

Marine Record

Cite this article: Lavallin E, Øien N, Sears R (2023). A fluke encounter: first record of the blue whale (*Balaenoptera musculus*) within the central North Sea, United Kingdom. *Journal of the Marine Biological Association of the United Kingdom* **103**, e64, 1–6. <https://doi.org/10.1017/S0025315423000516>

Received: 27 May 2022
Revised: 21 June 2023
Accepted: 29 June 2023


Keywords:

Balaenoptera musculus; blue whale;
distribution; migration; northeast Atlantic;
North Sea

Corresponding author:

Edward Lavallin;
Email: edward.lavallin@outlook.com

A fluke encounter: first record of the blue whale (*Balaenoptera musculus*) within the central North Sea, United Kingdom

Edward Lavallin¹ , Nils Øien² and Richard Sears³

¹Poseidon Scientific Services, 24 Main Street, Empingham, Rutland LE15 8PS, UK; ²Institute of Marine Research, Nordnes, PO Box 1870, 5817 Bergen, Norway and ³Mingan Island Cetacean Study (MICS), 285 Green, St. Lambert, QC J4P 1T3, Canada

Abstract

Despite holding the accolade as the largest animal ever to live on planet earth and ubiquitously inhabiting the world's major oceans, an acute paucity of information surrounds the geographical distribution and migration phenology of the endangered blue whale (*Balaenoptera musculus*) in the northeast Atlantic. Current migration and distribution information derived from robust scientific studies is required to ensure the formulation and implementation of successful conservation measures with a vision to support the ongoing recovery of the northeast Atlantic population. At 10:21 (UTC) on the 9th of November 2020, two blue whales were observed at position 55°13.99'N, 01°13.62'W, 18 km off the coast of the UK in the central North Sea just north of Newcastle at a water depth of 76 m. This is the first paper that has confirmed an account of live blue whales frequenting shallow waters of the central North Sea and represents a new area of occurrence within the accepted range of the northeast Atlantic population, an area in which sightings are extremely rare and may provide insight into the intricacies of migration routes and behaviour.

Introduction

Understanding the geographical distribution and migration patterns of blue whale (*Balaenoptera musculus*) (Linnaeus, 1758) populations is an essential prerequisite for the formulation and implementation of effective conservation measures within the northeast Atlantic. Despite historical exploitation as a result of commercial whaling between the late 19th and mid-20th centuries (Brown, 1976; Tønnessen and Johnsen, 1982), the blue whale remains a cosmopolitan species ubiquitous throughout the world's major oceans (Yochem, 1985).

Four distinct subspecies are currently recognized (committee on Taxonomy, 2021) which generally conform to populations with defined geographical distributions: *B. m. musculus* in the North Atlantic (Pike *et al.*, 2009) and North Pacific (Calambokidis *et al.*, 2009); *B. m. intermedia* in the Southern Ocean surrounding Antarctica (Attard *et al.*, 2016) and South Atlantic (Thomisch, 2017); *B. m. brevicauda* in the southern Indian Ocean, subantarctic zone and southwestern Pacific Ocean (Ichihara, 1966) and *B. m. indica* in the northern Indian Ocean from the Bay of Bengal west to the Gulf of Aden (Charles *et al.*, 2012).

The North Atlantic population was long thought to comprise two separate putative populations divided between the East and West Atlantic (Ingebrigtsen, 1929; Gambell, 1976; Best, 1993); however, more recently photo identification studies (Sears *et al.*, 2015), satellite tracking (Heide-Jørgensen *et al.*, 2001) and passive acoustic monitoring investigations (Clark, 1994) indicated some degree of mixing, more reminiscent of a single panmictic population roaming the entire North Atlantic basin as originally suggested by Thompson (1928).

The distribution of blue whales in the northeast Atlantic appears to range from The Gambia south of Cape Verde (Djiba *et al.*, 2015) northwards to Svalbard, only limited by the extent of the pack ice (Ingebrigtsen, 1929; Leonard and Øien, 2020). Whilst migration routes remain poorly understood, the North East Atlantic population generally adheres to an annual northward migration to productive feeding areas in the summer and then return via similar routes southwards to calving and mating grounds in sub-tropics during winter (Jonsgård, 1966; Christensen *et al.*, 1992; Reeves *et al.*, 2004).

Pre-exploitation population estimates within the North Atlantic remain ambiguous (Reeves *et al.*, 1998). Gambell (1976) suggested that the population comprised between 1100 and 1500 individuals; however, estimates by Rørvik and Jonsgård (1978) and more recently by Aguilar and Borrell (2022) implied abundance was far higher numbering *ca.* 12,500 and 15,000–20,000, respectively. As a result of commercial whaling between the 1860s and 1960s, the same population was estimated to have decreased to approximately 100 individuals (Gambell, 1976) constituting only 0.5–9.1% of their potential historic abundance.

North Atlantic catch records compiled by the International Whaling Commission (IWC) indicate that *ca.* 11,000 blue whales were taken as a result of commercial whaling between 1868 and 1978 (Branch *et al.*, 2008; Allison, 2017). When taking into account an additional 13,000 individuals that were classified as unidentified large whales (Allison, 2017) and the



high percentage of 'struck and lost' records (Tønnessen and Johnsen, 1982), it is likely that blue whale mortality rates were in fact much greater between 15,000 and 20,000 (Cooke, 2018).

Under the auspices of the IWC, North Atlantic blue whales were afforded protection in 1955, which was later extended to Antarctica in 1965 and to the North Pacific in 1966 (Best, 1993). In direct contradiction to the IWC's moratorium in 1955, Iceland refused to conform until 1960 (Tønnessen and Johnsen, 1982). The North Atlantic population is now classified as endangered by the International Union for Conservation of Nature (IUCN) Red List of Threatened Species and is protected under Appendix I of the Convention on International Trade in Endangered Species (CITES) of Wild Fauna and Flora and the Convention on the Conservation of Migratory Species of Wild Animals (CMS) (Oliver, 2018).

Since the abolition of commercial exploitation in 1966, the northeast Atlantic blue whale population has slowly begun to recover at a rate of *ca.* 5% per year (Sigurjónsson and Gunnlaugsson, 1990; Pike *et al.*, 2009). Abundance estimates remain tenuous; however, Pike *et al.* (2019) suggested that *ca.* 3000 individuals were present in the North Atlantic in 2015 which would constitute between 15 and 20% of the potential pre-exploitation abundance as presented by Aguilar and Borrell (2022).

Sustained multilateral conservation efforts underpinned by international legislation guided principally by up-to-date and robust scientific studies are required to ensure the northeast Atlantic blue whale population continues to recover. This study raises questions surrounding our current understanding of distribution and migration phenology of the blue whale in the North East Atlantic by documenting the first live sighting in the central North Sea, a new area of occurrence for the species.

Materials and methods

Dedicated visual observations specifically targeting marine mammals were conducted as part of a wider benthic habitat assessment and environmental baseline survey being undertaken aboard the research vessel *Fugro Venturer* during the survey period 25th October to 16th December 2020.

Visual observations were undertaken by a single dedicated marine mammal observer (MMO) from the vessel's bridge during hours of daylight.

The primary observation technique adopted by MMOs was to scan the area 360° around the vessel with the naked eye inspecting any areas of interest using 7×50 mm Helios marine reticle binoculars. Visual cues indicative of marine mammal presence included blow spray, surface disturbance, irregular white water, bird activity, dark or light shapes below the surface and of course visible surface behaviour. When possible, sighting photographs were captured using a Nikon D750 DSLR camera and Nikkor 200–500 mm telephoto zoom lens. Area coverage was non-systematic and dependent on vessel movements throughout the survey.

Results

At 10:21 (UTC) on the 9th of November 2020, two blue whales were observed at position 55°13.99'N, 01°13.62'W, 18 km off the east coast of the UK in the central North Sea just north of Newcastle at a water depth of 76 m (BSL) (Figure 1).

The pair were initially sighted at a range of 1750 m crossing perpendicular to the bow of the vessel at a bearing of 340° to true north heading towards the coast due west at 270°. As the vessel was travelling at 3.1 knots on a bearing of 350° proximity to the whales decreased to a closest distance of 1000 m before moving away and eventually out of sight of the vessel at 10:54 (UTC).

The encounter lasted a total duration of 33 min with both individuals surfacing four to six times before diving for 3–5 min. Upon surfacing the rostrum, splashguard and shoulders initially broke the surface immediately followed by a tall columnar blow *ca.* 6–8 m, the body then rose exposing vast flanks after which the blow hole disappeared beneath the surface initiating a long slow roll eventually revealing the dorsal fin before sinking gracefully below the surface. The caudal peduncle was raised high out of the water immediately prior to long dives, however, at no point were the tail flukes observed above the surface.

Prevailing weather conditions were not particularly conducive to visual observations with advection fog reducing visibility to *ca.* 3 km; swell was low (<2 m); sea state slight (no or few white caps) and wind force ranged from Beaufort force three to four.

Despite unfavourable weather conditions, key diagnostic features were clearly visible as the two individuals transited across the bow of the vessel. Both individuals were *ca.* 20–25 m in length and presented the following key diagnostic features: diminutive falcate dorsal fin located close to posterior; extremely robust caudal peduncle; mottled blue to grey dorsal surface and flanks; tall columnar blow *ca.* 6–8 m high; proportionately long U-shaped rostrum with single rostral ridge and heavily pronounced splash guard (Figure 2).

Whilst no feeding behaviour was observed at the surface, numerous benthic trawl fishing vessels were present in close proximity to the sighting location in much higher concentration than observed on previous days. At the time of the sighting the vessel's Hugin 1000 autonomous underwater vehicle (AUV) also picked up a high-density target on the integrated obstacle avoidance sonar and when returned to deck numerous northern krill (*Meganyctiphanes norvegica*) (Sars, 1857) were found trapped within the AUV housing.

Sighting photographs were sent to Richard Sears at the Mingan Island Cetacean Study for further analysis; however, we were unable to match either individual to the North Atlantic blue whale database (R. Sears, pers. comm., 24th November 2020).

Discussion

To draw conclusions from a single-opportunistic sighting is not only challenging but exceeds the capacity of this paper. We can, however, discuss the potential significance of this particular observation in light of current literature highlighting areas requiring further research to aid ongoing conservation efforts.

Distribution in the northeast Atlantic

Blue whale distribution in the northeast Atlantic appears to range from Svalbard in the Arctic (Leonard and Øien, 2020) southwards to the sub-tropics of The Gambia south of Cape Verde (Djiba *et al.*, 2015). Blue whales have been documented historically in landing records from UK whaling stations based in the Hebrides and Shetland Islands on the west coast of Scotland (Brown, 1976). Strandings have also been recorded along the west coast of Scotland, notably on the Isle of Colonsay in 1916 as well as the Isle of Eigg and Isle of Lewis both in 1920 (Coombs *et al.*, 2018). Stranding records from the adjacent North Sea are particularly scarce, comprising single events from Belgium in 1827, Holland in 1840 (Smeenk and Camphuysen, 2016), Germany in 1881 (Möbius, 1885) as well as two accounts from Denmark in 1907 and 1931 (Kinze, 2007). Strandings on the northeast coast of the UK are limited to a single record from Staxigoe in 1923 (Coombs *et al.*, 2018) *ca.* 375 km north of the sighting on the 9th of November 2020.

Whilst the North Sea is known to accommodate three mysticete species, comprising *Balaenoptera acutorostrata* (Lacépède,

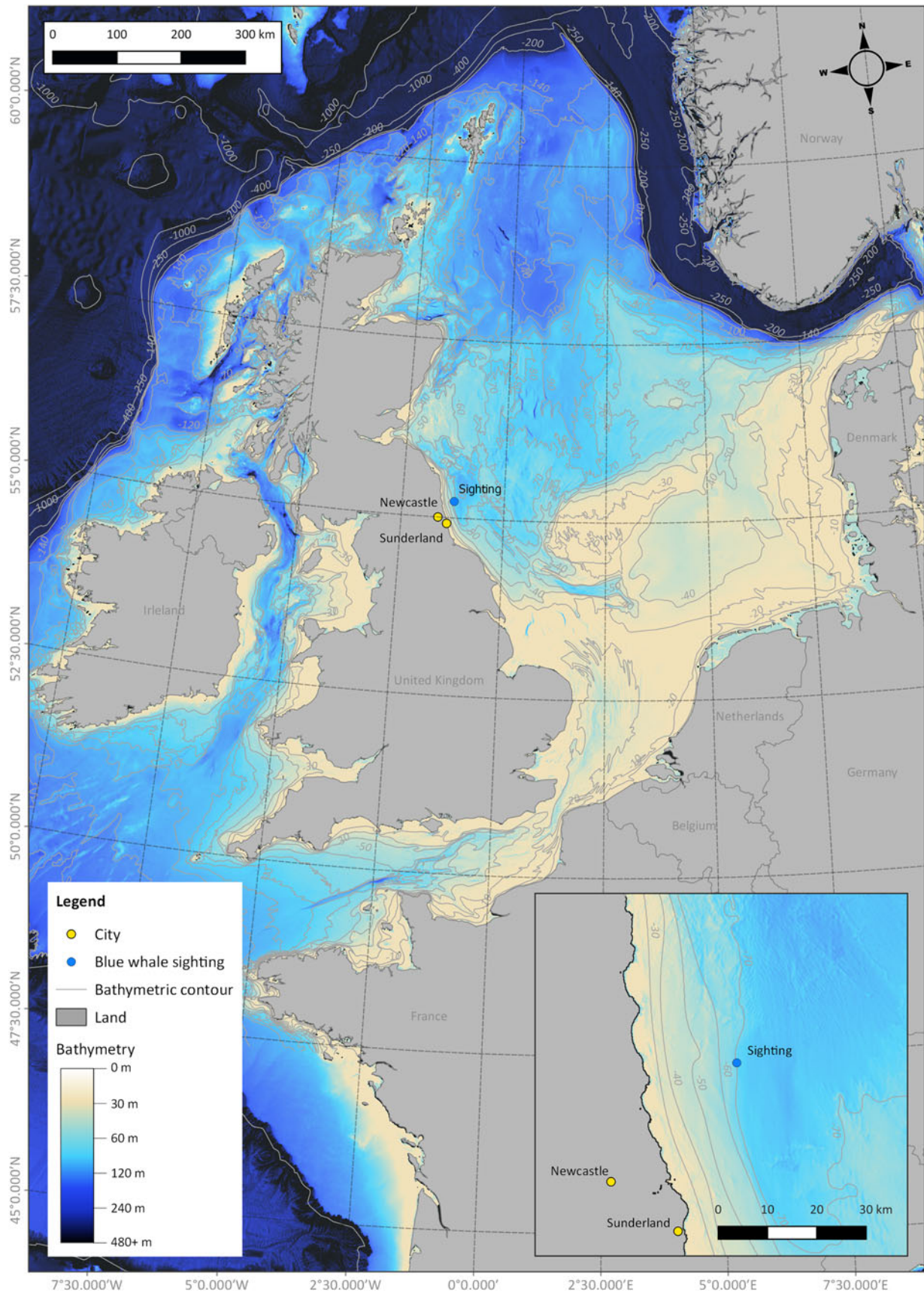


Figure 1. Map highlighting the sighting location of two blue whales (*B. musculus*) 18 km off the east coast of the UK in water depth of 76 m relative to bathymetry and land.

1804), *B. physalus* (Linnaeus, 1758) and *Megaptera novaeangliae* (Borowski, 1781) (Hammond *et al.*, 2017; Leopold *et al.*, 2018; Leonard and Øien, 2020), its' relatively shallow waters are not

considered to provide acceptable habitat for *B. musculus*, which generally frequent deeper water off the continental shelf (Sears *et al.*, 1987; Vikingsson *et al.*, 2015). Three separate large-scale

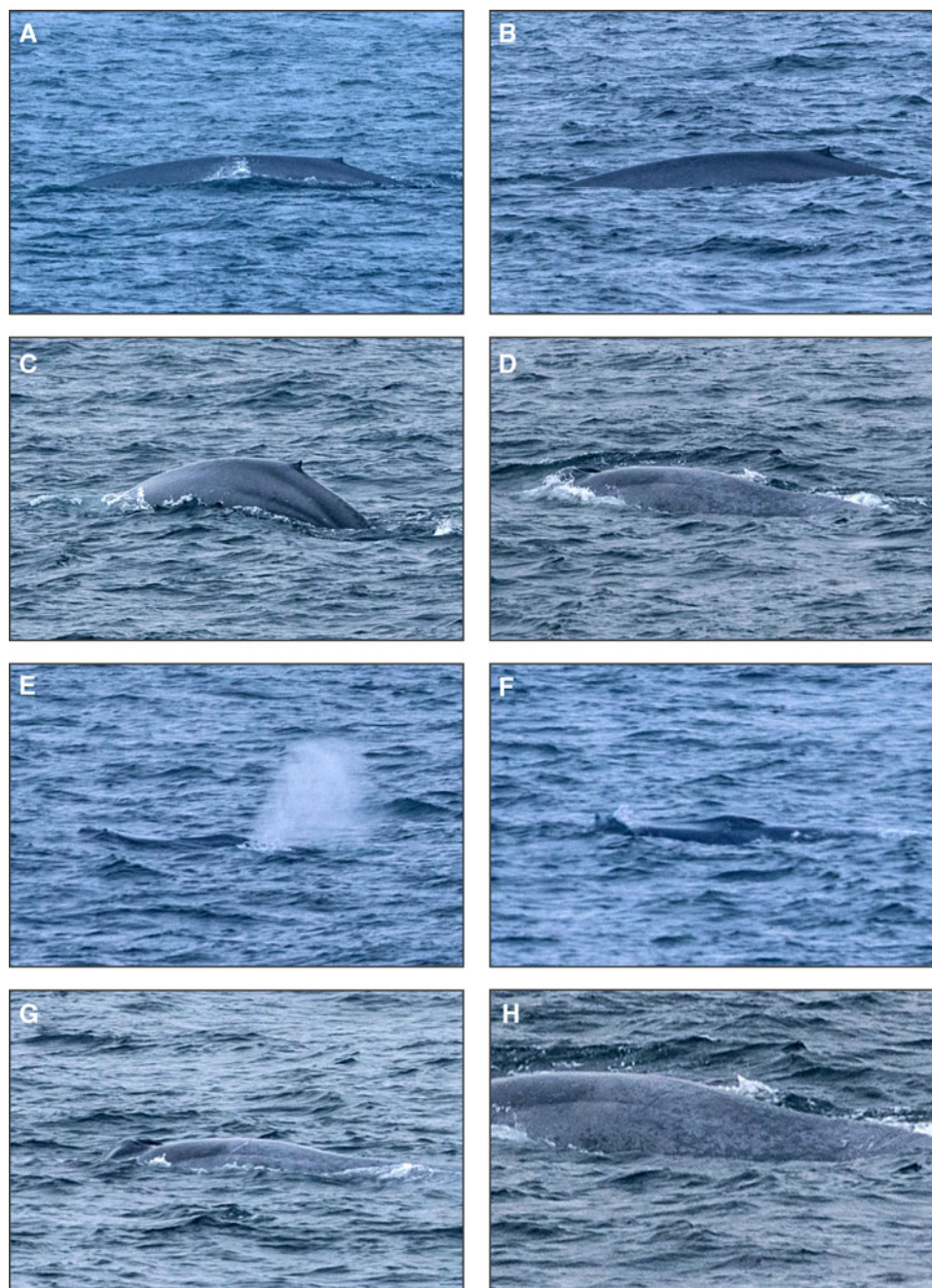


Figure 2. (A) Images of a blue whale (*B. musculus*) photographed on the 9th of November 2020 using a Nikon D750 DSLR camera and Nikkor 200–500 mm telephoto zoom lens (© Edward Lavallin, 2020). Key diagnostic features include: (B) diminutive falcate dorsal fin located close to the posterior; (C) extremely robust caudal peduncle raised out of the water prior to longer dive; (D) mottled blue grey colouration on dorsal surface and flanks; (E) tall columnar blow ca. 6–8 m high (bushy and dispersed by wind in this image); (F) proportionately long U-shaped rostrum with single rostral ridge; (G, H) heavily pronounced splash guard.

monitoring surveys titled Small Cetaceans in European Atlantic waters and the North Sea (SCANS, SCANS II and SCANS III) were conducted in 1994 (Hammond *et al.*, 2002), 2005 (Hammond *et al.*, 2013) and 2016 (Hammond *et al.*, 2017), respectively. Whilst other large rorquals were recorded, at no point were *B. musculus* encountered within the North Sea (Hammond *et al.*, 2017). Comparable large-scale shipboard cetacean surveys conducted by Leonard and Øien (2020) in the North Sea and greater northeast Atlantic between 2014 and 2018 also failed to record the *B. musculus* in the North Sea.

To the best of our knowledge, this record is the only confirmed account of live blue whale presence in shallow coastal waters of the central North Sea and highlights a new area of occurrence within the accepted range of the northeast Atlantic population,

an area in which sightings of this poorly understood and endangered species are extremely rare.

Migration routes in the northeast Atlantic

The northeast Atlantic blue whale population appears to conform to a general pattern of migration in which summers are spent feeding at high latitudes as far north as the Fram Strait west of Svalbard, followed by migration southwards through the Norwegian Sea, Faroe-Shetland channel and west of Ireland towards lower latitudes around the Azores and Mauritania in winter (Christensen *et al.*, 1992; Reeves *et al.*, 2004; Visser *et al.*, 2011; Baines and Reichelt, 2014; Leonard and Øien, 2020; Pérez-Jorge *et al.*, 2020). Historically, southward migration from summer

feeding grounds was thought to begin in September (Ingebrigtsen, 1929). Recent passive acoustic monitoring studies conducted by Charif and Clark (2009) indicate peak abundance north and west of the UK occur between November and December; therefore, the two individuals observed on the 9th of November generally conform to accepted migration phenology. Their presence within the central North Sea, however, indicates significant migration route deviation and supports suggestions of migration plasticity as documented by Szesciorka *et al.* (2020).

Research is only just beginning to elucidate the drivers and environmental cues associated with blue whale migration behaviour and relatively little is known about the spatiotemporal intricacies of routes taken (Oliver, 2018; Szesciorka *et al.*, 2020). This is particularly pertinent in the northeast Atlantic (Pike *et al.*, 2009) an area which would benefit from increased research effort.

Prey presence and influence on migration

North Atlantic blue whales are stenophagous, feeding almost exclusively on zooplankton predominantly comprised of northern and arctic krill (*M. norvegica* and *Thysanoessa raschii* (Sars, 1868) respectively) in the summer months (Sears *et al.*, 1987; Pauly *et al.*, 1998) and generally avoid feeding behaviour in favour of fasting whilst overwintering (Corkeron and Connor, 1999), a concept collectively referred to as the 'feast and famine' hypothesis.

More recently, however, research conducted by Silva *et al.* (2013) highlighted that some blue whales exhibit opportunistic feeding behaviour deviating from migration pathways to spend time in areas of high localised productivity as observed in other rorquals including Southern Hemisphere humpback whales (*M. novaeangliae*) (Gales *et al.*, 2009; Silva *et al.*, 2011; Zerbini *et al.*, 2011). Whilst feeding behaviour was not observed during the sighting, dense concentrations of northern krill detected on the AUV obstacle avoidance sonar, combined with increased fishing vessel presence, was indicative of high localised productivity. Whilst anecdotal, prey presence and the potential for opportunistic feeding behaviour may partially explain why two blue whales were observed in an area considered outside their usually accepted range. Tagging and satellite-tracking studies, such as those conducted by Silva *et al.* (2013) and Pérez-Jorge *et al.* (2020) in the Azores, focusing on the northernmost extent of blue whale range in the northeast Atlantic would provide much needed insight into the intricacies of southward migration routes and behaviours aiding ongoing conservation efforts.

Conclusion

It is difficult to draw conclusions from a single 'fluke' encounter obtained under opportunistic circumstances; however, to the best of our knowledge, this paper is the only confirmed account of live blue whales in the central North Sea and signifies a new area of occurrence, extending the accepted range of the northeast Atlantic population.

The record supports suggestions that blue whale migration routes and timings express a certain degree of plasticity with some individuals potentially deviating from suggested migration routes to take advantage of localised areas of high productivity through opportunistic feeding behaviour.

Industry-focused surveys which incorporate dedicated cetacean monitoring offer an opportunistic platform for research mitigating the usually high costs associated with offshore cetacean surveys, however, inherent operational constraints can detract from the overall merit of findings.

Dedicated satellite tracking and genetic sequencing studies focusing on the northernmost extent of blue whale range in the northeast Atlantic are required to address paucity in information

surrounding migration spatiotemporal dynamics and behaviour to assess implications on conservation efforts.

Only through peer-reviewed scientific publications derived from robust scientific studies can policy makers formulate and implement effective conservation legislation to ensure the continued recovery of a still heavily depleted blue whale population in the northeast Atlantic.

Acknowledgements. We would like to extend our gratitude to the crew of the research vessel *Fugro Venturer* for their company and hospitality during our time aboard the vessel. We would also like to thank Fugro for allowing the sighting and associated findings to be published.

Author's contribution. Edward Lavallin conducted all field work and prepared the manuscript. Nils Øien assisted in verifying the sighting. Richard Sears conducted photographic identification and evaluation against the North Atlantic blue whale database. Both Richard and Nils provided expert insight and advice contributing significantly to the final publication. All authors reviewed and approved the final manuscript prior to publication.

Financial support. This research received no specific grant from any funding agency, commercial or not-for-profit sectors.

Competing interests. None.

References

- Aguilar A and Borrell A (2022) Unreported catches, impact of whaling and current status of blue whales in the South European Atlantic Shelf. *Scientific Reports* **12**, 1–12.
- Allison C (2017) International Whaling Commission Catch Database v. 6.1.
- Attard CR, Beheregaray LB and Möller LM (2016) Towards population-level conservation in the critically endangered Antarctic blue whale: the number and distribution of their populations. *Scientific Reports* **6**, 22291.
- Baines ME and Reichelt M (2014) Upwellings, canyons and whales: an important winter habitat for balaenopterid whales off Mauritania, north-west Africa. *Journal Cetacean Research Management* **14**, 57–67.
- Best PB (1993) Increase rates in severely depleted stocks of baleen whales. *ICES Journal of Marine Science* **50**, 169–186.
- Branch T, Allison C, Mikhalev Y, Tormosov D and Brownell R Jr (2008) Historical catch series for Antarctic and pygmy blue whales. Report to the Scientific Committee of the International Whaling Commission, 135.
- Brown SG (1976) Modern whaling in Britain and the north-east Atlantic Ocean. *Mammal Review* **6**, 25–36.
- Calambokidis J, Barlow J, Ford JK, Chandler TE and Douglas AB (2009) Insights into the population structure of blue whales in the Eastern North Pacific from recent sightings and photographic identification. *Marine Mammal Science* **25**, 816–832.
- Charif RA and Clark CW (2009) *Acoustic Monitoring of Large Whales in Deep Waters North and West of the British Isles: 1996–2005*. Ithaca, NY, USA: Cornell University.
- Charles A, Branch TA, Alagiyawadu A, Baldwin R and Marsac F (2012) Seasonal distribution, movements and taxonomic status of blue whales (*Balaenoptera musculus*) in the northern Indian Ocean. *Journal of Cetacean Resources and Management* **12**, 203–218.
- Christensen I, Haug T and Øien N (1992) Seasonal distribution, exploitation and present abundance of stocks of large baleen whales (Mysticeti) and sperm whales (*Physeter macrocephalus*) in Norwegian and adjacent waters. *ICES Journal of Marine Science* **49**, 341–355.
- Clark CW (1994) Blue deep voices: insights from the Navy's Whales '93 program. *Whalewatcher* **28**, 6–11.
- Cooke JG (2018) *Balaenoptera musculus* (errata version published in 2019). vol. 2020: The IUCN Red List of Threatened Species 2018.
- Coombs E, Sabin R, Cooper N, Allan L, Smith B and Lyal R (2018) Dataset: historical UK cetacean strandings dataset (1913–1989). In Museum NH (ed.). <https://data.nhm.ac.uk/dataset/historical-uk-cetacean-strandings-dataset>
- Corkeron PJ and Connor RC (1999) Why do baleen whales migrate? *Marine Mammal Science* **15**, 1228–1245.
- Djiba A, Bamy I, Samba Ould Bilal A and Van Waerebeek K (2015) Biodiversity of cetaceans in coastal waters of Northwest Africa: new insights through platform-of-opportunity visual surveying in 2011–2013.

- Intergovernmental Oceanographic Commission (IOC) Technical Series* 115, 283–297.
- Gales N, Double MC, Robinson S, Jenner C, Jenner M, King E, Gedamke J, Paton D and Raymond B** (2009) Satellite tracking of southbound East Australian humpback whales (*Megaptera novaeangliae*): challenging the feast or famine model for migrating whales. No. SC61/SH17.
- Gambell R** (1976) World whale stocks. *Mammal Review* 6, 41–53.
- Hammond P, Berggren P, Benke H, Borchers D, Collet A, Heide-Jørgensen M, Heimlich S, Hiby A, Leopold MF and Øien N** (2002) Abundance of harbour porpoise and other cetaceans in the North Sea and adjacent waters. *Journal of Applied Ecology* 39, 361–376.
- Hammond P, Lacey C, Gilles A, Viquerat S, Börjesson P, Herr H, Macleod K, Ridoux V, Santos M and Scheidat M** (2017) Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys. *Wageningen Marine Research*. <https://library.wur.nl/WebQuery/wurpubs/fulltext/414756>
- Hammond PS, Macleod K, Berggren P, Borchers DL, Burt L, Cañadas A, Desportes G, Donovan GP, Gilles A and Gillespie D** (2013) Cetacean abundance and distribution in European Atlantic shelf waters to inform conservation and management. *Biological Conservation* 164, 107–122.
- Heide-Jørgensen MP, Kleivane L, Øien N, Laidre KL and Jensen MV** (2001) A new technique for deploying satellite transmitters on baleen whales: tracking a blue whale (*Balaenoptera musculus*) in the North Atlantic. *Marine Mammal Science* 17, 949–954.
- Ichihara T** (1966) The pygmy blue whale, *Balaenoptera musculus brevicauda*, a new subspecies from the Antarctic. In Norris K (ed.) *Whales, Dolphins and Porpoises*. London, England: University of California Press, pp. 79–111.
- Ingebrigtsen A** (1929) Whales caught in the North Atlantic and other seas. *Conseil Permanent International pour l'Exploration de la Mer. Rapports et Proces-Verbaux des Reunions* 56, 123–135.
- Jongård Å** (1966) The distribution of Balaenopteridae in the north Atlantic Ocean. In Norris K (ed.) *Whales, Dolphins and Porpoises*. London, England: University of California Press, pp. 114–124.
- Kinze CC** (2007) Blåhval. In Baagøe HJ and Jensen TS (eds), *Dansk Pattedyr*. Atlas. Gyldendal A/S, pp. 306–307.
- Leonard DM and Øien NI** (2020) *Estimated Abundances of Cetacean Species in the Northeast Atlantic from Two Multiyear Surveys Conducted by Norwegian Vessels between 2002–2013*. Forskningsparken Sykehusvegen, Tromsø: NAMMCO Scientific Publications.
- Leopold MF, Rotshuizen E and Evans PG** (2018) From nought to 100 in no time: how humpback whales (*Megaptera novaeangliae*) came into the southern North Sea. *Lutra* 61, 165–188.
- Möbius K** (1885) Über einen bei Sylt gestrandeten Blauwal (*Balaenoptera sibaldii* J.E. Gray). *Schriften des Naturwissenschaftlichen Vereins für Schleswig – Holstein*, 6, 57–60.
- Oliver CW** (2018) Recovery Plan for the Blue Whale (*Balaenoptera musculus*). National Oceanic and Atmospheric Administration (NOAA).
- Pauly D, Trites A, Capuli E and Christensen V** (1998) Diet composition and trophic levels of marine mammals. *ICES Journal of Marine Science* 55, 467–481.
- Pérez-Jorge S, Tobeña M, Prieto R, Vandeperre F, Calmettes B, Lehodey P and Silva MA** (2020) Environmental drivers of large-scale movements of baleen whales in the mid-North Atlantic Ocean. *Diversity and Distributions* 26, 683–698.
- Pike DG, Gunnlaugsson T, Mikkelsen B, Halldórsson SD and Víkingsson G** (2019) *Estimates of the abundance of cetaceans in the Central North Atlantic based on the NASS Icelandic and Faroese shipboard surveys conducted in 2015*. Forskningsparken Sykehusvegen, Tromsø: NAMMCO Scientific Publications, p. 11.
- Pike DG, Víkingsson GA, Gunnlaugsson T and Øien N** (2009) *A note on the distribution and abundance of blue whales (Balaenoptera musculus) in the Central and Northeast North Atlantic*. NAMMCO Scientific Publications, vol. 7, pp. 19–29.
- Reeves RR, Clapham P, Brownell RL and Silber GK** (1998) Recovery Plan for the Blue Whale (*Balaenoptera musculus*). Silver Spring, MD: National Oceanic and Atmospheric Administration (NOAA).
- Reeves RR, Smith TD, Josephson EA, Clapham PJ and Woolmer G** (2004) Historical observations of humpback and blue whales in the North Atlantic Ocean: clues to migratory routes and possibly additional feeding grounds. *Marine Mammal Science* 20, 774–786.
- Rorvik C and Jongård Å** (1978) Review of balaenopterids in the North Atlantic Ocean. *Mammals in the Seas: Report* 3, 269.
- Sears R, Víkingsson G, Santos R, Steiner L, Silva M and Ramp C** (2015) Comparison of northwest Atlantic (NWA) and northeast Atlantic (NEA) blue whale (*Balaenoptera musculus*) photo-identification catalogues. Proceedings of the 21st Biennial Conference on the Biology of Marine Mammals, pp. 13–18.
- Sears R, Wenzel FW and Williamson JM** (1987) The blue whale: a catalogue of individuals from the western North Atlantic, Gulf of St. Lawrence: Mingan Island Cetacean Study=Station de recherche des îles Mingan.
- Sigurjónsson J and Gunnlaugsson T** (1990) Recent trends in abundance of blue (*Balaenoptera musculus*) and humpback whales (*Megaptera novaeangliae*) off west and southwest Iceland, with a note on occurrence of other cetacean species. Report to the Scientific Committee of the International Whaling Commission, 40, 51.
- Silva I, Kaufman G, Hutsel A, Macie A, Maldini D and Rankin R** (2011) Mid-migration humpback whale feeding behavior off Eden, NSW, Australia. Proceedings of the 63rd Meeting of the Scientific Committee of the International Whaling Commission. Tromsø: International Whaling Commission, pp. 1–19.
- Silva MA, Prieto R, Jonsen I, Baumgartner MF and Santos RS** (2013) North Atlantic blue and fin whales suspend their spring migration to forage in middle latitudes: building up energy reserves for the journey? *PLoS ONE* 8, e76507.
- Smeenk C and Camphuysen C** (2016) Blauwe vinvis *Balaenoptera musculus*. In Broekhuizen S, Spoelstra K, Thissen JBM, Canters KJ and Buys JC (eds). *Atlas van de Nederlandse Zoogdieren*. Leiden: Naturalis Biodiversity Center, pp. 310–311.
- Szesciorka AR, Ballance LT, Širović A, Rice A, Ohman MD, Hildebrand JA and Franks PJ** (2020) Timing is everything: drivers of interannual variability in blue whale migration. *Scientific Reports* 10, 1–9.
- Taxonomy CO** (2021) List of marine mammal species and subspecies. Society for Marine Mammalogy.
- Thomisch K** (2017) Distribution patterns and migratory behavior of Antarctic blue whales. *Berichte zur Polar- und Meeresforschung=Reports on Polar and Marine Research* 707. https://epic.awi.de/id/eprint/44405/1/BzPM_0707_2017.pdf
- Thompson D** (1928) On whales landed at the Scottish whaling stations during the years 1908–1914 and 1920–1927. *Fishery Board for Scotland, Scientific Investigations* 3, 1–40.
- Tonnessen JN and Johnsen AO** (1982) *The History of Modern Whaling*. London: University of California Press.
- Visser F, Hartman KL, Pierce GJ, Valavanis VD and Huisman J** (2011) Timing of migratory baleen whales at the Azores in relation to the North Atlantic spring bloom. *Marine Ecology Progress Series* 440, 267–279.
- Víkingsson GA, Pike DG, Valdimarsson H, Schleimer A, Gunnlaugsson T, Silva T, Elvarsson BP, Mikkelsen B, Øien N and Desportes G** (2015) Distribution, abundance, and feeding ecology of baleen whales in Icelandic waters: have recent environmental changes had an effect? *Frontiers in Ecology and Evolution* 3, 6.
- Yochem P** (1985) Blue whale, *Balaenoptera musculus* (Linnaeus, 1758). In *Handbook of Marine Mammals*, vol. 3. The Sirenians and Baleen Whales.
- Zerbini A, Andriolo A, Danilewicz D, Heide-Jørgensen M, Gales N and Clapham P** (2011) An update on research on migratory routes and feeding destinations of southwest Atlantic humpback whales. Proceedings of the 63rd Meeting of the Scientific Committee of the International Whaling Commission. Tromsø: International Whaling Commission, pp. 1–7.