

ANTHROPOGENIC EXTINCTION OF THE ENDEMIC DEER MOUSE,
PEROMYSCUS MANICULATUS CINERITIUS, ON SAN ROQUE ISLAND,
BAJA CALIFORNIA SUR, MÉXICO

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Native mammals of 38 species are known from 35 of the islands that surround the Baja California Peninsula of western México (D. J. Hafner, pers. comm.). The majority of these (67 populations of 24 species of 11 species-groups) are rodents, and among the most common insular rodent of these islands is the deer mouse, *Peromyscus maniculatus*, which is known from 10 islands. Huey (1964) and Lindsay (1983) summarized the history of mammal surveys on the islands surrounding the Peninsula. The most extensive surveys were conducted by Nelson (1921) and Burt (1932). With few exceptions, survey efforts subsequent to 1960 targeted specific taxa, islands, or small sets of islands (e.g., Ryckman and Ryckman, 1963; Banks, 1964a, 1964b, 1967; Brand and Ryckman, 1969; Schultz et al., 1970; Lawlor, 1971).

At the same time, impact of humans on these islands has increased at an exponential rate during the past half-century (Bahre, 1983). Adverse effects of introduced non-native animals on native plant and animal communities of islands have been well documented (e.g., Owen, 1977; Konecny, 1987a, 1987b; Van Rensburg and Bester, 1988). Three endemic species of woodrats, *Neotoma anthonyi* (Isla Todos Santos), *N. martinensis* (Isla San Martin), and *N. bunkerii* (Isla Coronados), are regarded as extinct due to predation by introduced feral house cats (*Felis silvestris*) and depletion of food resources (Schultz et al., 1970; Smith et al., 1993; E. Mellink, in litt.). Three other endemic insular taxa (*Lepus insularis* of Isla Espíritu Santo, *Sylvilagus mansuetus* of Isla San José, and *Odocoileus hemionus cerrosensis* of Isla Cedros) are considered rare and potentially threatened (Groombridge, 1993). Further, O. J. Reichman (pers. comm.) has observed behavioral differences in populations of pocket mice (*Chaetodipus spinatus*) on islands in the Gulf of California lacking predators that would leave these mice more susceptible to introduced predators.

In 1994, the Centro de Investigaciones Biológicas del Noroeste, S. C. (CIBNOR) initiated a biological survey of islands of the southern Baja California Peninsula. In addition to collection of specimens and observations in the field, this survey involved interviews of visitors and residents of islands as to past and continuing activities (e.g., introduction of exotic species, poisoning, mining operations) that may impact native species on the islands. During September 1994, we surveyed Isla San Roque, on the Pacific coast of Baja California Sur (27°09'N, 114°23'W). Isla San Roque is a small (40 ha), rocky island, 3.2 km from the coast in San Roque Bay (Fig. 1). The highest point of the sparsely vegetated island is 15 m above sea level, and there is no fresh water (Muñoz, 1946). The island serves as a nesting ground for sea birds, particularly gulls (*Larus*), cormorants (*Phalacrocorax*), and brown pelicans (*Pelecanus occidentalis*).

Only one native mammal, *P. maniculatus cineritius*, has been recorded from Isla San Roque (Allen, 1898). Isla San Roque is a landbridge island, having been joined to the mainland during lower sea levels of the last (Wisconsinan) glacial interval. The island was isolated by elevated sea levels ca. 6,400 years ago (Lawlor, 1983), and *P. m. cineritius* presumably became isolated at that time. However, the presence of closely related species (*P. slevini* and *P. sejugis*) on oceanic islands in the Gulf of California (Hall, 1981) attests to the ability of *P. maniculatus* to colonize islands across saltwater. Thus, *P. m. cineritius* may have colonized Isla San Roque more recently.

Sherman live-traps were set in three transects (Fig. 1), 55 traps per transect, for a total of 165 trap-nights. One transect was at a heavily disturbed, but abandoned, site on the eastern side of the island. At this site, sea bird guano was stored prior to shipping during guano mining operations on the island from the 1940s to the 1970s. The other two transects were near the lighthouse on the west side of the island. These

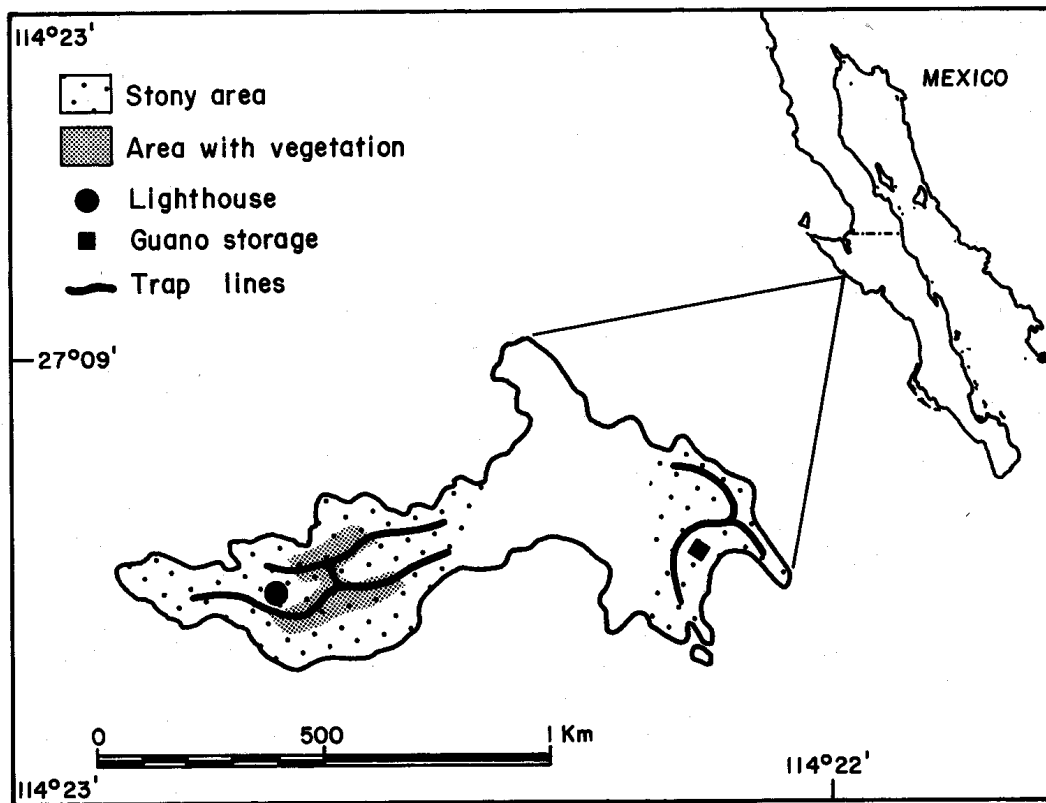


FIG. 1.—Distribution of trap transects and major features of Isla San Roque, a landbridge island 3.2 km off the Pacific coast of Baja California Sur, México.

two transects were more remote from the guano operations and were characterized by relatively dense vegetation, predominantly the exotic ice plant, *Mesembryanthemum crystallinum*. In addition, we found eight open and undisturbed Sherman traps that had been placed two months earlier by the Fisherman Association of Punta Prieta to monitor eradication of introduced rats (*Rattus* sp.) on the island as part of a program to protect eggs of sea birds.

No mammals were captured, and no tracks or other evidence of any rodents were observed. We believe that *P. m. cineritius* is extinct, probably as a result of several synergistic, human-related impacts. Guano from nesting sea birds was mined from islands along the Pacific coast of the Baja California Peninsula beginning in the late 1800s (Goss, 1888; Bahre, 1983). Permanent camps for watchmen and temporary camps for workers were established on Isla San Roque from the 1940s until the 1970s. A former watchman told us that the camps were a source of rats, the supply of which was constantly replenished by the arrival of cargo ships. During this period, large

quantities of rat poison were distributed on the island in an attempt to reduce predation by rats of eggs and chicks of nesting birds. We were told that by the late 1960s, the only mammals left on the island were rats (*Rattus*). We presume that house cats also were brought to the island, as they commonly are found as feral populations on islands that are frequented by fishermen or have permanent camps elsewhere around the Peninsula. Thus, *P. m. cineritius* was subjected to massive habitat alteration from guano mining, competition with introduced rats, direct poisoning from rat poison, and probably predation by house cats.

The history of Isla San Roque is not unique among the islands that surround the Baja California Peninsula. It is likely that other mammals reported from these islands at the beginning of this century are now extinct. In fact, lack of comprehensive and intensive survey efforts on many of these islands leads us to suspect that species may have been extirpated this century on heavily impacted islands without ever having been recorded. Only by surveying all of the islands and

adopting immediate measures to mitigate, eliminate, and reverse adverse impacts can the remaining mammalian fauna of these islands be preserved.

En 1994, se evaluaron las poblaciones de mamíferos de algunas islas en la costa del Pacífico de la Península de Baja California, entre ellas San Roque, donde se había registrado a *Peromyscus maniculatus cineritius* como único mamífero endémico. San Roque fue explotada en las últimas décadas para la extracción de guano, lo que conllevó a la introducción de ratas y gatos domésticos, que compitieron y predaron a la especie nativa, aunado a la aplicación de venenos para el control de roedores y protección de las aves anidantes, nos permiten considerar a *P. maniculatus cineritius* como extinto.

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