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A Checklist of the Bees (Insecta: Hymenoptera) and Their Floral Hosts at Plummers Island, Maryland

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Abstract.—Plummers Island, Maryland has been studied by naturalists for over 100 years. The bees collected on the Island and the immediately adjacent mainland represent six families, 41 genera, and 232 species. About 20% (47 species) are parasitic and do not collect pollen. Most bees are generalist (polylectic) foragers, but there are a few species that appear to visit only a few species or genera of plants (oligolectic foragers). Three exotic species are among the fauna, including the European honey bee (*Apis mellifera* L.). Based on historical specimens in the collection of the National Museum of Natural History, Smithsonian Institution (USNM), and contemporary survey efforts, the number of bee species on the Island appears to have increased since the 1920s–1960s, and there is no evidence of local species extinction. It is possible that the use of Malaise and pan traps in addition to hand nets have increased collecting efficiency so that the increase in species richness is an artifact of collecting techniques rather than a biological phenomenon. Alternatively, increased species richness may reflect the resiliency of bees and an increase in available nesting sites as heavily shaded forests of the eastern United States have become open through deforestation and urbanization. While the vegetation of the Island has matured through natural succession, the surrounding Washington, D.C. metropolitan area has seen major urban, industrial, and infrastructure development and the resultant opening of forests, increasing bee habitat. Plummers Island is likely a refugium for surrounding bee populations.

Key words.—Inventory, pollination, polylectic foragers, oligolectic foragers, exotic species.

The bee fauna of the eastern United States is one of the better known in the world, with approximately 700 species occurring east of the Mississippi River (Mitchell 1960, 1962). Nonetheless, relatively few studies of the bees of a single site within this region have been published. Such data may be valuable for biogeographic analysis and for studies of comparative community diversity and ecology (Deyrup et al. 2002). The present survey was conducted on Plummers Island in the Potomac River, Montgomery County, Maryland and on approximately 15 hectares of the Maryland mainland immediately adjacent to the Island, located approximately 14 km northwest of downtown Washington, D.C. Plummers Island became home to the Washington Biologists' Field Club in 1901, and it is considered one of the most thoroughly investigated sites in the world from a biological perspective. Local natural history studies have resulted in the descriptions of about 175 species, 16 genera, and 3 families from Plummers Island (Goldman et al. 1984).

Bees were collected on sunny days, with the great-

est number of individuals and species collected during April through June; over 9000 specimens were accumulated. Collections during the 1980s through summer 2006 focused on a comparison of the fauna between historic and modern times. However, variation in collecting techniques and efforts does not allow meaningful comparisons between early (pre-1980) and later collections. Nonetheless, it is somewhat surprising to find that in general the same species collected in the 1920s–1950s also are present in the 2000s. Similar findings of long-term studies were noted by Marlin & LaBerge (2001). The only exception was *Apis mellifera* L. (European honey bee) which was found less frequently on the Island in recent years, possibly owing to tracheal mites or other diseases of colonial nesters.

The vegetation of the Island has undergone natural succession from open land with a sparse growth of scattered hardwoods surrounded by agricultural plots on the mainland during the early part of the century, to its present state of predominately mixed deciduous woodland (oak, hickory, sycamore) and a well de-

veloped understory of herbaceous plants. The mainland is no longer farmland, but open woods surrounding the towpaths of the historic Chesapeake & Ohio Canal. The primary floodplain at the east end of the Island is regularly inundated with water once or twice a year. While the habitat has changed over the years, the same species are found today as were collected at the beginning of the 20th century. However, within the past three years, two additional species of alien bees (other than honey bees) have been found on the Island—*Anthophora pilipes* Smith and *Megachile sculpturalis* Smith. Neither species is known to have been intentionally introduced at the Island, and their establishment and persistence would be interesting to follow (Cane 2003). The addition of only two species is not surprising as noted by Batra (1998, 2003), since only about 10 adventive bee species have become established in the continental U.S. The apparent absence of local species extinctions from the Island is noteworthy, especially in light of studies on carabid beetles (Erwin 1981), tortricid moths (Brown 2001), and leaf-beetles (Staines 2004) in which declines in species richness were well documented. In 1985, 37 genera and 163 species were recorded for the Island and mainland. In 2006 we collected 41 genera and 232 species.

Bees are resilient, diverse, and relatively easy to study (Marlin & LaBerge 2001). Most species, even parasitic bees, visit flowers. The first collections on Plummers Island were made with hand nets by J. C. Crawford and H. L. Viereck from 1909 to 1919. Extensive collecting by K. V. Krombein was undertaken from 1958 to 1963. Much of his study included the use of wooden trap-nests hung throughout the Island, and this work resulted in a classic book on bees and wasps (Krombein 1967). From 1971 to 1972 Krombein and P. D. Hurd continued collecting with hand nets. During the 1980s, R. J. McGinley, S. S. Gingras, and I used hand nets, Malaise traps, and pan traps to census the bee fauna. Throughout the 1990s to the present, I have continued to collect bees by net or pan trap. Voucher specimens for all species listed in this paper are deposited in the national insect collection at the National Museum of Natural History, Smithsonian Institution (USNM), Washington, D.C. Bee nomenclature primarily follows Hurd (1979), and family classification follows Michener (2000). Genera and species are listed alphabetically under the family. Plant classification follows Shetler & Orli (2000, 2002) and the recent Plummers Island checklist of vascular plants (Shetler et al. 2006).

The checklist includes all of the bee species recorded from Plummers Island and vicinity. Where possible, a host plant (or family) is listed if the bees were collected gathering pollen from only a few species or genera of plants (oligolectic foragers). In other cases, “P” is used to indicate that the species is po-

lylectic (floral generalist), associated with five or more non-related plant species. Michener (1974, 2000) provides a complete discussion of bee foraging behavior. Plant records from historic specimens were noted, but the majority of plant observations were recorded by the author when bees were collected. Collections from Plummers Island indicate that in temperate North America and in mesic eastern forests, polylectic foragers dominate.

Checklist

Bee Species	Floral Record
Colletidae	
<i>Colletes aestivalis</i> Patton	P
<i>Colletes americanus</i> Cresson	Asteraceae
<i>Colletes armatus</i> Patton	P
<i>Colletes compactus</i> Cresson	Asteraceae
<i>Colletes inaequalis</i> Say	P
<i>Colletes latitaris</i> Robertson	P
<i>Colletes thoracicus</i> Smith	P
<i>Hylaeus affinis</i> (Smith)	P
<i>Hylaeus modestus</i> Say	P
<i>Hylaeus nelumbonis</i> (Robertson)	P
<i>Hylaeus saniculae</i> (Robertson)	P
Andrenidae	
<i>Andrena aliciae</i> Robertson	Asteraceae
<i>Andrena andrenoides</i> (Cresson)	Salix
<i>Andrena arabis</i> Robertson	P
<i>Andrena asteris</i> Robertson	Asteraceae
<i>Andrena asteroids</i> Mitchell	Aster
<i>Andrena banksi</i> Malloch	P
<i>Andrena bisalicensis</i> Viereck	P
<i>Andrena braccata</i> Viereck	Solidago
<i>Andrena carlini</i> Cockerell	P
<i>Andrena carolini</i> Viereck	P
<i>Andrena crataegi</i> Robertson	P
<i>Andrena cressoni</i> Robertson	P
<i>Andrena distans</i> Provancher	P
<i>Andrena dunningi</i> Cockerell	P
<i>Andrena erigoniae</i> Robertson	Claytonia
<i>Andrena erythrogaster</i> (Ashmead)	Salix
<i>Andrena fenningeri</i> Viereck	P
<i>Andrena forbesii</i> Robertson	Rosaceae & Salicaceae
<i>Andrena fragilis</i> Smith	Cornis
<i>Andrena frigida</i> Smith	P
<i>Andrena geranii</i> Robertson	P
<i>Andrena hiliaris</i> Smith	P
<i>Andrena hirticincta</i> Provancher	Asteraceae
<i>Andrena imitatrix</i> Cresson	Rosaceae & Salicaceae
<i>Andrena lamelliterga</i> Ribble	P
<i>Andrena macoupinensis</i> Robertson	P
<i>Andrena macra</i> Mitchell	<i>Crataegus</i> & <i>Rubus</i>
<i>Andrena mandibularis</i> Robertson	<i>Cornus</i> , <i>Crataegus</i> & <i>Malus</i>
<i>Andrena mariae</i> Robertson	Salix
<i>Andrena melanochoa</i> Cockerell	<i>Fragaria</i> & <i>Potentilla</i>
<i>Andrena mendica</i> Mitchell	P
<i>Andrena miranda</i> Smith	P
<i>Andrena miserabilis</i> Cresson	Rosaceae & Salicaceae
<i>Andrena nasonii</i> Robertson	P
<i>Andrena nida</i> Mitchell	Salix
<i>Andrena nigrae</i> Robertson	P
<i>Andrena nubecula</i> Smith	<i>Aster</i> & <i>Solidago</i>
<i>Andrena nuda</i> Robertson	Rosaceae

<i>Andrena perplexa</i> Smith	P	<i>Halictus confusus</i> Smith	P
<i>Andrena personata</i> Robertson	P	<i>Halictus ligatus</i> Say	P
<i>Andrena placata</i> Mitchell	<i>Solidago</i>	<i>Halictus rubicundus</i> (Christ)	P
<i>Andrena placida</i> Smith	P	<i>Lasioglossum coriaceum</i> (Smith)	P
<i>Andrena pruni</i> Robertson	P	<i>Lasioglossum forbesii</i> (Robertson)	P
<i>Andrena rehni</i> Viereck	P	<i>Lasioglossum fuscipenne</i> (Smith)	P
<i>Andrena robertsonii</i> Dalla Torre	P	<i>Sphecodes aroniae</i> Mitchell	Parasitic
<i>Andrena rugosa</i> Robertson	P	<i>Sphecodes atlantis</i> Mitchell	Parasitic
<i>Andrena salictaria</i> Robertson	<i>Salix</i>	<i>Sphecodes carolinus</i> Mitchell	Parasitic
<i>Andrena sayi</i> Robertson	P	<i>Sphecodes confertus</i> Say	Parasitic
<i>Andrena sigmundi</i> Cockerell	<i>Salix</i>	<i>Sphecodes cressonii</i> (Robertson)	Parasitic
<i>Andrena simplex</i> Smith	<i>Aster & Solidago</i>	<i>Sphecodes dichrous</i> Smith	Parasitic
<i>Andrena spiraean</i> Robertson	P	<i>Sphecodes heraclei</i> Robertson	Parasitic
<i>Andrena tridens</i> Robertson	P	<i>Sphecodes illinoensis</i> (Robertson)	Parasitic
<i>Andrena viburnella</i> Graenicher	P	<i>Sphecodes ranunculi</i> Robertson	Parasitic
<i>Andrena vicina</i> Smith	P	<i>Sphecodes stygius</i> Robertson	Parasitic
<i>Andrena violae</i> Robertson	<i>Viola</i>		
<i>Andrena wellesleyana</i> Robertson	P	Melittidae	
<i>Andrena wilkella</i> (Kirby)	P	<i>Macropis patellata</i> Patton	<i>Steironema</i>
<i>Andrena ziziae</i> Robertson	P		
<i>Andrena ziziaeformis</i> Cockerell	P	Megachilidae	
<i>Calliopsis andreniformis</i> Smith	P	<i>Anthidium maculifrons</i> Smith	P
<i>Heterosarus virginicus</i> (Cockerell)	P	<i>Coelioxys banksi</i> Crawford	Parasitic
<i>Perdita boltoniae</i> (Robertson)	P	<i>Coelioxys octodentata</i> Say	Parasitic
<i>Perdita chrysopsina</i> Timberlake	<i>Erigeron</i>	<i>Coelioxys rufitarsis</i> Smith	Parasitic
<i>Perdita octomaculata</i> (Say)	<i>Aster & Solidago</i>	<i>Coelioxys sayi</i> Robertson	Parasitic
		<i>Heriades carinata</i> Cresson	P
Halictidae		<i>Heriades pilosifrons</i> (Cresson)	P
<i>Agapostemon radiatus</i> (Say)	P	<i>Heriades producta</i> (Cresson)	P
<i>Agapostemon texanus</i> Cresson	P	<i>Hoplitis cylindrical</i> (Cresson)	P
<i>Augochlora pura</i> (Say)	P	<i>Hoplitis gleasoni</i> (Titus)	P
<i>Augochlora gratiosa</i> (Smith)	P	<i>Hoplitis pilosifrons</i> (Cresson)	P
<i>Augochlora striata</i> (Provancher)	P	<i>Hoplitis producta</i> (Cresson)	P
<i>Augochloropsis anonyma</i> (Cockerell)	P	<i>Hoplitis truncate</i> (Cresson)	P
<i>Dialictus abanci</i> (Crawford)	P	<i>Megachile brevis</i> Say	P
<i>Dialictus achilleae</i> Mitchell	P	<i>Megachile campanulae</i> (Robertson)	P
<i>Dialictus admirandus</i> (Sandhouse)	P	<i>Megachile mendica</i> Cresson	P
<i>Dialictus anomalus</i> (Robertson)	P	<i>Megachile montivaga</i> Cresson	Asteraceae
<i>Dialictus apertus</i> (Sandhouse)	P	<i>Megachile rotundata</i> (Fabricius)	P
<i>Dialictus atlanticus</i> Mitchell	P	<i>Megachile sculpturalis</i> Smith	<i>Catalpa, Chionanthus</i> & <i>Ligustrum</i>
<i>Dialictus callidus</i> (Sandhouse)	P	<i>Megachile texana</i> Cresson	P
<i>Dialictus coeruleus</i> (Robertson)	P	<i>Osmia atriventris</i> Cresson	P
<i>Dialictus cressonii</i> (Robertson)	P	<i>Osmia bucephala</i> Cresson	P
<i>Dialictus delectatus</i> Mitchell	P	<i>Osmia coerulescens</i> (Linnaeus)	P
<i>Dialictus dreisbachi</i> Mitchell	P	<i>Osmia collinsiae</i> Robertson	P
<i>Dialictus illinoensis</i> (Robertson)	P	<i>Osmia conjuncta</i> (Cresson)	P
<i>Dialictus imitatrix</i> (Smith)	P	<i>Osmia georgica</i> Cresson	P
<i>Dialictus inconspicuus</i> (Smith)	P	<i>Osmia inspergens</i> Lovell & Cockerell	P
<i>Dialictus laevissimus</i> (Smith)	P	<i>Osmia lignaria</i> Say	P
<i>Dialictus lineatulus</i> (Crawford)	P	<i>Osmia pumila</i> Cresson	P
<i>Dialictus nymphaeorum</i> (Robertson)	P	<i>Prochelostoma philadelphia</i> (Robertson)	<i>Ilex, Philadelphicus &</i> <i>Rubus</i>
<i>Dialictus oblongus</i> (Lovell)	P	<i>Stelis costalis</i> Cresson	Parasitic
<i>Dialictus obscurus</i> (Robertson)	P	<i>Stelis lateralis</i> Cresson	Parasitic
<i>Dialictus philanthus</i> Mitchell	P		
<i>Dialictus pilosus</i> (Smith)	P	Apidae	
<i>Dialictus pruinosus</i> (Robertson)	P	<i>Anthophora abrupta</i> Say	P
<i>Dialictus rohweri</i> (Ellis)	P	<i>Anthophora bomboidea</i> Kirby	P
<i>Dialictus tegularis</i> (Robertson)	P	<i>Anthophora pilipes</i> Smith	P
<i>Dialictus versans</i> (Lovell)	P	<i>Anthophora terminalis</i> Cresson	P
<i>Dialictus versatus</i> (Robertson)	P	<i>Anthophora ursine</i> Cresson	P
<i>Dialictus zephyrus</i> (Smith)	P	<i>Apis mellifera</i> Linnaeus	P
<i>Evylaeus arcuatus</i> (Robertson)	P	<i>Bombus affinis</i> Cresson	P
<i>Evylaeus foxii</i> (Robertson)	P	<i>Bombus auricomus</i> (Robertson)	P
<i>Evylaeus macoupinensis</i> (Robertson)	P	<i>Bombus bimaculatus</i> Cresson	P
<i>Evylaeus nelumbonis</i> (Robertson)	P	<i>Bombus fervidus</i> (Fabricius)	P
<i>Evylaeus pectinatus</i> (Robertson)	P	<i>Bombus fraternus</i> (Smith)	P
<i>Evylaeus pectoralis</i> (Smith)	P	<i>Bombus griseocollis</i> (Degeer)	P
<i>Evylaeus quebecensis</i> (Crawford)	P		

<i>Bombus impatiens</i> Cresson	P
<i>Bombus pennsylvanicus</i> (Degeer)	P
<i>Bombus perplexus</i> Cresson	P
<i>Bombus sandersoni</i> Franklin	P
<i>Bombus ternaries</i> Say	P
<i>Bombus terricola</i> Kirby	P
<i>Bombus vegans</i> Smith	P
<i>Ceratina calcarata</i> Robertson	P
<i>Ceratina dupla</i> Say	P
<i>Ceratina metallica</i> Smith	P
<i>Ceratina strenua</i> Smith	P
<i>Emphoropsis laboriosa</i> (Fabricius)	P
<i>Epeoloides pilosula</i> (Cresson)	Parasitic
<i>Epeolus autumnalis</i> Robertson	Parasitic
<i>Epeolus banksi</i> (Cockerell)	Parasitic
<i>Epeolus bifasciatus</i> Cresson	Parasitic
<i>Epeolus lectoides</i> Robertson	Parasitic
<i>Epeolus pusillus</i> Cresson	Parasitic
<i>Epeolus scutellaris</i> Say	Parasitic
<i>Melissodes agilis</i> Cresson	<i>Helianthus</i>
<i>Melissodes bimaculata</i> (Lepelletier)	P
<i>Melissodes comptoides</i> Robertson	P
<i>Melissodes denticulata</i> Small	<i>Vernonia</i>
<i>Melissodes dentiventris</i> Small	Asteraceae
<i>Melissodes rustica</i> (Say)	P
<i>Melitoma taurea</i> (Say)	P
<i>Nomada bella</i> Cresson	Parasitic
<i>Nomada bishoppi</i> Cockerell	Parasitic
<i>Nomada ceanothi</i> Cockerell	Parasitic
<i>Nomada cuneata</i> (Robertson)	Parasitic
<i>Nomada hydrophylli</i> Swenk	Parasitic
<i>Nomada integerrima</i> Dalla Torre	Parasitic
<i>Nomada lepida</i> Cresson	Parasitic
<i>Nomada maculata</i> Cresson	Parasitic
<i>Nomada oblitterata</i> Cresson	Parasitic
<i>Nomada ovata</i> (Robertson)	Parasitic
<i>Nomada parva</i> Robertson	Parasitic
<i>Nomada perplexa</i> Cresson	Parasitic
<i>Nomada pygmaea</i> Cresson	Parasitic
<i>Nomada sayi</i> Robertson	Parasitic
<i>Nomada tyrrellensis</i> Mitchell	Parasitic
<i>Nomada volatilis</i> Smith	Parasitic
<i>Peponapis pruinosa</i> (Say)	<i>Asclepias, Echinocystis,</i> <i>Ipomoea & Verbena</i>
<i>Ptilothrix bombiformis</i> (Cresson)	P
<i>Psithyrus ashtoni</i> (Cresson)	Parasitic
<i>Psithyrus citrius</i> (Smith)	Parasitic
<i>Svastra atrimitra</i> (LaBerge)	P
<i>Svastra caliginosa</i> (Cresson)	P
<i>Synhalonia atriventris</i> (Smith)	P
<i>Triepeolus atlanticus</i> Mitchell	Parasitic
<i>Triepeolus cressonii</i> (Robertson)	Parasitic
<i>Triepeolus donatus</i> (Smith)	Parasitic
<i>Triepeolus lunatus</i> (Say)	Parasitic
<i>Triepeolus pectoralis</i> (Robertson)	Parasitic
<i>Triepeolus remigatus</i> (Fabricius)	Parasitic
<i>Xylocopa virginica</i> (Linnaeus)	P

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