TW:eed

Tetrapod World: early evolution & diversification

Newsletter No 5, September 2013

In early September we had a team meeting at BGS Keyworth, Nottinghamshire, where we brought everyone up to date with progress so far. We have two new team members: Andrea Snelling will be working with Melanie Leng at BGS Keyworth, doing carbon isotope analysis of sampled sediment and fossil material, and Emma Reeves will be working with John Marshall at the University of Southampton, using information from plant spores to help with the devolopment of a new, quantitative palynostratigraphy for the earliest Carboniferous.

Andrea Snelling

Emma Reeves

While doing fieldwork in June, we found a new Ballagan Formation site near Cumledge, just north of Duns. This has yielded lungfish and rhizodont material. There is more in the cliff, but it will be difficult to extract and it turns out the site is in an SSSI. Nick Fraser (NMS), Stig Walsh (NMS) and Rob Clack (Cambridge) will meet up with the landowners and Scottish Natural Heritage reps in mid-October to recce the site.

Dan Snyder, from Middle Georgia State College in the USA, came to Cambridge to look at the gyracanthid spines. He reckons there's at least one new taxon. A large pelvic spine from Burnmouth shows wear on the ventral edge, suggesting the spine dragged along the bottom, implying this species was bottom-dwelling.

This *Gyracanthus* spine from Burnmouth is 44cm long and clearly came from a very big fish!

The tetrapods continue to fascinate the Cambridge team, though progress is predictably slow with such fragmentary material. In addition to the tetrapods, there are now at least three new lungfish taxa from the Ballagan Formation, contradicting our previous understanding that early Carboniferous lungfish fauna was impoverished.

Dave Millward (BGS) told us the borehole core has been slabbed, ie sawn in half lengthways, and photographed. High resolution photographs will be made available online.

One half of the core will be studied, the other half stored for the future. The core was laid out ready for the meeting, so we were able to go and pore over it. The picture below shows a few members of the team and some of the core laid out.

Dave has also been looking at the stratigraphy of Coomsden Burn and it looks as though that is rather younger than previously thought, possibly later than the entire Burnmouth sequence. The exposure logged in the 1920s is now obscured by rock falls, making it hard to see why it was interpreted differently then.

Melanie Leng (BGS) reported that some progress has been made monitoring the organic carbon and this may imply a marine environment, at least for these samples. Andrea Snelling will take over organic carbon monitoring.

Tim Kearsey (BGS) reported that the dGPS mapping of Burnmouth is complete. He will be taking aerial photographs, including infra-red, from a model hexacopter, but sadly this has been delayed owing to crash damage.

A paleosol at Burnmouth. The beds are vertical, younging to the left. The reddish rock indicates an oxidising environment, ie a soil, while the green squiggle shows where a root penetrated, reducing the iron oxide in the soil as it rotted, leaving a greenish sediment. The Swiss army knife is for scale.

Tim has found 64 paleosols at Burnmouth, categorised into five types. They appear thicker at the top of the section and it looks as though the environment was wetter earlier in the sequence and drier, with more forest soils, later.

Carys Bennett (Leicester) has been continuing the work on sedimentology, cementstones and microfossils from Burnmouth. She has 150 thin sections to be processed. She has been working with Tim Kearsey on paleosols and cementstones, and has had some volunteers helping in Leicester. You can see more about that on the blog. She did more fieldwork at Burnmouth in July, but that will probably be the last she'll do for the near future. She plans to finish the Burnmouth data and then start logging the borehole core.

Carys was just back from the International Geological Correlation Project meeting in Calgary. She returned with an actinoperygian fish braincase from Blue Beach, Nova Scotia, which Ket Smithson (Cambridge) will be studying alongside the Scottish material.

Sarah Davies (Leicester) has been working on the sedimentology at Coldstream and Burnmouth. At the latter, there are complex fluvial systems with multiple channels stacked on top of each other. She will be doing more work on the paleoflow.

Stig Walsh and Nick Fraser (NMS) are hoping that a new method of diverting the River Whiteadder at Willie's Hole will enable us to proceed with the excavation there next summer.

This coffer dam was in Cambridge, but the design looks promising for Willie's Hole.

John Marshall (Southampton) spent some time on Spitzbergen with Sarah Finney (Cambridge) over the summer, checking the date of some possible tetrapod remains that have come from there. The strata seem to be Late Devonian, but the dating is uncertain at present. The East Greenland sequences tie in well with the Spitzbergen ones, and make the Bear Island sequence particularly significant because that includes the Devonian-Carboniferous boundary.

Mike Coates was over from Chicago for the annual Symposium of Vertebrate Palaeontology and Comparative Anatomy (SVPCA) in Edinburgh, so stayed on to attend this meeting. He and Lauren Sallan (University of Michigan) have just published a paper on Early Carboniferous deep-bodied fish. He is looking at the dentition of this group where it's found in the Borders Region, looking for patterns in the ornamentation which might help with identification.

Public Outreach

Jenny Clack (Cambridge) has spoken at the International Congress of Vertebrate Morphology in Barcelona, SVPCA in Edinburgh, German Zoological Society in Munich and Cambridge Zoology Department. She will talk at a conference in Zurich in December. She has also been filmed by Windfall Films for a programme entitled "Your Inner Fish", due to be transmitted on PBS in the USA early next year.

In March she will speak at the Oxford Colloquium along with five other distinguished speakers, including Professor Iain Stewart, and will also give the Bennett Lecture at the University of Leicester. This will tie in with National Science Week. There will be an outreach activity for 16-18 year olds before the lecture. The plan is a half-hour session for about 60 students, tied in with the A-level curriculum.

Tim Smithson (Cambridge) gave a talk to Cambridge Geology Club, spoke at the SVPCA about the lungfish we've been finding, and will attend Society of Vertebrate Paleontology conference in Los Angeles in October, stopping to look at Tournaisian material held at Harvard and Yale on his way over.

Sarah Davies and Dave Millward showed posters about the sedimentological findings and the borehole at SVPCA and these will also be displayed at the Edinburgh BGS Open Day on Saturday, 28th September. Dave will also give a talk about the project to the general public.

The Yorkshire Geological Society are keen to hear about the project and a public meeting is likely in the autumn of 2014.

The British Sedimentology Research Group will meet at BGS in December, 2014 and there is the potential for team members to give talks and present posters. We may have done enough research to have a TW:eed-themed session.

Stig Walsh reported that the SVPCA went well, that the Stan Wood symposium was well received and that people were impressed by the field trips to Siccar Point, Burnmouth and Willie's Hole. The NMS is starting to plan a Willie's Hole exhibition to take place towards the end of the project.

Per Ahlberg (Uppsala) gave an interesting talk at SVPCA about a partial tetrapod jaw from the Ballagan Formation at Tantallan Castle. It is different from anything else seen.

The English and Spanish websites have been completely rewritten by BGS and meta-data added to raise the sites' ranking. More needs to be done as they still only appear on the third page of a google search.

http://tetrapods.org
http://es.tetrapods.org

Roz Wade has created a Facebook page for the project at

https://www.facebook.com/TWeedProject.

We are linking this to the vertebrate palaeontology scientific community which should increase traffic.

Note that where text is enclosed in a grey box, this indicates a hyperlink which you can click when reading this online.