Status of the Snail Kite in Florida: 1981–1985

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THE SNAIL KITE (*ROSTRHAMUS SOciabilis*) is a medium-sized raptor that feeds primarily on the fresh water Apple Snail *(Pomacea paludosa)* in open marsh-slough wetlands in central and southern Florida (Sykes 1978; Snyder and Kale 1983), Cuba, eastern Central America and South America (Bent 1961). The Florida Snail Kite (*R. s. plumbeus)* has been listed as endangered by the U.S. Fish and Wildlife Service since 1966 and by the State of Florida since 1977, owing to its restricted range and low population levels.

Although data on Snail Kite numbers are lacking for the late 1800s and early 1900s, Howell (1932) indicated that they were relatively common (*e.g.*, ". . . scattered flocks of a hundred or more . . .") during the 1920s. By the 1940s, Sprunt (1945) believed there were only 50–100 kites left, with significant decreases at Lake Okeechobee and the headwaters of the St. Johns River. Later, Sprunt (1954) estimated about 50–75 kites for the early 1950s. An incomplete Snail Kite survey in the mid-1960s by Stieglitz and Thompson (1967) yielded only 21 kites in three counties. Beginning in 1969, Paul W. Sykes of the U.S. Fish and Wildlife Service developed and carried out systematic annual kite censuses through 1980 (Sykes 1979, 1983a, 1983b, 1984). Sykes' survey results indicated a population of at least 654 kites in six counties by 1980.

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In 1981, the Florida Game and Fresh Water Fish Commission assumed the lead agency role in conducting the annual Snail Kite Survey. Because a recovery effort is judged in terms of population trends, the Snail Kite Survey was designated as the highest priority by the Snail Kite Recovery Team (USF&WS 1983), and continues as a high priority today. Here we present the results of the Snail Kite Surveys during 1981–1985, and compare these results with historic kite population trends in Florida.

STUDY AREA

Several impoundments on the headwaters of the St. Johns River (St. Johns Reservoir, Cloud Lake, Strazzulla Reservoir, Fellsmere Marsh), Savannas County Park, lakes Kissimmee, Tohopekaliga, and Okeechobee, Conservation Area (Loxahatchee National Wildlife Refuge), 2A, 2B, 3A, 3B, and the northern and eastern edges of Everglades National Park were surveyed in November–December 1981–1985 (Fig. 1). The water conservation areas are diked wetlands that represent the historic slough ecosystem that once was continuous from Lake Okeechobee to Everglades National Park.

METHODS

Our Snail Kite Surveys were made by airboat and car (Sykes 1979, 1982). The preliminary census technique employed parallel transects about 0.25–0.33 mile apart *via* airboat to provide a baseline count of the number of Snail Kites per region. Higher counts (>10 kites) in a concentrated subregion usually indicated the presence of an evening roost. These roosts are often used year after year and provide a convenient check on the accuracy of the transect counts. By positioning ourselves two to three hours before sunset, the kites were easily counted as they flew into these communal roosts. Generally, the total for the roost counts exceeded the transect counts, as it is probably impossible to observe every kite *via* airboat transect. This was especially true in the larger wetlands or in tall, dense vegetation (*e.g.*, Lake Okeechobee, Conservation Areas 2B and 3A).

Sykes (*pers. comm.*) usually conducted the U.S. Fish and Wildlife Service Snail Kite Survey by himself, with occasional volunteer assistance, over a three-to-four week period. The Florida Game and Fresh Water Fish Commission Snail Kite Survey was condensed into two-to-three weeks *via* the use of two-to-three full-time personnel, one airboat and the cooperation of the Okeechobee and Ft. Lauderdale field offices, which provided personnel and airboats. This assistance provided a more intense surveying and better coverage of each region. In recent years, some areas were covered by private or other agency personnel (*i.e.*, Savannas, Loxahatchee National Wildlife Refuge and Everglades National Park). This further allowed us to concentrate our effort in the recent kite high-use wetlands. Finally, larger or difficult to observe roost sites were counted by a minimum of two observers from two different vantage points and counts were coordinated by radios. We usually covered three or four kite roosts per evening, which proved extremely efficient.

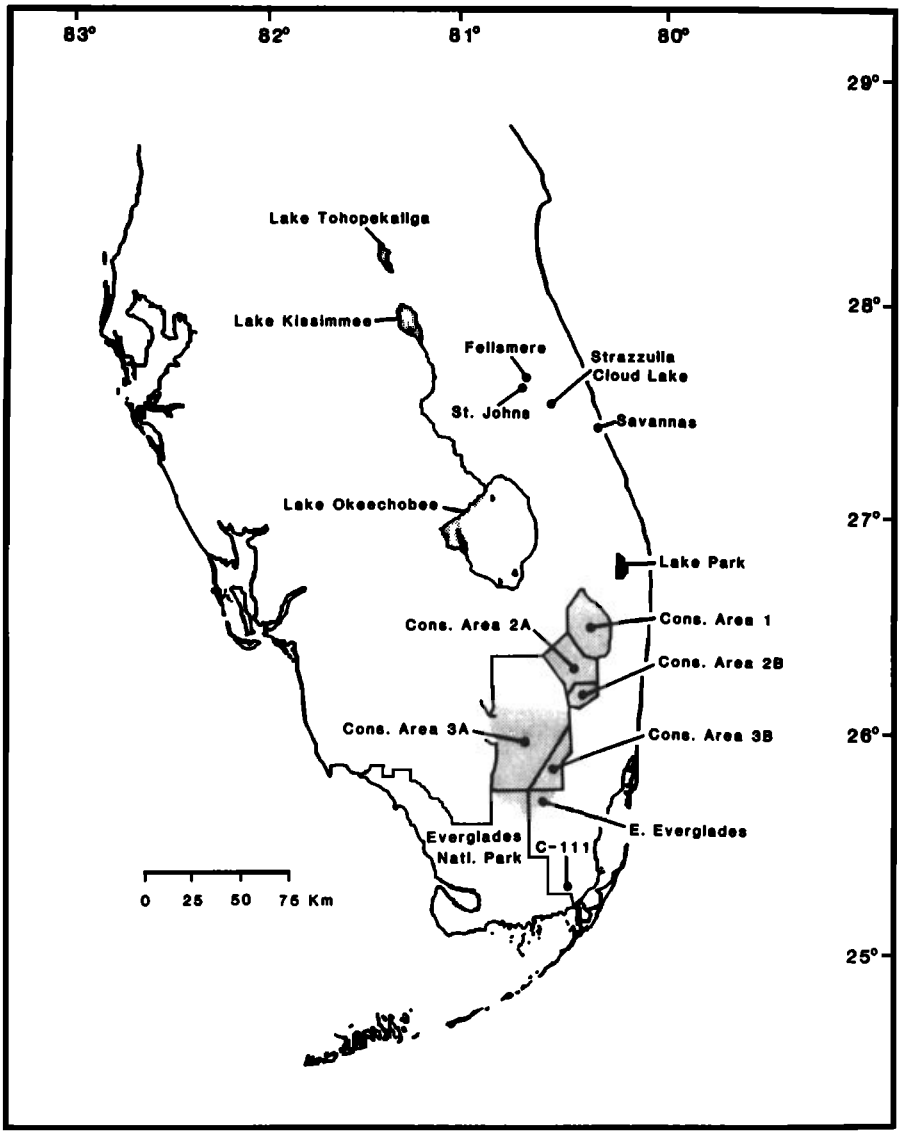

Figure 1. *Map of Florida showing the areas censused in 1981–1985.*

Water level data were derived from the U.S. Army Corps of Engineers or South Florida Water Management District. All data analyses and figure plots were made using computer procedures on SAS (1985).

RESULTS

The total Snail Kite Survey counts for 1981–1985 are shown in Figure 2 and listed by region in Table 1. The 1981 total count of 109 Snail Kites was only 16.7% of the U.S. Fish and Wildlife Service Snail Kite Survey count of 654 in 1980, but there was an extended drought in 1981. Water levels were so low during the 1981 Snail Kite Survey that little of the Lake Okeechobee marsh was inundated (Fig. 3). Water

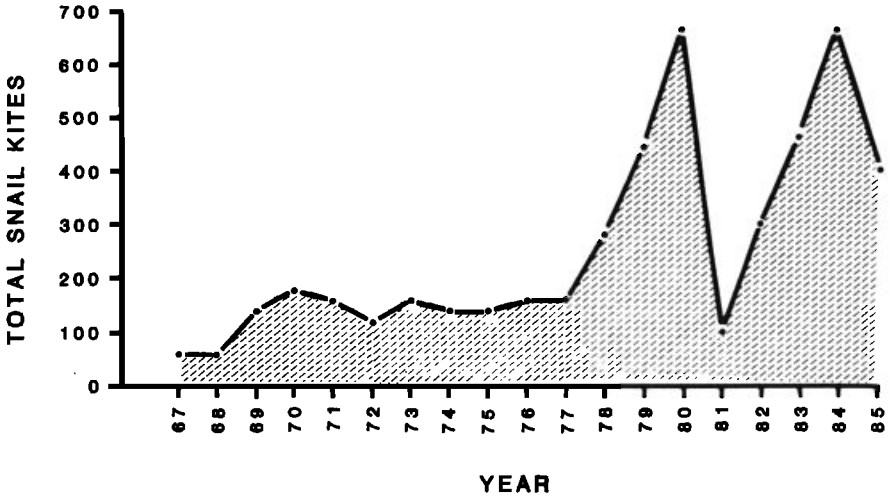

Figure 2. Total Snail Kite Survey counts: the U.S. Fish and Wildlife Service censuses were during 1967–1980 and the Florida Game and Fresh Water Fish Commission censuses were during 1981–1985.

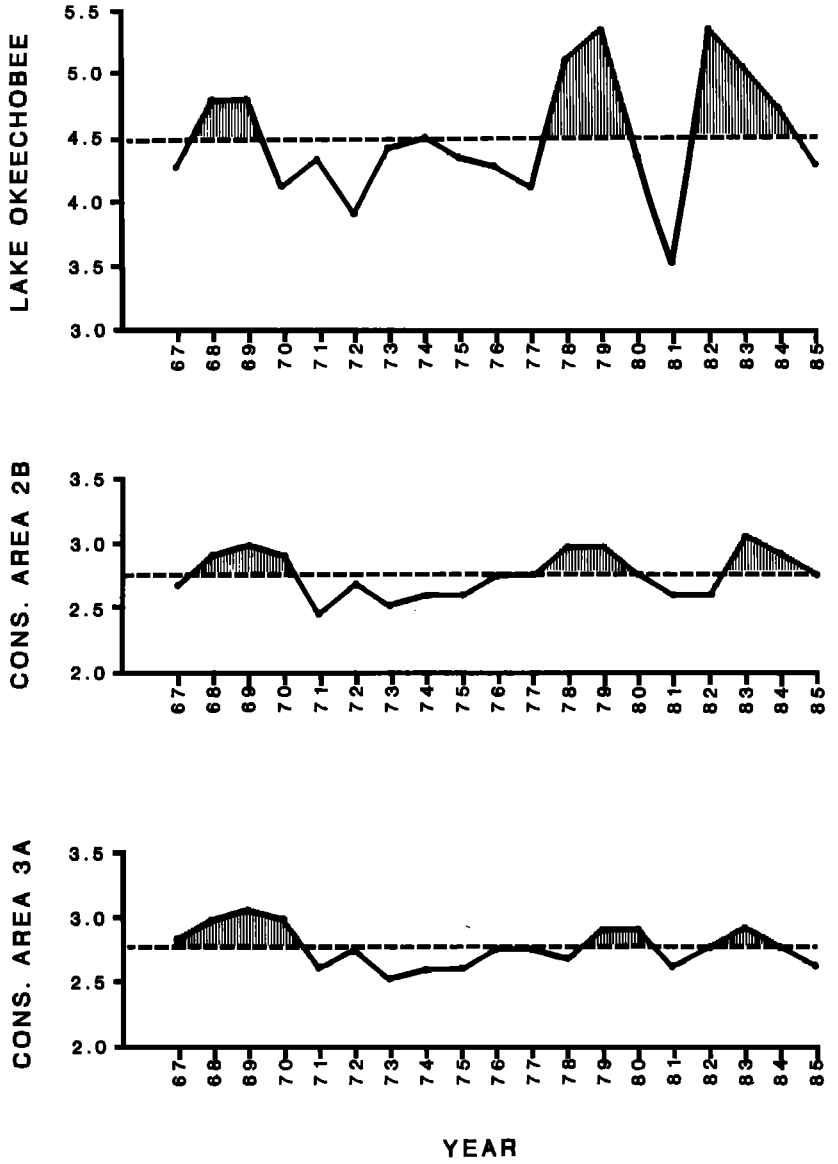

Figure 3. Mean annual water levels (meters above m.s.l.) for Lake Okeechobee, Conservation Areas 2B and 3A. The horizontal line represents the mean water levels during 1967–1985.

also was restricted to the southern half of Conservation Area 3A. Kites were observed in high numbers at lakes Kissimmee and Tohopekaliga suggesting the birds had dispersed from their traditional wetlands (Table 1).

From 1982 through 1984 an increase in the Snail Kite counts occurred statewide and in most regions, especially in Lake Okeechobee and Conservation Areas 2B and 3A (Fig. 4). However, the number of kites observed at lakes Kissimmee and Tohopekaliga decreased, probably in response to improved water and snail conditions elsewhere.

The 1984 total count of 668 kites represented a recent historic high (Table 1, Figs. 2 and 4). It appears the kites concentrated in this large marsh prior to the 1984–1985 drought.

With the 1985 Snail Kite Survey, drought conditions again prevailed (Fig. 3). The resulting decrease in total Snail Kite numbers for 1985 (N = 407) was 39.1% less than the total observed in 1984 (Fig. 2). Lake Okeechobee was relatively stable (Fig. 4); however, kites were observed using the Moonshine Bay region in large numbers (N = 83) for the first time during the study period. A dramatic decrease occurred in both Conservation Areas 2B and 3A (Table 1, Fig. 4). Whereas water levels were adequate in Conservation Areas 2B and 3A during the 1985 Snail Kite Survey, earlier these wetlands were nearly dry. This probably affected kite use of these areas during winter 1985. The 24 kites observed in Conservation Area 3B represent a high count for this wetland. In addition, record high numbers of kites were observed at lakes Kissimmee and Tohopekaliga (Table 1, Fig. 3).

The 1985 Snail Kite Surveys' total value is similar to the 1983 count of 437 kites. In 1983, however, 92.2% of the kites were observed in Conservation Area 3A as compared to 41.8% in 1985. In addition, kites generally returned to the roosts in Conservation Area 3A much later in the day, suggesting farther flight distances to foraging areas.

DISCUSSION

It is not accurately known whether the decrease in total Snail Kite numbers observed in the droughts of 1981 and 1985 was the result of kites dispersing from their normal censused range, increased mortality, decreased productivity, or a combination of these factors. However, the shift in use of lakes Kis-

Table 1. Total and regional wetland results from annual Snail Kite Surveys.

Regional wetland	Year[a,b]																		
	1967	*1968*	*1969*	*1970*	*1971*	*1972*	*1973*	*1974*	*1975*	*1976*	*1977*	*1978*	*1979*	*1980*	*1981*	*1982*	*1983*	*1984*	*1985*
Tohopekaliga															5	10	0	0	17
Kissimmee			0	0	0	0	1	0	0	0	0	0	0	1	5	27	15	4	38
St. Johns			3	0	10	19	12	15	5	4	2	2	0	0	1	3	0	0	0
Cloud Lake						6	13	1	2	0	0	0	0	0	2	0	0	0	0
Strazzulla						4	7	5	2	0	1	0	0	0	0	0	0	0	0
Savannas								1	0	0	4	3	3	1	0	2	0	0	0
Okeechobee	5	6	3	5	31	21	42	41	39	51	48	46	114	214	2	18	5	92	108
Lake Park				2	0	0	0	0	1	3	6	0	0	0	0	1	0	2	1
Cons. Area 1	0	0	31	45	6	4	21	23	20	6	5	3	1	0	0	3	0	3	4
Cons. Area 2A	39	50	91	38	43	7	0	2	7	5	2	0	0	1	1	1	0	2	1
Cons. Area 2B	0	0	0	20	20	0	0	0	0	0	0	6	41	115	1	4	7	88	16
Cons. Area 3A	6	2	1	65	44	53	63	48	62	84	100	212	273	305	78	227	403	462	170
Cons. Area 3B	0	0	0	1	0	0	0	0	0	0	0	0	4	0	13	2	6	2	24
Ev. Nat. Pk.	8	0	9	13	14	0	0	0	1	0	0	3	3	15	1	4	15	2	0
E. Everglades	0	0	0	0	0	0	0	0	0	0	0	0	10	1	0	0	0	1	0
C-111														0	0	0	0	0	0
Miscellaneous															0	0	1	12	16
Total	58	58	138	189	168	114	159	136	139	153	168	275	449	654	109	302	452	668	407

[a] *Censuses from 1967–1980 were conducted by the USF&WS (Sykes 1983a, 1983b).* [b] *Censuses from 1981–1985 were conducted by the FG&FWFC.*

simmee and Tohopekaliga (Table 1) and other wetlands indicate that dispersal is an important phenomenon.

Water related ecological parameters can probably explain, in large part, the Snail Kite Survey counts. A comparison of Figures 3 and 4 reveal that subregion counts fluctuate with mean annual water levels in these marshes. Except for the post-1969 hydrocycle, greater numbers of Snail Kites were observed after peak water levels. With an extreme drawdown as occurred on Lake Okeechobee in 1981, due to water withdrawal prior to the hurricane season and to supply fresh water to the southeast Florida population centers, kites soon abandoned the region. Beissinger's (1986) analyses revealed that lake levels declined throughout this century and periods of wet conditions have become shortened by management operations. At both Conservation Areas 2B and 3A, the greater Snail Kite Survey counts were associated during peak water levels (1979), but especially one year later (1980 and 1984) as the water depth decreased in these wetlands. However, whereas Conservation Area 2B exhibited fewer kites when water levels were low in 1982–1983, Conservation Area 3A possessed fewer kites when water levels were low in 1981 and 1985. Whether these peak numbers of kites are a response to larger snail populations or increased snail availability owing to a drop in water levels is unknown.

The large fluctuations in region and total counts make the Snail Kite Sur-

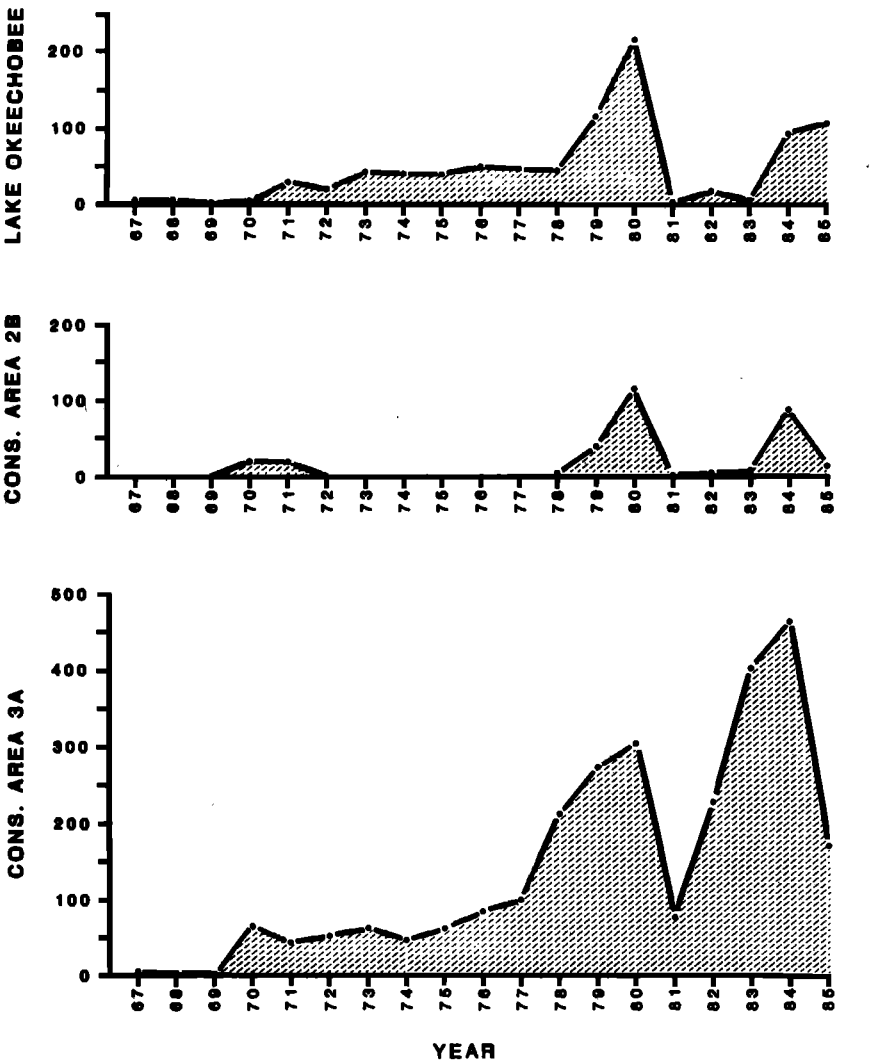

Figure 4. *Snail Kite Survey counts for Lake Okeechobee, Conservation Areas 2B and 3A. The U.S. Fish and Wildlife Service censuses were during 1967–1980 and the Florida Game and Fresh Water Fish Commission censuses were during 1981–1985.*

Photo/Helen Cruickshank/VIREO (C03/11/049)

Table 2. Annual mean results of Snail Kite Surveys by region.

	U.S. Fish & Wildlife Service: 1967–1980[a]			*Florida Game & Fresh Water Fish Commission: 1980–1985*		
Wetland	*Mean*	*Range*	*C.V.*[b]	*Mean*	*Range*	*C.V.*[b]
Tohopekaliga	N.S.[c]			6.4	0–17	113.0
Kissimmee	0.2	0–1	233.6	17.8	4–38	82.1
St. Johns	6.0	0–19	107.3	0.8	0–3	163.0
Cloud Lake	2.4	0–13	180.8	0.4	0–2	223.6
Strazzulla	2.1	0–7	124.0	0	0	
Savannas	1.7	0–4	93.5	0.4	0–2	223.6
Okeechobee	47.6	3–214	117.5	45.0	2–108	113.1
Lake Park	1.1	0–6	176.1	2.8	0–13	204.2
Cons. Area 1	11.8	0–45	118.5	2.0	0–4	93.5
Cons. Area 2A	20.4	0–91	135.7	1.0	0–2	70.7
Cons. Area 2B	14.4	0–115	217.7	23.2	1–88	158.0
Cons. Area 3A	94.1	1–305	104.0	268.0	78–462	59.9
Cons. Area 3B	0.4	0–4	302.9	9.4	2–24	99.1
Ev. Nat. Pk	4.7	0–15	123.8	4.4	0–15	138.8
E. Everglades	0.8	0–10	339.2	0.2	0–1	223.6
C-111	0	0		0	0	

[a] *Data from Sykes 1983a, 1983b.*
[b] *Coefficient of variation expressed as percent.*
[c] *Not surveyed.*

veys difficult to use as an index (Table 2). Because of drought related dispersal and inability to census every marsh in central and southern Florida, the total Snail Kite population can never be entirely counted. The Snail Kite Survey is not a census of the total population, but more appropriately an index of kite use of the wetlands surveyed, especially during favorable water or snail conditions (*e.g.*, 1980 and 1984).

Conservation Area 3A possessed the largest mean value of 268 Snail Kites or 69.4% of the total during the Florida Game and Fresh Water Fish Commission 1981–1985 Snail Kite Surveys. However, the large coefficient of variation (70–223%) for the remaining regions makes the counts in these wetlands difficult to interpret.

Whereas the total number of Snail Kites remained relatively constant from 1967–1977, the increases during 1977–1980 and 1981–1984 were similar (Fig. 2). It appears that the 1981 drought was more severe and caused a greater dispersal from normal habitat than 1985, but was not as detrimental as the 1950–1965 period when there were probably fewer than 40 kites remaining (Sykes 1983a).

There has been a shift in the range of the Snail Kite population from the 1967–1980 to the 1981–1985 periods (Tables 1, 2). Several regions are no longer consistently used by kites while the importance of other regions has increased. The average percent of the total Snail Kite Survey count for Lake Okeechobee was 20.1% during 1967–1980 and 9.8% during 1981–1985. Again, water levels probably affect kite use of a wetland: mean annual water levels at Lake Okeechobee exhibit greater fluctuation than both conservation Area 2B or 3A during 1967–1985. It is not surprising that the rescheduling of Lake Okeechobee water levels from the 4.4–4.9 meter range (pre-1978) to 4.7–5.3 meters (post-1977) created more marsh area and kite foraging habitat and was associated with the increase in kite numbers (Fig. 4). Though Sykes (1983a) recommended Lake Okeechobee water levels be maintained within a range of 4–5 meters, the drawdown below 4 meters during 1980–1981 (Fig. 3) again resulted in kite dispersal from the lake (Fig. 4). Likewise, below mean water levels in both Conservation Areas 2B and 3A during 1981–1982 (Fig. 3) resulted in fewer kites using these wetlands (Fig. 4). Also associated with a se-

vere draw down of Lake Okeechobee water levels during 1980–1981, the marsh region west of the Old Moore Haven Canal no longer supports adequate foraging habitat due to the invasion of dense cattail (*Typha* sp.) and torpedograss (*Panicum repens*). Further, if most of the kite population was accurately censused during 1967–1977, the shift to recent high-use areas is correlated with a rather rapid population increase in the short period of 1978–1980. This concentration of kite distribution has resulted in boom-or-bust population dynamics exhibited by the 1978–1980 and 1981–1985 cycles (Fig. 2).

Variation in regional and total counts for the two periods are equally high, but the former Snail Kite Survey period tends to exhibit greater subregion coefficient of variation (Table 2). Part of the reason for this is because the Snail Kites were in the process of abandoning the above mentioned sites and shifting to other wetlands and probably expanding their population size during 1967–1980. By 1981–1985, the single major shift was to concentrate their use of Conservation Area 3A and probably stabilize their population size to available foraging habitat and the snail resource. Snail Kites also recolonized lakes Tohopekaliga and Kissimmee during this period.

POSTSCRIPT

In a slightly modified census, 564 Snail Kites were observed during the 1986 Snail Kite Survey. The 1986 total is greater than the mean value of 383 kites for the five-year period of 1981–1985, but lower than the high count of 668 kites in 1984. Most of the Snail Kites (85.6%) still were seen in the wetlands of Lake Okeechobee and Conservation Areas 2B and 3A.

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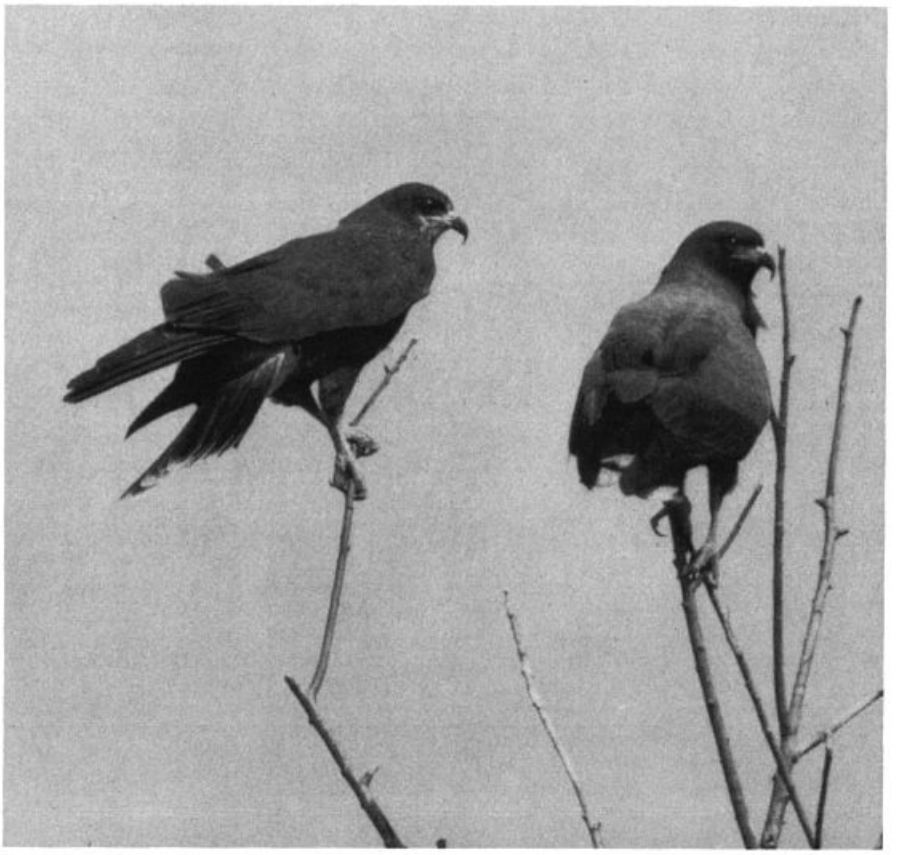

Photo/Helen Cruickshank/VIREO (C03/99/062)

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