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Cats in Iran










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Cover Photo: From top left to bottom right:
Caspian tiger (K. Rudloff)
Asiatic lion (P. Meier)
Asiatic cheetah (ICS/DoE/CACP/Panthera)
caracal (M. Eslami Dehkordi)
Eurasian lynx (F. Heidari)
Pallas's cat (F. Esfandiari)
Persian leopard (S. B. Mousavi)
Asiatic wildcat (S. B. Mousavi)
sand cat (M. R. Besmeli)
jungle cat (B. Farahanchi)

KAVEH FAIZOLAHI[1]

Tiger in Iran - historical distribution, extinction causes and feasibility of reintroduction

A historical range for the extirpated Caspian tiger *Panthera tigris virgata* in Iran, and close to Iran border in adjacent countries, is constructed based on records extracted from scientific literature as well as from travel journals from 17th century to first half of the 20th century. The records were classified into three categories of reliability, depending on the accuracy of identification and the precision of locality. The historical range is potentially open to re-introduction, and as new molecular research established, Amur tiger could be used as a stock to repopulate tiger in its former range from Central Asia to the Caucasus. However, Caspian tiger habitats in Iran have changed dramatically in the last century, and the main causes of its extinction are now at least as effective as before. If any potentially suitable habitat appears in feasibility studies, a long phase of preparation, beneficial to all wildlife, is needed before reintroducing tiger to land it disappeared from more than half a century ago.

The Caspian or Hyrcanian tiger is a usual member of many lists comprised of the most recent mammalian extinctions, including species and subspecies such as Tasmanian wolf *Thylacinus cynocephalus*, aurochs *Bos primigenius*, quagga *Equus quagga quagga*, Atlas bear *Ursus arctos crowtheri*, etc. The Caspian tiger once roamed across a wide range in northern Asia and was finally wiped out from northern Iran nearly half a century ago.

This is a literature review with the aim of determining the distribution and causes for the decline and disappearance of the Caspian tiger. I then looked at new molecular data which prove that the *virgata* (Caspian) and *altaica* (Amur) subspecies are taxonomically synonymous. Using these findings, I discuss the feasibility of tiger reintroduction within its former Iranian range using Amur tigers, *Panthera tigris altaica*.

Taxonomy

Traditionally there have been eight recognised subspecies of *P. tigris* (Mazák 1981), of which three are now considered extinct (Nowell & Jackson 1996, Jackson & Nowell 2008) and a new subspecies, *P. t. jacksoni*, was recently described from Malaysia (Luo et al. 2004). The Iranian population of tiger belonged to the extinct subspecies *P. t. virgata* (Illiger, 1815). Its type locality is Mazandaran, northern Iran (delimited by Harper 1940). No holotype specimen of *P. t. virgata* exists. Other common names for this subspecies include Hyrcanian tiger, Turan tiger, Persian tiger, Central Asian tiger, Turkestan tiger, Transoxiana tiger, Occidental tiger and Mazandaran tiger.

On one hand, some authors believe that the usual taxonomic lumping of all middle Asian tigers under the *P. t. virgata* subspecies may mask a great differentiation in co-adapted gene complexes between regional populations (Hemmer 1987); on the other hand, new molecular results show that recognising *P. t. virgata* at a subspecific level may be not justified. It has however been demonstrated that intraspecific variation of tiger is largely clinal and conforms more or less with ecogeographic rules such as Bergmann's (Kitchener 1999). By applying ancient DNA techniques to museum specimens, Driscoll et al. (2009) showed that the Amur and Caspian tigers are sister taxa to the Indochinese tiger, *P. t. corbetti*, being separated from that subspecies by only six and five mitochondrial steps respectively. Caspian tiger haplotype differs only by a single step from Amur tiger and the Caspian tiger was genetically more diverse than the almost identical Amur tiger. All Amur tigers share a haplotype that is derived from that of the main Caspian haplotype (Driscoll et al. 2009).

It is suggested that *P. t. virgata* (Illiger, 1815) and *P. t. altaica* Temminck, 1844 should taxonomically be considered as a single subspecies, as they comply with the three criteria of subspecific taxonomic designation: 1) a distinct and united geographic distribution throughout a continuous range, 2) a unique natural history, and 3) largely concordant phylogenetic characters (O'Brien & Mayr 1991, Driscoll et al. 2009). The Caspian tiger and Amur tiger may have a recent common ancestry and may thus be considered as synonymous under the prior *P. t. virgata* trinomial. There is even a suggestion to consider all continental tigers as one subspecies (Wilting et al. 2015), mainly with the intention to facilitate tiger conservation management.

As Hemmer (1987) put it: "Tigers have phylogenetically developed population differences, but man has developed the concept of subspecific taxonomy. Thus, conservation strategies must not rely primarily on such man-made concepts, but on nature's existing population".

Table 1. Size and cranial characters of Caspian tigers (Ognev 1962. Mazák 1981, Heptner & Sludskii 1992).

	Males		Females
Total length	270-295 cm		240-260 cm
Tail length		90-110 cm	
Weight	170-240 kg		85-135 kg
Skull length	316-369 mm		268-305 mm
Condylobasal length	259-308 mm		225-263 mm
Zygomatic width	219-254 mm		183-203 mm

Phylogeography

The Caspian tiger's uncertain biogeographical origin and phylogenetic placement in the tiger family tree has puzzled naturalists for over a century (Macdonald et al. 2010). Heptner & Sludskii (1992) proposed that tigers colonised this area from north-west India and Hemmer (1987) like Mazák (1981) suggested a route from north-east Asia via central Asia. Driscoll et al. (2009) deduced that tiger expanded in northern Asia through the Silk Road (Gansu corridor) from eastern China, between the Himalayan Plateau and the Mongolian Gobi desert, first towards west into Central Asia up to Anatolia, and then eastwards into the Russian Far East. Tiger expansion into Central Asia is very recent (Holocene) and Caspian tiger geographical variation dates back to less than 10,000 years ago.

Caspian tiger may have been the most isolated of all mainland tiger subspecies during the stadials of the Pleistocene, "(they) were doubtless excluded from India by the Hindu Koosh and the desert areas of Persia and Baluchistan" (Pocock 1929). Vereshchagin (1967)

considers it a postglacial immigrant due to lack of fossil remains in the Caucasus. Indeed, the nearly continuous range of the tiger in northern Asia (except a gap around 100° E) is clearly evident in older maps (Mazák 1965). "There is evidence that the tigers of the Perso-Turkestan district are, or were, continuous in their distribution with those of Mongolia" (Pocock 1929). Ellerman & Morrison-Scott (1951), report a historical distribution in the Ob basin and the Altai Mountains. The historical distribution of Amur and Caspian tigers extended from Anatolia to the Russian Far East and this range became discontinuous within the last 200 years, probably due to anthropogenic factors (Driscoll et al. 2009).

Morphology

The maximum known weight of Caspian tigers exceeds 240 kg but evidently could be greater (Heptner & Sludskii 1992). There is not much consensus on size of the Caspian tiger. According to different authors, it was the second or the third largest tiger of all. Lydekker (1901, 1907) described it as "a small and somewhat rough-haired variety" based on a mounted specimen in the British Museum. Pocock (1929) stated that "there is little, if any, difference in size between this tiger and the Indian subspecies". This is in concordance with Mázak (1981) while Joslin (1988) considered it of intermediate size.

Body size in tigers is probably influenced by phenotypic responses to the environment (Kitchener 1999). The great size variation may be a case of ecological variation resulting from temporary climatic conditions (Mayr & Ashlock 1991), indicating a highly plastic phenotype. Sexual size dimorphism in tigers increases with latitude (Kitchener 1999) and was striking in Caspian tiger, where males were almost two times heavier than females (Mázak 1981; Table 1).

Sagittal and temporal crests, especially in large males are very strong and prominent (Mazak 1981). The occiput is very broad (Pocock 1929), as in Amur tigers, "which may indicate a close relationship between these populations" (Kitchener 1999).

Though the Caspian tiger was in average smaller than the Amur tiger, the largest individual, killed on the Sumbar in Kopet-Dag on 10 January, 1954 (stuffed skin in Ashkhabad Museum), with a greatest skull length of 385 mm (Heptner & Sludskii 1992), exceeds slightly even the maximum value known for the Amur subspecies (skull length 383 mm; Mazak 1981; Table 1).

Coat pattern

Caspian tiger expected near the paler ground colour and fewer stripes ends of the range in a clinal variation that seems to be a rule for more northern tiger populations. However the stripes in Caspian tiger were more numerous and closer set (Pocock 1929). The ground colour was somewhat richer, darker red, with a tendency to turn brown in some specimens (Pocock 1929). The ground colour of tigers' pelages is usually understood as a reflection of habitat and/or humidity (Gloger's rule), so the dark, more striped pelage of the Caspian tiger is not unexpected in the dense humid jungles of south Caspian. Nevertheless, Heptner & Sludskii (1992) showed that Caspian tiger displayed a wide variety of striping patterns and ground colour variations.

Both Satunin (1914) and Pocock (1929) showed that the stripes in some Caspian tigers were not black as in the Bengal tiger (Harper 1940). Pocock (1929), however, points to a great variation in British Museum specimens, with two of four Caspian tiger pelts having quite black stripes just as in the Indian tigers. The other two are partly and wholly brown.

There are two Caspian tiger skins with dubious origin (most probably from Golestan area) in Iran Biodiversity Museum (Fig. 1) and Darabad Museum of Nature and Wildlife (Fig. 1), both in Tehran. They seem to conform to other descriptions of Caspian tiger pelage, as their ground colour is not so pale, with a red ochre hue.

Seasonal coat colour and length dimorphism was prominent: the winter coat was considerably lighter and paler in colour and denser and longer, than the summer coat with a less distinct pattern. Hair was markedly longer on the head insofar as the ears projected only insignificantly (Heptner & Sludski, 1992). The fur even in summer were thick (8 to 13 mm on the back and 20 to 30 mm on the abdomen), but tended to grow much longer in the winter (30 mm and more on the back) especially on the nape (up to 20 to 50, and even 90 mm long) that look like a mane, on the cheeks, on the sides of the face, and along the belly (Pocock 1929, Ognev 1962, Heptner & Sludski 1992, Mazák 1981).

Habitat

Primary habitat of the Caspian tiger in Iran included riparian and lowland forests, reed-covered coastal plains, and wetlands. Secondary habitat was alpine forests on the northern slopes of the Alborz Mountains made up of dense vegetation consisting of beech, oak, hornbeam, tamarisk, pomegranate, boxwood, and ash trees (Blanford 1876, Zarudny 1891, Vuosalo 1976, Joslin

Fig. 1. Left: the tiger hide in Biodiversity Museum of Iran, Tehran, and right the tiger hide in Darabad Museum of Nature and Wildlife, Tehran, both most probably from Golestan area (Photos F. Heidari).

1986). Its presence has been confirmed up to 1,800 m in northern Iran (Blanford 1876). It was also reported to have traversed vast expanses of desert while traveling from northern Iran to the eastern shores of the Caspian Sea (Heptner & Sludskii 1992).

Ecology and behaviour

There is little information on the natural history of Caspian tigers in Iran. In the Ili River Valley in Kazakhstan, tiger territories measured 20 by 50 km^2, while a male and two females were thought to have occupied an area measuring only 42 km^2. Their territories partially overlapped (Joslin 1988).

Tiger mortalities due to wild boar anti-predatory defence have been recorded in the Trans-Caucasus and Iran (Brandt 1856). Brown bears also may cause injuries and even death to tigers. Cubs were killed by male tigers, brown bears, and other predators. Evidence shows that tigers in the Trans-Caucasus had suffered injuries from porcupine. Wolf and leopard competed against tigers for prey and habitat (Heptner & Sludskii 1992).

An altitudinal migration was observed as tigers climbed into the mountains during spring and summer, following grazing ungulates, and descended to lower altitudes in autumn, wintering in the plains (Kock 1990, Heptner & Sludskii 1992). Chodźko (1850, cited in Sahami 2006) observed the same pattern of seasonal migration in Guilan Province, northern Iran. Due to following migrating ungulates the Caspian tiger was known as "road" or "travelling leopard" in Central Asia (Extinction Website 2010).

Prey

While the tiger's main prey was the wild boar *Sus scrofa*, roe deer *Capreolus capreolus*, Caspian red deer *Cervus elaphus maral*, urial *Ovis vignei arkal*, golden jackal *Canis aureus*, jungle cat *Felis chaus*, various domestic animals, including horse, ass, water buffalo, camel and dog (Vuosalo 1976, Heptner & Sludskii 1992) were also preyed upon. Cattle were attacked only in winter according to Vereshchagin (1967). In north-east Iran, tigers also preyed on goitered gazelle *Gazella subgutturosa* (Brandt 1856) and in Alborz on wild goat *Capra aegagrus* (Kotschy 1845). There is no record of Caspian tiger preying on locally extinct ungulate fauna such as Caucasian elk *Alces alces caucasicus*, Caucasian wisent *Bison boasus caucasicus*, aurochs *Bos primigenius*, or tarpan *Equus ferus* within its Iranian range, though their coexistence in Iran-Caucasus border in older times seems plausible.

Panthera tigris virgata

Names:
ببر Babr
Caspian tiger

Head and body length:
240-295 cm
Tail length:
90-110
Weight:
85-240 kg

Iranian population:
0

Distribution in Iran:
Nowhere

IUCN Red List:
Extinct (2008)
Excludes *P. t. altaica*
Amur Tiger: Endangered (2010)

CITES:
Appendix I

DoE List:
Protected (since 1957), extinct, based on hunting and fishing law

Photo K. Rudloff

Demography

The Iranian tiger populations of south-west (Talysh Mts) and south-east Caspian region were supposed to act as source to sink respectively in south Caucasus (Transcaucasia) and Turkmenia Kopet-Dagh (southern Transcaspica; Heptner & Sludskii 1992). It was reported to reproduce once every two or three years, bearing two to four cubs per litter. No particular breeding season has been documented (Joslin 1986).

In Trans-Caucasus, two litters with two cubs each have been recorded (Heptner & Sludskii 1992). A Caspian tiger reportedly bred and produced young twice in the Moscow Zoo over a two-year period (Joslin 1988). There is an image of a tigress with her two unborn cubs hunted by royalties in north-eastern Iran around the 1920s.

Distribution

The Caspian tiger occupied the most western area of the species' range. The distribution extended westwards to the south of the Caucasus and eastwards across central Asia from the Caspian, through northern Persia (Mount Elburz), northern Afghanistan, the Aral Sea, and the Pamirs, River Ili, Lake Balkhash, Tarim and Lake Lop-nor. The range extended as far east and north as the Altai and the southern Ob basin (Kirk 1969), reaching Europe through the Ukraine, in reed beds along the Terek and Kuban rivers, and in the Don River mouth.

Historical distribution of tiger in Iran

For a better apprehension of tiger historical range in Iran, scientific literature as well as travel journals from 17th century to first half of the 20th century have been searched for reports on tiger occurrence in Iran and records close to Iran border in adjacent countries (Supporting Online Material SOM Table T1 & T2). It should be noted that older provincial divisions of Iran in the period that contains most of the tiger records were different from now (for example Guilan and Mazandaran applied to much larger areas, and Golestan was not considered a separate province). Hence the vague older references to these names may not refer to their modern borders.

The tiger occurred in the northern Iran in forests and reed beds surrounding most rivers and wetlands, from Tejen in Sarakhs along the border with Turkmenistan through the south Caspian lowlands all the way along the border with Azerbaijan and Armenia to Arax near Ararat. This almost 2000 km strip includes parts of 8 provinces: West Azerbaijan, East Azerbaijan, Ardabil, Guilan,

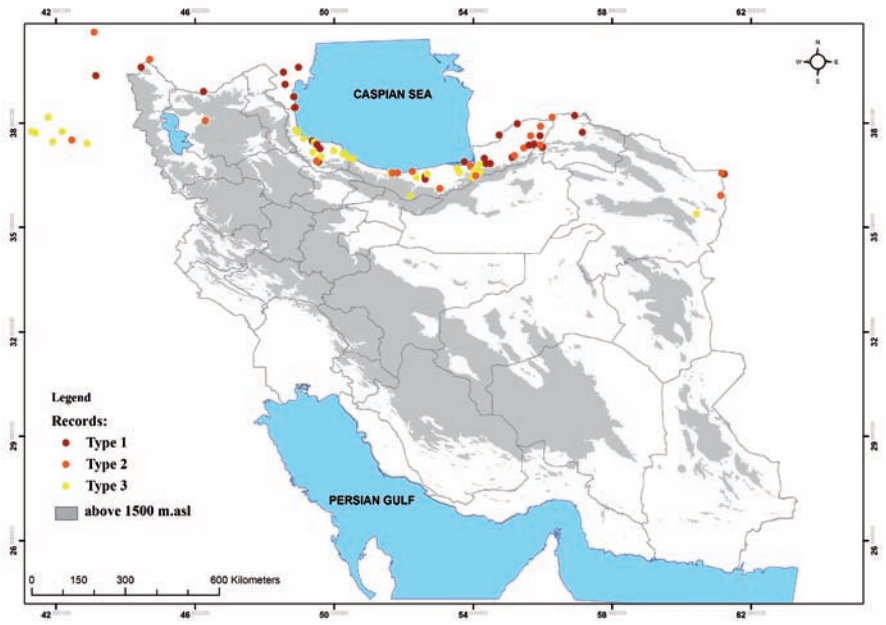

Fig. 2. Distribution range map of the tiger, based on historical records in Iran and close to the Iranian border in adjacent countries. For definitions of record types see the text "Historical distribution of tiger in Iran" (map produced by N. Ahmadi).

Mazandaran, Golestan, North Khorasan and Razavi Khorasan (Fig. 2, SOM T1 & T2). The specified records of known locality, were assigned to 3 categories based on their reliability, a concise version of Boshoff & Kerley (2010) method: 1) accurate identification and precise locality (sighting or specimen); 2) accurate identification or precise locality, but not both; and 3) questionable identification in imprecise locality.

Tiger in Persian arts and folklore

Objects in form of tigers or with tiger designs can be found dating back as far as 3400-3000 BP (Negahban 1996; Figs. 3-5). Moreover, the tiger appears in some ancient Persian miniatures and in tribal carpet designs (Vuosalo 1976, Tanavoli 1985). There are many references to tiger and its skin in Persian poetry of the 10th and 11th century, such as Shahnameh (977-1010) by Ferdowsi, Garshaspnameh (ca. 1066) by Asadi Tusi and Diwans of Farrukhi Sistani, Manuchehri Damghani, and Qatran Tabrizi among others. Tiger has been mentioned in some Persian bestiaries of the 12th to 14th centuries, such as Ajayebnameh by Hamadani (1166), Farrokhnameh (Fig. 6) by Yazdi (1184), Ajayeb Almakhluqat (Fig. 7) by Qazvini (1280), and Manafe'e Hayavan (Fig. 8) by Maraghi (1299).

Conservation status

The Caspian tiger is extinct in Iran (Harrington & Darreshuri 1977, Joslin 1986, Ziaie 1996, Jackson & Nowell 2008, Karami et al. 2008) with no conclusive records in more than 50 years, although dubious reports still surface.

In captivity

There are no Caspian tigers in captivity today (Kirk 1969, Nowell & Jackson 1996). A small tame tigress, named Theresa, which had been presented to the Soviet ambassador in Iran, lived from 1924 to 1942 in Moscow Zoological Garden (Heptner & Sludskii 1992). The only other tiger in European zoos which was certainly originated from Persia, was the young female tiger of Hagenbeck Zoo in Hamburg, Germany, that lived there from 1955 to 1960. This tigress, named Soraya (a female Persian name which means Pleiades, and the name of the queen of Iran, 1951-1960), probably was the last Caspian tiger in captivity (Fig. 9 & SOM Figure F1).

Causes of extinction

Sometime before 1911, Col. Kennion came across only two tigers in Golestan Province and wrote in his memoirs "considering the abundance of game and the fewness of the tigers' foes, it is quite a problem why the latter are not more numerous in these parts" (Kennion 1911, p. 246) and Pocock (1929, p. 522) stated that "there is reason to fear that the race is on the wane."

In the 1930's, around 80 to 100 tigers were presumed to still survive within its Iranian range but subsequently these numbers declined (Schaller 1967, Heptner & Sludskii 1992). Tigers became "quite rare" in the forests on the southern coasts of the Caspian Sea. By the middle of the last century, almost tiger's entire preferred habitat had been reclaimed for cultivation, with the result that the survivors retreated to the mountain forests, where the last recorded Caspian tiger was shot in 1959. Intense felling of forests appears to have caused the animal to disappear altogether from Iran (Misonne 1959, Lay 1967).

The extirpation of Caspian Tigers in northern Iran was caused by the loss of critical resources including habitat, water and prey. Habitat was lost through the burning of riparian vegetation, draining of wetlands and the conversion of forests into cultivation. Use of DDT in 1940s and 1950s cleared the reed-covered wetlands of malaria mosquito, as one of the most prohibiting factors for people invading tiger habitat. Tigers were forced to retreat to the margins of their natural habitat in the forested mountains. Here they competed for resources with the largest leopard subspecies - the Persian leopard *Panthera pardus saxicolor* - but were not able to survive and became extinct by the 1960's.

Between 1973 and 1976 extensive efforts were made by the biologists of the Iranian Department of the Environment DoE to search for tigers in the forests of the Alborz Mountains, but no trace or evidence was found (Joslin 1986 & 1988, Firouz 2005).

Tigers have proven to be an adaptable species and live in a variety of habitats and climates across the world. Tigers have a relatively high reproductive rate with short inter birth intervals. They are quick to fall back into oestrus in the event of the loss of a litter. They prey on a variety of species from small to large mammals and tigers can adapt their hunting technique based on the type of prey and habitat. However, some characteristics of the species in western Asia made it more susceptible to human development in the regions as well as to wildlife trade.

Distribution pattern

One of the most important factors concerning the decline and extinction of the Caspian tiger was its natural restricted distribution. The various historical records show that the distribution of the Caspian tiger was ramified and associated with watercourses, river basins and lake edges, embedded in a large expanse of desert environment, rendering the species vulnerable (Heptner & Sludskii 1992, Sunquist et al. 1999).

On the southern side of the Caspian Sea, tigers occurred in the forested areas of

northern Iran, where they were associated with riverine habitats, important areas for the species and its prey. With the increasing human population and the advent of development, rivers were used as modes of transport for colonisation. The persecution of tiger and its prey increased with increasing movement and activity of humans in the area (Sunquist et al. 1999).

Prey

The emergence of tiger as a large-bodied, forest-edge predator followed the radiation of the cervids. Cervids are vital to the tiger's survival in the wild. Tigers living in regions where high rainfall results in a naturally low cervid and other terrestrial mammal diversity are especially vulnerable (Sunquist et al. 1999). This was the case with the late Caspian tiger. The Caspian tiger's former distribution in Iran overlaps with distribution of cervids such as Maral red deer and roe deer.

Red deer and wild boar formed the tiger's prey base, with red deer being the principal item in the diet, but as deer numbers declined, tigers had increasingly to rely on wild boar, which were in those days abundant on the coastal plains. Wild boars are a resilient species and can sustain high rates of culling with the ability to recover populations over relatively short periods of time. However, their numbers were affected by hunting, disease, natural disasters and in the Caspian region, suid diseases, floods and fires have contributed to a high loss of individuals (Novikov 1962, Heptner & Sludskii 1992, Sunquist et al. 1999). The tiger's disappearance from the Caspian region was therefore related to the decline in wild boar on which it increasingly and solely relied.

Hunting and persecution

Not many tigers were killed in Iran, unlike the systematic tiger eradication which took place in Russian territory, when "large parties of sportsman and military squads actively hunted wild boar and tigers with reckless abandon" (Heptner & Sludskii 1992, Sunquist et al. 1999). Nonetheless, the conflict was inevitable nearing the end, as more tigers attacked livestock when their natural prey became scarce. Chodźko (1850, cited in Sahâmi 2006) reported that every year a lot of them were killed in Guilan and Mazandaran and mentioned a tiger that was shot by artillery guild in Sarakhs at 1833. As he observed "Guilan highlanders are generally dexterous shooters. When an ox was killed by a tiger, they never moved the corpse, but lay in ambush on a tall tree waiting for the tiger to come back. The tiger seldom dies with the first shoot, so it would be chased into the jungle by hunters and their hounds" (Sahâmi 2006, translated into English by the author).

The tiger's decline has been attributed to its over-hunting in the Caucasus (Vereshchagin 1967), Afghanistan (Habibi 2004) and also Iran (Misonne 1968). It seems that there was not a high demand for tiger fur in northern Iran as according to Nikitin (1941) "the animal's fur is inexpensive in Guilan and we purchased many kinds of them" (translation by the author). Nevertheless, there is another report of shops selling tiger and panther skins in the larger towns, such as Qom and Kermanshah (Bird 1891).

Direct persecution also played a critical role in elimination of the tiger from northern Iran. Cubs were caught to be exhibited in menageries (Novikov 1962). Blanford (1876) saw specimens in Tehran zoo and reported that "cubs are often captured in Mazandaran and brought to Tehran." There is a similar report from Mount Ararat that "young are caught in traps by the people round the mountain, to be exhibited in shows of wild beasts throughout Persia" (Blyth 1845).

Agriculture

Cotton, rice and other crops grew well in the rich silt along the rivers, thus the Caspian lowland dense forests and marshes were cleared for agricultural use (Sunquist et al. 1999). Cultivation of the reed beds led to disappearance of wild boars that supported the tigers. Indeed the last tigers were recorded in the remaining fragment of reed stands in the southeast Caspian region. Deforestation sped up as the human population increased and more pastures were needed for livestock. Local inhabitants carried out uncontrolled burning of thickets along the banks of the rivers to provide new growth of grass for their livestock (Habibi 2004). Apparently intense felling of forests and extensive habitat destruction has caused the animal to disappear altogether from Iran (Misonne 1959, Lay 1967).

Human-tiger conflict

The Caspian tiger is often an emblem of bloodthirsty cruelty in classical literature (e.g. Shakespeare in Macbeth); however, it seems that there was not an intense human-tiger conflict in the area.

Persian tigers were not man-eaters (Vuosalo 1976, McDougal 1978). "Man-eaters appear to have been almost non-existent among the Caspian race of the tiger, at least in Iran" (McDougal 1978). Mazandaran peasants told Vambery (1865) that they very rarely attack human beings. Kennion (1911), interviewing

Fig. 3. One of a pair of golden hollow tiger heads found in excavations of the ancient site of Marlik, near Rudbar in Guilan Province, 3400-3000 BP (Negahban 1996).

Fig. 4. A silver dish depicting a tigress against a tree, 4th century. Silver, 22.8 cm in diameter. The Hermitage Museum, Saint Petersburg (S-41).

Fig. 5. An oval silver bowl with running tigresses on each side, 6th-7th century, Sasanian period. Silver, niello inlay. The Metropolitan Museum of Art, New York, Met-05679.

Fig. 6. Tiger illustration in an old Persian bestiary, Farrokhnameh (1184).

Fig. 7. Painting of a maned tiger in an old Persian bestiary, Ajayeb Almakhluqat (= Marvels of Creation; 1280).

Fig. 8. Tiger, according to an old Persian bestiary, Manafe'e Hayavan (= Benefits of Animals; 1299). It could be read as "… if oppose a man, even though it is hungry, does not charge. When bleeds, it irritates and gets furious, and all the beasts would be wary of it. While it falls ill, looks after a dog, and rejuvenates after devouring it."

local hunters, concluded that "man-eating tigers, meaning tigers that regularly preyed on man in preference to game, were unknown in Mazandaran" (historical delimitation, including Golestan Province). The local hunters recalled only two men killed by tigers, both of them by beasts they had wounded. The same also affirmed specifically for Guilan tiger that "never attack a man unless it is wounded" (Chodźko 1850). Yet, there is a famous anecdote of an attack in 19th century in Guilan, in which a curious tiger, caused no casualties (Serena 1883).

A reputed depredation on livestock was never a problem as "abundance of wild boars and mountain sheep leaves no excuse for attacking livestock" (Chodźko 1850). However during the final phase of their existence, it became a source of conflict and led to direct persecution through all kinds of trapping and poisoning. Tigers searched for cattle in lowland villages in winter and visited mountain pens from May to October (Chodźko 1850).

There are no references of the use of tiger parts in traditional medicine of Iran. "The animal had not been surrounded by legends of therapeutic powers, as is the case in China" (Vuosalo 1976).

Conservation measurements

Tiger is protected in Iran under national legislations since 1957 (Firouz 2005) and was officially declared as extinct in 1967. Once the tiger's decline had become well recognised, laws were enacted both in Iran and the USSR giving it total protection. However, it was too late to save it in the wild (Joslin 1988).

As the indigenous local tiger population in Iran is extirpated, there remains only one conservation measure possible within Iranian borders, which is reintroduction, with the lowest score in effectiveness (Chundawat et al. 2008).

Feasibility of reintroduction

Habitat preference is likely to correlate strongly with taxonomy, and a good taxonomy should be informed by evolutionary relationships. The molecular differences between the extinct Caspian tiger and the extant Amur tiger are minimal, suggesting that they belong to the same subspecies (Driscoll et al. 2009). Indeed, the amount of genetic variation in Caspian/Amur tigers over their entire distribution, from the Caucasus to the Russian Far East, is less than the amount of variation within a single population of Bengal or Sumatran tigers (C. Driscoll, pers. comm.). This has practical implication for conservation, because a taxonomic assessment is a prerequisite to any re-introduction program.

According to re-introduction guidelines (IUCN/SSC 2013), "(individuals to be reintroduced) should preferably be of the same subspecies or race as those which were extirpated" and "the source population should ideally be closely related genetically to the original native stock and show similar ecological characteristics (morphology, physiology, behaviour, habitat preference) to the original sub-population", although it advises a cautious approach for populations that have long been extinct.

As Driscoll et al. (2009, 2012) suggest "one potential implication of the recent molecular study is that former Caspian tiger habitat in Central Asia is open to reintroductions from Amur stock." Based on their results, Macdonald et al. (2010) consider Caspian tiger a Management Unit MU separate from the Amur population that together would form an Evolutionarily Significant Unit ESU. Macdonald et al. (2010) musing about where Caspian tigers might be reintroduced in Iran, mention the Golestan National Park NP, Atrak valleys, and Miankaleh protected area. However, since its extinction, the original natural habitats of tiger in Iran have changed considerably. Golestan NP, which consists mainly of secondary tiger habitat and probably never contained a large population of tigers, could thus be excluded from the list. Two other potential areas have lost the larger part of their original vegetation and now are very poor in prey base. It is not known if the carrying capacity of the remaining habitat is sufficient to support a self-sustaining population of tiger in the long run. The habitat loss as the main cause of the extinction of local population is currently at a maximum.

Any tiger conservation program should ensure a healthy stable population of cervids, bovids and suids. No information is available for maral deer and wild boar populations in northern Iran. Populations of Maral deer in Golestan NP may not surpass 500 and probably no more than 60 in any specific locality in Iran (Kiabi et al. 2004) which is insufficient to sustain a healthy tiger population. No maral population lives in Miankaleh or Atrak valleys at present.

The effects of a re-introduced species on an ecosystem, including competitors and prey species need to be understood (IUCN 1998). Using captive-bred individuals does not increase the probability of success. Re-

introducing a species merely because of the availability of captive stock is a decision not recommended by the IUCN (1998). Nonetheless, the tiger is a resilient species and where conditions are favourable (sufficient cover and prey), its populations can grow rapidly (Sunquist et al. 1999). So if a reintroduction program for tigers is to be performed in any potentially suitable habitat in Iran, a long phase of preparation is to be expected. Prey base should be strengthened and vegetation should be improved.

Currently, there is no tiger reintroduction project in Iran, and no comprehensive feasibility study has been conducted on the potential of tiger habitats in Iran. Actually, two captive-bred Amur tigers (one male and one female) have been imported from Russia in an effort to start such a program, which was suspended after the male individual succumbed to a disease recognised as glanders in Eram Zoo, Tehran. There is no political will in Iran to proceed further, at the present time.

Fig. 9. Soraya lived in Hagenbeck Zoo from 1955 to 1960 (Photo K. Rudolff).

Conclusion

A disagreement on priorities for tiger conservation surfaced in 2011 when in a letter to Science, Driscoll et al. (2011) supported the restoration of populations in selected habitat within the historic range of the extinct Caspian tigers as a new boold infusion to the species. Their proposition includes reintroducing zoo-bred Amur tigers with known ancestry, to potentially suitable habitats assessed by Jungius (2010) in Central Asia among others. But then a counterpoint by Rabinowitz et al. (2011) underlined the efficiency of 'traditional' approaches when properly implemented. "If we are considering reconstructive surgery for the tiger, then let's stop the bleeding first" they concluded (Rabinowitz et al. 2011).

The situation in Iran is strangely similar to this debate: many species of large mammals are on the IUCN Red list of threatened species - Asiatic Cheetah, Persian Leopard, Asian Wild Ass, and Mesopotamian Fallow Deer - and the Iranian ungulate fauna have been decimated during the last three decades. This is why many Iranian experts have their reservations and express serious concern regarding reintroduction programs. The problem, in their view, is expending limited money and resources for a species which is globally important but not a priority in Iran.

However, "the reintroduction of tigers - a flagship species, could be a catalyst in motivating the restoration of habitat which is beneficial to all wildlife, not just the tigers" (C. Driscoll, pers. comm). So perhaps we are not confined to choose between having what we lost and losing what we still have. The common denominator is a secure, well-protected land and the goal is not just to have tigers, but to restore complete, working natural ecosystems. No doubt that not all reintroductions succeed, but many of them do and having tigers represented in the natural fauna in specific areas is not a fantasy at all.

In conclusion, the famous quote by William Beebe seems true more than ever: "when the last individual of a race of living beings breathes no more, another heaven and another earth must pass before such a one can be again." However, a conservationist should keep in mind that "restoration is not about the nostalgic re-creation of a lost past, but about building a sustainable future" (Macdonald 2010).

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Supporting Online Material SOM Figure F1, Table T1 and T2 are available at www.catsg.org

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