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RESOURCE MANAGEMENT ASSOCIATION
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6509 Palm Court
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

Dear Robbin:

This letter summarizes results of disorientation incidents during the 2018 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:

- 64% combined disorientation rate for loggerhead hatchlings
- Mortality of disoriented hatchlings documented at eight loggerhead nests
- Nine adult loggerheads disoriented after nesting and four disoriented without nesting
- Street lighting on Front Beach Rd was the subject of a September meeting between U.S. Fish and Wildlife Service and local government officials. Future plans were discussed as part of beachfront redevelopment efforts to reduce impacts of street lights which contributed to 16% of hatchling disorientation incidents this season.

All disorientation reports have been provided to local code enforcement with copies to the Florida Fish and Wildlife Conservation Commission (FWC). 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. Loggerhead nests identified during the morning surveys were marked with four stakes, orange survey tape and caution tape, and an informational sign with the nest number. These nests were checked for signs 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 the nesting surveyors, while volunteers performed the early evening and late-night checks. Early morning checks were done daily starting immediately after the nest was found. The start date for nighttime monitoring was determined from the measured sand temperature in the vicinity of the nest (typically after incubation day 50). Nighttime monitoring of the nests is not required by our permit but is performed due to the serious lighting problems in our survey area. One was nest was unmarked (47) because it was missed by the surveys. The clutch could not be found from hatchling tracks discovered on August 10.

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 officers and FWC during the season, usually within three days of the incident. Most are documented during night surveys by volunteers who are at the nest when the hatchlings emerge or arrive shortly after the emergence 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. When volunteers are present during the emergence, the number of disoriented hatchlings is determined by how many the volunteers collect, in addition to any turtles observed 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 Sunnyside Beach, the darkest part of our survey area.

Hatchling Orientation Index. In addition to the above approach, we also collected hatchling disorientation data 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 Shigetomo Hirama of FWC 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. Exceptions were made at four nests where a smaller radius circle was required due to obstacles (nest 7) or absence of hatchling tracks outside the marked nest area due to footprints or rain (nests 24, 27, 29).

Hatchling Disorientation Results. Main emergence results for 25 loggerhead nests that hatched at night are shown in Table 1, including those at which no disorientation occurred. Twenty two (22) nests were excluded from the sample. Of these, 16 failed to hatch due to flooding or wash-out from storms, two hatched during daylight hours, three hatched nests were excluded because disorientation could not be quantified or only a small number of hatchlings emerged (<10), and one produced no hatchlings and may not have been a nest (unable to find eggs at excavation). The column for "Total Emerged" represents the main emergence which excludes 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 show that 1227 of 1909 hatchlings were disoriented by artificial lights, giving a combined disorientation of 64%. Turtle Watch personnel observed the main emergence at 11 nests. The remaining 14 were documented by tracks observed and hatchlings collected after the emergence, either at night or during the morning survey. Mortality was documented at eight nests with disoriented hatchlings either lost in dunes or taken by predators. Figure 2 is a map showing locations of all hatchling disorientation incidents in 2018.

Hatchling Orientation Index Results. Table 2 shows results for eight 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 74%.

Adult Disorientation Results. Adult females became disoriented at 19% of the loggerhead nests (9 of 47). Also, four loggerheads became disoriented without nesting. Table 3 shows results of the incidents. Each was assessed based on a wandering track found during the morning survey after the turtle had returned to the water. The most serious incident occurred at false crawl 28, located at the Carousel Store, 19440 Front Beach Rd, where a disoriented turtle crawled almost 500 feet along beach before returning to the water without nesting.

Lights Contributing to Hatchling Disorientation. Figure 3 shows the types of lights contributing to hatchling disorientation incidents this year. Indirect lighting from urban glow was the largest contributor at 17%, followed by street lights (16%), parking lot lights (16%), and exterior condo lights (14%).

Discussion. Patty Kelly of the U.S. Fish and Wildlife Service, Panama City Field Office, and Jim Moyers of FWC met with local government officials in September to discuss adverse effects of street lighting on sea turtles on Panama City Beach. Discussion focused on Community Redevelopment Agency (CRA) projects on Front Beach Road. Local officials said that each phase of the CRA requires review from FWC and DEP which should include review of proposed street lighting. Gulf Power and Florida Department of Transportation need to be brought into this discussion to ensure compatible lighting is installed as part of redevelopment.

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 Coordinator

cc: Tonya Long FWC, Meghan Koperski FWC, Tomo Hirama FWC, Patty Kelly FWS, Jim Moyers FWC

Table 1. Nighttime loggerhead hatchling emergences on Panama City Beach in 2018 (25 nests).

Nest No.	Nearest Landmark	Incident Date	Emergence Time	Total Emerged	Number Disoriented	Percent Disoriented	Estimated Mortality	Dead Collected	Live Collected	Report Filed
2	House, 330 Beachside Dr, Carillon Beach	29-Jul	8-10 PM	92	0	0%	0	0	0	N
6	Emerald Isles Condo, 17545 Front Beach Rd	29-Jul	9:30-10:30 PM	105	90	86%	40	0	33	Y
7	Sterling Reef Condo, 12011 Front Beach Rd	7-Aug	8:31 PM	98	98	100%	0	0	98	Y
8	Edgewater Beach Resort, 11212 Front Beach Rd	2-Aug	8:27 PM	105	101	96%	0	0	101	Y
9	House, 21715 Front Beach Rd	8-Aug	11:27 PM	56	49	88%	0	0	50	Y
10	Townhouse, 8015 Surf Dr	5-Aug	7:47 PM	87	0	0%	0	0	0	N
11	House, 13223 Oleander Dr	31-Jul	7:45 PM	95	0	0%	0	0	0	N
12	Harpoon Harry's, 12627 Front Beach Rd	29-Jul	10:45-11:17 PM	125	72	58%	40	0	17	Y
13	Townhouse, 8515 Surf Dr	5-Aug	9:30-10 PM	102	102	100%	0	0	102	Y
14	Townhouse, 7719 Surf Dr	5-Aug	11:02 PM	96	82	85%	0	0	82	Y
15	House, 5309 Gulf Dr	6-Aug	8:58 PM	62	61	98%	0	0	58	Y
16	Townhouse, 19616 Front Beach Rd	10-Aug	6 PM - 8:25 PM	65	65	100%	64	0	0	Y
18	Sugar Sands Motel, 20723 Front Beach Rd	11-Aug	9 PM - 11 PM	94	94	100%	16	0	78	Y
20	Sterling Reef Condo, 12011 Front Beach Rd	15-Aug	8:51 PM	69	69	100%	0	0	69	Y
21	Pinnacle Port Condo, 23223 Front Beach Rd	14-Aug	7:30 PM - 8:30 PM	70	54	77%	16	0	0	Y
22	Townhouse, 22409 Front Beach Rd	21-Aug	8:17 PM	13	0	0%	0	0	0	N
23	Pirate Cove Villas, 23001 Front Beach Rd	17-Aug	9:18 PM - 10:28 PM	56	0	0%	0	0	0	N

24	Aquavista Condo, 17155 Front Beach Rd	14-Aug	8:53 PM	39	37	95%	0	0	37	Y
25	House, 13103 Oleander Dr	16-Aug	8:05 PM	68	48	71%	14	0	48	Y
26	Pinnacle Port Condo, 23223 Front Beach Rd	16-Aug	9:45 PM	131	5	4%	0	0	0	N
27	Fontainebleau Terrace, 14401 Front Beach Rd	23-Aug	8:20 PM	78	78	100%	0	0	78	Y
28	Beachside West Townhomes, 17927 Front Beach Rd	31-Aug	8:00 PM	88	88	100%	0	0	88	Y
29	Townhouse, 22319 Front Beach Rd	28-Aug	11 PM - 6:55 AM	33	15	45%	0	0	0	Y
44	Shores Townhomes, 22519 Front Beach Rd	25-Sep	8:30 PM - 6:47 AM	69	6	9%	6	0	0	N
47*	Townhouse, 22401 Front Beach Rd	10-Aug	UNK	13	13	100%	13	1	0	Y
			TOTAL	**1909**	**1227**	**64.3%**				

*Nest missed by morning survey, clutch could not be found from hatchling tracks discovered on 8/10/18

Table 2. Hatchling Orientation Index results for loggerhead hatchling emergences on Panama City Beach in 2018 (8 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**
7*	7-Aug	8:31 PM	215	20	295	Y	98	98	100%
9	8-Aug	11:27 PM	210	62	-87	Y	56	49	88%
21	14-Aug	7:30 PM - 8:30 PM	188.5	41	233	Y	70	54	77%
22	21-Aug	8:17 PM	207	189	163	Y	13	0	0%
24*	14-Aug	8:53 PM	192	32	260	Y	39	37	95%
27*	23-Aug	8:20 PM	192	30	227	Y	78	78	100%
29*	28-Aug	11 PM - 6:55 AM	185.5	130	171	Y	33	15	45%
44	25-Sep	8:30 PM - 6:47 AM	187	237	78	Y	69	6	9%
					TOTAL	**100%**			**73.9%**

*HOI data collected for reduced radius circle <10 meters due to obstacles and/or absence of tracks outside marked nest area

Table 3. Adult loggerhead disorientation incidents on Panama City Beach in 2018 (4 false crawls, 9 nests).

Crawl No.	Crawl Type	Nearest Landmark	Incident Date	Observations	Report Filed
7	False Crawl	Top of Gulf Condo, 8817 Thomas Dr	7-Jun	Track looped over itself, police reported possible harassment from bystanders	Y
12	False Crawl	Dunes of Panama Condo, 7205 Thomas Dr	15-Jun	Track looped over itself on return to water	Y
23	False Crawl	Emerald Isle Resort, 17545 Front Beach Rd	1-Jul	Track went between lounge chairs and then went parallel to shore for considerable distance before entering water	Y
28	False Crawl	Carousel (store), 19440 Front Beach Rd	3-Jul	Turtle severely disoriented crawling 471 ft along beach before returning to water, digging 7 times along the way. Turtle first encountered night before (7/2/18) by Wildlife Observer Carson Richards as part of Leave No Trace enforcement	Y
8	Nest	Edgewater Beach Resort, 11212 Front Beach Rd	2-Jun	Track wandered significantly after nesting with track looping over itself	Y
16	Nest	Townhouse, 19616 Front Beach Rd	7-Jun	Track looped over itself during return to water after nesting	Y
17	Nest	Shores Townhomes, 22519 Front Beach Rd	9-Jun	Track wandered east a considerable distance east after nesting	Y
23	Nest	Pirate Cove Villas, 23001 Front Beach Rd	14-Jun	Track wandered east 800 ft after nesting	Y
25	Nest	House, 13103 Oleander Dr	20-Jun	Track wandered west over 100 ft after nesting, looping over itself	Y
26	Nest	Pinnacle Port Condo, 23223 Front Beach Rd	23-Jun	Track wandered west over 100 ft after nesting	Y
37	Nest	Thomas Donut & Snack Shop, 19208 Front Beach Rd	11-Jul	Track showed turtle severely disoriented after nesting, crawling north toward Front Beach Rd, then into dunes and looping twice before returning to water	Y
39	Nest	Ramsgate Condo, 23011 Front Beach Rd	15-Jul	Track wandered east and looped over itself after nesting	Y
40	Nest	House, 9820 Beach Blvd	16-Jul	Track showed turtle severely disoriented after nesting, crawling north toward Front Beach Rd, making two loops, then into dunes before returning to water	Y

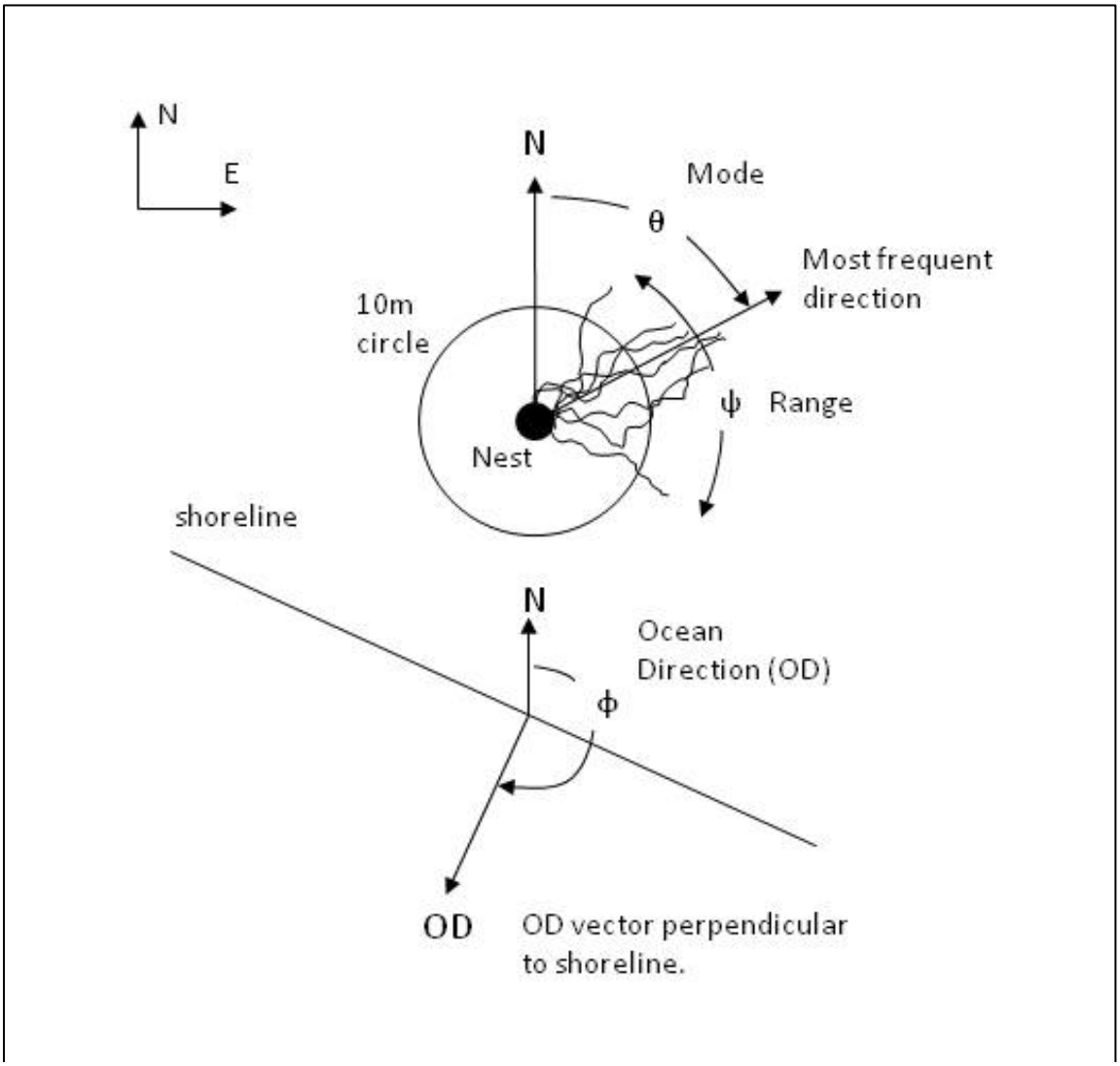

Figure 1. Definition of variables used in the Hatchling Orientation Index.

Figure 2. Map showing locations of loggerhead hatchling disorientation incidents on Panama City Beach in 2018 (18 nests).

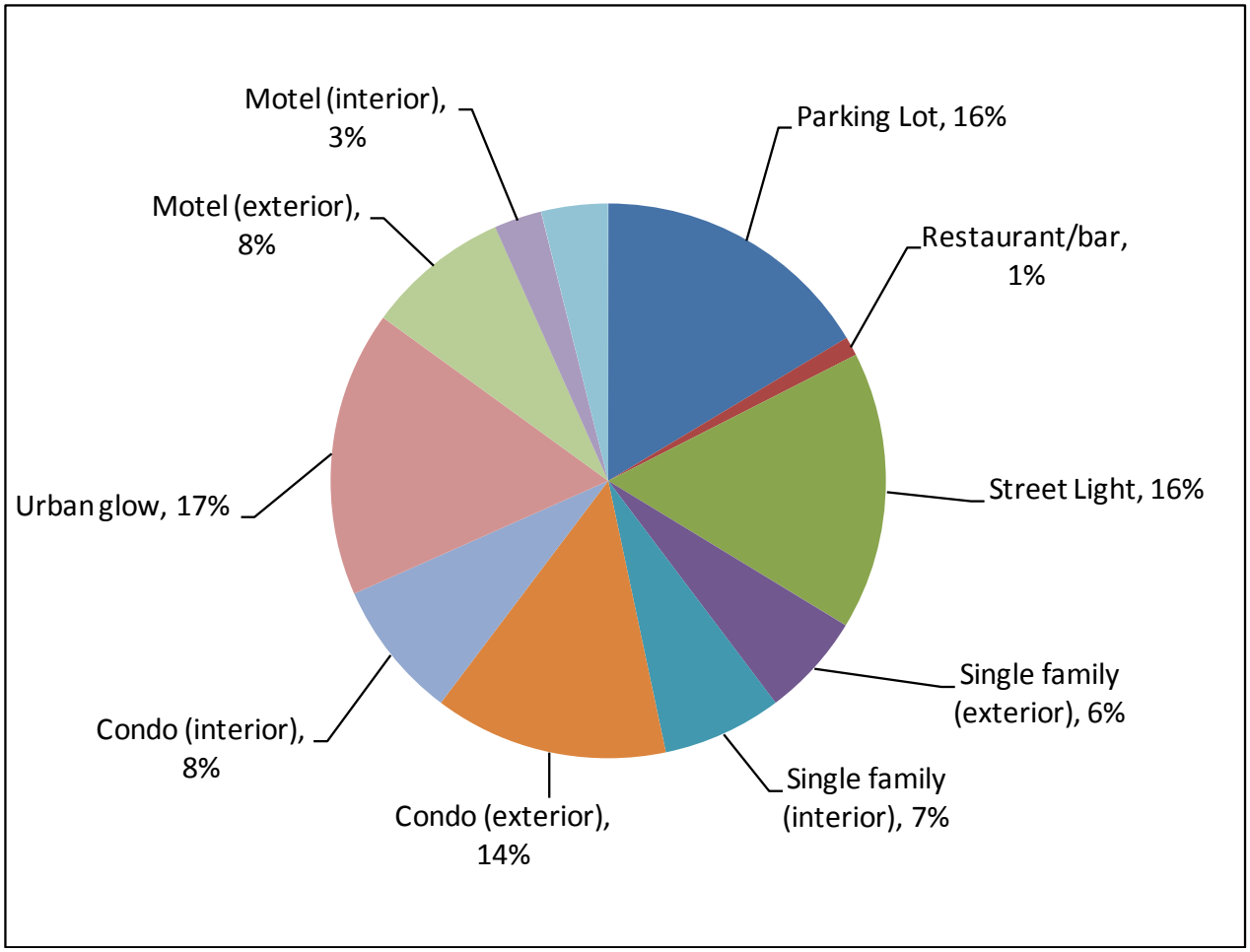

Figure 3. Lights contributing to loggerhead hatchling disorientation incidents on Panama City Beach in 2018 (18 nests).