# BARBARY AND CAPE LIONS: Their Phylogenetic Places and Conservation -- by Nobuyuki Yamaguchi

**NOTE:**

The African Lion Working Group newsletter is a non-pretentious yet highly professional publication devoted to the many conservation issues faced today by the dwindling populations of wild African lions. It's very worthwhile reading if you're concerned with lion and their wild range. The ALWG may be contacted by Email at: mwnatura@mweb.co.za. ALWG chairperson, Sarel van der Merwe, and the author, Nobuyuki Yamaguchi, have graciously given permission for Tiger Touch to reprint the paper together with this notice:

> *"The African Lion Working Group does not recognize the existence of a living specimen of either the Barbary or the Cape lion, and acknowledges that both subspecies are extinct. The article was published to enrich the reader with information about the research work that is currently undertaken by the author. This article is copyrighted and may not be reproduced or redistributed."*

**INTRODUCTION:**

In historical times, the lion, Panthera Leo, ranged across much of Africa and from south eastern Europe across the Arabian peninsula to the Middle East and India (Nowell & Jackson 1996). As a result of extensive human persecution its range declined dramatically, and by the beginning of the 20th century the Cape lion, P. l. melanochaita, had disappeared from the southern most tip of Africa and the Barbary lion, P. l. Leo, was about to disappear from the north, before zoologists could study them properly.

Later, their phylogenetic places among modern lions have been speculated through morphological studies of museum specimens (Mazák1964, 1970, 1975, Hemmer 1974) proposing that they were two distinct subspecies among the eight of the modern lion (Hemmer 1974, Mazák 1975). However, molecular phylogeny has suggested modern lions shared a common ancestor in the very recent past, estimated between 55,000 and 200,000 years ago (O'Brien etal. 1987, Janczewski et al. 1995). Inevitably a question has arisen about the status of lion subspecies. If the lion radiation was such a recent phenomenon, would it be appropriate to distinguish subspecies?

This highlighted a crucial problem in today's African lion conservation because subspecies are frequently the units for legislative protection of large felids (Nowell & Jackson). In other words, being sorted as a single subspecies called African lion, extinction of western African lions can be, legislatively, easily compensated by increase of southern African populations and vice versa.

In contrast to the lion whose sub-Saharan populations are largely contiguous, the tiger, Panthera tigris, whose regional populations are

isolated, enjoy the full legislative recognition of all putative five extant subspecies (Nowell & Jackson).

Ironically, when the tiger was examined using mitochondrial DNA (mtDNA)variation, it showed little genetic diversity as did the lion, although a direct comparison may not be appropriate because the regions in mtDNA analysed were different (Janczewski et al. 1995, Wentzel et al. 1999).

Nevertheless, it is likely that putative tiger subspecies can be genetically distinguished by analysing short tandem repeat (STR) of the nuclear DNA (Wentzel et al. 1999), suggesting some genetic characteristics can be found to distinguish the closely related African lion populations too.

If such genetic characteristics unique to major regional African lion populations are found, they would surely contribute to lion conservation across Africa.

Related to a part of this problem, I have been involved in a project concerning the extinct modern lions, including the Barbary lion and the Cape lion. Other members in the project are Prof. David W. Macdonald (Director, Wildlife Conservation research Unit, Department of Zoology, Oxford University), Dr Alan Cooper (Director, Ancient Biomolecules Centre, Departments of Bioanthropology and Zoology, Oxford University) and Dr Ian Barnes (ABC).

**THE BARBARY LION**

Probably due to its close geographical proximity to Europe, the lion from the north Africa: Constantine, Algeria was used when Linnaeus first gave the Latin name Panthera Leo to the species in 1758 (Harper 1945).

Since then, until it became extinct in 1920s the north African Barbary lion had occupied the top place of public attention among lions in Europe including Britain, because of the male's bigger and darker mane. (Newbery 1753,Vogt & Specht 1889, Cornish 1899, Meyer-Abich 1953).

Historic records suggest that in the past one contiguous Eurasian-north African lion population was distributed from north Africa through Middle East to India (Blanford 1876, Vogt & Specht 1889, Flower & Lydekker 1891).

It is not clear to what extent genetic mixture had been possible between the north African population and the Eurasian counterparts before the dawn of civilization along the Nile and Sinai Peninsula, which without doubt served as a major obstacle to its movements.

Available literature suggest that the eastern part of north Africa (now called Libya and Egypt) may not have supported a dense lion population even well before the time of major human persecution (Harper 1945, Nowell & Jackson 1996).

Then, probably at the latest by the early 18th century lion disappeared from that part of the Mediterranean littoral in north Africa (Johnston 1899). This left an isolated lion population in the western part of north Africa (now called Morocco, Algeria and Tunisia), which were thought to be still quite large at that time (Pease 1899, Harper 1945).

However, by the middle of the 19th century the remaining population was greatly diminished, mainly due to widely distributed firearms and the lion eradication policy of the Turkish administration in the region, except Morocco which was an independent sultanate (Pease 1915).

The last recorded lion was killed in Tunisia in 1981 and in Algeria in 1983 (Pease 1915,Nowell & Jackson 1996). In Morocco lions survived well into the 20th century, and yet ceased to exist finally by 1930s (Harper 1945, Mazák 1970).

Meanwhile it was said that sultans and kings of Morocco had been presented lions as the sign of obedience by indigenous Berber people who had shared the Atlas Mountains with the last Barbary lions (Haddane personal communication).

Therefore, when the last king Hassan II decided to move his lions from the royal palace to Rabat Zoo, their morphological characteristics were carefully examined (Leyhauzen 1975, Hemmer 1978, Nowell & Jackson 1996). In addition to the supposed origin of the collection, as the king's lion s appeared to show similar morphological characteristics to those of the Barbary lion, a Barbary lion reviving project including the eventual re-introduction to the Atlas Mountains was planned (Leyhauzen1975, Hemmer 1978, Nowell & Jackson 1996). However, there was no clear evidence to prove the king's animals were the real Barbary lion. Consequently Moroccan authorities, as well as the zoos that provided captive breeding efforts, became increasingly reluctant about the project as time passed by.

Those who participated in the project wanted to restore the lion that had been lost in north Africa, and did not want to breed the lion that merely resembled the Barbary lion.

Often, in wildlife conservation, crucial social and political decisions rely on whether the population (or local subspecies) has clear identities worth being preserved (Daniels 1997), and currently the most widely accepted such identity may come from molecular work (Wentzel et al.1999).

Comparing the DNA of king's animals to those extracted from Barbary lion specimens kept in museums, it may be possible to examine if the king's lions are real Barbary. This is an interesting project connecting ancient DNA techniques to conservation biology.

We have collected skin and bone samples of museum lion specimens originated from India, Iran, north Africa and various sub-Saharan African locations including the Cape, for detailed comparison.

Dr Cooper's team has recently extracted DNA from fossils of Homotherium, a saber-toothed cat extinct for nearly half a million years, giving us a hope that DNA might also be extracted from the skins and bones of Barbary lions preserved in museums.

The molecular work has just started with mtDNA analysis and later, probably, moves to nuclear DNA targeting STR for the finer scale analyses, if possible. If we can find genetic markers that identify the Barbary lion, this would provide us a more thorough way of gauging the purity of current breeding stock than outward appearance alone, which surely push the project forward towards its main goal, namely reintroduction.

**THE CAPE LION**

The "black-maned" lion of the Cape was once distributed in the south-western part of South Africa (Mazák 1975). Unlike the Barbary lion which would have been isolated from other African lions by the Sahara, the Cape lion was in close geographical proximity to other lion populations in southern Africa. Considering this, the Cape lion may have maintained genetic exchanges with the widely distributed southern African lions, P. l. krugeri. Lions in the Kruger- Mozambique region came down to the southern most parts of South Africa through the narrow corridor between the Great Escarpment and the Indian Ocean (Mazák 1975). Probably, many "Cape lions" recorded in the eastern side of the Great Escarpment in the Cape Province (Skead1987) may have been the current Kruger-Mozambique lion.

Interestingly, however, Mazák (1975) also suggested the Cape lion may not have had a regular population mixture with the Kruger- Mozambique lion because of a geological barrier, mountainous terrain of the eastern side of South Africa (the Great Escarpment). Separated by the Great Escarpment, the Cape lion distributed south-west and the Kruger-Mozambique lion north-east. There may be another circumstantial evidence to suggest that lion populations in southern Africa may not have been mixed constantly in spite of their relative geographical proximity to each other. More than 80% of lions in the Kruger National Park are feline immunodeficiency virus (FIV) positive, but, there is no FIV positive lion in the Etosha National Park (Spencer etal. 1992, Brown et al. 1994). Assuming the Kruger lion has been associated with FIV for a considerable period (Brown et al. 1994) there may not have been a large lion population mixture between the regions represented by the two parks.

Although it is not known how hard the River Orange and its tributaries were for lions to cross, the Cape lion may have closer genetic association with lions in Kalahari region. If the ancient DNA technique can extract Cape lion's DNA, comparing it to those of Kruger and Kalahari lions, this question would be answered. Then, if some populations of the existing southern African lion appears to be acceptably close to the extinct Cape lion, the resurrection of the black-maned lion lost in the Cape Province may become a feasible conservation project.

Nobuyuki Yamaguchi, Wildlife Conservation Research Unit Oxford University, Department of Zoology, South Parks Road, Oxford, OX1 3PS UK, Tel: UK (0)1865-281520, Fax: UK (0)1865-271211

E-mail: **nobuyuki.yamaguchi@zoology.oxford.ac.uk**
WildCRU Web Site: **http://users.ox.ac.uk/~wcruinfo**