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PRELIMINARY COMPARISONS OF WASP FAUNAS OF THE GREAT AND LITTLE BAHAMA BANKS (HYMENOPTERA: TIPHIIDAE, SCOLIIDAE, POMPILIDAE,MUTILLIDAE, SPHECIDAE, VESPIDAE)

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ABSTRACT

The islands of the Northern and Central Bahamas lie on one of two shallow ocean platforms, the Great and Little Bahama Banks. During Pleistocene glaciations, the islands on each bank system were united into two large but separate land masses. Because they share a similar geologic history, islands on one of the banks should show more faunal similarities with each other than with islands on the other bank. We made collections during winter and spring, 1992, on the major islands of the two bank systems to compare their faunas. Mean and standard error for proportion of species shared by islands on the same bank were 0.51 ± 0.03, and for islands on different banks, 0.40 ± 0.02. A second factor affecting faunas was the dominant vegetation type of the island. The proportion of species shared by pine-dominated islands (Abaco, Andros and Grand Bahama) was 0.49 ± 0.07; for scrub-dominated islands (Cat, Eleuthera, Exuma and Long), it was 0.58 ± 0.02, and for pairs of islands of differing vegetation types, it was 0.45 ± 0.02. The highest proportion of species were shared by scrub-dominated islands, which were also on the Great Bahama Bank, indicating that geologic history and environmental factors both affected wasp faunas.

INTRODUCTION

The islands of the Northern and Central Bahamas lie on one of two shallow oceanic platforms, the Little Bahama Bank with the islands of Grand Bahama, Great and Little Abaco, and the associated cays, or the Great Bahama Bank with Andros, New Providence, Bimini, the Berry Islands, Cat Island, Long Island, Eleuthera and the Exumas. The bank systems are separated from each other by two deep ocean trenches, the Northwest and Northeast Providence channels, where water depths reach 3000 meters, compared with depths no greater than 200 meters on the banks (Kendall *et al.*, 1990). Seventeen thousand years ago, during the Wisconsin Glaciation, when ocean levels fell by as much as 120 m, extensive land masses were exposed on these banks (Correll, 1979; Pregill and Olsen, 1981). Olsen and Pregill (1982) have demonstrated the importance of Pleistocene climate changes, in determining modern diversity and distribution of Bahamian vertebrates.

We have begun an extensive survey of wasps on islands of the Bahamas (Elliott, 1992). One purpose of the study was to improve knowledge of the Bahamian wasps, since previously only the islands of Bimini (Krombein, 1953) and San Salvador (Elliott *et al.*, 1979) were well studied. However, we were also testing the hypothesis that geological history has affected wasp faunas on the bank systems.

METHODS

From January through April, 1992, we conducted surveys of wasps on Grand Bahama and Great Abaco on the Little Bahama Bank

and on Andros, Great Exuma, Eleuthera, Cat Island and Long Island on the Great Bahama Bank. We spent approximately two weeks on each island.

For each pair of islands we determined faunal similarity by dividing the number of shared species by the total number of species on the two islands. These values were averaged for pairs of islands on the same and different banks, and also averaged to compare faunas shared by islands with the same vegetation type (either scrub or pinelands) and those differing in vegetation type.

RESULTS

We collected 47 species of wasps in the families Tiphiidae, Scoliidae, Pompilidae, Mutillidae, Specidae and Vespidae. There were 21 species collected from the Little Bahama Bank and 43 species from the Great Bahama Bank. Family distributions for the individual islands are compared in Table 1. Chi square tests showed that there were no differences between relative occurrence of each wasp family on an individual island and its percent occurrence in the overall wasp fauna of the Bahamas.

There were more similar wasp faunas on islands on the same bank than on different banks (Fig. 1). The mean and standard error for the values of similarity averaged for all pairs of islands on the same bank were 0.51 ± 0.03 compared with 0.40 ± 0.02 for all pairs of islands on different banks.

There were also more similarities between islands dominated by the same vegetation type (Fig. 2). Mean and standard error of similarities averaged for all pairs of islands dominated by pinelands (Andros, Abaco, Grand Bahamas) were 0.49 ± 0.07; for pairs dominated by scrublands (Cat, Exuma, Eleuthera and Long), they were 0.58 ± 0.02, and for pairs of islands differing in dominant vegetation type, 0.45 ± 0.02.

Of the forty-seven species of wasps collected, a number were found on all or all but one of the islands on both banks; these included *Campsomeris atratus* and *Campsomeris trifasciata nassauensis* of the family Scoliidae, and *Polistes exclamans*, *Polistes major*, *Mischocyttarus cubensis*, *Pachodynerus scrupeus*, *Pachodynerus cubensis bahamensis* and a *Zethus* species among the Vespidae. The tarantula hunter, *Pepsis saphyrus* was the only species of Pompilidae with such a wide distribution. Widely distributed species of Sphecidae included *Tachysphex alayoi*, *T. similis*, *Sphex jamaicensis*, *Stictia signata*. Several species were restricted in distribution to the Great Bahama bank; these included an as yet unidentified species of the Mutillidae, a tarantula-hunting pompilid, probably *Pepsis marginata*, and another pompilid, *Anoplius insignis bahamas*, as well as sphecids in the genera *Trypoxylon*, *Sceliphron* and *Ammophila*. There were no species found only on islands of the Little Bahama Bank.

TABLE 1

Family Representation of Wasps on the Island Surveyed*

Family	All	Ab	GB	An	Cat	El	Ex	Lo
Tiphiidae	2	0	1	0	0	1	1	0
Scoliidae	3	2	3	3	3	2	2	1
Pompilidae	10	1	1	3	4	5	2	4
Mutillidae	1	0	0	0	1	1	1	0
Sphecidae	19	7	6	5	14	9	6	13
Vespidae	12	7	6	5	9	9	7	6
Totals	47	17	17	16	31	27	19	24

* The abbreviated names for the islands are as follows: Ab - Great Abaco, GB - Grand Bahamas, An - Andros, Cat - Cat Island, El - Eleuthera, Ex - Great Exuma, Lo - Long.

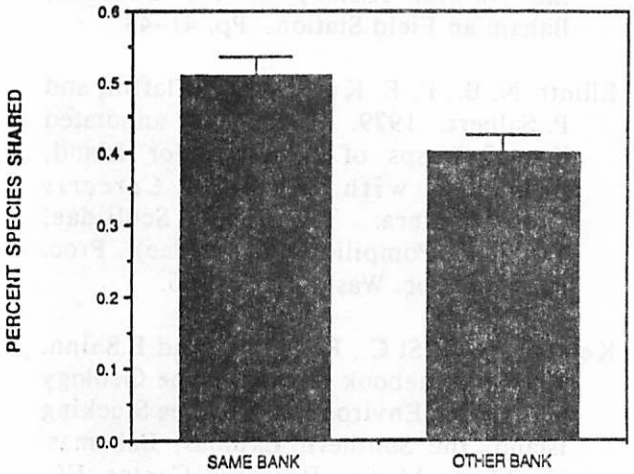

Figure 1. Proportion of species shared by pairs of islands on the same bank compared with those shared by pairs of islands on different banks. Measures of similarity were computed for all pairs of islands, and then averaged to compare pairs of islands on the same bank with pairs on different banks. Mean ± SE (same) = 0.51 ± 0.02; mean ± SE (different) = 0.40 ± 0.02.

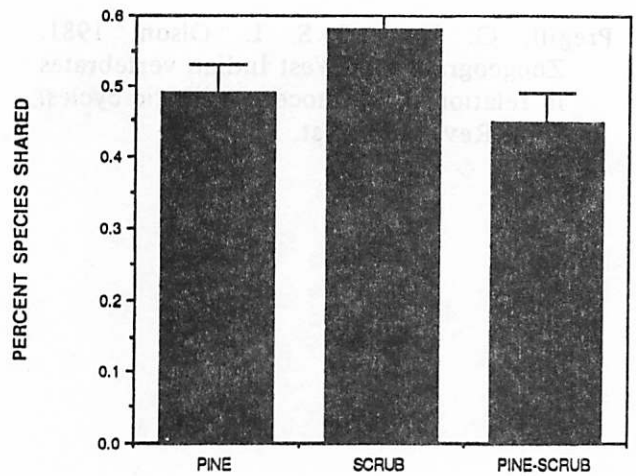

Figure 2. Proportion of species shared by pairs of pine-dominated islands (Abaco, Andros, Grand Bahama), pairs of scrub-dominated islands (Cat, Eleuthera, Exuma, and Long), and pairs of islands with differing vegetation types. Mean ± SE (pine) = 0.49 ± 0.07; Mean ± SE (scrub) = 0.58 ± 0.02; mean ± SE (different) = 0.45 ± 0.02.

DISCUSSION

There were approximately twice as many wasp species on the islands of the Great Bahama Bank, as on islands of the Little Bahama Bank; however, the fauna from Andros, which lies on the Great Bahama Bank, was also relatively sparse. As we hypothesized there were more similarities in wasp faunas when pairs of island on the same bank were compared than when we compared pairs of islands on different banks. However, Andros, on the Great Bahama Bank, showed a number of differences from other islands on that Bank. When we compared faunas of islands with similar vegetation types, now including Andros with other pine-dominated islands on the Little Bahama Bank, we found similarities in islands of the same vegetation type as well.

Our finding that wasp faunas were more similar when islands on the same bank system are compared supports the hypothesis that geologic history of the banks has affected their faunas. Islands that once belonged to the same land mass are more similar in their wasp faunas. This is further reinforced because some of the species restricted to the Great Bahama bank are of limited mobility, as for example, in the case for the mutillid. We also found lower diversity in wasps on the Little Bahama Bank, and this too may be related to the geologic history of the islands, as was suggested for similar numerical trends in vertebrates by Pregill and Olsen (1981). Their explanation for this is largely related to climate change following glaciation. In the Wisconsin, the Bahamas were drier than today and were vegetated predominantly by xerophytic scrub, which still covers the southern Bahamas (Olsen and Pregill, 1982), and they suggest that the lower diversity on the northern islands resulted from extinctions when increased rainfall modified vegetation there.

Our findings also suggest that dominant vegetation of an island has an effect on wasp faunas there. This too, may in part be explained by Olsen and Pregill's (1982) theory concerning climatic change and accompanying extinction, since the vegetation of the scrub-dominated islands is similar to Pleistocene conditions, while the pine-dominated islands have undergone climatic and vegetational

change. They also implicate the development of commercial pine plantations as a factor in reducing diversity in herpetofauna of the Little Bahama Bank (Pregill and Olsen, 1981), and this may help account not only for the lower diversity we found on Abaco and Grand Bahama, but that on Andros as well.

Other factors may also have affected our results with respect to the northern islands including Andros; we made our initial collections in winter and spring, and there is probably seasonality in activity of wasp species there, as Elliott *et al.*, (1979) reported for San Salvador. Summer studies of the islands will be necessary before we can draw final conclusions. In conclusion, our studies do support the hypothesis that Pleistocene events influenced the wasp fauna of the Bahamas, but other factors, particularly dominant vegetation on the islands are also important.

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