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Abstract. The *Anthonomus juniperinus* (Sanborn) species group is defined and two new species, *Anthonomus sanborni*, **new species**, and *A. rileyi* **new species**, from the United States are described, keyed and illustrated. The three species of the group are associated with the plant genus *Juniperus* and the larvae of *A. juniperinus* are known to develop in fungal galls of *Gymnosporangium* spp. as well as fruits of the Eastern redcedar, *Juniperus virginiana* L. The biology of the group and its taxonomic relationships to other species of *Anthonomus* Germar are also discussed.

Introduction

Sanborn (1868) described *Erirhinus juniperinus* as “a little weevil...found in Eastern Massachusetts during the month of May, depositing its eggs in the beautiful epiphytous fungus *Podisoma juniperina* [(Schwein.) Fr.] (now *Gymnosporangium juniperi-virginianae* Schwein.) upon the succulent flesh of which its larvae feed in numbers, and in which it undergoes its transformations.” This species was transferred to the genus *Anthonomus* Germar by LeConte (1876) where it now resides with two related species described as new herein. Aside from Sanborn’s comments on its developmental site in fungus galls on juniper, little biological information has been published on *Anthonomus juniperinus*. Burke (1968) described, illustrated and keyed the pupal stage of the species and Ahmad and Burke (1972) likewise treated the larval stage. Gates and Burke (1972) reviewed the biology of the species in the context of a study of *Anthonomus* associated with plant galls. The existence of two undescribed species, one from the western and one from the southwestern United States, related to *A. juniperinus* has been known for many years. The object of the present paper is to describe these species and to review the taxonomy and biology of the group as part of an overall study of the systematics of the weevil tribe Anthonomini.

Material and Methods

Two-hundred sixty-eight adult weevils of the *Anthonomus juniperinus* group were examined. These specimens are deposited in the collections of the following individuals and institutions: **AMNH**, American Museum of Natural History, New York, NY; **BMNH**, The Natural History Museum, London, England; **BYUC**, Brigham Young University, Provo, UT; **CMNC**, Canadian Museum of Nature, Ottawa, Canada; **CUIC**, Cornell University, Ithaca, NY; **CWOB**, Collection of C. W. O’Brien, Green Valley, AZ; **EGRC**, Collection of E.G. Riley, College Station, TX; **EMEC**, University of California Berkeley, Berkeley, CA; **INHS**, Illinois Natural History Survey, Urbana, IL.; **JSCC**, Joseph Schuh Collection, in AMNH, American Museum of Natural History, New York, NY; **MCZC**, Museum of Comparative Zoology, Cambridge, MA; **ODAC**, Oregon Department of Agriculture, Salem, OR; **TAMU**, Texas A&M University, College Station, TX; and **USNM**, National Museum of Natural History, Washington, D.C.

Measurements were made as follows: Body length from anterior margin of eye to elytral apex in lateral view; body width across widest point of elytra; pronotum length along dorsal midline from apex to base. Citation of label data: separate labels are indicated by brackets ([]); separate lines are indicated by slash (/).

***Anthonomus (Anthonomus) juniperinus* group**

Description. Body elongate-oval to more strongly ovate, length 1.5 to 3.0 mm. Vestiture consisting of slender, sometimes setalike, scales dorsally and ventrally sparsely to more densely distributed; not obscuring integument except occasionally on pronotum; elytral scales may be evenly distributed or partially denuded posteromedially forming a V-shaped pattern. Integument testaceous to reddish in color. Antennal funicle (including pedicel) with 7 articles. Rostrum slightly curved, nearly straight in some cases; joins head at slight angle. Eyes slightly to moderately strongly convex when viewed from above; may be somewhat protuberant posteriorly. Procoxae large, contiguous. Mesocoxae separated by about 1/3 width of coxa. Femora slender to moderately stout; femoral teeth minute to small, acutely or bluntly pointed, sometimes obsolete. Tibiae straight; metatibia with minute to small apical mucro. Tarsal claws each with distinct, small to minute or obsolete basal tooth. Abdominal sternum 1 along midline about length of sterna 2 + 3, sterna 3 and 4 subequal in length, 4 slightly longer. Median lobe with sides subparallel, apex rounded, membranous dorsally. Hosts. *Juniperus* spp.

Diagnosis. The *Anthonomus juniperinus* group is relatively easily distinguished from other groups of the genus by a combination of characters: small size (*A. rileyi* is among the smallest species of the genus); testaceous to reddish integument with vestiture of elongate, sometimes setalike scales; rostrum feebly curved and meeting head at a slight angle; minute to small tooth on femora, sometimes obsolete; and obsolete to short tooth on the tarsal claws. While the minute (and sometimes absent) to small teeth on the femora and tarsal claws are not characters unique to the juniperinus Group, this is unusual for species in the nominate subgenus. This combined with the elongate, often setalike scales and the rostrum meeting the head at a slight angle distinguishes the group. Although a rather subtle character, the angulate attachment of the rostrum to the head is perhaps the most distinctive single character defining the group.

Relationship to other species groups of *Anthonomus*. It is not clearly evident where the juniperinus group fits in *Anthonomus* other than that it is obviously a member of the nominate subgenus. Dietz (1891) recognized the juniperinus group within the subgenus *Anthonomus* to include *A. juniperinus*, *Anthonomus dissimilis* Dietz and *Anthonomus orchestroides* Dietz. On the basis of a recent study of the genus, neither of the latter two species is considered to be closely related to *A. juniperinus*. The characters Dietz used to distinguish the group were the small basal tooth of the tarsal claws, subequal abdominal sterna, and “pubescence” on both dorsal and ventral surfaces of the body. Blatchley (in Blatchley and Leng 1916) used the same grouping (his Group F) based essentially on the same characters cited by Dietz. In an attempt to broaden the character base used in the taxonomy of the Anthonomini, Burke (1968) made a comparison of pupal characters in a wide array of species of the tribe, including *A. juniperinus*. Based upon pupal characters, *A. juniperinus* keys out with *Anthonomus nigrinus* Boheman, another species with which, on the totality of its characters, it seems to have no close relationship. Results obtained by Ahmad and Burke (1972) in comparison of larval characters of *A. juniperinus* with those of 43 other species of Anthonomini were similarly inconclusive as to placement of the species in the genus. Addition of two previously undescribed species to the juniperinus group does not contribute to further understanding of where these taxa should be placed in the genus. At present, it can only be concluded that the three species constitute a recognizable group that should be assigned to the nominate subgenus of *Anthonomus*.

Key to species of the *Anthonomus juniperinus* group

1. Elytral scales fine, setalike, sparsely, evenly distributed. Body stout, sides of elytra subparallel in basal 1/2 or broadly rounded (Fig. 6). Small, length 1.5-1.9 mm. Central Texas, western Arkansas. Host. *Juniperus ashei* J. Buchholz ***A. rileyi* n.sp.**
- Elytral scales more coarse, densely distributed, interrupted by angulate postmedian fascia on elytra extending across intervals 2-4, forming chevron-shaped pattern (Figs. 2, 4); Body more elongate, sides of elytra nearly parallel in basal 1/2. Larger, length 2.0-3.0 mm. Eastern and western United States. Host. *Juniperus* spp., not including *J. ashei* **2**

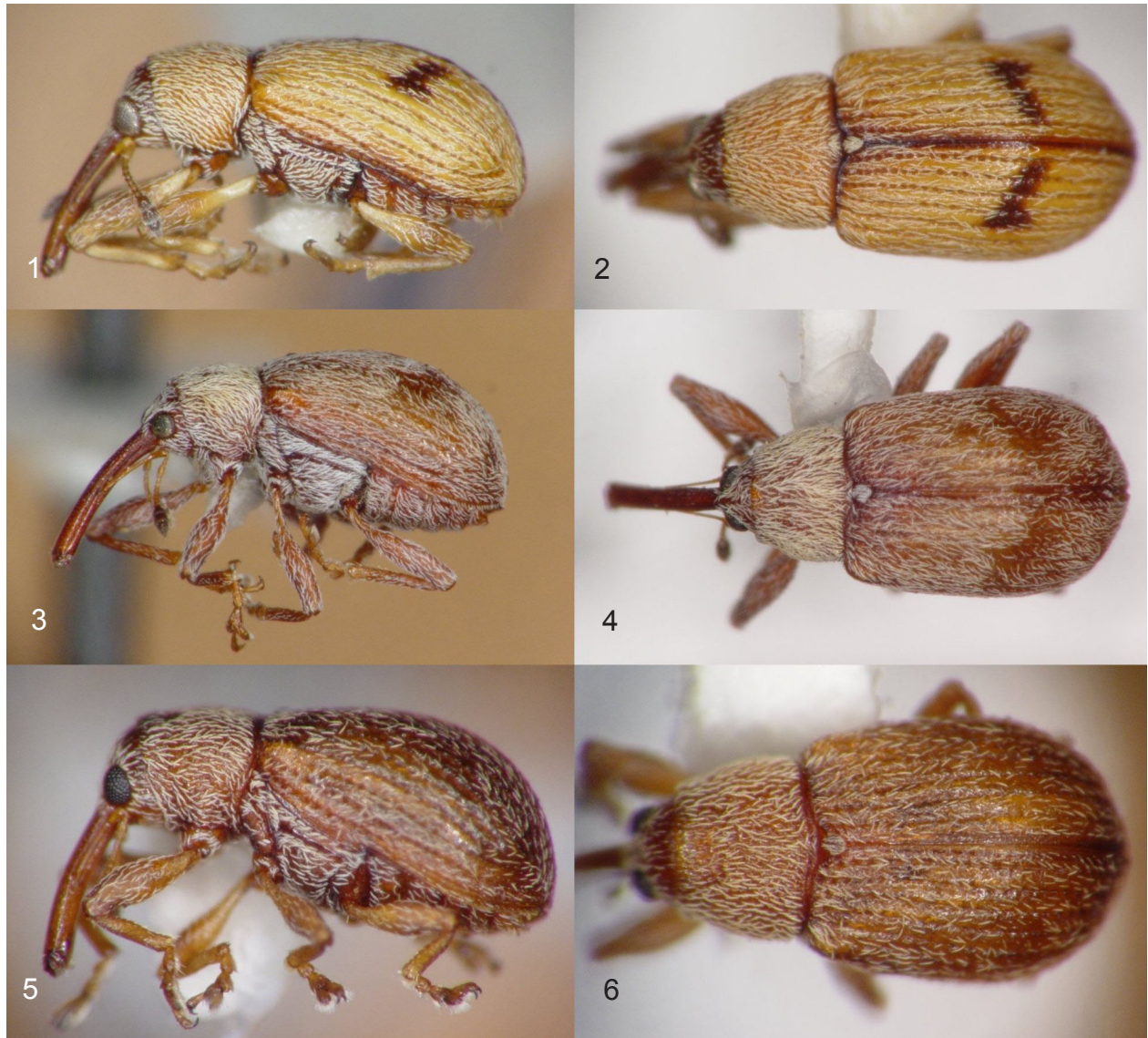


Figure 1-6. *Anthonomus juniperinus* group spp., habitus, lateral and dorsal views. **1, 2)** *A. juniperinus*, male, 10 mi. SW Elkhart, Texas. **3, 4)** *A. sanborni*, female, 15 mi. N Alvord Ranch, Harney County, Oregon. **5, 6)** *A. rileyi*, female, vic. Long Hollow Creek, Travis County, Texas.

- 2(1). Elytral postmedian fascia dark brown to black, distinctly defined (Fig. 2); pronotal and elytral scales equally densely distributed; Eyes strongly convex in dorsal view, somewhat protuberant posteriorly. Rostrum short, nearly straight, slightly longer in female, ca. 1.2x longer than pronotum along midline. Legs stout; metafemur with small tooth, Body elongate-oval, length 2.0-2.5 mm. Eastern United States as far west as eastern regions of Texas and Kansas.
 *A. juniperinus* (Sanborn)
- Elytral postmedian fascia sometimes faintly darkened but not distinctly defined, mostly bare with occasional small dark spots on interstriae 2 and 4; pronotal scales more densely distributed than elytral scales (Fig. 4). Eyes more evenly and not as strongly convex in dorsal view. Rostrum longer and more slender, especially in female, ca. 1.5x longer than pronotum along midline, Legs slender; metafemur without tooth. Body stouter, length 2.3-3.0 mm. Arizona, California, Colorado, Idaho, Oregon, and Utah. *A. sanborni* n.sp.



Figure 7-8. *Anthonomus sanborni*, pygidium, dorsal view. **7)** Male with exposed apical portion of median lobe, Laird's Landing, Siskiyou County, California. **8)** Female, Utah.

***Anthonomus juniperinus* (Sanborn)**

(Figure 1, 2, 9, 12)

Eriirhinus juniperinus Sanborn 1868:81. Lectotype: [Mass./F.G. Sanborn/Type.] [Cotype/No.] [M.C.Z./Type/ 27116] [LECTOTYPE/ *Anthonomus juniperinus*/ /Sanborn/ designated by/ H.R. Burke] (female, MCZC).

Anthonomus juniperinus (Sanborn): LeConte 1876:195, 199 (key, desc.); Dietz 1891:202, 225, 227 (key, desc.); Blatchley and Leng 1916:308 (key, desc.); Leng 1920:323 (cat.); Blatchley 1928:249 (distr. note); Schenkling and Marshall 1934:46 (cat.); Burke 1968:20, 67, 89 (pupa key, desc. illus., biol.); Ahmad and Burke 1972:38, 63, 78 (larva key, desc., illus., biol.); Gates and Burke 1972:1222 (biol.); O'Brien and Wibmer 1982:108 (cat.); Downie and Arnett 1996:1552, 1556 (key, desc.); Salsbury 2000:11, 23 (key, desc., illus.).

Description. Length 2.0-2.5 mm. **Body** elongate-oval (Figs. 1, 2); yellowish to pale reddish with distinct, dark V-shaped fascia on elytra behind middle; vestiture of elongate scales, sparse and fairly evenly distributed dorsally and ventrally. **Head** sparsely, minutely punctate, with elongate, acuminate, fulvous scales; eyes round, moderately strongly raised posteriorly, slightly larger in male. **Rostrum** nearly straight, slightly longer and more slender in female, with irregular lateral and lateromedian sulci proximally, smooth, shining, sparsely, shallowly punctate distally; with sparse elongate scales in proximal 1/3; dorsal margin of lateral rostral groove carinate; slightly narrowed to antennal insertions, widened to apex in dorsal view. **Pronotum** subcylindrical, slightly, broadly constricted subapically; densely punctate; with uniform vestiture of elongate, narrow, acuminate, fulvous scales. **Scutellum** with dense, pallid, elongate scales. **Elytra** narrow, slightly widened posteriorly; with sparse uniform vestiture of elongate, narrow, acuminate, fulvous scales; integument pallid, darker fuscous on sutural and 11th interstriae and in transverse posteromedian band extending across interstriae 2-5. **Pygidium** with sparse, narrow setose scales; tergum 7 with posteromedian fovea in male and female. **Sterna** subequal in length, with sparse, pallid fulvous scales laterally, sparse setae medially. **Legs** with femora stout, pallid basally and apically, darker in between; with sparse, pallid, setose scales; profemur with stout, conical, acute ventral tooth; mesofemur with smaller tooth; metafemur with minute tooth. **Protibia** with inner margin slightly sinuate, with acute, black, apical uncus that extends at right angles to long axis of tibia (Fig. 12); mesotibia with more slender, acute uncus; metatibial mucro slender, slightly curved, diagonal (Fig. 12). **Tarsal claws** each with small, distinct, acute basal tooth. Median lobe subparallel-sided, slightly narrowed to rounded apex in dorsal view (Fig. 9).

Discussion. *Anthonomus juniperinus* is distinguished from the other species in the group by the characters presented in the key, especially by the well-defined dark postmedian fascia on the elytra forming a V-shaped pattern. The vestiture on the pronotum and elytra is about equally distributed while in *A. sanborni* the pronotal vestiture is more dense than on the elytra (Fig. 3). This difference is quite evident in well preserved, unabraded specimens. Also, *A. juniperinus* is typically intermediate in size between *A. sanborni* and *A. rileyi*.

Distribution. *Anthonomus juniperinus* is widespread in the eastern United States as far west as the eastern areas of Texas and Kansas. Specimens have been examined from the following states: FL, GA, KS, LA, MA, MD, MS, PA, SC, TX, VA, WI, and WV. Outside of the eastern United States, a specimen has been examined in USNM from Paget, Bermuda and O'Brien and Wibmer (1982) listed Oregon among the states where the species occurs. These disjunct localities are surprising and need further confirmation. It is possible that the Oregon locality is based on a misidentification. *Anthonomus juniperinus* and *A. sanborni* may have been confused before the latter species was recognized, especially if the specimen in question was abraded or otherwise poorly preserved. *Juniperus virginiana* L. (Eastern redcedar) occurs in Oregon, probably being introduced there in commerce, so it is possible that *A. juniperinus* also occurs there. Eastern redcedar also occurs in Ontario and Quebec, Canada but we have not seen records of the weevil being present there.

Biology. Until relatively recently, the only biological information available on *A. juniperinus* was that which Sanborn (1868) included in the original description of the species. According to Sanborn, the weevil was common during May in eastern Massachusetts where it deposited its eggs in fungus galls, *Podosoma juniperina* (now known as *Gymnosporangium juniperi-virgininae*) on juniper. The larvae were observed to develop in numbers within the gall and pupated there. Although the species name of the juniper involved was not stated, it was surely *Juniperus virginiana*. The biological information provided by Sanborn has been frequently repeated by subsequent authors. The junior author has examined adult weevil specimens pinned with juniper berries having exit holes, indicating that the larvae also develop in fruit. Verification of such development in fruit was provided by entomologists in Georgia in 1989 when heavy infestations by *A. juniperinus* were discovered in juniper fruit in a seed orchard (Mike Young, Terry Price and Cecil Smith, pers. comms.). The larvae were feeding in the pulp of the fruit around the periphery of the seed. Only a single emergence hole was found in each fruit. This and the small amount of available food in a fruit that is almost completely filled with one or two seeds suggest that a single larva develops in each fruit. The practice of some species of *Anthonomus* that normally develop in flower buds and/or fruit also utilizing plant galls as alternate developmental sites was discussed by Gates and Burke (1972). These alternate sites persist for a longer period of time than reproductive structures, thus increasing the number of weevil generations possible. They also provide food for the development of larger numbers of individuals, and are possibly more nutritious than the original sites. *Anthonomus juniperinus* follows this pattern in utilizing the original developmental site, the juniper fruit, as well as the fungus gall.

Gates and Burke (1972) provided additional information on the biology of *A. juniperinus* in *Gymnosporangium* galls on Eastern redcedar in eastern Texas. These observations revealed that eggs were deposited when the gall tissue was soft in March and April. The young larvae burrowed through the gall tissue leaving frass-filled tunnels. As many as 10 larvae were found to develop in one gall, eventually reducing the tissue of the gall to a powder. As an additional contribution to its taxonomy and biology, the



Figure 9-11. *Anthonomus juniperinus* group spp., median lobe, dorsal views. **9)** *A. juniperinus*, 10 mi. SW Elkhart, Texas. **10)** *A. sanborni*, 13 mi. W Lehi, Utah County, Utah. **11)** *A. rileyi*, vic. Cypress Creek, Travis County, Texas.

pupal and larval stages of *A. juniperinus* were described by Burke (1968) and Ahmad and Burke (1972), respectively.

Dietz (1891) stated that *A. juniperinus* has a “remarkable similarity” to the Palearctic species *Nanophyes transversus* Aubé (now *Nanodiscus transversus* (Aubé)). The two distantly related species (of different curculionoid families) share a similar body shape and color and both have a V-shaped fascia on the elytra. However, the fascia of *N. transversus* occupies a larger area of the elytra than does that of *A. juniperinus* and is not as distinctly defined. According to Miguel Alonso-Zarazaga (pers. comm. to H.R. Burke, August 19, 2009), the hosts of *N. transversus* in the Iberian Peninsula are species of *Juniperus* and *Cupressus*. There the species somewhat resembles buds and short axillary twigs that are usually covered with dry scales. It is more likely to be collected by sweeping or beating than by visual search for individual specimens. A possible case of such camouflage may also exist for *A. juniperinus*.

With the exception of the Bermuda specimen that was collected on *Juniperus bermudiana*, *A. juniperinus* is only known to be associated with *Juniperus virginiana*.

Anthonomus sanborni, new species

(Figure 3, 4, 7, 8, 10, 13)

Type series. Holotype. **UTAH.** [Utah 13 mi. W Lehi/West Canyon Utah/ Co. May 10 1969/ Wayne E. Clark] [Juniperus] (male, TAMU). Paratypes (140). United States. **ARIZONA.** Apache Co.: [ARIZONA:/ Apache Co./ 5 mi. se Springerville/ August 16, 1982/ J. C. Schaffner] (2, TAMU). Cochise Co.: [Carr Cyn. 6200'/ Huachuca Mts./ IX-8-1965 Ariz./ C. W. O'Brien] (1, CWOB). Coconino Co.: [Pine/ Kaibab/ Nat. For./ Ariz 8/2/31] (1, INHS) Mohave Co.: [Ariz. 8 mi. SW./ Peach Springs/ 4600' Mohave/ Co. IX-7-1964] [C. W. O'Brien/ ex Juniperus] (1, CWOB). **CALIFORNIA.** [Calif. San/ Francisco/ IX-5-1962] [Collector: F. Greenfield] (1, CWOB). El Dorado Co.: [Fallen Leaf Cal./ E'l Dorado Co/ VII-8-35] [F E Blaisdell/ Collector] (2, EMEC). Lassen Co.: [13 mi. E. McArthur./ Cal.; Lassen County/ Juniperus occidentalis/ 6-3-65; Joe Schuh] (2, CWOB; 20, JSCC). [13 mi. E. McArthur./ Cal.; Lassen County/ Juniper/ June 3, 1965/ Joe Schuh coll.] (7, JSCC). [Hallelujah/ Jct. Lassen' Co. Calif./ VII-2-1964] [D. F. Veins/ Collector] (1, CWOB). [Buck Cr. Rgr. Sta/ 5150' Modoc Co./ CAL: vi-8-10-70] [J. Powell and R.E. Dietz] [Juniperus sp.] (15, EMEC). Siskiyou Co.: [Cal.; Siskiyou Co./ Laird's Landing/ beating Juniper/ June 7, 1971/ Joe Schuh, Coll.] (23, JSCC). **COLORADO.** Mesa Co.: [1.8 mi E Fruita/ 3VIII67 Colo] (1, TAMU). [1.8 mi E Fruita/ 3VIII67 Colo] [D. G. Kissinger/ Acc. No 1088] (7, TAMU). **IDAHO.** Bannock Co.: [IDA: Bannock/ Co., McCammon./ 3 mi. E. VI-29-66] [ex Juniperus/



Figure 12-14. *Anthonomus juniperinus* group spp., prothoracic and metathoracic legs, males, anterior views. **12)** *A. juniperinus*, 10 mi. SW Elkhart, Texas. **13)** *A. sanborni*, 13 mi. W Lehi, Utah County, Utah. **14)** *A. rileyi*, vic. Cypress Creek, Travis County, Texas.

sp] [Collector:/ W. Gagne] (1, CWOB). **OREGON.** Crook Co.: [5 Miles West of/ Prineville, Ore./ May 3, 1939/ Schuh & Gray] (1, JS). [Prineville, Ore./ May 26, 1964/ Beating Juniper/ Kenneth Goeden] (1, ODAC). Deschutes Co.: [Tumalo State Park./ Ore., VI-15-1967/ W. F. Chamberlain] (2, TAMU). Grant Co.: [Dayville, Ore./ April 9, 1961/ Juniper/ Kenneth Goeden] (5, ODAC). [Ore., 6 mi. NW of/ Monument Grant/ County. 12 IX 66/ sticky board/ in Juniper tree/ Kenneth Goeden] (2, ODAC). Harney Co.: [Ore., 15 mi N of/ Alvord Ranch/ Harney County/ June 11, 1964/ Beating juniper/ Kenneth Goeden] (3, ODAC). Jackson Co.: [Pinehurst, Ore./ Jackson County/ April 30, 1964/ Kenneth Goeden] [Ex Juniper] (1, ODAC). Jefferson Co.: [Ore., 3 mi NE of/ Madras. 25 v 64/ beating juniper/ Kenneth Goeden] (5, ODAC). [Ore., 5 mi N of/ Madras. 18 v 67/ beating juniper/ Kenneth Goeden] (3, ODAC). [Warm Springs, Ore./ Jefferson County/ May 20, 1964/ Beating Juniper/ Kenneth Goeden] (5, ODAC). Klamath Co.: [Sprague R. Canyon./ Ore.: 5 mi. E. Bly/ on Salix/ May 22, 1958/ Vertrees & Schuh] (1, JSCC). [3 mi. So. Saddle Mt./ Ore.: Klamath County/ Vertrees & Schuh] (1, JSCC) [ORE., Klamath Co./ Olene 4150'/ 22 May 1958] [R K Eppley/ Collector] (1, JSCC) Wasco Co.: [Simnasho, Ore./ Wasco County/ Sept. 5, 1962/ Juniper/ Kenneth Goeden] (2, ODAC). Wheeler Co.: [Ore., 10 mi W of/ Dayville. Wheeler/ Co. June 19, 1964/ beating Juniper/ Kenneth Goeden] (3, ODAC) **UTAH.** [UTAH. Juni-/ per berry/ H-135] (6, USNM). [UTAH/ Juniper/ berry] (2, USNM). Duchesne Co.: [Utah Roosevelt 7/ mi. W. Duchesne/ Co. May-17-1969] [Juniperus] (1, TAMU). Tooele Co.: [Johnson's Pass/ Tooele Co. Utah/ VIII-13-1953] [Juniperus/ utahensis] [P D Ashlock/ Collector] (1, JSCC). [Johnson's Pass/ Tooele Co. Utah/ VI-20-195] [Juniperus/ utahensis] [H E Cott/ Collector] (1, BYUC). Utah Co.: [Utah 13 mi. W Lehi/ West Canyon Utah/ Co. May 10 1969/ Wayne E. Clark] [Juniperus] (5, TAMU). [Spanish Fork/ Utah. Aug 4/ 1958. light/ G. F. Knowlton] (1, BYUC). Wayne Co.: [2 mi. E. Torrey,/ 6500', Utah./ VIII.10.1968/ A. T. Howden] (2, CMNC).

Description. Length 2.3-3.0 mm. **Body** oblong-ovate (Fig. 3, 4); pale to darker reddish; elongate fuscous scales sparsely distributed except for being more densely arranged on pronotum. **Head** moderately punctate, with elongate, acuminate, white to fulvous scales; eyes small, round, nearly evenly convex, slightly larger in male. **Rostrum** long, slender, especially in female, slightly, evenly curved; proximal portion with ill-defined lateral and lateromedian sulci, less well defined in female; distal portion smooth, shining, shallowly punctate, slightly sulcate near antennal insertions in male, glabrous except for sparse elongate scales at extreme base; dorsal margin of lateral rostral groove carinate; in male, more distinctly narrowed to point of antennal insertions and more widened apically in dorsal view. **Pronotum** slightly constricted subapically; densely punctate; with uniform vestiture of elongate, narrow, acuminate, fulvous scales. **Scutellum** with dense, pallid scales. **Elytra** broad, widened posteriorly; striae shallowly punctate; each puncture with one minute seta; interstriae broad, flat, slightly rugulose, minutely, sparsely punctate, with sparse vestiture of elongate, narrow, acuminate, fulvous scales, slightly to much less dense on broad, diagonal posteromedian fascia; integument ferruginous, slightly darker on bare posteromedian fasciae, and, in some, still darker in small maculae on interstriae 2 and 4. **Pygidium** with sparse, narrow setose scales; tergum 7 with posteromedian fovea in male (Fig. 7) and in female (Fig. 8). **Sterna** subequal in length; with sparse, pallid fulvous scales laterally; with sparse setae medially. Legs with femora slender, with sparse, long, pallid, setose scales; profemur with small, conical, acute ventral tooth (Fig. 13); mesofemur with smaller, minute tooth; metafemur unarmed. **Protibia** with inner margin nearly straight, slightly widened apically, with acute, black, curved, apical uncus (Fig. 13); mesotibia with more slender, acute uncus; metatibia slender, straight, with minute, slender, apical mucro (Fig. 13). **Tarsal claws** each with minute, blunt tooth. Median lobe subparallel-sided, slightly narrowed to broadly rounded apex in dorsal view (Fig. 7, 10).

Discussion. This species is named in honor of Francis G. Sanborn (1838-1884), the discoverer and describer of *A. juniperinus*. Sanborn was an economic entomologist in Massachusetts who studied the habits of insect pests of fruit and shade trees. He was also at one time employed by the Museum of the Boston Society of Natural History where he was involved in various entomological activities (Howard 1930).

Anthonomus sanborni is the western counterpart of the eastern *A. juniperinus*. Although superficially similar, the two species are easily distinguished by several characters. The most evident of these are the differences in color and definition of the V-shaped elytral fascia (cf. Figs. 2, 4) and the fact that the dorsal vestiture of *A. sanborni* is more dense on the pronotum than on the elytra as compared to *A.*

juniperinus where the density of the elongate scales is about the same on both parts of the body. Other differences are included in the key.

Biology. It is surprising that such a widespread and frequently collected species, although previously undescribed, is so little known biologically. Many of the specimens examined have label data indicating that they were collected on juniper but rarely is the species of the plant indicated. The exceptions are a few specimens collected on *Juniperus occidentalis* Hook. in California and *Juniperus utahensis* (Engelm.) Lemmon (synonym of *Juniperus osteosperma* (Torr.) Antoine) in Utah. The former juniper occurs mainly in California and Oregon while the latter is widely distributed throughout the western United States. The only indication of the site of larval development is the information included on a label that the specimen was associated (collected on or reared from?) with a juniper berry. No information is available indicating that *A. sanborni* may develop in *Gymnosporangium* galls.

***Anthonomus rileyi*, new species**

(Figure 5, 6, 11, 14)

Type series. Holotype. TEXAS [TEXAS: Travis Co./ vic. Cypress Creek/ 30°25'58", 97°52'01"/ Apr. 23-24, 1994 (22)] [Collectors: M. Quinn./ E. Riley, R. Wharton./ on *Quercus buckleyi*/ Qt G-MS1] (male, TAMU). Paratypes (95). ARKANSAS. [ARK: Logan Co./ Magazine Mtn./ FSR 1606/ VI-24-26-1993] [Coll. E. G. Riley/ beating/ juniper] (27, TAMU, 13 EGRC). TEXAS. Burnet Co.: [TEXAS: Burnet Co./ Inks Lake St. Pk./ 13.IV.1985/ P. W. Kovarik, R. W. Jones/ and C. W. Agnew, Collrs.] [collected/ sweeping] (2, TAMU). [TEXAS: Burnet Co./ Inks Lake St. Pk./ April 13, 1985/ sweeping/ P. W. Kovarik] [Taken on/ *Juniperus ashei*] (3, TAMU). [TEXAS: Burnet County./ Inks Lake State Park/ 13-IV-1985/ P. W. Kovarik, coll.] [Taken on/ *Juniperus ashei*] (1, TAMU). [U.S.A.: Hays Co./ 6 mi. NW Dripping Springs/ X-27-XI-11-2005, pit-fall trap/ 1,340', E.G. Riley, et al/ *Juniperus* managed plot] (1, EGRC). [U.S.A. TEXAS Kerr Co./ 6.5 mi. SW Hunt, 1,960'/ VI-3-30-2006, FIT-elev./ E.G. Riley, et al/ upland deciduous forest] (1, EGRC). [U.S.A. TEXAS Kerr Co./ 6.5 mi. SW Hunt, 1,960'/ VII-27-2006, FIT-grd./ E.G. Riley, et al/ upland deciduous forest] (1, EGRC). [U.S.A. TEXAS Kerr Co./ 6.5 mi. SW Hunt, 1,960'/ X-13-26-2005, FIT-Lingren FT./ E.G. Riley, et al/ upland deciduous forest] (1, EGRC). Kerr Co.: [Texas, Kerrville/ Sept. 21. 1951/ R. B. Gurney/ Beating cedar trees] (1, USNM). Travis Co.: Specimens from "vic. Cypress Creek" and "vic. Long Hollow Ck", with slight variations from that of the holotype, some indicating collection on "*Quercus buckleyi*", "*Q. virginiana*," and "*Juniperus ashei*" (44, TAMU).

Description. Length 1.5-1.9 mm. **Body** stout, ovate to sub-obvate (Fig. 5, 6); integument rufous; vestiture fine, setalike, sparsely distributed. **Head** sparsely, minutely punctate, with elongate, acuminate, fulvous scales; eyes round, slightly raised posteriorly, slightly larger in male. **Rostrum** nearly straight, slightly longer and more slender in female, with obsolescent lateral and lateromedian sulci proximally, smooth, shining, sparsely, shallowly punctate proximally and distally; with sparse elongate scales at extreme base; dorsal margin of lateral rostral groove carinate; subparallel-sided from base to antennal insertions, slightly widened to apex, in dorsal view. **Pronotum** slightly, broadly constricted subapically; densely punctate; with vestiture of elongate, narrow, acuminate, pallid fulvous scales, slightly narrower scales on dorsolateral portion. **Scutellum** with dense, pallid, elongate scales. **Elytra** ovate to sub-obvate in dorsal view; striae shallowly punctate; each puncture with one minute seta; interstriae slightly convex, slightly rugulose, minutely, sparsely punctate; with sparse, uniform vestiture of elongate, narrow, acuminate, fulvous scales. **Pygidium** with sparse setae; tergum 7 with posteromedian fovea in male and in female. **Sterna** subequal in length, with sparse, pallid fulvous scales laterally, sparse setae medially. Legs with femora stout, with sparse, pallid, elongate scales; profemur with stout, broad, ventral tooth (Fig. 14); mesofemur with smaller tooth; metafemur unarmed. **Protibia** with inner margin sinuate, with small, acute, black, apical uncus that extends parallel to long axis of tibia; mesotibia with more slender, acute uncus; metatibia with stout, oblique apical mucro (Fig. 14). **Tarsal claws** each with minute, acute basal tooth, sometimes visible only under high magnification. Median lobe subparallel-sided, slightly narrowed to rounded apex in dorsal view (Fig. 11).

Discussion. *Anthonomus rileyi* is the smallest species of the *A. juniperinus* Group. It is easily distinguished from the other species of the group by its smaller size and uniform, and more sparse dorsal vestiture. In addition, the body is usually stouter than that of *A. juniperinus* and *A. sanborni*. The protibial uncus being slightly curved and extended parallel to the long axis of the tibia of *A. rileyi* as compared to the protibial uncus being perpendicular to the tibia also distinguishes it from the other two species. The disjunct distribution of *A. rileyi* parallels that of its likely host plant, *Juniperus ashei*. This juniper is widely distributed throughout Central Texas (where most of the weevil collections were made) into the southwestern part of the state. The plant also occurs in Arkansas (Magazine Mountain) where specimens of *A. rileyi* have been collected.

Biology. Although larval development has not been observed, the fact that many adults have been collected on *Juniperus ashei* in Central Texas indicates that this is likely a true host plant of the species. The association of three teneral specimens (not included in the type series) with *Juniperus ashei* further suggests that this plant is a host. Its collection on two species of *Quercus*, both species intermixed with juniper, almost surely represent accidental associations.

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Literature Cited

- Ahmad, M., and H. R. Burke. 1972.** Larvae of the weevil tribe Anthonomini (Coleoptera: Curculionidae). Miscellaneous Publications, Entomological Society of America 8: 33-81.
- Blatchley, W.S. 1916.** p. 308. *In*: W.S. Blatchley and C.W. Leng. Rhynchophora or Weevils of Northeastern America. The Nature Publishing Company; Indianapolis. 682 p.
- Burke, H. R. 1968.** Pupae of the weevil tribe Anthonomini (Coleoptera: Curculionidae). Texas Agricultural Experiment Station Technical Monograph 5: 1-92.
- Dietz, W. G. 1891.** Revision of the genera and species of Anthonomini inhabiting North America. Transactions of the American Entomological Society 18: 177-276.
- Downie, N.M., and R.H. Arnett, Jr. 1996.** The beetles of northeastern North America, Vol. II. The Sandhill Crane Press; Gainesville, FL. p. 891- 1721.
- Gates, D. B., and H. R. Burke. 1972.** Review of the gall-inhabiting weevils of the genus *Anthonomus*, with description and biology of a new species (Coleoptera: Curculionidae). Annals of the Entomological Society of America 65(5): 1215-1224.
- Howard, L.O. 1930.** A history of applied entomology (somewhat anecdotal). Smithsonian Miscellaneous Collections 84: viii + 564 p.
- LeConte, J. L. 1876.** *In*: J.L. LeConte and G.H. Horn. The Rhynchophora of America, north of Mexico. Proceedings of the American Philosophical Society 15(96): 1-455.
- Leng, C. W. 1920.** Catalogue of Coleoptera of America, North of Mexico. John D. Sherman, Jr.; Mt. Vernon, NY. 470 p.
- O'Brien, C. W., and G. J. Wibmer. 1982.** Annotated checklist of the weevils (Curculionidae *sensu lato*) of North America, Central America, and the West Indies (Coleoptera: Curculionoidea). Memoirs of the American Entomological Institute 34: ix + 382 p.
- Salsbury, G. A. 2000.** The weevils of Kansas. A manual for identification. Privately published; Manhattan, Kansas. 662 p.

Sanborn, F. G. 1868. Description and history of a new species of *Eirrhinus*, *E. juniperinus*. Proceedings of the Boston Society of Natural History 12: 81.

Schenkling, S., and G. A. K. Marshall. 1934. Curculionidae: Anthonominae. Coleopterorum Catalogus, Pars 139: 1-82.

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