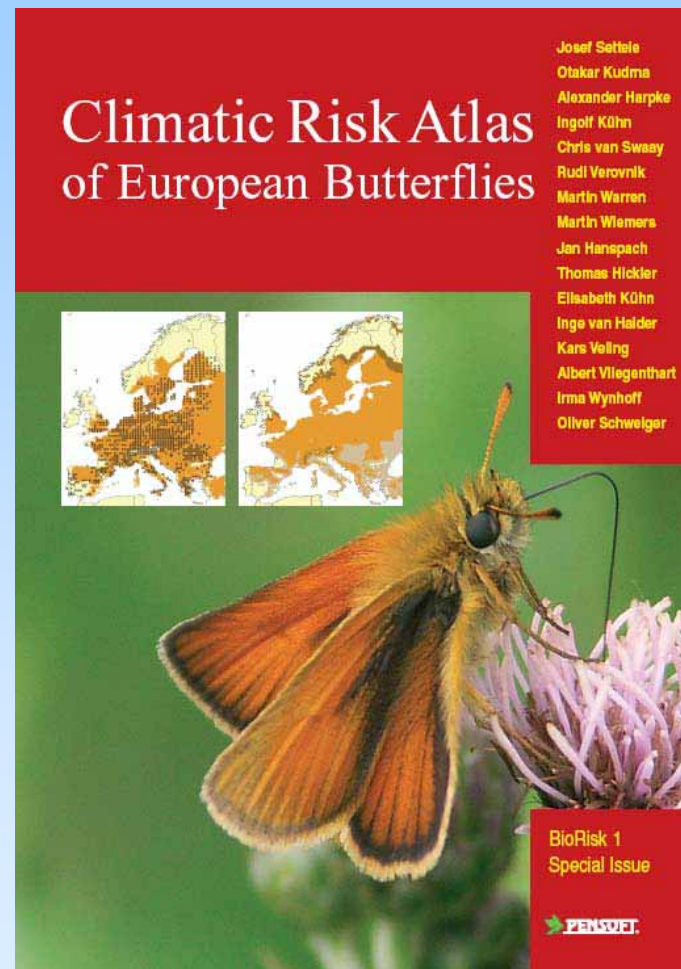


# Climatic Risk Atlas of European Butterflies

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# Climatic Risk Atlas of European Butterflies



Result of ALARM & MACIS EU-funded projects



# Methods

- Use distribution maps of butterflies at 50x50km grid from Mapping European Butterflies project (Kudrna, 2001)
- Fit climate models to current distributions using 22 variables (temp, soil moisture, humidity etc)
- Use models to predict future ranges (climate space) under three scenarios:-
  - SEDG (B1): moderate change; 2.4°C by 2080
  - BAMBU (A2): intermediate change; 3.1°C by 2080
  - GRAS (A1FI): maximum change; 4.1°C by 2080
- Assume either no or full dispersal ability of the butterfly



# Dusky Large Blue

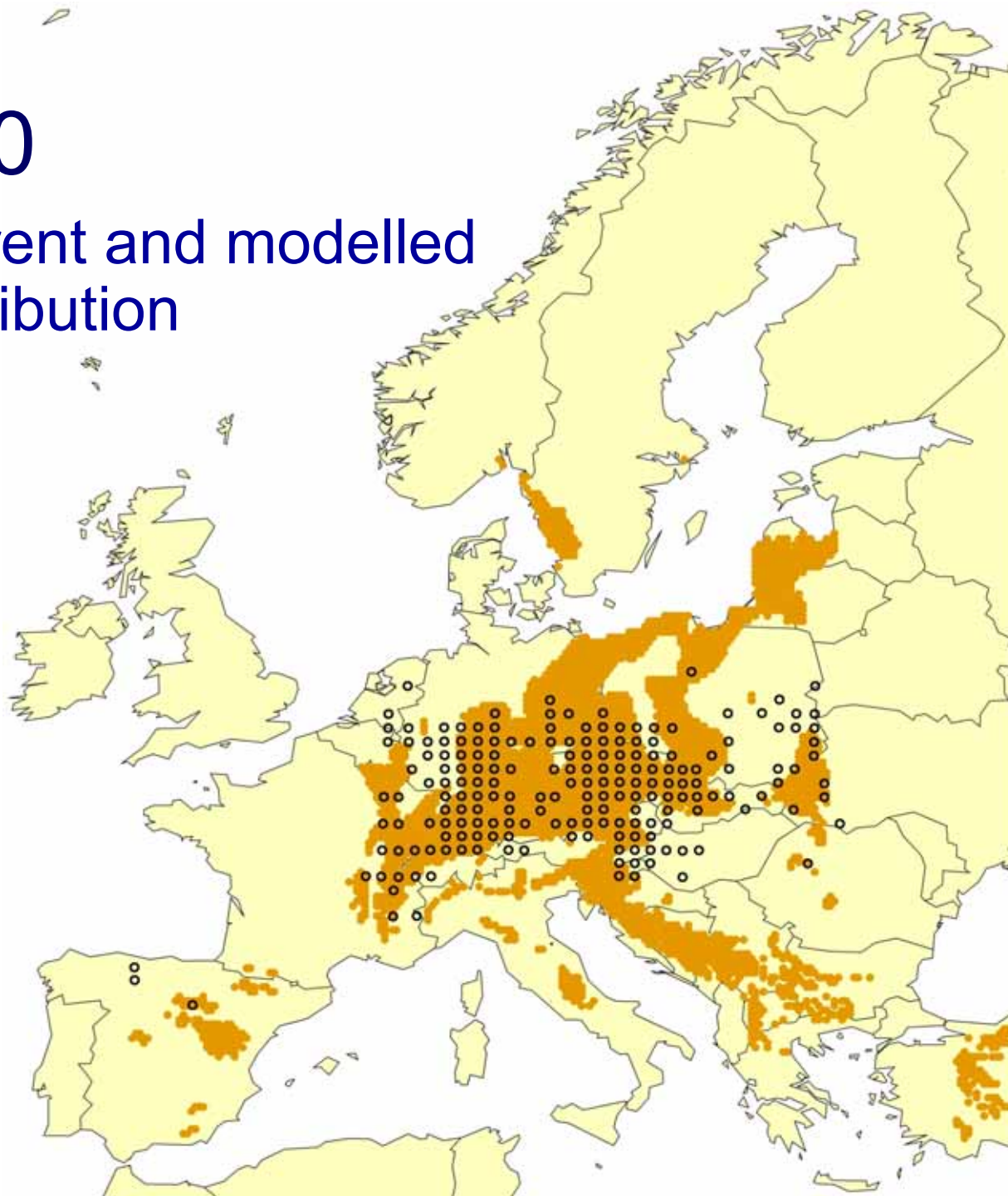
*Maculinea nausithous*

Habitats Directive species

Threatened in Europe

# 2000

- Current and modelled distribution



# SEDG 2050

Full = - 23 %

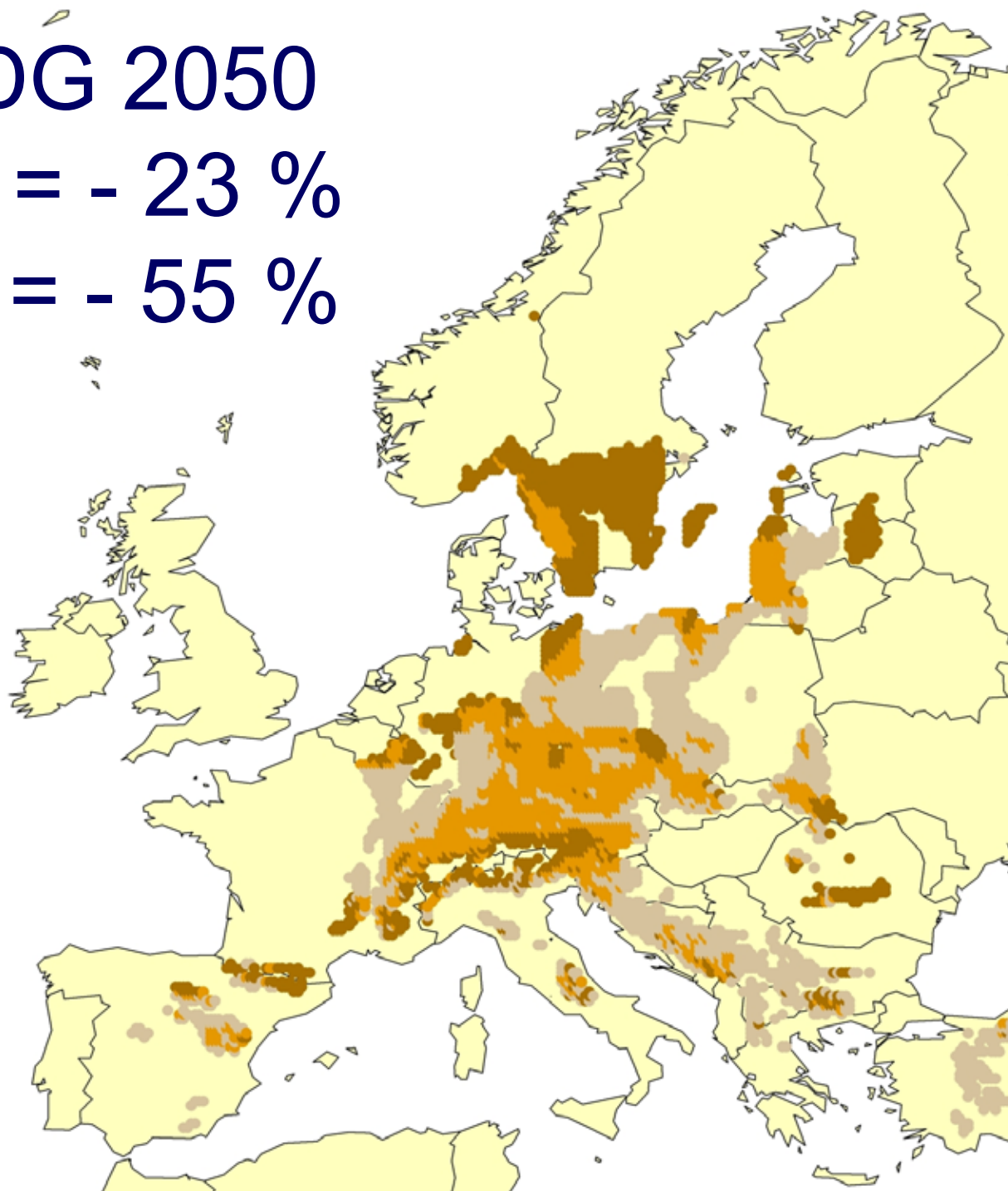
No = - 55 %

## KEY

 Range  
maintained

 Range  
lost (if no  
dispersal)

 Range  
gained  
(if full  
dispersal)



# SEDG 2080

Full = - 22 %

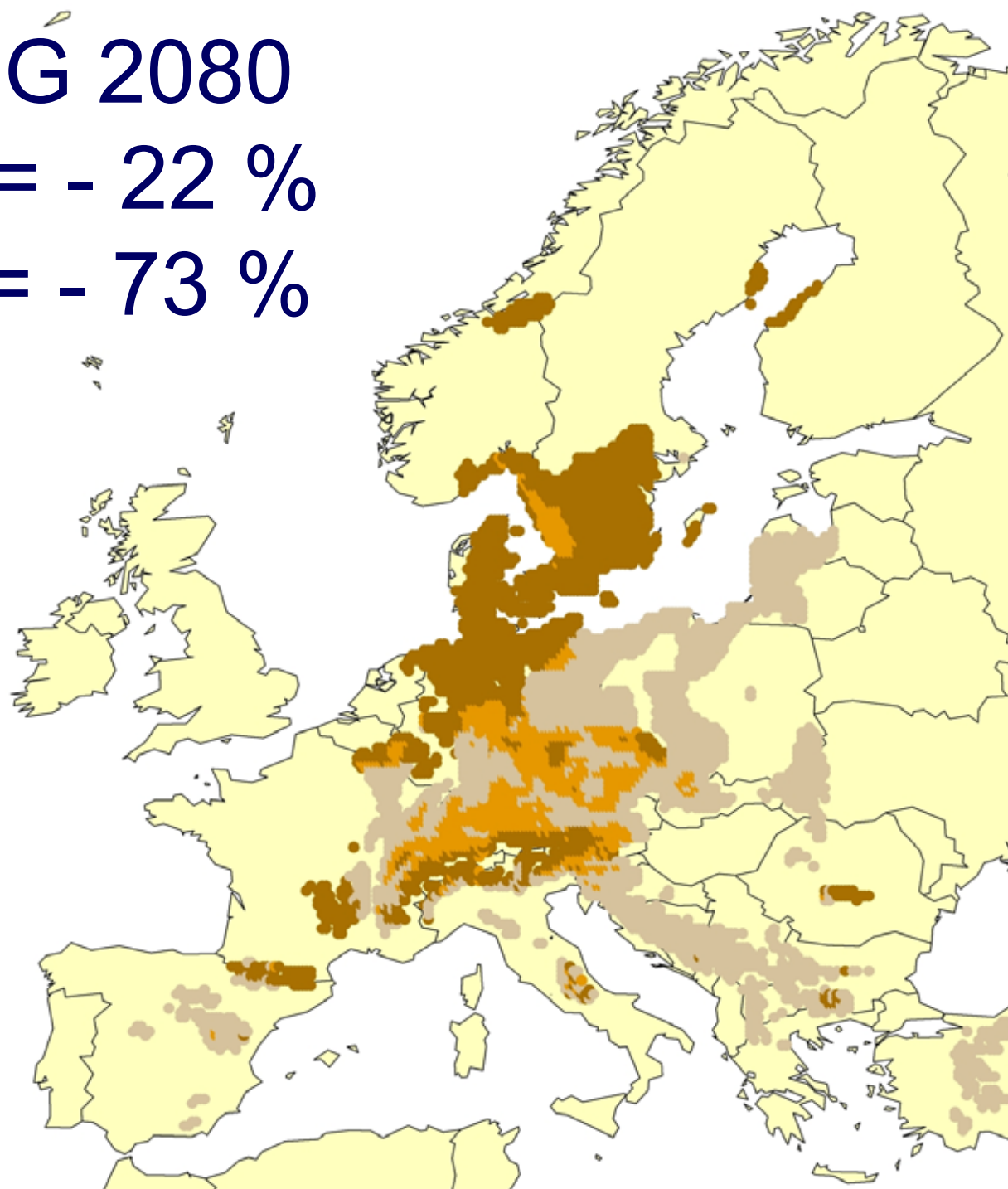
No = - 73 %

## KEY

 Range  
maintained

 Range  
lost (if no  
dispersal)

 Range  
gained  
(if full  
dispersal)



# BAMBU 2080

Full = - 47 %

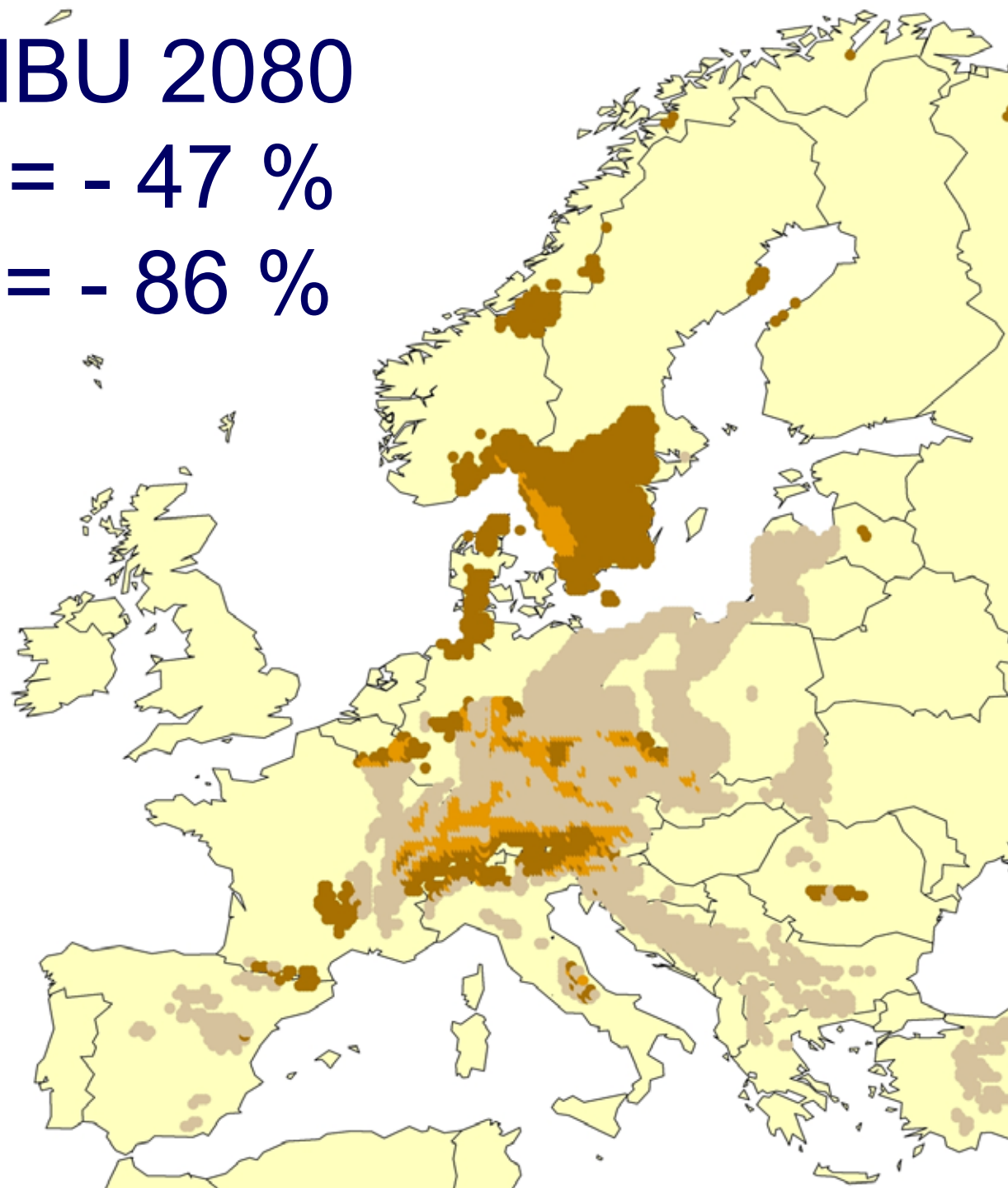
No = - 86 %

## KEY

 Range  
maintained

 Range  
lost (if no  
dispersal)

 Range  
gained  
(if full  
dispersal)



# GRAS 2080

Full = - 64 %

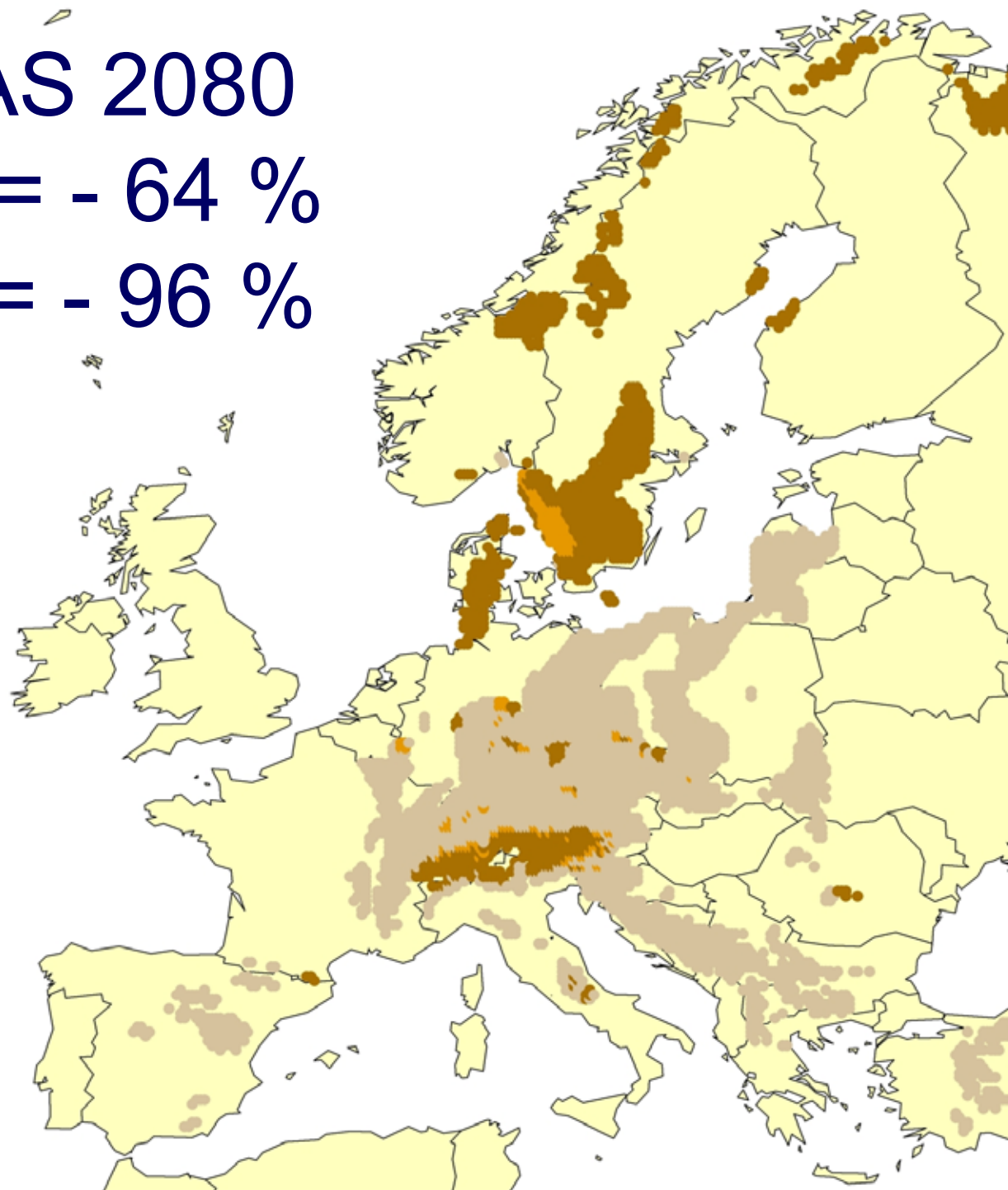
No = - 96 %

## KEY

 Range  
maintained

 Range  
lost (if no  
dispersal)

 Range  
gained  
(if full  
dispersal)

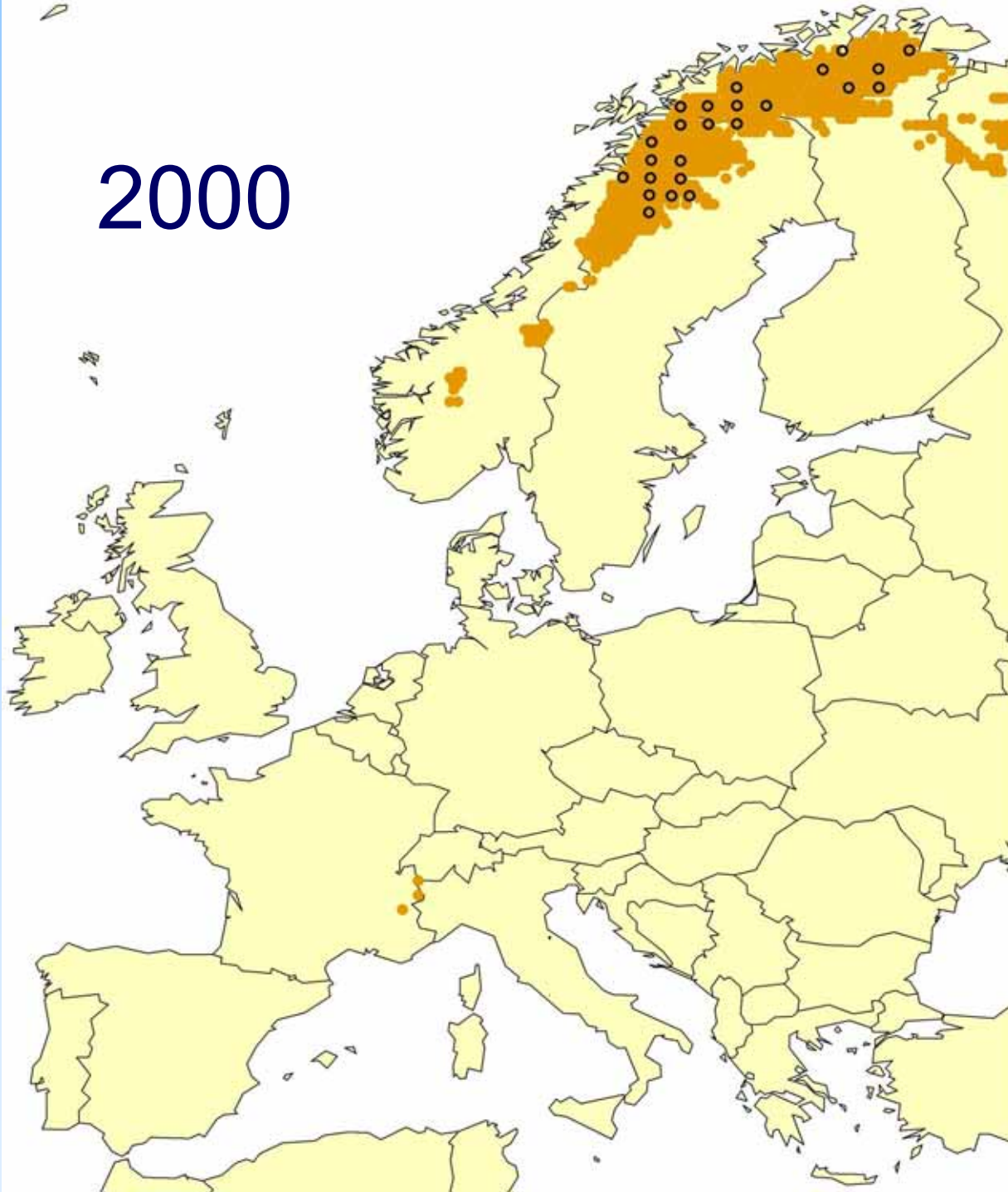


# Northern Clouded Yellow

*Colias hecla*



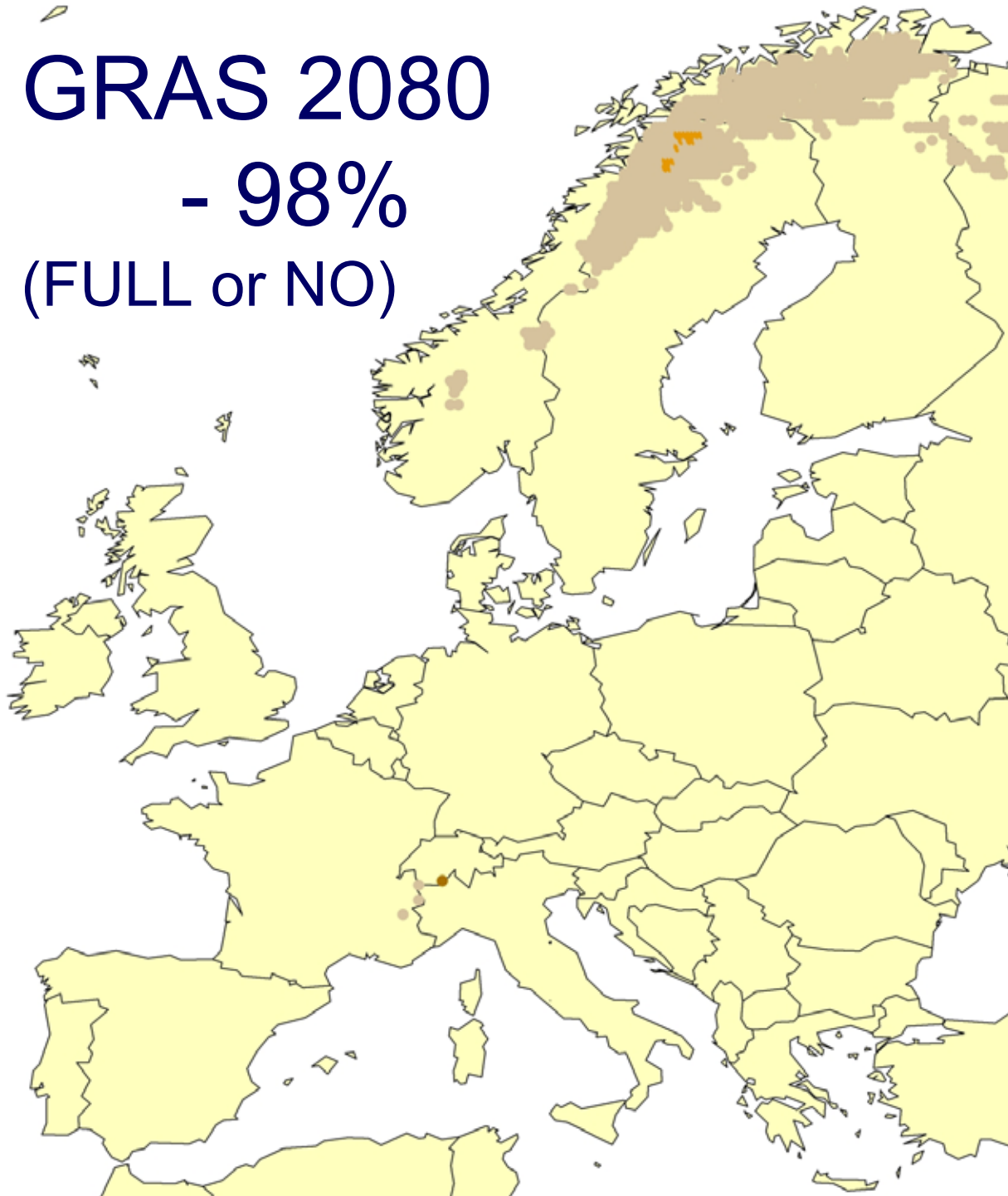
2000



**GRAS 2080**

**- 98%**

**(FULL or NO)**

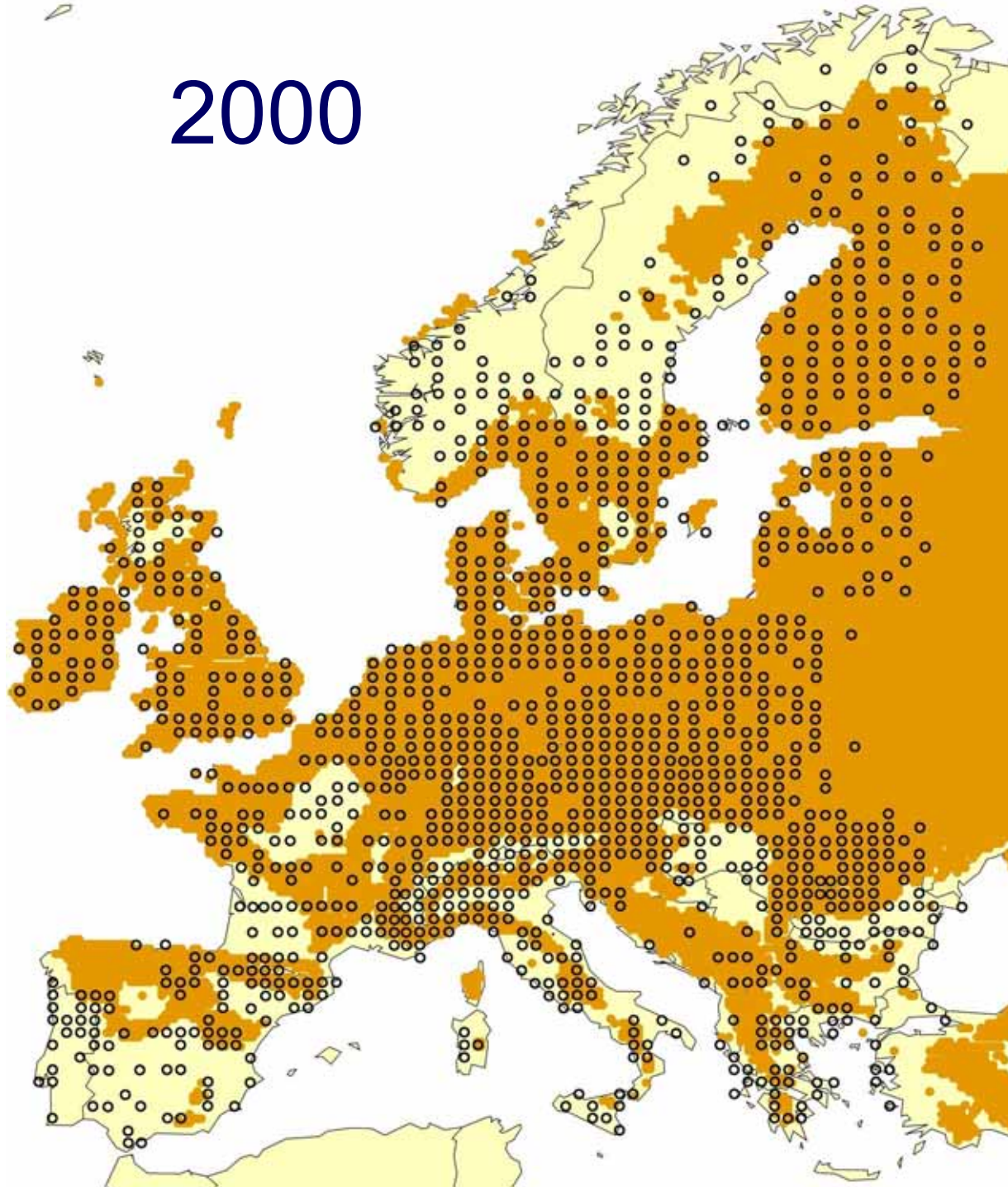


# Orange-tip

*Anthocaris cardamines*



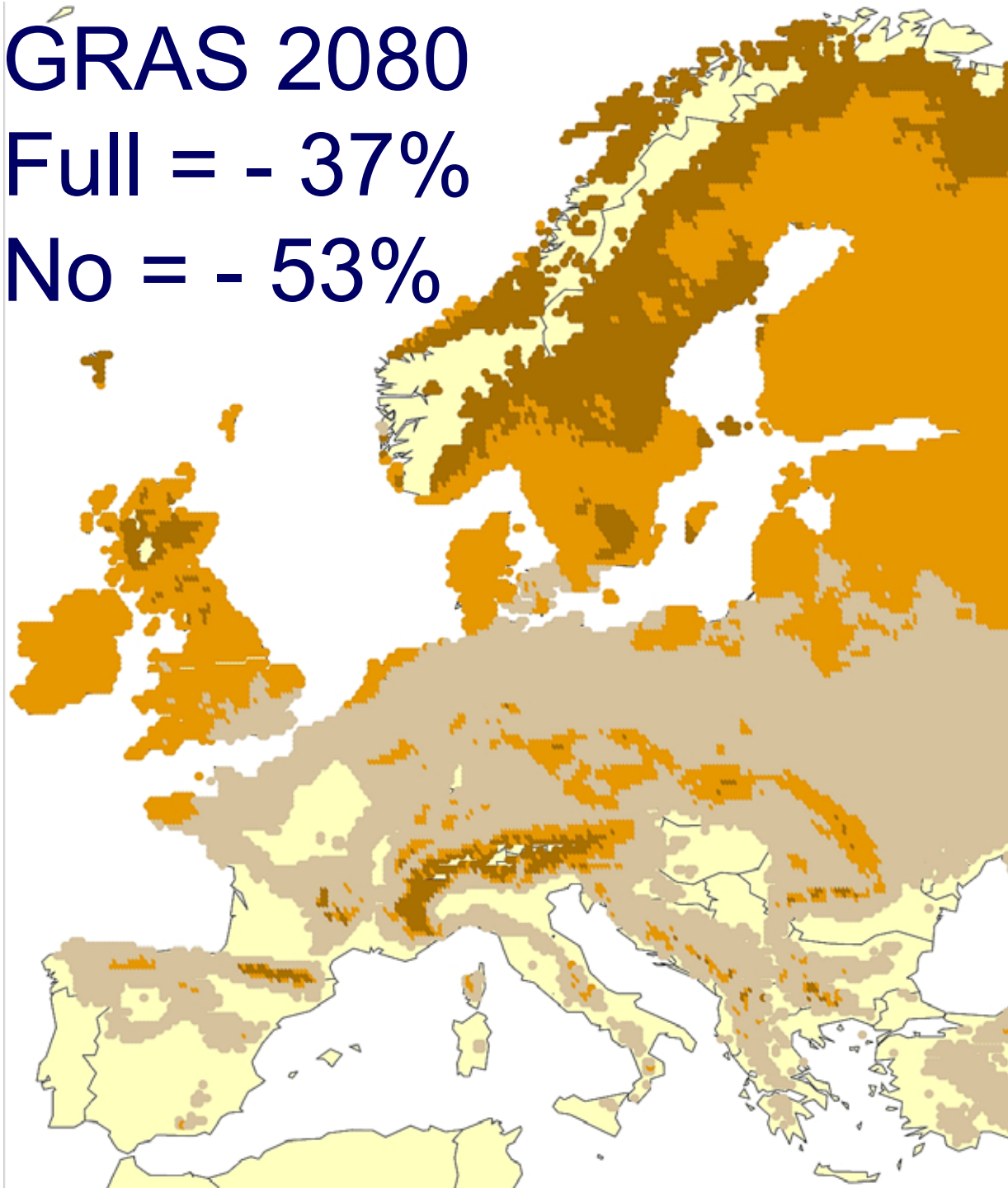
2000



GRAS 2080

Full = - 37%

No = - 53%



# Eastern Festoon

*Zerynthia cerisyi*



		<b>Full dispersal</b>	<b>No dispersal</b>
<b>2050</b>	<b>SEDG</b>	1685 (291.02%)	-11 (-1.9%)
	<b>BAMBU</b>	2079 (359.07%)	-10 (-1.73%)
	<b>GRAS</b>	2080 (359.24%)	-23 (-3.97%)
<b>2080</b>	<b>SEDG</b>	2970 (512.95%)	-35 (-6.04%)
	<b>BAMBU</b>	3022 (521.93%)	-73 (-12.61%)
	<b>GRAS</b>	4073 (703.45%)	-71 (-12.26%)

Changes in climatic niche distribution  
(in 10'×10' grid cells; present niche space: 579 cells)

# Results: No. Sp. at risk

(assuming no dispersal by 2080)

% sp. losing	SEDG	GRAS
> 95% range	3%	24%
> 50% range	48%	78%
< 50% range (low risk)	43%	6%

- Climate change poses a considerable additional risk to European butterflies.
- The risk varies considerably under the three scenarios.

# Results: time lag effects

(assuming no dispersal)

% sp. losing > 50% range	SEDG	GRAS
2050	28%	40%
2080	57%	96%

- There is considerable time lag to worst effects: assuming no dispersal

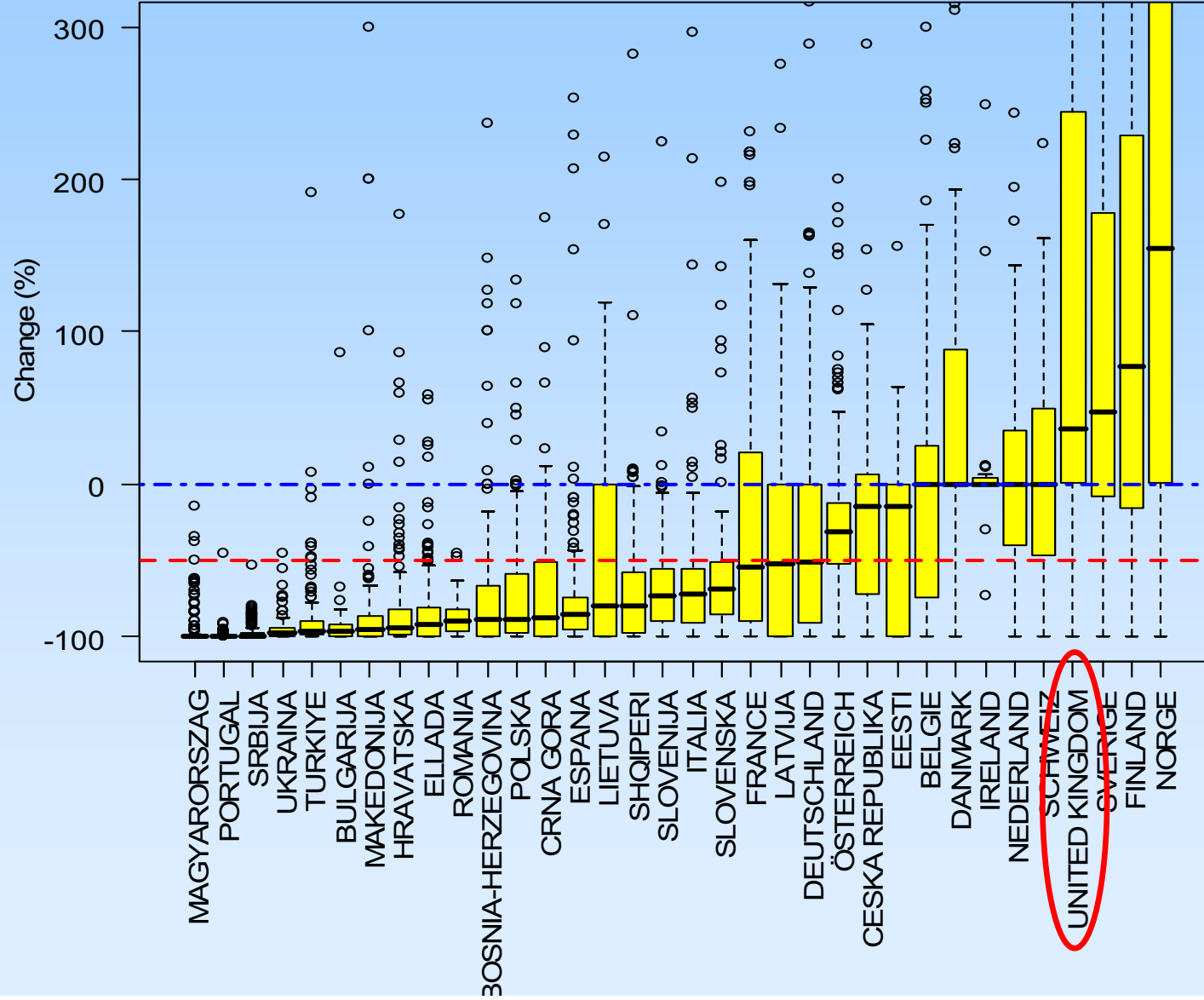
# Results: time lag of increasing sp. (assuming full dispersal)

% sp. Increasing range	SEDG	GRAS
2050	33%	23%
2080	30%	18%

- Until 2050 there may be better conditions for mobile warmth-loving species to disperse
- This effect reduces by 2080

# Country analysis

## Gras 2080 full dispersal



# Caveats

- More factors impact future species distributions than “simply” climate alone
  - e.g. food-plant, habitat, land use, dispersal
- 293 of the c 450 European species were modelled.
- 149 species could not be modelled – too rare
- AUC used to assess goodness of fit of models

# Conservation recommendations

Although some aspects of climate change may seem unstoppable, there are still some ways to mitigate some of the negative impacts.

- 1) Maintain large populations in diverse habitats
- 2) Encourage mobility across the landscape by restoring habitats
- 3) Reduce emissions of greenhouse gasses
- 4) Allow maximum time for species adaptation
- 5) Conduct further research on climate change and its impacts on biodiversity

# Policy recommendations

We have the chance to mitigate some of the worst effects of climate change if we act now.

Specifically, we need:

- A big shift in the spending of Common Agricultural Policy (CAP) funds to help conserve biodiversity.
- More funding of schemes that deliver environmental outcomes (e.g. better agri-environment schemes; High Nature Value (HNV) farming).
- Full implementation of the EU Habitats and Species Directives.
- Creation of habitat networks that support biodiversity and help mitigate adverse effect of climate change.
- International action to reduce greenhouse gas emission significantly

# UK results

To decline  
(further)



+ Others ??

# UK results

Already arrived



To arrive soon?



100+ Others will gain climate space but probably will not cross channel



# Main conclusions

- Climate change will have a profound and largely adverse impact on butterflies
- Many species are at risk of extinction unless they move
- Many species are not able to move, so face extinction or extreme threat
- We have some time if we act soon
- Our current conservation action at a landscape scale, and to create habitat mosaics, is a no risk policy for current and future scenarios

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