2020 Whale Research Report

Documenting distribution of marine life near Jeffreys Ledge in the Gulf of Maine

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June 17, 2021

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Abstract

Jeffreys Ledge is a rocky feature in the western Gulf of Maine approximately 32 km off the coasts of Maine, New Hampshire and Massachusetts. It is a productive and important habitat for a variety of marine life, including federally protected marine mammals under the Marine Mammal Protection Act and Endangered Species Act. Although several whale watching boats visit Jeffreys Ledge during the feeding season for whales, Blue Ocean Society for Marine Conservation is the only organization to collect detailed data on several factors to study the area and has been doing so since 1996. This report documents and summarizes the data collected during the 2020 season including whale distribution and habitat usage, combined with perceived threats and behaviors. A total of 130 trips were taken to the Jeffreys Ledge area from 04 June 2020 until 09 October 2020. Three of these trips were full day scouting trips while the rest were public whale watching trips. Two trips were conducted daily on 50 days, while single trips (including the 3 scouting trips) were conducted on the remainder of the days (30). The area observed included water from the coastline east as far as -070.02560W, between the latitudes of 43.15078N and 42.59534N. A minimum of 3169 animals were observed. Sixteen species were documented, including 3 species of baleen whales, 3 species of toothed whales, 2 species of sharks, 2 species of large fish, 2 species of pinnipeds, 3 species of sea turtles and 1 species of large jelly. Fifty-one individual humpback whales (*Megaptera novaeangliae*) were identified. Four of these were calves. Sightings of note include a second year with a spike in ocean sunfish (*Mola mola*) sightings, 4 sightings of common dolphins (*Delphinus delphis)*, and 11 sea turtle sightings. One humpback whale calf was documented with a new injury apparently caused by an entanglement. A total of 830 pelagic marine debris items were documented with 43 of these items seen near whales. Of the debris items that were identifiable, balloons (n=282), plastic bags (n=72) and plastic wrappers (n=69) were the top three items recorded.

Introduction

Jeffreys Ledge is a productive marine habitat due to the upwelling currents that surround the ledge. This productivity makes it an important habitat for a variety of marine life, including federally protected marine mammals under the Marine Mammal Protection Act and Endangered Species Act. Animals are attracted to the area due to the abundant fish and plankton resources. Large whales are facing human-related threats including collisions with ships of all sizes and entanglements in fishing gear. By monitoring the whale population annually, injuries can be documented and brought to the attention of management agencies including the National Oceanic and Atmospheric Administration (NOAA).

Commercial whale watching vessels regularly transit the area from May through October, the known feeding season for migratory whales. Data collected from these platforms of opportunity assist in understanding the habitat, populations and threats.

Methods

Study Area

Jeffreys Ledge (Figure 1) is a rocky feature in the western Gulf of Maine approximately 32 km off the coasts of Maine, New Hampshire and Massachusetts. The southern end of Jeffreys Ledge is included in SBNMS boundaries. The ledge is approximately 54 km long by 9 km wide. The water depth above the ledge is 45-60 m while the depth surrounding it is 90-150 m. Upwelling currents stir nutrients from the sea floor making for a more productive environment. Jeffreys Ledge is not regularly surveyed by other organizations. Whale watching boats from Kennebunk, Maine; Rye, Hampton and Seabrook, New Hampshire; and Newburyport and Gloucester, Massachusetts regularly visit this area, but not all vessels collect detailed data on marine life sightings and behaviors.

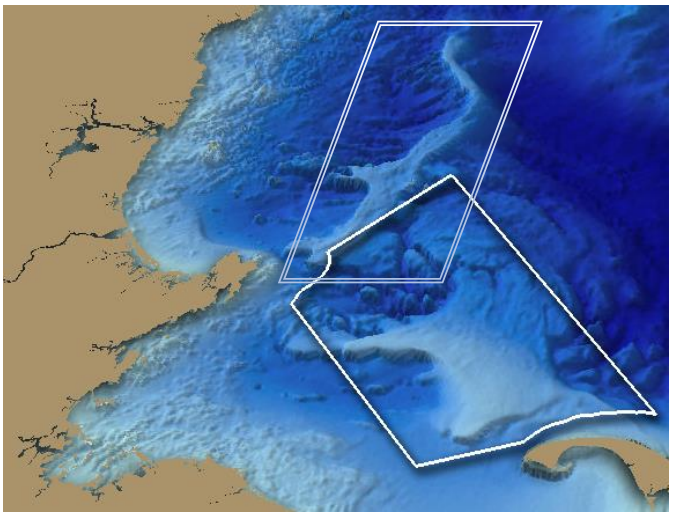


Figure 1: Jeffreys Ledge outlined in double line. Stellwagen Bank outlined in solid line. Image credit www.stellwagen.noaa.gov

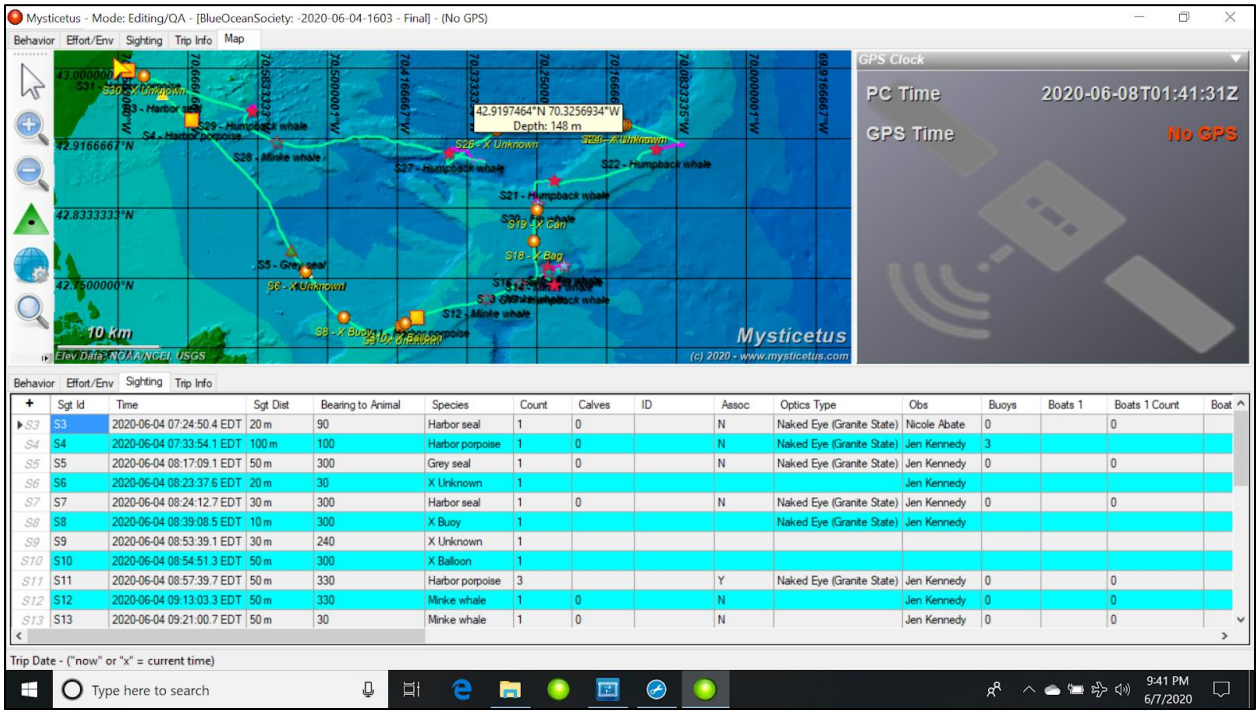
Opportunistic Surveys

One commercial whale-watching vessel based in Rye Harbor, NH, was used for opportunistic surveys in 2020. The average cruising speed of this 21m vessel, *Granite State*, was 14 knots. Whale watch trips were generally 4-5 hours long and were usually conducted once daily in June and Sept-October, and twice daily in July-August, weather permitting. When running two trips per day, the vessel would return to port in between trips.

Trip lengths ranged from 29.5 NM to 68.2 NM, with the average trip length being 49.1 NM. Trips were generally conducted in conditions of Beaufort 0-4. Visibility ranged from 0-32km. Trip routes and destinations were usually dependent on recent sightings as well as on information from other vessels. For example, if sightings were good in one area for the past few days, the vessel would likely return to that area. If sightings in that area began to drop, the vessel would choose a different area, often based on reports from fishing boats or other recreational boats. Since the vessel was working as a commercial whale-watching vessel and not as a dedicated research boat, standardized track line surveys were not possible.

Whale watch vessel crew consisted of a captain, a naturalist, two mates, and two interns with at least two people on watch at all times. In addition, college-level students and recent college graduates collected data after receiving extensive hands-on training in the classroom and the field.

This year, data were collected using the computer program Mysticetus (Figure 2). This was the first year using this method. Prior, data were collected using paper data sheets and handheld GPS units. Data for each sighting included the date, time, location, depth, slope, distance from shore, species, number of animals, identification if known, behaviors, associations, and weather conditions.



Sgt Id	Time	Sgt Dist	Bearing to Animal	Species	Count	Calves	ID	Assoc	Optics Type	Obs	Buoys	Boats 1	Boats 1 Count
S3	2020-06-04 07:24:50.4 EDT	20 m	90	Harbor seal	1	0		N	Naked Eye (Granite State)	Nicole Abate	0		0
S4	2020-06-04 07:33:54.1 EDT	100 m	100	Harbor porpoise	1	0		N	Naked Eye (Granite State)	Jen Kennedy	3		
S5	2020-06-04 08:17:09.1 EDT	50 m	300	Grey seal	1	0		N	Naked Eye (Granite State)	Jen Kennedy	0		0
S6	2020-06-04 08:23:37.6 EDT	20 m	30	X Unknown	1					Jen Kennedy			
S7	2020-06-04 08:24:12.7 EDT	30 m	300	Harbor seal	1	0		N	Naked Eye (Granite State)	Jen Kennedy	0		0
S8	2020-06-04 08:39:08.5 EDT	10 m	300	X Buoy	1				Naked Eye (Granite State)	Jen Kennedy			
S9	2020-06-04 08:53:39.1 EDT	30 m	240	X Unknown	1								
S10	2020-06-04 08:54:51.3 EDT	50 m	300	X Balloon	1								
S11	2020-06-04 08:57:39.7 EDT	50 m	330	Harbor porpoise	3			Y	Naked Eye (Granite State)	Jen Kennedy	0		0
S12	2020-06-04 09:13:03.3 EDT	50 m	330	Minke whale	1	0		N		Jen Kennedy	0		0
S13	2020-06-04 09:21:00.7 EDT	50 m	30	Minke whale	1	0		N		Jen Kennedy	0		0

Figure 2. Screen shot of Mysticetus interface

Data collectors also recorded potential threats (vessels, fishing gear, and marine debris) to marine life with each sighting. Ship strikes and entanglements in fishing gear are two of the leading causes of injury and mortality for large whale species (Henry et al., 2012). The number of boats of each type (whale watching, fishing, recreational) seen within 1 km of a sighting were recorded. By documenting the vessels of each kind near a sighting, the potential for collision can be determined. If a newly injured whale was observed, it was reported to Northeast Fisheries Science Center and National Oceanic and Atmospheric Administration (NOAA). If the strike itself was observed, United States Coast Guard (USCG) and NOAA were contacted immediately while also obtaining vessel registration numbers and images.

By documenting the amount of fixed and active fishing gear near a sighting, the potential for entanglement can be determined. Each fishing buoy recorded marks a vertical line in the water column that is attached to a set of fixed fishing gear (gear that is left unattended for one or more days). The type of gear is not always apparent based on the surface buoy system. However, the most prevalent fixed gear types in the region are lobster trawls and gill nets. Large whales are known to get tangled in the vertical buoy line from both types of gear, while smaller marine mammals (dolphins, porpoises, seals) are known to get tangled in gill net panels (Reeves et al., 2013). If an entangled whale is observed, USCG, NOAA, and or Center for Coastal Studies (CCS) are contacted immediately to launch a disentanglement rescue. If the entanglement is not evident in the field and later noticed in image post-processing, it will be submitted to NOAA and CCS.

By using digital images, injuries over time can be documented and monitored to determine survival rates of the afflicted individuals. These images are also used to determine the trend of injuries in the populations (increasing or decreasing) as well as the severity of each event.

Marine debris items (plastics, in particular) have been found in at least 9 deceased baleen whale species (Baulch & Perry, 2014). By documenting the amount of pelagic marine debris near whales, the potential for ingestion can be determined.

Photographic Identification

Digital images of marine life were collected by the naturalist using digital SLR cameras outfitted with 70-300mm lenses to identify the species and the individual whale. Images were often examined in the field but were also downloaded daily for a more thorough analysis. Detailed photo analysis continued into the fall and winter months. Humpback whales were identified by the unique pigmentation markings on their flukes (Katona & Whitehead, 1981). Fin whales and minke whaleswere identified by the unique pigmentation markings on their backs (chevron and blaze) as well as their dorsal fin shape (Agler et al., 1992). Right whales were identified by the unique patches of rough skin (callosities) on their heads (Kraus et al., 1986).

Results

Surveys

One hundred and thirty whale watching trips (surveys) were conducted over 80 days during the 2020 season (04 June-09 October). One trip ended early due to weather conditions (fog and high swell). Days

with no trips were primarily due to unacceptable weather conditions or lack of passengers. Survey range extended from the coastline eastward to -070.02560 W, northward to 43.15078 N and southward to 42.59534 N.

Sightings

Observations of marine life occurred at 1433 locations totaling 3169 animals. Some animals were observed multiple times throughout the study period. Sixteen species were documented including 3 species of baleen whales, 3 species of toothed whales, 2 species of sharks, 2 species of large fish (non-shark), 2 species of pinnipeds, 3 species of sea turtles and 1 species of large jelly.

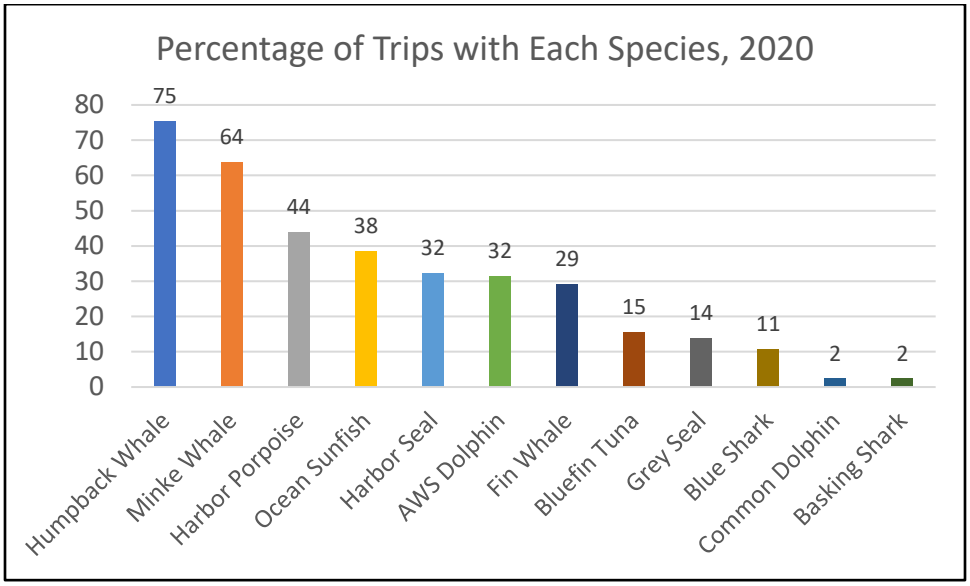


Figure 3. Percentage of trips with each species.

Sightings of Note

- Ocean sunfish were sighted on 38% of trips (see figure 4 for annual comparisons)
- Four sightings of common dolphins

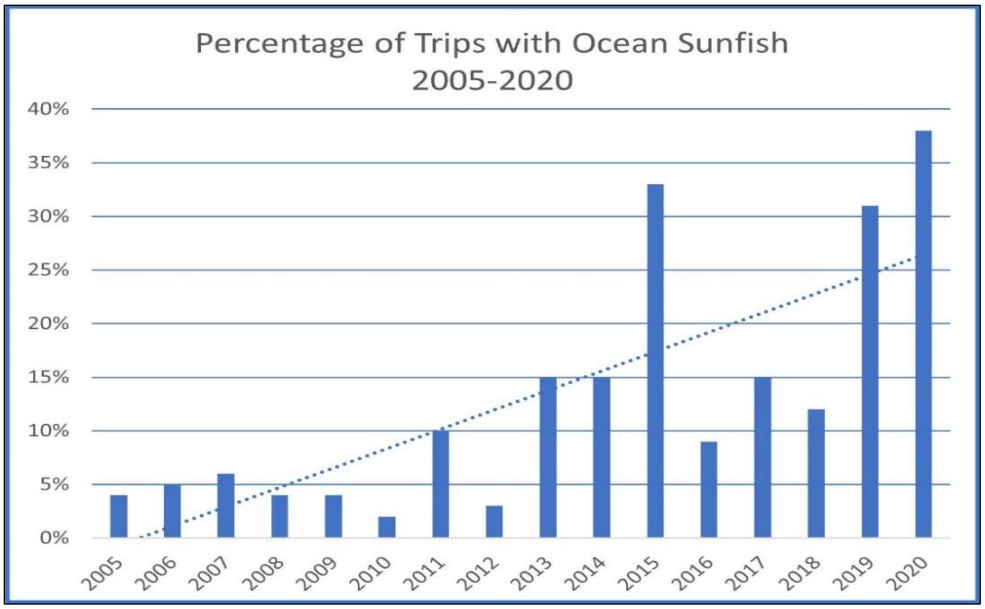


Figure 4. Percentage of trips that saw ocean sunfish, 2005-2020

Locations and details of sightings

The following maps depict the locations for the four most historically encountered species of Cetacea. A sighting is defined as the location where one or more whales of a certain species were seen. Group size refers to the temporary association of individual mysticetes (baleen whales). Pod size refers to the semi-permanent association of odotocetes (toothed whales). Sightings may represent multiple sightings of the same individual whales over the season.

Humpback whales:

Humpback whales were sighted at 204 locations with a total of 331 humpback whales seen. Associations of humpback whales occurred during 93 sightings with the group size ranging from 2 to 6 individuals. Mother/calf pairs were seen 31 times (accounting for 4 separate pairs). Associations with Atlantic white sided dolphins occurred 14 times.

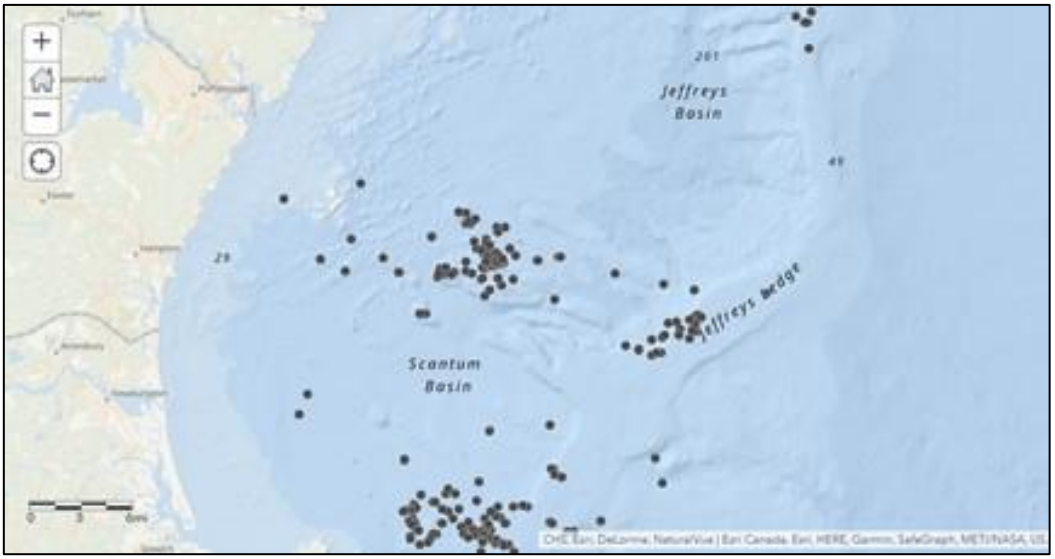


Figure 5. Humpback whale sightings near Jeffreys Ledge, 2020.

Fin whales:

Fin whales were seen at 79 locations with a total of 96 fin whales seen. Associations of fin whales occurred during 12 sightings with the group size ranging from 2 to 3 individuals. One mother/calf pair was seen. Associations with Atlantic white sided dolphins were not observed.

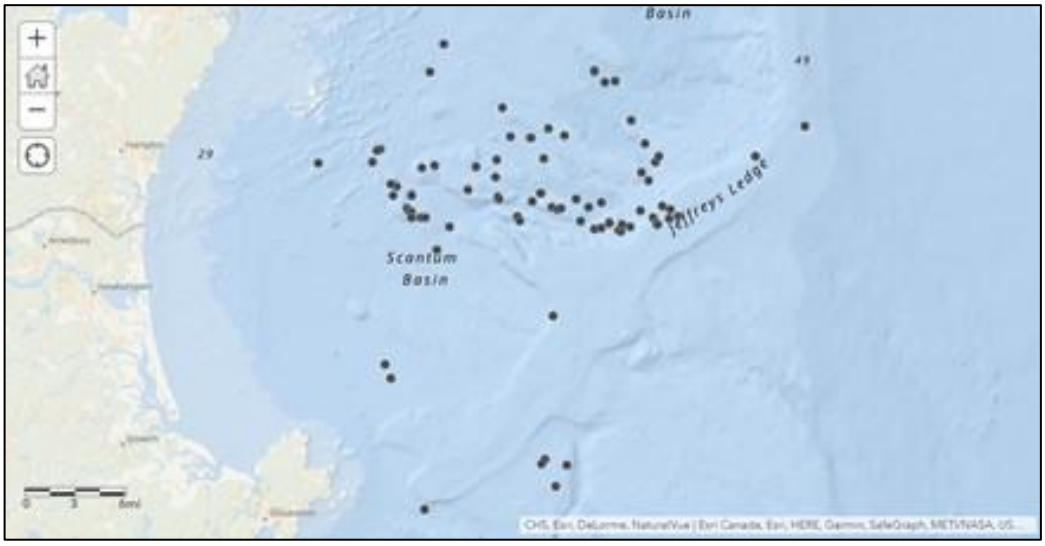


Figure 6. Fin whale sightings near Jeffreys Ledge, 2020.

Minke whales:

Minke whales were sighted a total of 205 times. Associations with other minke whales were not observed. Minke whales were not observed to be associated with Atlantic white sided dolphins.

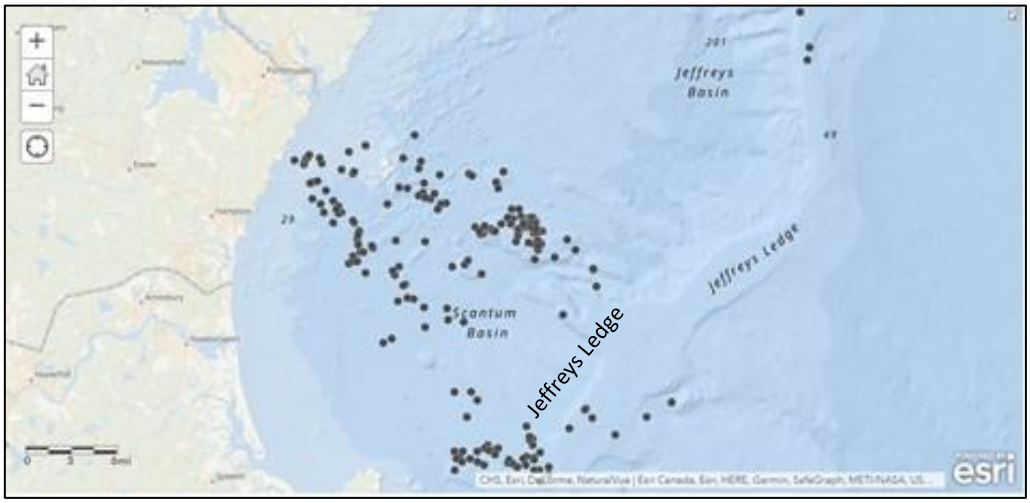


Figure 7. Minke whale sightings near Jeffreys Ledge, 2020.

Atlantic white sided dolphins:

Atlantic white sided dolphins were seen at 49 locations with a total of 1635 Atlantic white sided dolphins seen. Pod size ranged from 5-100 individuals with the average pod size being 33 individuals. Associations with other species occurred 15 times (once with common dolphins, and 14 times with humpback whales). Atlantic white sided dolphins were not seen associatiated with fin whales this year as they have in the past.

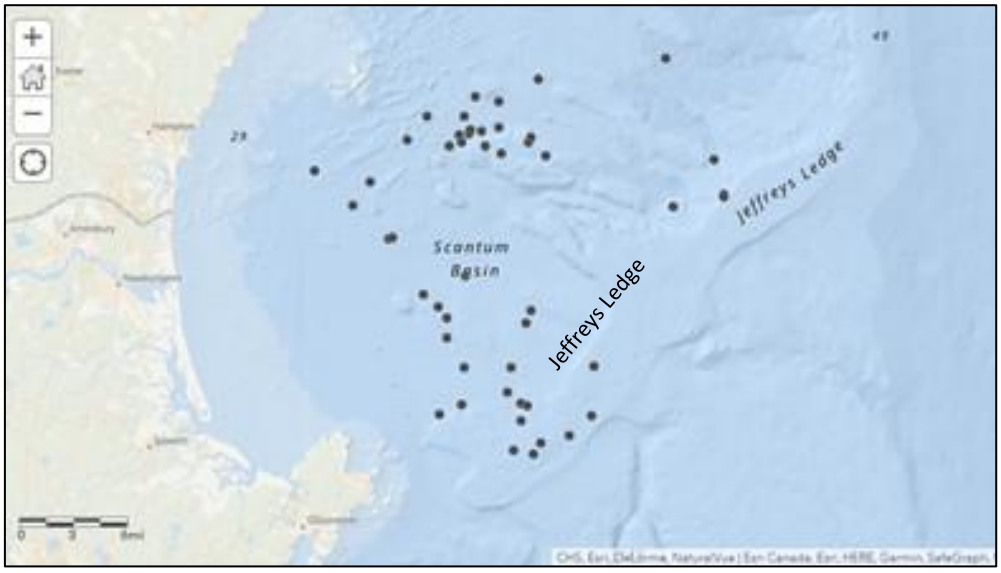


Figure 8. Atlantic white sided dolphin sightings near Jeffreys Ledge, 2020.

All Species:

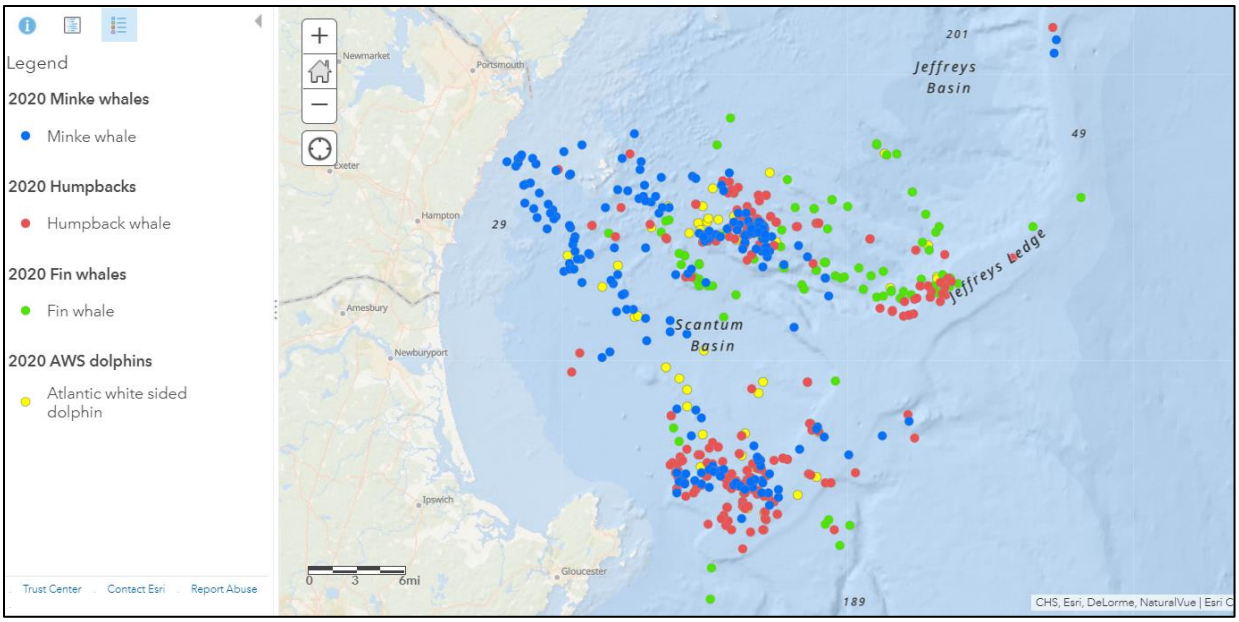


Figure 9. All sightings of commonly sighted species, 2020.

Identification of individual whales

Humpback whales are individually identified by unique natural pigmentation markings on their flukes. Additionally, humpback whales that feed in the Gulf of Maine (GOM) are assigned names by GOM whale researchers and whale watch naturalists. The names generally refer to a specific marking or overall pattern on the flukes. Forty-seven individual humpback whales, plus four calves, were observed in 2020 (Table 1). The majority of these individuals were adults (seven or more years old). Four juveniles were observed, and two individuals were of unknown age (see figure 10). More female humpback whales were seen than males, 53% versus 41% respectively, and 6% of unknown gender, not including the four calves (Figure 11).

Table 1: Identifications of humpback whales seen in 2020.

A-PLUS	DECIMAL	LITTLESPOT	PITCHER	TECTONIC
A-PLUS 2020 CALF	DIABLO	MILKYWAY	QUIXOTE	TONGS
BAYOU	DROSS	MOGUL	QUIXOTE 2020 CALF	VALLEY
CANTILEVER	DROSS 2018 CALF	NILE	QUOTE	VALLEY 2020 CALF
CHABLIS	FAN	OSPREY	RAVINE	WHIRLWIND
CHROMOSOME	FERN	OWL	REPEAT	BOS 2001
CLAMP 2016 CALF	FERN 2018 CALF	PALINDROME	SATULA	BOS 2004
CLIPPER	HIGHLIGHTER	PATCHES	SCYLLA	
CLIPPER 2020 CALF	JABIRU	PERISCOPE	SHUTTLE	
CRISSCROSS	JOY	PIANO	SPOON	
DASH DOT	LINER	PINBALL	SPRINKLES	

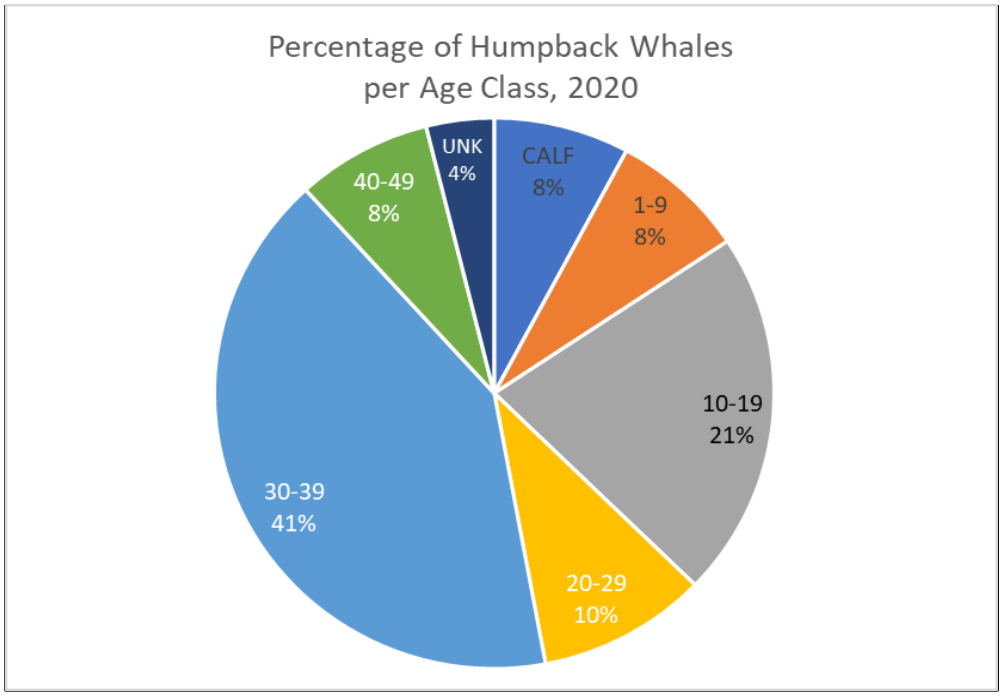


Figure 10. Age of humpback whales seen in 2020. (Data provided by Center for Coastal Studies)

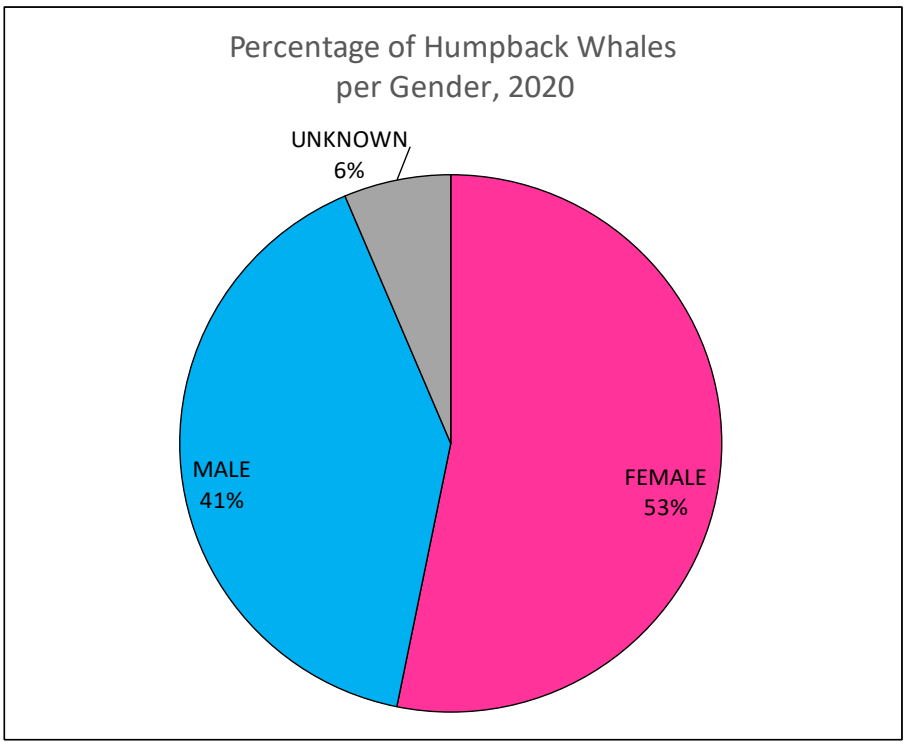


Figure 11. Gender of humpback whales seen in 2020 (Data provided by Center for Coastal Studies)

Eight previously identified individual fin whales were observed in 2020 (Table 2). Two of these individuals are female (were documented having at least one calf in the past), and one is a known male (based on Allied Whale's genetics data). Individual identification is still in process and will be written up in a later report.

Table 2: Identification numbers of fin whales seen in 2020.

9709	0402
9820	0723
0282	0902
0354	1015

Documented Threats

Ship Strikes

No ship strikes or evidence of recent ship strikes were documented.

Entanglements

Valley's 2020 calf had scars suggestive of entanglement (Figure 12, Figure 13). Additionally, Quote had injuries representing a new entanglement within the past year based on photo-ID (Figure 14, Figure 15).

Figure 12. Linear scarring at the base of Valley's 2020 calf's tail

Figure 13. Linear scarring at the base of Valley's 2020 calf's tail

Figure 14. Scarring (old, healed) observed in 2019 on Quote's peduncle/flukes

Figure 15. New (raw) injury observed in 2020 on Quote's peduncle/flukes

Potential Threats

Fixed Fishing Gear

A total of 3394 fishing buoys were recorded within 30 meters of animal sightings. Of the 1054 animal sightings, 506 had buoys associated (range 0-63 buoys). The average number of buoys present at a sighting was 6.7. Baleen whales are more likely to become entangled in the vertical line between the surface buoy and the fishing gear than other marine species. Baleen whales accounted for 294 of the sightings where marine life and buoys co-occurred. The number of buoys near baleen whales was 1632, with an average of 11 buoys per baleen whale sighting.

Marine Debris

Pelagic marine debris items were recorded throughout the entire trip. Debris items that were within 30 meters of a whale were flagged in the database.

- 830 pieces documented in total (Figure 16)
- 43 pieces recorded near whales (5%) (Figure 17)

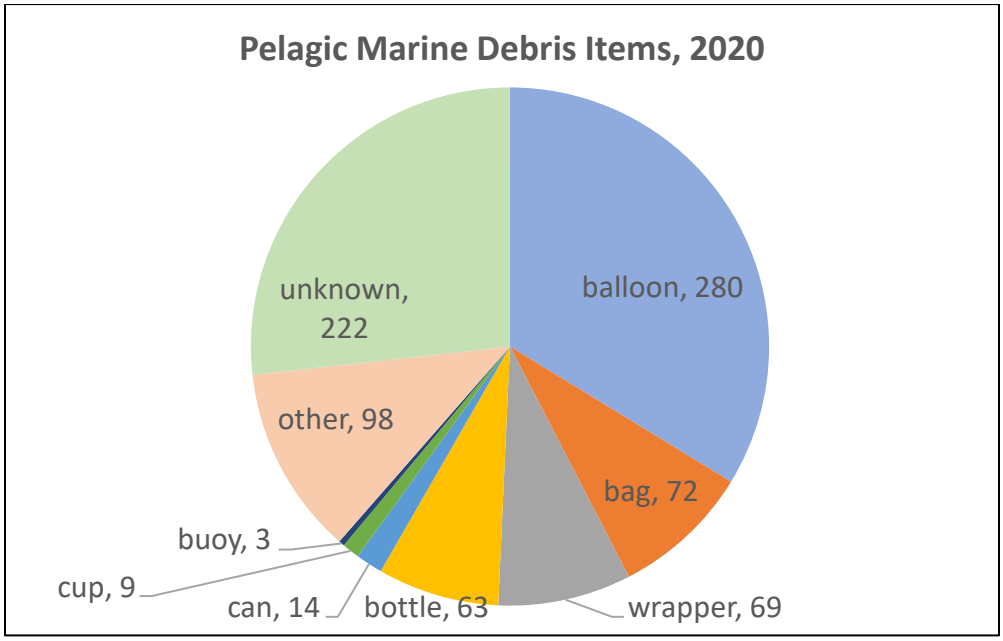


Figure 16. Number of all pelagic debris items recorded during whale watching trips, 2020.

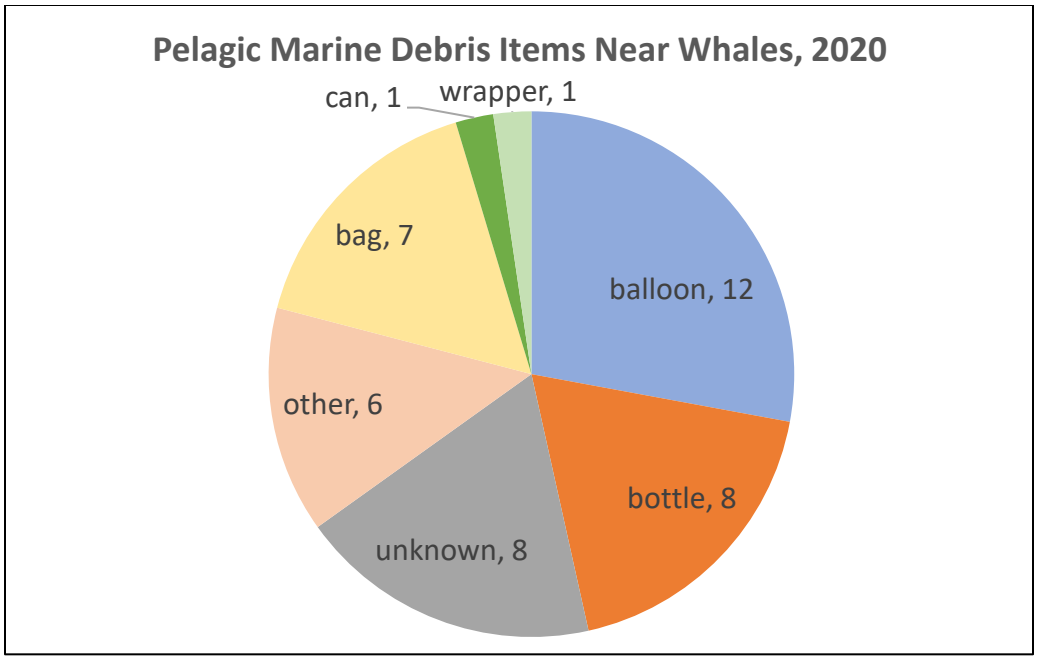


Figure 17. Number of debris items found near whales, 2020.

Summary and Recommendations

During the 2020 whale watching field season (June 04-Oct 09), a minimum of 3169 animals were observed during 130 whale watching trips/surveys. Sixteen species of marine life were documented, including 3 species of baleen whales (fin, humpback, minke), 3 species of toothed whales (Atlantic white-sided dolphin, common dolphin, harbor porpoise), 2 species of sharks (basking and blue), 2 species of large fish (ocean sunfish and bluefin tuna), 3 species of turtles, and 2 species of pinnipeds (grey and harbor seals). Sightings of note included another increase in ocean sunfish sightings, 3 sea turtle species (leatherback, loggerhead, and Kemps Ridley), and several Lion's Mane jellies that are rare to see from the platform of opportunity used. Forty-seven individual humpback whales (plus four calves) were identified. Two have yet to be identified; therefore, they are of unknown age. Of the rest, all but four of the non-calf individuals were adults.

The northernmost and easternmost areas of Jeffreys Ledge were not surveyed as consistently as the rest of the Ledge due to time constraints, which limited the ability of complete coverage spatially and temporally.

Although potential threats to marine mammals were documented, this aspect of the data collection should be more detailed in the future to properly guide authorities. For example, additional data would include the specific type of vessel, vessel's action (underway or anchored, holding course or variable course), vessel speed, and the number of lines in the water when appropriate. Additionally, AIS data can be incorporated into sightings maps to better understand the potential impact of large ship traffic.

Trends involving potential threats in this area should also be investigated. Further research will be done to examine the behaviors of whales in proximity to fishing gear and marine debris better to analyze potential risk for entanglement or debris ingestion.

Conservationists, researchers, and managers have speculated that the current boundaries of the Stellwagen Bank National Marine Sanctuary (SBNMS) habitat, established in 1992 may not accurately delineate the areas in need of management measures to allow these species to thrive and reduce anthropogenic mortality.

Acknowledgements

We want to thank Granite State Whale Watch for allowing us to bring interns aboard to collect opportunistic data and be willing to maneuver the vessel to achieve maximum photo-ID opportunities. Our captains, Peter Reynolds and Jonathan Gwalthney, were critical in obtaining the information necessary to provide this report. Thank you to our research affiliate and naturalist, Melanie White, for overseeing the data collection and for obtaining digital images of all animals when possible. And most notably, thank you to our interns who worked tirelessly to collect the data aboard the whale watching trips: Nicole Abate, Rachel Alcorn, Helene Bartsch, Sarah Bishop, Justine Bolling, Billy Curtin, Mckenna Hardie, Gracie Killen, Adeline McCullough, Kaela Preston, and Mikaela Terhune. Also, thank you to the Center for Coastal Studies for assistance with identifications and demographics.

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