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

Twenty-fifth meeting of the Plants Committee
Online, 2-4, 21 and 23 June 2021

Species specific matters

RESPONSE OF THE SULTANATE OF OMAN TO THE QUESTIONNAIRE ON BOSWELLIA TREES (BOSWELLIA SPP.)

1. This information document has been published by the Secretariat at the request of Oman[*] and is submitted in relation to agenda item 25 on *Boswellia trees (*Boswellia *spp.)*.

2. On April 21, 2021, the Secretariat received a response to Notification 2020/010 from Oman, which is attached in the Annex to this information document.

3. In its response, Oman communicates that it is range State to a population of 400,000 to 500,000 *Boswellia sacra* trees, which are considered to distribute across 400km^2 in several fragmented subpopulations. Total annual Frankincense production in Oman is estimated at 70 MT, of which approximately 40 to 50 MT are used in domestic markets. The responses suggests that Somalia is a principal exporter of Frankincense into Oman, and that Oman exports approximately 17 MT annually, largely to the United Arab Emirates. The response states that there are grounds for concern about diminished regeneration capacity of *Boswellia* trees, and detrimental effects of overharvesting, particularly due to unskilled migrant harvesters.

[*] *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.*

Response of the Sultanate of Oman to Notification 2020/010
on *Boswellia trees (*Boswellia *spp.)*

Section 1: Contact information

1a.	Party: Sultanate of Oman	
1b.	Institution: Environment Authority	
1c.	Contact information of the representative who responded to the questionnaire:	Name: Saleh Al Saadi Phone: +968 24404750 Email: saleh.alsaddi@ea.gov.om Other: BD@ea.gov.om

1b.	Institution: Environment Society of Oman	
1c.	Contact information of the representative who responded to the questionnaire:	Name: Maia Sarrouf Willson Phone: +968 247 90 945 Email: maia.sarrouwillson@eso.org.om Other: admin@eso.org.om

Section 2: Biological data on *Boswellia* (paragraphs a) and c) of Decision 18.205)

2a. **Please list the *Boswellia* species that are known to occur within the territory of your country:**

Boswellia sacra

2b. **For each species occurring in your country, please provide its population status. Add rows if needed.**

Species	No concern	Vulnerable	Endangered	Other, please specify	Unknown
• *Boswellia sacra*	☐	☐	☐		☒
•	☐	☐	☐		☐
•	☐	☐	☐		☐

2c. **For each species occurring in your country, please provide information on the population trend. Add rows if needed.**

Species	Increasing	Stable	Decreasing	Other, please specify	Unknown
• *Boswellia sacra*	☐	☐	☐		☒
•	☐	☐	☐		☐
•	☐	☐	☐		☐

2d. **For each species occurring in your country, please provide its habitat trends. Add rows if needed.**

Species	Increasing	Stable	Decreasing	Other, please specify	Unknown
• *Boswellia sacra*	☐	☐	☐		☒
•	☐	☐	☐		☐
•	☐	☐	☐		☐

2e. **Please provide a short qualitative summary of each species' habitat and role in its ecosystem. Add space if needed.**

Species habitat

Boswellia sacra in Oman is restricted in its habitat to the arid zone outside of the monsoon precipitation (Patzelt, 2014), but within the reach of the cool monsoon winds (Patzelt, 2014). It can be found in rocky slopes and on more vertical rock faces and along coastal slopes (Patzelt, 2014). Dhofar is considered to be home to 70% of the global population of *Boswellia sacra* (Patzelt, 2014) and most trees are found in the three contiguous mountains of Jabal Samhan, Jabal Al Qara and Jabal Al Qamar that run from Oman's Indian Ocean coast 200 km west to the Yemen border. These largely limestone mountains rise to just under 1800 metres asl and each year the south-facing slopes come under the influence of the South West Monsoon or *khareef* (Arabic). Consequently, the mountains support semi-tropical forests and grasslands, unique to south Arabia.

Role in the ecosystem

Various *Boswellia* species have been reported to grow under different environmental conditions and *Boswellia sacra* grows in dry tropical regions (Al-Harrasi, Khan, Asaf, & Al-Rawahi, 2019). Habitats where *Boswellia sacra* occur also include species such as *Acacia etbaica*, *Acacia tortilis* and occasionally *Maerua crassifolia* on the valley floors at lower altitude. Conspicuous species on the valley edge and slopes are the yellow-flowered *Kelleronia revoillii*, the endemic *Dhofaria macleishii* and the near-endemic *Maytenus dhofarensis* (Patzelt, n.d.).

2f. **Please provide a short qualitative summary of each species' population status, size, and distribution. Add space if needed.**

Population status

Boswellia sacra has a *Near Threatened* status on the IUCN Red List, and the last population estimate was conducted in 1998, with little information on population numbers and trends (Thulin, 1998). This assessment also mentions high habitat fragmentation with a continued decline of mature individuals (Thulin, 1998). No population assessment had been completed since, leaving twenty year gap in the conservation status of the tree. It is listed as rare and threatened in Oman Plant Red Data Book (Patzelt, 2014).

Population size and distribution

Boswellia sacra in Oman are fragmented into several subpopulations (Patzelt, 2014). Population sizes are small and increasing disturbance of habitat could threaten the survival of these subpopulations (Patzelt, 2014). Detailed survey are needed to identify populations size and distribution (Patzelt, 2014). It is estimated that there are 400'000 to 500'000 *Boswellia sacra* trees in Southern Oman scattered across more than 400 km^2 (Al Amri, 2012).

2g. **Please list the main threats that are known to affect the conservation and sustainable use of *Boswellia* species and known drivers of these threats.**

The various biological and anthropogenic threats affecting *Boswellia sacra* populations in Dhofar are:

- Natural and biological threats: lack of regeneration and infestation from insects and termites
- Anthropogenic threats: overgrazing by livestock (mainly camels), improper or incorrect tapping practices, habitat destruction from urban development, habitat destruction from industrial activities (quarrying, gravel mining etc.)

There are no studies quantifying the scale, extent and impact of these threats in Oman. However, existing literature suggests that over-tapping and inappropriate harvesting techniques are existing threats (Al Amri, 2012, 2014; CITES, 2019; Ebuen, 2016; Lemenih, Wiersum, Woldeamanuel, & Bongers, 2014; Mengistu, Sterck, Fetene, & Bongers, 2013). This might include making cuts that are too deep, or too long which might impact the overall regeneration of *Boswellia* trees including potential germination, vegetative growth, flowering and fruit production (Abtew, Pretzsch, Mohmoud, & Adam, 2011; Al Amri, 2017; CITES, 2019; Gessmalla, Raddad, & Ibrahim, 2015; Mengistu, Sterck, Fetene, Tadesse, & Bongers, 2011; Ogbazghi, 2001). However, this information is contested locally as the existing workforce involved in tapping has been doing for it for years and are considered caretakers of the trees.

Overharvested populations are characterized by a lack of young and sapling size classes, and with a high mortality of adult trees (CITES, 2019), which has devastating impacts on future production (Lemenih, Arts, Wiersum, & Bongers, 2014).

In addition is the threat posed by overgrazing by livestock to the populations close to residential areas, particularly by camels whose numbers in Dhofar have increased from about 50,000 in 1980 to nearly 150,000 in 2013 (Ministry of Agriculture and Fisheries, 2012). Across Dhofar livestock is the main cause of the loss of depletion of original vegetation including *Boswellia sacra* (Galletti, Turner II, & Myint, 2016; Patzelt, n.d.).

These threats would need to be mapped per area as they vary is scale and extent in the different areas.

2h. **Please provide citations of relevant literature and any supporting files to the questions above. Please add rows as needed.**

Abtew, A. A., Pretzsch, J., Mohmoud, T. E., & Adam, Y. O. (2011). Population Structure, density and natural regeneration of Boswellia papyrifera (Del.) Hochst in dry woodlands of Nuba Mountains, South Korkofan State, Sudan. Conference on International Research on Food Security, Natural Resource Management and Rural Development Population, 1. Technische Universitat Dresden.

Al-Harrasi, A., Khan, A. L., Asaf, S., & Al-Rawahi, A. (2019). Biology of Genus Boswellia (Springer Nature Switzerland, ed.). Cham: Springer.

Al Amri, M. (2012). Distribution Boswellia sacra in Dhofar Mountains, Sultanate of Oman: Economic value and environmental role. Journal of Life Sciences, 6(6), 632–636.

Al Amri, M. (2014). Sustainable harvesting of Frankincense trees in Oman. Muscat.

Al Amri, M. (2017). Sustainable Harvesting of Frankincense Trees: The Impact of Harvesting on Flowering, Fruit Production and Seed Germination. Muscat.

CITES. (2019). CoP18 Doc. 66. Trade in Boswellia SPP. (Burseraceae).

Ebuen, Y. (2016). Protecting the frankincense. Retrieved June 10, 2019, from Oman Observer website: https://omaninfo.om/english/module.php?module=topics-showtopic&CatID=35&ID=2744

Galletti, C., Turner II, B. L., & Myint, S. W. (2016). Land changes and their drivers in the cloud forest and coastal zone of Dhofar, Oman, between 1988 and 2013. Regional Environmental Change, 16(7), 2141–2153.

Gessmalla, A. F., Raddad, E. Y., & Ibrahim, G. E. A. (2015). Effects of tapping date, tapping direction and elevation on resin yield from Boswellia papyrifera in the Blue Nile State, Sudan. NAF International Working Paper Series, (15/12), 1–14.

Lemenih, M., Arts, B., Wiersum, K. F., & Bongers, F. (2014). Modelling the future of Boswellia papyrifera population and its frankincense production. Journal of Arid Environments2, 105, 33–40. Retrieved from https://www.sciencedirect.com/science/article/abs/pii/S0140196314000408

Lemenih, M., Wiersum, F. K., Woldeamanuel, T., & Bongers, F. (2014). Diversity and dynamics of management of gum and resin resources in Ethiopia: a tradeoff between degradation and domestication. Land Degradation & Development, 25, 130–142.

Mengistu, T., Sterck, F. J., Fetene, M., & Bongers, F. (2013). Frankincense tapping reduces the carbohydrate storage of Boswellia trees. Tree Physiology, 33(6), 601–608. https://doi.org/10.1093/treephys/tpt035

Mengistu, T., Sterck, F. J., Fetene, M., Tadesse, W., & Bongers, F. (2011). Leaf gas exchange in the frankincense tree (Boswellia papyrifera) of African dry woodlands. Tree Physiology, 31(7), 740–750. https://doi.org/10.1093/treephys/tpr067

Ministry of Agriculture and Fisheries. (2012). Agriculture Census 2012/2013. Volume 3: Dhofar Governorate. Muscat.

Ogbazghi, W. (2001). The distribution and regeneration of Boswellia papyrifera (Del.) Hochst. in Eritrea. University of Wageningen.

Patzelt, A. (n.d.). Flora and Vegetation (Jabal Samhan). In The Mountains of Oman. An Illustrated Reference to Nature and Society. Hildesheim: Georg Olms AG.

Patzelt, A. (2014). Oman Plant Red Data Book. Muscat: Al Roya Press and Publishing House.

Thulin, M. (1998). Boswellia sacra. Retrieved June 16, 2019, from The IUCN Red List of Threatened Species website: http://dx.doi.org/10.2305/IUCN.UK.1998.RLTS.T34533A9874201.en

Section 3: Harvest and exploitation (paragraph b), c) and d) of Decision 18.205)

3a.	**Which *Boswellia* species among those occurring in your country are harvested for subsistence or commercial use?**
Boswellia sacra	
3b.	**For what uses are *Boswellia* species mainly harvested (e.g. timber, medicine, incense, other)?**
Incense and oil for ritual, traditional, religious and cultural use, cosmetic use and medicinal use (Al-Harrasi et al., 2019; Al Amri, 2012; Farah, 2008).	
3c.	**For each of the above uses, what is the volume of harvest for commercial purposes (approximate annual harvest)? Please include an estimate of the number of trees harvested and/or volume of harvested material. If available, provide conversion factors.**
The total annual production of frankincense resin in Oman is estimated to be around 70-100 tons per year (Al Amri, 2012), and 40 to 50 tons of these are estimated to be used on the Omani market (Al Amri, 2012).	
3d.	**What volume is exported (approximate annual export)?**
Frankincense export from Oman is estimated to 16'600 kg in 1996 (Farah, 2008), and UAE is the largest importer of Omani frankincense (Farah, 2008). Somalia is the principal exporter of frankincense resin into Oman, and Omani wholesalers export the bulk of the imported frankincense into other countries (Farah, 2008). Further studies are required to update these numbers. On a global scale, the contribution of *Boswellia sacra* from the Arabian Peninsula to resin trade is currently negligible (Bongers et al., 2019).	
3e.	**Please specify to what extent (if any) harvest or export affects the sustainability of *Boswellia* populations.**
There are grounds for concern about the potential effects of over-harvesting of frankincense trees (Farah, 2008), particularly with the wide-spread of unskilled migrant harvesters (Al Amri, 2012). As there is little to no supervision during tapping, over-harvesting is a common practice and more accessible trees are often tapped continuously with no rest periods (Al Amri, 2012). Farah, 2008 mentions that over-harvesting was more of a problem in the 1970s than it is at present time due to the drop of harvester numbers. Although over harvesting is a persistent threat, the presence of low numbers of harvesters compared to the past might explain why tree mortality as a result of over-harvesting is less common today (Farah, 2008).	
3f.	**Please specify if harvest or export reduce or otherwise affect the regeneration capacity of *Boswellia* populations.**
When seed harvesting for sale is coupled with intensive tapping practices, *Boswellia sacra's* regeneration potential is diminished (Farah, 2008). This is the case when trees do not have enough time to heal and recover from tapping injuries between seasons (Farah, 2008). Tapping frankincense trees can adversely affect the tree flowering process and the production of healthy and mature seeds that can germinate (Al Amri, 2017). We note that livestock grazing (camel and goats) is the main factor affecting *Boswellia sacra's* regeneration and survival in lower elevation areas in Dhofar (Farah, 2008), and that some populations in the wild only show adult individuals with no active regeneration (Patzelt, 2014).	
3g.	**Please summarize any initiatives to artificially propagate/cultivate *Boswellia* species or to grow plantations or nurseries of them, and the scale and size of plantations/nurseries.**
The Oman Botanical Garden caries out ex-situ conservation and currently holds over 500 individual *Boswellia sacra* trees.	
3h.	**What are the challenges to artificially propagate/cultivate *Boswellia* species in your country?**
Seed germination rates of *Boswellia sacra* are low and propagation success from cuttings is 40% (Patzelt, 2014).	

3i. **Please provide citations of relevant literature and any supporting files to the questions above. Please add rows as needed.**

Al-Harrasi, A., Khan, A. L., Asaf, S., & Al-Rawahi, A. (2019). Biology of Genus Boswellia (Springer Nature Switzerland, Ed.). Cham: Springer.

Al Amri, M. (2012). Distribution Boswellia sacra in Dhofar Mountains, Sultanate of Oman: Economic value and environmental role. Journal of Life Sciences, 6(6), 632–636.

Al Amri, M. (2017). Sustainable Harvesting of Frankincense Trees: The Impact of Harvesting on Flowering, Fruit Production and Seed Germination. Muscat.

Bongers, F., Groenendijk, P., Bekele, T., Birhane, E., Damtew, A., Decuyper, M., … Zuidema, P. A. (2019). Frankincense in peril. Nature Sustainability, 9.

Farah, M. H. (2008). Non-Timber Forest Product (NTFP) extraction in arid environments: Land-use change, Frankincense production and the sustainability of Boswellia sacra in Dhofar (Oman). The University of Arizona.

Patzelt, A. (2014). Oman Plant Red Data Book. Muscat: Al Roya Press and Publishing House.

Section 4: Supply chains and international trade (paragraph a), b) and f) of Decision 18.205)

4a. **Who are the predominant legal or customary owners / custodians of *Boswellia*?**

Government-owned ☐ Local communities ☐ Individual ownership ☐ Community-based or individual land tenure ☒

Please describe the land ownership structure where *Boswellia* spp. occur, including harvest rights.

The Government owns all land in Oman but each tribe has some control over access to water, grazing resources etc. (Farah, 2008). *Boswellia sacra* land ownership in Oman is structured along tribal lineages where ownership parcels known as *menzela* are inherited and passed to the male members of the family (Farah, 2008). With each new generation, the ownership shares get smaller and smaller as parcels are subdivided among heirs in a fragmentation process (Farah, 2008). Tapping *Boswellia sacra* trees from individuals outside the owning tribe can be considered a serious offence (Farah, 2008).

4b. **If known, please specify who are the main harvesters of *Boswellia* specimens?**

Individual collectors ☒ Collector associations ☐ Private companies ☐ Other ☐

Please provide further details on the types of harvesters.

The harvesting of *Boswellia sacra* trees has undergone changes since the late 1970s, with rural Omanis opting for better paid jobs, and being replaced by migrant frankincense harvesters from Somalia (Farah, 2008).

4c. **Is there any in-country processing capacity for *Boswellia* specimens? Please describe.**

There are oil refineries producing essential oil but we have no details on the numbers or the size of these industries.

4d. **Approximately how many companies or institutions in your country are known to process and / or trade *Boswellia* specimens? Please list the main ones.**

We don't have this information.

4e. **What are the main *Boswellia* specimens known to be exported from your country (e.g. extract, woodchips, other)?**

Extract and oil.

4f. **Which are the main known importing countries of *Boswellia* specimens sourced from your country?**

A study in 2008 mentions that UAE is the largest importer of Omani frankincense (Farah, 2008). But there are individual companies that source directly from Oman as well. This information needs to be further exploited.

4g.	**Please list the *Boswellia* species that are imported into your country (whether finished or unfinished specimens) and the countries from which they were imported.**
	Somalia is the principal exporter of frankincense resin into Oman, and Omani wholesalers export the bulk of the imported frankincense into other countries (Farah, 2008).
4h.	**What are the main *Boswellia* specimens imported into your country (e.g. timber, medicine, incense, other)?**
	Extract and incense.
4i.	**What is the approximate volume of *Boswellia* specimens being imported? Please specify for each type of specimen.**
	Not known.
4j.	**Is there any re-export of *Boswellia* specimens from your country? Please specify including approximate volumes of the specimen re-exported and to which countries.**
	Somalia is the principal exporter of frankincense resin into Oman, and Omani wholesalers export the bulk of the imported frankincense into other countries (Farah, 2008).
4k.	**If known, please provide common trade names and/or product names under which the *Boswellia* specimens are internationally traded.**
	Frankincense resin grades has local names in the market, which might not be reflected in international trade. There are four common grades known as *hojari, nejdi, shazri, shabi* (Farah, 2008). The term *fusoos* is used to describe a tear shaped foggy white resin harvested in the Hojar or Nejd zone (Farah, 2008).
4l.	**If available, please provide information on any reference material, guidance, or tools to identify *Boswellia* specimens in trade.**
	Not available.
4m.	**If available, please provide contacts of any known stakeholder groups, specialists, or institutions that might aid the Secretariat in the implementation of Decision 18.206.**
	Professor Ahmed al Harrasi, Vice Chancellor for Research, Graduate Studies and External Relations, University of Nizwa, aharrasi@unizwa.edu.om Professor Luay Rashan, Principal Investigator, Research Center, Medicinal Plants Divisions, Dhofar University, lrashan@du.edu.om Ministry of Agriculture and Fisheries Wealth (no contact) Ministry of Industry and Commerce (no contact) Amouage (private fragrance and cosmetic entity, no contact)
4n.	Please provide citations of relevant literature and any supporting files to the questions above. Please add rows as needed.
	Farah, M. H. (2008). Non-Timber Forest Product (NTFP) extraction in arid environments: Land-use change, Frankincense production and the sustainability of Boswellia sacra in Dhofar (Oman). The University of Arizona.

Section 5: Regulatory framework and species management (paragraph e) of Decision 18.205)

5a.	**Please describe any regulations or management measures in place or in preparation concerning**
	i. The conservation of *Boswellia* populations and/or habitats?
N/A	
	ii. The sustainable harvest of *Boswellia* specimens?
N/A	
	iii. The export of *Boswellia* specimens?
N/A	
	iv. Ecological restoration efforts *in situ*, planned or underway, including the timeframe, source of propagation specimen, and outcomes.
N/A	
5b.	Please provide citations of relevant literature and any supporting files to the questions above. Please add rows as needed.
	File/attachment Comments (if any)

Section 6. Additional remarks or information

6a.	**Please provide any additional information or remarks relevant to the implementation of Decisions 18.205 to 18.208 on Boswellia trees (*Boswellia* spp.)**
N/A	

Thank you very much for your responses!