



Photo: iStockPhoto

Alternative approaches to monitoring rare and restricted species

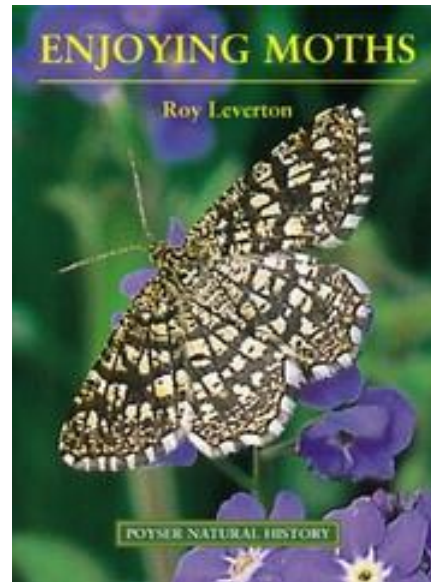
Michael Pocock

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Why observe wildlife?

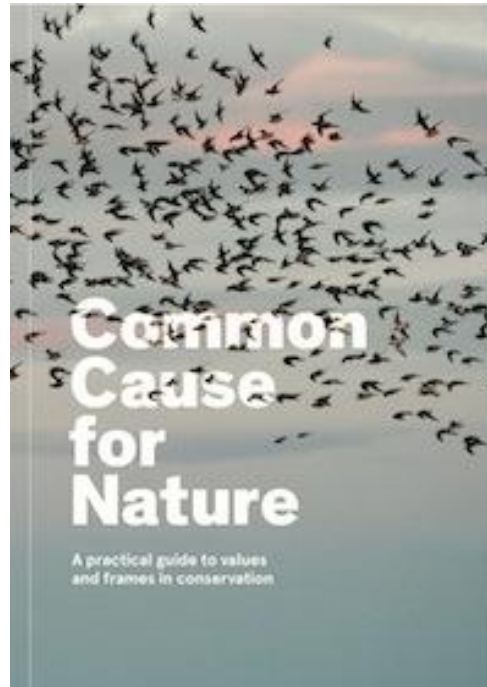
- It is enjoyable
 - Making discoveries
 - Getting out into nature
 - Time outdoors
 - Feeling healthy
 - Enjoying the seasons
 - Gaining and honing a skill
 - Achieving goals
 - Going out with family/
escaping from family*

*depending on the conditions at the time



Why *record* wildlife?

- Observers becoming recorders
- Working together to understand and protect wildlife
 - Humility and discovery
- Responsibility?: “Giving something back to nature”



Intrinsic Frames

Frames that relate to connections with other peoples, with and nature, and creative or collective action

Connection with nature	Shared experiences and connection to the natural world
Nature is beautiful	The beauty of the natural world
Discovery and exploration	Exploring nature and the outdoors
Working together	Joint action and community co-operation

Why *record* wildlife?

Intrinsic Frames		Extrinsic Frames	
<i>Frames that relate to connections with other peoples, with and nature, and creative or collective action</i>		<i>Frames that relate to self-interest, wealth, power and threat</i>	
Connection with nature	Shared experiences and connection to the natural world	Transactions and consumers	Commercial relationships and the public as 'consumers'
Nature is beautiful	The beauty of the natural world	Utility and commodity	Money as the main focus - as a means of valuation, or to enact change
Discovery and exploration	Exploring nature and the outdoors	Defender and threat	Powerful defenders protecting weak victims from threats
Working together	Joint action and community co-operation		

Duty?

Ecosystem services?

Threat and jeopardy?

Holding authority to account

Fulfilling international reporting obligations

Weaker motivations for long-term behaviour change

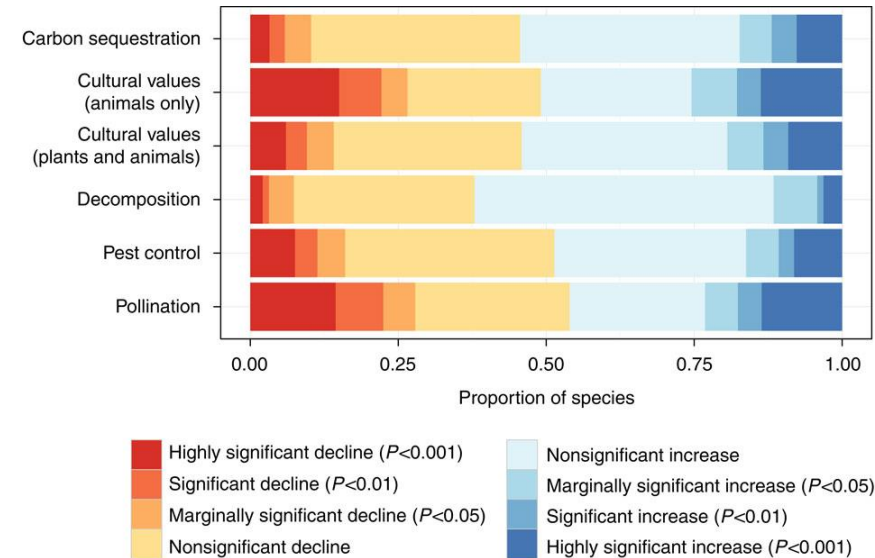
Why *monitor* wildlife?

- Using the records to assess and quantify changes
 - Makes people feel their records are worthwhile
 - Holds government and authorities to account
 - Allows us to fulfil the country's international obligations

- But why... ecologically?

Use data for monitoring to assess:

- Changes in species abundance/occurrence
 - Of interest for its own sake
 - Linking species to function (e.g. carbon sequestration, decomposition, pollination, seed dispersal etc.)
- Changes in community/assemblage composition
 - Homogenisation
- Changes in interactions and emergent function
 - (e.g. 'resilience' and 'resistance' of ecosystem services and maintenance of biodiversity)



Oliver et al. (2015) Nat. Comms.

ECOLOGY LETTERS

Ecology Letters, (2013) 16: 870–878

doi: 10.1111/ele.12121

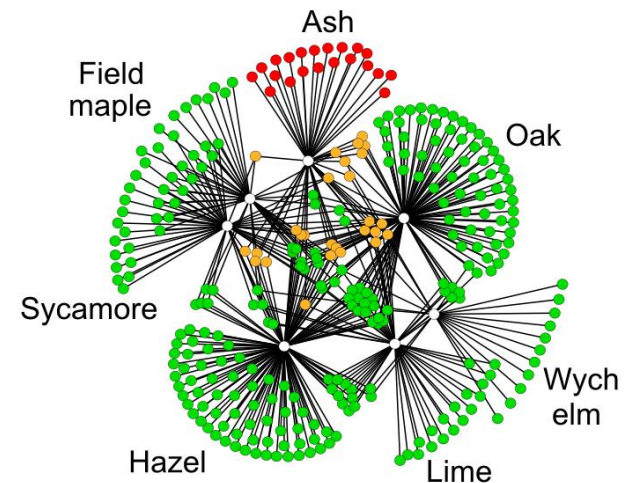
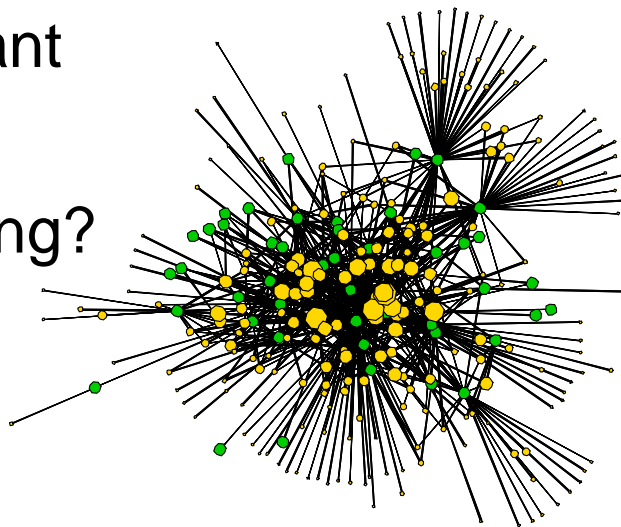
Species richness declines and biotic homogenisation have slowed down for NW-European pollinators and plants

Abstract

Concern about biodiversity loss has led to increased public investment in conservation. Whereas there is a widespread perception that such initiatives have been unsuccessful, there are few quantitative tests of this perception. Here, we evaluate whether rates of biodiversity change have altered in recent decades in three European countries (Great Britain, Netherlands and Belgium) for plants and flower visiting insects. We compared four 20-year periods, comparing periods of rapid land-use intensification and natural habitat loss (1930–1990) with a period of increased conservation investment (post-1990). We found that extensive species richness loss and biotic homogenisation occurred before 1990, whereas these negative trends became substantially less accentuated during recent decades, being partially reversed for certain taxa (e.g. bees in Great Britain and Netherlands). These results highlight the potential to maintain or even restore current

Recording interactions

- Ecological relevant
- whole system
- Enhance recording?



Tree-feeding Lepidoptera from DBIF

bms The Fungal Records Database of Britain and Ireland
British Mycological Society - promoting fungal science

Home Data entry Explore records Local recording groups My account Log out

Add simple record

Date: 11/01/2016

Fungus name: Birch Brittlegill

Current name: Birch Brittlegill

Certainty: Certain

Morph: Silver Birch

Associated: SX7772

Map reference: British National Grid

Locality: Ashburton Down, Dartmoor

Vice County: Devon, South

County: Devon

Collector: Brown, Joe

Identifier:

Confirmer:

Submit

iSpot share nature

Explore community Identify Help Language Communities

Communities - Global - Species interactions

Sign up to iSpot

Search iSpot

User login

Connect with Facebook

Username: Password:

Log in

OU users log in here

Request new password

Create new account

Sign in using one of these accounts

1 2 483 next

Garden Fairy ring

associated with

Kikuyu Grass (*Pennisetum clandestinum*)

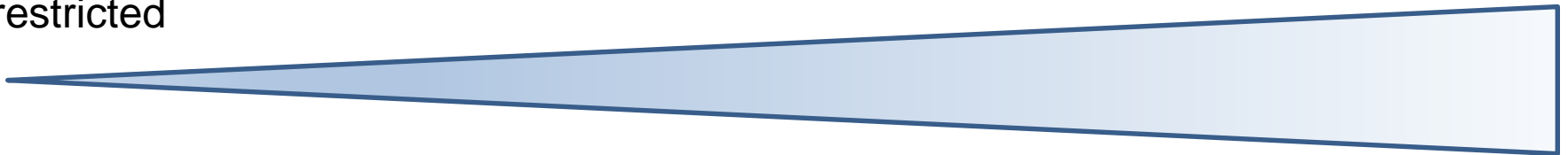
parasitising

What are the options for monitoring?

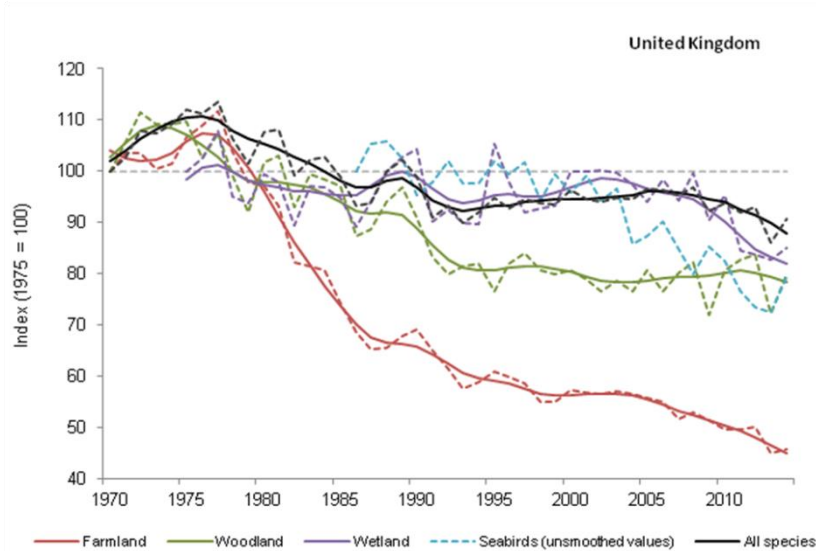
Ideally we know about species across the spectrum

Rare and
restricted

Widespread
and abundant



Systematic, randomised monitoring



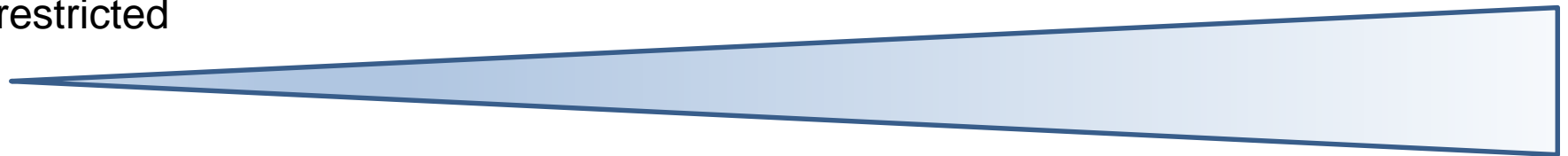
Systematic, randomised monitoring schemes

Assessing changes in abundance
e.g. birds

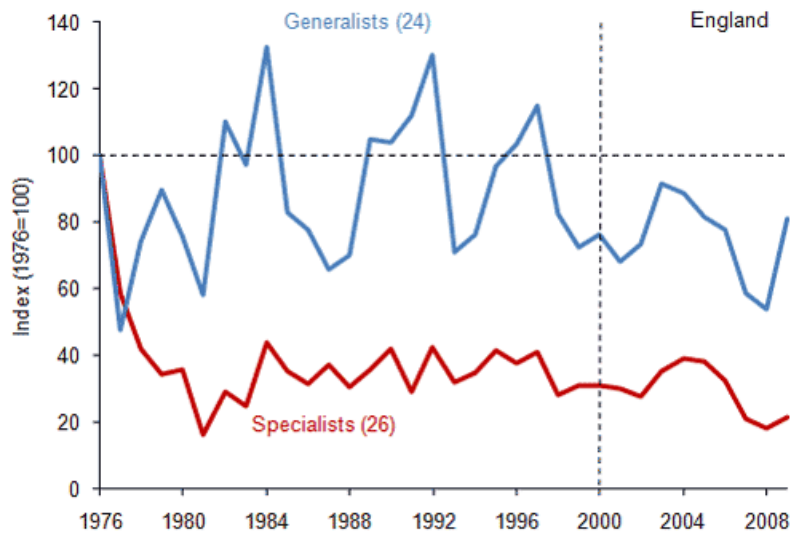
Relies on many volunteers willing to follow protocols in randomly-selected places

Widespread and abundant

Rare and restricted

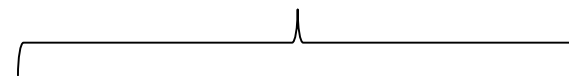


Systematic monitoring



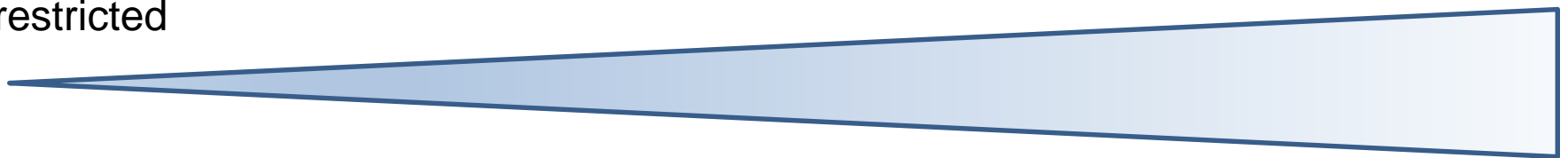
Systematic (non-random) monitoring

Assessing changes in abundance
e.g. butterfly monitoring; also trialled
for Odonata and some others
Needs volunteers willing to follow
protocols



Widespread
and abundant

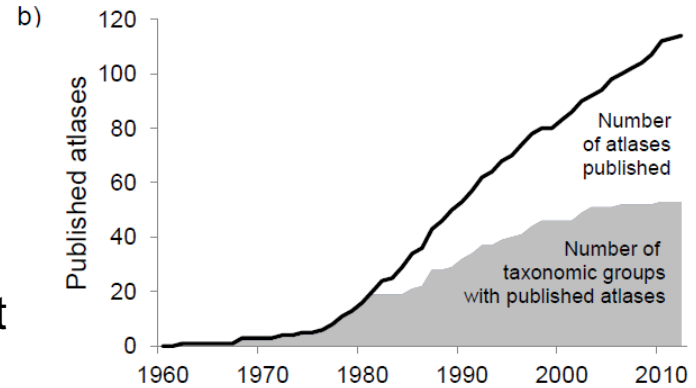
Rare and
restricted



Mapping distributions

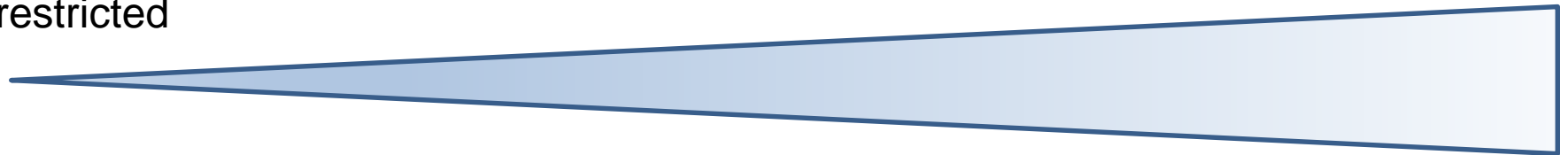


Mapping activities
Assessing changes in
occupancy e.g. recording
schemes and societies
But reporting is not frequent



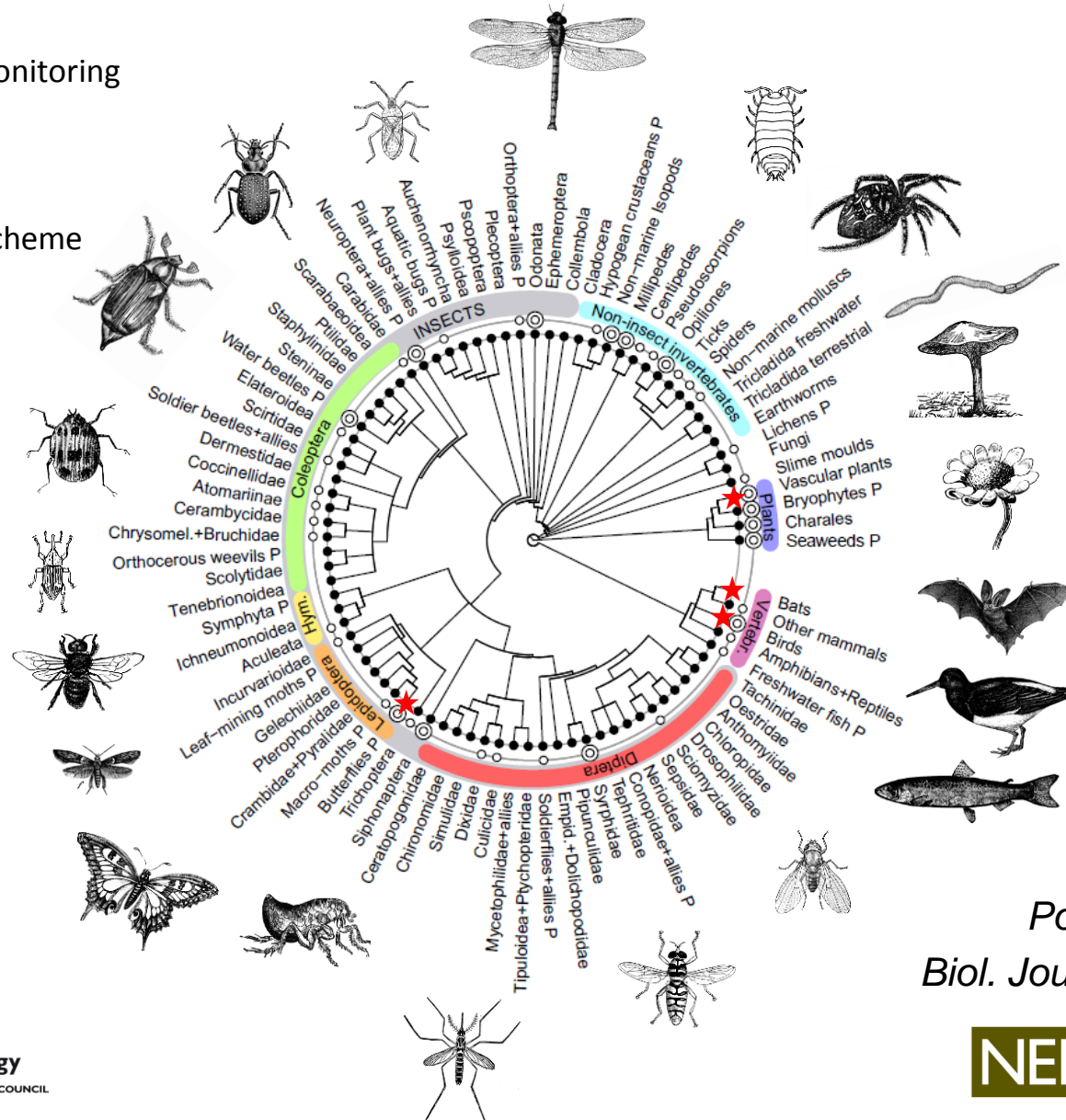
Rare and
restricted

Widespread
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Mapping distributions

- ★ With systematic monitoring
- With an atlas
- ◎ With a repeat atlas
- With a recording scheme

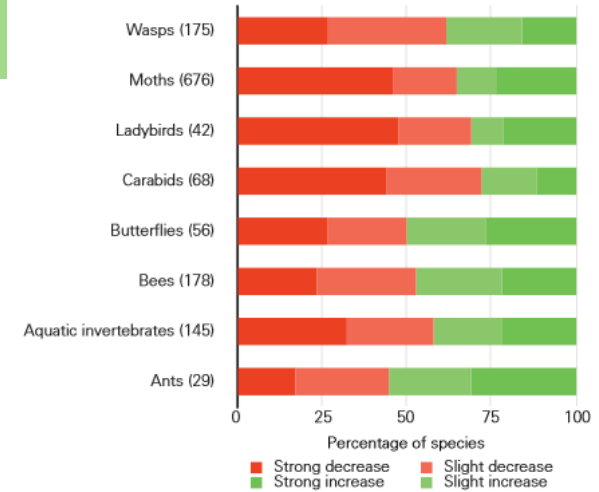


Pocock et al. (2015)
 Biol. Journal Linnean Soc.

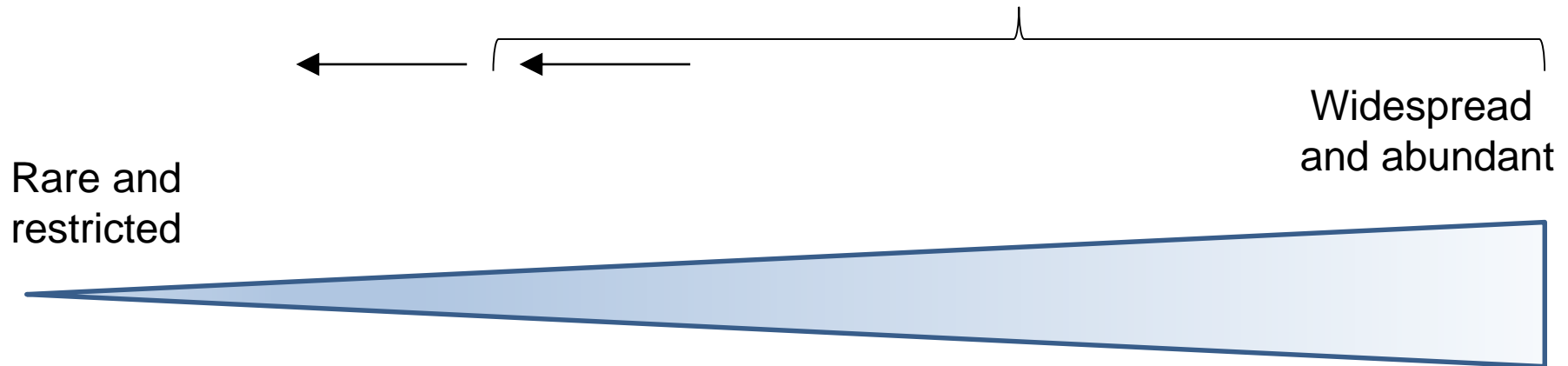
Opportunistic recording

'Opportunistic' records

Assessing changes in occupancy with good coverage
e.g. many recording schemes and societies



New statistics allow regular reporting
for an increasing number of species



Opportunistic recording

'Opportunistic' records

Assessing changes in occupancy with good coverage

'Opportunistic' records

i.e. 'unstructured databases' of records

Comprise a mixture of records:

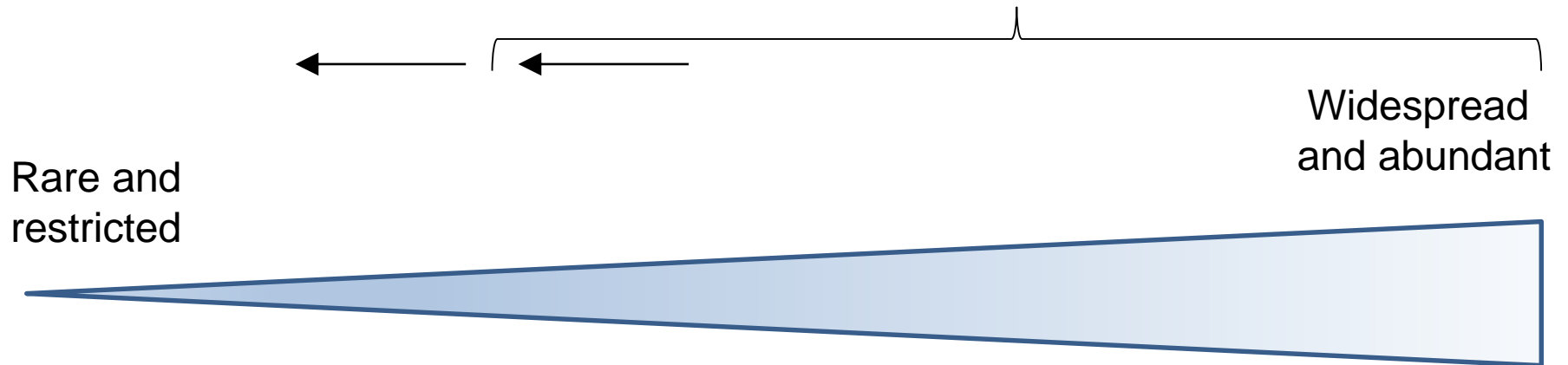
- May have structure
- May be truly opportunistic
- Metadata is not recorded
- Almost always presence only (though absences can be inferred)

Widespread
and abundant

Opportunistic recording

Eventually we
will be limited by
the data

New statistics allow regular reporting
for an increasing number of species

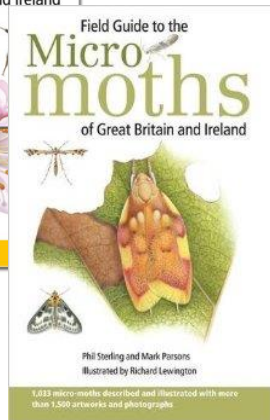


Opportunistic recording

Eventually we will be limited by the data

‘Opportunistic’ records
Assessing changes in occupancy with good coverage
e.g. many recording schemes and societies

Potential for step changes in data
(but still need skilled recorders)



Widespread and abundant

Rare and restricted species monitoring

- We are still left with a challenge of monitoring rare and restricted species
 - Always limited by the number of experts
 - But can we tweak our activities to get better (= more systematic) information?
 - What are the options?

Revisiting known locations

- Species will always appear to decline...
- ...Unless augmented by opportunistic records, but unsystematic
- Helps understand ecology → informing management
 - BSBI's Threatened Plants Project
- But often *ad hoc*
 - → appear as 'opportunistic' records
-



Rare and restricted species monitoring

- Can we combine:
 - The challenge of hunting for rare & restricted species
 - With a rolling programme of revisiting squares
 - Based on intelligently selecting squares to visit?

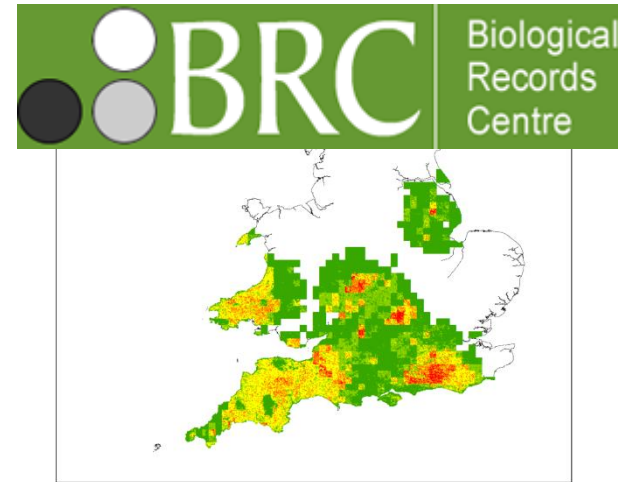


Working together?

Recording schemes & societies



Willing volunteers co-ordinated through recording schemes



Species distribution models +
Optimum selection of squares for
coverage and inclusion of rare spp.

A rolling programme of randomised targeted searches

Discovering and re-discovering sites
Learning more about rare species
Mission-based recording

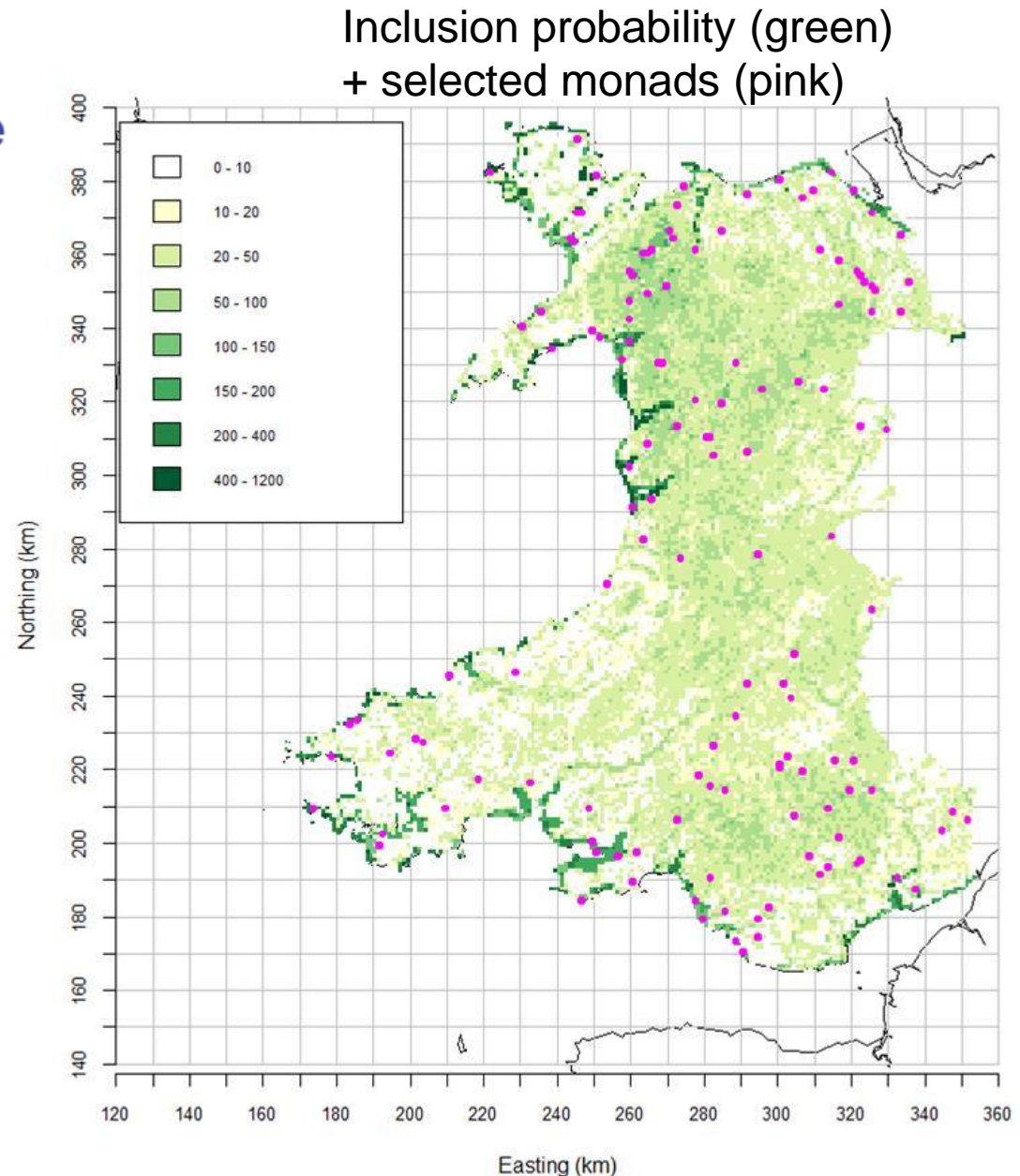
Report on status of priority species
on statistically rigorous way

Intelligently structured recording



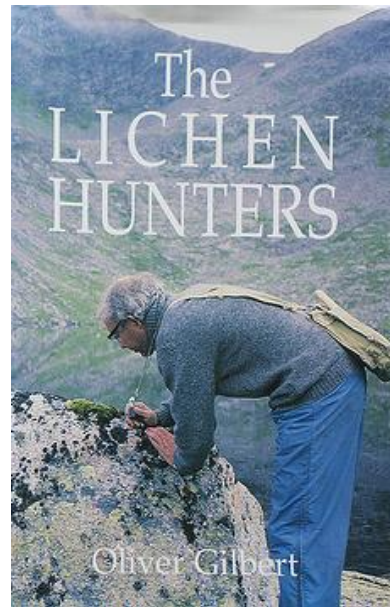
National Plant Monitoring Scheme

- Random selection of squares weighted by 'inclusion probability'
 - Most likely to go to interesting squares
 - Low probability of going to rubbish squares (but possible)
- Statistically rigorous



The challenge of the hunt?

A pioneering spirit
Adventure (alone or
with companions)

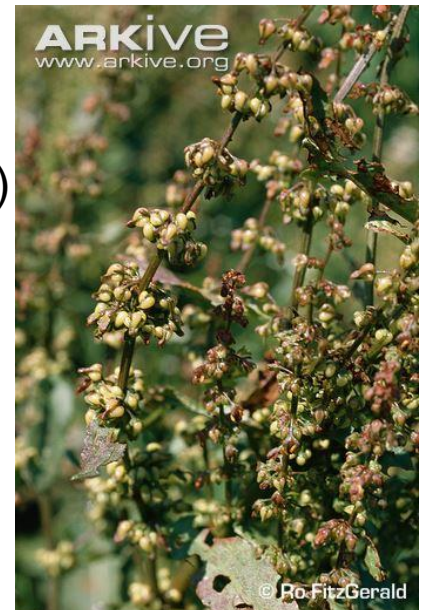


Searching in
previously
known locations



Exploring new habitats
e.g. Survey of bryophytes of arable land
(photo: South wales bryophytes blog)

Being unsuccessful
(but recording
these non-detections)



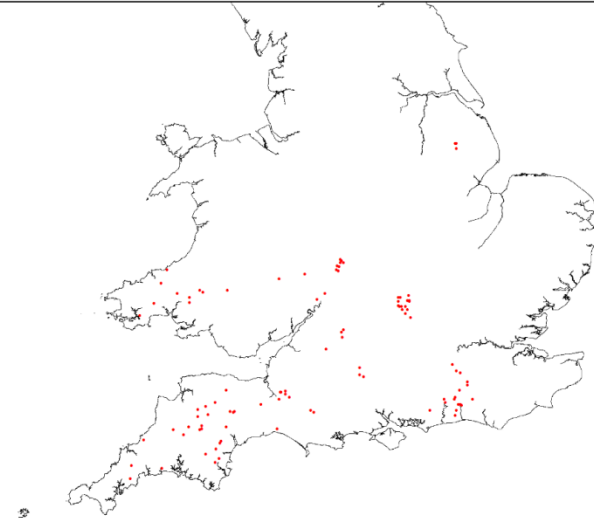
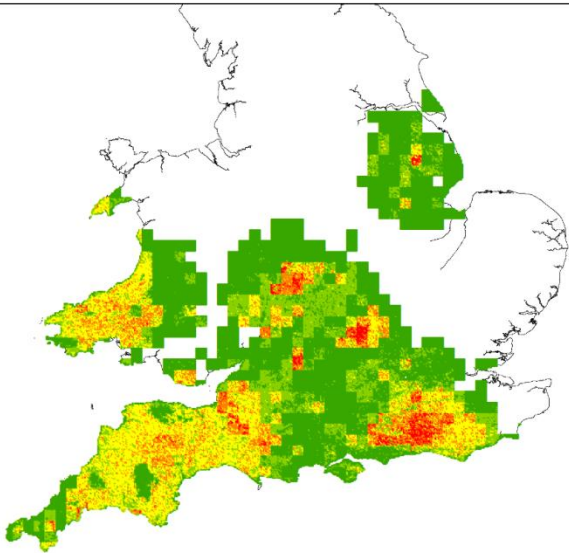
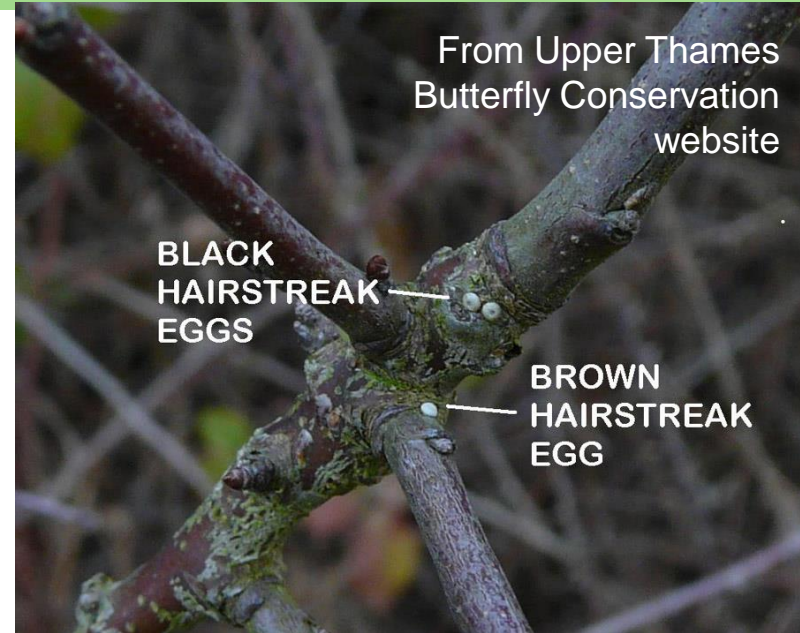


Previously recorded here

- Trifurcula headleyella* (in 2012)
- Coleophora niveicostella* (in 1988)
- Trifurcula cryptella* (in 1959)

Beyond known distributions

- Use Species Distribution Models to predict rare and restricted species
- Allocate squares based on 'inclusion probability'



Species distribution models

- A research need...
- Run SDMs for rare and restricted species
 - Based on habitats or environmental variables
 - Distribution of e.g. host plant
 - Based on 'faithful associates' (Smart et al. 2015 New Journal of Botany 5:72-88)
 - Maybe including expert opinion?

Common plants as indicators of habitat suitability for rare plants; quantifying the strength of the association between threatened plants and their neighbours

S. M. Smart^{*1}, S. Jarvis¹, K. J. Walker², P. A. Henrys¹, O. L. Pescott³, R. H. Marrs⁴

¹NERC Centre for Ecology and Hydrology, Lancaster Environment Centre, Bailrigg LA1 4AP, UK,

- Previously recorded here
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Species predicted to occur here

- 54% *Digitivalva perlepidella*
- 25% *Stigmella aeneofasciella*
- 12% *Phyllonorycter dubitella*
- 7% *Stephensia brunnichella*

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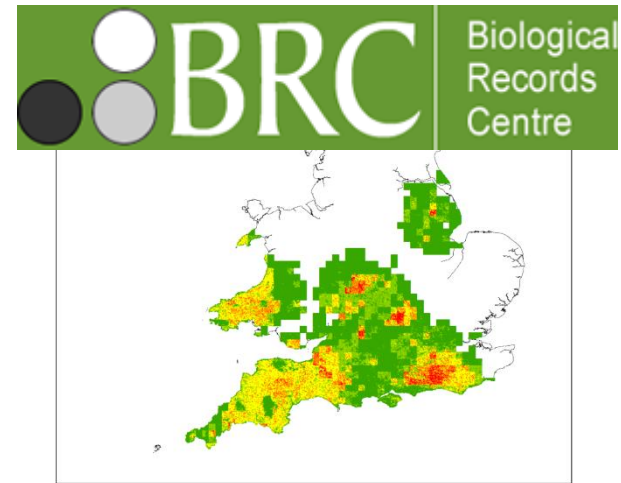
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