

MASTS Small Grant Report 2017

SG400 Title: Not so homogenous after all? Use of stable isotopes to identify regional population within European Lobsters (*Homarus gammarus*)

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Rational

Increasing importance is being placed upon understanding the key biological characteristics of historical exploited stocks, especially those that are still considered data poor. In relation to Scottish lobster fisheries, stocks have supported socio-economically important fisheries for hundreds of years. However significant knowledge gaps regarding this specie still occur. In particular, simple understanding of population structure is still relatively unknown, with stocks managed under arbitrary assessment areas which have little scientific or biological basis. However, increasing importance being placed upon managing stocks at regional levels despite the extent of regional stocks ill defined. Traditional methods used to identify regional differences in populations for sustainable fisheries management has been that of genetics. This has highlighted lobster stocks to be overall homogenous in the North East Atlantic (1,2), thus providing little information relating to regional small scale differences or benefits for management advice. In contrast regional differences in size at maturity and fecundity are observed within localised populations (3, 4) indicating regionally driven population

dynamics lost within traditional genetic analysis.

Recent advancements in the use of stable isotopes as a tool for in identifying localised geographic distinct stocks have been trialled in sea bass (5), demonstrating its use in identifying multiple stock boundaries within a migratory and previously thought homogenous stock. In contrast, European lobsters are a predominantly sedentary benthic species undertaking limited movements within natural home ranges compared to migratory fish species. Making the identification of possible distinct populations based on stable isotopes highly possible.

Main Objective:

Demonstrate the use of stable isotopes in identifying regional stocks and potential stock boundaries

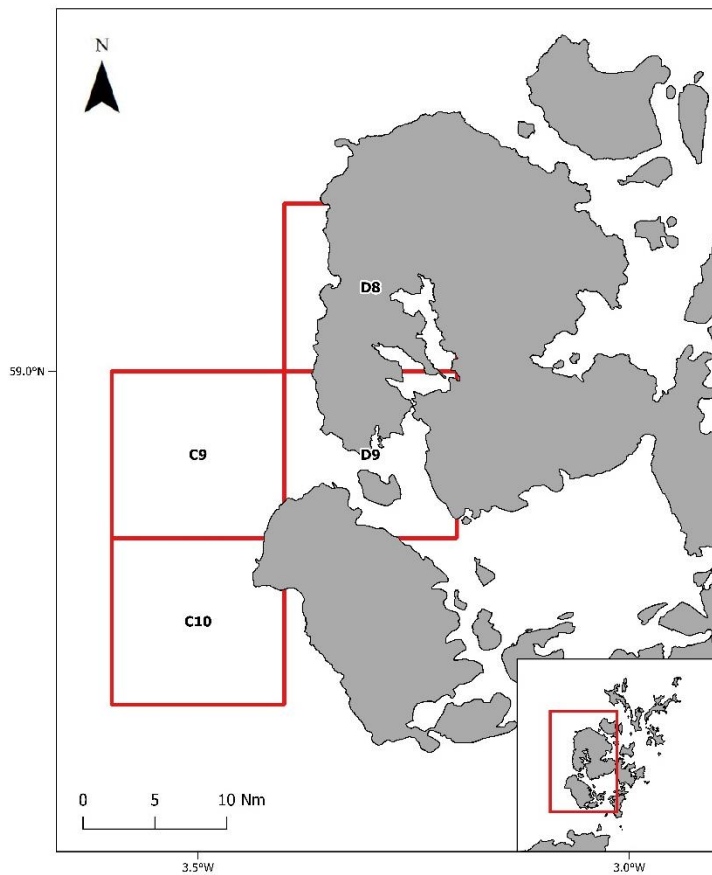


Figure 1. Location from which Orkney samples were sourced

Summary of Work funded by MASTS

In collaboration with the North Atlantic Fisheries College (NAFC) Shetland and Orkney Sustainable Fisheries Ltd., 100 lobster pleopod samples were collected (50 Orkney; 50 Shetland) for stable isotope analysis. Samples were sourced for the North Hoy and West Mainland Orkney in July 2017 (Fig1) and within Shetland SSMO management area K17 in August 2017 (Figure 2).

Samples were then freeze dried at the Environmental Research Institute (ERI) Thurso and sent for stable Isotope mass spectrometry analysis at the Scottish University Environmental Research Centre (SUERC), East Kilbride. Samples were analysed measuring stable isotope composition ($\delta^{13}\text{C}$ and $\delta^{15}\text{N}$). These signatures will allow the potential occurrence of regional differences to be explored and whether or not samples can be correctly assigned to the region of origin based on this composition.

Currently work is still ongoing for this project, with further analysis required before conclusion can be drawn. The results of this project will influence future work using stable isotopes to define stock boundaries and its role in national fisheries management.

Relevance to MASTS

This project is closely aligned to MASTS “Productive Seas” theme and the Fisheries Forum hosted by MASTS. This project plans to deliver evidence-based science that can be used by Marine Scotland Science and Scottish Inshore Fisheries Groups to directly affect management decisions, aiding in longer term sustainability of Scotland’s valuable inshore fisheries and the communities that depend upon it.

Outputs/Deliverables

- Peer-reviewed paper on the use of stable isotopes in identifying regional populations of a sedentary benthic crustacean and its implications for inshore fisheries management;
- Validation of a methodology using stable isotopes to identify regional crustacean population;
- Contribution to Heriot-Watt PhD Study;
- Presentation of results at ICES WGCRA B

References:

1. Triantafyllidis et al., (2005) Mitochondrial DNA variation in the European Lobster (*Homarus gammarus*) throughout the range. MAR BIOL.
2. Watson *et al.*, (2016) Population genetic structure of the European lobster (*Homarus gammarus*) in the Irish Sea and implications for the effectiveness of the first British marine protected area. FISH RES.
3. Lizarraga-Cubedo et al., (2003) Comparison of size at maturity and fecundity of two Scottish populations of the European Lobster (*Homarus gammarus*). FISH RES.
4. Coleman. (2016) Size at maturity and fecundity of Orkney European Lobster (*Homarus gammarus*). Unpublished.
5. Cambie et al., (2016) Stable isotope signatures reveal small-scale spatial separation in populations of European sea bass. MAR ECOL-PROG SER.

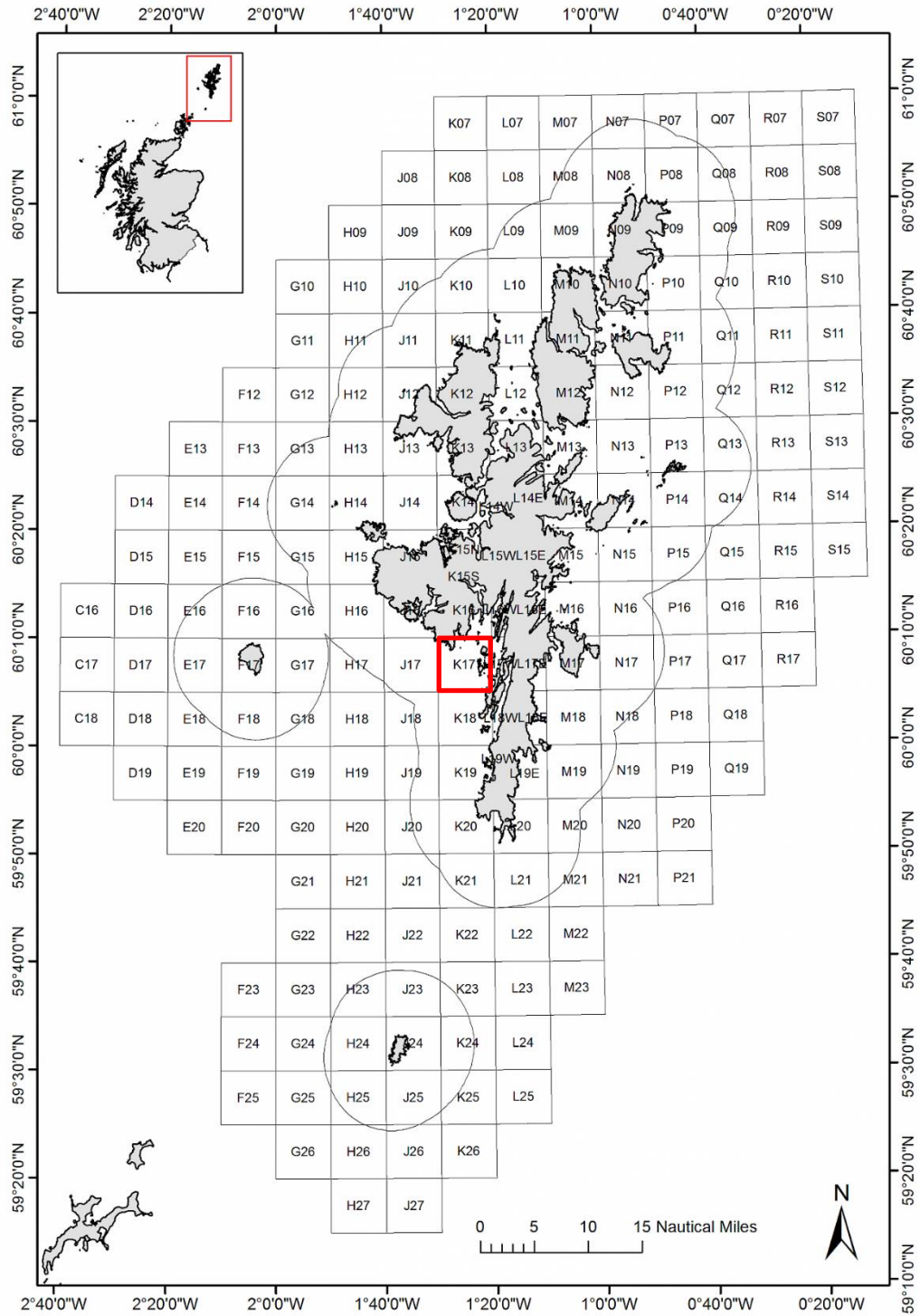


Figure 2. Shetland shellfish management organisation management areas and highlighted region from where samples were sourced