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HISTORY OF AN INTRODUCTION OF ELK IN FLORIDA

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Three introductions of exotic deer (Cervidae) into Florida resulting in persistent wild populations have been reported in the literature. These include sambar deer (*Cervus unicolor*) deliberately released in 1908 on St. Vincent Island off the coast of Franklin County (Newman 1948), axis deer (*Cervus axis*) accidentally introduced through the escape of a few animals in Volusia County during the early 1930s (Allen and Neill 1954), and elk (*Cervus elaphus*) introduced in Highlands County in south-central peninsular Florida in the late 1960s (Layne in Bryant and Maser 1982). This note provides further details of the history of the elk introduction in Highlands County.

In 1967 or 1968, six elk (sex ratio unknown) were released on the Buck Island Ranch (presently the MacArthur Agroecology Research Center of the Archbold Biological Station). The ranch is located in southern Highlands County about 22 km SE of the town of Lake Placid in sections 2, 9-11, 13-16, 21-28, 33-36, R31E, T38S. The Harney Pond Canal (C-41) forms part of the north and west boundaries of the ranch and bisects the property from east to west. Major habitats on the 4086-ha ranch include improved pastures (48%), citrus grove (2%), marshes and sloughs (35%), and forests (15%). The latter category includes cabbage palm (*Sabal palmetto*) hammocks, mixed cabbage palm/live oak (*Quercus virginiana*) hammocks, and live oak hammocks.

According to Anita Childs, wife of the ranch manager, the elk were brought to the ranch by then-owner, John D. MacArthur, from an animal exhibit in Miami owned by Ivan Tors, where they had been used in the filming of the "Gentle Ben" television series. The elk (presumably *C. e. nelsoni*) were originally obtained from Wyoming, the major source of stock for zoos and translocations (Robbins et al. 1982). When first released, the elk were tame and remained in the general vicinity of the ranch headquarters in improved pasture and cabbage palm/live oak hammock habitats, but in later years they became shyer and concentrated their activity in the northeast part of the ranch, which is the most remote and least disturbed section of the property. The predominant habitats in this area are extensive sawgrass marshes, cabbage palm/live oak hammocks, and dry palmetto prairie.

Breeding began soon after the animals were released, and twin calves were observed. The population increased relatively rapidly, with a minimum of 11 individuals in 1972 (A. Childs, pers. comm.) and 18 by 1976 (S. Childs, pers. comm.). The population reached a maximum of about 28 or 29 individuals in the late 1970s and then declined (D. Childs, pers. comm.). In May 1982, six elk were seen by B. G. Crawford just north of the ranch boundary. The most recent records from the ranch are of a bull and two cows seen by J. T. Childs in late March or early February 1990; three bulls and four cows observed by S. Phillips and M. C. Watters, III, on 31 December 1992; and two bulls seen by S. Phillips in late January 1993. All of these sightings were in native range habitat in the northeast corner of the ranch.

Movements off the ranch occurred as early as 1970, when elk occasionally appeared on the Lykes Brighton Ranch which borders Buck Island Ranch on the east and south (A. Waggener, Sr., pers. comm.). Most of the sightings were in the Lykes' Bullhead citrus grove on the south side of Indian Prairie Canal (C-40) in Glades County (T. Crum, A. Waggener, Sr., pers. comm.). Although sightings of elk in this area by ranch and grove employees were apparently fairly numerous, most were not recorded. However, A. Waggener (pers. comm.) recalled observing an antlered bull with a cow and calf in the grove in February 1976 and knew of four elk that had been shot there up to that time. In the late 1970s, F. M. Yusko (pers. comm.) heard bugling on one occasion and another time saw an elk chase a hound and attempt to stamp it with its forefeet. In November 1981, he and I found abundant elk scats in two places in the grove.

In addition to the dispersal onto adjacent property, several longer movements were documented. In December 1972, a "big deer," which from the description was almost certainly an elk, was reported struck by a vehicle on State Route 66 in Highlands or Hardee county, a minimum distance of 37 km from Buck Island Ranch. Another individual was killed by a car at the intersection of State Route 70 and County Route 721 at Brighton, about 13 km northeast of the ranch, sometime before 1972 (A. Childs, pers. comm.). By 1976, elk also had been seen in Lakeport, Glades County, approximately 22 km south-southeast (A. Waggener, Jr., pers. comm.). In 1986, a cow was observed crossing State Route 29 in Highlands County about 5 km N of State Route 70 and approximately 14 km northwest of the ranch (K. Simpson, pers. comm.).

The elk is unknown in the fossil record of Florida (Webb 1974), and the Highlands County introduction site is far south of the original southernmost boundary (southern Appalachian region of northern Georgia) of the historic range in eastern United States (Hall 1981, Murie 1951). The successful breeding and longterm persistence of the species in south-central Florida suggests that climate may not have been the barrier limiting the southward distribution of the elk in historic times as suggested by Murie (1951). As white-tailed deer (*Odocoileus virginianus*) are abundant on the Buck Island Ranch and in the general region, a possible factor favoring survival of the elk may have been the absence of the parasitic helminths *Parelaphostrongylus tenuis*, which has not been recorded in native deer in Florida, and *Elaeophora schneideri*, known only from the northern part of the state (Forrester 1992). These parasites are relatively benign in white-tailed deer but a serious health hazard in elk (Taber and Raedeke 1982). Although the cause of the decline of the population following the peak of about 30 animals in the late 1970s is conjectural, shooting

was probably the major factor. Although only five to seven deaths by shooting between 1968 and 1976 can be documented, the impression gained from residents in the area is that the number of animals actually killed is much higher. Shooting also appeared to be the major factor limiting increase of introduced elk in Pennsylvania (Doutt et al. 1973). High-way mortality; capture of calves, some of which died in captivity (F. M. Yusko, pers. comm.); and reduction of breeding rate by dispersal also probably contributed to suppression of population growth in the Florida introduction.

The histories of the three cervid introductions in Florida differ considerably. From the original four (one male, three females) sambar deer introduced on 5000-ha St Vincents Island in 1908, the population reached "several hundred" by 1940 (Newman 1948). Numbers fell to less than 50 during the World War II years (Newman 1948), then recovered to an estimated 75-100 by the late 1960s (Smith 1969) and about 200 in 1983-1986 (Flynn et al. 1990). Little information is available on the axis deer introduction in Volusia County in the early 1930s. The population persisted at least up to the mid-1950s, when the species was reported to occur in four counties east of the St. Johns River (Allen and Neill 1954). Thus, during about the same period of time (20-30 years) following release, the axis deer expanded its range whereas the elk did not. The peak population of axis deer also probably well exceeded that of elk. The greater success of the introduced sambar deer compared to either axis deer or elk is probably largely attributable to their isolation on an island and the amount of protection they received. Following introduction, the population was rigorously protected until large enough to allow limited hunting of stags (Newman 1948). Except for an occasional animal that managed to reach the mainland (Anonymous 1963), there was no opportunity for dispersal, which also probably contributed to rapid population growth. The dramatic reduction during World War II was attributed to an "epidemic" of illegal hunting (Newman 1948), although logging during the same period may also have been implicated (Lewis et al. 1990), and recovery of the population was associated with establishment of the island as a National Wildlife Refuge. In contrast, elk were at risk of being shot within a short time after release and had no barrier to dispersal. The fact that axis deer were given protection by law beginning in 1951 (Allen and Neill 1954) suggests that they also were subjected to considerable hunting pressure, which may eventually have led to their disappearance. The marked differences in the population trends of the sambar deer compared with axis deer and elk, despite the small number of founders in all cases, suggests that any effects of inbreeding were outweighed by demographic factors.

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RECENT NESTING OF GULL-BILLED TERNS IN NORTHWEST FLORIDA

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In the Gulf states region, Gull-billed Terns (*Sterna nilotica*) nest primarily with or near other colonial seabirds in coastal habitats (Clapp et al. 1983). Black Skimmers (*Rynchops niger*) and Least Terns (*Sterna antillarum*) are the most common neighboring species (Weston 1933, Hallman 1960, Portnoy 1977). Nesting habitats in North America include sandy coastal beaches, estuary islands, tidal wetlands, and freshwater wetlands (Spendelov and Patton 1988). Gull-billed Terns also nest on deposits of dredged material (Portnoy 1977; Sears 1978; Soots and Landin 1978; H. Kale, unpublished report to Shell Oil Corp.).

Observations of breeding Gull-billed Terns along the northwest coast of Florida have been very infrequent. A nest with two eggs was found near Pensacola, Escambia County in 1932 (Weston 1933). Three nests with two eggs each were located on an island in St. Joseph Bay, Gulf County in 1960 (Hallman 1960); in subsequent years, one nest was found in 1963 and one in 1965 (Hallman 1968). H. Stevenson found a nest with two eggs on St. George Island, Franklin County in 1973 (Stevenson and Anderson, in press). Stevenson also located 5-8 pairs of Gull-billed Terns with young on a spoil island near Eastpoint, Franklin County in 1979 (Stevenson and Anderson, in press). This note reports our observations of Gull-billed Terns nesting along the northwest coast of Florida from 1989-1992.

Since 1988, we have studied a large colony of Least Terns and Black Skimmers nesting along the causeway that connects St. George Island to the mainland at Eastpoint, Franklin County. The causeway is about 1.9 km long and made primarily of fill material. A variety of low herbaceous vegetation, primarily grasses, lines each side of the paved road that runs