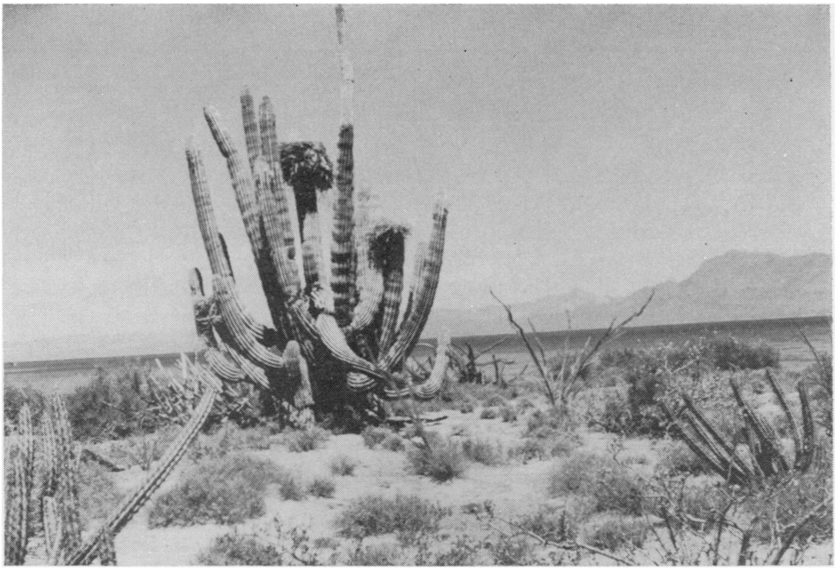

Fig. 1. Nests of Osprey (upper) and Great Blue Heron in cardon cactus, Tiburon Island, Sonora, May 1978.

almost immediately. The heron returned within a few minutes and attempted to alight on its nest. It made three attempts by approaching from above and passing over or alongside the Osprey nest. In each case it was driven off by the Osprey. On its fourth attempt it approached the nest from the front and below, apparently not disturbing the Osprey, and was permitted to settle on its nest.

Both species are known to use an extremely wide assortment of nest sites including the ground, cliffs, shrubs, and trees. Bent (1937) stated, for Ospreys, that, "Security and a good food supply seem to be all that they require," and that the Great Blue Heron prefers "to nest in trees and usually selects the tallest trees available; but often nests in low trees, or bushes, or even on the ground" (Bent 1926). On Tiburon Island, cardons provide the tallest and most substantial nest sites, and the waters of the adjacent bay apparently supply the necessary food supply.

I wish to thank Clyde Jones, U.S. Fish and Wildl. Serv., and the U.S. Nat. Park Serv. for supporting this U.S./Mexico cooperative project.—*Roland H. Wauer, National Park Service, Washington, D. C. 20240.*

INSECT POLLINATION OF PRICKLY-PEARS (*OPUNTIA*: CACTACEAE). —In conjunction with breeding studies of *Opuntia*, we attempted to determine the primary insect pollinators 1 mi S Mineral Park, in the Cerbat Mountains SE Santa Claus, Mohave Co., Arizona.

On 9-10 Jun. 1978, the flowers on one plant each of *Opuntia chlorotica* Engelm. & Bigel. and *Opuntia phaeacantha* Engelm. var. *discata* (Griffiths) Benson & Walkington were observed from 0810-0910 MST, and a different individual of each was observed from 0925-1025 MST. On the second day the observations were repeated using different individuals of the same taxa. Flowers commenced to open early in the first hour of observation and began to close late in the afternoon, about 1600 MST, of the same day.

An attempt was made to capture all insects visiting the flowers during the scheduled times. The insects were captured by placing a small glassine bag over the flower. Sap beetles (Nitidulidae) could not be easily captured upon entering a flower and were collected later (1500 MST) by placing an entire flower into a standard insect kill-jar.

At our study site the Anthophoridae (*Diadasia* sp.), the Halictidae (*Halictus* sp., *Lasioglossum* spp., and *Augochlorella* sp.), and the Megachilidae (*Ashmeadiella* sp.) were represented; the Apidae were not (Table 1). In contrast to other studies, we found the Megachilidae to be the least common of the visiting bees. Beutelspacher (Cactaceas y Suculentas Mexicanas 16:84–86, 1971) reported *Megachile* sp. (Megachilidae) to be an important pollinator of *Opuntia* spp. in the Valley of Mexico, with *Apis mellifera* L. (Apidae) and *Lasioglossum* sp. less common. Cockerell (Am. Nat. 34:487-488, 1900) discussed *Lithurge* spp. (Megachilidae) of New Mexican *Opuntia* and *Echinocactus* flowers.

In addition to bees, we found sap beetles in large numbers, and a single leaf-footed bug (Coreidae) was found in-flower, its occurrence probably incidental.

The large anthophorids (*Diadasia* sp.) visited the flowers for pollen and probably for nectar as well. They land upon the stigma or anthers and walk on the anther "platform" around the stigma as they collect pollen. These bees are sufficiently large that, while walking on the limited space provided by the platform, a pollen-loaded leg is in continual contact with the stigma. Thus from our observations, these are important insects for transferring pollen to the stigma. We collected a small anthophorid (*Ceratina nanula* Cockerell) which, although a pollen collector, is not an effective pollinator because its size is such that it may walk upon the anther platform without its legs necessarily coming in contact with the stigma.

The large anthophorids appear selective as to which flowers they visit. About half as many actually land on the flowers as fly past the plant. The non-visitors pause briefly above each flower before continuing on to another plant. Often the same bee flies from the flowers of one species of *Opuntia* to those of another, and the same species of *Diadasia* was found in the season's earliest flower of *Ferocactus acanthodes* (Lemaire) Britt. & Rose var. *Lecontei* (Engelm.) Lindsay.

Small solitary bees (Megachilidae and Halictidae) are apparently somewhat less important as pollinators. The megachilids collect pollen on the abdomen while some halictids carry great masses of pollen on their legs. These small bees almost always land on the anthers or adjacent perianth, and usually leave without having come in contact with the stigma. However, occasionally they land on the stigma before quickly moving to the anthers. We were unable to distinguish the two families of small bees in the field.

Nitidulids, the most common insects in the flowers, appear to be the least important as pollinators. Almost always they land upon the perianth or anthers and move immediately to the bases of these structures where they mate and probably feed upon nectar. Only rarely do they come in contact with the stigma. Although they fly to flowers on different plants, sap beetles have no pollen carrying apparatus and pollen does not adhere well to their bodies. The obvious decline in

TABLE 1. *Pollinator visits to two* Opuntia *species in the Cerbat Mountains, Arizona.*

		9 June		10 June		
		8:10	9:25	8:10	9:25	$\bar{x}$ *Insects/Flower*
	No. of Flowers	4	4	3	5	
Opuntia chlorotica	Anthophoridae[1]: *Diadasia* sp.	3	0	3	1	0.4
	Megachilidae: *Ashmeadiella* sp.	0	0	0	1	0.1
	Halictidae:	11	8	6	14	2.4
	Lasioglossum (*Dialictus*) spp.	11	6	3	11	1.9
	Halictus tripartitus	0	2	2	3	0.4
	Augochlorella sp.	0	0	1	0	0.1
	Small Bees[2]	0	3	10	6	1.2
	$\bar{x}$ Bees/Flower	3.5	2.8	6.3	4.4	4.1
	Nitidulidae	166	171	82	134	
	$\bar{x}$ Beetles/Flower	41.5	42.8	27.3	26.8	34.6
Opuntia phaeacantha var. *discata*	No. of Flowers	6	4	3	5	
	Anthophoridae: *Diadasia* sp.	2	3	5	2	0.7
	Megachilidae: *Ashmeadiella* sp.	0	3	0	0	0.2
	Halictidae:	9	9	5	2	1.4
	Lasioglossum (*Dialictus*) spp.	7	7	5	2	1.2
	Halictus tripartitus	0	2	0	0	0.1
	Augochlorella sp.	2	0	0	0	0.1
	Small Bees	0	1	0	3	0.2
	$\bar{x}$ Bees/Flower	1.8	4.0	3.3	1.4	2.4
	Nitidulidae	79	110	48	94	
	$\bar{x}$ Beetles/Flower	13.2	27.5	16.0	18.8	18.4

[1] We thank Charles D. Michener, University of Kansas, Lawrence, for insect identifications.

[2] Small bees, Megachilidae or Halictidae, which escaped and therefore could not be further identified.

beetle populations on 10 Jun. (Table 1) undoubtedly reflects the increased wind velocity that day. *Opuntia chlorotica* was near a ridge-top, where the especially gusty winds doubtless made flight difficult for the small beetles.

The flowers of the prickly-pears studied are apparently adapted to pollination by large bees, such as *Diadasia*, while small bees and sap beetles are largely thieves. The stamens of the opuntias studied are mobile and, when sufficiently stimulated, move inward and tightly enclose the style. Sap beetles and small bees do not have sufficient strength or weight to initiate a response, but we observed that the *Diadasia* species is capable of stimulating the stamens sufficiently. It may be that a large bee working its way to the nectar at the base of the style causes the stamens to close, and is forced to exit past the stigma where pollen is deposited during the struggle to escape. While guiding the bee past the stigma, the anthers also deposit pollen on the insect's body (Beutelspacher 1971). Because in our study small bees infrequently contacted the stigma, thigmotrophic behavior of the stamens takes maximum advantage of the infrequent visits by large bees.—*Bruce D. Parfitt and Charles H. Pickett, Dept. Botany and Microbiology, Arizona State Univ., Tempe, AZ 85218.*

OBSERVATIONS ON AQUATIC COLUBRID SNAKES IN TEXAS.—In this paper we report laboratory and field observations on several species of snakes of the genera *Nerodia* and *Regina* in eastern Texas. *Regina grahami* has been observed utilizing crayfish burrows (Strecker, Baylor Univ. Mus. Contrib. 4:3–11, 1926; Anderson, *The reptiles of Missouri*, Univ. Missouri Press, 1965; Mushinsky and Hebrard, Herpetologica 33:162–166, 1977), but the species has never been reported as a mud-burrower. On 22 Jul. 1977, a *R. grahami* was captured at night on a tree limb approximately 75 cm above the surface of the Navasota River, Brazos Co., Texas. The animal was kept in a 10-gallon aquarium partitioned into equal areas of water and soil. On several occasions the snake was observed excavating burrows, and burrowing was initiated both underwater and atop the soil. Burrowing usually resulted in the excavation of a chamber beneath the water level into which the snake would withdraw its entire body. Breathing was accomplished by the snake extending only its nostrils and eyes above the water for short periods of time. On the first day of introduction into the aquarium, extension of the head from the burrow occurred about every 5 min. However, several days later, the animal would remain within the chamber for about 45 min before extending the head to breath. The maximum period of submergence without respiration was 46 min. *Nerodia erythrogaster* and *N. rhombifera* have been reported to remain underwater for 26 min and *N. fasciata* for 24 min (Jacob and McDonald, Comp. Biochem. Physiol. 53A:69–72, 1976). After introduction into the aquarium, the *R. grahami* was not observed out of its burrow for 7 days. A pregnant *N. fasciata confluens* also was maintained in a separate aquarium with similar soil and water conditions, but burrowing behavior was not observed. Crayfish-burrow utilization by a single *N. fasciata* has been reported by Kofron (J. Herpetol. 12:543–554, 1978).

The *R. grahami* bore 16 young on 11 Sep., and the *N. fasciata* six young on 20 Sep. 1977. The *N. fasciata* gave birth upon soil, and several neonates shed within 1 h after birth. On the first day the young *N. fasciata* could not be induced to bite, but striking was elicited the second day. The vibrations of fingernails