

Xenobalanus globicipitis: Occurrence patterns and use for stock identification in New Jersey bottlenose dolphins (*Tursiops truncatus*)



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Abstract Management of bottlenose dolphins, *Tursiops truncatus*, is based on stock membership; currently, at least seven stocks are defined along the US Atlantic coast. The purpose of this study was to collect baseline information on the relationship between *T. truncatus* and the commensal barnacle *Xenobalanus globicipitis* (a potentially useful tool for stock differentiation). Boat-based surveys aboard the Cape May Whale Watcher were completed two times per week throughout the summer of 2014 (June-August). Data were collected and analyzed on *T. truncatus* location, and presence/abundance of *X. globicipitis* on dorsal fins. Results showed that Quadrat 3 had the highest abundance of *X. globicipitis* most often. Significantly 'heavier' amounts of *X. globicipitis* were found on *T. truncatus* further from shore compared to 'light' amounts on dolphins closer to shore. These results suggest that distance from shoreline may be a consistent factor in *X. globicipitis* occurrence on *T. truncatus* within the study area, and may be indicative of a coastal bottlenose dolphin stock boundary. Genetic studies will confirm if *X. globicipitis* occurrence/abundance is a reliable estimate of stock membership in New Jersey; if these results concur, this could be a cost effective technique to help delineate (and manage) *T. truncatus* stocks off New Jersey's coast.

Introduction

- On the US Atlantic coast, bottlenose dolphins are managed according to stock membership (Waring *et al.*, 2013). Photo-identification, satellite tagging, and genetic data help determine temporal/spatial stock differentiation.
- A 'stock' is a population of dolphins with distinct movement/behavioral/morphological patterns.
- Multiple studies have shown that the pseudo-stalked barnacle, *Xenobalanus globicipitis*, may be a useful indicator of stock membership. *X. globicipitis* has a commensal non-pathogenic relationship with bottlenose dolphins, commonly attaching to dorsal fins, pectoral fin, and flukes (Thiel *et al.*, 2015) by way of attachment plates (Anderson, 1994).
- Given the potential use of *X. globicipitis* in helping define bottlenose dolphin stocks, the purpose of this study was to:
 - Collect baseline data on the relationship of *X. globicipitis* to *T. truncatus* in Cape May; where on the dorsal fin are *X. globicipitis* most commonly attached when present?
 - Determine if there is there a spatial pattern of occurrence in *X. globicipitis* on bottlenose dolphins in Cape May; where is this spatial boundary?

Methods

- Study area: Cape May, NJ (Fig. 3) → Delaware Bay and Atlantic Ocean (xx nm)
- X. globicipitis* data was collected 2x/week via field observations and photographs aboard the Cape May Whale Watcher, June – September 2014
- A Garmin GPS marked survey and dolphin locations, ArcMAP v10 was used for spatial analysis
- Photographs were taken with Canon SLR (100-400mm) and edited in Adobe Photoshop Elements 2.0
- Photographs were then analyzed for *X. globicipitis* amount by category (# barnacles/fin) and quadrat
 - Light (1-5), Medium (6-10), Heavy (>10) (Toth-Brown *et al.*, 2007)
 - Quadrat (1-4) (Fig. 1) with highest amount of *X. globicipitis* on each dorsal fin (Fig. 2)

Results

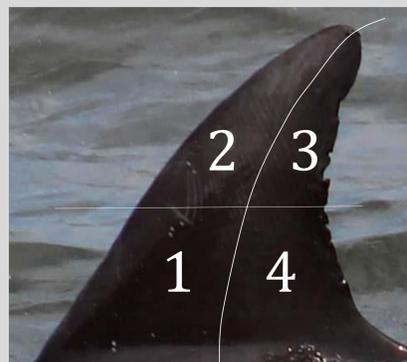


Figure 1: Quadrat breakdown

- X. globicipitis* occurred in all four dorsal fin Quadrats (Fig 3.)
- Quadrat 3 contained the most amount of *X. globicipitis* the most often
- Quadrat 1 contained the least amount of *X. globicipitis* the most often

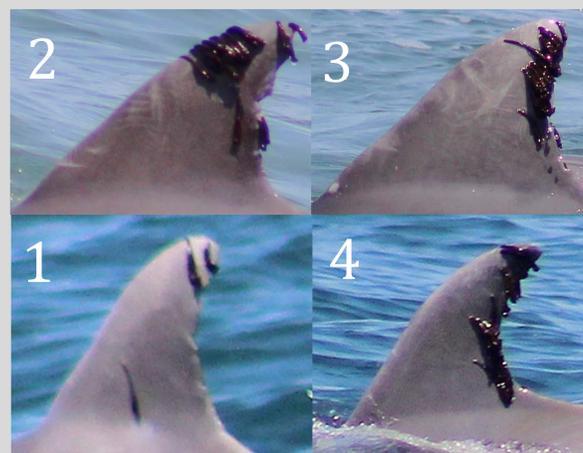


Figure 2: An example of each quadrat with *X. globicipitis*

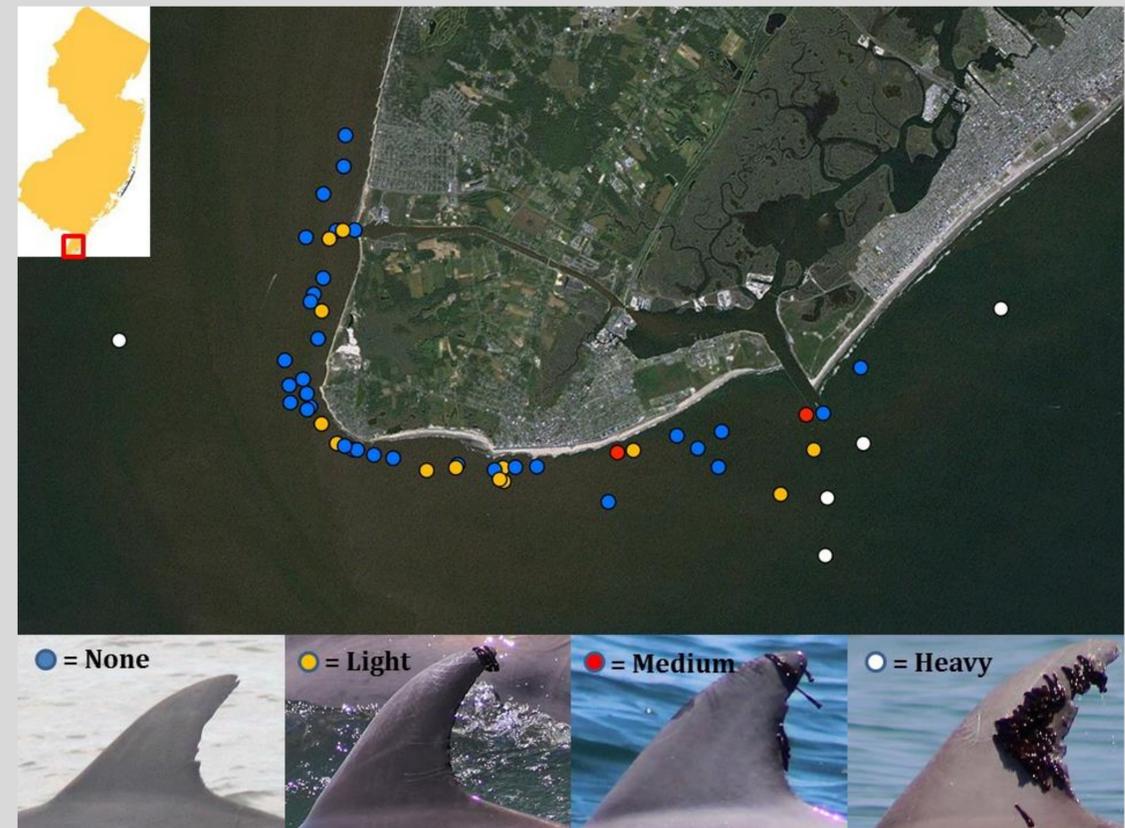


Figure 3: Map of the study area showing occurrence locations of *X. globicipitis* loads

Results continued

- X. globicipitis* loads were significantly heavier on dolphins farther from the shoreline ($p < 0.05$, $df=3$) (Fig. 3):
 - Heavy load = average 3.44 ± 0.880 km from shore,
 - Medium load = average 0.853 ± 0.460 km from shore,
 - Light load = average 0.966 ± 0.630 km from shore
 - None = average 0.628 ± 0.430 km from shore
- No *X. globicipitis* was found on *T. truncatus* calves or juveniles.
- Both juvenile and adult *X. globicipitis* occurred, evidenced by footplate and individual barnacle sizes.
- X. globicipitis* clusters characterized by a bright red coloration were found on some dorsal fins.

Conclusions

- X. globicipitis* regularly occurs on bottlenose dolphins throughout the study area from June-September.
- Occurrence of *X. globicipitis* in Quadrat 3 may provide insight into barnacle attachment morphology; this substrate provides features potentially essential for proper attachment.
- Consistent spatial differentiation in *X. globicipitis* loads (regarding distance from shoreline) supports its potential use for stock differentiation.
- Photo-ID and genetic studies are needed to confirm NJ stock variation. *X. globicipitis* patterns could be used as a cost effective way to evaluate *T. truncatus* stocks if the method is found to be consistent with genetic results.
- X. globicipitis* clusters were found on some dorsal fins with a bright red coloration. This requires further study; it could be an indication of the age of the barnacle, or a result of sun exposure/lighting on the photographs.
- Further research could be conducted to investigate the length of time *X. globicipitis* adheres to *T. truncatus* dorsal fins, which could possibly lead to a new identification technique of *T. truncatus* using *X. globicipitis* patterns.

% of Groups	June	July	August
<i>X. globicipitis</i> absent	60	67	62
<i>X. globicipitis</i> present	40	33	38

Table 1: Temporal presence/absence of *T. truncatus* groups with *X. globicipitis*

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