First records of *Ptilophorus wrightii* (LeConte 1868) (Coleoptera: Ripiphoridae: Ptilophorinae) in Colorado and Oklahoma, with Observations of Female Behavior

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Scientific Note

First records of *Ptilophorus wrightii* (LeConte 1868) (Coleoptera: Ripiphoridae: Ptilophorinae) in Colorado and Oklahoma, with observations of female behavior

The wedge-shaped beetle, *Ptilophorus wrightii* (LeConte 1868) (Coleoptera: Ripiphoridae: Ptilophorinae), has a known distribution in the deserts of southern Texas, Arizona, and New Mexico (Batelka 2012). Recent collections of one male *P. wrightii* from northern Colorado (Figs. 1–2) and two females from northwestern Oklahoma (Figs. 3–4) extend the known range of this species northward by approximately 550 miles and increase the upper elevation range from approximately 2900′ to 5900′ (Falin 2002). Northward and higher elevation range expansions of other insect species have recently been documented in Western North America and worldwide (Walther et al. 2002). In Colorado, the Eurasian splendid tamarisk weevil, *Coniatus splendidulus* (Fabricius 1781) (Coleoptera: Curculionidae), adventive in the deserts of Nevada and Arizona, was reported in western Colorado (Bright et al. 2013), while in Oklahoma the buprestid beetle, *Chrysobothris octocola* LeConte 1858 (Coleoptera: Buprestidae), previously known from desert areas in Texas, New Mexico, and Arizona, was recorded from one of the *P. wrightii* localities recorded herein (MacRae & Basham 2013). Several other typically southwestern Buprestidae and Cerambycidae not previously known to occur as far north as northwestern Oklahoma have also been collected there recently (MacRae & Brown 2011, MacRae 2013a–c). Whether these newly discovered localities of *P. wrightii* characterize a trend of range expansion concomitant with changes in climate and land use, represent relict populations that remained unknown due to artifacts of collecting, or perhaps even represent movement mediated by human activity remains unknown. However, it is interesting to note that in Colorado *P. wrightii* was collected in an area where extensive collecting has occurred during the past 120 years beginning with C. P. Gillette (Gillette & Baker 1895, Gillette 1917) and continuing with more recent workers (B. C. Kondratieff, pers. comm.).

Nothing has been recorded on the biology of *P. wrightii*; however, other basal ripiphorid lineages are known to parasitize larvae of wood-boring beetles in other families such as Ptinidae (formerly Anobiidae) and Cerambycidae (Batelka 2005). The one male from northern Colorado was swept from grasses in a foothill meadow just west of Horsetooth Reservoir in the foothills transition zone of sandstone and limestone hogback ridges between the Great Plains and southern Rocky Mountains. Plant communities are characterized by open forests dominated by *Pinus ponderosa* Lawson & C. Lawson (Pinaceae) mixed with shrublands consisting mainly of *Cercocarpus montanus* (Raf.) (Rosacese), *Rhus triloba* Nutt. (Anacardiaceae), *Juniperus scopulorum* Sarg. (Cupressaceae), *Ribes cereum* Douglas (Grossulariaceae), *Artemesia frigida* (Willd.) (Asteraceae), *Ericamerica nauseosa* (Pall. ex Pursh) (Asteraceae), *Yucca glauca* Nutt. (Agavaceae), and *Opuntia polyacantha* Haw. (Cactaceae), and grasslands where native grasses (family Poaceae) like *Andropogon gerardii* Vitman and *Bouteloua gracilis* (Willd. ex Kunth) have decreased in abundance due to competition with the exotic grass *Bromus tectorum* L. and livestock grazing (Kettler & Pineda 1999). The two females from Oklahoma were collected in the Glass Mountains, a

Figures 1–2. *Ptilophorus wrightii*, male, Horsetooth Mountain Park, Colorado. 1. Dorsal view. 2. Lateral view.

series of gypsum-capped mesas and buttes extending from the Permian red beds of the Blaine Escarpment. Mixed-grass prairie is the dominant plant community (see Figs 4–5 in MacRae & Brown 2011), with *Juniperus virginiana*, *Celtis* sp. and *Ulmus* sp. (Ulmaceae), *Prosopis glandulosa* Torr. (Fabaceae), *Sapindus saponaria* L. var. *drummondii* (Hook. & Arn.) L. D. Benson (Sapindaceae), and *Rhus aromatica* Aiton comprising the majority of woody plants. During the past 50–100 years *J. virginiana* has invasively increased in incidence as a result of anthropogenic influence (Steuter et al. 2003). One of the females (Fig. 3) was found during the afternoon hours on a dead branch of living *J. virginiana*. The branch had been killed by wood-boring beetle larvae, and the female was sitting still with the ovipositor exerted. A second female was found at a nearby location, this time at night and on a dead branch of living *R. aromatica*. Like the previous female, it was also sitting still with the ovipositor exerted but in addition was holding the elytra curiously outstretched (Fig. 4).

The observation of two females, each on a dead branch sitting motionless with the ovipositor exerted, warrants additional comment. The beetles were initially presumed

Figures 3–4. *Ptitilophorus wrightii*. 4. Female observed during the afternoon on dead branch of living *Juniperus virginiana*, Gloss Mountain State Park, Oklahoma. 5. Female observed at night with elytra outstretch on dead branch of living *Rhus aromatica*, 0.2 mi W of Gloss Mountains Overlook, Oklahoma. Photos by the first author.

to be ovipositing into the dead wood; however, several lines of evidence suggest this is unlikely. In most beetles oviposition is an active process in which the ovipositing female does not remain still for long periods of time, as was observed with both of the *P. wrightii* females. For example, ovipositon behavior in the ripiphorid beetle, *Ripiphorus caboverdianus* Batelka & Straka 2011, consists of agile movements by the female over the chosen plant, with actual ovipositing in the still position for a maximum of several tens of seconds (Batelka & Straka 2011). Neither of the *P. wrightii* females exhibited these oviposition behaviors. Moreover, the two plant species on which the *P. wrightii* females were observed are very distant taxonomic relatives and, as far as is known, lack a common, associated wood-boring beetle fauna. Both plants are widespread across the eastern U.S. west to the Great Plains (USDA, NRCS 2013) but are generally absent in the areas of the desert southwest that comprise most of the known distribution of *P. wrightii* (although congeners do exist at higher elevations in the desert southwest). In contrast, the European ripiphorid beetle, *Pelecotoma fennica* (Paykull 1799), is associated almost exclusively with soft dead wood of poplars and willows well eaten by larvae of *Ptilinus fuscus* (Geoffroy 1785) (Coleoptera: Ptinidae) (Švácha 1994), and another pelecotomine riphiphorid beetle, *Clinops spectabilis* Schaufuss 1872 from the Mediterranean region, is associated with a single species

of evergreen oak densely infested by several genera of Cerambycidae (Batelka 2005). Lastly, the *J. virginiana* branch on which the first female was found was collected along with numerous dead branches from nearby trees in September 2012 and confined in a fiber drum maintained at ambient temperature in St. Louis, Missouri through the end of 2013. Several *Chrysobothris ignicollis* Horn 1885 (Coleoptera: Buprestidae) and *Callidium texanum* Schaeffer 1917 (Coleoptera: Cerambycidae) adults emerged from the wood, but no *P. wrightii* adults were obtained, nor were any eggs observed on the branch in the area where the female was observed sitting. The *R. aromatica* branch on which the second female was found was not collected.

An alternative hypothesis is that the observed female behavior represents mate "calling" behavior (J. Batelka, in litt.). Females of some beetles are known to produce long-range sex pheromones to attract potential mates, and the behavior is undoubtedly widespread across many groups of Coleoptera. Moreover, sex pheromone producing glands have been associated with the ovipositor in *Prionus californicus* Motschulsky 1845 (Coleoptera: Cerambycidae: Prioninae) (Cervantes et al. 2006), and calling behavior by females with the ovipositor exerted has been observed in other Prioninae (Švácha & Lawrence 2014) and Cerambycinae (Curkovic & Ferrera 2012). Many Prioninae and some Cerambycinae also exhibit highly elaborated male antennae (Švácha & Lawrence 2014) consisting of flabellate antennomeres and, in the case of Prioninae, hypermery to further increase available surface area for detecting female sex pheromone. The *P. wrightii* female behavior documented here could provide the first clue regarding the mechanism by which virgin ptilophorine ripiphorid females attract males, which also possess characteristic flabellate antennae (Figs 1–2), for mating. The outstretched elytra of one of the observed females is an unusual behavior, and we are not aware of it being observed in any other beetle. At first the female was thought to have died, perhaps from entomopathogenic infection, but the exerted ovipositor and prodding of the beetle (after taking photographs) proved it to be very much alive. This could represent an additional behavior utilized by calling females to enable more effective release and dispersal of sex pheromone.

Material Examined. USA: Colorado, Larimer Co., Horsetooth Mountain Park 0.5 mi W of Dixon Cove, N40°32′44″, W105°10′22″, elev. 5905′, 26.IX.2013, swept from grasses in foothills meadow, coll. B. Heinold, 1 male, deposited Colorado State University Collection; Oklahoma, Major Co., Gloss Mountain State Park, atop main mesa, N36°21′56″, W98°34′45″, elev. 1542′, 16.IX.2012, on dead branch of living *Juniperus virginiana*, coll. T. C. MacRae, 1 female, deposited T. C. MacRae Collection (TCMC); 0.2 mi W Gloss Mountains Overlook, large mesa on S side of Hwy 412, N36°21′41″, W98°35′07″, elev. 1411′, 16.IX.2012, on dead branch of living *Rhus aromatica*, coll. T. C. MacRae, 1 female, deposited TCMC.

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