

St. Andrew Bay
RESOURCE MANAGEMENT ASSOCIATION
Post Office Box 15028
Panama City, Florida 32406
www.sabrma.org

6 November 2019

Kennard Watson, Turtle Watch Director
St. Andrew Bay Resource Management Association
6509 Palm Court
Panama City Beach, Florida 32408

Dan Rowe, Executive Director
Bay County Tourist Development Council
17001 Panama City Beach Parkway
Panama City Beach, Florida 32417

Dear Mr. Rowe:

This letter provides results for the 2019 sea turtle nesting season on Panama City Beach. The information is submitted by the Turtle Watch program of the St. Andrew Bay Resource Management Association to fulfill requirements of our contract with the Bay County Tourist Development Council. Highlights of the 2019 season include:

- Active nesting season with 47 nests and 40 non-nesting crawls made by loggerhead, green, and leatherback turtles. These numbers reflect a recent trend of increased nesting and species diversity.
- High rates of hatchlings disoriented by lights from beachfront development, affecting 70% of turtles emerging from nests at night.
- Reduced hatching success due to Tropical Storm Barry which flooded over two-thirds of the nests.
- Four nesting turtles, including one leatherback, encountered during nighttime enforcement of the Leave No Trace ordinance.
- Public nest excavations attended by 1899 residents and tourists.
- Active seabird nesting season for state-threatened least terns and black skimmers, which face many of the same threats as sea turtles on our beach. Turtle Watch surveyors coordinated with state biologists and volunteers monitoring posted seabird nesting sites.

Major results are summarized below. Additional reports and data forms have been submitted to the Florida Fish and Wildlife Conservation Commission (FWC) as part of reporting requirements under our State Permit No. 038. These documents are available upon request.

Survey Area and Nourishment Activities. Turtle Watch monitors sea turtle activity along 17.5 miles of Gulf beach between St. Andrews State Park and Camp Helen State Park. Portions of the survey area were nourished in 2017 with sand pumped onto the beach from an off-shore source. Figure 1 is a map of the

survey area showing the four construction sites totaling 4.13 miles located at Treasure Island Condo, M.B. Miller County Pier, Russell-Fields City Pier, and Pinnacle Port Condo.

Nest Identification and Relocation. All nests laid within the four nourished sections were left in place per FWC guidelines. FWC also specified “control areas” adjacent to each nourished section where nests were left in place and could not be moved for any reason. These areas have equivalent total length to the nourished beach and are shown in Figure 1. Nests found outside of the nourished and control areas were moved only if near a storm drain or below the daily high tide line. With regard to nest identification, this season we received permission from FWC to “verify” twenty loggerhead nests to maintain proficiency in egg finding, an important skill when nests must be moved during nourishment projects. Verification involves hand digging to locate the clutch when the nest is initially found. Other nests were identified solely from the physical evidence left in the sand by the nesting turtle (body pit and sand mound created by flippers).

Nesting and Hatchling Production. We found 47 nests and 40 non-nesting emergences (false crawls) during 2019. Of the 47 nests, 39 were made by threatened loggerheads, 4 by threatened greens, and 4 by endangered leatherbacks. Of the 40 false crawls, 36 were made by loggerheads, 2 by greens, and 2 by leatherbacks. Locations of nests and false crawls are shown in Figure 2, a map of the survey area with each column of symbols representing activity on a 0.5 mile section of beach. While not a record, these numbers continue a trend of increased nesting and more species diversity observed since 2012, shown in Figure 3. Tables 1-2 provide detailed information on each nest and false crawl, including the location and date found. Additional findings are as follows:

- Loggerhead nests produced 1517 hatchlings from 3093 eggs, giving overall emergence success of 49% (32 evaluated nests). Average nest size was 97 eggs (range 62-137), and average incubation period was 60 days (range 53-66). See Figures 4-5 and Table 3.
- Green nests produced 367 hatchlings from 396 eggs, giving an overall emergence success of 93% (3 evaluated nests). See Figure 4 and Table 4.
- Leatherback nests produced no hatchlings from 4 nests. Two nests were evaluated and revealed 183 unhatched eggs with no embryonic development. See Figure 4 and Table 4.
- Only one nest was relocated this season, a loggerhead nest laid near the water and moved to a higher elevation nearby.
- Tropical Storm Barry washed out 7 nests and flooded an additional 26.
- Four nesting turtles, one leatherback and 3 loggerheads, were encountered at night by cleaning crews during Leave No Trace ordinance enforcement. We tagged two of the loggerheads and found a tag on one that we had installed in 2011.
- Eggs were not found at excavation attempts for two leatherback nests and one green nest. It is possible that eggs were present and we simply missed them, or we may have incorrectly identified these nests which were actually false crawls. Their designation as nests was not changed per FWC guidelines.
- Two nests were missed by the surveys. One was discovered when eggs were exposed by Topical Storm Barry and the other from hatchling tracks.

Stranding Activities. Eleven (11) loggerheads and one green turtle stranded within the survey area between May and October (Table 5). Five were found alive in the water and taken to Gulf World for treatment, all but one with imbedded fishing hooks.

Beachfront Lighting Affecting Nesting and Hatchling Turtles. Artificial lights from beachfront development continue to be a serious threat to sea turtles on this urban beach, and significant hatchling mortality was documented this season associated with the lighting threat. We provided a report to FWC

with more on this subject, including methodology and copies of the disorientation reports. Key results are as follows:

- Lights affected 70% of hatchlings that emerged at night (1069 of 1535) from 21 nests.
- Hatchling mortality was documented at 12 nests. We estimated that 350 disoriented hatchlings were lost in dune vegetation or taken by predators.
- Condo lights (interior and exterior) contributed to 34% of the disorientation incidents, along with street lights and parking lot lights which contributed 23%. See Figure 6 for details.
- Adult turtles were disoriented at 2 nests and 2 false crawls.

Beach Furniture Affecting Nesting Turtles. Nesting turtles encountered obstructions on the beach at night at 17% of the nests (8 of 47 nests) and 7 false crawls (Table 6). As in previous years, the obstructions were almost exclusively vendor-owned lounge chairs left on the beach at night, often in tightly spaced rows near the shoreline.

Seabird Monitoring Coordination. Turtle Watch surveyors coordinated with FWC and Audubon personnel who surveyed the beach for seabird nesting activity. Four locations within the survey area were posted this year to protect nesting least terns and black skimmers: Bid-a-Wee Beach, Russell-Fields City Pier, Laguna Beach, and Santa Monica Beach. Key results are as follows:

- Bid-a-Wee Beach was the most productive with 48 least tern and 13 black skimmer fledglings (flight capable), shown in Figure 7. This site would have produced twice the number of fledglings except for Tropical Storm Barry which washed away many nests.
- Santa Monica and Laguna Beach also had active nesting, with over 40 tern and 4 skimmer nests, while the City Pier had lower nesting.
- Vehicles driving on the beach ran over and killed at least four state-threatened seabirds near the posted sites. Problems were caused by speed and general lack of awareness by drivers. Figure 8 shows pictures taken this summer of vehicles and chicks in tire ruts near the posted sites. On a positive note, when the City Public Works Department used tractors on the beach to clear storm drains, they drove slowly by the posted sites with someone walking in front to watch for chicks (special thanks to PCB city employee Mr. Denham for his help).
- Unleashed dogs are a chronic problem all along the beach. Seabird eggs are laid on top of the sand and are therefore extremely vulnerable to disturbance by dogs and other predators.

Beach Cleaning Coordination. Turtle Watch supported beach cleaning in two ways. Our morning surveys used walkers along with riders on all-terrain vehicles to accommodate beach cleaning by Coastal Parasail. Turtle Watch surveyors notified the beach cleaner immediately when sections were cleared or nests identified. Additionally, Turtle Watch provided Wildlife Observers as part of nighttime enforcement of the Leave No Trace ordinance. Coastal Parasail operated small vehicles on the beach at night between May 23 and September 13, removing tents and other personal gear covered by the ordinance. The Wildlife Observer's role was to ride with the crew and watch for nesting and hatchling sea turtles. Crews were advised to halt operations and turn off vehicle lights when turtles were observed, as happened on four occasions when a leatherback and three loggerheads were encountered nesting. Crews received new training this year from Turtle Watch and Audubon representatives on driving practices to minimize impacts on beach wildlife.

Management Recommendations. Sea turtles and shorebirds are nesting in larger numbers on our developed beaches, resulting in more interactions between wildlife and people. Tourists are generally delighted to share the beach with turtles and birds. Still, these animals face many threats that are not being adequately addressed by local authorities. Bay County and Panama City Beach need an integrated, beach-focused wildlife management program to protect these animals in the presence of ever increasing visitor

populations. A comprehensive approach should consider beachfront lighting, beach furniture (vendor and personal gear), personal fireworks, animal control (dogs, feral cats), beach driving, beach cleaning (grooming and trash collection), construction projects (nourishment, CRA redevelopment), and education. Here are three suggested focus areas which would do the most good in the near-term for sea turtles and shorebirds:

- Beachfront lighting. A decade has passed since lighting ordinances were adopted throughout the survey area to protect sea turtles. The ordinances apply to beachfront properties which are in mostly good compliance thanks to the efforts of local code enforcement. However, many lights visible from the beach are outside of the ordinance area, particularly street lights along Front Beach Road, which contribute to the high rates of disoriented hatchlings. Moving the ordinance boundary to the north side of the coastal highway would bring these lights under the purview of the ordinances and significantly improve their effectiveness in protecting sea turtles.
- Beach driving. Vehicles on the beach are mostly 4WD trucks and all-terrain vehicles used by vendors and police, but also heavy equipment used for beach cleaning and storm drain maintenance by contractors and local government. Beach driving seems loosely regulated, and most drivers encountered by turtle and bird surveyors have little knowledge of proper driving practices to minimize their impacts on the beach environment. Existing regulations should be reviewed to better control the number of non-emergency vehicles allowed on the beach. Training should be part of any application for a beach driving permit, incorporating FWC's Best Management Practices to protect sea turtles and shorebirds.
- Animal control. Educational efforts must be combined with enforcement to control unleashed dogs on the beach. Turtle Watch surveyors and FWC/Audubon volunteers educate beach users about this issue, but our efforts have been hampered by the lack of credible enforcement. This problem needs attention by code enforcement or animal control.

If you have questions, please contact me during business hours at (850) 238-9895 or at pcbturtle@yahoo.com. Thanks.

Sincerely,

Kennard Watson

Kennard Watson
Turtle Watch Director

cc: Robbin Trindell (FWC Tallahassee), Meghan Koperski (FWC Tequesta), Beth Mongiovi (FWRI St Petersburg), Kim Middlebrooks (FWC Panama City), Patty Kelly (FWS Panama City), Lisa Armbruster (Sustainable Beaches), John Ackerman (RMA), Bonnie Sammuelson (Audubon Florida), Rachel Tighe (Sea Turtle Conservancy), Lauren Albrittain (GWMI), James Tindle (PCB Code Enforcement), Cecilia James (Bay County Code Enforcement)



Figure 1. Survey area showing four beach sections nourished in 2017 (red nourished, yellow control).



Figure 2. Sea turtle nest and false crawl locations on Panama City Beach in 2019. Each column of symbols represents crawls on 1/2-mile beach segment (blue circles nests, yellow circles false crawls). Nourished sections shown by red line, control areas yellow.

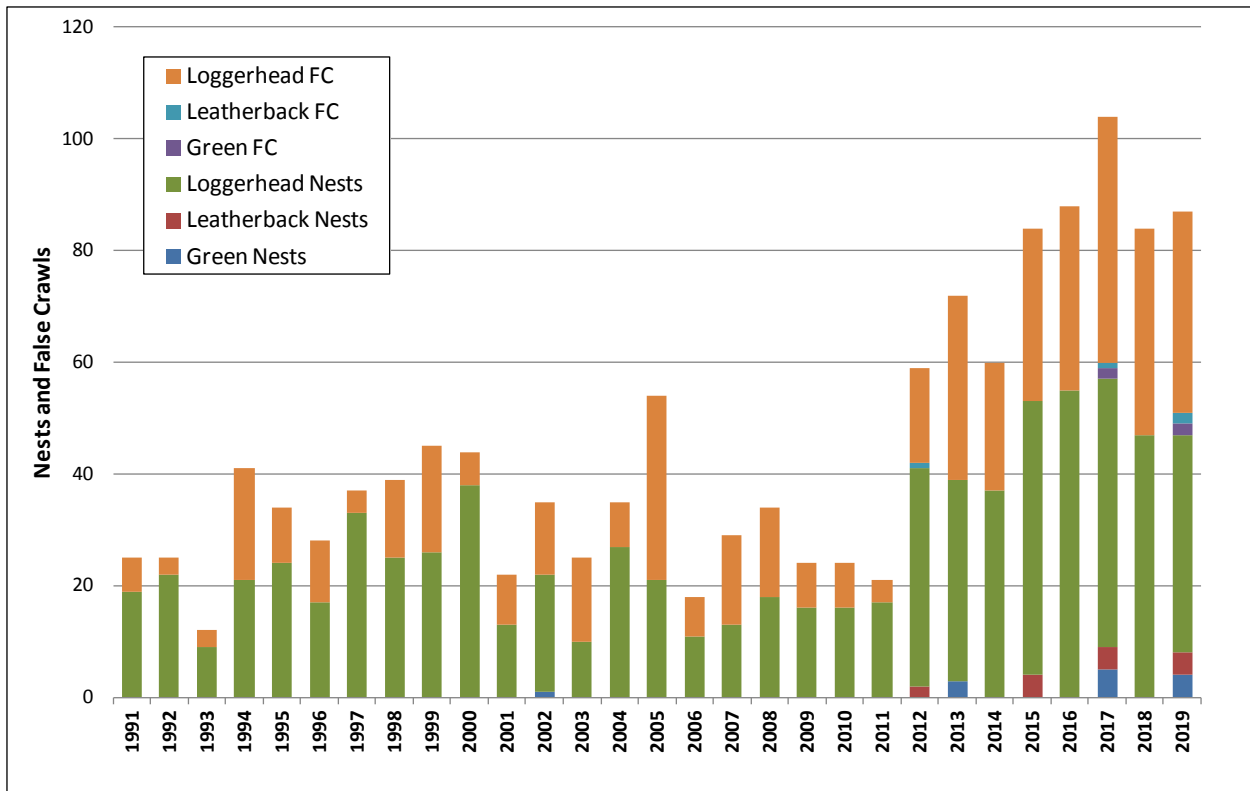
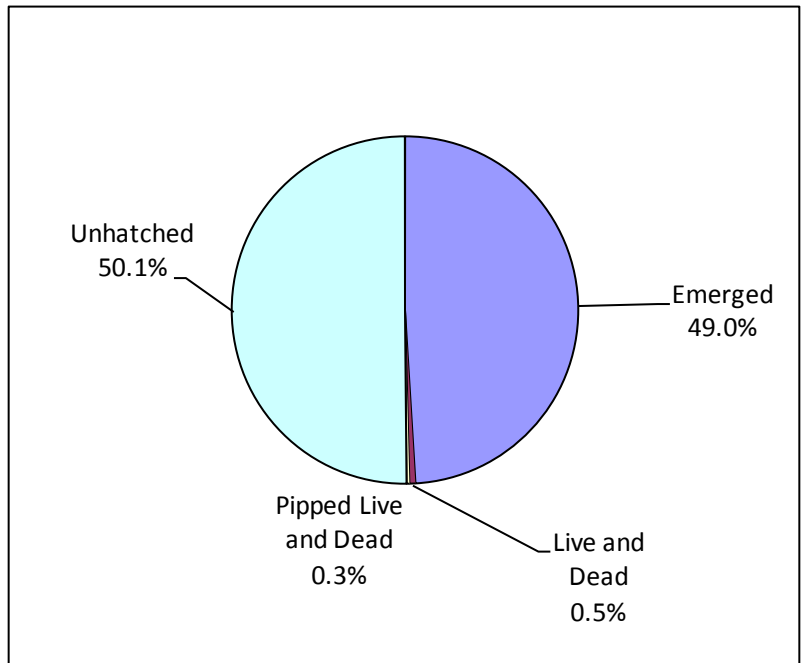
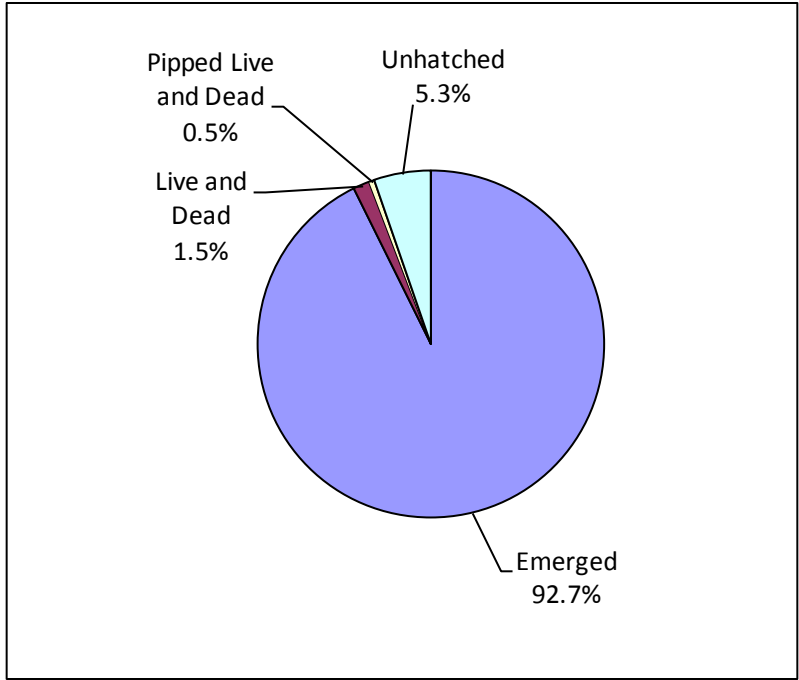


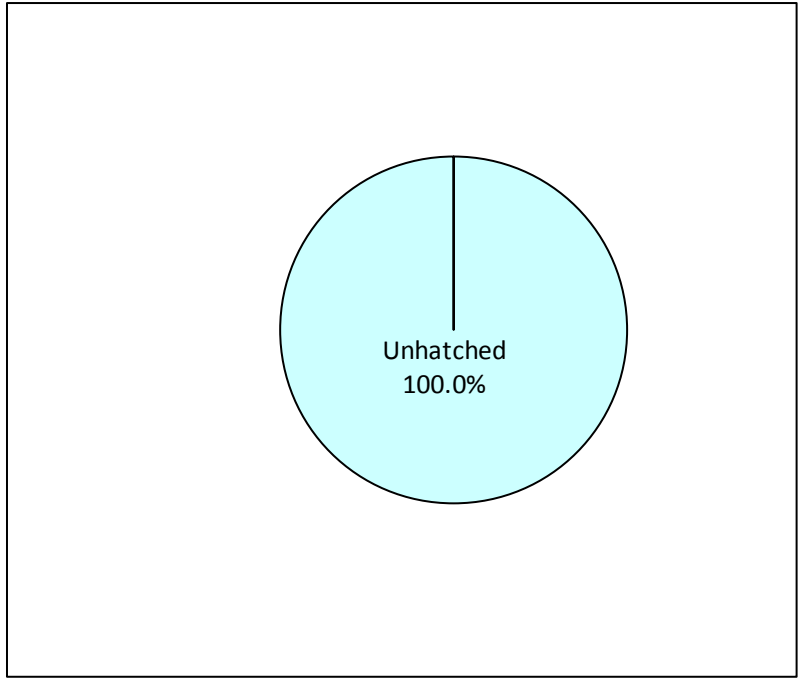
Figure 3. Annual sea turtle nests and false crawls on Panama City Beach, 1991-2019.



(a) Loggerhead nests (31 in situ, 1 relocated)



(b) Green nests (3 in situ)



(c) Leatherback nest (2 in situ)

Figure 4. Emergence success for loggerhead, green, and leatherback nests on Panama City Beach in 2019 (37 nests). Contents are unhatched eggs, live and dead hatchlings found in nest, pipped eggs where hatchling partially broke free of shell, and emerged hatchlings that escaped the nest.

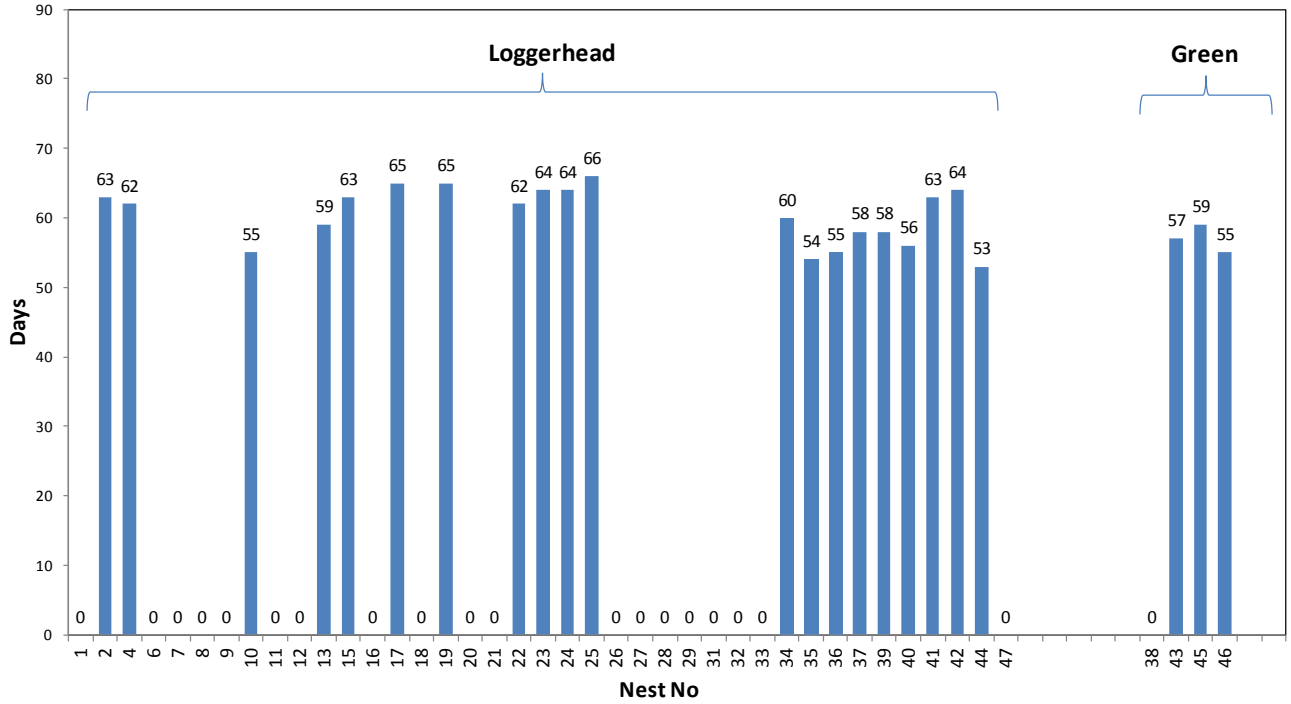


Figure 5. Loggerhead and green incubation periods on Panama City Beach in 2019 (39 loggerhead nests, 4 green nests). Zeroes indicate nests that failed to hatch or had unknown incubation periods.

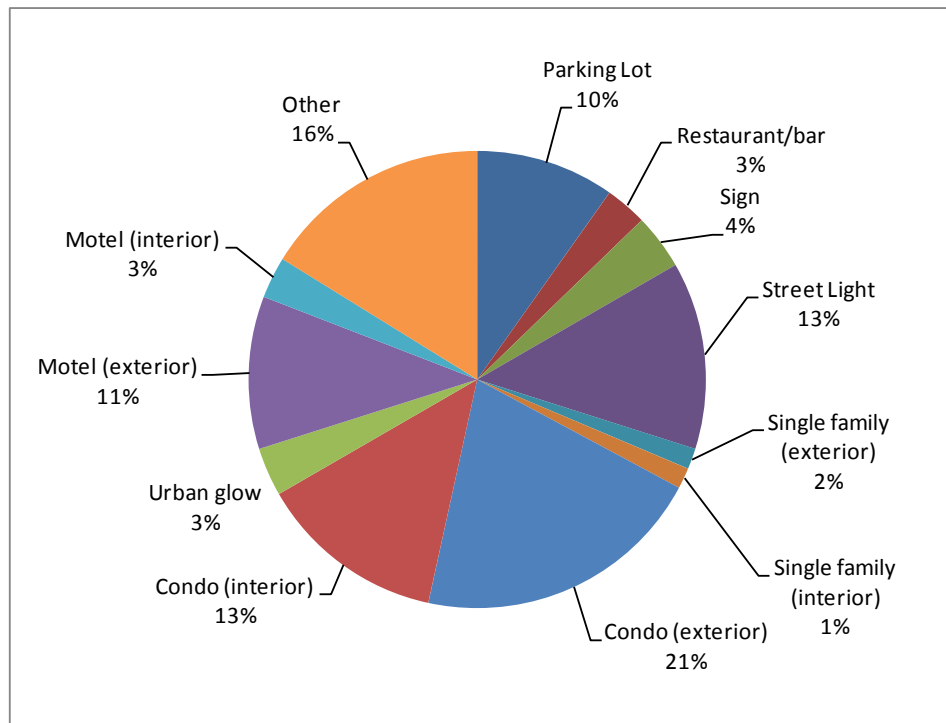


Figure 6. Lights contributing to hatchling disorientation incidents on Panama City Beach in 2019 (15 loggerhead nests, 2 green nests).



Figure 7. Black skimmer fledglings learning to fly at Bid-a-Wee Beach in 2019 (picture courtesy Bonnie Samuelson, Audubon Florida).



Trash collection tractor-trailer



Tern chick (circled) hiding in tire rut at Bid-a-Wee seabird site



Deep tire ruts at Bid-a-Wee seabird site



Mule off-road vehicle with vendors



Vendor truck at Santa Monica Beach seabird site

Figure 8. Examples of vehicles on beach near posted seabird sites in 2019 (pictures courtesy Bonnie Samuelsen, Audubon Florida).

Table 1. Loggerhead, green, and leatherback nest locations and hatching information on Panama City Beach in 2019. Latitude/longitude data obtained from GPS unit. Species Cc loggerhead, Cm green, Dc leatherback. UNK=unknown

Nest No	Species	Address	In Situ or Relocated	Date Laid	Date Hatched	Incubation (days)	Total Eggs	Emerged	Latitude	Longitude
1	Cc	Ramsgate Condo, 23011 Front Beach Rd	In situ	18-May	UNK	UNK	63	3	30.260074	-85.973957
2	Cc	House, 4919 Spyglass Dr	In situ	22-May	23-Jul	63	124	120	30.138727	-85.752209
3	Dc	House, 5141 Gulf Dr	In situ	23-May	UNK	UNK	UNK	0	30.141045	-85.755367
4	Cc	Ramsgate Condo, 23011 Front Beach Rd	In situ	28-May	29-Jul	62	86	34	30.260138	-85.974031
5	Dc	House, 19620 Front Beach Rd	In situ	31-May	UNK	UNK	82	0	30.239938	-85.927252
6	Cc	Blue Horizon Retreat, 19016 Front Beach Rd	In situ	3-Jun	UNK	UNK	UNK	0	30.236594	-85.920332
7	Cc	Mariner East Condo, 6211 Thomas Dr	In situ	4-Jun	UNK	UNK	107	0	30.149495	-85.766204
8	Cc	Palm Grove Motel, 14513 Front Beach Rd	In situ	5-Jun	UNK	UNK	100	0	30.203666	-85.856427
9	Cc	Pinnacle Port Condo, 23223 Front Beach Rd	In situ	5-Jun	UNK	UNK	UNK	0	30.264697	-85.985782
10	Cc	House, 13007 Oleander Dr	In situ	6-Jun	31-Jul	55	90	67	30.195092	-85.841048
11	Cc	Shores Townhouses, 22519 Front Beach Rd	In situ	6-Jun	UNK	UNK	UNK	0	30.258124	-85.969022
12	Cc	Emerald Beach Resort, 14700 Front Beach Rd	In situ	7-Jun	UNK	UNK	UNK	0	30.204699	-85.858258
13	Cc	Shores Townhouses, 22519 Front Beach Rd	In situ	10-Jun	7-Aug	59	105	29	30.258415	-85.969492
14	Dc	Long Beach Resort, 10511 Front Beach Rd	In situ	15-Jun	UNK	UNK	101	0	30.176758	-85.808888
15	Cc	Calypso Resort, 15817 Front Beach Rd	In situ	15-Jun	17-Aug	63	123	3	30.213511	-85.874792
16	Cc	Tropic Winds Condo, 17643 Front Beach Rd	In situ	15-Jun	UNK	UNK	UNK	0	30.230584	-85.907755
17	Cc	Grandview Condo, 10719 Front	In situ	18-Jun	21-Aug	65	102	31	30.178926	-85.812327

Beach Rd										
18	Cc	Shores Townhouses, 22519 Front Beach Rd	In situ	18-Jun	UNK	UNK	89	0	30.258364	-85.969387
19	Cc	House, 5415 Gulf Dr	In situ	22-Jun	25-Aug	65	62	19	30.143114	-85.757715
20	Cc	Gulf Crest Condo, 8715 Surf Dr	In situ	23-Jun	UNK	UNK	74	74	30.166276	-85.790696
21	Cc	House, 8205 Surf Dr	In situ	24-Jun	UNK	UNK	112	11	30.16219	-85.784369
22	Cc	Beachside Resort, 21905 Front Beach Rd	In situ	25-Jun	25-Aug	62	137	112	30.253975	-85.958877
23	Cc	Russell-Fields City Pier, 16201 Front Beach Rd	In situ	28-Jun	30-Aug	64	85	44	30.214282	-85.876399
24	Cc	Townhouse, 21000 Front Beach Rd	In situ	29-Jun	31-Aug	64	83	74	30.248392	-85.945843
25	Cc	House, 19612 Front Beach Rd	In situ	1-Jul	4-Sep	66	91	30	30.239659	-85.926575
26	Cc	Nautical Watch Villa, 6205 Thomas Dr	In situ	3-Jul	UNK	UNK	112	0	30.149069	-85.765609
27	Cc	Landmark Condo, 17501 Front Beach Rd	In situ	8-Jul	UNK	UNK	UNK	0	30.228148	-85.903079
28	Cc	Spinnaker Beach Club, 8795 Thomas Dr	In situ	9-Jul	UNK	UNK	77	0	30.168214	-85.794322
29	Cc	Commodore Condo, 4715 Thomas Dr	In situ	9-Jul	UNK	UNK	75	1	30.13633	-85.749287
30	Dc	House, 19907 Front Beach Rd	In situ	10-Jul	UNK	UNK	UNK	0	30.24104	-85.929702
31	Cc	Flamingo Motel, 15525 Front Beach Rd	In situ	11-Jul	UNK	UNK	UNK	0	30.21087	-85.86983
32	Cc	Carousel Store, 19440 Front Beach Rd	In situ	12-Jul	UNK	UNK	104	0	30.238871	-85.924882
33	Cc	House, 13904 Front Beach Rd	In situ	UNK	UNK	UNK	72	0	30.20047	-85.85055
34	Cc	House, 8312 Surf Dr	In situ	16-Jul	14-Sep	60	111	101	30.163307	-85.785753
35	Cc	Gulf Crest Condo, 8715 Surf Dr	In situ	20-Jul	11-Sep	54	101	95	30.166162	-85.790418
36	Cc	House, 5407 Gulf Dr	In situ	20-Jul	13-Sep	55	126	89	30.14280	-85.757244
37	Cc	Dunes of Panama Condo, 7205 Thomas Dr	In situ	22-Jul	17-Sep	58	82	34	30.157701	-85.777233
38	Cm	House, 21200 Front Beach Rd	In situ	22-Jul	UNK	UNK	UNK	0	30.249959	-85.948925
39	Cc	Townhouse, 17195 Front Beach Rd	In situ	25-Jul	21-Sep	58	73	70	30.223518	-85.893917
40	Cc	House, 13401 Oleander Dr	In situ	29-Jul	22-Sep	56	117	106	30.197588	-85.84516

41	Cc	Seachase Condo, 17351 Front Beach Rd	In situ	29-Jul	29-Sep	63	81	74	30.226168	-85.898748
42	Cc	Vacant lot, 19935 Front Beach Rd	In situ	29-Jul	30-Sep	64	86	81	30.241285	-85.930182
43	Cm	Holiday Inn Express, 12907 Front Beach Rd	In situ	1-Aug	27-Sep	57	141	126	30.194403	-85.839619
44	Cc	Twin Palms Resort, 10519 Front Beach Rd	Relocated	14-Aug	5-Oct	53	114	96	30.178156	-85.810906
45	Cm	House, 13223 Oleander Dr	In situ	16-Aug	14-Oct	59	114	104	30.196427	-85.842704
46	Cm	Casa Loma Motel, 13615 Front Beach Rd	In situ	28-Aug	22-Oct	55	141	137	30.19871	-85.846785
47	Cc	Moonspinner Condo, 4425 Thomas Dr	In situ	UNK	5-Sep	UNK	129	119	30.134702	-85.747171

Table 2. Sea turtle false crawl locations and crawl dates on Panama City Beach in 2019. Latitude/longitude data obtained from GPS unit. Species Cc loggerhead, Cm green, Dc leatherback.

Crawl No	Species	Address	Crawl Date	Latitude	Longitude
1	Dc	Townhouse, 17317 Front Beach Rd	10-May	30.22510	-85.89697
2	Cc	Coral Reef Condo, 6609 Thomas Dr	16-May	30.15198	-85.76958
3	Cc	Wyndham Beach Resort, 14700 Front Beach Rd	17-May	30.20596	-85.86055
4	Cc	Seaside Villas, 4701 Thomas Dr	22-May	30.13614	-85.74905
5	Cc	Holiday Inn Express, 12907 Front Beach Rd	28-May	30.19419	-85.83941
6	Dc	Club LaVela, 8813 Thomas Dr	30-May	30.16873	-85.79503
7	Cc	Chateau Motel, 12525 Front Beach Rd	31-May	30.19175	-85.83523
8	Cc	House, 13810 Front Beach Rd	1-Jun	30.20031	-85.84983
9	Cc	Gulf Gate Condo, 8200 Surf Dr	3-Jun	30.16177	-85.78384
10	Cc	Summerhouse Condo, 6505 Thomas Dr	4-Jun	30.15169	-85.76913
11	Cc	Watercrest Condo, 6201 Thomas Dr	4-Jun	30.14846	-85.76497
12	Cc	House, 4723 Spyglass Dr	4-Jun	30.13694	-85.75037
13	Cc	Sugar Beach Condo, 8727 Thomas Dr	4-Jun	30.16693	-85.79118
14	Cc	Colonial Shores, 8512 Surf Dr	5-Jun	30.16457	-85.78861
15	Cc	Largo Mar Condo, 5717 Thomas Dr	5-Jun	30.14509	-85.76066
16	Cc	House, 5417 Gulf Dr	5-Jun	30.14296	-85.75797
17	Cc	Treasure Island Condo, 5004 Thomas Dr	5-Jun	30.13912	-85.75298
18	Cc	Treasure Island Condo, 5004 Thomas Dr	6-Jun	30.13939	-85.75317
19	Cc	Vacant lot, 16413 Front Beach Rd	13-Jun	30.21675	-85.88075
20	Cc	Long Beach Resort, 10511 Front Beach Rd	18-Jun	30.17726	-85.80985
21	Cc	Long Beach Resort, 10511 Front Beach Rd	20-Jun	30.17725	-85.80978
22	Cc	Edgewater Beach Resort, 11212 Front Beach Rd	23-Jun	30.18448	-85.82199
23	Cc	Pinnacle Port Condo, 23223 Front Beach Rd	23-Jun	30.26520	-85.98669
24	Cc	Driftwood Lodge, 15811 Front Beach Rd	24-Jun	30.21276	-85.87344
25	Cc	Townhouse, 22807 Front Beach Rd	25-Jun	30.25906	-85.97124
26	Cc	House, 406 Beachside Dr, Carillon Beach	25-Jun	30.26106	-85.97629
27	Cc	Shores Townhomes, 22519 Front Beach Rd	27-Jun	30.25795	-85.96880
28	Cc	House, 21124 Front Beach Rd	29-Jun	30.24947	-85.94857
29	Cc	Pirates Cove Villas, 23001 Front Beach Rd	29-Jun	30.25940	-85.97238
30	Cc	Long Beach Resort, 10511 Front Beach Rd	3-Jul	30.17639	-85.80782
31	Cc	House, 21721 Front Beach Rd	6-Jul	30.25287	-85.95654
32	Cc	Shoreline Villas, 23007 Front Beach Rd	6-Jul	30.25949	-85.97277
33	Cc	House, 22013 Front Beach Rd	9-Jul	30.25444	-85.96041
34	Cc	Largo Mar Condo, 5717 Thomas Dr	20-Jul	30.14482	-85.76025
35	Cc	Tidewater Beach Resort, 16819 Front Beach Rd	23-Jul	30.22038	-85.88747
36	Cc	Townhouse, 22807 Front Beach Rd	24-Jul	30.25920	-85.97125
37	Cm	Vacant lot, 13621 Front Beach Rd	29-Jul	30.19914	-85.84794
38	Cc	Palm Grove Motel, 14513 Front Beach Rd	29-Jul	30.20372	-85.85619
39	Cc	Carousel (store), 19440 Front Beach Rd	8-Aug	30.23856	-85.92463
40	Cm	Days Inn, 12818 Front Beach Rd	8-Sep	30.19342	-85.83794

Table 3. Loggerhead nest excavation data on Panama City Beach in 2019 (32 nests). Contents are unhatched eggs, live and dead hatchlings found in nest, pipped eggs where hatchling partially broke free of shell, and emerged hatchlings that escaped the nest. **Rows in red indicate nests partially washed out.**

Nest No	Eggs	Emerged	Live in Nest	Dead in Nest	Pipped Live	Pipped Dead	Unhatch	Emergence Success	In Situ or Relocated
1	63	3	0	0	0	0	60	0.05	In situ
2	124	120	0	0	0	0	4	0.97	In situ
4	86	34	0	1	0	0	51	0.00	In situ
7	107	0	0	0	0	0	107	0.00	In situ
8	100	0	0	0	0	0	100	0.00	In situ
10	90	67	1	0	0	2	20	0.74	In situ
13	105	29	0	0	0	0	76	0.28	In situ
15	123	3	0	0	0	0	120	0.02	In situ
17	102	31	0	0	2	0	69	0.30	In situ
18	89	0	0	0	0	0	89	0.00	In situ
19	62	19	0	0	0	0	43	0.31	In situ
20	74	74	0	0	0	0	0	1.00	In situ
21	112	11	2	0	0	0	99	0.10	In situ
22	137	112	0	0	0	0	25	0.82	In situ
23	85	44	0	0	0	0	41	0.52	In situ
24	83	74	0	0	0	1	8	0.89	In situ
25	91	30	0	0	1	1	59	0.33	In situ
26	112	0	0	0	0	0	112	0.00	In situ
28	77	0	0	0	0	0	77	0.00	In situ
29	75	1	0	0	0	0	74	0.01	In situ
32	104	0	0	0	0	0	104	0.00	In situ
33	72	0	0	0	0	0	72	0.00	In situ
34	111	101	0	1	0	0	9	0.91	In situ
35	101	95	0	0	0	0	6	0.94	In situ
36	126	89	2	0	0	0	35	0.71	In situ
37	82	34	0	1	0	0	47	0.41	In situ
39	73	70	0	0	0	0	3	0.96	In situ
40	117	106	2	0	0	0	9	0.91	In situ
41	81	74	0	0	0	0	7	0.91	In situ
42	86	81	0	0	0	0	5	0.94	In situ
44	114	96	4	2	0	1	11	0.84	Relocated
47	129	119	0	1	0	0	9	0.92	In situ
TOTAL	3093	1517	11	6	3	5	1551	0.49	
Excluding Wash-outs	2909	1506	9	6	3	5	1380	0.52	

Table 4. Green and leatherback nest excavation data on Panama City Beach in 2019. Contents are unhatched eggs, live and dead hatchlings found in nest, pipped eggs where hatchling partially broke free of shell, and emerged hatchlings that escaped the nest.

Nest No	Eggs	Emerged	Live in Nest	Dead in Nest	Pipped Live	Pipped Dead	Unhatch	Emergence Success	In Situ or Relocated
Green nests									
43	141	126	1	2	0	0	12	0.89	In situ
45	114	104	2	0	2	0	6	0.91	In situ
46	141	137	1	0	0	0	3	0.97	In situ
TOTAL	396	367	4	2	2	0	21	0.93	
Leatherback nests									
5	82	0	0	0	0	0	82	0.00	In situ
14	101	0	0	0	0	0	101	0.00	In situ
TOTAL	183	0	0	0	0	0	183	0.00	

Table 5. Sea turtle strandings on Panama City Beach from May to October 2019.
 Latitude/longitude data obtained from GPS unit or estimated from Google Earth.
 Species Cc loggerhead, Cm green. NMFS National Marine Fisheries Service

No.	Date	Location	Latitude	Longitude	Species	Shell Length (inches)	Final Disposition
1	19-May	M.B. Miller County Pier, 12213 Front Beach Rd	30.186888	-85.833775	Cc	28.7	Live in water, Gulf World
2	21-May	Tidewater Condo, 16819 Front Beach Rd	30.21995	-85.88669	Cc	31.9	Dead on beach, NMFS
3	24-May	House, 16423 Front Beach Rd	30.21716	-85.88171	Cm	12.3	Dead on beach, disposed in landfill
4	1-Jun	Legacy by the Sea Resorts, 15325 Front Beach Rd	30.20935	-85.86609	Cc	28.8	Dead on beach, disposed in landfill
5	24-Jun	Fontainebleau Terrace, 14401 Front Beach Rd	30.20255	-85.85449	Cc	26.5	Dead on beach, disposed in landfill
6	2-Jul	House, 20019 Front Beach Rd	30.24308	-85.93466	Cc	35.4	Dead in water at pier, NMFS
7	10-Jul	M.B. Miller County Pier, 12213 Front Beach Rd	30.186888	-85.833775	Cc	30.3	Live in water, Gulf World
8	31-Jul	Driftwood Lodge, 15811 Front Beach Rd	30.21246	-85.87289	Cc	33.1	Dead on beach, disposed in landfill
9	2-Aug	M.B. Miller County Pier, 12213 Front Beach Rd	30.186888	-85.833775	Cc	25.9	Live in water, Gulf World
10	4-Aug	House, 17873 Front Beach Rd	30.23452	-85.91628	Cc	30.1	Dead on beach, Gulf World
11	19-Sep	Runaway Island Restaurant, 14521 Front Beach Rd	30.20420	-85.85721	Cc	27.1	Live in water, Gulf World
12	8-Oct	Russell-Fields City Pier, 16201 Front Beach Rd	30.20254	-85.87943	Cc	26.9	Live in water, Gulf World

Table 6. Obstacles encountered by sea turtles during nesting attempts on Panama City Beach in 2019. Latitude/longitude data obtained from GPS unit. Species Cc loggerhead, Cm green, Dc leatherback.

Crawl No	Species	Crawl Type	Address	Latitude	Longitude	Incident Date	Obstacles Encountered
2	Cc	Nest	House, 4919 Spyglass Dr	30.138727	-85.752209	22-May	trash can
17	Cc	Nest	Grandview Condo, 10719 Front Beach Rd	30.178926	-85.812327	18-Jun	banana boats and jet skies
20	Cc	Nest	Gulf Crest Condo, 8715 Surf Dr	30.166276	-85.790696	23-Jun	lounge chairs
22	Cc	Nest	Beachside Resort, 21905 Front Beach Rd	30.253975	-85.958877	25-Jun	lounge chairs
26	Cc	Nest	Nautical Watch Villa, 6205 Thomas Dr	30.149069	-85.765609	3-Jul	lounge chairs
35	Cc	Nest	Gulf Crest Condo, 8715 Surf Dr	30.166162	-85.790418	20-Jul	trash can, beach access
37	Cc	Nest	Dunes of Panama Condo, 7205 Thomas Dr	30.157701	-85.777233	22-Jul	lounge chairs
41	Cc	Nest	Seachase Condo, 17351 Front Beach Rd	30.226168	-85.898748	29-Jul	lounge chairs, kayaks, beach services stand
3	Cc	False Crawl	Wyndham Beach Resort, 14700 Front Beach Rd	30.20596	-85.86055	17-May	lounge chairs
4	Cc	False Crawl	Seaside Villas, 4701 Thomas Dr	30.13614	-85.74905	22-May	lounge chairs
6	Dc	False Crawl	Club LaVela, 8813 Thomas Dr	30.16873	-85.79503	30-May	lounge chairs
11	Cc	False Crawl	Watercrest Condo, 6201 Thomas Dr	30.14846	-85.76497	4-Jun	lounge chairs
30	Cc	False Crawl	Long Beach Resort, 10511 Front Beach Rd	30.17639	-85.80782	3-Jul	lounge chairs
38	Cc	False Crawl	Palm Grove Motel, 14513 Front Beach Rd	30.20372	-85.85619	29-Jul	lounge chairs
40	Cm	False Crawl	Days Inn, 12818 Front Beach Rd	30.19342	-85.83794	8-Sep	lounge chairs