AIMS

Evolutionary potential of animal taxa to adapt and survive climate change

Climate change has led to shifts in phenology in many species distributed widely across taxonomic groups (Hughes 2000, Parmesan & Yohe 2003, Dunn 2004). It is, however, unclear how we should interpret these shifts without some sort of a yardstick: a measure that will reflect how much a species should be shifting to match the change in its environment caused by climate change. In fact, many species are becoming mistimed due to climate change and the shift in the phenology of a species' food abundance is, by a first approximation, an appropriate yardstick. The review on phenology change across animal kingdom by Visser & Both (2005) suggests that an insufficient response to climate change is the rule rather than the exception, and that only in a few cases has the consumer shifted its phenology to the same extent as its food. A trophical decoupling of food web phenology may have severe consequences, including biodiversity loss (Visser et al. 2004).

- There is a great need to gain long-term datasets on phenology of species to link their data with those that may serve as a yardstick, because documentation of the incidence of climate change induced mistiming is crucial in assessing the impact of global climate change on the natural world.
- We need to know the potential adaptability of the species and their life histories to the change of environment due to climate change. Crucial data will be on the plasticity of the species in the observed traits and their heritability.
- Mountain systems provide an excellent field laboratory with the necessary conditions, namely a range of temperature regimes close to each other to assess the effect of climate differences on species life histories; this provides novel avenues towards testing evolutionary and ecological theory.
- Most studies on climate change effects on biodiversity concentrate on correlations of species' occurrence with temperature or certain habitat variables that lead to models on future distributions of species. Sadly they may well be misleading and not be satisfactory, because firstly temperature and habitat parameters may not be the key variable determining actual survival rates and distribution patterns. Secondly, an area experiencing environmental change may well lack behind the present carrying capacity of this area, particularly when species numbers are higher than expected since they well reflect former but not any more existent habitat conditions and species can already be at the brink of extinction (see also Kuussaari et al. 2009). A rapid decline and loss in individual numbers and biodiversity may easily happen soon in these areas.
  Therefore, only if the evolutionary potential, the phenotypic plasticity and the adaptability of a taxon including its yardsticks are known we may come up to better models and may get a better view on future potential biodiversity loss and distribution patterns of taxa.
- The tendency in the teaching programmes of Life Sciences at European universities is a support of microbiological and molecular genetic approaches on the cost of organism biology. It is more than crucial that universities may be able to provide teaching in the basics of "organism biology" namely identifying species, monitoring, biology of species, animal behaviour etc.. Universities need extra personnel to assure that the next generations of students will not loose the ability to know, measure and conserve biodiversity.

In the "Alpine Biodiversity Project" hole nesting birds such as Great Tits will serve as model species. They breed along altitudinal gradients and are therefore exposed to colder and warmer temperatures. Life history traits are closely related to habitat quality and that varies in our latitudes greatly between seasons. Timing of reproduction of Great Tits depends on insect development and this again from tree foliation and this again from temperature and/or daylight. In the different altitudes we find the perfect field laboratory where animals and their environment are exposed to different temperatures and may show adaptations to different temperatures and can offer insight in the speed of adaptability of a species and its food to long-term changes in climate.

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