TEXAS TECH UNIVERSITY
Natural Science Research Laboratory

Special Publications

Museum of Texas Tech University
Number 61 28 August 2013

Mammals of Padre Island National Seashore, Texas

Gerrad D. Jones and Jennifer K. Frey

Front cover: Top left: Tracks of the gray fox (*Urocyon cinereoargenteus*) on the Gulf beach. Top right: The northern pygmy mouse (*Baiomys taylori*) was associated with coastal prairie habitats. Center: The foredune zone adjacent to the Gulf of Mexico beach. Bottom: Dredged material island in the Laguna Madre. Cover photos by Gerrad D. Jones.

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New Mexico State University

Layout and Design: Lisa Bradley
Cover Design: Gerrad D. Jones
Production Editor: Lisa Bradley

This book was set in Times New Roman and printed on acid-free paper that meets the guidelines for permanence and durability of the Committee on Production Guidelines for Book Longevity of the Council on Library Resources.

Printed: 28 August 2013

Library of Congress Cataloging-in-Publication Data

Special Publications of the Museum of Texas Tech University, Number 61
Series Editor: Robert J. Baker

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ISSN 0169-0237
ISBN 1-929330-25-1
ISBN13 978-1-929330-25-6

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Abstract

Padre Island is the largest barrier island in the world, extending 182 km from Corpus Christi to Port Isabel along the Texas coast. Although parts of Padre Island are developed, Padre Island National Seashore (PAIS) is the largest stretch of undeveloped barrier island in the world and is dominated by coastal prairie. The coastal prairie ecosystem is the southernmost unit of the tallgrass prairie biome, which reaches its southern extent on Padre Island. Despite numerous investigations examining community structure in grasslands, little research has been conducted on small mammals in coastal prairie ecosystems. The goal of this study was to conduct a baseline inventory of the mammals of Padre Island, with an emphasis on PAIS. The mammal fauna was determined through museum queries, literature surveys, and field surveys that occurred from May 2005 thru March 2007. A total of 62 species of non-marine mammals were documented or reported from Padre Island and adjacent areas. Of those, 51 were native and 11 were exotic. Within PAIS, 25 species were present or probably present (including 3 exotic), 20 were encroaching (including 5 exotic), 10 were unconfirmed, 6 were historical (including 3 exotic), and 1 was a false report.

Key words: barrier island, coastal prairie, Gulf of Mexico, inventory, mammals, Texas, survey

Introduction

Although the flora and fauna of many islands have been thoroughly investigated, the majority of archipelagos are largely understudied (Hice and Schmidly 2002; Pilkey 2003). Barrier island chains are no exception, and yet they are dominant features of many coastal areas. These complex island systems are found on every continent except Antarctica, being most extensive in North America (Pilkey 2003). With almost 5,000 km of barrier island shoreline, the United States has the largest number (405) of barrier islands in the world, which represents about 25% of all barrier islands worldwide (Pilkey 2003). The largest barrier island in the world is Padre Island, which is one of several barrier islands along the Texas coastline. While averaging only about 3 km in width, Padre Island occupies about two-thirds of the Texas coastline extending 182 km through five counties (Nueces, Kleberg, Kenedy, Willacy, and Cameron) from Corpus Christi south to Port Isabel (Pilkey 2003; Fig. 1).

Geologic History.—Several processes were likely involved in the formation of barrier islands in the Gulf of Mexico, including Padre Island: submersion of offshore sand ridges; development from submerged shoals and sandbars; and spit accretion (Schwartz 1971; Weise et al. 1980; Pilkey 2003). Approximately 18,000 years before present (ybp), worldwide sea levels were 91 – 137 m below current levels (Curray 1960). At the end of the Pleistocene, rising sea levels from glacial melting inundated sand ridges that may have served as the foundation for barrier islands (Weise et al. 1980). As sea levels rose, currents and waves carried sand toward the shore, continually eroding and forming new sandbars, which provided the sand for barrier islands (Weise et al. 1980). Approximately 5,000-4,500 ybp, at the end of the Holocene, sea levels began to stabilize allowing submerged sand-shoals to coalesce (Fisk 1959; Schwartz 1971). Flooded river valleys and other low lying areas on the mainland created irregular shoreline profiles, forming bays and estuaries (Weise et al. 1980). Long shore currents formed barrier spits, or extensions of the shoreline across these bays and estuaries (Price and Gunter 1943; Tunnel and Judd 2002; Davis and Fitzgerald 2003). Once formed, approximately 3,000

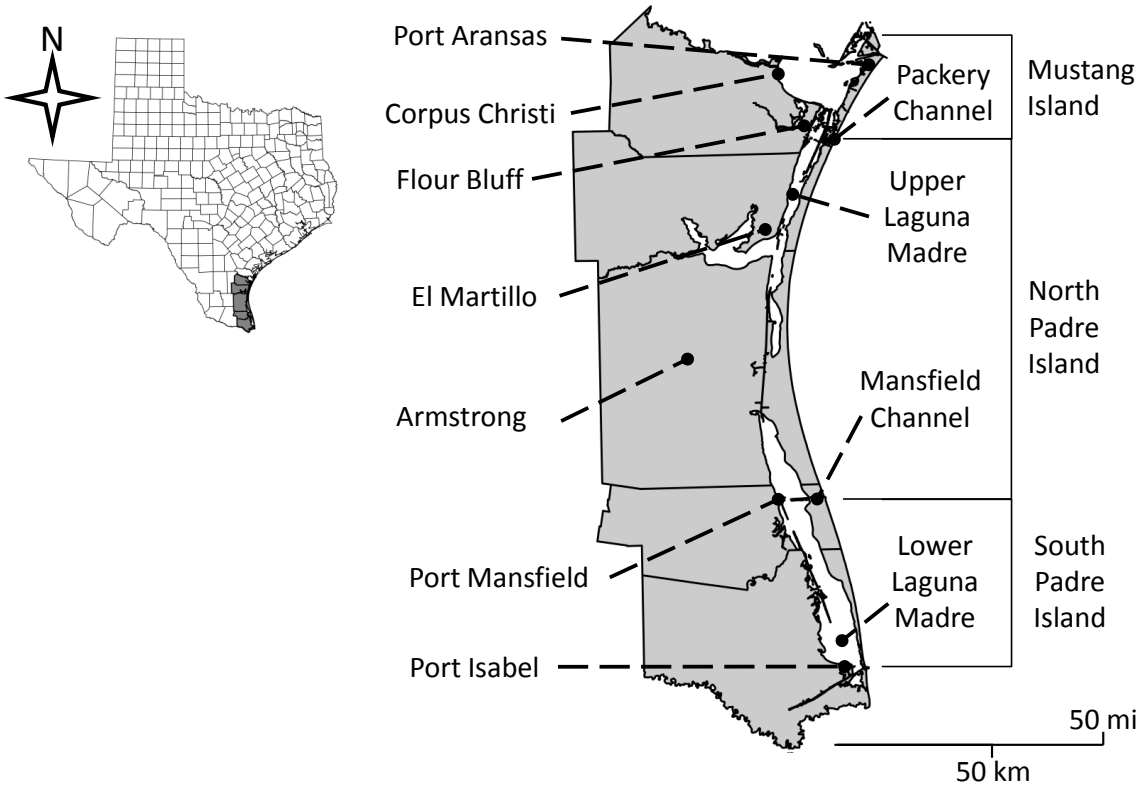

Figure 1. Overview map of Mustang, North Padre, and South Padre islands showing locations of county boundaries, towns, and shipping channels.

ybp, the barrier islands of Texas were shaped by winds, tides, and storms that entered the Gulf of Mexico (Weise et al. 1980; Tunnel and Judd 2002).

The Laguna Madre of Texas (hereafter referred to as Laguna Madre) is a hypersaline lagoon that separates Padre Island from the mainland of Texas (Fig. 1). It too was formed at the end of the Pleistocene and through the Holocene epochs (Tunnel and Judd 2002). The formation of Padre Island trapped sea water between it and the mainland. Because of little freshwater inflow, high evaporation, and limited exchange with Gulf waters, the water within this system has become increasingly saline. While the salinity in the Gulf of Mexico varies between 28-32 parts per thousand, the salinity in the Laguna Madre varies from 40-80 parts per thousand (Tunnel and Judd 2002).

Padre Island was used for cattle production beginning in the early 1800s and by the early 1940's considerable changes had occurred to the island. In 1941, an active dune field covered a portion of the northern part of the island (White et al. 1978). Winds carried sand and sediments from Padre Island and deposited them into the Laguna Madre (Price and Gunter 1943). As a result, by 1943 Padre Island was connected to the mainland by a sand bridge that completely divided the Laguna Madre into upper and lower portions (Price and Gunter 1943; Fig. 1). Subsequently, Padre Island was again separated from the mainland by the construction of the Gulf Intracoastal Waterway, which was completed in 1949. The Gulf Intracoastal Waterway is a *ca* 3.7 m deep by 38 m wide channel that serves as a barge shipping lane that connects the inland waters from Florida to Texas (Alperin 1983). Within larger bodies of water such as the Laguna Madre, dredged material was piled to form small (~3-4 ha) islands known as dredged material islands or spoil islands. Maintenance of the Waterway results in the continual addition of materials and formation of new islands. These islands line the coast of Texas and are prevalent features in the Laguna Madre.

Although once continuous, Padre Island is now separated into North and South Padre islands by the Mansfield Channel (Fig. 1). This channel was constructed between the Laguna Madre and the Gulf of Mexico in 1957 to promote shipping from the Gulf of Mexico into the Intracoastal Waterway (Morton and Pieper 1977). Within months of its completion, however, the channel was filled with sediments as a result of storms and tidal action. In 1962, a second channel was constructed with protective jetties that now separate the two islands (Morton and Pieper 1977). For temporal clarification, we will use the name Padre Island to refer to the island before the construction of the channel and will use the qualifiers of North Padre Island and South Padre Island to describe the sections of the island after the construction of the channel.

Historically, water from the Gulf of Mexico flowed into the Upper Laguna Madre through Corpus Christi Pass (Williams et al. 2007). Corpus Christi Pass was a natural land cut that traversed a nearly north to south path from the Laguna Madre to the Gulf of Mexico. Although Corpus Christi Pass formed the boundary between Mustang and Padre islands, the pass was repeatedly closed and reopened as a result of currents and hurricanes from the Gulf of Mexico (Williams et al. 2007; R. Watson pers. comm.). As a result of these dualistic forces, Mustang and Padre islands were repeatedly connected in the past. In 1924, the construction of Aransas Pass changed the hydraulics of Corpus Christi Pass (Williams et al. 2007). Water from the Gulf of Mexico that normally flowed through Corpus Christi Pass was redirected through Aransas Pass. This cut off the water supply through Corpus Christi Pass causing it to fill with sediments (Williams et al. 2007). Thus, by 1938 Mustang and Padre Island were connected (Baker and Lay 1938). In 2003, construction began on extending the existing Packery Channel in the Laguna Madre to the Gulf of Mexico. By 2006, Packery Channel was completed with protective jetties making a more permanent boundary between Mustang and North Padre islands (Williams et al. 2007).

Vegetation.—The earliest and most basic descriptions of the vegetation on Padre Island come from European explorers. From 1519 to 1800, European activity on Padre Island was minimal; however, the earliest descriptions of the vegetation come from journals of sailors and military personnel (Sherrod and Brown 1989). Although various descriptions of sand dunes and grasslands with little mention of trees were recorded, vegetative descriptions were generally scant during this period (Sherrod and Brown 1989). The first clear descriptions of the habitat occurred in 1745, when a ship commanded by Chevalier Grenier was shipwrecked on Padre Island. In his journal he wrote, "This is a low land without trees nor even any shrubby trees…. At fifty paces from the sea there are shifting sand dunes that separate the beach from a prairie interspersed with salty lakes where there is the best pasturage in the world…." (translated by Sherrod and Brown [1989]). While many of the early explorers note the lack of trees, William Lloyd (1891a) described patches of oak (unidentified) and willow (*Salix nigra*) at the northern portions of the island.

Since the 1800s much of the island's history and vegetation changes were shaped by livestock grazing. Padre Island was first settled in 1804 by the priest Padre Jose Nicolas Balli (hence the name of the island, Padre Island) for use as an open-range cattle ranch. By 1811 there were already an estimated 1,000 cattle on the island, but Balli's herd would eventually grow to an estimated 30,000 head by the time of the Texas Revolution (i.e., *ca* 1836; Reid 1859). In 1828 the first land survey was conducted by Domingo de la Fuente who traveled across the entire length of the island from south to north, noting land features and vegetation (Weise et al. 1980; translated by Sherrod and Brown [1989]). At the southern end of the island, de la Fuente described the environment as consisting of mostly sand dunes, with some salty bays and a few patches of poor pasture (translated by Sherrod and Brown [1989]). The vegetative cover increased and pasture quality improved as de la Fuente moved north, and at the northern end of Padre Island, de la Fuente described the land as a large flat pasture with dunes well covered in grasses (translated by Sherrod and Brown [1989]). In 1846, a Texas Ranger, Samuel Reid, described the island (Reid 1859:39): "the island is one hundred and twenty miles long, and averages only a mile in width, containing no sign of vegetation, save a species of sour wiry grass, which our horses would only eat when compelled by hunger. There is not a single tree throughout its whole extent. On all sides is to be seen sand hillocks and sand wastes; and, taken altogether, it is one of the most

gloomy and desolate looking places which it has ever been our bad fortune to visit. It seemed to us to be a long slice from the western coast of the desert of Sahara..." Patrick Dunn, founder and longtime owner and operator of the Dunn Ranch on Padre Island, claimed the verdure of Padre Island ended after 1870 (Price and Gunter 1943).

Several factors in addition to livestock grazing likely contributed to the reduction of vegetation during the late 19th and first half of the 20th centuries on Padre Island (Price and Gunter 1943; Morton and Pieper 1977). Since 1527 at least 78 hurricanes have hit the coast of Texas, 25 making landfall on Padre Island, often resulting in complete inundation (Price and Gunter 1943; Morton and Pieper 1977; Roth 2004). The earliest reports of widespread destruction caused by hurricanes on Padre Island come from the late 19th century. Between 1880 and 1890, four hurricanes hit Padre Island (Roth 2004). In 1887, a hurricane hit the midsection of Padre Island, leveling the dunes a half-mile inland and removing almost all vegetation along a 64 km stretch of the island (Bailey 1933). In 1919, storm surge inundated Padre Island with a mixture of water and sand, killing 3,000 head of cattle (Price and Gunter 1943). Storm surge from back to back hurricanes in 1933 also flooded Padre Island (Roth 2004). Almost immediately after these hurricanes, fire purportedly burned much of the northern part of Padre Island in 1934 and was followed by a severe drought that struck Texas (Lowery 1959; Morton and Pieper 1977; Roth 2004). Furthermore, in 1950 the worst drought in Texas history struck the state and lasted until 1957, which undoubtedly affected the vegetation on Padre Island.

The following decades marked a turning point in the vegetation on Padre Island. Following the 1950's drought, vegetation expanded considerably on Padre Island (White et al. 1978). Erosion decreased by 75%, while the vegetated dune and barrier flats more than doubled (White et al. 1978). Although the establishment of Padre Island National Seashore (PAIS) in 1963 marked the end of the cattle era on North Padre Island, cattle were allowed to graze within PAIS until 1971. Although a few stray cattle remained within PAIS until the mid 1970's, the vegetation on North Padre Island quickly recovered and began to resemble coastal prairie shortly after the removal of cattle (Fig. 2; L. Moorehead, pers. comm.).

History of Mammal Studies on Padre Island.— Prior to the first mammal surveys, the earliest accounts of mammals on Mustang and Padre islands come from the 18th century (Sherrod and Brown 1989). Journal entries from French and Spanish explorers, military personnel, and surveyors dating as far back as 1745 reported deer, hares, and hogs (Sherrod and Brown 1989) which likely translate to white-tailed deer (*Odocoileus virginianus*), black-tailed jackrabbit (*Lepus californicus*), and collared peccary (*Pecari tajacu*). Although these early accounts provide no information regarding small mammals, they provide valuable insights to the early composition of mammals especially in regards to large mammals. For example, in 1876 Halter wrote, "I use [a rifle] for protection against coyotes, wolves, and panthers which become more plenty as we go down the island" (Sheire 1971; Sherrod and Brown 1989).

The earliest mammal surveys, including small mammals, conducted on Padre Island were done in the late 19th and early 20th centuries. Although primarily through incidental trapping, a number of early specimens collected from Padre Island are included in papers written during the later 19th and early 20th centuries (True 1889; Allen 1891; Merriam 1893; Miller 1897; Osgood 1900; Howell 1901, 1914; Bailey 1905; Jackson 1915; Goldman 1918). The first records of bats on Padre Island were made during the late 19th century and included *Tadarida brasiliensis* and *Atalapha sp*. (= *Lasiurus sp.*; Lloyd 1891b; Allen 1893; Bailey 1905). Some species including *Perognathus merriami*, *Chaetodipus hispidus*, and *Conepatus leuconotus* are only reported from these early accounts.

Little work was conducted on the mammals of Padre Island, or adjacent Mustang Island to the north, from the 1920's through the 1960's. Accounts during this time, however, provide invaluable information on the distribution of various species on these islands (Baker and Lay 1938; Price and Gunter 1943; Blair 1952). Although these records fill in a gap between early surveys and work done after cattle were removed, it is worthwhile to note locality discrepancies. Baker and Lay (1938) report capture localities as "Mustang Island, 18 miles [29 km] south Port Aransas." The

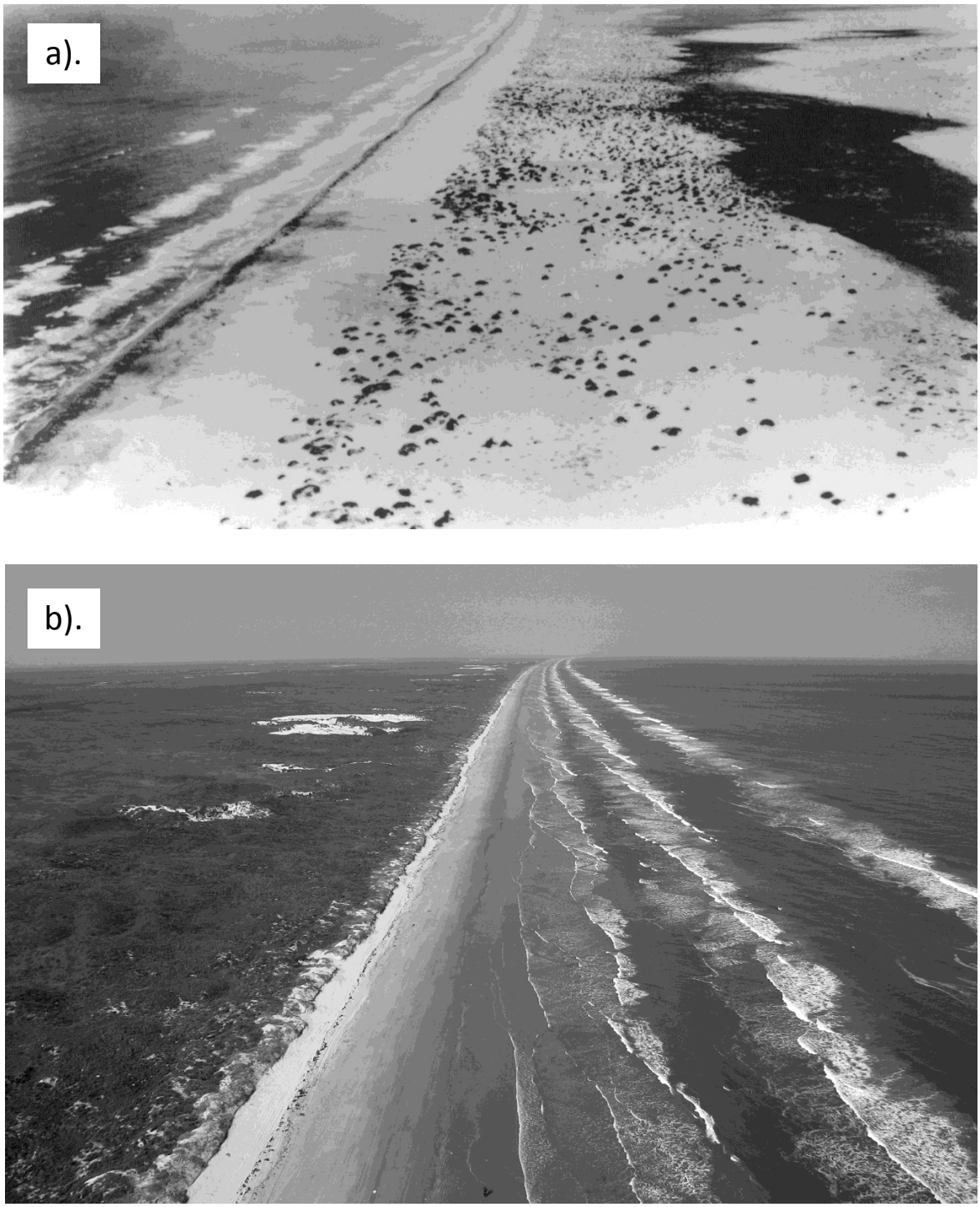

Figure 2. Comparison of vegetation from similar areas of northern North Padre Island between (a) circa 1950 (looking south; Padre Island National Seashore Archives) and (b) 2005 (looking north; used with permission by J. S. Aber and S. W. Aber).

currently recognized boundary between Mustang and North Padre islands (i.e., Packery Channel) is 17.5 miles (28.2 km) south Port Aransas by road (Texas State Highway 321). In 1938, the boundary between Mustang and North Padre islands was Corpus Christi Pass; however, where Texas State Highway 321 crosses from Mustang Island to Padre Island, Corpus Christi Pass and Packery Channel overlap. Although the boundary between North Padre and Mustang islands may have shifted over the years, 18 miles (29 km) south Port Aransas is currently on North Padre Island. Furthermore, a hurricane washover channel, 4.0 km north of Packery Channel by State Highway 321, is labeled Corpus Christi Pass. This washover channel is not the historic boundary between the two islands; however, Koepke (1969) used this washover channel as the distinction between the two islands.

The first annotated list of mammals on Padre Island was created by Raun (1959); it included both prior records in the literature in addition to species captured by him through limited trapping. However, it offered little supporting information regarding capture localities, habitat, effort, or species' distributions on the island. Consequently, we only included records from Raun (1959) when supporting evidence, such as trapping or observation, were included. Thomas (1972) and Rabalais (1975) created checklists of the mammals of North Padre Island and PAIS, but provided no supporting information and were possibly compilations of species based on distribution maps from general mammal field guides. For instance, N. Rabalais (pers. comm.) did not conduct any surveys at PAIS but instead compiled species records, visitor observations, and species that could possibly occur. Although these were the first efforts to compile information on mammals from these islands, they contain little scientific evidence and hence these references were not used to document the mammal fauna in this study.

Koepke (1969) conducted the first small mammal survey of Mustang and North Padre islands. On North Padre Island, his southernmost site was 6.4 km south of Bob Hall Pier, which is just north of the PAIS boundary. In 1,500 trap-nights, using Sherman traps, he captured 51 animals representing six rodent species, including *Xerospermophilus spilosoma*, *Dipodomys compactus*, *Onychomys leucogaster*, *Oryzomys palustris*, *Sigmodon hispidus*, and *Mus musculus*. Yzaguirre (1974) conducted a study of the relationship between small mammals with percent ground cover at a site near the northern end of PAIS (i.e., *ca* beach mile 9). In 1,890 trap-nights, using Sherman traps, he captured 62 animals representing three rodent species identified as *Ictidomys parvidens*, *D. compactus*, and *Peromyscus leucopus*; however, it is likely that *I. parvidens* and possibly *P. leucopus* were misidentified. Baccus et al. (1977) conducted a study of impacts of recreation on vegetation and mammals at four localities within PAIS, ranging from the main entrance south to *ca* beach mile 10. In 1,800 trap-nights, using Sherman traps, 144 animals were captured representing five rodent species, including *Xerospermophilus spilosoma*, *Dipodomys compactus*, *Sigmodon hispidus*, *Baiomys taylori*, and *Reithrodontomys fulvescens*. Baker and Rabalais (1978) conducted the most extensive survey of the mammals of North Padre and Mustang islands in the 20th century, compiling records through literature searches and conducting field surveys. However, it was never published and lacks important details such as trapping effort and descriptions of survey sites. Harris (1988) conducted the most recent mammal study at PAIS. This study focused on the region from the main entrance to South Beach, and he used 1,000 trap-nights to capture 33 individuals of six species (*Xerospermophilus spilosoma*, *Dipodomys compactus*, *Sigmodon hispidus*, *Oryzomys palustris*, *Baiomys taylori*, and *Mus musculus*).

During the last quarter of the 20th century, interest in mammals on North Padre Island shifted from surveys to other types of studies. Several studies have focused on the systematics and ecology of the Gulf Coast kangaroo rat (Kennedy et al. 1973; Schmidly and Hendricks 1976; Baumgardner and Schmidly 1981, 1985; Smith 1986). Segers and Chapman (1984) studied the ecology of the spotted ground squirrel on the island. Finally, Goetze et al. (1999) examined small mammal community patterns in different vegetation zones at three locations near the north end of PAIS. The study involved a total of 2,000 trap-nights, using Sherman traps, which captured just three species of rodents (*D. compactus*, *R. fulvescens*, and *B. taylori*).

Padre Island National Seashore.—Padre Island National Seashore was established in 1963 and encompasses 528 km^2 on North Padre Island (National Park Service 2008b). Only the northern 15 km of Gulf

shoreline are not included within PAIS and, of that, only the northern *ca* 5 km within Nueces County include human development, which is primarily a residential area of Corpus Christi. Approximately 105 km of PAIS parallels the Gulf of Mexico while 110 km of the western edge is lined by the upper and lower Laguna Madre and extensive mudflats. Although PAIS was created to preserve coastal habitats for the purposes of public recreation (National Park Service 2008b), several factors make PAIS a particularly valuable area for maintaining biodiversity and preserving biological processes. At *ca* 110 km in length, PAIS is the largest stretch of undeveloped barrier island in the world (National Park Service 2008b). PAIS also encompasses and protects a variety of habitats including coastal prairie and hypersaline environments that are found in few places in the world.

Increasingly, decisions affecting park resources are made without sufficient biological information (Ruggiero et al. 1992). As a result, the National Park Service Inventory and Monitoring Program was established in 1992 with the overall goal to maintain and manage the biodiversity within national parks (National Park Service 2008a). To appropriately manage the biodiversity within PAIS, it is necessary to document species and understand the factors contributing to their distribution within the park. Although some taxa are well documented in PAIS, relatively little work has been conducted on mammals across PAIS. Mammal studies that have been done were limited by both sampling effort and total area sampled with most focusing on a small area at the northern end of PAIS. To adequately manage the mammal fauna within PAIS, a rigorous survey was needed along the park's entire length. Thus, the primary goal of this study was to evaluate the current and historical mammalian fauna on North Padre Island with emphasis on PAIS. This was done through literature searches, museum queries, and field sampling using standardized, targeted, and opportunistic sampling techniques. By providing baseline data regarding the historical and current composition of the mammals and their habitat associations in PAIS, park personnel will be able to establish protocols for maintaining and monitoring populations within PAIS.

MATERIALS AND METHODS

Study Area.—Padre Island National Seashore was divided both latitudinally and longitudinally. Latitudinally, we divided PAIS into three sections based on beach naming conventions. North Beach was the northernmost 1.8 km section of beach within PAIS (Fig. 3). Malaquite Beach, also known as Closed Beach, was closed to vehicular traffic and extended *ca* 7.2 km south of North Beach to the end of the paved Park Road 22 (Fig. 3). South of Malaquite Beach was the Primitive Gulf Beach, also called South Beach, which had no roads (travel was via the beach) and extended *ca* 96.5 km south to Mansfield Channel. Along the Primitive Gulf Beach locations were designated by beach mile marker, which indicated the distance south (by beach) from the southern end of Malaquite Beach and Park Road 22 (Fig. 3). To assist people traveling "down island," markers were spaced every 5 miles along the Primitive Gulf Beach. We regularly used beach miles to identify trapping locations adjacent to the Gulf of Mexico.

Longitudinally, the terrestrial environment on Padre Island was divided into seven habitat zones working westward from the Gulf of Mexico to the Laguna Madre: beach, foredune, interdune, primary dune, interior dune, interior, and laguna matrix (Fig. 4). These zones, with the exception of the interior dunes, were found from the shore of the Gulf of Mexico to the Laguna Madre, respectively, and were continuous along the length of the island. Although discontinuous, the interior dunes were common on the west side of the primary dune system.

The beach zone, which occurs along the Gulf of Mexico, was gently sloped and was continually affected by wind, waves, tides, storm surges, and vehicular traffic. Although the beach was almost entirely devoid of vegetation, large quantities of sargassum (*Sargassum sp.*), a marine algae, were deposited on the beach during spring and summer months (National Park Service 2008b). Other organic debris that washed ashore included driftwood, fish, and invertebrates. Inorganic de-

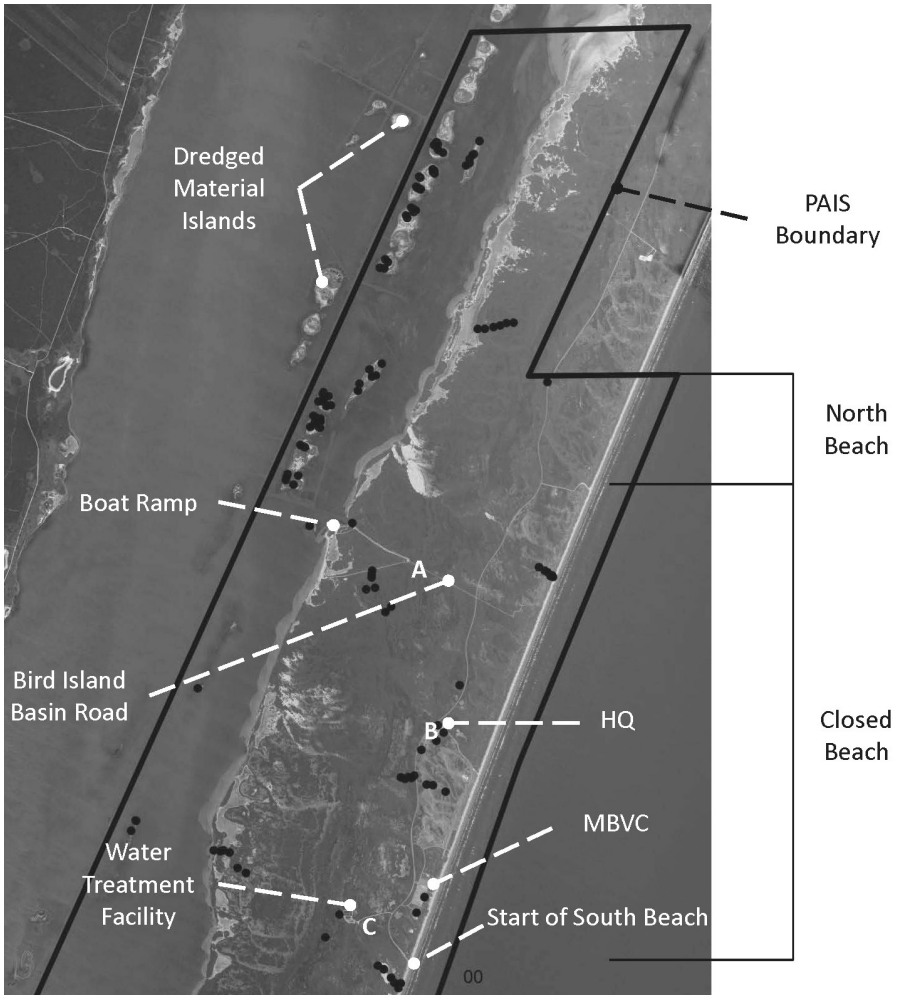

Figure 3. Map of the northern part of Padre Island National Seashore showing park boundaries (black line), prominent landmarks (HQ = park headquarters; MBVC = Malaquite Beach Visitors Center), freshwater ponds (A, B, and C), North Beach, Closed Beach, and northern end of Primitive Gulf Beach at beach mile marker 00. Black circles represent the northernmost trapping localities within PAIS.

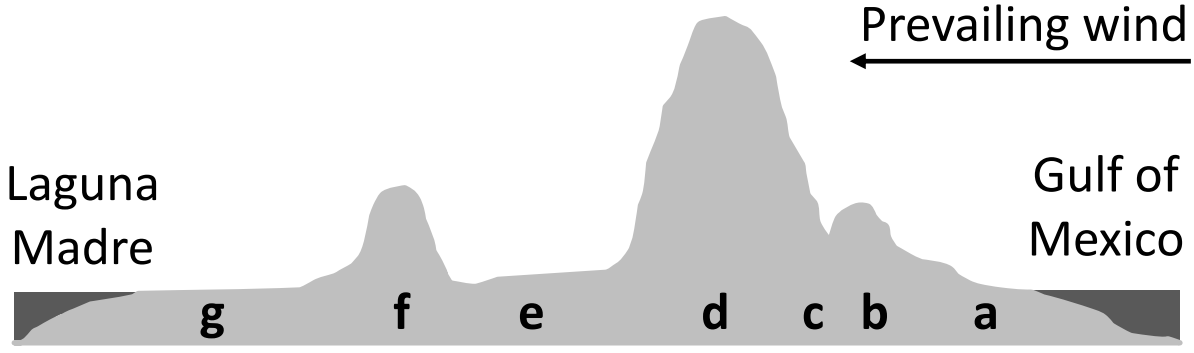

Figure 4. Cross-section of North Padre Island. Terrestrial classification zones were classified as beach (a), foredune (b), interdune (c), primary dune (d), interior (e), interior dune (f), and laguna matrix (g).

bris such as plastics and styrofoam also washed ashore, primarily from the shrimping industry, offshore natural gas platforms, and inland sources washing out from rivers and streams (National Park Service 2008b).

Landward of the beach was a ridge of vegetated coastal sand dunes. This dune system was subdivided into four zones including foredune, interdune, primary dune, and interior dune. The foredune was immediately adjacent to the beach and was dominated by morning glory (*Ipomoea imperati* and *Ipomoea pes-caprae*), in addition to sea oats (*Uniola paniculata*) and beach tea (*Croton punctatus*). The larger primary dune was located more inland and was typically dominated by grasses including seacoast bluestem (*Schizachyrium scoparium*) and sea oats, in addition to plains wild indigo (*Baptisia leucophaea*). When present, the interior dunes had vegetation similar to the primary dune, but they were generally smaller. The interdune was a low lying area located between the foredune and primary dune, and shared similar vegetation with both dune habitats. Although dunes can be found throughout Padre Island, they are concentrated adjacent to the beach. These dunes are fairly well stabilized by vegetation, except where vegetation had been removed by wind, water, or human activity (Drawe and Kattner 1978; Judd et al. 1989; D. Echols, pers. comm.; G. Jones, pers. obs.).

Behind the dune system was a relatively low lying zone composed of various habitats. The interior zone consisted of vegetated flats of coastal prairie dominated by bushy bluestem (*Andropogon glomeratus*), seacoast bluestem, plains wild indigo, and gulfdune paspalum (*Paspalum monostachyum*). The coastal prairie is the southernmost unit of the tallgrass prairie biome in North America (Diamond and Smeins 1984), and climatically it ranges from humid and sub-humid in the north to sub-humid and semi-arid in the south (Thornthwaite 1948; Diamond and Smeins 1984). The interior zone was the single largest terrestrial zone within PAIS (Ramsey et al. 2002). Within the flats, storm water collected in depressions to form wetlands dominated by plants such as bulrush (*Scirpus pungens* and *Sciprus americanus*), southern cattail (*Typha domingensis*), and the exotic giant reed (*Arundo donax*). The salinity of these wetlands varied, which resulted in floral communities that contained species tolerant of both fresh and salt water (National Park Service 2008b). Permanent sources of freshwater within PAIS were scarce. Within the northern portions of PAIS, these seemed to be limited to four ponds, which were located at Bird Island Basin (pond A), 0.8 km south of the headquarters building (pond B), and 1.0 km east south-east of the Malaquite Beach Visitor Center (pond C and the waste water treatment pond; Fig. 3). The laguna matrix zone consisted of extensive tidal flats composed of mud and sand that were found along the western edge of the island adjacent to the Laguna Madre. Although the majority of these flats were bare, vegetated areas included shoregrass (*Monanthochloe littoralis*), quelite (*Atriplex arenaria*), and glassword (*Salicornia virginica*). While trees are seemingly nonexistent throughout most of the park, live oak (*Quercus virginiana*) grows in several small mottes (i.e., dense groupings) in northern portions of PAIS whereas black willow (*Salix nigra*) grows in western portions of PAIS as far south as beach mile 6.

Several small islands (< 1 km^2), both natural and human-made, were located adjacent to North Padre Island in the Laguna Madre. The two natural islands, North and South Bird islands, were low islands partially inundated by salt water. Dominant plant species included wolfberry (*Lycium carolinianum*), cenicilla (*Sesuvium portulacastrum*), and sea purslane (*Sesuvium sessile*) as well as other salt marsh species. The human-made islands were composed of sediments dredged from the creation or maintenance of shipping lanes and were known as dredged material islands or spoil islands. The vegetation on dredged material islands was variable such that islands separated by < 100 m might have very different vegetative communities. However, some species common on these islands included black willow, sea ox-eye daisy (*Borrichia frutescens*), and vidrillos (*Batis maritima*). Dredged material islands were named based on the nearest US Coast Guard Intracoastal Waterway Marker.

Literature Searches.—Primary literature, field journals, personal accounts, and unpublished reports were examined for information regarding the mammals of North Padre Island, as well as the adjacent barrier islands, Mustang Island and South Padre Island. Literature search engines (ArticleFirst, BIOSIS, FirstSearch, Google Scholar, JSTOR, SciSearch, and Wildlife & Ecology Studies Worldwide) were used to find literature published by searching for key words such as barrier islands, coastal faunas, mammals, and

Texas. William Lloyd conducted mammal surveys on Padre Island during 1890-1892 as part of the Biological Survey of Texas (Bailey 1905) and his field catalog was reviewed at the Southwest Collection/Special Collections Library, Texas Tech University, Lubbock, Texas. Files at the Natural Resources and Interpretive offices at PAIS were examined for relevant information.

Museum Queries.—We queried 22 museums for records of mammals collected from the five counties surrounding Mustang, North Padre, and South Padre islands (Nueces, Kleberg, Kenedy, Willacy, and Cameron counties; Table 1). Of those, 19 museums responded with records of 958 mammal specimens. All specimens were included in the annotated list of mammals under *Specimens Reported*. We flagged original locality descriptions that we believed to contain errors (e.g., incorrect county; incorrect island) with an asterisk. In order to prevent any loss of information, locality data were reported as recorded by the museum and in the original units. Specimens from the American Museum of Natural History, National Museum of Natural History, Padre Island Natural History Museum, and Museum of Texas Tech University were examined and

Table 1. Museums queried for specimens of mammals from Mustang, North Padre, and South Padre islands, Texas. For museums with specimens, also indicated are the museum acronym and number of records (NR = no response was received). All specimens were included in the annotated list of mammals.

Acronym	Museum	Records
AMNH	American Museum of Natural History	11
ASNHC	Angelo State Natural History Collection	168
KU	Natural History Museum, University of Kansas	65
LSUMZ	Louisiana State University Museum of Natural Science	26
MSB	Museum of Southwestern Biology, University of New Mexico	59
MVZ	Museum of Vertebrate Zoology, University of California, Berkeley	12
NMNH	National Museum of Natural History	85
PAISNHM	Padre Island National Seashore Natural History Museum	18
PSM	Slater Museum of Natural History, University of Puget Sound	3
TCWC	Texas Cooperative Wildlife Collection, Texas A&M College Station	121
TTU	Museum of Texas Tech University	237
UIMNH	University of Illinois Museum of Natural History	145
UMMZ	University of Michigan Museum of Zoology	6
UWBM	Burke Museum of Natural History and Culture, University of Washington	2
	Carnegie Museum of Natural History	0
	Museum of Natural History, Midwestern State University	0
	Royal Ontario Museum	0
	Sternberg Museum of Natural History, Fort Hays State University	0
	Field Museum	0
	Centennial Museum, University of Texas El Paso	NR
	Pan American University, Mammal Collection	NR
	Texas A&M Collections, Kingsville	NR
	Total	958

were included in the annotated list of mammals under *Specimens Examined*.

Field Surveys.—We conducted field surveys on PAIS from May 2005 to March 2007. For each survey location, we described habitat and recorded date and locality information including county, mile marker or other spatial description, and Universal Transverse Mercator coordinate with a hand-held Global Positioning system unit. For each captured animal, we recorded species, sex, reproductive condition, age, and standard body measurements. A single individual of each species was euthanized using chloroform and prepared as a museum voucher, as were individuals found dead in traps. Specimens were provided with a PAIS accession number (281) and catalog numbers and were subsequently deposited in the Biodiversity Research and Teaching Museum at Texas A&M University. All other individuals were released at the capture location. All animals were handled in accordance with the guidelines set forth by the American Society of Mammalogists and the New Mexico State University Institutional Animal Care and Use Committee. All captured animals were included in the annotated list of mammals under *Captured*.

We surveyed mammals using both standardized small mammal trapping transect arrays and non-standardized sampling that targeted specific species or habitats (see Fig. 5a for locations surveyed for small terrestrial mammals). Standardized trapping occurred during the summers of 2005 and 2006 and fall of 2006 at a total of 35 locations (192 transects) in PAIS. These included 24 localities (140 transects) distributed along all three beach sections of PAIS (i.e., North, Closed, and Primitive Gulf Beach divisions). At each of these beach locations, we placed an array of six transects within each of the habitat zones except beach. If a habitat zone was absent from a locality, that transect was placed in the interior zone. Transects consisted of 50 LFA Sherman traps (7.6 x 8.9 x 22.9 cm; H. B. Sherman Traps, Tallahassee, FL), spaced 4 m apart, and placed along the orientation of each zone. Standardized trapping also occurred on 11 small islands in the Laguna Madre (52 transects; Table 2). Since these islands were small and did not contain the same zones as on the barrier island, the six transects were placed within the dominant vegetative features found on each island. Traps were baited each afternoon with a commercial horse sweet feed consisting of a mixture of grains and molasses. Traps were checked the following morning and closed during daylight hours. Traps were set for 2 consecutive nights, accumulating a total of 600 trap-nights per locality. The total sampling effort on standardized transects included 20,949 trap-nights (14,600 on North Padre Island and 6,349 on islands in the Laguna Madre). Assuming all closed but empty traps were open for half a night (i.e., a closed but empty trap accounted for 0.5 trap-nights), the effective sampling effort was 20,836.5 trap-nights (14,531.5 on North Padre Island and 6,295 on islands in the Laguna Madre).

Because standardized trapping missed some unique habitats and because some mammals are not readily captured using Sherman traps, several non-standardized techniques also were used to document mammals. We used Sherman traps and Tomahawk traps to sample other habitats or species that might be missed using standardized techniques. This also was done opportunistically and occurred in areas where mammal sign was present or where unique habitat patches existed. The total non-standardized sampling effort was 11,292 Sherman trap-nights (11,274.5 trap-nights when corrected for closed but empty traps) and 171 Tomahawk trap-nights.

Two species of shrews, the least shrew (*Cryptotis parva*) and desert shrew (*Notiosorex crawfordi*), have been documented in southern Texas but have not been reported on Texas barrier islands (Blair 1952; Hice and Schmidly 2002). We used a total of 365 pitfall trap-nights in an attempt to document these species. Pitfalls consisted of 1-liter plastic food containers that were placed in the ground, flush with the surface, and, where possible, on runways created by other species (e.g., hispid cotton rat [*Sigmodon hispidus*] and marsh oryzomys [*Oryzomys palustris*]), which often are used by shrews. In general, five traps were placed *ca* 4 m apart on a single runway. These species have been reported in marshes and saltgrass (*Distichila spicata*) associations elsewhere in the Southwest (Schmidly 2004; Frey 2005). Consequently, we used 55 pitfall trap-nights at Pond A, which was a permanent freshwater pond immediately south of Bird Island Basin road (Fig. 3; Kleberg Co., 13.5 km N, 15.00 km E El Martillo, UTM 14-3039331N-6685056E). Traps were set at the edge

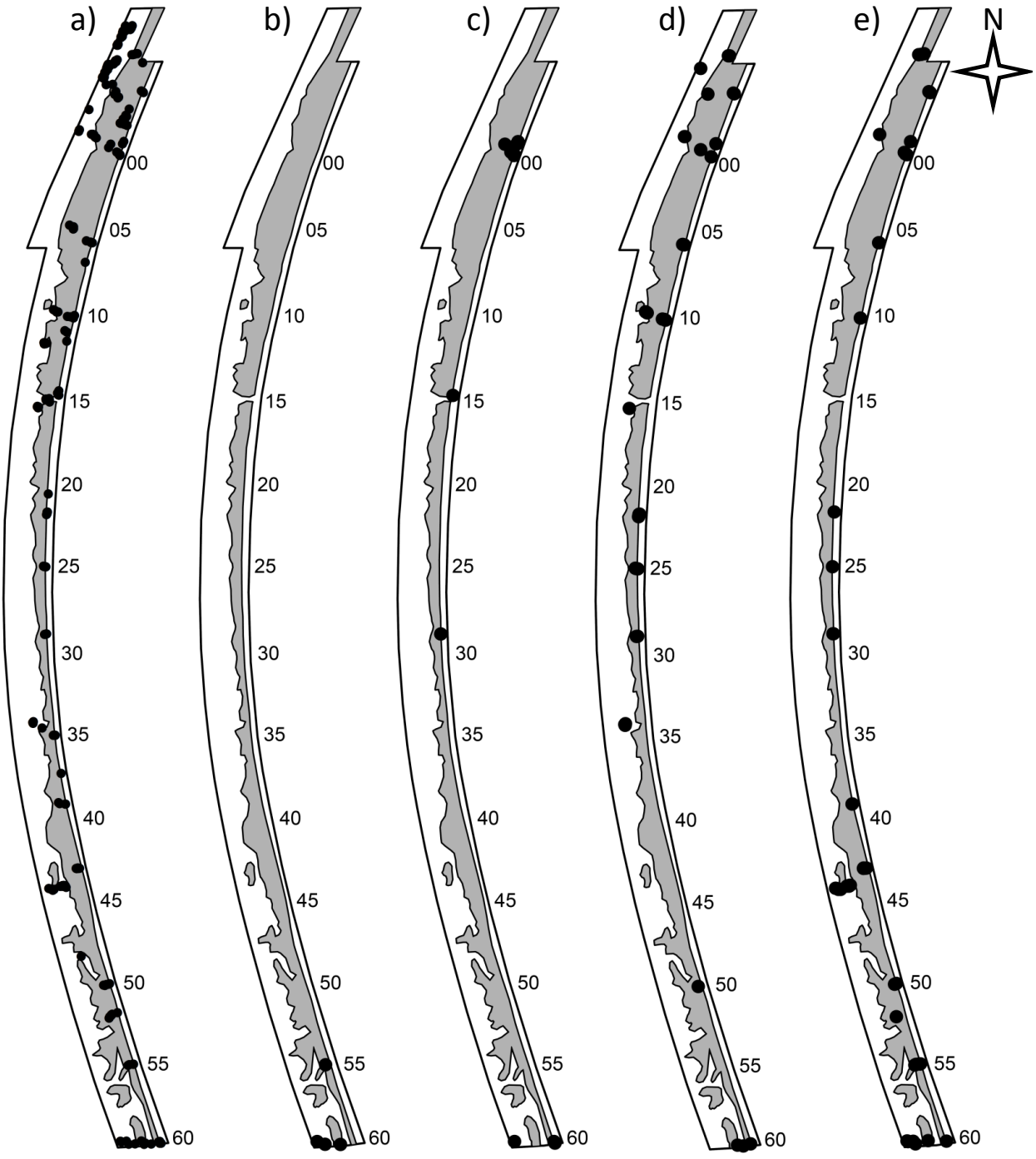

Figure 5. Map of Padre Island National Seashore (PAIS) showing locations of all sites trapped and records of mammals (black dots): a) All trapping locations within PAIS; b) *Dasypus novemcinctus*; c) *Xerospermophilus spilosoma*; d) *Geomys personatus*; e) *Dipodomys compactus*. Lines represent park boundaries; the shaded region is the vegetated part of North Padre Island; and the unshaded region is the Gulf of Mexico (right of vegetated part of island) and the Laguna Madre and unvegetated mud flats (left of the vegetated part of the island). Numbers represent beach mile markers in the Primitive Gulf Beach Zone.

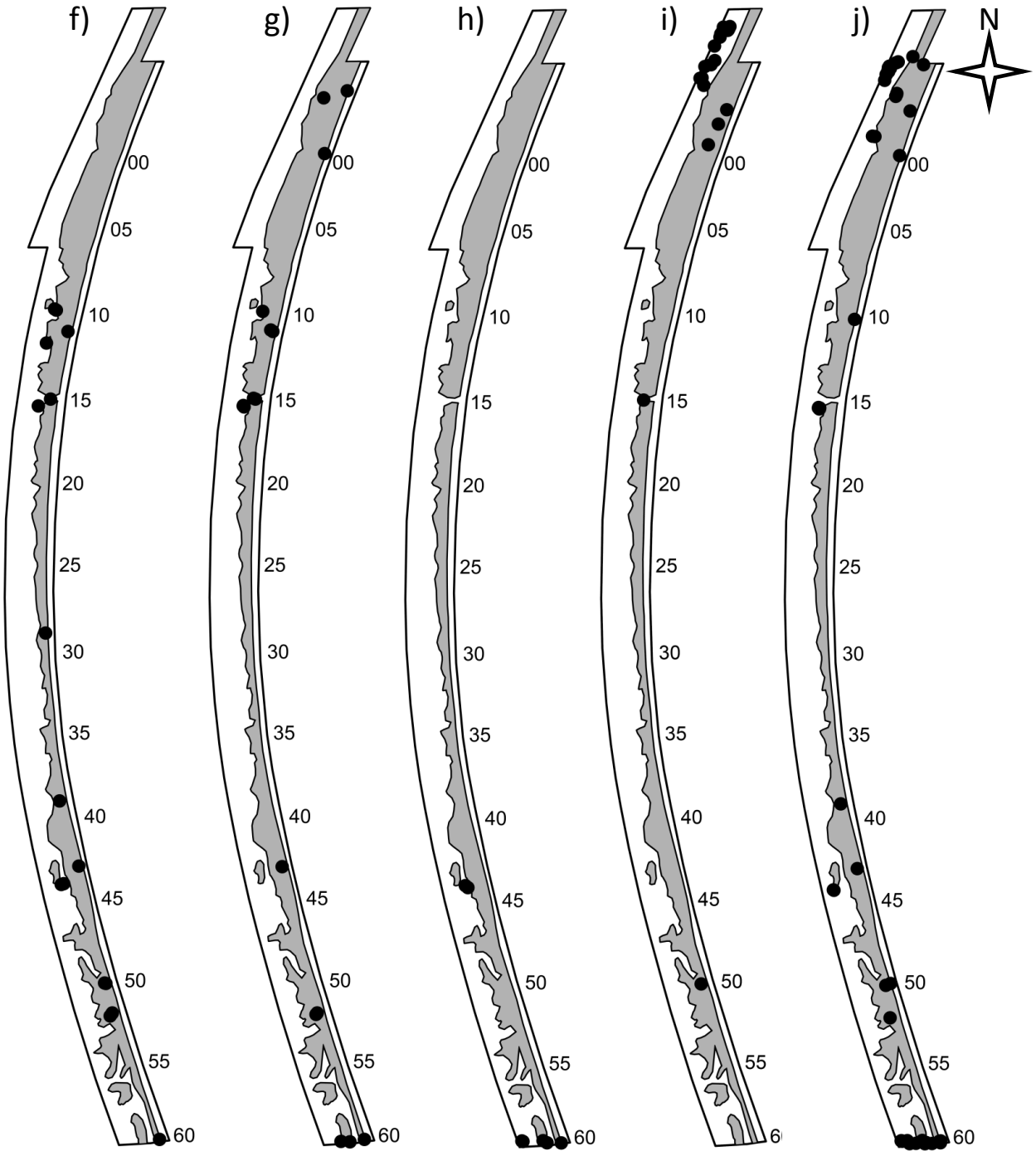

Figure 5 (continued). f) *Baiomys taylori*; g) *Reithrodontomys fulvescens*; h) *Onychomys leucogaster*; i) *Oryzomys palustris*; j) *Sigmodon hispidus*.

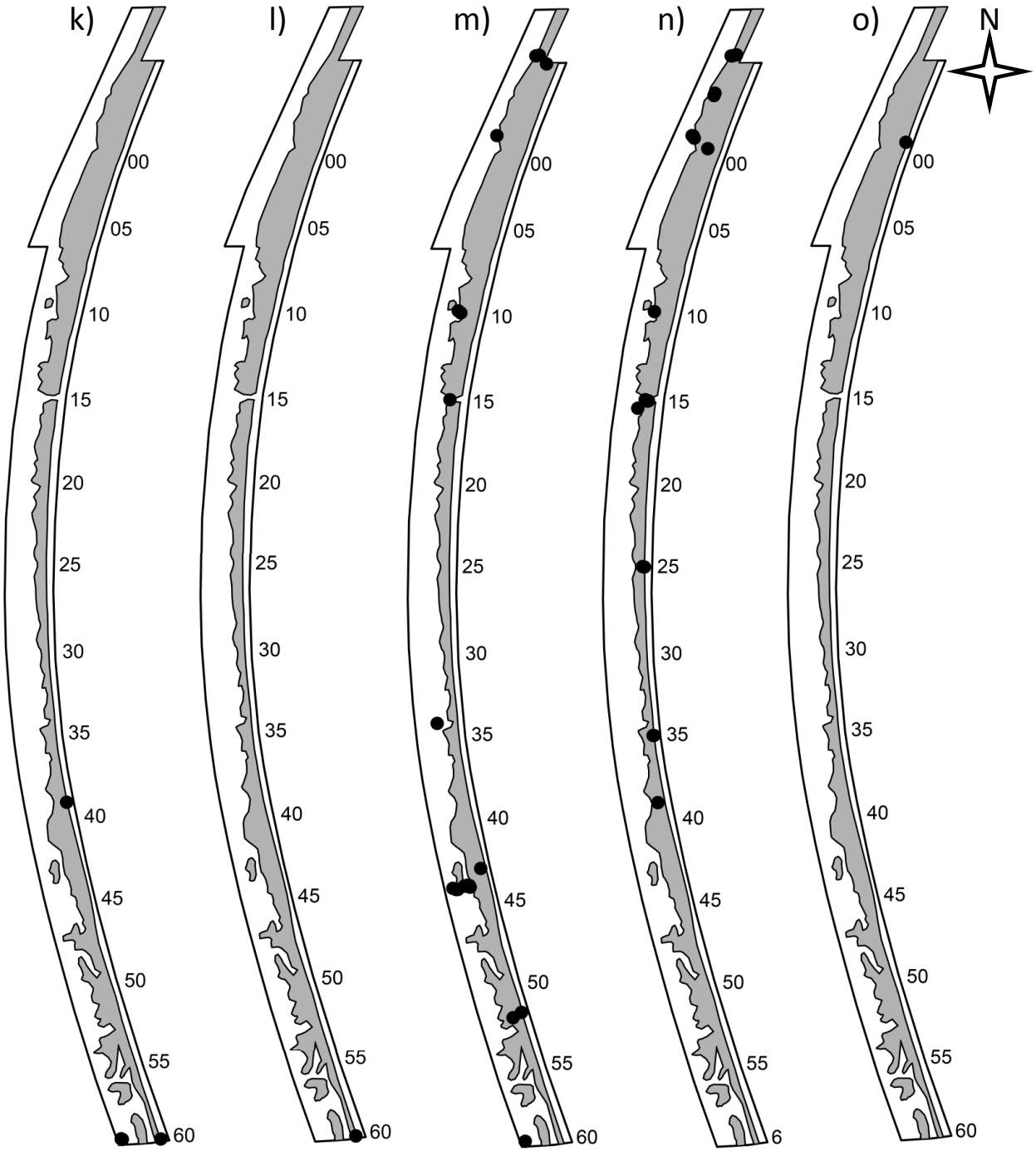

Figure 5 (continued). k) *Mus musculus*; l) *Rattus rattus*; m) *Lepus californicus*; n) *Scalopus aquaticus*; o) *Tadarida brasiliensis*.

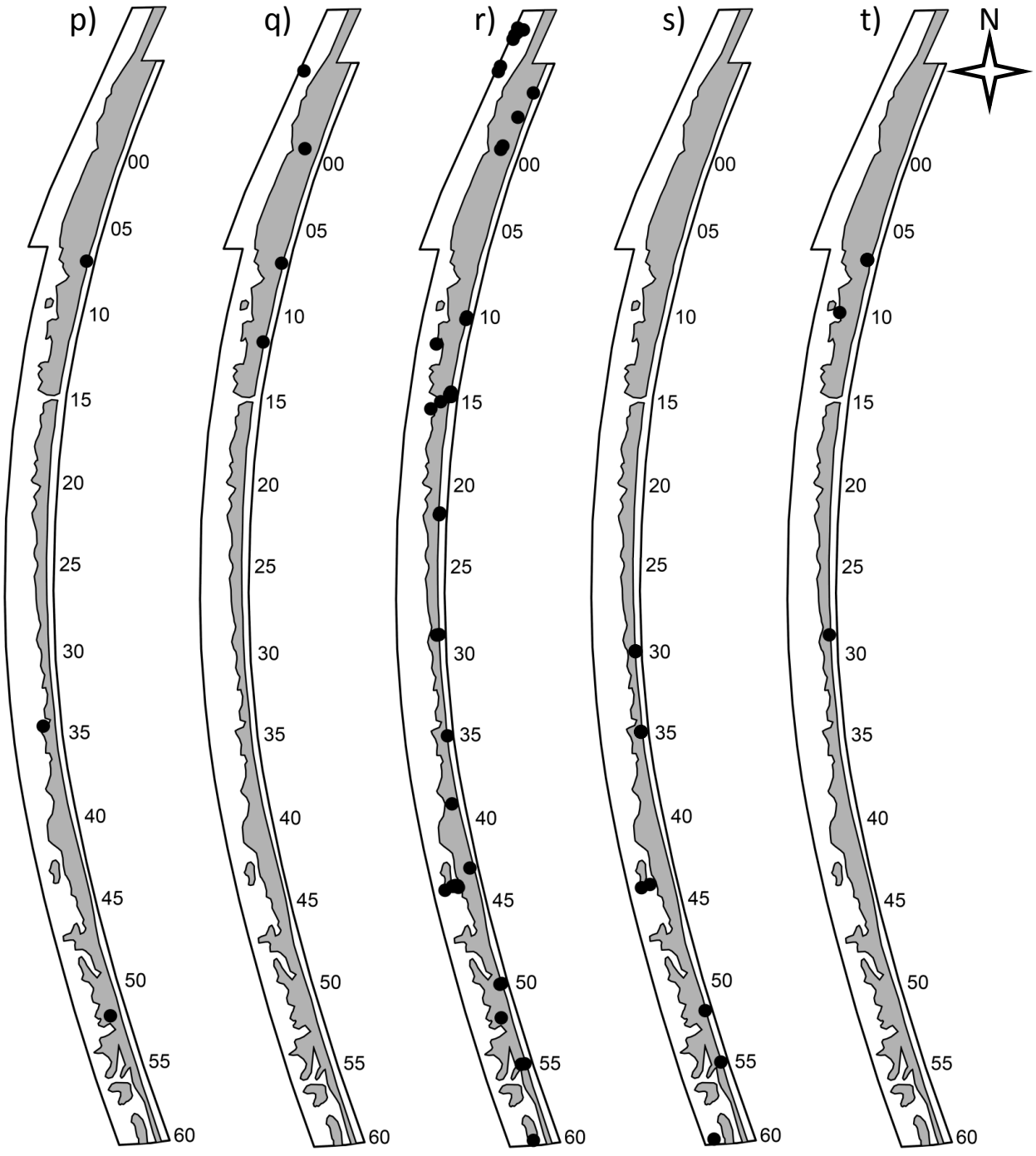

Figure 5 (continued). p) *Lynx rufus*; q) *Urocyon cinereoargenteus*; r) *Canis latrans*; s) *Taxidea taxus*; t) *Mephitis mephitis*.

Figure 5 (continued). u) *Procyon lotor*; v) *Odocoileus virginianus*.

*Table 2. Location, trapping effort, and results of mammal surveys on 14 small islands in the Laguna Madre within Padre Island National Seashore, Texas. Two islands (ROV and SAC) did not have names and were given random three letter names. Results include numbers of each species of mammal captured, including the marsh oryzomys (*Oryzomys palustris*; Orpa) and hispid cotton rat (*Sigmodon hispidus*; Sihi) and presence (1) or absence (0) of species observed including, Texas pocket gopher (*Geomys personatus*; Gepe), gray fox (*Urocyon cinereoargenteus*; Urci), coyote (*Canis latrans*; Cala), raccoon (*Procyon lotor*; Prlo), and white-tailed deer (*Odocoileus virginianus*; Odvi).*

	Location UTM (Zone 14R)		Sherman Trap Effort		Trapped		Observed				
Island	Easting	Northing	Traps set	Effective trap-nights	Orpa	Sihi	Gepe	Urci	Cala	Prlo	Odvi
DMI 95	668294	3045443	600	592	4	0	0	0	1	1	1
North Bird Island	668793	3045247	900	896	40	0	0	0	0	1	0
DMI 97	668150	3045070	600	597	2	0	0	0	0	1	1
DMI 99	667975	3044812	1200	1187.5	1	0	0	0	1	1	1
DMI 101	667908	3044475	600	594.5	2	0	0	0	0	1	1
DMI 103	667585	3043774	160	160	4	0	0	0	0	1	0
South Bird Island	667309	3042136	500	491	3	8	0	0	0	1	1
DMI 111	666663	3041781	699	690.5	1	130	1[a]	0	1	1	0
DMI 113	666515	3041454	700	696.5	0	43	0	1	1	1	0
DMI 115	666350	3041034	300	298	0	4	0	0	1	1	0
DMI 117	666173	3040638	939	937.5	2	2	0	0	1	1	0
SAC Island	666481	3039975	150	149.5	9	0	0	0	0	0	0
ROV Island	664807	3037602	200	189.5	0	0	0	0	0	0	0
Rock Island	663871	3035579	600	598.5	0	0	0	0	0	0	0

[a]The observation was a found skull; there was no sign of live gophers on the island.

of the pond in cattails and other wetland vegetation. We used 10 pitfall trap-nights in saltgrass habitat at the shooting range adjacent to the wastewater reclamation ponds west of Malaquite Beach Visitor Center (Fig. 3; Kleberg Co., 8.72 km N, 13.64 km E El Martillo, UTM 14-3034347N-666836E). Finally, we used 300 pitfall trap-nights in saltgrass adjacent to the boat ramp at Bird Island Basin (Fig. 3; Kleberg Co., 14.36 km N, 14.09 km E El Martillo, UTM 14-3040035N-667067E).

Many species of bats roost in human structures such as buildings (Harris 1988; Kunz et al. 1996). We periodically examined buildings at PAIS headquarters, Malaquite Beach Visitor Center, and employee housing for roost sites. We opportunistically searched abandoned bunkers and trees for roosting bats. In addition, we deployed mist nets for a total of 55.5 hours from 2005 to 2006 (Table 3). Three, three-tiered mist nets of varying lengths (6 m, 9 m, and 12 m) were deployed after dusk over freshwater ponds, in and adjacent to stands of black willow, which occurred sporadically along the Laguna Madre from the northern park boundary south approximately 21 km, and adjacent to buildings at headquarters and Malaquite Beach Visitor Center where insects were attracted to lights from buildings and street lamps. We also deployed an Anabat II detector for 97.7 hours to passively search for bats. The Anabat was used concurrently with mist netting and was used independently when mist netting was not feasible.

Fossorial species, including gophers (*Geomys personatus*) and moles (*Scalopus aquaticus*), were previously documented on PAIS. Although evidence of their presence was easily noticed based on ground disturbances, we attempted to capture individuals to confirm identifications using constructed live-capture Hart traps placed within active burrows or runs (Hart 1973). In order to document large mammals, we deployed two motion sensitive cameras (DeerCam, Park Falls, Wisconsin) along game trails, ponds, and burrows. Camera traps were baited with cat food, sardines, or carrion found on the beach. A total of 214 pictures were taken from 69 camera trap-nights. Lastly, we noted mammals and their sign observed at each survey location. Tracks and scat were photographed to provide evidence of species identification. No attempt was made to document marine mammals. All specimens observed but not captured (including those in photographs) were included in the annotated list of mammals under *Observational Localities*.

All reported or documented species from North Padre Island were included in the accounts of species. A checklist of the mammals of PAIS was generated wherein all species were classified into one of six occurrence groups used by the National Park Service Inventory and Monitoring Program: *present* - species' occurrence in park is verified and assumed to be extant; *probably present* - very high confidence that the organism currently is in PAIS; *encroaching* - species not documented within PAIS but documented in neighboring areas of Mustang, North Padre, and South Padre islands or along the adjacent mainland; *historical* - historical occurrence but species is now probably absent; *unconfirmed* - species' occurrence was based on weak or no evidence; *false report* - species previously reported within PAIS based on a misidentification. All scientific names follow Wilson and Reeder (2005) except for *Xerospermophilus spilosoma* (Helgen et al. 2009), *Ictidomys parvidens* (Helgen et al. 2009), and *Perimyotis subflavus* (Hoofer and Van Den Bussche 2003).

Table 3. Use of mist-nets and an ultrasonic bat detector to sample bats within Padre Island National Seashore, Kleberg County, Texas, 2005-2007. The ultrasonic bat detector was deployed at all locations; number of hours mist nets were deployed at each location are indicated (indicates when only the ultrasonic bat detector was deployed).*

		Location UTM, NAD83 (Zone 14R)			
Date	Descriptive Locality	Easting	Northing	Habitat	Mist Net Hours
26-Jun-05	11.4 km N, 14.6 km E El Martillo	668049	3036650	Water	4
27-Jun-05	13.8 km N,14.1 km E El Martillo	667474	3039002	Black Willow	2
1-Jul-05	11.7 km N, 14.9 km E El Martillo	668317	3037060	Structure	2.53
21-Jul-05	9.0 km N, 13.5 km E El Martillo	666885	3034317	Water	2
18-May-06	13.0 km N, 14.7 km E El Martillo	668073	3039319	Water	4
19-May-06	13.8 km N, 14.1 km E El Martillo	667474	3039002	Black Willow	4
20-May-06	13.8 km N, 14.1 km E El Martillo	667474	3039002	Black Willow	4
21-May-06	16.4 km N, 16.1 km E El Martillo	669485	3041711	Black Willow	4
22-May-06	10.1 km N, 11.8 km E El Martillo	666051	3034403	Black Willow	4.24
9-Jun-06	15.3 km S, 43.8 km E Armstrong	664180	2963510	Water	*10.1
12-Sep-06	9.0 km N, 14.5 km E El Martillo	668008	3034343	Structure	*11.36
20-Sep-06	9.0 km N, 14.5 km E El Martillo	668008	3034343	Structure	*10.49
23-Sep-06	9.4 km N, 14.8 km E El Martillo	668125	3034569	Structure	*10.23
25-Sep-06	9.4 km N, 14.8 km E El Martillo	668125	3034569	Structure	4.9
10-Oct-06	9.0 km N, 14.5 km E El Martillo	668008	3034343	Structure	8.27
30-Oct-06	9.0 km N, 14.5 km E El Martillo	668008	3034343	Structure	11.53

RESULTS

We compiled a list of 62 species of non-marine mammals that were reported from Padre Island or adjacent areas (Table 4). With respect to PAIS, 25 species were present or probably present, 20 were encroaching, 10 were unconfirmed, 6 were historical, and 1 was a false report. Before this study, relatively little effort was invested in mammal surveys on North Padre Island; however, the mammal fauna was surprisingly well-documented. In studies where Sherman trap effort was reported, a total of 8,220 trap-nights was accumulated on Mustang and North Padre islands during all prior studies (Baker and Lay 1938; Blair 1952; Koepke 1969; Yzaguirre 1974; Baccus et al. 1977; Harris 1988; Goetze et al. 1999). During this survey, the total effort was 32,241 Sherman trap-nights (32,101 trap-nights when corrected for closed but empty traps). Although this effort was nearly 4 times greater than all previous studies, no additional small mammal species were documented. However, our efforts substantiate the probable extirpation of species such as Merriam's pocket mouse (*Perognathus merriami*) and hispid pocket mouse (*Chaetodipus hispidus*) as well as a number of range shifts. The greatest proportion of unconfirmed and encroaching species were bats and carnivores. This is to be expected because these species are more difficult to sample. It is likely that some species, especially bats and carnivores, are present on North Padre Island and within PAIS but have gone unnoticed.

Of the 62 species, 11 were non-native. Of these, the horse (*Equus caballus*) and cow (*Bos taurus*) are historical and have been removed from PAIS. A single coyote-dog hybrid litter was reported but is considered

Table 4. Checklist of the mammals of Padre Island National Seashore, Texas, including status in the park and nativity.

Species	Common Name	Park Status	Nativity
Didelphis virginiana	Virginia opossum	unconfirmed	native
Dasypus novemcinctus	nine-banded armadillo	present	native
Sciurus niger	eastern fox squirrel	encroaching	native
Ictidomys mexicanus	Mexican ground squirrel	false report	native
Xerospermophilus spilosoma	spotted ground squirrel	present	native
Geomys personatus	Texas pocket gopher	present	native
Dipodomys compactus	Gulf Coast kangaroo rat	present	native
Perognathus merriami	Merriam's pocket mouse	historical	native
Chaetodipus hispidus	hispid pocket mouse	historical	native
Liomys irroratus	Mexican spiny pocket mouse	encroaching	native
Ondatra zibethicus	common muskrat	encroaching	native
Baiomys taylori	northern pygmy mouse	present	native
Reithrodontomys fulvescens	fulvous harvest mouse	present	native
Neotoma micropus	southern plains woodrat	unconfirmed	native
Onychomys leucogaster	northern grasshopper mouse	present	native
Peromyscus leucopus	white-footed deermouse	encroaching	native
Peromyscus maniculatus	North American deermouse	encroaching	native
Oryzomys couesi	Coues' oryzomys	encroaching	native
Oryzomys palustris	marsh oryzomys	present	native
Sigmodon hispidus	hispid cotton rat	present	native
Mus musculus	house mouse	present	non-native
Rattus norvegicus	brown rat	encroaching	non-native
Rattus rattus	roof rat	present	non-native
Myocastor coypus	coypu	encroaching	non-native
Lepus californicus	black-tailed jackrabbit	present	native
Sylvilagus floridanus	eastern cottontail	unconfirmed	native
Cryptotis parva	North American least shrew	encroaching	native
Notiosorex crawfordi	Crawford's gray shrew	encroaching	native
Scalopus aquaticus	eastern mole	present	native
Tadarida brasiliensis	Brazilian free-tailed bat	present*	native
Eptesicus fuscus	big brown bat	encroaching*	native
Nycticeius humeralis	evening bat	encroaching*	native
Lasiurus borealis	eastern red bat	encroaching*	native
Lasiurus cinereus	hoary bat	encroaching*	native
Lasiurus intermedius	northern yellow bat	unconfirmed*	native
Lasiurus seminolus	seminole bat	encroaching*	native

Table 4 (cont.).

Species	Common Name	Park Status	Nativity
Perimyotis subflavus	American perimyotis	present*	native
Myotis velifer	cave bat	encroaching*	native
Felis catus	domestic cat	encroaching*	non-native
Leopardus pardalis	ocelot	unconfirmed	native
Lynx rufus	bobcat	probably present	native
Puma concolor	cougar	unconfirmed	native
Puma yagouaroundi	jaguarundi	unconfirmed	native
Panthera onca	jaguar	unconfirmed	native
Urocyon cinereoargenteus	gray fox	present	native
Canis latrans	coyote	present	native
Canis lupus familiaris	domestic dog	encroaching*	non-native
Canis lupus familiaris x *latrans*	domestic dog x coyote hybrid	historical	non-native
Canis rufus	red wolf	historical	native
Mustela frenata	long-tailed weasel	encroaching	native
Taxidea taxus	American badger	present	native
Conepatus leuconotus	American hog-nosed skunk	unconfirmed	native
Mephitis mephitis	striped skunk	present	native
Spilogale putorius	eastern spotted skunk	unconfirmed	native
Nasua narica	white-nosed coati	probably present	native
Procyon lotor	raccoon	present	native
Equus caballus	horse	historical	non-native
Sus scrofa	wild boar	encroaching	non-native
Pecari tajacu	collared peccary	probably present	native
Bos taurus	domestic cow	historical	non-native
Boselaphus tragocamelus	nilgai	present*	non-native
Odocoileus virginianus	white-tailed deer	present	native

*Occurrence is likely to be only temporary due to natural movement patterns or active removal of non-natives from the park.

historical. The nutria (*Myocastor coypus*), feral house cat (*Felis catus*), feral domestic dog (*Canis lupus familiaris*), and feral pig (*Sus scrofa*) were reported in the past but currently are considered encroaching. Coupled with the Norway rat (*Rattus norvegicus*), these species are the most likely to invade PAIS given their close proximity to the park. Although the Norway rat has not been confirmed within PAIS, it occurs commensally with humans and therefore has a high probability of being transported into the park.

The house mouse (*Mus musculus*), roof rat (*Rattus rattus*), and nilgai (*Boselaphus tragocamelus*) are the only non-native mammalian species currently present within PAIS. Because park personnel actively remove nilgai, it is unlikely resident breeding populations oc-

cur within PAIS even though individuals are likely to continually disperse across the Laguna Madre from the mainland to North Padre Island. We only documented the house mouse at the Turtle Patrol Cabin (beach mile 39.5) and Mansfield Channel, while the roof rat was only captured at Mansfield Channel where it appeared to be relatively common in jetty rocks. It is possible that these species could spread to other areas of the island. We observed roof rats transported in the undercarriage of vehicles. Eradication of non-native rats and mice has been successful on islands adjacent to New Zealand (Towns and Broome 2003). Given the restricted distribution of these species within PAIS, implementing a successful eradication plan is plausible.

No bats were captured, but individuals were detected through observation and using the anabat detector. We identified two Brazilian free-tailed bats (*Tadarida brasiliensis*) roosting at the Malaquite Beach Visitor Center. On 9 July 2005, we saw an unidentified bat flying south over the foredune system in the morning near beach mile 30 (UTM 14-2987789N-660781E). On 25 September 2006, we saw two pale medium-large bats (possible *Lasiurus sp.*) flying around a street lamp at night near the volunteer housing just south of the Malaquite Beach Visitor Center (UTM 14-3034343N-668008-E). Adjacent to beach mile 44 (UTM 14-2963510N-664180E), short fragments of bat calls were recorded near a washover channel, but the calls were not high enough quality to identify the individual(s). The infrequent documentation of bats, especially with the Anabat, suggests that bats are rare within PAIS.

Of the non-native species, cattle have played the greatest role in shaping the distribution and composition of the mammals on North Padre Island. It is possible that cattle facilitated the northward expansion of more arid adapted species during the 19th and 20th centuries by maintaining short, sparse vegetation and creating unvegetated dunes. Species that may have benefited from the presence of cattle include the nine-banded armadillo (*Dasypus novemcinctus*), black-tailed jackrabbit (*Lepus californicus*), Merriam's pocket mouse (*Perognathus merriami*), hispid pocket mouse (*Chaetodipus hispidus*), northern grasshopper mouse (*Onychomys leucogaster*), and American badger (*Taxidea taxus*), all of which were historically found on northern portions of North Padre Island and adjacent Mustang Island. Following the removal of cattle in the early 1970's, the vegetation on North Padre Island began to recover. L. Moorehead (pers. comm.) described the vegetation during this time at the northern end of North Padre Island as knee length but sparse. During this study, however, the vegetation throughout the northern half of North Padre Island was dominated by tall, dense grass. During this time of vegetative succession, the range of many species retracted to the more arid southerly portions of North Padre Island. Of the previously mentioned species, only the black-tailed jackrabbit was found on the northern half of North Padre Island during this study, where it was observed only on mudflats and within burned areas. It is unknown if the range of many species will continue to shrink on North Padre Island or if the vegetation has reached a climax state.

Unlike other arid adapted species, the Gulf Coast kangaroo rat (*Dipodomys compactus*) and the spotted ground squirrel (*Xerospermophilus spilosoma*) were documented across the entire length of PAIS during this study. Although the vegetation throughout the northern half of North Padre Island was dominated by tall dense grass, short sparse vegetation was maintained adjacent to the beach by wind and tidal action throughout the foredune and primary dune systems. This continual disturbance is likely to have facilitated the persistence of both species on northern portions of North Padre Island. In northern portions of PAIS, both species were captured almost exclusively within the foredune and primary dune system. Interestingly, the northern grasshopper mouse was never documented within the foredune or primary dune despite the fact that suitable habitat appeared to exist. It is possible that the Gulf Coast kangaroo rat and the spotted ground squirrel have adapted to persisting within this continually disturbed environment while the northern grasshopper mouse has not. This might explain why the range of the northern grasshopper mouse receded during the last quarter of the 20th century, while no range reduction was documented for the Gulf Coast kangaroo rat or spotted ground squirrel.

Over the last two centuries, at least three native species appear to have been extirpated on North Padre Island including the red wolf (*Canis rufus*), Merriam's pocket mouse (*Perognathus merriami*), and hispid

pocket mouse (*Chaetodipus hispidus*). The disappearance of the red wolf was almost certainly a result of human persecution and introgression with coyotes (Paradiso and Nowak 1982; Phillips et al. 2003; Fredrickson and Hendrick 2006). Persecution by humans is the primary reason behind local extirpation of many carnivores and could explain why the presence of other large carnivores, such as jaguar (*Felis onca*) and cougar (*Puma concolor*) are intermittent on North Padre Island (Woodroffe 2000). Reasons for the disappearances of the two pocket mice are less clear. Although these species undoubtedly benefited from the presence of cattle, the effects of overgrazing were likely to have negatively impacted both tall grassland and arid grassland adapted species. In extreme cases, grazing, coupled with hurricanes and fire, denuded much of the vegetation over large tracts of Padre Island during the late 19th and early 20th centuries. This is likely to have created an inhospitable environment for most terrestrial species. It is possible that the pocket mice were unable to cope with the rapid environmental changes that occurred during this time, which may have resulted in their extirpation. It is likely that many heteromyids are less adept at dispersing over water when compared to cricetids and murids. It therefore would be less likely for pocket mice to recolonize North Padre Island after extirpation.

ACCOUNTS OF SPECIES PRESENT AND PROBABLY PRESENT

ORDER CINGULATA
Family Dasypodidae
Dasypus novemcinctus
Nine-banded Armadillo

Audubon and Bachman (1854) reported the first record of the nine-banded armadillo in the United States along the shore of the Rio Grande River in southern Texas. It subsequently expanded its range along the Gulf Coast to Corpus Christi by 1880 (Bailey 1905; Humphrey 1974). It spread throughout much of Texas during the 20th century and it is currently absent only from desert areas of western Texas (Blair 1952; McCarley 1959; Dalquest 1968; Humphrey 1974; Schmidly 2004). Bailey (1905) reported armadillos on Padre Island based on second-hand observations. Baker and Rabalais (1978) reported it within PAIS at the Malaquite Beach Campground, and Harris (1988) reported it north of PAIS near the Nueces-Kleberg County line on North Padre Island. We only documented this species south of beach mile 55 (Fig. 5b). We commonly saw tracks along Mansfield Channel where we also observed an individual walking along the edge of the water.

Over the last century nine-banded armadillos have dramatically expanded their range north and east (Price and Gunter 1943). Possible reasons for this expansion include climate change, overgrazing, and removal of carnivores (Fitch et al. 1952; Talmage and Buchanan 1954). On North Padre Island, however, the range of armadillos appears to have receded, because it is now apparently restricted to the southern half of the island (D. Echols, pers. comm.; L. Moorehead, pers. comm.; G. Jones, pers. obs.). Several factors may be responsible for this change. Livestock husbandry practices involving predator control have occurred extensively throughout Texas (Wade 1980). During the 150 years that ranching occurred on Padre Island, ranchers were likely to have killed predators. Nine-banded armadillos may have benefited from reduced predator populations (Fitch et al. 1952). With the establishment of PAIS in 1964, and with the end of ranching operations in 1971, coyotes and other predators of armadillos are likely to have increased in number, therefore reducing armadillo numbers.

Observational Localities (4).—Kenedy Co., 32.00 km South, 47.84 km East Armstrong, UTM 14-2946869N-668642E (1); Willacy Co., 1.34 km North, 10.88 km East Port Mansfield, UTM 14-2939571N-667838E (1); Willacy Co., 1.12 km North, 11.65 km East Port Mansfield, UTM 14-2939311N-668592E (1); Willacy Co., 1.02 km North, 13.09 km East Port Mansfield, UTM 14-2939303N-670043E (1).

ORDER RODENTIA
Family Sciuridae
Xerospermophilus spilosoma
Spotted Ground Squirrel

The spotted ground squirrel was formerly classified in the genus *Spermophilus* (Helgen et al. 2009). It occurs in a narrow band from southern South Dakota, through the central and southwestern United States, into Mexico (Hall 1981; Tomich 1982). In Texas, it ranges throughout much of the western and southern part of the state (Bailey 1905; Mearns 1907; Blair 1952; Dalquest 1968; Schmidly 2004). Merriam (1893) described the subspecies *annectens* from Padre Island. It has been well documented from PAIS and adjacent areas (Allen 1894; Bailey 1905; Baker and Lay 1938; Howell 1938; Blair 1952; Raun 1959; Koepke 1969; Smith 1973; Yzaguirre 1974; Baccus et al. 1977; Baker and Rabalais 1978; Segers and Chapman 1984; Harris 1988).

Within PAIS, we observed spotted ground squirrels in partially vegetated areas, especially in foredunes and primary dunes (Fig. 5c). For example, we observed them in abundance at the Malaquite Beach Visitor Center, the employee housing just south of the visitor center parking area, and in dunes near the Mansfield Channel jetty. We captured spotted ground squirrels on transects associated with high bare ground intermixed with sparse vegetation with poorly developed litter layers. Dominant vegetative species included partridge pea (*Chamaecrista fasciculata*), plains wild indigo (*Baptisia leucophaea*), beach tea (*Croton punctatus*), camphor daisy (*Machaeranthera phyllocephala*), indian blanket (*Gaillardia pulchells*), and other forbs, which is consistent with previous descriptions of habitat for this species (Raun 1959; Koepke 1969; Baccus et al. 1977; Baker and Rabalais 1978; Segers and Chapman 1984; Harris 1988). We captured few individuals, probably as a result of their diurnal activity patterns. It is likely, however, that it occurs wherever sparse vegetation is present.

Specimens Reported (96).—Nueces Co., Mustang Island (KU 80428); Nueces Co., Mustang Island, Port Aransas (TTU 90812); *San Patricio Co., Port Aransas (TTU 19831); *San Patricio Co., Port Aransas, City Limits (TTU 11437); Nueces Co., Port Aransas Park (TCWC 50420); Nueces Co., Nueces County Park (TCWC 50413, 50414, 50415, 50416, 50417, 50418); Mustang Island, 1.7 Mi SW Port Aransas (MSB 57450, 57451, 57452, 57453, 57454, 57455, 57456, 57460); *San Patricio Co., Mustang Island, 5 Mi S Port Aransas (TTU 19832, 19833, 19834, 19835, 19836, 19837, 19838, 19839, 19840); Mustang Island, 6 Mi SW Port Aransas (MSB 57457, 57458, 57459); Nueces Co., Mustang Island, 7 Mi S, 4 Mi W Port Aransas (TTU 25834, 25835, 25836, 25837, 25838, 25839, 25840, 25841, 25842, 25843, 25844); *San Patricio Co., 9 Mi S Port Aransas (TTU 31661); Nueces Co., Mustang Island, 10 Mi SW Port Aransas (TTU 90811); Nueces Co., Mustang Island, 13 Mi S of Port Aransas (KU 74377, 74382); *Nueces Co., Padre Island, 13 Mi S of Port Aransas (KU 74378, 74379, 74380, 74381); *San Patricio Co., 13 Mi S Port Aransas (TTU 19841, 19842); Nueces Co., Mustang Island, 14 Mi SW of Port Aransas (KU 27136, 27137, 27138, 27139, 27140, 27141, 35138); Padre Island (NMNH 301945); Nueces Co., Packery Channel Park (TCWC 50419); *Nueces Co., Mustang Island, 19 Mi S Port Aransas (TCWC 632, 633, 634, 635); Kleberg Co., Padre Island (PSM 9349, 9350, 9351); Cameron Co., Padre Island, 12 Mi from Port Isabel, The Tanks (NMNH 30410); Cameron Co., Padre Island, 6.5 Mi N, 2 Mi E Port Isabel (UIMNH 42800, 42801, 42802, 42803, 42804, 42805, 42806, 42807, 42808, 42809, 42810, 42811, 42812, 42813, 42814, 42815); Cameron Co., Padre Island, 6 Mi N, 3 Mi E Port Isabel (TCWC 27608).

Specimens Examined (13).—Nueces Co., Padre Island (NMNH 31436, 31437; TTU 93142); Cameron Co., Padre Island (NMNH 30407, 30408, 30409, 30411, 30412, 30413, 30414, 30415, 30416, A42370).

Observational Localities (7).—Kleberg Co., 9.33 km North, 14.75 km East El Martillo, UTM 14-3034569N-668125E (1); Kleberg Co., 8.99 km North, 14.43 km East El Martillo, UTM 14-3034343N-668008E (1); Kleberg Co., 8.99 km North, 14.43 km East El Martillo, UTM 14-3034343N-668008E (1); Kleberg Co., 8.99 km North, 13.44 km East El Martillo, UTM 14-3034317N-666885E (1); Kenedy Co., 14.88 km South, 8.13 km East El Martillo, UTM 14-3010465N-661972E (1); Kenedy Co., 8.72 km North, 40.8 km East Armstrong, UTM 14-2987792N-660813E (1); Willacy Co., 1.30 km North, 10.88 km East Port Mansfield, UTM 14-2939568N-667792E (1).

Captures (15).—Kleberg Co., 8.99 km North, 14.43 km East El Martillo, UTM 14-3034343N-668008E (3); Kleberg Co., 8.32 km North, 14.06 km East El Martillo, UTM 14-3033572N-667445E (1); Kleberg Co., 8.32 km North, 13.87 km East El Martillo, UTM 14-3033522N-667531E (1); Kleberg Co., 8.03 km North, 14.19 km East El Martillo, UTM 14-3033396N-667637E (4); Kleberg Co., 7.76 km North, 14.27 km East El Martillo, UTM 14-3033317N-667779E (2); Kleberg Co., 7.84 km North, 14.35 km East El Martillo, UTM 14-3033245N-667744E (1); Willacy Co., 40.00 km South, 50.56 km East Armstrong, UTM 14-2939566N-671536E (1); Willacy Co., 6.40 km North, 14.61 km East Port Mansfield, UTM 14-2939415N-671619E (2).

Family Geomyidae
Geomys personatus
Texas Pocket Gopher

True (1889) described the Texas pocket gopher from Padre Island; it is endemic to southern Texas and coastal areas of Tamaulipas, Mexico (Bailey 1905; Blair 1952; Selander et al. 1962; Schmidly 2004). It is well documented on PAIS and adjacent areas (Allen 1891; Bailey 1905; Baker and Lay 1938; Blair 1952; Raun 1959; Koepke 1969; Baccus et al. 1977; Baker and Rabalais 1978; Harris 1988). We documented the Texas pocket gopher primarily through sign as no other species of gopher is known to occur on Padre Island. We saw gopher mounds in the greatest density in dune areas, but they also were common throughout all terrestrial zones within PAIS (Fig. 5d). Furthermore, we found a skull on Dredged Material Island 111, but it is possible that it was brought there by a predator. We also found mounds in urban areas of North Padre Island, Nueces Co., in yards, golf courses, and roadsides. It is likely to occur in most habitat types across North Padre Island.

Specimens Reported (184).—Nueces Co., Mustang Island (LSUMZ 1583, 1584, 1585, 1586; TTU 92313, 92314, 92315, 92316, 92319, 92320, 92321, 92322, 92323, 92324, 92325, 92326, 92327, 92328, 92329, 92330, 92331, 92332, 92333, 92334, 92335, 92336, 92337, 92338, 92339); Nueces Co., Nueces County Park (TCWC 54066, 54067); Nueces Co., Port Aransas (ASNHC 11384, 11385, 11386, 11387, 11388, 11389; TTU 19332, 19333, 19334, 19335, 19336); Nueces Co., Mustang Island, Port Aransas, University of Texas (TTU 9648, 9649, 9650, 9651, 9652, 9653, 9654, 9655, 9656, 9657, 9658, 9659, 9660); Nueces Co., 2.5 Mi S Port Aransas (UIMNH 39580, 39581, 39582, 39583, 39584, 39585, 39586, 39587); *San Patricio Co., Mustang Island, 4.8 Mi S Port Aransas (TTU 4130); Nueces Co., 5 Mi S Port Aransas (ASNHC 11390, 11391); Nueces Co., Mustang Island, 4.5 Mi N access road no 2 on Park Road 53 (TTU 15334, 15335, 15336, 15337, 15338, 15339, 15340, 15341, 15342, 15343); Mustang Island, 6 Mi SW Port Aransas (MSB 57470, 57471, 57472); Nueces Co., Mustang Island, 7 Mi S, 4 Mi W Port Aransas (TTU 25206, 25207, 25208, 25209, 25210, 25211,25212, 25213, 25225); *Kleberg Co., Padre Island, 6.1 Mi S Nueces County Park (TTU 15329); Nueces Co., Mustang Island, access road no 2 (TTU 15344, 15345, 15346, 15347, 15348, 15349, 15350, 15351, 15352, 15353, 15354, 15355, 15356, 15357, 15358, 15359, 15360, 15361, 15362, 15363, 15364, 15365); Nueces Co., Mustang Island, 9 Mi S, 5 Mi W Port Aransas (TTU 25214, 25215, 25216, 25217, 25218, 25219, 25220, 25221, 25222, 25223, 25224); Nueces Co., Mustang Island, 14 Mi SW of Port Aransas (KU 27222, 27223, 27224, 27225, 27226); Nueces, Mustang Island State Park (TCWC 54091, 54092); Nueces Co., Mustang Island, 15 mi SW Port Aransas (TCWC 28013, 28644, 28645, 28646); Nueces Co., Mustang Island, 13 Mi S of Port Aransas (KU 74383); Nueces Co., Padre Island (AMNH 5542; NMNH A43528; TCWC 43633; TTU 92351); Nueces Co., N end Padre Island (TCWC 1499, 1500, 1501, 1502); Nueces, Padre Island, Packery Channel Park (TCWC 54068, 54069, 54070, 54076, 54077, 54078, 54079, 54080, 54081, 54082, 54083, 54084, 54085, 54086, 54087, 54088, 54089, 54090); *Mustang Island, 19 Mi S Port Aransas (MVZ 84157, 84158); *Nueces Co., 19 Mi S Port Aransas (TCWC 617, 618, 619); *Nueces Co., Mustang Island, 19 Mi S Port Aransas (TCWC 614, 615, 616); *Nueces Co., Mustang Island, 23 Mi S Port Aransas (TCWC 811); Nueces Co., Padre Island, 14 Mi SE of Corpus Christi (KU 57905, 57906, 57907); *San Patricio Co., Padre Island, jct Park Road 22 and 53 (TTU 53734, 53735, 53736, 53737, 53738); Willacy Co., 4 Mi E Port Mansfield (TTU 7011, 7012, 7013, 7015); Willacy Co., 4 Mi E Port Mansfield fm 547 (TTU 7003); Cameron Co., Padre Island (NMNH 19667, 19668).

Specimens Examined (65).—Nueces Co., Mustang Island (TTU 92317, 92318, 92340, 92341); *Kleberg Co., Padre Island, 6.1 Mi S Nueces County Park (TTU 15330, 15331, 15332, 15333); Nueces Co., Padre Island (AMNH 3468, 3469, 3470, 3471, 3472; NMNH 31429, 31549, 31551, 31552, 31553, 31554, 31555, 31556, 31557, 31558, 31661, 31662, 32947; TTU 92344, 92345, 92346, 92347, 92348, 92349, 92350); Kleberg Co., N Padre Island (TTU 92176, 92177, 92178, 92179, 92180, 92181, 92182, 92183, 92184, 92185, 92186, 92187, 92188, 92189, 92190, 92191, 92192, 92193, 92194, 92195, 92196, 92197, 92198, 92199, 92342, 92343); Willacy Co., 4 Mi E Port Mansfield (TTU 7014); Willacy Co., 4 Mi E Port Mansfield fm 547 (TTU 7004, 7005, 7006); Willacy Co., 8 Mi E Port Mansfield (TTU 7391, 7392).

Observational Localities (45).—Kleberg Co., 9.98 km North, 7.06 km East El Martillo, UTM 14-3042921N-669421E (1); Kleberg Co., 19.36 km South, 0.67 km West Flour Bluff, UTM 14-3042915N-669317E (1); Kleberg Co., Dredged Material Island 111, 16.43 km North, 13.23 km East El Martillo, UTM 14-3041719N-666760E (1); Kleberg Co., 13.98 km North, 16.48 km East El Martillo, UTM 14-3039362N-669791E (1); Kleberg Co., 13.92 km North, 16.32 km East El Martillo, UTM 14-3039314N-669874E (1); Kleberg Co., 13.70 km North, 13.94 km East El Martillo, UTM 14-3039266N-667355E (1); Kleberg Co., 9.95 km North, 11.78 km East El Martillo, UTM 14-3035242N-665198E (1); Kleberg Co., 9.95 km North, 11.74 km East El Martillo, UTM 14-3035229N-665151E (1); Kleberg Co., 9.33 km North, 14.75 km East El Martillo, UTM 14-3034569N-668125E (1); Kenedy Co., 8.67 km North, 13.17 km East El Martillo, UTM 14-3033984N-666680E (1); Kleberg Co., 7.76 km North, 14.19 km East El Martillo, UTM 14-3033324N-667685E (1); Kleberg Co., 0.21 km South, 11.41 km East El Martillo, UTM 14-3024998N-664975E (1); Kleberg Co., 0.34 km South, 11.42 km East El Martillo, UTM 14-3024954N-665035E (1); Kleberg Co., 0.29 km South, 11.57 km East El Martillo, UTM 14-3024943N-665142E (1); Kleberg Co., 6.82 km South, 7.68 km East El Martillo, UTM 14-3018591N-661468E (1); Kleberg Co., 6.86 km South, 7.76 km East El Martillo, UTM 14-3018554N-661533E (1); Kleberg Co., 6.91 km South, 7.90 km East El Martillo, UTM 14-3018489N-661631E (1); Kenedy Co., 7.28 km South, 9.66 km East El Martillo, UTM 14-3017900N-663061E (1); Kenedy Co., 7.46 km South, 9.70 km East El Martillo, UTM 14-3017864N-663231E (1); Kenedy Co., 7.68 km South, 9.79 km East El Martillo, UTM 14-3017801N-663356E (1); Kenedy Co., 54.88 km North, 4.34 km East Port Mansfield, UTM 14-3009404N-659939E (1); Kenedy Co., 25.92 km South, 7.15 km East El Martillo, UTM 14-2999362N-660902E (1); Kenedy Co., 25.92 km South, 7.15 km East El Martillo, UTM 14-2999359N-660859E (1); Kenedy Co., 25.92 km South, 7.14 km East El Martillo, UTM 14-2999291N-660843E (1); Kenedy Co., 25.92 km South, 7.12 km East El Martillo, UTM 14-2999256N-660856E (1); Kenedy Co., 25.92 km South, 7.10 km East El Martillo, UTM 14-2999191N-660847E (1); Kenedy Co., 26.08 km South, 7.06 km East El Martillo, UTM 14-2999121N-660804E (1); Kenedy Co., 54.54 km North, 4.50 km East Port Mansfield, UTM 14-2994215N-660504E (1); Kenedy Co., 54.53 km North, 4.77 km East Port Mansfield, UTM 14-2994195N-660554E (1); Kenedy Co., 54.53 km North, 4.61 km East Port Mansfield, UTM 14-2994175N-660664E (1); Kenedy Co., 54.53 km North, 4.32 km East Port Mansfield, UTM 14-2994174N-660690E (1); Kenedy Co., 54.54 km North, 4.32 km East Port Mansfield, UTM 14-2994170N-660731E (1); Kenedy Co., 8.48 km North, 40.32 km East Armstrong, UTM 14-2987762N-660719E (1); Kenedy Co., 8.46 km North, 40.64 km East Armstrong, UTM 14-2987750N-660662E (1); Kenedy Co., 8.32 km North, 40.16 km East Armstrong, UTM 14-2987742N-660619E (1); Kenedy Co., 41.12 km North, 3.47 km East Port Mansfield, UTM 14-2979451N-659554E (1); Kenedy Co., 40.96 km North, 3.04 km East Port Mansfield, UTM 14-2979377N-659521E (1); Kenedy Co., 40.96 km North, 3.30 km East Port Mansfield, UTM 14-2979367N-659503E (1); Kenedy Co., 41.12 km North, 2.90 km East Port Mansfield, UTM 14-2979362N-659546E (1); Kenedy Co., 41.28 km North, 2.72 km East Port Mansfield, UTM 14-2979303N-659531E (1); Kenedy Co., 41.28 km North, 2.72 km East Port Mansfield, UTM 14-2979303N-659531E (1); Kenedy Co., 24.00 km South, 45.92 km East Armstrong, UTM 14-2954474N-666465E (1); Willacy Co., 39.52 km South, 50.40 km East Armstrong, UTM 14-2939535N-671406E (1); Willacy Co., 39.52 km South, 49.60 km East Armstrong, UTM 14-2939414N-670171E (1); Willacy

Co., 39.68 km South, 49.76 km East Armstrong, UTM 14-2939326N-670719E (1).

Captures (1).—Kleberg Co., 0.29 km South, 11.57 km East El Martillo, UTM 14-3024943N-665142E (1).

Family Heteromyidae
Dipodomys compactus
Gulf Coast Kangaroo Rat

True (1889) described the Gulf Coast kangaroo rat from Padre Island, and it is endemic to southern Texas and coastal areas of Tamaulipas, Mexico (Allen 1891; Bailey 1905; Blair 1952; Schmidly and Hendricks 1976; Baumgardner and Schmidly 1981; Schmidly 2004). It is well documented from PAIS and adjacent areas (Allen 1891; Bailey 1905; Baker and Lay 1938; Setzer 1949; Raun 1959; Koepke 1969; Kennedy et al. 1973; Yzaguirre 1974; Baccus et al. 1977; Baker and Rabalais 1978; Baumgardner and Schmidly 1981; Smith 1986; Harris 1988; Goetze et al. 1999).

We captured this species across the entire length of PAIS (Fig. 5e), typically in habitats with greater proportions of bare ground, which is consistent with previous studies (Blair 1952; Raun 1959; Koepke 1969; Yzaguirre 1974; Baccus et al. 1977; Baker and Rabalais 1978; Harris 1988; Goetze et al. 1999). Its greatest relative abundance was at the southern end of the island, in dune areas and areas adjacent to mudflats. This species avoided areas dominated by gulfdune paspalum (*Paspalum monostachyum*) and other areas with dense vegetation and a closed canopy layer.

The Gulf Coast kangaroo rat has two distinct color phases: ochraceous-buff (i.e., cinnamon) and cartridge-buff (i.e., gray; Setzer 1949). Ratios between the two color types vary considerably among populations on barrier islands (Table 5; Baumgardner and Schmidly 1981). During this study, we found ochraceous to cartridge buff ratios of 4.7:95.3, while Baumgardner and Schmidly (1981) found ratios of 34.7:65.3. It is unknown whether changes have occurred on other islands or the reason for the apparent change in ratio.

Specimens Reported (232).—Nueces Co., Mustang Island (LSUMZ 1500, 1501, 1502, 1503, 1506, 1507, 1508, 1509, 1510, 1511, 1512, 1513, 1514; TCWC 27560; TTU 89284, 89285, 89289, 89290; UIMNH 24308, 24309; UIMNH 43420); Nueces, Nueces County Park (TCWC 50382, 50383); *Aransas Co., Mustang Island, Port Aransas (TTU 89105, 89106); *Aransas Co., Port Aransas (TTU 88895, 89085, 89098, 89313); *Aransas Co., Port Aransas, Access Road no 1 (TTU 93949); Nueces Co., Mustang Island, 2 Mi W of Port Aransas (KU 80478, 80479); Nueces Co., 2.5 Mi W Port Aransas (TTU 89288); Nueces Co., 1 Mi S Port Aransas (TTU 89287); *Aransas Co., 1 Mi S Port Aransas (TTU 89084); Mustang Island, 1.7 Mi SW Port Aransas (MSB 57505, 57506); Nueces Co., 2 Mi SW Port Aransas (TTU 89286); Nueces Co., 2.5 Mi S Port Aransas (UIMNH 39630, 39631, 39632, 39633); Nueces Co., Mustang Island, 3 Mi S Port Aransas (TTU 89299); Mustang Island, 6 Mi SW Port Aransas (MSB 57507, 57508, 57509, 57510, 57511, 57512); Nueces Co., Mustang Island, 7 Mi S, 4 Mi W Port Aransas (TTU 25854, 25855, 25856, 25857, 25858); Nueces Co., 7 Mi S, 5.4 Mi W Port Aransas (TTU 25853); Nueces Co., Mustang Island, 8 Mi S Aransas Pass (LSUMZ 34553); *Aransas Co., Mustang Island, 8 Mi S Port Aransas (TTU 7971); *San Patricio Co., Mustang Island, 10 Mi S Port Aransas (TTU 4354); Nueces Co., 10.7 Mi S Port Aransas (ASNHC 11393,

*Table 5. Percentage dorsal pelage color morphs in the Gulf Coast kangaroo rat (*Dipodomys compactus*) on barrier islands in the western Gulf of Mexico. Data from Padre Island National Seashore (PAIS) 2005-2007 are from the current study while all others are from Baumgardner and Schmidly (1981).*

Dorsal pelage color	PAIS 2005-2007	Mustang Island	North Padre Island	South Padre Island	Tamaulipas
Ochraceous-buff (cinnamon)	4.7	82.8	34.7	6.7	94.4
Cartridge-buff (gray)	95.3	17.2	65.3	93.3	5.6

11458, 11459, 11460); *Nueces Co., Padre Island, 13 Mi S Port Aransas (KU 74385, 74386, 74387, 74388, 74389, 74390, 74391, 74392); Nueces Co., Mustang Island, 14 Mi SW Port Aransas (KU 27227, 27228, 27229, 27230, 27231, 27232, 27233, 27234, 27235, 27236, 27237, 27238, 27325, 27326, 27327, 57929, 57930, 57931, 57932, 57933, 57934, 139123, 139124); Nueces Co., Mustang Island, 15 Mi S of Port Aransas (TCWC 27339, 27340); *Nueces Co., Padre Island, 15 Mi S of Port Aransas (KU 74384); Nueces Co., Padre Island (TCWC 27561); Nueces, N end Padre Island (TCWC 1503, 1504; UIMNH 52309); *Nueces, Mustang Island, 19 Mi S Port Aransas (TCWC 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654; MVZ 81610, 81611, 81612, 81613, 81614, 81615, 81616, 81617, 81618, 81619); *Nueces, Mustang Island, 23 Mi S Port Aransas (TCWC 810, 879, 1036, 1037, 1038; UMMZ 81686, 81687); Nueces Co., Padre Island, 14 Mi SE of Corpus Christi (KU 57927, 57928); Willacy Co., South Padre Island (UWBM 46715, 46716); Cameron Co., South Padre Island (TTU 78761); Cameron Co., 11 Mi N, 3 Mi E Port Isabel (ASNHC 4321, 5416); Cameron Co., South Padre Island, 3 Mi N Kind Edward Atwood Park (TTU 78765); Cameron Co., 10 Mi N, 3 Mi E Port Isabel (ASNHC 4322); Cameron Co., 8 Mi N South Padre Island (ASNHC 9743); Cameron Co., 7.5 Mi N, 3 Mi E Port Isabel (ASNHC 4323, 4324, 4325, 4326); Cameron Co., Padre Island, 6.5 Mi N, 2 Mi E Port Isabel (UIMNH 42839, 42840, 42841, 42842, 42843); Cameron, Padre Island, 6 Mi N, 2 Mi E Port Isabel (UIMNH 42844, 42845, 42846, 42847, 42848, 42849, 42850, 42851, 42852, 42853, 42854, 42855, 42856, 42857, 42858, 42859); Cameron, Padre Island, 6 Mi N, 3 Mi E Port Isabel (TCWC 27562, 27563, 27564, 27565, 27566, 27567, 27568, 27569, 27570, 27571, 27572, 27573, 27574, 27575, 27576, 27577, 27578, 27579, 27580, 27581, 27582, 27583, 27584, 27585, 27586, 27587, 29052); Cameron Co., 4.5 Mi N, 3.6 Mi E Port Isabel (ASNHC 4327); Cameron Co., 4.5 Mi N, 3 Mi E Port Isabel (ASNHC 4328); Cameron Co., Padre Island, 4 Mi NE Port Isabel (UIMNH 39626, 39627, 39628, 39629); Cameron, Padre Island, 3 Mi N, 2 Mi E Port Isabel (UIMNH 42860, 42861, 42862 42863, 42864, 42865, 42866, 42867, 42868, 42869, 42870, 42871, 42872, 42873, 42874, 42875, 42876, 42877, 42878, 42879, 42880, 42881, 42882, 42883, 42884, 42885, 42886, 42887).

Specimens Examined (46).—Nueces Co., Port Aransas (TTU 89297, 89298); Padre Island (NMNH 16442, 19420, 19421); Nueces Co., Padre Island (AMNH 3475, 3476, 3477, 4137; TTU 88893, TTU 89296; NMNH 31438, 31439, 31440, 31441, 31442, 31443, 31444, 31445, 31544, 31545, 31546, 31547, 31548, 31666, 31667, 32948, A42371, A43529, A43530); Nueces Co., Padre Island oak dune are south of Causeway on NW tip of Island (PAISNHM 486, 487); Nueces Co., Padre Island, 10 Mi SE Flour Bluff (TTU 89300); Willacy Co., Padre Island fore dunes N Side Mansfield Channel (PAISNHM 488); Cameron Co., Padre Island (NMNH 19665, 30393, 30394, 30395, 30396, 30397, 30398, 30399, 30400); Cameron Co., South Padre Island (TTU 78762, 78763, 78764).

Observational Localities (5).—Kleberg Co., 8.32 km North, 13.87 km East El Martillo, UTM 14-3033522N-667531E (1); Kleberg Co., 8.03 km North, 14.19 km East El Martillo, UTM 14-3033396N-667637E (1); Kenedy Co., 25.92 km South, 7.15 km East El Martillo, UTM 14-2999362N-660902E (1); Kenedy Co., 8.72 km North, 40.8 km East Armstrong, UTM 14-2987792N-660813E (1); Kenedy Co., 8.58 km North, 40.64 km East Armstrong, UTM 14-2987789N-660781E (1).

Captures (172).—Kleberg Co., 9.98 km North, 7.06 km East El Martillo, UTM 14-3042921N-669421E (1); Kleberg Co., 19.20 km South, 0.64 km West Flour Bluff, UTM 14-3042858N-669129E (2); Kleberg Co., 19.20 km South, 0.99 km West Flour Bluff, UTM 14-3042829N-668900E (1); Kleberg Co., 13.92 km North, 16.32 km East El Martillo, UTM 14-3039314N-669874E (1); Kleberg Co., 13.82 km North, 16.64 km East El Martillo, UTM 14-3039288N-669916E (1); Kleberg Co., 13.86 km North, 16.64 km East El Martillo, UTM 14-3039230N-669961E (4); Kleberg Co., 13.70 km North, 16.64 km East El Martillo, UTM 14-3039219N-669996E (10); Kleberg Co., 9.95 km North, 11.78 km East El Martillo, UTM 14-3035242N-665198E (3); Kleberg Co., 9.33 km North, 14.75 km East El Martillo, UTM 14-3034569N-668125E (1); Kleberg Co., 8.32 km North, 13.87 km East El Martillo, UTM 14-3033522N-667531E (1); Kleberg Co., 8.03 km North, 14.19 km East El Martillo, UTM 14-3033396N-667637E (6); Kleberg Co., 7.76 km North, 14.27 km East El Martillo, UTM 14-3033317N-

667779E (1); Kleberg Co., 0.17 km South, 11.54 km East El Martillo, UTM 14-3024953N-665096E (2); Kleberg Co., 0.30 km North, 11.57 km East El Martillo, UTM 14-3024943N-665147E (2); Kleberg Co., 0.29 km South, 11.57 km East El Martillo, UTM 14-3024943N-665142E (4); Kenedy Co., 7.28 km South, 9.12 km East El Martillo, UTM 14-3017803N-663371E (5); Kenedy Co., 25.92 km South, 7.15 km East El Martillo, UTM 14-2999362N-660902E (1); Kenedy Co., 54.53 km North, 4.82 km East Port Mansfield, UTM 14-2994167N-660740E (10); Kenedy Co., 6.64 km South, 42.19 km East Armstrong, UTM 14-2971618N-662601E (2); Kenedy Co., 6.64 km South, 42.19 km East Armstrong, UTM 14-2971614N-662587E (4); Kenedy Co., 12.86 km South, 43.42 km East Armstrong, UTM 14-2965519N-663933E (1); Kenedy Co., 12.86 km South, 43.42 km East Armstrong, UTM 14-2965509N-663685E (2); Kenedy Co., 12.86 km South, 43.42 km East Armstrong, UTM 14-2965506N-663861E (1); Kenedy Co., 12.86 km South, 43.42 km East Armstrong, UTM 14-2965486N-663673E (1); Kenedy Co., 25.60 km North, 5.84 km East Port Mansfield, UTM 14-2963896N-662426E (1); Kenedy Co., 25.44 km North, 5.84 km East Port Mansfield, UTM 14-2963881N-662328E (1); Kenedy Co., 25.44 km North, 5.84 km East Port Mansfield, UTM 14-2963803N-662293E (4); Kenedy Co., 25.60 km North, 5.60 km East Port Mansfield, UTM 14-2963802N-662105E (1); Kenedy Co., 25.44 km North, 4.48 km East Port Mansfield, UTM 14-2963600N-661019E (2); Kenedy Co., 25.28 km North, 4.56 km East Port Mansfield, UTM 14-2963556N-661225E (2); Kenedy Co., 25.12 km North, 4.96 km East Port Mansfield, UTM 14-2963501N-661511E (4); Kenedy Co., 25.28 km North, 4.96 km East Port Mansfield, UTM 14-2963489N-661303E (1); Kenedy Co., 24.80 km South, 47.84 km East Armstrong, UTM 14-2954558N-666777E (7); Kenedy Co., 24.96 km South, 47.84 km East Armstrong, UTM 14-2954511N-666703E (3); Kenedy Co., 24.32 km South, 45.92 km East Armstrong, UTM 14-2954488N-666608E (5); Kenedy Co., 13.04 km North, 9.92 km East Port Mansfield, UTM 14-2951393N-666774E (8); Kenedy Co., 32.16 km South, 48.16 km East Armstrong, UTM 14-2946910N-669039E (4); Kenedy Co., 31.84 km South, 48.48 km East Armstrong, UTM 14-2946905N-668979E (4); Kenedy Co., 32.32 km South, 48.32 km East Armstrong, UTM 14-2946904N-669048E (3); Kenedy Co., 32.48 km South, 47.68 km East Armstrong, UTM 14-2946901N-669014E (3); Kenedy Co., 32.00 km South, 47.84 km East Armstrong, UTM 14-2946869N-668642E (3); Kenedy Co., 32.00 km South, 48.00 km East Armstrong, UTM 14-2946801N-668528E (7); Willacy Co., 39.04 km South, 48.80 km East Armstrong, UTM 14-2939610N-669785E (13); Willacy Co., 1.32 km North, 10.85 km East Port Mansfield, UTM 14-2939588N-667784E (7); Willacy Co., 1.39 km North, 10.88 km East Port Mansfield, UTM 14-2939578N-667814E (1); Willacy Co., 1.34 km North, 10.88 km East Port Mansfield, UTM 14-2939571N-667838E (3); Willacy Co., 40.00 km South, 50.56 km East Armstrong, UTM 14-2939566N-671536E (1); Willacy Co., 1.04 km North, 11.58 km East Port Mansfield, UTM 14-2939555N-668389E (9); Willacy Co., 1.13 km North, 11.02 km East Port Mansfield, UTM 14-2939541N-667869E (4); Willacy Co., 1.12 km North, 10.94 km East Port Mansfield, UTM 14-2939533N-667890E (2); Willacy Co., 1.12 km North, 11.65 km East Port Mansfield, UTM 14-2939311N-668592E (2).

Family Cricetidae

Baiomys taylori

Northern Pygmy Mouse

The northern pygmy mouse occurs from the southwestern United States into southern Mexico (Hall 1981). Within Texas, it is absent only from the eastern and western edges of the state, although it is thought to be expanding its range west and north (Bailey 1905; Mearns 1907; Blair 1952; McCarley 1959; Packard 1960; Stangl and Dalquest 1986; Hollander et al. 1987; Schmidly 2004). It was previously reported from the northern end of North Padre Island including PAIS (Baccus et al. 1977; Baker and Rabalais 1978; Harris 1988; Goetze et al. 1999).

We captured this species in low abundance (1-3 captures per 100 trap-nights) across the length of PAIS (Fig. 5f). In general, we captured it on transects with deep litter layers, typically in areas dominated by bushy bluestem, seacoast bluestem (*Schizachyriu scoparium*), gulfdune paspalum (*Paspalum monostachyum*), and bulrush (*Schoenopleclus americanus*), which is consistent with findings of previous studies (Blair 1952; Baccus et al. 1977; Baker and Rabalais 1978; Harris

1988; Goetze et al. 1999). We found it common on transects with a continuous closed canopy and no bare ground, and it is likely to occur wherever dense grass cover exists. Stickel and Stickel (1949) and Jones et al. (2003) found it to be sensitive to reductions in grass cover as a result of cattle grazing. Because Padre Island was under grazing pressure approximately 80 years before the first small mammals surveys, it is not surprising northern pygmy mice were not documented until after the removal of cattle.

Specimens Reported (15).—Nueces Co., 2.5 Mi S Port Aransas (UIMNH 40436, 40437); Mustang Island, 6 Mi SW Port Aransas (MSB 57514, 57515, 57516, 57517, 57518, 57519, 57520, 57521, 57522, 57523, 57524, 57525, 57526).

Specimens Examined (1).—Nueces Co., Padre Island grassland SW corner Nueces County Park (PAISNHM 477).

Captures (30).—Kleberg Co., 6.82 km South, 7.68 km East El Martillo, UTM 14-3018591N-661468E (2); Kleberg Co., 6.91 km South, 7.90 km East El Martillo, UTM 14-3018489N-661631E (1); Kenedy Co., 9.02 km South, 8.67 km East El Martillo, UTM 14-3016460N-662730E (3); Kenedy Co., 9.73 km South, 6.96 km East El Martillo, UTM 14-3015351N-660695E (2); Kenedy Co., 15.01 km South, 7.33 km East El Martillo, UTM 14-3010013N-661083E (3); Kenedy Co., 54.88 km North, 4.34 km East Port Mansfield, UTM 14-3009361N-659926E (1); Kenedy Co., 8.32 km North, 40.16 km East Armstrong, UTM 14-2987742N-660619E (1); Kenedy Co., 6.56 km South, 41.70 km East Armstrong, UTM 14-2971757N-661942E (1); Kenedy Co., 12.86 km South, 43.42 km East Armstrong, UTM 14-2965551N-663765E (2); Kenedy Co., 25.44 km North, 5.84 km East Port Mansfield, UTM 14-2963881N-662328E (2); Kenedy Co., 25.60 km North, 5.60 km East Port Mansfield, UTM 14-2963802N-662105E (1); Kenedy Co., 24.64 km South, 45.6 km East Armstrong, UTM 14-2954426N-666211E (1); Kenedy Co., 24.16 km South, 45.6 km East Armstrong, UTM 14-2954375N-666332E (2); Kenedy Co., 13.25 km North, 10.22 km East Port Mansfield, UTM 14-2951565N-666931E (3); Kenedy Co., 13.26 km North, 10.08 km East Port Mansfield, UTM 14-2951505N-666891E (2); Kenedy Co., 12.88 km North, 10.00 km East Port Mansfield, UTM 14-2951281N-666731E (1); Willacy Co., 39.52 km South, 50.40 km East Armstrong, UTM 14-2939535N-671406E (2).

Reithrodontomys fulvescens
Fulvous Harvest Mouse

The fulvous harvest mouse ranges from the central United States through Central America (Hooper 1952). Within Texas, it occurs throughout the eastern two-thirds of the state and is only absent from the Edwards Plateau, western Texas, and portions of the Panhandle (Bailey 1905; Mearns 1907; Blair 1952; McCarley 1959; Dalquest 1968; Schmidly 2004). It was previously reported from PAIS and adjacent areas (Bailey 1905; Howell 1914; Raun 1959; Baccus et al. 1977; Baker and Rabalais 1978; Goetze et al. 1999).

We captured fulvous harvest mice in low abundance (1-3 captures per 100 trap-nights) across the length of PAIS (Fig. 5g). In general, we found it in areas with dense vegetation, deep litter layers, and a continuous canopy, which is consistent with previous studies (Blair 1952; Raun 1959; Baccus et al. 1977; Baker and Rabalais 1978; Goetze et al. 1999). It was common in areas dominated by bushy bluestem, seacoast bluestem, and gulfdune paspalum. It is likely to be found within PAIS wherever dense grass cover occurs.

As with the northern pygmy mouse, Gust and Schmidly (1986) and Jones et al. (2003) reported negative impacts on population densities of the fulvous harvest mouse as a result of cattle grazing. Although ranching occurred on Padre Island from 1804-1971, the fulvous harvest mouse was documented during that time period despite any adverse effects due to cattle (Bailey 1905; Howell 1914; Blair 1952). Jones et al. (2003) indicated that the fulvous harvest mouse was more tolerant of grazed areas than the northern pygmy mouse. This at least partially explains why the fulvous harvest mouse was documented during the era of cattle grazing within PAIS while the northern pygmy mouse was not.

Specimens Reported (10).—Nueces Co., Mustang Island, Port Aransas (TTU 91662); Nueces Co., 2 Mi S Port Aransas (UIMNH 39790, 39791); *San Patri-

cio Co., Mustang Island, 10 Mi S Port Aransas (TTU 4981); Nueces Co., Mustang Island, 10.7 Mi SW Port Aransas (ASNHC 11438, 11631, 11632, 11633, 11634, 11635).

Specimens Examined (5).—Nueces Co., Padre Island (NMNH 19666); Nueces Co., Padre Island, oak dune area south of Causeway on NW tip of Island (PAISNHM 478); Nueces Co., Padre Island, grassland adjacent to Nueces County Park no 2 (PAISNHM 475); Nueces Co., Padre Island, oak dune area of Nueces County Park no 2 (PAISNHM 476, 479).

Captures (27).—Kleberg Co., 13.98 km North, 16.48 km East El Martillo, UTM 14-3039362N-669791E (1); Kleberg Co., 13.39 km North, 13.97 km East El Martillo, UTM 14-3038709N-667555E (1); Kleberg Co., 8.03 km North, 14.19 km East El Martillo, UTM 14-3033396N-667637E (1); Kleberg Co., 7.06 km South, 8.06 km East El Martillo, UTM 14-3018371N-661781E (3); Kenedy Co., 8.50 km South, 8.85 km East El Martillo, UTM 14-3016602N-662531E (2); Kenedy Co., 9.02 km South, 8.67 km East El Martillo, UTM 14-3016460N-662730E (2); Kenedy Co., 15.23 km South, 7.14 km East El Martillo, UTM 14-3010089N-660901E (1); Kenedy Co., 15.01 km South, 7.33 km East El Martillo, UTM 14-3010013N-661083E (1); Kenedy Co., 54.88 km North, 4.34 km East Port Mansfield, UTM 14-3009404N-659939E (1); Kenedy Co., 54.88 km North, 4.34 km East Port Mansfield, UTM 14-3009361N-659926E (1); Kenedy Co., 54.88 km North, 4.34 km East Port Mansfield, UTM 14-3009329N-659984E (1); Kenedy Co., 54.72 km North, 4.32 km East Port Mansfield, UTM 14-3009272N-660001E (1); Kenedy Co., 12.86 km South, 43.42 km East Armstrong, UTM 14-2965503N-663617E (1); Kenedy Co., 13.25 km North, 10.22 km East Port Mansfield, UTM 14-2951565N-666931E (3); Kenedy Co., 13.26 km North, 10.08 km East Port Mansfield, UTM 14-2951505N-666891E (1); Kenedy Co., 13.06 km North, 10.03 km East Port Mansfield, UTM 14-2951440N-666828E (1); Willacy Co., 39.52 km South, 50.40 km East Armstrong, UTM 14-2939535N-671406E (2); Willacy Co., 1.12 km North, 12.26 km East Port Mansfield, UTM 14-2939339N-669191E (1); Willacy Co., 1.02 km North, 13.09 km East Port Mansfield, UTM 14-2939303N-670043E (2).

Onychomys leucogaster
Northern Grasshopper Mouse

The northern grasshopper mouse ranges from southern Canada through the western United States to northern Mexico (Hall 1981). Within Texas, it occurs in the western and southern portions of the state (Bailey 1905; Blair 1952; Dalquest 1968; Engstrom and Choate 1979; Schmidly 2004). It has been reported in PAIS and adjacent areas (Baker and Lay 1938; Raun 1959; Koepke 1969; Baker and Rabalais 1978; Hall 1981). We believe Yzaguirre (1974) may have captured this species in PAIS but reported it as the white-footed deermouse (see account of *Peromyscus leucopus*). We captured the grasshopper mouse only at the southern end of PAIS on transects with short, sparse vegetation, which included various forbs, shoregrass, and glasswort (*Salicornia sp.*).

During the 20th century, the distribution and abundance of the northern grasshopper mouse on Padre Island dramatically changed. Baker and Lay (1938) reported capturing 12 individuals in 100 trap-nights (12.00% trap success) on Mustang Island. Although Blair (1952) reported it as common on Mustang Island, Koepke (1969) only captured one individual in 1,500 trap-nights (0.07% trap success) from similar locations. Yzaguirre (1974) reported 7 individuals in 1,890 trap-nights (0.37% trap success) at beach mile 9 and Baker and Rabalais (1978) noted the decline in abundance of this species. By 1988, the species was apparently absent from northern portions of PAIS (Harris 1988). The results of our study exemplify this range reduction. We captured 14 individuals in 32,101 trap-nights (0.04% trap success), and only from south of beach mile 44 (Fig. 5h).

It is possible that cattle maintained suitable habitat for grasshopper mice at the northern end of the island by keeping vegetation low. Once cattle were removed in 1971, vegetation growth could have eliminated the species from northern areas of the island which are more humid and receive more rainfall. Thus, in absence of grazing the species is restricted to the more arid southern part of the island where vegetation is more sparse.

Specimens Reported (45).—Nueces Co., Mustang Island (LSUMZ 1496, 1497, 1498, 1499); *Aransas Co., Mustang Island, Port Aransas (TTU 92535); Nueces Co., Mustang Island, 2 Mi W Port Aransas (KU 80581); Nueces Co., Mustang Island, 2 Mi SW Port Aransas (TTU 92728, 92729, 92730, 92731); Nueces Co., Mustang Island, 2.5 Mi S Port Aransas (UIMNH 40443, 40444, 40445, 40446, 40447, 40448, 40449); Nueces Co., Mustang Island, 5 Mi SW Port Aransas (TTU 92732); Mustang Island, 6 Mi SW Port Aransas (MSB 141118); Nueces Co., Mustang Island, 7.8 Mi SE Port Aransas (TTU 92733); *Aransas Co., Mustang Island, 8 Mi S Port Aransas (TTU 7967, 7969); Nueces Co., N end Padre Island (TCWC 1505, 1800, 1801); *Nueces Co., Mustang Island, 19 Mi S Port (TCWC 843, 844, 845, 846); *Nueces Co., Mustang Island, 23 Mi S Port Aransas (TCWC 800, 801; UMMZ 81688, 81689, 81690, 81691); Cameron Co., 11 Mi N, 3 Mi E Port Isabel (ASNHC 4348); Cameron Co., Padre Island, 5 Mi N, 2 Mi E Port Isabel (UIMNH 42939, 42940, 42941, 42942, 42943, 42944); Cameron Co., Padre Island, 4 Mi NE Port Isabel (UIMNH 40450, 40451, 40452).

Specimens Examined (6).—Nueces Co., Padre Island, 0.5 Mi E Intracoastal Waterway, flats to left of J.F. Kennedy Causeway (PAISNHM 484, 485); Willacy Co., Padre Island, fore dunes N Side Mansfield Channel (PAISNHM 480, 481, 482, 483).

Captures (14).—Kenedy Co., 25.60 km North, 5.84 km East Port Mansfield, UTM 14-2963896N-662426E (3); Kenedy Co., 24.96 km North, 6.02 km East Port Mansfield, UTM 14-2963702N-662669E (2); Willacy Co., 39.04 km South, 48.80 km East Armstrong, UTM 14-2939610N-669785E (1); Willacy Co., 1.32 km North, 10.85 km East Port Mansfield, UTM 14-2939588N-667784E (2); Willacy Co., 1.30 km North, 10.88 km East Port Mansfield, UTM 14-2939568N-667792E (1); Willacy Co., 1.13 km North, 11.02 km East Port Mansfield, UTM 14-2939541N-667869E (1); Willacy Co., 1.12 km North, 10.94 km East Port Mansfield, UTM 14-2939533N-667890E (1); Willacy Co., 39.52 km South, 49.60 km East Armstrong, UTM 14-2939414N-670171E (2); Willacy Co., 1.25 km North, 14.50 km East Port Mansfield, UTM 14-2939399N-671516E (1).

Oryzomys palustris
Marsh Oryzomys

The marsh oryzomys, commonly called marsh rice rat, occurs through the mid-Atlantic and southern states, and occurs along coastal regions of Texas (Allen 1891; Bailey 1905; Mearns 1907; Blair 1952; McCarley 1959; Hall 1981). It was previously well-documented from PAIS and adjacent areas (Bailey 1905; Goldman 1918; Raun 1959; Koepke 1969; Baccus et al. 1977; Baker and Rabalais 1978; Hall 1981). Within PAIS, we captured it on 10 small islands in the Laguna Madre (Table 2) and from five localities on North Padre Island (Fig. 5i).

On small islands in the Laguna Madre, it was common on transects with dense vegetation that formed a closed canopy and a dense understory, such as areas dominated by various purslanes (Family Aizoaceae), saltgrass, bushy bluestem, cordgrass (*Spartina sp.*), and southern cattail. We did not capture it on transects with woody forbs and other vegetation with a closed canopy but an open understory, which was common on some islands. We captured marsh oryzomys in greatest relative abundance on North Bird Island (36 individuals in 300 trap-nights, 12.00% trap success), which is a low profile islands with standing salt water and dominated by sea purslane and other species of the purslane family. Raun (1959) also documented this species on small islands in the Laguna Madre.

In contrast, on North Padre Island the marsh oryzomys was rare. We captured only six individuals, each from the immediate vicinity of standing fresh water in vegetation dominated by bulrush and other wetland plants, which is consistent with previous findings (Raun 1959; Koepke 1969; Baker and Rabalais 1978; Wolfe 1982). Within PAIS, the species is likely restricted to fresh water ponds on North Padre Island and small islands with dense vegetation.

Specimens Reported (121).—Nueces Co., Mustang Island, 2 Mi W of Port Aransas (KU 80530, 80531); Nueces Co., 2.5 Mi S Port Aransas (UIMNH 39710, 39711, 39712); Mustang Island, 6 Mi SW Aransas (MSB 57558, 57559, 57560, 57561, 57562, 57563); Nueces Co., Mustang Island, 7.8 Mi SW Port Aransas (TTU 92734); Cameron Co., 3.6 Mi N, 3 Mi

E Port Isabel (ASNHC 2885, 2886, 2887, 2888, 2889, 2890, 2891, 2892, 2893, 2894, 2895, 2896, 2897, 2898, 2899, 2900, 2901, 2902, 2903, 2904, 2905, 2906, 2907, 2908, 2909, 2910, 2911, 2912, 2913, 2914, 2915, 2916, 2917, 2918, 2919, 2920, 2921, 2922, 2923, 2924, 2925, 2926, 2927, 2928, 2929, 2930, 2931, 2932, 2933, 2934, 2935, 2936, 2937, 2938, 2939, 2940, 2941, 2942, 2943, 2944, 2945, 2946, 2947, 2948, 2949, 2950, 2951, 2952, 2953, 2954, 2955, 2956, 2957, 2958, 2959, 2960, 2961, 2962, 2963, 2964, 2965, 2966, 2967, 2968, 2969, 2970, 2971, 2972, 2973, 2974, 2975, 2976, 2977, 2978, 2979, 2980, 2981, 2982, 2983, 2984, 2985, 2988, 2989, 2990, 2991, 2992, 2993, 2994, 2995).

Specimens Examined (5).—Nueces Co., Padre Island (NMNH 31540, 31541, 31542, 31543); Kleberg Co., Padre Island, Spoil Island just north and opposite South Bird Island (PAISNHM 490).

Captures (74).—Kleberg Co., 20.16 km North, 15.44 km East El Martillo, UTM 14-3045565N-668925E (4); Kleberg Co., 20.00 km North, 14.99 km East El Martillo, UTM 14-3045518N-668316E (3); Kleberg Co., 20.00 km North, 14.98 km East El Martillo, UTM 14-3045431N-668329E (1); Kleberg Co., 19.84 km North, 15.44 km East El Martillo, UTM 14-3045375N-668843E (2); Kleberg Co., 19.84 km North, 15.36 km East El Martillo, UTM 14-3045362N-668824E (3); Kleberg Co., 19.84 km North, 15.60 km East El Martillo, UTM 14-3045304N-668780E (11); Kleberg Co., 19.84 km North, 15.63 km East El Martillo, UTM 14-3045243N-668778E (7); Kleberg Co., 19.68 km North, 15.49 km East El Martillo, UTM 14-3045209N-668730E (13); Kleberg Co., 19.68 km North, 14.93 km East El Martillo, UTM 14-3045156N-668244E (1); Kleberg Co., 19.68 km North, 14.93 km East El Martillo, UTM 14-3045111N-668249E (1); Kleberg Co., 19.36 km North, 14.78 km East El Martillo, UTM 14-3044862N-668068E (1); Kleberg Co., 17.34 km South, 0.86 km West Flour Bluff, UTM 14-3044556N-667997E (2); Kleberg Co., 18.02 km South, 1.23 km West Flour Bluff, UTM 14-3043721N-667474E (4); Kleberg Co., 16.96 km North, 14.24 km East El Martillo, UTM 14-3042324N-667502E (2); Kleberg Co., 16.64 km North, 13.68 km East El Martillo, UTM 14-3041930N-667155E (1); Kleberg Co., 16.43 km North, 13.23 km East El Martillo, UTM 14-3041775N-666579E (1); Kleberg Co., 15.42 km North, 12.80 km East El Martillo, UTM 14-3040696N-666284E (1); Kleberg Co., 21.76 km South, 3.89 km West Flour Bluff, UTM 14-3040632N-666104E (1); Kleberg Co., 14.58 km North, 12.99 km East El Martillo, UTM 14-3039963N-666450E (9); Kleberg Co., 12.30 km North, 15.17 km East El Martillo, UTM 14-3037646N-668636E (1); Kleberg Co., 10.78 km North, 14.34 km East El Martillo, UTM 14-3036282N-667841E (2); Kleberg Co., 8.99 km North, 13.44 km East El Martillo, UTM 14-3034317N-666885E (1); Kenedy Co., 15.23 km South, 7.10 km East El Martillo, UTM 14-3010003N-660765E (1); Kenedy Co., 24.64 km South, 45.6 km East Armstrong, UTM 14-2954426N-666211E (1).

Sigmodon hispidus
Hispid Cotton Rat

The hispid cotton rat occurs throughout the central and southern United States and is found throughout much of Texas (Allen 1891; Bailey 1905; Mearns 1907; Blair 1952; McCarley 1959; Dalquest 1968; Hall 1981; Schmidly 2004). It has been well-documented from PAIS and adjacent areas (Raun 1959; Koepke 1969; Mascarello et al. 1974; Baccus et al. 1977; Baker and Rabalais 1978; Harris 1988). We documented it across the length of PAIS as well as on several small islands in the Laguna Madre (Table 2, Fig. 5j).

The hispid cotton rat was the most common species we captured. We caught it in a wide variety of habitats, but it was most common on islands in the Laguna Madre in areas with tall vegetation with a partially closed canopy but with an open understory with a poorly developed litter layer (e.g., sea ox-eye daisy, yucca on South Bird Island, cactus on Dredged Material Island 111, and mesquite on Dredged Material Island on 111). We documented it in greatest relative abundance on Dredged Material Island 111 (95 individuals in 300 trap-nights, 31.67% trap success). On this island, prickly pear (*Ountia sp.*) covered approximately 23% of the 3.0 ha island. Bailey (1905) described thorny chaparral and cactus as optimal protection for this species. We did not capture this species in areas with dense vegetation with a dense understory (e.g., gulfdune paspalum, wolfberry (*Lycium carolinianum*), cenicilla (*Sesuvium portulacastrum*), and sea purslane [*Sesuvium sessile*]), in areas with high proportions of

bare ground, or in extremely wet areas. These results are consistent with previous studies (Blair 1952; Raun 1959; Koepke 1969; Baccus et al. 1977; Baker and Rabalais 1978; Harris 1988). It is likely to occur within PAIS wherever drafty cover can be found.

Specimens Reported (80).—Nueces Co., Port Aransas (LSUMZ 33078, 33079); Nueces Co., UT Marine Science Institute (ASNHC 12484); Nueces Co., 2.5 Mi S Port Aransas (UIMNH 40487, 40488, 40489, 40490, 40491, 40492, 40493, 40494, 40495, 40496, 40497, 40498, 40499, 40500, 40501, 40502, 40503, 40504, 40505); Mustang Island, 6 Mi SW Port Aransas (MSB 57610, 57611, 57612, 57613, 57614, 57615, 57616, 57617, 57618, 57619, 57620, 57621, 57622, 57623, 57624); *Aransas Co., 8 Mi S Port Aransas (TTU 7970); Nueces Co., Mustang Island, 10.7 Mi SW Port Aransas (ASNHC 11648, 11649); *San Patricio Co., Mustang Island, 10 Mi S Port Aransas (TTU 4519); Nueces Co., Mustang Island, 14 Mi SW Port Aransas (KU 27267); Nueces Co., 13.9 Mi S, 10.6 Mi E Corpus Christi (ASNHC 7867); Cameron Co., Padre Island, 5 Mi N, 2 Mi E Port Isabel (UIMNH 42948, 42949, 42950, 42951, 42952, 42953, 42954, 42955, 42956, 42957, 42958, 42959); Cameron Co., 4.5 Mi N, 3 Mi E Port Isabel (ASNHC 4515, 4516, 4517, 4518, 4519, 4520); Cameron Co., Padre Island, 4 Mi NE Port Isabel (UIMNH 40506, 40507, 40508, 40509); Cameron Co., 3.6 Mi N, 3 Mi E Port Isabel (ASNHC 4521, 4522, 4523, 4524, 4525, 4526, 4527, 4528, 4529, 4530, 5610, 5611, 7942); Cameron Co., Padre Island, 2 Mi E Port Isabel (UIMNH 42963, 42964).

Specimens Examined (3).—Port Aransas (NMNH 532411); Nueces Co., Padre Island, oak dune area south of Causeway on NW tip of Island (PAISNHM 491); Nueces Co., Padre Island, oak dune area Nueces County Park no 2 (PAISNHM 492).

Captures (288).—Kleberg Co., 19.20 km South, 0.99 km West Flour Bluff, UTM 14-3042829N-668900E (3); Kleberg Co., 16.96 km North, 14.24 km East El Martillo, UTM 14-3042324N-667502E (1); Kleberg Co., 16.96 km North, 13.82 km East El Martillo, UTM 14-3042239N-667323E (7); Kleberg Co., 16.70 km North, 16.18 km East El Martillo, UTM 14-3042056N-669914E (2); Kleberg Co., 16.43 km North, 13.23 km East El Martillo, UTM 14-3041908N-666653E (4); Kleberg Co., 16.48 km North, 13.26 km East El Martillo, UTM 14-3041852N-666727E (3); Kleberg Co., 16.43 km North, 13.23 km East El Martillo, UTM 14-3041831N-666664E (6); Kleberg Co., 16.43 km North, 13.23 km East El Martillo, UTM 14-3041787N-666627E (8); Kleberg Co., 16.43 km North, 13.23 km East El Martillo, UTM 14-3041779N-666625E (25); Kleberg Co., 16.43 km North, 13.23 km East El Martillo, UTM 14-3041775N-666579E (3); Kleberg Co., 16.43 km North, 13.23 km East El Martillo, UTM 14-3041719N-666760E (18); Kleberg Co., 16.43 km North, 13.23 km East El Martillo, UTM 14-3041719N-666760E (32); Kleberg Co., 16.32 km North, 13.25 km East El Martillo, UTM 14-3041704N-666693E (31); Kleberg Co., 20.48 km South, 3.31 km West Flour Bluff, UTM 14-3041546N-666546E (9); Kleberg Co., 16.16 km North, 13.20 km East El Martillo, UTM 14-3041512N-666561E (6); Kleberg Co., 15.97 km North, 13.07 km East El Martillo, UTM 14-3041508N-666535E (6); Kleberg Co., 16.16 km North, 13.25 km East El Martillo, UTM 14-3041478N-666610E (6); Kleberg Co., 15.97 km North, 13.07 km East El Martillo, UTM 14-3041456N-666521E (2); Kleberg Co., 20.48 km South, 3.28 km West Flour Bluff, UTM 14-3041401N-666586E (8); Kleberg Co., 15.97 km North, 13.07 km East El Martillo, UTM 14-3041392N-666603E (6); Kleberg Co., 20.96 km South, 3.65 km West Flour Bluff, UTM 14-3041121N-666358E (2); Kleberg Co., 20.96 km South, 3.74 km West Flour Bluff, UTM 14-3041107N-666384E (2); Kleberg Co., 21.76 km South, 3.89 km West Flour Bluff, UTM 14-3040564N-666216E (2); Kleberg Co., 13.98 km North, 14.03 km East El Martillo, UTM 14-3039313N-667364E (2); Kleberg Co., 13.70 km North, 13.94 km East El Martillo, UTM 14-3039266N-667355E (2); Kleberg Co., 13.86 km North, 13.94 km East El Martillo, UTM 14-3039212N-667353E (1); Kleberg Co., 13.63 km North, 13.87 km East El Martillo, UTM 14-3039040N-667275E (2); Kleberg Co., 12.30 km North, 15.17 km East El Martillo, UTM 14-3037646N-668636E (1); Kleberg Co., 9.95 km North, 11.65 km East El Martillo, UTM 14-3035241N-665057E (1); Kleberg Co., 9.92 km North, 11.9 km East El Martillo, UTM 14-3035211N-665286E (1); Kleberg Co., 8.03 km North, 14.19 km East El Martillo, UTM 14-3033396N-667637E (1); Kenedy Co., 7.68 km South, 9.79 km East El Martillo, UTM 14-3017801N-663356E (2); Kenedy Co., 54.88 km North, 4.34 km

East Port Mansfield, UTM 14-3009404N-659939E (1); Kenedy Co., 54.88 km North, 4.34 km East Port Mansfield, UTM 14-3009361N-659926E (1); Kenedy Co., 54.88 km North, 4.34 km East Port Mansfield, UTM 14-3009360N-660039E (2); Kenedy Co., 54.88 km North, 4.34 km East Port Mansfield, UTM 14-3009329N-659984E (1); Kenedy Co., 54.72 km North, 4.32 km East Port Mansfield, UTM 14-3009281N-660035E (9); Kenedy Co., 54.72 km North, 4.32 km East Port Mansfield, UTM 14-3009272N-660001E (2); Kenedy Co., 6.56 km South, 41.70 km East Armstrong, UTM 14-2971664N-662052E (1); Kenedy Co., 12.86 km South, 43.42 km East Armstrong, UTM 14-2965503N-663617E (3); Kenedy Co., 25.28 km North, 4.72 km East Port Mansfield, UTM 14-2963474N-661343E (2); Kenedy Co., 25.28 km North, 4.64 km East Port Mansfield, UTM 14-2963437N-661392E (2); Kenedy Co., 24.80 km South, 47.84 km East Armstrong, UTM 14-2954558N-666777E (1); Kenedy Co., 24.16 km South, 45.6 km East Armstrong, UTM 14-2954375N-666332E (3); Kenedy Co., 12.88 km North, 10.00 km East Port Mansfield, UTM 14-2951281N-666731E (1); Willacy Co., 39.04 km South, 48.80 km East Armstrong, UTM 14-2939610N-669785E (1); Willacy Co., 1.18 km North, 11.44 km East Port Mansfield, UTM 14-2939591N-668369E (5); Willacy Co., 1.32 km North, 10.85 km East Port Mansfield, UTM 14-2939588N-667784E (1); Willacy Co., 1.39 km North, 10.88 km East Port Mansfield, UTM 14-2939578N-667814E (3); Willacy Co., 1.30 km North, 10.88 km East Port Mansfield, UTM 14-2939568N-667792E (4); Willacy Co., 40.00 km South, 50.56 km East Armstrong, UTM 14-2939566N-671536E (1); Willacy Co., 1.04 km North, 11.58 km East Port Mansfield, UTM 14-2939555N-668389E (4); Willacy Co., 1.13 km North, 11.02 km East Port Mansfield, UTM 14-2939541N-667869E (4); Willacy Co., 39.52 km South, 50.40 km East Armstrong, UTM 14-2939535N-671406E (4); Willacy Co., 1.12 km North, 10.94 km East Port Mansfield, UTM 14-2939533N-667890E (1); Willacy Co., 39.52 km South, 49.60 km East Armstrong, UTM 14-2939414N-670171E (1); Willacy Co., 1.25 km North, 14.50 km East Port Mansfield, UTM 14-2939399N-671516E (3); Willacy Co., 1.12 km North, 12.26 km East Port Mansfield, UTM 14-2939339N-669191E (2); Willacy Co., 39.68 km South, 49.76 km East Armstrong, UTM 14-2939326N-670719E (17); Willacy Co., 1.12 km North, 11.65 km East Port Mansfield, UTM 14-2939311N-668592E (2); Willacy Co., 1.02 km North, 13.09 km East Port Mansfield, UTM 14-2939303N-670043E (1).

Family Muridae
Mus musculus
House Mouse

The house mouse is native to Eurasia, but has been introduced worldwide and is present throughout Texas (Bailey 1905; McCarley 1959; Dalquest 1968; Auffray et al. 1990; Schmidly 2004). It was previously reported from Padre Island and adjacent areas (Baker and Lay 1938; Raun 1959; Koepke 1969; Baker and Rabalais 1978) and Harris (1988) reported it from the Malaquite Beach Visitor Center within PAIS. During this study, it appeared to be uncommon within PAIS. We only documented it at the Turtle Patrol Cabin (beach mile 39.5) and along Mansfield Channel (Fig. 5k). We captured it in areas with moderate grass cover and vegetation height, which is consistent with previous studies (Blair 1952; Koepke 1969; Baker and Rabalais 1978; Harris 1988). In addition, we observed fecal droppings presumably of this species in storage areas at PAIS headquarters, but trapping in these areas was unsuccessful.

Transportation of the house mouse by humans has greatly altered this species distribution, and its presence at the Turtle Patrol Cabin and Mansfield Channel is likely a result of anthropogenic factors (Auffray et al. 1990; Baker 1994). The Turtle Patrol Cabin and the Mansfield Channel jetties are among the most frequently visited sites along the Primitive Gulf Beach by both park staff and visitors. Considering the heavy human use at these localities, it is likely that humans inadvertently transport it down island in camping equipment, vehicles, food containers, and other storage devices. Although it was uncommon during this study, it has a high potential of becoming established in other areas within PAIS as a result of human transport.

Specimens Reported (7).—Nueces Co., Mustang Island (TTU 93795); Nueces Co., Mustang Island, 2 Mi W of Port Aransas (KU 80595); *San Patricio Co., Mustang Island, 10 Mi S Port Aransas (TTU 4952, 4953); Cameron Co., South Padre Island (ASNHC 11471, 11472); Cameron Co., South Padre Island, Coastal Studies Lab (ASNHC 10405).

Specimens Examined (1).—Willacy Co., Padre Island, fore dunes N Side Mansfield Channel (PAIS-NHM 489).

Captures (8).—Kenedy Co., 6.64 km South, 42.19 km East Armstrong, UTM 14-2971612N-662615E (1); Willacy Co., 1.32 km North, 10.85 km East Port Mansfield, UTM 14-2939588N-667784E (1); Willacy Co., 1.30 km North, 10.88 km East Port Mansfield, UTM 14-2939568N-667792E (2); Willacy Co., 40.00 km South, 50.56 km East Armstrong, UTM 14-2939566N-671536E (2); Willacy Co., 1.13 km North, 11.02 km East Port Mansfield, UTM 14-2939541N-667869E (1); Willacy Co., 1.12 km North, 10.94 km East Port Mansfield, UTM 14-2939533N-667890E (1).

Rattus rattus
Roof Rat

The roof rat, also known as black rat, is native to Eurasia, but has obtained a worldwide distribution through human-mediated introductions (Courchamp et al. 2003; Russell and Clout 2004). At the beginning of the 20th century, there were few specimens of the roof rat from Texas, but it is now commonly found living commensally with humans throughout the state (Bailey 1905; Davis 1947; Dalquest 1968; Schmidly 2004). Baker and Rabalais (1978) reported it on North Padre Island around urban areas in Nueces County, Bob Hall Pier, and near the Malaquite Beach Visitor Center within PAIS. However, we only documented roof rats in PAIS in the boulders at the Mansfield Channel jetty where it was locally abundant (Fig. 5l). We also received a report from a PAIS employee of this species at the Turtle Patrol Cabin (beach mile 39.5; L. Moorehead, pers. comm.), but we were unable to confirm or refute this dated report. Much like the house mouse, humans are likely responsible for transporting roof rats down island. At Mansfield Channel, we observed a rat jump from the undercarriage of a vehicle onto the ground and run to the jetty. This species appears to be restricted to the jetty at Mansfield Channel where it is locally common.

Observational Localities (1).—Kenedy Co., 6.64 km South, 42.19 km East Armstrong, UTM 14-2971612N-662615E (1).

Captures (6).—Willacy Co., 1.18 km North, 14.61 km East Port Mansfield, UTM 14-2939400N-671662E (6).

ORDER LAGOMORPHA
Family Leporidae
Lepus californicus
Black-tailed Jackrabbit

The black-tailed jackrabbit ranges throughout much the western United States and occurs throughout most of Texas (Bailey 1905; Blair 1952; McCarley 1959; Dalquest 1968; Hall 1981; Dunn et al. 1982; Schmidly 2004). It has been reported from PAIS and adjacent areas (Bailey 1905; Raun 1959; Koepke 1969; Baccus et al. 1977; Baker and Rabalais 1978; Harris 1988). We documented it by observation and tracks, which we typically saw on mudflats. Although we documented it across the entire length of PAIS in areas with little vegetation, it was more common at the southern end of North Padre Island (Fig. 5m).

Baccus et al. (1977) and Baker and Rabalais (1978) reported black-tailed jackrabbits as abundant in northern areas of PAIS and North Padre Island, and Harris (1988) reported jackrabbits as common along Bird Island Basin Road at night. However, we never observed this species along Bird Island Basin Road and it was rarely seen adjacent to any roads. We infrequently observed jackrabbits in the northern portion of PAIS. However, in fall 2005 a wildfire burned 149 ha near at the northern park boundary, west of the main entrance. Previous to this fire, we did not observe jackrabbits in this area, but after the fire we saw several individuals and captured a juvenile by hand.

Although the species was common in some places, we never observed it in abundance. It is likely that the presence of cattle facilitated a higher abundance of this species historically. Baker (1956) and Jones et al. (1983) reported that it favored areas disturbed by grazing and avoided tall grass. Cattle grazing maintained low levels of vegetation, and when cattle were removed from the island in 1971, it is likely the distribution of jackrabbits shrank to areas with shorter, less dense vegetation, primarily near the southern end of the island.

Specimens Reported (3).—Nueces Co., Mustang Island (LSUMZ 1578, 1579); *Nueces, Mustang Island, 23 Mi S Port Aransas (TCWC 825).

Specimens Examined (3).—Nueces Co., Padre Island (NMNH 31410, 31411, 31534).

Observational Localities (21).—Kleberg Co., 19.36 km South, 0.96 km West Flour Bluff, UTM 14-3042880N-669227E (1); Kleberg Co., 19.20 km South, 0.99 km West Flour Bluff, UTM 14-3042829N-668900E (1); Kleberg Co., 16.70 km North, 16.38 km East El Martillo, UTM 14-3042056N-669914E (1); Kleberg Co., 9.95 km North, 11.78 km East El Martillo, UTM 14-3035242N-665198E (1); Kleberg Co., 6.86 km South, 7.76 km East El Martillo, UTM 14-3018554N-661533E (1); Kleberg Co., 7.06 km South, 8.06 km East El Martillo, UTM 14-3018371N-661781E (1); Kenedy Co., 15.07 km South, 6.98 km East El Martillo, UTM 14-3010100N-660746E (1); Kenedy Co., 41.28 km North, 2.72 km East Port Mansfield, UTM 14-2979303N-659531E (1); Kenedy Co., 12.86 km South, 43.42 km East Armstrong, UTM 14-2965486N-663673E (1); Kenedy Co., 25.60 km North, 5.84 km East Port Mansfield, UTM 14-2963896N-662426E (1); Kenedy Co., 25.44 km North, 5.84 km East Port Mansfield, UTM 14-2963881N-662328E (1); Kenedy Co., 25.60 km North, 6.40 East Port Mansfield, UTM 14-2963873N-662580E (1); Kenedy Co., 25.44 km North, 5.84 km East Port Mansfield, UTM 14-2963803N-662293E (1); Kenedy Co., 25.60 km North, 5.60 km East Port Mansfield, UTM 14-2963802N-662105E (1); Kenedy Co., 24.96 km North, 6.02 km East Port Mansfield, UTM 14-2963702N-662669E (1); Kenedy Co., 25.44 km North, 4.48 km East Port Mansfield, UTM 14-2963600N-661019E (1); Kenedy Co., 25.12 km North, 4.96 km East Port Mansfield, UTM 14-2963501N-661511E (1); Kenedy Co., 25.28 km North, 4.72 km East Port Mansfield, UTM 14-2963474N-661343E (1); Kenedy Co., 13.55 km North, 10.61 km East Port Mansfield, UTM 14-2951797N-667537E (1); Kenedy Co., 12.88 km North, 10.00 km East Port Mansfield, UTM 14-2951281N-666731E (1); Willacy Co., 1.12 km North, 10.94 km East Port Mansfield, UTM 14-2939533N-667890E (1).

Captures (1).—Kleberg Co., 19.75 km S, 0.84 km W Flour Bluff, UTM 14-3014946N-669286E (1).

ORDER SORICOMORPHA
Family Talpidae
Scalopus aquaticus
Eastern Mole

The eastern mole ranges throughout the eastern and central United States and reaches its southern distribution limit in northern Mexico (Baker 1951; Hall 1981; Yates and Pedersen 1982). Within Texas, it occurs in the eastern two-thirds of the state, including parts of the panhandle and south Texas (Bailey 1905; Blair 1952; McCarley 1959; Dalquest 1968; Schmidly 2004). It was previously reported from PAIS and adjacent areas (Bailey 1905; Jackson 1915; Raun 1959; Yates and Schmidly 1977; Baker and Rabalais 1978; Harris 1988). We frequently documented moles through the presence of runs, which were readily visible in areas with little vegetation. We saw mole runs from the northern park boundary to beach mile 39.5 (Fig. 5n). We also captured an individual by hand crossing Park Road 22, 1.53 km by road north of PAIS headquarters. Baker and Rabalais (1978) also mentioned that moles were not found on the southern end of North Padre Island.

Specimens Reported (1).—Nueces Co., Packery Channel Park (TCWC 53317).

Specimens Examined (3).—Padre Island (NMNH 19666); Nueces Co., Padre Island (NMNH 31403, 31404).

Observational Localities (20).—Kleberg Co., 9.98 km North, 7.06 km East El Martillo, UTM 14-3042921N-669421E (1); Kleberg Co., 19.36 km South, 0.96 km West Flour Bluff, UTM 14-3042880N-669227E (1); Kleberg Co., 19.20 km South, 0.77 km West Flour Bluff, UTM 14-3042830N-669003E (1); Kleberg Co., 19.20 km South, 0.99 km West Flour Bluff, UTM 14-3042829N-668900E (1); Kleberg Co., 13.70 km North, 13.94 km East El Martillo, UTM 14-3039266N-667355E (1); Kleberg Co., 13.63 km North, 13.87 km East El Martillo, UTM 14-3039040N-667275E (1); Kleberg Co., 9.95 km North, 11.78 km East El Martillo, UTM 14-3035242N-665198E (1); Kleberg Co., 9.92 km North, 11.9 km East El Martillo, UTM 14-3035211N-665286E (1); Kleberg Co., 9.70 km North, 12.00 km East El Martillo, UTM 14-3034984N-665402E (1); Kenedy Co., 8.67 km

North, 13.17 km East El Martillo, UTM 14-3033984N-666680E (1); Kleberg Co., 6.91 km South, 7.90 km East El Martillo, UTM 14-3018489N-661631E (1); Kenedy Co., 15.07 km South, 6.98 km East El Martillo, UTM 14-3010100N-660746E (1); Kenedy Co., 15.33 km South, 7.36 km East El Martillo, UTM 14-3009982N-661048E (1); Kenedy Co., 15.23 km South, 7.30 km East El Martillo, UTM 14-3009963N-660982E (1); Kenedy Co., 54.72 km North, 4.32 km East Port Mansfield, UTM 14-3009281N-660035E (1); Kenedy Co., 54.54 km North, 4.50 km East Port Mansfield, UTM 14-2994215N-660504E (1); Kenedy Co., 54.53 km North, 4.61 km East Port Mansfield, UTM 14-2994175N-660664E (1); Kenedy Co., 0.34 km South, 41.25 km East Armstrong, UTM 14-2978155N-661577E (1); Kenedy Co., 0.34 km South, 41.25 km East Armstrong, UTM 14-2978149N-661486E (1); Kenedy Co., 6.56 km South, 41.70 km East Armstrong, UTM 14-2971757N-661942E (1).

Captures (1).—Kleberg Co., 13.09 km N, 15.25 km E El Martillo, UTM 14-3038417N-668766E (1).

ORDER CHIROPTERA
Family Molossidae
Tadarida brasiliensis
Brazilian Free-tailed Bat

The Brazilian free-tailed bat occurs throughout the southwestern and southern United States, Mexico, and Central and South America (Hall 1981; Humphrey 1982). During summer months, this species occurs throughout Texas (Keely and Tuttle 1999; Schmidly 2004). Bailey (1905) reported a specimen that was captured in an old house at the northern end of Padre Island. Koepke (1969) reported a small colony from within PAIS at the "ranger station," which is likely the current location of the Malaquite Beach Visitor Center. Baker and Rabalais (1978) reported observations made by residents of individuals occasionally roosting in man-made structures in residential areas of North Padre Island. Harris (1988) reported it from the Malaquite Beach Visitor Center as well as the sewage treatment plant within PAIS.

On 28 October 2006, we saw two medium-sized bats at the Malaquite Beach Visitor Center (Fig. 5o). After circling the building several times shortly after sunrise, the two bats roosted underneath the shutters of one of the windows on the north side of the building. The bats were closely observed through the windows from the inside of the building. The pelage of both individuals was short, uniformly brown on the dorsal side, and lighter brown on the ventral side. The distal portions of the tail were free from the uropatagium. Based on these characteristics, we identified both individuals as Brazilian free-tailed bats.

Some populations of Brazilian free-tailed bats within Texas are highly migratory (Glass 1982). Bailey's (1905) specimen was captured in November while Harris (1988) noted individuals in the spring and fall. Given this timing, it is possible that this species is only present within PAIS for short periods throughout the year during migration. This species should be considered rare and its residency status is unknown.

Observational Localities (1).—Kleberg Co., 21.48 km S, 0.48 km W Flour Bluff, UTM 14-3040081N-669404E.

Family Vespertilionidae
Perimyotis subflavus
American Perimyotis

The American perimyotis was formerly classified as the eastern pipistrelle (*Pipistrellus subflavus*; Hoofer and Van Den Bussche 2003). The American perimyotis occurs throughout the eastern half of the United States, through Mexico and Central America (Hall 1981). Within Texas, it occurs throughout the eastern two-thirds of the state (Bailey 1905; McCarley 1959; Dalquest 1968; Schmidly 2004). Zehner (1985) reported a specimen that was found clinging to the wall of a building approximately 2.4 km south of the main entrance of PAIS. American perimyotis require thermally stable roosts, which can consist of caves, mines, crevices, and buildings, as well as trees during summer months (Briggler and Prather 2003). Because potential roost sites are limited within PAIS, it is unlikely that this species is a resident in the park. However, it may occur in low numbers on North Padre Island in the urban areas of Nueces County, and it is likely an occasional visitor to PAIS.

ORDER CARNIVORA
Family Felidae
Lynx rufus
Bobcat

The bobcat occurs throughout much of North America including the continuous United States (Hall 1981; McCord and Cardoza 1982; Woolf and Hubert 1998). In Texas, it is common and ranges throughout the state (Bailey 1905; Blair 1952; McCarley 1959; Dalquest 1968; Schmidly 2004). Baker and Rabalais (1978) reported a second-hand observation of a bobcat by an oak motte near Packery Channel in 1965. Harris (1988) reported a second-hand observation made in 1967 of a bobcat near Packery Channel. Within PAIS, Park Service employees and oil and gas personnel reported bobcats in the vicinity of Pan Am road (6.85 Mi or 11.02 km south of the end of Park Road 22). During this study, we identified tracks of bobcat at two locations, once in the middle of the island west of beach mile 35 and once on a mudflat adjacent to beach mile 52 (Fig. 5p). In both cases, the rear of the heal pad had 3 lobes while the front of the heal pad had 2 lobes. Overall, the tracks were more circular when compared to those of coyote, which were oblong. No claw prints were seen in either set of tracks, which were 4.5-5 cm long. The bobcat likely occurs across the entire length of PAIS but its abundance is unknown. On Texas barrier islands, bobcats were previously only documented from Matagorda Island (Bailey 1905; however, see Hice and Schmidly 2002). Thus, this represents the first records of this species from North Padre Island. Like other members in the family Felidae, bobcats are elusive, and it is likely their presence has gone unnoticed on other islands.

Observational Localities (3).—Kleberg Co., 2.03 km South, 10.83 km East El Martillo, UTM 14-3023097N-664484E (1); Kenedy Co., 0.37 km North, 40.05 km East Armstrong, UTM 14-2978858N-660379E (1); Kenedy Co., 12.88 km North, 10.00 km East Port Mansfield, UTM 14-2951281N-666731E (1).

Family Canidae
Urocyon cinereoargenteus
Gray Fox

The gray fox ranges from southern Canada through much of the United States to Central and South America (Hall 1981; Samuel and Nelson 1982). Within Texas, it is found statewide (Bailey 1905; McCarley 1959; Dalquest 1968; Schmidly 2004). We previously reported (Jones and Frey 2008) the first record of gray fox from PAIS, which was the first report of the species on any barrier island in Texas. The first record was of a dead fox found near the entrance of Pan Am road (11.02 km south of the end of Park Road 22). Wounds on the animal's throat suggested that it was killed by a coyote. In addition, between August 2005 and March 2007 we made additional observations of gray foxes in PAIS and adjacent areas (Fig. 5q). Within PAIS, gray foxes were observed on three occasions north of beach mile 11.5 on North Padre Island as well as on a dredged material island. We observed five gray foxes sleeping together on a dry pond one half hour before sunset on 14 August 2005 (Kleberg Co., Padre Island National Seashore, 14-3033984N-666680E). We observed the group for *ca* 15 min until each woke and left. The last fox yipped at GDJ for *ca* 5 min before leaving in a separate direction from the previous four. This location was *ca* 20 m from a dense stand of southern cattail and common reed. At the same location the following year, we saw a single individual at dusk. It behaved aggressively by yipping, growling, charging, and baring its teeth. The individual did not retreat as we walked past. On 9 September 2006, we saw a gray fox adjacent to a large dune *ca* 30 m from the Gulf of Mexico beach (Kleberg Co., Padre Island National Seashore, 14-3015327N, 662764E). The fox yipped but did not retreat as GDJ walked past. Sea oats dominated the vegetation. On 15 August 2005, we saw a gray fox on Dredged Material Island (DMI) 113 (Kleberg Co., Padre Island National Seashore, Dredged Material Island 113, 14-3041471N-666579E; Table 2). DMI 113 is a small (3.7 ha) island located *ca* 600 m from North Padre Island and dominated by sea ox eye daisy, black willow, and honey mesquite (*Prosopis glandulosa*). GDJ flushed the fox from a dense patch of sea ox eye daisy and observed it running through shallow water to DMI 115, *ca* 30 m south of DMI 113.

Gray fox appear to be well established in residential areas at the north end of North Padre Island. Residents have regularly reported foxes in yards and on porches to the Padre Island Moon newspaper, which has occasionally published photographs and accounts of these reports (M. Ellis, in litt.). During summer 2005, Chief Ranger of Padre Island National Seashore, R. Larson (in. litt.) observed two gray fox in the Padre Isles residential area of Corpus Christi on North Padre Island, Nueces County. Larson observed the fox on the roof gable of a house. The fox then suddenly ran over the eve of the house, jumped a short distance to a tree, and ran to the ground.

We observed a gray fox on South Padre Island (Cameron Co., South Padre Island, 14-2899570N-0681208E) on 17 May 2006, which is the first report of the species from that island. The fox walked along the Gulf of Mexico beach and then moved west across the island where it was yipping on the Laguna Madre shore.

Coyotes are significant predators of gray foxes, and when threatened, gray foxes readily climb trees (Bailey 1905; Terres 1939; Fedriani et al. 2000; Schmidly 2004). The high abundance of coyotes and the near absence of arborescent growth make this species an unlikely resident of PAIS. However, as we previously noted (Jones and Frey 2008), several components of the vegetation within PAIS are likely to facilitate the existence of gray fox. Between Yarborough Pass to the northern boundary of PAIS, we found several tunnels in dense gulfdune paspalum that were large enough for a gray fox to pass through, but appeared too small to be used by coyotes, which are of larger body size. It is possible that gray foxes made the tunnels to avoid or escape coyotes. Furthermore, all of the fox records were within 1.6 km of black willow. It seems likely that gray foxes utilize willow stands, in addition to the dense vegetation, for protection against predation. Within PAIS, the gray fox should be considered rare and restricted to the northern regions of the park where black willows can be found.

Observational Localities (6).—Kleberg Co., 15.97 km North, 13.07 km East El Martillo, UTM 14-3041392N-666603E (1); Kenedy Co., 8.67 km North, 13.17 km East El Martillo, UTM 14-3033984N-666680E (6); Kleberg Co., 2.03 km South, 10.83 km East El Martillo, UTM 14-3023097N-664484E (1); Kenedy Co., 2.13 km South, 10.90 km East El Martillo (1); Kenedy Co., 9.55 km South, 9.04 km East El Martillo, UTM 14-3015589N-662725E (1); Cameron Co., South Padre Island, 14.59 km North, 2.14 East Port Isabel, UTM 14-2899570N-0681208E.

Canis latrans
Coyote

Coyotes occupy most of North America from Alaska to Costa Rica (Bekoff 1982). In Texas, it occurs statewide and has been reported as the most common large native carnivore in the Tamaulipan province in southern Texas (Bailey 1905; Blair 1952; McCarley 1959; Dalquest 1968; Schmidly 2004). Early surveyors, including R.E. Halter, reported this species on Padre Island during the mid 1870's (Sherrod and Brown 1989) and more recent studies also have documented it from PAIS and adjacent areas (Bailey 1905; Baccus et al. 1977; Raun 1959; Koepke 1969; Baker and Rabalais 1978; Harris 1988; Sissom et al. 1990). Based on our observations and camera trap photographs, coyotes were seemingly omnipresent along the entire length of PAIS. We frequently saw tracks traversing transects of Sherman traps, adjacent to mudflats, along the beach, and on most small islands in the Laguna Madre (Table 2, Table 6, Fig. 5r).

Coyotes appeared to consume a variety of food resources within PAIS. Feces on small islands were mostly composed of shell fragments from crabs. We observed individuals digging for and consuming ghost crabs (*Ocypode quadrata*) on the Gulf beach. During the winter of 2006, Park staff reported a partially consumed deer carcass on the beach at beach mile 50. They reported erratic deer and coyote tracks mingled with a blood trail from the dunes to the carcass. The deer was apparently trying to reach the Gulf of Mexico in order to escape the coyote attack. In addition to natural food sources, coyotes appeared to benefit from the presence of humans. We regularly saw coyotes scavenging for food in and around dumpsters at Malaquite Beach Visitor Center, the campground north of the visitor center, and near the picnic sites at Malaquite Beach. We also observed coyotes boldly scavenging the remains of fish discarded by fisherman. In these instances, the coyote

Table 6. Remote camera trap effort and results on Padre Island National Seashore, 2005-2007. Presence (1) or absence (0) of coyote, Canis latrans *(Cala), and raccoon,* Procyon lotor *(Prlo), are indicated; no other mammal species were photographed.*

				Location UTM, NAD83 (Zone 14R)		Species Captured	
Date Set	Nights Set	County	Descriptive Locality	Easting	Northing	Cala	Prlo
23-May-05	2	Kleberg	8.1 km N, 14.3 km E El Martillo	667744	3033245	1	0
23-May-05	2	Kleberg	8.2 km N, 14.3 km E El Martillo	667779	3033317	1	0
26-May-05	2	Kleberg	0.2 km S, 11.6 km E El Martillo	665142	3024943	1	0
26-May-05	2	Kleberg	0.2 km S, 11.6 km E El Martillo	665096	3024953	1	0
28-May-05	2	Kenedy	7.3 km S, 9.7 km E El Martillo	663231	3017864	0	0
28-May-05	2	Kenedy	7.3 km S, 9.9 km E El Martillo	663371	3017803	1	0
6-Jun-05	1	Willacy	1.5 km N, 14.7 km E Port Mansfield	671536	2939566	0	1
7-Jun-05	1	Willacy	1.5 km N, 14.5 km E Port Mansfield	671406	2939535	1	0
6-Jun-05	2	Willacy	1.2 km N, 13.8 km E Port Mansfield	670719	2939326	1	1
8-Jun-05	2	Kenedy	8.8 km N, 12.1 km E Port Mansfield	668979	2946905	0	0
8-Jun-05	2	Kenedy	8.8 km N, 12.1 km E Port Mansfield	669048	2946904	0	0
10-Jun-05	2	Kenedy	24.1 km S, 46.8 km E Armstrong	666777	2954558	0	0
10-Jun-05	2	Kenedy	24.2 km S, 46.5 km E Armstrong	666465	2954474	0	0
11-Jul-05	1	Kleberg	9.2 km N, 13.4 km E El Martillo	666885	3034317	1	1
30-May-06	2	Kleberg	10.1 km N, 11.6 km E El Martillo	665057	3035241	0	0
30-May-06	2	Kleberg	9.8 km N, 11.9 km E El Martillo	665402	3034984	0	0
4-Jun-06	2	Kleberg	14.1 km N, 16.5 km E El Martillo	669996	3039219	0	0
4-Jun-06	2	Kleberg	14.2 km N, 16.3 km E El Martillo	669791	3039362	0	0
6-Jun-06	2	Kenedy	14.7 km S, 42.4 km E Armstrong	662426	2963896	0	0
6-Jun-06	2	Kenedy	14.8 km S, 42.1 km E Armstrong	662105	2963802	0	0
8-Jun-06	2	Kenedy	15.1 km S, 41.5 km E Armstrong	661511	2963501	0	0
8-Jun-06	2	Kenedy	15.0 km S, 41.0 km E Armstrong	661019	2963600	0	0
10-Jun-06	2	Kenedy	0.8 km N, 39.6 km E Armstrong	659554	2979451	1	0
10-Jun-06	2	Kenedy	0.7 km N, 39.5 km E Armstrong	659531	2979303	0	0
26-Jun-06	2	Kenedy	13.2 km N,9.8 km E Port Mansfield	666731	2951281	0	0
26-Jun-06	2	Kenedy	13.5 km N,10.0 km E Port Mansfield	666931	2951565	0	0
28-Jun-06	2	Willacy	1.5 km N,11.5 km E Port Mansfield	668389	2939555	0	0
28-Jun-06	2	Willacy	1.2 km N,11.7 km E Port Mansfield	668592	2939311	0	0
30-Jun-06	2	Willacy	1.5 km N, 10.9 km E Port Mansfield	667838	2939571	0	0
30-Jun-06	2	Willacy	1.4 km N, 11.0 km E Port Mansfield	667890	2939533	0	0
11-Jul-06	2	Kenedy	31.0 km S, 7.2 km E El Martillo	660664	2994175	0	0
11-Jul-06	2	Kenedy	31.0 km S, 7.2 km E El Martillo	660740	2994167	0	0
13-Jul-06	2	Kenedy	15.8 km S, 6.4 km E El Martillo	659926	3009361	0	0
13-Jul-06	2	Kenedy	15.8 km S, 6.4 km E El Martillo	659984	3009329	0	0
18-Aug-06	3	Kleberg	1.5 km N, 9.5 km E El Martillo	662989	3026617	0	0

would invariably run from the cover of the foredune onto the beach, seemingly alerted to the discarded remains by the vociferous antics of mobbing laughing gulls. Once the fish remains were grabbed, the coyote would immediately retreat back into the dunes.

Specimens Reported (1).—Cameron Co., 11 Mi N, 3 Mi E Port Isabel (ASNHC 7914).

Specimens Examined (2).—Nueces Co., Padre Island (NMNH 31529, A43403).

Observational Localities (43).—Kleberg Co., 20.00 km North, 14.85 km East El Martillo, UTM 14-3045550N-668298E (1); Kleberg Co., 19.84 km North, 15.44 km East El Martillo, UTM 14-3045375N-668843E (1); Kleberg Co., 19.68 km North, 14.93 km East El Martillo, UTM 14-3045111N-668249E (1); Kleberg Co., 19.36 km North, 14.72 km East El Martillo, UTM 14-3044885N-668014E (1); Kleberg Co., 17.34 km South, 0.86 km West Flour Bluff, UTM 14-3044481N-667854E (1); Kleberg Co., 16.43 km North, 13.23 km East El Martillo, UTM 14-3041908N-666653E (1); Kleberg Co., 15.97 km North, 13.07 km East El Martillo, UTM 14-3041403N-666459E (1); Kleberg Co., 13.98 km North, 16.48 km East El Martillo, UTM 14-3039362N-669791E (1); Kleberg Co., 11.58 km North, 14.80 km East El Martillo, UTM 14-3037060N-668317E (1); Kleberg Co., 8.99 km North, 13.44 km East El Martillo, UTM 14-3034317N-666885E (1); Kenedy Co., 8.67 km North, 13.17 km East El Martillo, UTM 14-3033984N-666680E (1); Kenedy Co., 7.12 km South, 9.79 km East El Martillo, UTM 14-3018040N-663470E (1); Kenedy Co., 7.28 km South, 9.12 km East El Martillo, UTM 14-3017803N-663371E (1); Kenedy Co., 9.73 km South, 6.96 km East El Martillo, UTM 14-3015459N-660560E (1); Kenedy Co., 14.69 km South, 8.13 km East El Martillo, UTM 14-3010881N-661970E (1); Kenedy Co., 14.62 km South, 8.13 km East El Martillo, UTM 14-3010665N-661844E (1); Kenedy Co., 14.69 km South, 8.06 km East El Martillo, UTM 14-3010645N-661914E (1); Kenedy Co., 14.45 km South, 8.16 km East El Martillo, UTM 14-3010574N-661913E (1); Kenedy Co., 14.82 km South, 8.16 km East El Martillo, UTM 14-3010503N-661912E (1); Kenedy Co., 14.88 km South, 8.13 km East El Martillo, UTM 14-3010465N-661972E (1); Kenedy Co., 15.23 km South, 7.30 km East El Martillo, UTM 14-3009963N-660982E (1); Kenedy Co., 54.72 km North, 4.32 km East Port Mansfield, UTM 14-3009281N-660035E (1); Kenedy Co., 25.92 km South, 7.15 km East El Martillo, UTM 14-2999362N-660902E (1); Kenedy Co., 25.92 km South, 7.10 km East El Martillo, UTM 14-2999191N-660847E (1); Kenedy Co., 8.72 km North, 40.8 km East Armstrong, UTM 14-2987792N-660813E (1); Kenedy Co., 8.46 km North, 40.64 km East Armstrong, UTM 14-2987750N-660662E (1); Kenedy Co., 8.32 km North, 40.16 km East Armstrong, UTM 14-2987742N-660619E (1); Kenedy Co., 0.34 km South, 41.25 km East Armstrong, UTM 14-2978153N-661609E (1); Kenedy Co., 6.56 km South, 41.70 km East Armstrong, UTM 14-2971664N-662052E (1); Kenedy Co., 12.86 km South, 43.42 km East Armstrong, UTM 14-2965551N-663765E (1); Kenedy Co., 25.60 km North, 5.84 km East Port Mansfield, UTM 14-2963896N-662426E (1); Kenedy Co., 25.44 km North, 5.84 km East Port Mansfield, UTM 14-2963881N-662328E (1); Kenedy Co., 25.60 km North, 6.40 East Port Mansfield, UTM 14-2963873N-662580E (1); Kenedy Co., 25.44 km North, 5.84 km East Port Mansfield, UTM 14-2963803N-662293E (1); Kenedy Co., 25.60 km North, 5.60 km East Port Mansfield, UTM 14-2963802N-662105E (1); Kenedy Co., 24.96 km North, 6.02 km East Port Mansfield, UTM 14-2963702N-662669E (1); Kenedy Co., 25.28 km North, 4.64 km East Port Mansfield, UTM 14-2963437N-661392E (1); Kenedy Co., 24.80 km South, 47.84 km East Armstrong, UTM 14-2954558N-666777E (1); Kenedy Co., 24.32 km South, 45.92 km East Armstrong, UTM 14-2954488N-666608E (1); Kenedy Co., 12.88 km North, 10.00 km East Port Mansfield, UTM 14-2951281N-666731E (1); Kenedy Co., 31.84 km South, 48.48 km East Armstrong, UTM 14-2946905N-668979E (1); Kenedy Co., 32.00 km South, 47.84 km East Armstrong, UTM 14-2946869N-668642E (1); Willacy Co., 39.04 km South, 48.80 km East Armstrong, UTM 14-2939610N-669785E (1).

Family Mustelidae
Taxidea taxus
American Badger

The American badger ranges from central Canada through much of the central and western United States and Mexico (Lindzey 1982). In Texas, it is only absent

from eastern portions of the state and is common in grassland habitats throughout its range (Bailey 1905; Blair 1952; Dalquest 1968; Schmidly 2004). It was previously reported from PAIS and adjacent areas (Lloyd 1891b; Baker and Lay 1938; Schantz 1949; Raun 1959; Koepke 1969; Long 1972; Baccus et al. 1977; Baker and Rabalais 1978; Harris 1888). During this study, we only documented it south of beach mile 44 to Mansfield Channel (Fig. 5s). However, photographs taken in 2005 of a live badger near beach mile 30 (48 km S Malaquite Beach Visitor Center by beach) and a road killed specimen near beach mile 35 (56 km S Malaquite Beach Visitor Center by beach) attest to its occurrence further north. Park Service employees thought it was most common between beach miles 30 and 50 (D. Echols, pers. comm.; Moorehead, pers. comm).

We documented badgers primarily through sign. In the southern portions of the island, the vegetation was less dense, thereby making tracks in sand and mud more visible. It is likely that as vegetation increases in density and height in northerly portions of the island, badgers and their sign become increasingly difficult to find. Prior to the removal of cattle, much of North Padre Island was denuded of vegetation, which may account for more records further north historically. Considering that the primary food item of the badger is ground squirrels (Snead and Hendrickson 1942; Schmidly 2004), it is likely that their range extends the entire length of PAIS and is sympatric with spotted ground squirrels. This species should be considered uncommon.

Specimens Reported (1).—Cameron Co., 6.5 Mi N, 3 Mi E Port Isabel (ASNHC 5378).

Specimens Examined (1).—Nueces Co., Padre Island (NMNH A43397).

Observational Localities (7).—Kenedy Co., 48 km South of the end of Park Road 22 by beach (1); Kenedy Co., 56 km South of the end of Park Road 22 by beach (1); Kenedy Co., 25.44 km North, 5.84 km East Port Mansfield, UTM 14-2963803N-662293E (1); Kenedy Co., 25.12 km North, 4.96 km East Port Mansfield, UTM 14-2963501N-661511E (1); Kenedy Co., 13.55 km North, 10.61 km East Port Mansfield, UTM 14-2951797N-667537E (1); Kenedy Co., 32.48 km South, 47.68 km East Armstrong, UTM 14-2946901N-669014E (1); Willacy Co., 1.04 km North, 11.58 km East Port Mansfield, UTM 14-2939555N-668389E (1).

Family Mephitidae
Mephitis mephitis
Striped Skunk

The striped skunk occurs throughout much of North America (Hall 1981; Godin 1982). Within Texas it ranges across the state, especially in wooded or brushy areas (Bailey 1905; Blair 1952; McCarley 1959; Dalquest 1968; Godin 1982; Schmidly 2004). Lloyd (1891b), Howell (1901), and Baker and Rabalais (1978) reported it from Padre Island. Lloyd (1891b:2) shot one at the northern end of Padre Island and wrote, "Mr. Curry and his boys…killed over a dozen. He says there is only one species here." Baker and Rabalais (1978) reported three adjacent to Park Road 22 within PAIS. One was observed at night and the other two were road-killed individuals, but no specimens were retained. In 2006, National Park Service employees found a striped skunk carcass in interior portions of PAIS near Pan Am Road (11 km south of the end of Park Road 22). We identified it as a striped skunk based on the presence of hairs on the tail that had white bases and black tips, which is a distinguishing characteristic of this species. In addition, we smelled skunk on two occasions within PAIS: once in an interior area of the island adjacent to beach mile 10 and once behind the primary dunes at beach mile 29 (Fig. 5t). Because striped skunks are the only confirmed species of skunk on Padre Island, it is most likely that these animals were striped skunks.

Specimens Examined (2).—Nueces Co., Padre Island (NMNH 31416, A43402)

Additional Localities (3).—Kleberg Co., vicinity of Pan Am Road (1); Kleberg Co., 6.69 km South, 8.03 km East El Martillo, UTM 14-3018440N-661697E (1); Kenedy Co., 8.48 km North, 40.32 km East Armstrong, UTM 14-2987762N-660719E (1).

Family Procyonidae
Nasua narica
White-nosed Coati

The coati ranges from Arizona, New Mexico, and Texas and south through Mexico and Central America (Hall 1981; Kaufmann 1982). Within Texas, it occurs in woodland areas in the southern part of the state (Bailey 1905; Blair 1952; Kaufmann 1982; Schmidly 2004). Reliable reports of coatis within PAIS were given to us by B. Sandifer (pers. comm.). He observed one on the mudflats on the west side of the island adjacent to beach mile 20 and another at the entrance to PAIS in the early 1990's. In January 1996, he saw one at beach mile 29 digging for crabs on the foredune. In 2005, D. Echols (pers. comm.) saw photographs of a group of coatis at the Best Western Hotel (14050 S Padre Island Dr) adjacent to Packery Channel at the northern edge of North Padre Island (Nueces Co., 4.62 km S, 5.84 km E Flour Bluff, 14-3057251N-675261E), but these photos were not retained. Although coatis are probably present within PAIS, their status is unknown.

Procyon lotor
Raccoon

The raccoon occurs throughout North America (Hall 1981; Kaufmann 1982). In Texas, it is common and occurs throughout the state (Bailey 1905; Blair 1952; McCarley 1959; Dalquest 1968; Schmidly 2004). It previously was documented from PAIS and adjacent areas (Lloyd 1891b; Goldman 1950; Raun 1959; Baker and Rabalais 1978; Harris 1988). We captured four individuals and commonly saw tracks around ponds across PAIS and on several small islands in the Laguna Madre (Table 2, Fig. 5u). We also documented raccoons using camera traps (Table 6). Although we documented this species across the entire length of PAIS, it is likely restricted to areas with ponds for food and water.

Specimens Examined (1).—Nueces Co., Padre Island (NMNH A43400).

Observational Localities (27).—Kleberg Co., 20.00 km North, 14.85 km East El Martillo, UTM 14-3045550N-668298E (1); Kleberg Co., 19.84 km North, 15.10 km East El Martillo, UTM 14-3045396N-668390E (1); Kleberg Co., 19.52 km North, 14.88 km East El Martillo, UTM 14-3045048N-668047E (1); Kleberg Co., 19.36 km North, 14.83 km East El Martillo, UTM 14-3044901N-668003E (1); Kleberg Co., 17.34 km South, 0.86 km West Flour Bluff, UTM 14-3044481N-667854E (1); Kleberg Co., 18.02 km South, 1.23 km West Flour Bluff, UTM 14-3043845N-667553E (1); Kleberg Co., 16.96 km North, 13.82 km East El Martillo, UTM 14-3042239N-667323E (1); Kleberg Co., 16.43 km North, 13.23 km East El Martillo, UTM 14-3041908N-666653E (1); Kleberg Co., 15.97 km North, 13.07 km East El Martillo, UTM 14-3041508N-666535E (1); Kleberg Co., 8.99 km North, 13.44 km East El Martillo, UTM 14-3034317N-666885E (1); Kenedy Co., 8.67 km North, 13.17 km East El Martillo, UTM 14-3033984N-666680E (1); Kenedy Co., 15.07 km South, 6.98 km East El Martillo, UTM 14-3010100N-660746E (1); Kenedy Co., 6.56 km South, 41.70 km East Armstrong, UTM 14-2971757N-661942E (1); Kenedy Co., 6.56 km South, 41.70 km East Armstrong, UTM 14-2971664N-662052E (1); Kenedy Co., 25.60 km North, 5.84 km East Port Mansfield, UTM 14-2963896N-662426E (1); Kenedy Co., 25.44 km North, 5.84 km East Port Mansfield, UTM 14-2963881N-662328E (1); Kenedy Co., 25.60 km North, 6.40 East Port Mansfield, UTM 14-2963873N-662580E (1); Kenedy Co., 25.44 km North, 5.84 km East Port Mansfield, UTM 14-2963803N-662293E (1); Kenedy Co., 25.60 km North, 5.60 km East Port Mansfield, UTM 14-2963802N-662105E (1); Kenedy Co., 24.96 km North, 6.02 km East Port Mansfield, UTM 14-2963702N-662669E (1); Kenedy Co., 24.64 km South, 45.6 km East Armstrong, UTM 14-2954426N-666211E (1); Kenedy Co., 13.55 km North, 10.61 km East Port Mansfield, UTM 14-2951797N-667537E (1); Kenedy Co., 13.25 km North, 10.27 km East Port Mansfield, UTM 14-2951656N-667014E (1); Willacy Co., 40.00 km South, 50.56 km East Armstrong, UTM 14-2939566N-671536E (1); Willacy Co., 39.52 km South, 49.60 km East Armstrong, UTM 14-2939414N-670171E (1); Willacy Co., 1.25 km North, 14.50 km East Port Mansfield, UTM 14-2939399N-671516E (1); Willacy Co., 1.18 km North, 14.61 km East Port Mansfield, UTM 14-2939400N-671662E (1).

Captures (4).—Kleberg Co., 8.99 km North, 13.44 km East El Martillo, UTM 14-3034317N-666885E (1); Kenedy Co., 15.07 km South, 6.98 km

East El Martillo, UTM 14-3010100N-660746E (1); Willacy Co., 1.18 km North, 14.61 km East Port Mansfield, UTM 14-2939400N-671662E (2).

ORDER ARTIODACTYLA
Family Tayassuidae
Pecari tajacu
Collared Peccary

The collared peccary occurs from the southwestern United States to Argentina (Sowls 1966, 1978; Bissonette 1982). In Texas, it is restricted to southern and western portions of the state with introduced populations in the north (Bailey 1905; Blair 1952; Dalquest 1968; Schmidly 2004). Baker and Rabalais (1978) reported sporadic sightings of peccary during the 20th century. They also reported an observation within PAIS at the southern end of Big Shell Beach around beach mile 30. Harris (1988) also reported second-hand observations along the Laguna Madre on North Padre Island in 1983.

We saw a group of five peccaries adjacent to residential areas on North Padre Island, near Park Road 22, just north of the Nueces-Kleberg County line. We saw a dead peccary adjacent to Packery Channel. Within PAIS, we found a skull in a mudflat west of beach mile 48.

The collard peccary primarily feeds on various cacti and is capable of obtaining sufficient water from their diet when enough cacti are present (Eddy 1961; Bissonette 1982; Schmidly 2004). Since cacti and freshwater were limited within PAIS, this species is likely to be concentrated at the northern end of North Padre Island where fresh water and succulent vegetation (cultivated by residents) is more common. This species is probably present within PAIS, but it is likely to be uncommon.

Observational Localities (3).—Nueces Co., Packery Channel, 4.50 km S, 6.44 km E Flour Bluff, UTM 14-3057325N-675874E (1); Nueces Co., 9.92 km S, 5.48 km E Flour Bluff, UTM 14-3051914N -674974E (1); Kenedy Co., 18.91 km North, 7.23 km East Port Mansfield, UTM 14-2957152N-664083E (1).

Family Bovidae
Boselaphus tragocamelus
Nilgai

The nilgai is native to the Indian subcontinent, but today is one of the most abundant exotic ungulates in Texas (Schmidly 2004). They were first introduced to the King Ranch in southern Texas in the 1930's and they have been used for hunting and aesthetics on game ranches (Payne et al. 1987). Baker and Rabalais (1978) and Harris (1988) reported nilgai across PAIS based on second-hand observations. Park personnel removed nilgai from the PAIS in the 1990s (D. Echols, pers. comm.). We received a reliable report of four coyotes chasing a female nilgai into the Gulf of Mexico at beach mile 23 in the 1990's (B. Sandifer, pers. comm.). We did not document nilgai in PAIS during this study, but in 2006, we received reports of it from interior portions of the island adjacent to beach mile 4 (P. Slattery, pers. comm.). Shortly after receiving these reports, we searched the reported area but found no signs. Because nilgai are actively removed from PAIS, it is likely that a breeding population does not exist within PAIS. However, new individuals within PAIS are likely to arrive through dispersal across the Laguna Madre from the King Ranch and other areas on the mainland.

Observational Localities (2).—Kleberg Co., 6.4 km South of the end of Park Road 22 by beach, 1.6 km West of beach (1); Kenedy Co., 37 km South of the end of Park Road 22 by beach (1).

Family Cervidae
Odocoileus virginianus
White-tailed Deer

The white-tailed deer ranges from Canada to South America and occurs throughout much of the continuous United States (Hesselton and Hesselton 1982). In Texas, it is found in suitable habitat throughout the state (Bailey 1905; Mearns 1907; Blair 1952; McCarley 1959; Dalquest 1968; Schmidly 2004). It has been documented from PAIS and adjacent areas (Bailey 1905; Koepke 1969; Baker and Rabalais 1978; Harris 1988; Sherrod and Brown 1989). We found it to

be abundant throughout the year and found it across the entire length of PAIS including on many small islands in the Laguna Madre (Table 2, Fig. 5v). These deer were commonly observed adjacent to ponds. In addition to ponds, we frequently observed deer and saw tracks on mudflats along the western length of PAIS. During the summers of 2005 and 2006, several newborn fawns were seen at the beginning of June in areas surrounding the Malaquite Beach Visitor Center. We saw a white-tailed deer run through the water from Dredged Material Island 97 to Dredged Material Island 99.

Baker and Rabalais (1978) reported tracks but never observed white-tailed deer on North Padre Island. Likewise, during a seven-year period, Harris (1988) never observed white-tailed deer within PAIS and considered it to be an occasional visitor to PAIS. Historical populations of white-tailed deer on PAIS are unknown, but it seems apparent that populations have increased over the last 25 years because we frequently observed deer, sometimes in groups as large as 20. Perhaps the change in abundance is due to the removal of livestock grazing from PAIS.

Observational Localities (40).—Kleberg Co., 20.00 km North, 14.85 km East El Martillo, UTM 14-3045550N-668298E (1); Kleberg Co., 19.52 km North, 14.88 km East El Martillo, UTM 14-3045048N-668047E (1); Kleberg Co., 19.36 km North, 14.72 km East El Martillo, UTM 14-3044885N-668014E (1); Kleberg Co., 17.34 km South, 0.86 km West Flour Bluff, UTM 14-3044481N-667854E (1); Kleberg Co., 19.20 km South, 0.77 km West Flour Bluff, UTM 14-3042830N-669003E (1); Kleberg Co., 16.70 km North, 16.38 km East El Martillo, UTM 14-3042056N-669914E (1); Kleberg Co., 16.43 km North, 13.23 km East El Martillo, UTM 14-3041908N-666653E (1); Kleberg Co., 13.98 km North, 16.48 km East El Martillo, UTM 14-3039362N-669791E (1); Kleberg Co., 12.30 km North, 15.17 km East El Martillo, UTM 14-3037646N-668636E (1); Kleberg Co., 10.85 km North, 14.50 km East El Martillo, UTM 14-3036312N-667955E (1); Kleberg Co., 9.33 km North, 14.75 km East El Martillo, UTM 14-3034569N-668125E (1); Kleberg Co., 8.99 km North, 14.43 km East El Martillo, UTM 14-3034343N-668008E (1); Kleberg Co., 8.99 km North, 14.43 km East El Martillo, UTM 14-3034343N-668008E (1); Kleberg Co., 8.99 km North, 13.44 km East El Martillo, UTM 14-3034317N-666885E (1); Kenedy Co., 8.67 km North, 13.17 km East El Martillo, UTM 14-3033984N-666680E (1); Kleberg Co., 8.32 km North, 13.87 km East El Martillo, UTM 14-3033522N-667531E (1); Kleberg Co., 8.03 km North, 14.19 km East El Martillo, UTM 14-3033396N-667637E (1); Kleberg Co., 0.29 km South, 11.01 km East El Martillo, UTM 14-3025135N-664584E (1); Kleberg Co., 6.91 km South, 7.90 km East El Martillo, UTM 14-3018489N-661631E (1); Kleberg Co., 7.06 km South, 8.06 km East El Martillo, UTM 14-3018371N-661781E (1); Kenedy Co., 14.45 km South, 8.16 km East El Martillo, UTM 14-3010574N-661913E (1); Kenedy Co., 15.10 km South, 7.17 km East El Martillo, UTM 14-3010135N-661049E (1); Kenedy Co., 15.01 km South, 7.33 km East El Martillo, UTM 14-3010013N-661083E (1); Kenedy Co., 54.72 km North, 4.32 km East Port Mansfield, UTM 14-3009281N-660035E (1); Kenedy Co., 23.92 km South, 7.12 km East El Martillo, UTM 14-3001088N-660974E (1); Kenedy Co., 25.92 km South, 7.10 km East El Martillo, UTM 14-2999191N-660847E (1); Kenedy Co., 54.53 km North, 4.77 km East Port Mansfield, UTM 14-2994195N-660554E (1); Kenedy Co., 54.53 km North, 4.32 km East Port Mansfield, UTM 14-2994174N-660690E (1); Kenedy Co., 0.34 km South, 41.25 km East Armstrong, UTM 14-2978155N-661577E (1); Kenedy Co., 25.60 km North, 5.84 km East Port Mansfield, UTM 14-2963896N-662426E (1); Kenedy Co., 25.44 km North, 5.84 km East Port Mansfield, UTM 14-2963881N-662328E (1); Kenedy Co., 25.60 km North, 6.40 East Port Mansfield, UTM 14-2963873N-662580E (1); Kenedy Co., 25.44 km North, 5.84 km East Port Mansfield, UTM 14-2963803N-662293E (1); Kenedy Co., 25.60 km North, 5.60 km East Port Mansfield, UTM 14-2963802N-662105E (1); Kenedy Co., 24.96 km North, 6.02 km East Port Mansfield, UTM 14-2963702N-662669E (1); Kenedy Co., 25.28 km North, 4.96 km East Port Mansfield, UTM 14-2963489N-661303E (1); Kenedy Co., 24.64 km South, 45.6 km East Armstrong, UTM 14-2954426N-666211E (1); Kenedy Co., 12.88 km North, 10.00 km East Port Mansfield, UTM 14-2951281N-666731E (1); Kenedy Co., 32.48 km South, 47.68 km East Armstrong, UTM 14-2946901N-669014E (1); Willacy Co., 1.12 km North, 12.26 km East Port Mansfield, UTM 14-2939339N-669191E (1).

ENCROACHING, HISTORICAL, UNCONFIRMED, AND FALSE REPORTS

ORDER DIDELPHIMORPHIA
Family Didelphidae
Didelphis virginiana
Virginia Opossum

The Virginia opossum occurs from southern Ontario and the eastern United States through Central America (Gardner 1982). It ranges throughout Texas except for arid regions in the western part of the state (Bailey 1905; Mearns 1907; Blair 1952; McCarley 1959; Dalquest 1968; Schmidly 2004). Lloyd (1891b) was the first to report it from the northern end of Padre Island. Baker and Rabalais (1978) reported it from residential areas of North Padre Island, and Harris (1988) reported it from within PAIS at the Malaquite Beach Visitor Center.

We did not document opossums within PAIS. However, we found three road-killed opossums in urban areas on North Padre Island, Nueces County. In addition, we received a report from a PAIS employee that a dog killed an opossum in a residential area on North Padre Island outside PAIS (M. Havens, pers. comm.). Crooks (2002) reported opossums in greatest relative abundance near urban edges and suggested that this resource generalist benefited from supplemental food resources associated with residential developments. We do not believe there was a population of opossums at PAIS during this study. However, it possible for this species to be transported to the park where it could establish a population.

Specimens Reported (2).—Mustang Island, 1.7 Mi. Southwest Port Aransas (MSB 57405); Mustang Island, 6 Mi Southwest Port Aransas (MSB 57404).

Observational Localities (3).—Nueces Co., Padre Island, 5.25 Miles South, 3.96 Miles East Flour Bluff, 14R-675420N-3053574E (1); Nueces Co., 5.60 Miles South, 3.94 Miles East Flour Bluff, 14R-675399N-3053001E (1); Nueces Co., Padre Island, 14R-675386N-3052947E (1).

ORDER RODENTIA
Family Sciuridae
Sciurus niger
Eastern Fox Squirrel

The eastern fox squirrel occurs throughout the eastern half of the United States and is expanding its range westward (Flyger and Gates 1982). It occurs throughout the eastern two-thirds of Texas, and reaches its southern distributional limit along the Mexico-Texas border (Bailey 1905; Blair 1952; McCarley 1959; Dalquest 1968; Flyger and Gates 1982; Schmidly 2004). Although found in a wide variety of forest communities, it typically occurs in small forest patches dominated by oaks, hickories, walnut, and pines that provide suitable food resources (Koprowski 1994; Schmidly 2004).

We observed a large tree squirrel at the Padre Island Visitor Center, 14252 S Padre Island Drive, adjacent to Packery Channel on North Padre Island, Nueces County. The squirrel walked across a telephone wire and jumped into a tree when we approached it. The eastern gray squirrel (*Sciurus carolinensis*) also occurs in southern Texas (Flyger and Gates 1982; Schmidly 2004). However, we identified this squirrel as *S. niger* based on its large size, reddish brown dorsal pelage, rusty orange underparts, and no visible sign of white or gray in the pelage (Flyger and Gates 1982; Schmidly 2004). Fox squirrels inhabit open woodlands and take advantage of cultivated trees in urban developments (Schmidly 2004). We frequently observed fox squirrels in urban areas of Corpus Christi.

This represents the first record of the eastern fox squirrel on North Padre Island. On Texas barrier islands this species was only previously known to occur on Galveston Island (Hice and Schmidly 1999, 2002). Hice and Schmidly (1999) suspected that populations on Galveston Island were the result of released pets. Flyger and Gates (1982) reported that introductions were an important mechanism for the species range expansion. It is likely it was introduced to North Padre Island, either purposefully or accidentally. If fox

squirrels are established on North Padre Island, they are likely to be restricted to residential areas on the north end of the island where trees are common. Small, scattered stands of trees, including black willow (*Salix nigra*) and live oak (*Quercus virginiana*), occur at the northern end of PAIS. The largest live oak motte is approximately 0.08 hectares. Although fox squirrels eat a variety of acorns and nuts (Flyger and Gates 1982), it is unlikely this species could persist within PAIS as a result of limited food availability.

Observational Localities (1).—Nueces Co., North Padre Island, 14R-3056074N-3056074E.

Ictidomys parvidens
Rio Grande Ground Squirrel

The Rio Grande ground squirrel (*Ictidomys parvidens*) was formerly classified as a subspecies of the Mexican ground squirrel (*I. mexicanus*; Helgen et al. 2009). The Rio Grande ground squirrel ranges throughout much of western Texas and Tamaulipas, Mexico (Tomich 1982). Blair (1952) reported it as the most common and widespread ground squirrel in the Tamaulipan biotic province in south Texas. Yzaguirre (1974) reported this species from within PAIS. Subsequently, Baker and Rabalais (1978) disregarded reports of it from North Padre Island. With exception of Yzaguirre (1974), no specimens or observations of this conspicuous species have been made on North Padre Island. It is likely that Yzaguirre (1974) captured spotted ground squirrels (*Xerospermophilus spilosoma*), but misidentified them as *Ictidomys parvidens*. It is unlikely this species occurs within PAIS or North Padre Island.

Family Heteromyidae
Perognathus merriami
Merriam's Pocket Mouse

Merriam's pocket mouse ranges from northeastern New Mexico and western Oklahoma to Tamaulipas, Mexico (Hall 1981). In Texas, it is found in the western two thirds of the state (Bailey 1905; Blair 1952; Dalquest 1968; Schmidly 2004). Lloyd (1891b) reported it as rare but captured it at the northern and southern end of Padre Island. Osgood (1900) examined three specimens from Padre Island. Raun (1959) reported it on Padre Island without supporting information, and it is possible that he reported it based on historical records. We did not capture this species within PAIS.

Merriam's pocket mouse occurs in areas with short vegetation (< 15 cm) including arid brush lands, short grass prairie, and overgrazed pastures and appears to be limited by tall, dense vegetation (Blair 1952; Porter 1962; Dalquest and Horner 1984). During this study, only 19 transects had an average vegetation height of 15cm or less, and these were restricted to areas at the southern end of North Padre Island (Jones 2008). Although Lloyd (1891b) reported this species from the northern end of Padre Island, the vegetation height and density was greatest in northern portions of North Padre Island during this study. It is possible that cattle facilitated the existence of this species in northern portions of Padre Island during the 19th century by reducing vegetative cover and density. It is unknown, however, why this species was not documented during the 20th century. Given the lack of records in over a century, it seems likely that this species was extirpated, and it should be considered part of the historical mammal fauna of Padre Island.

Specimens Examined (4).—Nueces Co., Padre Island (NMNH 31538); Cameron Co., Padre Island (NMNH 30387, 30388, A42372).

Chaetodipus hispidus
Hispid Pocket Mouse

The hispid pocket mouse ranges from North Dakota through the central United States and Tamaulipas, Mexico (Hall 1981). It is common throughout much of Texas and occurs in semiarid shrublands, cane fields, tallgrass prairie, cotton fields, and a variety of other habitats, but avoids areas of dense grass (Bailey 1905; Glass 1947; Blair 1952; McCarley 1959; Dalquest 1968; Hall 1981; Schmidly 2004). Allen (1891, 1894) reported the only records of this species from Padre Island. Two specimens were collected in 1887 and 1891 from the northern part of the island in Nueces County. Osgood (1900) examined one specimen from Padre Island. We did not document this species on North Padre Island, nor have other investigators. As with Merriam's pocket mouse, it is possible that cattle facilitated the presence of this species in northern portions of Padre Island by reducing vegetative cover. Similarly, it is unknown why this species was not documented during

the 20th century. It is possible that irregular cattle operations coupled with the unstable dynamics of natural disasters including fires and hurricanes removed this species from Padre Island. It seems likely that this species was extirpated, and it should be considered part of the historical mammal fauna of Padre Island.

Specimens Examined (1).—Nueces Co., Padre Island (AMNH 3479).

Liomys irroratus
Mexican Spiny Pocket Mouse

The Mexican spiny pocket mouse ranges from extreme southern Texas to central Mexico and occurs in a variety dense shrub habitats including arid shrubland and dense chaparral (Bailey 1905; Blair 1952; Dowler and Genoways 1972; Schmidly 2004). Thomas (1972) reported this species from Padre Island without supporting information. It is unlikely that this species occurs on North Padre Island because dense shrublands are absent.

Family Cricetidae
Ondatra zibethicus
Common Muskrat

The common muskrat inhabits a variety of wetland habitats and ranges throughout most of Canada and the United States (Hall 1981; Perry 1982). In Texas, it occurs in parts of the Panhandle, through the eastern part of the state, and in limited parts of western Texas (Bailey 1905; Lay and O'Neil 1942; McCarley 1959; Dalquest 1968; Schmidly 2004). We obtained a skull of this species that was found in the foredunes at beach mile 37 in 2005. This is the first record of muskrat from North Padre Island. We actively searched for muskrat and their sign around pools of water; however, we found no other evidence of muskrat within PAIS, or elsewhere on Mustang and North Padre islands. The closest records to North Padre Island are from the Galveston Bay area, which is approximately 160 km north along the coast (Lay and O'Neil 1942; Hice and Schmidly 1999; Schmidly 2004).

Because muskrats are restricted to permanent water with marsh habitats, this species is most likely to occur within northern portions of PAIS. However, neither tracks, dens, nor other sign of muskrats have been reported by staff or visitors. Since suitable habitats are found in close proximity to Bird Island Basin, PAIS headquarters, and the Malaquite Beach Visitor Center, it is unlikely this species could have gone unnoticed considering the heavy human visitation to these areas. The skull most likely washed ashore from other coastal regions where it occurs.

Observational Localities (1).—Kenedy Co., 3.78 km South, 41.86 km East Armstrong, UTM 14-2974528N-662184E (1)

Neotoma micropus
Southern Plains Woodrat

The southern plains woodrat occurs in the southern Great Plains of the south-central and southwestern United States as well as northeastern Mexico (Hall 1981). Within Texas, it occurs in the western two-thirds of the state where it is commonly found around cactus, mesquite, and other arid brush lands (Bailey 1905; Blair 1952; Dalquest 1968; Schmidly 2004). Lloyd (1891b) reported a single second-hand observation of a rat and concluded that it was this species. There have been no subsequent reports of this species on Padre Island. Since PAIS is dominated by coastal prairie, it is unlikely this species occurs within PAIS.

Peromyscus leucopus
White-footed Deermouse

The white-footed deermouse ranges from Canada, through the eastern two-thirds of the United States to Mexico (Hall 1981). Within Texas, it occurs throughout the state in a variety of brushy and wooded habitats (Bailey 1905; Blair 1952; McCarley 1959; Dalquest 1968; Schmidly 2004). Blair (1952) reported it as the most common and widespread species within southern Texas but did not document it from Mustang Island. Although Bailey (1905:96) reported that Lloyd captured "a few on Padre Island," we were unable to substantiate that claim by examining specimens in the National Museum of Natural History where Lloyd's specimens are housed or by reviewing Lloyd's field catalog. We believe Bailey's statement was a lapses, perhaps referring to Matagorda. More recently, Baker and Rabalais (1978) reported these mice in oak mottes, a potentially

suitable habitat, adjacent to the Kenedy Causeway on North Padre Island. In contrast, Yzaguirre (1974) reported white-footed mice adjacent to beach mile 9 (14.4 km south of the Malaquite Beach Visitor Center by beach). The vegetation where Yzaguirre trapped was composed exclusively of coastal prairie grasses, and he reported capturing *Dipodomys* and *Peromyscus* together on transects with 25% to 30% foliar cover. This habitat is not consistent with known habitat associations of *P. leucopus*. For example, near Brownsville it was common in willows along river banks (Bailey 1905). Alvarez (1963) commonly captured it in forested and brushy areas in Tamaulipas, Mexico. Hall and Dalquest (1963) never found it in grasslands in the coastal areas of Veracruz and Schmidly (2004) claimed that it was almost completely absent from prairies. It is likely that Yzaguirre (1974) captured the northern grasshopper mouse (*Onychomys leucogaster*) and misidentified them as *P. leucopus*. Yzaguirre (1974) and Baker and Rabalais (1978) did not retain specimens to confirm identifications.

We made several attempts to capture *P. leucopus* within PAIS and North Padre Island. We accumulated 64 trap-nights at a live-oak motte (*Quercus virginiana*) 0.5 miles north of PAIS headquarters (UTM 14-3037646N-668636E), 399.5 trap-nights in stands of black willow at Bird Island Basin (UTM 14-3039040N-667275E), 650 trap-nights at interior portions of PAIS west of beach mile 4 (UTM 14-3026371N-663363E), and 70 trap-nights in live-oak mottes adjacent to Packery Channel (UTM 14-3057049N-675570E). Out of 1,183.5 trap-nights in woody vegetation, only two cotton rats (*Sigmodon hispidus*) were captured. It is possible for white-footed deermice to occur within the residential areas of the island where ornamental trees and shrubs are abundant. Foster (1965) concluded that the presence of *Peromyscus* on many of the Queen Charlotte Islands in British Columbia was a result of human transport. Because this species is common in southern Texas, it is possible that this species occasionally occurs within PAIS as a result of human mediated transport.

Specimens Reported (1).—Nueces Co., Mustang Island, 10 Mi SW Port Aransas (TTU 89869)

Peromyscus maniculatus
North American Deermouse

The North American deermouse occurs throughout most of Canada, the United States, and Mexico (Hall 1981). Within Texas, it ranges throughout much of the state, but is rare in eastern and coastal areas (Bailey 1905; McCarley 1959; Dalquest 1968; Schmidly 2004). Although Bailey (1905) reported it from northern portions of the Tamaulipan biotic province in southern Texas, Blair (1952) reported it as absent from the remaining portions of the same province. It was reported from Port Aransas, Mustang Island (TTU 91149, 91150). Because the deermouse is less common than the white-footed mouse in southern and coastal Texas, it is possible that the specimens were misidentified. Baker (1994), however, reported human mediated transport of this species. As with the white-footed deermouse, it is possible that this species occasionally occurs on North Padre Island.

Specimens Reported (2).—Aransas Co., Port Aransas (TTU 91149); Aransas Co., Port Aransas, Farm Road 1781 (TTU 91150)

Oryzomys couesi
Coues' Oryzomys

Coues' oryzomys, also known as Coues' rice rat, occurs from the southern Rio Grande Valley south to Coast Rica (Hall 1960; Schmidly 2004). Although Coues' oryzomys closely resemble the marsh oryzomys, Coues' oryzomys is distinctly larger and browner (Benson and Gehlbach 1979). This species has reported on the mainland near Mansfield Channel and on Green Island (Schmidt and Engstrom 1994). Green Island is a Dredged Material Island in the Lower Laguna Madre, and is only 18.8 km south of Mansfield Channel (Willacy Co., 17.83 km S, 9.62 km E Port Mansfield, UTM 14-2920237N-667065E).

We received photographs from C. Green (pers. comm.) that were taken in 2007 of a rat captured on Green Island. When compared to photographs of adult marsh oryzomys that we captured from PAIS, the supposed Coues' oryzomys appears larger in all respects

and browner. The dorsal pelage of the pictured animal appeared pale brown and the ventral pelage appeared a pale yellowish-brown. In contrast, the dorsal and ventral pelage of the marsh oryzomys within PAIS was consistently dark grayish-brown and pale gray, respectively. When compared to photographs of adult hispid cotton rats that we took from PAIS, the pictured animal had a longer, less blunt snout, and had less coarse pelage. In both cases, the pelage of marsh oryzomys and hispid cotton rats was more bicolored than the pictured animal. Although a positive identification was not made, it is unlikely the rat in the photograph was a marsh oryzomys or a hispid cotton rat and it seems likely that it was a Coues' oryzomys.

We sampled salt and freshwater ponds adjacent to Mansfield Channel for this species but did not capture either the Coues' or marsh oryzomys. Coues' oryzomys are capable swimmers (Cook et al. 2001). Because they have been found in such close proximity to the Mansfield Channel, it is possible they occasionally swim to the southern edge of PAIS.

Specimens Reported (1).—Cameron Co., 3.6 Mi N, 3 Mi E Port Isabel (ASNHC 5528)

Family Muridae
Rattus norvegicus
Brown Rat

The Norway rat is native to Eurasia, but has obtained a worldwide distribution through human-mediated introductions (Courchamp et al. 2003; Russell and Clout 2004). It occurs commensally with humans and is found throughout much of Texas (Bailey 1905; McCarley 1959; Schmidly 2004). Koepke (1969) reported it from North Padre Island without supporting information. Although Baker and Rabalais (1978) reported this species from Mustang and South Padre islands in close association with humans, this species has not yet been verified from North Padre Island. Although it may occur in urban areas of North Padre Island, it is likely currently absent from PAIS. However, like the black rat, unintentional human-mediated introductions into PAIS could occur.

Family Myocastoridae
Myocastor coypus
Coypu

The coypu, or nutria, is native to the Patagonia subregion of South America but was introduced into North America, and it occurs sporadically in Canada and the western, central, and southern United States (McCarley 1959; Hall 1981; Willner 1982; Woods et al. 1992). It currently ranges throughout the eastern two-thirds of Texas where it occurs in aquatic and semi-aquatic environments (McCarley 1959; Schmidly 2004). Baker and Rabalais (1978) found a dead coypu within PAIS adjacent to the foredune in 1965 and speculated that it washed ashore from flooded areas on the mainland north of North Padre Island. They also reported visitor observations of coypu on freshwater ponds in PAIS. D. Echols (pers. comm.) took photographs of a nutria walking in the surf along Closed Beach behind the headquarters building in the mid 1990's. We searched for evidence of coypu around the permanent water sources within PAIS and other areas of North Padre Island, but found no sign. However, we commonly saw coypu around water sources surrounding Port Aransas on Mustang Island, especially at Joan and Scott Holt Paradise Pond (UTM 14-3080425N-689806E) and the Leonabelle Turnbull Birding Center (UTM 14-3079595N-689136E) adjacent to the water reclamation facility on 28 October 2006 and 23 March 2007. It is unlikely that this species currently occurs within PAIS, but it would be easy for it to disperse across Mustang Island to North Padre Island during wet years when ephemeral ponds are full.

Observational Localities (2).—Nueces Co., 0.15 km N, 1.15 km West Port Aransas, UTM 14-3080415N-689820E (1); Nueces Co., 0.66 km S, 1.83 km W Port Aransas, UTM 14-3079685N-689148E (1)

ORDER LAGOMORPHA
Sylvilagus floridanus
Eastern Cottontail

The eastern cottontail occurs from southern Canada, the eastern two-thirds of the United States to northern South America (Hall 1981). Within Texas, it

is found in much of the state (Bailey 1905; Blair 1952; McCarley 1959; Dalquest 1968; Schmidly 2004). The status of cottontail on Padre Island is ambiguous. Patrick Dunn, longtime owner and operator of the Dunn Ranch on Padre Island, reported the disappearance of cottontails sometime before the 1870's (Price and Gunter 1943). Conversely, in a written summary of the Mammals of Padre Island, Lloyd (1891b:2) stated, "no cottontail on [Padre] Island and Curry says none ever have been to his knowledge. Mr. Dunn had offered to buy some from the mainland to have them introduced but his scheme…has fallen through up to date".

Raun (1959) reported the eastern cottontail on Padre Island based on observations made by residents but gave no other supporting evidence of its presence. Koepke (1969) reported it from Padre Island but with no supporting evidence. Baker and Rabalais (1978) reported cottontails in oak mottes and dense vegetation around the ponds west of the Malaquite Beach Visitor Center within PAIS. B. Sandifer (pers. comm.) reported observations of cottontails at the visitor center, Yarborough Pass adjacent to beach mile 15, and on the Back Island Road between beach miles 18 and 29; no date was reported.

We found no specimens or other evidence of cottontails within PAIS or elsewhere on North Padre Island. It is possible that observers confused this species with juvenile black-tailed jackrabbits. The historical and current status of the eastern cottontail on North Padre Island and within PAIS is unknown.

Observational Localities (1).—Kleberg Co., 2.03 km South, 10.83 km East El Martillo, UTM 14-3023097N-664484E (1)

ORDER SORICOMORPHA
Family Soricidae
Cryptotis parva
North American Least Shrew

The North American least shrew occurs throughout much of the eastern and central United States (Whitaker 1974). It occurs throughout much of central and eastern Texas in grassland habitats (Bailey 1905; Blair 1952; McCarley 1959; Dalquest 1968; Schmidly 2004). Raun (1959) and Rabalais (1975) reported it as possible on North Padre Island. Although McCarley (1959) reported it as common in coastal prairies, it has not been recorded on the barrier island system of Texas. We captured no specimens in 365 pitfall trap-nights in the northern portion of PAIS. It remains a possibility that the species occurs on the island but has missed detection.

Notiosorex crawfordi
Crawford's Gray Shrew

Crawford's gray shrew, also known as the desert shrew, ranges throughout the southwestern and south central United States and Mexico (Armstrong and Jones 1972). Within Texas, it occurs within the western half of the state but is not restricted to any particular habitat (Bailey 1905; Blair 1952; Dalquest 1968; Schmidly 2004). Raun (1959) reported it as possible on North Padre Island but it has not been documented on the Texas barrier island system. Like the North American least shrew, it is possible that this species is present in PAIS but has escaped detection.

ORDER CHIROPTERA
Family Vespertilionidae
Eptesicus fuscus
Big Brown Bat

The big brown bat occurs throughout North America and Texas (Bailey 1905; Blair 1952; McCarley 1959; Dalquest 1968; Humphrey 1982; Schmidly 2004). Raun (1959) reported it as possible on Padre Island. Although this species has not been documented within PAIS, it is likely to visit occasionally from the adjacent mainland.

Nycticeius humeralis
Evening Bat

The evening bat ranges throughout much of the eastern United States (Watkins 1972). Within Texas, it ranges throughout the eastern and southern portions of the state (Bailey 1905; Blair 1952; McCarley 1959; Schmidly 2004). Raun (1959) and Rabalais (1975) reported this species as possible on Padre Island. This tree bat is an unlikely resident, but it is likely to visit occasionally PAIS from the adjacent mainland.

Lasiurus borealis
Eastern Red Bat

The eastern red bat occurs throughout the eastern United States (Humphrey 1982) including throughout Texas (Bailey 1905; Blair 1952; McCarley 1959; Dalquest 1968; Schmidly 2004). Raun (1959) and Rabalais (1975) reported this species as possible on Padre Island. This tree bat is an unlikely resident, but it is likely to occasionally visit PIAS from the adjacent mainland.

Lasiurus cinereus
Hoary Bat

The hoary bat ranges throughout much of North and South America, is found throughout Texas, and frequents wooded areas (Shump and Shump 1982; Schmidly 2004). As with other lasiurines, hoary bats are considered tree bats that roost in trees year round (Cryan and Veilleux 2007). In August 2007, we received photos from C. Haralson and C. Boal of a male Hoary bat that had been partially consumed at a nest of a white-tailed hawk on Matagorda Island. The bat was independently identified as *L. cinereus* by M. Bogan and E. Valdez (pers. comm.). Because lasiurines (genus *Lasiurus*) typically roost alone or in small family groups (Barbour and Davis 1969), and because trees are uncommon within PAIS, this species is an unlikely resident within PAIS. It is likely that visitors from the mainland occur occasionally. Furthermore, like other lasiurines, hoary bats are highly migratory and move into northern latitudes during summer months and southern latitudes during winter months (Cryan 2003). It is likely that this species is most common during migration within PAIS.

Observational Localities (1).—Matagorda Island (1).

Lasiurus intermedius
Northern Yellow Bat

The northern yellow bat occurs in coastal states from South Carolina to Texas, through Mexico and Central America (Hall 1981). Within Texas, it occurs in the eastern quarter of the state where it parallels the Gulf of Mexico from Louisiana to Mexico (Bailey 1905; McCarley 1959; Schmidly 2004). Miller (1897) and Bailey (1905) reported it from the southern end of Padre Island, but neither provided supporting information of where it was captured. Raun (1959) reported it from Padre Island, but without any supporting evidence.

Upon reviewing photos archived at the Malaquite Beach Visitor Center, we found a photo of a *Lasiurus sp.* clinging to the outside wall of a building at PAIS headquarters. The photo contained no supporting information but was suspected to be *L. intermedius*. The bat in the photo appeared to have long hair on the back, brownish wing membranes, which are distinguishing characteristics of *L. intermedius*, and appeared to lack conspicuous frosting and white patches on the shoulders and wrists which are found in other species members of the same genus (M. Bogan, pers. comm.; P. Cryan, pers. comm.; E. Valdez, pers. comm.).

Northern yellow bats appear to be among the most common tree bats in southern Texas. A museum query of *Lasiurus sp.* in a 200 km radius of PAIS resulted in 211 records of *L. intermedius*, 23 of *L. borealis*, 7 of *L. blossevillii*, and 3 of *L. cinereus* (P. Cryan, pers. comm.). Schmidly (2004) reported this species to roost in Spanish moss and palm trees in Texas. Palm trees are common in residential areas on North Padre Island and the adjacent mainland, but do not occur within PAIS. It is likely that visitors from the mainland occur occasionally. Furthermore, like other lasiurines, yellow bats are highly migratory and move into northern latitudes during summer months and southern latitudes during winter months (Cryan 2003). It is likely that this species is most common during migration within PAIS.

Observational Localities (1).—Kleberg Co., Padre Island National Seashore Headquarters, approximately 11.6 km North, 14.8 km East El Martillo (1).

Lasiurus seminolus
Seminole Bat

The Seminole bat occurs in southeastern and coastal states from Texas to North Carolina (Wilkins 1987). Within Texas, it occurs in the eastern part of the state (McCarley 1959; Schmidly 2004). Raun (1959) and Rabalais (1975) reported this species as possible on Padre Island. This tree bat is an unlikely resident or visitor of PAIS. Although Bailey (1905) reported a

specimen captured near Brownsville, the current range of this species is not known to extend to southern portions of the state.

Myotis velifer
Cave Myotis

The cave myotis occurs in parts of the central and southwestern United States where it roosts in caves and buildings (Fitch et al. 1981). Within Texas it occurs throughout much of the western and southern part of the state (Bailey 1905; Blair 1952; Dalquest 1968; Schmidly 2004). Raun (1959) reported this species as possible on Padre Island. It is an unlikely resident of PAIS since few roosts sites are available. It is possible that this species occasionally visits North Padre Island from the adjacent mainland.

ORDER Carnivora
Family Felidae
Felis catus
Domestic Cat

The domestic cat is widespread because it occurs commensally with humans (Todd 1977). On Padre Island, feral cats appear to be uncommon. Lloyd collected a skull in the late 19th century (NMNH A43401). During this study, we were given the skull of a cat that was found at the northern end of PAIS. PAIS personnel occasionally removed cats from within the park (D. Echols, pers. comm.). We did not document any evidence of feral populations of cats within PAIS or elsewhere on North Padre Island. Although cats are probably uncommon, the high visitation rate and close proximity to residential areas make PAIS particularly susceptible to invasion by feral cats. Feral populations of cats have caused considerable damage to native species especially on islands (Whittaker 1998). Burbidge and Manly (2002) reported that mammal extinctions were more likely to occur on arid islands where native mammals are restricted to the grounds surface.

Specimens Examined (1).—Nueces Co., Padre Island (NMNH A43401).

Observational Localities (1).—Kleberg Co., 14.98 km N, 16.69 km E El Martillo, UTM 14-3040350N-670131E (1).

Leopardus pardalis
Ocelot

The ocelot ranges from the southern Rio Grande Valley in south Texas to northern Argentina (Bailey 1905; Hall 1981; Murray and Gardner 1997; Schmidly 2004; Haines et al. 2005). Harris (1988) reported visitor observation of an ocelot running along the gulf beach in 1982. This is the only report of this species on North Padre Island. Within Texas, it occurs in dense thorn scrub (Haines et al. 2005). Although North and South Padre islands are dominated by coastal prairie, much of the mainland adjacent to both islands is dense scrub, composed of such species as mesquite, acacia, and oak. Extant populations are known to occur within Laguna Atascosa National Wildlife Refuge, which is approximately 17 miles (28 km) south-southwest of PAIS. Individuals, especially juveniles, could disperse to PAIS, but their status should be considered temporary.

Puma concolor
Cougar

Historically, cougars occurred throughout North and South America; however, it has been extirpated in many areas of the United States (Hall 1981; Dixon 1982; Currier 1983). Although once widespread in Texas, the current range of the cougar is primarily restricted to areas in the western and southern parts of the state where it is usually found in dense shrublands (Bailey 1905; Baker 1949; Blair 1952; Dalquest 1968; Schmidly 2004). However, it occupies a variety of habitats, and in eastern portions of its range, it is restricted largely by the habitat and distribution of white-tailed deer, its primary prey (Dixon 1982, Currier 1983).

R.E. Halter, a surveyor from the U.S. Coast and Geodetic Survey, reported cougars on Padre Island in 1878. He wrote, “I use [a rifle] for protection against coyotes, wolves and panthers which become more plenty as we go down the island” (Sheire 1971; Sherrod and Brown 1989). Baker and Rabalais (1978) reported a visitor observation of a cougar adjacent to beach mile 5.5 (8.8 km south of the Malaquite Beach Visitor Center) in 1966. Although likely more common on the mainland, it is not surprising that cougars have been reported on the island, especially considering the current high abundance of white-tailed deer. This spe-

cies is likely to occur sporadically within PAIS, but its status should be considered extremely rare.

Puma yagouaroundi
Jaguarundi

The jaguarundi occurs in southeastern Arizona and southern Texas, through Central and South America (Hall 1981). Within Texas, it is found in dense thorny shrublands of the lower Rio Grande Valley (Bailey 1905; Tewes and Everet 1986; Schmidly 2004). B. Sandifer (pers. comm.) reported second-hand observations of jaguarondi on Big Shell Beach between beach miles 18 and 30 during the 1970s. Because PAIS is dominated by coastal prairie, it is unlikely for a resident population of this species to occur within PAIS. Like all felids, it is elusive and secretive, and it is possible for dispersing individuals, especially juveniles, go undetected within PAIS.

Panthera onca
Jaguar

The jaguar once ranged throughout much of the southwestern United States and Texas through South America, but it has been nearly extirpated in the United States (Hall 1981; McCain and Childs 2008). In Texas, it was found in dense chaparral across much of the state, but it is currently considered extirpated within the state (Bailey 1905; Taylor 1947; Blair 1952; McCarley 1959; Schmidly 2004). Jaguar food habits are not well known, but in Mexico, they are known to prey on peccaries and white-tailed deer in addition to sea turtle eggs (Schmidly 2004), making Padre Island suitable, at least in terms of food availability. Baker and Rabalais (1978) reported an observation of a jaguar with two cubs at beach mile 35. As with other large carnivores, home ranges of this species are very large and individuals are capable of dispersing great distances. Although jaguars are an unlikely visitor, it is possible for this species to occur within PAIS from time to time. Their presence should be considered temporary.

Family Canidae
Canis lupus familiaris
Domestic Dog

Stray and abandoned dogs are occasionally found within PAIS. PAIS personnel occasionally remove dogs from within the park (D. Echols, pers. comm.). We observed a pair of seemingly abandoned dogs in the interior portions of PAIS west of beach mile 35. Although stray dogs occur occasionally, it is unlikely that feral populations currently occur within PAIS.

Observational Localities (1).—Kenedy Co., 0.34 km South, 41.25 km East Armstrong, UTM 14-2978151N-661636E.

Family Canidae
Canis lupus familiaris* x *latrans
Domestic Dog x Coyote hybrid

Lloyd (1891b) reported a litter between a dog and coyote on Padre Island. Since dogs are unlikely residents of PAIS, hybrids between coyotes and dogs should be considered extremely rare, although possible.

Specimens Examined (1).—Padre Island (NMNH A43404).

Canis rufus
Red Wolf

The red wolf, sometimes considered a race of the gray wolf (Wilson and Reeder 2005), once ranged from southern Pennsylvania to Florida and west to central Texas, with western range limit on the Edward's Plateau (Bailey 1905; McCarley 1959; Nowak 1979; Paradiso and Nowak 1982; Hall 1981; Schmidly 2004). By the 1970's red wolves were extirpated from the wild as a result of human persecution and genetic degradation (Paradiso and Nowak 1982). As the range of coyotes expanded as a result of shrinking red wolf populations, red wolves and coyotes began to interbreed (Paradiso and Nowak 1982; Phillips et al. 2003; Fredrickson and Hendrick 2006). The last populations of pure red wolves existed within Louisiana and Texas (Paradiso and Nowak 1982). Approximately 24 red wolves were removed from the wild for a captive breeding program before the genetic integrity of remnant red wolf population was destroyed by hybridization events with coyotes.

R.E. Halter reported wolves on Padre Island in 1878 (Sherrod and Brown 1989). Bailey (1905) reported records from Corpus Christi in1897. In 1948

a specimen was taken from Port Aransas on Mustang Island. Because large carnivores occupy large home ranges, and because Mustang and Padre Island have been repeatedly connected, it is likely that red wolves inhabited North Padre Island. Within PAIS, unusually large canids are occasionally reported (D. Echols, pers. comm.). B. Sandifer reported observing a 65-80 pound canid at beach mile 28 in 1992 (pers. comm.). It is possible that red wolf genes exist in the coyote gene pool within PAIS. This species should be considered part of the historical mammal fauna of PAIS. Unless reintroductions occur within PAIS, it will remain absent from the island's fauna.

Specimens Reported (1).—Nueces Co., Mustang Island, Port Aransas (KU 27345).

Family Mustelidae
Mustela frenata
Long-tailed Weasel

The long-tailed weasel ranges throughout much of North America and part of South America (Svendsen 1982). It occurs throughout much of Texas except northern portions of the state (Bailey 1905; Blair 1952; McCarley 1959; Schmidly 2004). Thomas (1972) reported this species as possible on Padre Island. Its prey includes small mammals, especially ground squirrels and gophers (Svendsen 1982; Schmidly 2004). Although it has not been documented within PAIS, it is possible that this species occurs within PAIS and has gone unnoticed.

Family Mephitidae
Conepatus leuconotus
American Hog-nosed Skunk

The hog-nosed skunk ranges along coastal areas from southern Texas to Veracruz, Mexico (Bailey 1905; Hall 1981; Howard and Marsh 1982; Schmidly 2004). Bailey (1905) reported that Lloyd documented this species from Padre Island; however, we could not confirm this based on Lloyd's (1891) field catalog. Raun (1959) reported it from Padre Island, but with no supporting evidence. It has been extirpated from the eastern part of Texas, and it is likely that populations in the South Texas Plain have met the same fate (Schmidly 2004). The status of this species within PAIS is unknown.

Spilogale putorius
Eastern Spotted Skunk

The eastern spotted skunk ranges from southern Canada, through the eastern and central United States into Tamaulipas, Mexico (Hall 1891; Howard and Marsh 1982). Within Texas, it occurs in the eastern two-thirds of the state (Bailey 1905; Howell 1906; McCarley 1959; Dalquest 1968; Schmidly 2004). Price and Gunter (1943) reported that Patrick Dunn, owner and longtime operator of the Dunn Ranch on Padre Island, stated that spotted skunks disappeared sometime after 1870. This is the only report of spotted skunks on Padre Island and should be considered questionable. Although this species commonly occurs in prairie habitats (Davis 1951; Schmidly 2004), its historical and current status within PAIS is unknown.

ORDER PERISSODACTYLA
Family Equidae
Equus caballus
Horse

Horses have been associated with military and ranching operations on Padre Island since the early 1800's (Reid 1859; Baker and Rabalais 1978; Sherrod and Brown 1989; L. Moorehead pers. comm.). There are no feral horses on North Padre Island, but they are occasionally brought to Padre Island for recreational use. This species should be considered part of the historical mammal fauna of PAIS.

ORDER ARTIODACTYLA
Family Suidae
Sus scrofa
Wild Boar

Feral domesticated swine were reported on Padre Island as early as 1863 (Sherrod and Brown 1989). However, it is possible that these early reports were of collard peccary. Baker and Rabalais (1978) reported observations by Patrick Dunn during the early 20th century as well as second-hand observations of a pig around beach mile 43. D. Echols (pers. comm.) reported observations from a volunteer who purportedly saw a feral swine adjacent to the headquarters building in 1996. This species commonly makes wallows in mesic areas. Permanent freshwater ponds within PAID

are concentrated in northern portions of the park. Because these sources of water are in close proximity to developed areas within PAIS, it is unlikely this species could have gone unnoticed. It is possible, however, for individuals to cross from the mainland where they are common (G. Jones, pers. obs.).

Family Bovidae
Bos taurus
Domestic Cow

Cattle were first introduced on Padre Island about 1805 and were removed from PAIS and elsewhere on North Padre Island in 1971 with the exception of a few stray individuals (Baker and Rabalais 1978; National Park Service 2008b; L. Moorehead, pers. comm.). We found a femur adjacent to Black Hill line camp near beach mile 11. This species should be considered part of the historical mammal fauna of PAIS.

Observational Localities (1).—Kenedy Co., 9.02 km South, 8.67 km East El Martillo, UTM 14-3016460N-662730E (1).

ACKNOWLEDGMENTS

This paper represents a portion of a Master's thesis submitted at New Mexico State University by Gerrad Jones (Jones 2008). We would like to thank the National Park Service for providing funding for this project in addition to the staff and volunteers at Padre Island National Seashore, especially Darrell Echols, Michelle Havens, Wade Stablein, Linda Moorehead, and Arlene Wimer. We would like to thank Billy Sandifer for his expertise on Padre Island. We would like to thank our field assistants: John Anderson, Matthew Bast, Adam Petry, and Aaron Sims. We would like to thank the curators and staff at all of the museums we contacted especially those at AMNH, NMNH, PINHM, and TTU where we visited.

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