



SALSEA-MERGE FP7-ENV-2007-1
Grant Agreement No 212529

Work Package 5 and 6
Deliverables - D 5.1 and D 6.4

**GIS project on the statistical distribution of
specific stocks and regional stock groups (D5.1)**

and

**Completed stock distribution Atlas
(pdf-file) (D6.4)**

(Month 40)

Introduction

The deliverable **D6.4 Completed stock distribution Atlas** is based on the maps generated from the GIS project (**D5.1 GIS project on the statistical distribution of specific stocks and regional stock groups**). This report is therefore a combined report for both these two deliverables. This report gives an overview of the data sets used and the maps generated within the GIS project and which are subsequently included in the PDF-Atlas.

Within the GIS project, data collected during the marine surveys (WP2), as well as information generated from WP3, WP4 and also WP5, were combined into the Geographical Information System (GIS). The GIS ensures that all the charts produced have a common geographical reference framework (similar projections, coasts, etc.) enabling them to be easily combined and overlain. The decision on which data to be included and which charts to be made have been done through several discussions in several workshops. The charts and maps generated from the GIS are also used in the PDF-Atlas (WP6). In total the Atlas includes 20 maps, which together with the deliverables in Tasks 5.2 and 5.3 provide a useful synthesis of the main findings of SALSEA-Merge project.

Paths of Silver – An Atlas of Atlantic Salmon Migrations

Based on the maps in this report, a selection of unique images collected over the course of the study, and a range of additional material available through the SALSEA-Merge partners, it is planned to produce a coffee table type atlas of the salmon's migrations in both marine and freshwater. Through one of the SALSEA-Merge partners, the Atlantic Salmon Trust (www.atlanticsalmontrust.org), work has been on-going on planning the Atlas for the past twelve months. A fundraising brochure has been compiled by the publisher, Medlar Press (www.medlarpress.com) and following discussions in the autumn of last year, the Atlantic Salmon Federation in Canada (www.asf.ca) have expressed a great interest in supporting the project. The Atlas will present to the general public, in an enjoyable and accessible manner, the migrations of the Atlantic salmon. The emphasis will be on the original knowledge regarding ocean migration patterns acquired through the SALSEA-Merge programme. The production of the Atlas is being run as a separate project and will be financed through sponsorship. Partners include: the Atlantic Salmon Trust, Institute of Marine Research Bergen, and the scientists and technicians from SALSEA-Merge responsible for the compilation of the marine migration maps and the collection of images and relevant biological data. The success of the fundraising initiative will determine the publication date but it is hoped to have the Atlas available by the autumn of 2013. The Atlas project will complement the movie *Atlantic Salmon - Lost at Sea* described earlier in this report (www.atlanticsalmonlostatsea.net).

Note: A flier for **Pats of Silver** can be found at the end of this document.

SALSEA-Merge PDF GIS ATLAS

Map 1. Rivers with samples

Shows the river mouth position of all rivers sampled to build the SALSEA-Merge genetic river baseline

Map 2. Sample Sites

Shows the actual samples sites for which we have samples in the baseline (some sites do not have Lat/Long so river mouth used).

Map 3. Assignment units, Level 1

Shows the sample sites, but colour coded into the assignment units used at Level 1 (Iceland, Northern Europe & Southern Europe).

Map 4. Assignment units, Level 4

Shows the sample sites, but colour coded into the assignment units used at Level 4.

Map 5 Marine sample locations for post-smolts and older fish

Number to the right of pie in legend is scaling of numbers. Applies to all maps with pies.

Map 6. Marine Assignments Level 1

Shows assignments of the marine samples to the Level1 Assignment Units

Map 7. Assignment units level 1 and their sea distribution

Map 8. Marine Assignments Level 1 May

Catches made in May 2008-2009

Map 9. Marine Assignments Level 1 June

Catches made in June 2008-2009

Map 10. Marine Assignments Level 1 July-August

Catches made in July-August 2008-2009

Map 11. Marine Assignments Level 4

Shows assignments of the marine samples to the Level 4 Assignment Units

Map 12. Marine Assignments Level 4, spread pies

Shows assignments of the marine samples to the Level 4 Assignment Units re-plotted for better resolution of pies in map nr 11.

Map 13. Catch positions and dates of capture of post-smolts assigned to Loire Allier

Map 14. Loire Allier, France. Migration

Marine distribution of post-smolts assigned to river Loire Allier with suggested main migration pattern and approximate location of primary feeding area.

Map 15. Catch positions and dates of capture of post-smolts assigned to the River Bann

Map 16. River Bann, Northern Ireland. Migration

Marine distribution of post-smolts assigned to River Bann with suggested migration pattern and approximate location of primary feeding area.

Map 17. Catch positions and dates of capture of post-smolts assigned to river Namsen

Map 18. River Namsen, Norway. Migration

Marine distribution of post-smolts assigned to river Namsen with suggested migration pattern and approximate location of primary feeding area. Due to possible farm influence in western fishes as indicated in map 19 the proposed western migration arrow may have a western bias and should in that case be more northerly.

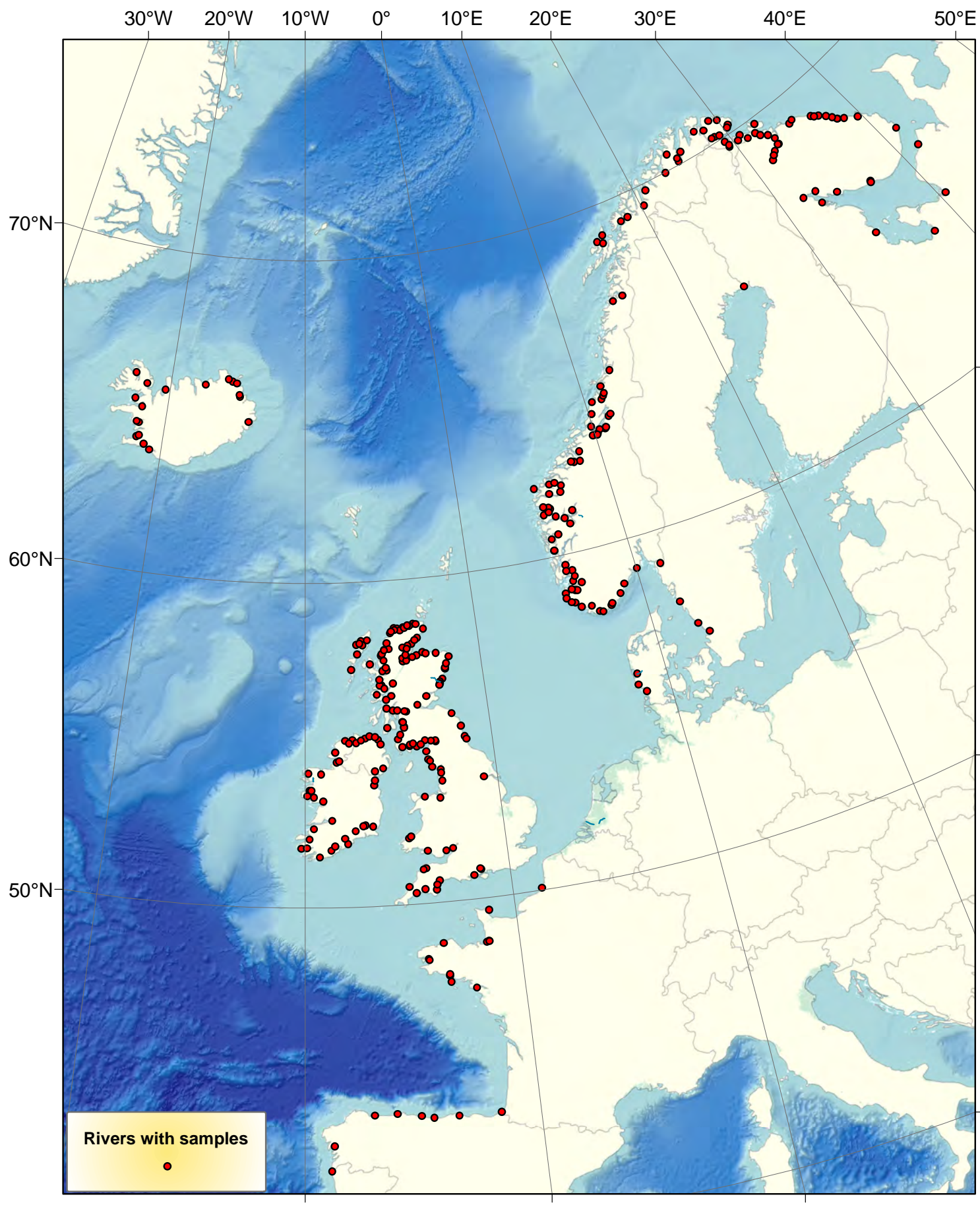
Map 19. River Namsen, Norway. Evidence of farmed fish

Marine distribution of post-smolts assigned to the river Namsen. The four fish encircled are thought to be of Norwegian farm strain origin; the offspring of fish that would have most likely escaped from farms in Ireland or Scotland.

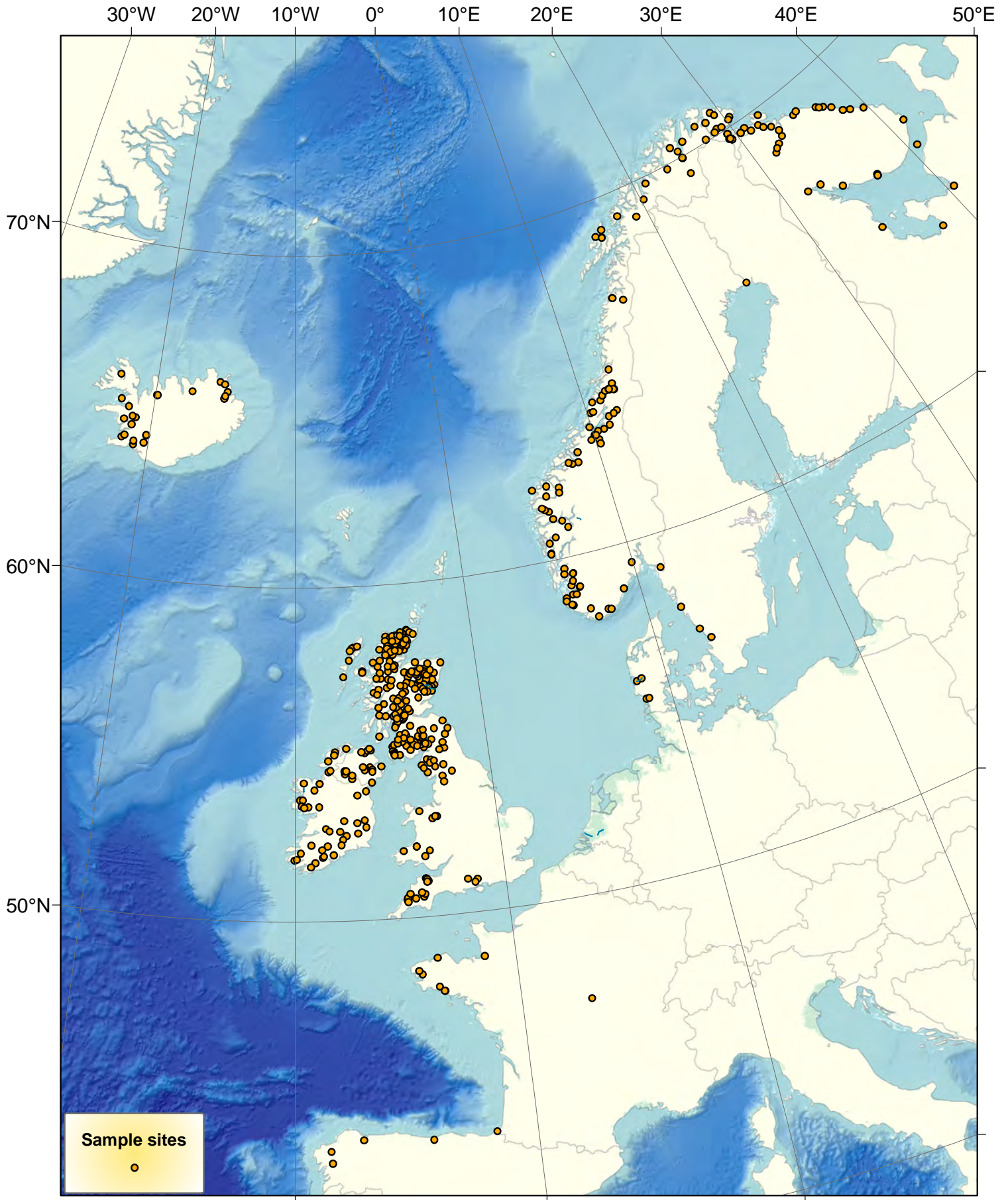
Map 20. SALSEA-Merge Summary map

Schematic model of Atlantic salmon post-smolt migration during first half year of their life at sea. Fish size is the approximate mean size of fish caught at specific latitudes. Temperature is the surface water temperature on the mean date of sea arrival at that location. Grey arrows are mean date of sea arrival at a specific latitude. Standing rectangles indicate the approximate range of river ages observed at these geographical locations. Green arrows show most likely main migration pathways from different European areas. The hatched area represents the major feeding area for European post-smolts originating from rivers south of approximately 70 degrees north (uncertain) with a consistent northern migration path. Pies are the proportions of fish originating from Southern and Northern rivers in positions indicated.

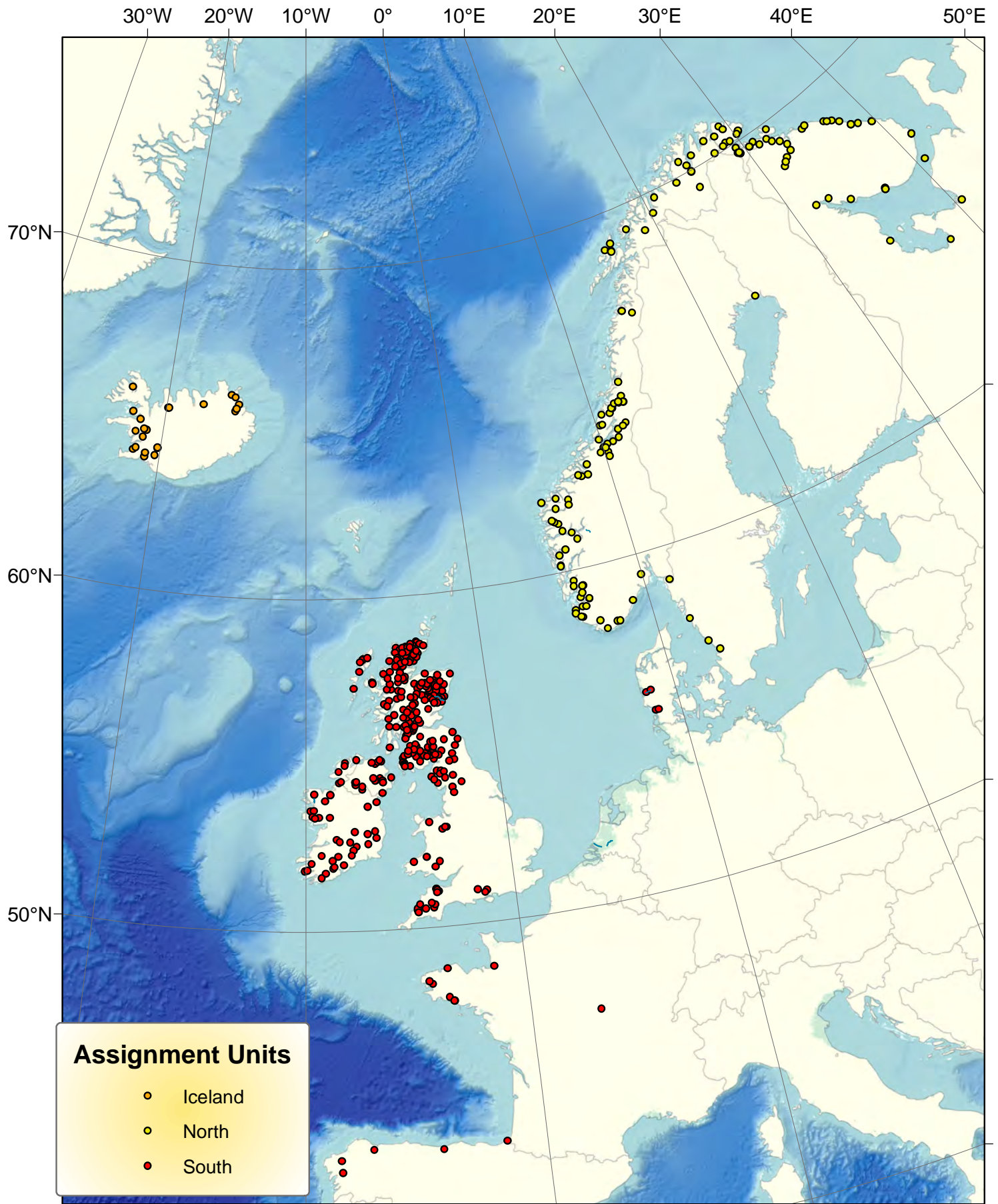
Map 1. Rivers with samples



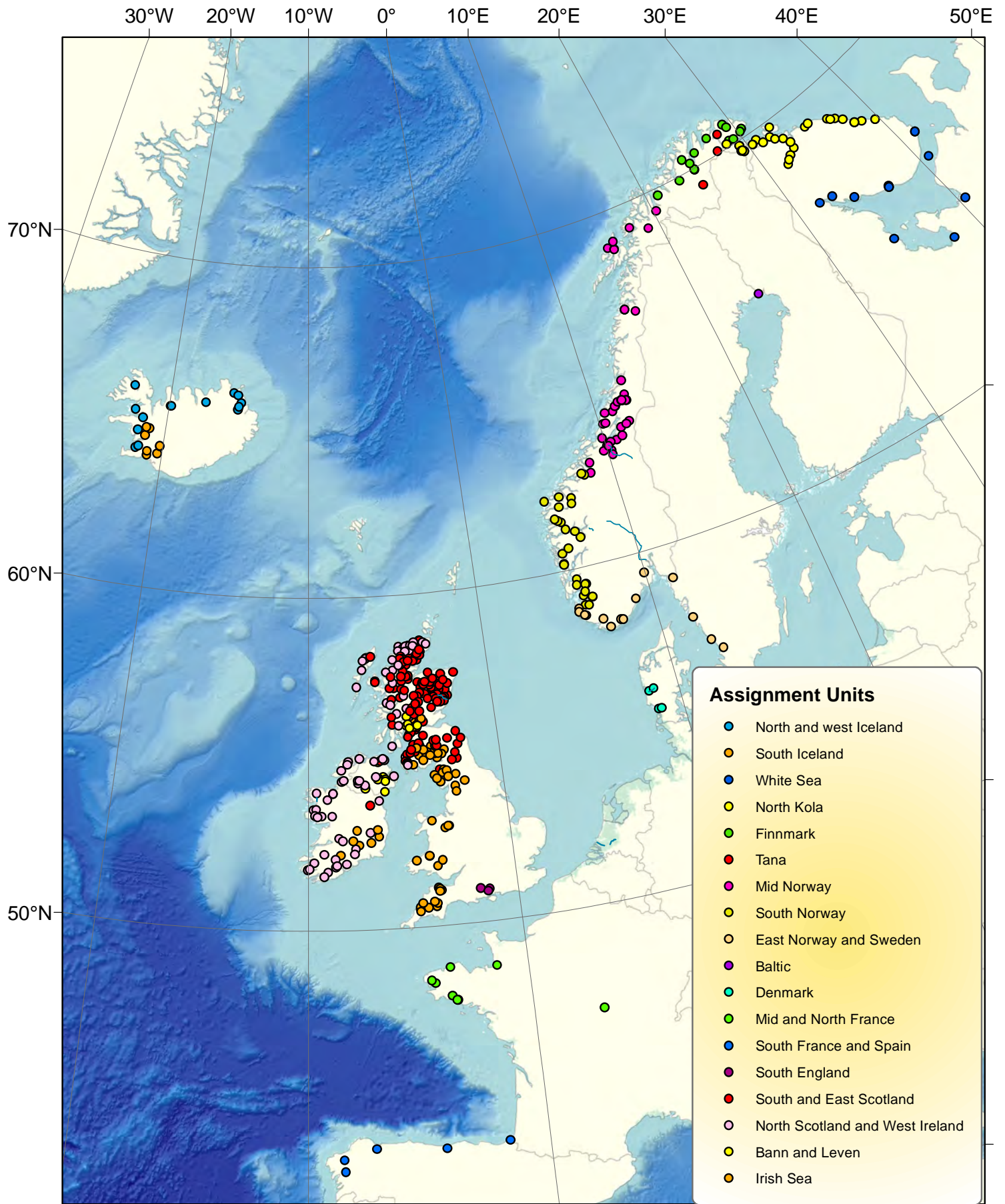
Map 2. Sample Sites



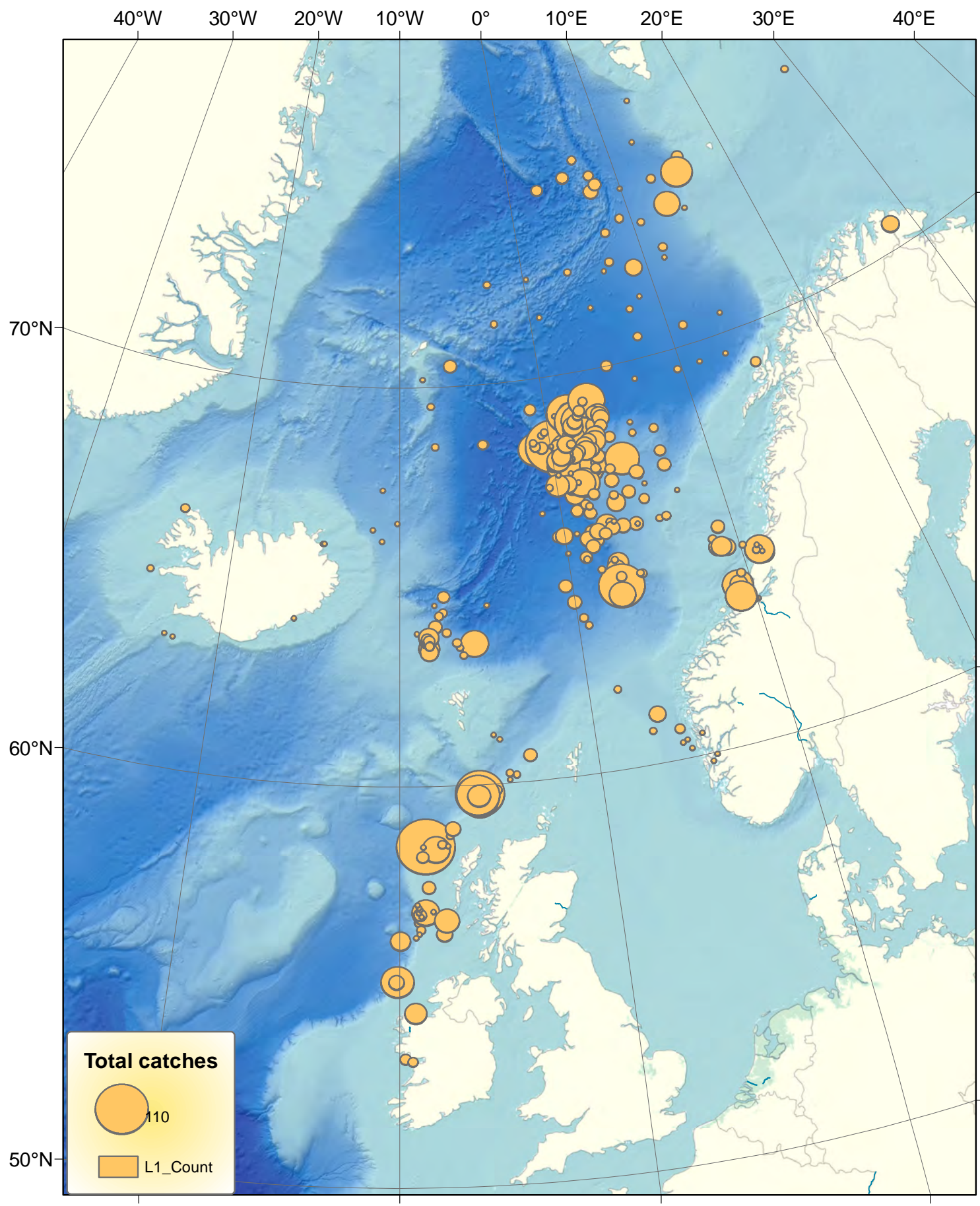
Map 3. Assignment units, Level 1



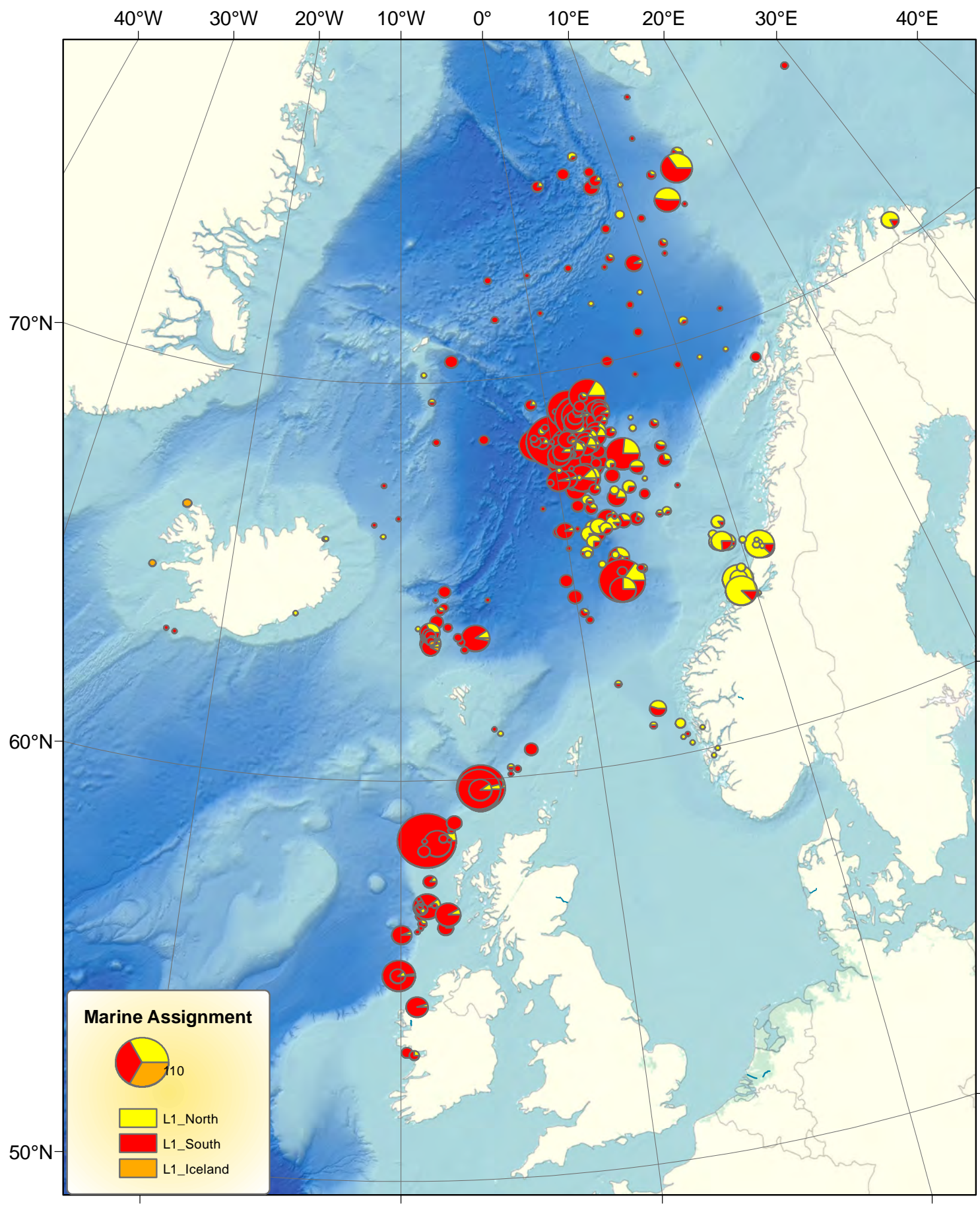
Map 4. Assignment units, Level 4



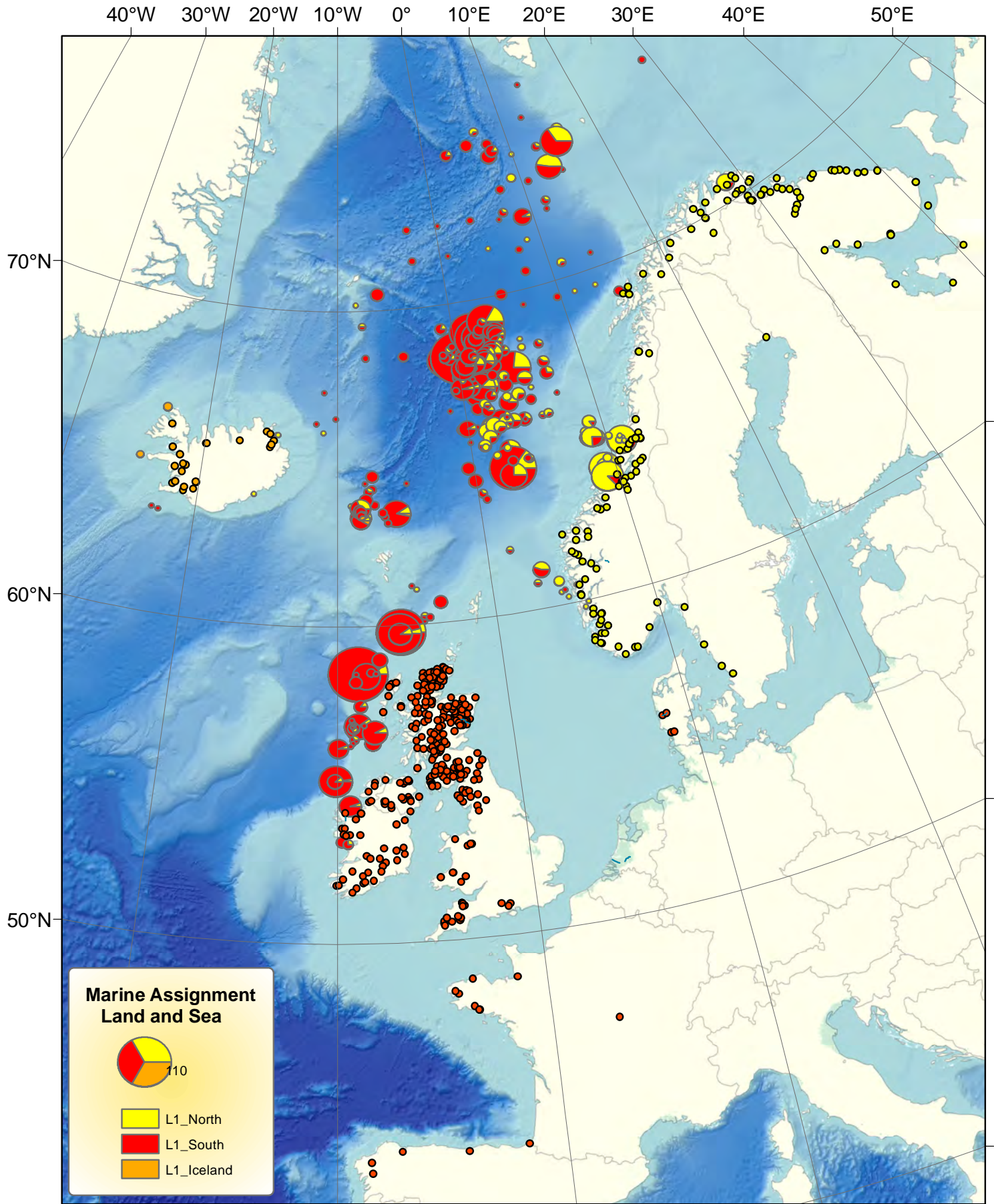
Map 5 Marine sample locations for post-smolts and older fish



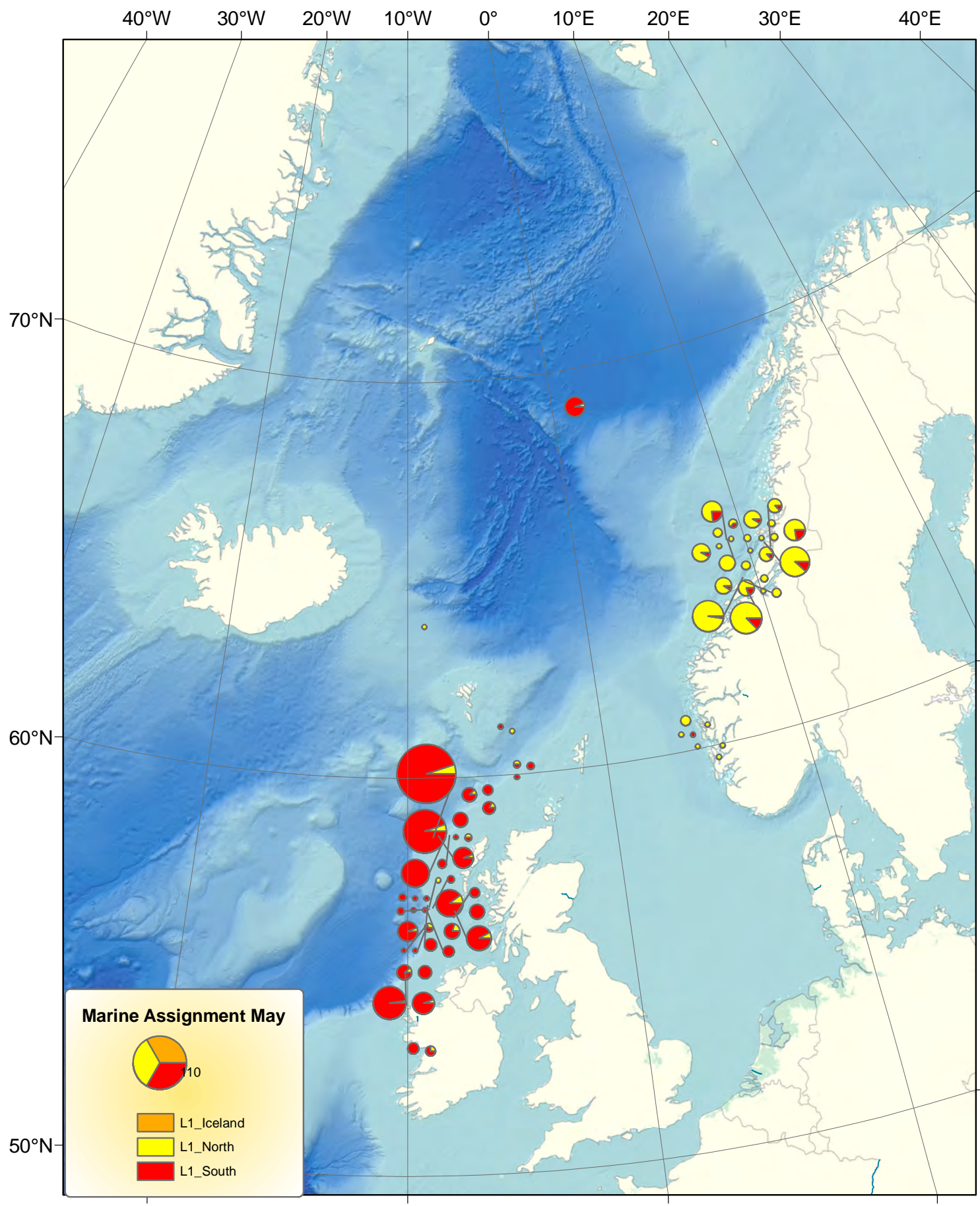
Map 6. Marine Assignments Level 1



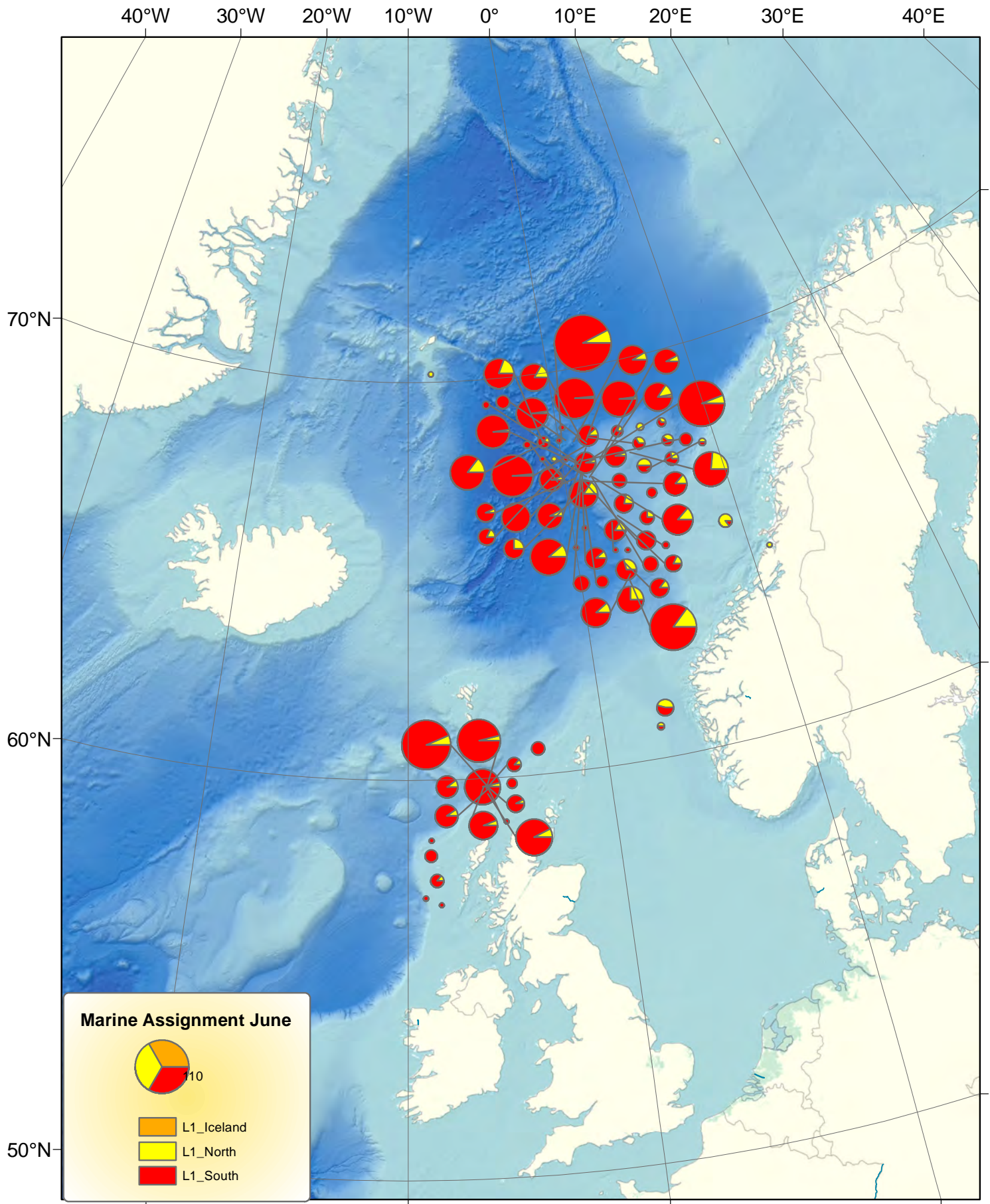
Map 7. Assignment unit level 1 and its sea distribution



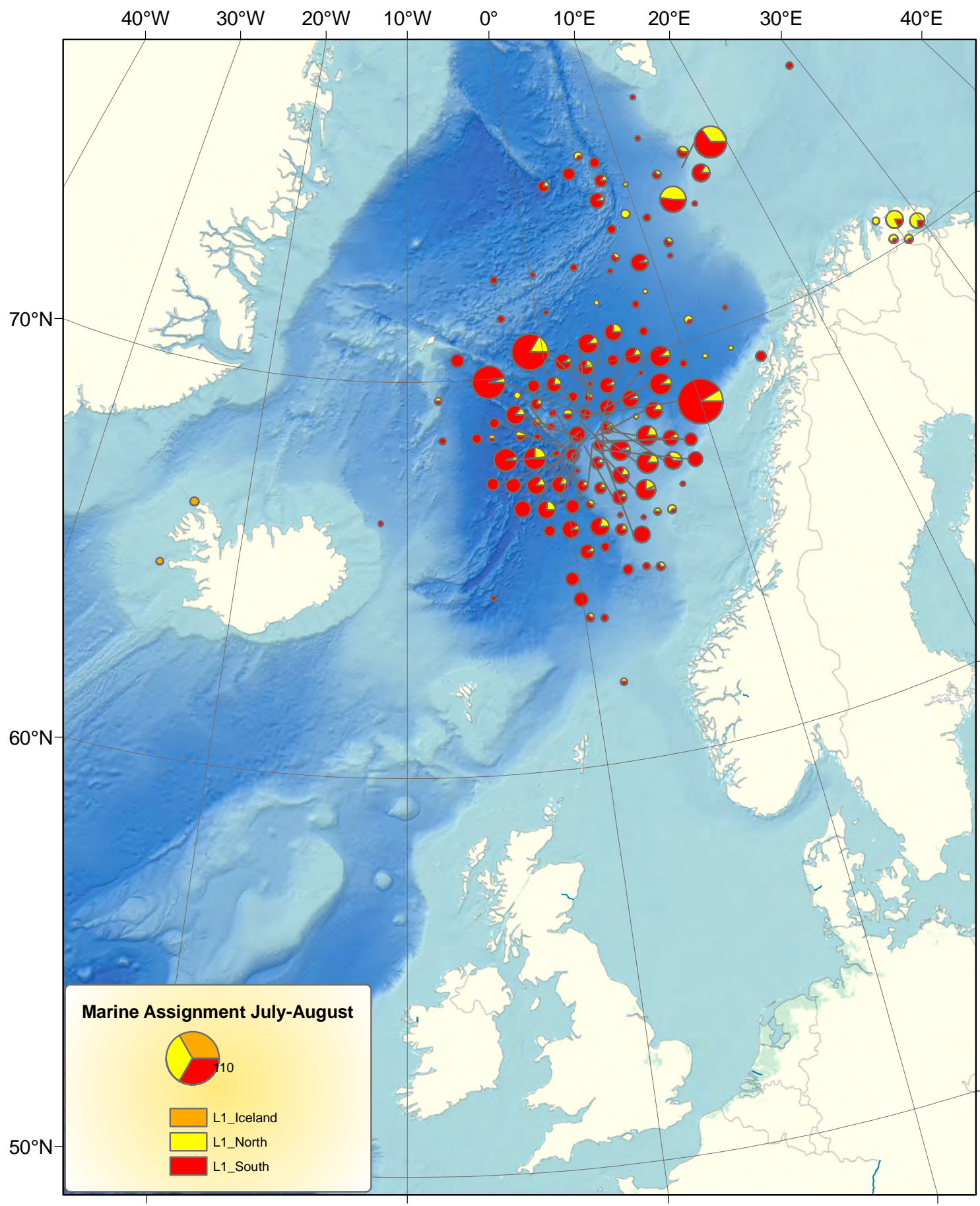
Map 8. Marine Assignments Level 1 May



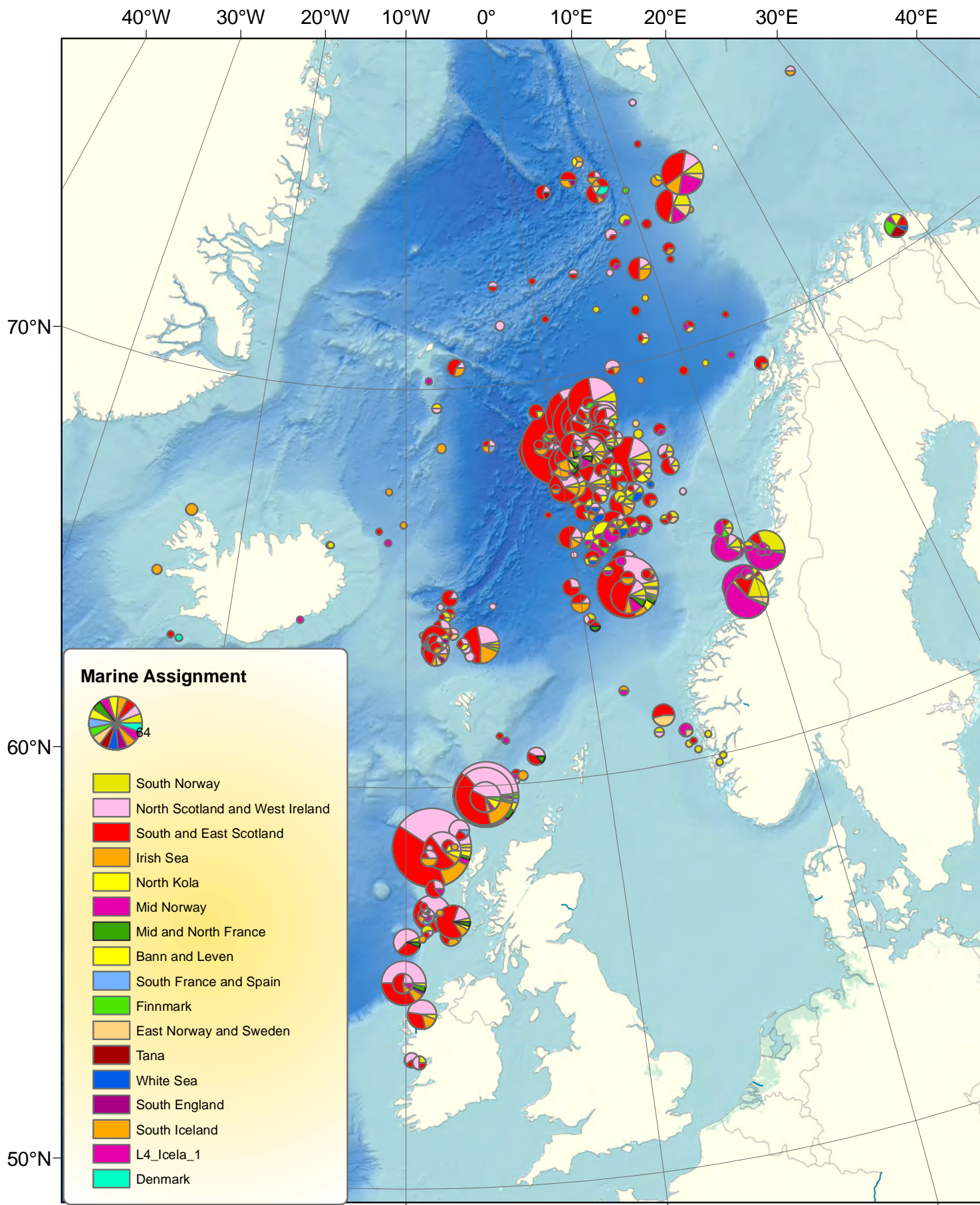
Map 9. Marine Assignments Level 1 June



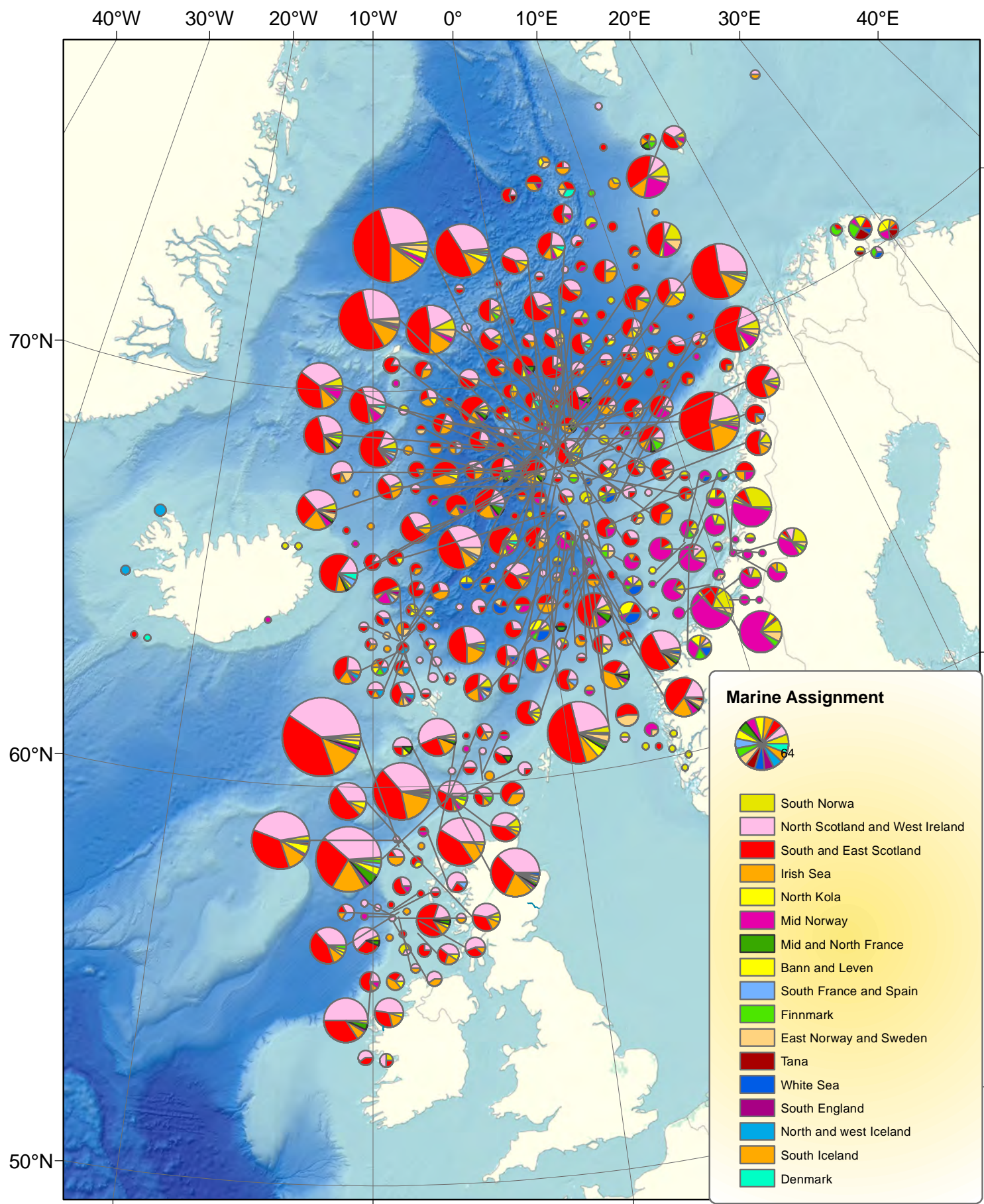
Map 10. Marine Assignments Level 1 July-August



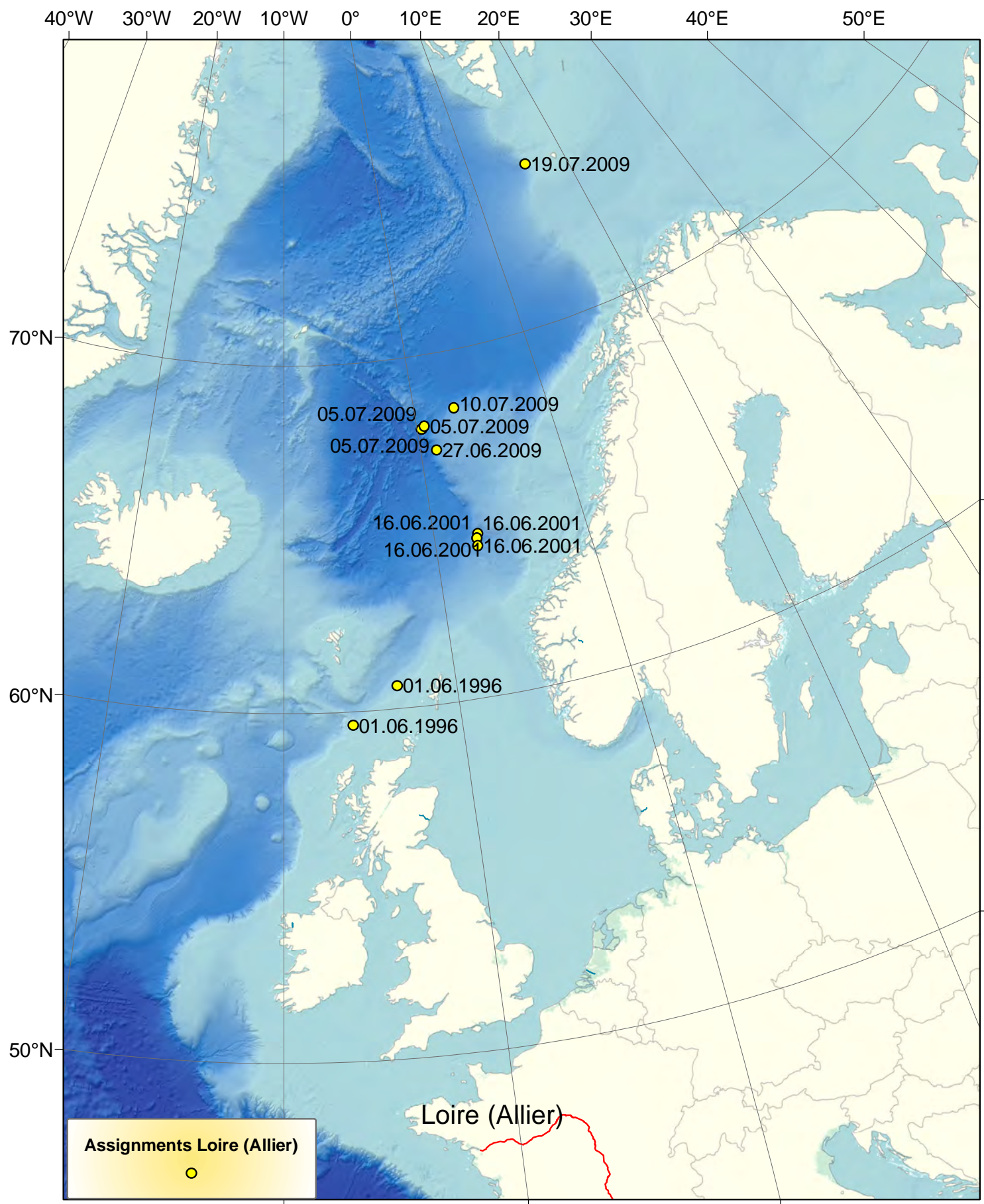
Map 11. Marine Assignments Level 4



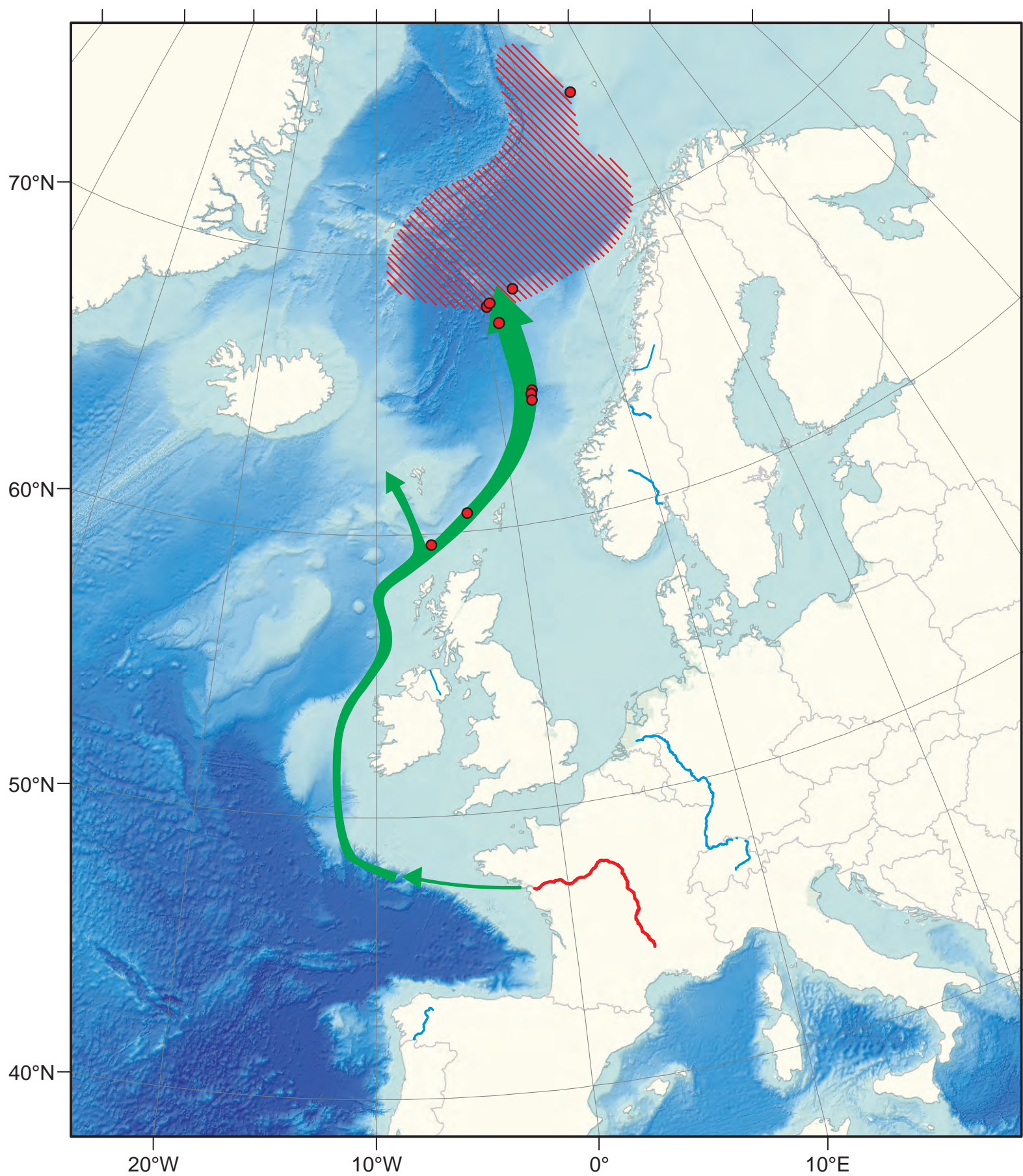
Map 12. Marine Assignments Level 4, spread pies



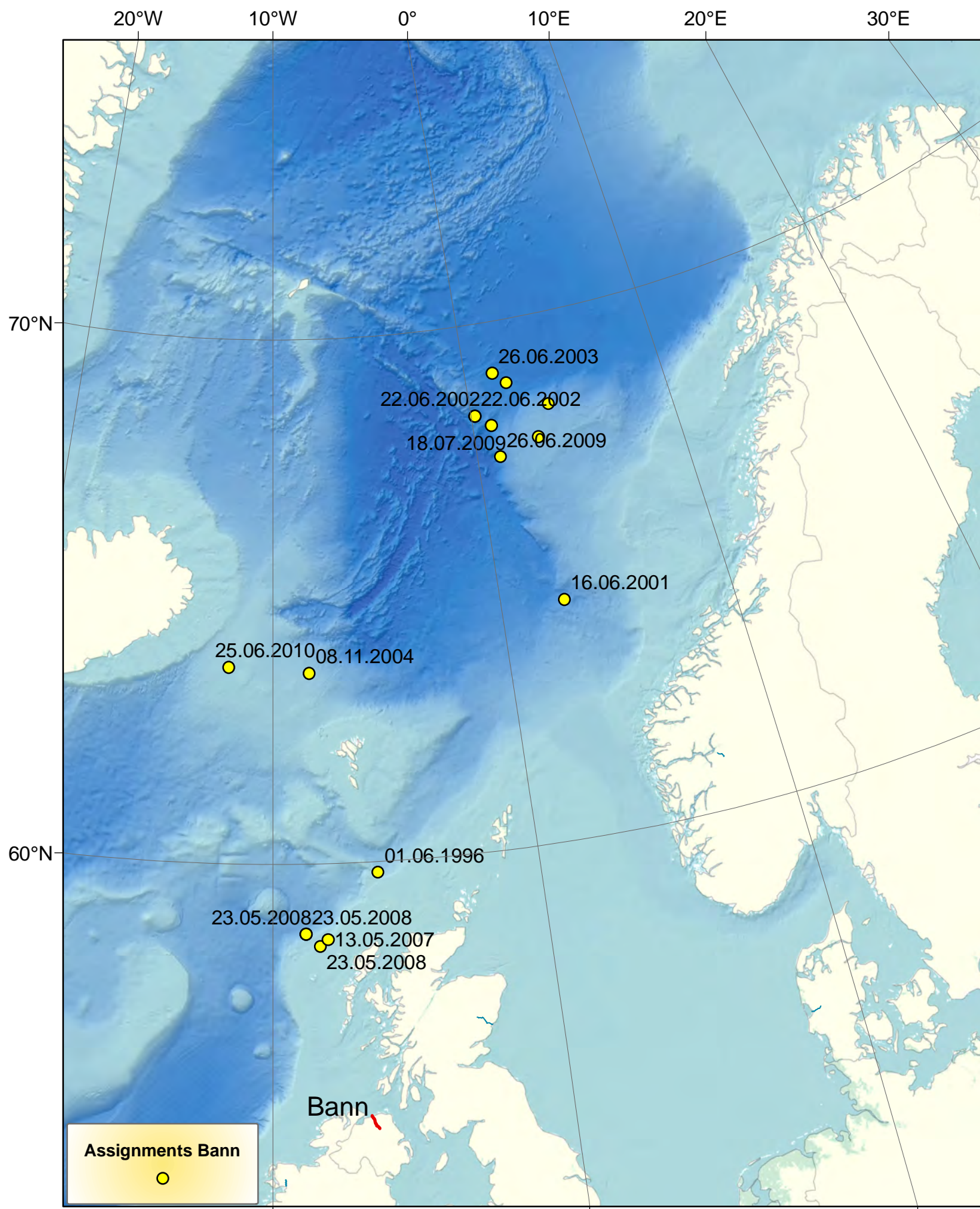
Map 13. Catch positions and dates of capture of post-smolts assigned to Loire Allier



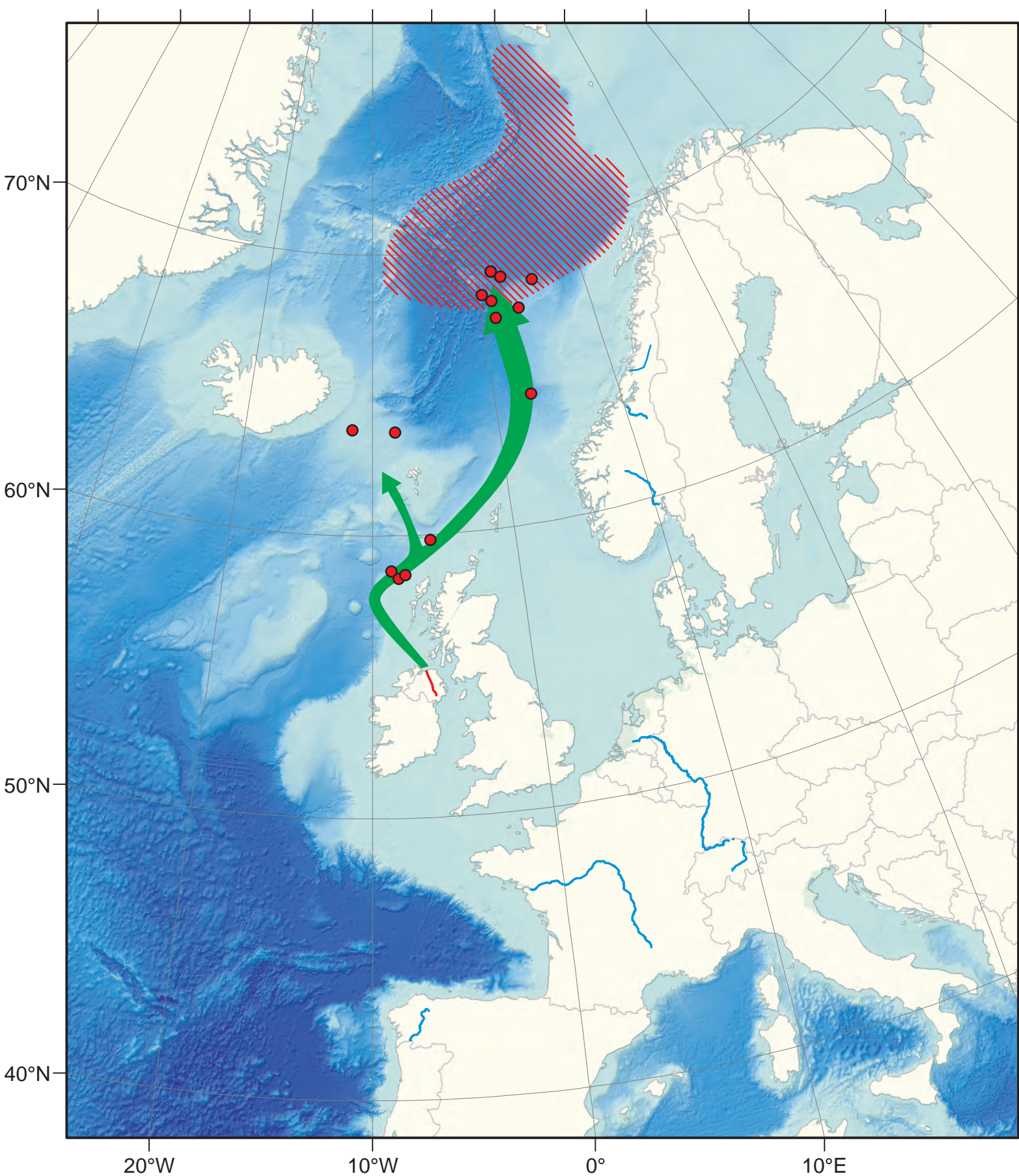
Map 14. Loire Allier, France. Migration



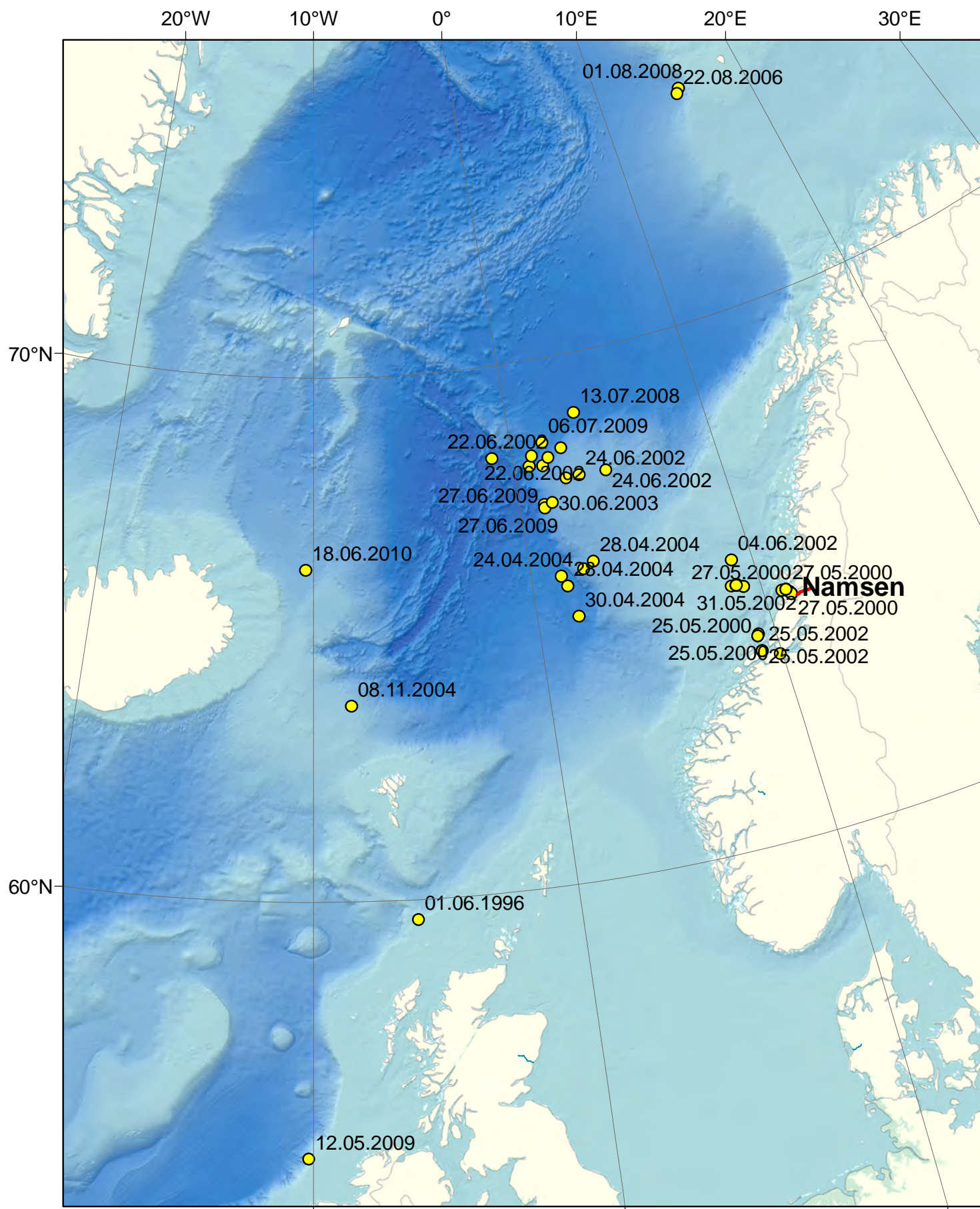
Map 15. Catch positions and dates of capture of post-smolts assigned to the River Bann



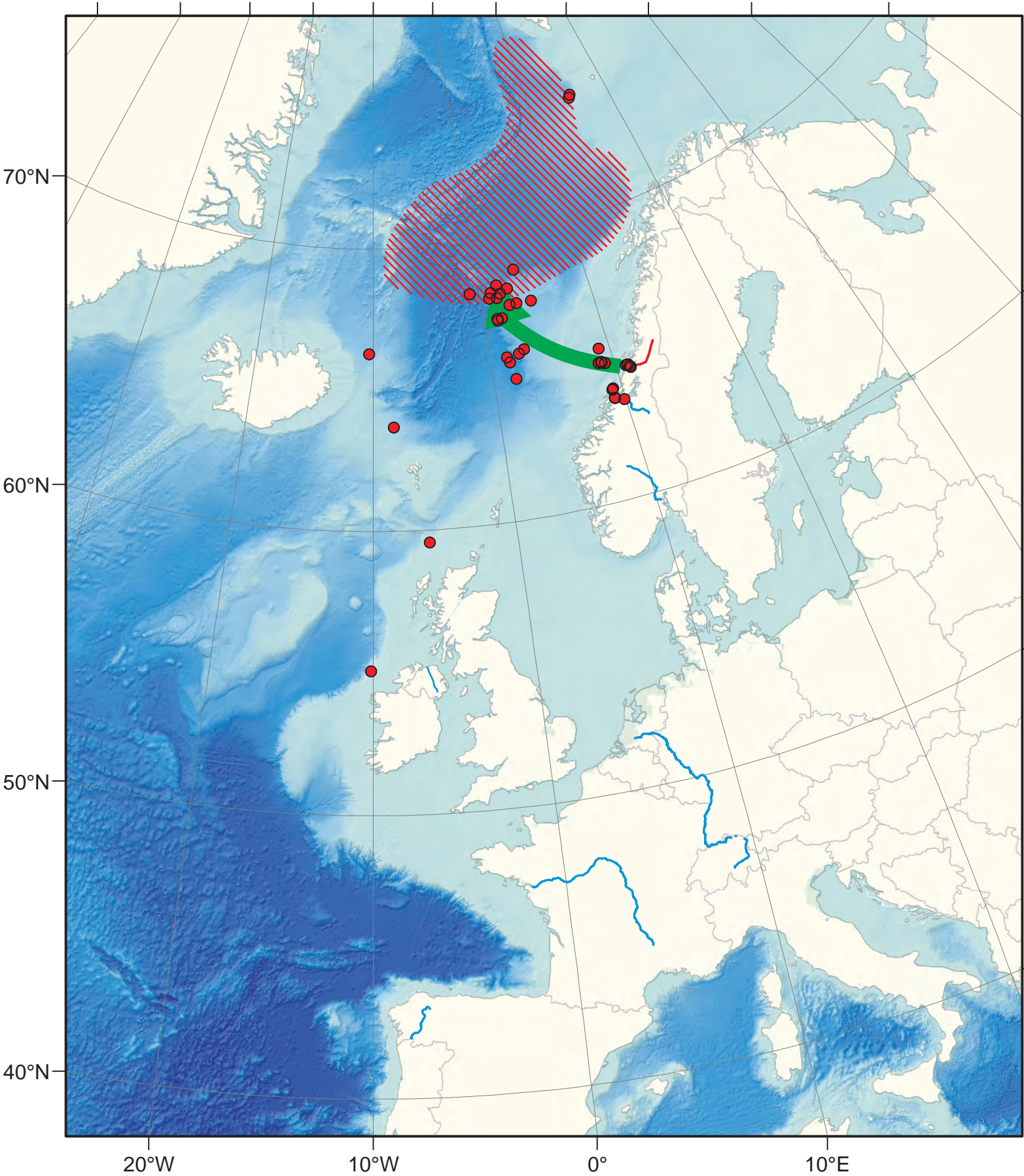
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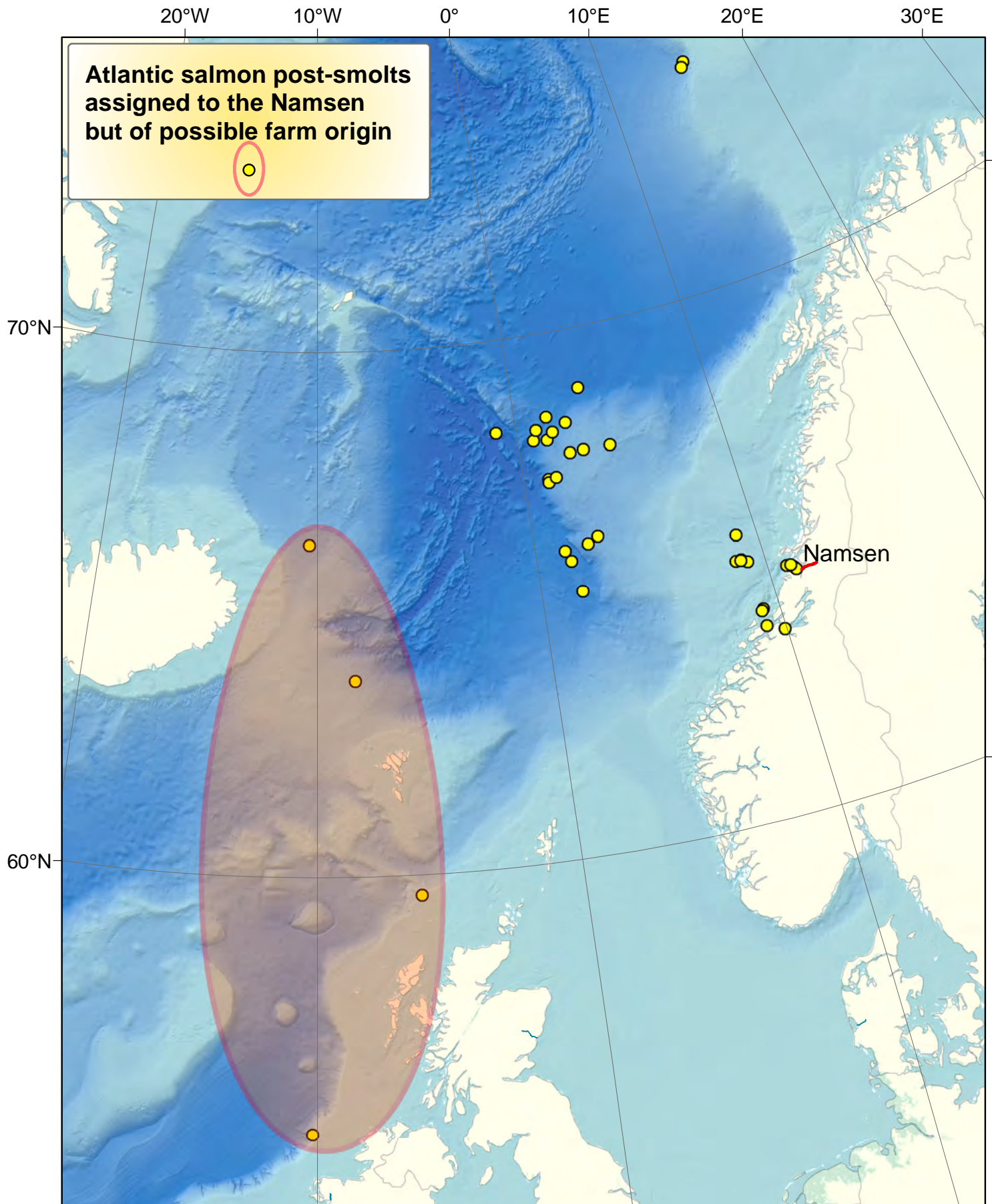
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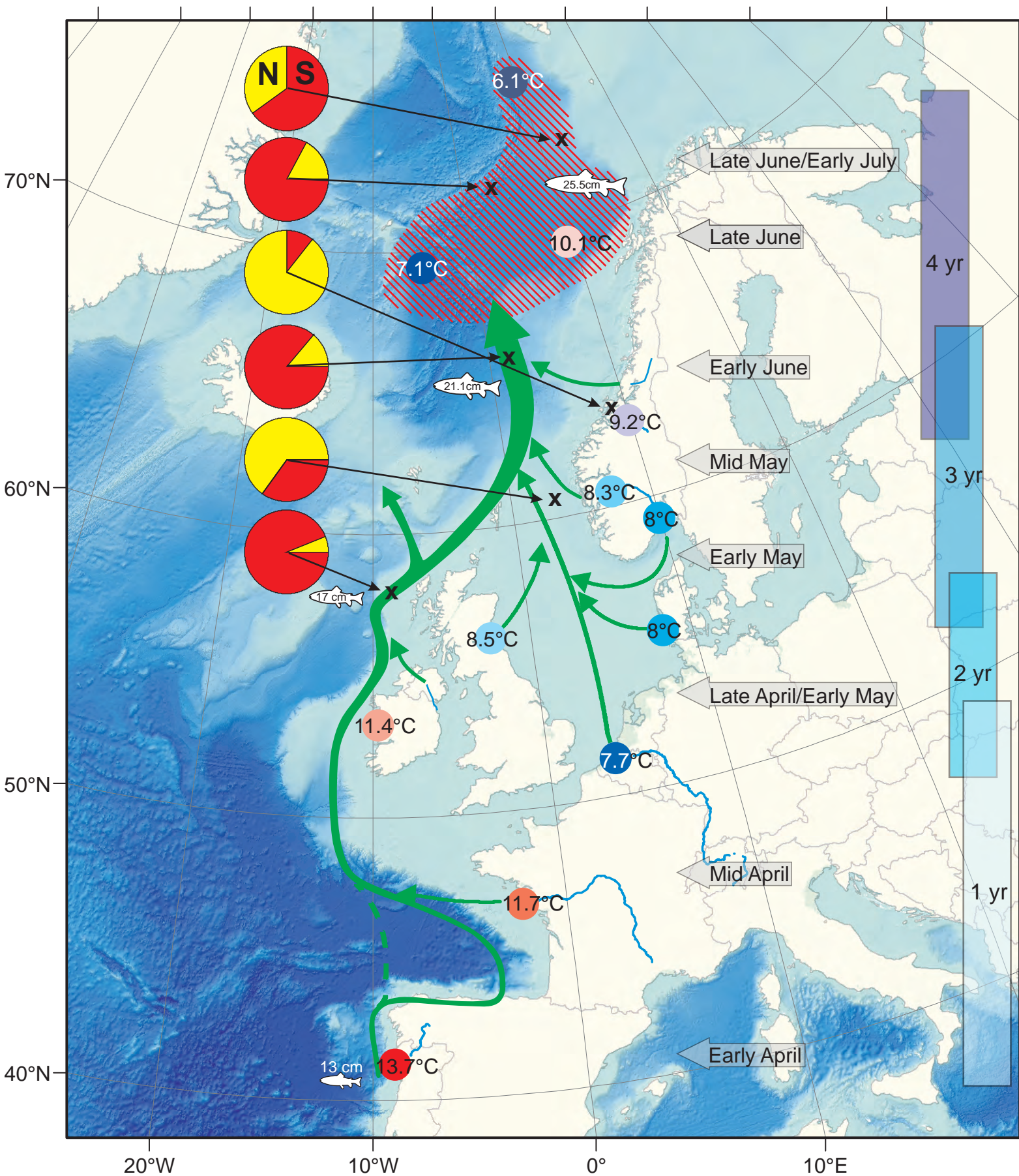
Map 18. River Namsen, Norway. Migration.



Map 19. River Namsen, Norway. Evidence of farmed fish



Map 20. SALSEA-Merge Summary map



Flier Paths of silver



PATHS OF SILVER

AN ATLAS OF ATLANTIC SALMON MIGRATIONS

Paths of Silver charts a modern day maritime adventure like no other. From humble beginnings in the remote mountain streams of Europe's highest mountains salmon have been retuning to their ancestral home, the ocean, for millennia. But conditions at sea are changing and many salmon are not surviving their long ocean journey. The epic voyage of the wild Atlantic salmon takes them through the waters of the North Atlantic to the feeding grounds in sub-Arctic regions, and then back again to spawn. Never before have their migration routes been charted in such detail; never before have the locations of individual stocks feeding at sea been pinpointed. Never before has such a major scientific study focused its resources on solving a single shared problem: the mystery of how Atlantic salmon use the ocean; where they go; how they use ocean currents and the ocean's food resources; and what factors influence migration and distribution at sea. *Paths of Silver* will bring you on a unique odyssey from the giant ice fields of the last ice age to the salmon rivers of today. It plots a course that will lead you through the intricacies of the salmon's genetic code and enables you to follow the wanderings of individual stocks of salmon from the river of their birth to the precise area in the ocean where they feed and grow. It will explain how, trapped for months at a time in the rushing, powerful ocean currents of the North East Atlantic



the baby salmon are adapted to survive and how changes in the strength or direction of these currents can spell disaster for these tiny silver morsels. It will introduce you to the salmon's neighbours at sea and explain why this large silvery fish, a minor player in the abundance of ocean life, is of such critical importance to the very existence of the oceans themselves. The scale rings of the salmon sequentially record every chemical and physical change they encounter in the ocean. With scales gathered by their predecessors, scientists explain how they track their weekly adventures down the decades. They can now decode this calcium carbonate log to reveal changes in weekly growth patterns and changes in the surrounding ocean temperatures. Expert scientists will reveal how the oceans are changing and why understanding the migration and distribution of individual stocks at sea may hold the key to understanding how and why the abundance of this unique fish has changed. Can it adapt to the fast changing conditions in the ocean? Has the salmon ever before encountered such rapid changes? Will the salmon's amazing natural diversity and its unique ability to adapt save it from extinction? *Paths of Silver* tackles these and many other vital questions that are fundamental to the survival of this unique and truly iconic fish.

Paths of Silver is scheduled for publication in 2012.



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