

TW:eed Project

Tetrapod World: early evolution & diversification

Newsletter No 4, July 2013



In June, members of the project completed a week's fieldwork in the Borders and Northumberland. Eight of us stayed in a cottage to the west of Berwick and visited various sites, collecting fossils, logging rock strata and collecting further sediment samples to supplement those collected last October.

As agreed with Scottish Natural Heritage (Burnmouth Bay is an SSSI), Tim Smithson collected a metre square sample from the south of Burnmouth Bay, for later detailed analysis in the lab in Cambridge.

This is Tim operating the rock saw. Photo copyright NMS.



Rob and Jenny found more fossil material in the cliffs on the south of the bay and also picked up some interesting fish fossils from a new site near Duns. These include two lungfish toothplates and rhizodont fish bones. There are more bones in the river cliff, but we need to get permission from the landowner before we can try to collect those.

On the Tuesday, team members from NMS and BGS Edinburgh came to join us for a team meeting, and we were also very glad to welcome Maggie Wood at the meeting. It was a little cosy with 15 of us in the living room, but it's a huge cottage, so we coped fine.

Jason Hilton came up from Birmingham for three days, though he wasn't able to make the meeting. He got very excited about some plant material he collected at Burnmouth.

BGS

Dave Millward reported completion of the borehole, but said they had not reached the bottom of the Ballagan Formation, despite reaching their target depth of 500m. The resulting core will be sawn in half lengthways and half stored, the other half used for sampling to assist with correlating the various beds within the Ballagan Formation.

He brought along a large print out of the complete log of the core for the rest of the team to see.

He commented that Alastair Birkett, the farmer who owned the land where the drilling took place, had been very helpful and enthusiastic throughout and also said how pleased he

was with the way Drilcorp had carried out the operation.

The drilling rig in operation. Photo copyright BGS.



Tim Kearsley has found over 40 separate horizons with root traces of a wide variety of types, which he will be discussing with Jason Hilton. Fossilised soils are common at Burnmouth and some suggest the presence of trees, but these are rare and only occur towards the top of the sequence. There is a suggestion of flooding and waterlogged soils.

University of Cambridge

Jenny Clack reported that Stan Wood's collection of fossils has now been purchased. She has given public talks about the project in Milan, Chicago and elsewhere and the public always seem to be very interested and enthusiastic about it.

She has been working on a small tetrapod known as Stanley which is probably a new taxon. It is the smallest tetrapod found so far, and there are some features indicating it might be a juvenile. It has some quite advanced characters, but others that are rather primitive.

She has two lower jaw specimens from different horizons but which may be the same taxon. Preliminary reconstructions show these to be somewhat similar to, though clearly different from a species from later in the Carboniferous.

Another tetrapod, provisionally called BTB (Below Tim's Bed) is confusing and looks as though the loose bones were swirled around before being finally deposited. Left and right limb bones seem to have been switched over with respect to the skull bones. It's very different from Stanley.

There's a fourth tetrapod skull, which Stan Wood collected at Willie's Hole, which is proving difficult to place, partly

because the posterior part of the skull is missing.

Sarah Finney sent a condition survey and treatment proposal for this specimen to the NMS. She then did some consolidation work as the specimen is very fragile, and prepared some of the matrix away from the skull so Jenny could see it better, particularly some of the teeth..

Keturah Smithson is working on the actinopterygian fishes. She said that Early Carboniferous actinoptes had all been thought to be very much the same in size, morphology and ecology, presumably as a result of the end Devonian extinction.

The actinoptes from this project are proving to be rather different - there's a very large jaw from Coquetdale and a very large scale from the cliffs south of Burnmouth. Specimens from Greenland show strange scale formation and peculiar dentition. The phylogeny needs to be looked at again.

Tim Smithson has been working on the lungfish and showed us pictures of various lungfish toothplates. There are at least four different species from around the Tweed basin, with high diversity, contradicting the literature which claims lungfish diversity was at its greatest in the Devonian.



A lungfish toothplate which Jenny and Rob Clack found. The scale bar on the left is 10mm. Photo copyright UMZC.

Rob Clack reported that the project website has been largely completed and he has translated it into Spanish. The translation is pretty much word-for-word, so he's looking for Spanish speakers willing to proof-read it.

<http://www.tetrapods.org>

University of Leicester

Carys Bennett told us that all the samples collected last autumn have been prepared and sent off for thin sectioning, ground up for geochemical analysis or sieved for micropalaeontology and sent to John Marshall at Southampton for palynological examination.

The section at Burnmouth is 450 m thick. Some rocks are only exposed at the lowest tide, and have not been fully logged. The thickness may change once this 'missing section' is measured and added to the existing log.

She finds there are more cementstones towards the bottom of the succession, and more palaeosols towards the top, though it will take more research to determine the relationships between them. She has identified 8 gypsum layers, indicating dried-up water bodies. She found 17 fossil-rich beds of which 7 are new horizons with potential bone material.

Project blog: <http://www.tetrapodworld.com>

The project blog has had in excess of 6000 views and the twitter feed has 167 followers.

Janet Sherwin has been logging the sediments at Coquetdale. The environment seems different from that at Burnmouth. Cementstones seem to occur in groups and are highly variable. Vertebrate remains have been found on the surface of some cementstones and in the mud and siltstones between them. Palaeosols are common and there is evidence of wave action which becomes more prevalent towards the top of the section. Two groups of sharks have been found at Coquetdale, though none has been found anywhere else in the area.

National Museums, Scotland

Nick Fraser expressed the disappointment of the whole team that we'd not received permission from SEPA to go ahead with the excavation we'd planned at Willie's Hole.

The last day of the SVPCA in September in Edinburgh will be dedicated to Stan Wood. Nick encouraged team members to submit posters about their work even though they might not normally attend this particular conference.

They're hoping to get £50,000 NERC and £50,000 HLF funding for a palaeoenvironment reconstruction exhibit for 2015.

Andy Ross has been working on the arthropods and has had a paper on arachnids accepted. Nick will transport Cambridge arthropod material to Andy, who is planning to complete an overview by September. He has much arthropod material from Tim's bed and Willie's Hole to consider.

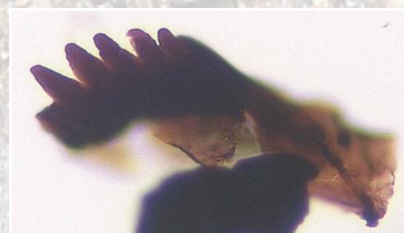
University of Southampton

John Marshall said that the log he's working on is still in progress. Carys has sent him lots of samples which have been productive, though not yielding many spores. There's a lot of charcoal in the samples, contradicting the idea that the atmosphere at this time was low in oxygen.

The lowest part of the section is a simple assemblage of small spores with rare, more complex ones. There are rare, more complex spores associated with the earliest tetrapods from the beds near the harbour entrance at Burnmouth. He sees evidence of a post-extinction recovery of microflora.

Further up the sequence, megaspores appear and the assemblage becomes richer in plant material, with evidence of larger trees.

He's found scolecodonts (teeth of marine worms) in various places, which is interesting as most of the sequence is non-marine, so this might indicate periodic marine incursions.



Scolecodont from Burnmouth. Copyright John Marshall. This specimen is rather small at about 90µm (ie 0.09mm) long.

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