



#### **Dr Carys Bennett logging sediments in Burnmouth**

Carys Bennett from the University of Leicester and Tim Kearsey from the British Geological Survey in Edinburgh spent most of October up in Burnmouth on a massive logging and sampling exercise covering the entire bay. They're recording all the rocks that exist there. These rocks were laid down in the Tournasian Period, roughly the first 20 million years of the Carboniferous, during which tetrapods evolved from largely aquatic animals into fully terrestrial ones. Carys and Tim finished on 3rd November in temperatures around zero.

In mid-October, they were joined by a number of other team members. John Marshall from the University of Southampton and Sarah Davies from the University of Leicester came up for a week. John is a palynologist and expert in Devonian/Carboniferous climate change, studying, amongst other things, plant spores, which will help us date the rocks. He was only just back from a summer expedition to east Greenland, and the work he was doing there will tie in neatly with our project.

This group spent the week walking the section and sampling the rocks in the bay, joined on at least three occasions by Mike Brown from the BGS. Tim brought a specialist GPS accurate to 3cm to precisely locate individual samples on the foreshore. Hundreds of samples were transported back to Leicester, driving rather cautiously as the car was so heavily loaded with rocks!

Carys has started cutting some of the samples with a rock saw and polishing the cut surfaces to see what's visible. Over the next few weeks she'll be preparing thin sections which can be examined microscopically, and crushing a portion of many samples to send to John for palynological analysis and to another team member, Melanie Leng at the NERC Isotope Geoscience Laboratory for stable isotope analysis. This will give us a detailed understanding of the sedimentary rocks, which in turn will reveal a lot about the conditions under which the sediments were laid down.

From Cambridge, Tim Smithson and Jenny Clack's new Research Associate, Keturah Smithson (no relation) came,

along with Sarah Finney from the Sedgwick Museum and Rob Clack. Sarah Finney was also just back from Greenland where she'd been working with John Marshall.

The Cambridge crew spent most of the week collecting fossils and taking bulk rock samples from a few, carefully chosen sites in the bay. One spot on the south of the bay has yielded abundant, isolated bones, particularly of rhizodont fishes. Although rhizodonts have been known for many years, not much has been published about them, so there's a good chance we'll be able to fill in a certain amount of detail regarding their anatomy.

Sarah Finney and Rob Clack had planned to snorkel just north of the harbour, collecting rock samples from below the low water mark, but in the event the tides were low enough to make that unnecessary. This was just as well as it was perishing cold and the water was quite opaque. Even with wetsuits it would not have been much fun.

We also collected bulk samples from a bed to the north of the harbour which has yielded interesting fossils in the past. The idea here is to examine the rocks in detail in the lab, pick the matrix away and hopefully find more fossils inside.

Another spot we looked at was further inshore, but still to the north of the harbour. These are among the oldest rocks exposed there, and they yielded a few very fragmentary fossils. We don't know what these are yet, but they are tantalising, and suggest we could usefully spend more time there.



#### **Tim Kearsey with GPS, and Sarah Finney**

The weather was foul for much of the week, and we were joined on what was possibly the worst day of all by four experts from the National Museums of Scotland. Curators and experts in Palaeozoic fossils, Andy Ross, Stig Walsh and Sarah Stewart, and Curator of Petrology, Simon Howard.

For the first couple of days we were also joined by tetrapod specialist Marcello Ruta, from the University of Lincoln. Like a number of others, Marcello had never been to Burnmouth before, so spent many happy hours getting soaked and frozen, scrambling over the rocks, familiarising himself with the place.



## What have we achieved so far?



Tim Kearsey has sent us this aerial view showing all the GPS mapping points he's taken. The red dots top left are the oldest rocks, just north of the harbour, the yellow ones nearer the middle are getting younger, and the green ones at the bottom are the youngest rocks. Because the beds are all vertical, what we see here is a slice through a continuous sequence of Tournaisian rocks, and although the three groups of mapping points are offset north-south, they record a contiguous sequence from oldest to youngest.

So far the Cambridge team has found a few tetrapod fragments - here are a scute and a couple of phalanges

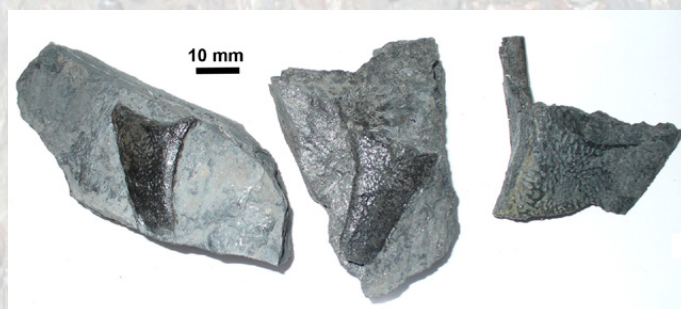


and, as expected, quite a few bits of rhizodont fish. Rob took a number of photographs of the bed where these all came from and has recently spent some time mapping the specimens that are coming to light onto the photographs, so that we have a good understanding of how the various bones related to one another within the bed.



These are three rhizodont cleithra, part of the shoulder girdle, and are clearly of different sizes, so they came from three different individuals of various sizes.

In the photograph below, we have three rhizodont clavicles, again, part of the shoulder girdle, and again, three different sized fish. It is tempting to think that we can associate the big clavicle with the big cleithrum above, etc, but it is far too early to speculate like that yet.



## What Next?

- Jenny Clack will give a talk about the project at the Geological Association's Festival of Geology in London on November 10th and at the Leicester Literary and Philosophical Society on November 12th.