



Kitty Hawk Wind



Construction and Operations Plan

Appendix S - Ornithological and Marine
Fauna Aerial Survey Results

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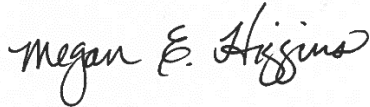
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Appendix S – Ornithological and Marine Fauna Aerial Survey Results

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As of Q3 2022, the Company has updated the Project name from “Kitty Hawk Offshore Wind Project” to “Kitty Hawk North Wind Project”.

The technical content of this report has not been changed since the previous submission.



Environmental Imaging Solutions

**Ornithological and Marine Fauna Aerial Survey Results
Kitty Hawk**

Avangrid Renewables

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1. Executive Summary

A programme of 12 monthly aerial digital surveys of Avangrid Renewables LLC's Kitty Hawk lease area, off the coast of North Carolina, were conducted between January and December 2019 using APEM Inc.'s (hereafter referred to as APEM) high-resolution camera system to capture digital still imagery. Images collected have been analyzed by APEM and quality assured by Normandeau Associates (hereafter referred to as Normandeau). Raw counts and design-based abundance estimates of all species and incidental observations recorded during the surveys are presented here as well as information on species distribution and flight direction. The key findings from each of the monthly aerial digital surveys are summarized below. Timings and coverage for each survey undertaken on behalf of Avangrid Renewables are provided in Section 4.1.

- Survey 1 – January 2019
 - Total targets (n=1,111).
 - The most abundant group recorded in the January survey was auks (n=848), followed by loons (n=143), dolphins (n=42), gannets (n=36), gulls (n=32), shorebirds (n=5), shearwaters (n=2) and cormorants (n=2), and porpoises (n=1).
- Survey 2 – February 2019
 - Total targets (n=99).
 - The most abundant group recorded in the February survey was auks (n=29), followed by sharks (n=23), gannets (n=17), loons (n=13), dolphins (n=11), gulls (n=2) and turtles (n=2), and fulmars (n=1) and terns (n=1).
 - A loggerhead turtle and a Kemp's ridley turtle were recorded. These species are Listed (Federally Listed as Threatened or Endangered, North Carolina State Listed as Endangered; and Federally Listed as Endangered, North Carolina State Listed as Endangered respectively).
- Survey 3 – March 2019
 - Total targets (n=277).
 - The most abundant group recorded in the March survey was loons (n=150), followed by dolphins (n=82), gannets (n=24), gulls (n=13), shearwaters (n=6), and turtles (n=2).
 - Two loggerhead turtles were recorded. This species is Listed (Federally Listed as Endangered, North Carolina State Listed as Threatened).
- Survey 4 – April 2019
 - Total targets (n=294).
 - The most abundant group recorded in the April survey was loons (n=155), followed by turtles (n=67), large bony fishes (n=52), dolphins (n=8), gulls (n=4),

sharks (n=3), gannets (n=2), and terns (n=1), whales (n=1) and unidentified marine mammals (n=1).

- All of the recorded sea turtles are Listed species. Due to the status of many whale species, unidentified whales are also considered Listed by extension. A total of 42 loggerhead turtles (Federally Listed as Threatened or Endangered, North Carolina State Listed as Threatened), 18 unidentified sea turtles and four loggerhead / Kemp's ridley turtles (Federally Listed as Threatened or Endangered, North Carolina State Listed as Threatened or Endangered), two leatherback turtles and one Kemp's ridley turtle (Federally Listed as Endangered, North Carolina State Listed as Endangered), and one unidentified whale (Federally Listed as Endangered, North Carolina State Listed as Endangered) were recorded.
- Survey 5 – May 2019
 - Total targets (n=142).
 - The most abundant group recorded in the May survey was turtles (n=92), followed by loons (n=23), large bony fishes (n=17), terns (n=6), and storm-petrels (n=4).
 - All of the recorded sea turtles are Listed species. A total of 69 loggerhead turtles (Federally Listed as Threatened or Endangered, North Carolina State Listed as Threatened), 15 unidentified sea turtles and seven loggerhead / Kemp's ridley turtles (Federally Listed as Threatened or Endangered, North Carolina State Listed as Threatened or Endangered), and one Kemp's ridley turtle (Federally Listed as Endangered, North Carolina State Listed as Endangered) were recorded.
- Survey 6 – June 2019
 - Total targets (n=344).
 - The most abundant group recorded in the June survey was rays (n=287), followed by turtles (n=46), large bony fishes (n=6), dolphins (n=2) and sharks (n=2), and storm-petrels (n=1).
 - All of the recorded sea turtles are Listed species. Due to status of the scalloped hammerhead, unidentified hammerhead sharks are also considered Listed as Threatened or Endangered by extension. A total of 28 loggerhead turtles (Federally Listed as Threatened or Endangered, North Carolina State Listed as Threatened), nine unidentified sea turtles and seven loggerhead / Kemp's ridley turtles (Federally Listed as Threatened or Endangered, North Carolina State Listed as Threatened or Endangered), two green sea turtle (Federally Listed as Threatened or Endangered, North Carolina State Listed as Threatened), and one unidentified hammerhead shark (Federally Listed as Threatened or Endangered) were recorded.
- Survey 7 – July 2019
 - Total targets (n=248).

- The most abundant group recorded in the July survey was large bony fishes (n=147), followed by turtles (n=83), sharks (n=10), and rays (n=8).
- All of the recorded sea turtles and (due to the status of the scalloped hammerhead shark) unidentified hammerheads are Listed species. A total of 34 loggerhead turtles (Federally Listed as Threatened or Endangered, North Carolina State Listed as Threatened), 22 leatherback turtles and three Kemp's ridley turtles (Federally Listed as Endangered, North Carolina State Listed as Endangered), 12 unidentified sea turtles and 12 loggerhead / Kemp's ridley turtles (Federally Listed as Threatened or Endangered, North Carolina State Listed as Threatened or Endangered), and two unidentified hammerhead sharks (Federally Listed as Threatened or Endangered) were recorded.
- Survey 8 – August 2019
 - Total targets (n=154).
 - The most abundant species group recorded in the August survey was turtles (n=60), followed by large bony fishes (n=53), dolphins (n=29), rays (n=6), sharks (n=3), shearwaters (n=2), and terns (n=1).
 - All of the recorded sea turtles are Listed species. A total of 29 loggerhead turtles (Federally Listed as Threatened or Endangered, North Carolina State Listed as Threatened), 16 unidentified sea turtles and four loggerhead / Kemp's ridley turtles (Federally Listed as Threatened or Endangered, North Carolina State Listed as Threatened or Endangered), and ten leatherback turtles (Federally Listed as Endangered, North Carolina State Listed as Endangered) were recorded.
- Survey 9 – September 2019
 - Total targets (n=57).
 - The most abundant species group recorded in the September survey was turtles (n=20), followed by shorebirds (n=19), sharks (n=6), terns (n=3) and large bony fishes (n=3), gulls (n=2) and dolphins (n=2), and shearwaters (n=1) and rays (n=1).
 - Eight loggerhead turtles and one green turtle (Federally Listed as Threatened or Endangered, North Carolina State Listed as Threatened), five loggerhead / Kemp's ridley turtles and five unidentified sea turtles (Federally Listed as Threatened or Endangered, North Carolina State Listed as Threatened or Endangered), and one leatherback turtle (Federally Listed as Endangered, North Carolina State Listed as Endangered) were recorded.
- Survey 10 – October 2019
 - Total targets (n=59).

- The most abundant group recorded in the October survey was large bony fishes (n=21), followed by turtles (n=17), shorebirds (n=13), dolphins (n=4), terns (n=2), and shearwaters (n=1) and passerines (n=1).
- Thirteen loggerhead turtles (Federally Listed as Threatened or Endangered, North Carolina State Listed as Threatened), two loggerhead / Kemp’s ridley turtles and one unidentified sea turtle (Federally Listed as Threatened or Endangered, North Carolina State Listed as Threatened or Endangered), and one leatherback turtle (Federally Listed as Endangered, North Carolina State Listed as Endangered) were recorded.
- Survey 11 – November 2019
 - Total targets (n=254).
 - The most abundant species group recorded in the November survey was large bony fishes (n=188), followed by gulls (n=34), turtles (n=18), sharks (n=8), and loons (n=3) and gannets (n=3).
 - Five loggerhead / Kemp’s ridley and three unidentified sea turtles (Federally Listed as Threatened or Endangered, North Carolina State Listed as Threatened or Endangered), four leatherback and two Kemp’s ridley turtles (Federally Listed as Endangered, North Carolina State Listed as Endangered), four loggerhead turtles (Federally Listed as Threatened or Endangered, North Carolina State Listed as Threatened), and one scalloped hammerhead shark (Federally Listed as Threatened or Endangered) were recorded.
- Survey 12 – December 2019
 - Total targets (n=92).
 - The most abundant species group recorded in the December survey was gulls (n=45), followed by shorebirds (n=14), loons (n=8), large bony fishes (n=8), turtles (n=7), auks (n=4), gannets (n=3), sharks (n=2), and shearwaters (n=1).
 - Four loggerhead turtles (Federally Listed as Threatened or Endangered, North Carolina State Listed as Threatened), one Kemp’s ridley turtle (Federally Listed as Endangered, North Carolina State Listed as Endangered), and one loggerhead / Kemp’s ridley turtle and one unidentified sea turtle (Federally Listed as Threatened or Endangered, North Carolina State Listed as Threatened or Endangered) were recorded.

A summary of the raw counts for all species recorded in each season are presented in **Table 1**, with an indication of their protected status as being Listed where applicable.

Table 1 **Number of individuals recorded in Kitty Hawk plus 4 km buffer in each survey season and their Listed status**

Species	Number of individuals per season				Listed
	Winter	Spring	Summer	Fall	
Red-throated loon	2	1	-	-	No
Common loon	162	327	-	3	No

Species	Number of individuals per season				Listed
	Winter	Spring	Summer	Fall	
Species unknown – storm-petrel	-	4	1	-	No
Northern fulmar	1	-	-	-	No
Cory's shearwater	-	-	2	-	No
Sooty shearwater	-	-	-	1	No
Great shearwater	1	-	-	-	No
Manx shearwater	2	6	-	-	No
Audubon's shearwater	-	-	-	1	No
Northern gannet	56	26	-	3	No
Species unknown – cormorant	2	-	-	-	No
Black-bellied plover	-	-	-	2	No
Red phalarope	19	-	-	-	No
Red / red-necked phalarope	-	-	-	30	No
Black-legged kittiwake	8	-	-	-	No
Bonaparte's gull	11	9	-	2	No
Laughing gull	1	-	-	10	No
Great black-backed gull	24	-	-	3	No
Herring gull	18	4	-	3	No
Species unknown – small gull	15	4	-	15	No
Species unknown – large gull	1	-	-	1	No
Species unknown – gull	1	-	-	2	No
Least tern	-	2	-	-	Yes
Forster's tern	1	-	-	-	No
'Commic' / Forster's tern	-	2	1	5	No
Species unknown – Sterna tern	-	3	-	-	Yes*
Dovekie	1	-	-	-	No
Common / thick-billed murre	8	-	-	-	No
Razorbill	286	-	-	-	No
Murre / Razorbill	385	-	-	-	No
Atlantic Puffin	201	-	-	-	No
Species unknown – passerine	-	-	-	1	No
Species unknown – whale	-	1	-	-	Yes*
Common dolphin	9	22	-	-	No
Pantropical spotted dolphin	2	-	-	-	No
Atlantic spotted dolphin	-	18	17	3	No
Common bottlenose dolphin	8	11	-	-	No
Bottlenose / Atlantic spotted dolphin	9	-	-	-	No
Species unknown – dolphin	25	39	14	3	No
Harbor porpoise	1	-	-	-	No
Species unknown – marine mammal	-	1	-	-	No
Green turtle	-	-	2	1	Yes
Loggerhead turtle	5	113	91	25	Yes
Kemp's ridley turtle	2	2	4	2	Yes
Loggerhead / Kemp's ridley turtle	1	11	23	12	Yes
Leatherback turtle	-	2	32	6	Yes

Species	Number of individuals per season				Listed
	Winter	Spring	Summer	Fall	
Species unknown – turtle	1	33	37	9	Yes*
Mahi-mahi	2	-	68	13	No
Species unknown – remora	-	-	-	1	No
Species unknown – flying fish	-	-	25	-	No
Ocean sunfish	5	44	25	14	No
Sharptail sunfish	-	1	-	-	No
Species unknown – sunfish	-	1	6	1	No
Cobia	-	-	3	6	No
Atlantic bluefin tuna	-	-	2	2	No
Species unknown – tuna	-	23	74	170	No
Species unknown – fish	1	-	3	5	No
Blue shark	-	1	-	-	No
Tiger shark	-	-	3	-	No
Species unknown – Carcharhinidae shark	-	-	3	3	No
Great white shark	2	1	-	2	No
Scalloped hammerhead shark	-	-	-	3	Yes
Smooth hammerhead shark	-	-	-	1	No
Species unknown – hammerhead shark	-	-	3	1	Yes*
Species unknown – spurdog	23	-	-	-	No
Species unknown – shark	-	1	6	4	No
Spotted eagle ray	-	-	1	-	No
Atlantic stingray	-	-	1	-	No
Giant manta ray	-	-	1	-	No
Giant devil ray	-	-	-	1	No
Chilean devil ray	-	-	1	-	No
Cownose ray	-	-	295	-	No
Cownose / bullnose ray	-	-	2	-	No

*Where species have not been identified but have been indicated as Listed, this has been determined by the genus or grouping encompassing one or more Listed species whose ranges overlap the survey area.

2. Introduction

APEM and Normandeau were contracted by Avangrid Renewables to provide monthly aerial digital survey data of the Kitty Hawk offshore wind lease area from January until December 2019. The aims and objectives of the work required by Avangrid Renewables were to assess the abundance and distribution, primarily of birds, present in the Kitty Hawk offshore wind lease area, and also to gather information on other marine fauna such as marine mammals, sharks, rays, and turtles for site characterization.

Prior to these surveys, the U.S. Bureau of Ocean Energy Management (BOEM) contracted Normandeau and APEM to undertake eight quarterly surveys of Kitty Hawk (as well as a wider area termed SASA). APEM were then subsequently contracted by Avangrid Renewables to undertake a further programme of monthly aerial digital surveys of Kitty Hawk from January to December 2019. The purpose of the data collected of the Kitty Hawk lease area is to provide the baseline information required for conducting impact assessments in accordance with BOEM's regulatory requirements for environmental review.

The area surveyed for Avangrid Renewables comprised of the Kitty Hawk offshore wind lease area (Lease Area OCS-A 0508 - the proposed turbine array footprint) plus a 4 km (2.5 miles) buffer surrounding it, referred to herein as the Kitty Hawk survey area (KHSA). The data in this report represent the total number of birds, other marine fauna, and incidental occurrences recorded across all images within the KHSA.

To meet the objectives of the project, images were captured using a grid-based survey design with a 1.5 cm ground sampling distance (GSD). Images were analyzed by APEM and quality control was undertaken by Normandeau.

This annual report summarizes the information collected following the completion of 12 monthly aerial digital surveys of Kitty Hawk between January and December 2019.

Other data sources (not collected on behalf of Avangrid Renewables) that are available in the literature that may be relevant to KHSA are summarized in Section 3.

The following information is provided in Section 4 for the data collected on behalf of Avangrid Renewables:

- The number of surveys conducted;
- The dates, start and end times, and weather conditions;
- Survey and analysis methodology; and
- Health and safety notes.

The following information is provided in also Section 5:

- The number of birds species / taxonomic group;
- Maps showing the locations of birds and actual survey route; and
- Flight direction information.

Anecdotal observations, for example shipping information recorded visually from the aircraft or captured in the imagery, has been provided in Section 6. Additionally, the locations of the vessels captured in the imagery are presented spatially within figures in Section 5.

3. Summary of Other Data Sources Available

There is a considerable amount of data available on marine megafauna activity and abundance from the wider area of the North West Atlantic, some of which are considered in this report to provide further context where applicable. Published information that is available is listed in **Table 2**.

Table 2 Relevant Reports

Author(s)	Date	Title
O'Connell <i>et al.</i>	2009	Compendium of Avian Occurrence Information for the Continental Shelf Waters along the Atlantic Coast of the United States, Final report
Robinson Willmott <i>et al.</i>	2013	The Relative Vulnerability of Migratory Bird Species to Offshore Wind Energy Projects on the Atlantic Outer Continental Shelf: An Assessment method and Database
Williams <i>et al.</i>	2015	Wildlife Densities and Habitat Use Across Temporal and Spatial Scales on the Mid-Atlantic Outer Continental Shelf: Final Report to the Department of Energy EERE Wind & Water Power Technologies Office
Kinlan <i>et al.</i>	2016	Modeling At-Sea Occurrence and Abundance of Marine Birds to Support Atlantic Marine Renewable Energy Planning Phase I Report
Waring <i>et al.</i>	2016	US Atlantic and Gulf of Mexico marine mammal stock assessments -- 2015. NOAA Tech Memo NMFS NE 238; 501 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at http://www.nefsc.noaa.gov/publications/
Palka <i>et al.</i>	2017	Atlantic Marine Assessment Program for Protected Species: 2010-2014. US Dept. of the Interior, Bureau of Ocean Energy Management, Atlantic OCS Region, Washington, DC. OCS Study BOEM 2017-071. 211 pp.
Winship <i>et al.</i>	2018	Modeling At-Sea Density of Marine Birds to Support Atlantic Marine Renewable Energy Planning Final Report
Normandeau Associates	2019	https://remote.normandeau.com/portal_data.php?pj=13&public=1 – BOEM Data 2019 May
CWS-ECCC	2019	CWS-ECCC (2019) Atlas of Seabirds at Sea in Eastern Canada 2006 – 2016

3.1 Aerial Digital Surveys of BOEM's South Atlantic Survey Area

In 2018, Normandeau and APEM were contracted by BOEM to complete quarterly aerial digital surveys within a 12-month period. The South Atlantic Survey Area (SASA), an area defined as the area of the ocean off the coast of North and South Carolina out to the 30 m contour line, and the South Carolina Grand Stand call area were surveyed using aerial digital still methods. In addition to these areas, individual wind energy areas (WEAs) were also surveyed which included Wilmington East, Wilmington West, and Kitty Hawk, each with a 1 nm buffer (c. 2 km). For the WEA surveys, and therefore Kitty Hawk, a coverage of >10% area was flown in line with BOEM's requirements for digital aerial surveys to achieve 10-20% coverage. The surveys in the first year were undertaken in February 2018, May / June 2018, October 2018, and December 2018. Figure 1 shows the extent of the SASA with the inclusion of the KHSA, and the subsequent extent of the expansion from a c. 2 km buffer for the previous BOEM surveys, to a 4 km buffer on behalf of Avangrid Renewables. The extension of the buffer

provides additional information for understanding any potential displacement impacts on surveyed species.

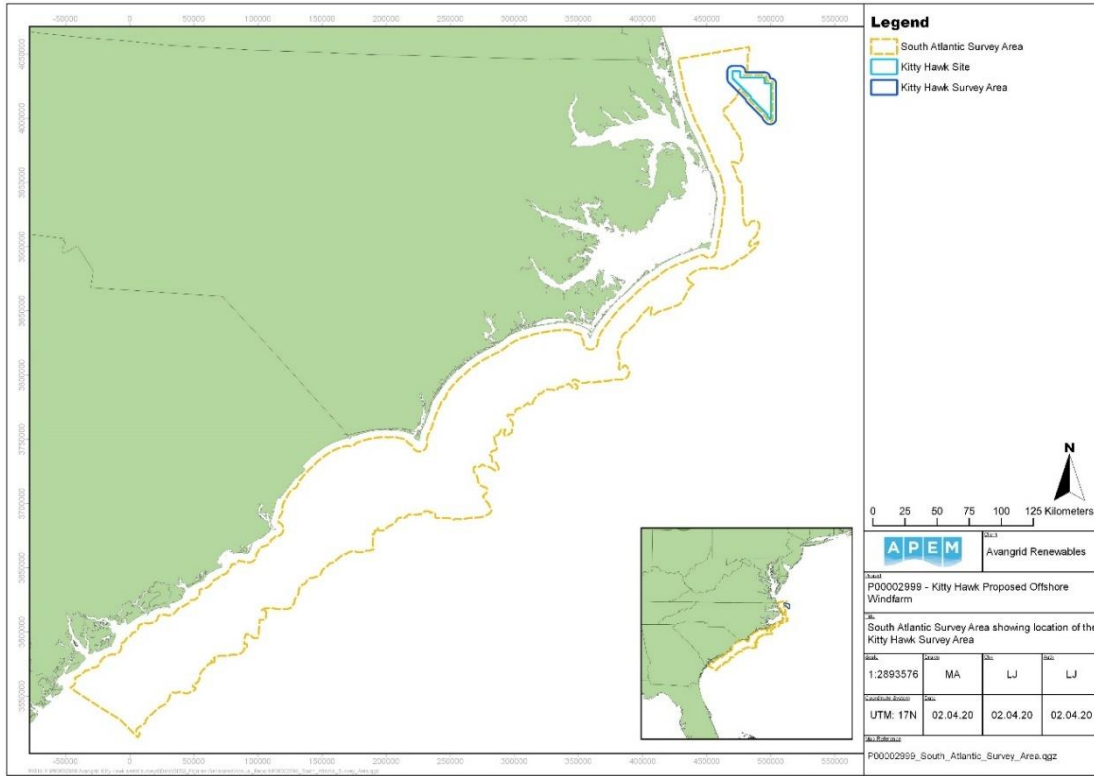


Figure 1 Kitty Hawk within the South Atlantic Survey Area

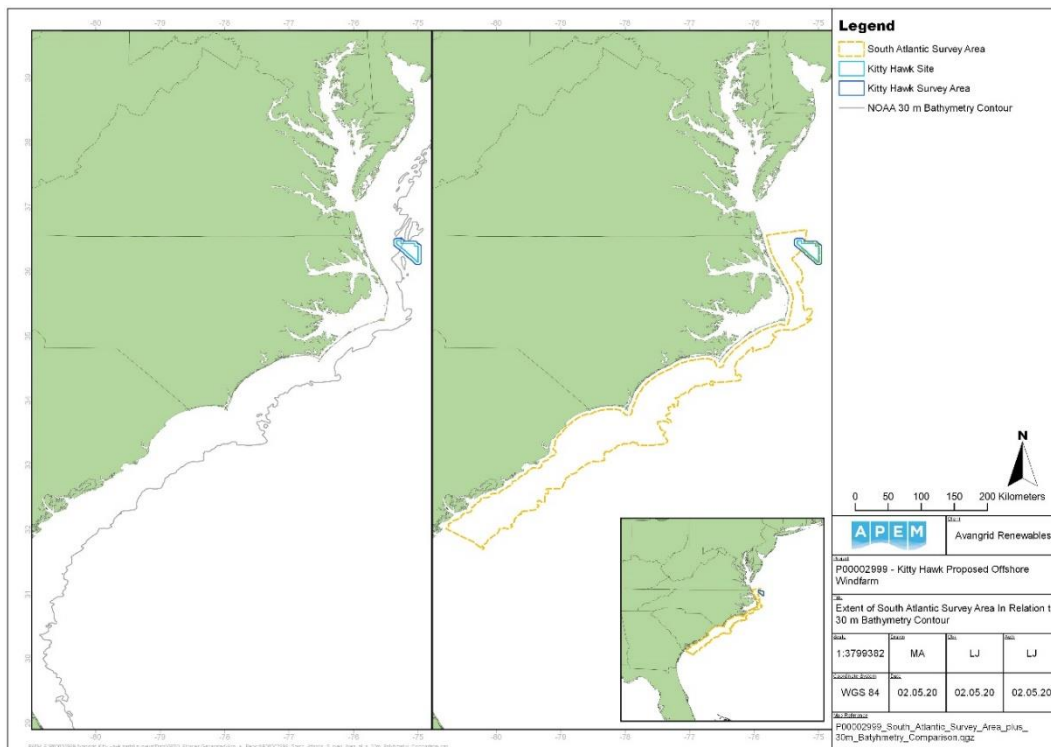


Figure 2 Extent of South Atlantic Survey Area compared with 30 m bathymetry contour

Upon inspection of the results of the SASA survey for May 2019, a few unidentified shorebirds and loggerhead turtles were recorded between the Kitty Hawk boundary and the shoreline (Normandeau, 2019). Winship *et al.* (2018) found that phalaropes tended to be distributed closer to shore during the summer and the BOEM data for May 2019 would appear to support this (Normandeau, 2019).

The data collected on behalf of BOEM are publicly accessible from Normandeau’s ReMOTe website, APEM’s teaming partner. Reports are not currently available for the BOEM programme of surveys, though the data can still be accessed and viewed when required (Normandeau, 2019).

3.2 Aerial Digital Surveys of BOEM’s Kitty Hawk Survey Area

For the KHSA, most of the sea depth is >30 m, as can be seen in **Figure 2**, with only a small portion of the survey area to the northwest remaining at or below the 30 m threshold. Since location from shore and sea depth are predicted to influence the occurrence of organisms, particularly bird species (Winship *et al.*, 2018), then it can be expected that these findings would be reflected to some degree in the results of the 2018-2019 BOEM surveys. Of the bird species found in the 2018-2019 BOEM surveys (**Table 3** to **Table 7**), data on gannets and gulls supported the findings of Winship *et al.* (2018), predicting that they would be found in higher quantities up to and including the offshore region; and data on shearwaters are predicted to bear highest densities further offshore (Winship *et al.*, 2018), which the December 2018 (**Table 6**) BOEM survey findings also support. Additionally, the relatively high abundance of phalaropes in December 2018 (**Table 6**) compared to other seasonal surveys, supports the finding that phalaropes tend to be distributed closer towards the shore during summer and therefore would be expected to range further out during the other seasons (Winship *et al.*, 2018).

Table 3 February 2018 survey results for the BOEM Kitty Hawk plus c. 2 km buffer

Common Name	Flying	Sitting	Total
Red-throated Loon	-	4	4
Common Loon	-	62	62
Northern Fulmar	2	1	3
Northern Gannet	46	3	49
Black-legged Kittiwake	3	2	5
Bonaparte's Gull	1	-	1
Great Black-backed Gull	1	5	6
Great Skua	1	-	1
Razorbill	-	11	11
Murre / Razorbill	-	1	1
Atlantic Puffin	-	5	5
Total	54	94	148
Common Name	Submerged	Surfacing	Total
North Atlantic Right Whale	1	-	1
Common Minke Whale	1	-	1
Short-beaked Common Dolphin	3	1	4

Risso's Dolphin	1	-	1
Dolphin sp. – unidentified	8	-	8
Loggerhead Turtle	1	-	1
Kemp's Ridley Turtle	1	-	1
Loggerhead / Kemp's Ridley Turtle	1	-	1
Total	17	1	18

Table 4 May / June 2018 survey results for the BOEM Kitty Hawk plus c. 2 km buffer

Common Name	Submerged	Surfacing	Total
Loggerhead Turtle	24	12	36
Loggerhead / Kemp's Turtle	-	2	2
Turtle sp. – unidentified	2	3	5
Ocean Sunfish	-	1	1
Chilean Devil Ray	-	2	2
Cownose Ray	104	2,759	2,863
Cownose / Bullnose Ray	1	426	427
Total	131	3205	3336

Table 5 October 2018 survey results for the BOEM Kitty Hawk plus c. 2 km buffer

Common Name	Flying	Sitting	Total
Cory's Shearwater	1	-	1
Northern Gannet	1	2	3
Total	2	2	4
Common Name	Submerged	Surfacing	Total
Whale sp. – unidentified	1	-	1
Dolphin sp. – unidentified	1	-	1
Loggerhead Turtle	-	4	4
Kemp's Ridley Turtle	1	13	14
Loggerhead / Kemp's Turtle	1	-	1
Mahi-mahi	4	-	4
Ocean Sunfish	14	-	14
Atlantic Bluefin Tuna	1	-	1
Carcharhinidae shark sp. – unidentified	2	1	3
Great White Shark	1	-	1
Total	26	18	44

Table 6 December 2018 survey results for the BOEM Kitty Hawk plus c. 2 km buffer

Common Name	Flying	Sitting	Total
Red-throated Loon	-	4	4
Common Loon	-	69	69
Cory's Shearwater	1	-	1
Sooty Shearwater	4	-	4
Manx Shearwater	145	144	289
Northern Gannet	2	7	9
Red-necked Phalarope	-	5	5
Red Phalarope	18	150	168
Red / Red-necked Phalarope	-	65	65
Black-legged Kittiwake	474	75	549
Bonaparte's Gull	937	144	1,081
Laughing Gull	-	7	7
Ring-billed Gull	-	15	15
Great Black-backed Gull	9	15	24
Herring Gull	5	9	14
Small Gull sp. – unidentified	10	1,030	1,040
Large Gull sp. – unidentified	-	3	3
'Commic' / Forster's Tern	1	-	1
Razorbill	2	14	16
Murre / Razorbill	1	3	4
Total	1,609	1,759	3,368
Common Name	Submerged	Surfacing	Total
Short-beaked Common Dolphin	3	23	26
Dolphin sp. – unidentified	29	1	30
Loggerhead / Kemp's Ridley Turtle	1	-	1
Turtle sp. – unidentified	2	-	2
Total	35	24	59

Table 7 May 2019 survey results for the BOEM Kitty Hawk plus c. 2 km buffer

Common Name	Flying	Sitting	Total
Common Loon	-	8	8
Trindade Petrel	1	-	1
Total	1	8	9
Common Name	Submerged	Surfacing	Total
Trindade Petrel	1	-	1
Loggerhead Turtle	59	-	59
Kemp's Ridley Turtle	1	-	1
Loggerhead / Kemp's Ridley Turtle	11	-	11

Leatherback Turtle	3	-	3
Turtle sp. – unidentified	12	-	12
Mahi-mahi	3	-	3
Ocean Sunfish	2	-	2
Tuna sp. – unidentified	73	-	73
Schooling pelagic fish sp. – unidentified	1	-	1
Blue Shark	1	-	1
Carcharhinidae shark sp. – unidentified	1	-	1
Hammerhead shark sp. – unidentified	3	-	3
Atlantic Devil Ray	1	-	1
Total	172	0	172

One species that was predicted to occur in lower numbers offshore, with a tendency towards inshore occurrence, was the common loon (Winship *et al.*, 2018). The results of the BOEM December 2018 survey found that common loons occurred throughout the survey area but at a higher density towards the northwest where the 30 m depth threshold is located (**Figure 3**). The results of the BOEM SASA survey also found large densities of common loons between the Kitty Hawk survey area and the inshore region (Normandeau, 2019). This may therefore support the predictions of Winship *et al.* (2018) for common loons to occur towards the inshore. Thus, most occurrences of common loon should be expected to occur mainly to the northwest.

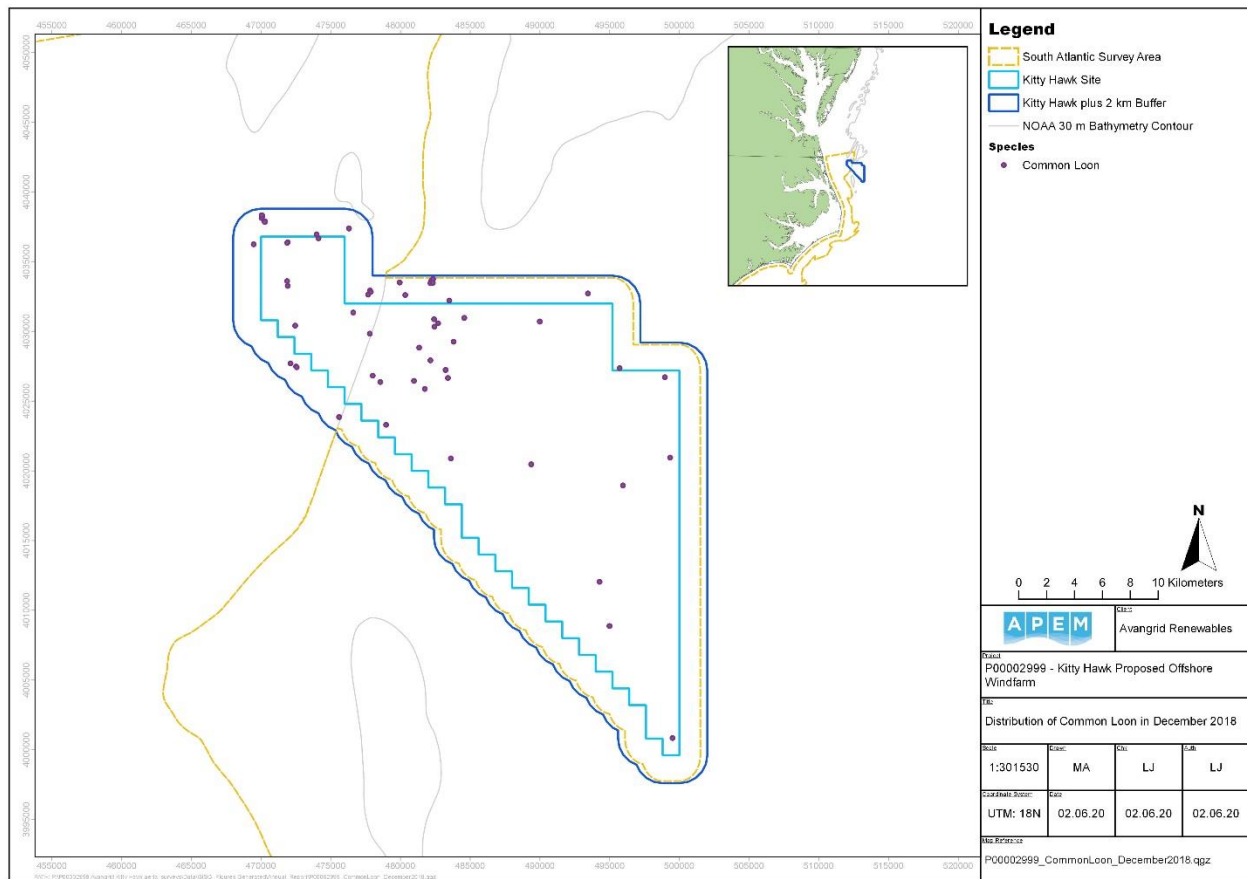


Figure 3 Distribution of common loons from BOEM Kitty Hawk December 2018

3.3 Information in the literature from the US Atlantic Outer Continental Shelf

BOEM funded the National Oceanic and Atmospheric Administration’s (NOAA) National Centers for Coastal Ocean Science (NCCOS) to provide broad-scale avian spatial information to aid marine spatial planning in the mid-Atlantic region. Kinlan *et al.* (2016) presents the first phase of the project. Winship *et al.* (2018) presents the second phase of modeled at-sea relative densities of marine bird species in the U.S. Atlantic Outer Continental Shelf (OCS), analyzing 92 survey datasets (mainly aerial and boat-based visual surveys at sea) over a time period spanning almost four decades (1978-2016). The report aimed to inform marine renewable energy spatial planning in the region by providing broad-scale spatial information on seabird distributions. These modeled outputs are publicly accessible (see Curtice *et al.*, 2018).

Data from the ‘Northwest Atlantic Seabird Catalog’ (O’Connell *et al.*, 2009) and Eastern Canada Seabirds at Sea data (ECSAS; see Fifield *et al.*, 2009; Gjerdrum *et al.*, 2012 for more details) from Canadian Wildlife Service, Environment and Climate Change Canada (CWS-ECCC, 2019) were used in the modeling. The report presents seasonal maps of the spatial distributions of 47 marine bird species in the US Atlantic Outer Continental Shelf and adjacent waters. It is worth noting the caveat Winship *et al.* (2018) provide to accompany the spatial distributions:

“The project [Winship *et al.*, 2018] was not designed to provide precise predictions of the actual number of individuals of a given species that would be expected in a specific location at a specific time. The project was also not designed to determine the ecological drivers of marine bird distributions, although the results provide related hypotheses for future research.”

Furthermore, the seasons represent environmental conditions and do not necessarily align with the timing of migration for individual species. The months that were assigned to each season in Winship *et al.* (2018) were the same as those used in this report.

Winship *et al.* (2018) noted that the predicted spatial distributions of relative density generally followed what is known about the distribution and density of individual species. The broad pattern of relative density distribution for species that were present in Kitty Hawk included loons, and several gull and tern species which were all reported as being relatively coastal with highest densities nearshore. Conversely, species such as northern fulmar, shearwaters, and storm-petrels were all reported as having relatively greater densities further offshore. Arctic tern and auks were reported as having mainly offshore distributions except during summer when the highest densities were nearer to the shore, the latter two being known to breed in the study area examined by Winship *et al.* (2018): the planning area boundary (see Figure 1 in Winship *et al.*, 2018). Phalaropes were reported as tending to be distributed closer to the shore during summer in comparison to their distribution during spring and fall.

The majority of species' distributions were predicted in the northern part of the study area from the Gulf of Maine to Cape Hatteras, for example Atlantic puffin, black-legged kittiwake, dovekie, great black-backed gull, great shearwater, herring gull, northern fulmar and sooty shearwater (Winship *et al.*, 2018). Migratory species that were absent for certain seasons included sea ducks during summer, and jaegers, phalaropes, skuas, storm-petrels and terns during winter (Winship *et al.*, 2018).

Broad patterns of relative density distribution for species of note by Winship *et al.* (2018), but that were not present in the Kitty Hawk surveys, included brown pelican and red-breasted merganser in relatively coastal regions, and bridled tern which was reported as having higher densities further offshore. Brown pelican and royal tern were noted as having more southerly distributions. Species such as black-capped petrel and sooty tern were predicted to have a mainly southerly distribution (Winship *et al.*, 2018). The endangered roseate tern was also noted as exhibiting a relatively restricted distribution, which included small areas of higher densities in and around Cape Cod and Nantucket Sound during spring-fall and along the east coast of Florida during summer.

The relative abundance in individual BOEM offshore wind energy lease areas, including Kitty Hawk, were provided as a proportion of the total relative abundance in the study area. The modeled distributions broadly reflected the proportion of total relative abundance although the results were also influenced by the size of the BOEM area in question.

Relative abundance in Kitty Hawk was a small proportion of the total relative abundance resulting in a proportion of less than 1% for all bird species modeled during any one season. A total of 22 species were found to have a total relative abundance across all BOEM lease areas that was 1% or greater of the total relative abundance in the study area for one or more seasons (Winship *et al.*, 2018). The highest found was for razorbill and common loon during spring, however the total relative abundance in the study area occurred mostly in Rhode Island and Massachusetts area for razorbill, and New Jersey areas and the South Carolina Grand Stand area for common loon (Winship *et al.*, 2018).

Species that were recorded during the Kitty Hawk aerial surveys but not modeled in Winship *et al.* (2018) included Forster's tern.

Other studies have included the collection and analysis of data to create distribution maps of marine wildlife densities to inform habitat use which took place in the mid-Atlantic Outer Continental Shelf, and intended to help address environmental barriers to offshore wind energy development around Delaware, Maryland, and Virginia (Williams *et al.*, 2015). Viet *et al.* (2015) provided a useful comparison of pelagic modeled seabird density across the mid-Atlantic region by providing species-specific distribution maps for data spanning 1970-1990 and also 2000-2010.

Williams *et al.* (2015) gives an overview of the seasonal variations in the mid-Atlantic region of birds which largely coincides with results from Winship *et al.* (2018). In terms of non-avian fauna, Williams *et al.* (2015) noted that during Spring (March to May) bottlenose dolphins and a variety of sea turtle species arrived to the area offshore Virginia, remaining in the region until late Fall (September to November). Common dolphins arrived in the area November and remained in the region during Winter (December to February). Williams *et al.* (2015) also recorded baleen whales during Winter including the common minke whale and the North Atlantic right whale. During Summer (May to July) Williams *et al.* (2015) noted large movements of cownose rays migrating through to the area, and left the area in early Fall. All sea turtles are listed as threatened or endangered and many cetacean species are also protected under the Endangered Species Act. The cownose ray is near threatened under the International Union for the Conservation of Nature (IUCN) Red List (Barker, 2006).

Robinson Willmott *et al.* (2013) presented data relating to the vulnerability of bird species in the Atlantic Outer Continental Shelf to potential impacts in relation to offshore wind farm developments. Species of gulls, phalaropes, cormorants and jaegers were identified as being of relatively high concern for potential collision of operational turbines, and species of sea ducks, loons, and some auks were identified as being most vulnerable to effects of displacement. Other more recent studies have assessed the relative sensitivity of seabirds in relation to breeding colonies (Wisman, 2018), and potential cumulative impacts of offshore wind farm developments (Goodale *et al.*, 2019).

Wisman *et al.* (2018) created a model to incorporate colonial nesting data of six seabird species from the mid-Atlantic region known to have a vulnerability to wind energy based on information presented in Robinson Willmott *et al.* (2013). The species that were modeled were brown pelican, common tern, great black-backed gull, gull-billed tern, herring gull, and laughing gull. Out of the species that were modeled, common tern was listed as the greatest conservation need with 'very high conservation need', gull-billed tern was listed as 'threatened', and laughing gull was listed as 'great conservation need' with 'moderated conservation need' for breeding in Virginia. However the foraging range of the breeding colonies are unlikely to overlap with the Kitty Hawk lease area off the coast of North Carolina (see Figures 5 and 6 from Wisman *et al.*, 2018).

Wisman *et al.* (2018) also presented the results of a tracking study of breeding common terns in Virginia. Other tracking studies have included Spiegel *et al.* (2017) which studied northern gannet, red-throated loon and surf scoter movements in the mid-Atlantic, and Normandeau (2011) which studied the movements of red knot. Normandeau (2011) also includes information relating to the potential risk to species with high conservation concern including roseate terns, piping plovers and red knots by offshore wind farm developments.

Since the year 2010, NOAA, BOEM, the US Fisheries and Wildlife Service (FWS) and the US Navy have surveyed the east coast of the United States, from Maine to the Florida Keys. The

Atlantic Marine Assessment Program for Protected Species (AMAPPS) aims to examine the habitat characteristics, behaviour, ecology and the distribution of marine mammals, seabirds and turtles. AMAPPS I occurred from 2010-2014, and AMAPPS II from 2015-2019.

Due to the complexity of marine ecosystems, several types of data were collected, including visual sightings of cetaceans, seabirds and sea turtles and seals (from both ship and aerial surveys), passive acoustic detections of cetaceans and fish, location/depth information from tagged turtles, seals and cetaceans.

During the AMAPPS I surveys, the ship and aerial surveys recorded a total of 60,500 cetaceans, 200 seals, 24,500 seabirds, 5,500 turtles, 800 ocean sunfish and 200 basking sharks (Palka *et al.*, 2017) from 125,000 km of track line, as well as cetacean acoustic recordings at 15 different locations. A total of 17 confirmed cetacean species were recorded in the south-eastern ship surveys, and 13 in the south-east aerial surveys. This data was used to create density maps and abundance estimates for 18 species of cetaceans and seals, as well as plots of species detected on few occasions. These figures were presented as averages over the years 2010-2013, with the 2014 data used to test the robustness of the data. By accounting for the availability bias, the negative bias was reduced, resulting in higher estimates than previously published data (e.g. Waring *et al.*, 2016).

Across the whole of the survey area, dolphin species including common bottlenose dolphin and common dolphin were found to be high abundance, with peak abundance recorded in summer for bottlenose dolphins (n=11,7209) and fall for common dolphin (n=183,509). The area around Rhode Island / Massachusetts was found to show the greatest diversity over the course of the 2010-2013 study period, whereas the area south of North Carolina showed fewer species and lower abundances. The abundance of harbor seals was estimated using the fraction of the time spent on haul-out sites (using the tag data) to correct the photographic counts of seals on haul-out sites, with the abundance estimated to be 75,834 (Waring *et al.*, 2016).

Many of the seabird species were mapped with their key sites identified, with predictions of high abundances of Long Island, Chesapeake Bay, around Martha's Vineyard / Nantucket Island, in Penobscot Bay, and off the central coast of Maine, with differences between the summer and winter patterns.

Sea turtles' tags were deployed between 2009-2015, with loggerhead turtles being the focus species. Dive time patterns, spatial distribution and the ecology of the species were documented using the data, with densities being greatest in the summer months from Cape Hatteras to Long Island, as well as along the Georgian and South Carolina coasts. During the winter, densities were greatest along the North Carolina and Florida coasts.

4. Survey and Analysis Methodologies

4.1 Aerial Digital Survey Methods

The methods and results presented are from the Avangrid Renewables surveys of the Kitty Hawk lease area and a 4 km buffer.

APEM has a bespoke camera system, termed "Shearwater III," customized by in-house specialists for surveying the offshore environment. The camera system is integrated with custom flight planning software that allowed each survey transect to be accurately mapped out before the aircraft leaves the ground. Each image capture node is defined allowing the system to fire the camera exposures at exactly the right location. This ensures that each

survey is flown with the same transect orientation and the camera is triggered at the same position along each transect within set tolerances. Any overlaps that are present between cameras and across nodes is accounted for when calculating total coverage. APEM's planning systems enable tolerances on flight path along survey lines to be set automatically, aborting survey lines that drift away from the aircraft's planned flight line.

APEM's on-board camera technician continually monitored the imagery as it was collected to ensure the data collected was fit for purpose. The camera technician would make the decision to cease data collection should the conditions become unsuitable for surveying and / or data collection. Subsequently, the survey would then be resumed at the next earliest opportunity. Though conditions remained favorable throughout the January to December 2019 surveys (**Table 8, Table 10**), technical issues were experienced during the January survey lines 4 and 5, leading to them to be re-flown later the same day.

Table 8 Dates and times of surveys undertaken from January to December 2019

Survey No.	Survey Date	Flight 01		Flight 02	
		Survey Time Start (UTC)	Survey Time End (UTC)	Survey Time Start (UTC)	Survey Time End (UTC)
01 (Jan)	01-26-19	10:08	13:16	16:20	16:49
02 (Feb)	03-03-19	09:58	12:47	-	-
03 (Mar)	03-22-19	09:43	13:00	-	-
04 (Apr)	04-23-19	09:35	12:42	-	-
05 (May)	05-16-19	08:33	11:30	-	-
06 (Jun)	06-14-19	14:26	17:13	-	-
07 (Jul)	08-09-19	14:20	17:22	-	-
08 (Aug)	08-19-19	14:15	17:11	-	-
09 (Sep)	09-21-19	14:24	17:20	-	-
10 (Oct)	10-01-19	08:11	11:11	-	-
11 (Nov)	11-26-19	13:48	16:47	-	-
12 (Dec)	12-08-19	14:17	17:12	-	-

The aerial digital surveys captured images along 15 lines spaced approximately 1.9 km across-track and 0.5 km along-track between image nodes within Kitty Hawk plus 4 km buffer (**Figure 4**) to achieve >10% coverage per survey (**Table 9**). Coverage slightly varies from month to month depending on whether images mostly fall inside or outside of the survey area. Data collected were 1.5 cm GSD digital still images using a GPS-linked bespoke flight management system to ensure the tracks were flown with a high degree of accuracy. The aircraft's internal GPS and IMU systems record to an accuracy of +/- 3 to 5 m as standard.

Table 9 Survey season duration with per survey area percentage coverage (the total area of the digital still images captured divided by the total survey area) of Kitty Hawk plus 4 km buffer

Survey Season	Survey No.	Number of Images	Survey Coverage (%)
Winter	01 (Jan)	13,889	11.71
	02 (Feb)	13,888	11.71

Survey Season	Survey No.	Number of Images	Survey Coverage (%)
Spring	03 (Mar)	13,860	11.69
	04 (Apr)	13,890	11.71
	05 (May)	13,890	11.71
Summer	06 (Jun)	13,890	11.71
	07 (Jul)	13,890	11.71
	08 (Aug)	13,887	11.71
Fall	09 (Sep)	13,890	11.71
	10 (Oct)	13,878	11.70
	11 (Nov)	13,894	11.71
Winter	12 (Dec)	13,899	11.72

Imagery is captured in raw format and post-processed to ensure optimal quality for the subsequent stage of image analysis, to extract information on marine fauna or other notable occurrences. When a survey is completed, the data are checked to ensure the number of lines and the number of images collected is correct, and that the quality of the imagery is acceptable. Once the image analysis is completed, further Quality Control (QC) processes take place (see Summary of Quality Control).

Scientific names of all recorded species are listed in Appendix I.

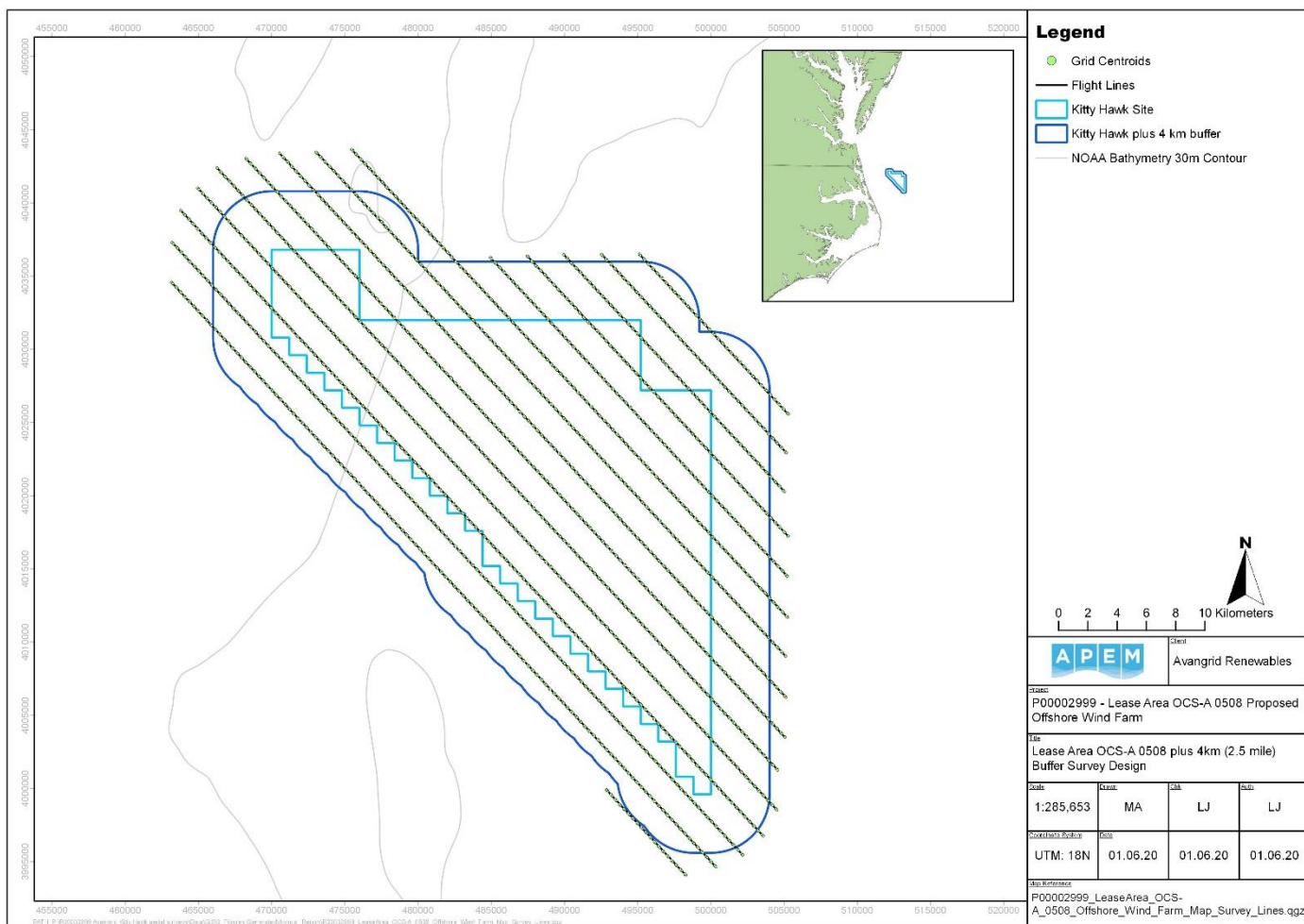


Figure 4 Flight lines and aerial digital still imagery capture points of Kitty Hawk plus 4 km (2.5 mile) buffer

No health or safety issues were reported during the surveys.

The date(s), start, and end times are provided for each aerial digital survey in **Table 8** with the corresponding weather conditions provided in **Table 10**. Weather conditions during all surveys were conducive to collecting and analyzing imagery for the purpose of providing data on the identification, distribution and abundance of bird species and marine fauna within Kitty Hawk plus 4 km buffer. Favorable conditions for surveying are defined as there being no precipitation, a sea state of <4, wind speeds of <30 knots, visibility of >5 km, and sun angle of more than 5 degrees (depending on cloud cover and other environmental conditions). For safety reasons, no surveying takes place in conditions conducive to icing. The weather criteria follow the BOEM guidelines for aerial digital surveys of birds for projects requiring a Construction and Operations Plan (COP) (BOEM, 2017). Measures were also taken to minimize glint and glare, when conditions may be subject to this, such as avoiding surveying around midday when the sun angle has the greatest potential to impact image quality. Furthermore, in the unlikely event that images are affected by glint or glare, additional imagery is collected to provide an alternative data set that can be selected for analysis to ensure that sufficient coverage is achieved. The various weather conditions that these data were captured in would not affect the ability to detect marine fauna in the imagery.

The number of images collected and associated coverage is provided in **Table 9****Error! Reference source not found.**

Table 10 Weather conditions recorded for completed surveys to date: January 2019 to December 2019

Survey No.	Date	Douglas Sea State ¹	Turbidity ²	Wind Speed (knots) / Direction	Cloud Cover (%) ³	Visibility (km)	Air Temp (°F)
1	01-26	1	1	Negligible (calm)	0 - 10	> 10 km	40 - 43
2	03-03	2 - 3	2 - 3	10 / S or SE	80 - 100	> 10 km	46 - 51
3	03-22	2 - 4	2	15 - 30 / N or NW	0 - 5	> 10 km	46 - 50
4	04-23	0 - 1	0	10 / NW	0	> 10 km	66 - 68
5	05-16	1 - 2	2	10 - 18 / NW	5 - 90	> 10 km	64 - 67
6	06-14	2	1	26 / W or NW	10 - 60	> 10 km	64 - 66
7	08-09	1	0	Calm - 5 / NW	0	> 10 km	81 - 84
8	08-19	0 - 2	0 - 1	Negligible (calm)	20 - 40	> 10 km	81 - 86
9	09-21	1	0	5 - 6 / SE or W	0	> 10 km	67 - 73
10	10-01	2	0 - 2	Calm - 5 / E or SE	0 - 30	> 10 km	70 - 71
11	11-26	1	1	7 / S	10	> 10 km	60 - 63
12	12-08	2	1	15 / E or S	0 - 80	> 10 km	52 - 56

¹ 0 = Calm (Glassy), 1 = Calm (Rippled), 2 = Smooth, 3 = Slightly Moderate, 4 = Moderate

² 0 = Clear, 1 = Slightly Turbid, 2 = Moderately Turbid, 3 = Highly Turbid

³ 0 = Clear, 1-10 = Few, 11-50 = Scattered, 51-95 = Broken, 96-100 = Overcast

4.2 Summary of Quality Control

Images were analyzed to enumerate birds to species level and to enumerate any other non-avian marine fauna. Survey data were uploaded to APEM's partner Normandeau's ReMOTE website in 'real time' as soon as image analysis was completed. These data are publicly accessible¹. Normandeau provided QC of the data to check for missed animals in 10% of images recorded as empty and also quality controlled 20% of the bird species identification undertaken by APEM (and 100% of Listed species). Normandeau identified 100% of the species of non-avian marine fauna including marine mammals, sharks, rays and turtles. Birds and marine fauna identified from the images were 'snagged' (i.e. located within the images) and categorized usually to species, but sometimes to the species grouping. The results of the QC are provided in **Table 11** and **Table 12**, demonstrating agreement exceeding 98% for all surveys.

After receiving results of QC as seen in **Table 12**, images containing any missed targets are checked again by the analyst team, as well as any surrounding 'blank' images. Additional random checks are continued throughout the blank images to ensure that any missed targets from the QC are outliers.

¹ https://remote.normandeau.com/ewind_overview.php

Table 11 The number of blank images & blank images to QC and results of the QC

Survey No.	Blank Images	Blank Images QC'd	Image Number QC'd Not Blank	Agreement (%)
1	13,273	1,327	13	99.02
2	13,833	1,383	1	99.93
3	13,664	1,367	20	98.54
4	13,665	1,367	25	98.17
5	13,717	1,372	1	99.93
6	13,771	1,377	5	99.64
7	13,695	1,370	2	99.85
8	13,768	1,377	2	99.85
9	13,835	1,384	0	100
10	13,825	1,383	2	99.86
11	13,674	1,367	10	99.27
12	13,811	1,381	3	99.78

Table 12 The number of individuals that were found during blank image QC

Survey No.	Order Found by QC	Number of individuals
1	Avian	7
	Marine Mammal	5
	Large Bony Fish	1
2	Avian	1
3	Avian	12
	Marine Mammal	1
	Turtle	4
	Large Bony Fish	2
	Ray	1
4	Avian	13
	Marine Mammal	1
	Large Bony Fish	6
	Ray	5
5	Avian	1
6	Turtle	4
	Ray	1
7	Large Bony Fish	1
	Small Bony Fish	1
8	Turtle	1
	Large Bony Fish	1
10	Large Bony Fish	7
	Shark	1
11	Small Bony Fish	10
12	Avian	1
	Small Bony Fish	12

4.3 Species Abundance Estimates

For each monthly aerial digital survey of Kitty Hawk plus 4 km buffer, geo-referenced locations of marine fauna, contained within each individual digital still image, were used to generate raw counts. Marine fauna locations contained within the boundaries of the two areas (Kitty Hawk and the 4 km buffer) were then extracted using either ArcGIS or QGIS, providing raw count data. These data are presented in this annual report for all species.

On a per survey basis, the raw counts were then divided by the number of images collected to give the mean number of animals per image (i). Abundance estimates (N) for each survey month were then generated by multiplying the mean number of animals per image by the total number of images required to cover the entire study area (A):

$$N = i A$$

Non-parametric bootstrap methods were used for variance estimation. A variability statistic was generated by re-sampling 999 times with replacement from the raw count data. The statistic was evaluated from each of these 999 bootstrap samples and upper and lower 95% confidence intervals of these 999 values were taken as the variability of the statistic over the population (Efron & Tibshirani, 1993).

A measure of precision was calculated using a Poisson estimator, suitable for a pseudo-Poisson over-dispersed distribution. This produced a coefficient of variation (CV) based on the relationship of the standard error to the mean.

All analysis and data simulations carried out by APEM were conducted in the R programming language (R Development Core Team, 2012) and non-parametric 95% confidence intervals were generated using the 'boot' library of functions (Canty & Ripley, 2010). This results in species-specific monthly abundance estimates being calculated from the raw count data, with upper and lower confidence limits. Where appropriate, a level of precision is also presented for each monthly abundance estimate. Dividing the monthly abundance estimates by the size of the Kitty Hawk or 4 km buffer sites determines the density (e.g. bird per km²) for any given species.

Raw counts from the aerial digital survey data and abundance estimates per designated species can be found in Appendix II.

4.4 Species Distribution Maps

Each individual located by the surveys is geo-referenced and this allows those locations to be related to the boundary of Kitty Hawk and any buffer placed around it out to 4 km. Seasonal relative density distribution maps were produced for total species using QGIS (v3.4) by summing the number of individuals recorded in each image per season and then representing this sum of individuals as a dot on a map that was proportional to the number of individuals in that image; i.e. large numbers of individuals per image are represented by larger dots than smaller numbers of individuals per image.

4.5 Species Flight Height Boxplots

Bird flight altitude was estimated from the digital still images. It was determined using bespoke APEM software that applies a set of rules developed in-house and trigonometry to provide an estimate of flight height. Flight height boxplot graphs were produced for each species, where

possible, by combining the suitable flight height data collected from the survey programme. The 'box' is the interquartile range, with the middle bold line representing the median of the data. The 'whiskers' are the largest and smallest non-outliers. The range of the entire data includes the outliers represented by circles.

4.6 Seasons

Separate seasons are recognized in this report in order to establish the level of importance any species has within Kitty Hawk plus 4 km buffer during a particular period of time. The seasons are defined within this report as follows:

- Spring represented by the months of March, April and May;
- Summer represented by the months of June, July and August;
- Fall represented by the months of September, October and November; and
- Winter represented by the months of January, February and December.

It should be noted that these seasons are based on the transition of environmental conditions and as such they may not necessarily coincide with the timing of species-specific breeding, migratory or non-breeding / wintering biological seasons.

4.7 Availability Bias

Diving birds, such as murre and razorbills, spend time foraging beneath the water surface. As a result of this, an unknown number of birds may go undetected due to the snap shot nature of aerial survey techniques. A correction factor to account for the 'availability bias' has to be applied.

The correction factor applied to each relevant auk species was based on that recommended by a UK-based organization, Joint Nature Conservation Committee (JNCC), in a submission during the examination phase of the East Anglia ONE offshore wind farm off the east coast of England, referred to by JNCC as Method C (JNCC, 2013) with a copy of the specific text provided in Appendix III. This applies a correction factor on the basis of aerial surveys recording 76% of sitting murre and 83% of sitting razorbills, as 24% and 17% respectively, of these species will be underwater when aerial imagery is captured. Therefore to correct for availability bias the 'unavailable' birds are added to the bird totals on a monthly basis to create revised abundance estimates. The 'corrected' abundance estimates for sitting murre and razorbills are presented in Appendix IV.

4.8 Age Classifications

Data identifying the age class proportions on a monthly basis for northern gannet, black-legged kittiwake, Bonaparte's gull, laughing gull, herring gull, and great black-backed gull are presented in Appendix V. A description of ageing the aforementioned species from aerial digital still imagery is also provided.

5. Species Accounts

The following species accounts present the raw counts, design-based abundance estimates, density estimates, behavioral and distribution data from the 12 month programme of aerial digital surveys of Kitty Hawk plus a 4 km buffer on behalf of Avangrid Renewables. The density estimates provide the number of individuals per square kilometer (e.g. bird km²). For purpose of this report, data are only presented for months where a species of marine megafauna were recorded. In some species, the separate abundance estimates for each of the two areas (the Kitty Hawk site and the 4 km buffer) differ from that of the abundance estimate for Kitty Hawk plus 4 km buffer combined. This is due to the abundance estimates in the three areas being calculated independently and also due to slight differences in figures being rounded up or down.

5.1 Red-throated Loon

Red-throated loons were recorded in March and December only, with raw counts of one and two respectively, resulting in abundance estimates of ten and 20 for Kitty Hawk plus 4 km buffer (Table 13).

For the spring surveys, one red-throated loon was recorded in March in the southwest of the 4 km buffer (Figure 5), whilst for the winter surveys, one red-throated loon was recorded in December in the southwest of the 4 km buffer and one was recorded in the northwest of the Kitty Hawk site (Figure 6).

Table 13 Raw counts and abundance and density estimates (No. estimated individuals per km²) of red-throated loons in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Mar-19	1	10	0.01	0	1
Dec-19	2	20	0.02	0	2
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Mar-19	0	0	-	0	0
Dec-19	1	10	0.02	0	1
c) 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Mar-19	1	10	0.02	0	1
Dec-19	1	10	0.02	0	1

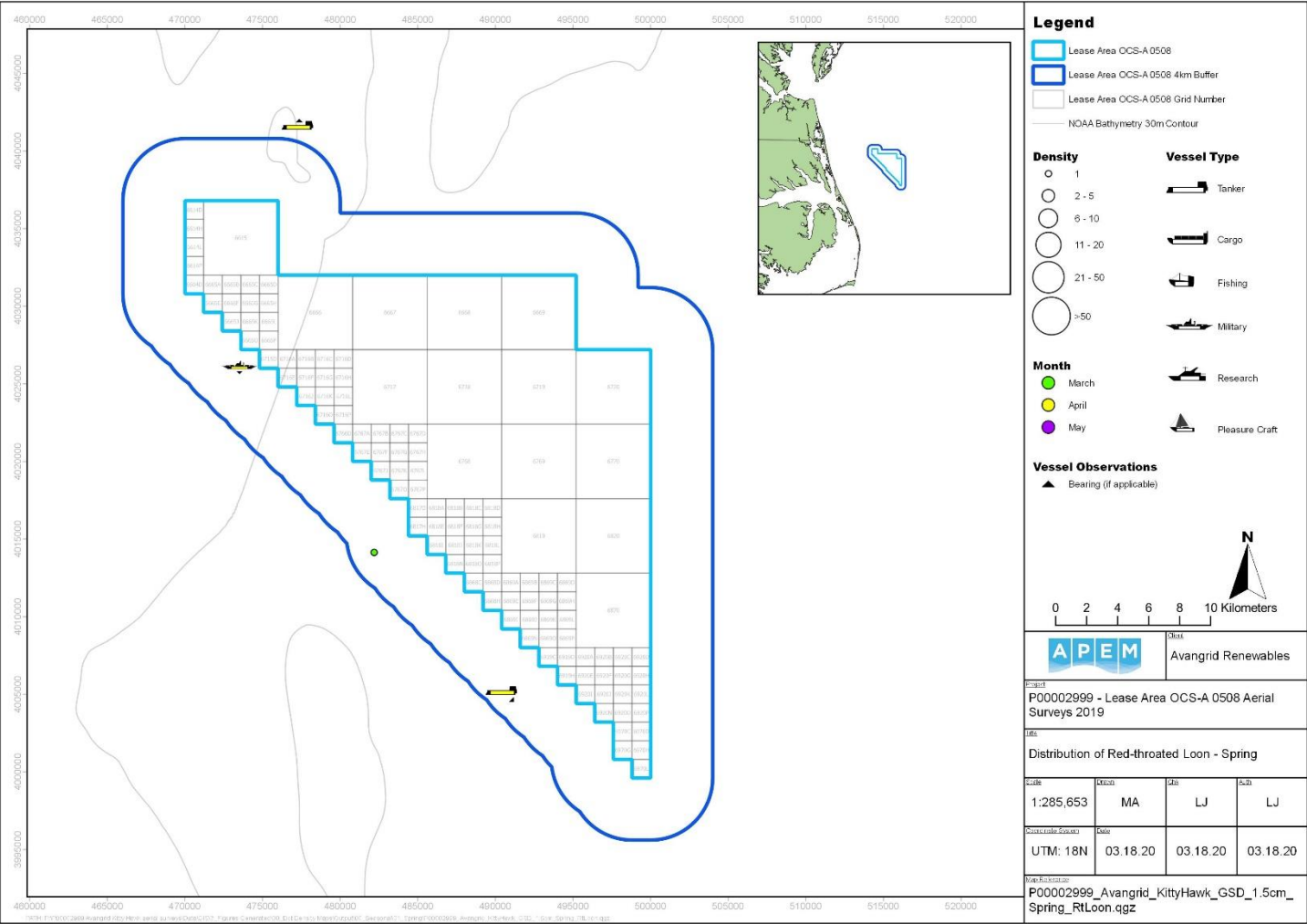


Figure 5 Distribution of red-throated loons recorded in Kitty Hawk plus 4 km buffer in the spring season

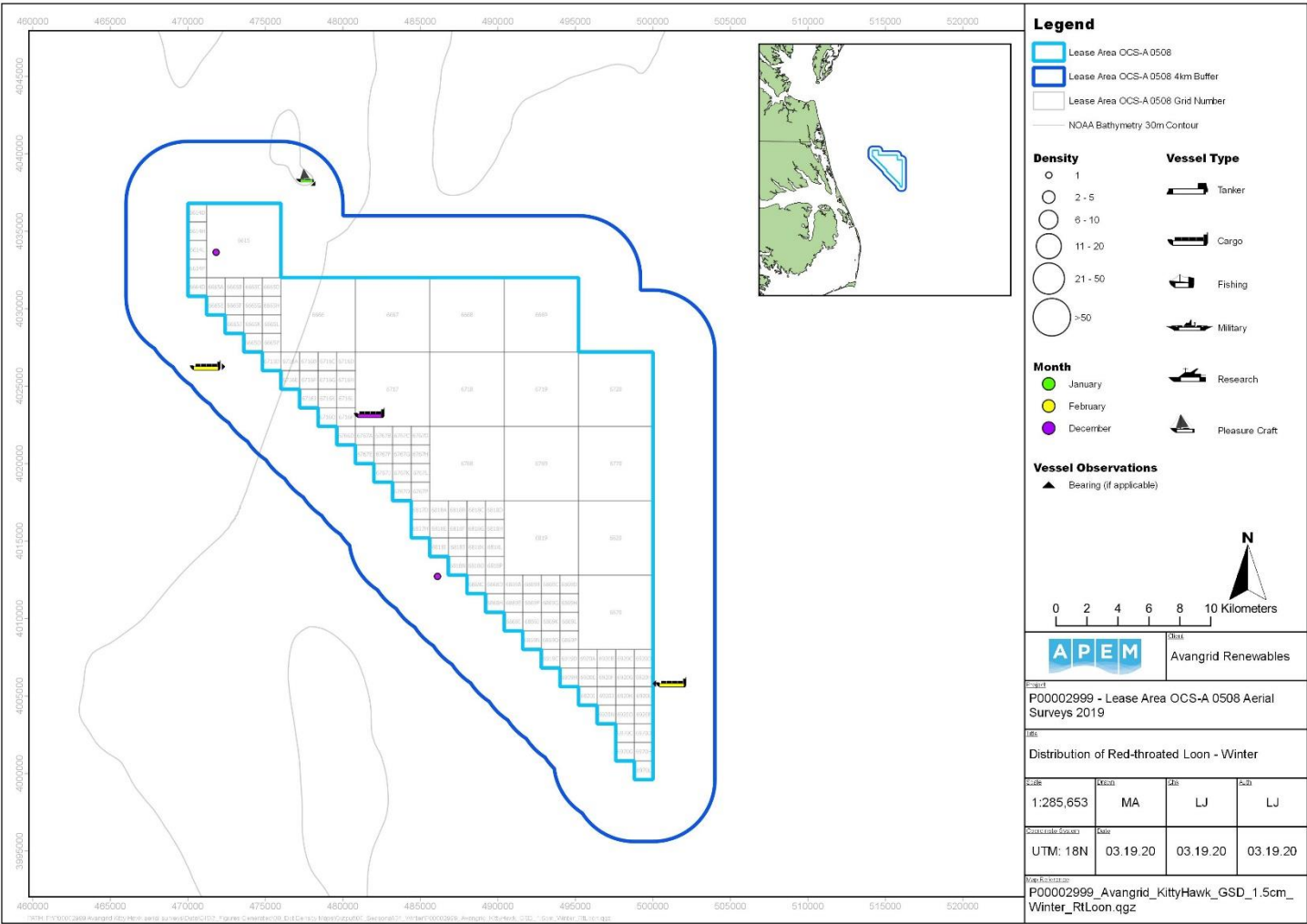


Figure 6 Distribution of red-throated loons recorded in Kitty Hawk plus 4 km buffer in the winter season

5.2 Common Loon

Common loons were recorded from January to May, as well as in November and December, with highest numbers recorded in spring (**Table 15**). A peak raw count of 74 individuals in the Kitty Hawk site and 81 individuals in the 4 km buffer for April, lead to abundance estimates of 714 and 839, respectively (**Table 14**).

A total of 327 common loons were recorded in Kitty Hawk plus 4 km buffer in the spring surveys (**Figure 7**), of which 149 were recorded in March, 155 were recorded in April, and 23 were recorded in May (**Table 14**). Individuals were primarily located to the west and northwest but with additional, scattered distribution throughout the survey area, particularly in April and May (**Figure 7**). In fall, common loons were recorded only in the November survey, distributed in the northwest of the survey area (**Figure 8**). In winter, a total of 162 common loons were recorded in Kitty Hawk plus 4 km buffer (**Figure 9**), of which 143 were recorded in January, 13 were recorded in February, and six were recorded in December (**Table 14**). Individuals were primarily located in the northwest of the survey area with limited occurrences away from this grouping (**Figure 9**).

In May, one common loon was recorded at a maximum flying height of 70 m above mean sea level (herein referred to as AMSL) in Kitty Hawk plus 4 km buffer.

Table 14 Raw counts and abundance and density estimates (No. estimated individuals per km²) of common loons in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	143	1,430	1.40	0	143
Feb-19	13	130	0.13	0	13
Mar-19	149	1,490	1.45	0	149
Apr-19	155	1,551	1.51	0	155
May-19	23	230	0.22	2	21
Nov-19	3	30	0.03	0	3
Dec-19	6	60	0.06	0	6
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	73	705	1.42	0	73
Feb-19	5	48	0.10	0	5
Mar-19	60	579	1.17	0	60
Apr-19	74	714	1.44	0	74
May-19	14	135	0.27	1	13
Nov-19	1	10	0.02	0	1
Dec-19	3	29	0.06	0	3
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	70	724	1.37	0	70
Feb-19	8	83	0.16	0	8
Mar-19	89	921	1.74	0	89
Apr-19	81	839	1.59	0	81

May-19	9	93	0.18	1	8
Nov-19	2	21	0.04	0	2
Dec-19	3	31	0.06	0	3

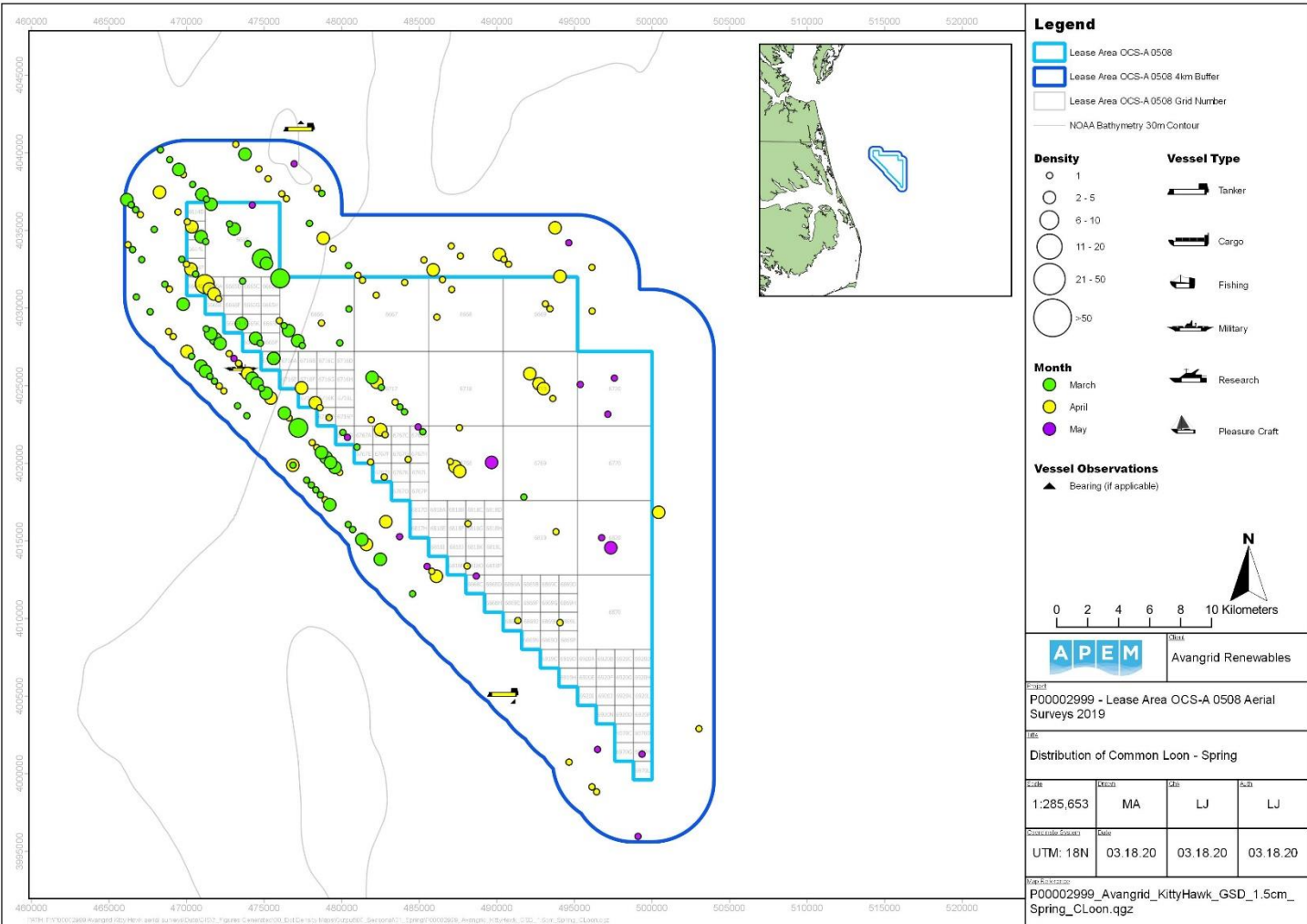


Figure 7 Distribution of common loons recorded in Kitty Hawk plus 4 km buffer in the spring season



Figure 8 Distribution of common loons recorded in Kitty Hawk plus 4 km buffer in the fall season

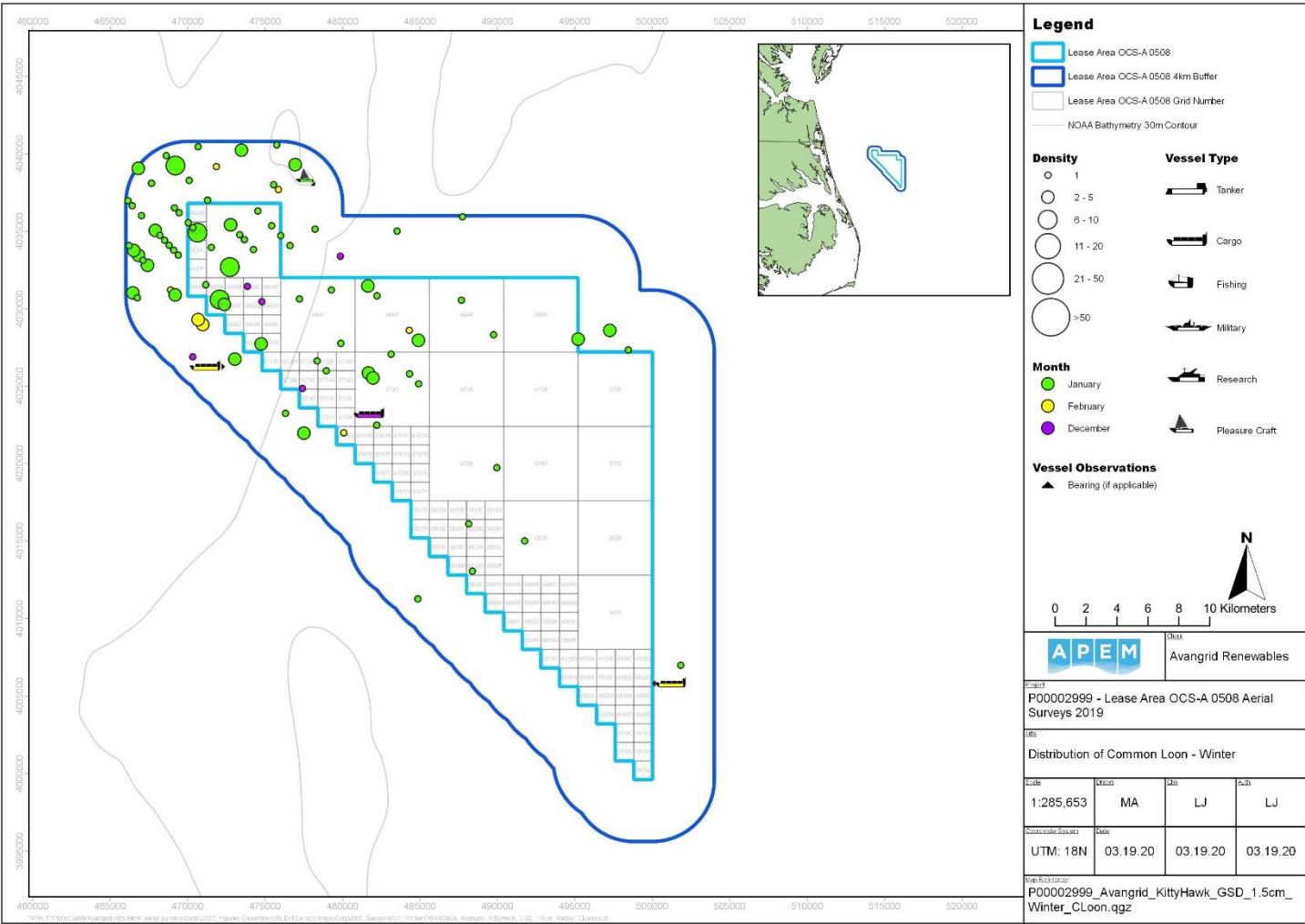


Figure 9 Distribution of common loons recorded in Kitty Hawk plus 4 km buffer in the winter season

5.3 Species Unknown – Storm-petrel

Unidentified storm-petrels were recorded in May and June only, with raw counts of four and one respectively, resulting in abundance estimates of 40 and ten for Kitty Hawk plus 4 km buffer (Table 15).

For the spring surveys, four unidentified storm-petrels were recorded in May, two of which were located in the northwest of the 4 km buffer, and two were located from the center to the northeast of the Kitty Hawk site (Figure 10). For the summer surveys, one unidentified storm petrel was recorded in June in the north of the 4 km buffer (Figure 11).

In June, one unidentified storm-petrel was recorded at a maximum flying height of 6 m AMSL in Kitty Hawk plus 4 km buffer.

Table 15 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified storm-petrels in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
May-19	4	40	0.04	4	0
Jun-19	1	10	0.01	1	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
May-19	2	19	0.04	2	0
Jun-19	0	0	-	0	0
c) 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
May-19	2	21	0.04	2	0
Jun-19	1	10	0.02	1	0

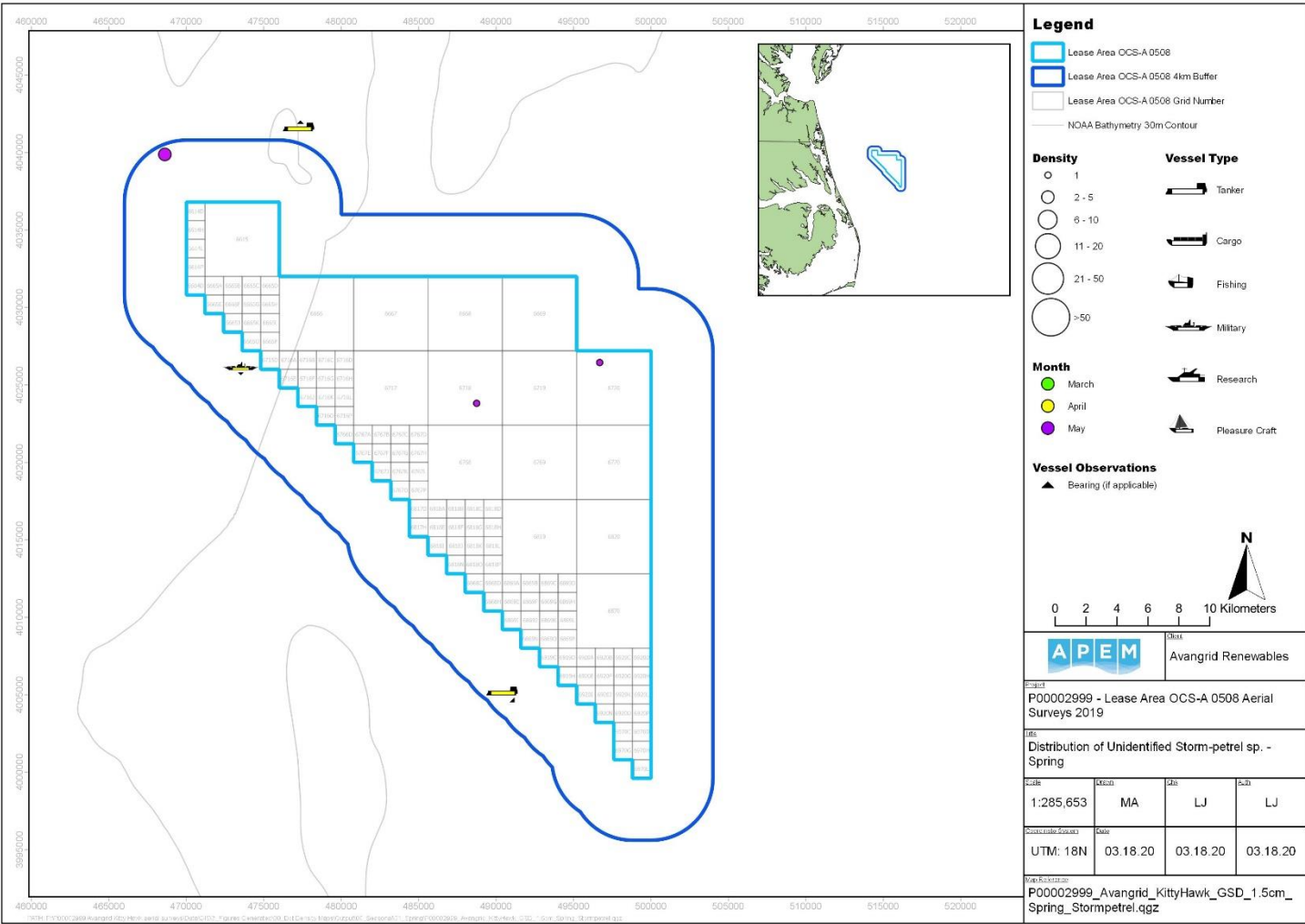


Figure 10 Distribution of unidentified storm-petrels recorded in Kitty Hawk plus 4 km buffer in the spring season

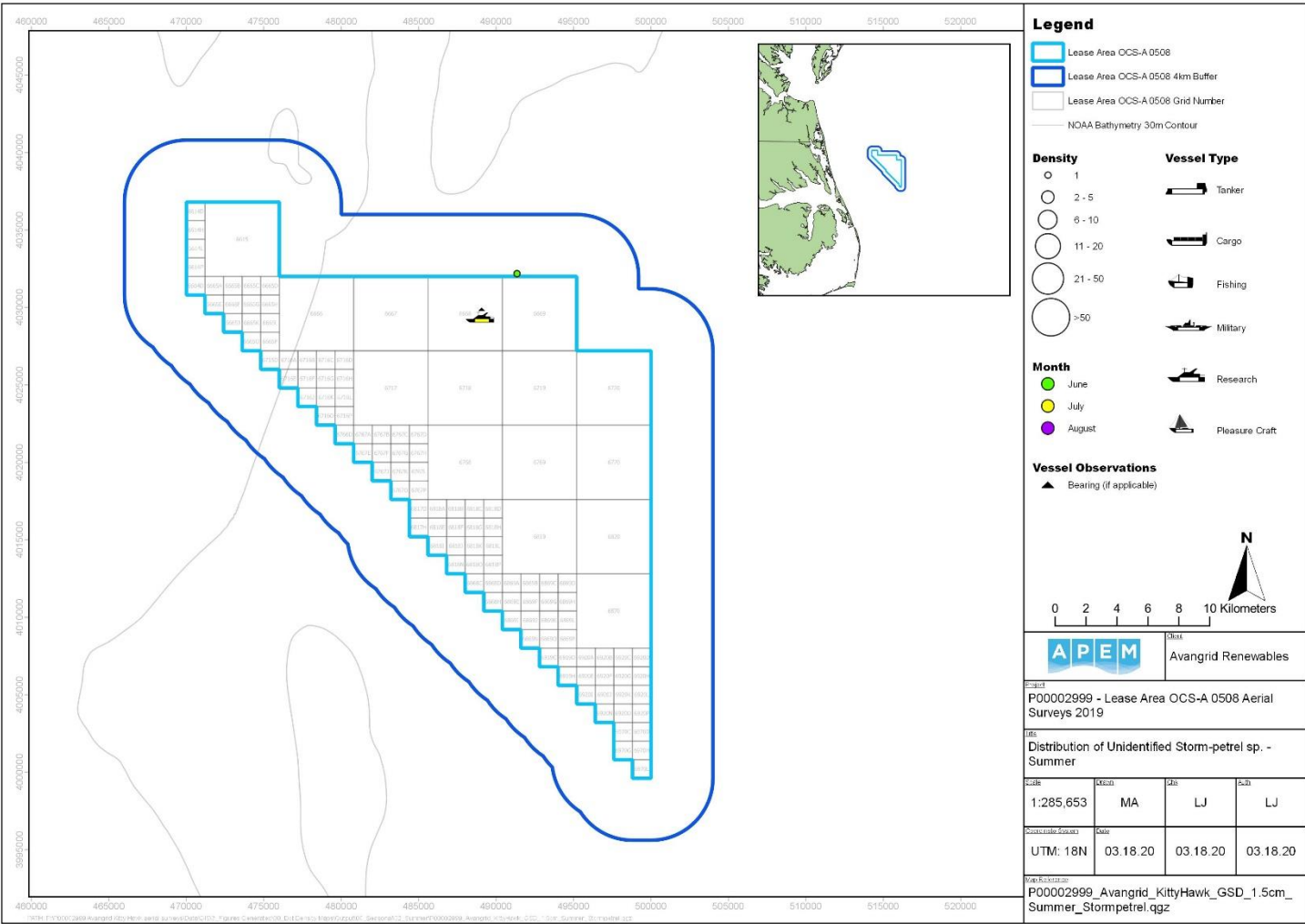


Figure 11 Distribution of unidentified storm-petrels recorded in Kitty Hawk plus 4 km buffer in the summer season

5.4 Northern Fulmar

A northern fulmar was recorded in February only, with a raw count of one, resulting in an abundance estimate of ten for Kitty Hawk plus 4 km buffer (**Table 16**).

For the winter surveys, the single northern fulmar in February was recorded in the north of the 4 km buffer (**Figure 12**).

In February, one northern fulmar was recorded at a flying height of 71 m AMSL in Kitty Hawk plus 4 km buffer.

Table 16 Raw counts and abundance and density estimates (No. estimated individuals per km²) of northern fulmars in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Feb-19	1	10	0.01	1	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Feb-19	0	0	-	0	0
c) 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Feb-19	1	10	0.02	1	0

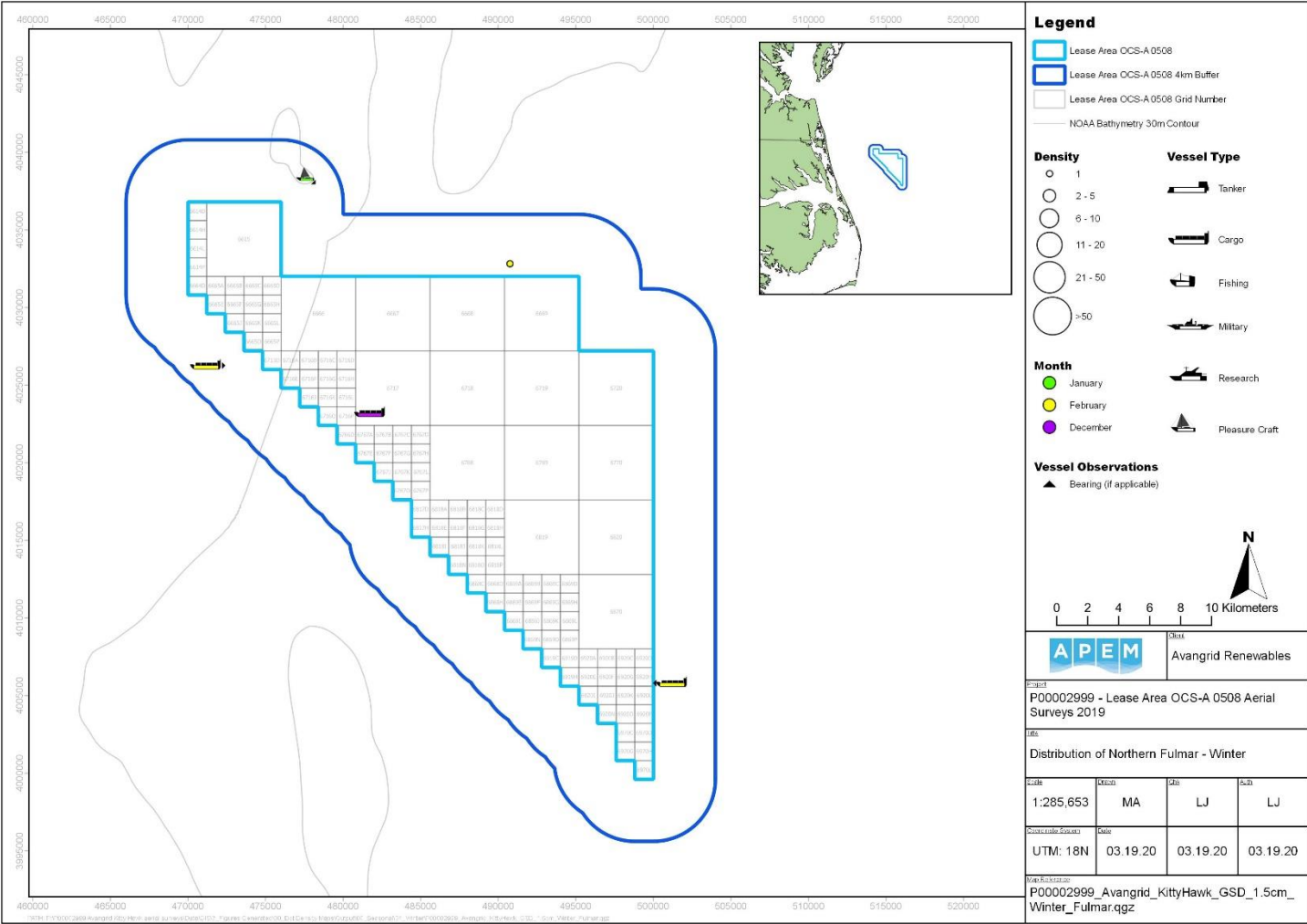


Figure 12 Distribution of northern fulmars recorded in Kitty Hawk plus 4 km buffer in the winter season

5.5 Cory's Shearwater

Cory's shearwaters were recorded in August only, with a raw count of two, resulting in an abundance estimate of 20 for Kitty Hawk plus 4 km buffer (**Table 17**).

For the summer surveys, two Cory's shearwaters in August were recorded in the south of the 4 km buffer (**Figure 13**).

In August, one Cory's shearwater was recorded at a flying height of 15 m AMSL in Kitty Hawk plus 4 km buffer.

Table 17 Raw counts and abundance and density estimates (No. estimated individuals per km²) of Cory's shearwaters in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Aug-19	2	20	0.02	2	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Aug-19	0	0	-	0	0
c) 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Aug-19	2	21	0.04	2	0

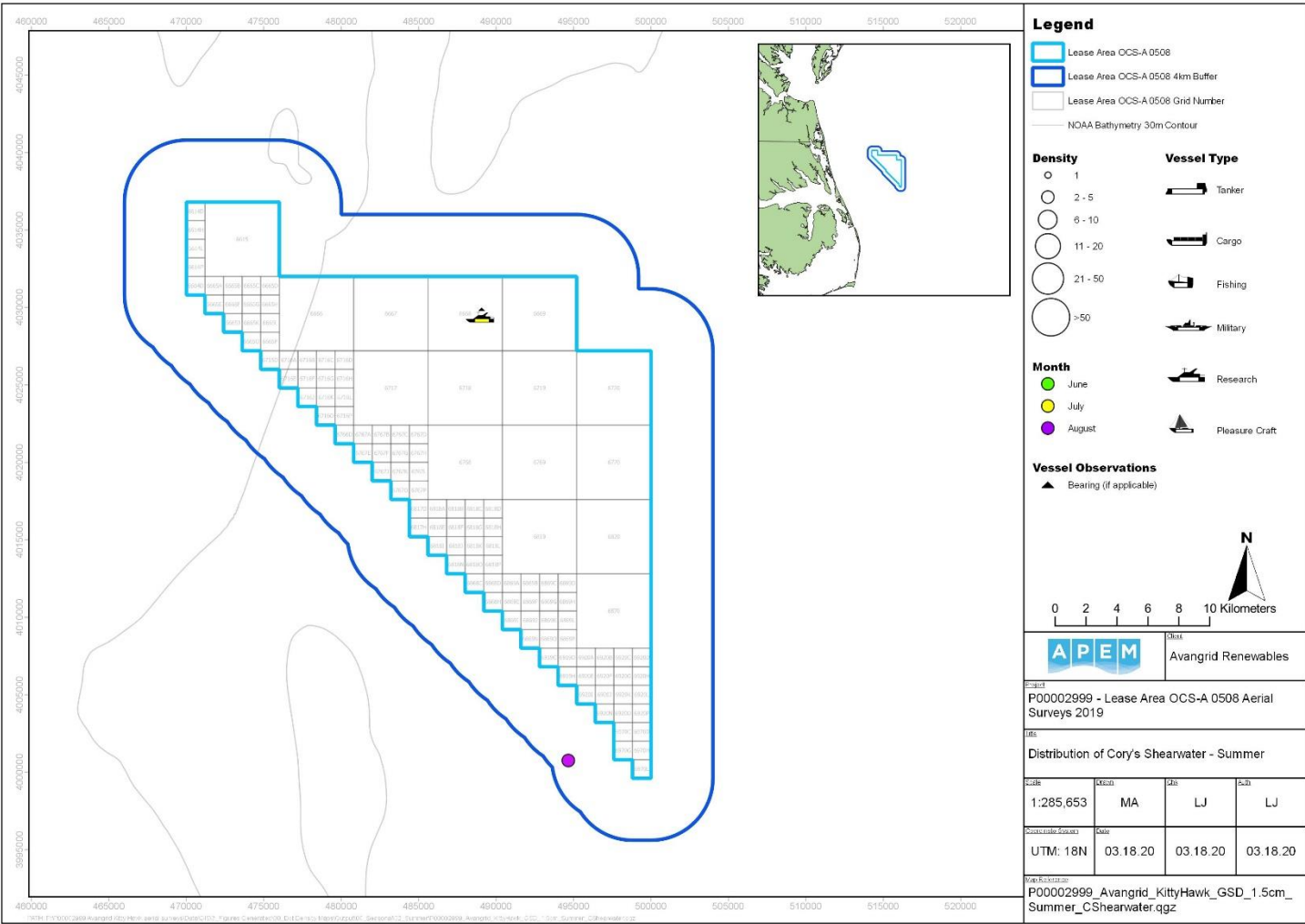


Figure 13 Distribution of Cory's shearwaters recorded in Kitty Hawk plus 4 km buffer in the summer season

5.6 Sooty Shearwater

A sooty shearwater was recorded in September only, with a raw count of one, resulting in an abundance estimate of ten for Kitty Hawk plus 4 km buffer (**Table 18**).

For the fall surveys, a single sooty shearwater in September was recorded in the east of the 4 km buffer (**Figure 14**).

Table 18 Raw counts and abundance and density estimates (No. estimated individuals per km²) of sooty shearwaters in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Sep-19	1	10	0.01	1	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Sep-19	0	0	-	0	0
c) 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Sep-19	1	10	0.02	1	0

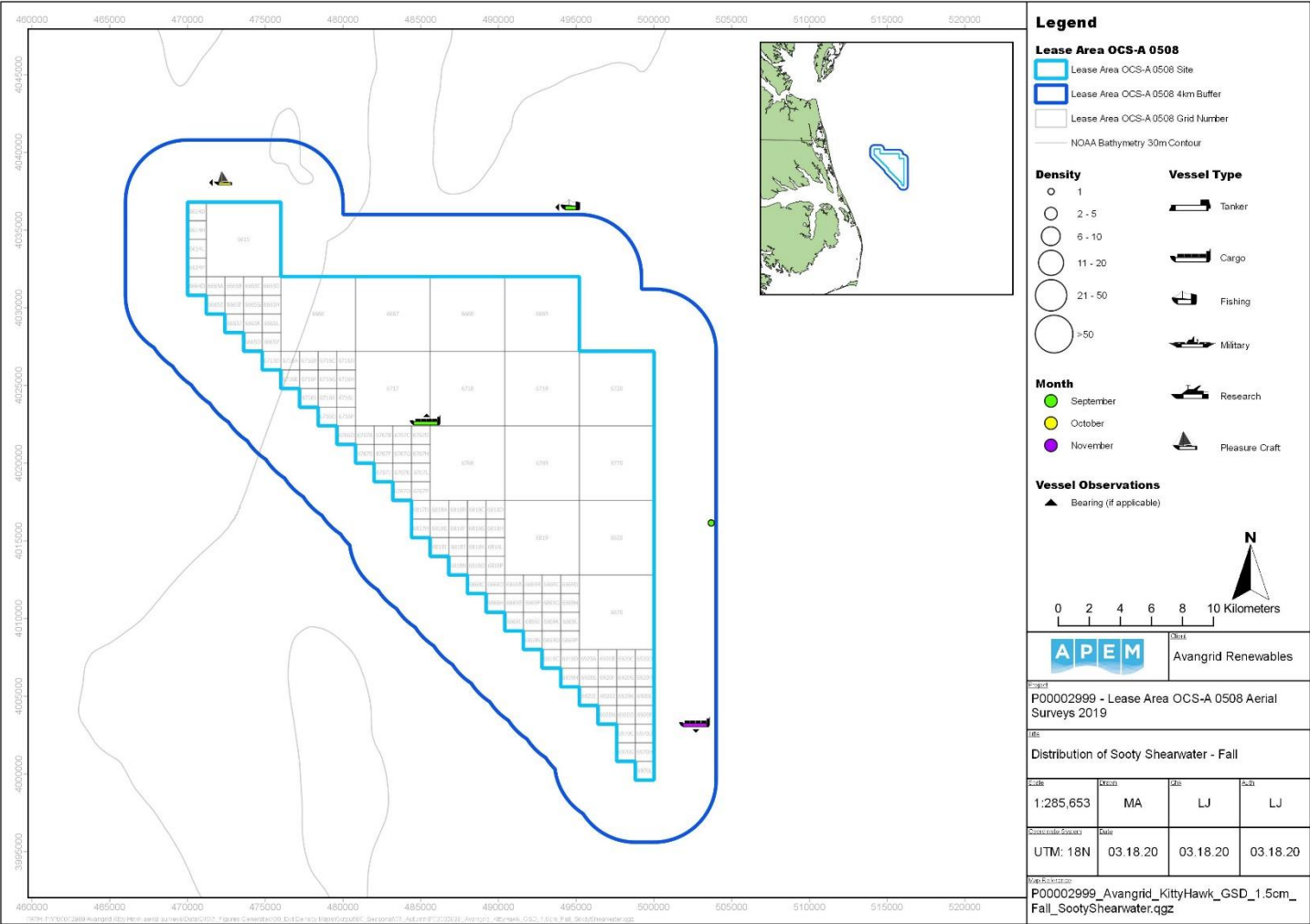


Figure 14 Distribution of sooty shearwaters recorded in Kitty Hawk plus 4 km buffer in the fall season

5.7 Great Shearwater

A great shearwater was recorded in December only, with a raw count of one, resulting in an abundance estimate of ten for Kitty Hawk plus 4 km buffer (Table 19).

For the winter surveys, a single great shearwater in December was recorded in the southeast of the 4 km buffer (Figure 15).

Table 19 Raw counts and abundance and density estimates (No. estimated individuals per km²) of great shearwaters in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Dec-19	1	10	0.01	1	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Dec-19	0	0	-	0	0
c) 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Dec-19	1	10	0.02	1	0

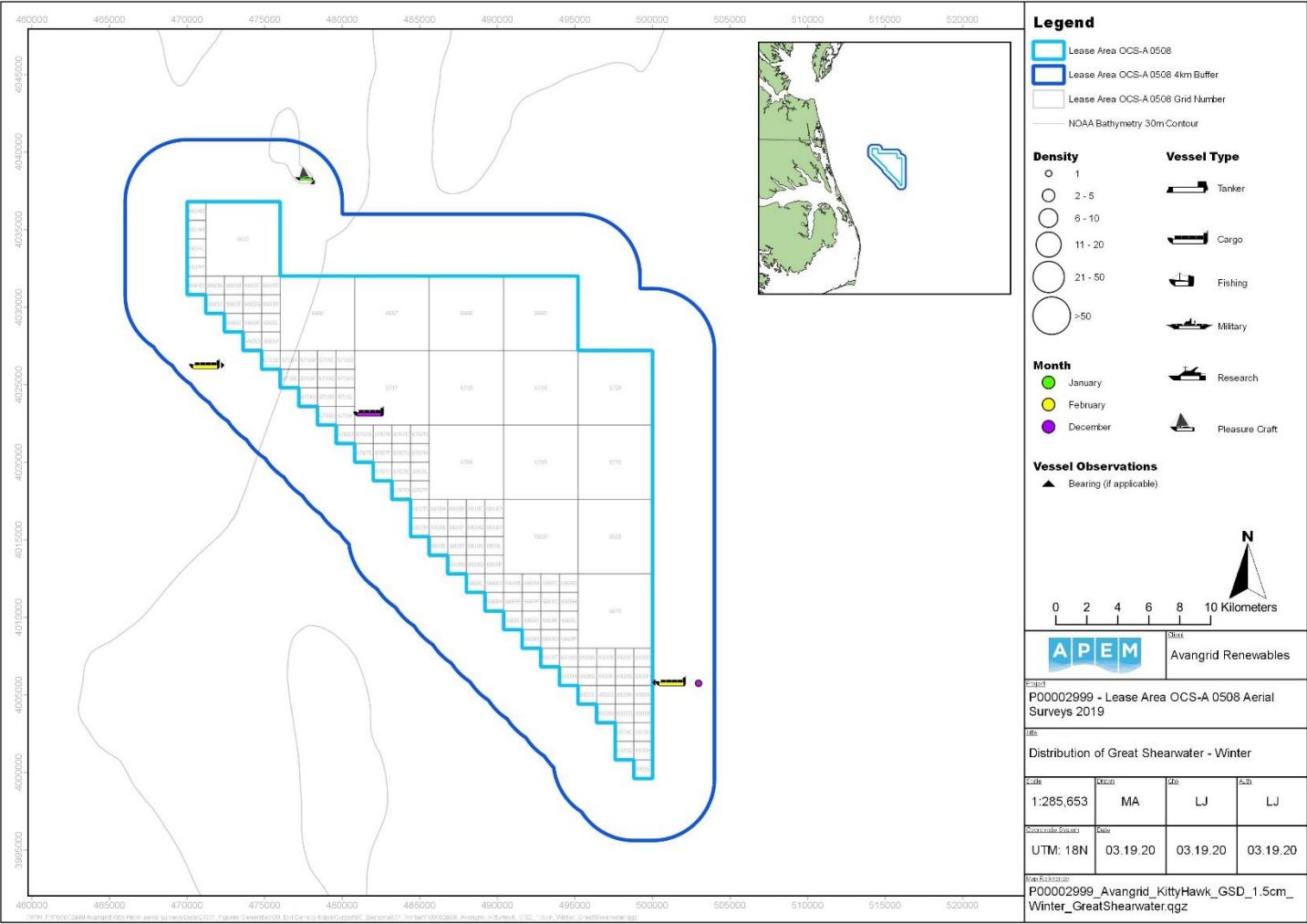


Figure 15 Distribution of great shearwaters recorded in Kitty Hawk plus 4 km buffer in the winter season

5.8 Manx Shearwater

Manx shearwaters were recorded in January and March only, with raw counts of two and six respectively, resulting in abundance estimates of 20 and 60 for Kitty Hawk plus 4 km buffer (Table 20).

For the spring surveys, six Manx shearwaters in March were recorded flying in the north of the 4 km buffer (Figure 16). For the winter surveys, two Manx shearwaters in January were recorded in the north of the 4 km buffer (Figure 17).

Table 20 Raw counts and abundance and density estimates (No. estimated individuals per km²) of Manx shearwaters in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	2	20	0.02	2	0
Mar-19	6	60	0.06	6	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	0	0	-	0	0
Mar-19	0	0	-	0	0
c) 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	2	21	0.04	2	0
Mar-19	6	62	0.12	6	0

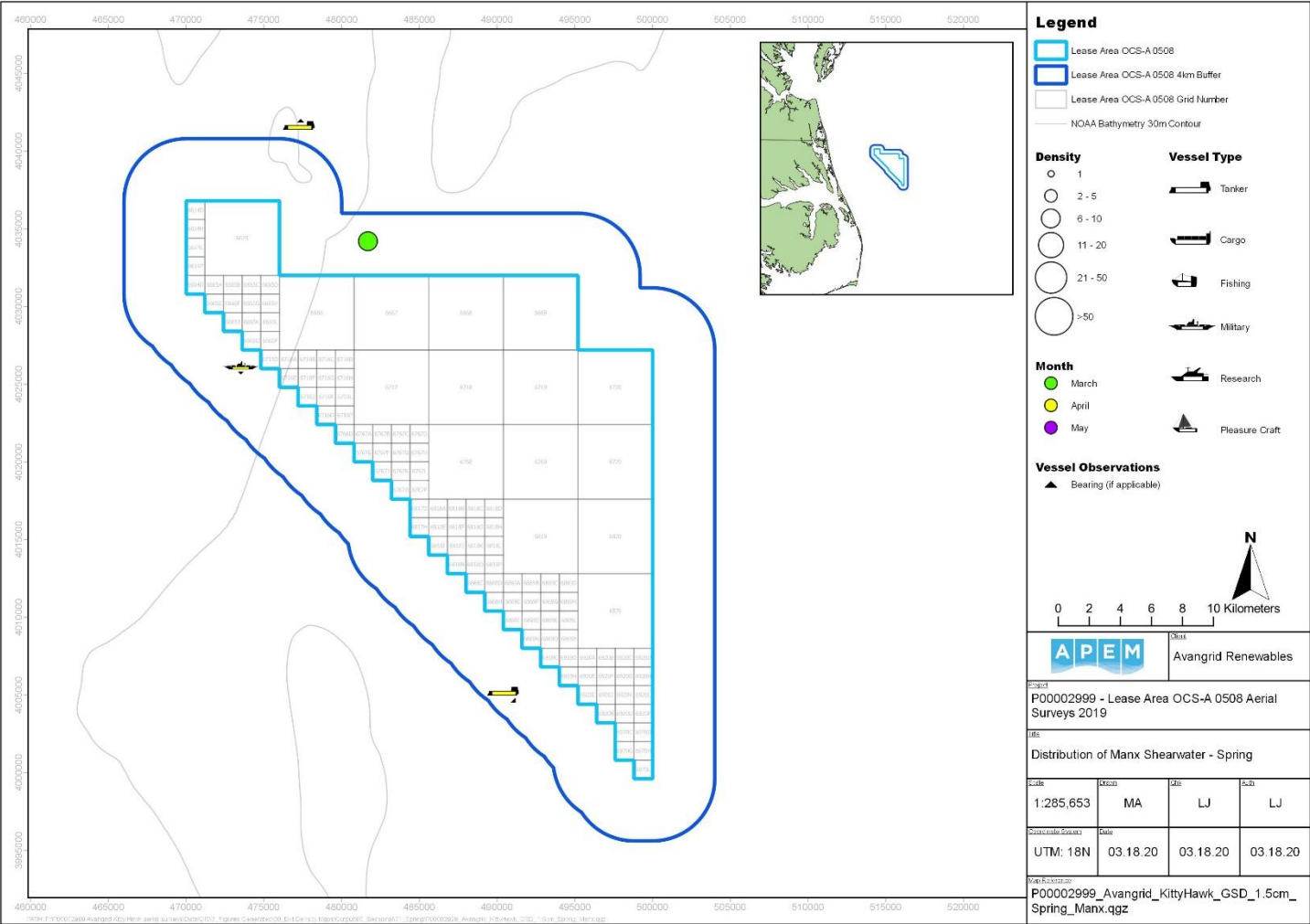


Figure 16 Distribution of Manx shearwaters recorded in Kitty Hawk plus 4 km buffer in the spring season

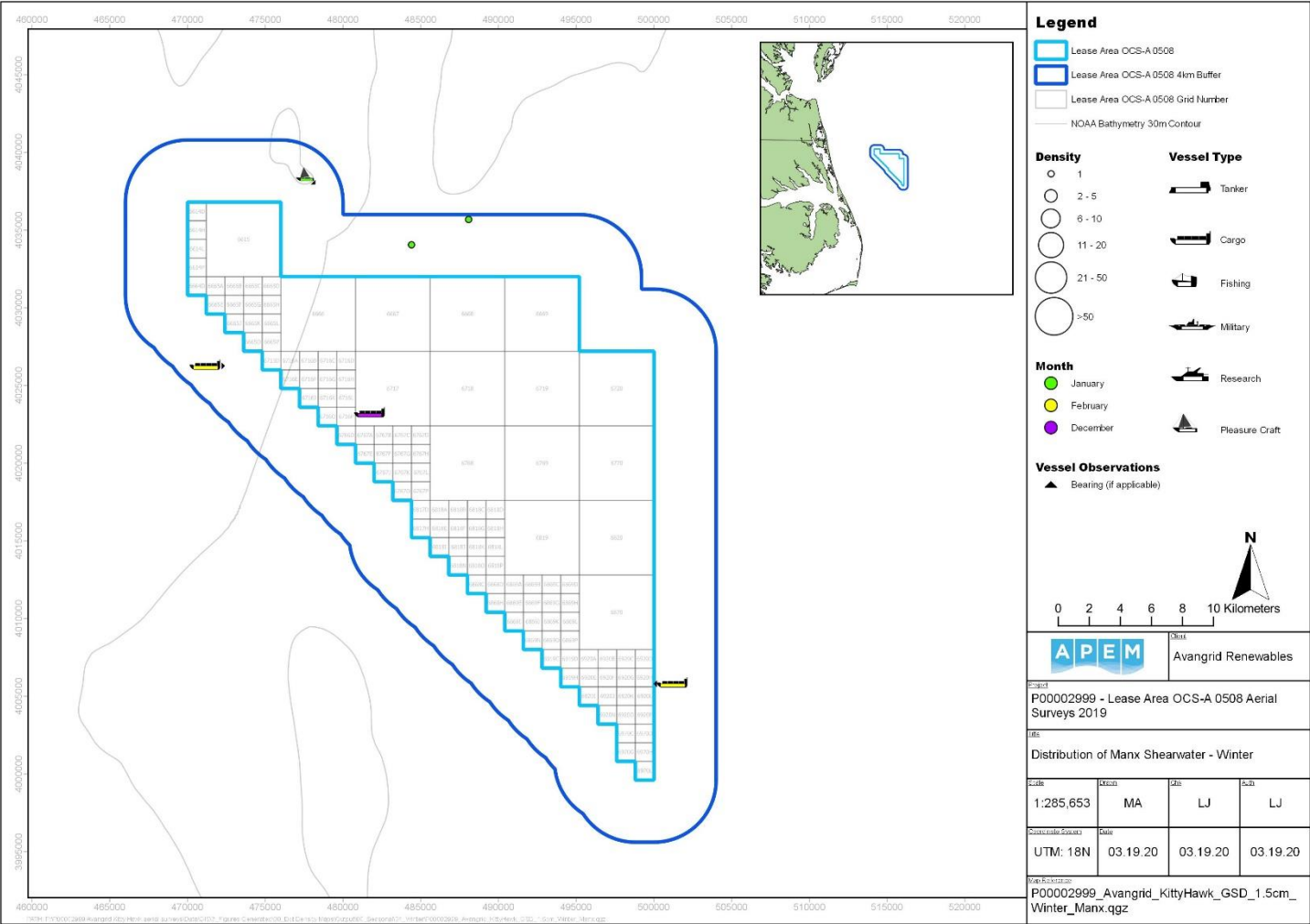


Figure 17 Distribution of Manx shearwaters recorded in Kitty Hawk plus 4 km buffer in the winter season

5.9 Audubon’s Shearwater

An Audubon’s shearwater was recorded in October only, with a raw count of one, resulting in an abundance estimate of ten for Kitty Hawk plus 4 km buffer (**Table 21**).

For the fall surveys, a single Audubon’s shearwater in October was recorded in the center of the Kitty Hawk site (**Figure 18**).

Table 21 Raw counts and abundance and density estimates (No. estimated individuals per km²) of Audubon’s shearwaters in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Oct-19	1	10	0.01	1	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Oct-19	1	10	0.02	1	0
c) 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Oct-19	0	0	-	0	0

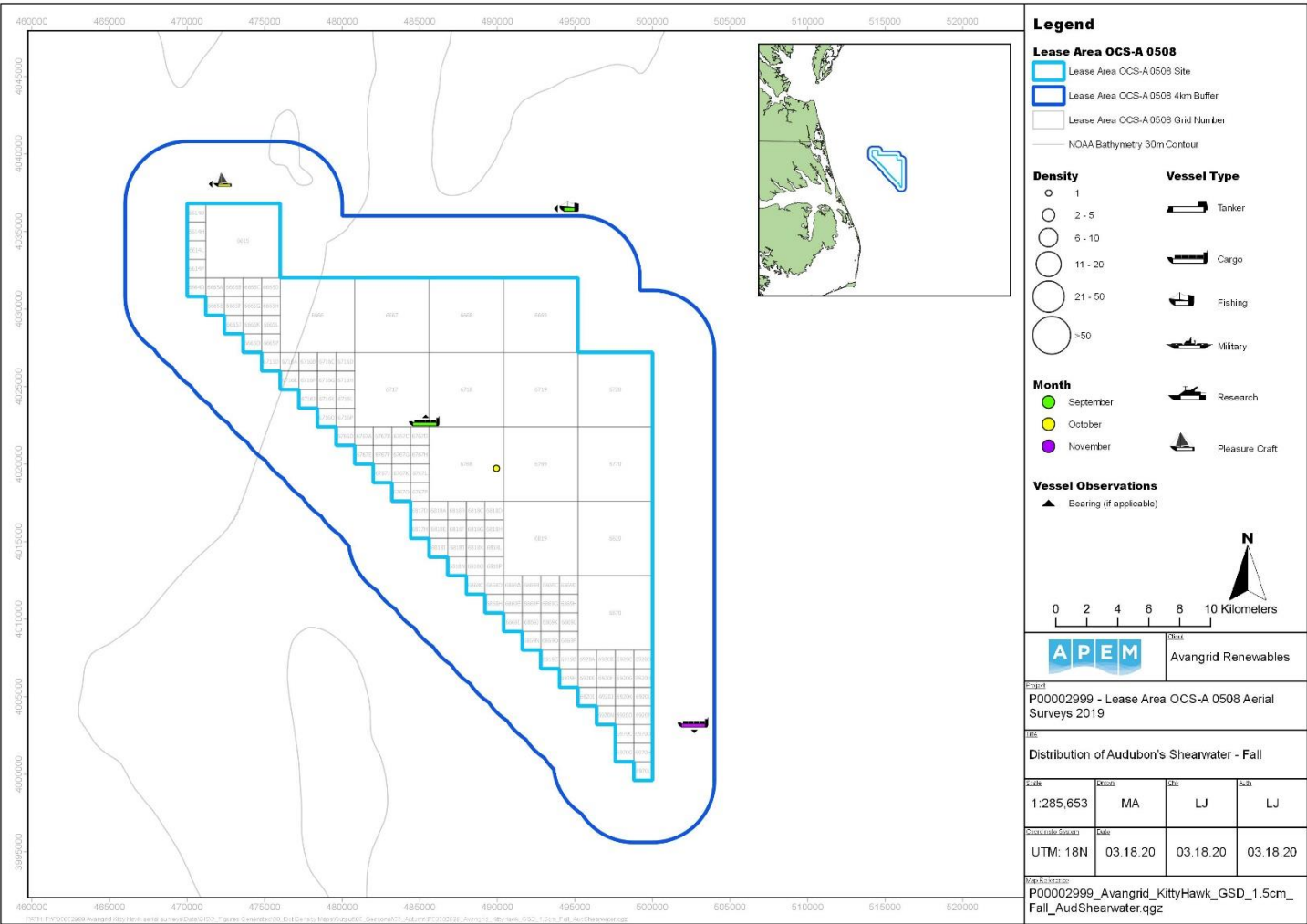


Figure 18 Distribution of Audubon's shearwaters recorded in the Kitty Hawk plus 4 km buffer in the fall season

5.10 Northern Gannet

Northern gannets were recorded from January to April, as well as in November and December, with highest numbers in winter (**Table 22**). A peak raw count of 19 individuals in the Kitty Hawk site and 17 individuals in the 4 km buffer for January, lead to abundance estimates of 183 and 176, respectively (**Table 22**).

A total of 26 northern gannets were recorded in Kitty Hawk plus 4 km buffer in the spring surveys (**Figure 19**), of which 24 were recorded in March and two were recorded in April (**Table 22**). Individuals were primarily located in the west to northwest of the survey area, with an isolated grouping in the east of the 4 km buffer for March. For the fall surveys, two northern gannets were recorded in November only, located in the east of the survey area (**Figure 20**). For the winter surveys, a total of 56 northern gannets were recorded in the Kitty Hawk plus 4 km buffer (**Figure 21**), of which 36 were recorded in January, 17 were recorded in February, and three were recorded in December (**Table 22**). Individuals were primarily located in the northwestern half of the survey area, with only one northern gannet located in the south of the 4 km buffer in January (**Figure 21**).

In January, a total of 17 northern gannets were recorded flying at a median flight height of 54 m AMSL with a maximum height of 107 m AMSL in Kitty Hawk plus 4 km buffer (**Figure 22**). In February, a total of eight northern gannets were recorded flying at a median flight height of 49 m AMSL with a maximum height of 89 m AMSL in Kitty Hawk plus 4 km buffer (**Figure 22**). In March, a total of 11 northern gannets were recorded flying at a median flight height of 22 m AMSL with a maximum height of 67 m AMSL in Kitty Hawk plus 4 km buffer (**Figure 22**).

Table 22 Raw counts and abundance and density estimates (No. estimated individuals per km²) of northern gannets in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	36	360	0.35	21	15
Feb-19	17	170	0.17	11	6
Mar-19	24	240	0.23	17	7
Apr-19	2	20	0.02	2	0
Nov-19	3	30	0.03	1	2
Dec-19	3	30	0.03	1	2
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	19	183	0.37	13	6
Feb-19	11	106	0.21	7	4
Mar-19	10	96	0.19	3	7
Apr-19	2	19	0.04	2	0
Nov-19	1	10	0.02	0	1
Dec-19	1	10	0.02	0	1
c) 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	17	176	0.33	8	9
Feb-19	6	62	0.12	4	2

Mar-19	14	145	0.27	14	0
Apr-19	0	0	-	0	0
Nov-19	2	21	0.04	1	1
Dec-19	2	21	0.04	1	1

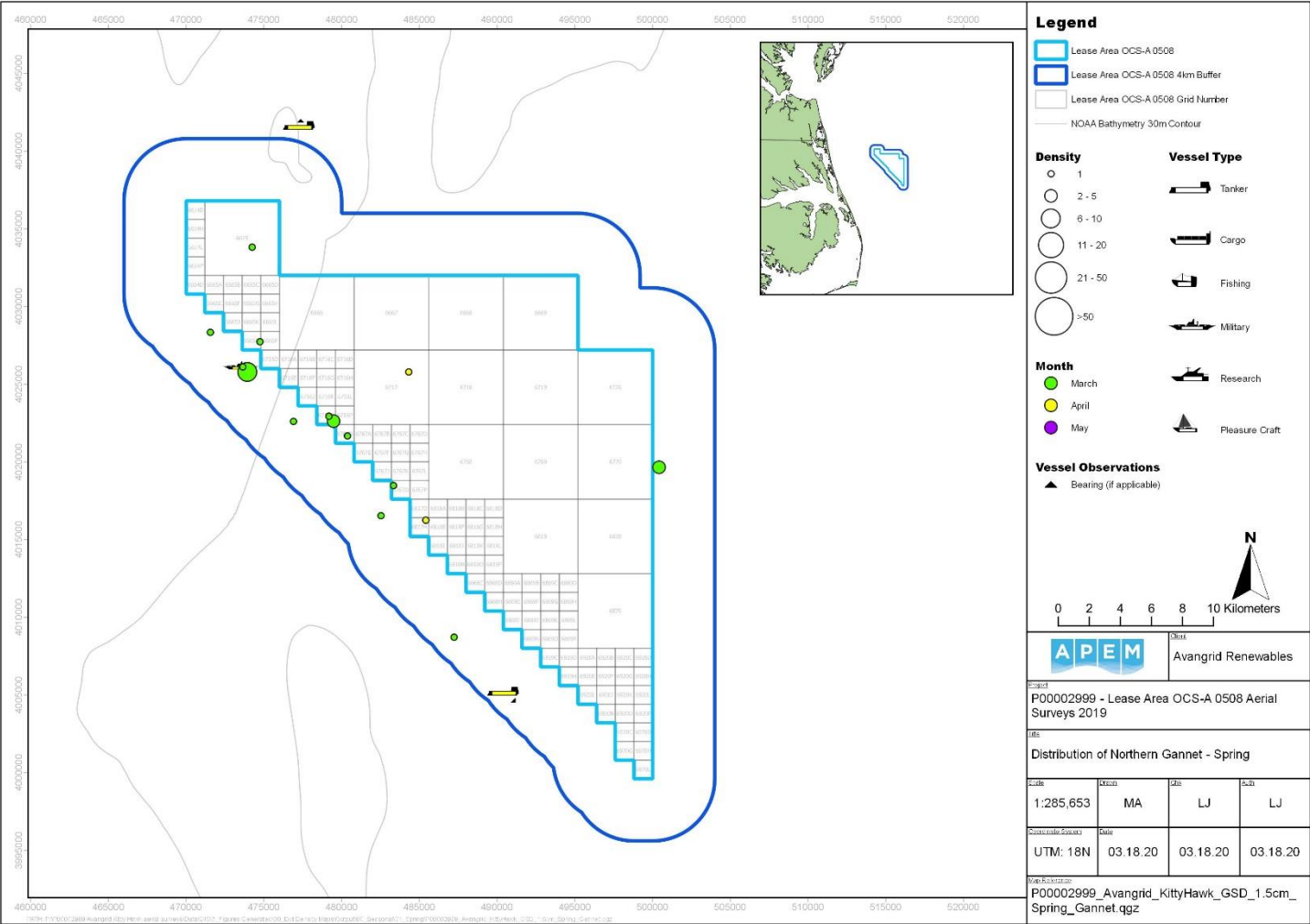


Figure 19 Distribution of northern gannets recorded in Kitty Hawk plus 4 km buffer in the spring season

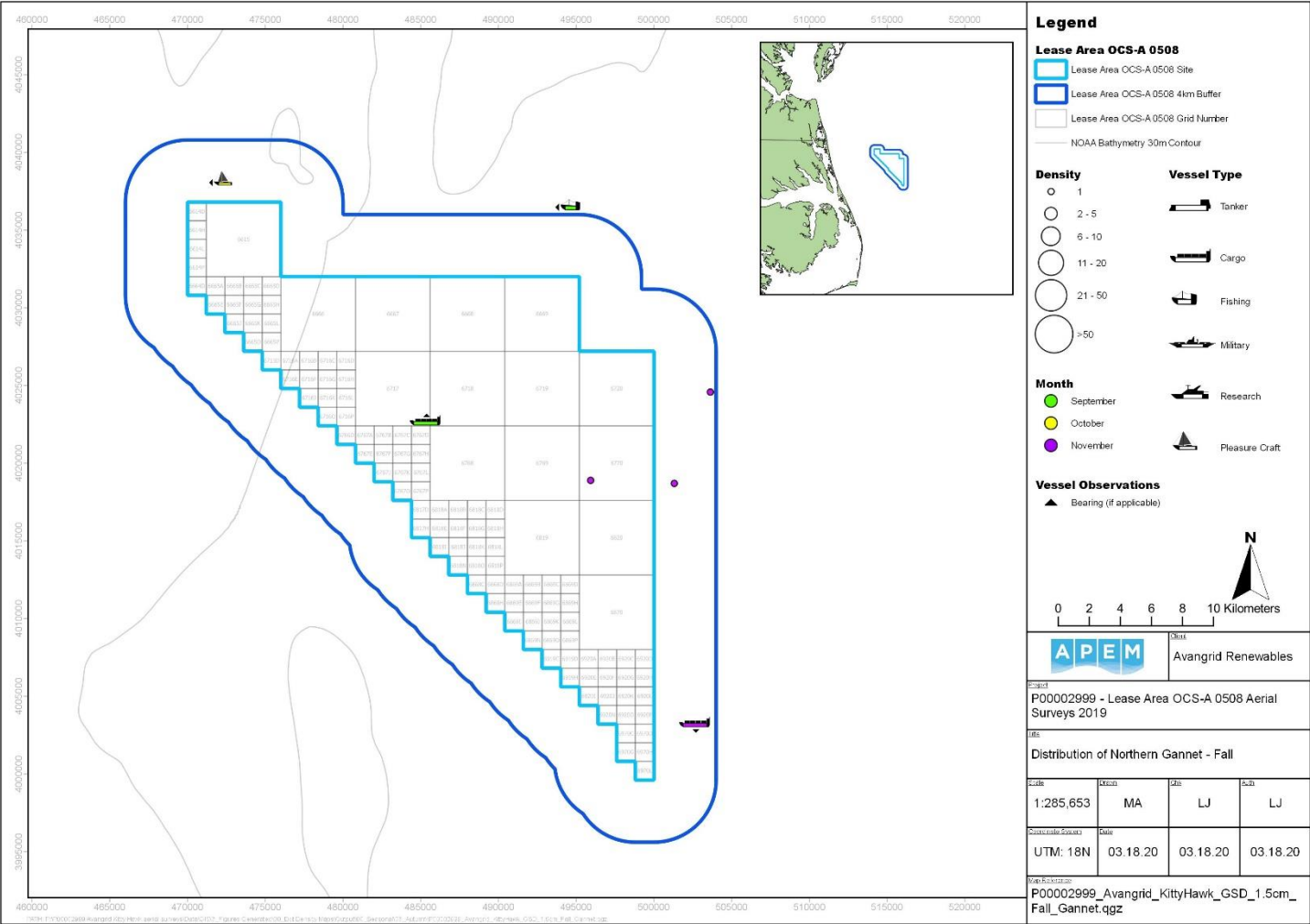


Figure 20 Distribution of northern gannets recorded in Kitty Hawk plus 4 km buffer in the fall season

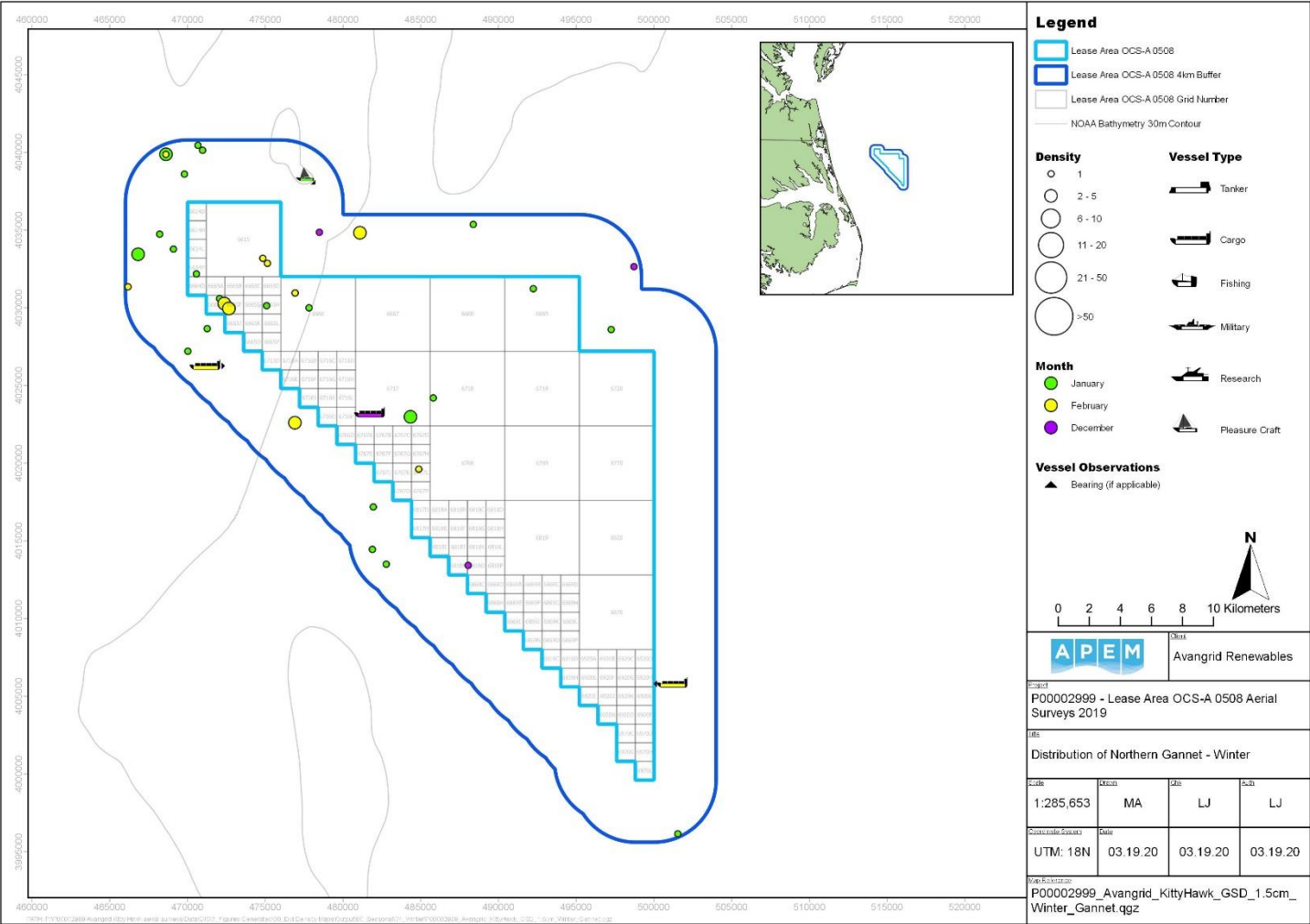


Figure 21 Distribution of northern gannets recorded in Kitty Hawk plus 4 km buffer in the winter season

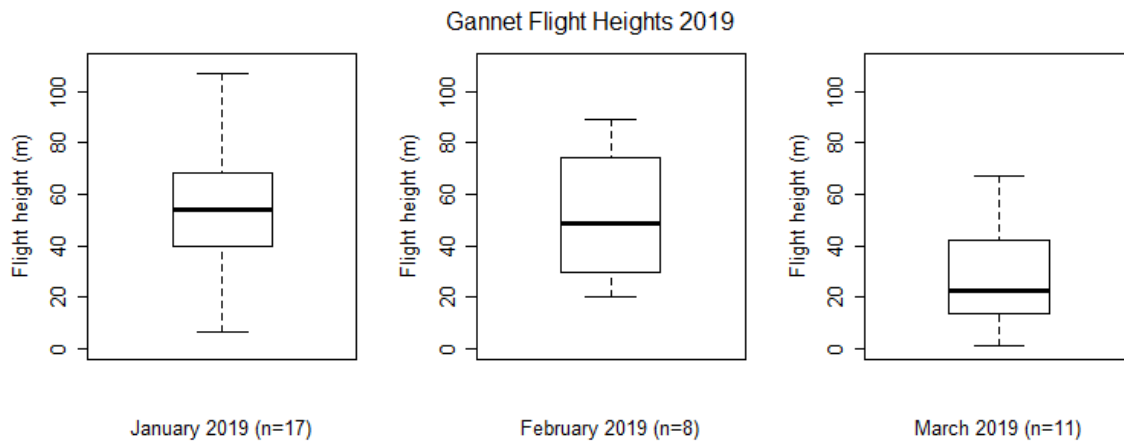


Figure 22 Flight heights of northern gannets in the Kitty Hawk plus 4 km buffer 2019 surveys

5.11 Species Unknown – Cormorant

Unidentified cormorants were recorded in January only, with raw counts of two, resulting in abundance estimates of 20 in Kitty Hawk plus 4 km buffer (**Table 23**).

For the winter surveys, two unidentified cormorants in January were recorded in the center of the Kitty Hawk site (**Figure 23**).

Table 23 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified cormorants in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	2	20	0.02	2	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	2	20	0.04	2	0
c) 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	0	0	-	0	0

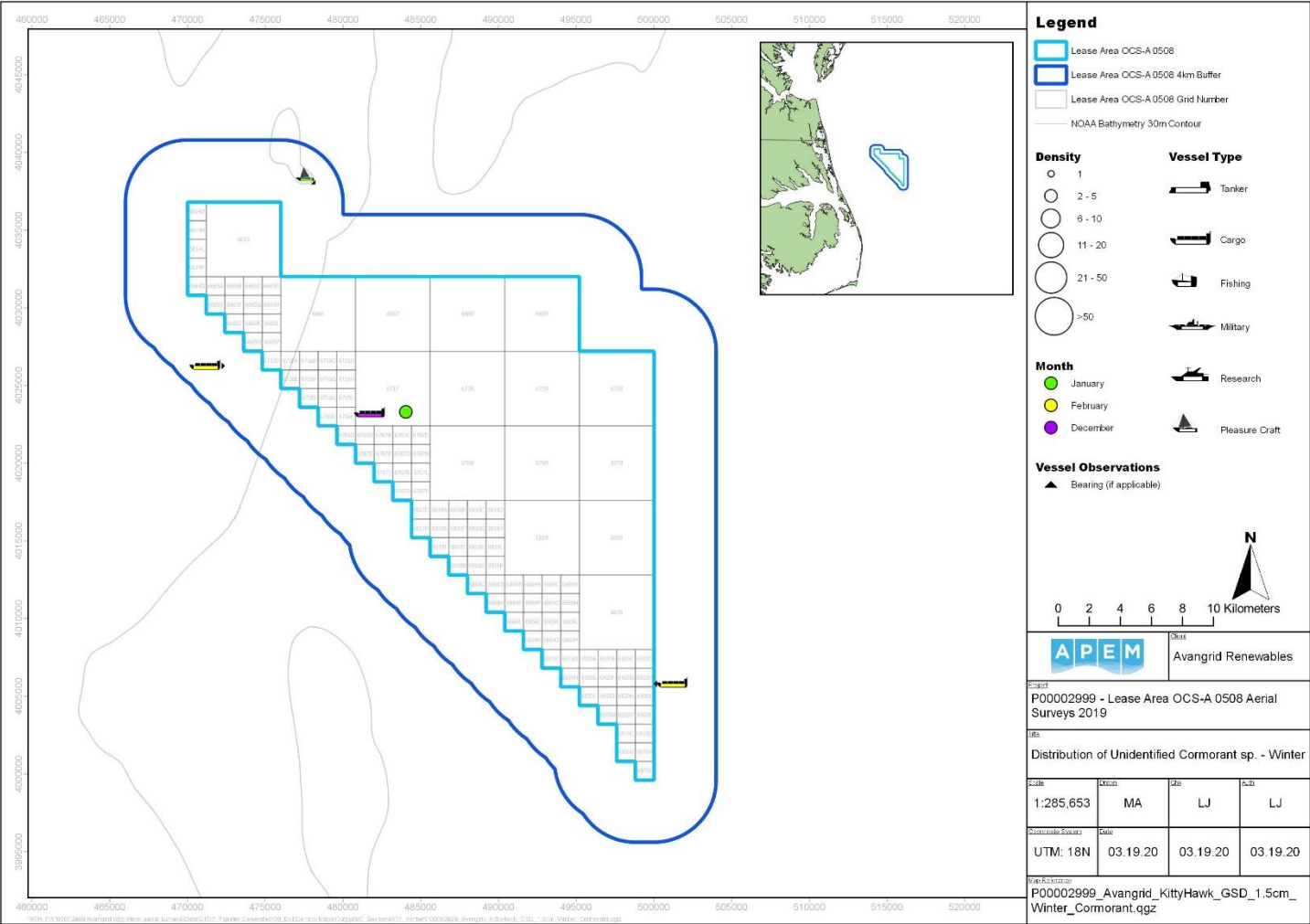


Figure 23 Distribution of unidentified cormorants recorded in the Kitty Hawk plus 4 km buffer in the winter season

5.12 Black-bellied Plover

Black-bellied plovers were recorded in September alone, with raw counts of two, resulting in abundance estimates of 20 in Kitty Hawk plus 4 km buffer (**Table 24**).

For the fall surveys, two black-bellied plovers in September were recorded in the southeast of the 4 km buffer (**Figure 24**).

Table 24 Raw counts and abundance and density estimates (No. estimated individuals per km²) of black-bellied plovers in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Sep-19	2	20	0.02	2	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Sep-19	0	0	-	0	0
c) 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Sep-19	2	21	0.04	2	0

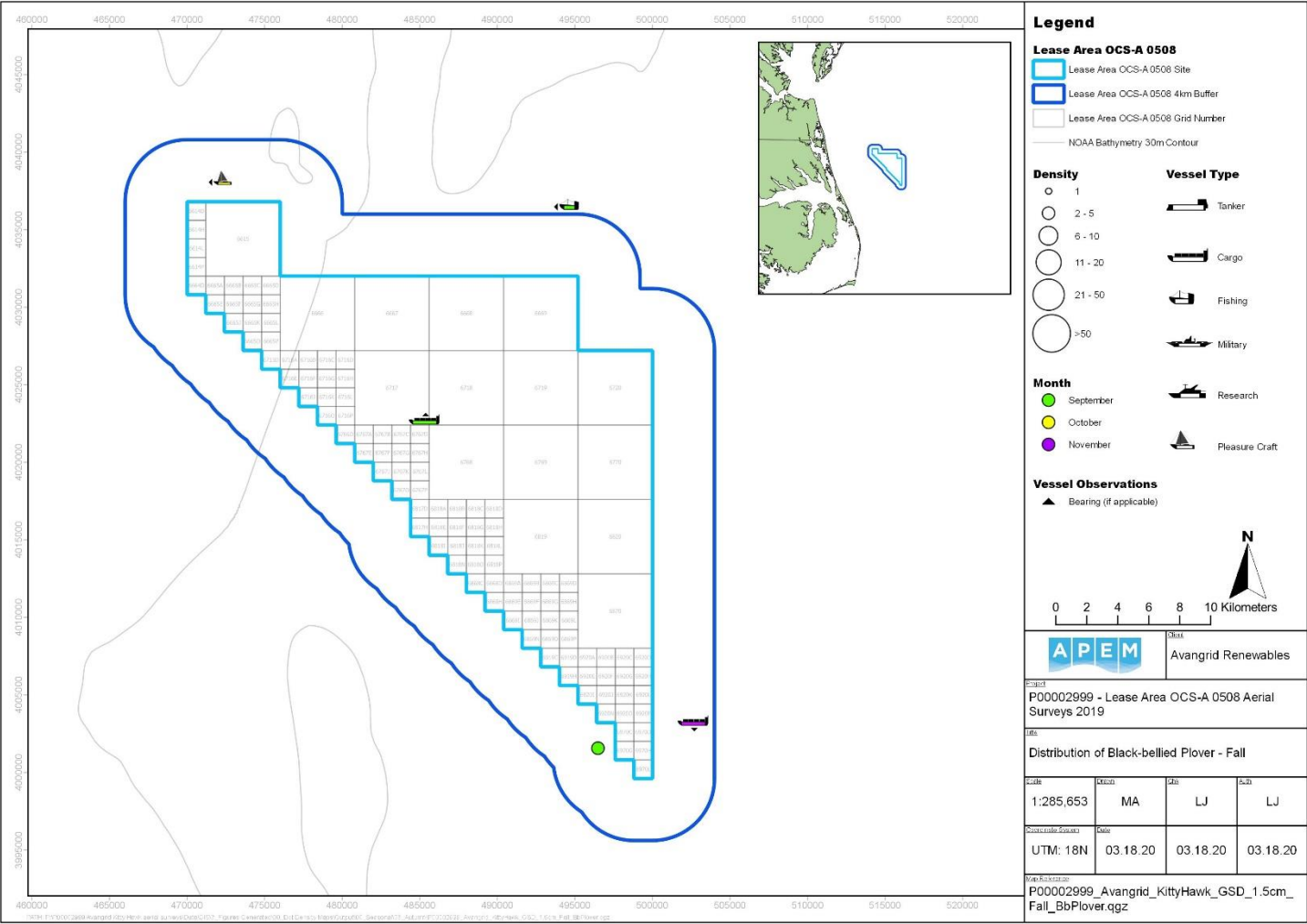


Figure 24 Distribution of black-bellied plovers recorded in Kitty Hawk plus 4 km buffer in the fall season

5.13 Red Phalarope

Red phalaropes were recorded in January and December, with peak raw counts of one for the Kitty Hawk and 13 for the 4 km buffer in December, resulting in abundance estimates of ten and 135, respectively (Table 25).

For the winter surveys, 19 red phalaropes were recorded in the Kitty Hawk plus 4 km buffer (Figure 25), of which five were recorded in January and 14 were recorded in December (Table 25). In January, all individuals were located in the central west of the Kitty Hawk site, and in December, red phalaropes were distributed almost exclusively within the 4 km buffer save for one red phalarope located in the northwest of the Kitty Hawk site (Figure 25).

Table 25 Raw counts and abundance and density estimates (No. estimated individuals per km²) of red phalaropes in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	5	50	0.05	5	0
Dec-19	14	140	0.14	7	7
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	5	48	0.1	5	0
Dec-19	1	10	0.02	1	0
c) 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	0	0	-	0	0
Dec-19	13	135	0.26	6	7

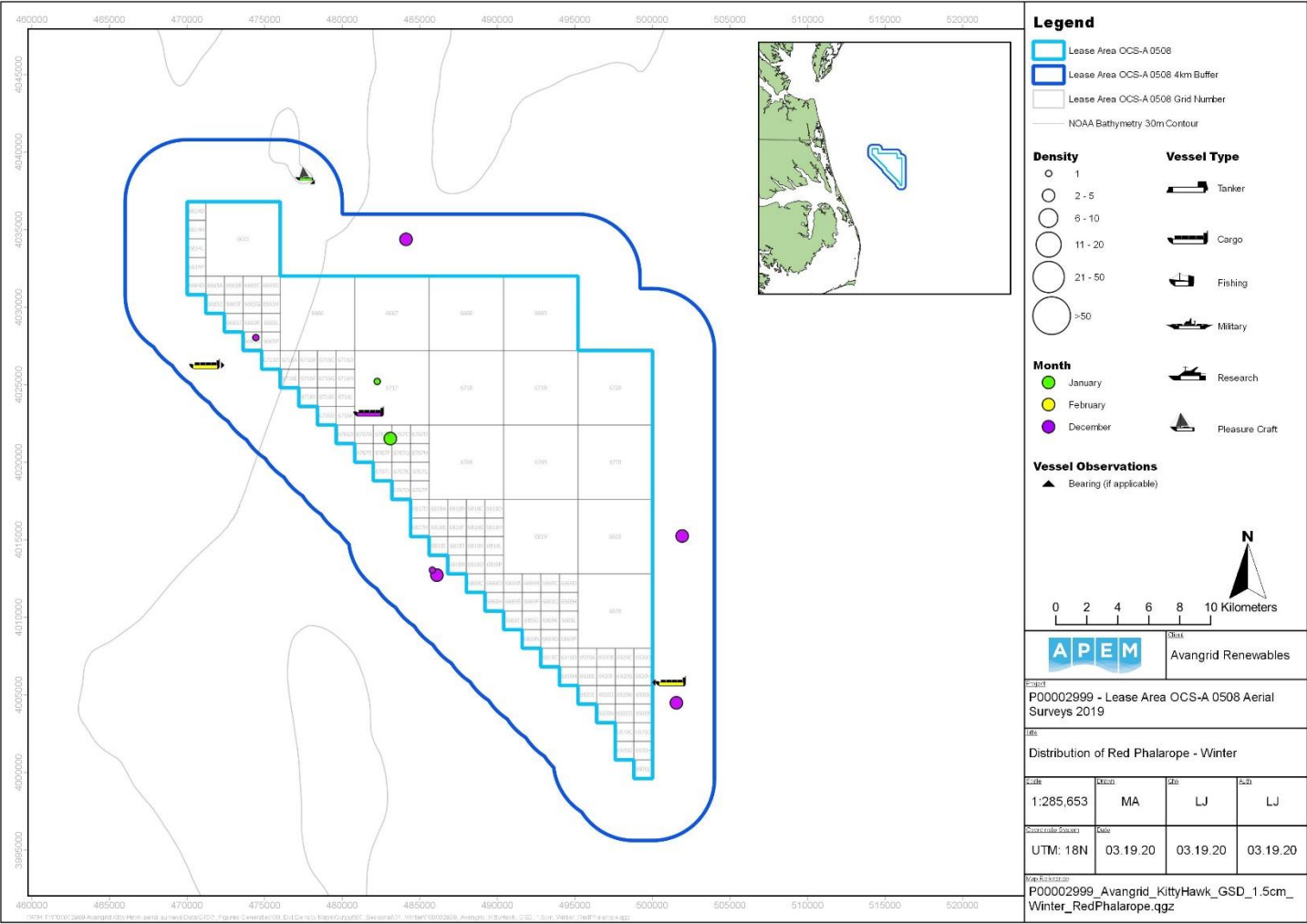


Figure 25 Distribution of red phalaropes recorded in Kitty Hawk plus 4 km buffer in the winter season

5.14 Red / Red-necked Phalarope

Red / red-necked phalaropes were recorded in September and October only, with peak raw counts of five for the Kitty Hawk site, and 12 for the 4 km buffer in October, resulting in abundance estimates of 48 and 124, respectively (Table 26).

For the fall surveys, a total of 30 red / red-necked phalaropes were recorded in Kitty Hawk plus 4 km buffer (Figure 26), of which 17 were recorded in September and 13 were recorded in October (Table 26). Individuals were located in the center and northeast of the Kitty Hawk site and in the southeast of the 4 km buffer in September, and located in the west of both the Kitty Hawk site and 4 km buffer for October (Figure 26).

Table 26 Raw counts and abundance and density estimates (No. estimated individuals per km²) of red / red-necked phalaropes in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Sep-19	17	170	0.17	0	17
Oct-19	13	130	0.13	0	13
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Sep-19	5	48	0.1	0	5
Oct-19	10	97	0.2	0	10
c) 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Sep-19	12	124	0.23	0	12
Oct-19	3	31	0.06	0	3

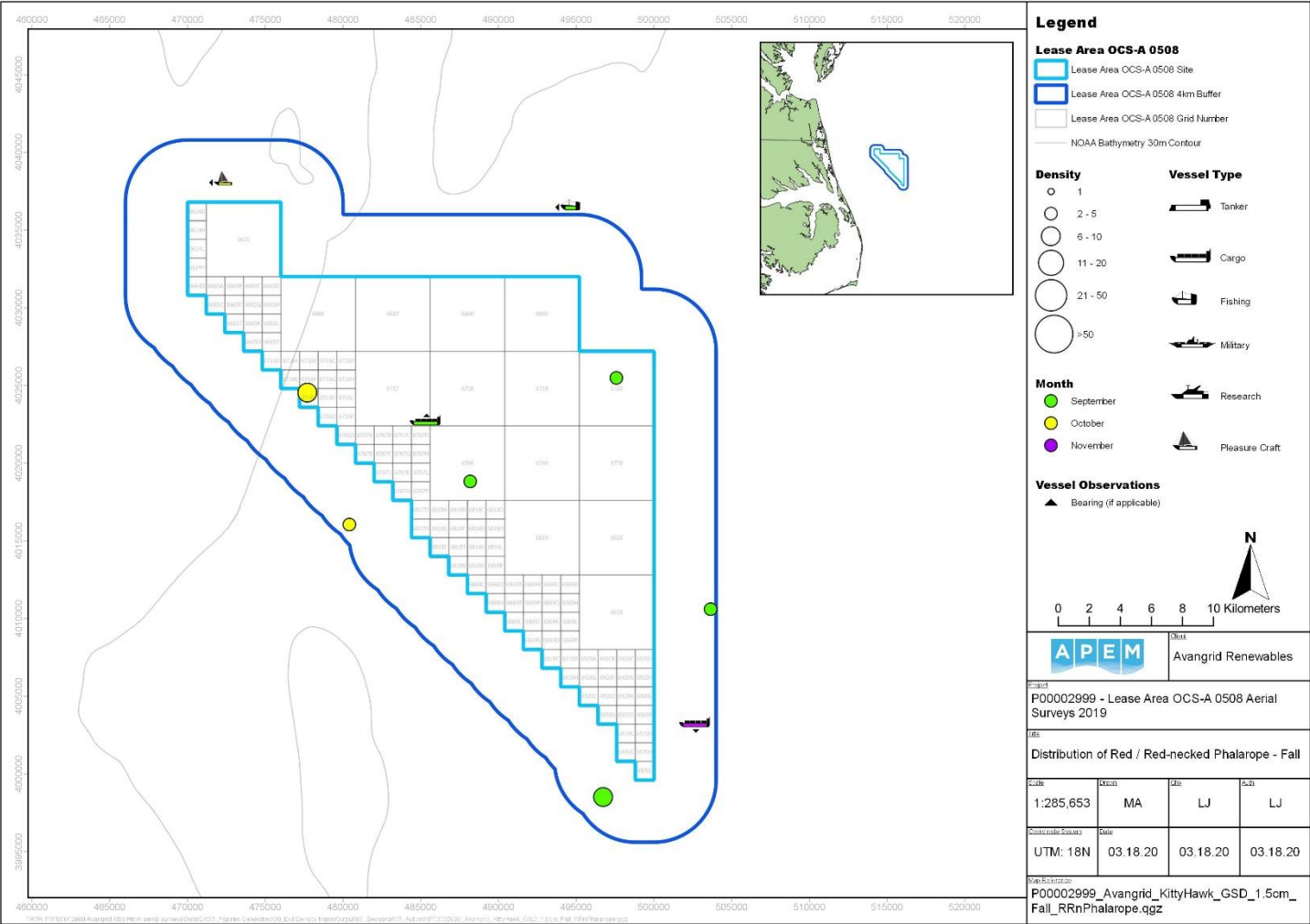


Figure 26 Distribution of red / red-necked phalaropes recorded in Kitty Hawk plus 4 km buffer in the fall season

5.15 Black-legged Kittiwake

Black-legged kittiwakes were recorded in January and December only, with peak raw counts of seven for the Kitty Hawk site, and four for the 4 km buffer in January, resulting in abundance estimates of 70 and 39 respectively (**Table 27**).

For the winter surveys, a total of eight black-legged kittiwakes were recorded in Kitty Hawk plus 4 km buffer (**Figure 27**), of which seven were recorded in January and one was recorded in December (**Table 27**). Individuals were located throughout the northern half of the survey area in January, and the single record for December was located in the south of the Kitty Hawk site (**Figure 27**).

In January, a total of five black-legged kittiwakes were recorded flying at a median flight height of 62 m AMSL with a maximum flight height of 79 m AMSL in Kitty Hawk plus 4 km buffer (**Figure 28**).

Table 27 Raw counts and abundance and density estimates (No. estimated individuals per km²) of black-legged kittiwakes in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only.

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	7	70	0.07	5	2
Dec-19	1	10	0.01	1	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	4	39	0.08	2	2
Dec-19	1	10	0.02	1	0
c) 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	3	31	0.06	3	0
Dec-19	0	0	-	0	0

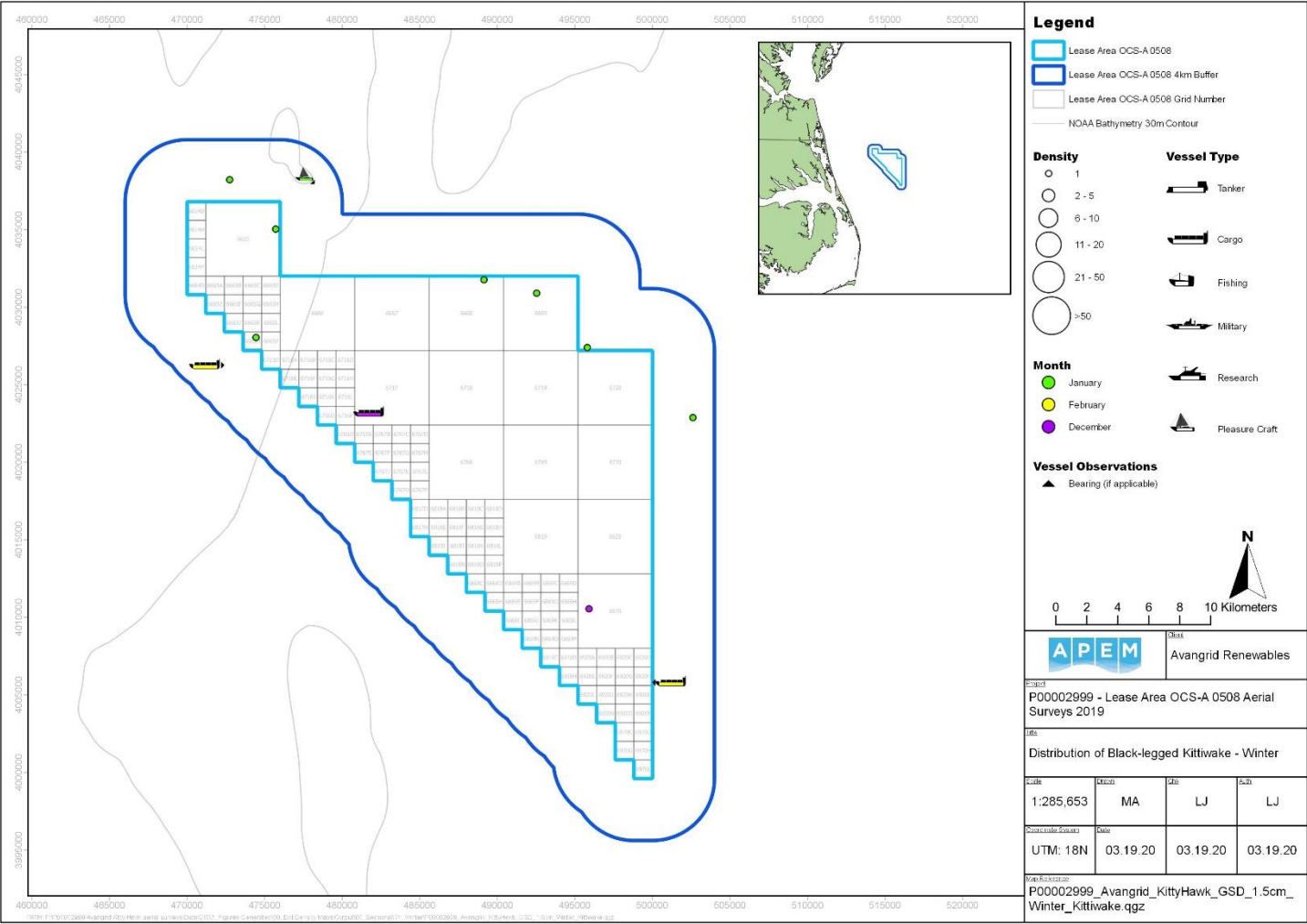


Figure 27 Distribution of black-legged kittiwakes recorded in Kitty Hawk plus 4 km buffer in the winter season

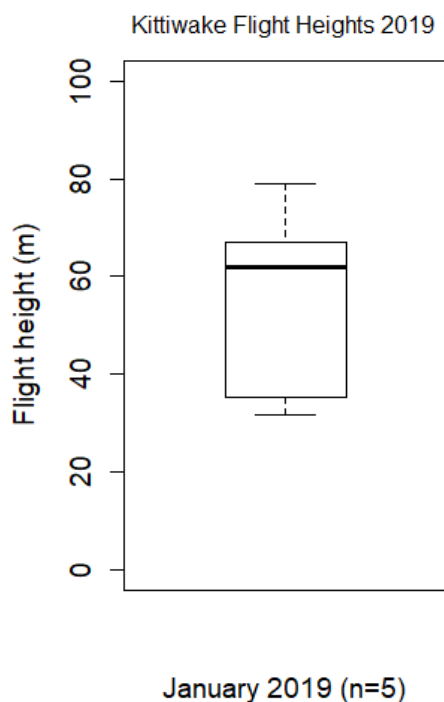


Figure 28 Flight heights of black-legged kittiwakes in Kitty Hawk plus 4 km buffer

5.16 Bonaparte's Gull

Bonaparte's gulls were recorded in all seasons apart from summer, with highest numbers recorded in winter (**Table 28**). A peak raw count of four in the Kitty Hawk site, and six in the 4 km buffer in January, lead to abundance estimates of 39 and 62 respectively (**Table 28**).

A total of nine Bonaparte's gulls were recorded in Kitty Hawk plus 4 km buffer in the spring surveys (**Figure 29**), of which seven were recorded in March and two were recorded in April (**Table 28**). Individuals were loosely dispersed from the south to the northwest of the survey area with some grouping in the center to northwest of the Kitty Hawk site in March, and were located in the northwest of the 4 km buffer in April (**Figure 29**). For the fall surveys, a total of two Bonaparte's gulls were recorded in November in the center and northwest of the Kitty Hawk site (**Figure 30**). For the winter surveys, a total of 11 Bonaparte's gulls were recorded in Kitty Hawk plus 4 km buffer (**Figure 31**), of which ten were recorded in January, and one was recorded in December (**Table 28**). Individuals were distributed primarily from the southwest to the northwest of the survey area for January, and located in the southwest of the 4 km buffer for December (**Figure 31**).

In January, a total of ten Bonaparte's gulls were recorded flying at a median flight height of 73 m AMSL with a maximum flight height of 115 m AMSL in Kitty Hawk plus 4 km buffer (**Figure 32**). In March, a total of eight Bonaparte's gulls were recorded flying at a median flight height of 81 m AMSL with a maximum flight height of 138 m AMSL in Kitty Hawk plus 4 km buffer (**Figure 32**). In April, a total of two Bonaparte's gulls were recorded flying at a median height of 77 m AMSL with a maximum flight height of 113 m AMSL in Kitty Hawk plus 4 km buffer (**Figure 32**). In November, a total of two Bonaparte's gulls were recorded flying at a median height of 92 m AMSL with a maximum flight height of 111 m AMSL in Kitty Hawk plus 4 km buffer (**Figure 32**).

Table 28 Raw counts and abundance and density estimates (No. estimated individuals per km²) of Bonaparte's gull in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	10	100	0.1	10	0
Mar-19	7	70	0.07	7	0
Apr-19	2	20	0.02	2	0
Nov-19	2	20	0.02	2	0
Dec-19	1	10	0.01	1	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	4	39	0.08	4	0
Mar-19	5	48	0.1	5	0
Apr-19	0	0	-	0	0
Nov-19	2	19	0.04	2	0
Dec-19	0	0	-	0	0
c) 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	6	62	0.12	6	0
Mar-19	2	21	0.04	2	0
Apr-19	2	21	0.04	2	0
Nov-19	0	0	-	0	0
Dec-19	1	10	0.02	1	0

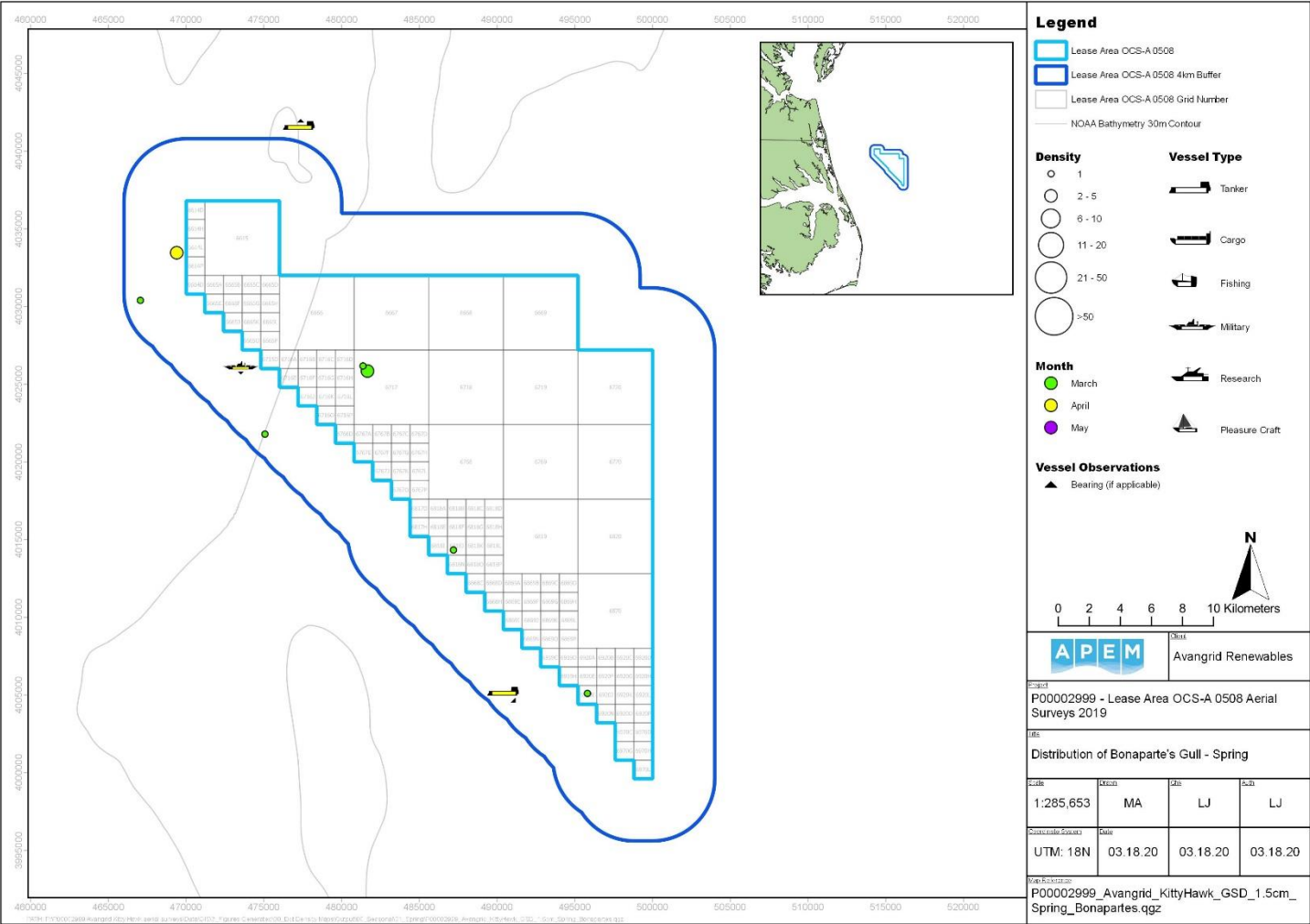


Figure 29 Distribution of Bonaparte’s gulls recorded in Kitty Hawk plus 4 km buffer in the spring season



Figure 30 Distribution of Bonaparte’s gulls recorded in Kitty Hawk plus 4 km buffer in the fall season

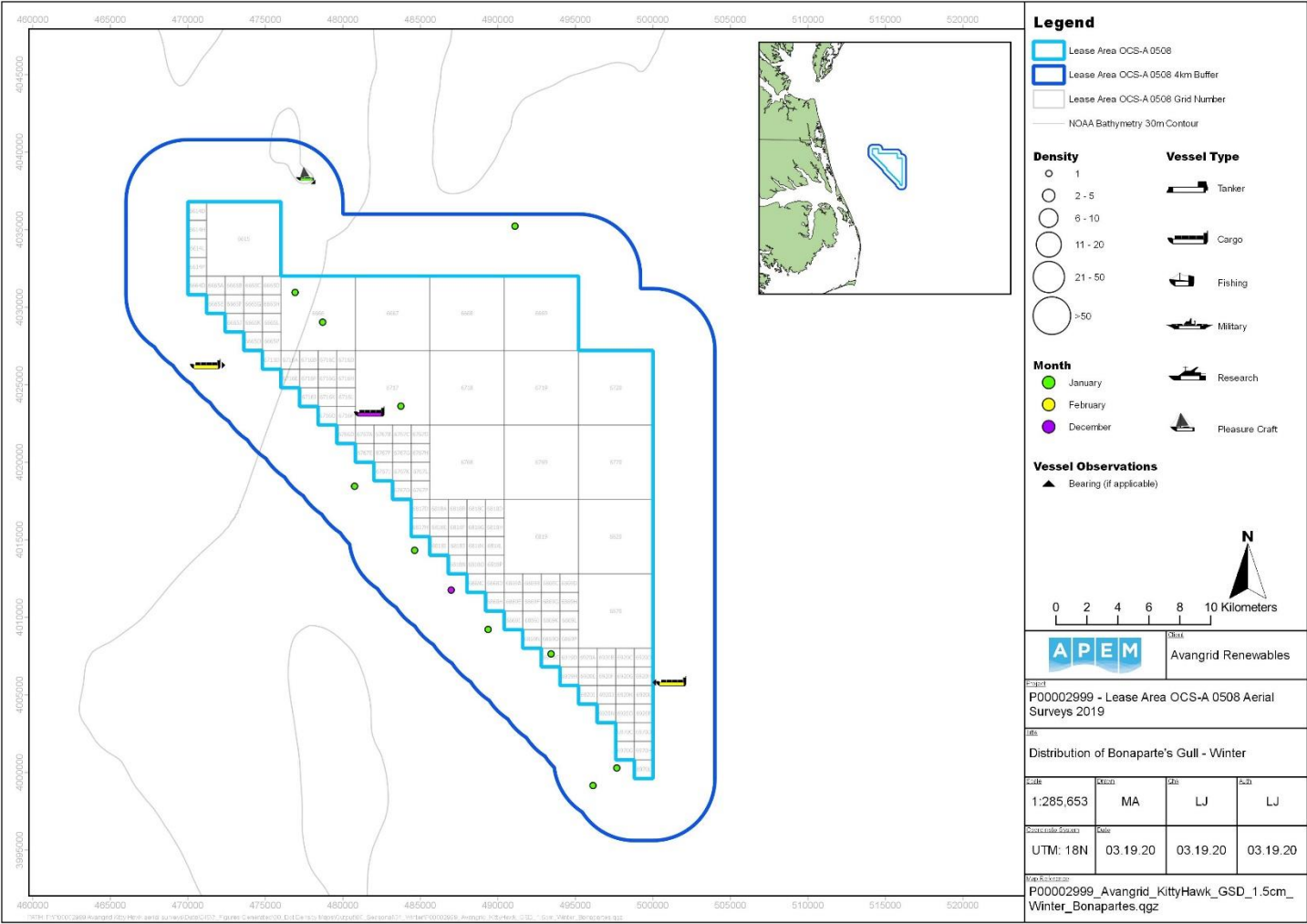


Figure 31 Distribution of Bonaparte’s gulls recorded in Kitty Hawk plus 4 km buffer in the winter season

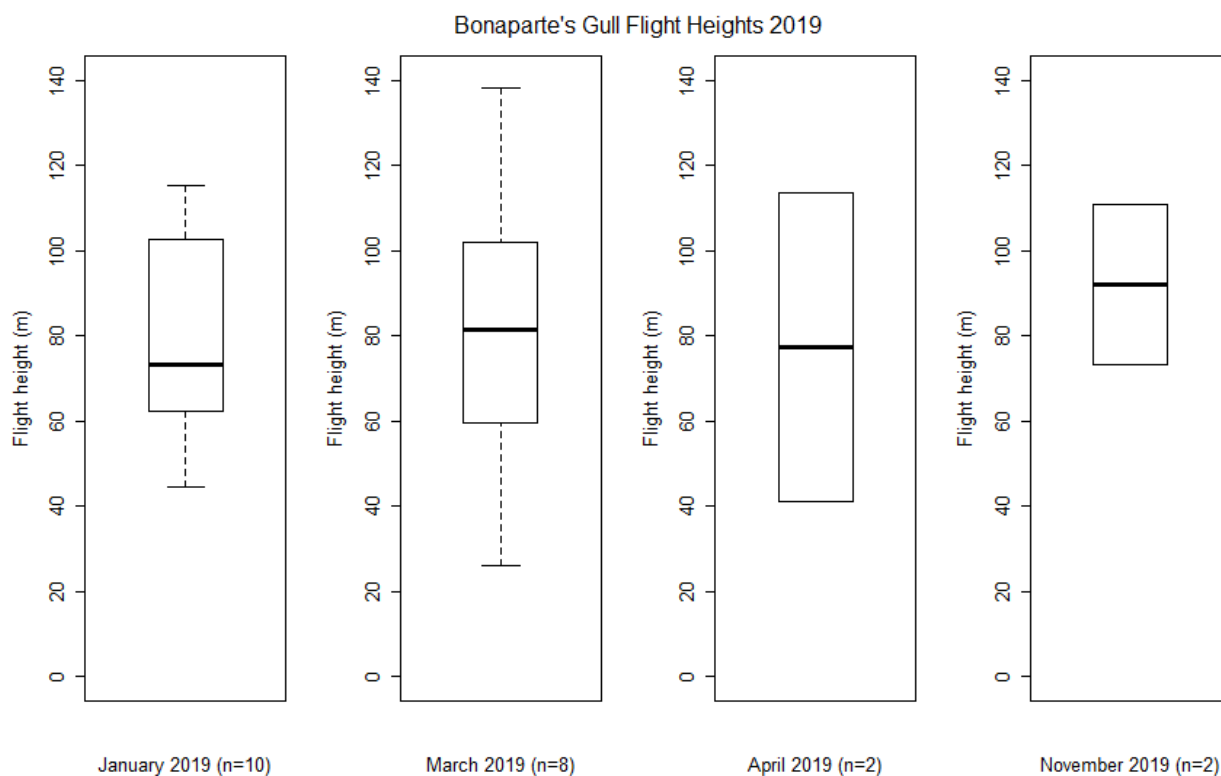


Figure 32 Flight heights of Bonaparte's gulls in Kitty Hawk plus 4 km buffer

5.17 Laughing Gull

Laughing gulls were recorded in all seasons apart from spring, with highest numbers occurring in fall (**Table 29**). A peak raw count of four individuals in the Kitty Hawk site, and four individuals in the 4 km buffer for November, lead to abundance estimates of 39 and 41 respectively (**Table 29**).

One laughing gull was recorded in Kitty Hawk plus 4 km buffer in the summer surveys, of which it was recorded in July, located in the northwest of the 4 km buffer (**Figure 33**). For the fall surveys, ten laughing gulls were recorded in Kitty Hawk plus 4 km buffer (**Figure 34**), of which two were recorded in September, and two were recorded in November (**Table 29**). Individuals were located in the north and northeast of the Kitty Hawk site in September, and located primarily in the northeast of both the Kitty Hawk site and the 4 km buffer in November, with some located in the west and northwest of the 4 km buffer (**Figure 34**). For the winter surveys, one laughing gull was recorded in December in Kitty Hawk plus 4 km buffer, located in the southwest of the Kitty Hawk site (**Figure 35**).

In November, five laughing gulls were recorded flying at a median flight height of 19 m AMSL in Kitty Hawk plus 4 km buffer (**Figure 36**).

Table 29 Raw counts and abundance and density estimates (No. estimated individuals per km²) of laughing gulls in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jul-19	1	10	0.01	1	0
Sep-19	2	20	0.02	1	1
Nov-19	8	80	0.08	8	0
Dec-19	1	10	0.01	1	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jul-19	0	0	-	0	0
Sep-19	2	19	0.04	1	1
Nov-19	4	39	0.08	4	0
Dec-19	1	10	0.02	1	0
c) 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jul-19	1	10	0.02	1	0
Sep-19	0	0	-	0	0
Nov-19	4	41	0.08	4	0
Dec-19	0	0	-	0	0

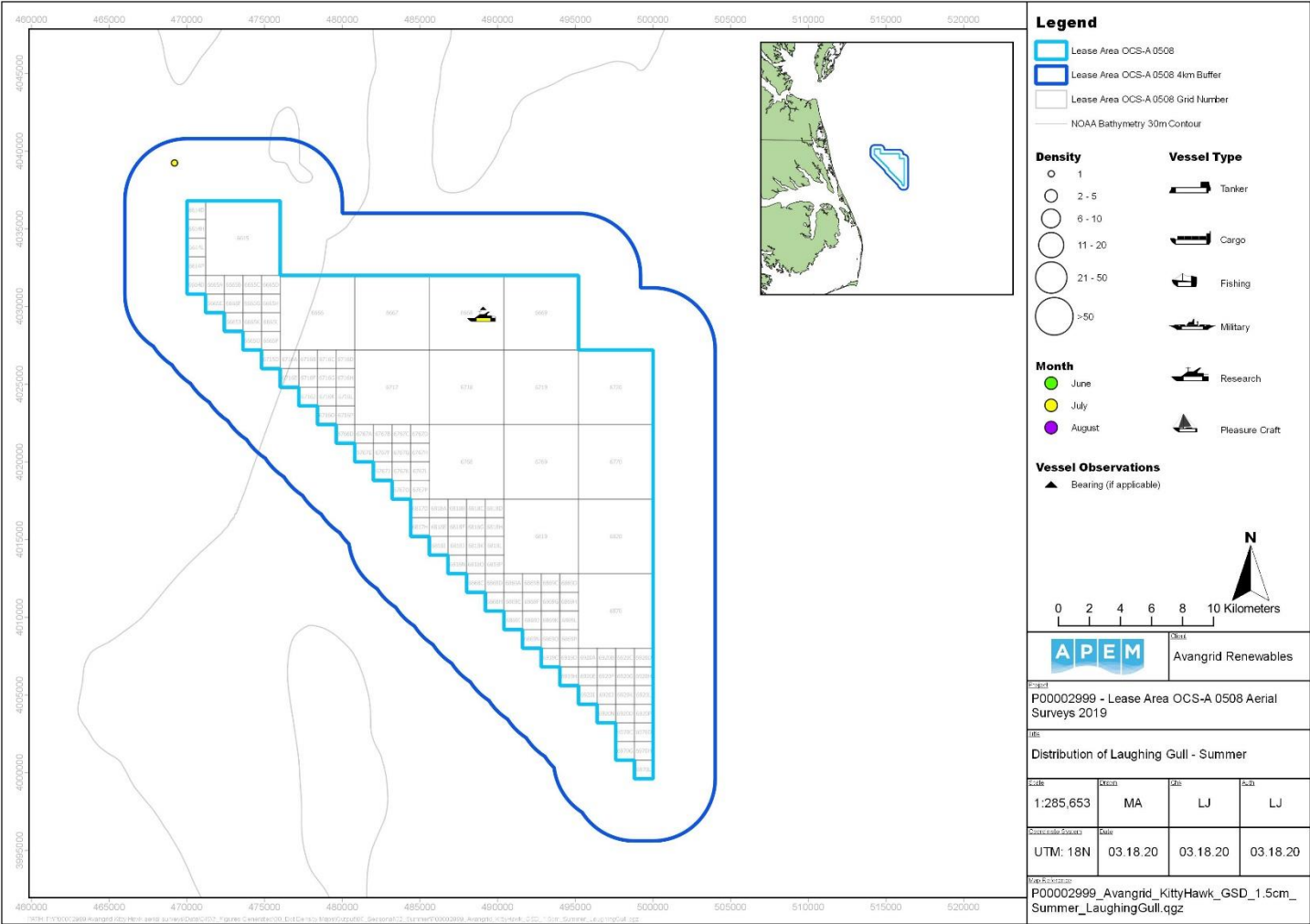


Figure 33 Distribution of laughing gulls recorded in Kitty Hawk plus 4 km buffer in the summer season

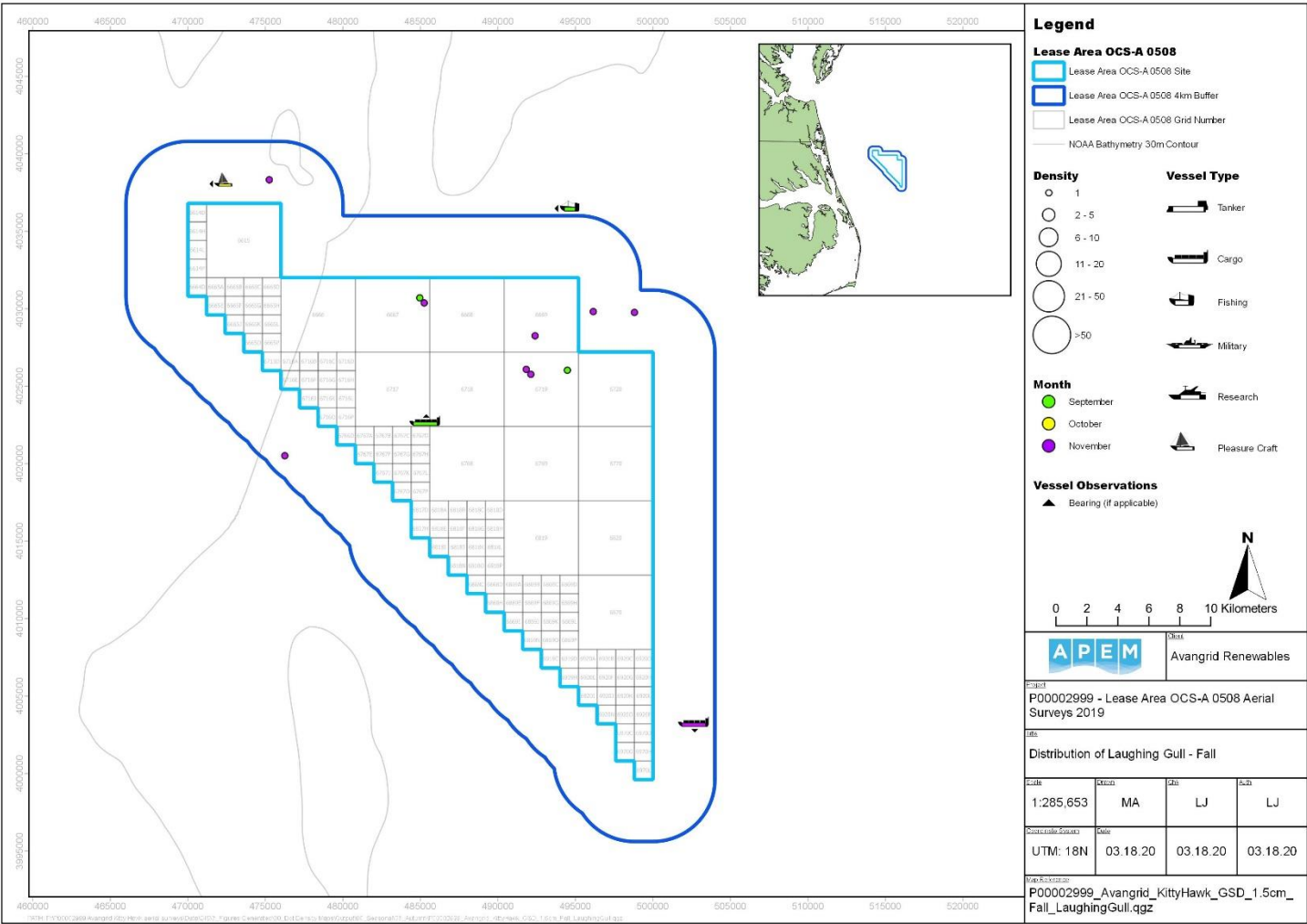


Figure 34 Distribution of laughing gulls recorded in Kitty Hawk plus 4 km buffer in the fall season

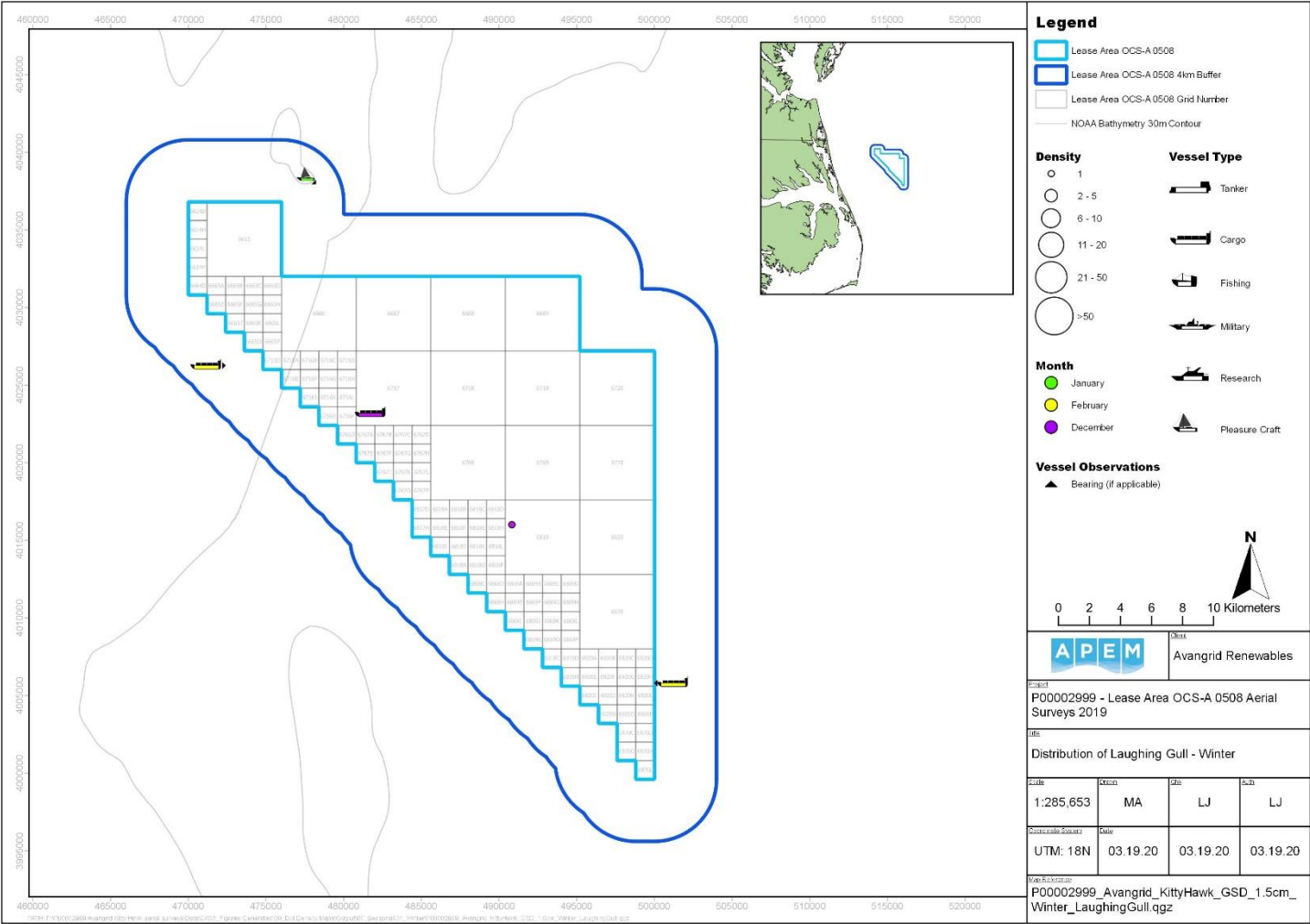


Figure 35 Distribution of laughing gulls recorded in Kitty Hawk plus 4 km buffer in the winter season

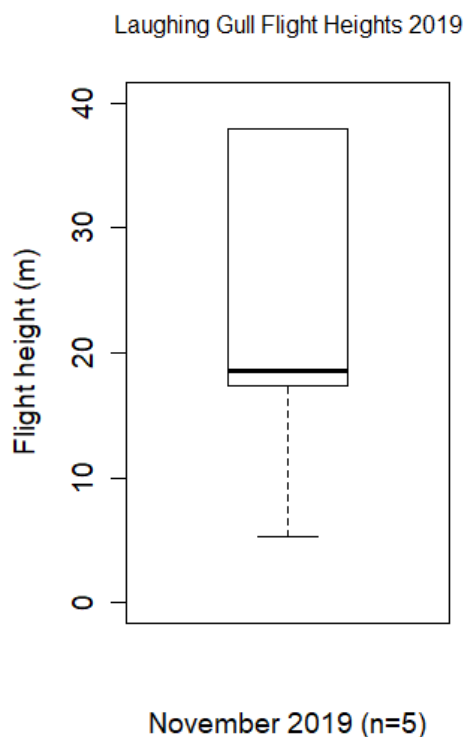


Figure 36 Flight heights of laughing gulls in Kitty Hawk plus 4 km buffer

5.18 Species Unknown – Small Gull

Unidentified small gulls were recorded in all seasons apart from summer, with highest numbers occurring in fall and winter (**Table 30**). A peak raw count of six individuals in the Kitty Hawk site, and nine individuals in the 4 km buffer for November, lead to abundance estimates of 58 and 93 respectively (**Table 30**).

For the spring surveys, a total of four unidentified small gulls were recorded in March in Kitty Hawk plus 4 km buffer (**Figure 37**). Individuals were located in the center of the Kitty Hawk site and in the west of the 4 km buffer (**Figure 37**). For the fall surveys, 15 unidentified small gulls were recorded in November, distributed primarily in the north of the survey area with one grouping in the west of the 4 km buffer (**Figure 38**). For the winter surveys, 15 unidentified small gulls were recorded in Kitty Hawk plus 4 km buffer (**Figure 39**), of which 11 were recorded in January, and four were recorded in December (**Table 30**). Individuals were located in the north of the survey area for January, and in the west of the 4 km buffer for December (**Figure 39**).

Table 30 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified small gulls in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	11	110	0.11	2	9

Mar-19	4	40	0.04	0	4
Nov-19	15	150	0.15	0	15
Dec-19	4	40	0.04	0	4
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	8	77	0.16	2	6
Mar-19	2	19	0.04	0	2
Nov-19	6	58	0.12	0	6
Dec-19	0	0	-	0	0
c) 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	3	31	0.06	0	3
Mar-19	2	21	0.04	0	2
Nov-19	9	93	0.18	0	9
Dec-19	4	41	0.08	0	4

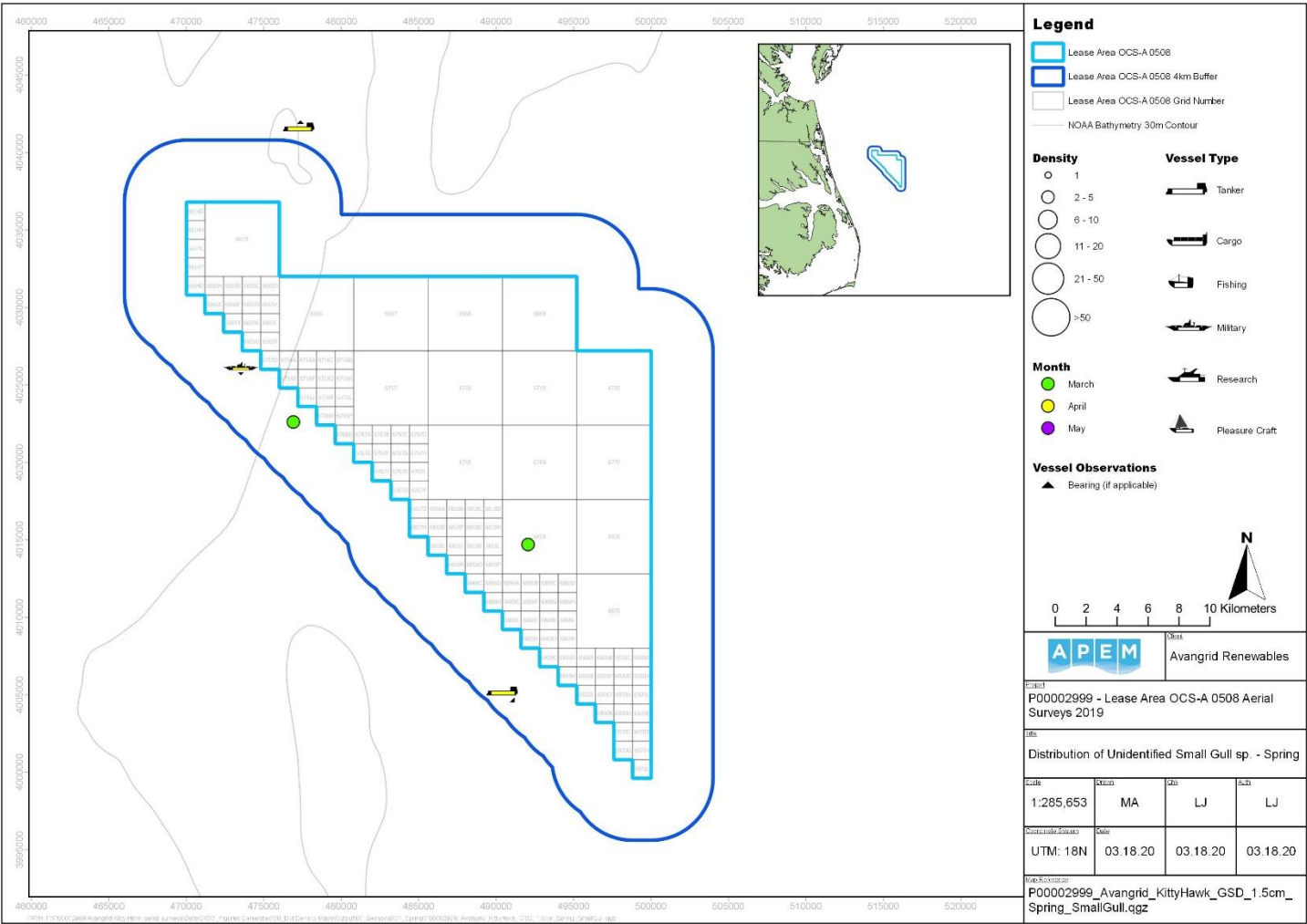


Figure 37 Distribution of unidentified small gulls recorded in Kitty Hawk plus 4 km buffer in the spring season

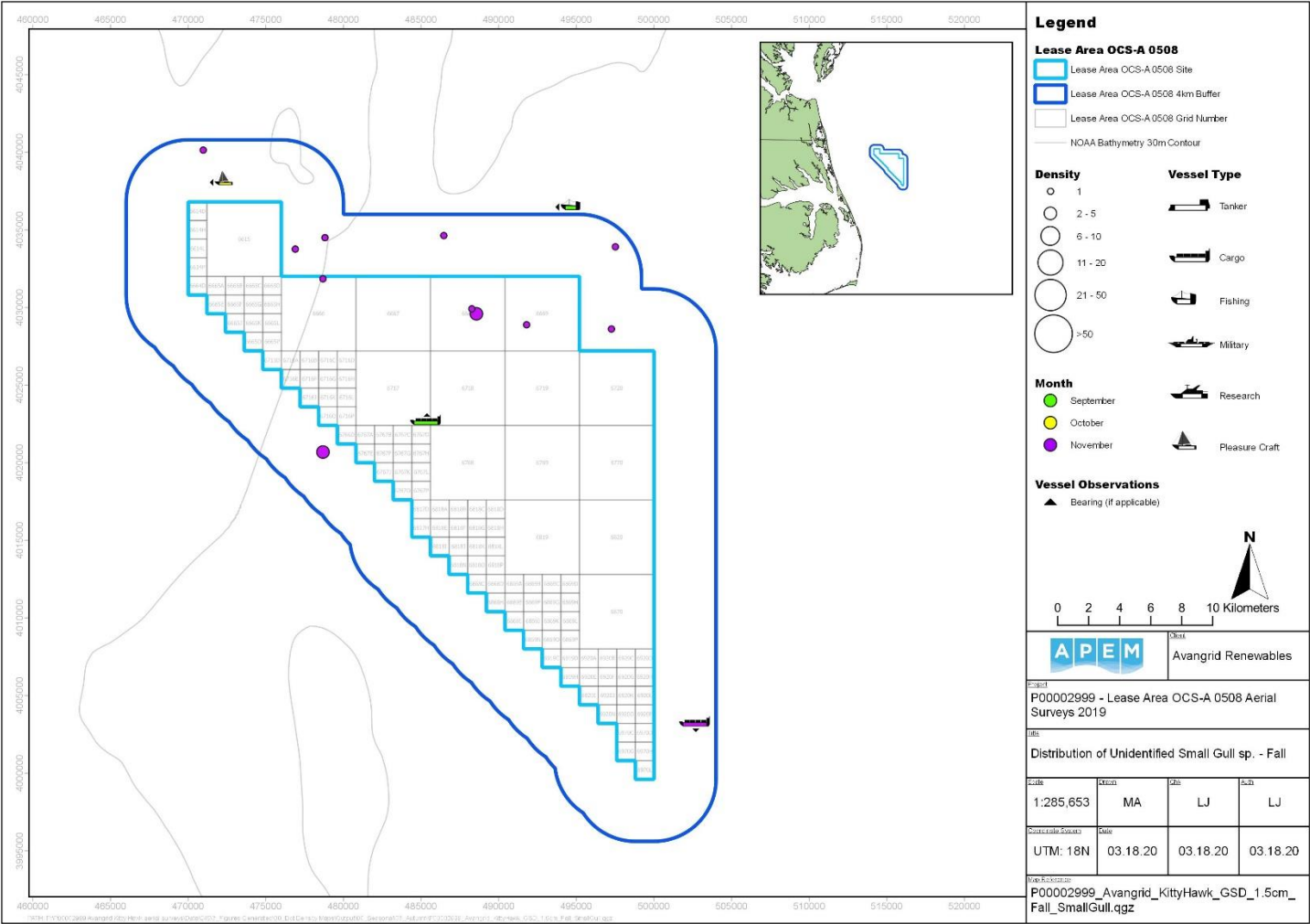


Figure 38 Distribution of unidentified small gulls recorded in Kitty Hawk plus 4 km buffer in the fall season

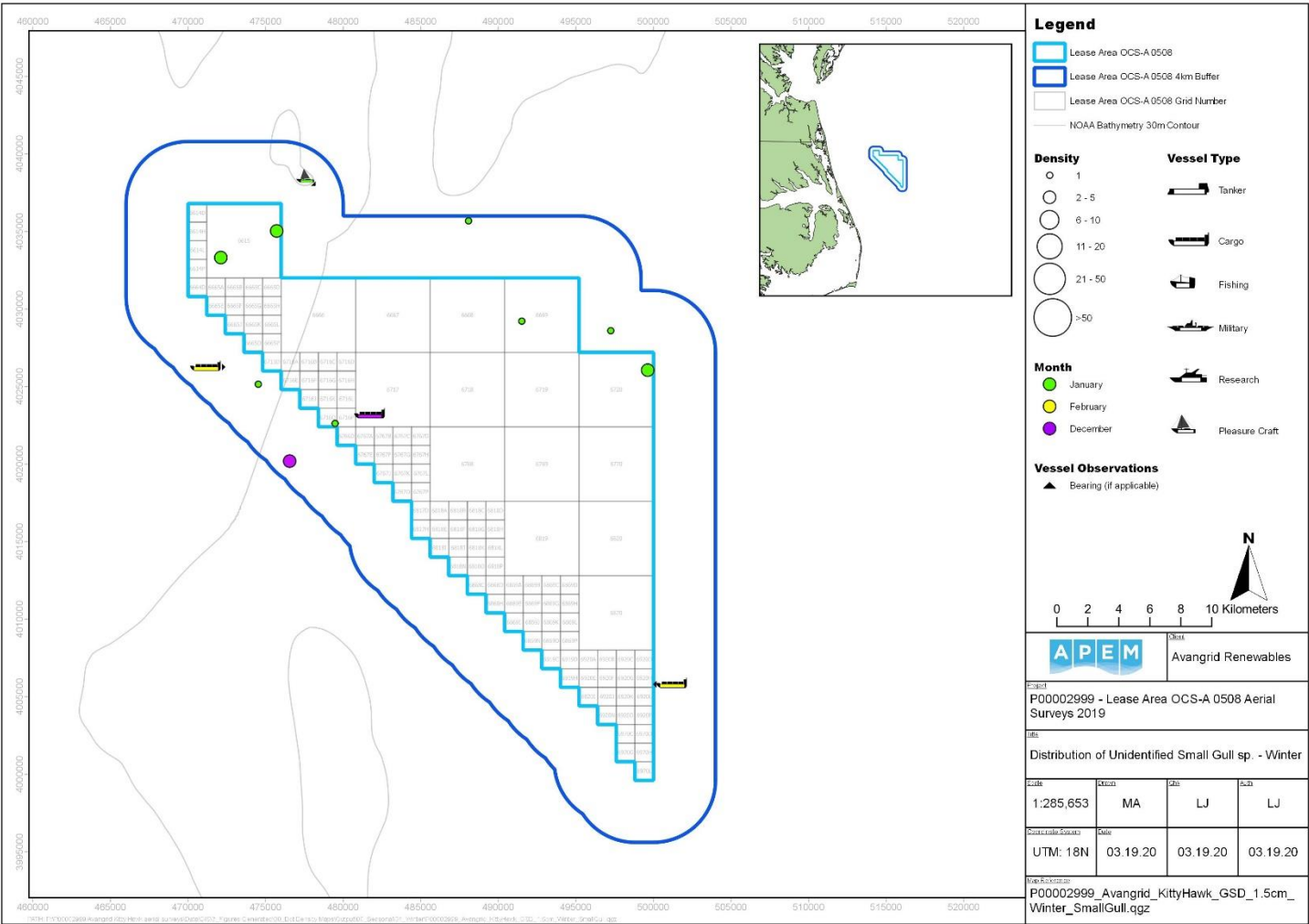


Figure 39 Distribution of unidentified small gulls recorded in Kitty Hawk plus 4 km buffer in the winter season

5.19 Great Black-backed Gull

Great black-backed gulls were recorded in January, November, and December, with highest numbers recorded in the winter (**Table 31**). A peak raw count of six individuals in the Kitty Hawk site, and 15 individuals in the 4 km buffer for December, lead to abundance estimates of 58 and 155 respectively (**Table 31**).

A total of three great black-backed gulls were recorded in November in Kitty Hawk plus 4 km buffer for the fall surveys (**Figure 40**). Individuals were located in the southeast of the survey area (**Figure 40**). For the winter surveys, a total of 24 great black-backed gulls were recorded in Kitty Hawk plus 4 km buffer (**Figure 41**), of which three were recorded in January, and 21 were recorded in December (**Table 31**). Individuals were located in the northeast and southeast of the 4 km buffer in January, and primarily in the southwest of the survey area in December, with one individual located in the north of the Kitty Hawk site (**Figure 41**).

In December, a total of 12 great black-backed gulls were recorded flying at a median flight height of 42 m AMSL in Kitty Hawk plus 4 km buffer (**Figure 42**).

Table 31 Raw counts and abundance and density estimates (No. estimated individuals per km²) of great black-backed gulls in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	3	30	0.03	1	2
Nov-19	3	30	0.03	1	2
Dec-19	21	210	0.21	14	7
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	0	0	-	0	0
Nov-19	2	19	0.04	0	2
Dec-19	6	58	0.12	5	1
c) 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	3	31	0.06	1	2
Nov-19	1	10	0.02	1	0
Dec-19	15	155	0.29	9	6



Figure 40 Distribution of great black-backed gulls recorded in Kitty Hawk plus 4 km buffer in the fall season

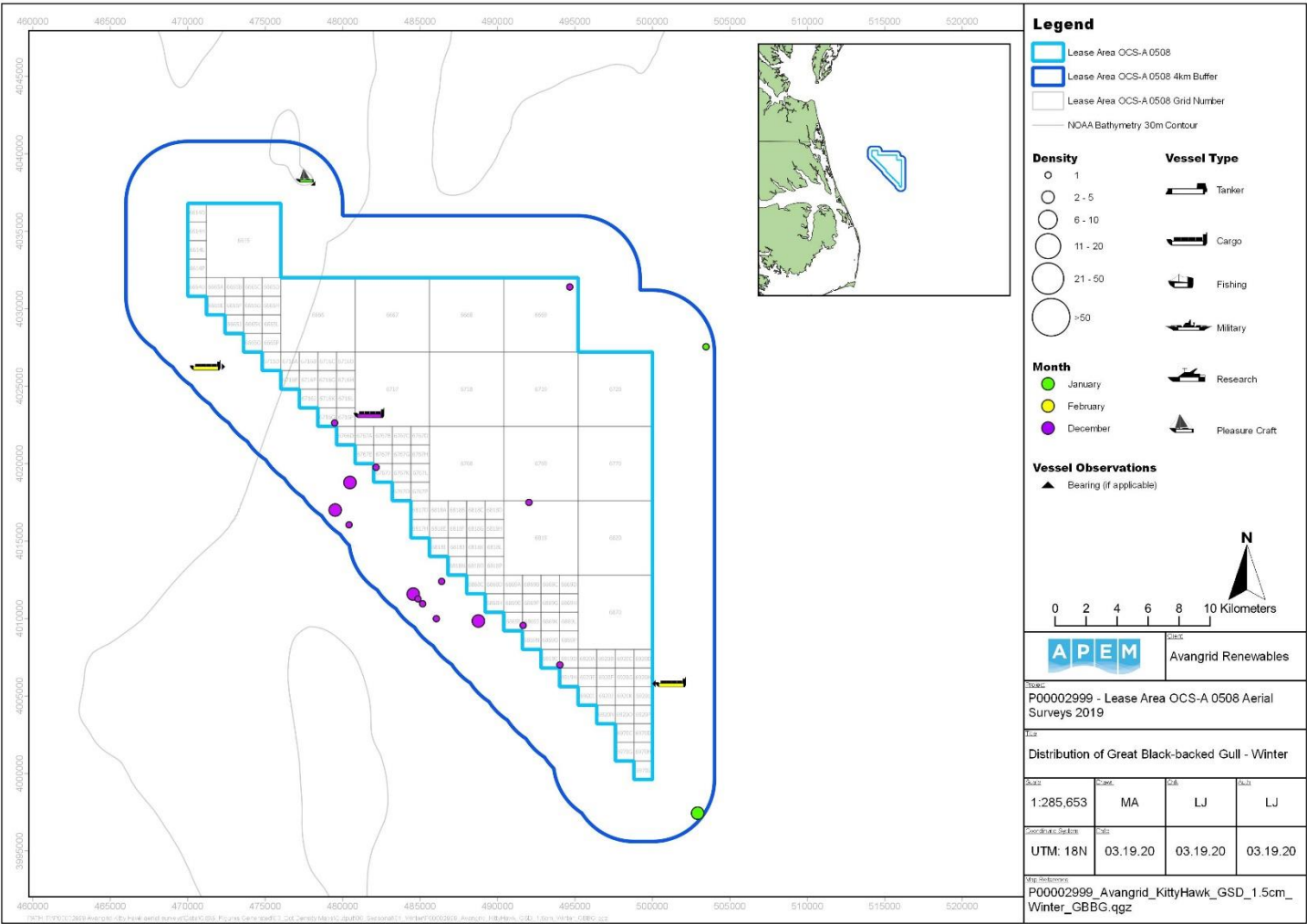


Figure 41 Distribution of great black-backed gulls recorded in Kitty Hawk plus 4 km buffer in the winter season

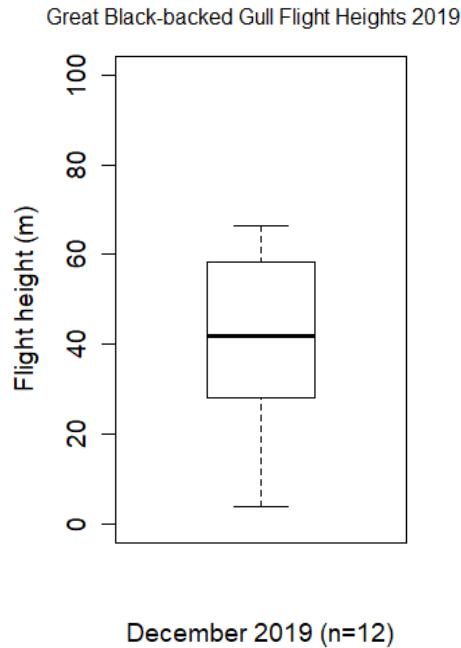


Figure 42 Flight heights of great black-backed gulls in Kitty Hawk plus 4 km buffer

5.20 Herring Gull

Herring gulls were recorded in all seasons apart from summer, with highest numbers recorded in winter (**Table 32**). A peak raw count of 11 individuals in the Kitty Hawk site and five individuals in the 4 km buffer for December, lead to abundance estimates of 106 and 52, respectively (**Table 32**).

A total of four herring gulls were recorded in Kitty Hawk plus 4 km buffer in the spring surveys (**Figure 43**), of which two were recorded in March, and two were recorded in April (**Table 32**). Individuals were located in the northeast of the Kitty Hawk site and the east of the 4 km buffer for March, and in the southwest of the 4 km buffer for April. For the fall surveys, a total of three herring gulls were recorded in November in the Kitty Hawk site (**Figure 44**). Individuals were located from the center to the northwest of the Kitty Hawk site (**Figure 44**). For the winter surveys, a total of 18 herring gulls were recorded in Kitty Hawk plus 4 km buffer (**Figure 45**), of which two were recorded in March, and 16 were recorded in December (**Table 32**). Individuals were located in the north of the 4 km buffer in February, and primarily in the south to southwest of the survey area in December, with one grouping in the north of the Kitty Hawk site (**Figure 45**).

In March, a total of two herring gulls were recorded flying at a median flight height of 96 m AMSL with a maximum flight height of 145 m AMSL in Kitty Hawk plus 4 km buffer (**Figure 46**). In November, a total of three herring gulls were recorded flying at a median flight height of 57 m AMSL with a maximum flight height of 69 m AMSL in Kitty Hawk plus 4 km buffer (**Figure 46**). In December, a total of six herring gulls were recorded flying at a median flight height of 23 m AMSL with a maximum flight height of 61 m AMSL in Kitty Hawk plus 4 km buffer (**Figure 46**).

Table 32 Raw counts and abundance and density estimates (No. estimated individuals per km²) of herring gulls in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Feb-19	2	20	0.02	0	2
Mar-19	2	20	0.02	2	0
Apr-19	2	20	0.02	2	0
Nov-19	3	30	0.03	3	0
Dec-19	16	160	0.16	13	3
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Feb-19	0	0	-	0	0
Mar-19	1	10	0.02	1	0
Apr-19	0	0	-	0	0
Nov-19	3	29	0.06	3	0
Dec-19	11	106	0.21	8	3
c) 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Feb-19	2	21	0.04	0	2
Mar-19	1	10	0.02	1	0
Apr-19	2	21	0.04	2	0
Nov-19	0	0	-	0	0
Dec-19	5	52	0.1	5	0

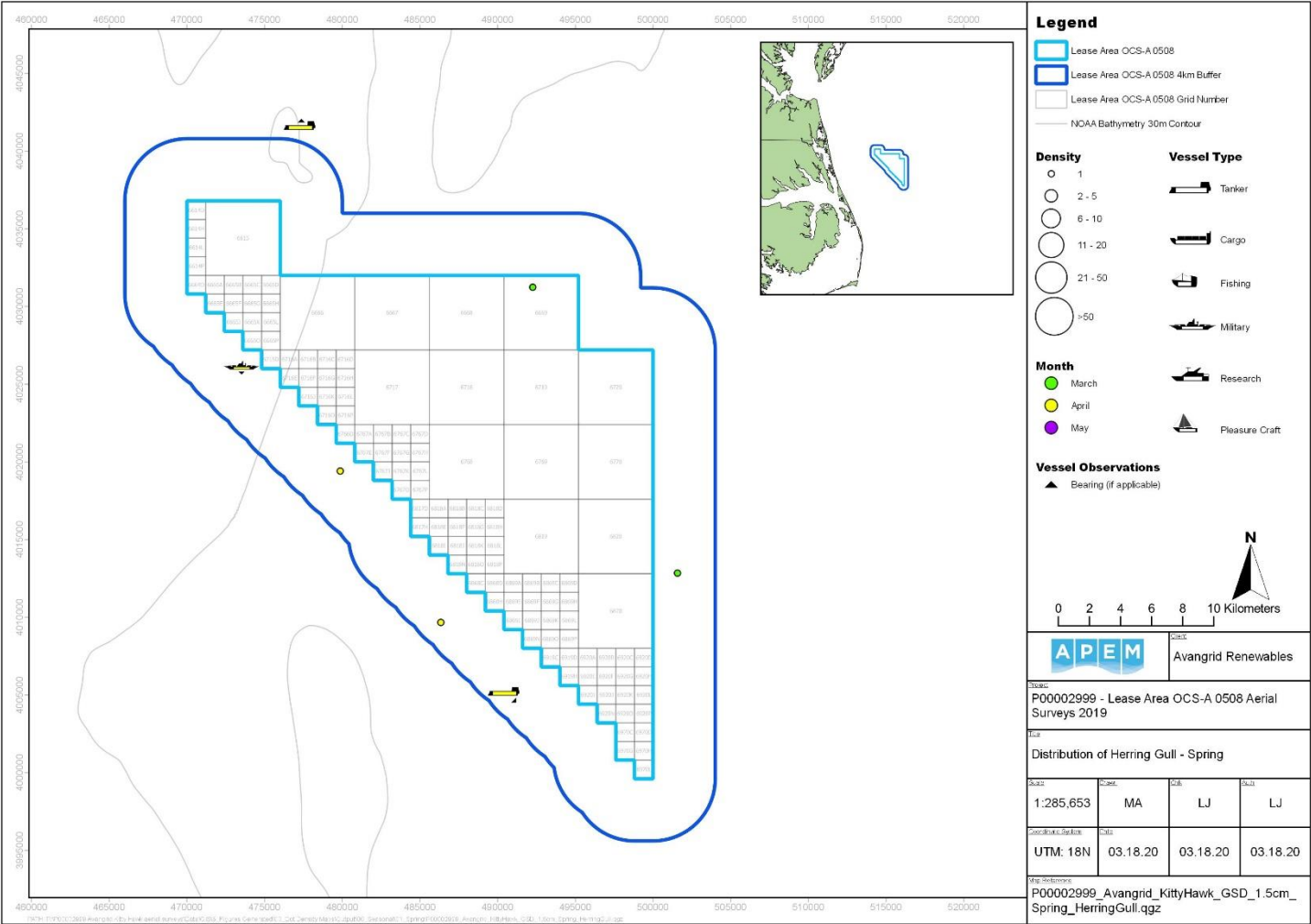


Figure 43 Distribution of herring gulls recorded in Kitty Hawk plus 4 km buffer in the spring season



Figure 44 Distribution of herring gulls recorded in Kitty Hawk plus 4 km buffer in the fall season

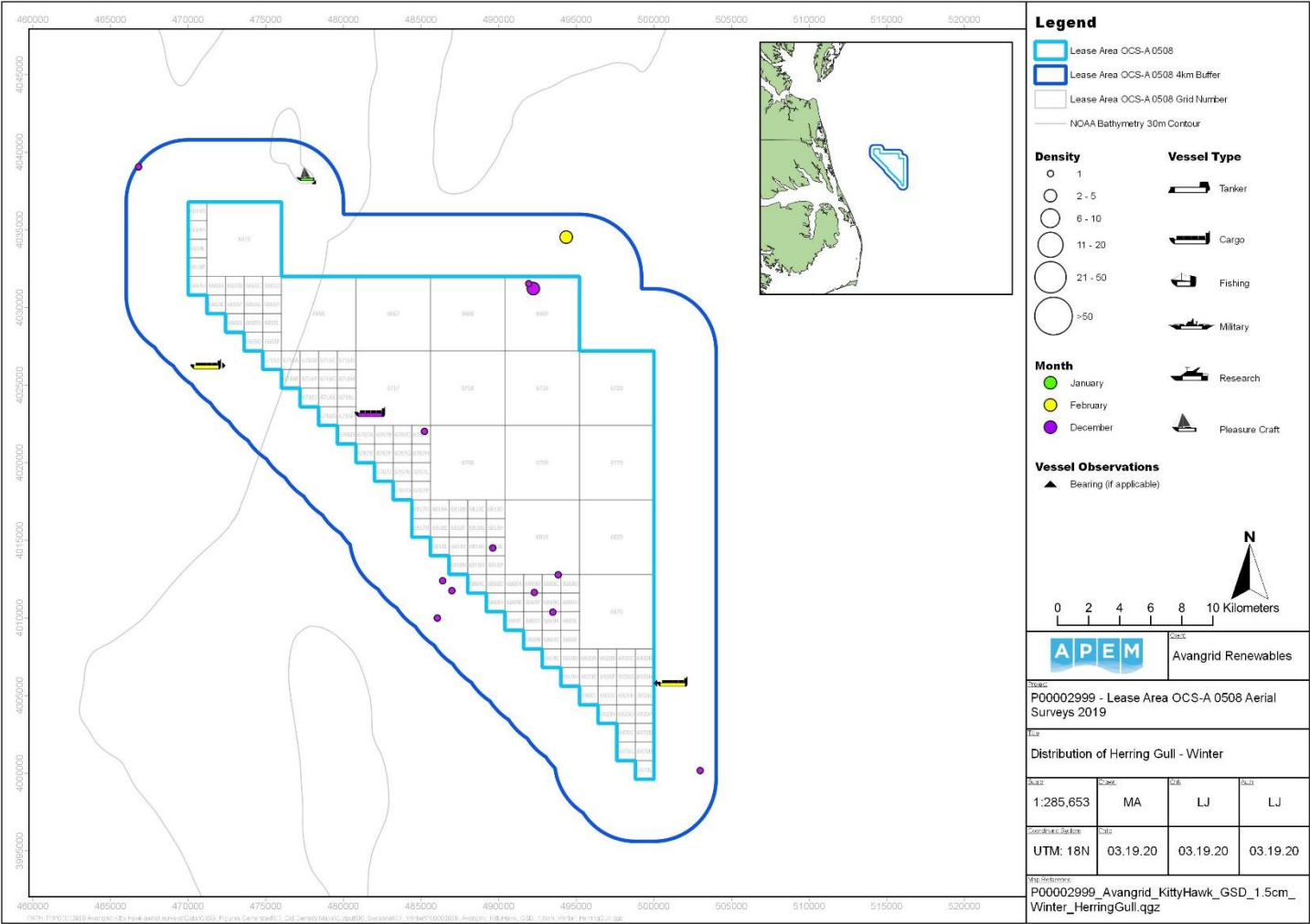


Figure 45 Distribution of herring gulls recorded in Kitty Hawk plus 4 km buffer in the winter season

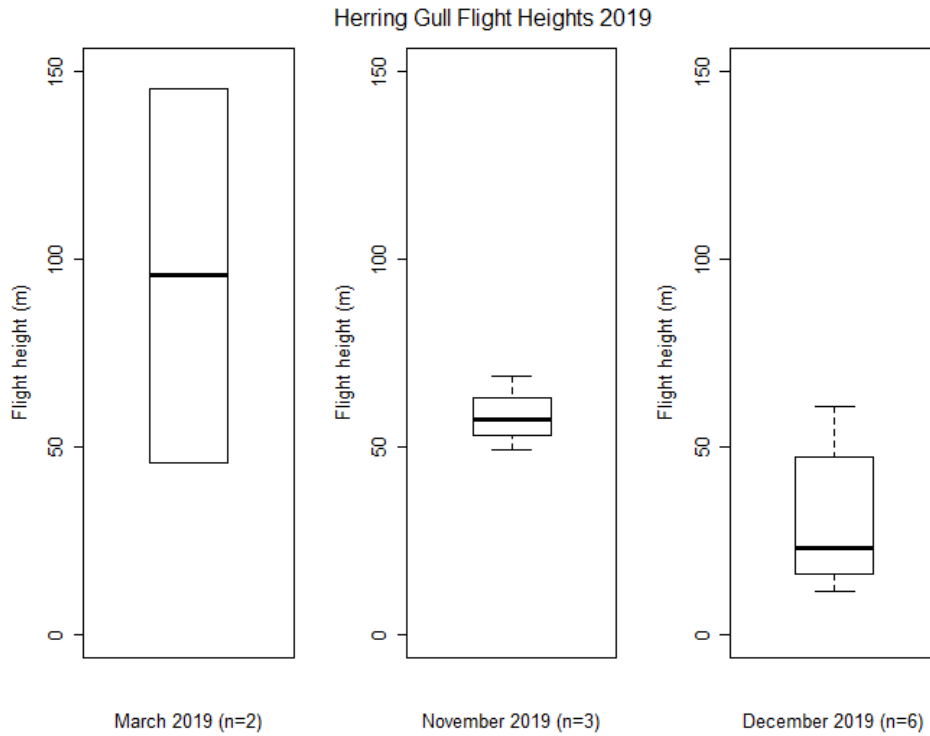


Figure 46 Flight heights of herring gulls in Kitty Hawk plus 4 km buffer

5.21 Species Unknown – Large Gull

Unidentified large gulls were recorded in January and November only, with peak raw counts of one in the 4 km buffer for January and one in the Kitty Hawk site for November, leading to abundance estimates of ten for both (Table 33).

For the fall surveys, one unidentified large gull was recorded in November in the northwest of the Kitty Hawk site (Figure 47). For the winter surveys, one unidentified large gull was recorded in January in the east of the 4 km buffer (Figure 48).

Table 33 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified large gulls in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	1	10	0.01	1	0
Nov-19	1	10	0.01	0	1
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	0	0	-	0	0
Nov-19	1	10	0.02	0	1
c) 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting

Jan-19	1	10	0.02	1	0
Nov-19	0	0	-	0	0

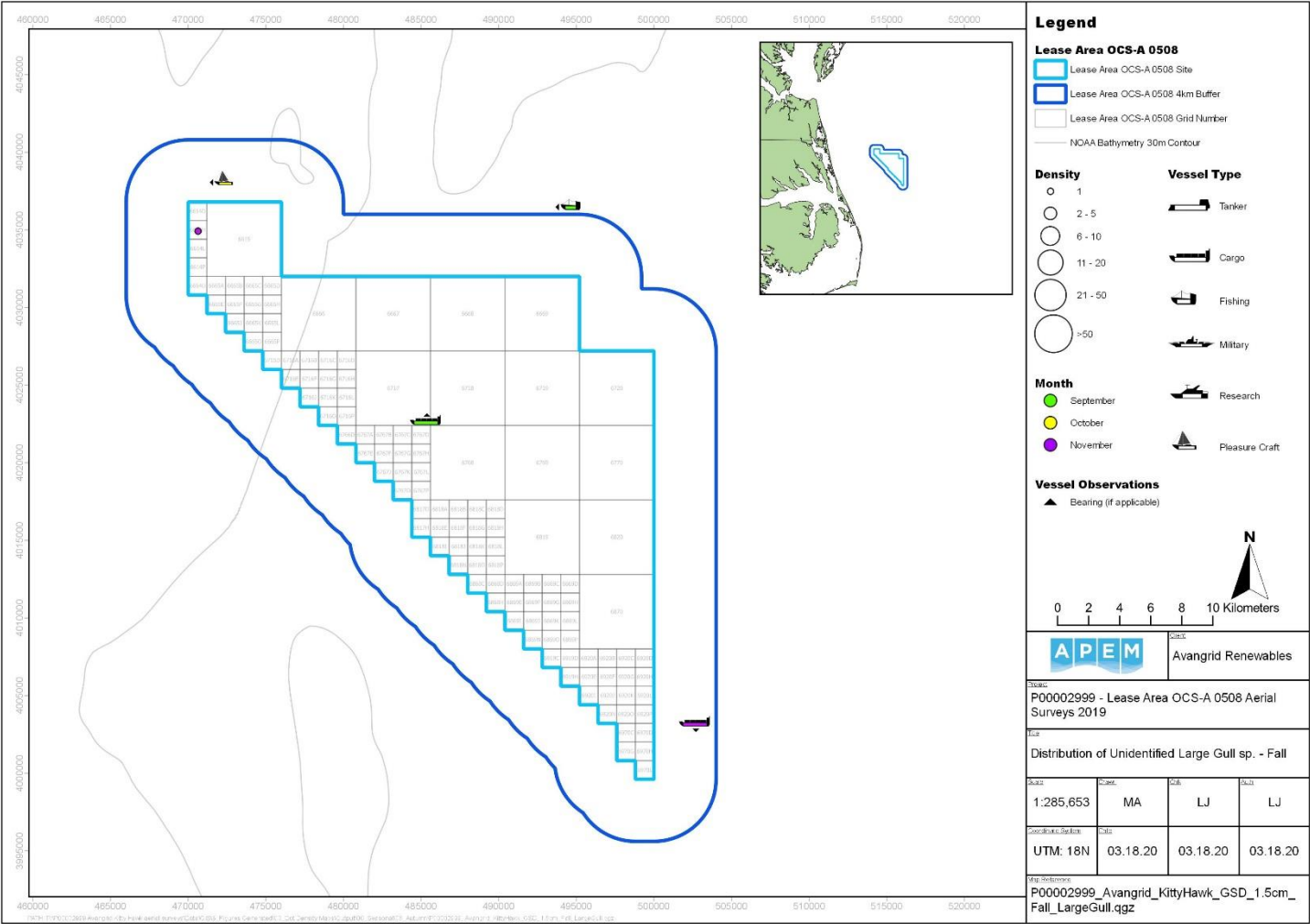


Figure 47 Distribution of unidentified large gulls recorded in Kitty Hawk plus 4 km buffer in the fall season

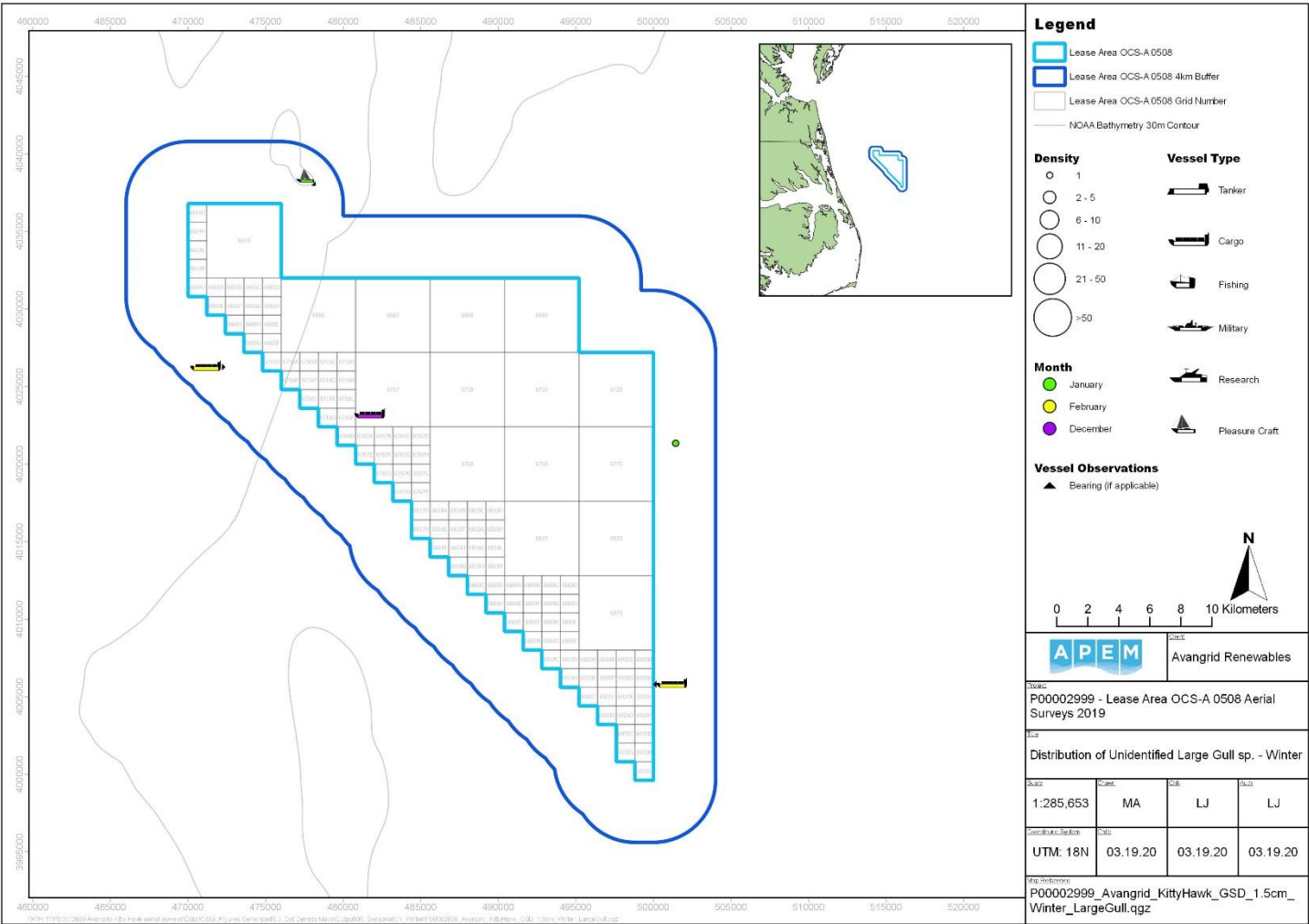


Figure 48 Distribution of unidentified large gulls recorded in Kitty Hawk plus 4 km buffer in the winter season

5.22 Species Unknown – Gull

Unidentified gulls were recorded in November and December, with highest numbers recorded in fall (**Table 34**). A peak raw count of two individuals in Kitty Hawk site plus 4 km buffer for November, lead to an abundance estimate of 20 (**Table 34**).

A total of two unidentified gulls were recorded in November in the northeast of Kitty Hawk plus 4 km buffer for the fall surveys (**Figure 49**). For the winter surveys, one unidentified gull was recorded in the southeast of the Kitty Hawk site (**Figure 50**).

Table 34 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified gulls in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Nov-19	2	20	0.02	1	1
Dec-19	1	10	0.01	0	1
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Nov-19	1	10	0.02	1	0
Dec-19	1	10	0.02	0	1
c) 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Nov-19	1	10	0.02	0	1
Dec-19	0	0	-	0	0

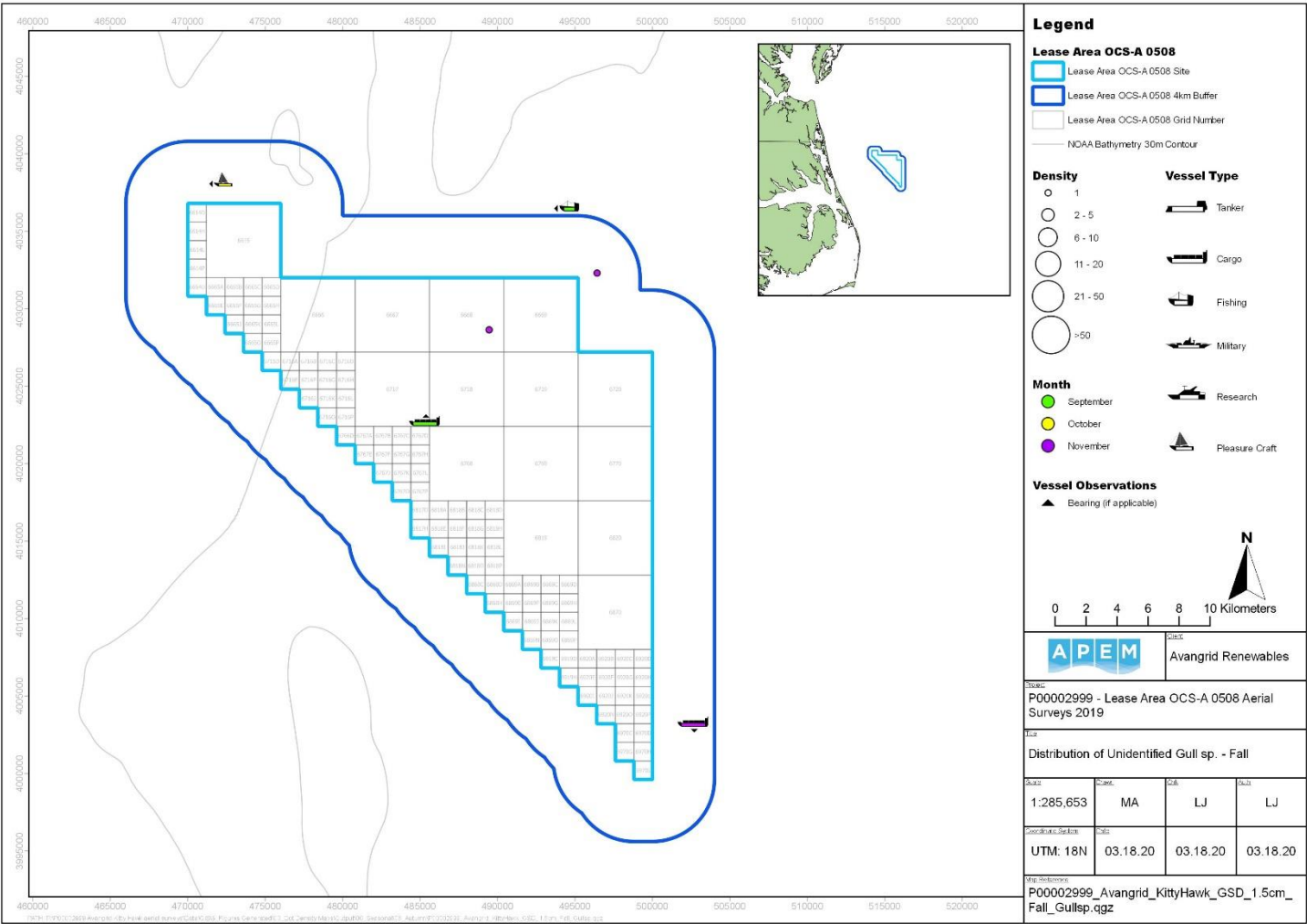


Figure 49 Distribution of unidentified gulls recorded in Kitty Hawk plus 4 km buffer in the fall season

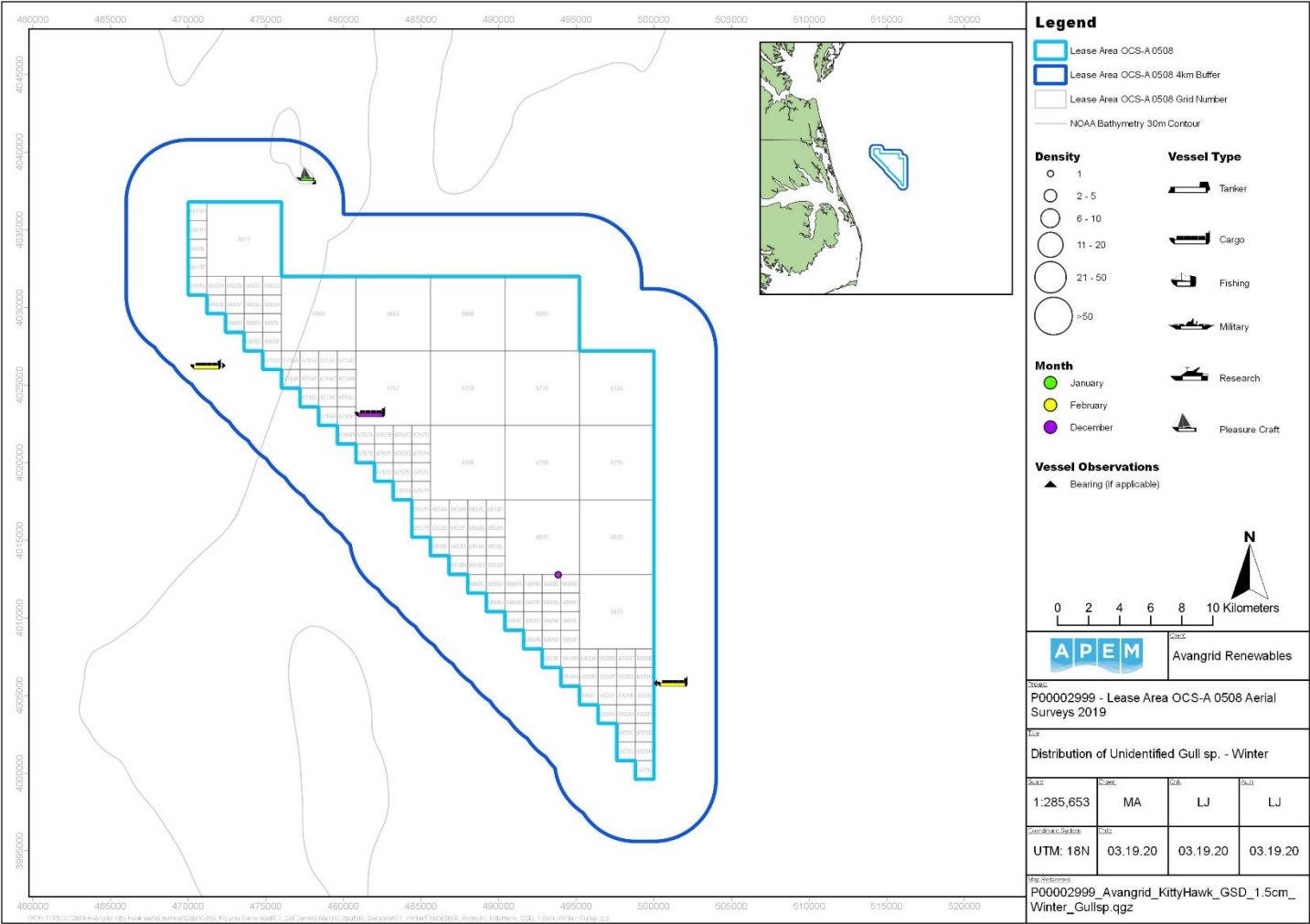


Figure 50 Distribution of unidentified gulls recorded in Kitty Hawk plus 4 km buffer in the winter season

5.23 Least Tern

Least terns were recorded in May only, with a peak raw count of two in the 4 km buffer, leading to an abundance estimate of 20 (Table 35).

A total of two least terns were recorded in the south of the 4 km buffer in May for the spring surveys (Figure 51).

Table 35 Raw counts and abundance and density estimates (No. estimated individuals per km²) of least terns in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
May-19	2	20	0.02	2	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
May-19	0	0	-	0	0
c) 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Nov-19	2	21	0.04	2	0

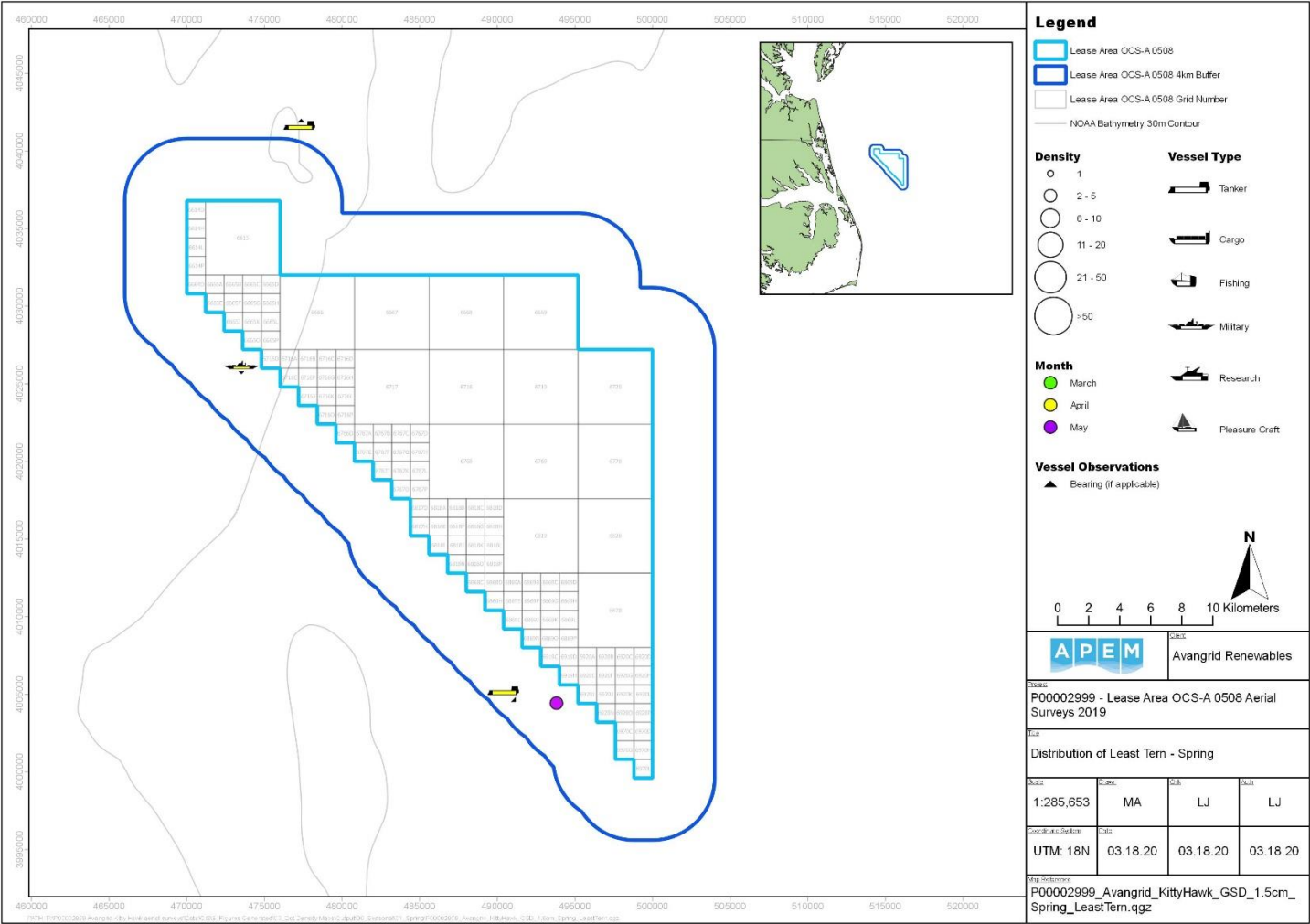


Figure 51 Distribution of least terns recorded in Kitty Hawk plus 4 km buffer in the spring season

5.24 Forster's Tern

A Forster's tern was recorded in February only, with a raw count of one in the 4 km buffer, leading to an abundance estimate of ten (Table 36).

A total of one Forster's tern was recorded in the east of the 4 km buffer in February for the winter surveys (Figure 52).

Table 36 Raw counts and abundance and density estimates (No. estimated individuals per km²) of Forster's terns in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Feb-19	1	10	0.01	0	1
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Feb-19	0	0	-	0	0
c) 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Feb-19	1	10	0.02	0	1

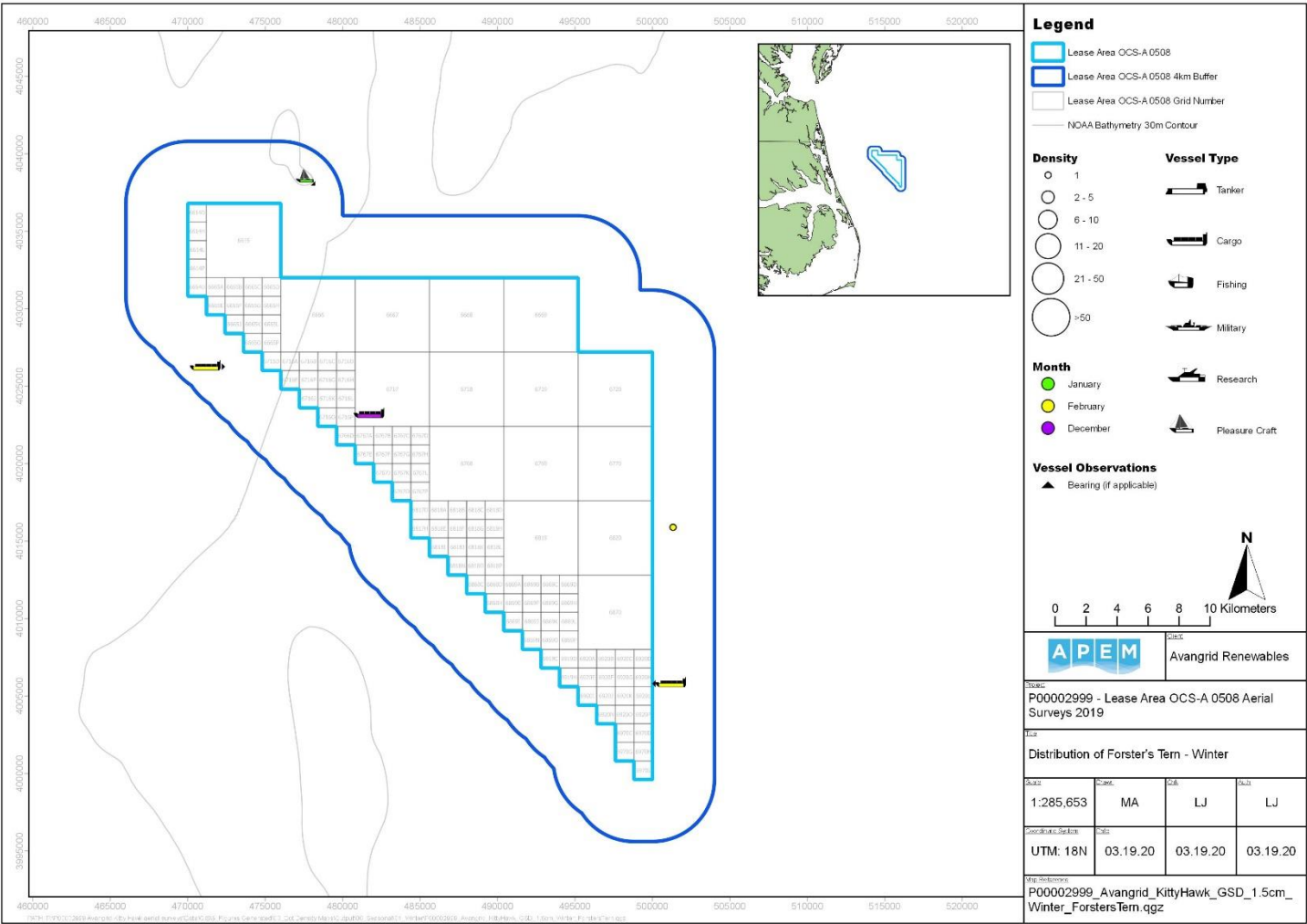


Figure 52 Distribution of Forster’s terns recorded in Kitty Hawk plus 4 km buffer in the winter season

5.25 'Commic' / Forster's Tern

'Commic' / Forster's terns were recorded in all seasons apart from winter, with a peak raw count of three in the 4 km buffer for September, leading to an abundance estimate of 31 (Table 37).

A total of two 'commic' / Forster's terns were recorded in Kitty Hawk plus 4 km buffer in spring (Figure 54), of which once was recorded in April, and one was recorded in May (Table 37). Individuals were located in the southwest of the 4 km buffer in April, and in the center of the Kitty Hawk site in May (Figure 54). For the summer surveys, one 'commic' / Forster's tern was recorded in August in the northwest of the Kitty Hawk site (Figure 55). For the fall surveys, five 'commic' / Forster's terns were recorded in Kitty Hawk plus 4 km buffer (Figure 56), of which three were recorded in September, and two were recorded in October (Table 37). Individuals were located in the northwest of the 4 km buffer for September, and in the center of the Kitty Hawk site for October (Figure 56).

Table 37 Raw counts and abundance and density estimates (No. estimated individuals per km²) of 'commic' / Forster's terns in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Apr-19	1	10	0.01	1	0
May-19	1	10	0.01	1	0
Aug-19	1	10	0.01	1	0
Sep-19	3	30	0.03	3	0
Oct-19	2	20	0.02	2	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Apr-19	0	0	-	0	0
May-19	1	10	0.02	1	0
Aug-19	1	10	0.02	1	0
Sep-19	0	0	-	0	0
Oct-19	2	19	0.04	2	0
c) 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Apr-19	1	10	0.02	1	0
May-19	0	0	-	0	0
Aug-19	0	0	-	0	0
Sep-19	3	31	0.06	3	0
Oct-19	0	0	-	0	0

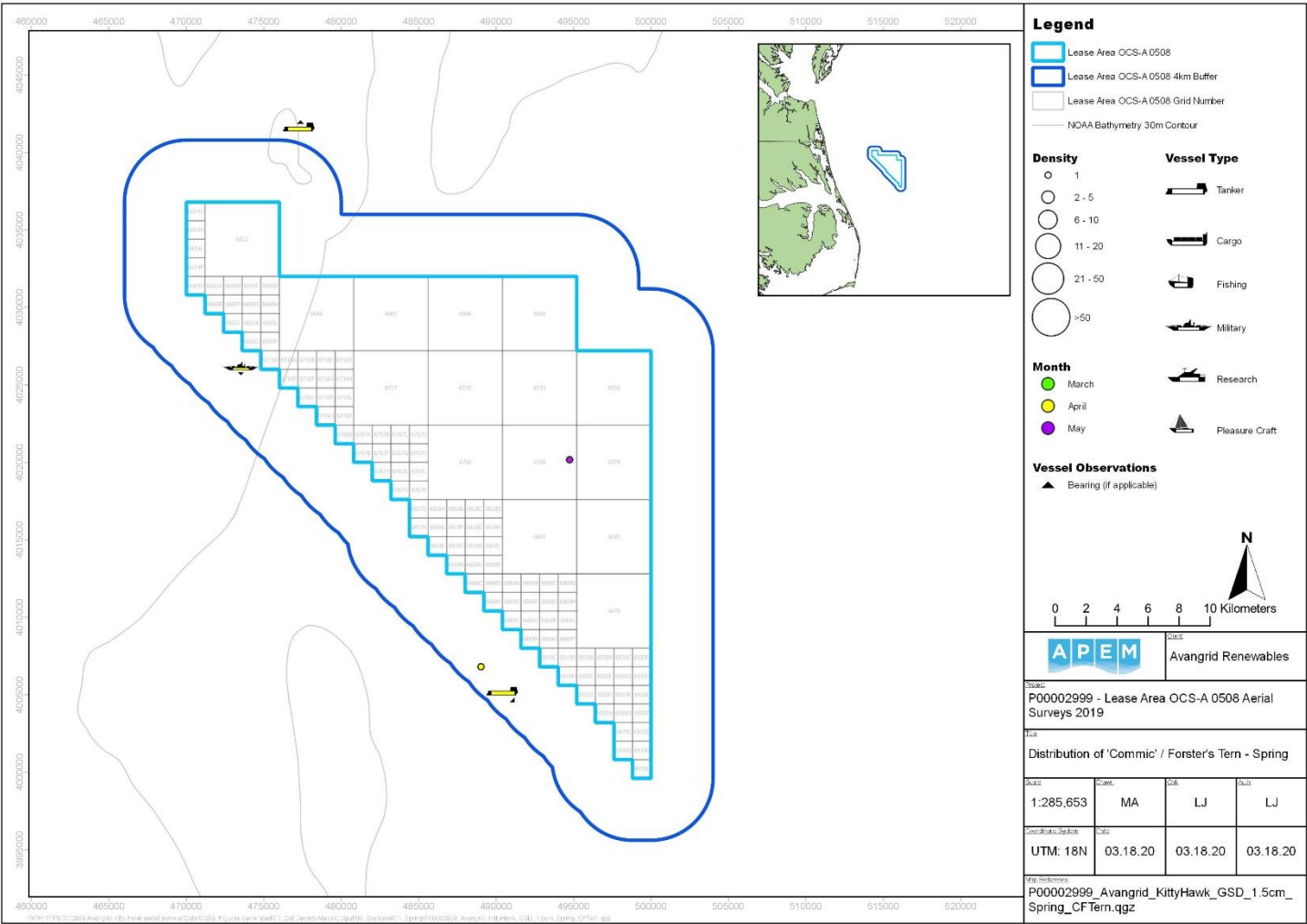


Figure 53 Distribution of 'commic' / Forster's terns recorded in Kitty Hawk plus 4 km buffer in the spring season

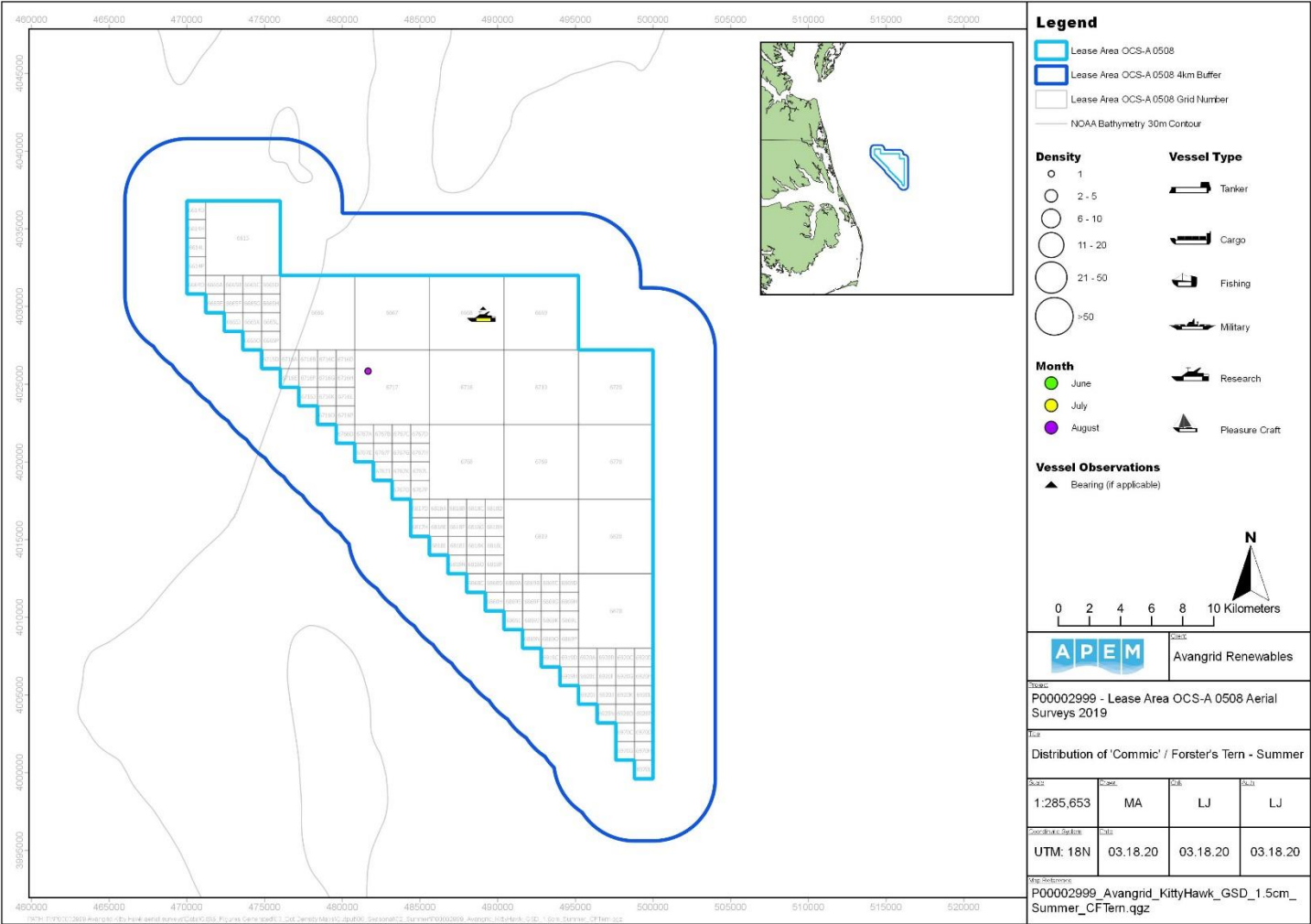


Figure 54 Distribution of 'commic' / Forster's terns recorded in Kitty Hawk plus 4 km buffer in the summer season



Figure 55 Distribution of 'commic' / Forster's terns recorded in Kitty Hawk plus 4 km buffer in the fall season

5.26 Species Unknown – Sterna Tern

Unidentified Sterna terns were recorded in May only, with a peak raw count of three in the 4 km buffer, leading to an abundance estimate of 31 (Table 38).

A total of three unidentified Sterna terns were recorded in the north of the 4 km buffer in May for the spring surveys (Figure 56).

Table 38 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified Sterna terns in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer						
Survey	Raw Count	Abundance	Density	Flying	Sitting	Perched
May-19	3	30	0.03	0	0	3
b) Kitty Hawk						
Survey	Raw Count	Abundance	Density	Flying	Sitting	Perched
May-19	0	0	-	0	0	0
c) 4 km Buffer						
Survey	Raw Count	Abundance	Density	Flying	Sitting	Perched
May-19	3	31	0.06	0	0	3

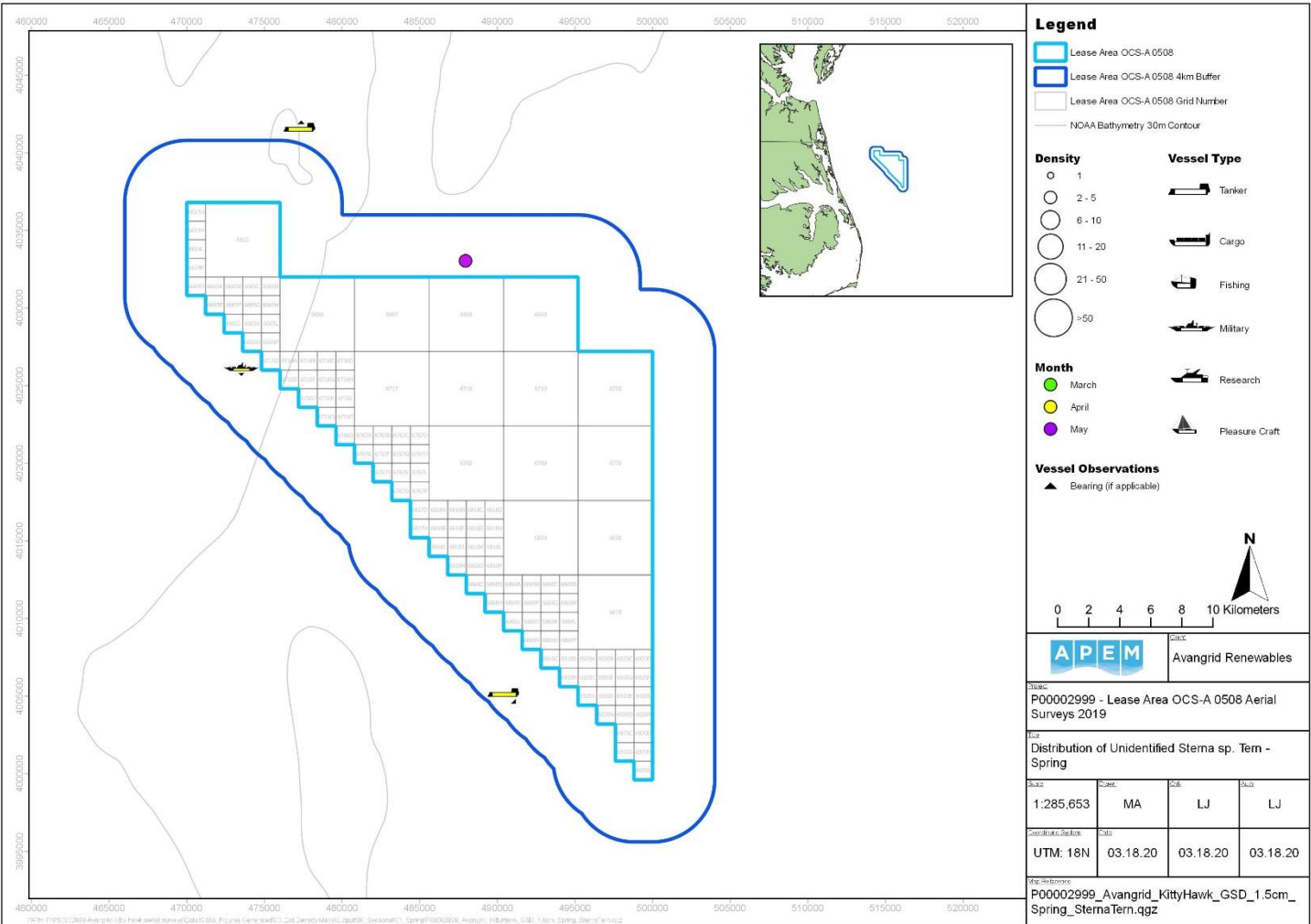


Figure 56 Distribution of unidentified Sterna terns recorded in Kitty Hawk plus 4 km buffer in the spring season

5.27 Dovekie

Dovekies were recorded in January only, with a raw count of one in the Kitty Hawk site, leading to an abundance estimate of ten (**Table 39**).

A total of one dovekie was recorded in the southwest of the Kitty Hawk site in January for the winter surveys (**Figure 57**).

Table 39 Raw counts and abundance and density estimates (No. estimated individuals per km²) of dovekies in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	1	10	0.01	0	1
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	1	10	0.02	0	1
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
May-19	0	0	-	0	0

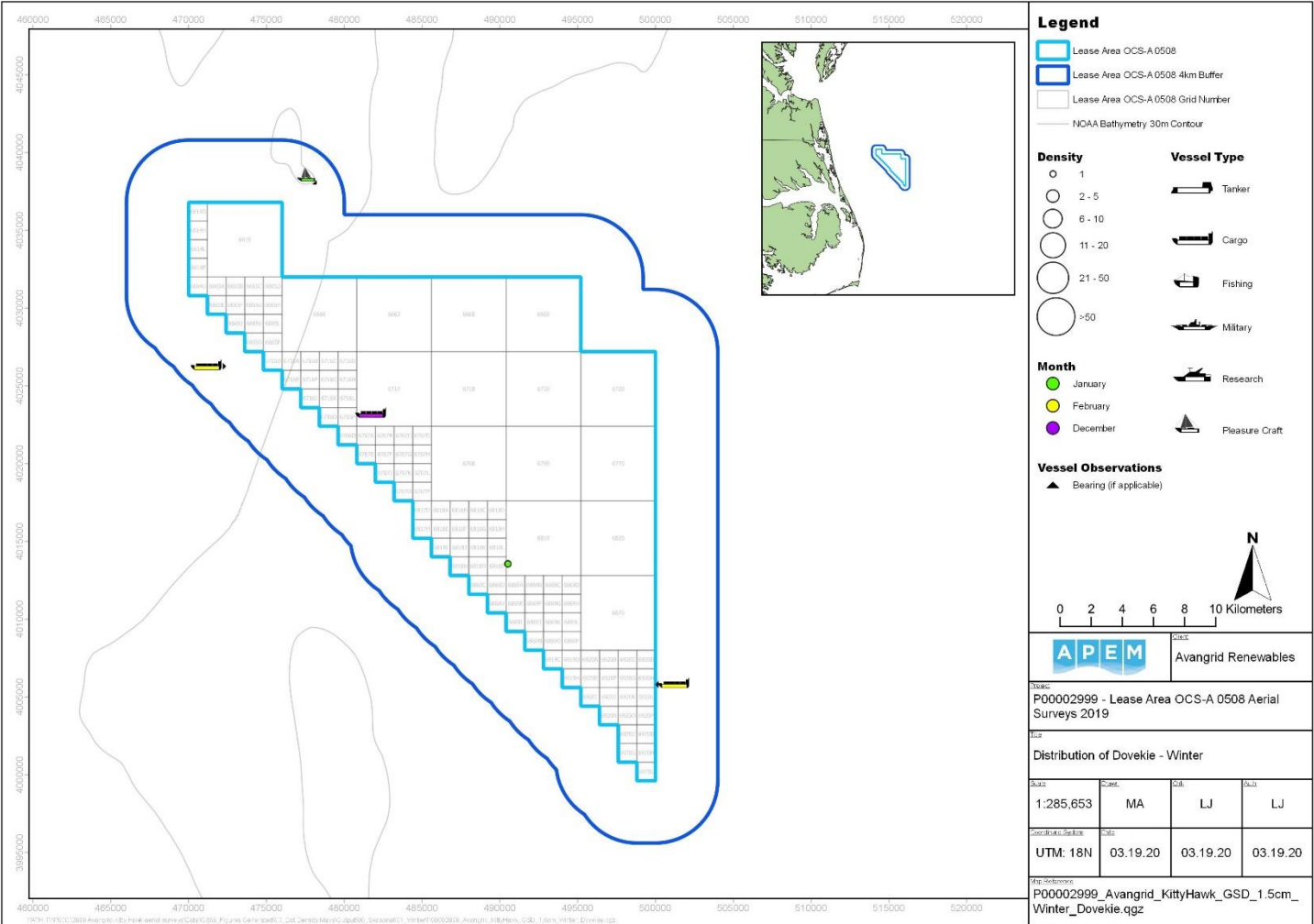


Figure 57 Distribution of dovekies recorded in Kitty Hawk plus 4 km buffer in the winter season

5.28 Common / Thick-billed Murre

Common / thick-billed murre were recorded in January only, with a peak raw count of five in the Kitty Hawk site, and three in the 4 km buffer, leading to abundance estimates of 48 and 31, respectively (Table 40). Sitting auk abundance corrections outlined in Appendix III were applied to common / thick-billed murre to allow for potential undetected diving targets. Corrected abundance estimates of 149 and 101 were calculated for the Kitty Hawk Site and the 4 km buffer respectively (Table 41). Results for all buffers are presented in Appendix IV: Table 1.

A total of eight common / thick-billed murre were recorded in Kitty Hawk plus 4 km buffer in January for the winter surveys (Figure 58). Individuals were located in the center of the Kitty Hawk site, as well as in the northwest and northeast of the 4 km buffer (Figure 58).

Table 40 Raw counts and abundance and density estimates (No. estimated individuals per km²) of common / thick-billed murre in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	8	80	0.08	0	8
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	5	48	0.1	0	5
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	3	31	0.06	0	3

Table 41 Corrected and apportioned abundance and density estimates of sitting common / thick-billed murre in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer – Sitting Birds				
Survey	Proportion	Abundance	Corrected	Density
Jan-19	0.03	194	254	0.25
b) Kitty Hawk – Sitting Birds				
Survey	Proportion	Abundance	Corrected	Density
Jan-19	0.03	114	149	0.30
c) 4 km buffer – Sitting Birds				
Survey	Proportion	Abundance	Corrected	Density
Jan-19	0.03	77	101	0.19

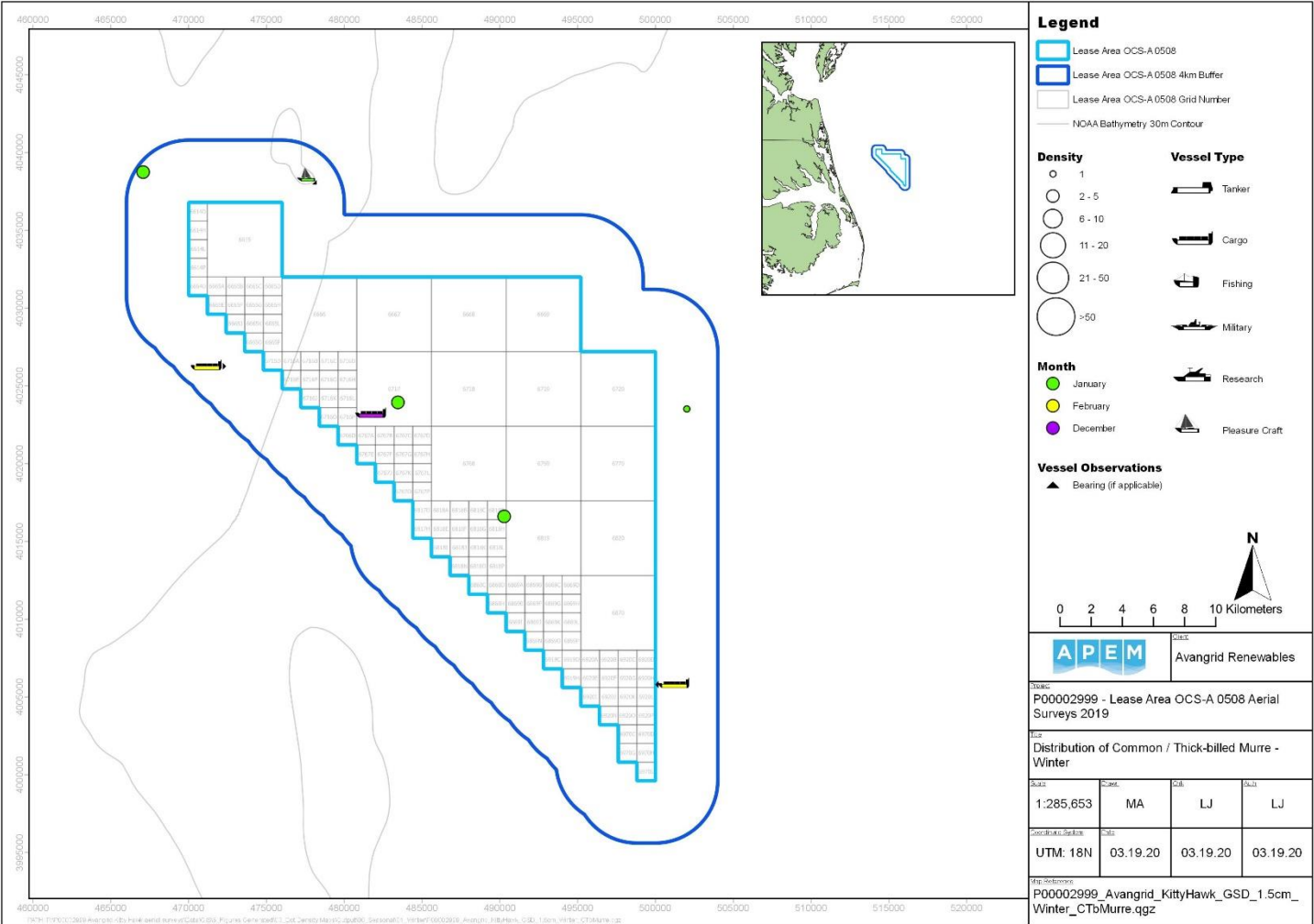


Figure 58 Distribution of common / thick-billed mures recorded in Kitty Hawk plus 4 km buffer in the winter season

5.29 Razorbill

Razorbills were only recorded in the winter months in the Kitty Hawk plus 4 km buffer (**Figure 59**). A peak raw count of 147 individuals in the Kitty Hawk site and 113 individuals in the 4 km buffer for January, lead to abundance estimates of 1419 and 1169, respectively (**Table 42**). Sitting auk abundance corrections outlined in Appendix III were applied to razorbill to allow for potential undetected diving targets. Corrected abundance estimates lead to peak estimates of 4069 and 3462 in January for the Kitty Hawk site and the 4 km buffer respectively (**Table 43**). Results for all buffers are presented in Appendix IV: Table 2.

A total of 286 razorbills were recorded in Kitty Hawk plus 4 km buffer in the winter surveys (**Figure 59**), of which 260 were recorded in January, 22 were recorded in February, and four were recorded in December (**Table 42**). Individuals were distributed throughout the survey area, with greater densities recorded towards the center and west of the survey area, particularly in January (**Figure 59**).

Table 42 Raw counts and abundance and density estimates (No. estimated individuals per km²) of razorbills in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	260	2600	2.54	5	255
Feb-19	22	220	0.21	6	16
Dec-19	4	40	0.04	1	3
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	147	1419	2.86	0	147
Feb-19	13	126	0.25	4	9
Dec-19	3	29	0.06	0	3
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	113	1169	2.21	5	108
Feb-19	9	93	0.18	2	7
Dec-19	1	10	0.02	1	0

Table 43 Corrected and apportioned abundance and density estimates of sitting common / thick-billed murre in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer – Sitting Birds				
Survey	Proportion	Abundance	Corrected	Density
Jan-19	0.97	6245	7560	7.38
Feb-19	1	200	242	0.24
Dec-19	1	30	36	0.04
b) Kitty Hawk – Sitting Birds				

Survey	Proportion	Abundance	Corrected	Density
Jan-19	0.97	3361	4069	8.21
Feb-19	1	116	140	0.28
Dec-19	1	29	35	0.07
c) 4 km buffer – Sitting Birds				
Survey	Proportion	Abundance	Corrected	Density
Jan-19	0.97	2860	3462	6.55
Feb-19	1	82	99	0.19
Dec-19	1	0	0	0

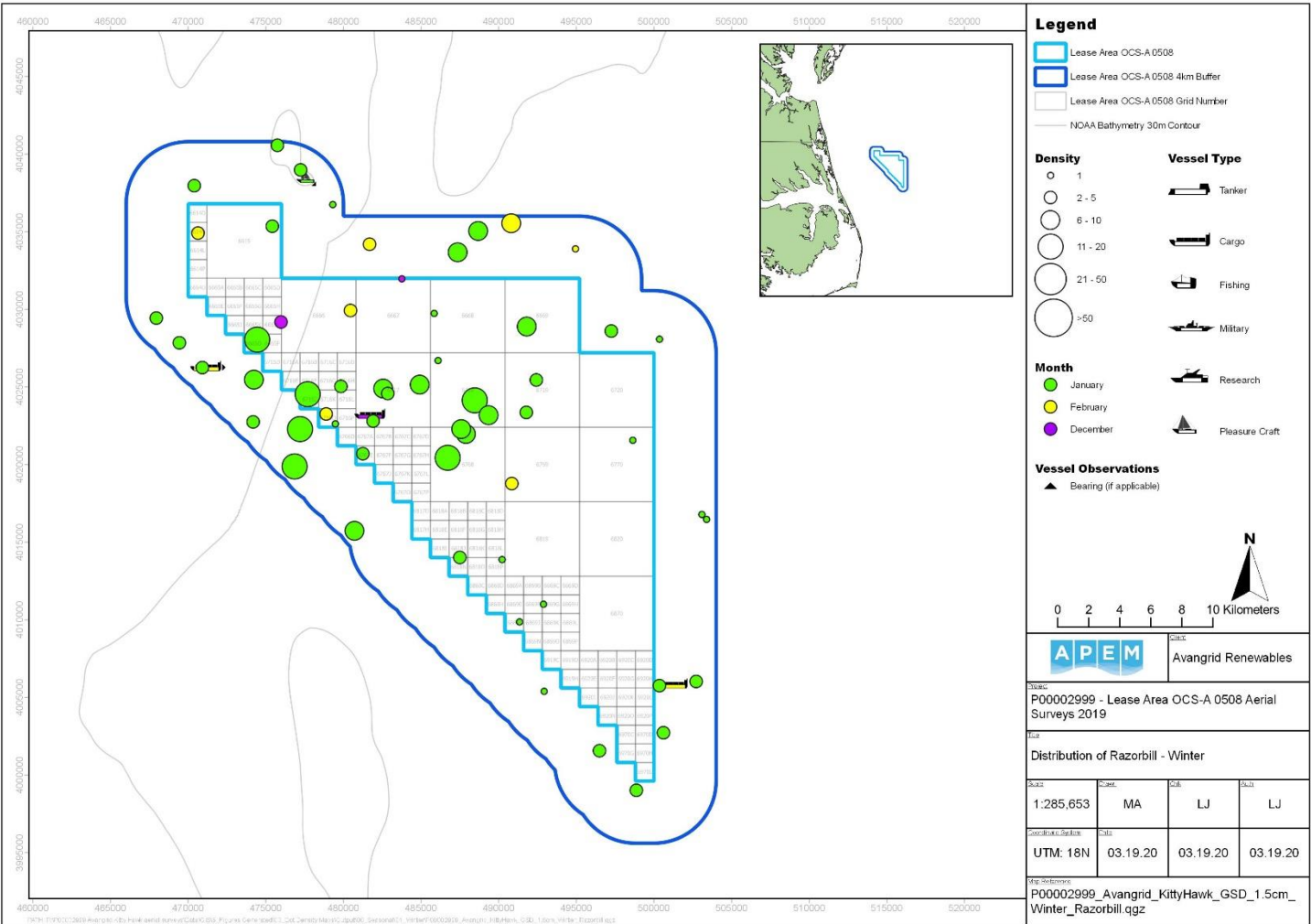


Figure 59 Distribution of razorbills recorded in Kitty Hawk plus 4 km buffer in the winter season

5.30 Murre / Razorbill

Murre / razorbills were recorded in January and February only in the Kitty Hawk plus 4 km buffer (**Figure 60**). A peak raw count of 208 individuals recorded in the Kitty Hawk site and 173 individuals in the 4 km buffer for January, lead to abundance estimates of 2008 and 1789 respectively (**Table 44**).

A total of 385 murre / razorbills were recorded in Kitty Hawk plus 4 km buffer in the winter surveys (**Figure 60**), of which 381 were recorded in January, and four were recorded in February (**Table 44**). Individuals were distributed throughout the survey area in January, with denser concentrations in the center and southeast, and in the center of the Kitty Hawk site in February (**Figure 60**).

Table 44 Raw counts and abundance and density estimates (No. estimated individuals per km²) of murre / razorbills in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	381	3809	3.72	0	381
Feb-19	4	40	0.04	0	4
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	208	2008	4.05	0	208
Feb-19	3	29	0.06	0	3
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	173	1789	3.38	0	173
Feb-19	1	10	0.02	0	1

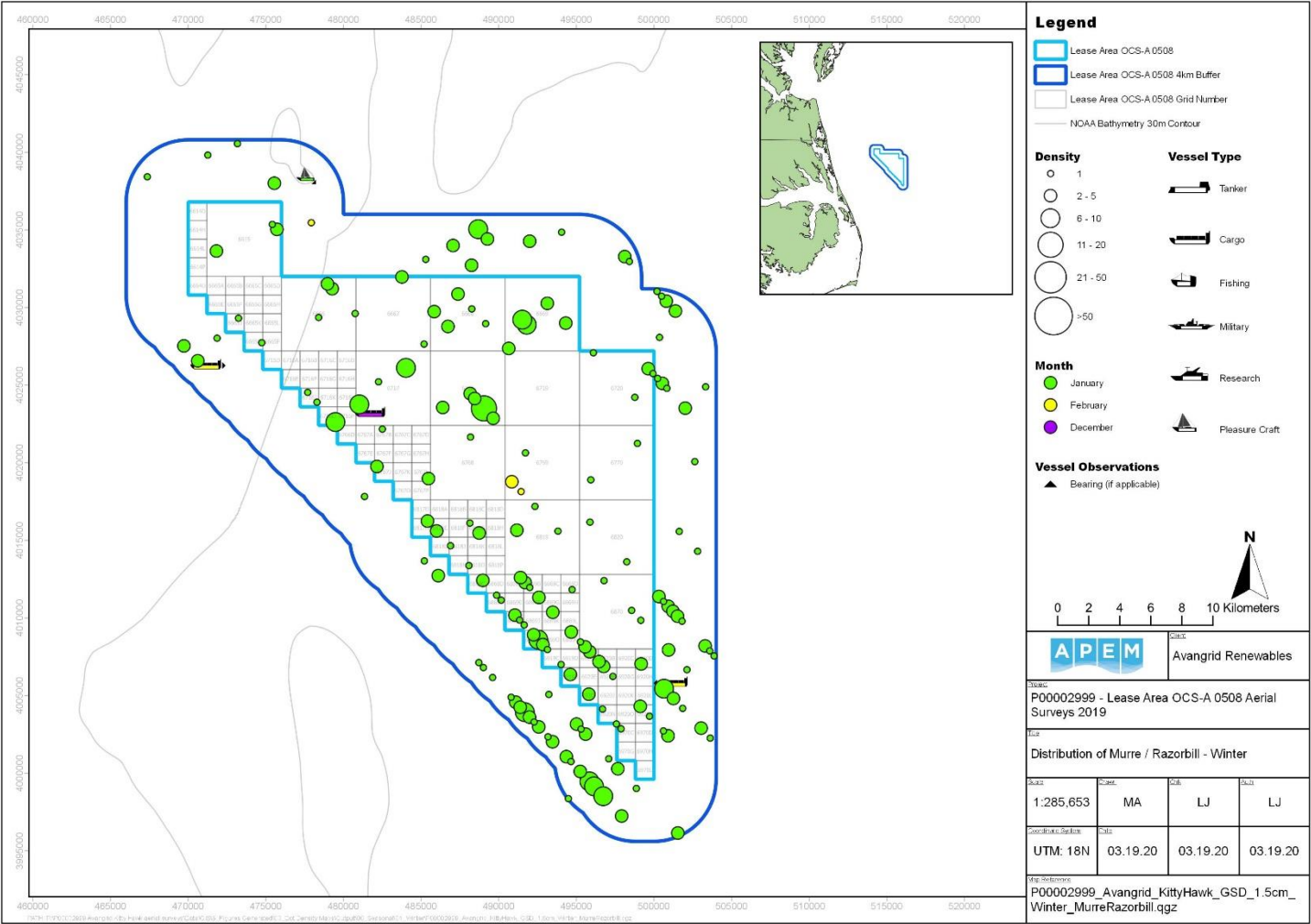


Figure 60 Distribution of murre / razorbills recorded in Kitty Hawk plus 4 km buffer in the winter season

5.31 Atlantic Puffin

Atlantic puffins were recorded in January and February only in Kitty Hawk plus 4 km buffer (Figure 61). A peak raw count of 73 individuals recorded in the Kitty Hawk site and 125 individuals in the 4 km buffer for January, lead to abundance estimates of 705 and 1293 respectively (Table 45).

A total of 201 Atlantic puffins were recorded in Kitty Hawk plus 4 km buffer in the winter surveys (Figure 61), of which 198 were recorded in January, and three were recorded in February (Table 45). Individuals were distributed throughout the survey area in January, with greater densities in the southeast, and distributed in the center of the Kitty Hawk site and north of the 4 km buffer for February (Figure 61).

Table 45 Raw counts and abundance and density estimates (No. estimated individuals per km²) of Atlantic puffins in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	198	1980	1.93	0	198
Feb-19	3	30	0.03	0	3
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	73	705	1.42	0	73
Feb-19	2	19	0.04	0	2
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan-19	125	1293	2.44	0	125
Feb-19	1	10	0.02	0	1

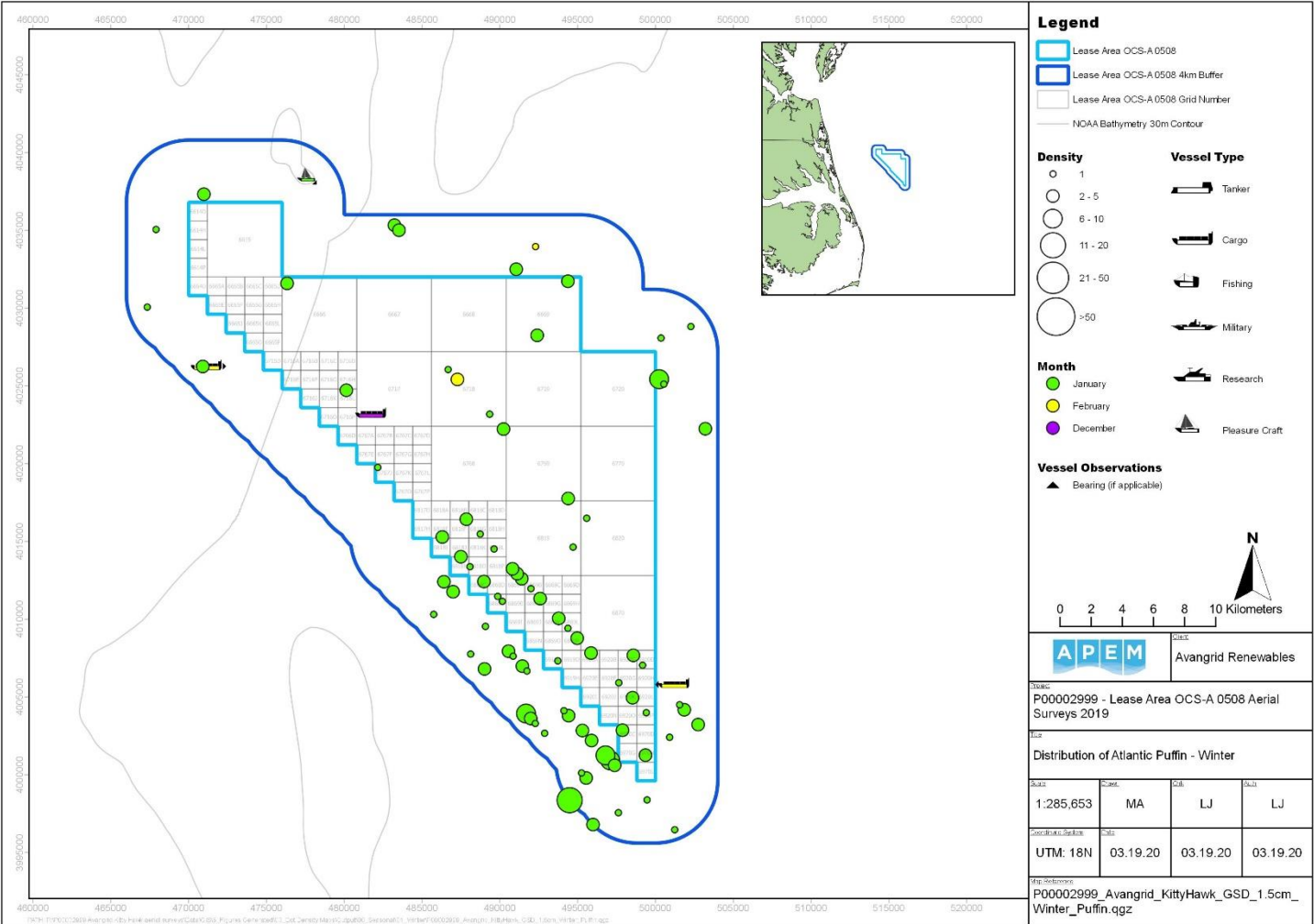


Figure 61 Distribution of Atlantic puffins recorded in Kitty Hawk plus 4 km buffer in the winter season

5.32 Species Unknown – Passerine

Unidentified passerines were recorded in October only in the 4 km buffer (**Figure 62**), with a raw count of one, leading to abundance estimates of ten (**Table 46**).

A total of one unidentified passerine was recorded in the northwest of the 4 km buffer in October for the fall surveys (**Figure 62**).

Table 46 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified passerines in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Oct-19	1	10	0.01	1	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Oct-19	0	0	-	0	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Oct-19	1	10	0.02	1	0



Figure 62 Distribution of unidentified passerines recorded in Kitty Hawk plus 4 km buffer in the fall season

5.33 Species Unknown – Whale

An unidentified whale was recorded in April only in the Kitty Hawk site (**Figure 63**), with a raw count of one, leading to an abundance estimate of ten (**Table 47**).

A total of one unidentified whale was recorded in the northwest of the Kitty Hawk site in April for the spring surveys (**Figure 63**).

Table 47 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified whales in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	1	10	0.01	1	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	1	10	0.02	1	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	0	0	-	0	0

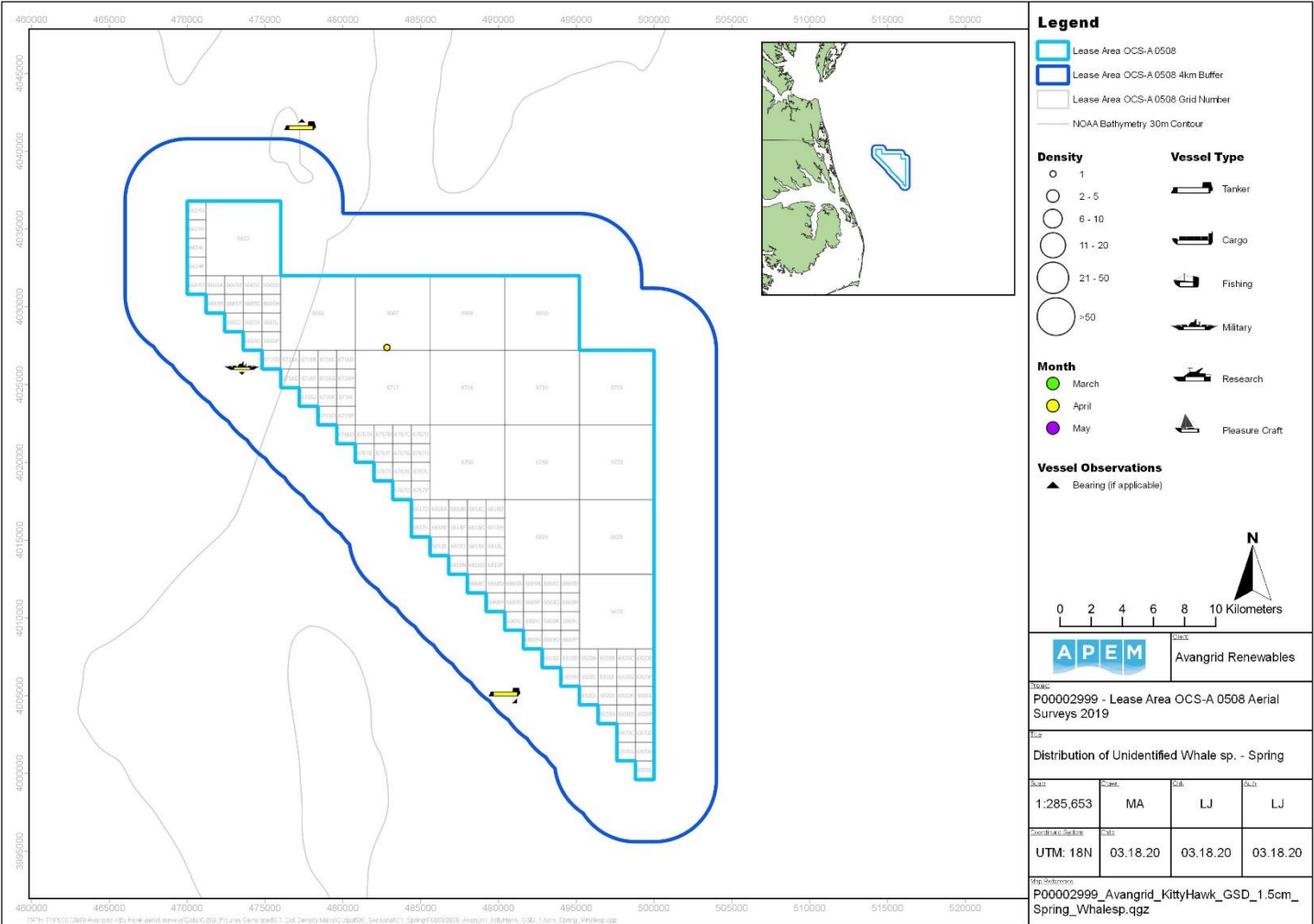


Figure 63 Distribution of unidentified whales recorded in Kitty Hawk plus 4 km buffer in the spring season

5.34 Common Dolphin

Common dolphins were recorded in January and March, with highest numbers recorded in spring (**Table 48**). A peak raw count of 22 individuals in the 4 km buffer for March, lead to an abundance estimate of 220 (**Table 48**).

A total of 22 common dolphins were recorded in the east and northwest of the 4 km buffer in March for the spring surveys (**Figure 64**). For the winter surveys, nine common dolphins were recorded in March in the northwest of the Kitty Hawk site and east of the 4 km buffer (**Figure 65**).

Table 48 Raw counts and abundance and density estimates (No. estimated individuals per km²) of common dolphins in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jan-19	9	90	0.09	9	0
Mar-19	22	220	0.21	20	2
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jan-19	5	48	0.1	5	0
Mar-19	0	0	-	0	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jan-19	4	41	0.08	4	0
Mar-19	22	228	0.43	20	2

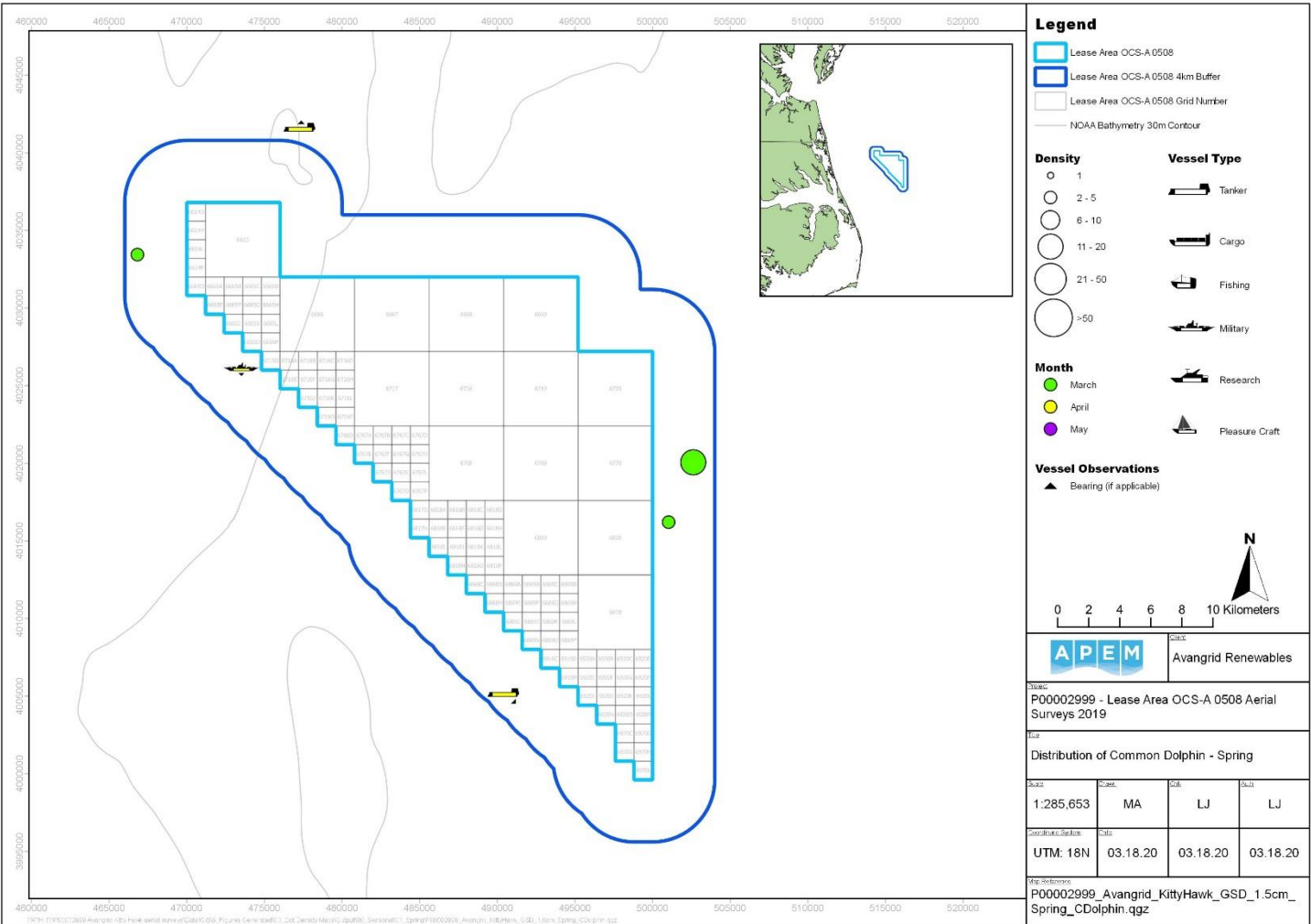


Figure 64 Distribution of common dolphins recorded in Kitty Hawk plus 4 km buffer in the spring season

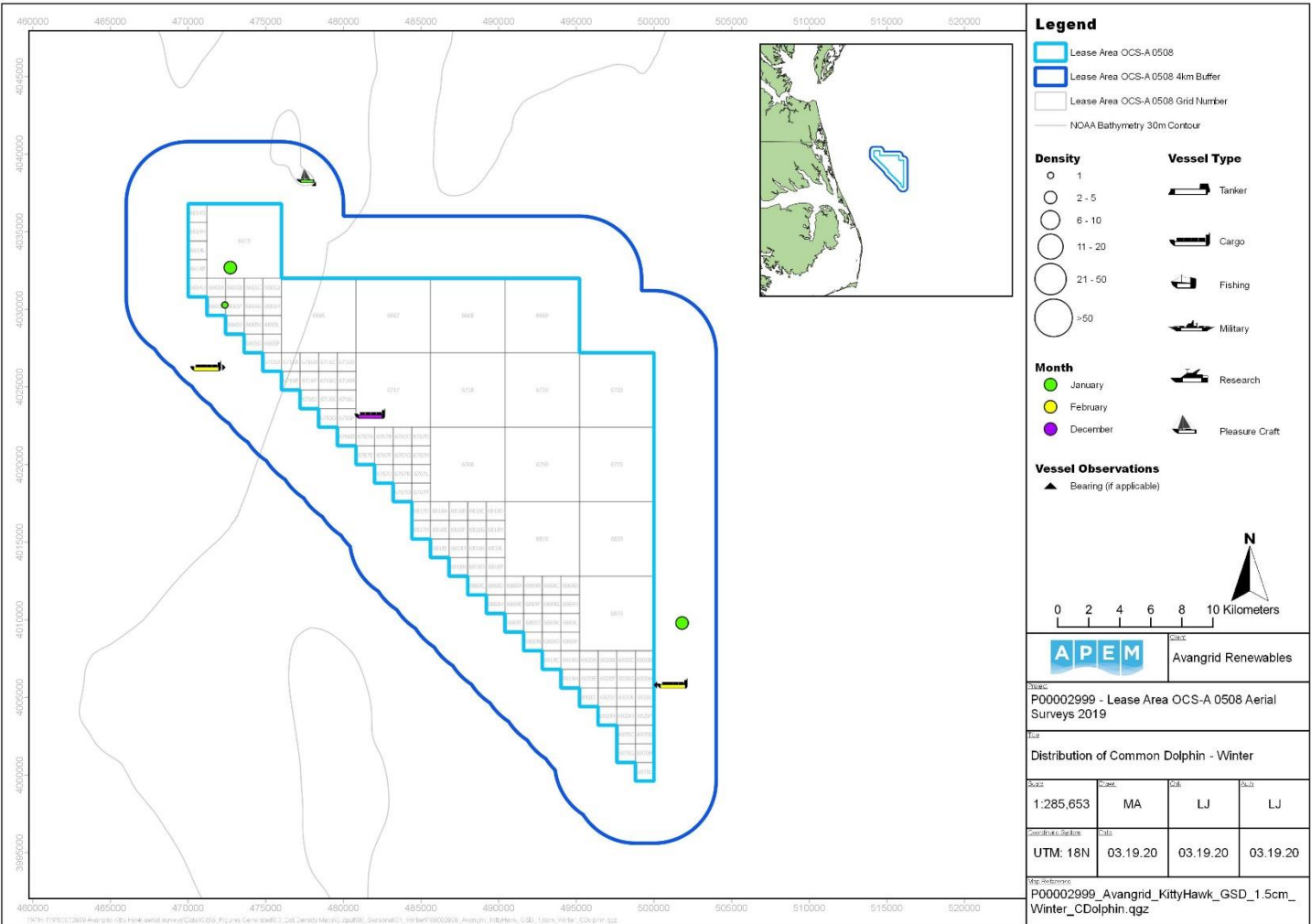


Figure 65 Distribution of common dolphins recorded in Kitty Hawk plus 4 km buffer in the winter season

5.35 Pantropical Spotted Dolphin

Pantropical spotted dolphins were recorded in January only in the Kitty Hawk site (Figure 66), with a peak raw count of two, leading to an abundance estimate of 20 (Table 49).

A total of two pantropical spotted dolphins were recorded in the center of the Kitty Hawk site in January for the winter surveys (Figure 66).

Table 49 Raw counts and abundance and density estimates (No. estimated individuals per km²) of pantropical spotted dolphins in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jan-19	2	20	0.02	1	1
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jan-19	2	19	0.04	1	1
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jan-19	0	0	-	0	0

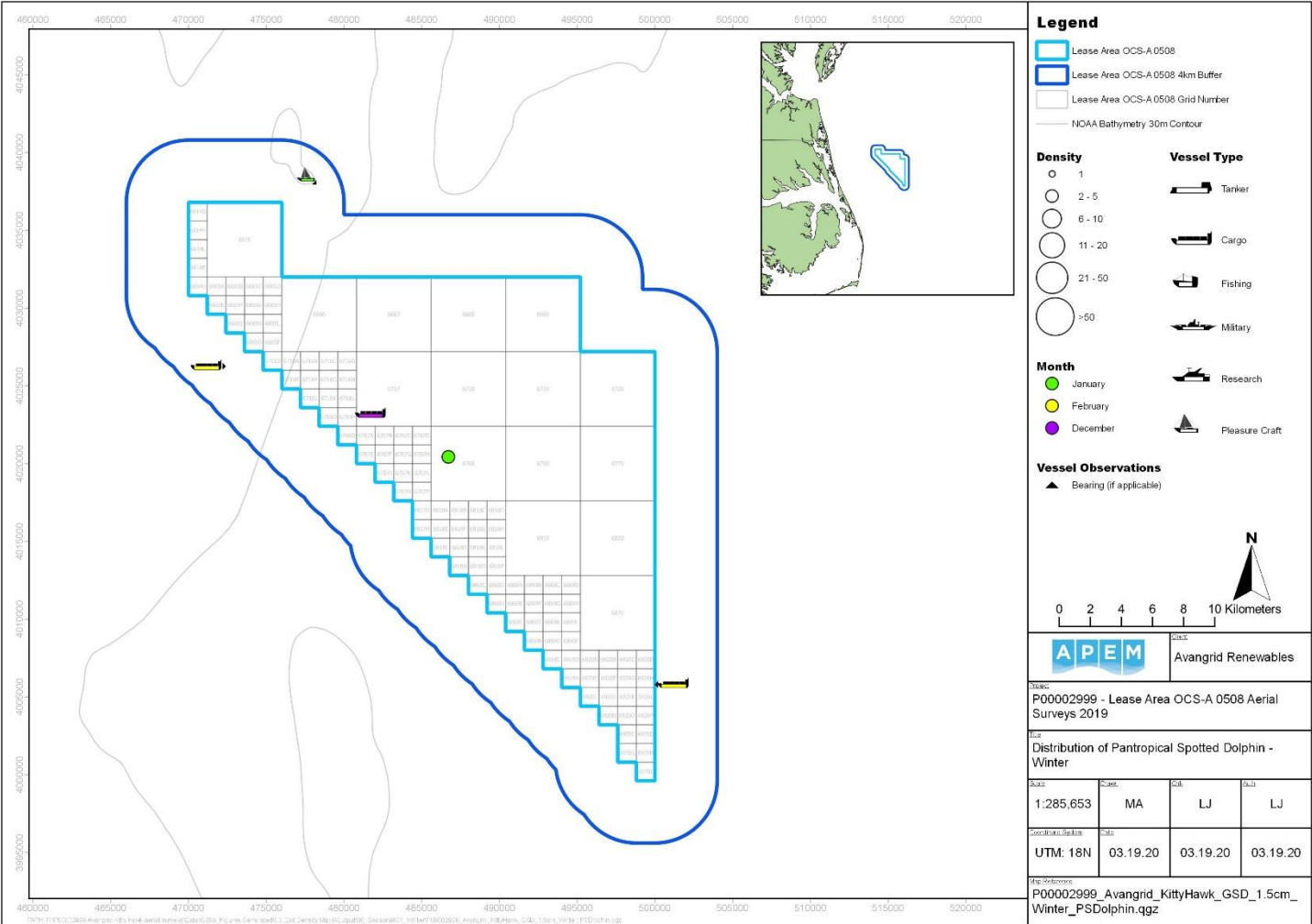


Figure 66 Distribution of pantropical spotted dolphins recorded in Kitty Hawk plus 4 km buffer in the winter season

5.36 Atlantic Spotted Dolphin

Atlantic spotted dolphins were recorded in all seasons bar winter, with highest numbers recorded in spring (**Table 50**). A peak raw count of three individuals in the Kitty Hawk site for October, and 17 in the 4 km buffer for August, lead to abundance estimates of 30 and 176 respectively (**Table 50**).

A total of 18 Atlantic spotted dolphins were recorded in Kitty Hawk plus 4 km buffer for the spring surveys (**Figure 67**), of which ten were recorded in March, and eight were recorded in April (**Table 50**). Individuals were located in the east of both the Kitty Hawk site and the 4 km buffer for March, and in the northeast of the 4 km buffer for April (**Figure 67**). For the summer surveys, a total of 17 Atlantic spotted dolphins were recorded primarily in the south of the 4 km buffer in August (**Figure 68**). For the fall surveys, a total of three Atlantic spotted dolphins were recorded in the center of the Kitty Hawk site in October (**Figure 69**).

Table 50 Raw counts and abundance and density estimates (No. estimated individuals per km²) of Atlantic spotted dolphins in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Mar-19	10	100	0.1	10	0
Apr-19	8	80	0.08	7	1
Aug-19	17	170	0.17	13	4
Oct-19	3	30	0.03	3	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Mar-19	2	19	0.04	2	0
Apr-19	0	0	-	0	0
Aug-19	0	0	-	0	0
Oct-19	3	29	0.06	3	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Mar-19	8	83	0.16	8	0
Apr-19	8	83	0.16	7	1
Aug-19	17	176	0.33	13	4
Oct-19	0	0	-	0	0

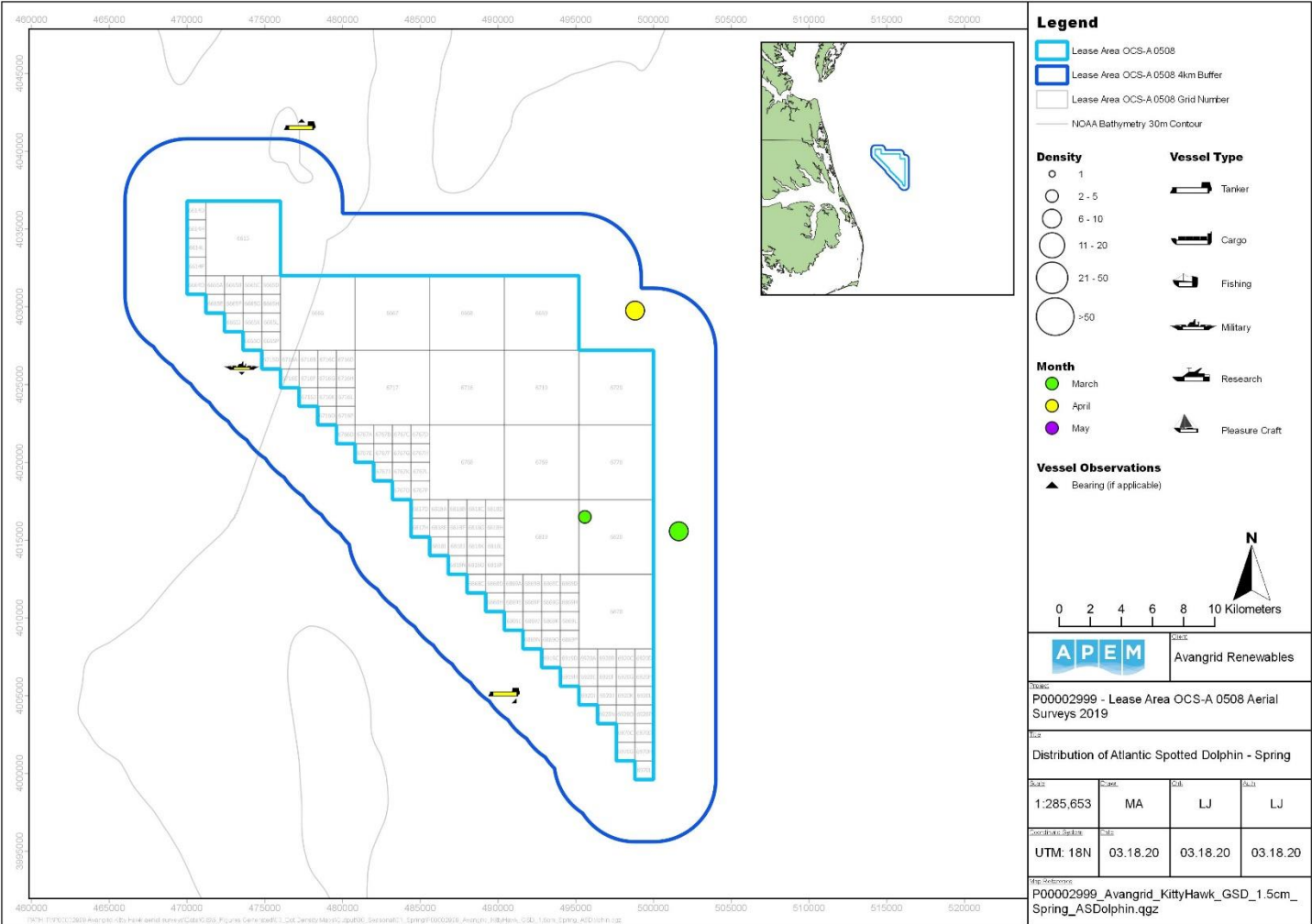


Figure 67 Distribution of Atlantic spotted dolphins recorded in Kitty Hawk plus 4 km buffer in the spring season

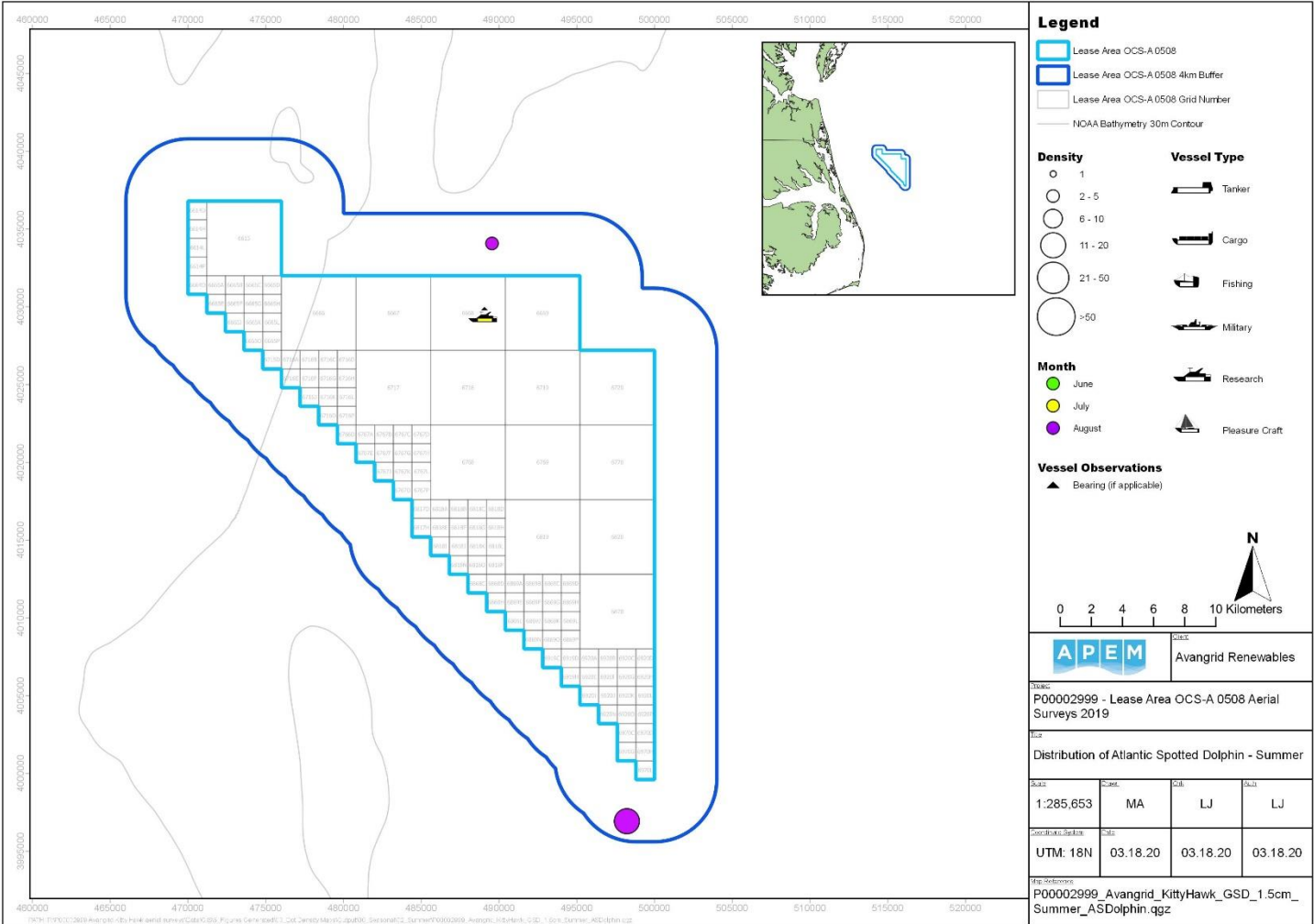


Figure 68 Distribution of Atlantic spotted dolphins recorded in Kitty Hawk plus 4 km buffer in the summer season

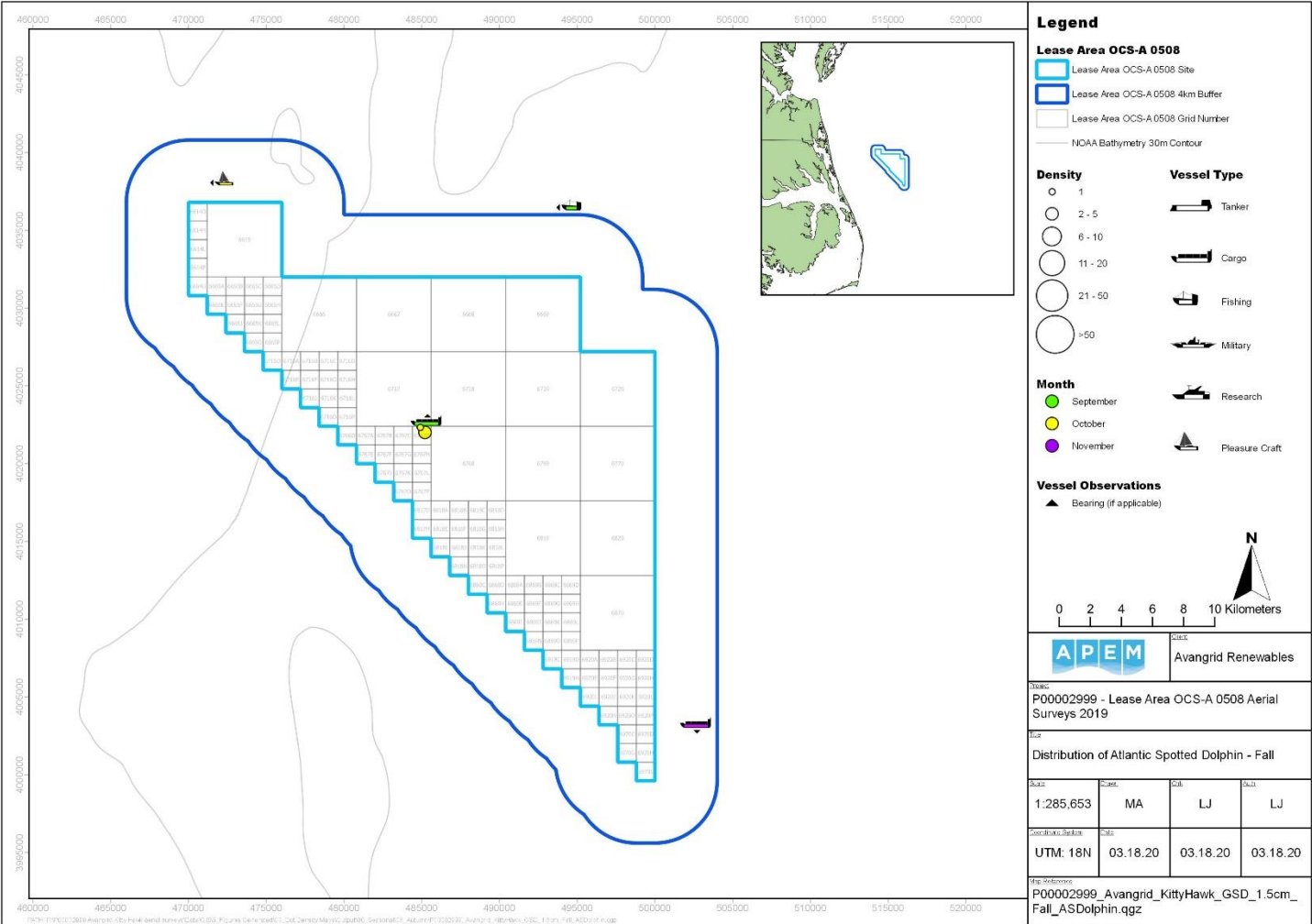


Figure 69 Distribution of Atlantic spotted dolphins recorded in Kitty Hawk plus 4 km buffer in the fall season

5.37 Common Bottlenose Dolphin

Common bottlenose dolphins were recorded in January and March only, with highest numbers recorded in spring (**Table 51**). A peak raw count of eleven individuals in the 4 km buffer for March, lead to an abundance estimate of 110 (**Table 51**).

A total of eleven common bottlenose dolphins were recorded in the east of the 4 km buffer in March for the spring surveys (**Figure 70**). For the winter surveys, eight common bottlenose dolphins were recorded in the northeast of the Kitty Hawk site in January (**Figure 71**).

Table 51 Raw counts and abundance and density estimates (No. estimated individuals per km²) of common bottlenose dolphins in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jan-19	8	80	0.08	7	1
Mar-19	11	110	0.11	11	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jan-19	8	77	0.16	7	1
Mar-19	0	0	-	0	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jan-19	0	0	-	0	0
Mar-19	11	114	0.22	11	0

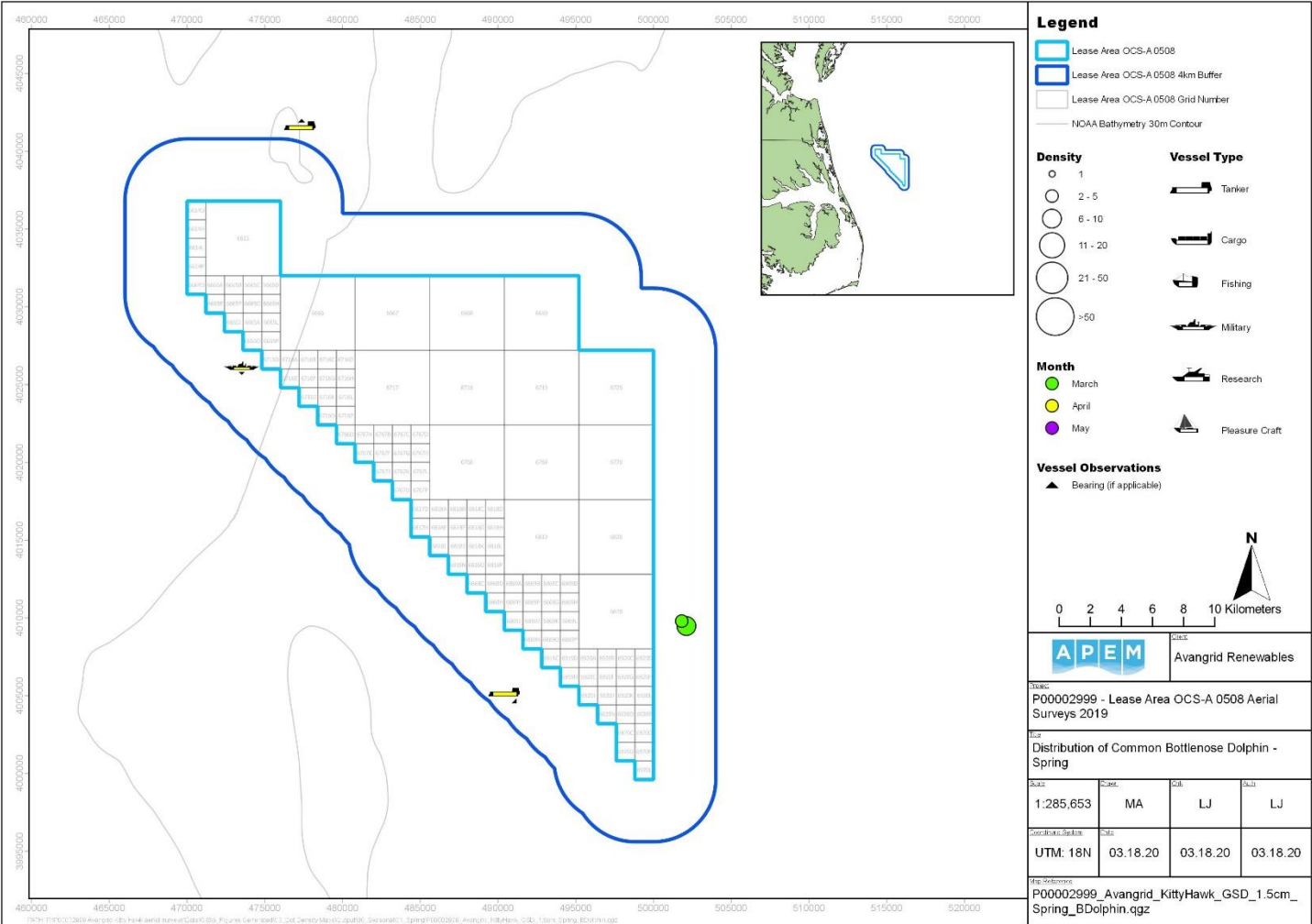


Figure 70 Distribution of common bottlenose dolphins recorded in Kitty Hawk plus 4 km buffer in the spring season

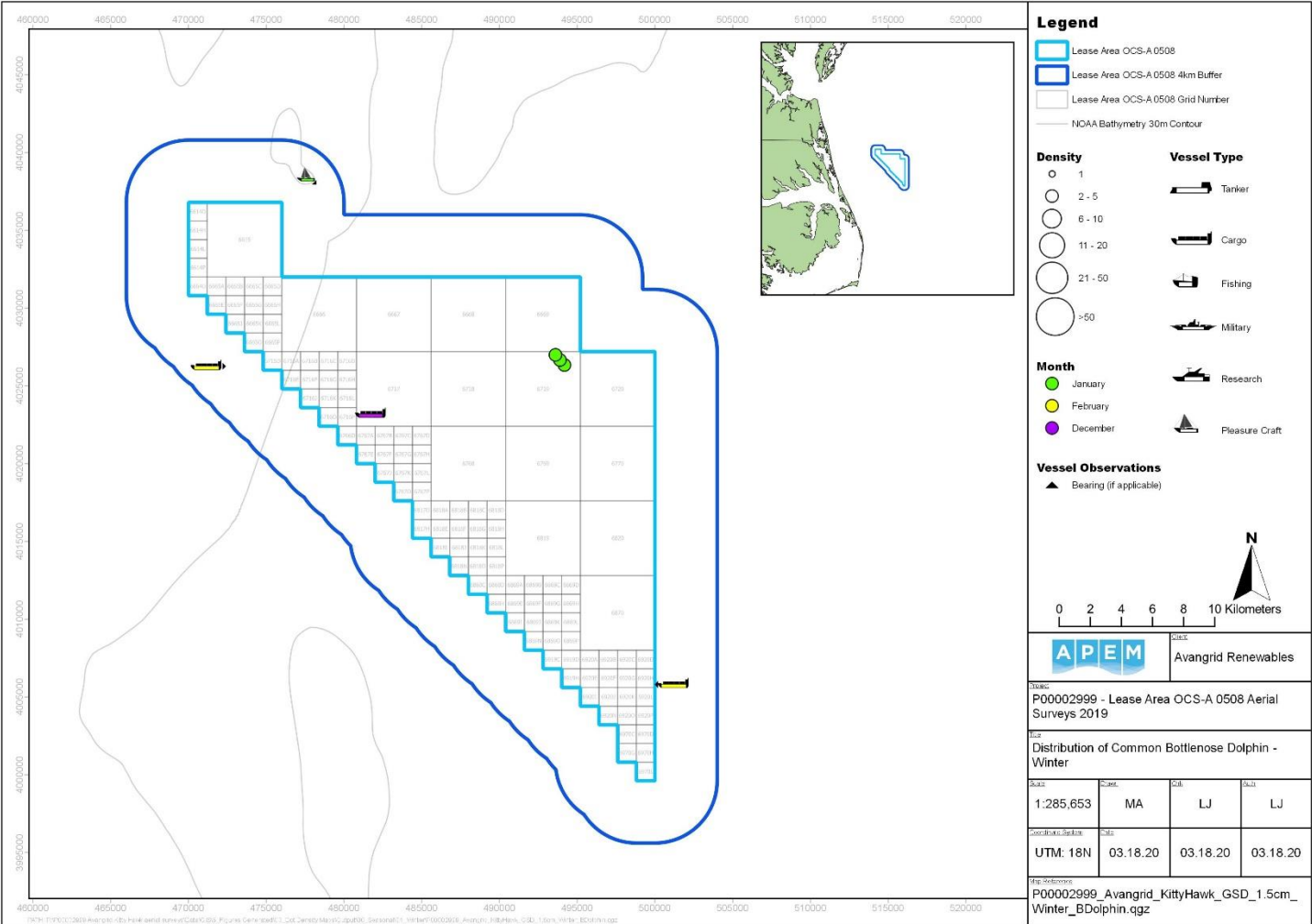


Figure 71 Distribution of common bottlenose dolphins recorded in Kitty Hawk plus 4 km buffer in the winter season

5.38 Common Bottlenose / Atlantic Spotted Dolphin

Common bottlenose / Atlantic spotted dolphins were recorded in January only in the Kitty Hawk site, with a peak raw count of nine, leading to an abundance estimate of 87 (Table 52).

A total of nine common bottlenose / Atlantic spotted dolphins were recorded in the center and northeast of the Kitty Hawk site in January for the winter surveys (Figure 72).

Table 52 Raw counts and abundance and density estimates (No. estimated individuals per km²) of common bottlenose / Atlantic spotted dolphins in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jan-19	9	90	0.09	8	1
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jan-19	9	87	0.18	8	1
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jan-19	0	0	-	0	0

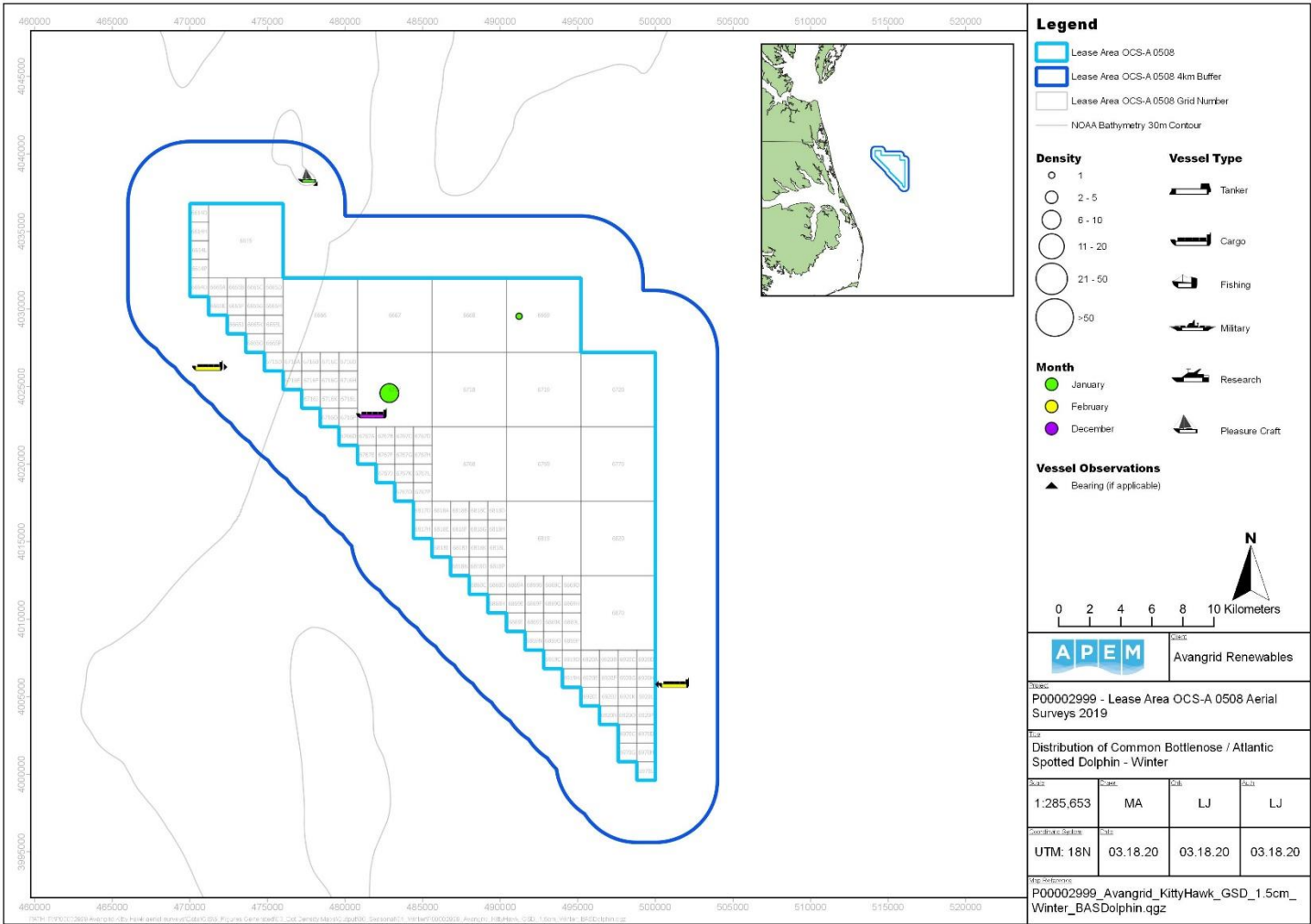


Figure 72 Distribution of common bottlenose / Atlantic spotted dolphins recorded in Kitty Hawk plus 4 km buffer in the winter season

5.39 Harbor Porpoise

A harbor porpoise was recorded in January only in the 4 km buffer, with a raw count of one, leading to an abundance estimate of ten (**Table 53**).

A total of one harbor porpoise was recorded in the west of the 4 km buffer in January for the winter surveys (**Figure 73**).

Table 53 Raw counts and abundance and density estimates (No. estimated individuals per km²) of harbor porpoises in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jan-19	1	10	0.01	0	1
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jan-19	0	0	-	0	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jan-19	1	10	0.02	0	1

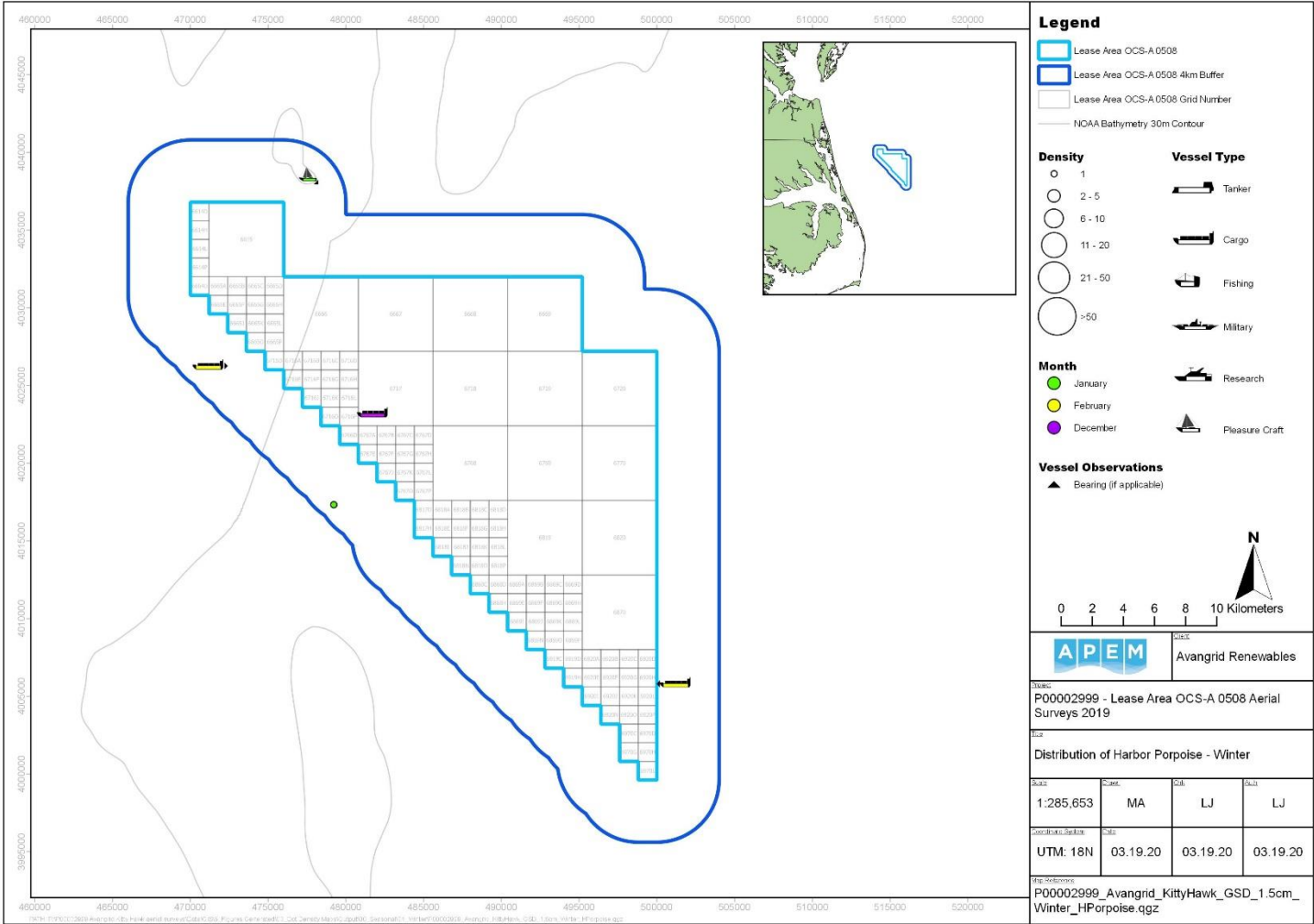


Figure 73 Distribution of harbor porpoises recorded in Kitty Hawk plus 4 km buffer in the winter season

5.40 Species Unknown – Dolphin

Unidentified dolphins were recorded in all four seasons, with highest numbers recorded in the spring (**Table 54**). A peak raw count of five individuals in the Kitty Hawk site, and 34 individuals in the 4 km buffer for March, lead to abundance estimates of 48 and 352 respectively (**Table 54**).

A total of 39 unidentified dolphins were recorded in the Kitty Hawk plus 4 km buffer in March for the spring surveys, located in the east of the survey area (**Figure 74**). For the summer surveys, 14 unidentified dolphins were recorded in the Kitty Hawk plus 4 km buffer (**Figure 75**), of which two were recorded in June, and 12 were recorded in August (**Table 54**). Individuals were located in the northwest of the 4 km buffer in June, and in the southeast of both the Kitty Hawk site and the 4 km buffer in August (**Figure 75**). For the fall surveys, three unidentified dolphins were recorded in the Kitty Hawk site (**Figure 76**), of which two were recorded in September, and one was recorded in October. Individuals were located in the east of the Kitty Hawk site for September, and in the center of the Kitty Hawk site for October (**Figure 76**). For the winter surveys, 25 unidentified dolphins were recorded in Kitty Hawk plus 4 km buffer (**Figure 77**), of which fourteen were recorded in January, and eleven were recorded in February (**Table 54**). Individuals were primarily located in the northwest of the Kitty Hawk site but also in the west of the 4 km buffer for January, and in the northwest of the survey area for February (**Figure 77**).

Table 54 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified dolphins in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jan-19	14	140	0.14	12	2
Feb-19	11	110	0.11	7	4
Mar-19	39	390	0.38	39	0
Jun-19	2	20	0.02	2	0
Aug-19	12	120	0.12	12	0
Sep-19	2	20	0.02	2	0
Oct-19	1	10	0.01	0	1
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jan-19	12	116	0.23	10	2
Feb-19	2	19	0.04	1	1
Mar-19	5	48	0.1	5	0
Jun-19	0	0	-	0	0
Aug-19	10	97	0.2	10	0
Sep-19	2	19	0.04	2	0
Oct-19	1	10	0.02	0	1
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jan-19	2	21	0.04	2	0

Feb-19	9	93	0.18	6	3
Mar-19	34	352	0.67	34	0
Jun-19	2	21	0.04	2	0
Aug-19	2	21	0.04	2	0
Sep-19	0	0	-	0	0
Oct-19	0	0	-	0	0

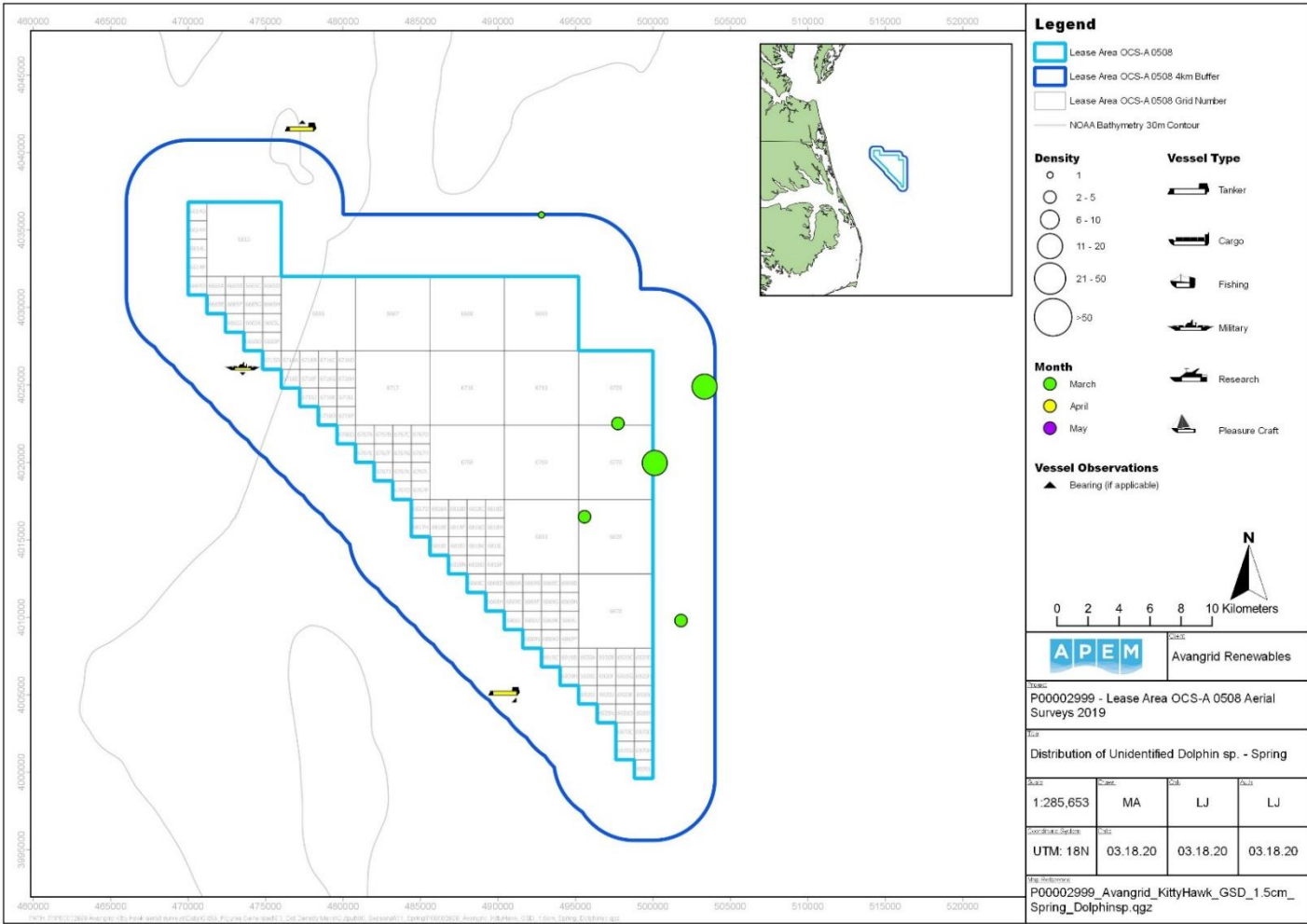


Figure 74 Distribution of unidentified dolphins recorded in Kitty Hawk plus 4 km buffer in the spring season

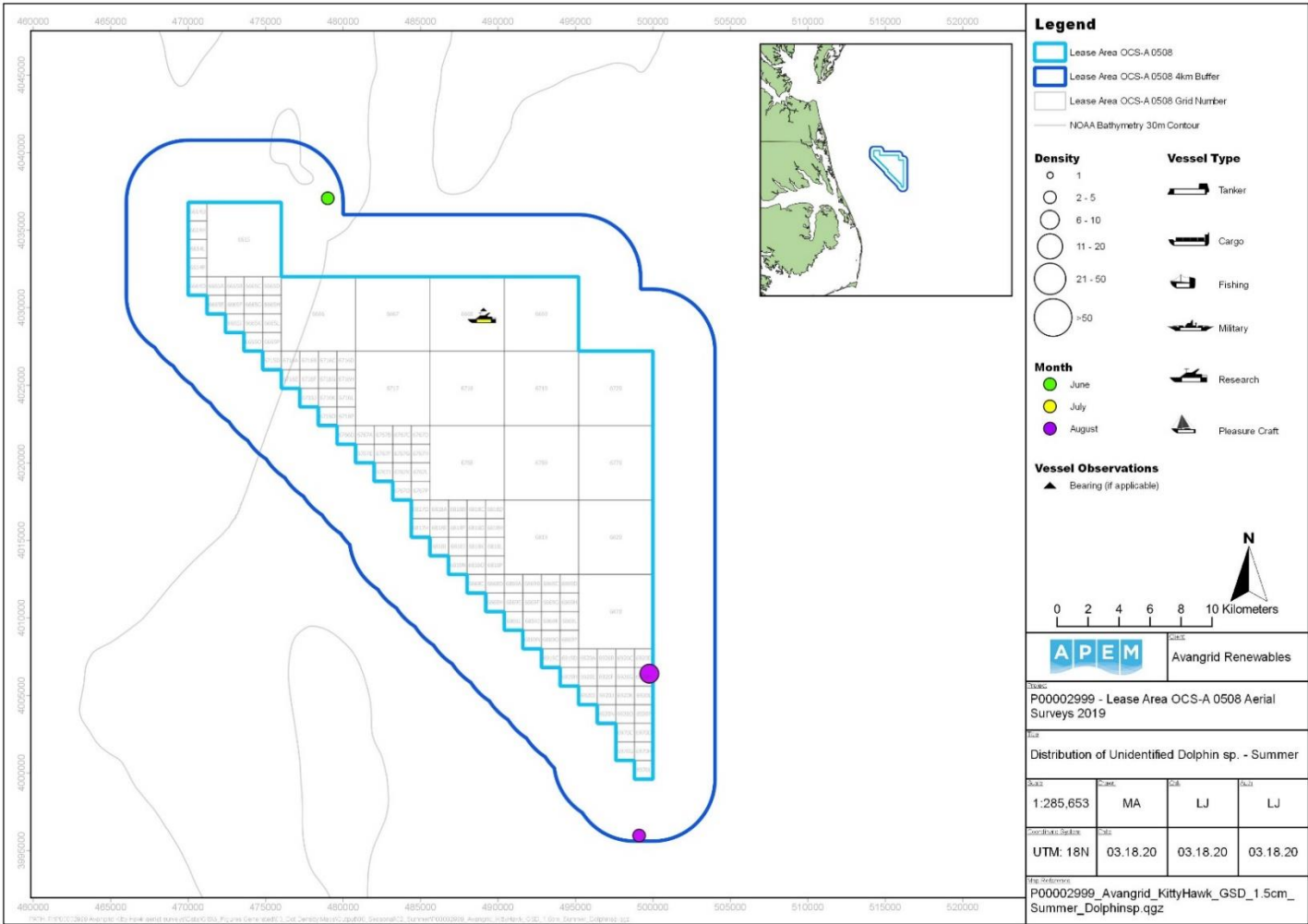


Figure 75 Distribution of unidentified dolphins recorded in Kitty Hawk plus 4 km buffer in the summer season

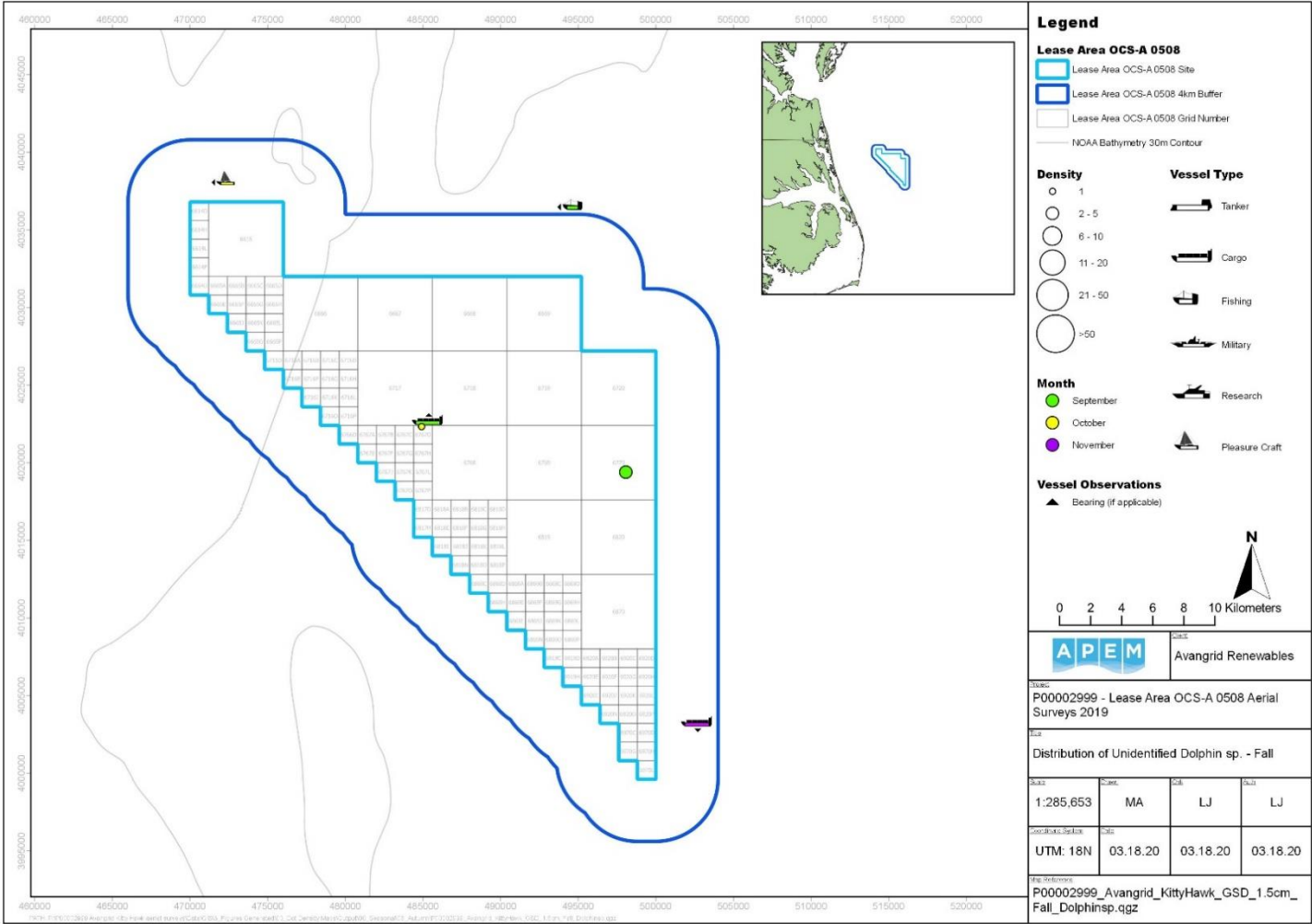


Figure 76 Distribution of unidentified dolphins recorded in Kitty Hawk plus 4 km buffer in the fall season

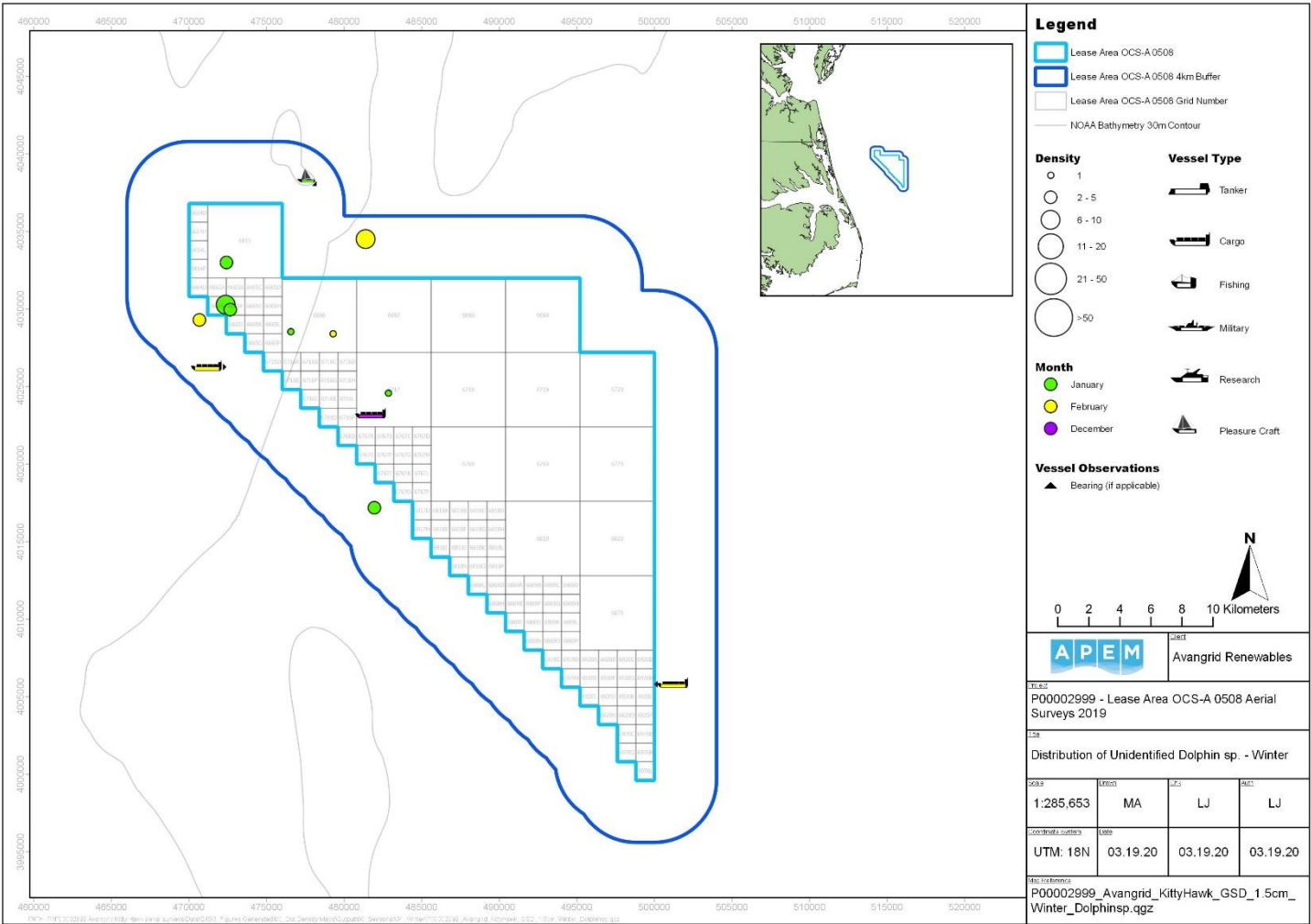


Figure 77 Distribution of unidentified dolphins recorded in Kitty Hawk plus 4 km buffer in the winter season

5.41 Species Unknown – Marine Mammals

An unidentified marine mammal was recorded in April only in the Kitty Hawk site, with a raw count of one, leading to an abundance estimate of ten (Table 55).

A total of one unidentified marine mammal was recorded in the southeast of the Kitty Hawk site in April for the spring surveys (Figure 78).

Table 55 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified marine mammals in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	1	10	0.01	1	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	1	10	0.02	1	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	0	0	-	0	0

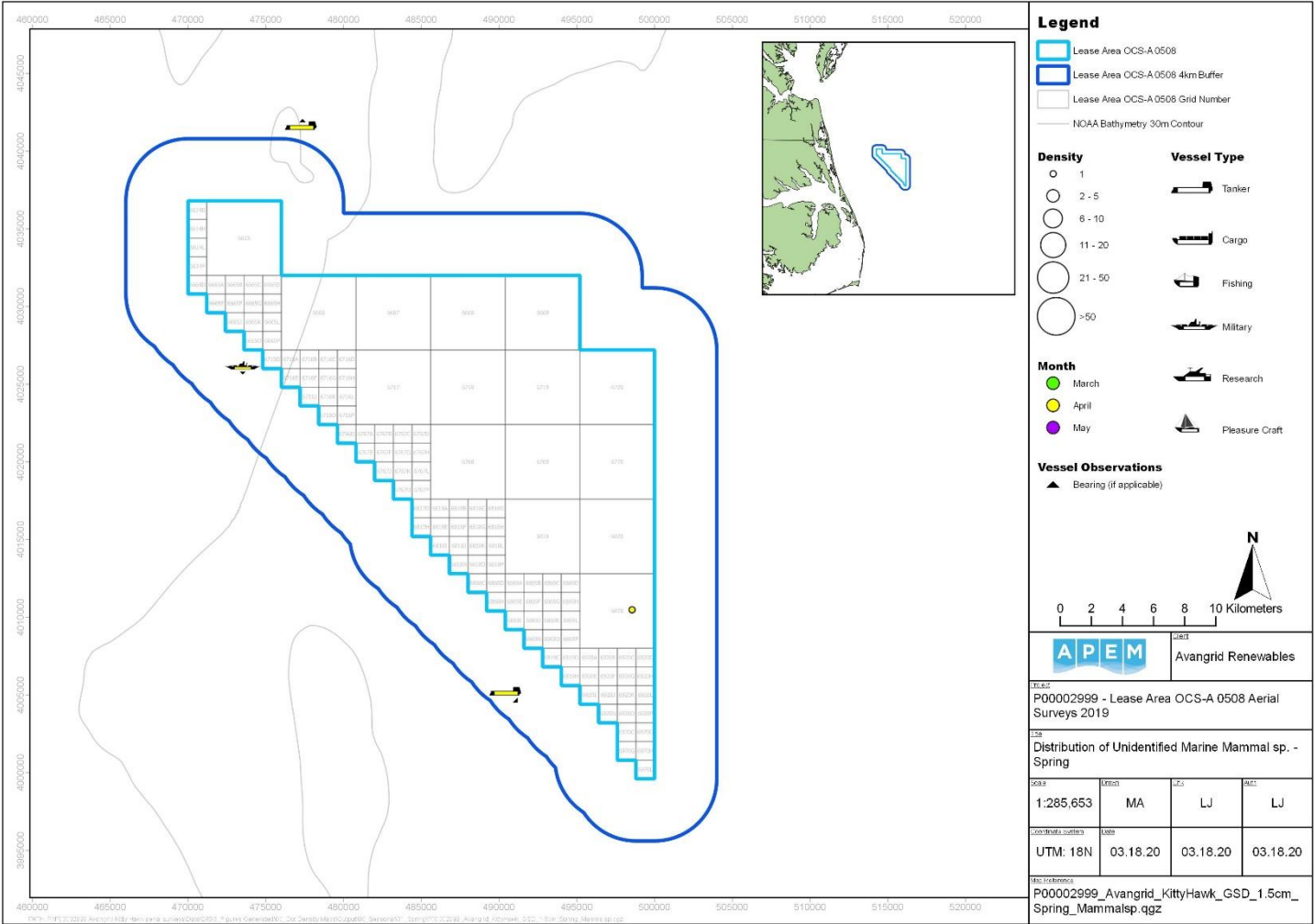


Figure 78 Distribution of unidentified marine mammals recorded in Kitty Hawk plus 4 km buffer in the spring season

5.42 Green Turtle

Green turtles were recorded in June and September only, with highest numbers recorded in summer (**Table 56**). A raw count of two individuals in the Kitty Hawk site for June, lead to an abundance estimate of 20 (**Table 56**).

A total of two green turtles were recorded in the Kitty Hawk site in June for the summer surveys (**Figure 79**). Individuals were located in the center and southeast of the Kitty Hawk site (**Figure 79**). For the fall surveys, one green turtle was recorded in September in the west of the Kitty Hawk site (**Figure 80**).

Table 56 Raw counts and abundance and density estimates (No. estimated individuals per km²) of green turtles in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun-19	2	20	0.02	2	0
Sep-19	1	10	0.01	1	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun-19	2	19	0.04	2	0
Sep-19	1	10	0.02	1	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun-19	0	0	-	0	0
Sep-19	0	0	-	0	0



Figure 79 Distribution of green turtles recorded in Kitty Hawk plus 4 km buffer in the summer season



Figure 80 Distribution of green turtles recorded in Kitty Hawk plus 4 km buffer in the fall season

5.43 Loggerhead Turtle

Loggerhead turtles were recorded in every month apart from January, with highest numbers recorded in spring (**Table 57**). A peak raw count of 38 individuals in the Kitty Hawk site, and 31 individuals in the 4 km buffer for May, lead to abundance estimates of 367 and 321 respectively (**Table 57**).

A total of 113 loggerhead turtles were recorded in the Kitty Hawk plus 4 km buffer in the spring surveys (**Figure 81**), of which two were recorded in March, 42 were recorded in April, and 69 were recorded in May (**Table 57**). Individuals were located in the east of the Kitty Hawk site for March, and throughout the survey area for April and May (**Figure 81**). For the summer surveys, a total of 91 loggerhead turtles were recorded in Kitty Hawk plus 4 km buffer (**Figure 82**), of which 28 were recorded in June, 34 were recorded in July, and 29 were recorded in August (**Table 57**). Individuals were distributed throughout the survey area for all months. For the fall surveys, a total of 25 loggerhead turtles were recorded in Kitty Hawk plus 4 km buffer (**Figure 83**), of which eight were recorded in September, 13 were recorded in October, and four were recorded in November (**Table 57**). Individuals were located primarily in the Kitty Hawk site, with some individuals located in the 4 km buffer for September and October (**Figure 83**). For the winter surveys, a total of five loggerhead turtles were recorded in Kitty Hawk plus 4 km buffer (**Figure 84**), of which one was recorded in February, and four were recorded in December (**Table 57**). Individuals were located in the southeast of the 4 km buffer for February, and were distributed evenly throughout the survey area for December (**Figure 84**).

Table 57 Raw counts and abundance and density estimates (No. estimated individuals per km²) of loggerhead turtles in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Feb-19	1	10	0.01	1	0
Mar-19	2	20	0.02	2	0
Apr-19	42	420	0.41	42	0
May-19	69	690	0.67	69	0
Jun-19	28	280	0.27	26	2
Jul-19	34	340	0.33	34	0
Aug-19	29	290	0.28	28	1
Sep-19	8	80	0.08	4	4
Oct-19	13	130	0.13	6	7
Nov-19	4	40	0.04	4	0
Dec-19	4	40	0.04	3	1
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Feb-19	0	0	-	0	0
Mar-19	2	19	0.04	2	0
Apr-19	29	280	0.57	29	0
May-19	38	367	0.74	38	0
Jun-19	12	116	0.23	12	0
Jul-19	13	126	0.25	13	0

Aug-19	18	174	0.35	17	1
Sep-19	4	39	0.08	3	1
Oct-19	9	87	0.18	5	4
Nov-19	4	39	0.08	4	0
Dec-19	2	19	0.04	1	1
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Feb-19	1	10	0.02	1	0
Mar-19	0	0	-	0	0
Apr-19	13	135	0.26	13	0
May-19	31	321	0.61	31	0
Jun-19	16	166	0.31	14	2
Jul-19	21	217	0.41	21	0
Aug-19	11	114	0.22	11	0
Sep-19	4	41	0.08	1	3
Oct-19	4	41	0.08	2	2
Nov-19	0	0	-	0	0
Dec-19	2	21	0.04	2	0

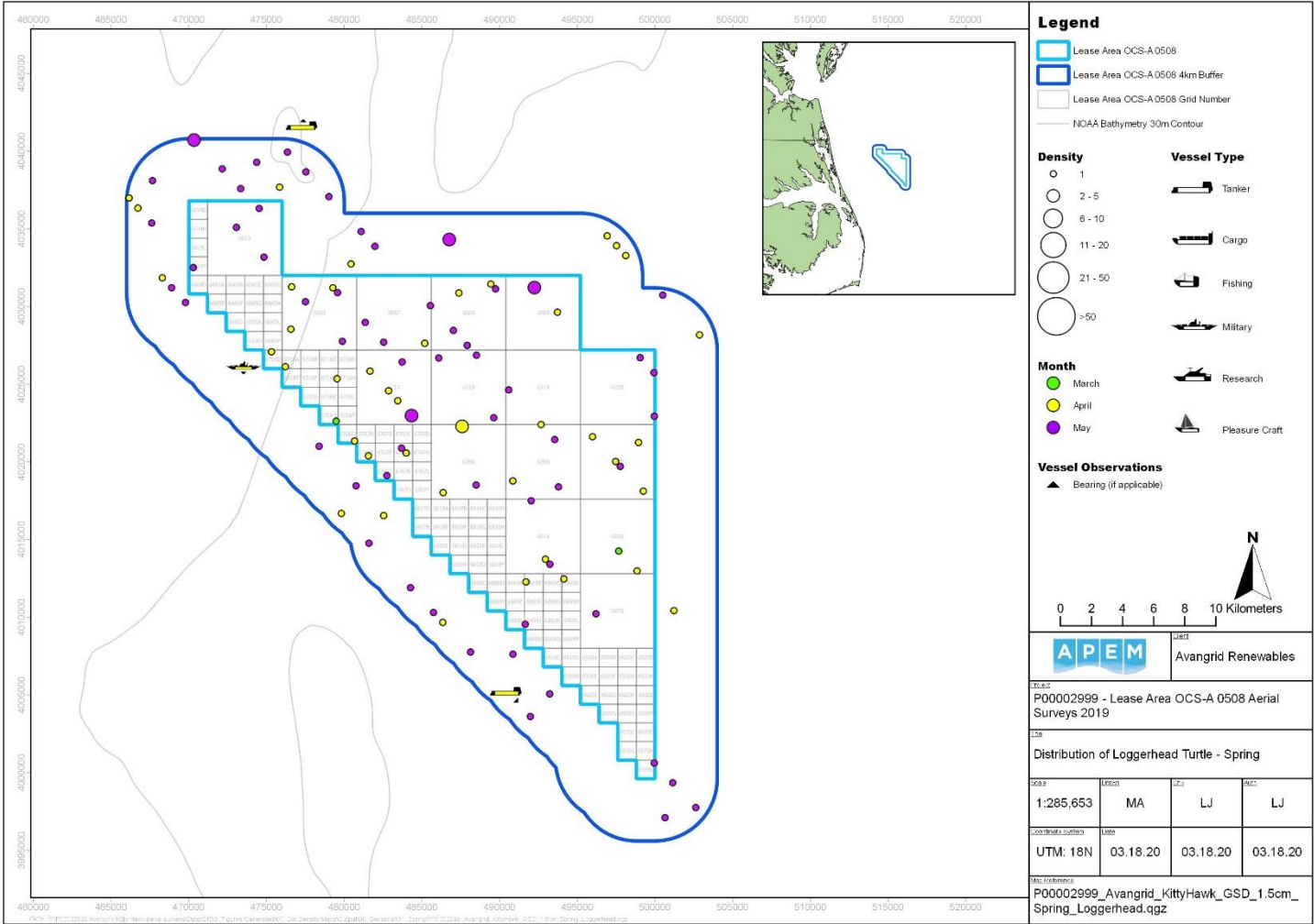


Figure 81 Distribution of loggerhead turtles recorded in Kitty Hawk plus 4 km buffer in the spring season

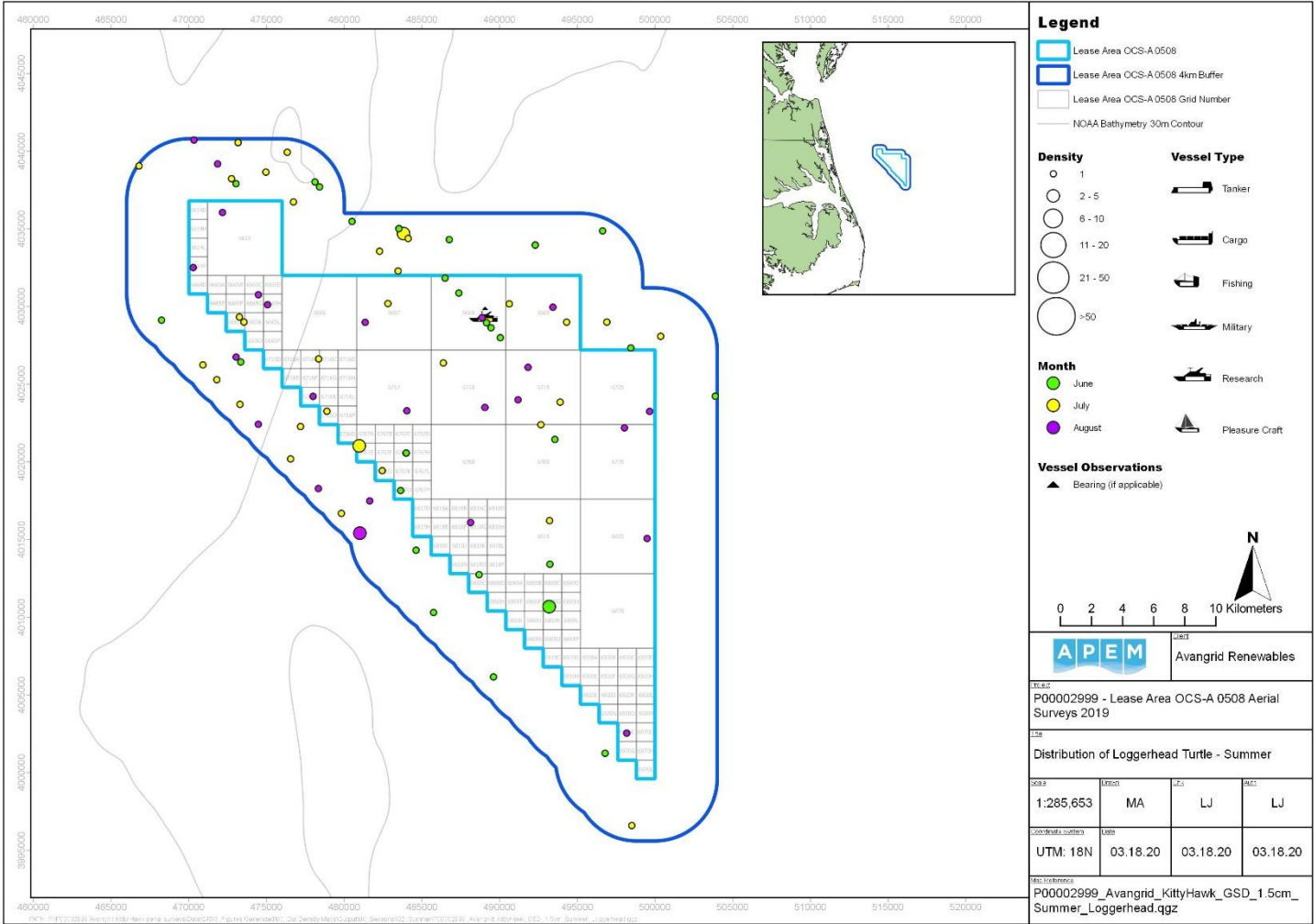


Figure 82 Distribution of loggerhead turtles recorded in Kitty Hawk plus 4 km buffer in the summer season

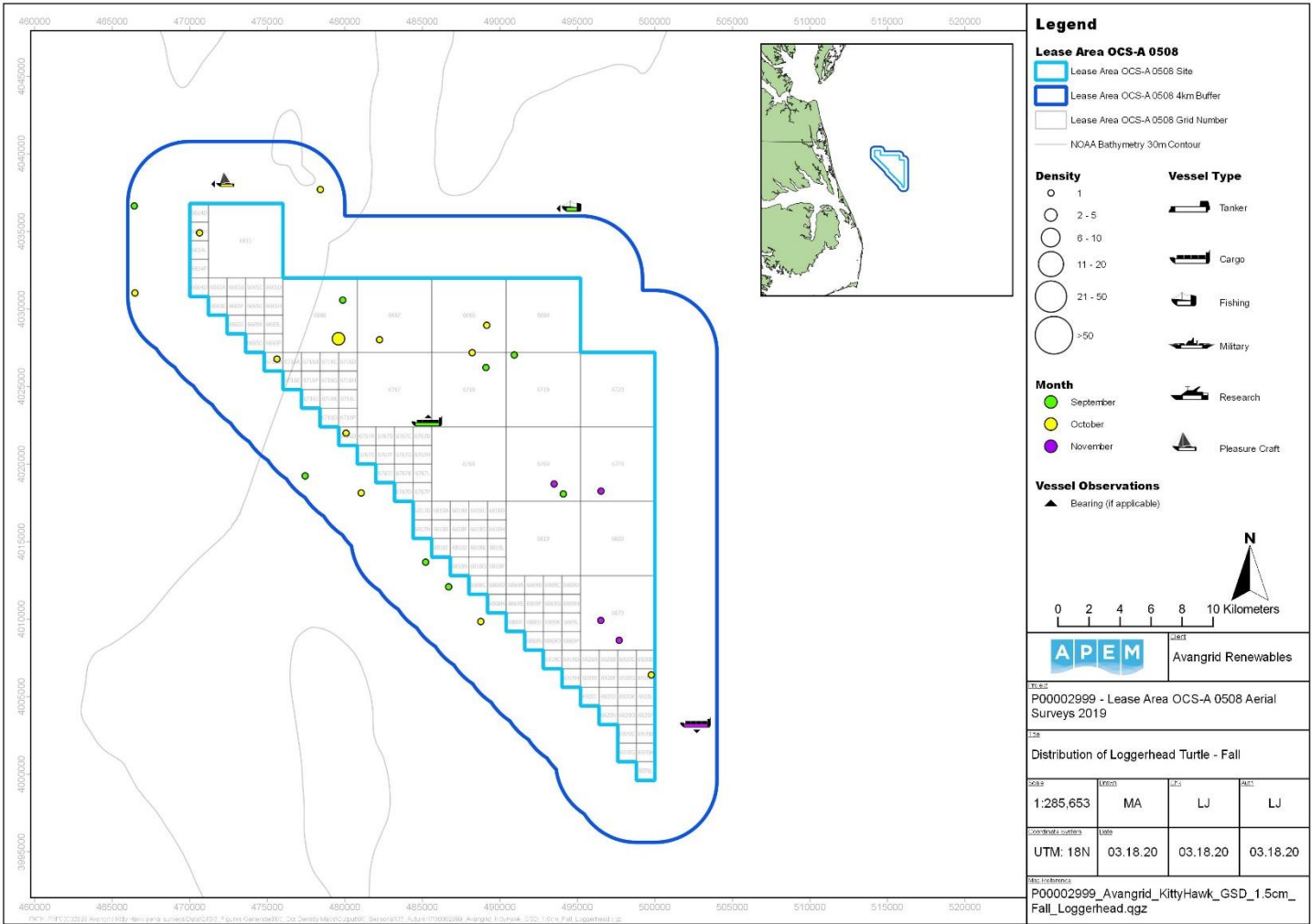


Figure 83 Distribution of loggerhead turtles recorded in the Kitty Hawk plus 4 km buffer in the fall season

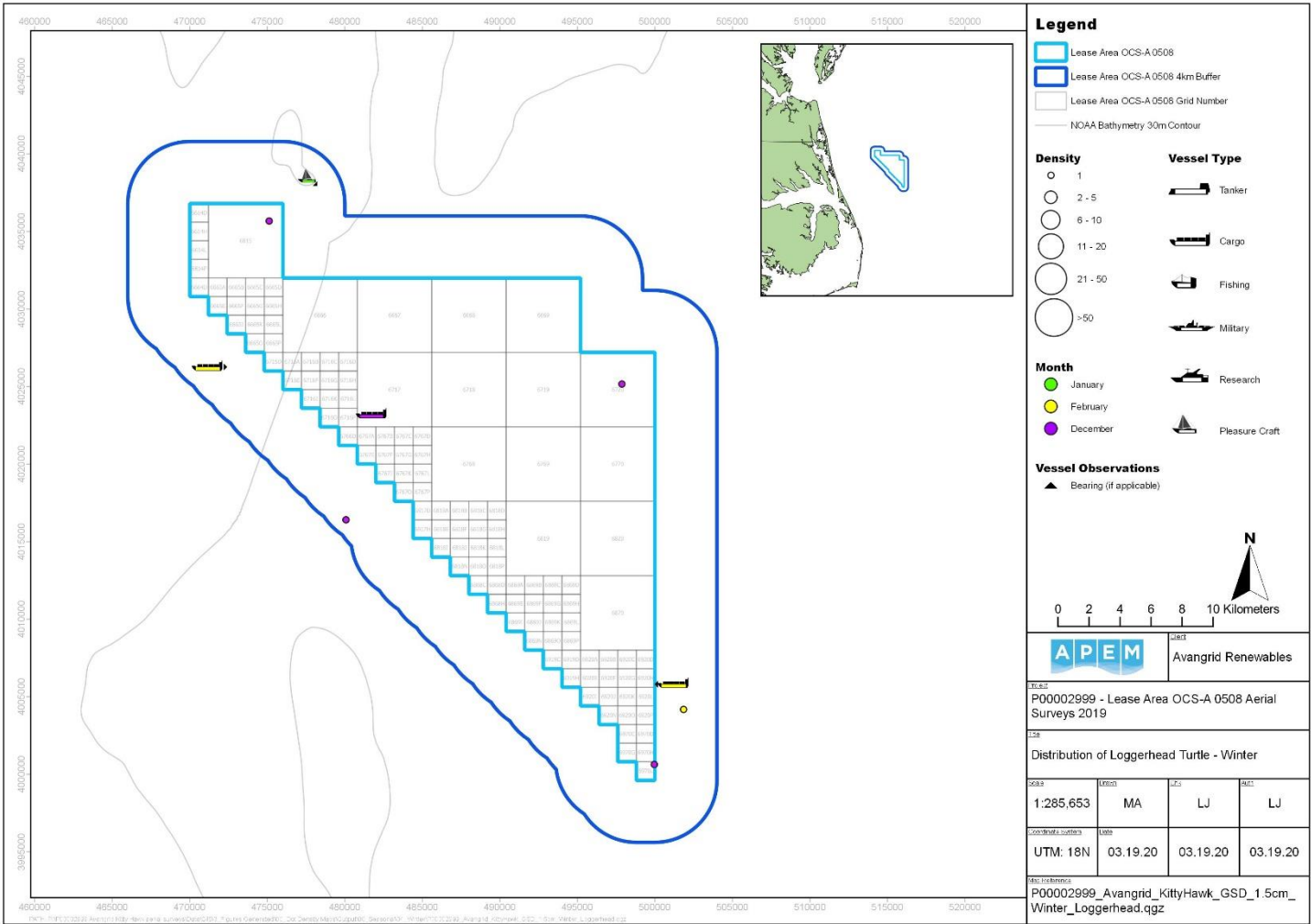


Figure 84 Distribution of loggerhead turtles recorded in Kitty Hawk plus 4 km buffer in the winter season

5.44 Kemp’s Ridley Turtle

Kemp’s ridley turtles were recorded in all four seasons, with highest numbers recorded in summer (**Table 58**). A raw count of one individual in the Kitty Hawk site, and two individuals in the 4 km buffer in July, lead to abundance estimates of ten and 20 respectively (**Table 58**).

A total of two Kemp’s ridley turtles were recorded in Kitty Hawk plus 4 km buffer in the spring surveys (**Figure 85**), of which one was recorded in April, and one was recorded in May (**Table 58**). Individuals were located in the northwest of the Kitty Hawk site for April, and in the north of the 4 km buffer for May (**Figure 85**). For the summer surveys, a total of four Kemp’s ridley turtles were recorded in Kitty Hawk plus 4 km buffer (**Figure 86**), of which three were recorded in July, and one was recorded in August (**Table 58**). Individuals were located in the west and northwest of the Kitty Hawk site, as well as the northwest of the 4 km buffer for July, and were located in the northeast of the 4 km buffer for August (**Figure 86**). For the fall surveys, a total of two Kemp’s ridley turtles were recorded in the north and northeast of the 4 km buffer in November (**Figure 87**). For the winter surveys, a total of two Kemp’s ridley turtles were recorded in Kitty Hawk plus 4 km buffer (**Figure 88**), of which one was recorded in February, and one was recorded in December (**Table 58**). Individuals were located in the southeast of the 4 km buffer for February, and in the northwest of the Kitty Hawk site for December (**Figure 88**).

Table 58 Raw counts and abundance and density estimates (No. estimated individuals per km²) of Kemp’s ridley turtles in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Feb-19	1	10	0.01	1	0
Apr-19	1	10	0.01	1	0
May-19	1	10	0.01	1	0
Jul-19	3	30	0.03	3	0
Aug-19	1	10	0.01	1	0
Nov-19	2	20	0.02	2	0
Dec-19	1	10	0.01	1	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Feb-19	0	0	-	0	0
Apr-19	1	10	0.02	1	0
May-19	0	0	-	0	0
Jul-19	1	10	0.02	1	0
Aug-19	0	0	-	0	0
Nov-19	0	0	-	0	0
Dec-19	1	10	0.02	1	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Feb-19	1	10	0.02	1	0
Apr-19	0	0	-	0	0

May-19	1	10	0.02	1	0
Jul-19	2	21	0.04	2	0
Aug-19	1	10	0.02	1	0
Nov-19	2	21	0.04	2	0
Dec-19	0	0	-	0	0

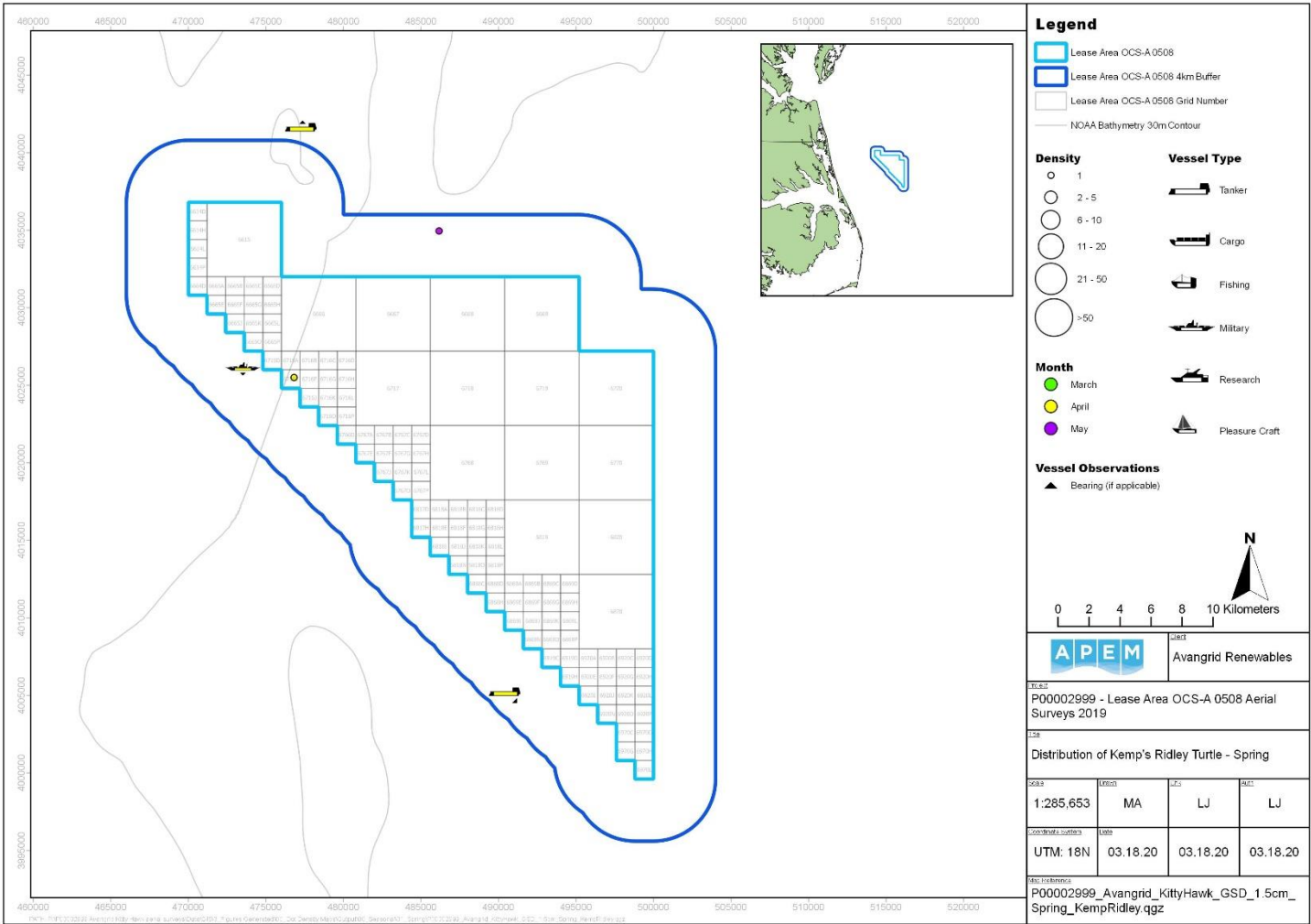


Figure 85 Distribution of Kemp’s ridley turtles recorded in Kitty Hawk plus 4 km buffer in the spring season



Figure 86 Distribution of Kemp's ridley turtles recorded in Kitty Hawk plus 4 km buffer in the summer season

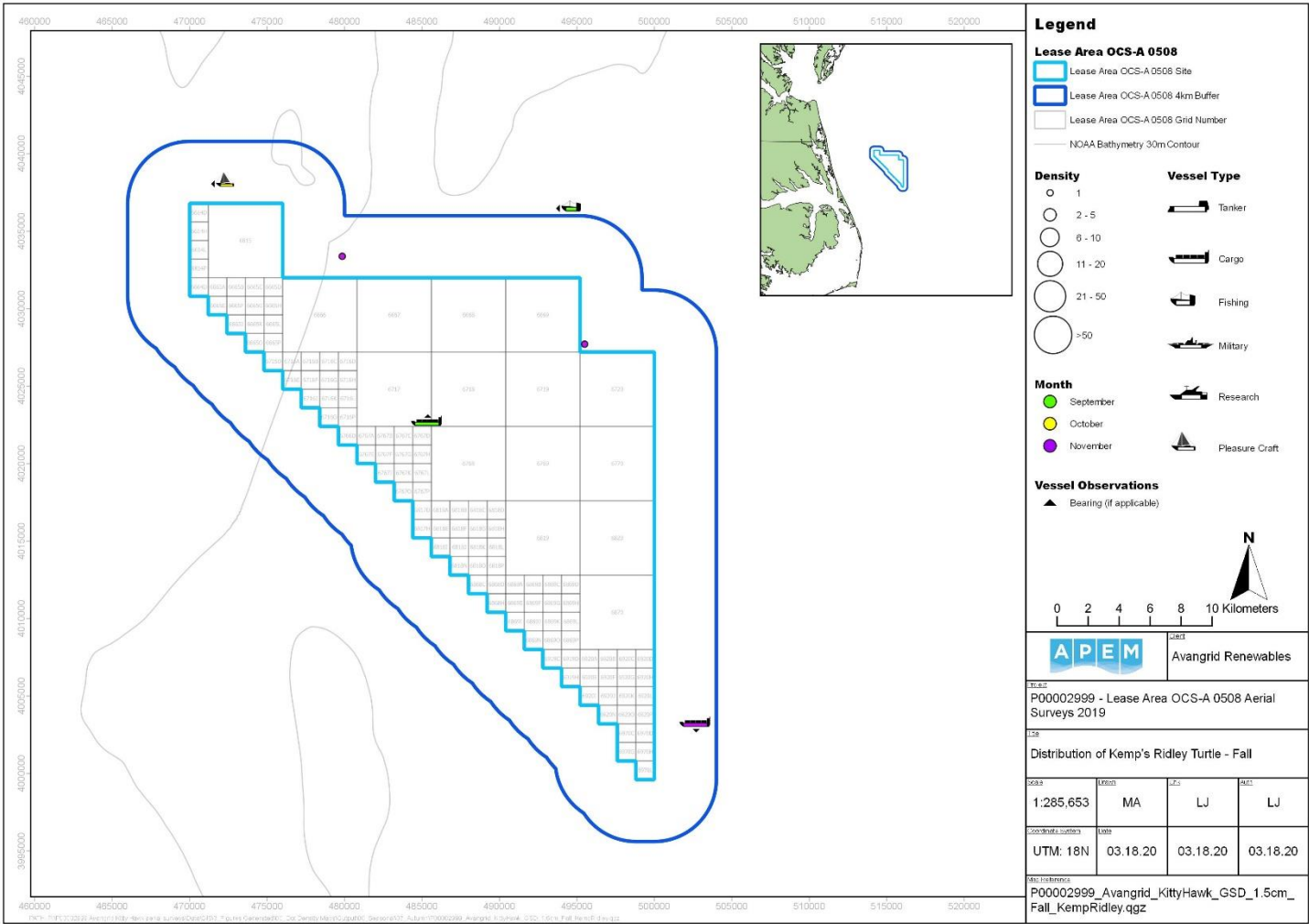


Figure 87 Distribution of Kemp's ridley turtles recorded in Kitty Hawk plus 4 km buffer in the fall season

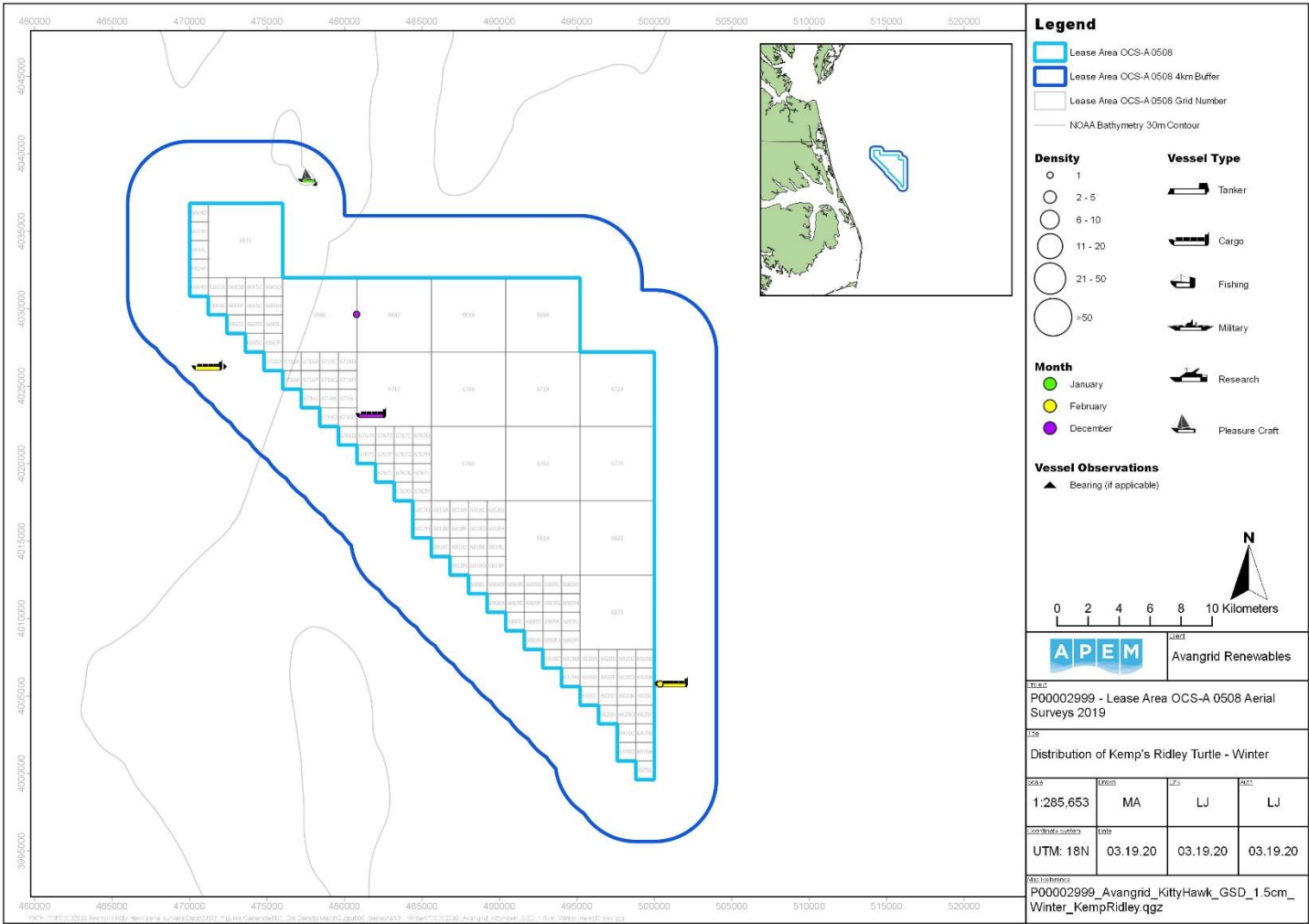


Figure 88 Distribution of Kemp’s ridley turtles recorded in Kitty Hawk plus 4 km buffer in the winter season

5.45 Loggerhead / Kemp's Ridley Turtle

Loggerhead / Kemp's ridley turtles were recorded from April to December, with highest numbers recorded in summer (**Table 59**). A peak raw count of seven individuals in the Kitty Hawk site, and five in the 4 km buffer in July, lead to abundance estimates of 68 and 52 respectively (**Table 59**).

A total of eleven loggerhead / Kemp's ridley turtles were recorded in Kitty Hawk plus 4 km buffer (**Figure 89**), of which four were recorded in April, and seven were recorded in May (**Table 59**) for the spring surveys. Individuals were distributed throughout the survey area for April and May (**Figure 89**). For the summer surveys, a total of 23 loggerhead / Kemp's ridley turtles were recorded in Kitty Hawk plus 4 km buffer (**Figure 90**), of which seven were recorded in June, 12 were recorded in July, and four were recorded in August (**Table 59**). Individuals were located throughout the survey area for all months (**Figure 90**). For the fall surveys, a total of 12 loggerhead / Kemp's ridley turtles were recorded in Kitty Hawk plus 4 km buffer (**Figure 91**), of which five were recorded in September, two were recorded in October, and five were recorded in November (**Table 59**). Individuals were distributed across the survey area for all months (**Figure 91**). For the winter surveys, a total of one loggerhead / Kemp's ridley turtle was recorded in December in the northwest of the 4 km buffer (**Figure 92**).

Table 59 Raw counts and abundance and density estimates (No. estimated individuals per km²) of loggerhead / Kemp's ridley turtles in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	4	40	0.04	4	0
May-19	7	70	0.07	7	0
Jun-19	7	70	0.07	7	0
Jul-19	12	120	0.12	12	0
Aug-19	4	40	0.04	4	0
Sep-19	5	50	0.05	5	0
Oct-19	2	20	0.02	2	0
Nov-19	5	50	0.05	5	0
Dec-19	1	10	0.01	1	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	3	29	0.06	3	0
May-19	2	19	0.04	2	0
Jun-19	2	19	0.04	2	0
Jul-19	7	68	0.14	7	0
Aug-19	2	19	0.04	2	0
Sep-19	3	29	0.06	3	0
Oct-19	1	10	0.02	1	0
Nov-19	3	29	0.06	3	0
Dec-19	0	0	-	0	0
c) 4 km buffer					

Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	1	10	0.02	1	0
May-19	5	52	0.1	5	0
Jun-19	5	52	0.1	5	0
Jul-19	5	52	0.1	5	0
Aug-19	2	21	0.04	2	0
Sep-19	2	21	0.04	2	0
Oct-19	1	10	0.02	1	0
Nov-19	2	21	0.04	2	0
Dec-19	1	10	0.02	1	0

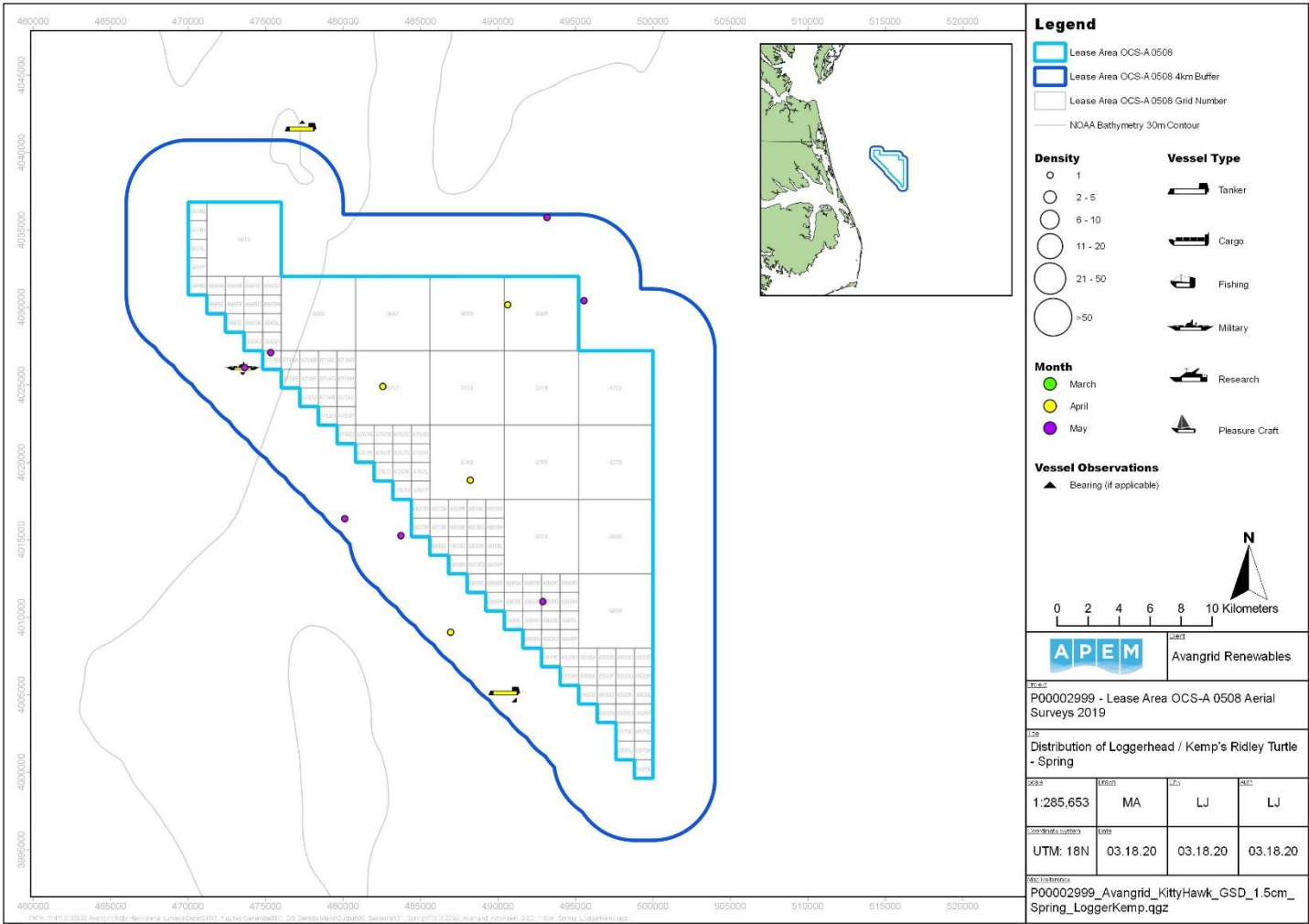


Figure 89 Distribution of loggerhead / Kemp's ridley turtles recorded in Kitty Hawk plus 4 km buffer in the spring season



Figure 90 Distribution of loggerhead / Kemp's ridley turtles recorded in Kitty Hawk plus 4 km buffer in the summer season

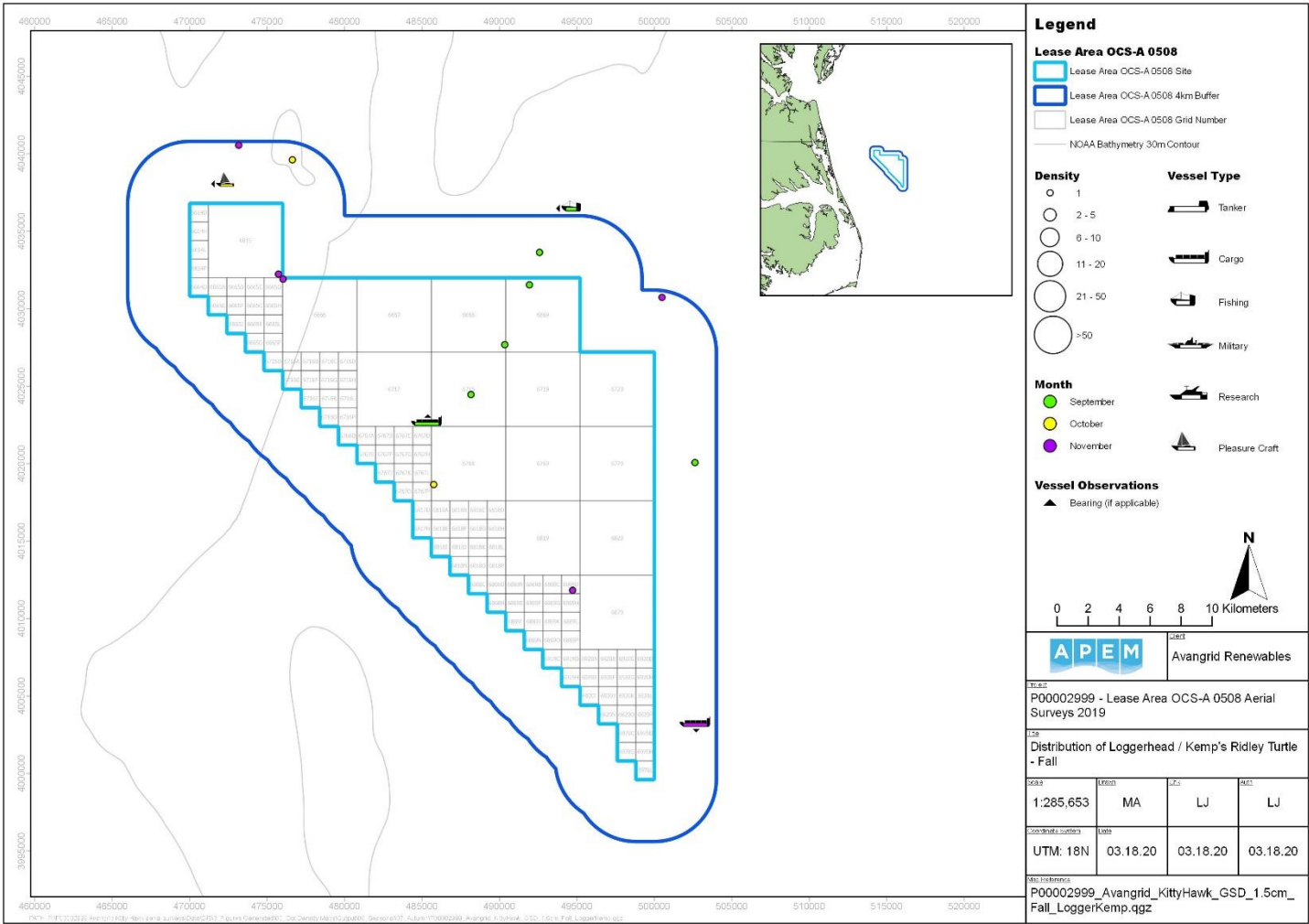


Figure 91 Distribution of loggerhead / Kemp's ridley turtles recorded in Kitty Hawk plus 4 km buffer in the fall season

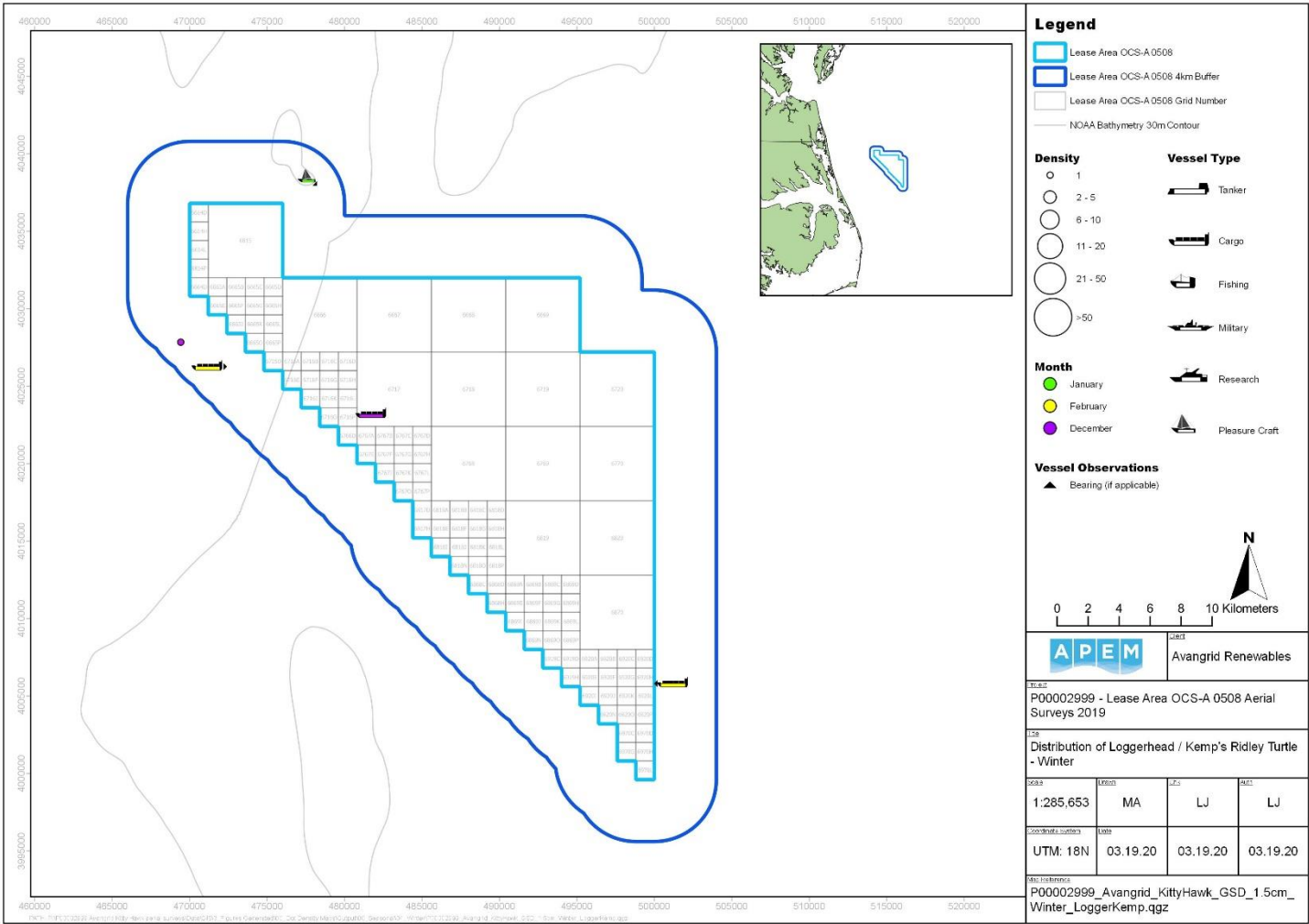


Figure 92 Distribution of loggerhead / Kemp's ridley turtles recorded in Kitty Hawk plus 4 km buffer in the winter season

5.46 Leatherback Turtle

Leatherback turtles were recorded in all seasons apart from winter, with highest numbers recorded in summer (**Table 60**). A peak raw count of ten individuals in the Kitty Hawk site, and 12 individuals in the 4 km buffer in July, lead to abundances estimates of 97 and 124, respectively (**Table 60**).

A total of two leatherback turtles were recorded in April in the west and southwest of the Kitty Hawk site for the spring surveys (**Figure 93**). For the summer surveys, a total of 32 leatherback turtles were recorded in the Kitty Hawk plus 4 km buffer (**Figure 94**), of which 22 were recorded in July, and ten were recorded in August (**Table 60**). Individuals were distributed across the northwestern half of the survey area for July, and primarily located in the southeast and northwest for August (**Figure 94**). For the fall surveys, a total of six leatherback turtles were recorded in the Kitty Hawk plus 4 km buffer (**Figure 95**), of which one was recorded in September, one was recorded in October, and four were recorded in November (**Table 60**). Individuals were located in the center of the Kitty Hawk site for September, in the northeast of the 4 km buffer for October, and primarily distributed in the southeast of the survey area for November (**Figure 95**).

Table 60 Raw counts and abundance and density estimates (No. estimated individuals per km²) of leatherback turtles in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	2	20	0.02	2	0
Jul-19	22	220	0.21	22	0
Aug-19	10	100	0.1	5	5
Sep-19	1	10	0.01	1	0
Oct-19	1	10	0.01	1	0
Nov-19	4	40	0.04	2	2
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	2	19	0.04	2	0
Jul-19	10	97	0.2	10	0
Aug-19	2	19	0.04	10	0
Sep-19	1	10	0.02	1	0
Oct-19	0	0	-	0	0
Nov-19	2	19	0.04	1	1
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	0	0	-	0	0
Jul-19	12	124	0.23	12	0
Aug-19	8	83	0.16	4	4
Sep-19	0	0	-	0	0
Oct-19	1	10	0.02	1	0

Nov-19	2	21	0.04	1	1
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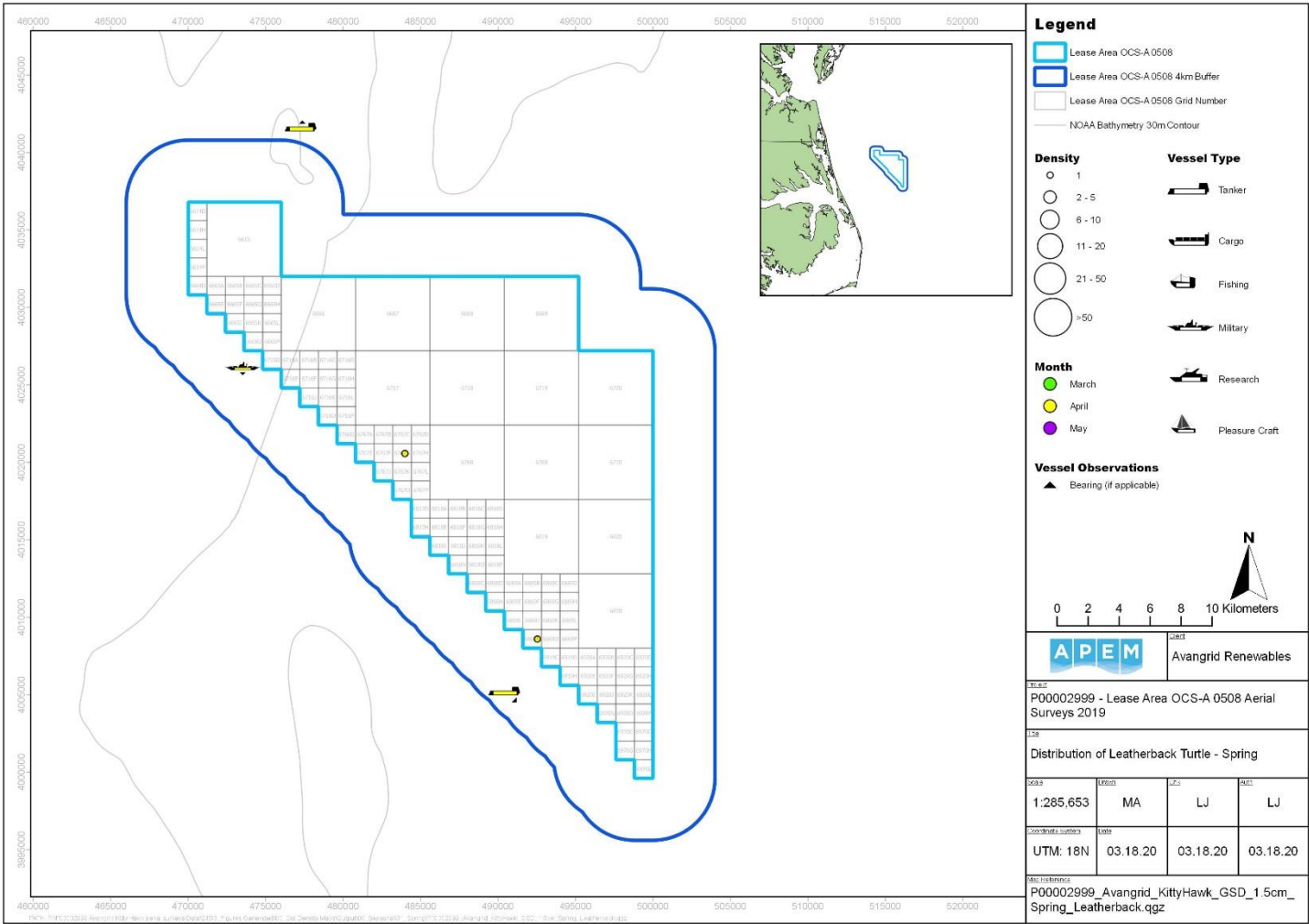


Figure 93 Distribution of leatherback turtles recorded in Kitty Hawk plus 4 km buffer in the spring season

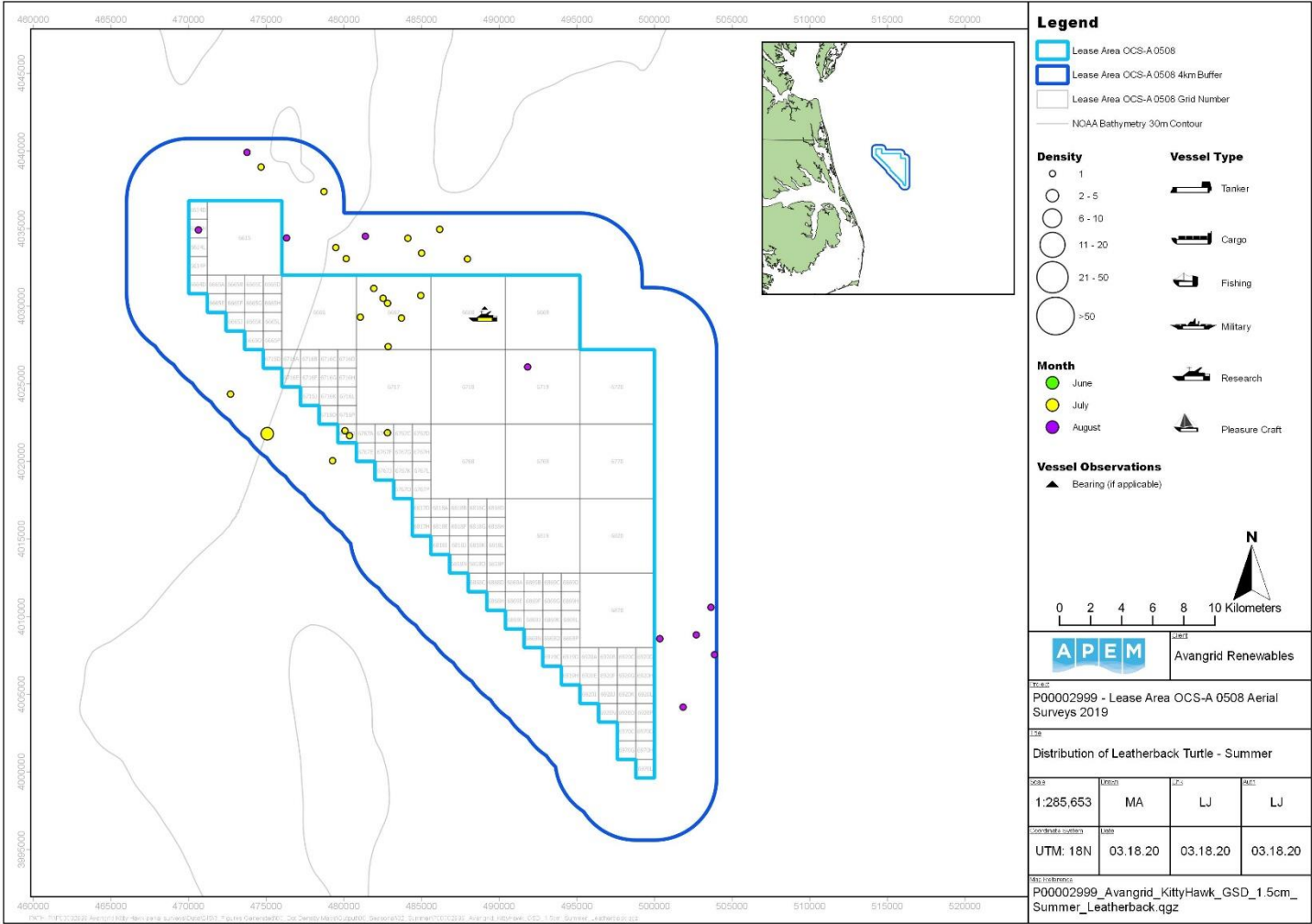


Figure 94 Distribution of leatherback turtles recorded in Kitty Hawk plus 4 km buffer in the summer season

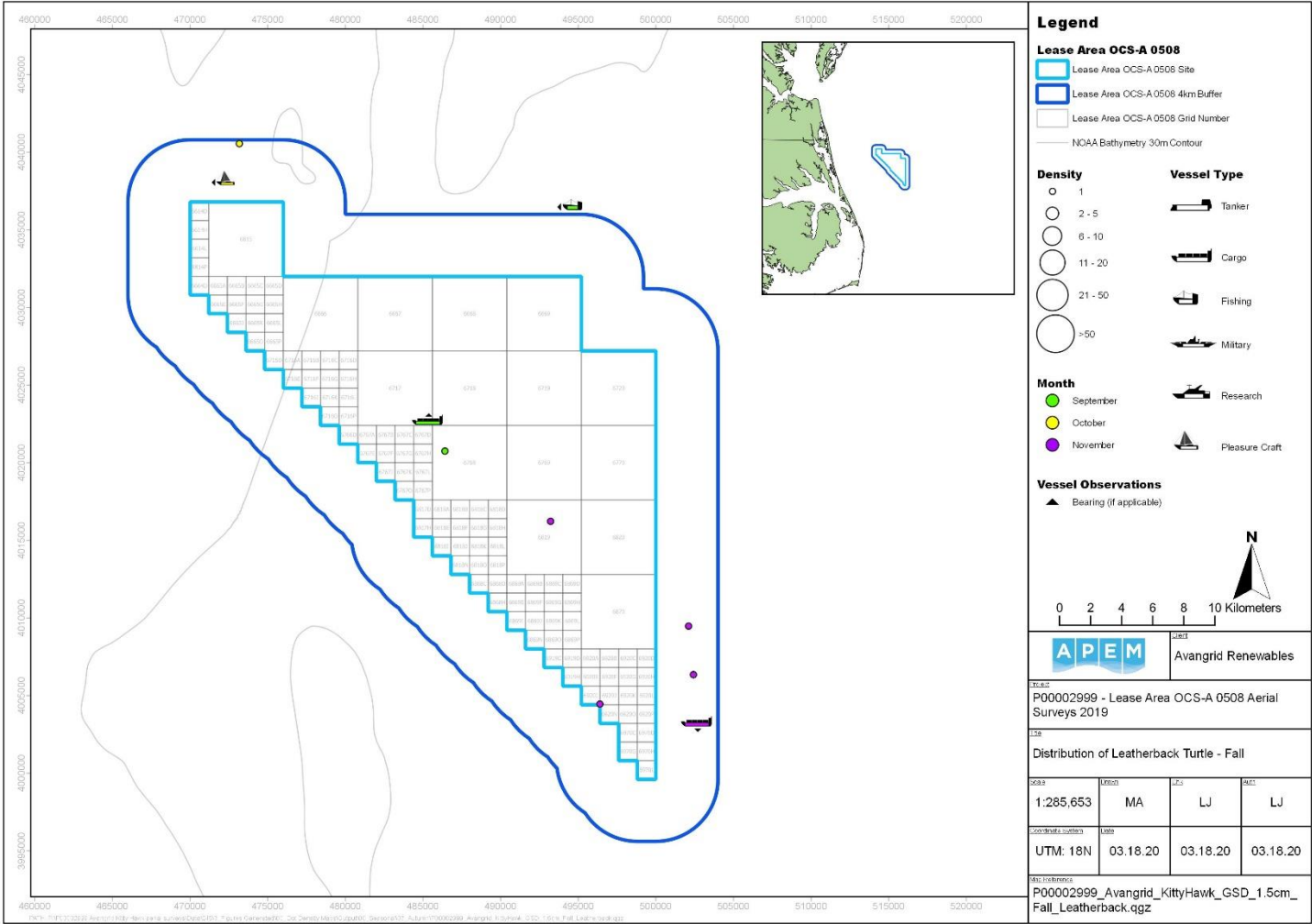


Figure 95 Distribution of leatherback turtles recorded in Kitty Hawk plus 4 km buffer in the fall season

5.47 Species Unknown – Turtle

Unidentified turtles were recorded in all seasons, with highest numbers recorded in summer (**Table 61**). A peak raw count of nine individuals in the Kitty Hawk site, and nine individuals in the 4 km buffer in April, lead to abundance estimates of 87 and 93, respectively (**Table 59**).

A total of 33 unidentified turtles were recorded in spring in Kitty Hawk plus 4 km buffer (**Figure 96**), of which 18 were recorded in April, and 15 were recorded in May (**Table 61**). Individuals were primarily distributed across the northern half of the survey area, with one individual in the south for both April and May (**Figure 96**). For the summer surveys, a total of 37 unidentified turtles were recorded in Kitty Hawk plus 4 km buffer (**Figure 97**), of which nine were recorded in June, 12 were recorded in July, and 16 were recorded in August (**Table 61**). Individuals were distributed throughout the survey area for all months (**Figure 97**). For the fall surveys, a total of nine unidentified turtles were recorded in Kitty Hawk plus 4 km buffer (**Figure 98**), of which five were recorded in August, five were recorded in September, and one was recorded in October (**Table 61**). Individuals were located in the center and north of the Kitty Hawk site for September, in the northeast of the 4 km buffer in October, and in the northwest of the Kitty Hawk site and in the west of the 4 km buffer for November (**Figure 98**). For the winter surveys, a total of one unidentified turtle was recorded in December in the east of the Kitty Hawk site (**Figure 99**).

Table 61 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified turtles in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	18	180	0.18	18	0
May-19	15	150	0.15	15	0
Jun-19	9	90	0.09	9	0
Jul-19	12	120	0.12	10	2
Aug-19	16	160	0.16	16	0
Sep-19	5	50	0.05	5	0
Oct-19	1	10	0.01	0	1
Nov-19	3	30	0.03	3	0
Dec-19	1	10	0.01	1	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	9	87	0.18	9	0
May-19	10	97	0.2	10	0
Jun-19	6	58	0.12	6	0
Jul-19	6	58	0.12	6	0
Aug-19	10	97	0.2	10	0
Sep-19	5	48	0.1	5	0
Oct-19	0	0	-	0	0
Nov-19	2	19	0.04	2	0
Dec-19	1	10	0.02	1	0
c) 4 km buffer					

Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	9	93	0.18	9	0
May-19	5	52	0.1	5	0
Jun-19	3	31	0.06	3	0
Jul-19	6	62	0.12	4	2
Aug-19	6	62	0.12	6	0
Sep-19	0	0	-	0	0
Oct-19	1	10	0.02	0	1
Nov-19	1	10	0.02	1	0
Dec-19	0	0	-	0	0

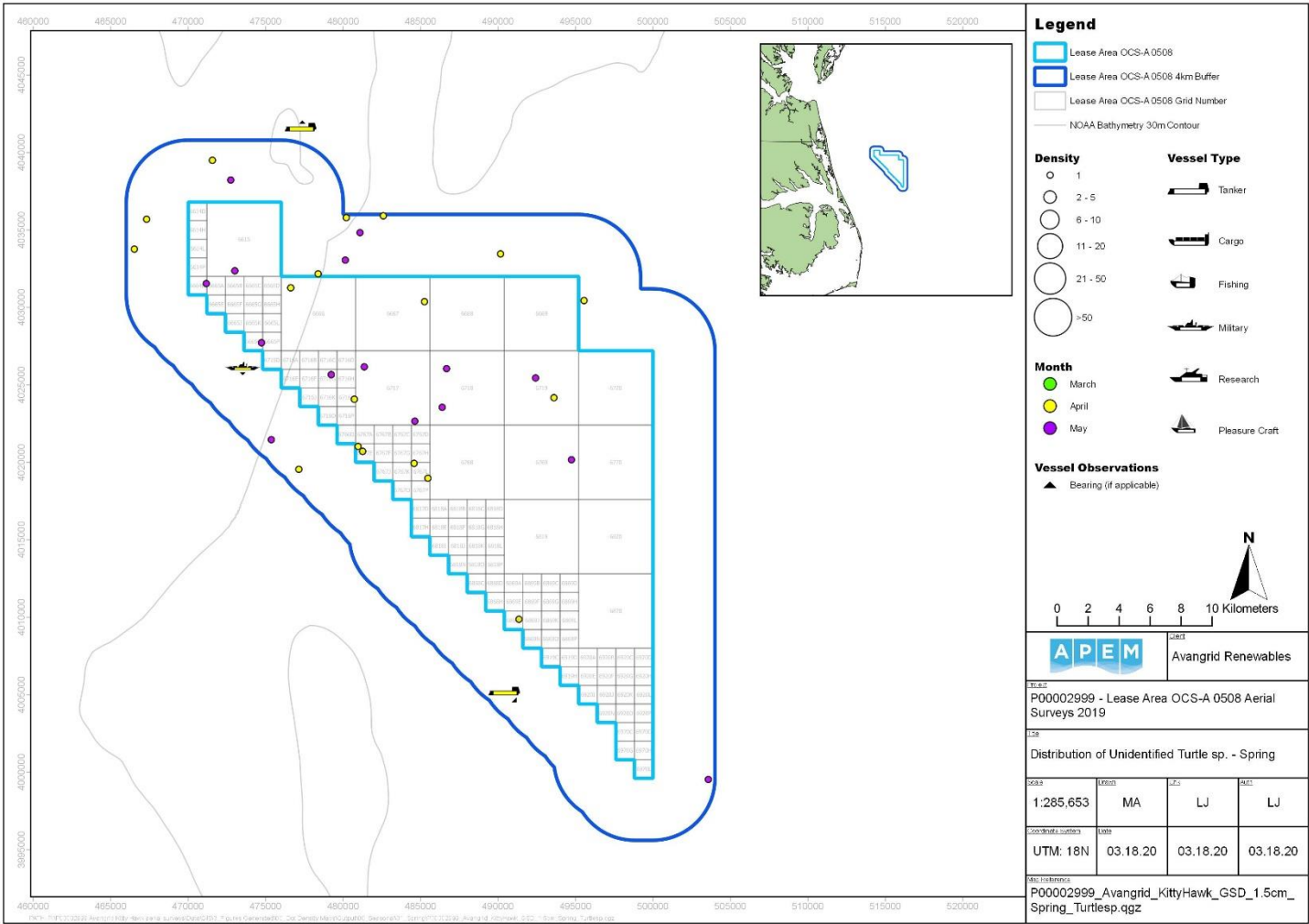


Figure 96 Distribution of unidentified turtles recorded in Kitty Hawk plus 4 km buffer in the spring season



Figure 97 Distribution of unidentified turtles recorded in Kitty Hawk plus 4 km buffer in the summer season

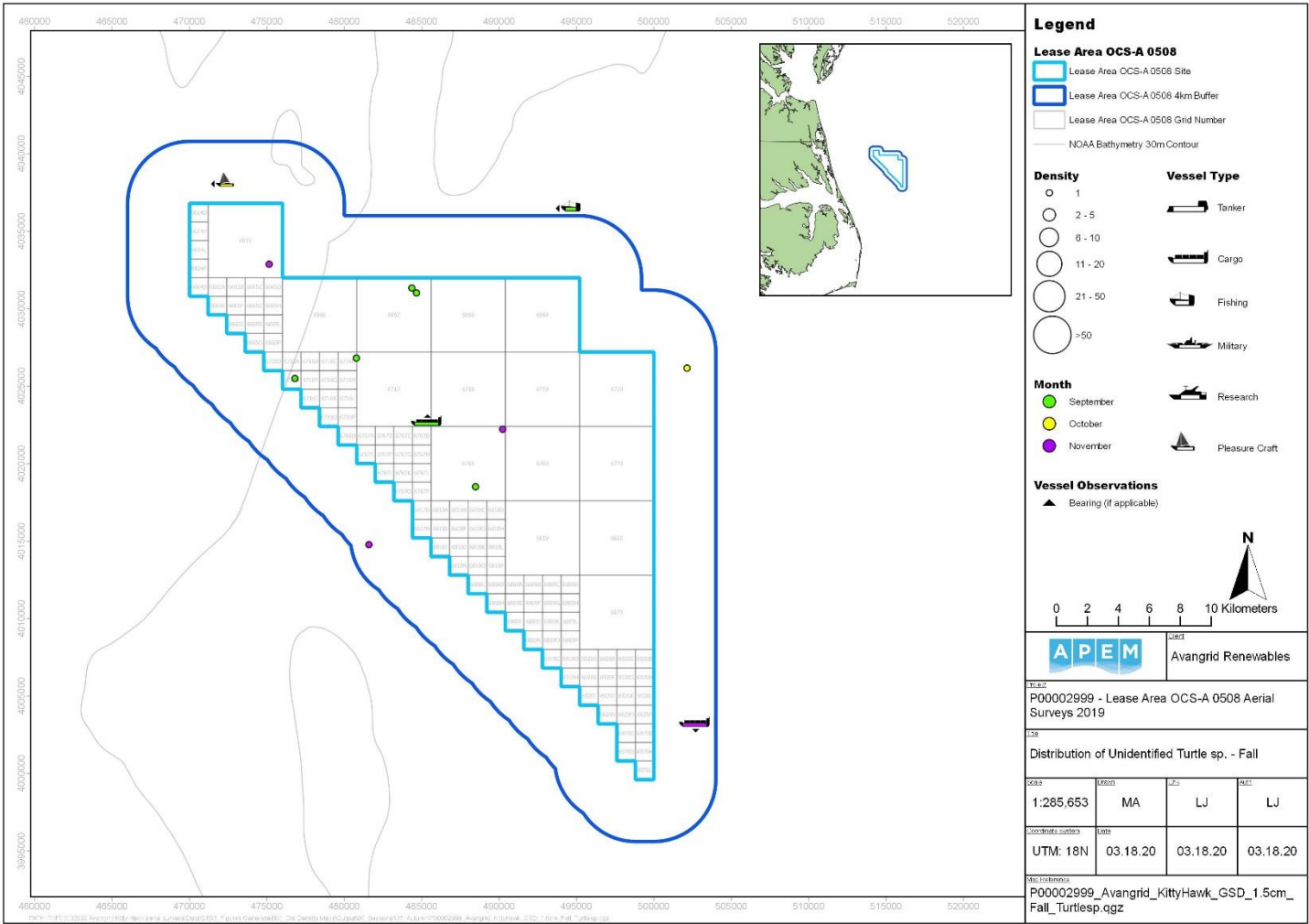


Figure 98 Distribution of unidentified turtles recorded in Kitty Hawk plus 4 km buffer in the fall season

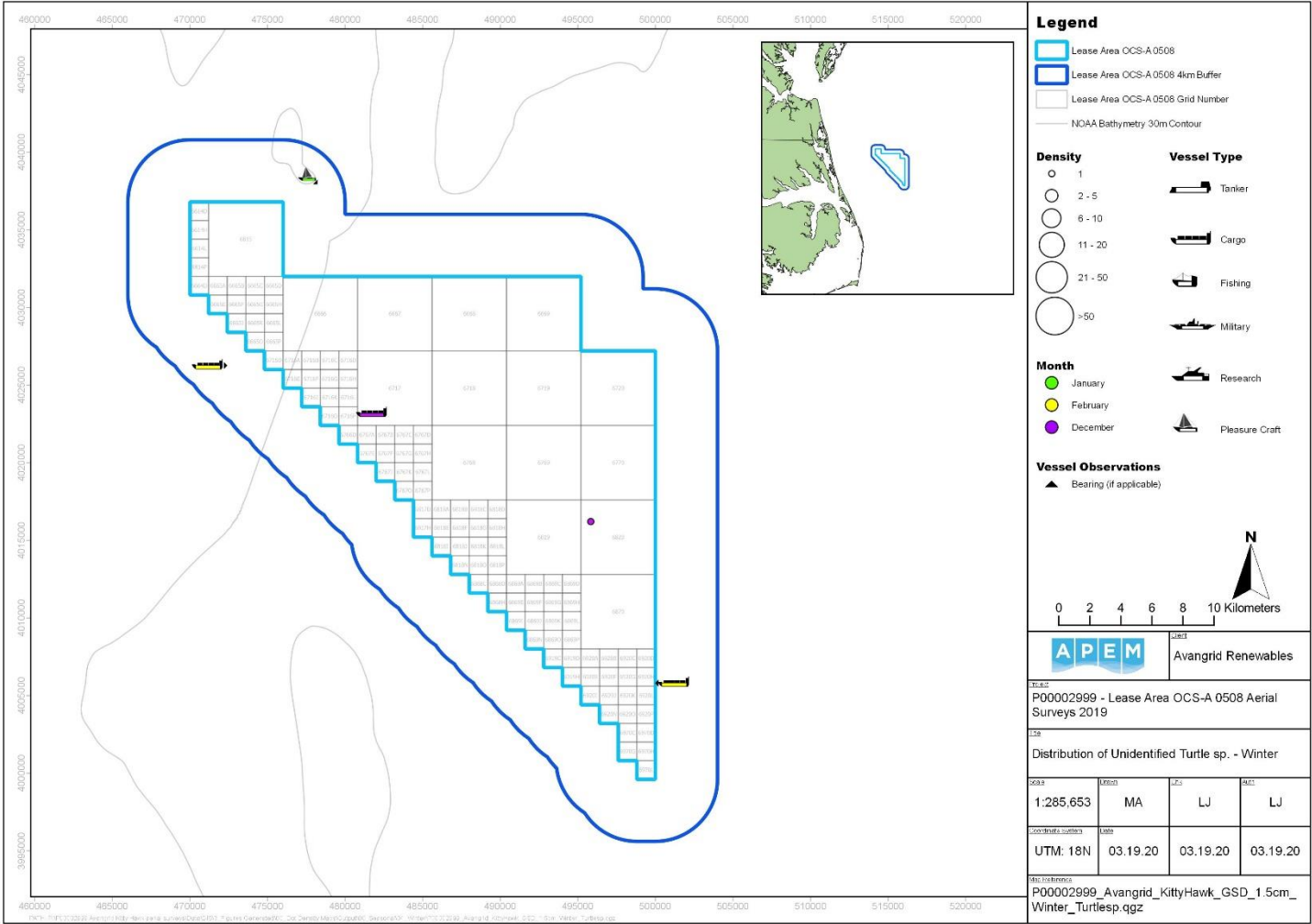


Figure 99 Distribution of unidentified turtles recorded in Kitty Hawk plus 4 km buffer in the winter season

5.48 Mahi-mahi

Mahi-mahi were recorded in all seasons apart from spring, with highest numbers recorded in summer (**Table 62**). A peak raw count of 32 individuals in the Kitty Hawk site, and 21 individuals in the 4 km buffer in July, lead to abundance estimates of 309 and 217, respectively (**Table 62**).

A total of 68 mahi-mahi were recorded in summer in Kitty Hawk plus 4 km buffer (**Figure 100**), of which 53 were recorded in July, and 15 were recorded in August (**Table 62**). Individuals were distributed throughout the survey area for both months (**Figure 100**). For the fall surveys, a total of 13 mahi-mahi were recorded in Kitty Hawk plus 4 km buffer (**Figure 101**), of which six were recorded in October, and seven were recorded in November (**Table 62**). Individuals were recorded in the center of the Kitty Hawk site for October, and in the west of the Kitty Hawk site and southeast of the 4 km buffer in November (**Figure 101**). For the winter surveys, a total of two mahi-mahi were recorded in December in the center of the Kitty Hawk site (**Figure 102**).

Table 62 Raw counts and abundance and density estimates (No. estimated individuals per km²) of mahi-mahi in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul-19	53	530	0.52	53	0
Aug-19	15	150	0.15	15	0
Oct-19	6	60	0.06	6	0
Nov-19	7	70	0.07	7	0
Dec-19	2	20	0.02	2	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul-19	32	309	0.62	32	0
Aug-19	2	19	0.04	2	0
Oct-19	6	58	0.12	6	0
Nov-19	2	19	0.04	2	0
Dec-19	2	19	0.04	2	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul-19	21	217	0.41	21	0
Aug-19	13	135	0.26	13	0
Oct-19	0	0	-	0	0
Nov-19	5	52	0.1	5	0
Dec-19	0	0	-	0	0

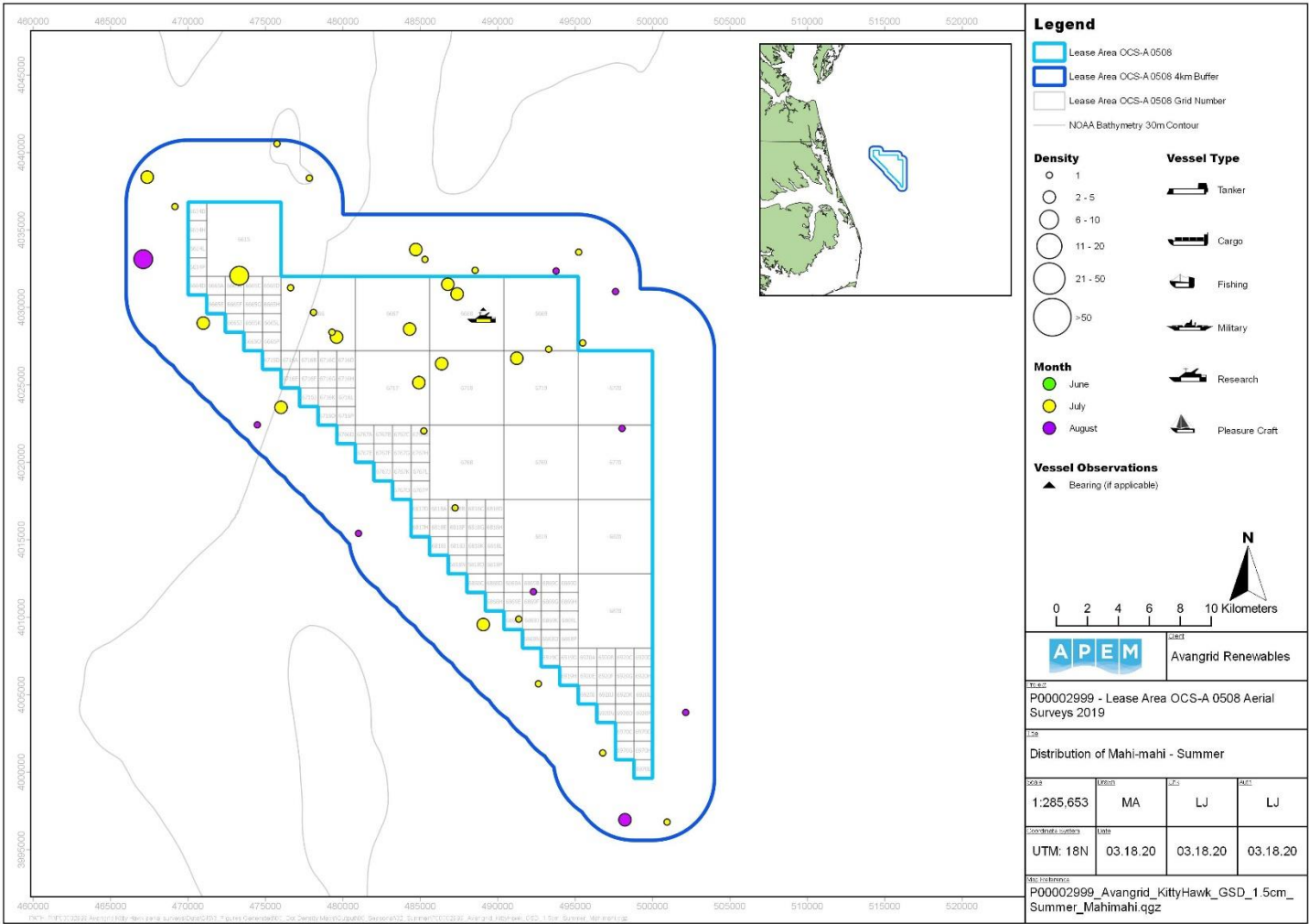


Figure 100 Distribution of mahi-mahi recorded in Kitty Hawk plus 4 km buffer in the summer season

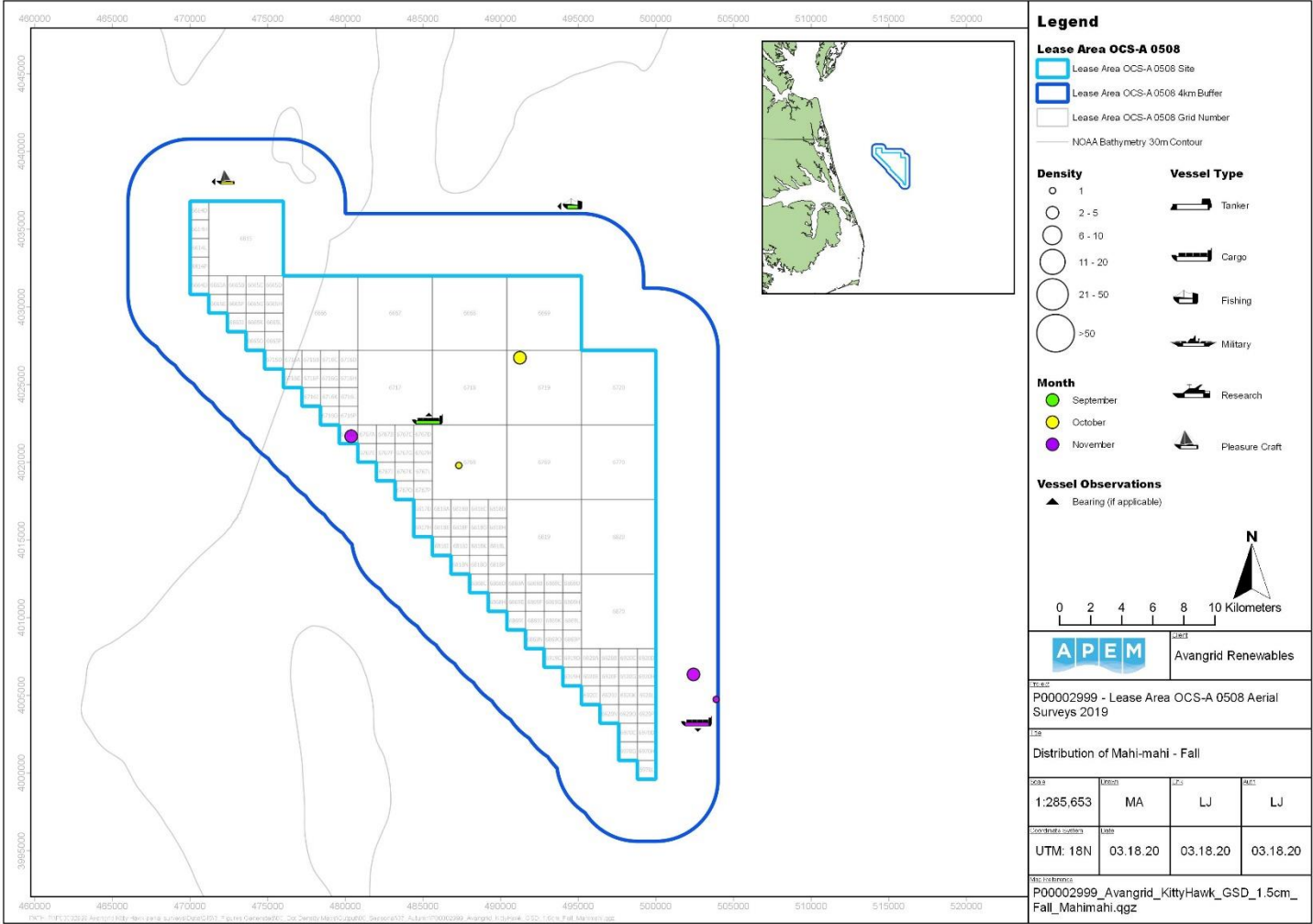


Figure 101 Distribution of mahi-mahi recorded in Kitty Hawk plus 4 km buffer in the fall season

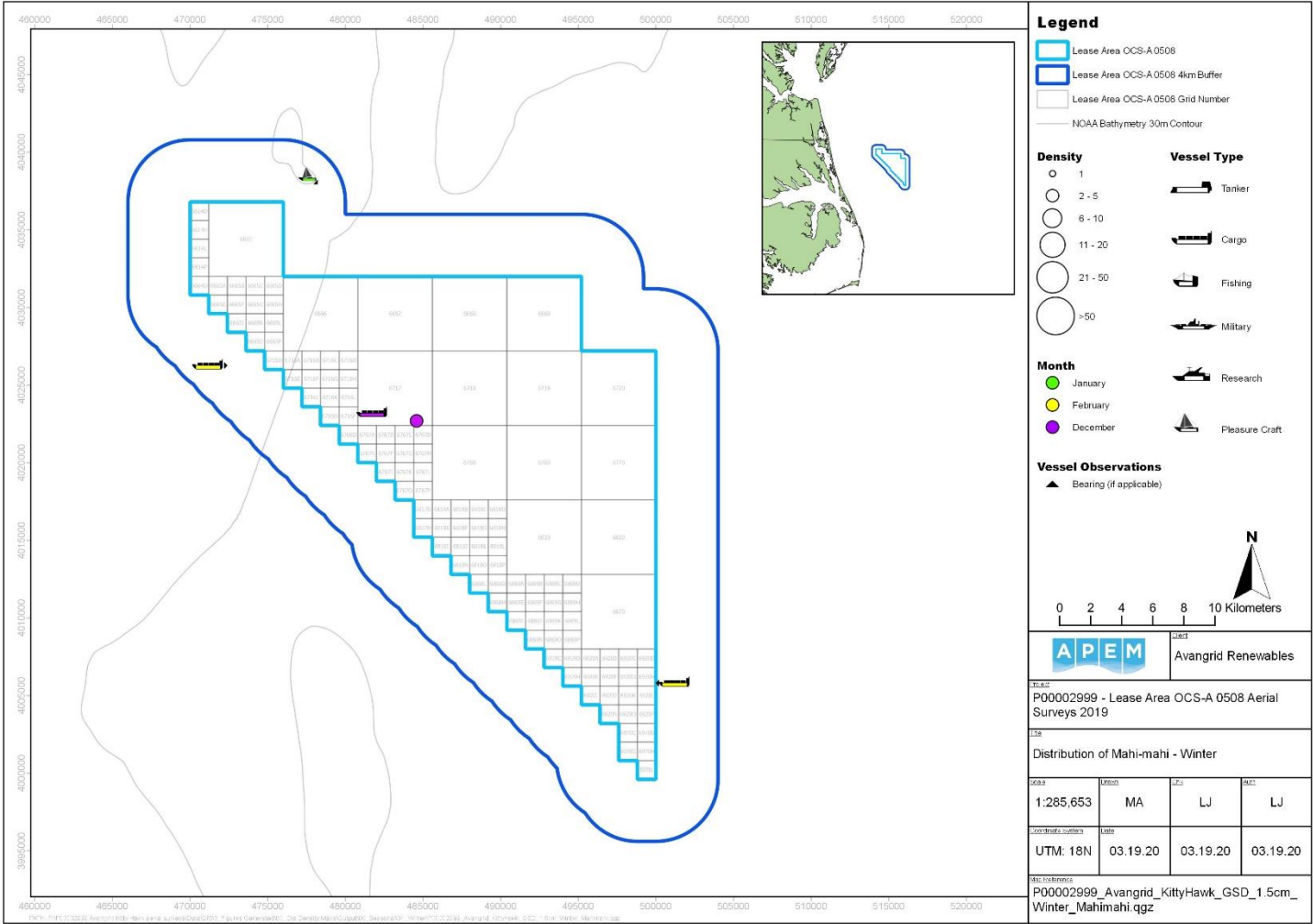


Figure 102 Distribution of mahi-mahi recorded in Kitty Hawk plus 4 km buffer in the winter season

5.49 Species Unknown – Remora

An unidentified remora was recorded in September only, with a raw count of one in the Kitty Hawk site, leading to an abundance estimate of ten (Table 63).

A total of one unidentified remora was recorded in September in the center of the Kitty Hawk site for the fall surveys (Figure 103).

Table 63 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified remoras in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Sep-19	1	10	0.01	1	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Sep-19	1	10	0.02	1	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Sep-19	0	0	-	0	0

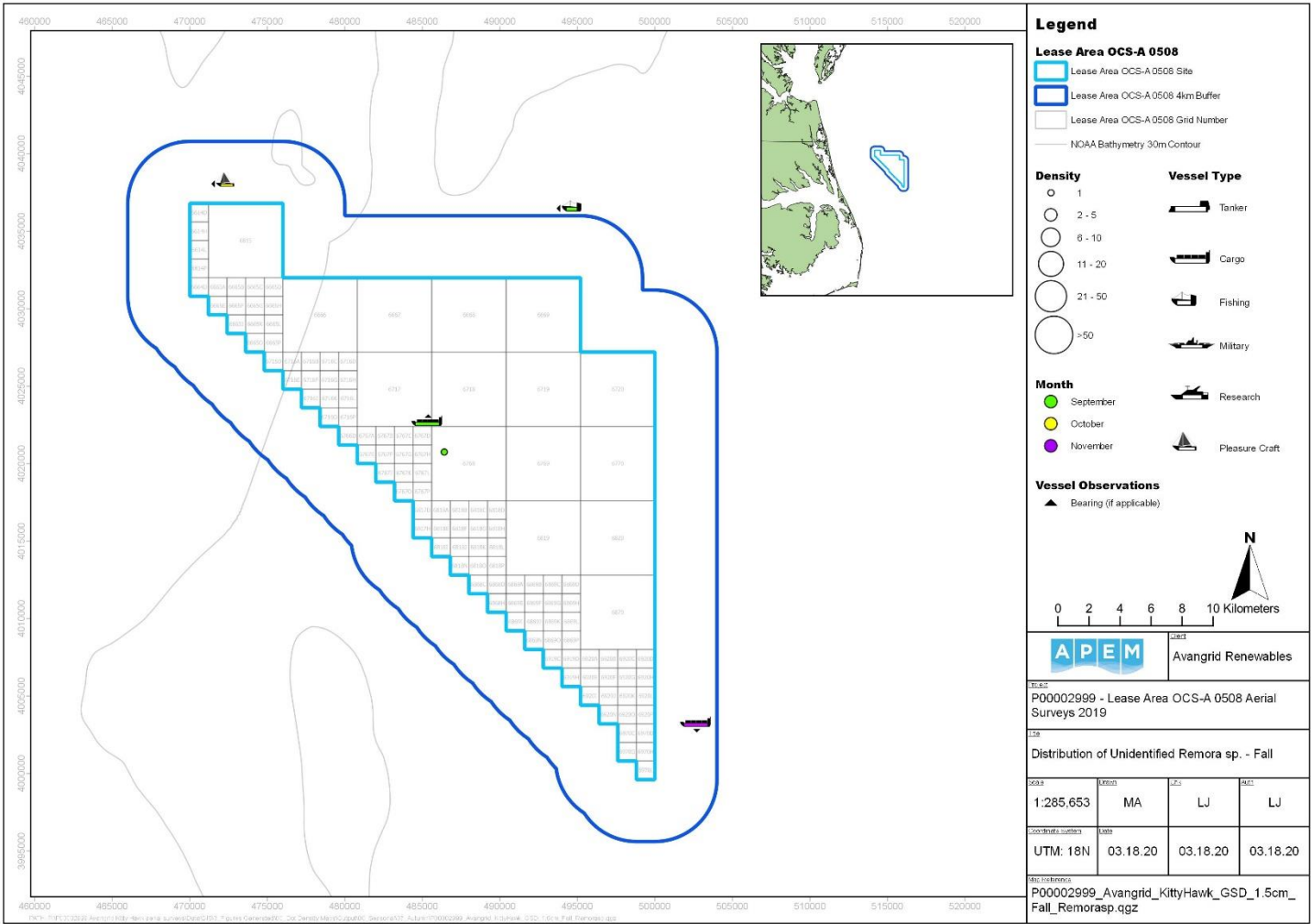


Figure 103 Distribution of unidentified remoras recorded in Kitty Hawk plus 4 km buffer in the fall season

5.50 Species Unknown – Flying Fish

Unidentified flying fish were recorded in August only, with a peak raw count of 25 in the 4 km buffer, leading to an abundance estimate of 250 (Table 64).

A total of 25 flying fish were recorded in August, located primarily in the northeast and also in the east of the 4 km buffer for the summer surveys (Figure 104).

Table 64 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified flying fish in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Aug-19	25	250	0.24	25	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Aug-19	0	0	-	0	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Aug-19	25	250	0.49	25	0

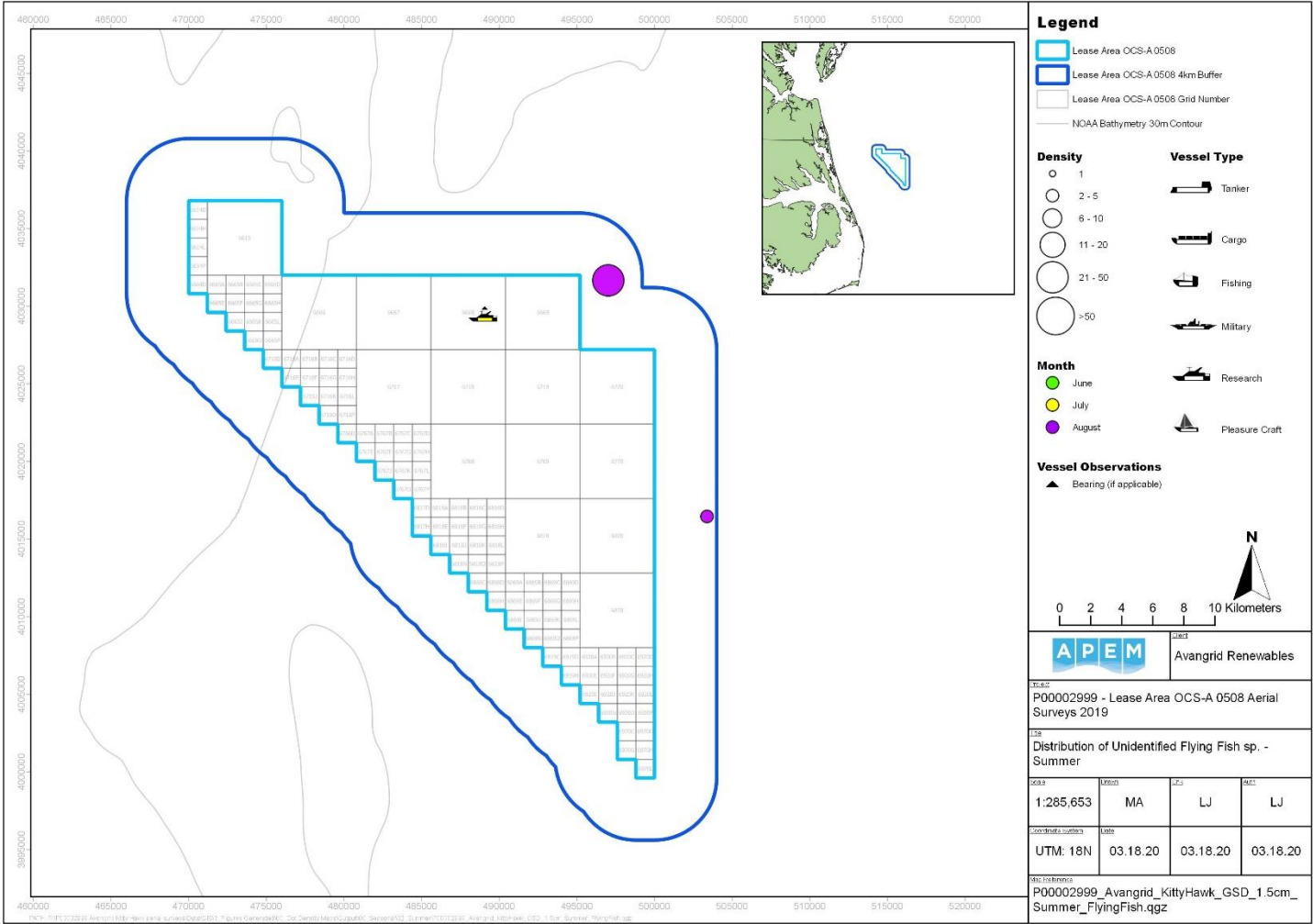


Figure 104 Distribution of unidentified flying fish recorded in Kitty Hawk plus 4 km buffer in the summer season

5.51 Ocean Sunfish

Ocean sunfish were recorded in all seasons, with highest numbers recorded in spring (**Table 65**). A peak raw count of 13 in the Kitty Hawk site, and 16 in the 4 km buffer, lead to abundance estimates of 125 and 166, respectively (**Table 65**).

A total of 44 ocean sunfish were recorded in spring in Kitty Hawk plus 4 km buffer (**Figure 105**), of which 29 were recorded in April, and 15 were recorded in May (**Table 65**). Individuals were located throughout the survey area for both months (**Figure 105**). For the summer surveys, a total of 25 ocean sunfish were recorded in Kitty Hawk plus 4 km buffer (**Figure 106**), of which 4 were recorded in June, 12 were recorded in July, and nine were recorded in August (**Table 65**). Individuals were located primarily within the Kitty Hawk site for all months (**Figure 106**). For the fall surveys, a total of 14 ocean sunfish were recorded in Kitty Hawk plus 4 km buffer (**Figure 107**), of which two were recorded in September, seven were recorded in October, and five were recorded in November (**Table 65**). Individuals were recorded in the south of the Kitty Hawk site for September, and distributed throughout the survey area for October and November (**Figure 107**). For the winter surveys, a total of five ocean sunfish were recorded in December distributed broadly across the northern half of Kitty Hawk plus 4 km buffer (**Figure 108**).

Table 65 Raw counts and abundance and density estimates (No. estimated individuals per km²) of ocean sunfish in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	29	290	0.28	29	0
May-19	15	150	0.15	15	0
Jun-19	4	40	0.04	4	0
Jul-19	12	120	0.12	12	0
Aug-19	9	90	0.09	9	0
Sep-19	2	20	0.02	2	0
Oct-19	7	70	0.07	7	0
Nov-19	5	50	0.05	5	0
Dec-19	5	50	0.05	5	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	13	125	0.25	13	0
May-19	6	58	0.12	6	0
Jun-19	2	19	0.04	2	0
Jul-19	11	106	0.21	11	0
Aug-19	6	58	0.12	6	0
Sep-19	2	19	0.04	2	0
Oct-19	3	29	0.06	3	0
Nov-19	2	19	0.04	2	0
Dec-19	2	19	0.04	2	0
c) 4 km buffer					

Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	16	166	0.31	16	0
May-19	9	93	0.18	9	0
Jun-19	2	21	0.04	1	0
Jul-19	1	10	0.02	1	0
Aug-19	3	31	0.06	3	0
Sep-19	0	0	-	0	0
Oct-19	4	41	0.08	4	0
Nov-19	3	31	0.06	3	0
Dec-19	3	31	0.06	3	0

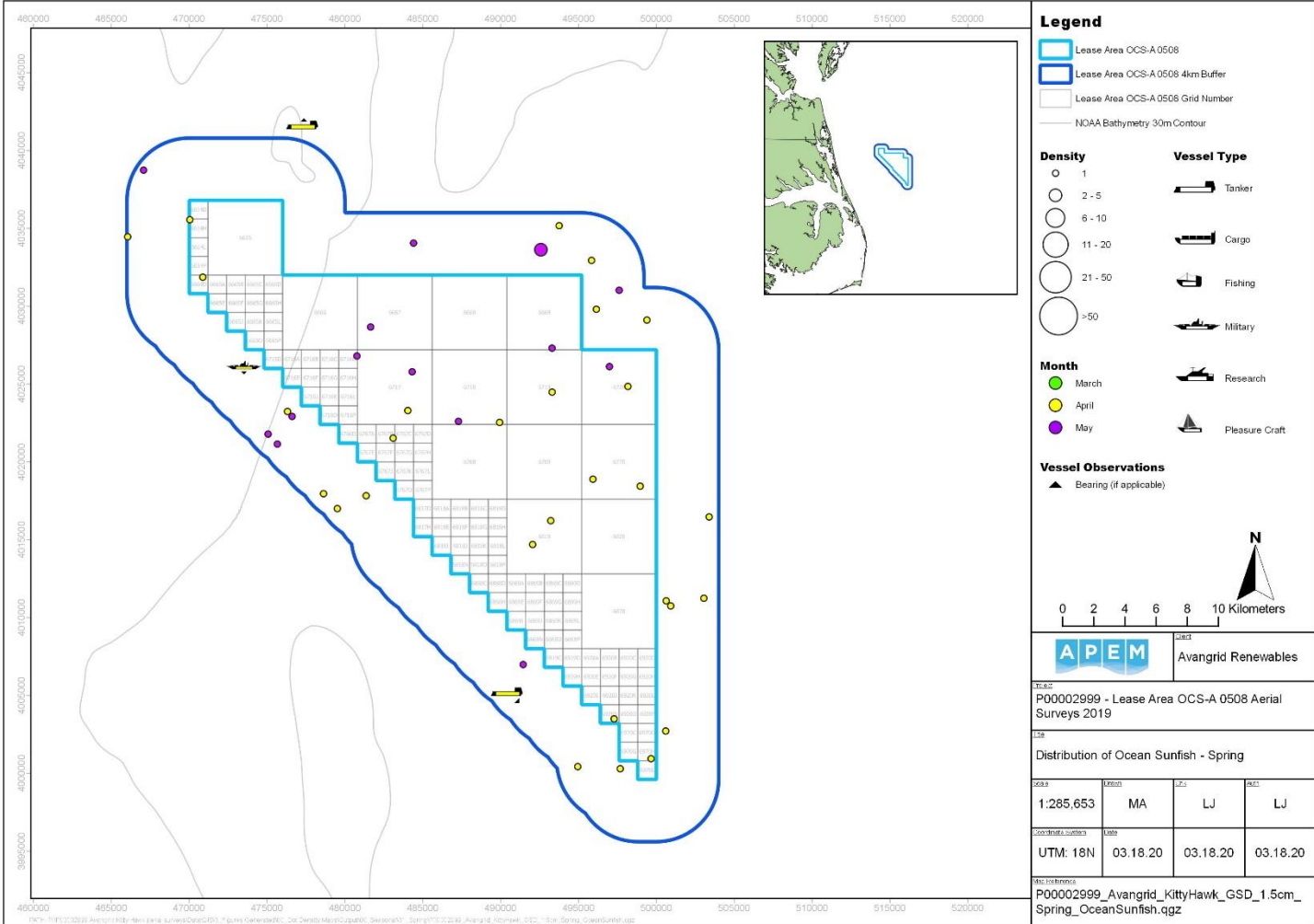


Figure 105 Distribution of ocean sunfish recorded in Kitty Hawk plus 4 km buffer in the spring season

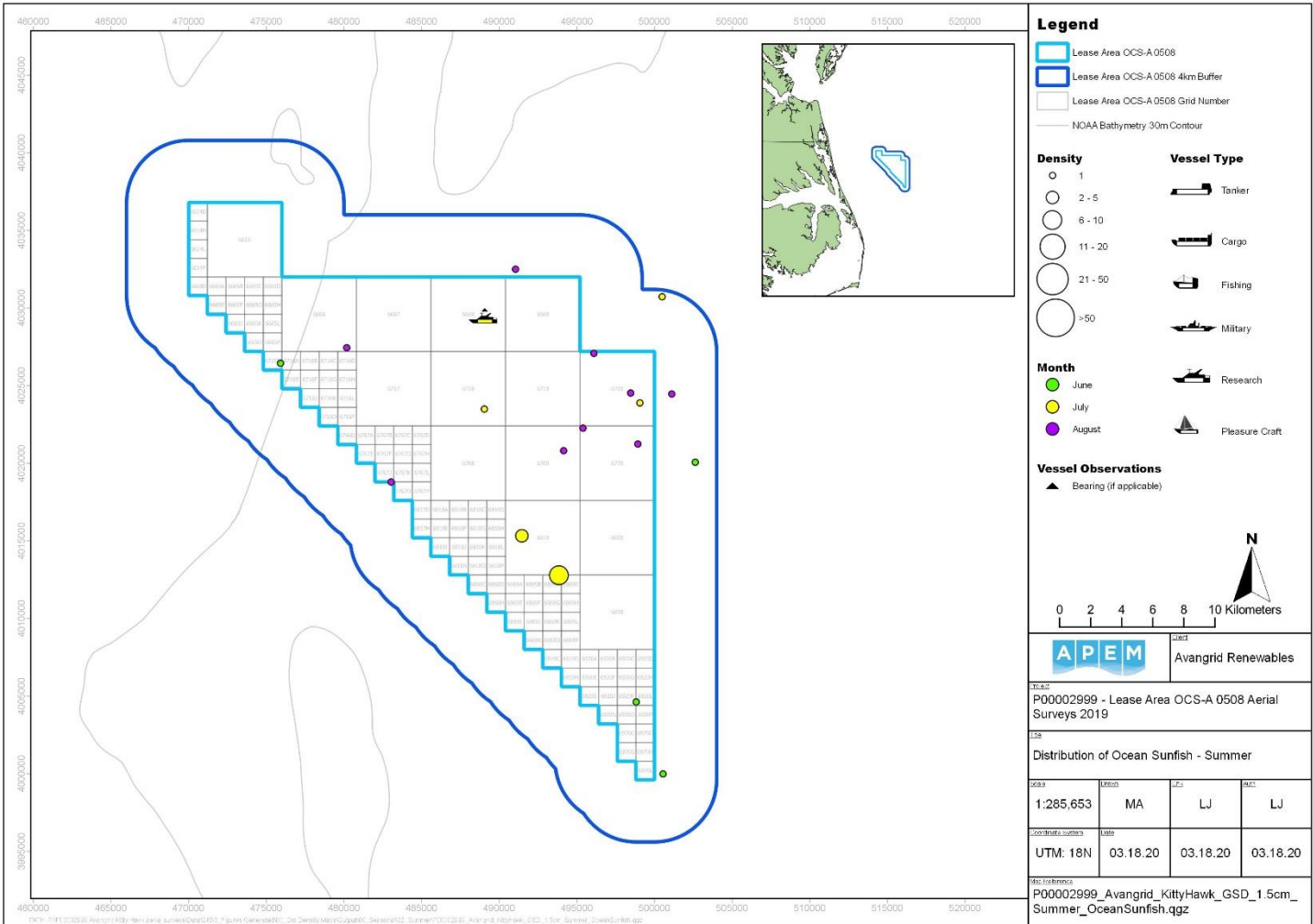


Figure 106 Distribution of ocean sunfish recorded in Kitty Hawk plus 4 km buffer in the summer season

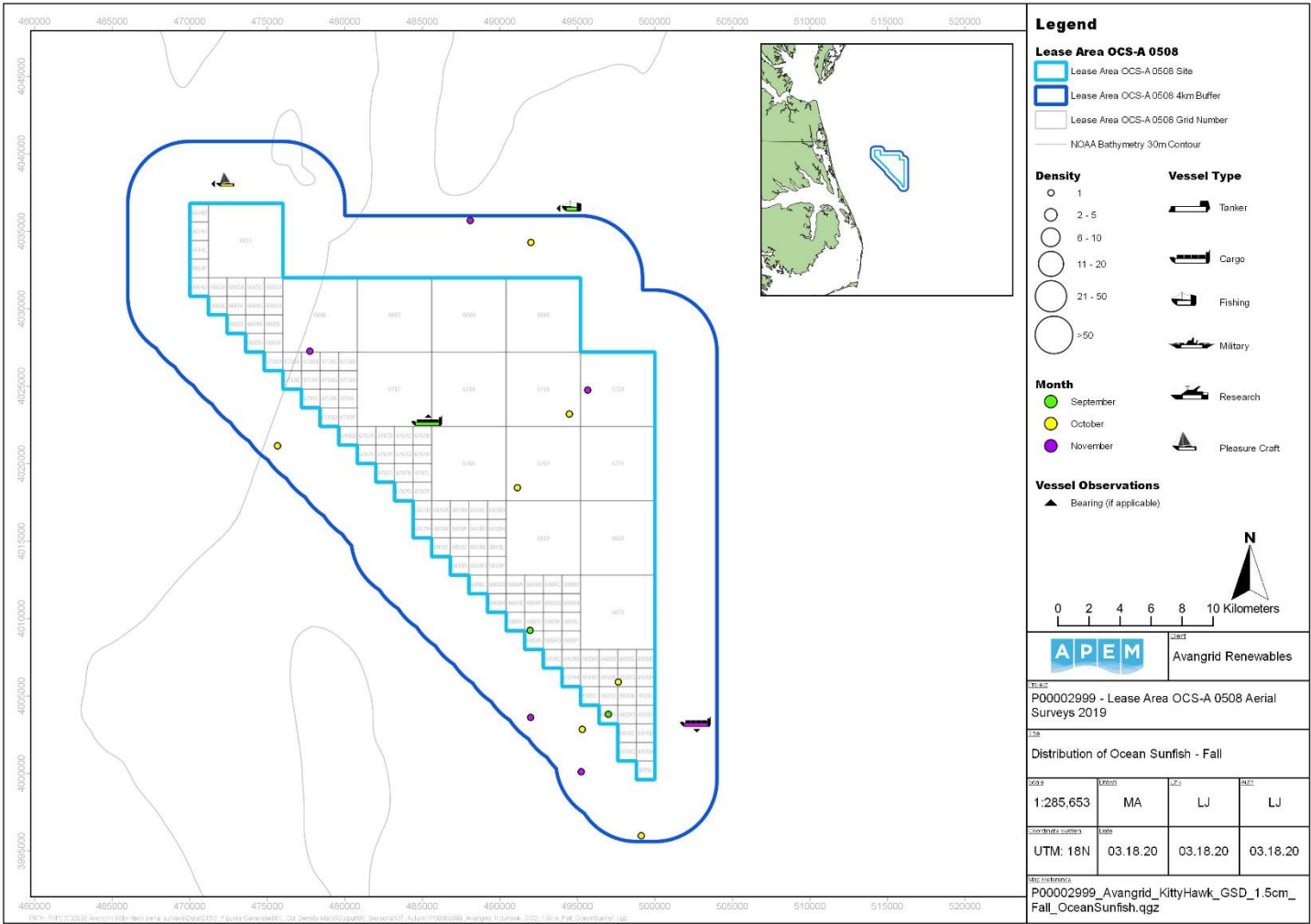


Figure 107 Distribution of ocean sunfish recorded in Kitty Hawk plus 4 km buffer in the fall season

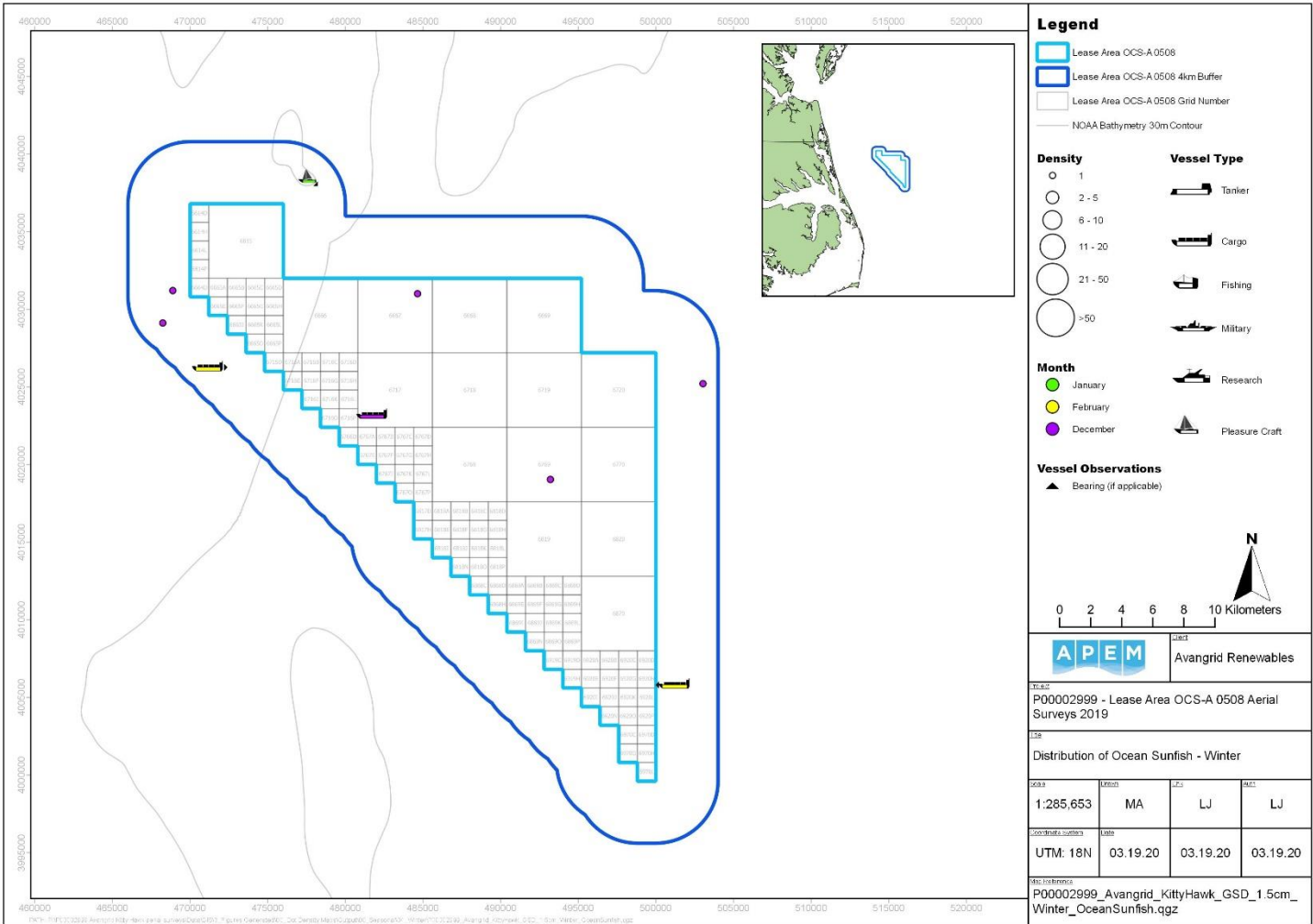


Figure 108 Distribution of ocean sunfish recorded in Kitty Hawk plus 4 km buffer in the winter season

5.52 Sharptail Sunfish

A sharptail sunfish was recorded in April only, with a raw count of one, leading to an abundance estimate of ten (Table 66).

A total of one sharptail sunfish was recorded in April in the north of the Kitty Hawk site for the spring surveys (Figure 109).

Table 66 Raw counts and abundance and density estimates (No. estimated individuals per km²) of sharptail sunfish in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	1	10	0.01	1	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	1	10	0.02	1	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	0	0	-	0	0

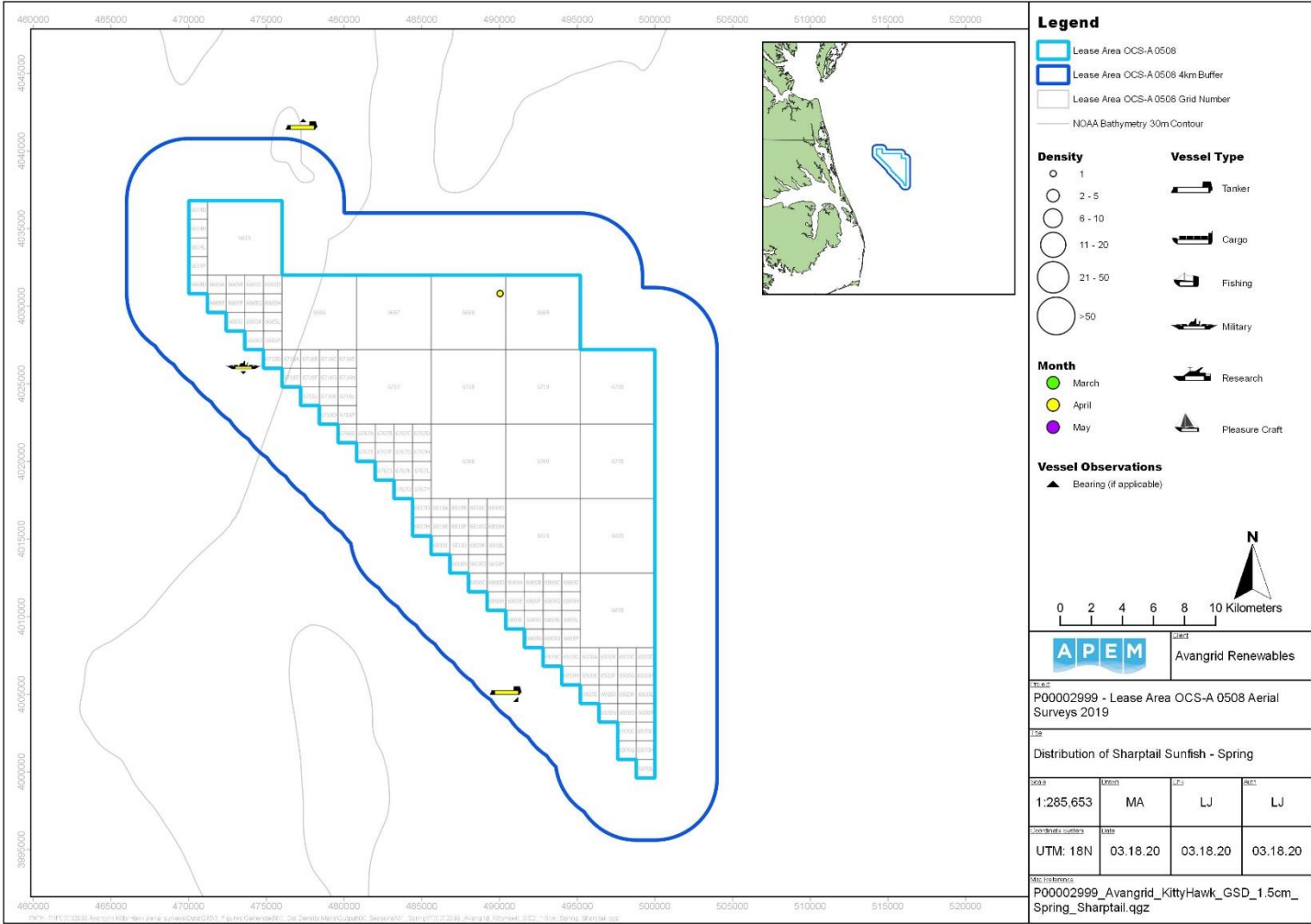


Figure 109 Distribution of sharptail sunfish recorded in the Kitty Hawk plus 4 km buffer in the spring season

5.53 Species Unknown – Sunfish

Unidentified sunfish were recorded in all seasons bar winter, with highest numbers recorded in summer (**Table 67**). A peak raw count of three in the Kitty Hawk site, and one in the 4 km buffer, lead to abundance estimates of 29 and ten, respectively (**Table 67**).

A total of one unidentified sunfish was recorded in April in the east of the Kitty Hawk site for the spring surveys (**Figure 110**). For the summer surveys, a total of six unidentified sunfish were recorded in Kitty Hawk plus 4 km buffer (**Figure 111**), of which two were recorded in July, and four were recorded in August (**Table 67**). Individuals were located in the southeast of the Kitty Hawk site in July, and in the central west and southeast of the Kitty Hawk site and northwest of the 4 km buffer in August (**Figure 111**). For the fall surveys, a total of one unidentified sunfish was recorded in November in the southwest of the 4 km buffer (**Figure 112**).

Table 67 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified sunfish in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	1	10	0.01	1	0
Jul-19	2	20	0.02	2	0
Aug-19	4	40	0.04	4	0
Nov-19	1	10	0.01	1	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	1	10	0.02	1	0
Jul-19	2	19	0.04	2	0
Aug-19	3	29	0.06	3	0
Nov-19	0	0	-	0	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	0	0	-	0	0
Jul-19	0	0	-	0	0
Aug-19	1	10	0.02	1	0
Nov-19	1	10	0.02	1	0

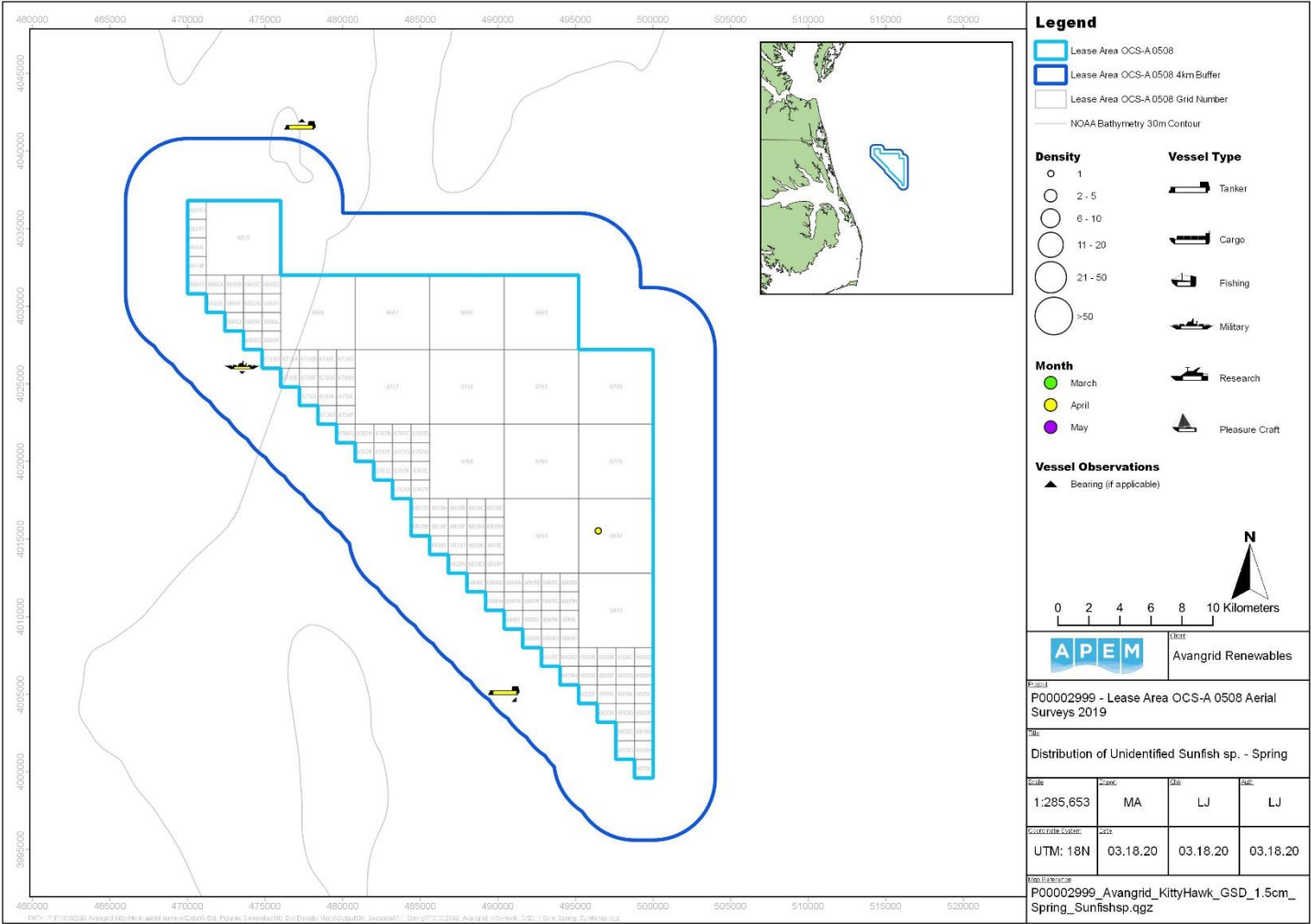


Figure 110 Distribution of unidentified sunfish recorded in Kitty Hawk plus 4 km buffer in the spring season

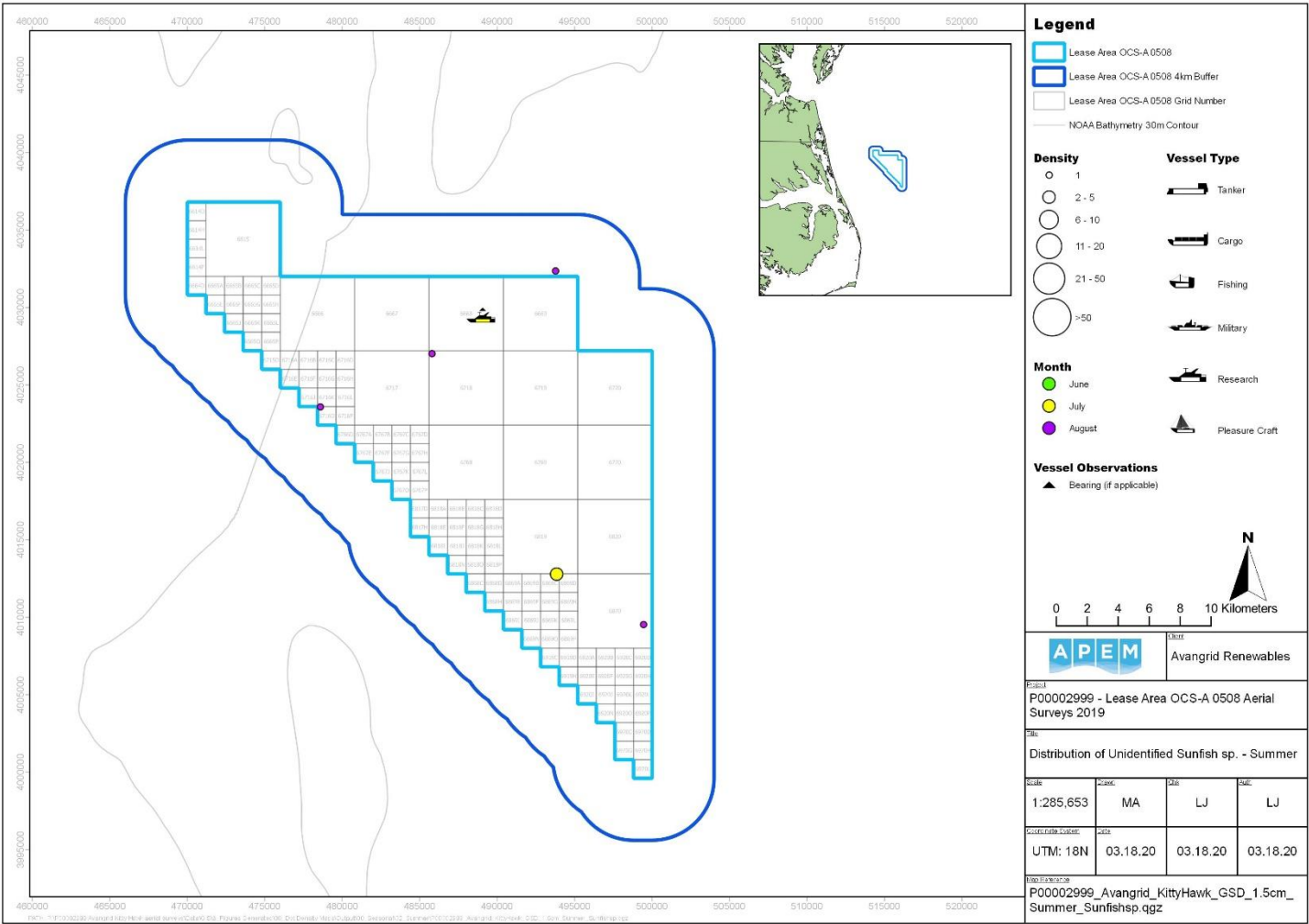


Figure 111 Distribution of unidentified sunfish recorded in Kitty Hawk plus 4 km buffer in the summer season

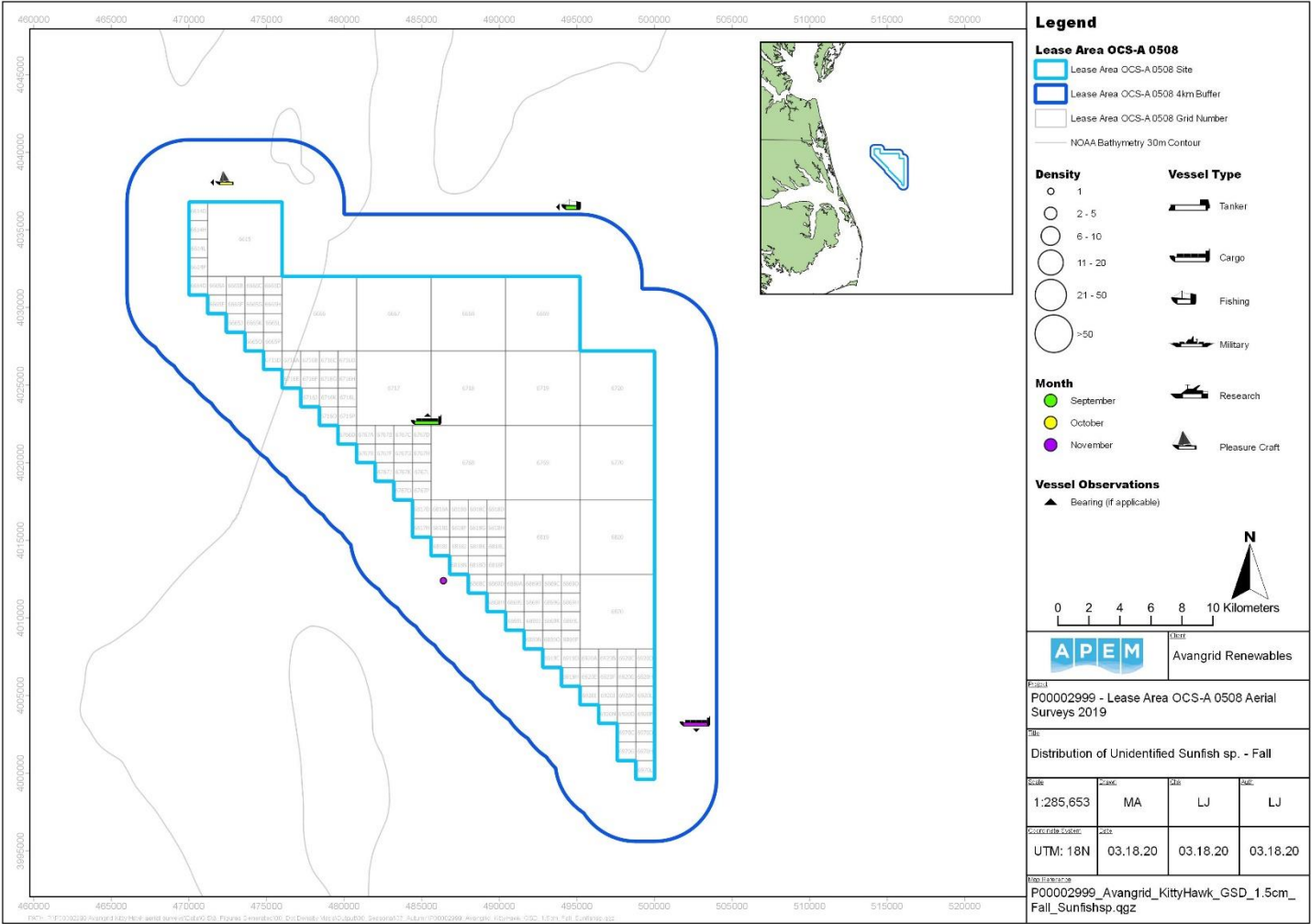


Figure 112 Distribution of unidentified sunfish recorded in Kitty Hawk plus 4 km buffer in the fall season

5.54 Cobia

Cobia were recorded in July and October only, with highest recorded numbers in fall (**Table 68**). A peak raw count of three in the Kitty Hawk site, and three in the 4 km buffer, lead to abundance estimates of 29 and 31, respectively (**Table 68**).

A total of three cobia were recorded in July in the center and northwest of the Kitty Hawk site for the summer surveys (**Figure 113**). For the fall surveys, a total of six cobia were recorded in October in the northwest and south of the Kitty Hawk site, and southwest of the 4 km buffer (**Figure 114**).

Table 68 Raw counts and abundance and density estimates (No. estimated individuals per km²) of cobia in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul-19	3	30	0.03	3	0
Oct-19	6	60	0.06	6	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul-19	3	29	0.06	3	0
Oct-19	3	29	0.06	3	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul-19	0	0	-	0	0
Oct-19	3	31	0.06	3	0



Figure 113 Distribution of cobia recorded in Kitty Hawk plus 4 km buffer in the summer season

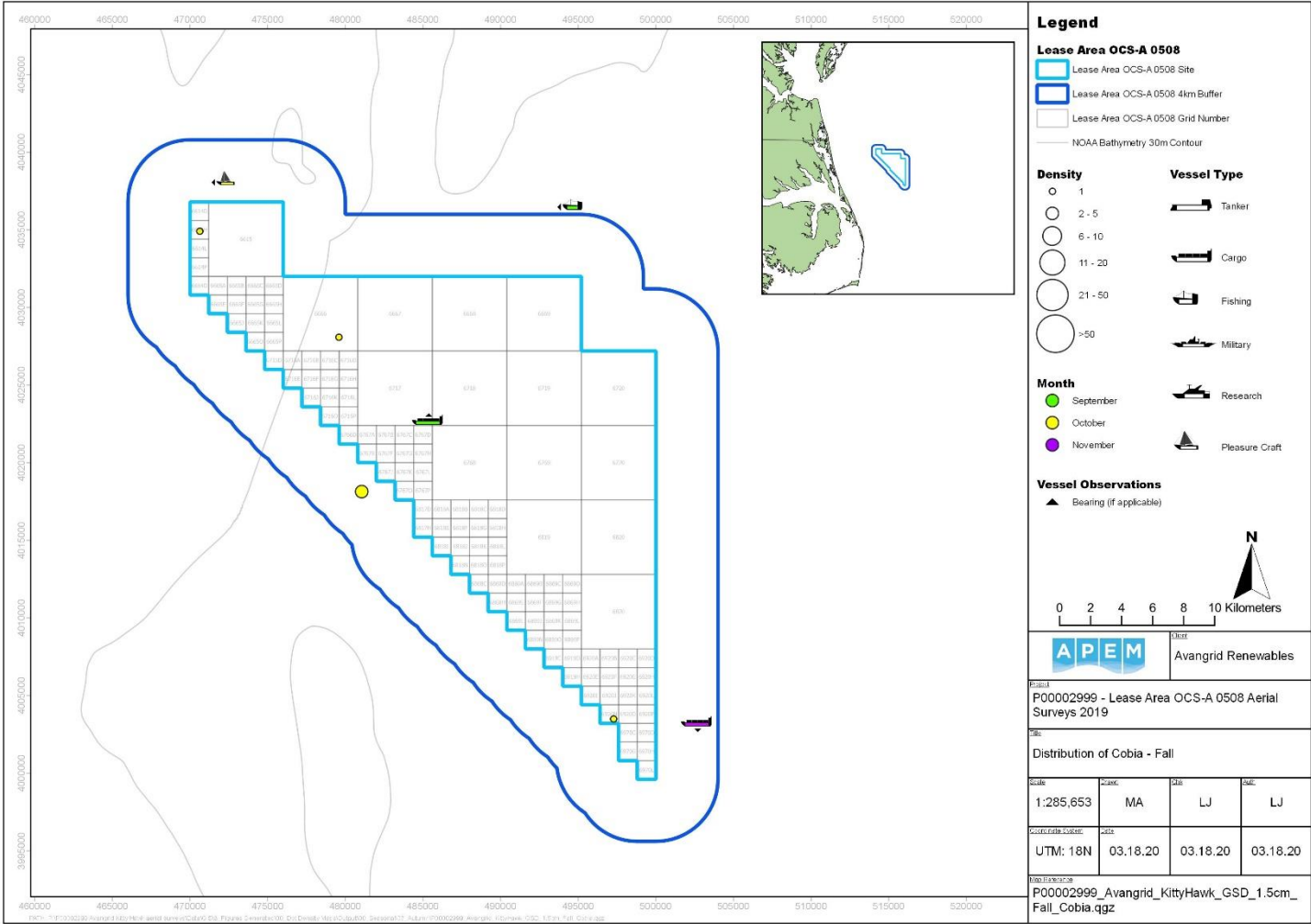


Figure 114 Distribution of cobia recorded in Kitty Hawk plus 4 km buffer in the fall season

5.55 Atlantic Bluefin Tuna

Atlantic bluefin tuna were recorded in June and October only, with peak raw counts of two in the Kitty Hawk site in June, and two in the 4 km buffer in October, leading to abundance estimates of 19 and 21, respectively (Table 69).

A total of two Atlantic bluefin tuna were recorded in June in the north of the Kitty Hawk site for the summer surveys (Figure 115). For the fall surveys, a total of two Atlantic bluefin tuna were recorded in the northwest of the 4 km buffer (Figure 116).

Table 69 Raw counts and abundance and density estimates (No. estimated individuals per km²) of Atlantic bluefin tuna in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun-19	2	20	0.02	2	0
Oct-19	2	20	0.02	2	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun-19	2	19	0.04	2	0
Oct-19	0	0	-	0	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun-19	0	0	-	0	0
Oct-19	2	21	0.04	2	0



Figure 115 Distribution of Atlantic bluefin tuna recorded in Kitty Hawk plus 4 km buffer in the summer season



Figure 116 Distribution of Atlantic bluefin tuna recorded in Kitty Hawk plus 4 km buffer in the fall season

5.56 Species Unknown – Tuna

Unidentified tuna were recorded in all seasons bar winter, with highest numbers recorded in fall (**Table 70**). A peak raw count of 80 in the Kitty Hawk site, and 90 in the 4 km buffer, lead to abundance estimates of 772 and 932, respectively (**Table 70**).

A total of 23 unidentified tuna were recorded in Kitty Hawk plus 4 km buffer (**Figure 117**), of which 21 were recorded in April, and two were recorded in May (**Table 70**) for the spring surveys. Individuals were located primarily in the west and north of the Kitty Hawk site, as well as in the north and southeast of the 4 km buffer for April, and located in the west of the Kitty Hawk site for May (**Figure 117**). For the summer surveys, 74 unidentified tuna were recorded in July, primarily across the northern half of the survey area (**Figure 118**). For the fall surveys, 170 unidentified tuna were recorded throughout the survey area, with highest densities recorded in the northwest of both the Kitty Hawk site and the 4 km buffer (**Figure 119**).

Table 70 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified tuna in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	21	210	0.21	21	0
May-19	2	20	0.02	2	0
Jul-19	74	740	0.72	74	0
Nov-19	170	1700	1.66	170	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	14	135	0.27	14	0
May-19	2	19	0.04	2	0
Jul-19	49	473	0.95	49	0
Nov-19	80	772	1.56	80	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	7	73	0.14	7	0
May-19	0	0	-	0	0
Jul-19	25	259	0.49	25	0
Nov-19	90	932	1.76	90	0

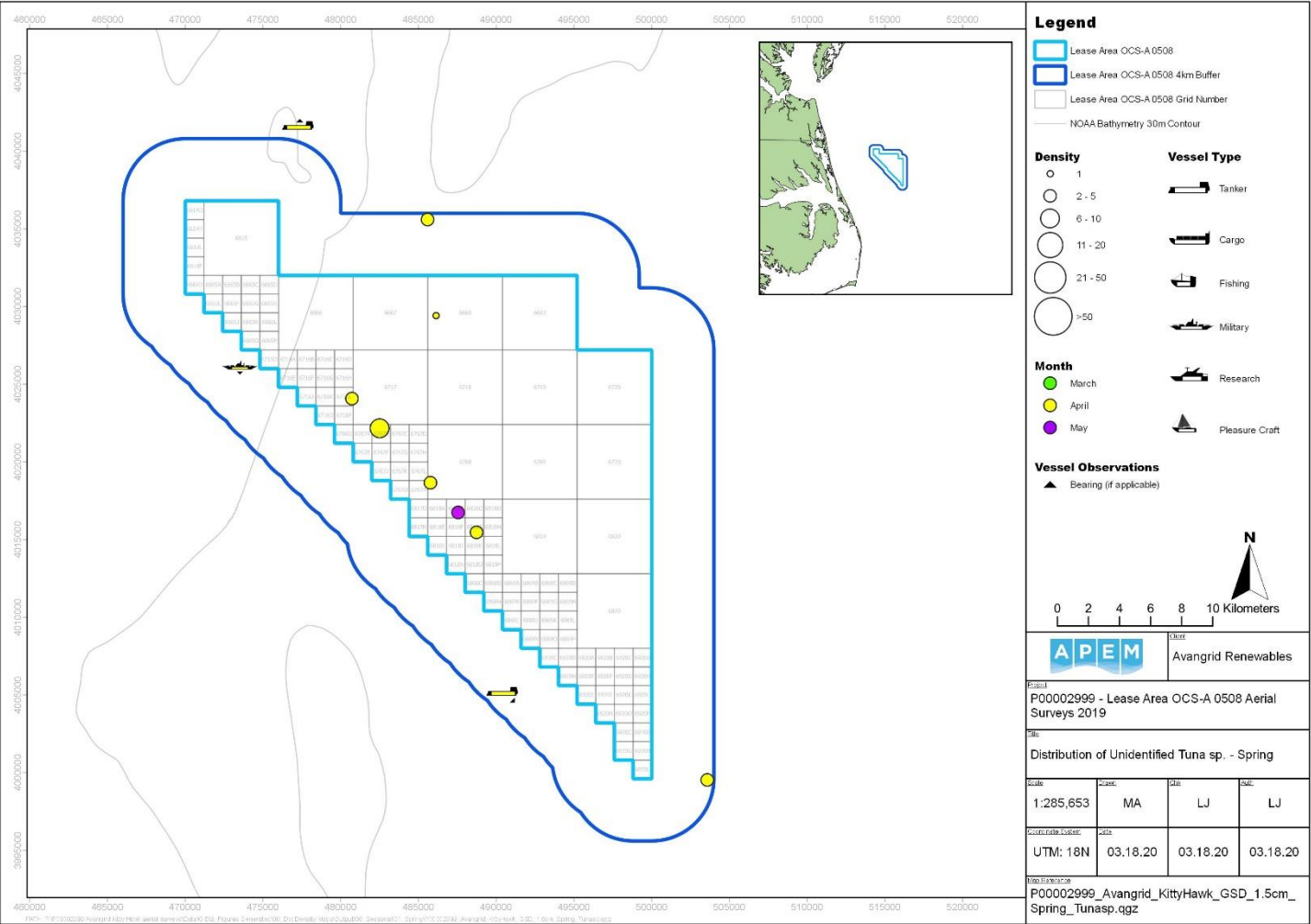


Figure 117 Distribution of unidentified tuna recorded in Kitty Hawk plus 4 km buffer in the spring season



Figure 118 Distribution of unidentified tuna recorded in Kitty Hawk plus 4 km buffer in the summer season

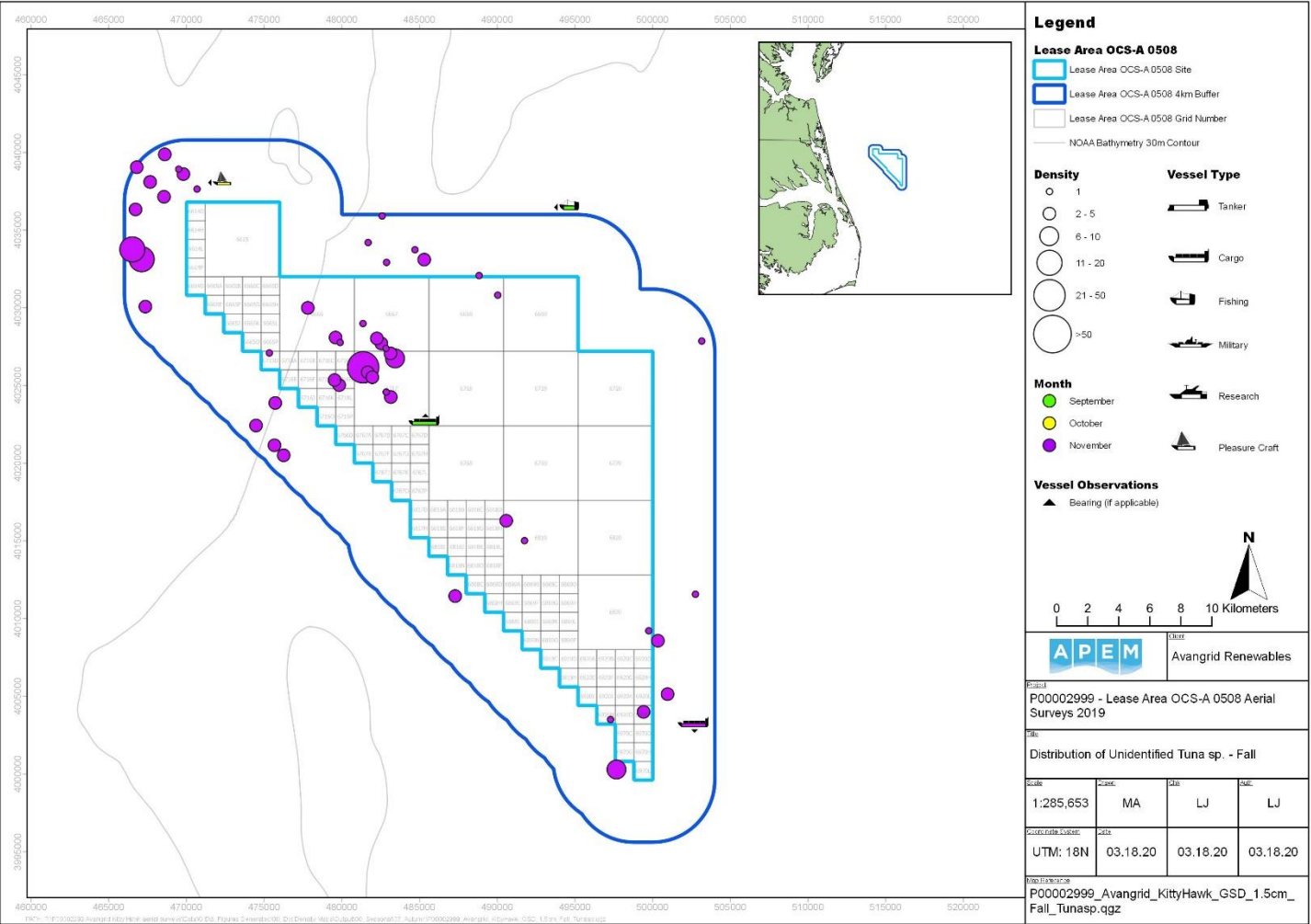


Figure 119 Distribution of unidentified tuna recorded in Kitty Hawk plus 4 km buffer in the fall season

5.57 Species Unknown – Fish

Unidentified fish were recorded in July, November, and December, with highest numbers recorded in fall (**Table 71**). A peak raw count of 5 individuals in the Kitty Hawk plus 4 km buffer in July, lead to an abundance estimate of 50 (**Table 71**).

A total of three unidentified fish were recorded in July in the northeast of the Kitty Hawk site and in the northwest of the 4 km buffer (**Figure 120**). For the fall surveys, a total of five unidentified fish were recorded in November in the northwest and the southwest of the 4 km buffer (**Figure 121**). For the winter surveys, a total of one unidentified fish was recorded in December in the north of the Kitty Hawk site (**Figure 122**).

Table 71 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified fish in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul-19	3	30	0.03	3	0
Nov-19	5	50	0.05	5	0
Dec-19	1	10	0.01	1	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul-19	1	10	0.02	1	0
Nov-19	0	0	-	0	0
Dec-19	1	10	0.02	1	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul-19	2	21	0.04	2	0
Nov-19	5	52	0.1	5	0
Dec-19	0	0	-	0	0



Figure 120 Distribution of unidentified fish recorded in Kitty Hawk plus 4 km buffer in the summer season

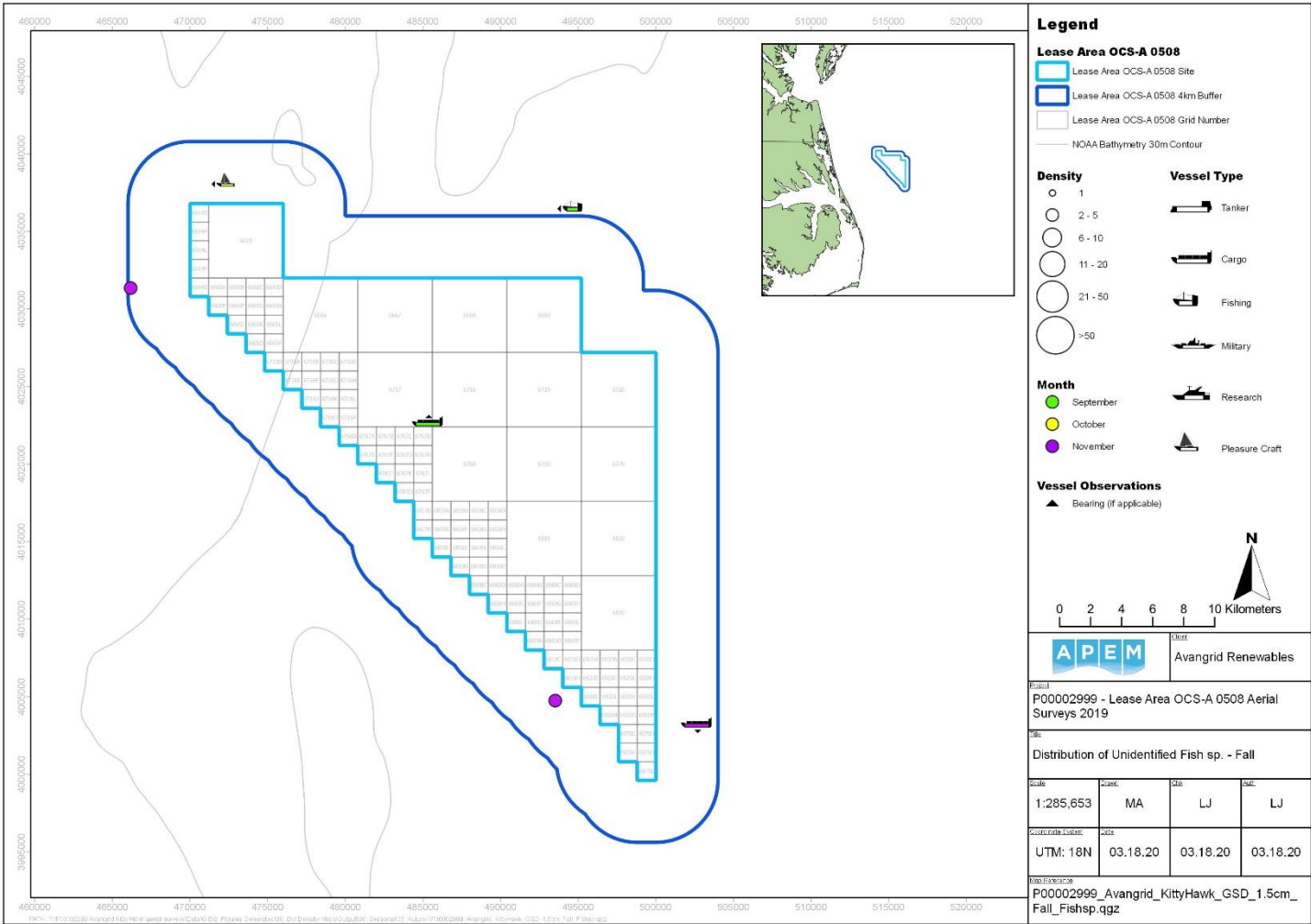


Figure 121 Distribution of unidentified fish recorded in Kitty Hawk plus 4 km buffer in the fall season

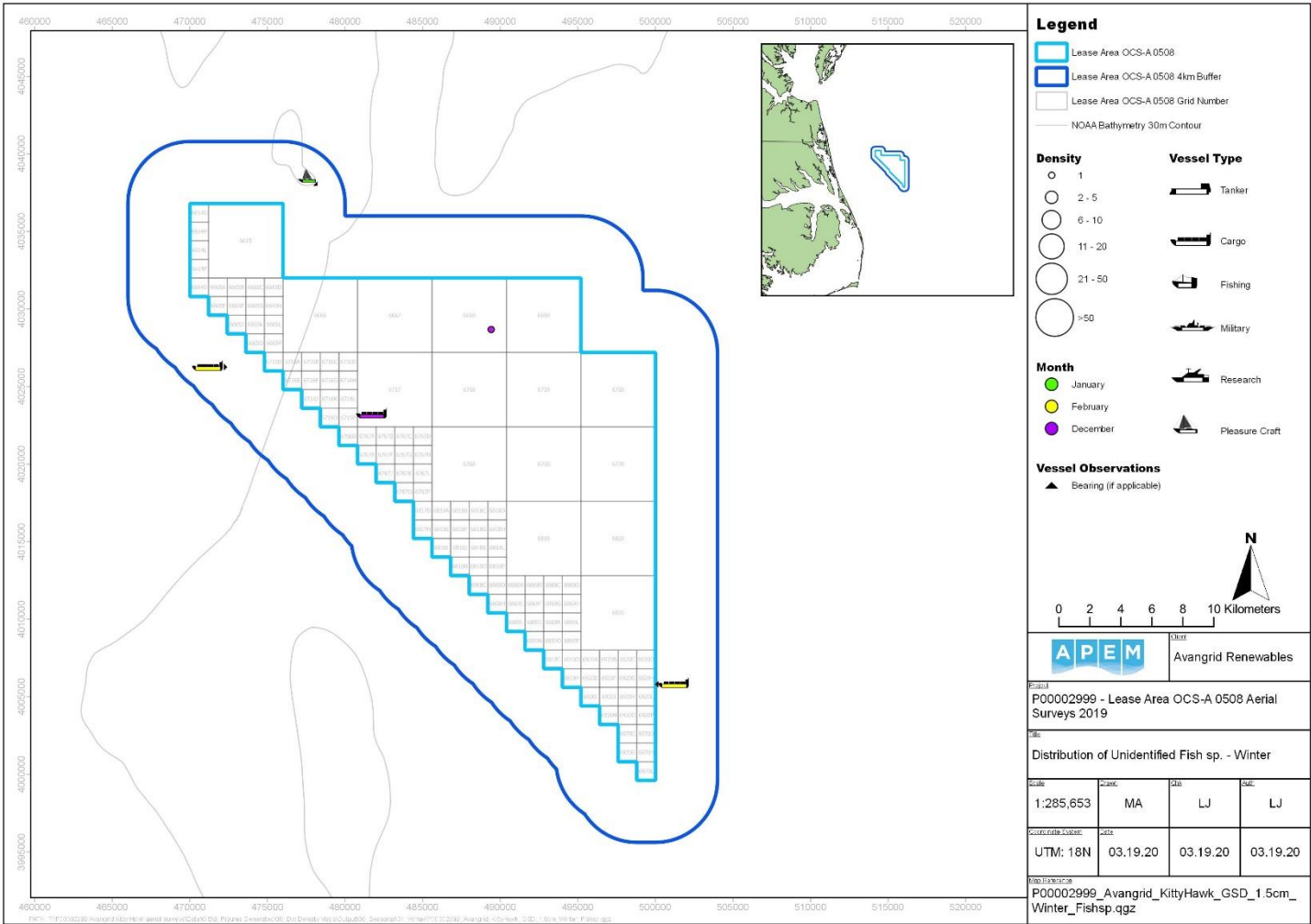


Figure 122 Distribution of unidentified fish recorded in Kitty Hawk plus 4 km buffer in the winter season

5.58 Blue Shark

Blue sharks were recorded in April only, with a raw count of one, leading to an abundance estimate of ten (Table 72).

A total of one blue shark was recorded in April in the northeast of the 4 km buffer for the spring surveys (Figure 123).

Table 72 Raw counts and abundance and density estimates (No. estimated individuals per km²) of blue sharks in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	1	10	0.01	1	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	0	0	-	0	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	1	10	0.02	1	0

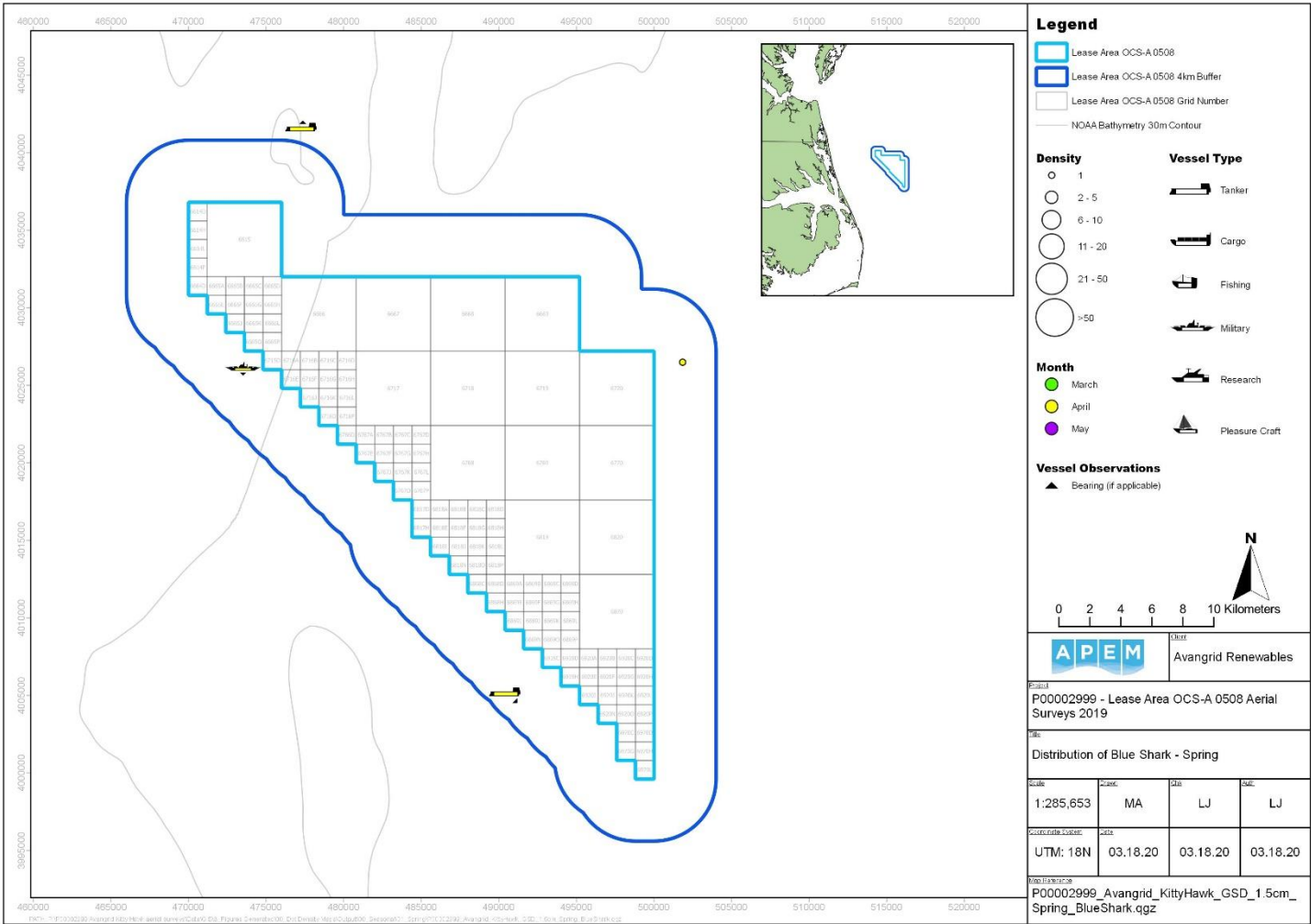


Figure 123 Distribution of blue sharks recorded in Kitty Hawk plus 4 km buffer in the spring season

5.59 Tiger Shark

Tiger sharks were recorded in June and July only, with a peak raw count of two in Kitty Hawk plus 4 km buffer in July leading to an abundance estimate of 20 (Table 73).

A total of three tiger sharks were recorded in the summer surveys in Kitty Hawk plus 4 km buffer (Figure 124), of which one was recorded in June, and two were recorded in July (Table 73). Individuals were located in the southeast of the 4 km buffer in June, and in the northwest of the Kitty Hawk site for July (Figure 124).

Table 73 Raw counts and abundance and density estimates (No. estimated individuals per km²) of tiger sharks in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun-19	1	10	0.01	1	0
Jul-19	2	20	0.02	2	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun-19	0	0	-	0	0
Jul-19	2	19	0.04	2	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun-19	1	10	0.02	1	0
Jul-19	0	0	-	0	0



Figure 124 Distribution of tiger sharks recorded in Kitty Hawk plus 4 km buffer in the summer season

5.60 Species Unknown – Carcharhinidae Shark

Unidentified Carcharhinidae sharks were recorded in July, August, and November only, with equal numbers recorded in both summer and fall (**Table 74**). A peak raw count of three in the Kitty Hawk site for November, and one in the 4 km buffer for August, lead to abundance estimates of 29 and ten respectively (**Table 74**).

A total of three unidentified Carcharhinidae sharks were recorded in the summer surveys in Kitty Hawk plus 4 km buffer (**Figure 125**), of which two were recorded in July, and one was recorded in August (**Table 74**). Individuals were located in the northwest of the Kitty Hawk site for July, and in the northwest of the 4 km buffer for August (**Figure 125**). For the fall surveys, three unidentified Carcharhinidae sharks were recorded in November, distributed from the center to the south of the Kitty Hawk site (**Figure 126**).

Table 74 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified Carcharhinidae sharks in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul-19	2	20	0.02	2	0
Aug-19	1	10	0.01	1	0
Nov-19	3	30	0.03	3	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul-19	2	19	0.04	2	0
Aug-19	0	0	-	0	0
Nov-19	3	29	0.06	3	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul-19	0	10	-	0	0
Aug-19	1	10	0.02	1	0
Nov-19	0	0	-	0	0



Figure 125 Distribution of unidentified Carcharhinidae sharks recorded in Kitty Hawk plus 4 km buffer in the summer season

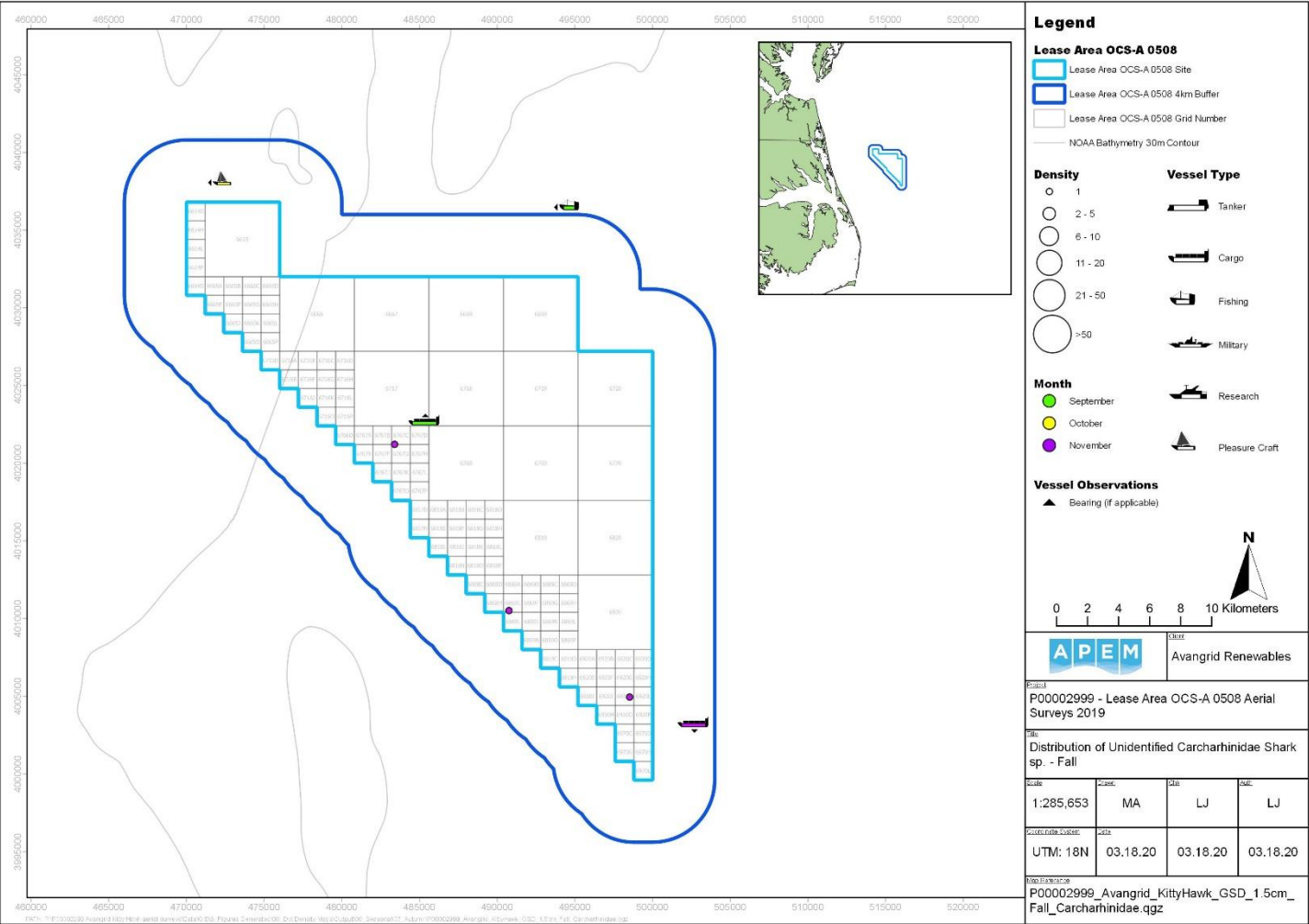


Figure 126 Distribution of unidentified Carcharhinidae sharks recorded in Kitty Hawk plus 4 km buffer in the fall season

5.61 Great White Shark

Great white sharks were recorded in April, November, and December only, with highest numbers recorded in fall and winter (**Table 75**). A peak raw count of two in Kitty Hawk plus 4 km buffer for both November and December, lead to abundance estimates of 20 for both months (**Table 75**).

A total of one great white shark was recorded in April in the north of the Kitty Hawk site for the spring surveys (**Figure 127**). For the fall surveys, a total of two great white sharks were recorded in the central southwest of the Kitty Hawk site and the southwest of the 4 km buffer (**Figure 128**). For the winter surveys, a total of two great white sharks were recorded in the southwest of both the Kitty Hawk site and the 4 km buffer (**Figure 129**).

Table 75 Raw counts and abundance and density estimates (No. estimated individuals per km²) of great white sharks in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	1	10	0.01	1	0
Nov-19	2	20	0.02	2	0
Dec-19	2	20	0.02	2	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	1	10	0.02	1	0
Nov-19	1	10	0.02	1	0
Dec-19	1	10	0.02	1	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	0	0	-	0	0
Nov-19	1	10	0.02	1	0
Dec-19	1	10	0.02	1	0

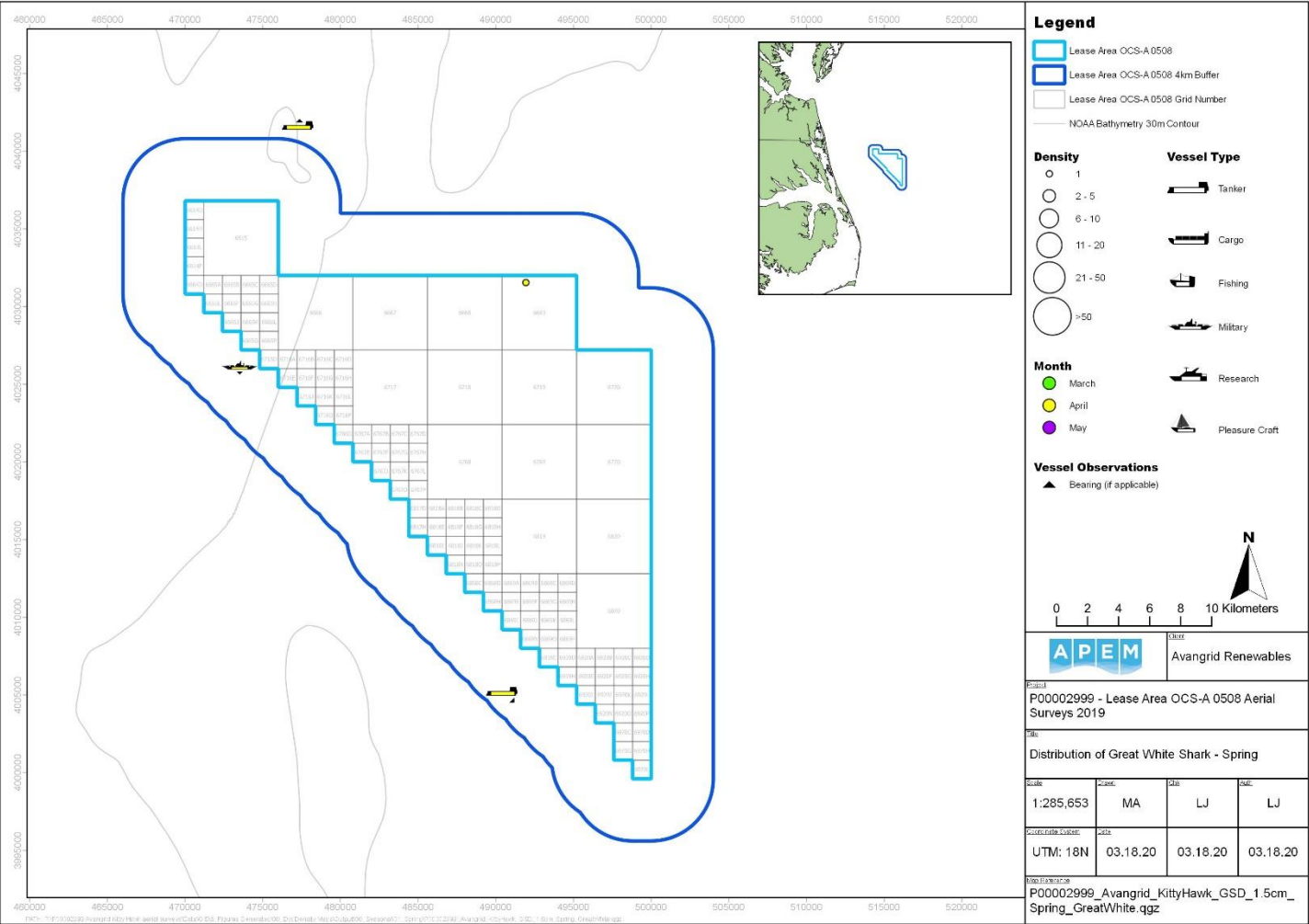


Figure 127 Distribution of great white sharks recorded in Kitty Hawk plus 4 km buffer in the spring season

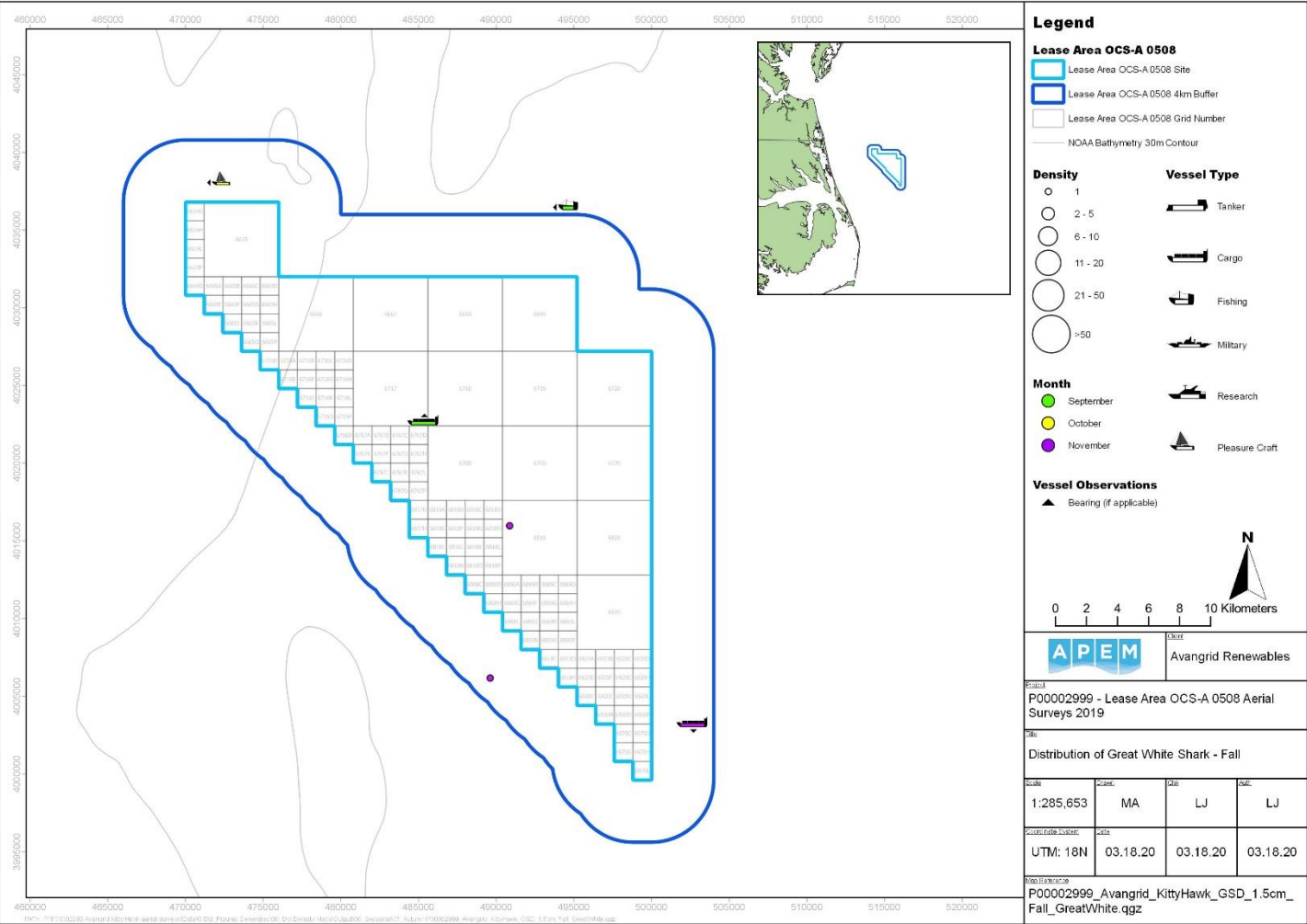


Figure 128 Distribution of great white sharks recorded in Kitty Hawk plus 4 km buffer in the fall season

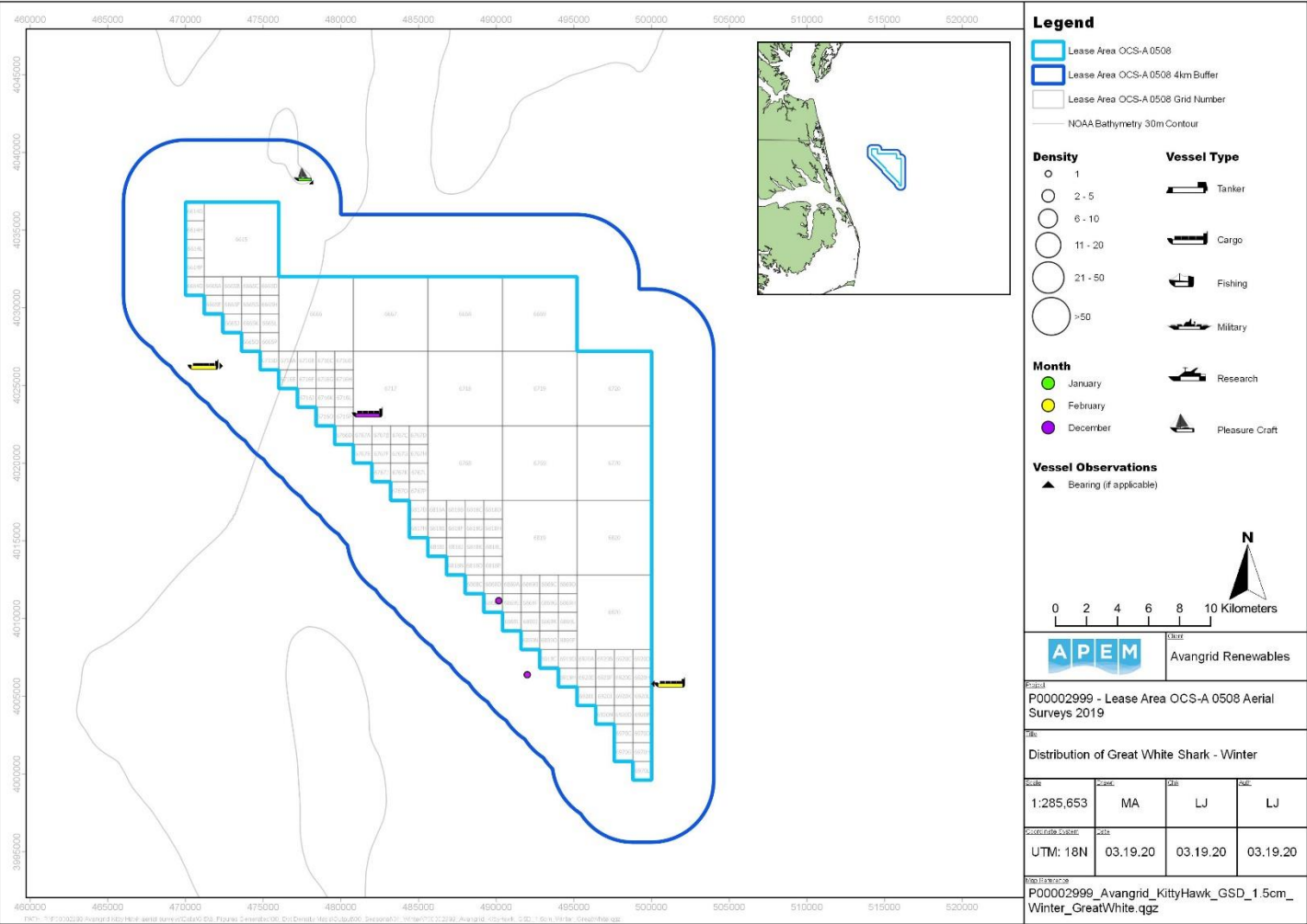


Figure 129 Distribution of great white sharks recorded in Kitty Hawk plus 4 km buffer in the winter season

5.62 Scalloped Hammerhead Shark

Scalloped hammerhead sharks were recorded in September and November only, with a peak raw count of two in Kitty Hawk plus 4 km buffer for September, leading to abundance estimates of 20 (Table 76).

A total of three scalloped hammerhead sharks were recorded in the fall surveys (Figure 130), of which two were recorded in September, and one was recorded in November (Table 76). Individuals were located in the north of the Kitty Hawk site for September, and in the south of the Kitty Hawk site for November (Figure 130).

Table 76 Raw counts and abundance and density estimates (No. estimated individuals per km²) of scalloped hammerhead sharks in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Sep-19	2	20	0.02	2	0
Nov-19	1	10	0.01	1	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Sep-19	2	19	0.04	2	0
Nov-19	1	10	0.02	1	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Sep-19	0	0	-	0	0
Nov-19	0	0	-	0	0

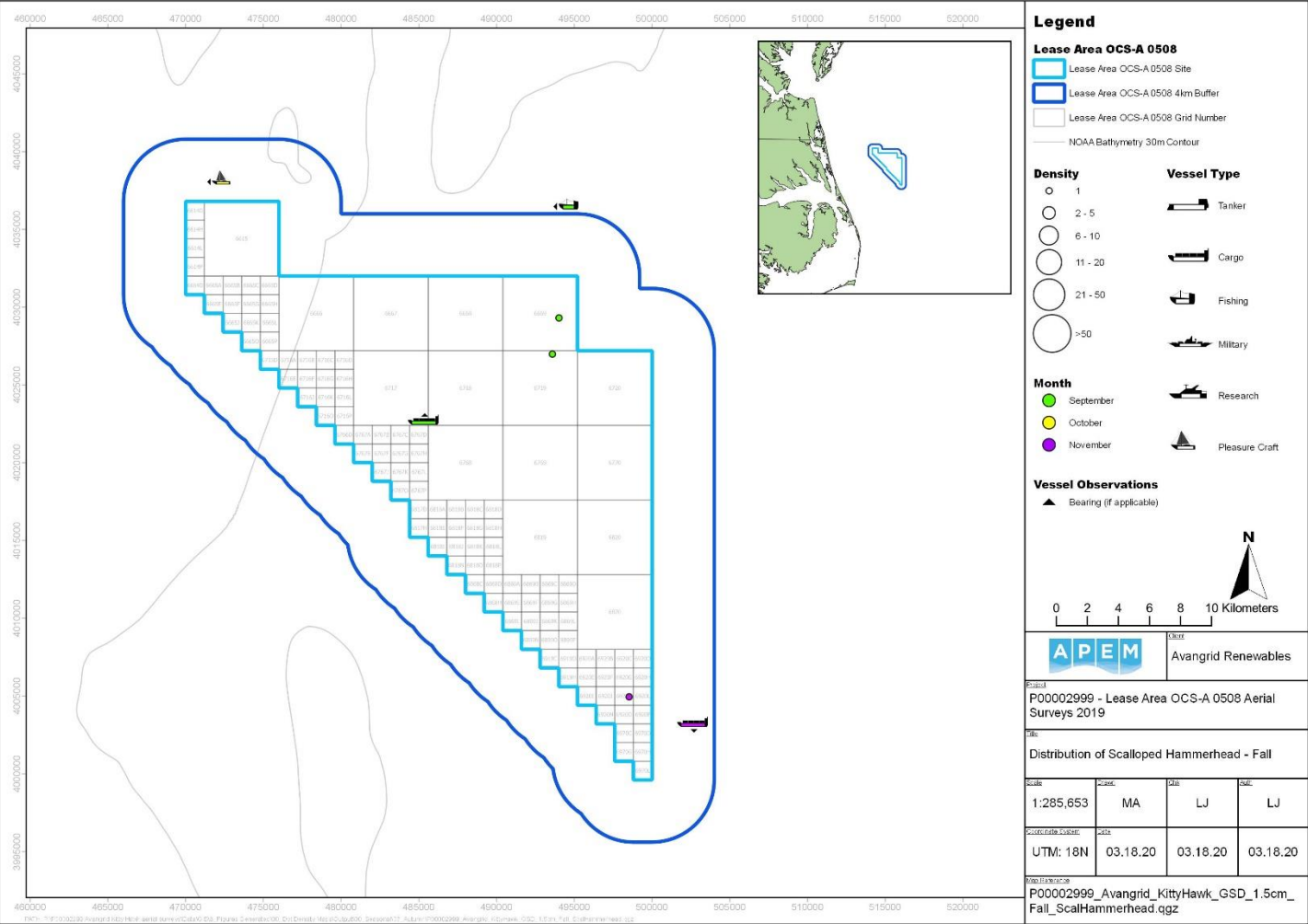


Figure 130 Distribution of scalloped hammerhead sharks recorded in Kitty Hawk plus 4 km buffer in the fall season

5.63 Smooth Hammerhead Shark

Smooth hammerhead sharks were recorded in September only, with a raw count of one in the Kitty Hawk site, leading to an abundance estimate of ten (Table 77).

A total of one smooth hammerhead shark was recorded in September in the north of the Kitty Hawk site for the fall surveys (Figure 131).

Table 77 Raw counts and abundance and density estimates (No. estimated individuals per km²) of smooth hammerhead sharks in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Sep-19	1	10	0.01	1	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Sep-19	1	10	0.02	1	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Sep-19	0	0	-	0	0

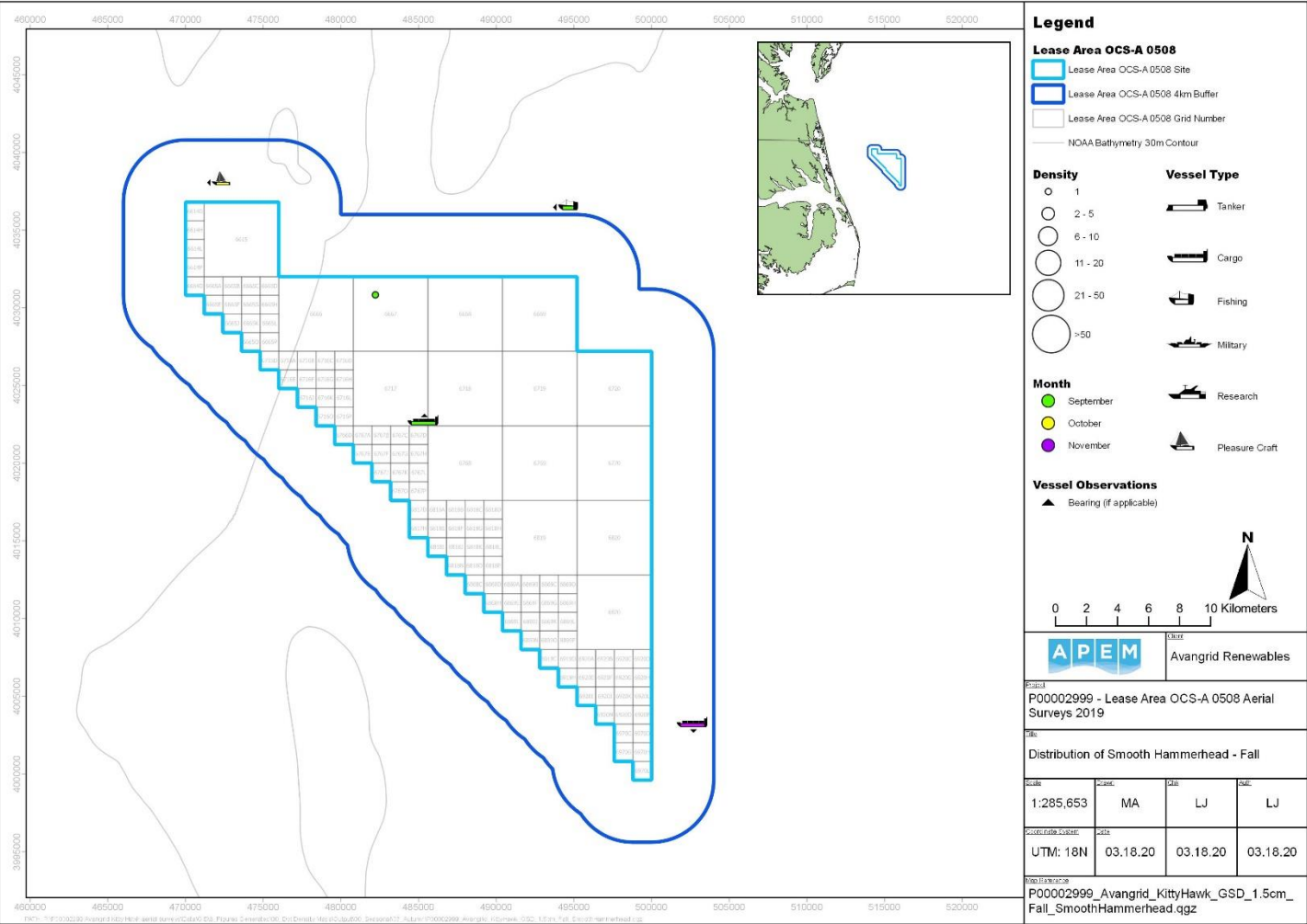


Figure 131 Distribution of smooth hammerhead sharks recorded in Kitty Hawk plus 4 km buffer in the fall season

5.64 Species Unknown – Hammerhead Shark

Unidentified hammerhead sharks were recorded in June, July, and September, with highest numbers recorded in summer (**Table 78**). A raw count of one unidentified hammerhead shark in the Kitty Hawk site, and one in the 4 km buffer, lead to abundance estimates of ten and ten, respectively (**Table 78**).

A total of three unidentified hammerhead sharks were recorded in the summer surveys in the Kitty Hawk site (**Figure 132**), of which one was recorded in June, and one was recorded in July (**Table 78**). Individuals were located in the northwest of the Kitty Hawk site for both months (**Figure 132**). For the fall surveys, a total of one unidentified hammerhead shark was recorded in September in the west of the Kitty Hawk site (**Figure 133**).

Table 78 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified hammerhead sharks in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun-19	1	10	0.01	1	0
Jul-19	2	20	0.02	2	0
Sep-19	1	10	0.01	1	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun-19	1	10	0.02	1	0
Jul-19	1	10	0.02	1	0
Sep-19	1	10	0.02	1	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun-19	0	0	-	0	0
Jul-19	1	10	0.02	1	0
Sep-19	0	0	-	0	0



Figure 132 Distribution of unidentified hammerhead sharks recorded in Kitty Hawk plus 4 km buffer in the summer season

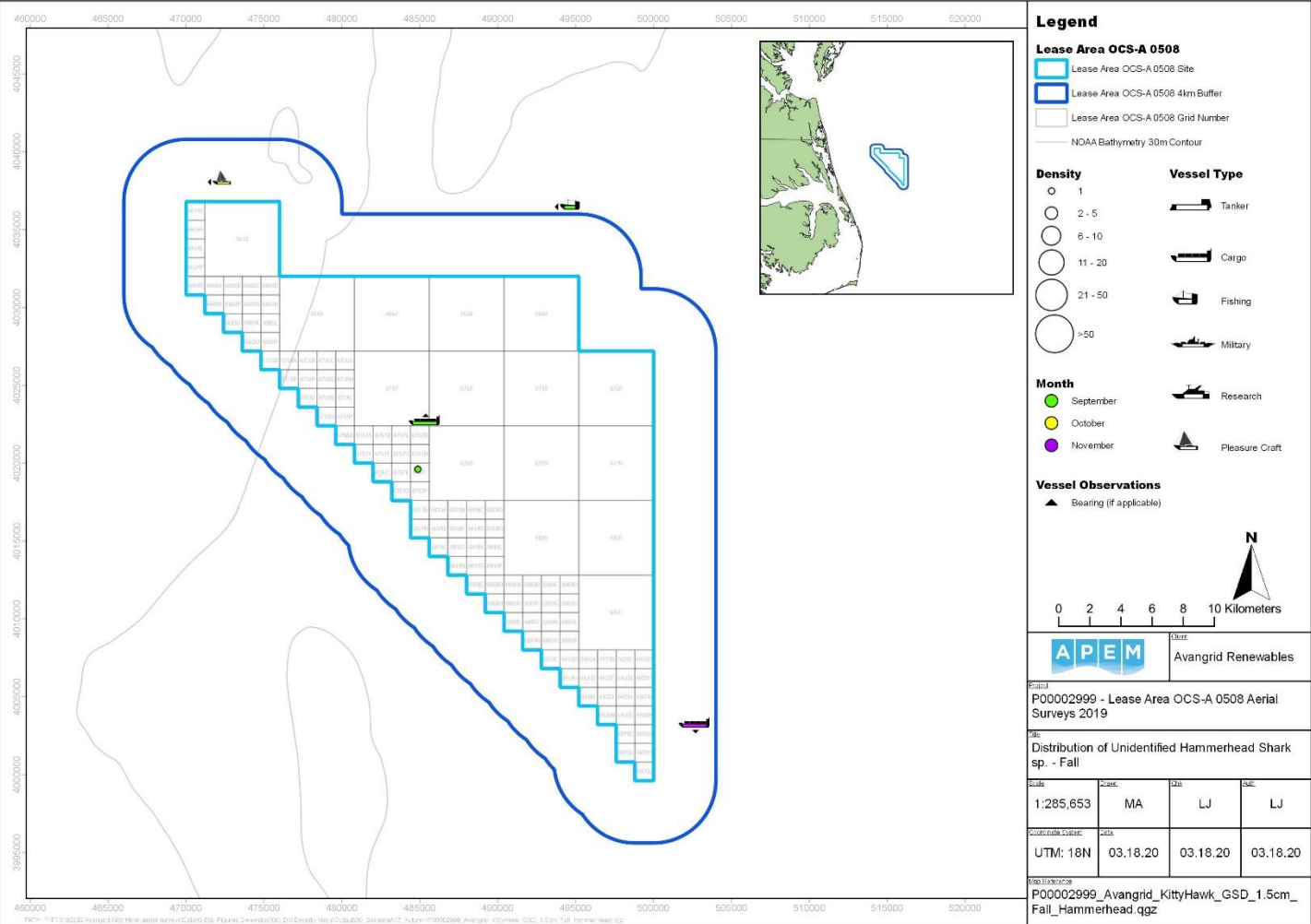


Figure 133 Distribution of unidentified hammerhead sharks recorded in Kitty Hawk plus 4 km buffer in the fall season

5.65 Species Unknown – Spurdog

Unidentified spurdogs were recorded in February only, with a peak raw count of 23 in the 4 km buffer, leading to an abundance estimate of 230 (Table 79).

A total of 23 unidentified spurdogs were recorded in February in the northeast of the 4 km buffer for the winter surveys (Figure 134).

Table 79 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified spurdogs in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Feb-19	23	230	0.22	23	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Feb-19	0	0	-	0	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Feb-19	23	238	0.45	23	0

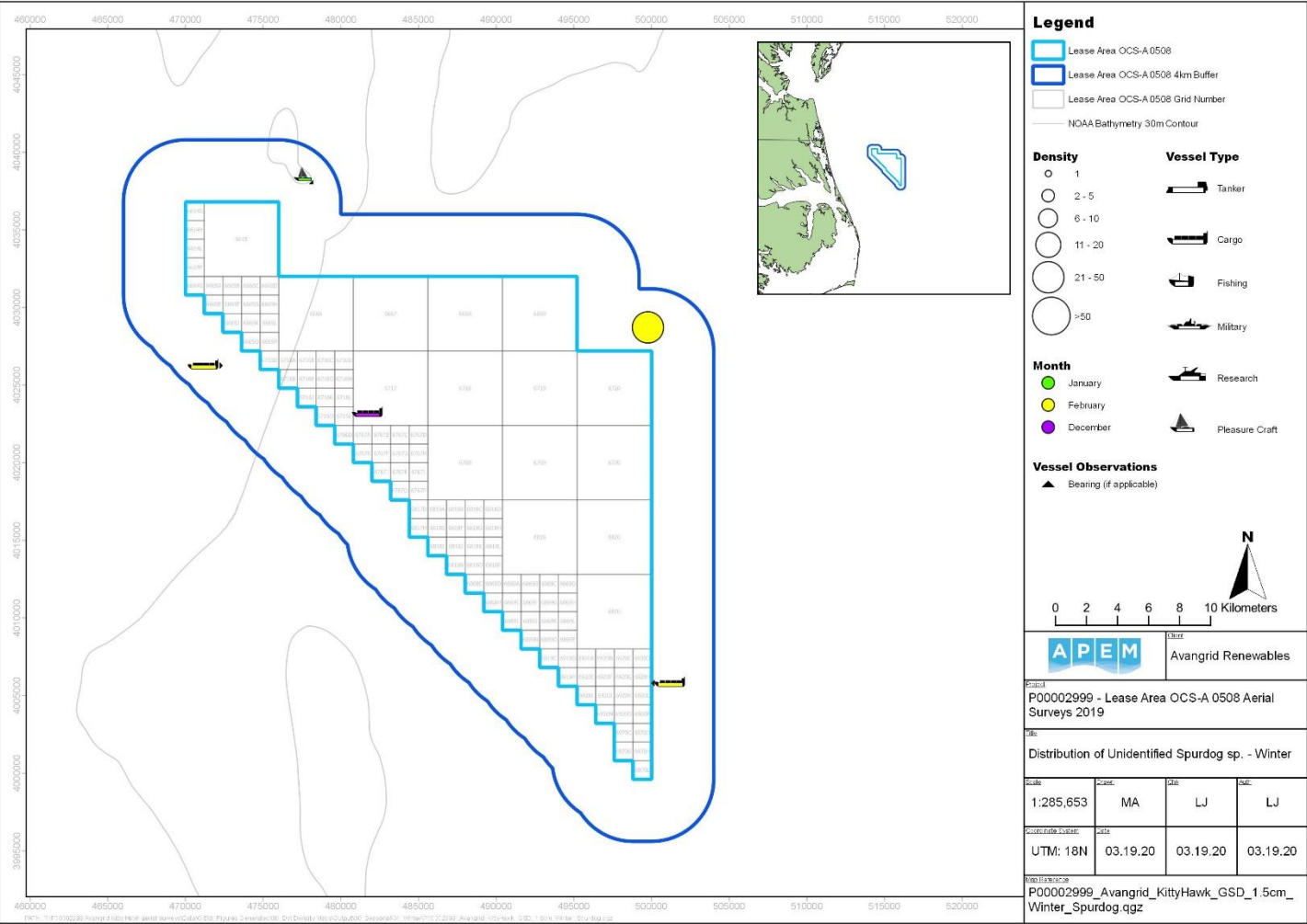


Figure 134 Distribution of unidentified spurdogs recorded in Kitty Hawk plus 4 km buffer in the winter season

5.66 Species Unknown – Shark

Unidentified sharks were recorded in all seasons bar winter, with highest numbers recorded in summer (**Table 80**). A peak raw count of two in the Kitty Hawk site, and two in the 4 km buffer for July, lead to abundance estimates of 19 and 21, respectively (**Table 80**).

A total of one unidentified shark was recorded in April in the northeast of the 4 km buffer for the spring surveys (**Figure 135**). For the summer surveys, a total of six unidentified sharks were recorded in Kitty Hawk plus 4 km buffer (**Figure 136**), of which four were recorded in July, and two were recorded in August (**Table 80**). Individuals were located in both the northwest of the Kitty Hawk site and the 4 km buffer for July, and located in the northwest and south of the 4 km buffer for August (**Figure 136**). For the fall surveys, a total of four unidentified sharks were recorded in Kitty Hawk plus 4 km buffer (**Figure 137**), of which two were recorded in September, and two were recorded in November (**Table 80**).

Table 80 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified sharks in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	1	10	0.01	1	0
Jul-19	4	40	0.04	4	0
Aug-19	2	20	0.02	2	0
Sep-19	2	20	0.02	2	0
Nov-19	2	20	0.02	2	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	0	0	-	0	0
Jul-19	2	19	0.04	2	0
Aug-19	0	0	-	0	0
Sep-19	1	10	0.02	0	0
Nov-19	2	19	0.04	0	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Apr-19	1	10	0.02	1	0
Jul-19	2	21	0.04	2	0
Aug-19	2	21	0.04	2	0
Sep-19	1	10	0.02	1	0
Nov-19	0	0	-	0	0

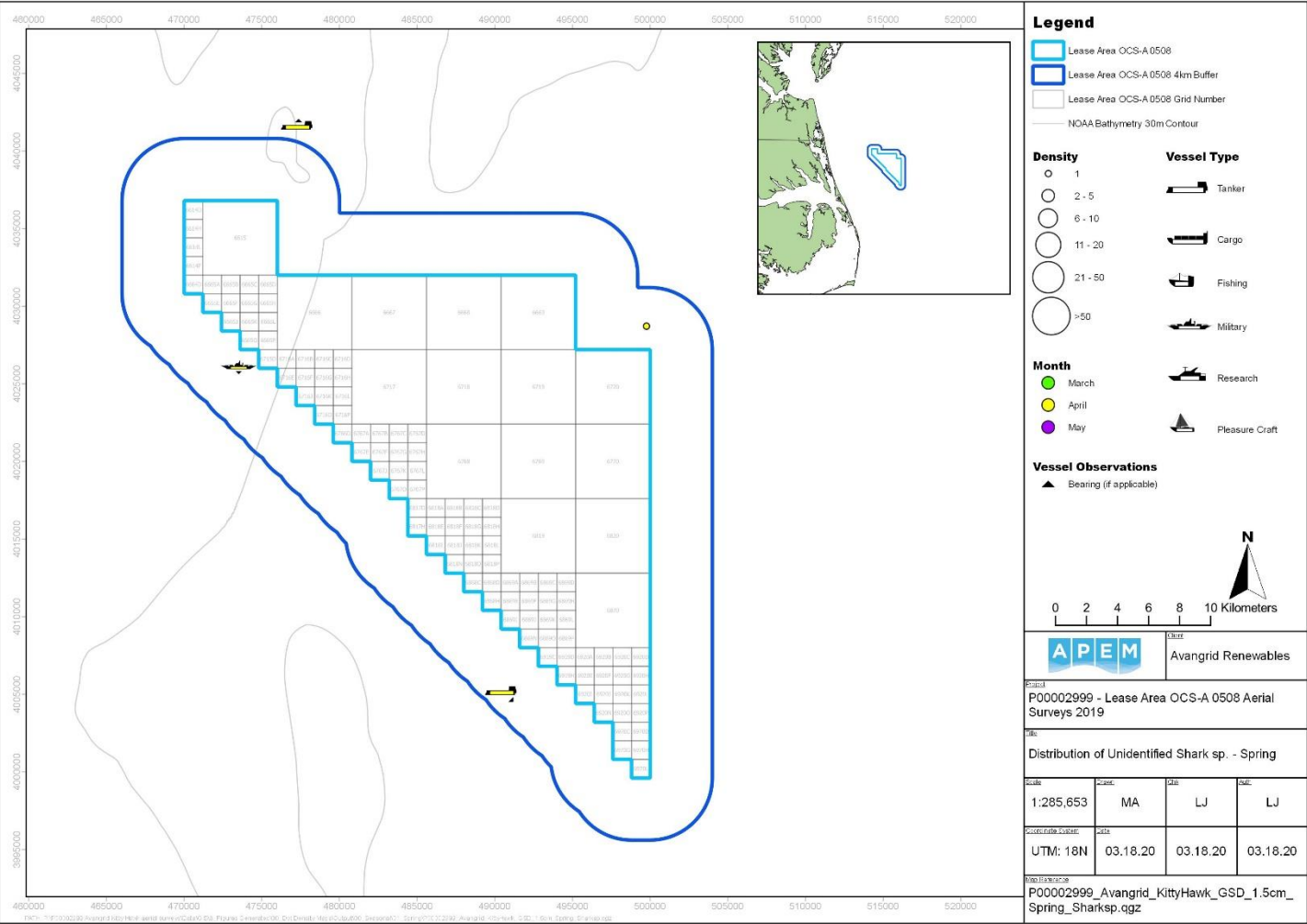


Figure 135 Distribution of unidentified sharks recorded in Kitty Hawk plus 4 km buffer in the spring season



Figure 136 Distribution of unidentified sharks recorded in Kitty Hawk plus 4 km buffer in the summer season

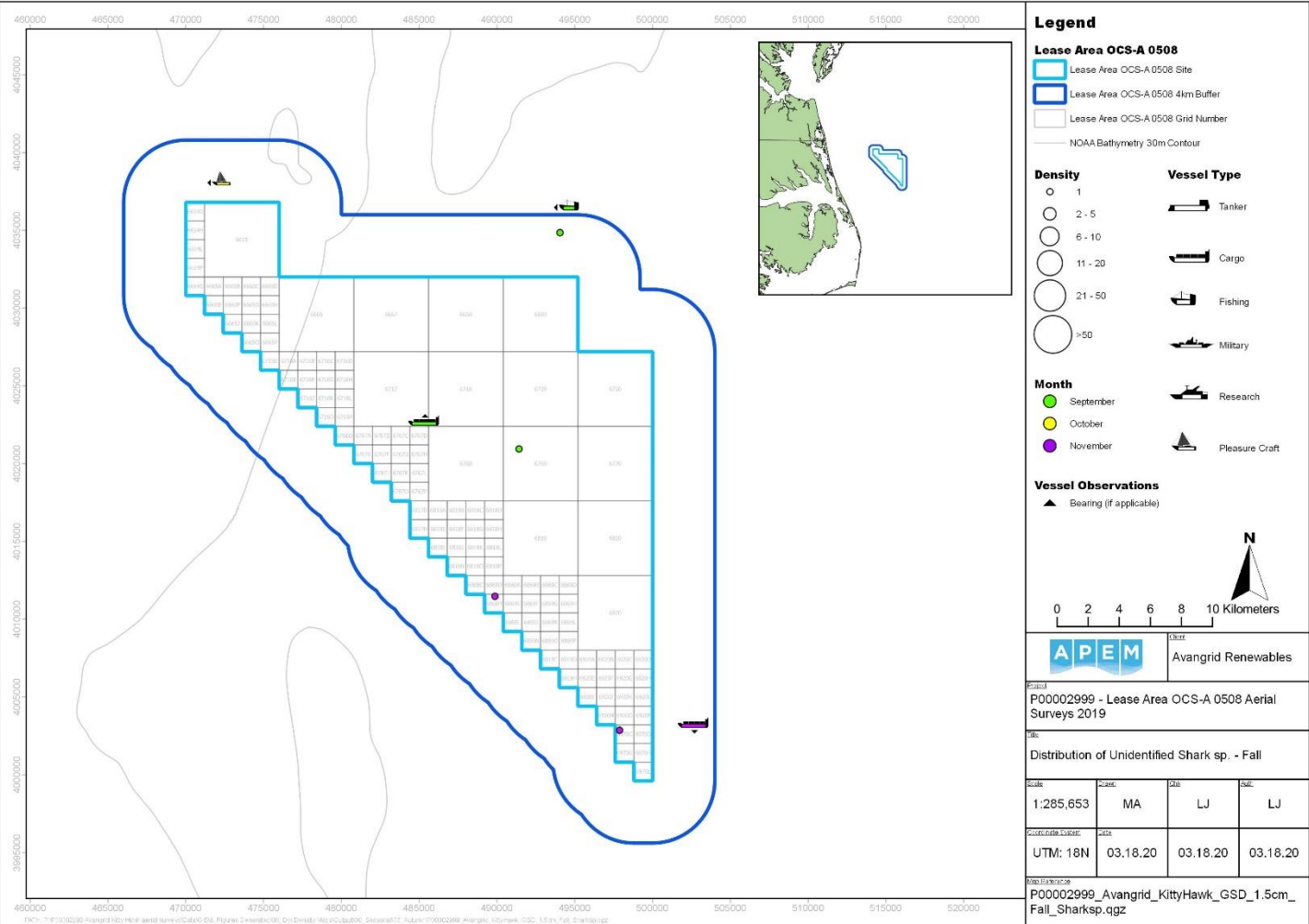


Figure 137 Distribution of unidentified sharks recorded in Kitty Hawk plus 4 km buffer in the fall season

5.67 Spotted Eagle Ray

Spotted eagle rays were recorded in August only, with a raw count of one in the Kitty Hawk site, leading to an abundance estimate of ten (**Table 81**).

A total of one spotted eagle ray was recorded in August in the northeast of the Kitty Hawk site for the summer surveys (**Figure 138**).

Table 81 Raw counts and abundance and density estimates (No. estimated individuals per km²) of spotted eagle rays in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Aug-19	1	10	0.01	1	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Aug-19	1	10	0.02	1	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Aug-19	0	0	-	0	0



Figure 138 Distribution of spotted eagle rays recorded in Kitty Hawk plus 4 km buffer in the summer season

5.68 Atlantic Stingray

Atlantic stingrays were recorded in July only, with a raw count of one in the 4 km buffer, leading to an abundance estimate of ten (**Table 82**).

A total of one Atlantic stingray was recorded in July in the northwest of the 4 km buffer for the summer surveys (**Figure 139**).

Table 82 Raw counts and abundance and density estimates (No. estimated individuals per km²) of Atlantic stingrays in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul-19	1	10	0.01	1	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul-19	0	0	-	0	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul-19	1	10	0.02	1	0



Figure 139 Distribution of Atlantic stingrays recorded in Kitty Hawk plus 4 km buffer in the summer season

5.69 Giant Manta Ray

A giant manta ray was recorded in August only, with a raw count of one in the 4 km buffer, leading to an abundance estimate of ten (Table 83).

A total of one giant manta ray was recorded in August in the north of the 4 km buffer for the summer surveys (Figure 140).

Table 83 Raw counts and abundance and density estimates (No. estimated individuals per km²) of giant manta rays in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Aug-19	1	10	0.01	1	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Aug-19	0	0	-	0	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul-19	1	10	0.02	1	0



Figure 140 Distribution of giant manta rays recorded in Kitty Hawk plus 4 km buffer in the summer season

5.70 Giant Devil Ray

A giant devil rays was recorded in September only, with a raw count of one in the Kitty Hawk site, leading to an abundance estimate of ten (**Table 84**).

A total of one giant devil ray was recorded in September in the north of the Kitty Hawk site for the fall surveys (**Figure 141**).

Table 84 Raw counts and abundance and density estimates (No. estimated individuals per km²) of giant devil rays in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Sep-19	1	10	0.01	1	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Sep-19	0	0	-	0	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul-19	1	10	0.02	1	0

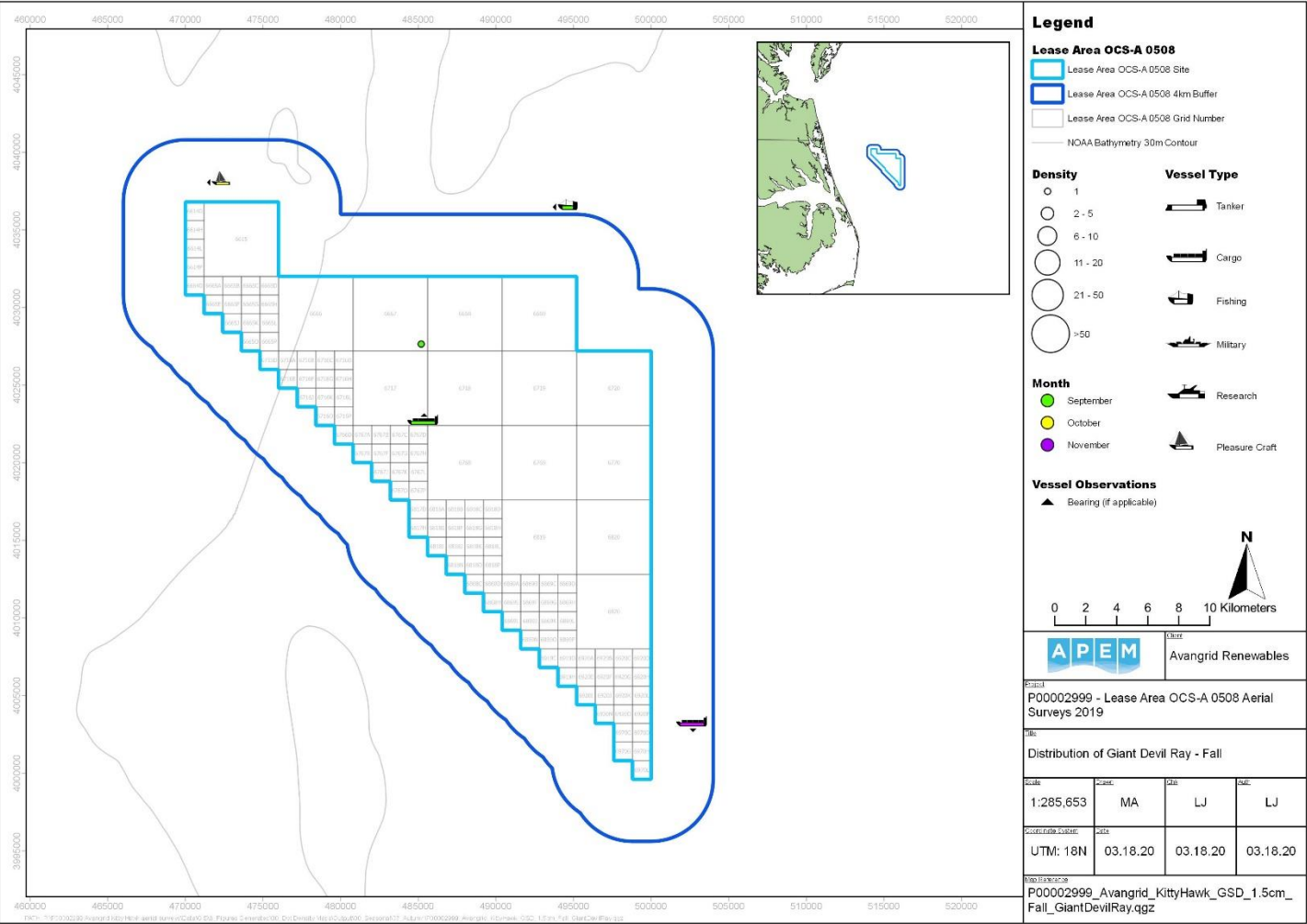


Figure 141 Distribution of giant devil rays recorded in Kitty Hawk plus 4 km buffer in the fall season

5.71 Chilean Devil Ray

A Chilean devil ray was recorded in August only, with a peak count of one in the 4 km buffer, leading to an abundance estimate of ten (Table 85).

A total of one Chilean devil ray was recorded in August in the northwest of the 4 km buffer for the summer surveys (Figure 142).

Table 85 Raw counts and abundance and density estimates (No. estimated individuals per km²) of Chilean devil rays in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Aug-19	1	10	0.01	1	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Aug-19	0	0	-	0	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Aug-19	1	10	0.02	1	0



Figure 142 Distribution of Chilean devil rays recorded in Kitty Hawk plus 4 km buffer in the summer season

5.72 Cownose Ray

Cownose rays were recorded in June, July and August only, with a peak count of 5 in July in the Kitty Hawk site, and 286 in June in the 4 km buffer, leading to abundance estimates of 48 and 2962, respectively (**Table 86**).

A total of 295 cownose rays were recorded in the summer surveys (**Figure 143**), of which 286 were recorded in June, six were recorded in July, and three were recorded in August (**Table 86**). Individuals were located in the northwest of the 4 km buffer for June and August, and located primarily in the west of the of the Kitty Hawk site for July (**Figure 143**).

Table 86 Raw counts and abundance and density estimates (No. estimated individuals per km²) of cownose rays in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun-19	286	2861	2.79	286	0
Jul-19	6	60	0.06	6	0
Aug-19	3	30	0.03	3	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun-19	0	0	-	0	0
Jul-19	5	48	0.1	5	0
Aug-19	0	0	-	0	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun-19	286	2962	5.6	286	0
Jul-19	1	10	0.02	1	0
Aug-19	3	31	0.06	3	0

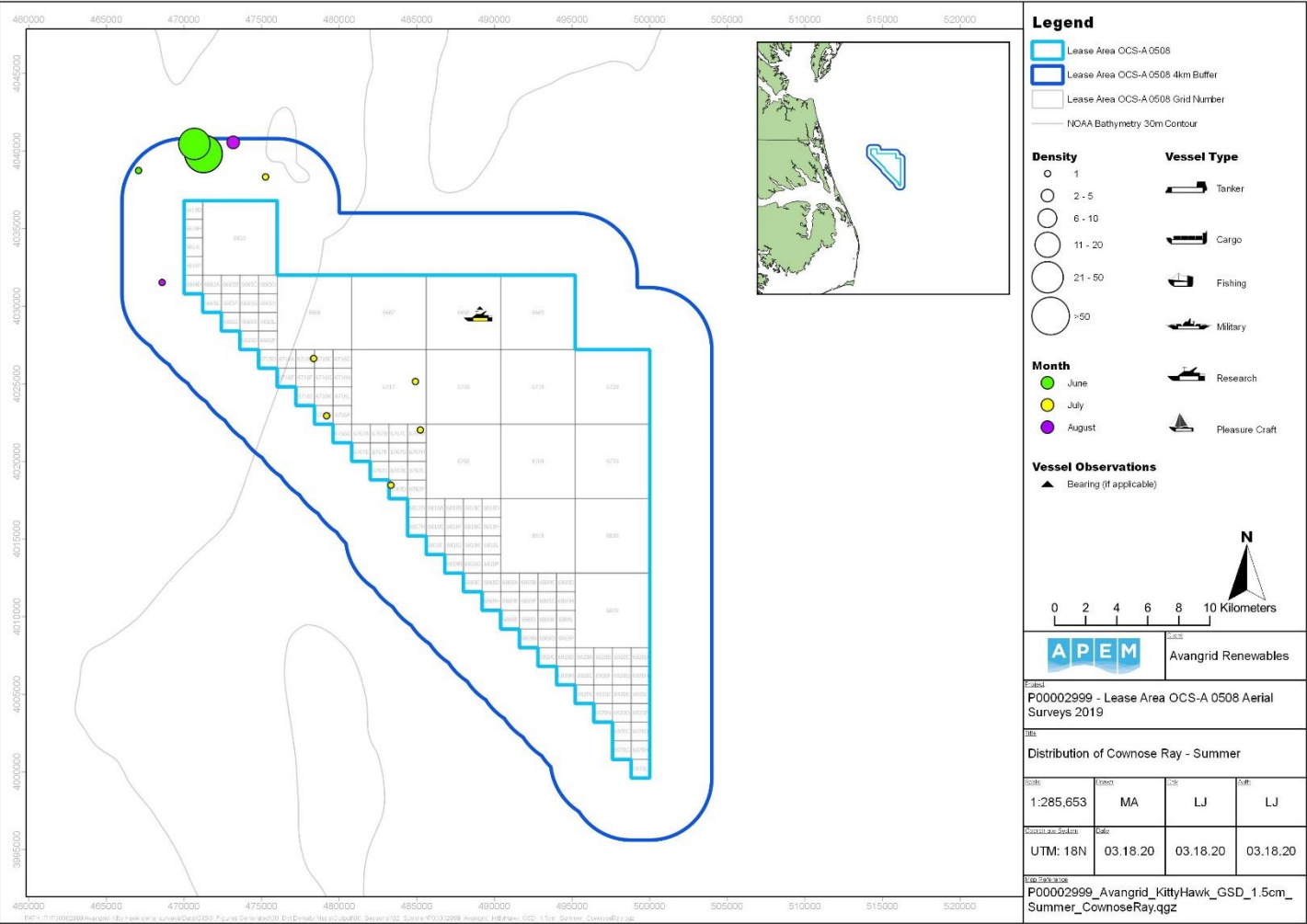


Figure 143 Distribution of cownose rays recorded in Kitty Hawk plus 4 km buffer in the summer season

5.73 Cownose / Bullnose Ray

Cownose / bullnose rays were recorded in June and July only, with a peak count of one in June in the Kitty Hawk site, and one in July in the 4 km buffer, leading to abundance estimates of ten and ten, respectively (**Table 87**).

A total of two cownose / bullnose rays were recorded in the summer surveys (**Figure 144**), of which one was recorded in June, and one was recorded in July (**Table 87**). Individuals were located in the center of the Kitty Hawk site in June, and located in the northwest of the 4 km buffer in July (**Figure 144**).

Table 87 Raw counts and abundance and density estimates (No. estimated individuals per km²) of cownose / bullnose rays in a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk; and c) the 4 km buffer only

a) Kitty Hawk plus 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun-19	1	10	0.01	1	0
Jul-19	1	10	0.01	1	0
b) Kitty Hawk					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun-19	1	10	0.02	1	0
Jul-19	0	0	-	0	0
c) 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun-19	0	0	-	0	0
Jul-19	1	10	0.02	1	0



Figure 144 Distribution of cownose / bullnose rays recorded in Kitty Hawk plus 4 km buffer in the summer season

6. Coincidental Observations of Abiotic Objects

In the January 2019 survey, one pleasure boat (with a south-westerly bearing) was observed visually from the aircraft. No vessels were recorded in the imagery.

In the February 2019 survey, two cargo vessels (one with an easterly bearing and one with a westerly bearing) were observed visually from the aircraft. No vessels were recorded in the imagery.

No vessels were recorded visually or in the imagery in the March 2019 survey.

In the April 2019 survey, two tankers (one with an south-easterly bearing and one with a northerly bearing), and a military vessel (with a southerly bearing) were observed visually from the aircraft. No vessels were recorded in the imagery.

No vessels were recorded visually or in the imagery in the May 2019 survey.

No vessels were recorded visually or in the imagery in the June 2019 survey.

In the July 2019 survey, one research vessel (with a northerly bearing) was recorded visually from the aircraft. No vessels were recorded in the imagery.

No vessels were recorded visually or in the imagery in the August 2019 survey.

In the September 2019 survey, a cargo vessel (with a southerly bearing) and a fishing vessel (with a westerly bearing) were observed visually from the aircraft.

In the October 2019 survey, one pleasure craft (with a westerly bearing) was observed visually from the aircraft. No vessels were recorded in the imagery.

In the November 2019 survey, one cargo vessel (with a southerly bearing) was observed visually from the aircraft. No vessels were recorded in the imagery. Thirty-five fish shoals were also recorded in the imagery.

In the December 2019 survey, one cargo vessel (stationary) was observed visually from the aircraft.

7. Discussion

Literature has been used to inform the findings of the Kitty Hawk survey results collected on behalf of Avangrid Renewables presented herein. A variety of sources have been referred to comprising of boat-based surveys, aerial surveys, and prediction models that span across the Atlantic outer continental shelf. For instance, AMAPPS II surveys were conducted during different seasons and over a considerably wider area than Avangrid Renewable surveys of Kitty Hawk, but the findings are useful for informing expected species occurrences and frequencies.

7.1 Loons

Loons were primarily recorded in spring and winter, with only three common loons recorded in fall. The most abundant loon species recorded was common loon (n=492), followed by red-throated loon (n=3). The peak abundance estimate was 1,551 for common loons in April, whilst for red-throated loons, the peak abundance estimate was 20 in December. Loons were recorded in highest numbers in the spring (n=328) and then remained unrecorded until fall (n=3), and the winter where records increased (n=164).

These findings are comparable to those of Winship *et al.* (2018) and Kinlan *et al.* (2016) which both predicted highest occurrences of red-throated loons and common loons during the winter

months, followed by spring. Winship *et al.* (2018) also reported higher proportional abundance predictions apparent for the BOEM lease areas when compared with their study area as a whole. Palka *et al.* (2017) found that highest counts for loons were reported in March, followed by December and January, though it should be noted that survey effort was higher in March compared with other months. The occurrences of loons in spring and winter for the Kitty Hawk surveys is therefore consistent with these findings.

Both common and red-throated loons winter off the coast, before migrating to the inland areas of Canada and Alaska to breed (Audubon Society, 2020^g; Birdlife International, 2018^{cd}). The presence of loons in fall to spring can therefore be explained by this migratory behavior.

7.2 Storm-petrels

Unidentified storm petrels were recorded in spring (n=4) and summer (n=1). In the spring, unidentified storm petrels were equally distributed between the northwest of the 4 km buffer and the center to northeast of the Kitty Hawk site.

Storm-petrels were found to be absent from winter predictions made by Winship *et al.* (2018) which is supported by their occurrences being limited to spring and summer in Kitty Hawk. Kinlan *et al.* (2016) and Palka *et al.* (2017) predicted and reported respectively, significantly higher observations of storm-petrel species during the summer months with comparatively less in spring and fall. NOAA (2019) reported highest records of storm-petrels in the spring and summer, with Wilson's storm-petrel being the most numerous species recorded in summer surveys.

7.3 Fulmars

Fulmars were only recorded once throughout the extent of the surveys, occurring only in winter (n=1), with an abundance estimate of ten in February. The northern fulmar was recorded in the north of the 4 km buffer.

Though there was only a single record of northern fulmar in Kitty Hawk, Winship *et al.* (2018), and Kinlan *et al.* (2016) found northern fulmar abundance predictions to be highest in the spring months with variable trends in predictions for the remaining survey seasons. Palka *et al.* (2017) recorded highest observations in spring, but with significantly less in summer.

Fulmars are more numerous in the eastern north Atlantic, in European waters, than in the western north Atlantic, though breeding birds do occur during the summer months in Alaska and northern Canada. Additionally, fulmars tend to be found over the open ocean (Audubon Society, 2020^e).

7.4 Large Shearwaters

Large shearwaters were recorded in low numbers in summer and winter, with Cory's shearwater (n=2) and great shearwater (n=1) occurring in August and December respectively, resulting in peak abundance estimates of 20 and ten.

All large shearwaters were located in the south of the 4 km buffer.

Winship *et al.* (2018) and Kinlan *et al.* (2016) reported highest predictions of great shearwaters and Cory's shearwaters in the fall and summer months. Winship *et al.* (2018) also predicted great shearwater density to be higher in the northern half of their survey area, which

encompasses Kitty Hawk. Highest densities of abundance were predicted to be offshore, with distance to land cited as an influencing factor on occurrence of shearwaters (Winship *et al.* 2018). Palka *et al.* (2017) reported highest observations of both great shearwaters and Cory's shearwaters in the summer months, and NOAA (2019) reported observations of great shearwaters in both spring and summer, with highest records in summer. The relatively low records of large shearwaters, particularly great shearwaters, in Kitty Hawk could therefore be considered unusual when compared with expectations.

Great shearwaters and Cory's shearwaters are both seen regularly off the North American coast in the summer months, neither species breeds in this area, and these birds are therefore non-breeders (Audubon Society, 2020^{ac}; Birdlife International, 2018^{ab}).

7.5 Small Shearwaters

Small shearwaters were recorded in small numbers in spring, fall and winter, with sooty shearwater (n=1) and Audubon's shearwater (n=1) occurring in September and October respectively, and Manx shearwater (n=8) occurring in January and March. Sooty shearwater and Audubon's shearwater consequently both resulted in abundance estimates of ten each, and Manx shearwaters resulted in a peak abundance estimate of 60.

Manx shearwaters were the only species to exhibit a distribution pattern as they were all located in the north of the 4 km buffer.

As with great shearwaters, Winship *et al.* (2018) predicted sooty shearwaters to be more commonly distributed from Cape Hatteras northwards up the Atlantic coast, with NOAA (2018) reporting highest observations in summer and spring. Kinlan *et al.* (2016) predicted greater observations of Manx, sooty, and Audubon's shearwaters in summer, with varied occurrences in other seasons. Similarly, Palka *et al.* (2017) recorded the majority of observations in summer, particularly for Audubon's shearwater.

Manx shearwaters are less common in North America than other species, and their movements are less studied in the western Atlantic than around Europe (Audubon Society, 2020ⁿ). There are, however, several breeding colonies off the coast of Newfoundland and Massachusetts (Birdlife International, 2018^e). Sooty shearwaters are seen more regularly off the Pacific coast, but the species is a non-breeder in this area (Audubon Society, 2020^b). Audubon's shearwaters are considered uncommon off the coast of North Carolina during the breeding season, and their presence in October may be explained by their tendency to migrate north during late summer and fall (Audubon Society, 2020^m).

7.6 Gannets

Northern gannets were recorded in spring, autumn, and winter, with a peak count in the January survey (n=36), resulting in a peak abundance estimate of 360. Lowest numbers were recorded in fall (n=3).

For January, February and March, northern gannets showed a tendency to be distributed towards the west and northwest of the survey area but were otherwise loosely distributed across the survey area.

Winship *et al.* (2018) reported northern gannet predictions throughout the survey seasons, with highest records in winter, and lowest in summer. The nearshore to offshore region tended to have the most abundance predictions (Winship *et al.*, 2018). Kinlan *et al.* (2016) and Palka

et al. (2017) reported higher predictions and sightings respectively, in winter, with Palka *et al.* (2017) also reporting high counts in March. Due to March being a transitional month between winter and spring it is reasonable that an overlap would occur. For NOAA (2019), northern gannets were only recorded in a November survey, where they were the most numerous species recorded. The occurrence of northern gannets in the majority of survey seasons, with peak counts in winter is therefore reasonably in line with the findings of the literature.

Like many other species, northern gannets migrate to more northern areas of the East Atlantic in the summer months to breed but spend time further south during the winter off the eastern coast of the United States (Audubon Society, 2020^j).

7.7 Cormorants

Unidentified cormorants were recorded in the winter only (n=2). A peak abundance estimate of 20 was recorded in the January survey.

All cormorants were recorded in the central west of the Kitty Hawk site.

Double-crested cormorant was the only cormorant species identified for predictions by Winship *et al.* (2018), Kinlan *et al.* (2016), and in observations by NOAA (2019), whilst double-crested cormorants and unidentified cormorants were both recorded by Palka *et al.* (2017). Kinlan *et al.* (2016) predicted double-crested cormorants at similar abundance levels throughout the year, whilst Winship *et al.* (2018) predicted highest abundance in spring and fall, and NOAA (2019) recorded only a few observations in summer. Palka *et al.* (2017) recorded both double-crested cormorants and unidentified cormorants throughout the year, with highest sightings recorded in fall.

7.8 Plovers

Plovers were recorded in fall only (n=2). A peak abundance estimate of twenty was recorded in the September survey.

All black-bellied plovers were recorded in the south of the 4 km buffer.

Palka *et al.* (2017) and NOAA (2019) recorded low numbers of black-bellied plover observations and in summer surveys only.

Black-bellied plovers are common in the winter along both the eastern and western coastlines of the United States and so their presence in fall may be linked to the start of the migration period (Audubon, 2020^l).

7.9 Phalaropes

Phalarope abundance peaked in fall, with red / red-necked phalaropes (n=30) recorded in September (n=17) and October (n=13), resulting in abundance estimates of 170 and 130, respectively. Red phalaropes were also recorded, occurring in the winter months of January (n=5) and December (n=14).

In both the fall and the winter surveys, phalaropes were loosely distributed in small groups throughout the survey area.

Winship *et al.* (2018) predicted phalarope distribution to be closer to shore in summer compared with spring and fall which may be a contributing factor to the absence of phalaropes from the Kitty Hawk summer surveys. Kinlan *et al.* (2016) predicted highest abundance of red phalaropes in spring followed by summer and fall, whilst red-necked phalarope predictions remained at consistent levels from spring through fall. Palka *et al.* (2017) recorded red phalarope and unidentified phalaropes in spring; red-necked and unidentified phalaropes in summer; and unidentified phalaropes only in fall. NOAA (2019) recorded red, red-necked, and unidentified phalaropes in summer, and red, and unidentified phalaropes in fall. Phalarope occurrence in Kitty Hawk being limited to fall and winter can therefore be seen as a reasonable outcome compared with expectations.

While red phalaropes may winter offshore in the region of Kitty Hawk plus 4 km buffer, red-necked phalaropes winter south of the equator. Both species, however, are commonly sighted off the east coast of America whilst migrating north to the Arctic tundra to breed (Audubon Society, 2020^{ik}).

7.10 Small Gulls

Small gull species included black-legged kittiwake, Bonaparte's gull, and laughing gull. The most abundant small gulls recorded were unidentified, with peak counts in November (n=15) and January (n=11), resulting in abundance estimates of 150 and 110, respectively. Bonaparte's gulls (n=22) were the second most abundant small gull species recorded, with peak counts in winter (n=11). Laughing gulls (n=11) and black-legged kittiwakes (n=8) were less abundant, with a peak count of eight laughing gulls in November and seven black-legged kittiwakes in January leading to abundance estimates of 80 and 70, respectively.

For all small gulls recorded throughout the survey period, distribution tended to be loose individuals throughout the survey area with limited grouping in any given area.

Winship *et al.* (2018) predicted black-legged kittiwake distribution to be concentrated mainly from the nearshore to the offshore. Kinlan *et al.* (2016) predicted highest abundance of black-legged kittiwakes during the winter, which was the case for Kitty Hawk, whilst Palka *et al.* (2017) recorded highest observations in spring. Winship *et al.* (2018) also predicted abundances to be denser around BOEM areas for Bonaparte's gulls and both Winship *et al.* (2018) and Kinlan *et al.* (2016), predicted highest Bonaparte's gull abundance in winter, supporting the Kitty Hawk findings. Palka *et al.* (2017) reported highest observations in spring, and NOAA (2019) reported highest observations in fall. Winship *et al.* (2018) and NOAA (2019) reported highest laughing gull predictions and observations respectively, in fall, as was the case for Kitty Hawk, and Kinlan *et al.* (2016) predicted highest abundance in summer, closely followed by fall. Laughing gulls were most often observed in spring from the Palka *et al.* (2017) surveys. Palka *et al.* (2017) also recorded instances of unidentified small gulls, the highest numbers of which were in summer surveys.

Peak abundances of each small gull species are likely related to their migratory habits. Bonaparte's gulls and black-legged kittiwakes mostly winter off the eastern United States, whilst for laughing gulls, the Kitty Hawk plus 4 km buffer is within their year-round range (Audubon Society, 2020^{doh}; Sibley, 2000).

7.11 Large Gulls

Large gull species included great black-backed gull and herring gull. Great black-backed gulls (n=27) were the most abundant of the large gulls recorded, with a peak count of 21 in

December leading to a peak abundance estimate of 210. Herring gulls (n=25) also occurred in greatest abundance in winter, with a peak count of 16 in December, leading to a peak abundance estimate of 160. No large gulls were recorded in summer, and limited numbers were recorded in spring and fall. Unidentified large gulls (n=2) and unidentified gulls (n=3) were also recorded.

Similar to small gulls, large gulls were distributed throughout the survey area, either individually or in small groups, with no significant distribution patterns recorded.

Winship *et al.* (2018) predicted distributions of great-black backed gulls and herring gulls to be closer to shore, more concentrated, and more northerly in summer; and further from shore, more dispersed, and more southerly in winter. Both Winship *et al.* (2018) and Kinlan *et al.* (2016) predicted highest abundances of great black-backed gulls and herring gulls in fall, with consistent abundance levels throughout the remaining seasons. Palka *et al.* (2017) and NOAA (2019) recorded highest observations in summer for great-black backed gulls, and spring and summer respectively for herring gulls. Palka *et al.* (2017) also recorded highest observations of lesser black-backed gulls in fall; unidentified large gulls in summer; and unidentified gulls in spring. Highest records being found in winter for Kitty Hawk may therefore be considered as somewhat unusual when compared with the literature.

Both herring gulls and great black-backed gulls winter off the eastern United States, and may be found year-round off the south-eastern Canadian coast (Sibley, 2000).

7.12 Terns

Terns were recorded in low numbers throughout the survey period, with only a marginally greater abundance in spring (n=7) compared with fall (n=5), and only one tern being recorded in both summer and winter. The most abundant terns recorded were 'commic' / Forster's terns (n=8), with peak numbers of three in September leading to an abundance estimate of thirty.

No clear distribution patterns were displayed amongst terns, with occurrences throughout the survey area.

Winship *et al.* (2018) and Kinlan *et al.* (2016) predicted peak abundances of, and Palka *et al.* (2017), and NOAA (2019) recorded peak observations of common terns in summer. Winship *et al.* (2018) and Kinlan *et al.* (2016) predicted peak abundances of Arctic terns in summer, which is also supported observations made in the NOAA (2019) surveys. Roseate terns were predicted at peak numbers in summer (Winship *et al.* 2018; Kinlan *et al.* 2016), whilst least terns were predicted (Kinlan *et al.* 2016) and recorded (Palka *et al.* 2017) in peak numbers in summer. Winship *et al.* (2018) reported highest least tern abundance predictions in fall. Royal terns displayed greater variation in the literature, with peak observations in spring (Palka *et al.* 2017), peak predictions in summer (Kinlan *et al.* 2016), and peak predictions in fall (Winship *et al.* 2018), though Kinlan *et al.* (2016) only recorded marginally higher predictions in abundance in summer when compared with spring and fall. Sooty terns were recorded in peak numbers in summer by Palka *et al.* (2017) and were predicted in similar numbers for both spring and summer by Winship *et al.* (2018).

Least terns, Forster's terns, and common terns may all breed along the coastlines closest to the Kitty Hawk plus 4 km buffer (Audubon Society, 2020^{ppr}). The largest abundance of terns being in spring is likely related to both the migratory and breeding habits of terns.

7.13 Auks

Auks included dovekie, common / thick-billed murre, razorbill, murre / razorbill, and Atlantic puffin. Auks were recorded in winter only (n=881), with occurrences almost exclusively limited to January (n=848) compared to February (n=29) and December (n=4). Peak counts were of murre / razorbills in January (n=381), followed by razorbills (n=260), and Atlantic puffins (n=198), leading to abundance estimates of 3809, 2600, and 1980, respectively.

Winter distribution of auks showed consistent coverage of auks throughout the whole of the survey area, with a pattern of large numbers of smaller groups in the south of Kitty Hawk plus 4 km buffer, and smaller numbers of larger groups distributed in the central and northern region of Kitty Hawk plus 4 km buffer.

Winship *et al.* (2018) predicted offshore distribution for auks except for the summer months, where razorbills and puffins would be expected to be further inshore for breeding. Razorbills accounted for a high proportion of predicted abundance in spring across the BOEM lease areas in particular for Winship *et al.* (2018). Razorbill, common murre, and dovekie were predicted in highest numbers in winter by Winship *et al.* (2018) and Kinlan *et al.* (2016), supporting the results of the Kitty Hawk surveys, whilst Palka *et al.* (2017) recorded highest observations in spring for all three species, as well as Atlantic puffin. Winship *et al.* (2018) recorded highest abundance predictions of Atlantic puffins in spring and summer, and Kinlan *et al.* (2016) predicted Atlantic puffin numbers to be marginally higher in winter, in line with the Kitty Hawk findings, but otherwise displayed similar abundance predictions for both summer and spring.

Both murre and razorbills winter off the east coast of the northern United States and breed off the north-east Canadian coast. It would therefore be expected for numbers to be at a peak in winter (Sibley, 2000).

7.14 Other Avian Species

Of the other avian species recorded, an unidentified passerine (n=1) in October was the only record. The individual was recorded in the northwest of the 4 km buffer.

Both Palka *et al.* (2017) and NOAA (2019) recorded few instances of unidentified passerine sightings offshore.

7.15 Marine Mammals

Unidentified dolphins (n=81) were the most abundant marine mammals recorded, with a peak count of 39 in May leading to an abundance estimate of 390. Peak monthly counts were followed by common dolphins in March (n=22) and Atlantic spotted dolphins in August (n=17) leading to abundance estimates of 220 and 170, respectively. Pantropical spotted dolphins, common bottlenose dolphins, bottlenose / Atlantic spotted dolphins, and an harbor porpoise were also recorded throughout the survey period, as were an unidentified whale, unidentified dolphins, and an unidentified marine mammal. Marine mammals were recorded in peak numbers in spring.

All dolphin species recorded can be resident, and therefore may potentially be recorded year-round (Shirihai & Jarrett, 2006). The results presented here are in agreement with those presented by Palka *et al.* (2017), who recorded a peak of 3,229 common dolphins during their

spring aerial surveys in the corresponding region in the years 2010-2013, and a peak of 861 Atlantic spotted dolphins in the summer.

During the three 2019 BOEM SASA surveys, no common dolphins were recorded. Unidentified dolphin sp. were again the most abundant marine mammal, with a peak of 258 in fall 2019. The peak monthly count of an identified species was Atlantic spotted dolphin, with a peak of 167 in fall 2019. In a direct contrast with the results of the Kitty Hawk surveys, no common dolphins were recorded during the 2019 BOEM surveys (Normandeau Associates, 2019).

7.16 Turtles

The most abundant turtle species recorded was loggerhead turtles, with a peak count of 69 in the May survey leading to an abundance estimate of 690. Loggerhead turtles were recorded in all survey months bar January, with spring having the greatest numbers for an individual species; loggerhead turtles (n=113), and with summer seeing the greatest number of turtles in total for one season (n=189). Winter saw the lowest number of turtle recorded (n=9) compared to other seasons. Green turtles, Kemp's ridley turtles, and leatherback turtles were also recorded throughout the survey period, as well as loggerhead / Kemp's ridley turtles, and unidentified turtles. There was no clear distribution patterns amongst turtles in any season.

The surveys conducted by the AMAPPS II programme (2015, 2016, 2017, 2018) also found loggerhead turtles to be the most commonly recorded species in each of the four surveys.

As with Kitty Hawk, the BOEM SASA surveys in 2019 found loggerhead turtles to be the most abundant turtle species, with a peak of 207 in spring / summer 2019. Unlike Kitty Hawk, turtles numbers were greatest during the winter 2019 survey (n=431), whilst the lowest numbers were recorded during the Fall 2019 survey (n=236) (Normandeau Associates, 2019).

7.17 Sunfish

Sunfish were recorded in every season, with peak numbers in spring (n=46), with a gradual decrease recorded in each subsequent season (n=31; 15; and 5 respectively). Peak numbers of sunfish were recorded in April (n=31) and January, February, and March saw no sunfish recorded. Of the sunfish species recorded, ocean sunfish were the most abundant (n=88) with a peak monthly count of 29 in April leading to an abundance estimate of 290. Sharptail sunfish, and unidentified sunfish were also recorded throughout the survey period. There was no clear distribution patterns amongst sunfish in any season.

During the BOEM SASA surveys, peak sunfish numbers were recorded in winter 2019, with a total of n=77 sunfish recorded. The lowest numbers were recorded in spring / summer 2019 (n=15), with this figure occurring one month after the peak numbers in the Kitty Hawk surveys. These numbers appear to be in contrast to the Kitty Hawk surveys, in which the peak numbers occurred during the spring. This could potentially be owing to the sunfish migrating towards more southerly waters during the colder months.

7.18 Large Bony Fish

Large bony fish were recorded from April to December, with peak numbers in fall (n=197), of which November recorded the highest monthly total (n=182), as well as the highest count for an individual species; unidentified tuna (n=170), leading to an abundance estimate of 1700. Winter saw the lowest records of large bony fish (n=3) compared to other seasons. Mahi-mahi,

cobia, and Atlantic bluefin tuna were also recorded throughout the survey period, as well as unidentified remoras, unidentified flying fish, and unidentified fish.

The spring and winter survey records tended to be located more within the Kitty Hawk site, but were relatively equally distributed between the Kitty Hawk site and the 4 km buffer for the summer and fall surveys.

During the BOEM SASA surveys, peak counts of large bony fish were recorded during the spring / summer 2019 survey (n=1212), with the peak count of an individual species; mahi-mahi (n=693) also occurring during this survey. Unidentified tuna sp. were also recorded in abundance during spring / summer 2019 (n=500) (Normandeau Associates, 2019). This shows a contrast to the Kitty Hawk surveys, in which peak numbers occurred towards the end of the calendar year.

7.19 Sharks

Sharks were recorded in low numbers throughout the survey period except for February where 23 unidentified spurdogs were recorded, leading to an abundance estimate of 230, as well as resulting in winter having the highest peak count of sharks (n=25) compared with other seasons. Summer and fall showed similar peak numbers (n=15 and 14, respectively) and spring showed the lowest peak count (n=3). Of the sharks identified to species level, tiger sharks, great white sharks, and scalloped hammerhead sharks had the highest peak counts for July (n=2), September (n=2), and November (n=2) respectively, leading to peak abundance estimates of 20 for each. Blue sharks, and smooth hammerhead sharks were also recorded throughout the survey period, as well as unidentified Carcharhinidae sharks, unidentified hammerhead sharks, and unidentified sharks.

Save for an isolated density of unidentified spurdogs in February being located in the northeast of the 4 km buffer only, no clear distribution pattern was otherwise shown amongst sharks throughout the seasons.

Sharks were recorded in peak numbers during spring / summer 2019 in the BOEM SASA surveys (n=1,115), with a peak individual species count of n=332 for unidentified Carcharhinidae sp., followed by spurdog in the same survey (n=324). Of the sharks identified to species level, blacktip shark, scalloped hammerhead and great white sharks had the highest peak counts in spring / summer (n=179 and n=36), and winter (n=12). Whereas the peak numbers did not occur during the same season as for Kitty Hawk, this does suggest a peak in shark numbers to occur during the warmer months (Normandeau Associates, 2019).

7.20 Rays

Rays were almost exclusively recorded in summer (n=301), with only one ray recorded outside of the summer season in September. Cownose rays were the most abundant species recorded (n=295) with peak numbers recorded in June (n=286) leading to peak abundance estimates of 2,861. The peak abundance in June suggests cownose rays were migrating at this time. Cownose rays were also recorded in July (n=6) and August (n=3). Spotted eagle rays, Atlantic stingrays, giant manta rays, giant devil rays, Chilean devil rays, and cownose / bullnose rays were also recorded in the summer and fall.

The majority of rays were recorded in the northwest of the 4 km buffer, owing to the large density of migrating cownose rays in June. When excluding this cluster, rays showed no clear

distribution pattern as they were recorded spread relatively evenly between both the Kitty Hawk site and the 4 km buffer.

Whereas rays were recorded exclusively in summer during the Kitty Hawk surveys, they were recorded during all three BOEM SASA surveys, with a peak of n=14,486 individuals being recorded during the spring/summer survey. Numbers gradually decreased throughout the year, reaching a lower of n=140 during the winter survey. Similarly to Kitty Hawk, the most abundant species recorded was cownose ray, with a peak of n=14,434 occurring in spring/summer (Normandeau Associates, 2019).

8. Conclusions

A programme of 12 monthly aerial digital surveys of Avangrid Renewables' Kitty Hawk off the coast of North Carolina was carried out between January and December 2019, using APEM Inc.'s high-resolution camera system to capture digital still imagery.

In the spring months, loons, turtles and marine mammals were the most abundant species groups recorded. During the summer, rays, large bony fish, and turtles were the most abundant, and large bony fish, turtles and gulls were the most abundant in fall. For winter, auks, loons, and gulls were the most abundant.

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Appendix I Scientific Names and Taxonomy of Marine Fauna

Common Name	Scientific Name	Family	Class
Red-throated Loon	<i>Gavia stellata</i>	Gaviidae	Aves
Common Loon	<i>Gavia immer</i>	Gaviidae	Aves
Wilson's Storm-petrel	<i>Oceanites oceanicus</i>	Oceanitidae	Aves
Northern Fulmar	<i>Fulmarus glacialis</i>	Procellariidae	Aves
Trindade Petrel	<i>Pterodroma arminjoniana</i>	Procellariidae	Aves
Cory's Shearwater	<i>Calonectris borealis</i>	Procellariidae	Aves
Sooty Shearwater	<i>Ardenna grisea</i>	Procellariidae	Aves
Great Shearwater	<i>Ardenna gravis</i>	Procellariidae	Aves
Manx Shearwater	<i>Puffinus puffinus</i>	Procellariidae	Aves
Audubon's Shearwater	<i>Puffinus lherminieri</i>	Procellariidae	Aves
Northern Gannet	<i>Morus bassanus</i>	Sulidae	Aves
Double-crested Cormorant	<i>Nannopterum auritus</i>	Phalacrocoracidae	Aves
Black-bellied Plover	<i>Pluvialis squatarola</i>	Charadriidae	Aves
Red-necked Phalarope	<i>Phalaropus lobatus</i>	Scolopacidae	Aves
Red Phalarope	<i>Phalaropus fulicarius</i>	Scolopacidae	Aves
Black-legged Kittiwake	<i>Rissa tridactyla</i>	Laridae	Aves
Bonaparte's Gull	<i>Chroicocephalus philadelphia</i>	Laridae	Aves
Laughing Gull	<i>Leucophaeus atricilla</i>	Laridae	Aves
Great Black-backed Gull	<i>Larus marinus</i>	Laridae	Aves
Herring Gull	<i>Larus smithsonianus</i>	Laridae	Aves
Gull-billed Tern	<i>Sterna nilotica</i>	Laridae	Aves
Caspian Tern	<i>Sterna caspia</i>	Laridae	Aves
Royal Tern	<i>Sterna maxima</i>	Laridae	Aves
Sandwich Tern	<i>Sterna sandvicensis</i>	Laridae	Aves
Least Tern	<i>Sterna antillarum</i>	Laridae	Aves
Bridled Tern	<i>Sterna anaethetus</i>	Laridae	Aves
Sooty Tern	<i>Sterna fuscata</i>	Laridae	Aves
Roseate Tern	<i>Sterna dougallii</i>	Laridae	Aves
Common Tern	<i>Sterna hirundo</i>	Laridae	Aves
Arctic Tern	<i>Sterna paradisaea</i>	Laridae	Aves
Forster's Tern	<i>Sterna forsteri</i>	Laridae	Aves
Great Skua	<i>Stercorarius skua</i>	Stercorariidae	Aves
Dovekie	<i>Alle alle</i>	Alcidae	Aves
Thick-billed Murre	<i>Uria lomvia</i>	Alcidae	Aves
Common Murre	<i>Uria aalge</i>	Alcidae	Aves
Razorbill	<i>Alca torda</i>	Alcidae	Aves
Atlantic Puffin	<i>Fratercula arctica</i>	Alcidae	Aves
North Atlantic Right Whale	<i>Eubalaena glacialis</i>	Balaenidae	Mammalia
Common Minke Whale	<i>Balaenoptera acutorostrata</i>	Balaenopteridae	Mammalia

Common Name	Scientific Name	Family	Class
Short-beaked Common Dolphin	<i>Delphinus delphis</i>	Delphinidae	Mammalia
Pantropical Spotted Dolphin	<i>Stenella attenuata</i>	Delphinidae	Mammalia
Atlantic Spotted Dolphin	<i>Stenella frontalis</i>	Delphinidae	Mammalia
Common Bottlenose Dolphin	<i>Tursiops truncatus</i>	Delphinidae	Mammalia
Harbor Porpoise	<i>Phocoena phocoena</i>	Phocoenidae	Mammalia
Green Turtle	<i>Chelonia mydas</i>	Cheloniidae	Reptilia
Loggerhead Turtle	<i>Caretta caretta</i>	Cheloniidae	Reptilia
Kemp's Ridley Turtle	<i>Lepidochelys kempii</i>	Cheloniidae	Reptilia
Leatherback Turtle	<i>Dermochelys coriacea</i>	Dermochelyidae	Reptilia
Mahi-mahi	<i>Coryphaena hippurus</i>	Coryphaenidae	Actinopterygii
Ocean Sunfish	<i>Mola mola</i>	Molidae	Actinopterygii
Sharptail Sunfish	<i>Masturus lanceolatus</i>	Molidae	Actinopterygii
Cobia	<i>Rachycentron canadum</i>	Rachycentridae	Actinopterygii
Atlantic Bluefin Tuna	<i>Thunnus thynnus</i>	Scombridae	Actinopterygii
Blacktip Shark	<i>Carcharhinus limbatus</i>	Carcharhinidae	Chondrichthyes
Blue Shark	<i>Prionace glauca</i>	Carcharhinidae	Chondrichthyes
Tiger Shark	<i>Galeocerdo cuvier</i>	Carcharhinidae	Chondrichthyes
Great White Shark	<i>Carcharodon carcharias</i>	Lamnidae	Chondrichthyes
Scalloped Hammerhead Shark	<i>Sphyrna lewini</i>	Sphyrnidae	Chondrichthyes
Smooth Hammerhead Shark	<i>Sphyrna zygaena</i>	Sphyrnidae	Chondrichthyes
Spotted Eagle Ray	<i>Aetobatus narinari</i>	Aetobatidae	Chondrichthyes
Atlantic Stingray	<i>Hypanus sabinus</i>	Dasyatidae	Chondrichthyes
Giant Manta Ray	<i>Mobula birostris</i>	Mobulidae	Chondrichthyes
Atlantic Devil Ray	<i>Mobula hypostoma</i>	Mobulidae	Chondrichthyes
Giant Devil Ray	<i>Mobula mobular</i>	Mobulidae	Chondrichthyes
Chilean Devil Ray	<i>Mobula tarapacana</i>	Mobulidae	Chondrichthyes
Bullnose Ray	<i>Myliobatis freminvillii</i>	Myliobatidae	Chondrichthyes
Cownose Ray	<i>Rhinoptera bonasus</i>	Rhinopteridae	Chondrichthyes

Appendix II Scientific Names and Taxonomy of Marine Fauna

Storm-petrel sp. – unidentified

Table 1 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for unidentified storm-petrel sp. in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) Site to 0.5 km buffer; d) 2 km to 4 km buffer; and e) 4 km buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	4	40	4	100	0.5	0.04
Jun-19	1	10	1	30	1	0.01
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	4	40	4	90	0.5	0.04
Jun-19	1	10	1	30	1	0.01
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
b) Kitty Hawk Site						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-

Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	2	19	2	48	0.71	0.04
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk Site – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	2	19	2	48	0.7	0.04
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
c) Site to 0.5 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	1	15	1	46	1	0.23
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Site to 0.5 km Buffer – Flying Birds						

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	1	15	1	46	1	0.23
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
d) 2 km to 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	2	20	2	61	0.71	0.07
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
2 km to 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	2	20	2	61	0.71	0.07
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-

Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
e) 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	2	21	2	62	0.71	0.04
Jun-19	1	10	1	31	1	0.02
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	2	21	2	62	0.71	0.04
Jun-19	1	10	1	31	1	0.02
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Cory's Shearwater

Table 2 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for Cory's shearwater in: a) Kitty Hawk plus 4 km buffer; b) 2 km to 4 km buffer; and c) 4 km Buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-

Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	2	20	2	60	0.71	0.02
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Kitty Hawk plus 4 km Buffer – Flying Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	2	20	2	60	0.71	0.02
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

b) 2 km to 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	2	20	2	61	0.71	0.07
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

2 km to 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	2	20	2	61	0.71	0.07
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
c) 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	2	21	2	62	0.71	0.04
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	2	21	2	62	0.71	0.04

Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Manx Shearwater

Table 3 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for Manx shearwater in: a) Kitty Hawk plus 4 km buffer; b) 2 km to 4 km buffer; and c) 4 km Buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	2	20	2	50	0.71	0.02
Feb-19	0	0	0	0	-	-
Mar-19	6	60	6	240	0.41	0.06
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	2	20	2	50	0.71	0.02
Feb-19	0	0	0	0	-	-
Mar-19	6	60	6	180	0.41	0.06
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
b) 2 km to 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density

Jan-19	2	20	2	51	0.7	0.07
Feb-19	0	0	0	0	-	-
Mar-19	6	61	6	182	0.41	0.23
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
2 km to 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	2	20	2	51	0.7	0.07
Feb-19	0	0	0	0	-	-
Mar-19	6	61	6	182	0.41	0.23
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
c) 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	2	21	2	52	0.7	0.04
Feb-19	0	0	0	0	-	-
Mar-19	6	62	6	248	0.41	0.12
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-

Dec-19	0	0	0	0	-	-
4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	2	21	2	52	0.7	0.04
Feb-19	0	0	0	0	-	-
Mar-19	6	62	6	186	0.41	0.12
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Sooty Shearwater

Table 4 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for sooty shearwater in: a) Kitty Hawk plus 4 km buffer; b) 2 km to 4 km buffer; and c) 4 km Buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	1	10	1	30	1	0.01
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-

Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	1	10	1	40	1	0.01
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

b) 2 km to 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	1	10	1	30	1	0.04
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

2 km to 4 km Buffer – Flying Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	1	10	1	30	1	0.04
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

c) 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
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Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	1	10	1	31	1	0.02
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
4 km Buffer - Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	1	10	1	31	1	0.02
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Great Shearwater

Table 5 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for great shearwater in: a) Kitty Hawk plus 4 km buffer; b) 2 km to 4 km buffer; and c) 4 km Buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-

Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	10	1	30	1	0.01

Kitty Hawk plus 4 km Buffer – Flying Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	10	1	40	1	0.01

b) 2 km to 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	10	1	30	1	0.04

2 km to 4 km Buffer – Flying Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-

Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	10	1	30	1	0.04

c) 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	10	1	41	1	0.02

4 km Buffer – Flying Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	10	1	31	1	0.02

Audubon's Shearwater

Table 6 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for Audubon's shearwater in: a) Kitty Hawk plus 4 km buffer; and b) Kitty Hawk Site

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	1	10	1	30	1	0.01
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	1	10	1	30	1	0.01
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
b) Kitty Hawk Site						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-

Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	1	10	1	29	1	0.02
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk Site – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	1	10	1	29	1	0.02
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Cormorant

Table 7 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for cormorant in: a) Kitty Hawk plus 4 km buffer; and b) Kitty Hawk Site

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	2	20	2	60	0.71	0.02
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-

Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	2	20	2	60	0.71	0.02
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
b) Kitty Hawk Site						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	2	19	2	77	0.71	0.04
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk Site – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	2	19	2	58	0.71	0.04
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-

Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Red-throated Loon

Table 8 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for red-throated loon in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) 0.5 km to 1 km buffer; d) 2 km to 4 km buffer; and e) 4 km buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	1	10	1	30	1	0.01
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	2	20	2	50	0.71	0.02
Kitty Hawk plus 4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	1	10	1	30	1	0.01
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	2	20	2	50	0.71	0.02
b) Kitty Hawk Site						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density

Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	10	1	39	1	0.02

Kitty Hawk Site – Sitting Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	10	1	29	1	0.02

c) 0.5 km to 1 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-

Dec-19	1	8	1	23	1	0.12
0.5 km to 1 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	8	1	31	1	0.12
d) 2 km to 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	1	10	1	40	1	0.04
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
2 km to 4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	1	10	1	30	1	0.04
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-

Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
e) 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	1	10	1	31	1	0.02
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	10	1	31	1	0.02
4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	1	10	1	31	1	0.02
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	10	1	31	1	0.02

Common Loon

Table 9 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for common loon in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) Site to 0.5 km buffer; d) 0.5 km to 1 km buffer; e) 1 km to 1.5 km buffer; f) 1.5 km to 2 km buffer; g) 2 km to 4 km buffer; and h) 4 km buffer

a) Kitty Hawk plus 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	143	1430	1010	1860	0.08	1.4
Feb-19	13	130	60	220	0.28	0.13
Mar-19	149	1490	1130	1919	0.08	1.45
Apr-19	155	1551	1231	1901	0.08	1.51
May-19	23	230	140	340	0.21	0.22
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	3	30	3	70	0.58	0.03
Dec-19	6	60	20	110	0.41	0.06
Kitty Hawk plus 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	2	20	2	50	0.71	0.02
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	143	1430	1010	1900	0.08	1.4
Feb-19	13	130	60	220	0.28	0.13
Mar-19	149	1490	1080	1909	0.08	1.45
Apr-19	155	1551	1201	1921	0.08	1.51
May-19	21	210	120	320	0.22	0.21
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-

Nov-19	3	30	3	70	0.58	0.03
Dec-19	6	60	20	110	0.41	0.06
b) Kitty Hawk Site						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	73	705	415	1091	0.12	1.42
Feb-19	5	48	10	106	0.45	0.1
Mar-19	60	579	328	888	0.13	1.17
Apr-19	74	714	473	985	0.12	1.44
May-19	14	135	58	212	0.27	0.27
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	10	1	29	1	0.02
Dec-19	3	29	3	68	0.58	0.06
Kitty Hawk Site – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	1	10	1	29	1	0.02
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk Site – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	73	705	396	1033	0.12	1.42
Feb-19	5	48	5	106	0.45	0.1
Mar-19	60	579	318	859	0.13	1.17
Apr-19	74	714	483	994	0.12	1.44
May-19	13	126	58	212	0.28	0.25
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-

Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	10	1	29	1	0.02
Dec-19	3	29	3	68	0.58	0.06
c) Site to 0.5 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	4	61	15	138	0.49	0.92
Feb-19	2	31	2	77	0.71	0.47
Mar-19	3	46	3	108	0.57	0.69
Apr-19	12	184	46	399	0.29	2.76
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Site to 0.5 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	4	61	15	138	0.49	0.92
Feb-19	2	31	2	77	0.69	0.47
Mar-19	3	46	3	108	0.57	0.69
Apr-19	12	184	46	399	0.29	2.76
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
d) 0.5 km to 1 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	12	94	23	179	0.29	1.44
Feb-19	4	31	4	78	0.5	0.47
Mar-19	21	164	70	274	0.22	2.51
Apr-19	13	102	39	187	0.28	1.56

May-19	3	23	3	55	0.57	0.35
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

0.5 km to 1 km Buffer – Flying Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	1	8	1	23	1	0.12
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

0.5 km to 1 km Buffer – Sitting Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	12	94	31	179	0.29	1.44
Feb-19	4	31	4	78	0.5	0.61
Mar-19	21	164	78	274	0.22	2.51
Apr-19	13	102	39	180	0.28	1.56
May-19	2	16	2	39	0.7	0.24
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

e) 1 km to 1.5 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
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Jan-19	6	49	8	123	0.41	0.76
Feb-19	1	8	1	25	1	0.12
Mar-19	21	172	49	344	0.22	2.68
Apr-19	15	123	49	214	0.26	1.91
May-19	1	8	1	25	1	0.12
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	2	16	2	41	0.7	0.25
Dec-19	0	0	0	0	-	-

1 km to 1.5 km Buffer – Sitting Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	6	49	8	115	0.41	0.76
Feb-19	1	8	1	25	1	0.12
Mar-19	21	172	49	344	0.22	2.68
Apr-19	15	123	49	205	0.26	1.91
May-19	1	8	1	25	1	0.12
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	2	16	2	41	0.7	0.25
Dec-19	0	0	0	0	-	-

f) 1.5 km to 2 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	3	48	3	111	0.56	0.75
Feb-19	0	0	0	0	-	-
Mar-19	2	32	2	80	0.69	0.5
Apr-19	9	145	32	305	0.33	2.25
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-

Dec-19	1	16	1	48	1	0.25
1.5 km to 2 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	3	48	3	111	0.56	0.75
Feb-19	0	0	0	0	-	-
Mar-19	2	32	2	80	0.69	0.5
Apr-19	9	145	32	305	0.33	2.25
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	16	1	48	1	0.25
g) 2 km to 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	45	455	253	738	0.15	1.7
Feb-19	1	10	1	30	1	0.04
Mar-19	42	425	263	586	0.16	1.58
Apr-19	32	324	202	445	0.18	1.21
May-19	5	51	10	101	0.44	0.19
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	2	20	2	51	0.7	0.07
2 km to 4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	45	455	253	718	0.15	1.7
Feb-19	1	10	1	30	1	0.04
Mar-19	42	425	273	586	0.16	1.58
Apr-19	32	324	202	456	0.18	1.21
May-19	5	51	10	101	0.44	0.19
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-

Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	2	20	2	51	0.7	0.07

h) 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	70	724	455	1024	0.12	1.37
Feb-19	8	83	21	166	0.35	0.16
Mar-19	89	921	631	1221	0.11	1.74
Apr-19	81	839	643	1109	0.11	1.59
May-19	9	93	41	155	0.33	0.18
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	2	21	2	52	0.7	0.04
Dec-19	3	31	3	62	0.58	0.06

4 km Buffer – Flying Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	1	10	1	31	1	0.02
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

4 km Buffer – Sitting Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	70	724	465	1024	0.12	1.37
Feb-19	8	83	21	155	0.35	0.16
Mar-19	89	921	631	1241	0.11	1.74
Apr-19	81	839	611	1088	0.11	1.59
May-19	8	83	31	145	0.35	0.16

Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	2	21	2	52	0.7	0.04
Dec-19	3	31	3	72	0.58	0.06

Northern Fulmar

Table 10 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for northern fulmar in: a) Kitty Hawk plus 4 km buffer; b) 0.5 km to 1 km buffer; and c) 4 km buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	1	10	1	30	1	0.01
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	1	10	1	30	1	0.01
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-

Dec-19	0	0	0	0	-	-
b) 0.5 km to 1 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	1	8	1	23	1	0.12
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
0.5 km to 1 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	1	8	1	23	1	0.12
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
c) 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	1	10	1	31	1	0.02
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-

Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	1	10	1	31	1	0.02
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Northern Gannet

Table 11 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for northern gannet in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) Site to 0.5 km buffer; d) 0.5 km to 1 km buffer; e) 1 km to 1.5 km; f) 1.5 km to 2 km buffer; g) 2 km to 4 km buffer; and h) 4 km buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	36	360	210	550	0.17	0.35
Feb-19	17	170	60	320	0.24	0.17
Mar-19	24	240	90	450	0.2	0.23
Apr-19	2	20	2	50	0.71	0.02
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	3	30	3	70	0.58	0.03
Dec-19	3	30	3	70	0.58	0.03
Kitty Hawk plus 4 km Buffer – Flying Birds						

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	21	210	90	380	0.22	0.21
Feb-19	11	110	20	220	0.3	0.11
Mar-19	17	170	50	340	0.24	0.17
Apr-19	2	20	2	50	0.71	0.02
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	10	1	30	1	0.01
Dec-19	1	10	1	30	1	0.01
Kitty Hawk plus 4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	15	150	70	240	0.26	0.15
Feb-19	6	60	10	120	0.41	0.06
Mar-19	7	70	7	190	0.38	0.07
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	2	20	2	50	0.71	0.02
Dec-19	2	20	2	50	0.71	0.02
b) Kitty Hawk Site						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	19	183	58	348	0.23	0.37
Feb-19	11	106	19	222	0.3	0.21
Mar-19	10	96	19	222	0.32	0.19
Apr-19	2	19	2	48	0.71	0.04
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-

Nov-19	1	10	1	29	1	0.02
Dec-19	1	10	1	29	1	0.02
Kitty Hawk Site – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	13	126	19	261	0.28	0.25
Feb-19	7	68	7	164	0.38	0.14
Mar-19	3	29	3	68	0.58	0.06
Apr-19	2	19	2	48	0.7	0.04
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk Site – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	6	58	19	106	0.41	0.12
Feb-19	4	39	10	77	0.5	0.08
Mar-19	7	68	7	183	0.38	0.14
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	10	1	29	1	0.02
Dec-19	1	10	1	29	1	0.02
c) Site to 0.5 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	2	31	2	123	0.71	0.47
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-

Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Site to 0.5 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	2	31	2	92	0.71	0.47
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
d) 0.5 km to 1 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	2	16	2	39	0.7	0.24
Feb-19	1	8	1	31	1	0.12
Mar-19	9	70	9	203	0.33	1.07
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
0.5 km to 1 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	8	1	23	1	0.12
Feb-19	1	8	1	23	1	0.12
Mar-19	9	70	9	188	0.33	1.07
Apr-19	0	0	0	0	-	-

May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
0.5 km to 1 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	8	1	23	1	0.12
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
e) 1 km to 1.5 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	8	1	25	1	0.12
Feb-19	1	8	1	25	1	0.12
Mar-19	2	16	2	41	0.7	0.25
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	8	1	25	1	0.12
Dec-19	0	0	0	0	-	-
1 km to 1.5 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	8	1	33	1	0.12

Feb-19	1	8	1	25	1	0.12
Mar-19	2	16	2	41	0.7	0.25
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	8	1	33	1	0.12
Dec-19	0	0	0	0	-	-

f) 1.5 km to 2 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	3	48	3	111	0.56	0.75
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

1.5 km to 2 km Buffer – Flying Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	2	32	2	79	0.69	0.5
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

1.5 km to 2 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	16	1	48	1	0.25
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
g) 2 km to 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	11	111	40	192	0.3	0.41
Feb-19	4	40	4	101	0.5	0.15
Mar-19	1	10	1	30	1	0.04
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	10	1	30	1	0.04
Dec-19	2	20	2	51	0.7	0.07
2 km to 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	4	40	10	81	0.5	0.15
Feb-19	2	20	2	51	0.7	0.07
Mar-19	1	10	1	40	1	0.04
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-

Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	10	1	30	1	0.04
2 km to 4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	7	71	20	142	0.38	0.26
Feb-19	2	20	2	61	0.71	0.07
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	10	1	40	1	0.04
Dec-19	1	10	1	30	1	0.04
h) 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	17	176	103	269	0.24	0.33
Feb-19	6	62	6	135	0.41	0.12
Mar-19	14	145	31	310	0.27	0.27
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	2	21	2	52	0.7	0.04
Dec-19	2	21	2	52	0.7	0.04
4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	8	83	31	145	0.35	0.16
Feb-19	4	41	4	104	0.5	0.08
Mar-19	14	145	21	310	0.27	0.27
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-

Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	10	1	31	1	0.02
Dec-19	1	10	1	31	1	0.02
4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	9	93	31	176	0.33	0.18
Feb-19	2	21	2	62	0.71	0.04
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	10	1	31	1	0.02
Dec-19	1	10	1	31	1	0.02

Black-legged Kittiwake

Table 12 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for black-legged kittiwake in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) Site to 0.5 km buffer; d) 1 km to 1.5 km buffer; e) 2 km to 4 km; and f) 4 km buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	7	70	20	120	0.38	0.07
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	10	1	40	1	0.01

Kitty Hawk plus 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	5	50	10	100	0.45	0.05
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	10	1	30	1	0.01
Kitty Hawk plus 4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	2	20	2	50	0.71	0.02
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
b) Kitty Hawk Site						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	4	39	10	77	0.5	0.08
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-

Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	10	1	29	1	0.02
Kitty Hawk Site – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	2	19	2	48	0.7	0.04
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	10	1	29	1	0.02
Kitty Hawk Site – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	2	19	2	48	0.7	0.04
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
c) Site to 0.5 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	15	1	46	1	0.23
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-

Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Site to 0.5 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	15	1	46	1	0.23
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
d) 1 km to 1.5 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	8	1	25	1	0.12
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
1 km to 1.5 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	8	1	25	1	0.12
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-

Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

e) 2 km to 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	10	1	30	1	0.04
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

2 km to 4 km Buffer – Flying Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	10	1	30	1	0.04
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

f) 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
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Jan-19	3	31	3	72	0.58	0.06
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	3	31	3	72	0.58	0.06
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Bonaparte’s Gull

Table 13 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for Bonaparte’s gull in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) 0.5 km to 1 km buffer; d) 1 km to 1.5 km buffer; e) 2 km to 4 km; and f) 4 km buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	10	100	40	170	0.31	0.1
Feb-19	0	0	0	0	-	-
Mar-19	7	70	20	130	0.38	0.07
Apr-19	2	20	2	60	0.71	0.02
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-

Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	2	20	2	50	0.71	0.02
Dec-19	1	10	1	30	1	0.01
Kitty Hawk plus 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	10	100	50	160	0.31	0.1
Feb-19	0	0	0	0	-	-
Mar-19	7	70	20	130	0.38	0.07
Apr-19	2	20	2	60	0.71	0.02
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	2	20	2	50	0.71	0.02
Dec-19	1	10	1	30	1	0.01
b) Kitty Hawk Site						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	4	39	10	77	0.5	0.08
Feb-19	0	0	0	0	-	-
Mar-19	5	48	5	106	0.45	0.1
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	2	19	2	48	0.7	0.04
Dec-19	0	0	0	0	-	-
Kitty Hawk Site – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	4	39	10	77	0.5	0.08
Feb-19	0	0	0	0	-	-
Mar-19	5	48	10	106	0.45	0.1

Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	2	19	2	48	0.7	0.04
Dec-19	0	0	0	0	-	-

c) 0.5 km to 1 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	3	23	3	55	0.57	0.35
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	2	16	2	47	0.71	0.24
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

0.5 km to 1 km Buffer – Flying Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	3	23	3	55	0.57	0.35
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	2	16	2	47	0.71	0.24
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

d) 1 km to 1.5 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
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Jan-19	1	8	1	25	1	0.12
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	8	1	25	1	0.12
1 km to 1.5 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	8	1	25	1	0.12
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	8	1	25	1	0.12
e) 2 km to 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	2	20	2	51	0.7	0.07
Feb-19	0	0	0	0	-	-
Mar-19	2	20	2	51	0.71	0.07
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-

Dec-19	0	0	0	0	-	-
2 km to 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	2	20	2	51	0.7	0.07
Feb-19	0	0	0	0	-	-
Mar-19	2	20	2	51	0.7	0.07
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
f) 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	6	62	21	124	0.41	0.12
Feb-19	0	0	0	0	-	-
Mar-19	2	21	2	52	0.7	0.04
Apr-19	2	21	2	83	0.71	0.04
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	10	1	31	1	0.02
4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	6	62	21	114	0.41	0.12
Feb-19	0	0	0	0	-	-
Mar-19	2	21	2	52	0.7	0.04
Apr-19	2	21	2	62	0.71	0.04
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-

Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	10	1	31	1	0.02

Laughing Gull

Table 14 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for laughing gull in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) 0.5 km to 1 km buffer; d) 1.5 km to 2 km buffer; e) 2 km to 4 km; and f) 4 km buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	1	10	1	40	1	0.01
Aug-19	0	0	0	0	-	-
Sep-19	2	20	2	50	0.71	0.02
Oct-19	0	0	0	0	-	-
Nov-19	8	80	30	140	0.35	0.08
Dec-19	1	10	1	30	1	0.01
Kitty Hawk plus 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	1	10	1	30	1	0.01
Aug-19	0	0	0	0	-	-
Sep-19	1	10	1	30	1	0.01
Oct-19	0	0	0	0	-	-
Nov-19	8	80	30	140	0.35	0.08
Dec-19	1	10	1	30	1	0.01
Kitty Hawk plus 4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density

Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	1	10	1	30	1	0.01
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

b) Kitty Hawk Site

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	2	19	2	48	0.7	0.04
Oct-19	0	0	0	0	-	-
Nov-19	4	39	10	77	0.5	0.08
Dec-19	1	10	1	29	1	0.02

Kitty Hawk Site – Flying Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	1	10	1	29	1	0.02
Oct-19	0	0	0	0	-	-
Nov-19	4	39	10	87	0.5	0.08

Dec-19	1	10	1	29	1	0.02
Kitty Hawk Site – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	1	10	1	29	1	0.02
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
c) 0.5 km to 1 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	8	1	23	1	0.12
Dec-19	0	0	0	0	-	-
0.5 km to 1 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-

Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	8	1	23	1	0.12
Dec-19	0	0	0	0	-	-
d) 1.5 km to 2 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	16	1	48	1	0.25
Dec-19	0	0	0	0	-	-
1.5 km to 2 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	16	1	48	1	0.25
Dec-19	0	0	0	0	-	-
e) 2 km to 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-

Jun-19	0	0	0	0	-	-
Jul-19	1	10	1	30	1	0.04
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	2	20	2	51	0.7	0.07
Dec-19	0	0	0	0	-	-
2 km to 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	1	10	1	30	1	0.04
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	2	20	2	51	0.7	0.07
Dec-19	0	0	0	0	-	-
f) 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	1	10	1	31	1	0.02
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	4	41	10	83	0.5	0.08
Dec-19	0	0	0	0	-	-
4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-

Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	1	10	1	31	1	0.02
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	4	41	10	83	0.5	0.08
Dec-19	0	0	0	0	-	-

Great Black-backed Gull

Table 15 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for great black-backed gull in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) 0.5 km to 1 km buffer; d) 1 km to 1.5 km buffer; e) 2 km to 4 km; and f) 4 km buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	3	30	3	80	0.58	0.03
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	3	30	3	70	0.58	0.03
Dec-19	21	210	100	340	0.22	0.21
Kitty Hawk plus 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	10	1	30	1	0.01
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-

Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	10	1	30	1	0.01
Dec-19	14	140	60	230	0.27	0.14
Kitty Hawk plus 4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	2	20	2	60	0.71	0.02
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	2	20	2	50	0.71	0.02
Dec-19	7	70	7	160	0.38	0.07
b) Kitty Hawk Site						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	2	19	2	48	0.7	0.04
Dec-19	6	58	19	106	0.41	0.12
Kitty Hawk Site – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-

Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	5	48	10	106	0.45	0.1

Kitty Hawk Site – Sitting Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	2	19	2	48	0.7	0.04
Dec-19	1	10	1	39	1	0.02

c) 0.5 km to 1 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	3	23	3	70	0.58	0.35

0.5 km to 1 km Buffer – Flying Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
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Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	3	23	3	70	0.58	0.35

d) 1 km to 1.5 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	3	25	3	74	0.58	0.39

1 km to 1.5 km Buffer – Sitting Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-

Dec-19	3	25	3	74	0.58	0.39
e) 2 km to 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	3	30	3	91	0.58	0.11
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	10	1	30	1	0.04
Dec-19	9	91	20	182	0.33	0.34
2 km to 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	10	1	30	1	0.04
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	10	1	30	1	0.04
Dec-19	6	61	10	121	0.41	0.23
2 km to 4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	2	20	2	61	0.71	0.07
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-

Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	3	30	3	91	0.58	0.11
f) 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	3	31	3	83	0.58	0.06
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	10	1	31	1	0.02
Dec-19	15	155	52	269	0.26	0.29
4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	10	1	31	1	0.02
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	10	1	31	1	0.02
Dec-19	9	93	31	176	0.33	0.18
4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	2	21	2	62	0.71	0.04
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-

Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	6	62	6	155	0.41	0.12

Herring Gull

Table 16 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for herring gull in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) 0.5 km to 1 km buffer; d) 1 km to 1.5 km buffer; e) 1.5 km to 2 km; f) 2 km to 4 km buffer; and g) 4 km buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	2	20	2	80	0.71	0.02
Mar-19	2	20	2	50	0.71	0.02
Apr-19	2	20	2	50	0.71	0.02
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	3	30	3	70	0.58	0.03
Dec-19	16	160	60	300	0.25	0.16
Kitty Hawk plus 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	2	20	2	50	0.71	0.02
Apr-19	2	20	2	50	0.71	0.02
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	3	30	3	70	0.58	0.03

Dec-19	13	130	60	220	0.28	0.13
Kitty Hawk plus 4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	2	20	2	60	0.71	0.02
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	3	30	3	80	0.58	0.03
b) Kitty Hawk Site						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	1	10	1	29	1	0.02
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	3	29	3	68	0.58	0.06
Dec-19	11	106	19	251	0.3	0.21
Kitty Hawk Site – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	1	10	1	29	1	0.02
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-

Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	3	29	3	68	0.58	0.06
Dec-19	8	77	19	154	0.35	0.16
Kitty Hawk Site – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	3	29	3	87	0.58	0.06
c) 0.5 km to 1 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	8	1	23	1	0.12
0.5 km to 1 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-

Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	8	1	23	1	0.12

d) 1 km to 1.5 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	1	8	1	25	1	0.12
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	8	1	25	1	0.12

1 km to 1.5 km Buffer – Flying Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	1	8	1	25	1	0.12
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	8	1	25	1	0.12

e) 1.5 km to 2 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-

Mar-19	1	16	1	48	1	0.25
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

1.5 km to 2 km Buffer – Flying Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	1	16	1	48	1	0.25
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

f) 2 km to 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	2	20	2	61	0.71	0.07
Mar-19	0	0	0	0	-	-
Apr-19	1	10	1	30	1	0.04
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	3	30	3	71	0.57	0.11

2 km to 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	1	10	1	30	1	0.04
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	3	30	3	71	0.57	0.11
2 km to 4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	2	20	2	61	0.71	0.07
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
g) 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	2	21	2	62	0.71	0.04
Mar-19	1	10	1	31	1	0.02
Apr-19	2	21	2	52	0.7	0.04
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-

Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	5	52	10	103	0.45	0.1
4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	1	10	1	31	1	0.02
Apr-19	2	21	2	52	0.7	0.04
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	5	52	10	103	0.45	0.1
4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	2	21	2	62	0.71	0.04
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Large Gull sp. - unidentified

Table 17 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for unidentified large gull sp. in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) 1.5 km to 2 km; and d) 4 km buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	10	1	30	1	0.01

Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	10	1	30	1	0.01
Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	10	1	30	1	0.01
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	10	1	30	1	0.01
Dec-19	0	0	0	0	-	-

b) Kitty Hawk Site						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	10	1	29	1	0.02
Dec-19	0	0	0	0	-	-
Kitty Hawk Site – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	10	1	29	1	0.02
Dec-19	0	0	0	0	-	-
c) 1.5 km to 2 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	16	1	48	1	0.25
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-

Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
1.5 km to 2 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	16	1	48	1	0.25
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
d) 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	10	1	41	1	0.02
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	10	1	31	1	0.02
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-

Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Small Gull sp. - unidentified

Table 18 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for unidentified small gull sp. in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) Site to 0.5 km; d) 0.5 km to 1 km buffer; e) 1 km to 1.5 km buffer; f) 2 km to 4 km buffer; and g) 4 km buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	11	110	40	200	0.3	0.11
Feb-19	0	0	0	0	-	-
Mar-19	4	40	4	100	0.5	0.04
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	15	150	60	280	0.26	0.15
Dec-19	4	40	4	120	0.5	0.04
Kitty Hawk plus 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	2	20	2	60	0.71	0.02
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-

Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	9	90	30	160	0.33	0.09
Feb-19	0	0	0	0	-	-
Mar-19	4	40	4	100	0.5	0.04
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	15	150	60	270	0.26	0.15
Dec-19	4	40	4	120	0.5	0.04
b) Kitty Hawk Site						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	8	77	19	164	0.35	0.16
Feb-19	0	0	0	0	-	-
Mar-19	2	19	2	58	0.71	0.04
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	6	58	6	154	0.41	0.12
Dec-19	0	0	0	0	-	-
Kitty Hawk Site – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	2	19	2	58	0.71	0.04
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-

Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk Site – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	6	58	10	126	0.41	0.12
Feb-19	0	0	0	0	-	-
Mar-19	2	19	2	58	0.71	0.04
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	6	58	6	154	0.41	0.12
Dec-19	0	0	0	0	-	-
c) Site to 0.5 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	15	1	46	1	0.23
Dec-19	0	0	0	0	-	-
Site to 0.5 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-

Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	15	1	46	1	0.23
Dec-19	0	0	0	0	-	-

d) 0.5 km to 1 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	8	1	31	1	0.12
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	2	16	2	39	0.7	0.24
Dec-19	0	0	0	0	-	-

0.5 km to 1 km Buffer – Sitting Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	8	1	23	1	0.12
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	2	16	2	39	0.7	0.24
Dec-19	0	0	0	0	-	-

e) 1 km to 1.5 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	8	1	25	1	0.12
Feb-19	0	0	0	0	-	-

Mar-19	2	16	2	65	0.71	0.25
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	2	16	2	41	0.7	0.25
Dec-19	0	0	0	0	-	-
1 km to 1.5 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	8	1	25	1	0.12
Feb-19	0	0	0	0	-	-
Mar-19	2	16	2	49	0.71	0.25
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	2	16	2	41	0.7	0.25
Dec-19	0	0	0	0	-	-
f) 2 km to 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	10	1	30	1	0.04
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	4	40	10	81	0.5	0.15
Dec-19	4	40	4	121	0.5	0.15
2 km to 4 km Buffer – Sitting Birds						

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	10	1	30	1	0.04
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	4	40	10	81	0.5	0.15
Dec-19	4	40	4	121	0.5	0.15

g) 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	3	31	3	72	0.58	0.06
Feb-19	0	0	0	0	-	-
Mar-19	2	21	2	62	0.71	0.04
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	9	93	31	166	0.33	0.18
Dec-19	4	41	4	124	0.5	0.08

4 km Buffer – Sitting Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	3	31	3	72	0.58	0.06
Feb-19	0	0	0	0	-	-
Mar-19	2	21	2	62	0.71	0.04
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-

Nov-19	9	93	31	166	0.33	0.18
Dec-19	4	41	4	124	0.5	0.08

Gull sp. - unidentified

Table 19 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for unidentified gull sp. in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) 1 km to 1.5 km buffer; and d) 4 km buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	2	20	2	50	0.71	0.02
Dec-19	1	10	1	30	1	0.01
Kitty Hawk plus 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	10	1	30	1	0.01
Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-

Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	10	1	30	1	0.01
Dec-19	1	10	1	30	1	0.01

b) Kitty Hawk Site

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	10	1	29	1	0.02
Dec-19	1	10	1	29	1	0.02

Kitty Hawk Site – Flying Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	10	1	29	1	0.02
Dec-19	0	0	0	0	-	-

Kitty Hawk Site – Sitting Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	10	1	29	1	0.02

c) 1 km to 1.5 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	8	1	25	1	0.12
Dec-19	0	0	0	0	-	-

1 km to 1.5 km Buffer – Sitting Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-

Nov-19	1	8	1	25	1	0.12
Dec-19	0	0	0	0	-	-
d) 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	10	1	31	1	0.02
Dec-19	0	0	0	0	-	-
4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	1	10	1	31	1	0.02
Dec-19	0	0	0	0	-	-

Razorbill

Table 20 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for razorbill in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) Site to 0.5 km buffer; d) 0.5 km to 1 km buffer; e) 1 km to 1.5 km buffer; f) 1.5 km to 2 km buffer; g) 2 km to 4 km buffer; and h) 4 km buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	260	2600	1710	3609	0.06	2.54

Feb-19	22	220	70	410	0.21	0.21
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	4	40	4	120	0.5	0.04
Kitty Hawk plus 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	5	50	5	150	0.45	0.05
Feb-19	6	60	6	180	0.41	0.06
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	10	1	30	1	0.01
Kitty Hawk plus 4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	255	2550	1630	3559	0.06	2.49
Feb-19	16	160	30	340	0.25	0.16
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	3	30	3	90	0.58	0.03

b) Kitty Hawk Site						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	147	1419	772	2201	0.08	2.86
Feb-19	13	126	19	251	0.28	0.25
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	3	29	3	116	0.58	0.06
Kitty Hawk Site – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	4	39	4	116	0.5	0.08
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk Site – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	147	1419	763	2172	0.08	2.86
Feb-19	9	87	9	193	0.33	0.18
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-

Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	3	29	3	87	0.58	0.06
c) Site to 0.5 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	6	92	6	246	0.41	1.38
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	15	1	62	1	0.23
Site to 0.5 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	15	1	46	1	0.23
Site to 0.5 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	6	92	6	246	0.41	1.38
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-

Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

d) 0.5 km to 1 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	11	86	11	257	0.3	1.32
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

0.5 km to 1 km Buffer – Sitting Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	11	86	11	242	0.3	1.32
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

e) 1 km to 1.5 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	25	205	33	493	0.2	3.19
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-

Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

1 km to 1.5 km Buffer – Sitting Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	25	205	33	509	0.2	3.19
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

f) 1.5 km to 2 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	8	127	8	381	0.35	1.97
Feb-19	1	16	1	48	1	0.25
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

1.5 km to 2 km Buffer – Sitting Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
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Jan-19	8	127	8	381	0.35	1.97
Feb-19	1	16	1	48	1	0.25
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

g) 2 km to 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	63	637	233	1122	0.13	2.37
Feb-19	8	81	8	243	0.35	0.3
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

2 km to 4 km Buffer – Flying Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	5	51	5	152	0.45	0.19
Feb-19	2	20	2	61	0.71	0.07
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-

Dec-19	0	0	0	0	-	-
2 km to 4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	58	587	202	1042	0.13	2.19
Feb-19	6	61	6	182	0.41	0.23
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
h) 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	113	1169	631	1862	0.09	2.21
Feb-19	9	93	9	248	0.33	0.18
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	10	1	31	1	0.02
4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	5	52	5	207	0.45	0.1
Feb-19	2	21	2	62	0.71	0.04
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-

Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	10	1	41	1	0.02
4 km Buffer - Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	108	1117	579	1779	0.1	2.11
Feb-19	7	72	7	207	0.38	0.14
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Common / Thick-billed Murre

Table 21 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for common / thick-billed murre in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) 2 km to 4 km buffer; and d) 4 km buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	8	80	10	180	0.35	0.08
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density

Jan-19	8	80	10	170	0.35	0.08
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

b) Kitty Hawk Site

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	5	48	5	126	0.45	0.1
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Kitty Hawk Site – Sitting Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	5	48	5	126	0.45	0.1
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-

Dec-19	0	0	0	0	-	-
c) 2 km to 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	3	30	3	81	0.58	0.11
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
2 km to 4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	3	30	3	81	0.58	0.11
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
d) 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	3	31	3	83	0.58	0.06
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-

Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	3	31	3	83	0.58	0.06
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Murre / Razorbill

Table 22 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for murre / razorbill in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) Site to 0.5 km buffer; d) 0.5 km to 1 km buffer; e) 1 km to 1.5 km buffer; f) 1.5 km to 2 km buffer; g) 2 km to 4 km buffer; and h) 4 km buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	381	3809	3099	4549	0.05	3.72
Feb-19	4	40	4	90	0.5	0.04
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer – Sitting Birds						

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	381	3809	3069	4589	0.05	3.72
Feb-19	4	40	4	100	0.5	0.04
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
b) Kitty Hawk Site						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	208	2008	1525	2539	0.07	4.05
Feb-19	3	29	3	77	0.58	0.06
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk Site – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	208	2008	1506	2568	0.07	4.05
Feb-19	3	29	3	77	0.58	0.06
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-

Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
c) Site to 0.5 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	11	169	61	307	0.3	2.54
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Site to 0.5 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	11	169	46	307	0.3	2.54
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
d) 0.5 km to 1 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	29	226	94	398	0.19	3.46
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-

Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
0.5 km to 1 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	29	226	94	405	0.19	3.46
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
e) 1 km to 1.5 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	21	173	74	296	0.22	2.69
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
1 km to 1.5 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	21	173	74	288	0.22	2.69
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-

May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

f) 1.5 km to 2 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	5	79	16	174	0.45	1.23
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

1.5 km to 2 km Buffer – Sitting Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	5	79	16	159	0.45	1.23
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

g) 2 km to 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	107	1082	688	1497	0.1	4.03

Feb-19	1	10	1	40	1	0.04
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
2 km to 4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	107	1082	718	1476	0.1	4.03
Feb-19	1	10	1	30	1	0.04
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
h) 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	173	1789	1334	2307	0.08	3.38
Feb-19	1	10	1	31	1	0.02
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	173	1789	1314	2369	0.08	3.38
Feb-19	1	10	1	31	1	0.02
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Atlantic Puffin

Table 23 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for Atlantic puffin in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) Site to 0.5 km buffer; d) 0.5 km to 1 km buffer; e) 1 km to 1.5 km buffer; f) 1.5 km to 2 km buffer; g) 2 km to 4 km buffer; and h) 4 km buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	198	1980	1430	2570	0.07	1.93
Feb-19	3	30	3	80	0.58	0.03
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	198	1980	1450	2610	0.07	1.93
Feb-19	3	30	3	80	0.58	0.03
Mar-19	0	0	0	0	-	-

Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

b) Kitty Hawk Site

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	73	705	454	956	0.12	1.42
Feb-19	2	19	2	58	0.71	0.04
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Kitty Hawk Site – Sitting Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	73	705	463	985	0.12	1.42
Feb-19	2	19	2	58	0.71	0.04
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

c) Site to 0.5 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
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Jan-19	18	276	31	599	0.24	4.14
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Site to 0.5 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	18	276	46	630	0.24	4.14
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
d) 0.5 km to 1 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	28	218	62	444	0.19	3.34
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-

Dec-19	0	0	0	0	-	-
0.5 km to 1 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	28	218	55	437	0.19	3.34
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
e) 1 km to 1.5 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	14	115	33	214	0.27	1.79
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
1 km to 1.5 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	14	115	33	222	0.27	1.79
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-

Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
f) 1.5 km to 2 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	6	95	6	254	0.41	1.48
Feb-19	1	16	1	48	1	0.25
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
1.5 km to 2 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	6	95	6	285	0.41	1.48
Feb-19	1	16	1	48	1	0.25
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
g) 2 km to 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	59	597	293	991	0.13	2.23
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-

Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
2 km to 4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	59	597	293	951	0.13	2.23
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
h) 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	125	1293	838	1800	0.09	2.44
Feb-19	1	10	1	41	1	0.02
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	125	1293	807	1831	0.09	2.44
Feb-19	1	10	1	31	1	0.02

Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Least Tern

Table 24 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for least tern in: a) Kitty Hawk plus 4 km buffer; b) 1 km to 1.5 km buffer; and c) 4 km buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	2	20	2	60	0.71	0.02
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	2	20	2	60	0.71	0.02
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-

Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
b) 1 km to 1.5 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	2	16	2	49	0.71	0.25
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
1 km to 1.5 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	2	16	2	49	0.71	0.25
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
c) 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	2	21	2	62	0.71	0.04

Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	2	21	2	62	0.71	0.04
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Forster’s Tern

Table 25 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for Forster’s tern in: a) Kitty Hawk plus 4 km buffer; b) 1 km to 1.5 km buffer; and c) 4 km buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	1	10	1	30	1	0.01
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-

Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	1	10	1	30	1	0.01
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
b) 1 km to 1.5 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	1	8	1	25	1	0.12
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
1 km to 1.5 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	1	8	1	25	1	0.12
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-

Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
c) 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	1	10	1	31	1	0.02
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	1	10	1	31	1	0.02
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

'Commic' / Forster's Tern

Table 26 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for 'commic' / Forster's tern in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) 2 km to 4 km buffer; and d) 4 km buffer

a) Kitty Hawk plus 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	1	10	1	30	1	0.01
May-19	1	10	1	40	1	0.01
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	1	10	1	30	1	0.01
Sep-19	3	30	3	90	0.58	0.03
Oct-19	2	20	2	60	0.71	0.02
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Kitty Hawk plus 4 km Buffer – Flying Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	1	10	1	30	1	0.01
May-19	1	10	1	40	1	0.01
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	1	10	1	30	1	0.01
Sep-19	3	30	3	90	0.58	0.03
Oct-19	2	20	2	80	0.71	0.02
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

b) Kitty Hawk Site

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	0	0
Apr-19	0	0	0	0	-	-
May-19	1	10	1	29	1	0.02
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	1	10	1	29	1	0.02
Sep-19	0	0	0	0	-	-
Oct-19	2	19	2	58	0.71	0.04

Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk Site – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	1	10	1	29	1	0.02
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	1	10	1	29	1	0.02
Sep-19	0	0	0	0	-	-
Oct-19	2	19	2	58	0.71	0.04
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
c) 2 km to 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	1	10	1	30	1	0.04
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	3	30	3	91	0.58	0.11
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
2 km to 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	1	10	1	30	1	0.04
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-

Aug-19	0	0	0	0	-	-
Sep-19	3	30	3	91	0.58	0.11
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
d) 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	1	10	1	31	1	0.02
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	3	31	3	93	0.58	0.06
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	1	10	1	31	1	0.02
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	3	31	3	124	0.58	0.06
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Sterna sp. Tern – unidentified

Table 27 Raw count and abundance estimate (no. estimated individuals per km²) by species designation for unidentified Sterna tern sp. in: a) Kitty Hawk plus 4 km buffer; b) 0.5 km to 1 km buffer; and c) 4 km buffer

a) Kitty Hawk plus 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	3	30	3	90	0.58	0.03
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
b) 0.5 km to 1 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	3	23	3	70	0.58	0.35
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
c) 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	3	31	3	124	0.58	0.06
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-

Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Black-bellied Plover

Table 28 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for black-bellied plover in: a) Kitty Hawk plus 4 km buffer; b) 0.5 km to 1 km buffer; and c) 4 km buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	2	20	2	60	0.71	0.02
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	2	20	2	60	0.71	0.02
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
b) 0.5 km to 1 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-

Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	2	16	2	47	0.71	0.24
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
0.5 km to 1 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	2	16	2	47	0.71	0.24
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
c) 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	2	21	2	62	0.71	0.04
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
4 km Buffer – Flying Birds						

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	2	21	2	62	0.71	0.04
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Red Phalarope

Table 29 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for red phalarope in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site c) 0.5 km to 1 km buffer; d) 1.5 km to 2 km buffer; e) 2 km to 4 km buffer; and f) 4 km buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	5	50	5	140	0.45	0.05
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	14	140	30	280	0.27	0.14
Kitty Hawk plus 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	5	50	5	140	0.45	0.05
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-

Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	7	70	10	160	0.38	0.07
Kitty Hawk plus 4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	7	70	10	150	0.38	0.07
b) Kitty Hawk Site						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	5	48	5	135	0.45	0.1
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	10	1	29	1	0.02
Kitty Hawk Site – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	5	48	5	135	0.45	0.1
Feb-19	0	0	0	0	-	-

Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	1	10	1	29	1	0.02

c) 0.5 km to 1 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	3	23	3	62	0.58	0.35

0.5 km to 1 km Buffer – Sitting Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	3	23	3	62	0.58	0.35

d) 1.5 km to 2 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	3	48	3	143	0.58	0.75
1.5 km to 2 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	3	48	3	143	0.58	0.75
e) 2 km to 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-

Nov-19	0	0	0	0	-	-
Dec-19	7	71	7	202	0.38	0.26
2 km to 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	3	30	3	81	0.58	0.11
2 km to 4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	4	40	4	121	0.5	0.15
f) 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-

Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	13	135	21	279	0.28	0.26
4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	6	62	6	155	0.41	0.12
4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	7	72	10	166	0.38	0.14

Red / Red-necked Phalarope

Table 30 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for red / red-necked phalarope in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site c) 2 km to 4 km buffer; and d) 4 km buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	17	170	20	410	0.24	0.17
Oct-19	13	130	13	400	0.28	0.13
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	17	170	20	400	0.24	0.17
Oct-19	13	130	13	390	0.28	0.13
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
b) Kitty Hawk Site						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	5	48	5	126	0.45	0.1

Oct-19	10	97	10	290	0.32	0.2
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk Site – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	5	48	5	126	0.45	0.1
Oct-19	10	97	10	386	0.32	0.2
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
c) 2 km to 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	12	121	12	324	0.29	0.45
Oct-19	3	30	3	91	0.58	0.11
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
2 km to 4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-

Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	12	121	12	324	0.29	0.45
Oct-19	3	30	3	91	0.58	0.11
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
d) 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	12	124	12	331	0.29	0.23
Oct-19	3	31	3	93	0.58	0.06
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	12	124	12	331	0.29	0.23
Oct-19	3	31	3	93	0.58	0.06
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Dovekie

Table 31 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for dovekie in: a) Kitty Hawk plus 4 km buffer; and b) Kitty Hawk Site

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	10	1	30	1	0.01
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	10	1	40	1	0.01
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
b) Kitty Hawk Site						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	10	1	29	1	0.02
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-

Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk Site – Sitting Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	10	1	29	1	0.02
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Passerine sp. – unidentified

Table 32 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for unidentified passerine sp. in: a) Kitty Hawk plus 4 km buffer; b) 2 km to 4 km buffer; and c) 4 km buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	1	10	1	30	1	0.01
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-

Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	1	10	1	30	1	0.01
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

b) 2 km to 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	1	10	1	30	1	0.04
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

2 km to 4 km Buffer – Flying Birds

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	1	10	1	30	1	0.04
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

c) 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	1	10	1	31	1	0.02
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
4 km Buffer – Flying Birds						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	1	10	1	31	1	0.02
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Common Dolphin

Table 33 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for common dolphin in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) 1 km to 1.5 km buffer; d) 1.5 km to 2 km buffer; e) 2 km to 4 km buffer; and f) 4 km buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	9	90	9	220	0.33	0.09
Feb-19	0	0	0	0	-	-
Mar-19	22	220	22	600	0.21	0.21

Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Kitty Hawk plus 4 km Buffer – Submerged Marine Mammals

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	9	90	9	210	0.33	0.09
Feb-19	0	0	0	0	-	-
Mar-19	20	200	20	520	0.22	0.2
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Kitty Hawk plus 4 km Buffer – Surfacing Marine Mammals

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	2	20	2	60	0.71	0.02
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

b) Kitty Hawk Site

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
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Jan-19	5	48	5	135	0.45	0.1
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk Site – Submerged Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	5	48	5	135	0.45	0.1
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
c) 1 km to 1.5 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	4	33	4	131	0.5	0.51
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-

Dec-19	0	0	0	0	-	-
1 km to 1.5 km Buffer – Submerged Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	4	33	4	98	0.5	0.51
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
d) 1.5 km to 2 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	4	63	4	190	0.5	0.98
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
1.5 km to 2 km Buffer – Submerged Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	4	63	4	190	0.5	0.98
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-

Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
e) 2 km to 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	18	182	18	506	0.24	0.81
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
2 km to 4 km Buffer – Submerged Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	16	162	16	445	0.25	0.6
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
2 km to 4 km Buffer – Surfacing Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	2	20	2	61	0.71	0.07
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-

Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
f) 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	4	41	4	124	0.5	0.08
Feb-19	0	0	0	0	-	-
Mar-19	22	228	22	559	0.21	0.43
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
4 km Buffer – Submerged Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	4	41	4	124	0.5	0.08
Feb-19	0	0	0	0	-	-
Mar-19	20	207	20	497	0.22	0.39
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
4 km Buffer – Surfacing Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-

Mar-19	2	21	2	62	0.71	0.04
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Pantropical Spotted Dolphin

Table 34 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for pantropical spotted dolphin in: a) Kitty Hawk plus 4 km buffer; and b) Kitty Hawk Site

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	2	20	2	60	0.71	0.02
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer – Submerged Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	10	1	30	1	0.01
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-

Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer – Surfacing Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	10	1	30	1	0.01
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
b) Kitty Hawk Site						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	2	19	2	58	0.71	0.04
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk Site – Submerged Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	10	1	29	1	0.02
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-

Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk Site – Surfacing Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	10	1	39	1	0.02
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Atlantic Spotted Dolphin

Table 35 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for Atlantic spotted dolphin in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) 1.5 km to 2 km buffer; d) 2 km to 4 km buffer; and e) 4 km buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	10	100	10	280	0.32	0.1
Apr-19	8	80	8	240	0.35	0.08
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	17	170	17	460	0.24	0.17
Sep-19	0	0	0	0	-	-
Oct-19	3	30	3	80	0.58	0.03
Nov-19	0	0	0	0	-	-

Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer – Submerged Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	10	100	10	280	0.32	0.1
Apr-19	7	70	7	210	0.38	0.07
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	13	130	13	370	0.28	0.13
Sep-19	0	0	0	0	-	-
Oct-19	3	30	3	80	0.58	0.03
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer – Surfacing Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	1	10	1	30	1	0.01
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	4	40	4	110	0.5	0.04
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
b) Kitty Hawk Site						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	2	19	2	58	0.71	0.04
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-

Sep-19	0	0	0	0	-	-
Oct-19	3	29	3	77	0.58	0.06
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk Site – Submerged Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	2	19	2	58	0.71	0.04
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	3	29	3	87	0.58	0.06
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
c) 1.5 km to 2 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	8	127	8	382	0.35	1.97
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	3	48	3	145	0.58	0.75
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
1.5 km to 2 km Buffer – Submerged Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	8	127	8	382	0.35	1.97
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-

Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	1	16	1	48	1	0.25
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
1.5 km to 2 km Buffer – Surfacing Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	2	32	2	96	0.71	0.5
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
d) 2 km to 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	8	81	8	243	0.35	0.3
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	14	142	14	466	0.27	0.53
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
2 km to 4 km Buffer – Submerged Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-

Mar-19	0	0	0	0	-	-
Apr-19	7	71	7	213	0.38	0.26
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	12	122	12	385	0.29	0.45
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
2 km to 4 km Buffer – Surfacing Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	1	10	1	30	1	0.04
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	2	20	2	51	0.7	0.07
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
e) 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	8	83	8	248	0.35	0.16
Apr-19	8	83	8	249	0.35	0.16
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	17	176	17	477	0.24	0.33
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
4 km Buffer – Submerged Marine Mammals						

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	8	83	8	248	0.35	0.16
Apr-19	7	73	7	218	0.38	0.14
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	13	135	13	456	0.28	0.26
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
4 km Buffer – Surfacing Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	1	10	1	31	1	0.02
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	4	41	4	124	0.5	0.08
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Common Bottlenose Dolphin

Table 36 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for common bottlenose dolphin in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) 1.5 km to 2 km buffer; d) 2 km to 4 km buffer; and e) 4 km buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	8	80	8	200	0.35	0.08
Feb-19	0	0	0	0	-	-
Mar-19	11	110	11	360	0.3	0.11
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-

Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer – Submerged Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	7	70	7	150	0.38	0.07
Feb-19	0	0	0	0	-	-
Mar-19	11	110	11	360	0.3	0.11
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer – Surfacing Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	10	1	30	1	0.01
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
b) Kitty Hawk Site						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	8	77	8	174	0.35	0.16
Feb-19	0	0	0	0	-	-

Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk Site – Submerged Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	7	68	7	154	0.38	0.14
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk Site – Surfacing Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	10	1	39	1	0.02
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
c) 1.5 km to 2 km Buffer						

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	2	32	2	95	0.71	0.5
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
1.5 km to 2 km Buffer – Submerged Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	2	32	2	95	0.71	0.5
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
d) 2 km to 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	9	91	9	273	0.33	0.34
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-

Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
2 km to 4 km Buffer – Submerged Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	9	91	9	273	0.33	0.34
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
e) 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	11	114	11	321	0.3	0.22
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
4 km Buffer – Submerged Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	11	114	11	300	0.3	0.22
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-

Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Common Bottlenose / Atlantic Spotted Dolphin

Table 37 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for common bottlenose / Atlantic spotted dolphin in: a) Kitty Hawk plus 4 km buffer; and b) Kitty Hawk Site

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	9	90	9	270	0.33	0.09
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer – Submerged Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	8	80	8	240	0.35	0.08
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer – Surfacing Marine Mammals						

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	10	1	30	1	0.01
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
b) Kitty Hawk Site						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	9	87	9	261	0.33	0.18
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk Site – Submerged Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	8	77	8	232	0.35	0.16
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-

Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk Site – Surfacing Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	10	1	29	1	0.02
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Dolphin sp. – unidentified

Table 38 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for unidentified dolphin sp. in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) Site to 0.5 km buffer; d) 0.5 km to 1 km buffer; e) 1 km to 1.5 km buffer; f) 1.5 km to 2 km buffer; g) 2km to 4km buffer; and h) 4 km buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	14	140	30	300	0.27	0.14
Feb-19	11	110	11	280	0.3	0.11
Mar-19	39	390	40	900	0.16	0.38
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	2	20	2	60	0.71	0.02
Jul-19	0	0	0	0	-	-
Aug-19	12	120	12	360	0.29	0.12
Sep-19	2	20	2	60	0.71	0.02
Oct-19	1	10	1	30	1	0.01
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Kitty Hawk plus 4 km Buffer – Submerged Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	12	120	20	270	0.29	0.12
Feb-19	7	70	7	210	0.38	0.07
Mar-19	39	390	50	910	0.16	0.38
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	2	20	2	60	0.71	0.02
Jul-19	0	0	0	0	-	-
Aug-19	12	120	12	360	0.29	0.12
Sep-19	2	20	2	60	0.71	0.02
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer – Surfacing Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	2	20	2	50	0.71	0.02
Feb-19	4	40	4	120	0.5	0.04
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	1	10	1	30	1	0.01
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
b) Kitty Hawk Site						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	12	116	19	280	0.29	0.23
Feb-19	2	19	2	48	0.71	0.04
Mar-19	5	48	5	125	0.45	0.1
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	10	97	10	290	0.32	0.2
Sep-19	2	19	2	58	0.71	0.04

Oct-19	1	10	1	29	1	0.02
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk Site – Submerged Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	10	97	10	222	0.32	0.2
Feb-19	1	10	1	29	1	0.02
Mar-19	5	48	5	125	0.45	0.1
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	10	97	10	290	0.32	0.2
Sep-19	2	19	2	58	0.71	0.04
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk Site – Surfacing Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	2	19	2	48	0.7	0.04
Feb-19	1	10	1	29	1	0.02
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	1	10	1	39	1	0.02
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
c) Site to 0.5 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	11	169	11	508	0.3	2.54
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-

Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Site to 0.5 km Buffer – Submerged Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	11	169	11	508	0.3	2.54
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
d) 0.5 km to 1 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	3	23	3	70	0.58	0.35
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
0.5 km to 1 km Buffer – Surfacing Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	3	23	3	70	0.58	0.35
Mar-19	0	0	0	0	-	-

Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

e) 1 km to 1.5 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	2	16	2	49	0.71	0.25
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

1 km to 1.5 km Buffer – Submerged Marine Mammals

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	2	16	2	49	0.71	0.25
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

f) 1.5 km to 2 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
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Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	2	32	2	95	0.71	0.5
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
1.5 km to 2 km Buffer – Submerged Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	2	32	2	95	0.71	0.5
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
g) 2 km to 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	6	61	6	182	0.41	0.23
Mar-19	21	212	21	627	0.22	0.79
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	2	20	2	61	0.71	0.07
Jul-19	0	0	0	0	-	-
Aug-19	2	20	2	61	0.71	0.07
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-

Dec-19	0	0	0	0	-	-
2 km to 4 km Buffer – Submerged Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	6	61	6	182	0.41	0.23
Mar-19	21	212	21	627	0.22	0.79
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	2	20	2	61	0.71	0.07
Jul-19	0	0	0	0	-	-
Aug-19	2	20	2	81	0.71	0.07
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
h) 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	2	21	2	62	0.71	0.04
Feb-19	9	93	9	248	0.33	0.18
Mar-19	34	352	34	869	0.17	0.67
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	2	21	2	62	0.71	0.04
Jul-19	0	0	0	0	-	-
Aug-19	2	21	2	83	0.71	0.04
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
4 km Buffer – Submerged Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	2	21	2	62	0.71	0.04
Feb-19	6	62	6	186	0.41	0.12
Mar-19	34	352	34	879	0.17	0.67
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	2	21	2	62	0.71	0.04
Jul-19	0	0	0	0	-	-
Aug-19	2	21	2	62	0.71	0.04

Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
4 km Buffer – Surfacing Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	3	31	3	93	0.58	0.06
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Whale sp. – unidentified

Table 39 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for unidentified whale sp. in: a) Kitty Hawk plus 4 km buffer; and b) Kitty Hawk Site

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	1	10	1	30	1	0.01
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer - Submerged Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density

Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	1	10	1	30	1	0.01
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

b) Kitty Hawk Site

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	1	10	1	29	1	0.02
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Kitty Hawk Site - Submerged Marine Mammals

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	1	10	1	29	1	0.02
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-

Dec-19	0	0	0	0	-	-
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Harbor Porpoise

Table 40 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for harbor porpoise in: a) Kitty Hawk plus 4 km buffer; b) 2 km to 4 km buffer; and c) 4 km buffer

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	10	1	40	1	0.01
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer - Surfacing Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	10	1	30	1	0.01
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
b) 2 km to 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	10	1	30	1	0.04

Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
2 km to 4 km Buffer - Surfacing Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	10	1	30	1	0.04
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
c) 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	10	1	31	1	0.02
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

4 km Buffer - Surfacing Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	1	10	1	31	1	0.02
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	0	0	0	0	-	-
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Marine Mammal sp. - unidentified

Table 41 Raw count and abundance estimate (no. estimated individuals per km²) by species designation and behavior for unidentified marine mammal sp. in: a) Kitty Hawk plus 4 km buffer; and b) Kitty Hawk Site

a) Kitty Hawk plus 4 km Buffer						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	1	10	1	30	1	0.01
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-
Kitty Hawk plus 4 km Buffer - Submerged Marine Mammals						
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	1	10	1	30	1	0.01

May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

b) Kitty Hawk Site

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	1	10	1	29	1	0.02
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Kitty Hawk Site - Submerged Marine Mammals

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density
Jan-19	0	0	0	0	-	-
Feb-19	0	0	0	0	-	-
Mar-19	0	0	0	0	-	-
Apr-19	1	10	1	29	1	0.02
May-19	0	0	0	0	-	-
Jun-19	0	0	0	0	-	-
Jul-19	0	0	0	0	-	-
Aug-19	0	0	0	0	-	-
Sep-19	0	0	0	0	-	-
Oct-19	0	0	0	0	-	-
Nov-19	0	0	0	0	-	-
Dec-19	0	0	0	0	-	-

Green Turtle

Table 42 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for green turtle in: a) Kitty Hawk plus 4 km buffer; and b) Kitty Hawk Site

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	2	20	2	50	0.71	0.02	0	2
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	1	10	1	40	1	0.01	0	1
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
b) Kitty Hawk Site								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0

Jun-19	2	19	2	48	0.7	0.04	0	2
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	1	10	1	29	1	0.02	0	1
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

Loggerhead Turtle

Table 43 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for loggerhead turtle in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) Site to 0.5 km Buffer; d) 0.5 km to 1 km buffer; e) 1 km to 1.5 km buffer; f) 1.5 km to 2 km buffer; g) 2 km to 4 km buffer; and h) 4 km buffer

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	1	10	1	30	1	0.01	0	1
Mar-19	2	20	2	50	0.71	0.02	0	2
Apr-19	42	420	290	550	0.16	0.41	0	42
May-19	69	690	530	860	0.12	0.67	0	69
Jun-19	28	280	180	390	0.19	0.27	2	26
Jul-19	34	340	230	470	0.17	0.33	0	34
Aug-19	29	290	180	410	0.19	0.28	1	28
Sep-19	8	80	30	140	0.35	0.08	4	4
Oct-19	13	130	60	210	0.28	0.13	6	7
Nov-19	4	40	10	80	0.5	0.04	0	4
Dec-19	4	40	4	80	0.5	0.04	1	3

b) Kitty Hawk Site								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	2	19	2	48	0.7	0.04	0	2
Apr-19	29	280	174	386	0.19	0.57	0	29
May-19	38	367	251	492	0.16	0.74	0	38
Jun-19	12	116	48	193	0.29	0.23	0	12
Jul-19	13	126	58	203	0.27	0.25	0	13
Aug-19	18	174	97	261	0.23	0.35	1	17
Sep-19	4	39	10	77	0.5	0.08	1	3
Oct-19	9	87	29	154	0.33	0.18	4	5
Nov-19	4	39	10	77	0.5	0.08	0	4
Dec-19	2	19	2	58	0.7	0.04	1	1
c) Site to 0.5 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	1	15	1	46	1	0.23	0	1
Jun-19	1	15	1	46	1	0.23	0	1
Jul-19	2	31	2	77	0.69	0.47	0	2
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0

Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	1	15	1	46	1	0.23	0	1

d) 0.5 km to 1 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	2	16	2	39	0.71	0.24	0	2
May-19	4	31	8	62	0.49	0.47	0	4
Jun-19	4	31	8	62	0.49	0.47	1	3
Jul-19	1	8	1	23	1	0.12	0	1
Aug-19	1	8	1	24	1	0.12	0	1
Sep-19	2	16	2	39	0.7	0.24	2	0
Oct-19	1	8	1	23	1	0.12	0	1
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

e) 1 km to 1.5 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	2	16	2	41	0.71	0.25	0	2
May-19	4	33	8	66	0.49	0.51	0	4
Jun-19	0	0	0	0	-	-	0	0
Jul-19	3	25	3	57	0.57	0.39	0	3

Aug-19	1	8	1	24	1	0.12	0	1
Sep-19	0	0	0	0	-	-	0	0
Oct-19	1	8	1	25	1	0.12	1	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

f) 1.5 km to 2 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	1	16	1	48	1	0.25	0	1
Mar-19	0	0	0	0	-	-	0	0
Apr-19	1	16	1	48	1	0.25	0	1
May-19	1	16	1	48	1	0.25	0	1
Jun-19	0	0	0	0	-	-	0	0
Jul-19	3	48	3	111	0.56	0.75	0	3
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

g) 2 km to 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	8	81	30	142	0.35	0.3	0	8
May-19	21	213	132	324	0.22	0.79	0	21

Jun-19	11	111	51	172	0.3	0.41	1	10
Jul-19	12	122	51	203	0.29	0.45	0	12
Aug-19	9	91	30	152	0.33	0.34	0	9
Sep-19	2	20	2	51	0.7	0.07	1	1
Oct-19	2	20	2	51	0.7	0.07	1	1
Nov-19	0	0	0	0	-	-	0	0
Dec-19	1	10	1	30	1	0.04	0	1
h) 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	1	10	1	31	1	0.02	0	1
Mar-19	0	0	0	0	-	-	0	0
Apr-19	13	135	73	218	0.27	0.26	0	13
May-19	31	321	207	435	0.18	0.61	0	31
Jun-19	16	166	93	249	0.25	0.31	2	14
Jul-19	21	217	135	321	0.22	0.41	0	21
Aug-19	11	114	41	197	0.3	0.22	0	11
Sep-19	4	41	10	93	0.5	0.08	3	1
Oct-19	4	41	10	83	0.5	0.08	2	2
Nov-19	0	0	0	0	-	-	0	0
Dec-19	2	21	2	52	0.7	0.04	0	2

Kemp's Ridley Turtle

Table 44 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for Kemp's ridley turtle in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) Site to 0.5 km Buffer; d) 1 km to 1.5 km buffer; e) 2 km to 4 km buffer; and f) 4 km buffer

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	1	10	1	30	1	0.01	0	1
Mar-19	0	0	0	0	-	-	0	0
Apr-19	1	10	1	30	1	0.01	0	1
May-19	1	10	1	30	1	0.01	0	1
Jun-19	0	0	0	0	-	-	0	0
Jul-19	3	30	3	70	0.58	0.03	0	3
Aug-19	1	10	1	30	1	0.01	0	1
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	2	20	2	50	0.71	0.02	0	2
Dec-19	1	10	1	30	1	0.01	0	1
b) Kitty Hawk Site								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	1	10	1	29	1	0.02	0	1
May-19	0	0	0	0	-	-	0	0

Jun-19	0	0	0	0	-	-	0	0
Jul-19	1	10	1	29	1	0.02	0	1
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	1	10	1	29	1	0.02	0	1

c) Site to 0.5 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	1	15	1	62	1	0.23	0	1
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	2	31	2	77	0.69	0.47	0	2
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	1	15	1	46	1	0.23	0	1
Dec-19	0	0	0	0	-	-	0	0

d) 1 km to 1.5 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0

Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	1	8	1	25	1	0.12	0	1
Dec-19	0	0	0	0	-	-	0	0

e) 2 km to 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	1	10	1	30	1	0.04	0	1
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	1	10	1	30	1	0.04	0	1
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

f) 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0

Feb-19	1	10	1	31	1	0.02	0	1
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	1	10	1	31	1	0.02	0	1
Jun-19	0	0	0	0	-	-	0	0
Jul-19	2	21	2	52	0.7	0.04	0	2
Aug-19	1	10	1	31	1	0.02	0	1
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	2	21	2	52	0.7	0.04	0	2
Dec-19	0	0	0	0	-	-	0	0

Loggerhead / Kemp’s Ridley Turtle

Table 45 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for loggerhead / Kemp’s ridley turtle in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) Site to 0.5 km Buffer; d) 0.5 km to 1 km buffer; e) 1 km to 1.5 km buffer; f) 1.5 to 2 km buffer; g) 2 km to 4 km buffer; and h) 4 km buffer

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	4	40	10	80	0.5	0.04	0	4
May-19	7	70	20	130	0.38	0.07	0	7
Jun-19	7	70	20	130	0.38	0.07	0	7
Jul-19	12	120	50	190	0.29	0.12	0	12
Aug-19	4	40	4	80	0.5	0.04	0	4

Sep-19	5	50	10	100	0.45	0.05	0	5
Oct-19	2	20	2	50	0.71	0.02	0	2
Nov-19	5	50	10	100	0.45	0.05	0	5
Dec-19	1	10	1	30	1	0.01	0	1
b) Kitty Hawk Site								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	3	29	3	68	0.58	0.06	0	3
May-19	2	19	2	48	0.7	0.04	0	2
Jun-19	2	19	2	48	0.71	0.04	0	2
Jul-19	7	68	19	126	0.38	0.14	0	7
Aug-19	2	19	2	48	0.71	0.04	0	2
Sep-19	3	29	3	68	0.58	0.06	0	3
Oct-19	1	10	1	29	1	0.02	0	1
Nov-19	3	29	3	68	0.58	0.06	0	3
Dec-19	0	0	0	0	-	-	0	0
c) Site to 0.5 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	1	15	1	46	1	0.23	0	1
Jun-19	1	15	1	46	1	0.23	0	1

Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

d) 0.5 km to 1 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	1	8	1	23	1	0.12	0	1
Jun-19	1	8	1	23	1	0.12	0	1
Jul-19	0	0	0	0	-	-	0	0
Aug-19	1	8	1	24	1	0.12	0	1
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

e) 1 km to 1.5 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0

May-19	1	8	1	25	1	0.12	0	1
Jun-19	0	0	0	0	-	-	0	0
Jul-19	2	16	2	41	0.7	0.25	0	2
Aug-19	1	8	1	24	1	0.12	0	1
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

f) 1.5 km to 2 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	1	16	1	48	1	0.25	0	1
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

g) 2 km to 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0

Mar-19	0	0	0	0	-	-	0	0
Apr-19	1	10	1	30	1	0.04	0	1
May-19	2	20	2	51	0.7	0.07	0	2
Jun-19	3	30	3	71	0.58	0.11	0	3
Jul-19	3	30	3	71	0.57	0.11	0	3
Aug-19	0	0	0	0	-	-	0	0
Sep-19	1	10	1	30	1	0.04	0	1
Oct-19	1	10	1	30	1	0.04	0	1
Nov-19	2	20	2	51	0.7	0.07	0	2
Dec-19	1	10	1	30	1	0.04	0	1
h) 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	1	10	1	31	1	0.02	0	1
May-19	5	52	10	93	0.45	0.1	0	5
Jun-19	5	52	10	104	0.45	0.1	0	5
Jul-19	5	52	10	104	0.45	0.1	0	5
Aug-19	2	21	2	52	0.71	0.04	0	2
Sep-19	2	21	2	52	0.7	0.04	0	2
Oct-19	1	10	1	31	1	0.02	0	1
Nov-19	2	21	2	52	0.7	0.04	0	2
Dec-19	1	10	1	31	1	0.02	0	1

Leatherback Turtle

Table 46 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for leatherback turtle in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) Site to 0.5 km Buffer; d) 0.5 km to 1 km buffer; e) 1 km to 1.5 km buffer; f) 1.5 to 2 km buffer; g) 2 km to 4 km buffer; and h) 4 km buffer

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	2	20	2	50	0.71	0.02	0	2
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	22	220	130	320	0.21	0.21	0	22
Aug-19	10	100	40	170	0.31	0.1	5	5
Sep-19	1	10	1	40	1	0.01	0	1
Oct-19	1	10	1	30	1	0.01	0	1
Nov-19	4	40	10	80	0.5	0.04	2	2
Dec-19	0	0	0	0	-	-	0	0
b) Kitty Hawk Site								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	2	19	2	48	0.71	0.04	0	2
May-19	0	0	0	0	-	-	0	0

Jun-19	0	0	0	0	-	-	0	0
Jul-19	10	97	39	154	0.31	0.2	0	10
Aug-19	2	19	2	48	0.7	0.04	1	1
Sep-19	1	10	1	29	1	0.02	0	1
Oct-19	0	0	0	0	-	-	0	0
Nov-19	2	19	2	48	0.7	0.04	1	1
Dec-19	0	0	0	0	-	-	0	0

c) Site to 0.5 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	2	31	2	77	0.69	0.47	1	1
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

d) 0.5 km to 1 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0

Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	1	8	1	23	1	0.12	0	1
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

e) 1 km to 1.5 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	3	25	3	57	0.57	0.39	0	3
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

f) 1.5 km to 2 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0

Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	1	16	1	48	1	0.25	0	1
Aug-19	1	16	1	48	1	0.25	0	1
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

g) 2 km to 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	7	71	20	142	0.38	0.26	0	7
Aug-19	5	51	10	101	0.44	0.19	3	2
Sep-19	0	0	0	0	-	-	0	0
Oct-19	1	10	1	40	1	0.04	0	1
Nov-19	2	20	2	51	0.7	0.07	1	1
Dec-19	0	0	0	0	-	-	0	0

h) 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	12	124	52	207	0.29	0.23	0	12
Aug-19	8	83	31	145	0.35	0.16	4	4
Sep-19	0	0	0	0	-	-	0	0
Oct-19	1	10	1	31	1	0.02	0	1
Nov-19	2	21	2	52	0.7	0.04	1	1
Dec-19	0	0	0	0	-	-	0	0

Turtle sp. – unidentified

Table 47 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for unidentified turtle sp. in : a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) Site to 0.5 km Buffer; d) 0.5 km to 1 km buffer; e) 1 km to 1.5 km buffer; f) 1.5 to 2 km buffer; g) 2 km to 4 km buffer; and h) 4 km buffer

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	18	180	110	260	0.23	0.18	0	18
May-19	15	150	80	230	0.26	0.15	0	15
Jun-19	9	90	40	160	0.33	0.09	0	9

Jul-19	12	120	50	190	0.29	0.12	2	10
Aug-19	16	160	90	250	0.25	0.16	0	16
Sep-19	5	50	10	100	0.45	0.05	0	5
Oct-19	1	10	1	30	1	0.01	1	0
Nov-19	3	30	3	70	0.58	0.03	0	3
Dec-19	1	10	1	30	1	0.01	0	1

b) Kitty Hawk Site

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	9	87	39	154	0.33	0.18	0	9
May-19	10	97	39	164	0.31	0.2	0	10
Jun-19	6	58	19	106	0.41	0.12	0	6
Jul-19	6	58	19	116	0.41	0.12	0	6
Aug-19	10	97	48	154	0.31	0.2	0	10
Sep-19	5	48	10	87	0.45	0.1	0	5
Oct-19	0	0	0	0	-	-	0	0
Nov-19	2	19	2	48	0.7	0.04	0	2
Dec-19	1	10	1	29	1	0.02	0	1

c) Site to 0.5 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	2	31	2	77	0.69	0.47	0	2

May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	1	15	1	46	1	0.23	0	1
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

d) 0.5 km to 1 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	1	8	1	23	1	0.12	0	1
Jun-19	0	0	0	0	-	-	0	0
Jul-19	2	16	2	39	0.7	0.24	1	1
Aug-19	1	8	1	24	1	0.12	0	1
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

e) 1 km to 1.5 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0

Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	1	8	1	25	1	0.12	0	1
Jun-19	2	16	2	41	0.7	0.25	0	2
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

f) 1.5 km to 2 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	1	16	1	48	1	0.25	0	1
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

g) 2 km to 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
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Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	6	61	20	111	0.4	0.23	0	6
May-19	3	30	3	71	0.57	0.11	0	3
Jun-19	1	10	1	30	1	0.04	0	1
Jul-19	3	30	3	71	0.57	0.11	1	2
Aug-19	5	51	10	101	0.44	0.19	0	5
Sep-19	0	0	0	0	-	-	0	0
Oct-19	1	10	1	30	1	0.04	1	0
Nov-19	1	10	1	30	1	0.04	0	1
Dec-19	0	0	0	0	-	-	0	0

h) 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	9	93	41	155	0.33	0.18	0	9
May-19	5	52	10	104	0.45	0.1	0	5
Jun-19	3	31	3	72	0.58	0.06	0	3
Jul-19	6	62	21	114	0.41	0.12	2	4
Aug-19	6	62	21	114	0.41	0.12	0	6
Sep-19	0	0	0	0	-	-	0	0
Oct-19	1	10	1	31	1	0.02	1	0
Nov-19	1	10	1	31	1	0.02	0	1
Dec-19	0	0	0	0	-	-	0	0

Mahi-mahi

Table 48 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for mahi-mahi in : a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) Site to 0.5 km Buffer; d) 0.5 km to 1 km buffer; e) 1 km to 1.5 km buffer; f) 1.5 to 2 km buffer; g) 2 km to 4 km buffer; and h) 4 km buffer

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	53	530	320	770	0.14	0.52	0	53
Aug-19	15	150	50	300	0.26	0.15	0	15
Sep-19	0	0	0	0	-	-	0	0
Oct-19	6	60	6	180	0.41	0.06	0	6
Nov-19	7	70	7	170	0.38	0.07	0	7
Dec-19	2	20	2	60	0.71	0.02	0	2
b) Kitty Hawk Site								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0

Jun-19	0	0	0	0	-	-	0	0
Jul-19	32	309	145	502	0.18	0.62	0	32
Aug-19	2	19	2	48	0.71	0.04	0	2
Sep-19	0	0	0	0	-	-	0	0
Oct-19	6	58	6	174	0.41	0.12	0	6
Nov-19	2	19	2	58	0.71	0.04	0	2
Dec-19	2	19	2	58	0.71	0.04	0	2

c) Site to 0.5 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	2	31	2	77	0.69	0.47	0	2
Aug-19	1	15	1	46	1	0.23	0	1
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

d) 0.5 km to 1 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0

Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	7	55	8	125	0.38	0.84	0	7
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

e) 1 km to 1.5 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	4	33	4	74	0.5	0.51	0	4
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

f) 1.5 km to 2 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0

Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	3	48	3	127	0.58	0.75	0	3
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
g) 2 km to 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	5	51	5	101	0.45	0.19	0	5
Aug-19	12	122	20	263	0.29	0.45	0	12
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	5	51	5	152	0.45	0.19	0	5
Dec-19	0	0	0	0	-	-	0	0
h) 4 km Buffer								

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	21	217	104	342	0.22	0.41	0	21
Aug-19	13	135	31	301	0.28	0.26	0	13
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	5	52	5	145	0.45	0.1	0	5
Dec-19	0	0	0	0	-	-	0	0

Remora sp. – unidentified

Table 49 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for unidentified remora sp. in: a) Kitty Hawk plus 4 km buffer; and b) Kitty Hawk Site

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0

Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	1	10	1	30	1	0.01	0	1
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
b) Kitty Hawk Site								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	1	10	1	29	1	0.02	0	1
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

Flying Fish sp. – unidentified

Table 50 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for unidentified remora sp. in: a) Kitty Hawk plus 4 km buffer; b) 1.5 km to 2 km buffer; c) 2 km to 4 km buffer; and d) 4 km buffer

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	25	250	25	751	0.2	0.24	0	25
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
b) 1.5 km to 2 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0

Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	22	353	22	1060	0.21	5.48	0	22
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

c) 2 km to 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	3	30	3	91	0.58	0.11	0	3
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

d) 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0

Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	25	259	25	912	0.2	0.49	0	25
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

Ocean Sunfish

Table 51 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for ocean sunfish in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) Site to 0.5 km buffer; d) 0.5 km to 1 km buffer; e) 1 km to 1.5 km buffer; f) 2 km to 4 km buffer; and g) 4 km buffer

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	29	290	190	400	0.18	0.28	0	29
May-19	15	150	80	240	0.26	0.15	0	15
Jun-19	4	40	10	80	0.5	0.04	0	4
Jul-19	12	120	12	280	0.29	0.12	0	12
Aug-19	9	90	40	160	0.33	0.09	0	9
Sep-19	2	20	2	50	0.71	0.02	0	2
Oct-19	7	70	20	130	0.38	0.07	0	7

Nov-19	5	50	10	100	0.45	0.05	0	5
Dec-19	5	50	10	100	0.45	0.05	0	5
b) Kitty Hawk Site								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	13	125	68	203	0.27	0.25	0	13
May-19	6	58	19	106	0.41	0.12	0	6
Jun-19	2	19	2	48	0.71	0.04	0	2
Jul-19	11	106	11	270	0.3	0.21	0	11
Aug-19	6	58	19	106	0.41	0.12	0	6
Sep-19	2	19	2	48	0.7	0.04	0	2
Oct-19	3	29	3	68	0.58	0.06	0	3
Nov-19	2	19	2	48	0.7	0.04	0	2
Dec-19	2	19	2	48	0.7	0.04	0	2
c) Site to 0.5 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	1	15	1	46	1	0.23	0	1
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	1	15	1	46	1	0.23	0	1

Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
d) 0.5 km to 1 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	6	47	16	86	0.4	0.72	0	6
May-19	1	8	1	23	1	0.12	0	1
Jun-19	1	8	1	23	1	0.12	0	1
Jul-19	0	0	0	0	-	-	0	0
Aug-19	1	8	1	24	1	0.12	0	1
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
e) 1 km to 1.5 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	1	8	1	25	1	0.12	0	1
May-19	3	25	3	66	0.58	0.39	0	3
Jun-19	0	0	0	0	-	-	0	0

Jul-19	0	0	0	0	-	-	0	0
Aug-19	1	8	1	24	1	0.12	0	1
Sep-19	0	0	0	0	-	-	0	0
Oct-19	1	8	1	33	1	0.12	0	1
Nov-19	0	0	0	0	-	-	0	0
Dec-19	1	8	1	25	1	0.12	0	1
f) 2 km to 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	8	81	30	142	0.35	0.3	0	8
May-19	5	51	10	101	0.44	0.19	0	5
Jun-19	1	10	1	30	1	0.04	0	1
Jul-19	1	10	1	30	1	0.04	0	1
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	3	30	3	71	0.57	0.11	0	3
Nov-19	3	30	3	71	0.57	0.11	0	3
Dec-19	2	20	2	51	0.7	0.07	0	2
g) 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	16	166	93	249	0.25	0.31	0	16

May-19	9	93	41	166	0.33	0.18	0	9
Jun-19	2	21	2	52	0.7	0.04	0	2
Jul-19	1	10	1	41	1	0.02	0	1
Aug-19	3	31	3	73	0.58	0.06	0	3
Sep-19	0	0	0	0	-	-	0	0
Oct-19	4	41	10	83	0.5	0.08	0	4
Nov-19	3	31	3	72	0.58	0.06	0	3
Dec-19	3	31	3	72	0.58	0.06	0	3

Sharptail Sunfish

Table 52 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for sharptail sunfish in: a) Kitty Hawk plus 4 km buffer; and b) Kitty Hawk Site

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	1	10	1	40	1	0.01	0	1
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

b) Kitty Hawk Site								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	1	10	1	29	1	0.02	0	1
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

Sunfish sp. – unidentified

Table 53 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for unidentified sunfish sp. in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) Site to 0.5 km buffer; d) 0.5 km to 1 km buffer; and e) 4 km buffer

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	1	10	1	30	1	0.01	0	1
May-19	0	0	0	0	-	-	0	0

Jun-19	0	0	0	0	-	-	0	0
Jul-19	2	20	2	60	0.71	0.02	0	2
Aug-19	4	40	10	80	0.5	0.04	0	4
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	1	10	1	30	1	0.01	0	1
Dec-19	0	0	0	0	-	-	0	0

b) Kitty Hawk Site

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	1	10	1	29	1	0.02	0	1
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	2	19	2	58	0.71	0.04	0	2
Aug-19	3	29	3	68	0.58	0.06	0	3
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

c) Site to 0.5 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0

Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	1	15	1	46	1	0.23	0	1
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

d) 0.5 km to 1 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	1	8	1	23	1	0.12	0	1
Dec-19	0	0	0	0	-	-	0	0

e) 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0

Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	1	10	1	31	1	0.02	0	1
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	1	10	1	31	1	0.02	0	1
Dec-19	0	0	0	0	-	-	0	0

Cobia

Table 54 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for cobia in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) 1 km to 1.5 km buffer; and d) 4 km buffer

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	3	30	3	80	0.58	0.03	0	3
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0

Oct-19	6	60	10	140	0.41	0.06	0	6
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

b) Kitty Hawk Site

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	3	29	3	77	0.58	0.06	0	3
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	3	29	3	68	0.58	0.06	0	3
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

c) 1 km to 1.5 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0

Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	3	25	3	74	0.58	0.39	0	3
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
d) 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	3	31	3	93	0.58	0.06	0	3
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

Atlantic Bluefin Tuna

Table 55 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for Atlantic bluefin tuna in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) Site to 0.5 km buffer; and d) 4 km buffer

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged

Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	2	20	2	60	0.71	0.02	0	2
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	2	20	2	60	0.71	0.02	0	2
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

b) Kitty Hawk Site

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	2	19	2	77	0.71	0.04	0	2
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

c) Site to 0.5 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	2	31	2	92	0.71	0.47	0	2
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
h) 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0

Oct-19	2	21	2	62	0.71	0.04	0	2
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

Tuna sp. – unidentified

Table 56 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for unidentified tuna sp. in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) Site to 0.5 km buffer; d) 0.5 km to 1 km buffer; e) 1 km to 1.5 km buffer; f) 1.5 km to 2 km buffer; g) 2 km to 4 km buffer; and h) 4 km buffer

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	21	210	50	390	0.22	0.21	0	21
May-19	2	20	2	60	0.71	0.02	0	2
Jun-19	0	0	0	0	-	-	0	0
Jul-19	74	740	230	1331	0.12	0.72	0	74
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	170	1700	980	2550	0.08	1.66	0	170
Dec-19	0	0	0	0	-	-	0	0
b) Kitty Hawk Site								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0

Mar-19	0	0	0	0	-	-	0	0
Apr-19	14	135	19	309	0.27	0.27	0	14
May-19	2	19	2	58	0.71	0.04	0	2
Jun-19	0	0	0	0	-	-	0	0
Jul-19	49	473	106	937	0.14	0.95	0	49
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	80	772	318	1428	0.11	1.56	0	80
Dec-19	0	0	0	0	-	-	0	0

c) Site to 0.5 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	3	46	3	123	0.58	0.69	0	3
Dec-19	0	0	0	0	-	-	0	0

d) 0.5 km to 1 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
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Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	17	133	23	289	0.24	2.03	0	17
Dec-19	0	0	0	0	-	-	0	0
e) 1 km to 1.5 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	5	41	5	123	0.45	0.64	0	5
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	5	41	5	107	0.45	0.64	0	5
Dec-19	0	0	0	0	-	-	0	0

f) 1.5 km to 2 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	4	63	4	190	0.5	0.98	0	4
Dec-19	0	0	0	0	-	-	0	0
g) 2 km to 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	7	71	7	182	0.38	0.26	0	7
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	20	203	20	648	0.22	0.76	0	20
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0

Oct-19	0	0	0	0	-	-	0	0
Nov-19	61	617	213	1134	0.13	2.3	0	61
Dec-19	0	0	0	0	-	-	0	0
h) 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	7	73	7	197	0.38	0.14	0	7
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	25	259	25	663	0.2	0.49	0	25
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	90	932	466	1512	0.11	1.76	0	90
Dec-19	0	0	0	0	-	-	0	0

Fish sp. – unidentified

Table 57 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for unidentified fish sp. in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) 0.5 km to 1 km buffer; d) 2 km to 4 km buffer; and e) 4 km buffer

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0

Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	3	30	3	70	0.58	0.03	0	3
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	5	50	5	130	0.45	0.05	0	5
Dec-19	1	10	1	30	1	0.01	0	1

b) Kitty Hawk Site

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	1	10	1	29	1	0.02	0	1
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	1	10	1	29	1	0.02	0	1

c) 0.5 km to 1 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
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Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	2	16	2	47	0.71	0.24	0	2
Dec-19	0	0	0	0	-	-	0	0

d) 2 km to 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	2	20	2	51	0.7	0.07	0	2
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	3	30	3	91	0.58	0.11	0	3
Dec-19	0	0	0	0	-	-	0	0

e) 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	2	21	2	52	0.7	0.04	0	2
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	5	52	5	135	0.45	0.1	0	5
Dec-19	0	0	0	0	-	-	0	0

Blue Shark

Table 58 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for blue shark in: a) Kitty Hawk plus 4 km buffer; b) 1.5 km to 2 km buffer; and c) 4 km buffer

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	1	10	1	30	1	0.01	0	1
May-19	0	0	0	0	-	-	0	0

Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
b) 1.5 km to 2 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	1	16	1	48	1	0.25	0	1
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
c) 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0

Apr-19	1	10	1	31	1	0.02	0	1
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

Tiger Shark

Table 59 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for tiger shark in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) 1 km to 1.5 km buffer; and d) 4 km buffer

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	1	10	1	30	1	0.01	0	1
Jul-19	2	20	2	50	0.71	0.02	0	2
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0

Dec-19	0	0	0	0	-	-	0	0
b) Kitty Hawk Site								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	2	19	2	48	0.7	0.04	0	2
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
c) 1 km to 1.5 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	1	8	1	25	1	0.12	0	1
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0

Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
d) 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	1	10	1	31	1	0.02	0	1
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

Carcharhinidae Shark sp. – unidentified

Table 60 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for unidentified Carcharhinidae shark sp. in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) 2 km to 4 km buffer; and d) 4 km buffer

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0

Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	2	20	2	50	0.71	0.02	0	2
Aug-19	1	10	1	30	1	0.01	0	1
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	3	30	3	70	0.58	0.03	0	3
Dec-19	0	0	0	0	-	-	0	0

b) Kitty Hawk Site

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	2	19	2	48	0.7	0.04	0	2
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	3	29	3	68	0.58	0.06	0	3
Dec-19	0	0	0	0	-	-	0	0

c) 2 km to 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
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Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	1	10	1	30	1	0.04	0	1
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
d) 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	1	10	1	31	1	0.02	0	1
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

Great White Shark

Table 61 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for great white shark in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) 0.5 km to 1 km buffer; d) 2 km to 4 km buffer; and e) 4 km buffer

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	1	10	1	30	1	0.01	0	1
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	2	20	2	50	0.71	0.02	0	2
Dec-19	2	20	2	50	0.71	0.02	0	2
b) Kitty Hawk Site								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	1	10	1	29	1	0.02	0	1
May-19	0	0	0	0	-	-	0	0

Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	1	10	1	29	1	0.02	0	1
Dec-19	1	10	1	29	1	0.02	0	1
c) 0.5 km to 1 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	1	8	1	23	1	0.12	0	1
d) 2 km to 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0

Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	1	10	1	30	1	0.04	0	1
Dec-19	0	0	0	0	-	-	0	0
e) 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	1	10	1	31	1	0.02	0	1
Dec-19	1	10	1	31	1	0.02	0	1

Scalloped Hammerhead Shark

Table 62 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for scalloped hammerhead shark in: a) Kitty Hawk plus 4 km buffer; and b) Kitty Hawk Site

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	2	20	2	50	0.71	0.02	0	2
Oct-19	0	0	0	0	-	-	0	0
Nov-19	1	10	1	30	1	0.01	0	1
Dec-19	0	0	0	0	-	-	0	0
b) Kitty Hawk Site								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0

Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	2	19	2	48	0.7	0.04	0	2
Oct-19	0	0	0	0	-	-	0	0
Nov-19	1	10	1	29	1	0.02	0	1
Dec-19	0	0	0	0	-	-	0	0

Smooth Hammerhead Shark

Table 63 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for smooth hammerhead shark in: a) Kitty Hawk plus 4 km buffer; and b) Kitty Hawk Site

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	1	10	1	40	1	0.01	0	1
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
b) Kitty Hawk Site								

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	1	10	1	29	1	0.02	0	1
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

Hammerhead Shark sp. – unidentified

Table 64 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for unidentified hammerhead shark sp. in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) 2 km to 4 km buffer; and d) 4 km buffer

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	1	10	1	40	1	0.01	0	1

Jul-19	2	20	2	50	0.71	0.02	0	2
Aug-19	0	0	0	0	-	-	0	0
Sep-19	1	10	1	30	1	0.01	0	1
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
b) Kitty Hawk Site								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	1	10	1	39	1	0.02	0	1
Jul-19	1	10	1	29	1	0.02	0	1
Aug-19	0	0	0	0	-	-	0	0
Sep-19	1	10	1	29	1	0.02	0	1
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
c) 2 km to 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0

May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	1	10	1	30	1	0.04	0	1
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
d) 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	1	10	1	31	1	0.02	0	1
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

Spurdog sp. – unidentified

Table 65 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for unidentified spurdog sp. in: a) Kitty Hawk plus 4 km buffer; b) 1 km to 1.5 km buffer; c) 1.5 km to 2 km buffer; and d) 4 km buffer

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	23	230	23	690	0.21	0.22	0	23
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
b) 1 km to 1.5 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	14	115	14	344	0.27	1.79	0	14
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0

Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
c) 1.5 km to 2 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	9	143	9	429	0.33	2.22	0	9
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
d) 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	23	238	23	714	0.21	0.45	0	23
Mar-19	0	0	0	0	-	-	0	0

Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

Shark sp. – unidentified

Table 66 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for unidentified shark sp. in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) 0.5 km to 1 km buffer; d) 1.5 km to 2 km buffer; e) 2 km to 4 km buffer; and f) 4 km buffer

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	1	10	1	30	1	0.01	0	1
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	4	40	10	80	0.5	0.04	0	4
Aug-19	2	20	2	50	0.71	0.02	0	2
Sep-19	2	20	2	50	0.71	0.02	0	2
Oct-19	0	0	0	0	-	-	0	0

Nov-19	2	20	2	50	0.71	0.02	0	2
Dec-19	0	0	0	0	-	-	0	0
b) Kitty Hawk Site								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	2	19	2	48	0.7	0.04	0	2
Aug-19	0	0	0	0	-	-	0	0
Sep-19	1	10	1	29	1	0.02	0	1
Oct-19	0	0	0	0	-	-	0	0
Nov-19	2	19	2	48	0.7	0.04	0	2
Dec-19	0	0	0	0	-	-	0	0
c) 0.5 km to 1 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	1	8	1	23	1	0.12	0	1
Aug-19	1	8	1	31	1	0.12	0	1

Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
d) 1.5 km to 2 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	1	16	1	48	1	0.25	0	1
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
e) 2 km to 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0

Jul-19	1	10	1	30	1	0.04	0	1
Aug-19	1	10	1	30	1	0.04	0	1
Sep-19	1	10	1	40	1	0.04	0	1
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
f) 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	1	10	1	31	1	0.02	0	1
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	2	21	2	52	0.7	0.04	0	2
Aug-19	2	21	2	52	0.7	0.04	0	2
Sep-19	1	10	1	31	1	0.02	0	1
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

Spotted Eagle Ray

Table 67 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for spotted eagle ray in: a) Kitty Hawk plus 4 km buffer; and b) Kitty Hawk Site

a) Kitty Hawk plus 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	1	10	1	30	1	0.01	0	1
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
b) Kitty Hawk Site								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	1	10	1	29	1	0.02	0	1
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0

Dec-19	0	0	0	0	-	-	0	0
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Atlantic Stingray

Table 68 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for Atlantic stingray in: a) Kitty Hawk plus 4 km buffer; b) Site to 0.5 km buffer; and c) 4 km buffer

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	1	1	1	40	1	0.01	0	1
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
b) Site to 0.5 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0

May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	1	15	1	46	1	0.23	0	1
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
c) 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	1	10	1	41	1	0.02	0	1
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

Giant Manta Ray

Table 69 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for giant manta ray in: a) Kitty Hawk plus 4 km buffer; b) 1 km to 1.5 km buffer; and c) 4 km buffer

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	1	10	1	30	1	0.01	0	1
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
b) 1 km to 1.5 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0

Jul-19	0	0	0	0	-	-	0	0
Aug-19	1	8	1	24	1	0.12	0	1
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
c) 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	1	10	1	31	1	0.02	0	1
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

Giant Devil Ray

Table 70 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for giant devil ray in: a) Kitty Hawk plus 4 km buffer; and b) Kitty Hawk Site

a) Kitty Hawk plus 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	1	10	1	30	1	0.01	0	1
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

b) Kitty Hawk Site

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	1	10	1	29	1	0.02	0	1
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0

Dec-19	0	0	0	0	-	-	0	0
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Chilean Devil Ray

Table 71 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for Chilean devil ray in: a) Kitty Hawk plus 4 km buffer; b) 2 km to 4 km buffer; and c) 4 km buffer

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	1	10	1	30	1	0.01	0	1
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
b) 2 km to 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0

May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	1	10	1	41	1	0.04	0	1
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
c) 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	1	10	1	31	1	0.02	0	1
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

Cownose Ray

Table 72 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for cownose ray in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) 1 km to 1.5 km buffer; d) 1.5 km to 2 km buffer; e) 2 km to 4 km buffer; and f) 4 km buffer

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	286	2861	286	8254	0.06	2.79	0	286
Jul-19	6	60	20	110	0.41	0.06	0	6
Aug-19	3	30	3	80	0.58	0.03	0	3
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
b) Kitty Hawk Site								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0

Jun-19	0	0	0	0	-	-	0	0
Jul-19	5	48	10	97	0.45	0.1	0	5
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

c) 1 km to 1.5 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	0	0	0	0	-	-	0	0
Aug-19	1	8	1	33	1	0.12	0	1
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

d) 1.5 km to 2 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0

Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	1	16	1	48	1	0.25	0	1
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

e) 2 km to 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	286	2896	286	9001	0.06	10.79	0	286
Jul-19	0	0	0	0	-	-	0	0
Aug-19	2	20	2	61	0.71	0.07	0	2
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

f) 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0

Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	286	2962	286	10439	0.06	5.6	0	286
Jul-19	1	10	1	31	1	0.02	0	1
Aug-19	3	31	3	83	0.58	0.06	0	3
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

Cownose / Bullnose Ray

Table 73 Raw count and abundance estimate (no. estimated individuals per km²) by species designation, and behavior for cownose / bullnose ray in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) 2 km to 4 km buffer; and d) 4 km buffer

a) Kitty Hawk plus 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	1	10	1	30	1	0.01	0	1
Jul-19	1	10	1	30	1	0.01	0	1
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0

Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

b) Kitty Hawk Site

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	1	10	1	29	1	0.02	0	1
Jul-19	0	0	0	0	-	-	0	0
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

c) 2 km to 4 km Buffer

Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	1	10	1	41	1	0.04	0	1

Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0
d) 4 km Buffer								
Survey	Raw Count	Abundance	Lower CI	Upper CI	Precision	Density	Surfacing	Submerged
Jan-19	0	0	0	0	-	-	0	0
Feb-19	0	0	0	0	-	-	0	0
Mar-19	0	0	0	0	-	-	0	0
Apr-19	0	0	0	0	-	-	0	0
May-19	0	0	0	0	-	-	0	0
Jun-19	0	0	0	0	-	-	0	0
Jul-19	1	10	1	31	1	0.02	0	1
Aug-19	0	0	0	0	-	-	0	0
Sep-19	0	0	0	0	-	-	0	0
Oct-19	0	0	0	0	-	-	0	0
Nov-19	0	0	0	0	-	-	0	0
Dec-19	0	0	0	0	-	-	0	0

Appendix III Correction factors applied to aerial survey data for availability

The correction factor applied to each relevant species is based on that recommended by the Joint Nature Conservation Committee (JNCC) in a submission during the examination phase of the East Anglia ONE OWF, referred to by the JNCC as Method C. Availability bias corrections are undertaken in order to account for birds that may not be seen in the imagery captured due to their being underwater following a dive. A copy of the text on Method C is provided below. Method C represents an amended calculation based on advice provided by Dr Sophy Allen. This advice related to the amount of time the bird was captured, and the average length of time spent at the sea surface. The Method C has been taken from Paragraph 5.6.5 of the following document and further details on the amendments to the methodology can be found in Section 5.6: Appendix 1:

Joint Nature Conservation Committee (2013). *JNCC Expert Statement on Ornithological Issues for Written Representations in Respect of East Anglia ONE Offshore Windfarm by Dr Sophy Allen*. Joint Nature Conservation Committee, Aberdeen.

METHOD C

Guillemots

Underwater (1.9h) / [Sea surface (5.1h) + Diving activity (2.9h)] = 0.2375

Therefore, for guillemot availability JNCC would calculate $g(0) = 0.7625$

Razorbills

Underwater (0.8h) / [Sea surface (3.1h) + Diving activity (1.5h)] = 0.1739

Therefore, for razorbill availability JNCC would calculate $g(0) = 0.8261$

This works on the following assumptions:

1. That all birds observed on the water in the project area are undertaking a foraging trip (in most cases this seems appropriate);
2. That 'birds in flight' are adequately characterised within the 'birds in flight' quotation of the Thaxter et al. (2010) figures (i.e. that portion which has been removed from the Correction Factor calculation);
3. That the proportions of time spent foraging underwater are representative of behaviour throughout the year (i.e. not just the breeding season – the period in which this proportional data was calculated from by Thaxter et al. 2010), should the Correction Factor be applied to annual abundance estimates.

Appendix IV Aerial Digital Survey Data Corrected Sitting Auk Abundance & Density Estimates

Common / Thick-billed Murre

Table 1 Corrected and apportioned abundance and density estimates of sitting common / thick-billed murre in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) Site to 0.5 km buffer; d) 0.5 km to 1 km buffer; e) 1 km to 1.5 km buffer; f) 1.5 km to 2 km buffer; g) 2 km to 4 km buffer; and h) 4 km buffer

a) Kitty Hawk plus 4 km Buffer – Sitting Birds				
Survey	Proportion	Abundance	Corrected	Density
Jan-19	0.03	194	254	0.25
b) Kitty Hawk Site – Sitting Birds				
Survey	Proportion	Abundance	Corrected	Density
Jan-19	0.03	114	149	0.30
c) Site to 0.5 km Buffer – Sitting Birds				
Survey	Proportion	Abundance	Corrected	Density
Jan-19	0.00	0	0	0.00
d) 0.5 km to 1 km Buffer – Sitting Birds				
Survey	Proportion	Abundance	Corrected	Density
Jan-19	0.00	0	0	0.00
e) 1 km to 1.5 km Buffer – Sitting Birds				
Survey	Proportion	Abundance	Corrected	Density
Jan-19	0.00	0	0	0.00
f) 1.5 km to 2 km Buffer – Sitting Birds				
Survey	Proportion	Abundance	Corrected	Density
Jan-19	0.00	0	0	0.00
g) 2 km to 4 km Buffer – Sitting Birds				
Survey	Proportion	Abundance	Corrected	Density
Jan-19	0.04	79	103	0.38
h) 4 km Buffer – Sitting Birds				
Survey	Proportion	Abundance	Corrected	Density
Jan-19	0.03	77	101	0.19

Razorbill

Table 2 Corrected and apportioned abundance and density estimates of sitting razorbill in: a) Kitty Hawk plus 4 km buffer; b) Kitty Hawk Site; c) Site to 0.5 km buffer; d) 0.5 km to 1 km buffer; e) 1 km to 1.5 km buffer; f) 1.5 km to 2 km buffer; g) 2 km to 4 km buffer; and h) 4 km buffer

a) Kitty Hawk plus 4 km Buffer – Sitting Birds				
Survey	Proportion	Abundance	Corrected	Density
Jan-19	0.97	6,245	7,560	7.38
Feb-19	1.00	200	242	0.24
Dec-19	1.00	30	36	0.04
b) Kitty Hawk Site – Sitting Birds				
Survey	Proportion	Abundance	Corrected	Density
Jan-19	0.97	3,361	4,069	8.21
Feb-19	1.00	116	140	0.28
Dec-19	1.00	29	35	0.07
c) Site to 0.5 km Buffer – Sitting Birds				
Survey	Proportion	Abundance	Corrected	Density
Jan-19	1.00	261	316	4.74
Feb-19	-	-	-	-
Dec-19	1.00	0.00	0.00	0.00
d) 0.5 km to 1 km Buffer – Sitting Birds				
Survey	Proportion	Abundance	Corrected	Density
Jan-19	1.00	312	378	5.78
Feb-19	-	-	-	-
Dec-19	-	-	-	-
e) 1 km to 1.5 km Buffer – Sitting Birds				
Survey	Proportion	Abundance	Corrected	Density
Jan-19	1.00	378	458	7.12
Feb-19	-	-	-	-
Dec-19	-	-	-	-
f) 1.5 km to 2 km Buffer – Sitting Birds				
Survey	Proportion	Abundance	Corrected	Density
Jan-19	1.00	206	249	3.87
Feb-19	1.00	16	19	0.30
Dec-19	-	-	-	-
g) 2 km to 4 km Buffer – Sitting Birds				
Survey	Proportion	Abundance	Corrected	Density
Jan-19	0.96	1,620	1,961	7.31
Feb-19	1.00	71	86	0.32

Dec-19	-	-	-	-
h) 4 km Buffer – Sitting Birds				
Survey	Proportion	Abundance	Corrected	Density
Jan-19	0.97	2,860	3,462	6.55
Feb-19	1.00	82	99	0.19
Dec-19	1.00	0.00	0.00	0.00

Appendix V Age Classification of Key Bird Species

Appendix V provides information on the methodology APEM uses to age gannets, kittiwakes and large gulls from digital still imagery. The proportion of adult individuals per species per month is presented in Table 7 (only birds for which an age class could be determined are included).

From high resolution digital aerial imagery, it is possible to identify most birds to species level given a suitable resolution (expressed as X cm ground sample distance). The only regular exception for surveys in the North Atlantic is differentiating between common and Arctic tern. High resolution digital aerial imagery is also able to differentiate between the different plumages shown by seabird species as they progress from immature to full adult plumage. For each of these species, example images have been provided. It should be noted that the actual image quality is superior to these compressed and cropped examples included in this document.

Northern Gannet

APEM can identify 100% of gannets encountered during our aerial digital surveys at 1.5 cm GSD resolution.

Separation of adults from sub-adults, both in flight and sitting on the water surface, is relatively straightforward.

For gannets in flight, APEM can identify all age groups, possibly except for fifth-year birds as seeing the blackish central tail feathers may be difficult even with 1.5 cm resolution. No fifth-year gannets were recorded in the Kitty Hawk surveys. Juvenile or first year (top left, Plate 1) can be separated from second year (top right, Plate 1) by the amount of white that is visible. The juvenile fully brown plumage (top left, Plate 1) can be compared in the example below to the second-year bird (top right, Plate 1) which shows white head and white forewing patches. First year birds can show slightly whiter around the neck and forewing than juveniles, but this can vary considerably in gannets. Adult gannets (bottom right, Plate 1) are obvious with yellow heads clearly visible. It is also possible to separate third year (bottom left, Plate 1) and fourth year gannet, based on the reduced amount of black in the upperparts of fourth year birds.

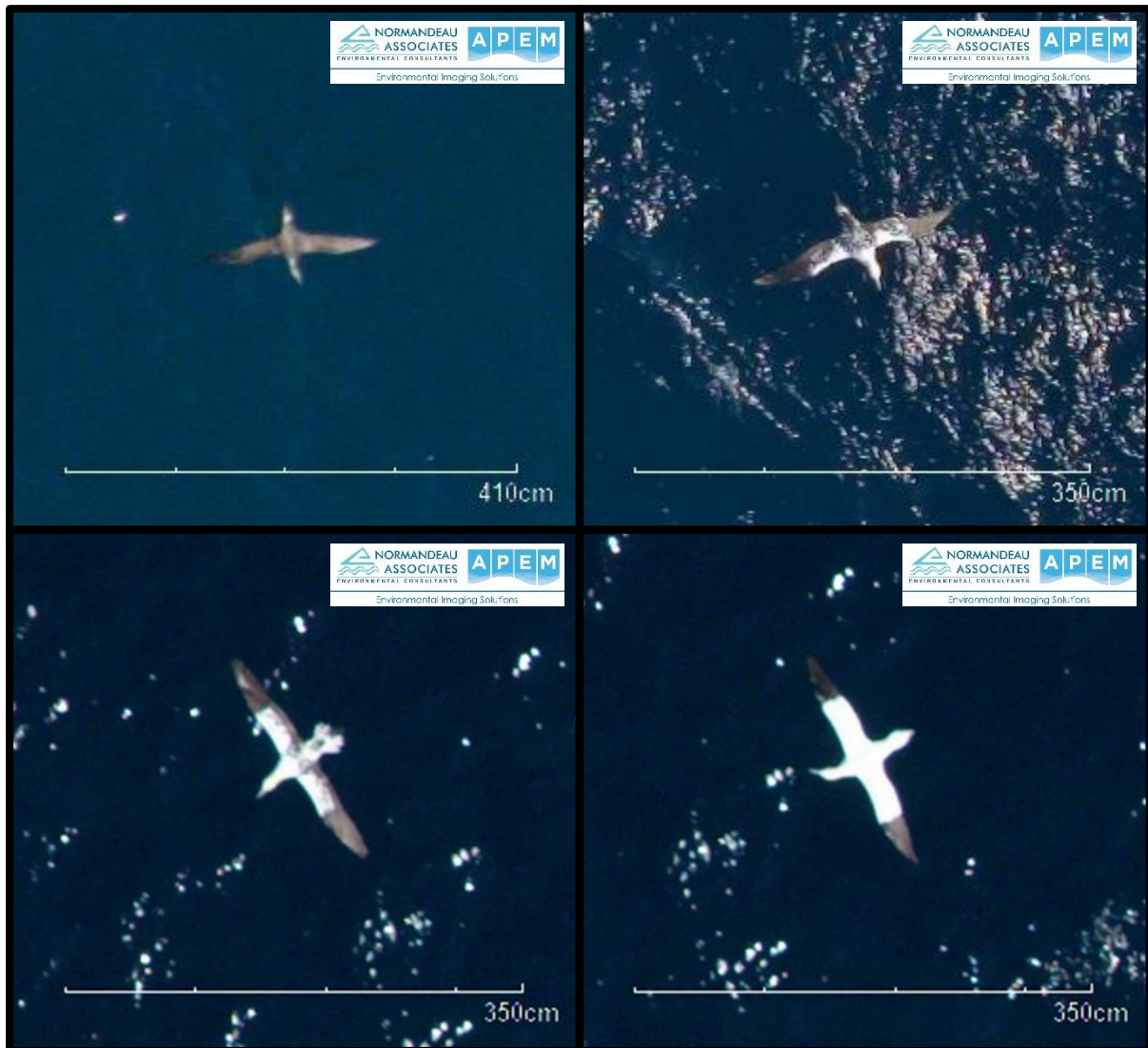


Plate 1 Flying northern gannets of different ages captured in digital still imagery (GSD 1.5 cm)

Ageing northern gannets sitting on the water is slightly more difficult than in flight when birds have their wings outstretched. For swimming birds, APEM can positively identify the following age groups: adults (top left, Plate 2), fourth years, third years, second years (top right, Plate 2), first years and juveniles. Separating third and fourth year is slightly less certain than the other age groups but varying amounts of black on the upperparts is used for separation. Any fifth-year birds sitting on the water are likely to be grouped with adults as few black primaries and any black on the tail feathers is unlikely to be visible.

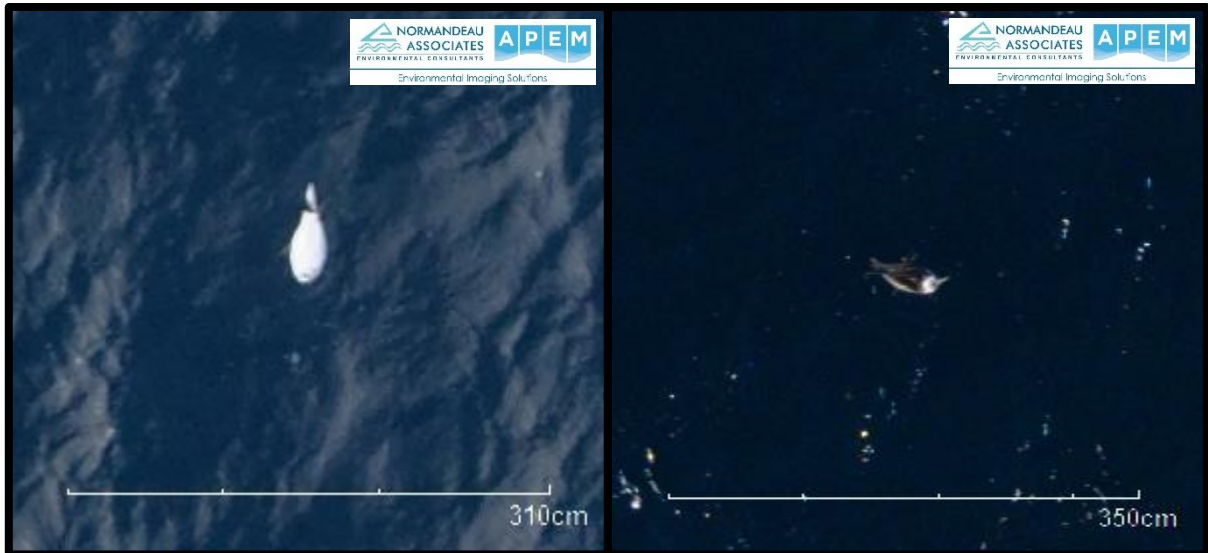


Plate 2 Sitting northern gannets of different ages captured in digital still imagery (GSD 1.5 cm)

Age categories of northern gannets used in the data tables produced by APEM of its analyzed high-resolution aerial images are provided in Table 1.

Table 1 Gannet age class

Age of northern gannet	APEM age category – sitting and flying birds
Adult	Adult
Fifth year	
Fourth year	Fourth year
Third year	Third year
Second year	Second year
First year	First year
Juvenile	Juvenile

Black-legged Kittiwake

Black-legged kittiwakes are the easiest small gull to identify in flight with very distinctive shape and wing tips.

In flight APEM can readily identify both adults (below left, Plate 3) and first years (below right, Plate 3) and with good image quality and higher resolution (i.e. 1.5 cm GSD) separation between juveniles and first years is possible (the juvenile's black neck collar can be seen from above).

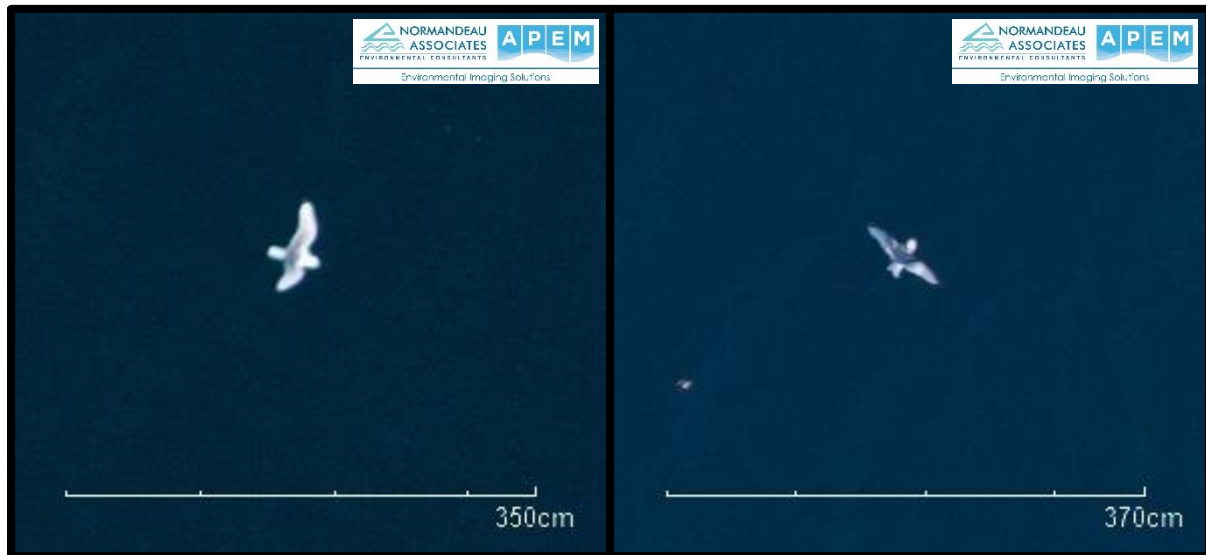


Plate 3 Flying black-legged kittiwakes of different ages captured in digital still imagery (GSD 1.5 cm)

Sitting adults viewed from above (below center, Plate 4) are distinctive, showing a light grey back with white either side and usually the black wing tips are not visible. Separation of sitting adults from immature birds is difficult at any resolution, and only realistically possible with good quality 1.5 cm GSD imagery. No sitting first years were recorded in the Kitty Hawk surveys but can be identified from black shown around the back of the neck or darker looking upperparts, though these features are not always visible.



Plate 4 **Sitting adult black-legged kittiwake captured in digital still imagery (GSD 1.5 cm)**

Age categories of black-legged kittiwakes used in the data tables produced by APEM of its analyzed high-resolution aerial images are provided in Table 2.

Table 2 **Black-legged kittiwake age class**

Age of black-legged kittiwake	APEM age category – sitting birds	APEM age category – flying birds
Adult	Adult	Adult
Second year		Second year
First year	First year	First year
Juvenile	Juvenile	Juvenile

Bonaparte's Gull

Bonaparte's gulls are identifiable by the distinct coloration on their wings. The species is distinguished from black-legged kittiwakes by their smaller size.

In flight APEM can identify both juveniles (left, Plate 5) and adults (right, Plate 5). Adults are identified by the white leading edges on their wings, whilst juveniles are identified by their darker wing tips and the dark 'M' on their back. Age categories of Bonaparte's gulls used in the data tables produced by APEM of its analyzed high-resolution aerial images are provided in Table 3.



Plate 5 Flying Bonaparte's gulls of different ages captured in digital still imagery (GSD 1.5 cm)

Table 3 Bonaparte's gull age class

Age of Bonaparte's gull	APEM age category – sitting birds	APEM age category – flying birds
Adult	Adult	Adult
Second year		Second year
First year	First year	First year
Juvenile	Juvenile	Juvenile

Laughing Gull

APEM can distinguish adult laughing gulls (below right, Plate 7) from first years (below left, Plate 7) and juveniles in flight by the uniform grey across the wings with black wingtips. Immature birds display brown plumage on the wings, with first years also showing a grey mantle.

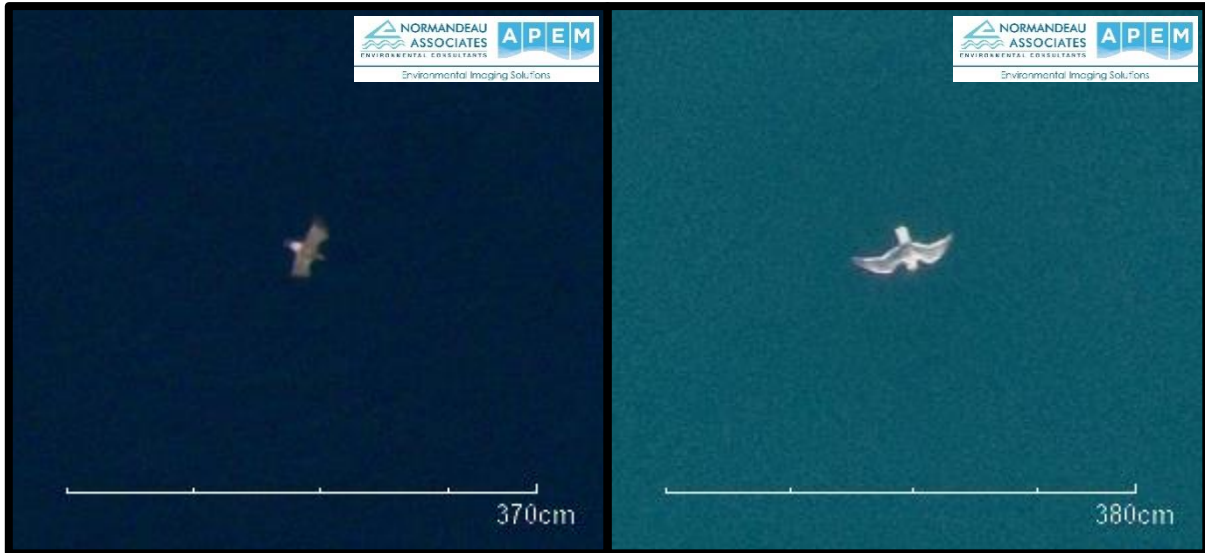


Plate 6 Flying laughing gulls of different ages captured in digital still imagery (GSD 1.5 cm)

Table 4 Laughing gull age class

Age of laughing gull	APEM age category – sitting birds	APEM age category – flying birds
Adult	Adult	Adult
Second year		Second year
First year	First year	First year
Juvenile	Juvenile	Juvenile

Herring Gull

For herring gulls in flight, APEM can identify all the age groups. Adults viewed from above display broad uniform light grey wings (below right, Plate 7) and immature birds show larger black wing tips without white mirrors with varying amounts of brown juvenile plumage (below left, Plate 7).



Plate 7 Flying herring gulls of different ages captured in digital still imagery (GSD 1.5 cm)

Like the other gulls, sitting birds offer greater identification challenges, though the adults grey upperparts are distinctive (below right, Plate 8). Sitting herring gulls consistently measure around 45 cm in body length, which is a valuable aid in separating juvenile birds from juvenile great black-backed gulls. APEM can readily identify first winters (below left, Plate 8) which display a mottled brown and grey plumage on the back and head. The only potential pitfall is separating sitting third year birds from adults, so these are likely to be recorded as adults.

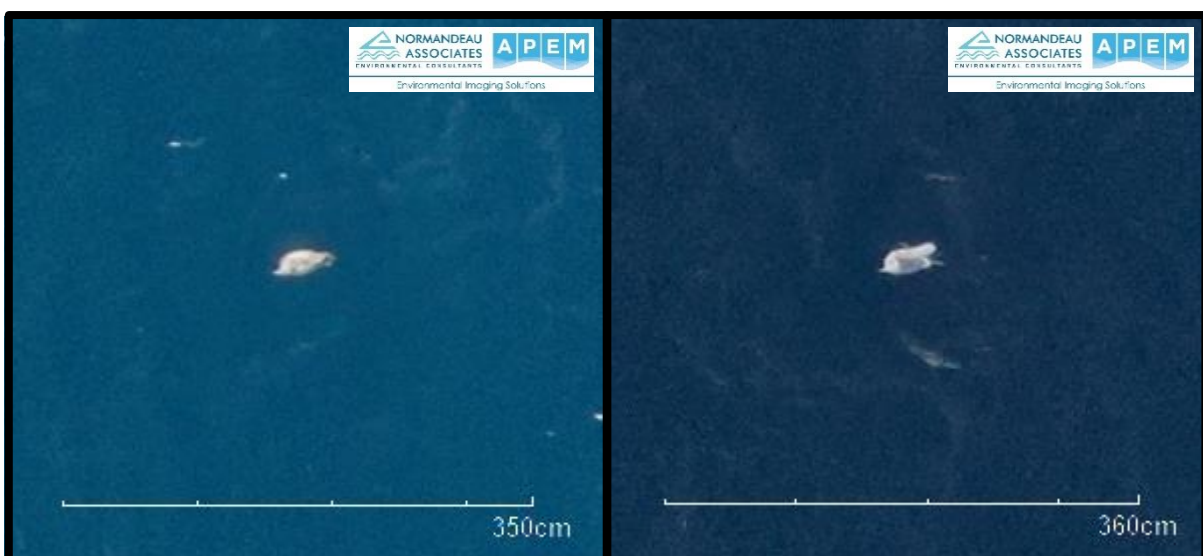


Plate 8 Sitting herring gulls of different ages captured in digital still imagery (GSD 1.5 cm)

Age categories of herring gulls used in the data tables produced by APEM of its analyzed high-resolution aerial images are provided in Table 5.

Table 5 Herring gull age class

Age of herring gull	APEM age category – sitting birds	APEM age category – flying birds
Adult	Adult	Adult
Third year		Third year
Second year	Second year	Second year
First year	First year	First year
Juvenile	Juvenile	Juvenile

Great Black-backed Gull

The easiest large gull to identify and separated from lesser black-backed gull on size.

In flight the following ages can be readily identified: juvenile, first year, second year, third year and adults. The adults are very distinctive (below left, Plate 9), with black upperparts and small white mirrors. First and second year birds (below right, Plate 9) are easily classified by light brown upperparts becoming darker towards the wing tips, white head, and pale tail with dark tail band.



Plate 9 Flying great black-backed gulls of different ages captured in digital still imagery (GSD 1.5 cm)

Sitting birds on the water tend to show varying amounts of brown from juveniles (bottom right, Plate 12) to the very dark black backed adults (below left, Plate 12). The only age that there may be difficulty in identifying is sitting third years as plumage-wise they will be very similar to adults.

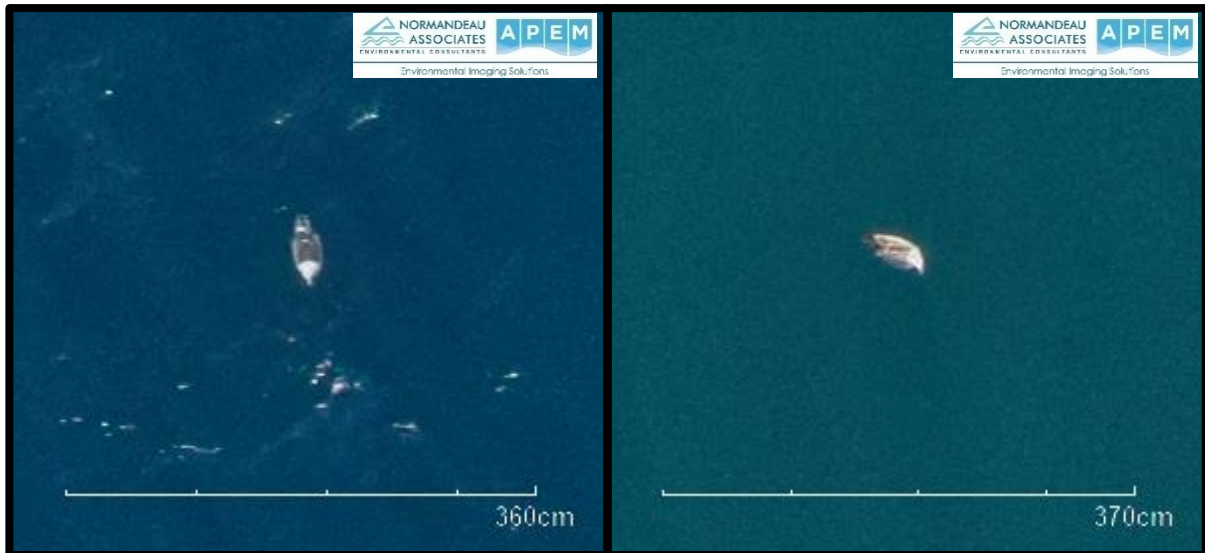


Plate 10 **Sitting great black-backed gulls of different ages captured in digital still imagery (GSD 1.5 cm)**

Age categories of great black-backed gulls used in the data tables produced by APEM of its analyzed high-resolution aerial images are provided in Table 8.

Table 6 **Great black-backed gull age class**

Age of great black-backed gull	APEM age category – sitting birds	APEM age category – flying birds
Adult	Adult	Adult
Third year		Third year
Second year	Second year	Second year
First year	First year	First year
Juvenile	Juvenile	Juvenile

Table 7 Proportion of positively identified adult northern gannets, black-legged kittiwakes, Bonaparte’s gulls, laughing gulls, herring gulls, and great black-backed gulls recorded in Kitty Hawk plus 4 km buffer from 12 months data (January 2019 to December 2019)

Species	Age	Survey Month											
		Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19
Northern gannet	Juvenile & sub-adults	6	2	9	2	0	0	0	0	0	0	0	1
	Adults	30	15	15	0	0	0	0	0	0	0	3	2
	Adults (%)	83	88	63	0	-	-	-	-	-	-	100	67
Black-legged kittiwake	Juvenile & sub-adults	1	0	0	0	0	0	0	0	0	0	0	1
	Adults	3	0	0	0	0	0	0	0	0	0	0	0
	Adults (%)	75	-	-	-	-	-	-	-	-	-	-	0
Bonaparte’s gull	Juvenile & sub-adults	0	0	0	1	0	0	0	0	0	0	0	0
	Adults	10	0	7	1	0	0	0	0	0	0	2	1
	Adults (%)	100	-	-	50	-	-	-	-	-	-	100	100
Laughing gull	Juvenile & sub-adults	0	0	0	0	0	0	1	0	2	0	0	0

Species	Age	Survey Month											
		Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19
	Adults	0	0	0	0	0	0	0	0	0	0	8	1
	Adults (%)	-	-	-	-	-	-	0	-	0	-	100	100
Herring gull	Juvenile & sub-adults	0	1	1	0	0	0	0	0	0	0	1	4
	Adults	0	1	1	2	0	0	0	0	0	0	2	12
	Adults (%)	-	50	50	100	-	-	-	-	-	-	67	75
Great black-backed gull	Juvenile & sub-adults	0	0	0	0	0	0	0	0	0	0	1	3
	Adults	3	0	0	0	0	0	0	0	0	0	2	18
	Adults (%)	100	-	-	-	-	-	-	-	-	-	67	86