

***Boswellia sacra* Flück.**

250

Burseraceae

Nomenclatural reference 1217 Govaerts, R. (2022): The World Checklist of Vascular Plants (WCVP). – Royal Botanic Gardens, Kew. Checklist dataset of 2022-12-08. Retrieved from <https://sftp.kew.org/pub/data-repositories/WCVP/>, viewed 4.3.2023.

Summary

Intrinsic Traits

Distribution	Boswellia sacra is native to parts of the Arabian peninsula (Yemen, Oman) and also northeastern Africa (Somalia).
Abundance	In some areas the population size can be large and dominant.
Habitat	Boswellia sacra is growing in xeric Acacia-Commiphora bushland, on hills, gullies and cliffs. It grows at altitudes from sea level to 1230m.
Regeneration	It may be inferred from another species (e.g. B. papyrifera) that propagation from rooted cuttings and the production of root suckers are possible.
Reproduction	The flowers are bisexual and self-fertile. The reproduction is by seed, but fruit production rates are low. Therefore the recruitment from seed is poor, even in the absence of commercial seed collection, fodder harvests and browsing by livestock.
Plant Parts	The part of the plant that is mainly used is the gum-resin, an exudate from the bark.
Lifeform	Boswellia sacra grows as a small tree, it can reach a height of up to 8m.
Systematics	The genus Boswellia comprises some 20 species, most of them distributed in dry tropical Africa with eight endemics on the island of Socotra and one species in India (B.serrata).

Extrinsic Traits

Threat Status	The species has been globally assessed by IUCN as "Lower Risk / Near Threatened" (LR/NT) in 1998. This assessment is in need of updating. In Oman, the species has been assessed nationally in 2014 as Near Threatened.
Threats	Gum and resin producing populations are severely deteriorating in most producing countries, mainly as a result of four major processes of over-exploitation: (i) clearing and conversion of woodlands to arable farming; (ii) excessive wood harvesting for fuelwood; (iii) improper harvesting and tapping of gums and resins; (iv) overgrazing by livestock. In Oman, B.sacra is so heavily browsed that it rarely flowers or sets seeds. Several improper harvesting procedures are used to temporarily increase resin yields: precipitate tapping before the resin is mellowed and ready for harvest; administering two deep parallel cuts on the surface of the ordinary tapping incision; burning of the white peel that covers the bark of the tree. Perhaps no less than one half of the entire Boswellia population in Somalia is to some degree damaged.
Purpose	The gum-resin produced from B. sacra is used for burning as incense, it is distilled to yield volatile oils in perfumery, and to a lesser degree in the preparation of traditional medicines as an anti-inflammatory agent and for wound healing.
Use Fields	Animal poison; food; food additive; material; medicine; social use (cosmetics).
Trade Trend	Main exporting country is Somalia (incl. Somaliland) with a production 200 mt in 2011. Biggest importing country is China, followed by Europe (France, Germany, United Kingdom). Despite significant trade in this species, international demand seems to be stable or perhaps even decreasing. From general trade data it can be inferred that demand today is less than in the 1970s and 1980s.
Legislation	The species is not protected by CITES. In 2019, the CITES CoP 18 decided to collect data on trade, status and harvest levels of the Boswellia species with an aim to assess whether any of the species meet the criteria for listing under CITES (https://cites.org/eng/taxonomy/term/42083). This process is still ongoing

Taxonomy and Identification

Taxonomy	Reference
genus: "c. 20 dry trop. Afr. (esp. NE; Socotra 8 endemics) & As."	3753 Mabberley, D.J. (2017): The plant-book. 4th ed.
genus: "17 species in rather dry areas from the Ivory Coast to India and southwards to north-eastern Tanzania and northern Madagascar"	8889 Thulin, M. (1999): Flora of Somalia. Volume 2.
genus: "19-20 species extending from the Ivory Coast to India and south to NE. Tanzania and N. Madagascar; most numerous in NE. tropical Africa."	8914 Gillett, J.B. (1991): Burseraceae. In: Flora of T
genus: "Despite their early recognition, classification and nomenclature of members of the two genera, <i>Boswellia</i> and <i>Commiphora</i> in tropical East Africa have remained unstable. They have been described by various botanists as taxonomically difficult [...]. The situation is worsened further by the fact that <i>Commiphora</i> is a gregarious genus and where one species is found, several others are likely to occur as well [...]. This has led to the practice of describing species from inadequate and often sterile material. As a result some species have been described by different botanists under different names."	3944 Gachathi, F.N. (1997): Recent advances on cl
"The affinity of <i>B. sacra</i> appears to be closest to <i>B. papyrifera</i> "	8793 Thulin, M. & Warfa, A.M. (1987): The francinse
"The name 'frankincense' is derived from the Old French 'franc encens', meaning pure incense or, more literally, free lighting."	1192 Plants of the World Online (POWO). Royal Bo
"There are six most common <i>Boswellia</i> species whose gum-resins are widely traded and these are: <i>B. frereana</i> Birdw. known only from Somalia; <i>B. sacra</i> Flueck. (syn. <i>B. carteri</i>) from Somalia, Yemen and Oman; <i>B. papyrifera</i> Hochst. from Ethiopia and Sudan; <i>B. rivae</i> Engl. from Ethiopia; <i>B. neglecta</i> S.Moore from Ethiopia and Kenya; and <i>B. serrata</i> Roxb. from India. They are all known as frankincense or olibanum."	8730 Brendler, T., Eloff, J.N., Gurib-Fakim, A. & Phi

Synonyms

Synonym	Eval	Ref
<i>Boswellia bhaw-dajiana</i> Birdw.	1217	Govaerts, R. (2022): The World Checklist of Vascular Plants (WCVP). –
<i>Boswellia carteri</i> Birdw.	1217	

Taxon Present in Pharmacopoeias and other References

Name as used in Source	Status	Reference
<i>Boswellia bhaw-dajiana</i> Birdw.	3586	Zhonghua Bencao Editorial Committee, Chinese State Administration of TCM (ed.) (1998): Zhonghua Bencao (Materia Medica of China), Vol. 1-10. Shanghai Scientific and Technical Press, Shanghai. Retrieved from http://www.zysj.com.cn/zhongyaocai/zhonghuabenca
<i>Boswellia carteri</i> Birdw.	2156	FRLHT - Indian Medicinal Plants Database - http://www.medicinalplants.in/
<i>Boswellia bhaw-dajiana</i> Birdw.	8871	China Pharmacopoeia Commission (ed.) (2010): Pharmacopoeia of the People's Republic of China. English edition. Ed. 9. Stationery Office Books, s.loc.
<i>Boswellia carteri</i> Birdw.	1101	Hänzel, R. & al. (1992-1998): Hagers Handbuch der pharmazeutischen Praxis. 5. Auflage. 5 volumes [4179, 4180, 4181, 6097, 6098]
<i>Boswellia carteri</i> Birdw.	3221	Goraya, G.S. & Ved, D.K. (2017): Medicinal plants in India. An assessment of their demand and supply. National Medicinal Plants Board & Indian Council of Forestry Research & Education, New Delhi & Dehradun. Retrieved from http://www.rcfceast.org/wp-content
<i>Boswellia carteri</i> Birdw.	3561	Quattrocchi, U. (2012): World dictionary of medicinal and poisonous plants. Common names, scientific names, eponyms, synonyms, and etymology. CRC Press, Boca Raton.
<i>Boswellia carteri</i> Birdw.	8547	Ved, D.K. & Goraya, G.S. (2008): Demand and supply of medicinal plants in India. FRLHT, Bangalore.
<i>Boswellia carterii</i>	8394	Therapeutic Goods Administration (ed.) (2007): Substances that may be used in listed medicines in Australia. Therapeutic Goods Administration, Symonston. Retrieved from http://www.tga.gov.au/cm/listsubs.pdf , viewed: 25.01.2009.
<i>Boswellia carterii</i> Birdw.	1236	United States Pharmacopeial Convention (2024): Dietary Supplements Compendium (DSC). https://www.usp.org/products/dietary-supplements-compedium
<i>Boswellia carterii</i> Birdw.	1237	United States Pharmacopeial Convention (2024): Food Chemicals Codex (FCC). https://www.foodchemicalscodex.org/
<i>Boswellia carterii</i> Birdw.	3091	National Pharmacopoeia Commission (ed.) (2020): Zhōnghuá rénmín gònghéguó yàodiǎn. 2020 Niánbǎn. Yī bù [Pharmacopoeia of the People's Republic of China. 2020 edition. Volume 1; in Chinese]. China Medical Science and Technology Press, Beijing.
<i>Boswellia carterii</i> Birdw.	8378	United States Pharmacopoeia (ed.) (2008): Food Chemicals Codex. 6th edition. U.S. Pharmacopoeia.
<i>Boswellia carterii</i> Birdw.	8450	Homoeopathic Pharmacopoeia of the United States (s.dat.): HPUS Online Database. Retrieved from http://www.hpus.com , viewed: 26.10.2009.
<i>Boswellia carterii</i> Birdw.	8871	China Pharmacopoeia Commission (ed.) (2010): Pharmacopoeia of the People's Republic of China. English edition. Ed. 9. Stationery Office Books, s.loc.
<i>Boswellia carterii</i> Birdwood	8389	Anon. (2002): The Korean Herbal Pharmacopoeia (English edition). Korea Food and Drug Administration, sine loco.
<i>Boswellia sacra</i>	3751	van Wyk, B.-E. & Wink, M. (2017): Medicinal plants of the world. 2nd edition. CABI, Wallingford & Boston.

<i>Boswellia sacra</i> Flueck.	1180	GRIN (17.3.2015): Download World Economic Plants report from GRIN Taxonomy for the query. Medizin = 'Alle Nutzungen'. Retrieved from http://www.ars-grin.gov/cgi-bin/npgs/html/taxecon.pl?language=de
<i>Boswellia sacra</i> Flueck.	3145	Brinckmann, J.A., Kathe, W., Berkhoudt, K, Harter, D.E.V. & Schippmann, U. (2022): A new global estimation of medicinal and aromatic plant species in commercial cultivation and their conservation status. <i>Economic Botany</i> 22(10): 1-15.
<i>Boswellia sacra</i> Flueck.	3221	Goraya, G.S. & Ved, D.K. (2017): Medicinal plants in India. An assessment of their demand and supply. National Medicinal Plants Board & Indian Council of Forestry Research & Education, New Delhi & Dehradun. Retrieved from http://www.rcfceast.org/wp-content
<i>Boswellia sacra</i> Flueck.	3561	Quattrocchi, U. (2012): World dictionary of medicinal and poisonous plants. Common names, scientific names, eponyms, synonyms, and etymology. CRC Press, Boca Raton.
<i>Boswellia sacra</i> Flueck.	6369	McGuffin, M., Kartesz, J.T., Leung, A.Y. & Tucker, A.O. (2000): Herbs of commerce. 2nd edition. AHPA, Silver Spring, USA.
<i>Boswellia sacra</i> Flueck.	8545	Anon. (2009): International Standard ISO 4720. Third edition 2009-08-15. Essential oils. Nomenclature (in English and French). International Organization for Standardization, Geneva.
<i>Boswellia sacra</i> Flueck.	8730	Brendler, T., Eloff, J.N., Gurib-Fakim, A. & Phillips, L.D. (ed.) (2010): African Herbal Pharmacopoeia. Graphic Press, Mauritius.
<i>Boswellia sacra</i> Flueckiger	3145	Brinckmann, J.A., Kathe, W., Berkhoudt, K, Harter, D.E.V. & Schippmann, U. (2022): A new global estimation of medicinal and aromatic plant species in commercial cultivation and their conservation status. <i>Economic Botany</i> 22(10): 1-15.
<i>Boswellia sacra</i> Flueckiger	7279	van Wyk, B.-E. & Wink, M. (2004): Medicinal plants of the world. Timber Press, Portland.

Common Names

Common Name	Typ	Language	Country	Ref
äktä rökelsesträd		Swedish		1100 GRIN Database (Germplasm Resources In
árbol del incensio	ver	Spanish		1100
arbre à encens	ver	French		1100
Beeyo	tra	Somali		8894 Hall, A. (12.2.2005): Viability of a sustaina
beyo	tra	Somali		4187 Coppen, J.J.W. (1995): Flavours and fragr
Beyo	tra	Somali		8730 Brendler, T., Eloff, J.N., Gurib-Fakim, A. &
Frankincense	ver	English		1100 GRIN Database (Germplasm Resources In
frankincense	tra	English		1100
frankincense (oleo-gum-resin)	scn	English		6369 McGuffin, M., Kartesz, J.T., Leung, A.Y. &
frankincense tree	ver	English		3751 van Wyk, B.-E. & Wink, M. (2017): Medicin
mogar	ver	Arabic		4187 Coppen, J.J.W. (1995): Flavours and fragr
mogar		transliterated Arabi		1100 GRIN Database (Germplasm Resources In
mohor	ver	Somali		4187 Coppen, J.J.W. (1995): Flavours and fragr
Mohor		Somali		1101 Hänsel, R. & al. (1992-1998): Hagers Han
Mohor maddow		Somali		1101
Mohur meddhu		Somali		1101
moxor		Somali		1100 GRIN Database (Germplasm Resources In
Moxor	ver	Somali		8894 Hall, A. (12.2.2005): Viability of a sustaina
Moxor		Somali		1101 Hänsel, R. & al. (1992-1998): Hagers Han
oliban	tra	French		1100 GRIN Database (Germplasm Resources In
olibán	tra	Spanish		1100
olibano	tra	Italian		1100
Olibanum	pha	Latin		1101 Hänsel, R. & al. (1992-1998): Hagers Han
Olibanum-tree	ver	English		1100 GRIN Database (Germplasm Resources In
olibanum-tree	ver	English		1100
ru xiang shu		Chinese		1100
shajerat al-luban		transliterated Arabi		1100
sheehaz	tra	Arabic		4187 Coppen, J.J.W. (1995): Flavours and fragr
Weihrauchbaum	ver	German		1100 GRIN Database (Germplasm Resources In
Weihrauchpflanze	tra	German		1100

Distribution Range

Distribution Range	Ref
"N Somalia, South Yemen (Hadhramaut) and Oman (Dhofar)"	8793 Thulin, M. & Warfa, A.M. (1987): The francin
"N.E. Trop. Afr.; Arabian Pen.; also cult."	1180 GRIN (17.3.2015): Download World Econom
"Native to Ethiopia, northern Somalia, south-western Oman and southern Yemen. [...] It is most widespread in northern Somalia, and in the woodlands of the escarpment mountains of the southern coast of the Arabian Peninsula."	1192 Plants of the World Online (POWO). Royal B
"Native to: Oman, Yemen" [The fact that Somalia is not mentioned in this enumeration and in the map provided on the PoWO website must be an error.]	1192 Plants of the World Online (POWO). Royal B

"Native: Africa: NORTHEAST TROPICAL AFRICA: Somalia. Asia-Temperate: ARABIAN PENINSULA: Oman, Yemen"	1100	GRIN Database (Germplasm Resources Info)
"Oman, Somalia, Yemen (Former South Yemen). The largest and most widespread occurrence of the species is in northern Somalia."	5520	Oldfield, S., Lusty, C. & MacKinven, A. (199
"restricted to north-eastern Somalia and the southern Arabian Peninsula (the Sultanate of Oman and the United Republic of Yemen)"	9915	Brendler, T., Brinckmann, J. & Cunningham,
"The largest and most widespread occurrence of the species is in northern Somalia"	3619	Thulin, M. (1998): <i>Boswellia sacra</i> . The IUC

Distribution

Continent	Region	ICC	Status	Free Text	Ref
2 Africa	24 Northeast Tropical Afri	SO		north	1109
		SO	native		1100
		SO	native	N	8793
3 Asia-Temperate	35 Arabian Peninsula	OM		Dhofar	1109
		OM	native		1100
		OM	native	Dhofar	8793
		YE		South Yemen // southeast	1109
		YE		S	2200
		YE	native		1100
		YE	native	S (Hardamaut)	8793
	36 China	CN			1109

Abundance / Local Population Size

ICC	Abundance	Reference
	"dominant component of desert-woodland"	5520 Oldfield, S., Lusty, C. & MacKi
	"Using the Rabinovitz seven forms of rarity assessment format <i>Boswellia sacra</i> has large (multinational) geographical spread, narrow habitat and a large and dominant population size in some places"	9915 Brendler, T., Brinckmann, J. &

Ecology

TypeEc	ICC	Ecology	Ref
alti		0-1230m	6493 Svoboda, K., Hampson, J.B. & F
alti	SO	5-1230m	8889 Thulin, M. (1999): Flora of Somæ
alti	SO	up to 1230m	8793 Thulin, M. & Warfa, A.M. (1987)
habit		"characteristic tree of xeric woodland on the escarpment of mountains in Dhofar in Oman, extending into Yemen. In Oman, <i>B. sacra</i> occurs mainly along the arid leeward areas of the Qamar, Qara and Samhan mountains [...], away from the influence of monsoon rains"	9915 Brendler, T., Brinckmann, J. & C
habit		"dominant component of desert-woodland on the escarpment mountains in Dhofar in Oman, extending into Yemen"	5520 Oldfield, S., Lusty, C. & MacKin
habit		"dominant component of desert-woodland on the escarpment mountains in Dhofar in Oman, extending into Yemen"	3619 Thulin, M. (1998): <i>Boswellia sac</i>
habit		"It grows on hills, gullies and cliffs up to an altitude of 1230 metres, and for 200 kilometres inland from the coast."	6493 Svoboda, K., Hampson, J.B. & F
habit		"widespread in northern Somalia, and in the woodlands of the escarpment mountains of the southern coast of the Arabian Peninsula. These coastal mountains are blanketed in thick fog during the summer months, allowing the development of dense woodlands supporting a surprisingly rich flora: a 'fog oasis' in a desert region."	1192 Plants of the World Online (POV
habit	SO	"Acacia-Commiphora woodland in subcoastal zone"	8793 Thulin, M. & Warfa, A.M. (1987)
habit	SO	"Rocky slopes and gullies on limestone, often on cliffs or large boulders"	8889 Thulin, M. (1999): Flora of Somæ
repro		"Although reproduction is by seed, fruit production rates are low [...] Germination rates are low (less than 8%), with flowering and seed set both affected by browsing. These factors result in poor recruitment from seed, even in the absence of commercial seed collection, fodder harvests and browsing by livestock."	9915 Brendler, T., Brinckmann, J. & C
repro		Flowers bisexual	8914 Gillett, J.B. (1991): Burseraceae
repro	KE	"bisexual and self-fertile", "sparsely distributed and cross-pollination seldom takes place"	8915 Eslamieh, J. (2011): Cultivation

Life Form

LF_Standard	Duration	Lifeform	Woodiness	Height	Ref
tree					3221 Goraya, G.S. & Ved, D.K. (201
tree				1,5-8m	1149 African Plants Database. - http
tree					1101 Hänsel, R. & al. (1992-1998):
tree					3751 van Wyk, B.-E. & Wink, M. (20
tree				1,5-8m	8889 Thulin, M. (1999): Flora of Som

Threat Situation

ICC	PopulationStatus	Ref
	"Owing to the lack of proper forest management practices, the stock of gum and resin producing vegetation, their ecosystem and the benefits expected of them is severely deteriorating in most	8897 Anon. (2010): Expanding inves

producing countries, mainly as a result of four major processes of over exploitation: clearing and conversion of woodlands to arable farming; resettlement programs; excessive wood harvesting for fuelwood; improper harvesting/tapping of gums and resins; overgrazing by livestock."

[all genera] "Browsing by livestock, particularly camels and, to a lesser extent, goats, appear to be a widespread threat across all Range States. In some cases, camels also eat the bark from the trunks of *B. sacra* trees, resulting in tree death." 9915 Brendler, T., Brinckmann, J. &

ET [non-species-specific information for *Boswellia* & *Commiphora*]: "Although reliable information on the distribution and abundance of the resin-yielding species is not available, and the scattered occurrence of the trees makes detailed surveys a difficult and expensive option, it is believed that the total size of the natural resource and its potential productivity significantly outweigh demand for the products. [One source] cites official estimates in 1981 of 23,000 tonnes pa for the potential production of olibanum in Ethiopia." 4187 Coppen, J.J.W. (1995): Flavou

OM "In Oman the tree is so heavily browsed that it rarely flowers or sets seeds. Trees appear to be dying and regeneration is poor." 5520 Oldfield, S., Lusty, C. & MacKi

OM "In Oman the tree is so heavily browsed that it rarely flowers or sets seeds." 3619 Thulin, M. (1998): *Boswellia* sa

OM "main threats to *B. sacra* habitat in Oman are gravel mining and intensive browsing by livestock (primarily camels), who quite literally are able to browse *B. sacra* to death, eating not only the leaves, but also the bark off tall old trees, exposing the wood to termite attack." 9915 Brendler, T., Brinckmann, J. &

SO [non-species-specific information for *B.sacra* & *B.frereana* in Somaliland]: "Precipitate tapping, which is locally known as *ceyriin sarc* or "harvesting raw resin" is a noxious form of exploitation. 'Avaricious' collectors who think they can increase output by administering tappings before the resin is mellowed and ready for harvest end up taxing the tree and lowering the quality of the resin [...]. Most damaging is an illicit tapping technique called *jaqeyn*, literally "stabbing the tree". Two deep parallel cuts are administered on the surface of the ordinary tapping incision. Rewarding in the short term, this increases resin production, though the effects of damaging their internal organs are disastrous. The tree may die, and even those which withstand the noxious deep cuts take a long time to recover. Deep incisions are also thought to act as a medium which permits wood borers to infect the weakened tree [...]. Another tactic to increase yield is to burn the white peel that covers the bark of the tree. The trees whose resin is milked out this way are known to die eventually. Perhaps no less than one half of the entire *Boswellia* population in Somalia is to some degree damaged." 8894 Hall, A. (12.2.2005): Viability of

SO [non-species-specific information for *B.sacra* & *B.frereana* in Somaliland]: „As stated by a harvester: "The health of the trees now is not the best thing. It is not the best because there are a lot of thieves who are cutting and doing damage. By the way, if it continues as it is, then maybe we could lose them in a short time." 3784 DeCarlo, A. & Ali, S.H. (2014):

SO [non-species-specific information for *B.sacra* & *B.frereana* in Somaliland]: „Even worse for the trees, illegal harvesters also collect resin by making additional cuts onto the bark after the 5-month legal harvesting season has ended. Desperate and irresponsible harvesters are reported as making too many cuts on the trees to drain resin as well as cutting in ways that can and does kill the trees. Thus across the interviewees almost everyone reported over harvesting leading to decline of the trees and in some cases pleaded that without intervention the most valuable species could be lost within the decade." 3784

SO [non-species-specific information for *B.sacra* & *B.frereana* in Somaliland]: „The economic situation is having a devastating effect on the trees themselves and, subsequently, the long-term sustainability of the resin market. Illegal harvesting is rampant. Youth with few opportunities are reported to sneak into these remote areas during the harvesting season and take the resin before the legitimate harvesters reach it." 3784

SO [non-species-specific information for *Boswellia* & *Commiphora*]: "It is impossible to prevent grazing of livestock and in times of drought nomads cut branches for fodder. Severe drought also affects the trees directly, slowing their growth and causing problems of regeneration. The more accessible trees are often tapped continuously through the year, with no rest periods, and this puts them under further stress." 4187 Coppen, J.J.W. (1995): Flavou

Threat Status: Global and Supranational

Glo	Threat Category	Criteria	Ass.	Publ.	Ref
glo	LR/nt	Lower Risk / near threatened	1998	2023	1223 2023 IUCN Red List of Threatened Species. Version 2023-1. www.iucnredlist.org . Download of plant data received from IUCN website 16.12.2023.
		Name used in redlist: <i>Boswellia sacra</i> Fleuckiger	Accepted		Name used in redlist: <i>Boswellia sacra</i> Fleuckiger
glo	LR/nt	Lower Risk/near threatened	1998-01-01	1998	1206 2020 IUCN Red List of Threatened Species. Version 2020-3. www.iucnredlist.org . Download of plant data received from IUCN 14.1.2021.
		Name used in redlist: <i>Boswellia sacra</i> Fleuckiger	Accepted		Name used in redlist: <i>Boswellia sacra</i> Fleuckiger
glo	LR/nt	Lower Risk/near threatened	1998	1998	5520 Oldfield, S., Lusty, C. & MacKinven, A. (1998): The world list of threatened trees. World Conservation Press, Cambridge.
		Name used in redlist: <i>Boswellia sacra</i>			Name used in redlist: <i>Boswellia sacra</i>
glo	LR/nt	Lower Risk/near threatened	1998	1998	3619 Thulin, M. (1998): <i>Boswellia sacra</i> . The IUCN red list of threatened species 1998. e.T34533A9874201. Retrieved from http://dx.doi.org/10.2305/IUCN.UK.1998.RLTS.T34533A9874201.en , viewed: 07.10.2016.
		Name used in redlist: <i>Boswellia sacra</i>			Name used in redlist: <i>Boswellia sacra</i>

Threat Status: Countries

ICC Region	Threat Category	Assd.	Publ.	Ref
OM	NT	Near Threatened	2014	3298 Patzelt, A. (2014): Oman plant red data book. Diwan
		Name used in redlist: <i>Boswellia sacra</i> Flück.	Accepted	Accepted Name: <i>Boswellia sacra</i> Flück.

Purpose of Use

Purpose	Ref	
<multiple>	"resin provides incense, perfume and medicine"	5520
animal poison	"The fumes also repel mosquitoes and other insects."	8889
food - sweets	"Das ätherische Öl aromatisiert industriell erzeugte Süßwaren."	8888
	"It is used widely as a type of chewing gum"	6493
	[non-species-specific information] "The 'clean', distinctive flavour of certain types of olibanum makes them highly valued for chewing and this constitutes an important use in some markets."	4187
food additive - flavouring & spice	[non-species-specific information] "flavour (principally 'maidi' for chewing but with some minor uses of the oils as flavouring agents)"	8897
material - general	"Materials: gum/resin"	1100
medicine - general	"antiseptic, expectorant, sedative; anti-inflammatory; antirheumatic"	3751
	"Boswellia resin has been used as a major anti-inflammatory agent and for wound healing for centuries."	8730
	"Frankincense has a wide range of traditional medicinal uses, for example in the treatment of digestive and respiratory complaints. Scientific research is underway into the possible use of Boswellia species in cancer treatment. The fumes can have a stimulant effect."	1192
	[non-species-specific information] "pharmaceutical applications"	8897
medicine - traditional herbal medicine	"in traditional medicine"	8889
	"The aromatic resin [...] has been used since ancient times for religious and medicinal purposes. It stimulates circulation and is antiseptic, analgesic, expectorant and sedative."	3751
	[non-species-specific information] "The main use for olibanum, myrrh and opopanax imported into the People's Republic of China is in the preparation of traditional medicines."	4187
	Medic. (folklore)	1180
	Medicines: folklore (fide CRC MedHerbs ed2; Herbs Commerce ed2)	1100
	Traditional African medicine	3751
	Traditional Chinese medicine	3751
	Traditional European medicine	3751
social use - cosmetics	"In Antifaltencremes [...] und Parfüms verwendet."	8888
	"used in the perfume industry"	8889
	[non-species-specific information] "Small amounts of resin are distilled to yield volatile oils [...] which find use in perfumery."	4187
social use - general	"Räucherwerk"	8888
	"religious purposes"	7279
	"source of the oleo-gum-resin frankincense, which besides other uses, has long been valued for its sweet-smelling fumes when burnt"	1192
	"The gum-resin of <i>B. sacra</i> is the frankincense most valued for use in churches, mosques etc."	8889
	"Today, frankincense is used mainly in the manufacture of incense, and is regarded as an essential ingredient. Incense is used particularly in Roman Catholic and Greek Orthodox Churches, and also in the cosmetics and pharmaceutical industries, for perfumes, fumigating powders and pastilles. Burning incense is an effective insect repellent."	1192
	[non-species-specific information] "fragrance (chiefly for incense use – either in religious ceremonies or around the home – but with some fine fragrance applications)"	8897
	[non-species-specific information] "The major fragrance use is for burning as incense in religious ceremonies."	4187
	[non-species-specific information] "Weihrauch wurde seit alters von verschiedenen Völkern in erster Linie für kultisch-religiöse Zwecke verwendet; die als Arzneimittel gebrauchten Mengen dürften im Verhältnis sehr gering gewesen sein."	8360

Purpose: Standardized Use Fields

Purpose: Fields of Use	Frequency
<multiple>	1
animal poison	1
food - sweets	3
food additive - flavouring & spice	1
material - general	1
medicine - general	4
medicine - traditional herbal medicine	8
social use - cosmetics	3

Purpose: Number of Use Fields

Purpose: Number of use fields

Taxon used in 8 different standardized use categories (max. 27 categories possible).

Plant Parts Used

Plant Part (standardized)	Plant Part (free text)	Remark	Ref
bark	"resin from bark"		9915 Brendler, T., Brinckmann, J. & Cunningham,
exudate			3751 van Wyk, B.-E. & Wink, M. (2017): Medicinal
exudate			1101 Hänsel, R. & al. (1992-1998): Hagers Handb
exudate	"resin"		3751 van Wyk, B.-E. & Wink, M. (2017): Medicinal
exudate	"gum-resin"		8889 Thulin, M. (1999): Flora of Somalia. Volume 2
exudate	"resin"		7279 van Wyk, B.-E. & Wink, M. (2004): Medicinal
exudate	Oleo-Gum Resin		3221 Goraya, G.S. & Ved, D.K. (2017): Medicinal p
fruit			9915 Brendler, T., Brinckmann, J. & Cunningham,
leaf			9915 Brendler, T., Brinckmann, J. & Cunningham,
seed			9915 Brendler, T., Brinckmann, J. & Cunningham,

Scale and Trend of Trade

ICC	Trade Trend	Ref
	[non-species-specific information for Acacia, Boswellia & Commiphora]: "Importers state that there are no supply problems and, with no new uses on the horizon which might lead to a significant increase in demand for any of the resins, there are no grounds for attempting to increase production."	8897 Anon. (2010): Expanding investment finance in Northern Kenya and other arid lands. Market assessment. Annex 3. Sector profiles. Reformconsult & Pipal, Nairobi. Retrieved from http://typo3.fao.org/fileadmin/user_upload/drought/docs/Final_Report_Annex_3_-_sector_profiles_-_logos.pdf , viewed: 12.06.2012.
	[non-species-specific information for Boswellia & Commiphora]: "Demand today is believed to be less than was current in the late 1970s/early 1980s."	4187 Coppen, J.J.W. (1995): Flavours and fragrances of plant origin. FAO, Rome (Non-wood Forest Products 1). Retrieved from http://www.fao.org/docrep/V5350E/V5350e00.htm , viewed: 07.11.2012.

Utilization: Commodity, Cultivation, Harvest, Sustainability, Trade

Type	ICC	Utilization	Ref
com		"Das aus Einschnitten in die Bäume ausgetretene erstarrte Gummiharz"	1101 Hänsel, R. & al. (1992-1998):
com		"Frankincense obtained from Boswellia frereana known as maidi is the best and the most expensive; frankincense obtained from B. sacra known as beyo is the second best, and frankincense obtained from B. neglecta is known as fooh has the lowest quality."	3942 Hassan, B.A., Glover, E.K., Lu
com		"frankincense produced from Boswellia sacra species (Somali name 'Moxor') is called Somali type olibanum in the international trade"	3786 Lemenih, M. & Teketay, D. (20
com		"In addition to tapping B. sacra for resin, harvesters also lop the leaves off for sale as camel fodder and collect fruits from the trees to take out the seeds, which are then sold."	9915 Brendler, T., Brinckmann, J. &
com		"In den Erzeugerländern werden drei 'beeyo'-Qualitäten, die von Boswellia carteri stammen, und acht 'maydi'-Qualitäten, die von Boswellia frereana stammen, unterschieden"	1101 Hänsel, R. & al. (1992-1998):
com		"Olibanum of Middle Eastern origin is said by some sources to come principally from three species of Boswellia: B. carteri and B. frereana in Somalia and B. sacra in southern Arabia. Some other Boswellia spp. are minor sources of resin and these include B. bhau-dajiana and B. neglecta in Somalia and B. papyrfera in Ethiopia."	4187 Coppen, J.J.W. (1995): Flavou
com	SO	"Boswellia sacra, with the Somali name moxor, yields the beeyo type incense. This is known as Somali type olibanum in the international trade market. Boswellia frereana, with the Somali name yagcar, yields instead the prized meydi incense."	8894 Hall, A. (12.2.2005): Viability o
com	SO	"This resin [B. frereana] is of superior quality due to its lemon-scent, sweet taste and pale topaz-yellow colour and is known locally as meydi. [...] it is much less bitter than B. sacra. On the open market it commands twice the price of beeyo [B. sacra]."	6493 Svoboda, K., Hampson, J.B. &
cul		"Ein Anbau scheint nicht stattzufinden. Seit Ende der 70er Jahre werden in Nordsomalia Versuchspflanzungen angelegt."	1101 Hänsel, R. & al. (1992-1998):
cul	OM	Agroforestry; Mountain oases in northern Oman	3145 Brinckmann, J.A., Kathe, W.,
cul	SO	"Although some plantations were established in Somalia prior to the 1991 civil war, it appears that all frankincense from B. sacra is wild harvested."	9915 Brendler, T., Brinckmann, J. &
exp	SO	"It is a major export commodity from Somalia."	8889 Thulin, M. (1999): Flora of Sor
exp	SO	"Somalia does export Frankincense Boswellia sacra to China for medicinal purposes. Official export records are largely unavailable; however, it is estimated that exports are approximately 150t per year"	5589 Marshall, N. (1998): Searching
har		"A single tree can yield several kilograms of resin each year."	1192 Plants of the World Online (PC

har		"Die Bewirtschaftung eines Baumes dauert maximal drei Jahre an, dann folgt eine mehrjährige Ruhepause."	1101	Hänsel, R. & al. (1992-1998):
har		"Gewinnung erfolgt durch künstliches Einschneiden des Baumes an ca. 10 bis 30 Wundstellen an Stamm und dickeren Ästen"	1101	
har		"The frankincense tree begins to yield resin in its third or fourth year. Collectors make slight incisions or slashes in the stout lower branches with a special knife. The gum exudes at these points and hardens into a tear-shaped resinous substance. After about ten days the drops are large enough for collection. Frankincense is collected chiefly during the monsoon months, and in Oman (from where the best frankincense comes), is stored in mountain caves until the winter after the south-west monsoon is over. This delay enables the product to dry properly, though normally it can be ready for export ten to twenty days after collection."	1192	Plants of the World Online (PC
har		"When slashed, the bark exudes an oily gum resin which is either scraped off the tree or collected from the ground as it drips off, a method which produces a better quality resin. The best quality resin is pale in colour, while resin which is scraped off the bark is reddish and considered inferior."	1192	
har	SO	"Somaliland's 2011 capacity for <i>B. sacra</i> [...] production was 200 tonnes, corresponding to revenue of US\$ 0.5 million with a potential capacity of 1,000 tonnes."	9915	Brendler, T., Brinckmann, J. &
har	SO	"there are usually two periods when <i>B. sacra</i> (<i>B. carteri</i>) is tapped, each lasting 3-4 months and involving successive tappings at approximately 15-day intervals."	4187	Coppen, J.J.W. (1995): Flavou
har	SO	[non-species-specific information for <i>Boswellia</i> & <i>Commiphora</i>]: "It is not possible from official records alone to estimate how much resin, on average, is obtained from a tree. Figures of 1-3 kg per tree per year have been cited for <i>olibanum</i> in Somalia."	4187	
imp		"China is the main importer of the gum."	1192	Plants of the World Online (PC
imp		[non-species-specific information for <i>Acacia</i> , <i>Boswellia</i> , <i>Commiphora</i>]: "Within Europe Germany is the biggest importer (and re-exporter) of the resins."	8897	Anon. (2010): Expanding inves
imp		[non-species-specific information for <i>B.sacra</i> & <i>B.frereana</i> in Somaliland]: "Current EEC imports are estimated at 190 tons per year."	8894	Hall, A. (12.2.2005): Viability o
imp		[non-species-specific information for <i>Boswellia</i> & <i>Commiphora</i>]: "The Middle East and the People's Republic of China are seen to be the major consumers. Germany has imported significant amounts of Ethiopian incense gum."	4187	Coppen, J.J.W. (1995): Flavou
imp		[non-species-specific information for <i>Boswellia</i> & <i>Commiphora</i>]: "The People's Republic of China is the largest market for all three resins, mainly for use in traditional medicines. Imports of <i>olibanum</i> (mainly the Eritrean type from Ethiopia and Sudan) and <i>myrrh</i> were each significantly in excess of 1,000 tonnes in 1984. [...] In Europe and Latin America, substantial amounts of Eritrean-type <i>olibanum</i> are used as incense by the Orthodox and Roman Catholic Churches (approaching 500 tonnes in 1987). Similar quantities are imported into North African countries where it is used for chewing. The Middle East, particularly Saudi Arabia, is another important market for the chewing grade of <i>olibanum</i> , this time the higher quality "maidi" type from Somalia (approximately 500 tonnes in 1987). [...] Of the order of 50 tonnes pa [...] of <i>olibanum</i> [...] are used in Europe (mainly France) for the production of essential oils and extracts."	4187	
imp	CN	"China is reported to be the biggest importer of [...] <i>B. sacra</i> frankincense from Somalia (including Somaliland). China is believed to be importing frankincense more for the manufacture of incense sticks than for traditional medicines as was previously supposed. Exports are also to the EU (France, Germany and the UK) and the USA."	9915	Brendler, T., Brinckmann, J. &
imp	IN	imported	3221	Goraya, G.S. & Ved, D.K. (201
imp	SO	[non-species-specific information for <i>B.sacra</i> & <i>B.frereana</i> in Somaliland]: "Today, the chief markets are the EEC (European Economic Community) countries where it is entirely consumed by the perfume industry, and China where it is used in alternative medicine. Saudi Arabia imports more than 80% of the total export value with a high proportion of the most valuable chewing grades. [...] Other significant markets are Egypt and Yemen."	8894	Hall, A. (12.2.2005): Viability o
socu		"Frankincense is strongly associated with Christmas, being named in the Bible as one of the three gifts brought to the baby Jesus by 'Three Wise Men' from the East, and has been used for thousands of years in many different cultures. The ancient Egyptians believed frankincense to be the sweat of gods, fallen to earth. The legendary Phoenix bird was believed to build its nest from twigs of frankincense and to feed upon 'tears' of the resin."	1192	Plants of the World Online (PC
socu		"in classical times (in Roman times c. 3 k t p.a. (2001 - 1 k t) as valuable as gold & poss. the orig. balsam brought from Somalia (Punt) by the Queen of Sheba)"	3753	Mabberley, D.J. (2017): The pl
socu		"The ancient Egyptians used the resin in religious rites, in anointing the mummified bodies of their kings, and to treat wounds and sores. Incense containing frankincense was found in Tutankhamen's tomb. The earliest recorded account of the use of Arabian frankincense and <i>myrrh</i> by the ancient Greeks comes from Herodotus, suggesting that by 500 BC a well-established trade existed between southern Arabia and Greece. In 295 BC Theophrastus recorded that Alexander the Greek (356-323 BC) sent Anaxicrates to southern Arabia to ascertain the origin of frankincense. Theophrastus (c. 372-287 BC), the Greek botanist, and Pliny the Elder (23-79 AD), the Latin naturalist, provided eyewitness accounts of the cultivation and harvesting of frankincense, and the methods remain largely unchanged today."	1192	Plants of the World Online (PC
socu		"Up until the 1830s, many Europeans mistakenly believed that frankincense was the resin of a species of <i>Juniperus</i> , a conifer."	1192	

socu	SO	"Two species important for their essential oils are found growing in Somalia, <i>Boswellia sacra</i> [...] and <i>Boswellia frereana</i> . The territories where these trees grow are divided up into xiji (Somalian term indicating an area of land controlled by one specific family for the purpose of harvesting the resin). Traditionally, these areas belong to one family group, and are handed down through the generations."	6493	Svoboda, K., Hampson, J.B. &
socu	SO	[non-species-specific information for <i>B.sacra</i> & <i>B.frereana</i> in Somaliland]: "Officials of the Frankincense and Gums Development and Sales Agency reasonably estimate the number of families which primarily depend upon incense gathering to be 10,000."	8894	Hall, A. (12.2.2005): Viability o
socu	SO	[non-species-specific information for <i>Boswellia</i>]: "In some cases, as in Somalia, the wild <i>Boswellia</i> stands belong to extended families who live in the resin-producing areas. There is therefore some incentive on the part of those who tap the trees not to do it in such a way as to damage the trees and jeopardise their livelihoods."	4187	Coppen, J.J.W. (1995): Flavou
socu	SO	[non-species-specific information re <i>B.sacra</i> & <i>B.frereana</i> in Somaliland]: „ <i>Boswellia</i> trees grow in territorially-bound collection areas [...] Characteristically they belong to a core of agnatic families [...] The land tenure system is fundamentally based on the principle of clan systems."	8894	Hall, A. (12.2.2005): Viability o
sus	SO	"Ideally, to reduce damaging the tree, it should be rested every 5 to 6 years."	6493	Svoboda, K., Hampson, J.B. &
sus	SO	"Specifically yagcar trees [= <i>B. frereana</i>] are ideally exploited for a period of about ten months, starting from the end of August or early September until June of the following year. During this period, the trees are visited or tapped 12-13 times."	8894	Hall, A. (12.2.2005): Viability o
sus	SO	[non-species-specific information for <i>B.sacra</i> & <i>B.frereana</i> in Somaliland]: "A variety of procedures are used to temporarily increase resin yields of frankincense trees. It is not the case that harvesters are ignorant in their practices; usually they know what they are doing will damage the tree."	8894	
sus	SO	[non-species-specific information for <i>B.sacra</i> & <i>B.frereana</i> in Somaliland]: "Regulation of tapping cycles is extremely important. Failure to conform to the rhythm could adversely affect production. The initial five or three tapping cycles in the exploitation of yagcar and moxor species are known as the preparatory cycles. Yield is relatively low, and the resin quality is poor compared to later cycles. Nevertheless, these cycles are necessary to stimulate the trees for increased production in succeeding peak cycles."	8894	
tra		[non-species-specific information for <i>Boswellia</i> & <i>Commiphora</i>]: "Somalia and Ethiopia are by far the biggest producers of the three resins [...]. Somalia is the only source of maidi-type olibanum, exports of which were estimated at 800-900 tonnes in 1987. Smaller quantities of the "beyo" type of olibanum are produced. Ethiopia and Sudan produce the most widely traded olibanum, the Eritrean type, and in 1987 this was reckoned to amount to some 2,000 tonnes."	4187	Coppen, J.J.W. (1995): Flavou
tra	IN	Estimated annual trade: <10 metric tonnes	3221	Goraya, G.S. & Ved, D.K. (201
tra	SO	[non species specific information] „The best figures currently available on global trade of Frankincense resin were released by the Food and Agriculture Organization (FAO). FAO estimates world trade in 1987, for Somali <i>Boswellia</i> as: 800 tones of <i>B. frereana</i> and 200 tones of <i>B. carterii</i> . Thus Somaliland produces approximately 1,000 tons of resin per year."	3784	DeCarlo, A. & Ali, S.H. (2014):
tra	SO	[non-species-specific information for <i>B.sacra</i> & <i>B.frereana</i> in Somaliland]: "The natural gum industry [...] is officially the third most important source of foreign exchange through exports, following livestock and bananas."	8894	Hall, A. (12.2.2005): Viability o
tra	SO	[non-species-specific information for <i>B.sacra</i> & <i>B.frereana</i> in Somaliland]: "The total estimated value for frankincense and gums annually exported from Somalia in 1994 was USD 15.6 million [...]. The estimated overall production was 1,000 tons per annum. Export volume, including no less than 500 tons of valuable chewing grades, is estimated at 800-900 tons."	8894	
tra	US	"sold in this country"	6369	McGuffin, M., Kartesz, J.T., Le

Legislation

Regulation

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ICC = ISO Country Codes Ref = literature reference

Altitude: Low / High = minimum and maximum limits of altitude range [m]

Legislation: Source Taxon = name of taxon as contained in legislation

Utilization: TypeUtil

<i>TypeUtil</i>	<i>TypeUtilLong</i>
com	commodity
cul	cultivation
exp	export
har	harvest
imp	import
man	management
price	price
rem	remark
socu	socio-cultural significance
sus	sustainability
tra	trade
trend	trend and scale of trade

Distribution Status: Standard

<i>Status</i>	<i>Explanation</i>
chk	check entry
nat	native
int	introd., established
adv	introduced, not established
ocd	occurrence doubtful
unc	status unclear
ext	extinct
cul	cultivated
sou	source doubtful
ica	introduced (casual or naturalized)
don	doubtfully native
pex	(presumably) extinct
ali	casual alien
nzd	naturalized
nna	not native
dpn	status doubtful, possibly native
abs	absent but reported in error

Common names: Type

<i>TypeShort</i>	<i>Type</i>
?	<unknown>
ayn	ayurvedic name
hom	homoeopathic name
pha	pharmaceutical name
scn	standardized common name
tra	trade name
ver	vernacular name

Ecology: TypeEcol

<i>TypeEcol</i>	<i>Explanation</i>
alti	altitude
grow	growth rate
habit	habitat
morph	morphology
regen	regeneration
repro	reproduction