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Marine Mammal Captivity in the Northeastern Caribbean, with Notes on the Rehabilitation of Stranded Whales, Dolphins, and Manatees

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ABSTRACT.—Marine mammals have been of interest to zoos and aquaria since the middle of the eighteenth century. With increasingly successful captive maintenance since the 1960s, a greater demand for captive whales, dolphins, manatees and sea lions has developed, at times threatening local populations. This study documents captivity records in Puerto Rico and the Virgin Islands. Eight species have been kept captive for research, rehabilitation, or public display, including 16 *Tursiops truncatus*, 2 *Stenella frontalis*, 1 *Steno bredanensis*, 1 *Stenella longirostris*, 1 *Grampus griseus*, 1 *Physeter macrocephalus*, 9 *Trichechus manatus*, and 12 *Zalophus californianus*. Five manatees as well as five cetaceans have been rescued and kept for rehabilitation, of which three manatees have been successfully returned to sea.

RESUMEN.—Los mamíferos marinos han sido de interés para los zoológicos y acuarios desde mediados del siglo dieciocho. Debido al éxito obtenido en el mantenimiento en cautiverio de estos animales a partir de los años 60, se ha suscitado un incremento en la demanda de ballenas, delfines, manatíes y lobos marinos en cautiverio, poniendo a veces en peligro poblaciones locales de estas especies. Este estudio documenta los archivos de cautiverio en Puerto Rico y las Islas Vírgenes. Ocho especies han sido mantenidas en cautiverio para investigación, rehabilitación o exhibición, incluyendo 16 *Tursiops truncatus*, 2 *Stenella frontalis*, 1 *Steno bredanensis*, 1 *Stenella longirostris*, 1 *Grampus griseus*, 1 *Physeter macrocephalus*, 9 *Trichechus manatus* y 12 *Zalophus californianus*. Cinco manatíes y cinco cetáceos han sido rescatados y mantenidos cautivos para rehabilitación, de los cuales tres manatíes fueron devueltos exitosamente al mar.

INTRODUCTION

Whales, dolphins, sea lions, and manatees have been of interest as exhibit animals to zoos and aquaria since the middle of the eighteenth century. With the increment of successful captive maintenance of these animals since the 1960s, an increased demand for captive animals has been developed, at times threatening local populations of these creatures. Sometimes the animals are kept in husbandry conditions detrimental to the their physiological and mental health. It is very important to understand the status of wild populations and the history of captive marine mammals in a given region in order to assist local governments in regulating the welfare of captive marine mammals.

Capturing dolphins for international sale and keeping marine mammals in captivity may be a developing industry in the Caribbean. Bottlenose dolphins (*Tursiops truncatus*) have been captured for captivity in Cuba, México, Honduras, Dominican Republic and Colombia. Cuba leads the international marketing of bottlenose dolphins worldwide, with over 40 animals placed in aquaria in Central America, South America, and Europe. Other species, such as roughtooth dolphins (*Steno bredanensis*) and tucuxi (*Sotalia fluviatilis*) have also been kept in Colombia for exhibit. Over 40 tucuxis captured in Colombia were exported to Holland, Belgium and Germany in the 1970s (F. Trujillo pers. comm.). Amazonian river dolphins (*Inia geoffrensis*) captured in Colombia were exported to the United States in the 1950s and a few were briefly kept captive in Bogotá, but died. Before 1972, animals from Venezuela were captured for exportation to the United

States, Europe, and Japan; and over 10 dolphins have been exhibited since the mid-1970s in an aquarium in Valencia, Venezuela.

West Indian manatees (*Trichechus manatus*) have been kept captive after capture or rescue in Colombia, Cuba, Venezuela, Dominican Republic, and Jamaica. A manatee captured in Colombia and a pair from Guyana have been kept captive in Germany since the late 1970s, and some of the 15 offsprings born from the Guyana animals between 1981 and 1996 have been distributed to aquaria in Berlin, Singapore and Japan (P. Müling, pers. comm.). California sea lions (*Zalophus californianus*) have been kept captive in Cuba, Curaçao, and Colombia; and South African fur seals (*Arctocephalus pusillus*) and South American sea lions (*Otaria byronia*) have been kept in acuaria in Cuba and Colombia, respectively.

The purpose of this study is to document captivity records of marine mammals in Puerto Rico and the Virgin Islands, including those kept for rehabilitation, to aid the present and future management of the species in the region.

Methods

The study area selected included the waters of Puerto Rico, the US Virgin Islands, and the British Virgin Islands. Captivity records were obtained by various methods. Preliminary field research in Puerto Rico and an initial literature review and interviews were conducted between May 1985 and January 1989 (Mignucci-Giannoni, 1989), and during June 1990. State and federal government officials were interviewed and their marine mammal data files were available for study. Rescue and rehabilitation efforts after 1989 were carried out as part of the efforts of the Caribbean Stranding Network (CSN) (Mignucci-Giannoni, 1996), under yearly permits from the Department of Natural and Environmental Resources (DNER), and under letters of authorization from the US National Marine Fisheries Service's (USNMFS) Protected Species Management Branch and the US Fish and Wildlife Service's (USFWS) Manatee Recovery Office.

Results and Discussion

Eight species of marine mammals have been kept captive for research, rehabilitation or public display in Puerto Rico and the Virgin Islands, including 16 bottlenose dolphins, 2 Atlantic spotted dolphins (*Stenella frontalis*), 1 roughtooth dolphin, 1 spinner dolphin (*Stenella longirostris*), 1 Risso's dolphin (*Grampus griseus*), 1 sperm whale (*Physeter macrocephalus*), 9 West Indian manatees (*Trichechus manatus*), and 12 California sea lions (*Zalophus californianus*). The captivity records for these 43 individuals have not been published, with the exception of some brief notes on the dolphins kept at the Communication Research Institute in St. Thomas during the 1960s (Lilly, 1961; Lilly, 1962; Lilly, 1967; Jeffrey and Lilly, 1990). West Indian manatees, classified as endangered by international, national and local legislation, were kept captive in Puerto Rico as early as 1864. This is one of the earliest records of manatees in captivity. On three occasions, dolphins and sea lions have escaped from captivity, but were recovered.

Bottlenose dolphins

Bottlenose dolphins are the most commonly kept captive marine mammal species in zoos, oceanaria, and research institutions. Sixteen bottlenose dolphins have been kept captive in the past 50 years in the area (Table 1). The earliest record of a captured bottlenose dolphin in Puerto Rico is from the 1950s, an animal that became stranded southwest of La Parguera in Lajas. The animal was caught by J. Vega in a gill net after he found it stranded at Arrecife Margarita. According to J. Irizarry and N. Cotté (pers. comm.), Vega tied a rope to the animal's tail and began to drag it back to La Parguera. However, in deeper water the dolphin towed the small sail boat quite a distance, to a sector of Cabo Rojo known as Pitahaya. Vega then tied the animal near shore and returned to La Parguera for help. He contacted Irizarry, who helped him bring the animal to the Isla Magueyes Zoo (present site for the field station of the Department of Marine Sciences) of the University of Puerto Rico (UPR), in Lajas. Vega

TABLE 1. Captivity records for cetaceans in Puerto Rico and the Virgin Islands.

Neptuno Data Base Number	Dates held	Institution/location where held captive	Sex	Size	Status
Bottlenose dolphin (*Tursiops truncatus*)					
NEPCV01	1950s to Apr 1960	Isla Magueyes Zoo (UPR), Lajas, PR	M	—	Dead Apr 1960
NEPCV07	Mar 1960 to Apr 1960	Communication Research Institute, Nazareth Bay, St. Thomas, USVI	F	181 kg, 244 cm	Dead 1960
NEPCV15	Mar 1960 to Apr 1960	Communication Research Institute, Nazareth Bay, St. Thomas, USVI	F	136 kg, 244 cm	Dead 1960
NEPCV16	Jul 1960 to 1962	Communication Research Institute, Nazareth Bay, St. Thomas, USVI	M	168 kg, 208 cm	Dead 1968
NEPCV17	1961 to 1962	Communication Research Institute, Nazareth Bay, St. Thomas, USVI	F	—	Dead 1968
NEPCV18	1962 to 1965	Communication Research Institute, Nazareth Bay, St. Thomas, USVI	F	181 kg, 198 cm	Dead 1965
NEPCV19	1962 to 1968	Communication Research Institute, Nazareth Bay, St. Thomas, USVI	M	—	Dead 1968
NEPCV20	1962 to 1968	Communication Research Institute, Nazareth Bay, St. Thomas, USVI	F	—	Dead 1968
NEPCV21	1962 to 1968	Communication Research Institute, Nazareth Bay, St. Thomas, USVI	F	—	Dead 1968
NEPCV05	Jan 1972 to Jun 1977	Ocean Life Park Aquarium, Boca de Cangrejos, Loiza, PR	F	183 cm	Dead 1978
NEPCV22	24 Mar 1974 to Jun 1977	Ocean Life Park Aquarium, Boca de Cangrejos, Loiza, PR	—	147 kg, 229 cm	Alive as of 1977
NEPCV23	24 Mar 1974 to Jun 1977	Ocean Life Park Aquarium, Boca de Cangrejos, Loiza, PR	—	125 kg, 216 cm	Alive as of 1977
NEPCV34	Summer 1987	Dolphin Research Center, Round Bay, St. John, USVI	F	250 kg, 261 cm	Alive as of 1990
NEPCV35	Summer 1987	Dolphin Research Center, Round Bay, St. John, USVI	F	195 kg, 232 cm	Alive as of 1990
NEPCV11	Summer 1987 and 19 Feb to 3 Mar 1989	Dolphin Research Center, Round Bay, St. John, USVI	M	244 kg, 257 cm	Alive as of 1990
NEPCV12	19 Feb to 3 Mar 1989	Dolphin Research Center, Round Bay, St. John, USVI	F	182 kg, 246 cm	Alive as of 1990
Atlantic spotted dolphin (*Stenella frontalis*)					
NEPCV36	5 to 7 Sep 1989	Private pools, Caguas and San Juan, PR	M	56 kg, 162 cm	Dead 7 Sep 1989
NEPCV37	17 to 21 Oct 1989	Isla Magueyes Laboratories, Department of Marine Sciences (UPR), Lajas, PR	F	86 kg, 190 cm	Dead 20 Oct 1989
Spinner dolphin (*Stenella longirostris*)					
NEPCV38	< 19 May 1974	Joyuda, Cabo Rojo, PR	F	162 cm	Released 19 May 1974
Roughtooth dolphin (*Steno bredanensis*)					
NEPCV25	1973	Joyuda, Cabo Rojo, PR	—	213 cm	Released alive

TABLE 1. Continued.

Neptuno Data Base Number	Dates held	Institution/location where held captive	Sex	Size	Status
Risso's dolphin (*Grampus griseus*)					
NEPCV39	16 to 17 Oct 1991	Isla Magueyes Laboratories, Department of Marine Sciences (UPR), Lajas, PR	M	273 cm	Dead 17 Oct 1991
Sperm whale (*Physeter macrocephalus*)					
NEPCV43	25 to 27 May 1994	Isla Magueyes Laboratories, Department of Marine Sciences (UPR), Lajas, PR	M	295 cm, 272 kg	Dead 27 May 1994

sold the animal to the zoo for $100. The dolphin was kept in a fenced-in dock pool and was trained by Vega's son for brief performances. The dolphin suffocated on April 1960 when its fluke became tangled in the pool fence.

It was not until March 1960, with the opening of Dr. John C. Lilly's Communication Research Institute in Nazareth Bay, St. Thomas, that bottlenose dolphins were again held locally captive. Eight animals were brought from Florida to the laboratory until the Institute closed in 1968. They were used for experiments on sound mimicry and the effects of hallucinogenic drugs (mainly lysergic acid diethylamide or LSD) on the dolphin brain and its vocalizations. Lilly (pers. comm.) and Jeffrey and Lilly (1990) reported a number of irregularities that occurred in the treatment of these animals, including animals fearing humans unless on LSD, two animals dying from pulmonary infections and injuries from falling, another dying from internal injuries and a head concussion after being washed out on a storm, and five dolphins dying from what Lilly termed "suicide deaths" due to self-starvation or self-suffocation. Additional details on the laboratory and all the dolphins there are noted in Lilly (1961; 1962; 1967; 1975), Lilly and Lilly (1976), Jeffrey and Lilly (1990).

In January of 1972, the Ocean Life Park Aquarium at Boca de Cangrejos exhibited a female bottlenose dolphin. The dolphin was acquired from Stewart's Gulf Porpoises in Florida on 5 January 1972 for $850 (R. E. Pile pers. comm.) and placed initially in a salt water pool 6.1 m in diameter, 2.1 m deep. Later the animal was transferred to a rectangular 3.7 m by 6 m pool where it lived and performed. On 24 March 1974 two other bottlenose dolphins were leased from Underwater Operations of New York, through Marine Mammal Enterprises in Florida, and brought to the aquarium for performances during the following two years. According to R. E. Pile (pers. comm.), these same two dolphins had been brought to Puerto Rico previous to 1974 on a show tour at the Coliseum in San Juan. A 15.2 m diameter, 2.5 m deep, concrete pool with a 4.6 m in diameter, 1.4 m deep, satellite pool was constructed to house the three dolphins and the daily shows. Upon the closure of the aquarium on 13 June 1977, one of the bottlenose dolphins was sold for $22,000 to an oceanarium in the Netherlands and the other two dolphins were returned to Florida (R. E. Pile pers. comm.).

During August and September 1987, the Dolphin Research Center (DRC, previously the Flipper Sea School) of the Florida Keys, used three bottlenose dolphins to film the French motion picture *The Big Blue* in South Haul Over Cove, Round Bay, an enclosed sandy bottom cove in St. John, US Virgin Islands (J. Burns pers. comm.). The fenced enclosure measured about 183 m^2, with depths varying from 3 m to 18 m. A small rectangular holding pen measuring 15 m by 30 m, with a maximum depth of 4 m, was used to hold the animals while not at work. A male and two females were transported from Miami to San Juan on 3 August and kept in a warehouse until the next day when they were taken by ferry boat to St. Thomas and then to St. John. The dolphins were transported back to the Florida Keys on 17 September upon completion of the film.

During February and March 1989, two DRC dolphins were again brought to Round Bay to film a French courier service television commercial (J. Burns pers. comm.). A male and a female were flown by aircraft to St. Thomas and transported by truck and barge on 19 February. On 26 February, the male jumped the fence holding him captive but returned to his enclosure upon commands from his trainers. The same male disappeared on 3 March, but again was recovered down the coastline. The same day in the afternoon, the female (and mother of the male), jumped the fence, headed out to sea, and the male followed. They were spotted 8.3 km away surfing in heavy seas and again were brought back to the fenced pool. Upon their return, the female became reluctant to gate in and went back offshore; the male followed. The trainers followed the dolphins out to sea but could not keep up with them (Hampp, 1989a, J. Burns pers. comm.).

After the dolphins were sighted by locals and divers on numerous occasions (6

March off Tortola, 10 March off Secret Harbor in St. Thomas, 13 March off Jost Van Dyke), the male's photograph appeared together with a newspaper article about a playful dolphin in St. Martin, 185 km from where he escaped. The newspaper reported that the dolphin, dubbed "Henry" by the staff of a local hotel and restaurant was lazily swimming in the shallow waters next to the beaches, as people snorkeled, played with, and petted him. The hotel staff fed the dolphin fresh swordfish and halibut daily. The animal was also reported to have interacted with swimmers several weeks before at La Samanna on Baie Longue. The male dolphin was recovered on 20 March and examined. The male had lost 32 kg over the weight recorded prior to escape and was immediately returned to Florida (Hampp, 1989b).

The female was later observed in the same begging behavior from boaters and divers near Brewer's Bay in Tortola. She was recaptured with the aid of local fishermen on 30 March 1989. She was very emaciated, having lost 68 kg, and was kept in Round Bay until she was healthy enough to be taken back to Florida on 3 April 1989 (Hampp, 1989c, J. Burns pers. comm.).

Atlantic spotted dolphins

Two Atlantic spotted dolphins were briefly kept captive in Puerto Rico for rehabilitation by the CSN after they were found stranded with symptoms of multiple diseases (Table 1). The first dolphin, a juvenile male, became stranded on 5 September 1989 on the waterfront at Arroyo, and was rescued the same day by Puerto Rico's DNER, Bureau of Natural Reserves and Wildlife Refuges (BNRWR). It was transported that night to a children's pool in Caguas, and later to a larger private pool in San Juan, where the animal was thoroughly examined and blood samples were taken. The animal died during the night of 7 September after attempts to stabilize its condition failed. A necropsy conducted the following day and a blood analysis revealed that the animal had suffered from electrolyte imbalance, liver problems, and a tumor in its peduncle.

The second spotted dolphin, an adult female, beached itself on 15 October 1989 at the marina of Cayo Lobos, east of Fajardo (Mignucci-Giannoni, 1990). Although the animal could swim, it refused to leave the embayment. Initial examination on 16 October by BNRWR personnel showed skin lesions and difficulties in swimming. On 17 October the dolphin was transferred by US Navy helicopter to the UPR's Isla Magueyes Marine Laboratories and placed in a 4.5 m diameter, 1 m deep pool. A thorough examination and blood tests revealed that the animal suffered from an acute case of dermatitis, internal bacterial infection, and that it had aborted. The animal was cared for around the clock during the following five days. The dolphin was offered fresh fish and frozen-thawed squid on its second day, and accepted it, which is rare for stranded animals. Through her stay, the dolphin ingested about 11 kg of fish and squid per day, together with antibiotics (oral suspension Cefadroxil, 125 mg per 5 ml twice a day) to treat her bacterial infection. The dolphin died on 21 October. The necropsy conducted that same day revealed septicemia-related complications as the cause of death. *Erysipelothrix* was suspected as the causing agent.

Spinner dolphin

D. S. Erdman (pers. comm.) reported observing a female spinner dolphin held captive by locals at Joyuda, Puerto Rico, in May 1974 (Table 1). The animal was held by a rope and was released on 19 May 1974.

Roughtooth dolphin

A stranded roughtooth dolphin was cared for in a boat dock at Joyuda (Cabo Rojo) in 1973 (M. Pagán Mir pers. comm.) (Table 1). The animal was released a few days later after being fed white mullet and given antibiotics. A photograph archived at the CSN files documents the species and this occurrence.

Risso's dolphin

A male Risso's dolphin was briefly kept for rehabilitation by the CSN after it was

found stranded and very emaciated (Table 1). The dolphin was found on 16 October 1991 on Playa Monte Santo in Isla de Vieques, and was rescued the same day by CSN participants with the aid of the BNRWR and the US Coast Guard. The dolphin was transferred by helicopter to the UPR's Isla Magueyes Marine Laboratories and placed in a 4.5 m diameter, 1 m deep pool. The animal died during the early morning of 17 October after attempts to stabilize its condition failed. A necropsy conducted that same day and a blood analysis revealed that the animal was suffering from a chronic acute pneumonia.

Sperm whale

On the afternoon of 25 May 1994, the CSN received a phone call reporting a stranded live whale on the coast of Cabo Rojo. Personnel from the CSN and DNER was immediately mobilized to confirm the report and found at Sector El Morrillo in El Faro a sperm whale calf in very poor condition struggling to breath. The whale was taken and transported to the CSN rehabilitation facility at Isla Magueyes in a DNER pick-up truck with five rehabilitators keeping the animal wet and assessing its condition (Table 1). Transportation took about 30 minutes, and the whale arrived in stable condition. It was placed in a 7.3-m round pool, 1.2-m in depth, and a complete physical examination was performed including assessment of vital sings. Judging from its weight, size, and the scar in its umbilicus, it was concluded that it was 1 to 3 days old. Breathing rates were monitored for the first 12 hours. The animal was very weak, not being able to surface on its own. Two rehabilitators stayed inside the pool holding the animal so it could breath, taking turns every three hours. Blood was taken from the peduncle for hematology and a chemistry panel. During the first day, the whale was hydrated orally with water via a stomach tube. On the second and third day, an adaptation of Sea World's formula was prepared and the animal was stomach tubed-fed every three hours. The formula consisted of a blend of 8.8 kg of fish, 920 ml of water, 100 ml of cod-liver oil, 1,200 ml of 5% dextrose, 1,500 ml of soybean bitch replacement milk (UpJohn's Unilact), 300 ml of whipping cream and one tablet of marine vitamin (Mizuri). Despite continuous care, the whale died on the morning of 27 May 1994.

A thorough *post-mortem* exam was carried out. Complete morphometrics were taken and sex of the specimen was verified. The calf was a female, 292.5 cm in length, and weighted 272 kg. It was observed during the necropsy and later histopathological analysis, that the whale's organs were not fully developed, that there was meconium in the intestinal tract, and that the animal suffered from necrotizing interstitial pneumonia; the latter most probably of a systemic nature. Considering that newborn sperm whales weight about 1,000 kg and are almost 400 cm long at birth, the calf stranded in Cabo Rojo is one of the smallest sperm whales measured in the Southeastern United States, Gulf of Mexico and the Caribbean and most probably born prematurely.

West Indian manatees

Ten manatees have been kept in captivity in the northeastern Caribbean (Table 2). A male and a female were captured in Puerto Rico by local fishermen using fish corrals (*corrales de pesca*) and kept in a large tank by the Austrian Consul to Puerto Rico, George Latimer, in March of 1864 (Latimer, 1864). These two animals were offered to the Commissioners of Central Park in New York City, but they seem never to have arrived according to the City's Department of Parks and Recreation Assistant Historian (H. Fried pers. comm.).

Between February and March of 1866, a young female was captured in Puerto Rico by local fishermen using the same technique. It was kept captive for some weeks by fastening a rope around the narrow part of its tail (Scalater, 1866; Murie, 1870). It was then given to Latimer, who placed it in a large tank in preparation for transportation to England. The animal was dispatched on 12 March 1866 to the Mail Steamer *Conway* leaving San Juan for St. Thomas, and on 16 March 1866, while in St.

TABLE 2. Captivity records for West Indian manatees (*Trichechus manatus*) in Puerto Rico and the Virgin Islands.

Neptuno Data Base Number	Dates held	Institution/location where held captive	Sex	Size	Status
NEPCV08	Mar 1864	San Juan, PR	M	227 kg, 259 cm	Dead 1860s
NEPCV24	Mar 1864	San Juan, PR	F	159 kg, 198 cm	Dead 1860s
NEPCV09	Feb to Mar 1866	San Juan, PR	F	165 cm	Dead 24 Mar 1866
NEPCV10	29 Jun 1866	St. Thomas, USVI	M	28 kg, 122 cm	Dead 10 Jul 1866
NEPCV03	1954 to 27 Feb 1955	Isla Magueyes Zoo (UPR), Lajas, PR	—	—	Dead 27 Feb 1955
NEPCV14	1960s (<Apr 1963)	Isla Magueyes Zoo (UPR), Lajas, PR	—	—	Dead 1960s
NEPCV40	5 Nov 1991 to 22 Mar 1994	Isla Magueyes Laboratories, Department of Marine Sciences (UPR), Lajas, PR	M	29 kg, 115 cm	Released 22 Mar 1994
NEPCV41	28 May 1993 to 23 Mar 1995	Isla Magueyes Laboratories, Department of Marine Sciences (UPR), Lajas, PR	M	31 kg, 121.5 cm	Dead 23 Mar 1995
NEPCV42	15 Jul 1995 to 29 Jul 1995	Isla Magueyes Laboratories, Department of Marine Sciences (UPR), Lajas, PR	F	19 kg, 102 cm	Dead 29 Jul 1995

Thomas, it was transferred to the *Tasmanian* for delivery to London's Zoological Society Menagerie in Southampton, England. The animal died onboard on 24 March 1866 from cutaneous abrasions, exposure to cold weather, and starvation. Its remains are housed in the Society's Menagerie. On 19 June 1866, a young male captured in the Maroni River of Surinam (South America) was transported alive *via* Barbados (on 25 June 1866) and St. Thomas (on 29 June 1866) to London's Zoological Society Menagerie (Murie, 1870). The remains of the animal's mother were also delivered onboard the vessel. The animal died on 10 July 1866 from exposure to cold weather. The remains of both animals are housed in the Society's menagerie.

The next record was of a manatee captured near Bahía Sucia (Cabo Rojo), sometime in late 1954 or early 1955, and kept for some months at the Isla Magueyes Zoo (J. A. Rivero pers. comm.; Rivero, 1990). Attempts to feed the animal with water lilies failed, and the animal died on 27 February 1955 from starvation (D. S. Erdman pers. comm.). During the early 1960s (but prior to March 1963), permits were obtained to capture another manatee. That animal was kept captive briefly at the same zoo until it was killed as part of an osteological study by C. Mohamed of the UPR's School of Dentistry (Mohamed, 1963). According to the late marine biologist L. R. Almodovar (pers. comm.), the animal's meat was cooked and eaten by the workers of the zoo and researchers.

As part of the rescue efforts of CSN and the DNER, three of five manatees rescued in the early 1990s (Mignucci-Giannoni, 1996), all dependent calves, were kept captive. The other two were released a few hours after stranding; one was returned successfully to its family group. Manatees in rehabilitation were kept in one of three salt water pools, all above-ground, galvanized-frame with an inside plastic liner. The dimensions of the first pool were 10 m long, 4.6 m wide, 1.2 m deep; the second pool measured 7.3 m in diameter and 1.2 m in depth; the third pool measured 4.6 m in diameter and 1.2 m in depth. Two of the calves rescued died during rehabilitation: a 121.5-cm male rescued in Punta Las Marías in Ocean Park (San Juan) on 27 May 1993, died after 20 months of rehabilitation; and a 102-cm female rescued in Pozuelo in Bahía de Jobos (Guayama) on 15 July 1995, died two weeks after rescue due to serous athrophy of fat around the heart and complications resulting from premature birth.

The remaining calf, a 115-cm male nicknamed "*Moisés el Manatí*", was rescued off Puente los Dominicos in Levittown (Toa Baja) on 4 November 1991. He was in rehabilitation for 27 months at the CSN Rehabilitation Facility (Fig. 1). Medical and husbandry techniques adapted from Sea World of Florida and Miami Seaquarium orphan manatee protocols were used.

A year after *Moisés'* rescue, the CSN and government agencies began planning the details for the reintroduction of the calf at the age of natural weaning (about two years of age), as mandated by the recovery plan for this species. An interagency pilot project involving the CSN, the US Navy, the USFWS, the US Geological Service's (USGS) Sirenia Project, and the DNER was established to reintroduce this captive-reared manatee using a conservative, progressive, and slow-adaptation protocol. Five requisites were set to define a successful release, including that the manatee: (1) be weaned from human interaction, (2) be able to constantly find a source of fresh water, (3) be able to find natural vegetation for food, (4) health and weight should be between normal ranges for his age, and (5) should exhibit normal behavior and possess normal swimming skills and buoyancy.

The plan was to release the manatee in an enclosed protected bay within the Roosevelt Roads Naval Station (RRNS) at Ceiba. This allowed up to a six month period of adaptation to a more natural environment. A 213-m chain-linked fence enclosed an area of 32,500 m^2 of the northern portion of Pelican Cove, a known high-use area for manatees (Rathbun et al., 1986). The depth of the sea-pen was between 1 and 2 m deep. The bottom was mostly muddy, with large areas of sea grass beds (mostly *Syringodium filiforme* and *Thalassia testudinum*) and the shoreline was red mangrove (*Rhizophora mangle*). The manatee was

FIG. 1. *Moisés*, one of the manatees kept captive for rehabilitation purposes at the CSN facilities at Isla Magueyes.

in salt water with access to sea grasses for feeding and, through the fence, could see or interact with other manatees which frequented the cove. Protocols were established for weaning the animal from his accustomed food (lettuce) and from human interaction, for recording his behavior and movements during the period, and for tracking *Moisés* after release.

After a full medical examination, *Moisés*, at 235 cm in length and 286 kg of weight, was transferred by land to Pelican Cove on 22 March 1994. A small VHF radio tag was attached to him when he was placed in the sea-pen. Initially the manatee swam rapidly in a tight circle, but soon moved to the west side of the bay and stayed there the first full day and night. As part of the protocol, ample food was provided during the first five days, then he was weaned from lettuce slowly until 24 April 1994, when no lettuce was provided. From this date to 4 June 1994, *Moisés* was not observed feeding on natural vegetation. An exam conducted on 4 June 1994 revealed a weight loss of 21 kg. The protocol was then modified and supplemental lettuce was provided stuffed with sea grass. The manatee was examined again on 17 August 1994 and progress was observed in terms of natural food consumption and weight increase. The decision to begin the release process was made and final Federal authorization was requested and granted. On 22 August 1994, the manatee was trained to exit and re-enter the pen's gate. He learned the technique rapidly. A satellite-monitored transmitter was attached prior to his first travels outside the pen. After a week of training, the manatee was allowed to stay out overnight, but the gate of the fence was kept open in case he needed the refuge of the fenced-in area.

Since then the manatee has been free. Efforts to radio track *Moisés* provided valuable information for evaluating his reintroduction to the wild. After his release he remained in the vicinity of Ceiba, frequently returning to the sea-pen in Pelican

Cove. Areas used outside of the pen were mostly sea grass beds within the protected boundaries of the RRNS. He also located and used two different fresh water sources and both sewer discharges at the RRNS. Observations have documented some feeding activity on natural forage. Although *Moisés* has used known manatee high-use areas, he has spent a greater amount of time in shallow, near-shore waters. On March 1995, the manatee traveled some 26 km south of his normal range, reaching Palmas del Mar (Humacao) and Puerto de Yabucoa, but returned four days later. During 1995 and 1996, although *Moisés* occasionally interacted with other manatees, he was most often observed alone on and just north of El Corcho, a fishing village on the boundary between Ceiba and Naguabo. He was seen using the freshwater outfall of the RRNS Bundy Waste Water Treatment Plant.

On 21 April 1996, *Moisés* was re-examined after his poor physical condition was noted. His weight was 139 kg, and although healthy otherwise (as evidence by blood analysis), he was emaciated. Supplemental feeding was initiated and continues periodically to date. By 1 September 1997, *Moisés* had recovered weight and seemed in good health.

Despite the differences in activities compared to wild manatees, and his reduced overall weight, *Moisés*, after 4 years of freedom, is somewhat slowly adapting to the natural environment. In October 1997, *Moisés* was sighted in numerous occasions accompanying a female and a calf near Bahía Cascajo in Ceiba. He also was sighted with three other male manatees who were pursuing a female, probably participating in a mating herd. *Moisés'* case is the first successful release of an orphaned, captive-raised manatee to the marine environment in the Caribbean, and this effort has helped wildlife managers and researchers in Florida model their manatee reintroduction program (R. K. Bonde pers. comm.; Marsh and Lefebvre, 1994).

California Sea Lions

California sea lions are native to the eastern Pacific Ocean coasts, from the State of Washington south to Baja California, and to the Galápagos Islands. Twelve animals have been brought on five occasions to Puerto Rico as pets or for public display and trained performance (Table 3). According to professional diver M. Pagán Mir (pers. comm.), and confirmed by Jean-Michel Cousteau (M. C. Tardif pers. comm.), a sea lion was sighted in Isabela and at Boca de Cangrejos (Carolina) in 1967. The animal belonged to the Cousteau family, who was visiting Puerto Rico on a ship-wreck research expedition. The animal, together with another sea lion, was housed in a cage with a water tub on the research vessel *Calypso*. At times both animals were allowed to swim free, but one escaped between Isla Monito and Punta Barrio Nuevo on Isla de Mona. The animal appeared two days later at Isabela and six days later at Boca de Cangrejos. Here the animal jumped into a fisherman's boat, who took advantage of its docility and sold it for $50 to an American woman residing in San Juan (M. Pagán Mir pers. comm.). She kept the sea lion in her backyard pool until Philippe Cousteau was notified of the incident and came to pick up the animal some days later. It was later released along with its companion off the coast of Perú (M. C. Tardif pers. comm.).

A male and a female were bought from a Florida dealer and brought to the Isla Magueyes Zoo about 1954 (Rivero, 1990). They were kept in a fenced-in dock pool until both escaped when the enclosure rusted apart. One of the animals stayed close to Isla Magueyes. The other was seen off Cabo Rojo's lighthouse and off Isabela. Both were subsequently recaptured. The animals died about 1956, one from an eye infection and the other from injuries suffered during its escape.

Other captive records for this species include a male and female obtained from a Miami animal supplier and kept at the Ocean Life Park Aquarium during the 1970s (R. E. Pile pers. comm.), three females brought by the Fuentes Gascas Mexican Circus in 1984, and three females that visited Puerto Rico with the Odyssey Circus (C. Allen pers. comm.) in 1989. The animals at the Ocean Life Park Aquarium were held

TABLE 3. Captivity records for California sea lions (*Zalophus californianus*) in Puerto Rico and the Virgin Islands.

Neptuno Data Base Number	Dates held	Institution/location where held captive	Sex	Status
NEPCV02	1954 to 1956	Isla Magueyes Zoo (UPR), Lajas, PR	M	Dead 1956
NEPCV26	1954 to 1956	Isla Magueyes Zoo (UPR), Lajas, PR	F	Dead 1956
NEPCV32	1967	*Calypso*, Pasaje de la Mona, PR	—	Alive as of 1967
NEPCV33	1967	*Calypso*, Pasaje de la Mona, PR	—	Alive as of 1967
NEPCV04	May 1971 to Jun 1977	Ocean Life Park Aquarium, Boca de Cangrejos, Carolina, PR	F	Alive as of 1977
NEPCV27	May 1971 to Jun 1977	Ocean Life Park Aquarium, Boca de Cangrejos, Carolina, PR	M	Alive as of 1977
NEPCV06	May to Nov 1984	Circo Mexicano Hermanos Fuetes Gasca, San Juan and other towns in PR	F	Alive as of 1984
NEPCV28	May to Nov 1984	Circo Mexicano Hermanos Fuetes Gasca, San Juan and other towns in PR	F	Alive as of 1984
NEPCV29	May to Nov 1984	Circo Mexicano Hermanos Fuetes Gasca, San Juan and other towns in PR	F	Alive as of 1984
NEPCV13	28 Feb to 21 Mar 1989	Odyssey Circus, Mayagüez and Parador Villa, Antonio, Rincón, PR	F	Alive as of 1989
NEPCV30	28 Feb to 21 Mar 1989	Odyssey Circus, Mayagüez and Parador Villa, Antonio, Rincón, PR	F	Alive as of 1989
NEPCV31	28 Feb to 21 Mar 1989	Odyssey Circus, Mayagüez and Parador Villa, Antonio, Rincón, PR	F	Alive as of 1989

in a 12.2 m long, 1.2 m deep kidney-shaped concrete pool until they were sold to an oceanarium in the Netherlands for about $1,000 each when the Ocean Life Park was forced to close in 1977 (R. E. Pile pers. comm.). Both circuses left Puerto Rico with all their animals.

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