



## *Polycentropus dinkinsorum* (Trichoptera: Polycentropodidae), a newly described caddisfly species from the southern Appalachian Mountains, USA

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### Abstract

We describe here a new caddisfly species of the genus *Polycentropus* (Trichoptera: Polycentropodidae) based on males from numerous localities throughout the southern Appalachian Mountains of the United States. *Polycentropus dinkinsorum* is a member of the *P. confusus* Species Group and is readily separated from its congeners based on aspects of the male genitalia. A diagnosis and illustrations of male genitalia are provided. In addition, *P. pentus* Ross 1941 is reported for the first time from the Canadian province of Newfoundland and Labrador.

**Key words:** Annulipalpia, biodiversity, distribution, new record, *Polycentropus confusus* Species Group

### Introduction

The *Polycentropus confusus* Species Group is restricted to the eastern half of North America, spanning from north Florida, USA, to Manitoba, Canada (Hamilton 1986). Like many caddisfly taxa, the taxonomy of the group is based on male terminalia with males well resolved and females and larvae in need of revision. The group itself is defined according to unique features of the male genitalia summarized by Hamilton *et al.* (1990). Currently, the *P. confusus* Species Group comprises 16 nominal species. Here, we describe the seventeenth species of the group, *P. dinkinsorum*, based on males collected from numerous localities from across the southern Appalachian Mountains, a region known to house high caddisfly diversity, including the *P. confusus* Species Group (Morse *et al.* 1993). We provide illustrations of the male genitalia and a diagnosis. The female and larva of *P. dinkinsorum* remain unknown.

### Materials and methods

Specimens were observed under a Unitron Z10 stereomicroscope or a Bausch and Lomb W.F. stereomicroscope at up to 120x magnification. To evaluate internal morphology, genitalia were cleared with an unheated solution of KOH, then rinsed with ethanol. Genitalia were viewed in glycerine, and then stored in a microvial within a vial of 80% ethanol with the rest of each respective specimen. The phallus was excised from some specimens for illustration. Line drawings were produced using a 10x10 gridded ocular lens used in conjunction with a gridded guide and pencil. Drawings were then scanned and used as templates for the final illustrations using Adobe Illustrator® version 23.1. Morphological terminology follows Hamilton *et al.* (1990). Representative males of the other members the *P. confusus* Species Group were examined and compared with those of *P. dinkinsorum*.

The holotype and a single paratype have been deposited at the US National Museum of Natural History, Smithsonian Institution, Washington, District of Columbia, USA. Other paratypes have been deposited at the

California Academy of Sciences, Clemson University Arthropod Collection, Illinois Natural History Survey, Florida State Collection of Arthropods at Florida A&M University, the Royal Ontario Museum, and the Trichoptera Collection at the University of Tennessee, Knoxville. Institutional abbreviations where identified material is deposited are as follows:

BIOUG = University of Guelph Insect Collection, Guelph, Ontario, Canada

CAS = California Academy of Sciences, San Francisco, California, USA

CUAC = Clemson University Arthropod Collection, Clemson, South Carolina, USA

FAMU = Florida State Collection of Arthropods, Florida A&M University, Tallahassee, Florida, USA

INHS = Illinois Natural History Survey, Champaign, Illinois, USA

NMNH = National Museum of Natural History, Smithsonian Institution, Washington, D.C., USA

ROM = Royal Ontario Museum, Toronto, Ontario, Canada

UTK = Trichoptera Collection of the University of Tennessee-Knoxville, Knoxville, Tennessee, USA

## Taxonomy

### *Polycentropus dinkinsorum* Orfinger & Etnier, new species

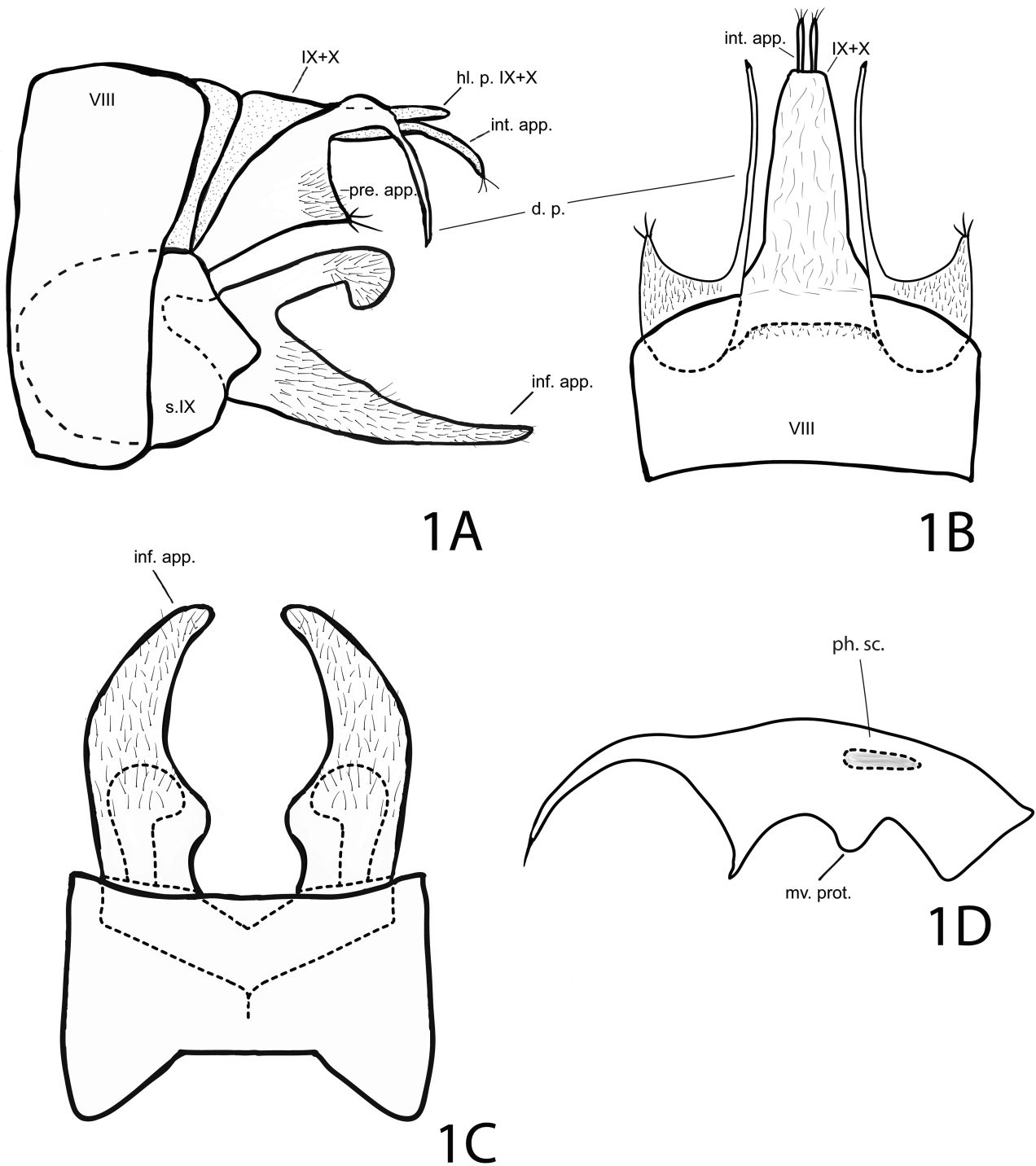
Figures 1A–1D.

**Description.** General Structure: Length 6.1–7.2 mm (n = 4). General habitus typical of males of the *P. confusus* Species Group. In ethanol, eyes dark purple and glazed; body color various shades of brown, with subtle spots of lighter brown forming irrorate pattern on front wings; hind wings uniformly brown; legs tan to pale yellow.

Male genitalia (Fig. 1). Abdominal segment VIII annular. Tergum IX fused with segment X, membranous, caudally extended as horn-like projection in lateral view (Fig. 1A). Sternum IX round in lateral view, posterior margin lobate. Intermediate appendages positioned beneath terga IX+X, distally extending beyond tergum X, apices each bearing 3 small setae; in lateral view (Fig. 1A) curved slightly ventrad; in dorsal view (Fig. 1B) apices proximate, parallel. Preanal appendages triangular in lateral view (Fig. 1A), each with posterior angle acute, forming tooth-like projection; in lateral view dorsal process wide basally, distally slender, terminating in long, whip-like process curved ventrad terminating in slender spine; in dorsal view (Fig. 1B) sub-parallel, slender, elongate. Inferior appendages each with ventral portion in lateral view gradually tapered, extended posterad slightly beyond intermediate appendages, ventral margin nearly straight; in ventral view (Fig. 1C), mesal projection near mid-length, distal half curved inward; dorsobasal process in lateral view erect, with long “neck” terminating in short, rounded “head” projecting downward, in ventral view (Fig. 1C) obscured completely by ventral portion of inferior appendage. Phallus in lateral view (Fig. 1D) slightly curved ventrad, mesoventral protuberance arising near mid-length, apical section rectangular, spinules absent, phallic sclerite moderately elongate with narrow distal portion.

Female and Larva: Unknown

**Diagnosis.** The male of *P. dinkinsorum* can be separated from those of all other currently known members of the *P. confusus* Species Group by the sharpness of the acute, tooth-like projection of the posteroventral margin on the body of the preanal appendage compared to the more blunt tooth-like projection of the posteroventral margin on the body of the preanal appendage, or absence of the tooth-like projection. Male genitalic structure is most similar to that of *P. carolinensis* and *P. carlsoni*. It can readily be separated from both *P. carolinensis* and *P. carlsoni* by the presence of a mesoventral protuberance on the phallus, the longer “necks” of the dorsobasal process of the inferior appendages, and the more obtusely curved “heads” of the dorsobasal processes of the inferior appendages. Males can also be distinguished from *P. carlsoni* by the slight downward curvature of the phallus, versus the stronger curvature exhibited by *P. carlsoni*, and the more obtusely curved head shape of the dorsobasal process of the inferior appendage. From *P. carolinensis* it can also be separated by the presence of a distinctly pronounced, horn-like, apical projection of the combined terga IX+X extending caudad over the intermediate appendages. From *P. floridensis*, *P. pentus*, and *P. vernus*, which each exhibit a ventral swelling on the phallobase, males of *P. dinkinsorum* can easily be separated by the more distal location of the mesoventral protuberance, the shape of the dorsobasal process of each inferior appendage. From *P. floridensis* and *P. vernus*, *P. dinkinsorum* can be distinguished by the presence of the acute, tooth-like projection of the posteroventral margin of the preanal appendage and from *P. pentus* by the prominent profile of this projection (set in a concavity in *P. pentus*).



**FIGURE 1.** *Polycentropus dinkinsorum* n. sp., male genitalia. 1A, left lateral (with phallus removed). 1B, dorsal. 1C, segment IX and inferior appendages, ventral. 1D, phallus, left lateral. Abbreviations: d.p. = dorsobasal process of a preanal appendage (paired); hl. p. = horn-like apical projection of terga IX+X; inf. app. = inferior appendage (paired); int. app. = intermediate appendage (paired); IX+X = combined terga IX + X; mv. prot. = mesoventral protuberance; ph. sc. = phallic sclerite; pre. app. = preanal appendage (paired); s.IX = sternum IX.

**Material Examined. Holotype: USA. North Carolina:** Henderson County, Flat Rock, Carl Sandburg Home National Historic Site, Malaise Trap, [N35°16'16.28, W82°27'01.04"], I. Hoff and E. Eleantar coll., 20-ix-2012, 1 male (USNMNT 01350618).

**Paratypes: USA. West Virginia:** Raleigh County, Piney Creek tributary, New River system, [N37°50'39.08", W81°06'48.88"], G.R. Dinkins, B.J. Dinkins, and H.O. Faust coll., 25-vi-2014, 1 male (CUAC000107314). **North**

**Carolina:** Swain County, Great Smoky Mountains National Park, Kephart Prong Trail near trail head across from bridge over Oconaluftee River, blacklight trap, 834 m, [N35°35'11.52", W83°21'32.87"], B. Sullivan coll., 23–25-vii-2000, 1 male (USNMENT 01350619), 1 male (FAMU), 1 male (INHS Insect Collection 923902). **North Carolina:** Henderson County, Carl Sandberg Home National Historic Site, Flat Rock, Duck Pond, Malaise Trap, [N35°16'15.96", W82°27'01.04"], I. Hoff and E. Eleantar coll., 16–24-v-2012, 1 male (ROME184984). Haywood County, Great Smoky Mountains National Park, Mt. Sterling Trail, D. Paulsen coll., 27-vi-1989, 9 males (UTK 3.269). **Tennessee:** Carter County, Roan Mountain State Park, black light, J. Ensminger coll., 6–12-viii-2000, 1 male (CASENT8468186). Blount County, Great Smoky Mountains National Park, Sams Creek, 100 m below Thunderhead Creek, D. Etnier coll., 7-vi-1996, 1 male (UTK 3.288).

**Comparative Material Examined.** The comparative material examined (Table 1) represents the remaining members of the *P. confusus* Species Group, with the exception of *P. vernus* Hamilton, Harris, & Lago 1990 for which the original description and illustrations were used. Type material was examined when available for most species, and all original descriptions were consulted.

**TABLE 1.** List of comparative material examined.

Species	Author(s)	Males Examined
<i>Polycentropus alabamensis</i>	Hamilton, Harris, & Lago 1990	1
<i>Polycentropus blicklei</i>	Ross & Yamamoto 1965	4
<i>Polycentropus carlsoni</i>	Morse 1971	2
<i>Polycentropus carolinensis</i>	Banks 1905	6
<i>Polycentropus centralis</i>	Banks 1914	109
<i>Polycentropus chelatus</i>	Ross & Yamamoto 1965	1
<i>Polycentropus chenoides</i>	Ross & Yamamoto 1965	5
<i>Polycentropus confusus</i>	Hagen 1861 (in Hagen & Uhler 1861)	2
<i>Polycentropus elarus</i>	Ross 1944	120
<i>Polycentropus floridensis</i>	Lago & Harris 1983	2
<i>Polycentropus maculatus</i>	Banks 1908	4
<i>Polycentropus neiswanderi</i>	Ross 1947	1
<i>Polycentropus pentus</i>	Ross 1941	3
<i>Polycentropus pixi</i>	Ross 1944	1
<i>Polycentropus thaxtoni</i>	Hamilton & Holzenthal 1986	1

**Etymology.** Named in honor of the family of Gerald R. and Barbara J. Dinkins, students, colleagues, and participants in many aquatic biology efforts throughout our long friendship. Their three adult “children”, Jamie, Timothy Charles (T.C.), and Zack, share our interests in science and the environment, and are also recognized in this species epithet.

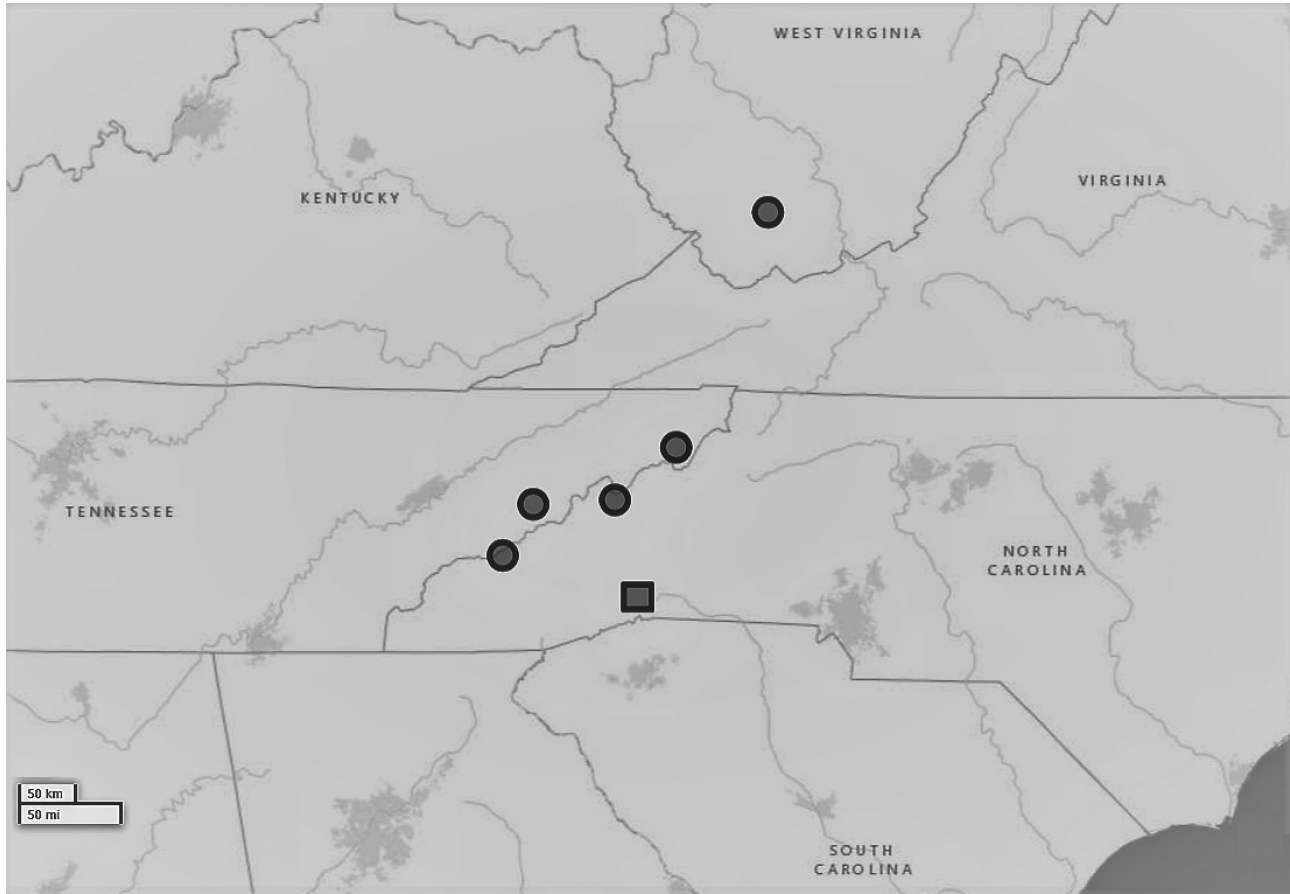
## Discussion

This species is currently known from the Appalachian Mountains of North Carolina, Tennessee, and West Virginia (Figure 2). Little is known of the ecology of this species. *Polycentropus dinkinsorum* has been collected near cool, rocky streams of the southern Appalachian Mountains from May to September. A representative habitat and collection site of *P. dinkinsorum* is shown in Fig. 3. The collection of specimens via both Townes-style Malaise trap (Townes 1962, 1972) and UV light trap suggests both diurnal and crepuscular flight activity, respectively. However, it has been demonstrated that light trapping can induce diurnal Trichoptera to exhibit atypical flight activity and these capture method data should therefore be interpreted cautiously in a biological context (Larsson *et al.* 2020). Indeed, collection by both Malaise traps and light traps appears to be common among members of the *P. confusus* Species Group as observed in field collections.

No phylogeny of the *P. confusus* Species Group exists. *Polycentropus dinkinsorum* is an interesting case that

shows close morphological affinity to multiple congeners. The phallic protuberance suggests affinity to *P. floridensis*, *P. pentus*, and *P. vernus*, while the apical horn-like projection of terga IX+X is most like that of *P. confusus*, *P. maculatus*, and *P. carlsoni*, and the superficial appearance of the male genitalia is similar to *P. carolinensis* and *P. carlsoni*. A robust phylogeny is needed to address the interspecific relationships of the *P. confusus* Species Group and test the phylogenetic utility of these noted characters.

Finally, a new Canadian province record of *P. pentus* was encountered during examination of comparative material based on three males, reported here.



**FIGURE 2.** Current recorded distribution of *Polycentropus dinkinsorum* n. sp. The square represents the holotype locality and circles represent other collection sites.

### *Polycentropus pentus* Ross 1941, New Record

**Canada. Newfoundland and Labrador:** Gros Morne National Park, James Callaghan Trail (aka Gros Morne Trail), Malaise Trap, 39 m, [N49°34'06.96", W57°49'48.72"], Anderson coll., 16-vii-2013, 1 male (BIOUG10090-F07). Tablelands Trail, 175 m, [N49°28'37.20", W57°58'12.00"], BIObus 2013 coll., 20-vii-2013, 1 male (BIOUG14743-A01), 1 male (BIOUG15057-D03). **Comments:** This is the first published report of this species from Newfoundland and Labrador.

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**FIGURE 3.** Sams Creek in Great Smoky Mountains National Park, Blount County, Tennessee, USA, on 5 June 2020, a representative habitat and collection site of *Polycentropus dinkinsorum* n. sp. Inset is a map of North America indicating site position (circle).

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