Contemporary Presence of Humpback Whales (*Megaptera novaeangliae*) and the Menhaden Reduction Commercial Fishing Fleet off Cape May, New Jersey

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ABSTRACT

North Atlantic Humpback Whales (*Megaptera novaeangliae*) utilize high latitude areas such as Cape May, New Jersey as integral feeding grounds during their extensive annual migration. In New Jersey, their main prey source is the Atlantic Menhaden (*Brevoortia tyrannus*), the most important fish of the sea. In addition to marine mammals, this keystone species is also an important food source for sea birds and predatory fish, as well as the primary target species for the Omega Protein Reduction Fishing Fleet. Reduction landings are responsible for the majority of menhaden take off New Jersey. Whale sightings data from the Atlantic Ocean in 2019-2020 was utilized from the Cape May Whale Watch and Research Center (CMWWRC) database. This was combined with vessel Automatic Identification System (AIS) data from MarineCadastre.gov, a partnership between National Oceanic and Atmospheric Administration (NOAA) and the Bureau of Ocean Energy Management (BOEM). Data was manipulated and extracted using Python Pandas libraries and visualized using ArcGIS Pro. Vessel tracks in the Atlantic Ocean were represented using heat map density plots and overlayed with Humpback Whale sightings. A total of 76% (n=93) of whale sightings intersected with locations where reduction vessels were occurring and 14% (n=13) of these sightings observed whales lunge feeding. Migrating Humpback whales are important to consider when establishing quotas and locations permitted for reduction harvests of one of their primary food sources.

INTRODUCTION

- Humpback whales (*Megaptera novaeangliae*) are a vital part to marine ecosystems as they structure the food web and facilitate nutrient cycling throughout the marine environment (Hain et al., 1982).
- Atlantic Menhaden (*Brevoortia tyrannus*), the main food source of humpback whales in New Jersey, are the most important fish of the sea as they are an integral component in food webs and harvested for multiple human uses. Since they are filter feeders, these fish expunge impurities from water as they swim in dense schools (Franklin, 2007).
- The Omega Protein company operates out of Reedville, Virginia and is the largest reduction fishing operation on the East coast. The reduction boats are responsible for the majority of menhaden take in the Atlantic Ocean and have a 3-mile fishing exclusion zone from the coast of Cape May, New Jersey.
- All vessels greater than 65ft in length are required to be equipped with an Automatic Identification System (AIS), a tracking system that communicates via VHF radio, transceivers and uses the vessel's Maritime Mobile Service Identity (MMSI) number to identify the ship.
- Humpback Whales compete with the Menhaden reduction fishing fleet as they are the primary food source for whales and target species for the fleet. It is necessary to gain a better understanding of how this species utilizes their migratory feeding grounds and assess the prevalence of contemporary occurrences between the two.

Figure 1: Humpback Whale lunge feeding on Atlantic Menhaden.

MATERIALS AND METHODS

- Opportunistic, photo-identification surveys of marine mammals were conducted during whale and dolphin watching trips on the 98ft *American Star* of the Cape May Whale Watch and Research Center (CMWWRC) from March-December in 2019 and May-December in 2020. Some camera and handheld GPS units were provided by the Whale and Dolphin Conservation (WDC). Surveys are ongoing from 2011-present but only Humpback Whale sightings during 2019-2020 in the Atlantic Ocean were examined at the time of this presentation.
- Vessel track data from Omega Protein Vessels *Calcasieu Pass*, *Cockrells Creek*, *Tidelands*, *Windmill Point* (2019 & 2020) and *John S. Dempster Jr.* (2019) were extracted from MarineCadastre.gov (SOURCE), a partnership between the National Oceanic and Atmospheric Administration (NOAA) and the Bureau of Ocean Energy Management (BOEM) by their vessel MMSI number. Tracks of these vessels were extracted from 2019-2020 using specified boundaries in the Atlantic Ocean: X Min = -74.98959, Y Min = 38.77328, X Max = -74.66394, and Y Max = 38.997349. These boundaries were assigned by reviewing the tracks of the *American Star* and choosing the most frequently explored areas by CMWWRC.
- Data was manipulated and extracted from MarineCadastre.gov (BOEM & NOAA, 2022) using Python Pandas libraries and visualized using a heatmap in ArcGIS Pro version 2.8.0 (ESRI Inc., 2021) to overlay Omega Protein Vessel tracks with whale sightings.
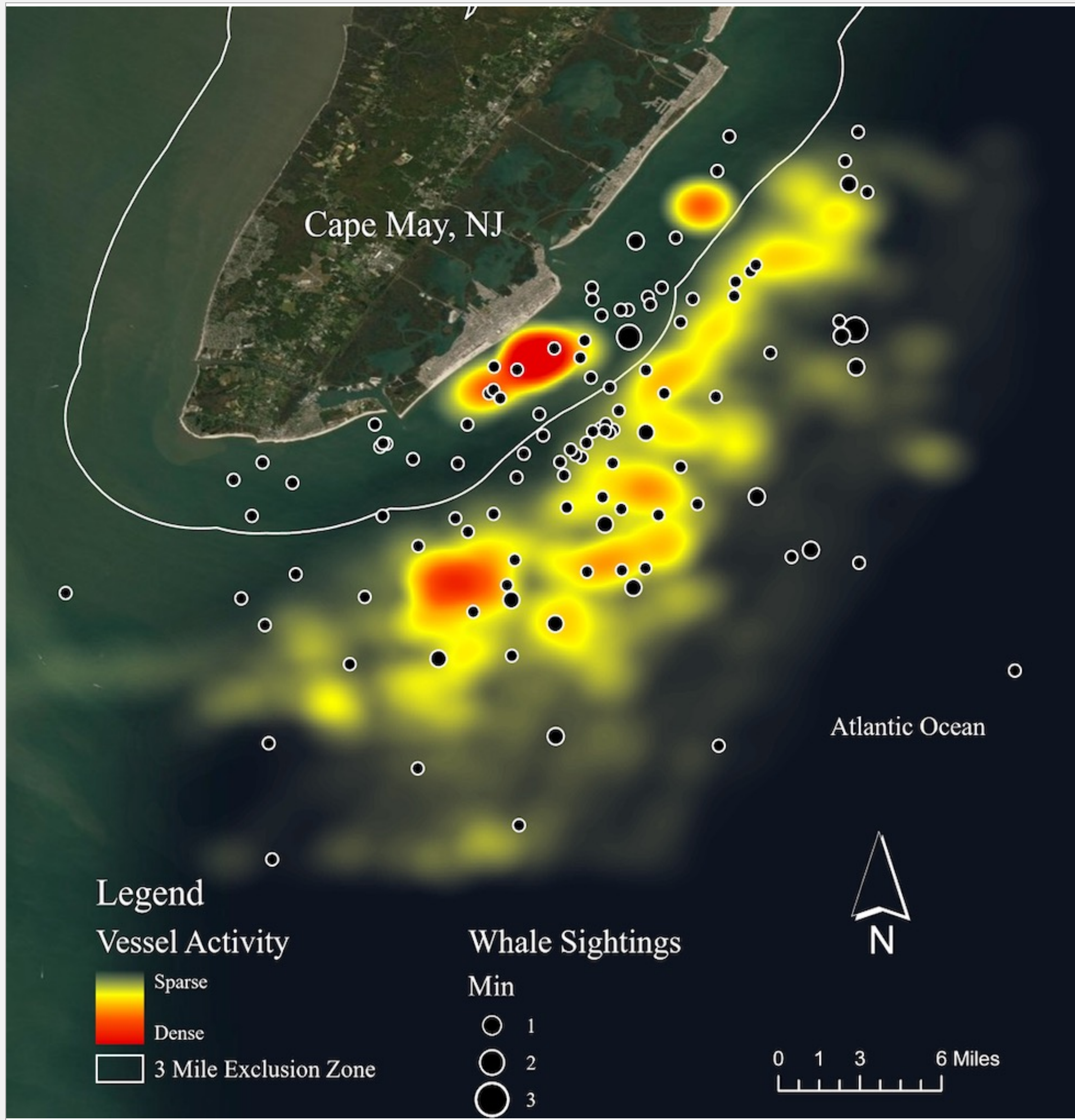
RESULTS

Figure 2: Map of whale sightings and reduction vessel activity in Cape May, NJ.
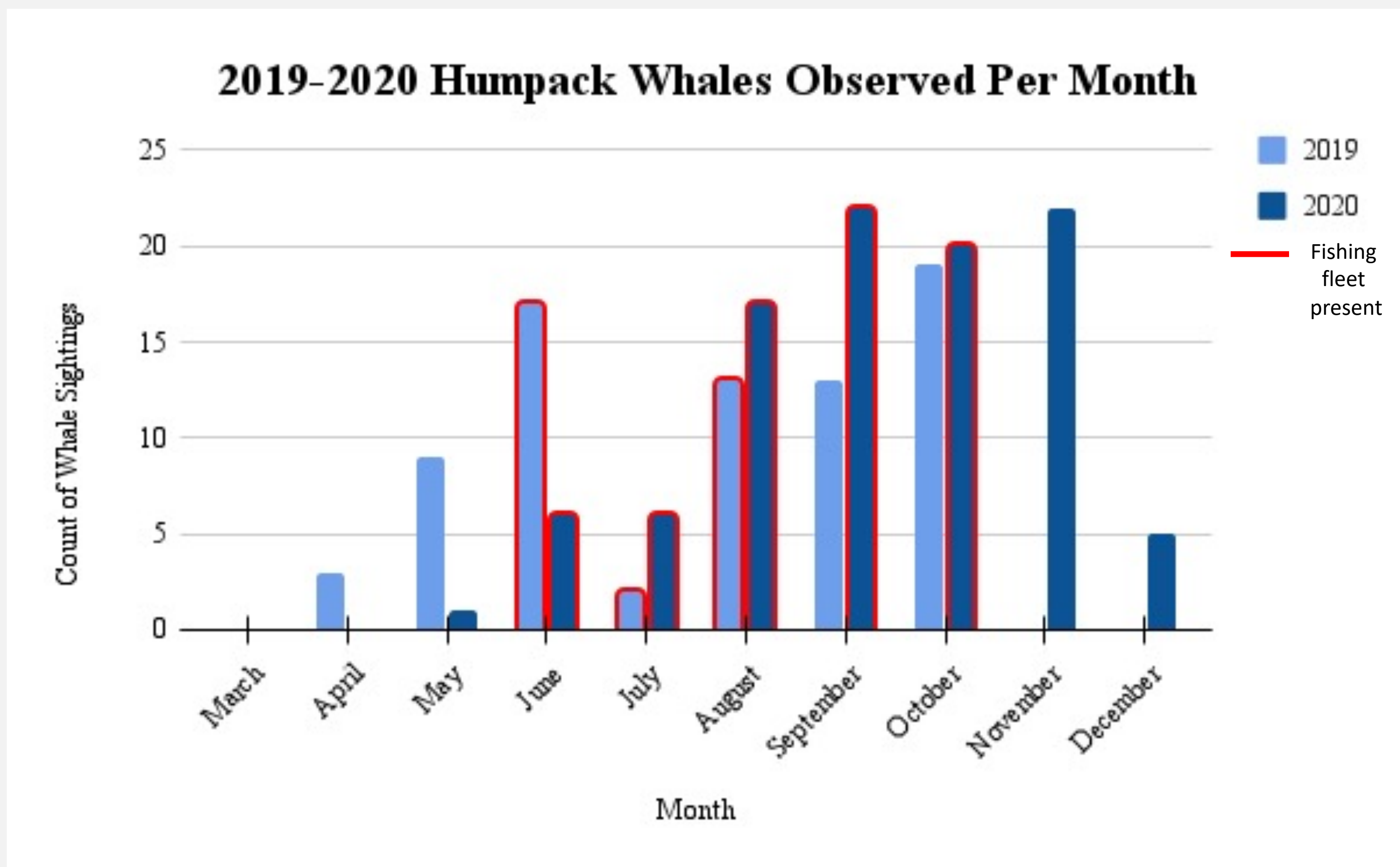

Figure 3: Humpback Whale sightings per month and presence of reduction operation.

DISCUSSION

- CMWWRC observed 174 Humpback Whale sightings in 2019-2020. A total of 122 sightings in the Atlantic Ocean were visualized omitting 45 Delaware Bay and 7 pelagic sightings that occurred outside the specified boundary (Figure 2).
- A total of 76% (n=93) of whale sightings intersected with locations where commercial fishing was occurring. Whales were observed actively lunge feeding in 14% (n=13) of these sightings (Figure 2).
- The reduction fleet was present in Cape May during the months of June-October but presence varied by month each year. During these months, whales were also present in the same areas (Figure 3).
- This overlap is important to consider when establishing allowable landings for the Menhaden commercial fishery and Humpback Whale conservation measures in the Mid-Atlantic. Whales are actively feeding where these vessels are actively fishing.
- A future direction could examine additional years of vessel track data since 2019-2020 was impacted by Global Pandemic, COVID-19. In addition, adding the AIS tracks from other vessels that harvest menhaden and adding them to our whale sightings would provide a larger scale view of these interactions. Other vessels that occupy the coastal zone do not have the 3-mile exclusion zone.

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