

Primary succession on the dry sea floor of the Aral Sea

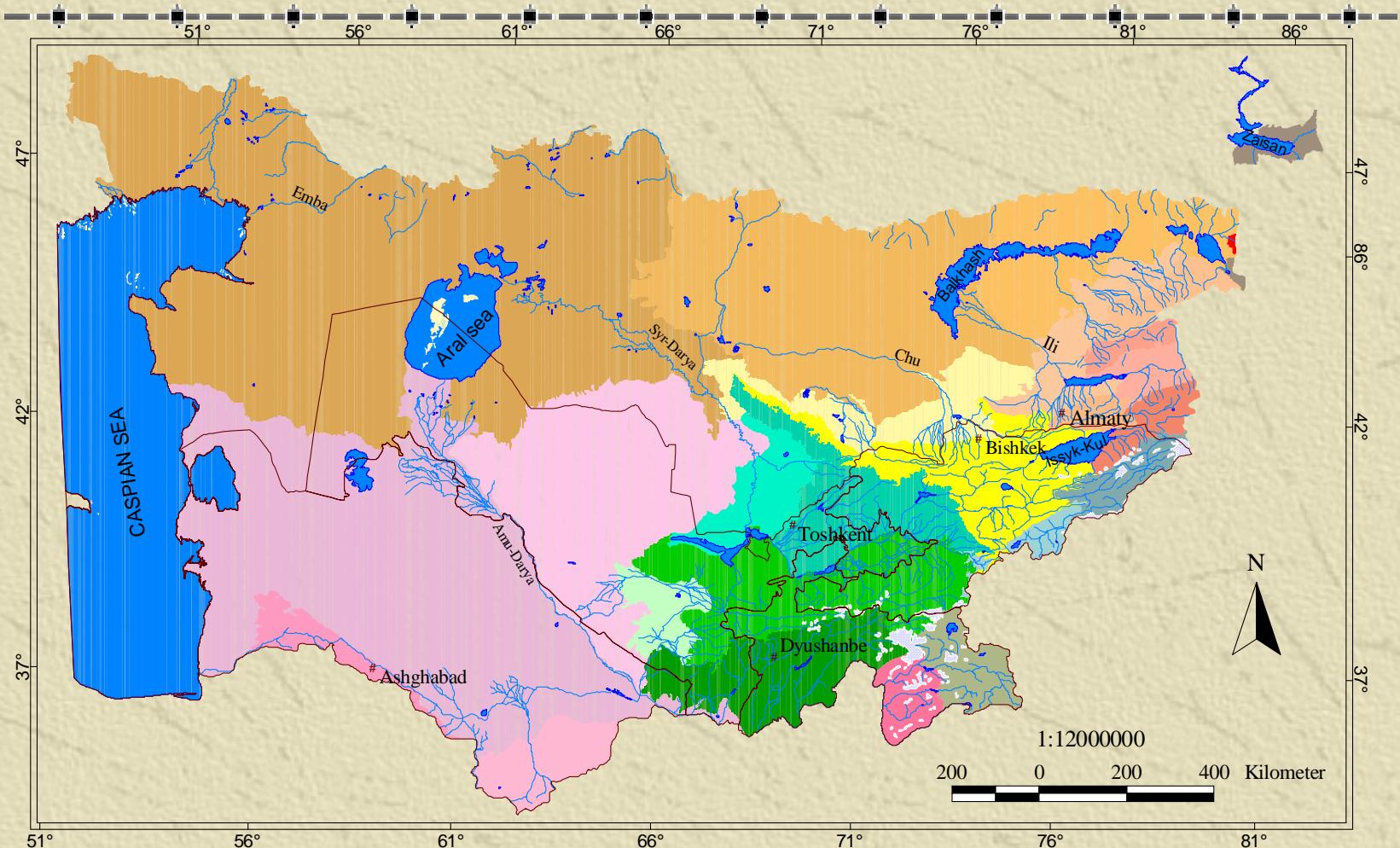
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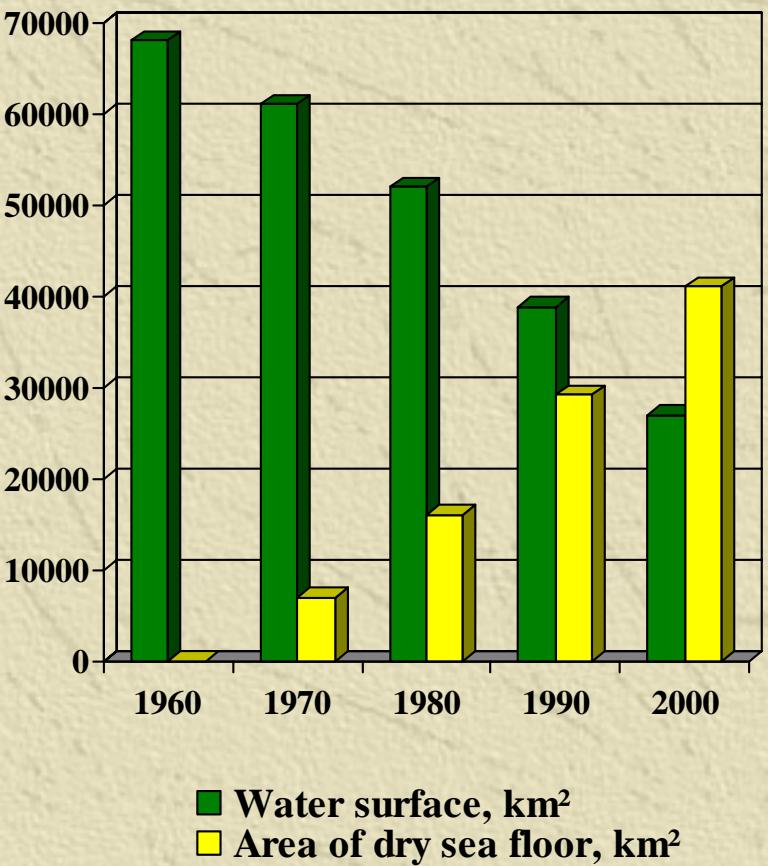
- ❖ Development of the Aralkum Desert
- ❖ Vegetation Districts of the Dry Sea Floor
- ❖ Flora of the Dry Sea Floor
- ❖ Succession on the loamy soils
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Deserts of Central Asia



Botanical-geographical classification of the deserts of Central Asia
(Rachkovskaya et al. 2004)

Development of the Aralkum desert



Development of the Aralkum desert

- ❖ What is this new desert?
- ❖ Which geological, geomorphological, edaphical and biological processes are affecting the present ecosystems development?
- ❖ Which mechanisms are governing the development of salt desert and of sand desert (barchanes)?
- ❖ Will there be an ecological limitation of colonisation by plants and where it will be?

Research activities in the region at the Aral Sea

I. 1977-1985 Institute of Botany, Alma-Ata

Complex research program under the leadership of the Geographical Institutes of Moscow „Investigation of the negative effects of the drying process of the Aral Sea....“

II. 1994-1995 University of Kassel, DFG-Project

„Transect investigation at the coast of the Aral Sea“

III. 1998-2004 University of Bielefeld, BMBF-Projects

1. „Successional processes on the dry sea floor of the Aral Sea and perspective of the land use“ (1998-2001)
2. „Combating desertification and rehabilitation of the salt deserts in the Region at the Aral Sea“ (2002-2004)



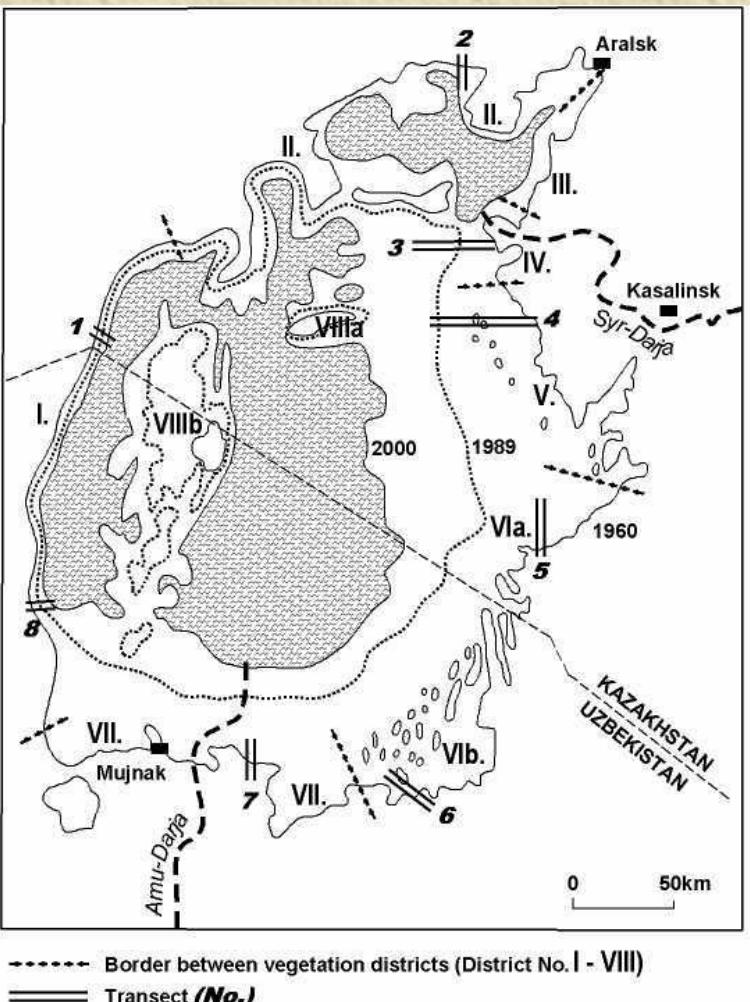
Dry sea floor of the Aral Sea at the North Coast



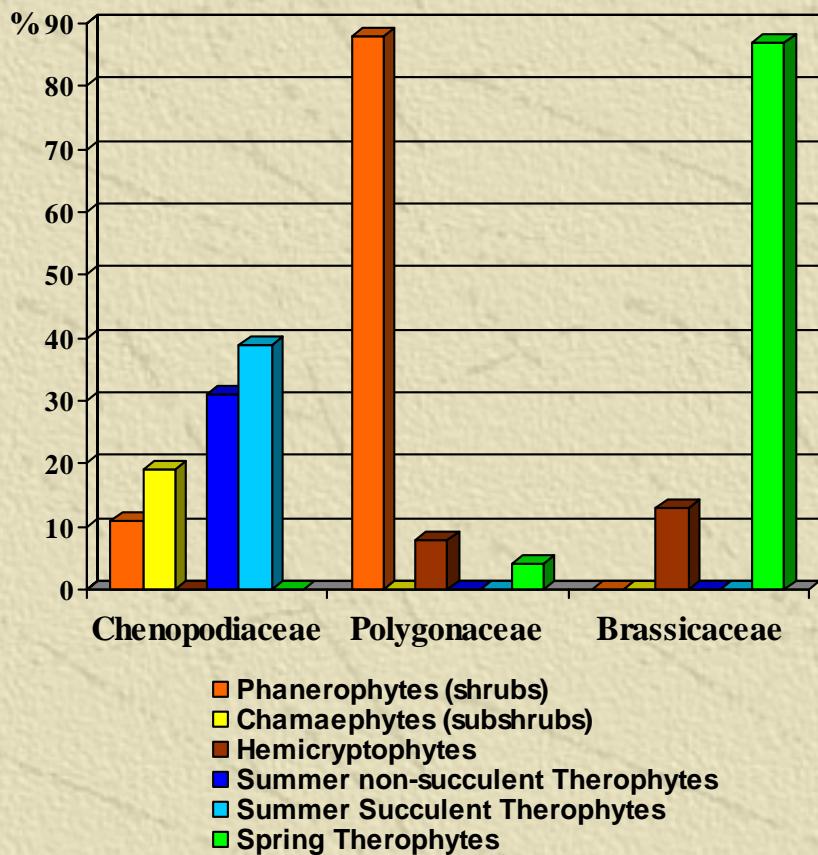
Transect Karabulak at the North Coast of the Aral Sea

Floristic and vegetation districts

- I. Chenopodiaceae + Fabaceae + Poaceae
- II. Chenopodiaceae + Brassicaceae
- III. Chenopodiaceae + Poaceae + Polygonaceae
- IV. Chenopodiaceae + Limoniaceae + Tamaricaceae
- V. Chenopodiaceae
- VI. Chenopodiaceae + Fabaceae + Polygonaceae
- VII. Chenopodiaceae + Poaceae + Tamaricaceae
- VIII. Chenopodiaceae + Poaceae



Life Forms / Flora of the Dry Sea Floor

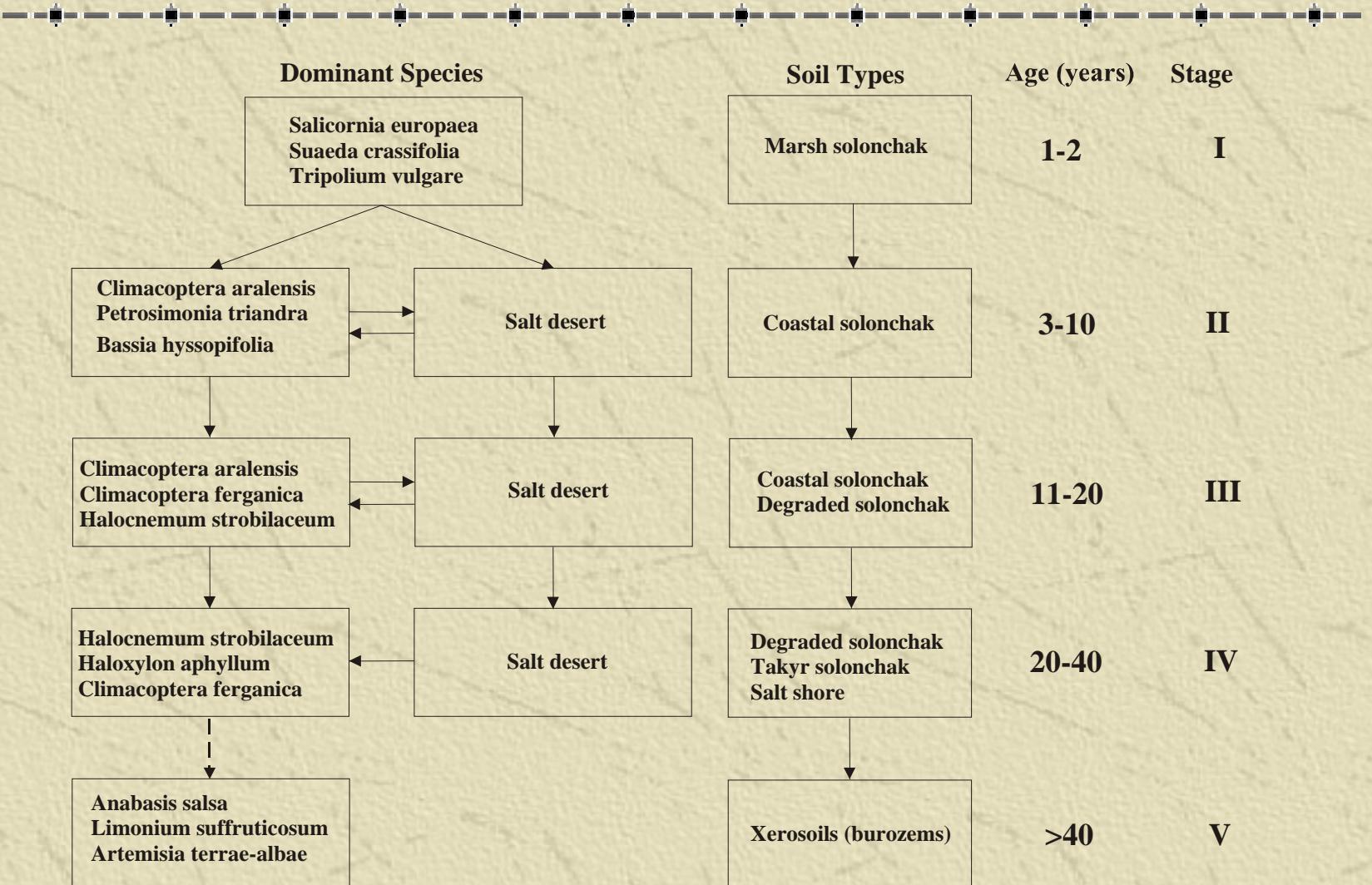


Plant life form spectrum of three dominant plant families of the dry seafloor of the Aral Sea

Family	Genera	Species	Species, %
<i>Chenopodiaceae</i>	27	75	28.2
<i>Polygonaceae</i>	5	36	13.5
<i>Brassicaceae</i>	23	31	11.7
<i>Asteraceae</i>	16	28	10.5
Poaceae	14	18	6.8
Fabaceae	9	17	6.4
Boraginaceae	6	8	3.0
Tamaricaceae	1	7	2.6
Cyperaceae	3	5	1.9
Zygophyllaceae	3	5	1.9
Other families	27	36	13.5

Floristic data on the vascular plants of the dry seafloor of the Aral Sea: the dominant 10 plant families and percentage of total flora

Succession on loamy soils





Stage I - *Salicornia europaea* plant community



Stage I - *Salicornia europaea* plant community



Stage II – *Bassia hyssopifolia* plant community

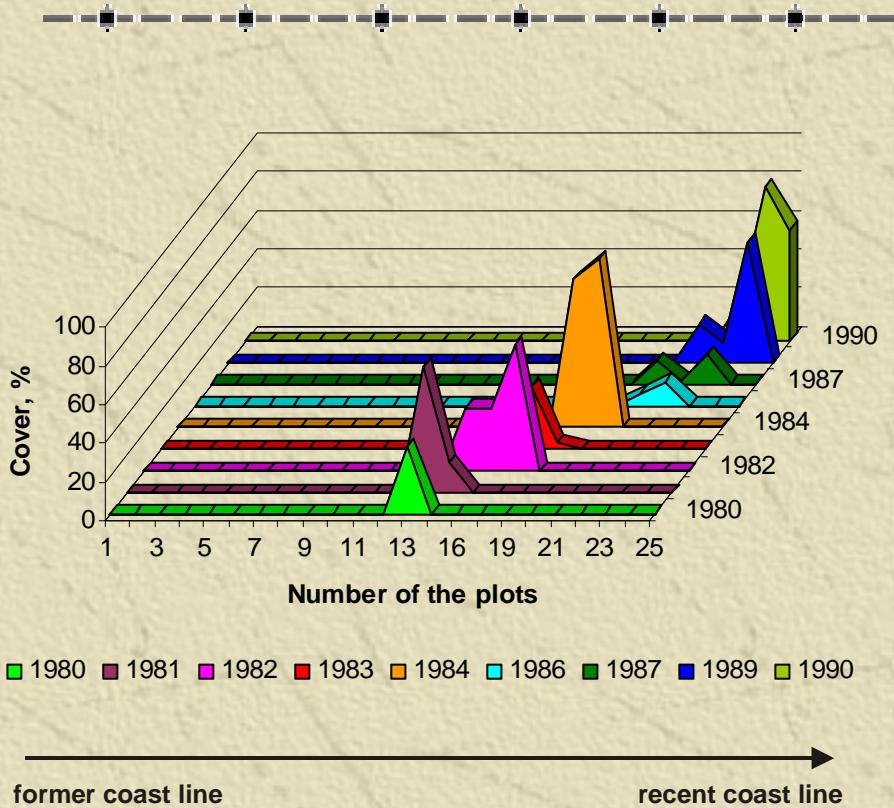


Stage IV – *Halocnemum strobilaceum* plant community

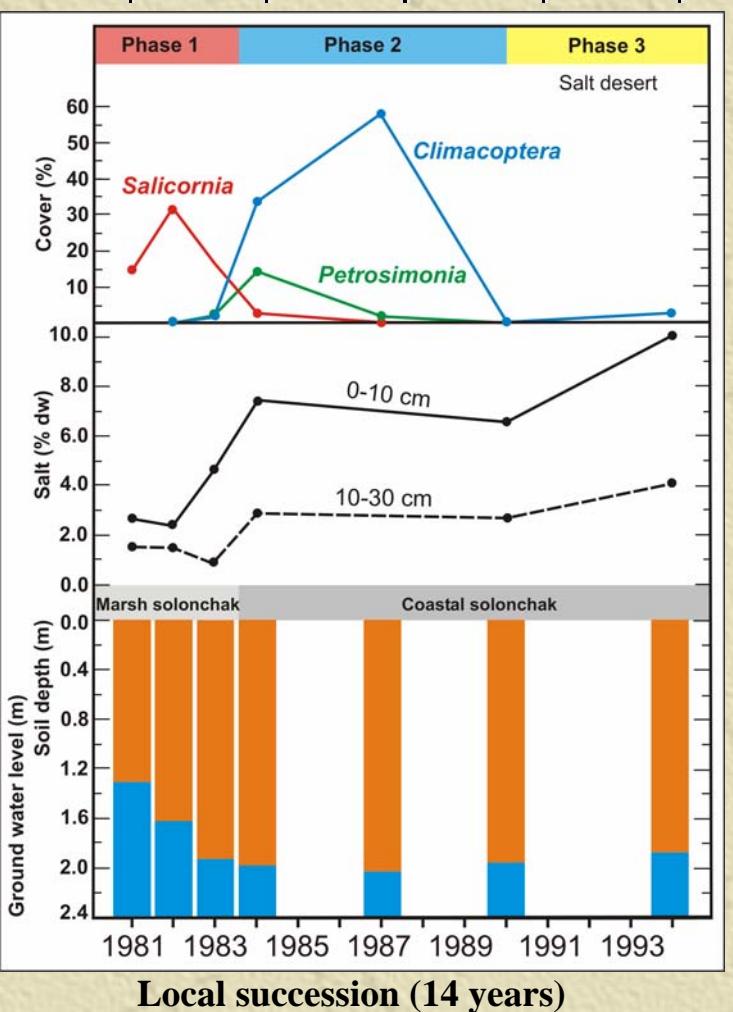


Stage II-IV – Salt desert on the dry sea floor of the Aral Sea

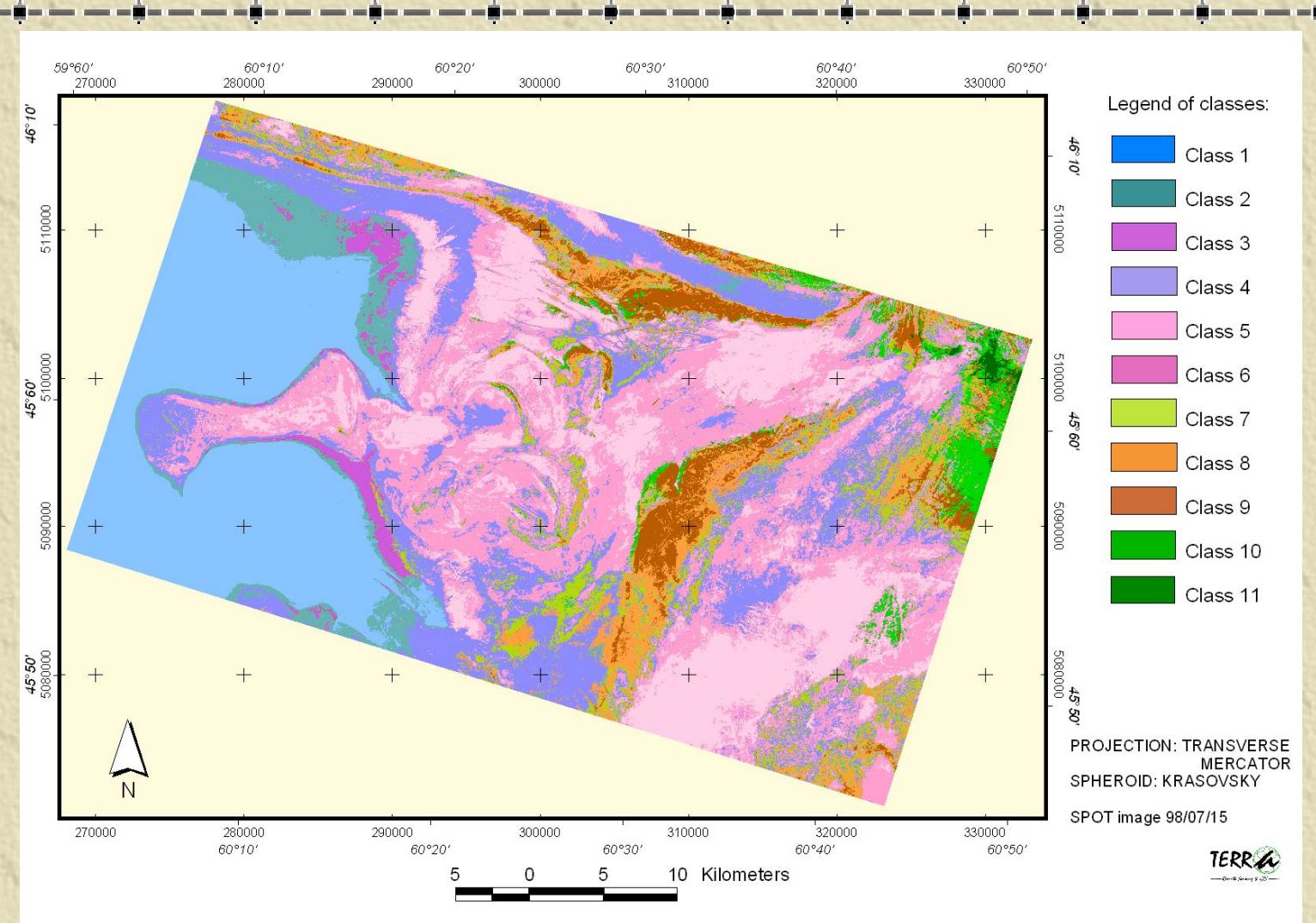
Succession on loamy soils



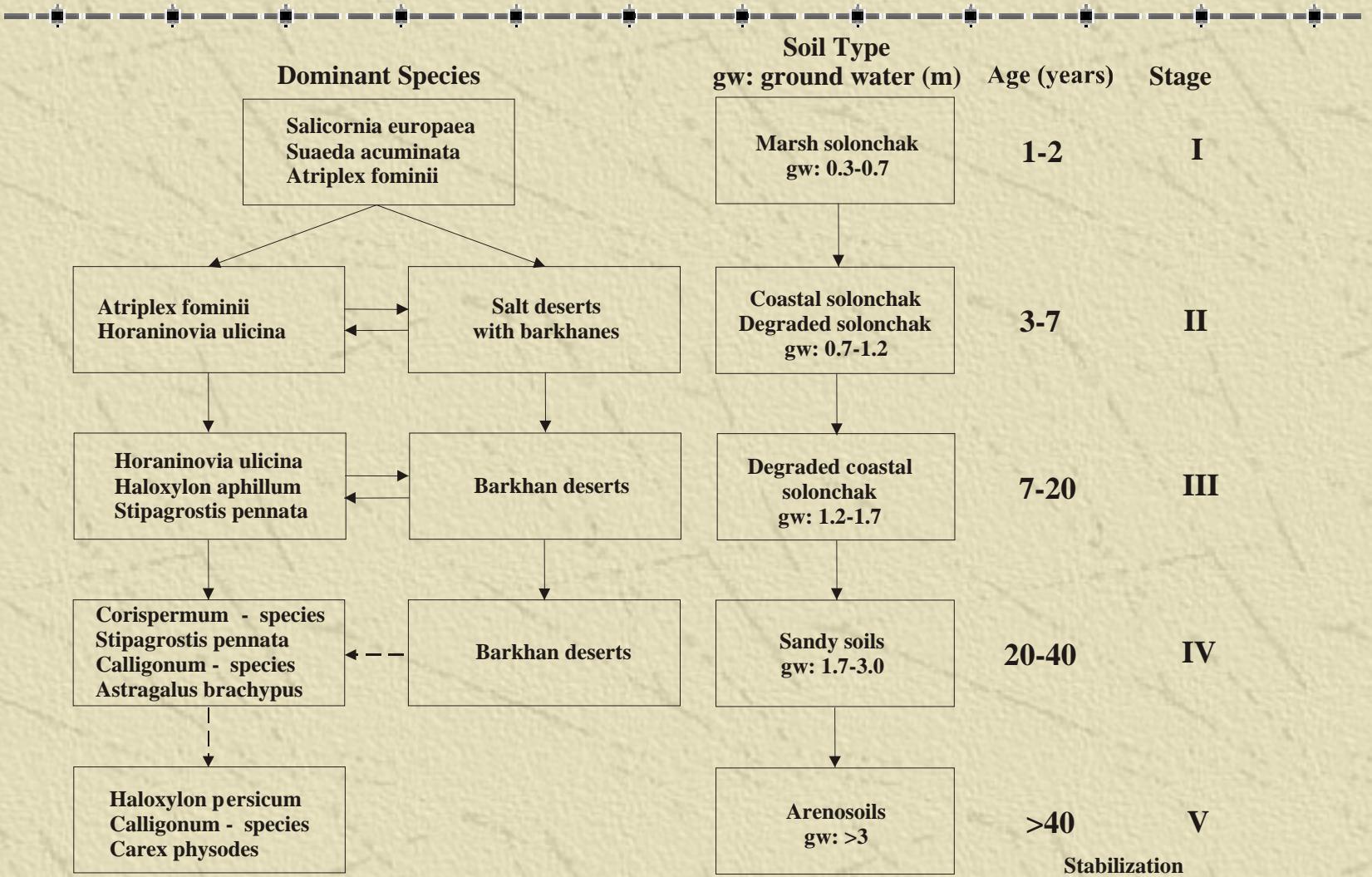
Dynamics of the cover of *Salicornia europaea* population (transect Bayan)



Vegetation map of the transect Bayan (east coast of the Aral Sea)



Succession on sandy soils





Stage II – *Horaninovia ulicina*-*Atriplex fominii* plant community

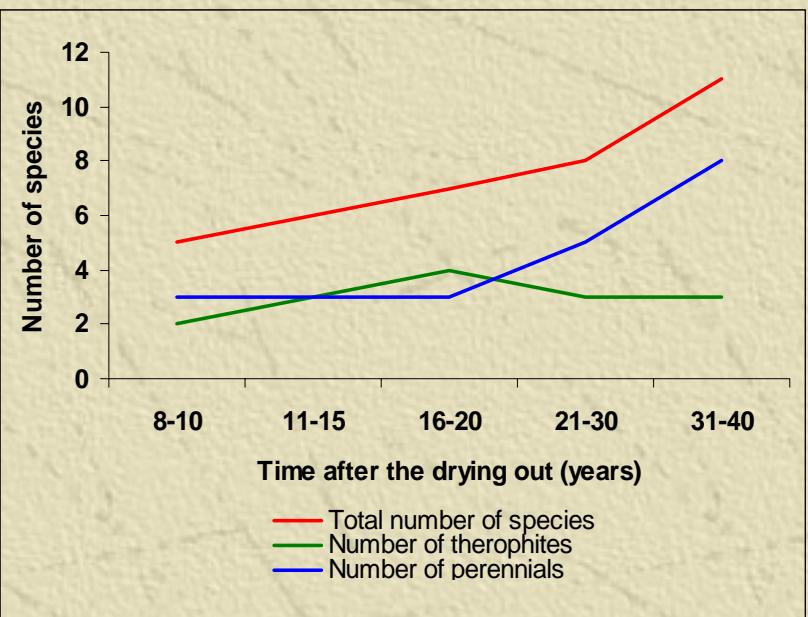


Stage III – *Haloxylon aphyllum*-*Atriplex fominii* plant community

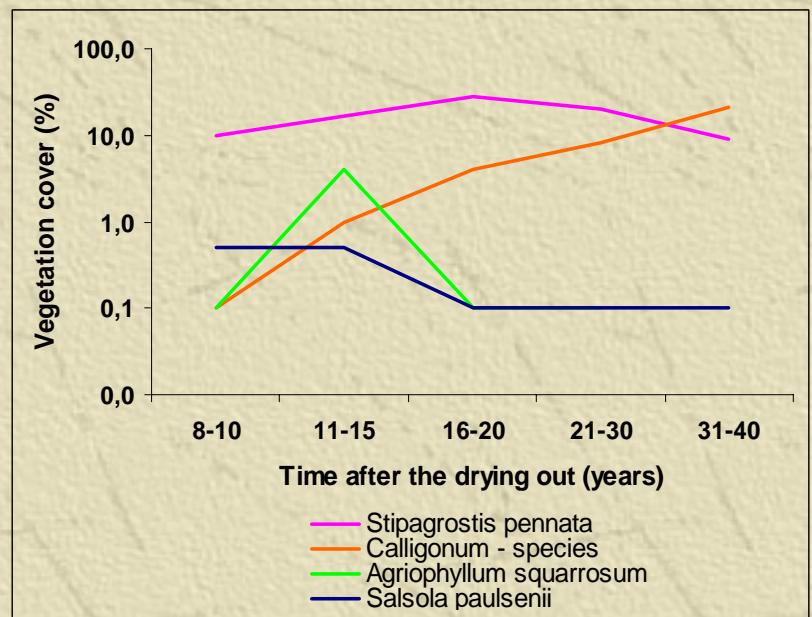


Stage IV – *Stipagrostis pennata*-*Haloxylon aphyllum* plant community

Succession on sandy soils



Change of the number species



Dynamics of the cover of several psammophyte species

Ecological peculiarities of the plant colonisation of the dry seafloor

- ❖ The coast of the Aral Sea as a floristical centre
- ❖ Expansion of plant species
- ❖ Development of unique plant communities and ecosystems
- ❖ Development of monotonous widespread vegetation units
- ❖ Development of unexpected plant combinations
- ❖ Development of new ecological attributes by the plant species
- ❖ Contrasting fluctuating dynamics



Establishment of *Haloxylon aphyllum* on the dead rest of *Phragmites australis*



***Halostachys caspica-Petrosimonia brachiata* plant community**

Conclusions

- ❖ The dry sea floor (Aralkum desert) is the largest area worldwide where a primary succession takes place. It has continued for 40 years
- ❖ The flora of the dry seafloor is an immigration-flora that developed since 1960. It consists of 34 plant families, with 134 genera and 300 species
- ❖ The dry seafloor and the coastline of the Aral Sea is one of the diversity centers for Chenopodiaceae and Polygonaceae (Calligonum) in Central Asia
- ❖ The typical pattern of landscapes, of vegetation types and soils of the dry seafloor is arranged along stripes

Conclusions

- ❖ The succession on the dry sea floor is a complex process, interrelated with exogenesis, endoexogenesis and syngensis
- ❖ Hundreds of species became the opportunity to fill out or to expand their distributional area. Unique compositions by various plant species have developed
- ❖ The ecological situation on the dry seafloor is very changeable and the dry seafloor is a big dynamic ecosystem. It is a huge experiment, a laboratory of nature with thousands of local events