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African Wild Ass (*Equus africanus*) Draft Status Review

(as at 19 February 2017, prepared by Patricia D. Moehlman)

Species Population Status

1) Species Taxonomy
(Groves 1986, Gentry el al 1996, Groves and Willoughby 1981, Groves and Smeenk 2007, Grubb 2005)

Two extant subspecies are recognized.
The Nubian Wild Ass, *E. a. africanus,*
The Somali Wild Ass, *E. a. somaliensis*,
The Atlas Wild Ass, *E. a . atlanticus* Extinct ~c.300 A.D.

Research on ancient DNA indicates that the Nubian wild ass is the ancestor of the domestic donkey (Kimura et al 2010). This research also concluded that based on MtDNA the Nubian wild ass were distinct from the Somali wild ass.

2) Red List Assessment: Critically Endangered (CR) version 3.1

Red List Criteria: C2a(i)

Rationale for the Red List Assessment

Listed as Critically Endangered as the species numbers (at best approximately 200 mature individuals) may be undergoing a continuing decline due to climate and human/livestock impact, and no subpopulation numbers in excess of 50 mature individuals. The species may also meet the threshold for Critically Endangered under D, as there may be less than 50 mature individuals in the wild.

Moehlman, P.D., Kebede, F. & Yohannes, H. 2015. *Equus africanus. The IUCN Red List of Threatened Species 2015*: e.T7949A45170994. http://dx.doi.org/10.2305/IUCN.UK.2015-2.RLTS.T7949A45170994.en

3) Species Function and Values

A large sized, non-ruminant herbivore that lives in an arid ecosystem.

The species can serve as a 'flagship' species for the conservation of desert ecosystems and their biodiversity

They persist in one of the harshest climates and terrains in the world.

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Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit

These arid habitats are also home to human populations that are also at risk from climatic extremes

Conservation of wildlife will be closely linked to local nomadic pastoralists being able to participate in and benefit from conservation management in their areas.

4) Geographic Range
a) Historic Distribution

The African wild ass was originally widespread from the Moroccan Atlas mountains across northern Africa to the Sudanese and Somali Arid zones (Sidney 1965, Ansell 1974, Kimura 2010). Because African wild ass and feral donkeys can be difficult to distinguish in the field, the historical record needs to be treated with caution.

The northern part of the range was occupied by the extinct Atlas wild ass (Groves 1986). Though asses have been reported in northern Chad, southern Algeria and the Hoggar Massif of the Central Sahara, these are probably feral donkeys.

The Nubian wild ass, *E. a. africanus*, lived in the Nubian desert of Egypt, Sudan, from east of the Nile River to the shores of the Red Sea, and south to the Atbara River and into northern Eritrea (Watson 1982). During aerial flights in the 1970s, wild asses were seen in the Barka Valley of Eritrea and in the border area between Eritrea and the Sudan (Klingel 1980, Watson 1982). There is no recent documentation of Nubian wild ass, but they may persist in northern Eritrea.

The Somali wild ass, *E. a. somaliensis*, was found in the Danakil Desert of Eritrea, western Djibouti, the Danakil Desert and the Awash River Valley in the Afar region of north-eastern Ethiopia. In Somalia, they ranged from Meit and Erigavo in the north to the Nugaal Valley (Yalden et al 1986, Moehlman 2002, Moehlman *et al*. 2013, Groves 2002).

b) Current Population Distribution

The African wild ass occurs in Eritrea and Ethiopia, and some animals may persist in Djibouti, Somaliland, Somalia, Sudan and Egypt, but there is no recent information available (Moehlman *et al*. 2013, Figures 1, 2, 3). Yalden *et al*. (1996) recorded them to 1,500 m in Ethiopia.

The current range of the African wild ass in the Danakil Desert of Ethiopia and Eritrea is approximately 23,000km².

c) Population Genetics and distribution

DNA extracted from fecal samples collected from animals in Eritrea and Ethiopia resulted in the identification of five mitochondrial DNA haplotypes: one haplotype (group of polymorphisms) specific to the Eritrean population (haplotype D); one haplotype specific to the Ethiopian population (E); and three shared haplotypes (A, B, and C). These results suggested that there had been gene flow between the subpopulations (Afdera, Serdo) in Ethiopia and the population in Eritrea (Oakenfull et al. 2002).

Additional fecal samples were collected from African wild ass in Eritrea and Ethiopia. Polymorphic microsatellite markers (N=10) were used to assess levels of genetic diversity, population structure and demographic parameters. The results revealed the absence of geographic structuring among extant African wild ass in Ethiopia and Eritrea. The Eritrean population had the highest values of genetic diversity (H_E=0.63; Na=4.7). F_{ST} among these

populations was estimated at 0.10 (P<0.05), confirming a scenario of low population structure. Bidirectional historical migration as well as recent migration were detected between the Ethiopian and Eritrean populations. Effective population sizes for both Ethiopian (*Ne* = 26.2) and Eritrean (*Ne* = 25.6) populations were low, confirming that these populations are extremely vulnerable. There was no evidence of hybridization in the wild population. However, one domestic donkey in Eritrea was identified as a first generation hybrid (Rosenbom et al. 2017).

5) Distribution Maps

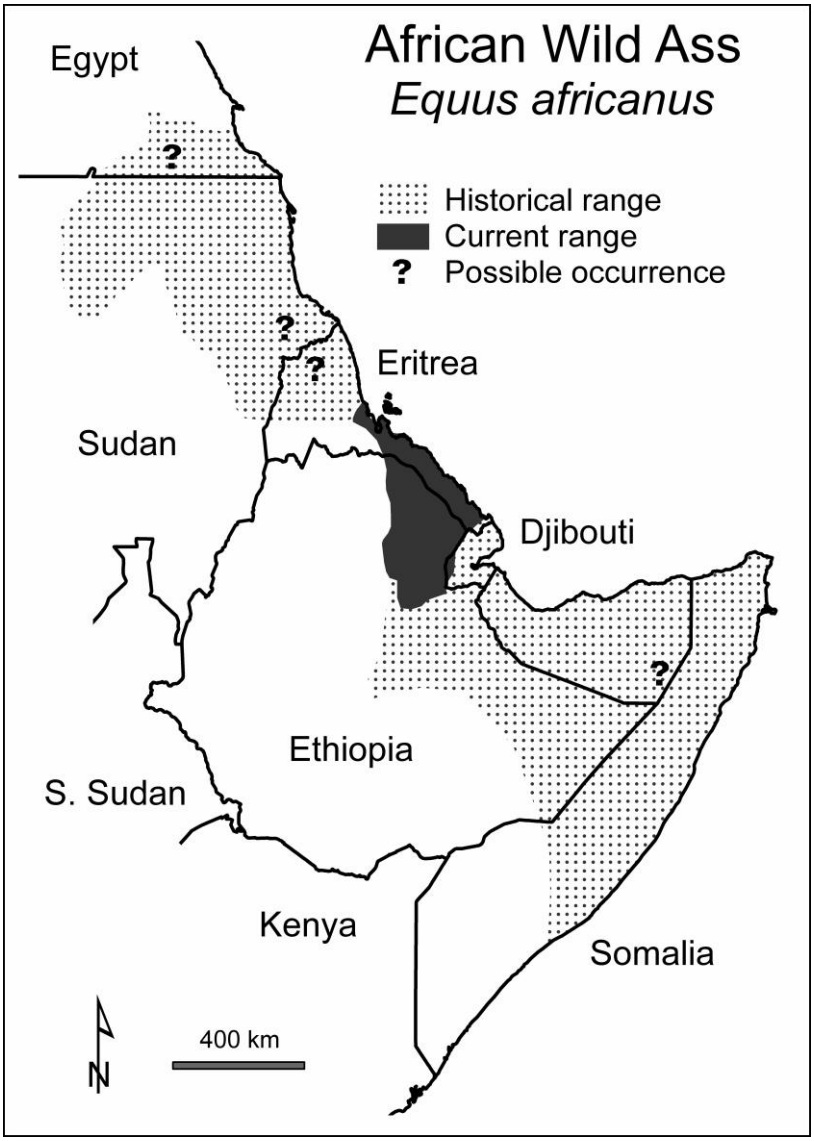
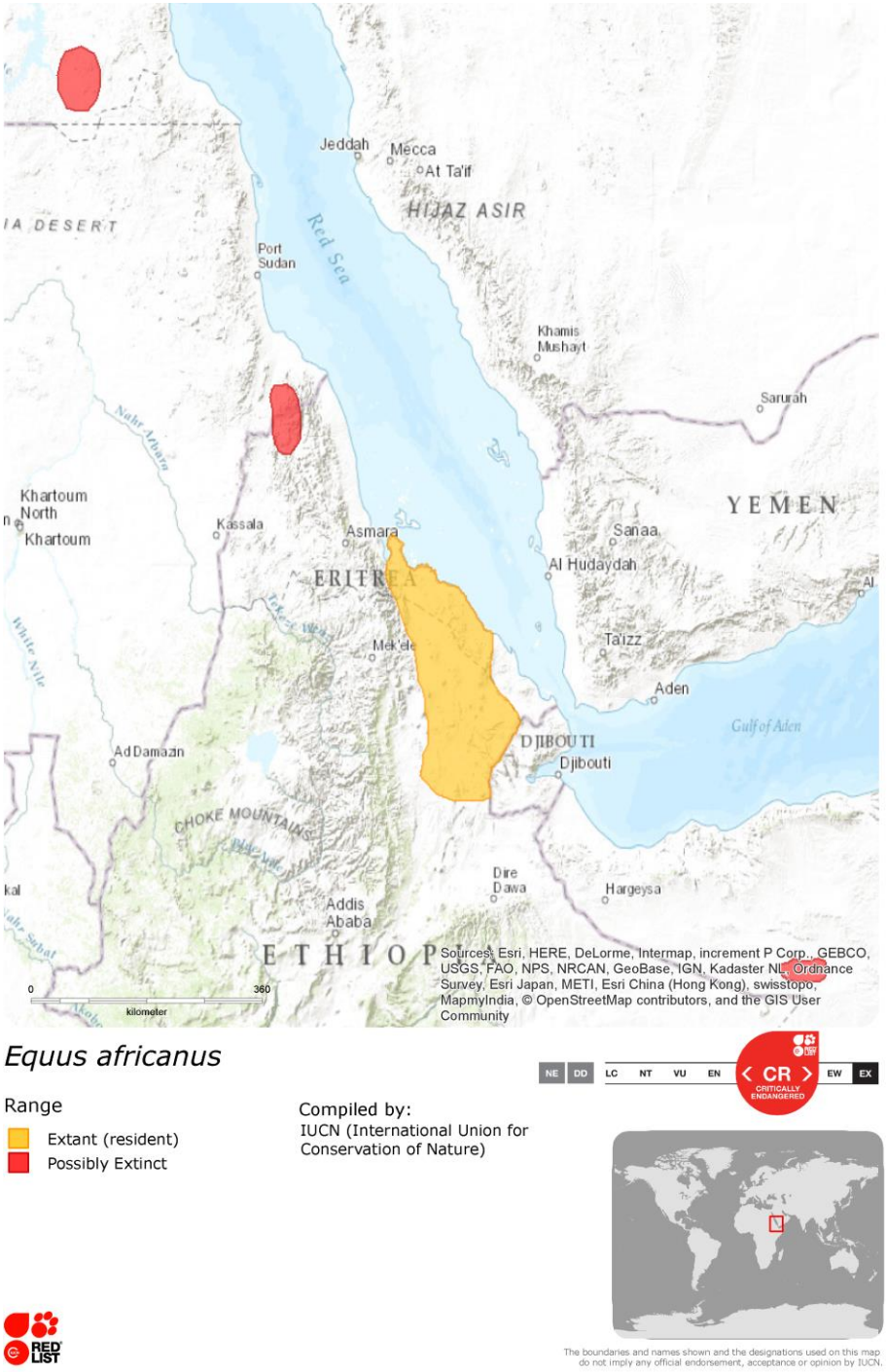


Figure 1. Historic and current distribution of African wild ass (Moehlman et al. 2016)



Equus africanus

Range

Extant (resident)

Possibly Extinct

Compiled by:
IUCN (International Union for Conservation of Nature)

NE DD LC NT VU EN CR CRITICALLY ENDANGERED EW EX

The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Figure 2. © The IUCN Red List of Threatened Species: Equus africanus – published in 2015. http://dx.doi.org/10.2305/IUCN.UK.2015-2.RLTS.T7949A45170994.en

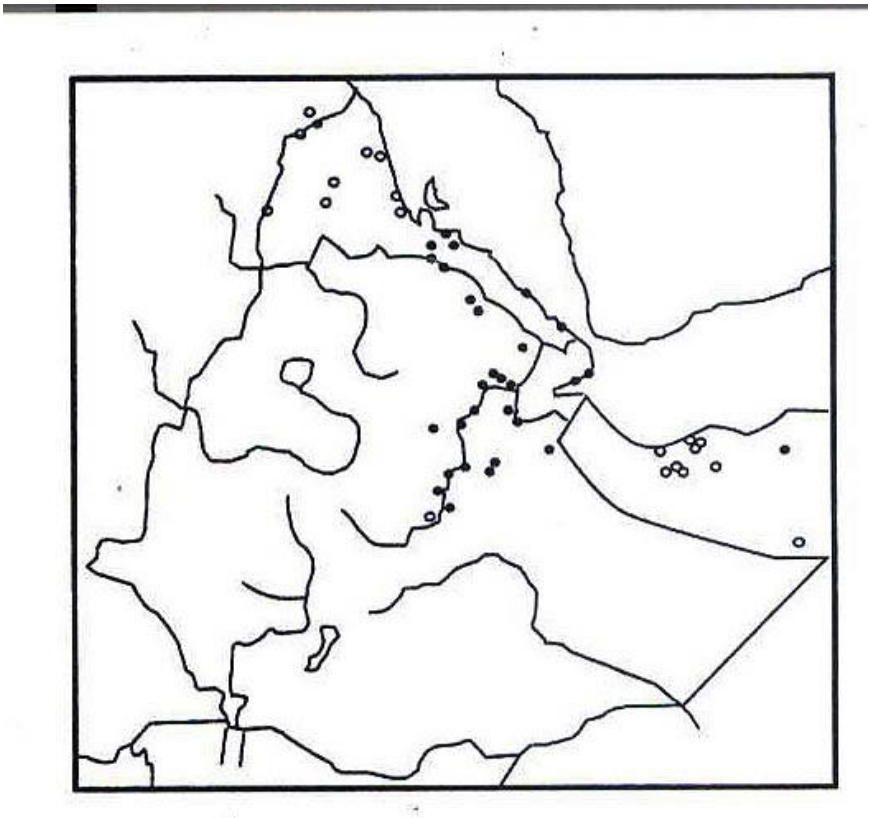


Figure 3. Historical distribution of the African wild ass in Eritrea, Ethiopia, Djibouti and Somalia (Afework and Yalden 2013)

6) Population

Ethiopia

In 1970-1971, Klingel and Watson did an aerial survey of the Teo area (5,280 km²), the Tendaho-Serdo area (4,270 km²), and the Lake Abbe area (6650 km²). Klingel estimated a total of 3,000 African wild ass, or 18.6 per 100 km² (Klingel 1972). The Teo area which is now part of the Yangudi-Rassa National Park had the highest density, 30 African wild ass per 100 km². However, Watson (1982) thought that this was an undercount and that the population was 6,000 to 12,000.

In 1976, Stephenson (1976) did aerial total counts in some of the same areas and reported estimates of 675 in Yangudi-Rassa National Park, i.e. approximately 21 African wild ass per 100 km². He recorded 725 in the southern Danakil and 75 in the Danakil depression. These population figures are not comparable because they were based on different survey methods, but they suggest that the population was declining sharply.

In January 1994, Moehlman and Kebede did a ground survey of the Yangudi-Rassa NP, but no African wild asses were seen, although local Issa pastoralists reported that they were present but rare and occurred at an approximate density well below one animal per 100 km² (Moehlman 1994, Kebede 1995). Issa pastoralists were utilizing the Yangudi-Rassa National Park and in some areas their herds of sheep and goat were in excess of 50 per km² (Thouless 1995). Surveys conducted from 1994-1998 in an area of 2,000 km² indicated that there were approximately 0.5 wild ass per 100 km² (Moehlman 2002). In 2007, Kebede surveyed the historic range of the African wild ass in Ethiopia (Kebede *et al*. 2007) and determined that they had been extirpated from the Yangudi-Rassa NP and the Somali Region and that the only remaining population was in the northeastern Afar Region. The total number of African wild ass observed during this survey was 25 in an area of 4,000 km²

yielding a density of 0.625 animals per 100 km². In 2009 and 2010, Kebede (2013) did quarterly ground surveys in the African wild ass range and sampled 17% of the total African wild ass range in Ethiopia (12,300 km2). The density estimate was computed applying D=N/A where D=density, N total number of individuals recorded, A= sample area (km²). Then the result obtained was extrapolated to the suitable habitat determined using the Maxent model to estimate the population (Kebede *et al*. 2014). The 2009-2010 survey results indicated that the species' distribution is restricted to few localities in the Danakil. The current population estimate indicated that this species occurs in low density, approximately one African Wild Ass per 100 km². Current population estimates indicate that the population size has declined significantly (~95%) since the 1970's and 112 +/- 4 individuals of African wild ass are estimated to survive in the Danakil desert of the northeastern Afar region (Kebede 2013).

Eritrea

In Eritrea, there are limited long-term data. The first successful documentation of African wild ass was in 1995 (Moehlman *et al*. 1998) and since that time the IUCN/SSC Equid Specialist Group has had a cooperative research, training and conservation program with the Ministry of Agriculture, Hamelmalo Agricultural College, and the Forestry and Wildlife Authority. Due to individual identification it has been possible to estimate that 47 African wild ass are found in the 100 km² main study site in the Northern Red Sea Zone (Moehlman *et al*. 1998, Moehlman 2002). This is the highest population density found anywhere in the present range of the species and is similar to population densities recorded in Ethiopia in the early 1970s (Klingel 1977). This is a limited study area, but research indicates that African wild ass inhabit approximately 11,000 km² in the Danakil Desert (Teclai 2006, Hagos 2015). Surveys and Maxent analyses of suitable habitat are needed to determine the distribution and density of African wild ass in this larger area. A rough estimate of African wild ass in Eritrea would yield a total of possibly 400 individuals.

Somalia

In 1978-1980, Watson (1982) did aerial surveys in northern Somalia and estimated that there was a population of 4,000-6,000 African wild ass in the area from the Nugaal Valley to the Djibouti border. Given the area covered by the survey, this would indicate approximately six African wild ass per 100 sq km. In 1979/82 Simonetta and Simonetta (1983) estimated that there were about 250 African Wild Ass in the northwestern Nugaal Valley and that there were about 50 African wild ass near Meit, with scattered groups in the Erigavo region. In 1989 (Moehlman et al. 1998) a ground survey with limited aerial reconnaissance in the Nugaal Valley yielded population estimates of roughly 135 to 205 wild asses or approximately 2.7 to 4.1 African wild ass per 100 km². This indicated that there had been a significant reduction in the African wild ass population during the decade between those surveys. In 1997, Moehlman returned to the Nugaal Valley but was not able to survey the entire area. Local pastoralists said that there were less than ten African wild ass left in the Nugaal Valley (Moehlman et al. 2013). Some animals may remain near Meit and Erigavo, but surveys in 2006 and 2010 did not yield any local reports or documentation of African wild ass (Killeh and Wirth 2006, Mallon and Jama 2015, Moehlman *et al*. 2013). It is not known if African Wild Ass currently persists in Somalia.

Djibouti

Historically the African wild ass occurred in Djibouti (Yalden et al 1986). Currently African wild ass have been documented in the Gamari mountains in Ethiopia near the Djibouti border. African wild ass may persist in western Djibouti (Kebede 2013).

Global population

In summary, the total number of observed African wild ass in Eritrea and Ethiopia is roughly 70

individuals; there may be as many as 600 individuals in these two countries, but this figure is a very rough extrapolation from more intensely studied areas. The number of mature individuals is approximately 30-50% of the population (Feh *et al*. 2001,Moehlman et al 2015, Hagos 2016), hence the minimum number of mature individuals is 23 and the maximum might be 300. In Ethiopia, in the last 35 years there has been an approximately 95% population decline and in the last 12 years the African Wild Ass has been extirpated from roughly 50% of its range (Kebede *et al*. 2007). In Eritrea, the population is stable and slowly increasing. However, it is difficult to predict population trends into the future. The desert habitat of the African Wild Ass in both Eritrea and Ethiopia suffers from recurrent and extreme droughts (Kebede 1999).

6) Habitat, Behavior and Ecology

The primary habitat is arid and semi-arid bushland and grassland. In Eritrea and Ethiopia, the African wild ass lives in the volcanic landscape of the Great Rift Valley where they range from below sea level in the Dalool Depression to 1,500 m (Yalden et al 1996). In Eritrea and Ethiopia, limited observations indicate that African Wild Asses are primarily grazers, but that they will also utilize browse. Dental wear (mesowear) analyses indicate that African wild ass are grazers and browse-graze intermediate feeders (Schulz and Kaiser 2012). In the Mille-Serdo Wild Ass Reserve the preferred forage is *Aristida* sp., *Chrysopogon plumulosus*, *Dactyloctenium schindicum*, *Digitaria* sp.,*Lasiurus scindicus*, and *Sporobolus iocladus* (Kebede 1999, Moehlman 2002, Moehlman *et al*. 2013). In Eritrea, *Pannicum turgidium* is an important forage species (Teclai 2006).

The African wild ass inhabits the driest and hottest areas in Northeastern Africa along an environmental gradient from Kenya to Eritrea (Bauer et al) . Analyses of rainfall, temperature and NDVI revealed that there were significant differences in the areas of historical occurrence of African wild ass compared to Grevy's zebra and Plains zebra which correlated with temperature, rainfall and green biomass. Historically there was a small overlap in area of occurrence (Alledeghi) between African wild ass and Grevy's zebra, but only the African wild ass were found in the hotter drier areas of Northeastern Ethiopia, Eritrea, Djibouti and Somalia.

Research on domestic donkeys (descendants of the African Wild Ass) documented that they have physiological adaptations to life in arid habitats. They can sustain a water loss of up to 30% of their body weight and can drink enough water in two to five minutes to restore fluid loss (Maloiy 1970). Tomkiewicz (1979), using temperature-sensitive implants, determined that feral asses varied their body temperature from 35.0 to 41.5 °C, depending on air temperature. Females maintained higher body temperatures and thus may have lost less water due to sweating. Tomkiewicz (1979) also found that the biological half-life of water for females was one day longer than for males, indicating that their water use was more efficient. Such information indicates that the ancestral species, the African Wild Ass, is probably even more physiologically adapted to life in the deserts of Eritrea, Ethiopia, Djibouti and Somalia. However, the African Wild Ass still needs access to surface water and the movements of lactating females are constrained by water and forage availability.

Typical of arid habitat wild equids, a female and her offspring form the only stable groups. Females do associate with other females and/or with males, but even temporary groups are small (<5 individuals). Female foals often stay with their mother and are residents in their natal
area. Adult males are frequently solitary, but also associate with other males. Some adult males are territorial and are dominant over conspecifics (Klingel 1977). Only territorial males have been observed copulating with estrous females. In more arid environments, limited

food availability (both spatially and temporally) usually does not permit females to forage in close proximity and/or to be associated consistently. Females tend to come into estrus asynchronously which allows territorial males to mate with multiple females. Territorial males control access to a critical resource, i.e. forage near water sources. They thus 'indirectly' control access to females that need that forage and good access to water. The African Wild Ass has a resource-defense polygynous mating system (Klingel 1977, Moehlman 1998).

The African wild ass is polyoestrus and foals are usually born from Oct to April after a gestation period of 12–13 months. A known-age African wild ass had her first live foal at six years, although they are sexually mature at approximately two years of age. Females typically have a surviving foal every other year and natality correlates with rainfall during the period of gestation (Moehlman *et al* 2013). In captivity the African wild ass can live up to 31 years (Steck 2016).

Spotted Hyenas (*Crocuta crocuta)* and Lions (*Panthera leo)* are potential predators, particularly
of foals and yearlings.

7) Threats

In Ethiopia and Eritrea, the major threat to the African Wild Ass is limited access to drinking water and good forage (largely due to competition with livestock). Reproductive females and foals less than three-months old are most at risk. It is important to determine critical water supplies and basic forage requirements, allowing management authorities to determine (in consultation with local pastoralists) how to conserve the African Wild Ass (Kebede 1999, 2007; Moehlman 2002; Teclai 2006; Moehlman *et al.* 2013, Hagos 2015).

In Ethiopia and Somalia, an additional threat is hunting for food and medicinal purposes; for example, body parts and soup made from bones are used for treating tuberculosis, constipation, rheumatism, backache, and bone ache (Moehlman et al 1998, Kebede 1999, Moehlman 2002, Moehlman *et al.* 2013). Research by Kebede (1999) revealed that 72% of 65 adult male Afar pastoralists had killed African wild ass for food and/or medicine. Their explanation was that they could not afford to buy medicine or that they were too far from medical facilities.
In 2002, detailed discussions were made with the respected religious leader of the Afar region (Sultan Altamira) and he played a key role to influence his followers to support the conservation effort in the region (Kebede et al 2007). Using his power and position the Sultan informed the local Afar elders to actively engage themselves and participate vigorously in the conservation of the natural habitat including wildlife. Particularly he mentioned from the holy Quran that Muslim religion does not allow eating the flesh of equids and therefore killing wild equids for food and medicinal purpose was not only against conservation but also against their religion. He emphasized his message by saying that eating equid flesh was *Haram,* forbidden*.*

In Eritrea, local pastoralists do not harm wildlife and guns are strictly controlled.

The third possible threat to the survival of the African Wild Ass is potential interbreeding with the domestic donkey (Moehlman 2002, Moehlman *et al.* 2013). However, there is no scientific evidence that indicates introgression of domestic donkey genes into African wild ass populations (Rosenbaum 2017).

8) Conservation Actions

In Ethiopia, Wildlife laws (Negarit Gazeta No.7, 1972) categorizes the African wild ass under Schedule 6, Specially Protected Animals and Birds. This legal status means that the African wild ass can not be hunted and/or killed, and there are no exceptions and/or special permits. The Yangudi-Rassa National Park (4,731 km²) and the Mille-Serdo Wild Ass Reserve (8,766 km²) were established in 1969. However, the former has never been formally gazetted, and both areas are utilized by large numbers of pastoralists and their livestock. These areas are remote and extremely arid, and the Ethiopian Wildlife Conservation Authority (EWCA) has not had sufficient funds or personnel for appropriate management (Kebede 1999). The IUCN/SSC Equid Specialist Group has worked with EWCA since 1994 to provide support for research, training and conservation. This has included support for post graduate training, scouts, workshops and educational materials.

In Eritrea, the government designated the African wild ass area between the Buri Peninsula and the Dalool Depression as a high-priority area for conservation protection as a nature reserve (Government of Eritrea 1995). In Eritrea cooperative programs between the IUCN/SSC Equid Specialist Group, the Ministry of Agriculture, Hamelmalo Agricultural College, and the Forestry and Wildlife Authority have been critical for sustaining African wild ass populations by supporting post graduate training, research, conservation and local community participation. Research has documented that the Messir Plateau is a critical area for reproduction and work has begun on demarcating a sanctuary for the African wild ass and other wildlife. In the far north of Eritrea in the Yob area there may be a population of the Nubian subspecies of African wild ass. In January 1996, a survey did not document the presence of African wild ass but local people reported that they had been observed in that area.

In Somalia, the African wild ass may occur in Somaliland, Sool, Sanag and Puntland. These areas are individually administrated and the African wild ass has no legal protected status.

Sudan: The African wild ass was legally protected in 1963 (Schomber 1963), but its present status is unknown.

The African Wild Ass is listed on CITES Appendix I in both Ethiopia and Eritrea. Populations of Somali wild ass are maintained in captivity and the 2016 studbook of African wild ass reported a total of 271 individuals consisting of 107 males and 164 females kept in 53 institutions (Steck 2017). These captive African wild ass are the descendants of five individuals (three males and two females) captured in the Nugaal Valley of Somalia and sent to the Basel Zoo in Switzerland in July 1970 and 12 individuals captured in 1972 from the Serdo area in the Afar Region of Ethiopia and sent to Hai-Bar in Israel (Moehlman 2002). Captive African wild ass have been documented with the following diseases: sarcoid tumors and Equine Herpes virus EHV1 and EHV9 (Ulrich et al 2016, Abdelgawad 2015).

9) Recommended research and conservation actions, include:

- Ecosystems based population dynamics research on the African Wild Ass in Eritrea and Ethiopia
- Ecosystems research on interactions among pastoralists, livestock, wildlife and the environment
- Educational awareness campaigns with local communities in Ethiopia on the 'haram' status of the African wild ass
- Development of medicine/veterinary care for local pastoralists
- Continued employment and training of local pastoralists as scouts
- Continued education and awareness campaigns on the ecological and cultural roles of wildlife

• Continued workshops and active involvement of local pastoralists in the preparation of management plans
• Post-graduate training of personnel in Eritrea and Ethiopia
• Surveys in northern Eritrea, Djibouti, Somaliland, Somalia, Sudan and Egypt to determine current distribution of African Wild Ass
• Genetic research on the two subspecies of African Wild Ass and also local domestic donkeys to determine the potential for hybridization.

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