



# Scientifically-based methodological approach to Bukhara deer conservation and restoration in Central Asia

- Uzbekistan, Turkmenistan, Tajikistan, Kazakhstan –

## and results of the practical activities in 1999-2015

**Olga Pereladova**  
*Ex-director, scientific adviser of WWF  
C A Programme*



# Subspecies-specific characteristics of this form of deer:

## ***Physiology:***

- Concentration of biologically- active compounds in velvets (concentration in 1,7 times higher than that of traditional species - sika deer and Siberian wapiti –"maral")
- Reversed moulting and rutting periods
- Adaptation to very poor diet

## ***Behavior / acoustic communication***

- Rutting activity;
- Size of reproductive groups;
- Level of aggressiveness;
- The only true deer species, forming a true lek (*in understanding of "The evolution of ungulate leks" after Clutton-Brock et.a., 1993*)



# Unusual for other red deer subspecies order of different phenological processes)

Males: summer/autumn -three major physiological processes, connected with important hormonal changes and energy-consuming - **never overlap** :

- Cleaning of velvets
- Autumn shedding
- Rutting period/reproduction

## ***European and Siberian subspecies:***

Cleaning of velvets & autumn shedding – before, after – **rutting and reproduction, exhausting dominant males**

## ***BD - natural populations:***

Cleaning of velvets - **rutting and reproduction, NON- exhausting dominant males** - autumn shedding

## ***BD – process of adaptation to new conditions:***

Cleaning of velvets & autumn shedding –before, after – **rutting and reproduction, NON-exhausting dominant males**



1 – cleaning of velvets –



2 – autumn shedding –



3 – rutting period –



A. Cycle typical for European and Siberian groups of subspecies:



B. Cycle typical for natural populations of Bukhara deer:



C. Cycle registered in the groups of BD during adaptation periods:





## Materials and method:



The study of the species ecology, behavior, population dynamics of Bukhara deer (*Cervus hanglu bactrianus* Lydd.) covers the period since **1972 till 2015**; Comparative analysis of behavior and acoustic communication was conducted in populations which varied in

**(a) geographical location, in total more then 1000 km from the North to the South, more then 1500 km – from the West to the East:**

✓ **Tajikistan** (3 sites)

- 1 – *Tigrovaja balka*,
- 2 – *Romit*

✓ **Kazakhstan** (2 sites)

- 3 – *Karatchingil*,
- 8 – *Turkestan, Syrdaria*

✓ **Uzbekistan** (3 sites)

- 4 – *Kyzylkumskii*,
- 5 – *Badai-Tugai*,
- 6 – *Zarafshan*

✓ and **Turkmenistan**  
(3 sites)

- 7 – *middle reaches of Amudaria-Gorelde*





## Materials and method (cont.) :

*(b) Repeated research in one population – with different number/population density;*

*(c) phase of the population development (growth, stabilization, decline, etc.), e.g. NATURAL POPULATIONS*

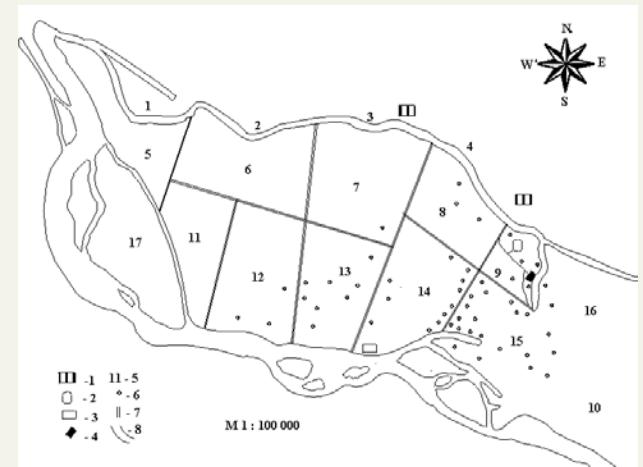
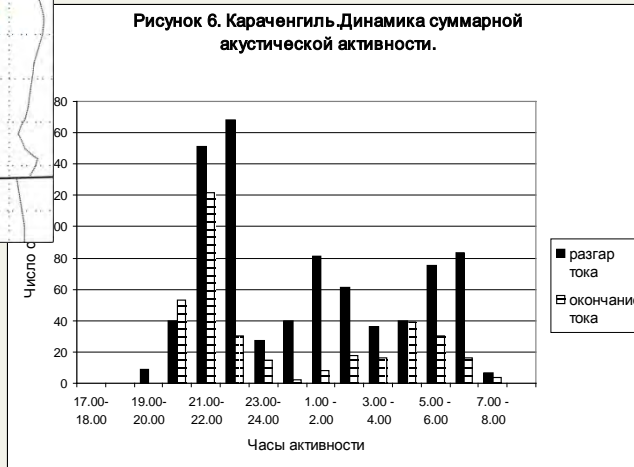
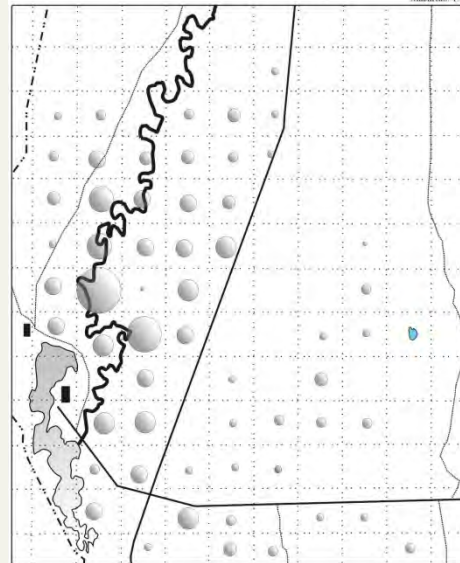
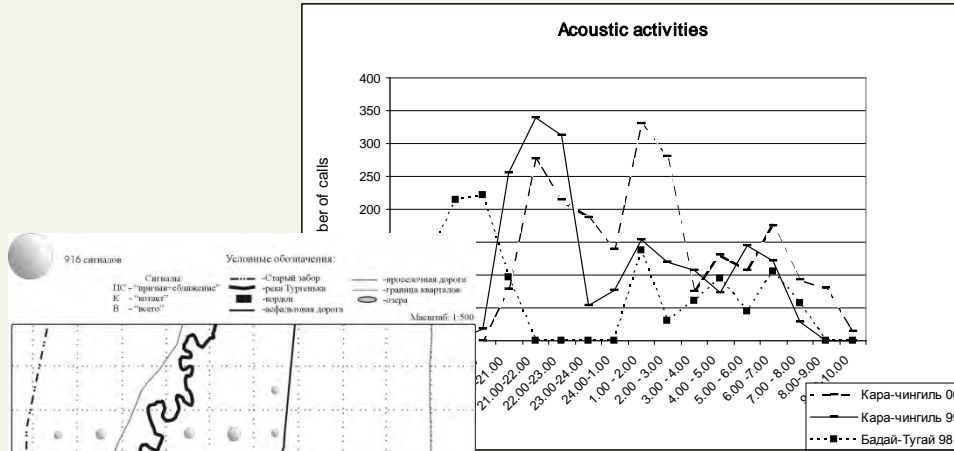
*(d) type of habitats;*

*(e) particular ecological conditions of the year;*

*(f) population origin (natural, reintroduced, introduced) – e.g. RECENTLY INTRODUCED GROUPS*

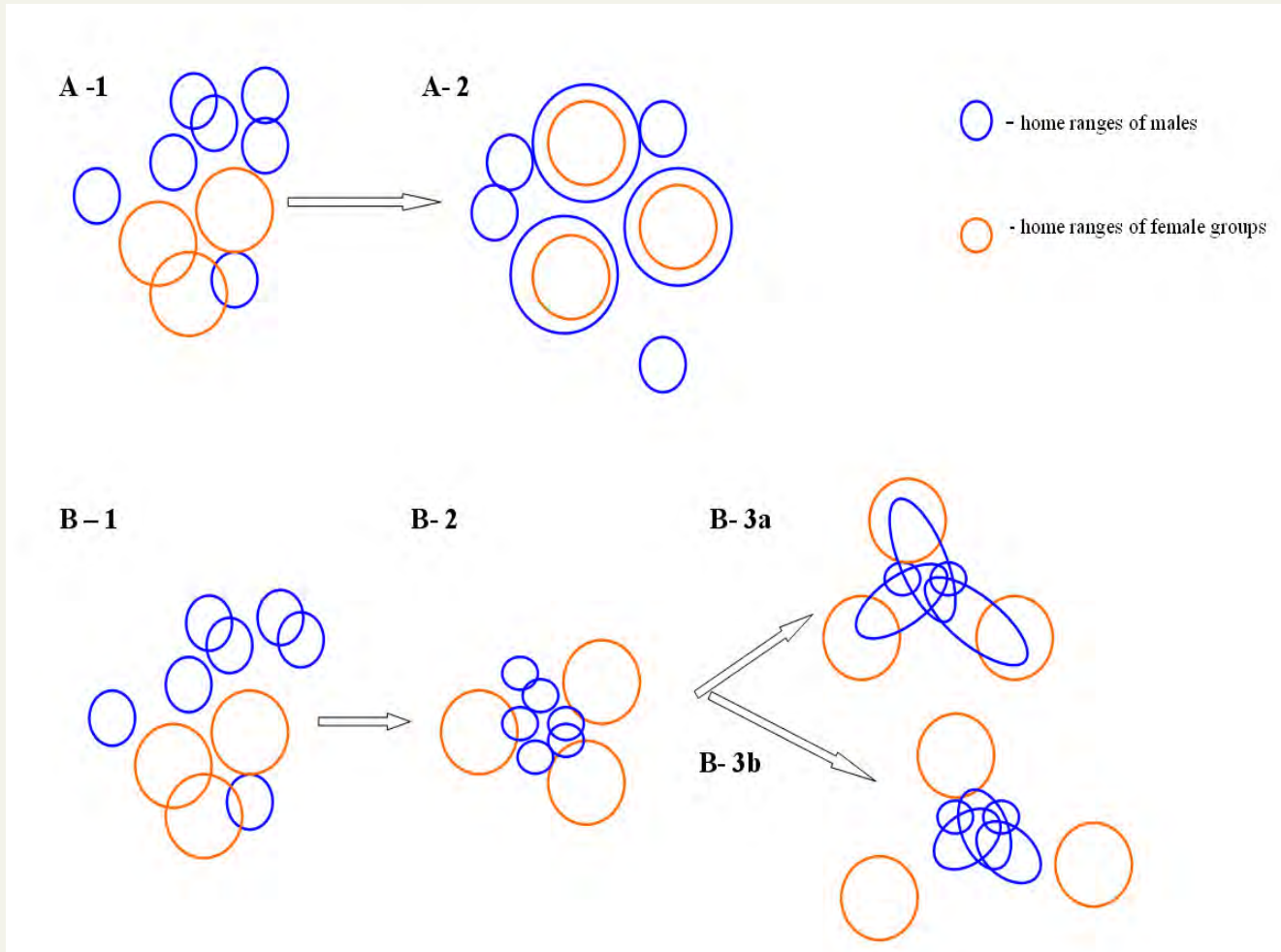
# Methodologies (cont.):

- Mapping of acoustic communication (all active period of the day / all active season);
- Recording and acoustic analyses of the vocalizations;
- Visual registration of animals on the routs (including size of the groups, sex-age ratio);
- Registration and mapping of traces.
- Visual long-term observations of individually recognized animals (behavior, phenology, etc.);





# Subspecies-specific characteristics: pure leks – registered for non other red deer subspecies



## A - Red deer:

- **A1**-pre-reproductive period;
- **A2**- reproduction

## B – Bukhara deer:

- **B1**- pre-reproductive period

- **B2**- lek

## B3- reproduction

- **B3a** – normal population structure

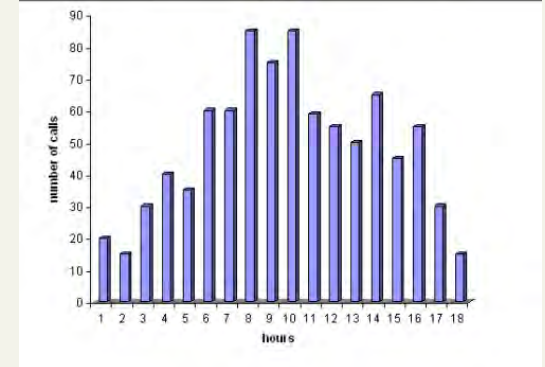
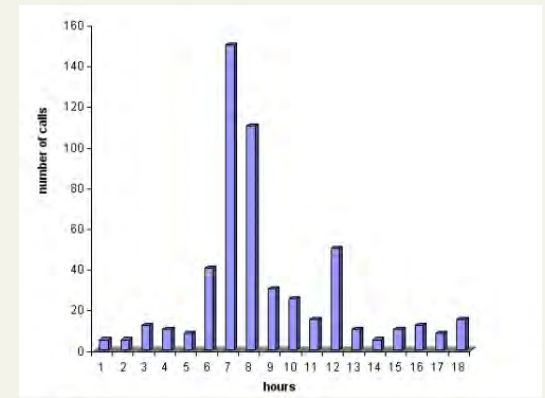
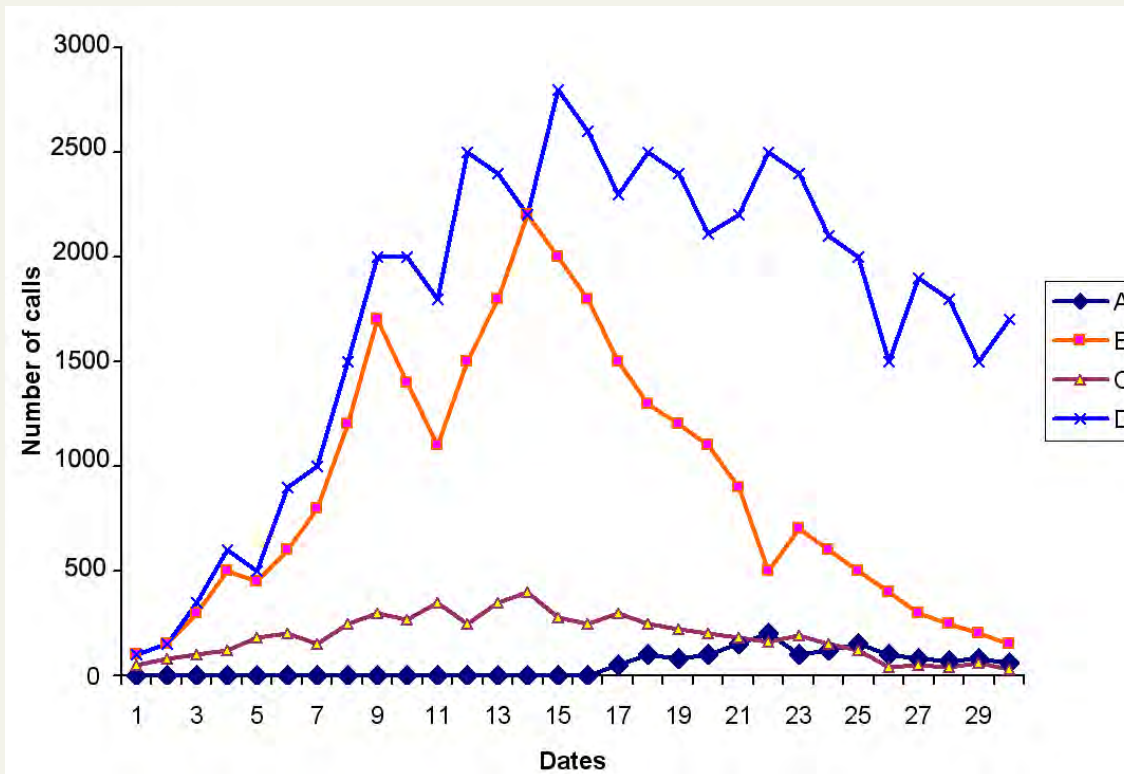
- **B3b**- extra males



# Population- dependent dynamics of acoustic activity

Time dynamics of rutting activity has:

- Subspecies-specific characteristics (typical period of rut in September , with the perk of activity – 14-17 September)
- Population-dependent characteristics (individual activity of roaring, length of roll-call period –BEFORE reproduction)







# Additional detailed observation – deer in pens in new reintroduction sites – Zarafshan, Uzb., Turkestan, Kaz.



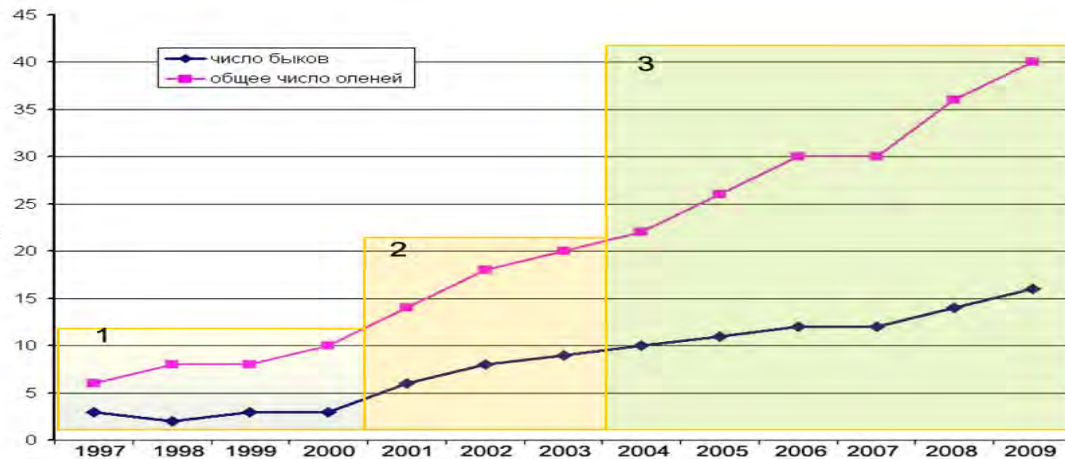


# Dynamics of populations' development

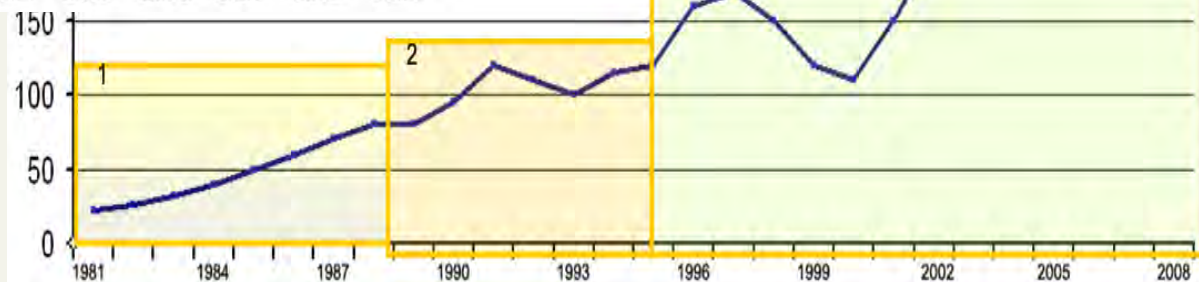
1- initial adaptation

2- the first phase of population growth, delay of rutting period

3 – complete adaptation, typical phenological order of rut



динамика численности группировки





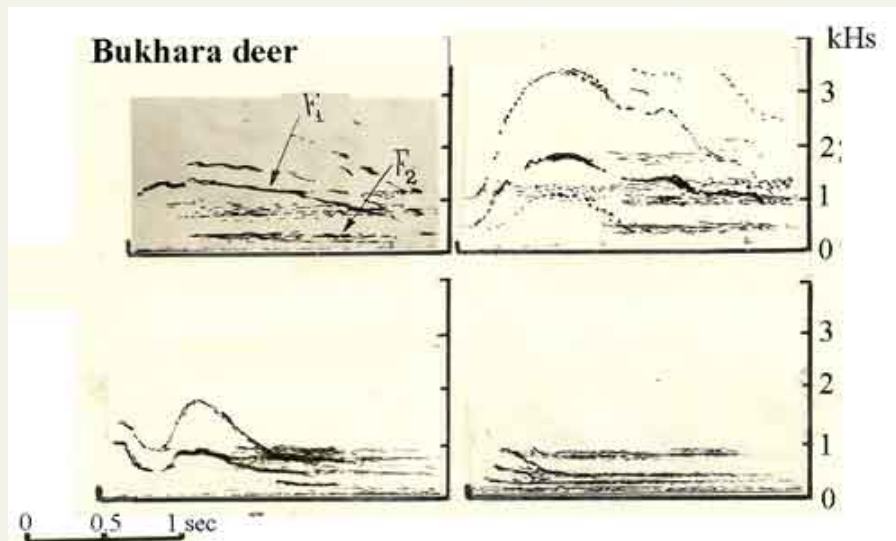
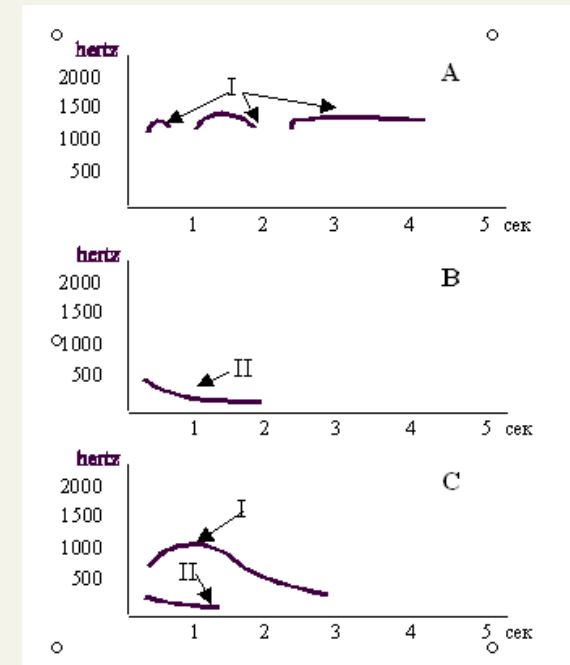
# Subspecies-specific characteristics of acoustic communication

**Three modifications** (distinguished for all subspecies) **of roaring:**

“Appeal” (A), “approaching” (C), “contact” (B) (*various motivations*)

**Type of modulations:**

Low frequency and high frequency component– independently modulated in one and the same signal





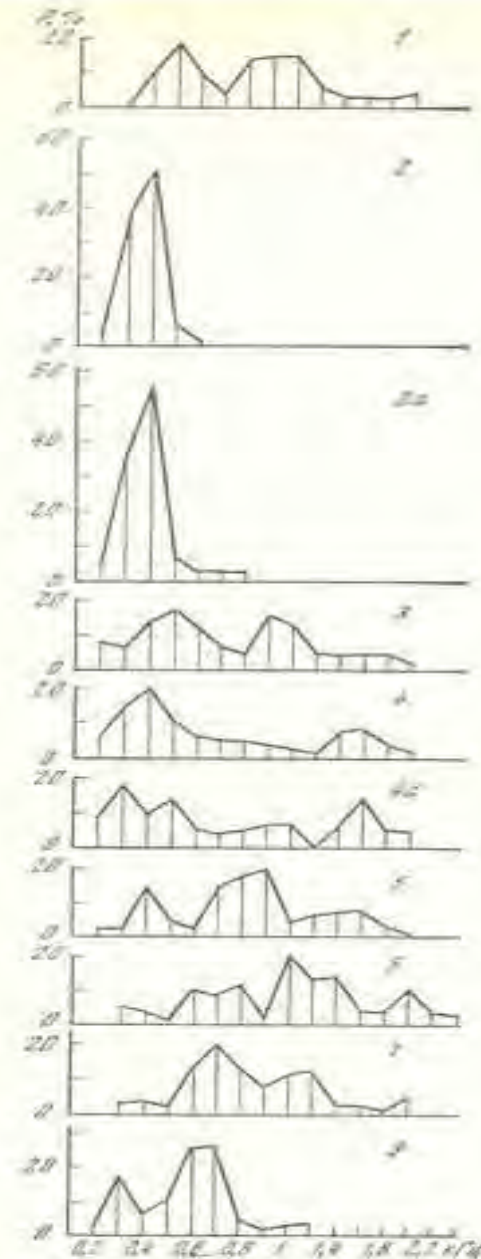
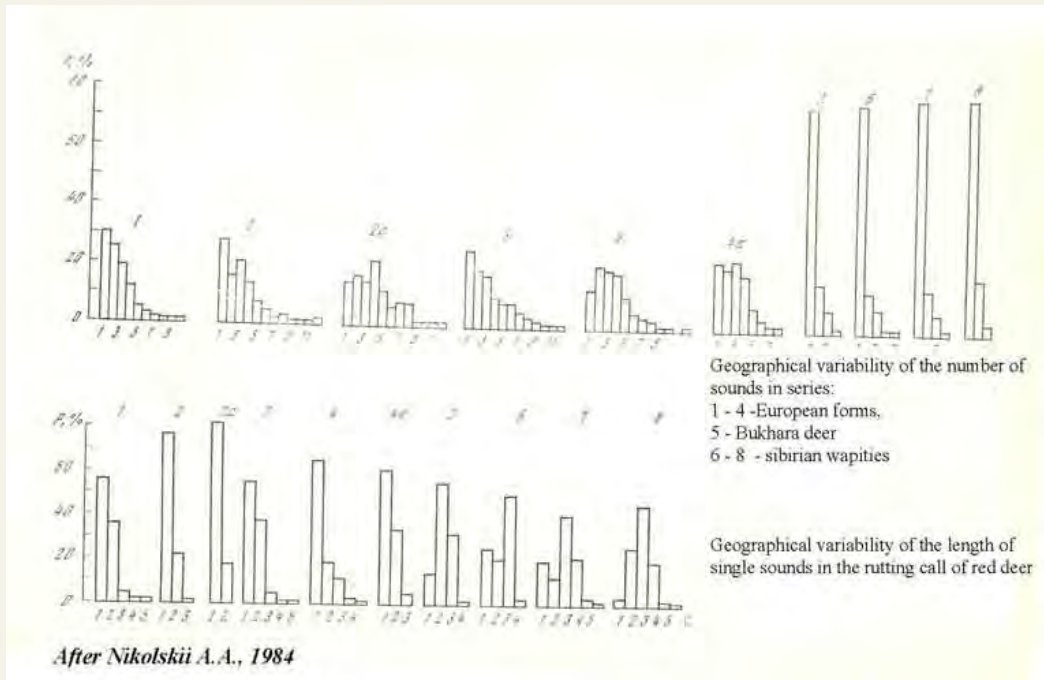
# Subspecies-specific characteristics of acoustic communication (cont.)

## Time characteristics:

- number of sounds in series,
- length of sounds

## Frequency characteristics :

- basing frequencies,
- dominant frequencies,
- harmonic or formant structure,
- type of modulations



Geographic variability of the dominant frequencies in the rutting calls of red deer

After Nikolskii A.A., 1984



# Population- dependent characteristics: *size of groups/ harems;* *ratio of modifications of signals*

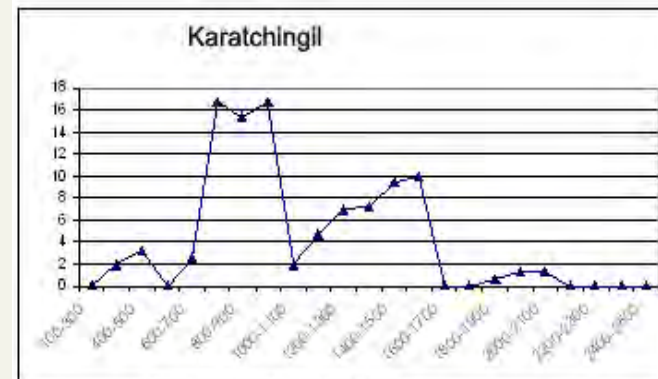
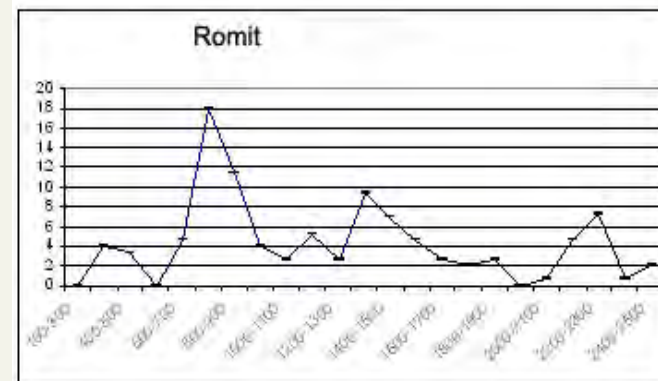
Typical for BD :

1-3 females in a harem, no aggressive demonstrations towards sub-adults; during the peak of rutting activity: 10-15 % of “contacts”, 50-60% of “approach”, 25-30 % of “appeals”

**Low density** population – practically no “contacts”

**High density**, high percentage of males – very high percentage of “Contacts” and “appeals”

etc...



Dominant frequencies



## Modern genetic analysis

***C.e. yarkandensis*, *C.e. Bactrianus* - a special ancient group** (Ludt e.a., 2004): “A very high probability for the existence of two different species of red deer with three subspecies in Asia and America (Eastern Red Deer) and four subspecies in Eurasia (Western Red Deer) and additional one or two primordial subspecies in Central Asia (Tarim group:). The origin of the genus *Cervus* seems to be in Central Asia near today’s Hindu Kush”.

Ludt et al., 2004

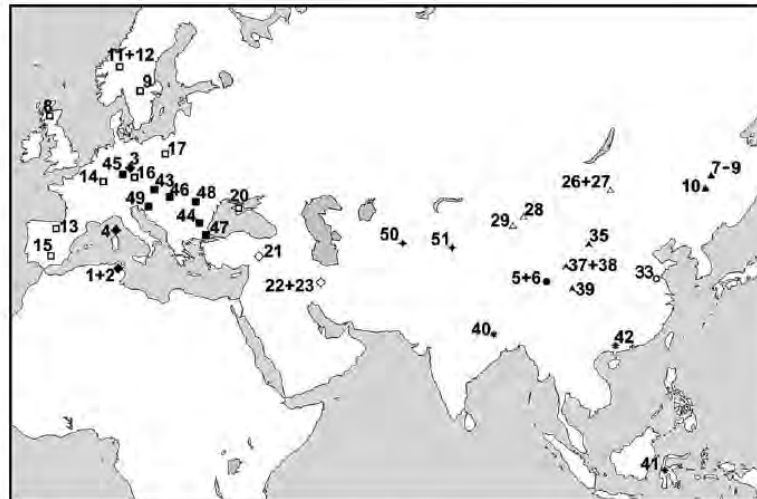
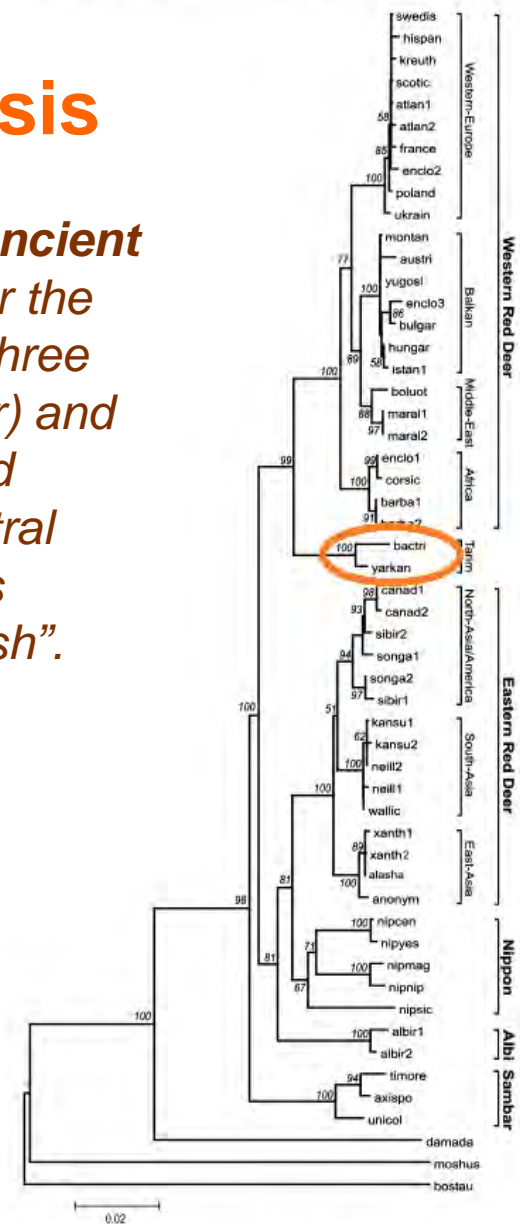


Fig. 1. Map showing approximate sample collection sites. Numbers next to sites are equivalent to numbers in Table 1. Symbols for sites are identical to group symbols in Table 1 and Fig. 4. Only populations with known geographical origin are shown. Population 24 from Montana/USA is not shown on this map due to inappropriate map size.



*Cervus* constructed using maximum-likelihood with GTR + G model (Rodríguez et al., 1990) with a  $\gamma$  shape parameter of 4. Bootstrap replicates are shown above each branch.



# IUCN – new systematics

Kingdom	Phylum	Class	Order	Family
ANIMALIA	CHORDATA	MAMMALIA	CETARTIODACTYLA	CERVIDAE

**Scientific Name:** **Cervus canadensis**

**Species Authority:** Erxleben, 1777

**Common Name/s:**

- English – Elk, Wapiti, Alashan Wapiti, Izubra/Manchurian Wapiti, Merriam's Wapiti, Tule Elk, Siberian Wapiti, Tien Shan Wapiti, Shou, McNeill's Deer
- French – Cerf Wapiti
- Spanish – Uapiti

*Here we recognise the following subspecies and their distributions as follows:*

- C. c. canadensis* – N America
- C. c. alashanicus* – N China
- C. c. nannodes* - California

**Taxonomic Notes:**

- C. c. roosevelti* - Vancouver Island, Washington state and Oregon
- C. c. sibiricus* – NE Kazakhstan and N Xinjiang to S Siberia and N Mongolia
- C. c. xanthopygus* – SE Siberia, Ussuriland, Manchuria
- C. c. macneilli* – Lydekker 1909 (Central and SW China (N Qinghai, Gansu, Shaanxi, W Sichuan and E Xizang))
- C. c. wallichii* - G. Cuvier 1823 (SW China (SE Xizang), Bhutan)

**Scientific Name:** **Cervus elaphus**

**Species Authority:** Linnaeus, 1758

**Common Name/s:**

- English – Red Deer, Western Red Deer, Elk,
- French – Cerf Élaphe,
- Spanish – Ciervo, Ciervo Rojo

*Several subspecies of Western Red Deer have been recognized with their ranges as follows:*

- C. e. elaphus*: Ireland, Great Britain, continental Europe
- C. e. barbarus*: Atlas Mountains (Algeria, Tunisia)
- C. e. corsicanus*: Corsica (extinct, reintroduced in 1985), Sardinia
- C. e. maral*: Anatolia, Caucasus (Russia, Georgia)
- C. e. brauneri*: Crimea ( Russia)
- C. e. montanus* (syn. *carpathicus*) – Carpathian mountains
- C. e. italicus* (Mesola Red Deer)

**Taxonomic Notes:**

**Scientific Name:** **Cervus hanglu**

**Species Authority:** Wagner 1844

**Common Name/s:**

- English – Tarim Red Deer, Central Asian Red Deer, Kashmir Stag, Hangul, Bukhara Red Deer, Bactrian Deer, Bactrian Red Deer,
- French – Cerf de Bactriane, Cerf Du Turkestan, Cerf Rouge Du Turkestan
- Spanish – Ciervo asiático, Ciervo Bactriano

*Here we provisionally elevate Cervus hanglu to species level for the purpose of the IUCN Red List assessment in 2016.*

**Taxonomic Notes:**

- C. h. hanglu* Wagner 1844 (N India (Kashmir))
- C. h. bactrianus* (W Turkestan (Kazakhstan, Uzbekistan, Tajikistan, Turkmenistan and N Afghanistan)
- C. h. yarkandensis* (E Turkestan (S Xinjiang, China))

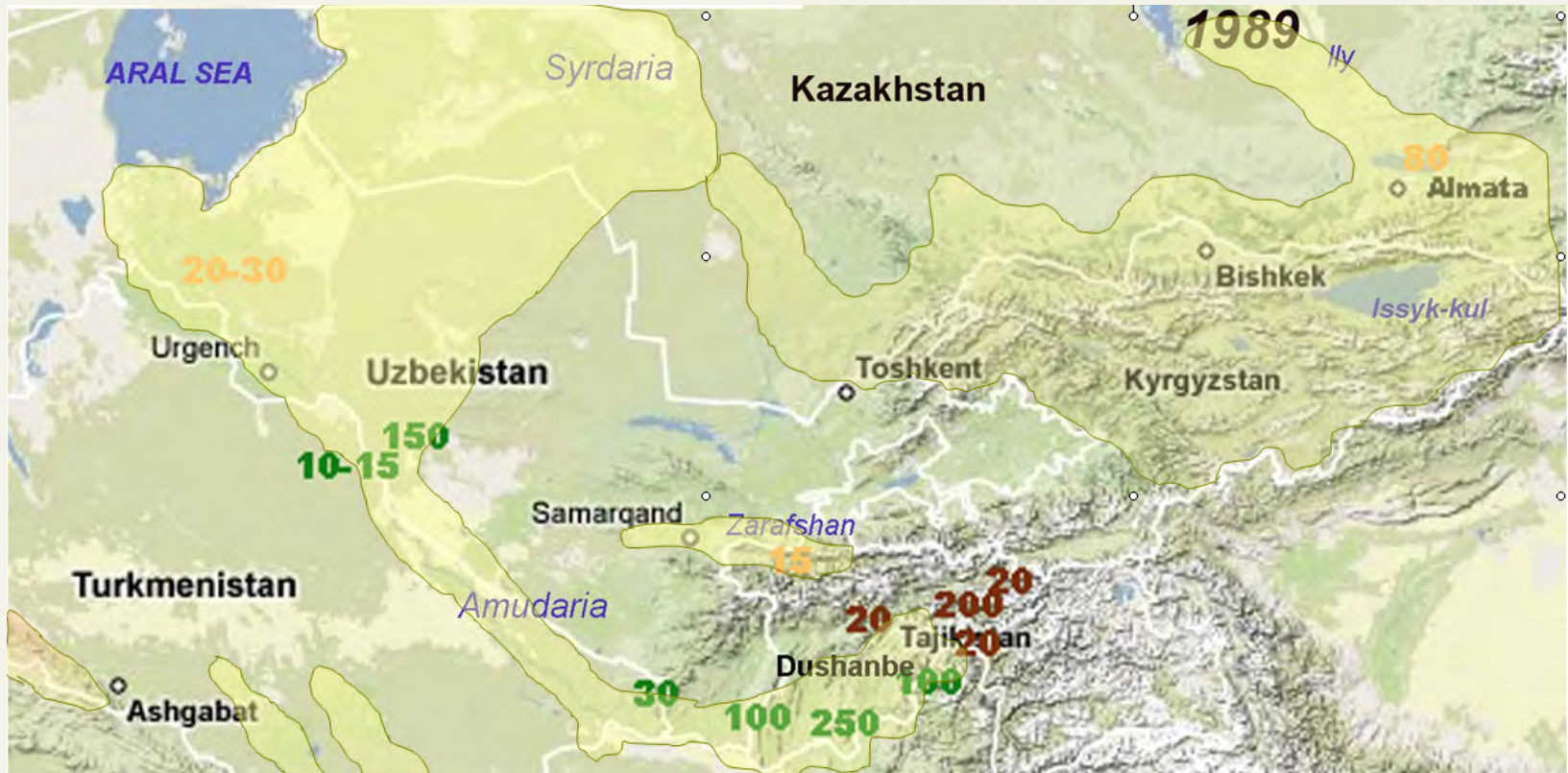


# Brief historical review

The endemic of Central Asia – Bukhara deer (BD) was seriously threatened already in 1960-th, to a great extent – because of habitat destruction.

Disappeared from Tedjen, Murgab, Lower Amudaria, Zarafshan, all Syrdaria valley (1962), Ily....

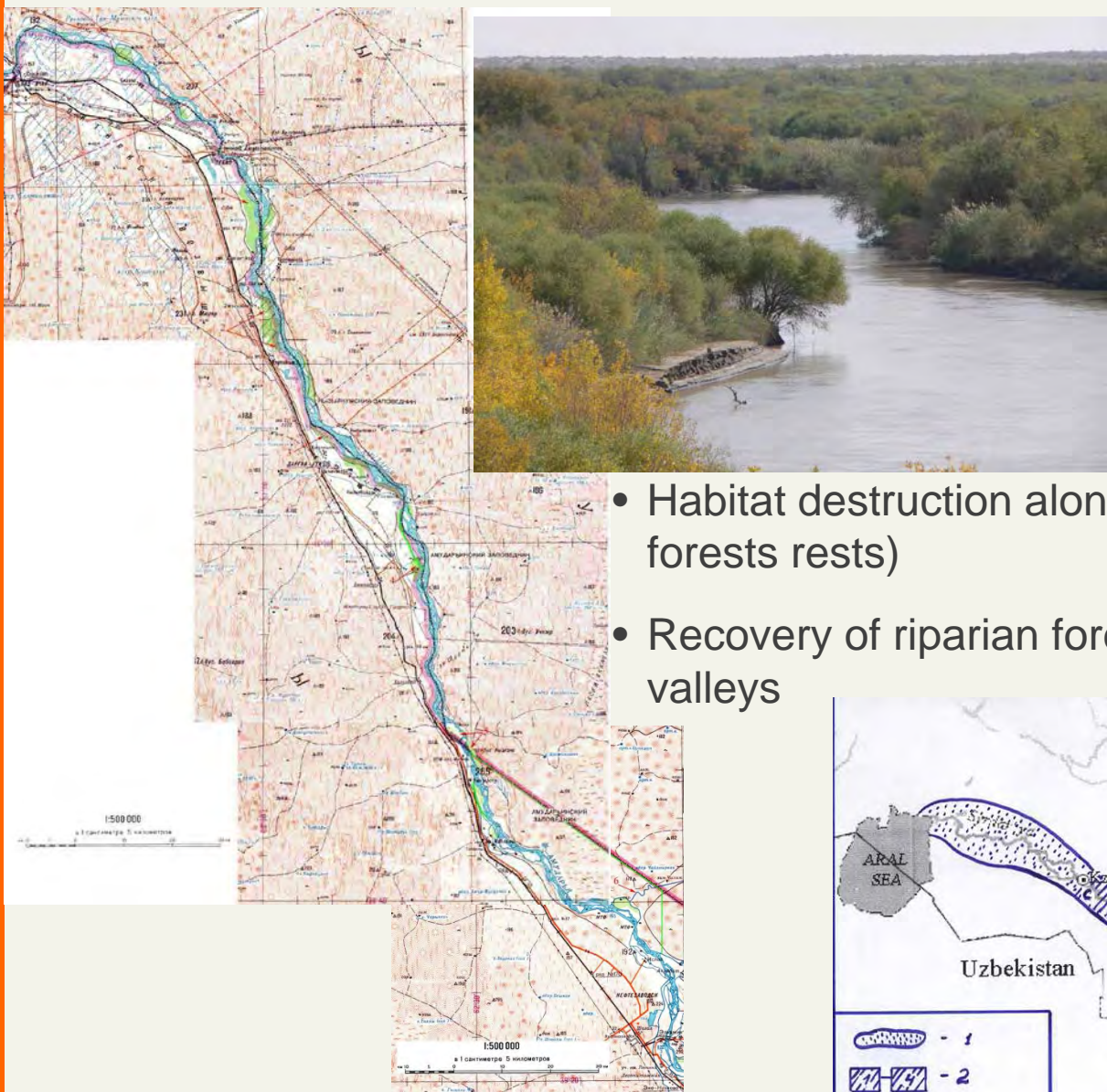
**Activities on the species restoration in 1960-th-70-th:** by 1989 there were about 900 BD totally in all groups, with potential for population growth up to **4000 – 5000** animals. Our survey, published in 1989, became in 2000-2001 the base for BD MOU and Action Plan Development (CMS / Bonn Convention)



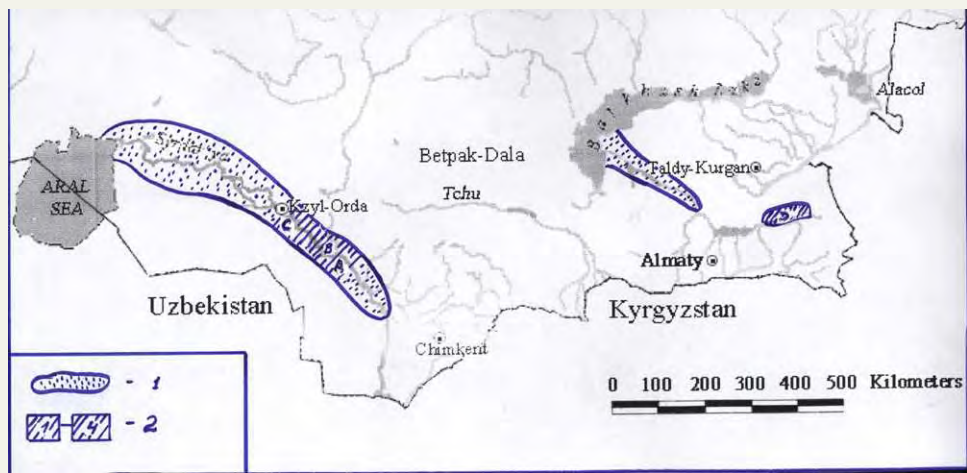
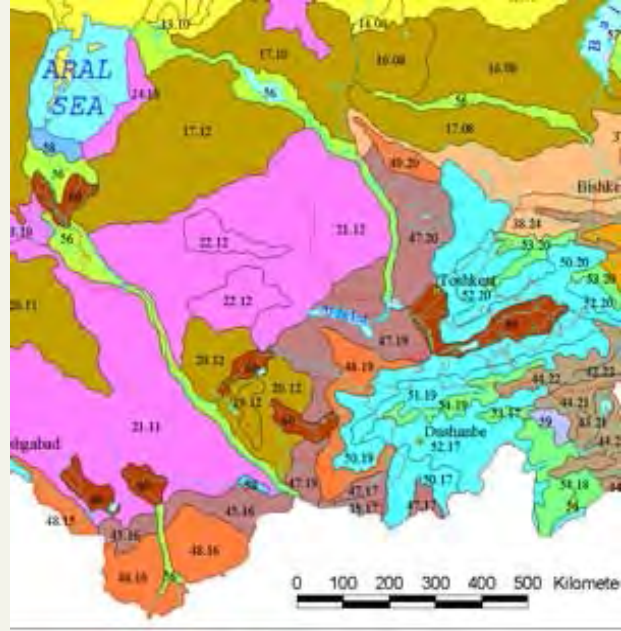




# Variability of opportunities



- Habitat destruction along Amudaria (10% of riparian forests rests)
- Recovery of riparian forests in Syrdaria and Ily valleys





# Second phase of population decline – threat of extinction

- After the break of the former Soviet Union only 350 BD rested in all populations throughout the area - as a result of poaching.
- Major groups – in Amudaria river valley – common threat in case of various disasters





# Major reason of decline in 1990-th

*Period of transitional economy :*

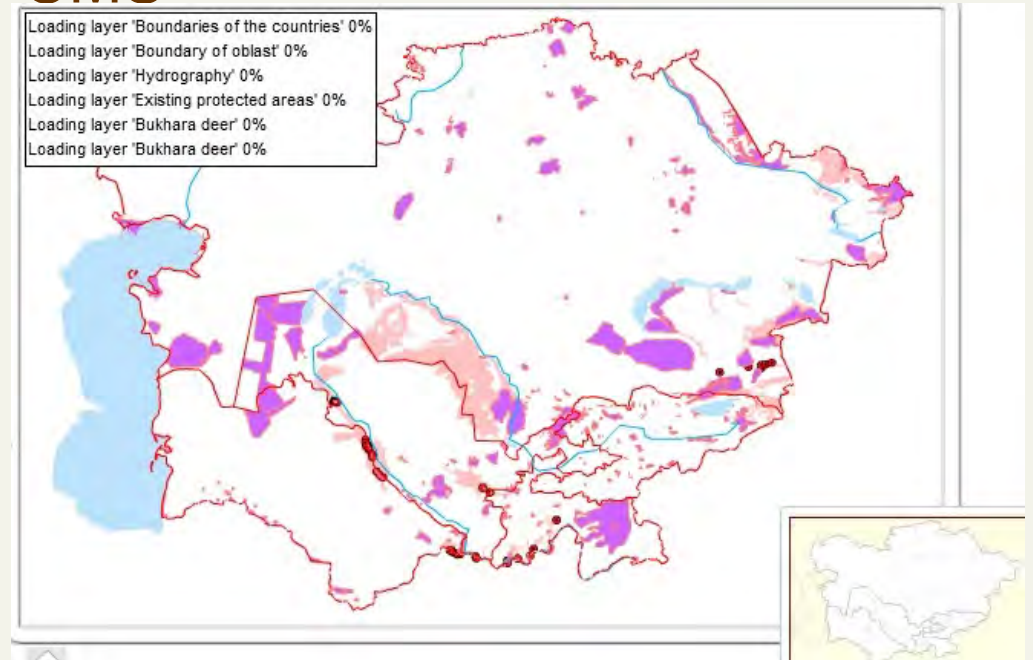
- Lack of food,
- Very limited family income
- Lack of fuel (destruction of habitats)



# Approaches to species restoration

- Improving of ecological conditions / ecosystems restoration
- Ensuring territorial protection – support to protected areas
- Ecological corridors – to ensure safe migrations – based on ECONET designn
- HD activities – ecological education, capacity building
- Political instruments – CMS
- Reintroduction

***Control  
of efficiency  
- monitoring***





# Turkmenistan



# Turkmenistan (cont.)





# Uzbekistan:





# Uzbekistan (cont.)







# Uzbekistan (cont.)





# Uzbekistan (cont.) - reintroduction





# Adaption to the life in the wild



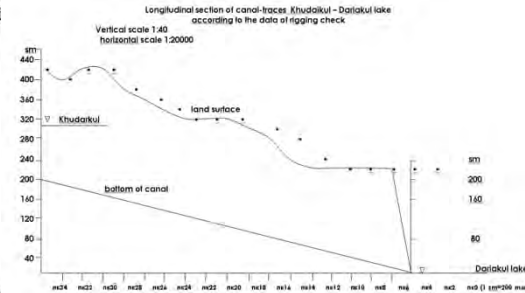
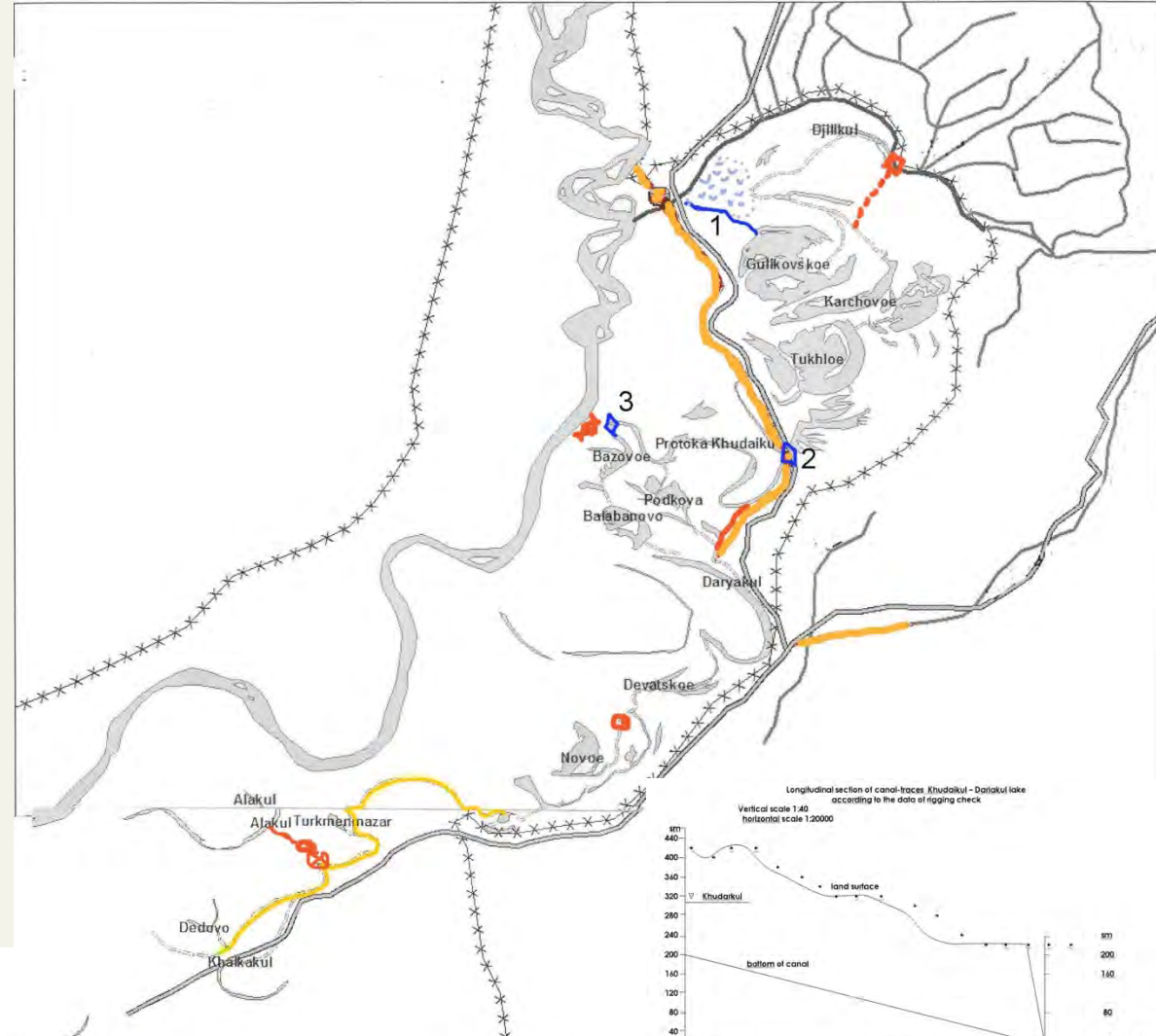


## Uzbekistan (cont.)

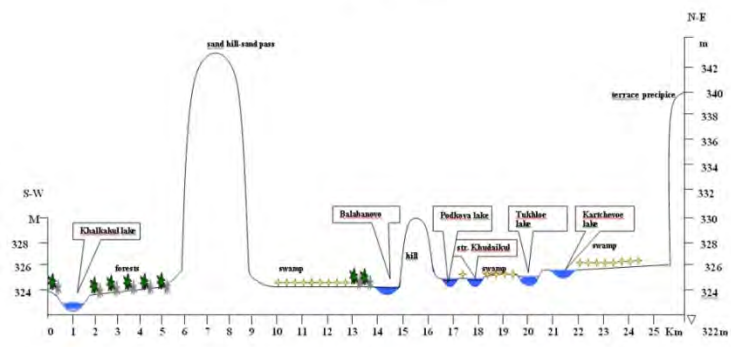
Amudaria delta – all possibilities for expansion of the species area ensured



# Tajikistan: Natural water supply regime restoration



Longitudinal section of the level of lakes (North-South of the reserve)  
Scale vertical 1:200  
horizontal 1:100000



- cleaned canal ( the first phase of the project, 2005)
- plans for next phases of the project
- cleaned culvette (second phase of the project - 2006)
- rebuilt sluices (second phase of the project - 2006)
- swamped area
- border of the zapovednik
- roads
- irrigation canals
- lakes

- Third phase of the project:  
PLANS**
- canal for fresh water
  - sluices
  - pump-station
  - DONE by 31.12.07**
  - canals
  - dumbs
  - cleaned jam







# Water returns to the lakes







**And lakes are full again.  
7 year monitoring of the stable situation after the  
end of the project**





# Tajikistan (cont).





# Kazakhstan – reintroduction – middle reaches of Syrdaria





## Kazakhstan (cont).

Cooperation with the government  
– funding of additional  
translocations, increasing pens,  
etc.





# Kazakhstan (cont).

## Animal releases





# All restoration activities are accompanied by species monitoring.

	Year (data for September-October)	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
U Z B	Badai-Tuagai NR	~100	120	140	150	160	220	250	265	316	346	374	517 +30 in pens	666
	Kyzylkumskii NR	76	40	75	80	95	120	80	110	120	120	130	~130	~130
	Other territories	~50	~50	~50	~50	~60	~90	~90	~90	~100	~100	~100	~140-180	160 + 80
	Zarafshan - reintroduction	9	10	14	18	20	23	26	32	33	39	46	30-32? (+22 in pens)	40 (+140 transboundary with TJ)**
	<b>Subtotal</b>	<b>~190</b>	<b>180</b>	<b>240</b>	<b>330</b>	<b>385</b>	<b>450</b>	<b>480</b>	<b>490</b>	<b>560</b>	<b>600</b>	<b>700</b>	<b>~900</b>	<b>1200</b>
K A Z	Karatchingil	80	100	150	~200	~250	~250	280	300	>300	>300	320-350	350	>350
	Turkestan (S-D)	0	0	4	6	8	10	12	15	19	22	34	18 (+22 in pens)	24 (+30 in pens)
	<b>Subtotal</b>	<b>80</b>	<b>100</b>	<b>150</b>	<b>~200</b>	<b>~250</b>	<b>250</b>	<b>280</b>	<b>300</b>	<b>280</b>	<b>350</b>	<b>370</b>	<b>390</b>	<b>&gt;400</b>
T U R K	Middle reaches of A-D (7 sites)	30	35	35	45	50	60	70	80	94	106	100	60-70	50-70
	Djazguzer (A-D upper reaches)	~20	~25	~35	45	~50	~50	~50	~50	~50	~50	~50	~50	~50
	<b>Subtotal</b>	<b>50</b>	<b>60</b>	<b>70</b>	<b>90</b>	<b>100</b>	<b>110</b>	<b>120</b>	<b>130</b>	<b>140</b>	<b>150</b>	<b>150</b>	<b>120</b>	<b>120</b>
T A J	Tigrovaja balka					80	>50	>50	>50	>80	>140	>150	>150	>150
	Zarafshan (upper reaches)					25		35	35	40	60	60-65	60-65	140 transboundary with Uz**
	<b>Subtotal</b>	<b>?</b>	<b>?</b>	<b>?</b>	<b>60</b>	<b>~100</b>	<b>?</b>	<b>~100</b>	<b>~100</b>	<b>120</b>	<b>200</b>	<b>210</b>	<b>210</b>	<b>~290</b>
<b>BD/ CA TOTAL</b>		<b>~350</b>	<b>400</b>	<b>500</b>	<b>650</b>	<b>800</b>	<b>850</b>	<b>&gt;900</b>	<b>1000</b>	<b>1100</b>	<b>1300</b>	<b>1430</b>	<b>1620</b>	<b>1900</b>

\*\* - calculating total number this figure once taken into consideration

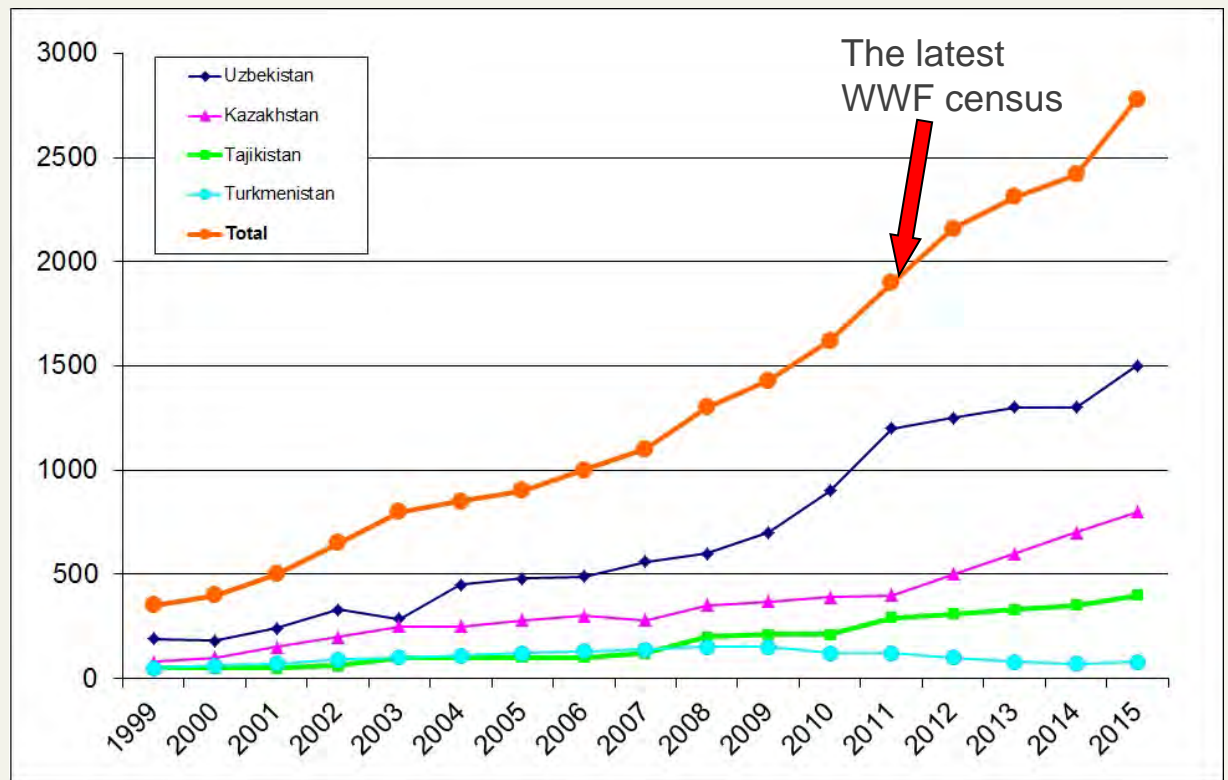
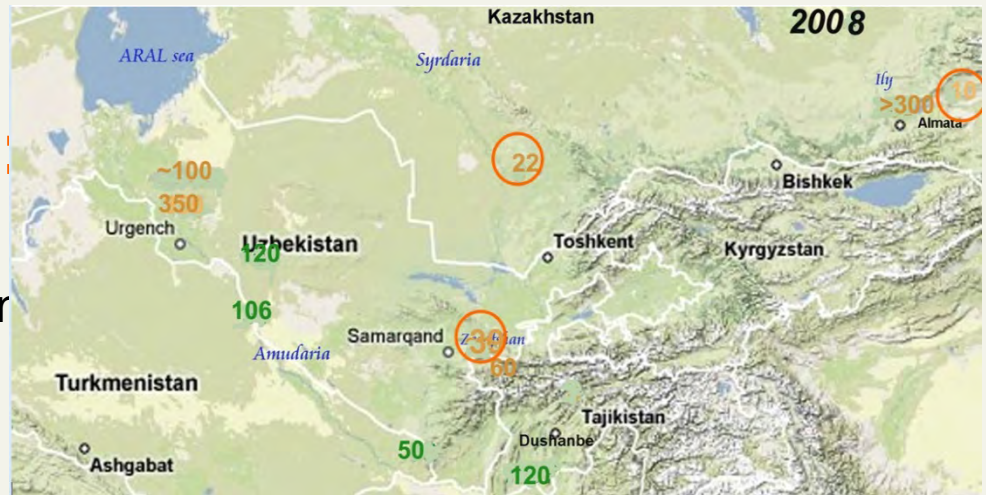


# Result of 15 years restoration activities

10 populations in 4 countries:  
from **350** in **1999** to 1900 in 2011, around **3000** in **2015**, including:

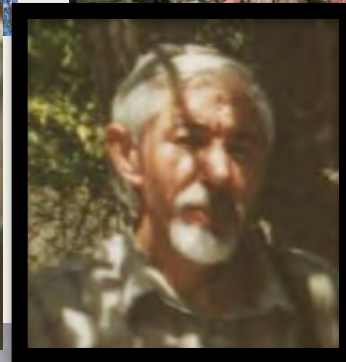
- Uzbekistan - in 4 sites - from 180-190– to 1500;
- Kazakhstan – 2 sites - from 80 to 350,
- Turkmenistan – 8 sites – from 50 to 150,
- Tajikistan – 2 sites – from 30-50 to 180.

Successful reintroduction process is on-going in 3 sites





# My colleagues – team-leaders in CA countries







# Methodology of reintroduction

- <https://new.wwf.ru/en/resources/publications/booklets/technical-guidelines-for-restoration-and-reintroduction-of-the-bukhara-deer-in-its-natural-environment/>



# Future – modelling as a part of tiger project

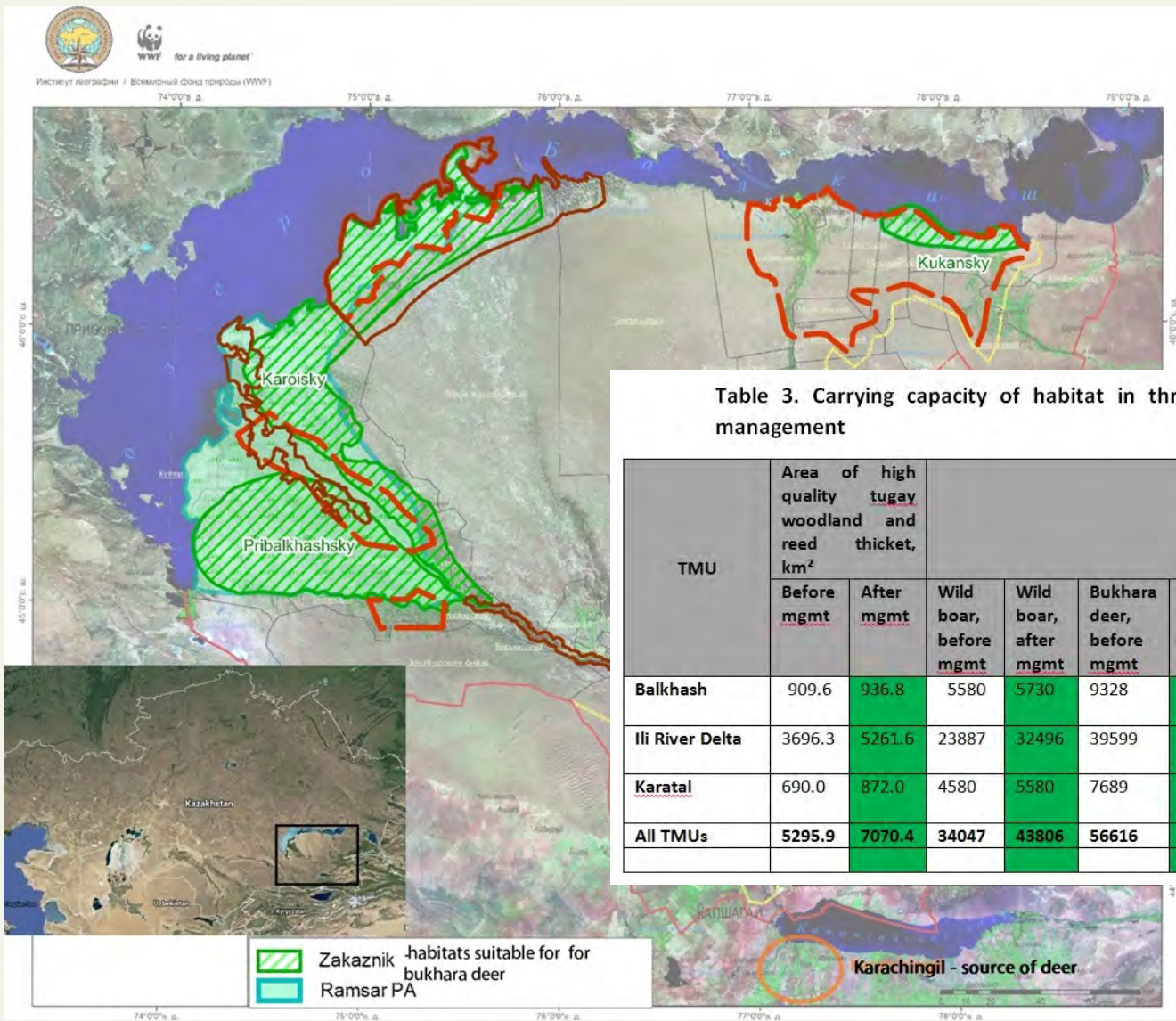


Table 3. Carrying capacity of habitat in three TMUs before and after 30 years of fire management

TMU	Area of high quality tugay woodland and reed thicket, km <sup>2</sup>		Carrying capacity, K							
	Before mgmt	After mgmt	Wild boar, before mgmt	Wild boar, after mgmt	Bukhara deer, before mgmt	Bukhara deer, after mgmt	Roe deer, before mgmt	Roe deer, after mgmt	All prey, before mgmt	All prey, after mgmt
Balkhash	909.6	936.8	5580	5730	9328	9586	687	687	15595	16003
Ili River Delta	3696.3	5261.6	23887	32496	39599	54470	4484	4484	67970	91450
Karatal	690.0	872.0	4580	5580	7689	9418	1134	1134	13403	16132
All TMUs	5295.9	7070.4	34047	43806	56616	73474	6305	6305	96968	123585



<http://www.wwf.ru/asia/>

***Thank you  
for your  
attention !***

