

The Anthophilous Insects of Indiana

1. A preliminary annotated list of the Apoidea¹

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Several thousand specimens of anthophilous insects have been collected during the past six years in the course of a study of the ecology of bumble bees, including their relationships to flowers of all types and to the other insects which also visit flowers. A majority of these specimens are bees, although a considerable number of other Hymenoptera, many flies, some beetles and a few insects of other groups are also included.

These bees appear to be representative enough of the fauna of the state to form the basis of a preliminary state list, especially as only a few scattered records of Indiana bees (except bumble bees) have been published.

The first records of Indiana bees appeared in 1837 in a posthumous paper by Thomas Say (14). Seventeen of the species of bees described in this paper are listed from Indiana in Say's usual laconic style of giving distribution, "Inhabits Indiana." Cresson's catalogue (9) lists Indiana for only three species of bees, all based on Say's records, although the ranges described for some other species include the state. There would appear to have been little collecting of bees in Indiana following Say's work as I have been able to find records of only sixteen other species before 1950. However, Cockerell (7) in listing two species from Lafayette, noted that these were collected by "Lutz and associates during their explorations of the western states." If this "expedition" yielded other specimens of bees from Indiana they apparently have not been noted in literature.

Franklin (11) listed nine species of bumble bees as occurring in Indiana, although he seemed to have based his listing on known ranges including the state for four species and to have had definite records of five; he questioned the occurrence of *B. ternarius* in Indiana. Viereck (15) described one species from the state; Cockerell in a series of papers (6, 7, 8) described one species and one variety—both named "*indianensis*"—and recorded three other species from Indiana. Lutz and Cockerell (12) quoted (from Say, Franklin and Cockerell, 1914) records of 11 species from Indiana. The Synoptic Catalogue of the Hymenoptera of America North of Mexico (13) lists "Ind." in the distribution of 22 species of bees, of which 10 are copied from previous authors, and 12 appear to be based upon previously unpublished records or upon published papers unacknowledged in the Catalogue and which the author has not noted.

¹Purdue University, Agricultural Experiment Station, Journal Paper No. 1048.

Three rather extensive studies of bees as pollinators have been carried on as thesis investigations at Purdue University in recent years. Howard R. Youse studied the collection of pollen by honey bees and prepared a thesis (16), entitled "A Contribution to the Taxonomic Study of Pollen Grains Collected by Honey Bees in Indiana." He listed 194 genera of plants upon which honey bees were observed by him or by co-operating beekeepers. He gathered and studied the characteristics of the pollen from one or more species of 153 of these genera and published (17) on 60 species which he considered as the more important sources of honey bee-collected pollen in Indiana. Plant genera among the 194 listed by Youse and not recorded in the collections or observations of the author have been incorporated in the host plant list for *Apis mellifera* without further acknowledgment.

Leland Chandler carried on a study of alfalfa pollination in selected fields in Tippecanoe and Marshall counties during the summer of 1950 and prepared a thesis (1) based upon his investigations. This thesis included an appendix entitled, "The Bombidae of Indiana," and consisting of some general information on bumble bees, and keys, descriptions and records of the Indiana species. These records were published (2), and three later papers (3, 4, 5) by the same author have included additional records and notes on Indiana bumble bees.

Studies extending over several years formed the basis of another thesis by Chandler (1955) on "The Ecological Life History of *Halictus (H.) ligatus* Say with Notes on Related Species." In addition to the life history studies this paper lists host plants and the seasonal range for *H. ligatus* and a few "related" species.

The following annotated list has been compiled by combining the records from the literature reviewed above with those based upon specimens in the Purdue University collections, especially material collected in the course of pollination studies since 1950.²

The nomenclature and sequence of the Synoptic Catalogue of Hymenoptera of America (13) has been followed. The genera of the Catalogue have been numbered (1-98), the subgenera when grouped have been lettered ("a", "b", etc.) within each genus, and the species have been numbered by page of the catalogue for use in reference and arrangement.

For each species, except for bumble bees and the honey bee, known distribution within the state is listed by counties, season distribution by earliest and latest dates of collection, and plants from which bees have been collected are listed by genera following the nomenclature and sequence of Deam (10). County records without plant host are starred (*) if not otherwise evident. Since Chandler's papers (1, 2, 3, 4, 5) give complete information on the county and seasonal records of

² Almost all of the determinations have been made or checked by specialists—some of the earlier specimens and records by the late Grace Sandhouse and Theodore Frison, the current collections by T. B. Mitchell, Karl V. Krombein, Wallace LaBerge (*Mellisodes*) and Leland Chandler (Bombini, and a few other Apidae). Valuable assistance in the determination of plants has been given by A. T. Guard and George Cummins.

Indiana bumble bees these are not repeated here, and as honey bees are present in every part of the state and fly whenever the temperature is high enough only plant records are given for this species.

List of Species

COLLETIDAE

COLLETINAE

3. COLLETES Latreille

1045. *C. americanus* Cresson. Spencer; Sept. 10-18; Polygonum, Mentha, Eupatorium, Solidago.
 1045. *C. compactus* Cresson. *Cass, Spencer, Tippecanoe, *Warren; Sept. 5-16; Eupatorium, Solidago, Rudbeckia.
 1046. *C. eulophi* Robertson. Tippecanoe, White; June 16-Sept. 10; Melilotus, Solidago.
 1046. *C. inaequalis* Say. (Indiana-Say, 1837), Clinton, Grant, Tippecanoe; April 1-May 7; Salix, Claytonia, Stellaria, Gypsophila, Pyrus, Prunus, Cercis, Taraxacum.
 1047. *C. latitarsus* Robertson. Clark, Tippecanoe; July 20-Aug. 10; Trifolium.
 1047. *C. kincaidii* Cockerell. (Ind.-Hym. Am.)
 1047. *C. nudus* Robertson. Tippecanoe; July 30; Mentha.
 1048. *C. simulans armatus* Patton. Spencer; Sept. 10; Eupatorium.
 1048. *C. solidaginis* Swenk. (Ind.-Hym. Am.)

HYLAEINAE

4. HYLAEUS Fabricius

1050. *H. (Hylaeus) cressonii* (Cockerell). Clark, Spencer, Tippecanoe; June 3-Sept. 14; Melilotus, Evonymus, Eryngium, Daucus, Leonurus, Mentha, Solidago.
 1050. *H. (H.) ellipticus* (Kirby). Tippecanoe; May 22; Gypsophila.
 1051. *H. (Prosopis) modestus* Say. *Carroll, Cass, Clark, Gibson, *Marshall, Putnam, Spencer, Tippecanoe, *Warren; June 8-Sept. 20; Hydrangea, Rosa, Trifolium, Hibiscus, Eryngium, Pastinaca, Daucus, Leonurus, Pycnanthemum, Mentha, Gerardia, Campanula, Eupatorium, Solidago.
 1052. *H. (P.) teleporus* (Lovell). Tippecanoe; July 3; Salvia.
 1052. *H. (P.) ziziae* (Robertson). Cass, Gibson, *Marshall, Tippecanoe; June 3-Sept. 18; Brassica, Agastache, Salvia, Pycnanthemum, Cephalanthus, Solidago, Erigeron.

ANDRENIDAE

ANDRENINAE

5. ANDRENA Fabricius

1055. *A. (Trachandrena) albofoveata* (Graenicher). Tippecanoe; April 3-6; Salix, Stellaria.

1057. *A. (Pterandrena) asteris* Robertson. Tippecanoe; Sept. 5; Rudbeckia.
1058. *A. (Cryptandrena) belfragei* Cresson. Tippecanoe; April 19; Salix, Pyrus.
1058. *A. (?Micrandrena) bipunctata* Cresson. Carroll, Gibson, Grant, Madison, Tippecanoe, Tipton, Warren; April 1-May 24; Salix, Claytonia, Stellaria, Gypsophila, Pyrus, Malus, Amelanchier, Prunus, Viburnum, Taraxacum.
1058. *A. (Thysandrena) bisalidis* Viereck. Gibson, Madison, Tippecanoe; April 1-28; Salix, Claytonia, Stellaria.
1060. *A. (Cryptandrena) carlini* Cockerell. Madison, Tippecanoe, *Warren; April 6-28; Salix, Claytonia, Stellaria, Lonicera.
1062. *A. (Gymnandrena) commoda* Smith. *Johnson, Tippecanoe, *Warren; June 16-July 1; Melilotus.
1062. *A. (Schizandrena) crataegi* Robertson. Tippecanoe; April 24-May 24; Gypsophila, Malus, Prunus, Viburnum.
1063. *A. (Opandrena) cressonii* Robertson. Grant, Tippecanoe; April 14-27; Salix, Claytonia, Pyrus.
1064. *A. (Cryptandrena) dunningi* Cockerell. Tippecanoe; April 3-May 10; Salix, Stellaria, Malus.
1065. *A. (Ptilandrena) erigeniae* Robertson. Madison, Tippecanoe; April 18-May 21; Claytonia, Gypsophila.
1065. *A. (Cryptandrena) erythrogaster* (Ashmead). Cass, Clinton, Grant, *Martin, Tippecanoe, Warren; April 19-May 7; Salix, Malus, Prunus, Amelanchier, Crataegus, Taraxacum.
1065. *A. (Trachandrena) fenningeri* Viereck. Tippecanoe; April 29; Taraxacum.
1065. *A. (T.) forbesii* Robertson. Grant, Tippecanoe; April 14-May 22; Salix, Gypsophila, Prunus, Taraxacum.
1066. *A. (Gonandrena) fragilis* Smith. Tippecanoe; June 8; Pastinaca.
1067. *A. (Pterandrena) helianthi* Robertson. *Lake, Tippecanoe; July 19-Aug. 16; Tagetes.
1067. *A. hirticincta* Provancher. Marshall; Sept. 14; Aster.
1068. *A. (Micrandrena) illinoiensis* Robertson. Clinton, Grant, Tippecanoe, Warren; April 3-May 7; Salix, Amelanchier, Crataegus, Taraxacum.
1068. *A. (M.) imitatrix* Cresson. Tippecanoe, Warren; April 14-May 7; Salix, Pyrus, Amelanchier, Crataegus, Prunus.
1068. *A. (Trachandrena) indianensis* Cockerell. (Monroe-Cockerell, 1929.)
1069. *A. (Thysandrena) lata* Viereck. Tippecanoe; April 14; Salix.
1071. *A. (Trachandrena) mariae mariae* Robertson. Tippecanoe; April 14-27; Salix.
1071. *A. (T.) mariae concolor* Robertson. Tippecanoe; April 14-19; Salix, Pyrus.
1072. *A. (T.) morrisonella* Viereck. Tippecanoe; April 24-May 24; Salix, Gypsophila, Malus, Prunus.
1074. *A. (T.) nuda* Robertson. *Tippecanoe, Warren; April 20-June 4; Amelanchier.

1077. *A. (Leucandrena) placida* Smith. Tippecanoe; April 20; Salix.
 1078. *A. (Cryptandrena) pruni* Robertson. Tippecanoe; April 14-24; Prunus.
 1079. *A. (?Gonandrena) robertsoni* Dalla Torre. Putnam; June 26; Trifolium.
 1079. *A. (Trachandrena) rugosa* Robertson. Tippecanoe; April 5-24; Salix, Cercis.
 1080. *A. (Micrandrena) salictaria* Robertson. Tippecanoe; April 20; Salix.
 1080. *A. (Gymnandrena) sayi* Robertson. Gibson, Tippecanoe, Warren; April 19-20; Salix, Stellaria, Amelanchier, Pyrus, Prunus.
 1081. *A. (Trachandrena) spiraeana* Robertson. Clark; June 20; Hydrangea.
 1083. *A. (Andrena) thaspis* Graenicher. (Ind.-Hym. Am.)
 1084. *A. (Cryptandrena) virburnella* Graenicher. Grant, Tippecanoe, Warren; April 12-May 7; Salix, Claytonia, Amelanchier, Crataegus, Malus, Prunus.
 1085. *A. (Gymnandrena) vicina* Smith. Tippecanoe; April 14-19; Salix.
 1085. *A. (Cryptandrena) wilkella* (Kirby). Hendricks, Porter, *Pulaski, Putnam, Tippecanoe, Wells; April 29-July 16; Cotonaster, Medicago, Melilotus, Trifolium, Robinia, Salvia, Taraxacum.

PANURGINAE

10. PERDITA Smith

1091. *P. gerhardi gerhardi* Viereck. (Lake; Aug. 28; Monarda-Viereck, 1904.)
 1091. *P. lacteipennis indianensis* Cockerell. (Tippecanoe; Aug. 16-Cockerell, 1922.)
 1092. *P. maura* Cockerell. (Tippecanoe; Aug. 16-Cockerell, 1922, as *P. bisignata*.)

12. PSEUDOPANURGUS Nylander

12c. Heterosarus Robertson

1099. *P. (H.) compositarum* (Robertson). Tippecanoe; Oct. 12; Aster.
 1100. *P. (H.) labrosus* (Robertson). Tippecanoe; Aug. 14.

14. CALLIOPSIS Smith

1103. *C. (Calliopsis) andreniformis* Smith. Tippecanoe; June 14-Aug. 16; Raphanus, Trifolium, Malva, Citrullus, Cucumis.

HALICTIDAE

HALICTINAE

16. HALICTUS Latreille

16a. Halictus Latreille

1104. *H. (H.) ligatus* Say. Cass, Carroll, Clark, Clinton, Gibson, Grant, Lawrence, Spencer, Tippecanoe, Warren, White; May 7-Oct. 12; Brassica, Melilotus, Trifolium, Malva, Eryngium, Nepeta, Monarda, Pycnanthemum, Mentha, Cephalanthus, Eupatorium, Solidago,

Aster, Erigeron, Helianthus, Calendula, Tagetes, Zinnia, Cirsium, Taraxacum.

1105. *H. (H.) parallelus* Say. (Indiana-Say, 1837), Carroll, Gibson, Jefferson, Warren; July 12-Sept. 16; Gypsophila, Melilotus, Trifolium, Cephalanthus, Sambucus, Solidago, Taraxacum.
1105. *H. (H.) rubicundus* (Christ). Clark, Morgan-Monroe, Porter, Tippecanoe; April 3-Sept. 5; Salix, Hydrangea, Prunus, Melilotus, Trifolium, Malva, Eupatorium.

16b. Seladonia Robertson

1105. *H. (S.) confusus* Smith. Carroll, Clinton, Hendricks, Tippecanoe, Warren; April 1-Sept. 5; Salix, Brassica, Prunus, Lotus, Melilotus, Trifolium, Malva, Hibiscus, Eryngium, Agastache, Salvia, Mentha, Solidago, Erigeron, Tagetes, Taraxacum.

17. LASIOGLOSSUM Curtis

17a. Lasioglossum Curtis

1106. *L. (L.) coriaceum* (Smith). *Clark, Tippecanoe, *Wells; April 19-July 8; Mertensia, Salvia.
1106. *L. (L.) forbesii* (Robertson). Tippecanoe; April 14-July 7; Salix, Melilotus, Taraxacum.
1106. *L. (L.) fuscipenne* (Smith). Clark; Aug 13; Viburnum.

17b. Evylaeus Robertson

1107. *L. (E.) arcuatum* (Robertson). Morgan-Monroe only, Tippecanoe, April 3-Aug. 25; Salix, Stellaria, Gypsophila, Hydrangea, Malus, Melilotus, Viburnum.
1107. *L. (E.) parisum* (Lovell). Clark; Aug. 13; Viburnum.
1108. *L. (E.) foxii* (Robertson). Morgan-Monroe, Tippecanoe, Warren; April 20-July 16; Amelanchier, Prunus, Melilotus.
1108. *L. (E.) macoupinense* (Robertson). Clark; July 13.
1109. *L. (E.) pectorale* Smith. Clark, *Davies, Fulton, Tippecanoe; May 21-Oct. 31; Brassica, Malva, Eryngium, Asclepias, Agastache, Solidago, Aster, Tagetes.
1110. *L. (E.) truncatum* (Robertson). Morgan-Monroe; April 14-July 15; Salix, Melilotus.

17c. Hemihalictus Cockerell

1110. *L. (H.) lustrans* (Cockerell). Marshall; June 2; Taraxacum.

17e. Chloralictus Robertson

1111. *L. (C.) albipenne* (Robertson). Clinton, Tippecanoe; July 21-Aug. 21; Agastache, Citrullus, Taraxacum.
1112. *L. (C.) bruneri* (Crawford). *Clark, Tippecanoe; June 3-Aug. 12; Gladiolus, Evonymus.
1113. *L. (C.) coeruleum* (Robertson). *Clark, Madison; April 28-July 28; Claytonia.
1113. *L. (C.) cressonii* (Robertson). Allen, *Clark, Tippecanoe; June 3-Aug. 25; Evonymus, Salvia, Malva, Cirsium.

1113. *L. (C.) coreopsis* (Robertson). Clark, Gibson, *Jackson, Tippecanoe; April 14-Aug. 12; Salix, Pycnanthemum, Solidago, Calendula.
1114. *L. (C.) illinoense* Robertson. *Clark, *Davies, *Jackson, Morgan-Monroe, Spencer, Tippecanoe, *Wells; April 4-Sept. 16; Polygonum, Prunus, Phaseolus, Ricinus, Malva, Asclepias, Salvia, Mentha, Eupatorium, Solidago, Taraxacum.
1114. *L. (C.) lineatulum* (Crawford). Tippecanoe; April 20; Salix.
1114. *L. (C.) unicum* (Sandhouse). Clark, Morgan-Monroe, Spencer, Tippecanoe; June 24-Sept. 18; Polygonum, Sida, Mentha, Eupatorium, Solidago, Tagetes.
1115. *L. (C.) obscurum* (Robertson). Clinton, Morgan-Monroe, Tippecanoe, Warren; April 15-Aug. 5; Salix, Brassica, Trifolium, Ricinus, Malva, Eryngium, Agastache, Salvia, Taraxacum.
1115. *L. (C.) planatum* (Lovell). Clinton, Tippecanoe; April 15-July 13; Brassica, Taraxacum.
1116. *L. (C.) pilosum* (Smith). Clinton, *Davies, *Jackson, Marshall, Tippecanoe, Warren; April 14-Sept. 23; Gladiolus, Salix, Prunus, Medicago, Trifolium, Malva, Cirsium, Taraxacum.
1117. *L. (C.) pruinatum* (Robertson). Tippecanoe; July 26-27; Gladiolus, Mentha.
1117. *L. (C.) reticulatum* (Robertson). Spencer; Sept. 11; Sida.
1118. *L. (C.) stultum* (Cresson). Carroll, *Clark, Clinton, *Davies, Gibson, Grant, Hendricks, Morgan-Monroe, Porter, Putnam, Tippecanoe, Warren; April 1-Sept. 14; Gladiolus, Salix, Gypsophila, Brassica, Raphanus, Hydrangea, Prunus, Baptisia, Melilotus, Trifolium, Evonymus, Malva, Eryngium, Pastinaca, Daucus, Agastache, Leonurus, Salvia, Mentha, Cephalanthus, Sambucus, Citrullus, Cirsium, Tagetes, Taraxacum.
1118. *L. (C.) tegulare* (Robertson). Clark, *Davies, Tippecanoe; April 1-July 30; Salix, Gypsophila, Citrullus, Solidago.
1118. *L. (C.) versatum* (Robertson). Carroll, Clinton, *Davies, Gibson, *Jackson, Madison, Tippecanoe, Tipton; April 14-Oct. 31; Salix, Brassica, Prunus, Ricinus, Malva, Pycnanthemum, Aster, Taraxacum.
1118. *L. (C.) zephyrum* (Smith). Morgan-Monroe, Tippecanoe, Warren; April 18-Sept. 25; Salix, Prunus, Hydrangea, Cercis, Malva, Viburnum, Helianthus, Cirsium.

17g. Paralictus Robertson

1119. *L. (P.) playparium* (Robertson). Tippecanoe; April 4; Salix.

19. SPHECODES Latreille

1120. *S. arvensis* Patton. (Ind.-Hym. Am.), Tippecanoe; April 21; Taraxacum.
1120. *S. confertus* Say. (Indiana-Say, 1837.)
1121. *S. heraclei* Robertson. Clark; July 29; Solidago.
1121. *S. illinoensis* (Robertson). (Ind.-Hym. Am.)
1121. *S. mandibularis* Cresson. Tippecanoe; July 20; Cucumis.

1123. *S. ranuculi* Robertson. Carroll; June 4.
 1123. *S. stygius* Robertson. Morgan-Monroe; July 15; Melilotus.

20. AGAPOSTEMON Guerin-Meneville

1124. *A. radiatus* (Say). (Indiana-Say, 1837), Gibson, Jefferson, Morgan-Monroe, Tippecanoe; April 14-Oct. 12; Salix, Prunus, Melilotus, Trifolium, Althaea, Elaeagnus, Hibiscus, Pycnanthemum, Aster, Tagetes.
 1124. *A. splendens* (Lepeletier). *Clark, Morgan-Monroe, *Pulaski; June 28-Aug. 2; Melilotus.
 1125. *A. virescens* (Fabricius). Gibson, Lawrence, Marshall, Morgan-Monroe, Tippecanoe, Williams (Ohio); May 20-Sept. 14; Gladiolus, Stellaria, Medicago, Melilotus, Rhus, Althaea, Malva, Hibiscus, Salvia, Cucurbita, Cucumis, Vernonia, Aster, Helianthus.

21. AUGOCHLORA Smith

21a. Augochlora Smith

1125. *A. (A.) pura* (Say). *Clark, *Johnson, *Lawrence, Tippecanoe; June 19-Aug. 26; Malva, Cucurbita, Tagetes.

21b. Augochlorella Sandhouse

1125. *A. (A.) aurata* Smith. Spencer, Tippecanoe, Warren; April 29-Sept. 11; Polygonum, Raphanus, Lotus, Melilotus, Trifolium, Malva, Sida, Agastache, Nepeta, Salvia, Monarda, Citrullus, Taraxacum.
 1125. *A. (A.) gratiosa* Smith. Tippecanoe; July 7; Malva.
 1126. *A. (A.) striata* Provancher. Clark, Clinton, Gibson, *Owen, Spencer, Tippecanoe, Warren; April 14-Sept. 20; Salix, Rosa, Melilotus, Lathyrus, Lotus, Malva, Sida, Agastache, Salvia, Monarda, Aureolaria, Cephalanthus, Cucurbita, Citrullus, Cucumis, Chrysanthemum, Taraxacum.

22. AUGOCHLOROPSIS Cockerell

1126. *A. cuprea* (Smith). Clark, Gibson, Tippecanoe; April 9-Aug. 2; Prunus, Melilotus, Tilia, Pycnanthemum, Lycopersicum.

NOMIINAE

23. NOMIA Latreille

23d. Dieunomia Cockerell

1129. *N. (D.) heteropoda valida* (Say). Starke; Sept. 10; Eupatorium.

MEGACHILIDAE

MEGACHILINAE

33. PARANTHIDIUM Cockerell and Cockerell

1138. *P. (Paranthidium) jugatorium jugatorium* (Say). (Indiana-Say, 1837, as *Stelis obesa*.)

37. ANTHIDIELLUM Cockerell

1146. *A. notatum* (Latreille). Tippecanoe; Sept. 5; Nepeta.

44. PROCHELOSTOMA Robertson

1152. *P. philadelphi* (Robertson). Noble; June 20.

45. HERIADES Spinola

45b. Neotrypetes Robertson

1152. *H. (N.) variolosa variolosa* (Cresson). Tippecanoe; Aug. 25; Brassica.

46. ASHMEADIELLA Cockerell

1153. *A. (Ashmeadiella) buconis buconis* (Say). (Indiana-Say, 1837.)

49. HOPLITIS Klug

49c. Alcidamea Cresson

1158. *H. (A.) producta* (Cresson). Tippecanoe; June 16; Trifolium.

53. OSMIA Panzer

53a. Osmia Panzer

1163. *O. (O.) lignaria* Say. Tippecanoe, Tipton, *Warren; April 3-May 13; Salix, Mertensia, Taraxacum.

53b. Chalcosmia Schiedeknecht

1163. *O. (C.) coerulescens* (Linnaeus). Morgan, Tippecanoe; June 3-July 5; Trifolium, Lotus, Salvia.

53f. Nothosmia Ashmead

1167. *O. (N.) albiventris* Cresson. Tippecanoe; July 7; Agastache.

1167. *O. (N.) atriventris* Cresson. Tippecanoe; June 20; Hydrangea.

1170. *O. (N.) pumila* Cresson. Tipton; April 28; Taraxacum.

1171. *O. (N.) simillima* Smith. Tippecanoe; July 7-16; Vicia, Malva.

54. MEGACHILE Latreille

54a. Litomegachile Mitchell

1172. *M. (L.) brevis* Say. (Indiana-Say, 1837), Carroll, Gibson, Greene, Jefferson, Lake, Marshall, Spencer, Tippecanoe; June 16-Oct. 12; Medicago, Trifolium, Lespedeza, Lotus, Phaseolus, Malva.

1172. *M. (L.) cleomis* Cockerell (Ind.-Hym. Am.)

1172. *M. (L.) mendica* Cresson. *Clark, *Fulton, Gibson, Jackson, Jefferson, Marshall, Tippecanoe, Wells; June 20-Sept. 20; Medicago, Trifolium, Lespedeza, Phaseolus, Gerardia.

1172. *M. (L.) texana* Cresson. Marshall; Aug. 23; Medicago.

54f. Delomegachile Viereck

1174. *M. (D.) gemula* Cresson. Marshall; Aug. 23; Lotus.

54j. Xeromegachile Mitchell

1177. *M. (X.) integra* Cresson. Tippecanoe; Aug. 29.

54k. Argyrophile Mitchell

1179. *M. (A.) parallela parallela* Smith. (Ind.-Hym. Am.)

54l. Xanthosarus Robertson

1179. *M. (S.) latimana* Say. Carroll, Gibson, Grant, Greene, Howard, Jay, Johnson, Marshall, Morgan, Spencer, Tippecanoe, *Union, Warren, Wells, White; July 5-Sept. 16; Medicago, Trifolium, Lotus, Verbena, Liatris, Solidago, Aster, Helianthus, Cirsium.

54m. Leptorachis Mitchell

1180. *M. (L.) petulans* Cresson. *Carroll, *Clark, Gibson, Morgan-Monroe, Tippecanoe, White; June 26-Sept. 5; Melilotus, Phaseolus, Verbena, Marrubium, Liatris.

54o. Acentron Mitchell

1180. *M. (A.) albitarsis* Cresson. White; Aug. 9; Liatris.

54q. Sayapis Titus

1181. *M. (S.) frugalis* Cresson. *Clark, Tippecanoe; June 19-July 13; Lathyrus, Lotus.
 1181. *M. (S.) inimica sayi* Cresson. (Ind.-Hym. Am.)
 1181. *M. (S.) pugnata* Say. (Indiana-Say, 1837), Tippecanoe; June 24-July 7; Agastache, Nepeta, Helianthus.

54r. Chelostomoides Robertson

1182. *M. (C.) campanulae* Robertson. *Clark, Gibson, Tippecanoe; June 28-July 13; Lathyrus, Verbena.
 1182. *M. (C.) exilis parvixilis* Mitchell. (Ind.-Hym. Am.), Tippecanoe; July 7; Marrubium.

55. COELIOXYS Latreille

1183. *C. alternata* Say. (Indiana-Say, 1837.)
 1184. *C. banksi* Crawford. (Ind.-Hym. Am.)
 1184. *C. germana* Cresson. Gibson, *Morgan-Monroe; June 24-July 11; Verbena.
 1185. *C. immaculata* Cockerell. (Miners, Indiana; July-Cockerell, 1912.)
 1185. *C. altilis* Cresson. Spencer; Sept. 11; Sida.
 1185. *C. modesta* Smith. (Ind.-Hym. Am.), Gibson; July 12; Pycnanthemum.
 1186. *C. rufitarsus* Smith. Marshall; Aug. 23; Lotus.
 1186. *C. sayi* Robertson. (Ind.-Hym. Am.), *Clark, Gibson, Morgan-Monroe, Tippecanoe; June 24-Sept. 20; Melilotus, Lespedeza, Lotus, Verbena, Agastache, Nepeta, Cephalanthus.

APIDAE

ANTHOPHORINAE

58. NOMADA Scopoli

58b. Gnathias Robertson

1195. *N. (G.) lepida* Cresson. Grant; April 27; Prunus.
 1196. *N. (G.) perplexa* Cresson. Clark; June 14.

58d. Heminomada Cockerell and Atkins

1199. *N. (H.) luteola* Olivier. Tippecanoe; April 29; Taraxacum.

1199. *N. (H.) obliterata* Cresson. Gibson, Tippecanoe; May 4; *Stellaria*,
Taraxacum.

58e. *Holonomada* Robertson

1201. *N. (H.) superba superba* Cresson. Tippecanoe; June 24; *Salvia*.

58g. *Pachynomada* Rodeck

1202. *N. (P.) vineta vineta* Say. (Indiana-Say, 1837.)

58k. *Nomadula* Cockerell

1205. *N. (N.) incerta* Cresson. Tippecanoe; June 16; *Melilotus*.

70. *EPEOLUS* Latreille

1211. *E. bifasciatus* Cresson. Tippecanoe; Aug. 13; *Nepeta*.

71. *TRIEPEOLUS* Robertson

1214. *T. concavus* (Cresson). Warren; Aug. 10; *Monarda*.

1214. *T. concolor* (Robertson). Gibson, Johnson, Tippecanoe, *Warren;
July 11-Aug. 13; *Melilotus*, *Malva*, *Verbena*, *Marrubium*, *Agas-*
tache, *Nepta*, *Salvia*, *Pycnanthemum*, *Cephalanthus*.

1214. *T. donatus* (Smith). Tippecanoe; Sept. 5.

1215. *T. lunatus* (Say). Gibson, Tippecanoe; July 11-Aug. 17; *Trifolium*;
Malva, *Verbena*, *Agastache*, *Nepeta*, *Helianthus*.

1217. *T. remigatus* (Fabricius). Tippecanoe; July 7-Aug. 13; *Malva*,
Agastache, *Salvia*, *Cucumis*, *Helianthus*, *Tagetes*.

1217. *T. simplex* Robertson. Gibson; July 11; *Verbena*.

73. *EMPHOR* Patton

1218. *E. bombiformis* (Cresson). *Fountain, Gibson, Tippecanoe; July
12-Aug. 28; *Hibiscus*, *Cephalanthus*.

75. *MELITOMA* Lepeletier et Serville

1221. *M. taurea* (Say). (Indiana-Say, 1837), *Clark, Gibson, *Johnson,
Spencer, Tippecanoe; June 25-Sept. 11; *Ipomoea*.

76. *PEPONAPIS* Robertson

1221. *P. pruinosa* (Say). (Indiana-Say, 1837), Tippecanoe; July 24-30;
Cucurbita, *Citrullus*.

77. *XENOGLOSSA* Smith

1221. *X. strenua* (Cresson). Tippecanoe; July 24-Aug. 25; *Cucurbita*.

81. *FLORILEGUS* Robertson

1222. *F. condignus* (Cresson). Fountain; July 24.

82. *MELISSODES* Latreille

1222. *M. agilis* Cresson. Tippecanoe; July 13; *Helianthus*.

1222. *M. agilis aurigeniae* Cresson. Tippecanoe; Aug. 25; *Helianthus*.

1223. *M. autumnalis* Robertson. White; Sept. 10; *Solidago*.

1223. *M. bimaculata* (Lepeletier). (Indiana-Say, 1837, as *Macrocera*
binotata), Carroll, Clark, Clinton, Gibson, Greene, Hendricks,

- Howard, Jay, Jefferson, Johnson, Marshall, Morgan, Posey, Tippecanoe, Warren; July 4-Aug. 28; Gladiolus, Melilotus, Trifolium, Phaseolus, Althaea, Malva, Hibiscus, Ipomoea, Agastache, Nepeta, Salvia, Monarda, Aureolaria, Cephalanthus, Cucurbita, Citrullus, Tagetes, Cirsium, Zinnia.
1224. *M. cini* Robertson. Clinton, *Fulton, Tippecanoe; Aug. 21-Sept. 10; Cucurbita, Solidago, Cirsium.
1224. *M. communis* Cresson. *Fountain, Gibson, Posey, *Tippecanoe; July 11-Aug. 21; Trifolium, Verbena.
1224. *M. desponsa* Smith. Allen, Warren, White; Aug. 6-Sept. 10; Cirsium.
1227. *M. nivea* Robertson. *Lawrence, Spencer, Tippecanoe; July 30-Sept. 16; Solidago, Helianthus.
1227. *M. obliqua* (Say). (Indiana-Say, 1837), Clinton, *Gibson, Jasper, *Lawrence, Marshall, Spencer, Tippecanoe, Warren; July 23-Sept. 13; Trifolium, Euphorbia, Monarda, Vernonia, Helianthus, Tagetes, Cirsium.
1227. *M. pennsylvanica* (Lepeletier). Tippecanoe; July 28; Helianthus.
1228. *M. rustica* (Say). (Indiana-Say, 1837), Spencer, Tippecanoe, White; Sept. 5-11; Eupatorium, Solidago.
1229. *M. trinodis* Robertson. Lake; Aug. 1.
1229. *M. vernoniae* Robertson. Marshall; July 27-Sept. 14; Vernonia, Aster.

84. TETRALONIA Spinola

1232. *T. dubitata* (Cresson). Tippecanoe; June 3-9; Melilotus, Salvia.
1232. *T. dilecta* (Cresson). (Monroe-Cockerell, 1914), Tippecanoe; May 6-June 3; Trifolium, Robinia, Salvia.
1232. *T. hamata* Bradley. Tippecanoe; June 16; Trifolium.

86. ANTHOPHORA Latreille

86a. Anthophora Latreille

1234. *A. abrupta* Say. (Indiana-Say, 1837.)

86b. Clisodon Patton

1237. *A. furcata terminalis* Cresson. Clark, *Tippecanoe; June 3-Sept. 28; Salvia, Cephalanthus.

86c. Amegilla Friese

1237. *A. walshii* Cresson. Tippecanoe; Sept. 20; Campanula.

XYLOCOPINAE

93. CERATINA Latreille

93b. Zadontomerus Ashmead

1244. *C. (Z.) calcarata*³ Robertson. Clark, Clinton, Grant, Marshall, Porter, Spencer, Tippecanoe; April 6-Sept. 5; Salix, Brassica,

³As Michener (1936) has indicated the females of *C. calcarata* and *C. dupla* cannot be distinguished with certainty. However, both Krombein and Mitchell have tentatively named all specimens submitted in accordance with Sandhouse's key (1935). About 125 specimens have not been separated

Trifolium, Prunus, Malva, Hibiscus, Mertensia, Agastache, Leonurus, Salvia, Aureolaria, Cucurbita, Citrullus, Cucumis, Eupatorium, Tagetes, Taraxacum.

1244. *C. (Z.) dupla*³ Say. (Indiana-Say, 1837), Cass, Clark, Grant, Marshall, Tippecanoe; April 4-Sept. 18; Salix, Prunus, Malva, Hibiscus, Salvia, Viburnum, Rudbeckia, Helianthus, Calendula, Taraxacum.
1245. *C. (Z.) metallica* H. S. Smith. Clark, Gibson, Spencer, Tippecanoe; April 19-Sept. 11; Mertensia, Pycnanthemum, Cephalanthus, Solidago.

94. XYLOCOPA Latreille

1246. *X. virginica* (Linnaeus). Spencer, Tippecanoe, Wells, *Warren; May-Sept. 11; Trifolium, Robinia, Phaseolus.

APINAE

96. BOMBUS Latreille

96a. Fraternobombus Skorikov

1247. *B. (F.) fraternus* (F. Smith). Trifolium (♂), Eupatorium (♀ ♂).

96b. Bombias Robertson

1247. *B. (B.) auricomus* (Robertson). Trifolium (♀ ♂), Cirsium (♀ ♂).

96c. Separatobombus Frison

1248. *B. (S.) griseocollis* (DeGeer). Hydrangea (♀), Trifolium (♀ ♂), Asclepias (♂), Cephalanthus (♀ ♂), Eupatorium (♂), Solidago (♂), Cirsium (♂).

96e. Subterraneobombus Vogt

1249. *B. (S.) borealis* Kirby.

96f. Fervidobombus Skorikov

1249. *B. (F.) americanorum* (Fabricius). Malus (♀), Trifolium Hibis- (♀ ♂), Phaseolus (♀ ♂), Sida (♀ ♂), Pycnanthemum (♂), Lycopersicum (♀), Cephalanthus (♀), Campanula (♀ ♂), Vernonia (♀ ♂), Aster (♀ ♂), Tagetes (♀ ♂), Cirsium (♀ ♂).
1249. *B. (F.) fervidus* (Fabricius), including var. *dorsalis* Cresson. Lotus (♀), Trifolium (♀ ♂), Monarda (♂), Eupatorium (♀ ♂), Cirsium (♀).

96g. Bombus Latreille

1250. *B. (B.) affinis* Cresson, including var. *novae-angliae* Bequaert.
1250. *B. (B.) terricola* Kirby.

on this basis nor submitted for identification; the records of these may be summarized, as follows: Allen, Carroll, Gibson, Marshall, Spencer, Tippecanoe, Warren, Wells; April 14-Sept. 18; Gladiolus, Salix, Trifolium, Raphanus, Malva, Sida, Eryngium, Agastache, Nepeta, Leonurus, Monarda, Mentha, Cephalanthus, Cucurbita, Eupatorium, Aster, Tagetes, Cirsium.

96h. *Pratobombus* Vogt

1251. *B. (P.) bimaculatus* Cresson, including var. *ridingsii* Cresson, Hibiscus (♂ ♀).
1252. *B. (P.) impatiens* Cresson, including var. *deayi* Chandler. Polygonum (♂ ♀), Hydrangea (♂), Melilotus (♂), Trifolium (♂), Althaea (♂), Sida (♂), Asclepias (♂), Gerardia (♂), Cephalanthus (♂), Campanula (♂), Eupatorium (♂), Solidago (♂ ♂), Aster (♂ ♂), Tagetes (♂).
1252. *B. (P.) perplexus* Cresson.
1253. *B. (P.) ternarius* Say.
1253. *B. (P.) vagans* F. Smith, including var. *helenae* (Frison), Trifolium (♂), Solidago (♂).

97. *PSITHYRUS* Lepeletier97b. *Ashtonipsithyrus* Frison

1254. *P. (A.) ashtoni* Cresson.

97c. *Laboriopsithyrus* Frison

1254. *P. (L.) insularis* (F. Smith).
1255. *P. (L.) laboriosus* (Fabricius), including var. *citrinus* (F. Smith) Melilotus (♀), Agastache (♀).
1255. *P. (L.) variabilis* (Cresson). Trifolium (♀), Vernonia (♂), Eupatorium (♂).

98. *APIS* Linnaeus

1255. *A. mellifera* Linnaeus.⁴ Sagittaria, Phleum, Zea, Symplocarpus, Arisaema, Tradescantia, Allium, Lilium, Erythronium, Asparagus, Polygonatum, Trillium, Gladiolus, Populus, Salix, Juglans, Carya, Corylus, Quercus, Ulmus, Celtis, Morus, Maclura, Humulus, Rumex, Polygonum, Fragopyrum, Amaranthus, Phytolacca, Claytonia, Portulaca, Stellaria, Nymphaea, Caltha, Aquilegia, Delphinium, Anemone, Hepatica, Clematis, Ranunculus, Mahonia, Podophyllum, Berberis, Menispermum, Liriodendron, Asimina, Sassafras, Benzoin, Sanguinaria, Papaver, Dicentra, Lepidium, Sisymbrium, Brassica, Barbarea, Nasturtium, Dentaria, Conringia, Polanisia, Sedum, Deutzia, Philadelphus, Hydrangea, Ribes, Grossularia, Hamamelis, Chaenomeles, Cotoneaster, Physocarpus, Spirea, Pyrus, Malus, Aronica, Amelanchier, Crataegus, Rubus, Fragaria, Potentilla, Rosa, Prunus, Cercis, Gleditsia, Medicago, Melilotus,

⁴Although the honeybee which was originally introduced into Indiana was *A. mellifera mellifera* from northern Europe, the extensive, almost universal, use of the "Italian" bees, *A. mellifera ligustica* Spinola by beekeepers in the state for fifty years has probably entirely replaced the typical variety of the species. Two other varieties, the Caucasian bee, *A. mellifera remipes* Gerstaecker, and the Carniolian bee, *A. mellifera carnica* Butt.-Reep., have been used to some extent also. Recently, there has been a shift to so-called hybrid bees and although these strains have been developed very largely from Italian bees stocks of other "races," especially the Caucasian have been incorporated into the breeding lines.

Trifolium, Robinia, Desmodium, Vicia, Lathyrus, Soja, Lotus, Phaseolus, Geranium, Dictamnus, Zanthoxylum, Ptelea, Ailanthus, Ricinus, Euphorbia, Rhus, Ilex, Evonymus, Celastrus, Staphylea, Acer, Aesculus, Koelreuteria, Impatiens, Rhamnus, Vitis, Parthenocissus, Tilia, Althaea, Malva, Hibiscus, Hypericum, Viola, Epilobium, Oenothera, Pastinaca, Daucus, Cornus, Gaylussacia, Vaccinium, Clethra, Diospyros, Ligustrum, Fraxinum, Apocynum, Asclepias, Ampelamus, Gonolobus, Convolvulus, Ipomoea, Phlox, Hydrophyllum, Cynoglossum, Hackelia, Mertensia, Vitex, Verbena, Teucrium, Marrubium, Agastache, Nepeta, Glecoma, Prunella, Leonurus, Stachys, Salvia, Monarda, Hedeoma, Pycnanthemum, Lycopus, Nicotiana, Physalis, Solanum, Datura, Digitalis, Verbascum, Veronicastrum, Campsis, Catalpa, Dianthera, Plantago, Cephalanthus, Abelia, Kolkwitzia, Weigelia, Sambucus, Viburnum, Symphoricarpos, Lonicera, Dipsacus, Citrullus, Cucumis, Curcubita, Echinocystis, Campanula, Vernonia, Eupatorium, Solidago, Aster, Erigeron, Ambrosia, Xanthium, Rudbeckia, Helianthus, Tagetes, Zinnia, Bidens, Helenium, Anthemis, Chrysanthemum, Tanacetum, Arctium, Cirsium, Taraxacum, Sonchus, Lactuca.

Literature Cited

1. CHANDLER, LELAND. 1951a. A study of the insect pollinators of alfalfa. Unpublished Thesis, Purdue University. (See following entry.)
2. ————. 1951b. The Bombidae of Indiana. Proc. Ind. Acad. Sci. **60**:167-177.
3. ————. 1952. Additional notes on Indiana bumble bees (Bombidae, Hymenoptera). Proc. Ind. Acad. Sci. **61**:142-144.
4. ————. 1954. Color variation in some common species of bumble bees (Hymenoptera, Bombidae). Proc. Ind. Acad. Sci. **63**:165-167.
5. ————. 1956. Parallel color variation in *Bombus impatiens* Cr., and *Bombus bimaculatus* Cr. (Hymenoptera, Apidae). Proc. Ind. Acad. Sci. **65**:116-117.
6. COCKERELL, T. D. A. 1912. Some parasitic bees (Coelioxys). Can. Ent. **44**:165-170.
7. ————. 1922. Bees of the genus *Perdita* from the western states. Am. Mus. Nov. **33**:15 pp.
8. ————. 1923. Some bees of the group *Trachandrena* Robertson (Hymenoptera:Andrenidae). Ann. Ent. Soc. Am. **22**:753-758.
9. CRESSON, E. T. 1887. Synopsis of the families and genera of the Hymenoptera of America, North of Mexico. Tr. Am. Ent. Soc., Suppl. Vol. 1887:4+350 pp.
10. DEAM, CHARLES C. 1940. Flora of Indiana. Dept. of Conservation, Indianapolis. 1236 pp. 2247 maps.
11. FRANKLIN, HENRY J. 1913. The Bombidae of the new world. Tr. Am. Ent. Soc. **38**:177-486; **39**:73-200.
12. LUTZ, FRANK E., and T. D. A. COCKERELL. 1920. Notes on the distribution and bibliography of North American bees of the families, Apidae, Meliponidae, Bombidae, Euglossidae and Anthophoridae. Bull. Am. Mus. Nat. Hist. **42**:491-641.
13. MUESEBECK, C. F. W., and KARL V. KROMBEIN. 1951. Hymenoptera of America north of Mexico—Synoptic Catalogue. U.S.D.A. Agr. Mon. **2**:1420 pp., 1 map.

14. SAY, THOMAS. 1837. Descriptions of New North American Hymenoptera, and observations on some already described. Boston Jr. Nat. Hist. 1:210-305, 361-416, (Leconte edition, 1891, 2:672-789).
15. VIREECK. 1904. Two new species of the bee genus *Perdita* from Indiana and New Jersey. Ent. News. 15:21-24.
16. YOUSE, HOWARD R. 1951. A contribution to the taxonomic study of pollen grains collected by honey bees in Indiana. Thesis, Purdue University. (See following entry.)
17. ————. 1953. A taxonomic study of sixty pollen grains collected by honey bees. Proc. Ind. Acad. Sci. 62:114-121.