The SymBiont

News from the Department of Biodiversity & Systematic Biology (BioSyB) **Summer 2010**

Editorial

In this, the International Year of Biodiversity (IYB), we are restating our commitment to biodiversity research and education. We are running a series of events and activities that highlight the regional and international roles of our collections, the research that emanates from them, and the public outreach that confirms their relevance to current environmental agendas such as biodiversity loss and climate change.

Natural history collections are the core tool for taxonomic research and a valuable resource for information on species and their distributions (bioinformatics). In this year we will launch two open access websites: a catalogue of type, figured and cited specimens and a catalogue of the specimens of species listed in UK conservation action plans.

With our current complement of 21 (16 full time) taxonomists we supply taxonomic support in the form of identification services and tools along with a research programme. This resource is significant in UK terms and is stated in the current NERC/BBSRC review of the status of taxonomy in the UK. As the underpinning science for biology it is essential that taxonomic capacity is retained in the UK. In this issue we focus on one taxonomic project with a strong relevance to Wales and another with an international perspective. We have recently seen our expertise being called on to identify alien and invasive taxa, and the note here on the Tiger Mosquito emphasises the need to be able to recognise potentially hazardous species.

Recognition of the role of Amgueddfa Cymru - National Museum Wales in biodiversity is sporadic and we have therefore launched a series of stakeholder and public outreach events. Activities include guided tours of the collections, open days and appearances at partnership events such as the Royal Horticultural Society Show in Cardiff. We are chairing the IYB2010 Wales Communications Group, a group of like-minded partners involved in action for biodiversity across Wales. Our IYB web mini-site acts as a hub for activities at our own museums and also links to the sites of our IYB partners across Wales. 2010 is a significant year for this department, and we look forward to increased opportunities to share, with the public, the critical importance of taxonomic expertise and a care for global biodiversity.

DNA barcoding the Welsh flora – a first for Wales

DNA barcodes are specific regions of DNA that can be used for species identification. Animal barcodes have been in use for nearly ten years, but in plants identifying one region that is unique to each species has proved far more difficult. In 2009 a unified approach was agreed using sequences from two different DNA regions: the rbcL and matK genes. Plant barcoding has since become a fast-moving and exciting topic, with the Amgueddfa Cymru – National Museum Wales collections at the forefront of research.

Dr Tim Rich (Head of Vascular Plants) is collaborating with Professor Mike Wilkinson (Aberystwyth University) and Dr Natasha de Vere (National Botanic Garden of Wales) to undertake the first ever DNA barcoding of a country's flora. DNA samples have been taken from 3,743 museum specimens representing the 1,143 native and archaeophyte (anciently introduced) flowering plants in Wales.

The success of DNA barcoding rests on the correct identification of the source material. The Welsh National Herbarium specimens at Amgueddfa Cymru have been rigorously studied over many years by experts, and the identifications of all 3,743 specimens sampled have been double-checked by Dr Rich, providing a perfect reference collection for the barcode project.

The potential applications for DNA barcoding are huge. The project team has applied it in pollination studies to see which flowers bees visit, and it has applications in forensics, endangered species trade and the identification of homeopathic medicines. Ultimately, the quality of the museum collections and the expertise of its staff over the years underpin this exciting new project.

Nature in our own backyard – Biodiversity Duty across Amgueddfa Cymru museums

The Natural Environment and Rural Communities (NERC) Act came into force in 2006. Part of the Act requires all public bodies to have regard to biodiversity conservation when carrying out their functions. This is commonly referred to as 'biodiversity duty'. As part of the museum's response to this legislation, biodiversity surveys have been carried out at all of our museum sites.

A range of surveys were conducted, covering Arachnida (spiders and harvestmen), Lower plants (mosses, lichen, and liverworts), Coleoptera (beetles), Mollusca (slugs and snails) and Vascular plants (ferns, conifers and flowering plants). The surveys produced some interesting finds:

- At Big Pit: National Coal Museum, 3 spider species were found that have 'vulnerable' conservation status.
- St Fagans: National History Museum yielded important finds of saproxylic beetles (species associated with dead or dying wood). A total of 71 species were found at the site, 17 of which are nationally notable or rare, making St Fagans the fourth best site in Wales for these beetles. The site is also a haven for *Groenlandia densa*, a declining aquatic plant that has one of its few remaining Welsh sites in the ornamental ponds.
- At the National Slate Museum, a species of lichen has proved particularly interesting. DNA analysis is now being carried out to investigate whether this is potentially a new species.
- At National Museum Cardiff, a record of a minute species of snail, *Paralaoma servilis*, proved to be the first for Wales.

George Hutchinson Retires

George began working for the Museum in 1985. A post-doctoral fellowship at the University of Oxford gave him the opportunity to study plants at a molecular level. This, combined with a keen interest in natural history, made George an incredible asset to the Department over the years. His job in the Vascular Plant Section involved plant identification, liaison with BSBI Vice-county Recorders and care of the collections.

He also developed expertise in difficult genera such as *Salix*, *Populus* and *Cotoneaster*. He has produced the Botanical Society of the British Isles Welsh Bulletin for many years, and in his own time has compiled the BSBI News Indices. George has also been a key figure in the production of some of the Department's major publications such as Flora of Glamorgan and Welsh Ferns, and is currently working on the Flora of Carmarthenshire.

A poster in Hong Kong warns people to be aware of the danger of Tiger mosquitoes. Photo ©Harold Deeming.

Asian Tiger Mosquito

On a visit to Malta John Deeming (Research Fellow) was bitten by a mosquito he subsequently identified as the Asian Tiger Mosquito[1]. This was the first record on the island for this notorious vector of Dengue Fever, Chikungunya virus, Yellow Fever, Japanese encephalitis and West Nile Fever.

The species has been extending its range westward in recent years and is responsible for a severe outbreak of Chikungunya virus in Italy. It would appear from discussions with medical experts that Chikungunya virus has similar symptoms and is as bad as Dengue Fever but with longer lasting effects. Dr Deeming fortunately suffered no ill effects. Specimens have been deposited in the Museum's collections.

1) Gatt, P., Deeming, J.C. & Schaffner, F. (2009) First record of *Aedes (Stegomyia) albopictus* (Skuse) (Diptera: Culicidae) in Malta. European Mosquito Bulletin 27:56-65.

TIGER Project

Entomologist Dr Adrian Plant has recently spent time in Thailand as part of the team in an international project measuring invertebrate diversity. The TIGER Project (Thailand Inventory Group for Entomological Research)[1] involves a world-wide network of specialists addressing important faunistic, taxonomic, ecological and biogeographical questions.

Southeast Asia is one of the most diverse and important regions for the world's biodiversity and Thailand falls within two of the world's top eight 'biodiversity mega-hotspots'. Like the UK, Thailand is part of the Convention on Biological Diversity (CBD), a treaty committed to the global conservation of biodiversity and sustainable management of resources. The core knowledge obtained through the TIGER project will help Thailand develop a scientific base from which to launch conservation management plans for the future and formulate better responses to the CBD.

Dr Plant is working in collaboration with museum and university scientists in Asia, North America and Europe, focusing on a large and ecologically important group of flies (Diptera) – the Empidoidea. Dr Plant has particular expertise in a group of small predatory flies known as Hemerodromiinae. Unsurprisingly in this region of vast biodiversity, the fauna is largely unknown and undescribed. New species and genera of Empidoidea are being described giving a better understanding of their diversity in this complex tropical ecosystem. The taxonomic discoveries being made are also shedding light on wider issues of dipteran origins and diversification, from which the collaborators intend to construct the first comprehensive appraisal of a dipteran group from a tropical country.

1) Supported by Thailand National Parks Department, Queen Sirikit Botanical Garden (Natural Science Museum) Thailand, funded primarily through US NSF grant no DEB-0542846 to Prof. Mike Sharkey, University of Kentucky.

Specialists setting traps in Thailand to collect material for the TIGER project. Photograph © Adrian Plant.

Leafhopper vectors of plant disease

One of the major challenges mankind will face in the next decades will be how to produce enough food to sustain a rapidly growing world population. This challenge is made more difficult in the face of climate change and its potential effects on many ecosystems, and substantial losses due to pests and diseases before harvest. Only a very small proportion of insects (luckily for us) have become pests – perhaps 1% or less in some groups. Being able to identify these pests and make this information easily available is arguably one of the most important tasks we can undertake as entomologists.

Leafhoppers and planthoppers (Hemiptera: Auchenorrhyncha) are perhaps among the most abundant groups of insects. Around 20,000 leafhopper species have been described but estimates suggest 100,000 species may exist. They all feed from plant tissue using piercing and sucking mouthparts, and around 200 leafhopper and planthopper species are already known to spread plant disease. Many more are likely to be recognised. Some of the crops most affected by these diseases are crucial for subsistence farmers in the developing world, including coconut, rice, maize, potato and sugarcane.

An Amgueddfa Cymru project, funded by The Leverhulme Trust, will provide both a printed identification handbook to leafhopper vectors of plant disease and web-accessible information. This will enable plant pathologists and entomologists to make identifications and find comprehensive information on the plant diseases and their vectors. Each datasheet will include high quality digital images of adult insects (and nymphs where available), taxonomic drawings of morphological features and text on the biology and pest status of each species.

International Geosciences Programme (IGCP)

The South Wales Coalfield preserves one of the most complete records of tropical wetlands of late Carboniferous age (some 300 million years ago). Not surprisingly, therefore, Amgueddfa Cymru has been at the centre of international studies on the ecology and biotas of these ancient swamps. A recently completed five-year study led by Dr Chris Cleal (Head of Vegetation History), involving 30 palaeontologists and geologists from 9 countries, has been investigating the wetlands of western and central Europe.

The project, organized as part of the UNESCO-funded International Geosciences Programme, has shown that the size of these wetlands was strongly controlled by earth movements resulting from the collision of two major continental plates. There also seems to have been a link between when the swamps contracted in size and a significant increase in global temperatures. It has now been announced that Chris Cleal is to lead a second IGCP project to extend the work into south eastern Europe and Turkey.

News in brief

• On 13 March and 22 May the BioSyB Department ran two open days aimed at communicating the work of the Department to the public. The open days included a number of behind-the-scenes tours offering an opportunity for visitors to see collection and research areas. The next open days will be on Tuesday 10 August and Wednesday 27 October, and form part of a programme of events for International Year of Biodiversity 2010.

• While running a course in Fiji as part of the Darwin Initiative, Chris Hodgson (Research Fellow in the Entomology Section) discovered four species of scale insect thought to be new to science, which are now being investigated. Three of these were collected from the same fern growing on a tree in the Botanical Gardens in Suva, and one species belongs to a genus only previously known from New Zealand.

• In October 2009 a new temporary exhibition was installed at National Museum Cardiff to mark the 200th anniversary of the birth of John Gwyn Jeffreys (1809-1885), one of Britain's most eminent 19th-century conchologists. The exhibition ran from 19 October 2009 to 16 February 2010. Staff from the Mollusca Section, along with colleagues from the New Media and Photography departments, are now developing ideas for a web version of the exhibition to go online.

• John Read le Brockton Tomlin was one of the most highly respected shell collectors of his time. Amgueddfa Cymru holds both his extensive shell collection and his archive of correspondence. More information about the archive is now available on Rhagor in the form of a gallery of images that showcases the content of the collection.

• Rhagor is the website for our national collections and the stories behind them. A rich selection of articles, image galleries, videos, interactives and more bring the collections alive.

English: www.museumwales.ac.uk/en/rhagor/ Welsh: www.amgueddfacymru.ac.uk/cy/rhagor/

Dr Bernard Verdcourt's Malacological Library

We are delighted to have been donated much of the malacological library and archive of Dr Bernard Verdcourt, formerly of RBG Kew. A world authority on East African molluscs as well as botany, Verdcourt described over 100 taxa from the region in more than 200 malacological papers, spanning almost 60 years.

Many of the papers are hard to obtain. This makes our complete, bound set a unique bioinformatic resource, invaluable to our taxonomic research on the fauna.

www.museumwales.ac.uk/en/1579/

Phyllis Knight-Jones Collection

After 6 months of curation and conservation by Holly Morgenroth, work on the Knight-Jones collection of Polychaeta (marine bristleworms, donated January 2009; see Winter 2009 newsletter) is nearly complete. Three polychaete families, the Sabellidae, Serpulidae and Spirorbidae, form the majority of the collection. In total, 4,630 new records have been added to the collections' database, including type material for 23 different species. Over 60 countries are represented and many specimens have been used in papers published in international journals. Original drawings from those papers also form part of the collection. All material is now fully accessible to interested parties.

Recent Publications

Whitebeams, Rowans and Service Trees of Britain and Ireland

Sorbus is a genus of trees in the Rose family, related to apples and pears, which includes Whitebeams and Rowans. The British Isles are one of three centres of *Sorbus* diversity in Europe.

This monograph has been produced by Amgueddfa Cymru – National Museum Wales in collaboration with Kew Gardens and the Universities of Bristol, Exeter and Oxford. Field work, DNA analysis and research into the evolution and reproductive biology of *Sorbus* have resulted in the description of 22 new species. In total there are 44 species and 8 hybrids, of which 43 are native to the British Isles and 7 are endemic to Wales.

The taxonomy, history, distribution, biology and ecology of each *Sorbus* is described, with an assessment of its conservation status. There are keys and notes to help with identification and 476 colour photographs, line drawings and distribution maps packed into the 223 pages.

Rich, T.C.G., Houston, L., Robertson, A. & Proctor, M.C.F. (2010). Whitebeams, Rowans and Service Trees of Britain and Ireland. Botanical Society of the British Isles, London.