CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA

Sixteenth meeting of the Conference of the Parties
Bangkok (Thailand), 3-14 March 2013

CONSIDERATION OF PROPOSALS FOR AMENDMENT OF APPENDICES I AND II

A. Proposal

Inclusion of *Osyris lanceolata* Hochst. & Steud. (1832), East African Sandalwood in Appendix II of CITES in accordance with Article II, paragraph 2 (a) of the Convention and Resolution Conf.9.24 (Rev.CoP), Annex 2 a, paragraph B. The Genus *Osyris* is currently known to contain the single species *Osyris lanceolata.*

B. Proponent

Kenya[*].

C. Supporting statement

1. Taxonomy

1.1 Class: Angiospermae

1.2 Order: Santalales

1.3 Family: Santalaceae

1.4 Genus, species or subspecies, including author and year: *Osyris lanceolata* Hochst. & Steud. (1832)

1.5 Scientific synonyms: *Osyris quadripartita* Decne (1836)
O. abyssinica Hochst. ex A. Rich (1850)
O. wightiana J. Graham (1839)
O. arborea A.DC. (1857)
O. pendula Balf.f. (1884)
O. rigidissima Engl. (1895)
O. tenuifolia Engl. (1895)
O. parvifolia Baker (1910)
O. urundiensis De Wild. (1925)
O. oblanceolata Peter (1932)
O. densifolia Peter (1932)
O. laeta Peter (1932)
O. compressa sensu auct., non (Berg.) (1954)

1.6 Common names: English: East African Sandalwood; African sandalwood
French:

[*] *The geographical designations employed in this document do not imply the expression of any opinion whatsoever on the part of the CITES Secretariat or the United Nations Environment Programme concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries. The responsibility for the contents of the document rests exclusively with its author.*

Spanish:

1.7 Code numbers: The species is not included in any of CITES Appendices

2. Overview

The exploitation of *Osyris lanceolata* from Africa could soon drive the species to extinction unless proper control measures are put in place to regulate international trade in the species. *Osyris lanceolata* has recently entered the international market as a substitute of the traditional sandalwood oil originally sourced from Asia and Australia. Sandalwood has over centuries been traded for its fragrance, medicinal value, religious value and wood carving potential. The main traded products include aromatic oils extracted from the heartwood, timber for handicrafts, and saw dust for making incense. The oil is useful in perfumery, pharmaceutical and religious practices. The limited supply, coupled with high demand and escalating prices of sandalwood oil from the traditional source countries have led to exploitation of the East African sandalwood as a preferred alternative. This is occasioned by diminishing populations and strict regulations on Australian sandalwood, *Santalum spicatum* and Indian Sandalwood *Santalum alba.* In India and China, Sandalwood is under State protection and often referred to as sacred tree and harvesting from the wild is prohibited. This has shifted the trade to the East African sandalwood leading to over exploitation of the species in the range States.

The use of, and trade in true Sandalwood in the source countries have existed for centuries. Control systems in traditional source countries have been put in place to ensure sustainable harvesting through artificial propagation, certification and legislations. Unlike the control system that has been put for the true Sandalwood, such mechanisms are lacking for *Osyris lanceolata* being a recent entrant in the international market and from new sources. Therefore, there is an urgent need to regulate the international trade in the species to ensure exploitation is not detrimental to the survival of the species in the wild. To achieve this, there is critical need for international cooperation within the framework of the Convention on International Trade in Endangered Species of Flora and Fauna (CITES).

The source of true sandalwood oil has been from the following species in the genus *Santalum*; *Santalum alba* L*, S. spicatum (R.Br.) A.DC., S. acuminatum A.DC., S. yasi Seem.,* S. salicifolium Meurisse; *S. paniculatum Hook. & Arn., S. obtusifolium, S. murrayanum C.A.Gardner, S. macgregorii F.Muell, S. lanceolatum R.Br., S. haleakalae Hillebr., S. freycinetianum Gaudich., S. fernandezianum Phil., S. ellipticum Gaudich.,* and *S. austrocaledonicum Vieill.* The oil from the species of the genus *Santalum* is reputed to have excellent blending properties and the presence of a large proportion of high-boiling constituents in the oil (about 90 percent santalols) also makes it valuable as a fixative for other fragrances.

The other source is the East African Sandalwood which is referred to as false Sandalwood. It is used as a substitute and belongs to the Genus *Osyris.* All species belong to the family Santalaceae. The East African Sandalwood oil has been found to have comparable similarities with the true Sandalwood oil though of different quality. The family Santalaceae, comprises about 35 genera and 400 species widely distributed but common in tropical or sub-tropical regions. *Osyris lanceolata* is the only species in the genus. The largest genus in this family is *Thesium* with more than 200 species and mainly native to Africa and Mediterranean regions. There are around 19 species of the Sandalwood in the genus *Santalum* that are found in different locations around the world. Three genera in this family are found in Africa namely; *Thesium*, *Osyridicarpus* and *Osyris*. *Osyris lanceolata* is slow growing and occurs widely in the drier areas of Kenya.

Reported cases indicate unsustainable exploitation of *Osyris lanceolata* from Kenya, United Republic of Tanzania, Uganda, and South Sudan. Kenya is leading with the highest level of trade and the trade goes back to 2006. The trade started in Tanzania in 2004, then to Kenya since 2006 and has currently spread to South Sudan and Uganda. The whole plant is uprooted to harvest the roots and in some cases the stem. The heartwood of the trunk, branches and roots contain the essential oil. The essential oil concentration is highest in the roots. Markets for the specimens of the species have been recorded in Germany, South Africa, France, India, Middle East countries, United Kingdom, among others.

3. Species characteristics

3.1 Distribution

The species is widely spread in many of the sub-Saharan countries ranging from Algeria to Ethiopia all the way to South Africa, Europe (Iberian Peninsula and Balearic Island), Asia (India to China) and

Socotra. Distribution is documented in Kenya, United Republic of Tanzania, Uganda, South Sudan, Rwanda, Burundi, Malawi, Mozambique, Ethiopia, Algeria, South Africa, Zambia, and Zimbabwe. The altitudinal range of the populations is 900-2700 m above sea level.

In Kenya, the species is widely distributed in the Arid and Semi Arid Lands (ASALs). In some places it is fairly common but not usually abundant in any one place. It has been recorded in Amboseli, Baringo, Bogoria, Narok, Pokot, Turkana, Samburu, Kajiado, Gwasi Hills, Kitui, Chyulu hills, Kikuyu escarpment forest, Taita hills, Mt. Kulal, Marsabit, Makueni, Mbeere, Narok, Ol donyo Sabuk, and Oloitokitok. The map is based on the herbarium specimens that have been collected in the last 100 years. In Uganda, the species is distributed in Karamoja, Kigezi, Mbale, (Elgon, Kaburorun). In Tanzania, the species has been recorded in Mbulu, Lake Manyara, Ufipa, Mbisi, and Songea.

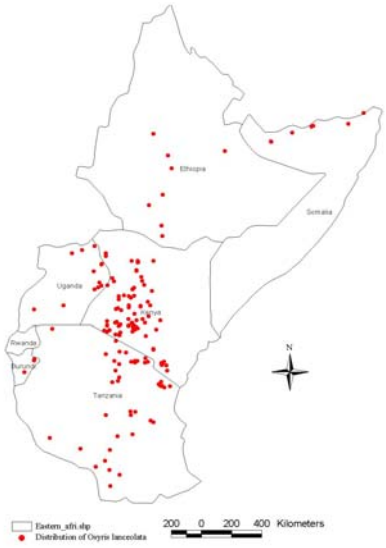

Fig. 1. *Osyris lanceolata* distribution map based on Herbarium specimen data

3.2 Habitat

The species is normally found in hilly slopes, rocky ridges in association with different types of vegetation; also found in *Brachystegia* woodlands, lowlands and lower slopes; strandveld, gorges, dry forest margins, evergreen bushland, grasslands, thickets and sometimes riverine vegetation. It occurs as isolated individuals, in close association with other woody species, and does not occur communally in large numbers. It is frost and drought-tolerant.

The species is semi-parasitic, growing on the roots of other plants and utilizing the root systems of these hosts to get nutrients, but it does produce its own chlorophyll. As a result this shrub is usually associated with other woody species.

In Kenya the species is normally found in various sites including rocky areas and along margins of dry forests, evergreen bushland, grassland, and thickets at altitude of 900 – 2700 m above sea level. It grows in all regions of Kenya. Studies show the species is more prevalent in nitisols followed by acrisols and more abundant in volcanic than non volcanic soil habitats (fig. 3 and 4).

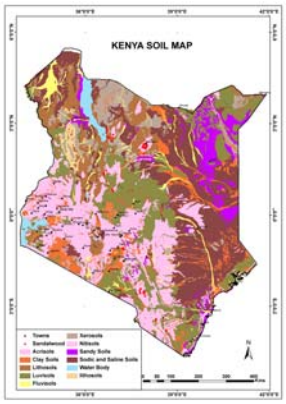

Fig. 3. Distribution of Kenyan soils

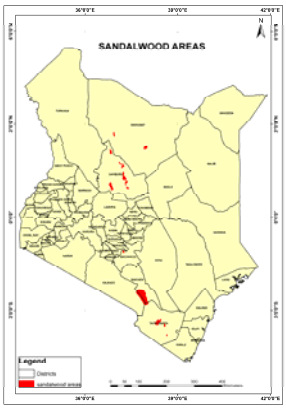

Fig. 4. Sandalwood areas in Kenya

3.3 Biological characteristics

The phenology of the East African Sandalwood is scantily studied. However, it is a semi-parasitic androdioecious, shrub or small evergreen tree with low regeneration potential (Orwa et al. 2008). There are no experimental studies that have been undertaken to ascertain the appropriate harvesting age of the East African sandalwood, however data collected from Kenyan smuggled specimens showed age ranging from 15-45 years (Kavaka et al. 2012). Further confirmation was done using study specimens harvested in Taita hills, Marsabit and Samburu. Flowers are either hermaphrodite or male appearing as single or in twos or more. The hermaphrodite flowers are located in axils of the upper leaves; peduncles solitary usually 1-flowered, occasionally flowers in 2-3 dichasia male flowers both axillary and terminal often panicled, each peduncle usually terminating in an umbellate cluster of flowers (Polhill 2005).

The species flowers from March to August or even later September to February with fruits ripening between May and September (Orwa *et al*. 2008). The fruits are more abundant from July to December. The plant can be propagated from seeds, coppice and rootstocks (Orwa et al. 2008; Kavaka et al. 2012). It requires various hosts from germination to maturity in support of its development. It has been found in association with various hosts such as *Dodonea viscosa, Tecomaria capensis, Catha edulis, Apodytes dimidiata, Brachytegia spiciforms, Rhus natalensis and Casuarina equisetifolia* (Mwang'ingo *et al.* (2006). The tree is exploited for its aromatic essential oils found in the heartwood. The heart wood matures from 15 years and good quality oil has been obtained from commercial *S. alba* and *S. spicatum* of ages 30 years and above (Kavaka *et al.* 2012). Studies reveal poor regeneration potential from various species localities. Whereas it is widely spread in Kenya, it has low population abundance where it is found. Flowers are pollinated by beetles. The seeds are orthodox, small, usually dispersed by birds, wind and water.

3.4 Morphological characteristics

The species has a height ranging from1.5-9 (14) m tall all parts glabrous; bark coarsely furrowed; slash bright crimson; branches somewhat flattened and sometimes rather pendent. Leaves usually alternate, elliptic or elliptic-oblong, rarely obovate, 1.5–6.5x0.7–4 cm, abruptly apiculate, base cuneate, veins ± immersed, only midvein raised beneath and running back down stem in a narrow ridge; petiole 1–3 mm long, articulated to a small cushion. Fruit ellipsoid, 5–6.5 mm in diameter when dry, epicarp thin, fleshy, red when ripe.

Rarely are flowers solitary, usually are in a 2-3 dichasium, peduncles of 4-28 mm long, bracts and bracteoles are linear-lanceolate, 1-3 mm long. The florets are tiny, yellow-green (perianth) in color, and leathery, bearing 5-petals. In the hermaphrodite flower, the tube is 0.5-0.6 mm long, obscured inside by a disk, with 3-4 lobes, spreading and ovate to deltate, 1.5-2 mm by 1.8 to 2 mm long. Tips are slightly hooded. Male flowers are similar, with stamens of 3-4 mm in hermaphrodite flowers. Ovules and placenta are usually aborted in the male flowers. The style is 0.8-1 mm long, thick and more less cylindrical. The stigma in hermaphrodite flower is normally 4-lobed, rarely 3-lobed and the lobes are ellipsoid and conspicuous. In male flowers both the style and stigma are aborted or rudimentary. The heartwood is golden brown in colour, the grains are straight to wavy, growth rings are visible by naked eyes, sapwood to heartwood value is variable with age and locality. The janka

hardness ranges from 9.45 kn to 11.04 kn which is in comparison with commercial wood carving species such as *Dalbergia melanoxylon*.

3.5 Role of the species in its ecosystem

The ecological functions of the species in the ecosystem has not well been understood as few studies have been done focusing on the species, however as in any ecological processes in the ecosystem the species provides services such as shade, prevent soil erosion; its trunks and branches support diversity of epiphytic plants such as Orchids, ferns, bryophytes, and lichens. It also further provides mechanical support to vines; offers habitat for birds, mammals, reptiles, insects, and arthropods. The flowers provide nectar to insects. Animals, some terrestrial invertebrates and birds feed on the flowers, seeds and fruits.

4. Status and trends

4.1 Habitat trends

Osyris lanceolata is common in semi arid areas in range countries. It is more prevalent in nitisols and acrisols and volcanic soils in Kenya. The species habitats are faced with immense threats from destructive harvesting and habitat conversion for agriculture and quarry mining.

4.2 Population size

Osyris lanceolata is a slow growing species and can take 40-50 years to mature. Its regeneration potential is low. In Kenya, field observations reveal very few young plants. Due to its parasitic nature, a host plant is crucial for its regeneration potential.In locality areas, population size range from medium to sparsely spread in a limited area. They are not abundant in most locality areas and their natural range habitats.

4.3 Population structure

In Kenya most of the clusters of the species are old population ranging from 20-45 years with little or no saplings. The studies undertaken reveal poor regeneration in most populations sampled.

4.4 Population trends

In Kenya, the population tends towards older generation and occurs in disjunct localities in the drylands of Kenya. The population size has been on the decline since 2002 due to overexploitation.

4.5 Geographic trends

The species has been reported in various range states. Studies reveal various synonyms some that are found in Europe but are more common in Sub Saharan Africa.

5. Threats

The major threat affecting the East African Sandalwood is unsustainable exploitation threatening the wild population. Destructive harvesting methods are used where the whole plant is uprooted. Given that most of the population preferred are old ones, coupled with poor recruitment rates, habitat destruction in locality areas due to human pressure, slow growth and attack by diseases and pests may lead to species extinction unless appropriate measures are put in place.

There is high demand of Sandalwood oils by the perfumery and pharmaceutical industries driven by limited supplies from traditional source countries such as India, Indonesia, Pacific and Australia putting pressure on the alternative source, the East African Sandalwood.

The emerging trade on East African Sandalwood and inadequate enforcement of legislations to control cross-border trade for compliance on the Sandalwood trade value chain makes the species more vulnerable. Whereas there exist appropriate legislations for certification on traditional Sandalwood species, such as *Santalum alba* and *S. spicatum* in India and Australia respectively, no such elaborate systems exist for the East African sandalwood. Furthermore, it has not been categorized as either threatened or vulnerable under IUCN RedList criteria as compared to the other commercial Sandalwood species.

Regardless of this, preliminary results indicate massive uncontrolled wild harvesting from its habitats, threatening the species survival in Kenya and Tanzania.

There are no domestication programmes and certification mechanisms for East African Sandalwood in place and therefore harvesting of the species from the wild is detrimental to its survival.

6. Utilization and trade

6.1 National utilization

Prior to entering into the international commercial market in 2004, Kenya's population of East African Sandalwood was just used locally for either timber, fuelwood or for herbal medicine at subsistence levels.

6.2 Legal trade

In Tanzania commercial exploitation of the East African Sandalwood exists. Four sandalwood processing factories were licensed and established in 2004. However, due to shortage of raw materials, three are closed down and only one in Babati, Manyara region is operational. This factory sources for its raw materials from most parts of East Africa (pers. Comm. manager, Sierra Ltd, June 2012).

Fig. 5. Processing Sandalwood for oil extraction in Sierra Ltd, Babati, Manyara region, Tanzania

There is no legal trade in Sandalwood in Kenya. Trade in Sandalwood harvested in the wild in Kenya has been banned since 2007 through a Presidential Decree. In 2011, Uganda authorized several shipments of of *Osyris lanceolata* some transiting through Kenya and others through United Republic of Tanzania.

6.3 Parts and derivatives in trade

The main part being exploited is the heart wood mainly from the root and the stem for extraction of essential oil as main derivatives. All parts of the plant have uses. The heartwood is used for extraction of essential oil, the stem for timber and wood carving.

6.4 Illegal trade

Trade in specimens of harvested East African Sandalwood was first reported in Kenya in 2004. Massive and unsustainable exploitation of the species, triggered ban on its harvesting and trade in the country in 2007 vide, Legal Notice No 3176 of 2007. Since then, trade in Sandalwood in Kenya is illegal. However, there are cases of illegal trade taking place in the country. Between 2007 and 2011, over 200 tonnes of Sandalwood illegally harvested and traded have been confiscated in Kenya by Law enforcement agencies while in transit (Table 1). Latest seizure in Kenya, of such materials was on 18th September 2012 in Nairobi. The harvesting of East African Sandalwood involves uprooting of the whole plant (Fig.7). The whole plant is debarked, chopped into small pieces and packed into gunny bags for ease of transport and in most cases concealed as firewood. Due to the destructive mode of harvesting, local populations have drastically reduced. The highly affected areas in Kenya include; Baringo, Pokot, Taita, Samburu, and Chyulu hills (Fig. 6).

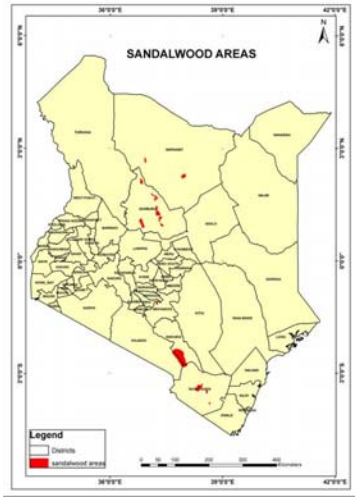

Fig 6. Areas in Kenya where East African Sandalwood has been harvested

Table 1. Confiscated/seized Sandalwood in Kenya between 2007-2011

Station holding seized materials	Weight of Seized materials (in Tonnes)
KWS Maralal	50
Tsavo West	31.361
Chyulu	152.834
Nakuru	22
KFS Mombasa	15
Marsabit station	5
KFS Headquarters	5
Total Weight	**276.195**

Source: KWS

Fig. 7.Specimens of East African Sandalwood confiscated in transit in Kenya

6.5 Actual or potential trade impacts

The high demand for the Sandalwood oil and restricted access to traditional sources due to diminishing populations has led to overexploitation of *Osyris lanceolata,* the alternative source. India, Indonesia and Australia are the main producers of Sandalwood oil while the United States and France are the two largest importers of Sandalwood oil. There are no clear records on trade of the *Osyris lanceolata* but it is estimated that 1, 000 tonnes are annually harvested from Africa, mostly from East Africa. It has been projected that, the East African Sandalwood is going to contribute significantly to global Sandalwood oil trade in the coming 5-10 years. Currently, trade on *Osyris lanceolata* is exclusively harvested from the wild. The study reveals that most of the wild

species population are of old generation with poor recruitment rates (Mothogoane 2011; Kavaka et al. 2012; Mwangingo *et al.* 2007). There are no established artificial propagations in the species range States. The status of Osyris lanceolata has not been established to guide sustainable harvesting. Only recently, Kenya and Tanzania initiated species status assessment surveys.

Lack of artificial propagation programmes to supplement the wild populations, inadequate data on species population status and ecological functions in ecosystems, poor recruitment rate, and unsustainable harvesting are major threat to the survival of the species in the wild, unless appropriate control measures are put in place.

Fig. 8. Uprooted stump of East African Sandalwood for commercial trade

7. Legal instruments

7.1 National

Osyris lanceolata is protected in Kenya and United Republic of Tanzania under Presidential decrees. In Kenya, Legal Notice No 3176 of 2007 under the Forests Act, 2005 placed East African Sandalwood under Presidential Protection to allow for development of mechanisms for sustainable harvesting of the species. Further, the species exploitation is regulated by the Wildlife Act Cap.376, Environment and Management Coordination Act, 1999, and The Constitution of Kenya, 2010.

7.2 International

No universal international legal instruments such as CITES or otherwise are in place to either protect or regulate and monitor utilization of the species across international borders and in essence call for international cooperation to regulate international trade in the species.

8. Species management

8.1 Management measures

There are no specific management measures that have been put in place by the range States. However, Kenya, and United Republic of Tanzania have put in place Decrees controlling trade in wild harvested specimens of the species. Also Kenya and United Republic of Tanzania have initiated programs for the species status assessments that will lead to establishment of certification measures for sustainable harvesting of *Osyris lanceolata*.

8.2 Population monitoring

There are no monitoring mechanisms in place however, United Republic of Tanzania and Kenya have initiated baseline survey as a basis for species monitoring.

Control under CITES Appendix II will enhance population monitoring through trade volumes data.

8.3 Control measures

8.3.1 International

Listing the species under CITES Appendix II will regulate international trade in the species and enhance population monitoring through trade volumes records.

8.3.2 Domestic

Legislations exist as domestic measures for controlling exploitation of *Osyris lanceolata.* Both Kenya and United Republic of Tanzania have in force Presidential Decrees banning harvesting of East African Sandalwood from the wild. Legislations related to use of forest products and environmental management in the two range States aim at controlling domestic exploitation of the species. Such legislations include the Forests Act, 2005, Environment and Management Coordination Act, 1999, Wildlife Act Cap.376, and Legal Notice No 3176 of 2007 in Kenya.

8.4 Artificial propagation

Species propagation poses a challenge as it is parasitic and requires various hosts during its stage of development. The slow growth is also an issue as the heart wood for the oil matures from 15 years.

Kenya and United Republic of Tanzania are actively involved in Research and Development for improved propagation to enhance establishment of the species in large scale plantations.

8.5 Habitat conservation

Scientific information generated in Kenya and United Republic of Tanzania shows that currently significant populations of the species in the two countries exist in protected areas while most of specimens harvested have been from non-protected areas.

Establishing sustainable harvesting from wild population through certification schemes will enhance conservation of the species both in protected and Non-protected areas.

8.6 Safeguards

Since East African Sandalwood products are traded globally, an international regulatory instrument such as CITES will ensure species conservation, sustainable use and equitable share of the benefits accruing.

9. Information on similar species

Other species that could be used as similar species by virtue of the derivatives sought by the market, though not in trade are the true Sandalwood; the *Santalum alba* and *Santalum spicatum*

10. Consultations

Various consultations were initiated within the range States. United Republic of Tanzania as co-sponsor of this proposal was consulted through a mission organized to Dar es Salaam in June 2012 to discuss sustainable management measures of the species and the need to list it in Appendix II of CITES to help regulate international trade. During the meeting, it was agreed that a joint proposal by Kenya and Tanzania be developed and submitted to CITES CoP 16 for consideration and listing under Appendix II.

Other consultations were made with Republic of Uganda through letters seeking invitation of a joint delegation of Kenya and United Republic of Tanzania to visit Uganda for further consultations and with representatives of Republic of South Sudan and Ethiopia in scheduled meetings participating the countries to seek their opinion.

Authorities in United Republic of Tanzania endorsed the preparation and submission of this proposal for consideration at CoP16

11. Additional remarks

Regulation in international trade of Sandalwood oil (both from *Osyris* and *Santalum*) will enhance species survival and fair trade.

12. References

Government of Kenya; Environment and Management Coordination Act, 1999

Government of Kenya; Wildlife Act CAP 376

Government of Kenya; Forests Act 2005

Government of Kenya; Legal Notice No 3176 of 2007

Laws of Kenya (www.klr.co.ke.)

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