

**Pre-Feasibility Study on the Possible
Restoration of the Caspian Tiger in the
Amu Darya Delta**

by

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2009



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Executive Summary:

The Caspian tigers occurred in eastern Turkey, the southern Caucasus, in northern Iran, Iraq, and in isolated pocket throughout Central Asia until northwestern China. In Central Asia the tiger was found along floodplains of rivers and in tall grass and reed beds along rivers and lakes. This type of riparian forest is called "Tugai" and used to be widespread throughout the region.

The tiger became extinct in the region about 30 year ago. The main reason for its disappearance in Central Asia was habitat destruction, hunting (bounty system) and extermination in order to guarantee safety conditions for colonists, in the process of agricultural land development, the latter accelerated destruction of remaining habitats and the decline of the tigers prey base due to over hunting.

Stimulated by recent findings that the Amur tiger is the closest relative of the Caspian tiger, discussions started if the Amur tiger could be an appropriate subspecies for reintroduction into a save place in the Central Asia. The Amu Darya Delta was suggested as a potential site for such a project. A feasibility study was initiated, to investigate if the area is suitable and if such an initiative would receive support from the relevant decision makers.

The project team analyzed the biological and ecological data of the species and its habitat. Factors for the species decline and extinction were analyzed. A detailed review, on the tigers history in Central Asia revealed that the species disappeared not long ago from the region, some records indicate that some individuals might still exist e.g. along the Ili river in Kazakhstan. The team visited the Amu Darya Delta to assess its suitability for the possible implementation of the project.

The final conclusion of this assessment is that a viable tiger population of about 100 animals would require at least 500.000 ha of large tracts of contiguous habitat with rich prey populations. Such habitat is not available at this stage and can not be provided in the short term. The proposed region is therefore unsuitable for the reintroduction, at least at this stage of developments.

However the Akpetki and Jiltyrbas Lake region were identified as a unique wilderness with a great potential for restoring and preserving a vast system of wetlands, forest, steppe and desert habitats for a large variety of wildlife. This region might be suitable to support a viable tiger population at a later stage, provided that:

- Protected area status is given for Akpetki and Jiltyrbas Lake region and the surrounding steppe and desert ecosystems up to a total of about 500.000 ha
- The protected area is well managed and protected by competent staff
- Regular fresh water supply to the area for nature conservation is guaranteed
- Agriculture and livestock is not expanding into the protected area
- Oil and gas developments follow strict environmental criteria

- Habitat restoration including forest and vegetation, re-establishment of prey species, in particular Bukhara deer and reinforcement of gazelle and Saiga populations
- Considerations for returning the tiger to this region should be re-examined when success or failure of restoration measures can be evaluated. Such a process might take 15-20 years
- Tigers existed much longer, perhaps even until today, in other parts of its former range, like the South Pribalkhash'e - Ili floodplain in Kazakhstan, which might provide more suitable ecological and political environment than the Amu Darya region for such a project.

I. Introduction

Tigers were widespread in Asia some 1.5 million years ago. They disappeared almost completely in the late Pleistocene, apparently about 10,000 to 12,000 years ago (Prynn, 2003). A remnant population survived in parts of China. From here it spread again into what is now known as its historical range, where it split into 8 subspecies, differing in size, coloration and ecology.

By the end of the last century, the range of the tiger extended from eastern Turkey and northern Iran to India and southeast Siberia. To date, they were exterminated or became rare in the most part of the range; the only relatively large populations have survived in India, Nepal, and Malaysia. The total number of wild tigers is estimated at 4.000 to 5.000 individuals.

One of these subspecies is the Caspian or Turanian Tiger (*Panthera tigris virgata*) which is considered extinct.



Recent genetic investigations (Driscoll et. al. 2009) demonstrated that it is closely related to the Amur tiger (*P.t.altaica*).

Tigers used to play an important role in the cultures of Southwest Asia. The Tigris River was named after a tiger which, according to a legend, carried a pregnant princess on its back across the wild river. The tiger is also depicted on the portal of the Sher-Dor Medrese in Samarqand (Uzbekistan), contrary to the Islamic tradition that living beings should not be depicted in Islamic art. It figures also on carpets and other fabrics in the Sufi tradition.

Based on the findings that the Amur tiger is the closest relative of the Caspian tiger, discussions started within the Central Asian conservation, scientific and to some extent also political communities, if the Amur tiger could be an appropriate subspecies for reintroducing into a save place in Central Asia, with the objective to return a missing link to the ecosystem.

The first step for such a project is to find out, if there is a suitable habitat for the species and if such an initiative would receive support from the relevant decision makers. One of the potential sites for a reintroduction project is the Amu Darya Delta and the Tugai forests along the Amu Darya River in Uzbekistan.

1. Study Methods

A literature survey was carried out to gather information on the specie's biology and former distribution. This was done to a large extent by Uzbek and Russian team members.

A field team, consisting of Hartmut Jungius, Yuri Chikin and Oleg Tsaruk visited potential habitats along the Amu Darya River and the Amu Darya Delta in June 2009. The delta was only visited by Yuri Chikin and Oleg Tsaruk (Annex 1). H. Jungius was prevented by the local authorities, "due to security reasons", from leaving the city of Nukus and unable to participate in the field survey to the delta. Information on the habitat conditions, human aspects, land use and vegetation, were collected by the Uzbek team members.

2. Basic Consideration for the Reintroduction of Species

The aim of a reintroduction project is to help maintain or establish a free-ranging and reproductive population of a species in its traditional range (G. Niethammer 1963; IUCN 1984, Jungius 1985).

Projects of this kind require careful preparation. Reasons for the species decline have to be identified. Factors which lead to its disappearance and other problems which might impede its re-establishment should be removed. Restoration projects should not be seen in isolation but within the overall context of a recovery strategy for the species.

They should also be integrated into the overall development of a region to ensure that harmful effects such as alteration of habitats, through changes in land use or disturbance through opening up the area are avoided. Initiatives need to be taken at an early stage to promote support for the project from political leaders and the local population and to introduce management measure to improve the habitat and protection of the animals.

The capture, transport, acclimatization and release of animals must be organized well in advance. The necessary infrastructure has to be built up and staff trained and engaged to guide and oversee these operations.

Restoration projects should therefore proceed through the following stages (IUCN 1984):

- 1) Feasibility study
- 2) Preparation of breeding facilities and training of staff
- 3) Captive breeding programme
- 4) Preparation of animals for release
- 5) Release of animals into the wild and follow-up to the release

This study is a pre-feasibility study and provides recommendations for Stage 1.

II. Species Distribution, Habitat and Biology

1. Former Distribution in Central Asia with Particular reference to the Tugai Forests of the Amu Darya (Annex 2).

The Caspian tigers occurred in eastern Turkey, the southern Caucasus, in northern Iran, Iraq, and in isolated pockets throughout Central Asia until northwestern China. Tigers were also relatively well known in Old Russia. Geptner (1969), recorded it from the coast of the Sea of Azov, he stated also that tigers entered the southern Russian steppe and perhaps even the forest-steppe (the Chernigov Princedom). Tigers were also regularly seen on the territory of current Ukraine, in reed beds along the Terek and Kuban rivers, and in the Don River mouth.

In Central Asia, the tiger lived in several from each other separated areas.

The main tiger habitats were along rivers and around lakes (Annex 2)

In Turkmenistan, the tiger was present in the western parts, in the Atrek River valley and along its tributaries, the Sumbar and Chandyr. In the 19th - 20th centuries, tigers are likely to have traveled far north, including to the Bolshoi Balkhan Range, and east, to the outskirts of Ashgabat. Further east, tigers were observed along the Tejen River until the 1890s. Approximately at the same time, they disappeared from the valleys of the Murgab and Kushka Rivers.

Along the Amu Darya River tigers were recorded from the lower and upper parts of the river, there were none in the middle section of the river. The lower parts included the delta, where the river enters the Aral Sea, from here to the town of Nukus and further south, along the floodplain forests (Tugai) until the town of Darganata.

An other stronghold were tugai and reed beds along the upper parts of the river, and its tributaries, in particular the Piandj River valley, the Chubek, the lower Kyzylsu, the Vakhsh and the Yakhsu River up to the early 20th century. The largest tiger population was recorded from the lower Vakhsh River. Kisch (1932) reports that an expedition captured 19 and shot 8 tigers in only 6 weeks. Tigers traveled from here to the upper reaches of the Kofarnihon and Surkhan Darya rivers. The geographic range included also the Tugai forests and reed thickets downstream to Termez and the Gissar valley. By the end of the 1940s numbers had decreased to 10-15 animals (Blagoveshchenskaya, 2008).

The Piandj River, which is another major tributary of the upper Amu Darya, shared by Tadjikistan and Afghanistan, was an additional long time stronghold for the species. Tigers were seen here up to 1964 and 1971 (<http://www.calc.ru/308.html>).

In Afghanistan, in the riparian forests of the left bank of Piandj, tigers were common until the mid 1950th, from where they disappeared in 1963 (Niethammer in move.narod.ru/tigra/2.html). Kunhert (in Petocz, 1973) notes “unmistakable tracks” of a tiger in 1967 along the Darked River. The animal was believed to come from the Soviet side (Habibi, 1977).

It is quite probable that tigers still inhabited these areas till 1970th. Afterwards, during the Soviet intrusion into Afghanistan, tigers were recorded several times along the Afghan-Russian border from 1982 to 1991 (personal communications, former boarder guards).

The latest information from border guards dates to 1998, from the southern part of the Babatag mountain ridge. There is some information that tiger footprints were seen in the Surkhandaria region in 2008 by Uzbek border-guards (personal communication).

The Tugai forests along the Syr Darya River were inhabited without any interruption from its mouth into the Aral Sea to the Fergana valley. Tigers were also common in reed beds along the Aral Sea between the Amu Darya and Syr Darya deltas and from here all along the northeast and north shore of the Aral Sea. They occurred along the Arys River up to the Talas Ala-Too Range; also further upstream along the Chirchiq, the right tributary of the Syr Darya, and upstream to the vicinity of Tashkent.

Further northeast (Kyrgyzstan and Kazakhstan) the tiger lived along the rivers Chu and Sarysu (lower reaches) until the 1930s. In the east of the range, they were present in reed thickets at the southern shore of Lake Balkhash, along the Ili River and along the shore of Lake Alakul. In the south, the animals inhabited the Trans-Ili Alatau, Chui valley, the vicinities of Issyk-Kul and Narynkol. The easternmost area of tiger presence in Central Asia and Kazakhstan comprised Lake Zaisan and the lower Kara-Irtysh River, where the animals were last observed at the end of the 19th century.

There are some records (Geptner, 1969) that these fragmented populations were in contact with each other. Regular migrations from the lower Syr Darya to the Amu Darya and back were registered. Sighting from the Bolshoi Balkhan Range and distant areas in the north, including the South Altai Mountains to Barnaul and Biysk, and from Lake Balkhash to Akmolinsk, demonstrate that tigers undertook long migrations (Geptner, 1969; Nobuyuki Yamaguchi, 2001; Netaliev Timur, 2006).

2. Decline of the Tiger in Central Asia with Particular Reference to the Amu Darya

The main reason for the disappearance of the tiger in Central Asia was habitat destruction and extermination by militaries and professional hunters (bounty system), in order to guarantee safety conditions for colonists, in the process of agricultural land development (Kisch 1932). Heptner and Sludskii (1972) point out that the rising price for tiger skins was another important factor leading to the species decline in Central Asia. Agricultural developments accelerated the destruction of remaining habitats and the decline of its prey base due to over hunting.

Hunting:

Tiger hunting was of high commercial interest. In the 20th century tigers were considered a pest in Russia and Central Asia, bounties were paid up to 1929. Another major incentive for tiger hunting was the high price for its skin. 1500 to 2500 rubles were paid in the beginning of the 20th century, compared to 300 to 500 rubles for a snow leopard. The average price for a cow was 10, for a horse 20 rubles. Until World War I, about 50 tigers were killed alone in the forests of Amu Darya and Piandj Rivers each year (Prokhorov V. 2002).

High prices for tiger bones and other body parts for use in Chinese and Korean medicine were another incentive for tiger hunting (Heptner and Sludskii, 1972, Prokhorov V. 2002). This demand is still an ongoing threat for the tiger throughout its range, in particular in the Amur region and in India.

Shepherds considered tigers to be a serious threat to their livestock, including camels, horses and sheep. They killed tigers with poison and traps. Selling the skin and bones to traders was an important occasional income for them.

In the end 19th early 20th century the regular Russian army was used to clear predators (tigers, wolves, leopards) from forests, around settlements and potential agricultural lands.

The prey base of the tiger, wild boar and deer was destroyed in particular by deforestation and subsistence hunting by the increasing population along the rivers, supported by the growing agricultural developments, which started in the early 19th century, especially in the 30th (Kisch, 1932; Rabinowitz, 1989).

Habitat destruction:

The past century was characterized by an increasing spread of the human population into former wilderness areas, which lead to severe habitat loss for wildlife in general and the tiger in particular. Large tracts of contiguous tiger habitat with the associated prey species became fragmented and to a large extent replaced by farmland, settlements and roads (Kisch 1932). Seidensticker (1987) concluded that small isolated reserves (habitat fragmentation) lead to the extinction of the Bali and Javan tigers. He underlined that large tracts of contiguous habitat are essential to assure the long-term survival of the species.

Central Asian wetlands and river valleys infected by malaria, were for long time hostile to people and a relatively save place for tiger and its prey. This changed with the intensive malaria eradication programmes in the 30th, which included cutting and burning of forests and shrub land.

Development of the riverine habitats for cotton growing in the 30th gave the final blow to the tiger and its prey. Large scale irrigation schemes drew water from the Amu Darya and the Syr Darya, which lead finally to the Aral Sea crisis. More than 50 % loss of the Aral Sea area and salinization of lands was the sad result. Forest clearance and burning destroyed most of the tiger habitats in the deltas of the Amu Darya and Syr Darya in the late 30th. Natural vegetation was replaced by cotton and other agricultural products (Annex 6.9). Similar processes were on-going in the floodplains of other large rives which used to provide prime tiger habitats, e.g. Murgab, Piandj, Ili. The tiger and its prey lost their live support systems.

Conservation measures to stop this process came too late. Legal protection was established by the USSR in 1947. The first protected area “Tigrovaja balka”, (Tigers Valley) was established in Tajikistan in 1938 (see below).

Only about 10 % of natural tiger habitat is left (see below).

Western Turkmenistan

The last tiger was seen in the Sumbar river valley (Western Kopetdag) near the settlement Koine-Kasyr on 10th of January 1954. Up to 1990 it occurred in the Tedjen river valley, in the Murgab river valley and along the Kushka River, the southern edge of Turkmenistan. (Rustamov,1985).

Amu Darya River valley

In the lower reaches of Amu Darya and in its delta, tigers were common at the beginning of the 20th century, their number decreased in the 1930th due to the “agricultural revolution” and hunting. Close to Nukus the last tiger was killed in 1938. In 1940th 12 to 15 animals lived in the southern part of Amu Darya Delta, where the last tiger was killed in 1947. Single animals were seen in 1955, 1963 and 1966. One tiger was seen twice in 1968, 25 km upstream from Nukus. In the State Museum of Karakalpakstan there is a tiger, which was killed in the region in 1972.

The Gissar valley with the Kofarnihan River, one of the main tributaries of the upper Amu Darya, a prime tiger habitat, became one of the main cotton growing areas of Tajikistan. The last tiger was killed in the Gissar valley in 1938. By the beginning of 1930th, in the lower reaches of Vakhsh, there were at least 15 to 20 animals in the Tigrovaja Balka Reserve. By the end of 1940th there were no more than 5 tigers; the last tiger was seen in 1953. Migrating single animals appeared in the Reserve and its surroundings much later (in 1955, 1957, 1959, 1960, 1962, 1964 and 1967), but disappeared again. (Records, from Tigrovaja Balka Reserve).

In 1950, 4 tigers were shot on the Tadjikistan side of the Piandj River. Niethammer (1967) recorded the disappearance of the tiger from the Afghanistan side of the Piandj River in 1963 due to habitat destruction and hunting. Kunhert (in Petocz, 1973) notes “unmistakable tracks” of tiger in 1967 along the Darked River.

Syr Darya River valley

Along the middle course of the river (Kazakhstan), the last tigers were shot around the region of Kyzyl-Orda in the middle of the 1930th, according to others information in the beginning of 1950th (http://www.express-k.kz/show_article.php?art_id=1477;)

In the lower reaches and in the delta the last tiger was killed in 1933. Single animals coming from the Amu Darya were seen in 1937 and 1945. The last tiger was seen in the early 1950th (ibid.)

In the surroundings of Tashkent the last tiger was killed by Prince Golitsyn in 1906. The specimen was stuffed and exhibited in the Tashkent Museum of Natural History till mid 1960th. Mark Bernes (Memoires: Moscow, Molodaya Guardiya, 2005) records that a tiger was shot near Tashkent in 1942, ironically near the place where the Tashkent Zoo was build many years later.

3. Tiger Habitats in Central Asia with Particular Reference to Amu Darya

3.1 Central Asia

The tiger was found along floodplains of rivers and in tall grass and reed beds along rivers and lakes. This type of riparian forest is called “Tugai” and used to be widespread throughout the region (Annex 6.1, 6.10). Recognized for its importance in global biodiversity, Tugai has been included into WWF’s Global 200 Ecoregions. They are most characteristic along the Amu Darya, the longest river of Central Asia, the Syr Darya and their tributaries. Two annual flooding per year and changing river courses create a mosaic of different habitats, based on soil and water availability. Three main habitat types can be distinguished:

- Forest
- Dense stands of tall grass and reeds
- Gravel plains and sedimentation areas

It is a unique habitat of woody-shrubby vegetation and high grasses which occurs only along the floodplains of Central Asian Rivers. Impenetrable thickets of trees entwined with lianas alternate with patches of tall reeds and grass up to 4 meters in height. These remarkable patchworks of vegetation, sometimes interspersed with wetlands and lakes, are the virtual oases for many species of resident and migratory wildlife.

Where Tugai occurs in the steppe zone, willow (*Salix*) and poplar (*Populus*) are the dominant trees. In the desert zone, the tugai plant communities are comprised of poplars (*Populus diversifolia*, *P. pruinosa*), Oleaster (*Elaeagnus oxycarpa*), willow and Tamarix, which alternate with meadows and reeds. Under the cover of dominant trees flourishes a large variety of shrubs such as barberry (*Berberis*), roses (*Rosa*), honeysuckle (*Lonicera*), Licorice or Sweet root (*Glycyrrhiza*) and Cotoneaster.

Along lake shores and wetlands, large areas are occupied by dense stands of tall reeds and grass (*Phragmites* and *Erianthus*), cattail (*Typha*), Tamarix and Common slat tree (*Halimodendron*).

Gravel plains are covered by sparse vegetation and pioneer plants followed by cattail (*Typha pallida*) and reeds (*Phragmites*).

3.2 Amu Darya Delta

General Characteristics (Annex 3 & 4):

The Amu Darya Delta, a slightly slanting plain covering about 45.000 sq. km, starts downstream of Nukus. The delta has been seriously degraded during the last 50 to 70 years due to increasing water deficiency, caused by irrigated agricultural in upstream areas. The uninterrupted flow of the Amu Darya into the Aral Sea stopped in 1986, which turned 5 million ha of shore and former lake bottom into a huge desert, especially in the south-eastern part.

90% of Tugai disappeared, due to lack of water, fire, illegal cutting and livestock pressure. (Sherimbetov, pers.com). It is uncertain, if the remaining forests will get enough water in future for survival. Forest degradation continues, in view of increasing water deficiency toward the north of Nukus.

Large parts of salted sands are bare of any vegetation, leading to sand and dust storms (Annex 3, 6.7, 6.8). With increasing distance from the coastline salinity decreases, due to eolithic weathering (erosion) of salt-containing soils. This leads to the creation of desert vegetation, – Saxaul (*Haloxylon*), various brushes, and sand acacia. This vegetation type covers between 500.000 to 1 million ha, (Annex 3, 4, 6.7, 6.8).

Reforestation attempts, by the State Committee of Forestry with support from GTZ had only limited success.

Most of the original wetlands disappeared; some have been replaced or maintained with drainage water, collected in canals from irrigated fields and brought over many kilometers to the delta. These canals used to flow into the Aral Sea, now they end in natural depressions, forming lakes with slightly or extremely mineralized water which is very often highly polluted with pesticides and fertilizer (Annex 6.2, 6.3, 6.4). Some of these canals stay dry most of the year, which leads to degradation of vegetation on the banks (information from local people).

Dominant vegetation along canals and around wetlands is tall grass (*Erianthus*), reed beds (*Phragmites*), extensive stands of cattail (*Typha*), and several species of willows and poplar, which develop into a kind of riparian forests. Desert shrubs such as Tamariks and Saxaul develop on salty soil.

Specific sites: Jiltyrbas Lake and System of Akpetki Lakes (Annex 4 & 6)
Jiltyrbas Lake (Annex 6.2)

A previous bay of the Aral Sea turned into a freshwater lake, surrounded by flat planes with salinated soils which are partly covered by halophytic vegetation: *Chenopodiaceae* - *Atriplex* sp., *Agriophyllum* sp., *Salsola* sp., *Camphorosma* sp., *Eurotia* sp., *Nanophyton* sp., *Suaeda* sp., *Halostachys caspica* and small brushes of Tamarisk. Reeds (*Phragmites* and *Typha*) and shrubs are found near the water. In some places huge areas are covered with dry reeds and Tamarisk, indicating that the vegetation is strongly influenced by fluctuating groundwater levels. Freshwater depending vegetation such as reeds (*Scirpus* sp.) mixed with *Karelinia caspia* and *Zygophyllum oxianum* are rare.

Moving sands reach the shore of the lake in the north-western and northern parts which are covered with Saksaul (*Haloxylon aphyllum*), *Calligonum* sp., *Tamarix* sp., small-growing *Senecio subdentalis* and other halophyte plants.

The area is inhabited by a large wild boar population and suitable for Bukhara deer (not present at this stage). There are large numbers of waterfowl, including ducks, geese, pelicans and cormorants. The lake is rich in fish. The desert surrounding the lake is populated by hares (*Lepus tolai*), goitered gazelle (*Gazella subgutturosa*), various rodents and lizards. This provides a good food base for various predators, especially wolves, jackals and foxes.

The only settlement in the area is Kazakhdarya. People use the lake and its vicinities for fishing and hunting, and some livestock grazing.

Sands to the East of Jiltyrbas Lake (Annex 6.8)

Open areas of bare sand dunes. A reforestation project was started with support from GTZ on flat plains of the former sea bottom with modest success. The following species were used: Saksaul (*Haloxylon aphyllum*), *Salsola richteri*, *Calligonum* sp., *Aristida karelinii* and other halophyte plants and desert forbs. In some wet spots reeds are growing. The ecosystems of these areas are very "young" but already inhabited by some species of lizards, gerbils, foxes, goitered gazelle and saiga antelope.

System of Akpetki Lakes (Annex 4, 6.3, 6.4, 6.6)

The lakes are part of the former Aral Sea, between the previous islands of Karabaily, the system developed already in the 1960ies and covers now about 50.000 ha. The water of the lake is in parts fresh in others brackish, thanks to Kukdaria River. The vegetation is composed of plants, which grew on the islands and by desert plants carried in (seeds) by the wind. Plant communities are therefore rather rich, including also species, typical for riparian forests of the Amu Darya Delta: *Populus diversifolia*,

Phragmites sp., *Karelinia caspia*, *Zygophyllum oxianum*, *Lycium turcomanicum*, *Nitraria sibirica*, *Atraphaxis spinosa*, *Alhagi pseudalhagi*, *Astragalus unifoliolatus*, *Glycyrrhiza glabra* and others.

These plant communities provide a good food resource for ungulates. The lakes in the periphery are unfortunately drying up; the water-supplying canal is crossed by a dam with a road.

The region's wildlife is fairly rich, similar to Jiltyrbas Lake (see above) and attracts poachers from villages located to the South (about 40-50 km), some times even from Nukus.

In the area there are no permanent settlements. Several lakes are used (no official rent) for fishing. There are a 4 to 5 cabins occupied by 1-2 people each. The whole territory is rented to Chinese for oil and gas exploration. About 10-12 km to the N-W of the lakes, Chinese build a camp occupied by about a hundred or two hundred workers (according locals). The area has been crossed with a road network. Exploration results are negative until now.

Artesian wells (Annex 6.5)

There is a dense network of wells in the area. The water has a high concentration of minerals. More than 15 wells were tested during the expedition, only one provided suitable drinking water, water temperature was between 35-40 ° C. Vegetation around these wells is well developed and represents a bright green oasis, which is a noticeable contrast in the surrounding desert. The following species are dominant: *Phragmites communis*, *Typha angustifolia*, *T. latifolia*, *Scirpus sp.*, *Carex sp.*, *Tamarix sp.* and others.

4. Climate

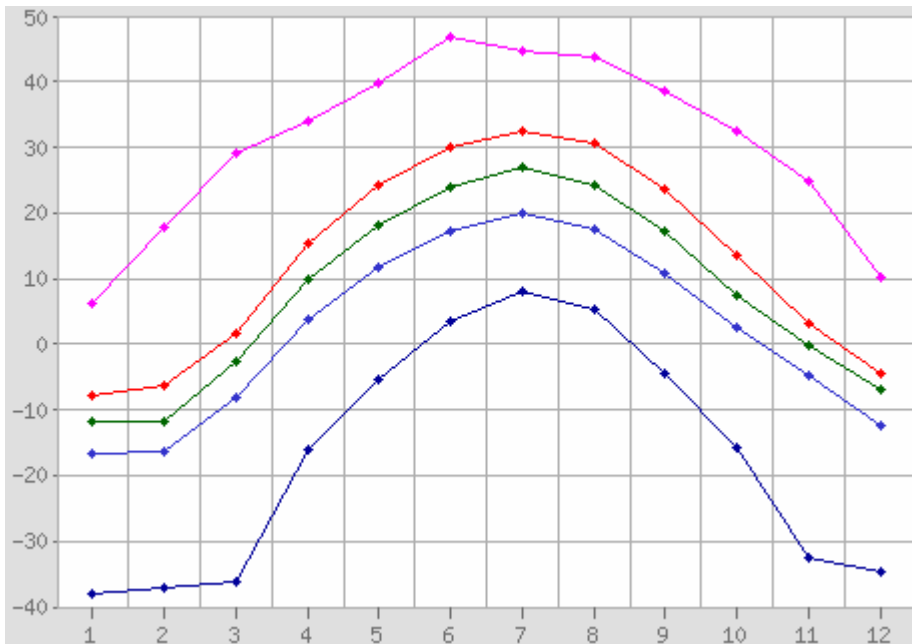
Atmospheric precipitation is very irregularly distributed on the territory of Uzbekistan. There are no more than 100- 200 mm of rain in the deserts, which occupy two third of the country, in some areas like Kyzyl-Kum desert and Priaralie, only 80 mm and less. The major part of precipitation arrives in spring (30-50%) and winter (25-40%), in autumn only 10-20% of the annual amount and only 16% in summer. Relative humidity of the air is between 60-65%.

A severe arid-continental climate is typical for the Aral Sea Basin with hot summers and cold winters, with dramatic changes during the last decades, caused by the drying up of the Aral Sea and climate change. The amplitude of summer and winter temperatures increased by 1.5 to 2.5 ° C. Maximum summer temperatures reach 43-48 ° C, minimum winter temperatures minus 28-30 ° C.

Mean temperatures in C°, for the last 10 years from Muinak Meteorological Station

Jan	Feb	Mt	Apr	May	Jin	Jul	Aug	St	Oct	Nov	Dec	Mean/year
-7, 4	-6, 6	0, 3	8, 3	17,3	22,9	26,3	24,9	19,5	11,0	3, 9	-2, 6	9, 8

Data from Aralsk Meteorological Station: Pink extreme maximum, red – average maximum, green – long-term average, light blue – average minimum, dark blue – extreme minimum.



Mean length of winter is 150 - 160 days, spring 50 - 60. Summer season starts lasts about 100 – 105 days. Relative humidity is a bit higher then in other plains of Central Asia, about 45-60% in July.

Summer is hot and dry, July, the hottest month with temperatures up to 39° C at the coast and 44° C in Nukus, 80-100 mm annual precipitation, with main rains in summer. Spring starts 7 days later, autumn 12-13 days later. Winter temperatures can reach minus 28 ° C in Nukus. Winter is really cold, but with little snow. Snow cover is not stable, can be up to 5-15 cm for 20-30 days. Freezing of soil can reach the depth up to 50-70 cm, rarely (1968-1969) 98 cm – 1 m.

Climatic changes reduced the vegetation period in the Muinak and Bozatausskii districts, along the former coast of the Aral Sea, by 10-12 days. The daily temperature amplitude doubled at the weather station Tigers Cape, Muinak, Uijaly. The average July temperature has increased by 5,1° C in Muinak, 2,1° C Uijaly, 1,9° C Tigers Cap, and 0,9° C Aral Sea. In winter 1985 mean temperature in January in Muinak was 5-7° C higher, in 1984 6-8° C lower then mean normal for Karakalpakstan Autonomous Region. (Data provided by Central Asian Meteorological Institute).

Average monthly precipitation (Muinak Meteorological Station)

mm	Months											
	Jan	Feb	Mar	Apr	Ma	Jun	Jul	Aug	Sep	Oct	Nov	Dec
15												
10												
5												

Days with drought increased significantly; 30 to 35 days were registered in Muinak in 1960, 120 to 150 in 1970. Mineralization (amount of salt in rain) increased in 6-7 times.

Drying up of the Aral Sea led also to remarkable changes of the water regime of the region. In areas once covered or influenced by the Sea, where deserts are developing, the ground water table has dramatically declined, while a significant increase has been noted on irrigated land, leading to salinsation of the soil. The areas with a critical level of ground waters (below 2 m) increased in Karakalpakstan Republic from 72 % to 90% since 1975 till 1980.

5. Fauna with Particular Reference to Tiger:

The number and diversity of animal species in the surroundings of the Aral Sea decreased dramatically from 178, including fish, to only 38 species (Kudriashov, 2005; Alamanov et.al. 2006).

The remaining natural and artificial wetlands are the main habitat for most species of wildlife, including the wild boar and Bukhara deer.

Wild boar prefers the wetlands (Annex 6.4) but enters occasionally also the dry rangelands.

It is of interest to note that Bukhara deer migrated recently into the delta (Ysbergen Shignak area) from the Badai-Tugai reserve, 150 km south of Nukus.

A recent study by N. Marzmazinskaya (pers.com.2009), commissioned by UNDP, suggests to reinforce this population by reintroducing additional animals and accelerating the expansion of the population by building up 2 more populations in the delta in the region of Sambanbay and Nazarhan. This initiative is part of the UNDP project for the conservation and restoration of Tugai in the Delta.

The dry lands provide good habitat for Goitered gazelle (*Gazella subguttorasa*), which moved into the area during the last years (Goncharov, 2007a, 2007c). Local people report that Saiga move into the area in some extremely cold years. Locals believe also that there is a “local” population migrating along the south coast of Aral Sea, but this information has not been confirmed by scientists.

6. Human Use of of the Amu Darya Delta

Sustainable use of natural resources and land use in general is impeded by the lack of a comprehensive Land Use Plan, agreed and supported by all relevant governmental agencies such as: Ministry of Agriculture and Water Management, State Agency on Hydrometeorology, State Committee on Geology, and regional authorities. Lack of a common Land Use Plan and Strategy impedes also coordination of activities within the international donor community and focus on top priorities. Governmental agencies work on their own agenda and development plans are being implemented with little or no coordination with others.

Intergovernmental cooperation and coordination through the “International Fund for the Protection of the Aral Sea” is also fairly low.

6.1 Dams and Polders

The creation of an artificial system of wetlands and polders is being considered as a serious option for developing the delta into a productive region. Dams at Takhiatash stop already the Amu Darya River from reaching the Aral Sea. Several polder systems collect drainage water and fresh water in the central and western parts of delta for irrigated agriculture, fish and game farms. Ambitious plans foresee to use water plants to clean drainage water from agriculture (polluted with pesticides and fertilizer) and to use this water for creating new lakes in desert depressions in the eastern part of delta.

6.2 Agriculture

The scarcity of water is the key factor which influences agriculture and the socio-economic development in general. The whole region is under increasing pressure from desertification, caused by the drying up of rivers, wetlands and the Aral Sea in particular. 80 % if the Aral Sea crisis goes back to anthropogenic factors, diversion of water from the rivers for irrigation. Wildlife habitats, in particular wetlands, are suffering in particular.

Drying up of the sea destroyed a stable local economy, based on small scale irrigated agriculture, fishery and livestock breeding, leaving about 50.000 unemployed (Alamanov, et.a., 2006) and depending more than before on the remaining natural resources.

This stage there is hardly any agriculture or livestock raising in the delta, due to lack of fresh water and harsh living conditions.

6.3 Hunting

Extensive use of game resources is widespread in the delta, leading to degradation of several species e.g. Saiga antelope, which moves temporarily into the steppe regions of the delta (Goncharov, 2007a, 2007c; Lanovenko, Ten, 2007). Increasing poverty leads to increasing hunting and accelerates the decline of other species in particular wild boar, gazelle and water birds. However, it is noteworthy that Bukhara Deer which moved on its own from the Badai Tugai Reserve into the delta, has not been poached until now (Sherimbetov, pers. Com)

6.4 Fisheries

Freshwater communities of fish developed in several lakes (pers.com. Karakalpak leading ichthyologist, Dr. Iliia Joldasova) for instance around the former Akpetki islands, which are now an uninhabited wetland area, where tiger were seen twice in 1980s (personal communications).

6.5 Oil and Gas

Large areas of the survey area are considered as 'highly promising' in terms of gas and oil exploration. Concessions have been given to Russian and Chinese companies for the entire basin, including large parts of former sea bottom.

Exploration for oil and gas has started (mainly in Ustyurt part); impact is rather low at this stage, but already visible (roads and dams).

6.6 Tourism

The Aral Sea and the former delta of the Amu Darya River have become a major attraction for "catastrophe tourism". Tours leave from Nukus to the area of Muinak and/or Komsomolsk-na-Ustyurte by car. Such tours are especially popular for visitors from France, Japan, Germany, Spain, and Italy.

6.7 Protected Areas and Nature Conservation

There is no efficient wildlife management in place, neither proper protection nor habitat management. There are no data on species numbers and take off (Goncharov, 2007a, 2007b). Conservation staff has very low capacity (sometimes now qualification at all), no special investigations on population structure and distribution of species have been conducted for the last decades.

Some small protected areas exist. This includes according to Uzbek legislation, State Forest Farms, Forest-Game Farms and Water Protecting Zones. The study area includes 12 State Forest Farms and 2 State Forest-Game Farms. There are also several refuges; the best known is Lake Sudochie, which is a Ramsar site.

The UNDP project on conservation of Tugai Forests aims at establishing a Biosphere Reserve (BR) of 176.000 ha along the Amu Darya (250km long and 500 to 3000m wide). The core of this reserve would be the existing Badai-Tugai Reserve (6.500 ha with a 13.000 ha buffer zone) south of Nukus, the BR would extent about 30-40 km to the north of Nukus. 18.000 ha of isolated blocks of Tugai will remain unprotected along irrigation canals, outside the proposed BR (Sherimbetov, pers. com.)

7. The Biology of the Caspian Tiger

7.1 Habitat Requirements

The tigers' habitat requirements can be summarized as follows:

- Dense vegetation cover
- A sufficient prey base of large ungulates, at least 2 to 3 ungulates per sqkm (Bragin 1986)
- Access to water

These conditions were provided by the Tugai ecosystem (see above 3.1).

7.2 Behavior

Tiger are mainly solitary, except females with cubs and during mating time, when males associate with females for breeding.

Tigers depend on water. During the heat of the day they prefer to stay in ponds and lakes, even in salty water (Sunderbans in Bangladesh and India). Tigers are excellent swimmers, Geptner and Sludskii (1972) report a tiger swimming for several km across the Amu Darya.

Tigers have among the large predators the greatest reputation of attacking people. Many of these records include tigers wounded by a hunter or being otherwise provoked. There are only very few records of tiger attacking people in the Aral Sea region.

Central Asian people in general did not consider the tiger as a threat, even at times of high population density (Stroganov S.U., Mammals of Siberia. // ASc.)

Tigers make long-distance travels in search of food, but also when dispersal is necessary. A tiger can travel 50 to 100 km a day; an adult male can make 200 to 400 km within a few days, with short breaks for rest. Females with 2 or 3-year old cubs can travel long distances as well. Rare encounters of tigers beyond their usual habitat can be ascribed to these migrations. A record-breaking travel of a Siberian tiger was registered in 1905: A single animal was killed at the Aldan River, which is 1000 km from its usual habitat.

Similar observations were made for the Caspian tiger: Animals were registered in the 19th century in the Altai Mountains, near the town of Akmolinsk, and in the area that is now the Orenburg Oblast of Russian Federation. (Stroganov, 1962)

7.3 Food

The tiger is not a nocturnal animal in the strict sense. It can be encountered at any time of the day, with preference for twilight hours at dusk and dawn.

Main food is larger sized prey, in particular deer and wild boar. Geptner (1969) considers the wild boar as most important based on records from the Caucasus, Central Asia and the Russian Far East. The tiger will attack bears and especially wolves. Similar to the leopard, tigers go for domestic dogs. Tigers feed mainly on fresh kill, but will also scavenge in the time of famine.

A hungry tiger will also hunt jackal or a swamp lynx (*Felis chaus*). It will even catch rodents, birds, terrapins, frogs, insects and spawning carps in shallow water. It will enjoy fruit of sea-buckthorn and oleaster (Geptner, 1969). In years of abundance, tigers will feed on bandicoot rat (*Nesokia sp.*). During mass migration of locust, tigers will even feed on these insects. (Stroganov 1962.)

Cold and snowy winters are the most difficult time for tigers. Old animals and 2-3-year old cubs that cannot hunt efficiently often attack domestic cattle. Sick or wounded tigers go to villages in search of food and attack dogs and sometimes even people.

They need regular access to fresh water for drinking, in particular during the hot summer months.

7.4 Home Range

There is no data available for the Caspian tiger. Home ranges of its closest relative, the Amur tiger vary from 40 to 100 sqkm (Geptner, 1969). It is likely that the home range of the Caspian tiger was closer to 40 sqkm for the following reason. Home-ranges of all riparian forests mammals (deer, wild boar) in Central Asia are at least 10 times smaller then in the Far East, but population densities at least 10-15 times higher (Pereladova, 1999; Kovshar, Pereladova, 1999).

III. Discussion and Conclusions

The review revealed that the tiger disappeared not long ago from Central Asia, some records seem even to indicate that some individuals might still exist e.g. along the Ili river in Kazakhstan (Netaliev, 2006).

The Amu Darya Delta and the area around the former Aral Sea, was a prime habitat for the tiger until the middle 20th century. Tugai forests, different kind of wetlands, extensive grasslands and reed beds provided an excellent habitat and a rich prey base. The extinction of the tiger in this region happened about 40 years ago. The last confirmed record from the delta dates back to 1972. Main reasons for the extinction were:

- Large scale habitat destruction for agriculture.
- Hunting; linked to agricultural developments, the military was given the task to clear the area of “vermin” for the colonists.
- Decline of prey species.
- Commercial hunting and poaching.

Two members of the survey team (Oleg Tsaruk and Yuriy Chikin) investigated 3 potential reintroduction sites in the former delta of the Amu Darya (Annex 1 & 4):

Site 1: Jiltyrbas Lake (Annex 4 & 6.2)

Part of a previous bay of the Aral Sea, with strongly salinated soil, in some places bare of vegetation and in others covered by halophytic vegetation, herbs and shrubs (see above). Closer to the shore of the lake reeds and dense bushes dominate. Huge dry reed beds with some tamarisk shrubs indicate highly fluctuating groundwater table.

The area covers about 300 000 ha with a good population of wild boar and waterfowl. The areas provides also good habitat for Bukhara deer.

The only settlement in the area is Kazakhdarya. People from the village use the lake for fishing and hunting. Areas around the lake are being used occasionally as pastures. The village is linked to Nukus by relatively good road, but the lake itself is not easily accessible outside of the dry season.

Artesian wells (Annex 6.5). There is a dense network of wells in the area. The water usually has a high concentration of minerals. More than 15 wells were tested during the expedition, only one provided suitable drinking water, water temperature was between 35-40 ° C. Vegetation around these wells is well developed and represents a bright green oasis, which is a noticeable contrast in the surrounding desert. The following species are dominant: *Phragmites communis*, *Typha angustifolia*, *T. latifolia*, *Scirpus sp.*, *Carex sp.*, *Tamarix sp.* and others.

Site 2: Sands to the east of Jiltyrbas Lake (Annex 4 & 6.8)

Open areas with sand dunes practically without vegetation. Reforestation efforts with salt tolerant trees and shrubs were partly successful. In some spots, where underground waters come close to the surface, reeds are growing. These ecosystems of these are fairly “young”, but already inhabited by several species of lizards, gerbils, foxes, goitered gazelle and saiga antelope in some years.

Site 3: Karabaily (Akpetki) (Annex 4 & 6.3, 6.4, 6.6)

System of Akpetki Lakes: This system of fresh water and brackish water lakes with rich vegetation, covers an impressive wilderness area of grasslands, steppes and emerging riverrine forests (about 1 million ha for the whole eastern part of delta, from Jiltyrbas to Akpetki). It provides a good habitat for several species of ungulates such as Bukhara deer (not present at this stage), goitered gazelle and wild boar (Annex 3). This is the only site of the 3 investigated areas with a certain potential for tiger and its prey for the following reasons:

- It provides fresh water, which is an essential precondition for tiger and its prey.
- Islands of good wildlife habitat exist which have a great potential for being extended and connected to become large enough to support substantial populations of Bukhara deer and wild boar.
- It is uninhabited.
- There are not human activities (livestock grazing, agriculture)
- A major effort of habitat restoration could link the area to the Syr Draya River valley via a similar system of lakes to N-E of Akpetki; this would provide a significant enlargement of the potential habitat.

However, this does not imply that the site is ready for the implementation of a large scale tiger reintroduction project. Suitable habitats are fragmented and a sufficient prey base is lacking, but the site, together with the Jiltyrbas Lake system, could become a nucleus for a comprehensive and long term habitat restoration project. Preparations for such a project would have to include:

1. Protected area status for the wilderness area of the Akpetki and Jiltyrbas Lake region and the surrounding steppe and desert ecosystems up to a total of at least 500.000 ha, with the clear priority for nature conservation, which would exclude all major forms of intensive agricultural and industrial (oil and gas) developments (Annex 3).

It is understood that this will be a long and painful process. Administrative processes in the country are very complicated; any decision has to pass a very long, time consuming process before official approval is being granted.

This process is impeded by the fact that responsibilities for protected areas and rare species are divided between several governmental bodies e.g. the State Committee for Nature Conservation and the Committee of Forestry of the Ministry of Agriculture and Water Resources. The regional government (Karakalpakstan) has also to be closely involved.

2. A very first step could be a governmental decision for regular water supply to the area for nature conservation; however this has been rather problematic until now, even farms located downstream from major agricultural areas are struggling to get access to sufficient water.
3. This would be important to ensure restoration of vegetation, such as reed beds, tall grass fields and forest. Without water the regions will continue to deteriorate.
4. Habitat restoration including vegetation development, including forest restoration, prey species restoration, including reintroduction of Bukhara deer and reinforcement of gazelle and Saiga populations.
5. The long term funding of the project needs to be ensured. The reintroduction project for the Leopard in the Russian Caucasus provides a guideline for the amount requested. The first three years for this project are budgeted at 4 million US \$.

Conclusion:

1. The tiger was a characteristic species of the riverine habitats and lake shores of Central Asia until about 60-70 years ago.
2. The Amu Darya River and Delta, with its rich Tugai forests, grasslands and reed beds, provided one of the prime habitats for the tiger.
3. The climate in the region with the disappearance of the Aral Sea has become more severe, summers are dryer and hotter and winters colder.
4. Most of the former tiger habitat has been destroyed throughout its former range, including the Amu Darya region.
5. Factors which lead to the extinction of the tiger in the region are still prevailing such as habitat destruction, including depriving the region of a regular and consistent supply of fresh water, and poaching.
6. The most interesting area, Karabaily (Akpetki), has been licensed to Chinese for oil and gas exploration.
7. A viable tiger population of about 100 animals would require at least 500.000 ha of large tracts of contiguous habitat with rich prey populations. Such habitat is not available and can not be provided in the near future. The proposed region is therefore unsuitable for the reintroduction, at least at this stage of developments.
8. However, the Amu Darya Delta and the surrounding areas of the former Aral Sea, in particular the wilderness area of the Akpetki and Jiltyrbas Lake region, provide a great opportunity for restoring and preserving a vast system of wetlands, forest, steppe and desert habitats for a large variety of wildlife (Annex 3), provided that:

- Sufficient fresh water is allowed to flow into the delta. This is not only important for the restoration of the vegetation, but also for all wildlife, in view of increasing extreme summer temperatures.
 - Agriculture and livestock is not expanding into the area.
 - Future oil and gas exploration and exploitation take ecological criteria into consideration and follow strict environmental guidelines.
 - Protected areas status is given to the area.
 - The Protected area is well protected and managed by competent staff.
9. Any further consideration of reintroducing the tiger into this region will depend on the successful completion of point 8, including the successful restoration of wildlife populations in particular wild boar, Bukhara deer, goitered gazelle and perhaps Saiga antelope and effective protection.
 10. Considerations for returning the tiger to this region should be reexamined at a later stage, when success or failure of restoration measures can be evaluated. Such a process might take 15-20 years.
 11. Tigers existed much longer, perhaps even until today, in other parts of its former range, like the South Pribalkhash'e – Ili floodplain in Kazakhstan, which might provide a more suitable ecological and political environment than the Amu Darya region for such a project.

IV. Recommendations

1. Recommend to the Uzbek Government to include the suggested area as a first-priority site into the full-size GEF project on model ECONET implementation in Central Asia.
2. Recommend to the Uzbek Government and GEF to develop and implement a long-term programme on ecosystem restoration and wildlife reintroduction for the Amu Darya Delta and former Aral-sea bottom areas (surroundings of Jildyrbas and Karabaily (Akpetki), with the long-term goal of restoring the original fauna and flora of the region.
3. Recommend to WWF-NL to expand the feasibility study to other sites in Central Asia, with the objective to seek confirmation of recent tiger sightings, in view of the latest, although scientifically unconfirmed, observation of tigers in the floodplains of the South Pribalkhash'e – Ili River and to investigate if other suitable sites for reintroduction are available, in particular in Kazakhstan, so that suitability of different sites can be weight against each other.
4. The WWF Central Asia Programme recommends to explore if the Kazakh Government is interested in a survey of the South Pribalkhash'e Ili River floodplains, as suggested by the representatives from Kazakh Government, during the ISDC meeting in Tashkent (May 2009).

V. Acknowledgements

Grateful acknowledgement is made to WWF-Netherlands for providing financial support for the study.

We thank the Academy of Science, Institute of Zoology, Republic of Uzbekistan for preparing the survey, making available equipment and arranging meetings with representatives from Government at national and regional level, scientist and conservationists.

We appreciate the support from Dr. Igor Chestin and Dr. Olga Pereladova for having initiated the survey. A particular thank you goes to Dr. Pereladova for supplying important information and for providing translations of the Russian language reports and literature.

We thank the staff of UNDP Tugai Restoration Project for support and assistance in preparing the survey, making available equipment and arranging meetings with representatives of local authorities. A particular thank you goes to Mr. Kh. Sherimbetov for providing important information and assistance for solving technical problems.

Thanks are expressed to Dr. B. Blaszkiewicz, Director of Berlin Zoologischer Garten for providing and permitting the use of the photos of the Caspian Tiger.

We are also obliged to Ann-Kathrin Jungius, who participated at her own cost in the survey, for review of the report and help with the lay-out and printing.

VI. References

Abdunazarov B.B. (ed.) 2003. Turanian tiger // Red Data Book of the Republic of Uzbekistan v. II. Tashkent: «Chinor ENK», 2003. – c. 216-217 (in Russ).

Almanov S.K., Lelevkin V.M., Podrezov A.O. 2006,. Climate change and water problems in Central Asia. M.-Bishkek, 2006. – 188 p. (in Rus).

Blagoveshchenskaya S. 2008. Turanian tiger // <http://www.tigrovajabalka.tj/stati/page,1,2,15-turanski-tigr.html> (in Russ.)

Bragin, A.P. 1986. Population characteristics and social-spatial patterns of the tiger on the eastern macro-slope of the Sikhote-Alin Mountain range. U.S.S.R. M.S. thesis Pacific Institute of Geography, Vladivostok.

Chegodaev A. 1983.: Caspian Tiger (in Russ.), Young Naturalist, 1983 – 4

Driscoll C. A. et. al. 2009, Mitochondrial Phylogeography illuminates the origin of the extinct Caspian Tiger and its relationship to the Amur Tiger.

Frost L. 2005. Trecking the Lord of Taiga. (in Russ.) "The Sochi" newspaper, №17 (762), 28.04. – 04.05 2005.

Geptner V.G. 1969. Tiger. // Geptner V.G., Naumov N.P., Bannikov A.G. Mammals of the Soviet Union. Cats and Hyenas (in Russ).

Geptner V.G., Sludski A.A.1972. Mammals of the Soviet Union. In: Geptner VG, Naumov NP, editors. Mammals of the Soviet Union, Carnivora (Hyaenas and Cats). Moscow: Smithsonian Institution and the National Science Foundation, Washington, D.C.

Goncharov G.F.2007a. Monitoring of biological resources // Biodiversity of Uzbekistan – monitoring and use. Tashkent, p. 4-7. (in Russ)

Goncharov G.F. 2007b. Productivity of ecosystems. // Biodiversity of Uzbekistan – monitoring and use. Tashkent, p. 7-9. (in Russ).

Goncharov G.F. 2007c. Evaluation and estimation of the level of the modern use of wild animals. // Biodiversity of Uzbekistan – monitoring and use. Tashkent , p. 220-224. (in Russ).

Habibi Kh. 1977. The Mammals of Afghanistan: their Distribution and Status. FAO Dield Document #1. Kabul. 19 pp.

Habibi K. 2003. Mammals of Afghanistan. 168 pp. Zoo Outreach Organization.

Heck L. 1899. Lebende Tierbestände des Berliner Zoologischen Gartens.

Jungius, H. 1985. Prospects for re-introductions. In Symp.zool.Soc.Lond. (1985) No. 54.

IUCN 1984. The IUCN position statement on translocation of living organisms, introductions, re-introductions and stocking. International Union for Conservation of Nature and Natural Resources, Gland, Switzerland.

Kisch,E.W. 1932. Asien gründlich verändert. Erich Reiss Verlag, Berlin

Kovshar A.F., Pereladova O.B., 1999. Recent situation and future possibilities of biodiversity conservation in Kazakhstan and other countries of the Region of Central Asia. // Biodiversity conservation (proceedings of the conference). M., AcSc, p.51-58 (in Rus).Lanovenko E.N., Ten A. Analysis of numbers and take off of various game species of birds in Uzbekistan. // Biodiversity of Uzbekistan – monitoring and use. Tashkent, 2007b. – p. 231-239. (in Rus)

Kunhert in Petocz, R. G. 1973. Background information on fluctuations in animal population sizes with comments on the expanding rodent population in the north of Afghanistan. Unpublished, cited in Habibi (1977, 2003).

Matushkin E.N. (ed.) 1985. Turanian tiger // Red Data Book of the USSR, v.. 1. M.,: Lesnaja promyshlennost, 1985. p. 46-47 (in Russ).

Mirzabekova R. (in Russ.). Azia-Plus-
<http://www.centrasia.ru/newsA.php?st=1192738200>

Netaliev T. 2006. Almaty. Express-K. Balkhash tiger exist! (in Russ.) № 77 (15979), 28.04.2006

Netaliev T., 2006. Almaty. Express-K. Stalking tiger, hiding cheetah. № 134 (16036) on 21.07.2006.

Niethammer G. 1963. Die Einbürgerung von Säugetieren und Vögeln in Europa. Paul Parey Verlag Hamburg und Berlin.

Niethammer J. 1967. Pelztierfelle im Bazaar von Kabul/Afghanistan. Das Pelzgewerbe: 18, 7-9,

Nobuyuki Yamaguchi 2001. Wild Cats in Kazakhstan and Uzbekistan / Cat News, 35 Autumn 2001, P. 22-24. Wildlife Conservation Research Unit, Department of Zoology, Oxford University.;

(Prokhorov V. 2002). [Illegal International Wildlife Trade]. Web page, available at: <http://www.yurclub.ru/docs/ecology/article13.html>

[Prynn, D., Marwell. 2003. № 116, pp. 10-11. On Caspian Tiger](#) (translated into Russian by Zoonovosti)

Pereladova O.B., 1999. Regulation of the separate components of riparian forests ecosystems on the protected areas (on the example of Bukhara deer population of Kyzylkumskii zapovednik). // "Protected areas' activities", Scientific-methodological papers; ser.4, pp.5-13 (in Russ).

Rustamov A.K. (ed.) 1985. Tiger // Red Data Book of Turkmen Republic. v. 1. Ashgabat, Turkmenistan, 1985. – p. 62-65. (in Russ).

Rabinowitz, A.R.1989. The density and behavior of large cats in a dry tropical forest mosaic in Huai Khaeng Wildlife Sanctuary. Tailand. Nat. Hist.Bull. Siam.Soc. 37 (2)

Seidensticker, J. 1986. Large carnivores and the consequences of habitat insularization: Ecology and conservation of tigers in Indonesia and Bangladash. Pp 1-42 in S.D. Miller and D.D.Everett, eds. Cats of the world: Biology, conservation and management. National Wildlife Federation, Washington, D.C.

Seidensticker J, Jackson P, Christie S. 1999. Riding the tiger: Tiger conservation in human-dominated landscapes. Cambridge; New York, NY: Zoological Society of London; Cambridge University Press.

Stroganov S.U., 1962. Mammals of Siberia. // ASc USSR, Moscow.

Vanin E., www.liter.kz

Yamaguchi N. 2001. Wild Cats in Kazakhstan and Uzbekistan / Cat News, 35 autumn 2001, P. 22-24. Wildlife Conservation Research Unit, Department of Zoology, Oxford University.

<http://antipodean-wor.livejournal.com/456088.html>

<http://bag.in.ua/aralsk/viewtopic.php?t=982&start=120>

<http://ege.go-test.ru/ege/index/2494>

<http://kultura.kubangov.ru/html/nato-6jw3s6.html>

<http://lugovsa.net/?p=1706>

<http://sapunov.livejournal.com/531911.html>

<http://www.5tigers.org/AllAboutTigers/Subspecies/caspian.htm>.

http://www.arkavun.kherson.ua/hersonskaja_oblast_kto_zdes_obital_i_pochemu_bolshe_ne_vstrechaetsja.htm

<http://www.calc.ru/308.html>

<http://www.CNSHB.ru/AKDiL/0021/base/k0520001.shtm/>

<http://www.day.az/forum/index.php?showtopic=4831/>

http://www.express-k.kz/show_article.php?art_id=1477

<http://www.historica.ru/index.php?showtopic=7689&mode=threaded&pid=362267>

http://www.krugosvet.ru/enc/nauka_i_tehnika/biologiya/TIGR.html

<http://www.lenzoo.ru/russian/zoo/?id=2385&p=2>

<http://www.nukri.org/modules.php/modules.php?op=modload&name=News&file=article&sid=109&mode=thread&order=0&thold=0>

<http://www.silktoir.uz/rus/nukus.htm>

<http://www.tigrologia.ru/vymershie-podvidy-tigrov/kaspiyskiy-tigr-turanskiy-persidskiy/>

<http://www.tigrovajabalka.tj/stati/page,1,2,15-turanskiy-tigr.html>

<http://www.yurclub.ru/docs/ecology/article13.html>

(IMG:http://bigcats.ru/images/tiger_podvid/photos/turanskiy.jpg)

(IMG:http://bigcats.ru/images/tiger_podvid/photos/turanskiy2.jpg)

VII. Annexes:

Annex 1: Survey Route and Sites Visited.



Annex 3: Priority Sites in the Amu Darya Delta for Habitat and Wildlife Restoration.

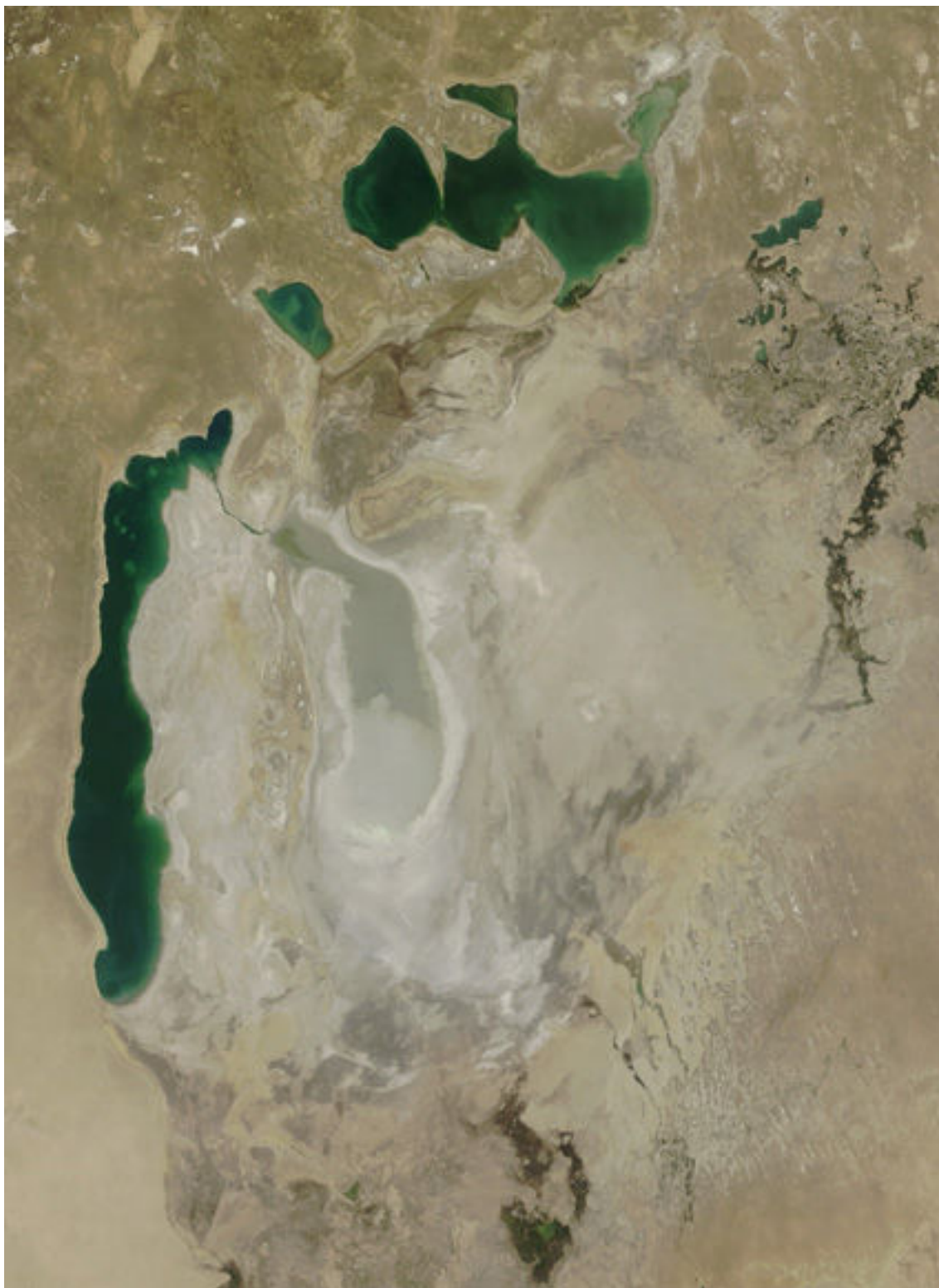


The bright-green line marks areas covered by tugai and reed beds, the most suitable site for habitat and wildlife restoration.

Annex 4: Lake System of the Amu Darya Delta



Annex 5: Aral Sea Basin



Annex 6: Photos

6.1 Old-growth Tugai in Badai-Tugay Reserve on the Amur Darya River



6.2 Jiltyrbas Lake System



6.3 Akpetki Lake System with Water Birds



6.4 Akpetki Lake System, Mudflat with Wild Boar Tracks



6.5 Artesian Well



6.6 Akpetki Region, Lake Drying up



6.7 Moving Sands



6.8. Fixed Sands



6.9. Cotton Fields Replace Tiger Habitat throughout Central Asia



6.10 Bukhara Deer in Tugai Landscape



A vision for the future for large parts of the Amu Darya Delta and one of the important preconditions for the successful return of the tiger.