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Vegetation dynamics on the dry seafloor of the Aral Sea

The Aral Sea, in 1960 the 4th largest sea on the globe, is critically drying out. The sea level has dropped by about 18 m, at the flat east coast horizontally almost 100 km. A new dry surface area of about 40.000 km² is exposed. The development of separate smaller independent water bodies is reality. The terms „Great Aral Sea“, „Small Aral Sea“, as well as „Aral Sea Syndrom“ for an ecological crisis, and „Aralkum Desert“ for a new desert area are used now.

The dynamics on the drying sea floor is unique. Unconsciously human mankind has created a huge experiment, an experimental set, a laboratory of nature with thousand of local events. The drying seafloor is a new surface, which is invaded actively by organisms. The dry seafloor is the biggest area worldwide where a primary succession takes place. With an extraordinary multiplicity it exhibits the appearing and disappearing of vegetation units:

- There have evolved unique plant communities and ecosystems
- 245 angiosperm species have enlarged their distributional area
- The high diversity of local stands is favouring microevolutionary processes
- The drying seafloor and the coastline of the Aral Sea is one of the diversity centers for Chenopodiaceae and Polygonaceae (Calligonaceae) in Central Asia

The new knowledge on vegetation dynamics in the Aralkum Desert, which is a mosaic of sand- and salt desert ecosystems, is very important for the understanding of the ecosystem dynamics in the whole central Asian area.

Since about 1990 the hydrological dynamics of the northern and southern part is different. The water level of the Small Aral Sea became more or less stabilized. The vegetation dynamics around the Small Aral Sea is now governed mainly by biotic factors. The retreat of the water level of the Great Aral Lake, however, still continues. The salt concentration of the water has increased now to about the level of ocean water. In consequence here exogenic and abiotic factors are dominating the ecosystems dynamic, especially the first few years after drying. Since about 1985 vast dried areas have developed to open salt deserts, hence the colonization with perennials is hindered increasingly. This causes the absolute dominance of various halophytes as pioneer species and the lack of almost all other life forms at the present colonization of the dry seafloor.

The study of the mechanisms of the ecosystems dynamics and the ecological attributes of the dominant species is of great importance for clarifying the following open questions:

- Will there be an ecological limitation of colonization by plants and where it will be?
- Which mechanisms are governing the development of salt desert and of sand desert (barchanes)?
- By which means the natural colonization by plants can be accelerated?
- Which geological, geomorphological and edaphical processes are affecting the present ecosystems development?

The dry seafloor of the Aral Sea at present is a huge open salt flat. According to several estimations it is the source of many million tons of salt and dust blown out by wind and transported to even distant neighbourhood areas, with irrigation areas and settlements. The present and future development of the drying sea is characterized by the creation of salt desert flats. The continuation of the drying process at the Great Aral Sea will increase the problem of salt dust storms tremendously. In this case the agricultural used areas east and south of the Aral Basin will be hit even more. It is high time for strict measures to decrease the salt dust output.

Preliminary results from the started BMBF-research project have already shown, that any plant cover on the dry seafloor is from eminent importance for stabilization of the soil surface.

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