Environment and Climate Change Canada – Canadian Wildlife Service
Submitted to the NL and NS Regional Assessment Committees

Atlantic Offshore Bat Observation Map and Database

Product Objective

The offshore bat observation map presents an inventory of documented sightings or detections of bat species in offshore and coastal environments in Atlantic Canada. Data were collected from published and private sources, including available published research, historical accounts, museum collections, and personal communications. Documented sightings of bats range from 1864 to 2023 and use various methods, including anecdotal evidence, visual sightings, acoustic detection and targeted survey efforts. Where information allows, observations associated with buoys, infrastructure, and vessels are highlighted.

The following data sources were used to produce the bat observation map:

- CWHC. Migratory Bat Offshore Records Newfoundland. CONFIDENTIAL. Excluded from map.
- de Lacoste, N., 2020. État des lieux des connaissances sur les chiroptères à Saint-Pierre-et-Miquelon.
- Desbrosse, A. & Etcheberry, R., 1987. Terrestrial Mammals of St-Pierre & Miquelon. Osprey, 18(3), pp.117-124.
- Hatch, S.K., Connelly, E.E., Divoll, T.J., Stenhouse, I.J. and Williams, K.A., 2013. Offshore observations of eastern red bats (Lasiurus borealis) in the mid-Atlantic United States using multiple survey methods. PloS one, 8(12), p.e83803.
- Humber, J. 2023. Unpublished Bat Observations. Obtained November 3, 2023.
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- Lucas, Z. & Hebda, A., 2011. Lasiurine bats in Nova Scotia. Proceedings of the Nova Scotian Institute of Science, 46, pp.117-138.
- McAlpine, D.F., Muldoon, F., Wandeler, A.I., 2002. First record of the Hoary Bat, Lasiurus cinereus (Chiroptera: Vespertilionidae), from Prince Edward Island. The Canadian field-naturalist, 116(1), pp.124-125.
- Pelletier, S.K., Omland, K., Watrous, K.S. and Peterson, T.S., 2013. Information Synthesis on the Potential for Bat Interactions with Offshore Wind Facilities—Final Report. U.S. Dept of the Interior, Bureau of Ocean Energy Management, Headquarters, Herndon, VA. OCS Study BOEM, 1163, p.119.
- Peterson, T., Pelletier, S. and Giovanni, M., 2016. Long-term bat monitoring on islands, offshore structures, and coastal sites in the Gulf of Maine, mid-Atlantic, and Great Lakes (No. DOE-Stantec-EE0005378). Stantec Consulting Services Inc., Topsham, ME (United States).
- True, M.C., Gorman, K.M., Taylor, H., Reynolds, R.J. and Ford, W.M., 2023. Fall migration, oceanic movement, and site residency patterns of eastern red bats (Lasiurus borealis) on the mid-Atlantic coast. Movement Ecology, 11(1), pp.1-16.
- Thornton, J.E.B., Richlen, M.E., McDonald, T.B. and Bell, J.T., 2023. Opportunistic Offshore Sighting of a Tricolored Bat (Perimyotis subflavus). Southeastern Naturalist, 22(1), pp.N9-N12.
- Threlfall, W., 1969. Further records of helminths from Newfoundland mammals. Canadian Journal of Zoology, 47(2), pp.197-201.

- Solick, D.I. & Newman, C.M. 2021. Oceanic records of North American bats and implications for offshore wind energy development in the United States. Ecology and Evolution, 11(21), p.14433-14447.
- Vanderwolf, K. Unpublished terrestrial hibernacula. CONFIDENTIAL. Excluded from map.
- Washinger, D.P, Reid, R., & Fraser, E.E., 2020. Acoustic Evidence of Hoary Bats (Lasiurus cinereus) on Newfoundland, Canada. Northeastern Naturalist, 27(3), pp.567-575.

A map of offshore bat observations is provided in Figure 1, including observations of the following species/species groups:

- Silver-haired Bat (*Lasionycteris noctivagans*; COSEWIC assessed Endangered)
- Eastern Red Bat (*Lasiurus borealis*; COSEWIC assessed Endangered)
- Hoary Bat (*Lasiurus cinereus*; COSEWIC assessed Endangered)
- Big Brown Bat (*Eptesicus fuscus*)
- Little Brown Bat (*Myotis lucifugus*, SARA listed Endangered)
- Tri-Coloured Bat (*Perimyotis subflavus*, SARA listed Endangered)
- Seminole Bat (*Lasiurus seminolus,* found in NE USA, not in Canadian territories*)*
- Northern myotis (*Myotis septentrionalis*, SARA listed Endangered)
- *Lasiurus* species
- *Myotis* species

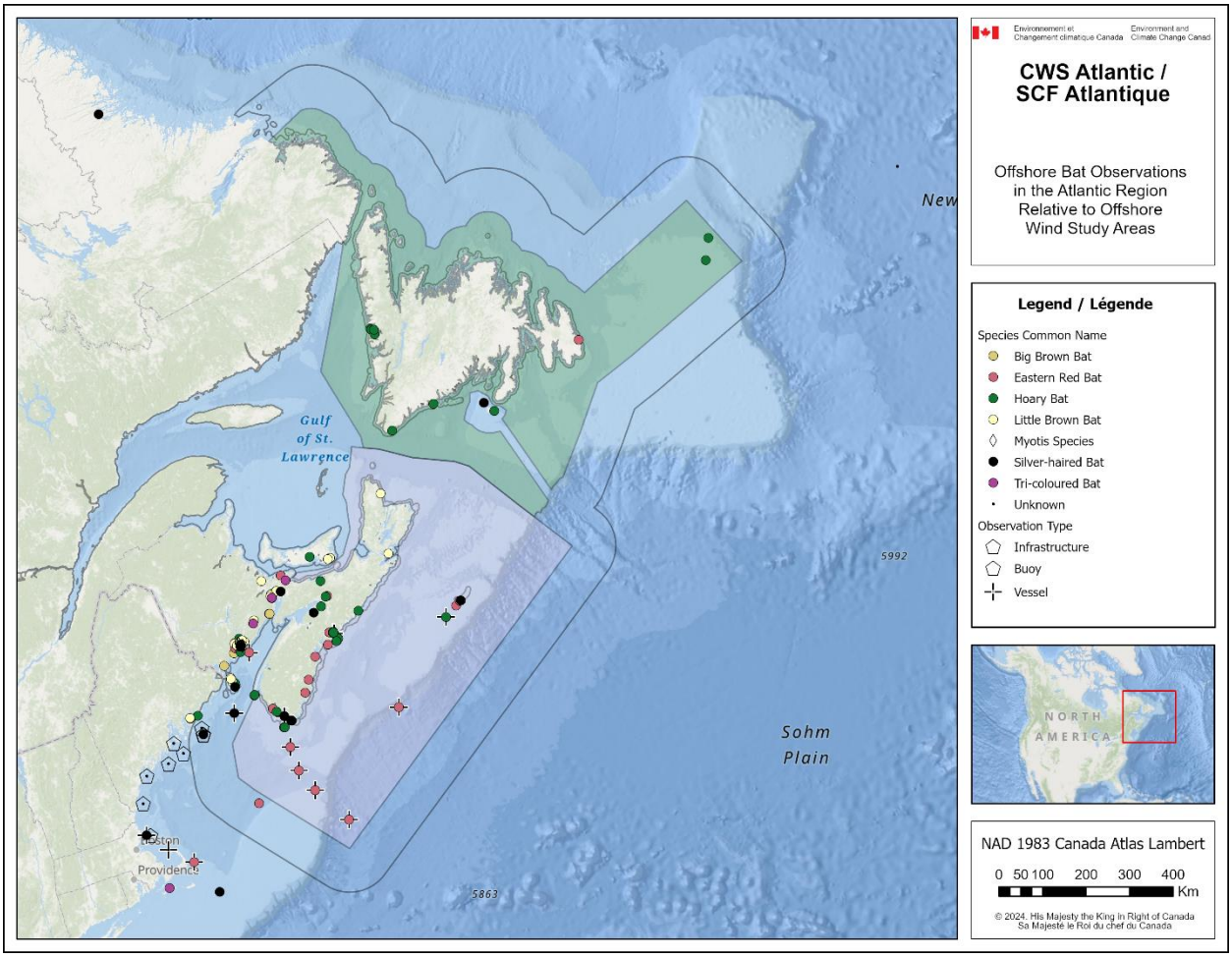

Figure 1: Coastal, coastal island, and offshore bat observations.

Interpretation

The map aims to provide information on offshore occurrences of bats in the Atlantic Region with an emphasis on migratory bat species. Each point represents a location where one or more bats have been reported. The locational accuracy of many offshore observations is low. The risk to bat species from offshore energy development is likely highest during migration and weather conditions that promote poor visibility. Conversely, risk of impacts from offshore wind energy development would be lowest to bats during the winter months as migratory species are absent and resident species are in hibernation.

Methodology

Historical data since 1874 were included. Information on weather conditions, number, species, age, sex, behaviour, and method of collection was included when known. Location estimates were required from some sources as they were provided in text format (verbatim). Data provided from the above sources were imported into ArcGIS Pro where coordinates were converted to points using the *X.Y. Table-to-Point* geoprocessing tool. Inland observations (locations greater than 20 km from the ocean) were excluded from the final map. Observations on coastal islands (e.g., Grand Manan) were retained even if they were greater than 20 km from the ocean. Symbology was applied to show the different bat species observed and indicate whether observations were associated with buoys, infrastructure, or vessels.

Limitations and Assumptions

- Location data is considered confidential and cannot be published without permission from ECCC. Some observations are excluded from the final map as per data sharing restrictions.
- The map is an inventory of confirmed bat presence in coastal and marine environments. Bat presence and usage in the marine environment is a known knowledge gap. As such, the map confirms only bat presence. Key areas or spatial distribution of potential bat migration and movement or important habitats are difficult to highlight with currently available data.
- Location accuracy and uncertainty: acoustic methods do not represent the accurate locations of bats. They represent a location within a certain radius, depending on the specifications of the detector used (typically 30-40 metres under ideal conditions). Coordinates had to be estimated for some sources using acoustic methods. Verbatim descriptions were given for some data sources, and coordinates were estimated using Google Earth. Uncertainty has not been assigned to all observations, only sources where it was readily available.
- The completeness of some records is limited due to the heterogeneity of the collected data. For instance, weather, temperature, behaviour, time, height, distance to shore, water depth, and number of bats is available for some sources but not others. Verbatim responses were recorded from anecdotal observations and sighting records. The exact date for some observations is not available. The sampling period, month, or year at minimum, with indicated accuracy, is captured for each observation.

Atlantic See Bats at Sea Program

Objective

Knowledge about bat species in the Atlantic Region marine environment is limited. The *Atlantic See Bats at Sea Program* was initiated in 2024 to address the knowledge gap regarding the spatial, temporal, and altitudinal distributions of bats in the offshore. Current research has focused on bat presence and behaviour in terrestrial areas, and less is known about their occurrences in the open ocean.

Migratory tree bats (Hoary, Silver-haired, and Eastern Red Bats) are known to migrate over long distances and have been documented traversing marine environments during seasonal movements (pre- and post-breeding). Eastern Red Bat has been observed flying up to 160 km from mainland Nova Scotia (Czenze et al., 2011). Historical records of this species have observed bats flying over 160 km from the coast. More commonly, recent studies have reported bats within 50 km of the coast (Hatch et al., 2013; Solick & Newman, 2021). Some flight averages have been reported below 30 km of the coastline (Sjollema et al., 2014). Eastern Red Bats are the most observed migratory bat species flying offshore along the Atlantic coast. Hoary Bats have been observed flying up to 50 km from the coastline (Kennerley et al., 2024). This species is found flying closer to shore, around 15 km (e.g. 11.5 km in Sjollema et al., 2014). Similarly, Silver-haired Bats have been observed flying 20 km or more from the coastline (Sjollema et al., 2014), though older accounts have reported sightings 180 km from the coast (Mackiewicz and Backus, 1956 as cited by Solick and Newman, 2021).

The presence of these species in the offshore could be linked to factors such as migratory routes, foraging behaviour, dispersal, or adverse weather conditions pushing them off course. Understanding spatial and

temporal distributions in marine areas is crucial to effectively manage and conserve migratory bat species, especially in the context of offshore wind energy development. Current data is sparse, creating significant knowledge gaps. As the offshore wind energy industry proceeds in the Atlantic Region, understanding bat movement patterns will be vital to minimize potential impacts on these species. More data will support species recovery efforts and inform the development of mitigation strategies to protect bats from potential risks associated with offshore energy infrastructure.

Approach

The *Atlantic See Bats at Sea Program* addresses data gaps by deploying Autonomous Recording Units (ARUs) on ships operating in the Atlantic Canada region. This approach leverages existing marine vessels to collect acoustic data, providing insights into the presence and distribution of bats in offshore environments. The initiative aims to enhance knowledge for better-informed offshore wind energy development and species recovery planning. Ultimately, this will contribute to more effective conservation and mitigation efforts for migratory bat species. This first year of work aims to resolve technical, technological, and operational hurdles to placing ARUs on marine vessels. Preliminary mission data has shown that data collection is possible, with several Silver-haired Bat observations collected during a mission in the Gulf of Maine (April 2024).

Figure 2: Vessel-mounted Autonomous Recording Unit and Ultrasonic Microphone.

Paired SM4BAT ARUs with SMM-U2 Ultrasonic Microphones from Wildlife Acoustics are attached to vessels. Microphones and units are placed as high on the vessel as possible, with greatest success when units are attached to the mast (~25-30 m above the water, see Figure 2). Units record acoustic activity near the vessel (likely within 50 m) during the day and night. Any positive detections are then georeferenced using the vessel's navigation and GPS data with the time and date of the detection. Paired units were installed to circumvent one of the units failing during a mission. A map of offshore bat observations is provided in Figure 3 for the preliminary missions in spring, 2024. Currently, Silver-haired Bats have been the only observed species during the pre-breeding migration period.

Detailed beneficial management practices for bats and offshore wind energy projects will be developed during Fall-Winter 2024, following the conclusion of work undertaken with Bat Conservation International. Once finalized, this document will be provided.

Interpretation

Figure 3 provides locations of offshore occurrences of bats during trial missions in the Atlantic Region. The Department of Fisheries and Oceans collaborated with ECCC-CWS on this mission. Bat observations were summarized by hour and assigned to an hourly location taken by the vessel. The number of detections in that hour is summarized in the map.

Limitations and Assumptions

- The map presented is an example of confirmed bat presence in coastal and marine environments. Bat presence and usage in the marine environment is a known knowledge gap. As such, the map confirms that bat presence was only detected by one mission.
- Location accuracy and uncertainty: acoustic methods do not represent the accurate locations of bats. They represent a location within a certain radius, depending on the specifications of the detector used. The acoustic data were analyzed, and the number of passes (the number of times a bat crosses through a unit's detection zone) were summed. The number of passes represents bat activity and does not represent the abundance of bats present. For example, this could be one bat following the marine vessel or 15 individual bats.

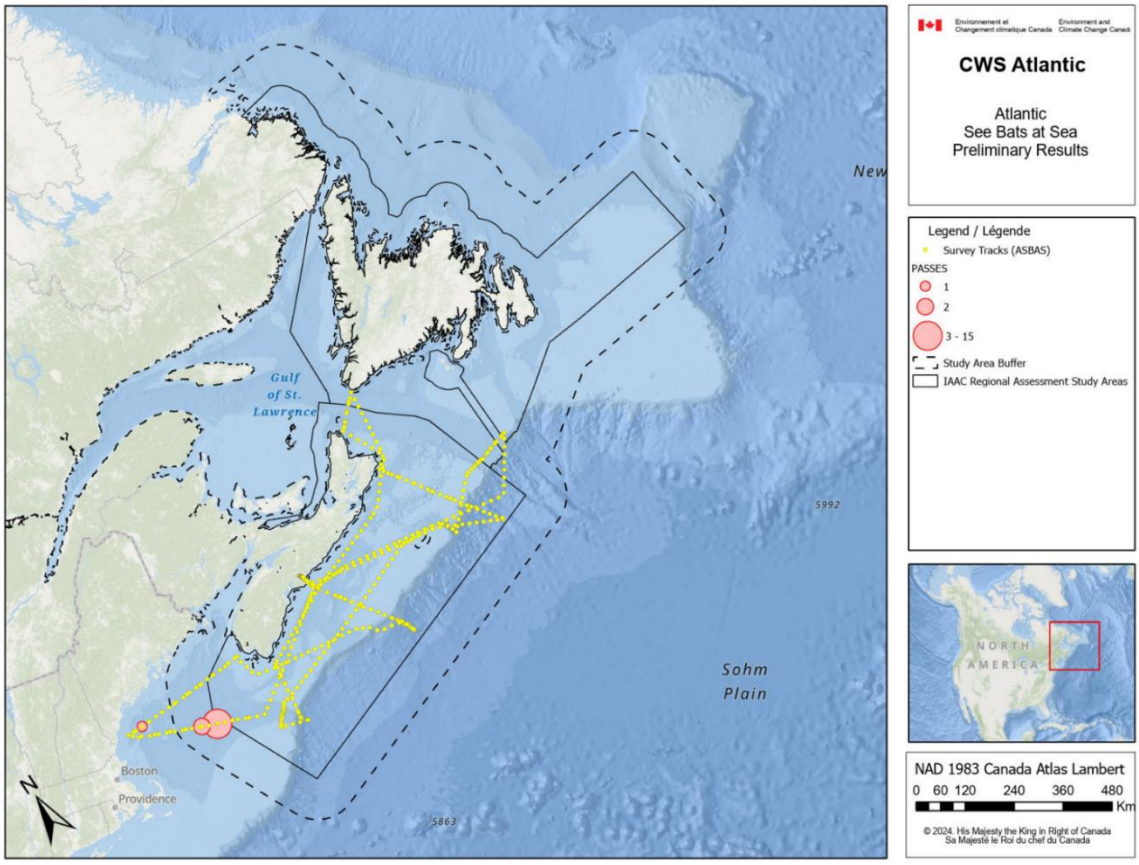

Figure 3: Vessel survey tracks with locations of detected bat calls.

Additional Information

A United States Geological Survey (USGS) study with Eastern Red Bats (using the Motus Wildlife Tracking System) along the United States east coast shows that migration along the Atlantic Coastal Plains, specifically concentrated to southern New Jersey and the Delmarva Peninsula of Delaware, Maryland, and Virginia, occurred between August and October, with peak over-water flights occurring late-August to early-September (True et al., 2023). It is possible that these results might vary for the Atlantic region, however, research is required to explore seasonal trends for over-water flights in this region.

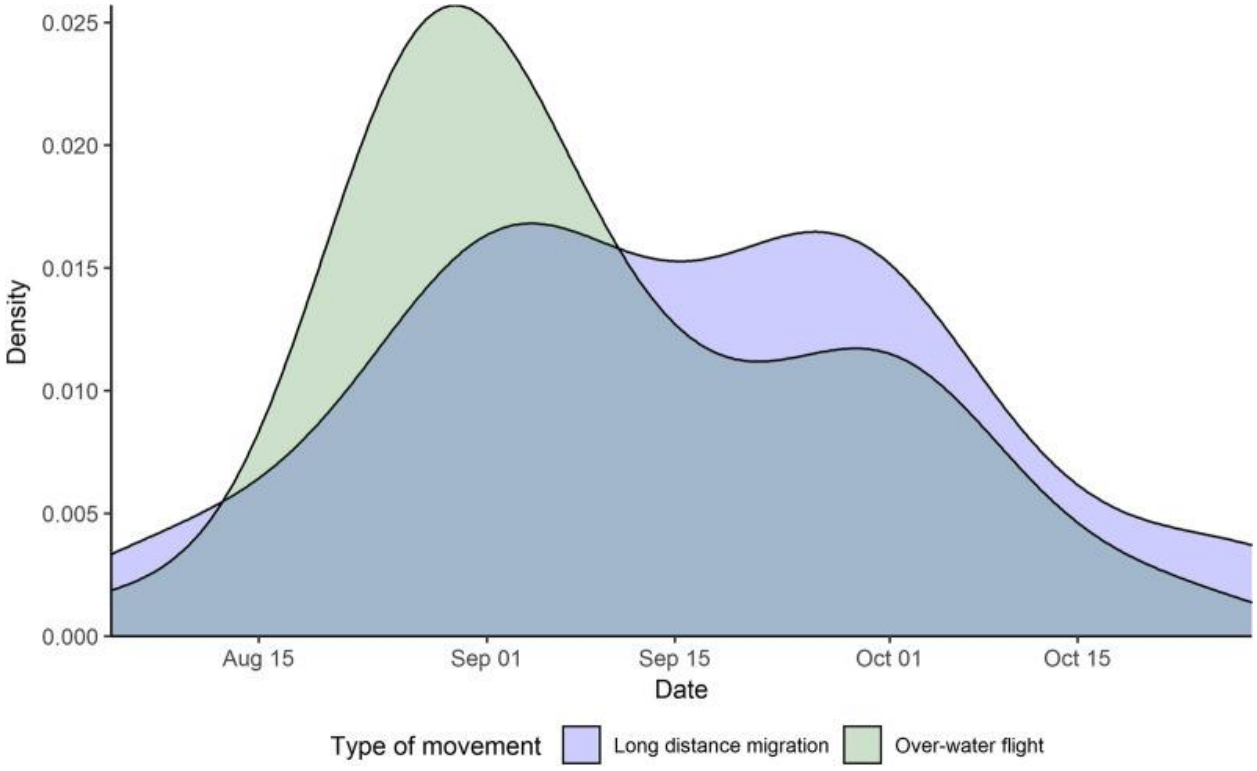

Figure 4: [Taken from True et al., 2023] The density of long-distance migration events (blue curve) and over-water flights (green curve) and as they relate to time of the year from Motus telemetry data on eastern red bats (Lasiurus borealis) in the mid-Atlantic Coastal Plain in falls of 2019 and 2021. Over-water forays distinctly peaked in late August to early September while long distance migration events were sustained from late August to early October. Note that tagging events were not evenly distributed throughout this period.

Timing of offshore movements by migratory tree bats in Canada is likely different than that reported by True et al., 2023. However, there is not enough information to support that assumption. For comparison, the coastal, coastal island, and offshore bat observations provided to the Committees were summarized by month of detection (Figure 5). Many of these observations are from the post-breeding migration period.

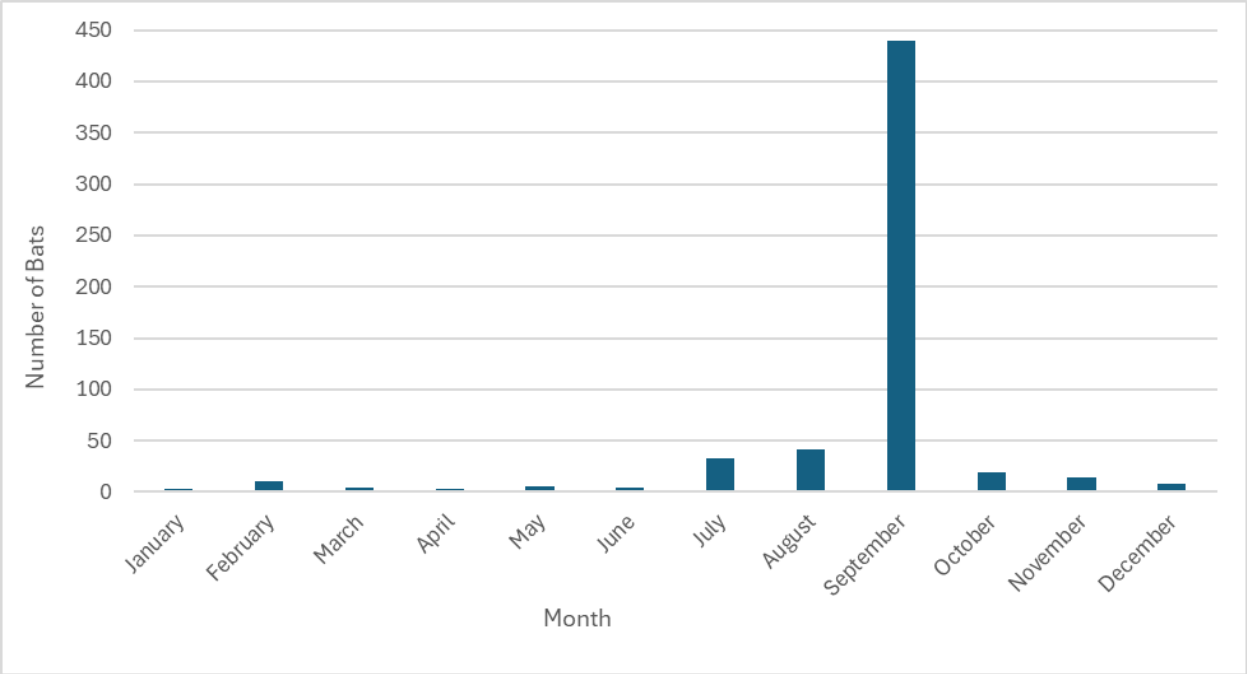

Figure 5: Timing of coastal, coastal island, and offshore bat observations, as displayed in Figure 1 for dated observations.

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True, M.C., Gorman, K.M., Taylor, H., Reynolds, R.J. and Ford, W.M., 2023. Fall migration, oceanic movement, and site residency patterns of eastern red bats (Lasiurus borealis) on the mid-Atlantic Coast. *Movement Ecology*, *11*(1), p.35.