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6 November 2019

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Panama City Beach, Florida 32408

Robbin Trindell, Ph.D.
Imperiled Species Management
Florida Fish and Wildlife Conservation Commission
620 South Meridian Street
Tallahassee, Florida 32399-1600

References:

1. Letter report from Kennard Watson to Robbin Trindell on screened green nest, 3 Oct 2019
2. Marine Turtle Permit 038 issued 18 May 2019, permit condition 6 "recover and release disoriented hatchlings" requiring report with results of temporary low-level barrier to contain disoriented hatchlings

Dear Robbin:

This letter summarizes results of disorientation incidents during the 2019 nesting season on Panama City Beach (Permit 038). The survey area extends 17.5 miles between St. Andrews State Park and Camp Helen State Park and is covered by two lighting ordinances. Major results are as follows:

- 1069 of 1535 hatchlings disoriented by artificial lights for a combined disorientation of 69.6%.
- 663 disoriented hatchlings collected by volunteers and released on a nearby dark beach.
- Mortality documented at 12 nests with approximately 350 disoriented hatchlings either lost in dunes or taken by predators on the beach. 11 dead turtles were collected.
- Adult turtles disoriented at 2 nests and 2 false crawls.
- New techniques used to rescue and release disoriented hatchlings. We used a containment device to collect disoriented turtles and a new release site which reduced holding times between hatchling collection and release.

All disorientation reports have been provided to local code enforcement with copies to the Florida Fish and Wildlife Conservation Commission (FWC). I also entered the data into FWC's new web-based system for disorientation reports. The following provides detailed results and includes a description of the methodology to quantify disorientations and types of lights contributing to the incidents.

Nest Marking and Monitoring Procedure. Nests identified during the morning surveys were marked with four stakes, orange survey tape, caution tape, and an informational sign with the nest number. These nests were checked for evidence of emergence each morning (6-8 am), early evening (7-9 pm), and late night (10-12 pm). The early morning checks were done by paid surveyors starting immediately after the nest was found. Volunteers performed the nightly checks with the start date determined from measured sand temperatures in the vicinity of the nest. These nighttime "spot checks" are performed under the "recover and release" section of our permit, required due to the serious lighting problems in our survey area. One green nest was screened to protect hatchlings from lights and is discussed in a separate letter report (Reference 1).

One loggerhead nest with disorientation was unmarked, because it was missed by the surveys and discovered from hatchling tracks.

Method to Quantify Hatchling Disorientations. We submit disorientation reports only for main emergences and not for small numbers of hatchlings that may emerge before or after. Reports are submitted electronically to local code enforcement and FWC, usually within three days of the incident. Beginning this summer, I also entered data from the hard-copy forms into FWC's new online reporting system. The methodology for estimating hatchling disorientation is as follows:

- Most incidents are documented during night surveys by volunteers who are at the nest when hatchlings emerge or arrive shortly after while hatchlings are still on the beach and tracks are fresh. Volunteers collect disoriented hatchlings and estimate the number of turtles reaching the water by observing the animals or counting tracks. Volunteers note the location of lights affecting the hatchlings and document the sky condition at the time of emergence, including the presence or absence of moonlight.
- The number of disoriented hatchlings is determined by how many are collected, tracks leading away from the water, in addition to any reaching the water after wandering. Nest excavation data are occasionally used to adjust disorientation estimates. For example, if volunteers arrive after an emergence and see all tracks leading away from the water, the nest is assumed to have 100% disorientation and the number of disoriented hatchlings is obtained from the excavation data.
- Disoriented turtles collected at the nest site are released the same night at a dark beach within our survey area. In the past, we used Sunnyside Beach on the west end, historically the darkest part of our survey area. Beginning this summer, we added a release site on the east end, selected from nighttime light levels measured in 2018 by Shigetomo Hirama of FWC for his dissertation. For nests that hatched on the east end, this site allowed us to reduce holding times between collection and release of disoriented turtles.

Hatchling Orientation Index. In addition to the above approach, we also estimated hatchling disorientation using a method called the Hatchling Orientation Index (HOI), continuing a practice that began on our beach in 2015. The procedure uses a phone app provided by Dr. Hirama to obtain compass measurements at the nest site. Three types of data were collected with the phone compass, as shown in Figure 1. Ocean direction is the angle of a line perpendicular to the shoreline at the nest location, pointing toward the water. Mode is the bearing of the most frequent direction of hatchling tracks, as estimated by the observer. Finally, angular range is the difference between two angles representing bearings of the most widely separated hatchling tracks. Mode and angular range are measured from the nest location to the point where tracks cross a 10-meter radius circle centered on the nest.

Method to Rescue Disoriented Hatchlings with Containment Barrier. FWC approved the use of a temporary containment device to aid in rescuing disoriented hatchlings (Reference 2). It is deployed at nests when pre-emergent hatchlings are visible and significant disorientation is expected. The primary purpose is to provide a barrier to contain any disoriented hatchlings before they become interspersed among bystanders or lost in dune vegetation. The device consists of light-weight, rip-stop nylon with a length of 60 ft and deployed height of about 6 inches above the sand. Small metal stakes, sewn into the fabric at 3-ft intervals, are hand-buried at a depth of about 6 inches to keep the fabric upright. The metal stakes have looped tops to prevent injury should anyone accidentally step on one. No tools are required to install the barrier, which can be easily stored in a volunteer's backpack and carried during nightly spot checks of marked nests. Figure 2 shows the device in its packaged and deployed configurations.

Method to Quantify Hatchling Mortality. We used two methods to quantify mortality of disoriented turtles. We collected dead hatchlings found typically in the dunes but sometimes on the road after an emergence. This number underestimates actual mortality, because disoriented hatchlings are difficult to find once they enter dune vegetation. We also know from experience that hatchlings are extremely vulnerable to predation

by ghost crabs and feral cats on our beach. Therefore, by assuming that any turtle track entering the dune where no hatchling is found results in mortality, we can obtain a more realistic estimate than simply counting dead turtles. Both numbers are provided in the results below.

Hatchling Disorientation Results. Main emergence results for 19 loggerhead nests and 2 green nests that hatched at night are shown in Table 1, including those at which no disorientation occurred. Twenty six (26) nests were excluded from the sample. Of these, 16 failed to hatch due to flooding or wash-out from storms, one hatched during daylight hours, six hatched nests were excluded because disorientation could not be quantified or only a small number of hatchlings emerged (<10), and three produced no hatchlings and may not have been nests (unable to find eggs at excavation attempt). The column for "Total Emerged" represents the main emergence excluding stragglers that may have emerged before or after. Information also is provided on the time of hatchling emergence, number of live hatchlings collected, and estimated number of dead hatchlings. Results are as follows:

- Combined hatchling disorientation rate was 69.6%, representing 1069 of 1535 turtles from 19 loggerhead nests and 2 green nests.
- 663 disoriented hatchlings were collected during nest monitoring and released on a dark beach within our survey area.
- Hatchling mortality was documented at 11 loggerhead nests and one green nest. We estimated 350 of 1535 hatchlings (23%) were lost in dune vegetation or taken by predators. We collected 11 dead hatchlings.
- Volunteers observed the main emergence at nine nests, and the remaining 12 were documented by tracks observed and hatchlings collected after the emergence, either at night or during the morning survey.
- Figure 3 shows the locations of all hatchling disorientation incidents and two release sites used in 2019.
- Figure 4 shows the types of lights contributing to hatchling disorientation incidents in 2019. Condo lights were the largest contributor at 34% (interior and exterior). Street lights and parking lot lights contributed 23%.

Hatchling Orientation Index Results. Table 2 shows results for six loggerhead nests for which HOI data were collected. The data were used to classify hatched nests as either disoriented or not disoriented using the following criteria. A nest was not disoriented if the mode was within ±45 degrees of the ocean direction and the angular range also was within 45 degrees. Otherwise, the nest was classified as disoriented. None of the nests met both criteria, giving an overall disorientation rate of 100%. Table 2 includes results using our standard method, showing a combined disorientation rate of only 25% for this small sample of nests.

Hatchling Containment Barrier Results. We only had two opportunities to deploy the containment device during the 2019 season, both loggerhead nests (40, 42) with significant disorientation. Table 1 has information on the nest locations, number of turtles, and emergence times. At nest 40, volunteers collected most of the 106 disoriented hatchlings before they reached the barrier, and the few encountering the device crawled underneath the fabric which hadn't been buried. At nest 42, the device was properly deployed with the fabric buried, and volunteers kept the small crowd of less than 10 people on the landward side. Volunteers collected 76 disoriented turtles as they reached the barrier, confirming that it effectively stopped the turtles. Three hatchlings were lost in dune vegetation based on tracks observed after the emergence. Additional observations are as follows:

- Volunteer feedback indicates that the device was helpful, even though opportunities for its use are limited, since the barrier can be deployed only when pre-emergent turtles are encountered during nightly monitoring.

- Training will be improved to demonstrate proper deployment, including burial of the fabric to prevent escape of hatchlings, and the importance of scanning the beach with red light following the emergence to identify turtles that may have escaped the barrier.
- Data collection will be improved to obtain HOI data at night, immediately after the emergence while hatchling tracks are fresh. We attempted to collect this data the following morning but were unable because the tracks were obscured by foot traffic.

Adult Disorientation Results. Adult females became disoriented at only 4% of the nests (2 of 47). Also, two became disoriented without nesting. Table 3 shows results of the incidents, three of which were loggerheads and one leatherback. Disorientation was assessed by examining the crawl after the turtle had returned to the water.

If you have questions on this material, 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: Tonya Long FWC Tequesta, Tomo Hirama FWC Gainesville, Patty Kelly FWS Panama City

Table 1. Nighttime hatchling emergences on Panama City Beach in 2019 (19 loggerhead nests, 2 green nests).

Nest No.	Species	Nearest Landmark	Incident Date	Emergence Time	Total Emerged	Number Disoriented	Percent Disoriented	Estimated Mortality	Dead Collected	Live Collected	Report Filed
4	Cc	Ramsgate Condo, 23011 Front Beach Rd	29-Jul	9 PM - 6 AM	34	34	100%	34	2	1	Y
10	Cc	House, 13007 Oleander Dr	31-Jul	nighttime	67	67	100%	37	2	0	Y
13	Cc	Shores Townhouses, 22519 Front Beach Rd	7-Aug	11:20 PM	29	0	0%	0	0	0	N
17	Cc	Grandview Condo, 10719 Front Beach Rd	21-Aug	8:48 PM	31	31	100%	0	0	31	Y
19	Cc	House, 5415 Gulf Dr	25-Aug	8:16 PM	19	17	89%	0	0	17	Y
22	Cc	Beachside Resort, 21905 Front Beach Rd	25-Aug	8:00 - 9:30 PM	112	112	100%	65	0	47	Y
23	Cc	Russell-Fields City Pier, 16201 Front Beach Rd	30-Aug	7:08 - 8:45 PM	44	44	100%	14	5	25	Y
24	Cc	Townhouse, 21000 Front Beach Rd	31-Aug	dusk - 9:09 PM	74	0	0%	0	0	0	N
25	Cc	House, 19612 Front Beach Rd	4-Sep	~10:10 PM	30	30	100%	10	0	18	Y
34	Cc	House, 8312 Surf Dr	14-Sep	10:50 PM - 6:20 AM	101	0	0%	0	0	0	N
35	Cc	Gulf Crest Condo, 8715 Surf Dr	11-Sep	8:49 PM	95	37	39%	0	0	37	Y
36	Cc	House, 5407 Gulf Dr	13-Sep	10:50 PM - 6:39 AM	89	0	0%	0	0	0	N
37	Cc	Dunes of Panama Condo, 7205 Thomas Dr	17-Sep	8:00 PM	34	34	100%	0	0	34	Y
39	Cc	Townhouse, 17195 Front Beach Rd	21-Sep	11:30 PM - ~7AM	70	70	100%	43	1	0	Y
40	Cc	House, 13401 Oleander Dr	22-Sep	8:41 PM	106	106	100%	3	0	103	Y
41	Cc	Seachase Condo, 17351 Front Beach Rd	29-Sep	7:30 PM - 10:40 PM	74	74	100%	27	0	47	Y
42	Cc	Vacant lot, 19935 Front	30-Sep	7:39 PM	81	80	99%	3	0	76	Y

		Beach Rd									
43	Cm	Holiday Inn Express, 12907 Front Beach Rd	27-Sep	4:57 AM	126	113	90%	1	0	126	Y
44	Cc	Twin Palms Resort, 10519 Front Beach Rd	5-Oct	9:30 PM	96	93	97%	3	0	93	Y
45	Cm	House, 13223 Oleander Dr	14-Oct	8:15 PM - 6:39 AM	104	8	8%	0	0	0	Y
47	Cc	Moonspinner Condo, 4425 Thomas Dr	5-Sep	UNK	119	119	100%	110	1	8	Y
				TOTAL	**1535**	**1069**	**69.6%**	**350**	**11**	**663**	

Table 2. Hatchling Orientation Index results for hatchling emergences on Panama City Beach in 2019 (6 loggerhead nests).

Nest Data			**Hatchling Orientation Index**				**Turtle Watch Method**		
Nest No	**Emergence Date**	**Emergence Time**	**Ocean Direction (deg)**	**Mode (deg)**	**Range (deg)**	**Disoriented (Yes or No)**	**Total Emerged**	**Number Disoriented**	**Percent Disoriented**
4	29-Jul	9 PM to 6 AM	190.5	26	317	Y	34	34	100%
24	31-Aug	Dusk to 9:09 PM	219	216	46	Y	74	0	0%
34	14-Sep	10:50 PM to 6:20 AM	199	278	15	Y	101	0	0%
35	11-Sep	8:49 PM	199	217	131	Y	95	37	39%
36	13-Sep	10:50 PM to 6:39 AM	201.5	282	18	Y	89	0	0%
37	17-Sep	8:00 PM	219.5	268	86	Y	34	34	100%
					TOTAL	**100%**	**427**	**105**	**25%**

Table 3. Adult turtle disorientation incidents on Panama City Beach in 2019.

Crawl No.	Species	Crawl Type	Nearest Landmark	Incident Date	Observations	Report Filed
8	Cc	False Crawl	House, 13810 Front Beach Rd	1-Jun	Track wandered over 200 ft along beach	Y
31	Cc	False Crawl	House, 21721 Front Beach Rd	6-Jul	Track wandered parallel to shoreline	Y
5	Dc	Nest	House, 19620 Front Beach Rd	31-May	Exit tack wandered parallel to shore and backtracked before entering water	Y
20	Cc	Nest	Gulf Crest Condo, 8715 Surf Dr	23-Jun	Track showed disorientation while turtle maneuvered through rows of chairs	Y

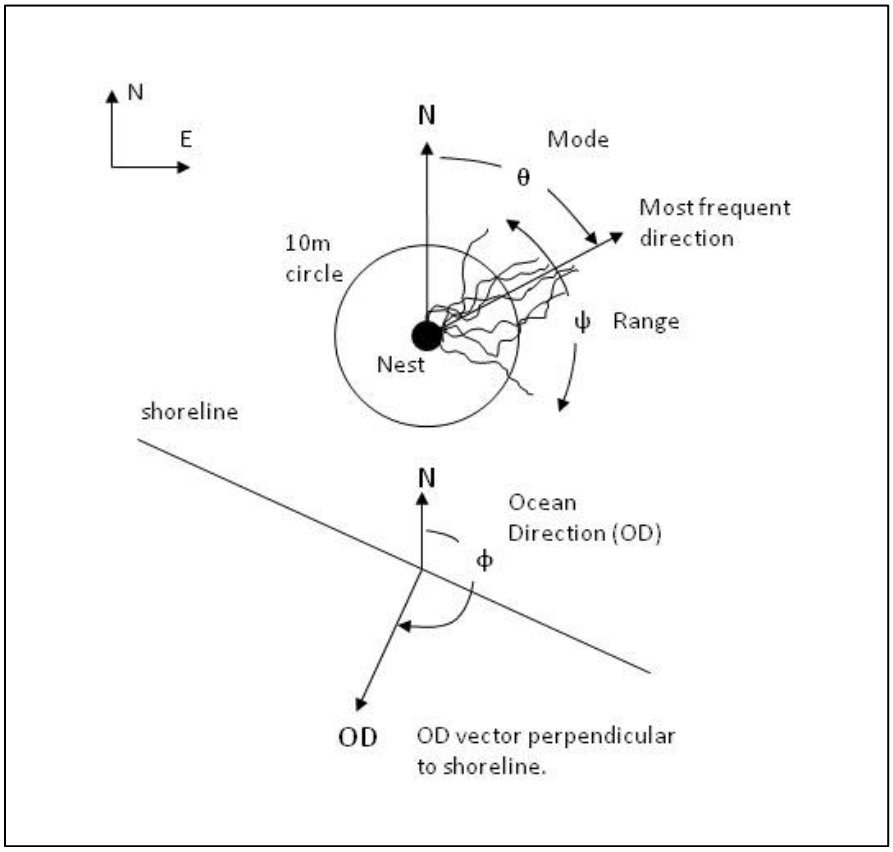

Figure 1. Definition of variables used in the Hatchling Orientation Index.

(a) Packaged device shown on floor with 12-inch square tiles

(b) Deployed behind marked nest

Figure 2. Pictures of hatchling containment device in packaged and deployed configurations.

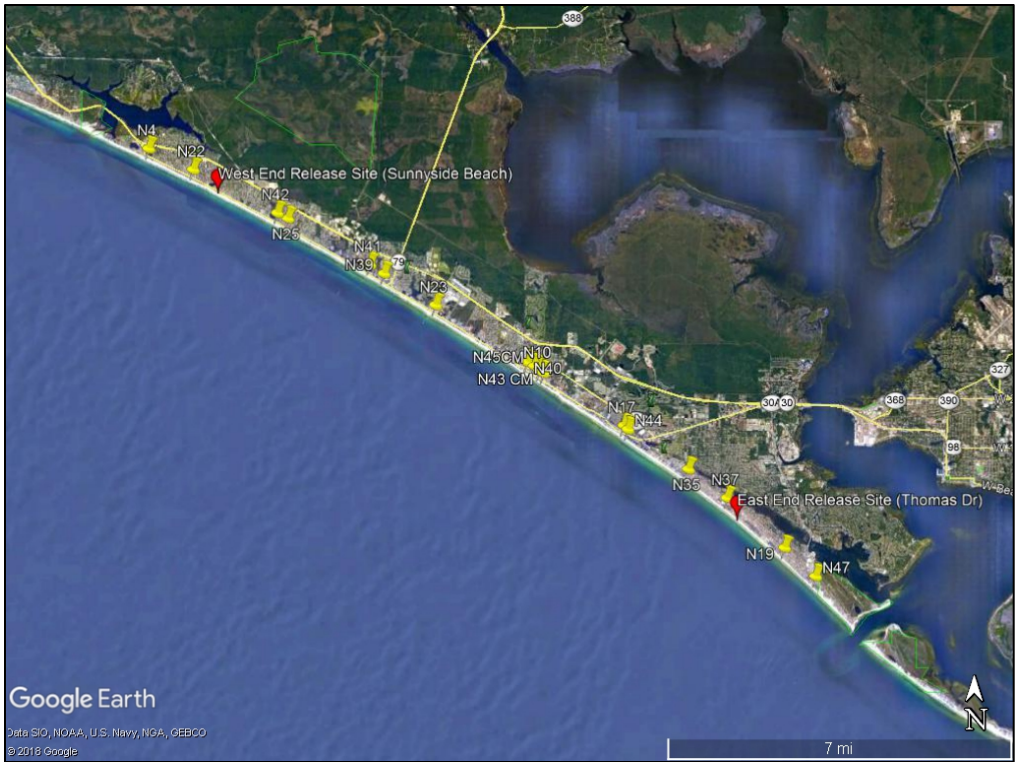

Figure 3. Map showing locations of hatchling disorientation incidents and release sites on Panama City Beach in 2019 (15 loggerhead nests, 2 green nests, 2 release sites).

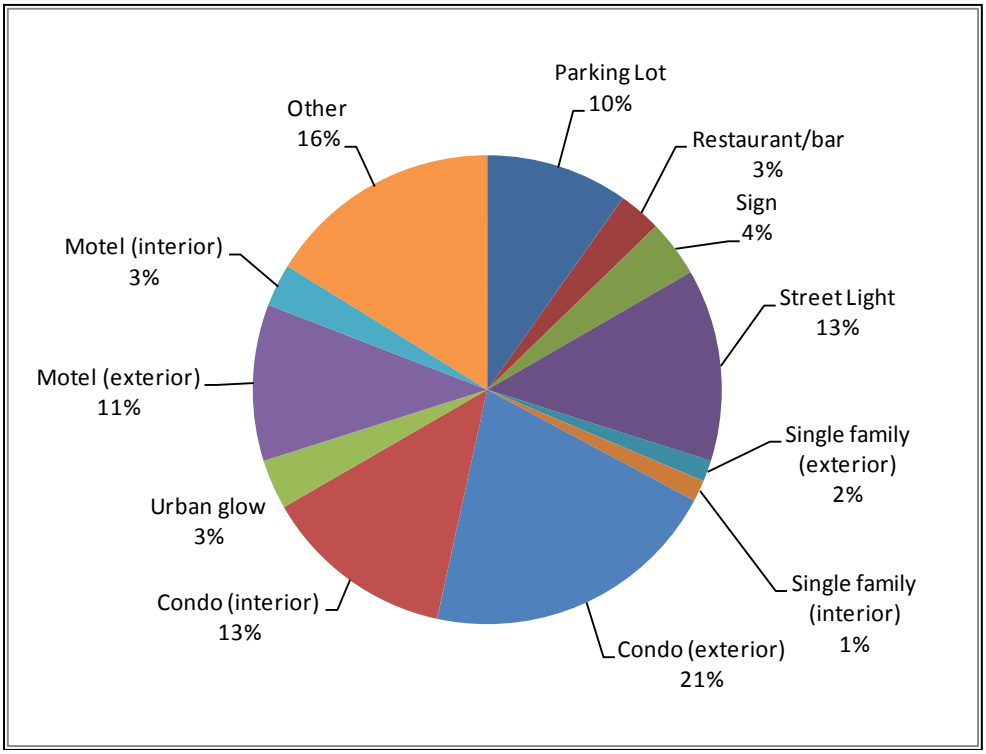

Figure 4. Lights contributing to hatchling disorientation incidents on Panama City Beach in 2019 (15 loggerhead nests, 2 green nests).