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APPENDIX O

Ornithological and Marine Faunal Aerial Survey – APEM Studies

Prepared for

Beacon Wind LLC

Photo credit: Matt Goldsmith, Equinor

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Environmental Imaging Solutions

Digital Aerial Wildlife Survey of BOEM Lease Area OCS-A 520

Annual Report: December 2019 to November 2020

Equinor Wind US

APEM Ref: P00004197

Issued April 2021

Matthew Arundale, Abigail Goulding, Kate Rogerson, Katie St John Glew, Simon Warford, and Laura Jervis

Client: Scott Lundin

Address: Equinor Wind US
1 Lincoln Street
Boston
Massachusetts
02111

Project reference: P00004197

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Project Director: Gillian Sutherland

Project Manager: Laura Jervis

Key Contributors: Matthew Arundale, Abigail Goulding, Kate Rogerson, Katie St John Glew, Simon Warford, Julia Robinson Willmott (Normandeau Associates)

APEM Inc.
2603 NW 13th Street
#402
Gainesville
Florida
FL 32609

Tel: (352) 559-9155

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1. Executive Summary

A programme of 16 aerial digital surveys of BOEM's Atlantic Outer Continental Shelf (OCS-A) 0520 lease area, off the coast of Massachusetts, were conducted between December 2019 and November 2020 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 and occasional bimonthly aerial digital surveys are summarized below. Timings and coverage for each survey undertaken on behalf of Equinor Wind US (hereafter referred to as Equinor) are provided in Section 4.1.

- Survey 01 – December 2019
    - Total targets (n=198).
    - The most abundant group recorded in the December survey was dolphins (n=36), followed by fulmars (n=35), waterfowl (n=32), auks (n=28), gannets (n=28), common dolphins (n=26), gulls (n=13), loons (n=11), seals (n=9), porpoises (n=3), and unidentified marine mammals (n=3).

- Survey 02 – January 2020
    - Total targets (n=1,371).
    - The most abundant group recorded in the January survey was waterfowl (n=1,273), followed by auks (n=62), gulls (n=13), gannets (n=9), loons (n=9), seals (n=3), and dolphins (n=2).

- Survey 03 – February 2020
    - Total targets (n=669).
    - The most abundant group recorded in the February survey was auks (n=431), followed by waterfowl (n=193), gulls (n=24), fulmars (n=9), dolphins (n=7), seals (n=3), gannets (n=1), and porpoises (n=1).

- Survey 04 – March 2020
    - Total targets (n=700).
    - The most abundant group recorded in the March survey was auks (n=498), followed by waterfowl (n=146), gulls (n=22), seals (n=15), fulmars (n=9), gannets (n=3), porpoises (n=3), loons (n=1), cormorant / shags (n=1), dolphins (n=1), and unidentified marine mammals (n=1).

- Survey 05 – April I 2020
  - Total targets (n=1,092).
  - The most abundant group recorded in the first April survey was auks (n=806), followed by waterfowl (n=136), fulmars (n=47), gulls (n=42), porpoises (n=13), seals (n=13), dolphins (n=11), loons (n=9), gannets (n=8), sharks (n=5), whales (n=1) and unidentified marine mammals (n=1).

- Survey 06 – April II 2020
  - Total targets (n=1,345).
  - The most abundant group recorded in the second April survey was loons (n=853), followed by auks (n=233), waterfowl (n=96), gannets (n=86), porpoises (n=34), gulls (n=23), unidentified marine mammals (n=7), terns (n=5), seals (n=5), storm petrels (n=2), and sharks (n=1).

- Survey 07 – May I 2020
  - Total targets (n=132).
  - The most abundant group recorded in the first May survey was terns (n=52), followed by loons (n=31), wildfowl (n=15), gulls (n=11), gannets (n=11), porpoises (n=7), seals (n=2), unidentified marine mammals (n=2), and fulmars (n=1).
  - Three roseate terns (Federally or State Listed as Threatened or Endangered) were recorded.

- Survey 08 – May II 2020
  - Total targets (n=145). Additional targets (n=302 small bony fish shoals).
  - The most abundant species group recorded in the second May survey was shearwaters (n=105), followed by gulls (n=10), dolphins (n=9), sharks (n=6), storm petrels (n=5), whales (n=3), large bony fish (n=3), loons (n=2), and porpoises (n=2).
  - Six basking sharks (Federally or State Listed as Threatened or Endangered) were recorded.

- Survey 09 – June 2020
  - Total targets (n=200).
  - The most abundant species group recorded in the June survey was shearwaters (n=95), followed by sharks (n=29), dolphins (n=23), large bony fish (n=23), gulls (n=11), storm petrels (n=9), whales (n=4), terns (n=2), seals (n=2), gannets (n=1), and unidentified marine mammals (n=1).

- One fin whale, one humpback whale, one Atlantic bluefin tuna, one shortfin mako, and three basking sharks (Federally or State Listed as Threatened or Endangered) were recorded.

- Survey 10 – July 2020
    - Total targets (n=234).
    - The most abundant group recorded in the July survey was sharks (n=122), followed by large bony fish (n=77), shearwaters (n=22), storm petrels (n=6), gulls (n=3), turtles (n=2), whales (n=1), and rays (n=1).
    - One loggerhead turtle, one Kemp's ridley turtle, eleven Atlantic bluefin tuna, ten basking sharks, two shortfin mako, six scalloped hammerheads, and one great hammerhead (Federally or State Listed as Threatened or Endangered) were recorded.

- Survey 11 – August I 2020
    - Total targets (n=195).
    - The most abundant species group recorded in the first August survey was large bony fish (n=78), followed by shearwaters (n=49), sharks (n=41), gulls (n=14), dolphins (n=6), storm petrels (n=3), terns (n=2), and whales (n=2).
    - One *Sterna sp.* tern, 27 Atlantic bluefin tuna, one oceanic whitetip shark, and 2 basking sharks (Federally or State Listed as Threatened or Endangered) were recorded.

- Survey 12 – August II 2020
    - Total targets (n=466).
    - The most abundant species group recorded in the second August survey was large bony fish (n=264), followed by shearwaters (n=94), gulls (n=48), sharks (n=37), shorebirds (n=13), dolphins (n=6), jaegers (n=2), porpoises (n=1), and unidentified marine mammals (n=1).
    - Three basking sharks, and one shortfin mako (Federally or State Listed as Threatened or Endangered) were recorded.

- Survey 13 – September I 2020
    - Total targets (n=164).
    - The most abundant species group recorded in the first September survey was shearwaters (n=150), followed by gulls (n=6), sharks (n=4), large bony fish (n=3), and jaegers (n=1).

- One dusky shark (Federally or State Listed as Threatened or Endangered) was recorded.

- Survey 14 – September II 2020
  - Total targets (n=93).
  - The most abundant species group recorded in the second September survey was gulls (n=76), followed by sharks (n=6), shearwaters (n=4), fulmars (n=4), gannets (n=1), passerines (n=1), and large bony fish (n=1).
  - One dusky shark and one basking shark (Federally Listed as Threatened or Endangered) was recorded.

- Survey 15 – October 2020
  - Total targets (n=80).
  - The most abundant species group recorded in the October 2020 survey was passerines (n=21), followed by gulls (n=19), shearwaters (n=16), large bony fish (n=10), dolphins (n=6), waterfowl (n=3), gannets (n=2), sharks (n=2), and terns (n=1).

- Survey 16 – November 2020
  - Total targets (n=461).
  - The most abundant species group recorded in the November 2020 survey was gulls (n=209), followed by shearwaters (n=80), dolphins (n=67), loons (n=30), gannets (n=21), shorebirds (n=13), auks (n=13), waterfowl (n=11), fulmars (n=6), sharks (n=3), porpoises (n=2), unidentified marine mammals (n=2), cormorant / shags (n=1), terns (n=1), storm petrels (n=1), and seals (n=1).

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 within the Survey Area in each survey season and their Listed status

Species	Number of individuals per season				Federally Listed	State Listed
	Winter	Spring	Summer	Fall		
Common Eider	1	-	-	-	No	No
Surf Scoter	-	1	-	9	No	No
White-winged Scoter	1248	301	-	1	No	No
Black Scoter	-	2	-	-	No	No
Scoter sp. – unidentified	32	10	-	3	No	No
Long-tailed Duck	215	73	-	1	No	No
Duck sp. – unidentified	2	6	-	-	No	No
Red-throated Loon	17	812	-	22	No	No
Common Loon	3	60	-	8	No	SC
Loon sp. – unidentified	-	24	-	-	No	SC*
Wilson's Storm Petrel	-	5	-	-	No	No
Storm Petrel sp. – unidentified	-	2	18	1	No	E*
Cory's Shearwater	-	13	62	99	No	No
Great Shearwater	-	14	59	45	No	No
Large Shearwater sp. – unidentified	-	-	114	54	No	No
Sooty Shearwater	-	61	15	-	No	No
Manx Shearwater	-	-	-	49	No	No
Small Shearwater sp. – unidentified	-	-	1	-	No	No
Shearwater sp. – unidentified	-	17	9	3	No	No
Northern Fulmar	44	57	-	9	No	No
Northern Gannet	38	108	1	24	No	No
Cormorant sp. – unidentified	-	1	-	1	No	No
Red / Red-necked Phalarope	-	-	13	-	No	No
Red Phalarope	-	-	-	13	No	No
Black-legged Kittiwake	20	1	-	65	No	No
Sabine's Gull	-	-	-	1	No	No
Bonaparte's Gull	2	12	-	108	No	No
Laughing Gull	-	2	-	1	No	No
Small Gull sp. – unidentified	1	12	-	17	No	No
Ring-billed Gull	-	-	1	-	No	No
Great Black-backed Gull	21	34	18	18	No	No
Iceland Gull	-	-	-	2	No	No
Herring Gull	6	45	53	87	No	No
Lesser Black-backed Gull	-	2	-	4	No	No
Large Gull sp. – unidentified	-	-	3	3	No	No
Gull sp. – unidentified	-	-	1	5	No	No
Common Tern	-	5	-	-	No	SC
Forster's Tern	-	-	-	1	No	No
'Commic'[1] / Forster's Tern	-	15	3	1	No	SC*
Roseate Tern	-	3	-	-	E	E
Sterna Tern sp. – unidentified	-	34	1	-	E*	E*
Parasitic Jaeger	-	-	2	1	No	No

Species	Number of individuals per season				Federally Listed	State Listed
	Winter	Spring	Summer	Fall		
Dovekie	7	-	-	-	No	No
Common / Thick-billed Murre	1	142	-	-	No	No
Razorbill	21	86	-	-	No	No
Murre[2] / Razorbill	389	925	-	12	No	No
Atlantic Puffin	97	318	-	-	No	No
Auk sp. – unidentified	6	66	-	1	No	No
Passerine sp. – unidentified	-	-	-	22	No	No
Common Minke Whale	-	4	4	-	No	No
Fin Whale	-	-	1	-	E	E
Humpback Whale	-	-	1	-	E	E
Beaked Whale sp. – unidentified	-	-	1	-	No	No
Common Dolphin	26	18	20	57	No	No
Common Bottlenose Dolphin	-	-	4	-	No	No
Common / Atlantic White-sided Dolphin	1	-	-	-	No	No
Dolphin sp. – unidentified	18	3	11	16	No	No
Harbor Porpoise	4	59	1	2	No	No
Gray Seal	-	8	1	-	No	No
Harbor Seal	-	-	-	2	No	No
Seal sp. – unidentified	15	26	1	-	No	No
Marine Mammal sp. – unidentified	3	11	2	2	No	No
Loggerhead Turtle	-	-	1	-	T	T
Kemp's Ridley Turtle	-	-	1	-	E	E
Mahi-mahi	-	-	65	-	No	No
Ocean Sunfish	-	2	31	11	No	No
Sunfish sp. – unidentified	-	-	-	2	No	No
Atlantic Bluefin Tuna	-	-	39	-	No	No
Tuna sp. – unidentified	-	-	256	1	No	No
Billfish sp. – unidentified	-	-	39	-	No	No
Atlantic Swordfish	-	1	-	-	No	No
Fish sp. – unidentified	-	-	12	-	No	No
Blacktip Shark	-	-	1	-	No	No
Oceanic Whitetip Shark	-	-	1	-	T	No
Dusky Shark	-	-	-	2	No	No
Sandbar Shark	-	-	2	-	No	No
Tiger Shark	-	-	3	-	No	No
Blue Shark	-	-	51	1	No	No
Carcharhinidae Shark sp. – unidentified	-	-	33	1	No	No
Basking Shark	-	6	17	2	No	No
White Shark	-	-	8	5	No	No
Shortfin Mako	-	-	4	-	No	No
Scalloped Hammerhead	-	-	6	-	E	E
Great Hammerhead	-	-	1	-	No	No
Smooth Hammerhead	-	-	5	-	No	No
Hammerhead sp. – unidentified	-	-	27	-	E*	E*
Spurdog	-	5	-	-	No	No

Species	Number of individuals per season				Federally Listed	State Listed
	Winter	Spring	Summer	Fall		
Shark sp. – unidentified	-	1	74	4	No	No
Chilean Devil Ray	-	-	1	-	No	No

[1] *'Commic' refers to either common or Arctic tern.*

[2] *Murre refers to either common murre or thick-billed murre.*

**Note: 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 Equinor to provide a full year of digital aerial wildlife surveys of the Massachusetts Lease Area OCS-A 0520. Surveys were carried out on a monthly basis from December 2019 through November 2020, except for April, May, August and September, when two surveys per month were carried out in order to coincide with potential use of the area by roseate tern (*Sterna dougallii*).

The aims and objectives of the work were to assess the abundance and distribution of birds, marine mammals, sharks, rays, and turtles present in the Lease Area OCS-A 0520 over the course of a full year. Data from the surveys will provide the baseline information required for conducting impact assessments and are consistent with the survey guidelines for providing avian, marine mammal, and sea turtle information for renewable energy development on the OCS (BOEM, 2017; 2019).

The 'Site' referred to herein is comprised of the Lease Area OCS-A 0520 only, whilst the 'Survey Area' is comprised of the Site, plus a 2 km (*c*. 1 NM) buffer surrounding it with an approximately 4 km (*c.* 2 NM) buffer towards the northeast end. 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 assurance (QA) was undertaken by Normandeau.

This annual report summarizes the information collected following the completion of 16 monthly and / or bimonthly aerial digital surveys of the Survey Area between December 2019 and November 2020.

Other data sources (not collected by APEM on behalf of Equinor) available in the literature that may be relevant to the Survey Area are summarized in Section 3.

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

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

The following information is provided in Section 5:

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

Abiotic 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
Perkins *et al.*	2005	Relative waterfowl abundance within Nantucket Sound, Massachusetts during the 2004–2005 winter season
Sadoti *et al.*	2005	A survey of tern activity within Nantucket Sound, Massachusetts, during the 2004 breeding period
O'Connell *et al.*	2009	Compendium of Avian Occurrence Information for the Continental Shelf Waters along the Atlantic Coast of the United States, Final report
Robinson Willmott *et al.*	2013	The Relative Vulnerability of Migratory Bird Species to Offshore Wind Energy Projects on the Atlantic Outer Continental Shelf: An Assessment method and Database
Veit *et al.*	2015	Pelagic Seabirds off the East Coast of the United States 2008-2013
Kinlan *et al.*	2016	Modeling At-Sea Occurrence and Abundance of Marine Birds to Support Atlantic Marine Renewable Energy Planning Phase I Report
Veit *et al.*	2016	Abundance and Distribution of Seabirds off Southeastern Massachusetts
Palka *et al.*	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.
Stone *et al.*	2017	Distribution and abundance of cetaceans in a wind energy development area offshore of Massachusetts and Rhode Island
Winship *et al.*	2018	Modeling At-Sea Density of Marine Birds to Support Atlantic Marine Renewable Energy Planning Final Report
CWS-ECCC	2019	CWS-ECCC (2019) Atlas of Seabirds at Sea in Eastern Canada 2006-2016

3.1 Lease Area OCS-A 0520 Survey Area

The OCS-A 0520 lease area is situated in the North Atlantic Planning Area of the Atlantic Outer Continental Shelf (**Figure 1**) and is part of the BOEM Massachusetts wind energy area (WEA) (**Figure 2**). The surrounding region of the Rhode Island / Massachusetts (RIMA), and Massachusetts (MA) WEAs is influenced by a number of factors owing to the local geography. Situated south of the islands of Martha's Vineyard and Nantucket, Lease Area OCS-A 0520 mostly covers an area of sea beyond depths of 50 m shown from the bathymetry contour (**Figure 2**). This contrasts with the comparatively shallow depths found to the northeast in and around the region of Nantucket Shoals, which lends itself to the creation of tidal-mixing fronts as the seabed gradually slopes upward (White & Veit, 2020), with strong tidal currents and nutrient upwelling also apparent at the Muskeget Channel (Veit *et al.*, 2016). These combined factors have all contributed to the recognition of Nantucket Shoals and surrounding areas as one of high biological activity, even as far back as the 18th century (Veit *et al.*, 2016).

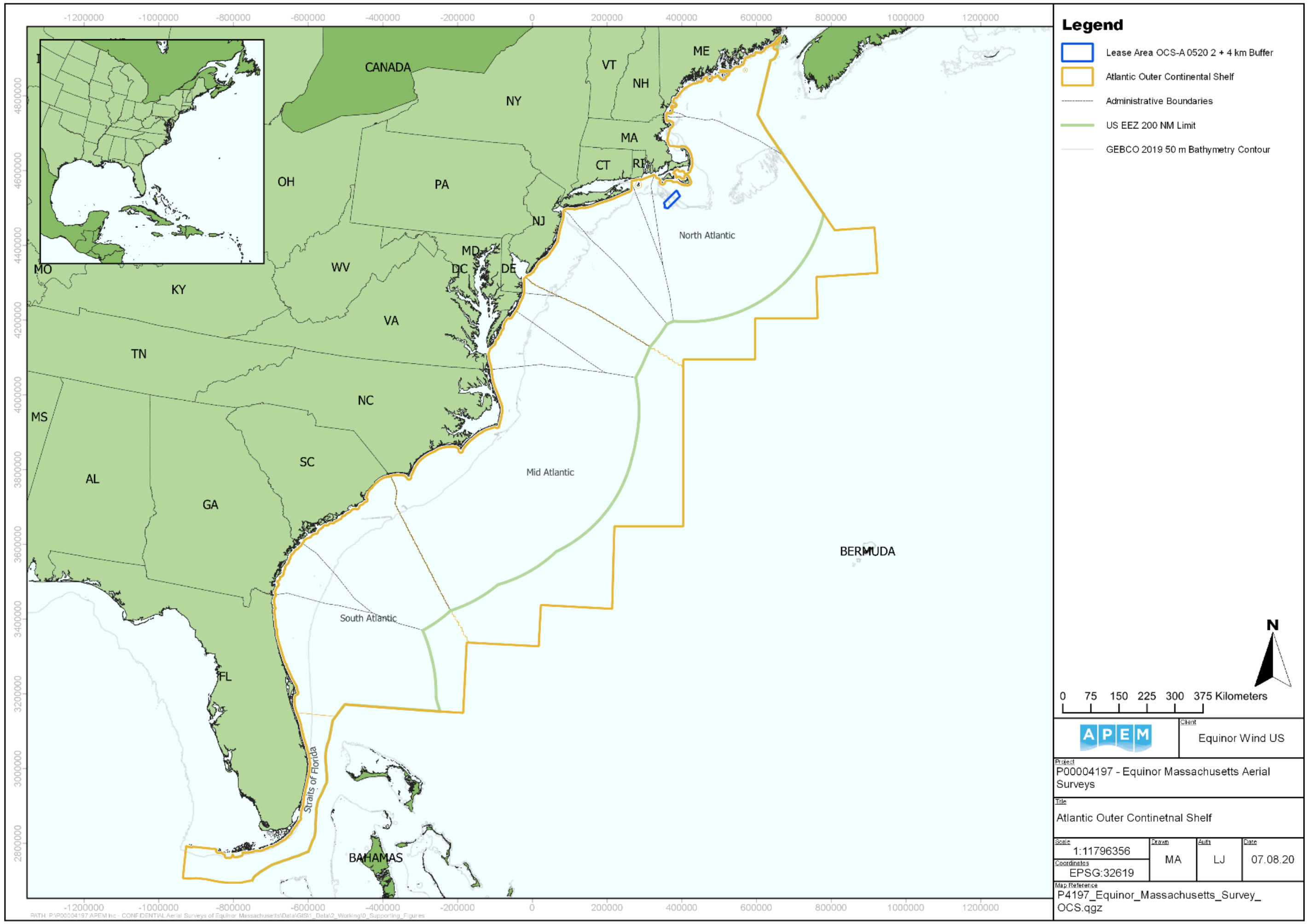

Figure 1 **Extent of Atlantic Outer Continental Shelf with reference to US administrative and Exclusive Economic Zone boundaries**

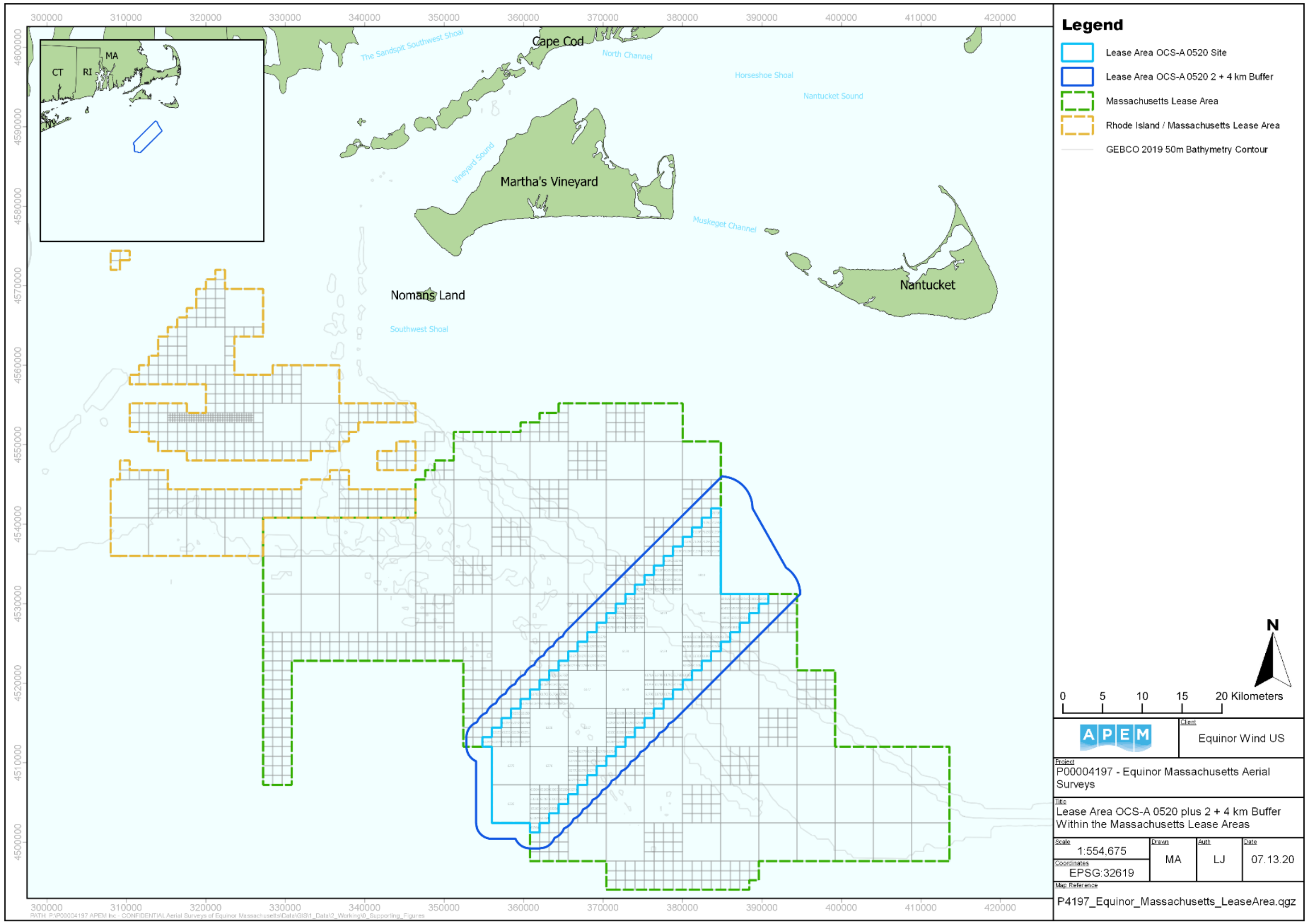

Figure 2 **Lease Area OCS-A displaying lease block numbers**

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

The National Oceanic and Atmospheric Administration's (NOAA) National Centers for Coastal Ocean Science (NCCOS) was funded by BOEM to provide broad-scale avian spatial information for the purposes of aiding marine spatial planning in the Atlantic Outer Continental Shelf (OCS). The first phase of the project is presented by Kinlan *et al.* (2016). Winship *et al.* (2018) presents the second phase of modeled at-sea relative densities of marine bird species in the U.S. Atlantic 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 presented 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 a wide variation in predicted spatial distributions of relative density due to the large number of species modeled. Generally however, broad patterns in predicted distributions did match with both observations and known distributions of species. Species such as northern fulmar, shearwaters, and storm-petrels reported highest density predictions further offshore. Seasonality was recognized as being an influencing factor on distribution predictions, as well as restricting distribution to certain areas for some species (Winship *et al*., 2018). Highest density areas for Arctic tern, breeding auks, and phalaropes were relatively nearshore off the coast of Maine and Nova Scotia during the summer, and waterfowl often exhibited highest densities in winter, localized to Nantucket Sound, Delaware Bay, and Chesapeake Bay.

The majority of species' distributions were predicted in the north and mid-Atlantic planning areas of the OCS (**Figure 1**), 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). For those species that were absent due to migration in certain seasons, including summer waterfowl, and winter jaegers, phalaropes, skuas, storm-petrels, and terns, seasonal modeling was not carried out (Winship *et al.,* 2018).

Individual BOEM WEAs had their predicted relative abundance expressed as a proportion of that of the study area as a whole, providing a broad reflection of total relative abundance, though size of the WEA also influenced the results. From these BOEM areas, a total of 22 species exhibited a total relative abundance of 1% or greater of the total relative abundance in the study area for one or more seasons (Winship *et al.,* 2018). The Rhode Island and Massachusetts area demonstrated highest total relative abundance for razorbills in spring (Winship *et al.,* 2018).

The roseate tern (Federally Listed as Threatened or Endangered; Massachusetts State Listed as Endangered) was 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 (Winship *et al*., 2018). The surrounding area of Horseshoe Shoal off the coast of Cape Cod has been hypothesized to be more important as a migratory stopover for terns than as a feeding area for the resident population, due to the majority of tern observations being comprised of travelling terns as opposed to feeding or resting individuals (Sadoti *et al.,* 2005). Approximately 50% of the North American population of roseate terns were found to breed in Buzzards Bay, Massachusetts in 1998 (Sadoti *et al*., 2005) and the species has witnessed a decline since the early 2000's, with attempts now underway to restore roseate terns to historic breeding locations in Massachusetts (NHESP, 2015). Goyert (2014) recognized the interspecific relationship between common and roseate terns to prey locating cues, so the sightings of one of the species off the Massachusetts coast could potentially be an indicator of the presence of the other.

Waterfowl presence in Nantucket Sound (**Figure 2**) is historically recorded in the hundreds of thousands for most of the winter period (Perkins *et al*., 2005). In particular, scoters, eiders, and long-tailed ducks were recorded in high abundance from surveys undertaken by Perkins *et al*. (2005), with scoters accounting for 54% of records. The occurrence of wildfowl in the region of Nantucket Shoals (south of Nantucket) is attributed to the enhanced concentrations of prey items such as pelagic amphipods and clams found to the west of the Shoals (White & Veit, 2020). Furthermore, the feeding behavior of waterfowl in Nantucket Shoals is hypothesized to be an influencing factor in the abundance of waterfowl in the region, as each species benefits from the foraging behaviors of the other (White & Veit, 2020).

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. Those deemed at highest risk of turbine collision included gull, phalarope, cormorant, and jaeger species, and those deemed at highest risk of displacement included waterfowl, loon, and some auk species. Another more recent study assessing the potential cumulative impacts of offshore wind farm developments (Goodale *et al.,* 2019), recognized the potential for offshore wind farms to affect different species groups to different degrees dependent on the location of the wind farm.

Aerial surveys focusing on seabirds between 2011 and 2015 including and around the Massachusetts wind energy area were undertaken by Veit *et al.* (2016) in order to identify areas of seabird "hotspots", defined as areas with larger than average aggregations of seabird occurrence on a regular or repeated basis. From these surveys, two seabird abundance hotspots were identified; one consisting mainly of long-tailed ducks and white-winged scoters in winter, and common and roseate terns in spring, occurring near the western edge of Nantucket Shoals; and one consisting mainly of scoters, eiders, loons, and terns situated in the area surrounding the Muskeget Channel (Veit *et al.*, 2016). The identification of these hotspots may inform the findings of the Lease Area 0520 surveys due to the close proximity of the survey area to these hotspots.

Cetacean surveys off the Massachusetts and Rhode Island coast were undertaken by Stone *et al*. (2017) between 2011 and 2015 to inform future wind energy development of the MA and RIMA WEAs. A total of twelve cetacean species were documented, displaying year-round usage of the wind energy areas, as they were recorded continually throughout the survey period (Stone *et al*., 2017). Most recorded cetaceans exhibited peak presence during the spring and summer months, with the exception of North Atlantic right whales, which were primarily recorded in the winter and spring months instead (Stone *et al*., 2017). The North Atlantic right whale is critically endangered under the International Union for Conservation of Nature (IUCN) Red List (Cooke, 2020). These findings are also supported by those of Kraus *et al*. (2016) who recorded six species of whale across the RI / MA and MA WEAs, with sightings also occurring throughout the year and peaking in spring and summer, in direct correlation with Stone *et al*. (2017).

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, along the extent of the Atlantic OCS. 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. Various types of data were collected, owing to the variation in methods available for marine wildlife surveying, including aerial and ship-based sightings; passive acoustic detections; and location/depth information from tagged fauna.

The area around RIMA WEA was found to show the greatest diversity of marine mammals over the course of the 2010-2013 study period (Palka *et al*., 2016), and Long Island, Chesapeake Bay, Martha's Vineyard / Nantucket Island, Penobscot Bay, and off the central coast of Maine predicted highest abundances of seabirds, with variations in summer and winter patterns (Palka *et al*., 2016).

4. Survey and Analysis Methodologies

4.1 Aerial Digital Survey Methods

The methods and results presented are from the Equinor surveys of the Massachusetts Survey Area.

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 December 2019 to November 2020 surveys on dates flown (**Table 3**; **Table 5**), the second August survey (Survey 12) had to be rescheduled due to adverse weather conditions in late August. This resulted in the second August survey being flown at the start of September, but for the purposes of this and preceding reports, is has been considered as part of the 'August' survey block.

Table 3 **Dates and times of surveys undertaken from December 2019 to November 2020**

Survey No.	Survey Date	Flight 01	
		UTC Start Time (HH:MM)	UTC End Time (HH:MM)
01 (Dec)	12-07-19	18:36	20:37
02 (Jan)	01-21-20	14:54	17:08
03 (Feb)	02-19-20	18:01	20:05
04 (Mar)	03-08-20	17:31	19:33
05 (Apr-I)	04-07-20	13:27	15:27
06 (Apr-II)	04-25-20	13:56	15:51
07 (May-I)	05-05-20	14:33	16:24
08 (May-II)	05-31-20	17:47	19:42
09 (Jun)	06-14-20	17:59	19:51
10 (Jul)	07-21-20	17:42	19:40
11 (Aug-I)	08-20-20	17:39	19:22
12 (Aug-II)	09-04-20	16:47	18:41
13 (Sep-I)	09-14-20	17:44	19:39
14 (Sep-II)	09-24-20	14:40	16:35
15 (Oct)	10-14-20	13:25	15:26
16 (Nov)	11-04-20	17:15	19:15

The aerial digital surveys captured images along nine lines spaced approximately 1.9 km across-track and 0.5 km along-track between image nodes within the Survey Area (**Figure 3**) to achieve >10% coverage per survey (**Table 4**). Coverage slightly varies from month to month depending on whether images mostly fall inside or outside of the area surveyed. 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 4 **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 Lease Area OCS-A 0520 plus 2 km / 4 km buffer**

Survey Season	Survey No.	Number of Images	Survey Coverage (%)
Winter	01 (Dec)	12,144	11.94
	02 (Jan)	12,059	11.86
	03 (Feb)	12,033	11.84
Spring	04 (Mar)	12,048	11.85
	05 (Apr-I)	12,048	11.85
	06 (Apr-II)	12,048	11.85
	07 (May-I)	12,048	11.85
	08 (May-II)	12,048	11.85
Summer	09 (Jun)	12,048	11.85
	10 (Jul)	12,010	11.81
	11 (Aug-I)	12,038	11.84
	12 (Aug-II)	12,048	11.85
Fall	13 (Sep-I)	12,054	11.86
	14 (Sep-II)	12,048	11.85
	15 (Oct)	12,047	11.85
	16 (Nov)	12,047	11.85

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.

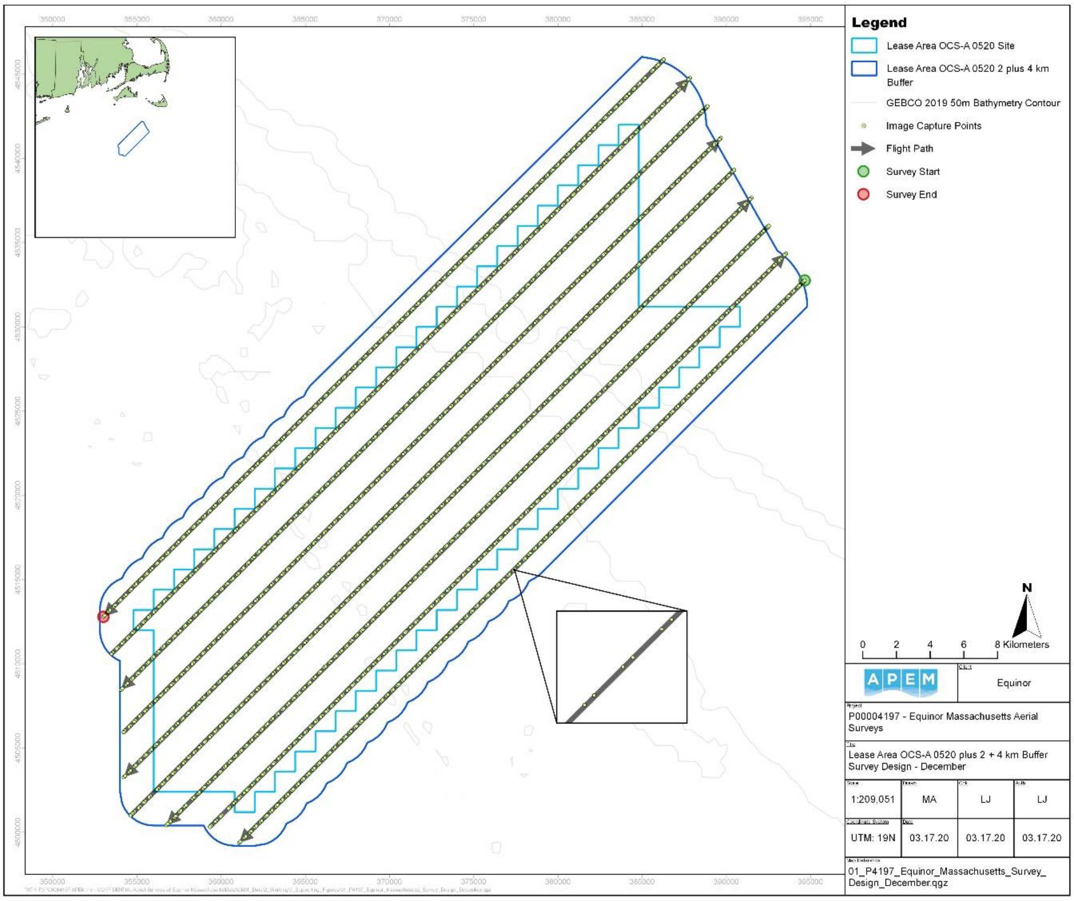

Figure 3 **Example of flight lines and aerial digital still imagery capture points of Lease Area OCS-A 0520 plus 2 km / 4 km buffer taken from the December 2019 survey**

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 3** with the corresponding weather conditions provided in **Table 5**. 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 the Survey Area. 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 a 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 4**.

Table 5 Weather conditions recorded for completed surveys to date: December 2019 to November 2020

Survey No.	Date	Douglas Sea State[1]	Turbidity [2]	Wind Speed (knots) / Direction	Cloud Cover (%)[3]	Visibility (km)	Air Temp (ºF)
01	12-07-19	2-3	2	10 / NW	10-80	> 10 km	29-31
02	01-21-20	2-3	1-2	12-15 / NNE	20-100	> 10 km	22-25
03	02-19-20	3	1	20 / W	90-100	> 10 km	37-39
04	03-08-20	2-3	1	12-20 NW	0-5	> 10 km	38-43
05	04-07-20	2	1	25 NW	5-20	> 10 km	47-50
06	04-25-20	2	1	8 NW	5-20	> 10 km	50-51
07	05-05-20	3	1-2	25 NW	0	> 10 km	43-44
08	05-31-20	1-2	1	22-24 N	0	> 10 km	57-59
09	06-14-20	2-3	1	30 NE	0-10	> 10 km	63-64
10	07-21-20	1	0	4 SW	0-10	> 10 km	80-82
11	08-20-20	1	0	9 E	20-40	> 10 km	67-69
12	09-04-20	2	1	6-10 W	0	> 10 km	79-81
13	09-14-20	2	1	29 N	100	> 10 km	68
14	09-24-20	1	0	10 NW	80	10 km	68-70
15	10-14-20	4	2	15 NW	0-5	> 10 km	54-56
16	11-04-20	2	1	10 N	0	> 10 km	46-52

[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 accessible[1]. 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). Additionally, Normandeau identified 100% of the species of non-avian marine fauna including marine mammals, turtles, large bony fish, sharks, and rays. 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 6** and **Table 7**, demonstrating agreement exceeding 98% for all surveys.

After receiving results of QC as seen in **Table 7**, 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/eqn22_overview.php

Table 6 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 (%)
01	12,045	1,205	0	100
02	11,825	1,183	3	99.75
03	11,623	1,163	5	99.57
04	11,600	1,160	6	99.48
05	11,521	1,153	4	99.65
06	11,241	1,125	12	98.93
07	11,976	1,197	8	99.33
08	11,657	1,166	6	99.49
09	11,930	1,193	4	99.66
10	11,422	1,181	5	99.58
11	11,869	1,190	4	99.66
12	11,956	1,196	4	99.67
13	11,947	1,195	11	99.08
14	11,992	1,200	2	99.83
15	11,994	1,200	8	99.33
16	11,804	1,181	3	99.75

Table 7 The number of individuals that were found during blank image QC

Survey No.	Order Found by QC	Number of individuals
1	-	-
2	Avian	3
3	Avian	3
	Marine Mammal	1
	Large Bony Fish	1
4	Avian	5
	Marine Mammal	1
5	Avian	4
6	Avian	10
	Large Bony Fish	1
	Small Bony Fish (Shoal)	1
7	Avian	7
	Marine Mammal	1
8	Avian	2
	Small Bony Fish (Shoal)	4
9	Avian	3
	Shark	1
10	Avian	2
	Marine Mammal	1
	Large Bony Fish	1
	Shark	1
11	Avian	1
	Large Bony Fish	1
	Small Bony Fish (Shoal)	1
	Shark	1
12	Avian	2
	Shark	1
	Large Bony Fish	1
13	Avian	2
	Marine Mammal	5
	Large Bony Fish	1
	Shark	3
14	Avian	1
	Large Bony Fish	1
15	Avian	8
16	Avian	1
	Small Bony Fish (Shoal)	2

4.3 Species Abundance Estimates

For each monthly aerial digital survey of the Survey Area, 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 (the Lease Area OCS-A 520 Site, and the 2 plus 4 km buffer) were then extracted using 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 Site or the 2 plus 4 km buffer determines the density (e.g. bird per km^2) for any given species.

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 the Site and any buffer placed around it, out to predominantly 2 km but potentially also 4 km dependent on where the buffer is extended from. Seasonal relative density distribution maps were produced for total species using QGIS (v3.10.13) 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 Seasons

Separate seasons are recognized in this report in order to establish the level of importance any species has within the Survey Area during a particular period of time. The seasons are defined within this report as follows:

- Winter represented by the December 2019, January 2020, and February 2020 surveys;
- Spring represented by the March 2020, April I 2020, April II 2020, May I 2020, and May II 2020 surveys;
- Summer represented by the June 2020, July 2020, August I 2020, and August II 2020 surveys; and
- Fall represented by the September I 2020, September II 2020, October 2020, and November 2020 surveys.

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.

4.6 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 II. 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, and behavioral and distribution data from the 16 month / bimonthly programme of aerial digital surveys of the Survey Area on behalf of Equinor. The density estimates provide the number of individuals per square kilometer (i.e. km^2). 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 Site and the 2 plus 4 km buffer) differ from that of the abundance estimate for the combined Survey Area. 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. Species **5.1** through **5.89** are those with Federal or State listings as outlined in **Table 1**.

Lease Area OCS-A 0520 is herein referred to as the 'Site' and the Lease Area OCS-A 0520 2 + 4 km Buffer is herein referred to as the 'Buffer'.

5.1 Common Eider (*Somateria mollissima)*

A single common eider was recorded in the January survey, with highest numbers therefore recorded in winter (**Table 1**). A peak count of one in the Survey Area from the January survey led to an abundance estimate of eight (**Table 8**).

One common eider was recorded in the winter from the January survey (**Table 8**

Table 8), located in the northeast of the Survey Area (**Figure 4**).

Table 8 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of common eiders in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan 20	1	8	0.01	0	1
b) Lease Area OCS-A 0520 Site					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan 20	0	0	-	0	0
c) 2 + 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan 20	1	9	0.03	0	1

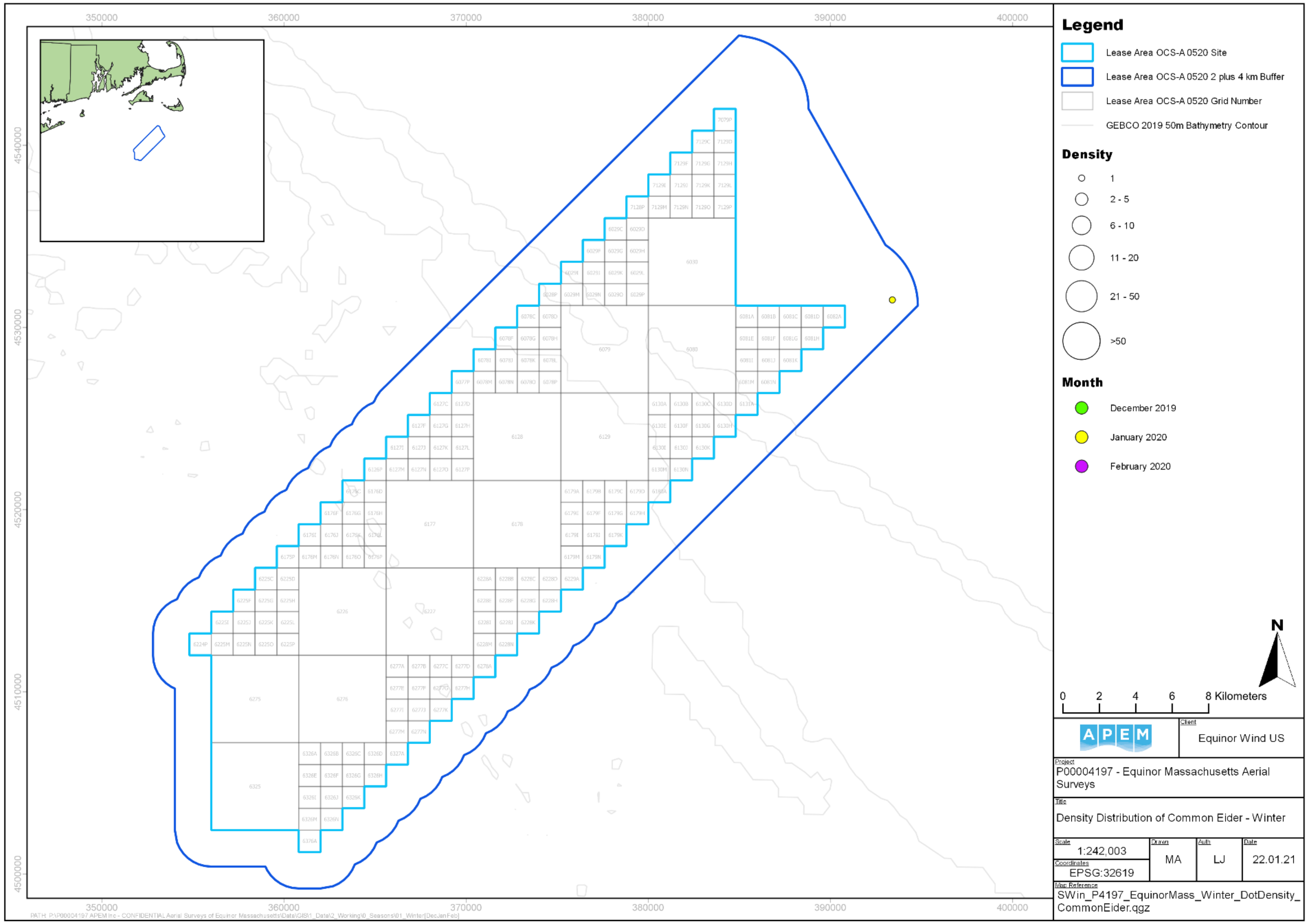

Figure 4 **Distribution of common eiders recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the winter season**

5.2 Surf Scoter (*Melanitta perspicillata)*

Surf scoters were recorded in the spring and fall surveys, with highest numbers recorded in fall (**Table 1**). A peak count of nine in the Survey Area from the November survey, led to an abundance estimate of 72 (**Table 9**).

A single surf scoter was recorded in the spring from the March survey (**Table 9**), located in the west of the Survey Area (**Figure 5**). Nine surf scoters were recorded in the fall from the November survey (**Table 9**), located in the center of the Survey Area (**Figure 6**).

Table 9 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of surf scoters in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Mar 20	1	8	0.01	0	1
Nov 20	9	72	0.08	0	9
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Mar 20	0	0	-	0	0
Nov 20	9	67	0.13	0	9
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Mar 20	1	9	0.03	0	1
Nov 20	0	0	-	0	0

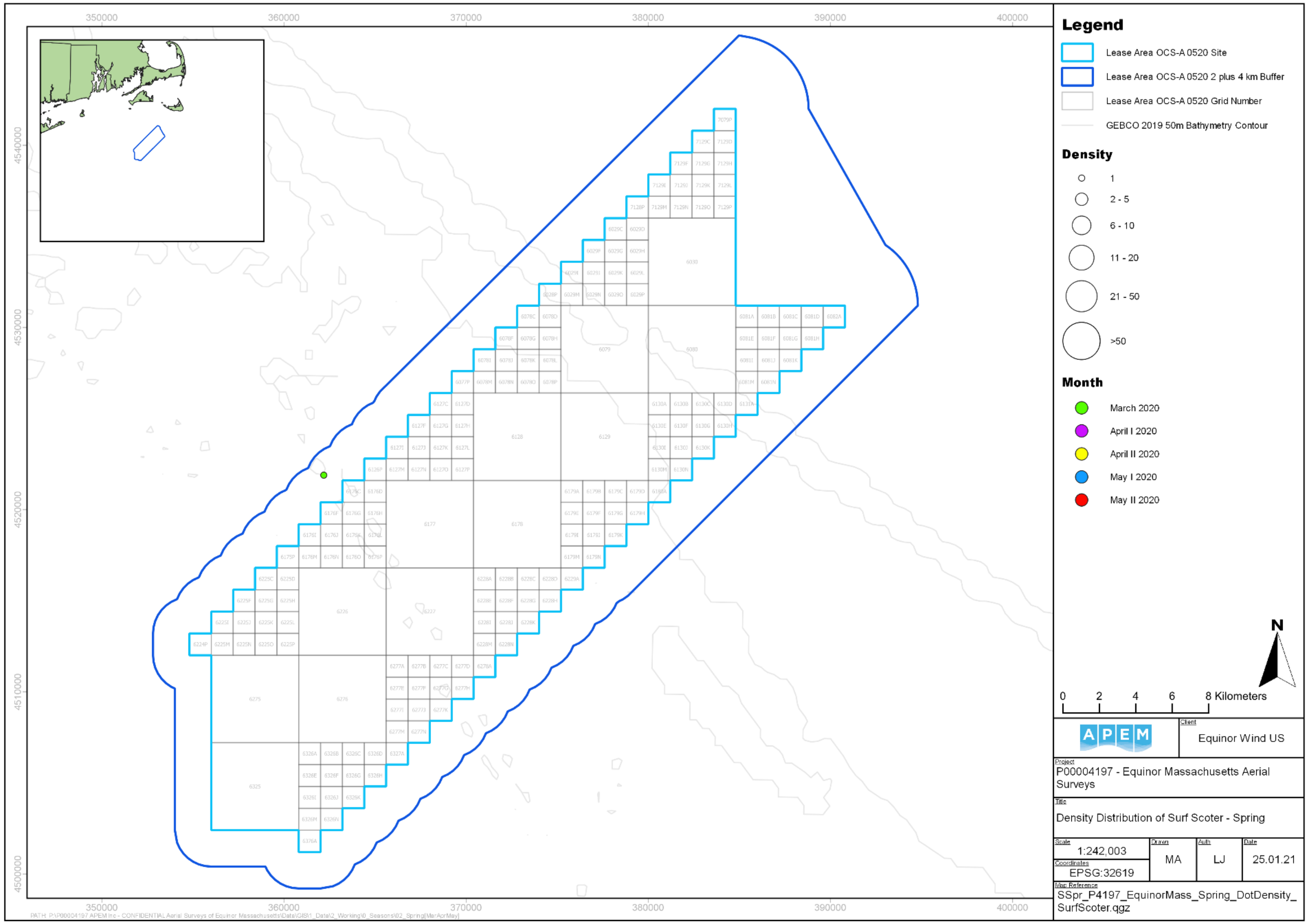

Figure 5 **Distribution of surf scoters recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

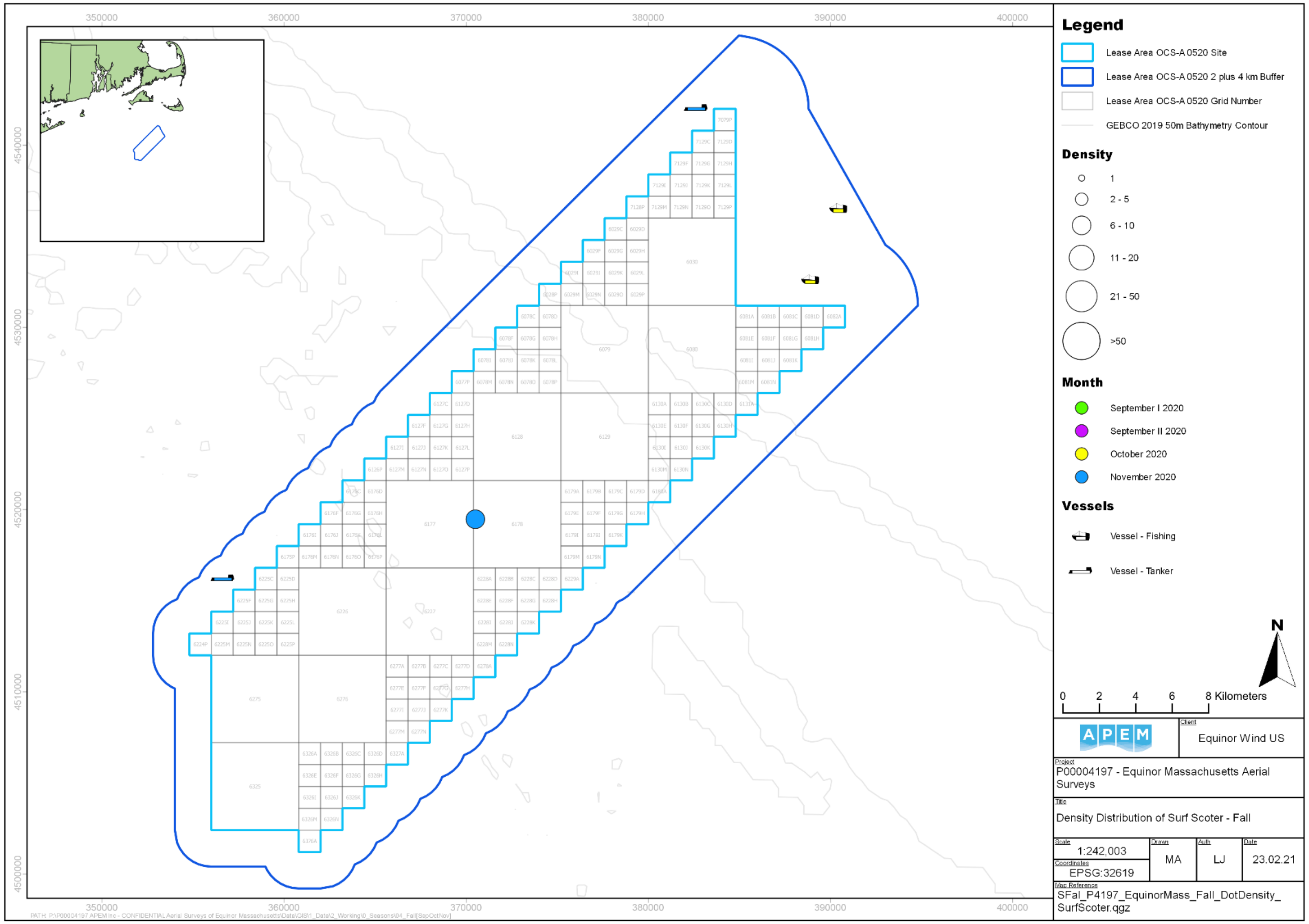

Figure 6 **Distribution of surf scoters recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.3 White-winged Scoter (*Melanitta deglandi)*

White-winged scoters were recorded in the winter, spring, and fall surveys, with highest numbers occurring in winter (**Table 1**). A peak count of one in the Site and 1059 in the Buffer from the January survey led to abundance estimates of seven and 9373 respectively (**Table 10**).

A total of 1,248 white-winged scoters were recorded in the winter surveys (**Figure 7**), of which 1,060 were recorded in January, and 188 were recorded in February (**Table 10**). For the January survey, the vast majority of scoters were concentrated in large groups in the northeast of the Survey Area, which was also exhibited for the February survey (**Figure 7**). A total of 301 scoters were recorded in the spring (**Figure 8**), of which 115 were recorded in March, 78 were recorded in April **I**, 93 were recorded in April **II**, and 15 were recorded in May (**Table 10**). For the March to May **I** surveys, scoters were mostly concentrated in groups in the north to northeast of the Survey Area, but with loose distributions across the Survey Area also present for the March to April **II** surveys (**Figure 8**). A single scoter was recorded in the fall from the November survey (**Table 10**), located in the north-northeast of the Survey Area (**Figure 9**).

Table 10 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of white-winged scoters in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan 20	1060	8413	9.79	2	1058
Feb 20	188	1502	1.75	0	188
Mar 20	115	913	1.06	3	112
Apr I 20	78	619	0.72	8	70
Apr II 20	93	739	0.86	4	89
May I 20	15	119	0.14	0	15
Nov 20	1	8	0.01	0	1
b) Lease Area OCS-A 0520 Site					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan 20	1	7	0.01	1	0
Feb 20	2	15	0.03	0	2
Mar 20	16	119	0.23	0	16
Apr I 20	9	67	0.13	6	3
Apr II 20	10	74	0.14	0	10
May I 20	0	0	-	0	0
Nov 20	0	0	-	0	0
c) 2 + 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Jan 20	1059	9373	27.76	1	1058
Feb 20	186	1656	4.9	0	186
Mar 20	99	876	2.59	3	96
Apr I 20	69	611	1.81	2	67
Apr II 20	83	734	2.17	4	79
May I 20	15	133	0.39	0	15
Nov 20	1	9	0.03	0	1

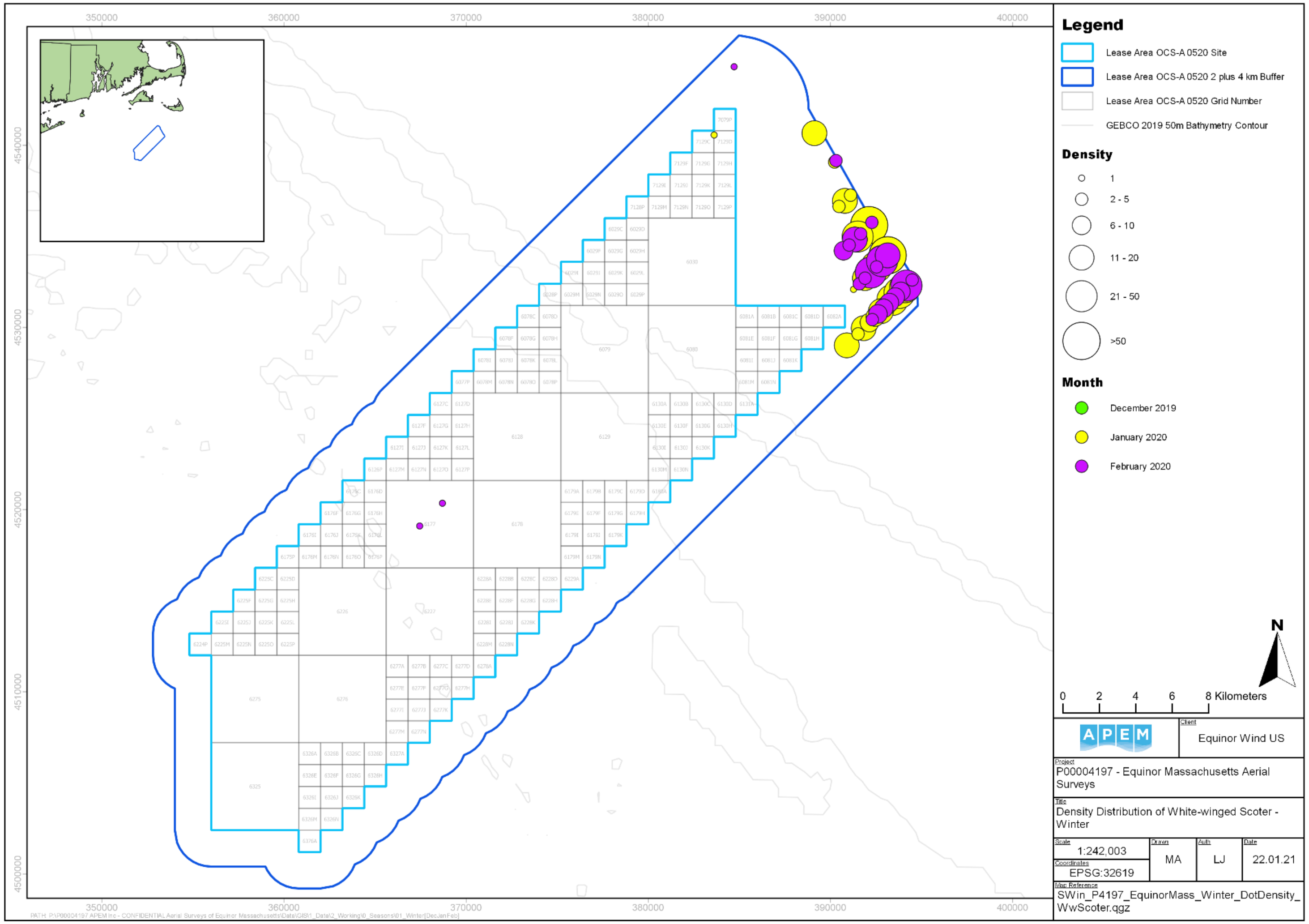

Figure 7 **Distribution of white-winged scoters recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the winter season**

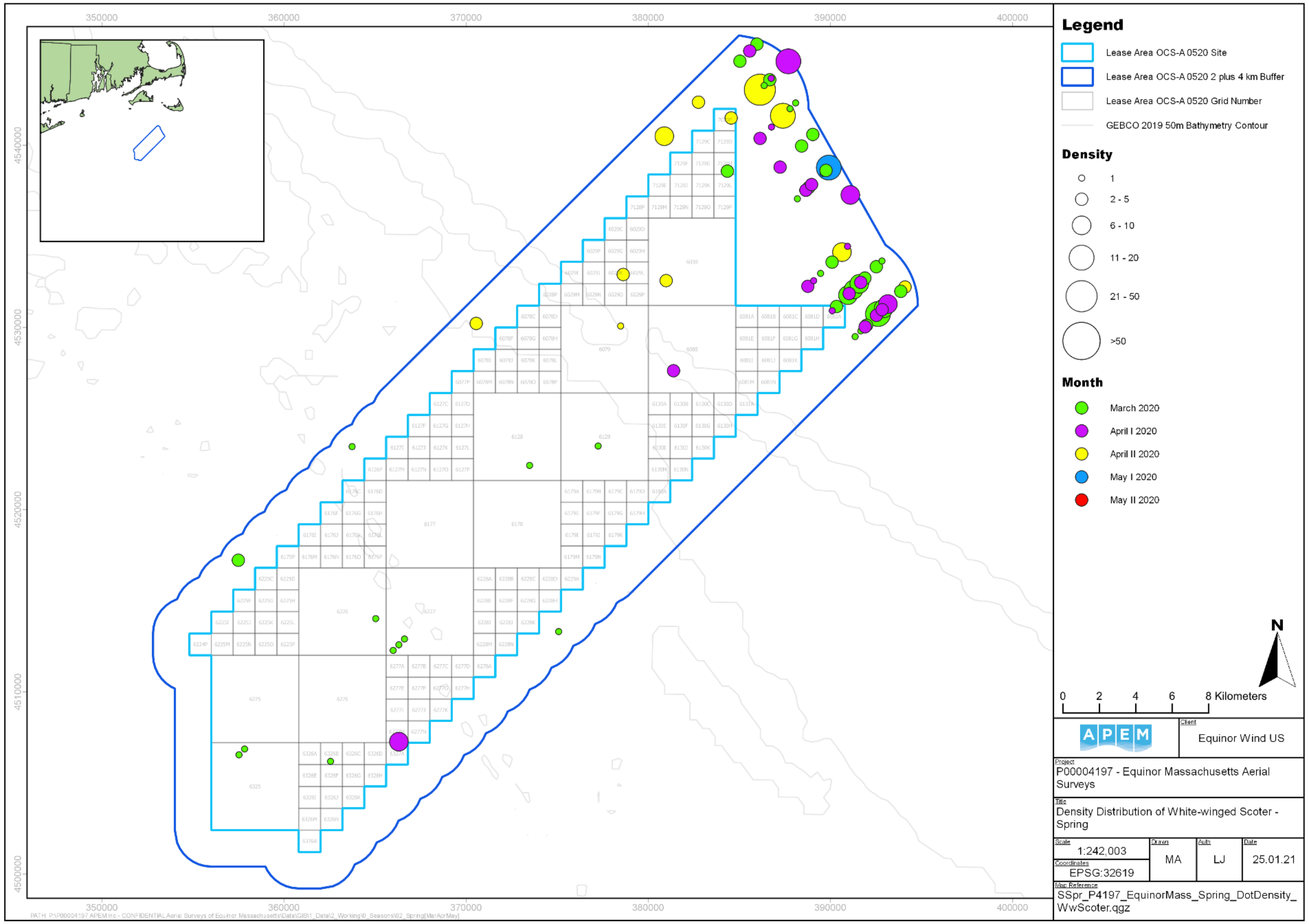

Figure 8 **Distribution of white-winged scoters recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

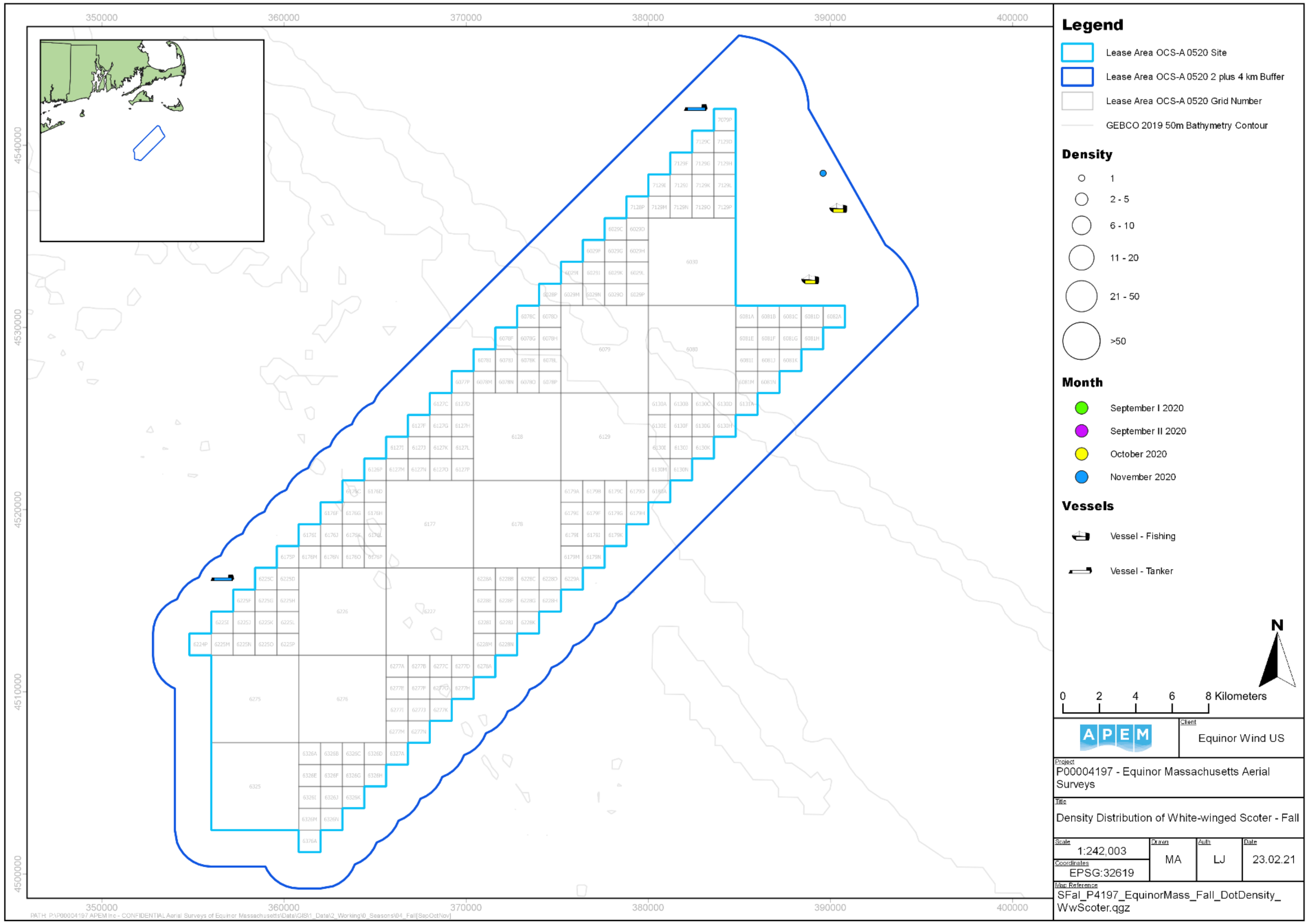

Figure 9 **Distribution of white-winged scoters recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.4 Black Scoter (*Melanitta americana)*

Black scoters were recorded in the April I survey only, with highest numbers therefore recorded in spring (**Table 1**). A peak count of two in the Survey Area from the April I survey led to an abundance estimate of 16 (**Table 11**).

Two black scoters were recorded in the spring from the April I survey (**Table 11**), located together in the north of the Survey Area (**Figure 10**).

Table 11 Raw counts and abundance and density estimates (No. estimated individuals per km²) of black scoters in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Apr I 20	2	16	0.02	0	2
b) Lease Area OCS-A 0520 Site					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Apr I 20	0	0	-	0	0
c) 2 + 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Apr I 20	2	18	0.05	0	2

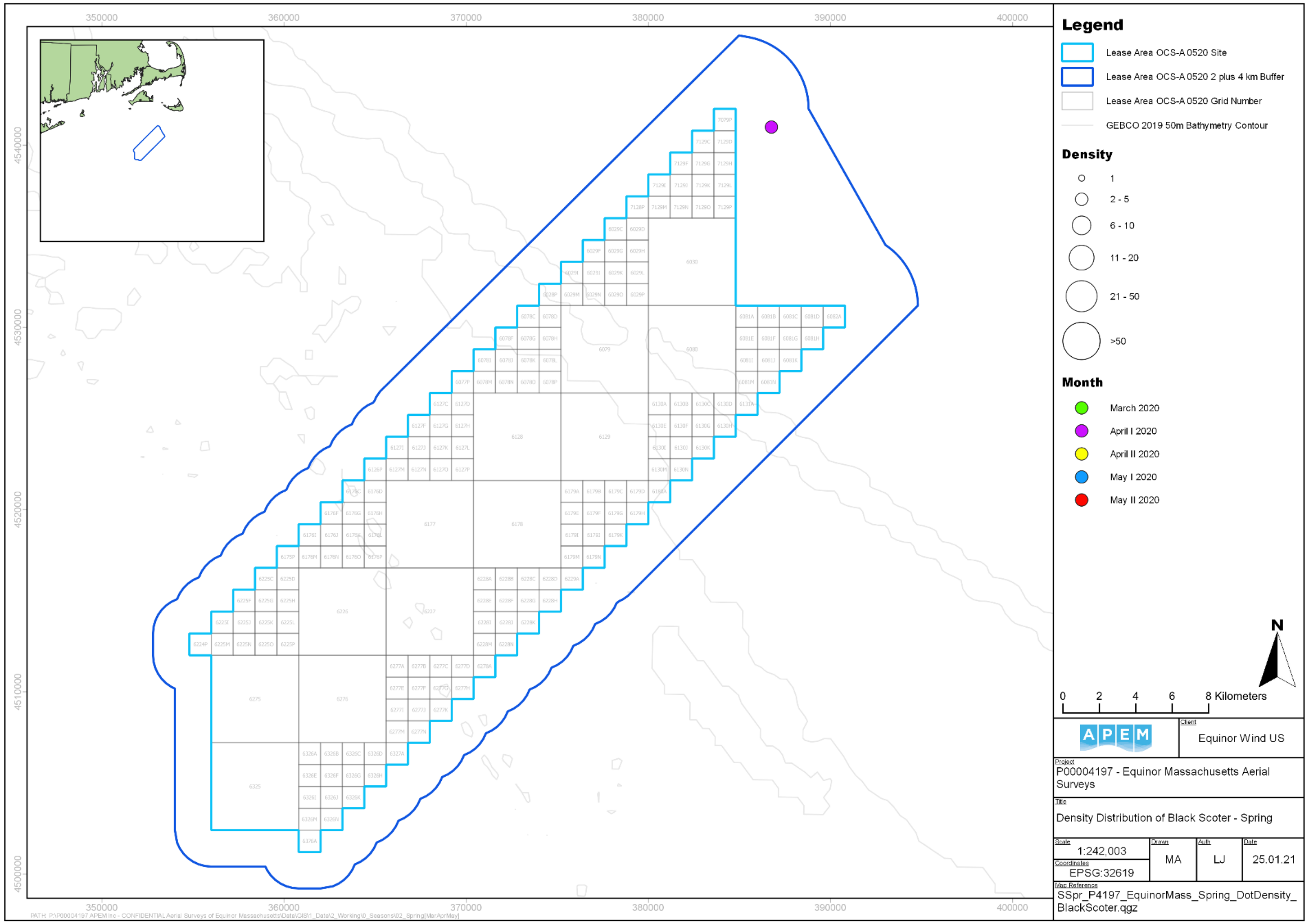

Figure 10 Distribution of black scoters recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season

5.5 Scoter Species (Unidentified *Melanitta spp.)*

Unidentified scoters were recorded in the winter, spring, and fall surveys, with highest numbers recorded in winter (**Table 1**). A peak count of 32 in the Survey Area from the December 2019 survey led to an abundance estimate of 254 (**Table 12**).

A total of 32 unidentified scoters were recorded in the winter from the December 2019 survey (**Table 12**), located in the north and northeast of the Survey Area (**Figure 11**). Ten scoters were recorded in the spring from the April I survey (**Table 12**), located in the north to northeast of the Survey Area (**Figure 12**). Three scoters were recorded in the October survey (**Table 12**), located in the northeast of the Survey Area (**Figure 13**).

Table 12 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified scoters in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Dec 19	32	254	0.3	0	32
Apr I 20	10	79	0.09	0	10
Oct 20	3	24	0.03	3	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Dec 19	0	0	-	0	0
Apr I 20	0	0	-	0	0
Oct 20	0	0	-	0	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Dec 19	32	284	0.84	0	32
Apr I 20	10	89	0.26	0	10
Oct 20	3	27	0.08	3	0

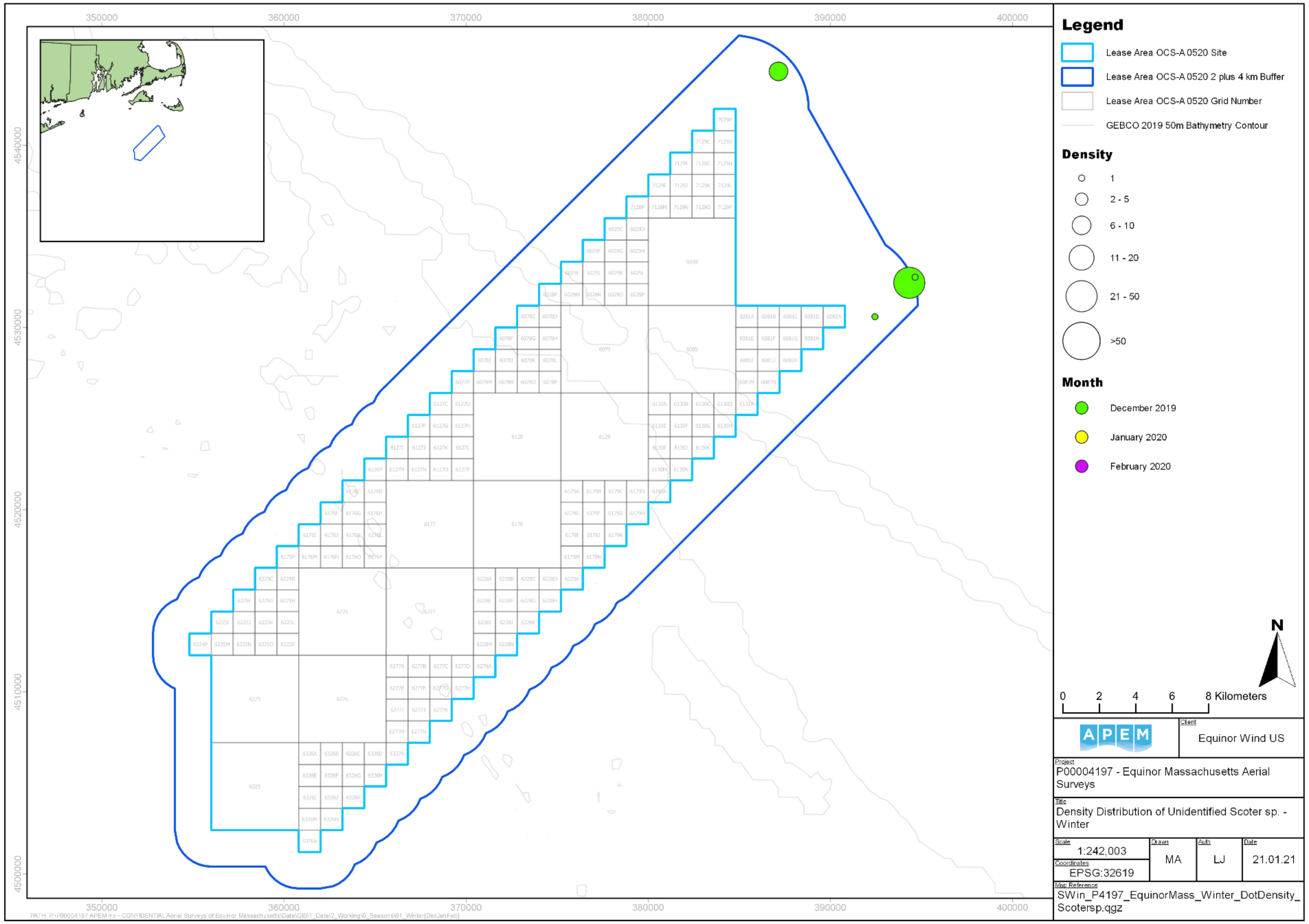

Figure 11 **Distribution of unidentified scoters recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the winter season**

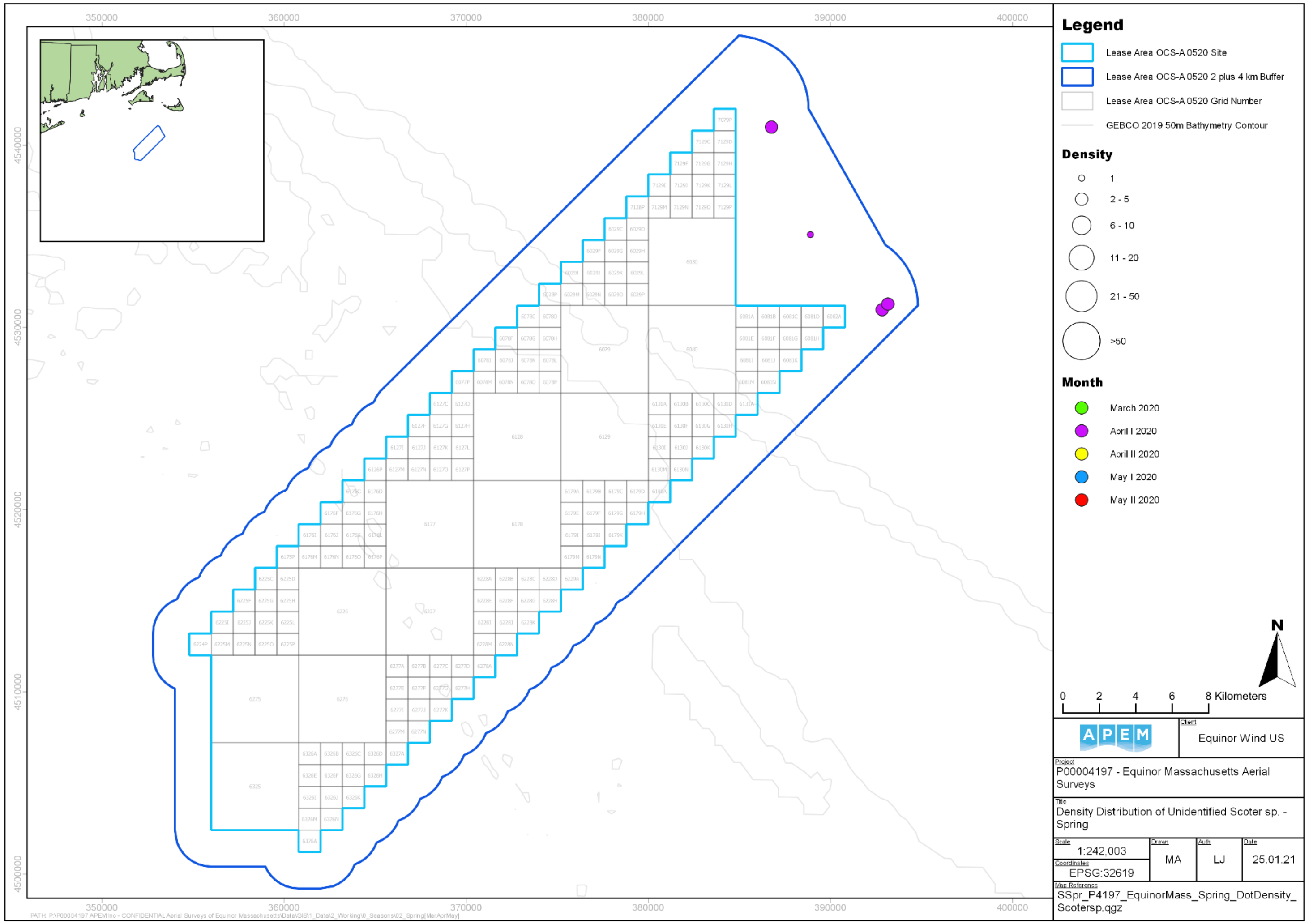

Figure 12 **Distribution of unidentified scoters recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

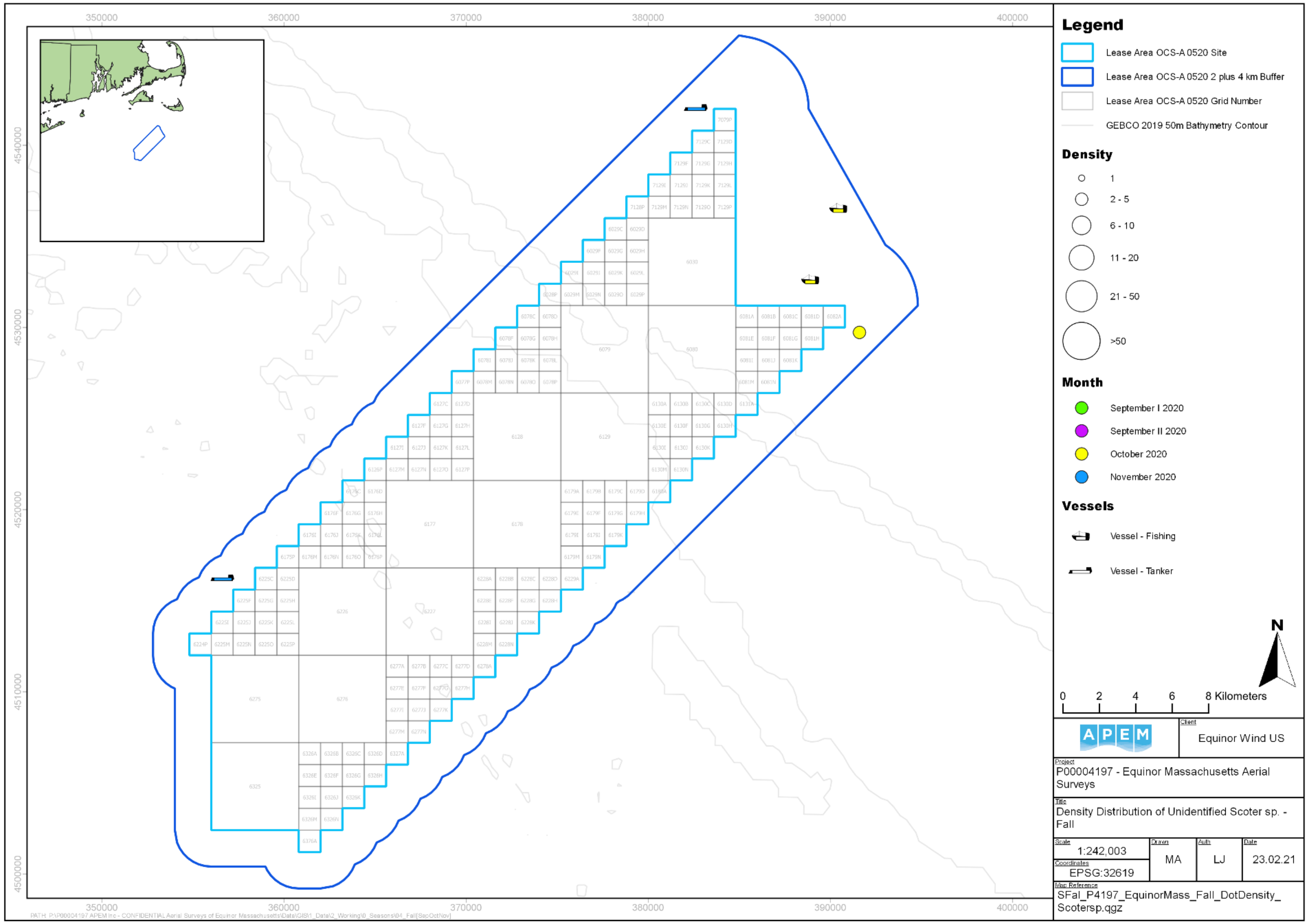

Figure 13 Distribution of unidentified scoters recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season

5.6 Long-tailed Duck (*Clangula hyemalis)*

Long-tailed ducks were recorded in the winter, spring, and fall surveys, with highest numbers recorded in winter (**Table 1**). A peak count of 211 in the Survey Area from the January survey led to an abundance estimate of 1,675 (**Table 13**).

A total of 215 long-tailed ducks were recorded in the winter surveys (**Figure 14**), of which 211 were recorded in January, and 4 were recorded in February (**Table 13**). For both surveys, distribution was concentrated in the northeast of the Survey Area (**Figure 14**). A total of 73 ducks were recorded in the spring surveys (**Figure 15**), of which 27 were recorded in March, and 46 were recorded in April **I** (**Table 13**). For the March and April **I** surveys, ducks were located mostly in the northeast but with loose distribution also exhibited across the Survey Area (**Figure 15**). A single duck was recorded in the fall from the November survey (**Table 13**), located in the north-northeast of the Survey Area (**Figure 16**).

Table 13 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of long-tailed ducks in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Jan 20	211	1675	1.95	2	209
Feb 20	4	32	0.04	0	4
Mar 20	27	214	0.25	22	5
Apr I 20	46	365	0.42	0	46
Nov 20	1	8	0.01	0	1
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Jan 20	0	0	-	0	0
Feb 20	0	0	-	0	0
Mar 20	6	45	0.09	5	1
Apr I 20	11	82	0.16	0	11
Nov 20	0	0	-	0	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Jan 20	211	1867	5.53	2	209
Feb 20	4	36	0.11	0	4
Mar 20	21	186	0.55	17	4
Apr I 20	35	310	0.92	0	35
Nov 20	1	9	0.03	0	1

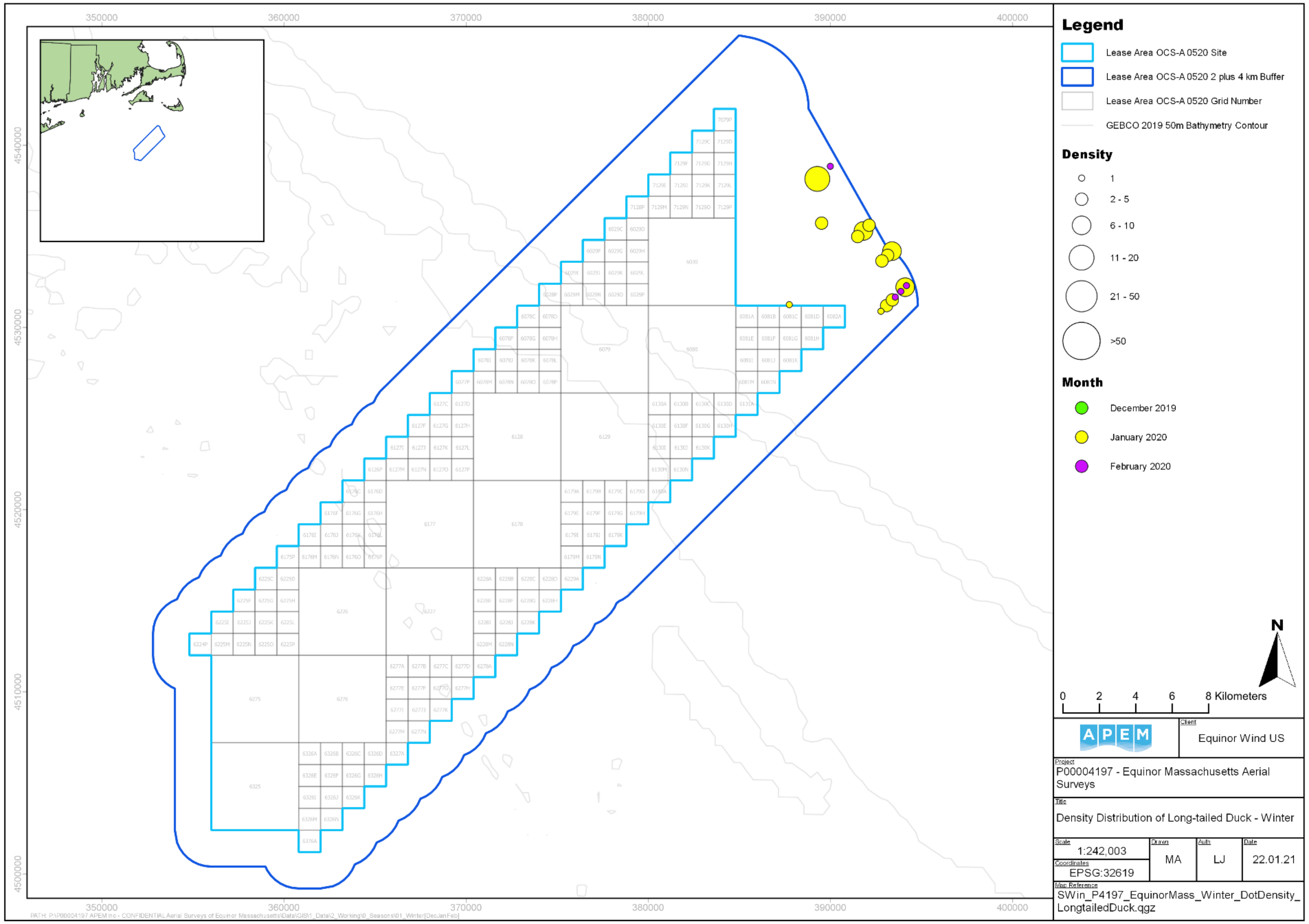

Figure 14 **Distribution of long-tailed ducks recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the winter season**

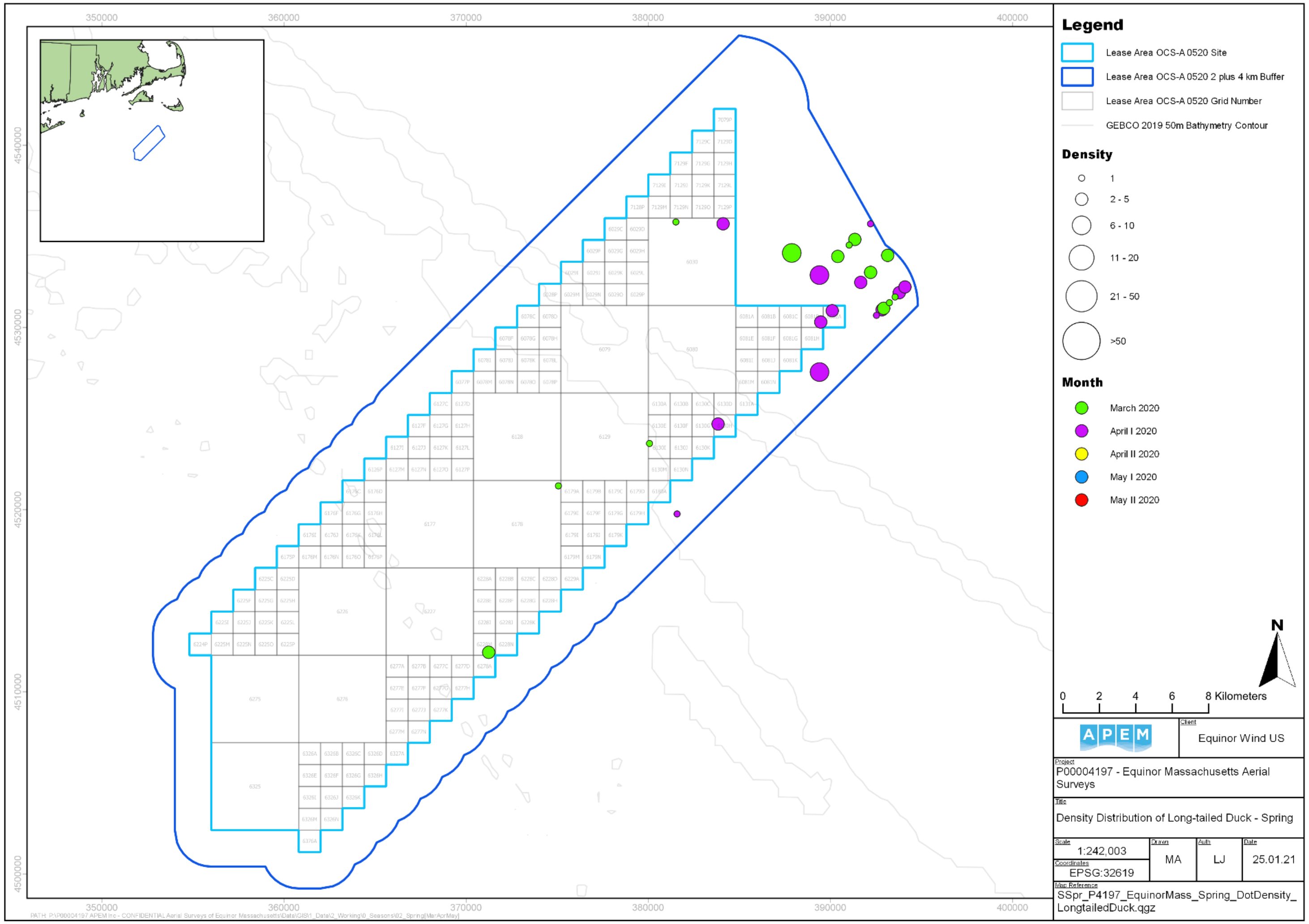

Figure 15 **Distribution of long-tailed ducks recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

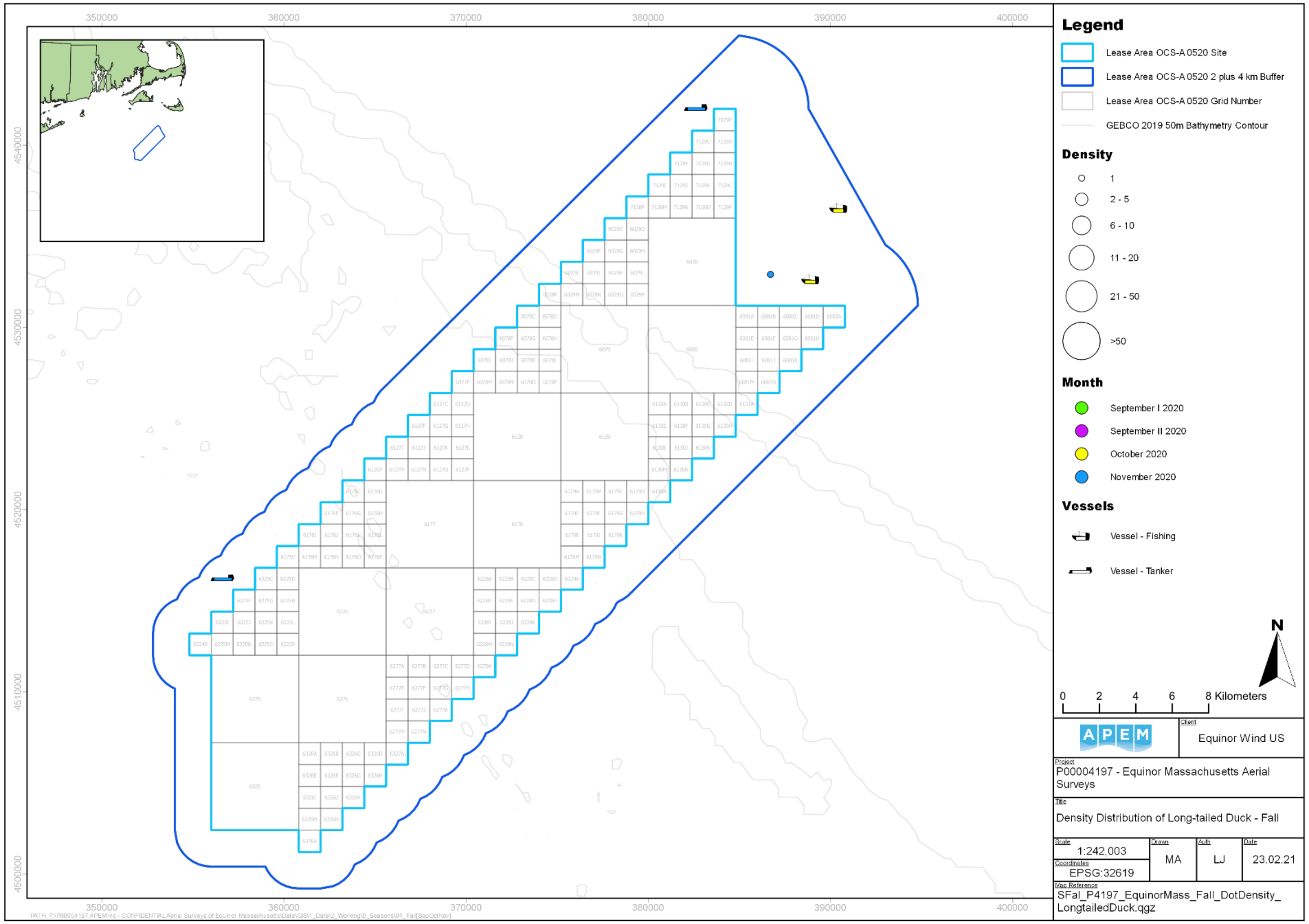

Figure 16 **Distribution of long-tailed ducks recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.7 Duck Species (Unidentified Anatidae)

Unidentified ducks were recorded in the winter and spring, with highest numbers recorded in spring (**Table 1**). A peak count of one in the Site and two in the Buffer from the March survey led to abundance estimates of 7 and 18 respectively (**Table 14**).

Two unidentified ducks were recorded in the winter surveys (**Figure 17**), of which one was recorded in the January survey, and one was recorded in the February survey (**Table 14**). For the January survey, the duck was recorded south of the center of the Survey Area, and for the February survey, the duck was located in the northeast (**Figure 17**). A total of six ducks were recorded in the spring surveys (**Figure 17**), of which three were recorded in the March survey, and three were recorded in the April II survey (**Table 14**). For the March survey, ducks were loosely distributed across the Survey Area, and for the April II survey, ducks were located in the center of the Survey Area (**Figure 17**).

Table 14 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified ducks in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Jan 20	1	8	0.01	0	1
Feb 20	1	8	0.01	0	1
Mar 20	3	24	0.03	0	3
Apr II 20	3	24	0.03	0	3
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Jan 20	1	7	0.01	0	1
Feb 20	0	0	-	0	0
Mar 20	1	7	0.01	0	1
Apr II 20	3	22	0.04	0	3
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Jan 20	0	0	-	0	0
Feb 20	1	9	0.03	0	1
Mar 20	2	18	0.05	0	2
Apr II 20	0	0	-	0	0

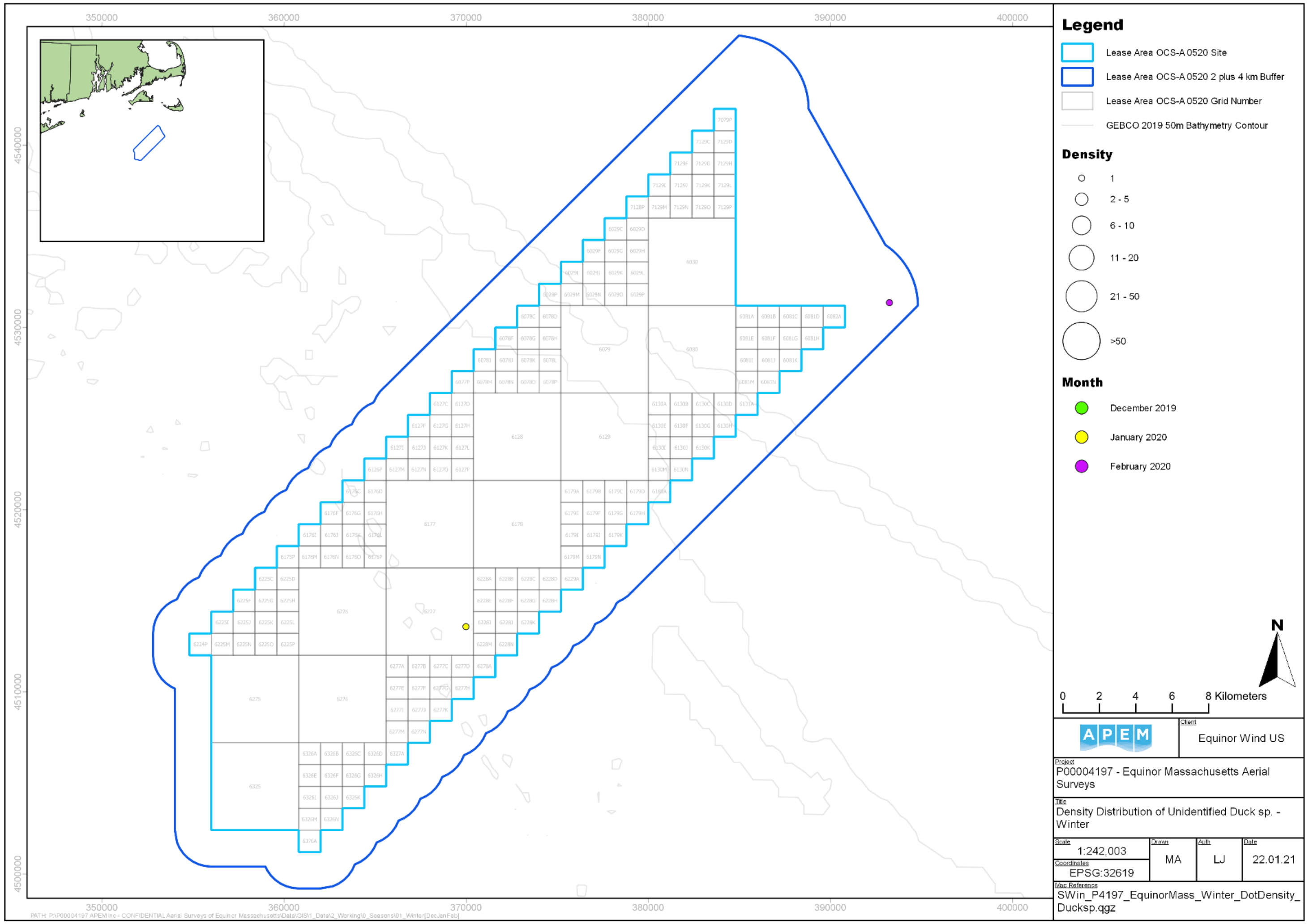

Figure 17 **Distribution of unidentified ducks recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the winter season**

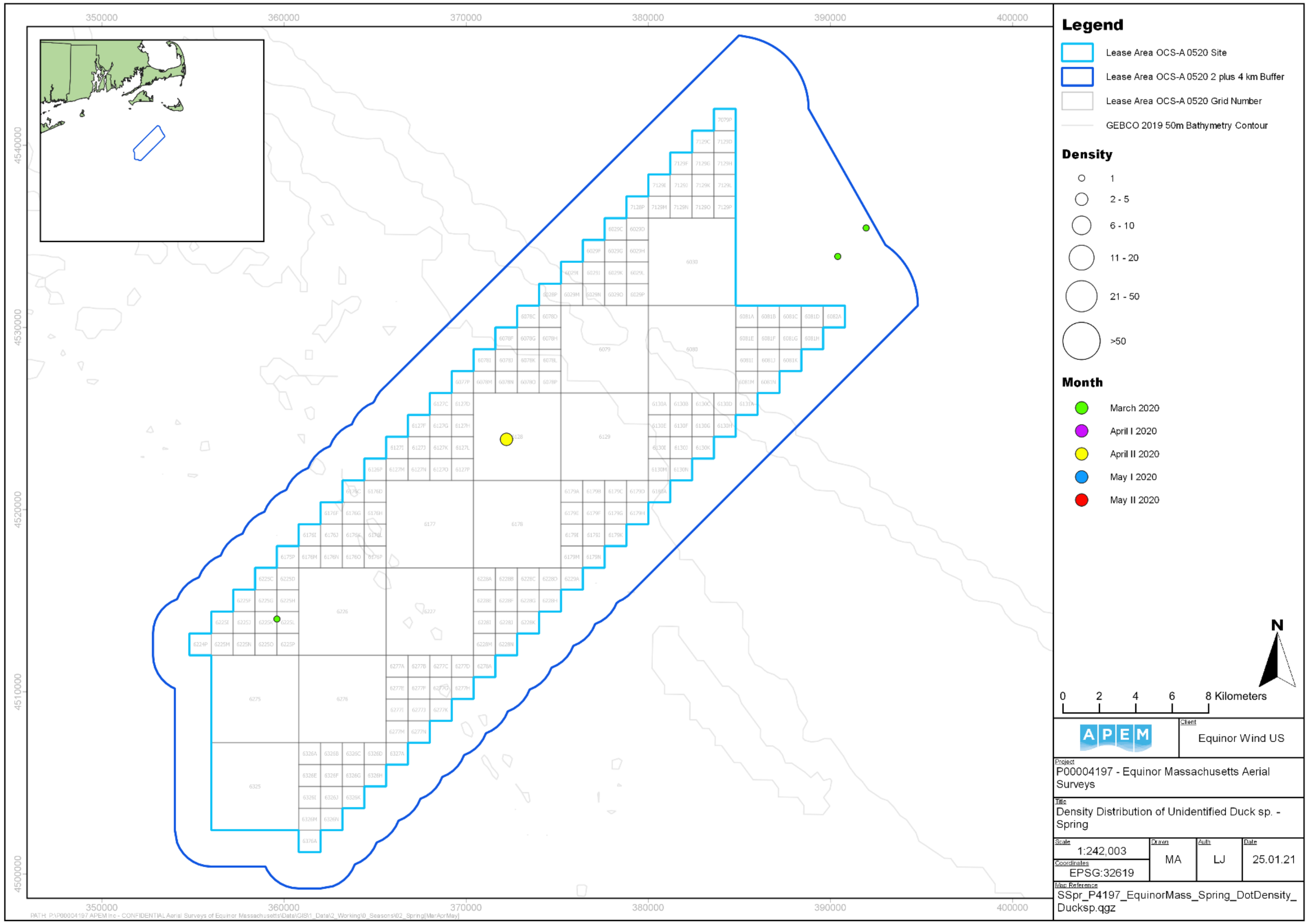

Figure 18 **Distribution of unidentified ducks recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

5.8 Red-throated Loon (*Gavia stellata)*

Red-throated loons were recorded in the winter, spring, and fall surveys, with highest numbers recorded in spring (**Table 1**). A peak count of 401 in the Site and 370 in the Buffer from the April II survey led to abundance estimates of 401 and 370 respectively (**Table 15**).

A total of 17 red-throated loons were recorded in the winter surveys (**Figure 19**), of which ten were recorded in the December 2019 survey, and seven were recorded in the January survey (**Table 15**). For both the December 2019 and January surveys, loons were loosely distributed in the north of the Survey Area (**Figure 19**). A total of 812 loons were recorded in the spring surveys (**Figure 20**), of which one was recorded in March, eight were recorded in April I, 771 were recorded in April II, 30 were recorded in May I, and two were recorded in May II (**Table 15**). For the March survey, the individual loon was located in the north of the Survey Area, and for the May II survey, loons were recorded in the center of the Survey Area (**Figure 20**). For the April I to May I surveys, loons were loosely distributed across the Survey Area (**Figure 20**). A total of 22 loons were recorded in the fall from the November survey only (**Table 15**), with distribution loose across predominantly the northern half of the Survey Area (**Figure 21**).

Table 15 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of red-throated loons in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Dec 19	10	79	0.09	2	8
Jan 20	7	56	0.07	1	6
Mar 20	1	8	0.01	0	1
Apr I 20	8	64	0.07	7	1
Apr II 20	771	6,123	7.03	24	747
May I 20	30	238	0.28	1	29
May II 20	2	16	0.02	2	0
Nov 20	22	175	0.2	1	21
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Dec 19	1	7	0.01	1	0
Jan 20	1	7	0.01	0	1
Mar 20	1	7	0.01	0	1
Apr I 20	6	45	0.09	5	1
Apr II 20	401	2,986	5.73	7	394
May I 20	21	156	0.3	1	20
May II 20	2	15	0.03	2	0
Nov 20	15	112	0.21	1	14
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Dec 19	9	80	0.24	1	8
Jan 20	6	53	0.16	1	5
Mar 20	0	0	-	0	0
Apr I 20	2	18	0.05	2	0
Apr II 20	370	3,274	9.7	17	353
May I 20	9	80	0.24	0	9

May II 20	0	0	-	0	0
Nov 20	7	62	0.18	0	7

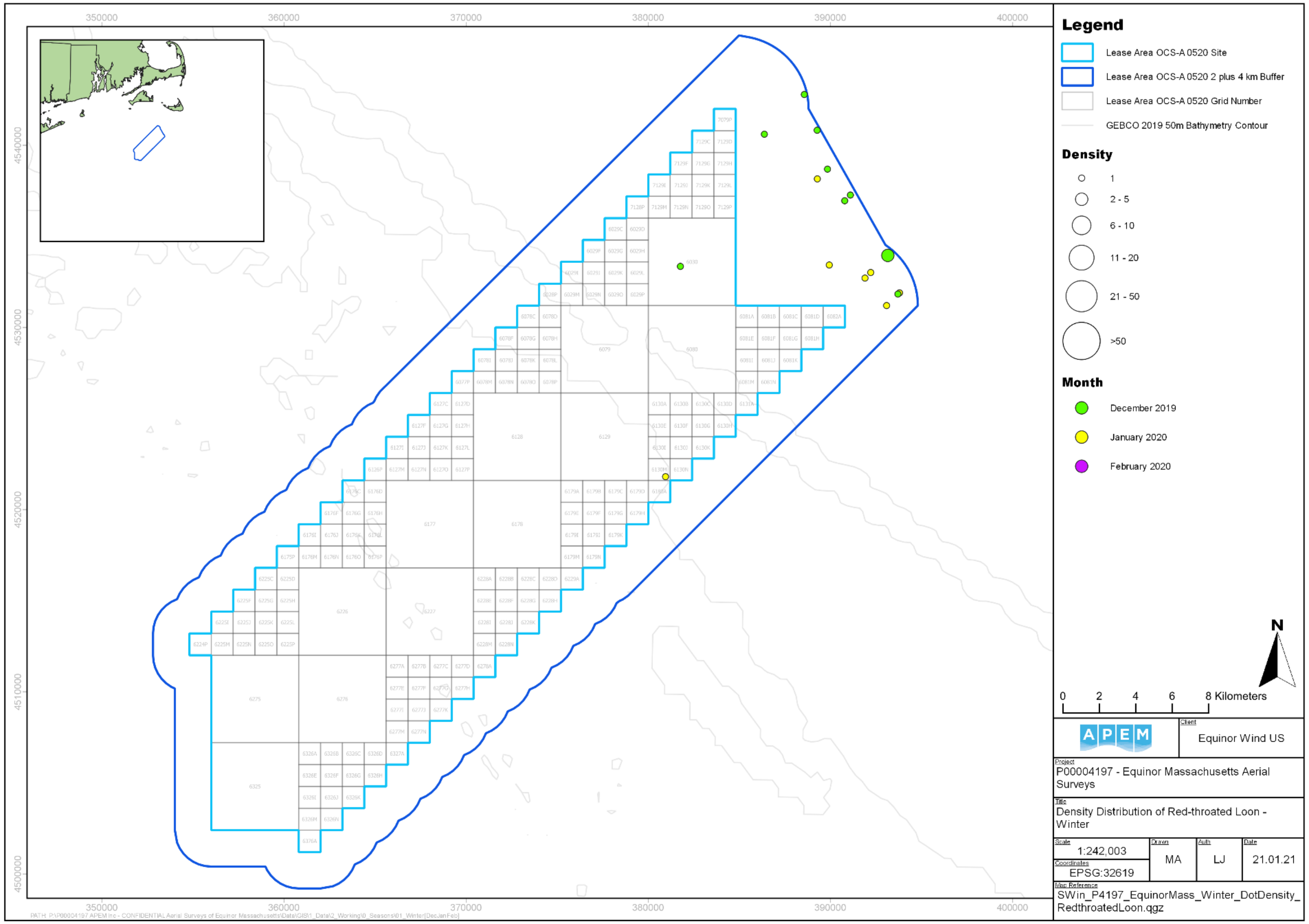

Figure 19 **Distribution of red-throated loons recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the winter season**

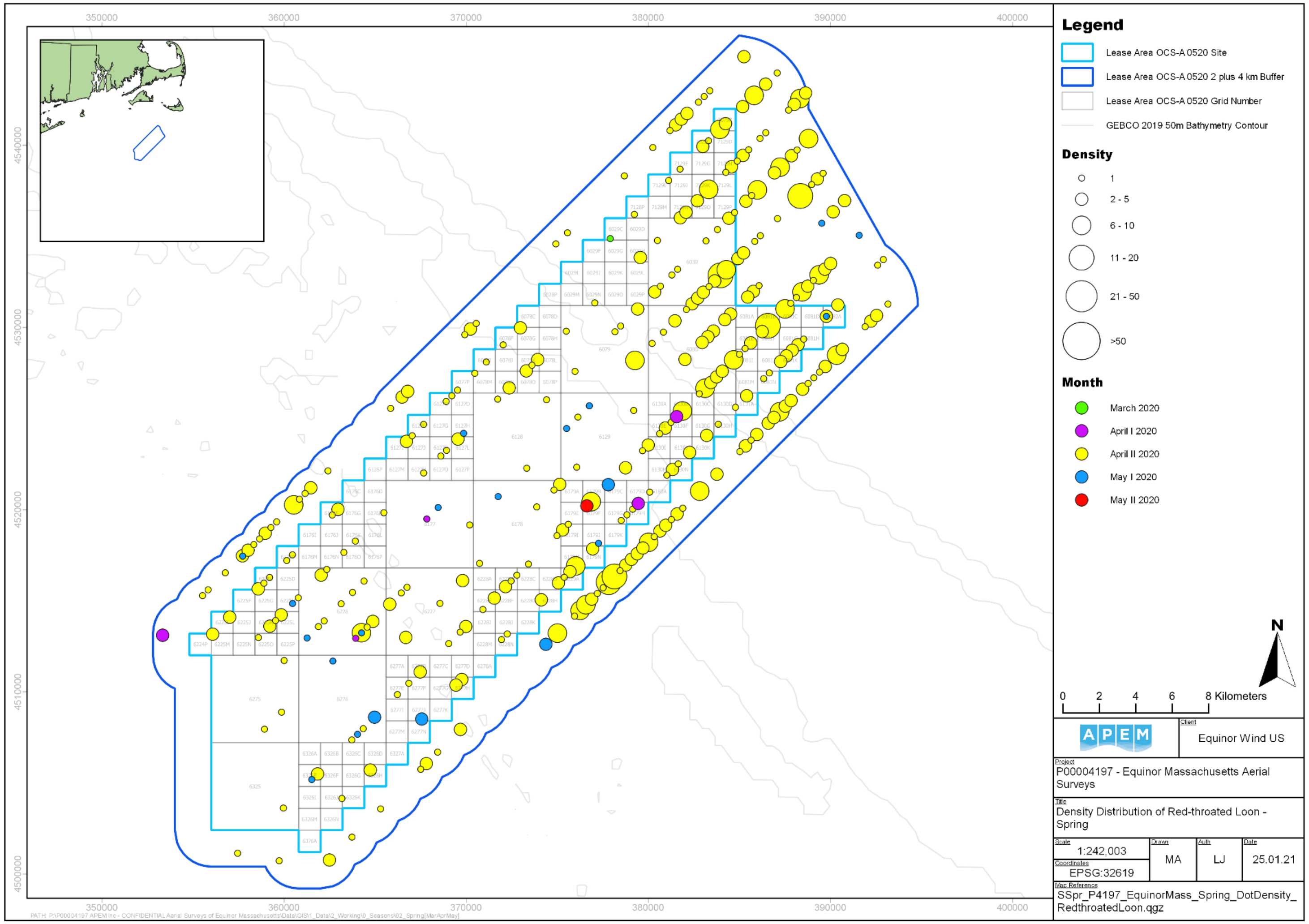

Figure 20 **Distribution of red-throated loons recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

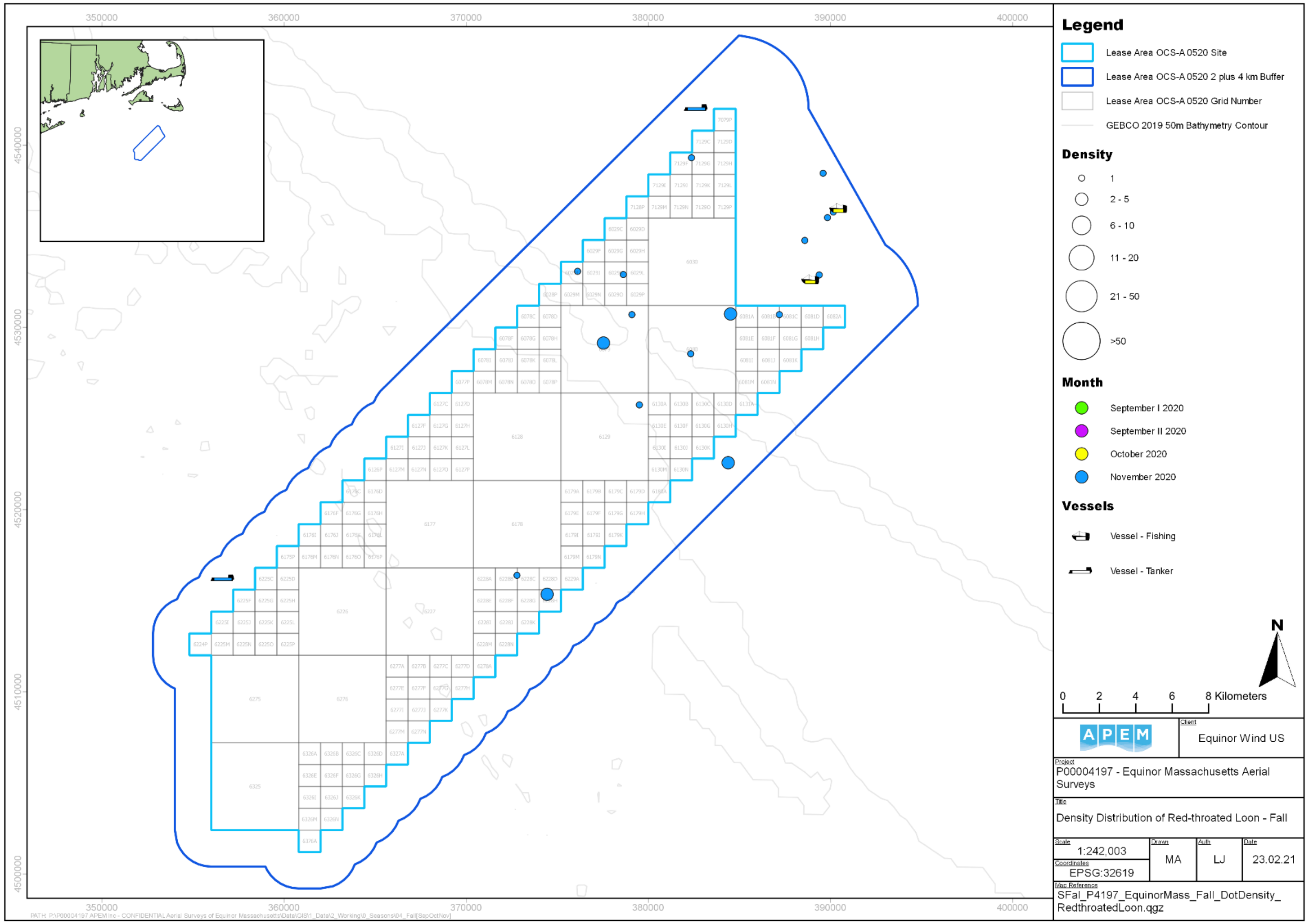

Figure 21 **Distribution of red-throated loons recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.9 Common Loon (*Gavia immer*)

Common loons were recorded in the winter, spring, and fall surveys, with highest numbers recorded in spring (**Table 1**). A peak count of 32 in the Site and 27 in the Buffer from the April II 2020 survey, led to abundance estimates of 238 and 239 respectively (**Table 16**).

Three common loons were recorded in the winter surveys (**Figure 22**), of which one was recorded in the December 2019 survey, and two were recorded in the January survey (**Table 16**). For the December survey, one loon was located in the north of the Survey Area; one was located in the center and one in the northeast of the Survey Area for January (**Figure 22**). A total of 60 loons were recorded in the Survey Area in the spring surveys (**Figure 23**), of which 59 were recorded in the April II survey, and one was recorded in the May I survey (**Table 16**). Individuals were distributed throughout the Survey area in April II, whilst the single individual in May I was located in the north (**Figure 23**). For the fall surveys, a total of eight loons were recorded in the Survey Area (**Figure 24**), all of which were recorded in the November survey (**Table 16**). Individuals were distributed from the north to the northeast of the Survey Area (**Figure 24**).

Table 16 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of common loons in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer						
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**	**Diving**
Dec 19	1	8	0.01	0	1	0
Jan 20	2	16	0.02	0	2	0
Apr II 20	59	469	0.55	0	58	1
May I 20	1	8	0.01	0	1	0
Nov 20	8	64	0.07	0	8	0
b) Lease Area OCS-A 0520 Site						
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**	**Diving**
Dec 19	0	0	-	0	0	0
Jan 20	1	7	0.01	0	1	0
Apr II 20	32	238	0.46	0	31	1
May I 20	0	0	-	0	0	0
Nov 20	4	30	0.06	0	4	0
c) 2 + 4 km Buffer						
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**	**Diving**
Dec 19	1	9	0.03	0	1	0
Jan 20	1	9	0.03	0	1	0
Apr II 20	27	239	0.71	0	27	0
May I 20	1	9	0.03	0	1	0
Nov 20	4	35	0.1	0	4	0

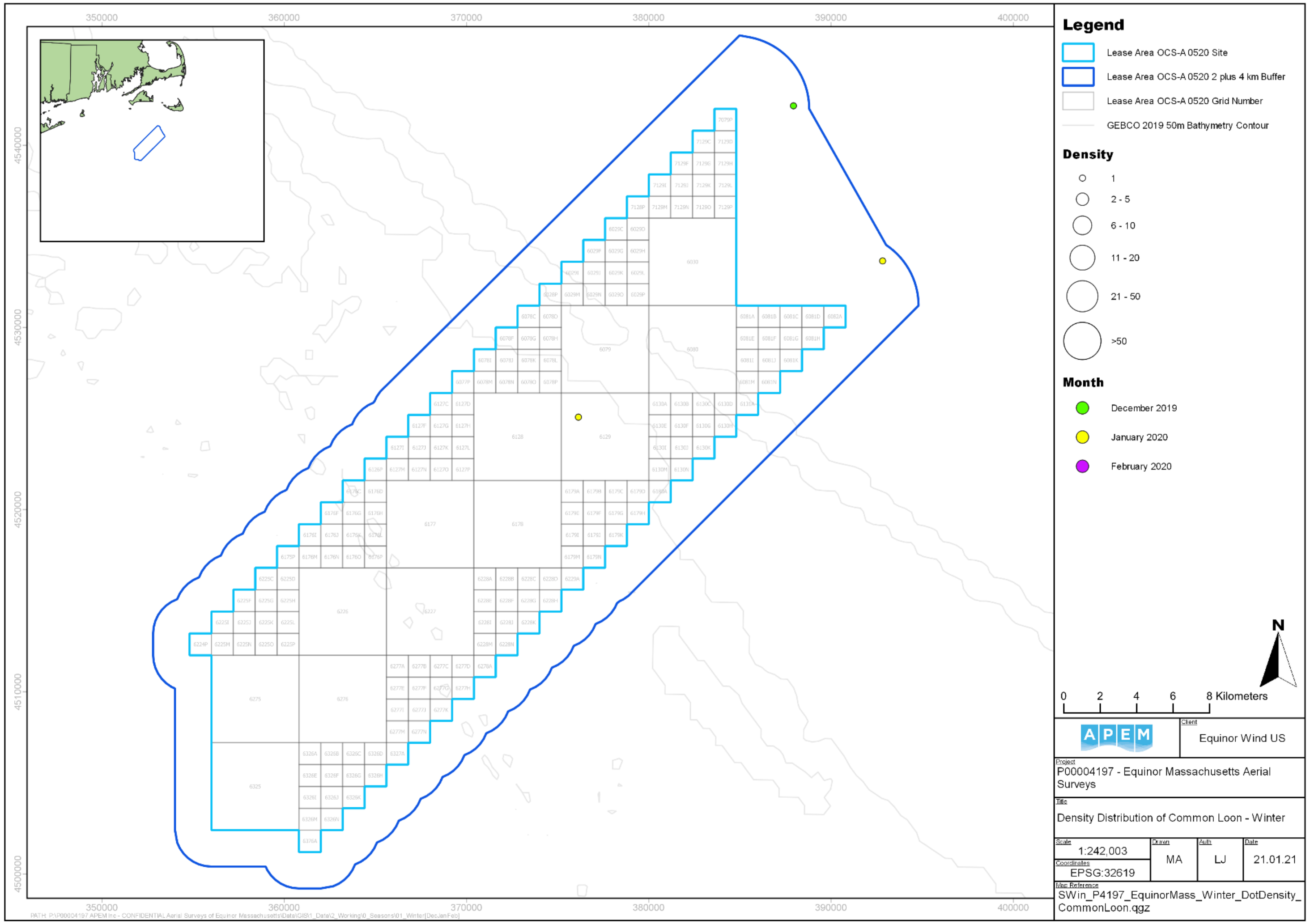

Figure 22 **Distribution of common loons recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the winter season**

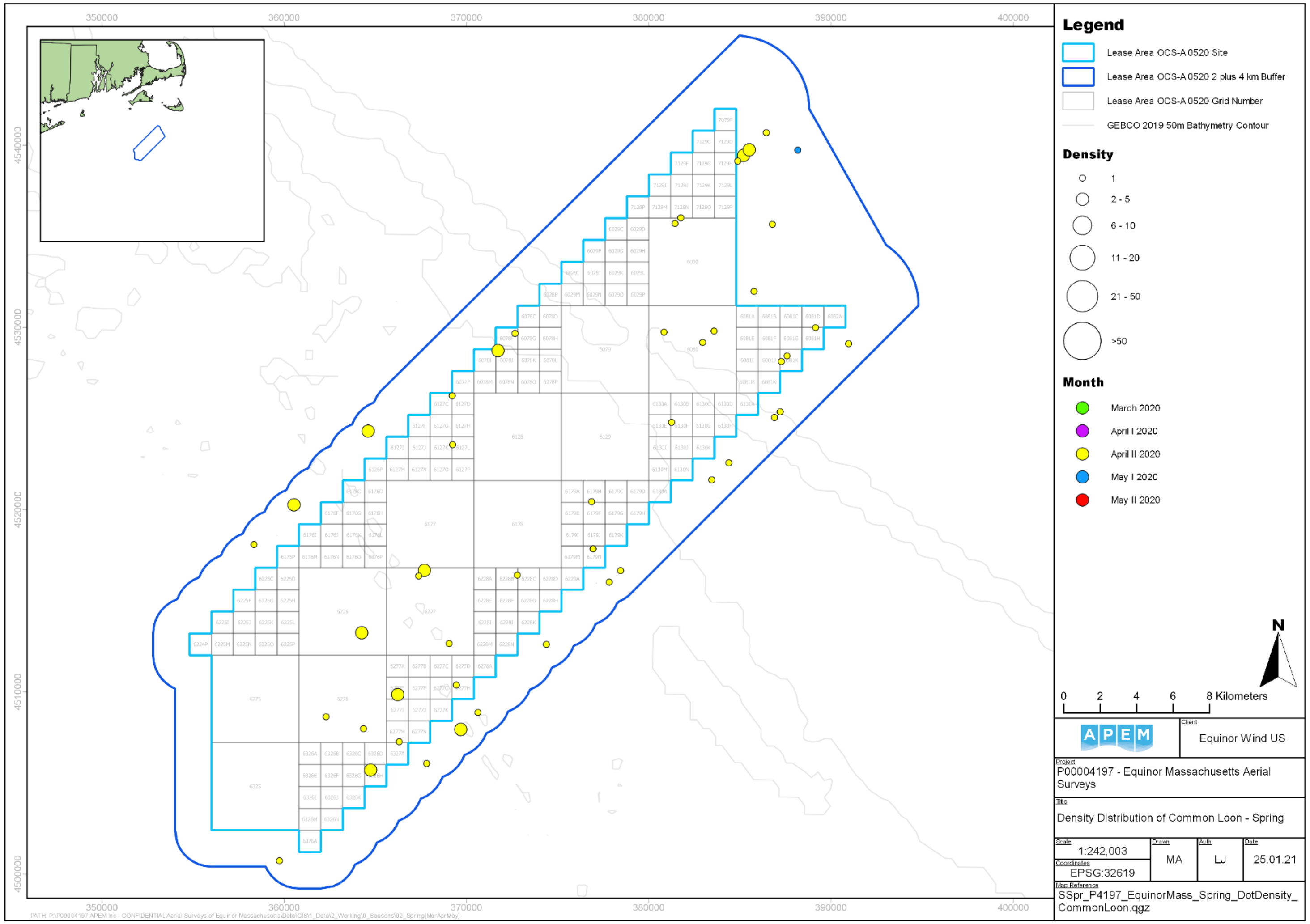

Figure 23 **Distribution of common loons recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

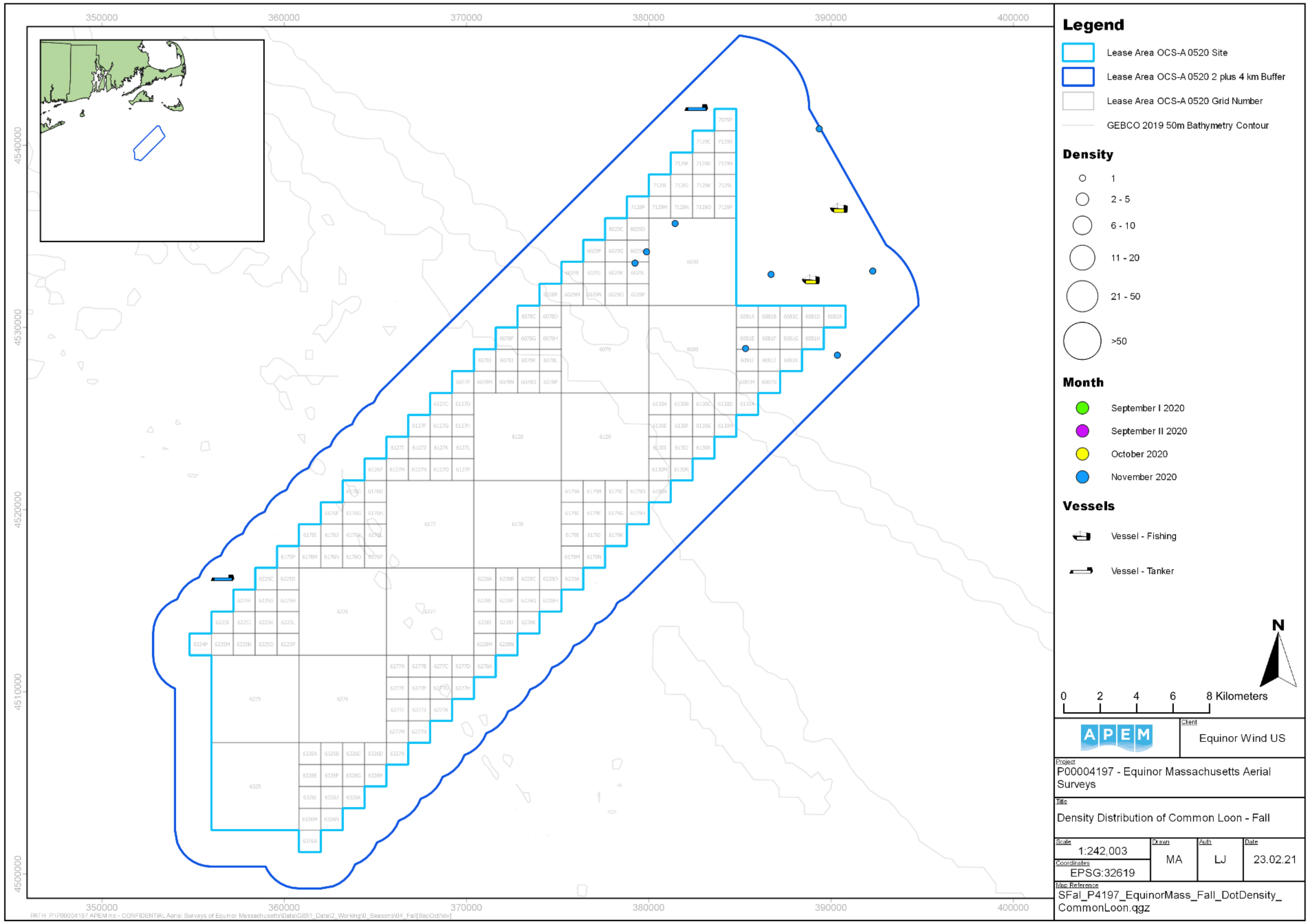

Figure 24 Distribution of common loons recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season

5.10 Loon Species (*Gavia spp.)*

Unidentified loons were recorded in the two April surveys only, with highest numbers therefore recorded in spring (**Table 1**). A peak count of 12 in the Site and 11 in the Buffer led to abundance estimates of 89 and 97 respectively (**Table 17**).

A total of 24 unidentified loons were recorded in the spring surveys (**Figure 25**), of which one was recorded in the April I survey and 23 were recorded in the April II survey (**Table 17**). The individual recorded in the first April survey was located in the west-southwest of the Survey Area, whilst the individuals in the second April survey were loosely distributed across the Survey Area (**Figure 25**).

Table 17 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified loons in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Apr I 20	1	8	0.01	0	1
Apr II 20	23	183	0.21	0	23
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Apr I 20	1	7	0.01	0	1
Apr II 20	12	89	0.17	0	12
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Apr I 20	0	0	-	0	0
Apr II 20	11	97	0.29	0	11

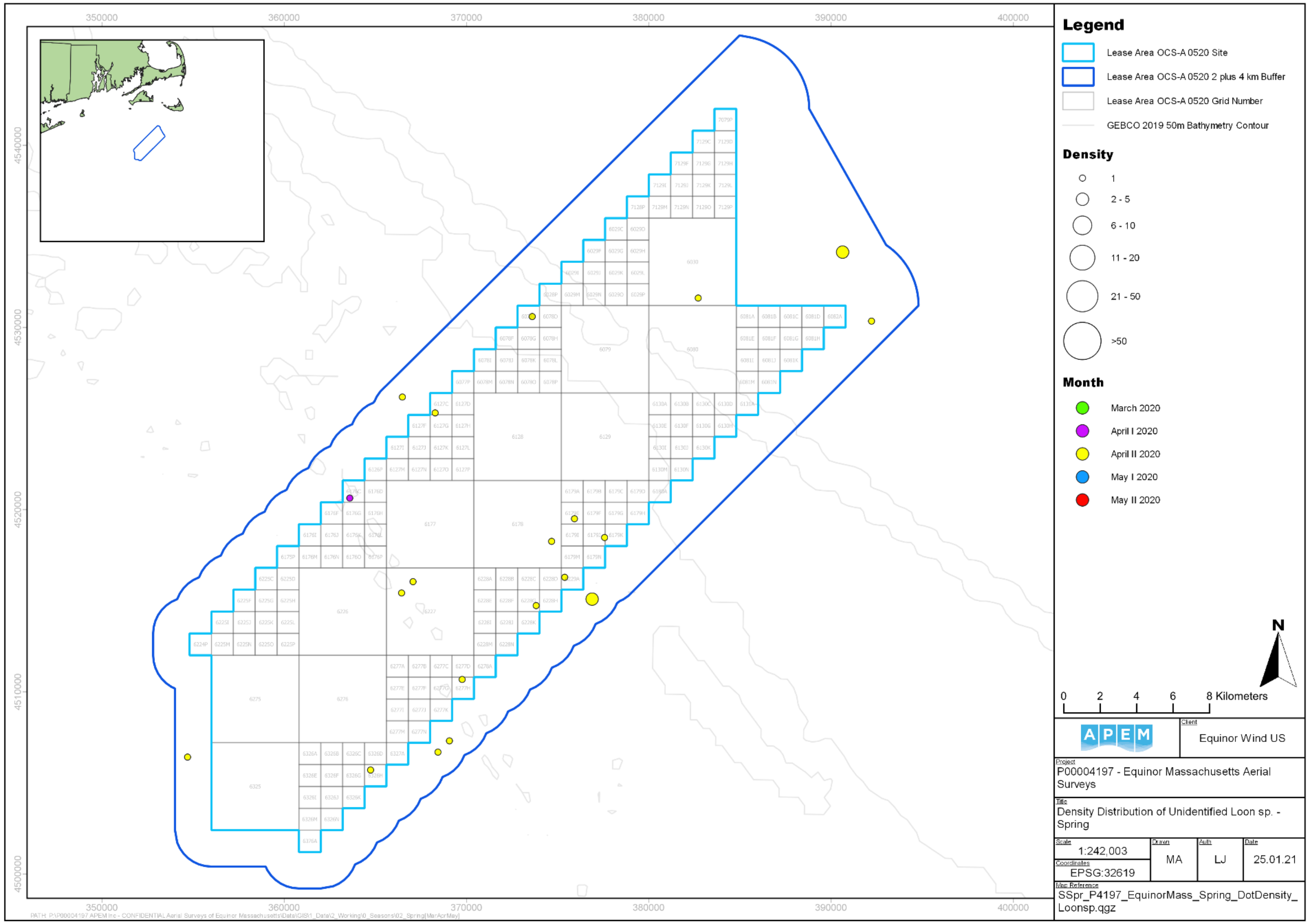

Figure 25 **Distribution of unidentified loons recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

5.11 Northern Fulmar (*Fulmarus glacialis)*

Northern fulmars were recorded in the winter, spring, and fall surveys, with highest numbers recorded in spring (**Table 1**). A peak count of 43 in the Site and four in the Buffer from the April I survey, led to abundance estimates of 320 and 35 respectively (**Table 18**).

A total of 44 northern fulmars were recorded in the winter (**Figure 26**), of which 35 were recorded in December 2019, and nine were recorded in February (**Table 18**). For the December 2019 survey, individuals were predominantly located in one large group in the southwest of the Survey Area. In February, individuals were loosely distributed south of the center of the Survey Area (**Figure 26**). A total of 57 fulmars were recorded in the spring (**Figure 27**), of which nine were recorded in the March survey, 47 were recorded in the April I survey, and one was recorded in the May I survey (**Table 18**). For the March survey, fulmars were predominantly located in the east of the Survey Area, and for April I and May I, fulmars were predominantly distributed across the south of the Survey Area (**Figure 27**). A total of nine fulmars were recorded in the fall (**Figure 28**), of which three were recorded in the September II survey, and six were recorded in the November survey (**Table 18**). For both fall surveys, fulmars were loosely distributed across the Survey Area (**Figure 28**).

Table 18 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of northern fulmars in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Dec 19	35	278	0.32	34	1
Feb 20	9	72	0.08	8	1
Mar 20	9	71	0.08	8	1
Apr I 20	47	373	0.43	44	3
May I 20	1	8	0.01	1	0
Sep II 20	3	24	0.03	2	1
Nov 20	6	48	0.06	1	5
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Dec 19	33	245	0.47	32	1
Feb 20	8	60	0.12	7	1
Mar 20	7	52	0.1	7	0
Apr I 20	43	320	0.61	40	3
May I 20	1	7	0.01	1	0
Sep II 20	2	15	0.03	2	0
Nov 20	3	22	0.04	1	2
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Dec 19	2	18	0.05	2	0
Feb 20	1	9	0.03	1	0
Mar 20	2	18	0.05	1	1
Apr I 20	4	35	0.1	4	0
May I 20	0	0	-	0	0
Sep II 20	1	9	0.03	0	1
Nov 20	3	27	0.08	0	3

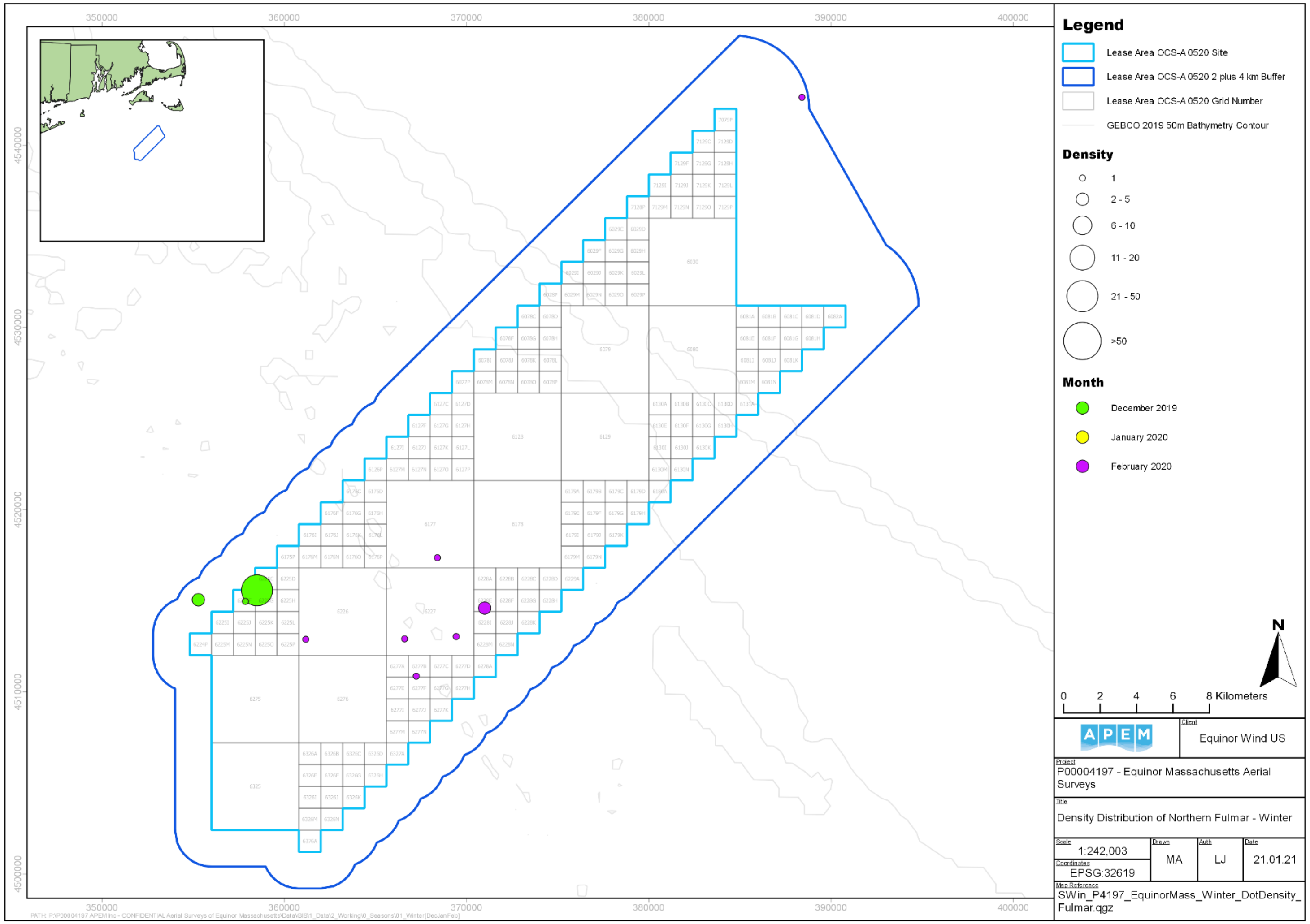

Figure 26 **Distribution of northern fulmars recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the winter season**

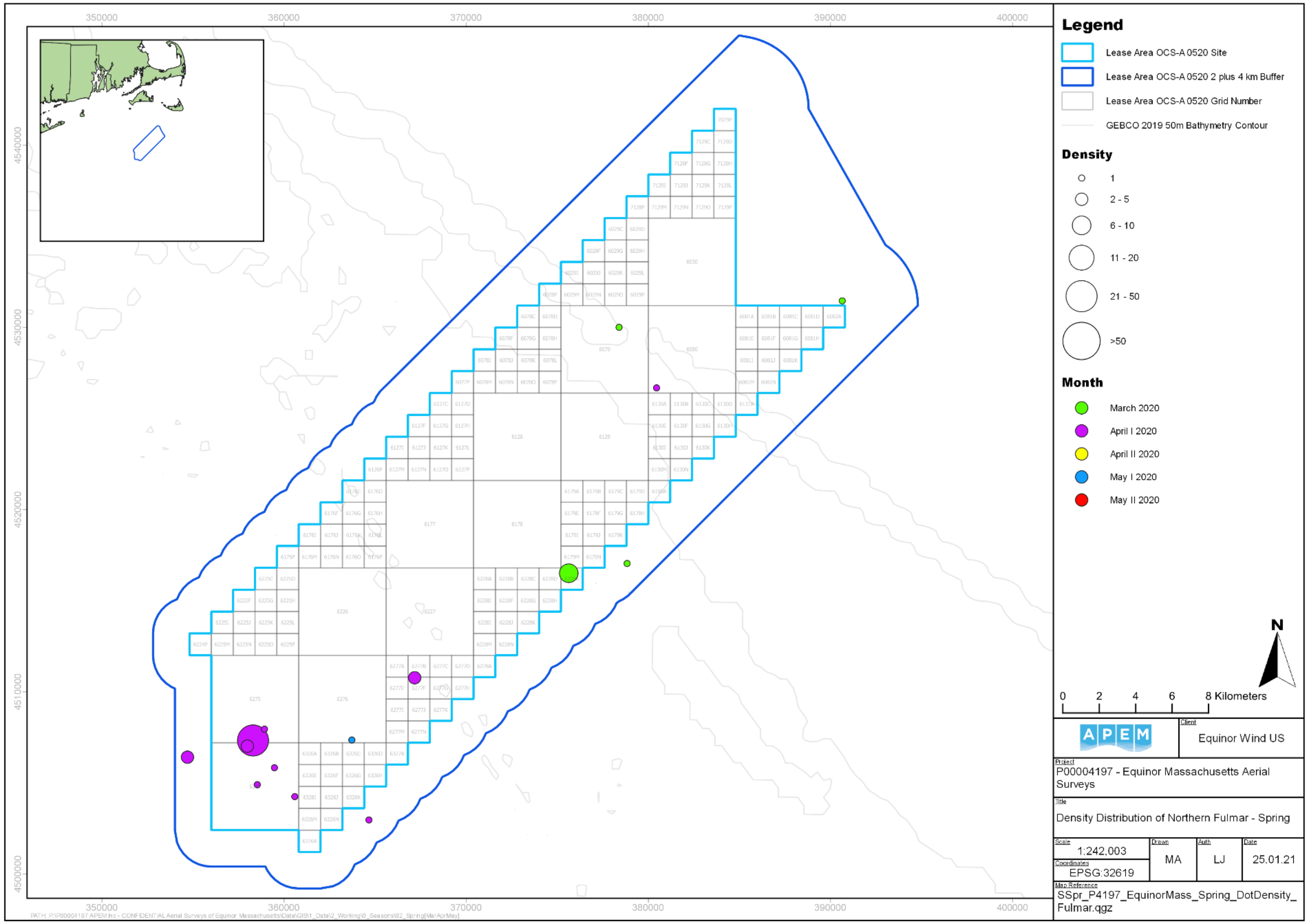

Figure 27 **Distribution of northern fulmars recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

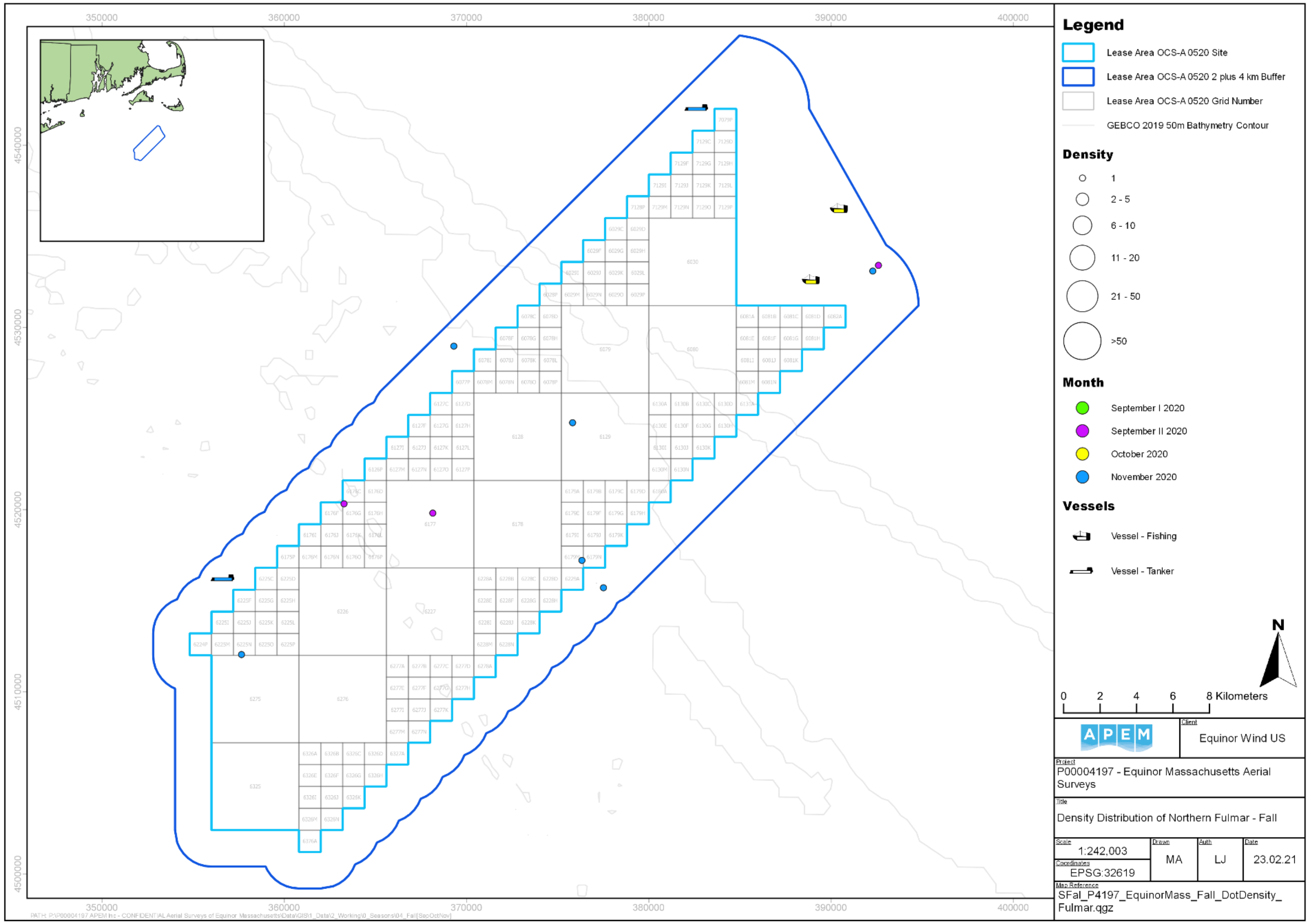

Figure 28 Distribution of northern fulmars recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season

5.12 Cory's Shearwater (*Calonectris diomedea)*

Cory's shearwaters were recorded in the spring, summer, and fall surveys, with highest numbers recorded in fall (**Table 1**). A peak count of 70 in the Site and 19 in the Buffer from the September I survey, led to abundance estimates of 522 and 167 respectively (**Table 19**).

A total of 13 Cory's shearwaters were recorded in the spring from the May II survey only (**Table 19**), located predominantly in the southwest of the Survey Area (**Figure 29**). A total of 62 shearwaters were recorded in the summer surveys (**Figure 30**), of which one was recorded in June, 20 were recorded in July, five were recorded in August I, and 36 were recorded in August II (**Table 19**). For the June survey, the single shearwater was located in the center of the Survey Area (**Figure 30**). For the July and August I surveys, shearwaters were predominantly distributed in the northern half of the Survey Area (**Figure 30**). For the August II survey, one shearwater was recorded in the north and the remaining majority were located in two large groups towards the center of the Survey Area, associated with the presence of a fishing vessel (**Figure 30**). A total of 99 shearwaters were recorded in the fall surveys (**Figure 31**), of which 89 were recorded in September I, four were recorded in September II, and six were recorded in October (**Table 19**). For the fall surveys, shearwaters were predominantly distributed across the southern half of the Survey Area (**Figure 31**).

Table 19 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of Cory's shearwaters in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
May II 20	13	103	0.12	11	2
Jun 20	1	8	0.01	1	0
Jul 20	20	159	0.19	19	1
Aug I 20	5	40	0.05	1	4
Aug II 20	36	286	0.33	10	26
Sep I 20	89	707	0.82	37	52
Sep II 20	4	32	0.04	3	1
Oct 20	6	48	0.06	6	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
May II 20	9	67	0.13	9	0
Jun 20	1	7	0.01	1	0
Jul 20	5	37	0.07	5	0
Aug I 20	4	30	0.06	1	3
Aug II 20	34	253	0.49	8	26
Sep I 20	70	522	1	33	37
Sep II 20	3	22	0.04	2	1
Oct 20	4	30	0.06	4	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
May II 20	4	35	0.1	2	2
Jun 20	0	0	-	0	0
Jul 20	15	134	0.4	14	1
Aug I 20	1	9	0.03	0	1

Aug II 20	2	18	0.05	2	0
Sep I 20	19	167	0.49	4	15
Sep II 20	1	9	0.03	1	0
Oct 20	2	18	0.05	2	0

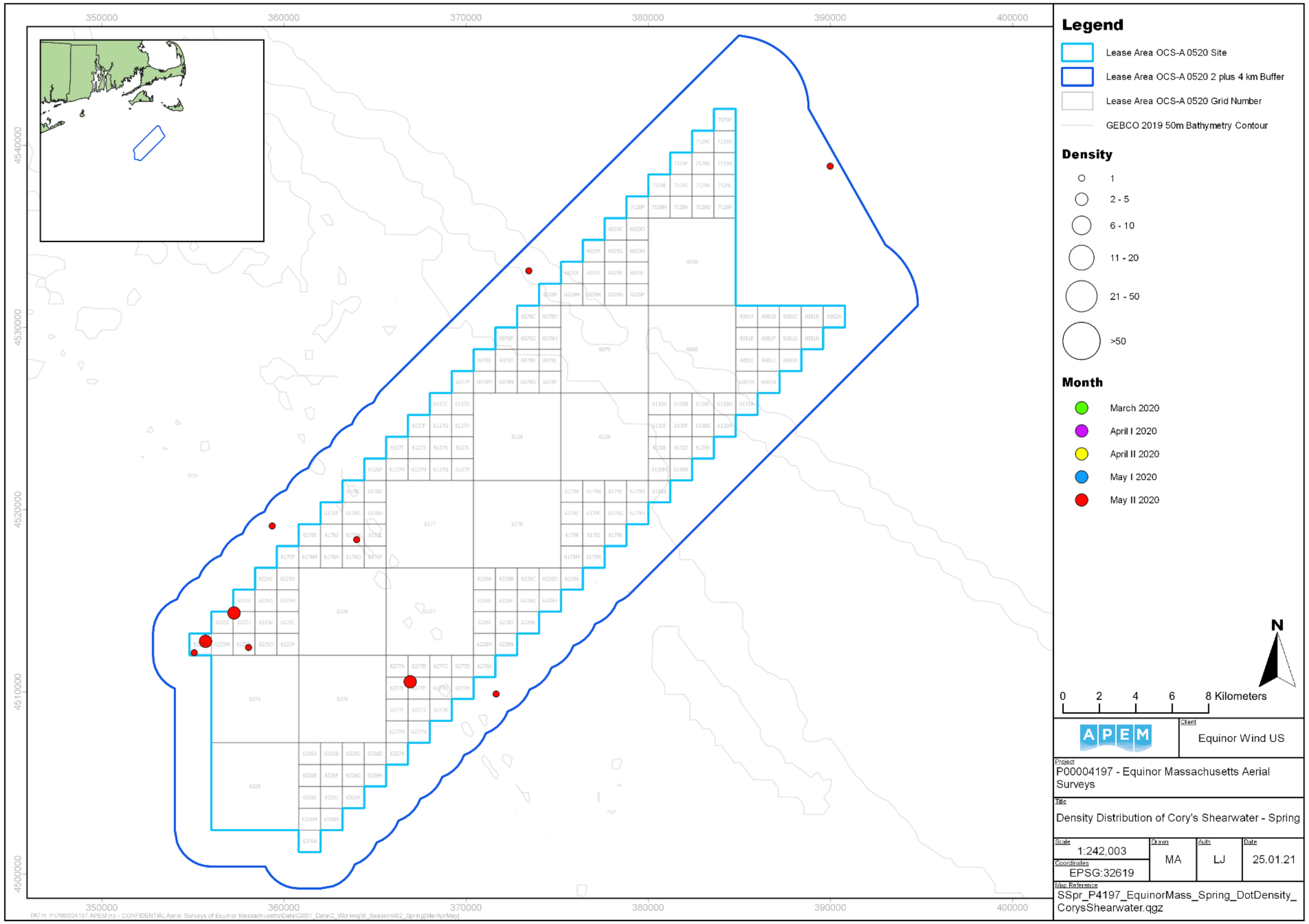

Figure 29 **Distribution of Cory's shearwaters recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

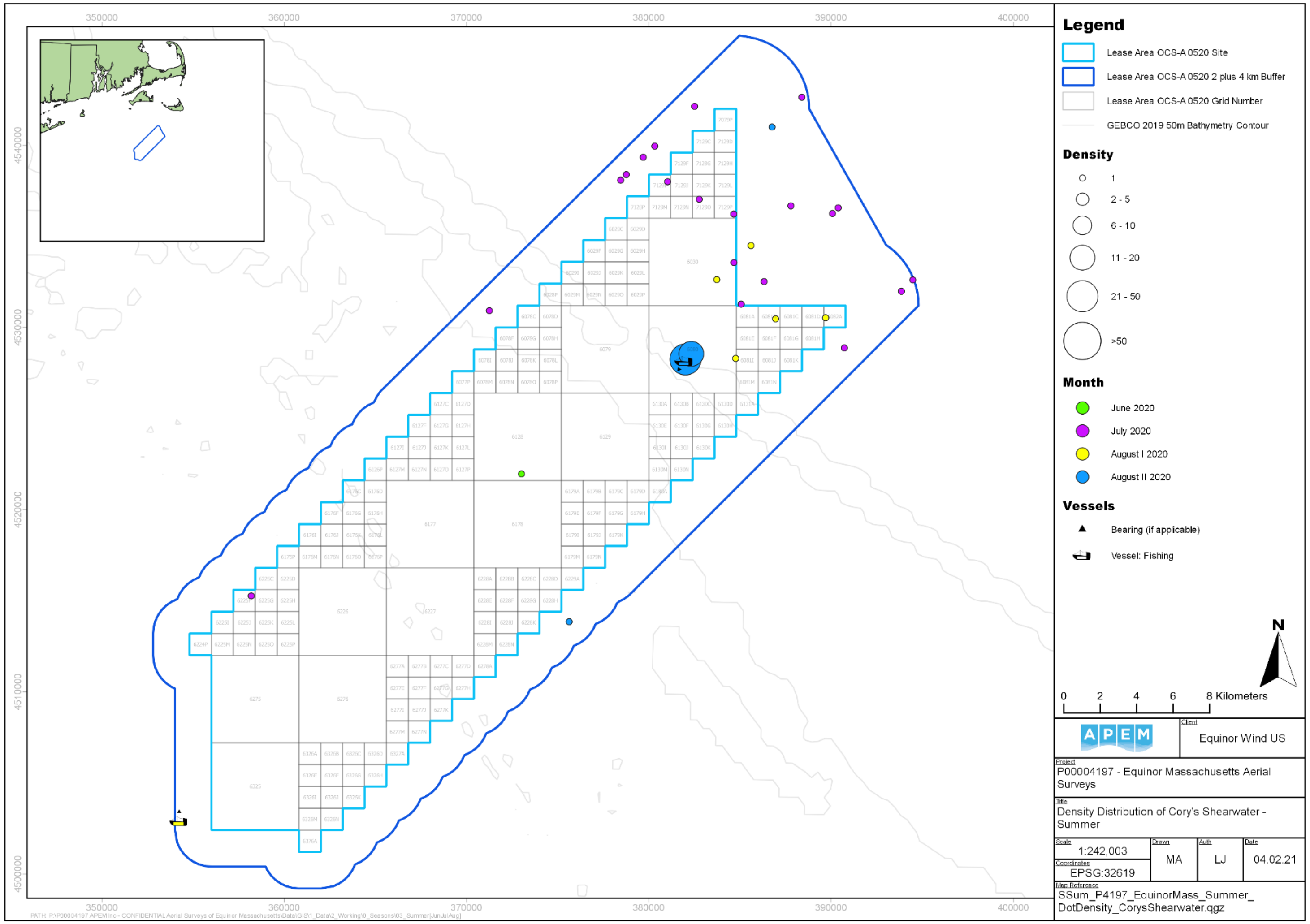

Figure 30 **Distribution of Cory's shearwaters recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

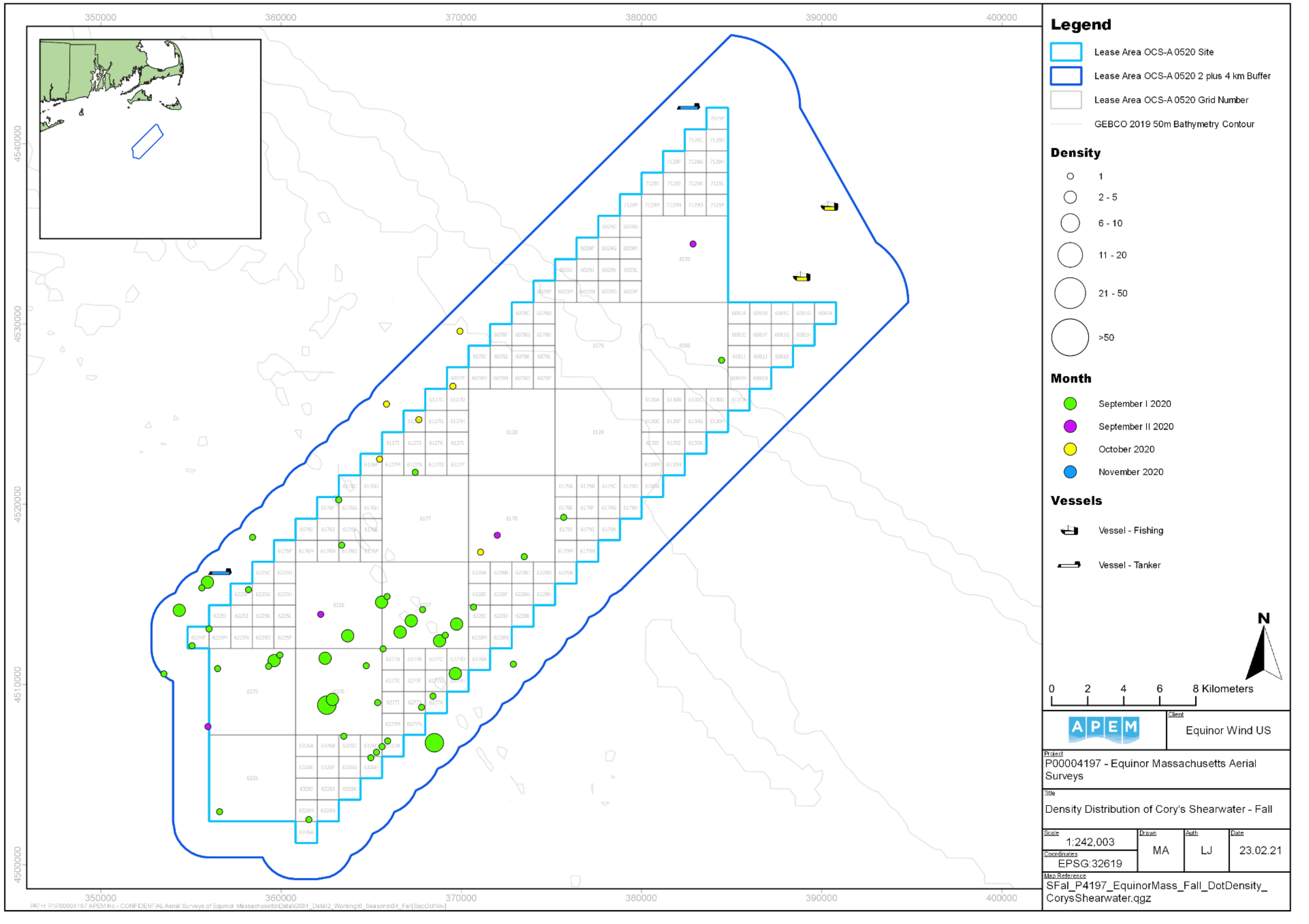

Figure 31 Distribution of Cory's shearwaters recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season

5.13 Great Shearwater (*Ardenna gravis)*

Great shearwaters were recorded in the spring, summer, and fall surveys, with highest numbers recorded in summer (**Table 1**). A peak count of 14 in the Site, and 15 in the Buffer from the November survey, led to abundance estimates of 104 and 133 respectively (**Table 20**).

A total of 14 great shearwaters were recorded in the spring from the May II survey only (**Table 20**), distributed loosely across the Survey Area (**Figure 32**). A total of 59 shearwaters were recorded in the summer surveys (**Figure 33**), of which 18 were recorded in June, two were recorded in July, eleven were recorded in August I, and 28 were recorded in August II (**Table 20**). For the June survey, shearwaters were located in the center of the Survey Area, and for the July survey, shearwaters were located in the north of the Survey Area (**Figure 33**). For the August I and II surveys, shearwaters were predominantly located in the northeast of the Survey Area, with the majority in two large groups for August II associated with the presence of a fishing vessel (**Figure 33**). A total of 45 shearwaters were recorded in the fall surveys (**Figure 34**), of which eight were recorded in the September I survey, eight were recorded in the October survey, and 29 were recorded in the November survey (**Table 20**). For the fall surveys, shearwaters were loosely distributed across the Survey Area (**Figure 34**).

Table 20 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of great shearwaters in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
May II 20	14	111	0.13	6	8
Jun 20	18	143	0.17	13	5
Jul 20	2	16	0.02	2	0
Aug I 20	11	88	0.01	5	6
Aug II 20	28	222	0.26	21	7
Sep I 20	8	63	0.07	7	1
Oct 20	8	64	0.07	6	2
Nov 20	29	230	0.27	17	12
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
May II 20	12	89	0.17	4	8
Jun 20	17	127	0.24	13	4
Jul 20	0	0	-	0	0
Aug I 20	7	52	0.1	4	3
Aug II 20	26	194	0.37	19	7
Sep I 20	7	52	0.1	6	1
Oct 20	5	37	0.07	3	2
Nov 20	14	104	0.2	9	5
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
May II 20	2	18	0.05	2	0
Jun 20	1	9	0.03	0	1
Jul 20	2	18	0.05	2	0
Aug I 20	4	35	0.1	1	3

Aug II 20	2	18	0.05	2	0
Sep I 20	1	9	0.03	1	0
Oct 20	3	27	0.08	3	0
Nov 20	15	133	0.39	8	7

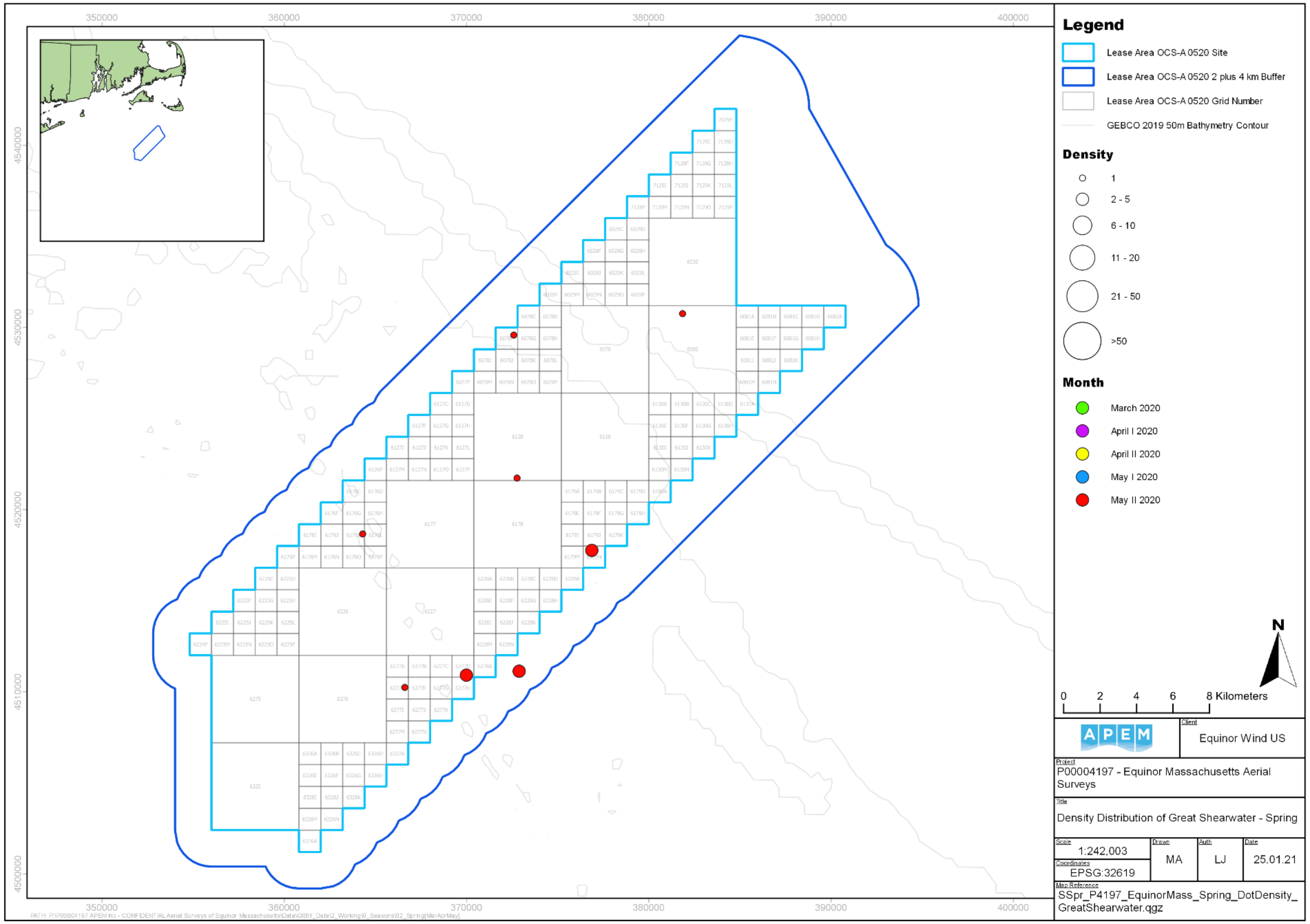

Figure 32 Distribution of great shearwaters recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season

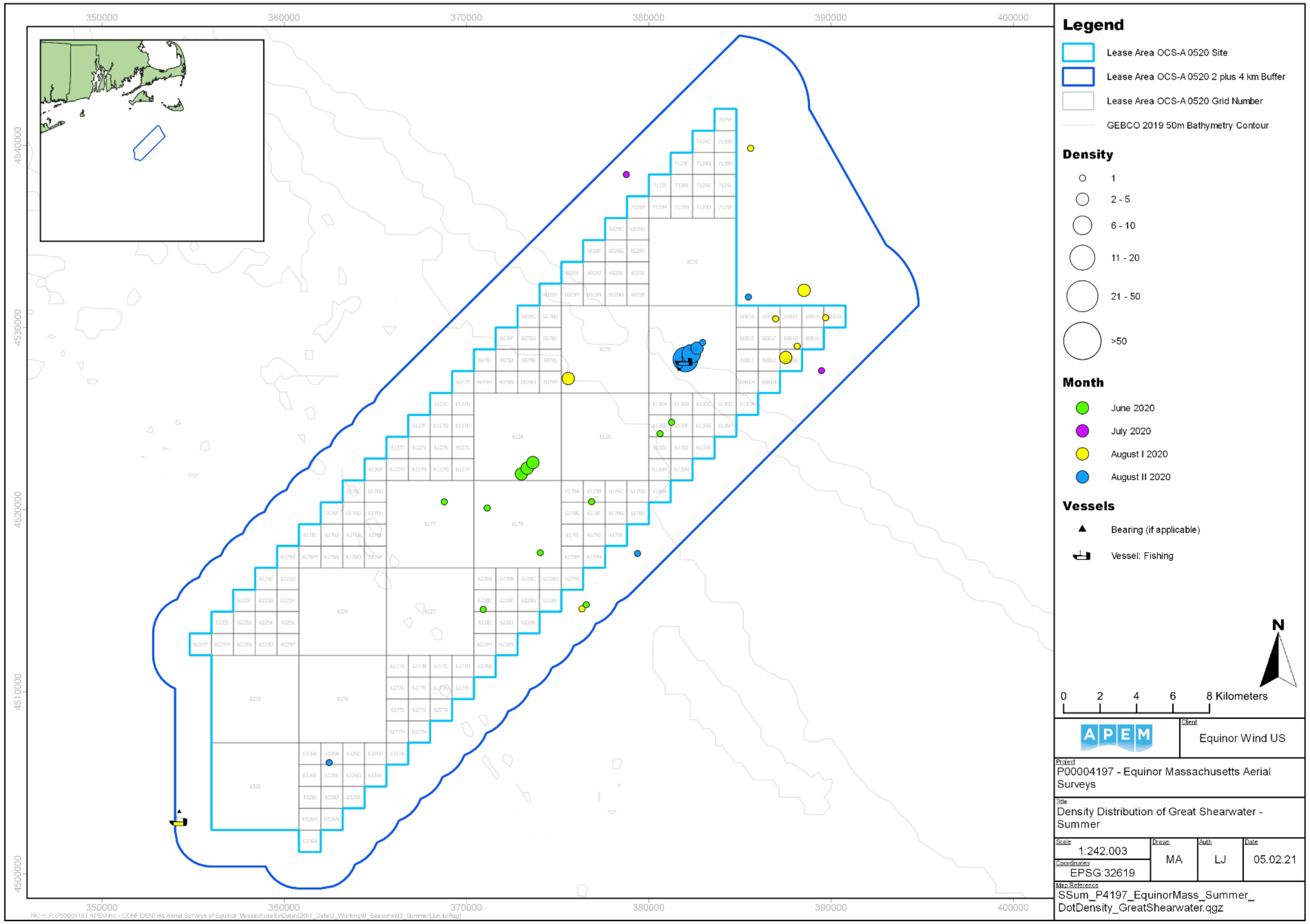

Figure 33 **Distribution of great shearwaters recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

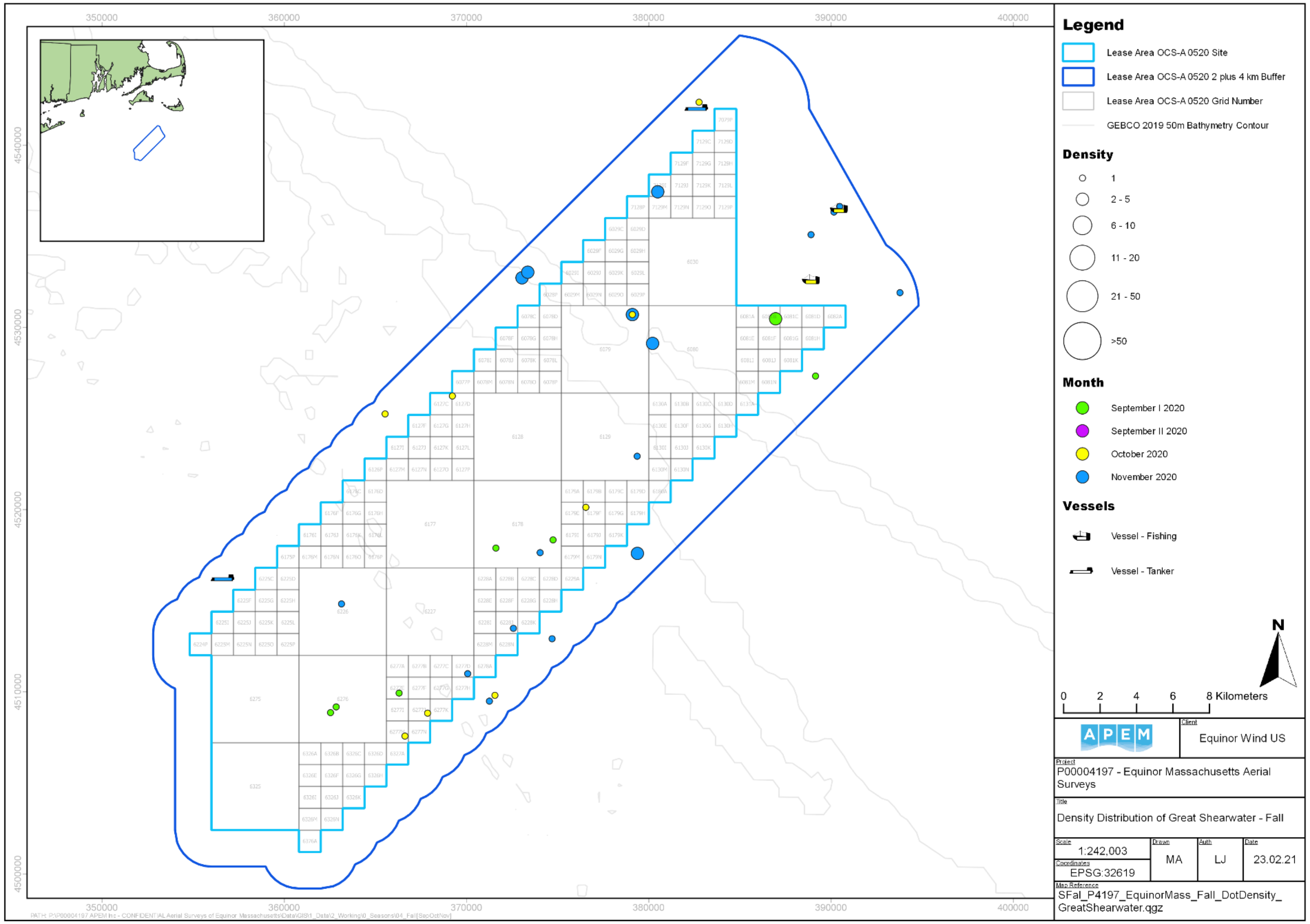

Figure 34 **Distribution of great shearwaters recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.14 Sooty Shearwater (*Ardenna grisea)*

Sooty shearwaters were recorded in the spring and summer surveys, with highest numbers recorded in spring (**Table 1**). A peak count of 27 in the Site and 34 in the Buffer from the May II survey, led to abundance estimates of 201 and 301 respectively (**Table 21**).

A total of 61 sooty shearwaters were recorded in the spring from the May II survey only (**Table 21**), loosely distributed across the Survey Area with a greater concentration in the south (**Figure 35**). A total of 15 shearwaters were recorded in the summer from the June survey only (**Table 21**), predominantly located around the center of the Survey Area (**Figure 36**).

Table 21 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of sooty shearwaters in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
May II 20	61	485	0.56	26	35
Jun 20	15	119	0.14	12	3
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
May II 20	27	201	0.39	22	5
Jun 20	14	104	0.2	11	3
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
May II 20	34	301	0.89	4	30
Jun 20	1	9	0.03	1	0

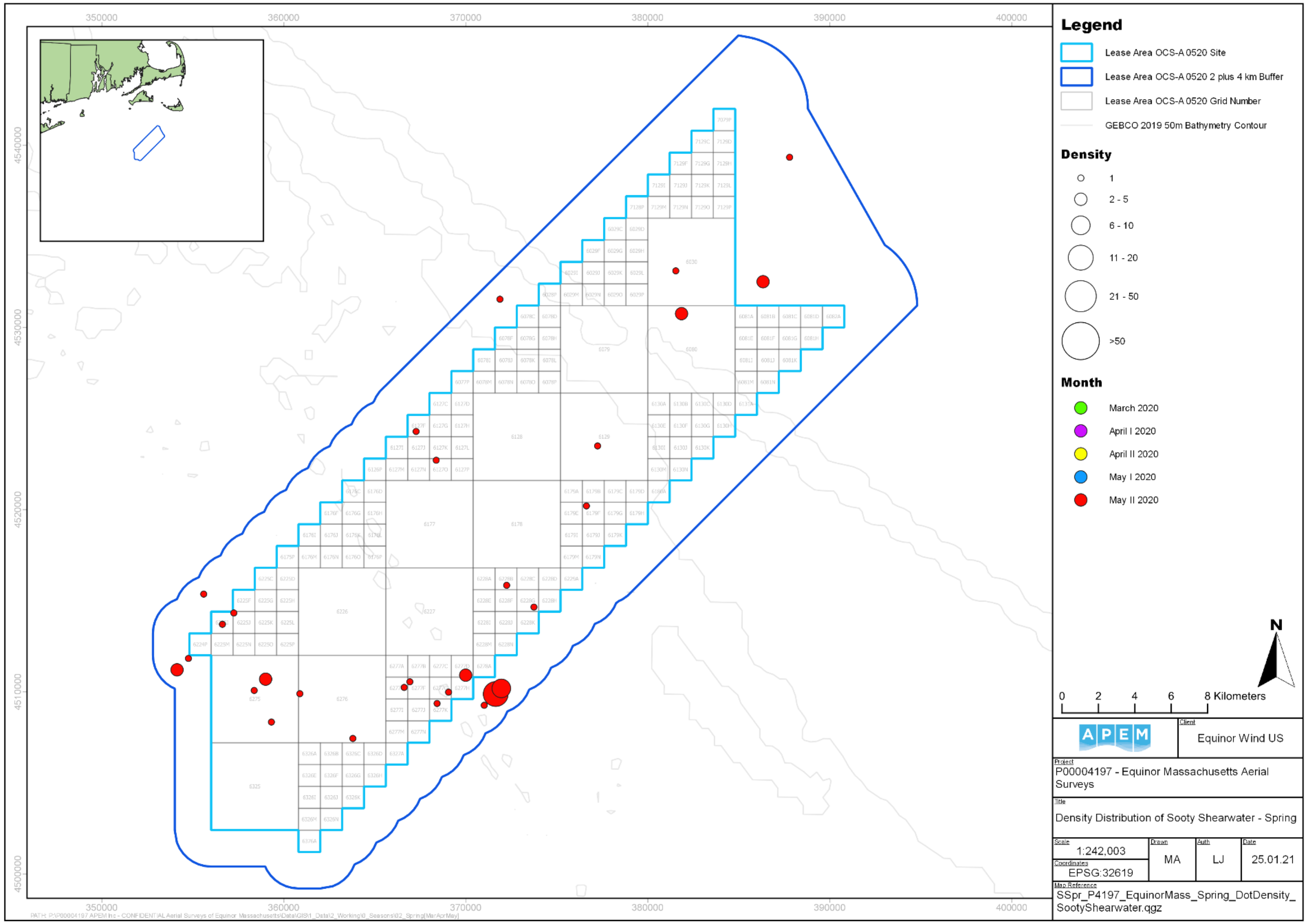

Figure 35 **Distribution of sooty shearwaters recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

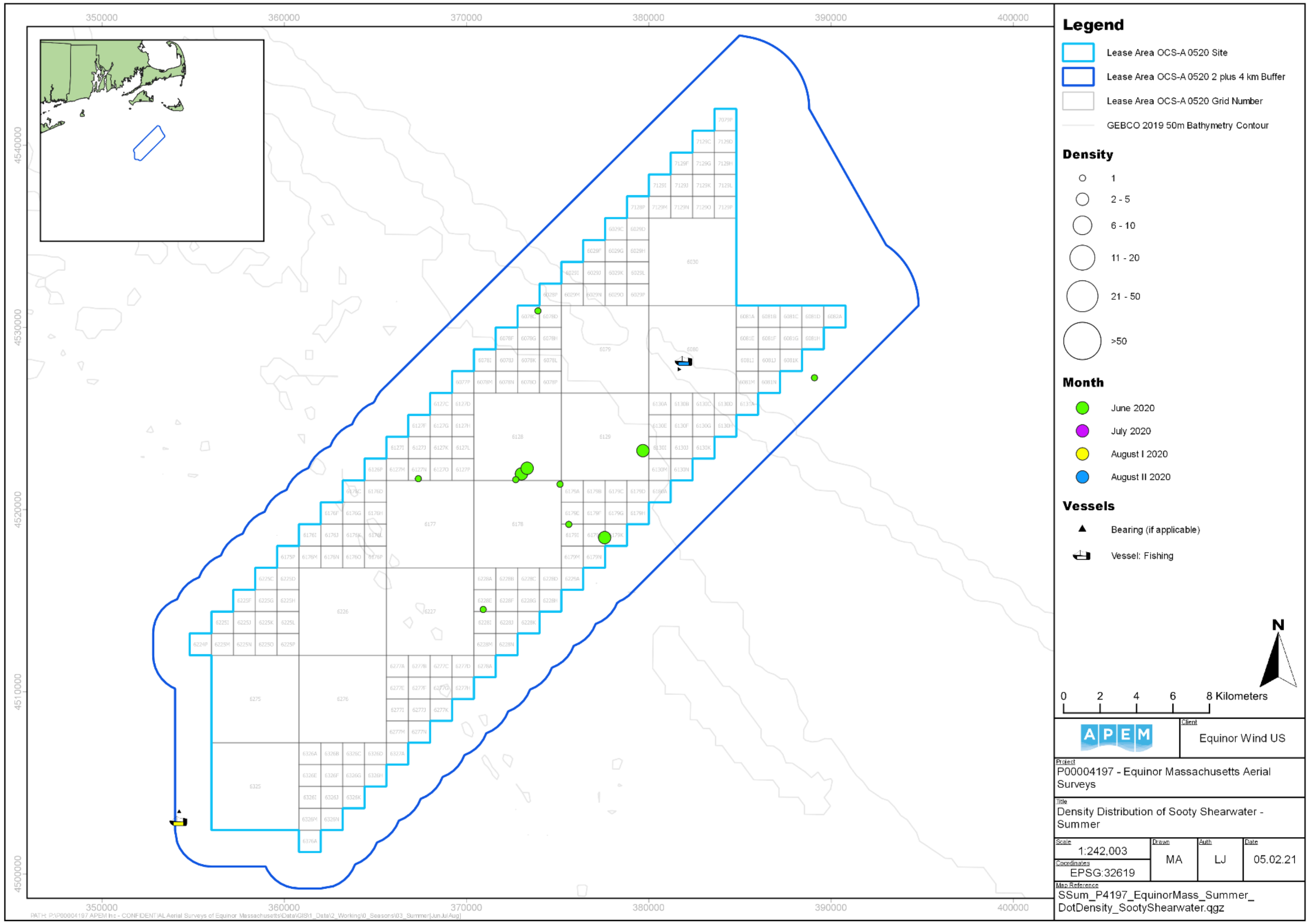

Figure 36 **Distribution of sooty shearwaters recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

5.15 Manx Shearwater (*Puffinus puffinus)*

Manx shearwaters were recorded in the November survey only, with highest numbers therefore recorded in fall (**Table 1**). A peak count of 37 in the Site and 12 in the Buffer from the November survey, led to abundance estimates of 276 and 106 respectively (**Table 22**).

A total of 49 Manx shearwaters were recorded in the fall from the November survey only (**Table 22**), loosely distributed across the Survey Area, predominantly towards the northern half (**Figure 37**).

Table 22 Raw counts and abundance and density estimates (No. estimated individuals per km²) of Manx shearwaters in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

d) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Nov 20	49	389	0.45	26	23
e) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Nov 20	37	276	0.53	18	19
f) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Nov 20	12	106	0.31	8	4

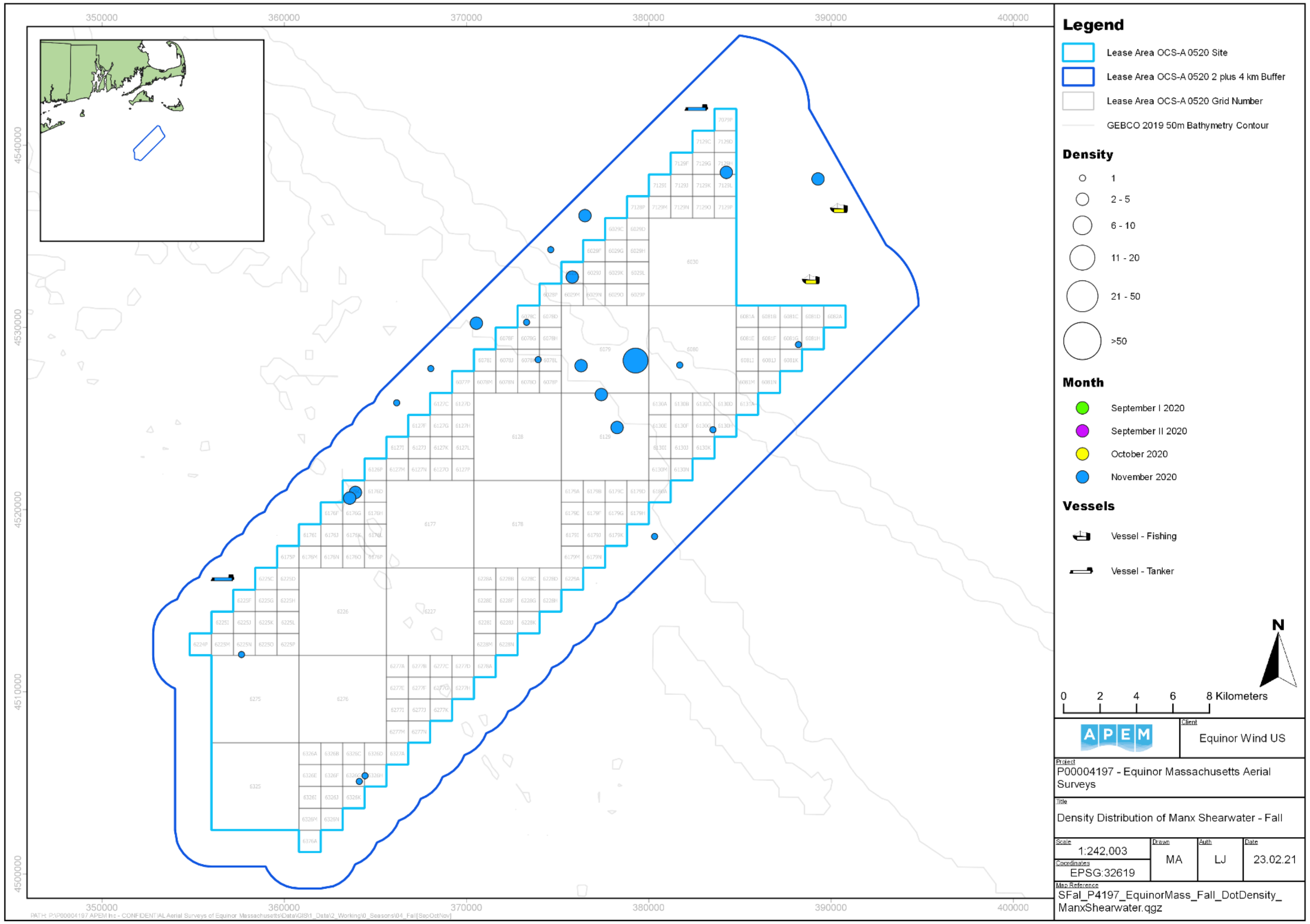

Figure 37 **Distribution of Manx shearwaters recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.16 Large Shearwater Species (Unidentified Procellariidae)

Unidentified large shearwaters were recorded in the summer and fall surveys, with highest numbers recorded in summer (**Table 1**). A peak count of 49 in the Site and four in the Buffer from the September I survey, led to abundance estimates of 366 and 35 respectively (**Table 23).**

A total of 114 unidentified large shearwaters were recorded in the summer surveys (**Figure 38**), of which 52 were recorded in June, 33 were recorded in August I, and 29 were recorded in August II (**Table 23).**). For the June survey, shearwaters were predominantly distributed in the southwest of the Survey Area, and for the August I survey, shearwaters were loosely distributed across the northern half of the Survey area (**Figure 38**). For the August II survey, shearwaters were distributed in the north and northeast of the Survey Area, predominantly associated with the presence of a fishing vessel (**Figure 38**). A total of 54 shearwaters were recorded in the fall surveys (**Figure 39**), of which 53 were recorded in the September I survey, and one was recorded in the October survey (**Table 23).**). Shearwaters were predominantly located in the southern half of the Survey Area for September I, and the single shearwater for the October survey was located in the north (**Figure 39**).

Table 23 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified large shearwaters in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Jun 20	52	413	0.48	0	52
Aug I 20	33	263	0.31	0	33
Aug II 20	29	290	0.27	4	25
Sep I 20	53	421	0.49	0	53
Oct 20	1	8	0.01	1	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Jun 20	51	380	0.73	0	51
Aug I 20	15	112	0.21	0	15
Aug II 20	29	216	0.41	4	25
Sep I 20	49	366	0.7	0	49
Oct 20	1	7	0.01	1	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Jun 20	1	9	0.03	0	1
Aug I 20	18	159	0.47	0	18
Aug II 20	0	0	-	0	0
Sep I 20	4	35	0.1	0	4
Oct 20	1	9	0.03	1	0

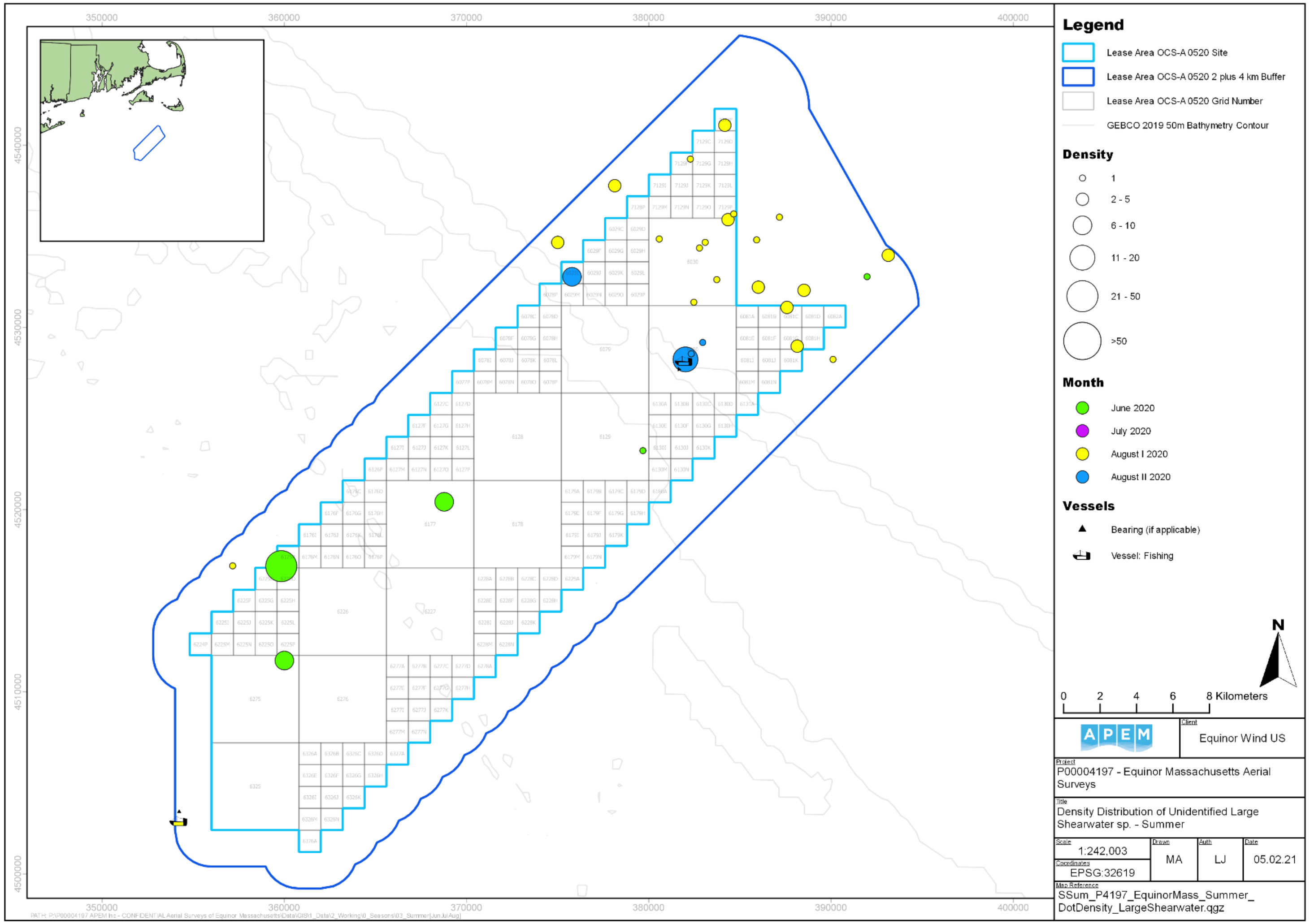

Figure 38 **Distribution of unidentified large shearwaters recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

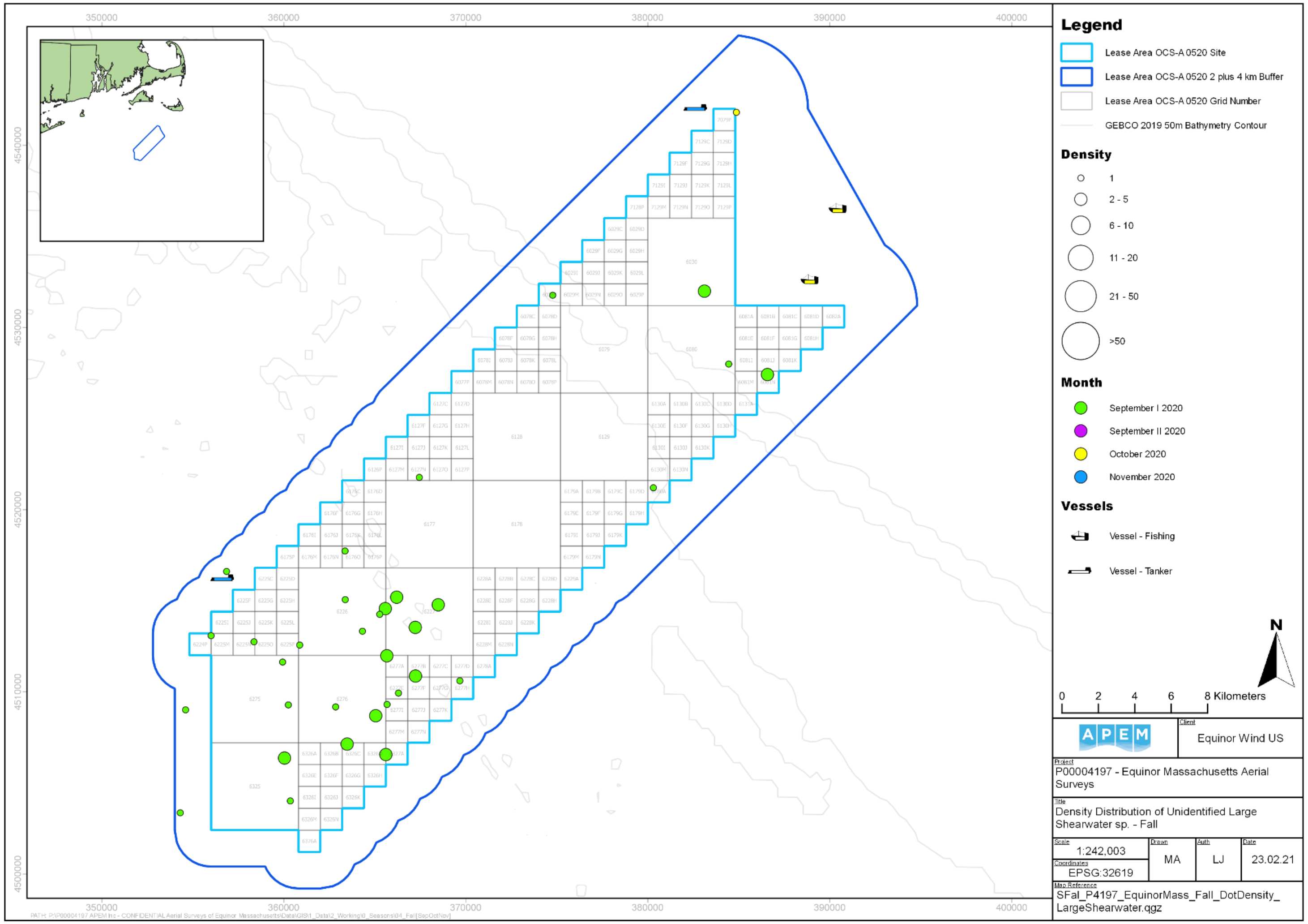

Figure 39 **Distribution of unidentified large shearwaters recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.17 Small Shearwater Species (Unidentified Procellariidae)

Unidentified small shearwaters were recorded in the August II survey only, with highest numbers therefore recorded in summer (**Table 1**). A peak raw count of one in the Survey Area from the August II survey, led to an abundance estimate of eight (**Table 24**).

A single unidentified small shearwater was recorded in the summer from the August II survey (**Table 24**), located in the center of the Survey Area (**Figure 40**).

Table 24 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified small shearwaters in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Aug II 20	1	8	0.01	1	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Aug II 20	1	7	0.01	1	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Aug II 20	0	0	-	0	0

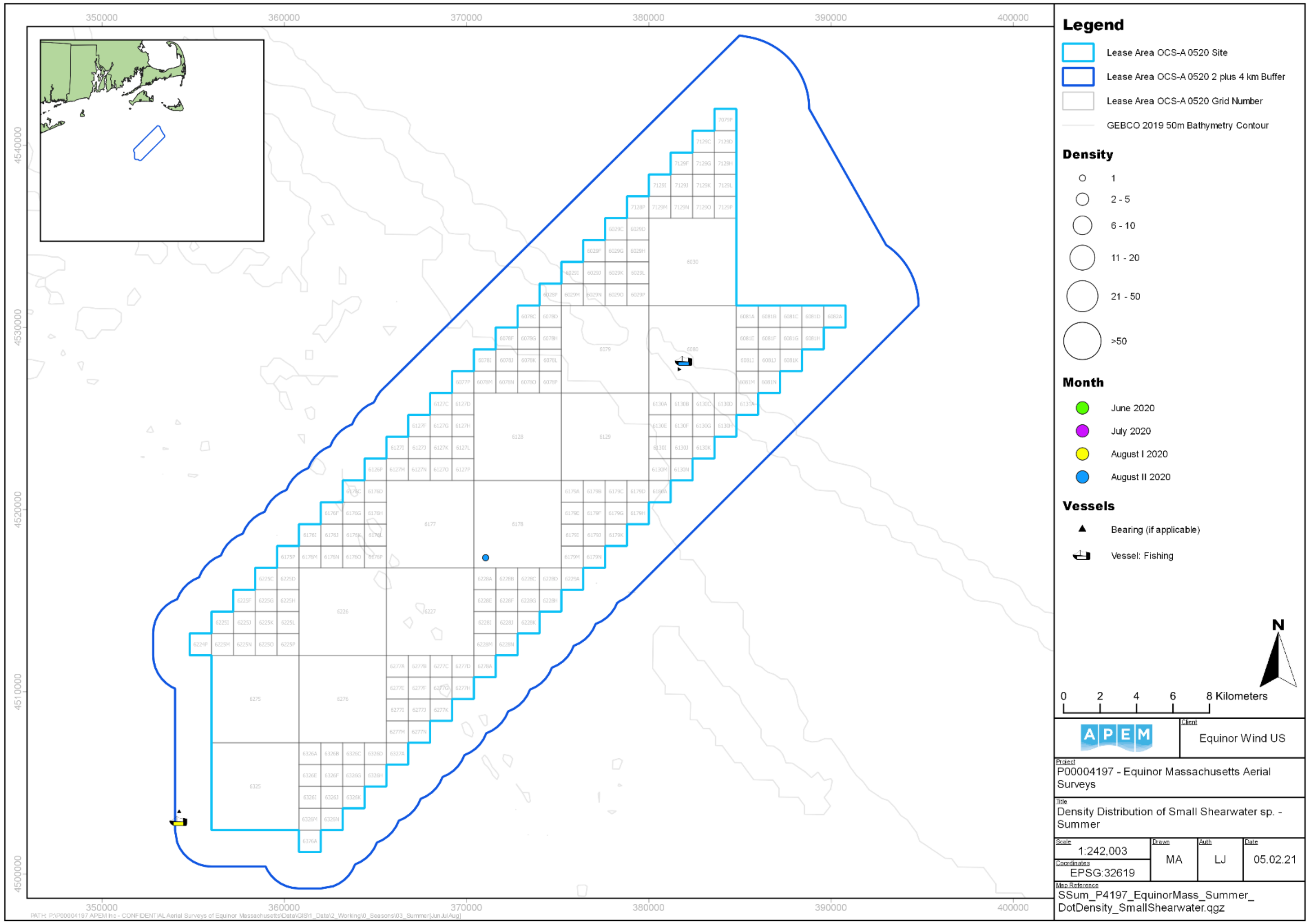

Figure 40 Distribution of unidentified small shearwaters recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season

5.18 Shearwater Species (Unidentified Procellariidae)

Unidentified shearwaters were recorded in the spring, summer, and fall surveys, with highest numbers recorded in spring (**Table 1**). A peak count of 15 in the Site and two in the Buffer from the May II survey, led to abundance estimates of 112 and 18 respectively (**Table 25**).

A total of 17 unidentified shearwaters were recorded in the spring from the May II survey (**Table 25**), loosely distributed across the Survey Area (**Figure 41**). A total of nine shearwaters were recorded in the summer from the June survey (**Table 25**), loosely distributed around the center of the Survey Area (**Figure 42**). A total of three shearwaters were recorded in the fall (**Figure 43**), of which one was recorded in the October survey, and two were recorded in the November survey (**Table 25**). For the October survey, the single shearwater was located in the west of the Survey Area, and for the November survey, the two shearwaters were located in the northeast of the Survey Area (**Figure 43**).

Table 25 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified shearwaters in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
May II 20	17	135	0.16	1	16
Jun 20	9	72	0.08	8	1
Oct 20	1	8	0.01	1	0
Nov 20	2	16	0.02	1	1
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
May II 20	15	112	0.21	1	14
Jun 20	9	67	0.13	8	1
Oct 20	0	0	-	0	0
Nov 20	2	15	0.03	1	1
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
May II 20	2	18	0.05	0	2
Jun 20	0	0	-	0	0
Oct 20	1	9	0.03	1	0
Nov 20	0	0	-	0	0

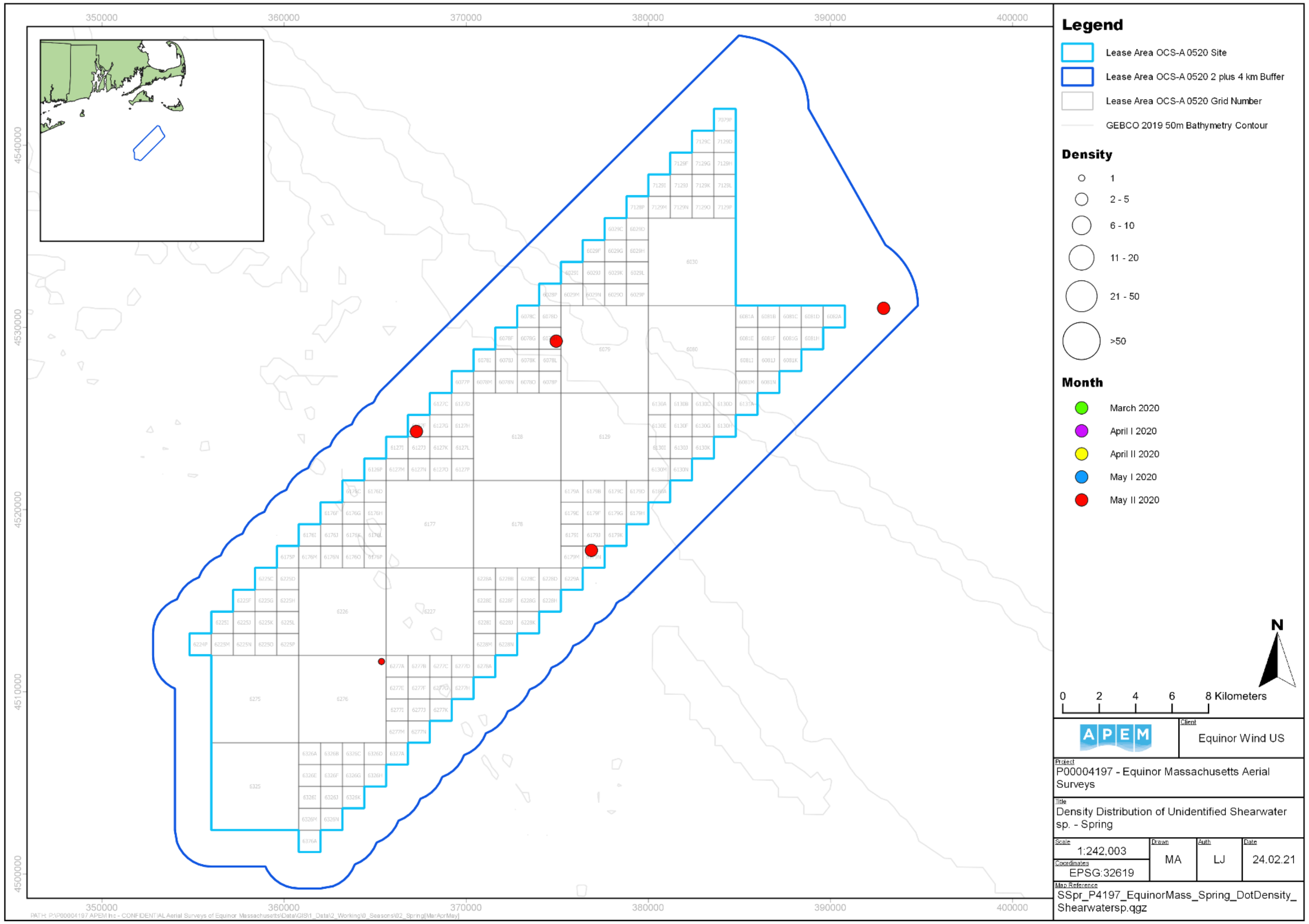

Figure 41 **Distribution of unidentified shearwaters recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

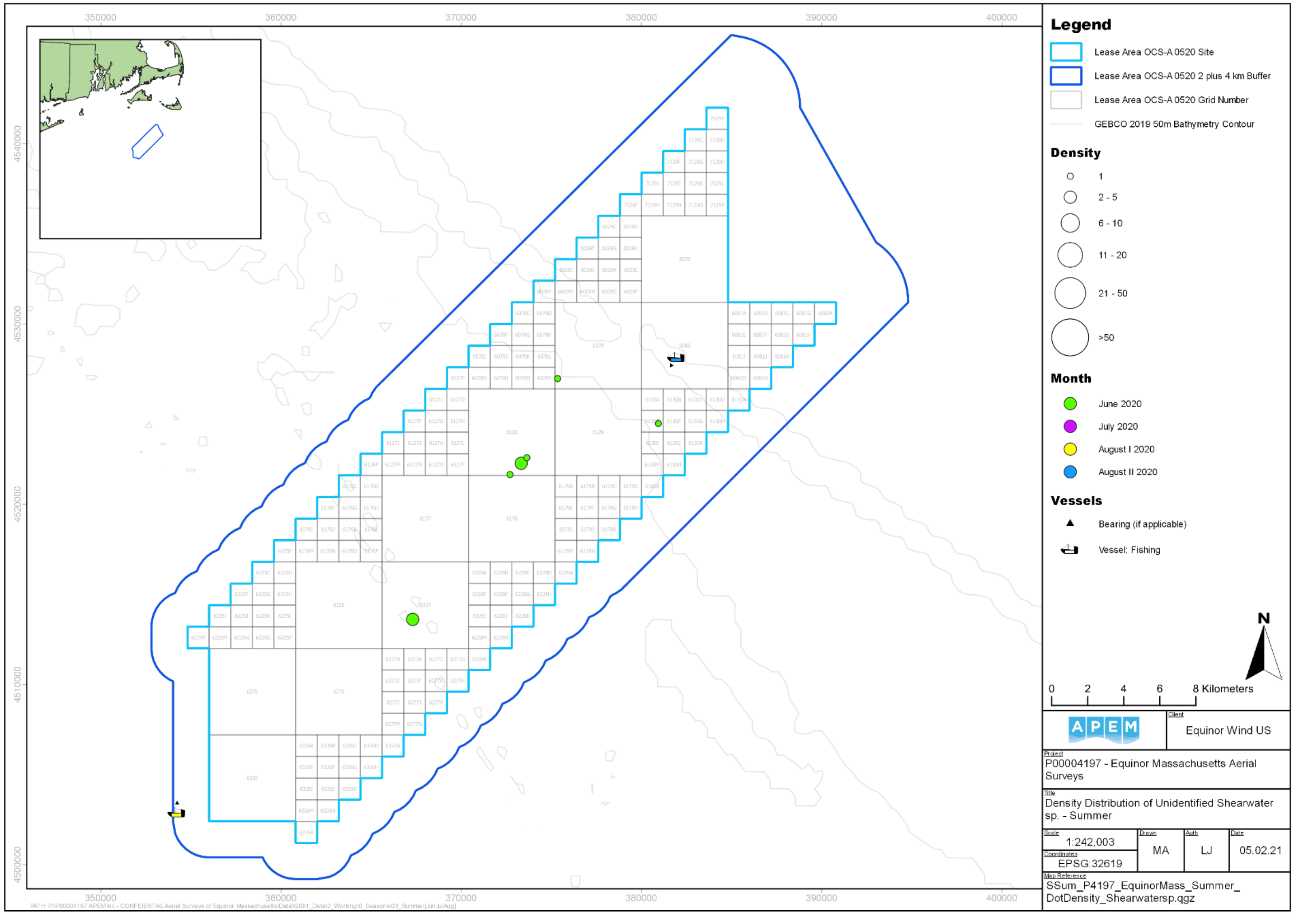

Figure 42 **Distribution of unidentified shearwaters recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

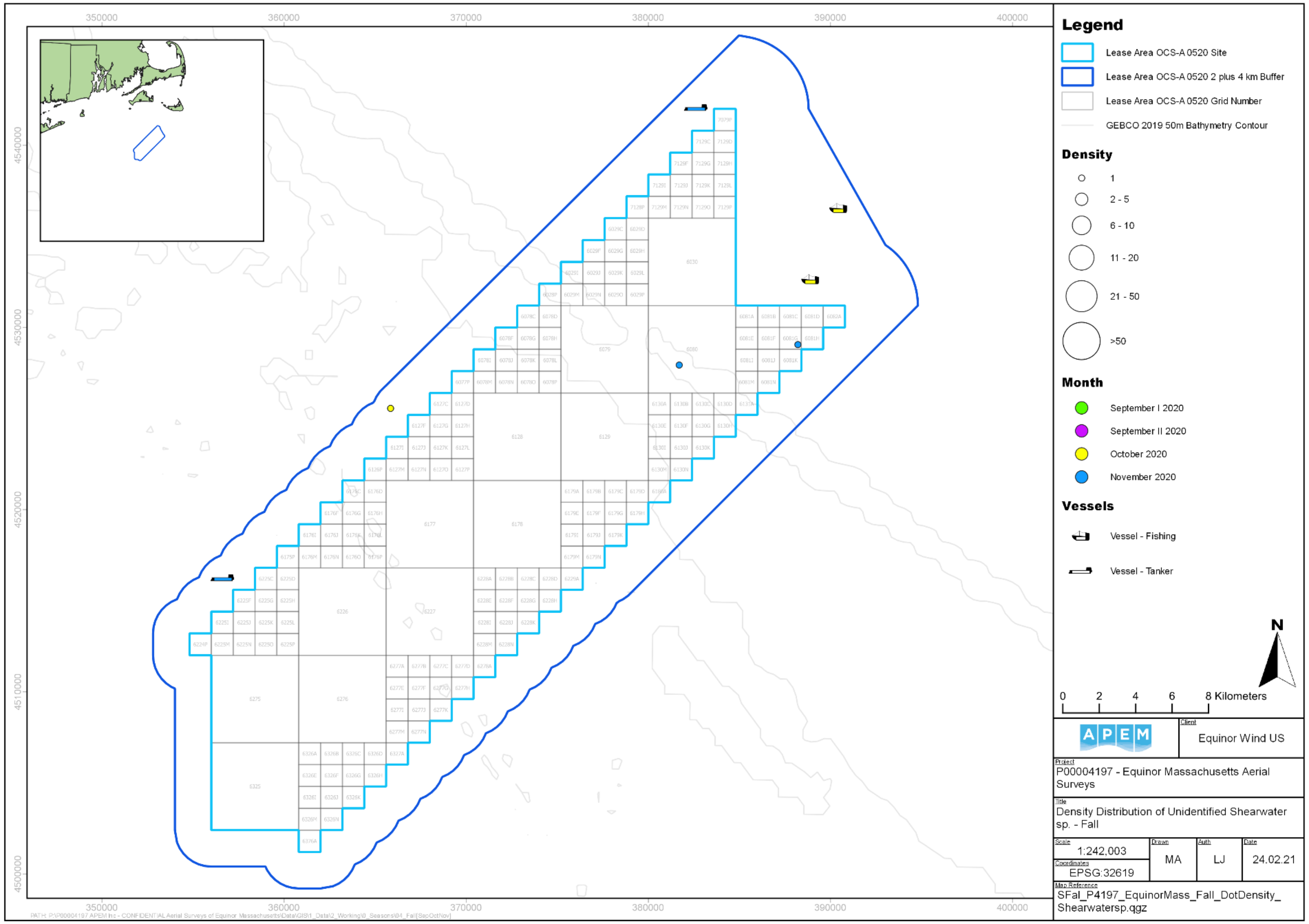

Figure 43 **Distribution of unidentified shearwaters recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.19 Wilson's Storm Petrel (*Oceanites oceanicus)*

Wilson's storm petrels were recorded in the May II survey only, with highest numbers therefore recorded in spring (**Table 1**). A peak count of one in the Site and four in the Buffer from the May II survey, led to abundance estimates of seven and 35 respectively (**Table 26**).

A total of five Wilson's storm petrels were recorded in the spring from the May II survey only (**Table 26**), predominantly distributed in the north of the Survey Area (**Figure 44**).

Table 26 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of Wilson's storm petrels in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
May II 20	5	40	0.05	5	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
May II 20	1	7	0.01	1	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
May II 20	4	35	0.1	4	0

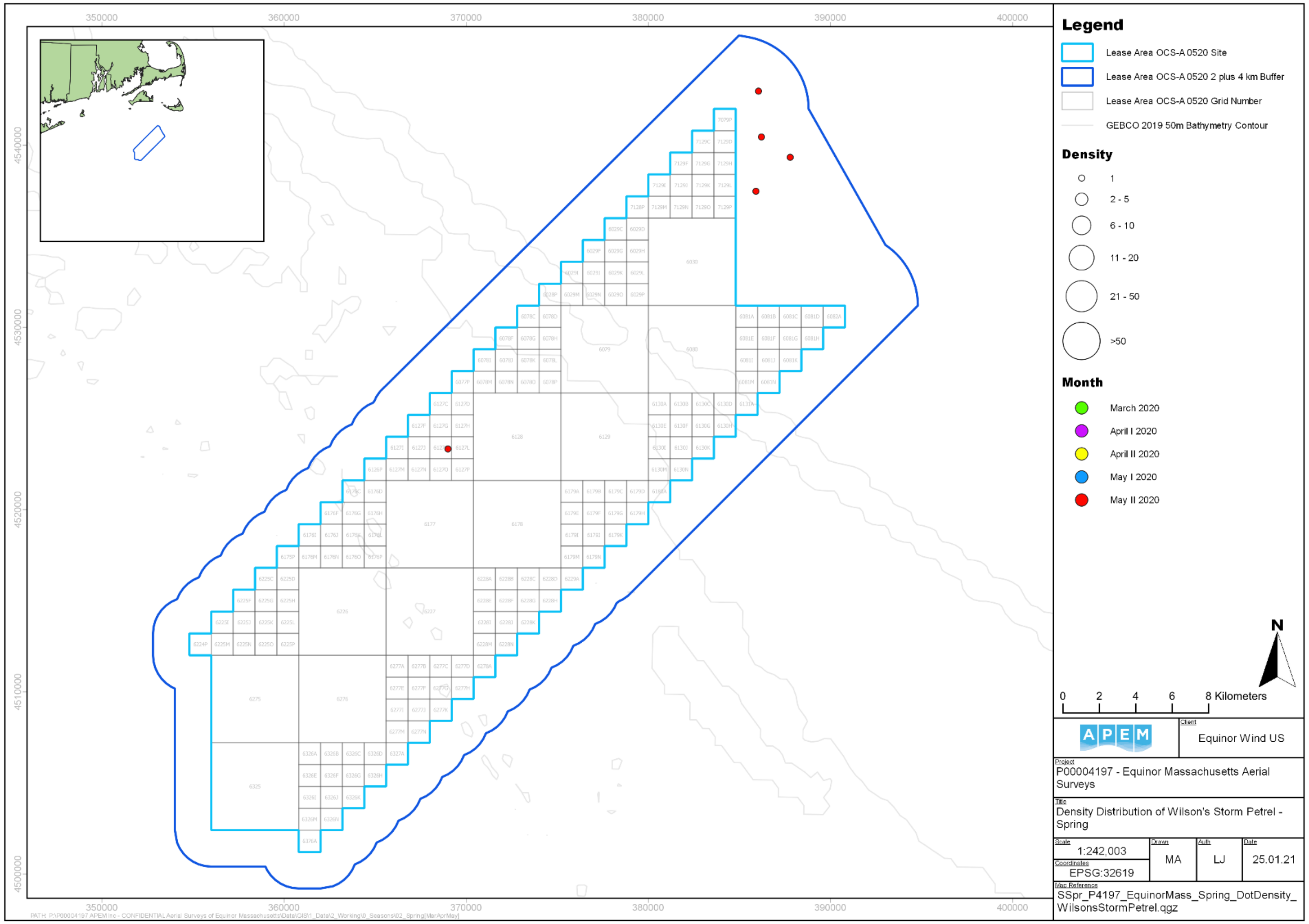

Figure 44 **Distribution of Wilson's storm petrels recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

5.20 Storm Petrel Species (Unidentified Hydrobatidae / Oceanitidae)

Unidentified storm petrels were recorded in spring, summer, and fall, with highest numbers recorded in summer (**Table 1**). A peak count of nine in the Survey Area from the June survey led to an abundance estimate of 72 (**Table 27**).

A total of two unidentified storm petrels were recorded in the spring (**Figure 45**), of which both were recorded in the April II survey in the southwest of the Survey Area (**Table 27**). A total of 18 storm petrels were recorded in the summer surveys (**Figure 46**), of which nine were recorded in June, six were recorded in July, and three were recorded in the first August survey (**Table 27**). Individuals were located southwest of the center of the Survey Area for June and were loosely distributed for July and August I (**Figure 46**). For the fall surveys, a total of one storm petrel was recorded in November (**Table 27**), located in the southwest of the Survey Area (**Figure 47**).

Table 27 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified storm petrels in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Apr II 20	2	16	0.02	2	0
Jun 20	9	72	0.08	9	0
Jul 20	6	48	0.06	5	1
Aug I 20	3	24	0.03	3	0
Nov 20	1	8	0.01	1	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Apr II 20	1	7	0.01	1	0
Jun 20	9	67	0.13	9	0
Jul 20	4	30	0.06	3	1
Aug I 20	1	7	0.01	1	0
Nov 20	1	7	0.01	1	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Apr II 20	1	9	0.03	1	0
Jun 20	0	0	-	0	0
Jul 20	2	18	0.05	2	0
Aug I 20	2	18	0.05	2	0
Nov 20	0	0	-	0	0

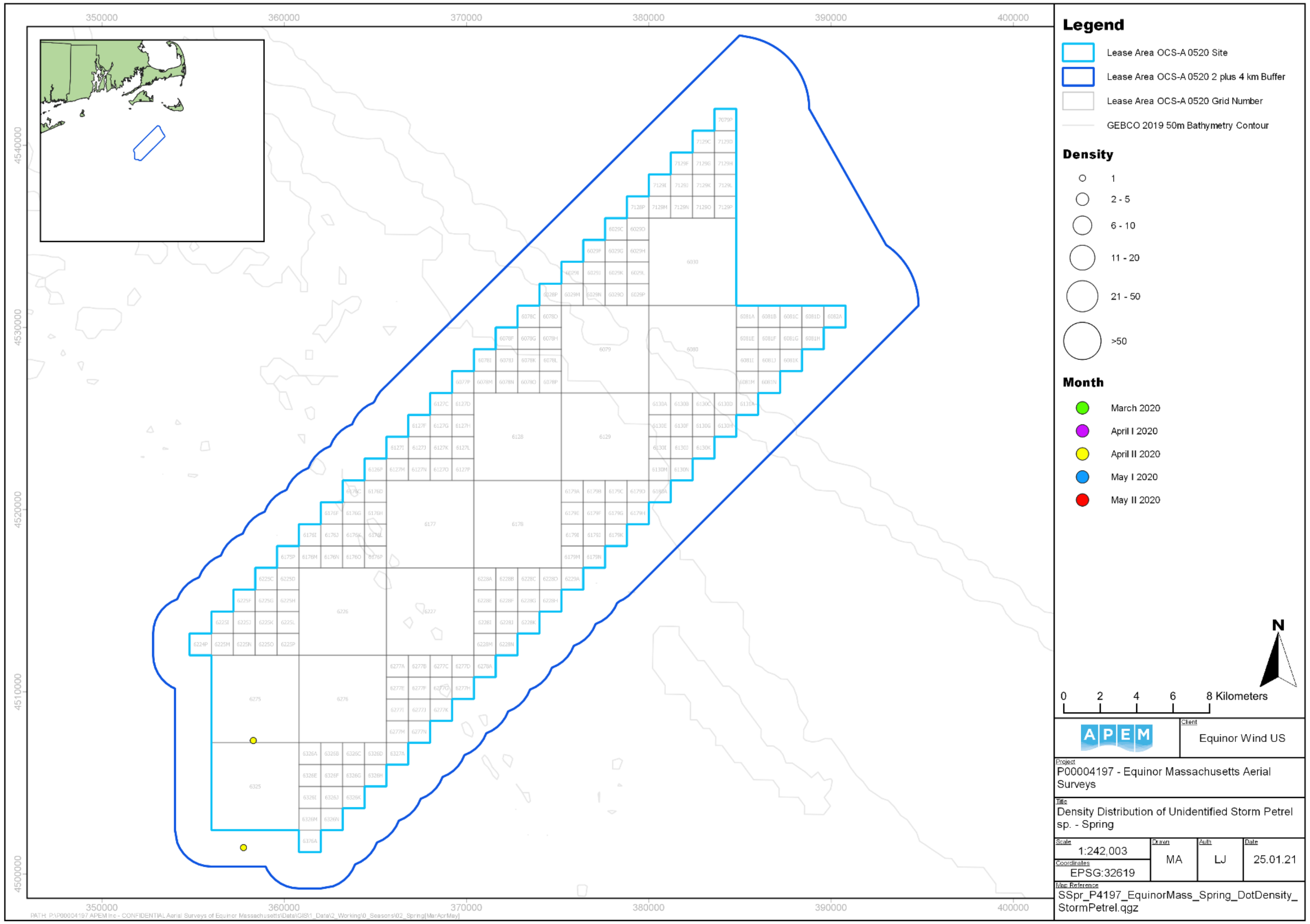

Figure 45 **Distribution of unidentified storm petrels recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

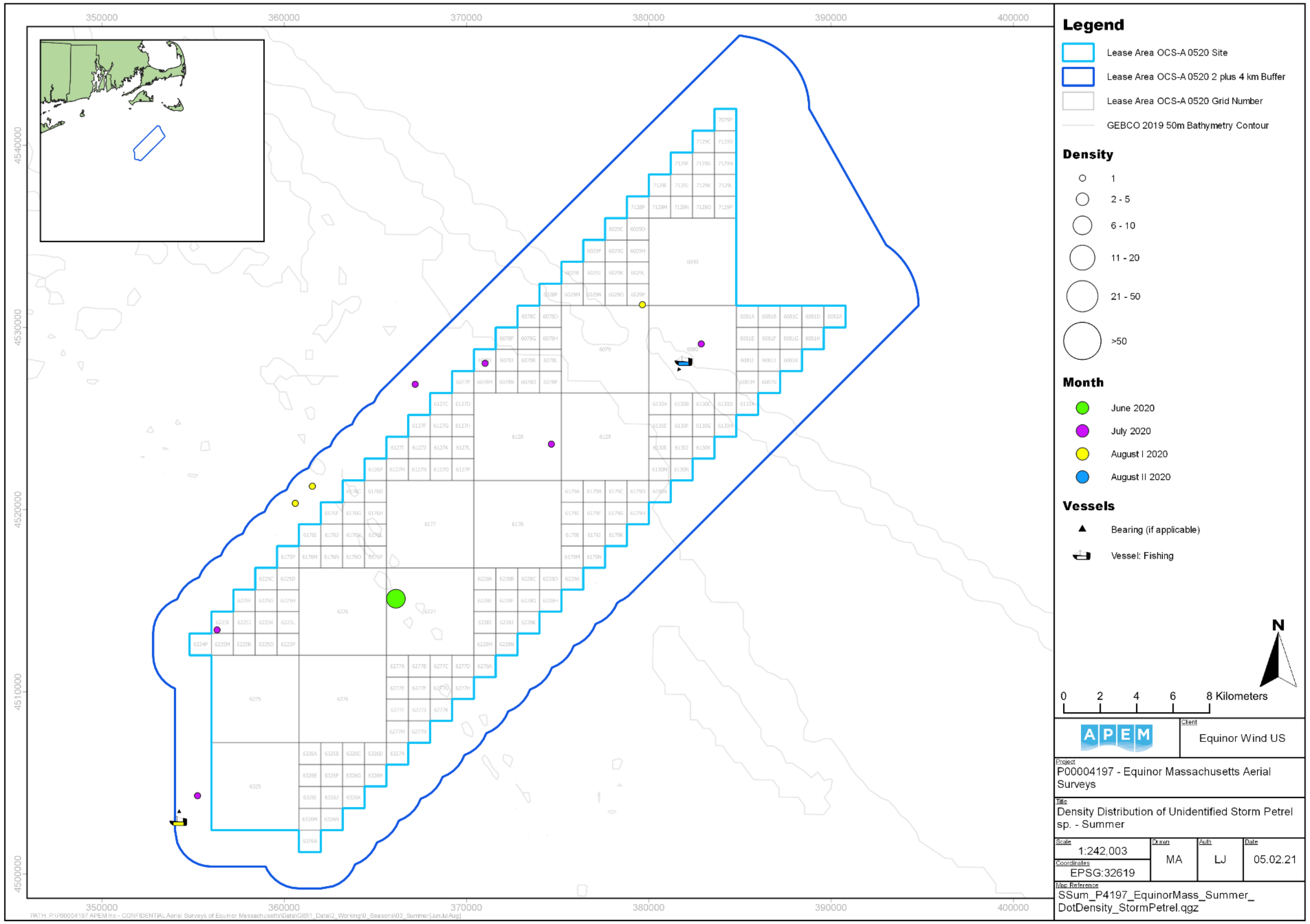

Figure 46 **Distribution of unidentified storm petrels recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

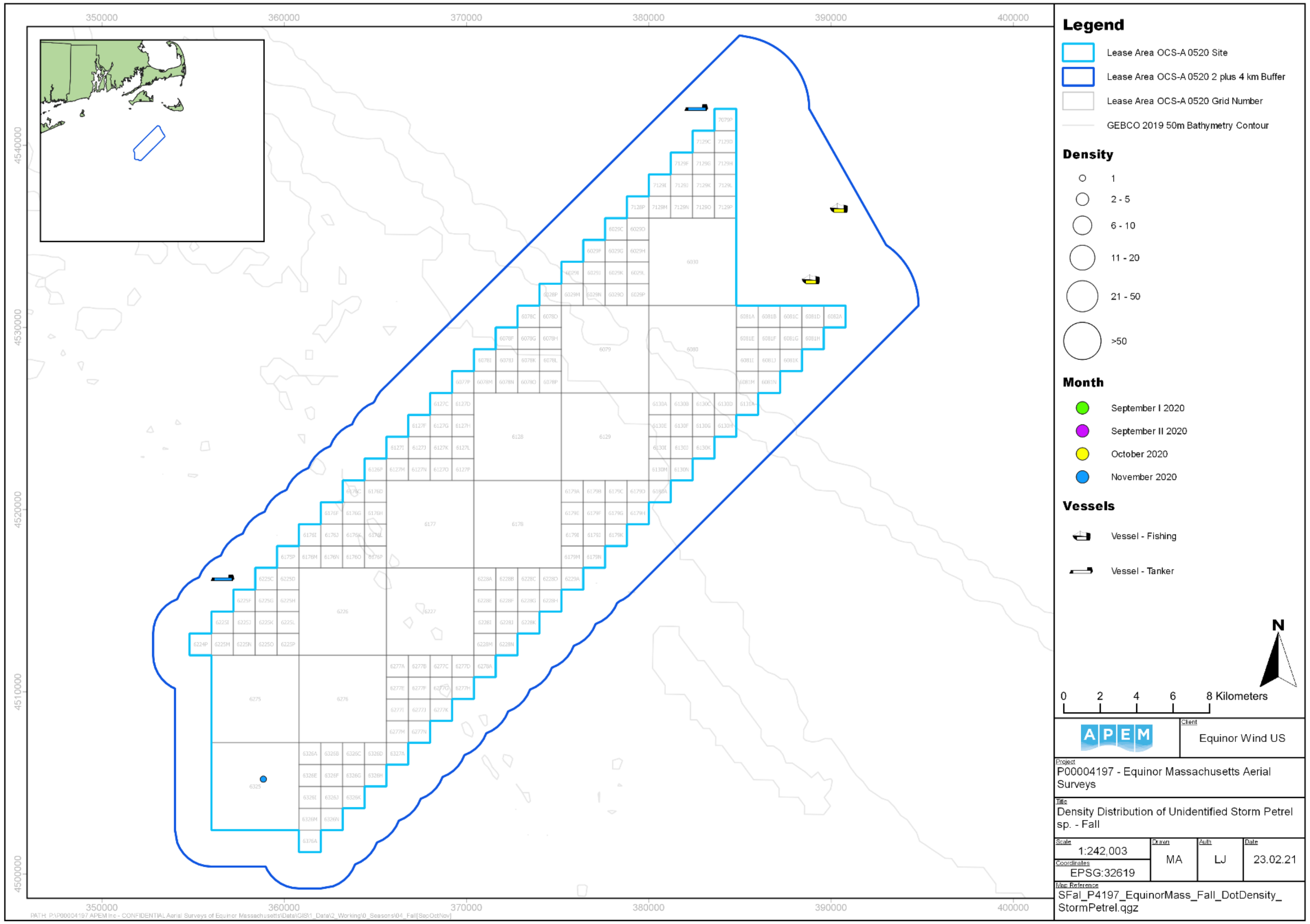

Figure 47 **Distribution of unidentified storm petrels recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.21 Northern Gannet (*Morus bassanus)*

Northern gannets were recorded in all four seasons, with highest numbers recorded in spring (**Table 1**). A peak count of 47 in the Site and 39 in the Buffer from the April **II** survey, led to abundance estimates of 350 and 345 respectively (**Table 28**).

A total of 38 northern gannets were recorded in the winter (**Figure 48**), of which 28 were recorded in the December 2019 survey, nine were recorded in the January survey, and one was recorded in the February survey (**Table 28**). For the December survey, gannets were predominantly located in one group to the north-northwest of the Survey Area, whilst distribution was loose across the Survey Area for January (**Figure 48**). The single gannet in February was located in the east of the Survey Area (**Figure 48**). A total of 108 gannets were recorded in the spring (**Figure 49**), of which three were recorded in the March survey, eight were recorded in the April **I** survey, 86 were recorded in the April **II** survey, and 11 were recorded in the May **I** survey (**Table 28**). For all four spring surveys, gannets were loosely distributed across the Survey Area, with small groups exhibited in the north to northwest for April **II**, and to the southwest for May **I** (**Figure 49**). A single gannet was recorded in the summer from the June survey (**Table 28**), located in the east of the Survey Area (**Figure 50**). A total of 24 gannets were recorded in the fall (**Figure 51**), of which one was recorded in the September **II** survey, two were recorded in the October survey, and 21 were recorded in the November survey (**Table 28**). For the September **II** and October surveys, gannets were distributed around the center of the Survey area, and for November, gannets were loosely distributed across the Survey Area (**Figure 51**).

Table 28 Raw counts and abundance and density estimates (No. estimated individuals per km²) of northern gannets in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Dec 19	28	222	0.26	5	23
Jan 20	9	71	0.08	6	3
Feb 20	1	8	0.01	1	0
Mar 20	3	24	0.03	3	0
Apr I 20	8	64	0.07	4	4
Apr II 20	86	683	0.8	18	68
May I 20	11	87	0.1	7	4
Jun 20	1	8	0.01	1	0
Sep II 20	1	8	0.01	0	1
Oct 20	2	16	0.02	2	0
Nov 20	21	167	0.19	19	2
b) Lease Area OCS-A 0520 Site					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Dec 19	3	22	0.04	3	0
Jan 20	8	60	0.12	5	3
Feb 20	0	0	-	0	0
Mar 20	3	22	0.04	3	0
Apr I 20	5	37	0.07	3	2
Apr II 20	47	350	0.67	10	37
May I 20	9	67	0.13	6	3

Jun 20	0	0	-	0	0
Sep II 20	1	7	0.01	0	1
Oct 20	2	15	0.03	2	0
Nov 20	2	15	0.03	2	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Dec 19	25	222	0.66	2	23
Jan 20	1	9	0.03	1	0
Feb 20	1	9	0.03	1	0
Mar 20	0	0	-	0	0
Apr I 20	3	27	0.08	1	2
Apr II 20	39	345	1.02	8	31
May I 20	2	18	0.05	1	1
Jun 20	1	9	0.03	1	0
Sep II 20	0	0	-	0	0
Oct 20	0	0	-	0	0
Nov 20	19	168	0.5	17	2

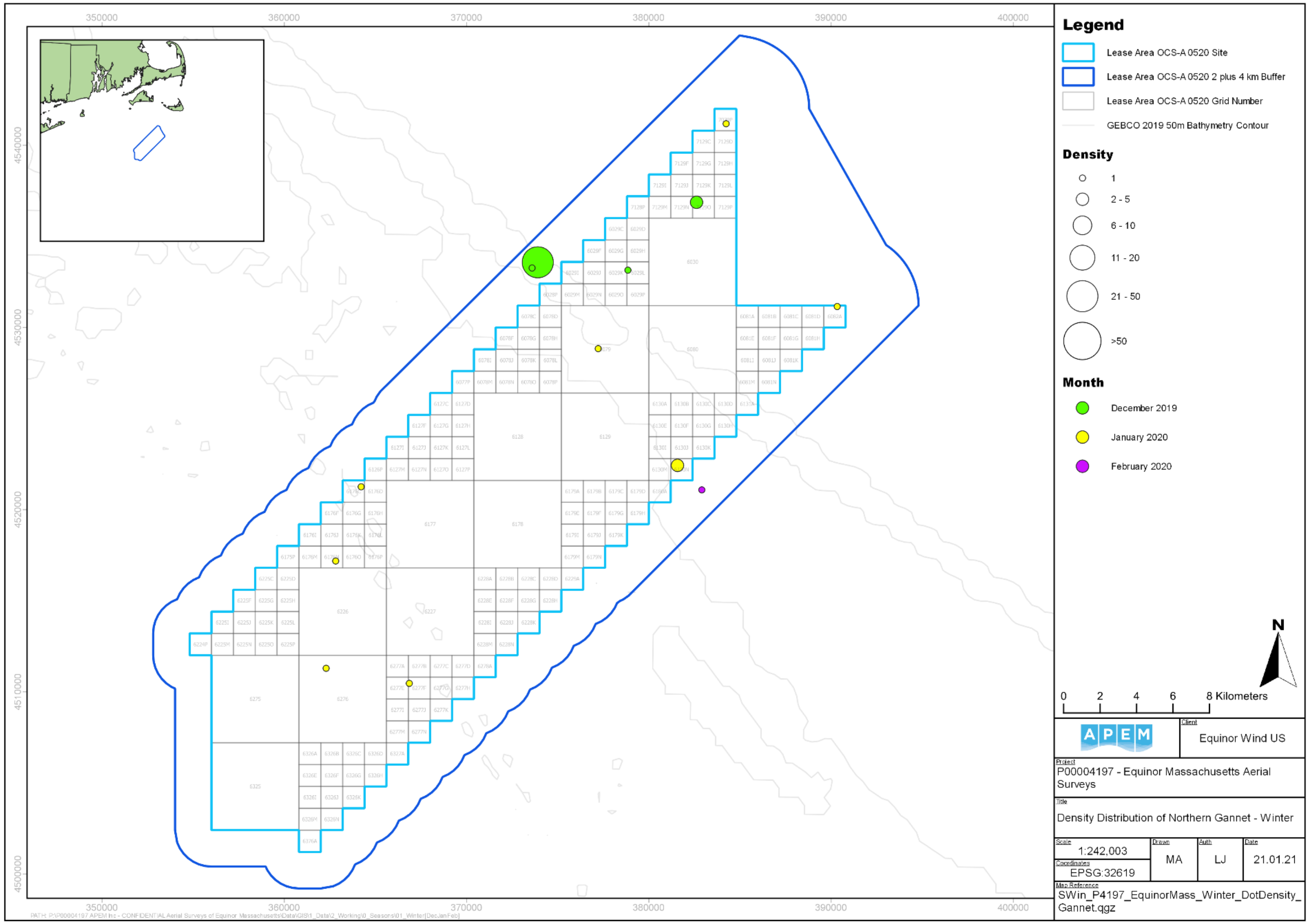

Figure 48 **Distribution of northern gannets recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the winter season**

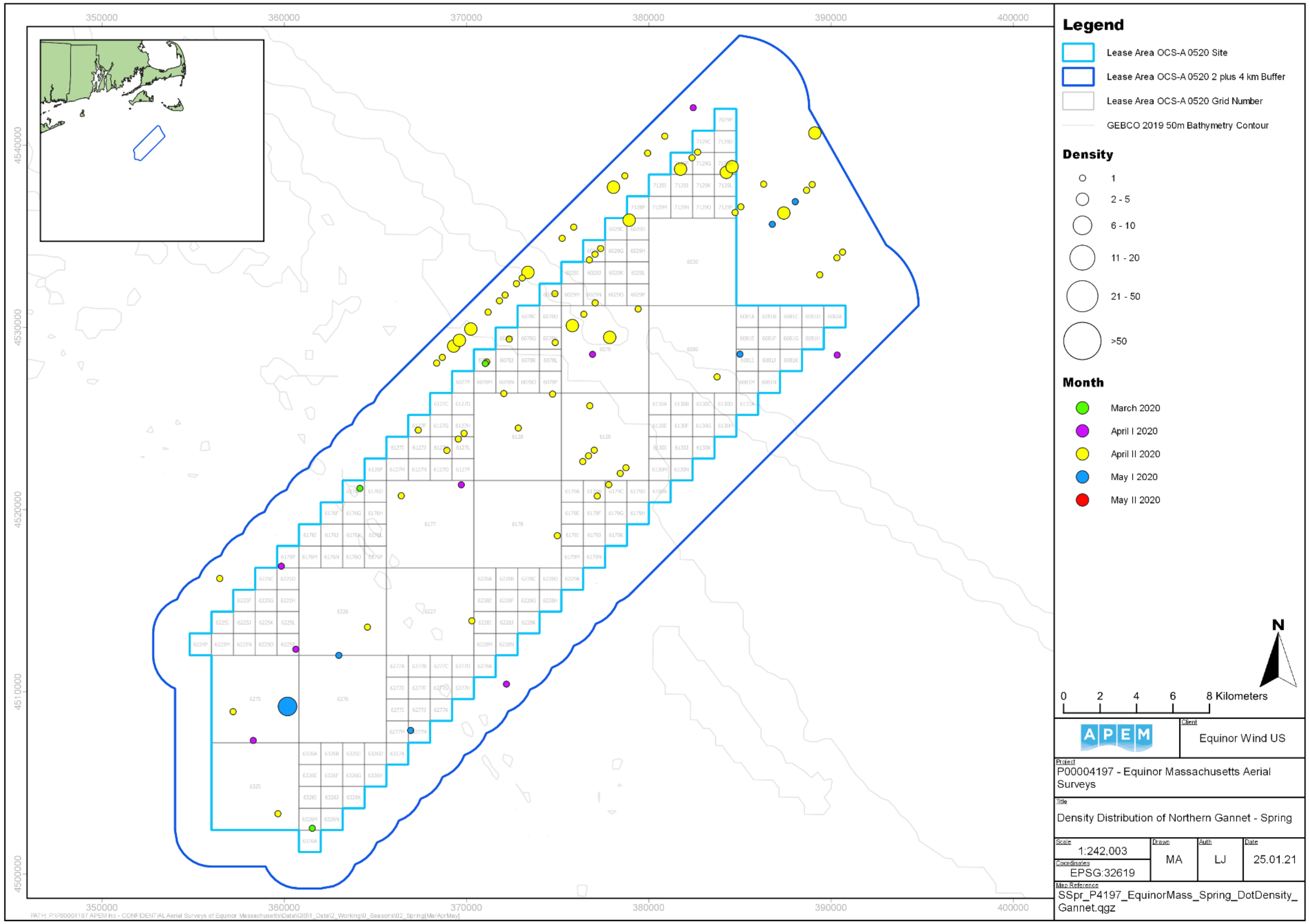

Figure 49 **Distribution of northern gannets recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

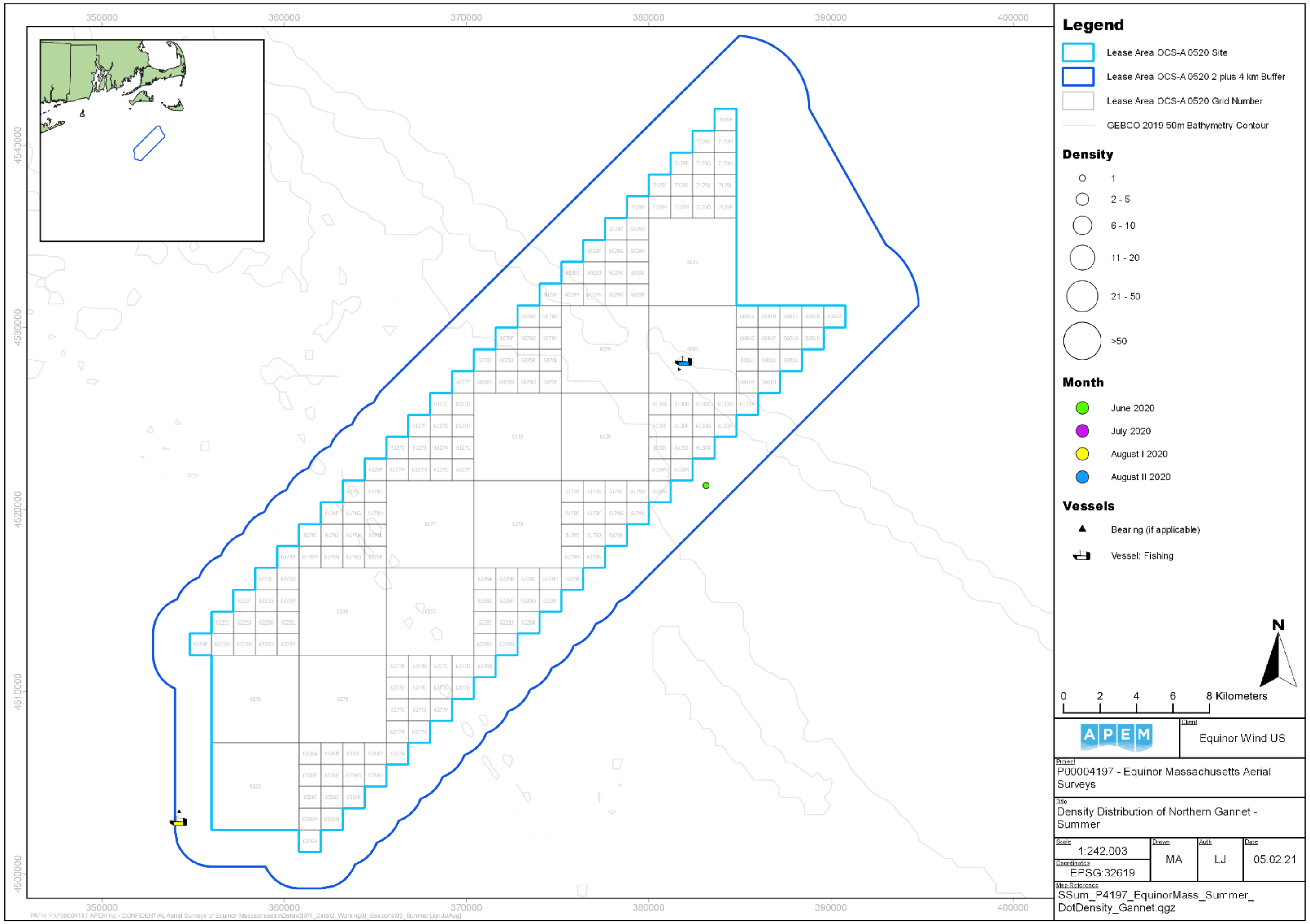

Figure 50 Distribution of northern gannets recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season

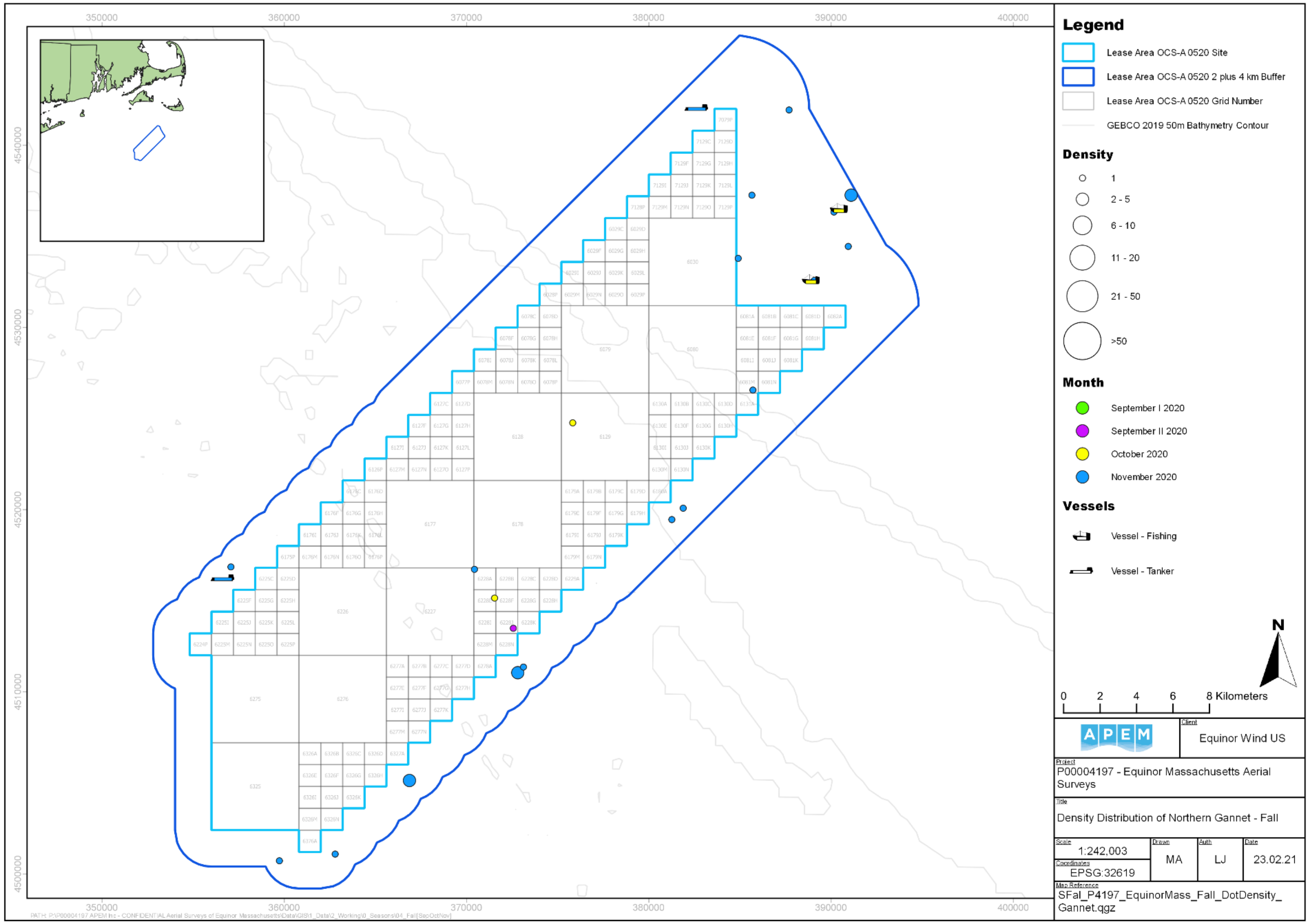

Figure 51 **Distribution of northern gannets recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.22 Cormorant Species (Unidentified Phalacrocoracidae)

Unidentified cormorants were recorded in the spring and fall surveys, with a total of one recorded per season (**Table 1**). A peak count of one was therefore recorded in the Survey Area from both the March and November surveys, which led to abundance estimates of eight for each (**Table 29**).

A total of one unidentified cormorant was recorded in the spring from the March survey (**Table 29**), located in the center of the Survey Area (**Figure 52**). A total of one unidentified cormorant was also recorded in the fall from the November survey (**Table 29**), located in the northwest of the Survey Area (**Figure 53**).

Table 29 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified cormorants in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Mar 20	1	8	0.01	0	1
Nov 20	1	8	0.01	0	1
b) Lease Area OCS-A 0520 Site					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Mar 20	1	7	0.01	0	1
Nov 20	1	7	0.01	0	1
c) 2 + 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Mar 20	0	0	-	0	0
Nov 20	0	0	-	0	0

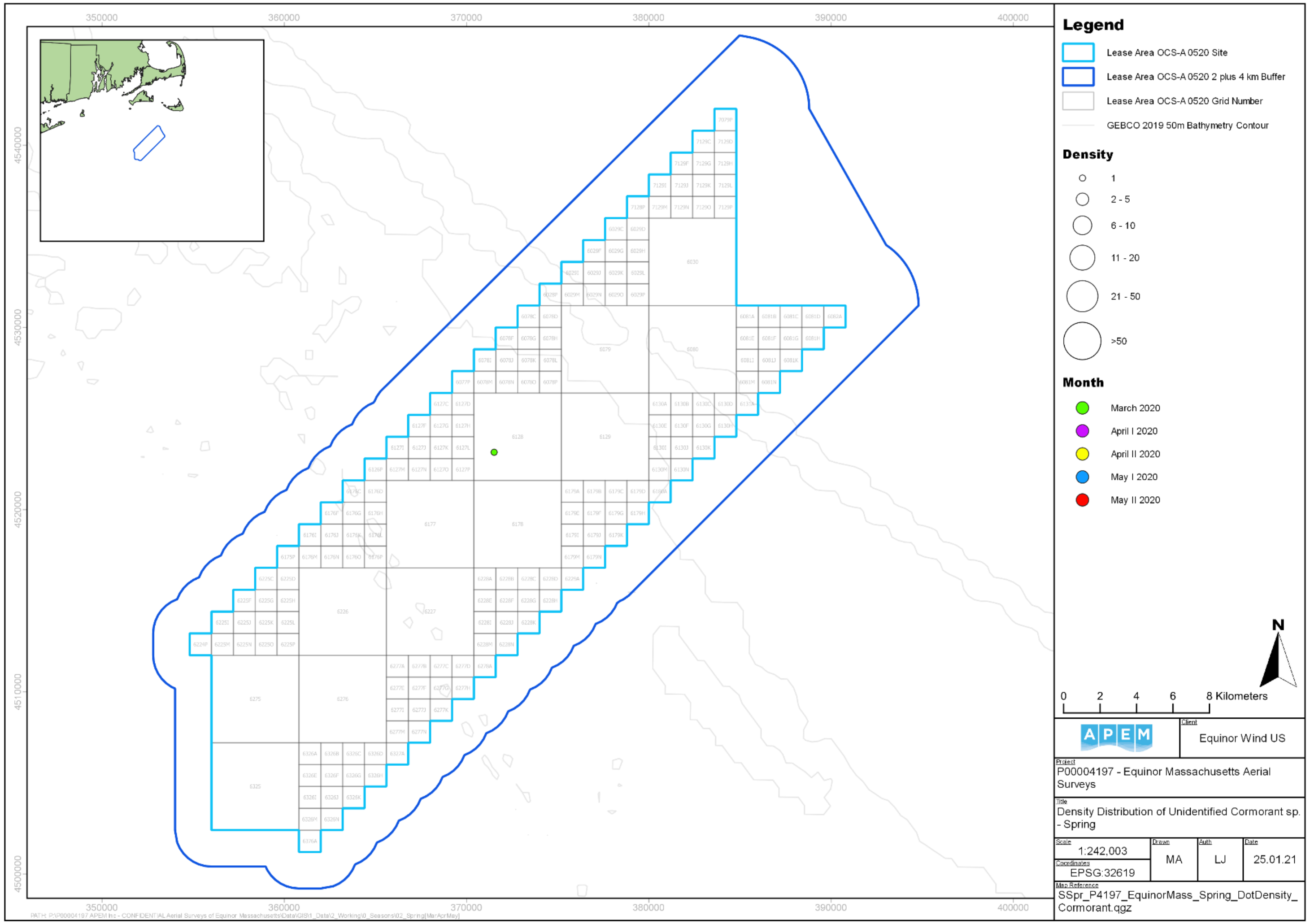

Figure 52 **Distribution of unidentified cormorants recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

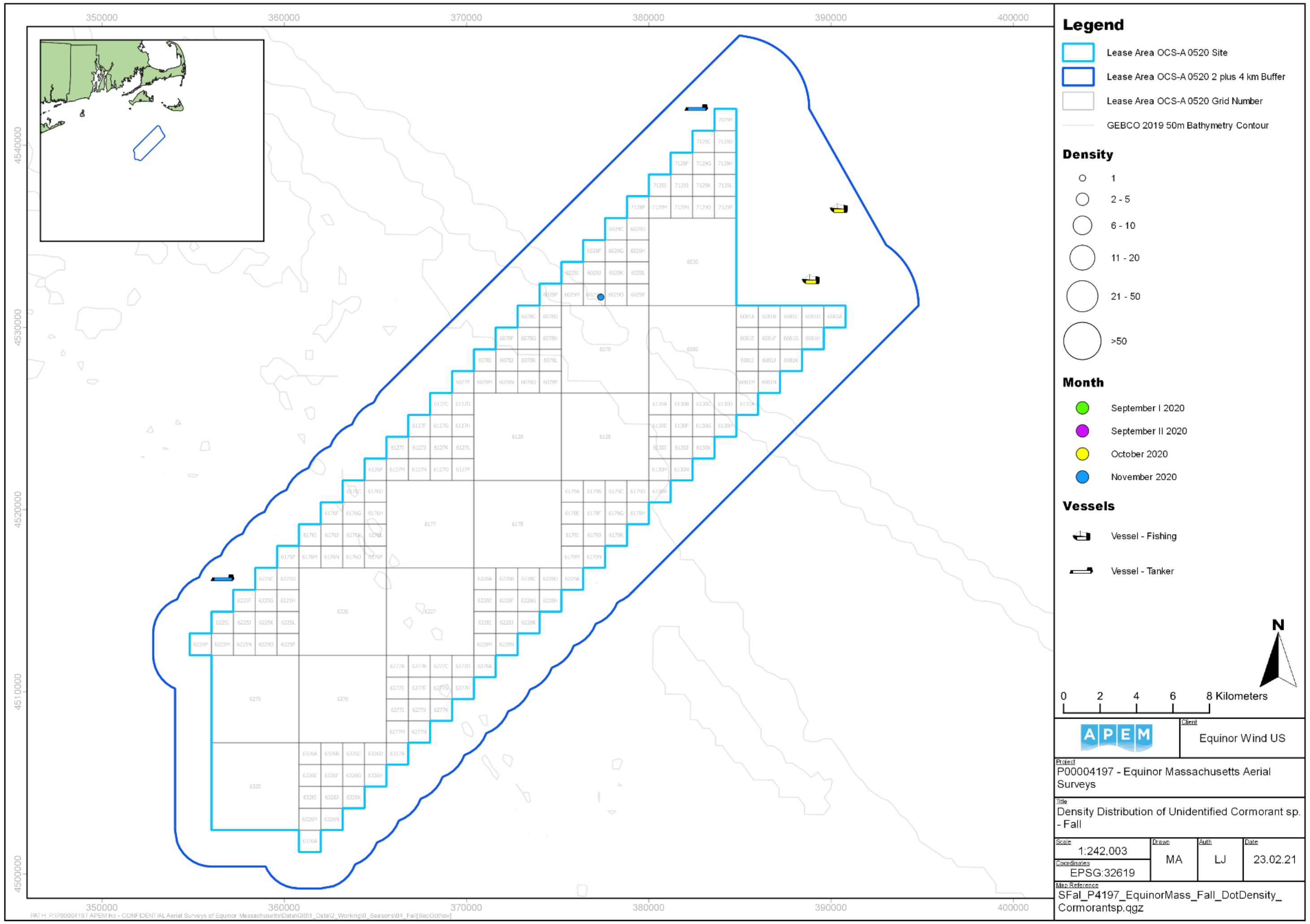

Figure 53 **Distribution of unidentified cormorants recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.23 Red Phalarope (*Phalaropus fulicarius)*

Red phalaropes were recorded in the November survey only, with highest numbers therefore recorded in fall (**Table 1**). A peak count of 13 in the Survey Area led to an abundance estimate of 103 (**Table 30**).

A total of 13 red phalaropes were recorded in the fall from the November survey only (**Table 30**), distributed in two groups; one in the northeast and one in the center of the Survey Area (**Figure 54**).

Table 30 Raw counts and abundance and density estimates (No. estimated individuals per km²) of red phalaropes in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Nov 20	13	103	0.12	0	13
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Nov 20	13	97	0.19	0	13
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Nov 20	0	0	-	0	0

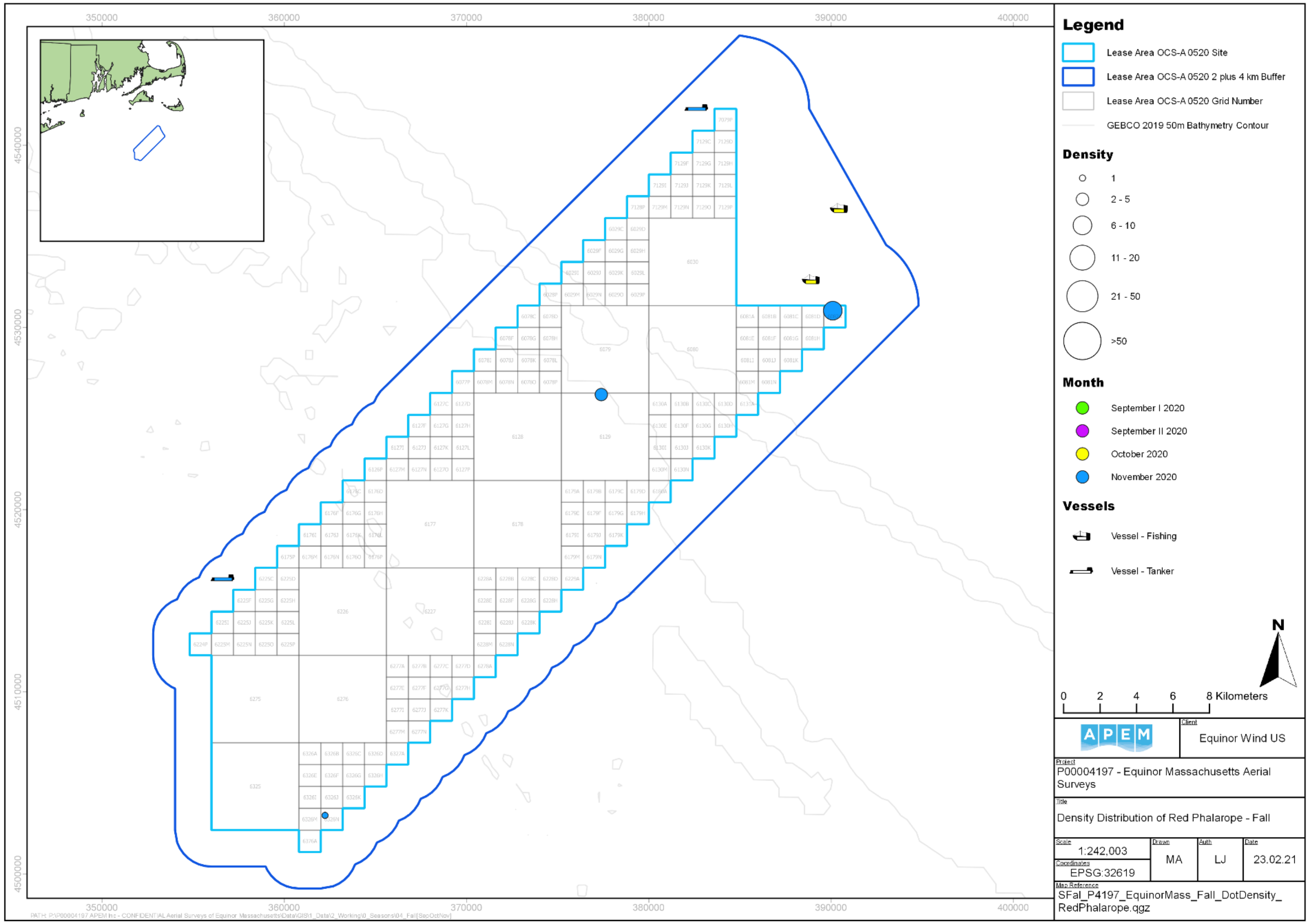

Figure 54 **Distribution of red phalaropes recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.24 Red / Red-necked Phalarope (*Phalaropus fulicarius / lobatus)*

Red / red-necked phalaropes were recorded in the August **II** survey only, with highest numbers therefore recorded in summer (**Table 1**). A peak count of 13 in the Survey Area from the August **II** survey, led to an abundance estimate of 103 (**Table 31**).

A total of 13 red / red-necked phalaropes were recorded in the summer from the August **II** survey only (**Table 31**), located in one group in the northeast of the Survey Area (**Figure 55**).

Table 31 Raw counts and abundance and density estimates (No. estimated individuals per km²) of red / red-necked phalaropes in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Aug II 20	13	103	0.12	13	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Aug II 20	0	0	-	0	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Aug II 20	13	115	0.34	13	0

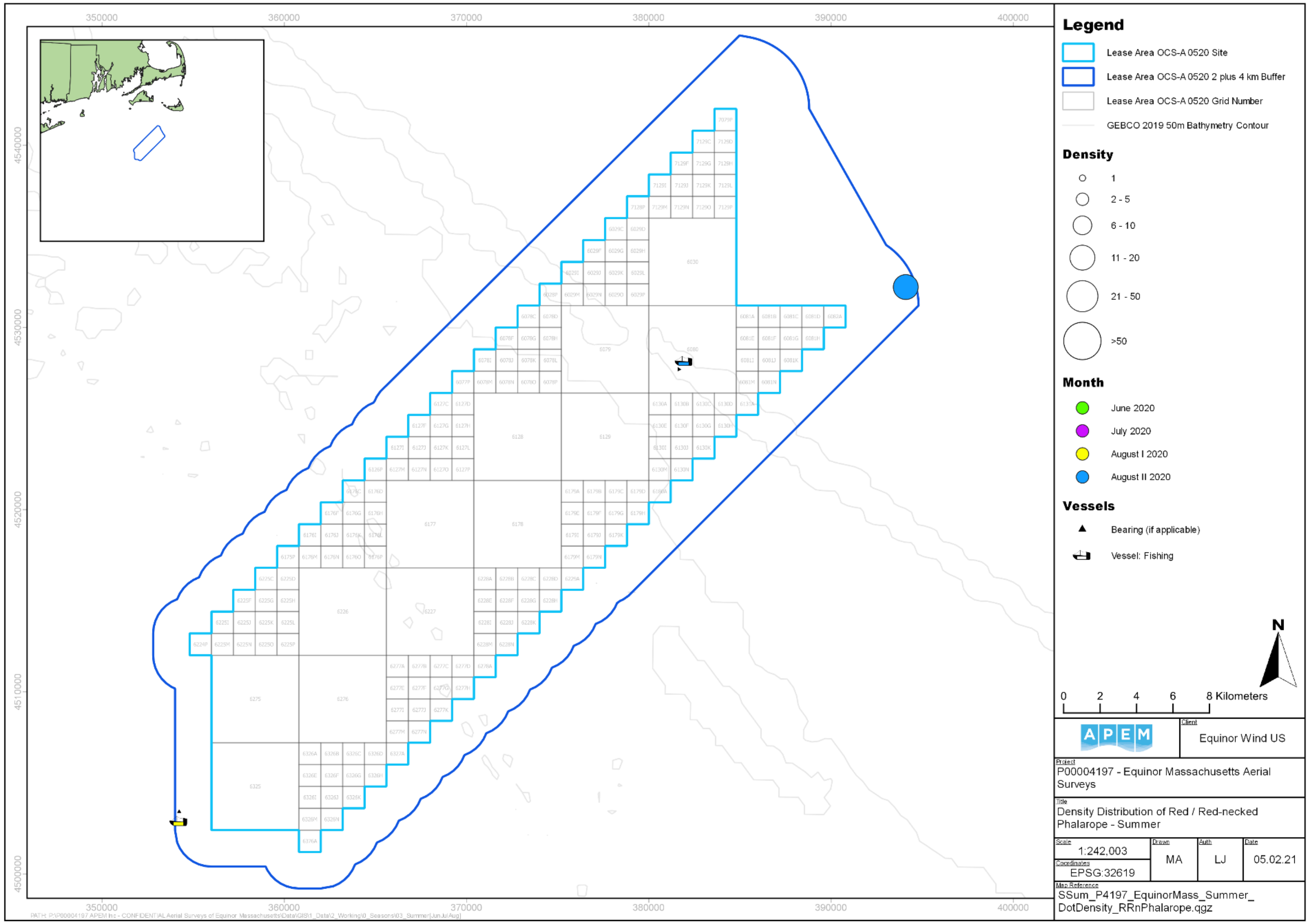

Figure 55 **Distribution of red / red-necked phalaropes recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

5.25 Parasitic Jaeger (*Stercorarius parasiticus)*

Parasitic jaegers were recorded in the summer and fall surveys, with highest numbers recorded in summer (**Table 1**). A peak count of two in the Survey Area from the August II survey, led to an abundance estimate of 16 (**Table 32**).

A total of two parasitic jaegers were recorded in the summer from the August II survey only (**Table 32**), located in the south-southwest of the Survey Area (**Figure 56**). A total of one jaeger was recorded in the fall from the September I survey (**Table 32**), located in the northwest of the Survey Area (**Figure 57**).

Table 32 Raw counts and abundance and density estimates (No. estimated individuals per km²) of parasitic jaegers in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Aug II 20	2	16	0.02	2	0
Sep I 20	1	8	0.01	1	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Aug II 20	2	15	0.03	2	0
Sep I 20	1	7	0.01	1	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Aug II 20	0	0	-	0	0
Sep I 20	0	0	-	0	0

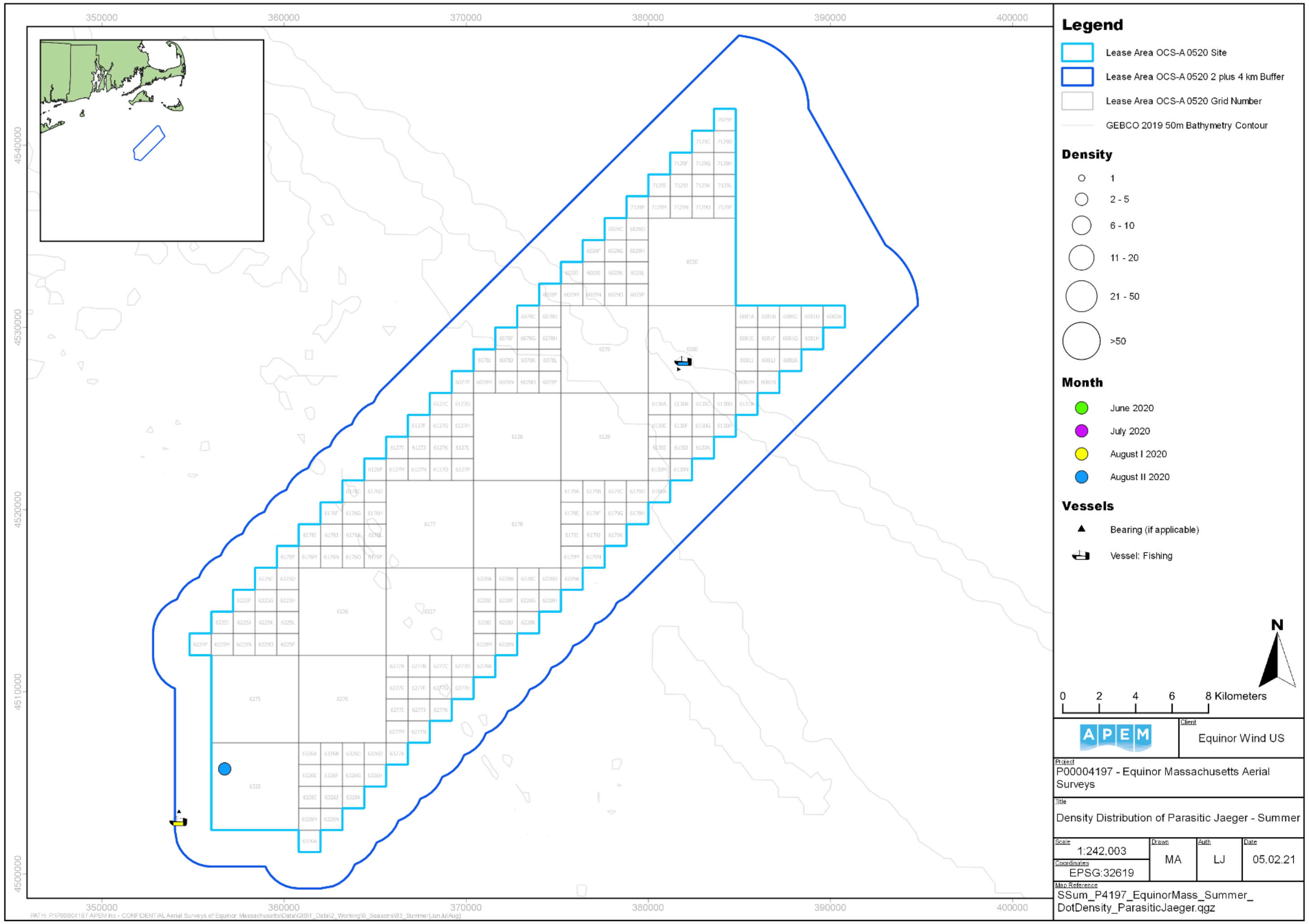

Figure 56 **Distribution of parasitic jaegers recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

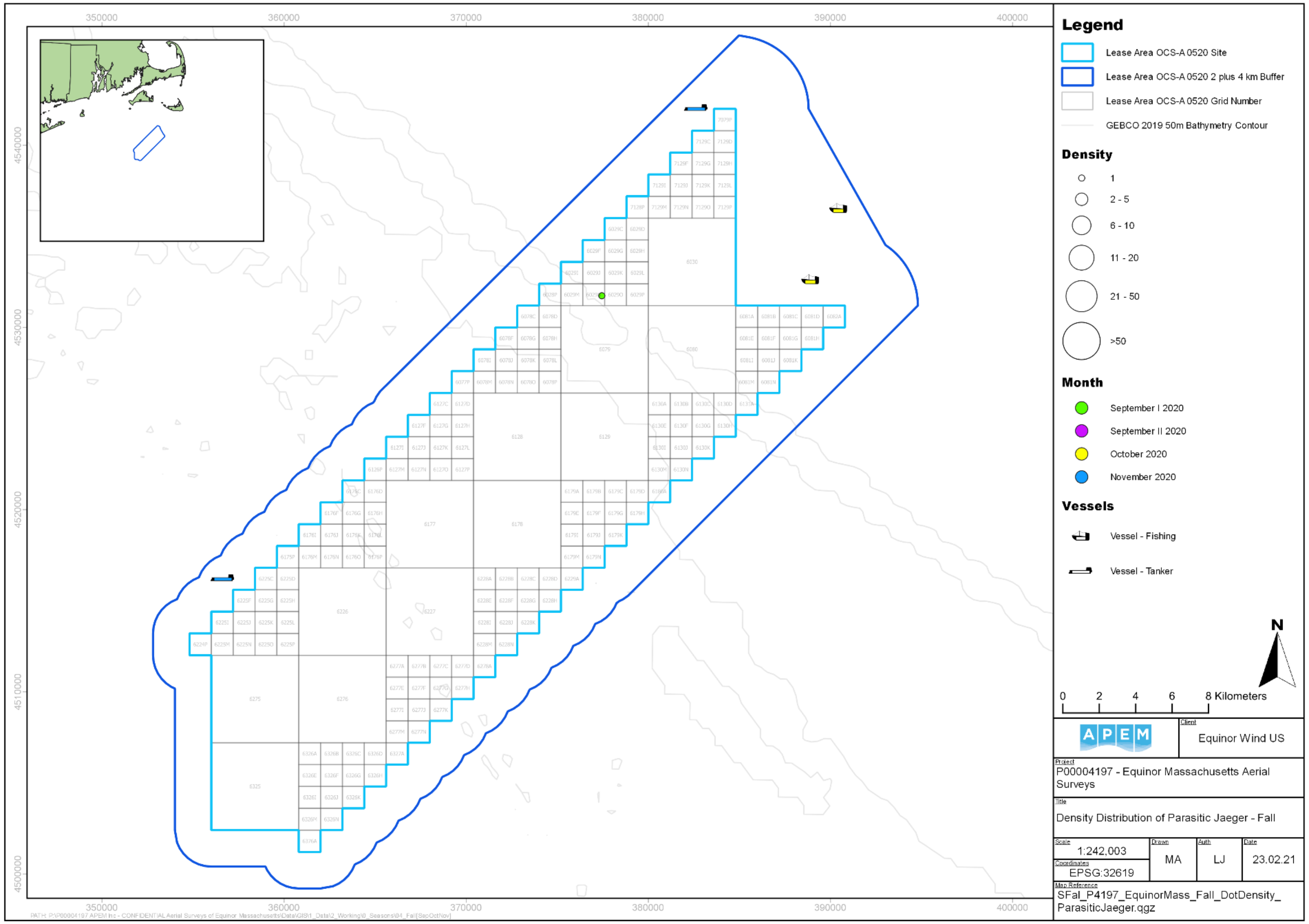

Figure 57 **Distribution of parasitic jaegers recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.26 Dovekie (*Alle alle*)

Dovekies were recorded in the February survey only, with highest numbers therefore recorded in winter (**Table 1**). A peak count of two in the Site and five in the Buffer from the February survey, led to abundance estimates of 15 and 45 respectively (**Table 33**).

A total of seven dovekies were recorded in the winter from the February survey only (**Table 33**), distributed loosely across the southern half of the Survey Area (**Figure 58**).

Table 33 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of dovekies in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Feb 20	7	56	0.07	0	7
b) Lease Area OCS-A 0520 Site					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Feb 20	2	15	0.03	0	2
c) 2 + 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Feb 20	5	45	0.13	0	5

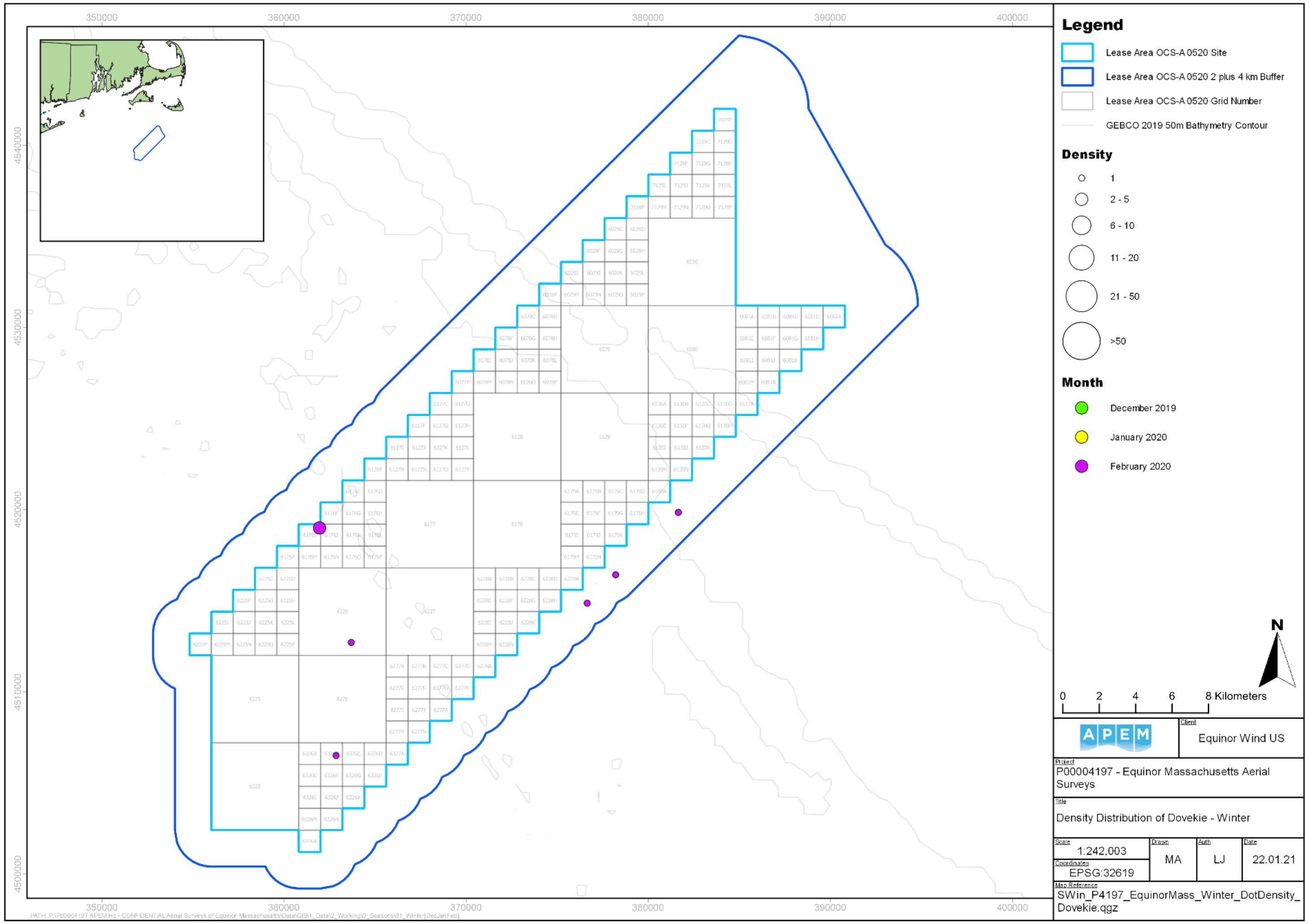

Figure 58 **Distribution of dovekies recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the winter season**

5.27 Common / Thick-billed Murre (*Uria aalge / lomvia)*

Common / thick-billed murres were recorded in the winter and spring surveys, with highest numbers recorded in spring (**Table 1**). A peak count of 59 in the Site and 54 in the Buffer from the April **I** survey, led to abundance estimates of 439 and 478 respectively (**Table 34**).

A total of one common / thick-billed murre was recorded in the winter from the December survey (**Table 34**), located south of the center of the Survey Area (**Figure 59**). A total of 142 murres were recorded in the spring (**Figure 60**), of which 113 were recorded in the April **I** survey, and 29 were recorded in the April **II** survey (**Table 34**). For the spring surveys, murres were loosely distributed across the Survey Area (**Figure 60**).

Table 34 Raw counts and abundance and density estimates (No. estimated individuals per km²) of common / thick-billed murres in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Dec 19	1	8	0.01	0	1
Apr I 20	113	897	1.04	3	110
Apr II 20	29	230	0.27	1	28
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Dec 19	1	7	0.01	0	1
Apr I 20	59	439	0.84	1	58
Apr II 20	9	67	0.13	0	9
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Dec 19	0	0	-	0	0
Apr I 20	54	478	1.42	2	52
Apr II 20	20	177	0.52	1	19

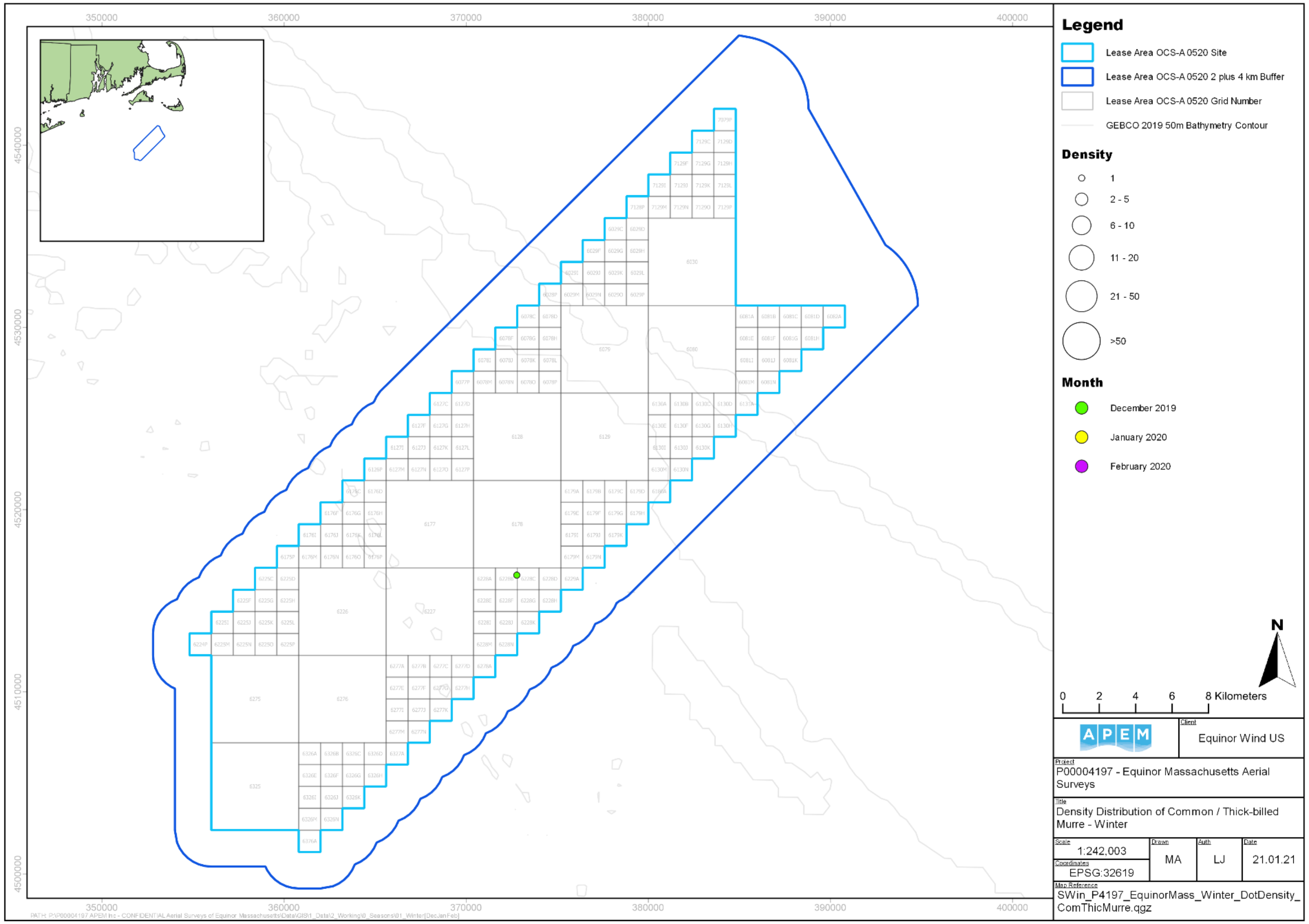

Figure 59 **Distribution of common / thick-billed murres recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the winter season**

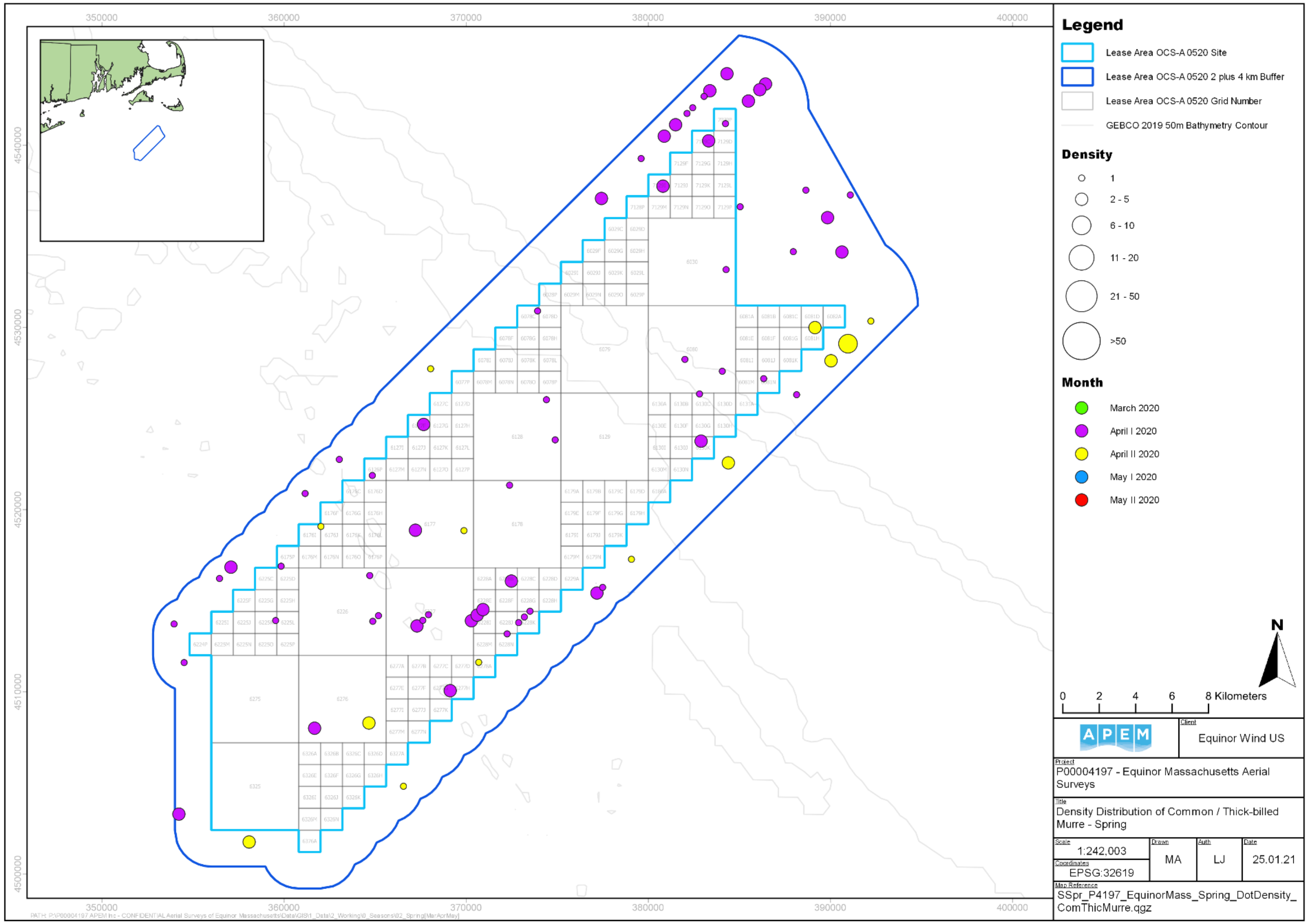

Figure 60 **Distribution of common / thick-billed murres recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

5.28 Razorbill (*Alca torda)*

Razorbills were recorded in the winter and spring surveys, with highest numbers recorded in the spring (**Table 1**). A peak count of 22 in the Site and 38 in the Buffer from the April I survey, led to abundance estimates of 164 and 336 respectively (**Table 35**).

A total of 21 razorbills were recorded in the winter from the December survey only (**Table 35**), distributed in small groups across the Survey Area (**Figure 61**). A total of 86 razorbills were recorded in the spring surveys (**Figure 62**), of which 60 were recorded in the April I survey and 26 were recorded in the April II survey (**Table 35**). For the spring surveys, razorbills were predominantly distributed from the southwest through to the north of the Survey Area (**Figure 62**).

Table 35 Raw counts and abundance and density estimates (No. estimated individuals per km²) of razorbills in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Dec 19	21	167	0.19	9	12
Apr I 20	60	477	0.56	1	59
Apr II 20	26	206	0.24	0	26
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Dec 19	16	119	0.23	8	8
Apr I 20	22	164	0.31	0	22
Apr II 20	21	156	0.3	0	21
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Dec 19	5	44	0.13	1	4
Apr I 20	38	336	1	1	37
Apr II 20	5	44	0.13	0	5

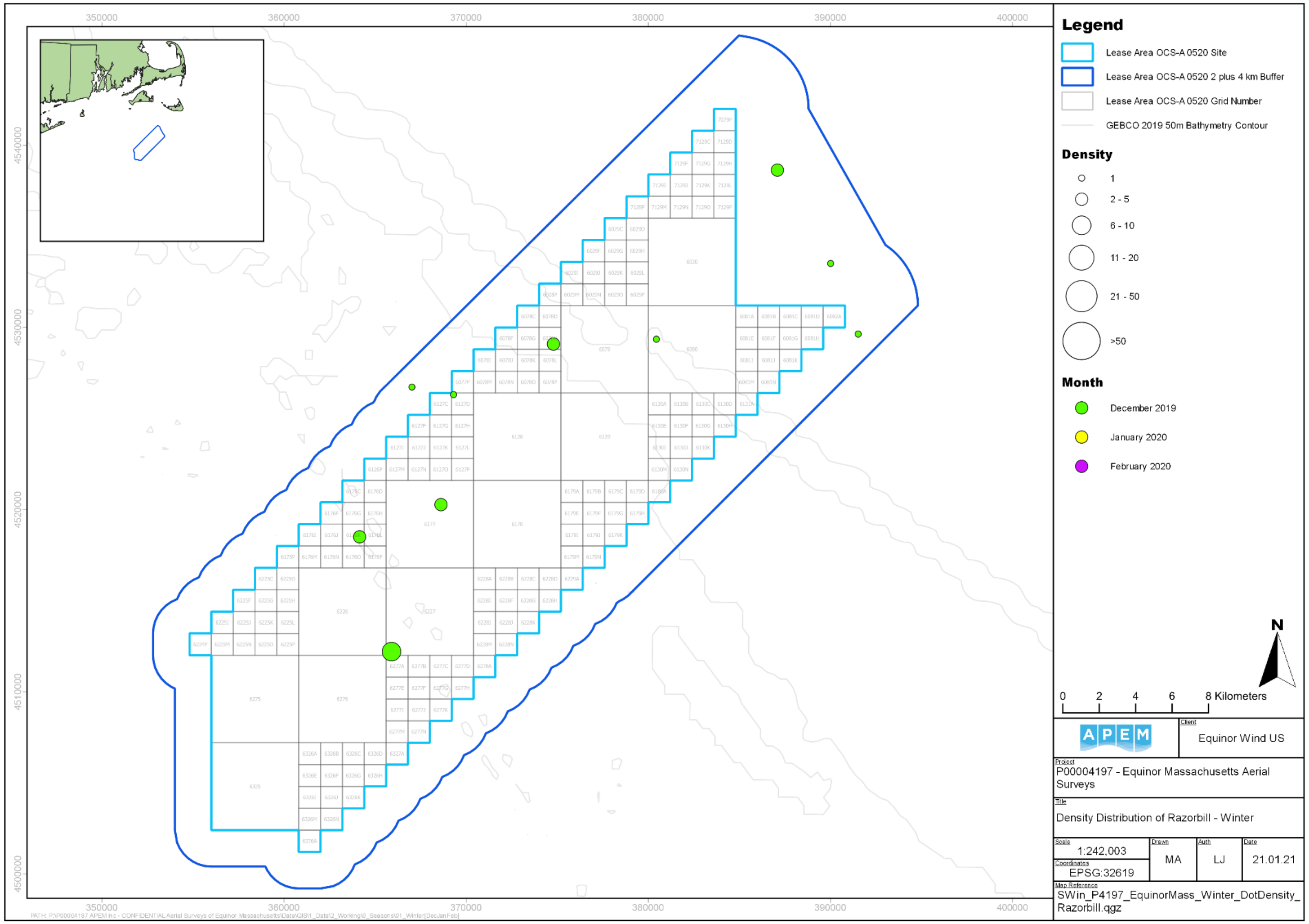

Figure 61 **Distribution of razorbills recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the winter season**

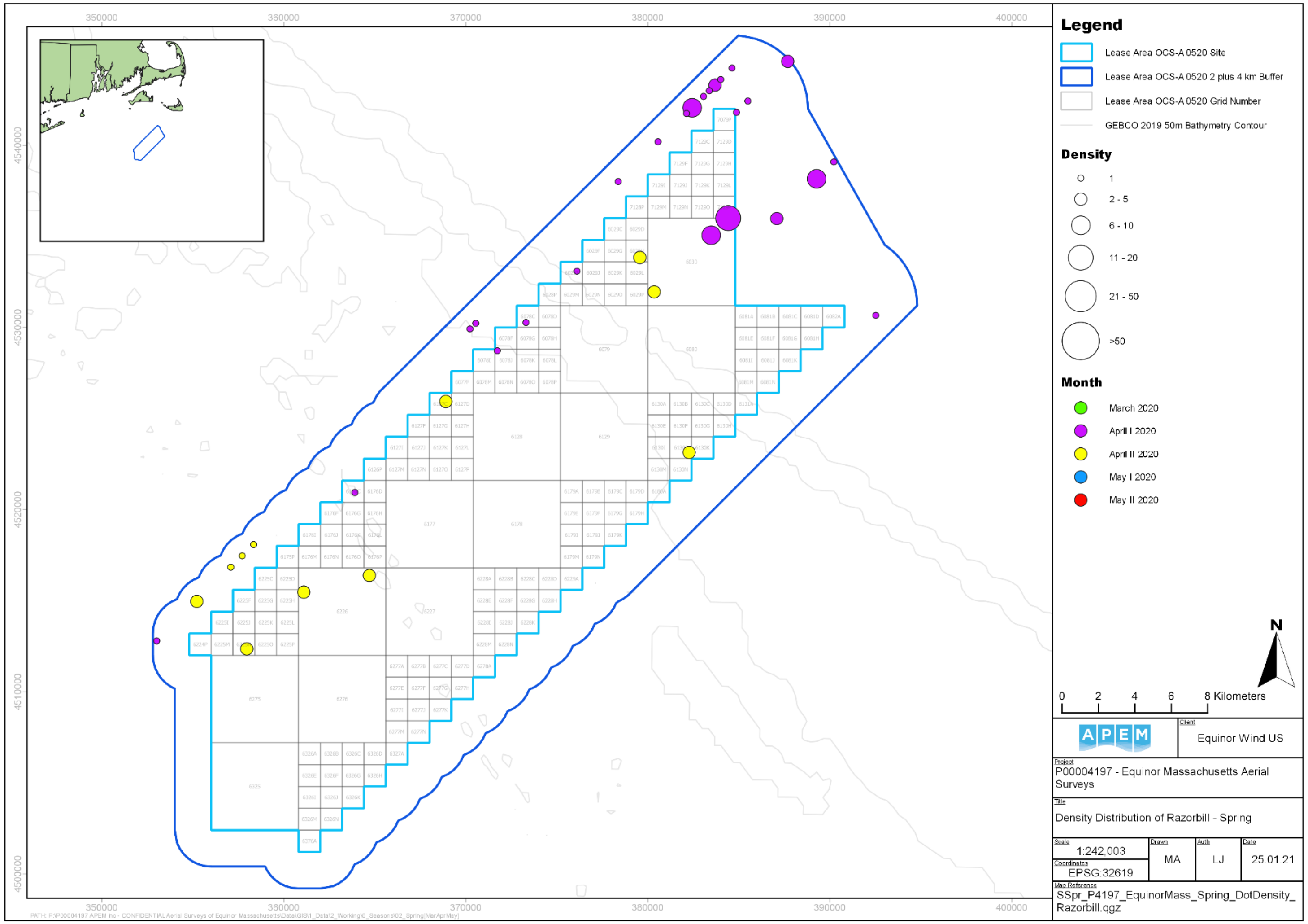

Figure 62 **Distribution of razorbills recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

5.29 Murre / Razorbill (*Uria aalge; lomvia / Alca torda)*

Murre / razorbills were recorded in the winter, spring, and fall surveys, with highest numbers recorded in the spring (**Table 1**). A peak count of 299 in the Site and 199 in the Buffer from the March survey, led to abundance estimates of 2,226 and 1,762 respectively (**Table 36**).

A total of 389 murre / razorbills were recorded in the winter (**Figure 63**), of which five were recorded in December 2019, 62 were recorded in January, and 322 were recorded in February (**Table 36**). For the December 2019 survey, murre / razorbills were located in two small groups; one in the center of the Survey Area, and one in the south (**Figure 63**). For the January and February surveys, murre / razorbills were predominantly distributed in small groups across the extent of the Survey Area (**Figure 63**). A total of 925 murre / razorbills were recorded in the spring (**Figure 64**), of which 498 were recorded in the March survey, 259 were recorded in the April **I** survey, and 168 were recorded in the April **II** survey (**Table 36**). For the spring surveys, murre / razorbills were distributed across the extent of the Survey area in varying group sizes (**Figure 64**). A total of 12 murre / razorbills were recorded in the fall from the November survey only (**Table 36**), distributed loosely across the Survey Area (**Figure 65**).

Table 36 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of murre / razorbills in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Dec 19	5	40	0.05	2	3
Jan 20	62	492	0.57	18	44
Feb 20	322	2,573	3	7	315
Mar 20	498	3,955	4.6	25	473
Apr I 20	259	2,057	2.39	3	256
Apr II 20	168	1,334	1.55	1	167
Nov 20	12	95	0.11	1	11
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Dec 19	5	37	0.07	2	3
Jan 20	38	283	0.54	17	21
Feb 20	216	1,618	3.1	2	214
Mar 20	299	2,226	4.27	16	283
Apr I 20	101	752	1.44	3	98
Apr II 20	149	1,110	2.13	1	148
Nov 20	6	45	0.09	1	5
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Dec 19	0	0	-	0	0
Jan 20	24	212	0.63	1	23
Feb 20	106	944	2.8	5	101
Mar 20	199	1,762	5.22	9	190
Apr I 20	158	1,399	4.14	0	158
Apr II 20	19	168	0.5	0	19
Nov 20	6	53	0.16	0	6

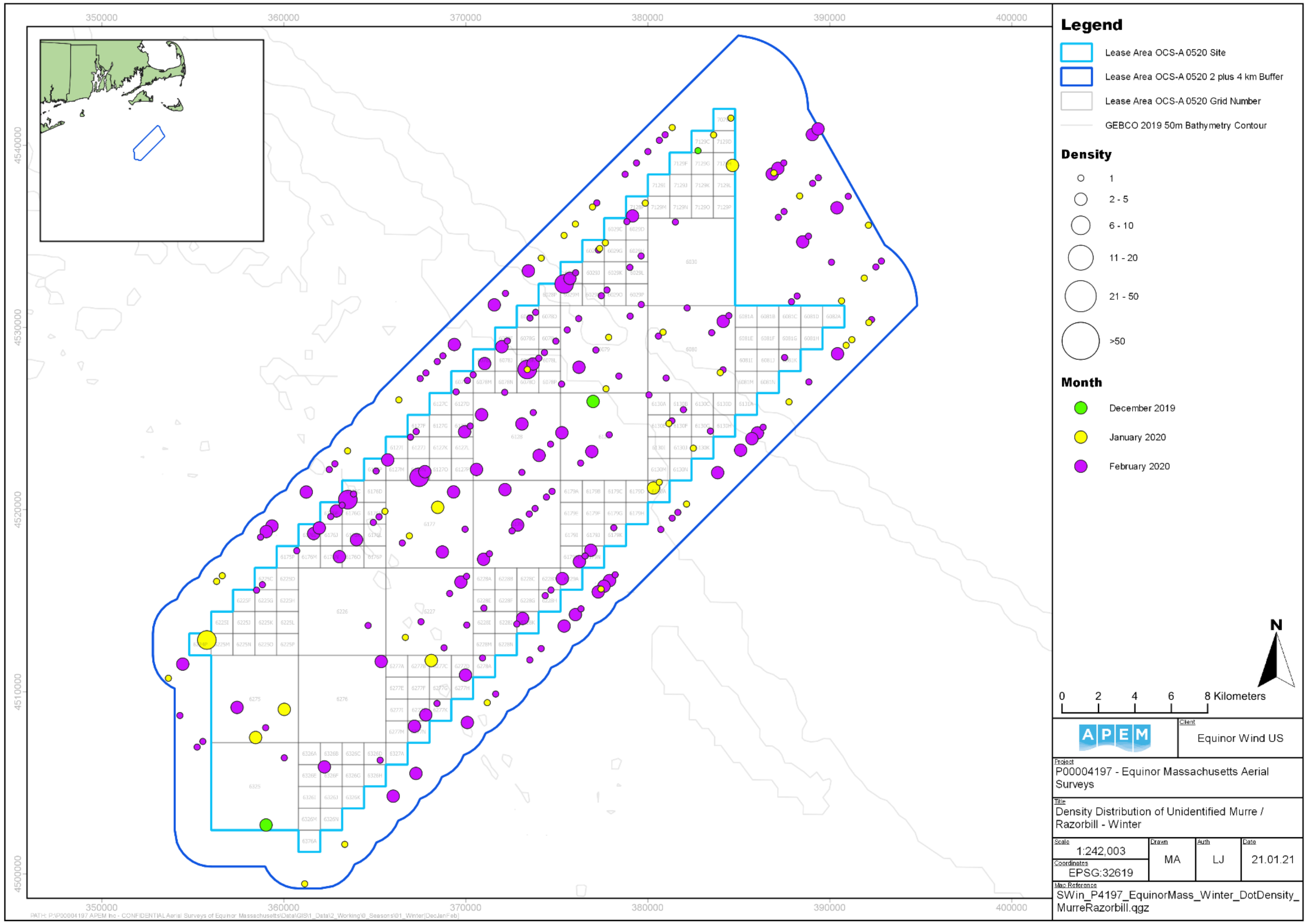

Figure 63 **Distribution of murre / razorbills recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the winter season**

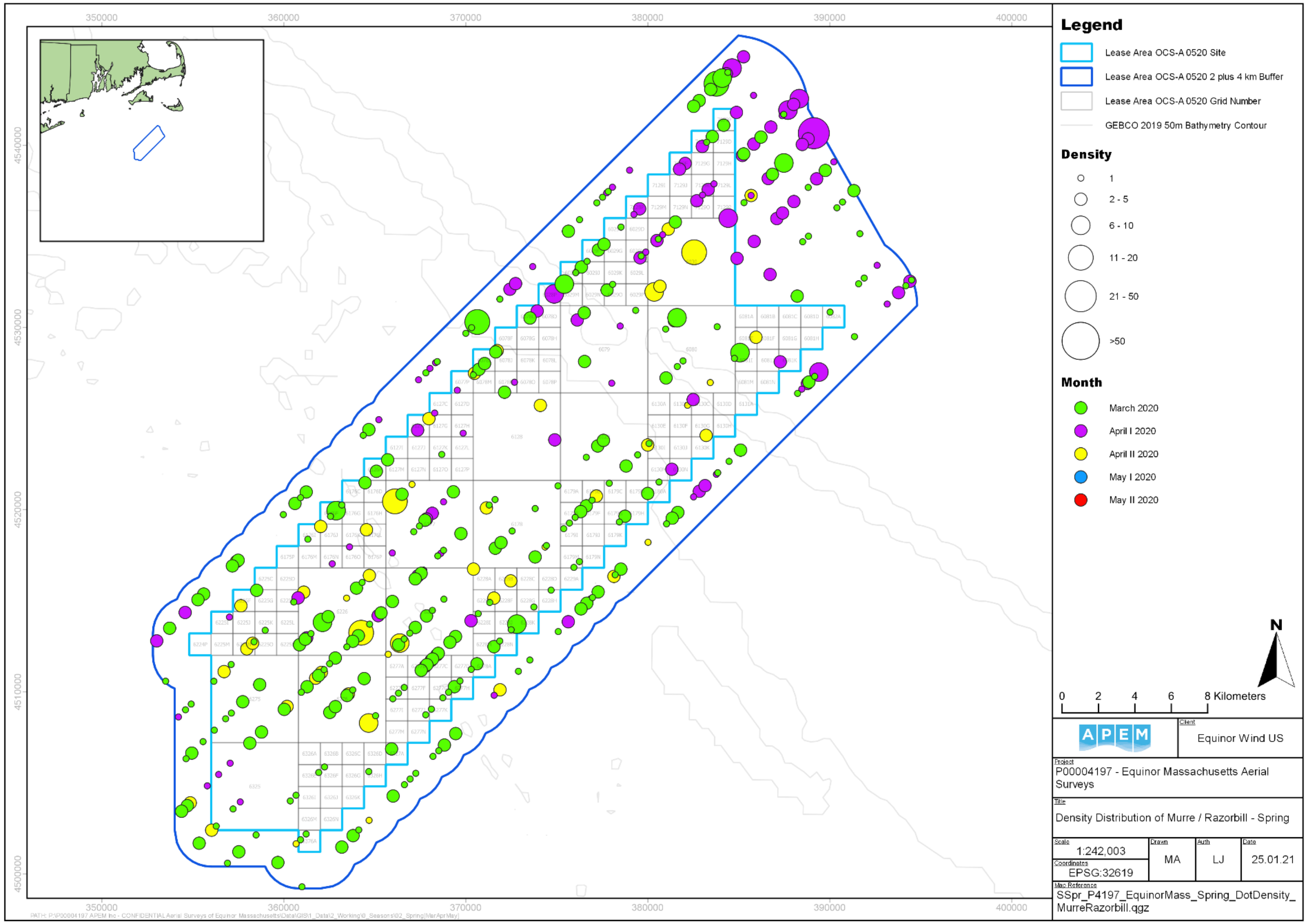

Figure 64 **Distribution of murre / razorbills recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

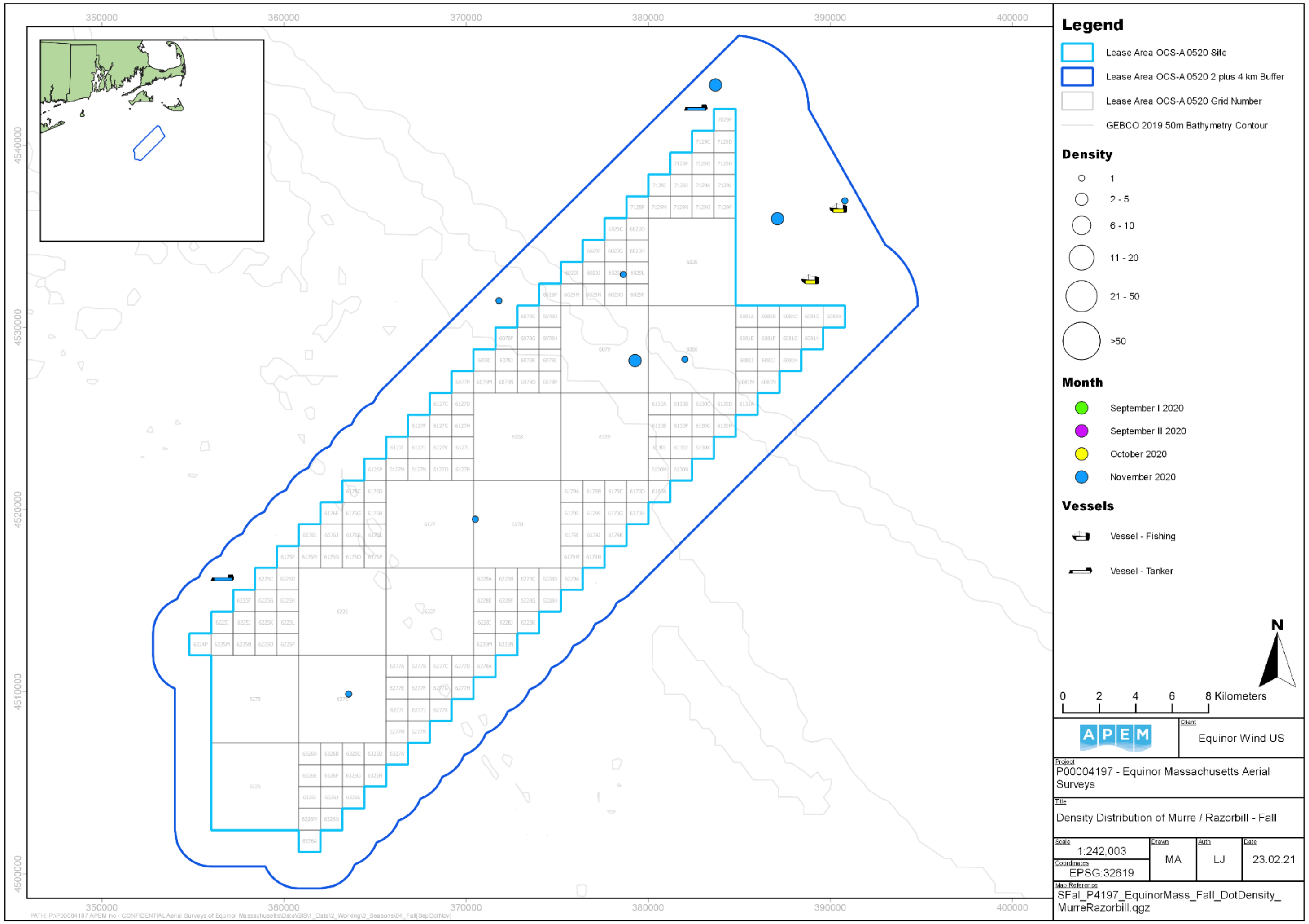

Figure 65 **Distribution of murre / razorbills recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

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5.30 Atlantic Puffin (*Fratercula arctica)*

Atlantic puffins were recorded in the winter and spring surveys, with highest numbers recorded in spring (**Table 1**). A peak count of 222 in the Site and 96 in the Buffer from the April I survey, led to abundance estimates of 1,653 and 850 respectively (**Table 37**).

A total of 37 Atlantic puffins were recorded in the winter (**Figure 66**), of which one was recorded in the December 2019 survey, and 96 were recorded in the February survey (**Table 37**). For the December 2019 survey, the single puffin was located in the center of the Survey Area, and for the February survey, puffins were distributed alone or in small groups predominantly to the south of the Survey Area (**Figure 66**). A total of 318 puffins were recorded in the spring from the April I survey only (**Table 37**), distributed across the Survey Area in varying group sizes (**Figure 67**).

Table 37 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of Atlantic puffins in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Dec 19	1	8	0	0	1
Feb 20	96	767	0.88	1	95
Apr I 20	318	2,526	2.94	0	318
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Dec 19	1	7	0.01	0	1
Feb 20	75	562	1.08	1	74
Apr I 20	222	1,653	3.17	0	222
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Dec 19	0	0	-	0	0
Feb 20	21	187	0.55	0	21
Apr I 20	96	850	2.52	0	96

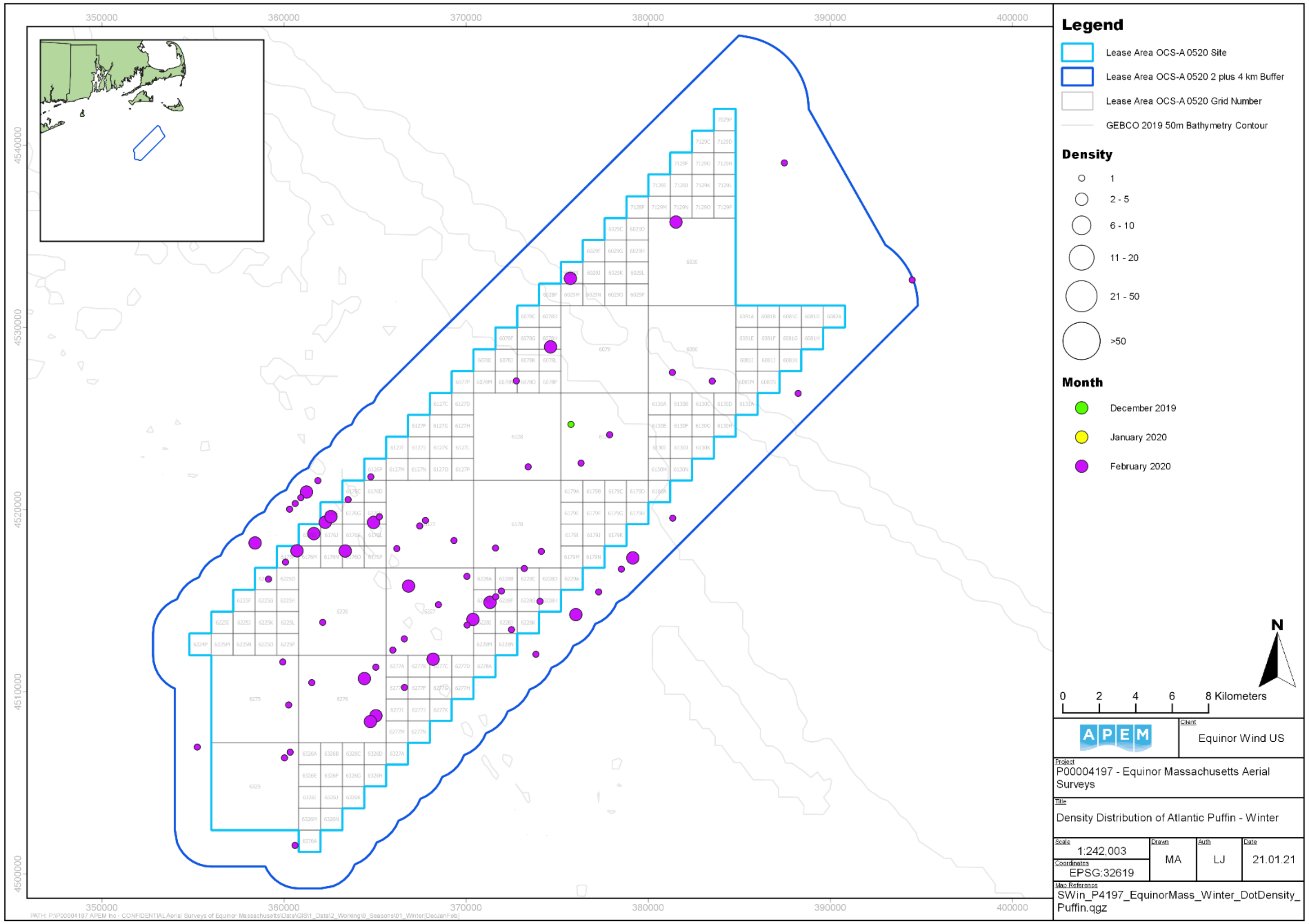

Figure 66 Distribution of Atlantic puffins recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the winter season

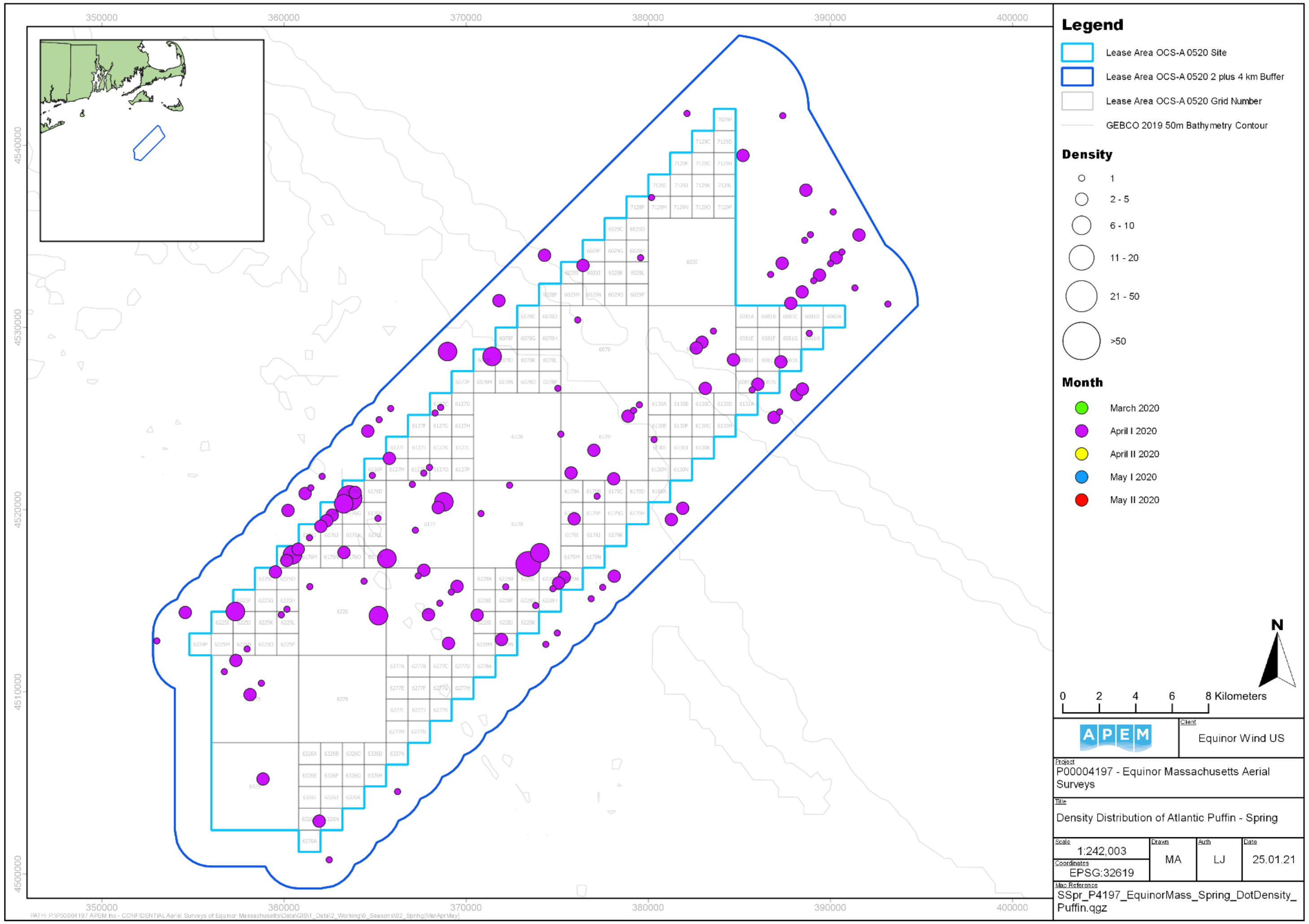

Figure 67 **Distribution of Atlantic puffins recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

5.31 Auk Species (Unidentified Alcidae)

Unidentified auks were recorded in the winter, spring, and summer surveys, with highest numbers recorded in the spring (**Table 1**). A peak count of 38 in the Site and 18 in the Buffer from the April **I** survey, led to abundance estimates of 38 and 18 respectively (**Table 38**).

A total of six unidentified auks were recorded in the winter from the February survey only (**Table 38**), loosely distributed across the Survey Area (**Figure 68**). A total of 66 auks were recorded in the spring surveys (**Figure 69**), of which 56 were recorded in the April **I** survey, and 10 were recorded in the April **II** survey (**Table 38**). For the April **I** and **II** surveys, auks were loosely distributed across the Survey Area (**Figure 69**). A total of one auk was recorded in the fall from the November survey (**Table 38**), located in the east-northeast of the Survey Area (**Figure 70**).

Table 38 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified auks in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Feb 20	6	48	0.06	0	6
Apr I 20	56	445	0.52	0	56
Apr II 20	10	79	0.09	0	10
Nov 20	1	8	0.01	0	1
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Feb 20	3	22	0.04	0	3
Apr I 20	38	283	0.54	0	38
Apr II 20	6	45	0.09	0	6
Nov 20	0	0	-	0	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Feb 20	3	27	0.08	0	3
Apr I 20	18	159	0.47	0	18
Apr II 20	4	35	0.1	0	4
Nov 20	1	9	0.03	0	1

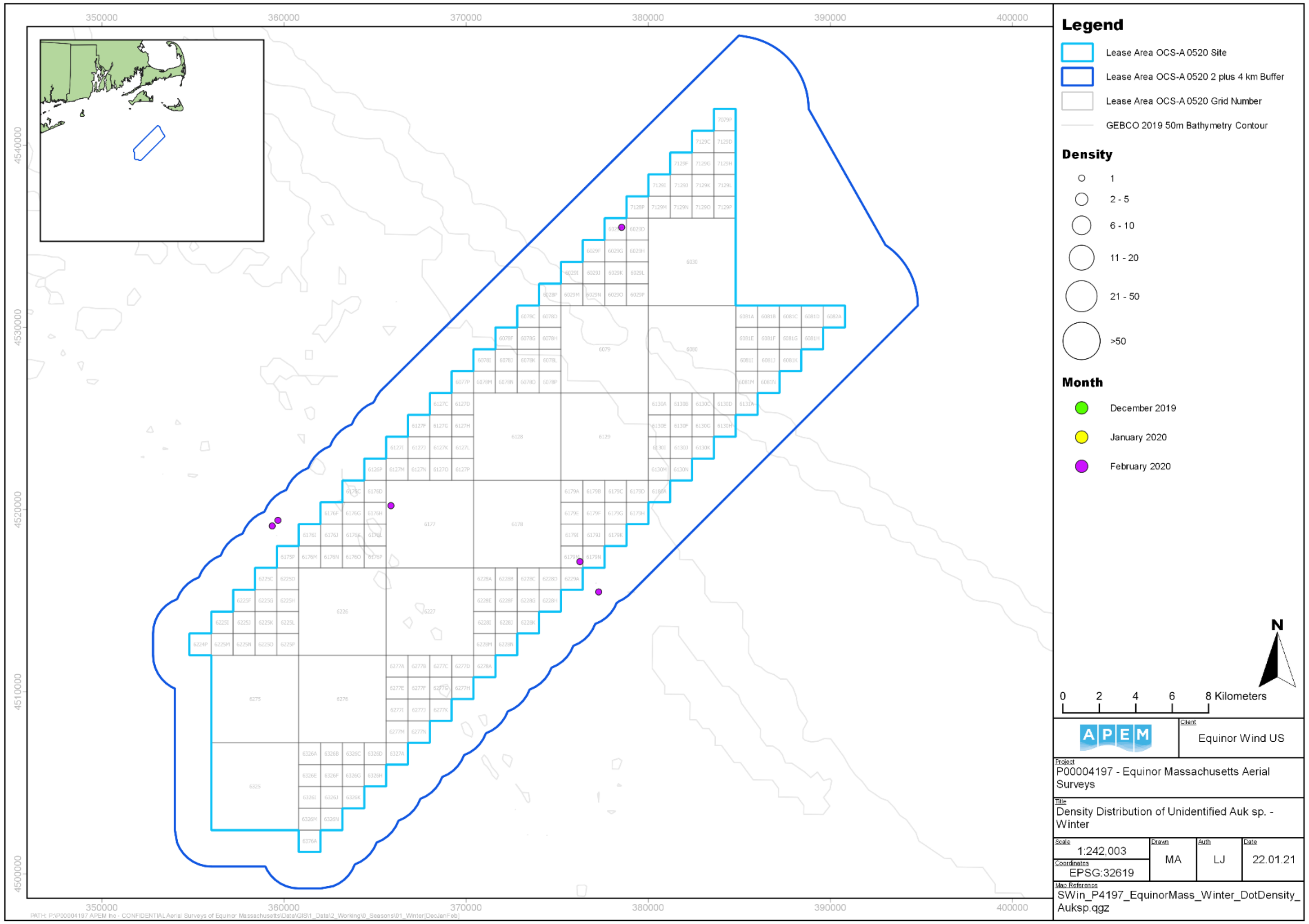

Figure 68 **Distribution of unidentified auks recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the winter season**

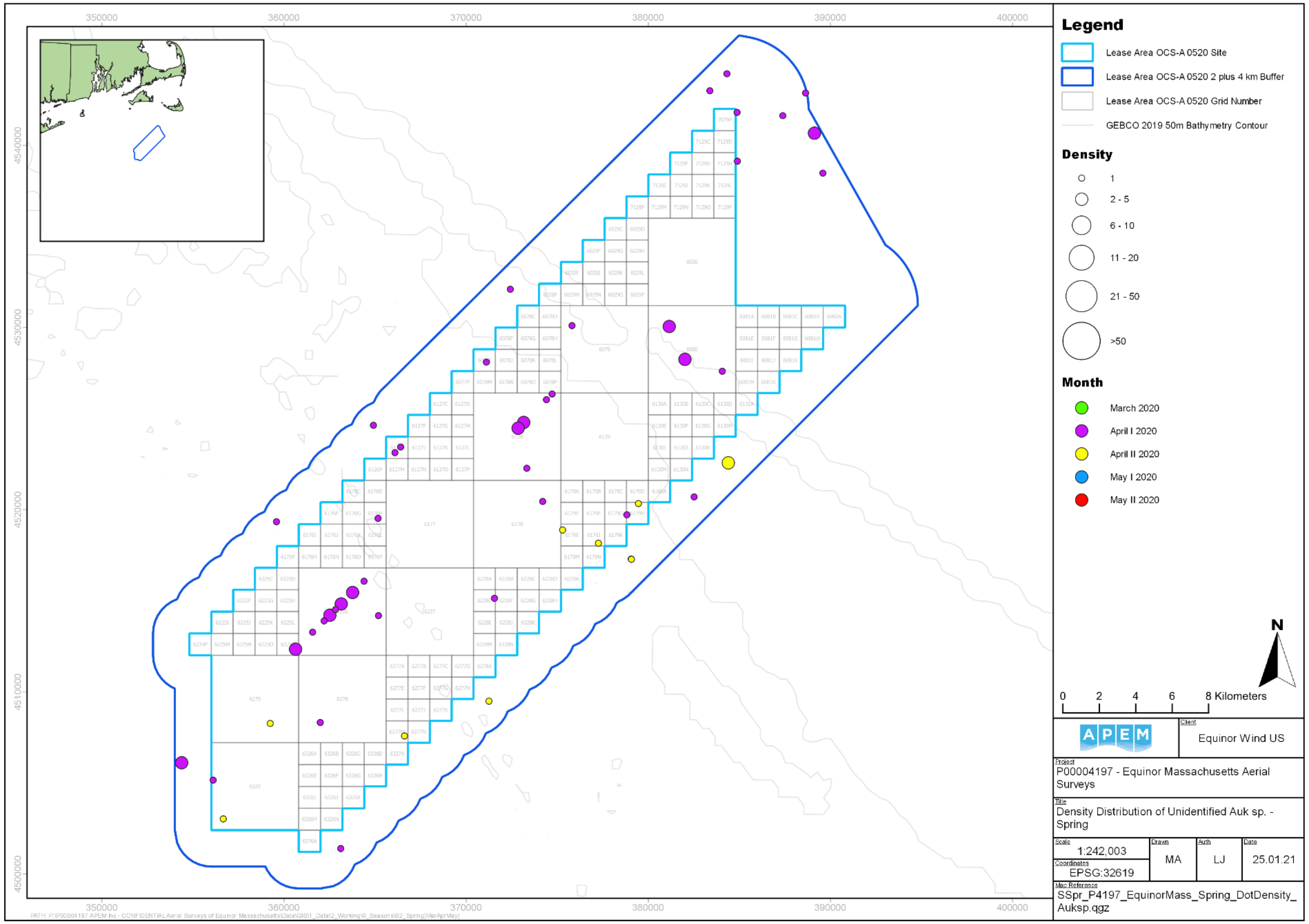

Figure 69 **Distribution of unidentified auks recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

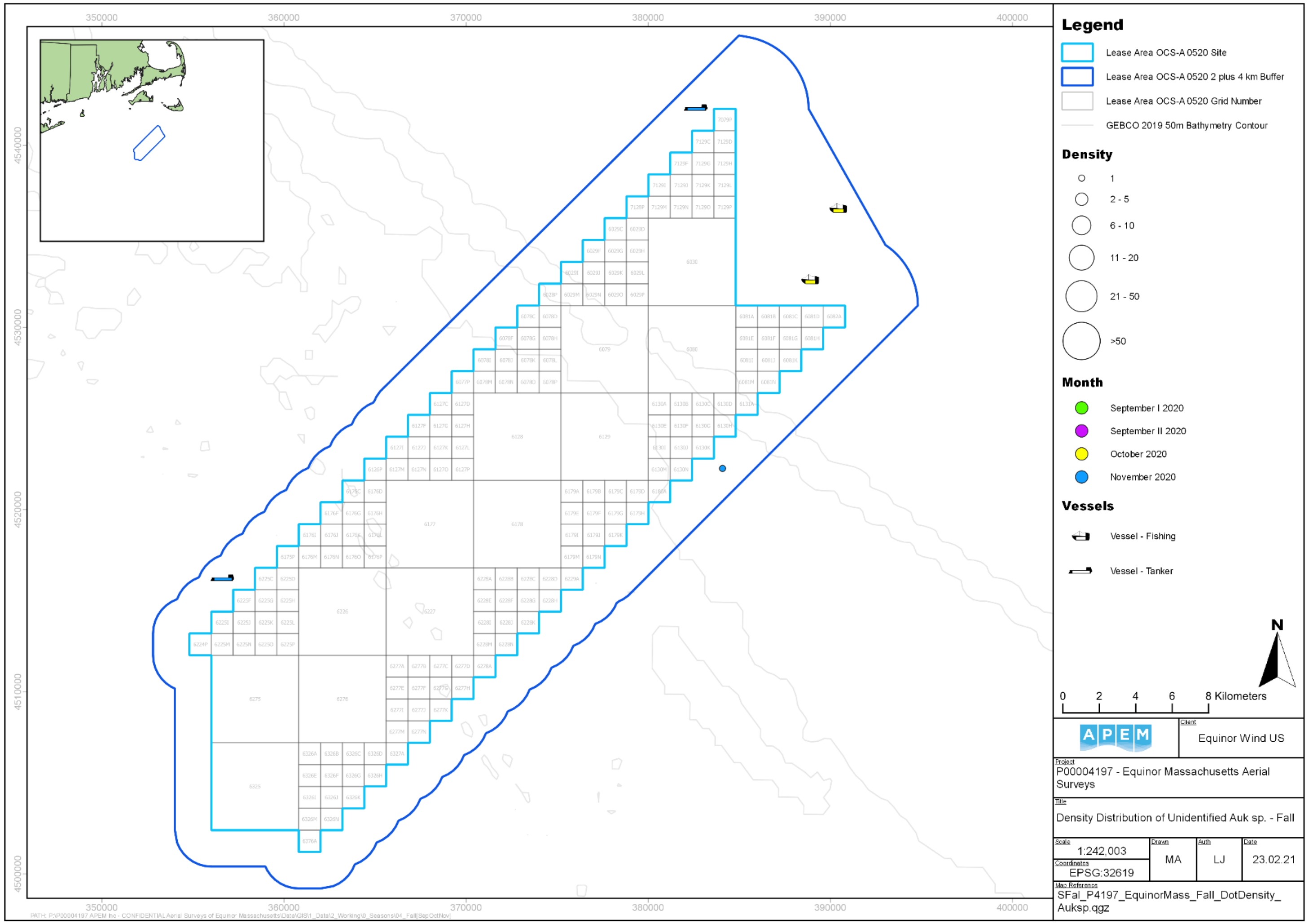

Figure 70 **Distribution of unidentified auks recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.32 Black-legged Kittiwake (*Rissa tridactyla)*

Black-legged kittiwakes were recorded in the winter, spring, and fall surveys, with highest numbers recorded in fall (**Table 1**). A peak count of 41 in the Site and 24 in the Buffer, led to abundance estimates of 305 and 212 respectively (**Table 39**).

A total of 20 black-legged kittiwakes were recorded in the winter (**Figure 71**), of which six were recorded in December 2019, five were recorded in January, and nine were recorded in February (**Table 39**). For the winter surveys, distribution was loose across the Survey Area (**Figure 71**). A single kittiwake was recorded in spring from the April I survey (**Table 39**), located in the southwest of the Survey Area (**Figure 72**). A total of 65 kittiwakes were recorded in the fall from the November survey only (**Table 39**), distributed loosely across the Survey Area (**Figure 73**).

Table 39 Raw counts and abundance and density estimates (No. estimated individuals per km²) of black-legged kittiwakes in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

d) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Dec 19	6	48	0.06	6	0
Jan 20	5	40	0.05	5	0
Feb 20	9	72	0.08	4	5
Apr I 20	1	8	0.01	1	0
Nov 20	65	516	0.6	46	19
e) Lease Area OCS-A 0520 Site					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Dec 19	5	37	0.07	5	0
Jan 20	1	7	0.01	1	0
Feb 20	2	15	0.03	1	1
Apr I 20	1	7	0.01	1	0
Nov 20	41	305	0.59	30	11
f) 2 + 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Dec 19	1	9	0.03	1	0
Jan 20	4	35	0.1	4	0
Feb 20	7	62	0.18	3	4
Apr I 20	0	0	-	0	0
Nov 20	24	212	0.63	16	8

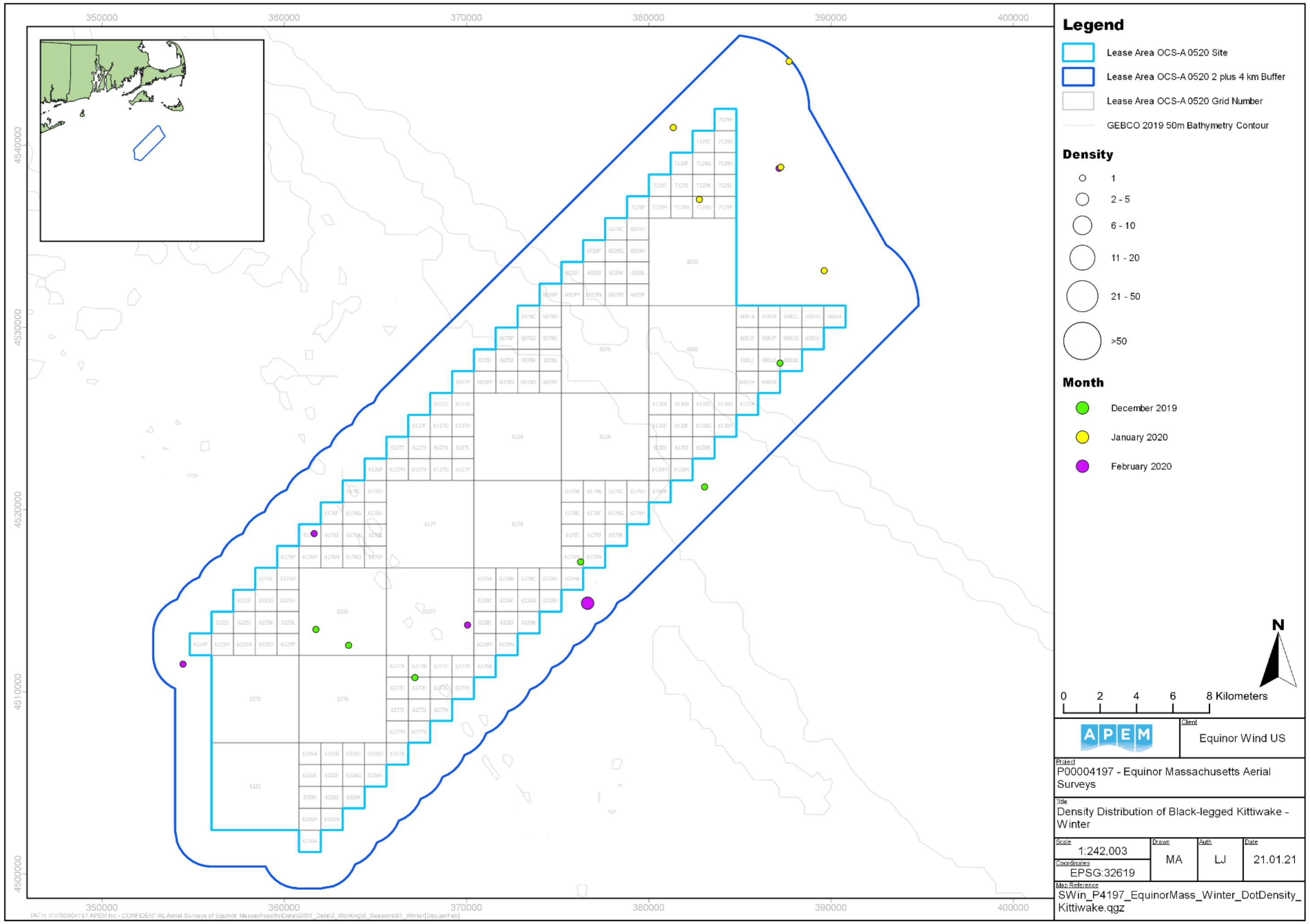

Figure 71 **Distribution of black-legged kittiwakes recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the winter season**

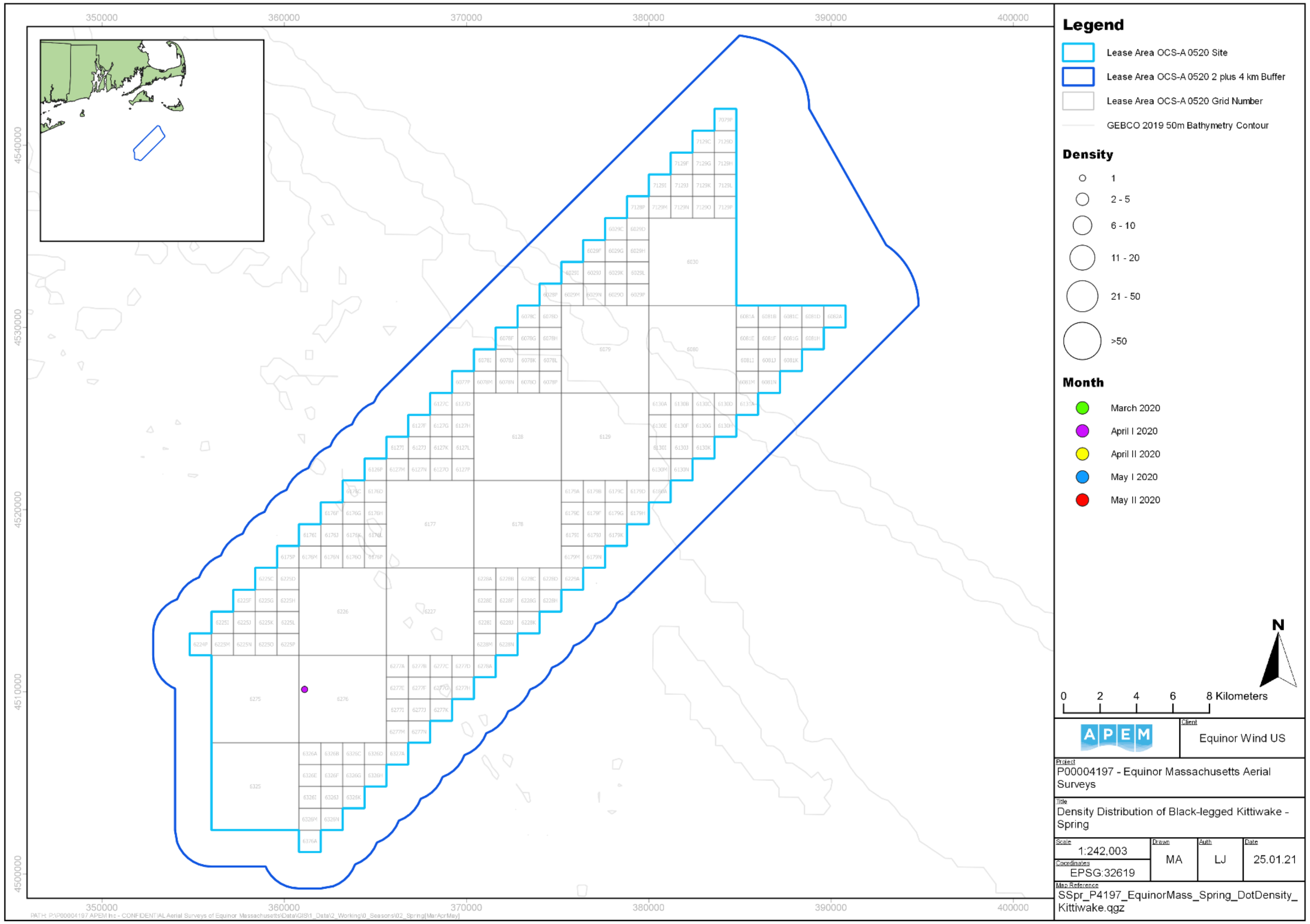

Figure 72 **Distribution of black-legged kittiwakes recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

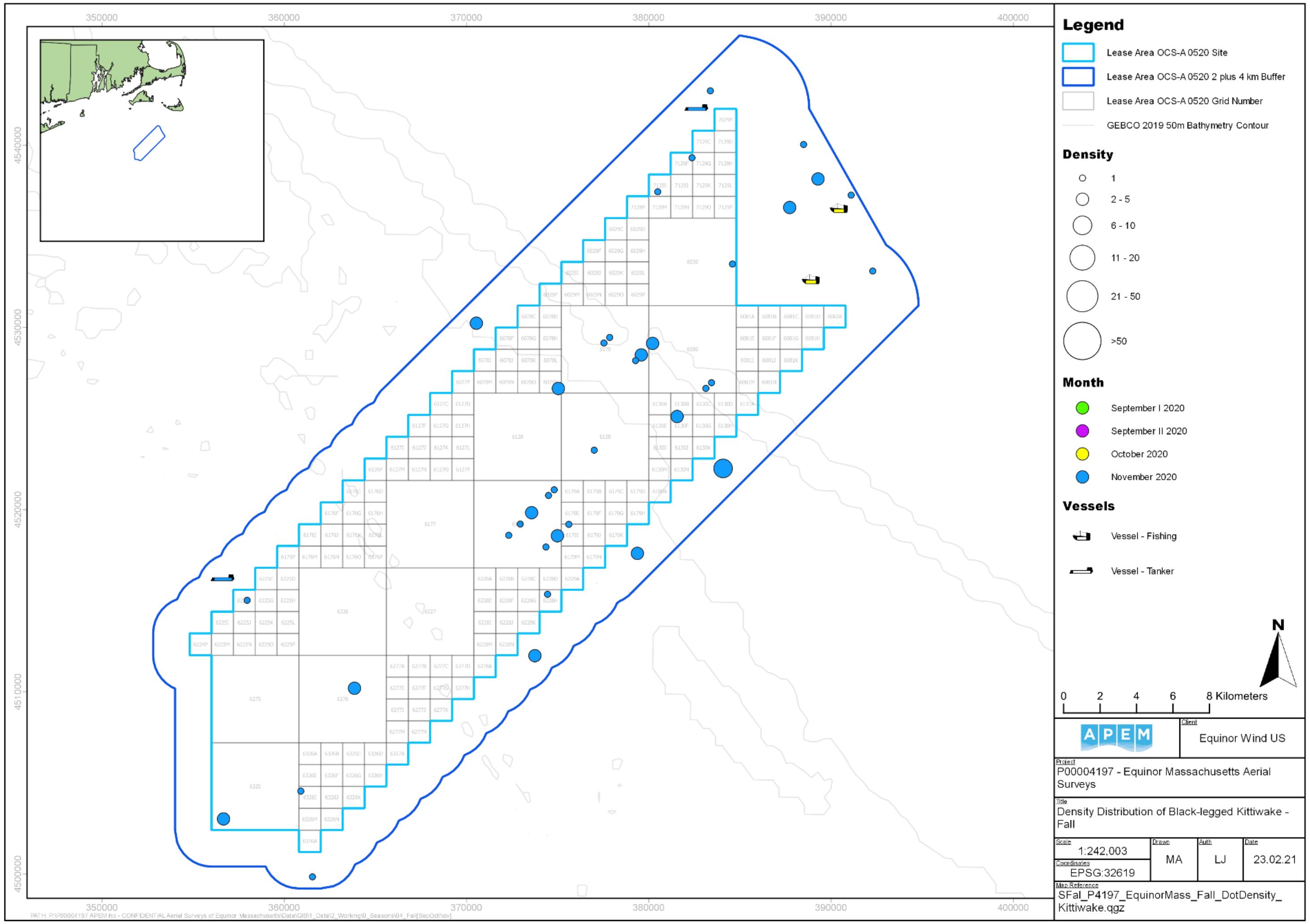

Figure 73 **Distribution of black-legged kittiwakes recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.33 Bonaparte's Gull (*Chroicocephalus philadelphia)*

Bonaparte's gulls were recorded in the winter, spring, and fall surveys, with highest numbers recorded in fall (**Table 1**). A peak count of 75 in the Site and 33 in the Buffer, led to abundance estimates of 558 and 292 respectively (**Table 40**).

A total of two Bonaparte's gulls were recorded in winter from the January survey only (**Table 40**), located in the center of the Survey Area (**Figure 74**). A total of 12 gulls were recorded in the spring (**Figure 75**), of which six were recorded in April **I**, five were recorded in April **II**, and one was recorded in May **I** (**Table 40**). For the April **I** survey, gulls were distributed in the west and north of the Survey Area, and for the April **II** survey, gulls were distributed in the west and south (**Figure 75**). A single gull was located in the southwest for the May **I** survey (**Figure 75**). A total of 108 gulls were recorded in fall from the November survey only (**Table 40**), with distribution loose across the northern half of the Survey Area (**Figure 76**).

Table 40 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of Bonaparte's gulls in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Jan 20	2	16	0.02	2	0
Apr I 20	6	48	0.06	6	0
Apr II 20	5	40	0.05	4	1
May I 20	1	8	0.01	1	0
Nov 20	108	858	1	42	66
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Jan 20	2	15	0.03	2	0
Apr I 20	1	7	0.01	1	0
Apr II 20	2	15	0.03	2	0
May I 20	1	7	0.01	1	0
Nov 20	75	558	1.07	35	40
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Jan 20	0	0	-	0	0
Apr I 20	5	44	0.13	5	0
Apr II 20	3	27	0.08	2	1
May I 20	0	0	-	0	0
Nov 20	33	292	0.86	7	26

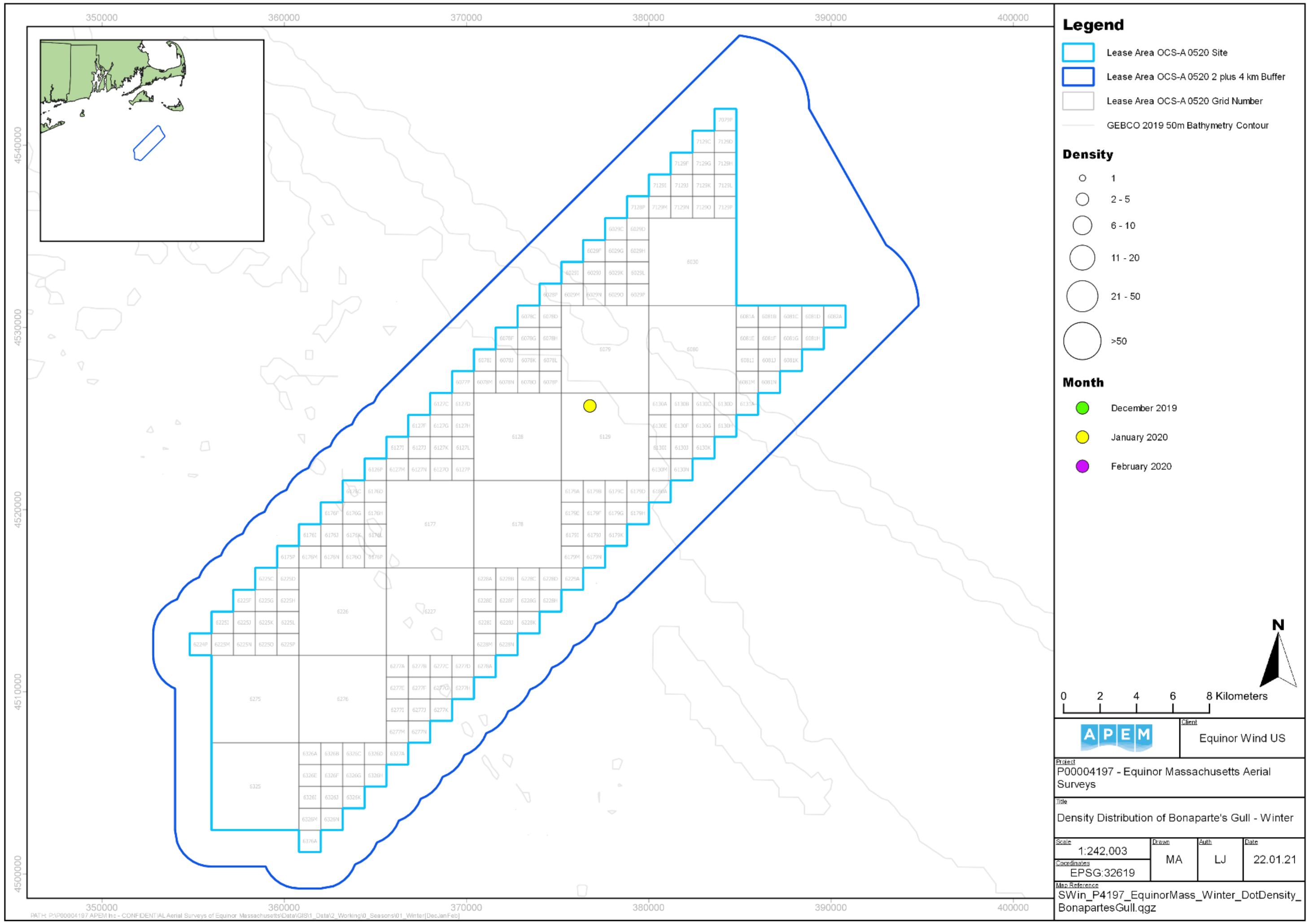

Figure 74 **Distribution of Bonaparte's gulls recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the winter season**

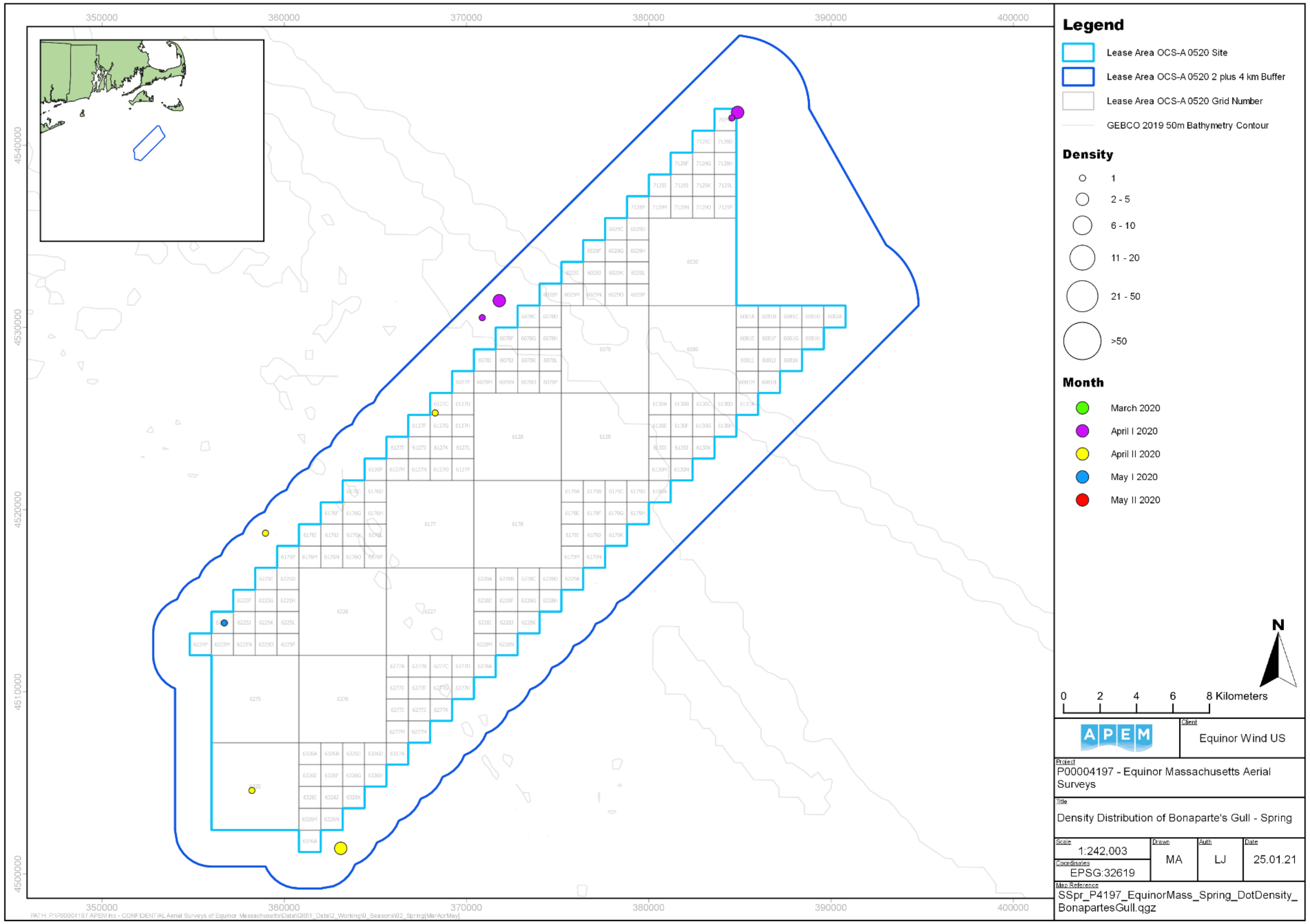

Figure 75 **Distribution of Bonaparte's gulls recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

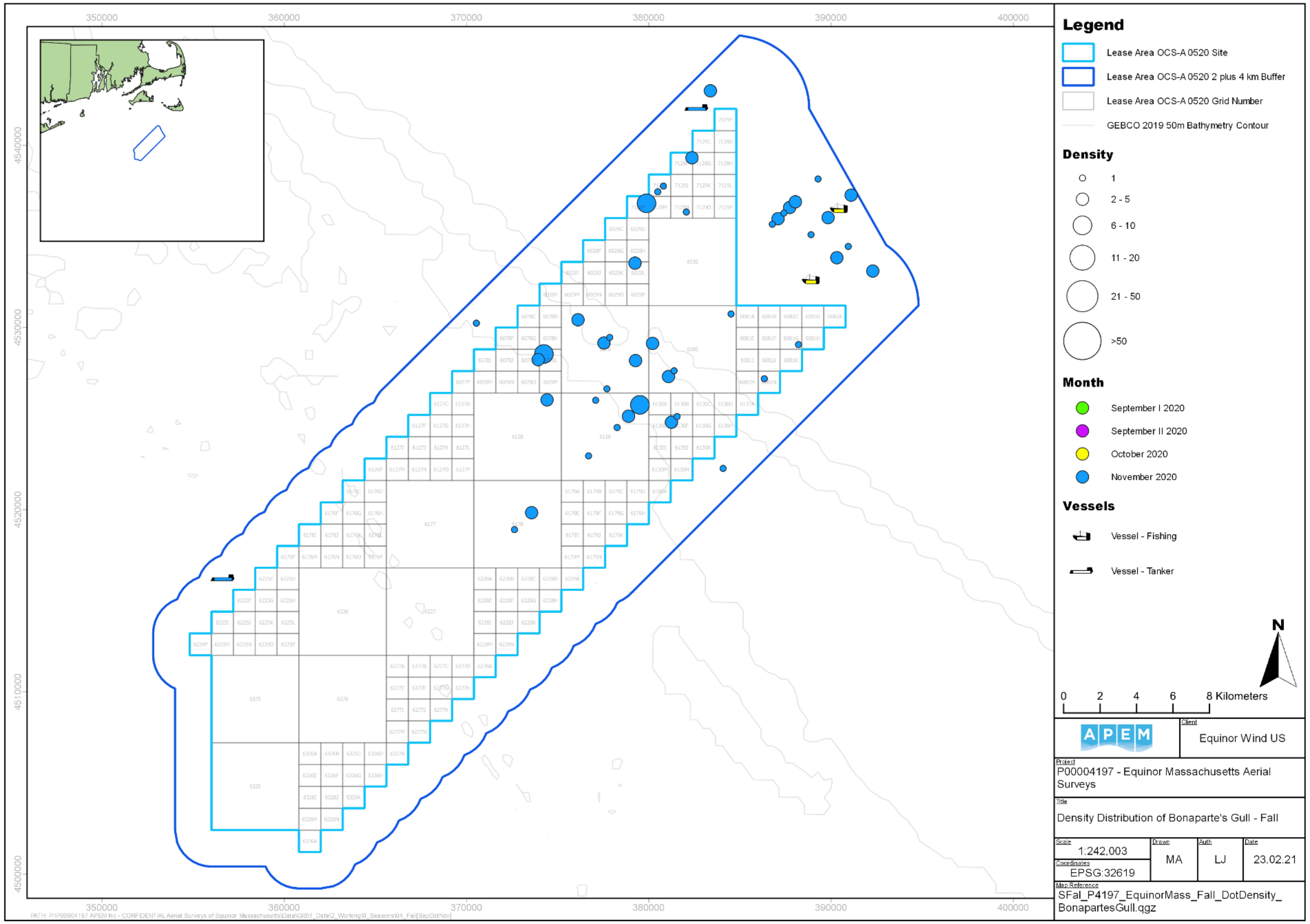

Figure 76 **Distribution of Bonaparte's gulls recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.34 Laughing Gull (*Leucophaeus atricilla)*

Laughing gulls were recorded in the spring and fall surveys, with highest numbers recorded in spring (**Table 1**). A peak count of one in the Survey Area was recorded for each month, with a subsequent abundance estimate of eight per month (**Table 41**).

A total of two laughing gulls were recorded in the spring (**Figure 77**), of which one was recorded in the April **II** survey, and one was recorded in the May **I** survey (**Table 41**). For the April **II** survey, the single gull was located southwest of the center of the Survey Area, and for the May **I** survey, the single gull was located in the east of the Survey Area (**Figure 77**). A total of one gull was recorded in the fall from the November survey (**Table 41**), located northeast of the center of the Survey Area (**Figure 78**).

Table 41 Raw counts and abundance and density estimates (No. estimated individuals per km²) of laughing gulls in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Apr II 20	1	8	0.01	1	0
May I 20	1	8	0.01	1	0
Nov 20	1	8	0.01	0	1
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Apr II 20	1	7	0.01	1	0
May I 20	1	7	0.01	1	0
Nov 20	1	7	0.01	0	1
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Apr II 20	0	0	-	0	0
May I 20	0	0	-	0	0
Nov 20	0	0	-	0	0

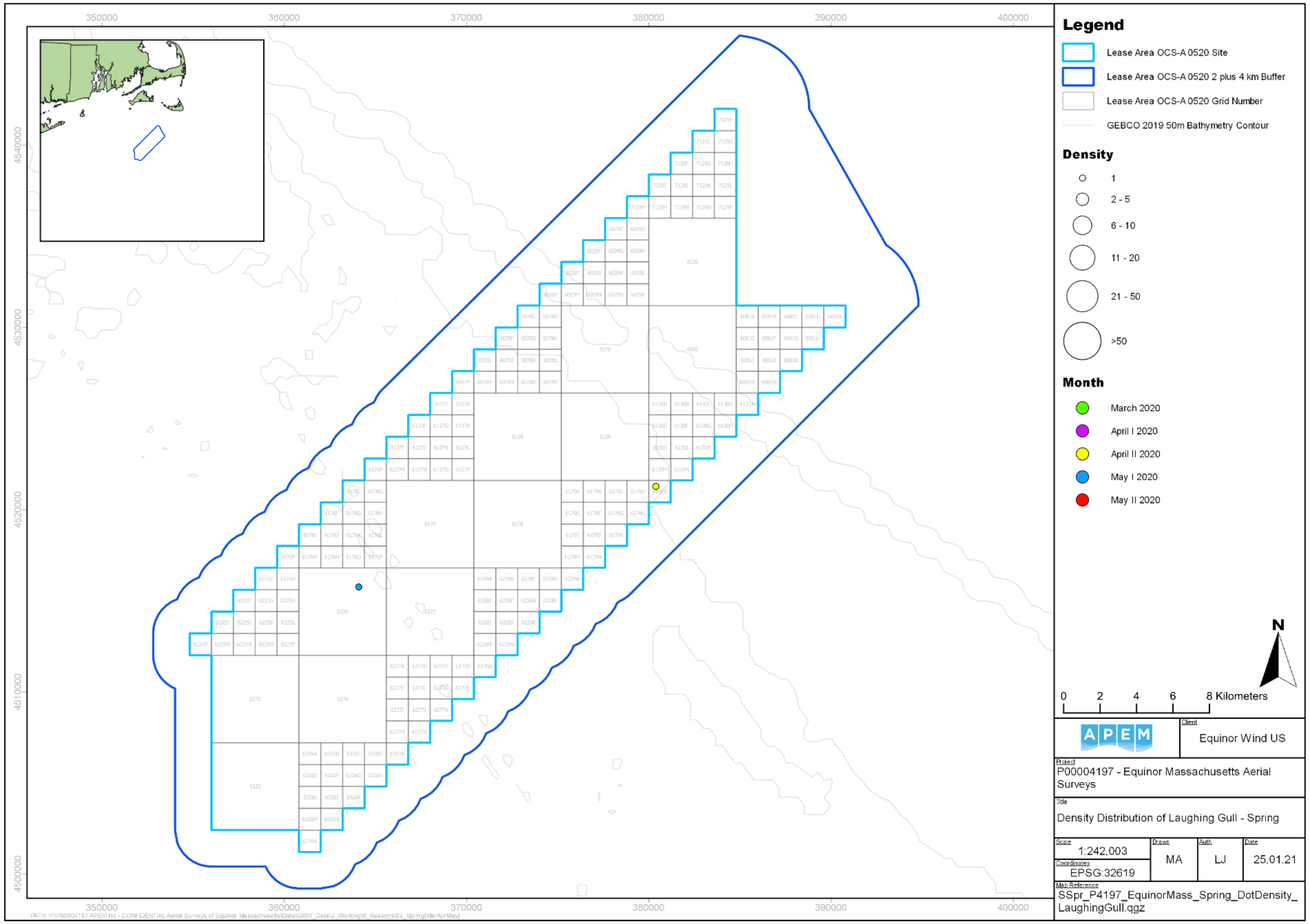

Figure 77 **Distribution of laughing gulls recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

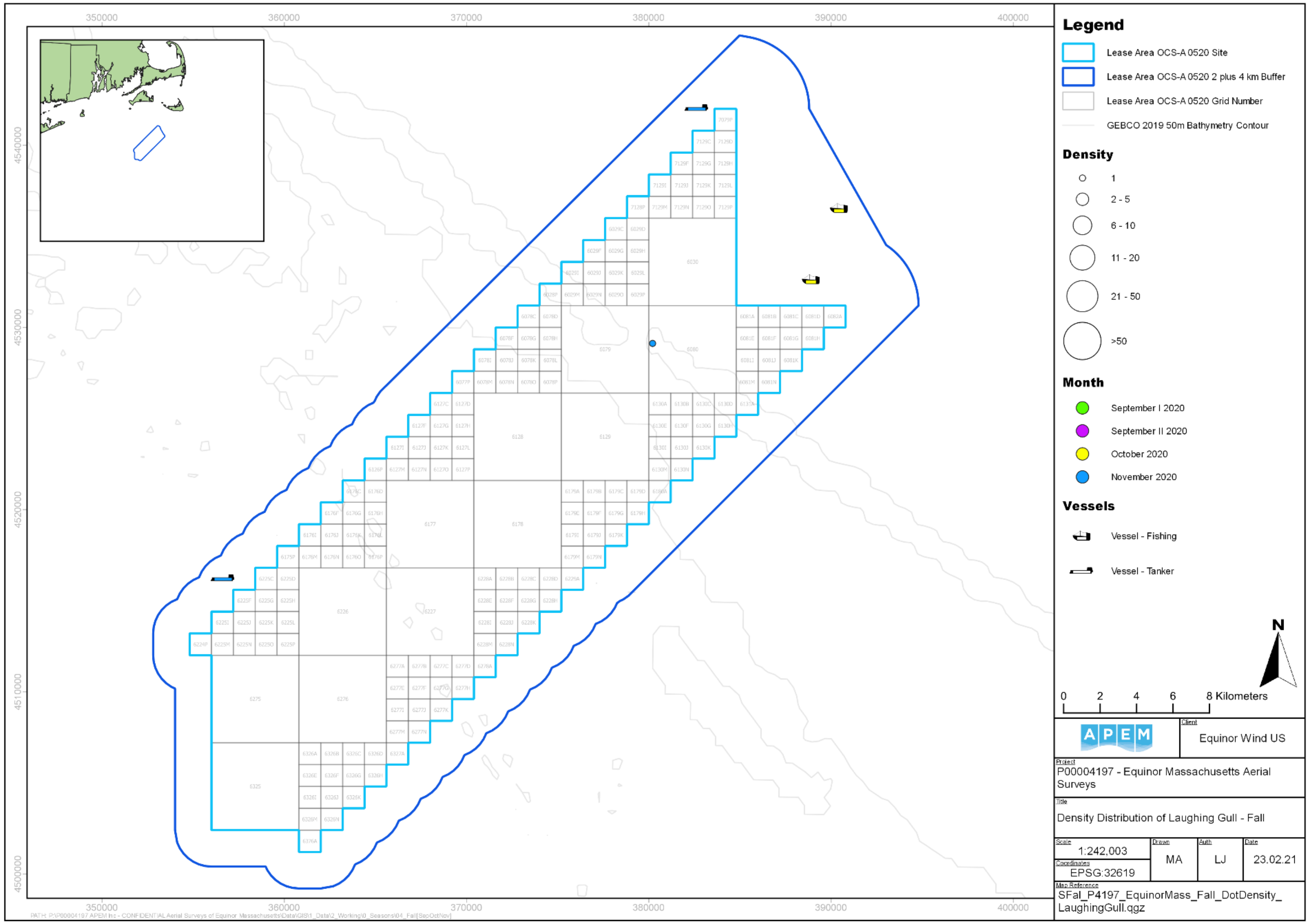

Figure 78 **Distribution of laughing gulls recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.35 Ring-billed Gull (*Larus delawarensis)*

A single ring-billed gull was recorded in the August II survey, with highest numbers therefore recorded in summer (**Table 1**). A peak count if one in the Survey Area from the August II survey, led to an abundance estimate of eight (**Table 42**).

A total of one ring-billed gull was recorded in the summer from the August II survey (**Table 42**), located in the northeast, associated with the presence of a fishing vessel (**Figure 79**).

Table 42 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of ring-billed gulls in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Aug II 20	1	8	0.01	0	1
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Aug II 20	1	7	0.01	0	1
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Aug II 20	0	0	-	0	0

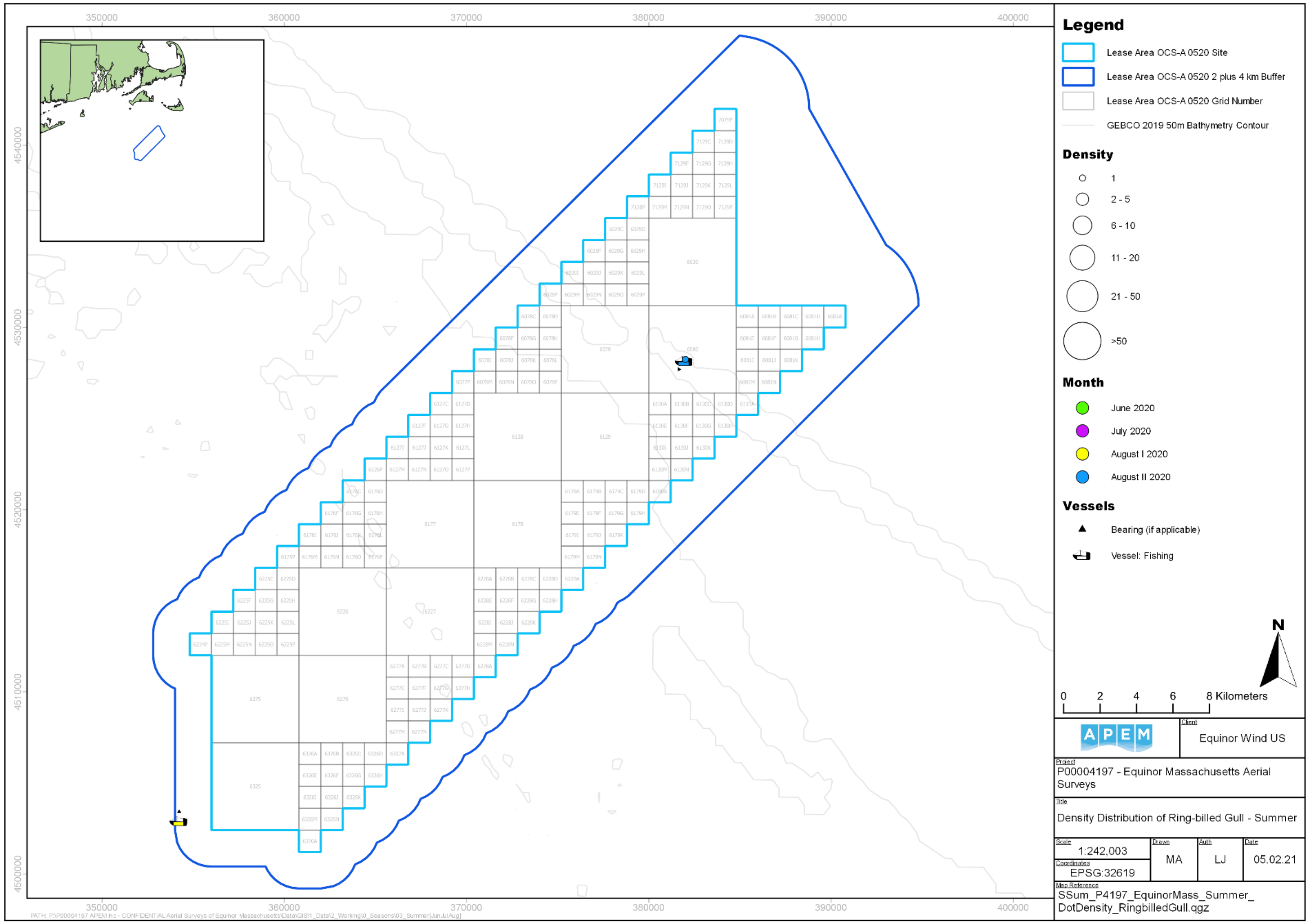

Figure 79 Distribution of ring-billed gulls recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season

5.36 Herring Gull (*Larus argentatus)*

Herring gulls were recorded in all four season, with highest numbers recorded in fall (**Table 1**). A peak count of six in the Site and 55 in the Buffer from the September II survey, led to abundance estimates of 45 and 487 respectively (**Table 43**).

A total of six herring gulls were recorded in the winter (**Figure 80**), of which two were recorded in December 2019, two were recorded in January, and two were recorded in February (**Table 43**). For the winter surveys, distribution was loose across the Survey Area (**Figure 80**). A total of 45 gulls were recorded in the spring (**Figure 81**) of which 12 were recorded in the March survey, 24 were recorded in the April I survey, one was recorded in the April II survey, three were recorded in the May I survey, and five were recorded in the May II survey (**Table 43**). For the spring surveys, distribution was loose across the Survey Area, with April II and May II distribution restricted to the north of the Survey Area (**Figure 81**). A total of 53 herring gulls were recorded in the summer surveys (**Figure 82**), of which two were recorded in June, one was recorded in July, twelve were recorded in August I, and 38 were recorded in August II (**Table 43**). For June and August I, distribution was loose across the Survey Area, whilst the single gull in July was recorded in the north of the Survey Area (**Figure 82**). For August II, distribution was almost exclusively restricted to large groups in the northeast associated with the presence of a fishing vessel (**Figure 82**). A total of 87 gulls were recorded in the fall surveys (**Figure 83**), of which four were recorded in the September I survey, 61 were recorded in the September II survey, 12 were recorded in the October survey, and ten were recorded in the November survey (**Table 43**). For the September I and II surveys, distribution was loose across the Survey Area, whilst for the October and November surveys, distribution was predominantly in the north of the Survey Area (**Figure 83**).

Table 43 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of herring gulls in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer						
Survey	Raw Count	Abundance	Density	Flying	Sitting	Perched
Dec 19	2	16	0.02	2	0	0
Jan 20	2	16	0.02	2	0	0
Feb 20	2	16	0.02	1	1	0
Mar 20	12	95	0.11	7	5	0
Apr I 20	24	191	0.22	5	19	0
Apr II 20	1	8	0.01	1	0	0
May I 20	3	24	0.03	1	2	0
May II 20	5	40	0.05	3	2	0
Jun 20	2	16	0.02	2	0	0
Jul 20	1	8	0.01	1	0	0
Aug I 20	12	96	0.11	5	7	0
Aug II 20	38	302	0.35	13	19	6
Sep I 20	4	32	0.04	0	4	0
Sep II 20	61	485	0.56	5	56	0
Oct 20	12	95	0.11	5	7	0
Nov 20	10	79	0.09	6	4	0
b) Lease Area OCS-A 0520 Site						
Survey	Raw Count	Abundance	Density	Flying	Sitting	Perched
Dec 19	1	7	0.01	1	0	0

Jan 20	1	7	0.01	1	0	0
Feb 20	2	15	0.03	1	1	0
Mar 20	10	74	0.14	5	5	0
Apr I 20	24	179	0.34	5	19	0
Apr II 20	1	7	0.01	1	0	0
May I 20	2	15	0.03	1	1	0
May II 20	2	15	0.03	2	0	0
Jun 20	2	15	0.03	2	0	0
Jul 20	1	7	0.01	1	0	0
Aug I 20	6	45	0.09	2	4	0
Aug II 20	36	268	0.51	11	19	6
Sep I 20	1	7	0.01	0	1	0
Sep II 20	6	45	0.09	1	5	0
Oct 20	9	67	0.13	4	5	0
Nov 20	5	37	0.07	3	2	0
c) 2 + 4 km Buffer						
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**	**Perched**
Dec 19	1	9	0.03	1	0	0
Jan 20	1	9	0.03	1	0	0
Feb 20	0	0	-	0	0	0
Mar 20	2	18	0.05	2	0	0
Apr I 20	0	0	-	0	0	0
Apr II 20	0	0	-	0	0	0
May I 20	1	9	0.03	0	1	0
May II 20	3	27	0.08	1	2	0
Jun 20	0	0	-	0	0	0
Jul 20	0	0	-	0	0	0
Aug I 20	6	53	0.16	3	3	0
Aug II 20	2	18	0.05	2	0	0
Sep I 20	3	26	0.08	0	3	0
Sep II 20	55	487	1.44	4	51	0
Oct 20	3	27	0.08	1	2	0
Nov 20	5	44	0.13	3	2	0

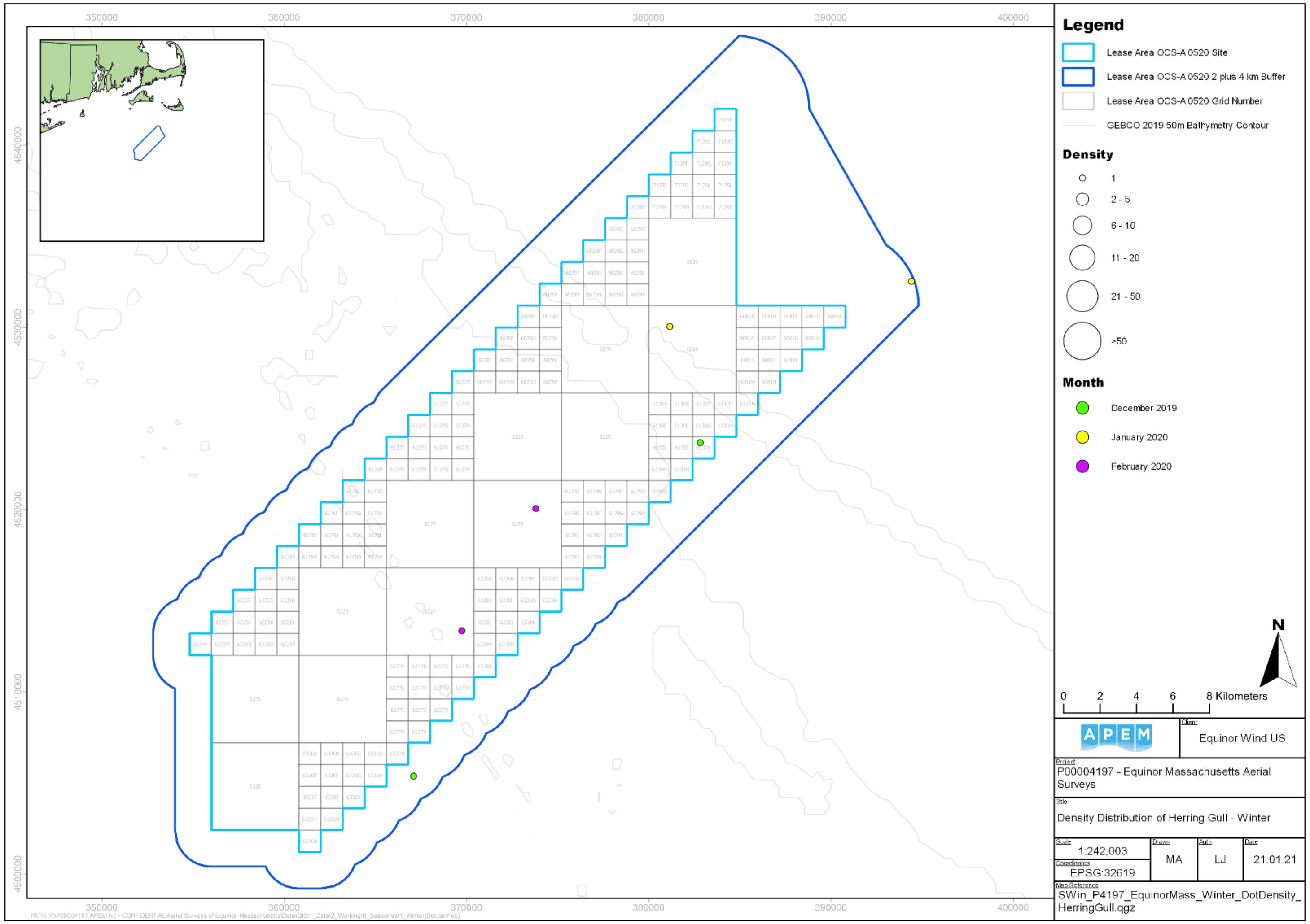

Figure 80 Distribution of herring gulls recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the winter season

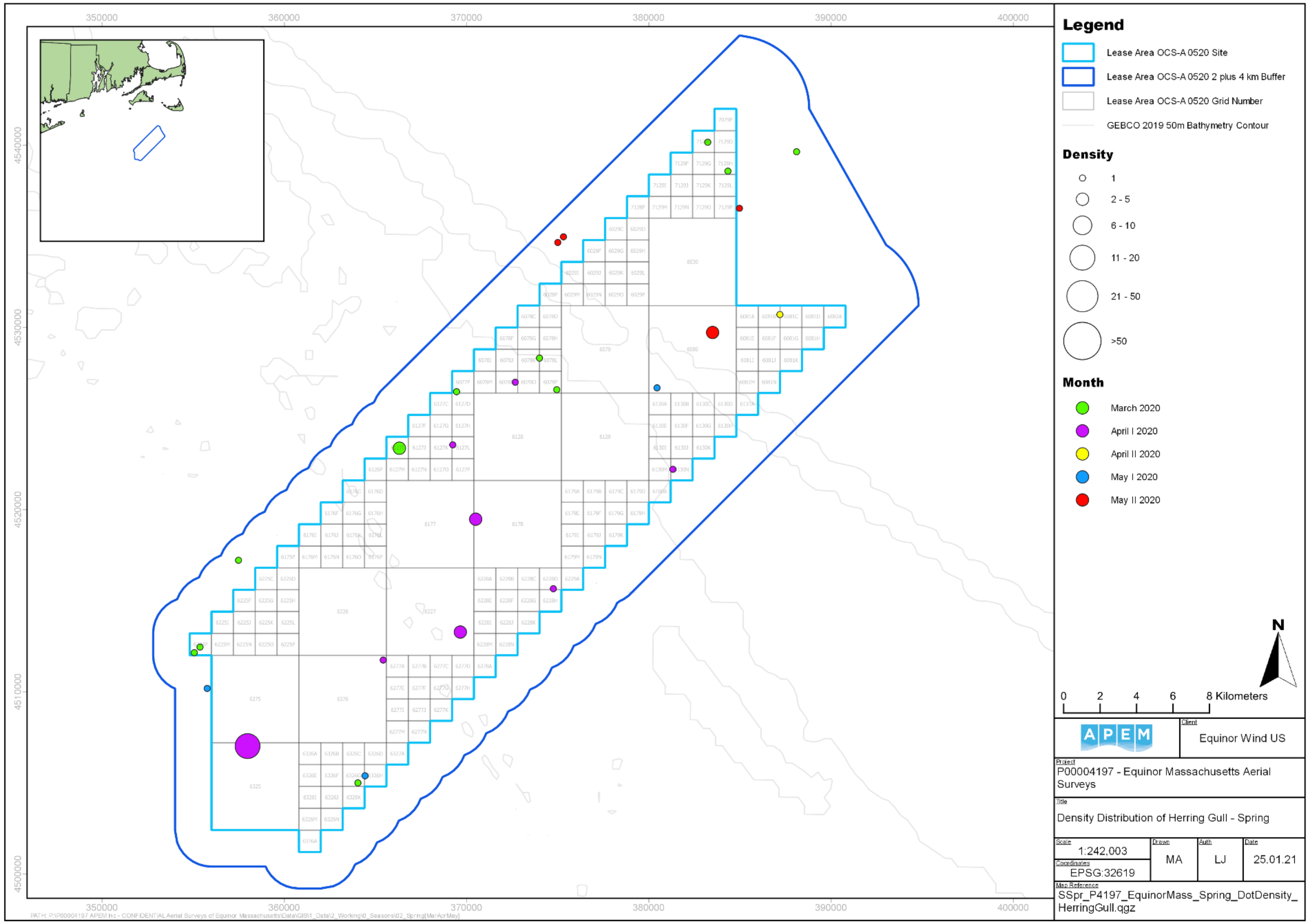

Figure 81 **Distribution of herring gulls recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

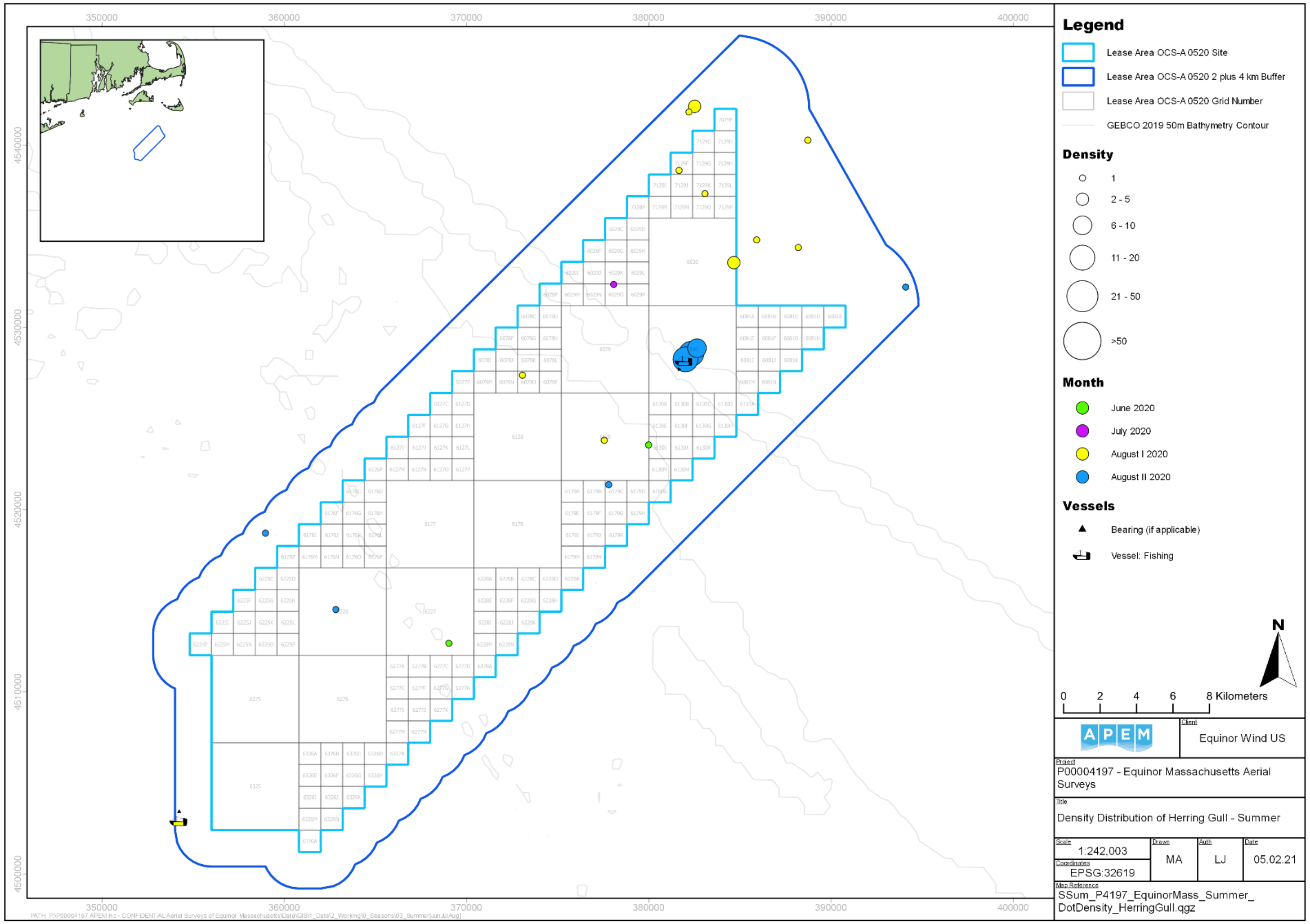

Figure 82 **Distribution of herring gulls recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

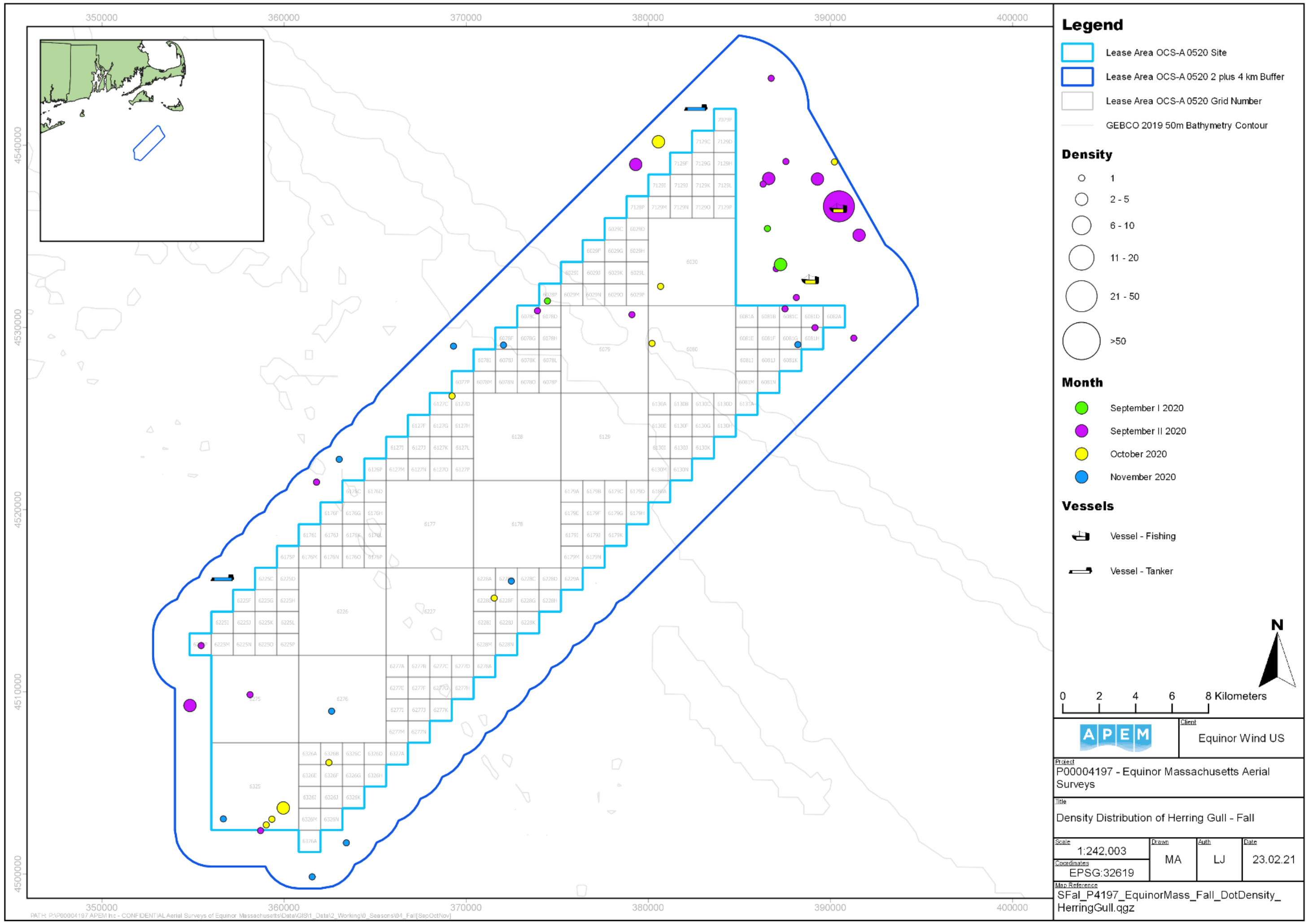

Figure 83 **Distribution of herring gulls recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.37 Iceland Gull (*Larus glaucoides)*

Iceland gulls were recorded in the November survey only, with highest numbers therefore recorded in fall (**Table 1**). A peak count of one in the Site and one in the Buffer from the November survey, led to abundance estimates of seven and nine respectively (**Table 44**).

A total of two Iceland gulls were recorded in the fall from the November survey only (**Table 44**), distributed in the northeast of the Survey Area (**Figure 84**).

Table 44 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of Iceland gulls in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

d) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Nov 20	2	16	0.02	0	2
e) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Nov 20	1	7	0.01	0	1
f) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Nov 20	1	9	0.03	0	1

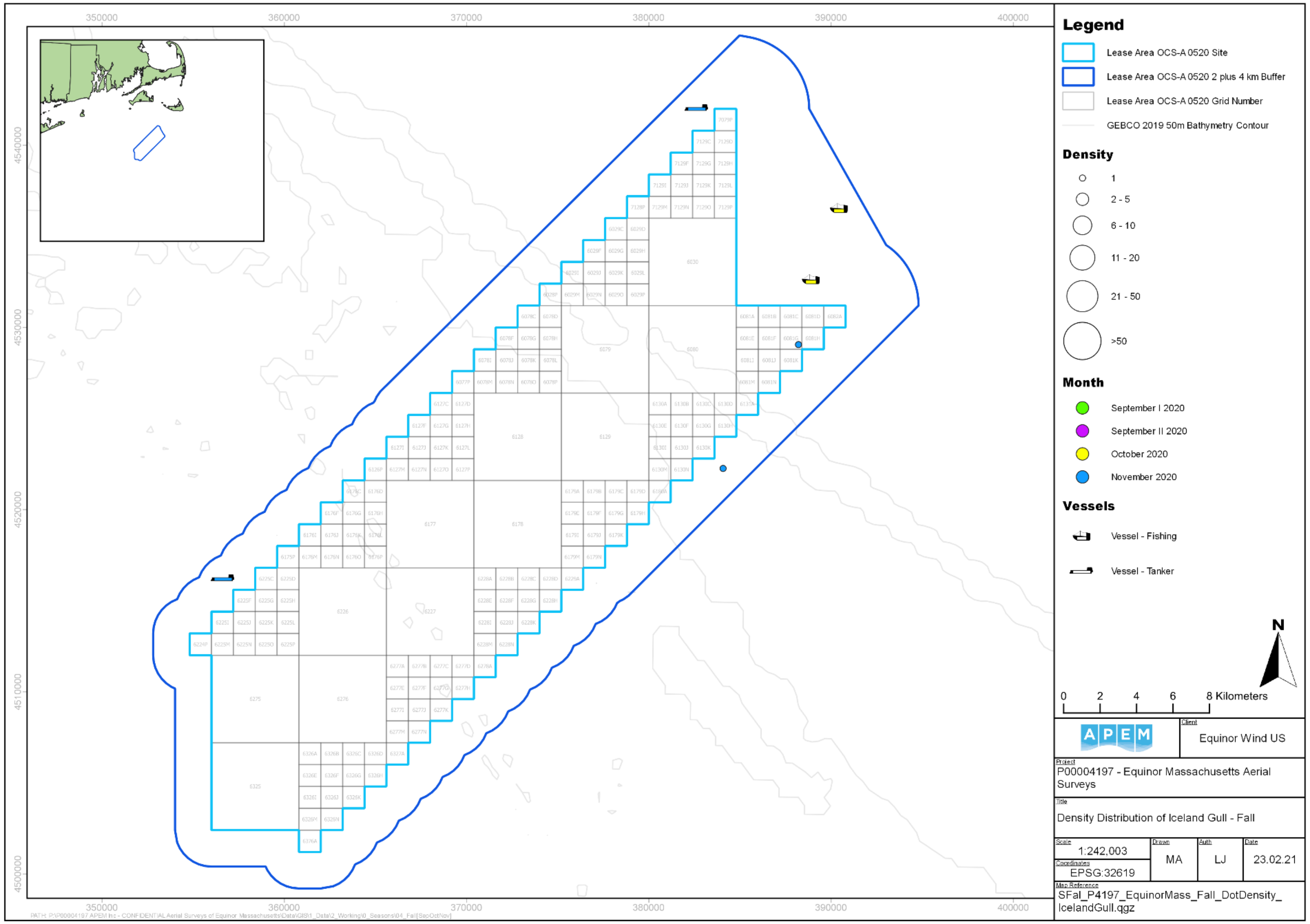

Figure 84 **Distribution of Iceland gulls recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.38 Lesser Black-backed Gull (*Larus fuscus)*

Lesser black-backed gulls were recorded in the spring and fall surveys, with highest numbers recorded in fall (**Table 1**). A peak count of three in the Survey Area from the September II survey led to an abundance estimate of 24 (**Table 45**).

A total of two lesser black-backed gulls were recorded in the spring from the April I survey (**Table 45**); one located in the north, and one located in the south (**Figure 85**). A total of four gulls were recorded in the fall (**Figure 86**), of which three were recorded in the September II survey, and one was recorded in the October survey (**Table 45**). For the September II survey, gulls were located in the northeast of the Survey Area, and for the October survey, the single gull was located south of the center of the Survey Area (**Figure 86**).

Table 45 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of lesser black-backed gulls in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Apr I 20	2	16	0.02	1	1
Sep II 20	3	24	0.03	0	3
Oct 20	1	8	0.01	1	0
b) Lease Area OCS-A 0520 Site					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Apr I 20	2	15	0.03	1	1
Sep II 20	0	0	-	0	0
Oct 20	1	7	0.01	1	0
c) 2 + 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Apr I 20	0	0	-	0	0
Sep II 20	3	27	0.08	0	3
Oct 20	0	0	-	0	0

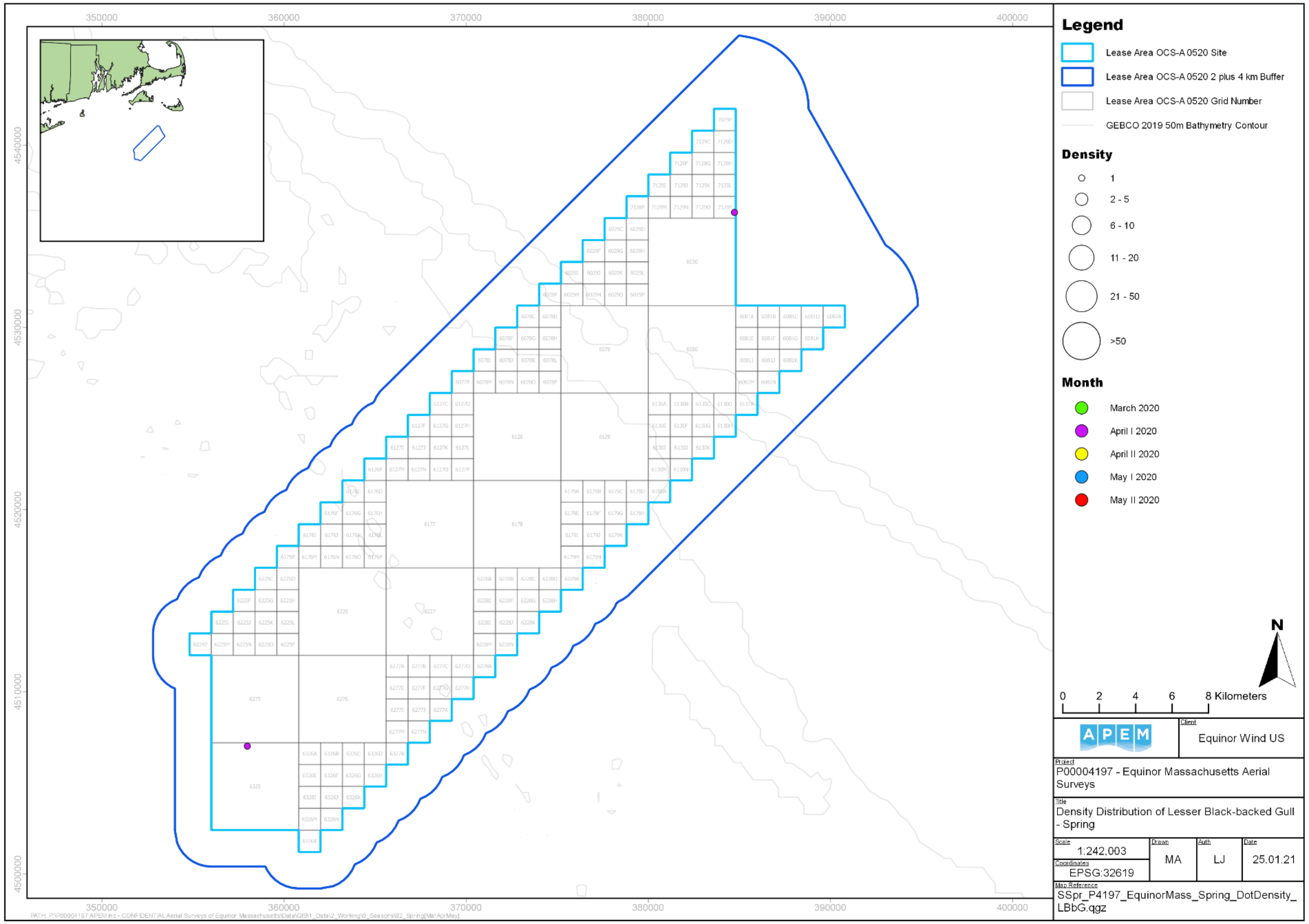

Figure 85 **Distribution of lesser black-backed gulls recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

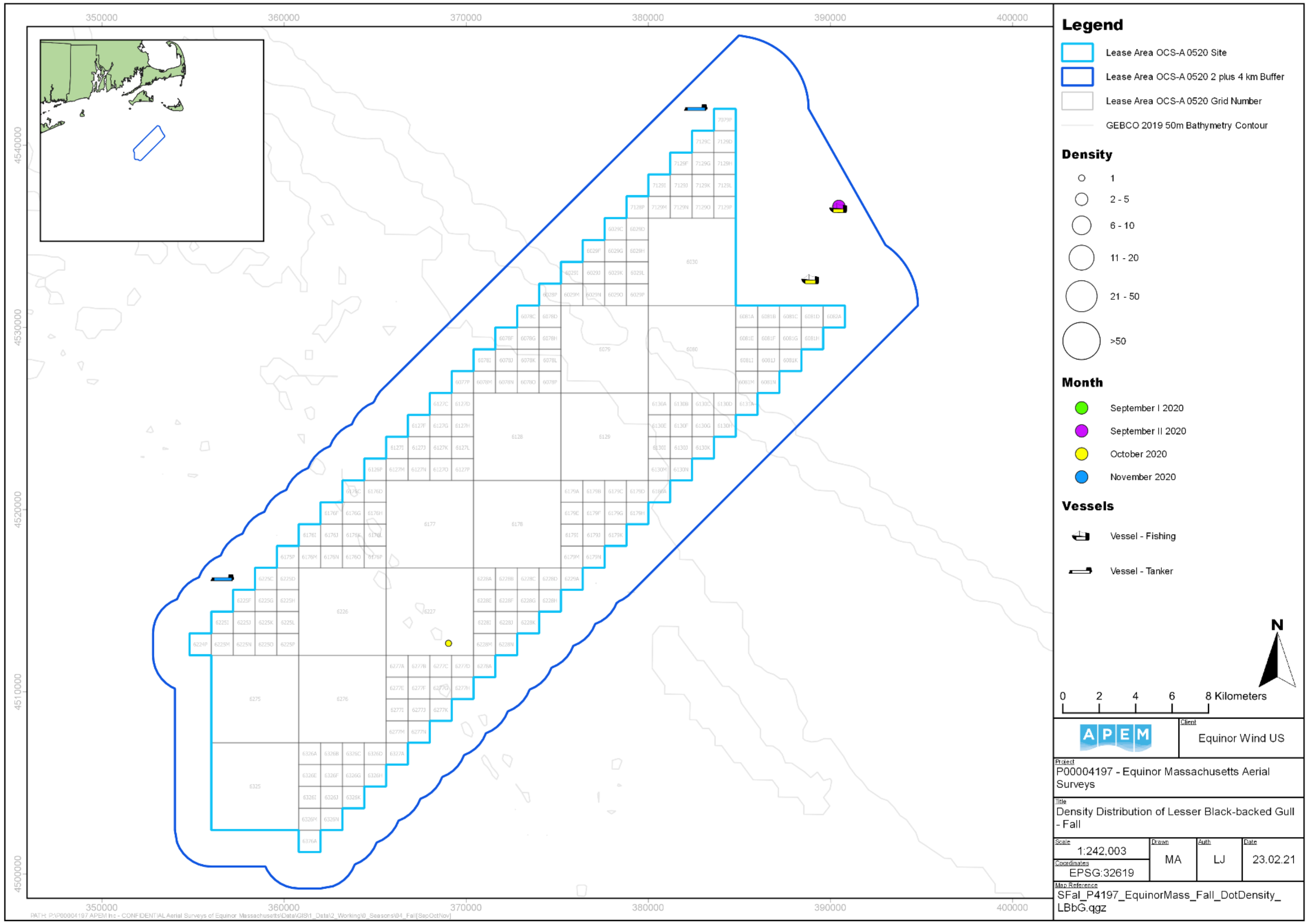

Figure 86 Distribution of lesser black-backed gulls recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season

5.39 Great Black-backed Gull (*Larus marinus)*

Great black-backed gulls were recorded in all four seasons, with highest numbers recorded in spring (**Table 1**). A peak count of 11 in the Site and two in the Buffer from the February survey, led to abundance estimates of 82 and two respectively (**Table 46**).

A total of 21 great black-backed gulls were recorded in the winter (**Figure 87**), of which four were recorded in December 2019, four were recorded in January, and 13 were recorded in February (**Table 46**). For the winter surveys, distribution was loose across the Survey Area (**Figure 87**). A total of 34 gulls were recorded in the spring (**Figure 88**), of which ten were recorded in March, seven were recorded in April I, seven were recorded in April II, six were recorded in May I, and four were recorded in May II (**Table 46**). For the spring surveys, distribution was loose across the Survey Area, with only May II showing distribution restricted to the northern half (**Figure 88**). A total of 18 gulls were recorded in the summer (**Figure 89**), of which nine were recorded in the June survey, two were recorded in the July survey, and seven were recorded in the August II survey (**Table 46**). For the June and July surveys, distribution was loose across the Survey Area, and for the August II survey, distribution was restricted to the northeast, associated with the presence of a fishing vessel (**Figure 89**). A total of 18 gulls were recorded in fall (**Figure 90**), of which one was recorded in the September I survey, 12 were recorded in the September II survey, four were recorded in the October survey, and one was recorded I the November survey (**Table 46**). For the September I and November surveys, the single gulls recorded per survey were located in the northeast of the Survey Area, and for the September II survey, distribution was also predominantly in the northeast (**Figure 90**). For the October survey, distribution was loose across the Survey Area (**Figure 90**).

Table 46 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of great black-backed gulls in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Dec 19	4	32	0.04	4	0
Jan 20	4	32	0.04	4	0
Feb 20	13	104	0.12	8	5
Mar 20	10	79	0.09	4	6
Apr I 20	7	56	0.07	3	4
Apr II 20	7	56	0.07	2	5
May I 20	6	48	0.06	5	1
May II 20	4	32	0.04	1	3
Jun 20	9	72	0.08	6	3
Jul 20	2	16	0.02	2	0
Aug II 20	7	56	0.07	6	1
Sep I 20	1	8	0.01	1	0
Sep II 20	12	95	0.11	1	11
Oct 20	4	32	0.04	3	1
Nov 20	1	8	0.01	1	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Dec 19	4	30	0.06	4	0
Jan 20	2	15	0.03	2	0
Feb 20	11	82	0.16	7	4

Mar 20	7	52	0.1	3	4
Apr I 20	6	45	0.09	2	4
Apr II 20	3	22	0.04	0	3
May I 20	3	22	0.04	3	0
May II 20	3	22	0.04	1	2
Jun 20	4	30	0.06	4	0
Jul 20	1	7	0.01	1	0
Aug II 20	6	45	0.09	5	1
Sep I 20	1	7	0.01	1	0
Sep II 20	1	7	0.01	0	1
Oct 20	1	7	0.01	0	1
Nov 20	1	7	0.01	1	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Dec 19	0	0	-	0	0
Jan 20	2	18	0.04	2	0
Feb 20	2	18	0.05	1	1
Mar 20	3	27	0.08	1	2
Apr I 20	1	9	0.03	1	0
Apr II 20	4	35	0.1	2	2
May I 20	3	27	0.08	2	1
May II 20	1	9	0.03	0	1
Jun 20	5	44	0.13	2	3
Jul 20	1	9	0.03	1	0
Aug II 20	1	9	0.03	1	0
Sep I 20	0	0	-	0	0
Sep II 20	11	97	0.29	1	10
Oct 20	3	27	0.08	3	0
Nov 20	0	0	-	0	0

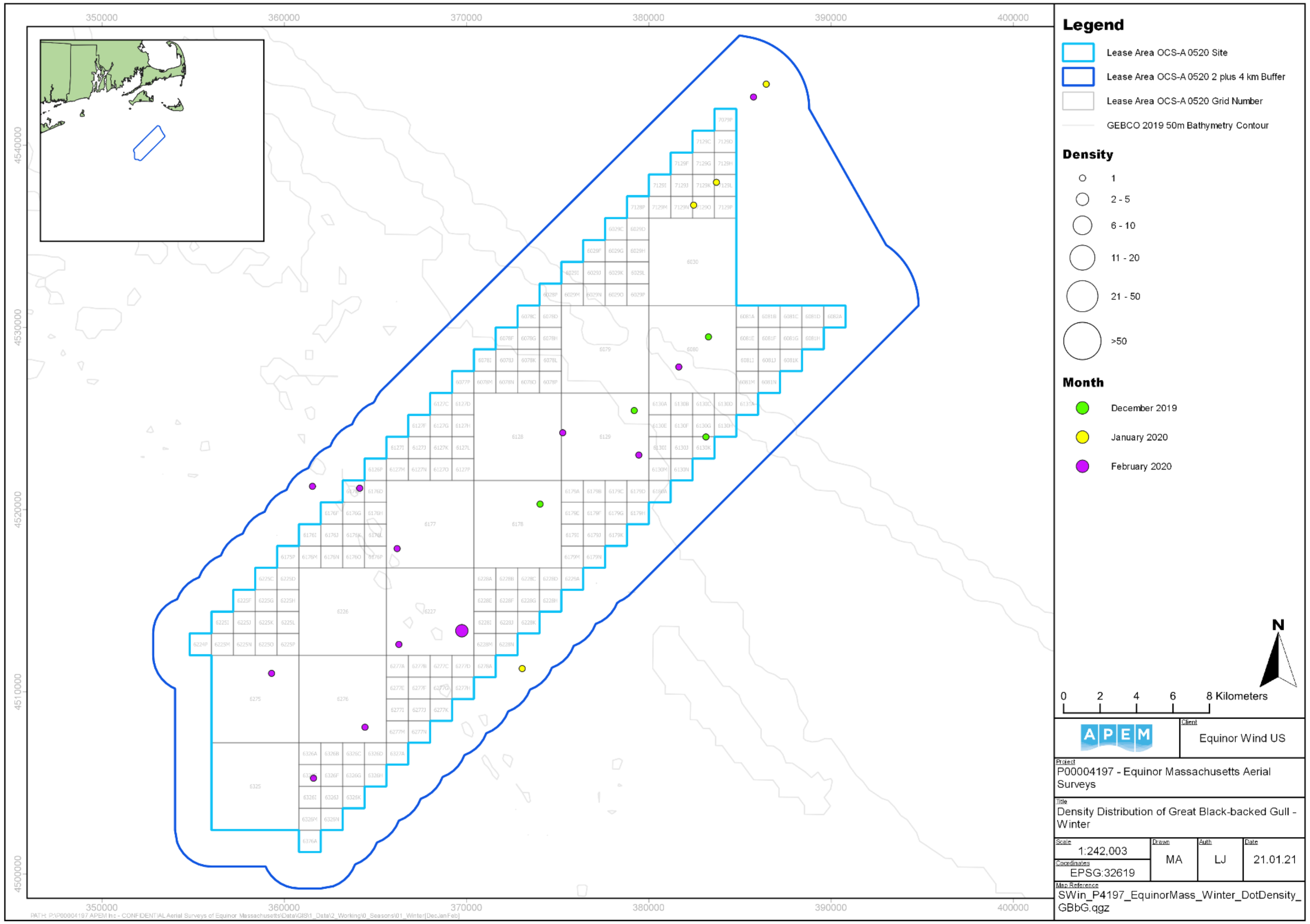

Figure 87 **Distribution of great black-backed gulls recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the winter season**

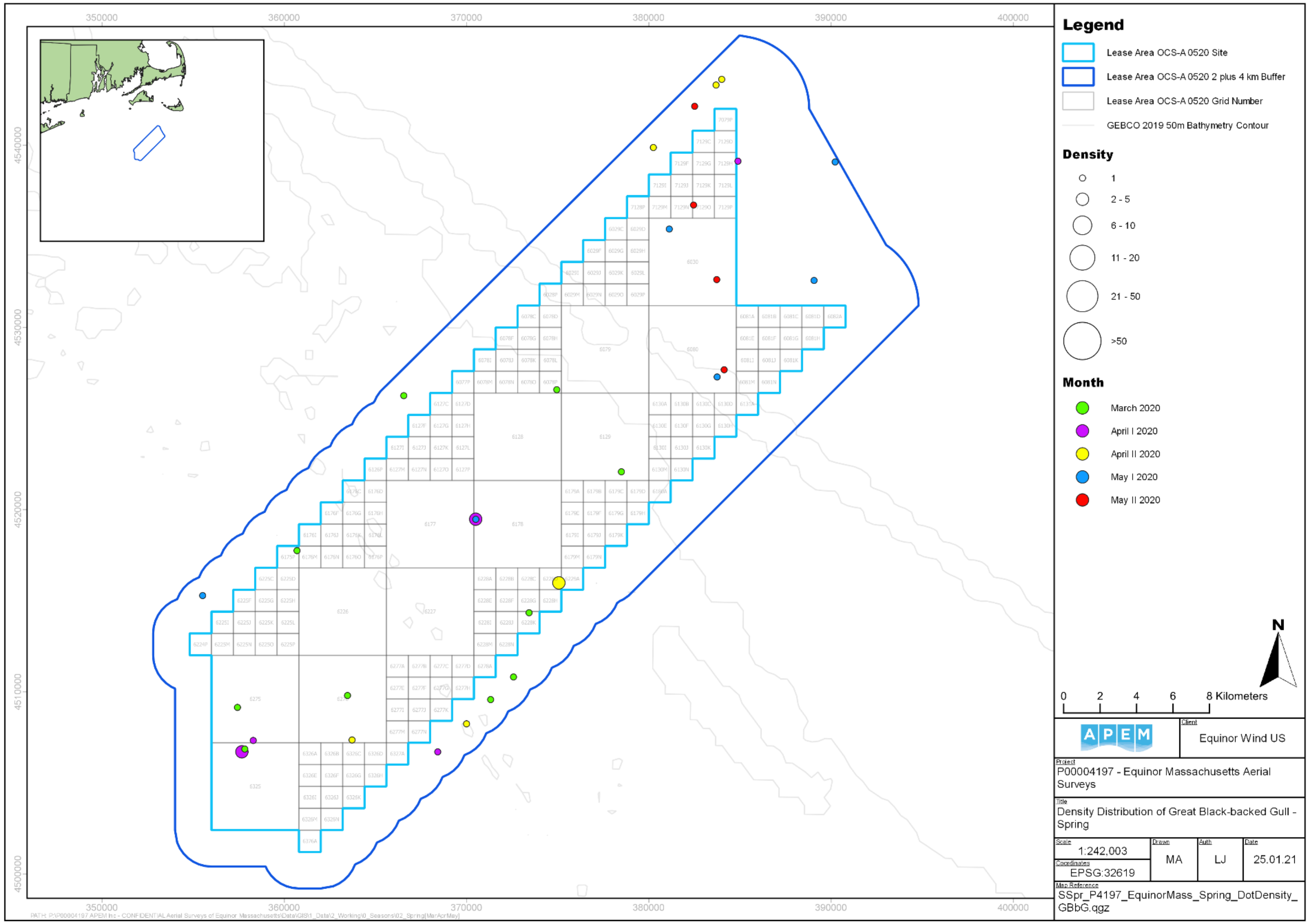

Figure 88 **Distribution of great black-backed gulls recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

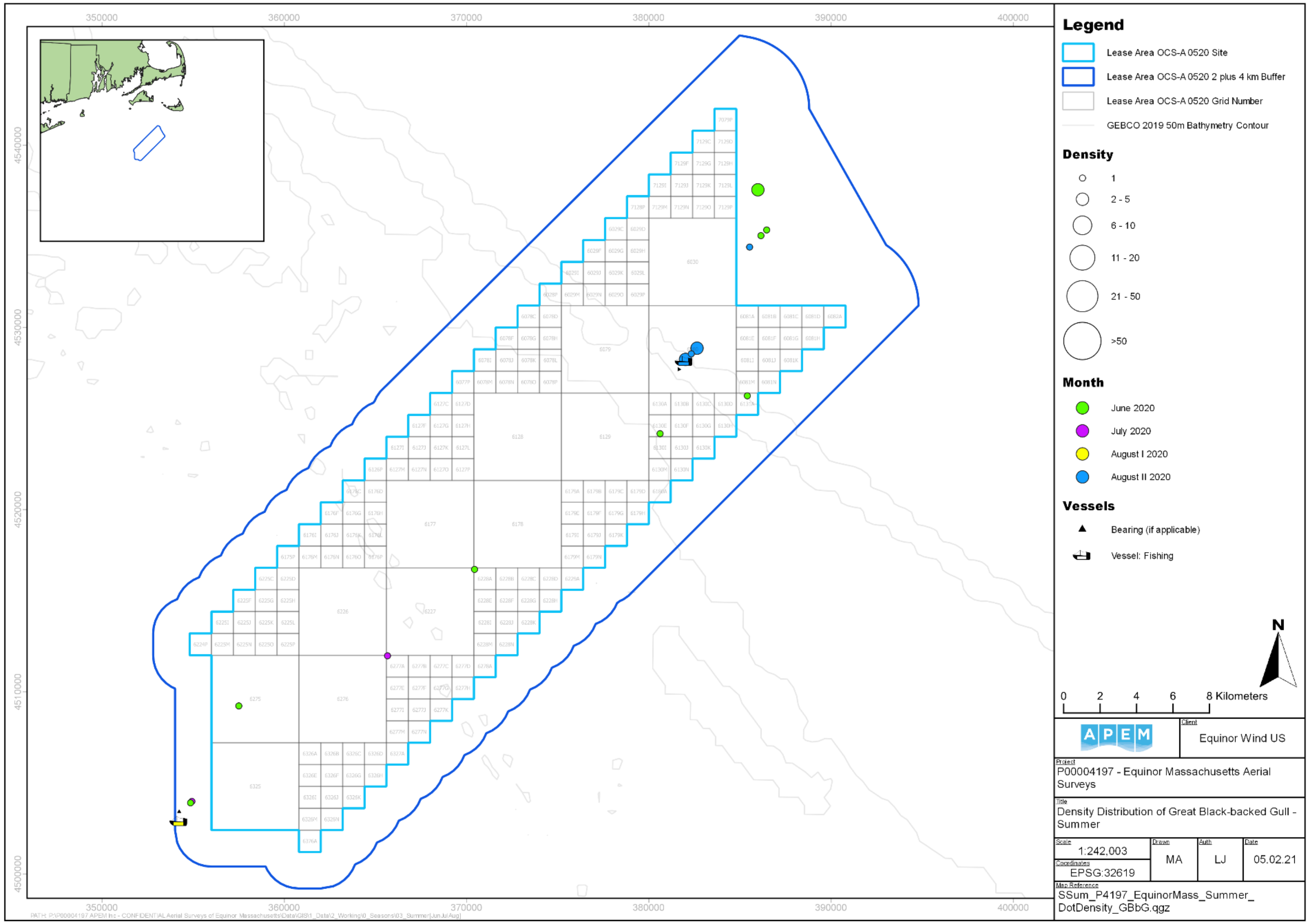

Figure 89 **Distribution of great black-backed gulls recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

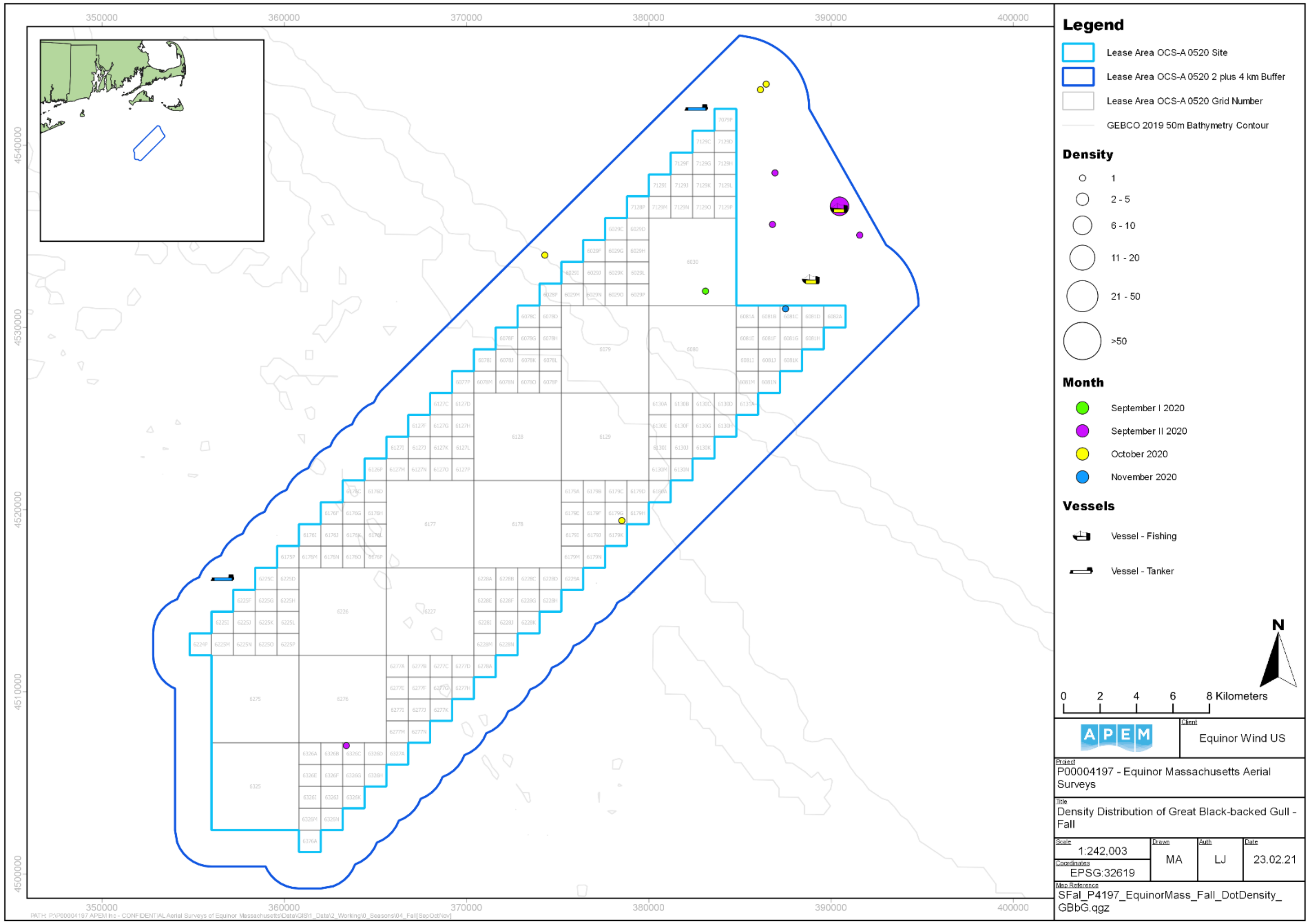

Figure 90 **Distribution of great black-backed gulls recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.40 Sabine's Gull (*Xema sabini)*

A single Sabine's gull was recorded in the November survey only, with highest numbers therefore recorded in fall (**Table 1**). A peak count of one in the Survey Area led to an abundance estimate of eight (**Table 47**).

A total of one Sabine's gull was recorded in fall from the November survey (**Table 47**), located in the center of the Survey Area (**Figure 91**).

Table 47 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of Sabine's gulls in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

d) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Nov 20	1	8	0.01	1	0
e) Lease Area OCS-A 0520 Site					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Nov 20	1	7	0.01	1	0
f) 2 + 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Nov 20	0	0	-	0	0

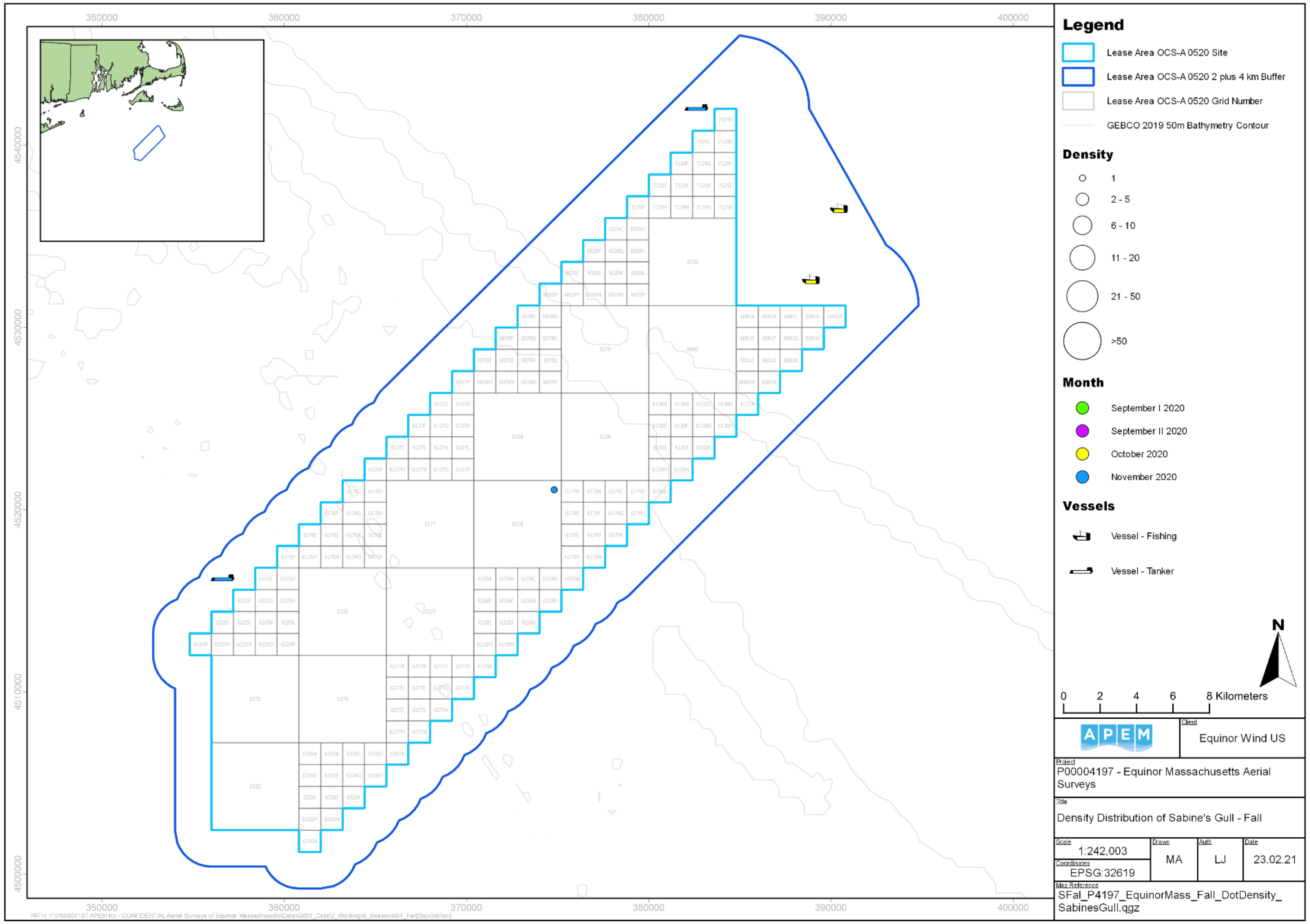

Figure 91 **Distribution of Sabine's gulls recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.41 Large Gull Species (Unidentified Laridae)

Unidentified large gulls were recorded in the summer and fall, with a total of three recorded for each season (**Table 1**). A peak count of one in the Site and one in the Buffer for the November survey, led to abundance estimates of seven and nine respectively (**Table 48**).

A total of three unidentified large gulls were recorded in the summer (**Figure 92**), of which two were recorded in the August **I** survey, and one was recorded in the August **II** survey (**Table 48**). For the August **I** survey, large gulls were located in the north of the Survey Area, and for the August **II** survey, a single large gull was located in the northeast, associated with the presence of a fishing vessel (**Figure 92**). A total of three large gulls were recorded in the fall (**Figure 93**), of which one was recorded in the October survey, and two were recorded in the November survey (**Table 48**). For the October survey, a single large gull was located in the southwest of the Survey Area, and for the November survey, one large gull was located in the southwest and one was located in the northeast (**Figure 93**).

Table 48 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified large gulls in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Aug I 20	2	16	0.02	0	2
Aug II 20	1	8	0.01	0	1
Oct 20	1	8	0.01	1	0
Nov 20	2	16	0.02	0	2
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Aug I 20	2	15	0.03	0	2
Aug II 20	1	7	0.01	0	1
Oct 20	1	7	0.01	1	0
Nov 20	1	7	0.01	0	1
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Aug I 20	0	0	-	0	0
Aug II 20	0	0	-	0	0
Oct 20	0	0	-	0	0
Nov 20	1	9	0.03	0	1

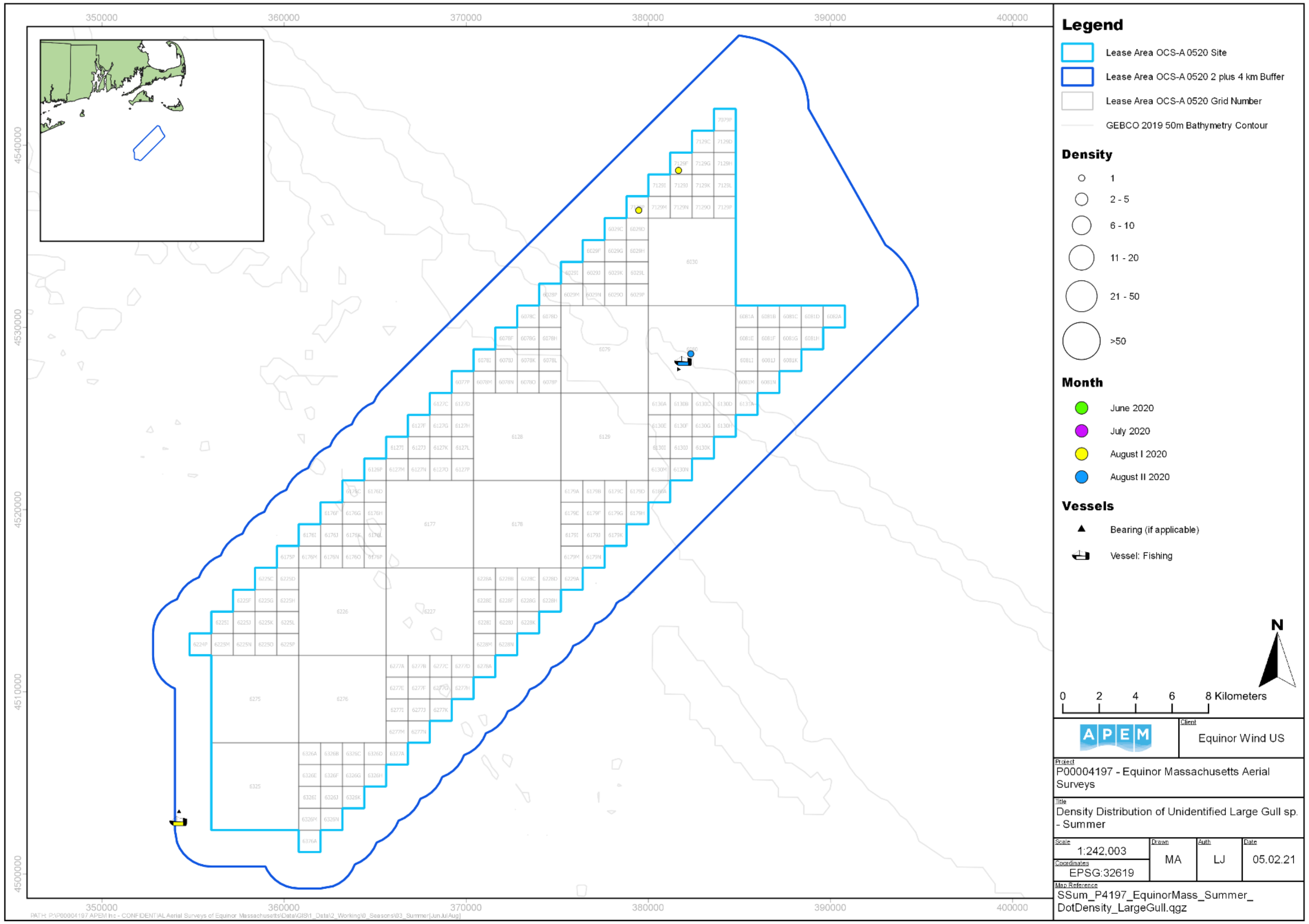

Figure 92 **Distribution of unidentified large gulls recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

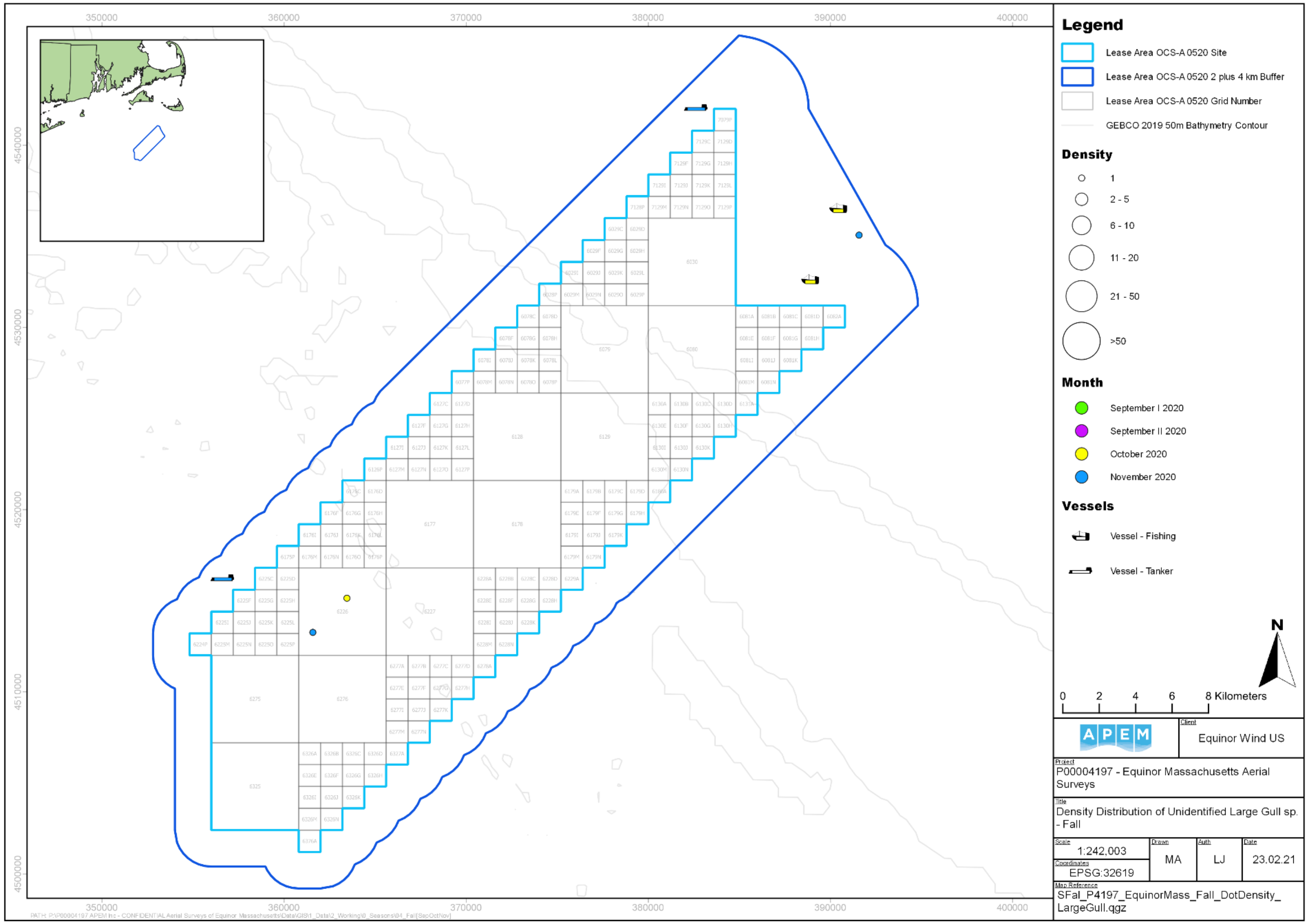

Figure 93 Distribution of unidentified large gulls recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season

5.42 Small Gull Species (Unidentified Laridae)

Unidentified small gulls were recorded in the winter, spring, and fall surveys, with highest numbers recorded in fall (**Table 1**). A peak count of 11 in the Site and five in the Buffer from the November survey, led to abundance estimates of 82 and 44 respectively (**Table 49**).

A total of one unidentified small gull was recorded in winter from the December 2019 survey (**Table 49**), located in the south of the Survey Area (**Figure 94**). A total of 12 small gulls were recorded in spring (**Figure 95**), of which two were recorded in the April **I** survey, nine were recorded in the April **II** survey, and one was recorded in the May **II** survey (**Table 49**). For the April **I** and April **II** surveys, small gulls were loosely distributed across the Survey Area, and for the May **II** survey, the single small gull was located in the west-northwest of the Survey Area (**Figure 95**). A total of 17 small gulls were recorded in fall (**Figure 96**), of which one was recorded in the October survey, and 16 were recorded in the November survey (**Table 49**). For the October survey, the single small gull was located in the northeast of the Survey Area, and for the November survey, distribution was loose across the Survey Area (**Figure 96**).

Table 49 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified small gulls in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Dec 19	1	8	0.01	0	1
Apr I 20	2	16	0.02	0	2
Apr II 20	9	72	0.08	2	7
May II 20	1	8	0.01	0	1
Oct 20	1	8	0.01	0	1
Nov 20	16	127	0.15	1	15
b) Lease Area OCS-A 0520 Site					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Dec 19	1	7	0.01	0	1
Apr I 20	0	0	-	0	0
Apr II 20	6	45	0.09	1	5
May II 20	0	0	-	0	0
Oct 20	1	7	0.01	0	1
Nov 20	11	82	0.16	0	11
c) 2 + 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Dec 19	0	0	-	0	0
Apr I 20	2	18	0.05	0	2
Apr II 20	3	27	0.08	1	2
May II 20	1	9	0.03	0	1
Oct 20	0	0	-	0	0
Nov 20	5	44	0.13	1	4

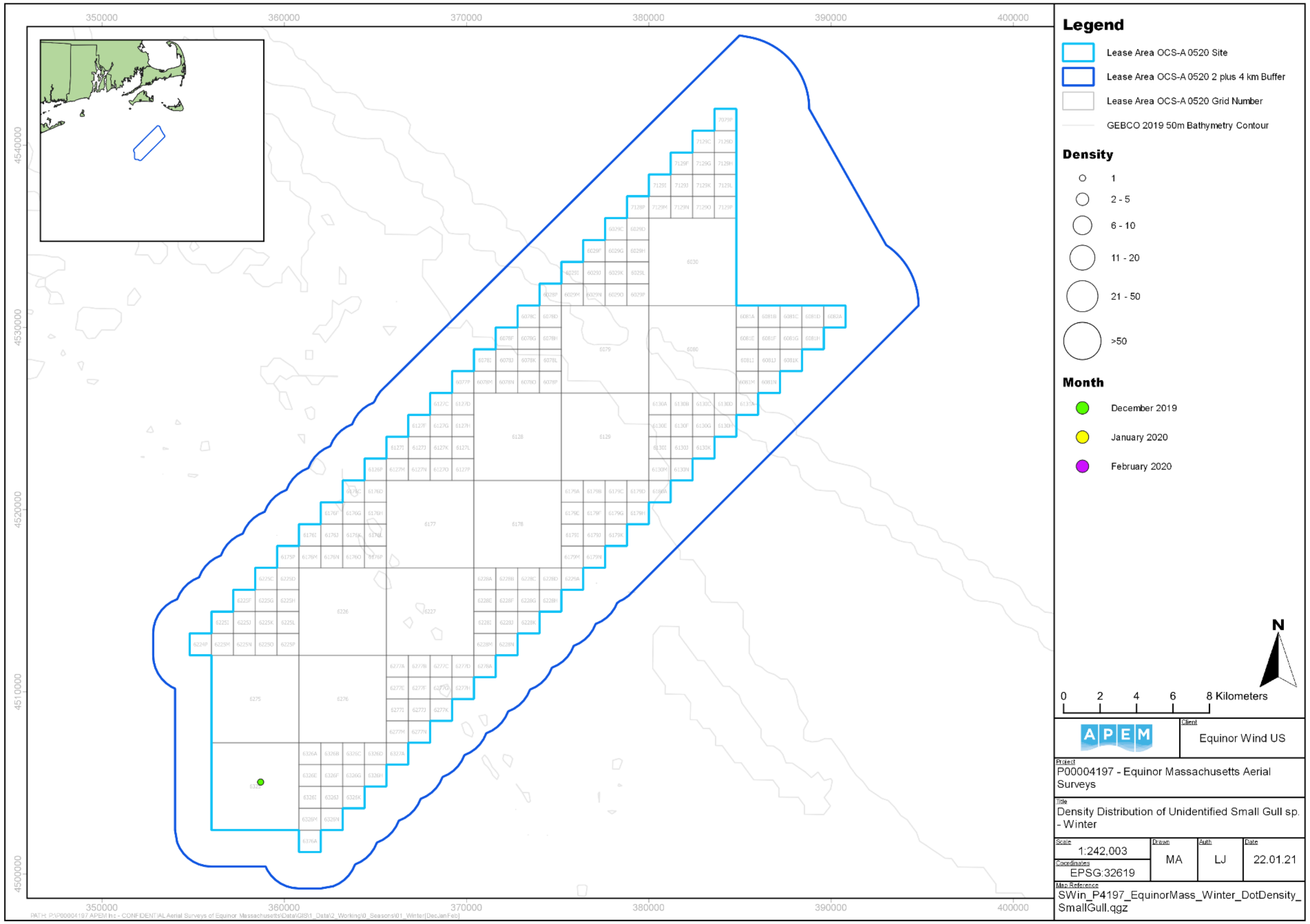

Figure 94 Distribution of unidentified small gulls recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the winter season

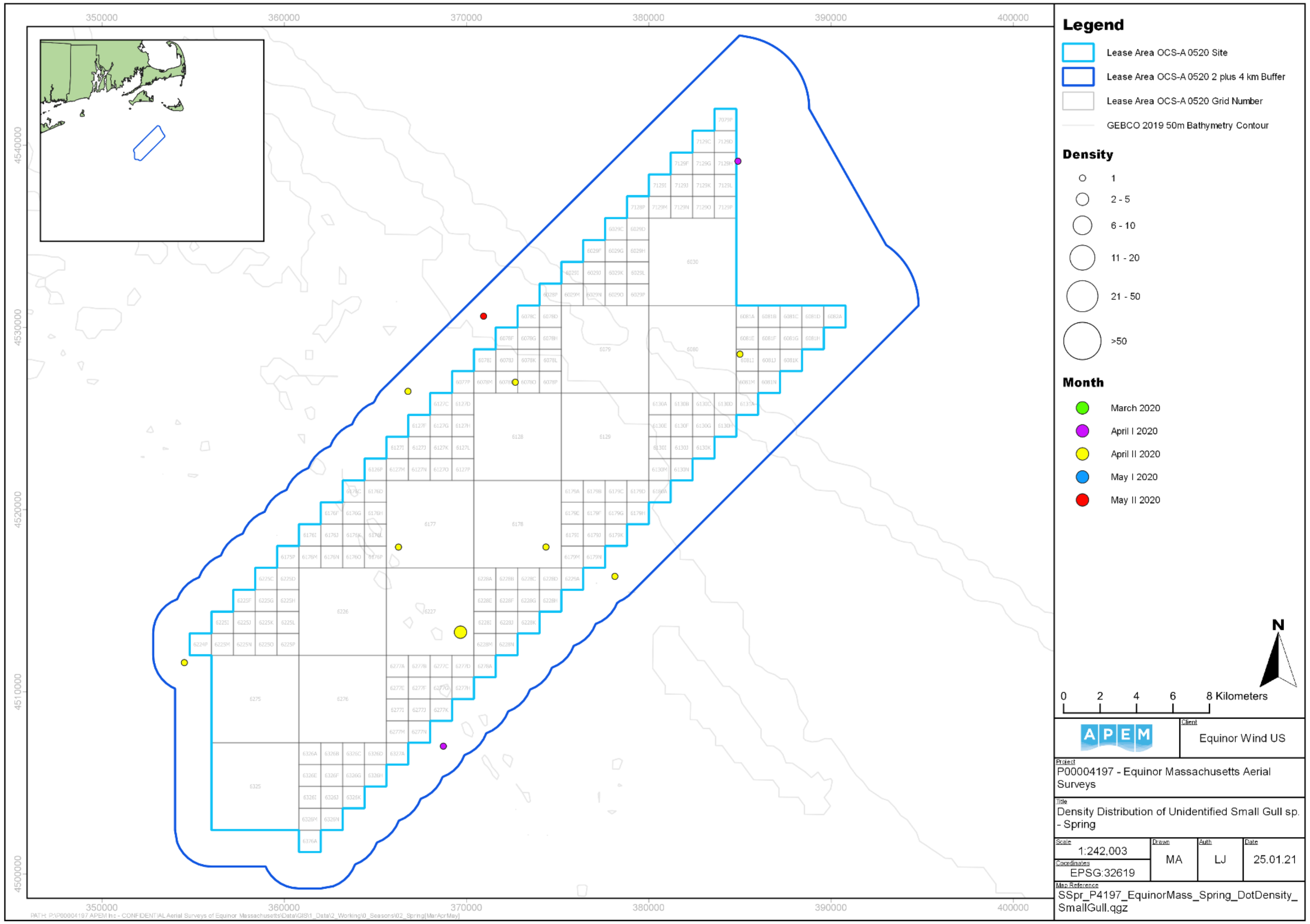

Figure 95 **Distribution of unidentified small gulls recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

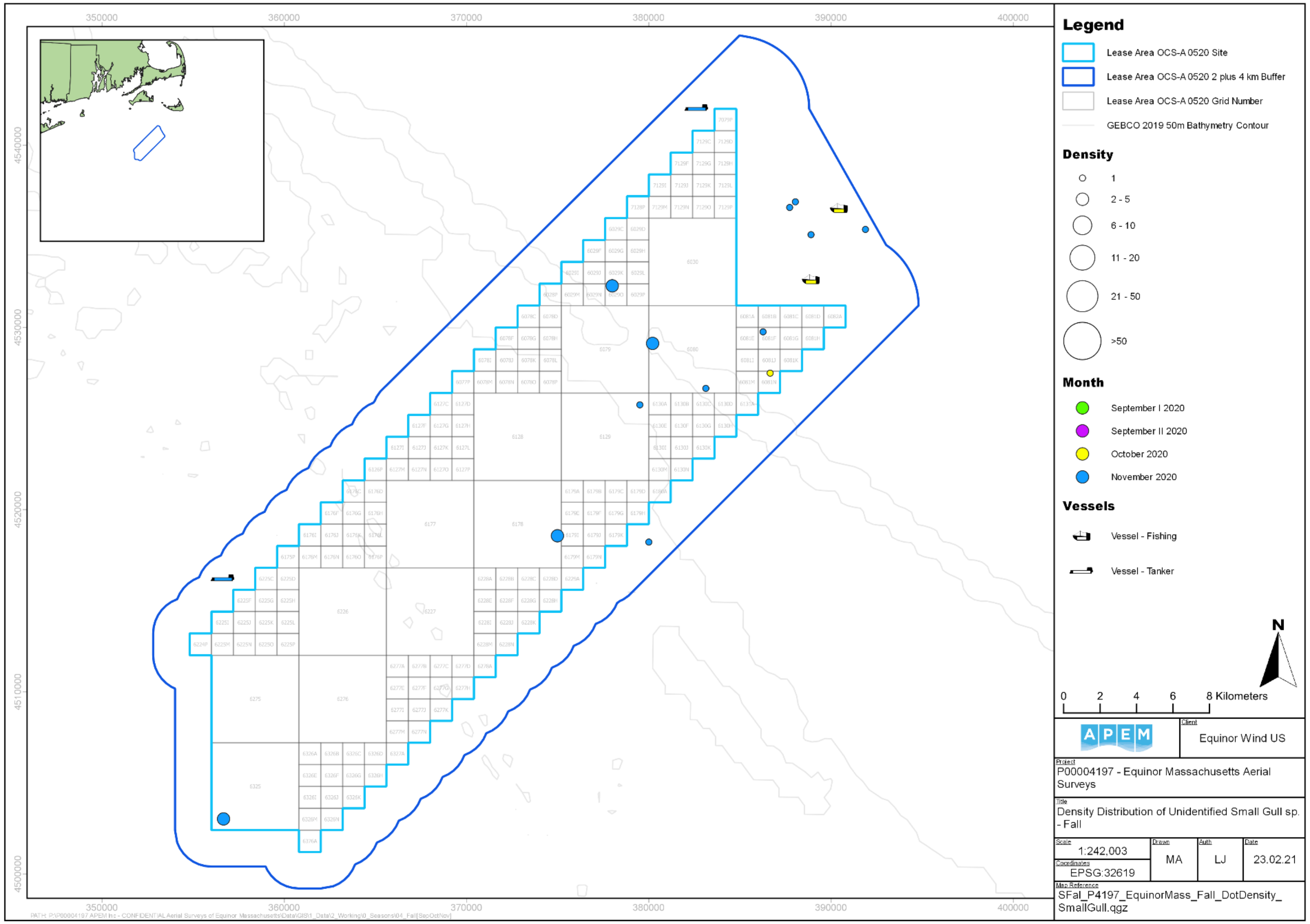

Figure 96 **Distribution of unidentified small gulls recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.43 Gull Species (Unidentified Laridae)

Unidentified gulls were recorded in the summer and fall surveys, with highest numbers recorded in fall (**Table 1**). A peak count of two in the Site and one in the Buffer from the November survey, led to abundance estimates of 15 and nine respectively (**Table 50**).

A total of one unidentified gull was recorded in the summer from the August **II** survey (**Table 50**), located in the northeast of the Survey Area, associated with the presence of a fishing vessel (**Figure 97**). A total of five unidentified gulls were recorded in the fall (**Figure 97**), of which one was recorded in the September **I** survey, one was recorded in the September **II** survey, and three were recorded in the November survey (**Table 50**). For the September **I** and **II** surveys, unidentified gulls were located in the southwest of the Survey Area, and for the November survey, unidentified gulls were loosely distributed across the Survey Area (**Figure 97**).

Table 50 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified gulls in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer						
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**	**Perched**
Aug II 20	1	8	0.01	0	0	1
Sep I 20	1	8	0.01	0	1	0
Sep II 20	1	8	0.01	0	1	0
Nov 20	3	24	0.03	0	3	0
b) Lease Area OCS-A 0520 Site						
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**	**Perched**
Aug II 20	1	7	0.01	0	0	1
Sep I 20	0	0	-	0	0	0
Sep II 20	0	0	-	0	0	0
Nov 20	2	15	0.03	0	2	0
c) 2 + 4 km Buffer						
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**	**Perched**
Aug II 20	0	0	-	0	0	0
Sep I 20	1	9	0.03	0	1	0
Sep II 20	1	9	0.03	0	1	0
Nov 20	1	9	0.03	0	1	0

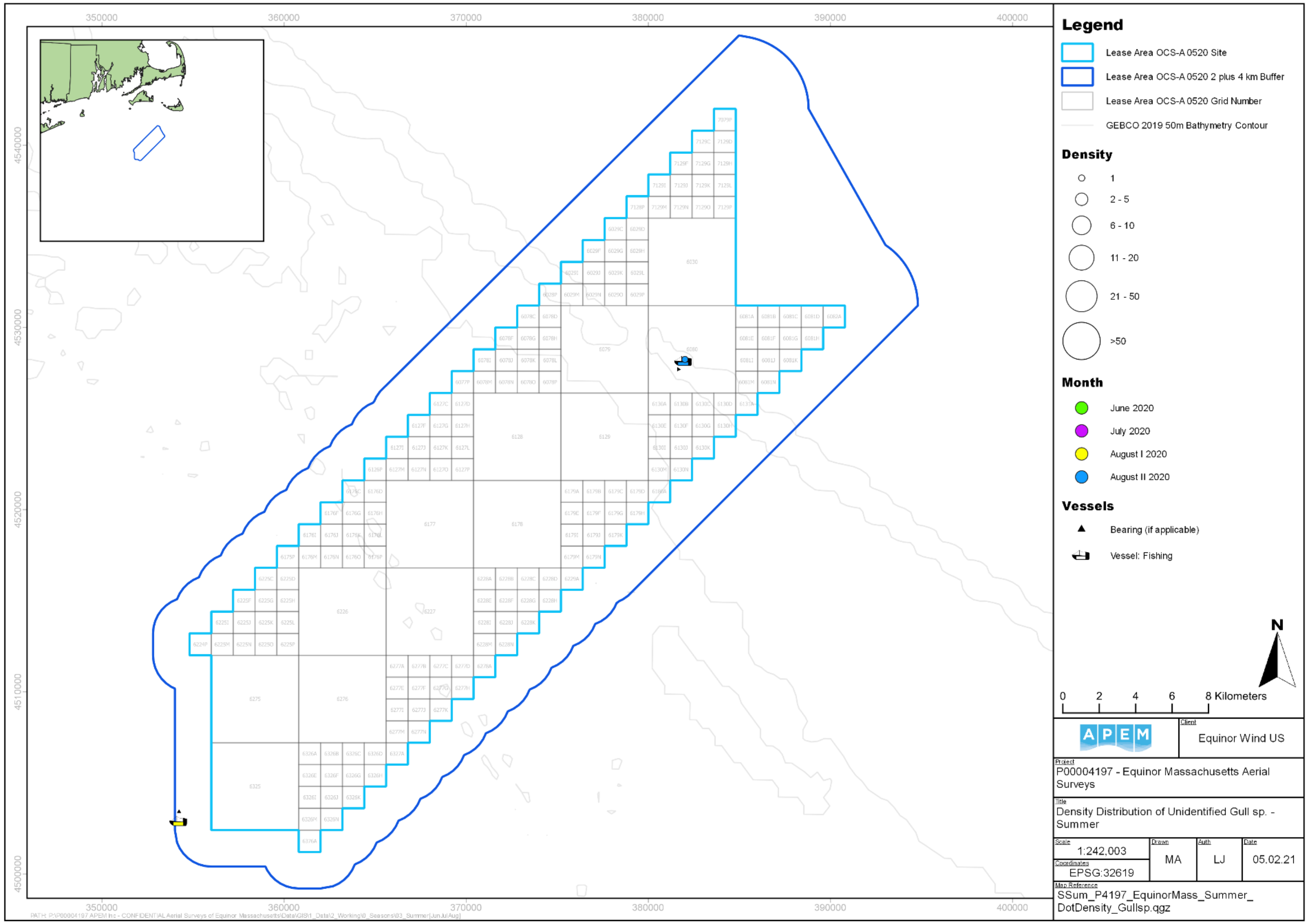

Figure 97 **Distribution of unidentified gulls recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

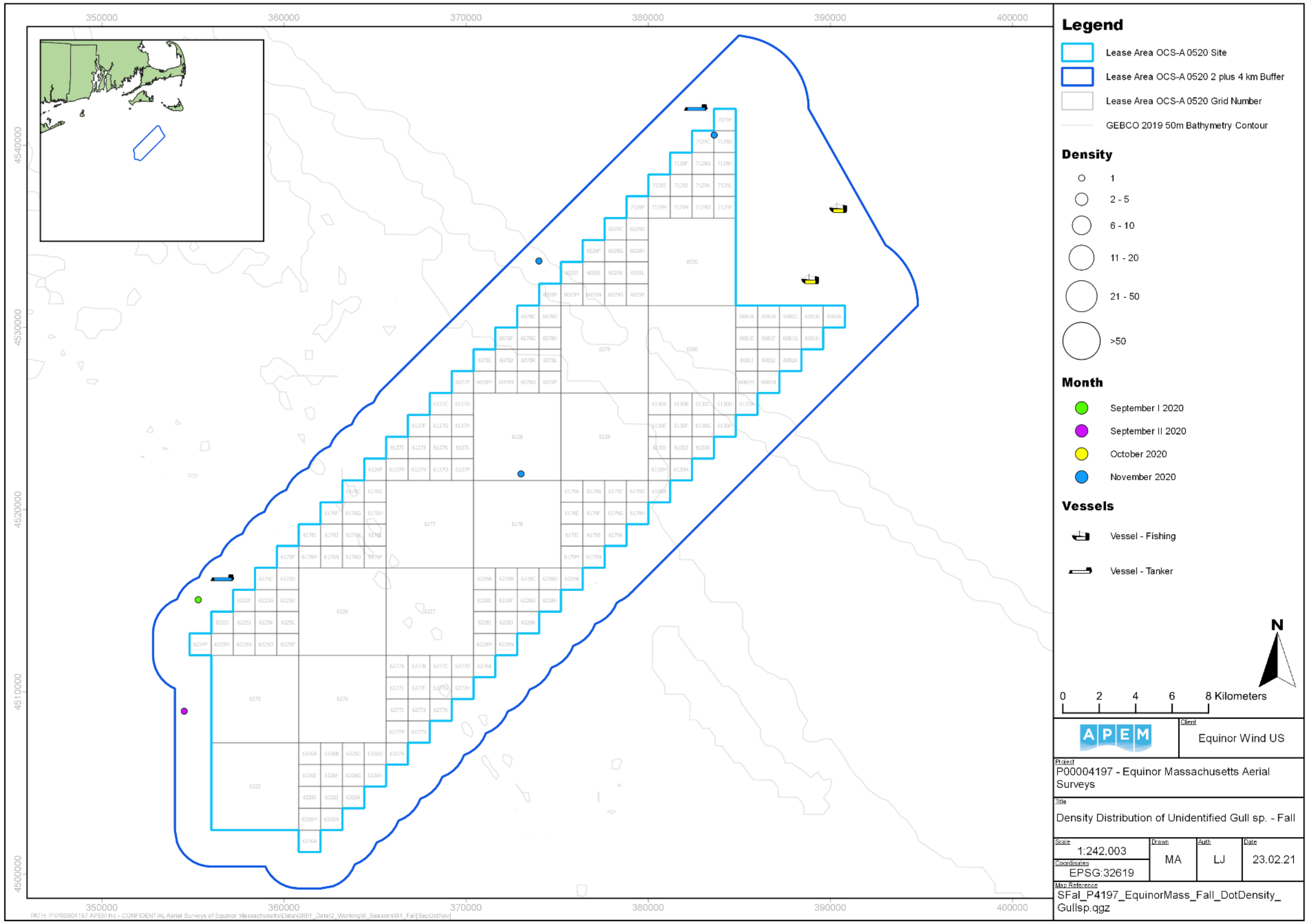

Figure 98 **Distribution of unidentified gulls recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.44 Roseate Tern (*Sterna dougallii)*

Roseate terns were recorded in the May I survey only, with highest numbers therefore recorded in spring (**Table 1**). A peak count of one in the Site and two in the Buffer led to abundance estimates of seven and 18 respectively (**Table 51**).

A total of three roseate terns were recorded in the spring from the May I survey (**Table 51**), located in the southwest of the Survey Area (**Figure 99**).

Table 51 Raw counts and abundance and density estimates (No. estimated individuals per km²) of roseate terns in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
May I 20	3	24	0.03	3	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
May I 20	1	7	0.01	1	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
May I 20	2	18	0.05	2	0

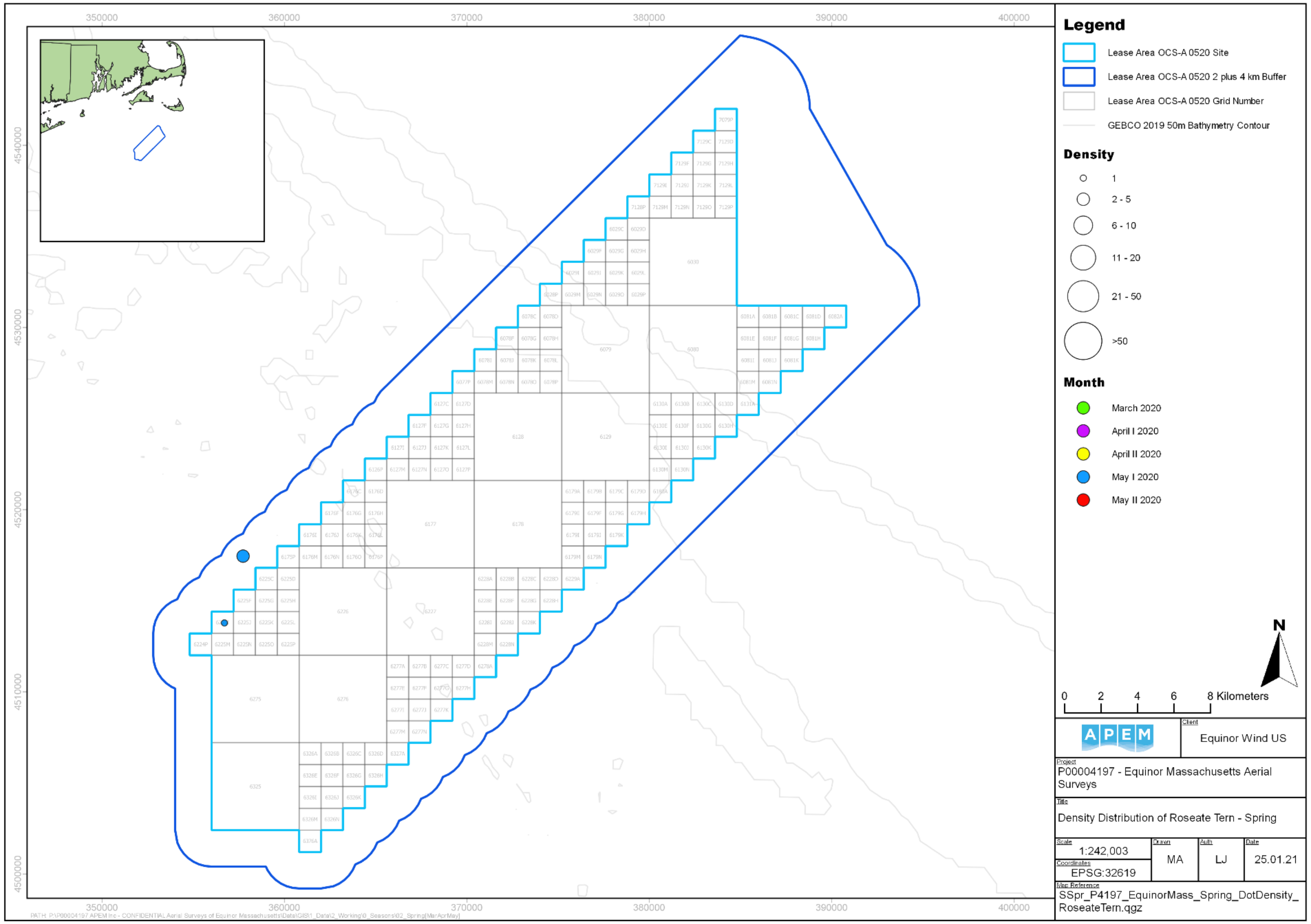

Figure 99 Distribution of roseate terns recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season

5.45 Common Tern (*Sterna hirundo)*

Common terns were recorded in the May I survey only, with highest numbers therefore recorded in spring (**Table 1**). A peak count of four in the Site and one in the Buffer led to abundance estimates of 30 and nine respectively (**Table 52**).

A total of five common terns were recorded in spring from the first May survey only (**Table 27**), with individuals predominantly located in the west-southwest of the Survey Area (**Figure 100**).

Table 52 Raw counts and abundance and density estimates (No. estimated individuals per km²) of common terns in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
May I 20	5	40	0.05	5	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
May I 20	4	30	0.06	4	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
May I 20	1	9	0.03	1	0

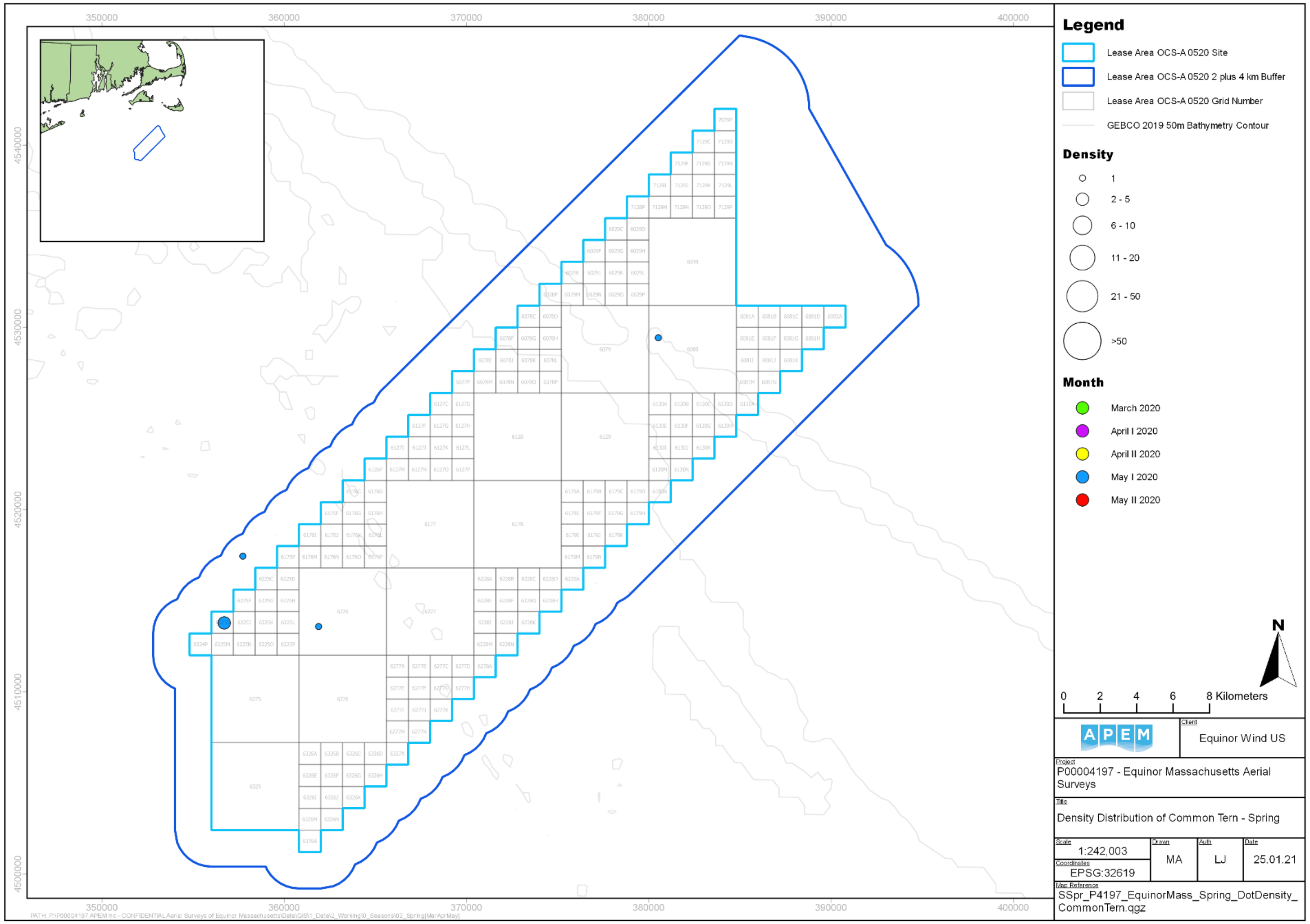

Figure 100 Distribution of common terns recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season

5.46 Forster's Tern (*Sterna forsteri)*

Forster's terns were recorded in the November survey only, with highest numbers therefore recorded in fall (**Table 1**). A peak count of one in the Survey Area led to an abundance estimate of eight (**Table 53**).

A total of one Forster's tern was recorded in fall from the November survey (**Table 53**), located in the northwest of the Survey Area (**Figure 101**).

Table 53 Raw counts and abundance and density estimates (No. estimated individuals per km²) of Forster's terns in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

d) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Nov 20	1	8	0.01	1	0
e) Lease Area OCS-A 0520 Site					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Nov 20	1	7	0.01	1	0
f) 2 + 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Nov 20	0	0	-	0	0

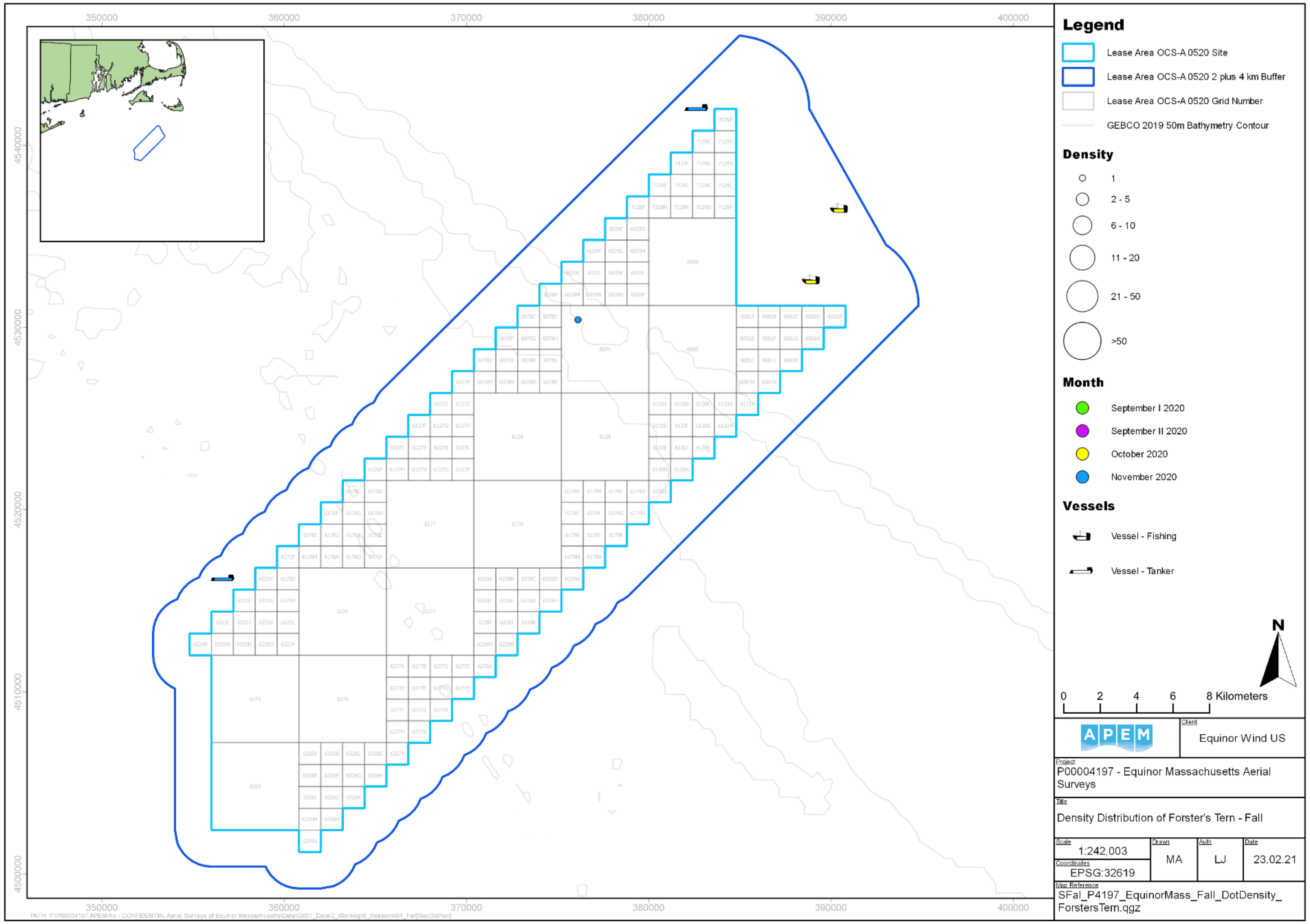

Figure 101 Distribution of Forster's terns recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season

5.47 'Commic' / Forster's Tern (*Sterna hirundo / paradisaea / forsteri)*

'Commic' / Forster's terns were recorded in the spring, summer, and fall surveys, with highest numbers recorded in spring (**Table 1**). A peak count of nine in the Site and one in the Buffer from the May I survey led to abundance estimates of 67 and nine respectively (**Table 54**).

A total of 15 'commic' / Forster's terns were recorded in the spring surveys (**Figure 102**), of which five were recorded in April II, and ten were recorded in May I (**Table 54**). For April II, terns were loosely distributed across the Survey Area and for May I, terns were predominantly distributed towards the west-southwest (**Figure 102**). A total of three terns were recorded in the summer surveys (**Figure 103**), of which two were recorded in June and one was recorded in August I (**Table 54**). For the June survey, terns were located in the northeast of the Survey Area and for the August I survey, the single tern was located north of the center of the Survey Area (**Figure 103**). A total of one tern was recorded in fall from the October survey (**Table 54**), located east of the Survey Area center (**Figure 104**).

Table 54 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of 'commic' / Forster's terns in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Apr II 20	5	40	0.05	5	0
May I 20	10	79	0.09	10	0
Jun 20	2	16	0.02	2	0
Aug I 20	1	8	0.01	1	0
Oct 20	1	8	0.01	1	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Apr II 20	3	22	0.04	3	0
May I 20	9	67	0.13	9	0
Jun 20	0	0	-	0	0
Aug I 20	1	7	0.01	1	0
Oct 20	1	7	0.01	1	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Flying**	**Sitting**
Apr II 20	2	18	0.05	2	0
May I 20	1	9	0.03	1	0
Jun 20	2	18	0.05	2	0
Aug I 20	0	0	-	0	0
Oct 20	0	0	-	0	0

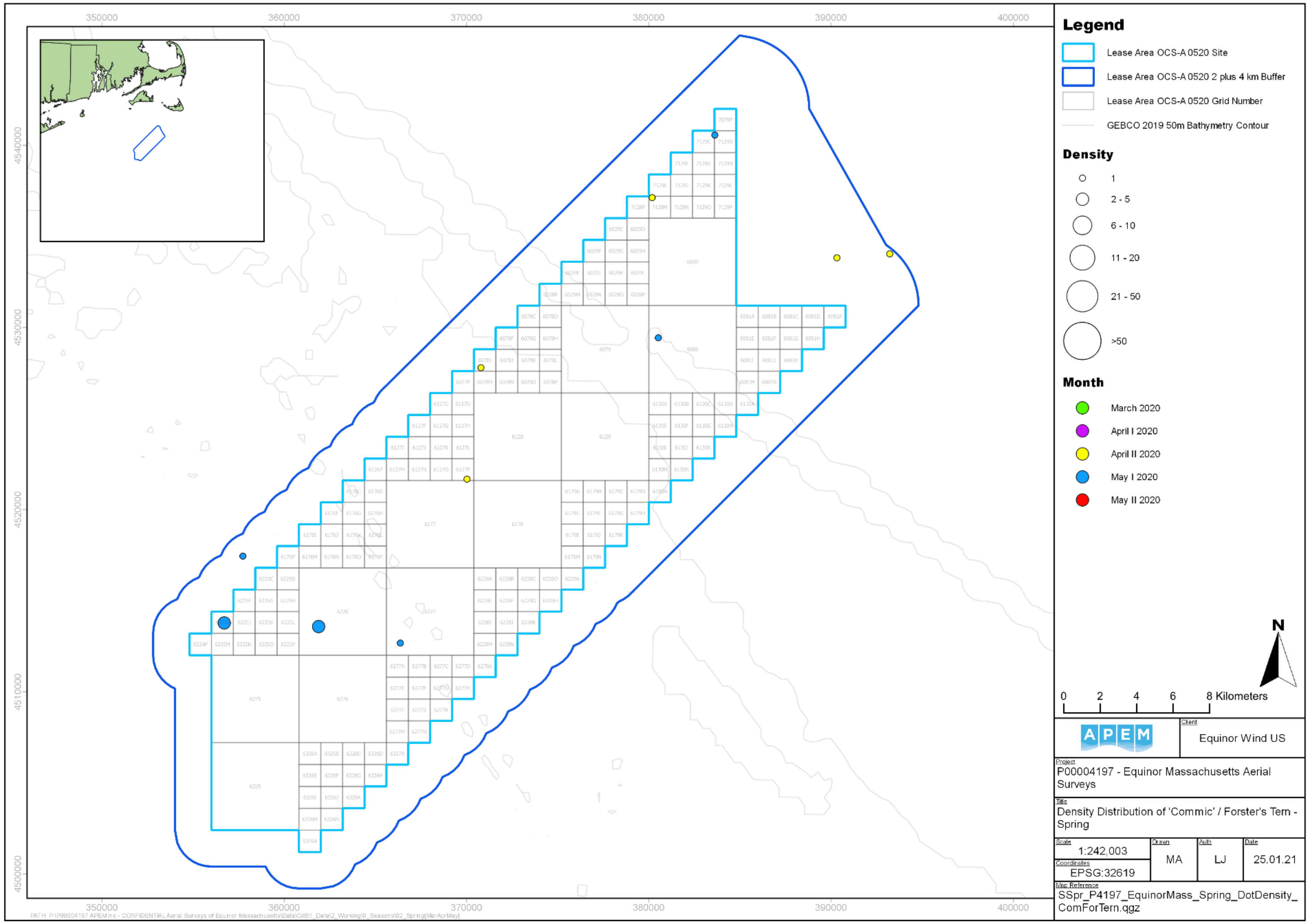

Figure 102 **Distribution of 'commic' / Forster's terns recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

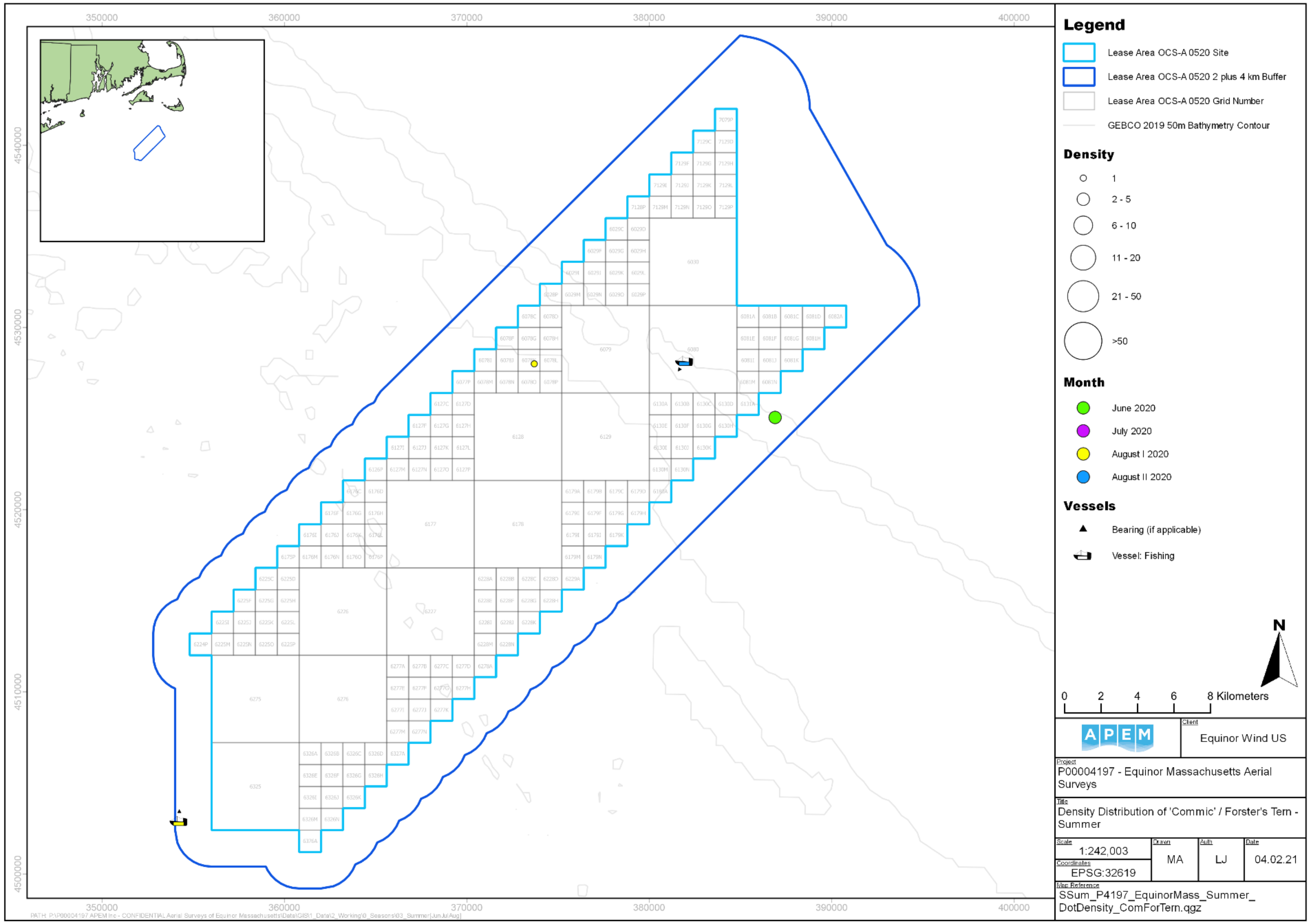

Figure 103 **Distribution of 'commic' / Forster's terns recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

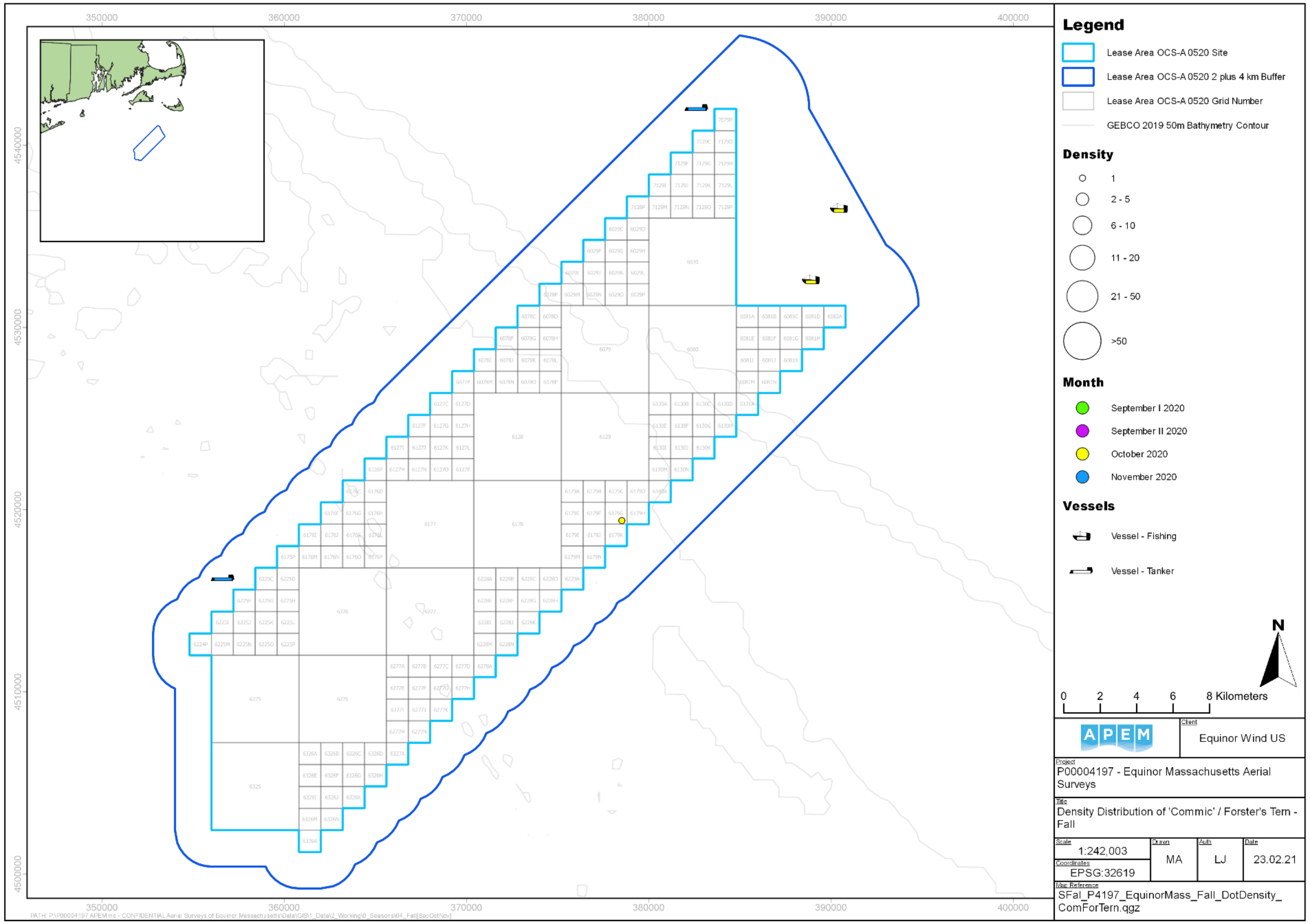

Figure 104 **Distribution of 'commic' / Forster's terns recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.48 Sterna Tern Species (Unidentified *Sterna spp.)*

Unidentified Sterna terns were recorded in the spring and summer surveys, with highest numbers recorded in spring (**Table 1**). A peak count of 34 in the Survey Area from the May I survey led to an abundance estimate of 270 (**Table 55**).

A total of 34 unidentified Sterna terns were recorded in the spring from the May I survey (**Table 55**), located in the south to southwest of the Survey Area, with the majority concentrated in one group (**Figure 105**). For the summer, a total of one tern was recorded in August I (**Table 55**), located in the northeast of the Survey Area (**Figure 106**).

Table 55 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified Sterna terns in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
May I 20	34	270	0.31	0	34
Aug I 20	1	8	0.01	1	0
b) Lease Area OCS-A 0520 Site					
Survey	Raw Count	Abundance	Density	Flying	Sitting
May I 20	34	253	0.49	0	34
Aug I 20	1	7	0.01	1	0
c) 2 + 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
May I 20	0	0	-	0	0
Aug I 20	0	0	-	0	0

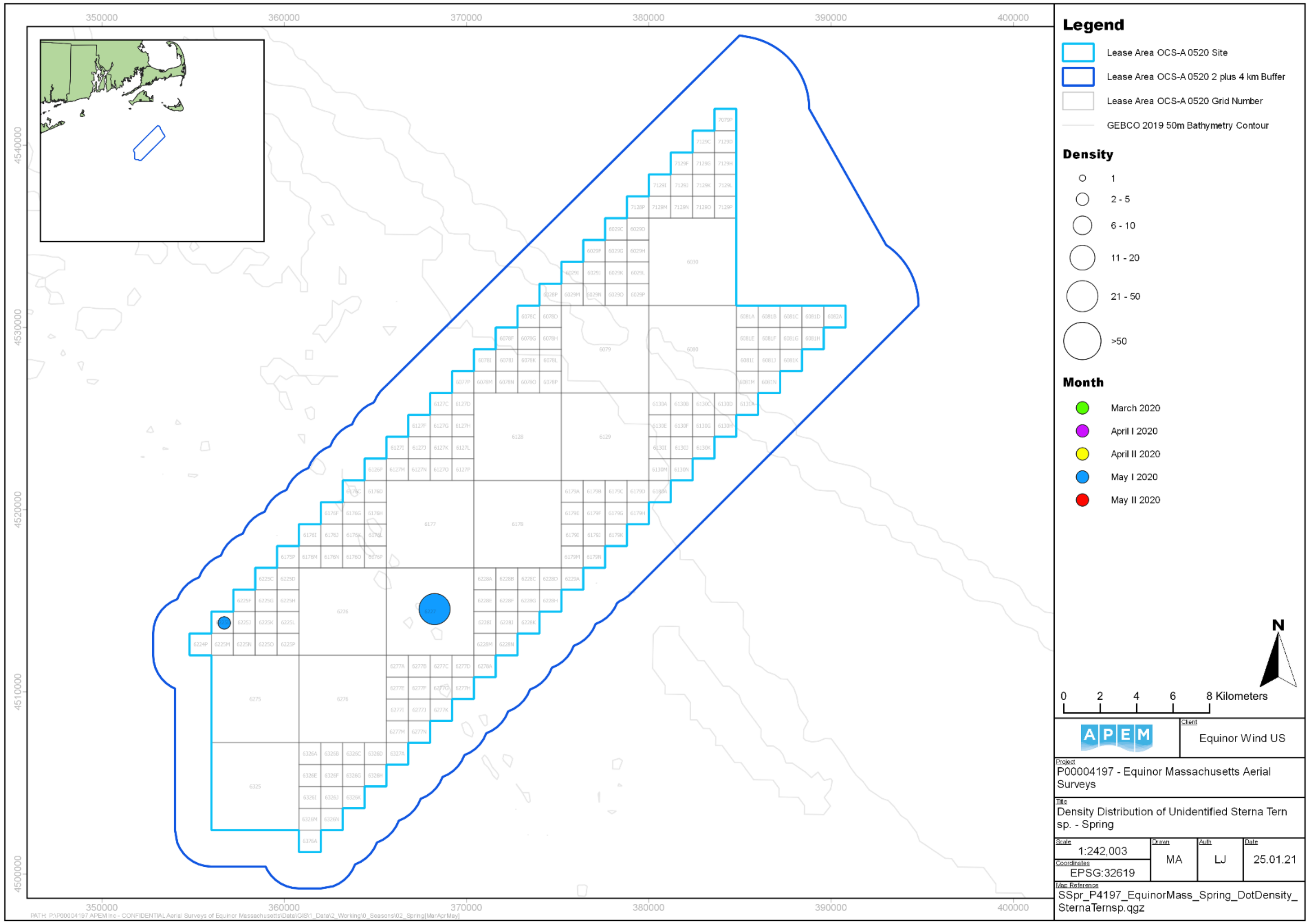

Figure 105 **Distribution of unidentified Sterna terns recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

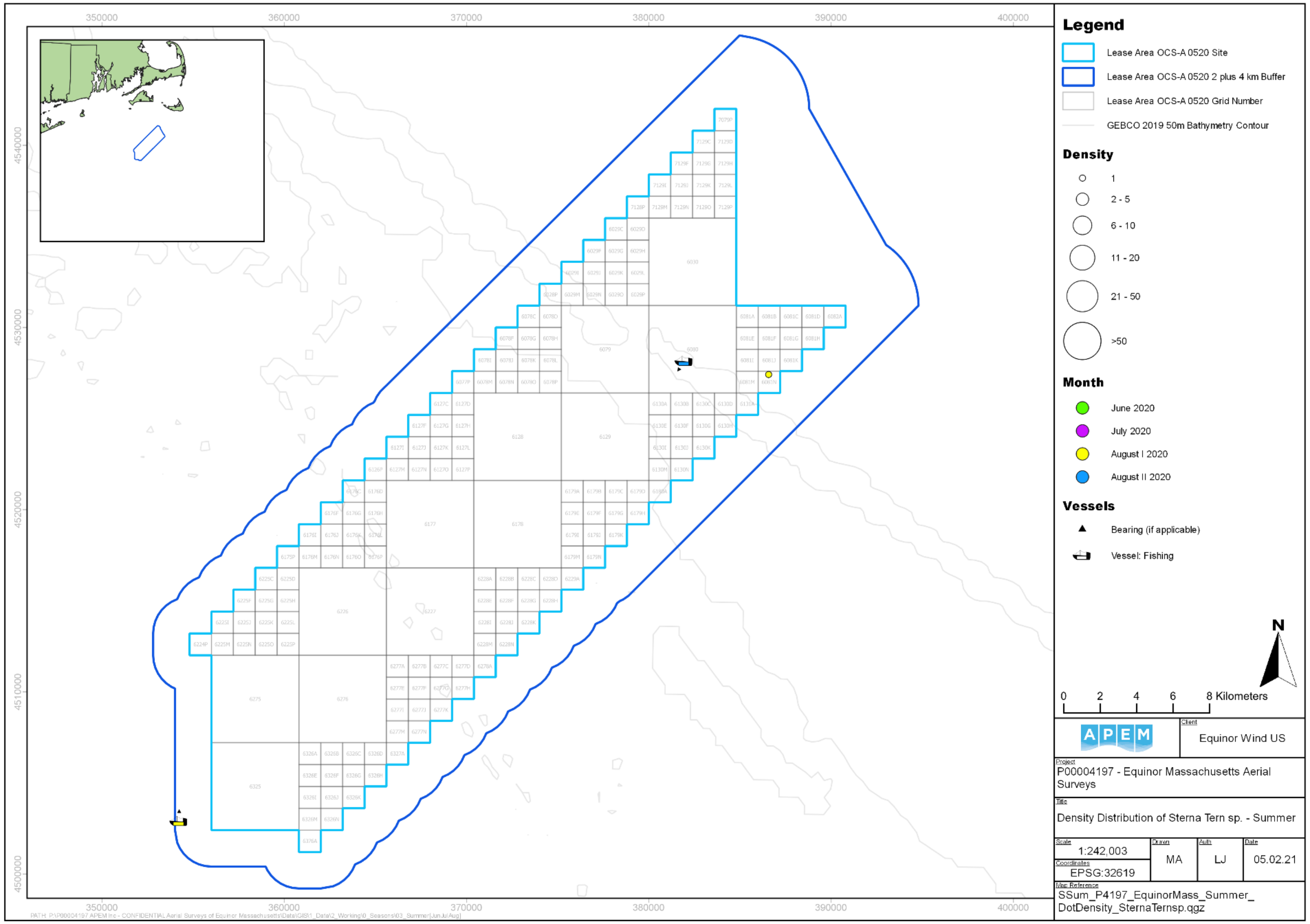

Figure 106 **Distribution of unidentified Sterna terns recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

5.49 Passerine Species (Unidentified Passeriformes)

Unidentified passerines were recorded in the September II and October surveys only, with highest numbers therefore record in fall (**Table 1**). A peak count of 21 in the Survey Area from the October survey, led to an abundance estimate of 167 (**Table 56**).

A total of 22 unidentified passerines were recorded in the fall (**Figure 107**), of which one was recorded in the September II survey, and 21 were recorded in the October survey (**Table 56**). For the September II survey, the single passerine was located in the north of the Survey Area, and for the October survey, passerines were located in the west of the Survey Area (**Figure 107**).

Table 56 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified passerines in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Sep II 20	1	8	0.01	1	0
Oct 20	21	167	0.19	21	0
b) Lease Area OCS-A 0520 Site					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Sep II 20	1	7	0.01	1	0
Oct 20	0	0	-	0	0
c) 2 + 4 km Buffer					
Survey	Raw Count	Abundance	Density	Flying	Sitting
Sep II 20	0	0	-	0	0
Oct 20	21	186	0.55	21	0

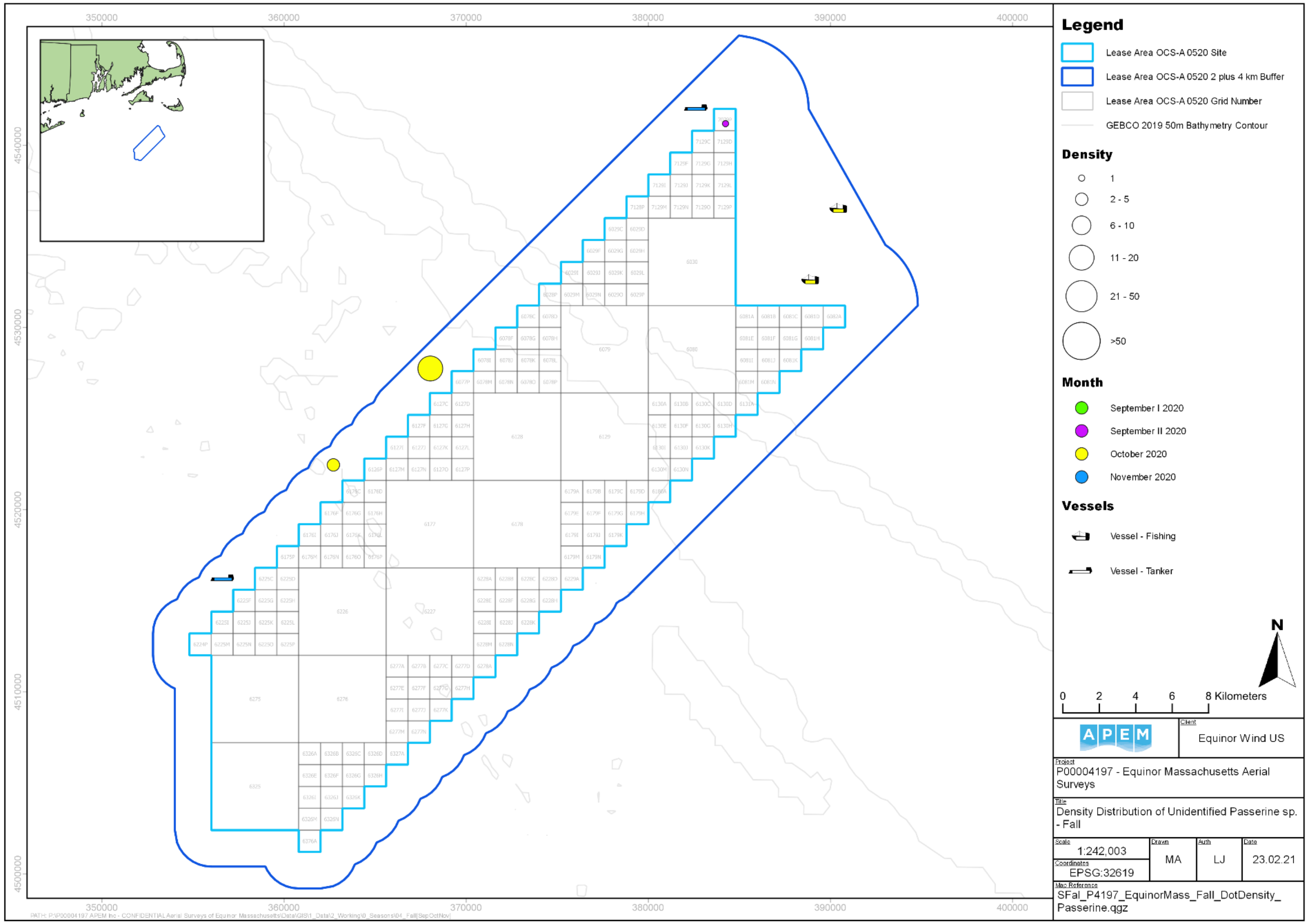

Figure 107 **Distribution of unidentified passerines recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.50 Loggerhead Turtle (*Caretta caretta)*

A single loggerhead turtle was recorded in the July survey, with highest numbers therefore recorded in summer (**Table 1**). A peak count of one in the Survey Area from the July survey led to an abundance estimate of eight (**Table 57**).

A total of one loggerhead turtle was recorded in the summer from the July survey (**Table 57**), located in the southwest of the Survey Area (**Figure 108**).

Table 57 Raw counts and abundance and density estimates (No. estimated individuals per km²) of loggerhead turtles in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jul 20	1	8	0.01	1	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jul 20	1	7	0.01	1	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jul 20	0	0	-	0	0

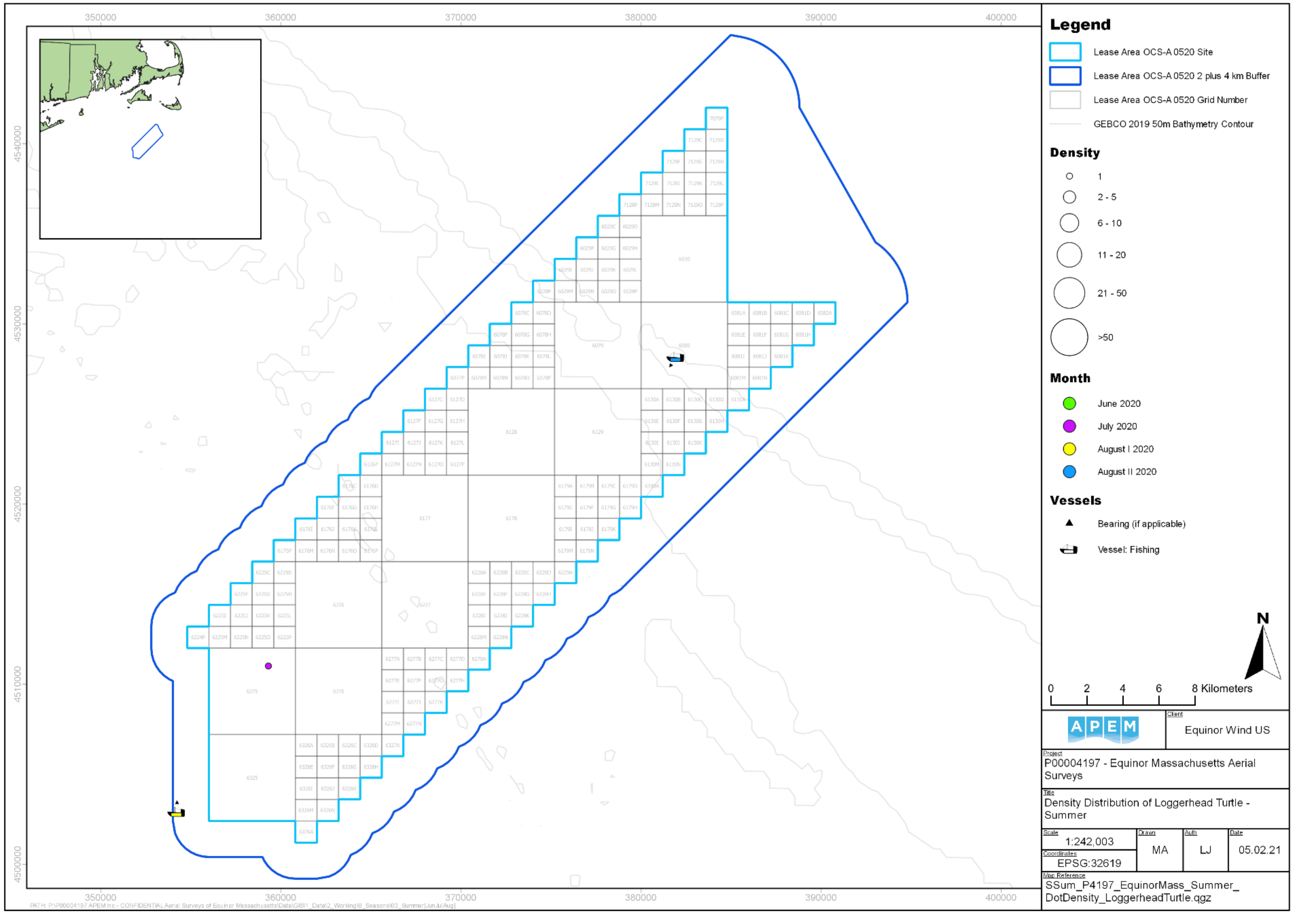

Figure 108 **Distribution of loggerhead turtles recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

5.51 Kemp's Ridley Turtle (*Lepidochelys kempii)*

A single Kemp's ridley turtle was recorded in the July survey, with highest numbers therefore recorded in summer (**Table 1**). A peak count of one in the Survey Area from the July survey led to an abundance estimate of eight (**Table 58**).

A total of one Kemp's ridley turtle was recorded in the summer from the July survey (**Table 58**), located in the south of the Survey Area (**Figure 109**).

Table 58 Raw counts and abundance and density estimates (No. estimated individuals per km²) of Kemp's ridley turtles in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jul 20	1	8	0.01	1	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jul 20	0	0	-	0	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jul 20	1	9	0.03	1	0

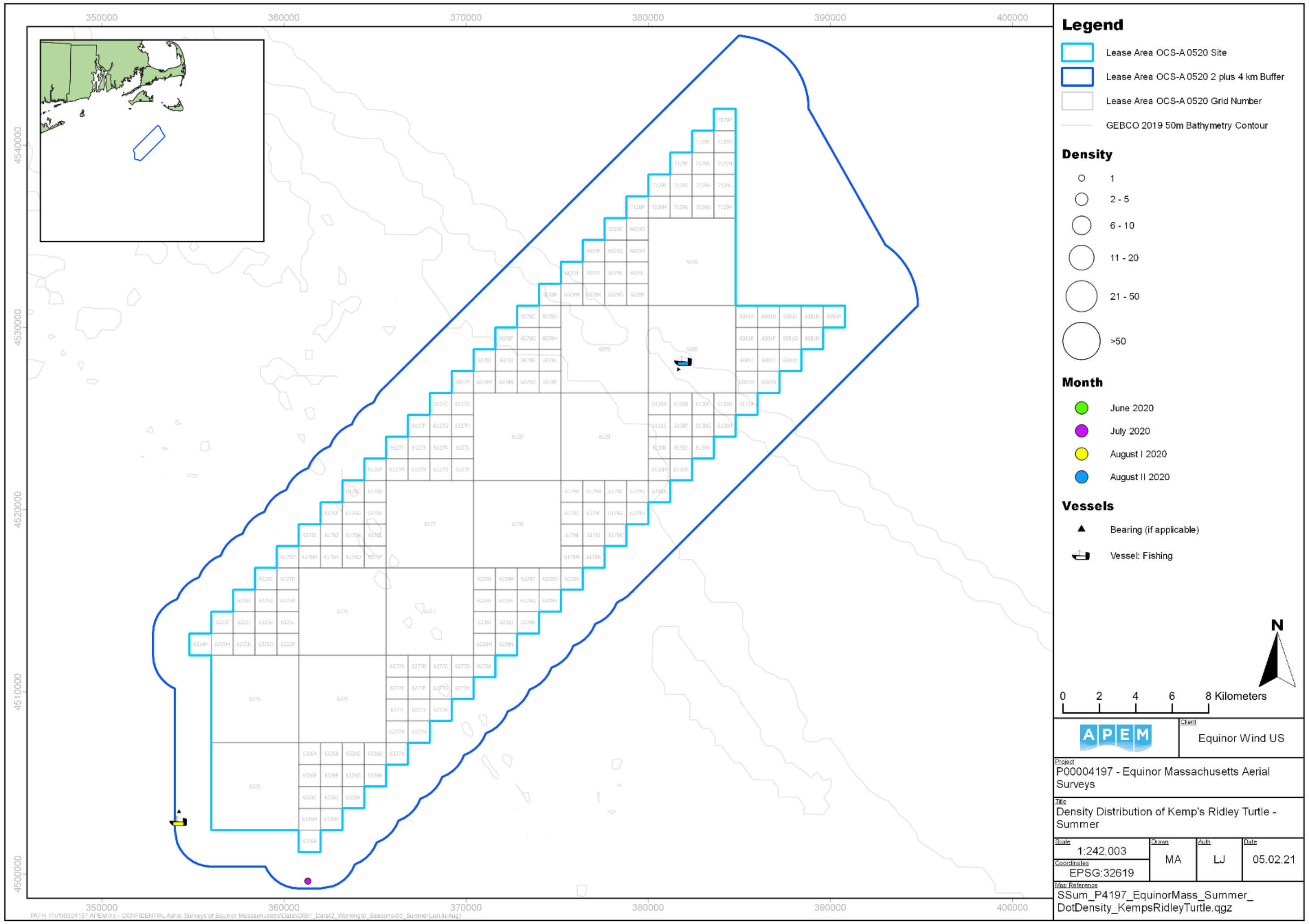

Figure 109 Distribution of Kemp's ridley turtles recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season

5.52 Gray Seal (*Halichoerus grypus)*

Gray seals were recorded in the spring and summer, with highest numbers recorded in spring (**Table 1**). A peak count of one in the Site and two in the Buffer from March led to abundance estimates of seven and 18 respectively (**Table 59**).

A total of eight gray seals were recorded in spring (**Figure 110**), of which three were recorded in March, two were recorded in April **I**, two were recorded in April **II**, and one was recorded in May **I** (**Table 59**). For the spring surveys, gray seals were loosely distributed across the Survey Area (**Figure 110**). A total of one seal was recorded in the summer from the June survey (**Table 59**), located northeast of the center of the Survey Area (**Figure 111**).

Table 59 Raw counts and abundance and density estimates (No. estimated individuals per km²) of gray seals in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Mar 20	3	24	0.03	1	2
Apr I 20	2	16	0.02	0	2
Apr II 20	2	16	0.02	1	1
May I 20	1	8	0.01	1	0
Jun 20	1	8	0.01	1	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Mar 20	1	7	0.01	0	1
Apr I 20	1	7	0.01	0	1
Apr II 20	2	15	0.03	1	1
May I 20	1	7	0.01	1	0
Jun 20	1	7	0.01	1	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Mar 20	2	18	0.05	1	1
Apr I 20	1	9	0.03	0	1
Apr II 20	0	0	-	0	0
May I 20	0	0	-	0	0
Jun 20	0	0	-	0	0

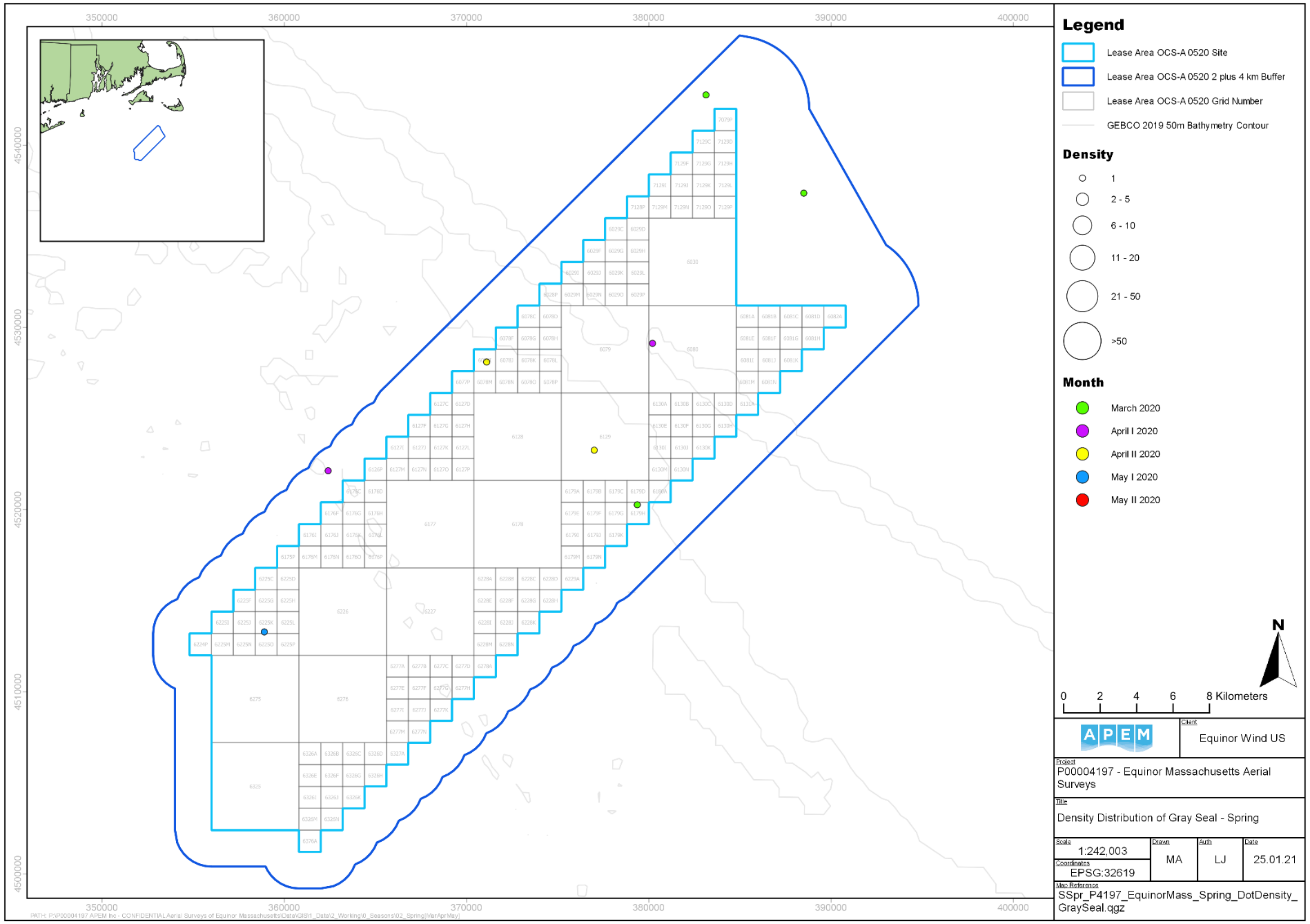

Figure 110 **Distribution of gray seals recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

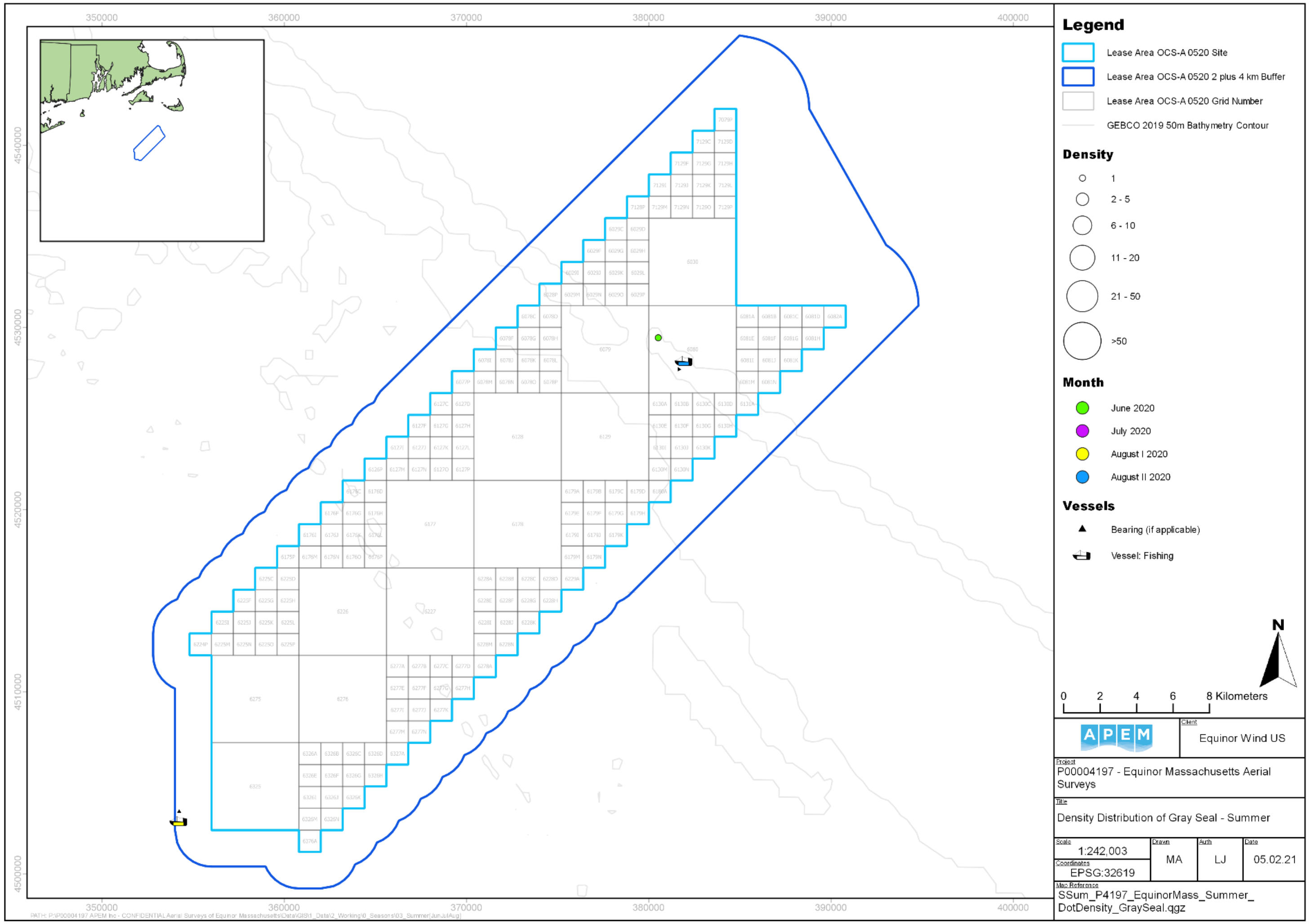

Figure 111 Distribution of gray seals recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season

5.53 Harbor Seal (*Phoca vitulina)*

A single harbor seal was recorded in the November survey, with highest numbers therefore recorded in fall (**Table 1**). A peak count of one in the Survey Area from the November survey, led to an abundance estimates of eight (**Table 60**).

A total of one harbor seal was recorded in the fall from the November survey, located in the center of the Survey Area (**Figure 112**).

Table 60 Raw counts and abundance and density estimates (No. estimated individuals per km²) of harbor seals in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Nov 20	1	8	0.01	0	1
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Nov 20	1	7	0.01	0	1
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Nov 20	0	0	-	0	0

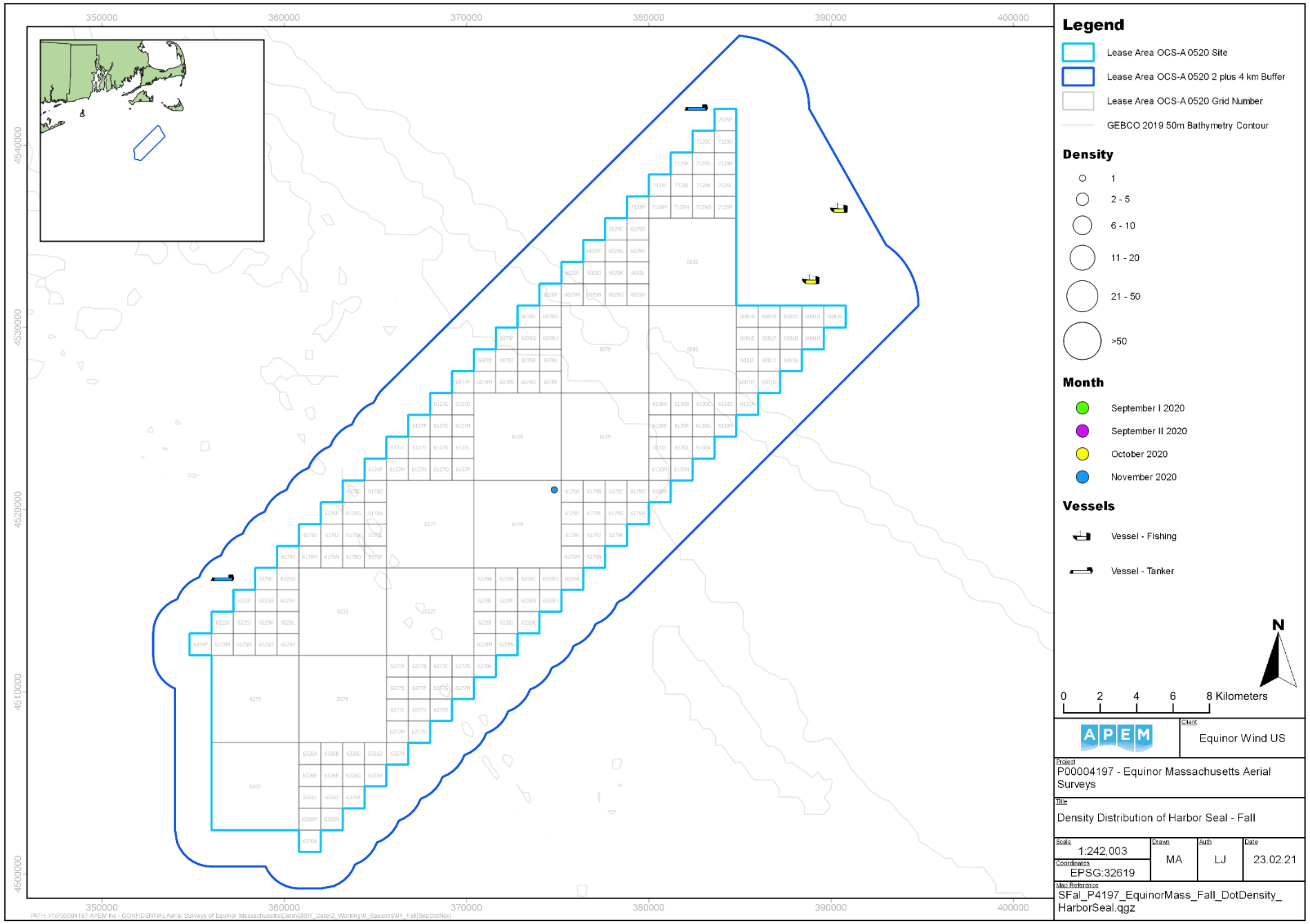

Figure 112 Distribution of harbor seals recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season

5.54 Seal Species (Unidentified Phocidae)

Unidentified seals were recorded in the winter, spring, and summer surveys, with highest numbers recorded in spring (**Table 1**). A peak count of nine in the Site and three in the Buffer from the March survey, led to abundance estimates of 67 and 27 respectively (**Table 61**).

A total of 15 unidentified seals were recorded in the winter (**Figure 113**), of which nine were recorded in December 2019, three were recorded in January, and three were recorded in February (**Table 61**). For the winter surveys, seals were loosely distributed across the Survey area (**Figure 113**). A total of 26 seals were recorded in the spring (**Figure 114**), of which 12 were recorded in March, 11 were recorded in April I, and three were recorded in April II (**Table 61**). For the spring surveys, seals were loosely distributed across the Survey Area (**Figure 114**). A total of one seal was recorded in the summer from the June survey (**Table 61**), located in the east-southeast of the Survey Area (**Figure 115**).

Table 61 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified seals in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

d) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Dec 19	9	71	0.08	2	7
Jan 20	3	24	0.01	2	1
Feb 20	3	24	0.03	3	0
Mar 20	12	95	0.11	12	0
Apr I 20	11	87	0.1	9	2
Apr II 20	3	24	0.03	0	3
Jun 20	1	8	0.01	1	0
e) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Dec 19	7	52	0.1	2	5
Jan 20	1	7	0.01	1	0
Feb 20	3	22	0.04	3	0
Mar 20	9	67	0.13	9	0
Apr I 20	8	60	0.12	7	1
Apr II 20	2	15	0.03	0	2
Jun 20	1	7	0.01	1	0
f) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Dec 19	2	18	0.05	0	2
Jan 20	2	9	0.03	1	1
Feb 20	0	0	-	0	0
Mar 20	3	27	0.08	3	0
Apr I 20	3	27	0.08	2	1
Apr II 20	1	9	0.03	0	1
Jun 20	0	0	-	0	0

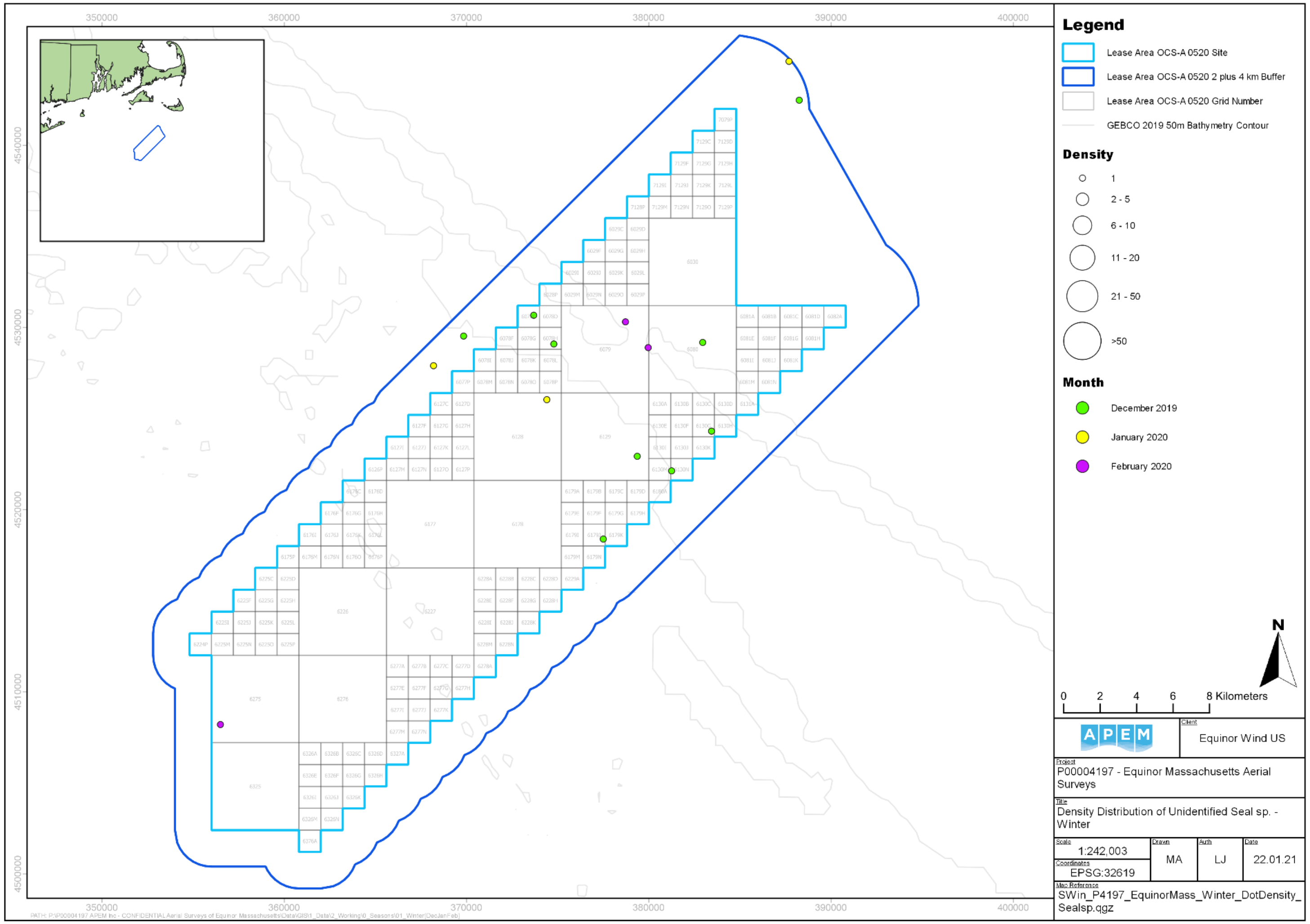

Figure 113 Distribution of unidentified seals recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the winter season

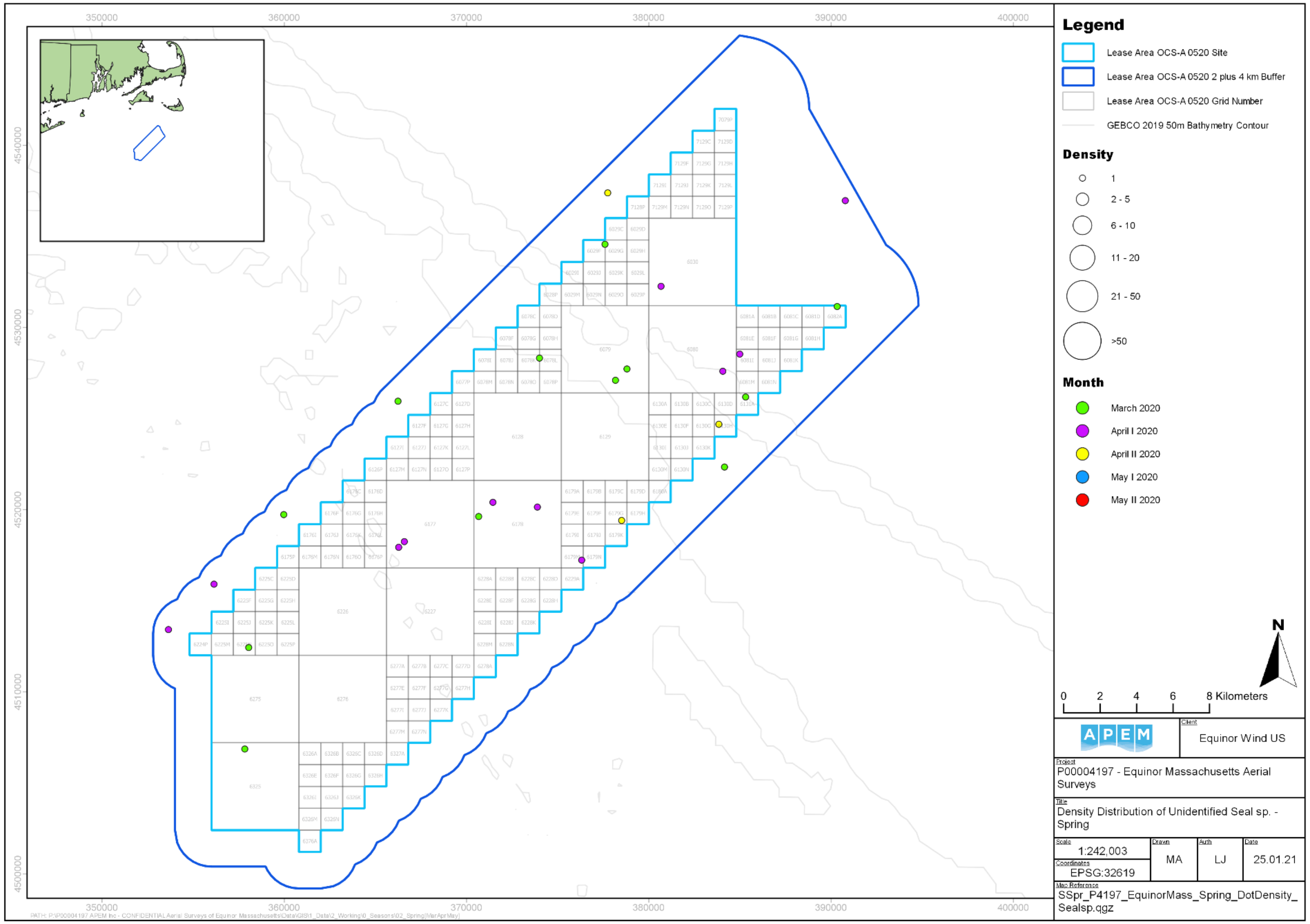

Figure 114 **Distribution of unidentified seals recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

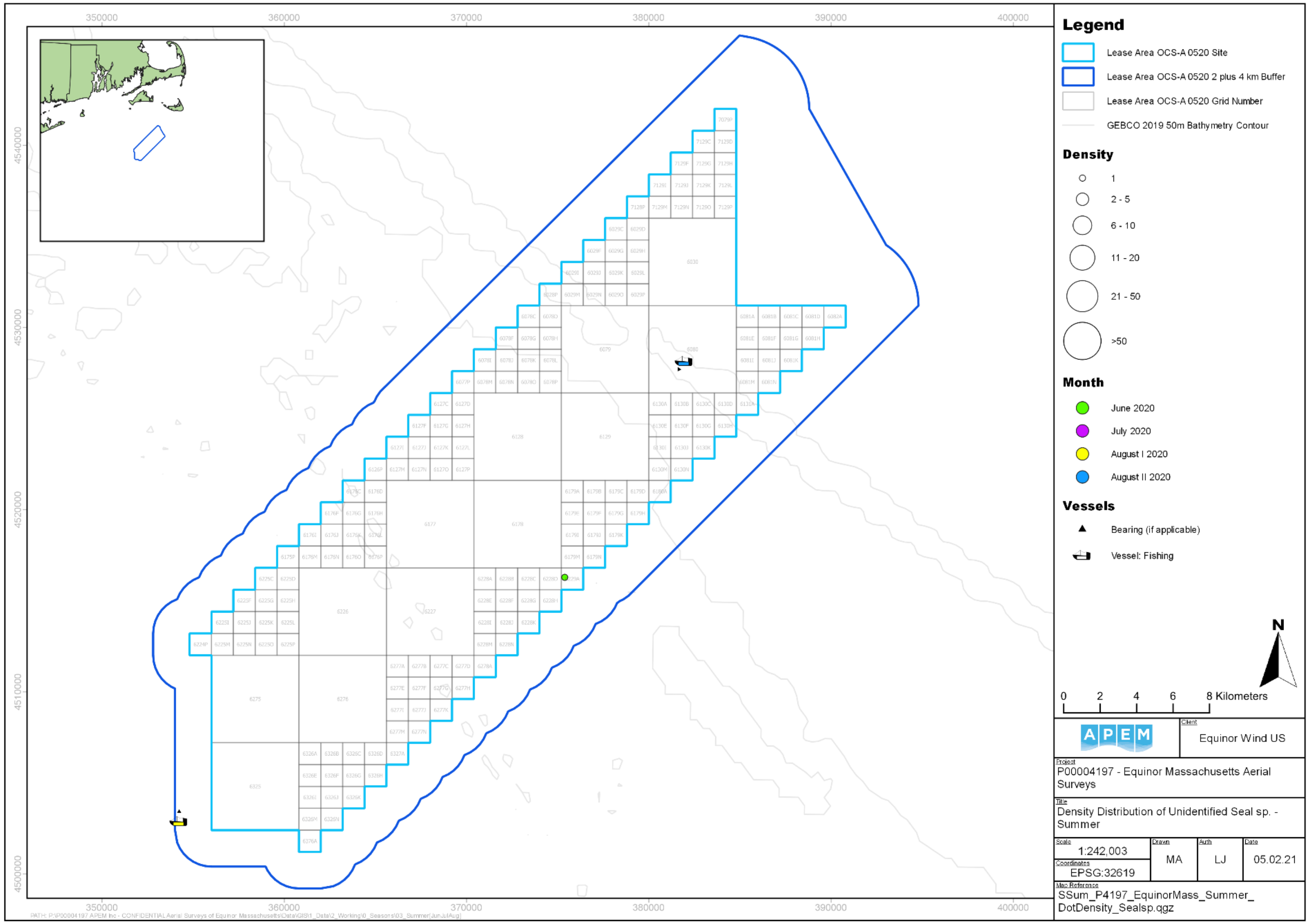

Figure 115 **Distribution of unidentified seals recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

5.55 Common Minke Whale (*Balaenoptera acutorostrata)*

Common minke whales were recorded in the spring and summer, with a total of four recorded for both seasons (**Table 1**). A peak count of one in the Site and two in the Buffer from the May II survey, led to abundance estimates of seven and 18 respectively (**Table 62**).

A total of four common minke whales were recorded in spring (**Figure 116**), of which one was recorded in the April I survey, and three were recorded in the May II survey (**Table 62**). For the April I survey, the single minke whale was recorded in the south of the Survey Area, and for the May II survey, two whales were located in the south of the Survey Area, and one was recorded in the north (**Figure 116**). A total of four whales were also recorded in the summer (**Figure 117**), of which one was recorded in the June survey, one was recorded in the July survey, and two were recorded in the August I survey (**Table 62**). For the June survey, the single whale was recorded in the southwest of the Survey Area, and for the July and August I surveys, whales were distributed in the north (**Figure 117**).

Table 62 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of common minke whales in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Apr I 20	1	8	0.01	0	1
May II 20	3	24	0.03	3	0
Jun 20	1	8	0.01	1	0
Jul 20	1	8	0.01	1	0
Aug I 20	2	16	0.02	2	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Apr I 20	1	7	0.01	0	1
May II 20	1	7	0.01	1	0
Jun 20	0	0	-	0	0
Jul 20	1	7	0.01	1	0
Aug I 20	0	0	-	0	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Apr I 20	0	0	-	0	0
May II 20	2	18	0.05	2	0
Jun 20	1	9	0.03	1	0
Jul 20	0	0	-	0	0
Aug I 20	2	18	0.05	2	0

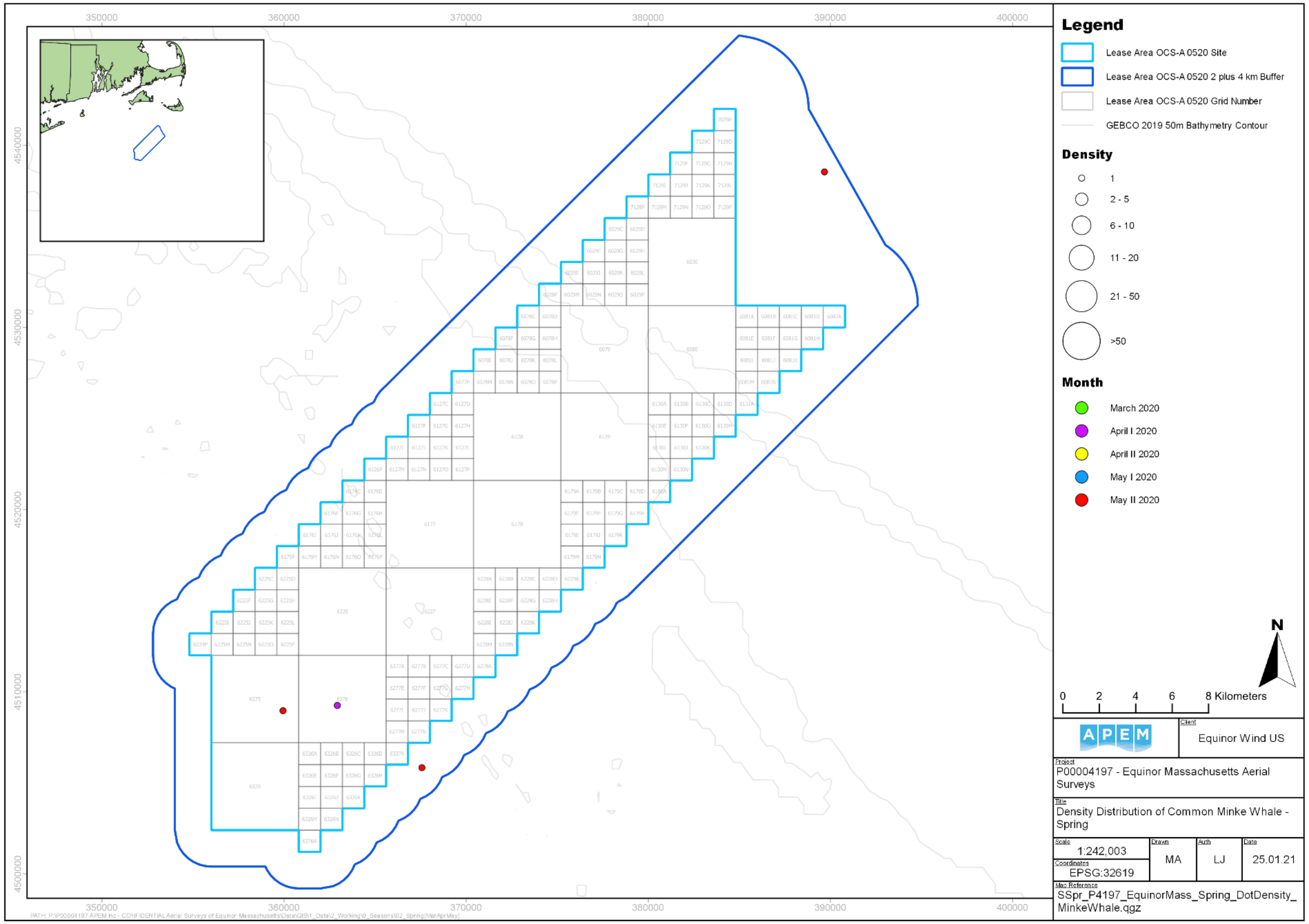

Figure 116 **Distribution of common minke whales recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

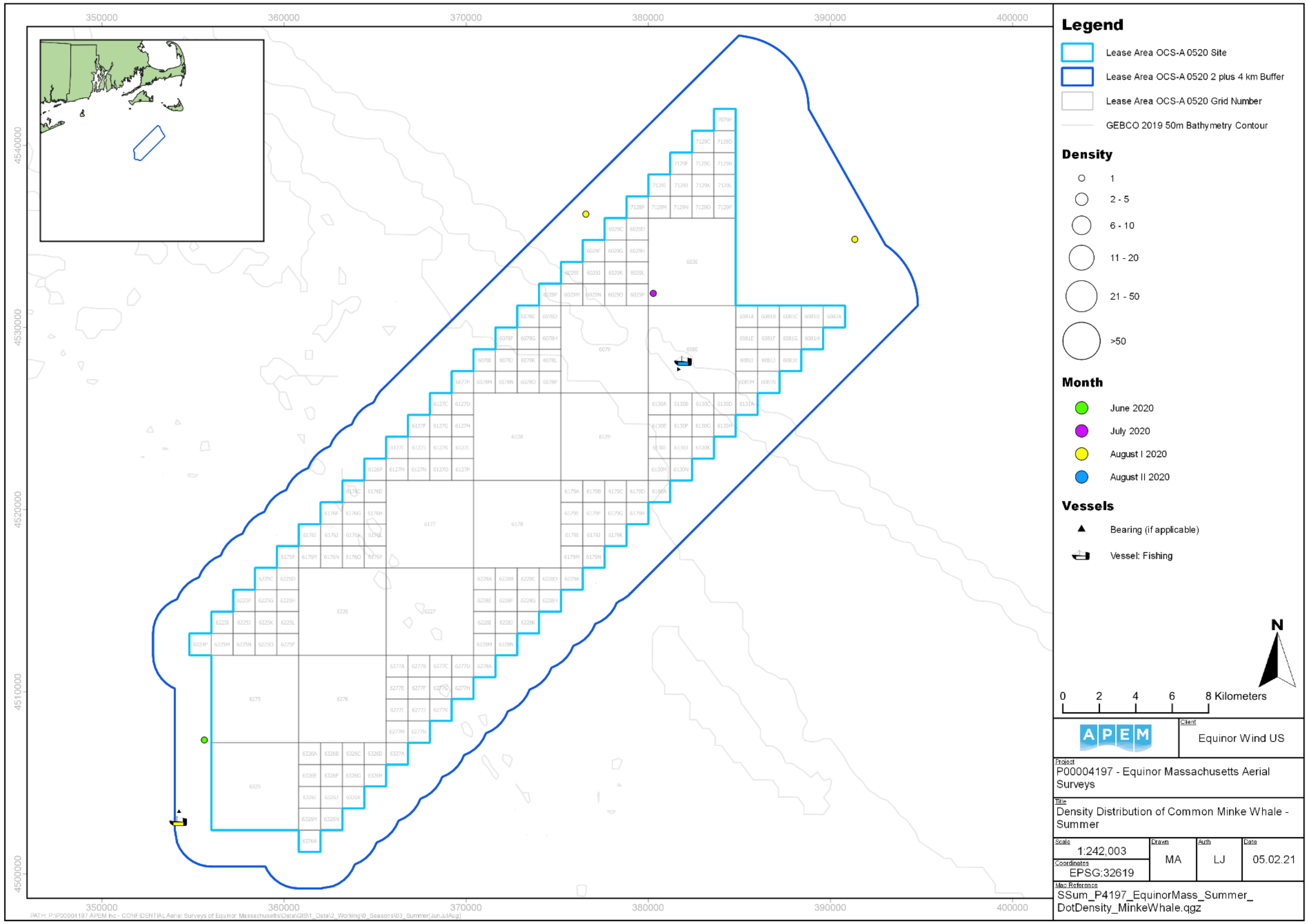

Figure 117 Distribution of common minke whales recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season

5.56 Fin Whale (*Balaenoptera physalus)*

A single fin whale was recorded in the June survey, with highest numbers therefore recorded in summer (**Table 1**). The peak count of one in the Survey Area led to an abundance estimate of eight (**Table 63**).

A total of one fin whale was recorded in the summer from the June survey (**Table 63**), located in the south of the Survey Area (**Figure 118**).

Table 63 Raw counts and abundance and density estimates (No. estimated individuals per km²) of fin whales in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun 20	1	8	0.01	1	0
b) Lease Area OCS-A 0520 Site					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun 20	1	7	0.01	1	0
c) 2 + 4 km Buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun 20	0	0	-	0	0

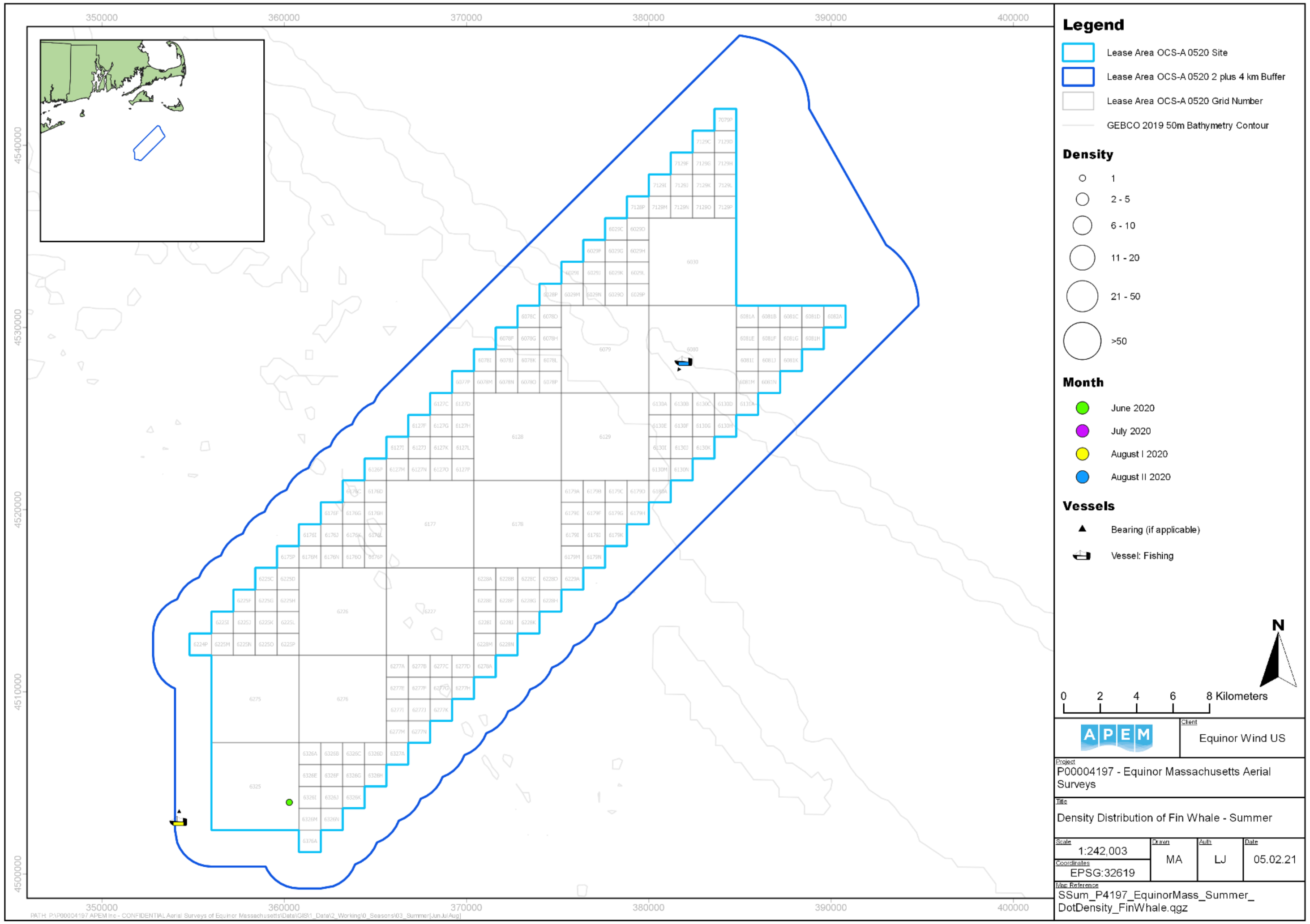

Figure 118 **Distribution of fin whales recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

5.57 Humpback Whale (*Megaptera novaeangliae)*

A single humpback whale was recorded in the June survey, with highest numbers therefore recorded in summer (**Table 1**). A peak count of one in the Survey Area from the June survey led to an abundance estimate of eight (**Table 64**).

A total of one humpback whale was recorded in the summer from the June survey (**Table 64**), located in the east of the Survey Area (**Figure 119**).

Table 64 Raw counts and abundance and density estimates (No. estimated individuals per km²) of humpback whales in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun 20	1	8	0.01	1	0
b) Lease Area OCS-A 0520 Site					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun 20	1	7	0.01	1	0
c) 2 + 4 km Buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun 20	0	0	-	0	0

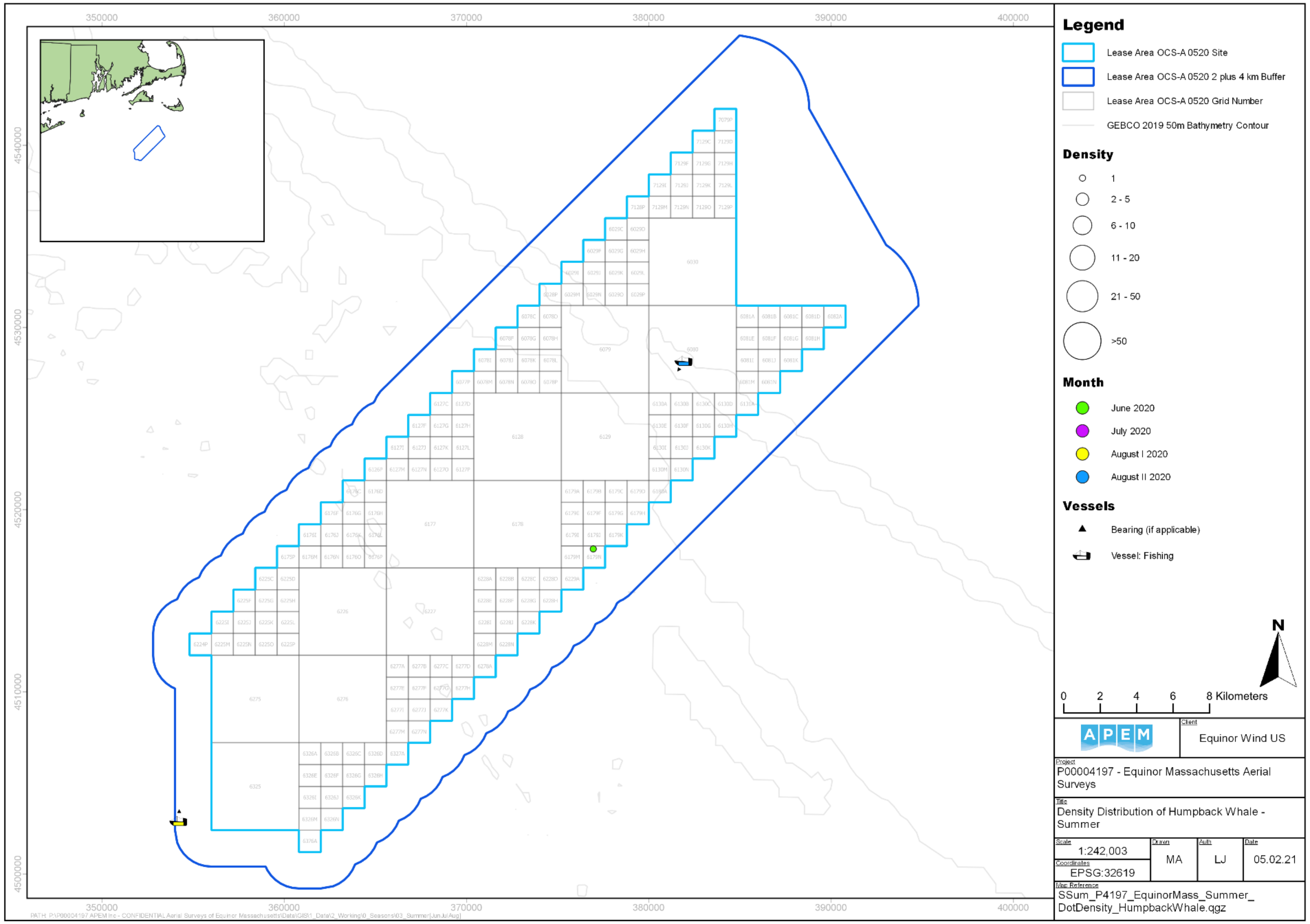

Figure 119 Distribution of humpback whales recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season

5.58 Beaked Whale Species (Unidentified Ziphiidae)

An unidentified beaked whale was recorded in the June survey only, with highest numbers therefore recorded in summer (**Table 1**). A peak count of one in the Survey Area from the June survey, led to an abundance estimate of eight (**Table 65**).

A total of one unidentified beaked whale was recorded in the summer from the June survey (**Table 65**), located in the east-southeast of the Survey Area (**Figure 120**).

Table 65 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified beaked whales in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun 20	1	8	0.01	1	0
b) Lease Area OCS-A 0520 Site					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun 20	0	0	-	0	0
c) 2 + 4 km Buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun 20	1	9	0.03	1	0

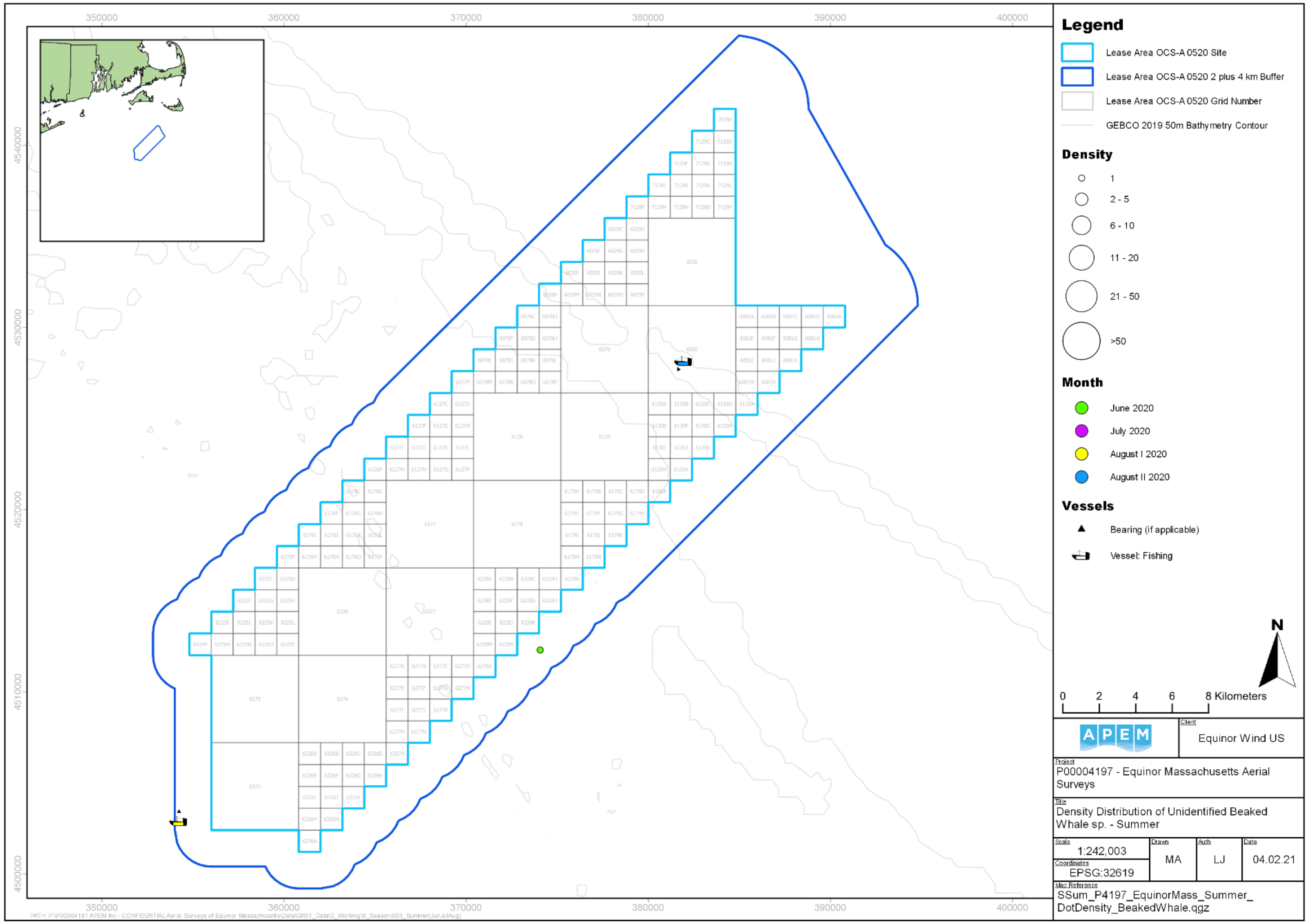

Figure 120 **Distribution of unidentified beaked whales recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

5.59 Common Dolphin (*Delphinus delphis*)

Common dolphins were recorded in all four seasons, with highest numbers recorded in fall (**Table 1**). A peak count of 34 in the Site and 19 in the Buffer from the November survey, led to abundance estimates of 253 and 168 respectively (**Table 66**).

A total of 26 common dolphins were recorded in the winter from the December survey only (**Table 66**), distributed in small pods across the Survey Area (**Figure 121**). A total of 18 common dolphins were recorded in the spring (**Figure 122**), of which 11 were recorded in the April I survey, and seven were recorded in the May II survey (**Table 66**). For the April I survey, a pod of dolphins was located in the south-southwest of the Survey Area, and for the May II survey, one small pod was located in the center of the Survey Area, and one was located in the south (**Figure 122**). A total of 20 dolphins were recorded in the summer (**Figure 123**), of which 13 were recorded in the summer, six were recorded in the August I survey, and one was recorded in the August II survey (**Table 66**). For the June and August I surveys, dolphins were distributed in small pods northeast of the center of the Survey Area, and the single dolphin in the August II survey was located in the south (**Figure 123**). A total of 57 dolphins were recorded in the fall surveys (**Figure 124**), of which four were recorded in the October survey, and 53 were recorded in the November survey (**Table 66**). For the October survey, one small pod was located in the north of the Survey Area, and for the November survey, several pods were located around the center of the Survey Area (**Figure 124**).

Table 66 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of common dolphins in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Dec 19	26	206	0.24	24	2
Apr I 20	11	87	0.1	11	0
May II 20	7	56	0.07	6	1
Jun 20	13	103	0.12	3	10
Aug I 20	6	48	0.06	6	0
Aug II 20	1	8	0.01	1	0
Oct 20	4	32	0.04	4	0
Nov 20	53	421	0.49	47	6
b) Lease Area OCS-A 0520 Site					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Dec 19	19	141	0.27	17	2
Apr I 20	0	0	-	0	0
May II 20	7	52	0.1	6	1
Jun 20	13	97	0.19	3	10
Aug I 20	0	0	-	0	0
Aug II 20	1	7	0.01	1	0
Oct 20	0	0	-	0	0
Nov 20	34	253	0.49	31	3
c) 2 + 4 km Buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Dec 19	7	62	0.18	7	0
Apr I 20	11	97	0.29	11	0

May II 20	0	0	-	0	0
Jun 20	0	0	-	0	0
Aug I 20	6	53	0.16	6	0
Aug II 20	0	0	-	0	0
Oct 20	4	35	0.1	4	0
Nov 20	19	168	0.5	16	3

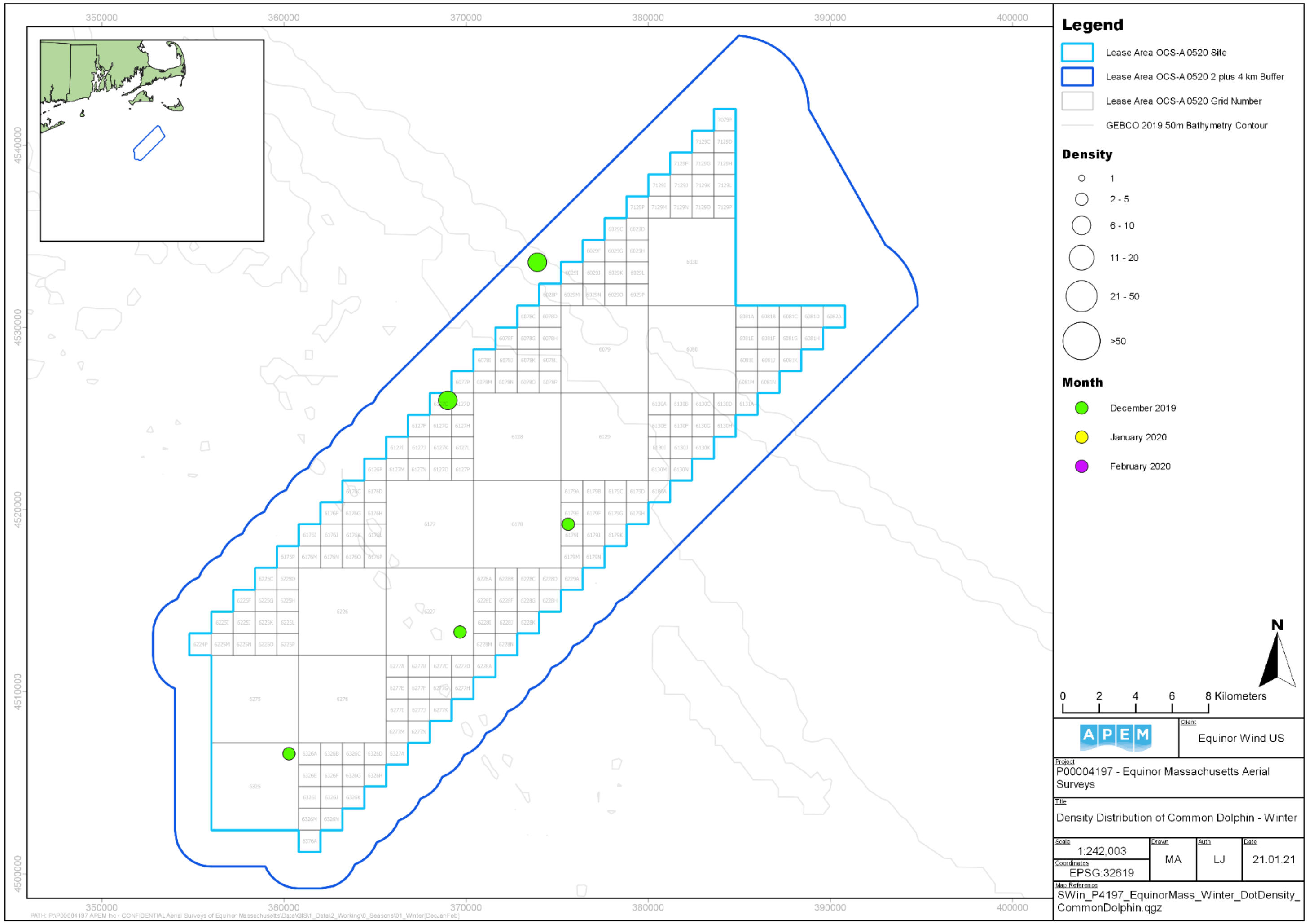

Figure 121 Distribution of common dolphins recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the winter season

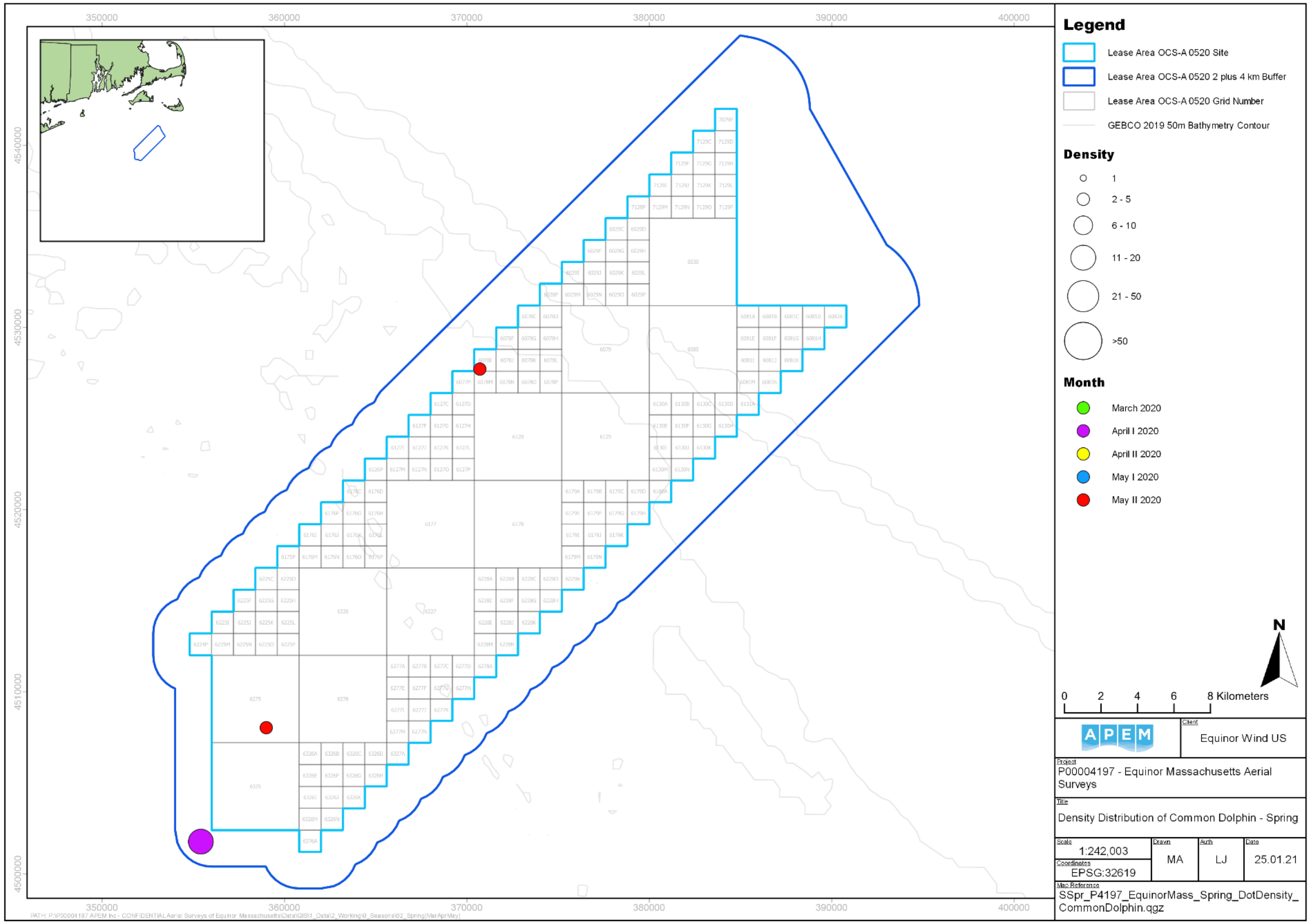

Figure 122 Distribution of common dolphins recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season

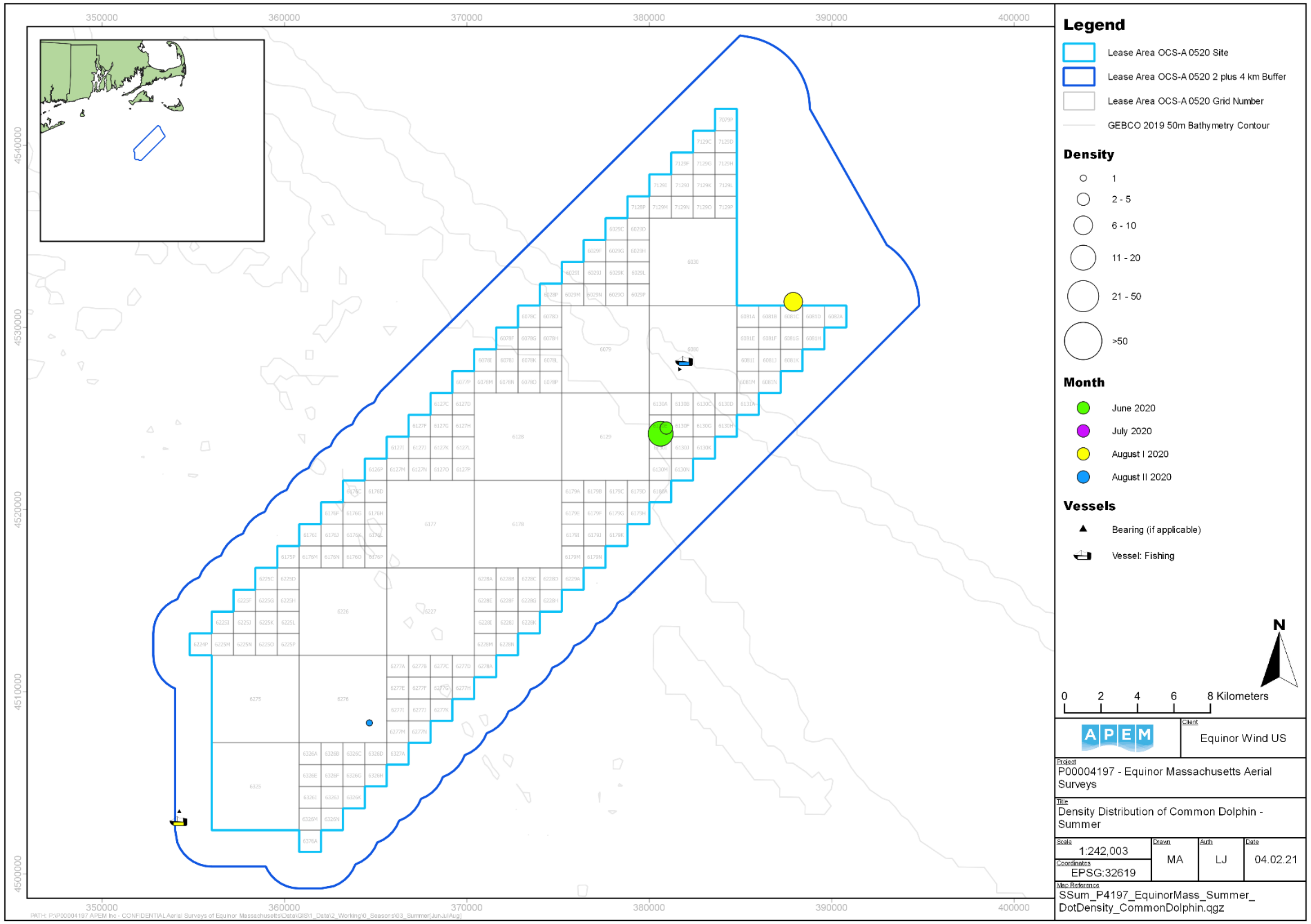

Figure 123 **Distribution of common dolphins recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

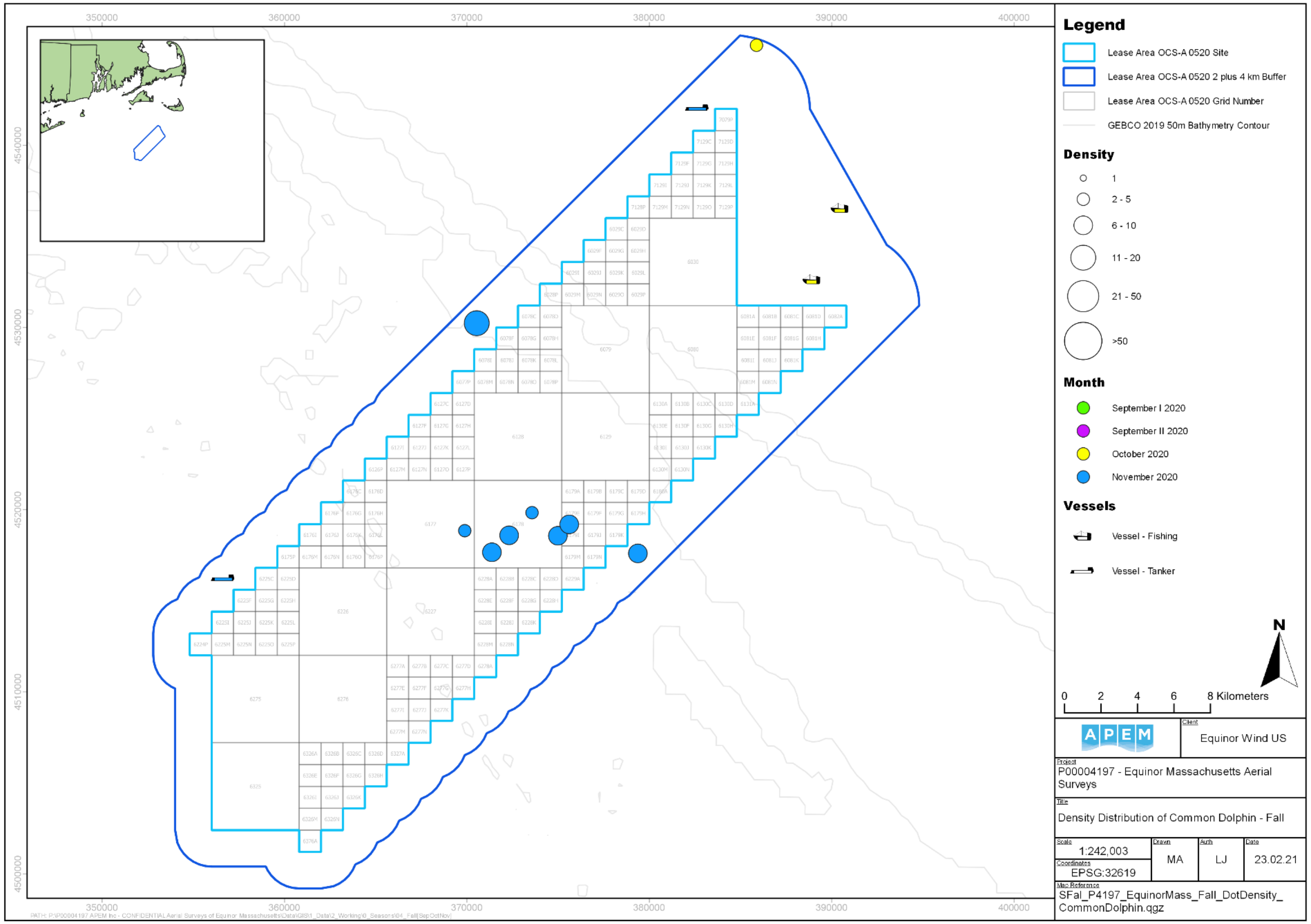

Figure 124 Distribution of common dolphins recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season

5.60 Common Bottlenose Dolphin (*Tursiops truncates)*

Common bottlenose dolphins were recorded in the June survey only, with highest numbers therefore recorded in summer (**Table 1**). A peak count of 4 in the Survey Area from the June survey, led to an abundance estimate of 32 (**Table 67**).

A total of 4 common bottlenose dolphins were recorded in the summer from the June survey (**Table 67**), located in one pod in the center of the Survey Area (**Figure 125**).

Table 67 Raw counts and abundance and density estimates (No. estimated individuals per km²) of common bottlenose dolphins in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun 20	4	32	0.04	4	0
b) Lease Area OCS-A 0520 Site					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun 20	4	30	0.06	4	0
c) 2 + 4 km Buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun 20	0	0	-	0	0

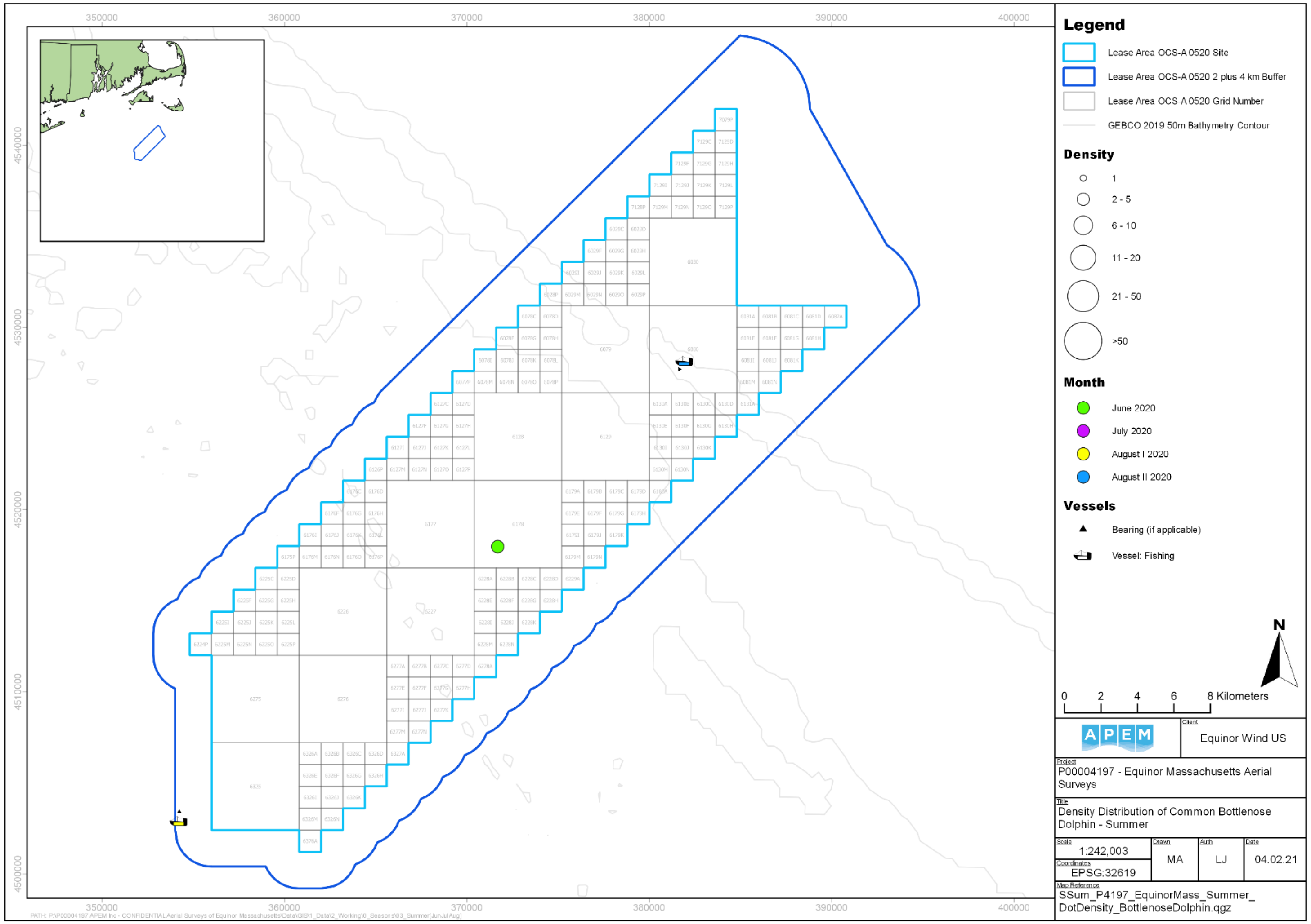

Figure 125 **Distribution of common bottlenose dolphins recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

5.61 Common / Atlantic White-sided Dolphin (*Delphinus delphis / Lagenorhynchus acutus)*

A single common / Atlantic white-sided dolphin was recorded in the December 2019 survey, with highest numbers therefore recorded in winter (**Table 1**). A peak count of one in the Survey Area from the December 2019 survey, led to an abundance estimate of eight (**Table 68**).

A total of one common / Atlantic white-sided dolphin was recorded in the winter from the December 2019 survey (**Table 68**), located in the northwest of the Survey Area (**Figure 126**).

Table 68 Raw counts and abundance and density estimates (No. estimated individuals per km²) of common / Atlantic white-sided dolphins in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Dec 19	1	8	0.01	0	1
b) Lease Area OCS-A 0520 Site					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Dec 19	0	0	-	0	0
c) 2 + 4 km Buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Dec 19	1	9	0.03	0	1

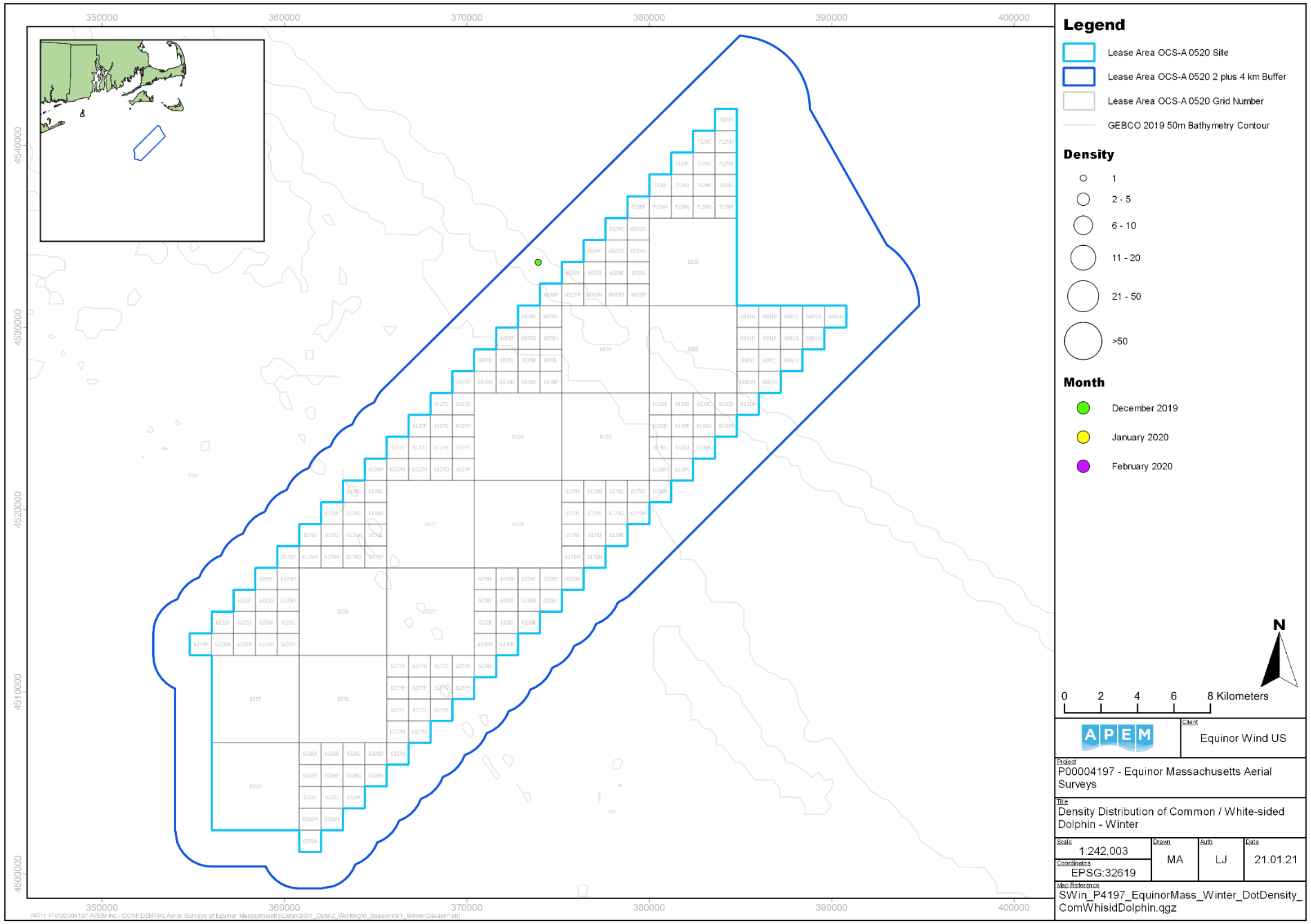

Figure 126 **Distribution of common / Atlantic white-sided dolphins recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the winter season**

5.62 Harbor Porpoise (*Phocoena phocoena)*

Harbor porpoises were recorded in all four seasons, with highest numbers recorded in spring (**Table 1**). A peak count of 16 in the Site and 18 in the Buffer from the April **II** survey, led to abundance estimates of 119 and 159 respectively (**Table 69**).

A total of four harbor porpoises were recorded in the winter (**Figure 127**), of which three were recorded in December 2019 and one was recorded in February (**Table 69**). For the December 2019 survey, harbor porpoises were recorded around the center of the Survey Area, and for the February survey, the single porpoise was located in the northeast (**Figure 127**). A total of 59 porpoises were recorded in the spring (**Figure 128**), of which three were recorded in March, 13 were recorded in April **I**, 34 were recorded in April **II**, seven were recorded in May **I**, and two were recorded in May **II** (**Table 69**). For the spring surveys, porpoises were loosely distributed across the Survey Area (**Figure 128**). A total of one harbor porpoise was recorded in the summer from the August **II** survey (**Table 69**), located in the northeast of the Survey Area (**Figure 129**). A total of two porpoises were recorded in the fall from the November survey only (**Table 69**), located in the west of the Survey Area (**Figure 130**).

Table 69 Raw counts and abundance and density estimates (No. estimated individuals per km²) of harbor porpoises in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Dec 19	3	24	0.03	2	1
Feb 20	1	8	0.01	1	0
Mar 20	3	24	0.03	3	0
Apr I 20	13	103	0.12	10	3
Apr II 20	34	270	0.31	30	4
May I 20	7	56	0.07	6	1
May II 20	2	16	0.02	1	1
Aug II 20	1	8	0.01	1	0
Nov 20	2	16	0.02	2	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Dec 19	3	22	0.04	2	1
Feb 20	0	0	-	0	0
Mar 20	2	15	0.03	2	0
Apr I 20	6	45	0.09	5	1
Apr II 20	16	119	0.23	14	2
May I 20	1	7	0.01	1	0
May II 20	0	0	-	0	0
Aug II 20	0	0	-	0	0
Nov 20	2	15	0.03	2	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Dec 19	0	0	-	0	0
Feb 20	1	9	0.03	1	0
Mar 20	1	9	0.03	1	0
Apr I 20	7	62	0.18	5	2

Apr II 20	18	159	0.47	16	2
May I 20	6	53	0.16	5	1
May II 20	2	18	0.05	1	1
Aug II 20	1	9	0.03	1	0
Nov 20	0	0	-	0	0

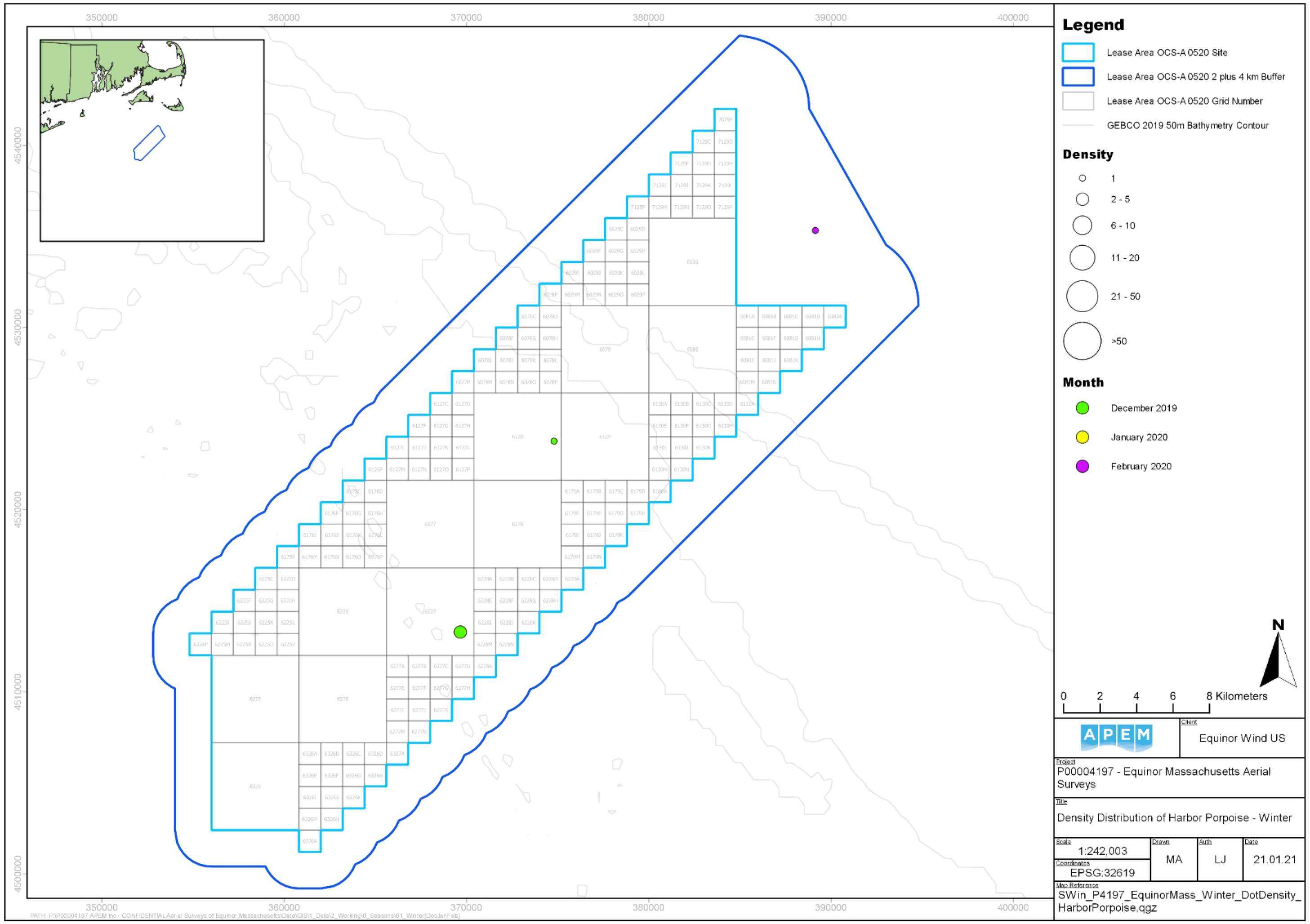

Figure 127 Distribution of harbor porpoises recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the winter season

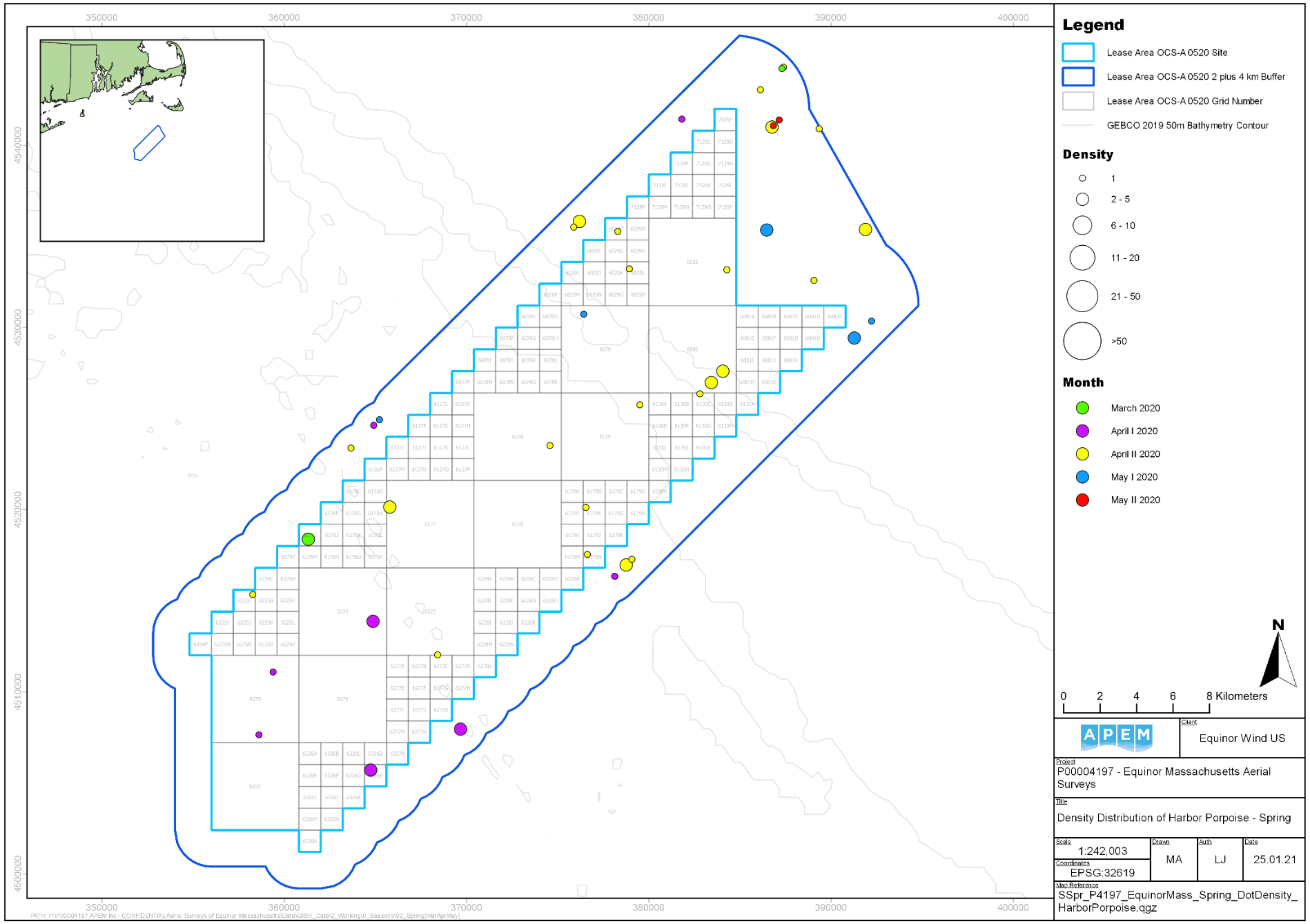

Figure 128 **Distribution of harbor porpoises recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

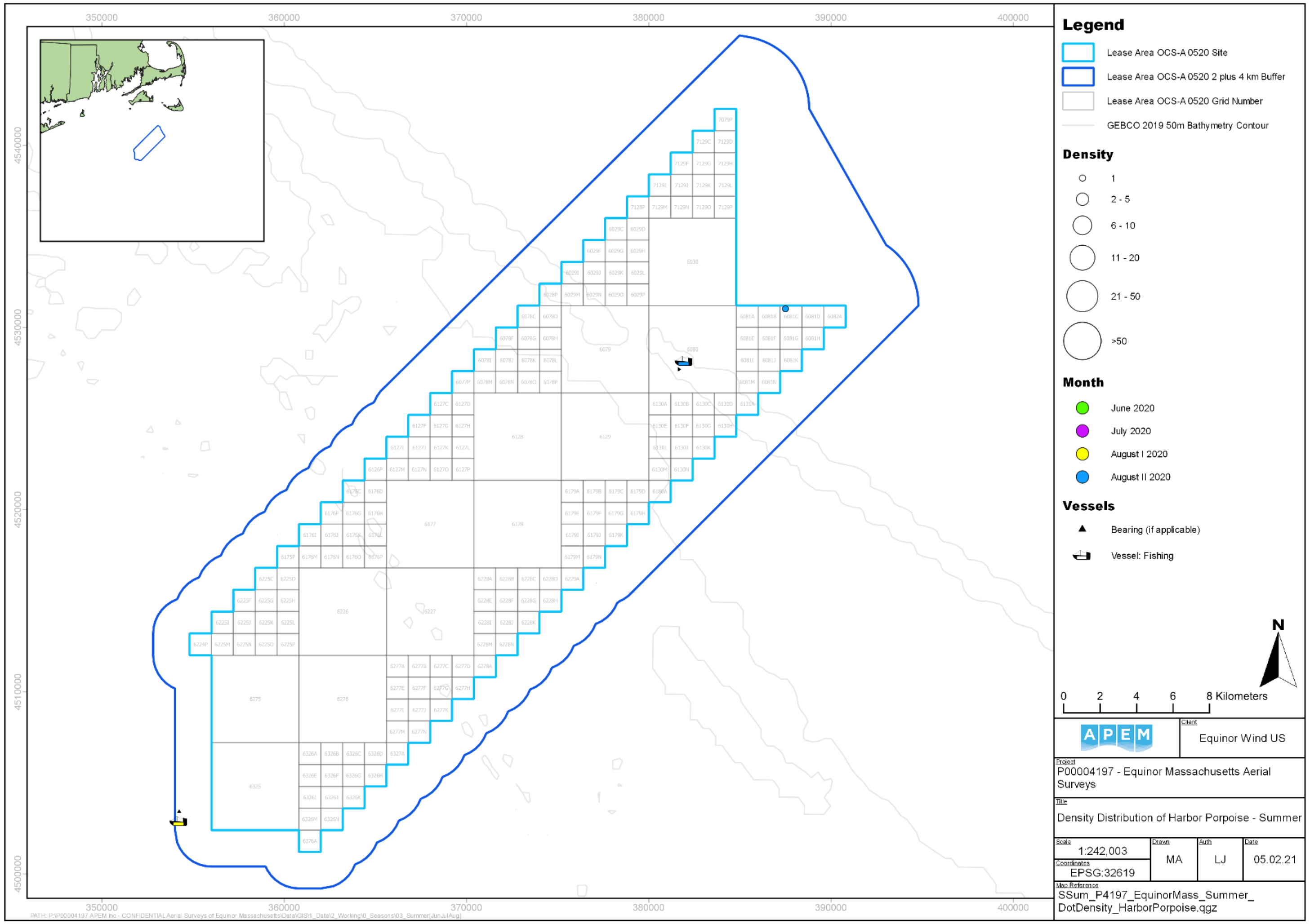

Figure 129 **Distribution of harbor porpoises recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

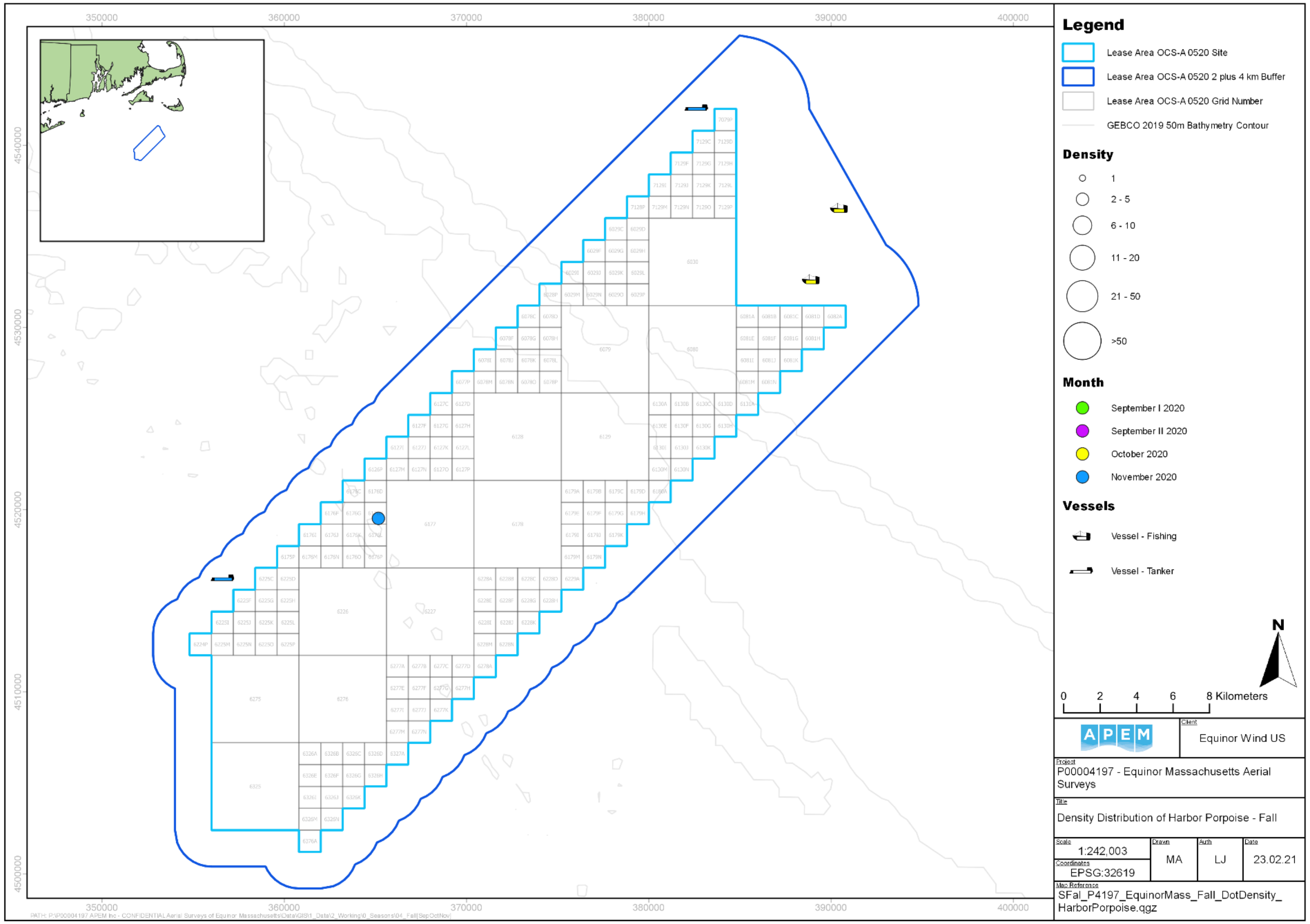

Figure 130 **Distribution of harbor porpoises recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.63 Dolphin Species (Unidentified Delphinidae)

Unidentified dolphins were recorded in all four seasons, with highest numbers recorded in winter (**Table 1**). A peak count of 12 in the Site and 2 in the Buffer from the November survey, led to abundance estimates of 89 and 18 respectively (**Table 70**).

A total of 18 unidentified dolphins were recorded in the winter (**Figure 131**), of which nine were recorded in December 2019, two were recorded in January, and seven were recorded in February (**Table 70**). For the December 2019 survey, dolphins were distributed alone or in a small pd in the center of the Survey Area, and for the January and February surveys, a pod of dolphins was located in the west and southeast respectively (**Figure 131**). A total of three dolphins were recorded in the spring (**Figure 132**), of which one was recorded in the March survey, and two were recorded in the May II survey (**Table 70**). For the March survey, the single dolphin was located in the north of the Survey Area, and for the May II survey, the dolphins were located in the southwest (**Figure 132**). A total of 11 dolphins were recorded in the summer (**Figure 133**), of which six were recorded in June, and five were recorded in August II (**Table 70**). For the June survey, one small pod was located in the east and one in the south, and for the August II survey, one pod was located in the south (**Figure 133**). A total of 16 dolphins were recorded in the fall (**Figure 134**), of which two were recorded in October and 14 were recorded in November (**Table 70**). For the October survey, a small pod was located northeast of the center of the Survey Area, and for the November survey, dolphins were predominantly located around the center of the Survey Area (**Figure 134**).

Table 70 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified dolphins in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Dec 19	9	71	0.08	9	0
Jan 20	2	16	0.02	2	0
Feb 20	7	56	0.07	6	1
Mar 20	1	8	0.01	1	0
May II 20	2	16	0.02	1	1
Jun 20	6	48	0.06	6	0
Aug II 20	5	40	0.05	5	0
Oct 20	2	16	0.02	2	0
Nov 20	14	111	0.13	14	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Dec 19	9	67	0.13	9	0
Jan 20	0	0	-	0	0
Feb 20	0	0	-	0	0
Mar 20	1	7	0.01	1	0
May II 20	2	15	0.03	1	1
Jun 20	6	45	0.09	6	0
Aug II 20	5	37	0.07	5	0
Oct 20	2	15	0.03	2	0
Nov 20	12	89	0.17	12	0
c) 2 + 4 km Buffer					

Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Dec 19	0	0	-	0	0
Jan 20	2	18	0.05	2	0
Feb 20	7	62	0.18	6	1
Mar 20	0	0	-	0	0
May II 20	0	0	-	0	0
Jun 20	0	0	-	0	0
Aug II 20	0	0	-	0	0
Oct 20	0	0	-	0	0
Nov 20	2	18	0.05	2	0

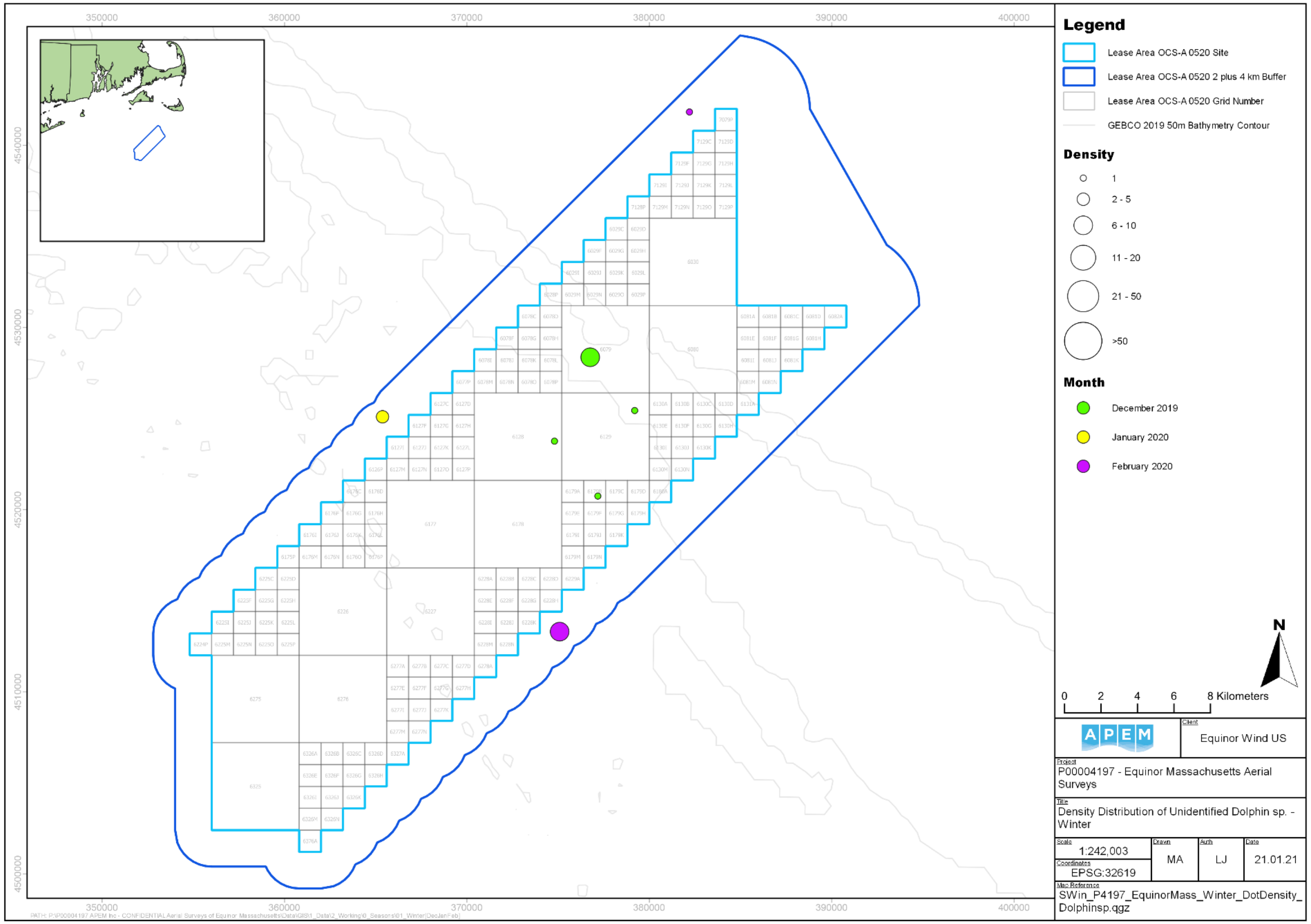

Figure 131 **Distribution of unidentified dolphins recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the winter season**

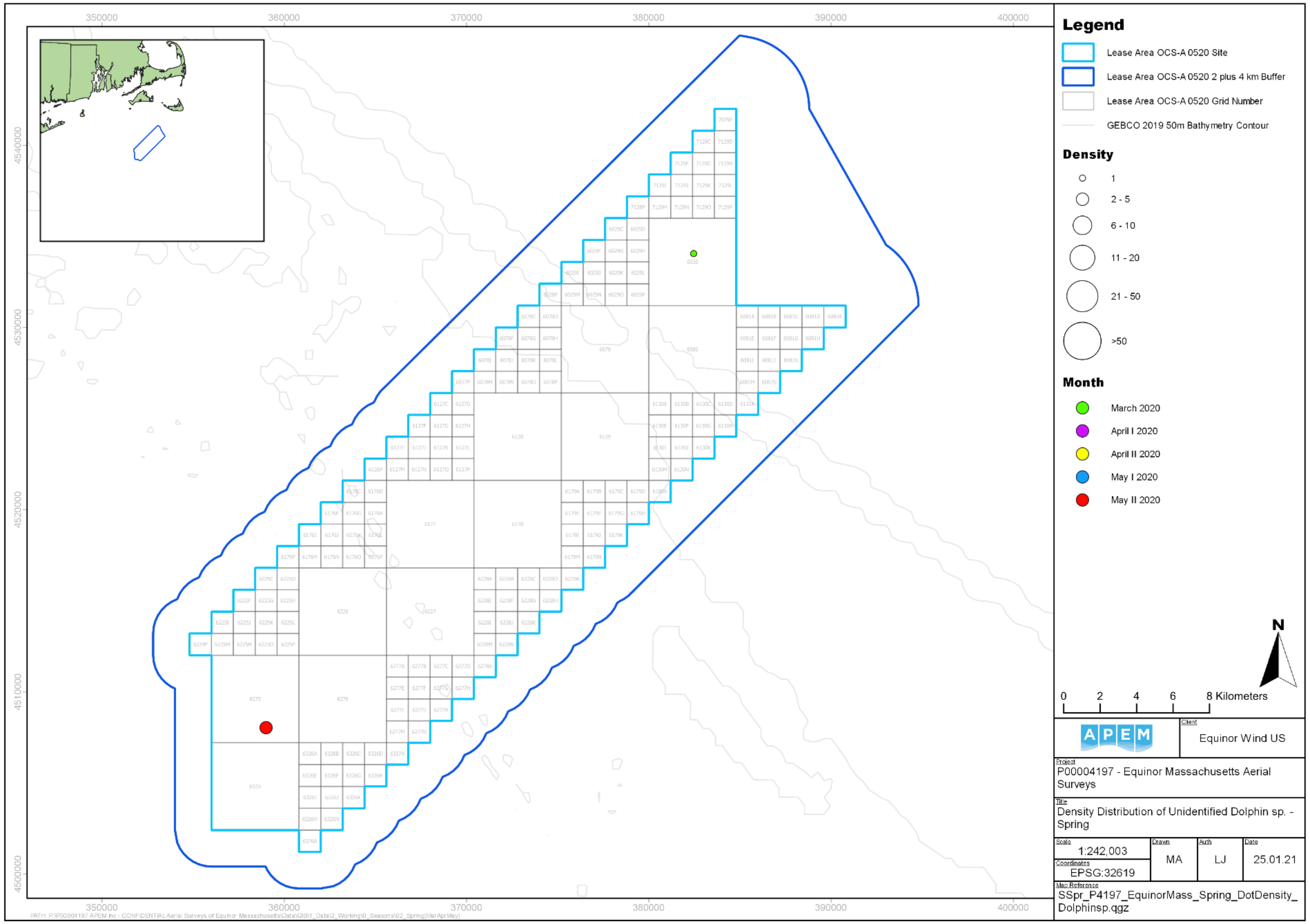

Figure 132 **Distribution of unidentified dolphins recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

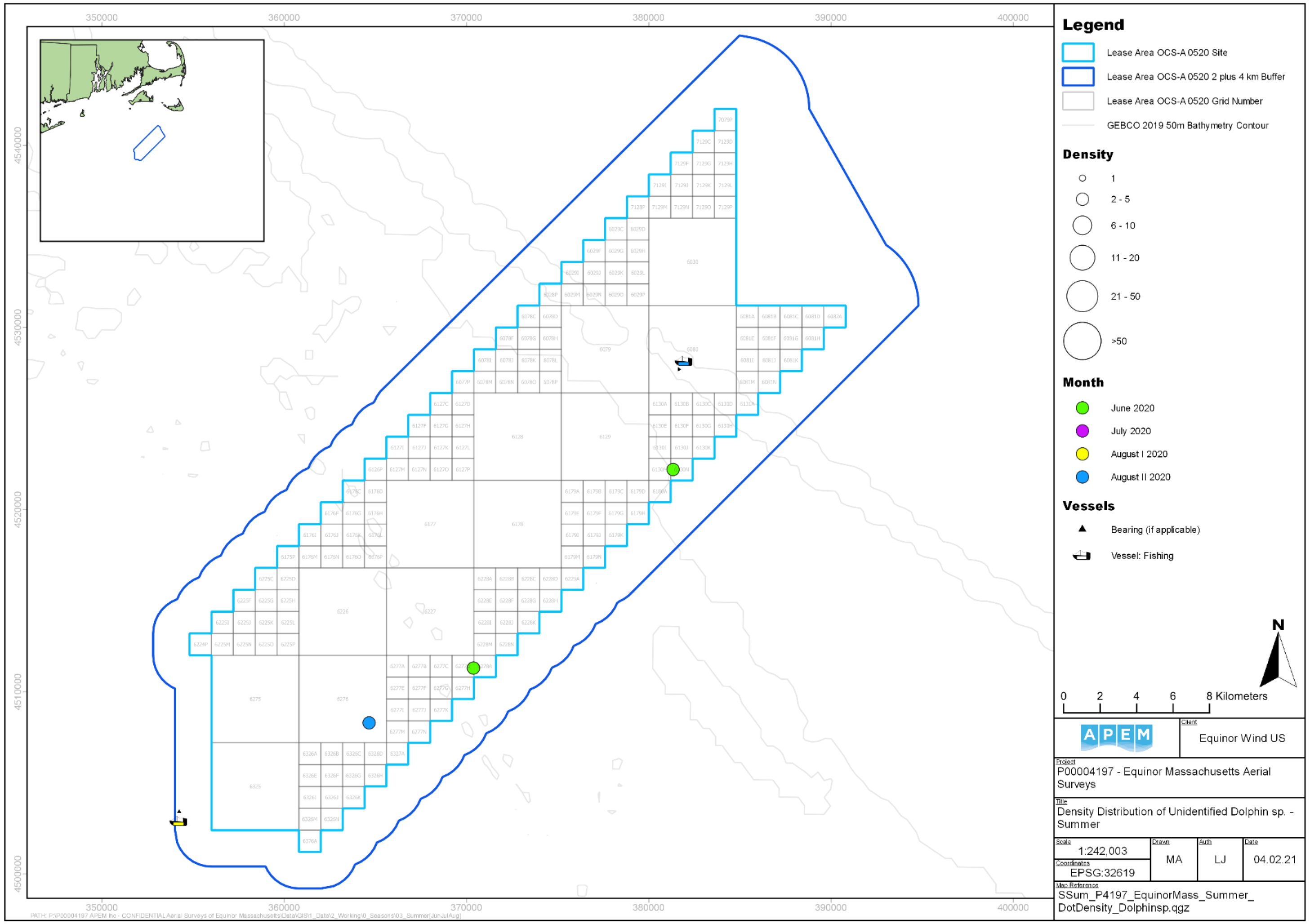

Figure 133 **Distribution of unidentified dolphins recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

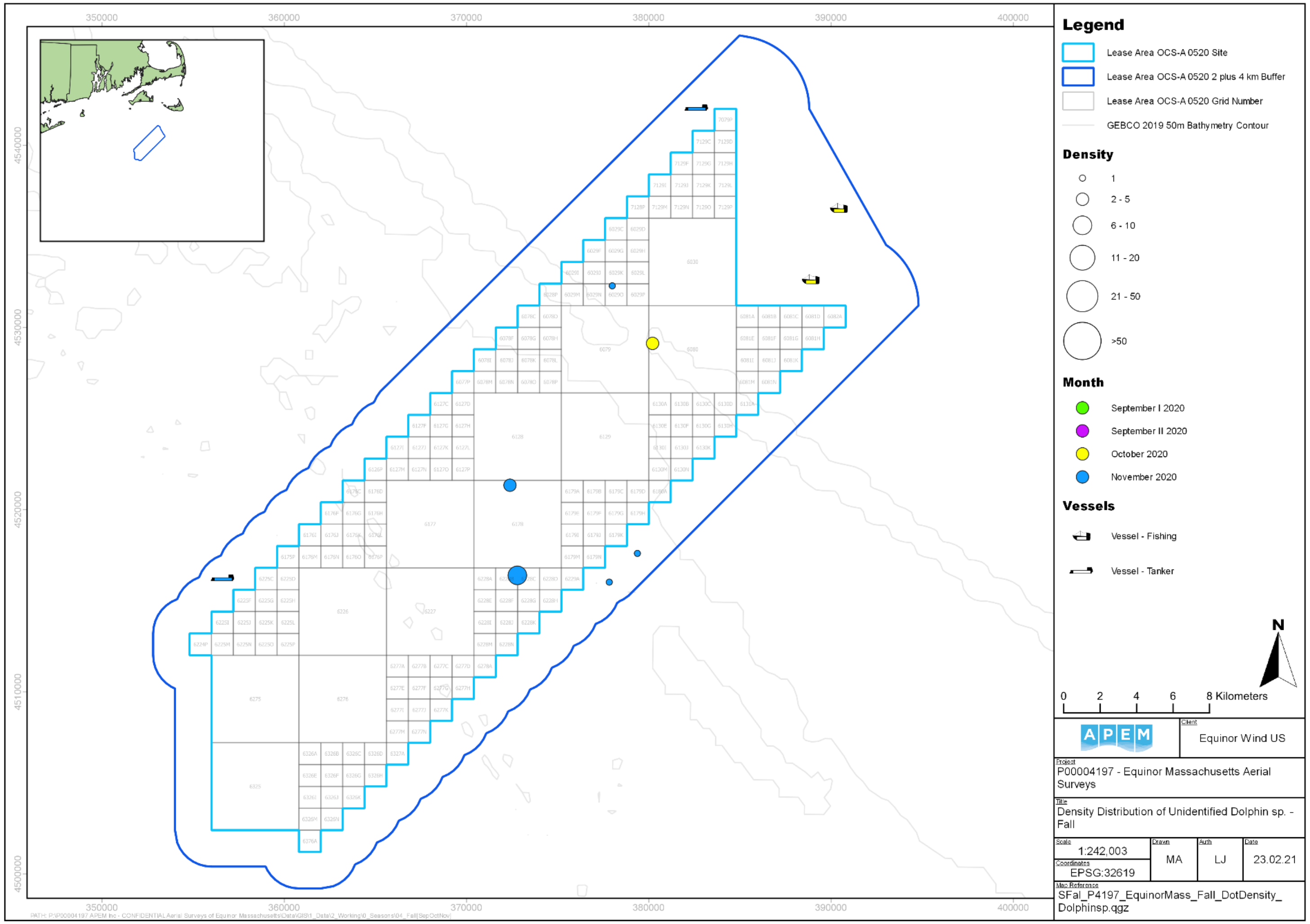

Figure 134 **Distribution of unidentified dolphins recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.64 Marine Mammal Species (Unidentified Mammalia)

Unidentified marine mammals were recorded in all four seasons, with highest numbers recorded in spring (**Table 1**). A peak count of four in the April **II** Site and three in the Buffer from the April **II** survey, led to abundance estimates of 30 and 27 respectively (**Table 71**).

A total of three unidentified marine mammals were recorded in the winter from the December 2019 survey only (**Table 71**), distributed around the center of the Survey Area (**Figure 135**). A total of 11 unidentified marine mammals were recorded in spring (**Figure 136**), of which one was recorded in the March survey, one was recorded in the April **I** survey, seven were recorded in the April **II** survey, and two were recorded in the June survey (**Table 71**). For the spring surveys, marine mammals were predominantly distributed around the center of the Survey Area, with the single marine mammal from the April **I** survey located in the south (**Figure 136**). A total of two marine mammals were recorded in the summer (**Figure 137**), of which one was recorded in the June survey, and one was recorded in the August **II** survey (**Table 71**). For the June survey, the marine mammal was located in the center of the Survey Area, and for the August **II** survey, the marine mammal was located in the south-southwest of the Survey Area (**Figure 137**). A total of two marine mammals were recorded in the fall from the November survey only (**Table 71**), distributed in the northeast of the Survey area (**Figure 138**).

Table 71 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified marine mammals in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Dec 19	3	24	0.03	2	1
Mar 20	1	8	0.01	1	0
Apr I 20	1	8	0.01	1	0
Apr II 20	7	56	0.07	5	2
May I 20	2	16	0.02	2	0
Jun 20	1	8	0.01	1	0
Aug II 20	1	8	0.01	1	0
Nov 20	2	16	0.02	2	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Dec 19	3	22	0.04	2	1
Mar 20	1	7	0.01	1	0
Apr I 20	1	7	0.01	1	0
Apr II 20	4	30	0.06	2	2
May I 20	2	15	0.03	2	0
Jun 20	1	7	0.01	1	0
Aug II 20	0	0	-	0	0
Nov 20	1	7	0.01	1	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Dec 19	0	0	-	0	0
Mar 20	0	0	-	0	0
Apr I 20	0	0	-	0	0

Apr II 20	3	27	0.08	3	0
May I 20	0	0	-	0	0
Jun 20	0	0	-	0	0
Aug II 20	1	9	0.03	1	0
Nov 20	1	9	0.03	1	0

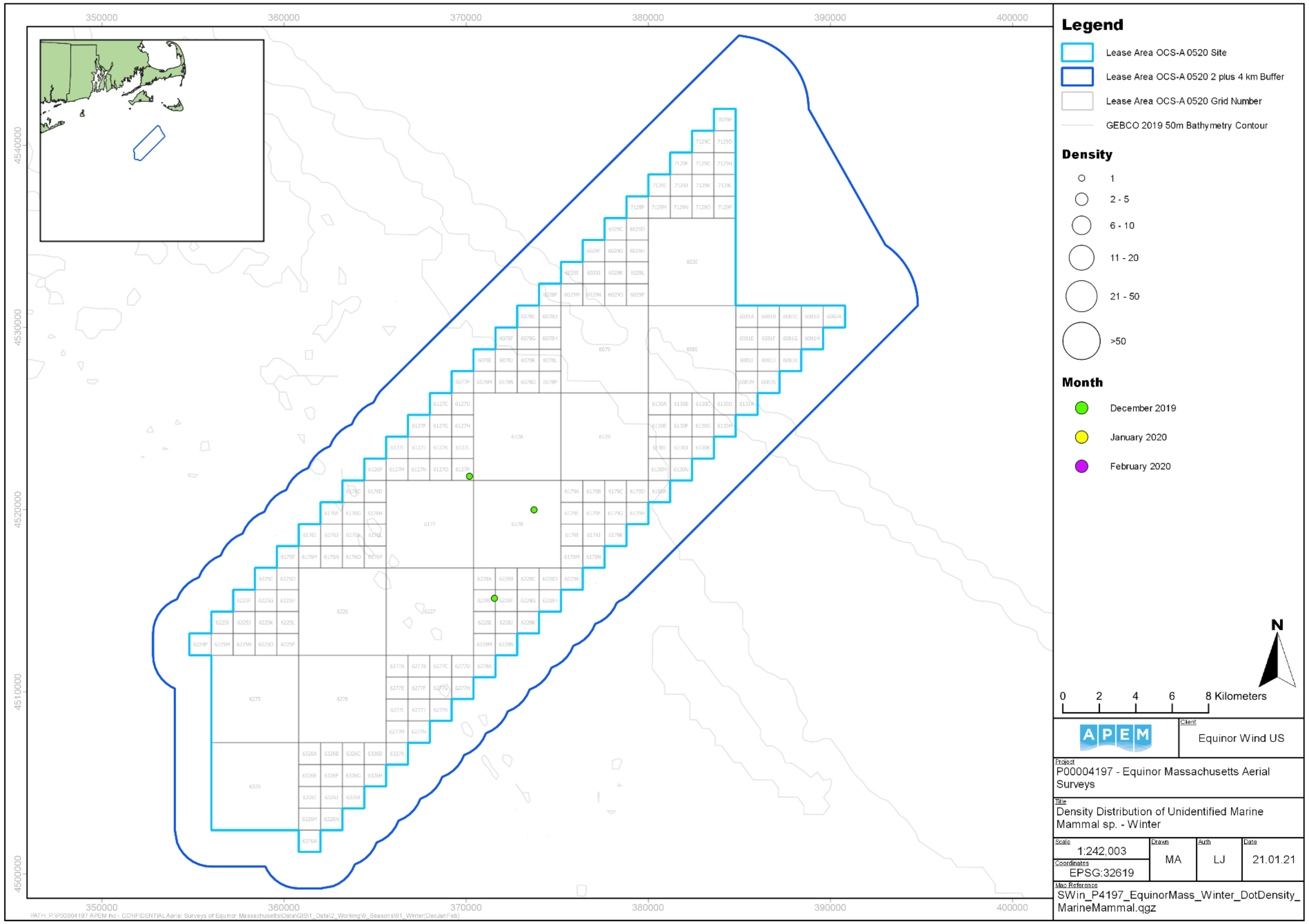

Figure 135 Distribution of unidentified marine mammals recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the winter season

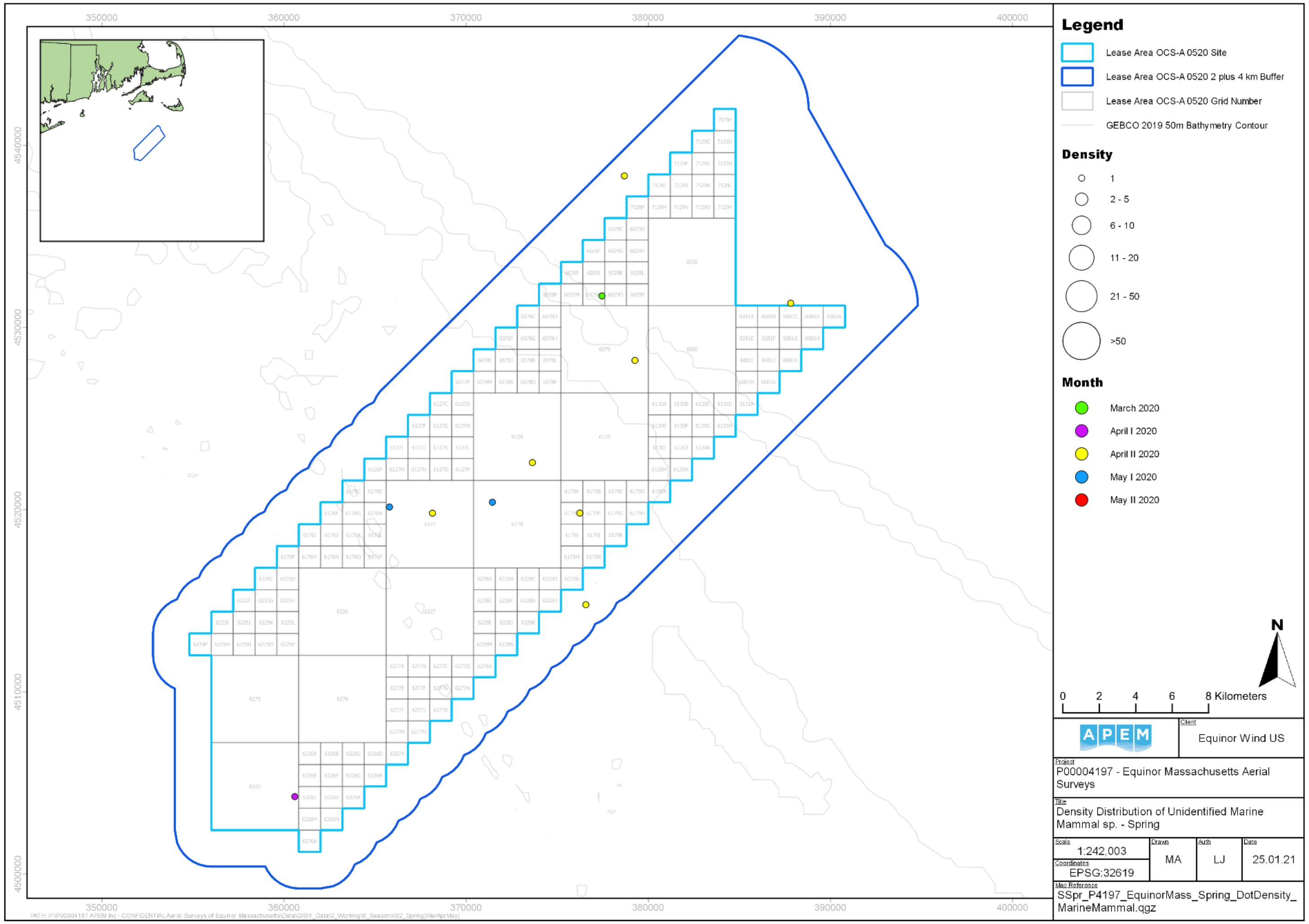

Figure 136 Distribution of unidentified marine mammals recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season

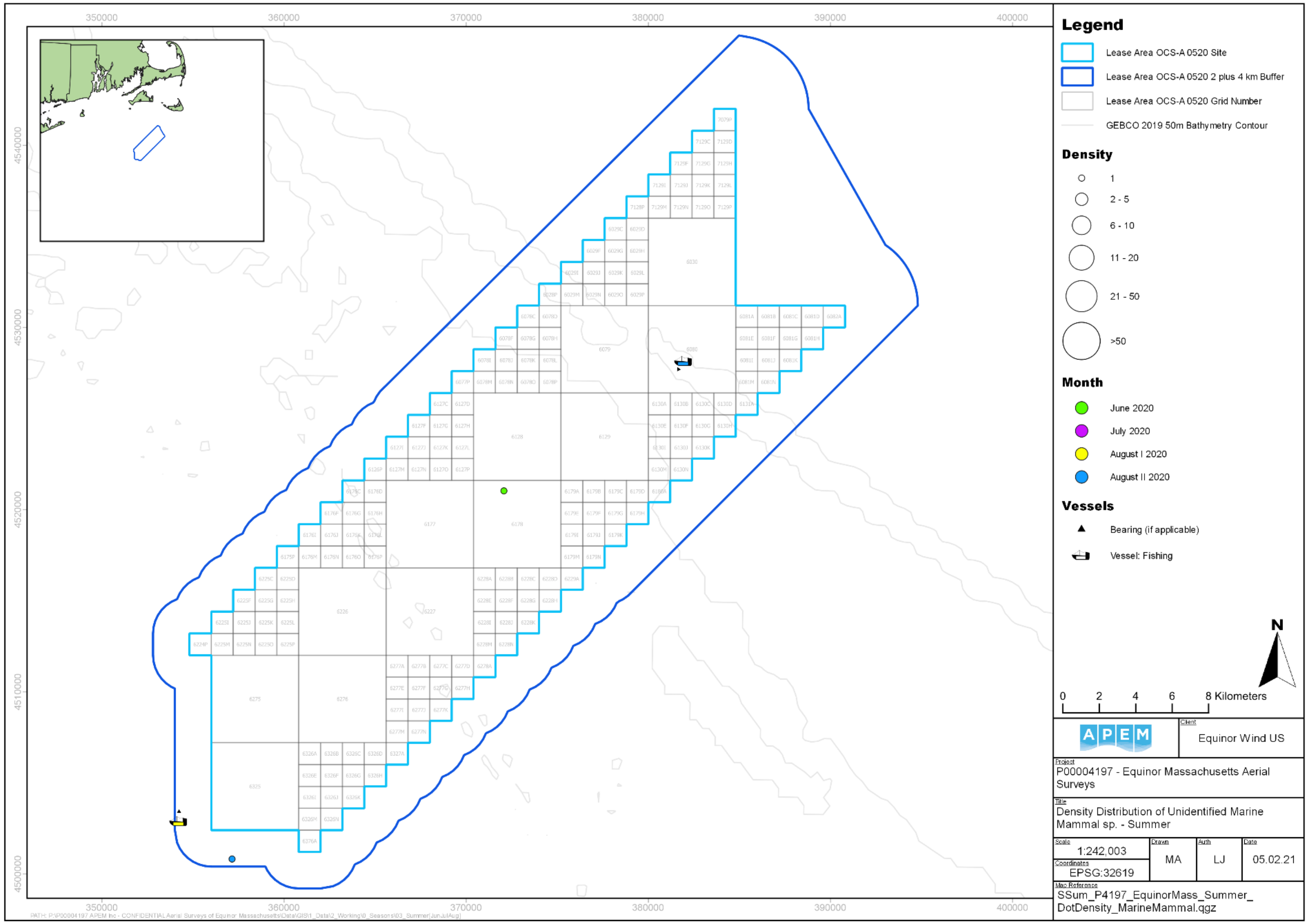

Figure 137 **Distribution of unidentified marine mammals recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

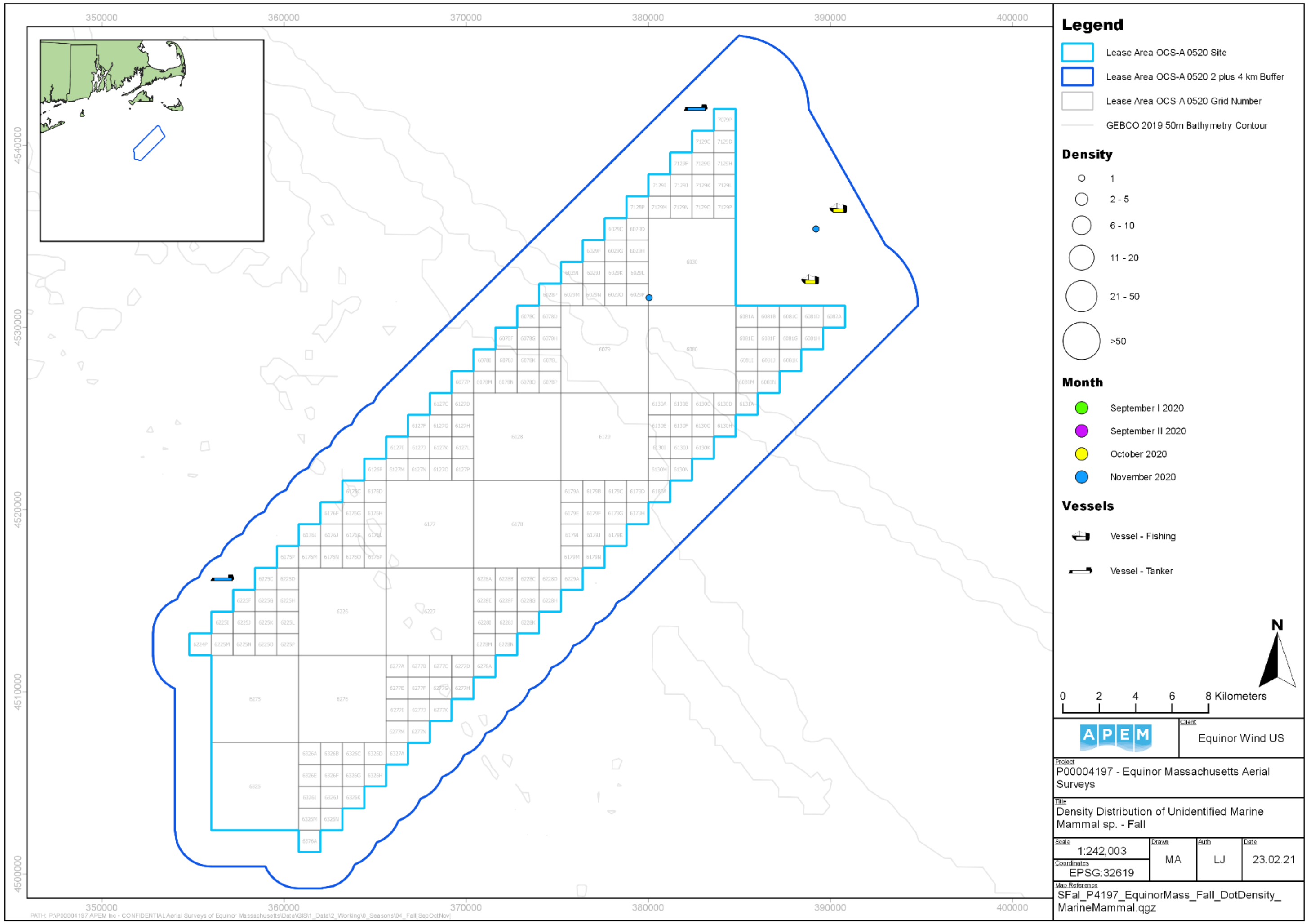

Figure 138 **Distribution of unidentified marine mammals recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.65 Chilean Devil Ray (*Mobula tarapacana)*

A single Chilean devil ray was recorded in the July survey only, with highest numbers therefore recorded in summer (**Table 1**). A peak count of one in the Survey Area from the July survey, led to an abundance estimate of eight (**Table 72**).

A total of one Chilean devil ray was recorded in the summer from the July survey (**Table 72**), located in the east-northeast of the Survey Area (**Figure 139**).

Table 72 Raw counts and abundance and density estimates (No. estimated individuals per km²) of Chilean devil ray in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul 20	1	8	0.01	1	0
b) Lease Area OCS-A 0520 Site					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul 20	1	7	0.01	1	0
c) 2 + 4 km Buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul 20	0	0	-	0	0

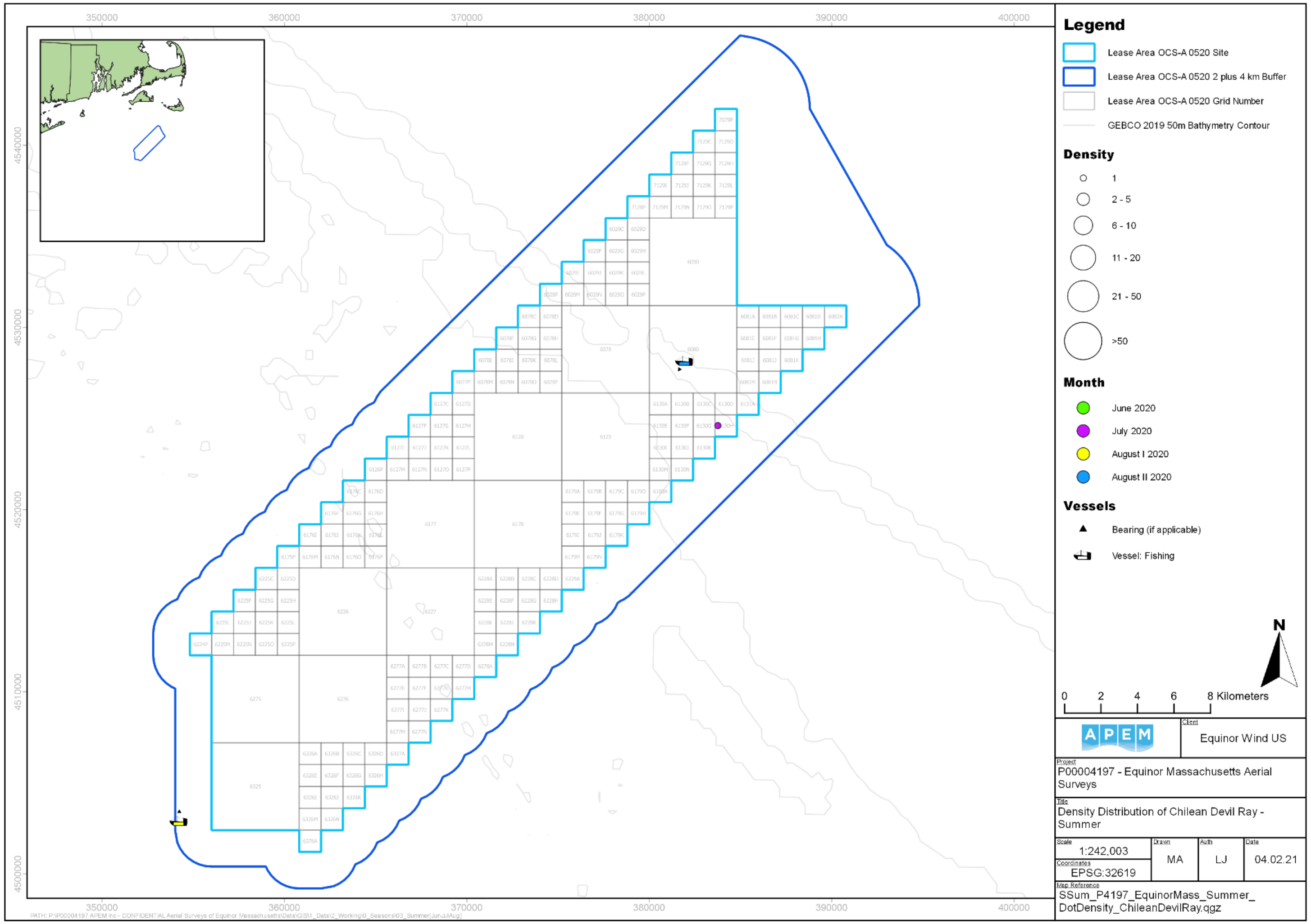

Figure 139 **Distribution of Chilean devil rays recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

5.66 Basking Shark (*Cetorhinus maximus)*

Basking sharks were recorded in the spring, summer, and fall, with highest numbers recorded in summer (**Table 1**). A peak count of eight in the Site and two in the Buffer from the July survey, led to abundance estimates of 60 and 18 respectively (**Table 73**).

A total of six basking sharks were recorded in the spring from the May II survey only (**Table 73**), loosely distributed across the Survey Area (**Figure 140**). A total of 17 basking sharks were recorded in summer (**Figure 141**), of which three were recorded in the June survey, ten were recorded in the July survey, one was recorded in the August I survey, and three were recorded in the August II survey (**Table 73**). For the June and August I surveys, basking sharks were located in the southwest of the Survey Area, and for the July and August II surveys, basking sharks were loosely distributed across the Survey Area (**Figure 141**). A total of two basking sharks were recorded in fall from the September II survey only (**Table 73**), located southwest of the Survey Area center (**Figure 141**).

Table 73 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of basking sharks in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
May II 20	6	48	0.06	6	0
Jun 20	3	24	0.03	3	0
Jul 20	10	80	0.09	10	0
Aug I 20	1	8	0.01	1	0
Aug II 20	3	24	0.03	3	0
Sep II 20	2	16	0.02	2	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
May II 20	4	30	0.06	4	0
Jun 20	3	22	0.04	3	0
Jul 20	8	60	0.12	8	0
Aug I 20	1	7	0.01	1	0
Aug II 20	1	7	0.01	1	0
Sep II 20	1	7	0.01	1	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
May II 20	2	18	0.05	2	0
Jun 20	0	0	-	0	0
Jul 20	2	18	0.05	2	0
Aug I 20	0	0	-	0	0
Aug II 20	2	18	0.05	2	0
Sep II 20	1	9	0.03	1	0

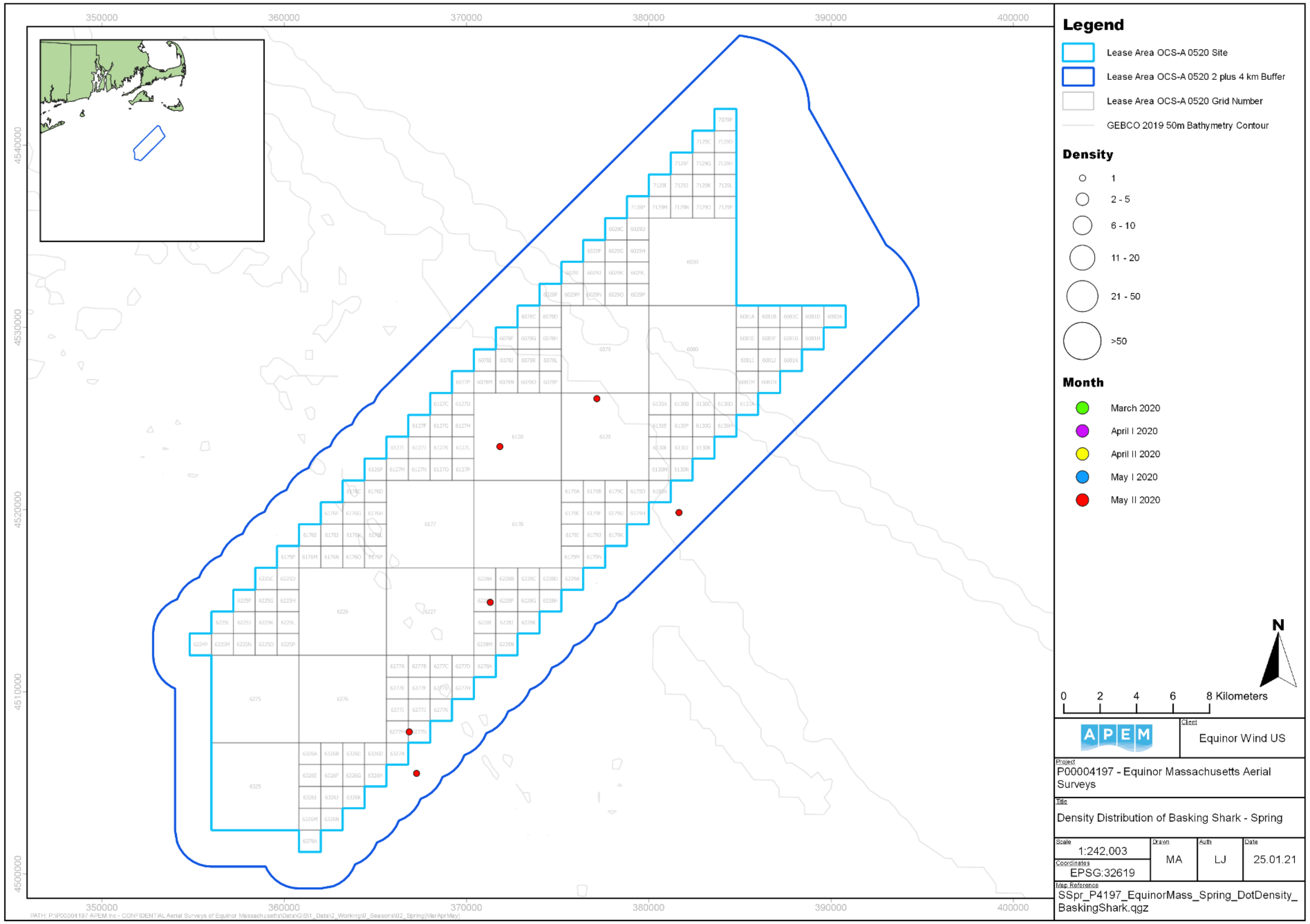

Figure 140 Distribution of basking sharks recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season

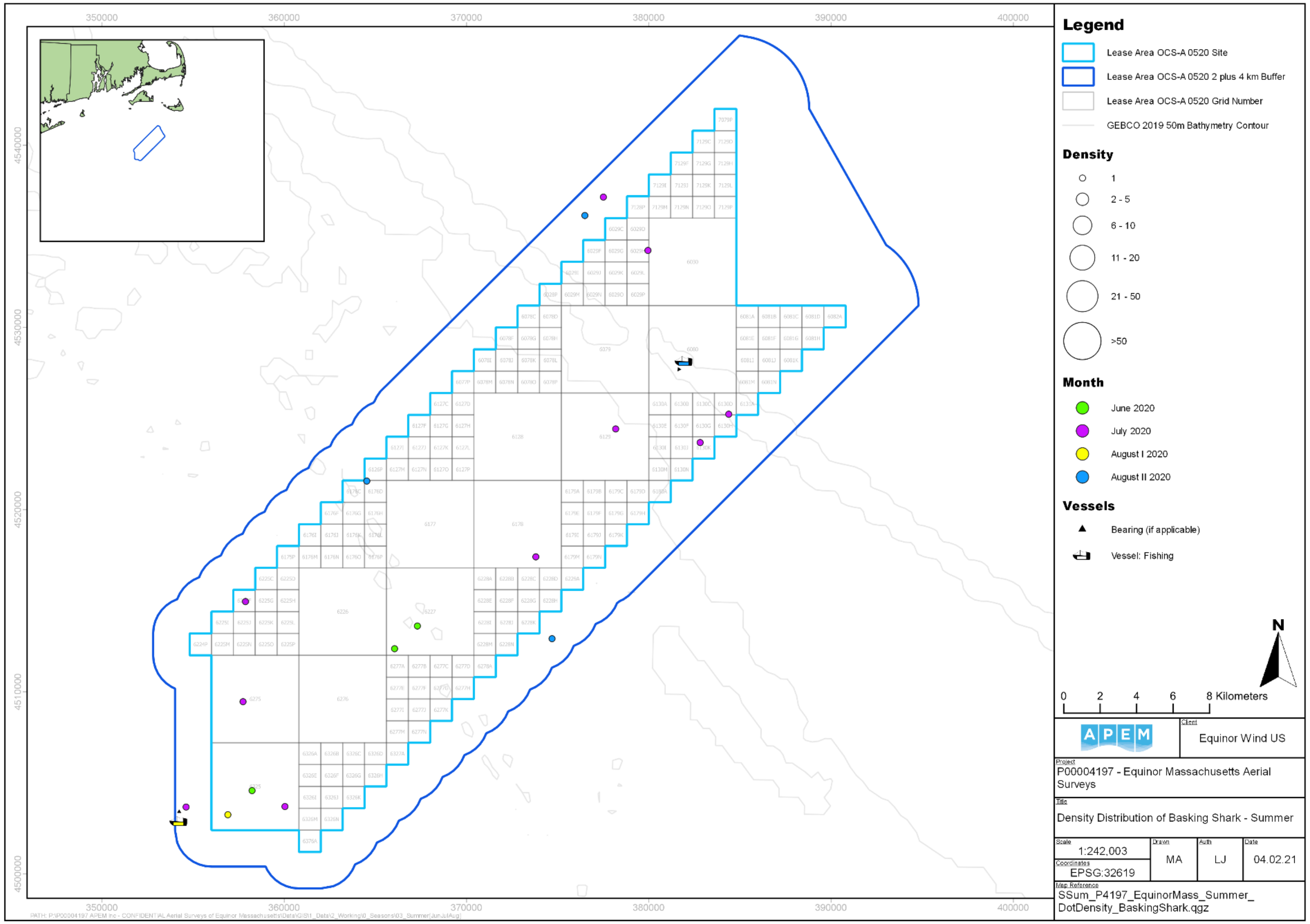

Figure 141 Distribution of basking sharks recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season

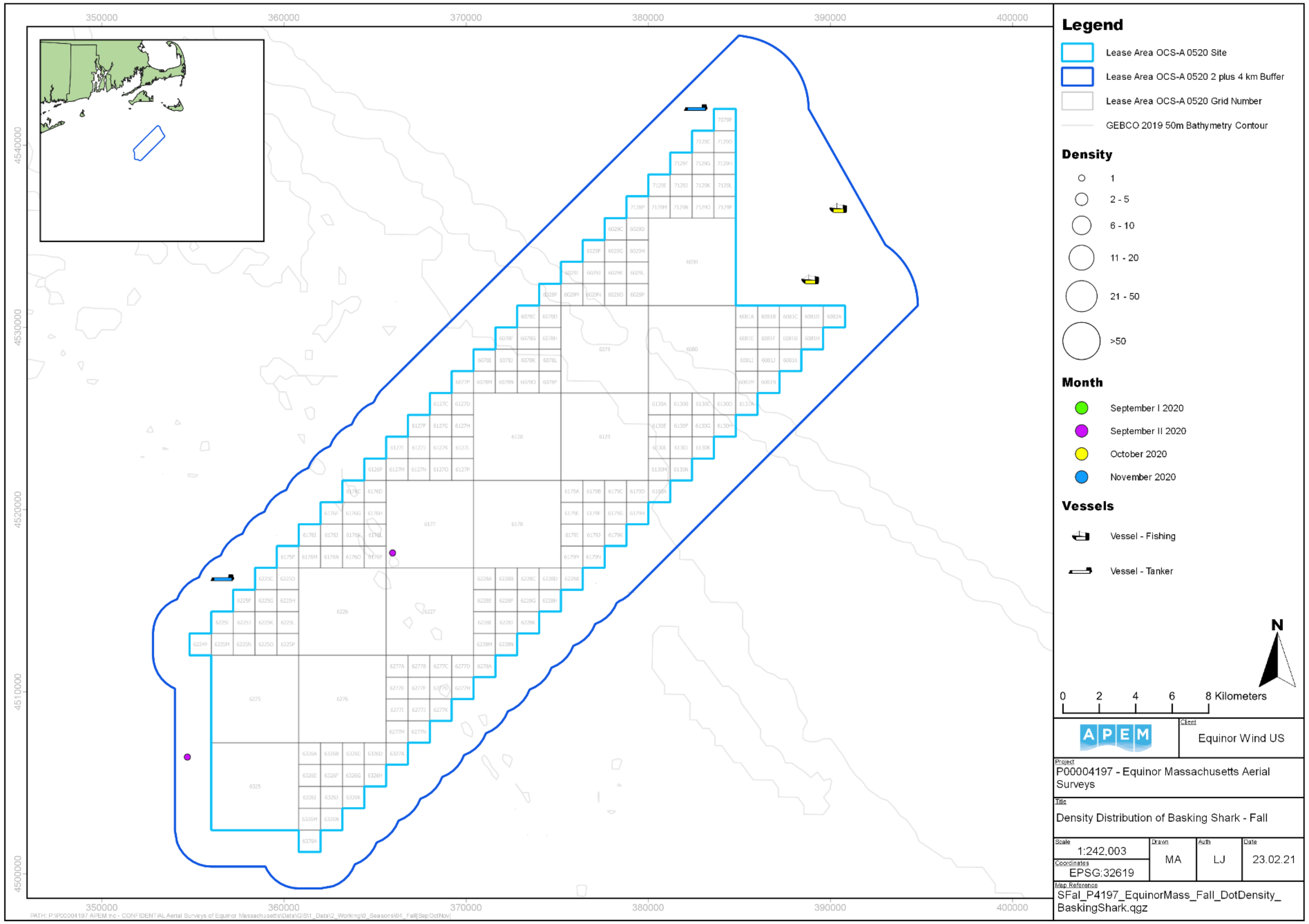

Figure 142 Distribution of basking sharks recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season

5.67 White Shark (*Carcharodon carcharias)*

White sharks were recorded in the summer and fall, with highest numbers recorded in summer (**Table 1**). A peak count of two in the Site and two in the Buffer from the August II survey, led to abundance estimates of 15 and 18 respectively (**Table 74**).

A total of eight white sharks were recorded in summer (**Figure 143**), of which two were recorded in the July survey, two were recorded in the August I survey, and four were recorded in the August II survey (**Table 74**). White sharks were loosely distributed across the Survey Area for the summer surveys (**Figure 143**). A total of five white sharks were recorded in the fall (**Figure 144**), of which one was recorded in the October survey, and two were recorded in the November survey (**Table 74**). For the September I, September II, and November surveys, white sharks were located around the center of the Survey Area, and for the October survey, the single white shark was located in the north (**Figure 144**).

Table 74 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of white sharks in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jul 20	2	16	0.02	2	0
Aug I 20	2	16	0.02	2	0
Aug II 20	4	32	0.04	4	0
Sep I 20	1	8	0.01	1	0
Sep II 20	1	8	0.01	1	0
Oct 20	1	8	0.01	1	0
Nov 20	2	16	0.02	2	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jul 20	0	0	-	0	0
Aug I 20	2	15	0.03	2	0
Aug II 20	2	15	0.03	2	0
Sep I 20	1	7	0.01	1	0
Sep II 20	0	0	-	0	0
Oct 20	0	0	-	0	0
Nov 20	2	15	0.03	2	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jul 20	2	18	0.05	2	0
Aug I 20	0	0	-	0	0
Aug II 20	2	18	0.05	2	0
Sep I 20	0	0	-	0	0
Sep II 20	1	9	0.03	1	0
Oct 20	1	9	0.03	1	0
Nov 20	0	0	-	0	0

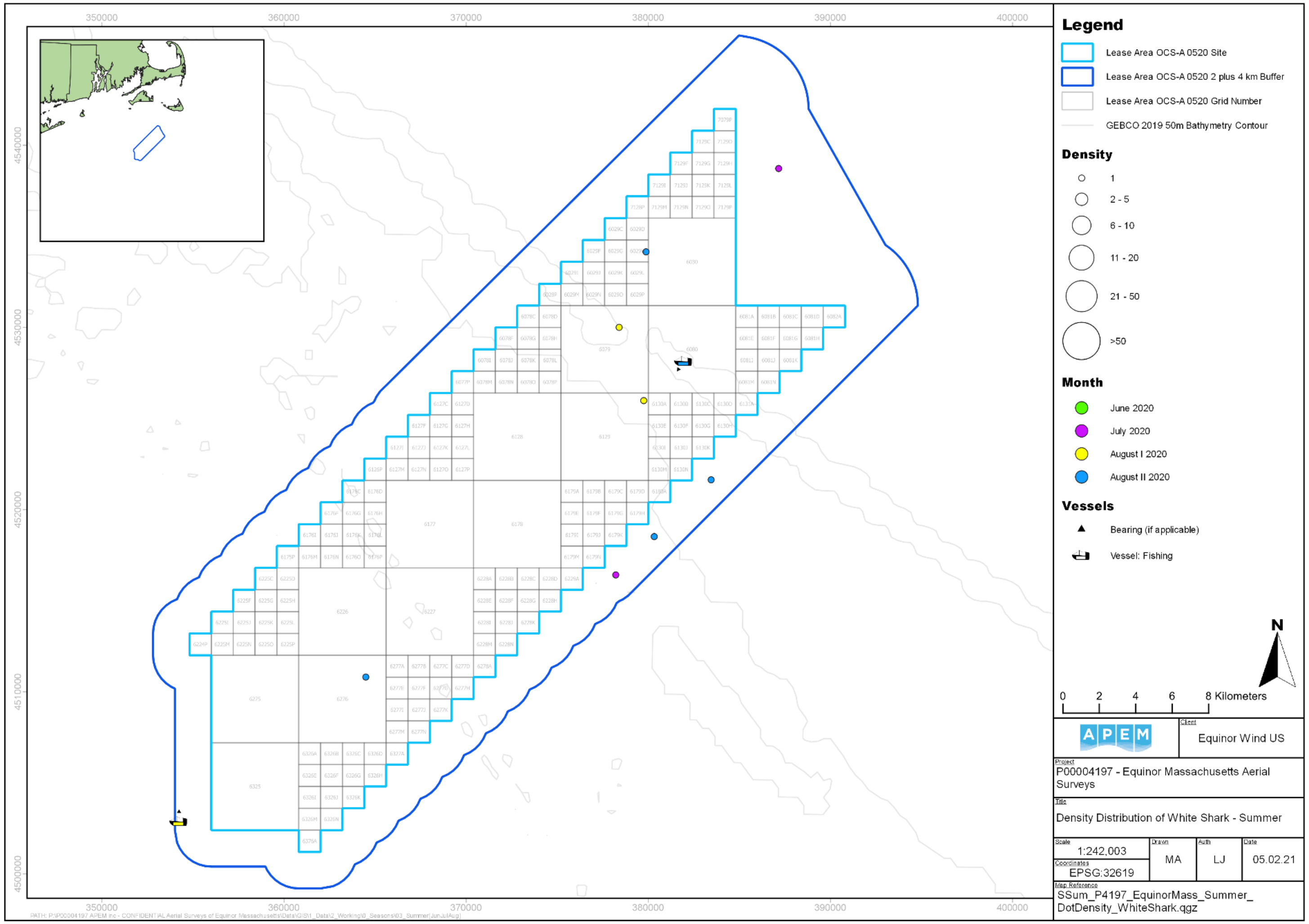

Figure 143 **Distribution of white sharks recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

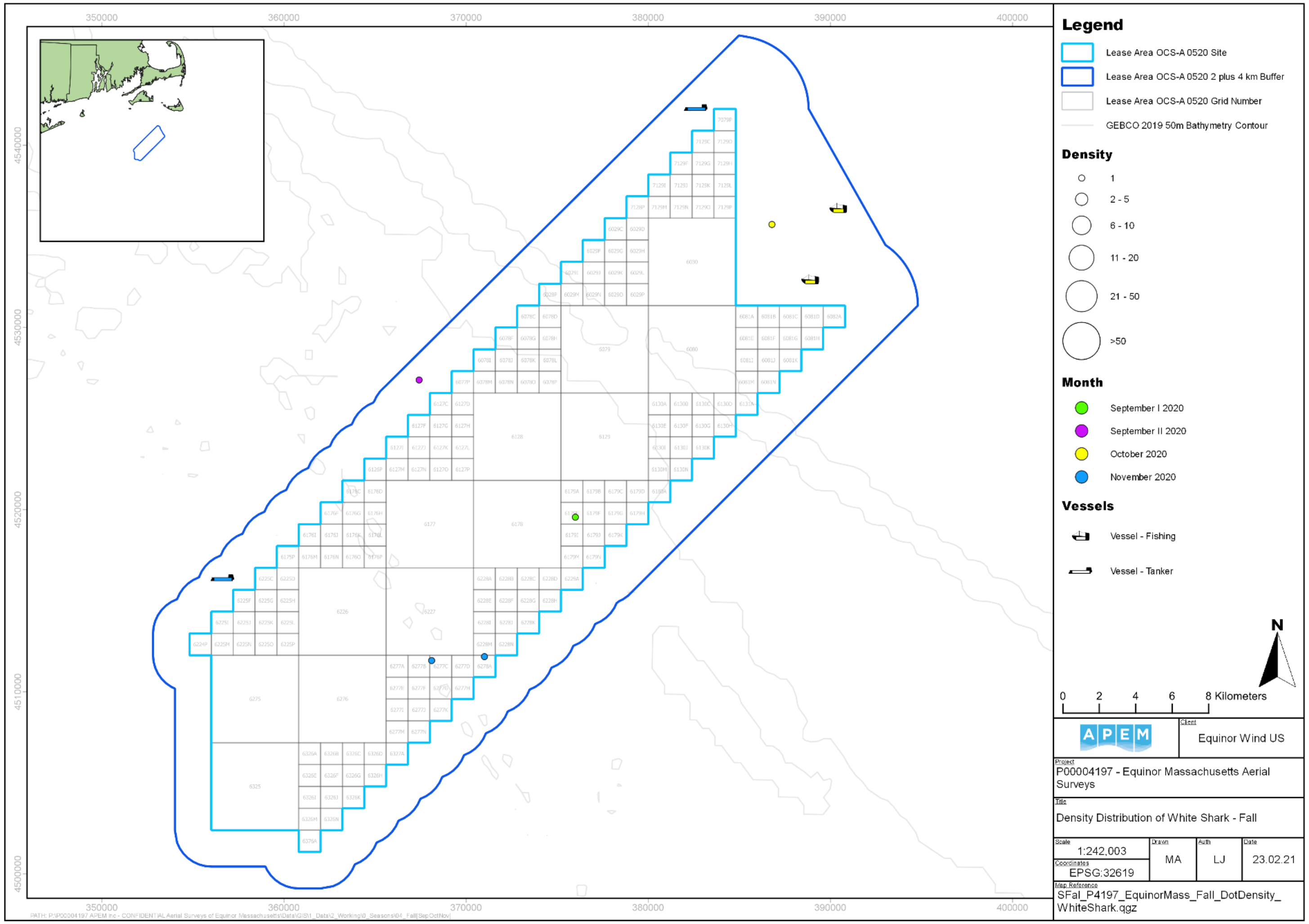

Figure 144 Distribution of white sharks recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season

5.68 Shortfin Mako (*Isurus oxyrinchus)*

Shortfin mako were recorded in the June, July, and August II surveys only, with highest numbers therefore recorded in summer (**Table 1**). A peak count of two in the Survey Area from the July survey, led to an abundance estimate of 16 (**Table 75**).

A total of four shortfin mako were recorded in the summer (**Figure 145**), of which one was recorded in the June survey, two were recorded in the July survey, and one was recorded in the August II survey (**Table 75**). For the June and August II surveys, shortfin mako were located I the south of the Survey Area, and for the July survey, shortfin mako were distributed in the northeast of the Survey Area (**Figure 145**).

Table 75 Raw counts and abundance and density estimates (No. estimated individuals per km²) of shortfin mako in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jun 20	1	8	0.01	1	0
Jul 20	2	16	0.02	2	0
Aug II 20	1	8	0.01	1	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jun 20	1	7	0.01	1	0
Jul 20	2	15	0.03	2	0
Aug II 20	1	7	0.01	1	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jun 20	0	0	-	0	0
Jul 20	0	0	-	0	0
Aug II 20	0	0	-	0	0

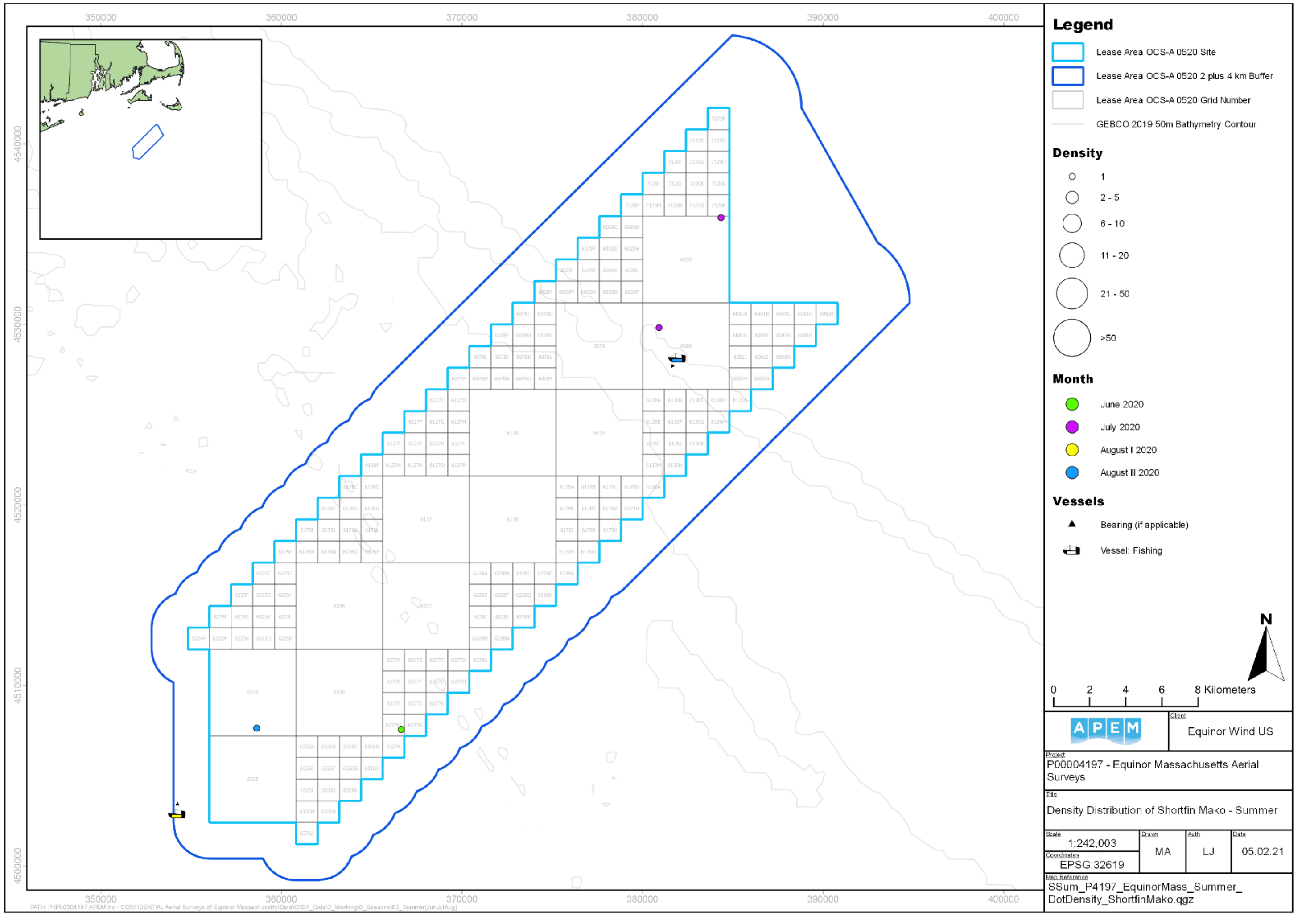

Figure 145 Distribution of shortfin mako recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season

5.69 Blacktip Shark (*Carcharhinus limbatus)*

A single blacktip shark was recorded in the July survey, with highest numbers therefore recorded in summer (**Table 1**). A peak count of one in the Survey Area from the July survey, led to an abundance estimate of eight (**Table 76**).

A total of one blacktip shark was recorded in the summer from the July survey (**Table 76**), located in the northeast of the Survey Area (**Figure 146**).

Table 76 Raw counts and abundance and density estimates (No. estimated individuals per km²) of blacktip sharks in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jul 20	1	8	0.01	1	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jul 20	1	7	0.01	1	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jul 20	0	0	-	0	0

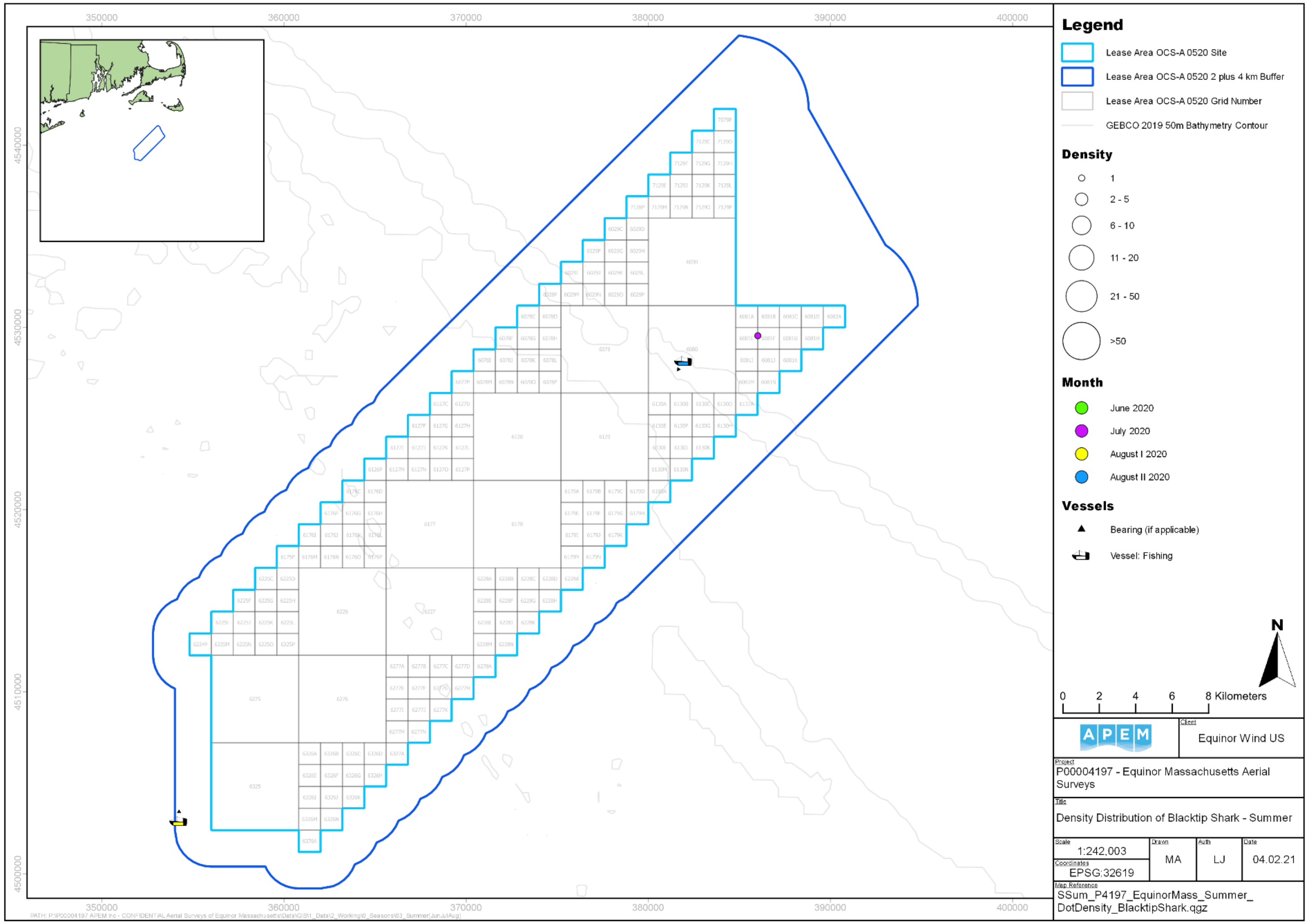

Figure 146 **Distribution of blacktip sharks recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

5.70 Blue Shark (*Prionace glauca)*

Blue sharks were recorded in the summer and fall surveys, with highest numbers recorded in summer (**Table 1**). A peak count of 11 in the Site and twelve in the Buffer from the August I survey, led to abundance estimates of 82 and 106 respectively (**Table 77**).

A total of 51 blue sharks were recorded in the summer (**Figure 147**), of which 21 were recorded in the June survey, three were recorded in the July survey, 23 were recorded in the August I survey, and four were recorded in the August II survey (**Table 77**). For the June and August I surveys, blue sharks were loosely distributed across the Survey Area (**Figure 147**). For the July survey, blue sharks were recorded in the north to northeast of the Survey Area, and for the August II survey, blue sharks were distributed around the center of the Survey Area (**Figure 147**). A total of one blue shark was recorded in the fall from the September II survey (**Table 77**), located in the north of the Survey Area (**Figure 148**).

Table 77 Raw counts and abundance and density estimates (No. estimated individuals per km²) of blue sharks in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jun 20	21	167	0.19	21	0
Jul 20	3	24	0.03	3	0
Aug I 20	23	183	0.21	23	0
Aug II 20	4	32	0.04	4	0
Sep II 20	1	8	0.01	1	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jun 20	20	149	0.29	20	0
Jul 20	0	0	-	0	0
Aug I 20	11	82	0.16	11	0
Aug II 20	3	22	0.04	3	0
Sep II 20	0	0	-	0	0
c) 2 + 4 km Buffer					
d)					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jun 20	1	9	0.03	1	0
Jul 20	3	27	0.08	3	0
Aug I 20	12	106	0.31	12	0
Aug II 20	1	9	0.03	1	0
Sep II 20	1	9	0.03	1	0

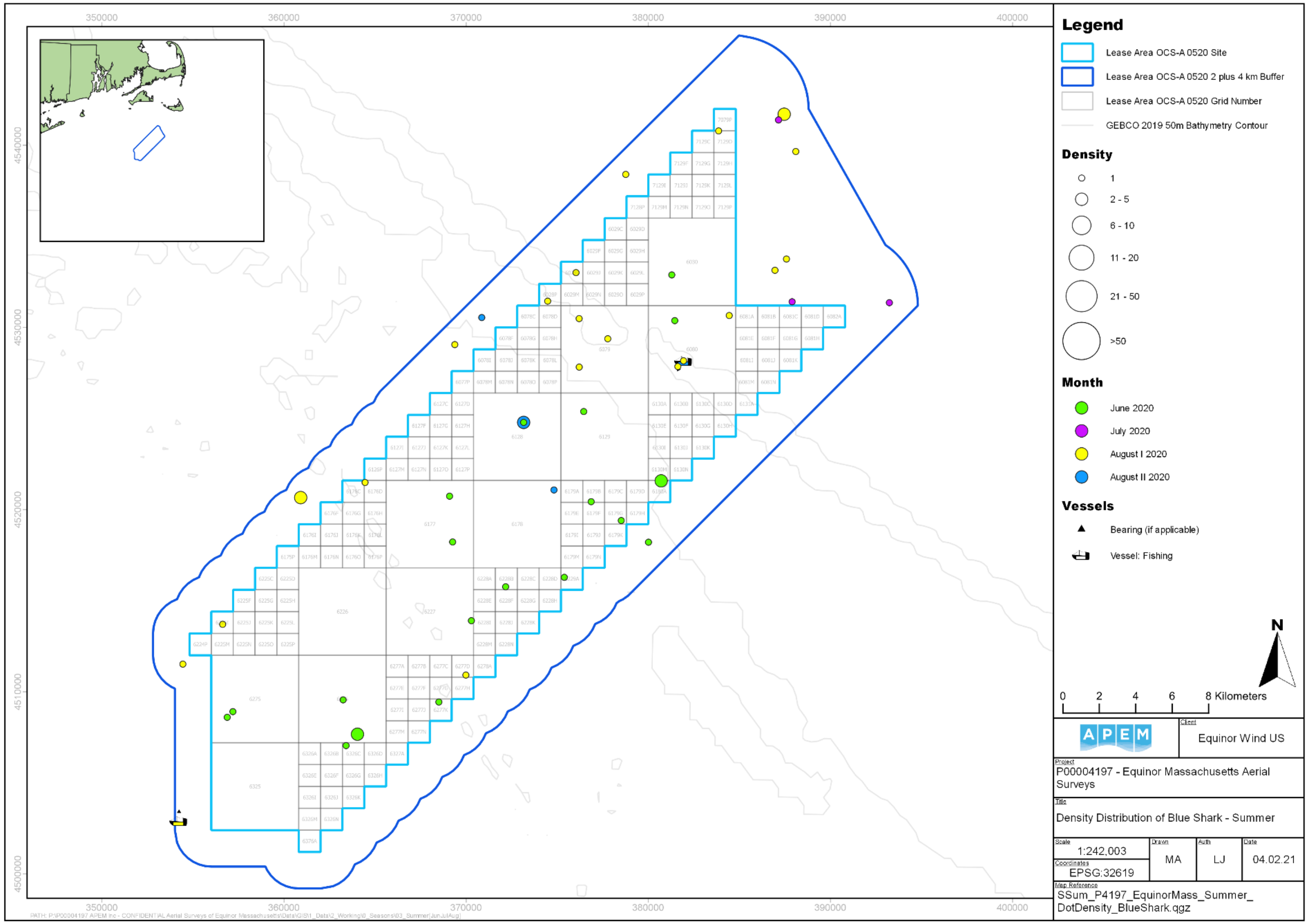

Figure 147 **Distribution of blue sharks recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

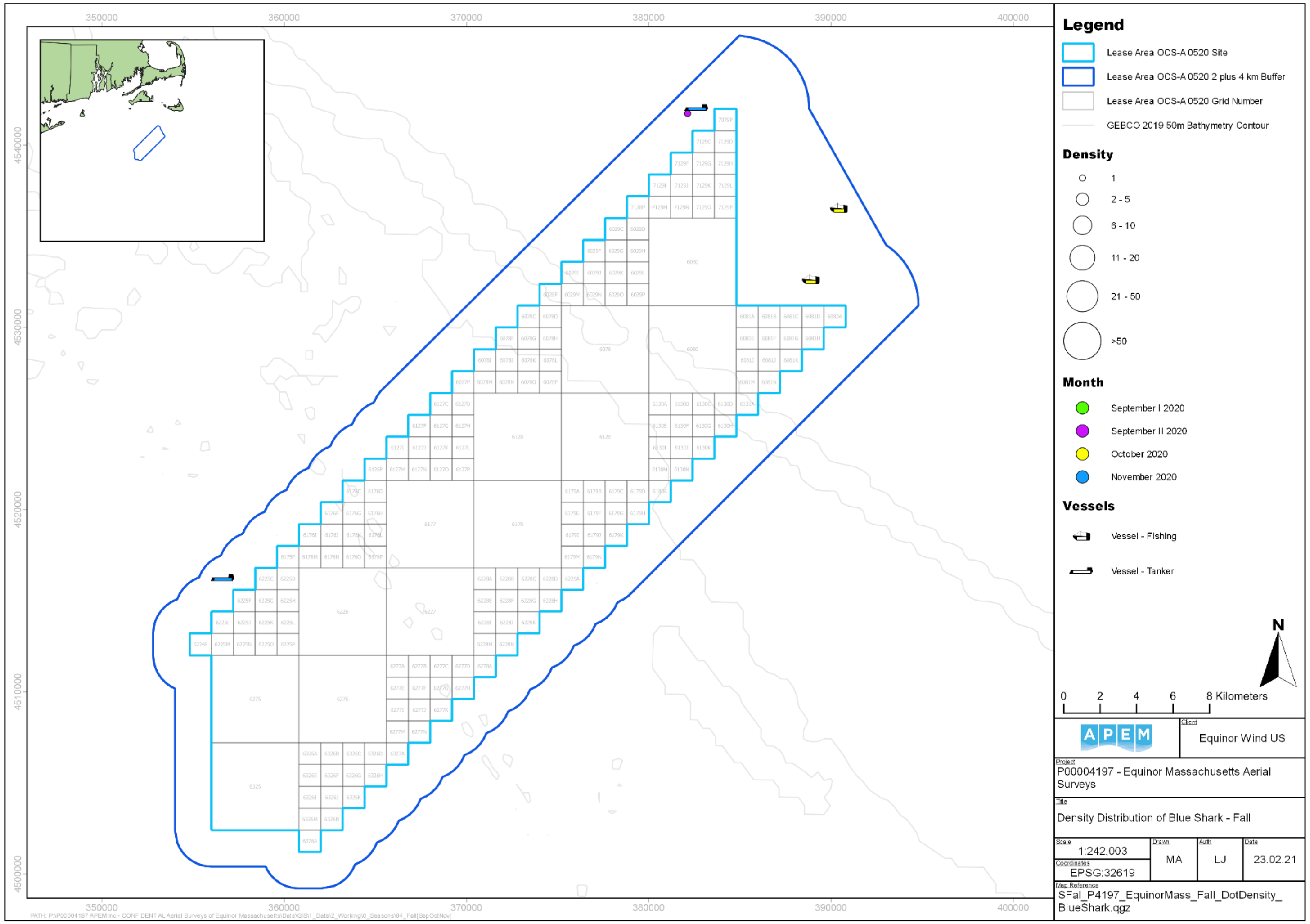

Figure 148 **Distribution of blue sharks recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.71 Carcharhinidae Shark Species (Unidentified Carcharhinidae)

Unidentified Carcharhinidae sharks were recorded in the summer and fall, with highest numbers recorded in summer (**Table 1**). A peak count of 21 in the Site and four in the Buffer from the July survey, led to abundance estimates of 157 and 36 respectively (**Table 78**).

A total of 33 unidentified Carcharhinidae sharks were recorded in the summer (**Figure 149**), of which one was recorded in the June survey, 25 were recorded in the July survey, three were recorded in the August **I** survey, and four were recorded in the August **II** survey (**Table 78**). For the summer surveys, Carcharhinidae sharks were loosely distributed across the Survey Area, with the single shark from the June survey located in the center of the Survey Area (**Figure 149**). A total of one Carcharhinidae shark was recorded in the fall from the September **I** survey (**Table 78**), located in the northeast of the Survey Area (**Figure 150**).

Table 78 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified Carcharhinidae sharks in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jun 20	1	8	0.01	1	0
Jul 20	25	199	0.23	25	0
Aug I 20	3	24	0.03	3	0
Aug II 20	4	32	0.04	4	0
Sep I 20	1	8	0.01	1	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jun 20	1	7	0.01	1	0
Jul 20	21	157	0.3	21	0
Aug I 20	3	22	0.04	3	0
Aug II 20	3	22	0.04	3	0
Sep I 20	0	0	-	0	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jun 20	0	0	-	0	0
Jul 20	4	36	0.11	4	0
Aug I 20	0	0	-	0	0
Aug II 20	1	9	0.03	1	0
Sep I 20	1	9	0.03	1	0

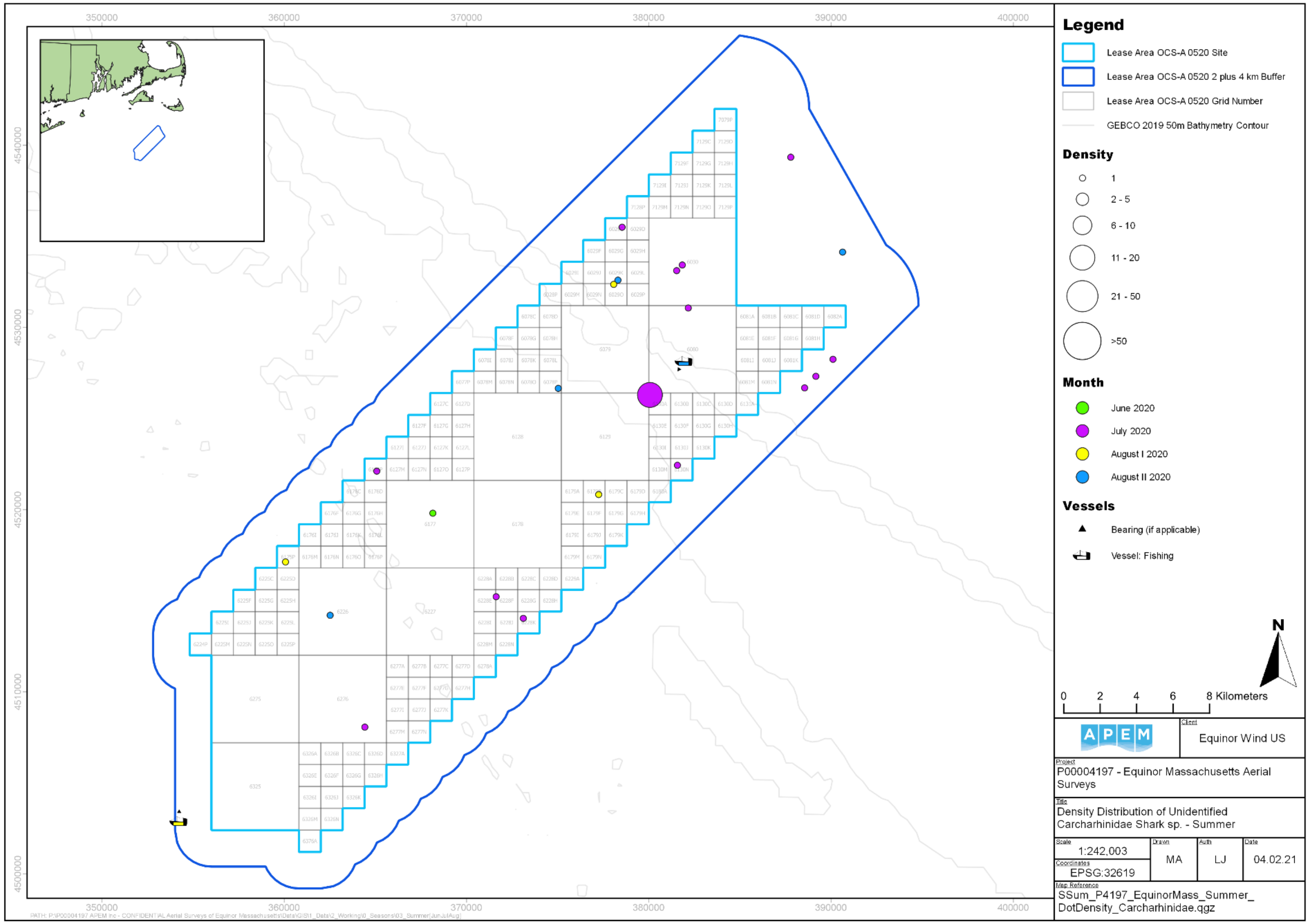

Figure 149 **Distribution of unidentified Carcharhinidae sharks recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

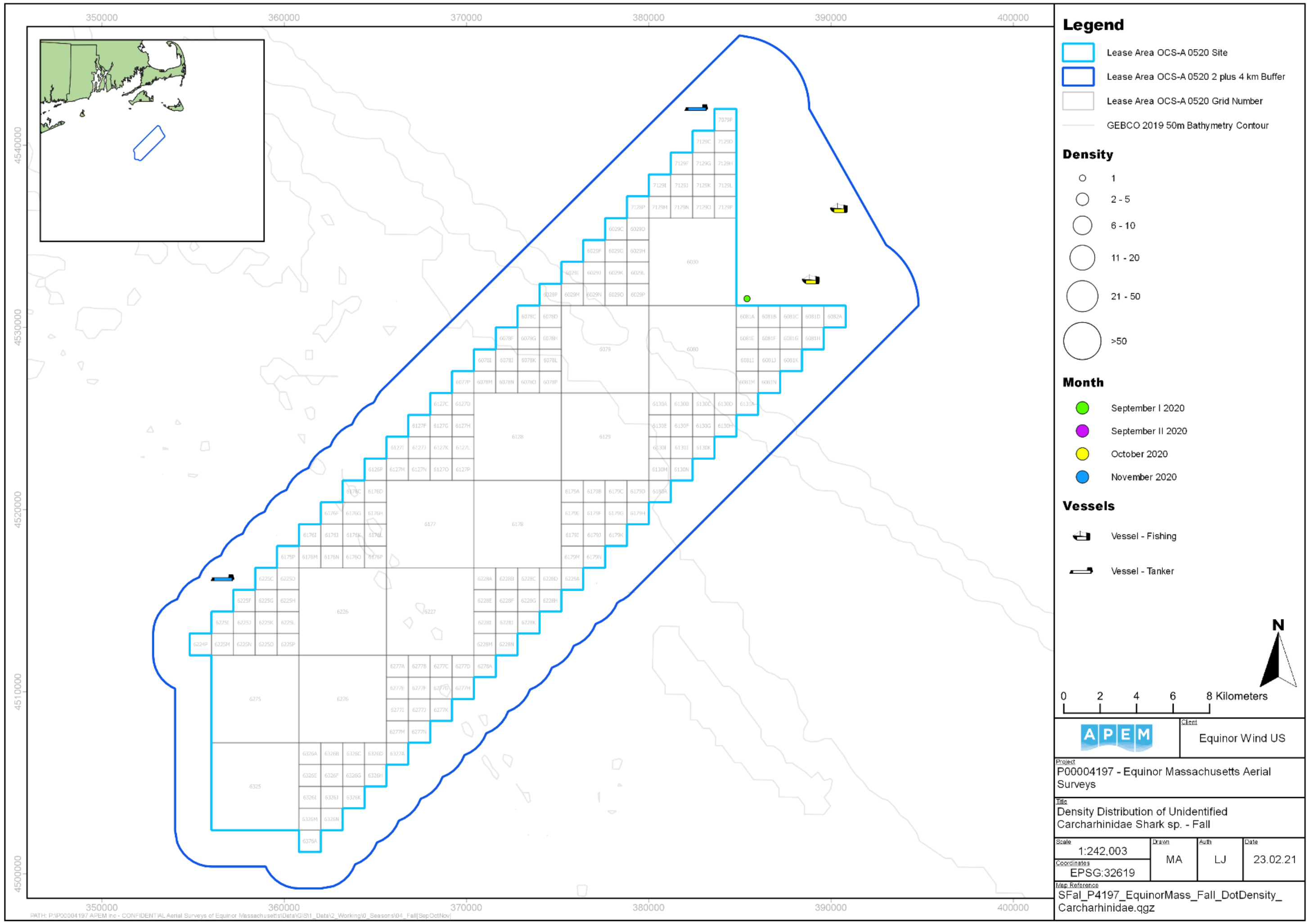

Figure 150 **Distribution of unidentified Carcharhinidae sharks recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season**

5.72 Dusky Shark (*Carcharhinus obscurus*)

Dusky sharks were recorded in the September I and September II surveys only, with highest numbers therefore recorded in fall (**Table 1**). A peak count of one was recorded in each survey, leading to abundance estimates of eight for each (**Table 79**).

A total of two dusky sharks were recorded in the fall (**Figure 151**), of which one was recorded in the September I survey, and one was recorded in the September II survey (**Table 79**). For the summer surveys, dusky sharks were located in the north of the Survey Area (**Figure 151**).

Table 79 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of dusky sharks in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Sep I 20	1	8	0.01	1	0
Sep II 20	1	8	0.01	1	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Sep I 20	1	7	0.01	1	0
Sep II 20	1	7	0.01	1	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Sep I 20	0	0	-	0	0
Sep II 20	0	0	-	0	0

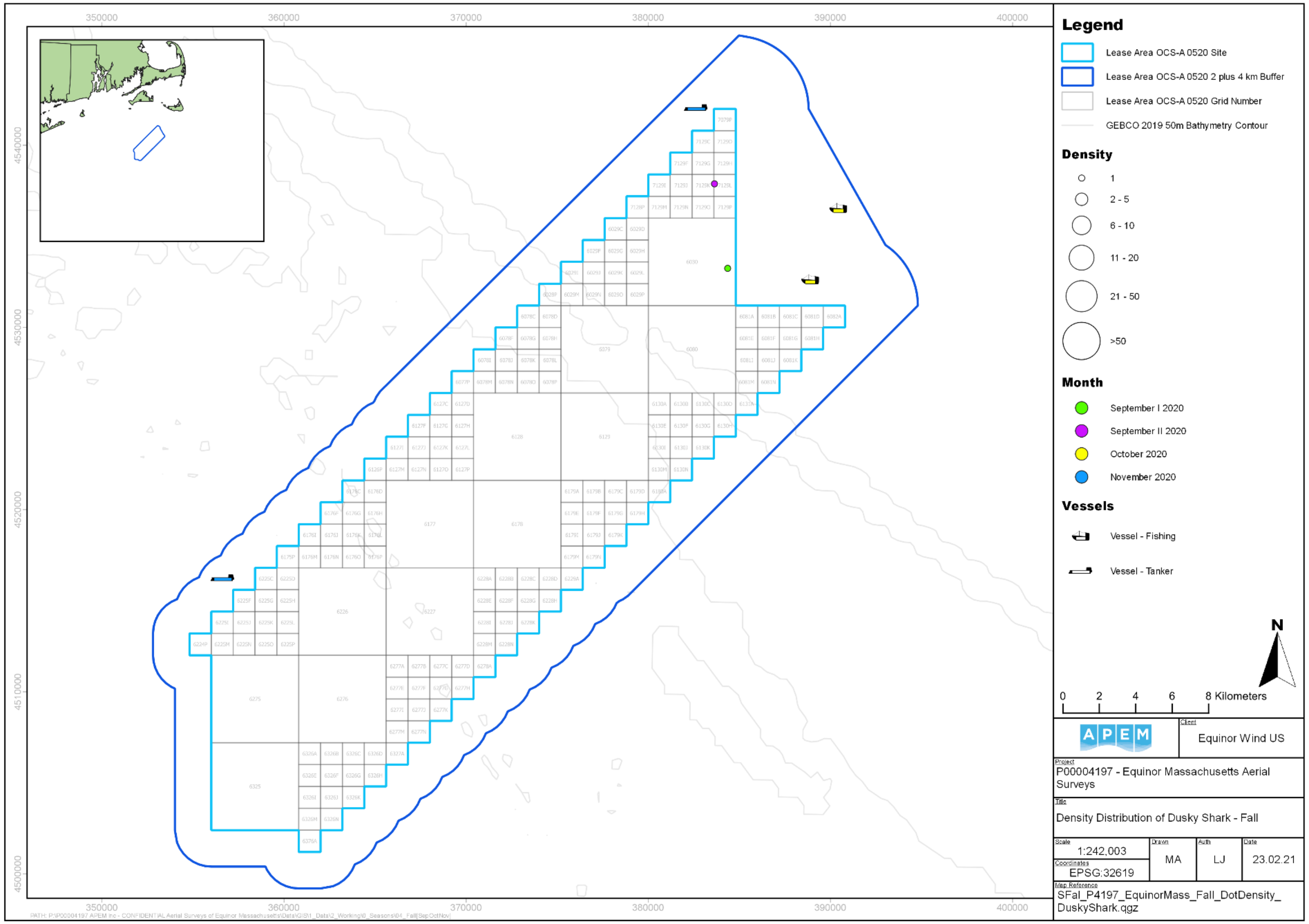

Figure 151 Distribution of dusky sharks recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season

5.73 Oceanic Whitetip Shark (*Carcharhinus longimanus)*

A single oceanic whitetip shark was recorded in the August I survey, with highest numbers therefore recorded in summer (**Table 1**). A peak count of one in the Survey Area from the August I survey led to an abundance estimate of eight (**Table 80**).

A total of one oceanic whitetip shark was recorded in the summer from the August I survey (**Table 80**), located in the north-northwest of the Survey Area (**Figure 152**).

Table 80 Raw counts and abundance and density estimates (No. estimated individuals per km²) of oceanic whitetip sharks in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Aug I 20	1	8	0.01	1	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Aug I 20	1	7	0.01	1	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Aug I 20	0	0	-	0	0

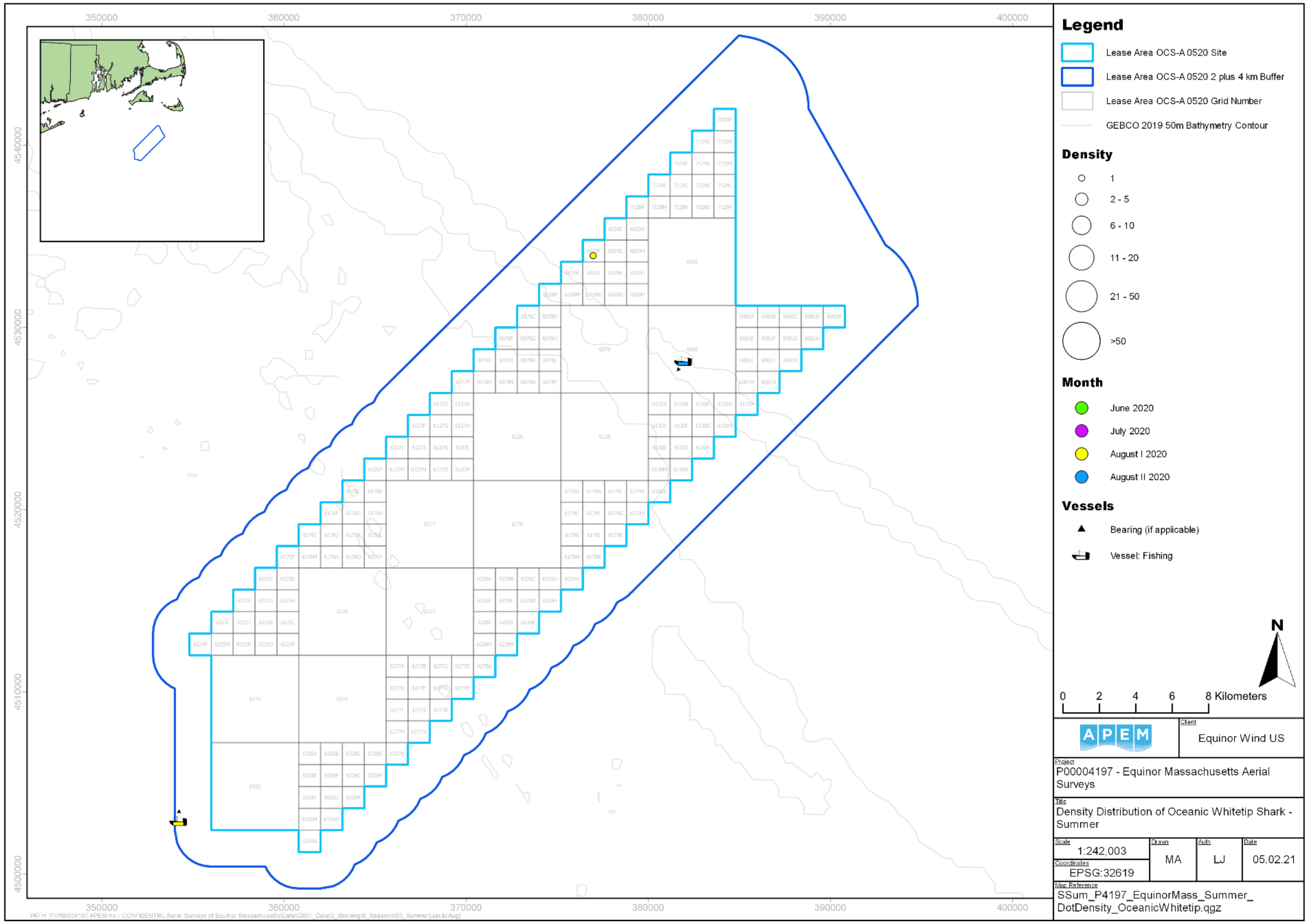

Figure 152 **Distribution of oceanic whitetip sharks recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

5.74 Sandbar Shark (*Carcharhinus plumbeus)*

Sandbar sharks were recorded in the July survey only, with highest numbers therefore recorded in July (**Table 1**). A peak count of one in the Site and one in the Buffer led to abundance estimates of seven and nine respectively (**Table 81**).

A total of two sandbar sharks were recorded in the summer from the July survey only (**Table 81**); one located in the northeast of the Survey Area, and one located in the southwest (**Figure 153**).

Table 81 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of sandbar sharks in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul 20	2	16	0.02	2	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jul 20	1	7	0.01	1	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jul 20	1	9	0.03	1	0

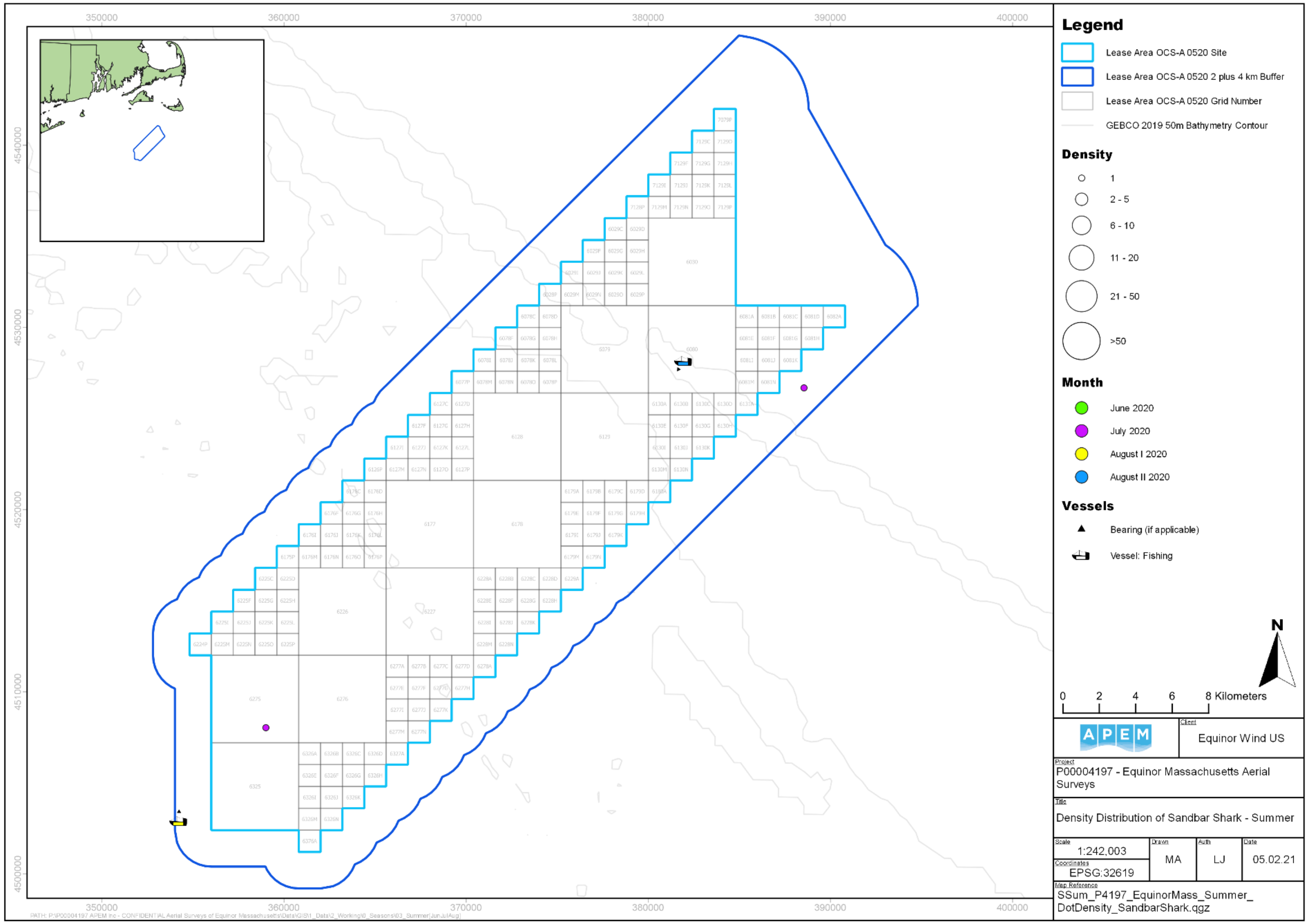

Figure 153 **Distribution of sandbar sharks recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

5.75 Tiger Shark (*Galeocerdo cuvier)*

Tiger sharks were recorded in the July and August II surveys only, with highest numbers therefore recorded in summer (**Table 1**). A peak count of two from the August II survey, led to an abundance estimate of 16 (**Table 82**).

A total of three tiger sharks were recorded in the summer (**Figure 154**), of which one was recorded in the July survey, and two were recorded in the August II survey (**Table 82**). For the July survey, the single tiger shark was located in the west-southwest of the Survey Area, and for the August II survey, both tiger sharks were distributed around the center of the Survey Area (**Figure 154**).

Table 82 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of tiger sharks in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jul 20	1	8	0.01	1	0
Aug II 20	2	16	0.02	2	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jul 20	0	0	-	0	0
Aug II 20	2	15	0.03	2	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jul 20	1	9	0.03	1	0
Aug II 20	0	0	-	0	0

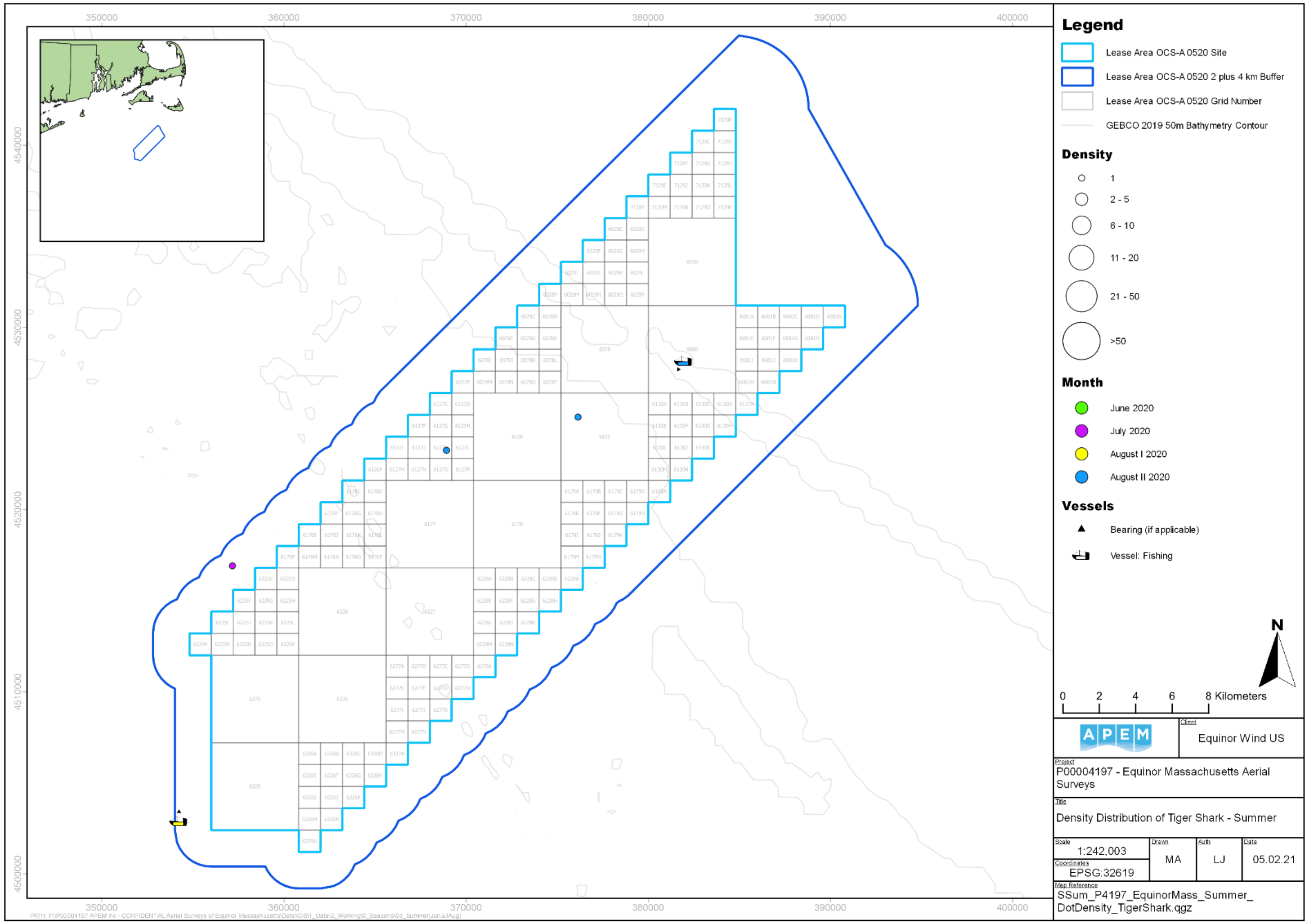

Figure 154 Distribution of tiger sharks recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season

5.76 Great Hammerhead (*Sphyrna mokarran)*

A single great hammerhead was recorded in the July survey, with highest numbers therefore recorded in summer (**Table 1**). A peak count of one in the Survey Area from the July survey, led to an abundance estimate of eight (**Table 83**).

A total of one great hammerhead was recorded in summer from the July survey (**Table 83**), located in the south of the Survey Area (**Figure 155**).

Table 83 Raw counts and abundance and density estimates (No. estimated individuals per km²) of great hammerheads in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul 20	1	8	0.01	1	0
b) Lease Area OCS-A 0520 Site					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul 20	0	0	-	0	0
c) 2 + 4 km Buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul 20	1	9	0.03	1	0

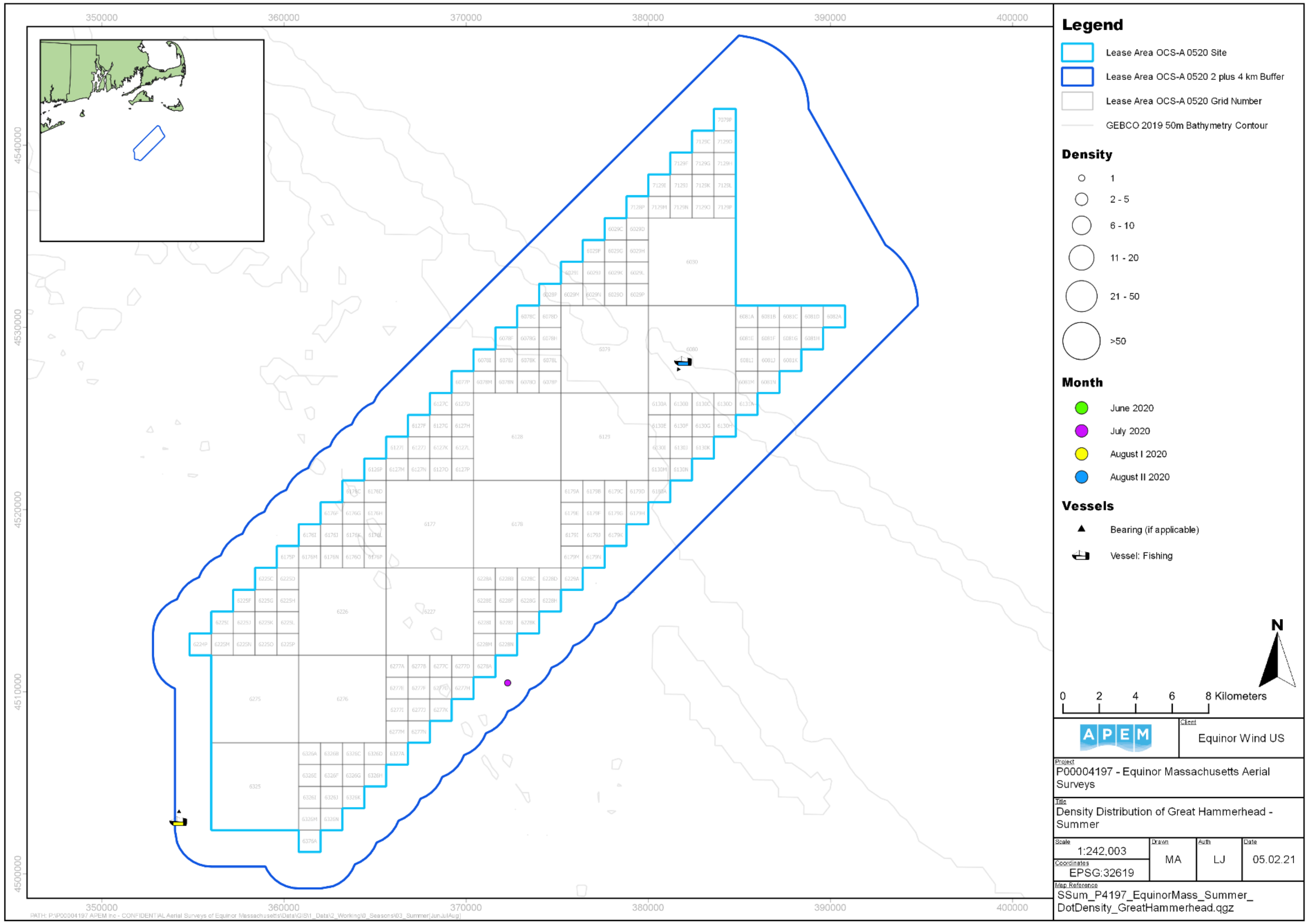

Figure 155 **Distribution of great hammerheads recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

5.77 Smooth Hammerhead (*Sphyrna zygaena)*

Smooth hammerheads were recorded in the July survey only, with highest numbers therefore recorded in summer (**Table 1**). A peak count of five in the Survey Area from the July survey, led to an abundance estimate of 40 (**Table 84**).

A total of five smooth hammerheads were recorded in the summer from the July survey only (**Figure 156**), distributed around the center of the Survey Area (**Table 84**).

Table 84 Raw counts and abundance and density estimates (No. estimated individuals per km²) of smooth hammerheads in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul 20	5	40	0.05	5	0
b) Lease Area OCS-A 0520 Site					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul 20	5	37	0.07	5	0
c) 2 + 4 km Buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul 20	0	0	-	0	0

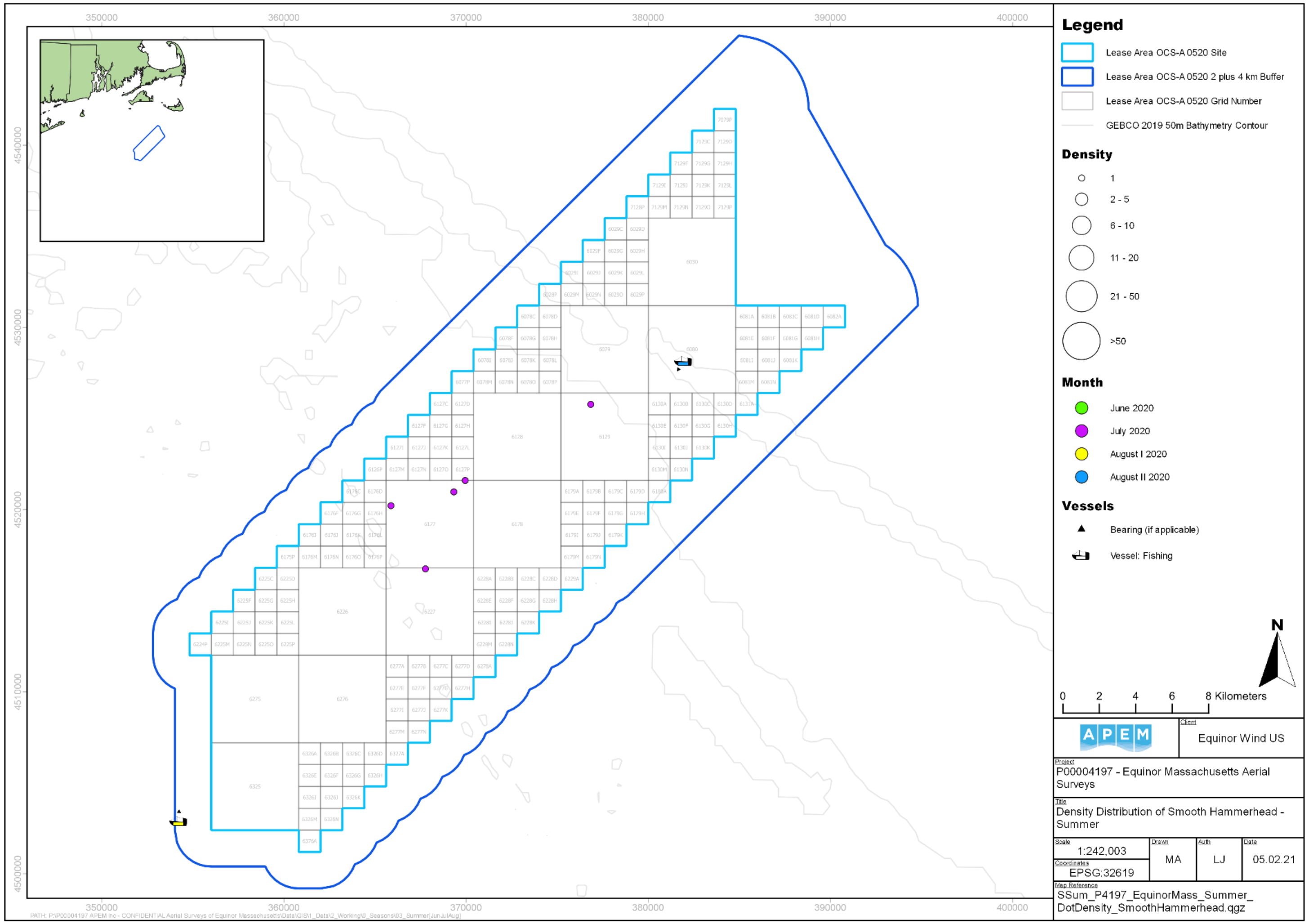

Figure 156 **Distribution of smooth hammerheads recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

5.78 Scalloped Hammerhead (*Sphyrna lewini)*

Scalloped hammerhead sharks were recorded in the July survey only, with highest numbers therefore recorded in summer (**Table 1**). A peak count of four in the Site and two in the Buffer from the July survey led to abundance estimates of 30 and 18 respectively (**Table 85**).

A total of six scalloped hammerheads were recorded in the summer from the July survey (**Table 85**), loosely distributed across the southern half of the Survey Area (**Figure 157**).

Table 85 Raw counts and abundance and density estimates (No. estimated individuals per km²) of scalloped hammerheads in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul 20	6	48	0.06	6	0
b) Lease Area OCS-A 0520 Site					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul 20	4	30	0.06	4	0
c) 2 + 4 km Buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul 20	2	18	0.05	2	0

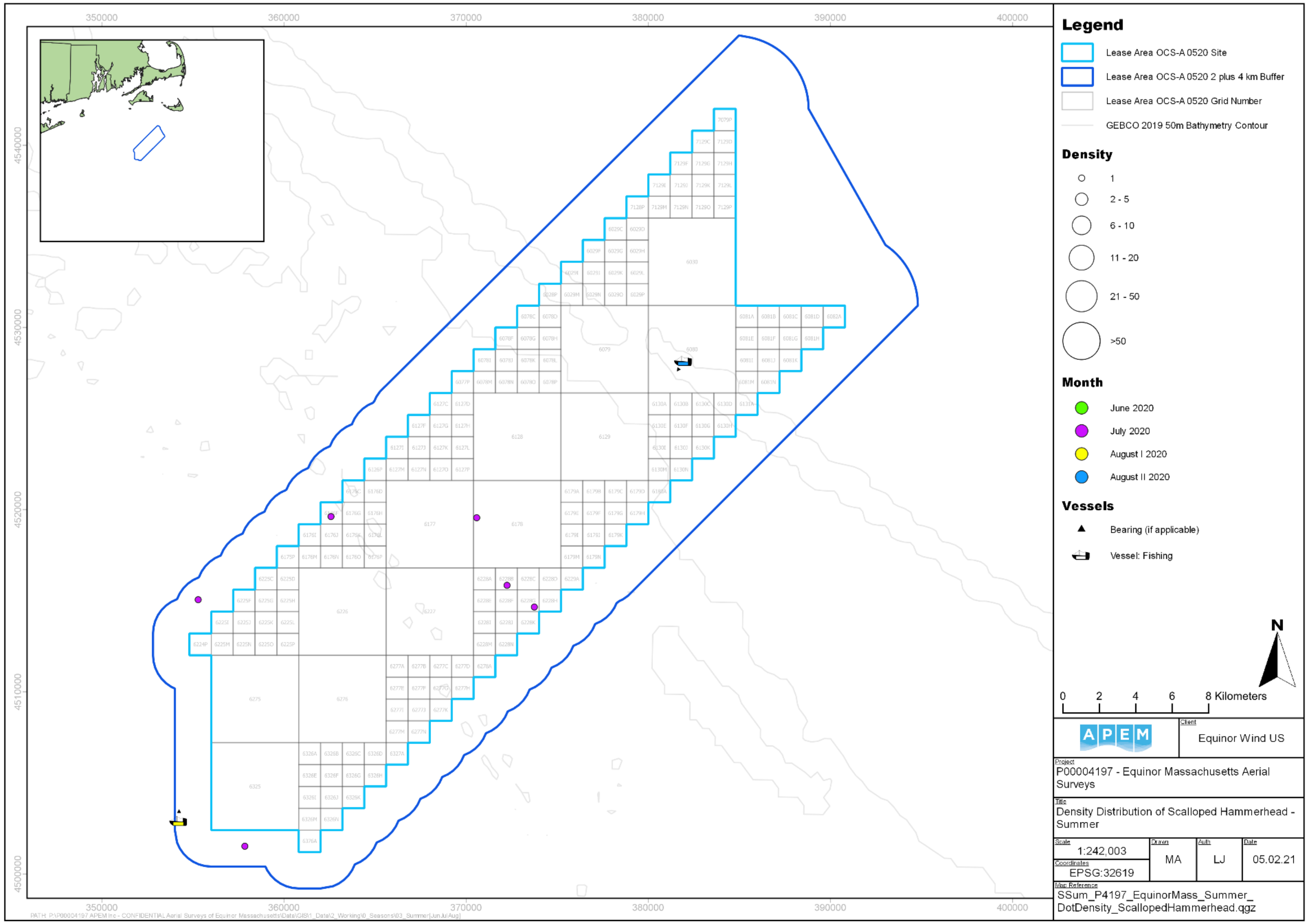

Figure 157 **Distribution of scalloped hammerheads recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

5.79 Hammerhead Shark Species (Unidentified Sphyrnidae)

Unidentified hammerhead sharks were recorded in the July and August I surveys only, with highest numbers therefore recorded in summer (**Table 1**). A peak count of 11 in the Site and 12 in the Buffer from the July survey, led to abundance estimates of 82 and 107 respectively (**Table 86**).

A total of 27 unidentified hammerheads were recorded in the summer (**Figure 158**), of which 23 were recorded in the July survey, and four were recorded in the August I survey (**Table 86**). For the July survey, unidentified hammerheads were loosely distributed across the Survey Area, with a greater concentration towards the south, and for the August I survey, hammerheads were predominantly located in the southwest (**Figure 158**).

Table 86 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified hammerhead sharks in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul 20	23	183	0.21	23	0
Aug I 20	4	32	0.04	4	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jul 20	11	82	0.16	11	0
Aug I 20	3	22	0.04	3	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jul 20	12	107	0.32	12	0
Aug I 20	1	9	0.03	1	0

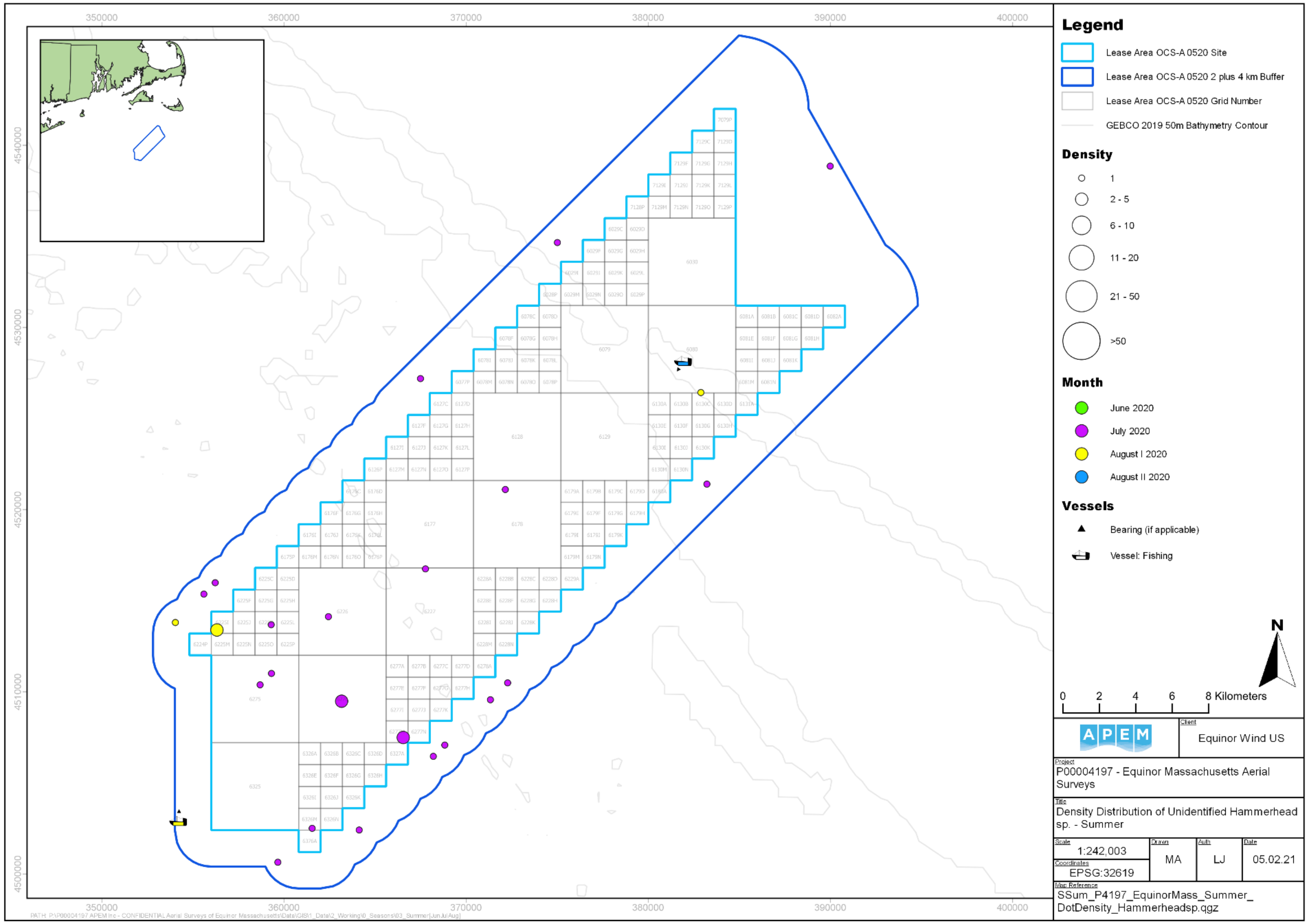

Figure 158 Distribution of unidentified hammerhead sharks recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season

5.80 Spurdog (Unidentified *Squalus spp.)*

Unidentified spurdogs were recorded in the April I survey only, with highest numbers therefore recorded in spring (**Table 87**). A peak count of five in the Survey Area from the April I survey led to an abundance estimate of 40 (**Table 87**).

A total of five unidentified spurdogs were recorded in the spring from the April I survey only (**Table 87**), distributed in two groups in the far south of the Survey Area (**Figure 156**).

Table 87 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified spurdogs in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Apr I 20	5	40	0.05	5	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Apr I 20	0	0	-	0	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Apr I 20	5	44	0.13	5	0

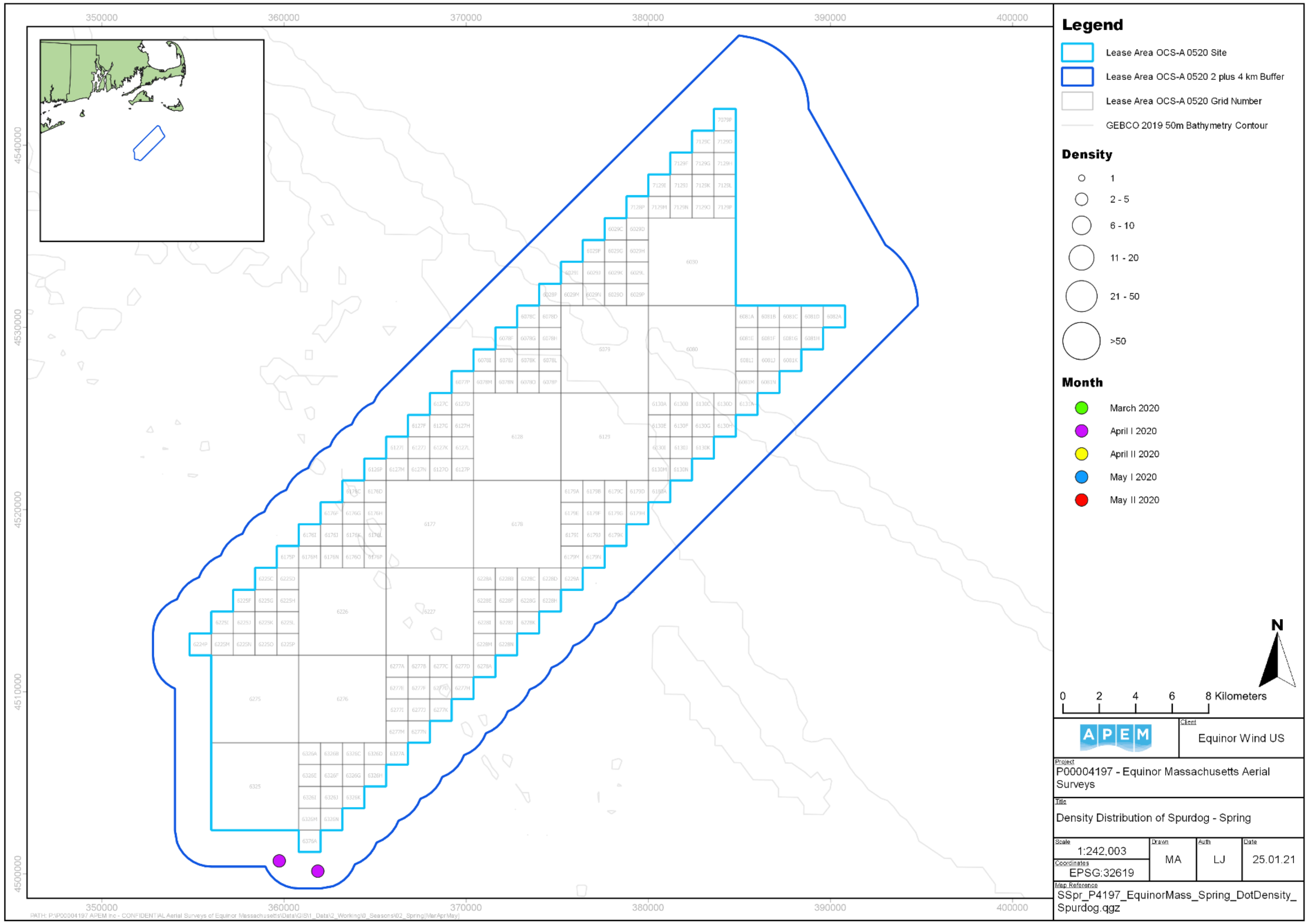

Figure 159 Distribution of unidentified spurdogs recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season

5.81 Shark Species (Unidentified Chondrichthyes)

Unidentified sharks were recorded in the spring, summer, and fall surveys, with highest numbers recorded in summer (**Table 1**). A peak count of 23 in the Site and 18 in the Buffer from the July survey, led to abundance estimates of 172 and 160 respectively (**Table 88**).

A total of one unidentified shark was recorded in the spring from the April **II** survey only (**Table 88**), located in the west of the Survey Area (**Figure 160**). A total of 74 unidentified sharks were recorded in summer (**Figure 161**), of which three were recorded in the June survey, 41 were recorded in the July survey, ten were recorded in the August **I** survey, and 20 were recorded in the August **II** survey (**Table 88**). For the summer surveys, unidentified sharks were loosely distributed across the Survey Area (**Figure 161**). A total of four unidentified sharks were recorded in the fall (**Figure 162**), of which one was recorded in the September **I** survey, one was recorded in the September **II** survey, one was recorded in the October survey, and one was recorded in the November survey (**Table 88**). For the September **I** and October surveys, unidentified sharks were located in the southeast of the Survey Area, and for the September **II** and November surveys, unidentified sharks were located in the northeast of the Survey Area (**Figure 162**).

Table 88 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified sharks in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Apr II 20	1	8	0.01	1	0
Jun 20	3	24	0.03	2	1
Jul 20	41	327	0.38	41	0
Aug I 20	10	80	0.09	10	0
Aug II 20	20	159	0.19	20	0
Sep I 20	1	8	0.01	1	0
Sep II 20	1	8	0.01	1	0
Oct 20	1	8	0.01	1	0
Nov 20	1	8	0.01	1	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Apr II 20	1	7	0.01	1	0
Jun 20	1	7	0.01	0	1
Jul 20	23	172	0.33	23	0
Aug I 20	7	52	0.1	7	0
Aug II 20	10	74	0.14	10	0
Sep I 20	1	7	0.01	1	0
Sep II 20	1	7	0.01	1	0
Oct 20	0	0	-	0	0
Nov 20	1	7	0.01	1	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Apr II 20	0	0	-	0	0
Jun 20	2	18	0.05	2	0
Jul 20	18	160	0.47	18	0

Aug I 20	3	27	0.08	3	0
Aug II 20	10	89	0.26	10	0
Sep I 20	0	0	-	0	0
Sep II 20	0	0	-	0	0
Oct 20	1	9	0.03	1	0
Nov 20	0	0	-	0	0

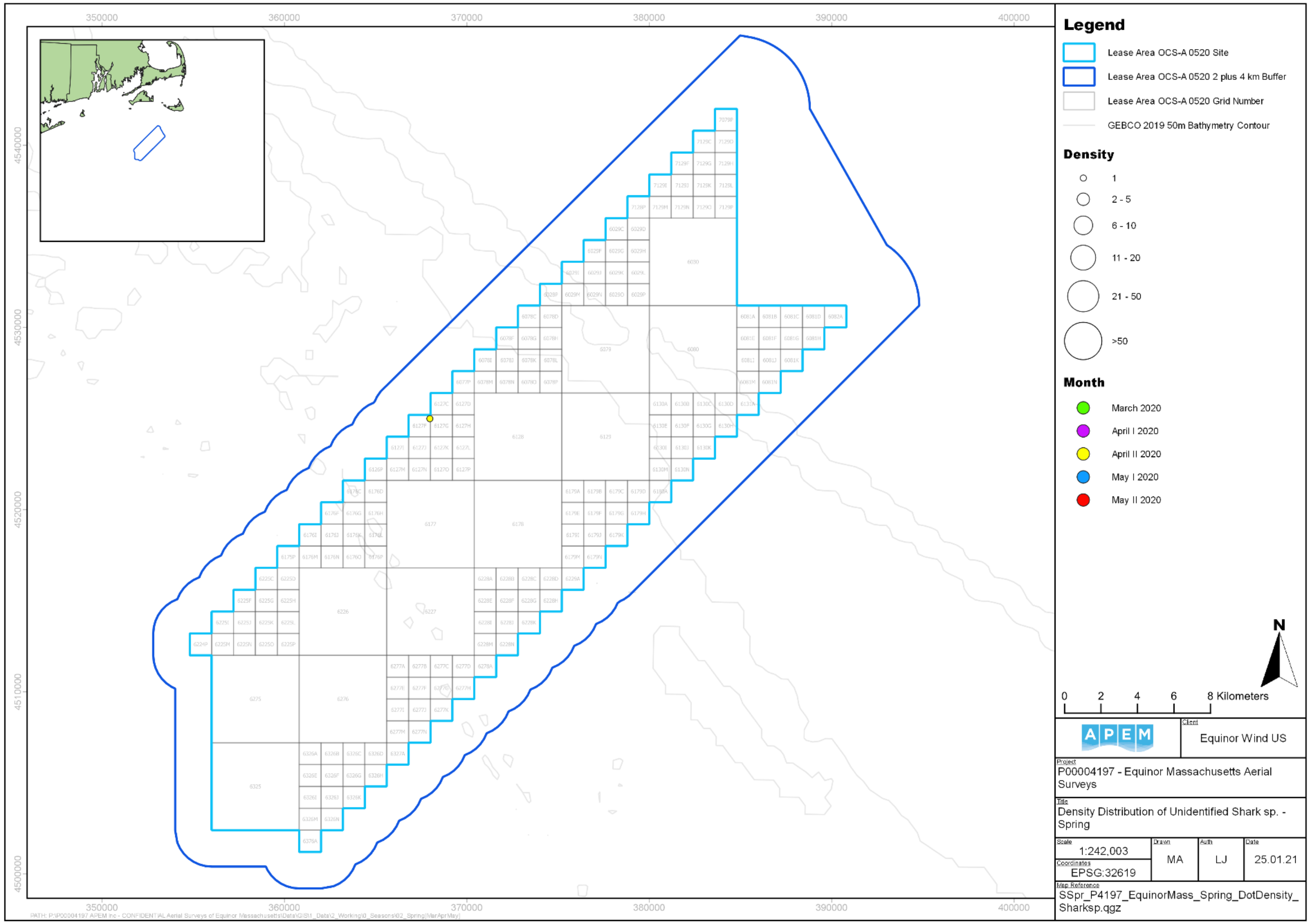

Figure 160 **Distribution of unidentified sharks recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season**

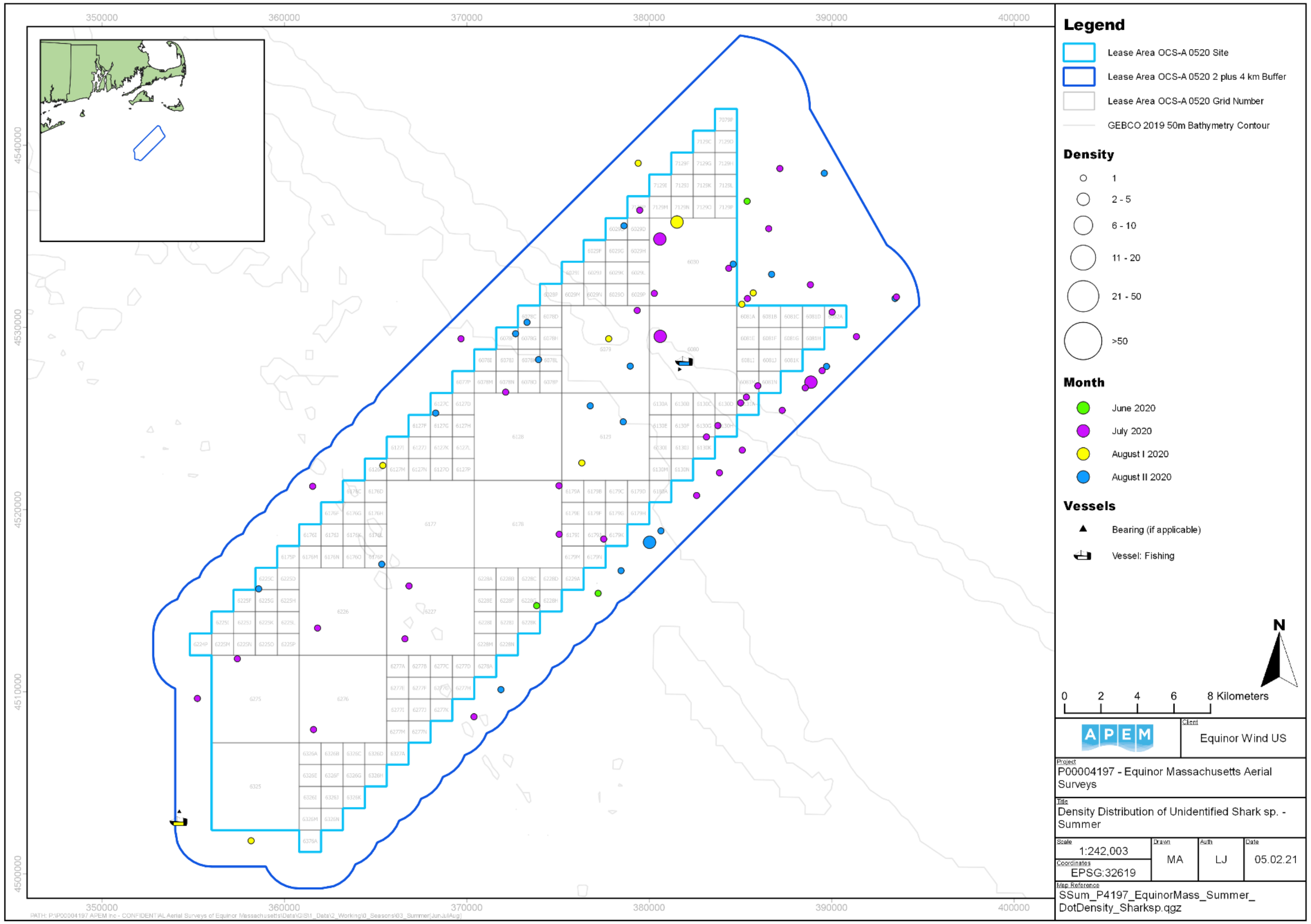

Figure 161 **Distribution of unidentified sharks recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

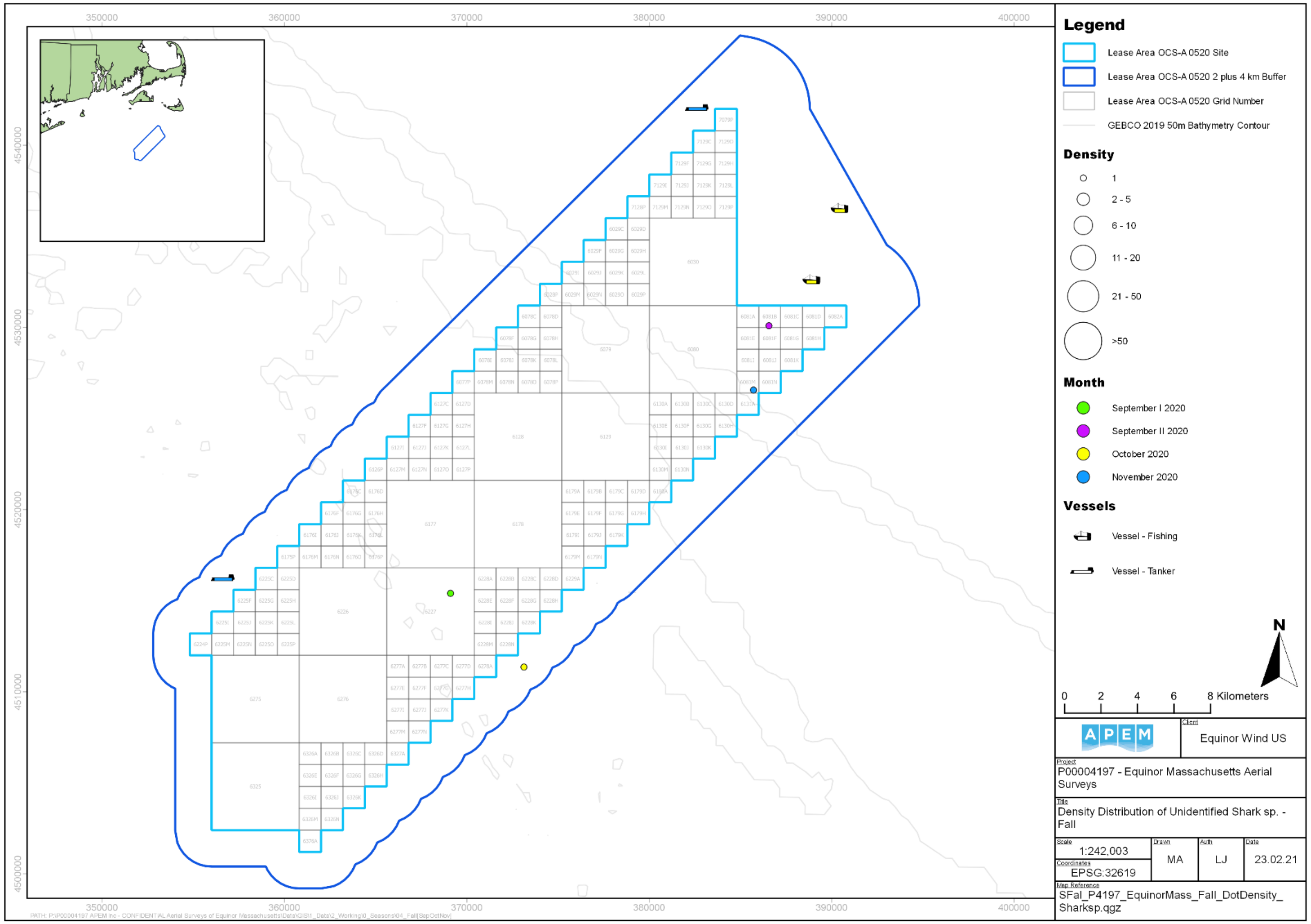

Figure 162 Distribution of unidentified sharks recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season

5.82 Mahi-mahi (*Coryphaena hippurus)*

Mahi-mahi were recorded in the July, August I, and August II surveys only, with highest numbers therefore recorded in summer (**Table 1**). A peak count of one in the Site and 26 in the Buffer from the August I survey, led to abundance estimates of seven and 230 respectively (**Table 89**).

A total of 65 mahi-mahi were recorded in the summer (**Figure 163**), of which 25 were recorded in July, 27 were recorded in August I, and 13 were recorded in August II (**Table 89**). For the July survey, mahi-mahi were predominantly distributed in small groups in the northern half of the Survey Area, and for the August I and August II surveys, mahi-mahi were located in groups in the north of the Survey Area (**Figure 163**).

Table 89 Raw counts and abundance and density estimates (No. estimated individuals per km²) of mahi-mahi in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jul 20	25	199	0.23	25	0
Aug I 20	27	215	0.25	27	0
Aug II 20	13	103	0.12	13	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jul 20	4	30	0.06	4	0
Aug I 20	1	7	0.01	1	0
Aug II 20	1	7	0.01	1	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jul 20	21	187	0.55	21	0
Aug I 20	26	230	0.68	26	0
Aug II 20	12	106	0.31	12	0

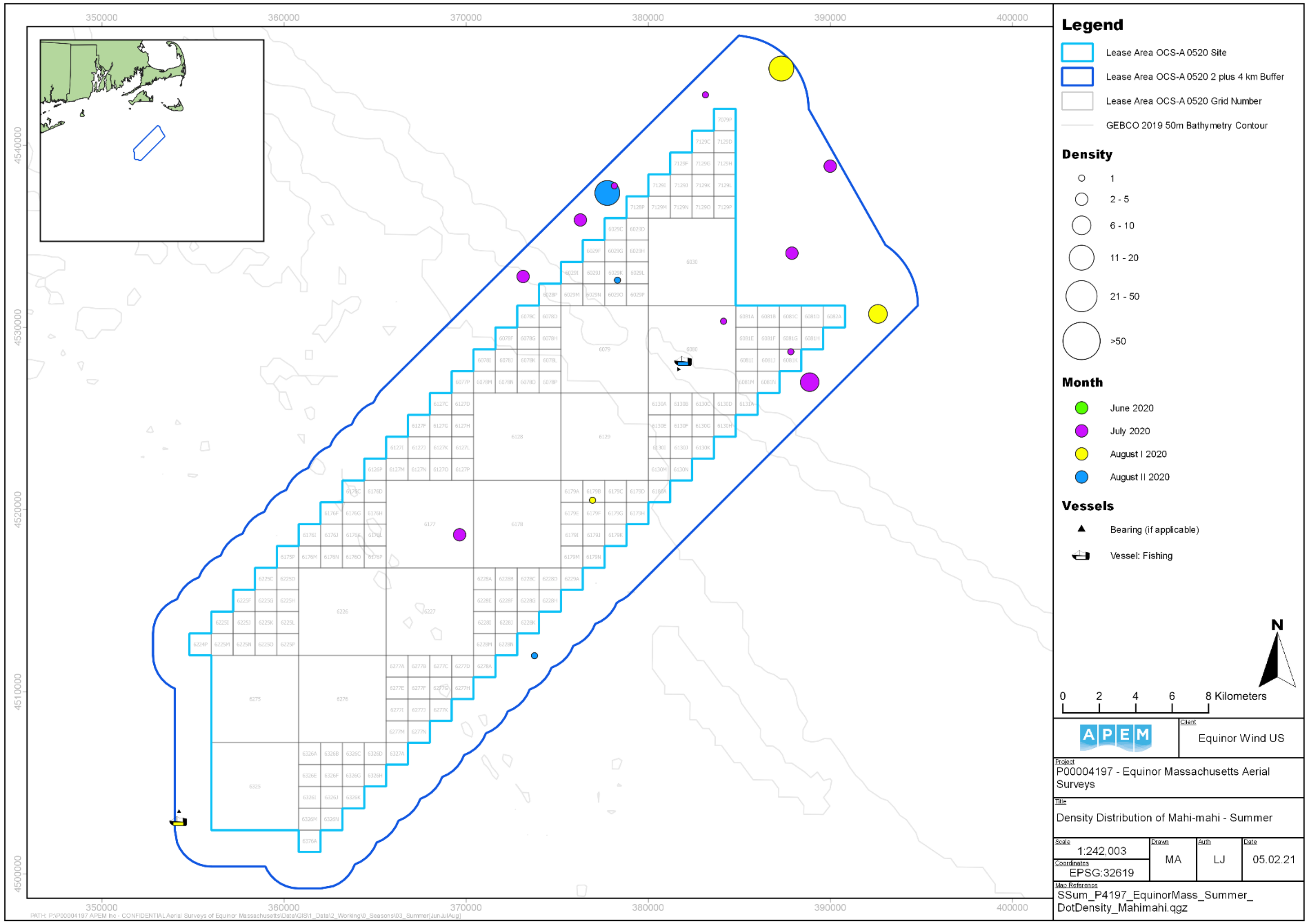

Figure 163 Distribution of mahi-mahi recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season

5.83 Atlantic Bluefin Tuna (*Thunnus thynnus*)

Atlantic bluefin tuna were recorded in the June, July, and August I surveys only, with highest numbers therefore recorded in summer (**Table 1**). A peak count of 27 in the Survey Area led to an abundance estimate of 215 (**Table 90**).

A total of 39 Atlantic bluefin tuna were recorded in the summer (**Figure 164**), of which one was recorded in the June survey, 11 were recorded in the July survey, and 27 were recorded in the August I survey (**Table 90**). For the June survey, the tuna was located in the center of the Survey Area (**Figure 164**). For the July survey, the tuna were located in two groups; one in the in the west and one in the southwest of the Survey Area, and for the August I survey, tuna were distributed in groups in the north (**Figure 164**).

Table 90 Raw counts and abundance and density estimates (No. estimated individuals per km²) of Atlantic bluefin tuna in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun 20	1	8	0.01	1	0
Jul 20	11	88	0.1	11	0
Aug I 20	27	215	0.25	27	0
b) Lease Area OCS-A 0520 Site					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun 20	1	7	0.01	1	0
Jul 20	4	30	0.06	4	0
Aug I 20	27	202	0.39	27	0
c) 2 + 4 km Buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jun 20	0	0	-	0	0
Jul 20	7	62	0.18	7	0
Aug I 20	0	0	-	0	0

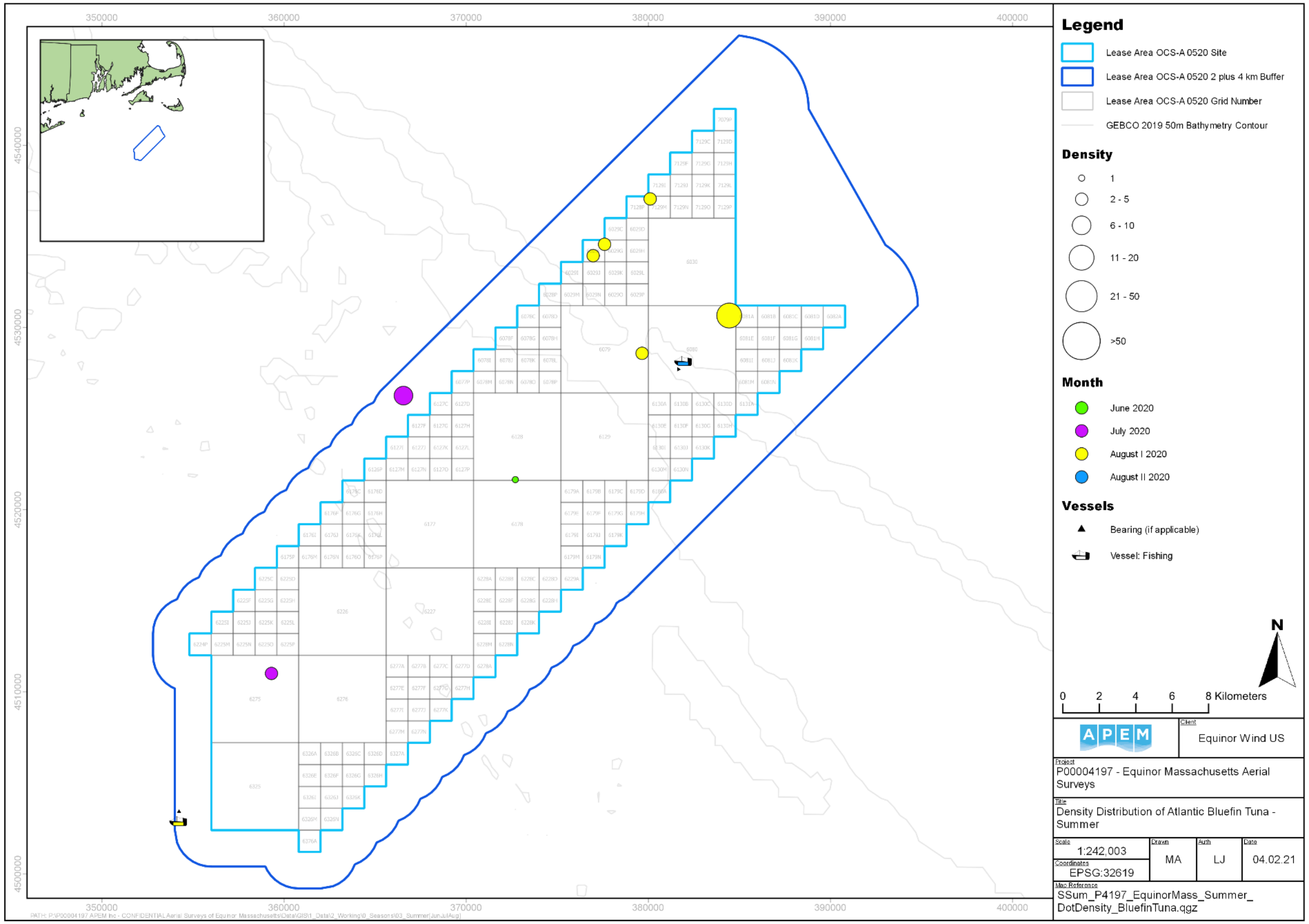

Figure 164 Distribution of Atlantic bluefin tuna recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season

5.84 Tuna Species (Unidentified Scombridae)

Unidentified tuna were recorded in the summer and fall, with highest numbers recorded in summer (**Table 1**). A peak count of 119 in the Site and 124 in the Buffer from the August **II** survey, led to abundance estimates of 886 and 1099 respectively (**Table 91**).

A total of 256 unidentified tuna were recorded in the summer (**Figure 165**), of which 11 were recorded in the June survey, two were recorded in the August **I** survey, and 243 were recorded in the August **II** survey (**Table 91**). For the July survey, tuna were distributed from the center to the west-southwest of the Survey Area (**Figure 165**). For the August **I** survey, tuna were located in the north of the Survey area, and in the center of the Survey Area for August **II** (**Figure 165**).

Table 91 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified tuna in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul 20	11	88	0.1	11	0
Aug I 20	2	16	0.02	2	0
Aug II 20	243	1931	2.25	243	0
Oct 20	1	8	0.01	1	0
b) Lease Area OCS-A 0520 Site					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul 20	7	52	0.1	7	0
Aug I 20	2	15	0.03	2	0
Aug II 20	119	886	1.7	119	0
Oct 20	0	0	-	0	0
c) 2 + 4 km Buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Jul 20	4	36	0.11	4	0
Aug I 20	0	0	-	0	0
Aug II 20	124	1099	3.25	124	0
Oct 20	1	9	0.03	1	0

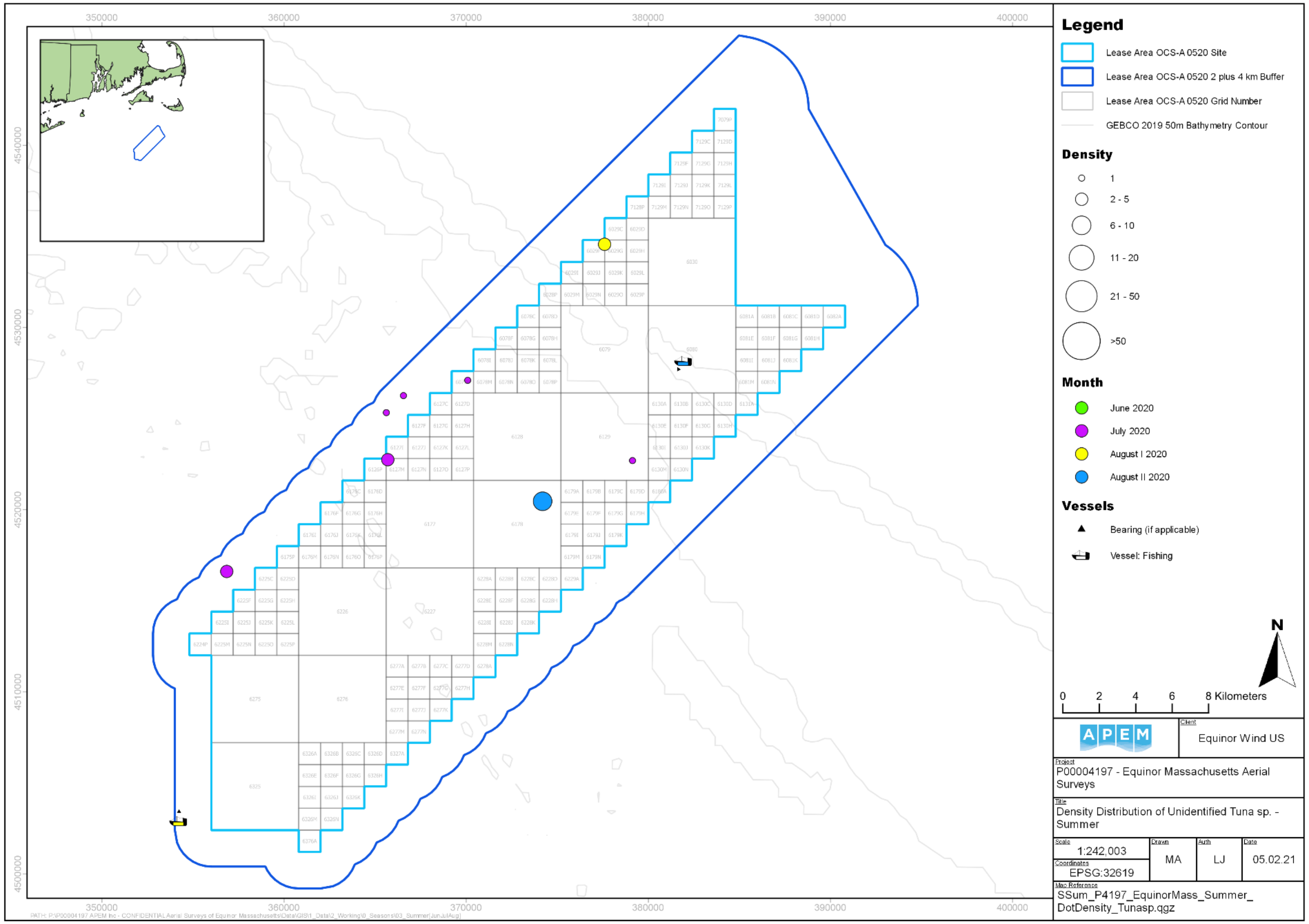

Figure 165 **Distribution of unidentified tuna recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

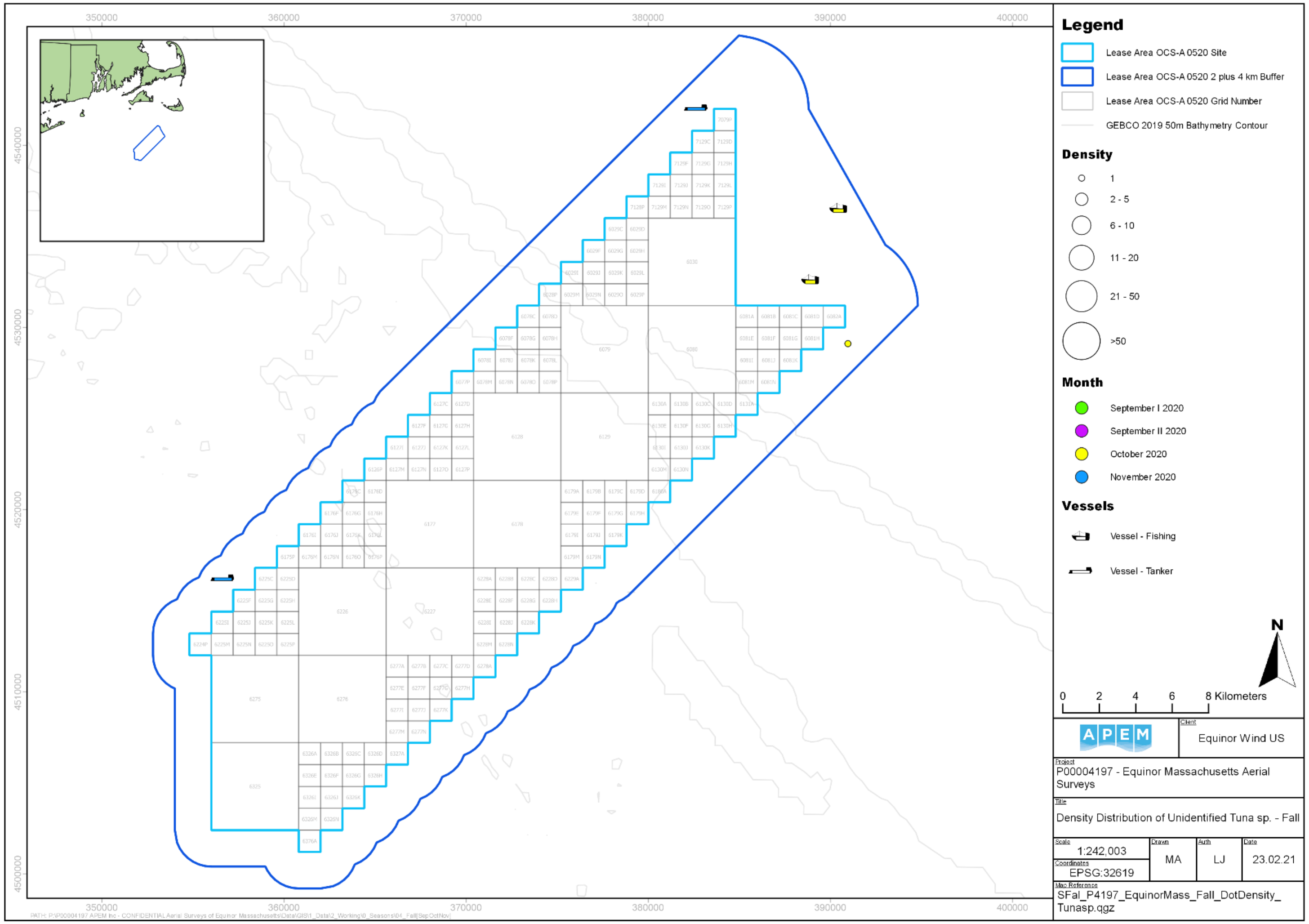

Figure 166 Distribution of unidentified tuna recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season

5.85 North Atlantic Swordfish (*Xiphias gladius)*

A north Atlantic swordfish was recorded in the May II survey, with highest numbers therefore recorded in spring (**Table 1**). A peak count of one in the Survey Area from the May II survey, led to an abundance estimate of eight (**Table 92**).

A total of one north Atlantic swordfish was recorded in the spring from the May II survey (**Table 92**), located in the southwest of the Survey Area (**Figure 167**).

Table 92 Raw counts and abundance and density estimates (No. estimated individuals per km²) of North Atlantic swordfish in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
May II 20	1	8	0.01	1	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
May II 20	0	0	-	0	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
May II 20	1	9	0.03	1	0

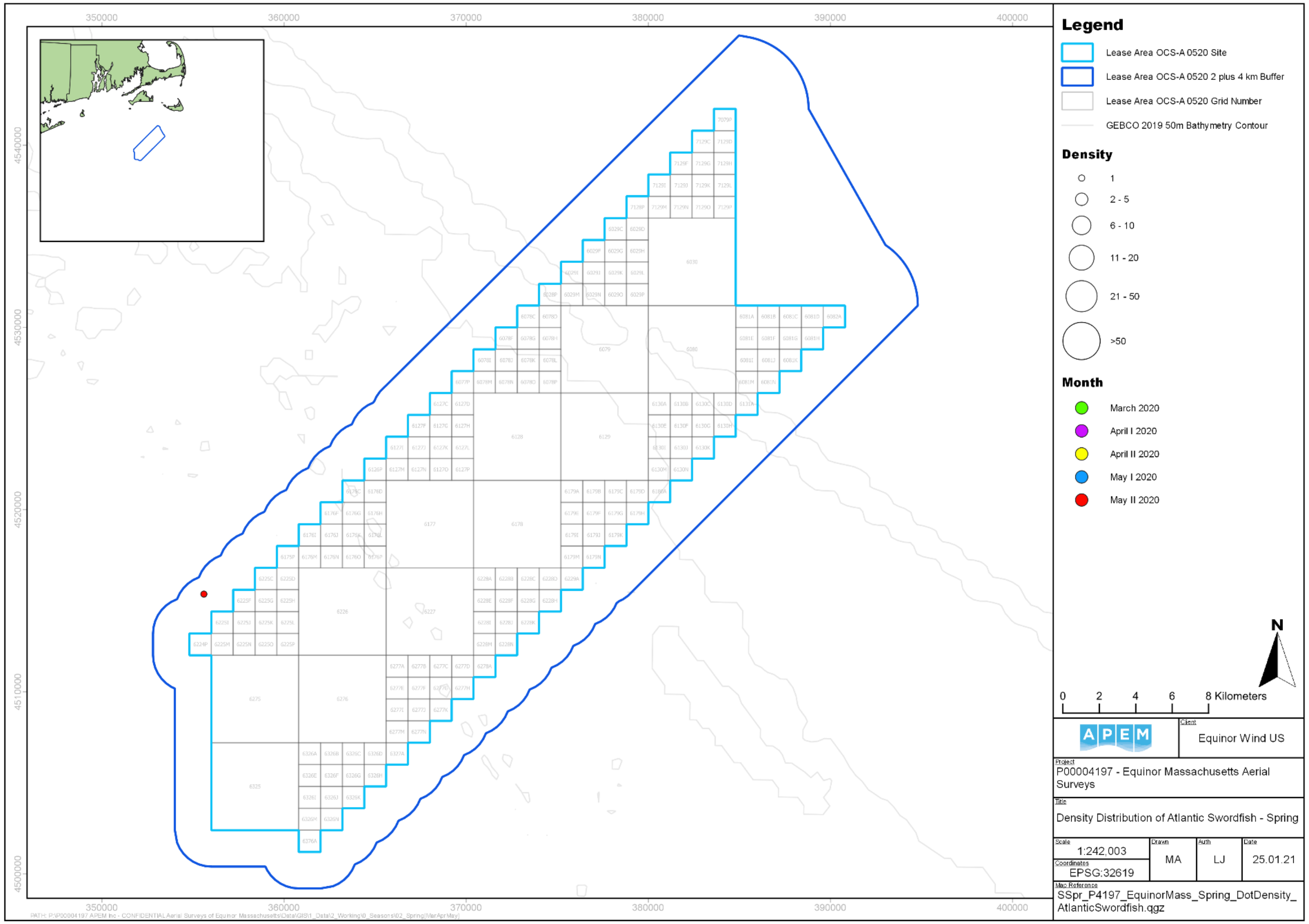

Figure 167 Distribution of North Atlantic swordfish recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season

5.86 Billfish Species (Unidentified Istiophoriformes)

Unidentified billfish were recorded in the July, August **I**, and August **II** surveys only, with highest numbers therefore recorded in summer (**Table 1**). A peak count of seven in the Site and 15 in the Buffer from the July survey, led to abundance estimates of 52 and 134 respectively (**Table 93**).

A total of 39 unidentified billfish were recorded in the summer (**Figure 168**), of which 22 were recorded in the July survey, 15 were recorded in the August **I** survey, and two were recorded in the August **II** survey (**Table 93**). For the summer surveys, unidentified billfish were loosely distributed across the Survey Area, predominantly towards the north for the July and August **I** surveys (**Figure 168**).

Table 93 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified billfish in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jul 20	22	175	0.2	22	0
Aug I 20	15	119	0.14	15	0
Aug II 20	2	16	0.02	2	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jul 20	7	52	0.1	7	0
Aug I 20	4	30	0.06	4	0
Aug II 20	1	7	0.01	1	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jul 20	15	134	0.4	15	0
Aug I 20	11	97	0.29	11	0
Aug II 20	1	9	0.03	1	0

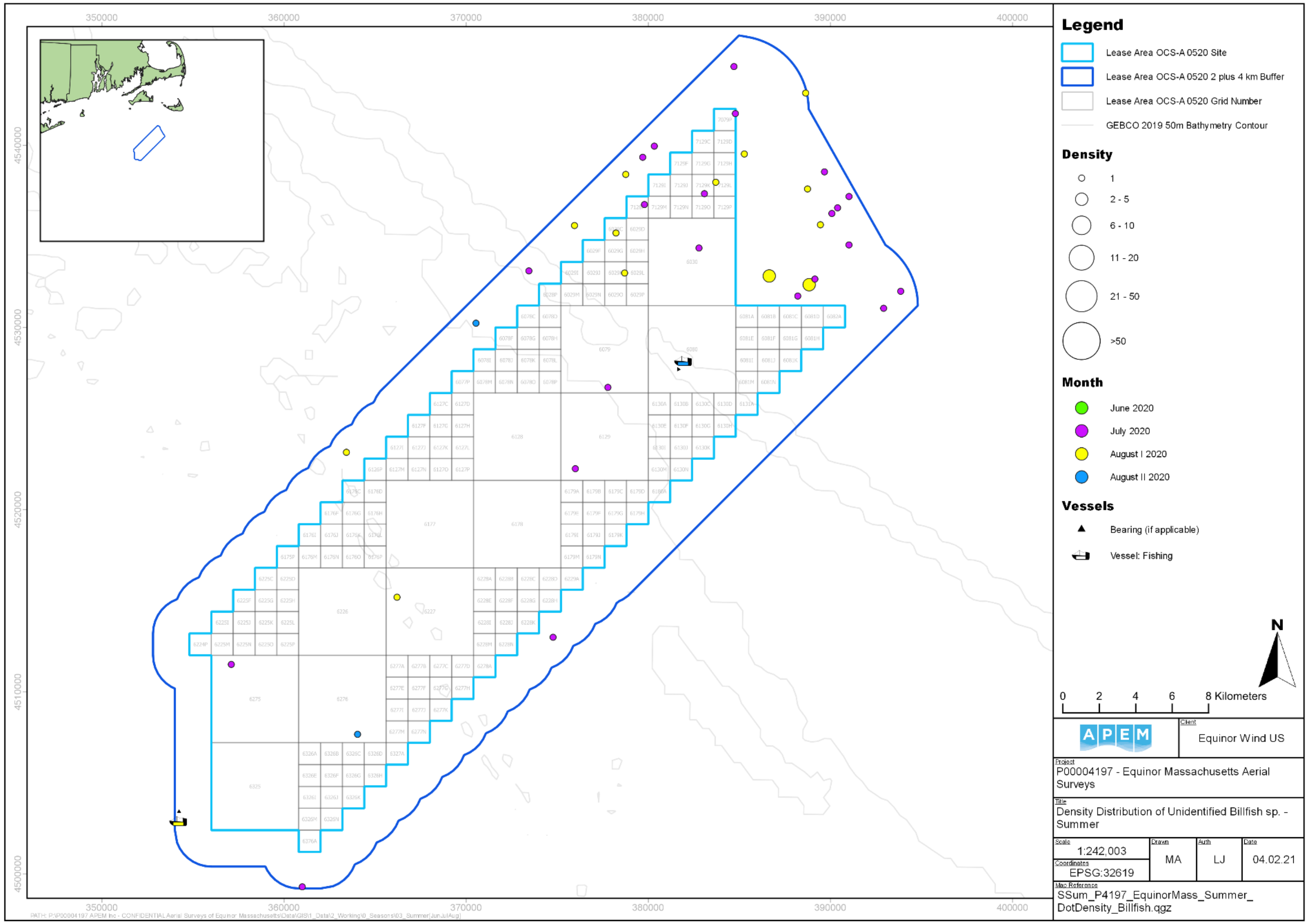

Figure 168 **Distribution of unidentified billfish recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

5.87 Ocean Sunfish (*Mola mola*)

Ocean sunfish were recorded in the spring, summer, and fall, with highest numbers recorded in summer (**Table 1**). A peak count of 16 in the Site and six in the Buffer from the June survey, led to abundance estimates of 119 and 53 respectively (**Table 94**).

A total of two ocean sunfish were recorded in spring from the May **II** survey only (**Table 94**); one located in the center of the Survey Area, and one located in the southwest (**Figure 169**). A total of 31 ocean sunfish were recorded in the summer (**Figure 170**), of which 22 were recorded in June, two were recorded in July, three were recorded in August **I**, and four were recorded in August **II** (**Table 94**). For the summer surveys, ocean sunfish were loosely distributed across the Survey Area (**Figure 170**). A total of 11 ocean sunfish were recorded in the fall (**Figure 171**), of which three were recorded in the September **I** survey, and eight were recorded in the October survey (**Table 94**). For the September **I** survey, ocean sunfish were distributed in the south to southwest of the Survey Area, and for the October survey, distribution was loose across the Survey Area (**Figure 171**).

Table 94 **Raw counts and abundance and density estimates (No. estimated individuals per km²) of ocean sunfish in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only**

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
May II 20	2	16	0.02	2	0
Jun 20	22	175	0.2	22	0
Jul 20	2	16	0.02	2	0
Aug I 20	3	24	0.03	3	0
Aug II 20	4	32	0.04	4	0
Sep I 20	3	24	0.03	3	0
Oct 20	8	64	0.07	8	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
May II 20	2	15	0.03	2	0
Jun 20	16	119	0.23	16	0
Jul 20	2	15	0.03	2	0
Aug I 20	2	15	0.03	2	0
Aug II 20	1	7	0.01	1	0
Sep I 20	3	22	0.04	3	0
Oct 20	4	30	0.06	4	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
May II 20	0	0	-	0	0
Jun 20	6	53	0.16	6	0
Jul 20	0	0	-	0	0
Aug I 20	1	9	0.03	1	0
Aug II 20	3	27	0.08	3	0
Sep I 20	0	0	-	0	0
Oct 20	4	35	0.1	4	0

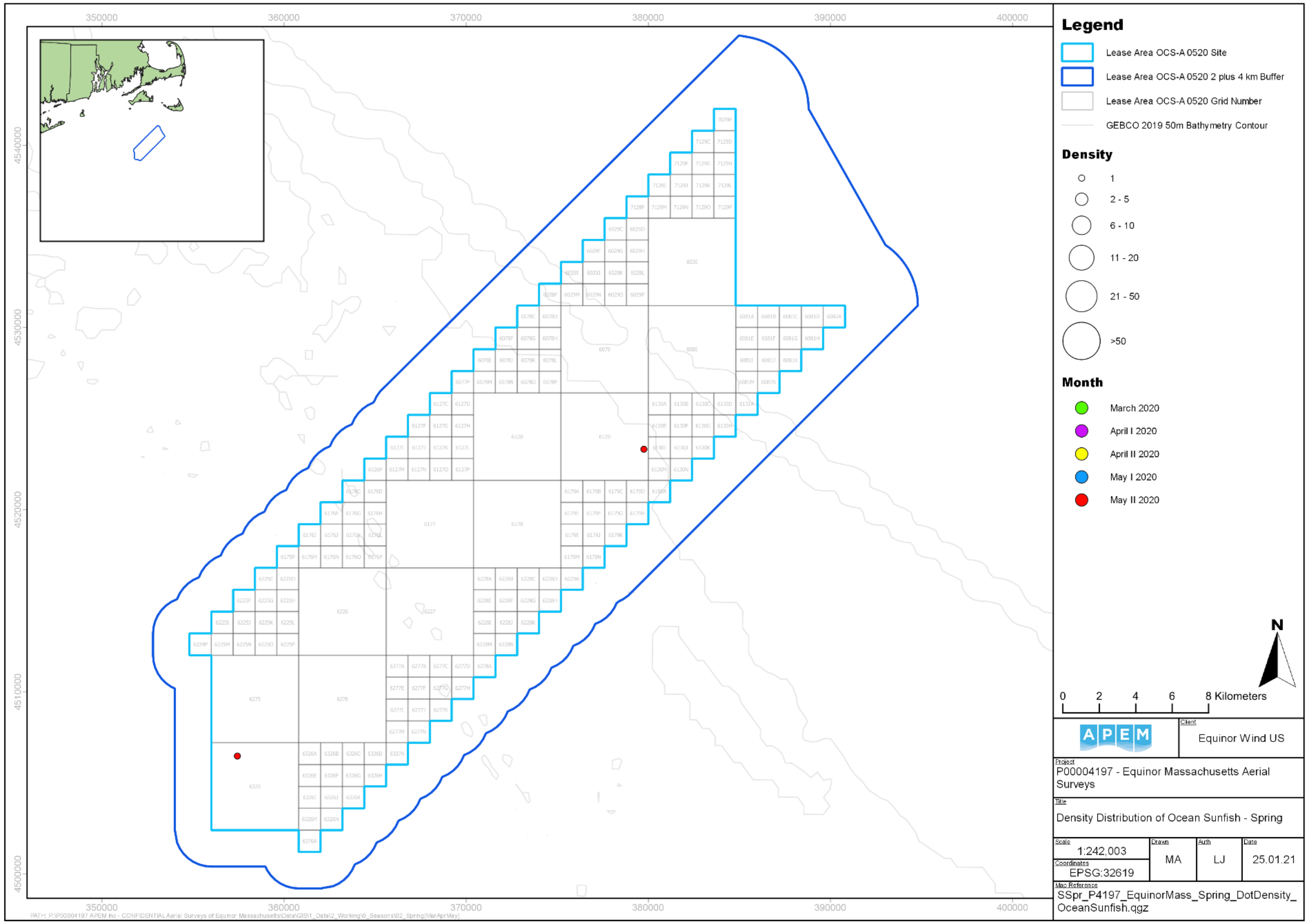

Figure 169 Distribution of ocean sunfish recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the spring season

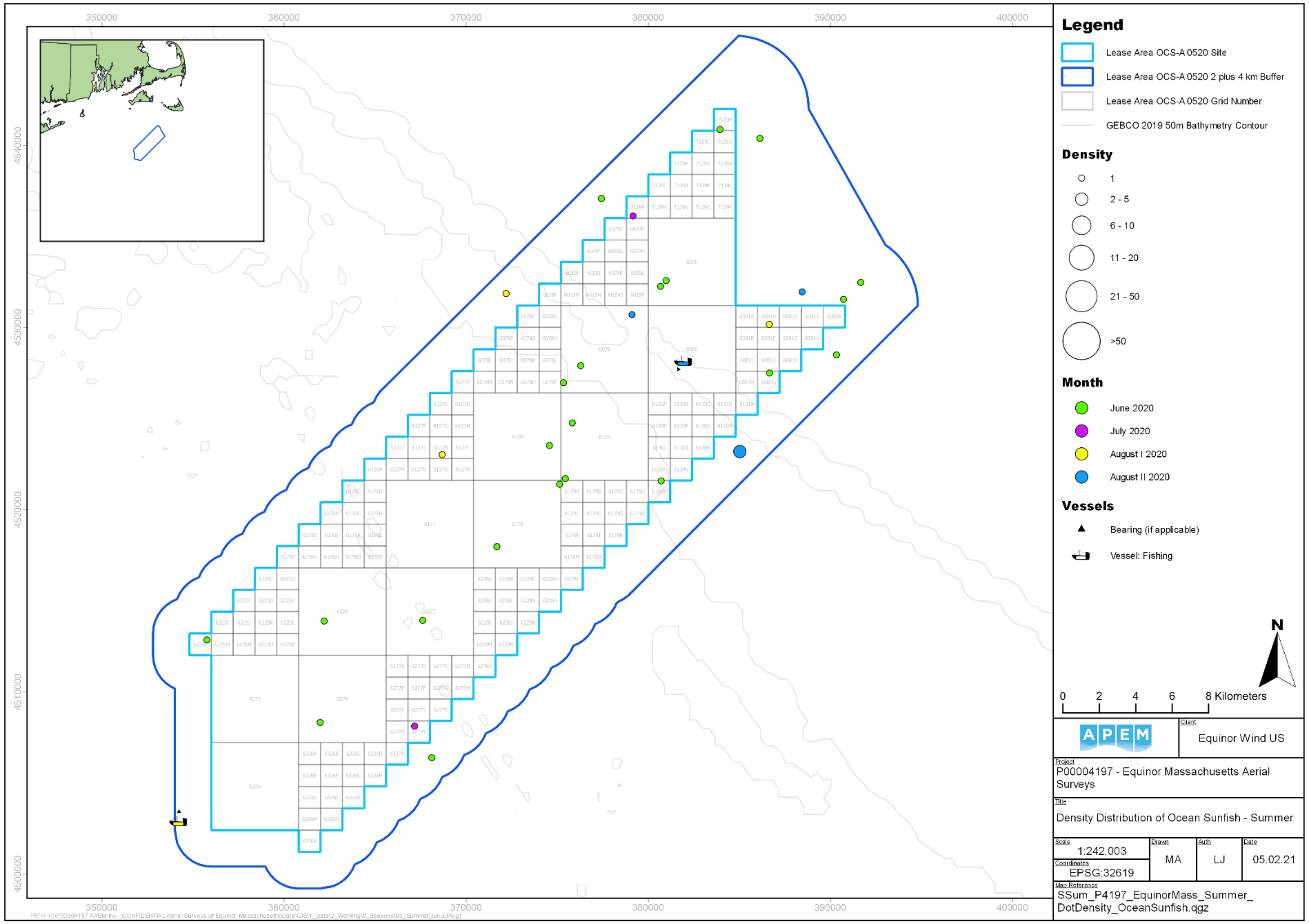

Figure 170 **Distribution of ocean sunfish recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

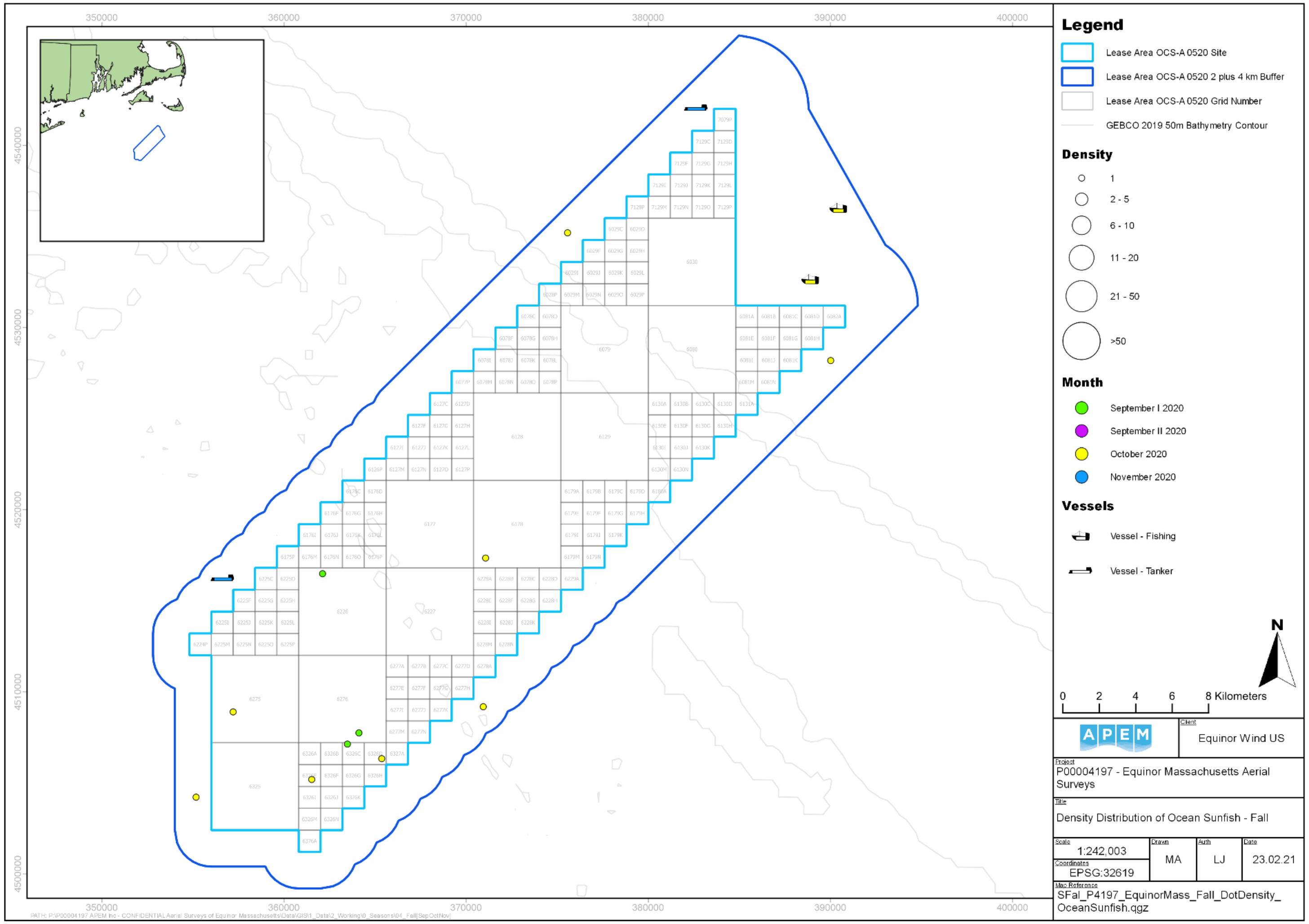

Figure 171 Distribution of ocean sunfish recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season

5.88 Sunfish Species (Unidentified Molidae)

Unidentified sunfish were recorded in the September II survey, and the October survey only, with highest numbers therefore recorded in fall (**Table 1**). A total of one ocean sunfish was recorded for each month, which led to abundance estimates of eight for each (**Table 95**).

A total of two unidentified sunfish were recorded in the fall (**Figure 172**), of which one was recorded in the September II survey, and one was recorded in the October survey (**Table 95**). For the September II survey, the unidentified sunfish was recorded in the west of the Survey Area, and for the October survey, the unidentified sunfish was located in the north (**Figure 172**).

Table 95 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified sunfish in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

d) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Sep II 20	1	8	0.01	1	0
Oct 20	1	8	0.01	1	0
e) Lease Area OCS-A 0520 Site					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Sep II 20	0	0	-	0	0
Oct 20	0	0	-	0	0
f) 2 + 4 km Buffer					
Survey	Raw Count	Abundance	Density	Submerged	Surfacing
Sep II 20	1	9	0.03	1	0
Oct 20	1	9	0.03	1	0

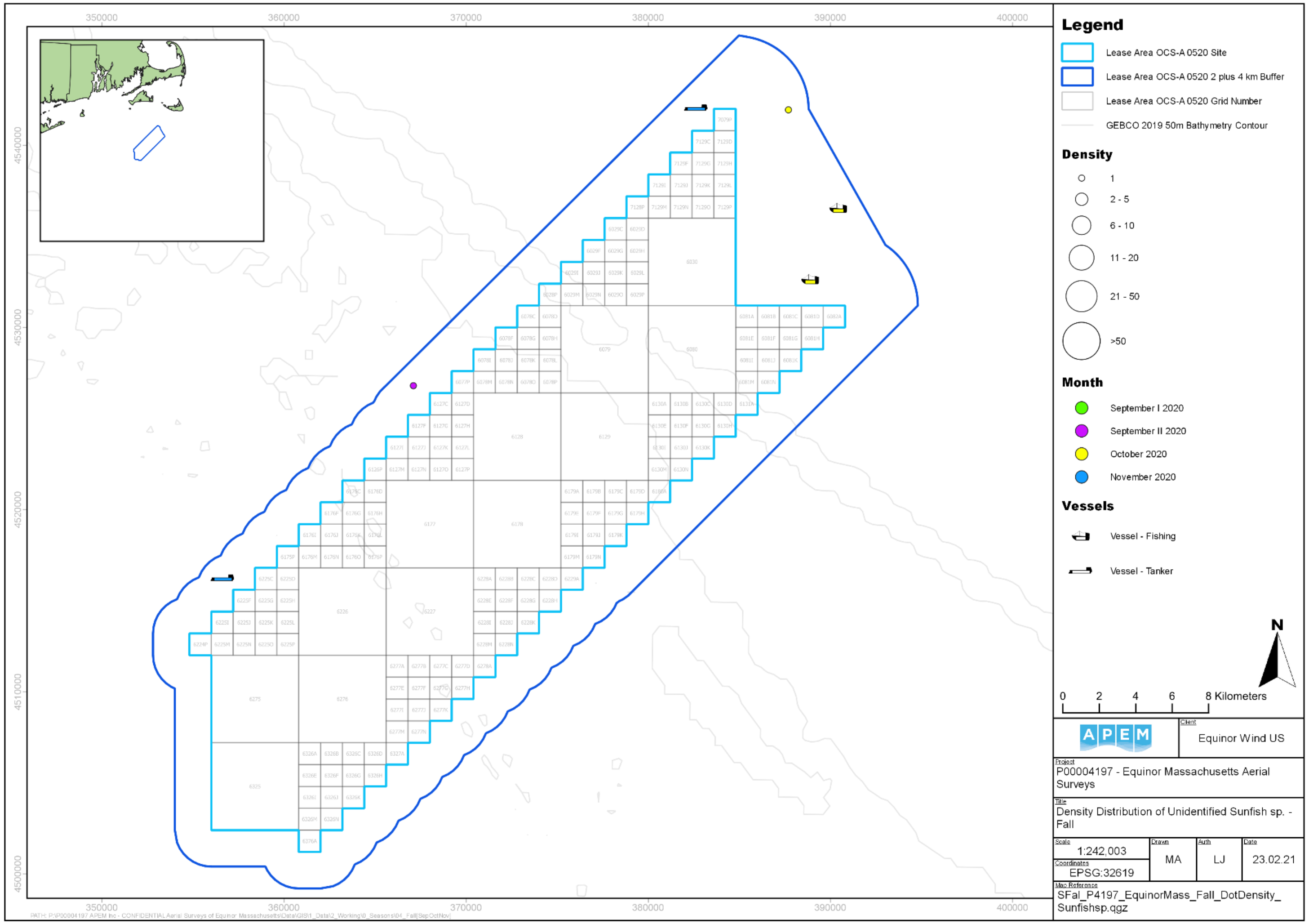

Figure 172 Distribution of unidentified sunfish recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the fall season

5.89 Large Bony Fish Species (Unidentified Actinopterygii)

Unidentified large bony fish were recorded in the July, August I, and August II surveys only, with highest numbers therefore recorded in the summer (**Table 1**). A peak count of six in the Survey Area from the July survey, led to an abundance estimate of six (**Table 96**).

A total of 12 unidentified large bony fish were recorded in the summer (**Figure 173**), of which six were recorded in the July survey, four were recorded in the August I survey, and two were recorded in the August II survey (**Table 96**). For the July and August I surveys, unidentified large bony fish were loosely distributed across the Survey Area, and for the August II survey, fish were located in the southeast of the Survey Area (**Figure 173**).

Table 96 Raw counts and abundance and density estimates (No. estimated individuals per km²) of unidentified large bony fishes in: a) Lease Area OCS-A 0512 plus 2 + 4 km buffer; b) Lease Area OCS-A 0520 Site; and c) the 2 + 4 km buffer only

a) Lease Area OCS-A 0520 plus 2 + 4 km buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jul 20	6	48	0.06	6	0
Aug I 20	4	32	0.04	4	0
Aug II 20	2	16	0.02	2	0
b) Lease Area OCS-A 0520 Site					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jul 20	0	0	-	0	0
Aug I 20	3	22	0.04	3	0
Aug II 20	0	0	-	0	0
c) 2 + 4 km Buffer					
Survey	**Raw Count**	**Abundance**	**Density**	**Submerged**	**Surfacing**
Jul 20	6	53	0.16	6	0
Aug I 20	1	9	0.03	1	0
Aug II 20	2	18	0.05	2	0

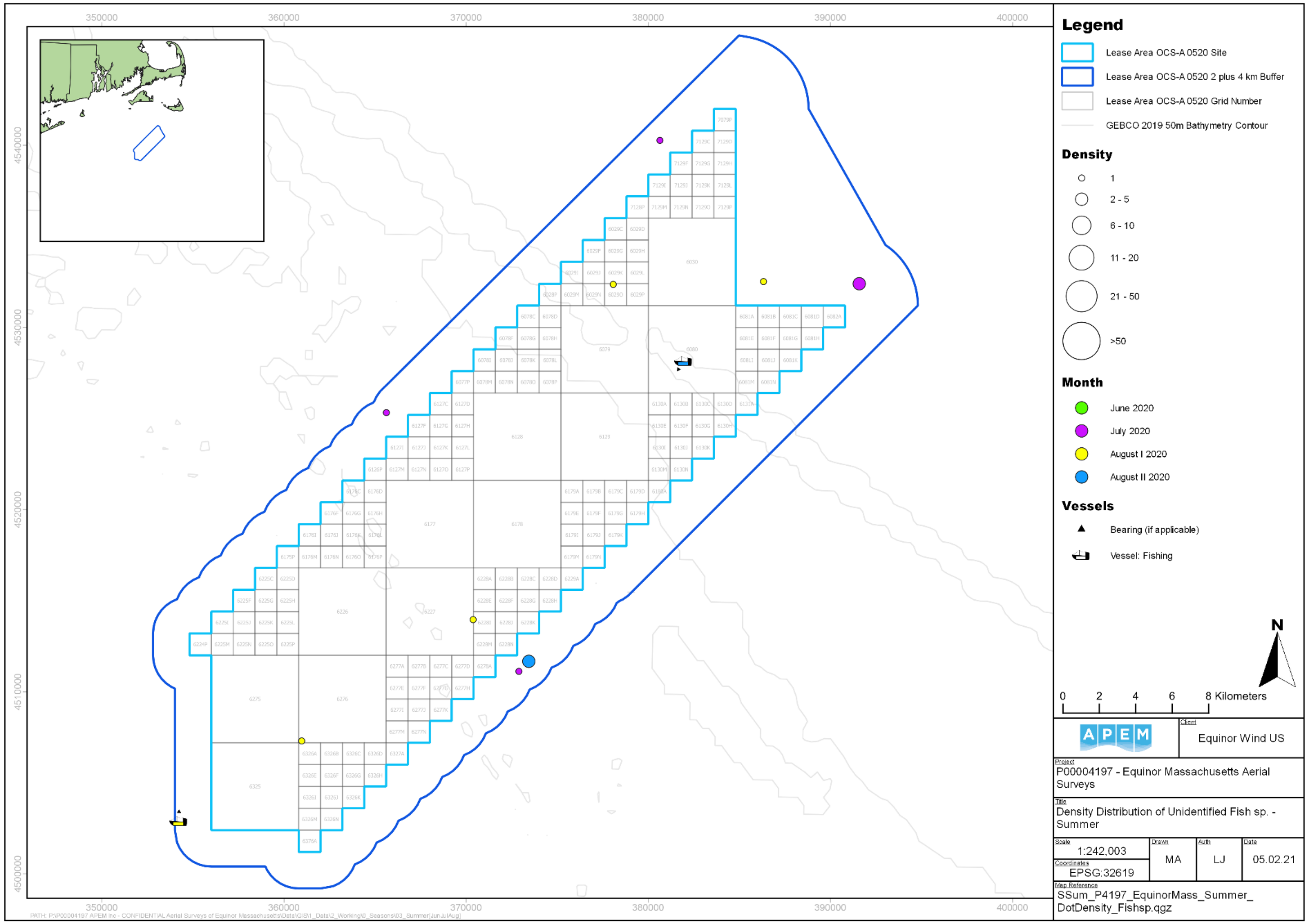

Figure 173 **Distribution of unidentified large bony fishes recorded in Lease Area OCS-A 0520 plus 2 + 4 km buffer in the summer season**

6. Observations of Abiotic Structures

No vessels were recorded in the imagery or visually from the aircraft in the December, January, February, March, April II, May I, May II or October surveys.

One unidentified vessel was recorded in the imagery in the April I 2020 survey; none were recorded visually from the aircraft.

A single vessel, identified as a fishing trawler, was recorded visually from the aircraft in the June 2020 survey; none were recorded in the imagery.

A single vessel, identified as a fishing vessel, was recorded visually from the aircraft in the July 2020 survey; none were recorded in the imagery.

One vessel, identified as a lobster boat, was recorded in the imagery in the August I 2020 survey. Four vessels, one identified as a survey vessel, and three identified as recreational yachts, were recorded visually from the aircraft.

One vessel, identified as a fishing trawler, was recorded in the imagery in the August II 2020 survey. Three vessels, one identified as a survey vessel, and the other two unidentified, were recorded visually from the aircraft.

A single vessel, identified as a supply vessel, was recorded visually from the aircraft in the September I 2020 survey; none were recorded in the imagery.

Two vessels, both identified as fishing trawlers, were recorded in the imagery in the September II 2020 survey. One vessel, identified as a fishing vessel, was recorded visually from the aircraft.

Two vessels, both identified as tankers, were recorded in the imagery in the November 2020 survey. Two vessels, one identified as a fishing vessel and one unidentified, were recorded visually from the aircraft.

7. Discussion

Literature has been used to inform the findings of the Lease Area OCS-A 0520 survey results collected on behalf of Equinor. 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, large-scale surveys undertaken for the BOEM lease areas which were conducted during different seasons and over a considerably wider area than the Survey Area have been used, but the findings are nonetheless useful for informing expected species occurrences and frequencies.

7.1 Waterfowl

Waterfowl were primarily recorded in winter (n=1,498), with a reduced count recorded in spring (n=393) and no further occurrences observed until the fall (n=14). The most numerous waterfowl species recorded was white-winged scoter (n=1,550), followed by long-tailed duck (n=289). The peak abundance estimate was 8,413 for white-winged scoter in January, whilst for long-tailed ducks, the peak abundance estimate was 1,675 recorded in January also.

The findings are comparable to the observations made by Kinlan *et al*. (2016) which reports the increased presence of both white-winged scoters and long-tailed ducks during the winter and early spring, particularly in the vicinity of Nantucket Shoals. Abundance models undertaken by Kinlan *et al*. (2016) also predicted higher white-winged scoter abundance around Cape Cod Bay, Nantucket Sound, and Nantucket Shoals which aligns with the high white-winged scoter abundances observed in the Survey Area. Palka *et al*. (2017) recorded highest observations of scoters in March even when adjusting for higher survey effort, followed by December and January. This suggests there may be annual fluctuations in when peak occurrences of scoters are expected between winter and spring, although the surveys conducted by Palka *et al*. (2017) covered a much larger area and are therefore less specific to the Massachusetts coast.

All waterfowl species recorded in the Survey Area winter along the North Atlantic coast of the US and Canada, with breeding grounds in Alaska and the far north of Canada (Audubon Society, 2021[g,l,m,n,ab]).

7.2 Loons

Loons were primarily recorded in spring (n=896), with low records for both winter (n=20) and fall (n=30). The most abundant loon species recorded was red-throated loon (n=851), followed by common loon (n=71). The peak abundance estimate was 6,123 for red-throated loons in April II; the peak abundance estimate for common loons occurred in April II also with an estimate of 469.

The findings of Winship *et al.* (2018) and Kinlan *et al.* (2016) both predicted highest occurrences of red-throated loons and common loons during the winter months, followed by spring. Though few loons were recorded in winter in the Survey Area, the high abundance recorded in spring conforms to the predictions. Winship *et al.* (2018) reported higher proportional abundance predictions associated with BOEM lease areas when compared with their study area as a whole for loons. Palka *et al.* (2017) supported highest counts for loons in spring, followed by winter, though it should be noted that a higher survey effort was undertaken in March compared with other months which may have contributed to these findings. Overall, loons being predominantly recorded in spring is therefore within expectations.

Both common and red-throated loons winter off the northeast Atlantic coast, with breeding grounds along the Canadian north and Alaskan coast (Audubon Society, 2021[jk]). The presence of loons in fall to spring is therefore in line with expected observations.

7.3 Fulmars

Northern fulmars were predominantly recorded in spring (n=57) and winter (n=44), with the remainder recorded in fall only (n=9). The peak abundance estimate for northern fulmars was 373 from the April I survey.

Winship *et al.* (2018), and Kinlan *et al.* (2016) predicted northern fulmar abundance to be highest in the spring months with variable trends in predictions for the remaining seasons. Palka *et al.* (2017) also recorded highest observations in spring, but with significantly less in summer. Both the highest abundance in spring, and the absence from summer recorded in the Survey Area supports the findings of the literature.

Fulmars are more numerous in the eastern north Atlantic, than in the western north Atlantic and tend to be found over the open ocean (Audubon Society, 2021[l]), though breeding bird records do occur during the summer months in Alaska and northern Canada.

7.4 Large Shearwaters

Large shearwaters were recorded in highest numbers in summer (n=235), followed by fall (n=198), with the remainder recorded in spring (n=27). The most abundant large shearwater species recorded was Cory's shearwater (n=174), followed by unidentified large shearwaters (n=168). The peak abundance estimate was 707 for Cory's shearwater in September I, and 421 for unidentified large shearwaters which also occured in September I.

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 which corresponds to the findings of this report. 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. This also supports the observations recorded in the Survey Area, with the exception of fall not recording high abundance compared with summer and spring. Highest density abundance for large shearwaters was predicted to be in offshore regions by Winship *et al*. (2018), with distance to land cited as an influencing factor on occurrence of shearwaters.

Great shearwaters and Cory's shearwaters both occur regularly off the east coast of North America in the summer months (Audubon Society, 2020[ce]), supporting their high abundance in summer.

7.5 Small Shearwaters

Small shearwaters were predominantly recorded in the spring (n=61) and fall (n=49), with the remainder recorded in summer (n=16). The most numerous small shearwater species recorded was sooty shearwater (n=76), followed by Manx shearwater (n=49). The peak abundance estimate was 485 for sooty shearwater in May II, and 389 for Manx shearwater in November.

As with great shearwaters, Winship *et al.* (2018) predicted sooty shearwaters to be more commonly distributed along the northeast US coast, with NOAA (2018) reporting highest observations in summer and spring. These spring observations are supported by the findings of this report from the Survey Area. Kinlan *et al.* (2016) however predicted greater observations of Manx and sooty shearwaters in summer, with Palka *et al.* (2017) similarly recording the majority of observations in summer. This differs to some degree from the findings presented in this report, as low abundance was recorded in summer with an increase in records exhibited during the fall months.

Manx shearwaters are less common in North America compared with other small shearwaters, and their movements are less studied in the western Atlantic than around Europe (Audubon Society, 2021[z]). However, several breeding colonies off the coast of Newfoundland and on islets off the Massachusetts coast are known (Birdlife International, 2021). Sooty shearwaters are seen more regularly off the Pacific coast, but are also present offshore along the Atlantic coast (Audubon Society, 2020[d]).

7.6 Storm Petrels

Storm petrels were recorded primarily in summer (n=18), followed by spring (n=7). Following that, a single storm petrel was recorded in fall. The majority of recorded storm petrels were unidentified storm petrels (n=21) with the remaining five identified as Wilson's storm petrels. The peak abundance estimate for storm petrels was 72 unidentified storm petrels in June.

Storm petrels were absent from winter predictions made by Winship *et al.* (2018) which supports their absence from the Survey Area in the winter months. Furthermore, 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. In addition, 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. This may suggest a higher likelihood of unidentified storm petrels being Wilson's as opposed to other storm petrel species.

Wilson's storm petrels breed at Antarctic island coasts and the southern extent of South America from late fall to late spring, before migrating to the North Atlantic during the summer (Audubon Society, 2021[v]) which the Survey Area findings support.

7.7 Gannets

Northern gannets occurred in highest numbers during the spring (n=108), with less recorded in winter (n=38) and fall (n=24), and particularly summer (n=1). The peak abundance estimate for northern gannets was 683 from the April II survey.

Winship *et al.* (2018) predicted northern gannet presence throughout the survey seasons, with highest records in winter and lowest in summer. Though highest numbers were recorded in spring from the Survey Area, lowest records were indeed in summer. The regions of highest abundance predictions tended to be in the nearshore to offshore region (Winship *et al.*, 2018), which applies to the Survey Area. 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. This does not strictly conform to the findings of this report, as numbers were highest during mid-spring. For NOAA (2019), northern gannets were only recorded in a November survey, where they were the most numerous species recorded. Despite gannets being found in all seasons in the Survey Area they were not highest in fall, though fall abundance was at least comparable to winter. The occurrence of northern gannets in the majority of survey seasons, with peak counts in spring is therefore in line with expectations from the literature.

Northern gannets spend time further south during the winter off the eastern coast of the US, and migrate to more northern areas of the East Atlantic in the summer months to breed (Audubon Society, 2020[u]).

7.8 Cormorants

Unidentified cormorants were recorded in the spring (n=1) and winter (n=1). The peak abundance estimate for unidentified cormorants was eight recorded from both the March and the November surveys.

The 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 unidentified cormorants were also recorded alongside them by Palka *et al.* (2017). Kinlan *et al.* (2016) predicted similar abundance year-round for double-crested cormorants, whilst spring and fall were predicted for highest abundance by Winship *et al.* (2018). NOAA (2019) recorded observations in summer alone, and Palka *et al.* (2017) recorded both double-crested cormorants and unidentified cormorants throughout the year, with highest sightings recorded in fall. Due to the low numbers recorded in the Survey Area and the variation in findings from the literature, cormorant abundance is likely to be relatively sporadic.

7.9 Phalaropes

Phalarope abundance peaked in both summer and fall, with red / red-necked phalaropes recorded in summer (n=30), and red phalaropes recorded in fall (n=30). The peak abundance estimate was 103 for both species, from the August II and November surveys respectively.

Winship *et al.* (2018) predicted phalarope distribution to be closer to shore in summer when compared with spring and fall, though their equal numbers in the Survey Area for both may not entirely align with this prediction. Kinlan *et al.* (2016) predicted highest abundance of red phalaropes in spring followed by summer and fall, whilst red-necked phalarope predictions specifically 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. Both the findings in the literature and the results of the Survey Area align in terms of species presence, though no phalaropes were recorded in spring in the Survey Area.

While red phalaropes may winter offshore, red-necked phalaropes winter south of the equator. Both species, however, are commonly sighted off the east coast of America on migration to the Arctic tundra to breed (Audubon Society, 2020[wx]).

7.10 Skuas

Skua numbers peaked during the summer (n=2), comprised of parasitic jaegers only, with a single parasitic jaeger also recorded in fall. The peak abundance estimate for parasitic jaegers was 16 from the August II survey.

Kinlan *et al*. (2016) reported data on pomarine jaegers only, which occurred in highest numbers in fall. Due to the difference in species this may only act as a rough indicator of expectations from the Survey Area. Palka *et al*. (2017) recorded a numbers of jaeger species, of which parasitic jaegers were recorded in highest numbers in summer, which supports the findings from the Survey Area. Overall however, the low number of records from the Survey Area are unlikely to provide insights into seasonal occurrence.

Parasitic jaegers winter along the southern coast of the United States and tend to be seen in the vicinity of the Survey Area during migration to the Canadian Arctic (Audubon Society, 2021[ac]).

7.11 Auks

Auks were recorded in highest numbers in spring (n=1,537), followed by winter (n=521). The most numerous auk species was murre / razorbill (n=1,326), followed by Atlantic puffin (n=415). The peak abundance estimate was 3,955 for murre / razorbill from the March survey, and 2,526 for Atlantic puffin from the April I survey.

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, which the summer absence in the Survey Area supports. Razorbills accounted for a high proportion of predicted abundance in spring across the BOEM lease areas in particular for Winship *et al.* (2018) which reflects the results from the Survey Area. Razorbill, common murre, and dovekie were predicted in highest numbers in winter by Winship *et al.* (2018) and Kinlan *et al.* (2016), which was the case for dovekies in the Survey Area, but not for razorbills and common murres, whilst Palka *et al.* (2017) did record 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, which supports the Survey area results, and Kinlan *et al.* (2016) predicted Atlantic puffin numbers to be marginally higher in winter, which was not the case for Atlantic puffins in the Survey Area.

Razorbills, dovekies, Atlantic puffins, and murres winter off the east coast of the northern United States (Audubon Society, 2021[a,b,h,ah,ai]). It would therefore be expected for numbers to be at a peak in winter (Sibley, 2000), which may suggest unseasonal weather conditions in winter and spring influenced the higher occurrences of auks in spring compared with winter (NRCC, 2021).

7.12 Large Gulls

Large gull species included ring-billed gull, great black-backed gull, Iceland gull, herring gull, and lesser black-backed gull. Large gulls were recorded in highest numbers in fall (n=114), followed by spring (n=81) and summer (n=75), with the remainder recorded in winter (n=27). The most numerous large gull species was herring gull (n=191), followed by great black-backed gull (n=91). The peak abundance estimate was 485 for herring gulls in the September II survey, and the peak abundance estimate for great black-backed gulls was 104 from the February survey.

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. As peak numbers for large gulls occurred in summer in the Survey Area, this supports this prediction. 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. Highest records overall being found in fall support the predictions of Winship *et al*. (2018) and Kinlan *et al*. (2016), whilst the findings of Palka *et al*. (2017) and NOAA (2019) also support the spring and summer results from the Survey Area. Palka *et al*. (2017) recorded highest numbers of ring-billed gulls in spring and winter, and Iceland gulls in spring and summer, which does not support the results for Iceland gulls in the Survey Area, although only a small sample size was recorded.

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).

7.13 Small Gulls

Small gull species included black-legged kittiwake, Sabine's gull, Bonaparte's gull, and laughing gull. Small gulls were recorded in highest numbers in fall (n=192), with comparatively less recorded in winter (n=23) and spring (n=27) which had similar numbers. The most numerous small gull species recorded was Bonaparte's gull (n=122), followed by black-legged kittiwake (n=86). The peak abundance estimate was 858 for Bonaparte's gulls in November, and 516 for black-legged kittiwakes, also recorded in November.

Kinlan *et al.* (2016) predicted highest abundance of black-legged kittiwakes during the winter, whilst Palka *et al.* (2017) recorded highest observations in spring, of which neither were the case for the Survey Area. Winship *et al.* (2018) predicted abundances to be denser around BOEM areas for Bonaparte's gulls, and both Winship e*t al.* (2018) and Kinlan *et al.* (2016), predicted highest Bonaparte's gull abundance in winter. Palka *et al.* (2017) reported highest observations in spring, and NOAA (2019) reported highest observations in fall. These differences between literature sources, as well as the results from the Survey Area only bearing similarities to the NOAA (2019) findings suggests a degree of annual seasonal variance may be expected from Bonaparte's gulls. Winship *et al.* (2018) and NOAA (2019) reported highest laughing gull predictions and observations respectively in fall, 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. Again, a degree of variance is shown from the literature, though for the Survey Area results, the small sample size of laughing gulls does not provide a clear resolution. A single Sabine's gull was recorded from Palka *et al*. (2017) in summer matching the total recorded in the Survey Area in fall, which supports their presence in the region.

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 Survey Area is within their year-round range (Audubon Society, 2021[f,t,aa]; Sibley, 2000). Sabine's gulls are recorded in the Atlantic during migration, on passage from Eastern Canada or Greenland to South Africa (Audubon Society, 2021 [aj]).

7.14 Terns

Terns were recorded in highest numbers in spring (n=57), followed by summer (n=4) and fall (n=2). The most numerous tern species was unidentified Sterna terns (n=35), followed by 'commic' / Forster's terns (n=19). The peak abundance estimate was 270 for unidentified Sterna terns in the May I survey, and 79 for the 'commic' / Forster's terns, also from the May I survey.

Common terns were predicted and recorded at peak numbers in summer from the literature (Winship *et al.,* 2018; Kinlan *et al.,* 2016; Palka *et al.,* 2017; NOAA, 2019), and Winship *et al.* (2018) and Kinlan *et al.* (2016) predicted peak abundances of Arctic terns also in summer, which is supported by observations made in the NOAA (2019) surveys. For both species, spring in fact proved to be the most numerous season from the Survey Area. This outcome was further exhibited by roseate terns which were predicted at peak numbers in summer from Winship *et al.* (2018) and Kinlan *et al.* (2016) but occurred only in spring in the Survey Area. Forster's terns were recorded in highest numbers in summer as well from Palka *et al.* (2017) but were confirmed in the fall surveys only from the Survey Area. The unidentified Sterna tern group (the majority of which were sitting on the water) are noteworthy due to this species group encompassing the roseate tern but would also include Forster's tern, common tern and

Arctic tern, of which the latter three species occurred in proportionally higher numbers during May I survey.

Common, Arctic, and roseate terns all have recorded breeding locations along the Massachusetts coastline (Audubon Society, 2021[af,ag,ad]). Forster's terns breed farther south along the east coast but can be found off Massachusetts during migration (Audubon Society, 2021[ae]). The largest abundance of terns being in spring is therefore likely related to both the migratory and breeding habits of terns.

7.15 Other Avian Species

The only instance of other avian species was unidentified passerines, recorded in fall (n=22). The peak abundance estimate for unidentified passerines was 167 from the October survey.

Both Palka *et al.* (2017) and NOAA (2019) recorded few instances of unidentified passerine sightings offshore which indicates the potential for migratory passerines to be expected offshore during seasonal intervals.

7.16 Turtles

Turtles were recorded in highest numbers in summer (n=2) from two species: loggerhead turtle and Kemp's ridley turtle. The peak abundance estimate was eight for both species from the July survey.

From the AMAPPS II (2019) surveys, loggerhead turtles were observed in highest numbers in fall, but were also recorded in spring, unidentified hardshell turtles were also recorded in spring which would potentially encompass Kemp's ridley turtles.

7.17 Marine Mammals

Marine mammals were recorded in highest numbers in spring (n=129), followed by fall (n=79) and winter (n=67), and finally summer (n=47). The most numerous marine mammal species was common dolphin (n=121), followed by harbor porpoise (n=66). The peak abundance estimate was 421 for common dolphins from the November survey, and 270 for harbor porpoise from the April II survey. Common minke whale, fin whale, humpback whale, common bottlenose dolphin, common / Atlantic white-sided dolphin, gray seal, and harbor seal were also recorded throughout the survey period, as were unidentified beaked whale, unidentified dolphin, unidentified seal, and unidentified marine mammal.

The overall results of peak marine mammal numbers in spring differed from the AMAPPS II (2019) northeast survey findings, where marine mammals had highest records in fall, though this was mainly due to a large concentration of common dolphins observed during the fall. All recorded marine mammals from the Survey Area were also recorded in the AMAPPS II (2019) survey, with up to four beaked whale species (Cuvier's, Sowerby's, and True's and/or Gervais') recorded in the AMAPPS II (2019) surveys, which could be likely candidates for the unidentified beaked whales found in the Survey Area.

7.18 Rays

Ray abundance peaked in summer with a single record from the July survey of a Chilean devil ray (n=1). The peak abundance estimate for rays was eight from the July survey.

Chilean devil rays tend to favor the tropics and warm temperate seas, though their expected range in the North Atlantic extends to the coast of Maine (Manta Trust, 2021).

7.19 Sharks

Sharks were recorded in highest numbers in summer (n=233), followed by fall (n=15) and spring (n=12). The most numerous sharks recorded were unidentified shark species (n=79), followed by blue shark (n=52). The peak abundance estimate was 327 for unidentified sharks from the July survey, and 183 for blue sharks from the August I survey. Blacktip shark, oceanic whitetip shark, dusky shark, sandbar shark, tiger shark, basking shark, white shark, shortfin mako, scalloped hammerhead, great hammerhead, and smooth hammerhead were also recorded throughout the survey period, as were unidentified Carcharhinidae sharks, unidentified hammerheads, and unidentified spurdogs.

Of the sharks recorded in the Survey Area, basking sharks, blue sharks, white sharks, unidentified hammerheads, and unidentified sharks were also recorded during the AMAPPS II (2019) surveys. For all species or species groups, highest numbers were recorded in spring (AMAPPS II, 2019), whilst for the Survey Area results, these were recorded in highest numbers in summer with almost no records in spring, save for basking sharks and unidentified sharks. During the summer months, ocean temperatures would be expected to be higher and so it is not unreasonable that shark species would show increased presence during this time.

7.20 Large Bony Fish

Large bony fish were recorded in highest numbers in summer (n=442), compared with fall (n=14) and spring (n=3). The most numerous large bony fish species was unidentified tuna (n=257), followed by mahi-mahi (n=65). The peak abundance estimate was 1,931 for unidentified tuna from the August II survey, and 215 for mahi-mahi from the August I survey. Ocean sunfish, Atlantic bluefin tuna, and Atlantic swordfish were also recorded throughout the survey period, as were unidentified sunfish, unidentified billfish, and unidentified large bony fish.

From the AMAPPS II (2019) surveys, only ocean sunfish were recorded from aerial surveys, with highest numbers in fall. This differs from the results of the Survey Area where ocean sunfish were most numerous in summer followed by fall. From their boat-based surveys, low numbers of ocean sunfish were recorded in summer, as well as unidentified tuna (AMAPPS II, 2019) which did also peak during the summer in the Survey Area.

8. Conclusions

A programme of 16 monthly and bi-monthly aerial digital surveys of Equinor's Lease Area OCS-A 0520 off the Massachusetts coast was carried out between December 2019 and November 2020, using APEM Inc.'s high-resolution camera system to capture digital still imagery.

In the winter months, waterfowl, auks, and marine mammals were the most abundant species groups recorded. During the spring, auks, loons, and marine mammals were the most abundant, whilst for summer, large bony fish, shearwaters, and sharks were the most abundant. For fall, gulls, shearwaters, and marine mammals were the most abundant.

Overall, species occurrence and abundance conformed to seasonal expectations, though a variation in winter and spring abundances for some species groups may have resulted from an unseasonably warm winter and cold spring (NRCC, 2020).

9. References

AMAPPS II., Annual Report of a Comprehensive Assessment of Marine Mammal, Marine Turtle, and Seabird Abundance and Spatial Distribution in US Waters of the Western North Atlantic Ocean (2019).

Audubon Society 2021[a]. Alca torda. The National Audubon Society https://www.audubon.org/field-guide/bird/razorbill. Downloaded on 1 March 2021.

Audubon Society 2021[b]. Alle alle. The National Audubon Society https://www.audubon.org/field-guide/bird/dovekie. Downloaded on 1 March 2021.

Audubon Society 2021[c]. Ardenna gravis. The National Audubon Society https://www.audubon.org/field-guide/bird/great-shearwater. Downloaded on 27 February 2020.

Audubon Society 2021[d]. Ardenna grisea. The National Audubon Society https://www.audubon.org/field-guide/bird/sooty-shearwater. Downloaded on 27 February 2020.

Audubon Society 2021[e]. Calonectris diomedea. The National Audubon Society https://www.audubon.org/field-guide/bird/corys-shearwater. Downloaded on 1 March 2021.

Audubon Society 2021[f]. Chroicocephalus philadelphia. The National Audubon Society https://www.audubon.org/field-guide/bird/bonapartes-gull. Downloaded on 1 March 2021.

Audubon Society 2021[g]. Clangula hyemalis. The National Audubon Society https://www.audubon.org/field-guide/bird/long-tailed-duck. Downloaded on 1 March 2021.

Audubon Society 2021[h]. Fratercula arctica. The National Audubon Society https://www.audubon.org/field-guide/bird/atlantic-puffin. Downloaded on 1 March 2021.

Audubon Society 2021[i]. Fulmarus glacialis. The National Audubon Society https://www.audubon.org/field-guide/bird/northern-fulmar. Downloaded on 1 March 2021.

Audubon Society 2021[j]. Gavia immer. The National Audubon Society https://www.audubon.org/field-guide/bird/common-loon. Downloaded on 1 March 2021.

Audubon Society 2021[k]. Gavia stellata. The National Audubon Society https://www.audubon.org/field-guide/bird/red-throated-loon. Downloaded on 1 March 2021.

Audubon Society 2021[l]. Melanitta americana. The National Audubon Society https://www.audubon.org/field-guide/bird/black-scoter. Downloaded on 1 March 2021.

Audubon Society 2021[m]. Melanitta deglandi. The National Audubon Society https://www.audubon.org/field-guide/bird/white-winged-scoter. Downloaded on 1 March 2021.

Audubon Society 2021[n]. Melanitta perspicillata. The National Audubon Society https://www.audubon.org/field-guide/bird/surf-scoter. Downloaded on 1 March 2021.

Audubon Society 2021[o]. Larus argentatus. The National Audubon Society https://www.audubon.org/field-guide/bird/herring-gull. Downloaded on 1 March 2021.

Audubon Society 2021[p]. Larus delawarensis. The National Audubon Society https://www.audubon.org/field-guide/bird/ring-billed-gull. Downloaded on 1 March 2021.

Audubon Society 2021[q]. Larus fuscus. The National Audubon Society https://www.audubon.org/field-guide/bird/lesser-black-backed-gull. Downloaded on 1 March 2021.

Audubon Society 2021[r]. Larus glaucoides. The National Audubon Society https://www.audubon.org/field-guide/bird/iceland-gull. Downloaded on 1 March 2021.

Audubon Society 2021[s]. Larus marinus. The National Audubon Society https://www.audubon.org/field-guide/bird/great-black-backed-gull. Downloaded on 1 March 2021.

Audubon Society 2021[t]. Leucophaeus atricilla. The National Audubon Society https://www.audubon.org/field-guide/bird/laughing-gull#. Downloaded on 1 March 2021.

Audubon Society 2021[u]. Morus bassanus. The National Audubon Society https://www.audubon.org/field-guide/bird/northern-gannet. Downloaded on 1 March 2021.

Audubon Society 2021[v]. Oceanites oceanicus. The National Audubon Society https://www.audubon.org/field-guide/bird/wilsons-storm-petrel. Downloaded on 1 March 2021.

Audubon Society 2021[w]. Pharalopus fulicarius. The National Audubon Society https://www.audubon.org/field-guide/bird/red-phalarope. Downloaded on 1 March 2021.

Audubon Society 2021[x]. Pharalopus lobatus. The National Audubon Society https://www.audubon.org/field-guide/bird/red-necked-phalarope. Downloaded on 1 March 2021.

Audubon Society 2021[y]. Puffinus lherminieri. The National Audubon Society https://www.audubon.org/field-guide/bird/audubons-shearwater. Downloaded on 1 March 2021.

Audubon Society 2021[z]. Puffinus puffinus. The National Audubon Society https://www.audubon.org/field-guide/bird/manx-shearwater. Downloaded on 1 March 2021.

Audubon Society 2021[aa]. Rissa tridactyla. The National Audubon Society https://www.audubon.org/field-guide/bird/black-legged-kittiwake. Downloaded on 1 March 2021.

Audubon Society 2021[ab]. Somateria mollissima. The National Audubon Society https://www.audubon.org/field-guide/bird/common-eider. Downloaded on 1 March 2021.

Audubon Society 2021[ac]. Stercorarius parasiticus. The National Audubon Society https://www.audubon.org/field-guide/bird/parasitic-jaeger. Downloaded on 1 March 2021.

Audubon Society 2021[ad]. Sterna dougallii. The National Audubon Society https://www.audubon.org/field-guide/bird/roseate-tern. Downloaded on 1 March 2021.

Audubon Society 2021[ae]. Sterna forsteri. The National Audubon Society https://www.audubon.org/field-guide/bird/forsters-tern. Downloaded on 1 March 2021.

Audubon Society 2021[af]. Sterna hirundo. The National Audubon Society https://www.audubon.org/field-guide/bird/common-tern. Downloaded on 1 March 2021.

Audubon Society 2021[ag]. Sterna paradisaea. The National Audubon Society https://www.audubon.org/field-guide/bird/arctic-tern. Downloaded on 1 March 2021

Audubon Society 2021[ah]. Uria aalge. The National Audubon Society https://www.audubon.org/field-guide/bird/common-murre. Downloaded on 1 March 2021.

Audubon Society 2021[ai]. Uria lomvia. The National Audubon Society https://www.audubon.org/field-guide/bird/thick-billed-murre. Downloaded on 1 March 2021.

Audubon Society 2021[aj]. Xema sabini. The National Audubon Society https://www.audubon.org/field-guide/bird/sabines-gull. Downloaded on 1 March 2021.

BirdLife International (2021) IUCN Red List for birds. Downloaded from http://www.birdlife.org on 01/03/2021.

Bureau of Ocean Energy Management (2017) Guidelines for Providing Avian Survey Information for Renewable Energy Development on the Outer Continental Shelf. [Online]. [Accessed March 1 2021] Available from: <https://www.boem.gov/Avian-Survey-Guidelines/>

Canty, A. & Ripley, B. (2010). *boot: bootstrap R (S-Plus) functions*. R package version 1.2-42.

Cooke, J.G. (2020). *Eubalaena glacialis*. *The IUCN Red List of Threatened Species* 2020: e.T41712A162001243. Downloaded on 13 July 2020.

Curtice, C., Cleary, J., Shumchenia, E., Halpin, P.N. (2018) Marine-life Data and Analysis Team (MDAT) technical report on the methods and development of marine-life data to support regional ocean planning and management. Prepared on behalf of the Marine-life Data and Analysis Team (MDAT). Accessed at: <http://seamap.env.duke.edu/models/MDAT/MDAT-Technical-Report.pdf>

CWS-ECCC (2019) Atlas of Seabirds at Sea in Eastern Canada 2006 – 2016. Accessed 15 July 2020 <https://open.canada.ca/data/en/dataset/f612e2b4-5c67-46dc-9a84-1154c649ab4e>

Efron, B. & Tibshirani, R.J. (1993). *An introduction to the bootstrap*. Chapman & Hall, London.

R Development Core Team (2012). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0, <http://www.R-project.org/>.

Fifield, D.A., Lewis, K.P., Gjerdrum, C., Robertson, G.J., Wells, R. (2009) Offshore Seabird Monitoring Program. Environment Studies Research Funds Report No. 183 St John's 68pp.

Gjerdrum, C., Fifield, D.A., Wilhelm, S.I. (2012) Eastern Canada Seabirds at Sea (ECSAS) standardized protocol for pelagic seabird surveys from moving and stationary platforms. Canadian Wildlife Service, Environment Canada, Ottawa.

Goodale, M.W., Milman, A., Griffin, C.R. (2019) Assessing the cumulative adverse effects of offshore wind energy development on seabird foraging guilds along the East Coast of the United States. Environmental Research Letters in press <https://doi.org/10.1088/1748-9326/ab205b>

Goyert, H. (2014). Relationship among prey availability, habitat, and the foraging behavior, distribution, and abundance of common terns Sterna hirundo and roseate terns S. dougallii. Marine Ecology Progress Series. 506. 291-302. 10.3354/meps10834.

Kinlan, B.P., A.J. Winship, T.P. White, and J. Christensen. (2016). Modeling At-Sea Occurrence and Abundance of Marine Birds to Support Atlantic Marine Renewable Energy Planning: Phase I Report. U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs, Sterling, VA. OCS Study BOEM 2016-039. xvii+113 pp.

Kraus, S.D., S. Leiter, K. Stone, B. Wikgren, C. Mayo, P. Hughes, R. D. Kenney, C. W. Clark, A. N. Rice, B. Estabrook and J. Tielens. (2016). Northeast Large Pelagic Survey Collaborative Aerial and Acoustic Surveys for Large Whales and Sea Turtles. US Department of the Interior, Bureau of Ocean Energy Management, Sterling, Virginia. OCS Study BOEM 2016-054. 117 pp. + appendices.

Manta Trust. (2021). *Sicklefin Devil Ray (Mobula tarapacana) Species Guide — Manta Trust*. [online] Available at: <https://www.mantatrust.org/mobula-tarapacana> [Accessed 2 March 2021].

Natural Heritage & Endangered Species Program [NHESP]., (2015). *Roseate Tern (Sterna dougallii)* [online]. Westborough: Massachusetts Division of Fisheries & Wildlife. [Viewed 14 July 2020]. Available from: https://www.mass.gov/files/documents/2016/08/wh/roseate-tern.pdf

NOAA (2019) 2018 Annual Report of a Comprehensive Assessment of Marine Mammal, Marine Turtle, and Seabird Abundance and Spatial Distribution in US waters of the Western North Atlantic Ocean – AMAPPS II. Accessed 1 March 2021 <https://repository.library.noaa.gov/view/noaa/22040>

Normandeau (2011) New insights and new tools regarding risk to roseate terns, piping plovers, and red knots from wind facility operations on the Atlantic Outer Continental Shelf. A Final Report for the U.S. Department of the Interior, Bureau of Ocean Energy Management, Regulation and Enforcement, Report No. BOEMRE 048-2011. Contract No. M08PC20060, 287pp.

Normandeau Associates (2019). Remote Marine and Onshore Technology. <https://remote.normandeau.com/remote_about.php>

Nrcc.cornell.edu. 2020. *NRCC State Maps*. [online] Available at: <http://www.nrcc.cornell.edu/regional/monthly/monthly.html> [Accessed 2 March 2021].

O'Connell, A.F., Gardner, B., Gilbert, A.T., Laurent, K. (2009) Compendium of Avian Occurrence Information for the Continental Shelf Waters along the Atlantic Coast of the United States, Final report (Database Section – Seabirds). U.S. Department of the Interior, Bureau of Ocean Energy Management, OCS Study BOEM 2012-076. Herndon, VA. 344 pp.

Palka, D.L., S. Chavez-Rosales, E. Josephson, D. Cholewiak, H.L. Haas, L. Garrison, M. Jones, D. Sigourney, G. Waring (retired), M. Jech, E. Broughton, M. Soldevilla, G. Davis, A. DeAngelis, C.R. Sasso, M.V.Winton, R.J. Smolowitz, G. Fay, E. LaBrecque, J.B. Leiness, Dettloff, M. Warden, K. Murray, and C. Orphanides. 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.

Perkins, S., Sadoti, G., Allison, T., Jedrey, E. and Jones, A. (2005). Relative waterfowl abundance within Nantucket Sound, Massachusetts during the 2004–2005 winter season. *Massachusetts Audubon Society Technical Report, Lincoln, MA, USA*.

R Development Core Team (2012). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0, <http://www.R-project.org/>.

Robinson Willmott, J., Forcey, G., Kent, A. (2013) The relative vulnerability of migratory bird species to offshore wind energy projects on the Atlantic outer continental shelf: an assessment method and database. 275 pp. in U.D. o. t. Interior, editor. Bureau of Ocean Energy Management, Herndon VA. OCS Study BOEM 2013-027, 275pp.

Sadoti, G., Allison, T., Perkins, S. and Jones, A. (2005). A survey of tern activity within Nantucket Sound, Massachusetts, during the 2004 breeding period. *Final Report for Massachusetts Technology Collaborative. Massachusetts Audubon Society, Lincoln, MA, USA*.

Sibley, D. (2000). *The North American Bird Guide.* Ed. New York: Chanticleer Press Inc.

Stone, K.M., Leiter, S.M., Kenney, R.D., Wikgren, B.C., Thompson, J.L., Taylor, J.K.D., and Kraus, S.D. (2017) Distribution and abundance of cetaceans in a wind energy development area offshore of Massachusetts and Rhode Island. *Journal of Coastal Conservation* [online] **21**(4), 527-543. [Viewed 13 July 2020] Available from: doi: 10.1007/s11852-017-0526-4

Veit, R.R., Goyert, H.F., White, T.P., Martin, M.C., Manne, L.L., Gilbert, A. (2015) Pelagic Seabirds off the East Coast of the United States 2008-2013. US Department of the Interior, Bureau of Ocean Energy Management, Office for Renewable Energy Programs, Sterling, VA. OCS Study BOEM 2015-024. 186 pp.

Veit, R.R., White, T.P., Perkins, S.A. and Curley, S. (2016). Abundance and Distribution of Seabirds off Southeastern Massachusetts, 2011-2015 Final Report.

White, T. P., and Veit, R. R. (2020). Spatial ecology of long-tailed ducks and white-winged scoters wintering on Nantucket Shoals. *Ecosphere* 11(1):e03002. 10.1002/ecs2.3002

Winship, A.J., Kinlan, B.P., White, T.P., Leirness, J.B., Christensen, J., (2018) Modeling At-Sea Density of Marine Birds to Support Atlantic Marine Renewable Energy Planning: Final Report. U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs, Sterling, VA. OCS Study BOEM 2018-010. 81 pp.

Appendix I Scientific Names and Taxonomy of Marine Fauna

Common Name	Scientific Name	Family	Class
Waterfowl			
Common Eider	*Somateria mollissima*	Anatidae	Aves
Surf Scoter	*Melanitta perspicillata*	Anatidae	Aves
White-winged Scoter	*Melanitta deglandi*	Anatidae	Aves
Black Scoter	*Melanitta americana*	Anatidae	Aves
Long-tailed Duck	*Clangula hyemalis*	Anatidae	Aves
Loon			
Red-throated Loon	*Gavia stellata*	Gaviidae	Aves
Common Loon	*Gavia immer*	Gaviidae	Aves
Storm Petrel			
Wilson's Storm Petrel	*Oceanites oceanicus*	Oceanitidae	Aves
Fulmar			
Northern Fulmar	*Fulmarus glacialis*	Procellariidae	Aves
Large Shearwater			
Cory's Shearwater	*Calonectris borealis*	Procellariidae	Aves
Great Shearwater	*Ardenna gravis*	Procellariidae	Aves
Small Shearwater			
Sooty Shearwater	*Ardenna grisea*	Procellariidae	Aves
Manx Shearwater	*Puffinus puffinus*	Procellariidae	Aves
Gannet			
Northern Gannet	*Morus bassanus*	Sulidae	Aves
Cormorant			
Double-crested Cormorant	*Phalacrocorax auritus*	Phalacrocoracidae	Aves
Phalarope			
Red Phalarope	*Phalaropus fulicarius*	Scolopacidae	Aves
Red-necked Phalarope	*Phalaropus lobatus*	Scolopacidae	Aves
Small Gull			
Black-legged Kittiwake	*Rissa tridactyla*	Laridae	Aves
Sabine's Gull	*Xema sabini*	Laridae	Aves
Bonaparte's Gull	*Chroicocephalus philadelphia*	Laridae	Aves
Laughing Gull	*Leucophaeus atricilla*	Laridae	Aves
Ring-billed Gull	*Larus delawarensis*	Laridae	Aves
Large Gull			
Great Black-backed Gull	*Larus marinus*	Laridae	Aves
Iceland Gull	*Larus glaucoides*	Laridae	Aves
Herring Gull	*Larus argentatus*	Laridae	Aves
Lesser Black-backed Gull	*Larus fuscus*	Laridae	Aves
Tern			
Roseate Tern	*Sterna dougallii*	Laridae	Aves
Common Tern	*Sterna hirundo*	Laridae	Aves
Arctic Tern	*Sterna paradisaea*	Laridae	Aves
Forster's Tern	*Sterna forsteri*	Laridae	Aves

Skua			
Pomarine Jaeger	*Stercorarius pomarinus*	Stercorariidae	Aves
Parasitic Jaeger	*Stercorarius parasiticus*	Stercorariidae	Aves
Auk			
Dovekie	*Alle alle*	Alcidae	Aves
Common Murre	*Uria aalge*	Alcidae	Aves
Thick-billed Murre	*Uria lomvia*	Alcidae	Aves
Razorbill	*Alca torda*	Alcidae	Aves
Atlantic Puffin	*Fratercula arctica*	Alcidae	Aves
Marine Mammal			
Common Minke Whale	*Balaenoptera acutorostrata*	Balaenopteridae	Mammalia
Fin Whale	*Balaenoptera physalus*	Balaenopteridae	Mammalia
Humpback Whale	*Megaptera novaeangliae*	Balaenopteridae	Mammalia
Sowerby's Beaked Whale	*Mesoplodon bidens*	Ziphiidae	Mammalia
Gervais' Beaked Whale	*Mesoplodon europaeus*	Ziphiidae	Mammalia
True's Beaked Whale	*Mesoplodon mirus*	Ziphiidae	Mammalia
Cuvier's Beaked Whale	*Ziphius cavirostris*	Ziphiidae	Mammalia
Common Dolphin	*Delphinus delphis*	Delphinidae	Mammalia
Atlantic White-sided Dolphin	*Lagenorhynchus acutus*	Delphinidae	Mammalia
Common Bottlenose Dolphin	*Tursiops truncatus*	Delphinidae	Mammalia
Harbor Porpoise	*Phocoena phocoena*	Phocoenidae	Mammalia
Gray Seal	*Halichoerus grypus*	Phocidae	Mammalia
Harbor Seal	*Phoca vitulina*	Phocidae	Mammalia
Turtle			
Loggerhead Turtle	*Caretta caretta*	Cheloniidae	Reptilia
Kemp's Ridley Turtle	*Lepidochelys kempii*	Cheloniidae	Reptilia
Large Bony Fish			
Mahi-mahi	*Coryphaena hippurus*	Coryphaenidae	Actinopterygii
Ocean Sunfish	*Mola mola*	Molidae	Actinopterygii
Atlantic Bluefin Tuna	*Thunnus thynnus*	Scombridae	Actinopterygii
Atlantic Swordfish	*Xiphias gladius*	Xiphiidae	Actinopterygii
Shark			
Blacktip Shark	*Carcharhinus limbatus*	Carcharhinidae	Chondrichthyes
Oceanic Whitetip Shark	*Carcharhinus longimanus*	Carcharhinidae	Chondrichthyes
Dusky Shark	*Carcharhinus obscurus*	Carcharhinidae	Chondrichthyes
Sandbar Shark	*Carcharhinus plumbeus*	Carcharhinidae	Chondrichthyes
Tiger Shark	*Galeocerdo cuvier*	Carcharhinidae	Chondrichthyes
Blue Shark	*Prionace glauca*	Carcharhinidae	Chondrichthyes
Basking Shark	*Cetorhinus maximus*	Cetorhinidae	Chondrichthyes
White Shark	*Carcharodon carcharias*	Lamnidae	Chondrichthyes
Shortfin Mako	*Isurus oxyrinchus*	Lamnidae	Chondrichthyes
Scalloped Hammerhead	*Sphyrna lewini*	Sphyrnidae	Chondrichthyes
Great Hammerhead	*Sphyrna mokarran*	Sphyrnidae	Chondrichthyes
Smooth Hammerhead	*Sphyrna zygaena*	Sphyrnidae	Chondrichthyes
Ray			
Chilean Devil Ray	*Mobula tarapacana*	Mobulidae	Chondrichthyes

Appendix II Age Classification of Key Bird Species

Appendix III provides information on the methodology APEM uses to age gannets and 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 the compressed and cropped examples included in this document.

Northern Gannet

With the exception of unfavorable survey conditions, 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 Survey Area. 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.

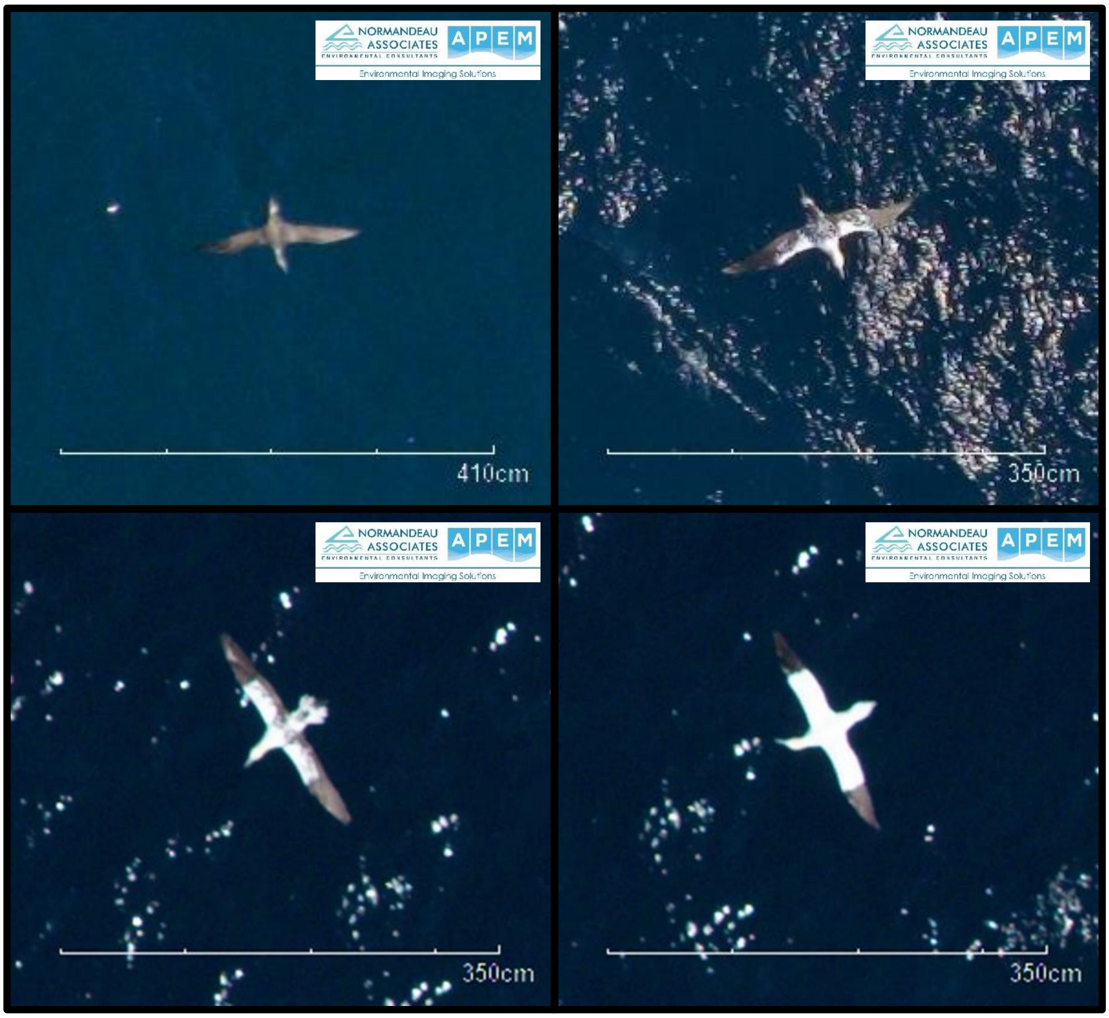

Plate 1 **Flying northern gannets of different ages captured in digital still imagery (GSD 1.5 cm)**

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 (left, **Plate 2**), fourth years, third years, second years (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.

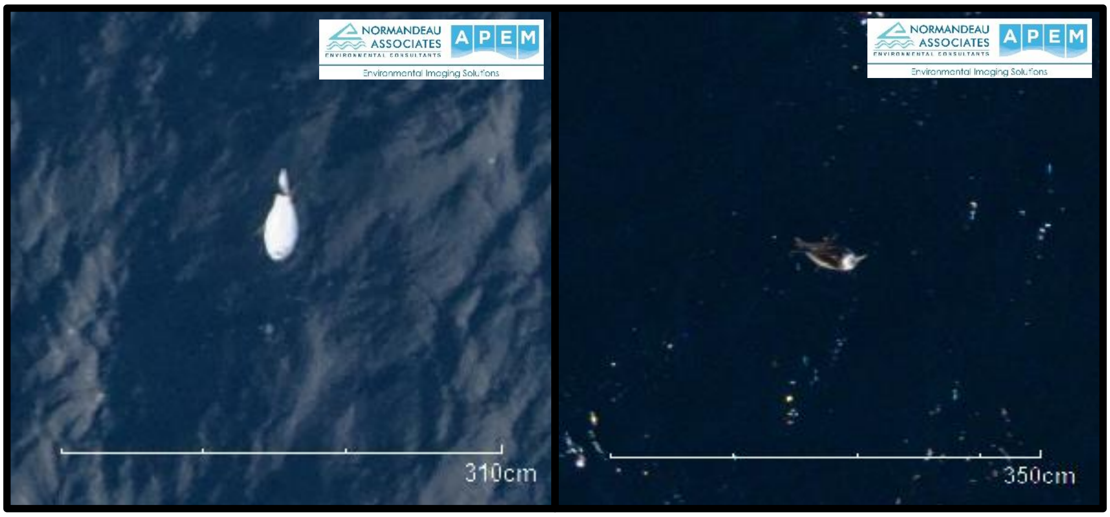

Plate 2 **Sitting northern gannets of different ages captured in digital still imagery (GSD 1.5 cm)**

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 year kittiwakes were recorded in the survey area 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 6**) from first years (below left, **Plate 6**) 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. Age categories for laughing gulls used in the data tables produced by APEM of its analyzed high-resolution aerial images are provided in **Table 4**.

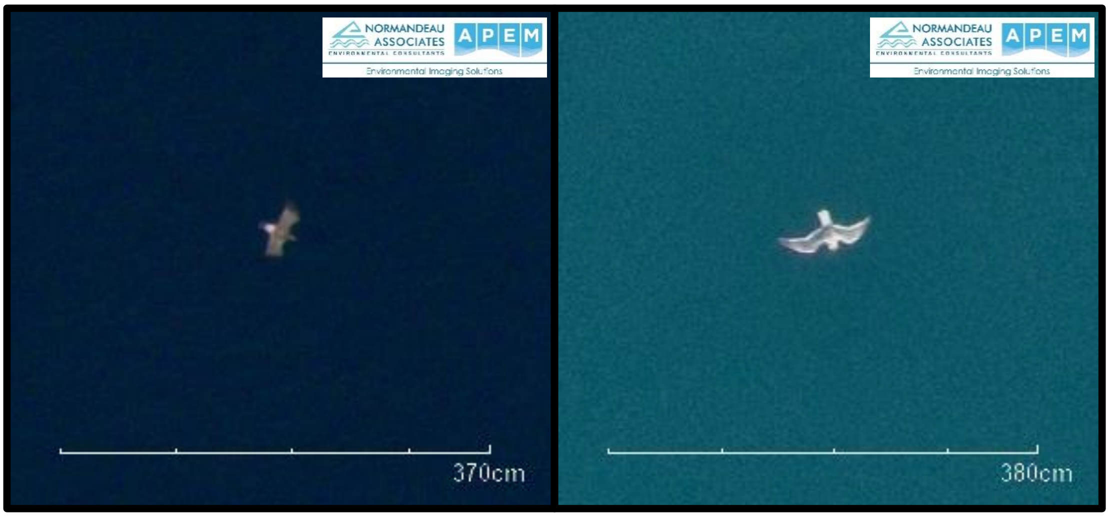

Plate 6 **Flying laughing gulls of different ages captured in digital still imagery (GSD 1.5 cm)**

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.

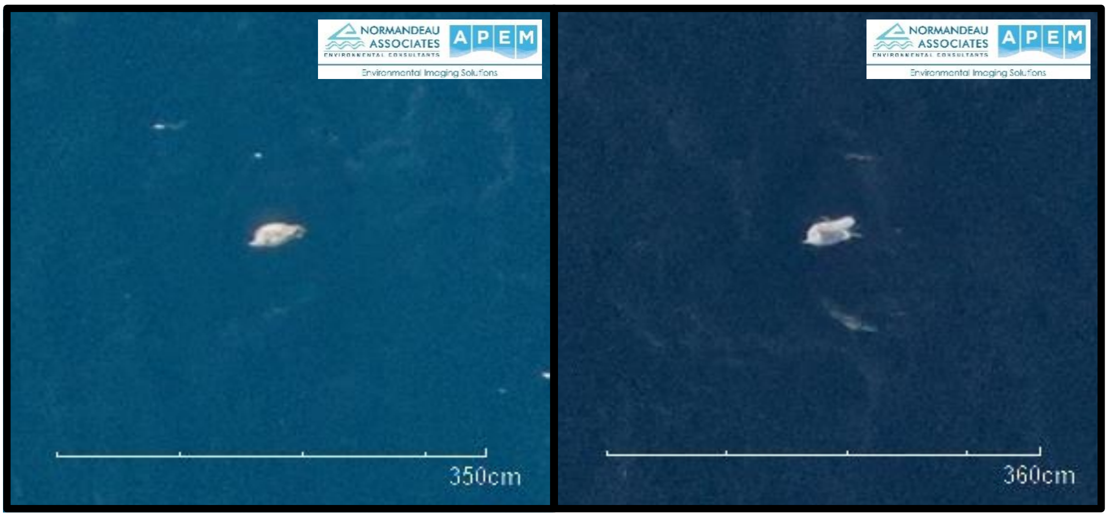

Plate 8 **Sitting herring gulls of different ages captured in digital still imagery (GSD 1.5 cm)**

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 10**) to the very dark black backed adults (below left, **Plate 10**). The only age that there may be difficulty in identifying is sitting third years as plumage-wise they will be very similar to adults.

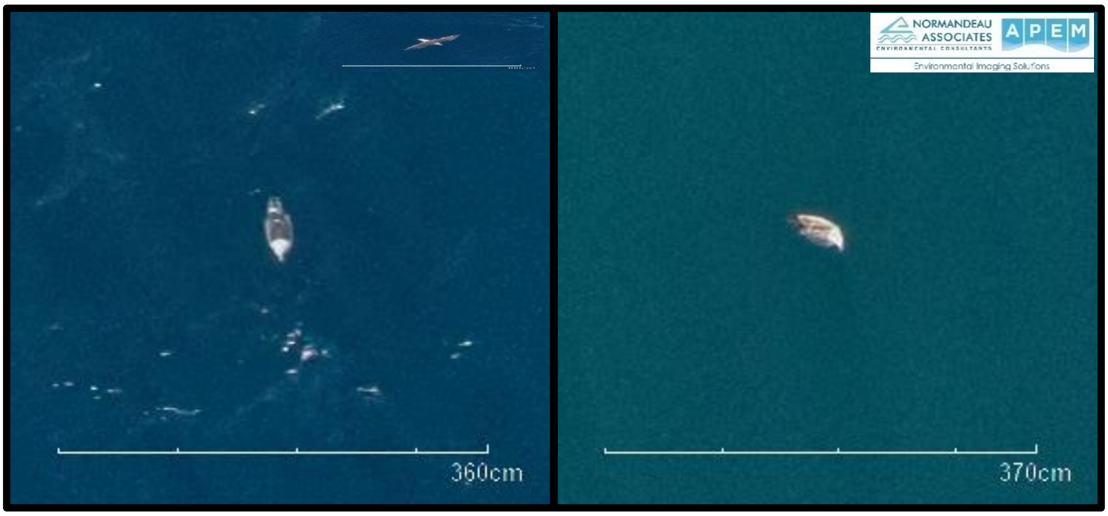

Plate 10 **Sitting great black-backed gulls of different ages captured in digital still imagery (GSD 1.5 cm)**

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 6**.

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 adult northern gannets, black-legged kittiwakes, Bonaparte's gulls, laughing gulls, herring gulls, and great black-backed gulls from age-identified birds recorded in Lease Area OCS-A 0520 from 16 surveys (December 2019 to November 2020)**

Species	Age	Survey Month															
		Dec-19	Jan-20	Feb-20	Mar-20	AprI-20	AprII-20	MayI-20	MayII-20	Jun-20	Jul-20	AugI-20	AugII-20	SepI-20	SepII-20	Oct-20	Nov-20
Northern gannet	Juvenile & sub-adults	0	0	0	0	0	21	10	0	1	0	0	0	0	1	1	2
	Adults	19	9	1	2	6	64	0	0	0	0	0	0	0	0	1	19
	Adults (%)	100	100	100	100	100	75	0	-	0	-	-	-	-	0	50	90
Black-legged kittiwake	Juvenile & sub-adults	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	33
	Adults	6	4	4	0	0	0	0	0	0	0	0	0	0	0	0	14
	Adults (%)	100	100	100	-	0	-	-	-	-	-	-	-	-	-	-	70
Bonaparte's gull	Juvenile & sub-adults	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	9
	Adults	0	0	0	0	6	4	0	0	0	0	0	0	0	0	0	28
	Adults (%)	-	-	-	-	100	100	0	-	-	-	-	-	-	-	-	76
Laughing gull	Juvenile & sub-adults	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Species	Age	Survey Month															
		Dec-19	Jan-20	Feb-20	Mar-20	AprI-20	AprII-20	MayI-20	MayII-20	Jun-20	Jul-20	AugI-20	AugII-20	SepI-20	SepII-20	Oct-20	Nov-20
	Adults	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	Adults (%)	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-
Herring gull	Juvenile & sub-adults	0	0	0	1	1	0	1	0	1	0	0	19	1	7	2	3
	Adults	2	1	2	10	13	1	0	2	1	1	7	9	3	49	4	4
	Adults (%)	100	100	100	91	93	100	0	100	50	100	100	32	75	87	67	57
Great black-backed gull	Juvenile & sub-adults	0	1	5	3	0	0	4	0	1	0	0	1	0	2	0	0
	Adults	4	1	8	7	3	6	2	4	8	2	0	5	1	10	3	1
	Adults (%)	100	50	62	70	100	100	33	100	89	100	-	83	100	83	100	100

Photo credit: Matt Goldsmith, Equinor