

## Notes from Local Interest Group 26<sup>th</sup> January 2017

**Apologies** were received from Dainis Ozols and Edwina Griffiths

**Present:** Maureen Lloyd, Hannah, Andy and Edward Shaw, Mike and Val Head, Jeremy and Chris Rose, Will Watson, Wendy Ozols, Gareth Jenkins, Jude Hurn, Steph Coates, Ben Mullen, Val Bradley, John and Margaret Price, Peter and Pauline Spode, Barbara Lloyd, Avryl and Roy Lloyd, Richard Martin, Lisa Lloyd, Richard Thomas, Jenny Francis, Giles Kingsolver, Stephen and Judith Mullard, Sue levers, Ben Rees, Lauren Roberts, Sue Farmer, Evelyn Bally, Richard Harris, Jessica Stokes and Matt Rose.

The speaker for the evening had been arranged by Hannah Shaw of the Freshwater Habitats Trust. Hannah welcomed us all, especially those who had come from afar, and then introduced our speaker, Sinclair Stammers. Sinclair is a renowned cameraman and has worked with David Attenborough, amongst others. The title of his illustrated talk was "**Microscopic Worlds**" and highlighted the presence of myriad unseen microscopic pondlife which form the base of the food chain in a pond.

Sinclair began by telling us that he lives in West Wales alongside the River Teifi, which is a great source of material for him, as is the pond in his garden. He went on to say that "you never know what you may find", even in the tiniest of pools; you do not even need to look in a pond – any container which collects water can yield some amazing life forms, eg a cattle trough, an old kitchen sink or bath, etc.

Basically, his talk took us from microscopic pondlife to fish (trout) size, all the way up the food chain, as well as from the beginning of life forms on Earth.

He started by talking about bacteria, which were amongst the very first life forms to evolve on Earth. There are, apparently, approximately  $5 \times 10^{30}$  bacteria on Earth, ie more than all of the plants and animals put together. This is a staggering and unimaginable number. They come in all sorts of shapes and sizes, but most are extremely small and can only be seen through a microscope. Sinclair uses very powerful microscopes to enable him to take his amazing photographs and video clips.

A good example of a type of bacterium is blue-green algae (Cyanobacteria or Cyanophyta). Some of them are amongst the oldest life forms on Earth and fossilised remains of these bacteria have been found that date from 3.5 billion years ago. Some are visible with the naked eye, eg. *Nostoc*, and Sinclair showed us a photo of one of this type from the limestone of The Burren in West Ireland. Blue-green algae are single-celled nitrogen fixers – they take nitrogen from the air and convert it into ammonia which can be absorbed and used by plants. We were shown many photos and time-lapse sequences of different types of blue-green algae, and it was fascinating to be able to see the internal structure of these micro-organisms. One, called a Desmid, was a very elegant crescent shape.

Sinclair went on to talk about green algae and showed us pictures of *Gonium* and *Dinobryon*, both of which are found in pondwater in early Spring. *Dinobryon* was a particularly pretty looking candelabra shape and *Gonium* usually forms in small colonies of 4 to 16 cells.

From here, Sinclair went on to talk about Diatoms, another group of algae, which are extremely important to mankind because it is from them that we get oil. The diatoms produce droplets of oil which collect over time when the diatom dies and sinks to the sea bed. After millions of years of compression under overlying sediments, and "cooking" from the hot rock beneath the crust, these collect into oil reserves.

The next photos we were shown were of *Euglena*; again, this is single-celled and is somewhere between an alga and an animal. It has chloroplasts, which allow it to feed like a plant (photosynthesis), but they can also take nourishment heterotrophically, like animals.

The next example we were shown was *Volvox*, which forms large colonies of globe-like individuals of up to 50 000 cells. This is yet another green alga which lives in freshwater habitats, such as ponds, ditches and even shallow puddles.

Sinclair then showed us some video of a Testate amoeba and reminded us that we would all have learned about this single cell organism in school. This is a predatory organism which eats by enveloping its prey and then digesting it within its structure. On the footage that Sinclair showed us, we could see the pseudopodia (false feet) which it extends and contracts thus constantly changing its shape. Amoebae use the pseudopodia to move and to feed.

The next photos were of *Ciliophora*. These organisms are covered in cilia (hair-like structures) which move in a rhythmic way thus enabling movement. One of the photos that Sinclair showed us was of a ciliate colony that he had found growing on the back of a water beetle.

All of the above examples are single cell organisms. Sinclair next introduced us to some multicellular organisms, which were still extremely small, such as the Gastrotrich, *Chaetonotus*. This is a worm-like animal which is abundant in both freshwater and marine environments. They are sometimes called "Hairybacks", and this describes them perfectly. In the photo, we could see the internal structure of this organism extremely clearly.

Sinclair told us that his favourite place for gathering water samples, and therefore micro-organisms, is Dolbryn Ponds, very close to his home. He uses plankton trawl nets to gather samples. These are pulled through the water, collecting the plankton as they go. He captures a large variety of things, including Rotifer, also known as "Wheel animals". He often finds two types – *Keratella* and *Filinia passa*.

The next organism on the list was the Nematode or roundworm. These are found everywhere. Many are parasitic, but there are also free-living forms. We were shown some very clear footage of these; they looked just like worms as they moved.

We then moved on to Tardigrades, sometimes referred to as Water Bears or Moss Piglets. These are extremely tough micro-animals and they have been sent into outer space; they were able to come back to life when they returned to Earth. They can withstand very large extremes of pressure, cold and of dryness and are found everywhere on Earth, from mountain tops to the deep sea, and from tropical rainforest to the Antarctic. They can go without food for 30 years and tolerate a temperature range from -272°C to +150°C. These were particularly active on the footage we were shown.

Sinclair showed us some photos of Fairy Shrimp next. Hannah Shaw reminded us that these have been found in pools up on Ireland Moor and they are certainly visible to the naked eye. They are very ancient organisms and fossil remains have been found in rocks dating from the Upper Cambrian (497 to 485 million years ago). In size, they range from 6mm to 25mm. They like temporary pools because there is no competition. Looking just like little shrimps, they are unusual in that they swim upside down, ie on their backs.

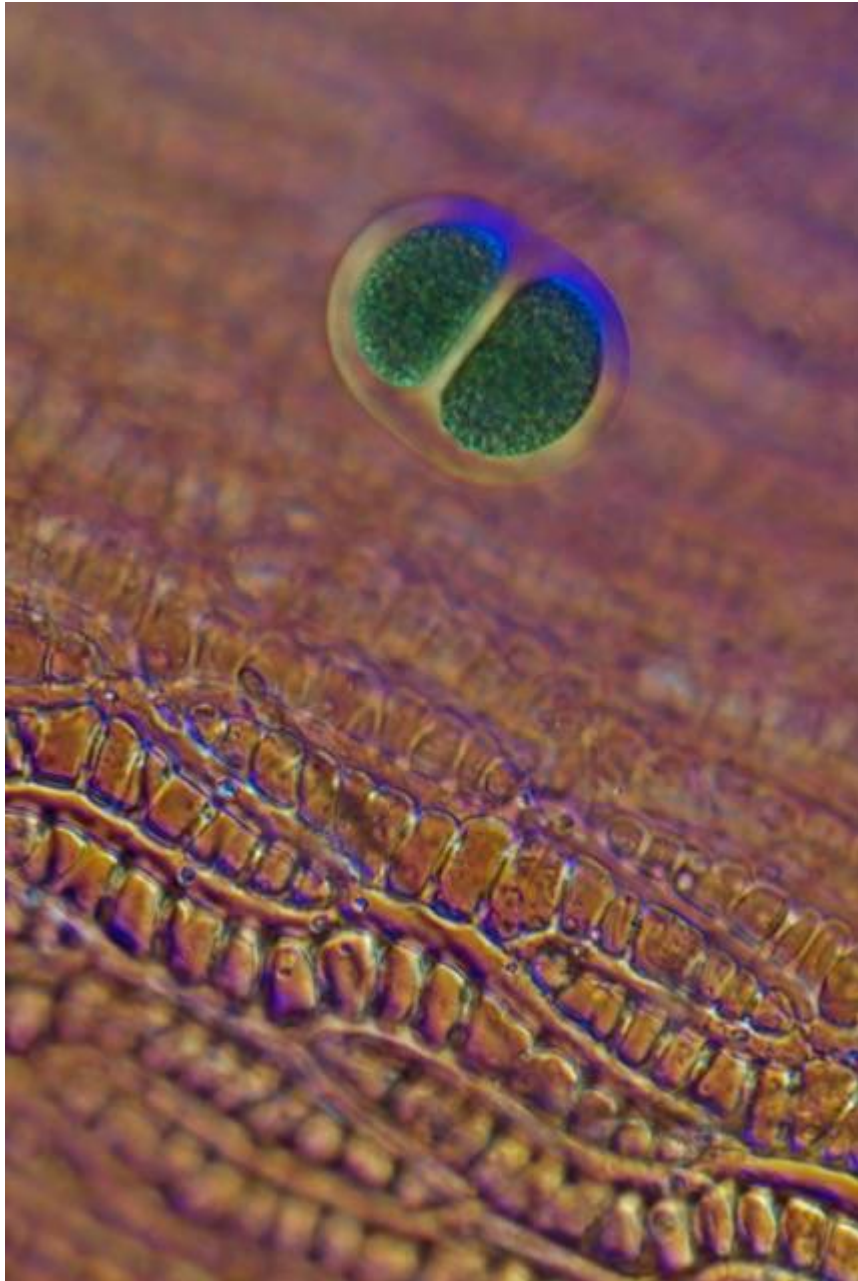
The next group of creatures that Sinclair talked to us about were the Ostracods. This is a very ancient class of crustacea and about 70 000 species are known of, of which about 13 000 are found on Earth today. Their fossils are extremely useful when dating rocks and they are the most common

arthropods found in the fossil records. They have a calcareous, bivalve shell which was very evident in the photos we were shown. They are typically about 1mm in size, but can range between 0.2mm to 30mm.

Sinclair briefly showed us some footage of *Daphnia*, or water fleas, before going on to talk about fish. He showed us some footage of fish fry – both minnow and roach – before talking to us about migratory eels in the River Teifi. The eels travel 3000 miles, from the Sargasso Sea in the Atlantic Ocean, and come up the river, where they can be seen wriggling over the rocks on the river bed. Sadly, these are a far less common sight now; Hannah informed us that their population has suffered a 95% crash in the last 25 years and eels are now a critically endangered species. To end with, we were shown some amazing film footage, in slow motion, of young trout jumping out of the water to catch mayfly, also filmed on the River Teifi close to Sinclair's home. The air was absolutely thick with insects and the trout were having a field day.

This was a most interesting and illuminating talk and, whilst many of us did not know all of the science involved, we could all thoroughly appreciate the amazing quality of the pictures and the clarity of Sinclair's commentary. Sinclair's talk reminded us all that it is the small things that run the planet. We are most grateful to him for giving so generously of his time to come to talk to us. Many thanks must also go to Hannah Shaw who organised the event. It was lovely to welcome so many guests and we had an excellent evening, which was rounded off with refreshments kindly made for us by Avryl Lloyd.

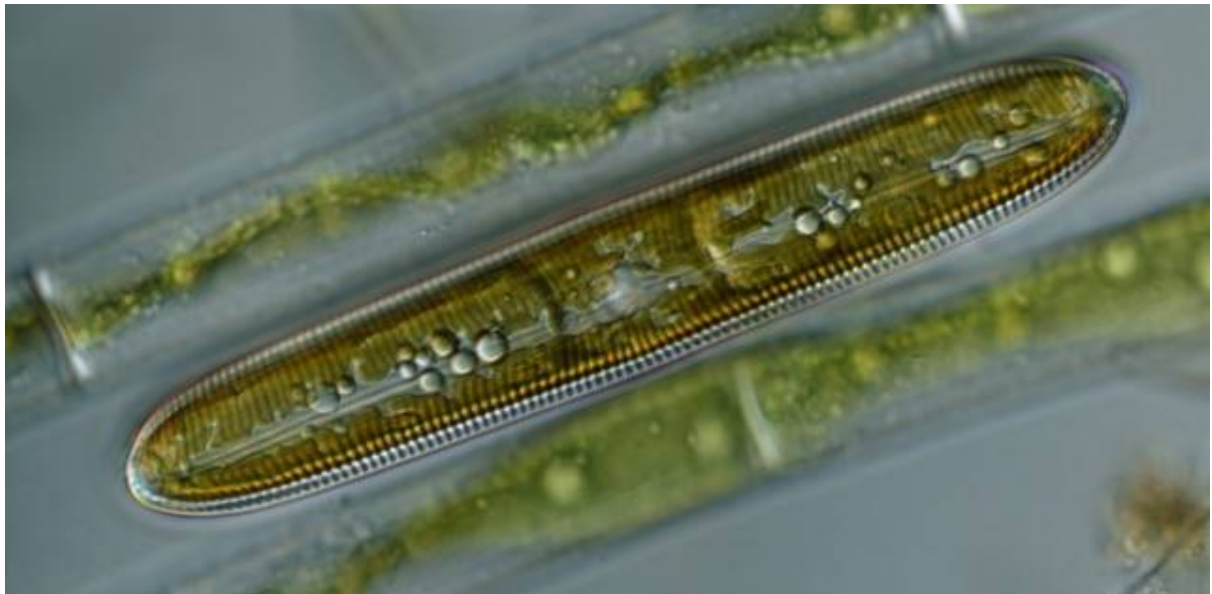
Photographs below taken by Sinclair Stammers.



1) Desmid with sphagnum moss from Tregaron bog



2) *Paramecium bursaria* with endosymbiotic zoochlorellae.



3) Diatom showing chloroplasts and oil droplets.