Accessing and developing the required biophysical datasets and data layers for Marine Protected Areas network planning and wider marine spatial planning purposes

Report No 14: Mapping of species with limited mobility (Benthic Species) (Task 2B)

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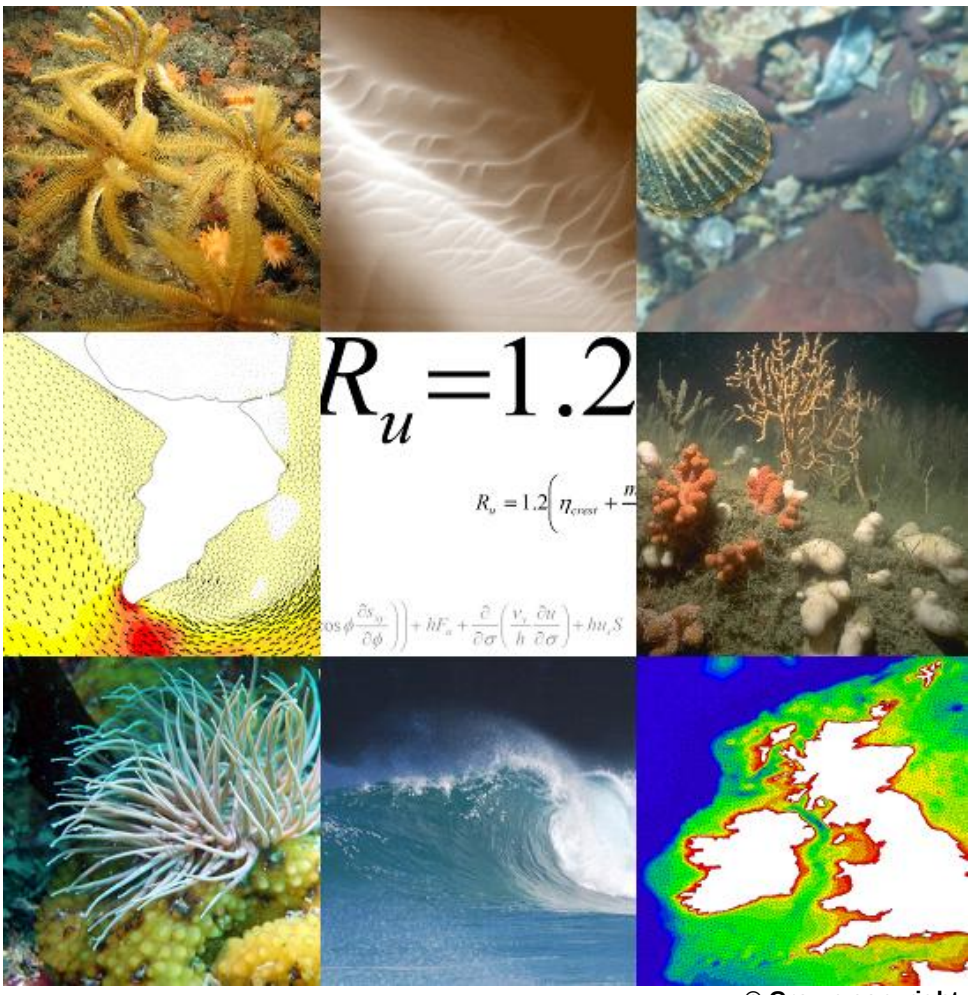

Proudman Oceanographic Laboratory
NATURAL ENVIRONMENT RESEARCH COUNCIL

PRIFYSGOL BANGOR UNIVERSITY 1884

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Defra Contract Manager: Jo Myers

Funded by:

Department for Environment Food and Rural Affairs (Defra)
Marine and Fisheries Science Unit
Marine Directorate
Nobel House
17 Smith Square
London SW1P 3JR

Joint Nature Conservation Committee (JNCC)
Monkstone House
City Road
Peterborough
PE1 1JY

Countryside Council for Wales (CCW)
Maes y Ffynnon
Penrhosgarnedd
Bangor
LL57 2DW

Natural England (NE)
Northminster House
Peterborough
PE1 1UA

Scottish Government (SG)
Marine Nature Conservation and Biodiversity
Marine Strategy Division
Room GH-93
Victoria Quay
Edinburgh
EH6 6QQ

Department of Environment Northern Ireland (DOENI)
Room 1306
River House
48 High Street
Belfast
BT1 2AW

Isle of Man Government (IOM)
Department of Agriculture Fisheries and Forestry
Rose House
51-59 Circular Road
Douglas
Isle of Man
IM1 1AZ

Authorship:

B. Seeley
Marine Life Information Network (MarLIN)
bese@mba.ac.uk

D. Lear
Marine Life Information Network (MarLIN)
dble@mba.ac.uk

S. Higgs
Marine Life Information Network (MarLIN)

M. Neilly
Marine Life Information Network (MarLIN)

J. Bilewitch
Marine Life Information Network (MarLIN)

J. Evans
Marine Life Information Network (MarLIN)

P. Wilkes
Marine Life Information Network (MarLIN)

L. Adams
Marine Life Information Network (MarLIN)

The Marine Life Information Network® for Britain and Ireland (MarLIN)
The Marine Biological Association of the United Kingdom
The Laboratory Citadel Hill
Plymouth
PL1 2PB
http://www.marlin.ac.uk

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Executive Summary

The UK is committed to the establishment of a network of Marine Protected Areas (MPAs) to help conserve marine ecosystems and marine biodiversity. MPAs can be a valuable tool to protect species and habitats and can also be used to aid implementation of the ecosystem approach to management, which aims to maintain the 'goods and services' produced by the healthy functioning of the marine ecosystem that are relied on by humans.

A consortium[1] led by ABPmer were commissioned (Contract Reference: MB0102) to develop a series of biophysical data layers to aid the selection of Marine Conservation Zones (MCZs) in England and Wales under the Marine and Coastal Access Act 2009 and the equivalent MPA measures in Scotland. Such data layers may also be of use in taking forward marine planning in UK waters. The overall aim of the project was to ensure that the best available information was used for the selection of MPAs in UK waters, and that the data layers produced were easily accessed and utilized by those with responsibility for selecting sites.

The Marine and Coastal Access Act 2009 allows for the designation of MCZs for biological, geological and geomorphological features of interest. To deliver this requirement, the project was divided into a number of discrete tasks, one of which (2B) included the production a series of data layers to show the distribution of key species with limited mobility.

These data layers were produced by the collation of existing data from a wide range of sources and represent the largest UK-wide data collation exercise undertaken in recent years. Once collated, the data was entered into a standard structure and is displayed as ESRI Shapefiles for inclusion in standard GIS and mapping packages including ArcGIS, MapInfo and Google Earth. In addition, the spatial referencing system was standardized and the distributions clipped to the MCZ project boundaries for England and jurisdiction boundaries for Scotland, Wales and Northern Ireland. Once in the standard format the underlying data tables were quality assured to check valid information was entered in each of the attributes. Alongside the spatial data, each derived data layer has a metadata record to assist in the discovery and reuse of the outputs.

For each layer a confidence assessment was produced. The confidence assessment was based on the volume of data acquired and the information provided by experts and organizations and took account of datasets that were not available or not in a suitable format.

The species covered by this report were based on the OSPAR Annex V and UK Biodiversity Action Plans (BAPs) as agreed at the start-up of the contract. The species include: the tentacled lagoon-worm *Alkmaria romijni,* sea-fan anemone *Amphianthus dohrnii,* the bearded red seaweed, *Anotrichium barbatum,* scarce tube-dwelling anemone *Arachnanthus sarsi,* ocean quahog *Arctica islandica,* lagoon sandworm *Armandia cirrhosa,* a seep-sea shrimp *Arrhis phyllonyx,* sea-loch egg

[1] ABPmer, MarLIN, Cefas, EMU Limited, Proudman Oceanographic Laboratory (POL) and Bangor University.

wrack, *Ascophyllum nodosum* ecad *mackaii,* fan mussel *Atrina pectinata (*syn. *fragilis,* Defolin's lagoon snail, (*Caecum armoricum),* a red seaweed *Cruoria cruoriaeformis,* a red seaweed *Dermocorynus montagnei,* Ivel's sea anemone *Edwardsia ivelli,* timid burrowing anemone *Edwardsia timida,* pink sea fan *Eunicella verrucosa,* a brown seaweed *Fucus distichus,* the tall sea pen *Funiculina quadrangularis,* lagoon sand shrimp *Gammarus insensibilis,* an amphipod shrimp *Gitanopsis bispinosa,* giant goby *Gobius cobitis,* Couch's goby *Gobius couchi,* a stalked jellyfish, *Haliclystus auricula,* lagoon spire snail*Heleobia stagnorum,* long snouted seahorse *Hippocampus guttulatus,* short snouted seahorse *Hippocampus hippocampus,* sunset cup coral *Leptopsammia pruvoti,* coral maerl, *Lithothamnion corallioides,* a stalked jellyfish *Lucernariopsis campanulata,* a stalked jellyfish *Lucernariopsis cruxmelitensis, a* gooseneck barnacle, *Mitella pollicipes,* starlet sea anemone *Nematostella vectensis,* the native oyster *Ostrea edulis,* fireworks anemone *Pachycerianthus multiplicatus,* brackish hydroid *Pachycordyle navis,* peacock's tail *Padina pavonica,* crayfish (crawfish or spiny lobster) *Palinurus elephas,* a sea snail *Paludinella littorina,* common maerl *Phymatolithon calcareum,* the Loch Goil sea squirt *Styela gelatinosa,* northern sea fan *Swiftia pallida,* lagoon sea slug *Tenellia adspersa,* northern hatchet shell *Thyasira gouldi,* and the trembling sea mat *Victorella pavida*.

Maps for species listed in Table 3 of the Marine Conservation Zone Project Ecological Network Guidance draft document[2] were reproduced within this document as image files to allow visualization of the distribution of a representative range of species

Where possible, it has been the aspiration of the contract to make the derived data layers generated from this project freely available. Due to the range of data sources this has not always been possible. Nevertheless, all derived data will be made available to Government Departments and Public Bodies for non-commercial purposes according to the restriction of use document.

A large data collation and aggregation exercise of this kind encountered several issues. In particular, the need to harmonize disparate data formats and the negotiation with a variety of data providers to allow the widest possible release of the resulting layers. In addition, the work highlighted the importance of cataloguing and storing datasets with an appropriate level of metadata.

The report also identified future considerations to improve access to marine data, which include the need to further promote and adopt the standards and specification developed through the Marine Environmental and Data Information Network (MEDIN) programme and to ensure that organizations comply with EU legislation such as the INSPIRE Directive.

[2] http://www.jncc.gov.uk/pdf/MPA_100514_ENG_v9.0r.pdf

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1. Introduction

1.1 Project Background

1.1 The UK is committed to the establishment of a network of Marine Protected Areas (MPAs) to help conserve marine ecosystems and marine biodiversity. MPAs can be a valuable tool to protect species and habitats and can also be used to aid implementation of the ecosystem approach to management, which aims to maintain the 'goods and services' produced by the healthy functioning of the marine ecosystem that are relied on by humans.

1.2 As a signatory of OSPAR, the UK is committed to establishing an ecologically coherent network of well managed MPAs. The UK is already in the process of completing a network consisting of Special Areas of Conservation (SACs) and Special Areas of Protection (SPAs), collectively known as Natura 2000 sites to fulfil its obligations under the EC Habitats Directive (92/43/EEC). Through provisions in the Marine and Coastal Access Act 2009, a network of Marine Conservation Zones (MCZs) can be designated in England and Welsh territorial waters and UK offshore waters. The Scottish Government is also considering equivalent Marine Protected Areas (MPAs) in Scotland. These sites are intended to help to protect areas where habitats and species are threatened, and to also protect areas of representative habitats. For further information on the purpose of MCZs and the design principles to be employed see [http://www.defra.gov.uk/marine/biodiversity/marine-bill/guidance.htm Defra, 2009].

1.3 MCZ selection will be undertaken via a participatory stakeholder engagement approach. Four Regional MCZ Projects have been established to lead this process, and have been identified as the principle 'customer' of any WebGIS system established. The Regional MCZ Projects were established during the latter half of 2009, and were expected to be fully functional by early 2010. The full stakeholder engagement process was anticipated to begin in February 2010, continuing until the end of 2011. A formal public consultation is expected in 2012.

1.4 Under the Marine and Coastal Access Act 2009, the UK government is committed to conserve, and promote the recovery of a wide range of habitats and species through the establishment of an ecologically coherent network of well managed MPAs. Five of the seven network design principles listed in the Ministerial Statement (2010)[3] cannot be fulfilled without the following knowledge:

1) Representativity – the range of marine habitats and species are represented through protecting all major habitat types and associated biological communities present in our marine area.
2) Replication – replication of major habitats through the network;
3) Viability – self-sustaining, geographically dispersed component sites of sufficient size to ensure species and habitats persistence through natural cycles of variation;

[3] Defra Ministerial Statement on the Creation of a Network of Marine Protected Areas. London: Defra, 2010.

4) Adequacy – the network is of adequate size to deliver its ecological objectives and ensure the ecological viability and integrity of populations, species and communities; and
5) Connectivity – to maximize and enhance the linkages among individual MPAs.

1.5 The selection of MPAs should be based on the best available data. This data will be a range of data types including biological, physical and oceanographic characteristics and socio-economic data (such as the location of current activities). To ensure such data are easily available to those who would have responsibility for selecting sites, Defra and its partners[4] commissioned a consortium lead by ABPmer and partners to take forward a package of work. The consortium were tasked with the development of the following new Geographical Information System (GIS) data layers:

- geological and geomorphological features;
- listed habitats and species
- selected non-native species;
- fetch and wave exposure;
- marine diversity layer;
- benthic productivity; and
- residual current flow.

1.6 In addition to the development of data layers, there is a need to ensure such information can be easily accessed given the participatory nature of the MCZ process that is currently being planned. Hence, all derived data products would be made available for use by the MCZ Regional Projects and to the Devolved Administrations for their equivalent processes.

1.7 This report provides a detailed description of the development of the priority species with limited mobility data layer, the steps taken to collate the data, standardise, undertake quality assurance and output the resulting layers in an accessible format.

1.8 Relevant datasets are held by a wide variety of organizations and individuals with a regional or species-specific bias to the data. Through large collation exercises, these datasets can be standardised and made widely available for future projects, greatly reducing the time taken to collate data and improving the long-term availability and visibility of important datasets.

1.2 Aims and Objectives

1.9 The aims of this element of the project were to produce spatially referenced tables and associated GIS layers showing the distribution of priority species of limited mobility.

1.10 The species covered by this report are the tentacled lagoon-worm, (*Alkmaria romijni),* sea-fan anemone, (*Amphianthus dohrnii),* bearded red seaweed, (*Anotrichium barbatum),* scarce tube-dwelling anemone, (*Arachnanthus sarsi),* ocean quahog, (*Arctica islandica),* lagoon sandworm, (*Armandia cirrhosa),* a deep-sea shrimp, (*Arrhis phyllonyx),* wig wrack or sea-loch egg wrack,

[4] Joint Nature Conservation Committee (JNCC), Countryside Council for Wales (CCW), Natural England (NE), Scottish Government (SG), Department of Environment Northern Ireland (DOENI) and Isle of Man Government.

(*Ascophyllum nodosum ecad mackaii),* fan mussel, (*Atrina fragilis),* Defolin's lagoon snail, (*Caecum armoricum),* a red seaweed, (*Cruoria cruoriaeformis),* a red seaweed, (*Dermocorynus montagnei),* Ivel's sea anemone, (*Edwardsia ivelli),* timid burrowing anemone, (*Edwardsia timida),* pink sea-fan, (*Eunicella verrucosa),* brown algae, (*Fucus distichus),* tall sea pen, (*Funiculina quadrangularis),* lagoon sand shrimp, (*Gammarus insensibilis),* an amphipod shrimp, (*Gitanopsis bispinosa),* giant goby, (*Gobius cobitis),* Couch's goby, (*Gobius couchi),* a stalked jellyfish, (*Haliclystus auricula),* lagoon spire snail, (*Heleobia stagnorum),* long snouted seahorse, (*Hippocampus guttulatus),* short snouted seahorse, (*Hippocampus hippocampus),* sunset cup coral, (*Leptopsammia pruvoti),* coral maërl, (*Lithothamnion corallioides),* a stalked jellyfish, (*Lucernariopsis campanulata),* a stalked jellyfish, (*Lucernariopsis cruxmelitensis),* a gooseneck barnacle, (*Mitella pollicipes),* starlet sea anemone, (*Nematostella vectensis),* native oyster, (*Ostrea edulis),* fireworks anemone, (*Pachycerianthus multiplicatus),* brackish hydroid, (*Pachycordyle navis),* peacock's tail, (*Padina pavonica),* crayfish (crawfish or spiny lobster), (*Palinurus elephas),* sea snail, (*Paludinella littorina),* common maërl, (*Phymatolithon calcareum),* Loch Goil sea squirt, (*Styela gelatinosa),* Northern sea fan, (*Swiftia pallida),* lagoon sea slug, (*Tenellia adspersa),* Northern hatchet-shell, (*Thyasira gouldi),* trembling sea mat, (*Victorella pavida)*.

1.11 The full species list and corresponding legislation that they fall under is listed in Appendix B.

1.3 Format of the Report

1.12 The report comprises three main sections:

- Section 1 details the approach and methodology used to derive the layers;
- Section 2 shows the results and outlines guidance for use and interpretation, and
- Section 3 outlines issues encountered during data collation and layer generation production and sets out future considerations.

1.13 In addition, the Appendices provide further contextual information.

2. Adopted Approach and Methodology

2.1 Collation of Data and Information

2.1 Data was requested from all the major holders of marine biodiversity data for the target species identified in Appendix B. Additional records for the species were sought through direct contact with authors, specialists, recording schemes, societies and organisations known to have carried out work on target species, or who were likely to hold records and information on their distribution. Their details are included in Appendix B.

2.2 The data collated from the statutory agencies and major databases (such as the UKOOA holdings) and the National Biodiversity Network (NBN) were augmented by a literature search for each species on the list, utilising the resources of the National Marine Biological Library (NMBL) and other online literature search tools.

2.3 The data collation was undertaken simultaneously for Limited Mobility Benthic Species (2B), Habitats (2C), Non-native species (2D) and the Biodiversity Layer (2F). In total, over 120 individuals from 68 organizations were initially contacted of which 107 provided data to the project. The resulting number of species records was over 2 million.

2.4 Publications containing relevant information were collected and records extracted. These records (and their originating publication) were then entered into Marine Recorder where permissions allowed. Where permission was not granted for Marine Recorder upload, or there was risk of duplication, some records were imported directly into the species layers. The risk of duplication was caused by access to the latest records from organizations such as Seasearch which had not yet been entered into Marine Recorder. Entry by MarLIN would therefore result in multiple entries for the same record when MarLIN holdings were uploaded to the NBN.

2.5 In addition to requests for data for the MB0102 project, the data providers were asked to give permission for wider dissemination and archiving in DASSH, the MEDIN Data Archive Centre (DAC) for biodiversity data. Where it was agreed, the requests enabled the derived data layers to be more widely available and ensured that data became available from a central point for future projects.

2.2 Quality Assurance

2.6 Progress of datasets through Marine Recorder into the archive used for the contract was monitored using an Access database to ensure that QA standards were adhered to during data input. A record of publication and data sources used was stored in an Endnote database. The bibliography is included in this report. Details of the points of contact and specialists consulted during the data acquisition phase of the project were also logged in the same Access database. The details of individuals and organizations contacted are all available in Appendix D of this report.

2.7 After initial data entry, all data and metadata were validated and verified to ensure the data met appropriate standards. The standards used included those established by the Join Nature Conservation Committee (JNCC) and

DASSH (the Archive for Marine Species and Habitat Data) in its role as a Marine Environmental Data and Information Network (MEDIN) Data Archive Centre (DAC). Data validation was carried out independently of the member of staff responsible for data entry.

2.3 Taxonomic Standards

2.8 All species records were matched to the World Register of Marine Species[5], (WoRMS) using the online "Match taxa" tool. The matching gave a consistent species list to work from and ensured that the layers included the most up-to-date taxonomic information. The matched taxonomic lists were then joined back to the original dataset. In all cases, the taxonomy originally assigned by the data provider was retained to ensure all changes were clear in the final layer.

2.4 Analysis and Data Layer Development

2.9 The species data was then imported into an ESRI Geodatabase structure and the GIS information was standardised and referenced to geographic coordinate system WGS84. The standardization involved the re-projection of any data held in different datums using the toolboxes available through the ESRI ArcGIS software. As Marine Recorder exports data in OSGB36 the Petroleum geographic transformation was applied to re-project the data from OSGB36 into WGS84.

2.10 The collated data was stored in an ESRI Geodatabase with standardised fields. The fields used were agreed with the Project Steering Group and are show in Table 1.

Table 1. Field names for species layers

Field Name	Description.
OrigName	Name in original dataset.
SciName	Name matched in WoRMS.
SurveyID	Unique Survey ID from Marine Recorder. Where data was not entered into Marine Recorder a unique project ID was assigned.
Date_	Date of Record.
LocName	Name of location where record is taken.
SampleID	Unique ID from Marine Recorder (where relevant).
Event	Name of Survey Event from Marine Recorder (where relevant).
Lat	Latitude of record.
Long	Longitude of record.
Determiner	The group or individual(s) responsible for the taxonomic determination.
Status	Status of the record (Present, Absent, Uncertain).
Precision	Precision of spatial information, based on how the spatial information was derived.

[5] SMEBD (2009). World Register of Marine Species. Accessed at http://www.marinespecies.org on [2009-09-15].

2.11 In addition, a survey table was produced in Microsoft Access, to record details of each survey and allow the further interrogation of the layers. The survey table was provided separately to the species layer as it would result in a large amount of duplicated information and greatly increase the size of the delivered layers. The layers can be linked through the SurveyID field which is common to both tables. The fields in the survey table are shown in Table 2.

Table 2. Field names for survey table

Field Name	Description.
SurveyID	Unique Survey ID from Marine Recorder. Where data was not entered into Marine Recorder a unique project ID was assigned.
SpeciesListUsed	The name of the species check list used. In all cases, this was "WoRMS – World Register of Marine Species".
SurveyName	Name of the Survey
SurveyTechnique	Where know the method of survey that the records result from.
StartDate	The date the survey started. In cases where only the month or year are know the first day of the month or year are recorded.
EndDate	The date the survey ended. In cases where only the month or year are know the last day of the month or year are recorded.
SurveyTechniqueDetails	Where known further details of survey technique are recorded.
UseContraints	The limitations on the use of the data.
DeterminedBy	The group or individual(s) responsible for the taxonomic determination.
Surveyors	The group or individual(s) responsible for the survey.

2.5 Confidence Assessment

2.12 In many cases, we were aware of data that was not available within the scope of the project, or that were not in an accessible format currently. Therefore, there was a need to attach a measure of confidence to the resultant species layers. Table 3 shows the ascribed confidence based on current data availability.

Table 3. Confidence assessment based on data availability

Scientific name	Confidence	Rationale
Alkmaria romijni	Medium	Many records in commercially collected EIA. Therefore, we suspect its distribution may be wider than shown.
Amphianthus dohrnii	High	All accessible data included.
Anotrichium barbatum	Medium	Not all data available
Arachnanthus sarsi	High	All accessible data included.

Arctica islandica	Medium	Widespread sublittoral species likely to be data deficient
Armandia cirrhosa	High	All accessible data included.
Arrhis phyllonyx	Medium-low	Offshore species data deficient
Ascophyllum nodosum ecad *mackaii*	Medium	Not all data available
Atrina pectinata (syn. fragilis)	High	All accessible data included.
Caecum armoricum	High	All accessible data included.
Cruoria cruoriaeformis	Medium	Not all data available
Dermocorynus montagnei	Medium	Not all data available
Edwardsia ivelli	High	All accessible data included.
Edwardsia timida	High	All accessible data included.
Eunicella verrucosa	High	All accessible data included.
Fucus distichus	Medium	Not all data available
Funiculina quadrangularis	Medium	Not all data available
Gammarus insensibilis	High	All accessible data included.
Gitanopsis bispinosa	High	All accessible data included.
Gobius cobitis	High	All accessible data included.
Gobius couchi	Medium	High probability of misidentification
Haliclystus auricula	Medium	Widespread sublittoral species likely to be data deficient
Heleobia stagnorum	High	All accessible data included.
Hippocampus guttulatus	Medium	Not all data available
Hippocampus hippocampus	Medium	Not all data available
Leptopsammia pruvoti	High	All accessible data included.
Lithothamnion corallioides	Medium	Not all data available
Lucernariopsis campanulata	Medium	Widespread sublittoral species likely to be data deficient
Lucernariopsis cruxmelitensis	High	All accessible data included.
Mitella pollicipes	High	May be more widely distributed. Unrecorded in Cornwall but we have all known records.
Nematostella vectensis	High	All accessible data included.
Ostrea edulis	Medium	Not all data available
Pachycerianthus multiplicatus	Medium	Not all data available
Pachycordyle navis	High	All accessible data included.
Padina pavonica	Medium	Not all data available
Palinurus elephas	High	Not all data collected in time
Paludinella littorina	Medium	Difficult to find species - data deficient

Phymatolithon calcareum	Medium	Not all data available
Styela gelatinosa	High	
Swiftia pallida	High	
Tenellia adspersa	High	
Thyasira gouldi	Medium	Fairly widespread sublittoral species likely to be data deficient
Victorella pavida	High	

2.13 Once sufficient preliminary records were collected a series of draft maps were produced, displaying the currently recognized distribution for each species. These maps were then made available, with restrictions through the MarLIN website. All previous consultants, along with any known specialists not yet contacted were invited to review the distributions and provide feedback. The feedback was then collated and additions and edits made to the underlying data. Details of the additional data are shown in Appendix D.

2.14 GIS data was manually screened for duplicate entries, missing information and points plotting on land. There remains an issue with creating point layers where some historic data is stored at resolutions of 1 or 10kms. Coordinate precision was therefore included as a data attribute, to allow records at these resolutions to be filtered out as required without having to remove them from the final layers.

2.15 Where many replicates were taken at one station, or duplicates formed by more than one surveyors records being entered the points were removed. Where sampling occurred at different years (for example as part of long-term monitoring programmes) the data from the latest year was retained.

2.16 Ivell's sea anemone *Edwardsia ivelli* and the brackish hydroid *Pachycordyle navis* have very limited distribution but are no longer found at their historic locations. Therefore both present and not present records were put into the resulting layers. However only the most recent "not present" records were shown in the layer. In addition, the British Phycological Society questioned the certainty of the identification of historic records of *Lithothamnion coralloides* and therefore Scottish records of this species have been labelled as uncertain but retained in the layers.

3. Derived Data Layers for Limited Mobility Species

3.1 Using the Data Layers

3.1 The interpretation and usage of the derived data layers should be carried out with reference to the information outlined in the sections below. Each layer had valid MEDIN discovery metadata associated with it, allowing further interpretation and additional information relating to the layer.

3.2 Coordinate Precision

3.2 All records are provided as points. However, this data must be interpreted using the coordinate precision field. The precision may affect how a record displays, particularly for those at 10 km resolution, as they may appear offshore for an intertidal species or intertidal for a sublittoral species.

3.3 Figure 1 illustrates the precision of a typical selection of records.

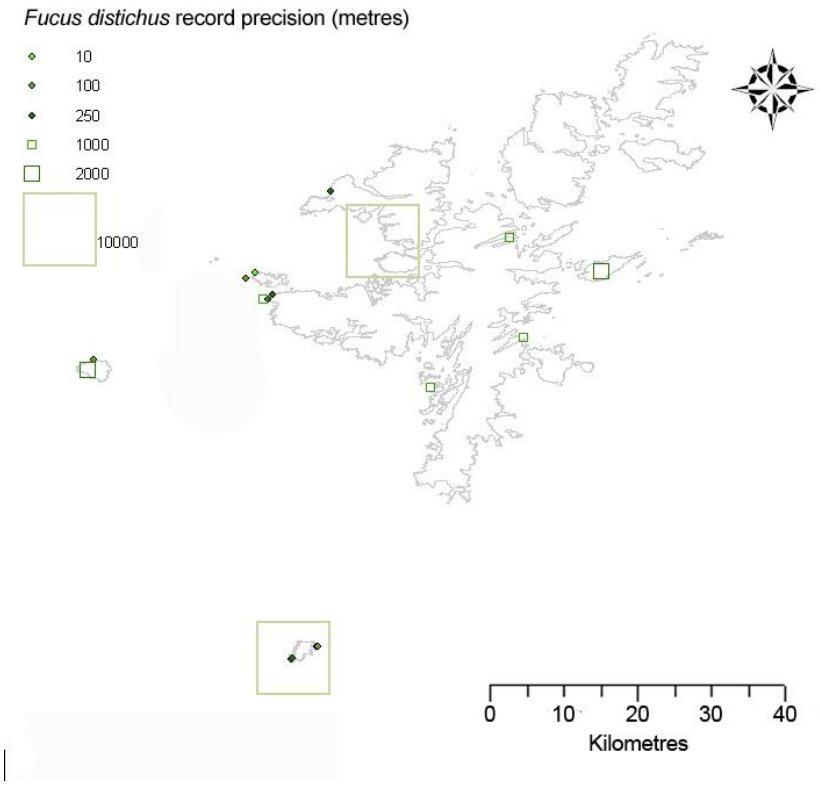

Figure 1. Example of varying coordinate precision of records within a dataset.

3.3 Permissions and Reuse

3.4 The limited mobility (2B) species layers are provided only for the uses set out by Defra in the Restrictions of Use document, included here as Appendix E. The original data providers should be contacted for any uses outside the 'Accessing and developing the required biophysical datasets and data layers for Marine Protected Areas network planning and wider marine spatial planning purposes' contract remit. Where possible, permission has additionally been cleared for data to be disseminated publicly via the NBN.

3.5 The derived data layers resulting from the MB0102 project will be made available through the MEDIN DAC network, with metadata available through the MEDIN portal available from the MEDIN website[6].

3.4 Example Maps

3.6 From the resulting data layers, a series of images have been produced within this report showing the distribution of those species listed in Table 3 of the Marine Conservation Zone Project Ecological Network Guidance draft document[7]. These demonstrate the outputs from the project GIS but do not include the GIS functionality to allow the user to zoom, pan and query the data points.

3.7 Data layers have been produced for all the species listed in Appendix B. However, the summary distribution map images for bearded red seaweed *Anotrichium barbatum*, scarce tube dwelling anemone *Arachnanthus sarsi*, deep sea shrimp *Arrhis phyllonyx*, sea loch egg wrack *Ascophyllum nodosum* ecad *mackaii*, red seaweed *Dermocorynus montagnei*, Ivell's sea anemone *Edwardsia ivelli*, timid burrowing anemone *Edwardsia timida*, brown seaweed *Fucus distichus*, tall sea pen *Funiculina quadrangularis*, Couch's goby *Gobius couchi*, lagoon spire snail *Heleobia stagnorum*, fireworks anemone *Pachycerianthus multiplicatus*, brackish hydroid *Pachycordyle navis*, Loch Goil sea squirt (*Styela gelatinosa*), northern sea fan *Swiftia pallida*, and the northern hatchet shell *Thyasira gouldi*, are not included in this report in order to maintain the report at a reasonable size.

[6] http://www.oceannet.org/
[7] http://www.jncc.gov.uk/pdf/MPA_100514_ENG_v9.0r.pdf

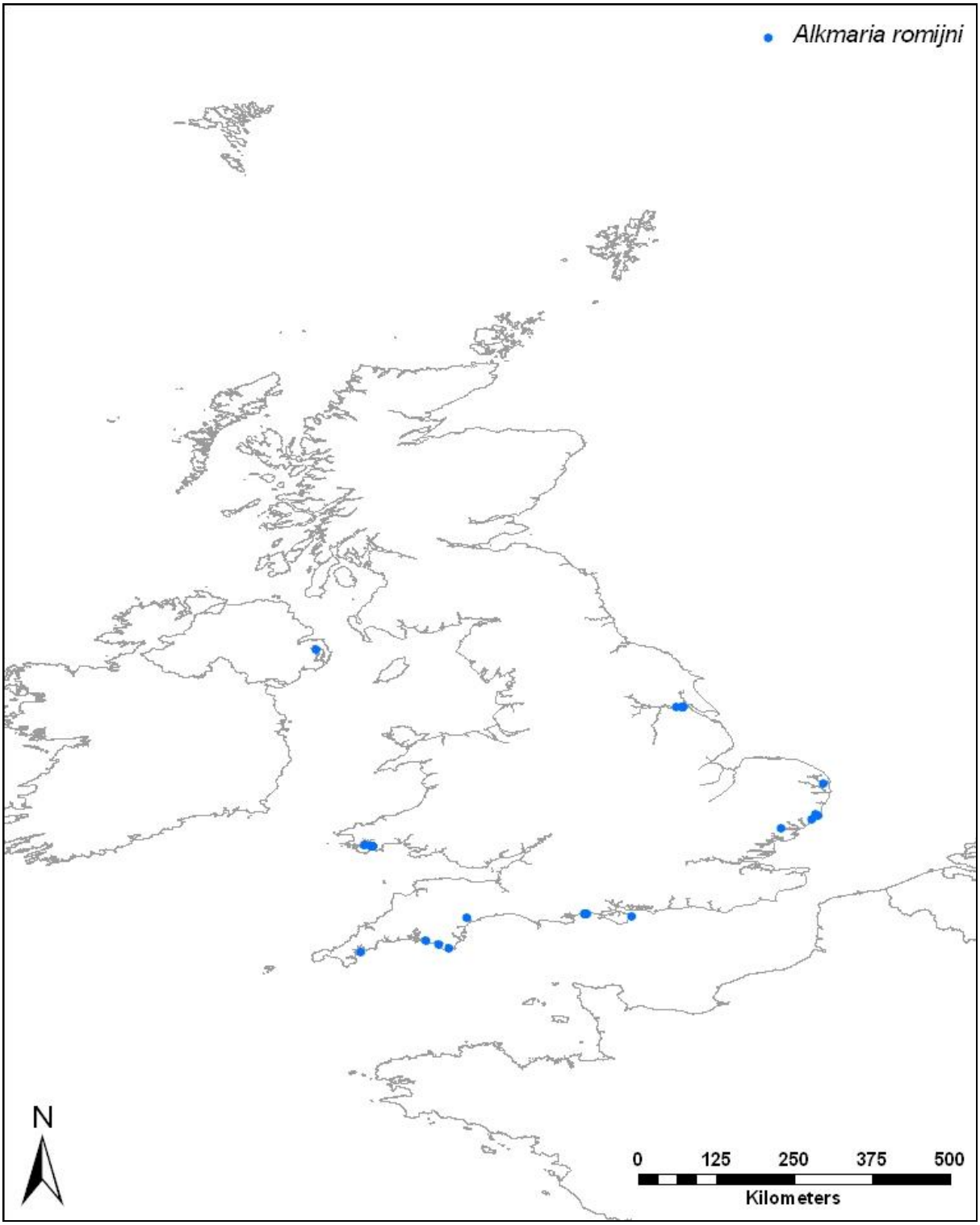

Figure 2. Final derived data layer for the tentacled lagoon worm *Alkmaria romijni*.

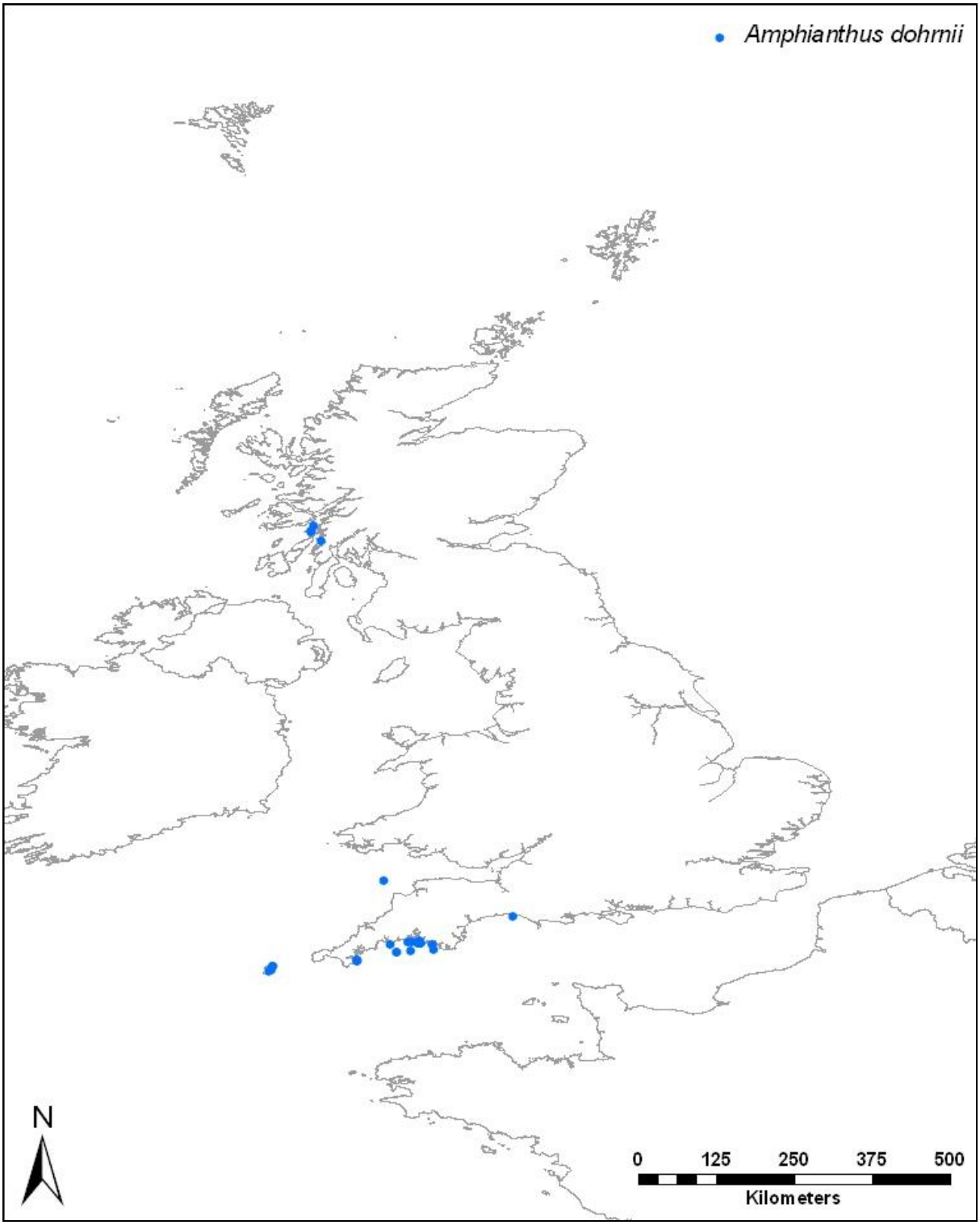

Figure 3. Final derived data layer for the sea fan anemone *Amphianthus dohrnii.*

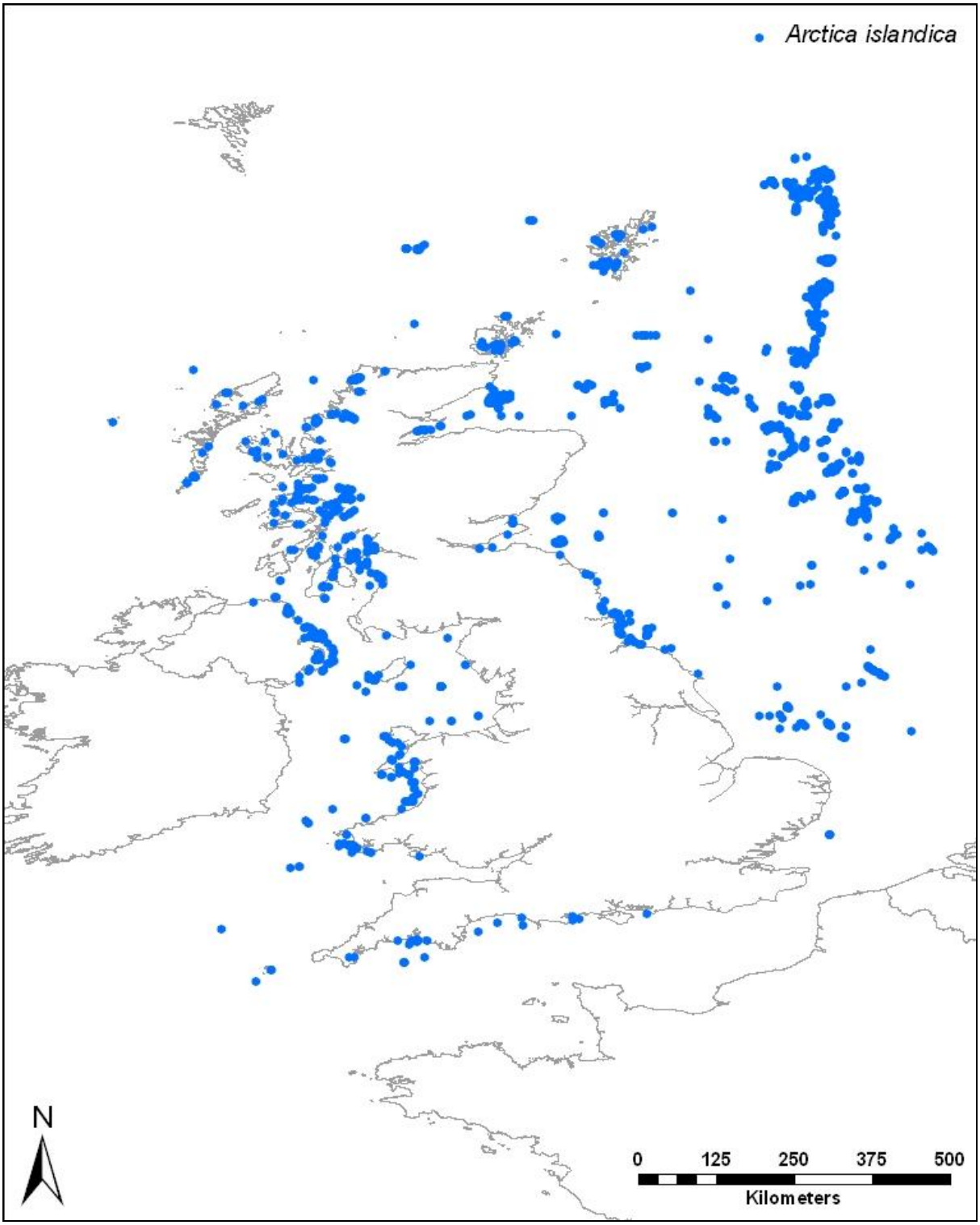

Figure 4. Final derived data layer for the Icelandic cyprine *Arctica islandica.*

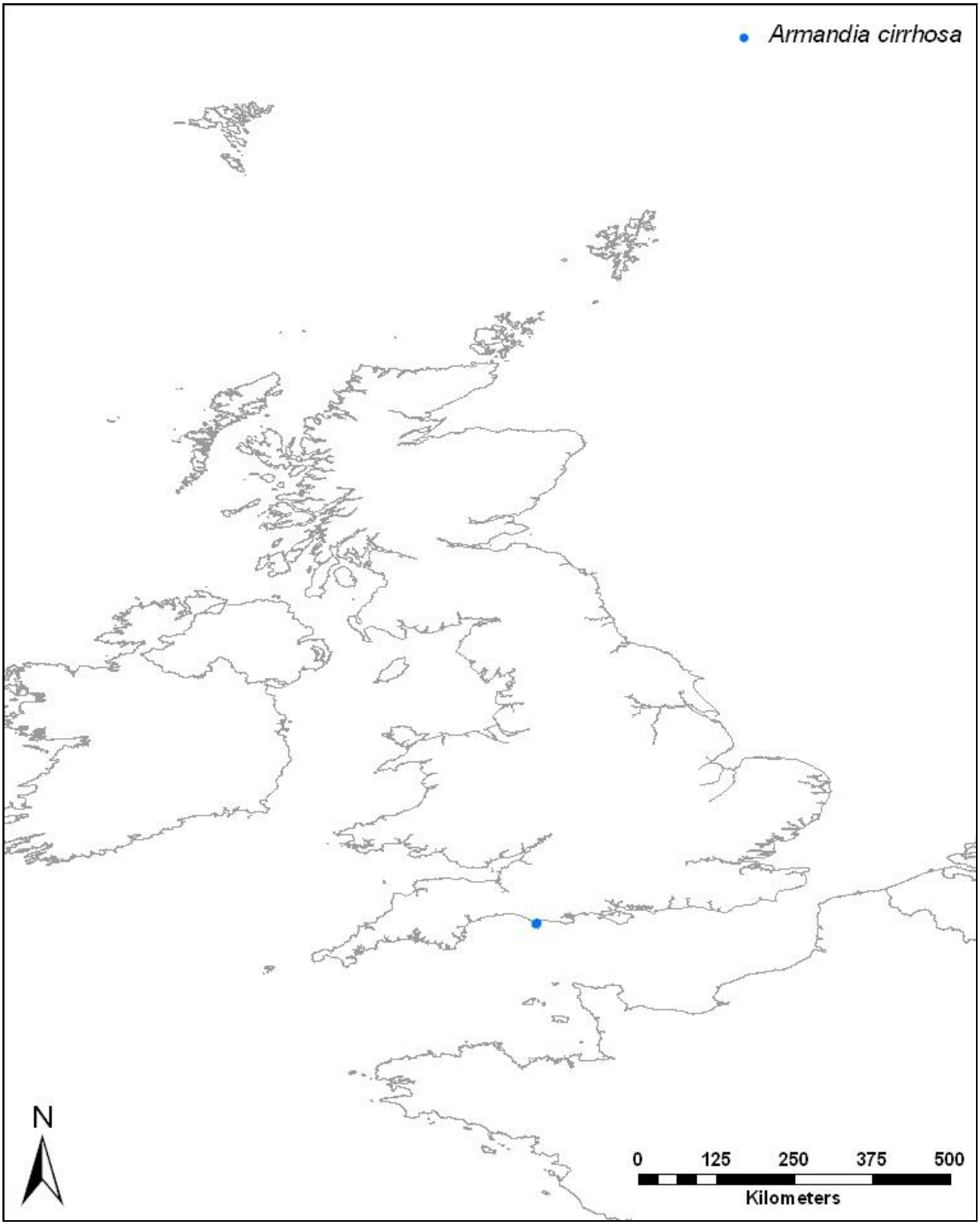

Figure 5. Final derived data layer for the lagoon sandworm *Armandia cirrhosa.*

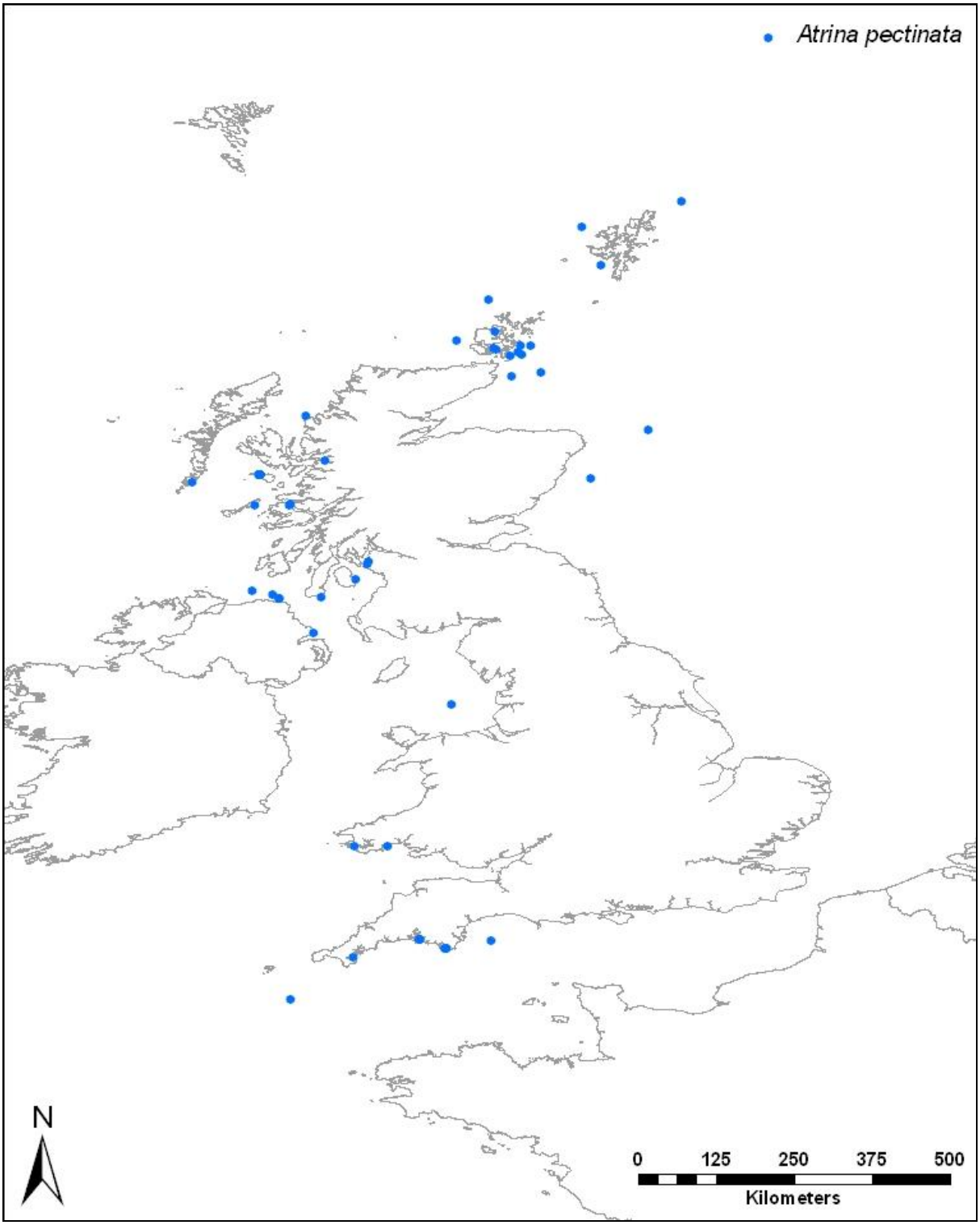

Figure 6. Final derived data layer for the fan mussel *Atrina pectinata (syn. fragilis).*

Figure 7. Final derived data layer for DeFolin's lagoon snail *Caecum amoricum.*

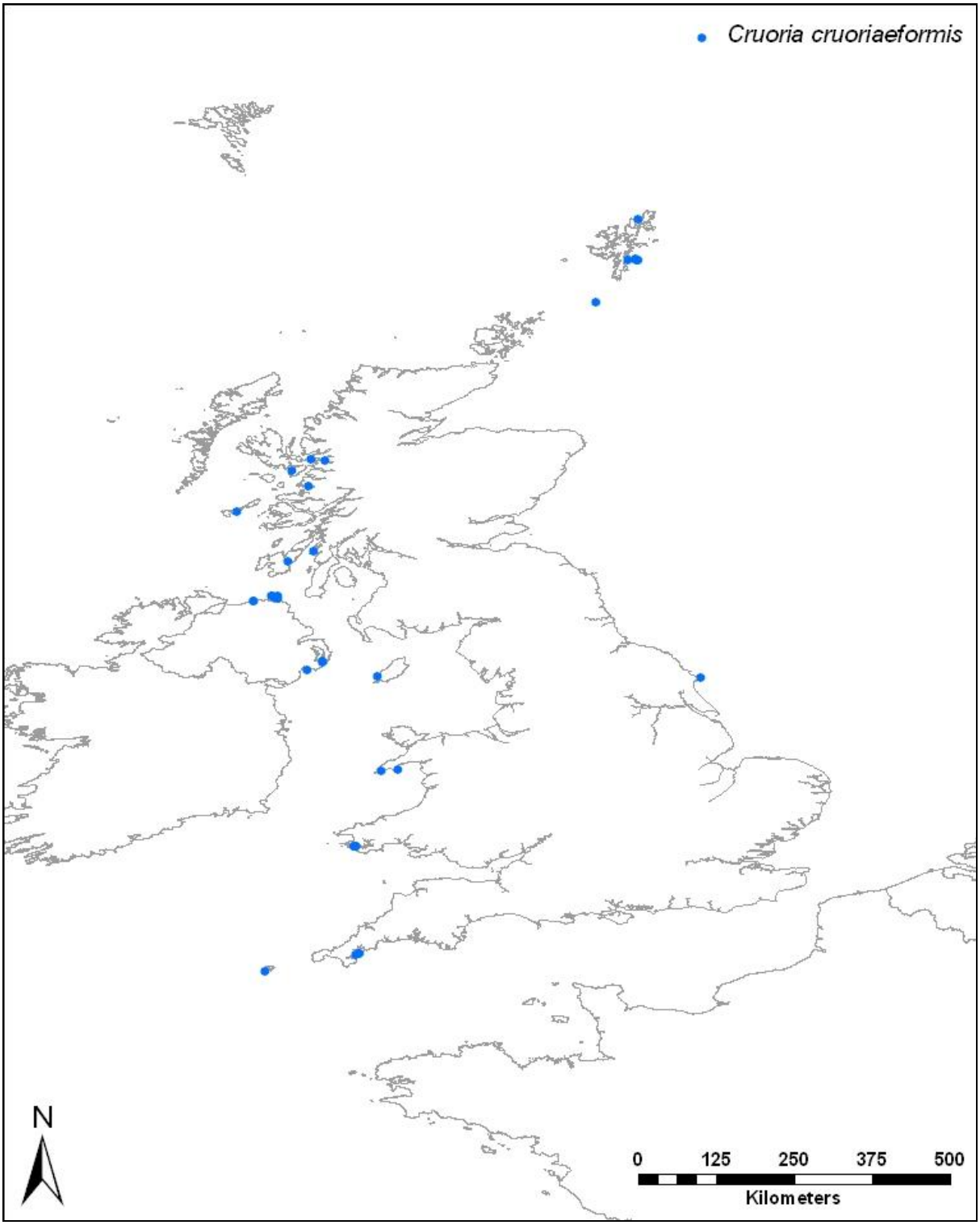

Figure 8. Final derived data layer for the red seaweed *Cruoria cruoriaeformis*.

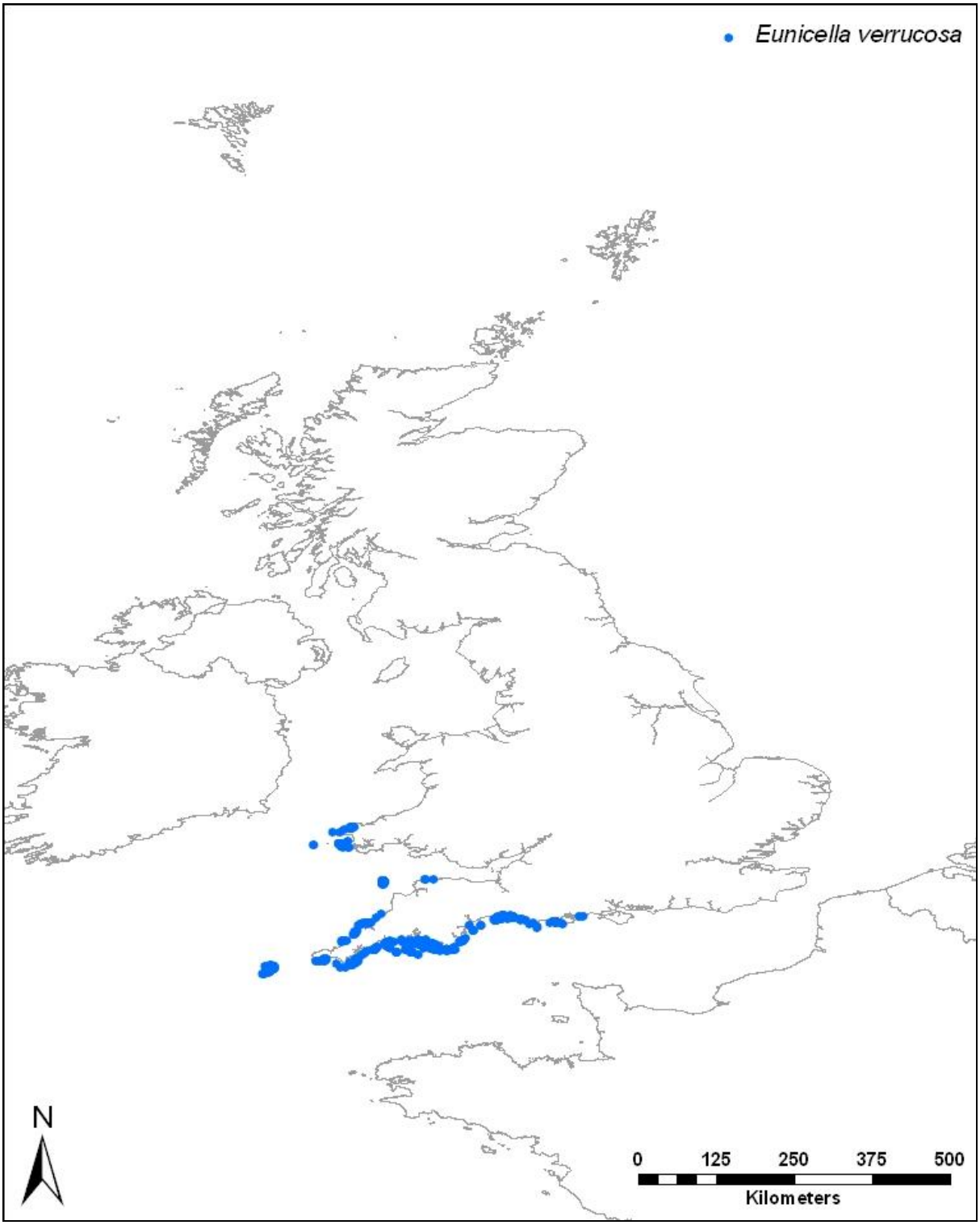

Figure 9. Final derived data layer for the pink sea fan *Eunicella verrucosa.*

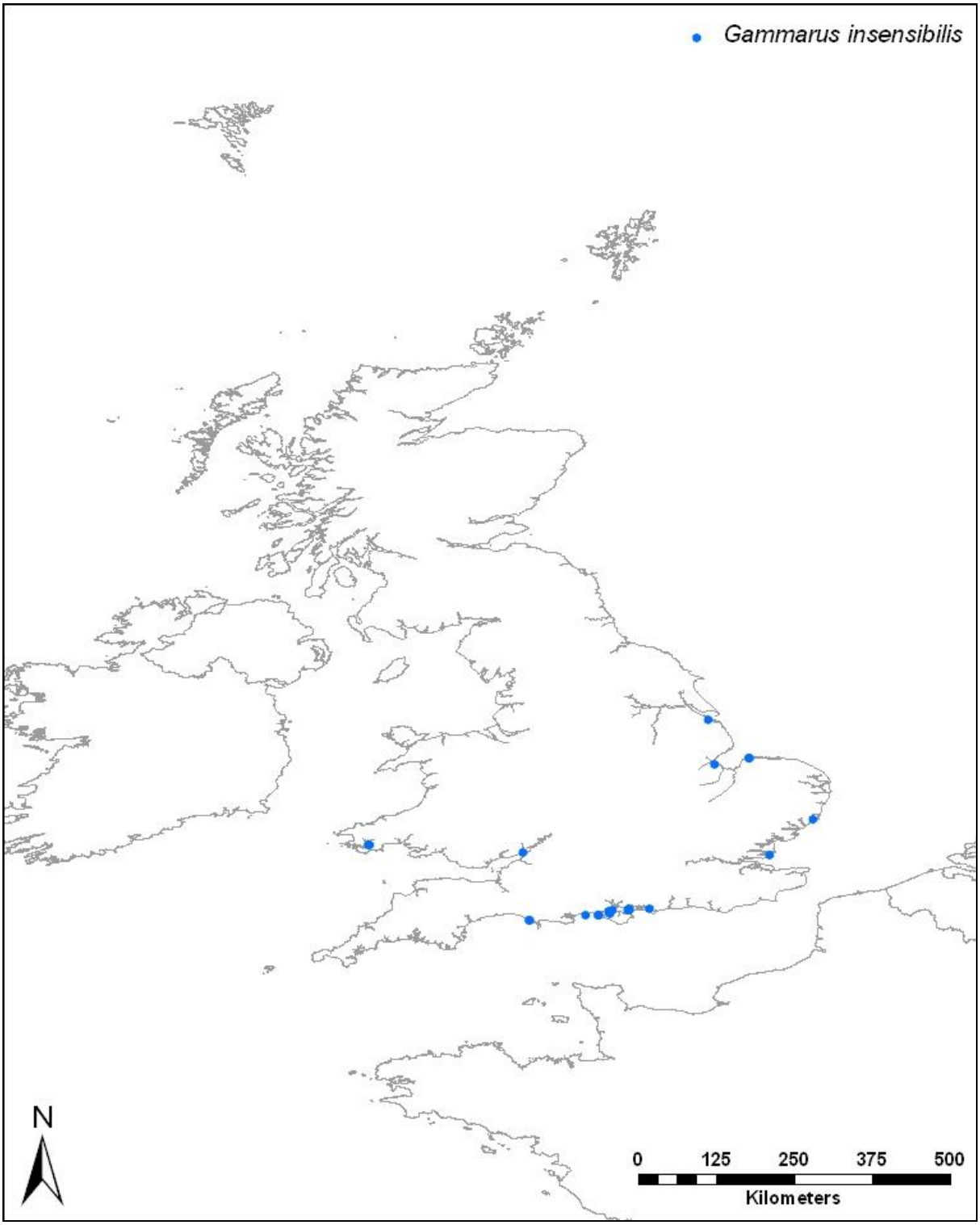

Figure 10. Final derived data layer for the lagoon sand shrimp *Gammarus insensibilis.*

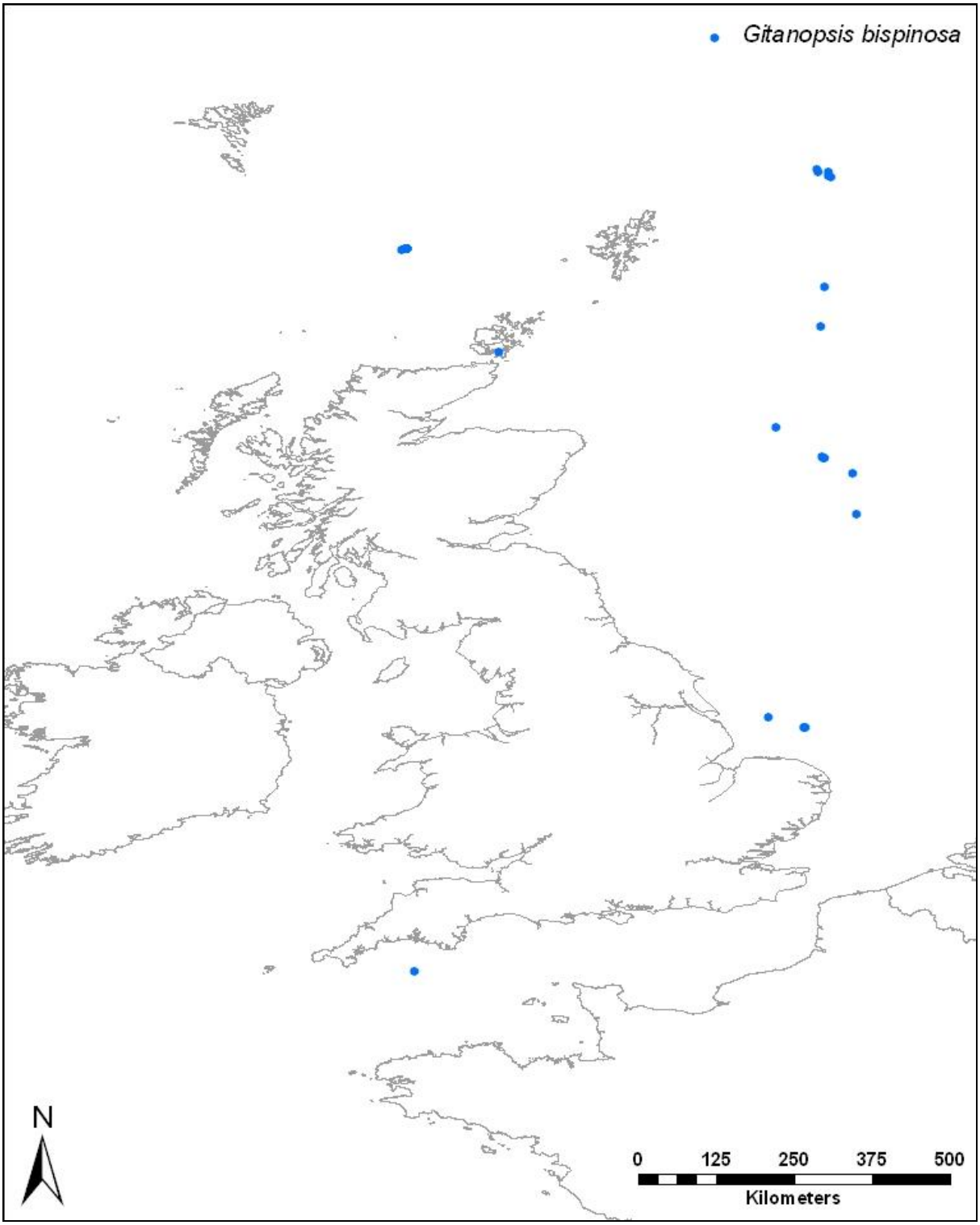

Figure 11. Final derived data layer for amphipod shrimp *Gitanopsis bispinosa.*

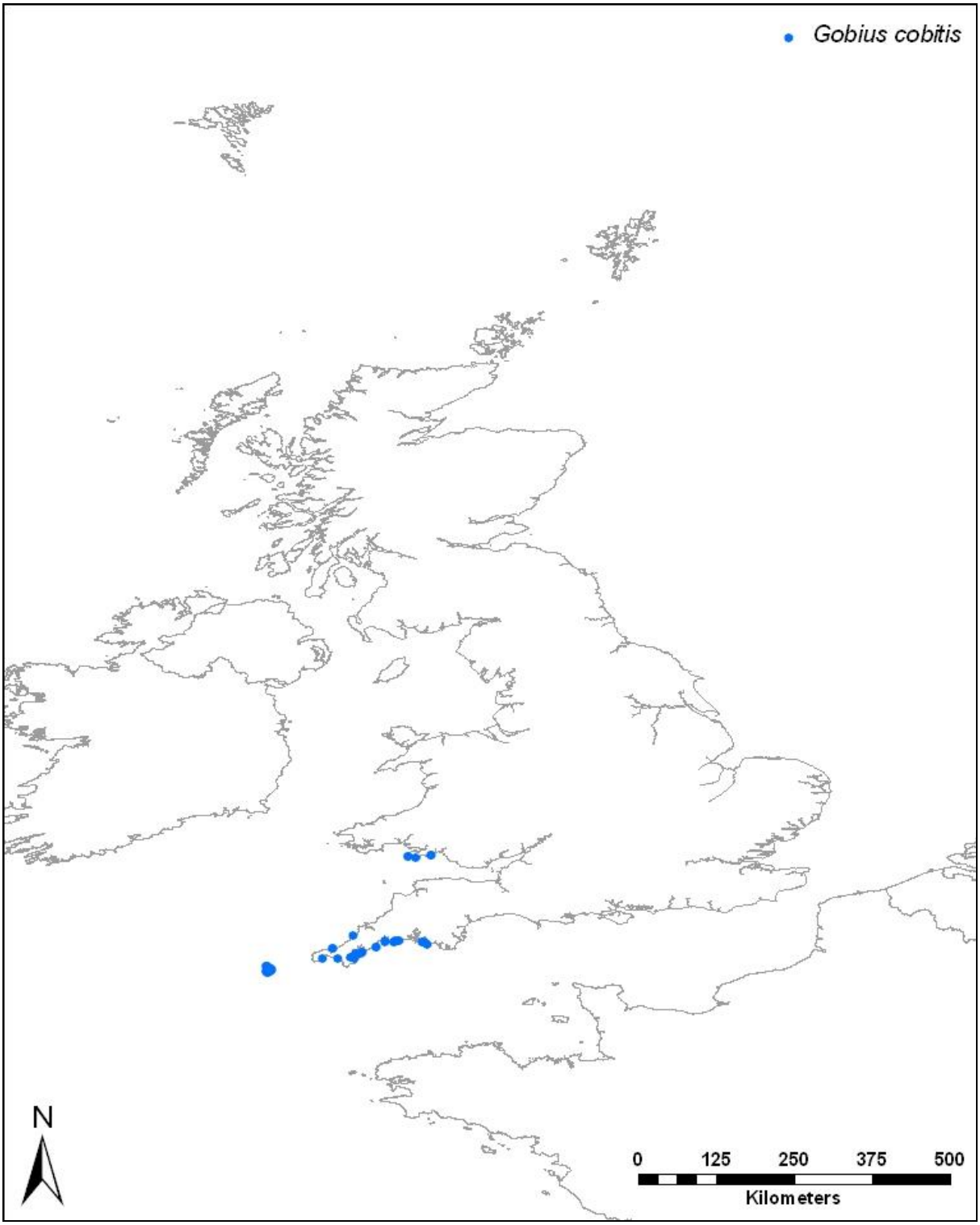

Figure 12. Final derived data layer for giant goby *Gobius cobitis.*

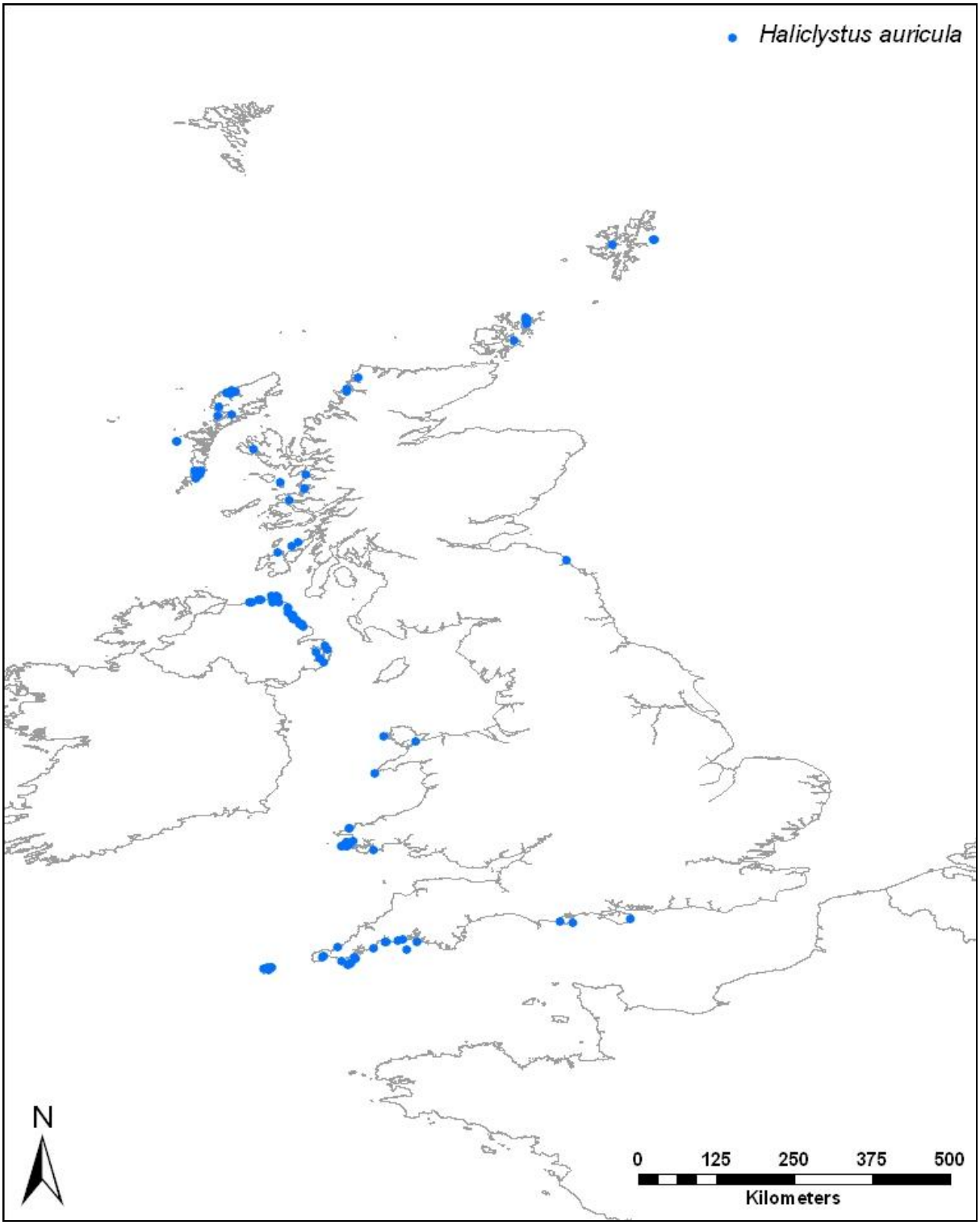

Figure 13. Final derived data layer for stalked jellyfish *Haliclystus auricula.*

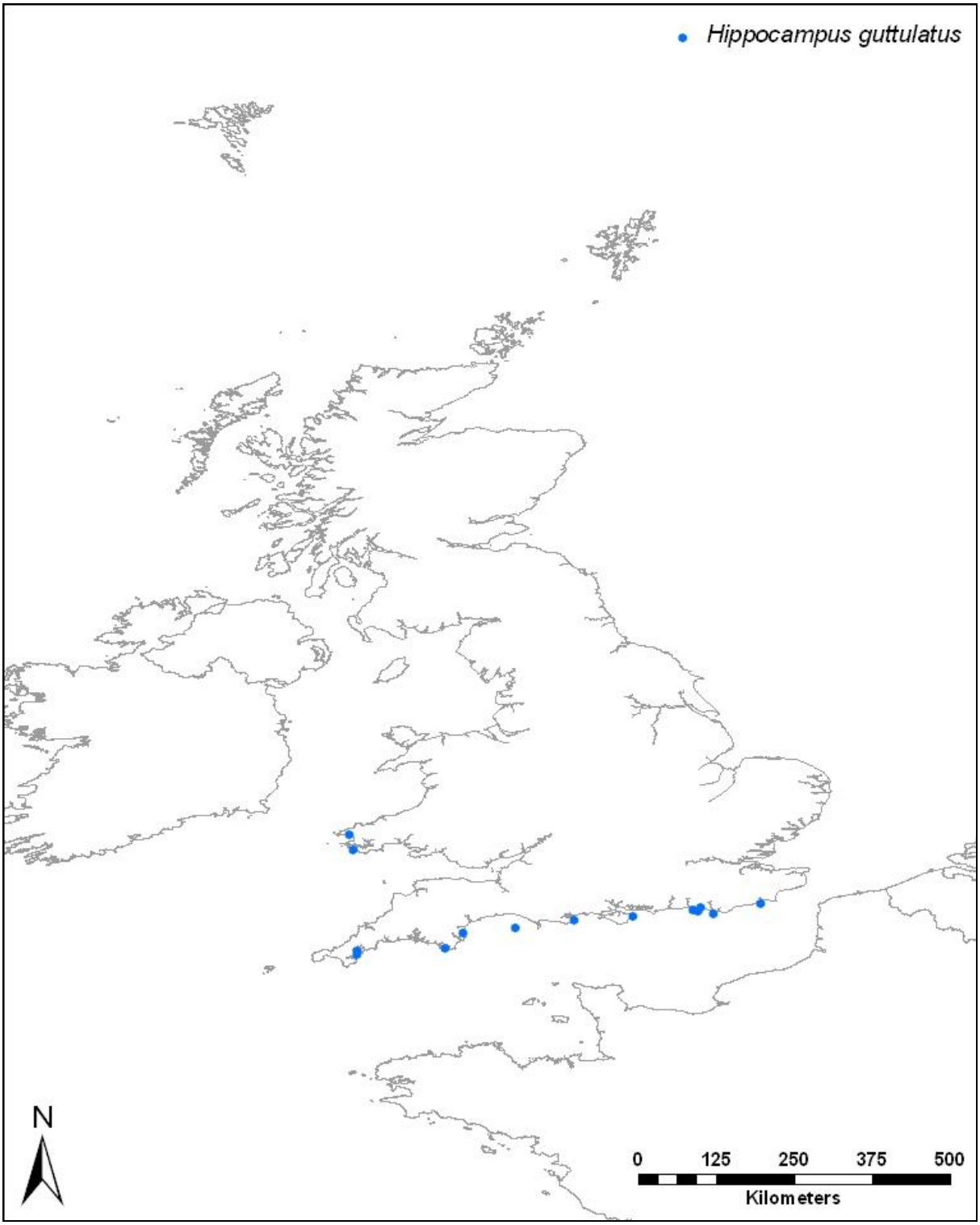

Figure 14. Final derived data layer for the long snouted seahorse *Hippocampus guttulatus.*

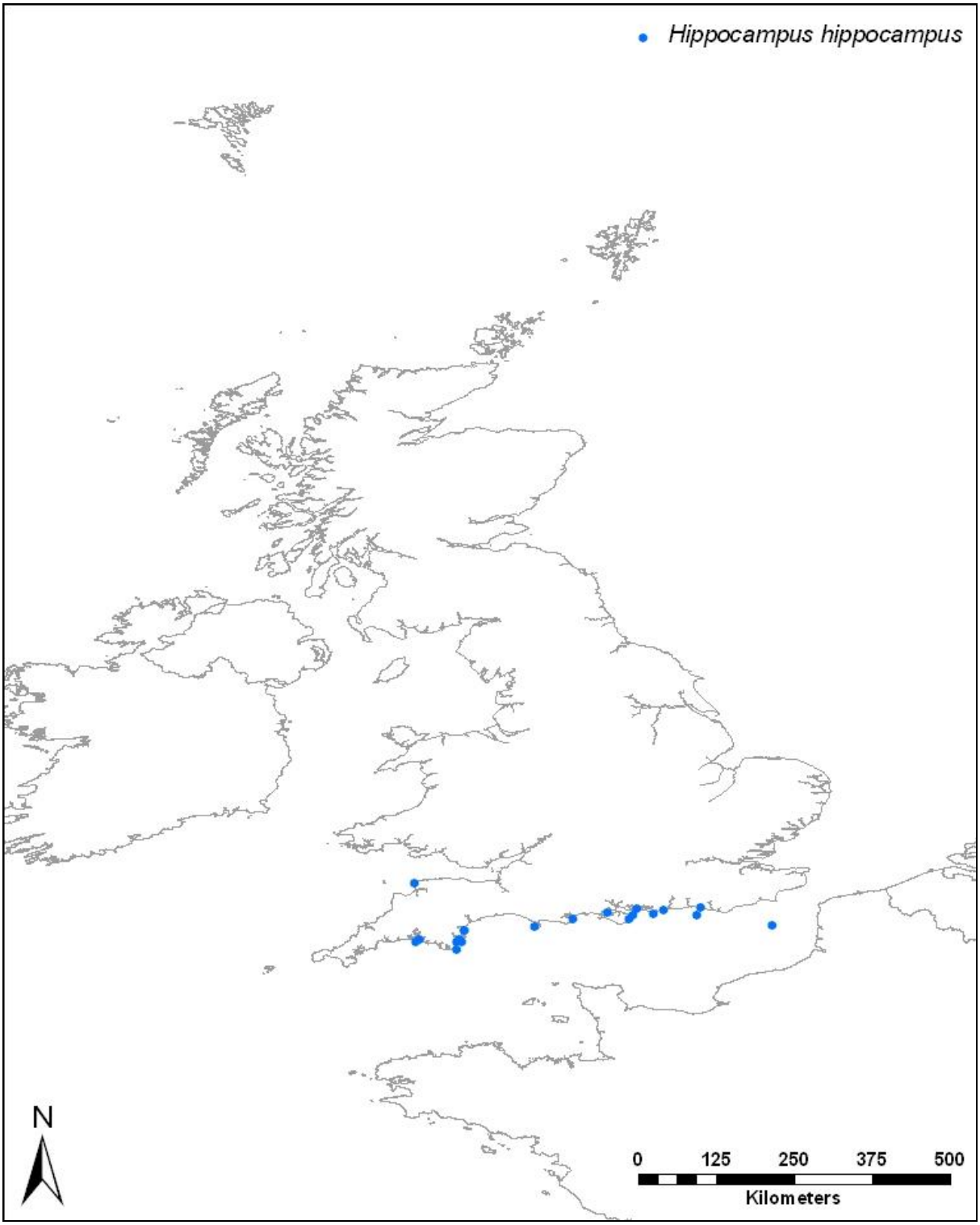

Figure 15. Final derived data layer for the short snouted seahorse *Hippocampus hippocampus.*

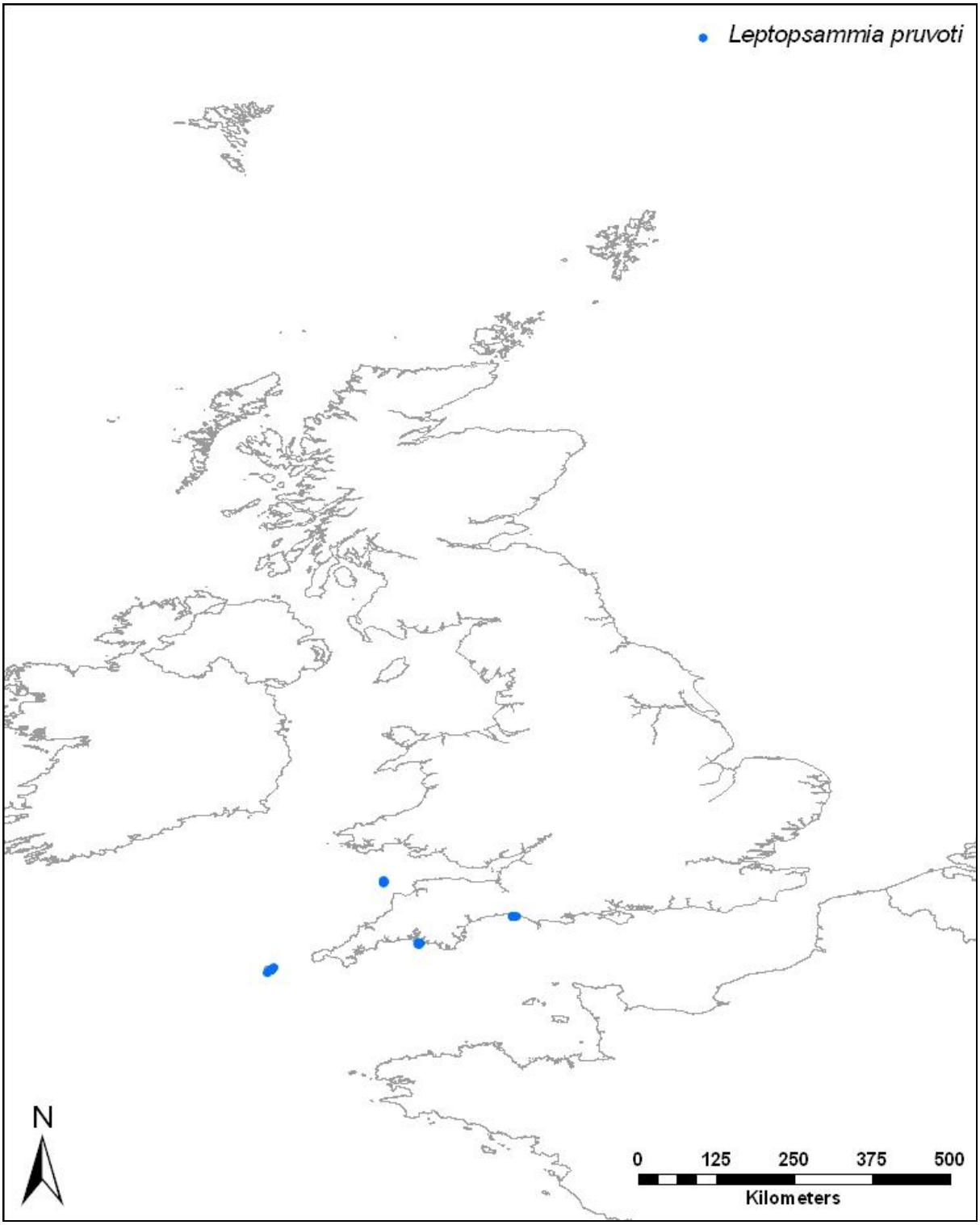

Figure 16. Final derived data layer for the sunset cup coral *Leptopsammia pruvoti.*

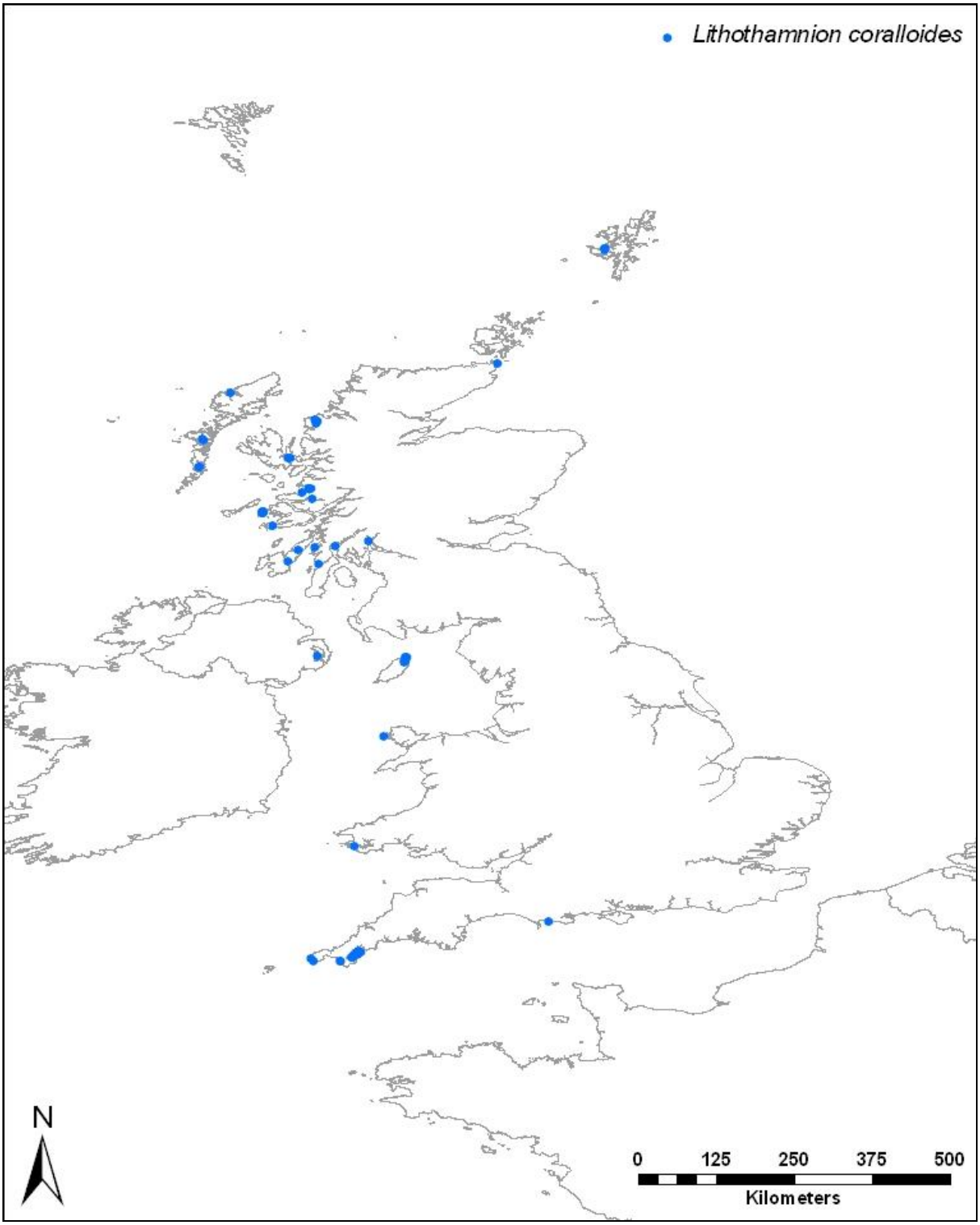

Figure 17. Final derived data layer for the maerl *Lithothamnion corralloides.*

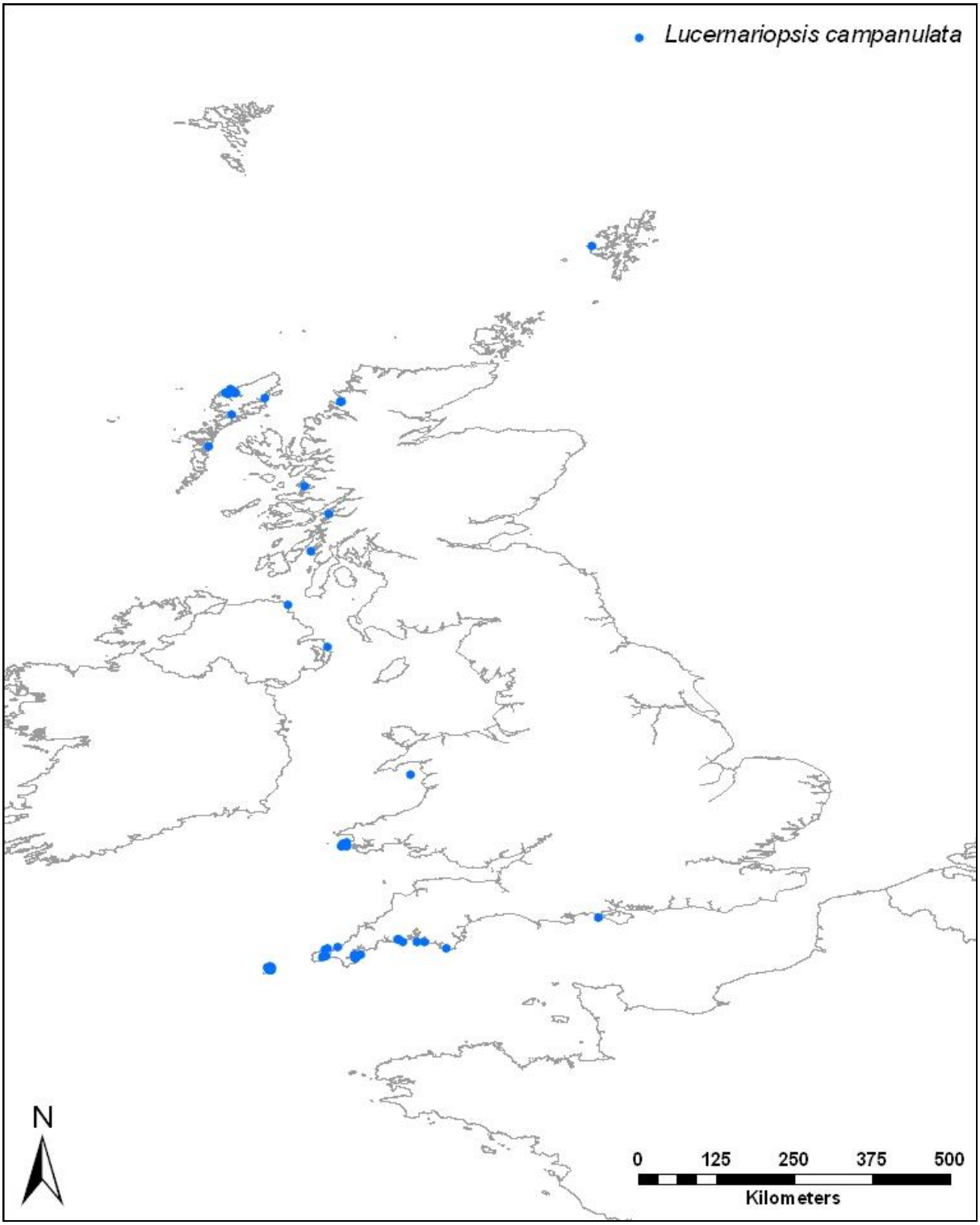

Figure 18. Final derived data layer for the stalked jellyfish *Lucernariopsis campanulata.*

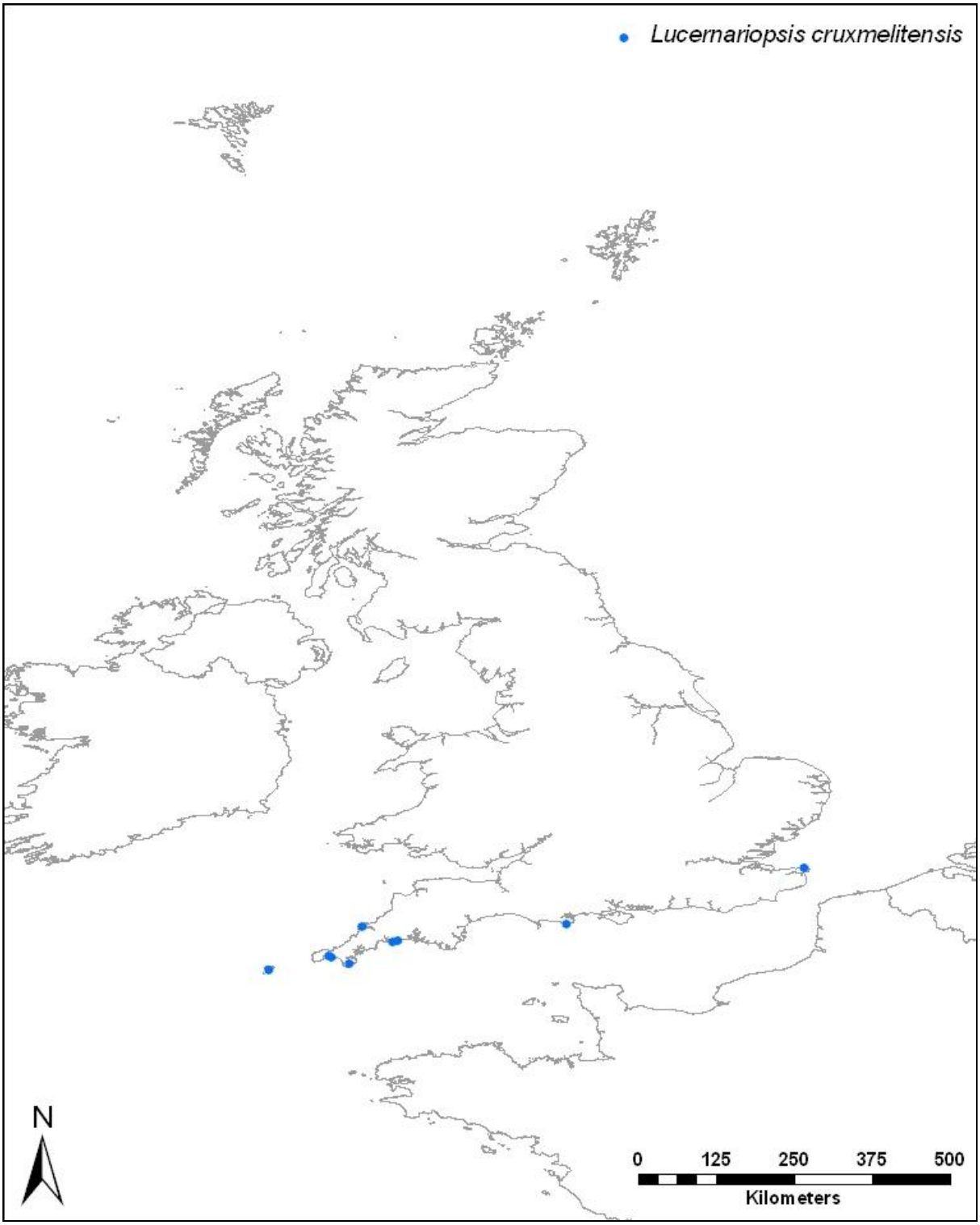

Figure 19. Final derived data layer for the stalked jellyfish *Lucernariopsis cruxmelitensis.*

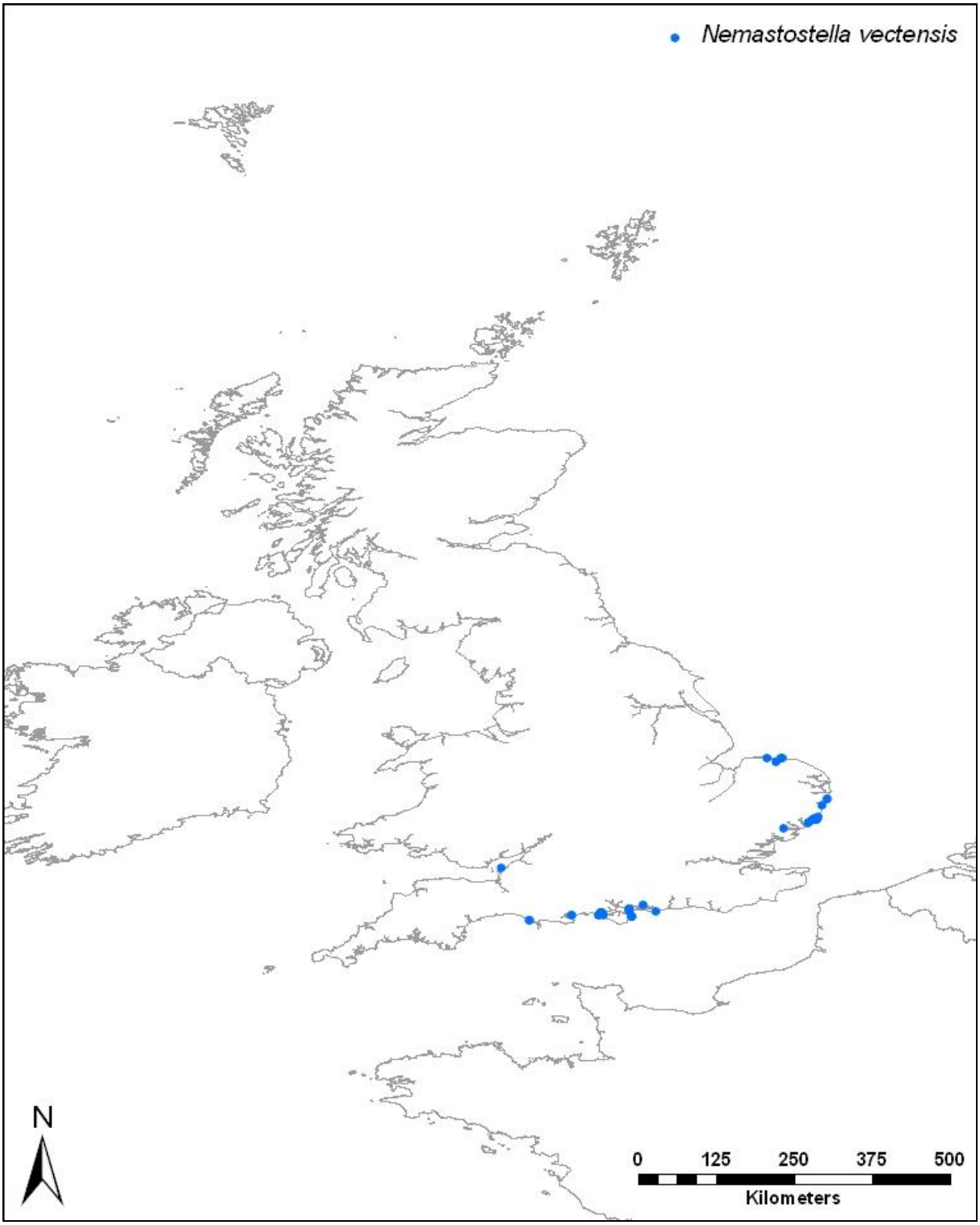

Figure 20. Final derived data layer for the starlet sea anemone *Nematostella vectensis.*

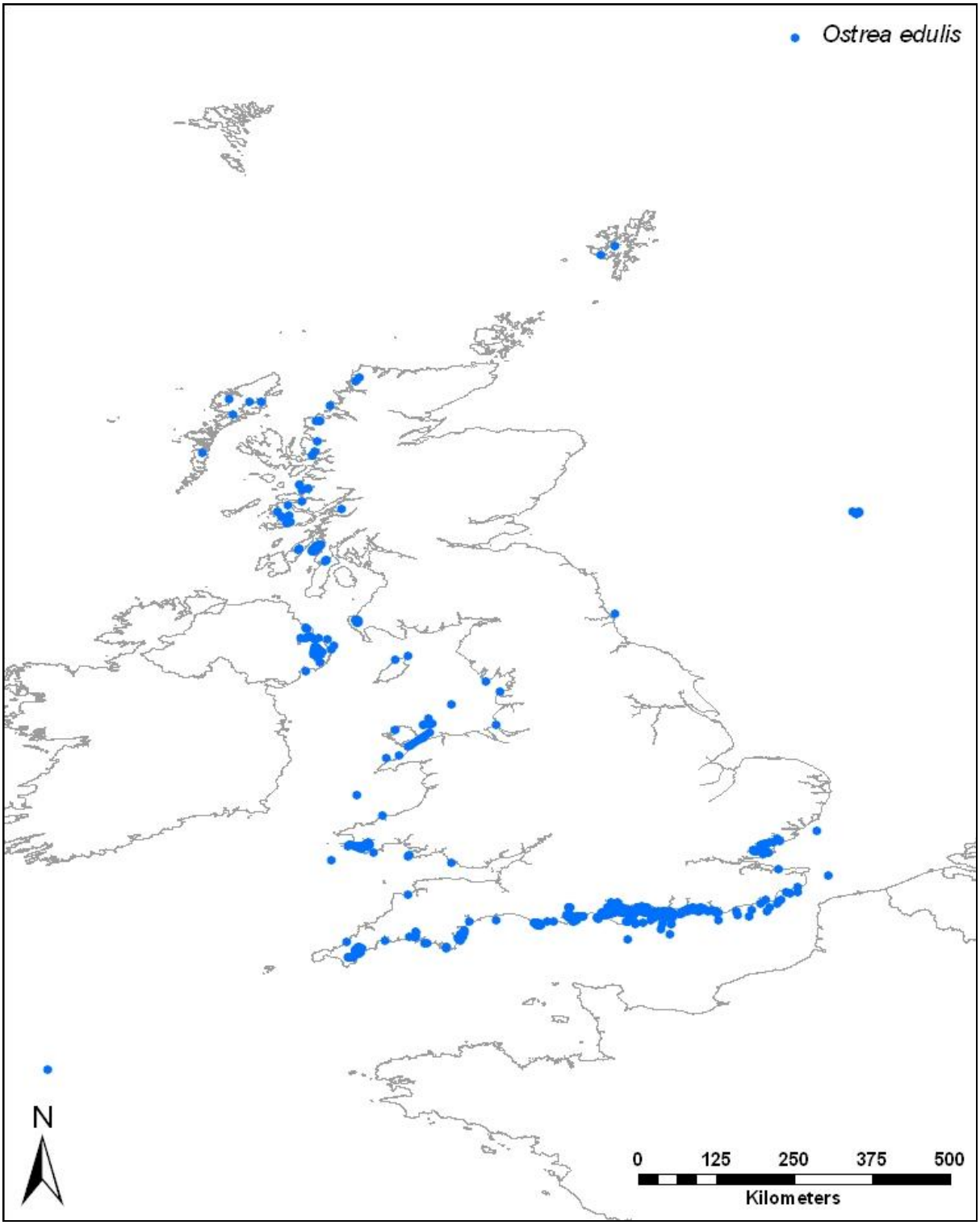

Figure 21. Final derived data layer for the native oyster *Ostrea edulis.*

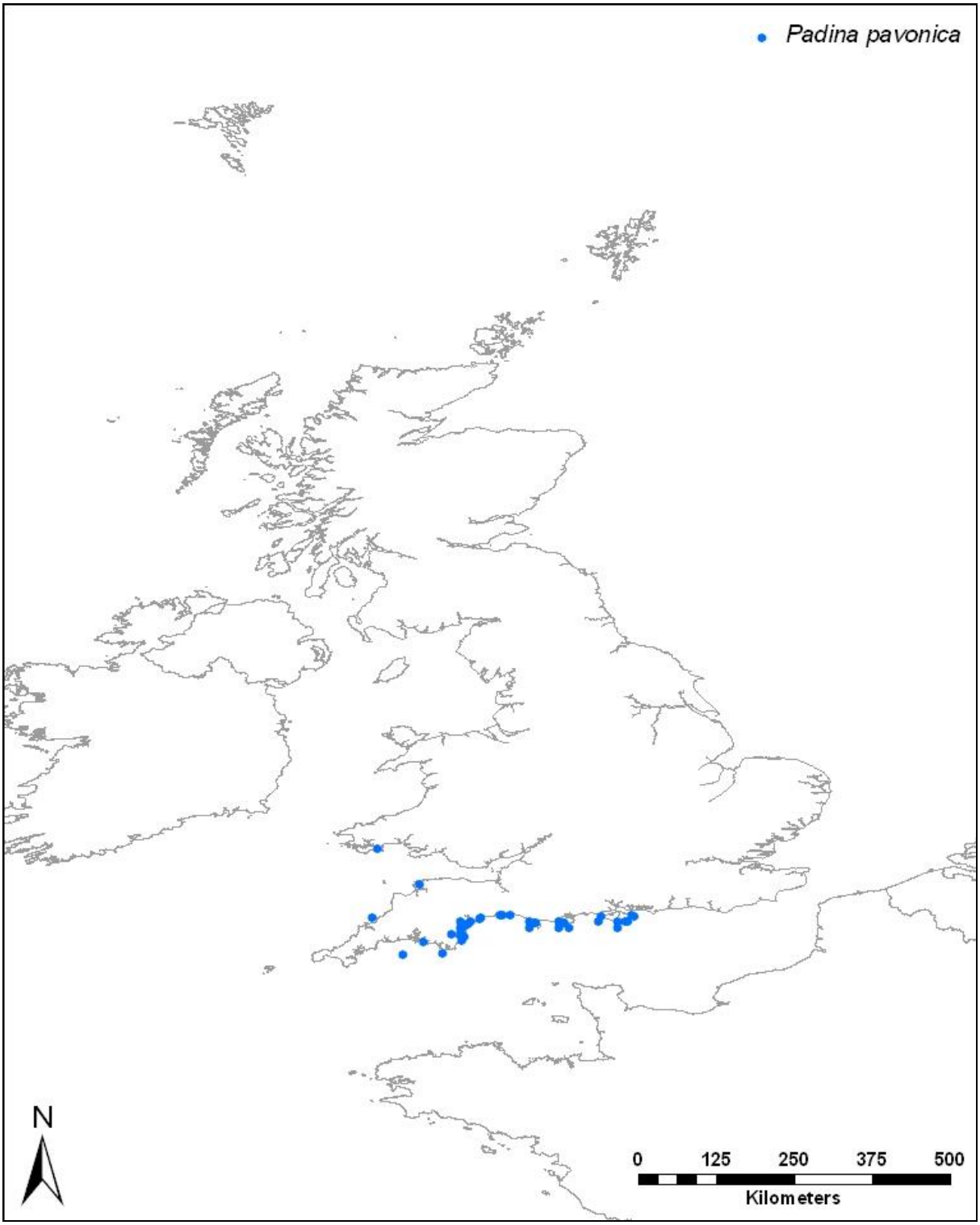

Figure 22. Final derived data layer for the peacock's tail *Padina pavonica.*

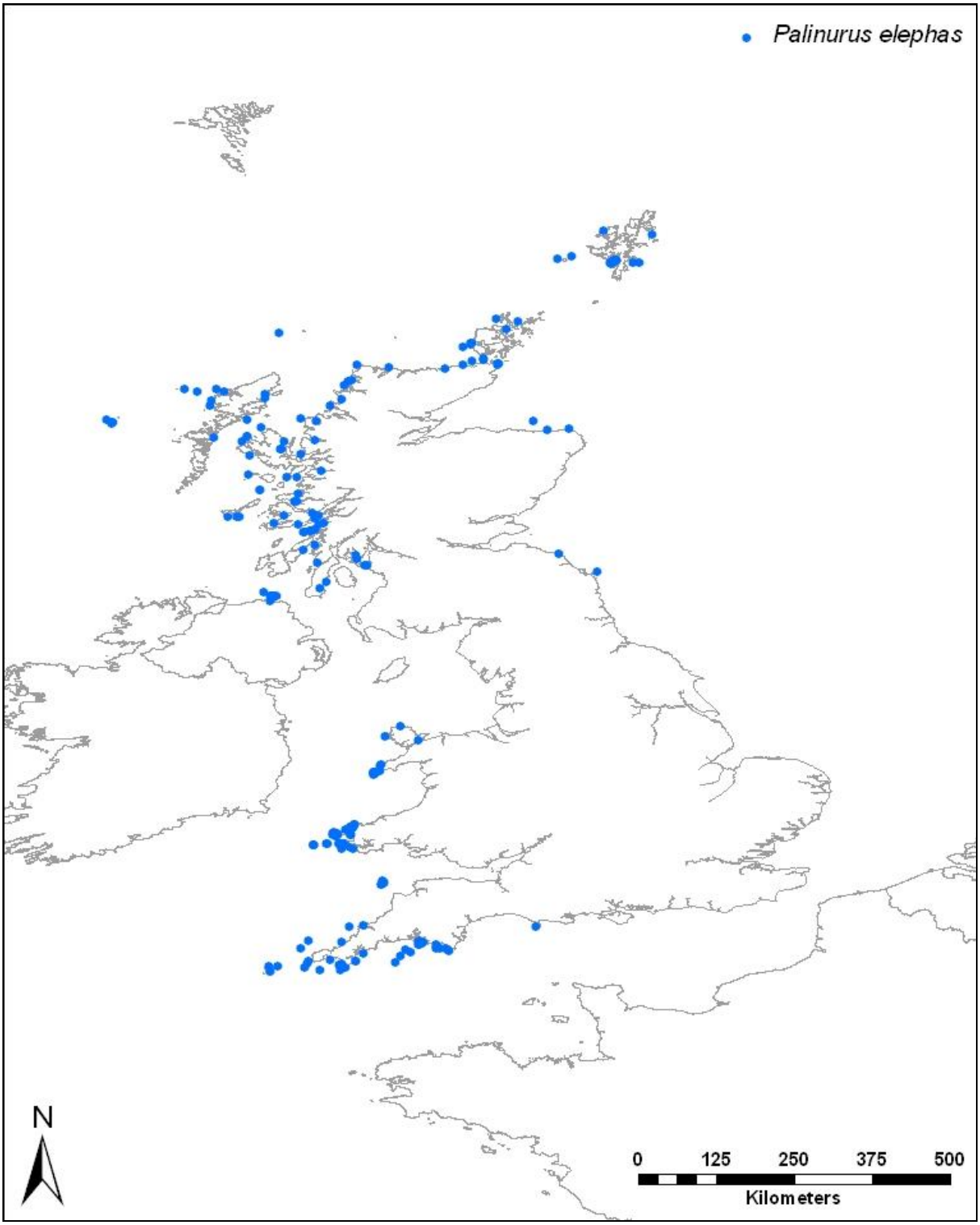

Figure 23. Final derived data layer for the European spiny lobster *Palinurus elephas.*

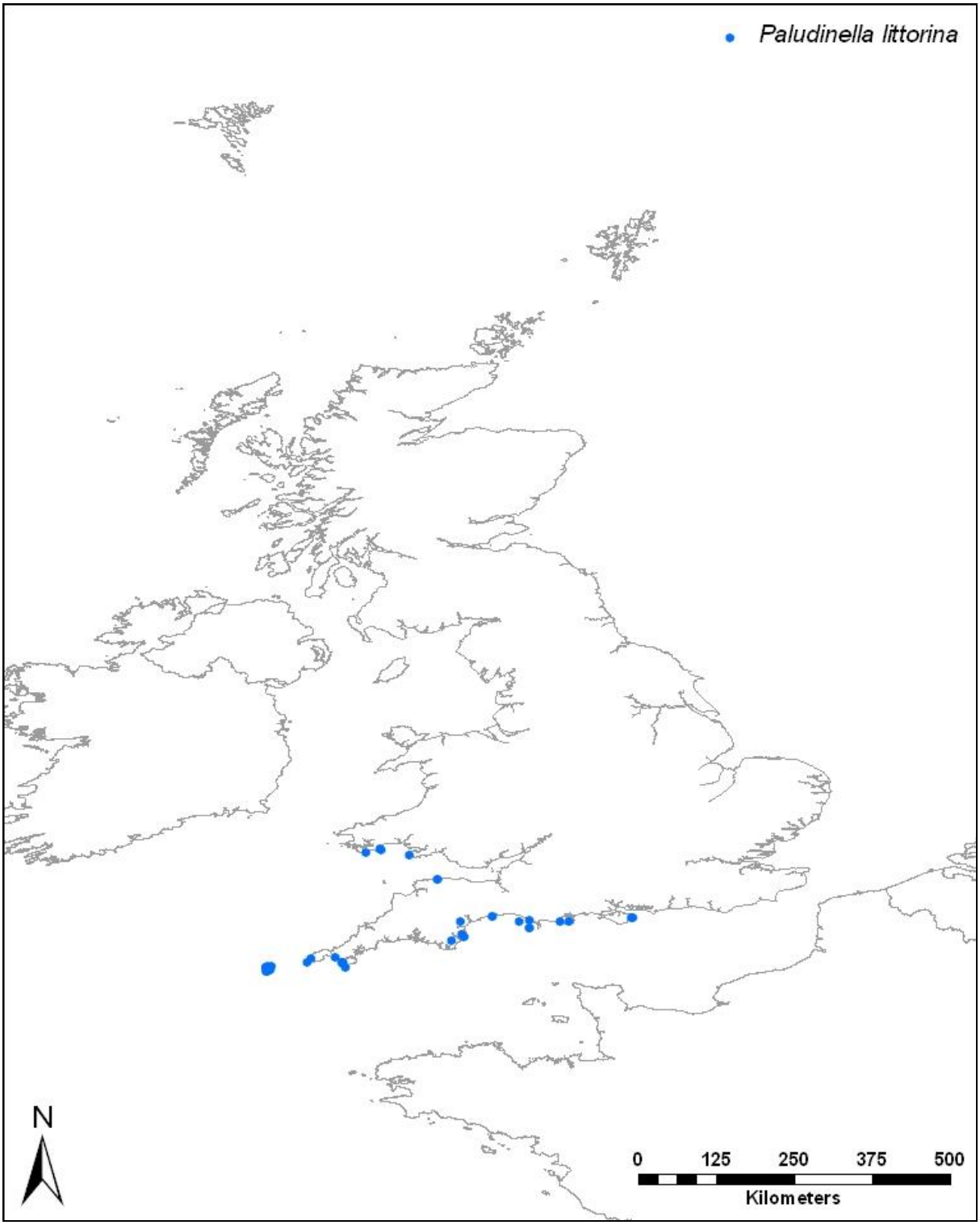

Figure 24. Final derived data layer for the lagoon snail *Paludinella littorina.*

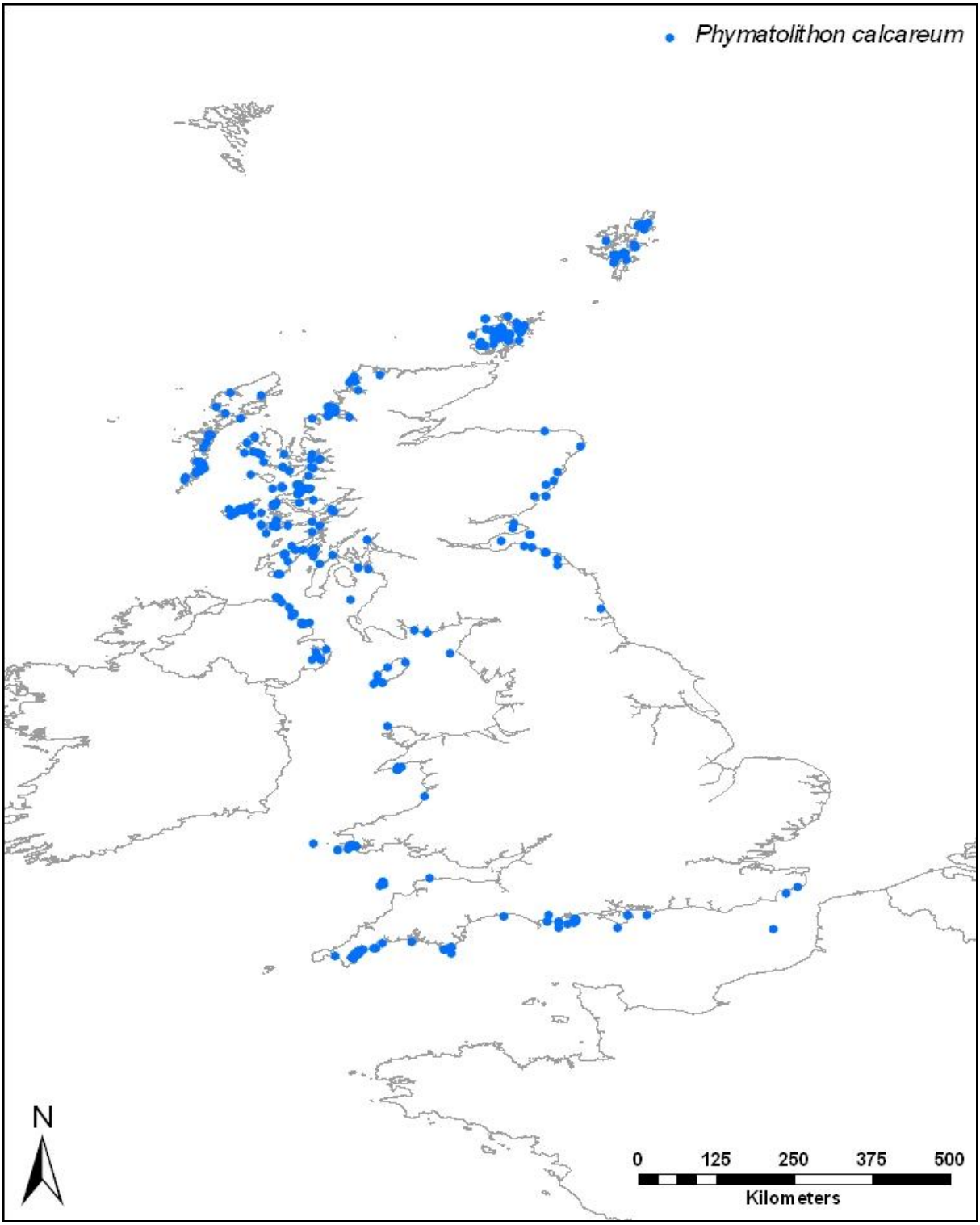

Figure 25. Final derived data layer for the maerl *Phymatolithon calcareum.*

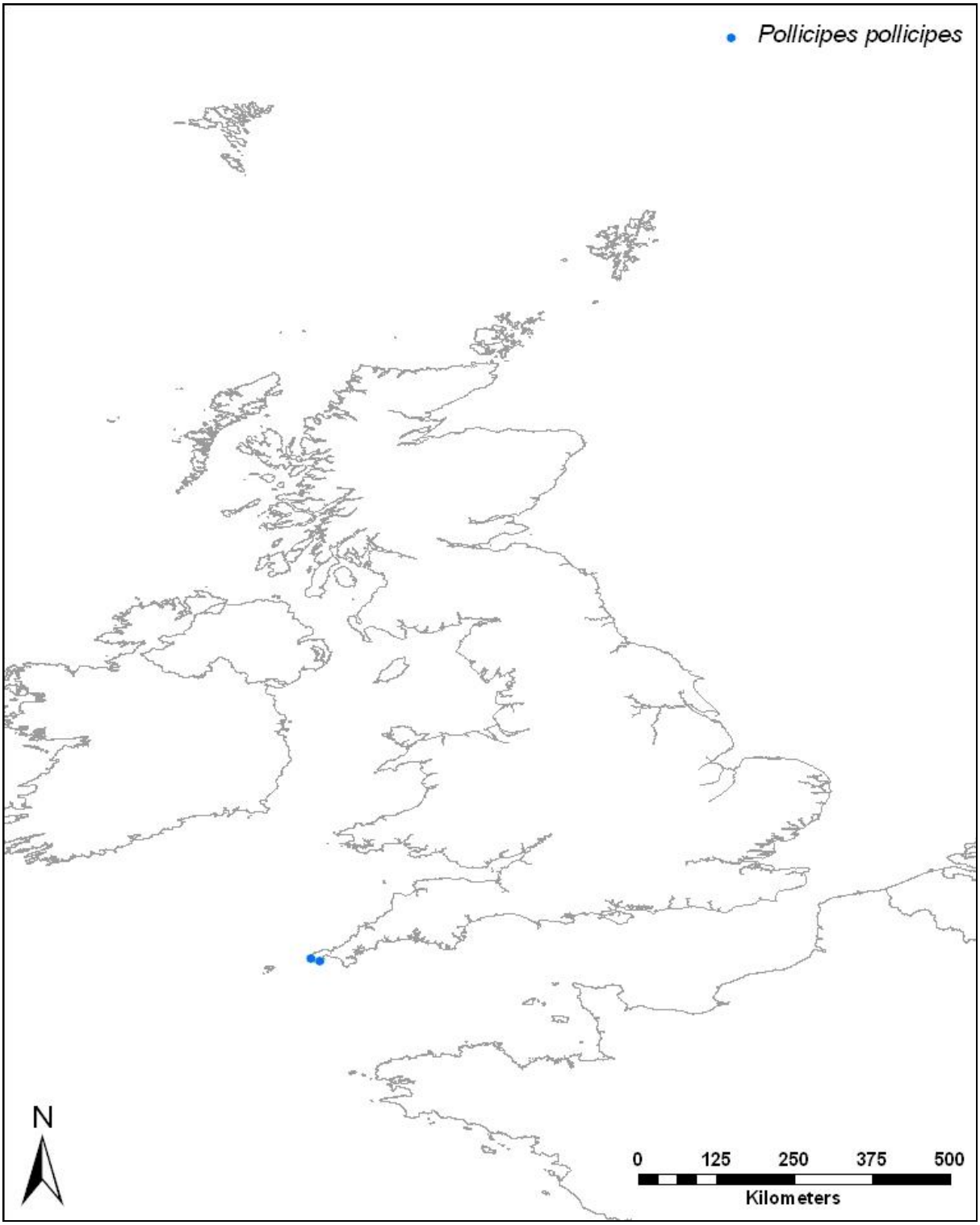

Figure 26. Final derived data layer for the goose barnacle *Pollicipes pollicipes.*

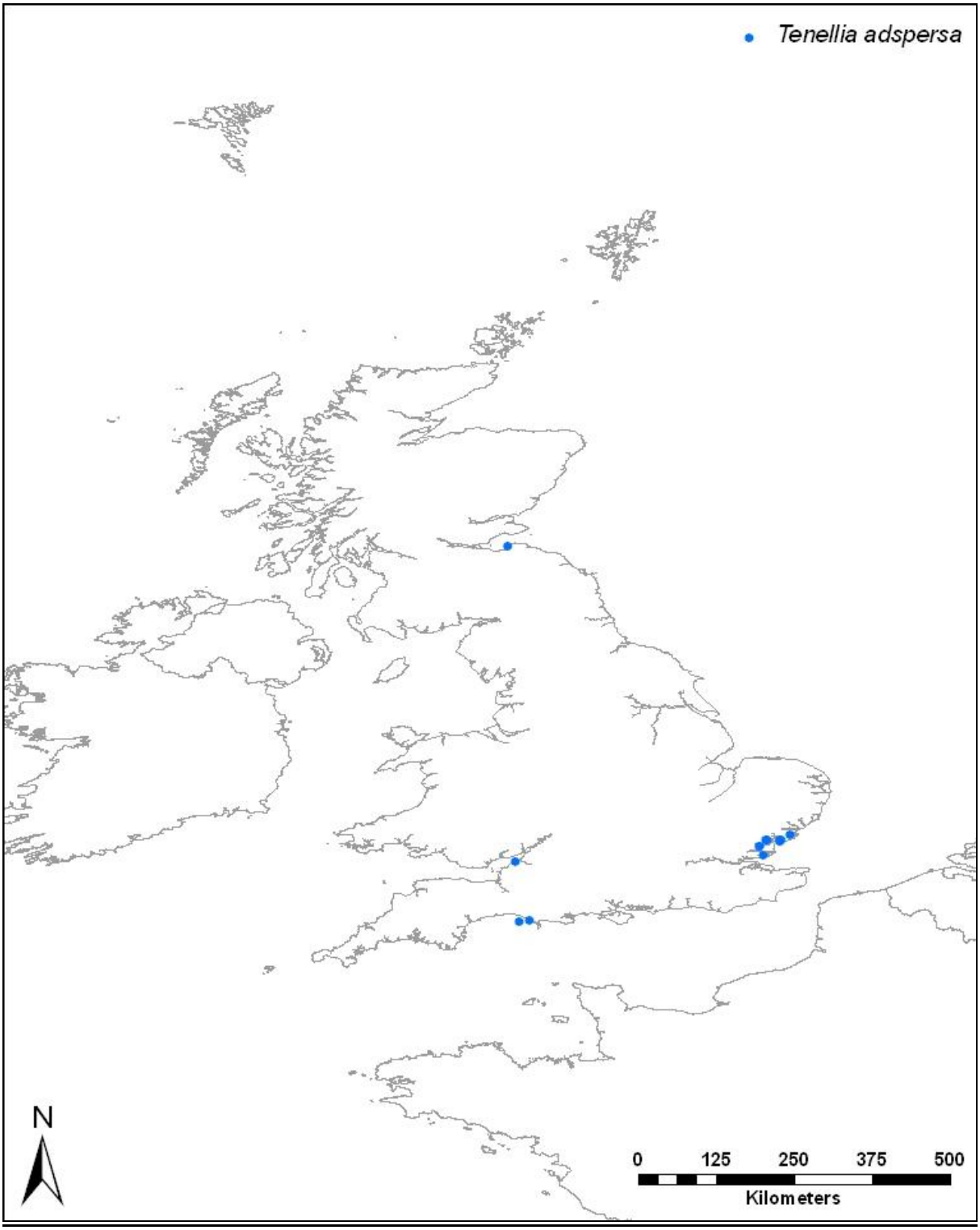

Figure 27. Final derived data layer for the lagoon sea slug *Tenellia adspersa.*

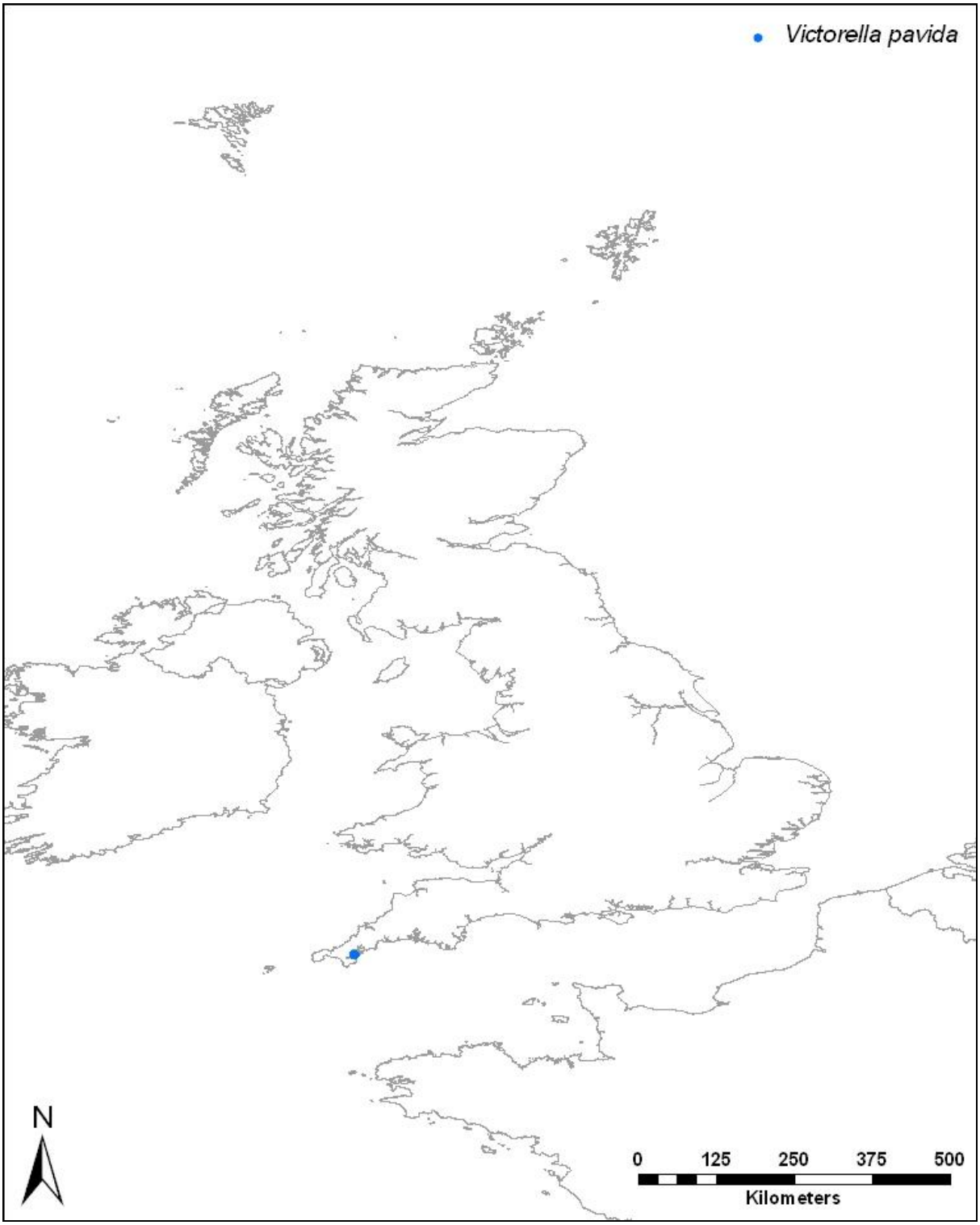

Figure 28. Final derived data layer for the trembling sea mat *Victorella pavida*.

4. Issues and Further Considerations

4.1 The project represented one of the largest data collation exercises ever undertaken for marine species and identified a number of issues related to access, collation and onward dissemination of data gathered from a wide variety of sources. The data providers recognised the importance of the project and were keen to be involved.

4.2 The collation of large volumes of data from disparate providers highlighted a number of issues which are discussed below.

4.1 Ease of Access and Supply of Data

4.3 A number of organisations holding key datasets were very slow to respond to data requests in spite of repeated attempts. We conclude that these organisations should review their data dissemination policies in order to ensure compliance with the 20 day limit specified in the UK's Environmental Information Regulation (EIR) and the EU's Information for Spatial Information in Europe (INSPIRE) legislation.

4.4 Although many data providers believed they had given most of their data, even providers with good, central, point data storage still had issues with the archiving of GIS polygon layers. It also appears that large volumes of data are held at regional level, often with incomplete cataloguing. It is hoped that organisations will soon develop complete INSPIRE compliant metadata catalogues, as this contract has shown that regional and local data is vital for use at a national level. In some cases, reports had been separated from the raw or derived data meaning that data had to be digitised to allow inclusion in the data layers at a less accurate level than would have been possible with the original data.

4.5 During the data collation, we encountered two organisations who felt that their data had previously been misused, either by being given to contractors without permission or by being published prior to publication by the original authors. These instances have made the suppliers unwilling to share their data again. We suggest that guidance should be developed on the collation, storage and reuse of third party data (i.e. that not collected under contract) to ensure the optimum flow of data between organisations and the protection of the IPR of data providers. The guidance could be developed based on the existing work of organisations such as the National Biodiversity Network (NBN) or the Marine Environmental Data and Information Network (MEDIN).

4.2 Data Formatting Issues and Standards

4.6 The provision of data without relevant report references or metadata of any kind resulted in difficulties in collating information to populate the survey table. Where GIS layers were provided there was often insufficient information relating to the projection of the original data. Both OSGB36 and WGS84 are widely used and can lead to inaccuracies in the spatial rendering of the data points. In addition, the lack of metadata greatly increases the level of QA that is required.

4.7 Much of the data arrived in a variety of formats. While transformation between electronic formats is (in most cases) simple, when data were late arriving it made incorporation into the project outputs difficult.

4.8 When comparing the species in the supplied datasets against the World Register of Marine Species, there was a typically a 70-80% correlation. Many mismatches were due to changes in taxonomy since the creation of the original dataset. However typographical errors and inconsistent naming conventions (such as the use of 'indet', 'crusts' etc) also meant matches had to be manually entered. Again, this is a time consuming process and one that can be avoided if data providers are able to adopt existing standards for the supply of data.

4.9 These data layers constitute the best available knowledge at the current date, but provide an incomplete picture, and this must be taken into consideration in their application. Further reduction in data quality would only act to reduce the applicability of these layers, both for MCZ Regional Projects and their potential subsequent wider use in spatial planning.

4.3 Future Considerations

4.10 It is hoped that the issues raised in this data collation and mapping exercise will assist organisations in developing their data management systems for easier data flow.

4.11 Many of the issues are being addressed though the work of MEDIN, which is developing data specifications, standards and metadata standards to simplify and harmonise the exchange of marine data and metadata.

4.12 The work detailed in this report is an important first step at broadening the availability of data for key species. Carefully defined pathways for marine data flow and the adoption of MEDIN standards and specifications will facilitate the update of these derived data products and provide a solid foundation for future marine data management.

5. References and Data Sources

Aldrich J.C., Crowe W., Murphy M., McManus C., Magennis B. and Murphy D. (1980). Analysis of environmental gradients and patchiness in the distribution of the epiphytic marine hydroid *Clava squamata*. *Marine Ecology Progress Series*, 2, 293-301.

Arenas F., Bishop J.D.D., Carlton J.T., Dyrynda P.J., Farnham W.F., Gonzalez D.J., Jacobs M.W., Lambert C., Lambert G., Nielsen S.E., Pederson J.A., Porter J.S., Ward S. and Wood C.A. (2006). Alien species and other notable records from a rapid assessment survey of marinas on the south coast of England. *Journal of the Marine Biological Association of the UK*, 86, 1329-1337.

Bamber R. (1997). Assessment of saline lagoons within Special Areas of Conservation *English Nature Research Report* No. 235, pp. 171.

Bamber R. (1999). Survey of selected saline lagoons, Suffolk Coast, September 1998 *English Nature Research Report* No. 300, pp. 66.

Bamber R. and Evans N.J. (2003). 140 years of the lagoon sand worm *Armandia cirrhosa* Filippi, 1862: the whole story, so far. *Porcupine Marine Natural History Society Newsletter*, 13, 23-25.

Barnes R.S.K., Coughlan J. and Holmes N.J. (1973). A preliminary survey of the macroscopic bottom fauna of the Solent with particular reference to *Crepidula fornicata* and *Ostrea edulis*. *Proceedings of the Malacological Society of London*, 40, 253-275.

Blunden G., Farnham W.F., Jephson N., Barwell C.J., Fenn R.H. and Plunkett B.A. (1981). The composition of maerl beds of economic interest in northern Brittany, Cornwall and Ireland. In W. de Gruyter *Proceedings of the Xth International Seaweed Symposium*, Goteborg, 11-15 August 1980, pp. 651-656.

Boyes S., Mazik K. and Burdon D. (2008). Intertidal monitoring of *Sabellaria alveolata* reefs in Cardigan Bay SAC in 2004 *Countryside Council for Wales, Bangor,* pp. 27.

Brown G.H. (1980). The British species of the aeolidacean family Tergipedae (Gastropoda: Opisthobranchia) with a discussion of the genera. *Zoological Journal of the Linnean Society*, 69, 225-255.

Choi H.G. and Norton T.A. (2005). Competition and facilitation between germlings of *Ascophyllum nodosum* and *Fucus vesiculosus*. *Marine Biology*, 147(2), 525-532.

Dauvin J.-C. and Vallet C. (1997). Apports d'echantillonnages suprabenthiques a la faunistique de la Manche et a la biogeographie du plateau continental nord-ouest europeen. Crustaces et Pycnogonides. *Cahiers de Biologie Marine*, 38, 251-266.

Davies A.J., Johnson M.P. and Maggs C.A. (2007). Limpet grazing and loss of *Ascophyllum nodosum* canopies on decadal time scales. *Marine Ecology Progress Series*, 339, 131-141.

Davies A.J., Johnson M.P. and Maggs C.A. (2008). Subsidy by *Ascophyllum nodosum* increases growth rate and survivorship of *Patella vulgata*. *Marine Ecology Progress Series*, 366, 43-48.

Edwards D.C.B. and Moore C.G. (2009). Reproduction in the sea pen *Funiculina quadrangularis* (Anthozoa: Pennatulacea) from the west coast of Scotland. *Estuarine, Coastal and Shelf Science*, 82, 161-168.

Gainey P.A. (1997). Trembling sea-mat: Baseline distribution in England and species action plan *English Nature Research Report* 225, pp. 21.

Gilliland P.M. and Sanderson W.G. (2000). Re-evaluation of marine benthic species of nature conservation importance: a new perspective on certain 'lagoonal specialists' with particular emphasis on *Alkmaria romijni* Horst (Polychaeta: Ampharetidae). *Aquatic conservation: Marine and freshwater ecosystems*, 10, 1-12.

Greathead C.F., Donnan D.W., Mair J.M. and Saunders G.R. (2007). The sea pens *Virgularia mirabilis*, *Pennatula phosphorea*, and *Funiculina quadrangularis*: distribution and conservation issues in Scottish waters. *Journal of the Marine Biological Association of the UK*, 87, 1095-1103.

Guiry M.D. and Maggs C.A. (1982). The morphology and life history of *Dermocorynus montagnei* Crouan frat. (Halymeniaceae; Rhodophyta) from Ireland. *British Phycological Journal*, 17, 215-228.

Hession C., Guiry M.D., McGarvey S. and Joyce D. (1998). Mapping and assessment of the seaweed resources (*Ascophyllum nodosum*, *Laminaria* spp.) off the west coast of Ireland. *Marine Resources Series*, 5, 74p.

Jenkins S.R., Hawkins S.J. and Norton T.A. (1999). Direct and indirect effects of macroalgal canopy and limpet grazing in structuring a sheltered inter-tidal community *Marine Ecology Progress Series*, 188, 81-92.

Joyce C. (2006). A baseline survey of Widewater lagoon, West Sussex 2005 *West Sussex County Council*.

Kelly L., Collier L., Costello M.J., Diver M., McGarvey S., Kraan S., Morrissey J. and Guiry M.D. (2001). Impact Assessment of Hand and Mechanical Harvesting of *Ascophyllum nodosum* on regeneration and biodiversity *Marine Institute (Dublin),* Marine Resource Series No. 19, pp. 51.

Killeen I.J. and Light M.J. (2002). The status, distribution and ecology of *Paludinella littorina* (Delle Chaije, 1828) (Gastropoda: Assimeidae) in the British Isles. *Journal of Conchology*, 37, 551-563.

Maggs C.A. (2003). Rare red algae in Wales. [Abstract]. *Porcupine Marine Natural History Society Newsletter*, 12, 35.

Manuel R.L. (1975). A new sea-anemone from a brackish lagoon in Sussex, *Edwardsia ivelli* sp. nov. *Journal of Natural History*, 9, 705 - 711.

Mathieson (2008). *Ascophyllum nodosum* ecad *mackayi* Species Dossier. www.plantlife.org

Moore J. (2002). The Porcupine Recording Scheme. *Porcupine Marine Natural History Society Newsletter*, 11, 15-16.

Morrison L., Baumann H.A. and Stengel D.B. (2008). An assessment of metal contamination along the Irish coast using the seaweed *Ascophyllum nodosum* (Fucales, Phaeophyceae). *Environmental Pollution*, 152, 293-303.

Moss B. (1971). Meristems and morphogenesis in *Ascophyllum nodosum ecad mackaii* (Cotton). *European Journal of Phycology*, 6, 187-193.

Pain C., Wilkinson S. and Light J. (2009). Two further UK sites for *Caecum armoricum*, de Folin, 1869, formerly known only in The Fleet, Dorset, as a member of the Interstitial 'springs' community. *Journal of Conchology*, 39, 779-780.

Potts G.W. and Swaby S.E. (1993). A study of the distribution, status and potential vulnerability of the giant goby, *Gobius cobitis* in the British Isles *Joint Nature Conservation Committee, Peterborough,* Contract Report, pp. 32.

Powell H.T. (1958). Occurrence of forms of *Fucus distichus* L. emend. Powell on North Rona and Sula Sgeir. . *Nature*, 182, 1246.

Powell H.T. and Lewis J.R. (1952). Occurrence of *Fucus inflatus* L. forma *distichus* (L.) Borgesen on the north coast of Scotland. *Nature*, 169, 508.

Ramsay K. and Holt R.H.F. (2001). Mantis Shrimps *Rissoides desmaresti* in Tremadog Bay, North Wales. *Journal of the Marine Biological Association of the UK*, 81, 695-696.

Rice E.L. and Chapman A.R.O. (1985). A numerical taxonomic study of *Fucus distichus* (Phaeophyta). *Journal of the Marine Biological Association of the United Kingdom*, 62, 433-459.

Sheader M. and Sheader A. (1985). New distribution records for *Gammarus insensibilis* Stock, 1966, in Britain. *Crustaceana*, 49, 101-105.

Sheader M. and Sheader A. (1987). The distribution of the lagoonal amphipod, *Gammarus insensibilis*, stock in England. *Porcupine Newsletter*, 3, 220-223.

Sheader M., Suwailem M. and Rowe G.A. (1997). The anemone, *Nematostella vectensis*, in Britain: Considerations for conservation management. *Aquatic conservation: Marine and freshwater ecosystems*, 7, 13-25.

Stengel D.B. and Dring M.J. (2000). Copper and iron concentrations in *Ascophyllum nodosum* from different sites in Ireland and after culture experiments in relation to thallus age and epiphytism. *Journal of Experimental Marine Biology and Ecology*, 246, 145-161.

Wheeler A. (1993). The distribution of *Gobius cobitis* in the British Isles. *Journal of Fish Biology*, 43, 652-655.

Wilkes R.J., McIvor L.M. and Guiry M.D. (2005). Using rbcL sequence data to reassess the taxonomic position of some *Grateloupia* and *Dermocorynus* species (Halymeniaceae, Rhodophyta) from the north-eastern Atlantic. *European Journal of Phycology*, 40, 53-60.

Witbaard R. (1997). *Tree of the Sea. The use of the internal growth lines in the shell of Arctica islandica (Bivalvia, Mollusca) for the retrospective assessment of marine environmental change*. Groningen: University of Groningen.

Appendix A. Validation Checklist

1. Check fields complete
OrigName
SciName
SurvID
Date
Location
Sample
Event
Lat
long
Determiner
Status
CoordinatePrecision (m)
2. Check points
Within UK territorial limits?
Any on land?
Remove duplicate records

Appendix B. Species list and relevant legislation

Scientific name	Common Name	Taxon group	BAP	W&C Act	OSPAR
Alkmaria romijni	Tentacled lagoon worm	Annelid		WACA: Sch5_Section9.1	
Amphianthus dohrnii	Sea fan anemone	Cnidaria	BAP:2007		
Anotrichium barbatum	Bearded red seaweed	Algae	BAP:2007		
Arachnanthus sarsi	Scarce tube dwelling anemone	Cnidaria	BAP:2007		
Arctica islandica	Ocean quahog	Mollusca			OSPAR 2003
Armandia cirrhosa	Lagoon sandworm	Annelid	BAP:2007	WACA: Sch5_Section9.1	
Arrhis phyllonyx	A deep sea shrimp	Crustacean	BAP:2007		
Ascophyllum nodosum ecad mackaii	Wig wrack or sea loch egg wrack	Algae	BAP:2007		
Atrina fragilis	Fan mussel	Mollusca	BAP:2007	WACA: Sch5_Section9.1	
Caecum armoricum	De Folin's lagoon snail	Mollusca		WACA: Sch5_Section9.1	
Cruoria cruoriaeformis	A red seaweed	Algae	BAP:2007		
Dermocorynus montagnei	A red seaweed	Algae	BAP:2007		
Edwardsia ivelli	Ivell's sea anemone	Cnidaria	BAP:2007	WACA: Sch5_Section9.1	
Edwardsia timida	Timid burrowing anemone	Cnidaria	BAP:2007		
Eunicella verrucosa	Pink sea fan	Cnidaria	BAP:2007	WACA:	

				Sch5_Section9.1	
Fucus distichus	A brown seaweed	Algae	BAP:2007		
Funiculina quadrangularis	Tall sea pen	Cnidaria	BAP:2007		
Gammarus insensibilis	Lagoon sand shrimp	Crustacean	BAP:2007	WACA: Sch5_Section9.1	
Gitanopsis bispinosa	An amphipod shrimp	Crustacean	BAP:2007		
Gobius cobitis	Giant goby	Bony fish		WACA: Sch5_Section9.1	
Gobius couchi	Couch's goby	Bony fish		WACA: Sch5_Section9.1	
Haliclystus auricula	A stalked jellyfish	Cnidaria	BAP:2007		
Heleobia stagnorum	Lagoon Spire Snail	Mollusca	BAP:2007		
Hippocampus guttulatus	Long snouted seahorse	Bony fish	BAP:2007		OSPAR 2004
Hippocampus hippocampus	Short snouted seahorse	Bony fish	BAP:2007		OSPAR 2004
Leptopsammia pruvoti	Sunset cup coral	Cnidaria	BAP:2007		
Lithothamnion corallioides	Coral maerl	Algae	BAP:2007		
Lucernariopsis campanulata	A stalked jellyfish	Cnidaria	BAP:2007		
Lucernariopsis cruxmelitensis	A stalked jellyfish	Cnidaria	BAP:2007		
Mitella pollicipes	A gooseneck barnacle	Crustacean	BAP:2007		
Nematostella vectensis	Starlet sea anemone	Cnidaria	BAP:2007	WACA: Sch5_Section9.1	

Ostrea edulis	Native oyster	Mollusca	BAP:2007		OSPAR 2003
Pachycerianthus multiplicatus	Fireworks anemone	Cnidaria	BAP:2007		
Pachycordyle navis	Brackish hydroid	Cnidaria	BAP:2007	WACA: Sch5_Section9.1	
Padina pavonica	Peacock's tail	Algae	BAP:2007		
Palinurus elephas	Crayfish, crawfish or spiny lobster	Crustacean	BAP:2007		
Paludinella littorina	Sea snail	Mollusca		WACA: Sch5_Section9.1	
Phymatolithon calcareum	Common maerl	Algae	BAP:2007		
Styela gelatinosa	Loch Goil sea squirt	Tunicate	BAP:2007		
Swiftia pallida	Northern sea fan	Cnidaria	BAP:2007		
Tenellia adspersa	Lagoon sea slug	Mollusca	BAP:2007	WACA: Sch5_Section9.1	
Thyasira gouldi	Northern hatchet shell	Mollusca		WACA: Sch5_Section9.1	
Victorella pavida	Trembling sea mat	Bryozoan	BAP:2007	WACA: Sch5_Section9.1	

Appendix C. Original Species list and WoRMS match

Scientific name	Common Name	AphiaID	TSN	WoRMS ScientificName	Authority
Alkmaria romijni	Tentacled lagoon-worm	129769	204597	*Alkmaria romijni*	Horst, 1919
Amphianthus dohrnii	Sea-fan anemone	100936		*Amphianthus dohrnii*	(Koch, 1878)
Anotrichium barbatum	Bearded red seaweed	144504		*Anotrichium barbatum*	(C. Agardh) Nägeli, 1862
Arachnanthus sarsi	Scarce tube-dwelling anemone	101007		*Arachnanthus sarsi*	Carlgren, 1912
Arctica islandica	Ocean quahog	138802	81343	*Arctica islandica*	(Linnaeus, 1767)
Armandia cirrhosa	Lagoon sandworm	130485	67352	*Armandia cirrhosa*	Filippi, 1861
Arrhis phyllonyx	A deep-sea shrimp	102870	94501	*Arrhis phyllonyx*	(Sars, 1858)
Ascophyllum nodosum ecad *mackaii*	Wig wrack or sea-loch egg wrack	182725		*Ascophyllum nodosum var. mackaii*	(Turner) Cotton 1912
Atrina fragilis	Fan mussel	140779		*Atrina pectinata*	(Linnaeus, 1767)
Caecum armoricum	Defolin's lagoon snail	138945		*Caecum armoricum*	de Folin, 1869
Cruoria cruoriaeformis	A red seaweed	145611		*Cruoria cruoriaeformis*	(P.L. Crouan & H.M. Crouan) Denizot
Dermocorynus montagnei	A red seaweed	145243	12555	*Dermocorynus montagnei*	P.L. Crouan & H.M. Crouan, 1858
Edwardsia ivelli	Ivel's sea anemone	100888	204162	*Edwardsia ivelli*	Manuel, 1975
Edwardsia timida	Timid burrowing anemone	100892	204164	*Edwardsia timida*	Quatrefages, 1842
Eunicella verrucosa	Pink sea-fan	125366		*Eunicella verrucosa*	(Pallas, 1766)
Fucus distichus	Brown algae	145544	11337	*Fucus distichus*	Linnaeus, 1767
Funiculina quadrangularis	Tall sea pen	128506	719232	*Funiculina quadrangularis*	(Pallas, 1766)
Gammarus insensibilis	Lagoon sand shrimp	102280	206450	*Gammarus insensibilis*	Stock, 1966
Gitanopsis bispinosa	An amphipod shrimp	101979	202749	*Gitanopsis bispinosa*	(Boeck, 1871)

Gobius cobitis	Giant goby	126886	171841	*Gobius cobitis*	Pallas, 1814
Gobius couchi	Couch's goby	126887	637448	*Gobius couchi*	Miller & El-Tawil, 1974
Haliclystus auricula	A stalked jellyfish	135322	51488	*Haliclystus auricula*	(Rathke, 1806)
Heleobia stagnorum	Lagoon spire snail	140122		*Heleobia stagnorum*	(Gmelin, 1791)
Hippocampus guttulatus	Long snouted seahorse	154776	645018	*Hippocampus guttulatus*	Cuvier, 1829
Hippocampus hippocampus	Short snouted seahorse	127380	166497	*Hippocampus hippocampus*	(Linnaeus, 1758)
Leptopsammia pruvoti	Sunset cup coral	135193	204202	*Leptopsammia pruvoti*	Lacaze-Duthiers, 1897
Lithothamnion corallioides	Coral maërl	145165		*Lithothamnion corallioides*	(P.L. Crouan & H.M. Crouan) P.L. Crouan & H.M. Crouan, 1867
Lucernariopsis campanulata	A stalked jellyfish	135318	51513	*Lucernariopsis campanulata*	(Lamouroux 1815)
Lucernariopsis cruxmelitensis	A stalked jellyfish	135319	204149	*Lucernariopsis cruxmelitensis*	Corbin 1978
Mitella pollicipes	Gooseneck barnacle	106177		*Pollicipes pollicipes*	(Gmelin, 1789)
Nematostella vectensis	Starlet sea anemone	100906	52498	*Nematostella vectensis*	Stephenson, 1935
Ostrea edulis	Native oyster	140658	79885	*Ostrea edulis*	Linnaeus, 1758
Pachycerianthus multiplicatus	Fireworks anemone	101013	204151	*Pachycerianthus multiplicatus*	Carlgren, 1912
Pachycordyle navis	Brackish hydroid	231683		*Pachycordyle navis*	(Millard, 1959)
Padina pavonica	Peacock's tail	145385		*Padina pavonica*	(Linnaeus) Thivy, 1960
Palinurus elephas	Crayfish, crawfish or spiny lobster	107703	97657	*Palinurus elephas*	(Fabricius, 1787)
Paludinella littorina	Sea snail	138815		*Paludinella littorina*	(delle Chiaje, 1828)
Phymatolithon calcareum	Common maërl	145199	12532	*Phymatolithon calcareum*	(Pallas) W.H.Adey & D.L.McKibbin, 1970
Styela gelatinosa	Loch Goil sea squirt	103932	159301	*Styela gelatinosa*	(Traustedt, 1886)
Swiftia pallida	Northern sea	1254	2041	*Swiftia pallida*	Madsen, 1970

	fan	01	54		
Tenellia adspersa	Lagoon sea slug	141639	78554	*Tenellia adspersa*	(Nordmann, 1845)
Thyasira gouldi	Northern hatchet-shell	141663	80548	*Thyasira gouldi*	(Philippi, 1845)
Victorella pavida	Trembling sea mat	111673	155524	*Victorella pavida*	Saville Kent, 1870

Appendix D. Data Contacts

The names of individuals have been removed to comply with the Data Protection Act, but have been retained for future reference.

Organisation	Data required	Data offered?	Data received?
Adur District Council	*Edwardsia ivelli*	No data	NA
AFBI	All species and biotopes	Yes	Yes
AFBI	Passed us on to Matt Service	NA	NA
Artoo Marine Consultants	Saline lagoons	Yes	Yes
Botanical Society of the British Isles	*Spartina anglica* distribution	Yes	Yes
Botanical Society of the British Isles	*Spartina anglica* distribution, tetrad shapefile	Yes	No
BPS	Seaweed data	Yes	Yes
Bristol Record Centre	Seaweed data bpc	Yes	Yes
Bristol Record Centre	*Tenellia* and *Spartina* records	Yes	Yes
British Phycological Society	Seaweed data	Yes - atlas and herbarium data - also possible seaweed survey data	NA
Cefas	Benthic invertebrate data	Yes	Yes
Cefas	Other relevant Cefas data	Yes seahorse data being sent	Yes
Cefas	Species distribution	Yes	Yes
Chichester Harbour Conservancy	*Heleobia stagnorum* distribution	Referred to other	NA
CMACS	Isle of Man intertidal reports	Yes	Yes
Conchological	*Heleobia stagnorum* distribution	Yes	Yes, and compiled

Organisation	Data required	Data offered?	Data received?
Society			physical data also for other species
Conchological Society	Mollusc data	Yes	Yes
Cornwall Wildlife Trust	*Amphianthus dorhnii* distribution records	Yes	yes
Countryside Council for Wales	Expert for map checking	NA	NA
Countryside Council for Wales	Saltmarsh distribution in Wales	Yes	Yes
Devon Sea Fisheries Committee	*Crepidula fornicata* distribution records	Yes	Yes
DOENI	Species and biotope data	Yes	Yes
Dorset Wildlife Trust	Species and biotope mapping	Biotope data not available	No
DWT	Species and biotope mapping	Yes	Biotope data not available
EMU	MB0102 Interpreted biotopes (1A) layers	Yes	Yes
Environment Agency	*Eriocheir sinensis* data	Yes	Yes
Environment Agency	Species and biotope data	Yes	Yes
Environment Agency	Species and biotope data	Yes	Yes
Environment Agency	Species and biotope data	NA	NA
Environment Agency	Species and biotope data	Yes	Yes
Environment	Species and biotope data	NA	NA

Organisation	Data required	Data offered?	Data received?
Agency			
ERCCIS	Maërl & stallked jellyfish distribution in Cornwall	Yes	Yes
Geodata	Offshore data ALSF/REA etc	Yes	Yes
Hampshire Wildlife Trust	*G.insensibilis*. All species & habitats. Hotspots	*G.insensibilis* so far	*G.insensibilis* so far
Individual	Fal & Helford records	Yes	Yes
Individual	Cornwall records, *Victorella pavida* data	Yes	Yes
Individual	Expert for map checking	NA	NA
Individual	Expert for map checking	NA	NA
Individual	Expert for Scotland for map checking	NA	NA
Individual	*Leptopsammia* & *Amphianthus* records	Yes	Yes
Individual	Welsh non native records	Yes	Yes
Isle of Man government	Species records in the Isle of Man	Yes	Yes
Isles of Scilly Wildlife Trust	Maërl records for Cornwall	Suggested good contacts	NA
Natural England	*Alkmaria* records	Yes paper	Yes
JNCC	JNCC data holdings	Yes	Yes
Kent & Essex Sea Fisheries Committee	*Ensis americanus* distribution records	Yes	Yes
Kent Wildlife Trust	Species and biotope data	Yes	Yes
Lancing Parish Council	*Edwardsia ivelli*	Passed on to ranger	NA
Marine Biological Association	Deep sea data	Yes	Yes
Marine Biological Association	Marclim data	Yes	Yes
Marine Biological	Non native species records	Yes	Yes

Organisation	Data required	Data offered?	Data received?
Association			
Marine Biological Association	Non-native species record check	Yes papers and non published records	Yes
Marine Fish Information Services	*Hippocampus* species, *Gobius cobitis* records	Yes	Yes
Marine Scotland	*Pachycerianthus multiplicatus* and *Funiculina* data	Yes	Yes
Marine Scotland	Species and biotope data	Passed on to other agencies	NA
MarLIN	MarLIN records	Yes	Yes
Marine Biological Association	Species and biotope data	Yes	Yes
Merman / BODC	CSEMP data	Yes	Yes
Merseyside Biobank	*Spartina anglica* records	Yes	Yes
Natural England	Species and biotope data	Yes	Yes
Natural England contractor	*Crassostrea gigas* in Kent area	Yes	Yes
Natural History Museum	*Eriocheir sinensis* distribution	Yes	Yes
Natural History Museum	Expert for map checking	NA	NA
NMGW	*Arctica islandica* and *Thyasira gouldii*	Yes	Yes
North East Sea Fisheries Committee	*Palinurus* distribution records	Yes	Yes
Northern Ireland Environment Agency	Species and biotope data	Yes	Yes

Organisation	Data required	Data offered?	Data received?
Plymouth Marine Laboratory	Scillies All-Taxa Biodiversity Index	Yes	Yes
Queens University, Belfast	Non native seaweeds	Yes database	Data not available
Ranger	*Edwardsia ivelli*	Yes	Yes
Research thesis	*Crassostrea.gigas* in Devon	Yes	Partial data received
Research thesis	*Crassostrea.gigas* in Strangford Lough	Yes	No
Salacia Marine	*Palinurus elephas* distribution	Suggested good contacts	NA
Scottish Association for Marine Science	*Caprella mutica* distribution records	Yes	Yes
Scottish Association for Marine Science	Species and biotope data	Yes	No
Scottish Environmental Protection Agency	Species and biotope data	Yes	Yes, but related to fishfarms
Scottish Environmental Protection Agency	Species and biotope data	Yes	Partial
Scottish Natural Heritage	Expert for map checking	NA	NA
Scottish Natural Heritage	Saline lagoons, *Spartina* and saltmarsh	Yes	Yes
Scottish Natural Heritage	Species and biotope data	Yes	Yes
Seafish	*Crassostrea*	Yes	Report contained no new data
Seahorse Trust	UK seahorse records	Yes but not at full resolution	Only partial data supplied

Organisation	Data required	Data offered?	Data received?
Seasearch	Expert for map checking	NA	NA
Seasearch	*Leptopsammia* & *Amphianthus* records	Yes	Yes
Seasearch	Seasearch records and expert for map checking	Yes	Yes
Shellfish Association GB	UK shellfish distribution records	Report sent	Yes
Southern Sea Fisheries Committee	*Palinurus elephas* distribution	No relevant data	NA
Student	*Caprella mutica* distribution records	Yes	Yes
Suffolk Biological Records Centre	Suffolk records of *Spartina anglica*	Yes	Yes
Sussex Wildlife Trust	*Spartina mutica* distribution in Sussex	Yes	Yes
Tullie House Museum and Art Gallery	*Eriocheir sinensis* in Duddon Estuary	Yes	No
Ulster Museum	*P.multiplicatus* in N.I.	Confirmation of absence in N.I.	Yes
University of Bangor	English Channel dredge results	Yes	Yes
University of Bangor	Expert for map checking	NA	NA
University of Bangor	*Modiolus* and North Wales data	Yes	Yes
University of Bournemouth	IOW records	Yes	Yes
University of Brighton	Saline lagoon species	Yes	Yes
University of	Expert for map checking	NA	NA

Organisation	Data required	Data offered?	Data received?
Bristol (retired)			
University of Plymouth	Maërl data	Yes	Yes
University of Portsmouth	Seaweed expert non natives for map checking	NA	NA
University of Ulster	*Tenellia* record	Yes	Yes
University of Bristol	*Arrhis phyllonyx* data	No data	NA
West Sussex county council	Saline lagoon species	No data	NA

Appendix E. Restriction of Use Document

MB0102 Task Reference	Derived Data Layer Title	Specific layers included in derived data layer	Restriction & Access	Copyright/Reference/ Acknowlegement	Comment	DAC
2B	Species Data Layers	*Alkmaria romijni, Amphianthus dohrnii, Anotrichium barbatum, Arachanthus sarsi, Artica islandica, Armandia cirrhosa, Arrhis phyllonyx, Ascophyllum nodosum ecad mackaii, Atrina pectinata, Caecum armoricum, Cruoria cruoriaeformis, Dermocorynus montagnei, Edwardsia ivelli, Edwardsia timida, Eunicella verrucosa, Fucus distichus, Funiculina quadrangularis, Gammarus insensibilis, Gitanopsis bispinosa, Gobius cobitis, Gobius couchi, Haliclystus auricula, Heleobia stagnorum, Hippocampus guttulatus, Hippocampus hippocampus, Leptopsammia pruvoti, Lithothamnion coralloides, Lucernariopsis campanulata, Lucernariopsis cruxmelitensis, Nemastostella vectensis, Ostrea edulis, Pachycerianthus multiplicatus, Pachycordyle navis, Padina pavonica, Palinurus elephas, Paludinella littorina, Phymatolithon calcareum, Pollicipes pollicipes, Swiftia pallida, Tenellia adspersa, Thyasira gouldi, Victorella pavida*	Public version freely available is gridded. Non public point or polygon data to 10km grid squares resolution	Crown Copyright – Defra – MB0102	All layers supplied for the specific uses outlined. They may not be disaggregated or used for any other purpose other than that specified in the license without the prior consent of the original data provider. Where agreed all data will be made available via the NBN.	DASSH

Merlangius merlangus, Dipturus batis, Rostroraja alba, Aphanopus carbo, Anguilla anguilla, Ammodytidae, Clupea harengus, Gadus morhua, Merluccius merluccius, Pleuronectes platessa, Scomber scombrus, Solea solea, Trachurus trachurus, Raja clavata, Raja montagui,,Raja undulata, Squalus acanthias, Molva molva, Lophius piscatorius, Micromesistius poutassou, Coryphaenoides rupestris, Hippoglossus hippoglossus, Hoplostethus atlanticus, Molva dypterygia, Reinhardtius hippoglossoi, Centrophorus granulosus, Centrophorus squamosus, Centroscymnus coelolepsis, Dalatias licha, Thunnus thynnus, Isurus oxyrinchus, Galeorhinus galeus, Lamna nasus, Prionace glauca, Cetorhinus maximus, Osmerus eperlanus, Salmo trutta, Leucoraja circularis, Squatina squatina, Dermochelys coriacea, Raja microocellata, Leucoraja naevus, Amblyraja radiata, Raja brachyura	Freely Available via MEDIN Data Archive Centre	Crown Copyright – Defra – MB0102	DASSH

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