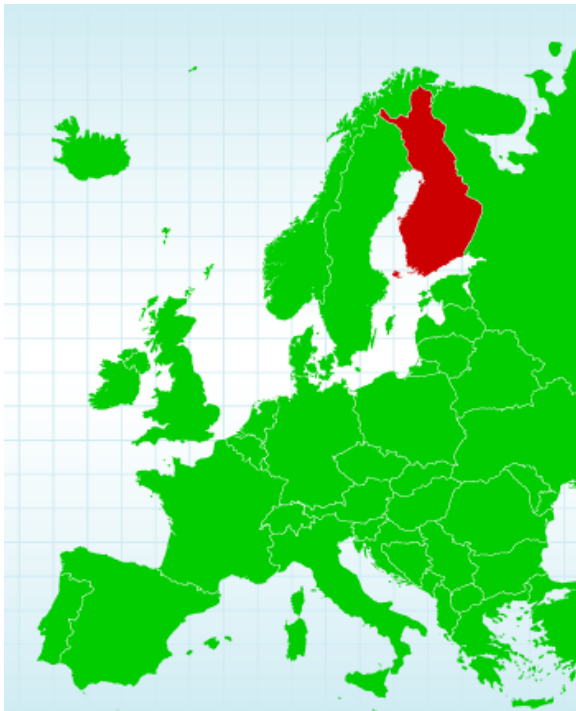# Results from country BMS: Finland

Mikko Kuussaari

Finnish Environment Institute (SYKE)


Janne Heliölä
National coordinator

Mikko Kuussaari
International research collaboration

"Recording and monitoring butterflies across Europe" Laufen 29 Nov – 2 Dec 2017
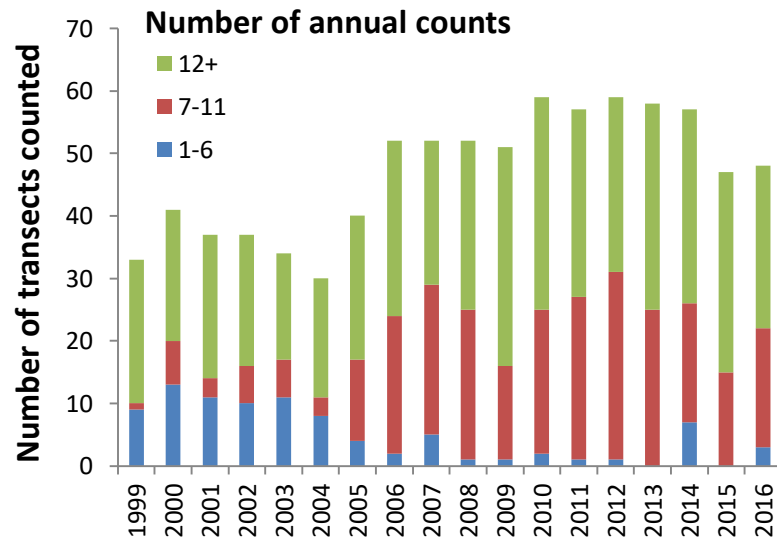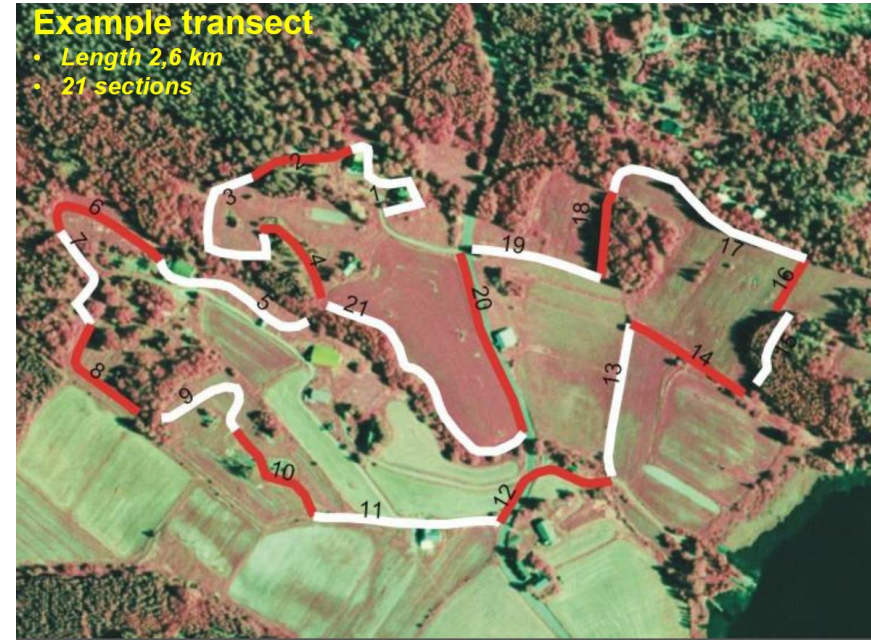
Structure of the talk

- Methods and summary statistics of the Finnish transect BMS 1999-2016
- Butterfly trends based on the transect BMS
- Transect BMS results compared to Finnish butterfly atlas monitoring and moth monitoring schemes
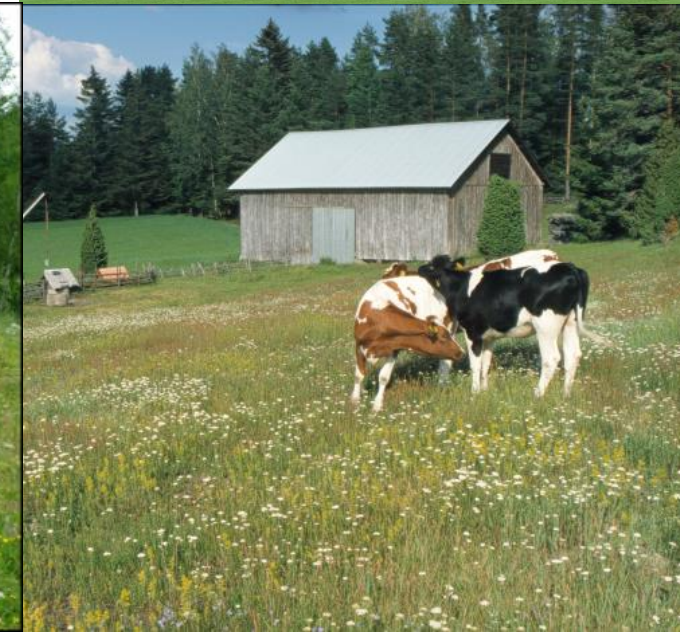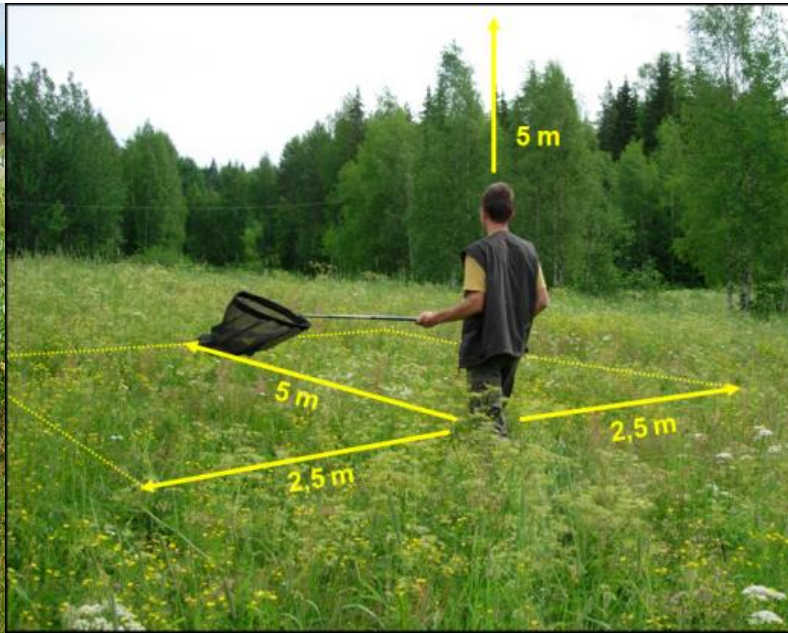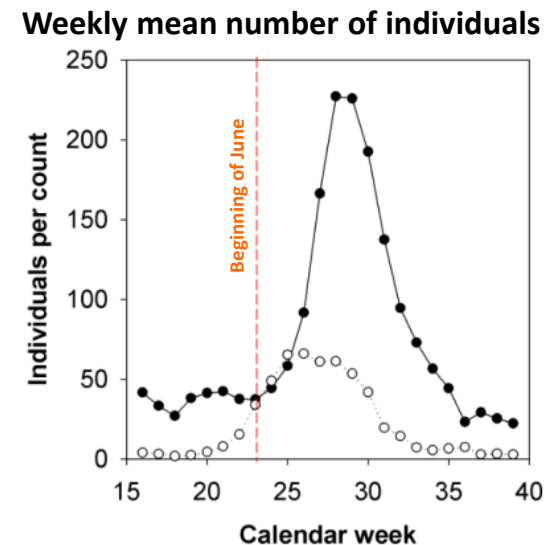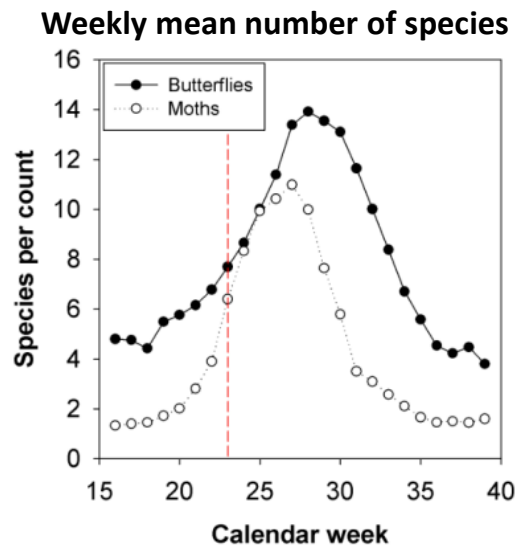
Aims and the methodology used in Finland

- Scheme started in 1999

- Coordinated by the Finnish Environment Institute (SYKE)

- **Focus on agricultural landscapes (monitoring of farmland biodiversity)**

- Mostly amateur transects
  - Length and number of sections vary
  - Average transect length 2-3 km
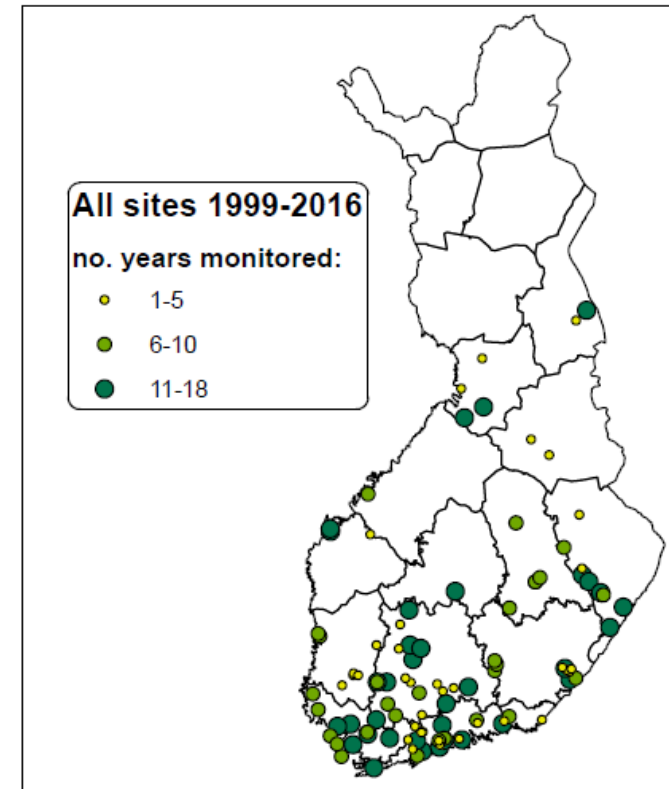 - Number of counts 10-12 (whole season only 16 weeks; May-August)

Example transect
- *Length 2,6 km*
- *21 sections*

Number of annual counts

12+
7-11
1-6

Number of transects counted

Timing of the Finnish butterfly season

Weekly mean number of species

Butterflies
Moths

Beginning of June

Weekly mean number of individuals
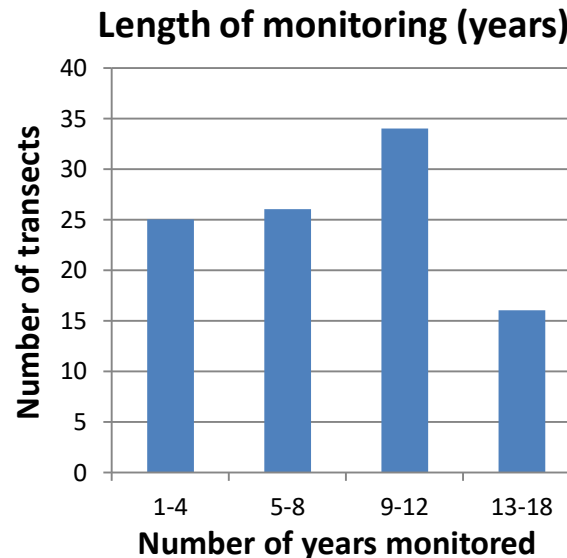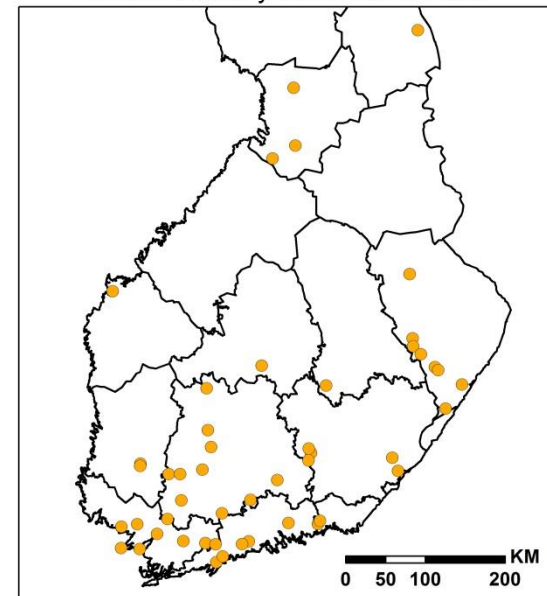
Beginning of June

Extent of the Finnish BMS

- Annually 48-60 transects counted
  - Total of 104 transects (1999-2016)
  - 42 transects counted in at least 10 years
  - Lacking data points filled in using TRIM
- Mostly linear habitats (field margins, forest edges and verges of small roads)
- Less than20% of transect subsections in various kinds of grassland habitats

All sites 1999-2016
no. years monitored:
- 1-5
- 6-10
- 11-18

Finnish butterfly transects in 2016

70 Sipoo, Nikkilä (1750 m)

Length of monitoring (years)

Number of transects (y-axis)
Number of years monitored (x-axis): 1-4, 5-8, 9-12, 13-18

Summary of data collected during 1999-2016

TOP 15 species		Total counted individuals 1999-2016
1.	Aphantopus hyperantus	207 396
2.	Pieris napi	103 838
3.	Thymelicus lineola	81 184
4.	Gonepteryx rhamni	52 790
5.	Nymphalis urticae	51 382
6.	Nymphalis io	45 343
7.	Brenthis ino	41 851
8.	Boloria selene	33 485
9.	Lycaena virgaureae	25 769
10.	Erebia ligea	24 342
11.	Ochlodes sylvanus	22 006
12.	Callophrys rubi	21 814
13.	Plebeius amandus	16 574
14.	Argynnis adippe	10 964
15.	Coenonympha glycerion	10 814

- Butterflies
  - 900 000 individuals and 90 species
  - On average ca. 30 species annually per transect
  - 45 species with calculated trends (TRIM)
- Also other day-active Macrolepidopterans counted on almost 50% of the transects
  - 170 000 individuals
  - 325 species, of which ca. 30-40 common in day-time
  - Calculated population trends for 27 species (TRIM)

$\Rightarrow$ Good coverage of common species in field margins, semi-natural grasslands and forest edges

$\Rightarrow$ Rare and threatened species only occasionally on transects

$\Rightarrow$ Bog specialists and arctic species not covered by the scheme

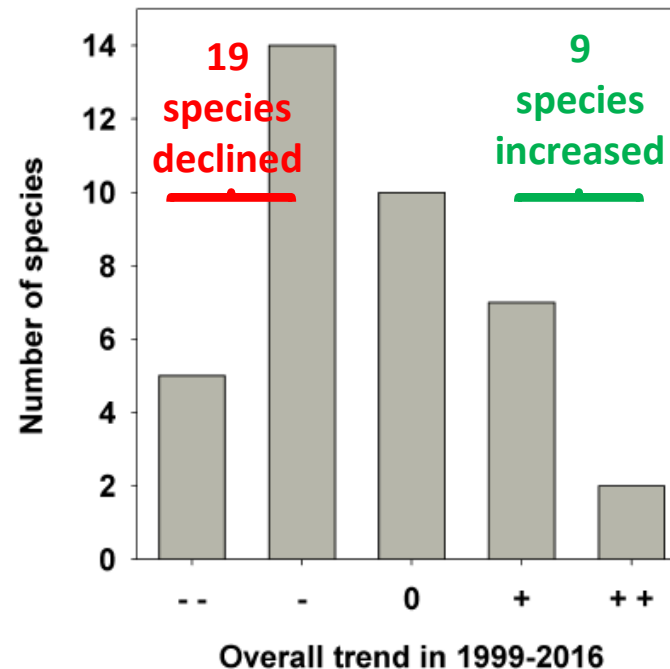# Reporting and general patterns

- Annual reporting in media and in the lepidopterological journal Baptria

- Results not yet published as scientific papers
  - Exceptions collaboration among European schemes

- Annual reporting based on TRIM and simplistic use of data
  - TRIM indices not yet based on annual phenology curves
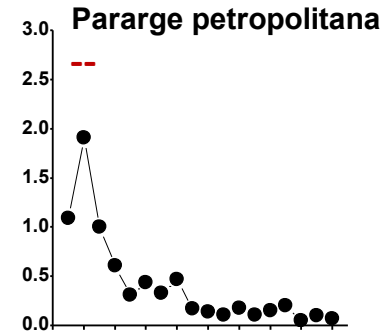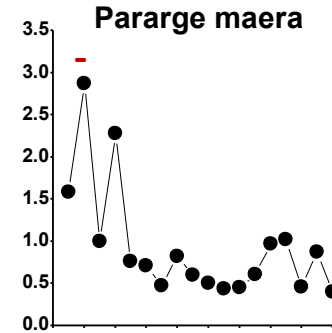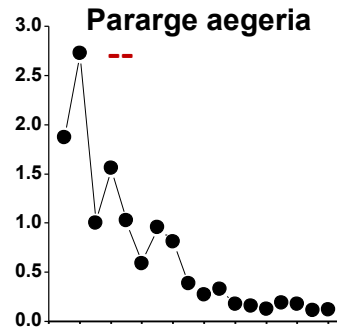
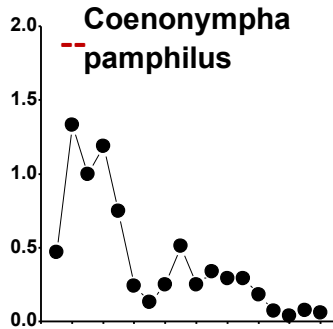**Slightly decreasing general trend**

Recently several consecutive summers of bad weather
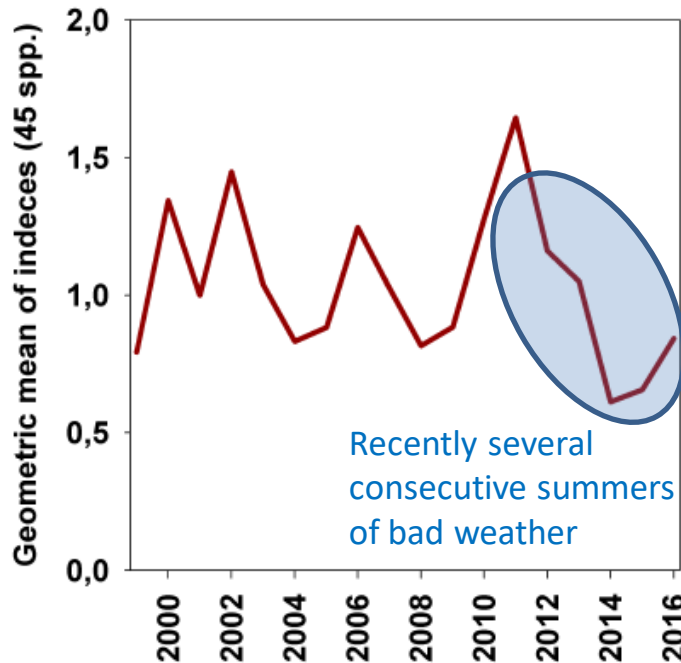
More species with negative than positive trends

19 species declined

9 species increased

Butterfly population trends (TRIM) 1999-2016

Examples of **negative trends**
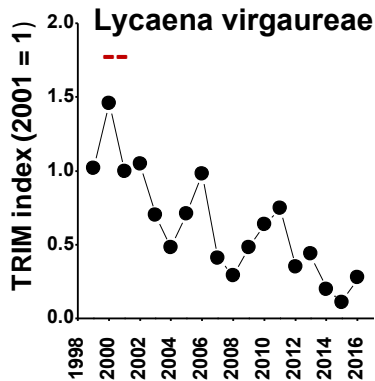
45 species with calculated TRIM trends

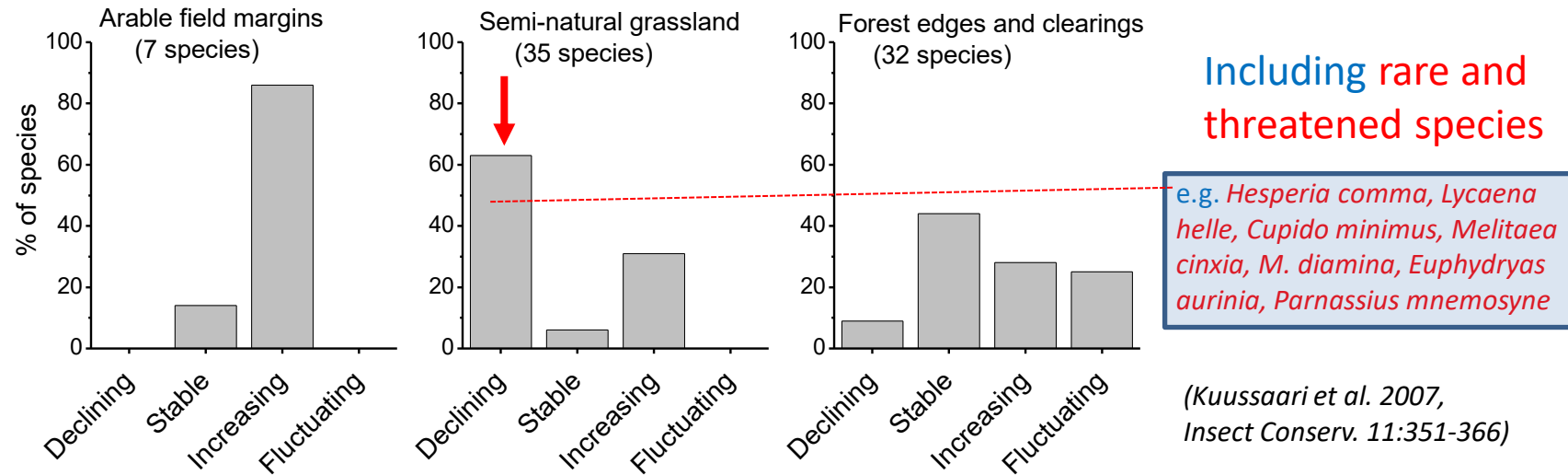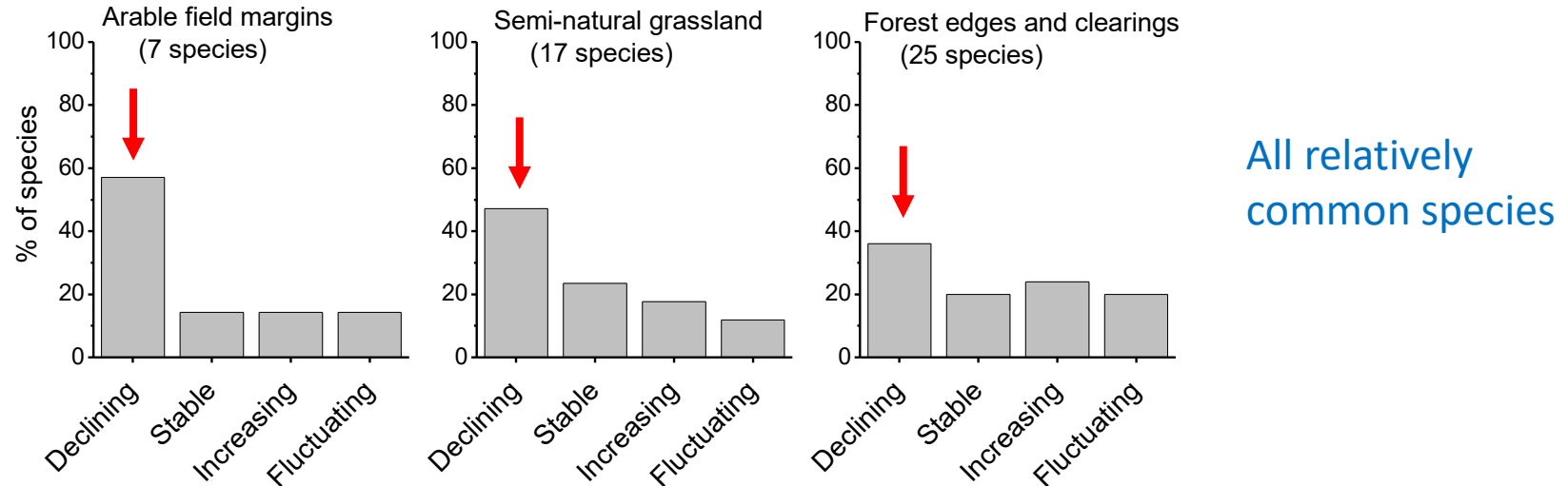| Strong decrease	Decrease	Stable	Increase	Strong increase
Lycaena virgaureae	*Carterocephalus silvicola*	*Aporia crataegi*	*Thymelicus lineola*	*Araschnia levana*
Coenonympha pamphilus	*Ochlodes sylvanus*	*Gonepteryx rhamni*	*Anthocaris cardamines*	*Argynnis paphia*
Parage aegeria	*Leptidea sinapis*	*Callophrys rubi*	*Lycaena hippothoe*	*(Leptidea juvernica)*
Parage petropolitana	*Pieris napi*	*Lycaena phlaeas*	*Celastrina argiolus*	
	Plebeius artaxerxes	*Plebeius argus*	*Plebeius idas*	
	Polyommatus amandus	*Polyommatus semiargus*	*Brenthis ino*	
	Polyommatus icarus	*Nymphalis antiopa*	*Melitaea athalia*	
	Nymphalis urticae	*Nymphalis io*		
	Nymphalis c-album	*Argynnis aglaja*		
	Argynnis adippe	*Boloria selene*		
	Boloria euphrosyne			
	Erebia ligea			
	Aphantopus hyperantus			
	Coenonympha glycerion			
	Pararge maera			

Examples of **positive trends**
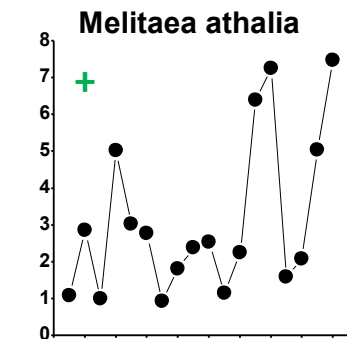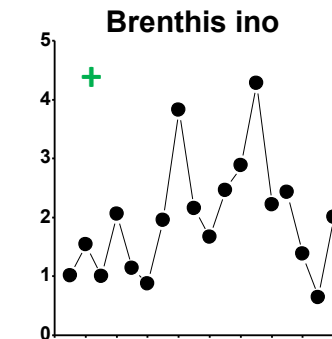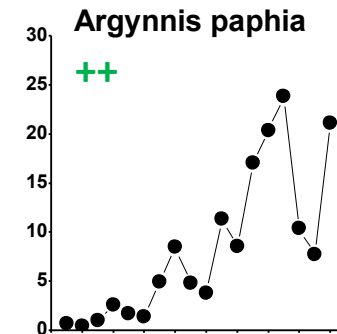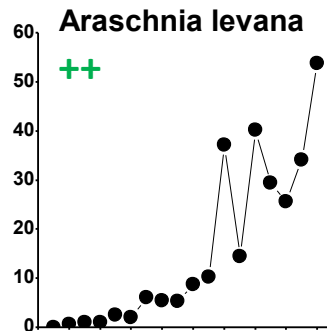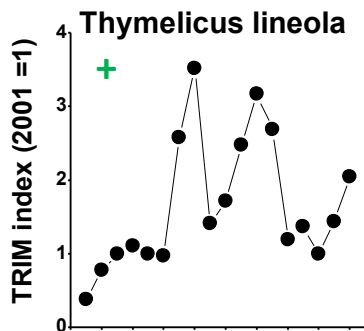
Observed trends in relation to habitat preferences

Based on **atlas data** (10 km grid square **occupancy**) **1950-2000**   (all the 74 species)

Including rare and threatened species

e.g. *Hesperia comma, Lycaena helle, Cupido minimus, Melitaea cinxia, M. diamina, Euphydryas aurinia, Parnassius mnemosyne*

(Kuussaari et al. 2007, Insect Conserv. 11:351-366)

Based on **transect counts** (i.e. **abundance**) **1999-2016**   (49 species with sufficient data)

All relatively common species

Population trend increases with preferred vegetation height

Scatter plot with x-axis "Change in frequency since 1960s (%)" ranging from -100 to 200, and y-axis "Mean vegetation height in July (cm) where the species present" ranging from 30 to 80.

R² = 0.26
p = 0.007
n = 60

Legend:
- Grassland species
- Forest edge species
- Field margin species

Butterfly images labeled: *Araschnia levana*, *Nymphalis io*, *Parnassius mnemosyne*, *Maniola jurtina*
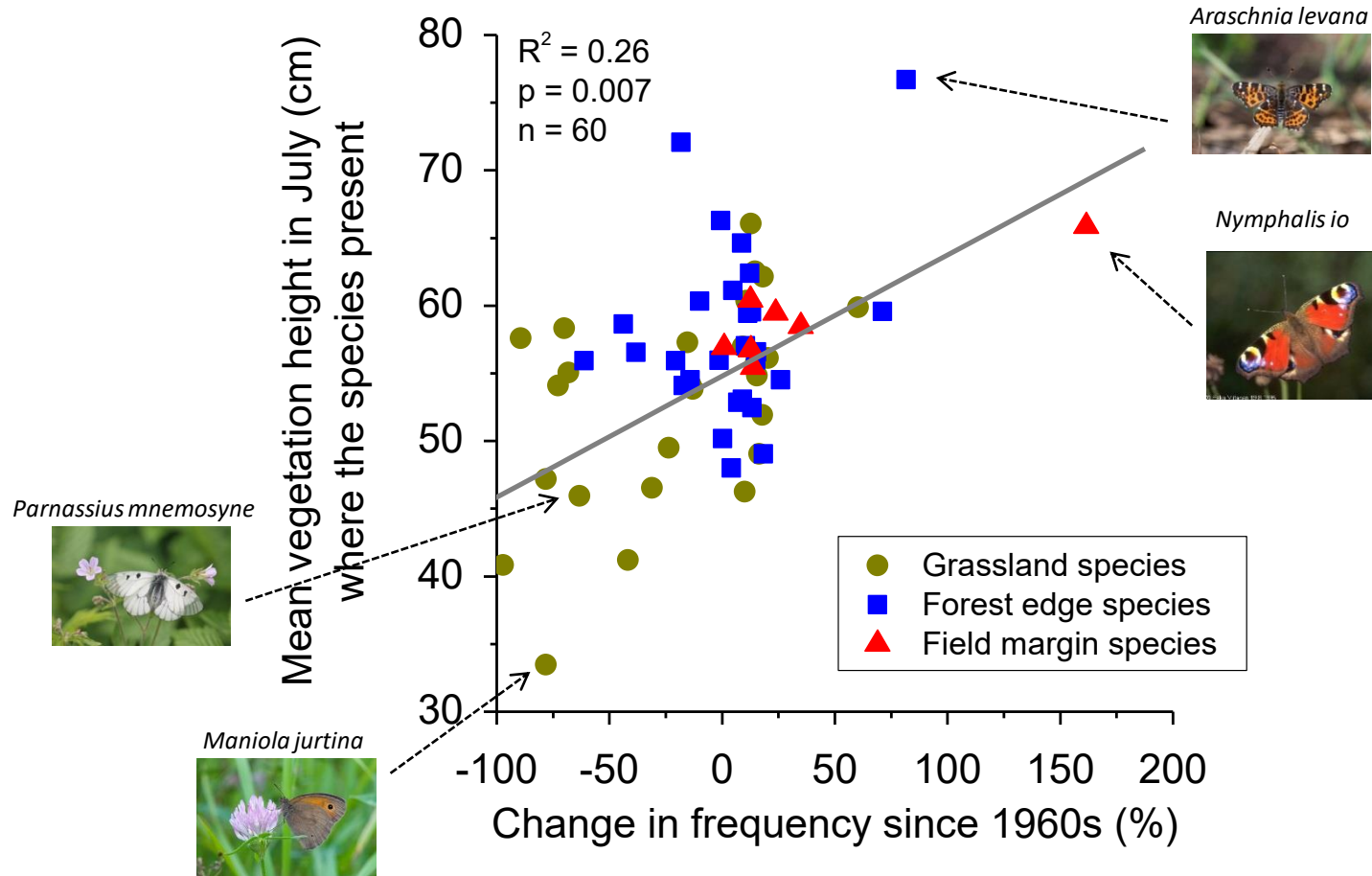
- Species preferring lower vegetation have decreased presumably due to loss of suitable habitat
- Habitat loss caused by
  - Agricultural changes, e.g. ceasing of grazing in natural pastures
  - Increasing nitrogen deposition
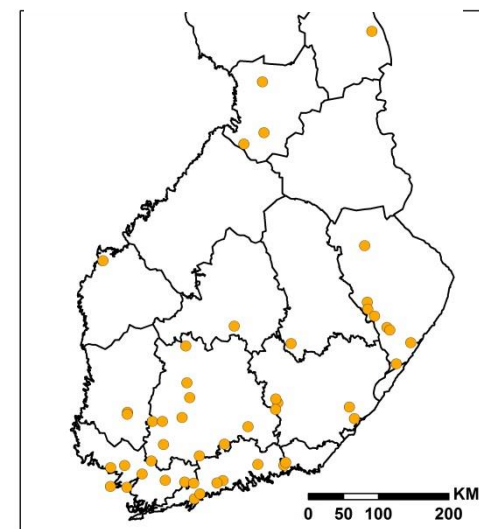
Almost all grass-feeding species have declined
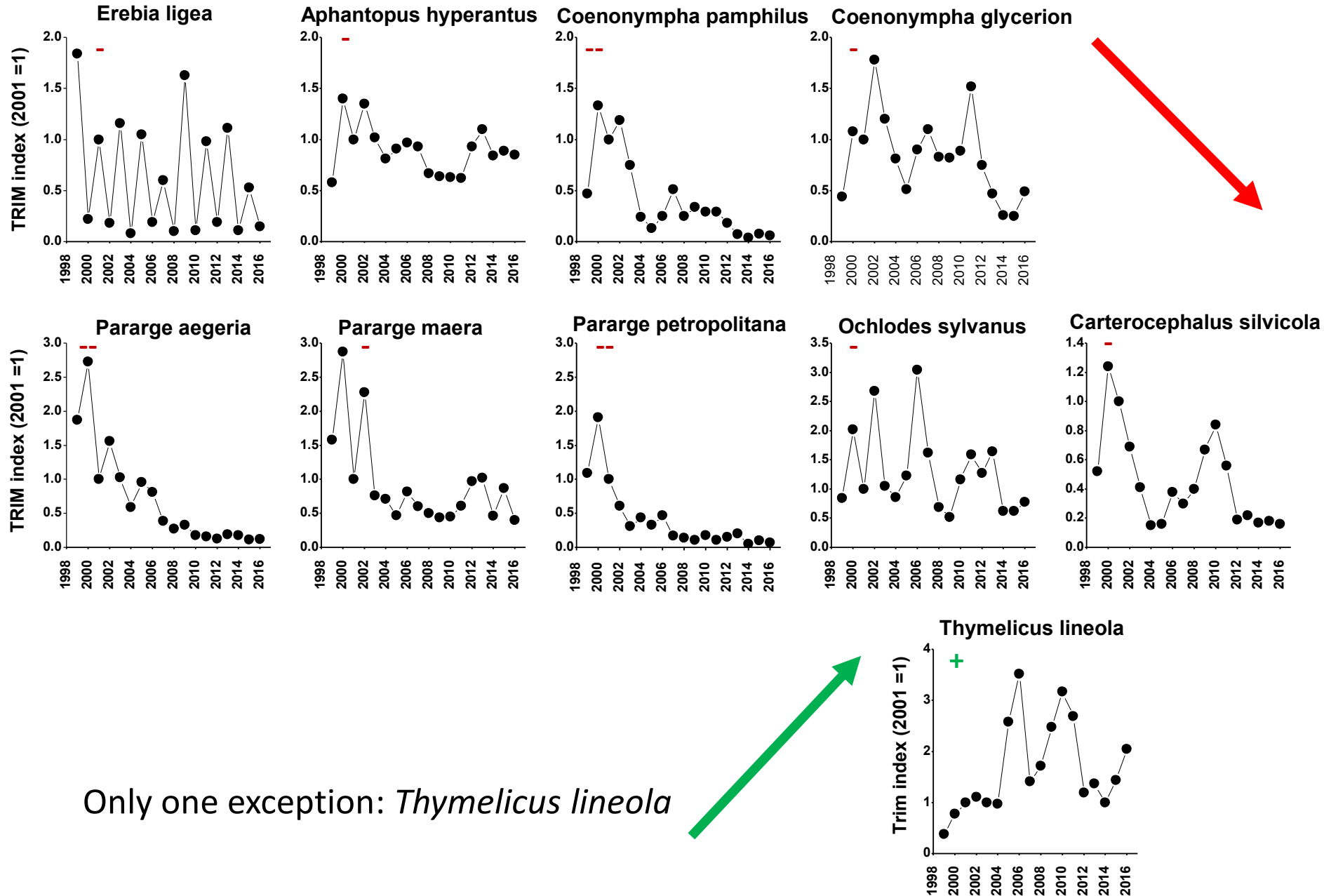
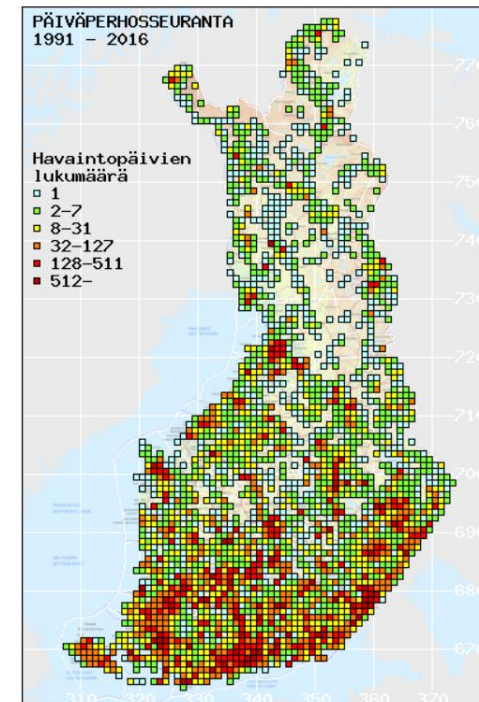Only one exception: *Thymelicus lineola*

Similar annual changes in abundance based on transect and atlas monitoring schemes

$R^2 = 0,51$
$p < 0.001$
$n = 50$

Change in species abundance in the Atlas scheme 1998-2008 (%)

Change in species abundance in transects 1999-2008 (% based TRIM)
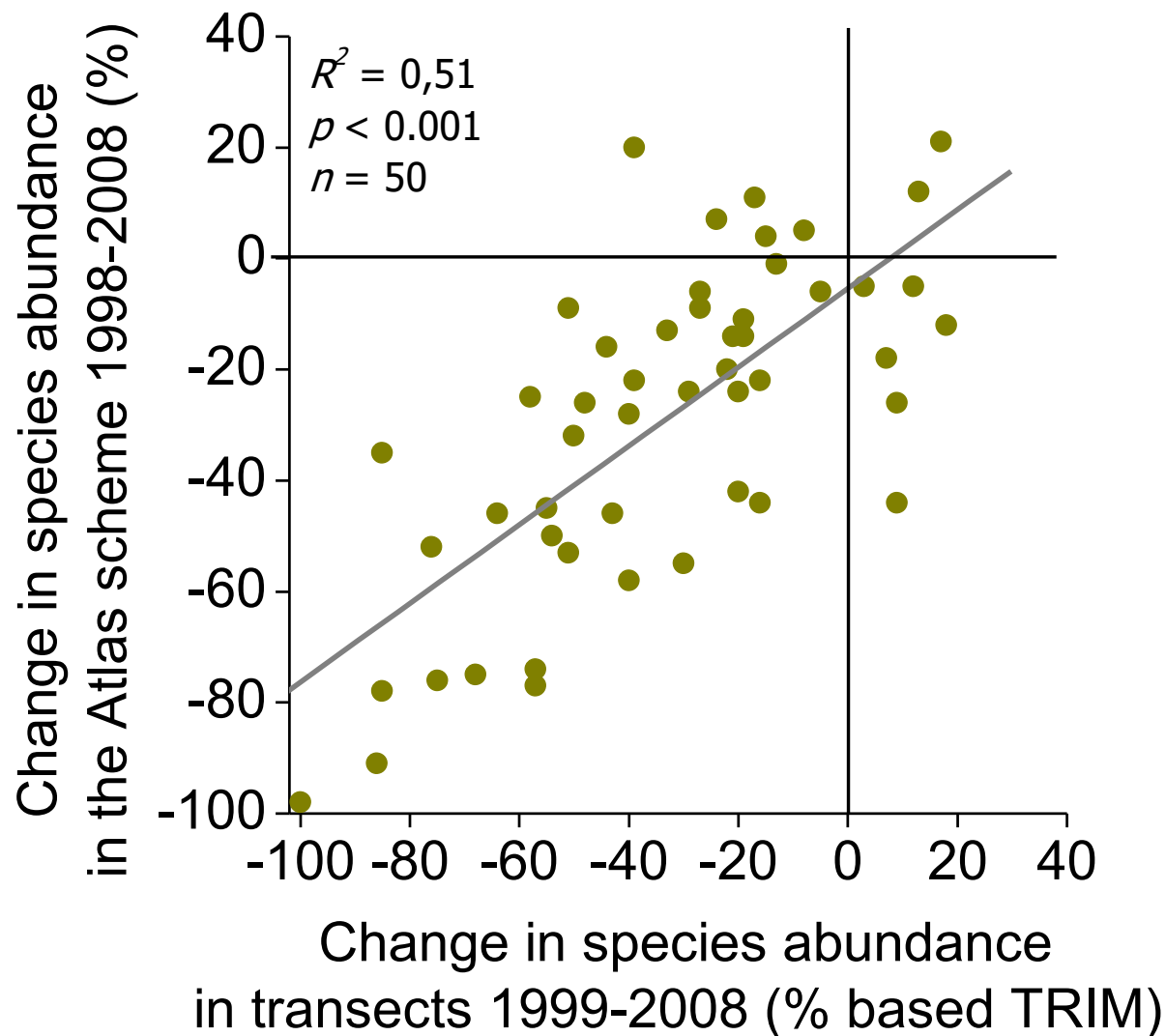
Transect monitoring

Atlas monitoring (NAFI)

Annual atlas scheme useful in detecting changes in distribution areas

Changing northern range margin due to warming climate

- For each species a comparison of 10 northernmost observation grid squares between two time periods: 1992-96 vs. 2000-2004

Results

- Much variation in observed range shifts between species
- Systematic differences between species trait groups:
  - Largest range shifts in species preferring forest edges (mean + 85 km)
  - Smallest range shifts in threatened species (mean - 2 km)

Observed northward expansion in 8 years

Forest edge species: mean = + 85 km

Limenitis populi   *Argynnis paphia*
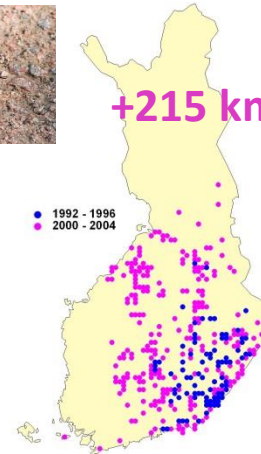
+215 km   **+335 km**
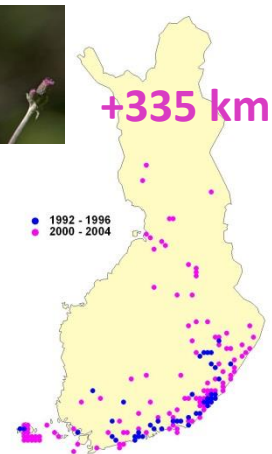
Threatened species: mean = - 2 km

Euphydryas aurinia   *Glaucopsyche alexis*

+15 km   **-20 km**

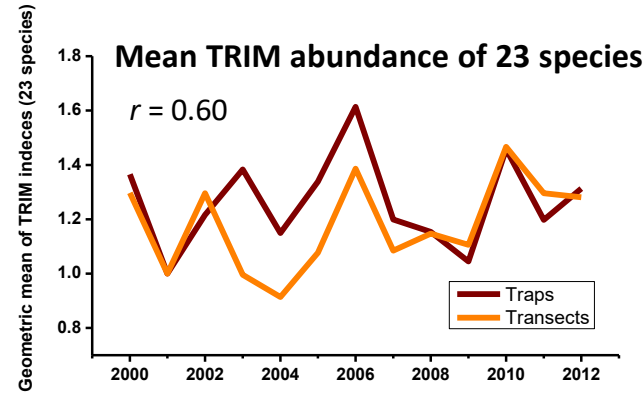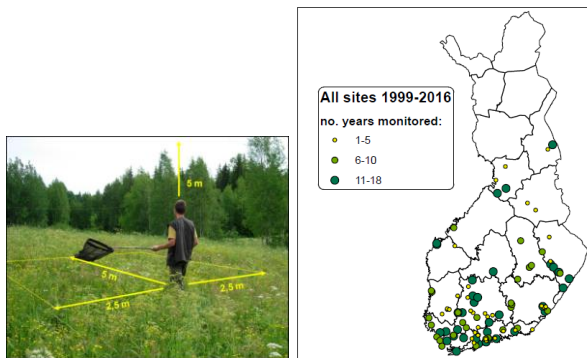*Pöyry, Luoto, Heikkinen, Kuussaari & Saarinen 2009, Global Change Biology 15:742-743*
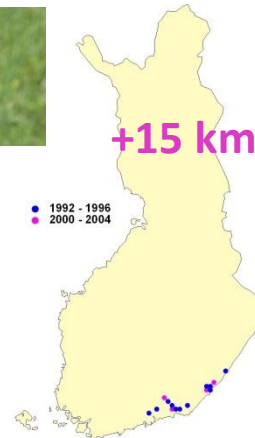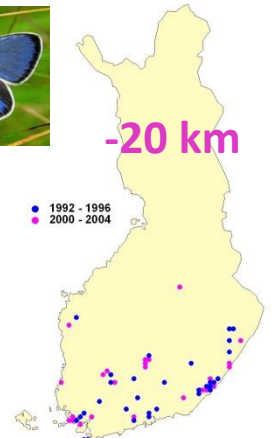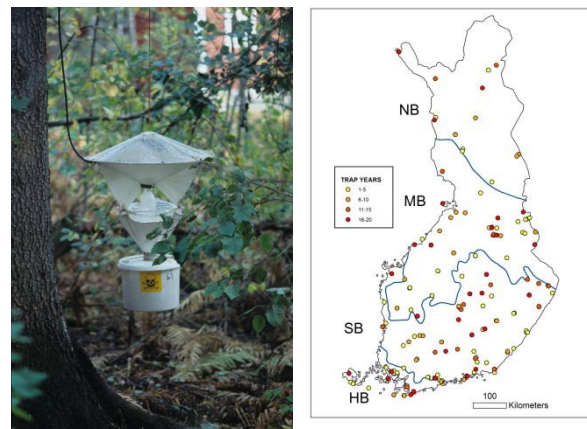
Most annual moth species abundance estimates correlate well between two Finnish schemes: the transect scheme and the moth monitoring scheme based on light traps
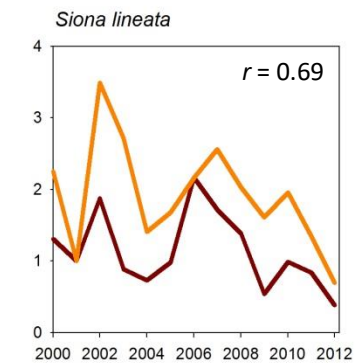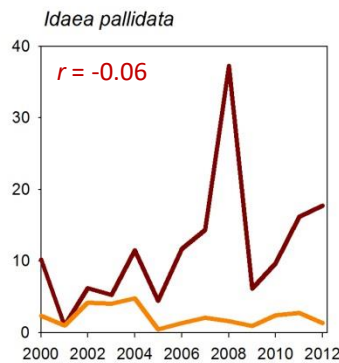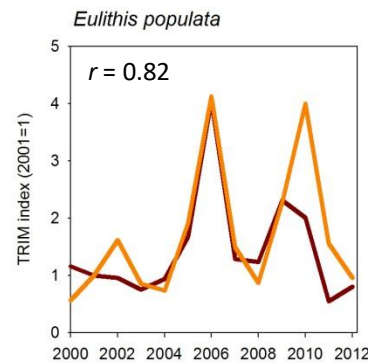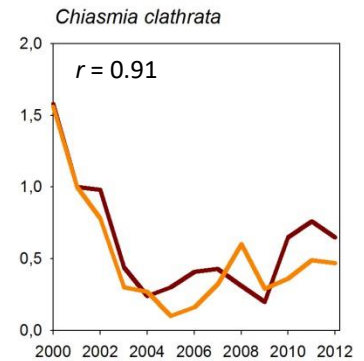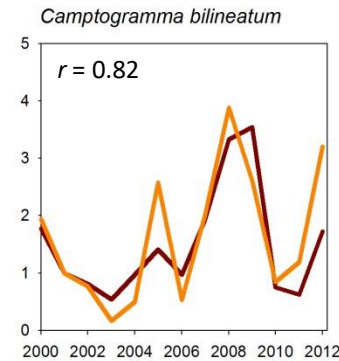

J. Pöyry, J. Heliölä & M. Kuussaari, unpublished
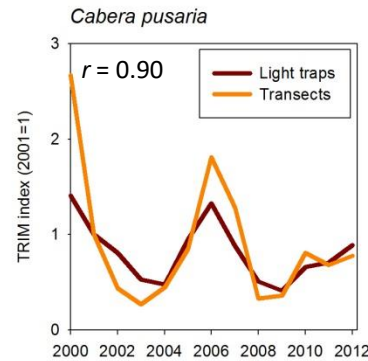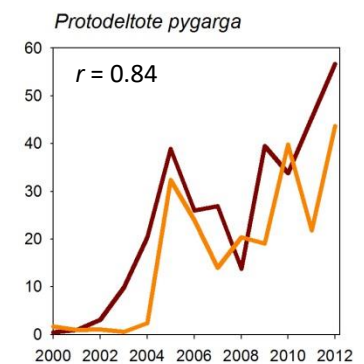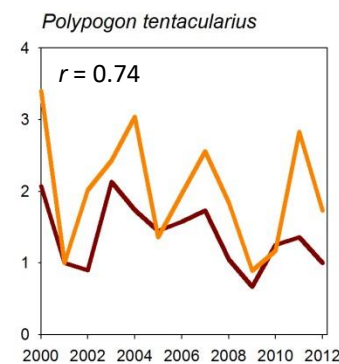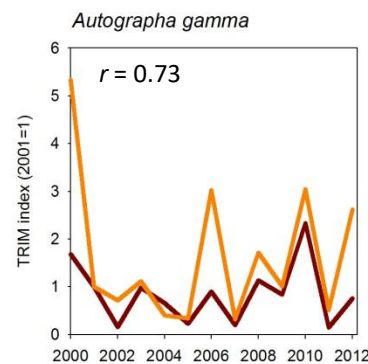
Summary 1/2

- Finnish scheme has been running already for 19 years
  - Typically >50 transects counted annually
  - Good monitoring data on ca 50 butterfly and ca 30 day-active moth species
- In butterflies there has been a slightly negative trend in abundance
  - 19 species significantly declining and 9 species increasing

Summary 2/2

The 19 years of data of the Finnish BMS

- Enable interesting analyses of population dynamics and trends in Finland

- Provide a useful set of northern data points for various European scale comparisons

In the next few years

- We hope to produce the first scientific papers from the Finnish scheme