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Relative Abundance & Distribution of Juvenile Sea Turtles Along the Mid-Lower Texas Coast Based on Directed Capture

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Abstract

Over recent decades, the Texas coast has undergone major changes in land development in & around all major bay systems, including those frequented by juvenile & sub-adult sea turtles. To help understand impacts of anthropogenic factors & potential habitat loss or destruction, as well as make suggestions towards future conservation efforts, it is important to understand how often these bay systems are utilized by these turtles. The upper Texas coast is primarily dominated by Kemp's ridley sea turtles (*Lepidochelys kempii*) while green sea turtles (*Chelonia mydas*) are more prevalent from the mid to lower coast (Landry and Costa 1999). Loggerhead (*Caretta caretta*), hawksbill (*Eretmochelys imbricata*) and leatherback (*Dermochelys coriacea*) turtles, though documented in Texas waters, are rarer. Directed capture survey data compiled from 1991-2013 was compared to new data collected in 2014 to evaluate trends in species distribution and composition along the mid to lower Texas coast. Large mesh entanglement nets & cast nets were used in surveys conducted at inshore locations in 3 major bay systems including the Lavaca-Matagorda Bay complex (LMB), the Aransas Bay complex (ABC), and the Lower Laguna Madre (LLM). From 1991-2013, 426 turtles representing 3 species (loggerhead, n = 3; green, n = 374; Kemp's ridley, n = 49) were documented in the aforementioned bay systems. In 2014, 36 turtles representing 3 species (loggerhead, n =1; Kemp's ridley, n = 2; green, n = 33) were captured in 15.74 km-hrs of entanglement netting (SCL = 78.7, 30.7-37.2, and 25.2-65.0 cm, respectively) while 8 green sea turtles were captured in 8.42 hours of cast netting (SCL = 27.2-30.9 cm). Loggerhead CPUE in 2014 was low compared to other species (0.19 turtles/km-hr) while no hawksbill or leatherback turtles were captured or observed. Entanglement netting *C. mydas* CPUE values in 2014 increased south along the coast from ABC (1.69 turtles/km-hr) to the LLM (4.72 turtles/km-hr) while jetty CPUE values remained relatively constant between the two bays (1.14 and 0.63 turtles/hr, respectively). Additionally, entanglement netting CPUE values for green turtles in 2014 are consistent with rising CPUE rates from 1991-2010 (1991: <1 turtle/km-hr; 2010: >4 turtle/km-hr) (Metz and Landry 2013). In LMB, *L. kempii* CPUE show an increasing trend from 1996 to 2013 (0.15 to 0.92 turtles/km-hr). In 2014, CPUE dropped to 0.56 turtles/km-hr, likely due to a reduction in sampling effort. Though these data provide insight to how often major bay systems are utilized by various sea turtle species over the last two and a half decades, continued long term monitoring of bay usage by juveniles and sub-adults is pivotal effective management and conservation of sea turtle species in the future.

Introduction & Objective

- Nearshore (neritic) areas along the Texas coast provide critical habitat to juvenile sea turtles
- Upper Texas coast dominated by Kemp's Ridley (*Lepidochelys kempii*); lower dominated by Green (*Chelonia mydas*)[1]; Loggerhead (*Caretta caretta*) observed less frequently along entirety of coast[2]
- Historically, juvenile green capture rates have increased exponentially since 1991[3] and Kemp's capture rates exhibit increasing trend in Lavaca-Matagorda Bay complex from 1991-2013[4]

Objective: compare historical capture rates of juvenile sea turtles along the mid-lower Texas coast to current (2014) sampling efforts

Figure 1 Capture methods employed; cast netting (left) and entanglement netting (right).

Methods

- 3 locations:
  - Lavaca-Matagorda Bay complex (LMB)
  - Aransas Bay complex (ABC)
  - Lower Laguna Madre (LLM)
- Entanglement nets: 2-4 (0.0914 km long); 2.7 or 3.7 m deep; 6+ hours
- Cast nets: 1-3 netters; 3.5ft diameter nets; time recorded
- Processing:
  - Checked for previous capture indicators
  - Equipped with PIT & flipper tags
  - Measured for straight and curved carapace length and width (SCL, SCW, CCL, CCW; cm)
  - Documented injuries/abnormalities
- CPUE calculated
  - Entanglement net: # turtles/km-hr
  - Cast net: # turtles/hr

Study Area

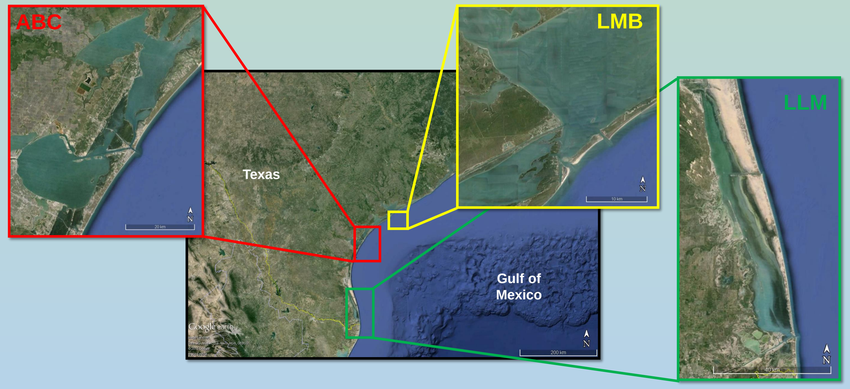


Figure 2 Map of bay systems sampled from 1991-present. Lavaca-Matagorda Bay complex = yellow; Aransas Bay complex = red; Lower Laguna Madre = green.

Results

Table 1 Historical (1991-2013[1,3,4]) and recent (2014) percent composition by species and bay system.

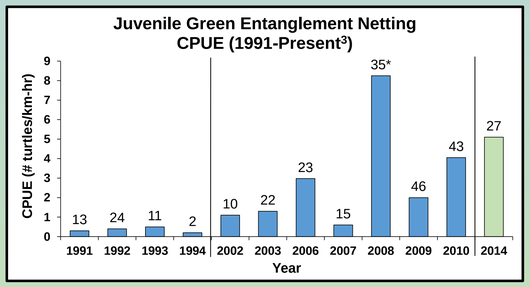
Netting Site	Loggerhead		Green		Ridley		Total N	
	(1991-2013)	(2014)	(1991-2013)	(2014)	(1991-2013)	(2014)	(1991-2013)	(2014)
LMB	0.0%	0.0%	25.0%	0.0%	75.0%	100.0%	64	2
ABC	4.3%	0.0%	95.7%	100.0%	0.0%	0.0%	23	14
LLM	0.6%	3.6%	99.1%	96.4%	0.3%	0.0%	339	28
All Sites	0.7%	4.5%	87.8%	93.2%	15.0%	2.3%		
Total N	3	1	374	41	49	2		

Table 2 Comparison of historical (1991-2013[4,3]) SCL values to those observed in 2014.

Species	Average SCL (cm, historical)	Gear	Min SCL (cm)	Max SCL (cm)	Average SCL (cm, 2014)
Ridley	30-34.9[4]	Entanglement	30.7	37.2	34.0
Green	ABC – 45.1 (29.4-71.2, n = 13)[3] LLM – 42.2 (31.4-68.6, n = 38)[3]	Entanglement	25.2	65.0	40.6
	29.2 (28.8-29.7, n = 2); 20.0-29.9 (estimated)[3]	Cast Net	27.2	30.9	28.6
Loggerhead	Atlantic neritic recruitment: > 45.5[5]	Entanglement		78.7	

Table 3 Effort and CPUE values for gear types used during 2014 sampling.

Species	Gear Type	Bay	# Captured	Effort (hours)	CPUE
Ridley	Entanglement	LMB	2	62.68	0.349
Green	Entanglement	ABC	8	51.65	1.695
		LLM	25	57.9	4.724
	Cast Net	ABC	6	5.25	1.143
		LLM	2	3.17	0.631
Loggerhead	Entanglement	LLM	1	57.9	0.189



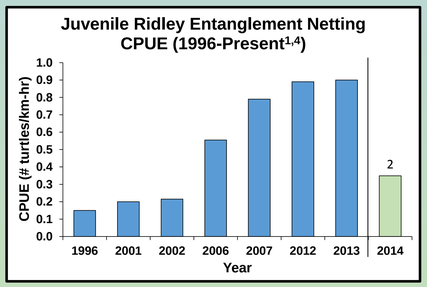


Figure 3 CPUE rates for juvenile Green (left) and Ridley (right) sea turtles in LLM and LMB, respectively. Blue bars represent historical CPUE values; green bars represent recent (2014) CPUE values; numbers above bars = total # individuals captured (unavailable for Ridley).

Discussion and Conclusions

- Loggerhead CPUE was low compared to other species
- Green entanglement CPUE values in 2014 increased south along coast from ABC to LLM while cast-net CPUE remained constant
  - 2014 entanglement CPUE in LLM consistent w/ historical rates[3]
- Ridley 2014 CPUE reduced from historical values[4]
  - Likely due to reduction in sampling effort from previous years
  - Original project aimed at capture of greens, reduction may be artifact of sampling areas w/ lower historical Ridley capture rates
- Increased numbers of greens present within LLM indicate positive responses to regulation and public education of the species
- Continued long-term monitoring of neritic areas by juvenile and sub-adults is pivotal to effective management and conservation of sea turtle species.
- More information about adult, breeding, and nesting individuals along the Texas coast is necessary to further understand how sea turtles are utilizing the Western Gulf of Mexico

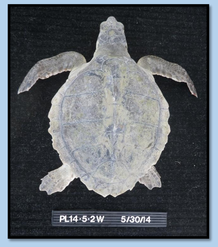


Figure 4 Field personnel measuring juvenile green captured with cast-net off jetty near Port Mansfield, TX (left); turtle "corral" on back of vessel prior to release of 13 individuals near Port Mansfield, TX (center); initial photographic documentation of Ridley captured near Port Lavaca (placard contains unique ID number and date of capture) (right).

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