Preliminary list of the Bees (Hymenoptera:Apoidea) of Assateague Island National Seashore Worchester County, Maryland

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Abstract
A survey from 2005 through 2007 of the bees of the Maryland portion of Assateague Island was undertaken. Both netting and "bee traps" were utilized during the survey. Fifty-seven (57) species were identified during the study. The native bee composition of the barrier island proved to be very different than from the adjacent mainland. New Maryland state bee records along with a number of sand specialists were identified during the survey. Wild Honey Bee colonies once established on the island are no longer present.

Introduction and Study Site
The National Park Service's Assateague Island National Seashore (ASIS) manages Assateague Island (island) north of the Maryland/Virginia state line along with the State of Maryland. The State owned section of the island (Assateague Island State Park) is limited in size and did not contain any unique habitat not found elsewhere within the much larger and more extensive ASIS. Therefore, the State Park was not sampled for bees. ASIS contains the only stretch of barrier island in the state of Maryland that is largely natural and undeveloped (Furbish, Railey and Meininger 1994). Assateague Island south of Maryland is managed by the Chincoteague National Wildlife Refuge and is not included as part of this paper.

Assateague Island is experiencing littoral drift towards its south end (Higgin, et. al. 1971). Currently the island runs uninterrupted from just south of Ocean City, Maryland to the sand hook at Tom's Cove in Virginia. In recent years this continuum has experienced intermittent ephemeral inundations due to storms and/or abnormally high tides, but the island still remains intact at the writing of this paper.

A three year survey of the insects of ASIS was undertaken from 2005 through 2007 (Orr 2008) by the Mid-Atlantic Invertebrate Field Studies (MAIF 2010). It was identified early on that bees should be a major focus for the three year survey since it would be the first ever bee survey for a barrier island in the Mid-Atlantic Region.

Materials and Methods
Two methods were relied on; the first was netting using both a general sweep net and targeting bees visiting flowers with an aerial net. Opportunistic netting occurred throughout the three year study. The second method was trapping. Bee cups were run in 2006 on April 6, April 7, May 4, May 5, June 13, June 17, July 1, September 19 and September 20. In 2007 bee cups were run on April 2, May 22, May 23, September 6 and September 7. Both netting and trapping were done at various locations throughout ASIS.

The traps consisted of fifteen 3.25 oz. Solo brand soufflé cups placed in transects. Five fluorescent yellow, fluorescent blue and non-fluorescent white bowls were alternated and spaced approximately 5 meters apart. The traps were filled with water that had been treated with a small amount of liquid soap. The traps were either set out in the early morning, before the other field work started and picked up at the end of the day (approximately 8 hours) or left over night and picked up the following evening (approximately 20 hours). The trap protocol used was fine tuned by the author for use on the island from that presented in the 2007 LeBuhn, et. al. paper.

All specimens required identification in the laboratory using the identification guides on the Discover Life website (http://www.discoverlife.org). All preliminary identifications made by the author were double checked by Sam Droege (Bee Specialist, USGS) to ensure accuracy. Voucher specimens of all the bee species identified were deposited with the National Park Service.

Results

Fifty-seven species of bees were recorded during the three year survey. In Table 1 these species are listed along with the number of bees collected in bee cups and while netting. The flight period known from ASIS (based on captures) is also provided in Table 1.

Table 1: The Bees of Assateague Island National Seashore
(Assateague Island National Seashore, Worcester County, Maryland)

FAMILY	GENUS	SPECIES, AUTHOR & DATE	FLIGHT PERIOD	# IN CUPS	# NETTED	TOTAL #
Colletidae	*Colletes*	*americanus* Cresson, 1868	19Sep to 20Sep	2	0	**2**
Colletidae	*Colletes*	*mitchelli* Stephen, 1954	19Sep to 20Sep	12	8	**20**
Colletidae	*Colletes*	*simulans* Cresson, 1868	19Sep to 20Sep	5	0	**5**
Colletidae	*Colletes*	*thoracicus* Smith, 1853	5May to 23May	0	2	**2**
Colletidae	*Colletes*	*validus* Cresson, 1868	2Apr to 4May	1	3	**4**
Colletidae	*Hylaeus*	*modestus* Say, 1837	2Jul	0	4	**4**
Halicitidae	*Agapostemon*	*splendens* (Lepeletier 1841)	11Jun to 20Sep	8	5	**13**
Halictidae	*Agapostemon*	*virescens* (Fabricius, 1775)	20Sep	1	0	**1**
Halictidae	*Augochlora*	*pura* (Say, 1837)	2Apr to 20Sep	24	5	**29**
Halicitidae	*Augochlorella*	*aurata* (Smith, 1853)	2Apr to 20Sep	197	7	**204**
Halictidae	*Halictus*	*poeyi* Lepeletier, 1841	22May to 8Oct	1	3	**4**
Halictidae	*Lasioglossum*	*admirandum* (Sandhouse, 1924)	20Sep	1	0	**1**
Halicitidae	*Lasioglossum*	*bruneri* (Crawford, 1902)	2Apr to 23May	10	1	**11**
Halictidae	*Lasioglossum*	*coreopsis* (Robertson, 1902)	4May	6	0	**6**
Halictidae	*Lasioglossum*	*forbesii* (Robertson, 1890)	19Sep to 20Sep	0	1	**1**
Halicitidae	*Lasioglossum*	*fuscipenne* (Smith, 1853)	2Apr to 2Jul	1	1	**2**
Halictidae	*Lasioglossum*	*halophitum* (Graenicher, 1927)	19Sep	1	0	**1**
Halictidae	*Lasioglossum*	*lustrans* (Cockerell, 1897)	19Sep to 20Sep	4	0	**4**
Halicitidae	*Lasioglossum*	*marinum* (Crawford, 1904)	4May to 20Sep	25	6	**31**
Halictidae	*Lasioglossum*	*nymphale* (Smith, 1853)	4May to 20Sep	30	3	**33**
Halictidae	*Lasioglossum*	*oblongum* (Lovell, 1905)	4May to 2Jul	8	2	**10**
Halicitidae	*Lasioglossum*	*pilosum* (Smith, 1853)	4May to 20Sep	19	5	**24**
Halictidae	*Lasioglossum*	*rohweri* (Ellis, 1915)	22May to 20Sep	7	0	**7**
Halictidae	*Lasioglossum*	*truncatum* (Robertson, 1901)	17Jun	1	1	**2**
Halicitidae	*Lasioglossum*	*versatum* (Robertson, 1902)	20Sep	1	0	**1**
Halictidae	*Lasioglossum*	*zephyrum* (Smith, 1853)	20Sep	0	1	**1**
Halictidae	*Sphecodes*	sp.	22May to -2Jul	1	1	**2**
Andrenidae	*Andrena*	*bracatta* Viereck, 1907	20Sep	0	1	**1**
Andrenidae	*Andrena*	*placata* Mitchell, 1960	20Sep	0	1	**1**
Andrenidae	*Andrena*	*simplex* Smith, 1853	20Sep	3	3	**6**
Andrenidae	*Andrena*	*violae* Robertson, 1891	2Apr	0	1	**1**
Andrenidae	*Perdita*	*octomaculata* (Say, 1824)	19Sep to 20Sep	23	6	**29**
Andrenidae	*Pseudopanurgus*	*compositarum* (Robertson, 1893)	19Sep to 20Sep	0	2	**2**
Megachilidae	*Coelioxys*	*dolichos* Fox, 1890	13Jun	0	1	**1**
Megachilidae	*Coelioxys*	*octodentata* Say, 1824	13Jun	0	1	**1**
Megachilidae	*Coelioxys*	*sayi* Robertson, 1897	2Jul	0	1	**1**
Megachilidae	*Heriades*	*leavitti* Crawford, 1913	20Sep	0	1	**1**
Megachilidae	*Heriades*	*variolosus* (Cresson, 1872)	2Jul	0	12	**12**
Megachilidae	*Hoplitis*	*pilosifrons* (Cresson, 1864)	23May	1	0	**1**

Megachilidae	*Megachile*	*inermis* Provancher, 1888	13Jun	0	2	**2**
Megachilidae	*Megachile*	*mendica* Cresson, 1878	11Jun to 2Jul	0	3	**3**
Megachilidae	*Megachile*	*sculpturalis* Smith, 1853	11Jun	0	1	**1**
Megachilidae	*Megachile*	*xylocopoides* Smith, 1853	13Jun to 2Jul	0	2	**2**
Megachilidae	*Osmia*	*pumila* Cresson, 1864	2Apr to 23May	6	2	**8**
Apidae	*Apis*	*mellifera* Linnaeus, 1758	21Sep	0	1	**1**
Apidae	*Bombus*	*bimaculatus* Cresson, 1863	4May to 12-Jun	0	7	**7**
Apidae	*Bombus*	*griseocollis* (DeGeer, 1773)	12-Jun to 13Jun	0	4	**4**
Apidae	*Bombus*	*pensylvanicus* (DeGeer, 1773)	13Jun	0	1	**1**
Apidae	*Epeolus*	*pusillus* Cresson, 1864	19Sep-20Sep	0	11	**11**
Apidae	*Epeolus*	*scutellaris* Say, 1824	19Sep to 20Sep	1	15	**15**
Apidae	*Nomada*	*articulata* Smith, 1854	22May to 23May	1	1	**2**
Apidae	*Nomada*	*maculata* Cresson 1863	4May	1	0	**1**
Apidae	*Ceratina*	*calcarata* Robertson, 1900	22May to 20Sep	6	4	**10**
Apidae	*Ceratina*	*dupla* Say, 1837	2Apr to 20Sep	10	4	**14**
Apidae	*Ceratina*	*strenua* Smith, 1879	2Apr to 20Sep	6	4	**10**
Apidae	*Melissodes*	*druriella* (Kirby, 1802)	19Sep to 20Sep	5	8	**13**
Apidae	*Xylocopa*	*virginica* (Linnaeus, 1771)	2Apr to 17Jun	0	4	**4**

There was an obvious seasonality to the diversity of species and flight periods of the island's bees. The most drastic change was between spring and fall, while in between there was a transition which was abrupt for some species, but slower for others. Figure 1 summarizes the results of spring (April/May) bee records from 2006-2007 data and Figure 2 summarizes the results of fall (September) bee records from 2006-2007 data.

Figure 1: Spring (April/May) Bee Captures from 2006-2007 [24 species, 316 individuals]

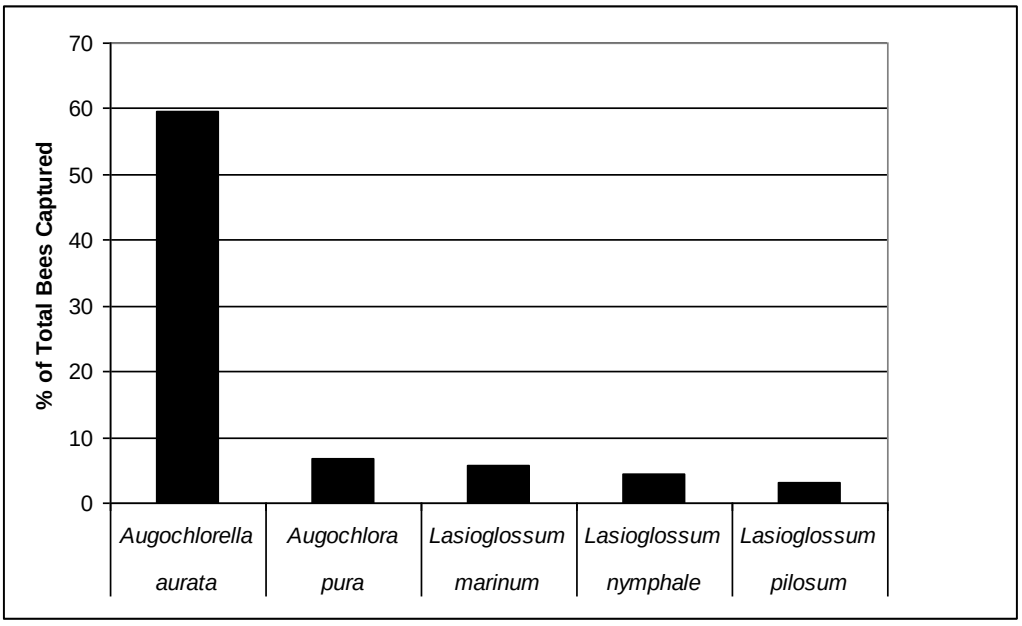
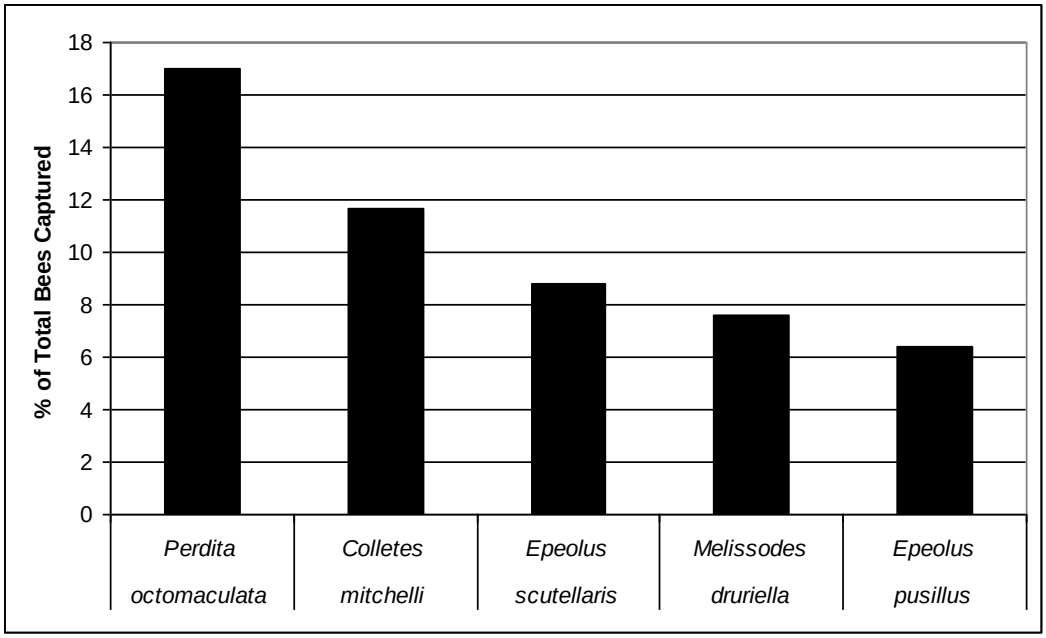


Figure 2: Fall (September) Bee Captures from 2006-2007 [30 species, 171 individuals]



Discussion

The interest in native pollinators has grown over the past few years ever since the honey bee (*Apis mellifera*) population started declining. The importance of native bees cannot be over emphasized due to their importance in pollination and thus on the structure of plant communities. ASIS is not an exception.

The honey bee once was a common sight at flowers on ASIS (personal communication with NPS personnel) and there is little doubt that wild colonies use to exist on the island. While the honey bee was never a long-term resident on the island, it still could re-establish after major storm events. This is no longer the case due to the introduction into North America in the 1980s of the tracheal and virola mites. Wild honey bee colonies are not only gone from the island, but also from most of the adjacent mainland. A single honey bee was recorded from the island during the three year survey. It was a well-worn individual found at the far southern end of ASIS and most likely came from a distant managed bee colony.

There was quite a contrast between the native bees on the island and those from the mainland. The following sand specialists were found: *Agapostemon splendens*, *Lasioglossum halophitum*, *L. lustans*, *L. nymphale*, *Heriades variolosus*, *Colletes thoracicus* and *Perdita octomaculata*. Even more restrictive in habitat were the dune/beach specialists that included *Colletes mitchelli*, *Lasioglossum marinum* and possibly *Andrena bracatta*. In the spring *L. nymphale* and *L. marinum* were among the 5 most abundant bees found on the island (Figure 1), while in the fall, *P. octomaculata* and *C. mitchelli* were among the top five species (Figure 2). Most telling is that *Colletes mitchelli*, *Lasioglossum lustans* and *Lasioglossum nymphale* were not known from Maryland until this survey, despite a good number of mainland Maryland bee surveys. *Lasioglossum marinum*, one of the two dune/beach specialists mentioned above had previously been collected only along a few Chesapeake Bay beaches (Sam Droege, personal communication). On all of these sand-specialized bees, additional research is warranted to determine their habitat requirements and if a potential human impact due to beach recreation is occurring.

Lasioglossum lustrans is an interesting bee in that it is a specialist on *Pyrrhopappus carolinianus* (false dandelion) where it appears largely restricted to the plant's range (Sam Droege, personal communication). Higgins et al, 1971, lists the false dandelion as rare on the island. Based on multiple individuals of this species encountered on the island, either the plant his increased in numbers since 1971 or the bee is utilizing other plant species.

Two additional new Maryland bee records were added during the survey. These were *Lasioglossum truncatum* and *Coelioxys dolichos*. The former was known from Virginia and Pennsylvania so it was really not a surprise. The latter is a nest parasite of the leaf cutting bee *Megachile xylocopoides*. *Coelioxys dolichos* had never been collected north of North Carolina before this survey.

The genus *Colletes* was more strongly represented on the island than the mainland. The common fall species *Epeolus scutellaris* and *Epeolus pusillus* on the island are nest parasites of *Colletes* species.

Assateague Island National Seashore was missing large groups of spring forest/shrub species in the *Osmia*, *Nomada*, and *Andrena* genera that are present on the mainland. Eucerines (a subgroup of Apidae) were in general also lacking, likely due to the lack of a large or a diverse assemblage of fall composites. Another oddity was the absence of *Megachile brevis* which is a relatively common bee in dry sand on the mainland. Other interesting bees that appear to be missing from ASIS are *Bombus impatiens* and *Halictus confusus*. *Bombus impatiens* is by far the most common bumblebee on the mainland and *Halictus confusus* is also very common on the mainland. Additional questions are why *Perdita octomaculata* occurs on the island and not additional species of *Perdita* or why only *Hylaeus modestus* and not other species in the genus were found?

Very little is known about the natural history of any of the bees that occur on ASIS. It is clear that the native bee assemblage on the island is unique in Maryland and possibly the whole Mid-Atlantic region and deserves additional study.

Acknowledgements
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