Monitoring biodiversity transformation to document climate change impacts in alpine protected areas

10th and 11th of September 2014
Ceresole Reale – Gran Paradiso National Park - Italy

Introduction to the topic

Biodiversity monitoring in times of climate change
Challenges for protected areas

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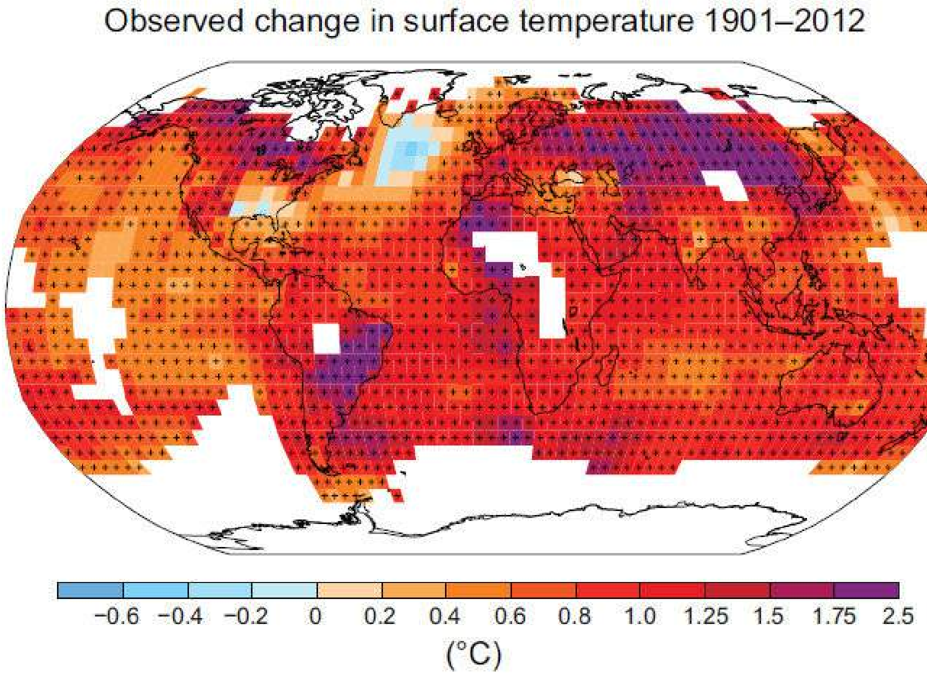
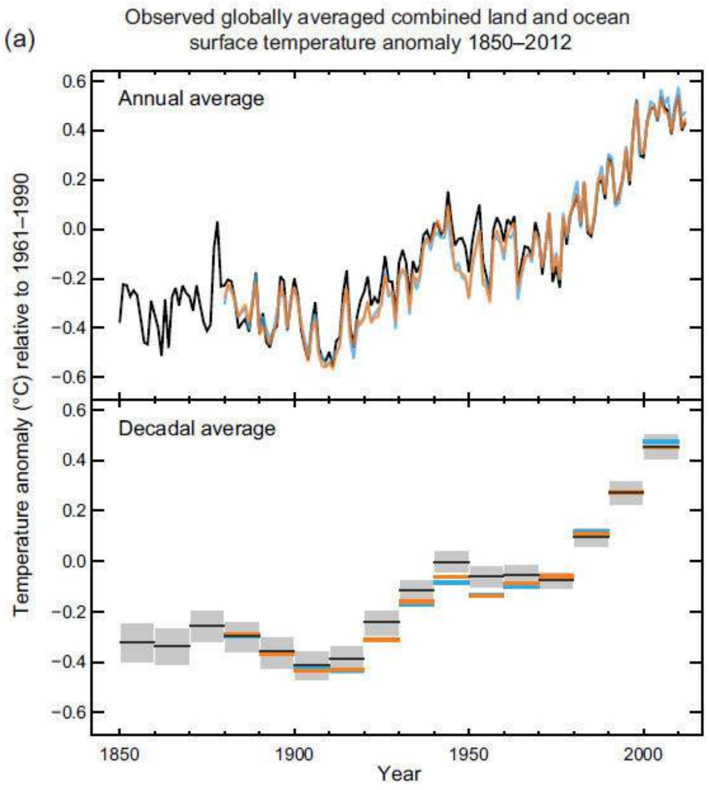
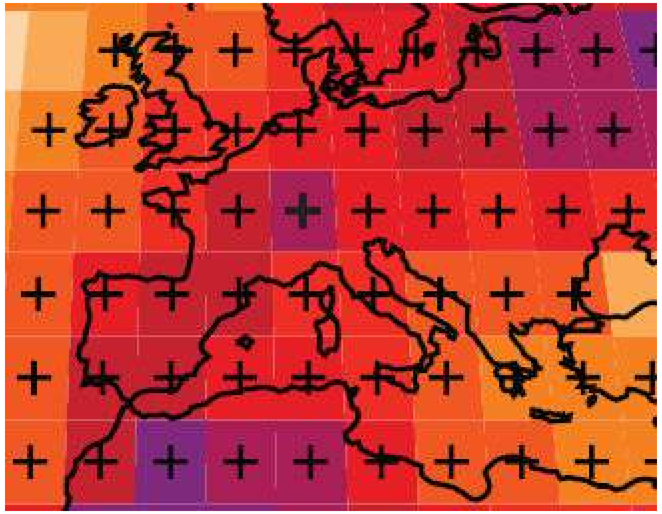
From ICCP Report 2013
Climate Change 2013: The Physical Science Basis

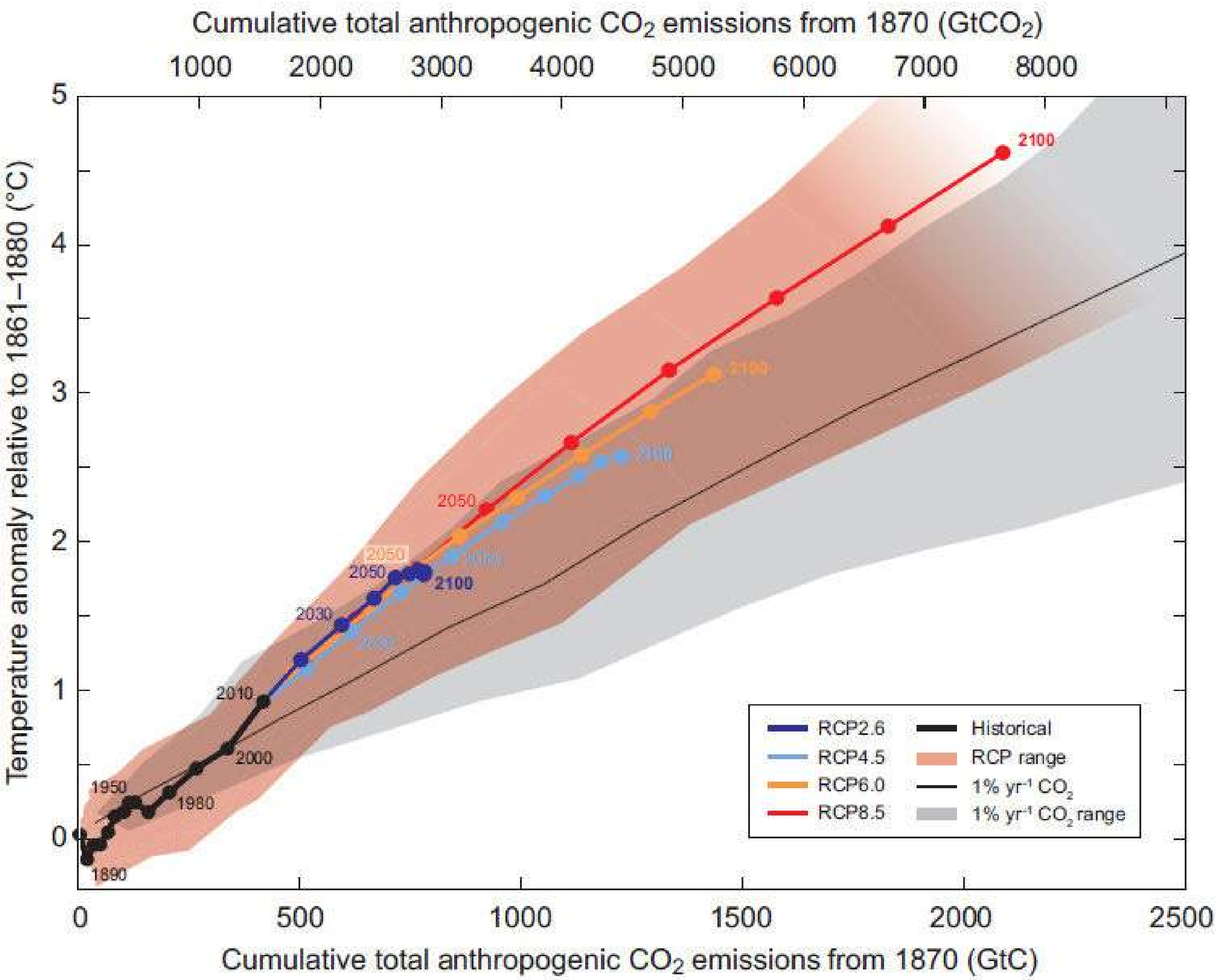
"Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased"



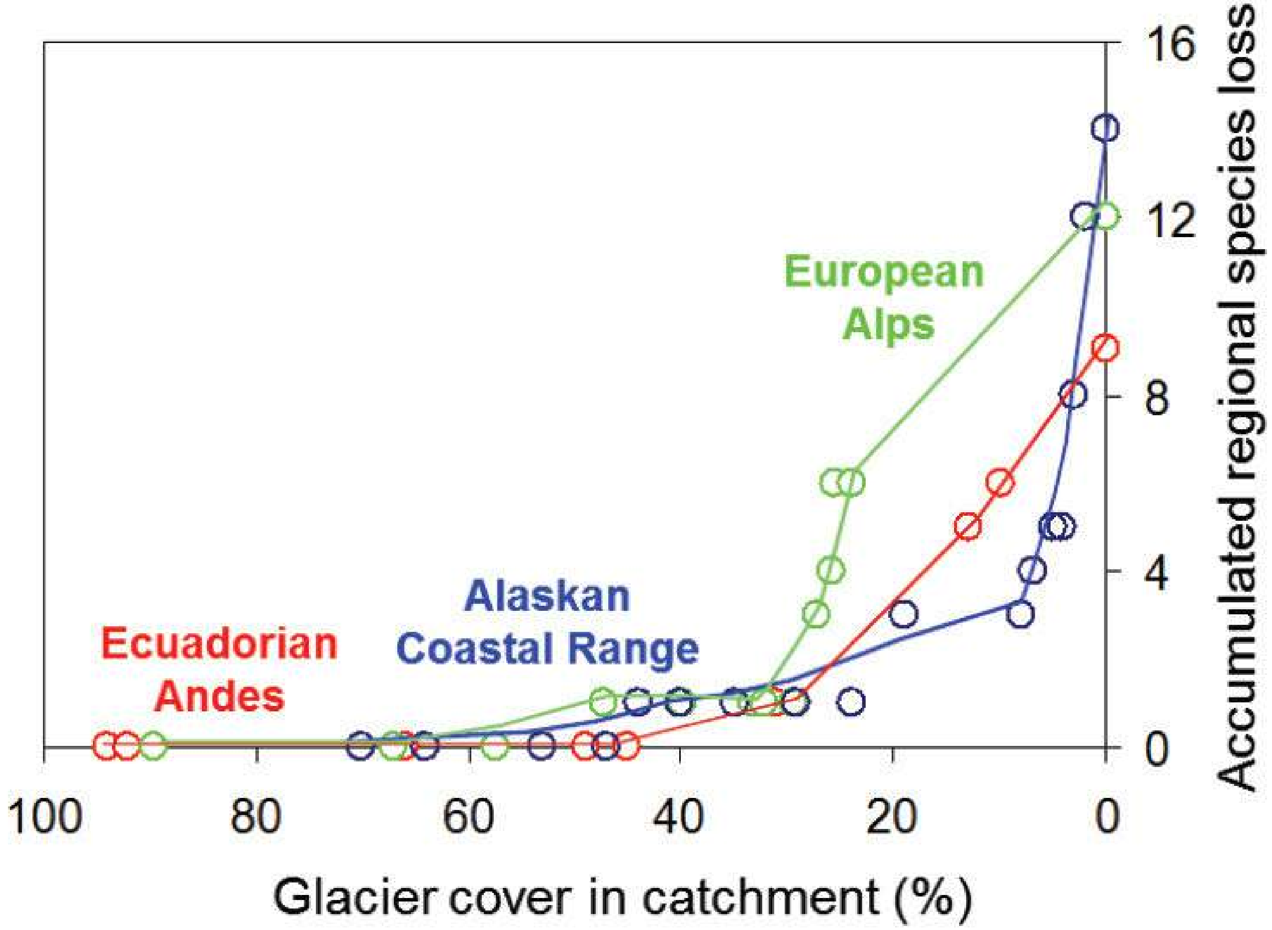




Forecasts

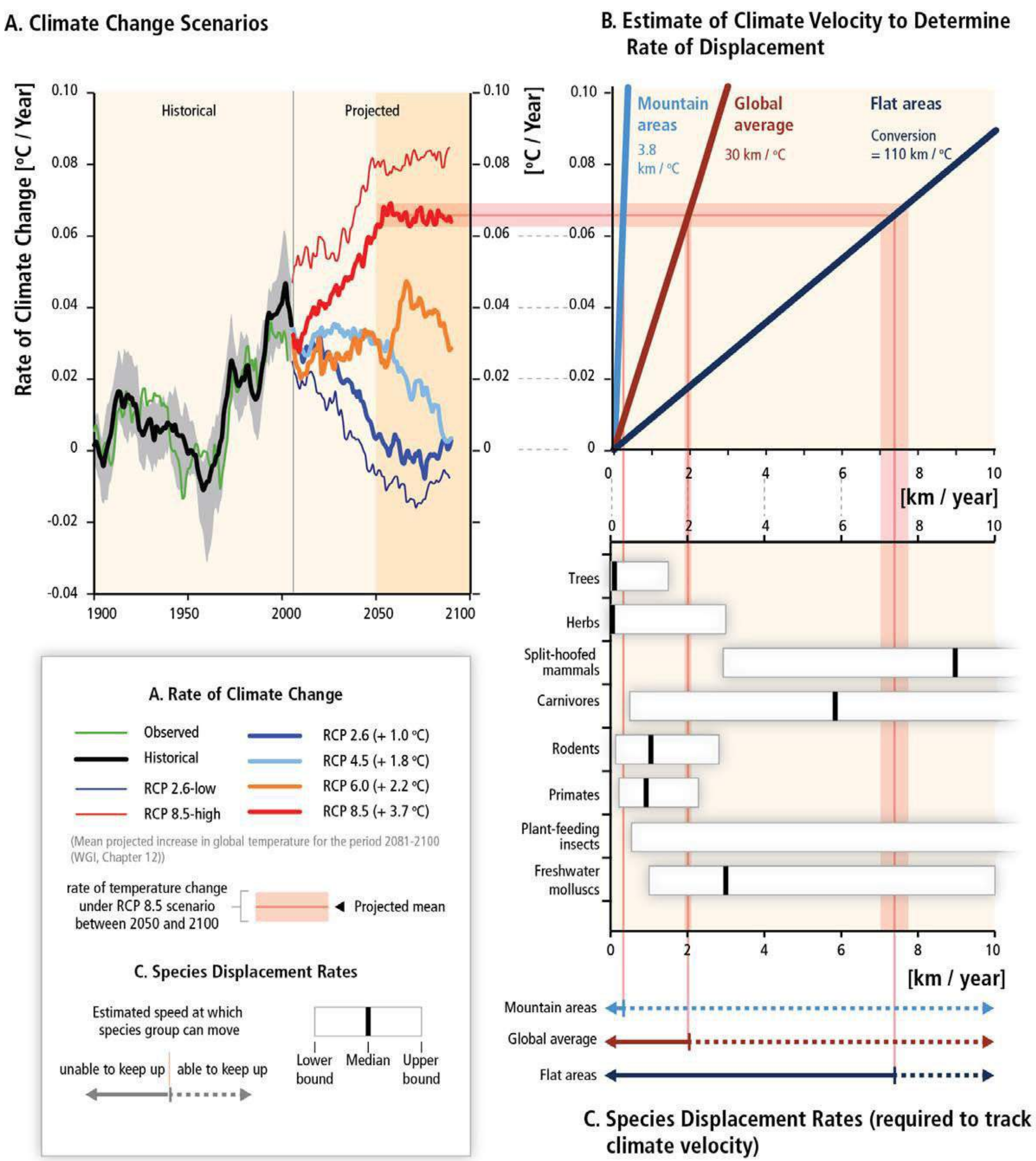


Cumulative total anthropogenic CO_2 emissions from 1870 ($GtCO_2$)
1000
2000
3000
4000
5000
6000
7000
8000
Temperature anomaly relative to 1861–1880 (°C)
0
1
2
3
4
5
Cumulative total anthropogenic CO_2 emissions from 1870 (GtC)
0
500
1000
1500
2000
2500
1890
1950
1980
2000
2010
2030
2050
2100
RCP2.6
RCP4.5
RCP6.0
RCP8.5
Historical
RCP range
1% yr^{-1} CO_2
1% yr^{-1} CO_2 range



"Accumulated loss of regional species richness (gamma diversity) of macroinvertebrates as a function of glacial cover in catchment. Obligate glacial river macroinvertebrates begin to disappear from assemblages when glacial cover in the catchment drops below approximately 50%, and 9-14 species are predicted to be lost with the complete disappearance of glaciers in each region, corresponding to 11, 16 and 38% of the total species richness in the three study regions in Ecuador, Europe and Alaska"

Jacobsen et al., 2012 Nature Climate Change



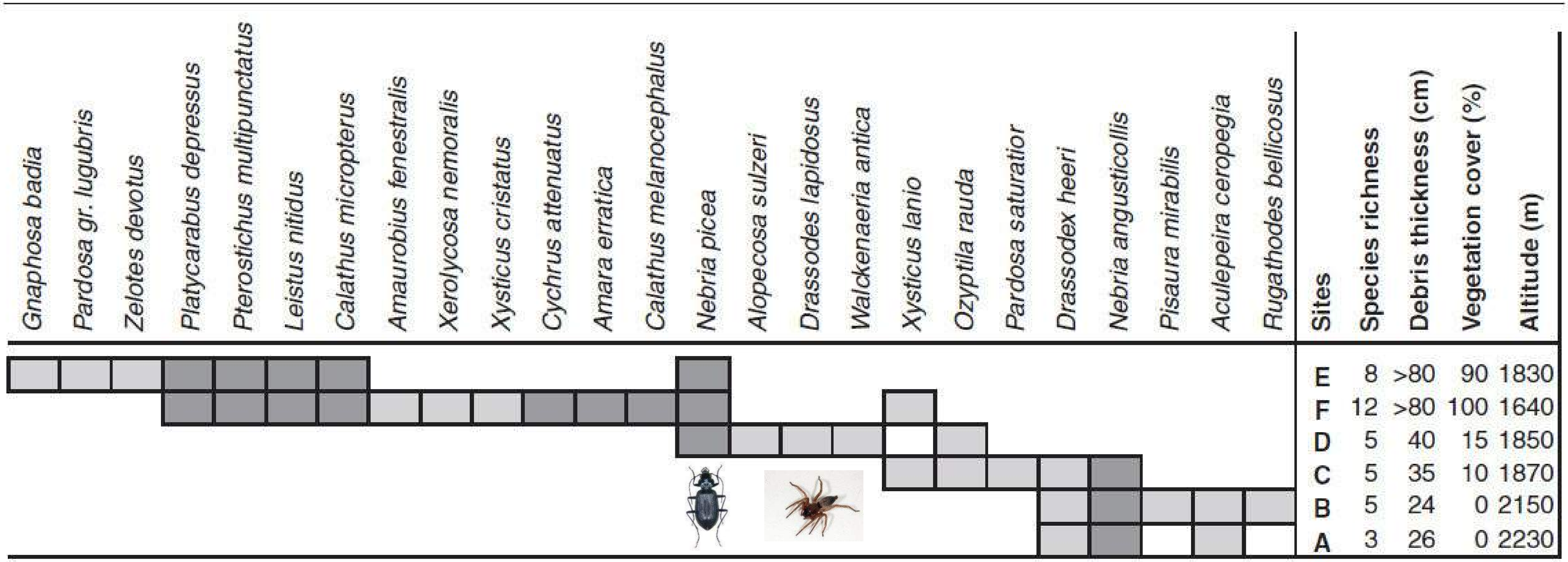
(A) Rates of climate change, (B) corresponding climate velocities and (C) rates of displacement of several terrestrial and freshwater species groups in the absence of human intervention.

Species groups with displacement rates below the band are projected to be unable to track climate in the absence of human intervention

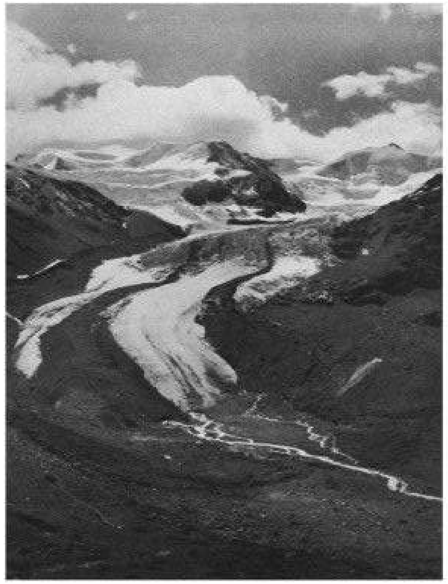
Species assemblages of carabid beetles and spiders at each analysed site in the Miage Glacier, Mont Blanc, Aosta Valley

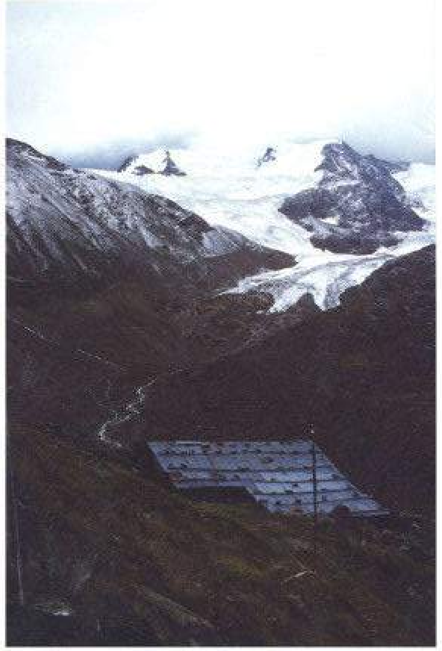
Sampling sites are ordered according to altitude; species are ordered according to the first axis obtained from a correspondence analysis. The grey dark rectangles are associated to the carabid beetles while those grey clear to the spiders.

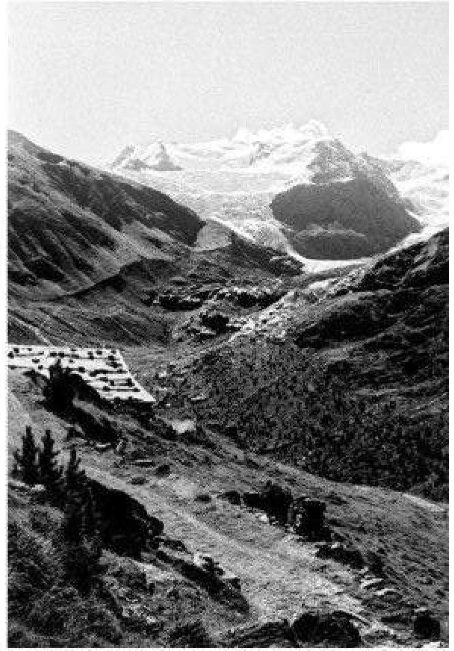
Gobbi et al., 2010. The Holocene



1890 *(photo Sella)* **1941** *(photo Desio)*







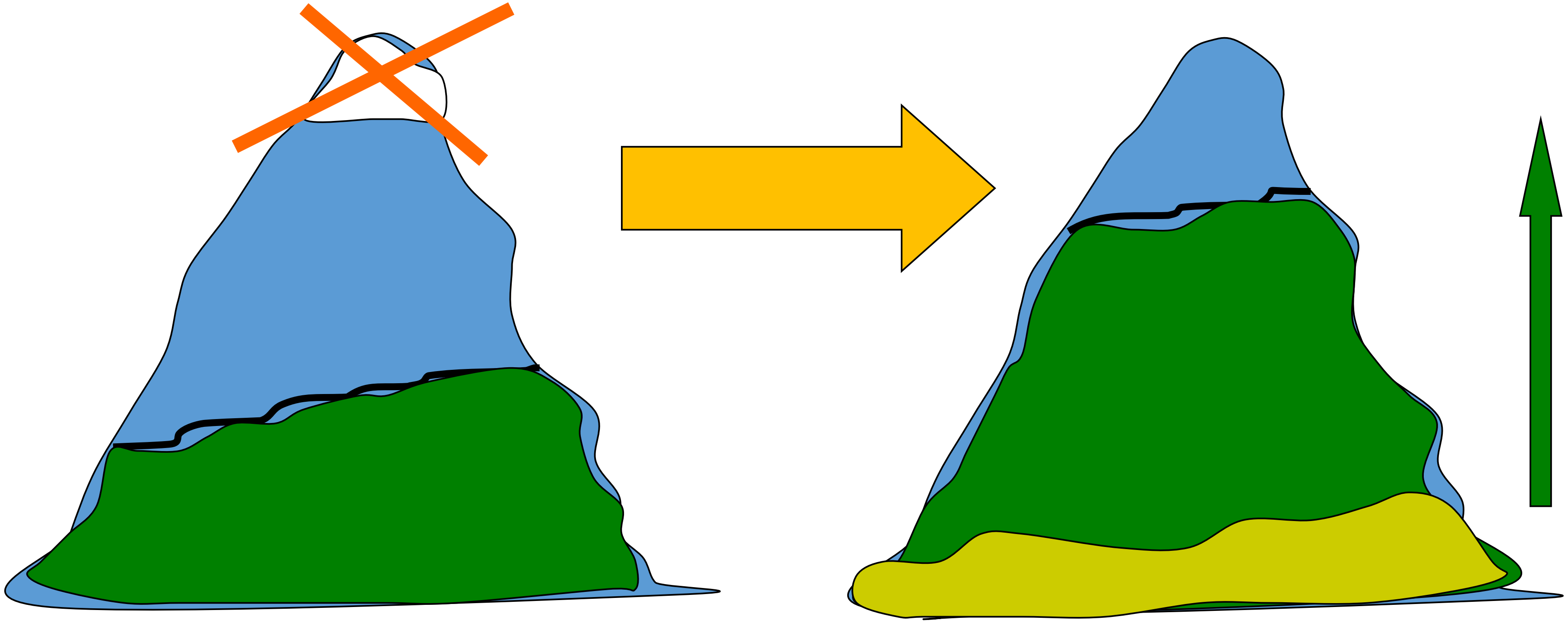
1997 *(photo Smiraglia)* **2007** *(photo Smiraglia)*

Delayed colonization of apparently suitable habitats due to a time-lag in response to changes of glacier cover (Forni Glacier, Lombardy)

“Sites already hosting the land cover type suitable for our study taxon, but ice-free for less than 100 yr, are mainly colonised by winged carabid beetles (which have high dispersal abilities and are mostly habitat generalists). No, or very few, wingless species (slow colonizers and ecologically specialized) occur within those sites. The overall pattern suggests that within a site, suitable land cover is established prior to colonization, due to a strong joint effect of time since deglaciation and land cover type”
Brambilla and Gobbi 2014, Ecography







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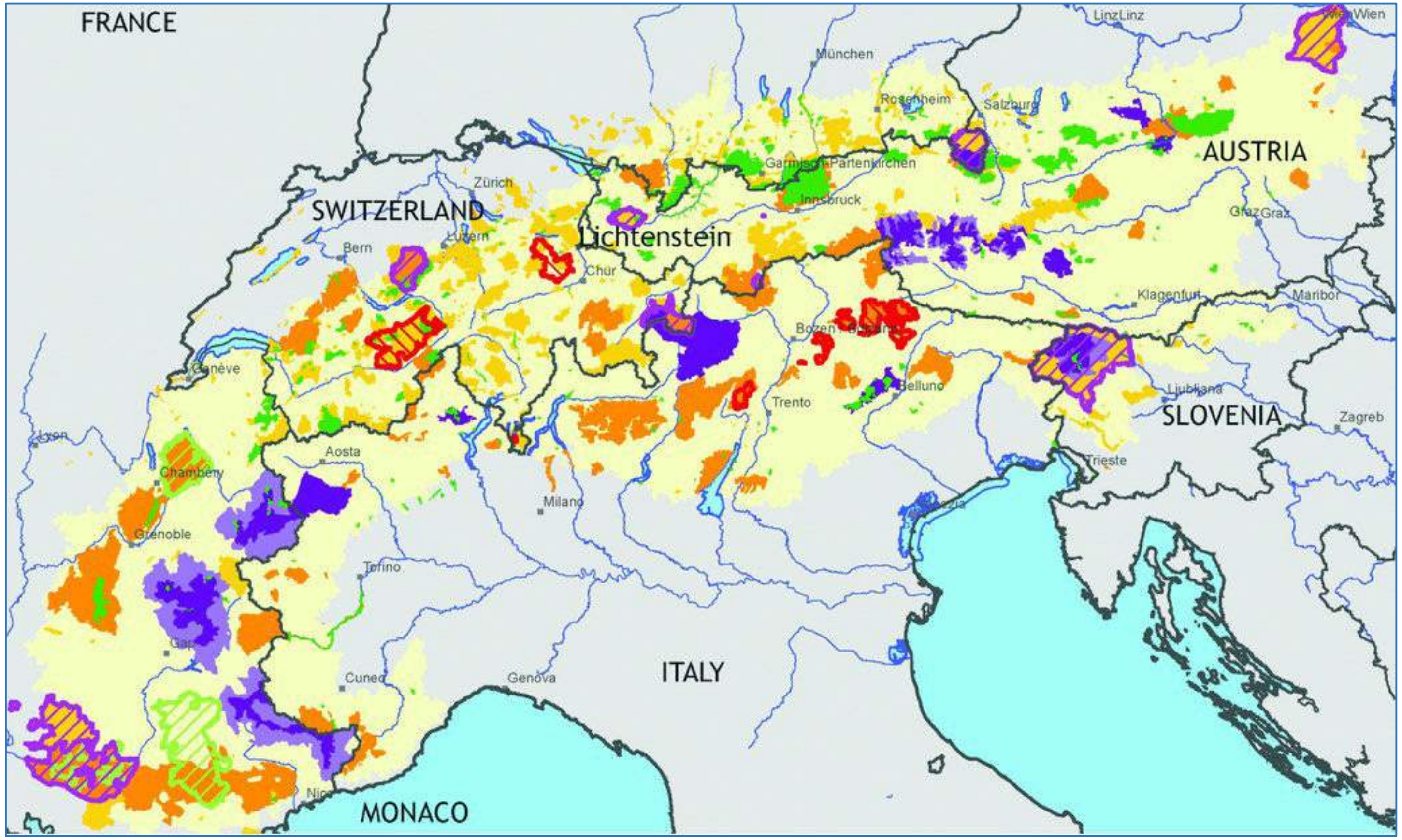

Some aspects for an effective ecological monitoring - 1

(from Lindenmayer and Likens 2010)

When long-term data are valuable

- **Documenting and providing baselines against which change or extremes can be evaluated**
- **Evaluating ecological responses to disturbance**
- **Detecting and evaluating changes in ecosystem structure and function**
- **Generating new and important questions about population, community and ecosystem dynamics**
- **Providing empirical data for testing ecological theory and models**
- **Data mining when exploring new questions**

= ***what parks are more interested to***

Some aspects for an effective ecological monitoring - 2

(from Lindenmayer and Likens 2010)

When long-term monitoring studies fail

- ➡ Mindless, lacking questions
- Poor experimental design
- ➡ Monitoring too many things poorly rather than fewer things well
- ➡ Failure to agree on what entities to monitor
- Flawed assumptions that all monitoring programs can be the same
- ➡ Scientific disengagement for monitoring programs
- Poor data management
- Loss of integrity on the long term data record
- Lack of funding
- Loss of key personnel
- Unexpected major events

➡ *when parks offer better conditions*

Thank you for the attention