1. What are the session key findings? What are the new Lesson(s) learned / Scientific progress (since AR5 release, if relevant)?

Biodiversity and ecosystems can amplify or dampen climate change. Any change of the structure and functioning of the ecosystem can alter the albedo and the surface temperature, the evapotranspiration and rainfall in adjacent ecosystems, the aerosols production, the surface roughness that impacts the efficiency of water and energy exchange with atmosphere, the radiation absorption through LAI change, the balance between greenhouse gas emission and sequestration in both terrestrial and aquatic ecosystems, etc.

Various processes are involved in biodiversity dynamics and evolution at different time scales, from phenotypic plasticity to genetic and phenotypic changes, through population dynamics and selection, also by trophic and non trophic interaction networks, community dynamics, etc. These processes are all impacted by the climate change, but not by the climate change alone. They are also impacted by biodiversity loss, land use, forestry, fire, fishing, pollution, and by the interactions between all these changes.

The analysis of global marine biogeography records and fisheries data shows that ocean warming has already been altering marine species assemblages in the past four decades. Such findings corroborate with results from simulation modelling of global shifts in distributions of marine fishes and invertebrates, highlighting the large climate risks on regional ecosystems, particularly in the tropics, in terms of decreases in biodiversity and key ecosystem services such as fisheries.

Body size is a major determinant of life histories, demography, population size, nutrient turnover rate, and food-web structure. By altering body sizes in whole communities, current warming can potentially disrupt ecosystem function and services. Organisms often have smaller body sizes under warmer climates (Bergmann's rule and the temperature-size rule). However, the magnitude of the effect of temperature on body-size partly depends on competition and predation, i.e. on local conditions: competition (both intra and interspecific) and predation favours smaller individuals under warmer conditions.
Phenology is commonly used as indicator for evaluating responses of ecosystems to climate change. Phenology matters for the dynamics of biodiversity-climate interactions. The timing of leaf development strongly regulates earth-atmosphere interactions and thus climate feedbacks, e.g. via biogeochemical cycles and impacts on the global energy balance, as well as biotic processes, such as pollination, agricultural and forestry production, and human health (via allergenic pollen). The reported variability in observed trends and responses has been related to geno / phenotypes, microclimate in stands, provenances and origins, species, species traits and phylogeny, regional climates and methodological considerations. Variability may yield to more plasticity and resilience to climate change and thus phenological responses will drive the fitness and adaptation capacities of species.

2. What are the major knowledge Gaps and Research Needs identified in the session?

Impact of genetic variability (body size, phenology, behaviour, dispersion) on adaptive capacities of species, on biogeochemical cycles and on determinants of the feedbacks of biodiversity on climate change.

Trophic organization of ecosystems and resilience of ecosystems under climate change.

Impact of trophic and non-trophic organization on the feedbacks of ecosystems on biogeochemical cycles and other functionings relevant for climate change.

Alteration of the ability of ecosystems to respond to climate change because of the loss of biodiversity.

3. Did the session discuss/identify promising approaches in the fields of Adaptation and Mitigation, or both?

4. Are there take-home messages from the session?

The trophic and non-trophic organizations of ecosystems, and their variability, are key-determinants of the feedbacks of biodiversity on climate change. They are also potential tools for the adaptation and mitigation of climate change, especially for managed and intensively exploited ecosystems. The quality of the predictions of the climate change and the relevance of adaptation strategies is partly dependent on our understanding of ecosystem dynamics. There is an urgent need to improve our forecasting abilities on the interactions between ecosystem structure and dynamics. General theories have to be developed, which requires the development and permanent financial support of experimental facilities in ecology.

If many researchers are now studying the effects of climate change on biodiversity, ecosystem functioning and ecological services, the study of ecological feedbacks should be a priority and should mobilize more scientists.
5. Are there Important Quotes from the session?

6. Please include any other remark that you might have.