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The Pentatomidae, or Stink Bugs, of Kansas With a Key to Species (Hemiptera: Heteroptera)

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The Pentatomidae, or Stink Bugs, of Kansas with a key to species (Hemiptera: Heteroptera)

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Abstract

Forty eight species of Pentatomidae are listed as occurring in the state of Kansas, nine of these are new state records. A key to all species known from the state of Kansas is given, along with some notes on new state records.

The family Pentatomidae, comprised of mainly phytophagous and a few predaceous species, is one of the largest families of Heteroptera. Some of the phytophagous species have a wide host range and this ability may make them the most economically important family among the Heteroptera (Panizzi et al. 2000). As a group, they have been found feeding on cotton, nuts, fruits, vegetables, legumes, and grain crops (McPherson 1982, McPherson and McPherson 2000, Panizzi et al 2000). On soybeans alone, losses can accrue to $60 million in the southeastern United States (McPherson and McPherson 2000), while in Georgia, in 1985, pecan industry losses to stink bugs were estimated to run as high as $3.5 million (Douce and Suber1986). A recent introduction (first seen in 1996 in PA), the brown marmorated stinkbug (BMSB, *Halyomorpha halys* (Stål)), has been found invading homes as overwintering sites in record numbers in the east and Pacific coast and becoming a major pest on a wide variety of crops, fruit trees, and ornamentals (Hamilton 2009; Nielsen and Hamilton 2009a, b; USDA NAL 2012). It has not been found in Kansas yet, but has been detected in 36 states and continues to expand its range. It is a striking brown colored species with alternating white and black bands on its antennae as well as similar markings along the sides of the abdomen.

The majority of the literature on pentatomids has been in reference to the eastern portion of the United States, with few publications on the family from the western states. This paper catalogs the species of Kansas and a key is given for identification of those species. Prior to this study, 35 species of pentatomids were listed from Kansas by Froeschner (1988). Here I expand that number to 48, and include notes on 9 new state records. I have not included Popenoe's (1885) record of *Chinavia pennsylvanica* (Gmelin) (as *Rhaphigaster pennsylvanicus*), which would have been the furthest western record of this species, nor Crevecoeur's (1905) record of *Perillus confluens* (Herrich-Schaeffer); both records are not included in Froeschner's (1988) localities and reference locality and specimen data is lacking for both.

Materials and Methods

The body of this work comes from examination and identification of specimens in both the Fort Hays Sternberg Museum (at Fort Hays State University) and the University of Kansas Biodiversity Institute Entomological Collection. For distributions of species, I relied mainly on Froeschner (1988), but supplemented

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this with other works that also facilitated identification (Knight, 1952; Lariviére, 1992; McDonald,1974, 1976, 1986; McPherson, 1982; McPherson and McPherson, 2000; Rider 1986, 1995; Rider and Chapin, 1992; Rolston and McDonald, 1984; Thomas, 1983, 1992; Thomas and Yonke 1981; Zimmer1910, 1912).

Key. The following key to species of Kansas was mainly modified from McPherson (1982), but also aided by McPherson and McPherson (2000), Buxton et al. (1983), Larivière (1992), McDonald (1986), Rider (1986, 1995), Rider and Chapin (1992), Rolston (1972, 1974), Rolston and McDonald (1984), Sailer (1952), Thomas (1983, 1992), and Zimmer (1910, 1912). Recent nomenclatorial changes include the creation of a new genus, *McPhersonarcys* Thomas, for *Hymenarcys aequalis* (Say) by Thomas (2012, this issue) and the recent placement of *Acrosternum hilare* (Say) into the genus *Chinavia* Orian (see Schwertner and Grazia 2006). A list of all species can be seen in Table 1.

Key to the species of Pentatomidae from Kansas

1 Eyes stalked (pedunculate); scutellum broadly U-shaped, nearly reaching tip of abdomen; lacking bright, contrasting colors (Podopinae, *Amaurochrous*).....2

1′ Eyes not stalked; scutellum usually roundedly triangular, but if large and U-shaped then having a broad oval shape (*Coenus* spp.) or bright, contrasting colors.....3

2(1) Juga and tylus equal or subequal at apices; lateral margin of pronotum strongly sinuate ..... *Amaurochrous cinctipes* (Say)

Table 1. Pentatomidae of Kansas

*** = new state record (also bolded)**

Subfamily Asopinae
Alcaeorrhynchus grandis* (Dallas)
Apoecilus cynicus (Say)
Perillus bioculatus (Fabricius)
Podisus maculiventris (Say)
Stiretrus anchorago (Fabricius)
Zicrona caerulea* (Linnaeus)

SubfamilyPentatominae
Acrosternum hilare (Say)
Aelia americana Dallas
Banasa dimidiata* (Say)
***Banasa euchlora* Stål ***
Brochymena cariosa Stål
Brochymena quadripustulata (Fabricius)
Brochymena sulcata* Van Duzee
Chinavia hilare (Say)
Chlorochroa faceta (Say)
Chlorochroa ligata (Say)
Chlorochroa persimilis Horvath
Chlorochloa sayi* (Stål)
Chlorochroa uhleri (Stål)
Coenus delius (Say)
Cosmopepla intergressus (Uhler)
Cosmopepla lintneriana (Thomas)
Dendrocoris humeralis (Uhler)
Euschistus latimarginatus* Zimmer
Euschistus servus servus (Say)
Euschistus tristigmus tristigmus (Say)
Euschistus variolarius (Palisot)
Holcostethus abbreviatus Uhler
Holcostethus limbolarius (Stål)
Hymenarcys nervosa* (Say)
Mcphersonarcys aequalis (Say)
Mecidea major Sailer
Menecles insertus (Say)
Mormidea lugens (Fabricius)
Murgantia histrionica (Hahn)
Neottiglossa sulcifrons Stål
Oebalus pugnax pugnax (Fabricius)
Parabrochymena arborea (Say)
***Prionosoma podopioides* Uhler ***
Tepa vanduzeei Rider
Thyanta custator acerra McAtee
Thyanta pallidovirens* (Stål)
Trichopepla atricornis* Stål
Trichopepla semivittata (Say)
Tylospilus acutissimus* (Stål)

Subfamily Podopinae
Amaurochrous brevitylus Barber & Sailer
Amaurochrous cinctipes (Say)

2′ Juga *markedly* longer than tylus, lateral margin of pronotum nearly straight.....*Amaurochrous brevitylus* Barber & Sailer

3(1) First segment of beak short, thickened, often free, extending well beyond bucculae; bucculae converging beneath basal segment of beak (Asopinae) 4

3′ First segment of beak slender, lying between bucculae (occasionally extending slightly beyond bucculae); bucculae subparallel, not converging posteriorly beneath basal segment (Pentatominae) 10

4(3) Humeri extended as a bifid process, length over 15 mm..... .....*Alcaeorrhynchus grandis* (Dallas)

4′ Humeri acute, angled, or rounded, never extended as a bifid process, length less than 10 mm 5

5(4) Profemora armed with ventral spine or tubercle at distal third to fourth; males with submedian pubescent patch on abdominal sternites 4-6.....6

5′ Profemora unarmed; males lacking submedian pubescent patches on abdominal sternites 7

6(5) Scutellum U-shaped, broadly rounded apically and its tip nearly reaching apex of abdomen; frena about ¼ length of scutellum..... .....*Stiretrus anchorago* (Fabricius)

6′ Scutellum not U-shaped, its tip not reaching apex of abdomen; frena about ½ length of scutellum..... *Perillus bioculatus* (Fabricius)

7(5) Abdominal sternite 2 (first visible) unarmed; color metallic purplish-blue to black; male pygophore lacking brushlike setae, at either side of middle on ventroposterior rim ..... *Zicrona americana* Thomas

7′ Abdominal sternite 2 armed with slender anteriorly directed spine; color not metallic blue to black 8

8(7) Juga slightly exceeding tylus in length; overall length usually more than 14mm..... *Apoecilus cynicus* (Say)

8′ Juga equal in length to tylus; overall length less than 12mm.....9

9(8) Scutellum with 3 whitish maculae at base; black macula centrally on each corium and median black stripe extending from tip of scutellum to apex of membrane ..... *Tylospilus acutissimus* (Stål)

9′ Without above combination of colors, dull brown with apex of corium slightly to fully red, often extending along margin. .... *Podisus maculiventris* (Say)

10(3) Body length to width ratio 3:1 or more; abdominal venter with wide longitudinal band of striations (stridulatory patch, often difficult to view) on first 3 segments on either side of middle (Mecideini) *Mecidea*.....46

10′ Body length to width ration 2.5:1, or much less; abdominal venter without striated areas 11

11(10) Juga each with subapical, lateral tooth; pronotum strongly dentate anterolaterally; abdominal venter with median shallow, longitudinal depression, disappearing posteriorly (Halyini).....12

11′ Juga lacking subapical teeth; pronotum variable anterolaterally, rarely dentate; abdomen without median ventral depression (at most, on basal segment) (Pentatomini).....14

12(11) Scutellar base (¼ to ⅓) elevated above remainder; humeri quadrate with large teeth..... *Parabrochymena arborea* (Say)

12′ Scutellar base (¼ to ⅓) slightly elevated; humeri subtriangular with small teeth (*Brochymena*) 13

13(12) Juga distinctly longer than tylus, exceeding it by at least their width at that point ..... *Brochymena quadripustulata* (Fabricius)

13′ Juga subequal to tylus, if exceeding it then by less than their width at that point..... *Brochymena cariosa* Stål

14(11) First visible segment of abdomen with a median spine or slightly raised area anteriorly directed (except in males of *Dendrocoris humeralis*)... 15

14′ First visible segment of abdomen without anteriorly directed spine or raised area 18

15(14) Juga extended and usually touching beyond tylus. .... *Dendrocoris humeralis* (Uhler)

15′ Juga not extending beyond tylus, but if so, then not touching 16

16(15) Large, over 13 mm; green; first visible abdominal segment with anteriorly directed acute spine..... *Chinavia hilare* (Say)

16′ Smaller, less than 10 mm; green or brown; first visible abdominal segment with a median raised area or obtuse spine directed anteriorly (*Banasa)* 17

17(16) Green in color; pronotum without distinctly darker area posteriorly; scutellum with whitish spot at each angle..... *Banasa euchlora* Stål

17′ Brown to green in color; pronotum lighter anteriorly, with a distinctly darker area beyond a line drawn through humeri, scutellum without light spots..... *Banasa dimidiata* (Say)

18(14) Ostiole usually with distinct auricle (sometimes not evident), but not extending as a long tapering canal, ostiole acutely tapering on inner side 19

18′ Ostiole without auricle, but extending laterally as a long, tapering canal, ostiole rounded on inner side…..... 35

19(18) Ostiole small (slight depression), without auricle; juga with whitish spot on either side of tylus; color variegated black with red to yellow. ..... *Murgantia histrionica* (Hahn)

19′ Ostiole conspicuous, auricle usually well-developed (lacking or small in *Neottiglossa*), color not as above… 20

20(19) Posterior margin of humeral angle emarginate; body heavily setose... ..... *Prionosoma podopioides* Uhler

20′ Posterior margin of humeral angle not emarginated; body not heavily setose 21

21(20) Scutellum shorter than corium, tip not broadly rounded, with apical third narrower than apex of corium……. 22

21′ Scutellum longer or equal to corium, tip broadly rounded, with apical third wider than apex of corium……. 30

22(21) Hind tibia with distinct sulcus dorsally for entire length 23

22′ Hind tibia without distinct sulcus for entire length..... 29

23(22) Pronotal margin anterolaterally crenulate; humeral angle acute to rounded (*Euschistus*). 24

23′ Pronotal margin anterolaterally not crenulate, humeral angles broadly rounded…..... 27

24(23) Abdominal sternites with black maculae at lateral angles; humeri variable; antennae with segments 4 and 5 pale red, or brown to black; males without dark macula on ventral side of pygophore..... 26

24′ Abdominal sternites without black maculae at lateral angles; humeri subacute to spinose; antennae with apical half of segment 4 and all of 5 black. 25

25(24) Juga longer than tylus, apex of head incised; membrane immaculate (from original description).....*Euschistus latimarginatus* Zimmer

25′ Juga subequal to tylus; membrane dotted with small brown maculae; males with dark brown to black macula on ventral side of pygophore ..... *Euschistus variolarius* (Palisot de Beauvois)

26(24) Abdominal venter with 1 to 4 median black maculae, occasionally obsolete; length less than 12 mm.... *Euschistus tristigmus tristigmus* (Say)

26′ Abdominal venter without black maculae; length variable .... *Euschistus servus servus* (Say)

27(23) Pronotum with anterior angles strongly produced, broadly widened, reaching level of mideye, margins strongly explanate, head appears recessed into prothorax; length 12 or more mm ..... *Menecles insertus* (Say)

27′ Pronotum with anterior angles less widened, never reaching level of mideye, margins not strongly explanate; length 11.5 mm or less 28

28(27) Head with sides parallel in front of middle, its length subequal to width across eyes; body length 6.0-8.5 mm..... *Mcphersonarcys aequalis* (Say)

28′ Head with sides sinuos in front of middle, its length much shorter than width across eyes; body length 8.5-11.5 mm...*Hymenarcys nervosa* (Say)

29(22) Pronotal humeri spined, directed anteriorly, beak segment 1 not longer than bucculae.....*Oebalus pugnax* (Fabricius)

29′ Pronotal humeri not spined; beak segment 1 distinctly longer than bucculae .....*Mormidea lugens* (Fabricius)

30(21) Tylus distinctly elevated above juga; membrane of hemelytron pale with strongly anastomosing veins (*Coenus*).....31

30′ Tylus scarcely, if at all, elevated above juga; membrane without strongly anastomosing veins. 32

31(30) Brown spots on upper surface of tibiae small, limited to base of each seta; posterior margin of male pygophore with distinct medial tooth.. ..... *Coenus delius* (Say)

31′ Fuscous spots on upper surface of tibiae large, irregular; posterior margin of male pygophore lacking medial tooth..... ..... *Coenus inermis* Harris & Johnston

32(30) Juga subequal to tylus: body black to brown with red or orange markings, head black. 33

32′ Juga longer than tylus, body without red or orange markings, head not black.. 34

33(32) Black with red markings, scutellum with two distinct marginal red spots.....*Cosmopepla lintneriana* (Kirkaldy)

33′ Brown or reddish brown with markings in orange and black; scutellum lacking red spots..... *Cosmopepla intergressa* (Uhler)

34(32) Propleura expanded anteriorly as thin plate surpassing level of base of antenna; longitudinal yellow levigate line extending from head to scutellum, bordered by black bands .....*Aelia americana* Fabricius

34′ Propleura not extended anteriorly as a thin plate, not surpassing base of eye; two prominent levigate yellow spots at basal angles of scutellum.. ..... *Neottiglossa sulcifrons* Stål

35(18) Juga longer than tylus by distance longer than width of tylar apex (*Holcostethus*).....36

35′ Juga slightly shorter to slightly longer than tylus, if longer then exceeding tylus by less than width of tylar apex.....37

36(35) Connexiva black with a pale margin; scutellum narrowed at tip; antennal segments 1-3 yellow to red, 4 and 5 brown to blackish..... ..... *Holcostethus limbolarius* (Stål)

36′ Connexiva alternated black and yellow; scutellum broader at apex; antennal segments concolorous ..... *Holcostethus abbreviatus* Uhler

37(35) Body distinctly pubescent, especially sides of abdominal sternites; frena reaching to middle of scutellum (*Trichopepla*).....38

37′ Body not pubescent, or slightly so; frena surpassing middle of scutellum 39

38(37) Head narrowly rounded, tapering apically; antennae reddish brown, 2 distal segments black .....*Trichopepla semivittata* (Say)

38′ Head broadly rounded or truncate apically, nearly porrect; antennae black with only basal segment pale.....*Trichopepla atricornis* Stål

39(37) Bucculae lobed or squarely truncate posteriorly; length of body 7.5 mm or less .....*Tepa vanduzeei* Rider

39′ Bucculae gradually disappearing or arcuate posteriorly; length, 10 mm or more 40

40(39) Ostiolar ruga reaching more than ½ distance from inner margin of ostiole to lateral margin of metapleuron (*Thyanta*) 41

40′ Ostiolar ruga reaching ½ or less distance from inner margin of ostiole to lateral margin of metapleuron (*Chlorochroa*).....42

41(40) Anterolateral margins and mesial angle of cicatrices of pronotum black .....*Thyanta calceata* (Say)

41′ Anterolateral margins of pronotum not black, color of mesial angle of cicatrices variable, often concolorous to pronotum..... .....*Thyanta custator accerra* McAtee

42(40) Scutellum with yellow medial stripe (rarely faint)..... ..... *Chlorochloa faceta* (Say)

42′ Scutellum without yellow medial stripe.....43

43(42) Scutellum with 3 ivory colored callosities at base; embolium subparallel or slightly widened apically, apex less than twice as wide as base.....44

43′ Scutellum lacking 3 ivory colored callosities at base, tip of scutellum whitish to red; embolium widened apically, with apex nearly twice as wide as base 45

44(43) Embolium wider apically; hemelytral membrane with purple flecks; callosities at base of scutellum moderate to small .... *Chlorochloa uhleri* (Stål)

44′ Embolium parallel, not widened apically; hemelytral membrane lacking purple flecks; callosities at base of scutellum large, distinct ....*Chlorochloa sayi* (Stål)

45(43) Dark tan to nearly black species, with margins of both pronotum and abdomen red to yellow..... *Chlorochloa ligata* (Say)

45′ Green colored species, with margins whitish yellow to red .... *Chlorochloa persimilis* Horvath

46(10) Males with medial tubercle slightly ventrad of ventroposterior rim of pygophore; female abdominal lateral black spots as wide as one-twelfth width of supporting segment ..... *Mecidea minor* Ruckes

46′ Males lacking medial tubercle slightly ventrad of ventroposterior rim of pygophore; female abdominal lateral black spots as wide as one-eighth width of supporting segment ..... *Mecidea major* Sailer

Notes on New State Records (NSR) and other species notes

The new state records were all determined by Packauskas, unless otherwise noted and are housed at the Fort Hays Sternberg Museum (FHSM), Fort Hays State University, University of Kansas Biodiversity Institute (KUBI), entomology collection, or University of Michigan Museum of Zoology (UMMZ).

***Alcaeorrhynchus grandis* (Dallas), NSR.** Published records for this species are restricted to FL, AR, and TX, although Barton and Lee (1981) suggested the Arkansas specimens might have been accidental introductions. Six specimens (FHSM): 1999-2007, Ellis County.

***Banasa dimidiata* (Say), NSR.** This species may occur across the entire U. S. continent, and has been recorded previously in NE and OK. Froeschner (1988) noted that the proper specific epithet should be *dimiata*; however, Hoffman (2005) provided strong evidence for accepting the emendation to *dimidiata* and I follow McPherson and McPherson (2000) in calling it *B. dimidiata.* Four specimens (FHSM): 1964-2005, Cherokee and Ellis County.

***Banasa euchlora* Stål, NSR.** This species was previously known from CO, NV, UT, TX and OK, as well as numerous midwestern states. Eleven specimens (FHSM): 1995-2008, Barton, Ellis, Harper, McPherson, Rooks, and Russell County.

***Brochymena carolinensis* (Westwood).** Although Lariviére (1992) published a record for Kansas as "Eagleton," this should be attributed to Eagleton, OK, as there is no Eagleton, KS. Lariviére also refers to OK for this species, although this is not listed in her distribution list.

***Chlorochloa sayi* (Stål), NSR.** This species is mainly western in distribution, but has been recorded from CO and AR. Three specimens (FHSM), 16 (KUBI): 1902-1998, Hamilton, Morton, and Trego County.

***Coenus inermis* Harris and Johnson.** Rider (1996) reported a single specimen from Montgomery County.

***Euschistus latimarginatus* Zimmer, NSR.** This species has only been recorded from CO and NE. Four specimens (KUBI, determined by D. Stoner): 1902-1912, Clark, Rooks, Russell, and Thomas County.

***Hymenarcys nervosa* (Say).** This species is mostly eastern in distribution, but has been recorded in OK and TX, while Crevecoeur (1905) recorded this from KS. This is now confirmed by a single specimen (UMMZ, det. R. F. Hussey, 1952): 1927, Franklin County. (personal communication, Daniel Swanson).

***Mecidea minor* Ruckes.** Sailer (1952) reported specimens from Clark, Hamilton, Meade, Morton, Saint John, Scott, Seward, and Stevens County, but these KS records were apparently overlooked by Froeschner (1988).

***Prionosoma podopioides* Uhler, NSR.** This species was recorded from NE and CO, and is known from other western states as well as IA, IL, and MI. Twelve specimens (KUBI, det. J. D. Lattin, 1958): 1911-1952, Douglas, Ellsworth, Kiowa, Meade, Norton, Reno, and Stafford County.

***Thyanta calceata* (Say).** Rider and Chapin (1992) reported specimens from Bourbon and Douglas County.

***Trichopepla atricornis* Stål, NSR.** This species seems to be northwestern in distribution, but has been recorded from CO, UT, and WY. It is easily separated from *T. semivittata* in having 4 longitudinal rows of black maculae across abdominal sterna and 4 ultimate segments of the antennae black, as well as the connexival segments with a pale margin (not variegated, occasionally uniformly brown). Three specimens (FHSM): 2000-2004, Ellis County.

***Tylospilus acutissimus* (Stål), NSR.** This species is only known from AZ, CO, NM, and TX. One specimen, lacking a head and pronotum, but nonetheless distinct (KUBI, det. by K. A. Philips, 1982): 1944, Ford County.

***Zicrona americana* Thomas, NSR.** This species has been recorded by Thomas (1992) from AZ, CA, and TX, and is relatively uncommon. One specimen: 2007, Logan County.

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This paper was written in honor of Dr. J. E. McPherson, who is retiring from his position at Southern Illinois University at Carbondale, Illinois. He was my Master's degree advisor and put me on track to study Heteroptera. Jay has finally gotten his way in having many of his former students all work on pentatomids. I would like to give my thanks to Zach Falin, collections manager, for allowing me some time in the collections of the University of Kansas Biodiversity Institute. Dr. Dave Rider deserves a special thank you for critically reviewing this paper, forcing it to be better. I would also like to sincerely thank Sheran Powers, Interlibrary Loan Coordinator, at the Forsyth Library, Fort Hays State University, for her amazing ability to accrue all of the journal articles and books I required.

Literature Cited

Buxton, G. M., D. B. Thomas, and R. C. Froeschner. 1983. Revision of the species of the *sayi*-group of *Chlorochloa* Stål (Hemiptera: Pentatomidae). California Department of Food and Agriculture, Occasional Papers in Entomology 29: 1–25.

Barton, H. E., and L. A. Lee. 1981. The Pentatomidae of Arkansas. Arkansas Academy of Science Proceedings 35: 20–25.

Crevecoeur, F. F. 1905. Addition to the list of the hemipterous fauna of Kansas. Transactions of the Kansas Academy of Science 19: 232–237.

Douce, G. K., and E. F. Suber [eds.]. 1986. Summary of insect losses from insect damage and costs of control in Georgia, 1985. University of Georgia Special Publications 55: 27.

Froeschner, R. C. 1988. Family Pentatomidae Leach, 1815. The stink bugs, pp. 544–597. *In* T. J. Henry, and R. C. Froeschner (eds.), Catalog of the Heteroptera, or True Bugs, of Canada and the Continental United States. E. J. Brill, New York. 958 pp.

Hamilton, G. C. 2009. Brown marmorated stink bug. American Entomologist 55(1): 19–20.

Hoffman, R. L. 2005. The Virginia species of *Banasa*, three decades later (Heteroptera: Pentatomidae). Banisteria 25: 41–44.

Knight, H. H.1952. Review of the genus *Perillus* with description of a new species. (Hemiptera, Pentatomidae). Annals of the Entomological Society of America 45: 229–232.

Larivière, M-C. 1992. Description of *Parabrochymena*, new genus, and redefinition and review of *Brochymena* Amyot and Audinet-Serville (Hemiptera:Pentatomidae): with considerations on natural history, chorological affinities, and evolutionary relationships. Memoirs of the Entomological Society of Canada 163. pp 75.

McDonald, F. J. D. 1974. Revision of the genus *Holcostethus* in N. America (Hemiptera: Pentatomidae). Journal of the New York Entomological Society 82: 245–258.

McDonald, F. J. D. 1976. Revision of the genus *Trichopepla* (Hemiptera: Pentatomidae) in N. America. Journal of the New York Entomological Society 84: 9–22.

McDonald, F. J. D. 1986. Revision of *Cosmopepla* Stål (Hemiptera: Pentatomidae). Journal of the New York Entomological Society 94: 1–15.

McPherson, J. E. 1982. The Pentatomoidea of Northeastern North America with Emphasis on the Fauna of Illinois. Southern Illinois University Press, Carbondale and Edwardsville, IL, pp 240.

McPherson, J. E., and R. M. McPherson. 2000. Stink Bugs of Economic Importance in America North of Mexico. CRC Press. Boca Raton, FL. pp. 253.

Nielsen, A. L., and G. C. Hamilton. 2009a. Life history of the invasive species *Halyomorpha halys* (Hemiptera: Pentatomidae) in northeastern United States. Annals of the Entomological Society of America 102: 608–616.

Nielsen, A. L., and G. C. Hamilton. 2009b. Seasonal occurrence and impact of *Halyomorpha halys* (Hemiptera: Pentatomidae) in tree fruit. Journal of Economic Entomology 102: 1133–1140.

Panizzi, A. R., J. E. McPherson, D. G. James, M. Javahery, and R. M. McPherson. 2000. Stinkbugs (Pentatomidae), pp. 421–474. *In* C. Schaefer, and A. R. Panizzi (eds.), Hemiptera of economic importance. Boca Raton, FL, 828 pp.

Popenoe, E. A. 1885. Contributions to a knowledge of the Hemiptera-fauna of Kansas. Transactions of the Kansas Academy of Science 9: 62–64.

Rider, D. A. 1986. A new species and new synonymy in the genus *Tepa* Rolston and McDonald (Hemiptera: Pentatomidae). Journal of the New York Entomological Society 94: 552–558.

Rider, D. A. 1995. Review of the genus *Coenus* Dallas with the description of *C. explanatus*, new species (Heteroptera: Pentatomidae). Journal of the New York Entomological Society 103: 39–47.

Rider, D. A. 1996. New state records from the southeastern United States for *Aelia americana* (Hemiptera: Pentatomidae). Florida Entomologist 69: 251–252.

Rider, D. A., and J. B. Chapin. 1992. Revision of the genus *Thyanta* Stål, 1862 (Heteroptera: Pentatomidae II. North America, Central America, and the West Indies. Journal of the New York Entomological Society 100: 42–98

Rolston, L. H, 1972. The genus *Menecles* Stål (Hemiptera: Pentatomidae). Journal of the New York Entomological Society 80: 234–237.

Rolston, L. H. 1974. Revision of the genus *Euschistus* in middle America (Hemiptera, Pentatomidae, Pentatomini). Entomologica Americana 48: 1–102.

Rolston, L. H., and F. J. D. McDonald. 1984. A conspectus of Pentatomini of the Western hemisphere. Part 3 (Hemiptera: Pentatomidae). Journal of the New York Entomological Society 92: 69–86.

Sailer, R. I. 1952. A review of the stinkbugs of the genus *Mecidea.* Proceedings of the United States National Museum 102: 471–505, plates 47–48.

Schwertner, C. F., and J. Grazia. 2006. Descrição de seis espécies de *Chinavia* (Hemiptera, Pentatomidae, Pentatominae) da América do Sul. Iheringia, Série Zoologia 96: 237–248.

Thomas, D. B. 1983. Taxonomic status of the genera *Chlorochloa* Stål, *Rhytidiloma* Stål, *Liodermon* Kirkaldy, and *Pitedia* Reuter, and their included species (Hemiptera: Pentatomidae). Annals of the Entomological Society of America 76: 215–224.

Thomas, D. B. 1992. Taxonomic synopsis of the asopine Pentatomidae (Heteroptera) of the western hemisphere. Entomological Society of America (Thomas Say Monograph), Lantham, Maryland. 156 pp.

Thomas, D. B. 2012. *Mcphersonarcys* a new genus for *Pentatoma aequalis* Say (Heteroptera: Pentatomidae). The Great Lakes Entomologist 45: 127–133.

Thomas, D. B., and T. R. Yonke. 1981. A review of the Nearctic species of the genus *Banasa* Stål (Hemiptera: Pentatomidae). Journal of the Kansas Entomological Society 54: 233–248.

(USDA NAL) United States Department of Agriculture National Agricultural Library. 2012. Animal: species profiles: brown marmorated stink bug, May 2012. (http://www.invasivespeciesinfo.gov/animals/stinkbug.shtml) accessed 6/1/2012.

Zimmer, J. T. 1910. Two new species of Pentatomidae from Nebraska. The Canadian Entomologist 42: 166–167.

Zimmer, J. T. 1912. The Pentatomidae of Nebraska. University of Nebraska, Contributions from the Department of Entomology, 4[1911]:1–33.