

Trends in Butterfly Monitoring

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Butterfly Monitoring

- What is butterfly monitoring?
- How are we using it?
- What future challenges are there?



Butterfly Monitoring

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What is butterfly monitoring

- Going into the field to watch butterflies?
- Entering records?
- Use some kind of protocol?
- Are distribution maps monitoring?
- Are estimates of the population size monitoring?
- Is establishing trend in distribution monitoring?
- Is establishing trend in population size monitoring?



Monitoring on transects

- Ernie Pollard on his way on one of the first transects



Butterfly Monitoring

- 1976: start of the first Butterfly Monitoring Scheme in the UK
- Well founded by many scientific papers
- Now at least 3000 transects in 15 European countries
- Every year our European volunteers count once around the world (40.000 km)!
- The Dutch BMS alone generates 200 000 records each year

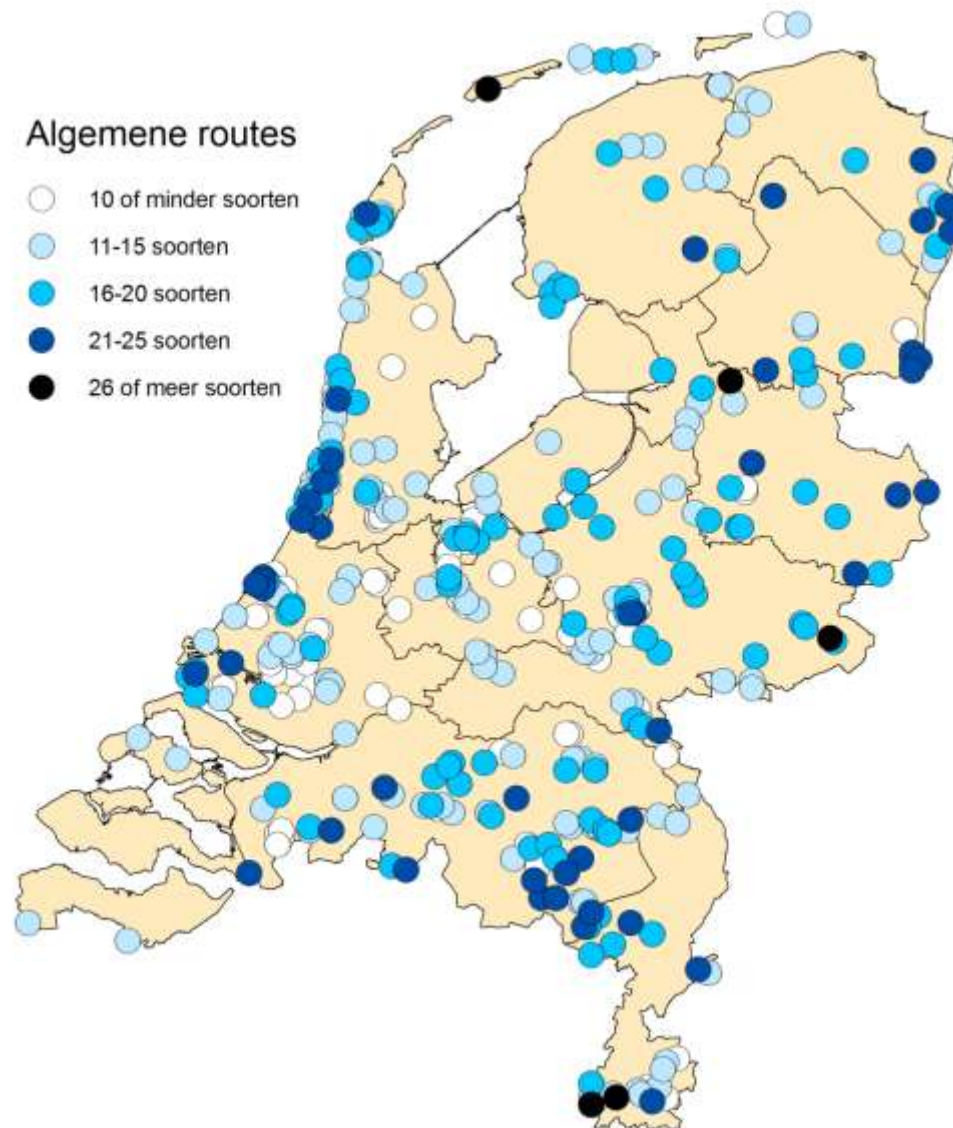


Population monitoring

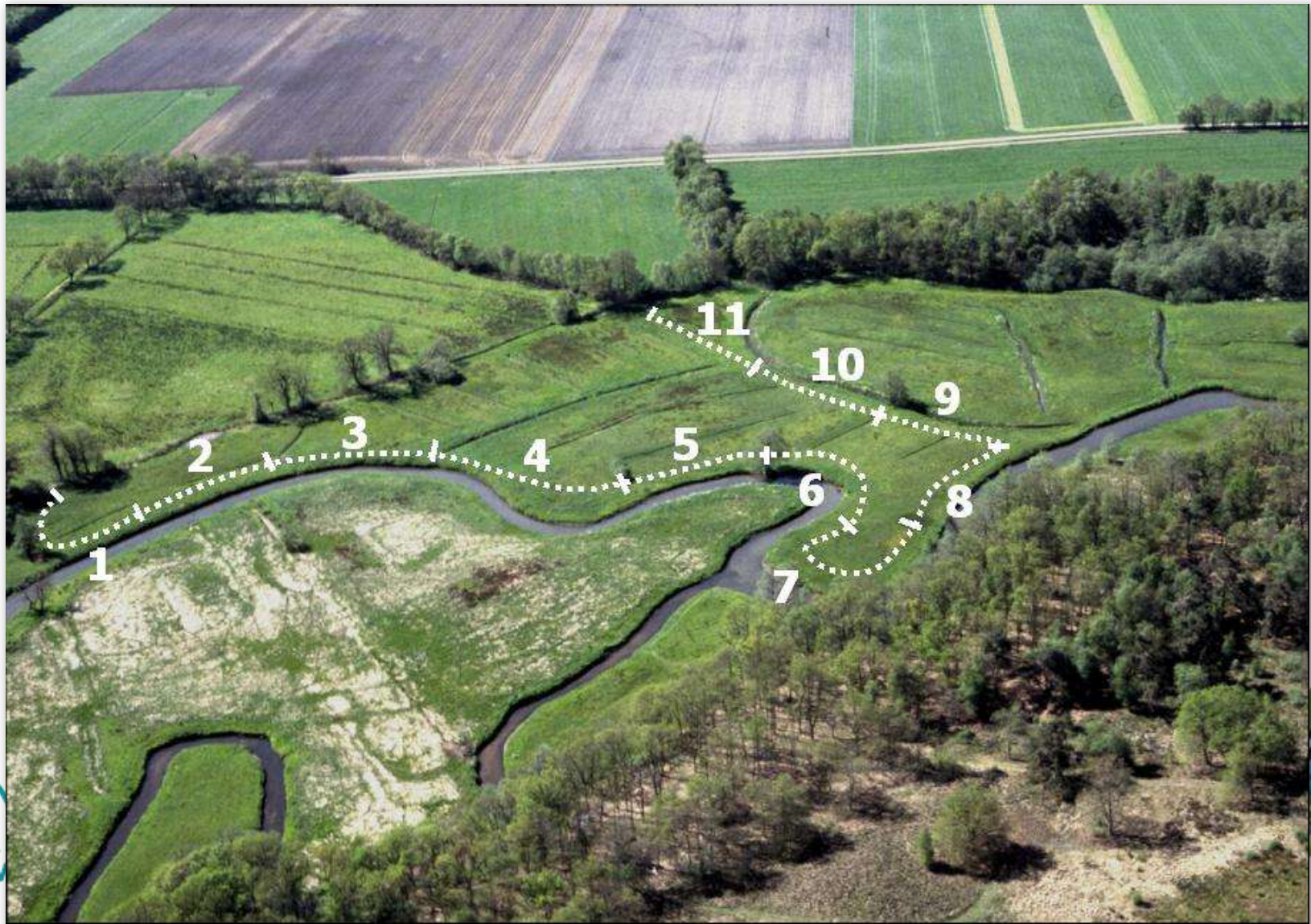
- We realise we can't count all butterflies
- But by taking samples we can estimate trends
- As a consequence we don't know the population size
- But we can calculate changes in the population size efficiently
- With random or grid sampling transects are properly distributed over the country
- But in many countries recorders have a free choice
- Stratified weighting can correct for this



Dutch BMS: >450 transects in 2011



Transect counts



Route of an observation

- Detection (-probability)
- Count
- ~~Write in notebook~~
- ~~Copy to formular by observer~~
- ~~Data entrance into database~~
- Check by co-ordinator
- Populationsize estimator ('index')
- Trend calculation

• Every step has a risk for errors
• Every step we can eliminate improves our schemes



What are we counting?

- Weekly counts on transects
- Estimation of the number of 'butterfly days' spent on the transect
- But population size depends also on the average age of a butterfly on the transect:
$$\text{population size} = \text{butterfly days} / \text{average age}$$
- This average age tends to be relatively long in cool weather and shorter in warm weather
- In theory climate change might cause a bias



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From counts to indicators

- The site-focused option:
fine-grained site resolution
- The extensive monitoring option:
fine-grained spatial variation



*Observation effort
per site (grain of
resolution)*

LTER

Local
monitoring

Extensive
monitoring

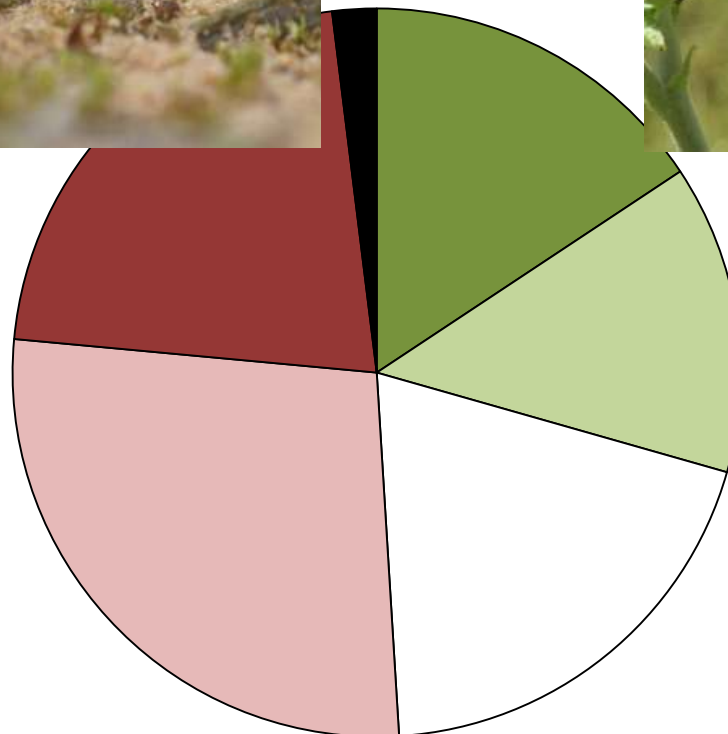
Remote
sensing

*Density of
monitored sites
(grain of spatial
variation)*

*Size of the area
monitored*



Winners and losers



- strong increase
- Medium increase
- Stable
- Medium decrease
- Strong decrease
- Uncertain



EU criteria for indicators

- Scientific sound method
- Sensitive
- Affordable monitoring, available and routinely collected data
- Spatial and temporal coverage of data
- Measure progress towards target
- Policy relevance
- Broad acceptance

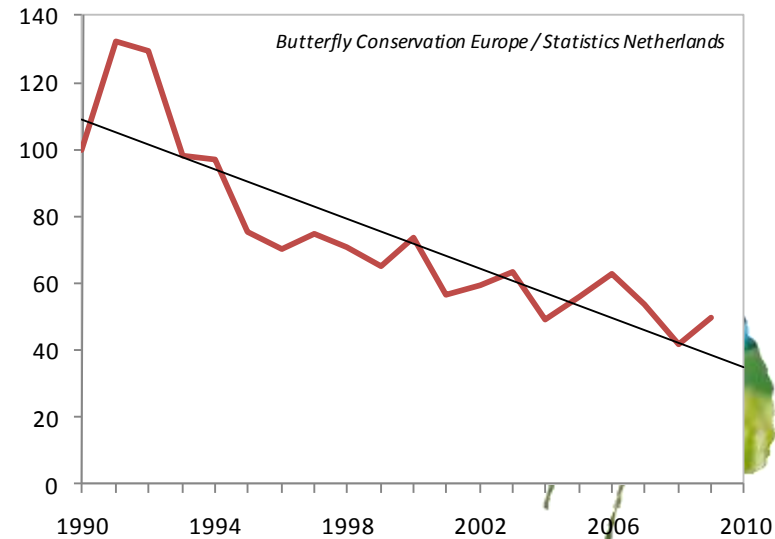
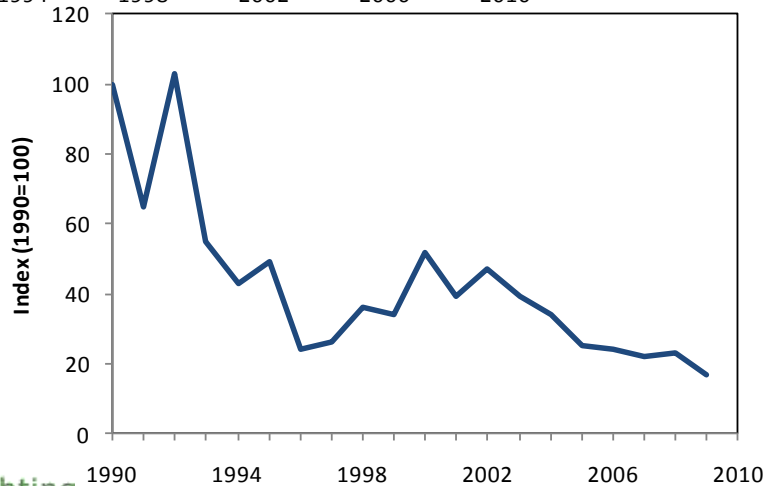
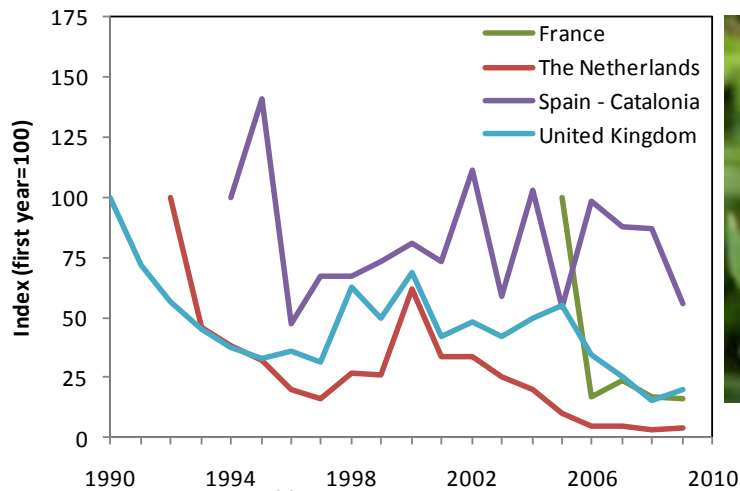


We use two types of indicators

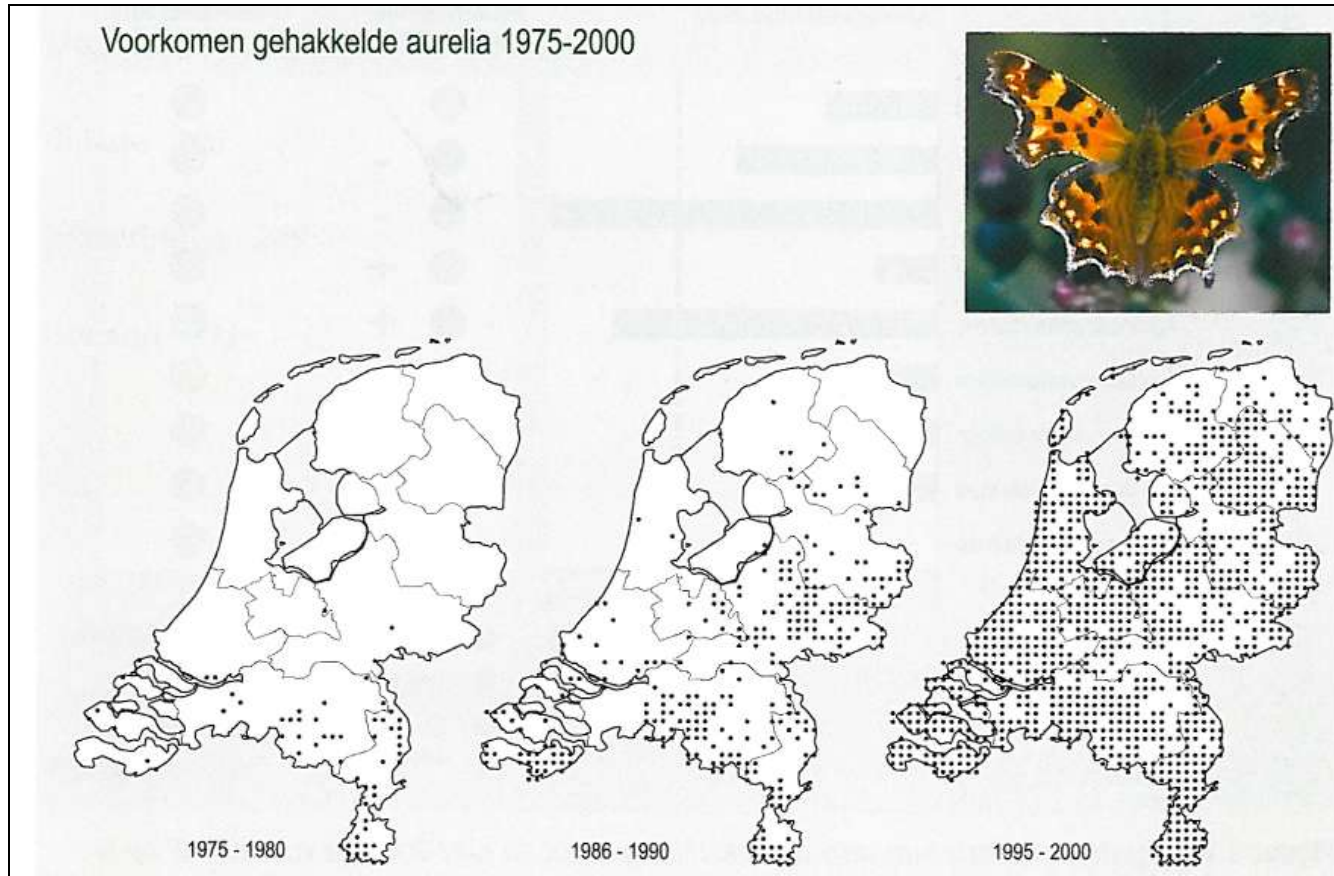
- Combine species trends to indicators: the European grassland butterfly indicator
- Build an indicator that uses changes in species composition: the Climate Change Indicator



From national trends to a European trend

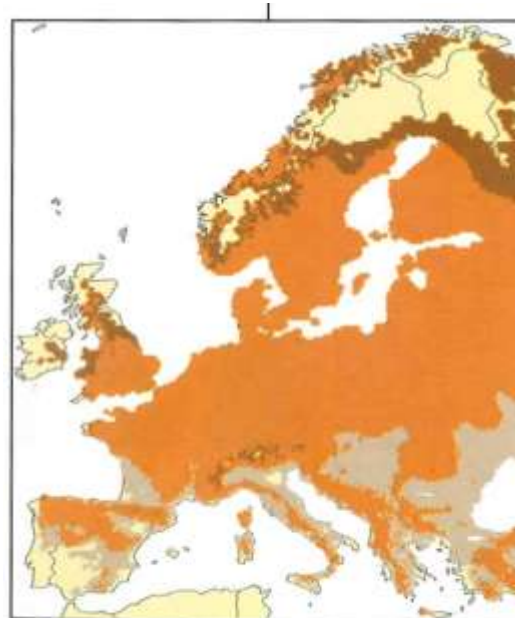
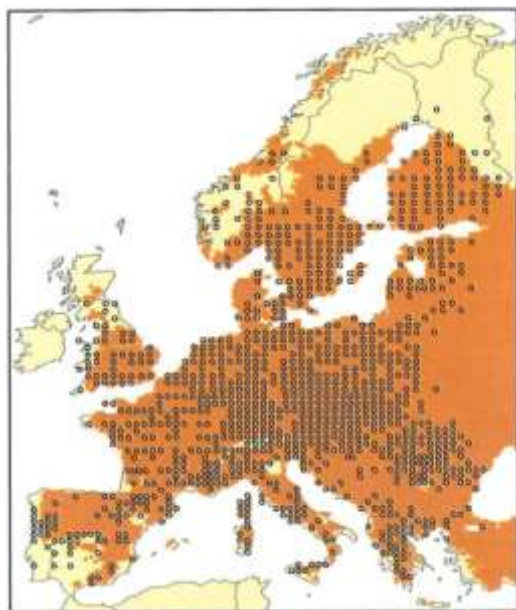


Shift in edge can be considerable

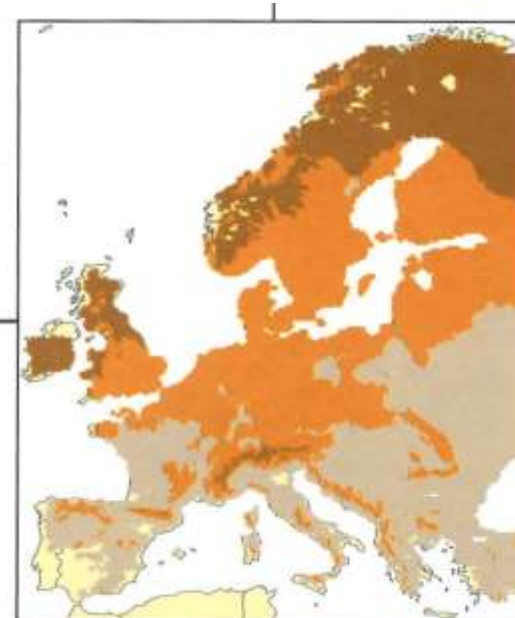


*Range expansion of *Polygonia c-album* in the Netherlands between 1975 and 2000 (Milieu- en Natuurplanbureau, 2003).*





2050

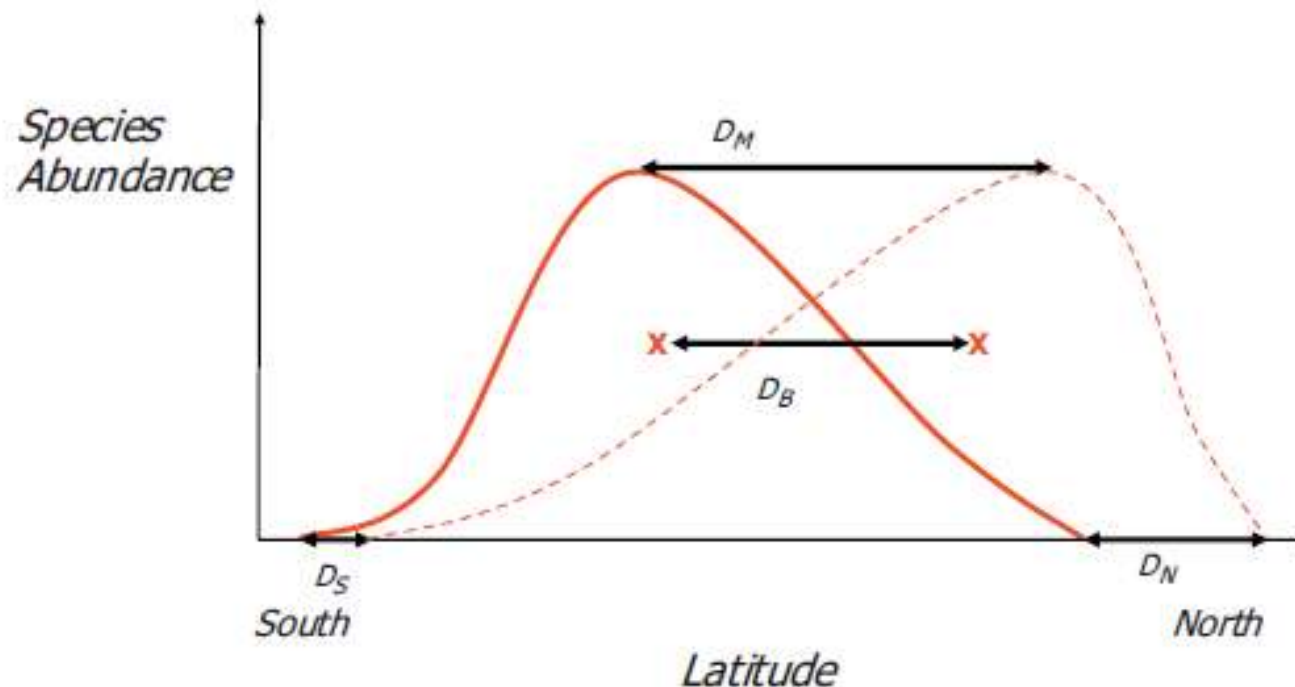


2080

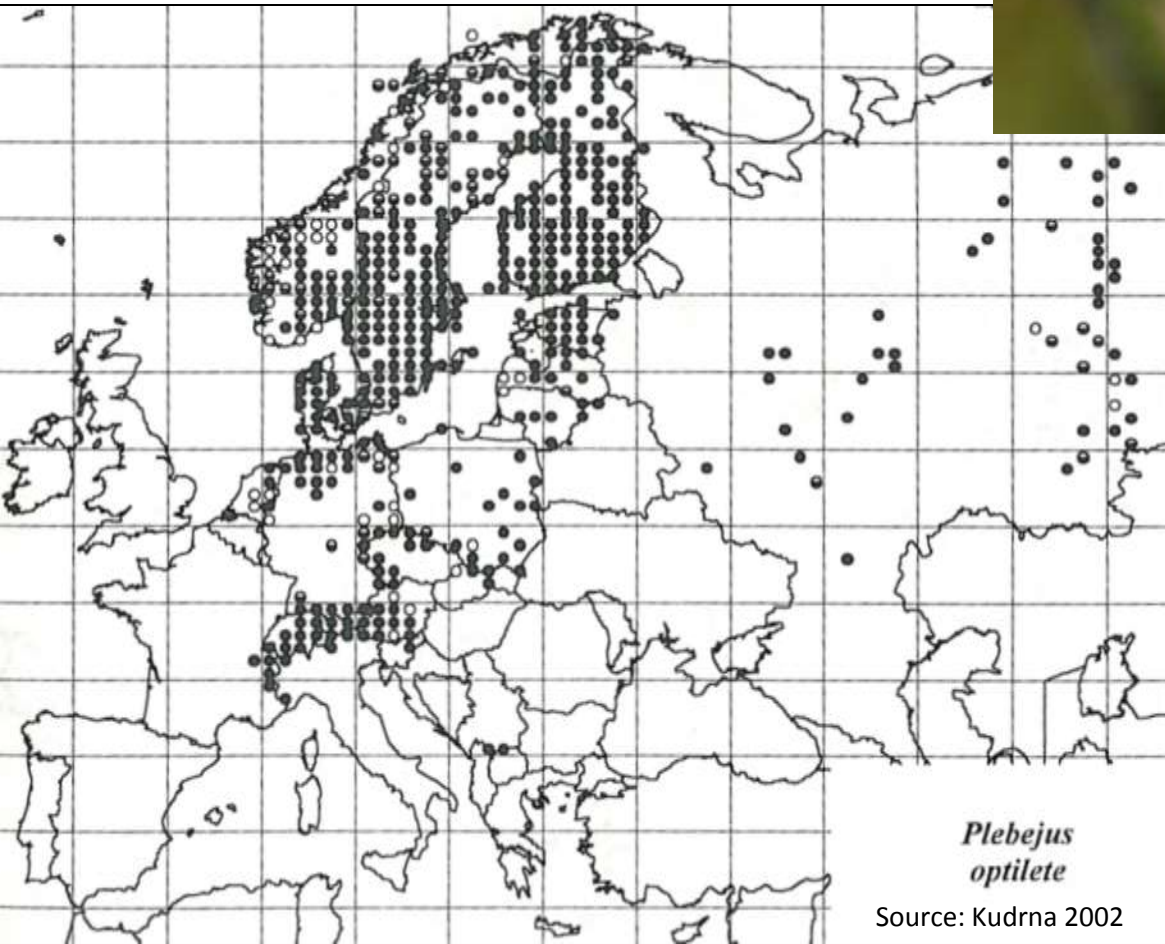
GRAS
(A1FI)



Shift in numbers causes shift in composition



A cool species: *Plebejus optilete*



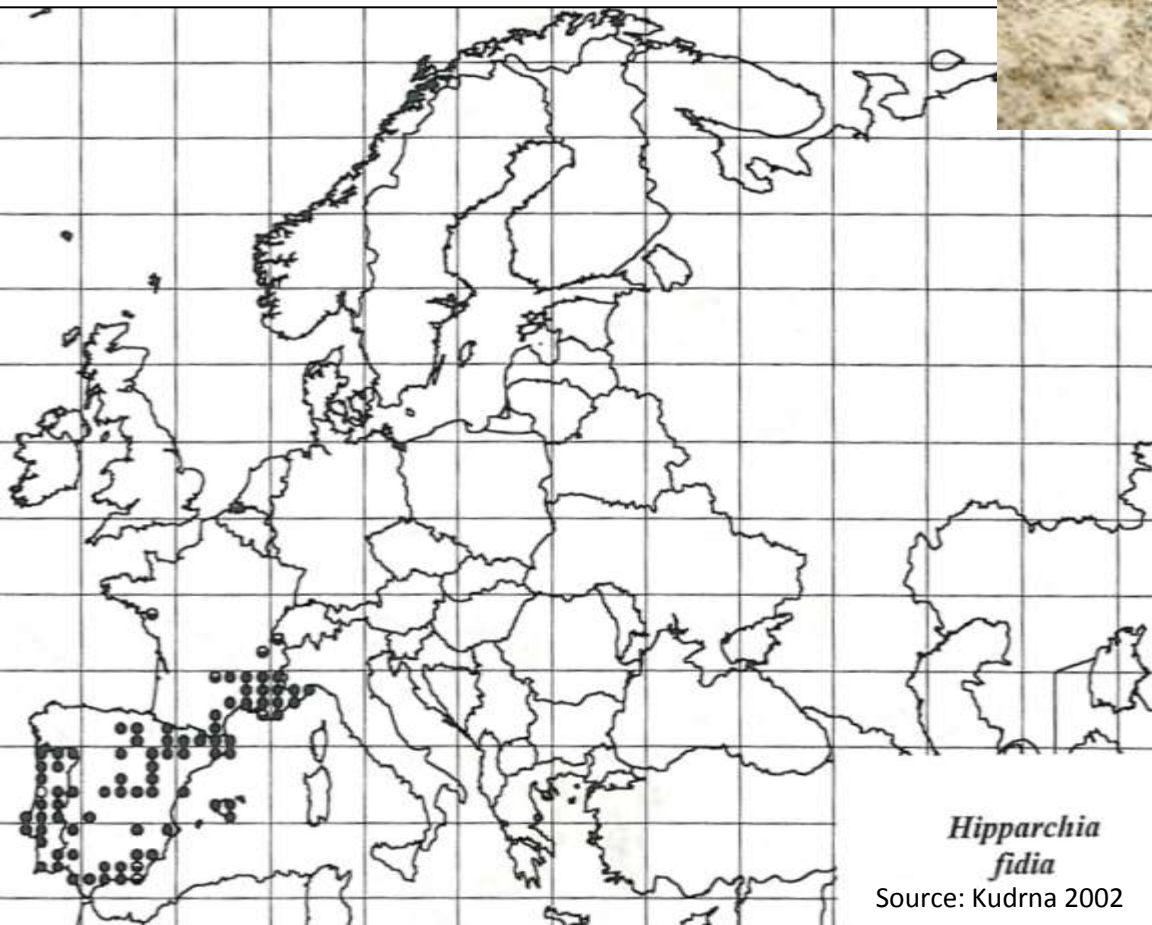
*Plebejus
optilete*

Source: Kudrna 2002

STI=4.2°C



A warm species: *Hipparchia fidia*



*Hipparchia
fidia*

Source: Kudrna 2002

STI=13.5°C

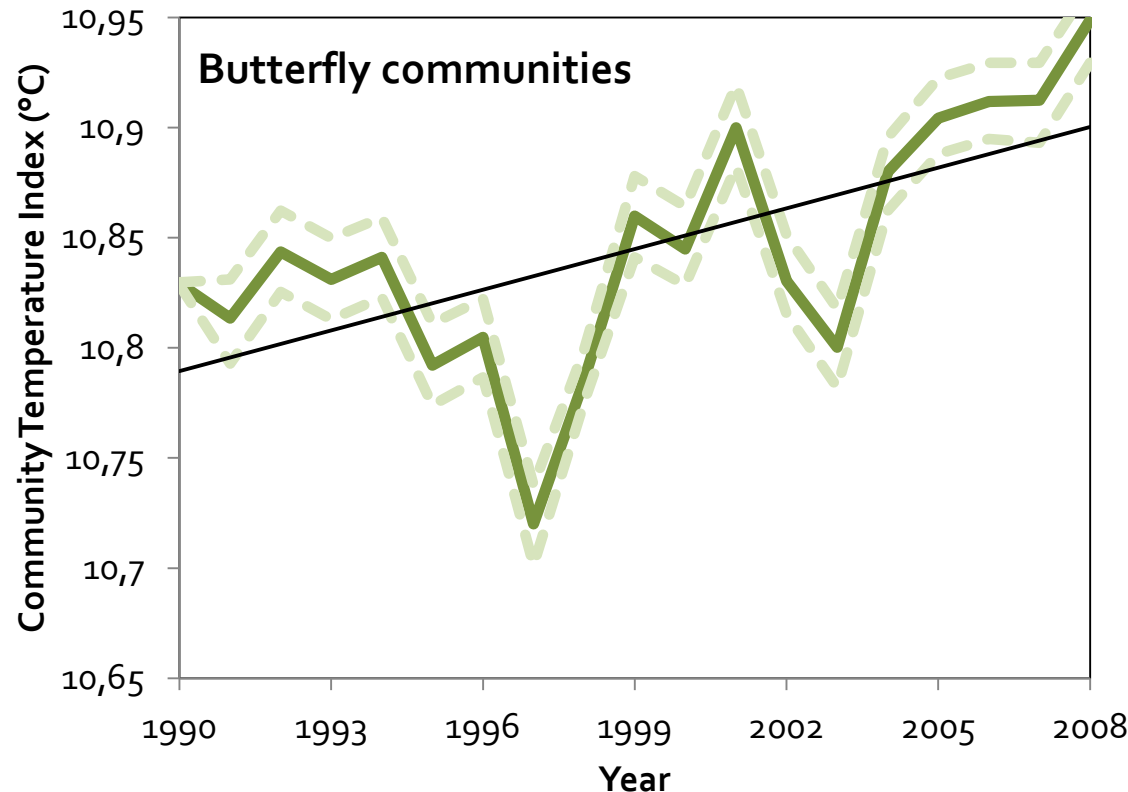


Community Temperature Index CTI

- Average of each individual's STI on a transect
- A high CTI would thus reflect a large proportion of warm species with a high STI, i.e. more high temperature dwelling species.
- A rising CTI means
 - warm species are increasing and/or
 - cool species declining



Change in temperature community

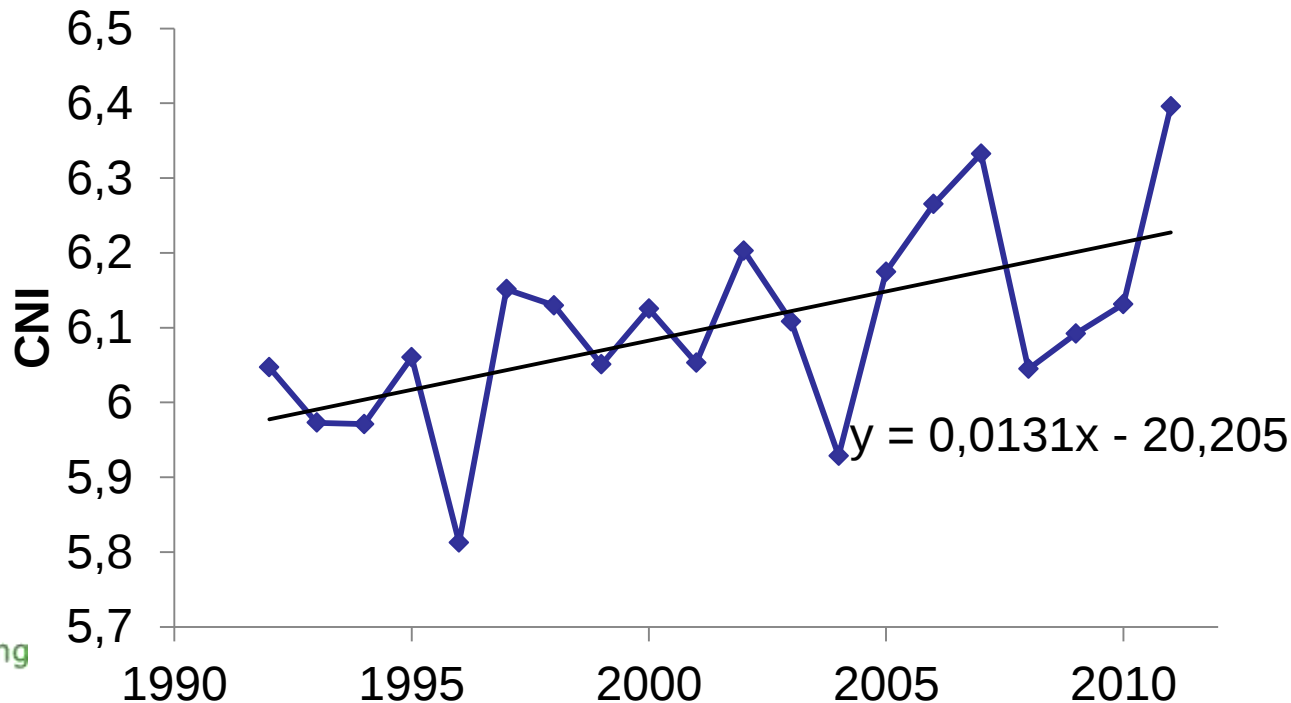


Shift in butterfly communities of 114 ± 9 km compared to a 249 ± 27 km shift of temperature

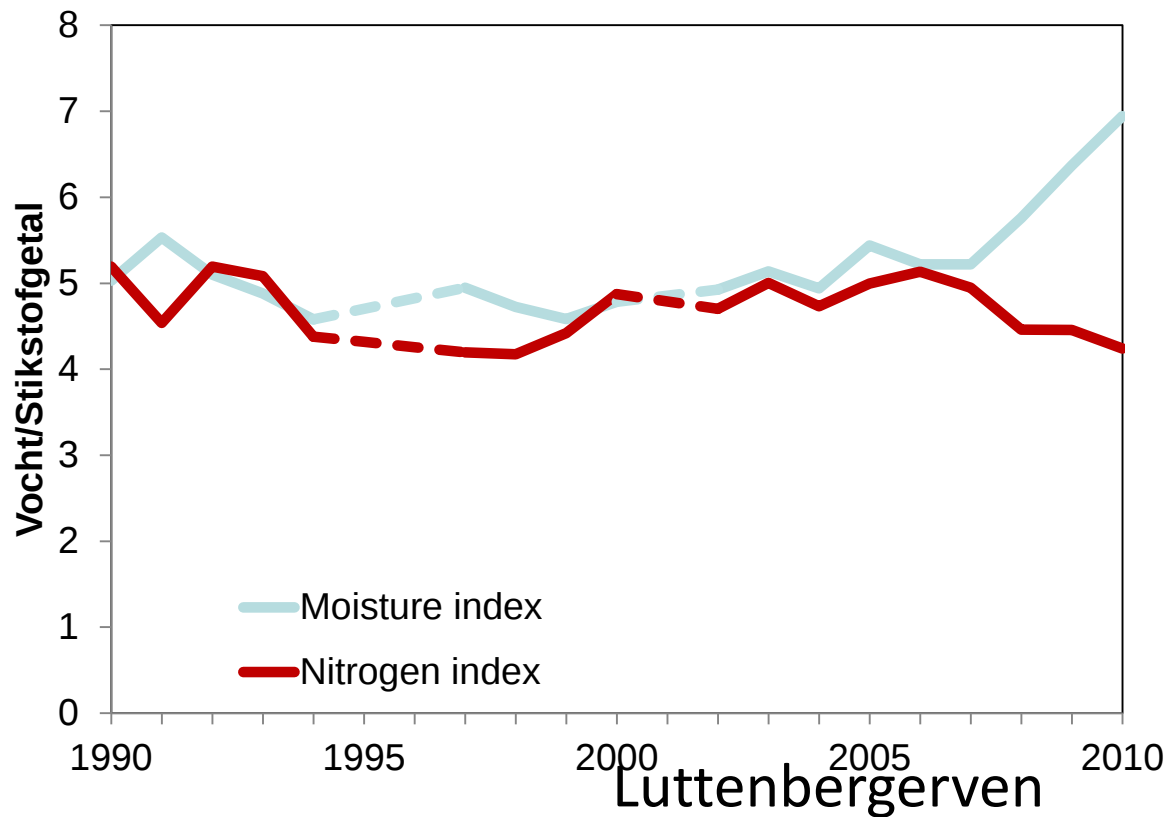


Community structure

- Michiel showed Nitrogen in his opening talk
- Could we show the effect of intensification vs abandonment?



Use butterfly monitoring results for site information



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Habitats Directive

- The Habitats Directive requires periodic assessment of the species and habitat types to see if they are at Favourable Conservation Status.



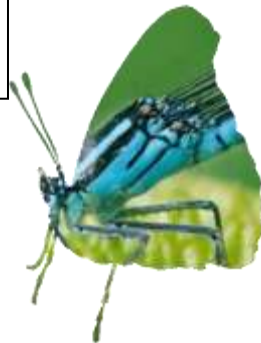
In 2013: reporting on article 17

Information

Article 17

1. Every six years from the date of expiry of the period laid down in Article 23, Member States shall draw up a report on the implementation of the measures taken under this Directive. This report shall include in particular information concerning the conservation measures referred to in Article 6 (1) as well as evaluation of the impact of those measures on

What are the consequences for butterfly monitoring?



Species that have to be reported

- species listed on Annexes II and/or IV
- for each biogeographical or marine region in which they occur by each Member State.



Assessing conservation status

- Favourable conservation status is defined by four parameters for each species:
 - Range
 - Population
 - Habitat for the species
 - Future Prospects
- Trend in population: a large decline equivalent to a loss of more than 1% per year leads to an unfavourable status
- This is where monitoring should come in!



Technique

- Can we extend our transect counts to other countries in Europe?
- And to the rest of the world?
- Or should we think of other ways?



New technique: occupancy modeling

- Exciting new technique
- At the moment especially used for distribution trends
- Certainly go to Arco van Striens talk (today, 15.00 h):

10-4	Arco van Strien	Occupancy trends derived from long time series data of butterflies
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Reporting back

- Our BMS focus on national/regional trends
- They are hard to use by landowners
- We need evidence based conservation
- Can we advice landowners / managers in more detail?
- Can we combine butterfly monitoring data and techniques with occupancy modeling on a detailed scale?



Future challenges

- How to get more countries in Europe involved?
- How to extend over the world?
- Can we use the same techniques?
- Can we make our results more useful for landowners / nature reserve wardens / nature conservation organisations etc.



Broader involvement in Europe

- Butterfly Conservation aims at extending butterfly monitoring efforts in more countries
- We hope to develop an online tool to make it easy for everyone to enter and analyse their data

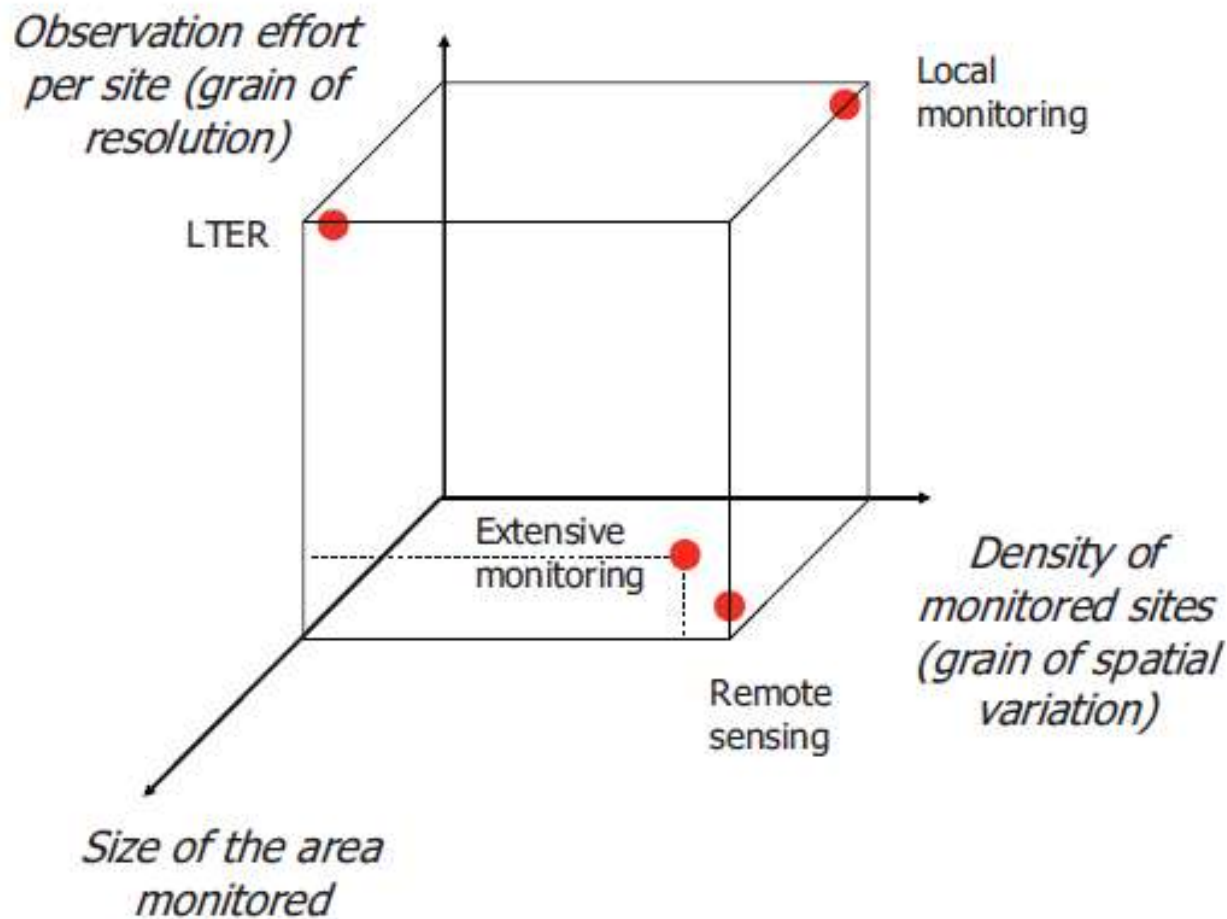


The world?

- Just like in the climate world a distinction becomes visible between biodiversity data collection and the interpretation at global scale.
- GEO BON: Biodiversity Observation Network
- IPBES: Intergovernmental Platform on Biodiversity and Ecosystem Services



Conclusions



Conclusions

- We are on the right way!
- Extensive monitoring
- But also take care of the demands of landowners/nature wardens
- Think of ways to expand to the rest of Europe and the rest of the world
- Butterflies are beautiful, fun, not threatening, so the ideal world biodiversity indicators





De Vlinderstichting
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www.vlinderstichting.nl



Centraal Bureau voor de Statistiek
Statistics Netherlands
www.cbs.nl

