APPLE-SNAILS AND LIMPKINS AT WAKULLA SPRINGS
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Limpkins were recorded on the Wakulla River in every Christmas Bird Count since 1949. Typically, between 1979 and 1995 there have been 6-8 breeding pairs within the tour boat section (pers. obs.), and any Christmas count would document 12-25 birds. For the 9 years, 1987-95, 8 years had double-digit counts, and the 9 years averaged 19 birds. However, from 1996-2000 the counts dropped to 2, 4, 9, 1, and 1, and have been 0 from 1999-2018). See graph below for the 1947-99 period of record.

The park conducts its own wildlife surveys in July/August and again in Jan/Feb. In the winter counts 1991-1995, 4 of 5 counts were double-digit, and the 5 counts averaged 14 birds. However, in the years 1996-1999, the counts dropped to 2, 4, 3, and 5, and have been 0 since then (to 2018). In the summer counts, 1989-1994, all 6 counts were double-digit, averaging 17 birds. However, in the years 1995-1999, the counts have been 6, 3, 9, 6, and 4, and have been 0 since then (to 2017), except for one individual in 2002. That one individual is representative of occasional limpkin visits over the years, none of which stayed for very long. Combined, the Christmas counts and the park counts indicate that a significant population decline occurred around 1995-1996. Prior to that, the counts did not seem out of the ordinary, given expected natural variability.

About the same time the Limpkins were disappearing, the staff noticed that apple-snail eggs were no longer appearing on the emergent vegetation, but no one reported a snail egg reduction before the Limpkin decline was reported.

Possible reasons for the apple-snail and the Limpkin decline include hydrilla and nitrates, which are discussed below.

Hydrilla was first discovered in April 1997 and at that time it was fairly restricted to patchy areas at the headspring and a little distance downstream. By that time, the Limpkin counts had already been single digits for 2 years. It does not seem possible that the apple-snail and Limpkin populations could be so quickly affected by a relatively small amount of hydrilla coverage. Also, as many know, Limpkins and hydrilla continue to co-exist in relative abundance as close as the Wacissa River.

While hydrilla doesn't seem to be the cause of the decline, it may be having an effect on the recovery. I've speculated that apple-snails may have a difficult time in the water column when it's full of hydrilla. They do regularly rise to breath and then drop back down to forage, so areas socked in with hydrilla may no longer be usable.

Nitrates have clearly increased at Wakulla Springs and are blamed for the explosion of hydrilla and algae. The Florida Springs Initiative funded a study by Dr. Phil Darby (a well-published apple-snail expert), and to quote from his resulting report: "Our [experimental laboratory] data indicate that the nitrate concentrations measured in impacted springs of Florida do not directly affect adult or juvenile [apple-]snails. Our field surveys corroborate the laboratory evidence."

A third possible explanation of the apple-snail and Limpkin decline is unusual weather. Snail egg clutches are deposited at Wakulla Springs above the water starting in mid-April; by May there are a good number; and they seem to peak in numbers in July - August. Hatching has been reported to be at 16-18 days.

The summer of 1994 was especially wet and stormy. [For the purposes of this discussion, "normal" is characterized by rainfall during the 5 years 1995-1999. In those 5 years, average monthly rainfall was 5.31 in. per month.] May 1994 was below normal (1.99 in), which may have resulted in egg clutches

being deposited lower than usual on emergent surfaces. June rainfall was 2 1/2 times normal at 13.1 in. July was over 4 times normal at 22.65 in., and included an enduring T.S. Alberta which dropped 1 in. of rain on 7/1; 2 in. on 7/2; and 6 in. on 7/3 at the Tallahassee airport. On top of that, August was almost 2 1/2 times above normal at 12.78 in. for the month, and included T. S. Beryl which dropped 2 in. on 8/15 and 5.75 in. on 8/16. Rain was also higher than normal in Sept. (7.64 in.) and Oct. (9.98 in.). This wet summer resulted in the glass-bottom boat not running on a single day from July 1994 through April 1995, for a total of a then-record 333 consecutive days.

Regarding river stage, levels are read from a dock gage. Looking at other years, the readings were usually in the 1-2 ft. range. On 6/21 the water rose from 1.8 ft. to 2.7 ft., and on 6/29 to 3.5 ft. Then in July the water rose again and stayed between 3.5 ft. and 4.4 ft. for the next 14 days, and varied between 3.2 ft. and 3.9 ft. (mostly at the higher end of the range) until Aug 16 when the reading jumped to 6.0+ ft. and the park was closed due to TS Beryl flooding. It stayed above 6 ft. until Sept. 7, then fell some, but remained high through mid-Nov.

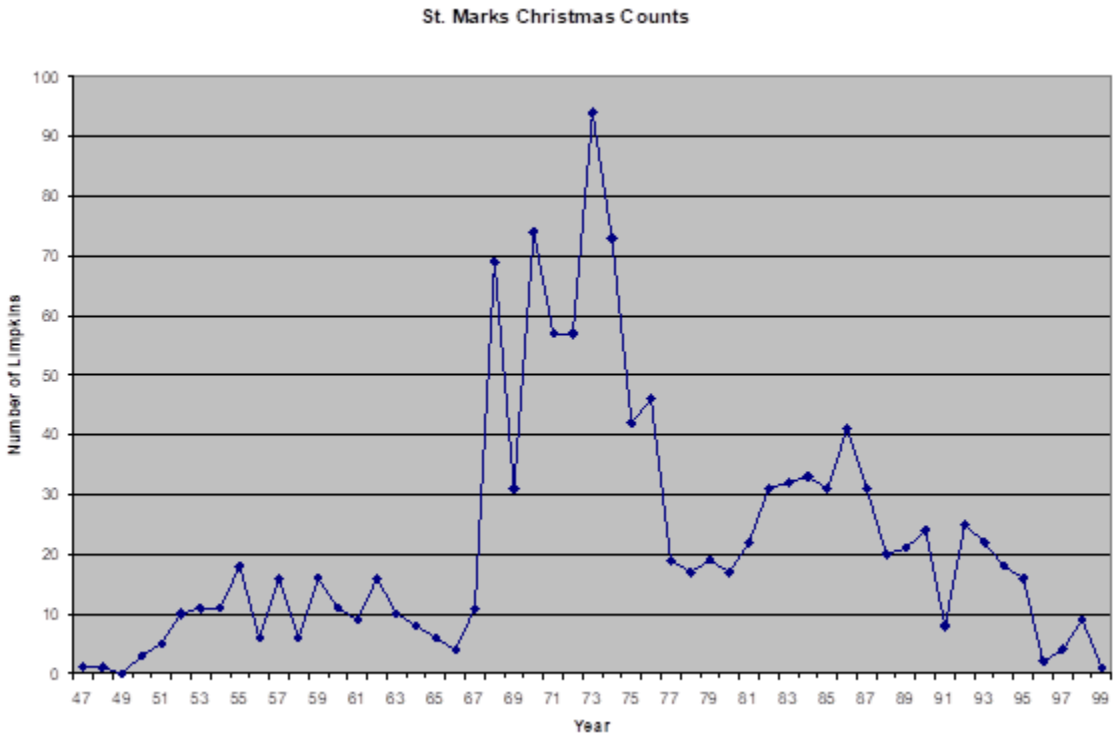
I speculate that most of the egg clutches deposited by female snails on emergent flexible vegetation were simply pushed over by the river's high velocity and stage and were drowned, and that most eggs deposited on cypress knees or other solid objects were simply inundated by the high river stage. Wind and driving rain probably also destroyed higher eggs. I have no statistics showing the range of elevations that snail eggs are typically laid above the water at Wakulla Springs, but my impression is that these 1994 water levels would inundate most or all of them.

Phil Darby has demonstrated that apple-snails only live one year, thus making each summer's recruitment critical for replacing the population.

If the flooding wiped out most of the snail clutches of that summer, it would account for the drop in Limpkins first noticed the following year. Limpkins could continue to eat adult snails until they died off naturally at about 1 year of age, and then freshwater mussels, possibly accounting for the trailing off of resident Limpkins until their eventual disappearance in 2000. No monitoring of mussels has occurred, although the exploding hydrilla since 1997 may have affected their abundance.

Of course, there is still a potential that the disappearance of apple-snails from Wakulla Springs is due to an unknown factor or event.

Some of us have speculated that the tiny population that did survive (a few clutches were seen each summer after the Limpkin disappearance), along with the 3,000 or so Jess VanDyke re-introduced from the Wacissa River up until 2007, may be having a hard time overcoming predation pressure because of their low numbers. In the past when population numbers were huge, the predation pressure could have been easily overcome by high reproduction rates. Staff started egg cluster counts in 2006 (usually once per month May-September). In summer 2011 the count peaked at 2,519, but has been less than 1,000 each summer from 2012-2017.



Notes on graph:

1. Henry Stevenson reported that there was no canoe (i.e., no observations downstream from the boat tour) in 1947-48, ’55, ‘60-61, and ‘64-67. There was a canoe in ’49-54, and ’56-59. It is unknown for ’62-63.

2. The 1946 count was actually zero, not as graphed.

3. The low counts for the first 5 years of the count are unexplained. The next 16 years may represent the pre-dredging “normal”.

4. Carl Buchheister reported that the river dredging took place over two years, 1968-69.

5. The dredging resulted in a population surge for at least 9 years. The Bryan research (1978-1990) was the result of the observation that the limpkin population was crashing, but the observers (the Bubas and Buchheisters) only observed the population starting in 1968 and may have thought the “boom years” to be typical.

6. Betty Ingalls studied the limpkins from late January to early July in 1970 and estimated that there were 40 at that time.

7. Hydrilla was discovered in April 1997, after the rapid decline.

8. Since 1999, the counts have been zero. Update – the 2019-20 Christmas count had one individual.