JNCC Report 734

Review of Management Unit boundaries for cetaceans in UK waters (2023)

IAMMWG

March 2023
(Revised May 2023)

ISSN 0963 8091

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This report should be cited as:
IAMMWG. 2023. Review of Management Unit boundaries for cetaceans in UK waters (2023). JNCC Report 734, JNCC, Peterborough, ISSN 0963-8091.
https://hub.jncc.gov.uk/assets/b48b8332-349f-4358-b080-b4506384f4f7

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Summary

The Inter-Agency Marine Mammal Working Group (IAMMWG) comprises representatives of the UK Statutory Nature Conservation Bodies (SNCBs) from, Natural England (NE), NatureScot (previously known as Scottish Natural Heritage), Natural Resources Wales (NRW), the Department of Agriculture, Environment and Rural Affairs (DAERA, previously Department of Agriculture and Rural Development), and Joint Nature Conservation Committee (JNCC). In 2015, the IAMMWG defined Management Units (MUs) for the seven most common cetacean species found in UK waters (IAMMWG 2015): harbour porpoise (*Phocoena phocoena*), bottlenose dolphin (*Tursiops truncatus*), short-beaked common dolphin (*Delphinus delphis*), white-beaked dolphin (*Lagenorhynchus albirostris*), Atlantic white-sided dolphin (*Lagenorhynchus acutus*), Risso's dolphin (*Grampus griseus*), and minke whale (*Balaenoptera acutorostrata*) (IAMMWG 2015). MU boundaries and supporting evidence on population structure were agreed to be reviewed every five years, and abundance estimates to be revised and updated using data from the most recent dedicated surveys when available. This report provides a review of the supporting evidence on population structure and where necessary, updates MU boundaries to reflect new evidence.

This review has highlighted that the MU boundaries defined in 2015 remain unchanged for harbour porpoise, short-beaked common dolphin, white-beaked dolphin, Atlantic white-sided dolphin, Risso's dolphin and minke whale. Based on new evidence, the Coastal West Channel MU for bottlenose dolphin has been extended in both directions from Padstow on the northern coast of Cornwall, to east of the Isle of Wight, in line with Eastbourne. A southward expansion of the range of bottlenose dolphin in the Coastal East Scotland MU is also noted, though there is insufficient evidence at this stage to change the MU boundary.

The updated boundaries of the Coastal West Channel MU for bottlenose dolphins described in this report supersede those in IAMMWG (2015) and should be used in preference. Abundance estimate updates for the Coastal West Channel MU and Offshore Channel and South West England MU associated with this boundary change are noted in this report.

The principles underpinning the delineation and application of MUs remain unchanged and IAMMWG (2015) must continue to be referred to in combination with this document.

Contents

Glossary

Species is a specifically named taxonomic group of living organisms (e.g. animals and plants) of the same kind which are capable of producing fertile offspring but are predominantly reproductively isolated from other organisms.

Population is a collection of individuals all of the same species with a tendency to be found in the same area. Populations contain genetic variation within the population itself, and between other populations. Populations can exist in isolation or can co-exist at least during a part of the year with other conspecific populations (i.e. other populations of the same species) in the same area.

Management Unit (MU) typically refers to a geographical area in which the animals of a particular species are found to which management of human activities is applied. An MU may be smaller than what is believed to be a 'population' to reflect spatial differences in human activities and their management. If MUs are defined at a smaller spatial scale than the population, it is important that management takes into account the rates of interchange of individuals between MUs; that is, adjacent MUs should not be treated as if they were demographically independent.

1 Introduction

Almost all species of cetacean found in UK waters are part of larger biological populations whose ranges extend into international waters and/or the High Seas. Equally, the number of individuals present at any one time in a particular area may be only a small proportion of those that make use of UK waters throughout the year. Management Unit (MU) boundaries, defined in the IAMMWG (2015), are geographical areas in which animals of a particular species are found and management of human activities is applied. The delineation of boundaries is based on best understanding of the population structure of species, taking into account jurisdictional boundaries and divisions already used for the management of human activities. MUs are used to inform SNCB advice in several ways, including: the relevant spatial scale for assessment of environmental impacts of marine developments (e.g. through Habitats Regulations Assessment (HRA), Environmental Impact Assessment (EIA), Strategic Environmental Assessment (SEA)); the appropriate scale for the selection of Marine Protected Areas (e.g. harbour porpoise SACs); the relevant spatial scale for reporting on conservation status of cetacean species. The MUs provide an indication of the most relevant spatial scales at which impacts of marine plans and developments (both alone and cumulatively) should be assessed for the key cetacean species in UK waters, and support consistency across the UK SNCBs. However, use of the MUs may vary between SNCBs, or on a case-by-case basis, as SNCBs deliver marine advice to best suit the particular need. For example, this might include subdividing units to provide advice on a smaller spatial scale for a given purpose. Example on how management units are used by SNCBs are provided in NRW's position statement on the use of marine mammal MUs in HRA.

MU boundaries and supporting evidence on population structure are reviewed at least every five years, although significant changes in the available evidence may trigger an early review. Abundance estimates are revised using data from the most recent dedicated surveys or to reflect amendments to MU boundaries following an evidence review. This report reviews information published since 2015 on the populations of the seven cetacean species in UK waters and identifies whether there is sufficient evidence to warrant a change to any of the MU boundaries. Updated abundance estimates in line with amendments made in this review are also provided. Information provided here supersedes IAMMWG (2015, 2022) although the principles underlying the delineation of MUs and calculation of abundance estimates remain unchanged, and both IAMMWG 2015 and IAMMWG 2022 should be referred to in conjunction with this document.

2 Species Management Units

2.1 Harbour porpoise (*Phocoena phocoena*)

Three MUs were identified for harbour porpoise (Figure 2; IAMMWG 2015):

1. North Sea (NS; comprising ICES Subareas 4, Division 7d and part of Division 3a (Skagerrak and northern Kattegat})

   The northern and western boundary is arbitrary and does not align with ICES divisions, and there will be an interchange of animals with the West Scotland MU. The eastern boundary has been defined by the ASCOBANS North Sea Conservation Plan for the species. The northern peak of the UK's EEZ is to be treated as part of the NS MU and has been included in abundance estimates (see below).

2. West Scotland (WS; comprising ICES Divisions 6a and b)

   The boundary with the NS MU is arbitrary and there will be an interchange of animals here and in the south of the MU with the Celtic and Irish Seas MU. It should be noted that harbour porpoise are generally rare in waters greater than 200 m depth.

3. Celtic and Irish Seas (CIS; comprising ICES Subareas 6, excluding 6a and 6b, and 7, except 7d)

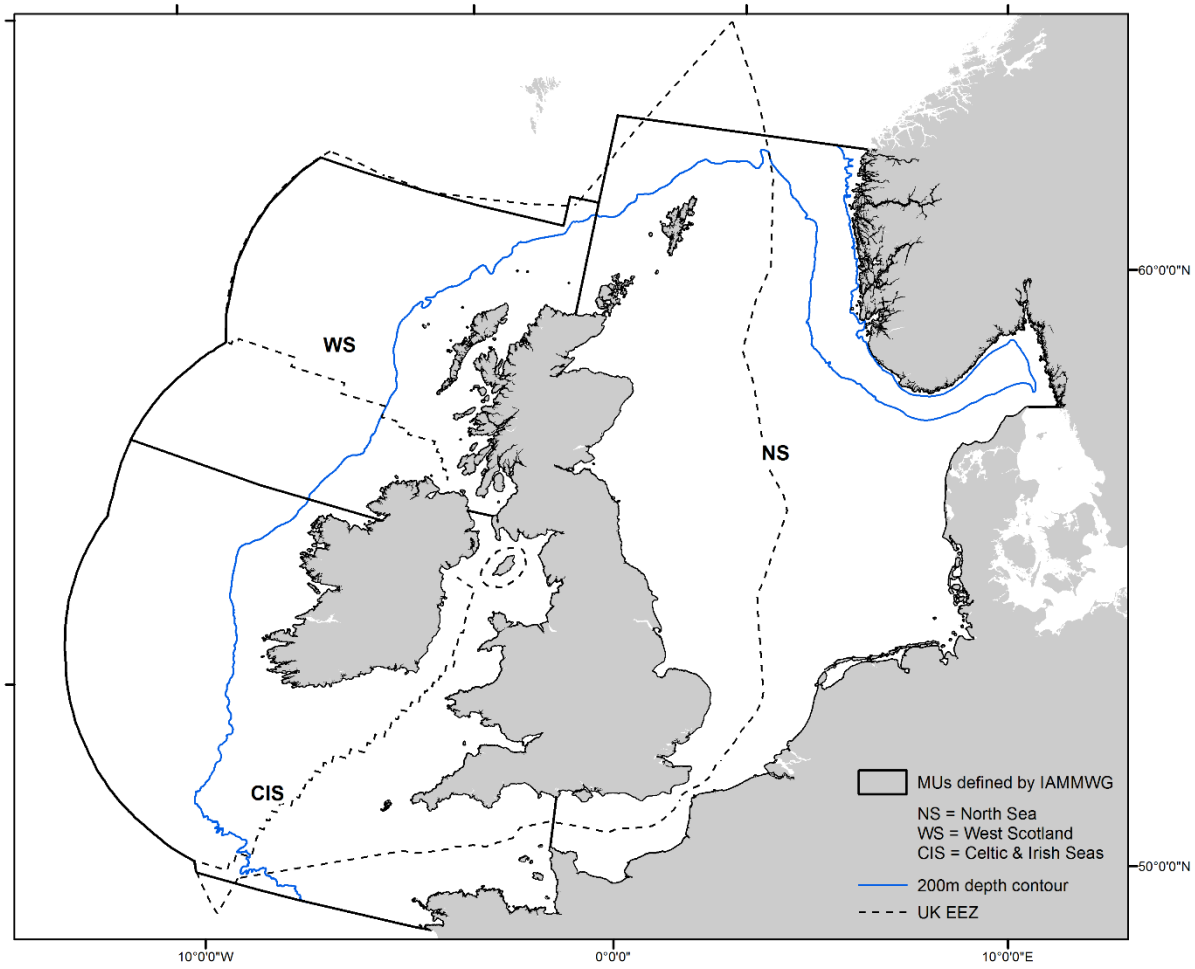


Figure 1. Harbour porpoise Management Units (MUs), noting that this species is largely confined to the continental shelf (i.e. waters less than 200 m depth).

A review of literature published since 2015 has not provided any new evidence on population structure to change this advice. As part of the joint North Atlantic Marine Mammal Commission (NAMMCO) and the Norwegian Institute for Marine Research (IMR) meeting in 2018, new boundaries across the Celtic and Irish Seas were proposed combining much of the original West Scotland and Celtic & Irish Sea assessment areas (NAMMCO & IMR 2019). This was based on evidence presented in Fontaine *et al.* (2017) who reported a closer genetic relationship between Western Ireland and North-Western Scotland than between Western Ireland and the Celtic Sea. Additionally, the Irish Sea (ICES division VIIa) was identified as a 'zone of uncertainty', acknowledging the idea of substantial gene transfer in the area between porpoises in the Celtic Sea, Bay of Biscay and Western Channel (Fontaine *et al*. 2014; 2017). Genetic sampling in this study did not provide strong enough evidence to diverge from the original assessment area. Consequently, the expert group agreed that the Irish Sea should not be separated from the Celtic Sea, and so these proposed amendments were not adopted (NAMMCO 2019). Uncertainty remains regarding fine-scale structures, spatial distribution and the scale of interbreeding between geographic regions (NAMMCO 2019). Further genetic studies are required to fill these gaps and to make any further recommendations about different ecological units for assessment and management of this species.

This review has not identified any new genetic evidence since 2019 to strengthen the argument for adopting the boundaries laid out by NAMMCO and IMR (2019). While Fontaine *et al*. (2014, 2017) note that there appears to be a genetic differentiation between animals in the North Sea and northern coasts of Scotland to those in south-west UK, the UK population is still considered to be a genetic continuum.

There are growing suggestions that the distribution of North Sea harbour porpoise within their range is shifting southwards (Hammond *et al*. 2013; Hammond *et al*. 2021; Nachtsheim *et al*. 2021; Ijsseldijk *et al*. 2020). This southerly shift could indicate the beginning of changes in habitat use because of environmental change and shifting prey availability, as with other cetacean species found in British waters (Hammond *et al*. 2013; Williamson *et al*. 2021). However, the full extent of their known range has shown no signs of change, and there are some suggestions that changes in distribution within this range might be seasonal, with greater increases of harbour porpoise seen in the spring and summer in the Southern North Sea (Nachtsheim *et al*. 2021).

The current evidence base does not justify an adjustment to the harbour porpoise MU boundaries at this time. Fine-scale examination of harbour porpoise distribution, genetic relationships and population structure within UK waters is advisable to inform future MU boundary reviews.

2.2 Bottlenose dolphin (*Tursiops truncatus*)

Two distinct ecotypes of bottlenose dolphin are recognised in UK waters– a wide-ranging offshore type, and an inshore or coastal type, more likely to be site/area faithful (Louis *et al*. 2014). Previously reviewed evidence highlighted a number of inshore populations with little connection between them (Robinson *et al*. 2012; Cheney *et al*. 2013; ICES 2014; IAMMWG 2015; Lohrengel *et al*. 2018). From this, seven bottlenose dolphin MUs were developed for UK waters (Figure 2):

1. Coastal West Scotland and the Hebrides (CWSH; to 12 nautical miles (nm));

2. Coastal East Scotland (CES; to 12 nm);

3. Greater North Sea (GNS; represented by ICES Subarea 4 excluding coastal east Scotland; and ICES Division 3a)

4. Offshore Channel and South West England (OCSW; ICES Divisions 7d–h);

5. Coastal West Channel (CWC; to 12 nm);

6. Irish Sea (IS; ICES Division 7a);

7. Oceanic waters (OW; ICES Divisions 6a–b, 7b, c, k and j, excluding coastal west Scotland).

Two MUs in the Republic of Ireland are included in Figure 2 for completeness – the Shannon Estuary (SHE) and West Coast of Ireland (WCI) MUs – as they represent two distinct inshore populations of bottlenose dolphin in western Irish waters of the British Isles.

A review of the literature published since 2015 indicates that the CWC MU no longer adequately covers the semi-resident inshore bottlenose dolphin population in South West England. The MU presently extends from the west of the Isle of Wight to in line with the Isles of Scilly. Additional year-round photo-identification data provides key evidence that the core range of this population further extends in both directions than previously understood, with sightings of known population-individuals through to East Sussex and North Cornwall (Dudley 2017; Corr 2020; Duncan 2021).

In line with the evidence presented for the inshore bottlenose dolphin population within the CWC MU, the end boundaries for this unit have been extended in both directions to span from Padstow on the northern coast of Cornwall, to east of the Isle of Wight, in line with Eastbourne.

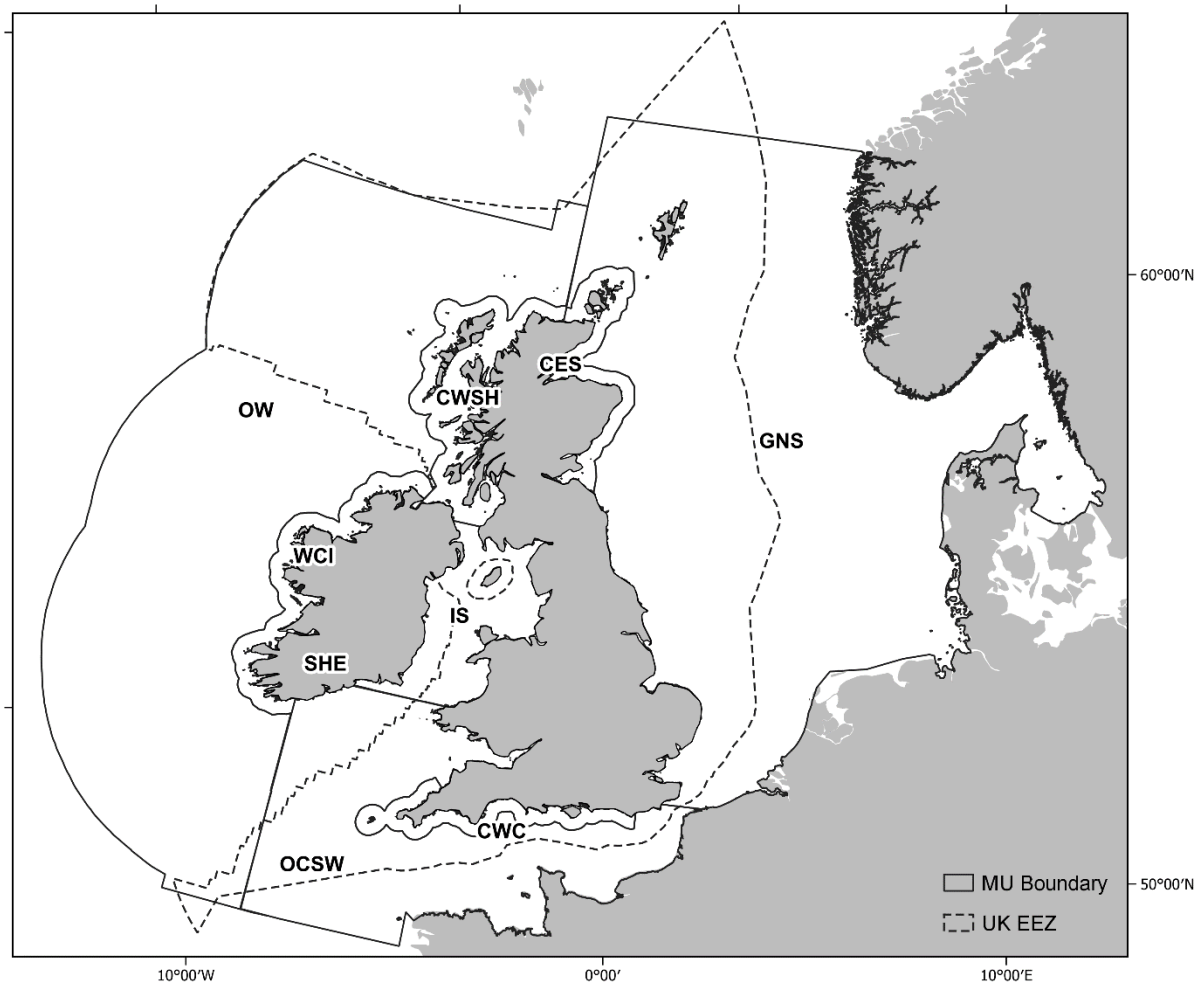
Similar photo-identification studies along the north-east coast of Scotland have indicated a potential southerly range shift, or expansion of the inshore bottlenose dolphin that were originally associated predominantly with the Moray Firth. Arso Civil *et al.* (2019) reports sightings of individuals from this population further south towards St Andrews Bay and the Tay estuary. Guttierrez-Munoz (2021) has identified a need for further research to better understand how this population is shifting; whether it reflects a shift in the distribution, a southerly expansion of range, and/or seasonal changes. The known ranging behaviour of this inshore bottlenose dolphin population in Scottish waters is reflected in the current extent of the CES MU.

The number of reported sightings of bottlenose dolphin along the north-east coast of England has increased over the last decade. Preliminary evidence reports that tens of known individuals from the CES MU have been matched, using photo-identification, to individuals sighted in inshore north-east English waters (Aynsley 2017; Citizen Fins 2022). Although the emerging evidence base is limited, it is considered that bottlenose dolphin seen in inshore waters along the north-east coast of England are connected to those within the CES MU. At present, the evidence is too limited to draw confident conclusions on the temporal and spatial extent of these movements; therefore, further research is required and the southerly boundary of the CES MU should not be extended at this time.

Given the present uncertainty of the underlying patterns and seasonality of the reported southerly movements of individuals from the CES MU, the evidence is not yet sufficient to adjust the southern boundary of the CES MU. It is important that monitoring of the population is continued in the CES MU, and potentially expanded to areas of known usage by CES MU individuals south of the border, to better understand the patterns and mechanisms of the southward shift/expansion. New evidence will continue to be monitored in line with future MU boundary reviews.

No other evidence is available to suggest the boundaries of the remaining inshore/coastal or

offshore bottlenose dolphin MUs require updating at this time. However, the review has highlighted those recent studies on the social and population structure of bottlenose dolphin, particularly offshore, is still limited.



GNS = Greater North Sea
CES = Coastal East Scotland
CWSH = Coastal West Scotland & Hebrides
IS = Irish Sea
CWC = Coastal West Channel
OCSW = Offshore Channel, Celtic Sea & South West England
WCI = West Coast of Ireland
SHE = Shannon Estuary
OW = Offshore Waters

Figure 2. Bottlenose dolphin Management Units (MU). The Coastal West Channel MU has been extended to span from Padstow, northern Cornwall to in line with Eastbourne.

2.3 Common dolphin (*Delphinus delphis*)

Based on the formal ICES advice to OSPAR (ICES 2014), a single MU was deemed appropriate for this species comprising all UK waters and extending to the seaward boundary used by the European Commission for Habitats Directive reporting (area known as Marine Atlantic, termed MATL), with the eastern boundary determined by OSPAR's Regional Seas boundary (Figure 3) (IAMMWG 2015).

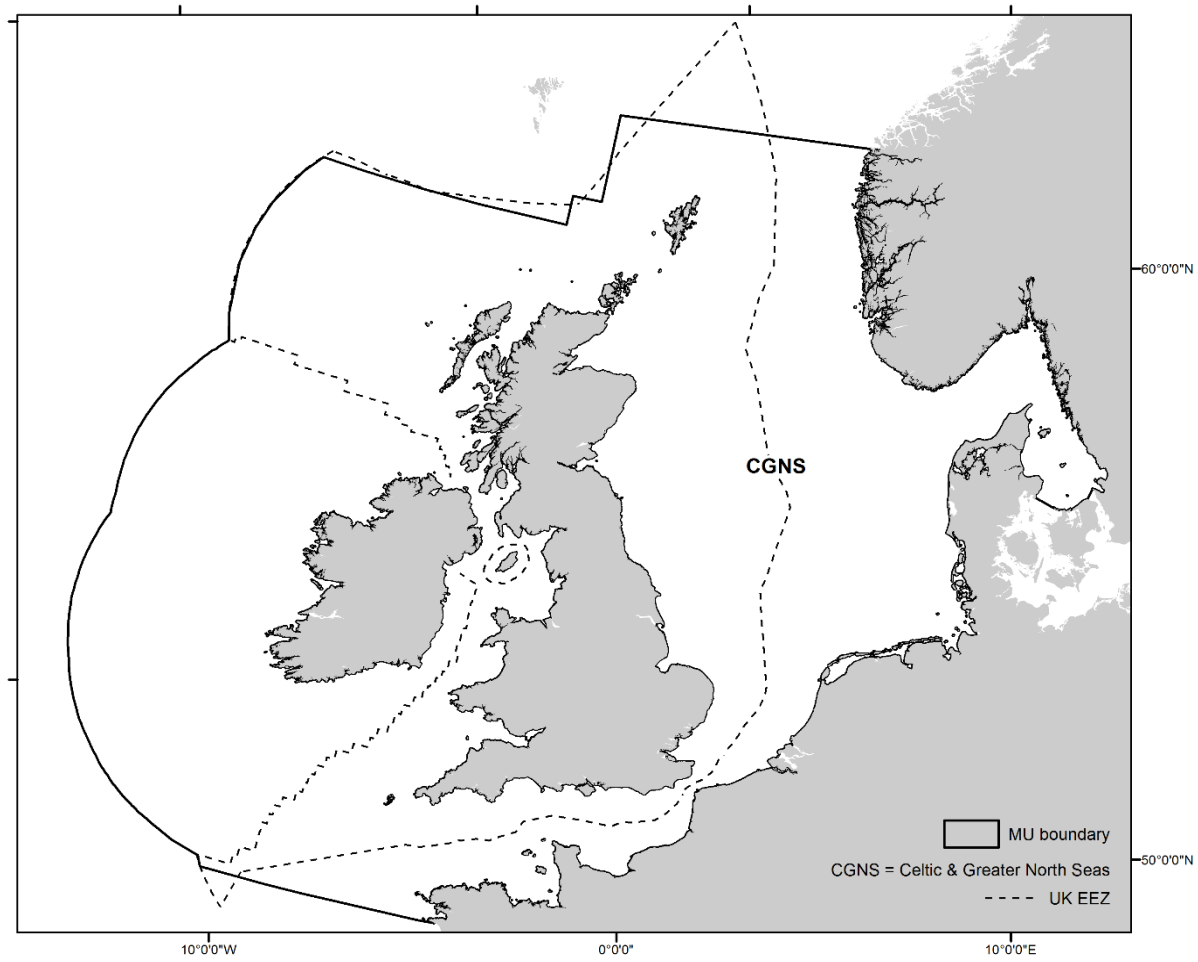


Figure 3. Management Unit (MU) for common dolphin.

A review of literature published since 2015 has not provided any new evidence on population structure to change this advice. Information on dispersal patterns and site fidelity is scarce, although Moura *et al.* (2013) report that genetic structure suggests potential long-range movements. Ball *et al.* (2017) indicates that common dolphins along the Portuguese coast (which are part of the wider north-east Atlantic population that also encompasses the UK) live in fluid aggregations regardless of genetic relationships. This fluid social structure combined with high dispersal potential is a key factor in the high level of genetic flow among populations, resulting in a low level of distinct genetic sub-populations. As such a single population across the entire North Atlantic cannot be disregarded (Murphy *et al*. 2019).

A review of common dolphin conservation management by Murphy *et al.* (2019) recommends using surveys and genetic data from across the Atlantic to investigate both the range of the northeast Atlantic population and potential distinct inshore and offshore ecological stocks. More information on population structure, distribution and site fidelity is clearly needed to make any further recommendations about different ecological units for assessment and management of this species.

Given the reviewed evidence, there is no ecological evidence to suggest redefinition of the boundaries at this time. It should however be noted that a growing number of studies are suggesting a northward shift in the distribution of common dolphin around the UK, indicating the potential start of changes in habitat use as a consequence of changes in sea surface temperature and prey availability (Evans *et al*. 2003; Macleod *et al*. 2005; Evans & Bjørge 2013; Evans & Waggit 2020; Williamson *et al*. 2021).

2.4 White-beaked dolphin (*Lagenorhynchus albirostris*)

Using formal ICES advice to OSPAR (ICES 2014), a single MU was deemed appropriate for this species comprising all UK waters and extending to the seaward boundary used by the European Commission for Habitats Directive reporting, with the eastern boundary determined by OSPAR's Regional Seas boundary (Figure 4) while also acknowledging that the species usually occurs within the continental shelf (i.e. in waters less than 200 m depth) (Reid *et al.* 2003).

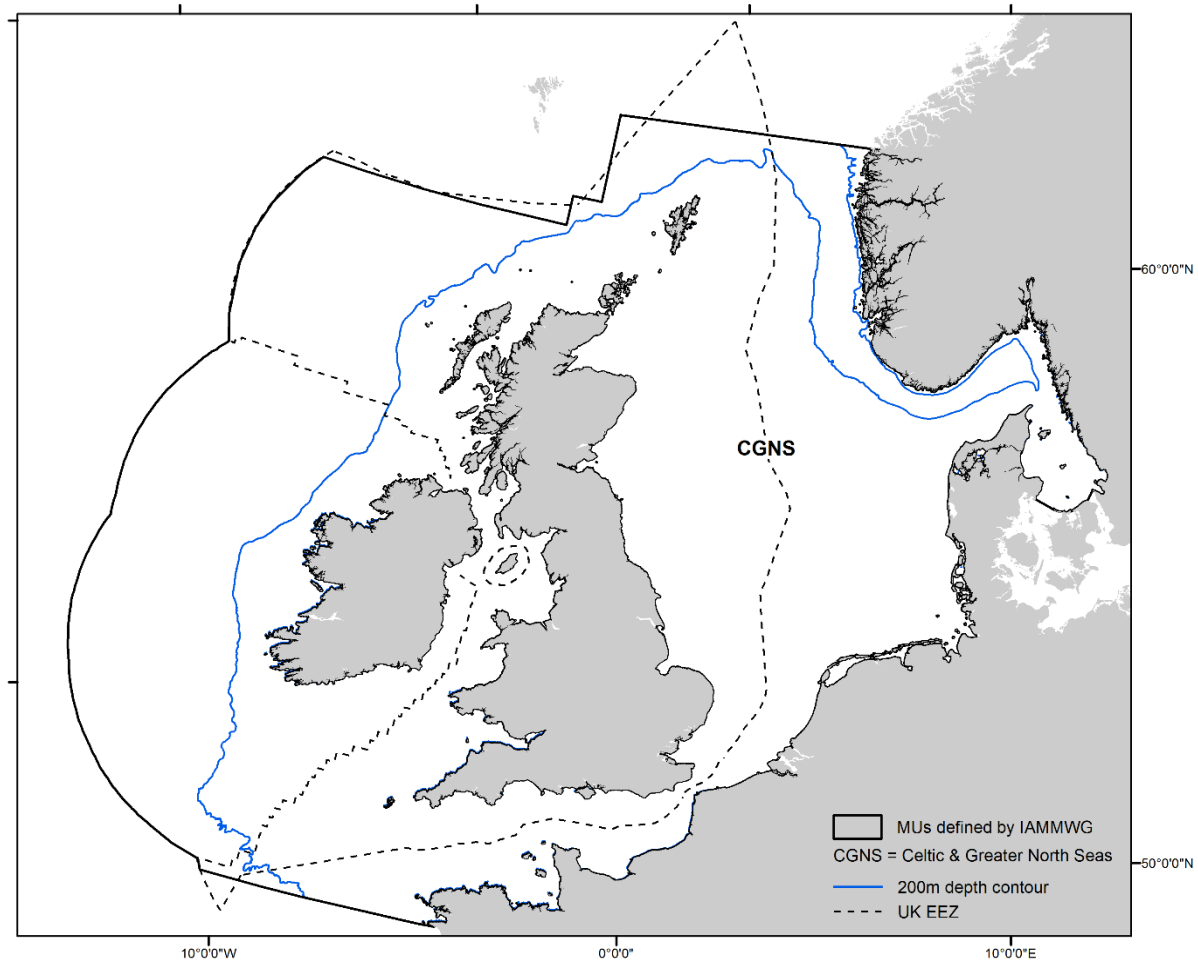


Figure 4. Management Unit (MU) for white-beaked dolphin.

A review of literature published since 2015 has not provided any new evidence on population structure to change this advice.

Fernández *et al*. (2016) investigated genetic variation in 70 white-beaked and 43 white-sided dolphins from across their north-east Atlantic distribution range. This study did identify some population sub-structuring among white-beaked dolphins in the north-east Atlantic, but it was not linked to geographical region.

Data collected from photo-identification projects in Lyme Bay (South West England) and Northumberland (north-east England) indicate a high level of site fidelity in English inshore waters (Brereton *et al*. 2016), although further analysis of the data alongside that from opportunistic surveys is still needed.

Analysis of white beaked dolphin strandings between 1991 and 2017 in the North Sea demonstrated that the frequency of strandings has declined in the southern North Sea, while either remaining stable or increasing along the central and northern coasts (Ijsseldijk *et al.* 2018). It is suggested that the overall decline in strandings in the south is largely as a result of decreasing numbers of individuals in the area, potentially as a result of changes in distribution of the species. This shift may be an early indication of a change in habitat use and population distribution from southern to northern regions, potentially due to climate change effects on prey distribution and availability. Similar findings have also been reported in other studies which have seen colder water adapted species (such as the white-beaked dolphin) less frequently in British waters (Evans & Waggit 2020; Williamson *et al*. 2021).

High-resolution analysis of white-beaked dolphin tissue samples collected from across the North East Atlantic is currently being undertaken to improve understanding of the species population structure (Gose *et al.* 2021). Preliminary results based on Single Nucleotide Polymorphisms (SNPs) and mtDNA indicate that there is strong evidence to suggest at least two distinct geographical structures; a northern population centred around Iceland and Norwegian waters, and a second encompassing the UK and continental European waters (M Gose, personal communication, 9 August 2022). It is possible that further clusters within the southern group may be identified as the analysis continues.

Future genetic analysis to examine fine-scale population structure may provide evidence to support the delineation of further MUs for the species within UK waters. However, at present there is not sufficient evidence on the population structure of the species to change previous advice; as such, there is no proposal for amending the boundaries at this time. The evidence will continue to be reviewed and an update to the boundaries will be considered if necessary in the future.

2.5 Atlantic white-sided dolphin (*Lagenorhynchus actus*)

The population status, structure and distribution of Atlantic white-sided dolphins across their range are not yet well understood and limited genetic diversity has been identified across putative populations within the North Atlantic. Based on genetics analysis of white-sided dolphins across the North Atlantic (WGMME 2012, 2013) and formal ICES advice to OSPAR (ICES 2014), a single MU, comprising all UK waters and extending to the seaward boundary used by the European Commission for Habitats Directive reporting (the area known as ‘Marine Atlantic’, termed MATL) was deemed appropriate for this species (Figure 5) (IAMMWG 2015).

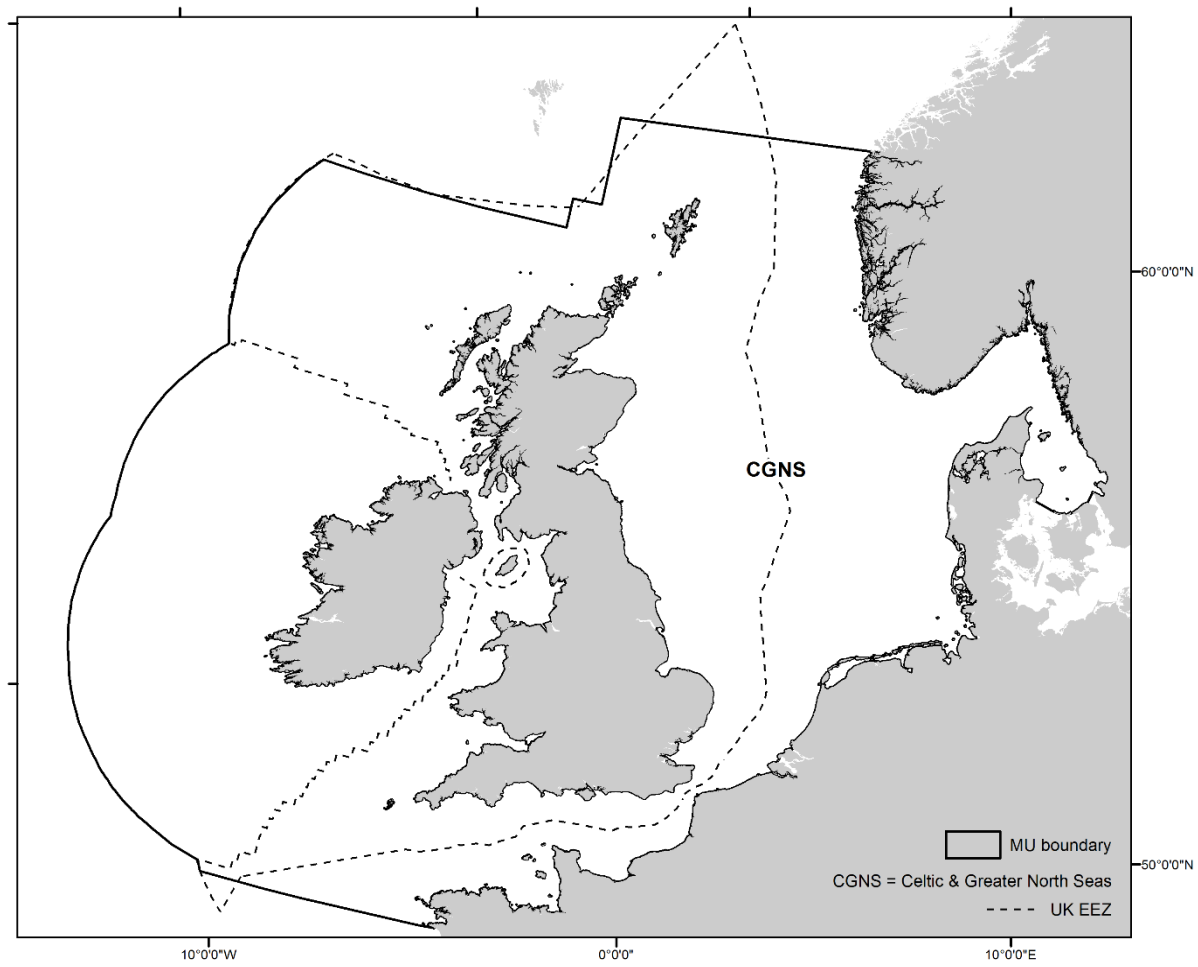


Figure 5. Management Unit (MU) for Atlantic white-sided dolphin, Risso's dolphin and minke whale.

A review of literature published since 2015 has not provided any new evidence on population structure to challenge this advice.

Banguera-Hinestroza *et al.* (2014) identified a level of genetic variability between groups in the easternmost part of the North Atlantic (Shetland Isles and North Sea) and samples from the rest of the North Atlantic. This division is hypothesised to be an artifact of historical differentiation that possibly occurred during the last glacial maximum but is unlikely to reflect contemporary population structure.

Fernández *et al*. (2015) reported higher nucleotide diversity in white-sided dolphins, in comparison to white-beaked dolphins, but found no evidence of population differentiation in 43 Atlantic white-sided dolphins sampled across their range in the north-east Atlantic. These results are consistent with previous studies (Banguera-Hinestroza *et al*. 2010; Mirimin *et al*. 2011) and likely reflect wide pelagic distribution and high mobility of this species.

Using tissue samples collected from across the north-east Atlantic, high-resolution genetic analysis of Atlantic white-sided dolphins is currently being undertaken to further understand the population structure of the species within this range (Gose *et al*. 2021). Preliminary results indicate that there is no clear geographical structure based on thousands of nuclear SNPs and mtDNA. Continuous gene flow seems to occur between the sampled individuals, with some limited evidence for large groups of non-related individuals grouping together for periods of time (M Gose, personal communication, 9 August 2022). It is possible that the species mixes more widely still with individuals from across its full range of the Atlantic, such

as those closer to the coast of North America, as suggested by samples from the central and western North Atlantic (Gose *et al*. 2021).

From a genetic perspective, this recent evidence supports the present MU structure for this species within UK waters. Further research is required to provide more information on distribution, abundance and movement patterns to identify behavioural differentiation within the species which may warrant separate management.

There has been increasing evidence of a decrease in colder water species, including the white-sided dolphin, in UK waters (Evans *et al*. 2003; Macleod *et al*. 2005; Evans & Bjørge 2013; Evans & Waggit 2020; Williamson *et al*. 2021). Reports of sightings from the central North Sea are decreasing, yet the species appear to remain stable in the Northern Isles (Evans & Waggitt 2020). The distribution of white-sided dolphins is still poorly understood around the UK, but this suggests a northward range shift or contraction perhaps due to changing sea surface temperatures and prey availability.

At present the current literature does not provide evidence on population structure to change previous advice; as such, there is no proposal for amending the boundaries at this time.

2.6 Risso's dolphin (*Grampus griseus*)

Based on information available when the MUs were published in 2015, a single MU, comprising all UK waters and extending to the seaward boundary used by the European Commission for Habitats Directive reporting (the area known as 'Marine Atlantic', termed MATL) was deemed appropriate for Risso's dolphin (Figure 5).

A review of literature published since 2015 has provided further insight into possible sub-structuring of UK Risso's dolphins. Risso's dolphins are most commonly sighted in waters to the north and west of the UK where they are seen year-round. Around the coasts of the Western and Northern Isles, as well as the northern Scottish mainland, Risso's dolphins are repeatedly encountered in shallow water (less than 20 m) and in close proximity to the shore (Weir *et al.* 2019; WDC Shorewatch, unpublished data; Shetland Biological Records Centre, unpublished data; Shetland Sea Mammal Group, unpublished data, Hodgins *et al*. in press).

Risso's dolphins show evidence of site fidelity throughout their range (Paxton *et al.* 2014; Weir *et al.* 2019) and initial analysis of photo-identification catalogues from various areas of Scotland shows evidence of potential population sub-structuring in these waters (N Hodgins, personal communication, 12 December 2022). Photo-identification catalogues presently exist for Risso's dolphins in Shetland and Fair Isle, north coast of Scotland, Orkney and Caithness, the west coast of Scotland, Bardsey Island, Wales and the south-west of England, Bardsey Island and the Llyn Peninsula, and the Isle of Man/Irish Sea. At present the evidence is still emerging and with further research and analysis it is possible that multiple sub-populations may exist around the UK. Further research and analysis is required before any additional boundaries for Risso's dolphin are delineated.

2.7 Minke whale (*Balaenoptera acutorostrata*)

WGMME (2012, 2013) proposed that the Management Areas proposed by the IWC for minke whales in the North Atlantic should be retained, thus comprising a single MU for the European North Atlantic. This was confirmed in formal ICES advice to OSPAR (ICES 2014) and, based on this, a single MU was deemed appropriate for this species comprising all UK waters (Figure 5) (IAMMWG 2015).

The 2018 UK Marine Strategy Assessment (Pinn *et. al.* 2018) noted that while the range of minke whales had remained unchanged, the centre of their distribution shifted south

between 1994 and 2005 and has remained here since (Hammond *et al.* 2013; Hammond *et al.* 2021). A review of literature published since 2015 has not provided evidence on population structure to change previous advice. As such, there is no proposal for redefinition of the boundaries at this time.

3 Abundance Estimates

Abundance estimates were calculated for MUs upon their delineation in 2015 using the best available evidence at the time. These were then updated using the most recent dedicated surveys as of February 2021, namely SCANS-III (Hammond *et al*. 2021) and the ObSERVE Programme (Rogan *et al*. 2018). This report outlines updated abundance estimates for each species following the review of information published since 2015 and subsequent amendments of boundaries. The principles and data behind abundance estimates remain unchanged since IAMMWG (2022) which should be referred to in combination.

3.1 Harbour porpoise (*Phocoena phocoena*)

Table 1 shows the most recent estimates of harbour porpoise abundance for the three UK MUs. These remain unchanged from IAMMWG (2022).

Table 1. Abundance estimates of harbour porpoise by Management Unit (MU) and the UK portion of the MU (defined by the EEZ).

MU	Abundance of animals in MU (CV)	95% Confidence interval for MU	Abundance of animals in the UK portion of MU (CV)	95% Confidence interval for UK portion of MU	Source
NS	346,601 (0.09)	289,498 – 419,967	159,632 (0.12)	127,442 – 199,954	Hammond *et al*. 2021; Rogan *et al*. 2018
WS	28,936 (0.16)	21,140 – 39,608	24,305 (0.18)	17,121 – 34,505	Hammond *et al*. 2021; Rogan *et al*. 2018
CIS	62,517 (0.13)	48,324 – 80,877	16,777 (0.2)	11,216 – 25,096	Hammond *et al*. 2021; Rogan *et al*. 2018

3.2 Bottlenose dolphin (*Tursiops truncatus*)

An updated abundance estimate for bottlenose dolphin MUs OCSW, in line with the CWC boundary change outlined above, are described in Table 2. Abundance estimate for all other bottlenose dolphin MUs remain unchanged from IAMMWG (2022). More information on the different data sources used to calculate abundance estimates can be found in IAMMWG (2022).

Table 2. Abundance estimates of bottlenose dolphins by Management Units. Estimates of inshore populations from regional line-transect (identified with [a]) and photo-identification (identified with [b]) studies.

MU	Abundance of animals in MU (CV)	95% Confidence interval for MU	Abundance of animals in the UK portion of MU (CV)	95% Confidence interval for UK portion of MU	Source
CWSH	-	-	45 [b]	33 – 66	Cheney *et al.* 2013
CES	-	-	224 (0.02) [b]	214 – 234	Arso Civil *et al.* 2021
GNS	2,022 (0.75)	548 – 7,453	1,885 (0.8) [a]	476 – 7,461	Hammond *et al.* 2021; Rogan *et al.* 2018
OCSW	10,653 (0.25)	6,533 – 17,372	3,573 (0.35) [a]	1,851 – 6,898	Hammond *et al.* 2021; Rogan *et al.* 2018
CWC	-	-	40 (0.18) [b]	30 – 59	Corr 2020
IS	293 (0.54)	108 – 793	186 (0.52) [a & b]	70 – 492	Hammond *et al.* 2021; Rogan *et al.* 2018
OW	70,249 (0.17)	49,720 – 99,255	1,299 (0.41) [a]	597 – 2,826	Hammond *et al.* 2021; Rogan *et al.* 2018

3.3 Other species

The most recent abundance estimates for common dolphin, white-beaked dolphin, Atlantic white-sided dolphin, Risso's dolphin and minke whale are detailed in Table 3. These remain unchanged from IAMMWG (2022).

Table 3. Abundance estimates of common dolphin (CD), white-beaked dolphin (WBD), white-sided dolphin (WSD), Risso's dolphin (RD), and minke whale (MW) of the Celtic and Greater North Seas (CGNS) MU.

Species	Abundance of animals in MU (CV)	95% Confidence interval for MU	Abundance of animals in the UK portion of MU (CV)	95% Confidence interval for UK portion of MU	Source
CD	102,656 (0.29)	58,932 – 178,822	57,417 (0.32)	30,850 – 106,863	Hammond *et al.* 2021; Rogan *et al.* 2018
WBD	43,951 (0.22)	28,439 – 67,924	34,025 (0.28)	20,026 – 57,807	Hammond *et al.* 2021; Rogan *et al.* 2018
WSD	18,128 (0.61)	6,049 – 54,323	12,293 (0.64)	3,891 – 38,841	Hammond *et al.* 2021; Rogan *et al.* 2018
RD	12,262 (0.46)	5,227 – 28,764	8,687 (0.63)	2,810 – 26,852	Hammond *et al.* 2021; Rogan *et al.* 2018
MW	20,118 (0.18)	14,061 – 28,786	10,288 (0.26)	6,210 – 17,042	Hammond *et al.* 2021; Rogan *et al.* 2018

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