

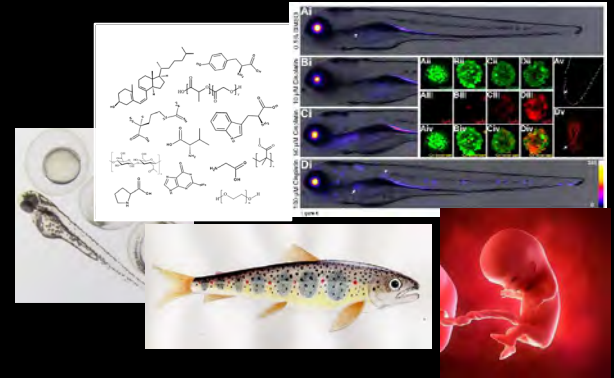
*A Wildlife Safari through Dartmoor's varied Habitats
(peppered with a touch of science).*



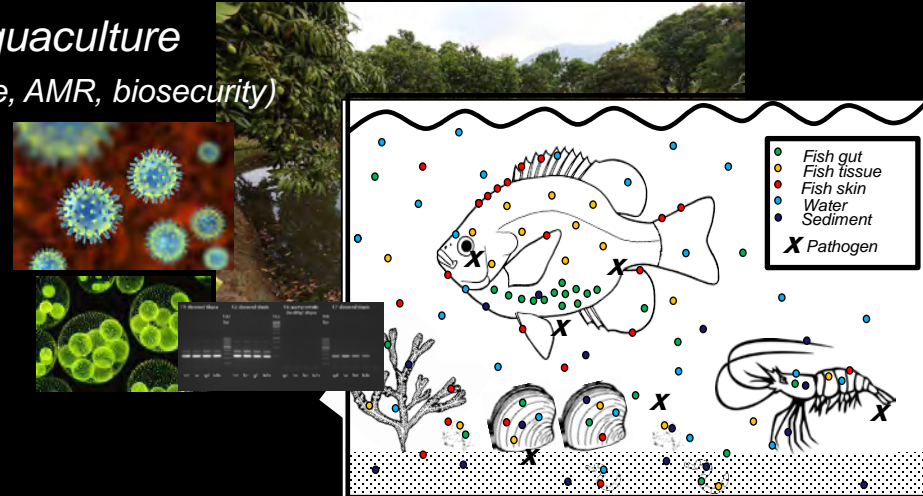
Research Activities



Ecotoxicology
 (Environmental monitoring, mechanisms, new tools, testing, population impacts)



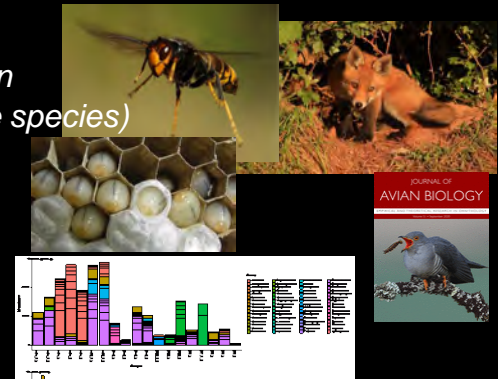
Food Security -Aquaculture
 (disease biosurveillance, AMR, biosecurity)



Integrative research that seeks to better understand how 'we' affect organism physiology, behaviour and ecology to inform better protection of our natural environment.

Ecological Biosurveillance
 (predation pressure, predation pressure, population status, invasive species)

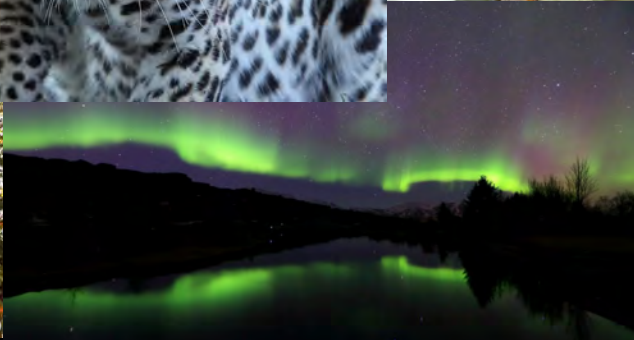
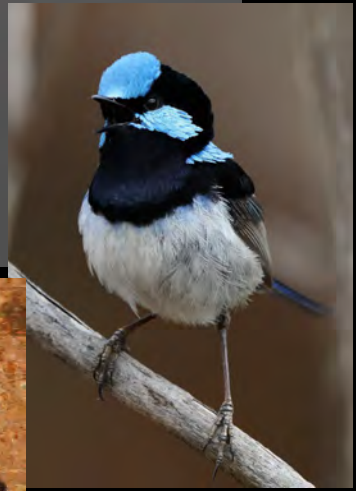
DNA metabarcoding



Natural History- A Passion



Global Travels



Highlights...beauty .



Resplendent Quetzal

Highlights... Close encounters....



Jaguar

Highlights... Closer to home!



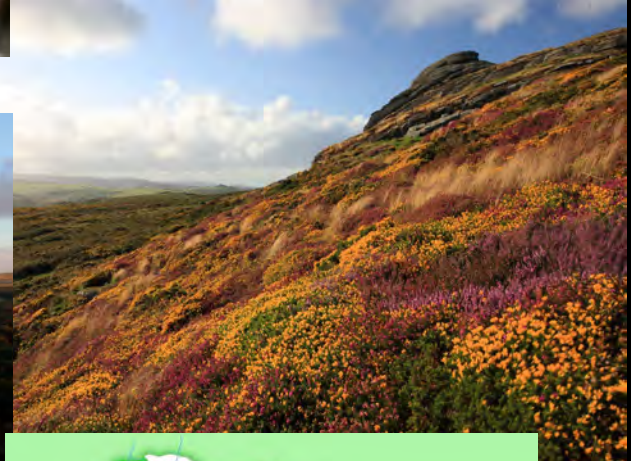
Highlights... Closer to home!



At Home - Dartmoor



Dartmoor – A Mosaic of Habitats



Dartmoor National Park - 945sqkm. A mosaic of habitats: 47% moorland, 38% farmland, 12% woodland and 1% reservoirs, rivers and streams. 41 SSSI – 30% of the National Park



Home to some fabulous wildlife.....



High Ground -Tors.....



Oenanthe Oenanthe
Wheatear



'White-arse'



Early arrivals

Turdus torquatus
Ring Ouzel



April Showers

Rowan feast- fueling passage migrants



Turdus iliacus
Redwing

Turdus torquatus

Turdus pilaris
Fieldfare

Blanket Bogs - A natural sponge

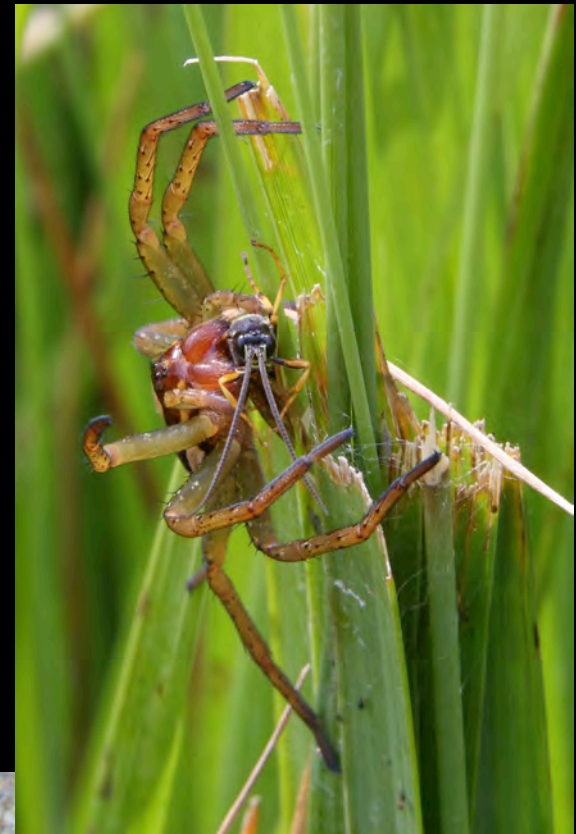


Drosera rotundifolia
Round leaved sundew

8500 hectares

Dolomedes fimbriatus

Wraft spider



*The largest of 650
UK spp*

Breeding Waders- still with us

Gallinago Gallinago
Snipe



Calidris alpina
Dunlin



Single cell
7g
50% +bwt

Waders- Head start - attempting a recovery



Lymnocyrtes minimus
Curlew

Waders-lost

Pluvialis apricaria
Golden plover



2005



Pure gold!

Flowing Water- Rivers and Streams



Headwaters for 9 main river catchments, 18 Rivers – Dart , Teign , Erme , Bovey

Flowing Water- Streams



Streams

Clean water

Flowing Water- Streams



Autumnal beauty

Flowing Water- Streams



Dart
a 14 mile journey

Aquatic birdlife highways



Cinclus cinclus
Dipper



Motacilla cinerea
Grey wagtail



— a scholar of invertebrate ecology

Sawbill



Mergus merganser
Goosander



Gecko on the moon

– and their little jumpers

Exotics



Alcedo atthis
Kingfisher



The ultimate 'fisherman'

You can never see too many kingfishers!



Alcedo atthis

Standing Water - reservoirs



Burrator, Fernworthy, Meldon, Tottiford, Colliford, Kennick, Roadford, Avon Dam, Stithians, Venford

Dragons

Amazing engineering

Ommatidia, ocelli



300 M Years of evolution. 57 UK species.

Aeshna cyanea
Southern hawker

Frogs- breeding



One in captivity lived for 50 years!!

40% decline on 40 years



Rana temporaria
Common frog



Bufo bufo
Common toad

Early breeders – different genetics?

Hunting ground



Lissotriton vulgaris!

Natrix Helvetica
Grass snake

Upland Woodland

13% of England's upland woodland



Woodland Specials



Limax maximus
Leopard slugs



Carabus intricatus
Blue ground beetle

Woodland Butterflies

Argynnis paphia
Silver washed fritillary



Limenitis Camilla
White admiral



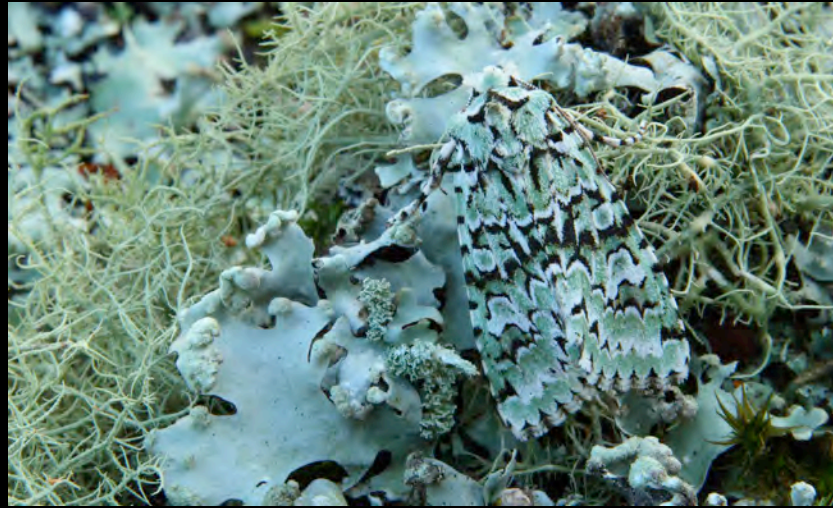
Gonepteryx rhamni
Brimstone



Woodland Moths- hidden in plain sight



Phalera Bucephala
Buff tip



2600 spp

Griposia aprilina
Merveille du Jour

Metamorphosis..... incredible cell biology



Hermaris tityus

.....apoptosis and autophagy, cell growth, differentiation, and tissue remodelling

Aves - The understory



Sylvia atricapilla
Blackcap

Sylvia borin
Garden warbler



Gecko on the moon

Quintessential trio



Phoenicurus phoenicurus
Redstart



Back from the brink –nest boxes

Ficedula hypoleuca
Pied flycatcher



Quintessential trio

Whistling leaf lover



Phylloscopus sibilatrix
Wood warbler



Arboreal



Mustela erminea

Dryobates minor
Lesser spotted woodpecker

Predators



Accipiter nisus
Sparrowhawk

Acorns



Garrulus glandarius
Jay

Conifer Woodland

Gold and Fire!

Regulus ignicapilla
Firecrest



Regulus regulus
Goldcrest

Princes and Kings!!

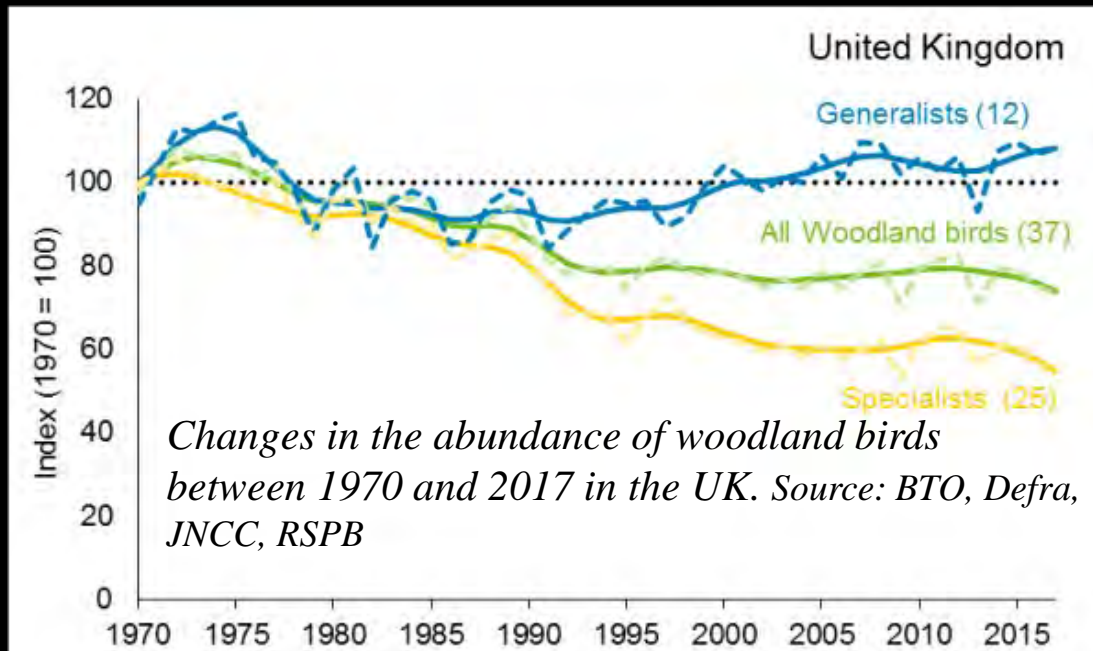
5.5g

Winter woodland roost



Aegithalos caudatus
Long tailed tit

Woodland Birds- the national picture



Breeding woodland bird index for UK has declined by 25% between 1970 and 2017.

- *Woodland specialists; down 46% since 1970.*
- *Generalist woodland species increased, by 14%.*



*Wood warbler-
down by 70%*

*Lesser Spotted Woodpecker
down by almost 80%*



The Open Moor and Heathlands



Pollen records reveal its history....Bronze Age (4-6000 yrs ago)

Swayling

Spring and Summer Bonanza



A matrix of gorse and heather – Dorset, ling, cross leaved and bell

Insecta - Bees

Diversity – 270+ species



Apis mellifera



Megachile leachella



Anthophora bimaculata

Green eyes

Parasitic (Sand/Digger) Wasps

Preying on Caterpillars

6000 spp



Ammophila sabulosa

Parasitic (Sand/Digger) Wasps

Preying on Flies

Crabro cribarius



Oxybelus uniglumis



Mellinus arvensis



Stalking

Parasitic (Sand/Digger) Wasps

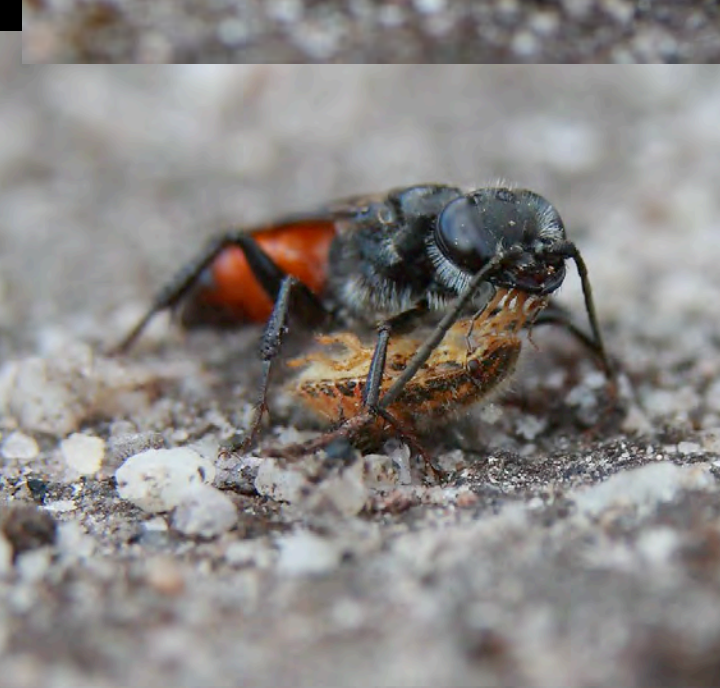
Preying on Spiders



Episyron rufipes

Parasitic (Sand/Digger) Wasps
Astata boops

Preying on shield bugs



Parasitic (Sand/Digger) Wasps

Preying on Grasshoppers

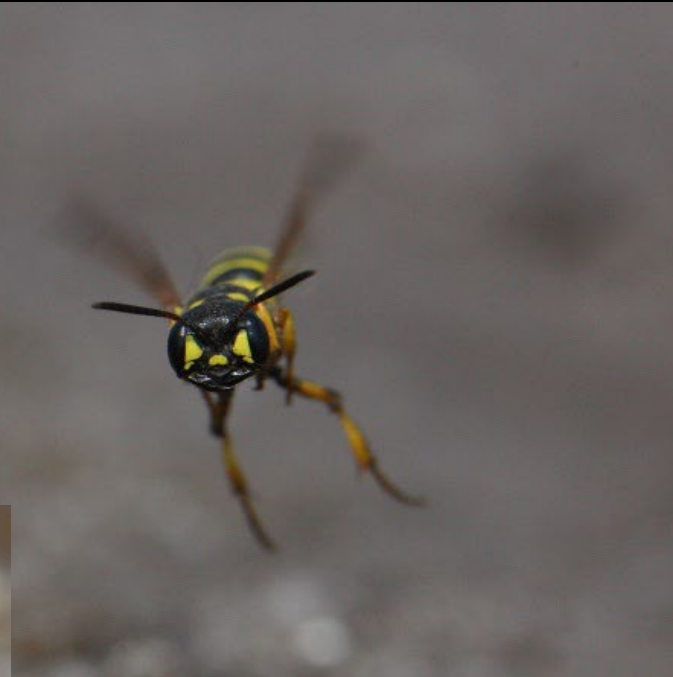


Tachyspex pompiliformis

Red-banded Grasshopper Grabber

Parasitic (Sand/Digger) Wasps

Preying on weevils



Cerceris arenaria
Weevil wolf/sand tailed digger wasp

Parasitic (Sand/Digger) Wasps



Preying on solitary bees



Cerceris rybensis
Ornate tailed digger wasp



Parasitic (Sand/Digger) Wasps

Preying on honey bees

Philanthus triangulum

Bee wolf



Embarlming - Post pharyngeal gland –pentacosene/heptacosene

Parasitic (Sand/Digger) Wasps

Eumenes coarctatus
Potter wasp



Parasites of parasites... Chrysididae

Gold embroidered dress



Chrysis ignita



Chrysis viridula

Cuckoo wasps

Parasitoid wasps

- *Possibly the most diverse animal group - as many as 2 million species*
- *Fundamental in ecological systems - a major check point*
- *Thousands of purposeful introductions have been made in an attempt to control more than 500 'pests' in over 200 countries*

Heathland butterflies



Callophris rubi
Green hairstreak



Plebejus argus
Silver studded blue

Myrmecophily

Speaking to ants

The Ultimate (silk) Moth

Olfaction

Saturnia pavonia
Emperor moth

One Molecule!
Better than an MS triple quad (with orbitrap!)

(6Z,11Z)-hexadeca-6,11-dien-1-yl acetate



Sensilla

Reptiles



Zootoca vivipara
Common lizard



European Glass Lizard
Pseudopus apodus

Anguis fragilis
Slowworm



World's largest legless lizard

Adder



Vipera berus



Dress code

Vipera berus



Sloughing - change of clothes

Vipera berus



In black - climate

Vipera berus

*Passive – but venomous !
(cocktail of cytotoxic and haemotoxic enzymes)*



Last human death from an adder bite in the UK was in 1975!!

The only time I missed some teaching!



Fun facts: 3,900 species only 725 are venomous, and of these only 250 are able to kill a human with one bite

- Saw-scaled viper (*Echis carinatus*)- 5000 deaths per year in India alone
- Inland taipan (*Oxyuranus microlepidotus*)- one bite can kill 100 people! Fierce snake!

Aves – ‘Residents’



Emberiza citronella
Yellowhammer

Saxicola torquata
Stonechat



Carduelis flammea
Redpole



Linaria cannabina
Linnet



Sylvia undata
Dartford warbler



Alauda arvensis
Skylark

Carduelis spinus
Siskin



Emberiza schoeniclus
Reed bunting



Aves - Migrants



Anthus trivialis
Tree pipit



24 000km in 6 monhs
Bwt- three teaspoons
of water!

Phylloscopus trochilus
Willow warbler



Anthus pratensis
Meadow pipit



Locustella naevia
Grasshopper warbler



Saxicola rubetra
Whinchat

.....5 billion birds migrate to Eurasia from Africa

Nests



'Jewels of the Moor'

Beyond compare



Stretchy nests!



Feathers!

Aegithalos caudatus
Long tailed tit

Fun fact: *Spider silk 5X stronger than steel of same thickness and pencil width is as strong as Kevlar – it would stop a Boeing 747!!*

No nest



Caprimulgus europaeus
Nightjar



Sweep nets



Cryptic *Caprimulgus europaeus*



I am a log!

The Cuckoo

Cuculus canorus



Cuckoldry – A Complex Biology



A slightly larger egg



A trick – allows for an 11 day incubation

Doomed



An obvious Alien – just how does this dupe its foster parents?

Cuckoldry – A Complex Biology



Trouble ahead- Ariel assault



Cuckoldry – A Complex Biology

Carefully nurtured



Six times the size of an adult pipit and insatiable

The Cuckoo — New Discoveries



The Cuckoo — Some wonderful encounters

A rare surrogate



Saxicola rubetra

Dartmoor Bird Nesting Project

Nest Finding:



*Mark Lawrence, Mark Penny, Dave Scott
John Walters, Sara Zonneveld, Lowell Mills*

- *Regular (4 days/week) systematic searches for nesting birds March – July*
- *Record nest species, location, status, success, ringing of nestlings*
- *NRC sent to BTO*

<http://www.dartmoornests.org/>



Nest Finding



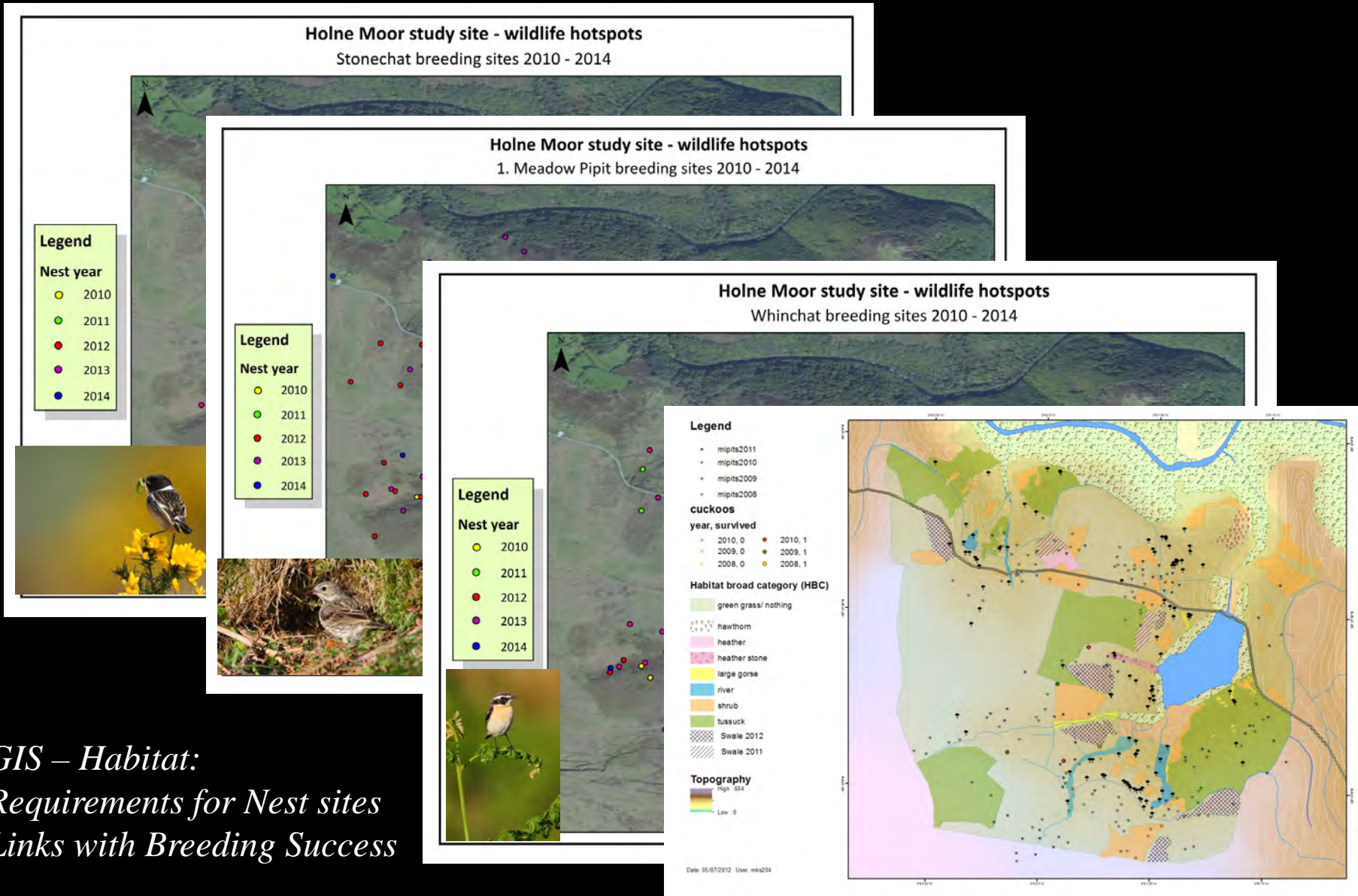
'Jewels of the Moor'

Year:	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	all years
Total:	54	91	150	172	192	227	149	302	228	217	1782

34 breeding species – 8 amber listed , 9 red listed

Data Analysis – Understanding Breeding Success

Spatio-temporal nesting distributions

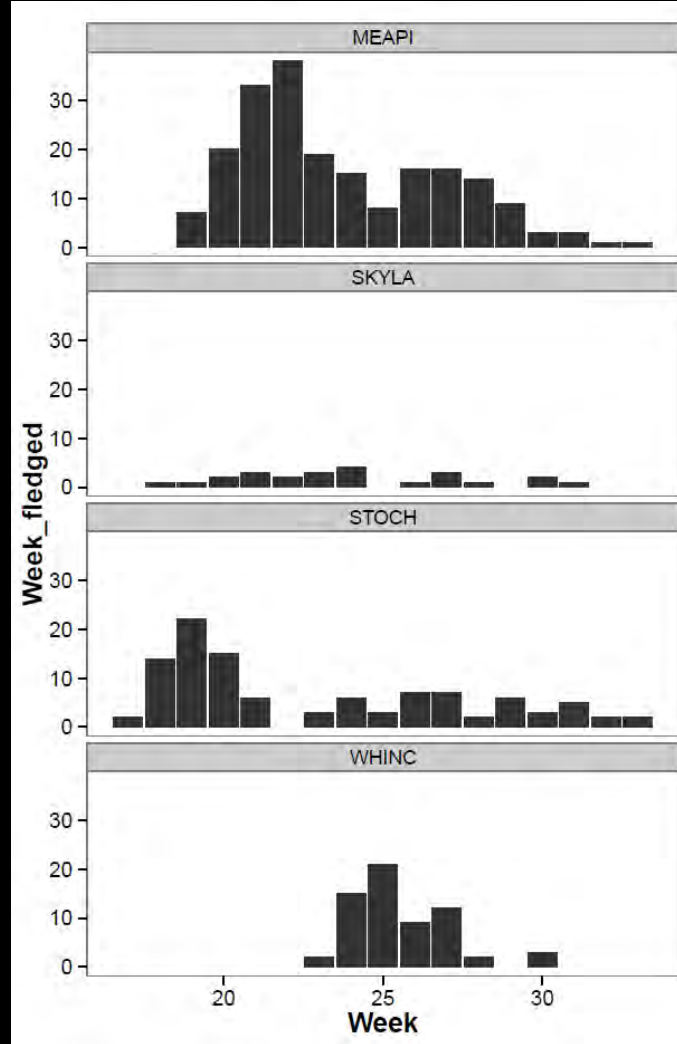


Data Analysis - Breeding Seasonal Patterns

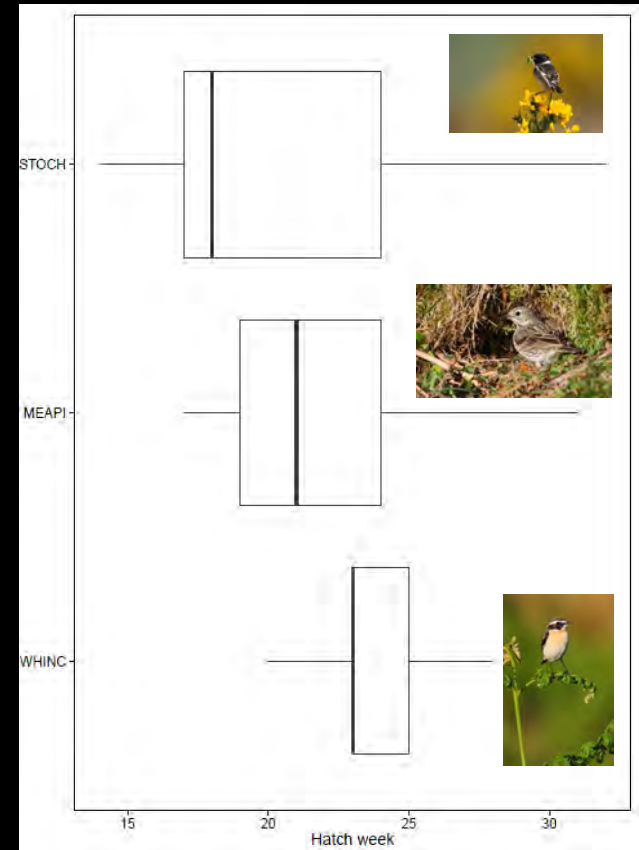
Weeks of fledging (all years grouped)



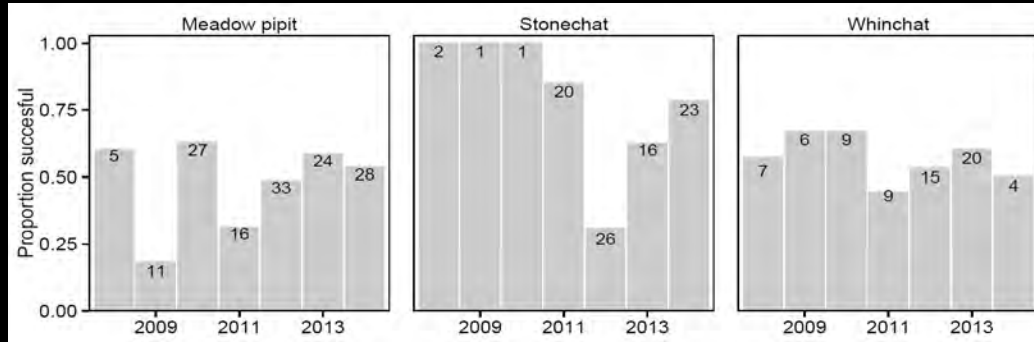
Sara Zonneveld – PhD student



Peak of breeding (median hatch weeks (all years grouped))



Data Analysis - Breeding Success




Hugely variable


Breeding success (egg to fledge)



Overall breeding success rates

Meadow Pipit - 22% 

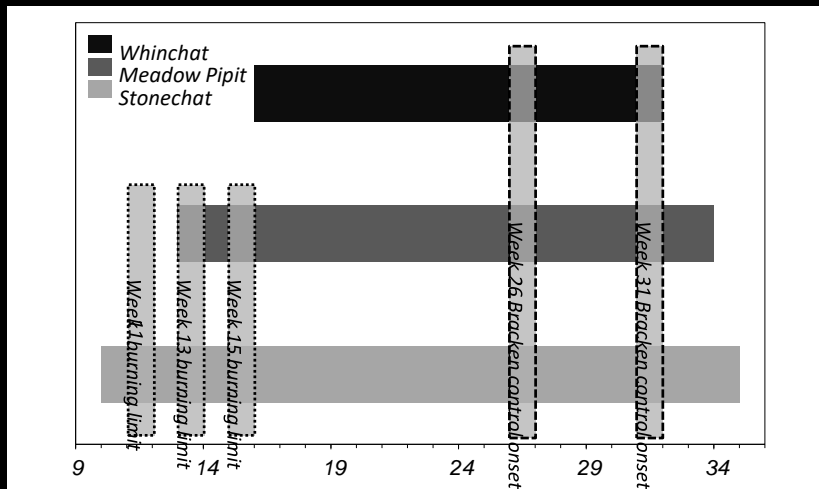
Stonechat 38% 

Whinchat - 25% 

Predation



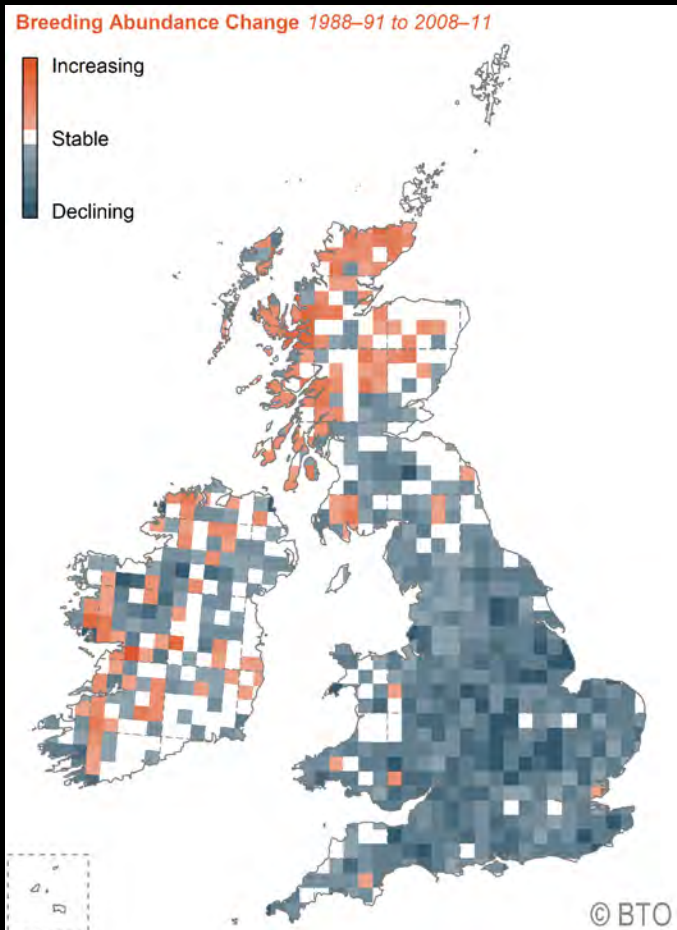
Breeding Success and Land Management



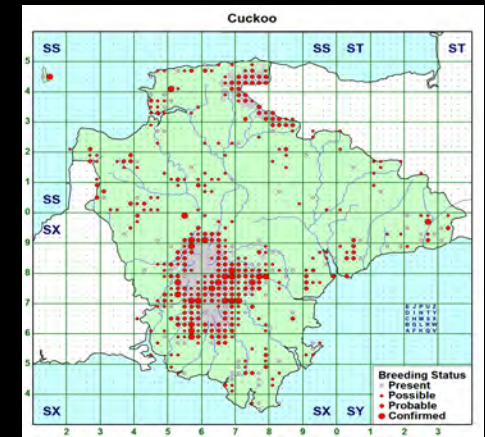
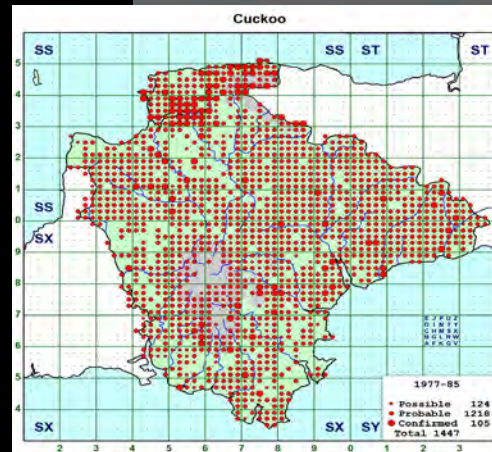
Breeding phenology for Stonechat and Whinchat show conflicts with the timing of land management (swayling and bracken control) practices:

Zonneveld, Mark Lawrence, Mark Penney, Dave Scott, John Walters & Charles R. Tyler (2024). Potential conflicts between the breeding activity of three passerine bird species and vegetation management on an upland site in south-west England. *Bird Study* <https://doi.org/10.1080/00063657.2024.2307472>

Back to the Cuckoo- declines!!!



UK Status



Devon – 72% decline

- 62% decline across England
- Declines seen in farmland habitats but retained in semi-natural habitats (Denerley 2014)
- Contrasting picture in England vs Scotland

With kind permission from the BTO and Devon Birds

Why is the Cuckoo declining in England ?



- *Afro-Palaeartic migrant bird - travelling up to 7000 km – 50% of its life on migration*
- *Obligate brood parasite – dependent on other bird species (declines in most host species)*
- *Dietary specialism*
- *Habitat- Land Management*
- *Climate*



Arctia caja

The Cuckoo Project

Satellite-tracking -population declines to Cuckoo's choice of migration route?

Hewson, C.M., Thorup, K., Pearce-Higgins, J. & Atkinson, P.W. (2016) Population decline is linked to migration route in the Common Cuckoo, a long distance nocturnally-migrating migrant. *Nature Communications*. DOI: 10.1038/NCOMMS12296



The Cuckoo PhD Project

Cuckoos resource needs on their breeding grounds

- *What is the diet of adult Cuckoos on Dartmoor ?*
- *How do the dietary requirements of Cuckoo nestlings compare with Meadow pipit nestlings?*
- *How does land use affect availability of resources for Cuckoos, hosts and nestlings ?*



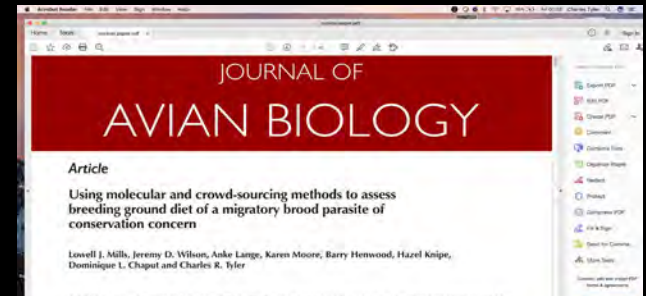
University
of Exeter

NERC
SCIENCE OF THE
ENVIRONMENT



The Cuckoo PhD Project

What is the diet of adult Cuckoos on Dartmoor ?



Based on 41 field samples plus 7 samples from trapped individuals

Sequences matched to arthropods of two classes (Insecta and Arachnida) and seven orders (Lepidoptera, Orthoptera, Diptera, Coleoptera, Hemiptera, Plecoptera, Sarcoptiformes),

Lepidoptera - drinker moth. Diptera – snipeflies, grass flies) and craneflies

Orthoptera - common green grasshopper



Many of these foodstuffs may have been overlooked by previous observational studies

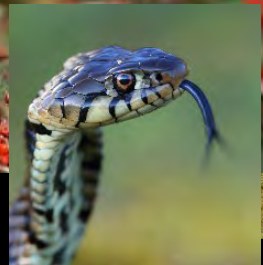
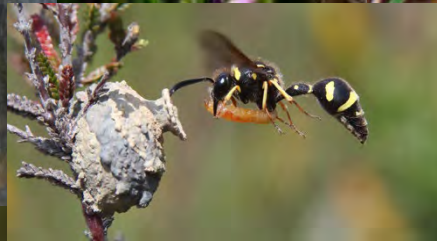
Waking up to Planetary Health



Urgent News!



Never has there been a more urgent need to better protect our
Biodiversity



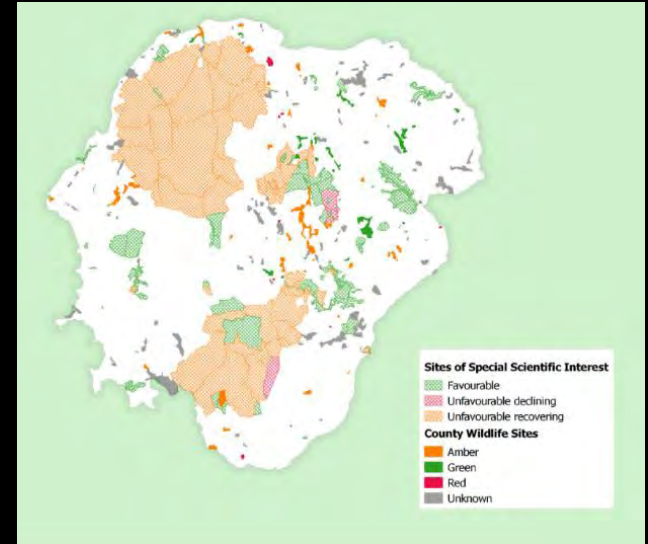
*Globally populations have
dropped in abundance (since
1970): Freshwater-80%
Terrestrial-38%, marine -36%*

Dartmoor – an important wildlife refuge.....

Internationally important vegetation communities:

- *blanket bogs (3.5% of England's total resource);*
- *upland heaths (3% of the resource);*
- *upland oak woods (13%);*
- *Rhôs pastures (20%);*

28% of Dartmoor National Park is statutorily designated and protected, lying within 42 Sites of Special Scientific Interest (SSSIs) (DNPA 2017) - 26 designated for their biodiversity interest



Independent Review of Protected Site Management on Dartmoor: <https://www.gov.uk/government/publications/independent-review-of-protected-site-management-on-dartmoor/independent-review-of-protected-site-management-on-dartmoor>)

ONLY 18% of Dartmoor's SSSI area in 'favourable' condition, 82% in 'unfavourable/ recovering'

Priorities?

Upland Agriculture

Visitors/Tourism

Archaeology

Wildlife



Please help us!!!

Thank you for listening



Questions?