

FINAL REPORT

**THE 2002 - 2003 MONITORING PROGRAM FOR THE
ENDANGERED AMERICAN CROCODILE IN SOUTH FLORIDA**

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A REPORT ON THE 2002 - 2003 MONITORING PROGRAM FOR THE ENDANGERED AMERICAN CROCODILE IN SOUTH FLORIDA

Introduction

The American crocodile (*Crocodylus acutus*) is a primarily coastal crocodylian that occurs in parts of Mexico, Central and South America, the Caribbean, and at the northern end of its range South Florida. As with other species of crocodylians, hunting (for hides, meat, collections, and out of fear) and habitat loss (direct and/or due to degradation) have made the American crocodile endangered throughout its range. In Florida, habitat loss, due to development required to support a rapidly growing human population along coastal areas of Palm Beach, Broward, Dade, and Monroe Counties, has been the primary factor endangering the United States population of the American crocodile. This loss of habitat principally affected the nesting range of crocodiles, restricting nesting to a small area of northeastern Florida Bay and northern Key Largo by the early 1970's (Ogden 1978, Kushlan and Mazzotti 1989). At one time most of the remaining crocodiles (about 75% of known nests) were located in Florida Bay in Everglades National Park. When crocodiles were declared endangered in 1975 (Federal Register 40:44149) scant data were available for making informed management decisions. Field and laboratory data that were available suggested that low nest success, combined with high hatchling mortality, provided a dim prognosis for survival (Evans and Ellis 1977, Ogden 1978). Results of intensive studies conducted by the National Park Service, Florida Game and Fresh Water Fish Commission (now Florida Fish and Wildlife Conservation Commission), and Florida Power and Light Company resulted in a more optimistic outlook for crocodiles in Florida (Mazzotti 1983, Moler 1992). Three actions occurred based on results of these studies and recovery efforts by the U.S. Fish and Wildlife Service. The National Park Service established a crocodile sanctuary in northeastern Florida Bay in 1980, Crocodile Lake National Wildlife Refuge was created, and Florida Power and Light Company began a long-term management and monitoring program. Crocodiles have responded positively to these efforts.

Currently, crocodiles face new issues – Florida and Biscayne Bays have undergone a number of changes that have caused a great deal of concern for the ecological health of this ecosystem. Efforts have been, and continue to be made, to improve Florida Bay and adjacent Biscayne Bay. Monitoring and research studies also have continued on crocodiles with the dual purposes of assessing the status of the population and evaluating ecosystem restoration efforts. As with other species of wildlife in South Florida, the survival of crocodiles has been linked to regional hydrological conditions, especially rainfall, water level, and salinity. Alternatives for improving water delivery into South Florida estuaries may change salinities, water levels, and availability of nesting habitat in the receiving bodies of water. Research and monitoring will be essential to ensure the continued survival of an endangered species in this changing environment.

There are more crocodiles in more places today than there were in 1975 when crocodiles were declared endangered. Crocodiles now occur in most of the habitat that remains for them in South Florida. Most of the remaining habitat is currently protected in public ownership or engaged in energy production. In these areas, destruction of habitat has not been an issue. However, questions of potential modification of habitat through continued alteration of freshwater flow due to upstream development and potential curtailment of the range of crocodiles need to be addressed.

Crocodiles have been found in Broward County, Biscayne Bay and several areas between Shark River and Sanibel Island on Florida's southwest coast. However, virtually nothing is known about the population structure, distribution, and habitat use of crocodiles in these areas. Once again we lack data for making informed management decisions. The most important factors affecting crocodiles in these locations will likely be negative impacts of projected land uses and the positive potential of restoration efforts.

In South Florida we have the unique opportunity to integrate endangered species conservation with ecosystem restoration and management. American crocodiles thrive in healthy estuarine environments and are particularly dependent on natural freshwater deliveries. In this regard crocodiles can be used to evaluate restoration alternatives and set success criteria for Florida and Biscayne Bay restoration efforts. Crocodiles can also be used as an indicator of negative impacts of freshwater diversion due to coastal development in Miami-Dade, Collier, and Lee Counties.

Perhaps even more importantly, we have the opportunity to reevaluate the status of the American crocodile, which provides an excellent opportunity to spotlight the success of an endangered species recovery effort. Continued research and monitoring will be an essential component of this effort.

Objectives

The objectives of the crocodile monitoring program were:

1. To monitor nesting effort (number of crocodiles that attempt to nest) and success (number of nests that hatch) of the American crocodile in South Florida.
2. To assess patterns of growth and survival of crocodiles from different locations and habitats.

Methods

Population surveys and monitoring include nesting effort and success, and growth and survival of crocodiles. In areas of recently observed crocodile activity, additional effort was expended to determine population structure, relative abundance, and habitat relations. Crocodile nesting effort and success was determined by searching known and potential nesting habitat in South Florida (Figures 1-5) through April and May (effort) and July through August (success) for

activity (tail drags, digging or scraping) or the presence of eggs or hatchlings. When nests were located, the vegetation, substrate, and salinity of adjacent waters were recorded. Hatched eggshells or hatchling crocodiles were counted as evidence of successful nests. The number and causes of egg failure were noted whenever possible. Florida Power and Light Company (FPL) conducted nest surveys at the Turkey Point Power Plant site, and Florida Fish and Wildlife Conservation Commission conducted nest surveys at the Crocodile Lake National Wildlife Refuge. Results of those surveys are not reported here.

Distribution, growth, survival, relative abundance, and habitat relations of crocodiles were assessed by quarterly survey and capture efforts. Over 800 crocodiles have been marked in Everglades National Park and over 2000 at other locations in South Florida. Recapture of crocodiles tagged from previous studies will yield valuable information on long-term growth and survival.

Results

January – March 2003 Intensive Survey

During the first quarter of 2003 (January-March) an extended effort was made to perform a comprehensive survey for crocodiles through out South Florida (Figure1). Spotlight surveys were performed all through South Florida, including the Turkey Point Power Plant and a more thorough survey of the Crocodile Lake National Wildlife Refuge and Cape Sable areas than regularly performed. A total of 119 crocodiles were observed, of which 39 were captured. There were 97 alligators and 76 indistinguishable eyeshines observed during the spotlight surveys. Information on crocodiles that were captured is included in Table 1, which covers the entire year of capture effort.

Fifty-one of all crocodiles observed and/or captured during this quarter were in Everglades National Park, 26 in Biscayne Bay (including Card and Barnes Sound and Lake Surprise), 36 at Turkey Point Power Plant site, one from Key Largo and five on the west coast near Naples. Ten of the Everglades National Park observations were from northeastern Florida Bay. Forty-one observations were made in the Flamingo area. Fifteen of the Biscayne Bay observations were from the Barnes Sound area, seven from the canals south of Turkey Point and Card Sound Road and three from the northern extent of the survey area within Biscayne Bay. Eighty-five observations were in artificial habitats. One hundred and seventeen observations were in habitats protected from wind and wave action and two were along exposed shoreline.

Water salinity for crocodile observations ranged between seven and 61 ppt (parts per thousand). Fourteen (13 %) of the observations were in water with a salinity of 20 ppt or lower. Fifty-six (52%) of the observations ranged between 20 and 40 ppt and 38 were found in habitat with a salinity greater than 40ppt. The high number of observations in the greater salinity regime was associated with the Turkey Point Power Plant survey.

Annual Report Results from April 1, 2002 – March 31, 2003

Thirty-six nests were located in 2002. Thirty-one nests were in Everglades National Park. Thirty-nine percent (12) were successful, 45% (14) were depredated by raccoons and the remainder failed for unknown reasons (Table 1). The depredated clutches were located along Buttonwood Canal, East Cape Canal, Clubhouse Beach, Flamingo boat basin, West Lake, East Creek, Cocoa Beach, Eagle Key, Dead Stork Beach and Davis Cove. As in past years all of the clutches at Marco Island Executive Airport failed. The results from the analyses conducted on the eggs collected from the Airport nests showed the eggs only contained genetic material from the female and have no paternal component. This indicates that the eggs were not fertilized. One successful nest was located along the shoreline of Biscayne Bay at Chapman Field County Park, Miami-Dade County.

A total of 56 hatchlings (Table 2) were captured. Thirty-five from nests in Everglades National Park and 21 from nests in Biscayne Bay (including Card and Barnes Sound). Seventy-four captures were made of 65 individual non-hatchling crocodiles, including one road-killed crocodile (Table 3) during surveys of Everglades National Park, Biscayne Bay and the southwest coast of Florida. Of the 74 captures, 25 were recaptures (12 originally marked as hatchlings, nine marked as non-hatchlings and the remaining four unknown). There were three separate captures of one crocodile originally marked by the FWC. Personnel at the Turkey Point Power Plant originally marked four of the crocodiles and the remaining 18 were originally marked by the University of Florida. The growth of recaptured crocodiles ranged from 0.002 cm/day to 0.104 cm/day total length and 0.32 g/day to 13.74 g/day mass (Table 3). The growth for seven crocodiles could not be calculated due to irregularities in the data or the original data were not available.

Forty-three of all captures were in Everglades National Park, 27 in Biscayne Bay (including Card and Barnes sounds and Lake Surprise) and four from the Florida Keys (Figures 2-5, Table 3). Eight of the Everglades National Park captures were from northeastern Florida Bay. Thirty-five captures were made in the Flamingo area. Ten of the Biscayne Bay Complex captures were from Crocodile Lake National Wildlife Refuge, six from the canals south of the power plant in Card Sound and four from the Chapman Field/Deering Bay area.

Forty-nine captures were in artificial habitats (46 in canals, two in man-made ponds and one in a swimming pool). Seventy-one captures were in habitats protected from wind and wave action and two were along exposed shoreline.

Water salinity at capture sites ranged between 5 and 42 ppt. Twenty-three (33 %) of the captures were in water with a salinity of 20 ppt or lower. Eighteen (25%) captures ranged between 20 and 30 ppt, 28 (39%) between 30 and 40ppt and 2 were found in salinity above 40ppt.

Discussion

Although 45% of the nests were lost to predation, 12 hatched successfully. Raccoons did not depredate all the nests in either northeastern Florida Bay or the Flamingo area. Nesting in Everglades National Park reached a new record in 2002 with 31 known nests. A total of 35 hatchling crocodiles being marked within Everglades National Park.

Following the loss of nest sites to reconstruction of the East Cape Plug, crocodiles began nesting along the banks of East Cape Canal, north of the plug. Several hundred meters of berm with marl soil and adequate elevation for nests compose this area. In addition, there has been an increase in the number and size of crocodiles observed in the East Cape Canal and surrounding creek areas, as well as an increase in nesting activity observed in the East Cape Canal past the plug. The increase in crocodile and nesting activity has been observed both during surveys for crocodiles and during patrols by rangers. There has also been an increase in nesting at beach locations. This year, three nests were found on Cape Sable, two of which were successful. Nests on Cape Sable are usually found first by raccoons and are easy to miss in the extensive depredation of sea turtle nests. A depredated nest was found along Club House Beach.

West Lake and Buttonwood Canal provide important habitat for hatchling and juvenile crocodiles. Buttonwood Canal has daily use by motorboats, canoes, and kayaks during the winter season. The increased use of these areas by crocodiles for nesting shows that as long as humans do not directly harass or threaten crocodiles, crocodiles and humans can coexist. At both locations there are other bodies of water where crocodiles could easily move to as a response to being disturbed by humans.

Outside of Everglades National Park, nesting has been observed at Chapman Field County Park in Biscayne Bay. This nest site has been active on and off since it was first discovered in 1997 and was active during the 2002-nesting season. Fourteen hatchlings were marked there along with an additional hatchling on the adjacent Deering Bay property. In addition, individuals marked at this location as hatchlings have been recaptured on properties adjacent to the south and as far north as Matheson Hammock County Park.

Growth rates for crocodiles in Everglades National Park reported here are similar to previous studies, and continue to be less than those reported at other nesting colonies in Florida (Table 4). Survival, as determined by direct enumeration, also was lowest in Everglades National Park (Table 4).

Mortality of hatchling crocodiles has been associated with the distance that hatchlings have to disperse to find nursery habitat (Mazzotti 1999). Nursery habitat can be defined as areas that are protected from wind and wave action, have a low to intermediate salinity regime, abundant food, and refugia from predators. In Florida, estuarine creeks, natural and man-made ponds, and canals meet these habitat requirements. On North Key Largo nests are adjacent to nursery habitat. At Turkey Point the distance from nest to nursery can range from meters to hundreds of meters. In Everglades National Park most hatchlings are marked from shoreline nests that can be kilometers from nursery habitat. We hypothesize that greater dispersal distance primarily increases the risk to predation and it may also expose a hatchling crocodile to harsher environmental conditions during transit. For a hatchling crocodile, the best way to avoid the threat of predation is to outgrow it.

On North Key Largo and at Turkey Point Power Plant the creation of canals not only created nesting habitat, but also created a productive aquatic environment as evidenced by the growth rates of crocodiles and personal observation of abundant prey items at these locations. Even so, lower growth rates at both locations have been associated with spatial or temporal patterns of higher salinity (Brandt and Mazzotti in prep., Moler 1992). In northeastern Florida Bay, Everglades National Park, lower aquatic productivity has been associated with elevated

salinities caused by the diversion of freshwater for drainage and flood control (J. Lorenz pers. comm.). Although faster growth decreases exposure to the threat of predation by non-crocodilian predators, it also shortens the time it takes a crocodile to become a subadult, and hence, a threat to adult crocodiles. When a population of crocodiles has good nest success and adequate hatchling survival, mortality and dispersal of older juveniles and subadults become the most likely factors to limit population numbers.

The 27 crocodiles captured northeast of US 1 in Barnes Sound, Card Sound, and Biscayne Bay in the Biscayne Bay Complex (BBC), along with the documented movement of crocodiles from the Chapman Field nest site to other areas underscore the emergence of the BBC as a critical area for the recovery of the American crocodile in Florida. One crocodile originally marked at the Turkey Point Power Plant was found as a road kill at mile marker 117.5 on US Highway 1. In addition, three crocodiles were captured in the Key Largo area and reported sightings of additional crocodiles in the upper Florida Keys have increased as well. Humans use many of the habitats (for example, golf courses, marinas and residential canals) used by crocodiles in the BBC. This has caused concern among people unaware of the relatively gentle nature of this species, and has significance to the potential recovery of this endangered species. A proactive education program is needed to prepare residents and visitors for the arrival of crocodiles in these areas.

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Table 1. Summary of 2002 nesting season of the American crocodile in Everglades National Park, Biscayne Bay and at Marco Island Executive Airport.

Location	Fate
Davis Cove	Depredated
Deer Key	Successful
Eagle Key	Depredated
Lake Key	Successful
Dead Stork Beach	Depredated
Cocoa Beach North	Successful
Cocoa Beach Middle	Depredated
Cocoa Beach South	Successful
Little Madeira Point	Failed
Little Madeira Beach Mound 1	Successful
Little Madeira Beach Mound 2	Successful
Little Madeira Beach Mound 3	Successful
Little Madeira Beach Mid 1	Successful
Little Madeira Beach Mid 2	Successful
Little Madeira Beach South	Failed
East Creek	Depredated
Black Betsy Key	Failed
Club Key	Failed
West Lake	Depredated
Buttonwood Canal 1	Successful
Buttonwood Canal 2	Depredated
Flamingo Boat Basin 1	Depredated
Flamingo Boat Basin 2	Depredated
Flamingo Boat Basin 3	Depredated
Clubhouse Beach	Depredated
Cape Sable 1	Successful
Cape Sable 2	Successful
Cape Sable 3	Failed
East Cape Canal 1	Depredated
East Cape Canal 2	Depredated
East Cape Canal 3	Depredated
Chapman Field	Successful
Marco Executive Airport 1	Failed
Marco Executive Airport 2	Failed
Marco Executive Airport 3	Failed
Marco Executive Airport 4	Failed

Table 2. Summary of Hatchling crocodiles captured during the 2002 nesting season within Everglades National Park and the Biscayne Bay Complex, Florida, along with explanations for all abbreviations.

Date	Clip	TL (cm)	SVL (cm)	Mass (g)	Air	Water	Sal (ppt)	Location
07/28/02	1298	31.0	15.3	70.5	31	36	5	LME
08/01/02	1299	25.9	13.0	55.0	30	32	8	LME
08/01/02	1300	26.0	13.6	60.0	30	32	8	LME
08/01/02	1310	26.4	13.0	59.0	30	32	8	LME
08/01/02	1302	25.6	13.0	55.0	30	32	8	LME
08/01/02	1303	25.8	13.5	60.0	30	32	8	LME
08/01/02	1304	24.5	12.5	50.0	30	32	8	LME
08/01/02	1305	26.5	13.8	62.0	30	32	8	LME
08/01/02	1306	25.8	13.0	60.0	30	32	8	LME
08/01/02	1307	26.3	13.4	66.0	30	32	8	LME
08/01/02	1308	25.0	12.6	53.0	30	32	8	LME
08/01/02	1309	25.0	12.5	55.0	30	32	8	LME
08/01/02	1311	26.4	13.5	62.0	30	32	8	LME
08/01/02	1312	26.4	13.5	56.0	30	32	8	LME
08/01/02	1313	26.7	13.9	60.0	30	32	8	LME
08/01/02	1314	26.8	13.6	58.0	30	32	8	LME
08/01/02	1315	26.0	13.0	48.0	30	32	8	LME
08/01/02	1316	25.7	12.8	65.0	30	32	8	LME
08/01/02	1317	27.0	13.6	58.0	30	32	8	LME
08/01/02	1318	25.5	13.0	55.0	30	32	8	LME
08/01/02	1319	26.3	13.5	58.0	30	32	8	LME
08/01/02	1320	26.0	13.1	58.0	30	32	8	LME
08/01/02	1321	25.5	13.2	48.0	30	32	8	LME
08/01/02	1322	25.7	13.2	58.0	30	32	8	LME
08/01/02	1323	26.0	13.5	62.0	30	32	8	LME
08/07/02	1412	28.5	13.8	55.0	24	30	10	BWC
08/07/02	1413	28.3	14.0	56.0	24	30	10	BWC
08/07/02	1414	24.3	13.1	42.0	24	30	10	BWC
08/07/02	1415	27.9	13.9	50.0	24	30	10	BWC
08/07/02	1416	25.1	11.9	55.0	24	30	10	BWC
08/07/02	1417	27.1	13.3	53.0	24	30	10	BWC
08/07/02	1418	27.8	13.6	50.0	24	30	10	BWC
08/07/02	1419	26.5	13.3	60.0	24	30	10	BWC
08/07/02	1420	24.3	12.5	47.0	24	30	10	BWC
08/07/02	1421	25.1	12.6	46.0	24	30	10	BWC
07/30/02	1398	30.2	14.5	66.0	30	31	5	CHB

Table 2. Cont.

Date	Clip	TL (cm)	SVL (cm)	Mass (g)	Air	Water	Sal (ppt)	Location
07/30/02	1399	32.7	16.2	85.0	30	31	5	CHB
07/30/02	1400	31.9	15.7	76.0	30	31	5	CHB
07/30/02	1401	27.9	14.0	53.0	30	31	5	CHB
07/30/02	1402	30.0	14.9	64.0	30	31	5	CHB
07/30/02	1403	29.9	14.6	76.0	30	31	5	CHB
07/30/02	1404	29.2	14.3	55.0	30	31	5	CHB
07/30/02	1405	35.0	15.3	71.0	30	31	5	CHB
07/30/02	1406	31.5	15.6	67.0	30	31	5	CHB
07/30/02	1407	29.4	14.8	59.0	30	31	5	CHB
07/30/02	1408	28.9	14.4	59.0	30	31	5	CHB
07/30/02	1409	32.4	16.2	76.0	30	31	5	CHB
07/30/02	1410	31.7	15.5	72.0	30	31	5	CHB
07/30/02	1411	31.0	15.3	68.0	30	31	5	CHB
07/16/02	1297	26.2	13.5	57.0	30	33	5	DRB
09/04/02	1423	28.7	14.9	62.0	27	29	30	CRL
09/04/02	1424	37.2	18.5	130.0	29	29	25	CRL
09/04/02	1425	37.6	19.6	137.0	27	29	25	CRL
09/04/02	1426	30.9	16.1	75.0	29	30	29	CRL
09/04/02	1427	35.2	17.5	96.0	25	28	27	CRL
09/04/02	1428	35.5	18.2	109.0	25	26	27	CRL

Abbreviation	Location Name	Abbreviation	Location Name
BAH	Basin Hills	HDC	Homestead Canal
BPC	Black Point Canal	INT	Intus Property
BRL	Bear Lake	JEF	Jewfish Creek
BRS	Barnes Sound	JOB	Joe Bay
BWC	Buttonwood Canal	LAR	Largo Sound
BWS	Blackwater Sound	LAS	Lake Surprise
CAP	Card Point	LMB	Little Madeira Bay
CDS	Card Sound	LME	Little Madeira Beach
CHB	Chapman Field Borrow Pit	MAB	Manatee Bay
CHC	Chapman Field Canal	MAT	Matheson Hammock Park
CRL	Crocodile Lake Nat.Wildlife Refuge	TAR	Taylor River
DRB	Deering Bay Estate	TCI	Trout Cove Island
ECC	East Cape Canal	TPC	Turkey Point Canal
FLC	Florida City	WEL	West Lake

Table 3. Summary of non-hatchling crocodiles captured during the 2002 – 2003 survey period.

Date	Clip	Location	Recapture	Sex	TL(cm)	SVL(cm)	Mass (g)	Capt. as hatchling	Original Location	TL/day	SVL/day	Mass/day	Original Date
04/15/02	1179	JOB	No	M	70.0	36.0	885.0						
04/23/02	943	BWC	Yes	M	55.5	29.0	500.0	Yes	BWC	0.104	0.054	1.550	07/17/01
04/24/02	FWC	CRL	Yes	M	67.6	34.8	910.0	Yes	BAH				08/08/00
04/24/02	1180	CRL	No		40.6	20.5	175.0						
04/25/02	1162	LAS	Yes	M	68.5	34.9	680.0	No	LAS	0.048	0.024	1.000	08/07/01
05/03/02	1167	LAS	Yes		81.3	42.7	1400.0	No	LAS	0.037	0.020	1.571	10/24/01
05/09/02	1181	LBS	No	M	114.5	43.8	1700.0						
05/28/02	1182	WEL	No	M	68.0	34.6	825.0						
06/10/02	1183	BPC	No		63.4	33.7	950.0						
06/17/02	1184	CHB	No		54.6	26.3	410.0						
06/17/02	1185	CHB	No		50.9	25.1	350.0						
06/17/02	1186	CHB	No		48.4	23.5	340.0						
06/25/02	960	DRB	Yes	M	154.0	79.2	11100.0	No	CHC	0.074	0.038	7.108	04/10/98
07/28/02	590	FLC	Yes	F	210.0	108.5	47000.0	Yes	LME	0.046	0.024	11.718	08/09/91
08/07/02	947	BWC	Yes	M	66.0	35.8	660.0	Yes	BWC	0.098	0.054	1.536	07/17/01
08/19/02	1422	MAT	Yes	M	133.3	71.3	7900.0	Yes	CHB	0.070	0.038	5.248	07/19/98
09/04/02		BRS	Yes	F	111.8	57.5	3600.0						
09/09/02	TP	CDS	Yes	M	33.0	16.9	90.0						
09/11/02	1324	LAR	No	M	147.6	80.0	10500.0						
09/26/02	1429	LMB	No	F	214.0	115.8	35000.0						
09/30/02	TP	MM117.5	Yes		75.0								
10/17/02	1325	LMB	No	M	212.0	113.0	30000.0						
10/22/02	1326	BWC	No	M	29.8	15.4	67.0						
10/22/02	1327	BWC	No	M	39.2	20.3	118.0						

Table 3. Cont.

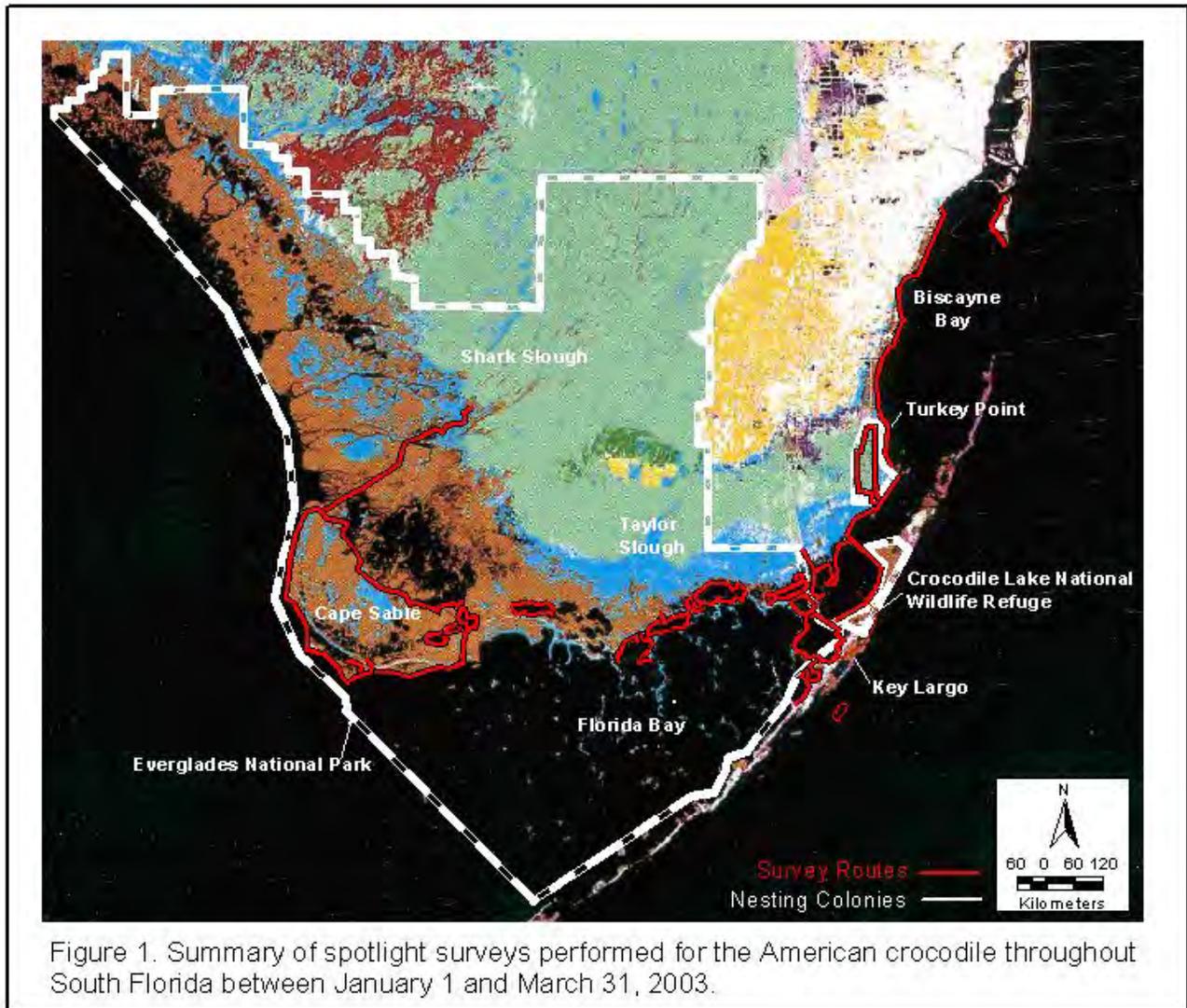
Date	Clip	Location	Recapture	Sex	TL (cm)	SVL (cm)	Mass (g)	Capt. as hatchling	Original Location	TL/day	SVL/day	Mass/day	Original Date
10/22/02	1328	BWC	No	F	38.4	19.5	125.0						
10/22/02	1329	BWC	No	F	46.3	23.9	248.0						
10/22/02	1430	BWC	No		39.0	19.4	130.0						
10/22/02	1415	BWC	Yes		33.0	16.6	75.0	Yes	BWC	0.067	0.036	0.329	08/07/02
12/05/02	1330	CAP	No	M	216.5	116.0	33000.0						
12/11/02	1331	JEF	No	M	293.6	162.0	92000.0						
12/20/02	1332	BRL	No	F	45.2	24.0	317.0						
12/20/02	1333	BRL	No	M	168.0	88.2	16000.0						
12/20/02	1334	BRL	No	M	142.0	76.0	10000.0						
12/20/02	1430	BWC	Yes		42.7	22.0	176.0	No	BWC	0.063	0.044	0.780	10/22/02
12/20/02	1335	BWC	No		44.2	23.0	208.0						
01/02/03	FWC	CRL	Yes	F	43.7	83.5	1560.0	Yes	BAH				08/08/00
01/02/03	1336	CRL	No		35.0	17.7	79.0						
01/02/03	1337	CRL	No	M	42.2	22.0	210.0						
01/29/03	1331	MAB	Yes	M	298.0	161.0		No	JEF	0.090	-0.020		12/11/02
01/29/03	TP	TPC	Yes	F	85.0	44.7	1600.0						
01/29/03	FWC	CRL	Yes	F	81.7	42.7	1450.0	Yes	BAH				08/08/00
01/29/03	1338	TPC	No	F	56.0	30.5	580.0						
02/02/03	1339	CDS	No	M	132.8	70.5							
02/02/03	1340	CDS	No	M	91.1	47.4	2200.0						
02/02/03	TP	CDS	Yes	M	244.3	130.0	48000.0	Yes	B27SXN5	0.063	0.033	13.740	07/15/93
02/09/03	1341	BWS	No	M	157.1	82.5	13000.0						
02/11/03	1342	CRL	No	F	66.0	35.6	800.0						
02/11/03	1343	CRL	No		43.5	22.5	190.0						
02/11/03	1344	CRL	No		43.5	22.5	180.0						

Table 3. Cont.

Date	Clip	Location	Recapture	Sex	TL (cm)	SVL (cm)	Mass (g)	Capt. as hatchling	Original Location	TL/day	SVL/day	Mass/day	Original Date
02/24/03	1446	ECC	No	M	193.0	106.5	24000.0						
02/24/03	1447	ECC	No	F	41.5	23.4	270.0						
02/24/03	1345	BWC	No	F	77.0	40.0	1250.0						
02/24/03	1346	BWC	No		35.5	17.8	85.0						
02/24/03	1106	BWC	Yes	M	78.9	41.2	1440.0	Yes	BWC	0.086	0.045	2.330	07/17/01
02/24/03	1327	BWC	Yes	F	39.5	19.9	162.0	No	BWC	0.002	-0.003	0.352	10/22/02
02/24/03	1329	BWC	Yes	F	48.4	24.4	300.0	No	BWC	0.017	0.004	0.416	10/22/02
02/24/03	940	BWC	Yes	M	85.8	44.6	1800.0	Yes	BWC	0.104	0.052	2.951	07/17/01
02/24/03	1328	BWC	Yes		42.5	21.8	190.0	No	BWC	0.033	0.018	0.520	10/22/02
02/24/03	1430	BWC	Yes		43.2	21.5	170.0	No	BWC	0.034	0.017	0.320	10/22/02
02/25/03	1468	BRL	No	M	171.5	92.5	16400.0						
02/25/03	1469	BRL	No	M	54.6	28.8	535.0						
02/26/03	1347	ECC	No	F	290.0	185.0							
02/26/03	1348	ECC	No	F	152.9	80.4	9500.0						
02/26/03	1349	ECC	No	F	227.0	126.0	48000.0						
02/26/03	1350	ECC	No	M	244.0	135.5	52000.0						
02/26/03	1470	HDC	No	F	295.3	168.0							
02/26/03	1471	HDC	No	M	62.9	33.2	390.0						
02/26/03	1472	HDC	No	M	58.4	32.0	540.0						
02/26/03	1473	ECC	No	F	283.3	151.3							
03/02/03	1351	TAR	No	F	177.5	92.5	18000.0						
03/02/03	1352	TAR	No	F	293.0	152.0							
03/03/03	879	TCI	Yes	F	144.0	75.2	9500.0	Yes	TCI	0.052	0.029	4.599	07/24/97
03/18/03	1353	INT	No	M	44.6	24.4	271.0						
03/18/03	1354	CRL	No		46.2	23.7	262.0						

Table 4. Absolute growth rates (cm/day total length) and minimum cumulative survival (expressed as % of hatchlings tagged that survived for 12 months) for crocodiles hatched on North Key Largo, Turkey Point, and Everglades National Park. Data are from Moler 1992, Brandt et al. 1995, Mazzotti 1999, Brandt and Mazzotti in prep.)

Location	Growth (range) Period (N)	Minimum Survival (alive/marked) Period
Turkey Point	0.146 (0.026-0.268) 1978-1993 (153)	3.6 (22/603) 1978-1995
Crocodile Lake NWR	0.137 (0.117-0.157) 1980-1990 (95)	20.4 (70/343) 1979-1988
Everglades National Park	0.101 (0.013-0.332) 1987-1996 (5)	1.5 (13/853) 1978-1995



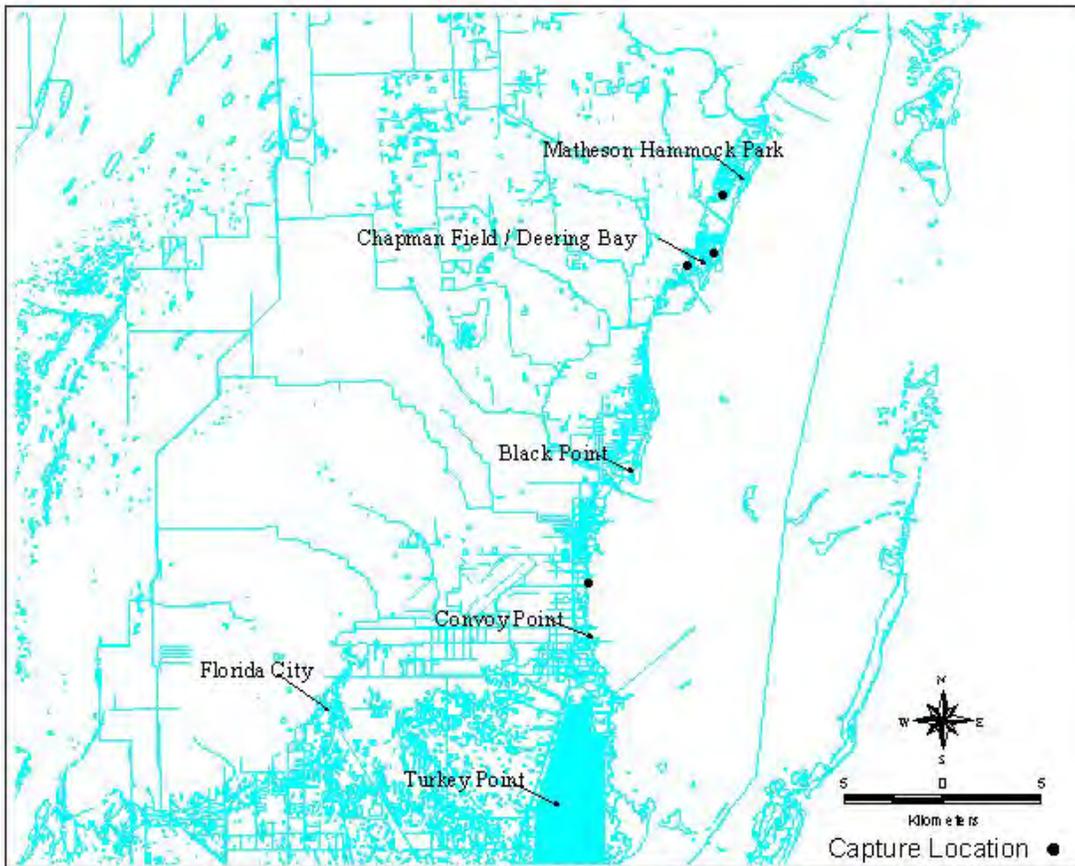


Figure 2. Areas important to crocodiles in Biscayne Bay.

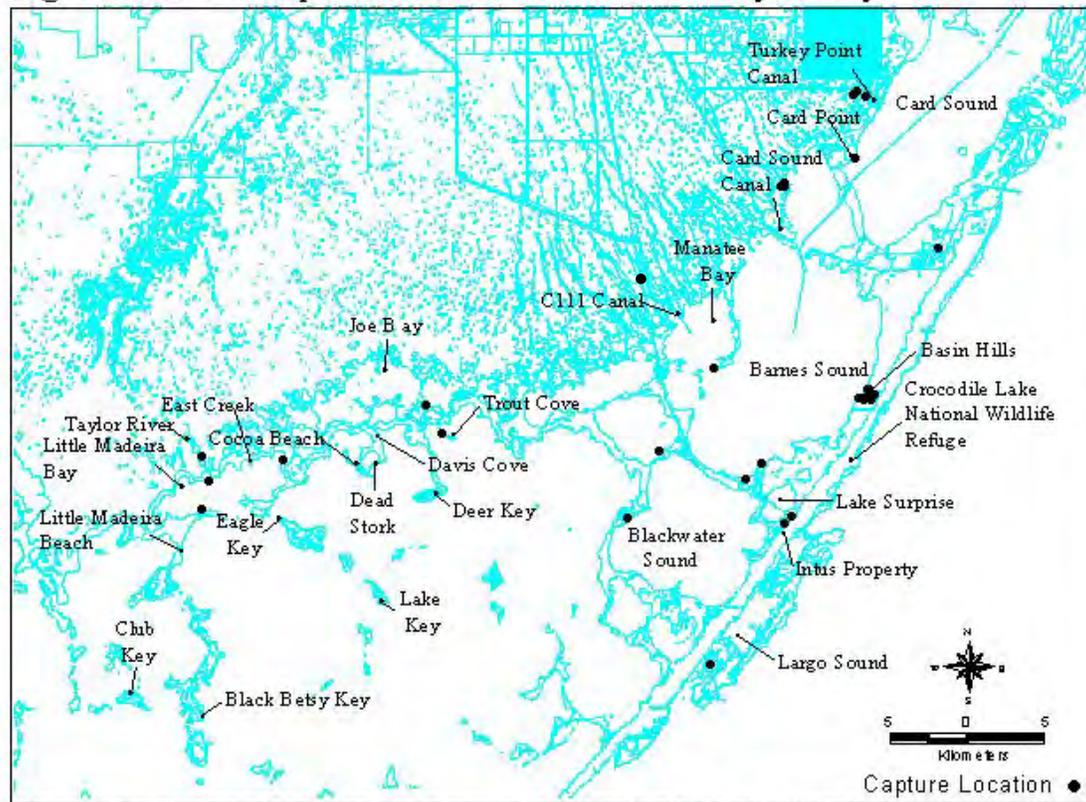


Figure 3. Areas important to crocodiles in NE Florida Bay.

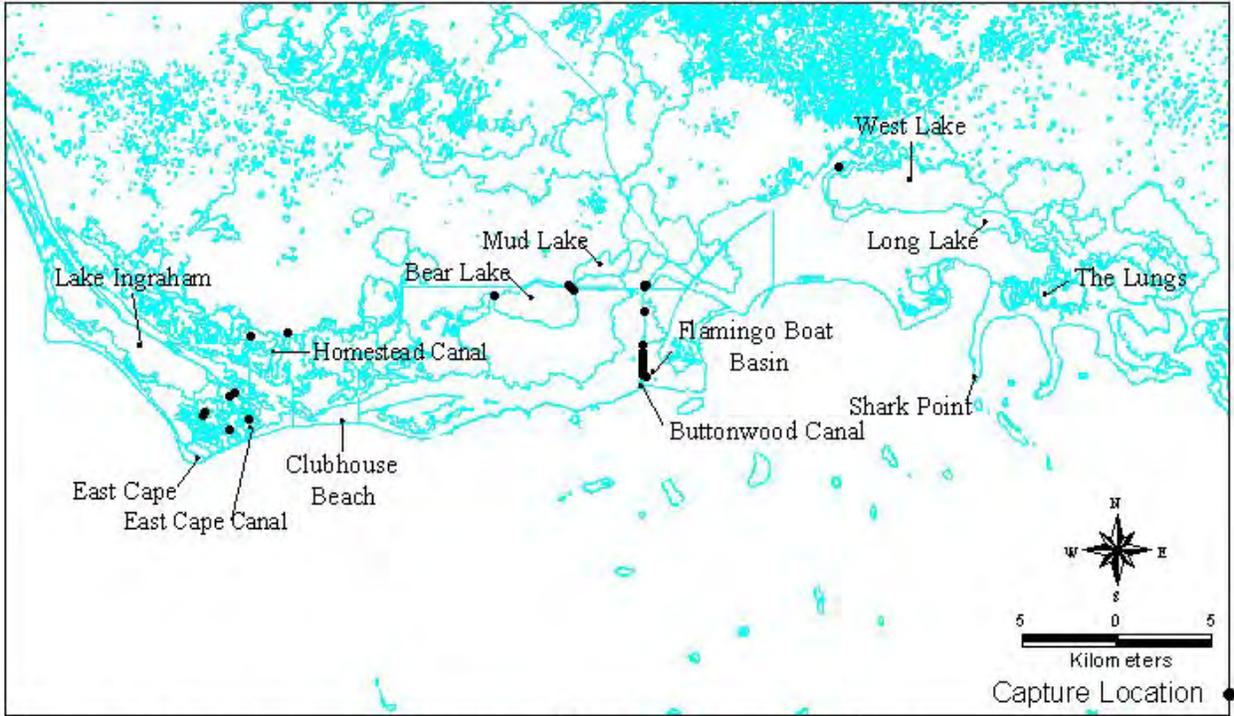


Figure 4. Areas important to crocodiles in greater Flamingo.

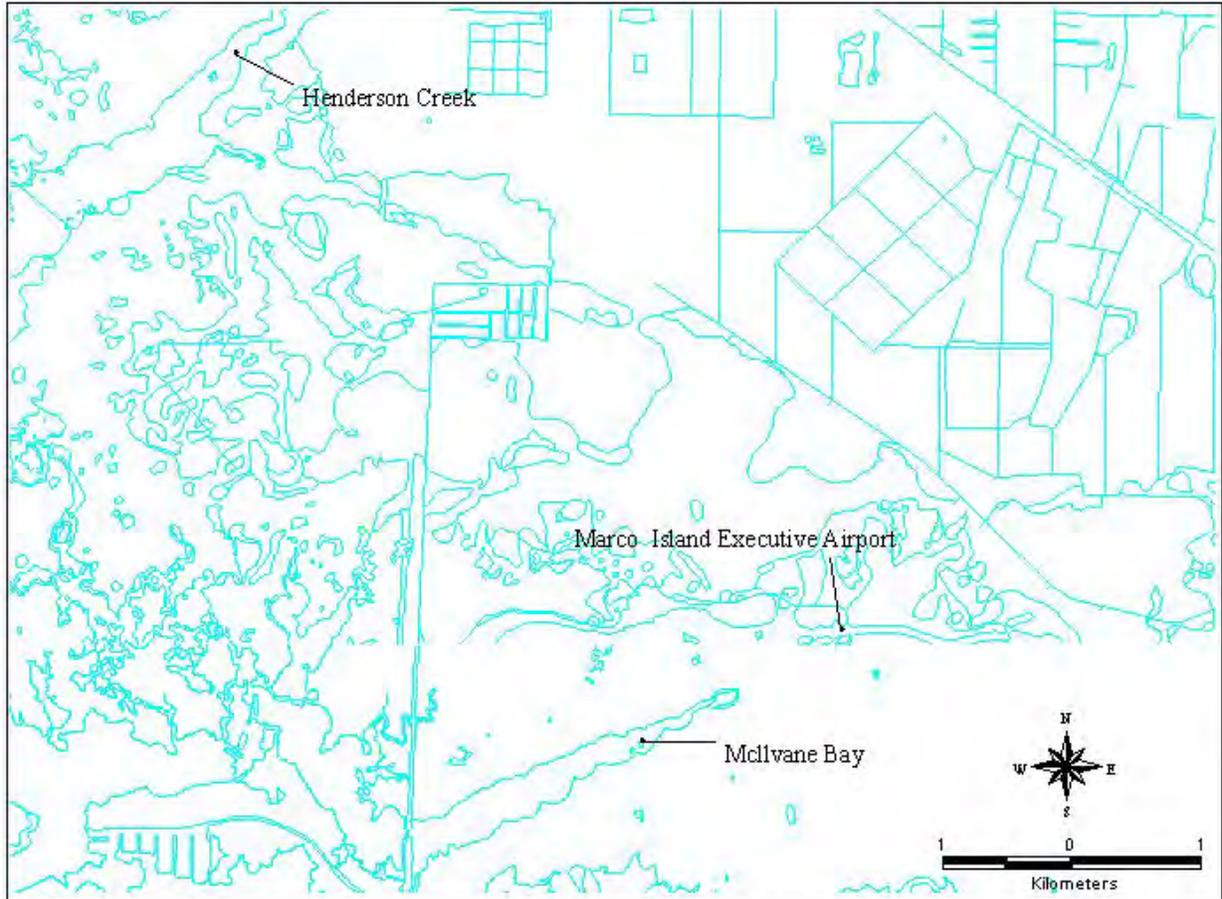


Figure 5. Areas important to crocodiles in Rookery Bay.