ULRMC biotic GIS group

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East Europe Mammals Distribution Modelling

in Scope of Climate Change Prediction by 2050

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The National Conference-2009 for Young Scientists. Kyiv, Ukraine

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EEBIO area

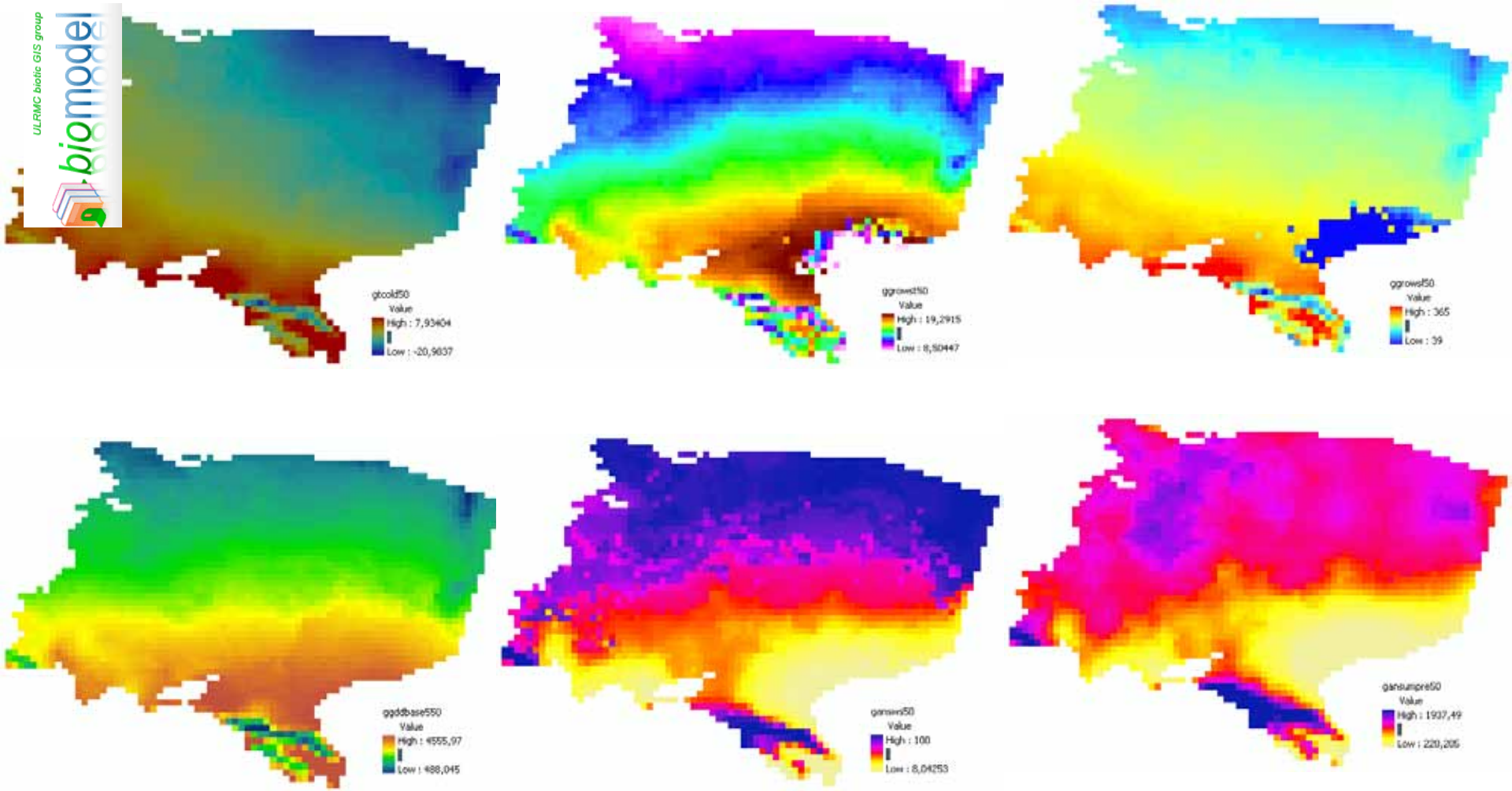
	CNTRY_NAME	rnam_cntry
	Armenia	Армения
	Azerbaijan	Азербайджан
	Belarus	Беларусь
	Georgia	Грузия
	Kazakhstan	Казахстан
	Kyrgyzstan	Кыргыстан
	Moldova	Молдова
	Russia	Россия
	Tajikistan	Таджикистан
	Turkmenistan	Туркменистан
	Ukraine	Украина
	Uzbekistan	Узбекистан

Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia (European part), Tajikistan, Turkmenistan, Ukraine, Uzbekistan

Planbureau voor de Leefomgeving

Climate Change Data

(Sources: IMAGE-model based on OECD baseline scenario)



Netherlands Environmental Assessment Agency

<u>*Parameters*</u>

Annual soil water index; Annual sum of precipitation
Growing degrees above 5 ^{0}C; Length of growing season
Mean temp. of growing season; Temperature of coldest month

General Linear Model (GLM) code and "R" software

RGui

File Edit View Misc Packages Windows Help

```
Call:
glm(formula = d1 ~ ggrowsl + I(ggrowsl^2) + ggrowst + I(ggrowst^2) +
    gtcold + I(gtcold^2) + gansumpre + I(gansumpre^2) + gansws +
    I(gansws^2) + ggddbase5 + I(ggddbase5^2), family = binomial,
    na.action = na.omit, maxit = 30)

Deviance Residuals:
      Min        1Q    Median        3Q       Max
-3.0587763 -0.0002161  0.0315899  0.1063675  3.3230012

Coefficients:
                Estimate Std. Error z value Pr(>|z|)
(Intercept)   -1.891e+01  3.262e+01  -0.580 0.562056
ggrowsl        1.451e-01  2.704e-01   0.537 0.591577
I(ggrowsl^2)  -4.787e-05  7.978e-04  -0.060 0.952159
ggrowst       -8.233e+00  5.777e+00  -1.425 0.154118
I(ggrowst^2)   2.077e-01  2.251e-01   0.923 0.356245
gtcold        -2.836e+00  7.268e-01  -3.902 9.53e-05 ***
I(gtcold^2)   -6.105e-02  2.814e-02  -2.169 0.030059 *
gansumpre      6.303e-02  2.377e-02   2.652 0.008001 **
I(gansumpre^2) -7.151e-05  1.884e-05  -3.796 0.000147 ***
gansws         2.932e-01  8.406e-02   3.488 0.000486 ***
I(gansws^2)   -1.707e-03  6.248e-04  -2.732 0.006304 **
ggddbase5      2.536e-02  7.811e-03   3.246 0.001169 **
I(ggddbase5^2) -6.441e-06  2.991e-06  -2.153 0.031289 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 3163.11  on 2585  degrees of freedom
Residual deviance:  528.27  on 2573  degrees of freedom
AIC: 554.27

Number of Fisher Scoring iterations: 12

[1] "difference" "pdev"       "explained"  "df"
[1] 2634.83614    0.00000     83.29893     12.00000
[1] "max kappa" "threshold"
[1] 0.8979439 0.6100000
```

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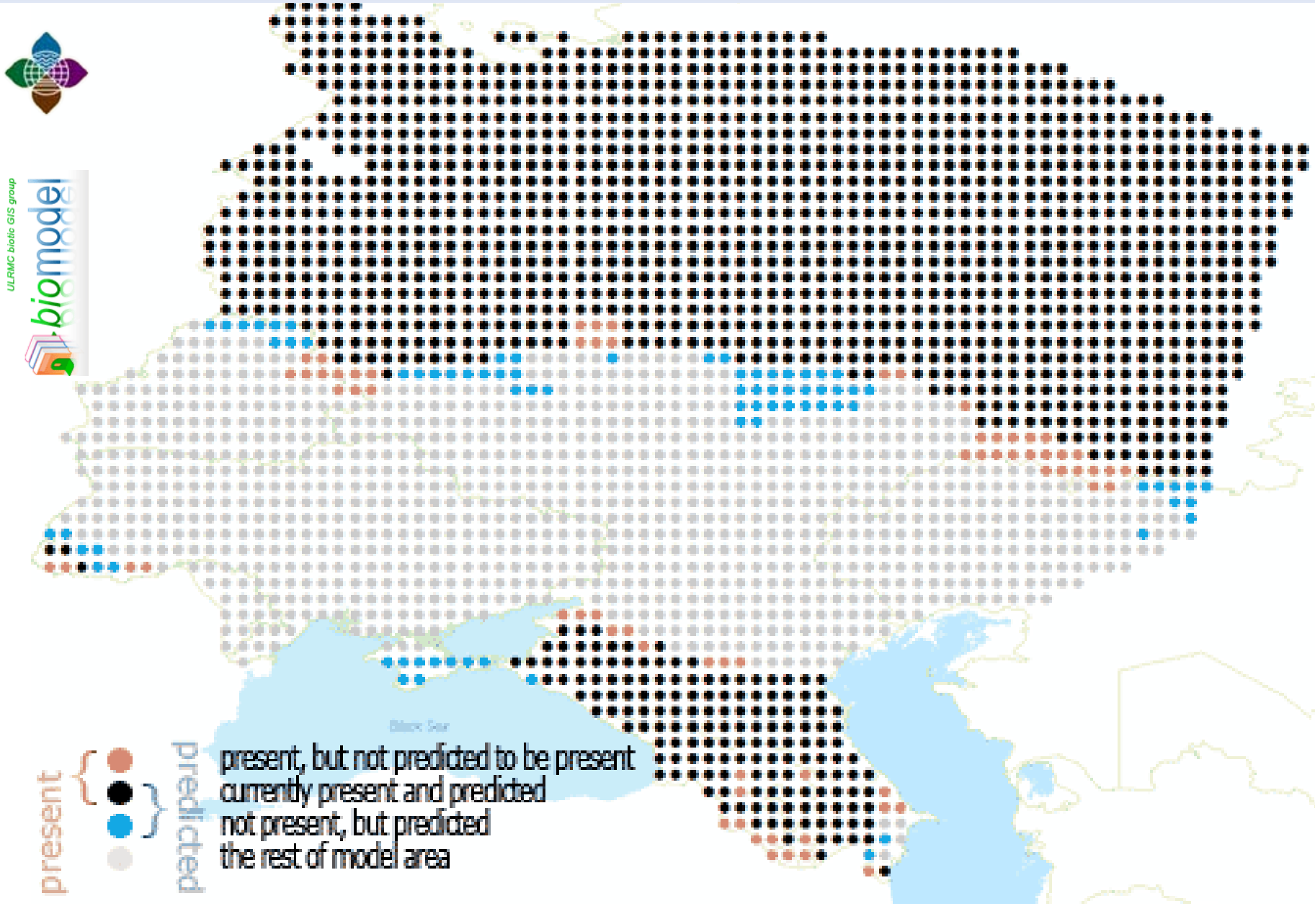
Brown bear (Ursus arctos): *model calibration*



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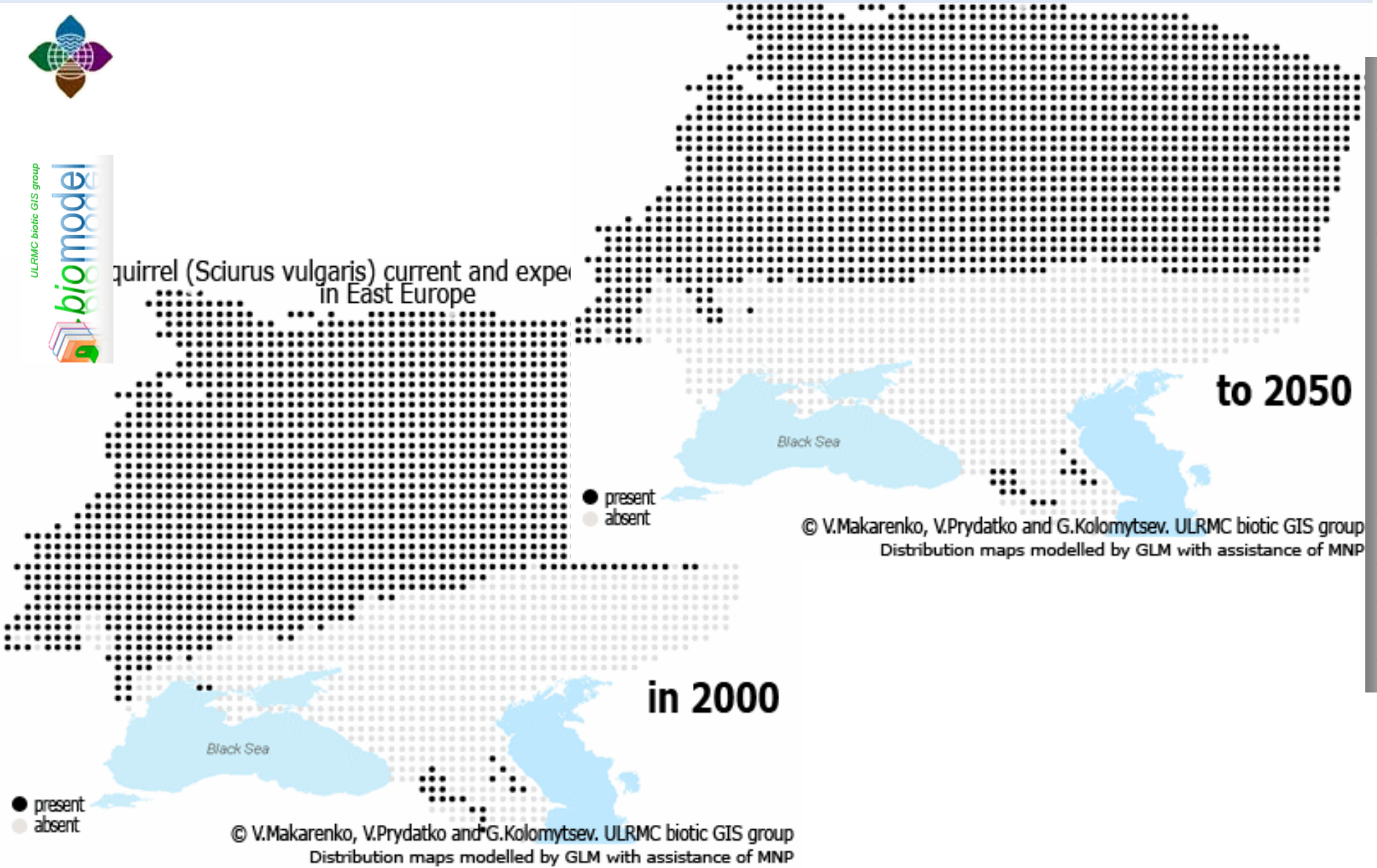
Red squirrel (Sciurus vulgaris) *model:*
Current and expected future distribution in Europe



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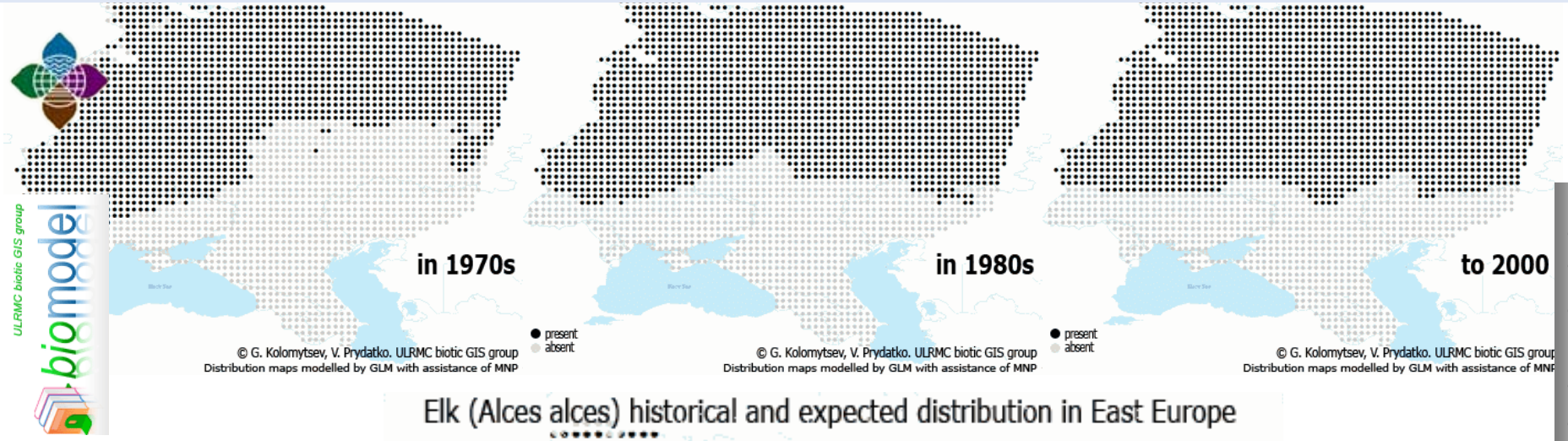
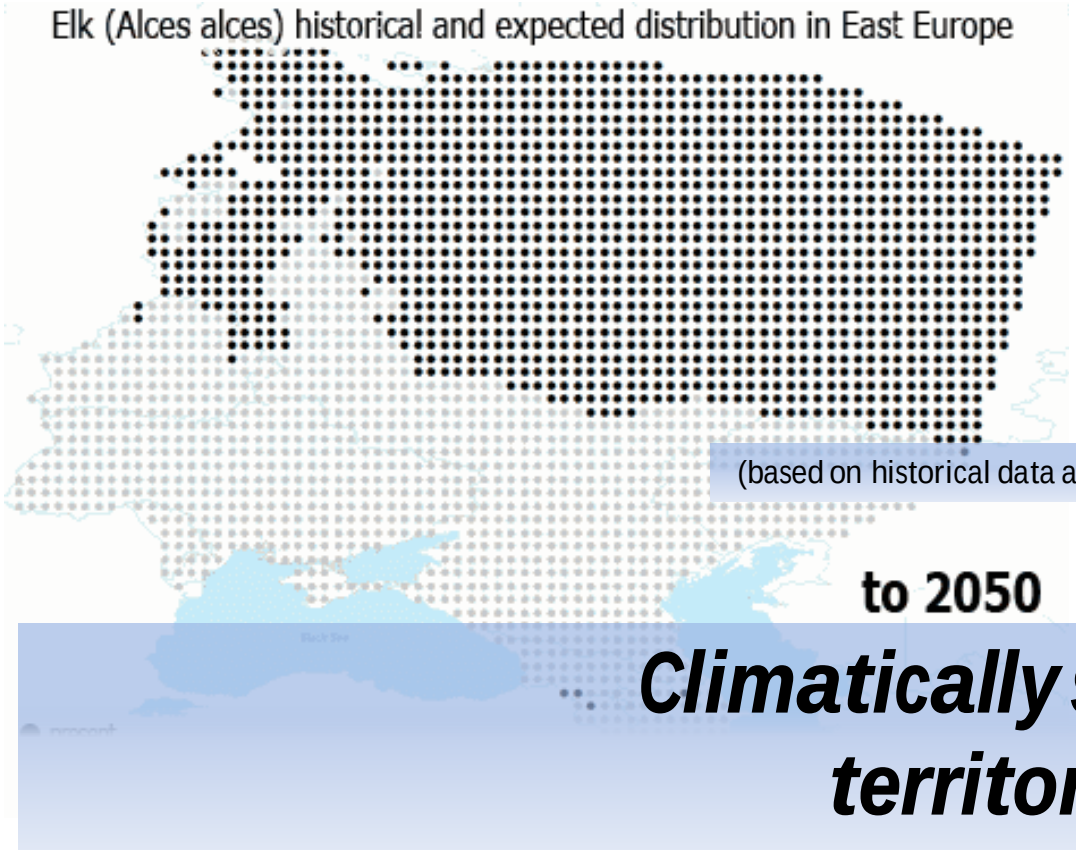
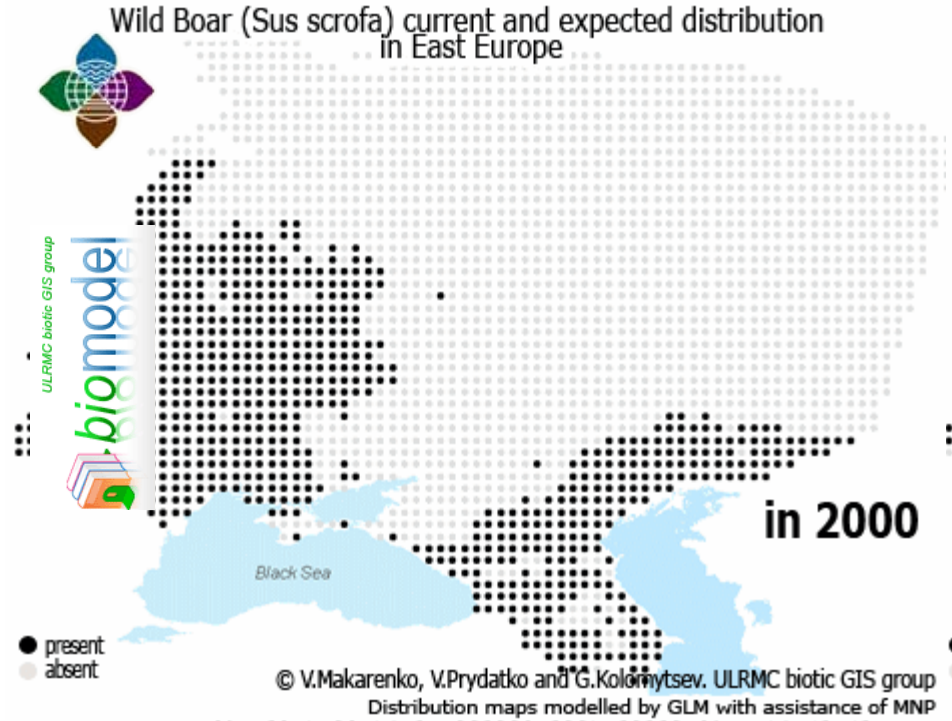
***Elk (Alces alces)**: historical, current and expected distribution*

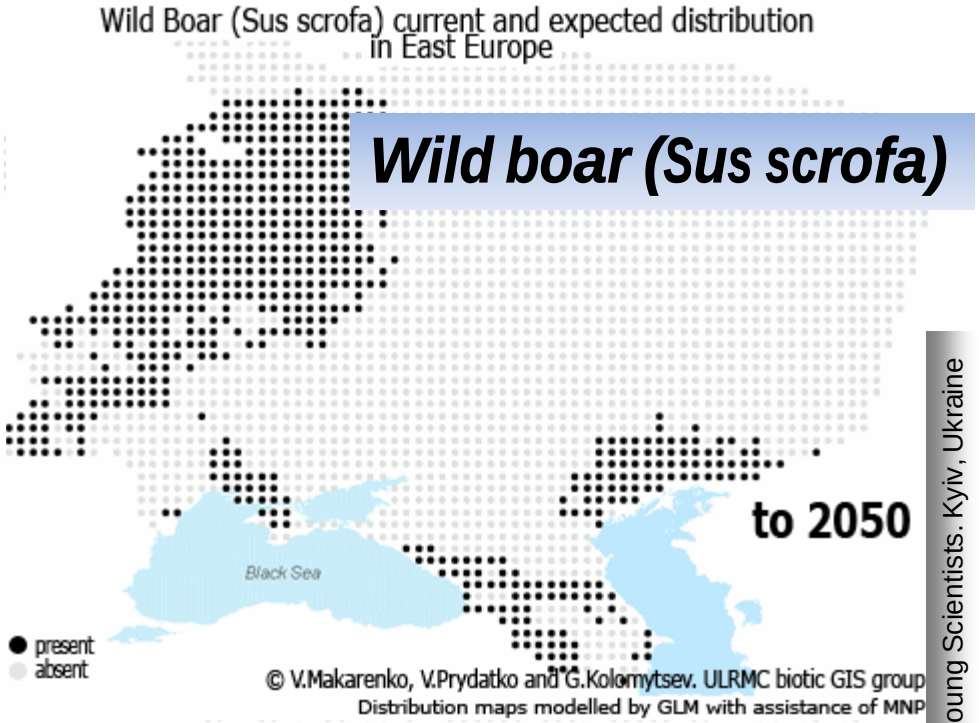




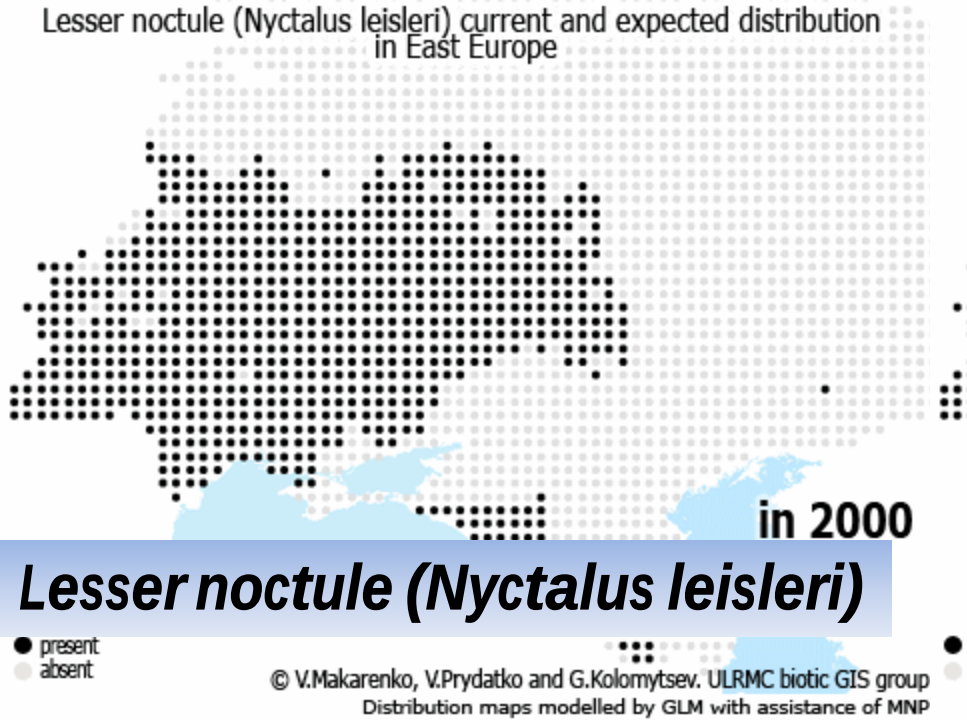
(based on historical data and modelling results)

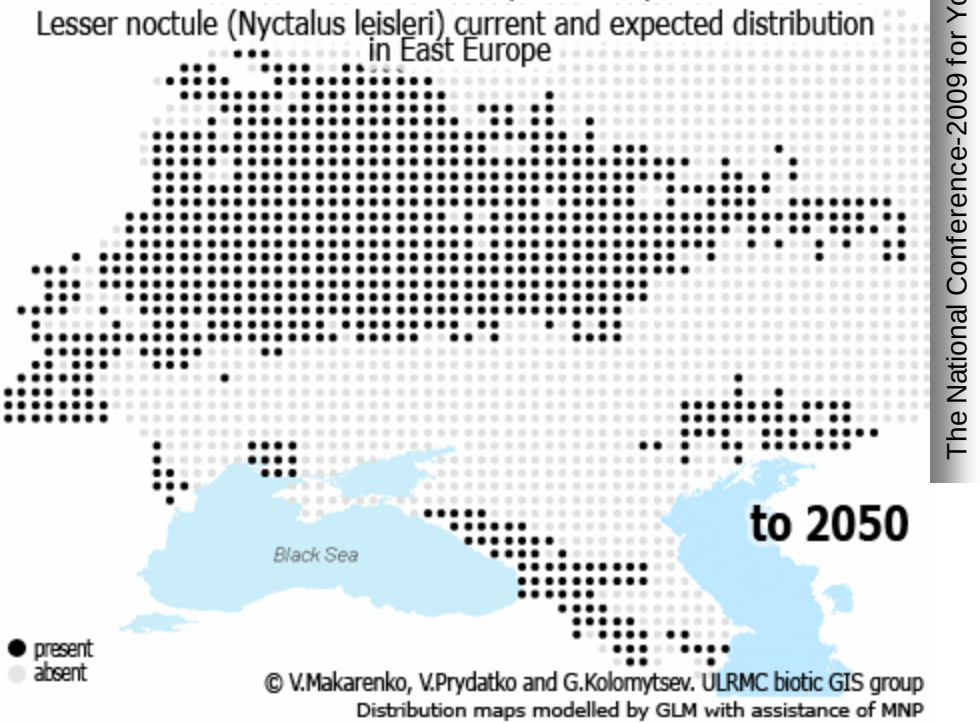
Climatically suitable territories shift





Wild boar (Sus scrofa)





Lesser noctule (Nyctalus leisleri)

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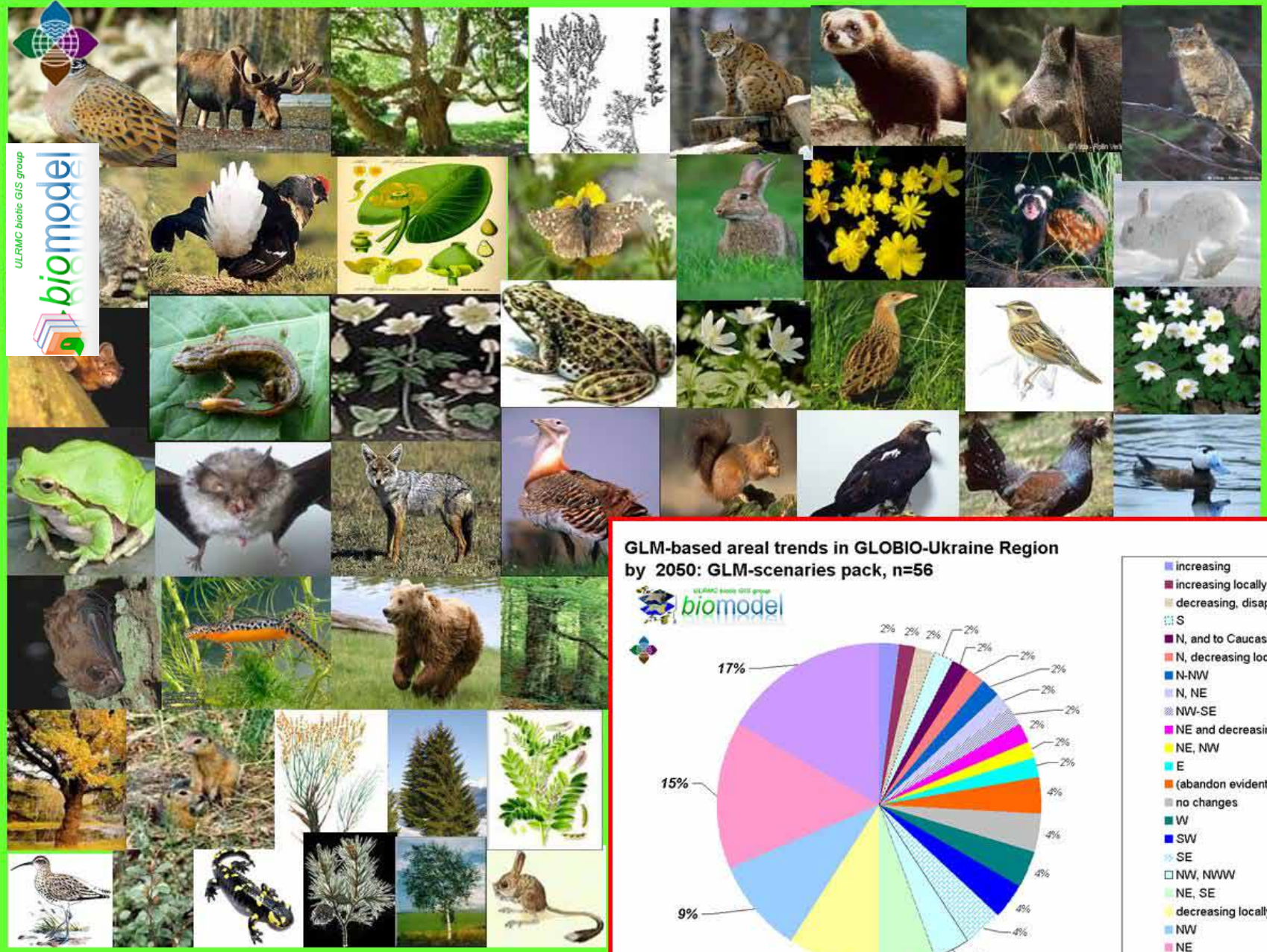
Mammals distribution trend by 2050, GLM

Species	Predicted trend by 2050, GLM
Brown bear (Ursus arctos)	NE,SE
European elk (Alces alces)	N
Blue Hare (Lepus timidus)	NE
Jackal (Canis aureus)	no changes
Wild Boar (Sus scrofa)	NE,SE
European polecat (Mustela putorius)	N, NE
Lesser noctule (Nyctalus leisleri)	N, decreasing locally
European Rabbit (Oryctolagus cuniculus)	NW-SE
Marbled Polecat (Vormela peregusna)	NW
Steppe Polecat (Mustela eversmanni)	N-NW
Red Squirrel (Sciurus vulgaris)	NE
Great Jerboa (Allactaga major)	NW, NWW
Little Ground Squirrel (Spermophilus pygmaeus)	NW, NWW
Lynx (Lynx lynx)	NE
Wild Cat (Felis sylvestris)	decreasing locally

Sources: http://biomodel.org.ua/?page_id=418



13% - species loss, 4% - species gain and turnover, 83% - species regional relocation - due to global climate- and land use change

GLOBIO-Ukraine 2050

http://biomodel.org.ua/?page_id=418

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Ukraine Mean Species Abundance (MSA_{Xi})

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Key Questions

- What is the situation with biodiversity loss in the region caused by buildings, agricultural, livestock and forestry production?
- What is the combined impact on biodiversity caused by several pressures in [xxxx] year?
- What is the impact on biodiversity from society development scenarios?
- How to improve preservation of biodiversity within agro-landscapes and PAs?
- Where are high biodiversity spots located?
- What areas are preferred for planning reservation (i.e. PAs)?

100%

0%

water

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http://biomodel.org.ua/?page_id=418

Thank you