

**Rocky Mountain Juniper (*Juniperus scopulorum*;
Cupressaceae) as a Host Plant of *Banasa tumidifrons* Thomas
and Yonke (Hemiptera: Pentatomidae) in the Western United
States**

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**ROCKY MOUNTAIN JUNIPER (*JUNIPERUS SCOPULORUM*;
CUPRESSACEAE) AS A HOST PLANT OF *BANASA TUMIDIFRONS*
THOMAS AND YONKE (HEMIPTERA: PENTATOMIDAE) IN THE
WESTERN UNITED STATES**

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Abstract.—*Banasa tumidifrons* Thomas and Yonke is a little-known stink bug of the nominotypical tribe of the subfamily Pentatominae. Described from California, Idaho, and Oregon, it since has been recorded only from Washington State. Adults are known from juniper (*Juniperus*), but it is not known whether junipers support the pentatomid's nymphal development. From 2012 to 2014, nymphs and adults were collected from Rocky Mountain juniper (*J. scopulorum*) in natural communities and ornamental plantings at 18 sites in five states: Colorado, Kansas, Nebraska, South Dakota, and Wyoming; all are new state records. Nymphs of all instars (I–V) were found on female plants of the dioecious *J. scopulorum* in early July and instars II–V in early to mid-September. *Juniperus scopulorum* is considered a host plant in a restricted sense of the term: a plant on which nymphs feed and develop. Occasionally present on junipers were fifth instars of three other pentatomids: *B. euchlora* Stål (Wyoming is a new state record), *Thyanta calceata* (Say), and *T. custator accerra* McAtee.

Key Words: Heteroptera, stink bugs, distribution, new records, seasonality

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The pentatomine stink bug *Banasa tumidifrons* Thomas and Yonke was described from California, Idaho, and Oregon (Thomas and Yonke 1981a). Since the original description, only Washington State (two sites in Whitman County; Zack et al. 2012) has been added to the known distribution. Biological information is lacking, except for the collection of adults on juniper (*Juniperus*) (Thomas and Yonke 1981a).

In western Nebraska in July of 2012, I collected a reddish species of *Banasa* that resembled the northern and western race (race B; Thomas and Yonke 1981a, b) of

B. dimidiata (Say). Nymphs and adults were found on female plants of the dioecious Rocky Mountain juniper, *Juniperus scopulorum* Sarg. Adults of the wide-ranging, polyphagous *B. dimidiata* have been reported from species of *Juniperus* in New England (Parshley 1923, Procter 1946), but without evidence that the bug develops on these plants, junipers have been considered doubtful hosts (DeCoursey 1963). After collecting a *Juniperus*-associated species of *Banasa* in Nebraska in 2012, my objective was to determine if junipers support nymphal development of the pentatomid and thus meet a restrictive

definition of host plant. Based on fieldwork in 2013 and 2014, I report the consistent use of junipers by nymphs and adults of a pentatomid later identified as *B. tumidifrons*. Also recorded is the occurrence on junipers of fifth instars of the pentatomids *B. euchlora* Stål, *Thyanta calceata* (Say), and *T. custator accerra* McAtee.

MATERIALS AND METHODS

Rocky Mountain juniper was sampled in natural communities and ornamental plantings in Nebraska in early July 2013 and in Colorado, Kansas, Nebraska, South Dakota, and Wyoming in early to mid-September 2014. *Juniperus scopulorum* intergrades with eastern redcedar (*J. virginiana* L.) in western Nebraska; these species can be difficult to distinguish because of hybridization and introgression (Kaul et al. 2006, Adams 2014). Nearly all plants in natural communities were identified as *J. scopulorum* on the basis of distribution maps for both juniper species (Kaul et al. 2006, Adams 2014). Junipers at Scotts Bluff National Monument in the Nebraska panhandle include native *J. scopulorum*, as well as plantings of *J. virginiana*. Even though the former species presumably is more numerous (R. Manasek, pers. comm.), the pentatomid's hosts along the monument's North and South Overlook Trails are listed under specimens examined as *Juniperus* spp. When the specific identity of an ornamental plant is in doubt, it is listed as *Juniperus* sp.

Species of *Banasa* are frugivorous, and fieldwork in 2012 indicated that nymphs of *B. tumidifrons* are found on female plants of *J. scopulorum*. Branches with berrylike fruits (ovulate or seed cones) were beaten over a shallow net with the flat end of an ax handle, and dislodged specimens of *B. tumidifrons* and other pentatomids were collected into snap-cap

plastic vials. Most nymphs of *B. tumidifrons* were determined to instar in the field and either the numbers of each instar or the ranges present (e.g., II–IV) were recorded. In 2013, nymphs collected at five sites were preserved in ethanol and later sorted to instar with a stereomicroscope as a check on the accuracy of field sorting. Fifth instars of *B. tumidifrons* ($n = 1$) and those of three other pentatomid species—*B. euchlora* ($n = 2$), *Thyanta calceata* ($n = 1$), and *T. custator accerra* ($n = 3$)—were held for eclosion in vials with fruit-bearing sprigs of juniper to associate nymphs with their respective adults. I collected all adults ($n = 6$) of the juniper specialist *B. euchlora*, but not all adults of the two polyphagous species of *Thyanta* were collected.

Voucher specimens of *B. tumidifrons* and the other pentatomid species are deposited in the U.S. National Museum of Natural History, Smithsonian Institution, Washington, DC.

RESULTS

Banasa tumidifrons Thomas and Yonke

Recognition features.—Adults of *B. tumidifrons* are similar to those of *B. rolstoni* Thomas and Yonke, an apparent specialist on ash (*Fraxinus* spp.) (Thomas and Yonke 1981a, Jones 1993), and the polyphagous *B. dimidiata*. The shape of the male pygophore (Thomas and Yonke 1981a: figs. 4, 5, 9) is the key character differentiating the juniper-feeding *B. tumidifrons* from *B. dimidiata* and *B. rolstoni*. Secondary characters that help distinguish *B. tumidifrons* include the dorsally yellow and convex head, jugum lacking dark punctations, labium attaining or slightly surpassing the tubercle-bearing (3rd) abdominal sternite, sparsely punctate scutellum, red corium with a milky suffusion, and hemelytral membrane with a basal

brownish blotch (Thomas and Yonke (1981a).

Collection sites, host plants, and seasonality.—*Banasa tumidifrons* was found in natural communities and ornamental plantings on female junipers, mainly those of *J. scopulorum*, at 18 sites (west of 100th meridian) in five states: Colorado (1 site), Kansas (1), Nebraska (11), South Dakota (2), and Wyoming (3). Elevation exceeded 950 m at all sites and in Wyoming (Burns) was about 1690 m.

Nymphs (Fig. 1) and adults (Fig. 2) were observed in early July and early September. All nymphal instars were present in early July; nymphs (instars II–V) were encountered less frequently and in fewer numbers in September. The nymphal coloration and markings resemble those of the yellowish-green and glaucous immature berries (Fig. 1).

Specimens examined.—COLORADO: *Weld Co.*, Banner Lakes State Wildlife Area, 7 km E of Hudson, 40°04.418'N 104°33.882'W, 13 Sep 2014, instars III–V, 2♀ ex *Juniperus scopulorum*. KANSAS: *Cheyenne Co.*, Bird City, 39°45.366'N 101°32.264'W, 1 Sep 2014, 1♂ ex *J. virginiana* (ornamental). NEBRASKA: *Dawes Co.*, Chadron Cemetery, Rt. 20, 2.1 km W of Chadron, 42°49.692'N 103°01.530'W, 5 July 2013, 4–I, 19–II, 3–III, 3–IV, 7–V ex *J. scopulorum* (ornamental); jct. Rts. 2 & 71, Crawford, 42°40.696'N 103°24.260'W, 8 Sep 2014, 2♂, 6♀ ex *J. scopulorum* (ornamental); Crawford Cemetery, 4 km N of Crawford, 42°43.152'N 103°24.280'W, 6 July 2013, 1–II, 2–III, 1–IV, 2–V & 8 Sep 2014, 11♂, 5♀ ex *J. scopulorum* (ornamental). *Deuel Co.*, Lake Chappell, 1.1 km S of Chappell, 41°05.140'N 102°28.088'W, 4 Sep 2014, 1♂, 3♀. *Kimball Co.*, Gotte Park, Kimball, 41°14.047'N 103°39.110'W, 3 Sep 2014, 1♂ ex *Juniperus* sp. (ornamental). *Scotts Bluff Co.*, Rt. 71, 11.8 km S of Gering, 41°43.045'N 103°41.230'W, 7 July 2012, 2 early instars,

2–V, 3♂, 5♀ ex *J. scopulorum*; Rt. 71, 10.7 km S of Gering, 41°43.289'N 103°41.112'W, 4 July 2013, 2–II, 1–III, 3–IV, 7–V ex *J. scopulorum*; *Scotts Bluff National Monument*, South Overlook Trail, 41°50.23'N 103°42.04'W, 2 July 2013, instars II–V, 2♂, 3♀ & 6 Sep 2014, 4♂, 2♀; North Overlook Trail (Saddle Rock area), 41°50.258–267'N 103°41.895–944'W, 5 Sep 2014, 2♀ ex *Juniperus* spp. *Sheridan Co.*, Rushville, 42°42.908'N 102°28.125'W, 7 July 2013, 2–II, 1–III, 4–V ex *J. scopulorum*; Rt. 250 at Niobrara River S of Rushville, 42°33.663'N 102°27.885'W, 7 July 2013, 1–III, 2–V ex *J. scopulorum*. *Sioux Co.*, Agate Fossil Beds National Monument Visitor Center, ca. 36 km S of Harrison, 42°25.516'N 103°44.072'W, 7 Sep 2014, 1♂, 3♀ ex *Juniperus scopulorum* (ornamental). SOUTH DAKOTA: *Fall River Co.*, Rt. 71, 4 km N of Ardmore (ghost town), 43°08.882'N 103°39.730'W, 10 Sep 2014, 1♀ ex *J. scopulorum*; Rt. 71, 22.7 km S of Hot Springs, 43°16.085'N 103°34.717'W, 10 Sep 2014, 2–III, 1–IV, 1♂ (teneral) ex *J. scopulorum*. WYOMING: *Laramie Co.*, Burns, 41°11.279'N 104°21.526'W, 12 Sep 2014, 1♀ ex *Juniperus* sp. (ornamental); Rt. 213, 3.8 km S of Burns, 41°09.539'N 104°21.525'W, 12 Sep 2014, 1♀ ex *Juniperus* sp. (ornamental); South Beech Ave., 1 km S of Pine Bluffs, 41°10.211'N 104°03.850'W, 12 Sep 2014, 4♀ ex *J. scopulorum*.

Other Pentatomidae on *Juniperus*

Banasa euchlora was observed in 2014 on *Juniperus* at the following sites where *B. tumidifrons* was syntopic (except in Kansas): Kansas: *Sherman Co.*, Goodland (39°20.254'N 101°42.464'W), 1–V (reared to adult ♂), 1♂, 2♀; Nebraska: *Deuel Co.*, Lake Chappell, S of Chappell, 1–V (reared to adult ♂), and *Scotts Bluff Co.*, *Scotts Bluff National Monument*, North Overlook Trail, 1♀;



Figs. 1, 2. *Banasa dimidiata* on *Juniperus scopulorum*, Scotts Bluff National Monument, Scotts-bluff, Nebraska, July 2013. 1, Fifth instar. 2, Adult ♀.

South Dakota: Fall River Co., 4 km N of Ardmore, 1♀; and Wyoming: Laramie Co., 3.8 km S of Burns, 1♂. *Banasa euchlora* was not listed from South Dakota and Wyoming by Froeschner (1988). The first record for South Dakota was reported by Rider (2012); Wyoming apparently is a new state record.

In 2014, nymphs of *T. custator accerra* were encountered at three sites where *B. tumidifrons* was present: Colorado: Weld Co., Banner Lakes State Wildlife Area, 7 km E of Hudson, 2–V; Kansas: Cheyenne Co., Bird City, 2–V (reared to adult ♀♀), 1♂, 1♀, and Sherman Co., Goodland, 1–V (reared to adult ♂). *Thyanta calceata* was collected at one site: Nebraska: Kimball Co., Gotte Park, Kimball, 1–V (reared to adult ♀).

DISCUSSION

Previous biological studies of the insect fauna associated with juniper berries and seeds (Marcovitch 1915, Dimitri et al. 2014) did not include species of *Banasa* or other heteropterans. Previously, seven species of this pentatomid genus, including *B. tumidifrons* (adults only), were recorded from junipers or other cupressaceous plants (Stoner 1922, Thomas and Yonke 1981a, Jones 1993, Wheeler and Krimmel 2012).

The frugivorous *B. tumidifrons* was encountered on female *Juniperus scopulorum* in natural communities and ornamental plantings in western Nebraska and adjacent states. Definitions of insect host plants vary widely (Fothergill et al. 2013), but junipers can be considered host plants of *B. tumidifrons* in a restrictive sense of the term (Roderick and Percy 2008, Nielsen and Hamilton 2009, Mound 2013, Burckhardt et al. 2014), rather than plants used only for adult feeding or shelter. Junipers also qualify as primary hosts: plants used regularly by large numbers of individuals (Walter 2003).

All instars of *B. tumidifrons* were present on Rocky Mountain juniper in July and second to fifth instars in September. This pentatomid was observed in consecutive years at three sites in the Nebraska panhandle: Wildcat Hills south of Gering (2012, 2013) and Scotts Bluff National Monument and an ornamental planting near Crawford (2013, 2014). The nymphs in September might represent a second generation or late-hatching cohorts of a single generation.

The distribution of *B. tumidifrons*, known previously from Washington, Oregon, northern California, and Idaho, is extended eastward to western Nebraska and southwestern South Dakota. Additional sampling of junipers west of the 100th meridian probably will extend the known range of this pentatomid. I did not encounter *B. tumidifrons* in western states during less extensive sampling of alligator juniper (*J. deppeana* Steud.), oneseed juniper (*J. monosperma* [Engelm.] Sarg.), and Utah juniper (*J. osteosperma* [Torr.] Little). Further sampling, however, is needed to determine the pentatomid's host range. Jones (1993) reported only one congener, *B. subcarnea* Van Duzee (from *J. deppeana*), in a study of pentatomoid host plants in southeastern Arizona.

When I thought my specimens from Rocky Mountain juniper referred to the reddish, mainly northern and western race of *B. dimidiata*, I was prepared to suggest that the use of molecular studies could help determine whether this wide-ranging, polyphagous pentatomid of karyotypic and morphological variability (Thomas and Yonke 1981a b) might represent a complex of unrecognized species having narrower geographic and host-plant ranges. Once my specimens were identified (by Thomas J. Henry) as *B. tumidifrons*, it became apparent that Thomas and Yonke (1981a) had realized that reddish, *B. dimidiata*-like specimens

from the northwestern United States represented a new species, which they described as *B. tumidifrons*. Molecular work might yet reveal the presence of additional cryptic species within a potential *B. dimidiata* complex.

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