Common bottlenose dolphin occurrence in St. Andrew Bay, Florida and coastal waters near the Naval Surface Warfare Center, Panama City Division Testing Range

B. Balmer[1,6], S. Watwood[2], T. Speakman[1], B. Quigley[1], K. Barry[3], J. Bolton[4], K. Mullin[3], P. Rosel[5], C. Sinclair[3], G. Ylitalo[4], E. Zolman[1], and L. Schwacke[6]

[1]JHT, Inc. under contract to National Marine Mammal Foundation, 2240 Shelter Island Drive, Suite 200, San Diego, CA 92106 USA
[2]Naval Undersea Warfare Center Division, Newport, Environmental Branch, 1176 Howell Street, Newport, RI 02841 USA
[3]National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Science Center, 3209 Frederic Street, Pascagoula, MS 39567 USA
[4]National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northwest Fisheries Science Center, 2725 Montlake Boulevard East, Seattle, WA 98112 USA
[5]National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Science Center, 646 Cajundome Boulevard, Lafayette, LA 70506 USA
[6]National Marine Mammal Foundation, 2240 Shelter Island Drive, Suite 200, San Diego, CA 92106 USA

Abstract

Common bottlenose dolphins *(Tursiops truncatus)* inhabit bays, sounds, and estuaries (BSEs), and coastal waters of the Florida Panhandle. These same waters, inclusive of St. Andrew Bay, and stretching into Alabama, are also home to the Naval Surface Warfare Center, Panama City Division (NSWC PCD) Testing Range. Currently, the National Marine Fisheries Service has delineated one coastal (Northern Coastal Stock) and seven BSE dolphin stocks within the nearshore waters of the Florida Panhandle. Two stocks, the St. Andrew Bay Stock and the Northern Coastal Stock, occur within the boundaries of the NSWC PCD Testing Range. The goals of this study were to determine seasonal abundance, habitat use, and distribution patterns of dolphins in St. Andrew Bay and adjacent coastal waters. In addition, remote biopsy samples were collected to provide baseline data on stock structure and contaminants. Small vessel, capture-recapture surveys and remote biopsy sampling were conducted during two seasons a year in 2015 and 2016. Preliminary results from 2015 identified comparable abundance estimates between July and October primary periods; 399 (311 – 539, 95% CI) and 407 (346 – 499, 95% CI), respectively. Dolphin habitat use was highest in Channel and Seagrass habitat types; 3.85 and 2.50 dolphins/km^2, respectively. There was minimal crossover between dolphins encountered in BSE versus coastal waters (N = 15/246; 6%). Male dolphins had ΣDDT levels (66.19 µg/g lipid; 48.95 – 89.51, 95% CI) that are the highest known in the southeastern U.S., potentially as a result of a National Priority List site in St. Andrew Bay. Photo and remote biopsy analyses are currently underway for 2016 (April and October), and will provide additional insight into population structure and anthropogenic threats to dolphins in the St. Andrew Bay region.

Study Area

Florida Panhandle Stock Structure (Fig. 1)

- Bay, Sound, and Estuary (BSE): N = 7
- Coastal: N = 1; Northern Coastal Stock

Naval Surface Warfare Center, Panama City Division (NSWC PCD) Testing Range

- Estuarine, coastal, and offshore waters of FL Panhandle and Alabama
- Inclusive of St. Andrew Bay, FL (Fig. 2)
- Limited data on St. Andrew Bay BSE Stock and adjacent Northern Coastal Stock

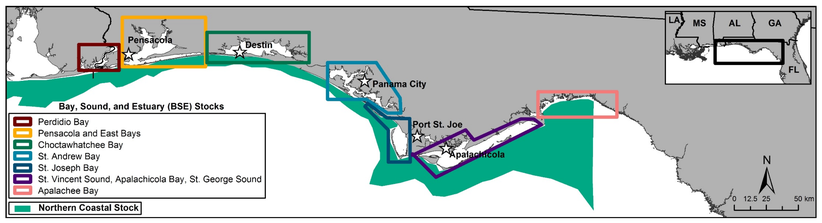


Figure 1. Bottlenose dolphin BSE and coastal stock structure in the Florida Panhandle.

Objectives

- Determine abundance, distribution, and habitat use of bottlenose dolphins in St. Andrew Bay and coastal waters.
- Collect remote biopsy samples for baseline data on genetic stock structure and persistent organic pollutants (POPs).

Methods

St. Andrew Bay Study Area

- St. Andrew Bay proper (SAB), North Bay (NOB), West Bay (WEB), East Bay (EAB), adjacent coastal waters (CSTC) and 3 km offshore (CST3K) (Fig. 2A).
- Vessel-based, photographic-identification (photo-ID) and remote biopsy surveys (Jul. and Oct. 2015, Apr. and Oct. 2016).

Abundance

- Capture-recapture, robust-design methodologies[1,2].

Distribution

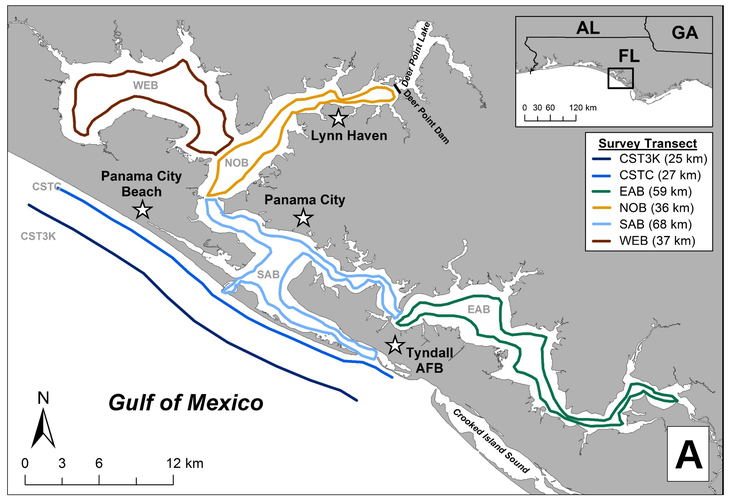
- Individual classification: sighted solely in BSE waters, solely in CST waters, or sighted in both.

Habitat Use

- Study area subdivided into one of six habitat types (Fig. 2B).
- Dolphin density: total dolphins/habitat area (km^2).

Persistent Organic Pollutants (POPs)

- Remote biopsies/POP analyses: standardized protocols[3,4,5].



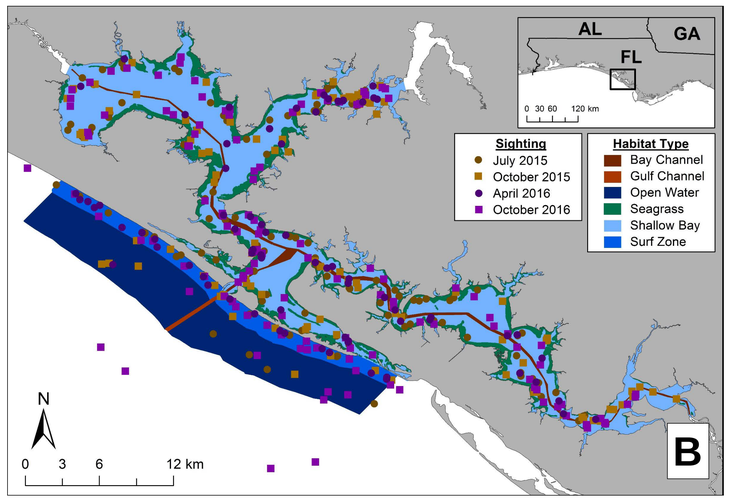


Figure 2. (A) St. Andrew Bay study area and transects, and (B) dolphin sightings with habitat classifications.

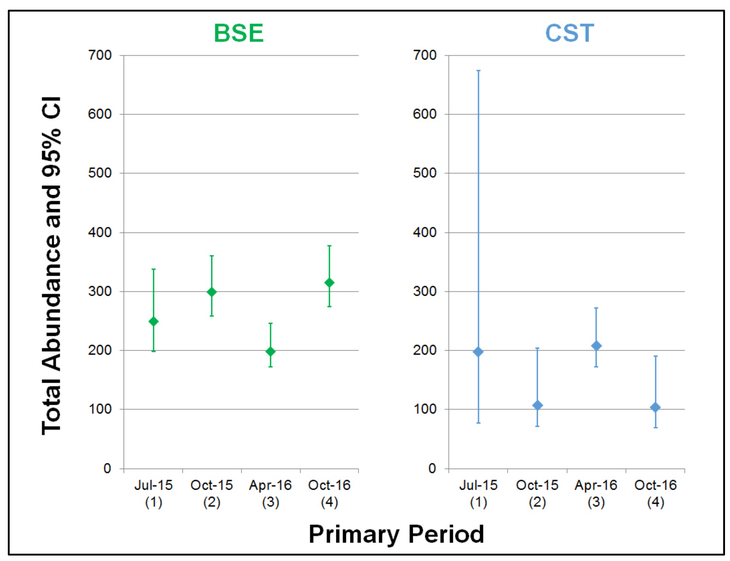


Figure 3. Total abundance and 95% CI for BSE and CST dolphins in St. Andrew Bay study area during the four primary periods using robust-design model in MARK.

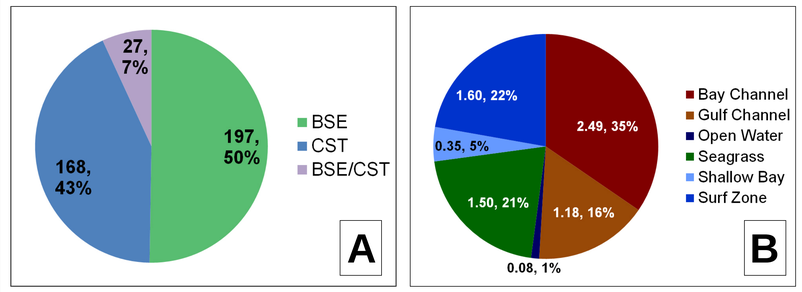


Figure 4. (A) Number and percent of individuals in St. Andrew Bay photo-ID catalog (N = 392) by distribution pattern (BSE, CST, or BSE/CST); and (B) density (dolphins/km^2) and percentage of dolphin habitat use during study period.

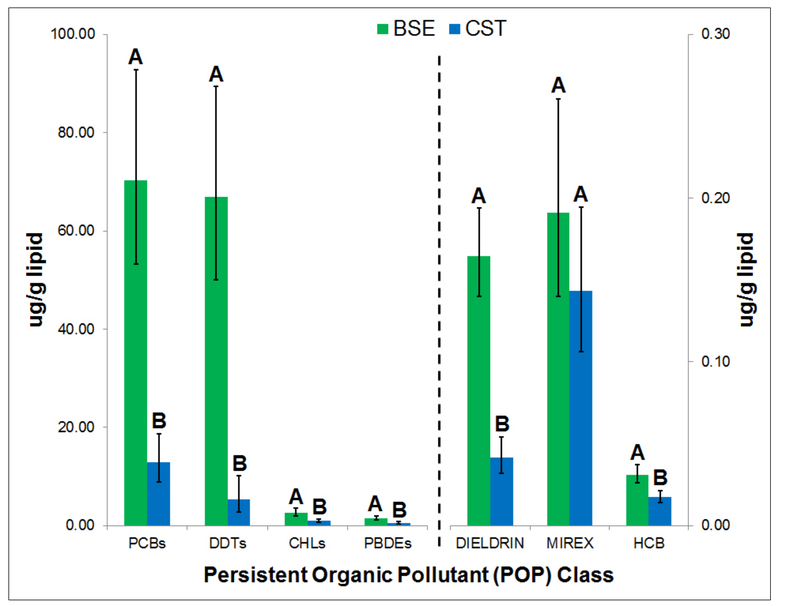


Figure 5. POP levels (µg/g lipid; geometric mean, 95% CI) measured in remote blubber samples of male dolphins (N = 31) grouped by distribution pattern (BSE or CST).

Statistically homogeneous groups are indicated by the same letter subscripts.

Results and Discussion

- BSE abundance similar across primary periods (Fig. 3); comparable to other northern Gulf of Mexico BSEs[1].
- CST abundance had large 95% CIs confounding assessment of seasonal trends. However, there may be a seasonal influx during spring similar to observations in adjacent St. Joseph Bay[6].
- Small number of individuals sighted across BSE and CST (N = 27/392; 7%) (Fig. 4A), and limited connections between BSE and CST; BSE survey area likely a predominantly-closed population and CST likely an open population.
- BSE density highest in Channel and Seagrass habitat types (Fig. 4B); similar to other Gulf of Mexico study sites[7].
- POP levels significantly higher in BSE than CST (Fig. 5).
- BSE dolphins: highest ΣDDT in southeastern U.S[8] (Fig. 5); may be attributed to presence of National Priority List site.

Acknowledgements

This research was conducted under NMFS Permit Number 14450, and represents a multi-agency collaboration of the Navy Sea Systems Command, Naval Undersea Warfare Center Division, Newport; NOAA National Ocean Service National Centers for Coastal Ocean Science; National Marine Mammal Foundation; NOAA NMFS Southeast Fisheries Science Center; NOAA NMFS Southeast Regional Office; NOAA NMFS Northwest Fisheries Science Center; National Institute of Standards and Technology; Medical University of South Carolina; Florida Department of Environmental Protection; Dolphin Relief and Research; Gulfarium Marine Adventure Park; and Gulf World Marine Park. Support for POP analyses were provided by the Marine Mammal Health and Stranding Network, NOAA Office of Protected Resources.

References

[1]Rosel et al. 2011. Photo-identification capture-mark-recapture techniques for estimating abundance of bay, sound and estuary populations of bottlenose dolphins along the U.S. East Coast and Gulf of Mexico: a workshop report. NOAA Technical Memorandum NMFS-SEFSC-621, 30 pp.
[2]Urian et al. 2015. Recommendations for photo-identification methods used in capture-recapture models with cetaceans. Marine Mammal Science 31:298-321.
[3]Sinclair et al. 2015. Remote biopsy sampling field procedures for cetaceans used during the Natural Resource Damage Assessment of the MSC252 Deepwater Horizon oil spill. NOAA Technical Memorandum NMFS-SEFSC-670, 36 pp.
[4]Sloan et al. 2014. Northwest Fisheries Science Center's analyses of tissue, sediment and water samples for organic contaminants by gas chromatography mass spectrometry and analyses of tissue for lipid classes by thin layer chromatography/flame ionization detection. NOAA Technical Memorandum NMFS-NWFSC-125, 61 pp.
[5]Rosel. 2003. PCR-based sex determination in Odontocete cetaceans. Conservation Genetics, 4:647-649.
[6]Balmer et al. 2008. Seasonal abundance and distribution patterns of common bottlenose dolphins *(Tursiops truncatus)* near St. Joseph Bay, Florida, USA. Journal of Cetacean Research and Management 10:157-167.
[7]Barros and Wells. 1998. Prey and feeding patterns of resident bottlenose dolphins *(Tursiops truncatus)* in Sarasota Bay, Florida. Journal of Mammalogy 79:1045-1059.
[8]Kucklick et a. 2011. Bottlenose dolphins as indicators of persistent organic pollutants in waters along the US East and Gulf of Mexico coasts. Environmental Science and Technology 45:4270-4277.