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New records of woodboring beetles
(Coleoptera: Buprestidae)
for the eastern United States

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New records of woodboring beetles (Coleoptera: Buprestidae) for the eastern United States

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Abstract. An abundance-based checklist of eastern Buprestidae (Coleoptera) was compiled from collection records from invasive insect surveys conducted during 2010–2018. Reported are 111 species in 17 genera based on 33,047 specimens examined from 10 states. Sixty-three new state records in nine states are reported. Collection date ranges by month for each state are provided.

Key words. New record, collection ranges, metallic wood borers, bycatch

Introduction

The jewel beetles (Coleoptera: Buprestidae) have been of great interest in North America, especially since the detection and spread of the pestiferous emerald ash borer (EAB) (*Agrilus planipennis* Fairmaire) across the continent. Other jewel beetles, such as the goldspotted oak borer (*Agrilus auroguttatus* Schaeffer), European oak borer (*Agrilus sulcicollis* Lacordaire), and oak splendor beetle (*Agrilus biguttatus* Fabricius) also pose risks to North America's forests and are the focus of surveys by governmental agencies (Haack et al. 2009; Cooperative Agricultural Pest Survey 2019). The resulting extensive surveys, trap efficacy studies, and collections have produced thousands of records of Buprestidae, both native and introduced.

The Buprestidae of North America north of Mexico have been recently assessed and summarized by Nelson et al. (2008). Paiero et al. (2012) updated this for northeastern North America with their field guide for east of the Mississippi River, and there have been many other recent additions to the fauna east of the Mississippi River (e.g. Hansen et al. 2011; Rutledge et al. 2013; Barringer and Ciafré 2014; Harpootlian and Bellamy 2014; Klingeman et al. 2015; Swink et al. 2015; Westcott and Thomas 2015; Barringer 2016a, 2016b, 2017; Hoebeke et al. 2017; Carlton et al. 2018; Bohne et al. 2019; Hanson et al. 2019). The emerald ash borer's expansion across North America is also continuously updated and tracked by USDA APHIS (Bopp 2019). Large gaps still exist in distributions for many species with large swathes of host plant ranges seemingly unused. Cryptic and technically difficult taxa can also mask diversity for many groups, especially genera such as *Chrysobothris* Eschscholtz and *Agrilus* Curtis.

Buprestidae are collected most often by sweeping, panel traps, flight intercept traps, predatory wasp surveys, Lindgren funnels, and rearing. Buprestidae can also be collected as bycatch in traps intended for insects in other orders. Sticky cards and bands, bucket traps, and delta traps can occasionally yield Buprestidae by chance due to the diversity of this family's host plants. All these pieces can be compiled to give a more complete picture of their total diversity and life histories.

This paper collects the efforts of agricultural pest surveys from various commodities, targeted pests, and states processed by the Pennsylvania Department of Agriculture (PDA) during 2010–2018. The department was either involved in collecting the samples themselves (Pennsylvania records) or cooperated with state and federal agencies to provide identification services for survey and research. These survey efforts, often employing trapping methods not associated with or targeting Buprestidae, were all screened for target pest groups resulting in their retention and identification. These records are intended to provide abundance-based data for Buprestidae using traditional and nontraditional sampling methods, contribute to their life history in the eastern United States, and update the list of known species for the surveyed states.

Materials and Methods

Trapping methods. Methodology for surveys covered a wide variety of pests over the trapping seasons (2010–2018). Most specimens were collected using standard trapping methods for wood-boring insect pests such as Cerambycidae (Coleoptera), Buprestidae (Coleoptera), Scolytinae (Coleoptera: Curculionidae), and Siricidae (Hymenoptera). Incidental captures were also recorded from traps meant to catch other taxa (Lepidoptera; Hymenoptera: Vespidae; and Diptera: Agromyzidae).

The most common collection methods were panel traps, flight intercept panel traps, and Lindgren funnel traps. A summary of the methodology for PDA trapping was provided in Barringer (2015), elaborated on in Barringer and Bartlett (2018), and can generally be applied to the other states. Specific trapping methods in some states can be found in Francese et al. (2013), Crook et al. (2014), and Ray et al. (2019). The preservative agent in the collection cups was propylene glycol. Collections were conducted during February through December, with most of the trapping taking place between April and October, especially in the Northeast. All traps in these surveys were serviced every two weeks. Samples collected outside this window were either destructive samples from host trees (Pennsylvania) or from lower latitudes which extended the trapping season.

Incidental trapping for other invasive insects included spotted lanternfly, *Lycorma delicatula* White (Hemiptera: Fulgoridae), Asian giant hornet, *Vespa mandarina* Smith (Vespidae: Hymenoptera), Allium leafminer, *Phytomyza gymnostoma* Loew (Agromyzidae: Diptera), grape commodity pests, and tomato commodity pests. Spotted lanternfly incidentals were captured using brown paper sticky bands (Hoebeke et al. 2017). For the Asian giant hornet surveys insects were collected in plastic jugs, typically one gallon in volume, baited with water mixed with brown sugar. Allium leafminer traps were yellow sticky cards placed in fields of *Allium* spp., typically *A. cepa* L. or *A. sativum* L. (Barringer et al. 2018). The grape and tomato commodities were a combination of bucket traps for Lepidoptera (green, white, or multi-color (green, white, and yellow)), sticky cards for Psyllidae (Hemiptera) (typically yellow), brown paper deltas, and white paper deltas (Lepidoptera). Unlike the hornet (brown sugar scent) and allium traps (visual cue) the grape and tomato traps used pheromone lures and some visual cues (for Lepidoptera) as their attractants. Grape traps were placed on trellises in vineyards and tomato traps were placed on nearby fence posts or installed metal posts.

Identification. All adult Buprestidae were extracted, identified to species when possible, and voucher specimens deposited in the Pennsylvania Department of Agriculture Collection, Harrisburg, Pennsylvania, USA (PADA). Duplicate specimens collected prior to 2016 were also dispersed by PADA to other collections. Material has been passed on to the following collections: The American Museum of Natural History (AMNH), Denver Museum of Natural History (DMNS), University of California (EMEC), Mississippi State University (MEM), The Natural History Museum (NHMUK), New York Botanical Garden (NYBG), Ohio State University (OSUC), Pennsylvania State University (PSUC), and Purdue University (PURC), University of Delaware (UDCC). A portion was also distributed to private collections and universities (Georgia College, New York Botanical Garden) without collection codens.

Certain taxa were identified only to genus (typically females of *Agrilus* and *Chrysobothris*), even if males of similar appearance were collected in the same sampling event. In situations where all females looked similar they were recorded as “sp.,” while unidentified females of multiple morphospecies in a single sample were recorded as “spp.” Specimens were identified by comparison to materials in the PADA collection and with published descriptions and illustrations (notably Wellso et al. 1976; Bright 1987; McCrae 1991; Paeiro et al. 2012). Sex was sporadically recorded during 2010–2012, and explicitly recorded during 2013 onwards. All sex determination was done by examination of the genitalia and no external morphologies were considered. If genitalia were unavailable to be examined, it was recorded as undetermined. Authors of included genera and species are provided in Table 1 and are otherwise not duplicated in other tables.

Results

Of 33,047 specimens examined from ten states, 17 genera and 111 species were identified, including 63 new state records (Table 2). Louisiana was the only state without a new record. The total count

of specimens includes individuals identifiable to genus only (typically females) but were not tallied as individual species for diversity for each state (Tables 3–12). Pennsylvania supplied the largest portion of specimens (48%) as it was the only state that had material collected every year, and had multiple surveys processed every year. The next most numerous states were Massachusetts (19%), Ohio (16%), and Michigan (12%), all of which implemented surveys specifically targeting Buprestidae. The month of July had the highest catch at 15,911 specimens (48%), followed by June 10,488 (32%) and August 3,244 (10%) (Table 1).

Agrilus was the most numerous genus collected (24,112, 73%), and included the highest diversity with 47 species. The next most numerous were *Chrysobothris* (4,371 specimens, 13%), *Dicerca* Eschscholtz (1,635 specimens, 5%), and *Anthaxia* Eschscholtz (1506 specimens, 4.6%). After *Agrilus*, the most speciose genera were *Chrysobothris* (15), *Dicerca* (12), *Buprestis* L. (8), and *Anthaxia* (7). The most common species collected were *Agrilus plannipennis* (36%), *A. bilineatus* (Weber) (8.1%), *Chrysobothris femorata* (Olivier) (6.5%), and *C. sexsignata* (Say) (5.8%) (Table 1). If unidentified *Agrilus* specimens were treated as one species, they would account for 10.2% of the total abundance. All other specimens identified only to genus was accounted for 0.5% of the total.

The combined surveys produced a ratio of 1:1.74 ($n = 22,827$), male to female. Several taxa had strong female capture bias (greater than 1:4). At the generic level *Buprestis* and *Brachys* Dejean were almost exclusively female captures. Of 105 collected *Buprestis* there was a single male of *B. striata* F., and 536 out of 545 *Brachys* were females. Four species individually showed strong female trends across three genera: *Agrilus cuprescens* (Menetries) 1:3.98 ($n = 1051$), *A. cyanescens* Ratzeburg 1:5.38 ($n = 83$), *Chrysobothris sexsignata* 1:5.45 ($n = 302$), *Dicerca divaricata* (Say) 1:5.23 ($n = 385$).

No genus had a male bias, but individual species did and to a greater extreme than any female bias found. The eight species (in two genera) with sex ratios strongly male were: *Agrilus arcuatus* (Say) 6.17:1 ($n = 86$), *A. crinicornis* Horn 23.8:1 ($n = 149$), *A. egenus* Gory 6:1 ($n = 30$), *A. geminatus* (Say) 25:1 ($n = 26$), *A. masculinus* Horn 6.46:1 ($n = 433$), *A. osburni* Knull 37:1 ($n = 38$), *A. otiosus* Say 14:1 ($n = 60$), and *Anthaxia quercata* (F.) 2.44:1 ($n = 196$). It is important to note, however, that these trends are likely due to high numbers of unidentified female specimens in these taxa. For example, over 1700 unidentified female *Agrilus* are reported from Pennsylvania alone.

Collection information is presented for new state records by species and state using the following notation: [State: County, location name: coordinates, date collected (number of individuals collected)]. State abbreviations are as follows: MA = Massachusetts, MD = Maryland, MI = Michigan, MO = Missouri, NH = New Hampshire, NY = New York, OH = Ohio, PA = Pennsylvania, WV = West Virginia. Full collection records, vouchers, and specimen data can be obtained by contacting the PADA collection.

Actenodes

***A. acornis* (Say): MA:** Essex Co., Otis 2014-MA-16 WH: 42.6956 N, 71.111 W, 23-vi-2014 (1).

Agrilus

***A. amelanchieri* Knull: MD:** Washington Co., Otis 2013-MD-5435: 39.6865 N, 78.0708 W, 20-vi-2013 (1), **OH:** Clermont Co., East Fork 504: 39.0049 N, 84.1345 W, 31-vii-2014 (1), **WV:** Lewis Co., Otis 2013-WV-16: 38.924 N, 80.4838 W, 23-vii-2013 (1).

***A. atricornis* Fisher: PA:** Juniata Co., 333 Landscape Supplies: 40.5421 N, 77.4059 W, 31-v-2012 (1).

***A. audax* Horn: MA:** Plymouth Co., 329SynergyR4: 41.8901 N, 70.6328 W, 21-vi-2017 (1), **MD:** Washington Co., MD10GMFU: 39.6052 N, 78.0045 W, 16-vi-2014 (1), **OH:** Clermont Co., East Fork 504: 39.0049 N, 84.1345 W, 31-vii-2014 (3).

***A. carpini* (Knull): MD:** Charles Co., MD01GMFU: 38.5891 N, 77.1181 W, 4-vi-2014 (1).

***A. cephalicus* LeConte: NH:** Merrimack Co., CalibrationC10: 43.1814 N, 71.573 W, 18-vi-2018 (1).

***A. champlaini* Frost: MA:** Essex Co., Otis 2015-MA-625-HP: 42.6151 N, 71.0734 W, 25-vi-2015 (1).

A. cliftoni Knull: MD: Howard Co., MD07GMFB: 39.2612 N, 77.0367 W, 3-vi-2014 (1), PA: Bradford Co., CRAFTMASTER: 41.7644 N, 76.4183 W, 15-vi-2012 (1).

A. crataegi Frost: MA: Essex Co., Otis 2015-MA-632-HP: 42.6253 N, 71.0693 W, 4-viii-2015 (1).

A. cyanescens Ratzeberg: PA: Snyder Co., 11/15 South Susq Exit: 40.7922 N, 76.8597 W, 26-v-2010 (1).

A. difficilis Gory: PA: Berks Co., 1802 Paper Mill Road: 40.3482 N, 75.9732 W, 13-vii-2011 (1).

A. egeniformis Champlain and Knull: NY: Westchester Co., GrSRidge2Hi: 41.001 N, 73.7592 W, 20-vii-2016 (1).

A. fallax Say: MA: Essex Co., 309SweeneyR3: 42.6237 N, 71.0675 W, 10-viii-2016 (3).

A. ferrisi Dury: PA: Mifflin Co., 1186 middle rd. (6): 40.5602 N, 77.6464 W, 1-vii-2010 (1).

A. geminatus (Say): MD: Charles Co., Otis 2013-MD-5687: 38.4906 N, 76.9228 W, 26-vi-2013 (1), OH: Clermont Co., Stone Lick 511: 39.2235 N, 84.0586 W, 31-vii-2014 (2).

A. imbellis Crotch: OH: Clermont Co., Stone Lick 511: 39.2235 N, 84.0586 W, 31-vii-2014 (1).

A. lacustris LeConte: MI: Clinton Co., Otis 2013-MI-49-MRSGA: 43.123 N, 84.6637 W, 20-vi-2013 (1), MO: Wayne Co., Otis 2013-MO-8: 37.1919 N, -90.5169 W, 25-vi-2013 (1), OH: Clermont Co., East Fork 532: 39.047 N, 84.1184 W, 31-vii-2014 (1), PA: Centre Co., 144-322 Split: 40.7943 N, 77.6263 W, 22-vi-2010 (1).

A. lecontei Saunders: MA: Plymouth Co., Otis 2014-MA-206-Soule: 41.9323 N, 70.8393 W, 9-vii-2014 (1).

A. masculinus Horn: WV: Ritchie Co., Otis 2013-WV-4: 39.2593 N, 81.0808 W, 28-v-2013 (1).

A. oblongus Fisher: OH: Clermont Co., Stone Lick 539: 39.2173 N, 84.0647 W, 31-vii-2014 (1), PA: Dauphin Co., RADEL RD- TRAP 701: 40.4635 N, 76.826 W, 17-vi-2016 (1).

A. olentagyi Champlain and Knull: PA: Dauphin Co., MILLER RD.-HALIFAX3: 40.4736 N, 76.8305 W, 16-vi-2017 (1).

A. parvus Saunders: MA: Essex Co., Otis 2015-MA-607-HP: 42.6133 N, 71.0691 W, 4-viii-2015 (1), MD: Washington Co., Otis 2013-MD-5683: 39.606 N, 78.0104 W, 20-vi-2013 (1).

A. subcinctus Gory: MA: Essex Co., Otis 2014-MA-13 WH: 42.6972 N, 71.1109 W, 23-vi-2014 (1), MD: Howard Co., MD08GMFU: 39.2623 N, 77.033 W, 3-vi-2014 (1), NH: Merrimack Co., CalibrationC12: 43.1813 N, 71.5724 W, 18-vi-2018 (1).

A. transimpressus Fall: PA: Montgomery Co., 885 county line rd 18976 (2): 40.2162 N, 75.1532 W, 3-vi-2014 (1).

Anthaxia

A. cyanella (Gory): MD: Howard Co., Otis 2013-MD-5540: 39.1497 N, 76.7862 W, 12-vii-2013 (2), NH: Merrimack Co., CalibrationC10: 43.1814 N, 71.573 W, 18-vi-2018 (1).

A. fisheri Obenberger: MA: Berkshire Co., Otis 2013-MA-42 AW: 42.4179 N, 73.1933 W, 8-vii-2013 (1), MD: Charles Co., MD03GMFB: 38.491 N, 76.9249 W, 4-vi-2014 (1), PA: Beaver Co., TURNPIKE 76: 40.7952 N, 80.2802 W, 1-vi-2012 (1).

A. inornata (Randall): MA: Essex Co., Otis 2015-MA-617-HP: 42.6143 N, 71.0654 W, 25-vi-2015 (1), PA: Berks Co., rt. 12, pricetown rd.: 40.3847 N, 75.8931 W, 2-viii-2011 (1).

A. quercicola (Wellso): MD: Charles Co., MD01GMFU: 38.5891 N, 77.1181 W, 14-vii-2014 (2), NH: Merrimack Co., CalibrationC4: 43.1809 N, 71.5731 W, 13-vi-2017 (1), PA: Crawford Co., NORTHWEST HARDWOODS - 5: 41.6228 N, 79.6365 W, 12-vii-2012 (1).

A. viridicornis Gory: NH: Merrimack Co., CalibrationC5: 43.1813 N, 71.5736 W, 3-viii-2017 (1).

Brachys

B. aeruginosus Melsheimer: MD: Washington Co., MD09GMFB: 39.6056 N, 78.0053 W, 21-viii-2014 (1), OH: Clermont Co., Stone Lick 547: 39.2169 N, 84.0552 W, 31-vii-2014 (1).

B. ovatus (Weber): MD: Charles Co., MD01GMFU: 38.5891 N, 77.1181 W, 19-viii-2014 (1).

Buprestis

B. maculipennis Gory: MD: Charles Co., MD03PMFU: 38.4911 N, 76.9233 W, 2-vii-2014 (1).

Dicerca

D. caudata LeConte: WV: Braxton Co., Otis 2013-WV-28: 38.8428 N, 80.6141 W, 25-vi-2013 (1).

D. lepida LeConte: MA: Essex Co., Otis 2015-MA-618-HP: 42.6144 N, 71.065 W, 4-viii-2015 (1), MD: Charles Co., MD03GMFU: 38.4909 N, 76.9259 W, 17-vi-2014 (1), MI: Midland Co., QUER05PMF: 43.7007 N, 84.4276 W, 18-vi-2014 (2), OH: Clermont Co., East Fork 530: 39.0467 N, 84.1177 W, 31-vii-2014 (1), WV: Braxton Co., Otis 2013-WV-28: 38.8428 N, 80.6141 W, 28-v-2013 (4).

D. tenebrica (Kirby): MA: Berkshire Co., Otis 2014-MA-95 AT: 42.3767 N, 73.1516 W, 2-vii-2014 (1).

D. tenebrosa (Kirby): MA: Berkshire Co., Otis 2014-MA-92 WMR: 42.4015 N, 73.1717 W, 11-vi-2014 (1), OH: Clermont Co., East Fork 502: 39.0038 N, 84.1346 W, 31-vii-2014 (1).

Phaenops

P. aneola (Melshimer): MA: Plymouth Co., Otis 2013-MA-70 MSSF: 41.8487 N, 70.6941 W, 19-viii-2013 (1).

Discussion

Pennsylvania was the only state to be sampled for the entire eight-year period using multiple surveys, therefore the majority of Buprestidae presented are from there. Pennsylvania already had a well-documented fauna with 124 species. The extensive sampling added 12 new state records, bringing the total to 136. Some taxa in the state are still poorly collected, both in historic collections and during these surveys, include *Taphrocerus* Solier, *Paragrilus* Saunders, *Pachyschelus* Solier, and *Phaenops* Dejean. These rare or infrequent groups represent the most likely overlooked taxa in the state. Specialized efforts focusing on hosts at certain times and larval rearing are the most likely option to find these rare taxa.

West Virginia is likely the most under sampled of the 10 states presented. The survey material that PDA processed was small in total Buprestidae screened ($n = 217$) but very productive in terms of number species (18 total, two new state records), an indication that there is a high likelihood that a greater diversity exists. The diversity of adjacent states Ohio and Pennsylvania (96 and 136, respectively) also supports the idea that West Virginia (77) could harbor many unreported species. New Hampshire's collections were extremely productive given the small collection of Buprestids. Five new state records were found from only 48 specimens, a ratio of one out every 10 representing a new state record.

This checklist should not be considered comprehensive as there are likely multiple records housed in entomological institutions that have not yet been assessed. Additionally, the large-scale trapping efforts presented here likely missed portions of the known fauna. These species tended to be ecological specialists or use hosts that inhabit terrain that is not forested or agricultural, such as marshes, barrens, and riparian corridors. Additionally, the semiochemical lures used in trapping may be unattractive or have a repellent effect to non-target taxa.

The emerald ash borer's frequency of over one third of the collected Buprestidae is reflective of the work PDA did for tracking the species' expansion across the state as well as work involving other states. Samples from other states, especially Massachusetts, often emphasized improving trapping efficacy for

capture of emerald ash borer as well as generalized Buprestidae capture (Francese et al. 2013). This trap efficacy program is partly why *Agrilus* accounted for over two thirds of specimens, with specialized trap designs, plant volatiles, and lures.

Surveys that targeted non-woodboring taxa, such as Asian giant hornet, *Allium* leafminer, grape, and tomato commodity pests exhibited no patterns in either traps that captured Buprestidae or with specific Lepidoptera pheromones. These captures (n = 291) were likely a result of chance captures by the trap, presence of suitable hosts nearby, or another unknown effect. The sparse collections do not suggest that these non-targeted traps hold much value for collecting most Buprestidae. One exception, however, is that regarding brown paper sticky bands used for spotted lanternfly (*Lycorma delicatula* White) was reliable in catching the invasive species *Agrilus smaragdifrons* Ganglbauer when symptomatic host trees were present (Hoebeke et al. 2017). Both species share the host tree of heaven (*Ailanthus altissima* (Mill.) Swingle). Sticky traps, such as panel and prism traps, are an effective trap for bycatch, so the additional collection value of sticky bands is limited (Crook et al. 2014).

PDA has never used species-specific sex pheromones for Buprestidae in trapping. Sex pheromones for Cerambycidae have been used in some surveys, with and without adjuncts, but no pattern was indicated when examined. Plant volatiles, used in conjunction with visual cues, were used on most traps. Several traps and surveys were designed to target Buprestidae specifically and improve trap efficacy. Plant volatiles would be assumedly equally appealing to both sexes; however, some have been shown to have sex biased responses such as when EAB males responded more strongly to (Z)-3-Hexenol, but at a 2:1 ratio (Grant et al. 2011). However, the PDA traps captured EAB with a female bias ratio of 1:1.31 (n = 11,312) using a variety of lures including (Z)-3-Hexenol. Study of lab-reared populations of *Agrilus* support a 1:1 sex ration (Zang et al. 2017), however little information exists for groups that don't contain pestiferous species.

Unequal sex ratios may be the consequence of overlapping sex pheromones or differences in behavior rather than population-level ratio biases. For example, male EAB spend more time hovering around trees to look for mates, possibly increasing their trap encounter rate (Rodriguez-Saona et al. 2007). Males may also appear to be more common in genera with high proportions of unidentified female specimens (such as *Agrilus*). Trapping date ranges may affect capture rates in species with sexually divergent emergence and behaviors, however trapping occurred before and after most flight periods and should therefore account for this.

Narrow trapping date ranges for some surveys (mainly those outside of Pennsylvania) may also limit what is caught, such as *Agrilus subcinctus* Gory which appeared more frequently in Pennsylvania during the spring (May and June) with capture rates declining in subsequent months. Records from other states only start in June or July and decline as well. Variations in trapping dates also coincided with climatic differences and degree day accumulations. However, only 82 total specimens were examined during February to April, supporting that trapping starting in May (which saw 2,785 specimens) is the earliest month to start trapping to capture early season Buprestidae.

Alternate trapping methods not presented here have been shown to capture a portion of the remaining fauna that static trapping misses. Trapping with *Cerceris fumipennis* Say (Hymenoptera: Crabronidae) by monitoring their nest provisions has become a popular monitoring tool for EAB in low population density areas. While limited by weather and labor intensive, it can be effective tool to supplement panel and prism traps (Careless et al. 2009). Surveys for EAB in New England using *C. fumipennis* resulted in 56 new state records over a 10-year period (Bohne et al. 2019). This methodology resulted in a similar number of collection records to the presented work but with significantly fewer species compared to PDA's efforts. Bohne et al. collected 2,115 specimens (Massachusetts n = 890, New Hampshire n = 1,225) and found four and six new state records in four years. PDA collected 6,310 specimens (Massachusetts n = 6262, New Hampshire n = 48) in six years and found 14 and five state records, respectively.

However, the known fauna of some states such as Michigan, Missouri, Louisiana, New York, and Pennsylvania probably represent a large portion of the total that can be collected through general collecting and passive methods (MacRae 1991; Paiero et al. 2012; Carlton et al. 2018). Further diversity may be found as PDA conservatively identified some taxa of the *Agrilus anxius* (Fisher) and the *Chrysobothris femorata* complexes. Possible new records may be hidden in the taxa left at the generic level (typically females). In most situations, however, it is likely that many of the *Agrilus* left at the generic level could

be reasonably ascribed based on experience and taxa collected from that locality on other dates. The *Chrysobothris*, while not as speciose, may have a higher chance of hiding additional species due to their lower captures rates in the samples.

The destruction of bycatch is often lamented as it is praised as a missed source of information on ecological and economical value (Spears and Ramirez 2015). The ideal goal of complete identifications can be mitigated by narrower, tractable attempts of taxa that are already being screened, such as the examination of Buprestidae here. Work like this can serve as a model to share information that may have been previously been discarded.

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Table 1. Seasonality of specimen capture of Buprestidae from 10 states by month.

	Month										
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Dec	Total
<i>Acmaeodera</i> Eschscholtz											
<i>ornata</i> (F.)				1							1
<i>pulchella</i> Herbst				2		3	6	5			16
<i>tubulus</i> (F.)				50	15	8	22				95
<i>Actenodes</i> Dejean											
<i>acornis</i> (Say)				1	17	13	7	1		2	41
<i>simi</i> Fisher						1					1
<i>Agrilus</i> Curtis											
<i>amelanchieri</i> Knull					3	4	2				9
<i>anxious</i> (Fisher)				31	271	484	217	5			1008
<i>arcuatus</i> (Say)					14	62	10	1			87
<i>atricornis</i> Fisher				2	2	4					8
<i>audax</i> Horn					3	7					10
<i>bilineatus</i> (Weber)		1	1	15	877	1423	370	8			2695
<i>carpini</i> (Knull)					1						1
<i>celti</i> Knull				4	226	122	21	3			376
<i>cephalicus</i> LeConte				4	40	18	11	2			75
<i>champlaini</i> Frost					2	1	1				4
<i>cliftoni</i> Knull				2	10	1	3				16
<i>crataegi</i> Frost					6	18	3				27
<i>criddlei</i> Frost					1			1			2
<i>crinicornis</i> Horn				1	86	62					149
<i>cuprescens</i> (Menetries)				1	1	481	298	270			1051
<i>cyanescens</i> Ratzeberg				28	61	34	5	1			129
<i>defectus</i> LeConte				17	7	1			1		26
<i>difficilis</i> Gory						7	8				15
<i>egeniformis</i> Champlain and Knull						19					19
<i>egenus</i> Gory				5	44	18	6				73
<i>fallax</i> Say				1	9	26	9				45
<i>ferrisi</i> Dury					1	11	6	1			19
<i>frosti</i> Knull					2	12					14
<i>fuscipennis</i> Gory						1					1
<i>geminatus</i> (Say)				3	11	12					26
<i>granulatus</i> (Say)						1					1
<i>imbellis</i> Crotch				1	9	5	1				16

	Month										
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Dec	Total
<i>juglandis</i> (Knull)					1	2					3
<i>lacustris</i> LeConte				2	6	33					41
<i>lecontei</i> Saunders				25	235	117	47	2			426
<i>masculinus</i> Horn				144	313	223	19				699
<i>oblongus</i> Fisher					4	1					5
<i>obsoletoguttatus</i> Gory				6	161	182	46	1			396
<i>olentangyi</i> Champlain and Knull					4	1					5
<i>osburni</i> Knull					24	14		1			39
<i>otiosus</i> Say				135	69	16	1				221
<i>parvus</i> Saunders					12	15	1				28
<i>pensus</i> Horn					2	8					10
<i>planipennis</i> Fairmaire		2		797	3748	7088	284	24	7		11950
<i>politus</i> (Say)				1	16	26	34	4			81
<i>putillus</i> Say				2	13	65	1				81
<i>ruficollis</i> (F.)					13	11	1	1			26
<i>smaragdifrons</i> Ganglbauer					5	12	60	49	3		129
<i>subcinctus</i> Gory				226	285	146	11				668
<i>sulcicollis</i> Lacordaire					14			1			15
<i>transimpressus</i> Fall				2	9	2	1				14
<i>vittaticollis</i> Randall					1						1
sp.			2	152	909	812	186	20	19		2100
spp.				90	624	492	66				1272
<i>Anthaxia</i> Eschscholtz											
<i>cyanella</i> (Gory)				3	18	8					29
<i>fisheri</i> Obenberger				17	50	8	1				76
<i>inornata</i> (Randall)					18		1				19
<i>quercata</i> (F.)			3	286	57	181	11				538
<i>quercicola</i> (Wellso)					4	5					9
<i>viridicornis</i> (Say)				114	41	274	6				435
<i>viridifrons</i> Gory				109	230	25	1	1			366
sp.				5	12	13	4				34
<i>Brachys</i> Dejean											
<i>aerosus</i> Melsheimer				5	78	162	73	30			348
<i>aeruginosus</i> Gory					17	77	41	6			141
<i>ovatus</i> (Weber)					15	62	32	4			113
<i>Buprestis</i> Linnaeus											
<i>apricans</i> Herbst		6	3	1							10
<i>consularis</i> Gory							1		2		3
<i>lineata</i> F.				10	1	9	4				24
<i>maculativentris</i> Say						1	2				3
<i>maculipennis</i> Gory				1		12	30				43
<i>rufipes</i> (Olivier)					3	4	13				20
<i>salisburyensis</i> Herbst				1	4	1	1				7
<i>striata</i> F.			1	11	26	14	9				61
sp.					1						1
<i>Chalcophora</i> Dejean											
<i>fortis</i> LeConte						1					1
<i>georgiana</i> (Germar)		16	14	8	1	2	4	5			50
<i>virginiensis</i> (Drury)	2	5			1						8

	Month										
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Dec	Total
<i>Chrysobothris</i> Eschscholtz											
<i>adelpha</i> Gemminger and Harold					7	7	10	1			25
<i>azurea</i> LeConte				1	8	8	6	2			25
<i>chlorocephala</i> Gory				1	3	10	6				20
<i>cribraria</i> Mannerheim					3						3
<i>dentipes</i> (Germar)					1	4	1				6
<i>femorata</i> (Olivier)			1	58	636	1013	444	9	1		2162
<i>harrisi</i> (Hentz)					3	1					4
<i>pusilla</i> Gory and Laporte				1	2	23	2				28
<i>rotundicollis</i> Gory and Laporte						2					2
<i>rugosiceps</i> Melsheimer				1	3	2	4				10
<i>scabripennis</i> Gory and Laporte				5	5	6	5				21
<i>sexsignata</i> (Say)			1	10	269	1069	554	18	3	1	1925
<i>trinervia</i> Kirby						9	2				11
<i>verdigrispennis</i> Frost						1					1
<i>viridiceps</i> Melsheimer					3	3	2				8
sp.				6	26	63	18	1			114
spp.						4		2			6
<i>Dicerca</i> Eschscholtz											
<i>asperata</i> (Gory and Laporte)				4	9	6	3				22
<i>callosa</i> Casey					1						1
<i>caudata</i> LeConte			1	2	9	8	3				23
<i>divaricata</i> (Say)			6	200	470	323	73	7			1079
<i>lepida</i> LeConte				22	19	3	1	1			46
<i>lurida</i> (F.)		10	6	93	95	72	23	3	3		305
<i>obscura</i> (F.)				8	10	1	2		2		23
<i>pugionata</i> Germar					2						2
<i>punctulata</i> (Schoenherr)				3	25	19	2	2			51
<i>tenebrica</i> (Kirby)				4	32	7	2				45
<i>tenebrosa</i> (Kirby)				1	6	6	2	1			16
<i>tuberculata</i> (Castlenau)				7		1					8
sp.				2	2	1		1			6
spp.							8				8
<i>Eupristocerus</i> Deyrolle											
<i>cogitans</i> Weber					1	1					2
<i>Mastogenius</i> Solier											
<i>crenulatus</i> Knull					8	2					10
<i>subcyaneus</i> (LeConte)					1						1
<i>Phaenops</i> Dejean											
<i>aeneola</i> (Melsheimer)				2		10	8				20
<i>fulvoguttata</i> (Harris)				2	27	114	27	1			171
sp.						1					1
<i>Poecilnota</i> Eschscholtz											
<i>cyanipes</i> (Say)						4	9	2			15
<i>Ptosima</i> Dejean											
<i>gibbicollis</i> (Say)				13	10	35					58
<i>walshii</i> LeConte			1	7	2	1					11
<i>Spectralia</i> Casey											
<i>gracilipes</i> (Melsheimer)				2	25	87	29				143

	Month										
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Dec	Total
<i>Taphrocerus</i> Solier											
<i>schaefferi</i> Nicolay and Weiss				1							1
<i>Texania</i> Casey											
<i>campestris</i> (Say)				2	1						3
	2	40	40	2780	10488	15911	3244	498	41	3	33047

Table 2. Summary by state of trapping results and survey date ranges. Total diversity is a combination of records from literature and presented here of the number of Buprestidae reported in each state.

State	Genera	Species	New state records	Total diversity	Year(s) of survey
Louisiana	9	21	0	110	2016–2017
Massachusetts	11	47	15	101	2013–2018
Maryland	11	70	14	95	2013–2018
Michigan	8	51	2	124	2013–2014
Missouri	8	33	1	113	2013
New Hampshire	4	11	5	86	2017–2018
New York	4	12	1	113	2016
Ohio	9	45	9	96	2014, 2016
Pennsylvania	16	2	12	136	2010–2018
West Virginia	5	18	4	77	2013

Table 3. Number of Buprestidae specimens by species and month for Louisiana.

	Month									
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Total
<i>Acmaeodera</i>										
<i>tubulus</i>				2						2
<i>Actenodes</i>										
<i>acornis</i>					1					1
<i>Agrilus</i>										
<i>bilineatus</i>		1	1							2
<i>geminatus</i>				1						1
<i>obsoletoguttatus</i>				1						1
sp.				1						1
<i>Anthaxia</i>										
<i>fisheri</i>				1						1
<i>quercata</i>			3	11						14
<i>Buprestis</i>										
<i>apricans</i>		6	3	1						10
<i>consularis</i>							1		2	3
<i>lineata</i>				10						10
<i>maculipennis</i>				1		1				2
<i>rufipes</i>					2		1			3
<i>Chalcophora</i>										
<i>georgiana</i>		16	14	8	1	2	4	5		50
<i>virginiensis</i>	2	5			1					8
<i>Chrysobothris</i>										
<i>femorata</i>				2	1					3
<i>pusilla</i>				1						1
<i>sexsignata</i>			1	3						4
sp.				2		2				4
<i>Dicerca</i>										
<i>asperata</i>					1					1
<i>lurida</i>		10		3	3	3	2	1		22
<i>obscura</i>				1						1
<i>Phaenops</i>										
<i>aeneola</i>				2						2
Totals	2	38	22	51	10	8	8	6	2	147

Table 4. Number of Buprestidae specimens by species and month for Massachusetts. New state records are denoted with an “*”.

	Month					
	Jun	Jul	Aug	Sep	Oct	Total
Actenodes						
<i>acornis*</i>	1	1				2
Agrilus						
<i>anxius</i>	36	175	82	1		294
<i>arcuatus</i>	9	52	9	1		71
<i>atricornis</i>	1	3				4
<i>audax*</i>	1					1
<i>bilineatus</i>	341	665	81	1		1088
<i>cephalicus</i>	2	2	1			5
<i>champlaini*</i>	1	1	1			3
<i>crataegi*</i>			2			2
<i>crnicornis</i>	82	62				144
<i>cuprescens</i>		480	297	270		1047
<i>cyanescens</i>	7	2				9
<i>defectus</i>	5	1			1	7
<i>fallax*</i>		6	7			13
<i>frosti</i>		4				4
<i>geminatus</i>	1					1
<i>imbellis</i>		1				1
<i>juglandis</i>		1				1
<i>lecontei*</i>		1				1
<i>masculinus</i>	116	153	6			275
<i>obsoletoguttatus</i>	63	123	40	1		227
<i>osburni</i>	21	14		1		36
<i>otiosus</i>	8		1			9
<i>parvus*</i>			1			1
<i>pensus</i>		6				6
<i>planipennis</i>	64	147	31	12		254
<i>politus</i>	1	18	33	4		56
<i>putillus</i>	5	15	1			21
<i>subcinctus*</i>	72	17	2			91
sp.	214	358	70	9	19	670
spp.	283	245	35			563
Anthaxia						
<i>fisheri*</i>	9	2	1			12
<i>inornata*</i>	4					4
<i>quercata</i>	3	150	1			154
<i>viridifrons</i>	20	12				32
sp.	1		1			2
Brachys						
<i>aerosus</i>	68	105	31	2		206
<i>aeruginosus</i>	11	46	30			87
<i>ovatus</i>	11	54	21	1		87
Buprestis						
<i>lineata</i>		3	3			6
<i>maculativentris</i>		1	2			3
<i>maculipennis</i>		5	29			34

	Month					Total
	Jun	Jul	Aug	Sep	Oct	
<i>salisburyensis</i>	2	1				3
<i>striata</i>	13	9	3			25
sp.	1					1
Chrysobothris						
<i>adelpha</i>	3					3
<i>azurea</i>	1		1			2
<i>cribraria</i>	3					3
<i>dentipes</i>	1	3	1			5
<i>femorata</i>	32	98	39	3		172
<i>harrisi</i>	2					2
<i>pusilla</i>	2	23				25
<i>rotundicollis</i>		2				2
<i>rugosiceps</i>			2			2
<i>scabripennis</i>		2	3			5
<i>sexsignata</i>	11	84	36	2		133
<i>trinervia</i>		9	2			11
<i>verdigrispennis</i>		1				1
<i>viridiceps</i>	2	2				4
sp.	15	25	11			51
spp.		2				2
Dicerca						
<i>asperata</i>	2	4				6
<i>callosa</i>	1					1
<i>caudata</i>	1	1	1			3
<i>divaricata</i>	66	37	15	1		119
<i>lepida*</i>			1			1
<i>lurida</i>	23	10	2			35
<i>obscura</i>		1				1
<i>punctulata</i>	24	16	2	1		43
<i>tenebrica*</i>	6	7	1			14
<i>tenebrosa*</i>	1	1	1			3
Mastogenius						
<i>crenulatus</i>	8	2				10
Phaenops						
<i>aeneola*</i>		1	3			4
<i>fulvoguttata</i>		2	3	1		6
Poecilnota						
<i>cyanipes</i>		4	8	1		13
Spectralia						
<i>gracilipes</i>	2	11	2			15
Totals	1683	3289	956	312	20	6260

Table 5. Number of Buprestidae specimens by species and month for Maryland. New state records are denoted with an “*”.

	Month						Total
	May	Jun	Jul	Aug	Sep	Oct	
Acmaeodera							
<i>tubulus</i>	4						4
Actenodes							
<i>acornis</i>		1					1
Agrilus							
<i>amelanchieri*</i>		1					1
<i>anxius</i>		5					5
<i>arcuatus</i>		1					1
<i>audax*</i>		2					2
<i>bilineatus</i>		12	5				17
<i>carpini*</i>		1					1
<i>celti</i>		2					2
<i>cephalicus</i>		2					2
<i>cliftoni*</i>		1					1
<i>crnicornis</i>		1					1
<i>geminatus*</i>		2					2
<i>lecontei</i>		2					2
<i>masculus</i>	4	1					5
<i>obsoletoguttatus</i>		2					2
<i>otiosus</i>		1					1
<i>parvus*</i>		1					1
<i>planipennis</i>	2	116	39	5			162
<i>subcinctus*</i>		2	2				4
sp.	3	15	4				22
Anthaxia							
<i>cyanella*</i>			3				3
<i>fisheri*</i>	1	4					5
<i>quercata</i>	2	1					3
<i>quercicola*</i>			2				2
<i>viridicornis</i>		12					12
<i>viridifrons</i>	5	11		1			17
sp.	1	2					3
Brachys							
<i>aeruginosus*</i>				1			1
<i>ovatus*</i>		1		1			2
Buprestis							
<i>lineata</i>			1				1
<i>maculipennis*</i>			2				2
<i>rufipes</i>			1	6			7
<i>striata</i>	1	4	2				7
Chrysobothris							
<i>femorata</i>		3	3	4			10
<i>rugosiceps</i>			1	2			3
<i>sexsignata</i>		1	1	1			3
sp.		1	3				4
Dicerca							
<i>asperata</i>				2			2

	Month						Total
	May	Jun	Jul	Aug	Sep	Oct	
<i>caudata</i>		1					1
<i>divaricata</i>	5	4	1	1			11
<i>lepida*</i>	10	2	1		1		14
<i>lurida</i>	1	2		1		1	5
<i>obscura</i>				1		2	3
<i>punctulata</i>	1						1
<i>tenebrica</i>	1	1					2
Phaenops							
<i>aeneola</i>			1				1
Ptosima							
<i>gibbicollis</i>	1	3					4
<i>walshii</i>	1						1
Texania							
<i>campestris</i>	2						2
Totals	45	224	72	26	1	3	371

Table 6. Number of Buprestidae specimens by species and month for Michigan. New state records are denoted with an “*”.

	Month					Total
	Jun	Jul	Aug	Sep	Dec	
Agrilus						
<i>amelanchieri</i>	2					2
<i>anxius</i>	48	23	28	2		101
<i>arcuatus</i>		7	1			8
<i>atricornis</i>	1					1
<i>bilineatus</i>	60	43	7	2		112
<i>celti</i>	190	82	21	3		296
<i>cephalicus</i>	4	1	1			6
<i>cliftoni</i>			1			1
<i>crataegi</i>		3				3
<i>criddlei</i>	1			1		2
<i>cuprescens</i>		1	1			2
<i>cyanescens</i>	35	22	4	1		62
<i>egeniformis</i>		2				2
<i>ferrisi</i>		1	2			3
<i>geminatus</i>		1				1
<i>granulatus</i>		1				1
<i>imbellis</i>	1	1				2
<i>lacustris*</i>	1	1				2
<i>lecontei</i>	46	40	22			108
<i>masculinus</i>	5	5	1			11
<i>obsoletoguttatus</i>	12	6	1			19
<i>osburni</i>	2					2
<i>otiosus</i>	7	7				14
<i>parvus</i>	11	9				20
<i>planipennis</i>	1091	1537	113	7		2748
<i>putillus</i>		1				1

	Month					Total
	Jun	Jul	Aug	Sep	Dec	
<i>subcinctus</i>	63	2	4			69
<i>sulcicollis</i>	14			1		15
<i>transimpressus</i>	1		1			2
sp.	44	56	16	3		119
spp.	24	12	4			40
<i>Anthaxia</i>						
<i>cyanella</i>	1	1				2
<i>fisheri</i>	1					1
<i>quercata</i>		3	1			4
<i>viridicornis</i>	1		4			5
<i>viridifrons</i>	53	7				60
sp.	2	1				3
<i>Brachys</i>						
<i>aerosus</i>		1		1		2
<i>aeruginosus</i>	1	4	2			7
<i>Chrysobothris</i>						
<i>adelpha</i>	1		1			2
<i>azurea</i>	1	1		2		4
<i>femorata</i>	20	17	4	1		42
<i>sexsignata</i>	7	42	10	4	1	64
<i>viridiceps</i>		1				1
sp.	2	8				10
<i>Dicerca</i>						
<i>asperata</i>		1				1
<i>caudata</i>	1		1			2
<i>divaricata</i>	38	18	1			57
<i>lepida*</i>	2					2
<i>lurida</i>	10	2	1			13
<i>punctulata</i>		1				1
<i>tenebrica</i>	19		1			20
<i>Phaenops</i>						
<i>fulvoguttata</i>		1				1
<i>Ptosima</i>						
<i>walshii</i>	1	1				2
<i>Spectralia</i>						
<i>gracilipes</i>		8				8
Totals	1824	1982	254	28	1	4089

Table 7. Number of Buprestidae specimens by species and month for Missouri. New state records are denoted with an “*”.

	Month		
	May	Jun	Total
<i>Acmaeodera</i>			
<i>ornata</i>	1		1
<i>pulchella</i>	1		1
<i>tubulus</i>	38	8	46
<i>Actenodes</i>			
<i>acornis</i>		4	4
<i>Agrilus</i>			
<i>anxius</i>		1	1
<i>bilineatus</i>	1	22	23
<i>celti</i>		2	2
<i>cephalicus</i>	4	13	17
<i>champlaini</i>		1	1
<i>cliftoni</i>	2	1	3
<i>crnicornis</i>	1		1
<i>defectus</i>	1		1
<i>fallax</i>		1	1
<i>geminatus</i>	1	3	4
<i>lacustris*</i>		1	1
<i>lecontei</i>	2	2	4
<i>masculus</i>		6	6
<i>obsoletoguttatus</i>	1	14	15
<i>planipennis</i>	1	97	98
<i>putillus</i>		3	3
<i>subcinctus</i>		1	1
<i>vittaticollis</i>		1	1
sp.	4	7	11
spp.	2	24	26
<i>Anthaxia</i>			
<i>fisheri</i>	5	3	8
<i>quercata</i>		13	13
<i>viridifrons</i>	94	65	159
<i>Chrysobothris</i>			
<i>femorata</i>	4	287	291
<i>sexsignata</i>		37	37
<i>Dicerca</i>			
<i>asperata</i>	2	1	3
<i>lepida</i>	1	1	2
<i>lurida</i>	6	2	8
<i>tenebrica</i>	1		1
<i>Ptosima</i>			
<i>gibbicollis</i>	10	5	15
<i>Texania</i>			
<i>campestris</i>		1	1
Totals	183	627	810

Table 8. Number of Buprestidae specimens by species and month for New Hampshire. New state records are denoted with an “*”.

	Month			
	Jun	Jul	Aug	Total
<i>Agrilus</i>				
<i>anxius</i>		1	1	2
<i>bilineatus</i>	1			1
<i>cephalicus*</i>	1			1
<i>cyanescens</i>	4			4
<i>subcinctus*</i>	4			4
sp.	1			1
<i>Anthaxia</i>				
<i>cyanella*</i>	1			1
<i>quercicola*</i>	1			1
<i>viridicornis*</i>	1		1	2
<i>viridifrons</i>	26			26
<i>Brachys</i>				
<i>ovatus</i>	1			1
<i>Dicerca</i>				
<i>divaricata</i>	4			4
Totals	45	1	2	48

Table 9. Number of Buprestidae specimens by species and month for New York. New state records are denoted with an “*”.

	Month			
	Jun	Jul	Aug	Total
<i>Agrilus</i>				
<i>anxius</i>	7	2	2	11
<i>bilineatus</i>	2	1		3
<i>cyanescens</i>	1			1
<i>egeniformis*</i>		1		1
<i>egenus</i>	1			1
<i>obsoletoguttatus</i>	3	1		4
<i>ruficollis</i>	1			1
<i>smaragdifrons</i>	1			1
sp.		3		3
<i>Brachys</i>				
<i>aeruginosus</i>	1			1
<i>Chrysobothris</i>				
<i>sexsignata</i>		2		2
<i>viridiceps</i>	1		1	2
sp.		1		1
<i>Dicerca</i>				
<i>divaricata</i>			1	1
Totals	18	11	4	33

Table 10. Number of Buprestidae specimens by species and month for Ohio. New state records are denoted with an “*”.

	Month		
	Jul	Sep	Total
Actenodes			
<i>acornis</i>	2		2
<i>simi</i>	1		1
Agrilus			
<i>amelanchieri*</i>	1		1
<i>anxius</i>	5		5
<i>arcuatus</i>	1		1
<i>audax*</i>	7		7
<i>bilineatus</i>	20		20
<i>celti</i>	18		18
<i>cephalicus</i>	3		3
<i>crataegi</i>	2		2
<i>cyanescens</i>	4		4
<i>difficilis</i>	2		2
<i>egeniformis</i>	14		14
<i>egenus</i>	1		1
<i>fallax</i>	10		10
<i>fuscipennis</i>	1		1
<i>geminatus*</i>	6		6
<i>imbellis*</i>	2		2
<i>lacustris*</i>	22		22
<i>lecontei</i>	28		28
<i>masculinus</i>	23		23
<i>oblongus*</i>	1		1
<i>obsoletoguttatus</i>	24		24
<i>otiosus</i>	5		5
<i>parvus</i>	5		5
<i>planipennis</i>	4333	1	4334
<i>putillus</i>	48		48
<i>subcinctus</i>	61		61
<i>transimpressus</i>	2		2
sp.	16		16
spp.	126		126
Anthaxia			
<i>cyanella</i>	1		1
<i>fisheri</i>	1		1
<i>quercata</i>	3		3
<i>viridicornis</i>	271		271
Brachys			
<i>aerosus</i>	22	1	23
<i>aeruginosus*</i>	7		7
Buprestis			
<i>rufipes</i>	1		1
Chrysobothris			
<i>azurea</i>	1		1
<i>femorata</i>	5		5
<i>sexsignata</i>	4		4

	Month		
	Jul	Sep	Total
sp.	1		1
spp.	2		2
<i>Dicerca</i>			
<i>divaricata</i>	4		4
<i>lepida*</i>	1		1
<i>lurida</i>	2		2
<i>tenebrosa*</i>	5		5
<i>Ptosima</i>			
<i>gibbicollis</i>	34		34
<i>Spectralia</i>			
<i>gracilipes</i>	1		1
Totals	5160	2	5162

Table 11. Number of Buprestidae specimens by species and month for Pennsylvania. New state records are denoted with an “*”.

	Month									
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Dec	Total
<i>Acmaeodera</i>										
<i>pulchella</i>			1		3	6	5			15
<i>tubulus</i>			6	7	8	22				43
<i>Actenodes</i>										
<i>acornis</i>			1	10	10	7	1		2	31
<i>Agrilus</i>										
<i>amelanchieri</i>					2	2				4
<i>anxius</i>			31	171	278	104	2			586
<i>arcuatus</i>				4	2					6
<i>atricornis*</i>			2		1					3
<i>bilineatus</i>			14	433	688	282	5			1422
<i>celti</i>			4	32	22					58
<i>cephalicus</i>				18	12	9	2			41
<i>cliftoni*</i>				8	1	2				11
<i>crataegi</i>				6	13	1				20
<i>crnicornis</i>				3						3
<i>cuprescens</i>			1	1						2
<i>cyanescens*</i>			28	14	6	1				49
<i>defectus</i>			16	2						18
<i>difficilis*</i>					5	8				13
<i>egeniformis</i>					2					2
<i>egenus</i>			5	43	17	6				71
<i>fallax</i>			1	8	10	2				21
<i>ferrisi*</i>				1	10	4	1			16
<i>frosti</i>				2	8					10
<i>geminatus</i>			1	5	5					11
<i>imbellis</i>			1	8	1	1				11
<i>juglandis</i>				1	1					2
<i>lacustris*</i>			2	4	10					16
<i>lecontei</i>			23	185	48	25	2			283
<i>masculinus</i>			139	184	42	12				377

	Month									
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Dec	Total
<i>oblongus*</i>				4						4
<i>obsoletoguttatus</i>			4	67	28	5				104
<i>olentangyi*</i>				4	1					5
<i>osburni</i>				1						1
<i>otiosus</i>			135	53	4					192
<i>parvus</i>					1					1
<i>pensus</i>				2	2					4
<i>planipennis</i>	2		794	2326	1024	134	4	7		4291
<i>politus</i>			1	15	8	1				25
<i>putillus</i>			2	5	1					8
<i>ruficollis</i>				12	11	1	1			25
<i>smaragdifrons</i>				4	12	60	49	3		128
<i>subcinctus</i>			226	143	64	5				438
<i>transimpressus*</i>			2	8						10
sp.		2	143	626	374	100	8			1253
spp.			88	291	109	27				515
Anthaxia										
<i>cyanella</i>			3	16	3					22
<i>fisheri*</i>			10	33	5					48
<i>inornata*</i>				14		1				15
<i>quercata</i>			273	40	25	9				347
<i>quercicola*</i>				3	3					6
<i>viridicornis</i>			114	27	3	1				145
<i>viridifrons</i>			9	55	6		1			71
sp.			4	7	12	3				26
Brachys										
<i>aerosus</i>			5	10	34	42	26			117
<i>aeruginosus</i>				4	20	8	6			38
<i>ovatus</i>				2	8	10	3			23
Buprestis										
<i>lineata</i>				1	4	1				6
<i>maculipennis</i>					4	1				5
<i>rufipes</i>				1	1	6				8
<i>salisburyensis</i>			1	2		1				4
<i>striata</i>		1	9	9	3	6				28
Chalcophora										
<i>fortis</i>					1					1
Chrysobothris										
<i>adelpha</i>				3	7	9	1			20
<i>azurea</i>			1	6	6	5				18
<i>chlorocephala</i>			1	3	10	6				20
<i>dentipes</i>					1					1
<i>femorata</i>		1	51	285	889	397	5	1		1629
<i>harrisi</i>				1	1					2
<i>pusilla</i>						2				2
<i>rugosiceps</i>			1		1					2
<i>scabripennis</i>			5	5	4	2				16
<i>sexsignata</i>			7	211	936	507	12	3		1676
<i>viridiceps</i>						1				1
sp.			3	7	19	6	1			36

	Month									
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Dec	Total
spp.							2			2
Dicerca										
<i>asperata</i>			1	5	1	1				8
<i>caudata</i>		1	2	5	6	1				15
<i>divaricata</i>		6	173	348	262	55	6			850
<i>lepida</i>			2	14	1					17
<i>lurida</i>		6	47	52	47	17	2	2		173
<i>obscura</i>				1						1
<i>pugionata</i>				2						2
<i>punctulata</i>			2	1	2		1			6
<i>tenebrica</i>			2	6						8
<i>tenebrosa</i>			1	5		1	1			8
<i>tuberculata</i>			7		1					8
sp.			2	2	1		1			6
spp.						8				8
Eupristocerus										
<i>cogitans</i>				1	1					2
Mastogenius										
<i>subcyaneus</i>				1						1
Phaenops										
<i>aeneola</i>					8	5				13
<i>fulvoguttata</i>			2	27	111	24				164
sp.					1					1
Poecilnota										
<i>cyanipes</i>						1	1			2
Ptosima										
<i>gibbicollis</i>			2	2	1					5
<i>walshii</i>		1	6	1						8
Spectralia										
<i>gracilipes</i>			2	23	67	27				119
Taphrocerus										
<i>schaefferi</i>			1							1
Totals	2	18	2420	5952	5360	1991	149	16	2	15910

Table 12. Number of Buprestidae specimens by species and month for West Virginia. New state records are denoted with an “*”.

	Month				Total
	May	Jun	Jul	Aug	
<i>Agrilus</i>					
<i>amelanchieri*</i>			1		1
<i>anxius</i>		3			3
<i>bilineatus</i>		6	1		7
<i>masculinus*</i>	1	1			2
<i>planipennis</i>		54	8	1	63
sp.	1	2	1		4
spp.		2			2
<i>Anthaxia</i>					
<i>viridifrons</i>	1				1
<i>Buprestis</i>					
<i>lineata</i>			1		1
<i>rufipes</i>			1		1
<i>striata</i>	1				1
<i>Chrysobothris</i>					
<i>femorata</i>	1	8	1		10
<i>rugosiceps</i>		3			3
<i>sexsignata</i>		2			2
sp.	1	1	4	1	7
<i>Dicerca</i>					
<i>asperata</i>	1				1
<i>caudata*</i>		1	1		2
<i>divaricata</i>	22	10	1		33
<i>lepida*</i>	9				9
<i>lurida</i>	36	3	8		47
<i>obscura</i>	7	9		1	17
Totals	81	105	28	3	217

