JOURNAL OF THE KANSAS ENTOMOLOGICAL SOCIETY
83(1), 2010, pp. 7–24

A Checklist of the Bees (Hymenoptera: Apoidea) of Pennsylvania

Leo R. Donovall, III[1] and Dennis vanEngelsdorp[1,2]

ABSTRACT: The initial results of the first formal survey of the bee fauna of Pennsylvania are reported. Specimens were examined from some 20 private, research and institutional collections in and around the state, as well as from pan-trapping and sweep-netting results from three years (2005–2007) of surveying by the Pennsylvania Department of Agriculture (PDA) Apiary Inspection Service. Of the 371 species reported here, 150 are new state records, including 27 of the 98 species found in the PDA surveys. Non-native species are indicated along with the earliest year of collection in the state and, for all species, the range of collection dates and the most recent year of collection are reported.

KEY WORDS: Apoidea, Bees, Checklist, new state records, Pennsylvania

Concern over the general decline in honey bee populations in the United States, including the recent devastation caused by colony collapse disorder, has prompted increased interest in understanding native bee populations. Winfree *et al.* (2007) indicate that native pollinators can provide ''insurance'' against honey bee losses. In fact, Greenleaf and Kremen (2006) demonstrated that honey bee pollination efficiency on sunflowers increased nearly five-fold when native bees were present. Native pollinators are known to contribute important pollination services in many crops (Klein *et al.*, 2007); a report on native pollinator health published by the National Research Council's Committee on the Status of Pollinators in North America (2007) attributed an estimated $2 to 3 billion in agricultural pollination services, annually (U.S.), to native pollinators. However, as important as native pollinators are in supporting agricultural systems, the status of the overwhelming majority of them remains largely unknown (NRC, 2007).

Pennsylvania is comprised of an exceptional juxtaposition of diverse geological regions and their associated distinctive plant communities, providing a unique set of environments for a broad diversity of bee species. This mosaic of ecological communities connects Pennsylvania with surrounding regions by providing both continuous and contiguously similar habitats. Representative communities connect the region with coastal plains, piedmont plateaus, the Appalachian Mountains, glaciated ridges, forests, grasslands, prairies, bogs, sand dunes, barrens and more, each with vastly different floral and faunal communities. Species distributed in more northerly, southerly and westerly regions often reach Pennsylvania through these habitat connections.

Pennsylvania's bee fauna has never been intensively surveyed, though specimens collected from Pennsylvania have been included in various faunal revisions and regional checklists. Mitchell (1960, 1962) included 180 species/subspecies from the state. Subsequent revisions of various bee taxa have increased the published species count to 221 species. These revisions include: Baker (1975) for *Coelioxys* Latreille;

[1] Department of Entomology – Apiary Section, Pennsylvania Department of Agriculture, Bureau of Plant Industry, Harrisburg, PA 17110
[2] Department of Entomology, The Pennsylvania State University, University Park, PA

Accepted 7 October 2008; Revised 20 May 2008

Bouseman and LaBerge (1979) for *Andrena* Fabricius; Broemeling (1988) for *Nomada* Scopoli; Daly (1973) for *Ceratina* Latreille; LaBerge (1973, 1977, 1980, 1986, 1987) for *Andrena*; LaBerge and Bouseman (1970) for *Andrena*; LaBerge and Ribble (1972) for *Andrena*; McGinley (1986, 2003) for *Lasioglossum* Curtis; Milliron (1973) for *Bombus* Latreille; Ordway (1966) for *Augochlorella* Sandhouse; Roberts (1972) for *Agapostemon* Guérin-Méneville; Shinn (1967) for *Calliopsis* Smith); Timberlake (1975) for *Pseudopanurgus* Cockerell. Distribution maps provided by Droege *et al.* (2008) indicate some 329 species occurring in Pennsylvania, most of which are unpublished records lacking locality information, with as many as 540 species occurring in Pennsylvania or adjacent states.

Institutional collections hold much information regarding past faunal diversity and species distributions. For a checklist, an institutional collection can serve as a reference for identifying taxa, verify published records, add new records from overlooked, misidentified or unidentified material, and provide environmental, spatial and temporal information, including identifying habitats and hosts. However, institutional collections can only provide a limited understanding of past diversity and distributions. Most collections housing Pennsylvania material hold specimens collected more than 50 yrs ago, often with major efforts made between 1900 and 1940. Collections from this era were often made near major academic institutions or museums in metropolitan areas, or in vacation spots, along major transportation routes, or in small quantities from outside of these areas. In Pennsylvania, these major collection spots focused on the region surrounding Philadelphia (Academy of Natural Sciences), Pittsburgh (Carnegie Museum of Natural History), Harrisburg (Pennsylvania Department of Agriculture) and State College (Penn State University), with spotty collection in the Poconos region, Lake Erie region, and in the lower Susquehanna Valley (Lancaster, York, Adams and Cumberland Counties).

Since 2005, the Pennsylvania Department of Agriculture (PDA) apiary inspection service has been conducting surveys of the native bee fauna of Pennsylvania, with the goal of establishing baseline biodiversity and habitat data for use in the development of native pollinator management practices. Through the 2007 field season, these survey efforts have provided some 98 species, 27 of which are new to the state, from 11 established field sites around the state, as well as a handful of additional sites. The PDA survey has also incorporated institutional and private collection visits in and around Pennsylvania as a means of validating published faunal lists, revealing many new state records. Here, we present the first comprehensive list of all bee species found in Pennsylvania through 2007, including the establishment of new state records and a list of collections housing voucher specimens.

Materials and Methods

Materials examined for this study were comprised of 13,076 preserved specimens from institutional and private collections, including 1369 specimens collected during the state-wide survey conducted by the Pennsylvania Department of Agriculture between 2005 and 2007. Private collections from personal research studies include those of Anita Collins (AC; survey of Lehigh Gap, PA), Frank Fee (FF; State College, PA and surrounding area), Rajwinder Singh (RS; dissertation research near State College, PA) and Sven-Erik Spichiger (SS; South-central Pennsylvania).

Institutional collections utilized in this study are listed below, with codens following Evenhuis (2008; additional collection codens are preceded by an asterisk (*)):

AMNH	Department of Entomology Collection, American Museum of Natural History, Central Park West at 79th St., New York, NY
ANSP	Department of Entomology, Academy of Natural Sciences, Philadelphia, PA
CEMU	Cleveland Museum of Natural History, Cleveland, OH
CMNH	Section of Insects and Spiders, Carnegie Museum of Natural History, Pittsburg, PA (=ICCM)
CUIC	Cornell University Insect Collection, Department of Entomology, Cornell University, Ithaca, NY
INHS	Illinois Natural History Survey Insect Collection, 607 E. Peabody Drive, Champaign, IL
*NMLC	North Museum, Lancaster, PA
PADA	Pennsylvania Department of Agriculture Arthropod Collection, Bureau of Plant Industry, Pennsylvania Department of Agriculture, Harrisburg, PA
*PSUB	Penn State University Fruit Research and Extension Center, Biglerville, PA
PSUC	Frost Entomological Museum, Department of Entomology, Pennsylvania State University, University Park, PA
*PWRC	Patuxent Wildlife Research Center, United States Geological Survey, Beltsville, MD (Sam Droege Research Collection)
*RPMC	Reading Public Museum, Reading, PA
SEMC	Snow Entomological Museum, University of Kansas, Lawrence, KS
*TREC	Tom Ridge Environmental Center, Erie, PA
UDCC	Department of Entomology and Applied Ecology Collection, University of Delaware, Newark, DE
USNM	United States National Entomological Collection, Department of Entomology, US National Museum of Natural History, Washington, DC

Current survey efforts follow the Bee Inventory (BI) Plot collection and preservation protocols (LeBuhn *et al.*, unpubl.), as summarized and modified here. PDA entomology staff and apiary inspectors, each supplied with a ''bee bowl'' collection kit, collected specimens from 11 established sites around Pennsylvania. Collection kits consisted of a single set of colored 12 oz. bowls (one each of white, yellow, light blue and dark blue; Solo® brand), a tea strainer, blue Dawn® detergent, water and a plastic spoon; purple-, red- and orange-colored bowls were also utilized by PDA apiary staff in 2007. At an individual collection site, ''bee bowls'' were placed three to five meters apart, filled with soapy water and retrieved 8 to 24 hr following placement. The specimens were removed from the soapy water by pouring the bowl collection into the tea strainer, scooping the specimens out of the strainer using the plastic spoon, and placing the specimens and a locality label into a collection vial with 70% ethanol for preservation, storage and later processing. Collections at a single location were made over a single 8 to 24 hr period, once every one to four weeks. Additional specimens were obtained by general sweep-netting and

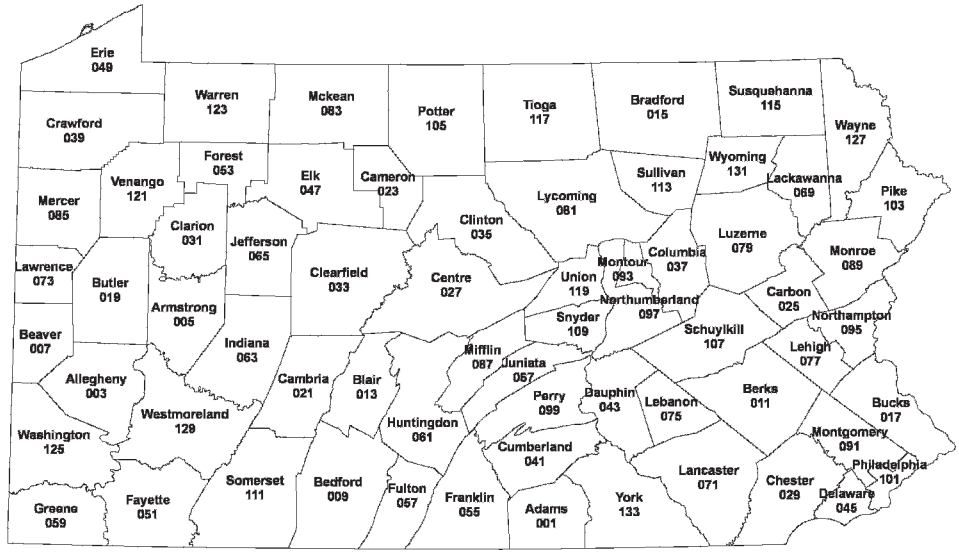

Fig. 1. Pennsylvania counties and associated FIPS codes.

as by-catch in Lindgren funnel traps and sugar-bait traps utilized in pest surveys conducted by PDA and USDA-APHIS. Depending on the preservation method, all specimens were rinsed in water and ethanol, placed in a mason jar fitted with a screen top, blown dry using a hair drier, pinned for preservation and deposited in the PDA arthropod reference collection.

Species determinations followed Mitchell (1960, 1962) and Droege *et al.* (2008). Difficult taxa were confirmed by experts when possible. County codens (Fig. 1) follow the Federal Information Processing Standards (FIPS 6-4) Codes (Pennsylvania codens: alpha, ''PA''; numeric, ''42''), as issued by the National Institute of Standards and Technology (NIST, 1990, 1992). Taxonomic combinations follow Michener (2000; family, subfamily and tribe), Hurd (1979; genus and subgenus) and Droege *et al.* (2008; species and synonymies). Species names and combinations follow Ascher (2008). Recognizing that many groups are in dire need of taxonomic revision (e.g., *Nomada*, *Lasioglossum*, and *Sphecodes* Latreille), determinations reported here follow the most recent nomenclatural and taxonomic designations available.

Checklist

The following checklist records all species verified or reported from Pennsylvania, including those indicated by Droege *et al.* (2008). The list is arranged by family and genus in taxonomic order following Michener (2000); species are arranged alphabetically within each genus. For each species, the counties for which a voucher specimen has been verified or recorded are listed by county FIPS code, as are the range of collection dates and most recent collection year (Note: a designation of ''… not reported'' is recorded for those lacking collection locations, dates and/or years). New Pennsylvania state records are indicated in bold and all species not native to North America are indicated by an asterisk (*) followed by the earliest verified

Pennsylvania collection year in parenthesis. Species listed from published records only (i.e., not confirmed with a specimen during this study), are underlined, with the source of the record referenced.

Colletidae

1. ***Colletes aestivalis*** **Patton – 043, 089; 4 Jun–4 Jul (1918).**
2. ***C. americanus*** **Cresson – 009, 045, 133, USNM (1); 20 Sep–3 Oct (1909).**
3. ***C. brimleyi*** **Mitchell – 073; 17 Jun (1961).**
4. *C. compactus* Cresson – 003, 009, 027, 035, 037, 061, 117; 20 Aug–1 Oct (1962).
5. *C. eulophi* Robertson – 009, 027; 20 Jul–20 Sep (1954).
6. *C. inaequalis* Say – 003, 027, 041, 043, 049, 061, 077, 091, 099, 101, 125, 133; 31 Mar–11 May (2007).
7. *C. latitarsis* Robertson – 003, 027, 043, 099, 121, 125; 2 Jul–23 Aug (1965).
8. *C. nudus* Robertson – 043, 049, 055; 20 May–8 Jul (1919).
9. ***C. productus*** **Robertson – 043, 101; 27 Apr–2 Jul (year not reported).**
10. ***C. simulans armatus*** **Patton – 027, 035, 061, 065, 089; 23 Jul–16 Sep (1976).**
11. ***C. thoracicus*** **Smith – 061; 1 Jun–10 Jun (2006).**
12. *C. validus* Cresson – 027, 061; 7 May (1975).
13. *C. willistoni* Robertson – Mitchell, 1960.
14. *Hylaeus affinis* (Smith) – 001, 003, 027, 029, 039, 043, 045, 055, 057, 061, 071, 077, 089, 091, 097, 101, 113, 115, 117, 121, 129, 133; 4 Jun–5 Oct (2007).
15. ***H. annulatus*** **(Linnaeus) – 043, 069, 113, 117; 4 Jul–15 Aug (1986).**
16. ***H. leptocephalus*** **Morawitz* (2005) – 097, 101; 23 Aug–25 Aug (2005).**
17. ***H. mesillae*** **(Cockerell) – 001, 043, 045, 055, 077, 089; 22 May–25 Jul (2007).**
18. *H. modestus* Say – 001, 003, 015, 017, 019, 027, 029, 039, 041, 043, 045, 047, 049, 055, 061, 077, 079, 089, 091, 099, 101, 103, 113, 117, 129; 14 May–25 Sep (2007).
19. ***H. saniculae*** **(Robertson) – 077; 29 Jun–19 Jul (1903).**
20. *H. sparsus* (Cresson) – Mitchell, 1960.

Andrenidae

21. *Andrena algida* Smith – 027, 053; 8 May–23 Jun (1956).
22. ***A. aliciae*** **Robertson – 003, 043, 051; 6 Aug–1 Sep (1940).**
23. ***A. alleghaniensis*** **Viereck – 043, 101; 30 May (year not reported).**
24. *A. arabis* Robertson – 003, 025, 043, 045, 079, 091, 101, 125, 129; 29 Mar–21 Jun (1982).
25. *A. asteris* Robertson – 003, 007, 029, 043, 045, 081, 101; 7 Sep–24 Sep (2007).
26. ***A. asteroides*** **Mitchell – 027; 5 Mar (1930).**
27. *A. barbara* Bouseman and LaBerge – 001, 027, 129; 10 May (2007).
28. *A. barbilabris* (Kirby) – 027, 041, 043, 045, 051, 073, 091, 101; 30 Mar–23 May (1940).
29. *A. bisalicis* Viereck – 003, 027, 035, 041, 043, 045, 053, 077, 091, 129; 22 Mar–4 May (2007).
30. *A. bradleyi* Viereck – 017, 035, 043; 16 Apr–14 May (1966).
31. *A. brevipalpis* Cockerell – 003, 019, 041, 043, 103, 111, 129; 14 May–21 Jul (1957).
32. *A. carlini* Cockerell – 001, 003, 007, 011, 027, 029, 035, 039, 041, 043, 045, 055, 077, 079, 091, 097, 099, 101, 103, 113, 119, 127, 129, 133; 23 Mar–1 Aug (2007).
33. *A. carolina* Viereck – 027, 047, 079, 101, 103; 9 Apr–29 May (2002).
34. *A. ceanothi* Viereck – 001, 003, 027, 041, 043, 055, 077; 30 May–29 Jun (2007).

35. *A. chromotricha* Cockerell – 003; dates not reported.
36. *A. clarkella* (Kirby) – 053, 113; 1 Apr–6 May (1983).
37. *A. commoda* Smith – 003, 011, 019, 027, 041, 043, 049, 089, 091, 097, 101, 103, 117; 27 Apr–25 Jul (2007).
38. ***A. confederata* Viereck – 039, 045; 30 May–6 Jun (2007).**
39. *A. cornelli* Viereck – 041, 101; 13 May (1910).
40. *A. crataegi* Robertson – 003, 005, 019, 027, 039, 041, 043, 049, 053, 057, 061, 063, 077, 079, 089, 091, 097, 103, 105, 109, 111, 117, 129; 3 May–8 Aug (2007).
41. *A. cressonii* Robertson – 001, 003, 027, 029, 041, 043, 045, 047, 055, 077, 091, 099, 101, 129, 133; 3 Apr–29 Aug (2007).
42. ***A. daeckei* Viereck – 027, 087; dates not reported (2007).**
43. *A. dimorpha* Mitchell – LaBerge, 1986.
44. *A. distans* Provancher – 003, 027, 045, 119; 17 Apr–21 Jul (1948).
45. *A. dunningi* Cockerell – 003, 027, 029, 041, 043, 101; 26 Mar–10 Jun (1980).
46. *A. erigeniae* Robertson – 003, 019, 039, 043, 045, 055, 101, 103, 129, 133; 26 Mar–7 Jun (2007).
47. *A. erythrogaster* (Ashmead) – 003, 041, 043, 097, 101, 105, 113; 3 May–7 Jun (1955).
48. *A. erythronii* Robertson – 003, 027, 039, 097, 119, 129; 4 Apr–6 Jun (2007).
49. ***A. fenningeri* Viereck – 101; 2 May–9 May (1982).**
50. *A. forbesii* Robertson – 003, 005, 027, 029, 039, 041, 043, 045, 055, 087, 091, 101, 103, 119, 129; 31 Mar–14 Jul (2007).
51. *A. fragilis* Smith – 041, 043, 071, 077, 091, 101, 129, 133; 28 May–7 Jul (1982).
52. *A. frigida* Smith - Mitchell, 1960.
53. ***A. gardineri* Cockerell – 129; 18 May (1982).**
54. *A. geranii* Robertson – 003, 027, 045, 051, 091, 119, 129; 22 Apr–30 Jun (1948).
55. ***A. helianthi* Robertson – 003, 029, 105, 129; 21 Apr–16 Sep (2007).**
56. *A. heraclei* Robertson – 101; 22 Apr (1905).
57. *A. hilaris* Smith – 029, 045, 101; 21 Apr–10 Aug (1951).
58. *A. hippotes* Robertson – 003, 005, 029, 041, 043, 045, 055, 089, 097, 101, 129; 22 Apr–21 Sep (1982).
59. *A. hirticincta* Provancher – 003, 007, 029, 041, 045, 053, 085, 101, 117; 20 Jun–2 Oct (1997).
60. ***A. ilicis* Mitchell – 101, 129; 16 May–8 Jun (1950).**
61. ***A. illini* Bouseman and La Berge – 129; 31 May–2 Jun (1982).**
62. *A. imitatrix* Cresson – 003, 005, 007, 009, 019, 027, 039, 041, 043, 045, 055, 061, 079, 091, 101, 103, 129, 133; 6 Apr–30 Jun (2007).
63. *A. integra* Smith – 003, 061, 129; 18 May–20 Jun (1941).
64. ***A. irana* Cockerell – 129; 18 May (1982).**
65. ***A. kalmiae* Atwood – 027; dates not reported (2007).**
66. ***A. krigiana* Robertson – 043, 091, 099, 101; 24 May–3 Oct (1965).**
67. ***A. lamelliterga* Ribble – 007; 5 Jun (1931).**
68. *A. macoupinensis* Robertson – 101, 103; 2 May–30 May (2002).
69. *A. mandibularis* Robertson – 003, 027, 039, 043, 055, 091, 101, 129; 5 Mar–6 Jun (2007).
70. ***A. mariae* Robertson – 007, 097, 101; 10 May–8 Jun (1951).**
71. ***A. melanochroa* Cockerell – 003, 133; 8 May–26 May (1940).**
72. ***A. mendica* Mitchell – 003; 15 Jun (1937).**

73. *A. milwaukeensis* Graenicher – 003, 027, 041, 043, 089, 111, 129, 131; 18 Apr–22 Jun (1989).
74. *A. miranda* Smith – 039, 041, 043, 055, 091, 101, 133; 28 Apr–14 Jul (2007).
75. *A. miserabilis* Cresson – 001, 003, 017, 027, 029, 041, 043, 045, 053, 089, 091, 101, 103, 105, 117, 119, 129, 133; 14 Feb–11 Jun (2002).
76. *A. morrisonella* Viereck – 003, 101, 133; 30 Apr–Jul (1967).
77. *A. nasonii* Robertson – 003, 015, 019, 027, 029, 035, 039, 041, 043, 045, 055, 089, 091, 101, 103, 129; 4 Apr–24 Jun (2007).
78. *A. nida* Mitchell – 073; 27 Apr (1940).
79. ***A. nigrae* Robertson – 003, 097, 101, 133; 24 Apr–30 May (1967).**
80. *A. nigrihirta* (Ashmead) – 017, 027, 089; 30 May–16 Jul (1954).
81. *A. nivalis* Smith – 015, 027, 035, 039, 041, 043, 047, 077, 079, 091, 099, 103, 113, 129; 9 May–26 Jul (2007).
82. *A. nubecula* Smith – 003, 027, 031, 041, 045, 053, 079, 089, 091, 131; 21 Jul–15 Sep (1982).
83. *A. nuda* Robertson – 003, 017, 029, 039, 043, 045, 101, 129, 133; 21 Apr–25 Jun (2007).
84. *A. perplexa* Smith – 003, 027, 041, 045, 051, 063, 069, 071, 089, 099, 101, 129, 133; 5 Mar–21 Jun (1988).
85. ***A. personata* Robertson – 055, 101, 133; 6 Apr–7 Jun (1970).**
86. *A. phaceliae* Mitchell – 027; 22 May (1947).
87. ***A. placata* Mitchell – 101; 19 Sep (1913).**
88. *A. platyparia* Robertson – 027, 037, 039, 043, 091; 1 Jun–12 Jul (2007).
89. *A. pruni* Robertson – 003, 027, 041, 043, 045, 091, 101, 133; 20 Apr–10 Jun (2007).
90. *A. regularis* Malloch – 027, 035; 26 Apr–12 May (1966).
91. *A. rehni* Viereck – 003, 043, 045, 077, 129; 22 Jun–29 Jul (1910).
92. *A. robertsonii* (Dalla Torre) – 041, 043, 055, 101, 103, 105, 129, 133; 3 May–14 Jul (1982).
93. ***A. rudbeckiae* Robertson – 061; 13 Jul (2005).**
94. *A. rufosignata* Cockerell – 027, 035, 053, 113, 129; 13 May–16 Jul (2006).
95. *A. rugosa* Robertson – 003, 013, 027, 039, 041, 043, 045, 053, 073, 091, 101, 103, 105, 129, 133; 1 Apr–22 Jun (2007).
96. *A. salictaria* Robertson – 003, 055, 061, 129; 9 Apr–4 May (1966).
97. ***A. sayi* Robertson – 101; 16 May (1925).**
98. *A. sigmundi* Cockerell – 035, 045; 26 Apr–27 Apr (1966).
99. *A. simplex* Smith – 003, 029, 041, 045, 101, 131; 30 Aug–15 Sep (1926).
100. *A. spiraeana* Robertson – 003, 027, 037, 041, 043, 045, 053, 061, 071, 077, 101, 129, 133; 8 May–13 Jul (1982).
101. *A. thaspii* Graenicher – 003, 027; 15 Jun–4 Jul (1960).
102. *A. tridens* Robertson – 027, 055, 075, 099, 101, 129; 27 Mar–27 May (1982).
103. ***A. uvulariae* Mitchell – 129; 18 May (1982).**
104. *A. vicina* Smith – 019, 027, 043, 045, 053, 061, 077, 079, 089, 091, 097, 101, 103, 129; 16 Apr–15 Aug (2006).
105. *A. violae* Robertson – 003, 035, 039, 041, 043, 045, 101, 129, 133; 4 Apr–10 Jun (2007).
106. *A. virginiana* Mitchell – 027, 041, 077; 27 Jun–4 Jul (1918).
107. *A. wheeleri* Graenicher – 027; 10 May (1916).

108. *A. wilkella* (Kirby)* (1912) – 003, 017, 019, 027, 035, 043, 049, 055, 061, 087, 099, 101, 107, 133; 21 Apr–20 Jul (2006).
109. *A. wilmattae* Cockerell – 003, 119; 19 May–2 Jul (1910).
110. *A. w-scripta* Viereck – 003, 005, 041, 043, 061, 077, 079, 101, 105, 111; 19 May–29 Jul (1958).
111. ***A. ziziae* Robertson – 003, 117; 20 May (1928).**
112. *A. ziziaeformis* Cockerell – 043, 045, 089, 101, 103, 133; 30 Apr–9 Jun (2002).
113. *Protandrena abdominalis* (Cresson) – locations and dates not reported.
114. ***Psuedopanurgus compositarum* (Robertson) – 029; 18 Sep (1998).**
115. *P. parvus* (Robertson) – Timberlake, 1975.
116. *P. pauper* (Cresson) – 077; 29 Jun–12 Jul (1901).
117. ***Perdita octomaculata* (Say) – 101; 15 Sep (1901).**
118. *Calliopsis andreniformis* Smith – 001, 015, 017, 027, 039, 041, 043, 045, 049, 055, 069, 077, 103, 129, 133; 30 May–2 Sep (2007).

Halictidae

119. ***Dieunomia heteropoda* (Say) – 101; 10 Sep (1971).**
120. ***Nomia nortoni* Cresson – 003; dates not reported.**
121. *Agapostemon sericeus* (Forster) – 003, 005, 007, 017, 027, 037 041, 043, 045, 047, 049, 051, Huntindon, 077, 089, 091, 097, 099, 101, 111, 119, 125, 133; 1 Apr–30 Oct (2006).
122. *A. splendens* (Lepeletier) – 003, 027, 039, 045, 049, 101; 10 Jul–13 Aug (2007).
123. *A. texanus* Cresson – 001, 003, 005, 027, 041, 045, 049, 077, 097, 101, 103, 129; 29 May–2 Sep (2007).
124. *A. virescens* (Fabricius) – 001, 003, 007, 011, 017, 019, 027, 033, 035, 037, 039, Cumbeland, 043, 045, 049, 059, 061, 071, 077, 079, 087, 091, 095, 099, 101, 103, 113, 117, 125, 129, 133; 22 Mar–13 Oct (2007).
125. *Halictus confusus* Smith – 001, 003, 015, 017, 021, 025, 027, 035, 039, 041, 043, 045, 049, 071, 077, 089, 091, 097, 099, 101, 103, 113, 115, 117, 127, 129, 133; 17 Apr–5 Nov (2007).
126. *H. ligatus* Say – 001, 003, 007, 015, 017, 019, 025, 027, 033, 035, 039, 041, 043, 045, 053, 061, 067, 071, 077, 079, 081, 089, 091, 097, 099, 101, 103, 117; 28 Apr–17 Oct (2007).
127. ***H. parallelus* Say – 003, 101, 127; 25 Jul–17 Aug (1874).**
128. ***H. poeyi* Lepeletier – 045; 24 May (2007).**
129. *H. rubicundus* (Christ) – 001, 003, 017, 019, 027, 035, 041, 043, 045, 053, 055, 077, 079, 089, 091, 097, 099, 101, 115, 117, 129; 13 Apr–18 Aug (2007).
130. ***H. tectus* Radoszkowski* (2005) – 101; 23 Aug–24 Aug (2005).**
131. ***Lasioglossum abanci* (Crawford) – 015, 025, 055, 077, 099; 28 Apr–30 Jul (2007).**
132. *L. acuminatum* McGinley – 027, 035, 061, 077, 089, 103, 111; 12 May–7 Oct (2007).
133. *L. admirandum* (Sandhouse) – 001, 015, 027, 029, 033, 035, 039, 041, 043, 045, 055, 067, 071, 077, 079, 087 099, 101, 103, 113, 129, 133; 22 Apr–3 Oct (2007).
134. *L. albipenne* (Robertson) – 035, 045, 077, 079, 091; 5 May–6 Aug (2007).
135. ***L. anomalum* (Robertson) – 103; 17 Aug (1955).**
136. *L. apertum* (Sandhouse) – 071; Jul (1939).
137. ***L. asteris* (Mitchell) – 043, 075, 077, 107; 28 Apr–18 Aug (2007).**

138. *L. athabascense* (Sandhouse) – 001, 003, 015, 027, 033, 035, 039, 041, 043, 077, 113; 11 May–29 Aug (2007).
139. ***L. atlanticum* (Mitchell) – 077, 099; 30 May–Jul (1969).**
140. *L. bruneri* (039) – 043, 101; 8 Aug–23 Aug (2007).
141. *L. cephalotes* (Dalla Torre) – Mitchell, 1960.
142. *L. cinctipes* (Provancher) – 027, 041, 043, 115; 31 Jul–14 Oct (1918).
143. *L. coeruleum* (Robertson) – 015, 019, 027, 035, 043, 045, 077, 089, 091, 099, 101; 17 Apr–4 Sep (2007).
144. ***L. coreopse* (Robertson) – 103; 30 May (2002).**
145. *L. coriaceum* (Smith) – 003, 007, 015, 019, 027, 035, 039, 041, 043, 045, 047, 049, 051, 053, 061, 065, 071, 077, 089, 097, 099, 103, 113, 117, 119, 125, 129, 133; 16 Apr–14 Oct (2007).
146. *L. cressonii* (Robertson) – 003, 015, 027, 035, 039, 041, 043, 045, 057, 061, 063, 069, 077, 089, 099, 101, 103, 125; 19 Apr–12 Sep (2007).
147. ***L. divergens* (Lovell) – 017; 28 Jun (1958).**
148. *L. forbesii* (Robertson) – 041, 051, 129; 14 Jul–22 Jul (1918).
149. ***L. foxii* (Robertson) – 043, 077; 28 Apr–12 May (2007).**
150. *L. fuscipenne* (Smith) – 015, 027, 039, 041, 043, 133; 8 May–25 Aug (2007).
151. ***L. halophitum* (Graenicher) – 027; 3 Jul (2007).**
152. *L. heterognathum* (Mitchell) – 027, 041, 077, 079; 28 Apr–22 Jul (2007).
153. *L. illinoense* (Robertson) – 039, 041, 043, 045, 055, 077; 28 Apr–6 Sep (2007).
154. *L. imitatum* (Smith) – 001, 013, 015, 027, 035, 039, 041, 043, 045, 055, 061, 071, 075, 077, 087, 089, 091, 095, 099, 101, 103, 113, 119, 133; 19 Apr–27 Sep (2007).
155. ***L. laevissimum* (Smith) – 015, 027, 035, 039, 043, 045, 113; 8 May–12 Aug (2007).**
156. ***L. leucozonium* (Schrenk)* (2007) – 001, 015, 039; 13 June–25 Aug (2007).**
157. *L. lineatulum* (039) – 015, 027, 035, 039, 043, 077, 091, 097, 101, 103, 113; 17 Apr–20 Aug (2007).
158. ***L. macoupinense* (Robertson) – 043; 28 Apr (year not reported).**
159. ***L. marinum* (039) – 045; 18 Jul (1901).**
160. ***L. nelumbonis* (Robertson) – 103; 29 May (2005).**
161. ***L. nigroviride* (Graenicher) – 027, 053, 069, 089, 103; 6 May–4 Jul (1989).**
162. *L. nymphaerum* (Robertson) – 015, 027, 035, 039, 041, 043, 045, 061, 071, 077, 091, 101; 10 May–5 Sep (2007).
163. *L. oblongum* (Lovell) – 015, 027, 045, 053, 069, 077, 089, 113, 129; 6 May–20 Aug (2006).
164. *L. obscurum* (Robertson) – 001, 027, 041, 043, 045, 097, 099, 129; 16 Apr–31 Jul (2007).
165. *L. oenotherae* (Stevens) – McGinley, 2003.
166. ***L. paradmirandum* (Knerer and Atwood) – 025, 077; 24 Jul–25 Jul (1903).**
167. ***L. pectorale* (Smith) – 001, 017, 041, 055, 061, 077; 28 Apr–27 Jul (2007).**
168. *L. perpunctatum* (Ellis) – 027; 21 May–13 Jul (2007).
169. ***L. perspicuum* (Knerer and Atwood) – 001; 23 May (2007).**
170. *L. pilosum* (Smith) – 001, 011, 017, 027, 029, 035, 041, 043, 045, 055, 077, 079, 089, 091, 097, 099, 101, 103, 113; 2 Apr–19 Sep (2007).
171. *L. quebecense* (039) – 027, 043, 051, 129; 14 Jul–2 Oct (2007).
172. ***L. rohweri* (Ellis) – 001, 015, 027, 033, 035, 039, 043, 045, 055, 069, 077, 091, 097, 099, 101, 103, 113, 129, 133; 29 Mar–13 Sep (2007).**
173. *L. simplex* (Robertson) – 027; Aug (1945).

174. ***L. subversans*** **(Mitchell) – 027; 25 May–13 Jul (2007).**
175. *L. tegulare* (Robertson) – 015, 041, 043, 045, 055, 067, 077, 079, 091, 099, 101, 111; 28 Apr–13 Sep (2007).
176. ***L. testaceum*** **(Robertson) – 103; 3 Aug (1936).**
177. *L. truncatum* (Robertson) – 015, 027, 039; 22 May–16 Jul (2007).
178. ***L. versans*** **(Lovell) – 015, 027, 043, 103, 113; 8 Jun–26 Sep (2007).**
179. ***L. versatum*** **(Robertson) – 055; 30 Jul (2007).**
180. ***L. viridatum*** **(Lovell) – 071; Jul (1939).**
181. *L. zephyrum* (Smith) – 015, 027, 041, 043, 045, 049, 077, 091, 097, 101, 119; 17 Apr–25 Aug (2007).
182. ***L. zonulum*** **(Smith) – 015, 039; 8 Jul–22 Aug (2007).**
183. ***Sphecodes atlantis*** **Mitchell 049; 8 Jul (1971).**
184. ***S. coronus*** **Mitchell – 101 18 Jun–2 Jul (1909).**
185. *S. cressonii* (Robertson – 043; 4 Jun (1984).
186. *S. dichrous* Smith – 027, 041, 043, 049, 071; 12 May–29 Jul (1958).
187. ***S. heraclei*** **Robertson – 027, 045; 6 Aug–19 Aug (2006).**
188. ***S. levis*** **Lovell and Cockerell 049; 4 Jun (1966).**
189. ***S. minor*** **Robertson – 043, 133; 8 May–17 Jul (1909).**
190. ***S. pimpinellae*** **Robertson – 043, 049; 4 Jul (year not reported).**
191. ***S. prosphorus*** **Lovell and Cockerell –027; 9 Aug (1996).**
192. *S. ranunculi* Robertson 043, 049, 061, 091 5 May–14 Jul (2007).
193. *Augochlora pura pura* Say – 001, 003, 005, 007, 011, 015, 019, 027, 029, 033, 035, 039, 041, 043, 045, 047, 049, 051, 053, 061, 063, 065, 067, 069, 071, 073, 075, 077, 083, 091, 099, 101, 103, 107, 111, 113, 117, 125, 129, 133; 13 Jan–14 Nov (2007).
194. *Augochlorella aurata* (Smith) – 001, 003, 011, 015, 017, 019, 021, 025, 027, 029, 035, 037, 039, 041, 043, 045, 049, 051, 055, 061, 071, 077, 079, 089, 091, 097, 099, 101, 103, 111, 113, 117, 119, 121, 125, 129, 133; Feb–17 Oct (2007).
195. *A. gratiosa* (Smith) – Mitchell, 1960.
196. *A. persimilis* (Viereck) – 003, 017, 045; 18 Jun–23 Jun (1905).
197. ***Augochloropsis metallica*** **(Fabricius) – 007, 027, 029, 035, 043, 045, 047, 075, 077, 079, 061, 089, 099, 101, 103, 133; 30 Apr–9 Oct (2007).**
198. ***A. sumptuosa*** **(Smith) – 029, 043; 16 Apr–6 May (1909).**

Melittidae

199. ***Macropis ciliata*** **Patton – 017, 041, 043, 045, 071, 077; 12 Jun–9 Jul (1922).**
200. ***M. nuda*** **(Provancher) – 077, 103; 21 Apr–9 Jul (1983).**
201. ***M. patellata*** **Patton – 017, 041, 043, 061, 077, 101; 25 Jun–14 Jul (1922).**
202. *Melitta mellitoides* (Viereck) – 027; 16 Jun (1958).

Megachilidae

203. ***Lithurgus chrysurus*** **Fonscolombe* (2007) – 077; 7 Jul (2007).**
204. *Chelostoma philadelphi* (Robertson) – Allgheny, 043, 045, 051, 057, 081, 091, 097, 099, 101, 103, 129; 18 May–27 Jul (1971).
205. ***Hoplitis pilosifrons*** **(Cresson) – 013, 061, 097, 099, 101; 13 May–13 Jul (2006).**
206. *H. producta* (Cresson) – 003, 019, 029, 039, 041, 043, 077; 13 May–27 Jul (1995).
207. ***H. spoliata*** **(Provancher) – 027, 043, 061, 077, 099; 27 May–13 Jul (2005).**
208. ***H. truncata*** **(Cresson) – 031, 041, 055, 077; 1 Jun–9 Aug (2007).**
209. *Osmia albiventris* Cresson, 1864 – 027, 077, 091, 101, 117, 23 Apr–30 Jun (2007).

210. *O. atriventris* Cresson – 003, 015, 043, 045, 089, 101, 103, 117; 17 May–25 Jul (2005).
211. *O. bucephala* Cresson – 001, 011, 043, 045, 061, 103, 107, 125; 10 Apr–4 Jul (2007).
212. *O. caerulescens* (Linnaeus)* (1905) – 003, 015, 019, 027, 041, 043, 055, 099, 101, 103, 125; 11 Apr–29 Aug (2006).
213. ***O. chalybea* Smith – 045; 22 Jun (1907).**
214. *O. collinsiae* Robertson –003; 1 Jul (1917).
215. ***O. coloradensis* Cresson – 015; 13 Jun–2 Jul (1939).**
216. ***O. cornifrons* (Radoszkowski)* (2008) – PADA (15); 11 Apr–11 Jun (2008).**
217. *O. distincta* Cresson – 043, 045, 061, 079, 103; 29 Apr–10 Jun (2006).
218. *O. felti* Cockerell – Mitchell, 1962.
219. *O. georgica* Cresson 003, 043, 045, 133; 16 Apr–Jul (1970).
220. *O. inspergens* Lovell and Cockerell – Mitchell, 1962.
221. *O. lignaria* Say – 001, 003, 019, 021, 027, 041, 043, 045, 055, 057, 061, 077, 091, 099, 111, 125, 129; 7 Apr–1 Sep (2007).
222. ***O. proxima* Cresson – 113, 133; 27 Apr–15 Aug (1941).**
223. *O. pumila* Cresson – 001, 013, 015, 027, 029, 039, 041, 043, 045, 055, 061, 071, 077, 091, 101, 103, 111, 125 ; 15 Apr–9 Jul (2007).
224. *O. simillima* Smith – 001, 027, 041, 091, 101, 117; 8 May–12 Jul (1909).
225. ***O. texana* Cresson 003, 059, 061; 25 May–3 Sep (1963).**
226. *O. virga* Sandhouse – Mitchell, 1962.
227. ***Heriades carinatus* Cresson – 003, 041, 049, 077, 101; 2 Jun–5 Aug (1933).**
228. ***Anthidiellum notatum* (Latreille) – 027, 061, 087, 089, 101; 12 Jul–23 Aug (2005).**
229. ***Anthidium manicatum* (Linnaeus)* (1990) – 027, 041, 043, 061, 101, 113, 133; 6 Jul–12 Oct (2007).**
230. ***A. oblongatum* (Illiger)* (1994) – 027, 037, 039, 043, 045, 071, 077, 101; 7 Jul–17 Oct (2007).**
231. ***Paranthidium jugatorum* (Say) – 009, 027; 28 Jul–29 Aug (2006).**
232. *Stelis coarctatus* Crawford – 001; 22 May–25 May (2007).
233. ***S. foederalis* Smith –061; 17 May–27 May (1999).**
234. *S. labiata* (Provancher) – Mitchell, 1962.
235. *S. lateralis* Cresson – 003; 27 May (1919).
236. *S. vernalis* Mitchell – Mitchell, 1962.
237. *Coelioxys alternata* Say – 061; 11 Jul (2005).
238. ***C. banksi* 039 – 003, 027; 24 Aug (1996).**
239. *C. funeraria* Smith – locations and dates not reported.
240. ***C. hunteri* 039 – 125; 13 Jul (1910).**
241. ***C. immaculata* Cockerell – 003; dates not reported.**
242. *C. modesta* Smith – 003, 077; Jun–12 Jul (1899).
243. *C. moesta* Cresson – 003, 013, 073, 101; 10 Jun–4 Aug (2006).
244. *C. octodentata* Say – Allgheny, 043, 053, 077, 101; 28 Jun–24 Aug (2006).
245. *C. porterae* Cockerell – 003, 027, 077; 25 Jun–23 Jul (1954).
246. *C. rufitarsis* Smith – 003, 007, 011, 017, 049, 077, 101, 133; 18 Jun–25 Sep (1979).
247. *C. sayi* Robertson – 003, 011, 017, 027, 029, 037, 041, 043, 045, 049, 051, 061, 073, 077, 089, 091, 101; 30 May–25 Aug (2006).
248. *Megachile addenda* Cresson – 001, 003, 043, 077; 26 Jun–15 Jul (2007).

249. ***M. apicalis*** **Spinola* (1996) – 043; 15 Jul–7 Aug (2007).**
250. *M. brevis* Say – 001, 003, 027, 041, 043, 045, 055, 067, 091, 099, 101; 28 Jun–21 Sep (2007).
251. *M. campanulae* (Robertson) – 003, 007, 027, 043, 061, 089, 101; 15 May–24 Aug (2006).
252. *M. centuncularis* (Linnaeus) – 001, 003, 027, 043, 045, 049, 055, 101, 133; 15 May–24 Sep (2005).
253. *M. concinna* Smith* (1946) – 027; 20 Jul (1946).
254. ***M. exilis*** **Cresson – 101; 23 Aug (2005).**
255. *M. frigida* Smith – 027, 043, 049, 053, 075; 30 May–20 Aug (1954).
256. *M. frugalis* Cresson – 027, 043, 077; 26 May–3 Jul (1939).
257. *M. gemula* Cresson – 003, 027, 041, 043, 047, 077, 089, 101, 113; 30 Apr–20 Aug (1960).
258. *M. inermis* Provancher – 027, 051, 053, 061; 24 Jun–9 Sep (1956).
259. *M. ingenua* Cresson – Mitchell, 1962.
260. *M. inimica* Cresson – 003, 027, 041, 043, 049, 061; 27 Jun–23 Sep (2007).
261. ***M. integra*** **Cresson – 017, 043, 061, 099, 101; 5 May–18 Sep (1970).**
262. *M. latimanus* Say – 003, 017, 027, 041, 043, 045, 049, 055, 061, 077, 089, 101, 107, 113, 125, 129, 131; 5 Jun–1 Oct (2002).
263. *M. melanophaea* Smith – 003, 043, 113; 4 Jun–22 Jun (1922).
264. *M. mendica* Cresson – 003, 017, 027, 029, 041, 043, 045, 049, 061, 071, 077, 079, 087, 089, 091, 097, 101, 113, 129; 6 Mar–3 Oct (2006).
265. *M. montivaga* Cresson – 015, 027, 039, 043, 103, 113; 29 May–14 Sep (2007).
266. ***M. mucida*** **Cresson – 053; 19 Jul (1924).**
267. *M. petulans* Cresson – 045, 123; 30 Jul (year not reported).
268. *M. pugnata* Say – 003, 007, 027, 043, 061, 119, 125; 25 Jun–18 Jul (2005).
269. *M. relativa* Cresson – 003, 013, 027, 033, 043, 061, 071, 089, 099, 111, 113, 125; 10 Jun–3 Oct (2007).
270. ***M. rotundata*** **(Fabricius)* (1946) – 015, 027, 035, 043, 045, 101; 10 Jul–26 Aug (2007).**
271. ***M. sculpturalis*** **Smith* (1996) – 015, 027, 035, 043, 049, 061, 065, 117; 5 Jul–2 Aug (2007).**
272. *M. texana* Cresson – 077, 101; 7 Jul–25 Aug (2007).

Apidae

273. ***Xylocopa virginica*** **(Linnaeus) – 001, 003, 013, 017, 019, 027, 029, 033, 037, 039, 043, 045, 049, 051, 053, 059, 061, 063, 065, 067, 071, 077, 079, 091, 099, 101, 107, 119, 125, 129, 133; 5 Mar–16 Oct (2007).**
274. *Ceratina calcarata* Robertson – 001, 003, 011, 015, 017, 027, 029, 033, 035, 039, 041, 043, 045, 049, 053, 067, 077, 089, 095, 097, 099, 101, 111, 125, 129, 133; 5 Apr–29 Sep (2007).
275. *C. dupla* Say – 001, 003, 011, 015, 017, 025, 027, 029, 039, 041, 043, 045, 049, 055, 061, 069, 073, 077, 091, 097, 099, 101, 103, 117, 133; 20 Feb–22 Dec (2007).
276. *C. strenua* Smith – 001, 003, 017, 029, 039, 041, 043, 045, 055, 061, 067, 071, 097, 099, 101, 103, 129, 133; 22 Apr–20 Sep (2007).
277. ***Nomada armatella*** **Cockerell – 047; 9 Apr (1910).**
278. *N. articulata* Smith – 041, 043, 045, 049, 061, 079, 091, 101, 119; 25 Apr–8 Jul (2005).

279. ***N. bella* Cresson – 027, 041, 047, 061, 101; 27 Mar–12 Jun (1997).**
280. ***N. bethunei* Cockerell – 027, 041, 099; 18 May–29 Aug (1996).**
281. *N. bishoppi* Cockerell – Mitchell, 1962.
282. ***N. bisignata* Say – locations and dates not reported.**
283. ***N. ceanothi* Cockerell – 041, 045, 091, 133; 19 Apr–25 Jun (1967).**
284. ***N. composita* Mitchell – 027; 2 Apr–15 Apr (2003).**
285. *N. cressonii* Robertson – 001, 013, 027, 039, 041, 043, 045, 047, 049, 061, 077, 091, 099, 101, 111, 117, 133; 5 Apr–20 Aug (2007).
286. *N. cuneata* (Robertson) – 013, 027, 043, 049, 055, 061, 099, 103, 113, 133; 3 Apr–26 Jun (2006).
287. *N. denticulata* Robertson – 041, 043, 045, 047, 055, 103, 133; 6 May–11 Jun (1971).
288. ***N. depressa* Cresson – 027, 043, 061, 079; 15 Apr–19 Sep (2007).**
289. ***N. fervida* Smith – 049; 16 Jul–30 Jul (1966).**
290. ***N. fragariae* Mitchell – 027; 5 May (1909).**
291. ***N. illinoensis* Robertson – 043; 11 Jun–26 Jun (1909).**
292. ***N. imbricata* Smith – 027, 039, 041, 043, 045, 061, 101, 133; 12 May–13 Jun (2006).**
293. ***N. inepta* Mitchell – 061; 2 May–28 May (1997).**
294. *N. integerrima* Dalla Torre – Mitchell, 1962.
295. *N. 077ensis* Cockerell – 049, 077; 4 Jun–21 Jul (1966).
296. *N. lepida* Cresson – 041, 043, 045, 049, 101; 22 Apr–30 Jun (1984).
297. ***N. luteola* Olivier – 043, 045, 061, 091, 101; 22 May–21 Jun (1917).**
298. ***N. luteoloides* Robertson – 027, 041, 043, 045, 049, 055, 061, 079, 101, 107, 133; 20 Apr–11 Jun (1998).**
299. ***N. maculata* Cresson – 027, 029, 043, 045, 049, 061, 091, 099, 101, 103, 107, 117, 133; 13 Apr–17 Jun (2006).**
300. ***N. obliterata* Cresson – 041, 043, 133; 30 Apr–27 Jun (1970).**
301. *N. ovata* (Robertson) – 027, 041, 061; 13 May–11 Jul (1998).
302. *N. parva* Robertson – 043; 6 May (1909).
303. *N. perplexa* Cresson –027, 039, 043, 049, 061, 077; 5 Mar–14 Jul (2007).
304. *N. placida* Cresson – 041, 045; 28 Aug–8 Sep (1947).
305. *N. pygmaea* Cresson – 041, 043, 045, 077, 091, 101, 103, 133 20 Apr–29 Jun (2007).
306. ***N. rubicunda* Olivier – 101, dates not reported.**
307. *N. sayi* Robertson – 039, 043, 055, 061, 091, 101; 28 Apr–11 Jul (2007).
308. *N. skinneri* Cockerell – Mitchell, 1962.
309. ***N. sulphurata* Smith –043, 091 28 Apr–5 May (1912).**
310. *N. ulsterensis* Mitchell – Mitchell, 1962.
311. ***N. valida* Smith –035, 039, 3 Apr–28 May (1966).**
312. ***N. vicina* Cresson – 027, 049, 061 12 Aug–20 Sep (1998).**
313. ***N. xanthura* Cockerell – 027, 103; 1 May (1999).**
314. *Triepeolus atripes* Mitchell – Mitchell, 1962.
315. *T. donatus* (Smith) –053; 25 May (1939).
316. ***T. helianthi* (Robertson) – 007, 027, 055; 9 Jul–19 Aug (1995).**
317. *T. lunatus* (Say) – 001, Alleghany, 041, 043, 045, 071, 091, 111, 133; 16 Jul–11 Sep (1963).
318. ***T. pectoralis* (Robertson) – 045, 133; 4 Sep–13 Sep (1911).**

319. ***T. quadrifasciatus atlanticus*** **Mitchell – 061; 10 Sep (1996).**
320. *T. remigatus* (Fabricius) – 027, 043, 045, 061, 071, 101; 14 Jul–7 Sep (2007).
321. ***T. rhododontus*** **Cockerell – 061; 26 Aug (1996).**
322. ***T. rugosus*** **Mitchell – 061; 26 Aug (1996).**
323. ***T. simplex*** **Robertson – 133; 6 Aug (1997).**
324. ***Epeolus autumnalis*** **Robertson – 027, 061; 28 Aug–20 Sep (2003).**
325. *E. bifasciatus* Cresson – 027, 043, 061, 077, 101; 14 Jul–5 Sep (2003).
326. *E. lanhami* Mitchell – 043; 6 Jun (1914).
327. ***E. lectoides*** **Robertson – 101; 17 Sep (year not reported).**
328. ***E. pusillus*** **Cresson – 037; 26 Sep (1914).**
329. *E. scutellaris* Say – 027, 049, 061, 089; 10 Aug–25 Sep (2003).
330. ***Holcopasites calliopsidis*** **(Linsley) – 027, 043, 063, 069, 101, 133; 16 Jun–14 Jul (2007).**
331. ***H. illinoiensis*** **(Robertson) – 017; 28 Jun (1936).**
332. ***Epeoloides pilosula*** **(Cresson) – 043, 077; 9 Jun–30 Jun (1911).**
333. ***Ptilothrix bombiformis*** **(Cresson) – 045; 13 Jul–9 Aug (2007).**
334. *Eucera atriventris* (Smith) – 003, 027, 041, 043, 045, 055, 091, 101, 133; 12 Apr–30 May (1925).
335. *E. dubitata* (Cresson) – Mitchell, 1962.
336. *Melissodes agilis* Cresson – 003, 043, 071, 075, 101; 14 Jul–12 Aug (2007).
337. *M. bimaculata* (Lepeletier) – 001, 003, 017, 027, 029, 041, 043, 045, 055, 061, 067, 071, 075, 087, 091, 093, 099, 101, 125, 133; 19 Jun–31 Oct (2007).
338. *M. boltoniae* Robertson – 027, 053; 25 Jun–27 Aug (1956).
339. ***M. communis*** **Cresson – 003; dates not reported.**
340. *M. denticulata* Smith – 003, 005, 007, 041, 043, 099, 101, 125, 133; 13 Jul–8 Oct (2007).
341. *M. dentiventris* Smith – 003, 041, 043, 101, 133; 30 Jul–17 Oct (1911).
342. *M. desponsa* Smith – 001, 027, 041, 053, 075, 101; 2 May–31 Aug (2007).
343. *M. druriella* (Kirby) – 003, 027, 043, 045, 069, 089, 091, 101, 117, 129; 10 Aug–26 Sep (2007).
344. *M. illata* Lovell and Cockerell – Mitchell, 1962.
345. *M. nivea* Robertson – 045; 3 Sep (1903).
346. *M. trinodis* Robertson – 003, 041, 043, 045, 101; 26 Jul–14 Sep (1967).
347. *Peponapis pruinosa* (Say) –003, 027, 043, 049, 101 127, 129, 133; 5 May–11 Aug (2007).
348. ***Svastra compta*** **(Cresson) – 101; dates not reported.**
349. *Anthophora abrupta* Say – 003, 041, 043, 077, 091, 117; 31 May–1 Aug (1921).
350. *A. bomboides* Kirby – 003, 025, 027, 077, 097; 28 Jun–25 Jul (2003).
351. *A. terminalis* Cresson – 003, 013, 027, 029, 041, 043, 051, 055, 061, 091, 097, 099, 101, 133; 26 May–22 Sep (2006).
352. ***A. ursina*** **Cresson – 107; 29 May (1988).**
353. ***Habropoda laboriosa*** **(Fabricius) – 041, 043, 101; 23 Apr–4 Jun (1911).**
354. ***Bombus affinis*** **Cresson – 003, 027, 035, 041, 043, 049, 051, 053, 057, 061, 067, 071, 073, 077, 079, 081, 083, 089, 097, 099, 101, 117, 121, 123, 125, 129, 133; 22 Apr–4 Oct (1992).**
355. ***B. ashtoni*** **(Cresson) – 003, 027, 041, 043, 049, 069, 099, 129; 12 May–15 Sep (1977).**

356. ***B. auricomus*** **(Robertson) – 003, 015, 017, 027, 041, 043, 045, 049, 051, 067, 073, 075, 077, 091, 097, 101, 111, 117, 125, 129; 27 Apr–13 Sep (1986).**
357. ***B. bimaculatus*** **Cresson – 001, 003, 009, 027, 039, 041, 043, 045, 057, 061, 067, 069, 071, 075, 077, 087, 089, 097, 099, 101, 103, 111, 119, 125, 129, 133; 14 Mar–12 Nov (2007).**
358. ***B. borealis*** **Kirby – 003, 007, 117; 11 Aug (1936).**
359. ***B. citrinus*** **(Smith) – 003, 011, 027, 037, 041, 043, 049, 057, 061, 071, 077, 081, 097, 099, 103, 129, 133; 2 Apr–14 Nov (2007).**
360. ***B. fernaldae*** **(055) – 001, 027; 30 Jun–5 Aug (1983).**
361. *B. fervidus* (Fabricius) – 001, 003, 011, 017, 027, 029, 035, 037, 041, 043, 045, 049, 053, 055, 059, 061, 071, 073, 077, 079, 091, 097, 101, 087, 091, 117, 125, 129, 133; 4 Apr–4 Nov (2007).
362. *B. griseocollis* (DeGeer) – 003, 015, 017, 027, 029, 041, 043, 045, 049, 051, 061, 071, 077, 089, 099, 101, 103, 117, 125, 129; 15 Apr–23 Sep (2007).
363. *B. impatiens* Cresson – 003, 015, 017, 019, 025, 027, 029, 033, 035, 039, 041, 043, 045, 049, 051, 055, 057, 061, 063, 065, 067, 069, 071, 075, 077, 079, 081, 083, 087, 089, 091, 097, 101, 099, 113, 119, 125, 127, 129, 133; 10 Apr–12 Nov (2007).
364. ***B. insularis*** **(Smith) – 027, 041, 099; 23 Jun (1977).**
365. *B. pensylvanicus* (DeGeer) – 003, 007, 027, 029, 031, 037, 039, 041, 043, 045, 049, 051, 065, 067, 071, 075, 087, 091, 101, 117, 119, 125, 129, 133; 23 Apr–15 Oct (2007).
366. ***B. perplexus*** **Cresson – 001, 027, 071; 15 Apr–27 Dec (2007).**
367. *B. sandersoni* 055 – 003, 017, 025, 027, 029, 041, 043, 045, 055, 061, 077, 083, 089, 097, 099, 101, 113, 117, 129; 30 Apr–28 Jul (1977).
368. *B. ternarius* Say – 015, 025, 027, 035, 037, 039, 061, 069, 079, 081, 083, 089, 099, 113; 25 Apr–16 Oct (2007).
369. ***B. terricola*** **Kirby – 013, 027, 033, 035, 037, 049, 061, 079, 081, 083, 089, 103, 113, 117, 123; 26 May–2 Nov (1992).**
370. *B. vagans* Smith – 001, 003, 007, 009, 017, 019, 021, 027, 029, 035, 037, 039, 041, 043, 045, 049, 051, 053, 055, 057, 061, 067, 071, 075, 077, 079, 081, 083, 091, 097, 099, 101, 103, 107, 113, 117, 119, 123, 125, 129, 131, 133; 12 Apr–3 Nov (2007).
371. *Apis mellifera* Linnaeus* (1887) – Ubiquitous; 14 Mar–17 Nov (2007).

Discussion

Prior to the Pennsylvania Department of Agriculture Native Bee Survey, Pennsylvania had neither had a formal faunal survey nor collecting of any kind in most of the state, leading to a rather truncate list of species. The state list had largely been the product of heavy collections made in the first half of the Twentieth Century around the four major institutions of insect study in the state: the Academy of Natural Science (Philadelphia), Carnegie Museum of Natural History (Pittsburgh), Penn State University (State College) and the Pennsylvania Department of Agriculture (Harrisburg), as well as spotty collections in the southeastern, central, south-central and midwestern regions of the state. Many of the new records come from specimens housed in major collections, but had not been included in distribution lists of species in published taxonomic revisions. Distributions for many species not yet included in this checklist include states bordering Pennsylvania, such that it is likely within a species' range, but remains undocumented. Current

efforts at formally surveying the state could possibly add many new species as regions and habitats connecting Pennsylvania to surrounding states are more intensively surveyed.

Of the 371 species of bees reported here from Pennsylvania, 350 have been verified with specimens and 21 by published records only. Additionally, 150 new state records are reported. Distribution data presented by Droege *et al.* (2008), which was not considered a published source here, indicate that another 191 species may potentially be present in Pennsylvania or are reported from adjacent states. Some 14 species are known or thought to be recently introduced to the region, and are now reported from Pennsylvania, include: *Hylaeus leptocephalus* (Colletidae); *Andrena wilkella* (Andrenidae); *Lasioglossum leucozonium* and *Halictus tectus* (Halictidae); *Anthidium manicatum*, *A. oblongatum*, *Lithurgus chrysurus*, *Megachile apicalis*, *M. concinna*, *M. rotundata*, *M. sculpturalis*, *Osmia caerulescens*, and *O. cornifrons* (Megachilidae); and *Anthophora plumipes* and *Apis mellifera* (Apidae). However, this list may not be exhaustive or completely verifiable because original species distribution patterns and early anthropogenic introductions are difficult to determine and remain questionable.

The majority of Pennsylvania's new species accounts are from authoritatively identified specimens found in institutional collections. While institutional collections are a valuable resource, novel faunal surveys can provide a measurable snapshot of diversity and distributions that can be used in longitudinal studies of population dynamics. Pennsylvania's great diversity of habitats lends to the possibility of great faunistic diversity, but a large state requires great collection effort. While current survey efforts do not elucidate habitat relationships, they do provide a broader understanding of diversity in the state. By utilizing past collections we have been able to determine, at least by historical occurances, the overall bee diversity of Pennsylvania. From the state's current survey efforts, 27 of the 98 species collected from 2005 through 2007 were new records identified by the authors and/or current experts in bee taxonomy found in the region. As we continue to increase our collection intensity, and document collections from habitats throughout the state, we will be able to begin associating species with habitats.

This checklist includes several species of note. *Halictus tectus* Radoszkowski was first collected in the United States by Sam Droege in 101 in 2005; it has since been found just outside of Washington, D.C. *Lithurgus chrysurus* Fonscolombe was originally detected in Phillipsburg, New Jersey in 1977 (Roberts, 1978), but was thought to be eradicated (Michener, 2000), as it had not been collected since; this species was found in 077 County, Pennsylvania in 2007, approximately 19 mi from the original site of detection. *O. cornifrons* had been experimentally released in Pennsylvania for apple pollination in the 1970's and 1980's, but its naturalized status had not yet been documented; its presence in the state is now documented from collections in 2008. *Bombus affinis* Cresson, a species of concern, has not been detected since 1992 and is thought to be extinct from much of the northeastern United States. Some 94 species, roughly one-quarter of those in this checklist, have not been collected in Pennsylvania since prior to Mitchell's (1960, 1962) treatments of the bees of the eastern United States.

With much concern over pollinator health, and the documented decline of honeybees, in particular, there is much need to begin to document the status of native pollinators. We cannot yet say for certain what is happening to native bees in

Pennsylvania, neither about the status of pollinator health nor about the effects of pollinator decline, but current survey efforts will provide a baseline dataset for comparison of bee populations in future surveys. In 2008 and 2009, our survey efforts will expand to include collection sites in nearly all of the counties in Pennsylvania, documenting habitat preferences, providing a clearer understanding of current distribution patterns and futures changes in distribution, and documenting threats and their effects to native pollinator populations.

Acknowledgments

We would like to thank: Sam Droege (USGS Patuxent Wildlife Research Center) for his help in identifying our *Lasioglossum* and *Nomada* species collected during our survey; John Ascher (AMNH) and Rob Jean (Indiana State University) for their taxonomic support and guidance; Linda Wertz, Sharon McDonald, John Baker, Nishit Patel and Nicky Chang for time spent databasing the many specimens; Anita Collins and the Lehigh Gap Nature Center for sending their specimen information; Frank Fee, Sven Spichiger and Karl Valley for lending specimens from their personal collections; the collection managers (and their institutions) that provided access to specimens and/or sent us their collection databases, including KC Kim (Penn State – Frost Entomological Museum), David Biddinger (Penn State Fruit Research and Extension Center), Brian Harris and Dave Furth (US National Museum), Jason Weintraub (Academy of Natural Science in Philadelphia), Tom Pucci (Cleveland Museum of Natural History), Ed Masteller (Tom Ridge Enivronmental Center), Mike Feyers (Reading Public Museum), Alison Eickelberger (North Museum of Natural History and Science), Charles Bartlett (University of Delaware), John Rawlins, Bob Davidson and Chen Young (Carnegie Museum of Natural History), and Bryan Danforth and Rick Hoebecke (Cornell University Insect Collection). Many thanks, also, to the PDA apiary inspectors and staff that contributed to the ongoing survey of native bees in Pennsylvania. This paper was supported by the Pennsylvania Department of Agriculture and Penn State Hatch funds. Mention of proprietary products does not constitute an endorsement by the authors, the Pennsylvania State University, or the government offices of the State of Pennsylvania.

Literature Cited

Baker, J. R. 1975. Taxonomy of five nearctic subgenera of *Coelioxys*. University of Kansas Science Bulletin 50:649–730.

Bouseman, J. K., and W. E. LaBerge. 1979. A revision of the bees of the genus *Andrena* of the Western Hemisphere, Part IX. Subgenus *Melandrena*. Transactions of the American Entomological Society 104:275–389.

Broemeling, D. K. 1988. A revision of the *Nomada* subgenus *Nomadita* of North America. Pan-Pacific Entomologist 64:321–344.

Daly, H. V. 1973. Bees of the genus *Ceratina* in America north of Mexico. University of California Publications in Entomology 74:1–114.

Droege, S., S. Kolski, J. Ascher, and J. Pickering. 2008. Apoidea (Bees). Online: *http://www.discoverlife.org/mp/20q?search=Apoidea* [Last accessed: 12 June 2008].

Evenhuis, N. L. 2008. Abbreviations for insect and spider collections of the world. Online: *http://hbs.bishopmuseum.org/codens/codens-inst.html* [Last accessed: 12 June 2008].

Greenleaf, S. S., and C. Kremen. 2006. Wild bees enhance honey bees' pollination of hybrid sunflower. Proceedings of the National Academies of Science 103(37):13890–13895.

Hurd, P. D., Jr. 1979. Superfamily Apoidea. pp. 1741–2209. *In* K. V. Krombein, P. D. Hurd, Jr., D. R. Smith, and B. D. Burks (eds.). Catalog of Hymenoptera in America North of Mexico, Vol. 2: Apocrita (Aculeata). Smithsonian Institution Press, Washington, D.C. xvi+1011[1199–2209].

Klein, A.-M., B. E. Vaissière, J. H. Cane, I. Steffan-Dewenter, S. A. Cunningham, C. Kremen, and T. Tscharntke. 2007. Importance of pollinators in changing landscapes for world crops. Proceedings of the Royal Society of London, Series B: Biological Sciences 274(1608):303–313.

LaBerge, W. E. 1973. A revision of the bees of the genus *Andrena* of the western hemisphere, Part VI. Subgenus *Trachandrena*. Transactions of the American Entomological Society 99:235–371.

LaBerge, W. E. 1977. A revision of the bees of the genus *Andrena* of the western hemisphere, Part VIII. Subgenus *Thasandrena*, *Dasyandrena*, *Psammandrena*, *Rhacandrena*, *Euandrena*, and *Oxyandrena*. Transactions of the American Entomological Society 103:1–143.

LaBerge, W. E. 1980. A revision of the bees of the genus *Andrena* of the western hemisphere, Part X. Subgenus *Andrena*. Transactions of the American Entomological Society 106:395–525.

LaBerge, W. E. 1986. A revision of the bees of the genus *Andrena* of the western hemisphere, Part XI. Minor subgenera and subgeneric key. Transactions of the American Entomological Society 111:441–567.

LaBerge, W. E. 1987. A revision of the bees of the genus *Andrena* of the western hemisphere, Part XII. Subgenera *Leucandrena*, *Ptilandrena*, *Scoliandrena*, and *Melandrena*. Transactions of the American Entomological Society 112:191–248.

LaBerge, W. E., and J. K. Bouseman. 1970. A revision of the bees of the genus *Andrena* of the western hemisphere, Part III. *Tylandrena*. Transactions of the American Entomological Society 96:543–605.

LaBerge, W. E., and D. W. Ribble. 1972. A revision of the bees of the genus *Andrena* of the western hemisphere, Part V. *Gonandrena*, *Geissandrean*, *Parandrena*, *Pelicandrena*. Transactions of the American Entomological Society 98:271–358.

McGinley, R. J. 1986. Studies of Halictinae (Apoidea: Halictidae), I: Revision of New World *Lasioglossum* Curtis. Smithsonian Contributions to Zoology no. 429:1–294.

McGinley, R. J. 2003. Studies of Halictinae (Apoidea: Halictidae), II: Revision of *Sphecodegastra* Ashmead, Floral Specialists of Onagraceae. Smithsonian Contributions to Zoology no. 610:1–55.

Michener, C. D. 2000. The Bees of the World. John Hopkins University Press, Baltimore, Maryland. xiv+[1]+913 pp.

Milliron, H. E. 1973. A monograph of the western hemisphere bumblebees (Part 3). Memoirs of the Entomological Society of Canada no. 89:81–237.

Mitchell, T. B. 1960. Bees of the Eastern United States, Vol. I. Technical Bulletin of the North Carolina Agricultural Experiment Station 141:1–538.

Mitchell, T. B. 1962. Bees of the Eastern United States, Vol. II. Technical Bulletin of the North Carolina Agricultural Experiment Station 152:1–557.

National Institute for Statistics and Technology (NIST). 1990 (1992). Counties and equivalent entities of the United States, its possessions, and associated areas. Federal Information Processing Standards Publication 6-4, with updates (1992).

National Research Council (NRC), Committee on the Status of Pollinatorsin North America. 2007. Status of Pollinators in North America. National Academies Press, Washington, D.C. 322 pp.

Ordway, E. 1966. Systematics of the genus *Augochlorella* (Hymenoptera, Halictidae) north of Mexico. University of Kansas Science Bulletin 46:509–624.

Roberts, R. B. 1972. Revision of the bee genus *Agapostemon*. University of Kansas Science Bulletin 49:437–590.

Roberts, R. B. 1978. The nesting biology, behavior and immature stages of *Lithurge chrysurus*, an adventitious wood-boring bee in New Jersey (Hymenoptera: Megachilidae). Journal of the Kansas Entomological Society 51(4):735–745.

Shinn, A. F. 1967. A revision of the bee genus *Calliopsis* and the biology and ecology of *C. andreniformis*. University of Kansas Science Bulletin 46:753–936.

Timberlake, P. H. 1975. The North American species of *Heterosarus* Robertson. University of California Publications in Entomology 77:i–vi + 1–56, pls. 1–8.

Winfree, R., N. M. Williams, J. Dushoff, and C. Kremen. 2007. Native bees provide insurance against ongoing honey bee losses. Ecology Letters 10:1105–1113.