CARDIFF NATURALISTS' SOCIETY

Founded 1867

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January 2020

Charity No. 1092496

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Cover: Snow bunting, The Knap, Barry. Photo by Mary Salter.

Meetings 2020

All indoor meetings start at 7.30 p.m. in Room 0.23 (ground floor) of the School of Management, Cardiff Metropolitan University, Llandaff Campus, Western Avenue, Cardiff CF5 2YB (see page 6) - unless otherwise indicated (*).

Wednesday 15 January 2020

Members' Evening
CNS members' short illustrated talks. Contact Hilary Wicks (indoor@cardiffnaturalists.org.uk) if you wish to make a presentation.

Sunday 19 January 2020

New Year's Birdwatch

Cosmeston Lakes Country Park, Penarth, Vale of Glamorgan CF64 5UY. ST17846918.

Meet at the Visitor Centre in the car park at 10am. Cosmeston's two lakes attract plenty of waterbirds, and the surrounding bushes, reedbeds and meadows support a variety of other birds. Afterwards we may go on to a different site depending on the weather and other birding opportunities, such as last January's Black-necked Grebe in Cardiff Bay. Mostly we will be on firm level paths. There is a café (with toilets), or bring a packed lunch.

This is a joint meeting with the Cardiff Group of the Wildlife Trust of South and West Wales, led by Linda and Rob Nottage.

Wednesday 29 January

Welsh Mineral Classics

Tom Cotterell
Wales has a rich geological diversity which has helped to shape the landscape. Associated with the geology are minerals, or crystals, some of which were first discovered in Wales. Others are aesthetic, or show unusual features. This talk by Tom Cotterell, who is Senior Curator of Mineralogy at National Museum Wales, will introduce some of the iconic minerals of Wales, and explain why they are so significant.

Tuesday 18 February

Harold Augustus Hyde (1892-1973): a pioneering palynologist

Dr Heather Pardoe
Harold Augustus Hyde was appointed Keeper of Botany at the National Museum of Wales in 1922, a post he held until his retirement in 1962. He published extensively on the Welsh flora, but his most important work was considered to be on aero-palynology (the study of airborne pollen and spores). Hyde became the 63rd President of the Cardiff Naturalists' Society in 1935. This talk examines the highlights of Hyde's career and considers how his life was shaped by his fascination for botany, his military service, and the influence of his museum colleagues and international contacts.

Thursday 27 February (*)

Cardigan Bay Marine Wildlife Centre

Laura Evans
Laura Evans is the Living Seas Wales Project Officer, based at Cardigan Bay Marine Wildlife Centre, a part of the Wildlife Trust of South and West Wales. The Wildlife Centre, in New Quay, aims to help conserve Cardigan Bay's marine wildlife through education, interpretation and research activities.

This is a joint meeting with the Cardiff Group of the Wildlife Trust South and West Wales, in the Wallace Lecture Theatre, Cardiff University, Park Place, Cardiff CF10 3AT.

Monday 9 March

Student Bursary evening:

i) Biosciences Award winner
Award of Student Bursary, in memory of Prof Ursula Henriques and Dr Mary Gillham, to a Cardiff University School of Biosciences student for their outstanding fieldwork. The student will give a presentation on their work.

ii) Dan Rouse
A tale of bird conservation in Wales, taking you from the green woodlands of mid-Wales that host outstanding birds, such as pied flycatcher and common redstart, to the rocky coasts, home to red-billed chough and Manx shearwater.

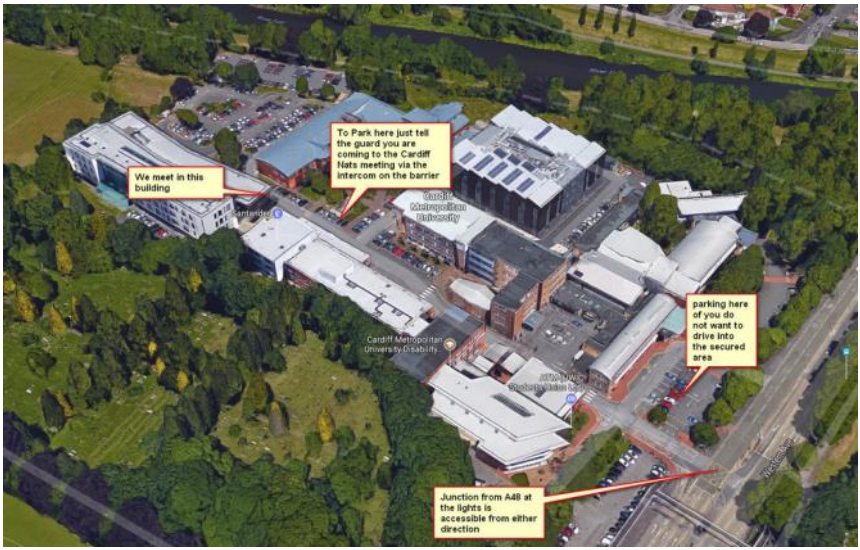
Wednesday 18 March 2020

Crayfish

Oliver Brown
The population of white-clawed crayfish, the only native UK crayfish species, has been in decline over decent decades in Wales. However, as a result of a breeding and release programme, in 2018 the first captive-bred individuals reproduced in the wild. Dr Oliver Brown, Fish Culture Officer at Natural Resources Wales, will talk about the importance of crayfish to river ecosystems and give us the latest on this Welsh conservation success story.

Please look online for all the latest information and additions to the CNS Meetings Programme: http://cardiffnaturalists.blogspot.co.uk/p/programme.html

An aerial view of our usual indoor meeting location at Cardiff Metropolitan University, Llandaff Campus.



New President of Cardiff Naturalists' Society

Professor Anthony K. Campbell became the 120th President of the Cardiff Naturalists' Society at our AGM on Monday 23 September 2019. In the following pages, he introduces himself, describes his work on bioluminescence, and how studies on the mechanism behind bioluminescence led to clinical applications and the foundation of the Darwin Centre in Pembrokeshire.

Photo by Stephen Nottingham.

From the new President
A life that sparkles

It was a great honour to be elected President of the Cardiff Naturalists' Society in September. I have loved natural history all my life. In fact, my first prize at school when I was 8 years old was for my Anglesey shell collection. I was born in Bangor, but grew up in South London. I read Natural Sciences at Pembroke College, Cambridge, obtaining a first class degree, and then a PhD in Biochemistry. I moved to Cardiff as Lecturer in Medical Biochemistry at the then Welsh National School of Medicine in 1970, and then Professor in Medical Biochemistry, followed by Professor in the School of Pharmacy and Pharmaceutical Sciences at Cardiff University.

I am a keen bird watcher, but my real passion is for marine invertebrates, particularly those that glow or flash in the dark. Bioluminescence has been a dominant feature of my research at the Medical School, now the School of Pharmacy and Pharmaceutical Sciences, at Cardiff University.

I was lucky enough to go on three research cruises on RRS Discovery to collect deep sea bioluminescent organisms, including fish, medusae, fire bodies, decapod and euphausid shrimp, copepods and ostracods. It was inspiring to turn the lights off on the ship when the net came up, to see this dripping with blue light. As a result, I discovered the most common chemistry in the sea responsible for bioluminescence, which is the major communication process in what is the biggest ecosystem on our planet. More than half of our planet's surface is covered by sea more than one thousand metres deep. Here, in this dark environment, most organisms produce their own light. The key chemistry is a compound known as coelenterazine[1]. When this reacts with oxygen, catalysed by an enzyme, it produces light. I found that this is the cause of bioluminescence in some eight phyla, including organisms such as radiolaria, jelly fish, sea pens, comb jellies, decapod shrimp, copepods and ostracods, and many fish.

In fact, surprisingly, the name coelenterazine turned out to be a misnomer. It was called this because it was first discovered in a bioluminescent jellyfish – a coelenterate. But, these jellyfish do not make it. I discovered that two organisms do – decapod shrimp and copepods. So, the jellyfish have to eat these if they are to produce any light.

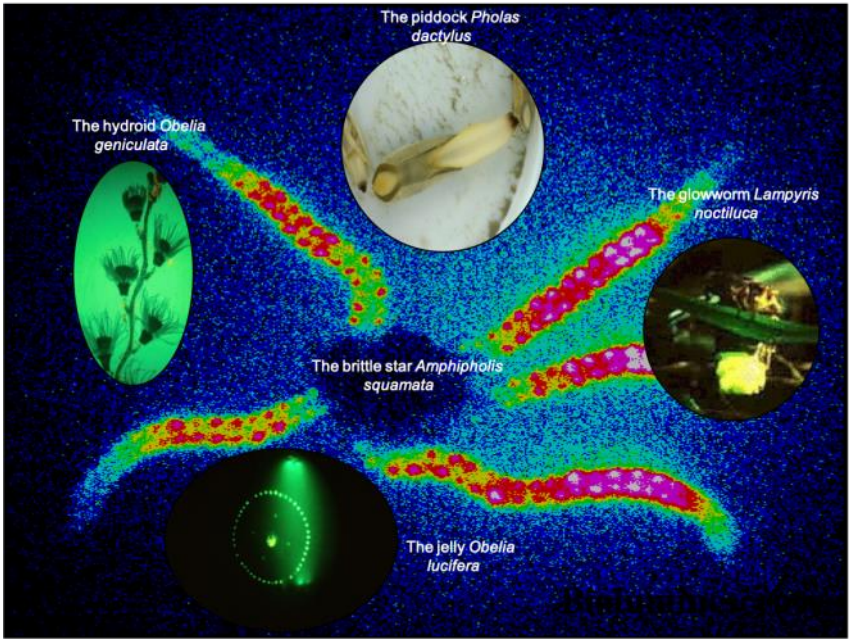
But what was the evolutionary origin of all this? There is a fossil myctophid fish I found in the Natural History Museum in which you can clearly see the light emitting photophores on its under surface. I found the present day mycophids use coelenterazine. But also, I found that many non-luminous species also have a lot of coelenterazine. A real puzzle. Until I realised that fish do not eat apples! So coelenterazine turns out to be their vitamin C, protecting them against toxic oxygen species.

The first entry in Darwin's Beagle Zoology notebook is recorded on the 16th January 1836. He had spent most of the time across the Bay of Biscay being sea sick. When they got to Tenerife the Beagle was quarantined, and not allowed in because of a cholera outbreak in England. At this point Darwin went up on deck, at night. So I was excited to discover Darwin's first two entries in his handwritten notebook on 6th January, where he describes brilliant bioluminescence surrounding the ship - almost certainly dinoflagellates. He collected some and did experiments with them. These amazing unicellular organisms have a circadian rhythm. During the day they do not produce any light. But once it gets dark they flash brilliantly when shaken.

So, what is the function of all this light? Darwin and Wallace taught us that this is the wrong question. We should really ask what is the selective advantage of bioluminescence? I found out that this follows the 'three S rule' – Sex, Safety and Sustenance. The female glowworm uses the light from its two green bars and two dots to attract the flying male. But the angler fish uses its luminous lure, containing a culture of luminous bacteria, to attract food, as it hangs it in front of its mouth.

In contrast, other marine species of fish use bioluminescence to hide their dark silhouette, and invertebrates can quirt a luminous cloud to blind or scare potential predators. Amazingly a good friend of ours from Discovery days, Edie Widder from Virginia, who dives in deep-sea submersibles, discovered why some jellyfish flash when touched. It is a burglar alarm. When fish try to eat it, the flash attracts giant squid that eat predators of jellyfish.

Four bioluminescent organisms have played a major role in my research (illustrated below): the hydroid and jellyfish *Obelia*, the glowworm *Lampyris noctiluca*, the piddock *Pholas dactylus*, and the brittle star *Amphipholis squamata*. My work on *Obelia* started at the Marine Biological Association at Plymouth. If I asked you what you know about calcium, then you would probably answer – bones, teeth and shells. Quite so. But there is another crucial role for calcium in the whole of life – intracellular calcium[2]. That is calcium inside cells, where it acts as a chemical switch to make a cell do something – a nerve to fire, a muscle to contract, a heart to beat, a pancreatic cell to secrete digestive enzymes into the gut, a fertilised egg to divide, and even a cell to be told to kill itself.



Without a wave of intracellular calcium you would never have been conceived, born, or able to digest your food, run, or even survive. Intracellular calcium even plays a crucial role in all plants, and in many bacteria. But how to prove this. I, and a few others, said that the key experiment was to measure and image a change in free calcium in these.

Not so easy. The concentration of free calcium inside cells is 10,000 times lower than outside in the blood, sub-micromolar instead of millimolar. My hydroid and jellyfish came to the rescue. It turned out that the trigger for the bioluminescence in these species was calcium. When calcium binds to the protein in the jelly fish cells it flashes.

So, easy peasy, just extract the protein and get it into live cells. Well, it wasn't that easy. But we did it, and published the results in the world's most prodigious scientific journal Nature[3]. I then used genetic engineering to get the jellyfish DNA into live cells, which then glowed. I found, as a result, that this calcium switch was the trigger in the cells that infiltrates the joint of someone with rheumatoid arthritis, causing them to release damaging enzymes, that cause the pain and degradation on this crippling condition. We also showed it was the trigger that can cause demyelination in the brain of people with multiple sclerosis. The technology is also now used routinely in drug discovery. All quite a surprise to my colleagues, some who couldn't quite fathom why I had been brought from Cambridge to carry out medical research, but spent much of my time on the beach looking for things that glowed or flashed in the dark! They were in for another surprise.

My boss had pioneered the use of antibodies to measure things in blood – hormones like insulin and vitamin D, vitamins, bacterial and viral proteins, drugs, cancer proteins, and diabetes indicators like haemoglobin H1C. But the antibodies had to be tagged with radioactive iodine to detect them. Very nasty stuff! So, I said why not use chemiluminescence? And they said how do you spell chemiluminescence?

Anyway, with colleagues, I found a way of tagging antibodies with a chemical that had been originally developed as a model for the bioluminescent jellyfish reaction. Eureka! It worked. This technology is now used in several hundred million clinical tests per year worldwide. We patented the technology, which is also used in virus detection and DNA/RNA measurements. The patents turned out to be some of the most successful ever from the university sector in Wales and the UK. The technology was awarded the Queen's Anniversary Prize in 1998, and received several other awards. In 2015, the UK celebrated 400 years of patents, and my key patent was selected as one of sixty featured.

I have been fascinated by evolution since I was a teenager, growing up not far from Darwins's house at Downe. The famous astrophysicist Fred Hoyle argued that natural selection as the cause of new proteins was impossible mathematically. Yet I have been able to use bioluminescence to show why Hoyle was wrong, solving one of the greatest problems on evolution for a biochemist like me – the origin of a new protein. By the way, my work with my wife Stephanie also solved Darwin's 50 year illness. He had lactose and food intolerance[4].

Incredibly, curiosity about bioluminescence and what many thought was some obscure phenomenon has revolutionised biomedical research and clinical diagnostics, creating three individual billion dollar markets.

I believe passionately in communicating science to the public, and in exciting pupils and students about natural history and cutting edge science. And bioluminescence has the wow factor. It was a key phenomenon that led Stephanie and I to set up the Darwin Centre. We moved this to Pembrokeshire using my patent income to set up a science centre – The Welston Court Science Centre. I also founded the Public Understanding of Science (PUSH) group at Cardiff University in 1994, which organises many events with schools and the public. I give regular talks on food intolerance, Darwin, and bioluminescence, at scientific meetings, to schools and the public.

In 2013, I was elected a Fellow of the Learned Society of Wales, and to the Council of the Linnean Society. My publications include 10 books, and over 250 internationally peer-reviewed papers on intracellular calcium, bioluminescence, lactose and food intolerance.

In 2016, with Stephanie, we set up The Young Darwinian, an international journal for school students to publish their projects and scientific experiences (www.theyoungdarwinian.com). Their current flagship project is focused on the occurrence of microplastics and their damaging effect on living systems. I am very keen to help Cardiff Nats continue to evolve, and get involved with young people.

The key message is Nature always knows best. As the founder of British biochemistry Frederick Gowland Hopkins once wrote:
'All true biologists deserve the coveted name of naturalist. The touchstone of the naturalist is their abiding interest in Nature in all its aspects.'
Curiosity inspires, discovery reveals.

Tony Campbell
President
22/11/2019

Bibliography

1. Campbell,AK and Herring,PJ. (1990). Imidazolopyrazine bioluminescence in copepods and other marine animals. Marine Biology 104:219-225.

2. Campbell AK (2017). Fundamentals of intracellular calcium, pp 428. Wiley, Chichester. ISBN 9781118941874.

3. Hallett,MB and Campbell,AK. (1982). Measurement of changes in cytoplasmic free Ca in fused cell hybrids. Nature 295: 155-158.

4. Campbell, AK and Matthews, SB (2015). Darwin diagnosed? Biol J Linn Soc 116 (4): 964-984.

Colonel H. Morrey Salmon Project update

Andy Kendall

As many of you are aware, we have been in long discussion arranging to get the Morrey Salmon picture archive passed to the museum, scanned and made available to people via the internet. It will ensure that he gets the recognition that he is due as a pioneer in nature (especially bird) photography.
This is being done as part of an overall project where we pass the ownership to the National Museum of Wales. The Salmon family have kindly provided the funds to employ someone within the museum to do the professional conservation and scanning work.

We are pleased to announce that we are now in a position to ask for people who would like to help with this project to make themselves known to Andy Kendall or Mike Dean at: *info@cardiffnaturalists.org.uk* or *secretary@ cardiffnaturalists.org.uk*, respectively.

What we need volunteers to do, is to help the museum with cleaning the slides before they are scanned, understanding the pictures, making sure that the birds and other wildlife are properly identified, and also to take on other such activities that we think will enhance the value of the collection. Cleaning will be using soft brushes and clean water, and putting the pictures into clean wallets along with any information that is with them, checking the ID is correct and the slides have not been mixed up (If you are good at bird identification that is clearly a good start, but we can provide some identification books), and help with inputting the information into computers.

We will also possibly be linking the information on the slides to information in notebooks which have been identified by Stephen Howe as mainly from his photographic partner Geoffrey Ingram.

This transcribed information will be put into a format that can be used when they place the pictures on the museum website (it is proposed that all pictures are made publicly available).

People will be able to contribute in many ways. We will have working days (one or two per week in the museum). There is no specific minimum time commitment, and some work may be able to be done at home (such as notebook transcription if we get scanned copies). As we get going it will of course be useful to make a plan with people who have volunteered so we have an effective rota.

The project work will start formally in the near future, probably after Christmas. Please do get in touch and let us know what you think you can offer to this exciting and important project. More information about these pioneers can be found on the following webpages:

Colonel H. Morrey Salmon, CBE, MC, DL, DSc: http://cardiffnaturalists.org.uk/htmfiles/150th-05.htm

Geoffrey C. S. Ingram: http://cardiffnaturalists.org.uk/htmfiles/150th-53.htm

Coot nest, 1909. Photo by H. Morrey Salmon.

Mistle thrush nest with eggs, April 1909.

Oystercatcher nest with eggs, 1909.

Photos by H. Morrey Salmon.

“My Tree” by Andy Kendall

I recently gave a talk about the rich and varied landscape in the Cardiff area and how that had evolved through geological time. I ended with a slideshow set to music. Amongst the pictures were a selection showing one specific tree, which is sighted on the skyline when viewed from Penylan Road in Old St Mellons (Penylan Rd, Bassaleg, Newport NP10 8RW). I have taken pictures of this tree in various conditions of lighting and weather and at different times of the year. It looks spectacular on the skyline with the sun behind it at various times, and with it shining on it at others, and I regularly stop in the same place to photograph it.

I pointed out that none of the pictures included false colours. The spectacular red skies were taken on 09-09-09 (that’s 9th September 2009) and again on the 11th. The reason for this spectacular colouration was a long dry period with strong southerly winds bringing very fine sand and dust from the Sahara desert up to northern latitudes. According to the Met office, this is more likely to happen in the winter, but it was happening for me on a nice warm early autumn evening which was lovely for taking pictures.

As autumn went on it lost it's leaves, but not its grandeur and it looked majestic on the skyline with green shoots of autumn sown crops at is feet and a bright blue sky.

I had also visited the same spot in December 2010 when the tree was surrounded by snow, and have done many times since.

At the end of the talk came the questions, and one question which I should have known the answer to, but did not came… "what was the tree?" It may surprise people, but I had never thought to walk up to the tree to find out. It looked so wonderful from the distance and I had not wanted to disturb the crop in the field. Rob Nottage did warn me that I would need to get a move on if I was to find leaves and he wasn't wrong because in the two weeks between me giving the talk and making the walk it had lost almost all of its leaves.

Still, there was enough evidence … it's a Beech tree (*Fagus sylvatica*), as clearly seen from the leaves and masts (below).

Given I was talking about the way that the landscape had evolved as Wales moved around the globe during geological times, it's worth noting that the Beech was a late entrant to Britain after the last glaciation circa 115,000 – 11,700 years ago, and may have been restricted to basic soils in southern England. It is classified as a native there, and as a non-native in the north where it was often removed from 'native' woods, but since the early 2000s there has been more acceptance that it would have been able to move north naturally and should be allowed to exist in case the southern Beeches suffer because of climate change. More locally, the Garth Woodlands and Cwm Clydach National Nature Reserve are believed to be on the western edge of its natural range in this steep limestone gorge. I'll be back to see "My Tree" when the lighting is right for some more pictures.

Cardiff Nats T-shirts

Andy Kendall

As many of you are aware, we have recycled the logo which Stephen Howe, Mike Dean and myself rediscovered on a letterhead dated from 1876 whilst looking at the Cardiff Naturalists' Society archives (below). Rhian then kindly digitised this embossed logo into a computer format that we have been using since 2017. It illustrates all of the things that we as a Society are interested in. With bats and moth between Earth and Air, flying fish between Air and Water, the volcano between Water and Fire, and the castle filling the final quadrant, along with the Cardiff Borough crest (predating the city) in the centre.

We have recently made arrangements with a local company that prints logos onto clothing to have it printed on T-Shirts and Polo shirts which we are selling through the Society. If you want to order any shirts then please send the following details to Andy Kendall (*info@cardiffnaturalists.org.uk*):

Name; Contact details; Shirt Style, either T-Shirt (£10) or Polo shirt (£13); Logo Style, either Large or Small (only small on Polo shirts); and Shirt size.

Payment for all shirts is on delivery.

If you would like any other items of clothing, this is possible as you can see on the bottom of their website (http://www.designs-signs.co.uk/index.html). Just drop me a line to explain what you would like and I will ascertain whether that is possible and the cost.

Nestbox surprises

Linda Nottage

There are 50 woodcrete nestboxes in Coed Garnllwyd, a WTSWW–managed reserve in the Vale of Glamorgan. Post-breeding monitoring of these boxes is an annual autumn task. Recently, Rob & I helped Conservation Officer Vaughn Matthews locate, check & clean out 45 nestboxes. Pleasingly, most contained tit nests lined with moss, although a few held unhatched eggs or the skeletal remains of nestlings that failed to fledge. Woodmice had set up home in a handful, in one case leaping out at Vaughn who nearly fell off the ladder. Care was taken not to disturb the occupants when bat droppings were noted outside of a couple of boxes. Minibeasts such as woodlice & *Amaurobius* spiders, as well as clusters of garden snails, occupied several boxes. A magnificent leopard slug was much admired.

Blue tit eggs in nest box at Coed Garnllwyd.

Leopard slug.

Woodmouse and Amaurobius spider in nest boxes.

All photos: Linda Nottage.

Mandrake

Further to Bruce McDonald's article on poisonous plants in the previous newsletter, **Eirian Edwards** has shared with us some photos of mandrake, which she took on the Greek island of Rhodes, complete with a green spider.

Slime moulds

Phill Blanning has been taking photos of slime moulds and jelly fungus this Autumn. Here are some near Radyr Weir: small stagshorn, *Calocera cornea* (top); *Ceratiomyxa fruticulosa* (middle); and purple jellydisc, *Ascocoryne sarcoides* (bottom).

Alien Invaders

Elizabeth Morgan

I started noticing random, dried-up black curls on my kitchen floor over the August Bank Holiday. Having guests staying, and thinking it was something they'd dropped, I brushed them up.

The following week I noticed a thin, black, very sticky, worm-like organism emerge from under the garden door. It was similar to an elver, but like nothing I had ever encountered on land before. I did some online research and found some quite alarming possibilities, but nothing definitive.

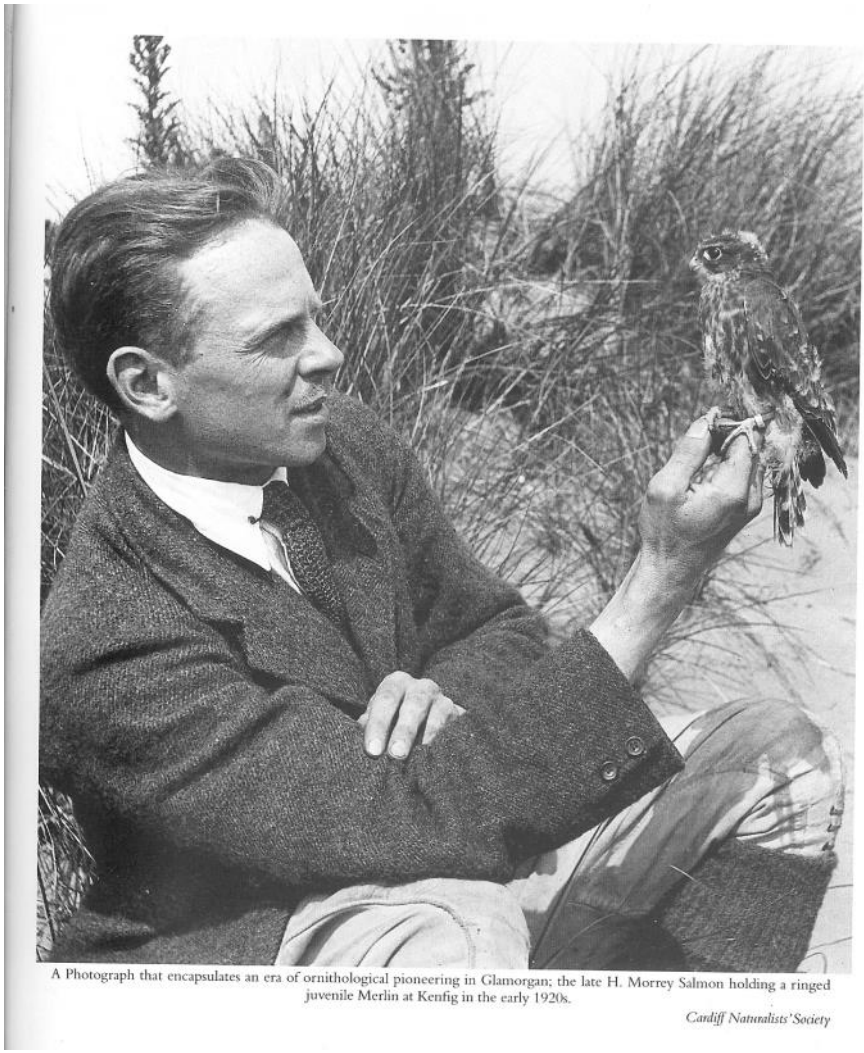
I then contacted Buglife Cymru, where Liam Olds suggested I bring in a live specimen to their Forest Farm headquarters. I did this, and in due course, they came up with the following identification: *Caenoplana bicolor* – an alien flatworm species, native to Australia, but spread throughout Europe via poor bio-security in the horticultural trade.

Its English name is the Southampton Flatworm, as this is where it was first discovered in the UK in 2013. Flatworms are top-level predators of soil invertebrates such as snails, slugs, woodlice and others. It has been suggested that alien flatworms might pose a threat to local wildlife, but thankfully earthworms are not on *Caenoplana bicolor*'s menu.

Where mine originated from and what entices them into my home remains a mystery - especially as now the heating is on they face certain death by dehydration.

Deadline for submissions to the next newsletter: Monday 6th April 2020.

Correction: In the last issue, the bird that Col. H. Morrey Salmon is holding was misidentified as a falcon. It is in fact a young merlin, as correctly captioned in this previous CNS article.



A Photograph that encapsulates an era of ornithological pioneering in Glamorgan; the late H. Morrey Salmon holding a ringed juvenile Merlin at Kenfig in the early 1920s.

Cardiff Naturalists' Society

Parrot waxcap in Cathays Cemetery. Photo by Linda Morris.

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