Interview with Dr. Alan Jamieson

We interviewed Dr. Alan Jamieson from Newcastle University. His research is focused on the development and application of the environmental field, especially on measurement of the impact of microplastic in the ocean.

Doctor Jamieson, thank you very much for spending some time for this interview. At first, could you outline the research and let us know what discovery and achievement have been made so far?

My main research focus is the exploration of the deepest parts of the ocean, namely the 'hadal zone' which means anywhere deeper than 6000 metres. There are usually large ultra-deep trenches that until recently we knew very little about. Our main goals are to study the ecology, habitats and connectivity between different trench communities and we have been really successful in having studied nine of these deep trenches, including the deepest place on Earth. In the process we have amassed a large sample archive, particularly samples of the crustacea amphipoda (hoppers). A couple of years ago we thought it would be interesting to investigate anthropogenic impacts at the greatest ocean depths. We did a study showing extraordinary high levels of persistent organic pollutants (PCBs and PBDEs) in the deepest samples. This was shocking and gain a huge international interest in the media. During that time many people were asking if these hadal animals showed any signs of having ingested plastic, which is of course a very concerning and hot topic at the moment. Having worked with Shimadzu we established that a saddening high level of these animals from 6 of the deepest trenches in world had indeed ingested plastics and through collaboration with Shimadzu in Milton Keynes, UK, we were able to identify the materials as well.

How are Shimadzu instruments helping you in your research?

The main driver of the plastic as full ocean depth study was firstly to simple demonstrate the reach of mankinds activities and shake the perception that the deep sea is somehow exempt from what we do on land or near the surface. The idea of 'out of sight, out of mind' simply doesn't work. Anything that goes into the ocean will eventually sink, when it sinks it enters the deep sea and has nowhere else to go and therefore only ever accumulate more. The second goal is assess the level in which this might affecting animals and ecosystem that we still don't really understand. Perhaps the more concerning aspect of all this is that we have lost the window to study these ecosystems in a pristine condition, clearly they are already contaminated and it only now were are regularly studying them.

Could you tell us why you chose Shimadzu as your partner when you established this new lab?

We came in this rather naively as it wasn't something we normally did. We were trying to use an FTIR facility within the Chemistry department to examine what materials these tiny fibers were but it became clear early on it was not the right machine for the job. The University is a long standing customer and user of Shimadzu technology and our technicians put me on to Dan Parnaby, our Shimadzu sales representative, to talk about how they could help. Dan was extremely helpful and put me in touch with Bob Keighley at the Milton Keynes facility and after long conversations about we were trying to do and what Bob wanted to do in terms of demonstrating Shimadzu capability we teamed up for this project. Also Sky News were very keen on using this research as part of their Ocean Rescue campaign and so we invited their film crew to the Shimadzu facility on the day to film us doing the research live.

How are our instruments helping you?

We used the Fourier-Transform Infrared Spectrophotometer (FTIR; IR Tracer-100) connected to an automatic infrared microscope (AIM-9000) at the Shimadzu UK Ltd Laboratory Facility in Milton Keynes. Individual fibres were manually removed and transferred to the surface of FTIR reflective slides or transferred to a Specac DC3 Diamond Cell and compressed for transmission measurements. The transmission measurements provided the most reliable results. The fibre was observed using the wide field camera to identify possible locations for further investigation and the measurements were made in transmittance or reflectance mode (50 scans over approx. 20 s) using the Wide-Band MCT (mercury cadmium telluride) detector. For each fibre, three points were scanned and the results were compared to those in the Shimadzu materials library for matches or closest similarity. Some of the fibres which showed unusual structure were scanned in several places to reveal more about their chemical composition. What really impressed me was the speed in which we could work and how quickly we could get results.

What are Shimadzu's strengths compared to other vendors (not limited to the instruments)?

Shimadzu were very keen to assist in this project and worked together for a mutually beneficial result.

Finally, could you share any requests that you have with respect to analytical and measuring instrument vendors?

It would be great to keep scientist informed of developments and applications of this type of technology, perhaps specific to a particular type of technology, e.g. an FTIR microscopy update.

It was significant to know what you think of us and our collaboration. We will strive to meet your request more than ever. Thank you very much.

Here are his recent publications:

Jamieson, A.J., Brooks, L.S.R., Reid, W.D.K., Piertney, S.B., Narayanaswamy, B.E., Linley, T.D. (In press) Microplastic and synthetic fibers ingested by deep-sea amphipods in six of the deepest marine environments on Earth. *Royal Society Open Science*

Ritchie, H., Jamieson A.J., Piertney, S.B. (2018) Heat-shock protein adaptation in abyssal and hadal amphipods. *Deep-Sea Research II.* 155 61-69.

Reid, W.D.K, Cuomo, N.J. and Jamieson, A.J., (2018). Geographic and bathymetric comparisons of trace metal concentrations (Cd, Cu, Fe, Mn, and Zn) in deep-sea Lysianassoid amphipods from abyssal and hadal depths across the Pacific Ocean. *Deep Sea Research Part I,* 138, 11-21.

Ritchie, H., Jamieson A.J., Piertney, S.B. (2017) Genome size variation in deep-sea amphipods. *Royal Society Open Science.* 4, 170862

Jamieson, A.J., Malkocs, T., Piertney, S.B., Fujii, T., Zhang, Z. (2017) Bioaccumulation of persistent organic pollutants in the deepest ocean fauna. *Nature Ecology and Evolution.* 1, 0051