21 November 2021

Kennard Watson, Director
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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 2021 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:

- 456 of 806 hatchlings that emerged at night from 9 nests (8 loggerhead, 1 green) were disoriented by artificial lights for a combined disorientation of 57%.
- 360 disoriented hatchlings were released on a nearby dark beach.
- Mortality documented at 4 nests with approximately 53 disoriented hatchlings either lost in dunes or taken by predators on the beach. No dead turtles were found.
- Hatchlings were disoriented at one of 3 nests with restraining cages.

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. 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 starting on a 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. Restraining cages were placed on 3 nests where hatchlings were vulnerable to lights from construction equipment operating at night during beach nourishment. The caged nests were checked 3 times daily following FWC protocols, starting on October 26 when the cages were installed.

Method to Quantify Hatchling Disorientations. We submitted disorientation reports only for main emergences and not for small numbers of hatchlings that may emerge before or after. Reports were submitted electronically to local code enforcement and FWC, usually within three days of the incident. For caged nests, disorientation was estimated by observing hatchlings within the restraining cage, prior to collection, and by releasing a sample of 10 turtles at the nest site to confirm disorientation. For uncaged nests, the methodology for estimating hatchling disorientation was as follows:

- Incidents were documented mainly during night surveys by volunteers who were at the nest when hatchlings emerged or arrived shortly after while hatchlings were still on the beach and tracks fresh. Volunteers collected disoriented hatchlings and estimated the number of turtles reaching the water by observing the animals or counting tracks. Volunteers noted the location of lights affecting the hatchlings and documented the sky condition at the time of emergence, including the presence or absence of moonlight.
- The number of disoriented hatchlings was determined by summing the number of live and dead turtles collected, supplemented by counting tracks leading away from the water, in addition to any reaching the water after wandering. Nest excavation data were occasionally used to adjust disorientation estimates. For example, if volunteers arrived after an emergence with all tracks leading away from the water, the nest was assumed to have 100% disorientation and the number of disoriented hatchlings was obtained from the excavation data.
- Disoriented turtles collected at the nest site were released the same night at Santa Monica Beach which is within our survey area. Previously we've used Sunnyside Beach, historically the darkest part of our survey area, but it was not available as a release site in 2021.

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 at night. 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 8 loggerhead nests and one green nest that hatched at night are shown in Table 1, including those at which no disorientation occurred. Eighteen (18) nests were excluded from the sample. Of these, 16 failed to hatch due to flooding or wash-out from storms, one hatched nest was excluded because disorientation could not be quantified, and another was excluded because eggs could not be found from a nest where no hatchlings emerged. Table 1 includes the time of hatchling emergence, number of live hatchlings collected, and estimated number of dead hatchlings. Table 2 contains additional information on numbers of authorized and non-authorized personnel at the disorientation incidents. Results are as follows:

- Combined hatchling disorientation rate was 57%, representing 456 of 806 turtles that emerged at night from 8 loggerhead nests and one green nest.
- 360 disoriented hatchlings were collected at night during nest monitoring and released at Santa Monica Beach within our survey area.
- Hatchling mortality was documented at 4 loggerhead nests. We estimated 53 of 806 hatchlings (7%) were lost in dune vegetation or taken by predators. No dead hatchlings were found.
- Volunteers observed the main emergence at 2 nests, and the remaining 6 were documented by tracks observed and hatchlings collected after the emergence, either at night or during the morning survey.
- Urban glow, motel lights (interior and exterior), and streetlights were the largest contributors to hatchling disorientation incidents. Figure 1 shows the types of lights documented in the disorientation reports.

Hatchling Disorientation Results for Caged Nests. Hatchling emergence results for 3 nests with restraining cages are shown in Table 3. Disorientation was estimated for one caged green nest (26) where hatchlings emerged at night. Hatchlings were concentrated on the southeast corner of the cage toward nourishment lights and urban glow from Panama City Beach. We released a sample of 10 from the main emergence of 75 turtles at the nest site to confirm disorientation, with 6 of 10 crawling east toward the lights (Table 3 shows 84 hatchlings were collected from this nest which includes 75 from the main emergence and 9 stragglers removed from the cage in the days following the first emergence, prior to excavation). For the two caged loggerhead nests (24, 25), one hatched during daylight hours with no disorientation and the other failed to hatch.

Adult Disorientation Results. Three disorientation incidents of an adult loggerheads were recorded this season (Table 4). 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, Patty Kelly FWS Panama City, Tomo Hirama FWRI Gainesville

Table 1. Nighttime hatchling emergences on Panama City Beach in 2021 (8 loggerhead nests, 1 green nest).

Nest No.& Species	Nearest Landmark	Incident Date	Emergence Time	Night Emerged	Number Disoriented	Percent Disoriented	Estimated Mortality	Dead Collected	Live Collected	Report Filed
1 Cc	Sandpiper Beacon Resort, 17403 Front Beach Rd	8-Aug	10:14 PM	129	129	100%	0	0	129	Y
2 Cc	Mariner West Condo, 6213 Thomas Dr	9-Aug	9:24 PM	119	113	95%	6	0	113	Y
7 Cc	House, 21615 Front Beach Rd	18-Aug	~8 PM	94	0	0%	0	0	0	N
11 Cc	Townhouse, 21312 Front Beach Rd	20-Aug	< 9 PM	108	0	0%	0	0	0	N
12 Cc	House, 13103 Oleander Dr	24-Aug	9:20 PM	45	37	82%	14	0	31	Y
17 Cc	House, 5203 Gulf Dr	18-Sep	10:38 PM - 7:13 AM	104	0	0%	0	0	0	N
18 Cc	House, 20804 Front Beach Rd	27-Sep	10:20 PM - 6:31 AM	62	62	100%	9	0	1	Y
26 Cm	House, 20804 Front Beach Rd	3-Nov	Sunset – 11:10 PM	75	45	60%	0	0	75	Y
27 Cc	Holiday Inn Express, 12907 Front Beach Rd	22-Aug	~10:30 PM	70	70	100%	24	0	11	Y
			TOTAL	**806**	**456**	**56.6%**	**53**	**0**	**360**	

Table 2. Authorized and non-authorized personnel present at hatchling disorientation incidents on Panama City Beach in 2021 (5 loggerhead nests, 1 green nest).

Nest No.& Species	Nearest Landmark	Incident Date	Arrival Time	Number Authorized Personnel	Number Non-authorized Personnel	Time at Nest Prior to Hatch	Comments
1 Cc	Sandpiper Beacon Resort, 17403 Front Beach Rd	8-Aug	10:00 PM	3	10-50	~10 min	3 volunteers needed to retrieve hatchlings and manage bystanders
2 Cc	Mariner West Condo, 6213 Thomas Dr	9-Aug	7:30 PM	4	>50	~10 min	Early evening emergence and nest location at condo contributed to large number of bystanders. 4 volunteers needed to retrieve hatchlings and manage bystanders
12 Cc	House, 13103 Oleander Dr	24-Aug	9:40 PM	2	<10	0	Hatchlings had already emerged when volunteers arrived
18 Cc	House, 20804 Front Beach Rd	27-Sep	7:58 AM	Not applicable	Not applicable	Not applicable	Disorientation estimated from tracks observed during morning survey
26 Cm	House, 20804 Front Beach Rd	3-Nov	11:10 PM	2	0	0	Hatchlings had already emerged within cage when volunteers arrived
27 Cc	Holiday Inn Express, 12907 Front Beach Rd	22-Aug	11:40 PM	2	<10	0	Hatchlings had already emerged when volunteers arrived

Table 3. Hatchling emergence results for nests with restraining cages on Panama City Beach in 2021 (2 loggerhead nests, 1 green nest).

Nest No. & Species	Nearest Landmark	Incident Date	Emergence Time	Total Emerged	Number Disoriented	Percent Disoriented	Estimated Mortality	Dead Collected	Live Collected	Report Filed
24 Cc	House, 20804 Front Beach Rd	Failed	Failed	0	0	0%	0	0	0	N
25 Cc	House, 17491 Front Beach Rd	6-Nov	Daytime	46	0	0%	6	0	0	N
26 Cm	House, 20804 Front Beach Rd	3-Nov	Sunset – 11:10 PM	91	45	60%	0	0	84	Y

Table 4. Adult loggerhead disorientation incidents on Panama City Beach in 2021.

Crawl No.	Crawl Type	Nearest Landmark	Incident Date	Observations	Report Filed
2	Nest	Mariner West Condo, 6213 Thomas Dr	4-Jun	Turtle nested in dune, track wandered 252 ft down beach after nesting, eventually entering water	Y
21	Nest	Osprey Motel, 15801 Front Beach Rd	9-Aug	Turtle crawled east about 100 ft after nesting and then returned to water	Y
18	False Crawl	Moonspinner Condo, 4425 Thomas Dr	5-Jul	Turtle had to crawl around beach chairs on entry and exit.	Y

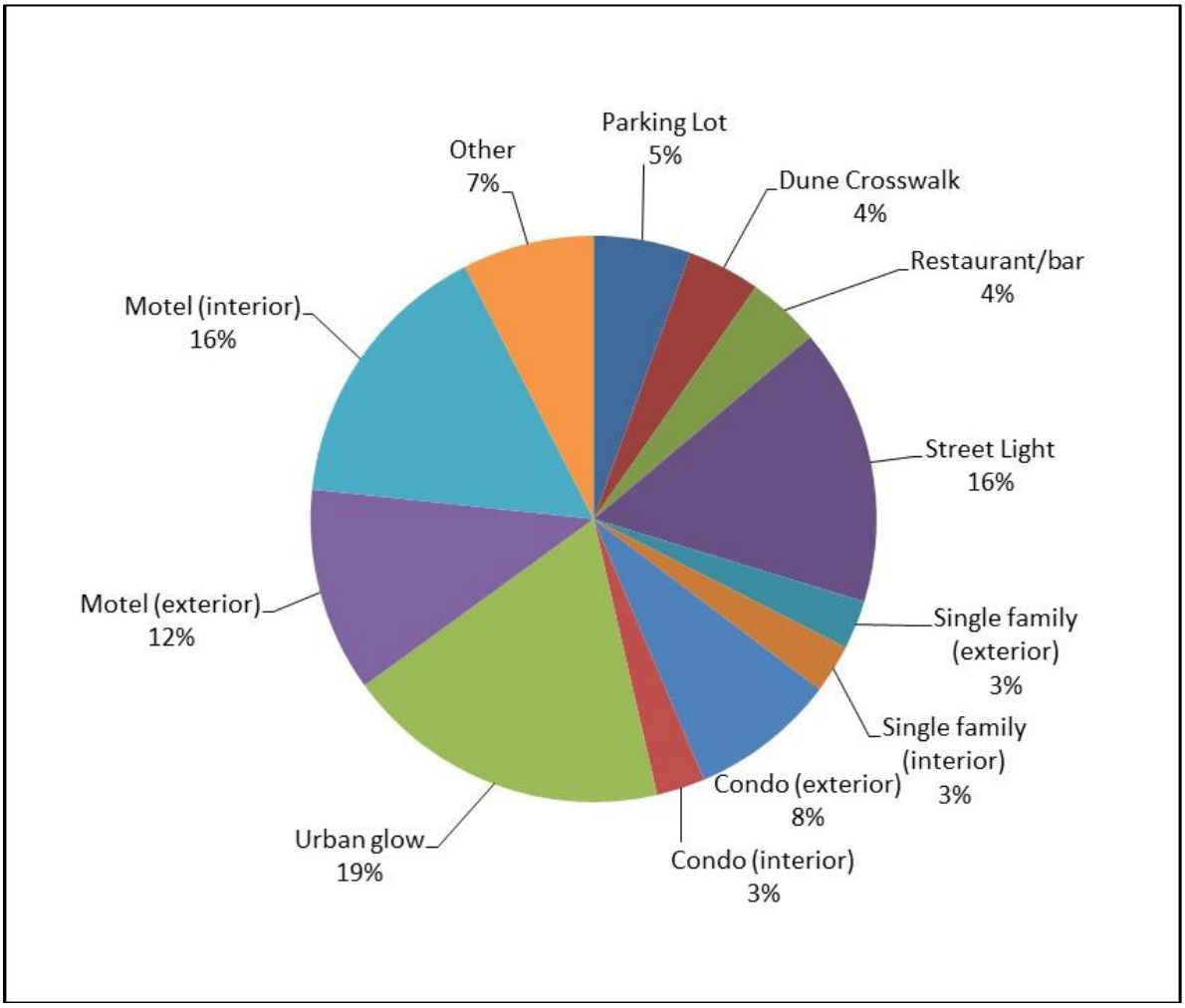

Figure 1. Lights contributing to hatchling disorientation incidents on Panama City Beach in 2021 (5 loggerhead nests, 1 green nest).