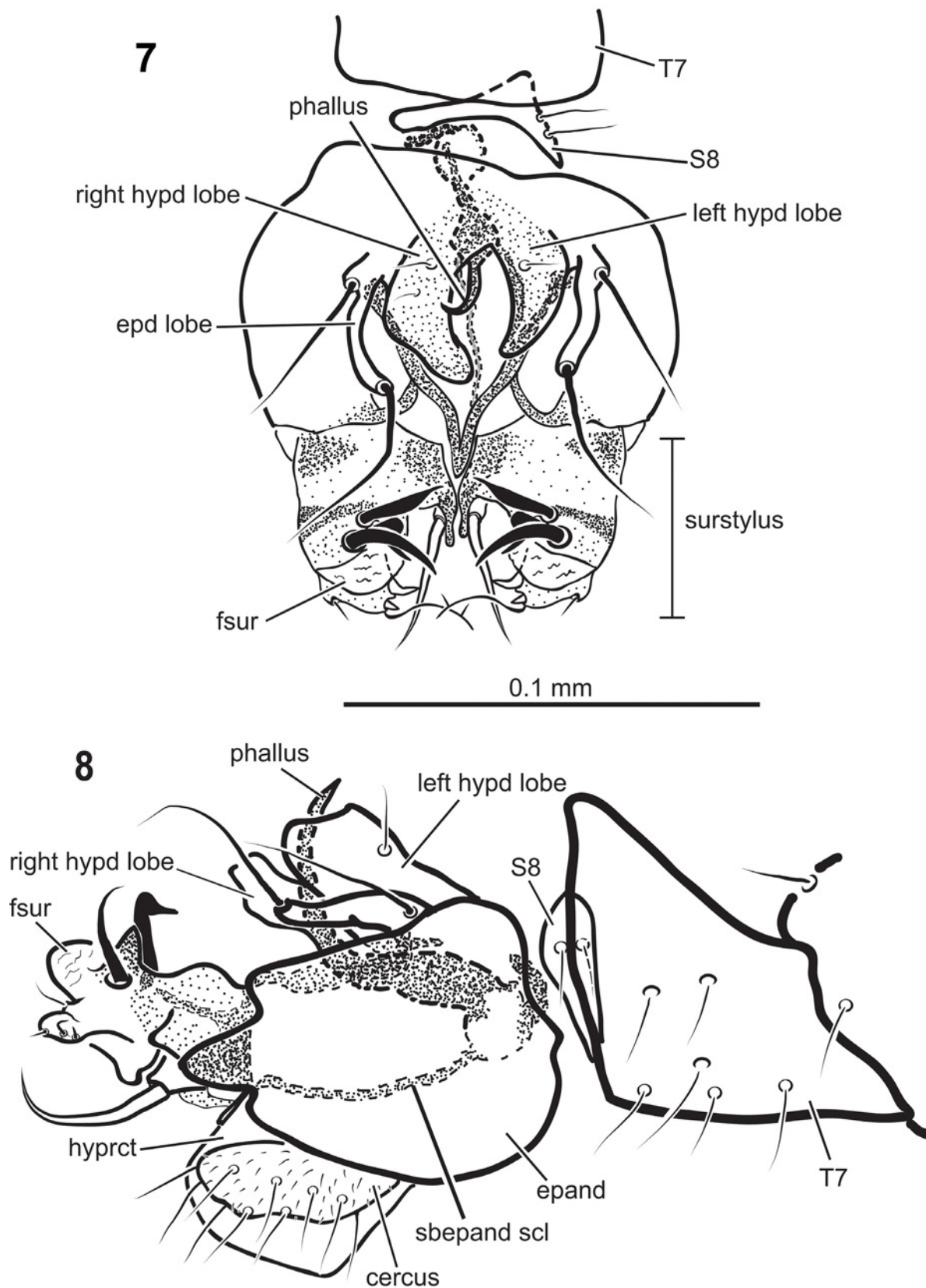


**FIGURES 5–6.** Photographs of male heads, anterior view. **5.** *Hurleyella belizensis* sp. nov.; **6.** *Hurleyella salina* sp. nov. Scale bars = 0.25 mm.

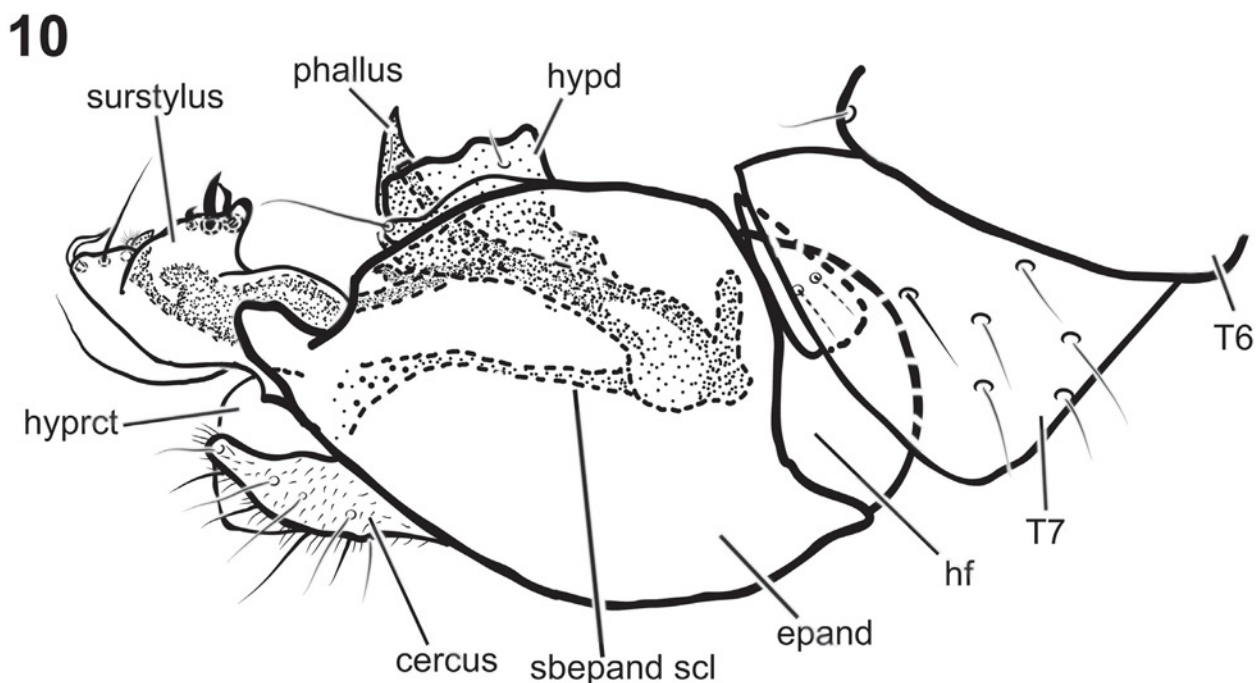
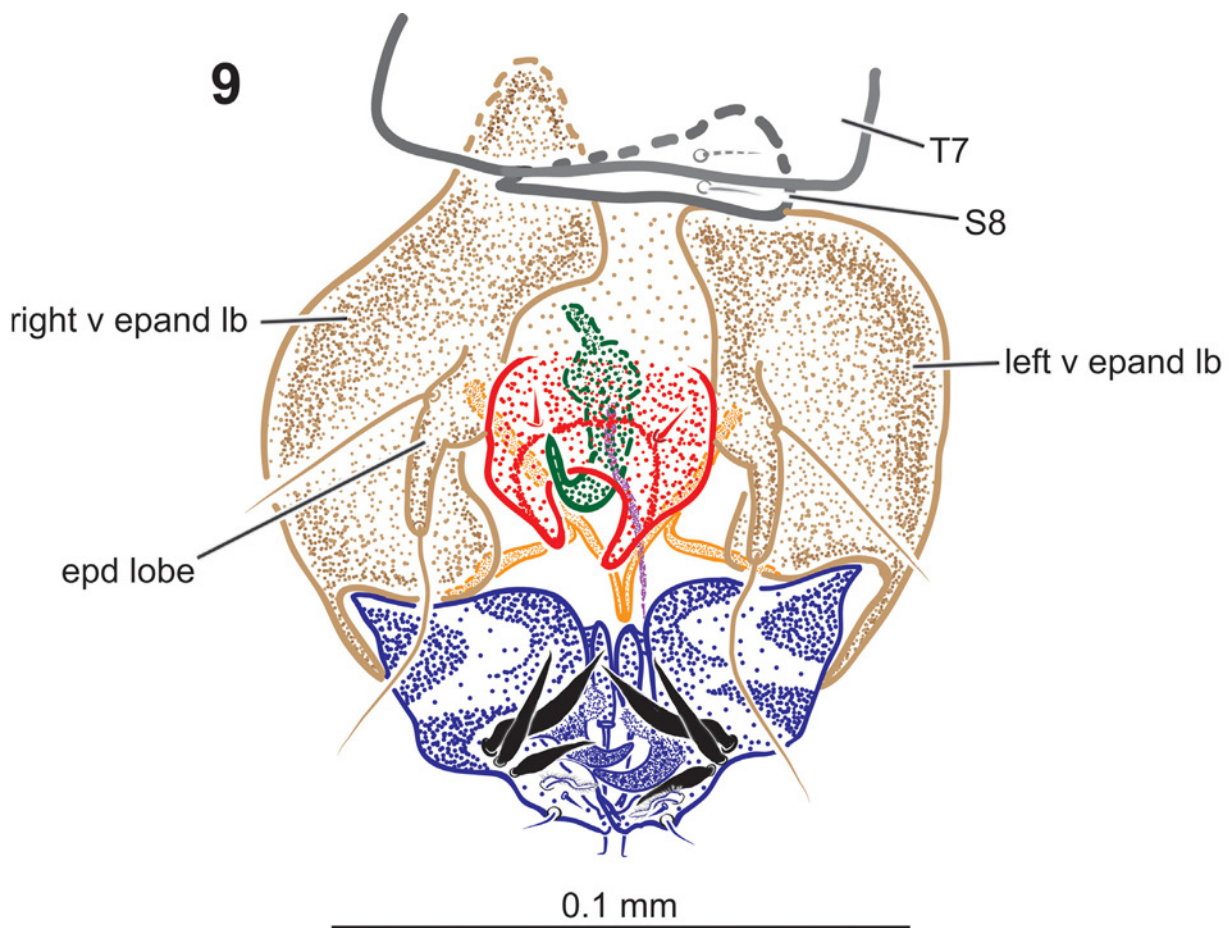
***Hurleyella salina* sp. nov.**

(Figs 2, 4, 6, 9, 10, 15–21)

**Description. Male.** Body length 0.8–1.0 mm; wing 1.0–1.1 mm x 0.4–0.5 mm (width). Habitus (Fig. 2). **Head** (Fig. 6): Relatively broad, slightly longer than wide; face covered with dense silver pruinosity; dorsal half broadly triangular, ventral half very narrow, with sides nearly parallel; frontoclypeal suture rather distinct, separating broader upper face from narrow lower face; ommatidia distinctly enlarged near face. Frons with silver pruinosity except with dark brown pruinosity on and around ocellar triangle. Dorsal postcranium with silver pruinosity. Vertical setae positioned lateral to anterior ocellus and midway between anterior ocellus and margin of eye, subequal in size to ocellar setae (subequal in length to first flagellomere); postocular setae largely absent, but with at most 3–4 very short, white setae. Palpus gray pruinose, small, ovate, with subapical brown to black seta (with strong pale reflections in certain lights) and minute pale hairs. Proboscis dark yellow-brown, sclerotized, shiny, not enlarged; with short white hairs at apex. Antenna wholly black; first flagellomere subtriangular with round apex, slightly longer than wide, with rather long pale hairs; arista-like stylus apical, about as long as height of face. **Thorax:** Scutum dark brown with sparse gray-silver pruinosity and violet reflections; postpronotum and notopleuron with dense gray-silver pruinosity. Setae of thorax rather short, black; 4–5 dorsocentral setae; acrostichal setae absent; 1 notopleural seta; 1 scutellar seta per side, no additional hairs; 1 postpronotal seta; proepisternum with 1 small white hair. Pleura dark brown with dense gray-silver pruinosity. **Legs:** Mostly yellow and without major setae. Coxa I yellow, sometimes darkened basally, with very sparse, white anterior hairs, those at apex distinctly longer. Coxa II and III dark brown with dense gray-silver pruinosity on basal half or more, usually yellow at apex. Coxa II without lateral seta; coxa III with minute lateral hair. Femora yellow, without preapical setae. Tibia I, II and III yellow, darkened at extreme apex. Tarsi brown from apex of basal tarsomere. Ratios of tibia:tarsomeres for leg I: 20–10–6–4–3–3; for leg II: 26–13–6–4–3–3; for leg III: 30–9–8–5–3–3. **Wing** (Fig. 4): Hyaline, rather broad.  $R_{2+3}$  very short, fused with costa near midpoint of total wing length and slightly closer to

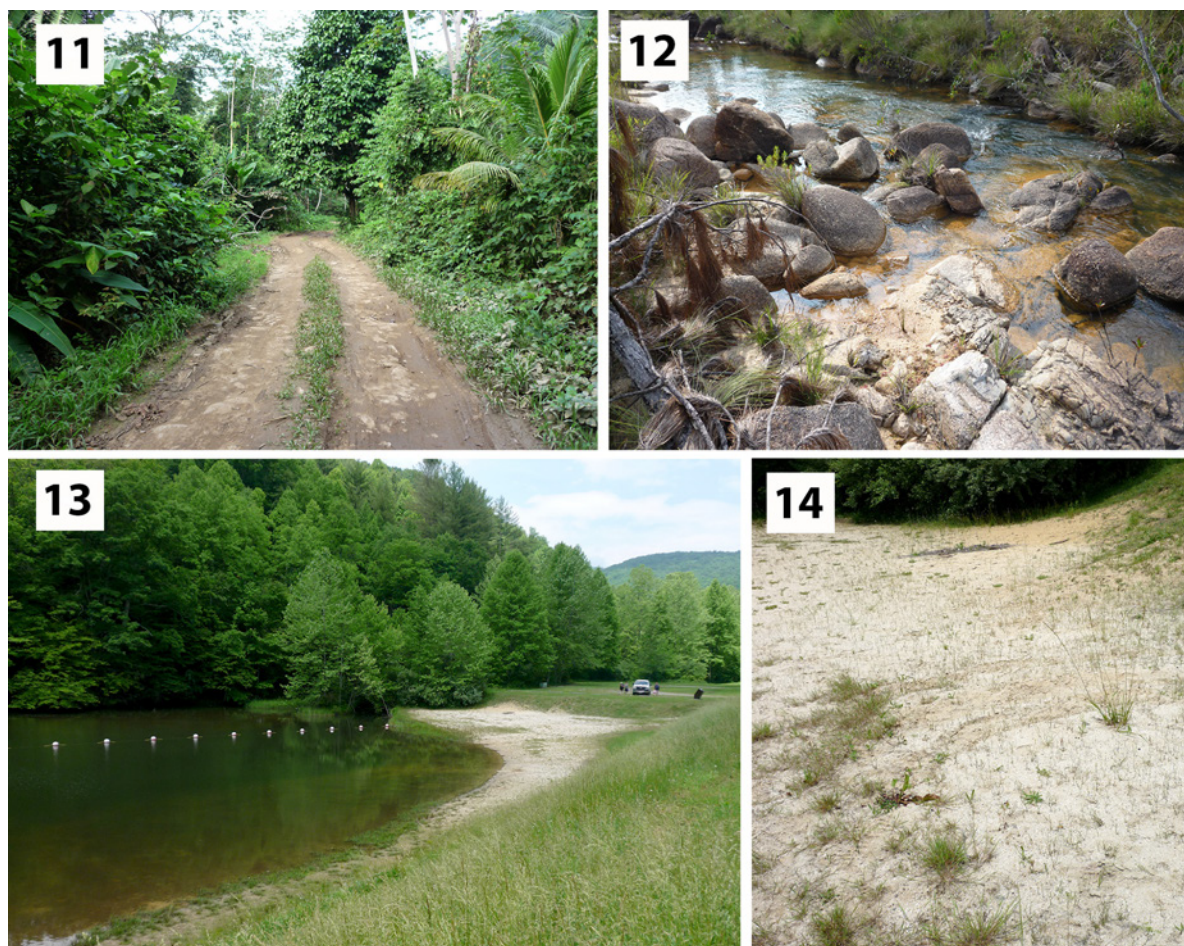


**FIGURES 7–8.** *Hurleyella belizensis* sp. nov., male terminalia. 7. ventral view; 8. left lateral view. Abbreviations: epand—epandrium; epd lobe—epandrial lobe; fsur—lateroapical flange of surstylus; hyprct—hypoproct; left hypd lobe—left lobe of hypandrium; right hypd lobe—right lobe of hypandrium; sbepand scl—subepandrial sclerite; S—abdominal sternite; T—abdominal tergite. Scale bar = 0.1 mm.



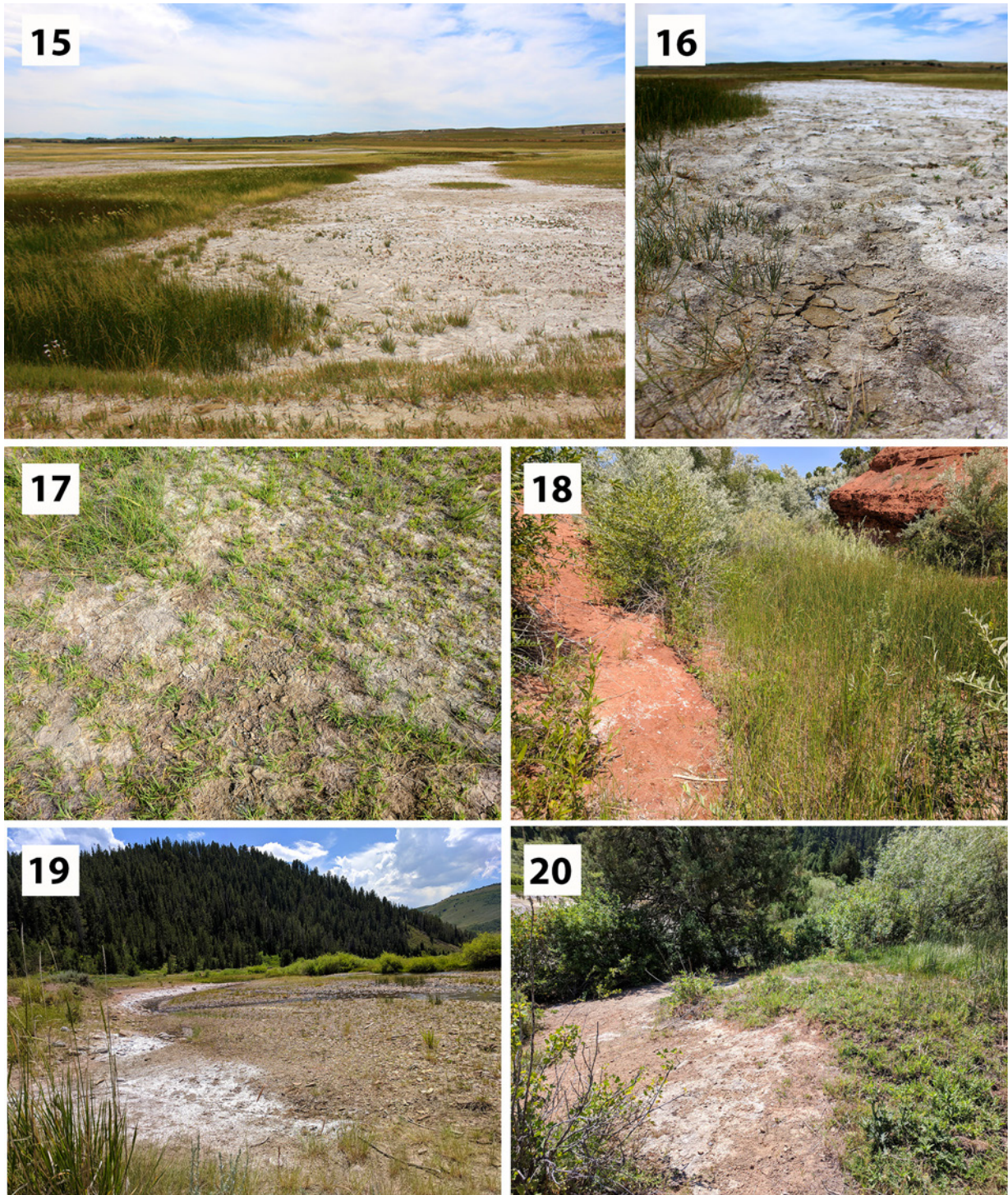
**FIGURES 9–10.** *Hurleyella salina* sp. nov., male terminalia. **9.** ventral view; **10.** left lateral view. Color codes of structures: light brown—epandrium; red—hypandrium; green—phallus + sperm pump + ejaculatory apodeme; blue—surstylus; orange—bacilliform sclerite; purple—subepandrial sclerite; dark gray—abdominal sternite 8 and tergite 7. Abbreviations: epand—epandrium; epd lobe—epandrial lobe; fsur—lateroapical flange of surstylus; hf—hypopygial foramen; hypd—hypandrium; hyprct—hypoproct; left v epand lb—left ventral lobe of epandrium; right v epand lb—right ventral lobe of epandrium; sbepand scl—subepandrial sclerite; S—abdominal sternite; T—abdominal tergite. Scale bar = 0.1 mm.

termination of  $R_1$  than  $R_{4+5}$ .  $R_{4+5}$  nearly straight, very slightly arched toward  $M_1$  apically.  $M_1$  gradually arched far anteriorly on apical half of wing, lying alongside and nearly parallel to  $R_{4+5}$  on apical third of wing. Length of distal section of vein  $CuA_1$  about 3 times longer than crossvein  $dm-cu$ .  $CuA_1$  slightly arched and fading apically, usually not reaching wing margin. Vein  $A_1$  absent. Halter knob bright yellow; stem brownish. Calypter very small, brown, without evident setae. *Abdomen*: Cylindrical, gradually but only slightly tapered, arched downward on approximately apical half; dark brown with sparse gray-silver pruinosity; tergites with very short, sparse stiff black setae. Hypopygium (Figs 9, 10) bulbous, borne on broad peduncle formed by segment 7; dark brown to nearly black, shiny, with rather coarse sparse gray pruinosity. Hypopygial foramen at left at very base. Epandrium ventrally divided into two lateral lobes, asymmetrical basally, with base of right lobe projected into abdomen beneath tergite 7, and base of left lobe evenly rounded; each side with single large finger-like epandrial lobe near 1/2 bearing one large seta near base and one large seta at apex. Hypandrium nearly symmetrical, hood-like and nearly surrounding phallus, bifurcate apically into right and left lobes; fused basally with epandrium. Surstylus shiny, dark brown, large, complex and loosely attached to epandrium, with many lobes and processes including medial sclerotized hook with rounded spiny lobe at base; 3 large blade-like setae directed medially; without obvious lateroapical membranous flange; phallus rather wide, arched and projected ventrally. Cercus dark brown-gray, elongate oval with narrowed apex in lateral view, covered with small hairs and several longer setae, especially along margin. Hypoproct arising between cerci, hyaline and subquadrate in lateral view. **Female**. Body length 0.9–1.2 mm; wing 1.1–1.2 mm x 0.4–0.5 mm (width). Similar to male except: face slightly wider; abdomen dorsoventrally flattened and usually arched ventrally, tergite 6 with short ventral setae along apical margin.



**FIGURES 11–14.** Collection localities and habitats of *Hurleyella belizensis* sp. nov. and *H. cumberlandensis* Runyon & Robinson. **11.** Type locality of *H. belizensis* sp. nov. in Mayflower Bocawina National Park, Belize. Specimens were taken by sweeping bare soil of roadway (16°55.63'N 88°23.51'W); **12.** *H. belizensis* sp. nov. was also found by sweeping mostly dry coarse sandy area near a creek on Mountain Pine Ridge, Belize (17°00.86'N 88°58.82'W); **13, 14.** Type locality of *H. cumberlandensis* where Phillips Creek flows into North Fork of Pound Lake, Virginia, USA (37°18.37'N 82°17.72'W); **14.** *H. cumberlandensis* specimens were collected by sweeping dry, sandy soil with sparse vegetation near the lake.



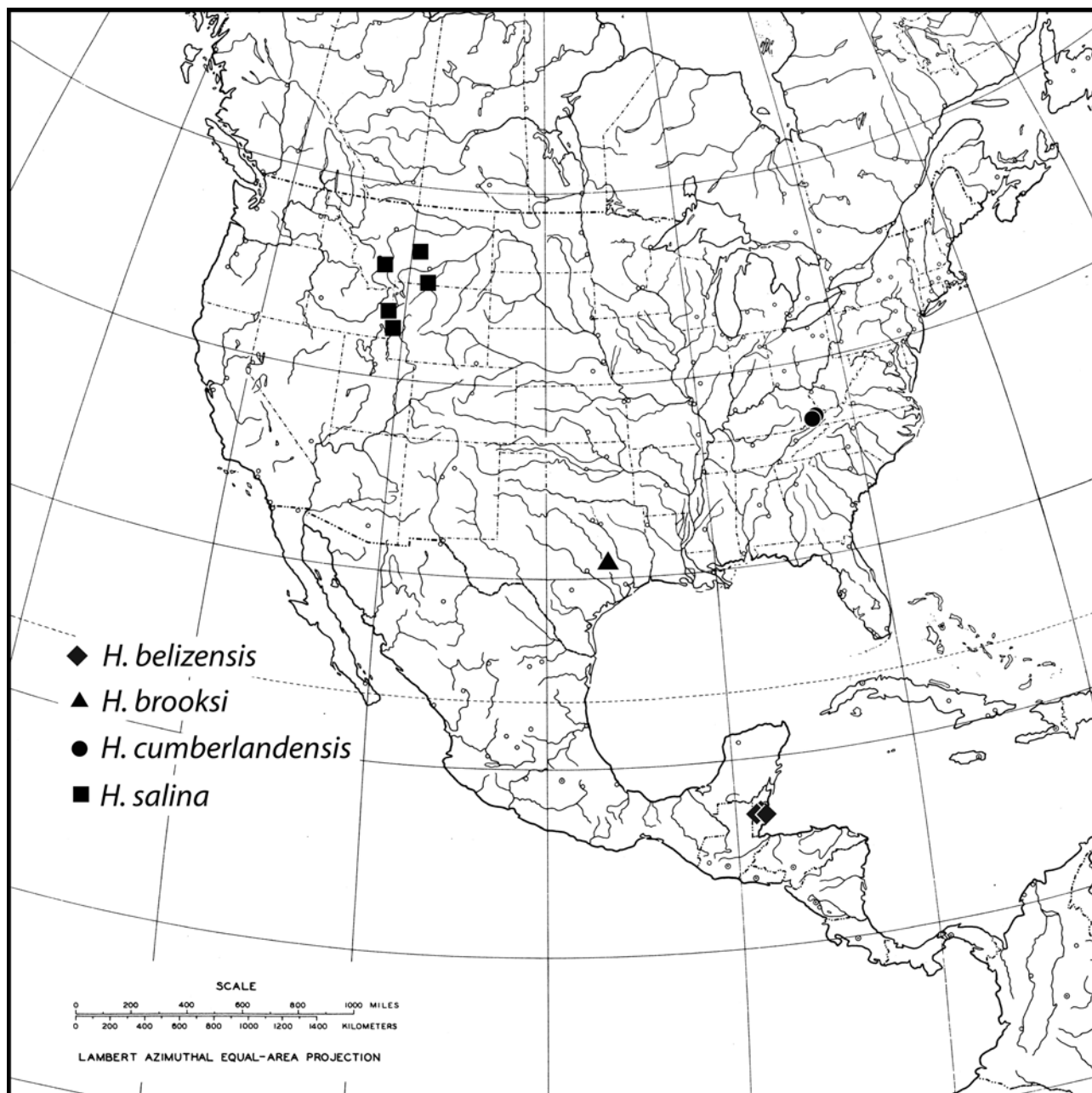


**FIGURES 15–20.** Collection localities and habitats of *Hurleyella salina* **sp. nov.** **15, 16.** Type locality of *H. salina* **sp. nov.** at Deadman’s Basin, Montana, USA (46°20.53’N 109°22.94’W); **16.** Specimens of *H. salina* **sp. nov.** were found at Deadman’s Basin in areas with lots of salt, mud cracks, and a little moisture; **17.** Specimens were collected at Piedmont Pond, Montana, USA (45°50.634’N 112°06.848’W) on mostly dry soil with scattered grasses and a little crusted salt; **18.** At Gyp Springs in south central Montana, USA (45°00.36’N 108°25.80’W), specimens were found on bare soil along lower wall of small canyon where water evaporates and salt forms (left center); **19.** At Salt Creek in west central Wyoming, USA (42°28.00’N 110°58.07’W), *H. salina* **sp. nov.** was taken from areas near the creek with lots of salt (lower left); **20.** At Fall Creek in eastern Idaho, USA (43°25.48’N 111°24.86’W), specimens were found on dry part of a travertine mound formed by cold mineral springs with evidence of some salt and other minerals.

**Etymology.** The epithet is derived from the Latin *salinus* meaning “of salt” and is in reference to the salty and alkali habitats where this species occurs (Figs 15–20).

**Type material. HOLOTYPE** ♂, labelled: “MONTANA: Golden Valley Co. | alkali area/ Deadman’s Basin | N46°20.528’; W109°22.937’ | 04July2017, J.B. Runyon” [USNM, type number USNMENT01519228].

**PARATYPES: USA: Idaho:** Bonneville Co., Fall Creek mineral springs, 43°25.48’N 111°24.86’W, 20.vii.2018, J.B. Runyon (5 ♂, 1 ♀). **Montana:** same data as holotype (6 ♂, 2 ♀); same data as holotype, except 7.vii.2016 (1 ♀); Jefferson Co., Piedmont Pond, 1325 m, 45°50.634’N 112°06.848’W, 10.vii.2017, J.B. Runyon, sweeping ground with scattered grasses, a little moisture, and a little crusted salt (6 ♂, 2 ♀); Carbon Co., Pryor Mountains, Gyp Springs, 1410 m, 45°00.36’N 108°25.801’W, 4–5.vii.2018, J.B. Runyon (6 ♂, 2 ♀). **Wyoming:** Lincoln Co., Salt Creek, 2020 m, 42°28.00’N 110°58.07’W, 9.vii.2018, J.B. Runyon (10 ♂). Paratype specimens deposited in CNC, MTEC, USNM.



**FIGURE 21.** Known geographical distribution of *Hurleyella* species.

**Remarks.** Specimens of *Hurleyella salina* **sp. nov.** have been collected at five localities, three in Montana and one each in Idaho and Wyoming (Fig. 21), all with at least some crusted salt and/or other minerals on the soil

surface. The type locality, Deadman's Basin in central Montana, has large areas of salt (Fig. 15) and *H. salina* **sp. nov.** was found there sweeping nearly bare soil with scattered grasses; most specimens were taken from areas with mud cracks and at least some signs of a little moisture (Fig. 16). Specimens were collected at the Piedmont Pond site in southwestern Montana from similar habitat but with more grasses and less salt on the soil surface (Fig. 17). The Gyp Springs site in southcentral Montana is part of the Chugwater Formation of red sandstone, and specimens were found on bare soil at the bottom sides of a small canyon where moisture evaporated and left a line of crusted salt (Fig. 18). In west central Wyoming, *H. salina* **sp. nov.** was found sweeping bare, moist areas of side pools along Salt Creek with large amounts of crusted salt on the soil surface (Fig. 19). Lastly, in southeastern Idaho, adults were found on the dry, crumbling surface of a sloping travertine mound composed of low-magnesian calcite and formed by a cold spring (Chafetz & Folk 1984; Fig. 20).

*Hurleyella salina* **sp. nov.** is distinct, in a number of respects, from the other three species of *Hurleyella*. For example, the head of *H. salina* **sp. nov.** is relatively short and broad (Fig. 6). Several characteristics of the hypopygium (Figs 9, 10) of *H. salina* **sp. nov.** are unlike the other species, including lacking an obvious flange at apex of the surstylus, lacking a strongly sclerotized apical epandrial margin, having a nearly symmetrical hypandrium, and the epandrium almost wholly divided ventrally into left and right lobes.

## Discussion

This paper extends the known distribution of *Hurleyella* north and westward in the Nearctic and southward into the Neotropics. The discovery of *H. belizensis* **sp. nov.** in the Neotropics is not surprising and was predicted by Runyon & Robinson (2010). Their hypothesis was that *Hurleyella* is a largely Neotropical element with a relict extension (from the generally warmer Tertiary Period) into the Southeastern United States, a pattern reminiscent of some plant species (Braun 1955) and proposed for some dolichopodid species (e.g., *Sympycnidelphus sharpi*; Robinson 1964a). However, the discovery of *H. salina* **sp. nov.** in the Northern Rockies (Fig. 21) suggests that the distribution of *Hurleyella* is more complicated, and its occurrence in North America is not simply a holdout from warmer times. At this time, the diversity and distribution of *Hurleyella* is not understood adequately to answer questions concerning how historical factors have affected current geographic patterns. This is true for the micro-dolichopodids in general which are poorly documented, particularly in the tropics, and more sampling is needed, especially with a focus on complete inventories (Borkent *et al.* 2018; Brown *et al.* 2018).

*Hurleyella* belongs to the group of micro-dolichopodids containing *Microcyrtura* Robinson, *Microchrysotus* and *Micromedetera*, and is most similar to *Micromedetera* based on wing venation and general gestalt (Runyon & Robinson 2010). More work is needed to elucidate the relationships among these genera, but one distinct difference appears to be habitat. Adults of *Hurleyella* are found on soil in open, relatively dry habitats with little to no vegetation (Figs 11–20), whereas *Microcyrtura*, *Microchrysotus*, and *Micromedetera* appear to be restricted to moist, shaded habitats (Robinson 1964b, 1975). Robinson (1964b) collected *Microcyrtura* in Mexico from rocks in shaded ravines and I have collected specimens in Belize and Costa Rica from moss-covered rocks in dark ravines. *Microchrysotus* was found on leaves and moist rocks in roadside ditches (Robinson 1964b). The genus *Micromedetera* is known only from four specimens, but two specimens of *M. archboldi* Robinson were collected “on rocks wet from spray, at side of river” (Robinson 1975, p. 38). Other micro-dolichopodid genera, including *Enlinia* Aldrich and *Harmstonia* Robinson, also prefer or are restricted to moist habitats (Robinson 1964a, 1969; Runyon & Pollet 2018). This difference in habitat, occurring in relatively dry, open environments, suggests that *Hurleyella* has a fundamentally different ecology than the other micro-dolichopodids.

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