Questions and Answers to Lecture 9

1.) In Chapter 12.1 the mechanistic description of physical processes are being discussed. In the first exception, we look at models that have a significant feedback from biological and ecological processes on the physical process. Do we need to treat that differently as before, because we modelled the physical conditions ar external influence factors on the biogeochemical processes but now there is a mutual interaction?

Yes. In this case, we cannot any more calculate (or even just specify as we did it) physical conditions beforehand and then do ecology in prescribed physics. This would need to set-up a joint model for physics, chemistry and biology and to jointly solve all equations simultaneously.

2.) Couldn't age, size or life-stages also be functional groups?

In some cases, they may be modelled similarly as functional groups. However, under functional groups we understand a collection of species that behave similarly in aspects that are of interest in the current problem.

3.) Leslie-Matrix: we do consider the surviving and new born individuals in the matrix, but what about the death rate?

The survival probability in one time step can be calculated as $s = \exp(- k_{death} \Delta t)$. This equation links survival to death. The fraction s survives, the fraction (1-s) dies. In this simple model, similarly to our very first models, the dead organisms are not tracked by the model.

4.) In chapter 12.3.1 we discuss the continuous time approach. I understood that the time has the same scale as the age. Further, we say that death depends on age, time and the number of organisms. How can it depend on time, as time and age have the same scale?

Time and age increase at the same rate (this corresponds to our everyday experience). This does not exclude the possibility for time-dependence in the model, e.g. by seasonal variations in external influence factors as we had it in our models. It is no problem to be half a year older in a summer following a winter and at the same time have a higher mean temperature that roughly depends on the time in the year. Time and age advance at the same pace. But time is a “universal” variable whereas age is a property of the individual. In our models, seasonal variations in external influence factors are time-dependent whereas birth rates are age-dependent (in the simplest case just zero before reaching maturation age and constant afterwards, but more refined models are easily possible).