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Authors: Veit, Michael F., Ascher, John S., Milam, Joan, Morrison, Fred R., and Goldstein, Paul Z.

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A Checklist of the Bees of Massachusetts (Hymenoptera: Apoidea: Anthophila)

Michael F. Veit[1,2], John S. Ascher[3], Joan Milam[4], Fred R. Morrison[5], and Paul Z. Goldstein[6]

Abstract: We present the first county-level checklist of the bees of Massachusetts, including verified records of 390 species. We review the literature and historical material, and supplement these with recent collections and online image databases, compiling a dataset of over 100,000 records. Detailed accounts are provided for 50 species reported for the first time in Massachusetts, including six species reported for the first time in New England, and 49 other species noteworthy for their paucity of records, distributional significance, novel host/parasite associations, or taxonomic uncertainty. The addition of newly reported species is largely the result of increased bee surveys in the past 15 years, including targeted sampling on known host plants. Twenty-three species represented in collections prior to 2005 are absent from recently collected material. The richness of the Massachusetts bee fauna is compared to that of neighboring states. Sixteen of the approximately 35 exotic species recorded from North America are verified from Massachusetts. We report recent rediscoveries in the state of *Andrena rehni* Viereck, 1907, and the regionally rare *Epeoloides pilosulus* (Cresson, 1878). Two new presumed host-parasite associations are made, those of *Epeolus inornatus* Onuferko, 2018 parasitizing the nests of *Colletes banksi* Swenk, 1908, and of *Triepeolus obliteratus* Graenicher, 1911 parasitizing the nests of *Melissodes apicatus* Lovell and Cockerell, 1906.

KEY WORDS: *Andrena rehni*, *Epeoloides pilosulus*, native bees, New England, pollinators

Bees are among the most conspicuous, efficient, and well-documented pollinators and are essential for the propagation of both agricultural and wild plants (Neff and Simpson, 1993; Klein *et al.*, 2007; Winfree, 2010; Ollerton *et al.*, 2011; IPBES, 2016). Reports of global and regional declines in bees and other pollinators are, therefore, of great concern (Grixti *et al.*, 2008; Bartomeus *et al.*, 2013; Goulson *et al.*, 2015; IPBES, 2016; Richardson *et al.*, 2018) and status assessments of North American bees have been identified as a priority in evaluating pollinator declines (NAS, 2007). Increasing efforts to compile and digitize bee records and make them publicly available have improved our knowledge of bee distributions, life histories, and changes in distributions, but many species remain poorly understood throughout much of their ranges (Biesmeijer *et al.*, 2006; Colla *et al.*, 2012; Bartomeus *et al.*, 2013; IPBES, 2016). For example, a conservation assessment of bees in Europe, which is exceptionally well-studied, could statistically assess the status of approximately half of the species, with the rest categorized in the IUCN Red List as Data Deficient (Nieto *et al.*, 2014).

[1] Pepperell, Massachusetts, 01463 USA
[2] Corresponding author email: beedude76@gmail.com
[3]Department of Biological Sciences, National University of Singapore, 14 Science Drive 4, Singapore 117543, email: dbsajs@nus.edu.sg
[4]University of Massachusetts Amherst, Department of Environmental Conservation, 160 Holdsworth Way, Amherst, MA 01003, email: jmilam@umass.edu
[5]A Natural Focus LLC., 56 Montague Rd., Westhampton, MA, email: frmorrison2009@live.com
[6]Systematic Entomology Laboratory, USDA, National Museum of Natural History, P.O. Box 37012, MRC 168, Washington, DC, email: paul.goldstein@usda.gov

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In many regions, including eastern North America, the lack of comprehensive taxonomic revisions for some groups, notably the parasitic genera *Nomada* Scopoli and *Sphecodes* Latreille, has impeded species-level identifications and range-wide status assessments (Droege *et al.*, 2010). For some taxa, such as *Lasioglossum* Curtis (*Dialictus* Robertson), recent integrative taxonomic studies combining molecular diagnostics with detailed morphological study have clarified previously intractable identification problems (e.g. Gibbs 2010, 2011), but species in such groups remain a challenge to identify and the precise ranges and habitat associations of many are poorly understood.

Uneven geographic and temporal sampling and non-standardized sampling techniques prohibit rigorous statistical analysis of changing bee populations (Wilson *et al.*, 2008; Portman *et al.*, 2020). Nevertheless, presence/absence data provide a first-order indication of the geographic distribution and status of bee species, which in turn represents coarse baseline information with which to gauge general trends in species composition over time (Gibbs *et al.*, 2017; Richardson *et al.*, 2018; Kilpatrick *et al.* 2020). Contributions to establishing such baselines for status assessments include the growing number of local and statewide surveys and compilations, e.g., for Colorado (Scott *et al.*, 2011), Indiana (Jean, 2010), Maine (Dibble *et al.*, 2017), Maryland (Droege, 2019), Michigan (Gibbs *et al.*, 2017), Pennsylvania (Donovall and vanEngelsdorp, 2010; Kilpatrick *et al.*, 2020), and Wisconsin (Wolf and Ascher, 2009), with several other state accounts in progress, including Connecticut (building on Zarrillo *et al.*, 2016) and Vermont (Hardy *et al.*, 2021) in New England.

Recent state-specific bee surveys have been aided by the increasing availability of museum specimen records shared online through data portals such as Discover Life (Ascher and Pickering, 2020, www.discoverlife.org), BISON (Biodiversity Information Serving Our Nation), iDigbio (Digital Bee Collections Network and Integrated Digital Biocollection), and GBIF (Global Biodiversity Information Network), as well as community ("citizen") science photo-documentation-based websites such as BugGuide, iNaturalist, and Bumble Bee Watch.

Massachusetts boasts a long history of entomological activity, and various components of the Massachusetts insect fauna have been studied in various contexts of regional conservation efforts and faunal change (Goldstein *et al.*, 2018). Until recently, much of what was known about bee diversity and distribution in the eastern United States was based on the works of Mitchell (1960, 1962). His list of Massachusetts bees, relatively extensive for its time, was aided considerably by the works of Lovell (1909) and Viereck (1902a,b, 1904, 1907a,b, 1917b, 1922), and by institutional collections such as those of the Museum of Comparative Zoology (MCZ), American Museum of Natural History (AMNH), Illinois Natural History Survey (INHS), and the National Museum of Natural History (USNM). Subsequent taxonomic revisions refined our understanding of the Massachusetts fauna, and recent surveys, including those from previously under-sampled regions (e.g., western Massachusetts and the offshore islands) and certain habitats (e.g., sandplains, sand pits, forest openings) have greatly expanded Mitchell's Massachusetts list.

Massachusetts is the third most densely populated state in the U.S. and 47th in the nation in the total value of its agricultural commodities. Nevertheless, it supports more than 7,000 farms, averaging 68 acres and occupying over 490,000 acres statewide. The percentage of farmland area in each county can be divided into cohorts of 3-7% (Barnstable, Essex, Middlesex, Nantucket, Norfolk), 8-10% (Berkshire, Bristol, Hampden, Worcester), 11-15% (Dukes, Hampshire, Plymouth), and 16-19% (Franklin) (MDAR, 2021). Like much of the Northeast, Massachusetts relies on pollinators for more than 30% of its crop income. The prevalence of small farms actively

involved in the cultivation of insect-pollinated crops puts Massachusetts among those states which may rely more heavily on native pollinators than those dominated more by industrialized agriculture. Cranberries, which are pollinated by bumble bees and solitary bees (Cane *et al.*, 1996; Averill *et al.*, 2018), account for approximately one eighth of the state's agroeconomy, and the percentage of that economy occupied by vegetables and other fruits has risen in recent years.

Although Massachusetts is relatively small compared to many western and southern states (2.73 million ha in area), it is topographically diverse with elevations ranging from sea level to 1,064 m. The state has a continental climate with hot summers and cold, often snowy winters, and a varied landscape that supports a wide variety of plant and animal communities. Thirteen ecoregions are recognized in Massachusetts including sandy glacial outwash plains of Cape Cod and the Islands, the acidic Worcester Plateau, flood plains and sandy glacial deltas of the Connecticut River Valley, the Berkshire Mountains, and the calcium-rich valleys of the state's western border (Natural Heritage and Endangered Species Program, 2011).

The primary goal of this paper is to provide a thorough summary of recorded occurrence data for bees in the Commonwealth of Massachusetts. To achieve this we (1) compiled a comprehensive taxonomic list of all bee species presently known in the state with occurrences tabulated for each of the counties in Massachusetts based on historical and recent collections and a review of citizen science records; (2) document new and noteworthy records of bees from the state including regionally rare and exotic/adventive species; (3) highlight possible changes in species occurrences based on historical collection data; (4) compare the composition of the bee fauna of Massachusetts with that of the other New England States; and (5) provide information relevant to the conservation status of bees in the state. The data compiled here may be used as a reliable baseline for bee occurrence across the state to guide policy decisions with respect to threatened bees and inform the management of natural communities for the preservation or enhancement of bee species richness and abundance.

METHODS

Checklist Compilation

We compiled species occurrence records for Massachusetts from critical review of all available sources including published taxonomic and distributional literature, specimen and other occurrence datasets housed in museums, other institutions, and personal collections, image databases from online biodiversity portals, and published and unpublished "gray literature" reports of Massachusetts bee studies. Species treatments are based on a comprehensive compilation of available records through June 2021.

Our list is arranged taxonomically and we summarize coursely the taxonomic and behavioral composition of the Massachusetts fauna. In addition to indicating county distribution for each species, we denote species not native to North America, historical records of species that have not been recorded in Massachusetts for at least 45 years, new records of species added since Mitchell (1960, 1962), and bees documented from Massachusetts for the first time. Life history information and behaviors associated with sociality, nesting substrate, host plant use, and degree of specialization (oligolecty) reflect the available knowledge of North American bees (Hurd, 1979; cf. Giles and Ascher, 2006; Ascher *et al.*, 2014).

Literature Review

We reviewed the relevant taxonomic literature (e.g. Baker, 1975; Bouseman and LaBerge, 1979; Broemeling and Moalif, 1988; Brumley, 1965; Donovan, 1977; Droege *et al.*, 2010; Gibbs, 2010, 2011; Gibbs *et al.*, 2013; Hurd and Lindsey, 1972; LaBerge, 1956 a,b, 1961, 1967, 1969, 1971, 1973, 1977, 1980, 1986, 1987, 1989; LaBerge and Bouseman, 1970; LaBerge and Ribble, 1972, 1975; McGinley, 1986, 2003; Michener, 1947; Michez and Eardly, 2007; Mitchell, 1935, 1936, 1937a,b; Onuferko, 2017, 2018; Ribble, 1967, 1968, 1974; Rightmyer, 2008; Rightmyer *et al.*, 2010; Shinn, 1967; Sinha and Michener, 1958; Snelling and Stage, 1995; Stephen, 1954), catalogues (e.g. Hurd, 1979; Moure and Hurd, 1987), and other distributional studies (Bartomeus *et al.*, 2013; Lovell, 1909; Mitchell, 1960, 1962; Schwarz, 1926). We also accessed a compilation of type localities and collecting events for all species in the United States, including those now in synonymy, compiled by John Ascher (JSA) (unpublished).

Published studies and unpublished reports, many from the last 15 years, added significantly to our current understanding of bee distribution in Massachusetts and represent an intensified period of bee surveys in the state. Table 1 provides a breakdown of records by county for these studies and includes publication references when available.

Museum, Database, and Collection Review

The most historically significant collections of Massachusetts bees accessed for this project are housed at the following institutions: Harvard University in the Museum of Comparative Zoology (MCZ), American Museum of Natural History (AMNH), University of Massachusetts (UMEC), Cornell University (CUIC), Peabody Museum of Natural History (PMNH), and the University of Connecticut (UCMS). Records deposited in several institutions were accessed via their institutional web portals or through integrated collections web portals: iDigbio (https://www.idigbio.org), GBIF (https://www.gbif.org/), and BISON (https://bison.usgs.gov/). The collections in institutions outside the Northeast containing the greatest number of Massachusetts records used for this project include the USGS Native Bee Inventory and Monitoring Lab (BIML), USDA-ARS Bee Biology and Systematics Laboratory (BBSL), National Museum of Natural History (USNM), and Illinois Natural History Survey Insect Collection (INHS). Most of the collection data listed above are error-checked and displayed on www.discoverlife, accessible through its Global Mapper. The personal collections of Massachusetts bees, including those of authors (M. F. Veit (MFV), J. Milam (JM), and F. R. Morrison (FRM)), and those of Massasoit Community College (MCC) contained numerous state and county records. A list of the largest Massachusetts holdings in major institutional and personal collections is presented in Table 2.

Community science data, accessible through biodiversity portals, were checked for additional records. The subset of species records that could be confirmed with confidence (most by JSA) helped expand spatiotemporal coverage and were particularly useful for documenting the persistence of bee species at sites which were not intensively surveyed by recent collectors. The main source of citizen science records were Bug Guide (www.bugguide.net) and iNaturalist (www.inaturalist.org). Table 3 lists the number of images and species accessed for quantitative assessment from the most significant portals.

Table 1. Noteworthy surveys of Massachusetts bees, 1973 - 2019.

Survey Location	Duration	Counties	Approx. no. of specimens collected	Principal Investigators
Martha's Vineyard	2010-2012	Dukes	13,009	P. Z. Goldstein[1]
Nantucket		Nantucket	1,476	
Boston Harbor Islands NP	2005-2011	Norfolk	2,680	J. Rykken[2]
		Plymouth	2,464	
		Suffolk	5,094	
Selected locations, Plymouth Co.	2016-2019	Plymouth	9,269	M. Bankson
Cranberry Bogs	2007-2016	Barnstable	8,128	A. Averill[3]
		Plymouth		
Montague Plains WMA	2008-2019	Franklin	7,237	J. Milam
Elizabeth Islands	1973-1976	Dukes	1,674	G. I. Stage and S. Kent
	2009-2010		4,365	
Urban Lawns	2013-2014	Hampden	5,374	S. Lerman[4]
Powerline Right-of-Way	2017	Franklin	1,232	D. L. Wagner[5]
		Hampden	624	
		Hampshire	1,018	
Forest Openings	2014-2015	Franklin	1,922	H. P. Roberts[6]
		Worcester	1,748	
Muddy Brook WMA	2011-2018	Worcester	2,293	J. Milam
Camp Edwards Military Base	2014, 2017	Barnstable	2,037	M. F. Veit
Berkshire County (mainly *Bombus* spp.)	2008	Berkshire	1,177	C. Scully
Parker River NWR	2010-2012	Essex	1,020	M. F. Veit
Selected Gardens	2007-2019	Hampshire	517	F. R. Morrison
Birch Hill WMA	2019	Worcester	345	J. Milam

[1]Goldstein and Ascher, 2016; [2]Rykken and Farrell, 2013; [3]Averill *et al.*, 2018; [4]Lerman and Milam, 2016; [5]Wagner *et al.*, 2019; [6]Roberts *et al.*, 2017

Other Relevant Studies

Regional studies consulted for ecological and distributional data for Massachusetts include those listed in Table 1, and surveys from Connecticut (Zarrillo *et al.*, 2016), Maine (Dibble *et al.*, 2017), New Hampshire (Tucker and Rehan, 2016, 2017), Vermont (Richardson *et al.*, 2018), and New York (Giles and Ascher, 2006; Ascher *et al.*, 2014). Select extralimital studies from the midwestern United States and other eastern states (Wolf and Ascher, 2008; Donovall and vanEngelsdorp, 2010; Jean, 2010; Gibbs *et al.*, 2017; Kilpatrick *et al.*, 2020) were also consulted.

Table 2. Largest collections of Massachusetts bees utilized for this project including the number of specimens accessed.* - Available online.

Institutional Collections	Approx. No. of Specimens Accessed
American Museum of Natural History, New York NY (AMNH)*	20,889
Museum of Comparative Zoology, Cambridge MA (MCZ)*	11,284
Massasoit Community College, Brockton MA (MCC)	9,269
University of Connecticut, Storrs CT (UCMS)*	6,230
USGS PWRC - Native Bee Inventory and Monitoring Lab, Laurel MD (BIML)*	3,084
Yale University, Peabody Museum, New Haven CT (PMNH)*	2,489
University of Massachusetts, Amherst MA (UMEC)	876
Personal Collections	**Approx. No. of Specimens**
M. F. Veit	15,000
J. Milam	12,000
F. R. Morrison	2,468

Table 3. Community science records from online biodiversity image collections.

Online biodiversity portal	Approx. No. of images	Approx. no. of identifiable species from Massachusetts	No. of observers	Main identifier
BugGuide	2,960	109	unavailable	JSA
iNaturalist	20,464	135	3,054	JSA

Taxonomic Updates and Verifications

Identifications and verifications of cryptic and problematic species from historic and recent collections were made by JSA, Sam Droege (SD), Jason Gibbs (JG) (primarily *Lasioglossum* spp.), and MFV.

State and county species records were verified by examining the original specimens whenever possible. Unverifiable records, both published and unpublished, including some digitized in major collections, were removed to a "hypothetical" or "excluded" list when the original material was not available, when considerable taxonomic or identification challenges existed, or when they were biogeographically implausible (Appendix A). In all, we reviewed over 100,000 specimen records along with those obtained from the literature.

New Records, Historical Records, and Expected Occurrences

We compile notes and occurrence information for species documented from Massachusetts for the first time, species rarely encountered or of conservation interest, or otherwise exceptional enough to warrant discussion (Appendix B). We include collection data, distributional, historical, and taxonomic notes, and natural history information such as host plant and host-parasite associations. In addition, we discuss species that have not been recorded in at least 15 years (most > 45 yrs.), and present a summary of species documented in neighboring states that are likely to occur in Massachusetts (Appendix C).

RESULTS

Overview of the Massachusetts Bee Fauna

A summary of 390 bee species recorded from Massachusetts is presented in Table 4. These include representatives of 43 genera from all six New World bee families. Fifty species are documented from Massachusetts for the first time, of which six are newly reported from New England. One hundred thirty-nine species were added to those documented by Mitchell (1960, 1962). Records of fifteen previously reported species were omitted because of misidentification, taxonomic uncertainty, or implausible range extensions. (Appendix A). Two species (*Dianthidium simile* (Cresson, 1864), *Osmia felti* Cockerell, 1911) reported from the state are not assigned a county occurrence in Table 4 because published records did not include specific locality information.

Most of the species we document are widespread in the state: more than half (55%) have been collected in seven or more of Massachusetts' fourteen counties and over a third (37%) have been collected in ten or more counties. A majority of species range across the entire state from the coastal plain to the western highlands. Others appear to be geographically restricted to a few sites in a limited area, which may be a function of nesting substrate preferences, climatic, and plant and host-parasite requirements.

Statewide, Halictidae are represented by the greatest species richness (103 spp.), followed by Apidae and Andrenidae (both 91 spp.), Megachilidae (72 spp.), Colletidae (27 spp.) and Melittidae (6 spp.). The behavioral/social composition of Massachusetts bees is dominated by solitary species (217 spp.; 56%), followed by eusocial (71 spp.; 18%), and subsocial species (5 spp.; 2%). Parasitic bees, including cleptoparasites and social parasites, comprise 96 spp. (25%).

The majority of Massachusetts bees species nest in soil (275 spp.; 71%), followed by those nesting in pre-existing cavities (78spp. 20%), hives (18 spp. 5%), stems (8 spp. 2%), wood (8 spp. 2%), and other or unknown substrates (3 spp.). At least 88 species (22%) are considered oligolectic, specializing on plants in a single family or genus. A majority of the oligoleges are associated with only one of a few plant families: Asteraceae (31 spp.), Ericaceae (14 spp.), Salicaceae (6 spp.), Rosaceae (4 spp.), Solanaceae (4 spp.), Cornaceae (4 spp.), Primulaceae (3 spp.), Nymphaeaceae (2 spp.), and Pontederiaceae (2 spp.). Each of the remaining oligoleges are individually associated with separate plant families.

Added Species and Historical Occurrences

Of the 50 species we report for the first time from Massachusetts, five are from specimen or literature records that predate Mitchell's treatise on eastern bees, three are adventive species whose ranges have presumably expanded since they were first introduced (see Exotic Species below), and one is from a community science photograph i.e. *Chelostoma philadelphi* (Robertson, 1891). We interpret most of the remaining species as likely to have been present but undetected, and their discovery the result of the heightened intensity and targeted nature of sampling during the past 15 years. However, a few species native to the region such as *C. philadelphi* may have extended their range to the northeast recently following planting of their host plants in gardens. Included among the native species we report from Massachusetts for the first time are 13 whose discoveries represent range extensions, all of which are northerly (Appendix B).

Twenty-three species included by Mitchell (1960,1962) from Massachusetts are not represented in collections from the past 15 years. Of these, 21 have not been found in at least 45 years. We discuss these historical species in more detail below (page 110).

Table 4. - Bee Species found in Massachusetts by county.

† - species with no known Massachusetts record for at least forty-five years; + - species added to Massachusetts list since Mitchell (1960, 1962); @ - species reported from Massachusetts for first time; # - non-native species. Most Recent Record: D - County unavailable; < - precedes publication date of revision when collection date was unavailable. County abbreviations: BA-Barnstable; BE-Berkshire; BR-Bristol; DU-Dukes; ES-Essex; FR-Franklin; HN-Hampden; HE-Hampshire; MI-Middlesex; NA-Nantucket; NO-Norfolk; PL-Plymouth; SU-Suffolk; WO-Worcester.

FAMILY/Subfamily/Tribe/*Genus*/*Subgenus*/*species*	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	Most Recent Record
ANDRENIDAE															
Andreninae															
Andrenini															
Andrena (*Andrena*) *carolina* Viereck, 1909	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL		WO	2021
Andrena (*Andrena*) *clarkella* (Kirby, 1802)	BA	BE				FR		HE	MI		NO		SU	WO	2021
Andrena (*Andrena*) *cornelli* Viereck, 1907	BA					FR	HN	HE	MI			PL	SU	WO	2021
Andrena (*Andrena*) *frigida* Smith, 1853	BA	BE	BR	DU	ES	FR		HE	MI		NO	PL	SU	WO	2021
Andrena (*Andrena*) *mandibularis* Robertson, 1892	BA	BE		DU		FR		HE	MI			PL	SU	WO	2021
Andrena (*Andrena*) *milwaukeensis* Graenicher, 1903	BA	BE		DU		FR	HN	HE	MI			PL	SU	WO	2021
Andrena (*Andrena*) *rufosignata* Cockerell, 1902	BA	BE		DU	ES	FR	HN	HE	MI			PL	SU	WO	2020
Andrena (*Andrena*) *thaspii* Graenicher, 1903	BA	BE		DU	ES		HN	HE	MI		NO	PL		WO	2020
Andrena (*Andrena*) *tridens* Robertson, 1902			BR	DU	ES	FR		HE	MI	NA	NO	PL	SU	WO	2018
Andrena (*Callandrena* s.l.) *aliciae* Robertson, 1891[+, @]		BE				FR	HN	HE							2020
Andrena (*Callandrena* s.l.) *asteris* Robertson, 1891		BE		DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2020
Andrena (*Callandrena* s.l.) *braccata* Viereck, 1907	BA	BE		DU	ES	FR	HN	HE	MI	NA	NO		SU	WO	2020
Andrena (*Callandrena* s.l.) *helianthi* Robertson, 1891[+]		BE				FR	HN	HE	MI				SU		2020
Andrena (*Callandrena* s.l.) *krigiana* Robertson, 1901[+, @]									MI						2009
Andrena (*Callandrena* s.l.) *placata* Mitchell, 1960	BA	BE		DU	ES	FR	HN	HE	MI		NO	PL		WO	2020
Andrena (*Callandrena* s.l.) *simplex* Smith, 1853[+]	BA	BE		DU	ES	FR		HE	MI				SU	WO	2020
Andrena (*Cnemidandrena*) *canadensis* Dalla Torre, 1896	BA	BE		DU	ES	FR		HE	MI		NO		SU	WO	2019
Andrena (*Cnemidandrena*) *hirticincta* Provancher, 1888	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2020
Andrena (*Cnemidandrena*) *nubecula* Smith, 1853	BA	BE	BR	DU	ES	FR	HN	HE	MI			PL	SU	WO	2020
Andrena (*Cnemidandrena*) *parnassiae* Cockerell, 1902 [+, @]		BE				FR									2020

FAMILY/Subfamily/Tribe/*Genus*/*Subgenus*/*species*	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	Most Recent Record
Andrena (*Cnemidandrena*) *robervalensis* Mitchell, 1960	BA					FR	HN	HE	MI						2017
Andrena (*Conandrena*) *bradleyi* Viereck, 1907	BA			DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
[1]*Andrena uvulariae* Mitchell, 1960[+]	BA	BE				FR	HN	HE	MI			PL		WO	2020
[1]*Andrena ziziaeformis* Cockerell, 1908						FR	HN	HE							2017
Andrena (*Gonandrena*) *fragilis* Smith, 1853		BE	BR		ES	FR	HN		MI		NO	PL	SU		2020
Andrena (*Gonandrena*) *integra* Smith, 1853	BA						HN	HE	MI					WO	2016
Andrena (*Gonandrena*) *persimulata* Viereck, 1917		BE						HE			NO				2008
Andrena (*Gonandrena*) *platyparia* Robertson, 1895	BA	BE	BR			FR			MI		NO		SU		2019
Andrena (*Iomelissa*) *violae* Robertson, 1891[+]						FR	HN	HE	MI					WO	2017
Andrena (*Larandrena*) *miserabilis* Cresson, 1872	BA	BE	BR	DU	ES	FR	HN	HE	MI		NO	PL	SU	WO	2020
Andrena (*Leucandrena*) *barbilabris* (Kirby, 1802)		BE	BR		ES	FR	HN	HE	MI				SU		2020
Andrena (*Leucandrena*) *erythronii* Robertson, 1891	BA	BE							MI						2018
Andrena (*Melandrena*) *barbara* Bouseman and LaBerge, 1979[+,@]								HE	MI			PL			2017
Andrena (*Melandrena*) *carlini* Cockerell, 1901	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2020
Andrena (*Melandrena*) *commoda* Smith, 1879[+]	BA		BR	DU			HN		MI	NA	NO	PL	SU		2018
Andrena (*Melandrena*) *dunningi* Cockerell, 1898		BE			ES		HN	HE	MI		NO	PL	SU	WO	2021
[2]*Andrena* (*Melandrena*) *erythrogaster* (Ashmead, 1890)		BE				FR	HN	HE	MI		NO	PL	SU		2018
Andrena (*Melandrena*) *hilaris* Smith, 1853	BA			DU				HE	MI				SU		2007
Andrena (*Melandrena*) *nivalis* Smith, 1853[+]	BA	BE	BR		ES	FR	HN	HE	MI		NO	PL		WO	2020
[2]*Andrena* (*Melandrena*) *perplexa* Smith, 1853	BA	BE		DU				HE	MI			PL	SU	WO	2017
Andrena (*Melandrena*) *pruni* Robertson, 1891	BA	BE		DU		FR	HN	HE						WO	2019
Andrena (*Melandrena*) *regularis* Malloch, 1917		BE			ES	FR	HN		MI		NO		SU	WO	2020
Andrena (*Melandrena*) *vicina* Smith, 1853	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Andrena (*Micrandrena*) *melanochroa* Cockerell, 1898		BE		DU		FR	HN	HE	MI		NO			WO	2019
Andrena (*Micrandrena*) *neonana* Viereck, 1917[+]				DU											2011
Andrena (*Micrandrena*) *salictaria* Robertson, 1905					ES			HE	MI		NO				2017

FAMILY/Subfamily/Tribe/*Genus*/*Subgenus*/*species*	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	Most Recent Record
Andrena (*Micrandrena*) *ziziae* Robertson, 1891		BE				FR	HN		MI					WO	2019
[3]*Andrena* (*Opandrena*) *cressonii cressonii* Robertson, 1891	BA	BE	BR	DU	ES	FR		HE	MI		NO	PL	SU	WO	2021
Andrena (*Parandrena*) *wellesleyana* Robertson, 1897						FR			MI		NO		SU		2021
Andrena (*Plastandrena*) *crataegi* Robertson, 1893	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
[4]*Andrena* (*Ptilandrena*) *algida* Smith, 1853						FR	HN	HE	MI		NO	PL	SU	WO	2020
Andrena (*Ptilandrena*) *distans* Provancher, 1888				DU	ES	FR	HN	HE	MI		NO	PL		WO	2021
Andrena (*Ptilandrena*) *erigeniae* Robertson, 1891[+]		BE				FR		HE							2014
[4]*Andrena* (*Ptilandrena*) *geranii* Robertson, 1891[+]		BE				FR			MI						2020
[4]*Andrena* (*Ptilandrena*) *nigrihirta* (Ashmead, 1890)		BE				FR			MI					WO	2018
Andrena (*Rhacandrena*) *brevipalpis* Cockerell, 1930	BA	BE	BR	DU		FR		HE	MI		NO	PL	SU	WO	2020
Andrena (*Rhacandrena*) *robertsonii* Dalla Torre, 1896	BA		BR			FR	HN	HE	MI			PL	SU	WO	2019
Andrena (*Scaphandrena*) *arabis* Robertson, 1897[+]		BE					HN	HE	MI						2019
[5]*Andrena* (*Scrapteropsis* s.l.) *alleghaniensis* Viereck, 1907[+]		BE		DU	ES	FR	HN	HE	MI			PL	SU	WO	2021
[5]*Andrena* (*Scrapteropsis* s.l.) *atlantica* Mitchell, 1960[+,@]	BA								MI						2020
Andrena (*Scrapteropsis*) *fenningeri* Viereck, 1922[+]													SU	WO	2008
Andrena (*Scrapteropsis*) *ilicis* Mitchell, 1960[+,@]	BA		BR									PL			2018
Andrena (*Scrapteropsis*) *imitatrix* Cresson, 1872	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2020
Andrena (*Scrapteropsis*) *kalmiae* Atwood, 1934	BA					FR	HN		MI	NA	NO	PL		WO	2021
Andrena (*Scrapteropsis*) *morrisonella* Viereck, 1917				DU					MI		NO			WO	2011
Andrena (*Simandrena*) *nasonii* Robertson, 1895	BA	BE		DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Andrena (*Simandrena*) *wheeleri* Graenicher, 1904[+]		BE			ES				MI		NO	PL		WO	2020
Andrena (*Taeniandrena*) *wilkella* (Kirby, 1802)[#]	BA	BE	BR	DU	ES	FR	HN	HE	MI		NO	PL	SU	WO	2021
Andrena (*Thysandrena*) *bisalicis* Viereck, 1908		BE				FR	HN	HE	MI		NO	PL	SU	WO	2020
Andrena (*Thysandrena*) *w-scripta* Viereck, 1904		BE			ES	FR			MI			PL	SU	WO	2017
Andrena (*Trachandrena*) *ceanothi* Viereck, 1917	BA	BE		DU	ES	FR	HN		MI	NA	NO	PL		WO	2020
Andrena (*Trachandrena*) *forbesii* Robertson, 1891	BA	BE	BR	DU	ES	FR	HN	HE	MI		NO	PL	SU	WO	2020
Andrena (*Trachandrena*) *heraclei* Robertson, 1897[+]				DU		FR				NA					2020

FAMILY/Subfamily/Tribe/*Genus*/*Subgenus*/*species*	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	Most Recent Record
Andrena (*Trachandrena*) *hippotes* Robertson, 1895		BE	BR	DU	ES	FR	HN	HE	MI				SU	WO	2018
Andrena (*Trachandrena*) *miranda* Smith, 1879		BE				FR		HE	MI			PL		WO	2020
Andrena (*Trachandrena*) *nuda* Robertson, 1891[+]	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL		WO	2021
Andrena (*Trachandrena*) *rehni* Viereck, 1907			BR		ES		HN	HE						WO	2021
Andrena (*Trachandrena*) *rugosa* Robertson, 1891		BE	BR	DU	ES	FR	HN	HE	MI		NO	PL	SU	WO	2021
Andrena (*Trachandrena*) *sigmundi* Cockerell, 1902	BA	BE	BR		ES		HN	HE	MI		NO		SU	WO	2020
Andrena (*Trachandrena*) *spiraeana* Robertson, 1895	BA	BE	BR	DU	ES	FR	HN	HE	MI		NO	PL		WO	2020
Andrena (*Trachandrena*) *virginiana* Mitchell, 1960[+]		BE				FR		HE	MI					WO	2017
Panurginae															
Calliopsini															
Calliopsis (*Calliopsis*) *andreniformis* Smith, 1853	BA			DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Panurgini															
Panurginus potentillae (Crawford, 1916)[+]						FR	HN								2014
Perdita (*Alloperdita*) *bradleyi* Viereck, 1907[+,@]	BA														2018
Perdita (*Alloperdita*) *novaeangliae* Viereck, 1907	BA					FR			MI						2020
Perdita (*Cockerellia*) *bequaerti* Viereck, 1917[+,@]								HE							2019
Perdita (*Perdita*) *halictoides* Smith, 1853[+,@]						FR		HE							2018
Perdita (*Perdita*) *octomaculata octomaculata* (Say, 1824)	BA			DU	ES	FR	HN	HE	MI	NA		PL	SU	WO	2020
Protandrenini															
Pseudopanurgus aestivalis (Provancher, 1882)						FR			MI			PL	SU		2019
Pseudopanurgus andrenoides (Smith, 1853)[+]		BE			ES	FR	HN	HE						WO	2020
Pseudopanurgus pauper (Cresson, 1878)[†]													SU		<1932
APIDAE															
Apinae															
Anthophorini															
Anthophora (*Clisodon*) *terminalis* Cresson, 1869		BE			ES	FR	HN	HE	MI		NO	PL	SU	WO	2021

FAMILY/Subfamily/Tribe/*Genus*/*Subgenus*/*species*	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	Most Recent Record
Anthophora (*Lophanthophora*) *ursina ursina* Cresson, 1869 †,+,@								HE					SU		1914
Anthophora (*Mystacanthophora*) *walshii* Cresson, 1869	BA			DU											2020
Habropoda laboriosa (Fabricius, 1804)+,@	BA			DU	ES			HE	MI			PL	SU		2021
Apini															
Apis (*Apis*) *mellifera* Linnaeus, 1758#	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Bombini															
Bombus (*Bombias*) *auricomus* (Robertson, 1903)†,+	BA				ES			HE			NO				1973
Bombus (*Bombus*) *affinis* Cresson, 1863	BA	BE	BR	DU	ES	FR	HN	HE	MI		NO	PL	SU	WO	2009
Bombus (*Bombus*) *terricola* Kirby, 1837	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Bombus (*Cullumanobombus*) *griseocollis* (DeGeer, 1773)	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Bombus (*Cullumanobombus*) *rufocinctus* Cresson, 1863+	BA														1990
Bombus (*Psithyrus*) *ashtoni* (Cresson, 1864)	BA					FR	HN	HE	MI		NO	PL	SU	WO	1992
Bombus (*Psithyrus*) *citrinus* (Smith, 1854)	BA	BE	BR	DU	ES	FR	HN	HE	MI		NO	PL	SU		2008
[6]*Bombus* (*Psithyrus*) *flavidus appalachiensis* Lhomme and Hines, 2021		BE				FR			MI					WO	2020
Bombus (*Pyrobombus*) *bimaculatus* Cresson, 1863	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Bombus (*Pyrobombus*) *impatiens* Cresson, 1863	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Bombus (*Pyrobombus*) *perplexus* Cresson, 1863+	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Bombus (*Pyrobombus*) *sandersoni* Franklin, 1913	BA	BE		DU		FR	HN	HE	MI		NO	PL		WO	2019
Bombus (*Pyrobombus*) *ternarius* Say, 1837	BA	BE			ES	FR	HN	HE	MI		NO	PL	SU	WO	2021
Bombus (*Pyrobombus*) *vagans vagans* Smith, 1854	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Bombus (*Subterraneobombus*) *borealis* Kirby, 1837+		BE				FR		HE	MI						2020
Bombus (*Thoracobombus*) *fervidus* (Fabricius, 1798)	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Bombus (*Thoracobombus*) *pensylvanicus* (DeGeer, 1773)	BA			DU		FR		HE	MI		NO	PL	SU	WO	2012
Osirini															
Epeoloides pilosulus (Cresson, 1878)					ES		HN		MI		NO			WO	2021

FAMILY/Subfamily/Tribe/*Genus*/*Subgenus*/*species*	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	Most Recent Record
Eucerinae															
Eucerini															
Eucera (*Synhalonia*) *atriventris* (Smith, 1854)[+,@]								HE							2018
Melissodes (*Apomelissodes*) *apicatus* Lovell and Cockerell, 1906			BR			FR		HE	MI			PL		WO	2021
Melissodes (*Eumelissodes*) *agilis* Cresson, 1878	BA	BE		DU			HN	HE	MI		NO	PL			2020
Melissodes (*Eumelissodes*) *denticulatus* Smith, 1854	BA						HN	HE					SU		2017
Melissodes (*Eumelissodes*) *dentiventris* Smith, 1854	BA			DU											2011
Melissodes (*Eumelissodes*) *druriellus* (Kirby, 1802)	BA	BE		DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2020
Melissodes (*Eumelissodes*) *illatus* Lovell and Cockerell, 1906	BA	BE				FR		HE	MI			PL	SU	WO	2020
Melissodes (*Eumelissodes*) *subillatus* LaBerge, 1961[+]				DU			HN					PL	SU		2016
Melissodes (*Eumelissodes*) *trinodis* Robertson, 1901		BE		DU	ES	FR	HN	HE	MI		NO	PL	SU		2020
Melissodes (*Heliomelissodes*) *desponsus* Smith, 1854	BA	BE	BR	DU	ES	FR	HN	HE	MI			PL	SU	WO	2020
Melissodes (*Melissodes*) *bimaculatus bimaculatus* (Lepeletier, 1825)	BA	BE	BR	DU		FR	HN	HE	MI		NO	PL	SU	WO	2021
[7]*Peponapis* (*Peponapis*) *pruinosa* (Say, 1837)	BA	BE		DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2020
Nomadinae															
Ammobatoidini															
Holcopasites calliopsidis calliopsidis (Linsley, 1943)[+]	BA			DU	ES	FR	HN	HE	MI			PL			2020
Holcopasites illinoiensis (Robertson, 1891)[†]											NO	PL			1925
Epeolini															
Epeolus autumnalis Robertson, 1902	BA			DU	ES	FR			MI	NA		PL	SU	WO	2018
Epeolus bifasciatus Cresson, 1864[+]								HE	MI		NO				2020
Epeolus inornatus Onuferko, 2018	BA							HE	MI				SU		2020
Epeolus lectoides Robertson, 1901	BA			DU					MI						2020
Epeolus pusillus Cresson, 1864	BA			DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2020

FAMILY/Subfamily/Tribe/*Genus*/*Subgenus*/*species*	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	Most Recent Record
Epeolus scutellaris Say, 1824	BA	BE		DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2020
Triepeolus donatus (Smith, 1854)[+]				DU				HE	MI						2010
Triepeolus helianthi (Robertson, 1897)[+, @]						FR	HN	HE							2020
Triepeolus lunatus (Say, 1824)	BA			DU				HE	MI			PL		WO	2020
Triepeolus obliteratus Graenicher, 1911[+, @]					ES		HN	HE	MI					WO	2020
Triepeolus pectoralis (Robertson, 1897)				DU	ES	FR		HE	MI			PL	SU	WO	2020
Triepeolus remigatus (Fabricius, 1804)[+, @]						FR		HE							2019
Nomadini															
Nomada armatella Cockerell, 1903				DU		FR	HN	HE	MI					WO	2017
Nomada articulata Smith, 1854	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Nomada australis Mitchell, 1962[+]	BA				ES	FR	HN		MI			PL			2018
Nomada bella bella Cresson, 1863			BR	DU	ES	FR	HN	HE	MI		NO	PL		WO	2013
Nomada bethunei Cockerell, 1903				DU				HE	MI			PL			2018
Nomada binotata (Robertson, 1903)[+]	BA			DU		FR									2017
Nomada capillata Mitchell, 1962 [†]											NO				1902
Nomada composita Mitchell, 1962[+]			BR	DU			HN	HE	MI			PL		WO	2018
Nomada sp. aff. *composita*[+]				DU											2011
Nomada cressonii cressonii Robertson, 1893	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2019
Nomada cuneata (Robertson, 1903)	BA	BE	BR		ES	FR	HN	HE	MI					WO	2017
Nomada denticulata Robertson, 1902				DU	ES			HE	MI		NO	PL	SU	WO	2020
Nomada depressa Cresson, 1863[+]	BA	BE		DU		FR	HN	HE	MI					WO	2021
Nomada dreisbachi Mitchell, 1962 [†]											NO				1901
Nomada electa Cresson, 1863	BA	BE		DU	ES	FR		HE	MI	NA	NO			WO	2019
Nomada electella Cockerell, 1903[+, @]		BE							MI						2007
Nomada erigeronis Robertson, 1897	BA								MI					WO	2013
Nomada gracilis Cresson, 1863		BE			ES	FR	HN	HE	MI		NO	PL	SU	WO	2017
Nomada illinoensis Robertson, 1900		BE		DU	ES	FR	HN	HE						WO	2020

FAMILY/Subfamily/Tribe/*Genus*/*Subgenus*/*species*	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	Most Recent Record
Nomada imbricata Smith, 1854	BA	BE		DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2020
Nomada integerrima Dalla Torre, 1896 †									MI					WO	1904
Nomada lehighensis Cockerell, 1903+, @							HN		MI					WO	2009
Nomada lepida Cresson, 1863		BE				FR	HN	HE			NO			WO	2017
Nomada sp. cf. *lepida*+				DU											
Nomada luteoloides Robertson, 1895+	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Nomada maculata Cresson, 1863	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Nomada ovata (Robertson, 1903)			BR	DU		FR	HN	HE	MI					WO	2017
Nomada parva Robertson, 1900+				DU					MI	NA					2017
Nomada perplexa Cresson, 1863		BE	BR	DU		FR		HE	MI			PL			2017
Nomada pygmaea Cresson, 1863	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2019
Nomada rodecki Mitchell, 1962+	BA		BR	DU			HN		MI			PL			2019
Nomada sayi Robertson, 1893	BA			DU					MI			PL		WO	2017
Nomada tiftonensis Cockerell, 1903	BA	BE			ES	FR		HE	MI		NO	PL	SU	WO	2020
Nomada valida Smith, 1854+, @									MI						2011
Nomada vicina vicina Cresson, 1863				DU				HE	MI	NA	NO	PL	SU		2020
Nomada vincta Say, 1837+, @		BE				FR		HE							2020
Nomada xanthura Cockerell, 1908+				DU											2011
Xylocopinae															
Ceratinini															
Ceratina (*Zadontomerus*) *calcarata* Robertson, 1900	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Ceratina (*Zadontomerus*) *dupla* Say, 1837	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2020
Ceratina (*Zadontomerus*) *mikmaqi* Rehan and Sheffield, 2011+	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA		PL		WO	2019
Ceratina (*Zadontomerus*) *strenua* Smith, 1879	BA	BE		DU		FR	HN	HE	MI			PL		WO	2020
Xylocopini															
Xylocopa (*Xylocopoides*) *virginica virginica* (Linnaeus, 1771)	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021

FAMILY/Subfamily/Tribe/*Genus*/*Subgenus*/*species*	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	Most Recent Record
COLLETIDAE															
Colletinae															
Colletes aestivalis Patton, 1879[†]					ES										<1954
Colletes americanus Cresson, 1868	BA	BE		DU	ES	FR	HN		MI	NA	NO	PL	SU	WO	2020
Colletes banksi Swenk, 1908[+, @]								HE	MI						2020
Colletes compactus compactus Cresson, 1868	BA	BE		DU	ES	FR	HN	HE	MI	NA	NO		SU	WO	2020
Colletes consors mesocopus Swenk, 1907[†]											NO				<1954
Colletes inaequalis Say, 1837	BA	BE	BR	DU	ES	FR	HN	HE	MI		NO	PL	SU	WO	2021
Colletes latitarsis Robertson, 1891[+]						FR	HN	HE	MI				SU	WO	2020
Colletes nudus Robertson, 1898	BA			DU	ES				MI			PL			2014
Colletes productus Robertson, 1891				DU	ES				MI			PL			2021
Colletes simulans armatus Patton, 1879	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2020
Colletes solidaginis Swenk, 1906	BA			DU		FR			MI	NA	NO	PL	SU	WO	2020
Colletes speculiferus Cockerell, 1927[+]				DU	ES					NA					2020
Colletes thoracicus Smith, 1853	BA			DU	ES		HN	HE	MI		NO	PL			2021
Colletes validus Cresson, 1868	BA			DU	ES	FR	HN	HE	MI	NA		PL		WO	2021
Colletes willistoni Robertson, 1891[+, @]						FR			MI						2019
Hylaeinae															
Hylaeus (*Cephalylaeus*) *basalis* (Smith, 1853)[+, @]						FR			MI						2013
Hylaeus (*Hylaeus*) *annulatus* (Linnaeus, 1758)[+]		BE		DU		FR									2020
Hylaeus (*Hylaeus*) *leptocephalus* (Morawitz, 1870)[+, @, #]			BR					HE	MI						2021
Hylaeus (*Hylaeus*) *mesillae cressoni* (Cockerell, 1907)	BA	BE		DU	ES	FR		HE	MI	NA	NO	PL	SU	WO	2020
Hylaeus (*Hylaeus*) *saniculae* (Robertson, 1896)[†]									MI					WO	<1953
Hylaeus (*Hylaeus*) *verticalis* (Cresson, 1869)						FR					NO		SU	WO	2006
Hylaeus (*Prosopis*) *affinis* (Smith, 1853)	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2020
Hylaeus (*Prosopis*) *illinoisensis* (Robertson, 1896)	BA												SU		2010
Hylaeus (*Prosopis*) *modestus modestus* Say, 1837	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021

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Hylaeus (*Prosopis*) *nelumbonis* (Robertson, 1890)[+, @]					ES										2011
Hylaeus (*Prosopis*) *schwarzii* (Cockerell, 1896)				DU	ES							PL	SU		2011
Hylaeus (*Spatulariella*) *punctatus* (Brullé, 1832)[#, +, @]												PL	SU		2018
HALICTIDAE															
Halictinae															
Augochlorini															
Augochlora (*Augochlora*) *pura pura* (Smith, 1853)	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Augochlorella aurata (Smith, 1853)	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Augochloropsis (*Paraugochloropsis*) *metallica fulgida* (Fabricius, 1793)/ Smith 1853[+]	BA	BE	BR	DU	ES	FR	HN	HE	MI		NO	PL	SU	WO	2021
Agapostemon (*Agapostemon*) *sericeus* (Förster, 1771)	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Agapostemon (*Agapostemon*) *splendens* (Lepeletier de Saint Fargeau, 1841)	BA			DU	ES	FR	HN		MI	NA		PL			2020
Agapostemon (*Agapostemon*) *texanus* Cresson, 1872	BA		BR	DU	ES	FR	HN	HE	MI	NA		PL	SU	WO	2021
Agapostemon (*Agapostemon*) *virescens* (Fabricius, 1775)	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Halictini															
Halictus (*Nealictus*) *parallelus* Say, 1837[+]	BA		BR	DU	ES	FR	HN	HE	MI		NO	PL			2021
Halictus (*Odontalictus*) *ligatus* Say, 1837	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Halictus (*Protohalictus*) *rubicundus* (Christ, 1791)	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Halictus (*Seladonia*) *confusus confusus* Smith, 1853	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Lasioglossum (*Dialictus*) *achilleae* (Mitchell, 1960)[+]							HN		MI						1905
Lasioglossum (*Dialictus*) *admirandum* (Sandhouse, 1924)	BA			DU	ES	FR		HE	MI	NA		PL	SU	WO	2019
Lasioglossum (*Dialictus*) *albipenne* (Robertson, 1890)				DU					MI		NO		SU		2011
Lasioglossum (*Dialictus*) *anomalum* (Robertson, 1892)[+]		BE				FR	HN	HE				PL			2017
Lasioglossum (*Dialictus*) *atwoodi* Gibbs, 2010[+]						FR	HN		MI			PL		WO	2017
Lasioglossum (*Dialictus*) *bruneri* (Crawford, 1902)[+]	BA			DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2019
Lasioglossum (*Dialictus*) *callidum* (Sandhouse, 1924)[+]		BE	BR												2011

FAMILY/Subfamily/Tribe/*Genus*/*Subgenus*/*species*	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	Most Recent Record
Lasioglossum (*Dialictus*) *cattellae* (Ellis, 1913)											NO		SU		2011
Lasioglossum (*Dialictus*) *coeruleum* (Robertson, 1893)				DU	ES	FR	HN	HE	MI		NO	PL	SU	WO	2020
Lasioglossum (*Dialictus*) *coreopsis* (Robertson, 1902)	BA		BR	DU	ES	FR	HN					PL			2019
Lasioglossum (*Dialictus*) *cressonii* (Robertson, 1890)	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Lasioglossum (*Dialictus*) *ellisiae* (Sandhouse, 1924)[+]					ES	FR	HN	HE	MI		NO	PL	SU		2021
Lasioglossum (*Dialictus*) *ephialtum* Gibbs, 2010[+]	BA	BE	BR	DU	ES	FR	HN	HE	MI		NO	PL	SU	WO	2021
Lasioglossum (*Dialictus*) *fattigi* (Mitchell, 1960)[+]					ES	FR	HN							WO	2016
Lasioglossum (*Dialictus*) *furunculum* Gibbs 2011[+]						FR									2009
Lasioglossum (*Dialictus*) *georgeickworti* Gibbs, 2011[+]	BA			DU	ES	FR			MI	NA		PL	SU	WO	2019
Lasioglossum (*Dialictus*) *gotham* Gibbs, 2011[+]						FR			MI				SU		2017
Lasioglossum (*Dialictus*) *heterognathus* (Mitchell, 1960)			BR	DU	ES				MI		NO		SU	WO	2011
Lasioglossum (*Dialictus*) *hitchensi* Gibbs, 2012					ES	FR			MI				SU	WO	2013
Lasioglossum (*Dialictus*) *illinoense* (Robertson, 1892)[+]							HN	HE					SU	WO	2017
Lasioglossum (*Dialictus*) *imitatum* (Smith, 1853)		BE	BR	DU	ES	FR	HN	HE	MI		NO	PL	SU	WO	2020
Lasioglossum (*Dialictus*) *izawsum* Gibbs, 2011[+]						FR	HN							WO	2019
Lasioglossum (*Dialictus*) *katherineae* Gibbs, 2011[+]	BA			DU		FR	HN		MI					WO	2019
Lasioglossum (*Dialictus*) *laevissimum* (Smith, 1853)		BE			ES	FR	HN		MI	NA		PL		WO	2020
Lasioglossum (*Dialictus*) *leucocomus* (Lovell, 1908)[+]	BA		BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Lasioglossum (*Dialictus*) *lineatulum* (Crawford, 1906)	BA	BE	BR	DU	ES	FR	HN	HE	MI			PL	SU	WO	2020
Lasioglossum (*Dialictus*) *lionotus* (Sandhouse, 1923)[+,@]					ES	FR		HE			NO		SU		2016
Lasioglossum (*Dialictus*) *marinum* (Crawford, 1904)	BA		BR	DU	ES					NA		PL	SU		2018
Lasioglossum (*Dialictus*) *michiganense* (Mitchell, 1960)[+,@]									MI						2006
Lasioglossum (*Dialictus*) *nigroviride* (Graenicher, 1911)		BE	BR	DU		FR	HN	HE	MI		NO	PL		WO	2020
Lasioglossum (*Dialictus*) *oblongum* (Lovell, 1905)	BA	BE	BR	DU	ES	FR	HN		MI	NA	NO	PL	SU	WO	2020
Lasioglossum (*Dialictus*) *obscurum* (Robertson, 1892)[+]	BA					FR			MI		NO	PL		WO	2015
Lasioglossum (*Dialictus*) *oceanicum* (Cockerell, 1916)	BA		BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2019
Lasioglossum (*Dialictus*) *perpunctatum* (Ellis, 1913)													SU		2010

FAMILY/Subfamily/Tribe/*Genus*/*Subgenus*/*species*	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	Most Recent Record
Lasioglossum (*Dialictus*) *pilosum* (Smith, 1853)	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Lasioglossum (*Dialictus*) *planatum* (Lovell, 1905)[+]					ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2020
Lasioglossum (*Dialictus*) *platyparium* (Robertson, 1895)[+]						FR	HN	HE							2013
Lasioglossum (*Dialictus*) *pruinosum* (Robertson, 1892)	BA			DU		FR		HE		NA		PL			2018
Lasioglossum (*Dialictus*) *rozeni* Gibbs, 2011[+]				DU		FR			MI			PL		WO	2020
Lasioglossum (*Dialictus*) *smilacinae* (Roberson, 1899)[+]	BA		BR	DU	ES	FR	HN	HE	MI		NO	PL		WO	2020
Lasioglossum (*Dialictus*) *subviridatum* (Cockerell, 1938)[+]	BA	BE	BR	DU		FR	HN	HE	MI		NO	PL	SU	WO	2019
Lasioglossum (*Dialictus*) *taylorae* Gibbs, 2010[+]						FR	HN							WO	2019
Lasioglossum (*Dialictus*) *tegulare* (Robertson, 1890)[+]	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2020
Lasioglossum (*Dialictus*) *timothyi* Gibbs, 2010[+]	BA			DU		FR	HN	HE		NA		PL			2019
Lasioglossum (*Dialictus*) *versans* (Lovell, 1905)	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA		PL	SU	WO	2021
Lasioglossum (*Dialictus*) *versatum* (Robertson, 1902)	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Lasioglossum (*Dialictus*) *vierecki* (Crawford, 1904)	BA		BR	DU	ES	FR	HN	HE	MI	NA	NO	PL		WO	2021
Lasioglossum (*Dialictus*) *viridatum* (Lovell, 1905)	BA	BE		DU	ES	FR	HN	HE			NO		SU	WO	2019
Lasioglossum (*Dialictus*) *weemsi* (Mitchell, 1960)[+]						FR	HN		MI				SU	WO	2012
Lasioglossum (*Dialictus*) *wheeleri* (Mitchell, 1960)[†]													SU		1922
Lasioglossum (*Dialictus*) *zephyrus* (Smith, 1853)	BA			DU		FR			MI		NO	PL	SU	WO	2020
Lasioglossum (*Evylaeus*) *cinctipes* (Provancher, 1888)[+]	BA	BE	BR	DU	ES	FR	HN	HE	MI			PL	SU	WO	2021
Lasioglossum (*Hemihalictus*) *birkmanni* (Crawford, 1906)	BA			DU		FR	HN	HE	MI		NO	PL	SU	WO	2020
Lasioglossum (*Hemihalictus*) *foxii* (Robertson, 1895)		BE			ES	FR	HN	HE	MI		NO	PL	SU	WO	2020
Lasioglossum (*Hemihalictus*) *inconditum* (Cockerell, 1916)[+]		BE				FR								WO	2017
Lasioglossum (*Hemihalictus*) *macoupinense* (Robertson, 1895), non auct. "=*divergens*" (Lovell, 1905)		BE		DU	ES	FR	HN	HE	MI		NO	PL	SU	WO	2014
Lasioglossum (*Hemihalictus*) *nelumbonis* (Robertson, 1890)[+]	BA			DU		FR	HN		MI		NO	PL		WO	2020
Lasioglossum (*Hemihalictus*) *pectinatum* (Robertson, 1890)[+]		BE				FR			MI						2020
Lasioglossum (*Hemihalictus*) *pectorale* (Smith, 1853)	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2020

FAMILY/Subfamily/Tribe/*Genus*/*Subgenus*/*species*	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	Most Recent Record
Lasioglossum (*Lasioglossum*) *acuminatum* McGinley, 1986[+]	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2019
Lasioglossum (*Lasioglossum*) *athabascense* (Sandhouse, 1933)			BR		ES	FR	HN		MI			PL			2014
Lasioglossum (*Lasioglossum*) *coriaceum* (Smith, 1853)	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Lasioglossum (*Lasioglossum*) *fuscipenne* (Smith, 1853)[+]	BA			DU	ES	FR		HE	MI			PL		WO	2019
Lasioglossum (*Leuchalictus*) *leucozonium leucozonium* (Schrank, 1781)[+,#]	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2020
Lasioglossum (*Leuchalictus*) *zonulum zonulum* (Smith, 1848)[+,@,#]		BE				FR									2019
Lasioglossum (*Sphecodogastra*) *oenotherae* (Stevens, 1920)[+]						FR	HN	HE	MI			PL		WO	2021
Lasioglossum (*Sphecodogastra*) *quebecense* (Crawford, 1907)	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2020
Lasioglossum (*Sphecodogastra*) *truncatum* (Robertson, 1901)	BA						HN	HE	MI		NO		SU	WO	2019
Sphecodes aroniae Mitchell, 1960[+]				DU			HN	HE	MI			PL		WO	2018
Sphecodes atlantis Mitchell, 1956		BE		DU		FR	HN	HE	MI		NO	PL	SU	WO	2020
Sphecodes autumnalis Mitchell, 1956[+]				DU		FR		HE	MI	NA		PL			2020
Sphecodes banksii Lovell, 1909[+,@]									MI						2015
Sphecodes clematidis Robertson, 1897[†]									MI						<1909
Sphecodes confertus Say, 1837	BA			DU	ES	FR	HN	HE	MI	NA	NO	PL			2020
Sphecodes coronus Mitchell, 1956	BA	BE		DU	ES	FR	HN	HE	MI	NA		PL	SU	WO	2020
Sphecodes cressonii (Robertson, 1903)	BA			DU		FR	HN	HE		NA		PL	SU	WO	2020
Sphecodes davisii Robertson, 1897	BA			DU	ES		HN	HE	MI	NA	NO	PL	SU	WO	2021
Sphecodes dichrous Smith, 1853	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2020
Sphecodes fattigi Mitchell, 1956[+,@]	BA						HN		MI					WO	2020
Sphecodes galerus Lovell and Cockerell, 1907		BE			ES	FR			MI			PL	SU		2020
Sphecodes heraclei Robertson, 1897	BA		BR	DU		FR	HN	HE	MI			PL	SU	HN	2021
Sphecodes illinoensis (Robertson, 1903)	BA		BR	DU		FR	HN	HE	MI	NA		PL	SU	WO	2015

FAMILY/Subfamily/Tribe/*Genus*/*Subgenus*/*species*	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	Most Recent Record
Sphecodes johnsonii Lovell, 1909		BE	BR	DU	ES	FR		HE	MI	NA		PL	SU	WO	2020
Sphecodes levis Lovell and Cockerell, 1907[+]		BE				FR	HN		MI	NA	NO			WO	2021
Sphecodes mandibularis Cresson, 1872	BA	BE		DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2020
Sphecodes minor Robertson, 1898	BA			DU	ES	FR	HN	HE	MI		NO	PL	SU	WO	2019
Sphecodes pimpinellae Robertson, 1900[+]	BA		BR	DU			HN	HE		NA	NO	PL	SU		2020
Sphecodes prosphorus Lovell and Cockerell, 1907 [†,+]								HE	MI		NO				1908
Sphecodes ranunculi Robertson, 1897	BA	BE		DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Sphecodes townesi Mitchell, 1956[+]		BE		DU		FR			MI					WO	2012
Rophitinae															
Rophitini															
Dufourea monardae (*Viereck, 1924*)[+, @]		BE													2019
Dufourea novaeangliae (Robertson, 1897)		BE	BR			FR	HN	HE	MI		NO	PL	SU	WO	2021
MEGACHILIDAE															
Megachilinae															
Anthidiini															
Anthidiellum (*Loyolanthidium*) *notatum notatum* (Latreille, 1809)	BA			DU	ES	FR	HN	HE	MI			PL	SU	WO	2021
Anthidium (*Anthidium*) *manicatum manicatum* (Linnaeus, 1758)[+, #]	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Anthidium (*Proanthidium*) *oblongatum oblongatum* (Illiger, 1806)[+, #]	BA	BE	BR		ES	FR	HN	HE	MI		NO	PL	SU	WO	2021
Dianthidium (*Dianthidium*) *simile* (Cresson, 1864) [†,+, @]															D, <1864
Paranthidium (*Paranthidium*) *jugatorium* (Say, 1824)[+, @]		BE													2020
Pseudoanthidium (*Pseudoanthidium*) *nanum* (Mocsáry, 1879)[+, @, #]	BA								MI				SU		2021
Stelis (*Dolichostelis*) *louisae* Cockerell, 1911[+]	BA				ES		HN	HE	MI		NO	PL			2020
Stelis (*Stelis*) *coarctatus* Crawford, 1916[+, @]						FR	HN	HE	MI						2019
Stelis (*Stelis*) *foederalis* Smith, 1854 [†,+, @]														WO	1892

FAMILY/Subfamily/Tribe/*Genus*/*Subgenus*/*species*	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	Most Recent Record
Stelis (*Stelis*) *labiata* (Provancher, 1888)[+,@]						FR			MI			PL		WO	2019
Stelis (*Stelis*) *lateralis* Cresson, 1864	BA			DU	ES	FR		HE		NA	NO	PL	SU		2019
Megachilini															
Coelioxys (*Allocoelioxys*) *coturnix* Pérez, 1884[+,@,#]								HE							2018
Coelioxys (*Boreocoelioxys*) *banksi* Crawford, 1914[+,@]		BE						HE							2020
Coelioxys (*Boreocoelioxys*) *moestus* Cresson, 1864						FR		HE	MI				SU	WO	2019
Coelioxys (*Boreocoelioxys*) *octodentatus* Say, 1824	BA				ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2020
Coelioxys (*Boreocoelioxys*) *porterae* Cockerell, 1900					ES	FR		HE	MI			PL		WO	2020
Coelioxys (*Boreocoelioxys*) *rufitarsis* Smith, 1854	BA	BE	BR	DU		FR		HE	MI	NA	NO	PL	SU	WO	2021
Coelioxys (*Boreocoelioxys*) *sayi* Robertson, 1897	BA			DU		FR	HN	HE	MI		NO	PL	SU	WO	2020
Coelioxys (*Coelioxys*) *sodalis* Cresson, 1878[+,@]	BA					FR	HN	HE	MI						2018
Coelioxys (*Cyrtocoelioxys*) *modestus* Smith, 1854	BA			DU	ES	FR	HN	HE	MI			PL		WO	2020
Coelioxys (*Paracoelioxys*) *funerarius* Smith, 1854[†]									MI					WO	<1972
Coelioxys (*Synocoelioxys*) *alternatus* Say, 1837						FR		HE	MI			PL			2019
Coelioxys (*Synocoelioxys*) *hunteri* Crawford, 1914[+,@]								HE	MI						2018
Coelioxys (*Xerocoelioxys*) *immaculatus* Cockerell, 1912	BA			DU					MI			PL			2017
Megachile (*Callomegachile*) *sculpturalis* Smith, 1853[+,#]	BA		BR	DU	ES	FR	HN	HE	MI		NO	PL	SU	WO	2020
Megachile (*Chelostomoides*) *campanulae* (Robertson, 1903)	BA	BE	BR	DU	ES	FR	HN	HE	MI		NO	PL	SU	WO	2021
Megachile (*Eutricharaea*) *rotundata* (Fabricius, 1793)[#]	BA	BE			ES	FR	HN	HE	MI		NO	PL	SU		2021
Megachile (*Leptorachis*) *petulans* Cresson, 1878[+]				DU											2011
Megachile (*Litomegachile*) *brevis* Say, 1837	BA			DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Megachile (*Litomegachile*) *mendica* Cresson, 1878	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Megachile (*Litomegachile*) *texana* Cresson, 1878	BA			DU		FR	HN	HE	MI		NO	PL	SU		2020
Megachile (*Megachile*) *centuncularis* (Linnaeus, 1758)[#]	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Megachile (*Megachile*) *inermis* Provancher, 1888	BA	BE												WO	2009
Megachile (*Megachile*) *montivaga* Cresson, 1878		BE			ES	FR	HN	HE	MI		NO	PL	SU	WO	2019
Megachile (*Megachile*) *relativa* Cresson, 1878	BA	BE			ES	FR	HN	HE	MI		NO	PL	SU	WO	2018

FAMILY/Subfamily/Tribe/*Genus*/*Subgenus*/*species*	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	Most Recent Record
Megachile (*Sayapis*) *frugalis frugalis* Cresson, 1872[+,@]	BA				ES				MI			PL		WO	2020
Megachile (*Sayapis*) *inimica sayi* Cresson, 1878[+]			BR		ES			HE	MI			PL		WO	2020
Megachile (*Sayapis*) *pugnata pugnata* Say, 1837		BE	BR		ES	FR		HE	MI		NO	PL			2021
Megachile (*Xanthosarus*) *addenda* Cresson, 1878	BA			DU	ES	FR	HN			NA	NO	PL		WO	2020
Megachile (*Xanthosarus*) *frigida frigida* Smith, 1853	BA				ES	FR	HN	HE	MI			PL	SU	WO	2021
Megachile (*Xanthosarus*) *gemula gemula* Cresson, 1878	BA	BE	BR	DU	ES	FR	HN	HE	MI		NO	PL	SU	WO	2019
Megachile (*Xanthosarus*) *latimanus* Say, 1823	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Megachile (*Xanthosarus*) *melanophaea melanophaea* Smith, 1853		BE		DU	ES	FR	HN	HE	MI			PL	SU	WO	2012
Megachile (*Xanthosarus*) *mucida* Cresson, 1878[+,@]	BA					FR		HE	MI			PL			2017
Osmiini															
Chelostoma (*Gyrodromella*) *rapunculi* (Lepeletier, 1841)[+,@,#]		BE						HE	MI						2019
Chelostoma (*Prochelostoma*) *philadelphi* (Robertson, 1891)[+,@]									MI						2020
Heriades (*Neotrypetes*) *carinata* Cresson, 1864		BE	BR		ES	FR	HN	HE	MI		NO	PL	SU	WO	2021
Heriades (*Neotrypetes*) *leavitti* Crawford, 1913[+,@]					ES										2008
Heriades (*Neotrypetes*) *variolosa variolosa* (Cresson, 1872)					ES								SU	WO	2011
Hoplitis (*Alcidamea*) *pilosifrons* (Cresson, 1864)	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU		2020
Hoplitis (*Alcidamea*) *producta producta* (Cresson, 1864)[+]	BA			DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2019
Hoplitis (*Alcidamea*) *spoliata* (Provancher, 1888)[+]	BA	BE		DU	ES	FR	HN	HE	MI		NO	PL	SU	WO	2020
Hoplitis (*Alcidamea*) *truncata truncata* (Cresson, 1878)	BA			DU	ES	FR	HN	HE	MI	NA		PL	SU	WO	2019
Osmia (*Diceratosmia*) *conjuncta* Cresson, 1864[†,+,@]								HE							1927
Osmia (*Helicosmia*) *caerulescens* (Linnaeus, 1758)[#]									MI				SU		2020
Osmia (*Helicosmia*) *georgica* Cresson, 1878					ES	FR	HN	HE	MI			PL		WO	2021
Osmia (*Melanosmia*) *albiventris* Cresson, 1864		BE			ES	FR		HE	MI			PL	SU	WO	2019
Osmia (*Melanosmia*) *atriventris* Cresson, 1864	BA	BE		DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2021
Osmia (*Melanosmia*) *bucephala* Cresson, 1864	BA	BE	BR		ES	FR	HN	HE	MI		NO	PL	SU	WO	2021

FAMILY/Subfamily/Tribe/*Genus*/*Subgenus*/*species*	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	Most Recent Record
Osmia (*Melanosmia*) *collinsiae* Robertson, 1905[+]						FR	HN		MI		NO	PL	SU	WO	2019
Osmia (*Melanosmia*) *distincta* Cresson, 1864	BA	BE				FR	HN	HE	MI			PL		WO	2019
Osmia (*Melanosmia*) *felti* Cockerell, 1911[†]															<1939, D
Osmia (*Melanosmia*) *inermis* (Zetterstedt, 1838)[†]									MI				SU		1914
Osmia (*Melanosmia*) *inspergens* Lovell and Cockerell, 1907	BA	BE			ES	FR	HN	HE	MI			PL	SU	WO	2019
Osmia (*Melanosmia*) *proxima* Cresson, 1864	BA					FR							SU	WO	2018
Osmia (*Melanosmia*) *pumila* Cresson, 1864	BA	BE	BR	DU	ES	FR	HN	HE	MI	NA	NO	PL	SU	WO	2020
Osmia (*Melanosmia*) *simillima* Smith, 1853				DU	ES	FR		HE	MI		NO	PL	SU		2019
Osmia (*Melanosmia*) *tersula* Cockerell, 1912[+, @]									MI					WO	2009
Osmia (*Melanosmia*) *virga* Sandhouse, 1939	BA			DU		FR	HN	HE	MI			PL		WO	2020
Osmia (*Osmia*) *cornifrons* (Radoszkowski, 1887)[+, #]	BA	BE	BR		ES	FR	HN	HE	MI		NO	PL	SU	WO	2021
Osmia (*Osmia*) *lignaria* Say, 1837	BA				ES	FR		HE	MI		NO	PL	SU	WO	2021
Osmia (*Osmia*) *taurus* (Smith, 1873)[+, @]	BA					FR		HE	MI		NO	PL		WO	2020
MELITTIDAE															
Melittinae															
Macropidini															
Macropis (*Macropis*) *ciliata* Patton, 1880	BA	BE			ES	FR	HN	HE	MI		NO	PL	SU	WO	2021
Macropis (*Macropis*) *nuda* (Provancher, 1882)	BA	BE				FR	HN	HE	MI		NO	PL		WO	2019
Macropis (*Macropis*) *patellata* Patton, 1880[†]	BA								MI						1933
Melittini															
Melitta (*Cilissa*) *americana* (Smith, 1853)	BA		BR			FR	HN	HE	MI	NA		PL		WO	2021
Melitta (*Cilissa*) *eickworti* (Snelling and Stage, 1995)[+, @]	BA					FR		HE							2021
Melitta (*Cilissa*) *melittoides* (Viereck, 1909)				DU	ES	FR	HN		MI					WO	2021
No. of species - 390	215	184	119	209	199	276	228	264	307	111	187	239	208	250	

Legend for Table 4 is on page 105

Legend for Table 4

[1] *Andrena ziziaeformis* was removed from subgenus *Derandrena* to *incertae sedis* within *Andrena* by Pisanty *et al.* (2021) based on its divergence from the type species of the subgenus, *Andrena vandykei* Cockerell from California and vicinity. *Andrena uvulariae* is likely related to *A. ziziaeformis* so is likewise treated as *incertae sedis* here.
[2] *Tylandrena* has been treated recently as a junior synonym of *Melandrena* (Pisanty *et al.*, 2021).
[3] Subgenus *Opandrena* has been reinstated as a valid subgenus distinct from *Holandrena* (Pisanty *et al.*, 2021).
[4] All New World *Euandrena* have been reassigned to subgenus *Ptilandrena* (Pisanty *et al.*, 2021).
[5] The *alleghaniensis* species group of subgenus *Scrapteropsis* is closer to subgenus *Rhaphandrena* than to typical *Scrapteropsis* (Pisanty *et al.*, 2021) so will likely be reassigned to that subgenus or a new subgenus.
[6] *Bombus* (*Psithyrus*) *fernaldae* (Franklin, 1911) was recently synonymized with *Bombus* (*Psithyrus*) *flavidus* Eversmann and eastern North America populations designated the subspecies *B.* (*Psithyrus*) *flavidus appalachiensis* Lhomme and Hines (Lhomme *et al.*, 2021).
[7] A broader concept of *Eucera* has been proposed to include *Peponapis* (Dorchin *et al.*, 2018), but we retain *Peponapis* as a genus pending improved resolution of phylogenetic relationships among *Eucera* sensu lato (especially *Tetraloniella* sensu lato).

Exotic Species

Out of roughly 35 species of exotic bees of Old World origin found in North America (USGS, 2019; Russo, 2016), 16 (46%) are known from Massachusetts (Table 4). The best known and most wide ranging exotic is the European honey bee, *Apis mellifera* Linnaeus, 1758. The majority of Massachusetts' exotic bees are widespread and relatively common throughout the state. *Apis mellifera*, *Lasioglossum leucozonium* (Schrank, 1781), *Anthidium manicatum* (Linnaeus, 1758), and *Megachile centuncularis* (Linnaeus, 1758) have all been documented from every county. The records and distributions of other exotic species are more restricted; *Hylaeus punctatus* (Brullé, 1832), *Pseudoanthidium nanum* (Mocsáry, 1879), *Chelostoma rapunculi* (Lepeletier, 1841), *Coelioxys coturnix* Pérez, 1884, and *Osmia caerulescens* (Linnaeus, 1758) are each known from few records in no more than two or three counties. The most recently discovered exotic species in the state are *Hylaeus leptocephalus* (Morawitz, 1870) (2014), *H. punctatus* (2012), *P. nanum* (2013), and *C. coturnix* (2014). Exotic species documented in our region, but not yet found in Massachusetts, include: *Hylaeus hyalinatus* Smith, 1842, *Halictus tectus* Radoszkowski, 1876, *Megachile apicalis* Spinola, 1808, and *Chelostoma campanularum* (Kirby, 1802).

DISCUSSION

Our county-level checklist represents our current understanding of the composition and distribution of bees species in Massachusetts. It reveals some general patterns of distribution and species richness, as well as regions of the state and habitats that are in need of greater sampling effort. Several historically recorded species have not been found in more recent surveys. The bee fauna contains numerous regionally uncommon and rare species including pollen specialists, cleptoparasites, and species near their range limits in the state.

Range Limits, Distribution and Richness

Based on available distributional data, Massachusetts appears at or near the southern limit in the East for at least eleven species: *Andrena nigrihirta* (Ashmead, 1890), *A. persimulata* Viereck, 1917, *Bombus borealis* Kirby, 1837, *Colletes consors mesocopus* Swenk, 1907, *Hylaeus basalis* (Smith, 1853), *Lasioglossum inconditum* (Cockerell, 1916), *L. zonulum* (Smith, 1848), *Coelioxys sodalis* Cresson, 1878, *Megachile melanophaea* Smith, 1853, *Osmia inermis* (Zetterstedt, 1838), and *O. tersula* Cockerell, 1912. Ten others are at or near their northern limit: *Andrena atlantica* Mitchell, 1960, *A. fenningeri* Viereck, 1922, *A. heraclei* Robertson, 1897, *A. ilicis* Mitchell, 1960, *A. neonana* Viereck, 1917, *Panurginus potentillae* (Crawford, 1916), *Pseudopanurgus pauper* (Cresson, 1878), *Melissodes dentiventris* Smith, 1854, *Megachile petulans* Cresson, 1878, and *Osmia conjuncta* Cresson, 1864.

Several species, some along with their cleptoparasites, have been collected primarily or exclusively in counties west of the Connecticut River. Of those which are oligolectic species, this is also where their host plants appear to be most abundant (host genera in parentheses). These species include: *Andrena aliciae* Robertson, 1891 and *A. helianthi* Robertson, 1891 (*Helianthus*; Asteraceae; note that *A. helianthi* also occurs locally in the Boston area), along with their presumed cleptoparasite *Nomada vincta* Say, 1837. Other species include: *Andrena parnassiae* (*Parnassia*; Celastraceae), *A. geranii* Robertson, 1891 (*Hydrophyllum*; Boraginaceae), *A. ziziaeformis* Cockerell, 1908, and *Panurginus potentillae* (*Potentilla*; Rosaceae), and *Triepeolus helianthi* (Robertson, 1897) (a cleptoparasite of *Melissodes*).

At least two species, *Hylaeus schwarzii* and *Lasioglossum marinum*, have been recorded exclusively in coastal counties, while others (*Andrena wellesleyana* Robertson, 1897, *Lasioglossum georgeickworti* Gibbs, 2011, *L. katherineae* Gibbs, 2011, *L. pilosum* (Smith, 1853), *L. pruinosum* (Robertson, 1892), and *L. vierecki* (Crawford, 1904)) are also associated with interior sand plains and former gravel and sandpits. Numerous species with typically more southern distributions have been documented mainly or exclusively from coastal counties. These include *Andrena atlantica, A. ilicis, Perdita bradleyi* Viereck, 1907, *Melissodes dentiventris, Colletes speculiferus* Cockerell, 1927, *Megachile petulans*, and the exotic *Hylaeus punctatus*.

The documentation of high species richness, roughly half the state fauna or greater, from both Martha's Vineyard (approximately 210 sq. kilometers of land mass) and Montague Plain (15 sq. kilometers, but one of the largest inland sandplains in Massachusetts), probably reflects in part the intensity with which these areas were surveyed over multiple years as well as the predominance of well drained sandy soils and host plant variability in both areas. But it may also speak to the dynamic nature of local bee faunas. Indeed, the fact that over a third of the species documented from Martha's Vineyard were captured in only one of the two years of primary surveys implies that a significant number of species resident on the island have yet to be recorded. More generally, we expect the local composition of bee faunas (and those of most insects) to be highly fluid, depending on scale.

Although greater sampling effort for bees is recommended in much of the state, the counties which are least well-represented in modern surveys but likely to harbor interesting or unusual bees include Barnstable (Cape Cod), Bristol, Berkshire, and Essex counties. Targeting under-sampled habitats in these counties may uncover additional extralimital species with specific affinities, particularly southern coastal plain species in the sandplains and dunes of Barnstable County and boreal species at higher elevations in Berkshire County.

Localized Sampling and Variation in Recorded Species Across Counties

The number of documented species varies considerably among counties and ranges from as few as 111 in Nantucket County and 119 Bristol County to as many as 307 (79% of known Massachusetts species) in Middlesex County (Table 5, Fig. 1). Most Massachusetts counties are not biogeographically discrete (exceptions being Barnstable County, Dukes County, and Nantucket County) and there is little variation in recorded per-county species composition that cannot be attributed to the intensity of historical and/or recent collecting. Collection efforts have not been uniformly distributed throughout the Commonwealth, either historically or recently, and significant gaps occur in the coverage of central and southern Worcester County and much of interior of Bristol and Plymouth counties (Fig. 2). The relatively high counts for Plymouth County (239 spp.), Franklin County (274 spp.), and to some degree Dukes County (208 spp.) (which is less than 260 square kilometers), reflect recent surveys (Tables 1, 4). The high numbers of recorded species in Middlesex County (307spp.), Hampden County (228 spp.), Hampshire County (264 spp.), and Worcester County (250 spp.) have no doubt been influenced by their proximity to several of the authors' homes and to colleges and universities. Hampshire County, for example, is home to the flagship campus of the University of Massachusetts, the state's land-grant university and the former home of the Hatch Agricultural Experiment Station, which was the source of many early Massachusetts bee records.

Comparison with Other States

The 390 valid bee species recorded from Massachusetts include most (85.5%) of the 456 species recorded from New England as a whole and nearly half (46.5%) of the 839 species recorded from the Eastern United States. The species total we report from Massachusetts is comparable to that of other states in the Northeast and Midwest (Table 6) but much lower than those for Southwestern states. JSA (unpubl.) has compiled bee distributional records for political areas globally (Orr *et al.*, 2021) including for all of the Eastern United States, supplemented with unpublished records provided by collaborators and correspondents (notably S. Droege, pers. comm.). Of the New England states, Connecticut appears to support the greatest overlap in bee fauna with Massachusetts (Jaccard Similarity Index value of 0.84), followed by New Hampshire (0.74), Vermont (0.71), Maine (0.61), and Rhode Island (0.54) (Table 6). Massachusetts shares most of its southern border with Connecticut along with several contiguous geographical features, including river valleys and mountain ranges. Both states have similar land-use histories, floral assemblages, and forest types, particularly in the areas where they meet. New Hampshire, Vermont, Maine, and New York have more extensive mountainous regions, and their faunas include boreal species less likely to be found in Massachusetts.

Species recorded from Massachusetts but not from adjoining states include *Andrena atlantica*, *Nomada capillata* Mitchell, 1962, *N. erigeronis* Robertson, 1897, *N. rodecki* Mitchell, 1962, *Lasioglossum furunculum* Gibbs 2011, *L. izawsum* Gibbs, 2011, *L. wheeleri* (Mitchell, 1960), and *Coelioxys banksi* Crawford, 1914. Both *N. capillata* and *L. wheeleri* are known only from their Massachusetts holotypes. See Appendix B for data and notes regarding these species. At least a dozen species collected in nearby states but not yet recorded from Massachusetts are likely to be found there with continued sampling effort. (Appendix C).

The taxonomic and behavioral/social compositions of the Massachusetts bee fauna are similar to that of Martha's Vineyard (Goldstein and Ascher, 2016) and Black Rock Forest, New York (Giles and Ascher, 2006), as well as other states in the Northeast where data are available, including Maine (Dibble *et al.*, 2017), New York (Ascher *et al.*, 2014), Pennsylvania (Donovall

and vanEnglesdorp, 2010; Kilpatrick *et al.*, 2020), Vermont (Hardy, *et al.*, 2021), and Michigan (Gibbs, *et al.*, 2017).

Table 5. Number of bee species in Massachusetts per county, with approximate number of collecting events, land area, and number of available records.

County	Species	Collection Events[1]	Area[2] (sq. km.)	Specimen/Citizen Science Records[1]
Nantucket	111	64	124	1,828/60
Bristol	119	47	1440	395/374
Berkshire	184	160	2411	1,839/330
Norfolk	187	165	1036	1,352/1035
Essex	199	199	1290	997/1634
Suffolk	208	367	150	6,084/1810
Dukes	209	626	269	21,658/159
Barnstable	215	346	1026	2,476/1187
Hampden	228	685	1600	6,129/347
Plymouth	239	387	1711	11,398/556
Worcester	250	455	3918	3,838/1278
Hampshire	264	594	1370	3,073/643
Franklin	276	974	1818	10,980/40
Middlesex	307	862	2134	4,099/9971

[1] Based upon available digitized records. Specimen totals are noted first, followed by number of observations on iNaturalist

[2] Source: https://en.wikipedia.org/wiki/List_of_counties_in_Massachusetts

Table 6. Bee species richness reported for ten states.

State	Species Count[1]	Source	Jaccard Similarity Index- (New England States)
Michigan	460	Gibbs *et al.*, 2017	-
New York	454	Ascher *et al.*, 2014	-
Pennsylvania	415	Kilpatrick *et al.*, 2020, 2021	-
Wisconsin	416	Wolf and Ascher 2009	-
Massachusetts	390	Current study	1.00
Connecticut	377	T. Zarrillo, pers. comm.	0.84
New Hampshire	325[2]	JSA, MFV unpubl. data sets	0.74
Vermont	319	Hardy *et al.*, 2021	0.71
Maine	278	Dibble *et al.*, 2017	0.61
Rhode Island	218	JSA, H. Ginsberg (pers. comm.)	0.54

[1] Totals include only valid species accepted as certainly confirmed for the state by JSA (unpublished) except New Hampshire and Rhode Island where estimated totals are reported. Additional morphospecies and records lacking adequate documentation were excluded, whereas some newly confirmed records were included.

[2] Species totals are an update of Ascher and Pickering, 2020, which did not accept several new state records reported for New Hampshire by Tucker and Rehan, 2016.

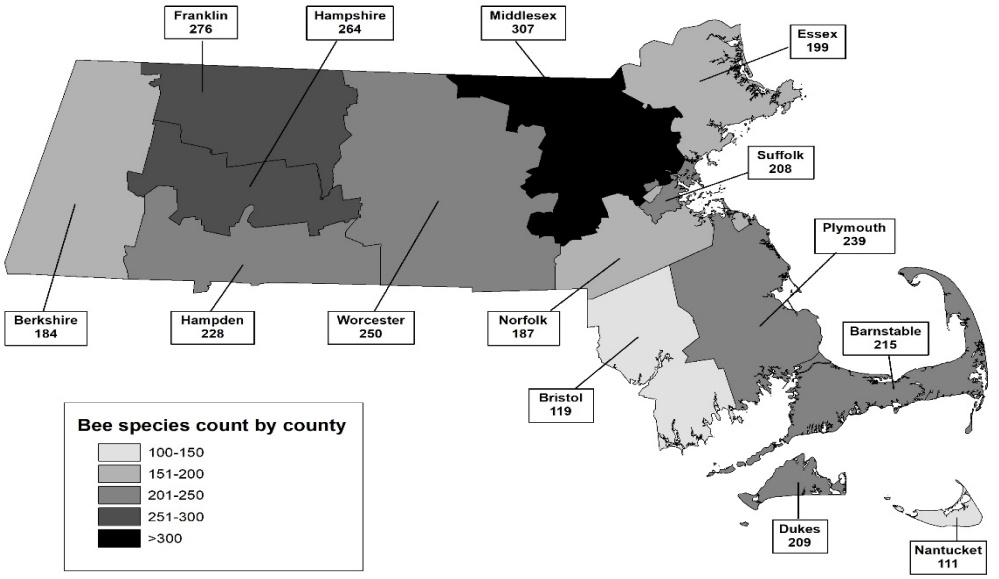

Figure 1. Numbers of Massachusetts bee species documented per county. (Courtesy of Mass. Natural Heritage and Endangered Species Program).

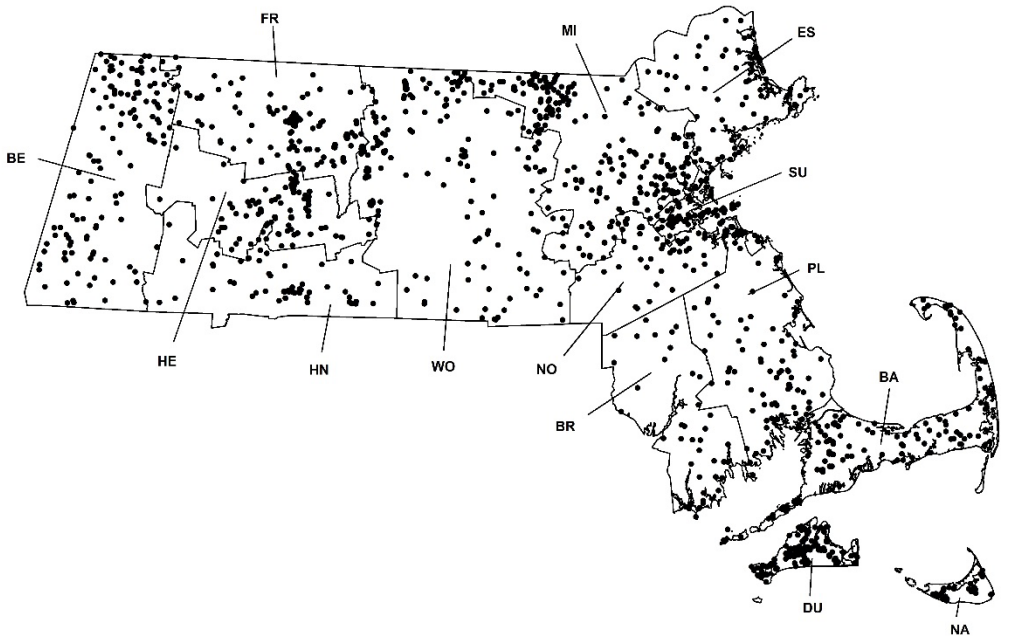

Figure 2. Distribution of bee collecting locations in Massachusetts. County abbreviations: BA - Barnstable, BE - Berkshire, BR - Bristol, DU - Dukes, ES - Essex, FR - Franklin, HN - Hampden, HR - Hampshire, MI - Middlesex, NA - Nantucket, NO - Norfolk, PL - Plymouth, SU - Sussex, WO - Worcester. (Courtesy of Mass. Natural Heritage and Endangered Species Program).

Notable Occurrences, Additions, and Rediscoveries

Species of potential interest include several newly reported from Massachusetts and others rediscovered as a result of targeted collecting at host plants and in unique habitats. For example, targeted searches in 2019 and 2020 for *Andrena parnassiae*, a rarely collected specialist on grass-of-Parnassus (*Parnassia* spp.), resulted in the documentation of eight new locations: seven in Berkshire County and one in Franklin County. Its host plant in the Northeast, fen grass-of-Parnassus *P. glauca* Raf., grows almost exclusively in calcareous wetlands and flowers in late summer through early fall. It is notable that *A. parnassiae* were collected in every wetland where substantial numbers of *P. glauca* plants were flowering, suggesting that this bee may be more widespread than once believed. In 2020, *Andrena rehni*, believed to be a specialist on American Chestnut (*Castanea dentata*; Fabaceae) and possibly other species of *Castanea*, was rediscovered in Massachusetts after at least 47 years. A record of *A. rehni* collected in 2019 in a hybrid American Chestnut orchard in Connecticut (Sam Droege, pers. comm.) prompted a survey for this species. In 2020 several female *A. rehni* were collected on native American Chestnut flowers growing from stump sprouts in Monson, Hampden County, at a site where extensive tornado damage had occurred ten years prior, and in 2021 it was also found at a site in Easthampton, Hampshire Co., that had similarly sustained considerable damage from a microburst in 2014. In 2019, *Melitta eickworti* (Snelling and Stage, 1995) was collected in the state for the first time on its host plant, deerberry (*Vaccinium stamineum*; Ericaceae). This species was first described in 1995 (Snelling and Stage, 1995) and is closely related to *M. americana* (Smith, 1853) with which it has likely been confused in the past.

Some other recent species discoveries are also of note. Previously known only from its male holotype collected in 1950 in Southern Pines, North Carolina (Mitchell, 1962), a single male *Nomada rodecki* was collected on maleberry (*Lyonia ligustrina*; (Ericaceae) in 2007. Since then, both male and females have been collected at seven other sites in Massachusetts, and in all cases associated with maleberry or large cranberry (*Vaccinium macrocarpon*; Ericaceae). In several cases individuals were collected together with either *Melitta melittoides* (Viereck, 1909), a *Lyonia* specialist, or *Melitta americana*, a *Vaccinium* specialist found regularly in both commercial and wild cranberry bogs. Both *Melitta* species are uncommonly collected bees. Goldstein and Ascher (2016) specifically targeted *Lyonia* and concluded that *N. rodecki* is most likely a cleptoparasite of *Melitta* spp. To the best of our knowledge, the only other state where *N. rodecki* has been collected recently is New Jersey where it was collected in cranberry bogs where *M. americana* was abundant (D. Cariveau, unpubl). Targeted collecting on *Lyonia* spp. and *Vaccinium macrocarpon* for both *Melitta* spp. and *N. rodecki* are encouraged elsewhere in the Eastern US.

Considered by some to be one of the rarest bees in North America, *Epeoloides pilosulus* was rediscovered in Massachusetts in 2018. This cleptoparasite of oil-collecting bees in the genus *Macropis* Panzer had not been found in collections from the state since 1927. It is currently known from six sites in four counties (Appendix B). At one site, over a dozen individuals were observed either visiting *Apocynum androsaemifolium* (Apocynaceae) flowers or searching for *Macropis* spp. nests along an exposed bank. We are aware of no other New England state with more than one modern site record for this species. *Epeoloides pilosulus* had not been documented in North America between 1960 and 2002, when it was discovered in Nova Scotia (Sheffield *et al.*, 2004). In New England, this species was rediscovered in 2006 along a Connecticut powerline right-of-way (ROW) (Wagner and Ascher, 2008). In the Northeast, specimens have subsequently been collected in New York (2014, http://bugguide.net/node/view/954741), Maine (2016; Dibble *et al.*, 2017), New Hampshire (Wagner *et al.*, 2019), and, as reported here, in Mas-

sachusetts in 2018-2020 (Appendix. C). Elsewhere in the U.S., *E. pilosulus* was found for the first time in seventy years in Michigan (2018; Wood *et al.*, 2019) and Wisconsin (2019; USDA, 2019); in Canada it was reported for the first time in Alberta (2010; Sheffield and Heron, 2018) and was recently rediscovered in Manitoba after 95 years (2019; Gibbs *et al.*, 2020). Before its rediscovery in 2002 *E. pilosulus* was suspected of being extinct (Sheffield *et al.*, 2004). However, with the increasing interest and effort in documenting bee faunas, it is clear that *E. pilosulus* persists over a large geographic range.

Several regional endemics uncommonly collected elsewhere within the Northeast have regularly been collected in Massachusetts. *Andrena kalmiae* Atwood, 1934, a laurel specialist (*Kalmia* spp.; Ericaceae) can be locally abundant on sheep laurel (*K. angustifolia*), especially along managed powerline rights-of-way where its host plant can be common. The diminutive *Perdita novaeangliae* Viereck, 1907 has been collected with increasing frequency in the past several years as efforts have targeted maleberry (*Lyonia ligustrina*) along with other uncommonly collected *Lyonia*-specialist bees *Melitta melittoides* and *Colletes productus* Robertson, 1891. *Lasioglossum izawsum,* a presumed social parasite of other *Lasioglossum* (*Dialictus*) species, including *L. katherineae*, was captured in large numbers in bowl traps in the Montague Plains Wildlife Management Area. The only other state from which this species has been documented is Pennsylvania (Gibbs, 2011; Kilpatrick *et al.*, 2020).

Possible Faunal Change Versus Persistence in the Massachusetts Bee Fauna

One value of checklists is that they provide a coarse baseline from which to gauge major changes in bee faunas over time. It is unclear whether the absence of 23 species recorded historically from Massachusetts, but not collected in that past 15 years of relatively intensive sampling, reflects local gaps in sampling or actual species declines.

The 23 historical species are all considered uncommon or rare in collections from the northeastern U.S. There are fewer than five known Massachusetts records for 22 of these species, and most are known from only one or two records from the state (Table 7). It is possible, if not likely, that these species persist in Massachusetts in such low numbers that they have proven difficult to re-verify. The Massachusetts records for eight of the 23 historical species represent the limits or near-limits of their distributions, and their records may therefore represent vagrants or ephemeral populations. Importantly, almost half (10) of the 23 historical species are of questionable taxonomic status and/or are difficult to identify; and thus may be miscurated in collections.

With the exceptions of *Bombus auricomus* (Robertson, 1903), *B. rufocinctus* Cresson, 1863, and possibly *Lasioglossum achilleae* (Mitchell, 1960) and *L. wheeleri*, all the historical species are solitary. We also note that of these 23 species, the proportion of parasitic species (39%, 9 spp.) is greater than that for the recorded Massachusetts fauna as a whole (25%, 97 spp.). This may be explained in part by the taxonomic issues and identification problems associated with cleptoparasitic genera *Nomada* and *Sphecodes* and/or to the typically low numbers of specimens of parasitic species in collections compared to pollen-collecting species. Parasitic species in general tend to be less frequently collected and thus appear "rarer" than their hosts for obvious biological reasons, a phenomenon amplified when the host itself is a specialist. Parasitic bees also tend to be underrepresented in collections that derive from generalized survey methods (Goldstein and Scott, 2015; Goldstein and Ascher, 2016), and for many, the host species are either poorly understood or completely unknown. See Appendix B for accounts of known and probable hosts of the uncommonly collected cleptoparasites *Holcopasites illinoiensis* (Robertson, 1891), *Triepeolus remigatus* (Fabricius, 1804), *Nomada rodecki*, *N. vincta*, *Epeoloides pilosulus*, *Sphecodes*

banksii Mitchell, 1956, *Stelis foederalis* Smith, 1854, *Coelioxys coturnix*, *C. banksi*, and *C. funerarius*. Likewise, pollen specialists (oligoleges) tend to be more seasonally restricted and less frequently encountered than polylectic social bees which tend to be active throughout more of the season and visit a broader range of floral hosts over the course of a given season. As such, oligolectic bees and their parasites are expected to be among the most infrequently encountered, and therefore least thoroughly collected, and to be over-represented among species suspected of decline (Goldstein and Scott, 2015; Goldstein and Ascher, 2016).

Several species may have been under-collected because they are specialists on plants which have not been widely targeted, are uncommon in Massachusetts, or are associated with under-sampled or geographically restricted habitats. These include (host genera in parentheses) *Andrena parnassiae* (*Parnassia*), *A. krigiana* Robertson, 1901 (*Krigia*; Asteraceae), *A. rehni* (*Castanea*), *Perdita novaeangliae* (*Lyonia*), *P. halictoides* Smith, 1853 (*Physalis*; Solanaceae), *Panurginus potentillae* (*Potentilla*), *Pseudopanurgus pauper* (*Ceanothus*; Rosaceae), *Colletes aestivalis* Patton, 1879 (*Heuchera*; Saxifragaceae), *C. banksii* (*Ilex*; Aquifoliaceae), *C. willistoni* Robertson, 1891 (*Physalis*), *Hylaeus nelumbonis* (Robertson, 1890) (*Nymphaea*; Nymphaeaceae), *Lasioglossum pectinatum* (Robertson, 1890) (*Physalis*), *Dufourea monardae* (Viereck, 1924) (*Monarda*; Lamiaceae), and *Melitta eickworti* (*Vaccinium stamineum*). Targeted collecting on host plants of specialist bees (Hurd, 1979; Fowler, 2016) is critical to our understanding of any fauna, since specialist bees are among those least likely to be captured by generalized sweep-netting and bowl trap surveys (Goldstein and Scott, 2015; Goldstein and Ascher, 2016).

The only one of the 23 historical species with more than five records, *Bombus ashtoni* (Cresson, 1864), is recorded from nine counties and is known from approximately 70 records in Massachusetts. The Nearctic *Bombus ashtoni* is considered by Williams *et al.* (2014) to be a junior synonym of *B. bohemicus* Seidl, 1838, a species that ranges throughout the Palearctic. The decline of this species in the Northeast and elsewhere over the past two decades, especially in the southern portion of its historic range, is well documented and has been correlated with parallel declines of its host species *B. affinis* Cresson, 1863 and *B. terricola* Kirby, 1837 (Colla and Packer, 2008; Cameron *et al.*, 2011; Colla *et al.*, 2012; Richardson *et al.*, 2018).

In addition to *B. ashtoni*, we flag five historical species whose populations appear to have experienced regional declines based on a drastic drop-off in recent observations (Table 7). Two of these are pollen specialists; *Pseudopanurgus pauper*, a specialist on *Ceanothus*, and *Macropis patellata* Patton, 1880, a specialist on *Lysimachia* (Primulaceae). Reduced host plant populations resulting from impacts such as reforestation and deer browse may have contributed to their apparent declines. Reforestation in New England, beginning in the mid-nineteenth century as a result of the abandonment of agricultural land (Foster, 1992), may also have contributed to the regional decline of *Bombus auricomus*. The remaining two historical species, *Holcopasites illinoiensis* and *Coelioxys funerarius* Smith, 1854, are both cleptoparasites. However, most of their known hosts are well-represented in modern Massachusetts collections (See Appendix B).

Threats to Bees and Conservation

Threats to wild bees are varied. They include bee-specific phenomena such as pathogen spillover from exotic bees (Cameron *et al.*, 2011; Cordes *et al.*, 2012; Goulson *et al.*, 2015; Hedtke *et al.*, 2015), competition from exotic bees (Laporte and Minckley, 2012; Roulston and Malfi, 2012; LeCroy *et al.*, 2020), and plant community-level such as the loss of forest understory plants to deer browse (Goldstein and Ascher, 2016; Richins, 2020; Sakata and Yamasaki, 2015) and the loss of grasslands and shrublands to fire-suppression and forest succession (Roberts *et al.*

Table 7. Bee species not collected in Massachusetts in the past 15 years (2005-2019).

Species	Details	Most Recent Year	No. records	Notes
Pseudopanurgus pauper	DEC	<1932	1	Absent from recent collections throughout the Northeast. Reforestation and deer browse on host plant (*Ceanothus*) may have contributed to decline.
Anthophora ursina	DEC, L(N)	1914	3	Absent from recent collections throughout Northeast.
Bombus auricomus	L(N)	1973	4	Reforestation may have contributed to historical decline in New England.
Bombus rufocinctus		1990	2	Historically rare and local in the Northeast.
Bombus ashtoni	DEC	1997	approx. 70	Well documented large-scale decline throughout Northeast.
Holcopasites illinoiensis	DEC, L(N)	1925	2	Few or no recent records in the Northeast.
Nomada capillata	T, ID	1902	1	Known only from the male holotype.
Nomada dreisbachi	T, ID	1901	1	Female unknown, very few records throughout its range.
Nomada integerrima	ID	1904	2	Rare and enigmatic.
Colletes aestivalis	L(N)	<1954	1	MA is outside range of native pollen plant (*Heuchera americana*), although it is widely cultivated.
Colletes consors mesocopus	L(S)	<1954	1	Primarily boreal in distribution.
Hylaeus saniculae	ID	<1954	2	Possibly overlooked in collections of *H. mesillae*, generally rare throughout range.
Lasioglossum achilleae	ID	1905	2	A rare and poorly known species.
Lasioglossum wheeleri	ID	1922	1	Known only from the male holotype.
Sphecodes clematidis	ID	<1909	1	Difficult to separate from similar members of genus which is in need of revision.
Sphecodes prosphorus	ID	1908	4	Difficult to separate from similar members of genus which is in need of revision.
Dianthidium simile		<1864	2	Rare in collections throughout range.
Stelis foederalis	L(N)	1892	1	Most species of *Stelis* are rare in collections.
Coelioxys funerarius	DEC, L(N)	"72"	2	No known modern records in Northeast; may be extirpated.
Osmia conjuncta	L(N)	1927	2	Nests in snail shells, possibly occurs locally.
Osmia felti	ID	<1939	1	Historically *O. virga* were misidentified as this. Primarily boreal and montane.
Osmia inermis	ID	1914	2	Primarily boreal in the East.
Macropis patellata	DEC	1933	2	Very few modern records in Northeast and elsewhere. Specialist on *Lysimachia* spp.

DEC - declining regional population; L(N) - near its known northern range limit; L(S) - near its known southern range limit; T - taxonomic uncertainty; ID - identification difficulties. Most recent year = year of most recent documented record for Massachusetts; <[date] - record with no year indicated, year of publication or year of collector's death is noted; No. records = number of known Massachusetts records.

2017; Taki, 2013), as well as systemic threats such as generalized habitat loss and fragmentation (Brown and Paxton, 2009; Goulson *et al.*, 2015; Koh *et al.*, 2016), misuse of pesticides (Goulson *et al.*, 2015; Tsvetkov *et al.*, 2017; Woodcock *et al.*, 2017), climate change (Stout and Morales, 2009; Kerr *et al.*, 2015), and the spread of invasive plants (Stout and Morales, 2009).

Massachusetts has one of the highest population growth rates in the Northeast (5.3% annually, UMass Donahue Institute, 2021). Urban sprawl and development have contributed to increased habitat loss and fragmentation (Ricci *et al.*, 2020). Historical suppression of natural disturbances, especially fire, to protect personal property has led to the reduction of natural communities including both coastal and inland pitch pine/scrub oak woodlands and grasslands, and an increase in closed-canopy forests (Commonwealth of Massachusetts, 2021). Fortunately, efforts are currently underway by the Massachusetts Division of Fisheries and Wildlife and others to restore and maintain a portion of this bee-rich habitat. Climate change/global warming with rising sea level poses a threat to Massachusetts extensive coastline and coastal natural communities and has the potential to shift bee populations throughout the state northwards and/or upslope.

Concern over widespread declines in pollinators has resulted in numerous efforts to increase plantings of native plants in urban and residential settings (including green spaces such as community gardens and roadside plantings) and in certification programs that support pollinator conservation in cities, towns, and counties (Fetridge *et al.*, 2008; Matteson *et al.*, 2008; Pardee and Philpot, 2014; Hall, *et al.*, 2017). Studies have documented increased bee diversity following restoration efforts in grasslands and barrens (Bried and Dillon, 2012; Tonietto and Larkin, 2017, Milam *et al.*, 2018). Systemic threats to pollinators, including climate change, present challenges that may be outside the power of legislative tools to protect native bees.

There appear to be both taxonomic and behavioral patterns in declines and persistence of bees over time, but these are difficult to parse given the range of intensity and methods with which many bees have been surveyed (Bartomeus *et al.*, 2013; Portman *et al.*, 2020). Collection data for bumble bees (*Bombus* spp.) are relatively extensive. Analyses (Cameron *et al.*, 2011; Cameron and Sadd, 2020) have demonstrated declines in a number of species. For example, *Bombus affinis* has been extirpated from much of its historic range, including New England, and has been listed as endangered under the federal Endangered Species Act (U.S. Fish and Wildlife Service, 2017). The most recent documented record for this species in the Northeast is from Cape Cod (Barnstable County) in 2009.

In 2019, three bees were added to the Massachusetts list of Endangered, Threatened and Special Concern Species for the first time (MANHESP, 2019a,b,c). Massachusetts is the third New England state to place bees under formal protection as endangered or threatened species, but assessment of what constitutes critical habitat for such species presents an obvious challenge to enforcement. *Bombus pensylvanicus* (DeGeer, 1773) and *Anthophora walshii* Cresson, 1869 were listed as Endangered and *B. terricola* as Threatened. *Bombus terricola* was once widespread in Massachusetts, and there are historical records from all fourteen counties, but modern records suggest that this species persists in only scattered populations in the state's western counties. *Bombus terricola* populations remain more robust in northern New England (Dibble *et al.*, 2017; Tucker and Rehan, 2017; Richardson *et al.*, 2018). Although it was neither as historically widespread nor as common in Massachusetts as *B. terricola*, *B. pensylvanicus* was collected regularly until the last few decades. The most recent record we know of is from Franklin County in 2012. The decline of this species in Massachusetts and other New England states may be associated with re-forestation of the landscape since the early part of the 20th century (Richardson

et al. 2018). *Bombus pensylvanicus* remains abundant within its core range in the southern U.S. (Colla and Packer, 2008; Cameron *et al.*, 2011; Colla *et al.*, 2012). *Anthophora walshii* had not been recorded in Massachusetts or anywhere east of Ohio for over four decades until its rediscovery on Martha's Vineyard in 2010 (Goldstein and Ascher, 2016). With only a few site records, it is localized in Massachusetts and remains widely separated from its core range in the Midwest. The documented distribution of this species in Massachusetts is southeastern, including Martha's Vineyard Island, Cape Cod, and (historically) Penikese Island, and it appears to be strongly associated with high concentrations of *Baptisia tinctoria* (Fabaceae) in open sandplain habitats. These habitats have been subject to intensive degradation by development and afforestation due to fire suppression (Breunig, 2003; New England Wildflower Society, 2015).

Although assessing the regional status of many bee species is not feasible at present due to the lack of understanding of their specific habitat requirements and the lack of adequate baseline data on their abundance and distribution (NAS, 2007; Potts *et al.*, 2010; Winfree, 2010; Bartomeus, 2013; Goulson *et al.*, 2015; Harmon-Threatt, 2020), we intend that this checklist provide a baseline reference point useful for monitoring the ensemble bee fauna. Additional research, including surveys of under-sampled habitats and monitoring of specific populations to evaluate persistence, will be needed to develop a more comprehensive understanding of bee community dynamics. It is our hope that this paper will provide a foundation for future Massachusetts bee research and encourage additional collection efforts and photographic documentation that will refine our understanding of bees region-wide and inform conservation efforts.

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LITERATURE CITED

Ascher, J. S., P. Gambino, and S. Droege. 2006. Adventive *Hylaeus* (*Spatulariella*) Popov in the New World (Hymenoptera: Apoidea: Colletidae). *Proceedings of the Entomological Society of Washington* 108: 237-239.

Ascher, J. S., S. Kornbluth, and R. G. Goelet. 2014. Bees (Hymenoptera: Apoidea: Anthophila) of

Gardiners Island, Suffolk County, New York. *Northeastern Naturalist* 21: 47-71.
Ascher, J. S., and J. Pickering. 2020. *Discover Life bee species guide and world checklist (Hymenoptera: Apoidea: Anthophila)*. Draft-50. https://www.discoverlife.org/mp/20q?guide=Apoidea_species&flags=HAS. Accessed 18 Aug. 2020.
Averill, A. L., M. M. Sylvia, N. Hahn, and A. V. Couto. 2018. Bees (Hymenoptera: Apoidea) foraging on American cranberry in Massachusetts. *Northeastern Naturalist* 25(3): 502-512.
Baker, J. R. 1975. Taxonomy of five Nearctic subgenera of *Coelioxys* (Hymenoptera: Megachilidae). *University of Kansas Science Bulletin* 50(12): 649-730.
Bartomeus, I., J. S. Ascher, J. Gibbs, B. N. Danforth, D. L. Wagner, S.M. Hedtke, and R. Winfree. 2013. Historical changes in northeastern US bee pollinators related to shared ecological traits. *Proceedings of the National Academy of Sciences* 110: 4656-4660.
Bequaert, J. 1920. Hymenoptera collected near Boston, Mass., with description of a variety of *Bombus affinis*. *Psyche* 27: 6-12.
Biesmeijer, J. C., S.P.M. Roberts, M. Reemer, R. Ohlemuller, M. Edwards, T. Peeters, A. P. Schaffers, S. G. Potts, R. Kleukers, C. D. Thomas, J. Settele, and W. E. Kunin. 2006. Parallel declines in pollinators and insect-pollinated plants in Britain and the Netherlands. *Science* 313: 351-354.
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.
Breunig, K. 2003. *Losing Ground: At What Cost?* Massachusetts Audubon Society, Inc., Lincoln, Massachusetts, 28 pp. Available online at: https://www.massaudubon.org/our-conservation-work/advocacy/shaping-the-future-of-your-community/publications-community-resources/losing-ground/previous-editions
Bried, J. T., and A. M. Dillon. 2012. Bee diversity in scrub oak patches 2 years after mow and herbicide treatment. *Insect Conservation and Diversity* 5: 237-243. Available online at: https://doi.org/10.1111/j.1752-4598.2011.00154.x
Broemeling, D. K., and Moalif, A. S. 1988. A revision of the *Nomada* subgenus *Pachynomada* (Hymenoptera: Anthophoridae). *Pan-Pacific Entomologist* 64(3): 201-227.
Brown, M.J.F., and R. J. Paxton. 2009. The conservation of bees: A global perspective. *Apidologie* 40: 410-416.
Brumley, R. L. 1965. *A Revision of the Bee Genus Epeolus Latreille of Western America North of Mexico*. M.S. thesis. Utah State University; Logan, Utah. 92 pp.
Buck, M., S. Paiero, and S. Marshall. 2005. New records of native and introduced aculeate Hymenoptera from Ontario, with keys to eastern Canadian species of *Cerceris* (Crabronidae) and eastern Nearctic species of *Chelostoma* (Megachilidae). *Journal of the Entomological Society of Ontario* 136: 37-52.
BugGuide.net. *Anthophila*. https://bugguide.net/node/view/8267/bgpage. Accessed 20 Sep. 2020.
Cameron, S. A., J. D. Lozier, J. P. Strange, J. B. Koch, N. Cordes, L. F. Solter, and T. L. Griswold. 2011. Patterns of widespread decline in North American bumble bees. *Proceedings of the National Academy of Sciences* 108: 662-667. Available online at: https://doi.org/10.1073/pnas.1014743108.
Cameron, S. A. and B. M. Sadd, B.M. 2020. Global trends in bumble bee health. *Annual Review of Entomology*, 65: 209-232.
Cane, J. H. 1989. Nesting biology notes for *Perdita (Alloperdita) bradleyi* Viereck (Hymenoptera: Andrenidae). *Journal of the Kansas Entomological Society* 62(1): 140-143.
Cane, J. H., G. C. Eickwort, F. R. Wesley, and J. Spielholz. 1985. Pollination ecology of *Vaccinium stamineum* (Ericaceae: Vaccinoideae). *American Journal of Botany* 72: 135-142.

Cane, J. H., D. Schiffhauer, and L. J. Kervin. 1996. Pollination ecology of the leaf-cutting bee *Megachile (Delomegachile) addenda* (Hymenoptera: Megachilidae) on cranberry beds. *Annals of the Entomological Society of America* 89(3):361-367.

Coelho, B.W.T. 2004. A review of the bee genus *Augochlorella* (Hymenoptera: Halictidae: Augochlorini). *Systematic Entomology* 29(3): 282-323.

Colla, S. R., J. S. Ascher, M. Arduser, J. Cane, M. Deyrup, S. Droege, J. Gibbs, T. Griswold, H. G. Hall, J. Neff, R. P. Jean, M. G. Rightmyer, C. Sheffield, M. Veit, and A. Wolf. 2012. Documenting persistence of most eastern North American bee species (Hymenoptera: Apoidea: Anthophila) to 1990-2009. *Journal of the Kansas Entomological Society* 85(1): 14-22.

Colla, S. R., and L. Packer. 2008. Evidence for decline in eastern North American bumblebees (Hymenoptera: Apidae), with special focus on *Bombus affinis* Cresson. *Biodiversity and Conservation* 17: 1379-1391.

Commonwealth of Massachusetts, 2021. *MassWildlife's Biodiversity Initiative*. https://www.mass.gov/service-details/masswildlifes-biodiversity-initiative-bdi. Accessed 31 May 2021.

Cordes, N., W. F. Huang, J. P. Strange, S. A. Cameron, T. L. Griswold, J. D. Lozier, and L. F. Solter. 2012. Interspecific geographic distribution and variation of the pathogens *Nosema bombi* and *Crithidia* species in United States bumble bee populations. *Journal of Invertebrate Pathology* 109: 209-216.

Cresson E. T., 1864. On the North American species of several genera of Apidae. *Proceedings of the Entomological Society of Philadelphia* 2(4): 373-411.

Cresson, E. T. 1868. Descriptions of North American bees No. 1. *Proceedings of the Boston Society of Natural History* 12(1): 165-171.

Danforth, B., and M. van Dyke. *Species List - Bees of New York | Pollinator Network @ Cornell*, 16 Oct. 2015. https://pollinator.cals.cornell.edu/wild-bees-new-york/species-list-bees-new-york/. Accessed 9 Feb 2020.

Decker, B.L., C. Bryan, L. Kassim, N. Soley, S.D. Sipes, M. Arduser, and A.N. Harmon-Threatt. 2020. Preliminary Illinois Bee Species Checklist (Hymenoptera: Apoidea) and use of Museum Collections. *Journal of the Kansas Entomological Society* 93(1): 34-74.

Dibble, A. C., F. A. Drummond, C. Stubbs, M. F. Veit, and J. S. Ascher. 2017. Bees of Maine, with a state species checklist. *Northeastern Naturalist*. 24(Monograph 15): 1-48.

Donovall, L. R., and D. vanEngelsdorp. 2010. A checklist of the bees (Hymenoptera: Apoidea) of Pennsylvania. *Journal of the Kansas Entomological Society* 83: 7-24.

Donovan, B. J. 1977. A revision of North American bees of the subgenus *Cnemidandrena* (Hymenoptera: Andrenidae). *University of California Publications in Entomology* 81: 1-107.

Dorchin, A., M.M. López-Uribe, C.J. Praz, T. Griswold, B.N. Danforth. 2018. Phylogeny, new generic-level classification, and historical biogeography of the *Eucera* complex (Hymenoptera: Apidae). *Molecular Phylogenetics and Evolution* 119: 81–92.

Droege, S. 2019. *Apoidea-Bees of Maryland.* https://www.flickr.com/photos/usgsbiml/collections/72157664097451559/ Accessed 11 May 2019.

Droege, S., M. G. Rightmyer, C. S. Sheffield, and S. G. Brady. 2010. New synonymies in the bee genus *Nomada* from North America (Hymenoptera: Apidae). *Zootaxa* 2661: 1-32.

Droege, S., and L. H. Shapiro. 2011. An August survey of wild bees (Hymenoptera: Apoidea) in the northeastern port areas of Baltimore, Maryland and the second North American record of *Pseudoanthidium nanum* (Mocsáry). *The Maryland Entomologist* 5(3): 33-44.

Eickwort, G. C. 1981. Two European species of *Chelostoma* established in New York State (Hymenoptera: Megachilidae). *Psyche* 87: 315-323.

Fetridge, E. D., J. S. Ascher, and G. A. Langellotto. 2008. The bee fauna of residential gardens in a suburb of New York City (Hymenoptera: Apoidea). *Annals of the Entomological Society America* 101: 1067-1077.

Foster, D. R. 1992. Land-Use History (1730-1990) and Vegetation Dynamics in Central New England. *Journal of Ecology* 80(4): 753-771.

Fowler, J. 2016. Specialist bees of the Northeast: Host plants and habitat conservation. *Northeastern Naturalist* 23(2): 305-320.

Fowler, J. and S. Droege. 2020. *Pollen Specialist Bees of the Eastern United States.* https://jarrodfowler.com/specialist_bees.html. Accessed 17 Oct. 2020.

Fye, R.E. 1965. Biology of Apoidea taken in trap nests in northwestern Ontario (Hymenoptera). *The Canadian Entomologist* 97: 863-877.

Gibbs, J. 2010. Revision of the metallic species of *Lasioglossum* (*Dialictus*) in Canada (Hymenoptera: Halictidae: Halictini). *Zootaxa* 2591: 1-382.

Gibbs, J. 2011. Revision of the metallic *Lasioglossum* (*Dialictus*) of eastern North America (Hymenoptera: Halictidae: Halictini). *Zootaxa* 3073: 1-216.

Gibbs, J. 2017. Notes on the nests of *Augochloropsis metallica fulgida* and *Megachile mucida* in central Michigan (Hymenoptera: Halictidae, Megachilidae). *The Great Lakes Entomologist* 50: 17–24.

Gibbs, J., J. S. Ascher, M. G. Rightmyer, and R. Isaacs. 2017. The bees of Michigan (Hymenoptera: Apoidea: Anthophila), with notes on distribution, taxonomy, pollination, and natural history. *Zootaxa* 4352(1): 001-160.

Gibbs, J., E. Hanuschuk, and S. Shukla-Bergen. 2021. Rediscovery of the Rare Bee *Epeoloides pilosulus* in Manitoba (Hymenoptera: Apidae). *Journal of the Kansas Entomological Society.* 93(2), 176-182. Available online at: http://doi.org/10.2317/0022-8567-93.2.176.

Gibbs, J., Packer, L., Dumesh, S., and Danforth, B. N. 2013. Revision and reclassification of *Lasioglossum* (*Evylaeus*), L. (*Hemihalictus*) and L. (*Sphecodogastra*) in eastern North America (Hymenoptera: Apoidea: Halictidae). *Zootaxa*, 3672 (1): 1-117. Available online at: https://doi.org/10.11646/zootaxa.3672.1.1

Giles, V., and J. S. Ascher. 2006. A survey of the bees of the Black Rock Forest Preserve, New York (Hymenoptera: Apoidea). *Journal of Hymenoptera Research* 15(2): 208-231.

Go Botany: Native Plant Trust. The Native Plant Trust, Framingham, MA gobotany.nativeplanttrust.org/. Accessed 21 Oct. 2019.

Goldstein, P. Z., and J. S. Ascher. 2016. Taxonomic and behavioral composition of an island fauna: A survey of bees (Hymenoptera: Apoidea: Anthophila) on Martha's Vineyard (Dukes County, Massachusetts, USA). *Proceedings of the Entomological Society of Washington* 118(1): 37-92.

Goldstein, P.Z., M.W. Nelson, T. Simmons, and L. Raleigh. 2018. Historical and ecological insights from a relictual sandplain: reexamining the insular moth fauna (Lepidoptera) of Martha's Vineyard, Dukes County, Massachusetts, USA. *Proceedings of the Entomological Society of Washington* 120(1): 76—133.

Goldstein, P. Z. and V. L. Scott. 2015. Taxonomic and behavioral components of faunal comparisons over time: The bees (Hymenoptera: Anthophila) of Boulder County, Colorado, Past and Present. *Proceedings of the Entomological Society of Washington* 117(3): 290-346.

Goulson, D., E. Nicholls, C. Botías, and E. L. Rotheray. 2015. Bee declines driven by combined stress from parasites, pesticides, and lack of flowers. *Science* 347: 6229.

Graenicher, S. 1905. Some observations on the life history and habits of parasitic bees. *Bulletin of the Wisconsin Natural History Society* 3: 153-167.

Graenicher, S. 1927. On the biology of the parasitic bees of the genus *Coelioxys* (Hymen., Megachilidae). *Entomological News* 38: 231-235, 273-276.

Graenicher, S. 1935. Bee-fauna and vegetation of Wisconsin. *Annals of the Entomological Society of America* 28: 285-310. Available online at: https://doi.org/10.1093/aesa/28.2.285

Grixti, J. C., L. T. Wonga, S. A. Cameron, and C. Favreta. 2008. Decline of bumble bees (*Bombus)* in the North American Midwest. *Biological Conservation* 142: 75-84.

Hall, D. M., G. R. Camilo, R. K. Tonietto, J. Ollerton, K. Ahrné, M. Arduser, J. S. Ascher, K. C. Baldock, R. Fowler, G. Frankie, and D. Goulson. 2017. The city as a refuge for insect pollinators. *Conservation Biology*, 31(1): 24-29.

Hardy, S., L. L. Richardson, M. F. Veit, J. Milam, M. Ferguson, and K. P. McFarland. 2021. *Vermont Atlas of Life Wild Bee Survey.* Vermont Center for Ecostudies. https://val.vtecostudies.org/projects/vtbees/species/ Accessed 8 March 2021,

Harmon-Threatt, A. 2020. Influence of nesting characteristics on health of wild bee communities. *Annual Review of Entomology* 65: 39-56.

Hatfield, R., S. Jepsen, R. Thorp, L. Richardson, and S. Colla. 2016. *Bombus bohemicus*. The IUCN Red List of Threatened Species 2016: e.T13152926A46440141. Available online at: https://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T13152926A46440141.en.

Hedtke, S. M., E. J. Blitzer, G. A. Montgomery, and B. N. Danforth. 2015. Introduction of non-native pollinators can lead to trans-continental movement of bee-associated fungi. *PLoS ONE* 10(6): e0130560.

Hobbs, G.A. 1968. Controlling insect enemies of the alfalfa leaf-cutter bee, *Megachile rotundata. The Canadian Entomologist* 100: 781–784. Available online at: https://doi.org/10.4039/ent100781-7

Hurd, P. D., Jr. 1979. Superfamily Apoidea in: *Catalog of Hymenoptera in America North of Mexico, vol. 2.* Eds. K. V. Krombein, P. D. Hurd, Jr., D. R. Smith, and B. D. Burks. *Smithsonian Institution Press*; Washington, D.C., pp. 1741-2209.

Hurd, P. D., Jr., and E. G. Linsley. 1972. Parasitic bees of the genus *Holcopasites* Ashmead (Hymenoptera: Apoidea). *Smithsonian Contributions to Zoology* 114: 1-41.

IPBES, 2016. *Summary for Policymakers of the Assessment Report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services on Pollinators, Pollination and Food Production.* S. G. Potts, V. L. Imperatriz-Fonseca, H. T. Ngo, J. C. Biesmeijer, T. D. Breeze, L. V. Dicks, L. A. Garibaldi, R. Hill, J. Settele, A. J. Vanbergen, M. A. Aizen, S. A. Cunningham, C. Eardley, B. M. Freitas, N. Gallai, P. G. Kevan, A. Kovacs-Hostyanszki, P. K. Kwapong, J. Li, X. Li, D. J. Martins, G. Nates-Parra, J. S. Pettis, R. Rader, and B. F. Viana (eds.). Secretariat of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, Bonn, Germany. 36 pages.

Jacobson, M. M., E. M. Tucker, M. E. Mathiasson, and S. M. Rehan. 2018. Decline of bumble bees in northeastern North America, with special focus on *Bombus terricola. Biological Conservation* 217: 437-445.

Jean, R. P. 2010. *Studies of Bee Diversity in Indiana: The Influence of Collection Methods on Species Capture, and a State Checklist Based on Museum Collections.* Ph.D. dissertation, Indiana State University; Terre Haute, Indiana, 235 pp.

Kerr, J. T., A. Pindar, P. Galpern, L. Packer, S. G. Potts, S. M. Roberts, P. Rasmont, O. Schweiger, S. R. Colla, L. L. Richardson, D. L. Wagner, L. F. Gall, D. S. Sikes, and A. Pantoja. 2015. Climate change impacts on bumblebees converge across continents. *Science* 349: 177-180.

Kilpatrick, S. K., Gibbs, J., Mikulas, M. M., Spichiger, S. E., Ostiguy, N., Biddinger, D. J., and

Lopez-Uribe, M. M. 2020. An updated checklist of the bees (Hymenoptera, Apoidea, Anthophila) of Pennsylvania, United States of America. *Journal of Hymenopteran Research* 77: 1-86.

Kilpatrick, S. K., Gibbs, J., Mikulas, M. M., Spichiger, S. E., Ostiguy, N., Biddinger, D. J., and Lopez-Uribe, M. M. 2021. Corrigenda: An updated checklist of the bees (Hymenoptera, Apoidea, Anthophila) of Pennsylvania, United States of America. *Journal of Hymenopteran Research* 81: 181-189.

Klein, A-M., B. E. Vaissie`re, 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.

Koh, I., E. V. Lonsdorf, N. M. Williams, C. Brittain, R. Isaacs, J. Gibbs, and T. H. Ricketts. 2016. Modeling the status, trends, and impacts of wild bee abundance in the United States. *Proceedings of the National Academy of Sciences USA* 113: 140-145.

Kuhlmann, M., and J. S. Ascher. 2010. Two new synonymies of Eastern North American *Colletes* Latr. species described from Japan (Hymenoptera: Colletidae). *Entomological News*. 121: 325-328.

LaBerge, W. E. 1956a. A revision of the bees of the genus *Melissodes* in North and Central America. Part I (Hymenoptera, Apidae). *University of Kansas Science Bulletin* 37 (pt. 2, no. 18): 911-1194.

LaBerge, W. E. 1956b. A revision of the bees of the genus *Melissodes* in North and Central America. Part II (Hymenoptera, Apidae). *University of Kansas Science Bulletin* 38 (pt. 1, no. 8): 533-578.

LaBerge, W. E. 1961. A revision of the bees of the genus *Melissodes* in North and Central America. Part III (Hymenoptera, Apidae). *University of Kansas Science Bulletin* 42(5): 283-663.

LaBerge, W. E. 1967. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part I. *Callandrena* (Hymenoptera: Andrenidae). *Bulletin of the University of Nebraska State Museum* 7: 1-316.

LaBerge, W. E. 1969. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part II. *Plastandrena, Aporandrena, Charitandrena*. *Transactions of the American Entomological Society* 95: 1-47.

LaBerge, W. E. 1971. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part IV. *Scrapteropsis*, *Xiphandrena* and *Rhaphandrena*. *Transactions of the American Entomological Society* 97: 441-520.

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. Subgenera *Thysandrena*, *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. 1989. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part

XIII. Subgenera *Simandrena* and *Taeniadrena*. *Transactions of the American Entomological Society* 115: 1-56.

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. Subgenera *Gonandrena*, *Geissandrena*, *Parandrena*, *Pelicandrena*. *Transactions of the American Entomological Society* 98: 271-358.

LaBerge, W. E., and D. W. Ribble. 1975. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part VII. Subgenus *Euandrena*. *Transactions of the American Entomological Society* 101: 371-446.

Laport, R. G., and R. L. Minckley. 2012. Occupation of active *Xylocopa virginica* nests by the recently invasive *Megachile sculpturalis* in upstate New York. *Journal of the Kansas Entomological Society* 85: 384-386.

LeCroy, K. A., G. Savoy-Burke, D. E. Carr, D. A. Delaney, and T. H. Roulston. 2020. Decline of six native mason bee species following the arrival of an exotic congener. *Scientific Reports* 10: 18745. Available online at: https://doi.org/10.1038/s41598-020-75566-9

Lerman, S. B., A. R. Contostac, J. Milam, and C. Bangd. 2018. To mow or to mow less: Lawn mowing frequency affects bee abundance and diversity in suburban yards. *Biological Conservation* 221: 160-174.

Lerman, S. B., and J. Milam. 2016. Bee fauna and floral abundance within lawn-dominated suburban yards in Springfield, MA. *Annals of the Entomological Society of America* 109 (5): 713-723.

Lhomme, P., S. D. Williams, G. Guillaume, B. Martinet, M. Gérard, and H. M. Hines. 2021. Diversification Pattern of the Widespread Holarctic Cuckoo Bumble Bee, *Bombus flavidus* (Hymenoptera: Apidae): The East Side Story. *Insect Systematics and Diversity* 5(2): 1–15.

Loose, J. L. 2000. *The Relationships Between Native Bee Communities and Floral Resources in Massachusetts Cranberry Bogs.* M.S. thesis, University of Maine, Orono. 79 pp.

Loose, J. L., F. A. Drummond, C. Stubbs, S. Woods, and S. Hoffman. 2005. Conservation and Management of Native Bees in Cranberry. *Maine Agricultural and Forest Experiment Station: University of Maine, Technical Bulletin* 191: 1-27.

Lovell, J. H. 1909. The bees of Massachusetts: *Osmia* and *Sphecodes. Entomological News* 20: 122-126.

MacKenzie, K. E., and A. L. Averill. 1995. Bee (Hymenoptera: Apoidea) diversity and abundance on cranberry in southeastern Massachusetts. *Annals of the Entomological Society of America* 88(3): 341-334.

MacPhail, V. C., L. L. Richardson, and S. R. Colla. 2019. Incorporating citizen science, museum specimens, and field work into the assessment of extinction risk of the American Bumble bee (*Bombus pensylvanicus* De Geer 1773) in Canada. *Journal of Insect Conservation* 23: 597-611.

MANHESP, 2019a. Massachusetts Natural Heritage and Endangered Species Program Fact sheet -American Bumble Bee *Bombus pensylvanicus*. Available online at: https://www.mass.gov/doc/american-bumble-bee/download

MANHESP, 2019b. Massachusetts Natural Heritage and Endangered Species Program Fact sheet - Walsh's *Anthophora walshii*. Available online at: https://www.mass.gov/doc/walshs-anthophora/download

MANHESP, 2019c. Massachusetts Natural Heritage and Endangered Species Program Fact sheet

-Yellow-banded Bumble Bee *Bombus terricola*. Available online at: https://www.mass.gov/doc/yellow-banded-bumble-bee/download

Matteson, K. C., J. S. Ascher, and G. A. Langellotto. 2008. Bee richness and abundance in New York City urban gardens. *Annals of the Entomological Society of America* 101: 140-150.

Matthews, R. W. 1965. The biology of *Heriades carinata* Cresson (Hymenoptera, Megachilidae). *Contributions of the American Entomological Institute* 1: 1-33.

McGinley, R. J. 1986. Studies of Halictinae (Apoidea: Halictidae), I: Revision of New World *Lasioglossum* Curtis. *Smithsonian Contributions to Zoology* 429: 1-294.

McGinley, R. J. 2003. Studies of Halictinae (Apoidea, Halictidae), II: Revision of *Sphecodogastra* Ashmead, Floral specialists of Onagraceae. *Smithsonian Contributions to Zoology* 610: 1-55.

MDAR, 2021. Massachusetts Department of Agricultural Resources. *Agricultural Resources Facts and Statistics.* https://www.mass.gov/info-details/agricultural-resources-facts-and-statistics. Accessed 22 May 22 2021

Medler, J. T. 1961. A note on *Hoplitis producta* (Cress.) in Wisconsin (Hymenoptera: Megachilidae). *Canadian Entomologist* 93: 571-573.

Medler, J. T. 1967. *Hoplitis cylindrica* in trap nests in Wisconsin (Hymenoptera: Megachilidae). *Journal of the Kansas Entomological Society* 40: 137-140.

Medler, J. T., and Koerber, T. W. 1958. Biology of *Megachile relativa* Cresson (Hymenoptera, Megachilidae) in trap-nests in Wisconsin. *Annals of the Entomological Society of America,* 51: 337-344.

Michener, C. D. 1947. A revision of the American species of *Hoplitis* (Hymenoptera, Megachilidae). *Bulletin of the American Museum of Natural History* 89 (article 4): 257-318.

Michener, C. D. 2007. *The Bees of the World,* 2nd edition. Johns Hopkins University Press; Baltimore, MD. 953 pp.

Michez, D., and C. Eardley. 2007. Monographic revision of the bee genus *Melitta* Kirby 1802 (Hymenoptera: Apoidea: Melittidae). *Annales de la Société Entomologique de France* 43(4): 379-440.

Milam, J.C., J. A. Litvaitis, A. Warren, D. Keirstead, and K.I. King. 2018. Bee assemblages in managed early-successional habitats in southeastern New Hampshire. *Northeastern Naturalist* 25(3): 437-459.

Miliczky, E. R. 1988. Observations on the bionomics of the bee *Andrena (Tylandrena) erythrogaster* Ashmead (Hymenoptera: Andrenidae) with notes on *A. (Micrandrena) personata* Robertson and *A. (Holandrena) c. cressonii*. *Illinois Natural History Survey Biological Notes*, 130; 1-28.

Mitchell, T. B. 1935. A revision of the genus *Megachile* in the nearctic Region Part II. Morphology of the male sternites and genital armature and the taxonomy of the subgenera *Litomegachile, Neomegachile* and *Cressoniella* (Hymenoptera: Megachilidae). *Transactions of the American Entomological Society* 61: 1-44.

Mitchell, T. B. 1936. A revision of the genus *Megachile* in the nearctic region Part IV. Taxonomy of subgenera *Xanthosarus, Phaenosarus, Megachiloides* and *Derotropis* (Hymenoptera: Megachilidae). *Transactions of the American Entomological Society* 62: 117-166.

Mitchell, T. B. 1937a. A revision of the genus *Megachile* in the nearctic region Part VII. Taxonomy of the subgenus *Sayapis* (Hymenoptera: Megachilidae). *Transactions of the American Entomological Society* 63: 175-206.

Mitchell, T. B. 1937b. A revision of the genus *Megachile* in the nearctic Region Part VIII. Taxonomy of the subgenus *Chelostomoides*, addenda and index (Hymenoptera: Megachilidae). *Transactions of the American Entomological Society* 63, 381-426.

Mitchell, T. B. 1960. *Bees of the Eastern United States*, volume 1. North Carolina Agricultural Experiment Station Technical Bulletin 141: 1-538.

Mitchell, T. B. 1962. *Bees of the Eastern United States*, volume 2. North Carolina Agricultural Experiment Station Technical Bulletin 152: 1-557.

Moure, J. S., and P. D. Hurd, Jr. 1987. *An Annotated Catalog of the Halictid Bees of the Western Hemisphere.* Smithsonian Institution Press; Washington, D.C. 405 pp.

NAS, 2007. National Academy of Sciences - National Research Council: *Status of Pollinators in North America.* National Academies Press; Washington, D.C. 307 pp.

Natural Heritage and Endangered Species Program. 2011. *BioMap2 Technical Report – Building a Better BioMap:* A supplement to MioMap2: Conserving the Biodiversity of Massachusetts in a Changing World. Natural Heritage and Endangered Species Program, Massachusetts Division of Fisheries and Wildlife, Westborough, MA. Available online at: https://www.mass.gov/service-details/biomap2-conserving-the-biodiversity-of-massachusetts-in-a-changing-world

Neff, J. I., and B. B. Simpson. 1993. Bees, Pollination Systems and Plant Diversity. *In* (ed.s) LeSalle J., and I. D. *Gauld, Hymenoptera and Biodiversity.* Center for Agriculture and Bioscience (CAB) International, Wallingford, England. pp. 143-167.

New England Wild Flower Society. 2015. *State of the Plants: Challenges and Opportunities for Conserving New England's Native Flora*. Framingham, MA, 26 pp.

Nieto, A., S.P.M. Roberts, J. Kemp, P. Rasmont, M. Kuhlmann, M. García Criado, J. C. Biesmeijer, P. Bogusch, H. H. Dathe, P. De la Rúa, T. De Meulemeester, M. Dehon, A. Dewulf, F. J. Ortiz-Sánchez, P. Lhomme, A. Pauly, S. G. Potts, C. Praz, M. Quaranta, V. G. Radchenko, E. Scheuchl, J. Smit, J. Straka, M. Terzo, B. Tomozii, J. Window, and D. Michez. 2014. *European Red List of bees.* Luxembourg: Publication Office of the European Union.

Notestine, M. 2010. *Pollinator Populations in Massachusetts Cranberry, 1990 to 2009: Changes in Diversity and Abundance, Effects of Agricultural Intensification, and a Contribution to the North American Pollinator Survey*. M.S. thesis, University of Massachusetts; Amherst, MA, 63 pp.

O'Brien, M.F. 2007. Notes on *Dianthidium simile* (Cresson) in Michigan (Hymenoptera: Megachilidae). *The Great Lakes Entomologist* 40: 23–28.

Ollerton, J., R. Winfree, and S. Tarrant. 2011. How many flowering plants are pollinated by animals? *Oikos*. 120: 321 - 326.

Onuferko, T. M. 2017. Cleptoparasitic bees of the genus *Epeolus* Latreille (Hymenoptera: Apidae) in Canada. *Canadian Journal of Arthropod Identification* 30: 1-62.

Onuferko, T. M. 2018. A revision of the cleptoparasitic bee genus *Epeolus* Latreille for Nearctic species, north of Mexico (Hymenoptera, Apidae). *ZooKeys* 755: 1-185. Available online at: https://zookeys.pensoft.net/article/23939/

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

Orr, M. C., A. C. Hughes, D. Chesters, J. Pickering, C. D. Zhu, and J. S. Ascher, 2021. Global patterns and drivers of bee distribution. *Current Biology* 31(3): 451-458.

Pardee G. L., and S. M. Philpott. 2014. Native plants are the bee's knees: local and landscape predictors of bee richness and abundance in backyard gardens. *Urban Ecosystems* 17: 641-659.

Parker, F. D., V. J. Tepedino, and G. E. Bohart. 1981. Notes on the biology of a common sunflower bee, *Melissodes (Eumelissodes) agilis* Cresson. *Journal of the New York Entomological Society* 89: 43-52.

Pengelly, D. H. 1955. *The Biology of Bees of the Genus Megachile With Special Reference to Their Importance in Alfalfa Seed Production in Southern Ontario*. Ph.D. dissertation, Cornell University; Ithaca, New York. 538 pp.

Pisanty G., R. Richter, T. Martin1, J. Dettman and S. Cardinal. 2021. Molecular phylogeny and historical biogeography of andrenine bees (Hymenoptera: Andrenidae). *Molecular phylogenetics and Evolution*. In press, Journal Pre-proof available online at: https://www.sciencedirect.com/science/article/abs/pii/S1055790321000841.

Plath, O. E. 1922. Notes on the nesting habits of several North American bumblebees. *Psyche* vol 5-6: 189-203.

Plath, O. E. 1927. Notes on the nesting habits of some of the less common New England bumblebees. *Psyche* 34: 122-128.

Portman, Z. M., B. Bruninga-Socolar, and D. P. Cariveau. 2020. The state of bee monitoring in the United States: a call to refocus away from bowl traps and towards more effective methods. *Annals of the Entomological Society of America*, 113(5): 337-342.

Portman, Z. M., S. J. Burrows, T. Griswold, M. Arduser, A. J. Irber, R. K. Tonietto, and D. P. Cariveau. 2019. First records of the adventive *Pseudoanthidium nanum* (Mocsáry) (Hymenoptera: Megachilidae) in Illinois and Minnesota, with notes on its identification and taxonomy. *The Great Lakes Entomologist*, 52(1): 12-20. Available online at: https://scholar.valpo.edu/tgle/vol52/iss1/6

Potts, S. G., J. C. Biesmeijer, C. Kremen, P. Neumann, O. Schweiger, and W. E. Kunin. 2010. Global pollinator declines: trends, impacts and drivers. *Trends in Ecology & Evolution* 25(6): 345-353. Available online at: https://doi.org/10.1016/j.tree.2010.01.007.

Rau, P. 1937. The life-history of *Osmia lignaria* and *O. cordata*, with notes on *O. conjuncta*. *Annals of the Entomological Society of America*. 30: 324-343.

Ribble, D. W. 1967. The monotypic North American *Larandrena* of *Andrena* (Hymenoptera: Apoidea). *Bulletin of the University of Nebraska State Museum* 6(3): 27-42.

Ribble, D. W. 1968. Revisions of two subgenera of *Andrena: Micrandrena* Ashmead and *Derandrena,* new subgenus (Hymenoptera: Apoidea). *Bulletin of the University of Nebraska State Museum* 8(5): 237-394.

Ribble, D. W. 1974. A revision of the bees of the genus *Andrena* of the Western Hemisphere, subgenus *Scaphandrena*. *Transactions of the American Entomological Society* 100: 101-189.

Ricci, E.H., J. Collins, J. Clarke, P. Dolci, and L. de la Parra. 2020. *Losing Ground: Nature's Value in a Changing Climate.* Massachusetts Audubon Society, Inc., Lincoln, Massachusetts, 33 pp. Available online at: https://www.massaudubon.org/our-conservation-work/advocacy/shaping-climate-resilient-communities/publications-community-resources/losing-ground

Richardson, L. L., K. P. McFarland, S. Zahendra, and S. Hardy. 2018. Bumble bee (*Bombus*) distribution and diversity in Vermont, USA: A century of change. *Journal of Insect Conservation* 23[2019]: 45-62. Available online at: https://doi.org/10.1007/s10841-018-0113-5

Richins, A. 2020. *Plant-pollinator associations in an eastern serpentine savannah and the effects of overbrowsing and the effects of overbrowsing.* M.S. thesis. Virginia Commonwealth University; Richmond, VA. 59 pp.

Rightmyer, M. G. 2008. A review of the cleptoparasitic bee genus *Triepeolus* (Hymenoptera: Apidae) - Part I. *Zootaxa* 1710: 1-170.

Rightmyer, M. G., T. Griswold, and M. S. Arduser. 2010. A review of the non-metallic *Osmia (Melanosmia)* found in North America, with additional notes on palearctic *Melanosmia* (Hymenoptera, Megachilidae). *ZooKeys* 60: 37-77. Available online at: https://zookeys.

pensoft.net/articles.php?id=2362
Roberts, H. P., D. I. King, and J. Milam. 2017. Factors affecting bee communities in forest openings and adjacent mature forest. *Forest Ecology and Management* 394: 111-122.
Roch, J.C., D.C.M. Agudelo, L.S. Adler, and J. Milam. 2021. First Records of *Perdita bequaerti* (Hymenoptera: Andrenidae) from New England. *Journal of the Kansas Entomological Society*, 93(4): 354-360.
Roulston, T., and R. Malfi. 2012. Aggressive eviction of the eastern carpenter bee (*Xylocopa virginica* (Linnaeus)) from its nest by the giant resin bee (*Megachile sculpturalis* Smith). *Journal of the Kansas Entomological Society*, 85(4): 387-388.
Russo, L. 2016. Positive and negative impacts of non-native bee species around the world. *Insects,* 7(4), p.69. Available online at: https://www.researchgate.net/publication/311095897_Positive_and_Negative_Impacts_of_Non-Native_Bee_Species_around_the_World
Rykken, J. J., and B. D. Farrell. 2013. *Boston Harbor Islands all taxa biodiversity inventory: Discovering the "microwilderness" of an urban island park.* Natural Resource Technical Report NPS/BOHA/NRTR—2013/746. National Park Service, Fort Collins, CO. Available online at: https://irma.nps.gov/Datastore/DownloadFile/469837
Sakata, Y., and M. Yamasaki. 2015. Deer overbrowsing on autumnal flowering plants causes bumblebee decline and impairs pollination service. *Ecosphere*, 6(12), pp.1-13.
Sandhouse, G. A. 1939. The North American bees of the genus *Osmia* (Hymenoptera: Apoidea). *Memoirs of the Entomological Society of Washington* 1: 1-167.
Schwarz, H. F. 1926. North American *Dianthidium*, *Anthidiellum*, and *Paranthidium*. *American Museum Novitates* 226: 1-25.
Schwarz, M., and F. Gusenleitner. 2004. Beitrag zur Klärung und Kenntnis parasitärer Bienen der Gattungen *Coelioxys* and *Nomada* (Hymenoptera, Apidae). *Linzer biologie Beiträge* 36: 1413-1485.
Scott, V. L., J. S. Ascher, T. Griswold, and C. R. Nufio. 2011. The bees of Colorado (Hymenoptera: Apoidea: Anthophila). *Natural History Inventory of Colorado*: 1-100.
Sharkey, J.K., A. Pindar, and N.E. Raine. 2020. First Canadian Record of the Specialist Hibiscus Bee, *Ptilothrix bombiformis* (Cresson) (Hymenoptera: Apidae). *Journal of the Entomological Society of Ontario* 151: 41-48.
Sheffield, C. S., and J. Heron. 2018. A new western Canadian record of *Epeoloides pilosulus* (Cresson), with discussion of ecological associations, distribution, and conservation status in Canada. *Biodiversity Data Journal* 6: e22837. Available online at: https://bdj.pensoft.net/articles.php?id=22837
Sheffield, C. S., and J-M. Perron. 2014. Annotated catalogue of the bees described by Léon Provancher (Hymenoptera: Apoidea). *Canadian Entomologist* 146: 117-169.
Sheffield, C. S., P. D. N. Hebert, P. G. Kevan, and L. Packer. 2009. DNA barcoding a regional bee (Hymenoptera: Apoidea) fauna and its potential for ecological studies. *Molecular Ecology Resources* 9(s1): 196-207.
Sheffield, C. S., P. G. Kevan, S. M. Westbury, and R. R. Smith. 2008. Diversity of cavity-nesting bees (Hymenoptera: Apoidea) within apple orchards and wild habitats in the Annapolis Valley, Nova Scotia, Canada. *Canadian Entomologist* 140: 235-249.
Sheffield, C. S., S. M. Rigby, R. F. Smith, and P. G. Kevan. 2004. The rare cleptoparasitic bee *Epeoloides pilosula* (Hymenoptera: Apoidea: Apidae) discovered in Nova Scotia, Canada, with distributional notes. *Journal of the Kansas Entomological Society* 77: 161-164.
Shinn, A. F. 1967. A revision of the bee genus *Calliopsis* and the biology and ecology of

C. andreniformis (Hymenoptera, Andrenidae). *University of Kansas Science Bulletin* 46 (21): 753-936.

Sinha, R. N., and C. D. Michener. 1958. A revision of the genus *Osmia*, subgenus *Centrosmia* (Hymenoptera: Megachilidae). *University of Kansas Science Bulletin* 39(7): 275-303. *California Academy of Sciences* 82(1): 12-16.

Snelling, R. R. 1970. Studies on North American bees of the genus *Hylaeus*. 5. The subgenera *Hylaeus*, s. str. and *Paraprosopis* (Hymenoptera: Colletidae). *Los Angeles County Museum Contributions in Science* 180: 1-59.

Snelling, R. R. 1983. Studies on North American Bees of the Genus *Hylaeus*. 6. An adventive Palearctic species in Southern California (Hymenoptera: Colletidae). *Bulletin of the Southern California Academy of Sciences* 82: 12-16.

Snelling, R. R., and G. I. Stage. 1995. A revision of the Nearctic Melittidae: The subfamily Melittinae (Hymenoptera: Apoidea). *Contributions in Science - Natural History Museum of Los Angeles County* 451: 19-31.

Stephen, W. P. 1954. A revision of the bee genus *Colletes* in America north of Mexico (Hymenoptera, Colletidae). *University of Kansas Science Bulletin* 36 (pt. 1, no. 6): 149-527.

Stout, J. C., and C. L. Morales. 2009. Ecological impacts of invasive alien species on bees. *Apidologie* 40: 388-409.

Taki H, I. Okochi, K. Okabe, T. Inoue, H. Goto, T. Matsumura, and M. Shun'ichi Makino. 2013. Succession Influences Wild Bees in a Temperate Forest Landscape: The Value of Early Successional Stages in Naturally Regenerated and Planted Forests. *PLoS ONE* 8(2): e56678. Available online at: https://doi:10.1371/journal.pone.0056678.

Timberlake, P. H. 1956. A revisional study of the bees of the genus *Perdita* F. Smith, with special reference to the fauna of the Pacific Coast (Hymenoptera, Apoidea). Part II. *University of California Publications in Entomology* 11 (5): 247-350.

Tonietto, R., and D. Larkin. 2018. Habitat restoration benefits wild bees: A meta- analysis. *Journal Applied Ecology.* 55: 582-590.

Tsvetkov N., O. Samson-Robert, K. Sood, H. S. Patel, D. A. Malena, P. H. Gajiwala, P. Maciukiewicz, V. Fournier, and A. Zayed. 2017. Chronic exposure to neonicotinoids reduces honey bee health near corn crops. *Science* 356: 1395-1397.

Tucker, E. M., and S. M. Rehan. 2016. Wild bee pollination networks in northern New England. *Journal of Insect Conservation* 20: 325-337.

Tucker, E. M., and S. M. Rehan 2017. High elevation refugia for *Bombus terricola* (Hymenoptera: Apidae): Conservation and wild bees of the White Mountain National Forest. *Journal of Insect Science*. 17(1): 1-10.

UMass Donahue Institute, 2021. *Massachusetts Population Estimates Program*. https://donahue.umass.edu/business-groups/economic-public-policy-research/massachusetts-population-estimates-program/population-estimates-by-massachusetts-geography/by-state. Accessed 31 May 2021.

USDA, 2019. *Rare bee discovered in northern Wisconsin*. Chequamegon-Nicolet National Forest; News and Events. https://www.fs.usda.gov/detail/cnnf/newsevents/?cid=FSEPRD657159. Accessed 14 Sep. 2020.

U.S. Fish and Wildlife Service. 2017. *Endangered Species Status for Rusty Patched Bumble Bee*. 80 Fed. Reg. 3186 (Jan. 11, 2017)

USGS, 2019. *Introduced and Alien Bee Species of North America (North of Mexico)*. USGS Patuxent Wildlife Research Center; Native Bee Inventory and Monitoring Lab. https://www.usgs.gov/

centers/pwrc/science/introduced-and-alien-bee-species-north-america-north-mexico?qt-science_center_objects=0#qt-science_center_objects. Accessed 19 Sep. 2020.
Viereck, H. L. 1902a. Concerning bees. *Entomological News* 8: 237-238.
Viereck, H. L. 1902b. Descriptions of North American bees. *Canadian Entomologist* 34(12): 325-331.
Viereck, H. L. 1904. Two new species of the bee genus *Perdita* from Indiana and New Jersey. *Entomological News* 15(1): 21-24.
Viereck, H. L. 1907a. Andrenae of the Canadian, Alleghanian and Carolinian plant zones occurring or likely to occur in Connecticut. *Entomological News* 18: 280-286.
Viereck, H. L. 1907b. Two new species of *Perdita. Entomological News* 18: 393-395.
Viereck, H. L. 1917a. Contributions to our knowledge of the bee genus *Perdita* Smith. *Bulletin of the American Museum of Natural History* 38(8): 241-242.
Viereck, H. L. 1917b. New species of North American bees of the genus *Andrena* contained in the collection of the Academy of Natural Sciences of Philadelphia. *Transactions of the American Entomological Society*, 43: 365-407.
Viereck, H. L. 1922. New bees of the genus *Andrena. Occasional papers of the Boston Society of Natural History* 5: 35-45.
Wagner, D. L., and J. S. Ascher. 2008. Rediscovery of *Epeoloides pilosula* (Hymenoptera: Apoidea: Apidae) in New England. *Journal of the Kansas Entomological Society* 81(2): 81-83.
Wagner, D. L., K. J. Metzler, and H. Frye. 2019. Importance of transmission line corridors for conservation of native bees and other wildlife. *Biological Conservation* 235: 147-156.
Williams, P. H., R. W. Thorp, L. Richardson, and S. Colla, 2014. *Bumble bees of North America: An identification guide*. Princeton University Press, Princeton, New Jersey, 208 pp.
Wilson, J. S., T. Griswold, and O. J. Messinger. 2008. Sampling bee communities (Hymenoptera: Apiformes) in a desert landscape: are pan traps sufficient? *Journal of the Kansas Entomological Society*, 81(3): 288-300.
Winfree, R. 2010. The conservation and restoration of wild bees. *Annals of the New York Academy of Sciences* 1195: 169-197.
Wolf, A. T., and J. S. Ascher. 2009. Bees of Wisconsin (Hymenoptera: Apoidea: Anthophila). *Great Lakes Entomologist* 41(3-4): 129-168.
World Population Review, 2021. *Massachusetts Population*. https://worldpopulationreview.com/states/massachusetts-population. Accessed 31 May 2021.
Wood, T. J., M. F. Killewald, K. K. Graham, J. Gibbs, and R. Isaacs. 2019. *Epeoloides pilosulus* (Cresson) rediscovered in Michigan, with notes on the distribution and status of its *Macropis* hosts. *The Great Lakes Entomologist* 52(1); 1-5. Available at: https://scholar.valpo.edu/tgle/vol52/iss1/4
Woodcock, B. A., J. M. Bullock, R. F. Shore, M. S. Heard, M. G. Pereira, J. Redhead, L. Ridding, H. Dean, D. Sleep, P. Henrys, J. Peyton, S. Hulmes, L. Hulmes, M. Sárospataki, C. Saure, M. Edwards, E. Genersch, S. Knäbe, and R. F. Pywell. 2017. Country-specific effects of neonicotinoid pesticides on honey bees and wild bees. *Science* 356: 1393-1395.
Zarrillo, T. A., J. S. Ascher, J. Gibbs, and K. A. Stoner. 2016. New and noteworthy records of bees (Hymenoptera: Apoidea: Anthophila) for Connecticut. *Journal of the Kansas Entomological Society,* 89: 138-157.
Zarrillo, T. A., and K. A. Stoner. 2019. The bee fauna of an Atlantic coastal plain tidal marsh community in southern New England, USA. *Journal of Melittology* 86: 1-34.