

Trans-boundary conservation of dragon tree come as part for establish the regional Dragon tree conservation consortium in North Africa and south West Asia:

Dragon tree land project

Dracaena ombet status survey in Erkowit Mountains in East Sudan

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1.1. Project : introduction:

Dracaena ombet is globally endangered tree (EN) it known as dragon tree, is a flagship for Afromontane ecoregions, its populations in Hargeisa area in Somaliland; Goda & hemed mountains in Djibouti, Erkwit in Sudan, Gabel Elba in egypt, Asir mountains in Saudi Arabia, Bora mountain in Yemen, Bale mountain in Ethiopia are threatened. Is under rapid decline due to climate change & habitats degradation. No data or information known about this species in the horn of Africa countries. About 65% of its populations in Egypt and Sudan vanished within the last 20 years.

The action-oriented initiative for conserve this species is initiated by young egyptian conservationist since 2004, which in 2007 and with support form the Conservation leadership program, an egyptian rangers team conducted the first ever comprehensive survey for the dragon tree in Gabel elba in south east Egypt. results indicated that ombet tree lost is 60% of it populations in this area along the last 20 years or more.

This phase that started from 2012 till 2015, and with support from [Rufford Small Grants](#) and [Mohammed bin Zayed Conservation Fund](#) aims to extend assessment of the dragon tree in Djibouti and Somaliland as the centre of the Horn of Africa international hotspot and also as it the western outliers of the Afromountain international hotspot which including about 2,750 endemic plant species an about 5000 plan species found there. The Horn of Africa is one of the most degraded hotspots in the world, with only about 5 percent of original habitat in relatively pristine condition.

Depends on our previous experience with monitoring the Dragon tree in Egypt, we will initiate a monitoring program in the project areas with cooperation of local NGOs to prepare conservation action plan for the species and its habitats in the same time provide training and experts linkages for local NGOs for further conservation action.

Main project objectives:

To assess the Dracaena ombet conservation & threats status in north and east africa; prepare a GIS-maps for its distribution & suitable habitats; by collates field data, interview local community and working with local NGOs and regional partners from Egypt.

To contribute for strengthen the capacity of NGOs, parks rangers & stakeholders in Somaliland & Djibouti in monitoring & conservation of D.ombet, through participation in the project, training on monitoring and mapping to develop their skills and experience and link them with international expertise in filed of plant conservation

To increase international, regional and national awareness of value of Dracaena ombet; by public awareness activities & community participation

in the project works and support Local school in Field of conservation education.

To build a *Dracaena ombet* regional conservation consortium include Djibouti, Somaliland, Egypt and Sudan, by conclude a collaborative agreement with key NGOs & stakeholders; & prepare a project proposal to fund assessment of *D.ombet* in East & North Africa countries.

To prepare a Regional *D.ombet* Conservation & Action Plan, to strength the global Strategy of Plant Conservation and to update the *D.ombet* status in the IUCN Red List on regional and global level. To establish a website to act as "Dragon tree Online conservation forum and monitoring resources facility"

1.2. Species:



Dracaena ombet is globally endangered tree (EN) it known as dragon tree, is a flagship for Afromontane ecoregions, its populations in Hargeisa area in Somaliland; Goda & hemed mountains in Djibouti, Erkwit in Sudan, Gabel Elba in egypt, Asir mountains in Saudi Arabia, Bora mountain in Yemen, Bale mountain in Ethiopia are threatened. Is under rapid decline due to climate change & habitats degradation. No data or information known about this species in the horn of Africa countries. About 65% of its populations in Egypt and Sudan vanished within the last 20 years.

NUBIAN DRAGON TREE classification

Common Name: Nubian dragon tree
Scientific Name: *Dracaena ombet*
Categories: Timber, Medicinal
Conservation Status: Endangered - EN A1cd

Global Assessment Information based on the IUCN Red List (2007)

Red List Category & Criteria: EN A1cd ver 2.3 (1994)

Year Assessed: 1998 , Assessor/s: World Conservation Monitoring Centre

History: 1978- Vulnerable/Endangered (Lucas and Synge 1978)

1997- Vulnerable (Walter and Gillett 1998)

Why is this species important

This is one of the few species that can survive the extensive periods of drought in all parts of its range and is likely to therefore be an important part of the desert ecosystem. The mature fruits are eaten and, if similar to other species, the sap and fruit may also have medicinal properties.

Why this project:

The species was once widespread but overgrazing and droughts have contributed to a marked decline in living memory. There are few studies into these losses so exact reasons are unknown. Surveys in 2007 in Egypt indicated that the species is experiencing rapid decline particularly from climate change and habitats degradation - about 65% of its populations in Egypt has vanished in the last 20 years.

Globally there is lack of information about *Dracaena ombet* tree, which inside their distribution range there is a few previous activities mainly focuses on *Dracaena ombet* status, this alters to a deficient of information which needed for more effective conservation action for this endangered species worldwide. We build our project proposal depending on vision towards contribution in assessment this species and support its conservation action, so here we attempt to collect, gather and organize the related available information about *dracaena ombet* and its habitats on the international level. Gathering and understanding the available data about this species globally could help in conduct a global assessment for the species, as same as could help us locally for more understanding for nature of this species and the threats that faces it.

1.3. Methodology of work and history:

1.3.1. Site of work :

Erkowit (there are various spellings) is situated in the Red Sea Hills about one hour south of Port Sudan. The erkwoit plateau lies at the edge of a steep escarpment dropping abruptly 600m to the red sea plains. At the northern boundary are jabel Nakee 1176 m and jabel essit 1143m. the two jabels drop to khor dahand which separate the erkwoit oasis from barren hills on the other side of the khor. At the eastern boundary is jabel sela, which the highest evergreen mountain in the area, at the southern boundary are jabel tatasi 1190m, jabel lagagribab 1209 m , jabel auliai 1191 m and jabel erbab 1523 m . The plateau and the hills are built of basement complex rocks ; gneiss, basalt, granites, shales and marble, with khors (ephemeral water ways) dissect the plateau, usually contains alluvial deposits. Although receiving more moisture than the lowlands, most of the plateau was quite dry with scattered trees and bushes

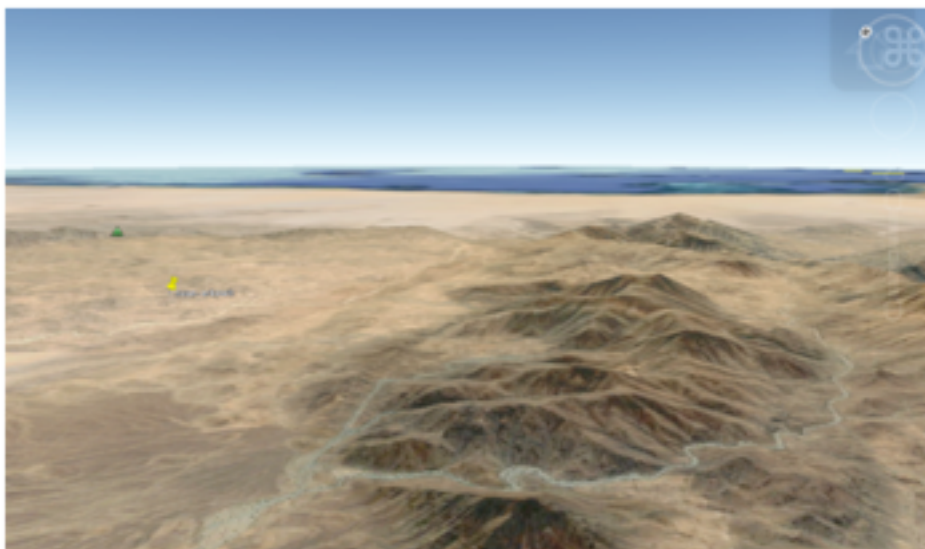


map of Sudan show the location of erkowit mountain

Ciimate

The northeast part of Erkwoit, which comprising the hilly region of the Erkowit mountains province, is on the fringes of the seasonal influence of the moist southerly winds, blowing mainly in July and August.

“Frequent drought and famine conditions in the Red Sea hills has been the norm during the 20th century. Since the long drought of the 1980s their has been little evidence of the traditional pattern of natural short-term recovery and resilience”.

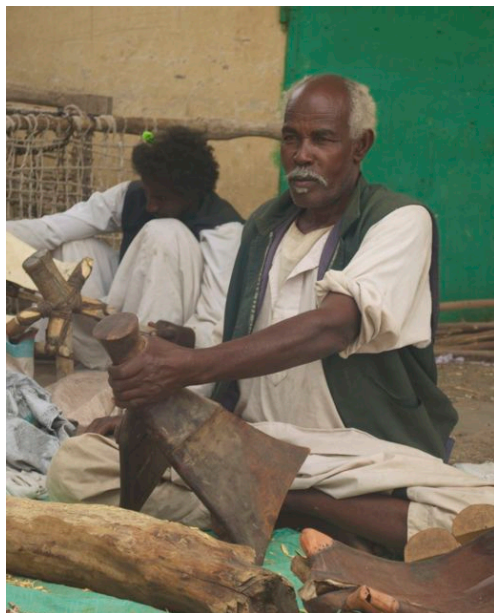


map show the location of Erkowit massive and how it face the coastal lines of red sea.

Local community and history:

The area of the project inhabits by The Beja people, are an ethnic group inhabiting Sudan, as well as parts of Eritrea, Egypt, and the Sahara desert. They speak the Beja language as a mother tongue, which belongs to the Afro-Asiatic family. The Beja people are an ancient Cushitic people closely kin to the ancient Egyptians, who have lived in the desert between the Nile river and the Red Sea since at least 25000 BC. The Beja word for their language is To Bedawie (or To Bedawiat), and the people and language are also called Bedawiye

They still follow a nomadic lifestyle centered around herding. They raise a wide range of animals; cattle, goats, sheep, donkeys and camels. They are best known as camel traders, moving up and down the Red Sea area from Egypt to Eritrea. They also maintain food crops, usually farmed for them by West Africans engaged for this purpose. They also trade their crafts of straw mats and wollen rugs or charcoal and firewood for food in the markets. Some Beja groups are more nomadic than others. The more nomadic do not have permanent homes and carry few possessions, but they live in hemispherical or rectangular tents made of straw mats laid over a wooden frame. The more sedentary Beja build mud-walled houses with more furnishings.



Suakin....the story of old ports on red sea:

Suakin or Sawakin (Arabic: Sawákin) is a port in north-eastern Sudan, on the west coast of the Red Sea. Suakin was the height of medieval luxury

on the Red Sea. Suakin was likely Ptolemy's Port of Good Hope. Suakin was first mentioned by name in the 10th century by al-Hamdani, who says it was already an ancient town. At that time, Suakin was a small Beja settlement, but it began to expand after the abandonment of the port of Badi to its south. The Crusades and Mongol invasions drove more trade into the region: there are a number of references to Venetian merchants residing at Suakin and Massawa as early as the 14th century.

In 1517, the Ottoman sultan Selim I conquered the port, Under the Turks, Suakin declined sharply, as the Portuguese explorers discovered and perfected the sea route around Africa: when the Ottomans were unable to stop this trade, the local merchants began to abandon the town. Some trade was kept up with the Sultanate of Sennar, but by the 18th and 19th centuries, the Swiss traveler Johann Ludwig Burckhardt found two-thirds of the homes in ruin.





1.3.2. Methodology standardization and field logistics:

Before conducting a fieldwork, we met with some experts from Sudan as well as some locals to arrange with them the appropriate community introduction and discuss logistics organization. Then with participation of a community guides we standardized and improved our methodologies depending on available equipment's, survey requirements and the nature of the study area. The field survey team was organized into one group, which the group included Usama Ghazali, team leader, Abu baker Mohammed , national expert, Mohamed Amin, wildlife service guide, Mostafa, Community guide.

1.3.3. Pre-filed work protocols



(Participatory eco-geographical D.ombet distribution mapping and analysis) Before starting a field work we conducted a simple eco-geographical exercise with the local community. The goal of this work is ' for ensuring coverage all the distribution range

of dracaena in the same time to integrate the available data about D.ombet distribution with a gathered TK form community guides and locals, and also decreasing the area of search for more cost effective. During this exercise first we prepared a Google earth map with potential sites for ombet based in some literature, and we conducted interview and open discussion group with some local community members, worked with locals for screening the area map, as results for a discussion and a participatory analysis we get a good information about a potential distribution range of D.ombet inside Erkowit area and name of hills where the tree historically observed in the last 10 -15 years.



1.3.4. Para-professional training and Researches Action Participation Protocols”

Towards empowering local people and support their role in monitoring and conservation of Erkowit biodiversity especially the endangered species, the community guide not only guide us for search and record the ombet trees, but also join an on-job training during the survey, which we trained them in using the digital camera photography for monitoring the tree healthy status for take photography for the site, tree, branching status, as well as start using GPS for recording the trees locations. Also assess it healthy status by measure and scaled the current threats such as `grazing, drought effect and human impacts such as charcoaling or tree cutting. The objective of this training to contribute in strengthens community capabilities to lead monitoring in future.

1.3.5. Active search a long elevation belt (Prospecting)

The main objective for this survey is to document the presence and distribution of the *Dracaena ombet* species within and among the potential areas for its distribution, and to drawn up a full distribution for *D.ombet*, assess its population status and detect the locations og the tree for each population as appropriate. The study was conducted in Erkowit mountain (altitudinal range 1100–1450 m).



The population status of *Dracaena ombet* was documented through extensive field survey and all the detected ombet trees were counted in each population and each tree was geographically marked with global positioning system (GPS). Phenological observations were made and notes were compiled on vegetative as well as reproductive events. For each tree the following attributes were assessed and measured: tree trunk DBH, tree trunk height, branches height, branches style, fruiting branches and the grazing/human impact. For assess and ranking the trees based on its healthy status, we used an illustrated guide sheet that prepared by the project team (figure 10), which we measured and scaled the tree branching style and status, trunk status and leaves status. Inside each study site 5 quadrates of 400 m² size, were laid randomly in and around *D.ombet*. Individuals for estimate its density and for recording associated woody plants.



1.4. Results:

1.4.1. Populations survey and short term monitoring results

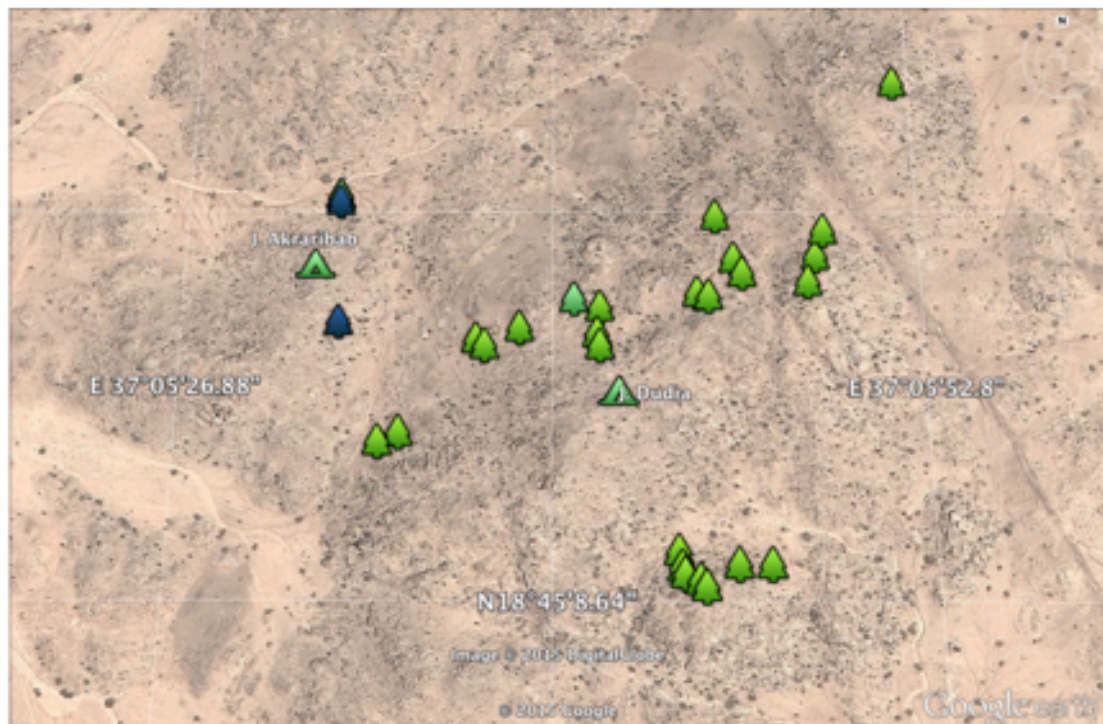
Main observations:

- The team has completed the *D.ombet* survey and populations assessment, the results of this phase has been indicated that:
- This flagship species has a fragmented distribution with different subpopulations showing varying degrees of vigor.
- Survey results for the first time found anew locations for the *Dracaena ombet* distribution in the granite Erkwoit mouniatin on Akribaba hills.
- Dracaena ombet* observed within 10 localities, which 7 locations/population have been completely surveyed and the other 1 region have been explored for more further survey work , while 2 sites not accessible and entry is restricted due to security measures, these areas

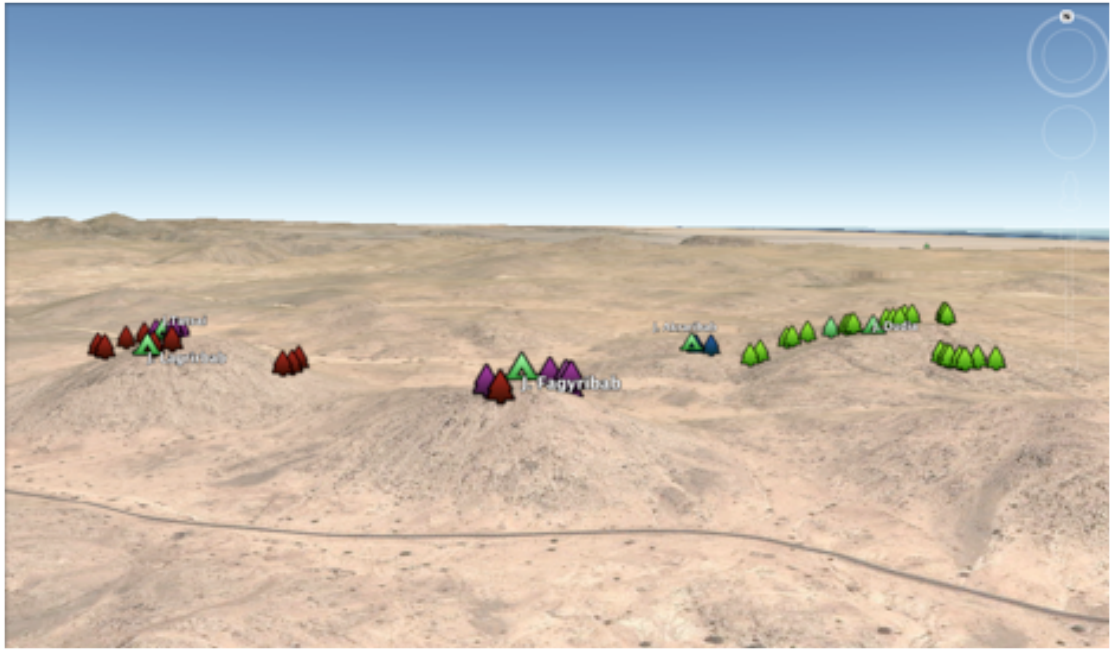
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1.4.2. Populations size and distribution:

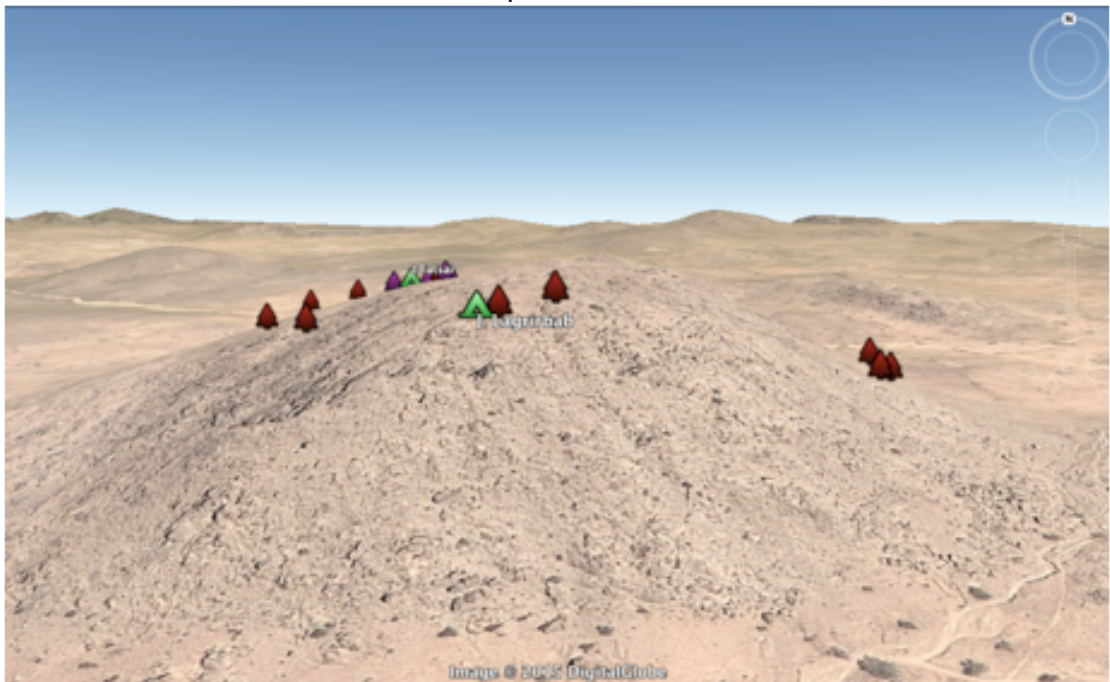
Site name	Code	Population size	Site name	Code	Population size
Jabel erbab	ERBB	1	Jabel el sit	JEST	0
Jabel Aoulinia	AULB	?	Jabel bilaitteek	BLTC	11
Jabel lagagribab	LGRB	7	Jabel akhribab	AKRB	3
Jabel fageribab	FGRB	6	Jabel dudyay	DDIA	25
Jabel tatasai	TTSI	8	Okoam Wahadel	OKHD	?
Total population size observed	61 tree of <i>Dracaena ombet</i>				



map for the spatial distribution of observed population of *D.ombet* in Erkwoit area



map for the spatial distribution of observed population of D.ombet in terrain map of Erkwoit area

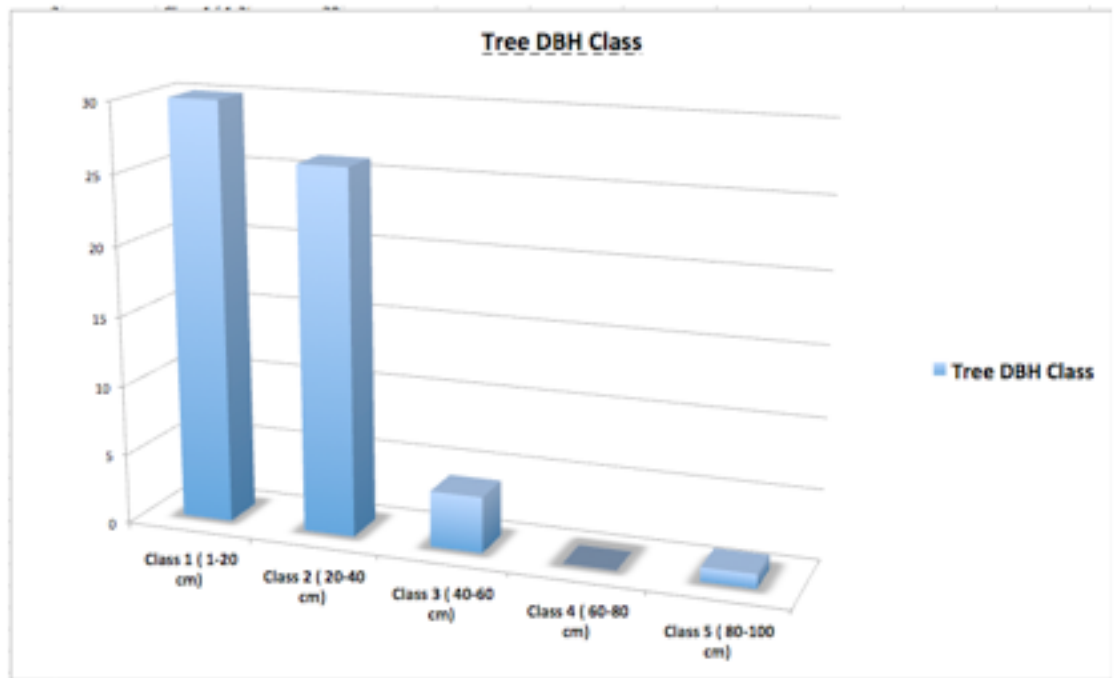


map for the spatial distribution of observed population of D.ombet in terrain map of Lagribib in Erkwoit area

- D.ombet's Populations in erkwoit grow at elevation range from 1100 to 1250 meter above sea level .
- In general all the D.ombet tree sub-populations marked by a bad age structure inside its distribution range on erkwoit Mountains, which there is no present for old tree expect in Erbab mountain, only one tree, but with good signs of regeneration observed during the filed survey, most of the trees considers as juvenile/young trees with trunk less than 50 cm in diameter and 1.5 m height,
- The best Dracaena woodland was detected on Dudai mountain, which has a good abundance (19 trees), followed with area of tatasi-granite massive which include about (12) tree.
- The other population in akrarbib hills found there as relict populations or as isolated individuals (2 tree).
- All the D.ombet trees woodlands and regenerations took place at the Eastern and Northern and eastern parts of the erkwoit mountains, which in northern parts the Northeast dominance wind can blow and summer rain fall. No trees found or historical known in at the western or the southern slopes of the Mountain, where the climate is different from the eastern parts. Which the climate of western parts of the mountains considers as part of Sahara climate (hot and less exposures for rain or moisture)

1.4.3. Regeneration and seeds dispersal

- About 40% of trees found as young seedling, it seem is sprouting form old tree, it mean that after the death of old tree, the root system and the abover soild parts of the tree trunk promoted for reproduction vegetative to give new generation (this note need further study as is very important for conservation of the species, so can help for promote its vegetativly reproduction as the seeds and fruits is very rare under current harsh climate conditions)
- So based in figure 2 below, we find, that 49.18% of trees are young trees, belong to DBH Calss 1 – DBH 1-20 cm in diameter, this mean it ranging from 5-10 (15) years of age.
- while 42.62% belong to calss 2 – DBH 20-40 cm in diameter, this mean it ranging in age from 10-20 (25) years.
- 6.56% calss 3 – DBH 40-60 Cm in diameter, this mean it ranging in age from 20-30 (35) (20) years.
- While no trees, 0 % within calss 4 – DBH 60-80 Cm in diameter, ranging in age from 30-40 (50) (20) years.
- only one tree, = 1.64% within calss 5 – DBH 80-100 Cm in diameter , it ranging in age about 100 year years.



- The team observed only one tree with fruits, it seem from the last year fruiting season, while our field survey results indicated that the ombet seeds seems to have a long dormancy period and high viability period, which enable the seed to stay underground for longer periods and only grow when there are favorable climatic conditions, the same like in Elba mountains in south Egypt.
- The same situation like in Elba mountain in Egypt, As all the D.ombet grows at high altitudes at hard slopes, it also seems that the seeds in usual are not the kind that can be transmitted by animal, like acacia as example that have a high rate of germination as after transmitting by camels in this area.. This can indicate that may be the ombet seeds transmission happened by some kind of residents wild birds in this area or/and, water and wind. Very important findings is the Raven birds (Fan-Tailed Raven) observed fly and stay of top of all the areas of ombet woodland, " local community in gabel elba, stated that these birds like the ombet seeds and it observed eat its seeds at the fruiting seasons in the past". This can lead that may be there is possibilities that these birds acts as a main transmitting agent for the ombet seeds.

1.4.4. Healthy status classes:

- Based on the survey methods and results, we divided the ombet trees healthy status into 5 classes/grades based on the tree vigor status: very Good Healthy (80-100), good healthy (60-80), moderate healthy (40-60), (20-40) , server (1-20%) , so the Dead trees (= 0).

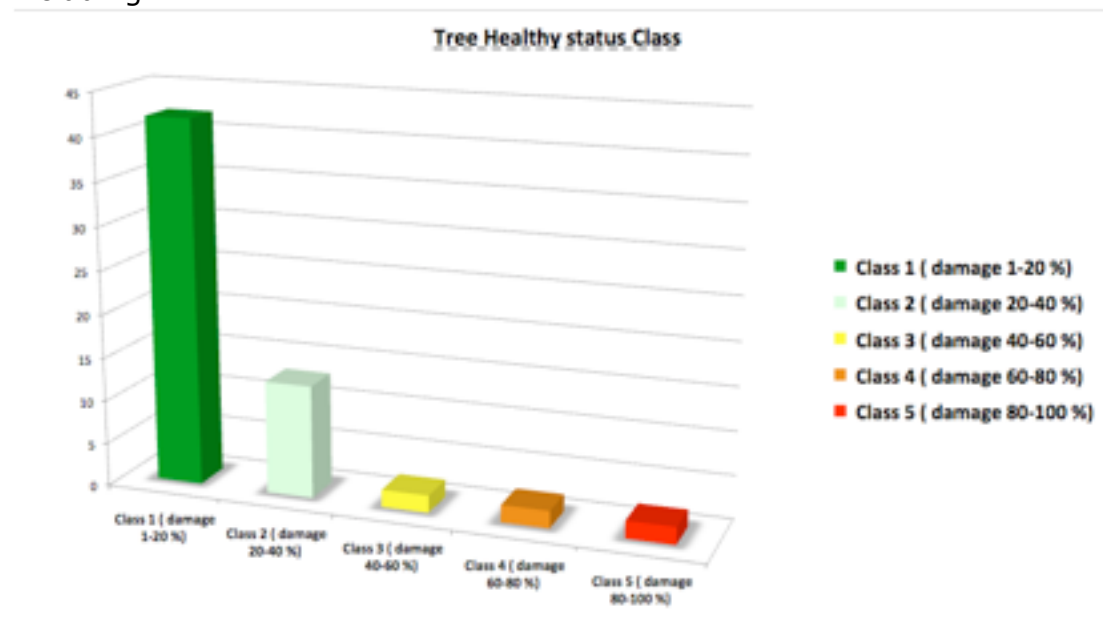
So based in figure (3), 68.85% of trees is with very good healthy or within class 1; while 21.31% is good healthy (class 2) ; and 3.27% are moderate status (class 3), while 6.54% are sever with bad healthy status (class 4,5)

1.4.5. Population boundaries and coverage:

1.4.5.1. D. ombet's Extent of Occurrence (EOO) in Sudan:

Depending on the IUCN (IUCN 2001), Extent of occurrence is defined as the area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred or projected sites of present occurrence of a taxon, excluding cases of vagrancy. Extent of occurrence can often be measured by a minimum convex polygon (the smallest polygon in which no internal angle exceeds 180 degrees and which contains all the sites of occurrence). Depending on the results of the population's survey and mapping activities, we measured the current EOO for the *Dracaena ombet's* sub-populations in Erkwoit, which we estimated this area as following:

- including all the cases of vagrancy and the closest populations, this including



Erbab mountain's population. For that and as maps 2 show, the EOO for *D.ombet's* populations is equal and came among 4.70 sq km, which represents about 0.6% of the whole suitable erkwoite massive total area (= about 700 sq km) (include all thhe mountain massive with northern border at Gabel el set, and 0.18% of the total area of proposed Erwoit Protected Area (= 2500 sq km) (northern border in east is suakin town, and in north west is Sinkat town, in south east is red sea coast, and in south west borders is the erkowit mountain west limit).



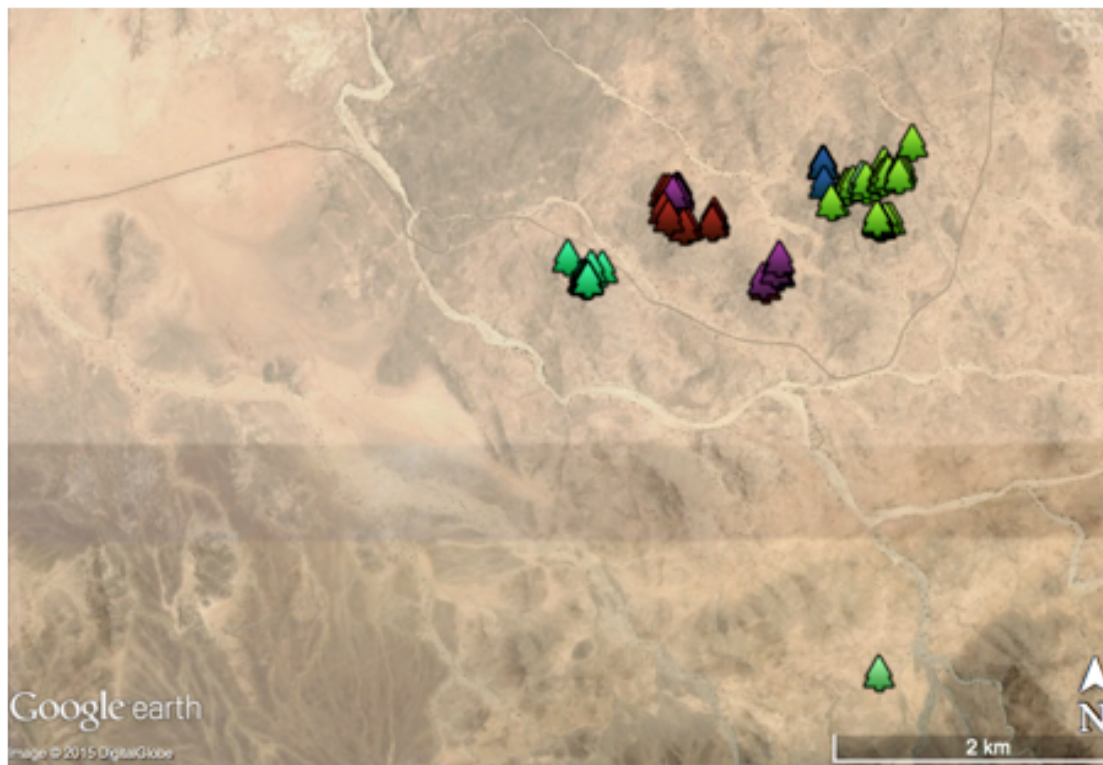
map for the spatial distribution and extent of occurrence of observed population of *D.ombet* in terrain map of Erkoit area

1.4.5.2. *D.ombet* Area of Occupancy (AOO)

Area of occupancy is defined as the area within its 'extent of occurrence' (see above) which is occupied by a taxon, excluding cases of vagrancy. The measure reflects the fact that a taxon will not usually occur throughout the area of its extent of occurrence, which may contain unsuitable or unoccupied habitats (IUCN 2001). The size of the area of occupancy will be a function of the scale at which it is measured, which here for accurate AOO estimation, we need more accurate mapping scale, which should be at a scale appropriate to relevant biological aspects of the species, the nature of threats and the comprehensiveness of the available data. Thus to avoid bias and to estimate a relevant AOO, we need to estimating area of occupancy at different scales.

For that in case of *D. ombet* populations' available data, and based on the produced ombet trees distribution map, that included a GPS record for each tree based on its geographical location, we measured the AOO using a Grid technique, which the distribution map for the species divided into equal grids depending on the used scale. For this we used 3 different scale Grids system: at 25.92" second (grid area = 0.6 sq km), 12.96 seconds (grid area = 0.15 sq km), 6.48 seconds (grid area = 0.04 sq km). As the table below shown, there is a different estimated AOO for the same population at the different scales; this return for the used Grid/scale which at small grid/scale reveals more areas in which the taxon is unrecorded. Conversely, coarse-scale mapping/large grid reveals fewer unoccupied areas, resulting in over-estimation that is more likely to be or accept.

	GRID 1		GRID 2		GRID 3	
	Scale	25.92"	Scale	12.96"	Scale	6.48"
	area sq km	0.6	area sq km	0.15	area sq km	0.04
Site Name	Grids No	Area sq km	Grids No	Area sq km	Grids No	Area sq km
Jabel erbab	1	0.6	1	0.15	1	0.04
Jabel lagaribab	2	1.2	4	0.6	5	0.2
Jabel fagaribab	1	0.6	2	0.3	3	0.12
Jabel tatasi	1	0.6	1	0.15	1	0.04
Jabel belatic	2	1.2	2	0.3	3	0.12
Jabel akhribab	1	0.6	2	0.3	2	0.08
Jabel dudia	2	1.2	4	0.6	8	0.32
Total		6 sq km		2.4 sq km		0.92 sq km



map for the spatial distribution and grid scale of observed population of D.ombet in Erkwoit area

As we used finer scale (smaller grid area) as we can get results reflects the facts on ground, and can used for assessment the status of the threatened species.

These results indicate that:

In case of the current recorded populations

At 25.92" second scale (grid area = 0.6 sq km, D.ombet populations occupied about 6 sq km, which this represents about 0.85% of the total Erwkoit massive `s habitats estimated area (=700 sq km)

While at 12.96 seconds scale (grid area = 0.15 sq km) D.ombet populations occupied about 2.4 sq km, which this represents about 0.34% of the total area.

While at 6.48 seconds (grid area = 0.04 sq km), D.ombet populations occupied about 0.92 sq km, which this represents about 0.13% of the total area.



Next step:

- Complete the survey in Sudan
- Start the D. ombet woodland survey in Somaliland

- Present the result in Society for conservation biology conference in Montpellier in France in august 2015
- Prepare a documentary film about D.ombet and its habitats (we already received offer from Silverback Films to include the ombet as part of their movie "the fragile planet").

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- Final report and Update the status of D.ombet in the IUCN red list

- **Reference:**

GHAZALI, U., EL BAILY, H., DORA, A., ARKEEB, H.H., AOUD, M., OSSMAN, G. et al. (2008) The Globally Endangered *Dracaena ombet* Monitoring and Assessment Project in Gabel Elba Protected

KASSAS, M. (1956) The Mist Oasis of Erkwit, Sudan. *Journal of Ecology*, 44, 180–194.

SOS Sahel International UK, Sudan Programme, Feasibility Study Report on Conservation of the *Dracaena ombet*, the Red Sea Hills, Sudan, unpublished report 2003.

Wikipedia, the Suakin port, sudan , www.wikipedia.org

Some photos for example of fauna and flora recorded in the study area (identification will be mentioned in final report)

Fauna images : by Abu Bakar Mohammed









