

## Deep-Sea Forum Small Grants Round 2014: FINAL REPORT, DSSG22

### “Trench Connection Internship”

Awarded to Alan Jamieson (The University of Aberdeen, now Newcastle University)

#### Summary

The last 10 years has seen a renewed interest in the deepest ecosystem on Earth; the hadal zone (6500-11,000m; Jamieson *et al.* 2010). This is partly due to the new-wave of deep-submergence technology available to science (e.g. Bowen *et al.* 2009; Jamieson *et al.* 2009ab) and mounting evidence that the deep-sea is not exempt to anthropogenic disturbance nor a variable climate (Froescheis *et al.* 2000; Ruhl *et al.* 2004; 2008; Smith *et al.* 2009). The hadal zone represents a distinct cluster of ultra-deep yet geographically and bathymetrically isolated ecosystems, situated mostly around the Pacific Rim (Jamieson *et al.* 2010). The trenches are deep subducting zones and despite the extreme hydrostatic pressure, low temperatures and limited food supply, are known to host a diverse and often locally endemic assemblages of species (Wolff 1960).

Within the HADEEP I-IV projects and the International HADES-K projects, the PI had amassed an extraordinary large collection of abyssal and hadal amphipods (Crustacea), recovered using baited traps, some of which were constructed within MASTS. Ms. (now Dr.) Nichola Lacey, a then-MASTS funded PhD student was working on the diversity and life history of the amphipod community over an unprecedented depth range from the same area (1000m to 9900m in the Kermadec Trench, at 200m intervals).

This internship was to identify and weigh, measure, sex and stage another equivalent dataset from the New Hebrides Trench, located 1000km north of Kermadec to address the following questions:

*Are hadal organisms distributed by depth alone?* Whilst the terms ‘abyssal’ and ‘hadal’ provide convenient nomenclature, deep-dwelling communities do not abide by such stratification and therefore the majority of species cross this bathymetric boundary thus trench endemism is lower than previously anticipated.

*Are trench communities influenced by topography as well as depth?* The zonation patterns observed in the trench differ from abyssal counterparts as a result of topography *and* hydrostatic pressure, therefore the presence-absence of key species at the deeper sites is not always driven exclusively by depth.

*Are trench communities isolated in biogeographic provinces as opposed to individual trench localities?* Endemism at extreme depths is driven by biogeographic provinces (influence of surface derived food)

The internship was given to Mr. Ryan Eustace who delivered the scope of work with professionalism and on time. These data went on to form a vital part of the analysis of Dr. Lacey’s 2016 *Deep-Sea Research part 1* paper. The conclusions, that were only possible with the addition of this work to Lacey’s project, were that depth does not dictate diversity in the trenches (Q1), topographical influence is likely but not yet immediately obvious (Q2) and that overlying productivity is likely the main driver of community structure in hadal amphipods (Q3).

Furthermore, during the internship, Mr. Eustace also wrote up and submitted his Honours project, also to *Deep-Sea Research part 1*, and was accepted with many corrections. These papers have been scored 4\* and 3\* respectively for the REF as part of Newcastle University’s Internal Quality assurance.

Mr Eustace has since gone on to do a Masters in Biotechnology at Stirling University, and Niki Lacey has found full-time employment with Marine Scotland Science and Shell.

**The papers are:**

Lacey, N.C., Rowden, A.A., Clarke, M., Kilgallen, N.M., Linley, T.D., Mayor, D.J., Jamieson, A.J. (2016) Community structure and diversity of scavenging amphipods from bathyal to hadal depths in three South Pacific trenches. *Deep-Sea Research I*. 111, 121-137.

Eustace, R.M., Kilgallen, N.M., Ritchie, H., Piertney, S.B., Jamieson, A.J. (2016) Morphological and ontogenetic stratification of abyssal and hadal *Eurythenes gryllus* (Amphipoda: Lysianassidae) from the Peru-Chile Trench. *Deep-Sea Research I*. 109, 91-98.