Final Report

Ecological and Conservation Assessment of Rosa arabica in St Katherine-Egypt

01252115

Edited by: Dr. Karim Omar (Team Leader)

Abdullah Nagy 2015

Project Title:	Ecological and Conservation Assessment of Rosa arabica in St Katherine- Egypt
Project ID:	1252115
Project period:	2015-2016
Target Area:	St. Katherine Protected Area, South Sinai, Egypt
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Table of Contents

Acknowledgements

We would like to thank and express our sincere appreciation to the Conservation Leadership Programme (CLP) with all its partner organizations for giving us the opportunity to do our part in conservation. It was a very good learning experience for us, which will help us a lot in our future careers. We would also like to take this opportunity to thank the CLP team for providing us with the necessary advice and assistance whenever we needed it. I would like to extend my thanks to all those who contributed time, suggestions and support during the planning, research and writing of this work. I am personally indebted to:

Prof. Dr. Francis Gilbert Professor in Faculty of Medicine & Health Sciences, School of Biology, University of Nottingham, UK for his continuous valuable advises during this work. Eng. Mohamed Kotb General Manger of Saint Katherine protectorate for his honest support. Special thanks for fruitful advices from Prof. Dr. Townsend Peterson, Distinguished Professor, KU Department of Ecology and Evolutionary Biology.

Deep thanks due to Prof. Dr. Moustafa Fouda the Minister Advisor on Biodiversity, Nature Conservation Sector, Egyptian Environmental Affairs Agency (EEAA) for his encouragement and total support during the hard times.

Special thanks are due to my Team for their support and encouragement during this study. We would like to express our sincere thanks towards volunteer researchers whose devoted their time and knowledge in the implementation of this study: Mr Ibraheim Elgamal, Dr. Allaeldein Sayed, and Mr. Amir Shalouf. I would like to thank with all the love our professional Bedouin guide Seleim Mehana for his hard work and professionalism within our fieldwork in St. Katherine protectorate.

I would thank my parents, my wife my sweet daughter Laian, and my brother for their encouragement and fruitful support during this study. At the final, big thanks and much appreciated to all whose learn me the way for good thinking, working smart not hard inside, and outside Egypt.

Karim A. Omar

SECTION 1:

Summary:

Rosa Arabica is an endemic to the St Katherine Protectorate (SKP) in southern Sinai, Egypt. This species face many threats than may lead to its extinction in the future. The project objectives are to: 1- assess the current conservation status of R. arabica within SKP boundaries and to clearly identify conservation priorities, suitable habitats for growth and suggest appropriate strategies for conservation by in situ and ex situ techniques, 2- study its reproductive ecology to assess whether regeneration is adequate, 3- Identify and rank the various threats, and try to identify their underlying root causes and barriers to solutions, and 4- raise awareness about R. arabica in SKP among school students and rangers. From June 2015 to date the team success to determain the geographical distribution, population characteristics, habitat and ecology, uses, threats, and conservation status based on IUCN Red List Categories and criteria. Acourding to the collected data the species listed as Critically Edengered. With the help of local communites we identifed the major threats on the target species, root causes extracted and soulution sugessted.

INTRODUCTION

It is clear that the loss of biodiversity has serious economic and social costs. The genes, species, ecosystems and human knowledge that are being lost represent a living library of options available for adapting to local and global change (UNEP, 1995). Environmental deterioration in arid ecosystems due to unmanaged human activities including harvesting of vegetation for fuel and medicine, overgrazing, urbanization and quarrying is evident in a decrease of plant cover, deterioration of soil productivity, and aggravation of soil erosion (Batanouny, 1983). Damage to vegetation and the soil surface and in arid lands is not easily repaired (Milton et al. 1994). An accurate picture of the status of plants and the trends that are impacting on them is difficult to determine. Indeed, we do not yet know the exact number of plant species in the world (estimated currently at 370,000 known species). However, it is predicted that as many as two-thirds of the world's plant species are in danger of extinction in nature during the course of the 21st century.

Extinction and declines in plant diversity are due to a range of factors, including population growth, high rates of habitat modification and deforestation, over-exploitation, the spread of invasive alien species, pollution and climate change. The Millennium Ecosystem Assessment noted that approximately 60% of the ecosystem services evaluated are being degraded or used unsustainably (www.milleniumassessment.org). The degradation of ecosystem services often causes significant harm to human well-being and represents a loss of a natural asset or wealth of a country.

When the environmental factor changes beyond a certain level; plants try to adapt. Adaptation is any morphological, anatomical, physiological or behavioral feature, which favour results from some environmental pressure to increase the ability of an organism under changing environment and favour the success of an organism in a given environmental condition. A given population shows different levels of tolerance to a given limiting factor over its geographic distribution. Such locally adapted populations are called ecotypes, which may have developed due to genetic changes resulting in different responses to varying environment (Agrawal, 2005).

An important consequence of the sedentary lifestyle of plants is that they cannot escape from the environment in which they grow or from any changes in this environment. To cope with this, many plants are able to alter one or more morphological characters in response to both abiotic (e.g., climate and weather) and biotic (e.g., grazing and competition) factors of the environment with a potential effect on resource acquisition. For example, leaf size and leaf area of many alpine plants change with altitude (Meinzer et al., 1985; Ko¨rner et al., 1989; Galal, 2011 and Omar et al., 2012), and some arctic plants may produce more or larger leaves during warmer summers than during colder ones (Havstro¨m et al., 1995; Stenstro¨m and Jo´nsdo´ttir, 1997). Knowledge of how ecologically important morphological characters vary within the distributional range of plant species, as well as the underlying control mechanisms for such variation, is essential to understand how the plants may respond to environmental change (Stenstro¨m et al., 2002).

The area-specific action plan and networking of natural sites has to be considered the most important aspects of in-situ conservation activities. The ecological requirement of many of the species is complex. Hence moving them out of their own area of comfort to new area may sometime prove counterproductive. Hence by improving the protection, removing all kind of threats is one of the important steps towards in-situ conservation. Conservation units are not kept too small because this will cause continuous loss of genetic diversity by

the effects of genetic drift and increased inbreeding. Considering this, the area has to be large enough for maintaining the genetic integrity of the original population and for generating enough seed production (Punjoo, 1993).

Traditionally, protected areas have been seen as the cornerstone of in-situ conservation. Conservation approaches that are more adaptable to individual situations and applicable beyond protected areas, are being increasingly applied (Heywood and Dulloo 2005). Protected areas are the cornerstone of in-situ conservation, as is outlined in Article 8 of the CBD. A protected area network may contribute to conservation targets through the maintenance of target species and their habitats, as well as the conservation of natural or semi-natural ecosystems. There is a however growing awareness of the importance of extending in-situ conservation beyond protected areas (Newmark, 2008, Primack, 2012).

Many of the problems of conservation actions and policies are related to conflicts between actions and processes occurring at different scales. Such is the case of the time periods needed to investigate the life history of an endangered species, or to implement a species recovery plan with regard to the terms of research funding programmes, or conservation actions of the administration, which are tightly dependent on political terms of office (Heywood and Iriondo, 2003). In a similar way, management and economic considerations often restrict the size of protected areas or restoration projects when these should be much larger if purely biological considerations were taken into account (Heywood and Iriondo, 2003).

It is widely accepted today that the primary strategy for nature conservation is the establishment and maintenance of a system or network of protected areas. But as Huntley (1999) points out, in a changing world this is a necessary but not sufficient condition of the successful conservation of biodiversity. Some conservationists believe that efforts to expand and strengthen the global system of protected areas should be redoubled and at the same time dismiss the whole concept of sustainable development of resources as a misguided effort (Brandon, 1997; Kramer et al., 1997; Soule´ and Sanjayan, 1998).

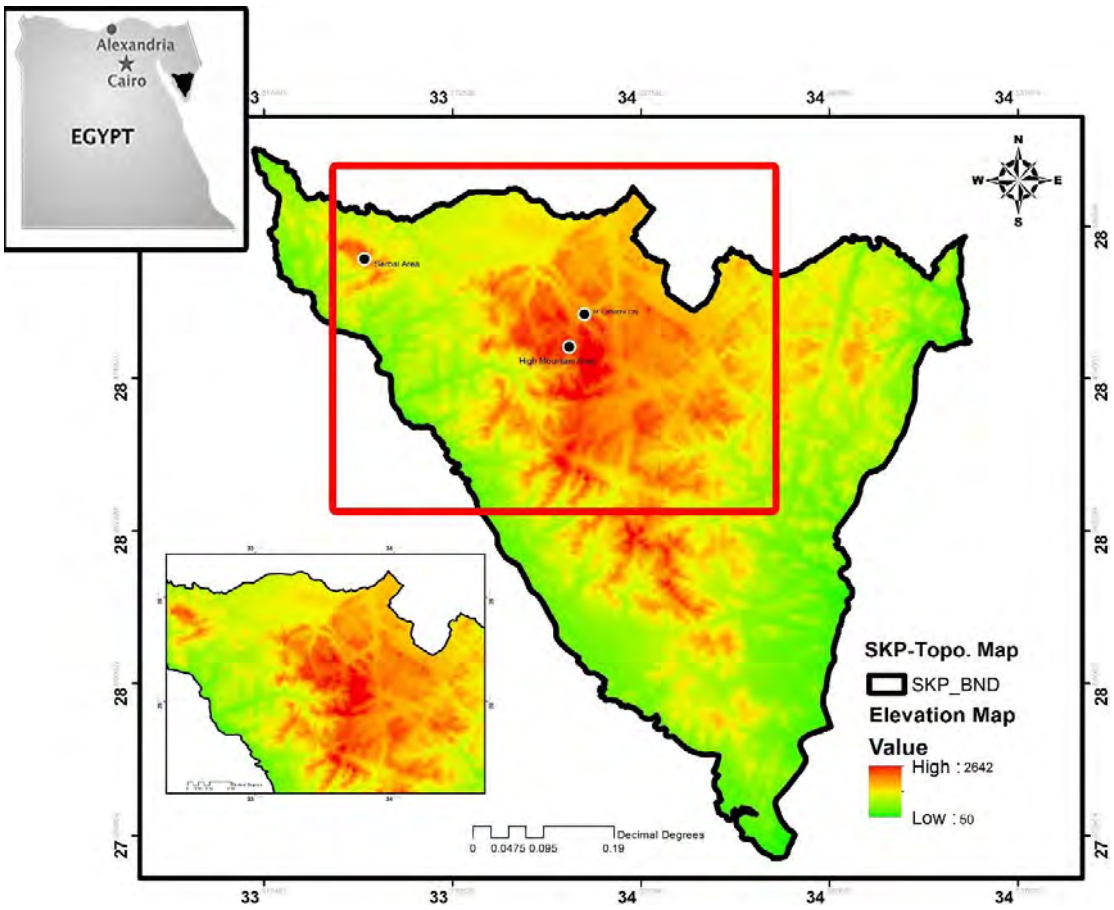
Conservation planning is also essential for effective conservation of plant genetic resources hotspots. Thus, Maxted (2003) indicates ways for efficient, active conservation of plant genetic resources in European protected areas and for identifying gaps in the in situ conservation of key resources for Europe. Decision making is another element, inherent in all stages and areas of conservation, which is directly related to the cost-efficiency of the process.

It can be difficult to determine which areas to restore, what species and/or vegetation communities to target in restoration programs, and what threatening processes need to be mitigated. Plant communities are in fact basic components of the landscape and their extent and arrangement has consequences both for species survival and for ecosystem processes (Heywood and Iriondo, 2003).

The Sinai Peninsular extends over 61,000km^2: it forms a land bridge between Africa and Asia and its flora and fauna have been influenced by both continental masses. Four phytogeographic regions meet and overlap in Sinai; of these the Saharo-Arabian (desert vegetation) and the Irano-Turanian (steppe vegetation) largely characterise the central mountain block, which covers most of the Sinai south of latitude 29o N. and contains the St Katherine Protectorate. This South Sinai massif is an isolated mountainous block composed largely of crystalline rocks and is geologically related to the Precambrian African plate and

the Arabian Shield. The Gulfs of Aqaba and Suez form effective ecological barriers. The crystalline massif is very rough country characterised by the highest mountains in Egypt, a dense wadi system and an arid climate. The central higher mountains constituting the Protectorate form an island of Central Asian steppe vegetation along with Irano-Turanian biota. Sinai's endemic species are largely restricted to this "island" together with relict populations of Palaearctic and Oriental species (SKP Management Plan 2003).

In 1996, Prime Ministerial Decree No. 904 formally declared the St Katherine Protectorate; full protected-area status was given to approximately 4,350km² of largely mountainous terrain in South Sinai. The area includes the highest peaks in Egypt and contains a unique assemblage of natural resources, notably high altitude ecosystems with surprisingly diverse fauna and flora and with a significant proportion of endemic species. The Protectorate has enormous national and international significance but its natural resources and cultural heritage had been placed at risk of serious damage from unsustainable development pressure. The St Katherine Protectorate abuts the Ras Mohammed National Park and the Nabq and Abu Galum Managed Resource Areas along the Gulf of Aqaba. Although the coastal areas are the main attractions for mass tourism development, the St Katherine area is attracting an increasing numbers of visitors (SKP Management Plan 2003).



Map 1. Saint Katherine Protectorate; Elevation Map and zoom in the area of study

The St Katherine Protectorate is an area of great biological interest; it has been recognized by IUCN, as one of the most important regions for flora diversity in the Middle East. It contains about 30% of Egypt's endemic flora and a very high proportion of Egypt's endemic fauna, including butterflies. The dominant flora is that of montane vegetation thinly

scattered over the better-watered mountain peak system and largely made up of Irano-Turanian elements. Twelve main plant communities are recognised dominated by various dwarf shrubs that reflect differences in habitat conditions such as altitude, slope, exposure, geology etc. Serphedium herba-alba is the most prominent floral component of the higher altitude landscapes and is the dominant or co-dominant in almost all communities. Acacia is the physiognomically dominant species of lower altitude wadi communities (SKP Management Plan 2003, Hatab 2009, Omar, 2013). Due to the low rainfall and poor soil development on the extensive bare rock surfaces plant life is largely restricted to the drainage channel (wadi) systems drainage network; as rainfall often results in torrential floods, plant life is more common on alluvium terraces bordering channels. The main threats discerned for vegetation are localised overgrazing, uprooting of plants for fuel or camel fodder and over collection of medicinal and herbal plants for sale.

The number of wild plant species requiring specific conservation efforts is far too numerous to include all of them in conservation programmes (Sutherland 2001). Even within the main groups of target species of economic importance (wild relatives, forest tree species, medicinal and aromatic plants), the number of species to consider is greatly in excess of any reasonable expectation of conservation possibilities. If a conservation strategy depends, as it often will, on the results of ecogeographical surveys and analyses of genetic and biological variation, all of which require considerable investments of time, money and expertise, not to mention any management interventions and monitoring, then effective action will not be possible for most of the species identified. It follows that the selection of target (candidate) species is a key element of any in situ programme. A useful review of the principles of priority setting in species conservation, although in an ornithological context, is included in a recent volume on conserving bird biodiversity (Mace and Collar 2002).

The St. Catherine wild rose, *Rosa arabica* has been listed as one of the world's most threatened species. This species has high medical importance because of substances extracted from its leaves and fruits. This species is severely threatened by both natural (aridity of the area and climate change) and human factors (Over collection, scientific research, and over-grazing). All these factors are pushing *R. arabica* to the brink of extinction. The aim of this study is to assess the conservation status of this species with the help of local community, and to generate long-term conservation plans through a multidisciplinary approach that integrates demography and ecology.

Project members:

1. Karim abdelhai Omar (**PROJECT LEADER)**

Nationality:	Egyptian
Age as of December 31, 2016:	32
Email:	kariemomar@gmail.com
Highest level of education achieved:	Doctorate/Postdoc
Education levels:	Ph.D. in plant conservation (2013) entitle: Using GIS to detect the ecological and geographical status of Hypericum sinaicum in South Sinai, Egypt. M.Sc. in Plant ecology (2010) entitle: Ecogeographical study on Nepeta septemcrenata in South Sinai, Egypt
Work experience:	Minister Assistant on Nature Conservation Sector development. Environmental researcher at Nature Conservation Sector/ EEAA from 2010 to date. Medical Rep. from 2007 to 2009.
Team Role:	Team leader, Fieldwork, Mapping, data entry, analysis, IUCN Red Listing, and reporting
Relevant skills and experience you bring to the project:	IUCN Red List Global Assessor, leadership skills and a willingness, excellent organizational skills, field work experience, ability to communicate, data analysis and reporting, able to motivate others.
Skills and knowledge gained through this project:	strength my ability to communicate with big organizations like CLP, self-development with leadership ability, increase my ability to understand our conservation field, accessing, quality controlling, and statistically analyzing environmental data.
How many years of experience do you have working in the conservation sector (paid employment):	3-5 years

2. Ahmed Abdallah

Nationality:	Egyptian
Age as of December 31, 2016:	32
Email:	ahmed.tpa@gmail.com
Highest level of education achieved:	Master
Education levels:	M.Sc. in plant ecology (2013) entitle: Spatial variation in vegetation structure among wadis in South Sinai, Egypt. B.Sc. (2006) in botany.
Work experience:	Botanist at Taba protected area from 2010 to date.
Team Role:	Field coordinator, soil analysis
Relevant skills and experience you bring to the project:	Good experience in communication with local community, fieldwork experience, adaptability, & flexibility, good organizer for environmental events, work confidently under pressure.

Skills and knowledge gained through this project:	It helped to improve my ability to deal with international conservation topics and how I can extract valuable information about threatened species from simple field data. Beside this, it supported the aim of teamwork that we miss here in Egypt, preparing scenarios of future environmental changes.
How many years of experience do you have working in the conservation sector (paid employment):	3-5 years

3. Gamal Mohamed Aboelftooh

Nationality:	Egyptian
Age as of December 31, 2016:	32
Email:	gamal2006_eg@yahoo.com
Highest level of education achieved:	Bachelor
Education levels:	Bachelor of Tourism Management 2006
Work experience:	Public awareness specialist in Southern Sinai protected areas from 2010 to date. English translator at many tourist sites in Cairo from 2007 to 2010.
Team Role:	Tourism and Public awareness
Relevant skills and experience you bring to the project:	English proficiency, oral communication skills, public awareness experience, awareness, and education for tourists visit the site, collaboration, & teamwork.
Skills and knowledge gained through this project:	Involvement in the cycle of conservation, Judgment negates my ability to move forward
How many years of experience do you have working in the conservation sector (paid employment):	3-5 years

4. Mohamed Abdallah

Nationality:	Egyptian
Age as of December 31, 2016:	31
Email:	mohamed_biology1@yahoo.com
Highest level of education achieved:	Master
Education levels:	M.Sc. in plant ecology 2013. In the topic of plant communities dynamics and distribution. B.Sc. in Botany 2010.
Work experience:	Lecturer at the Faculty of Science, Helwan University from 2010 to date.
Team Role:	Coordinator, Communication with relevant organization (universities, scientific centers)
Relevant skills and experience you bring to the project:	Ability to teach, creative thinking & problem solving skills, quality & carry through, ability to accept responsibility, field scientific background, communication with expert.
Skills and knowledge gained through	Practical field methods, teamwork, collaboration,

this project:	thought of scientific research, and engaged in work with international support
How many years of experience do you have working in the conservation sector (paid employment):	3-5 years

5. Abdullah Mohammed Nagy Abdelgawad

Name:	Abdullah Mohammed Nagy Abdelgawad
Nationality:	Egyptian
Age as of December 31, 2016:	30
Email:	ogalan007@gmail.com
Highest level of education achieved:	Master
Education levels:	European Masters in Applied Ecology (EMAE) University of Poitiers (France), University Kiel (Germany) & University of East Angelia (UK). 2014. Bachelor of Science, major in zoology, Alazhar University 2008.
Work experience:	Assistant lecturer, Faculty of Science, Alazhar University. 2012 to date. Animal Ecologist, Saint Katherine Protected Area, Ministry of Environment. 2009 -2012
Team Role:	Field Work assistance, Data entry & analysis, education activities within university students.
Relevant skills and experience you bring to the project:	Motivation skills, ability to communicate, teaching skills, good creative mind, GIS and IT skills, major practical experience in field work and conservation measurements.
Skills and knowledge gained through this project:	Leadership skills developed, connection to the world leading organizations in the field of conservation enhanced and supported, teamwork, community engagement strategies developed, strengthen my scientific abilities about conservation planning and its implementations.
How many years of experience do you have working in the conservation sector (paid employment):	3-5 years

SECTION 2:

Aim and objectives:

Overall Goal:
Sustain the distribution, diversity, and abundance of wild plant Rosa arabica populations and its habitats in SKP Conservation Regions and to generate long-term conservation plans for threatened species within Egypt.

Project Purpose:
With the help of local community and other stakeholders, we will assess the ecological and conservation status of Rosa arabica within SKP as a first step for entire conservation program.

Aim:
To assess the conservation status of this species with the help of local community, and to generate long-term conservation plans through a multidisciplinary approach that integrates demography and ecology.

Project Objectives & Activities:

- To assess the current conservation status of R. arabica within SKP boundaries by using IUCN Red List categories and criteria and to clearly identify conservation priorities, suitable habitats for growth and suggest appropriate strategies for conservation by in situ and ex situ techniques.
  - Vegetation analysis (community structure, species richness, density, abundance, frequency, cover per meter, size index)
    - Soil analysis (physical and chemical)
    - Geographical and topographic analysis (distribution range, Extent Of Occurrence, Area Of Occupancy, elevation effect, aspect effect and slope effect)
    - Eco-geographical analysis for all data collected during the field study (geographic, ecological, and climatic attribute analysis)
- To study its reproductive ecology to assess whether regeneration is adequate.
  - Morphological study: plant traits within and among populations will be measured, including morphological (internode length, leaves per plant, branches per plant) and reproductive (flowers and seeds) aspects.
  - Demographic study: we will count the number of individuals in each site).
- Identify and rank threats, and try to identify their underlying root causes and barriers to solutions.
  - Hold orientation seminar on in-situ conservation, threat analysis, and threat reduction assessment methodology for the locals & SKP staff to clarify the mission's objective and methodology.
  - Meetings and interviews with locals and other relevant stakeholders to extract information about the threats, its timeline curve, find its root causes and suggest possible solutions.
  - Field visits to record the on-ground threats with the help of local guide.
  - Mapping and ranking the recorded sites affected by these threats.
  - Utilize the Threat Reduction Assessment tool and calculate the predicted TRA index.
- To raise awareness about R. arabica in SKP among school students and rangers

- School visits (trips, stories, and drawing activities)
- Training and field visits for local community guards and young researcher on fieldwork observation, data capture and analysing.
- Meetings with relevant stakeholders to discuss and set a suitable plan for future entire conservation program for the target species (in situ and ex situ).
- Prepare IUCN draft report and publications including a list of all the collected data, analysis, results and discussion, summary, conclusion and recommendation and propose different possible interventions that the project could implement in order to fill the gaps in data deficiency.
- Finally, we will convene validation workshop whereby the key stakeholder's representatives will meet, discuss, evaluate and validate the information presented in the final project report.

Changes to original project plan:

We didn't make any changes to the original project plans. Only minor modifications had done in the area of threat analysis "detailed information (feral donkey's distribution) and extra mapping were add to improve effectiveness of this objective". Number of meeting, workshops, and field training were doubled to improve the data accuracy and benefits to the maximum. All project objectives mostly have been achieved without any problems. As expected, resulting from political instability in Egypt especially in Sinai "Target area" only the educational outreach faced some minor obstacles in the form of scale and publicity range. In order to solve this we made our educational activities (workshops, training, and meetings) in small scale and divided in two times.

Methodology:

Data Collection:

- The present study was carried out in the period between July 2015 to date.
- Data used for analysis in this study were collected from the fieldwork survey (2015 - 2016), target PA reports, and previous literatures to minimize the gaps in analysis process to the maximum.
- To fit to the IUCN Red List Assessment requirements we need to study and discuss the Geographic Range, Population Characteristics, Habitat and Ecology, Threats, Uses and trade, and conservation actions for the target species.

IUCN Red List Assessment:

1- Geographic Range:

Enough data have been collected to determine the geographical range of this species, as following:

- Distribution of *target species* within the target PA during the field survey was recorded. A GPS fix was recorded in decimal degrees and datum WGS84 using Garmin 12 XL receiver. The fix was recorded to the fifth decimal digit. Arc View GIS 10.3 was used to plot the study sites.
- Number of locations where the target species occurs, Extent of Occurrence (EOO), Area of Occupancy (AOO), and its decline trend were recorded and measured according to IUCN guidelines, 2014.
- For more clarification;
    - Extent of Occurrence measured by drawing a polygon PAs through the distribution points from outside. GIS then determined the area of this polygon in km^2.
    - Area of Occupancy also measured though GIS; the distribution map was converted to grids each one cover 2 km^2, each occupied cell was then extracted and the total size were collected and presented in the form of km^2.
    - Recorded GPS points for each location were imported into GIS 10.3 software as excel sheet, then it add on TIN map then from 3D analyst tool TIN surface was chosen to extract the topographic features (Elevation, aspect, and slope) of this species.

2- Population Characteristics

Enough data have been collected to understand the population characteristics of this species, as following:

- Number of *species* populations, subpopulations, and number of total individuals were recorded within field survey.
- Number of mature individuals, population structure and dynamics were determined according to IUCN (2014).
- Population trend, fluctuations, fragmentation, and decline trend were recorded and measured based on IUCN guidelines (2014) using historical data about population size, number of individuals, occurrences from former studies.

3- Habitats and Ecology:

Enough data have been collected to determine the habitats and ecology of this species, as following:

- Preferable habitat and microhabitat of the target species and its decline trend within the field survey according to IUCN Habitats Classification Scheme were recorded (IUCN 2014).
- Life form and species correlation were recorded according to field observation.
- Climatic features (Max. Temp., Min. Temp., and Perception) were extracted from BIOCLIM data using DIVA-GIS.
- Soil properties (Physical and chemical) were extracted from several studies held in the area.
- Vegetation characteristics of target species like density, cover, and associated species were recorded within each site.
- Plant species in each given quadrant has been recorded in the field and put in tabulated form, giving the authentication of their identification with the help of the local floristic workers (Boulos, 1999; 2000; 2002 and 2003 & Fayed and Shaltout, 2004). More than 200 circles with diameter 25 and 50 m were established to cover all vegetation aspects.

4- Threats:

Using the IUCN threats classification scheme, version 3.1 and based on fieldwork observation, previous work and local community and St. Catherine PA staff discussions, we used a systematic sampling approach to capture local environmental gradients, placing more than 200 circles with 25 and 50 m diameters at equal distances apart to cover most area of targets which containing the hottest spots for vegetation inside target PA. Within each circle, we record any sign that may be a threat to the plant community. Each threat was evaluated as follows:

- **Climate change & severe weather:** Based on available historical data we had recorded all signs indicate the presence of Habitat shifting & alteration, Droughts, Temperature extremes, Storms & flooding, etc.
- **Pollution:** The presence and degree of domestic & urban waste water, Industrial & military effluents, agricultural & forestry effluents, garbage & solid waste, air-borne pollutants have been recorded.
- **Natural system modifications:** The presence and effect degree of Fire & fire suppression, Dams & water management/use have been recorded.
- **Biological resource use: Over collection**: At each circle we recorded signs indicate the presence of plant collection for the purposes of trade as medicinal plants, fuel or any economic value. Also assessment through meetings and interviews with the relevant stakeholders (collectors, traders and eco guides) has been held to cover the medicinal plants rich sites within target PA and identify the hot spots. **Collection for Scientific Research:** Sites and target species of scientific interest by universities, research centers have been recorded and identified.
- **Tourist Intrusions and recreation areas:** At each site we recorded tourism activity (paths, camping, rest points and wastes) and it ranked according to its intensity (How much area it cover) (Very low 20%, Low 40%, Medium 60%, High 80% and Very high >80%).

- **Overgrazing:** Intensity of grazing and its distribution were measured by counting dung abundance and it ranked according to its intensity (How much area it cover) (Very low 20%, Low 40%, Medium 60%, High 80% and Very high >80%).
- **Feral Donkeys:** Using the methods of El-Alqamy, (2005); Hatab, (2009) and Omar et al., (2012) the numbers of dung (droppings) of donkeys were counted at each circle to determine the frequency of animal presence.
- **Residential & commercial development:** Urbanization, Settlement, and Agriculture Expansion: In this factor we used several approaches. First, using satellite images available in Google Earth 6.0.1.2032 (beta) with build date 2015, we record settlements, agriculture areas, roads and gardens and characterized them according to boundaries and density. Second, we carried out field assessment to detect constructions (buildings, dams, wells and roads).
- **Energy production & mining:** We recorded the presence and degree of these activities within the rich areas of the target PA.

✓**Underlying threat root causes, barriers and solutions.**

For each threat, we assigned the root causes, barriers, area, intensity, urgency, total ranking and categorical threat level. The above terms will describe as follows: **Root causes:** These are the underlying factors, usually social, economic, political, institutional, or cultural in nature, which enable or otherwise contribute to the occurrence and/or persistence of direct threats (IUCN definition). There is typically a chain of underlying causes behind any given direct threat. **Barriers:** These are constraints (institutional, legal, technical, knowledge), which limit effective conservation of MPs. **A = Area:** Approximate proportion of the overall area of a site likely to be affected by a threat under current circumstances (i.e. given the continuation of the existing situation). *Since there are 8 direct threats, the highest ranked threat for "Area" receives a score of 8, and the lowest ranked threat receives a score of 1 **I = Intensity:** refers to the impact of the threat within a micro-site. Will the threat completely destroy the habitat in a small locality, or will it only cause minor changes (i.e. given the continuation of the existing situation). Since there are 8 direct threats, the highest ranked threat for "Intensity" receives a score of 8, and the lowest ranked threat receives a score of 1 . **U = Urgency:** The importance of taking immediate action to counter the threat. Since there are 8 direct threats, the highest ranked threat for "Urgency" receives a score of 8, and the lowest ranked threat receives a score of 1. **TR = Total Ranking:** Sum of Area + Intensity + Urgency.

✓ **Threat Level:**

5- Conservation actions & requirements:

- Timing, scope, severity, and impact score for each threat were determined according to IUCN Threats Classification Scheme (IUCN, 2014).
- Former, ongoing, and future conservation activities to protect the *target species* in-place or outside-place were recorded. Conservation actions that will take place on land or that needed in the near future were extracted and suggested. Researches needed according to IUCN Scheme were recommended (IUCN 2014).

Outputs and Results:

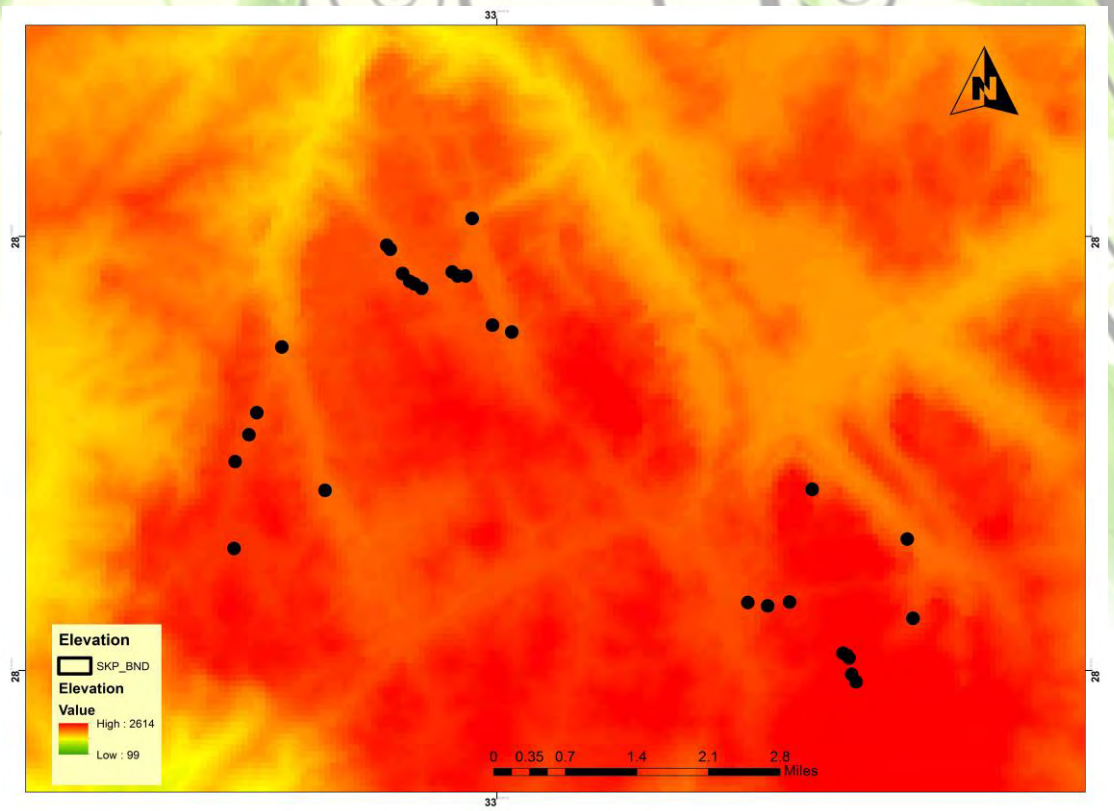
Rosa arabica Crep.

Taxonomic notes on *Rosa arabica* Crep.

Taxonomic Notes	Justification
Full Name	*Rosa arabica*
Level	Species
Parent	*Rosa*
Taxonomic Authority	Crep.
Status	Accepted
Taxonomy	PLANTAE-TRACHEOPHYTA-MAGNOLIOPSIDA-ROSALES-ROSACEAE-Rosa-arabica
Hybrid	No
Synonyms	Rosa rubiginosa var. arabica (Crepin) Boiss.
Common Names	* Sinai Wild Rose (English), Alward Elbary (Arabic), Rosier Rampant (French), Rosier des Champs (French), St. Catherine Wild Rose (English), and Wardit Cathrerine (Arabic)

GEOGRAPHIC RANGE:

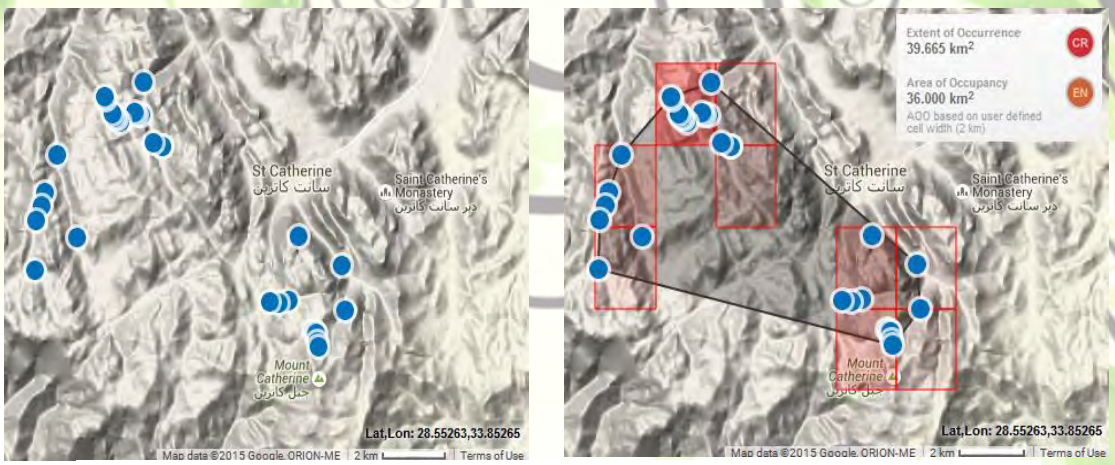
The Sinai Wild Rose is endemic to the high mountain area of the St. Katherine Protectorate (SKP) in southern Sinai, Egypt, with a narrow altitudinal range between 1,700 and 2,350 m asl. Its extent of occurrence (EOO) is c. 40 km^2 and its area of occupancy (AOO) is 36 km^2. Wadi Abu Twita, St. Catherine Mountain, and Wadi Tenia are the most important places for this species within the area of SKP.



Elevation map of *Rosa arabica* inside St. Katherine Protectorate

Geographical distribution range of *Rosa arabica* inside St. Katherine Protectorate

Geographical Aspects	Justification
EOO	40 km^2
AOO	36 km^2
Elevation Lower Limit (in metres above sea level)	1700
Elevation Upper Limit (in metres above sea level)	2350
Countries of Occurrence	Egypt -> Sinai
Presence	Extant
Origin	Native
Seasonality	Resident
Biogeographic Realm	Palearctic



Geographical Range map of *Rosa arabica* inside St. Katherine Protectorate

POPULATION INFORMATIONS:

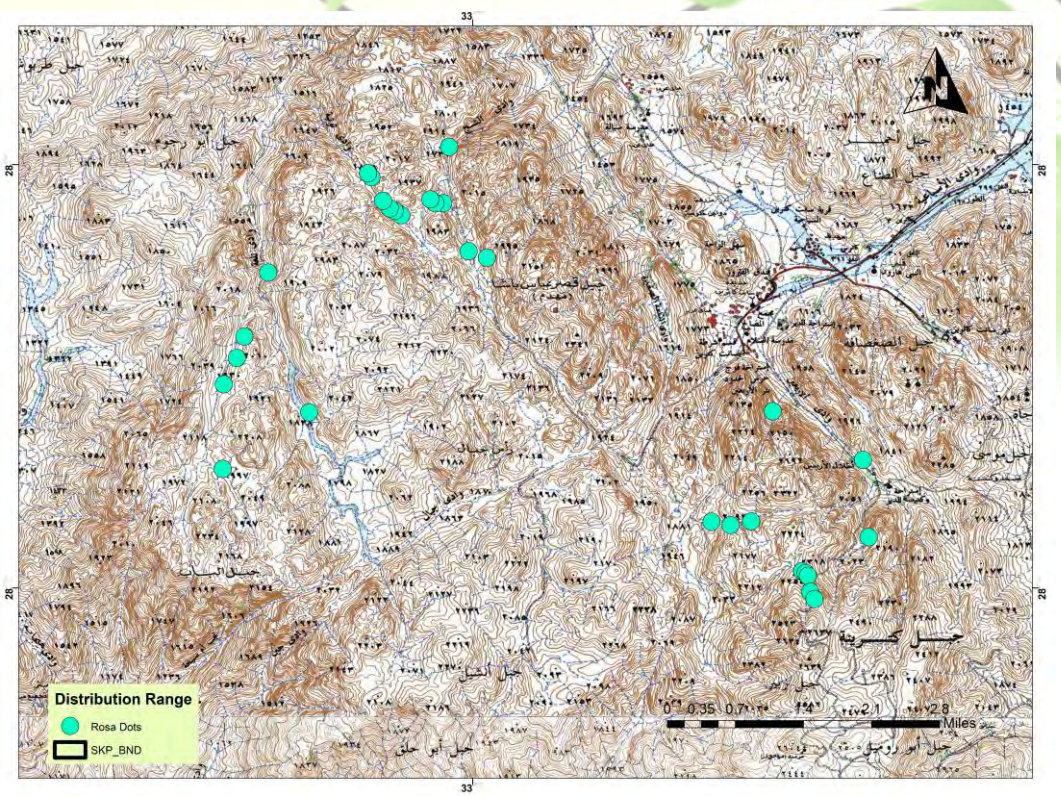
Most of the *Rosa arabica* subpopulations are very small, with individual plants occurring sporadically in space in little groups where the soil is rocky. The number of mature plants has been observed to decline as a result of over-collection and cutting for local use. Also, some individuals were observed to die from droughts and flooding. In 2015, the total global population size was recorded at about 90 mature individuals during the last survey carried out by the National Team of Protected Areas and St. Katherine Protectorate (SKP) rangers. There are 13 very small but clearly separate subpopulations and the number of mature individuals ranges from one to 36 individuals in each subpopulation. During the last 10 years these subpopulations have been observed to have large changes in the total number of individuals, cover and density.

Some facts about population characteristics of *Rosa arabica*

Population Information	Justification
Locations	One location- High Mountains Area
Current Population Trend	Decreasing
Number of mature individuals (=population size	90
Severely fragmented?	Yes - *Roas arabica* produce only small numbers of seeds (mostly not germinate), and this make it less efficient at long distance dispersal and therefore more easily isolated. Mountains make as barriers between different small subpopulations. Subpopulations range from 1 to 36 mature individuals.
Continuing decline in mature individuals?	Yes - Observed
All individuals in one subpopulation	No
Number of mature individuals in largest subpopulation	36

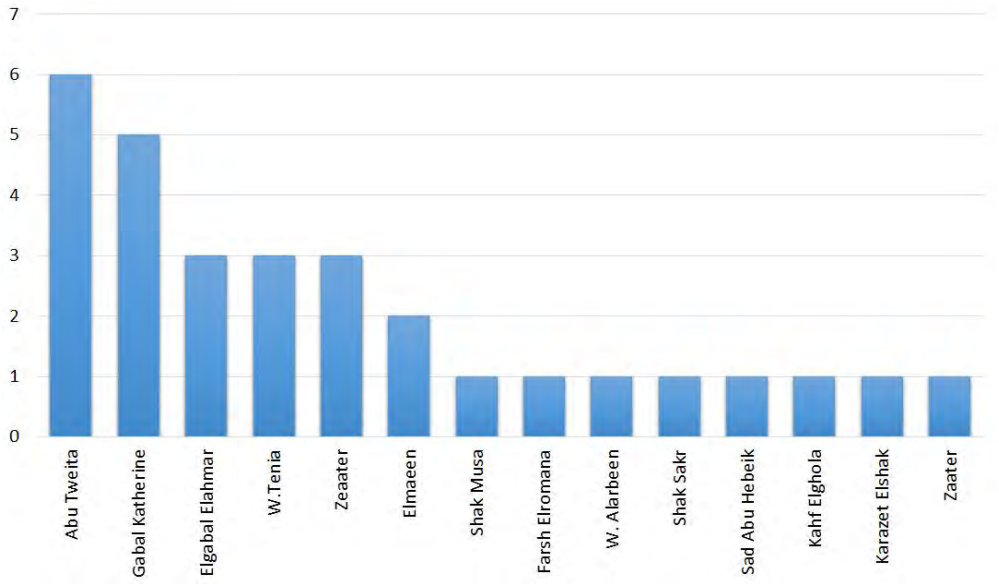
Plant seed dormancy is very long and to break this dormancy in normal conditions seeds may take several years to germinate. Therefore, it will be difficult for the new generation to compensate for dead individuals. Due to the lack of dispersal between

subpopulations and the low reproductive output and poor dispersal ability of this species, the population is considered severely fragmented. Drought is the main limiting factor for this species, and because the plant is distributed within so restricted an area, the effect of this most serious plausible threat is felt by the entire population: thus all individuals are effectively in one location.

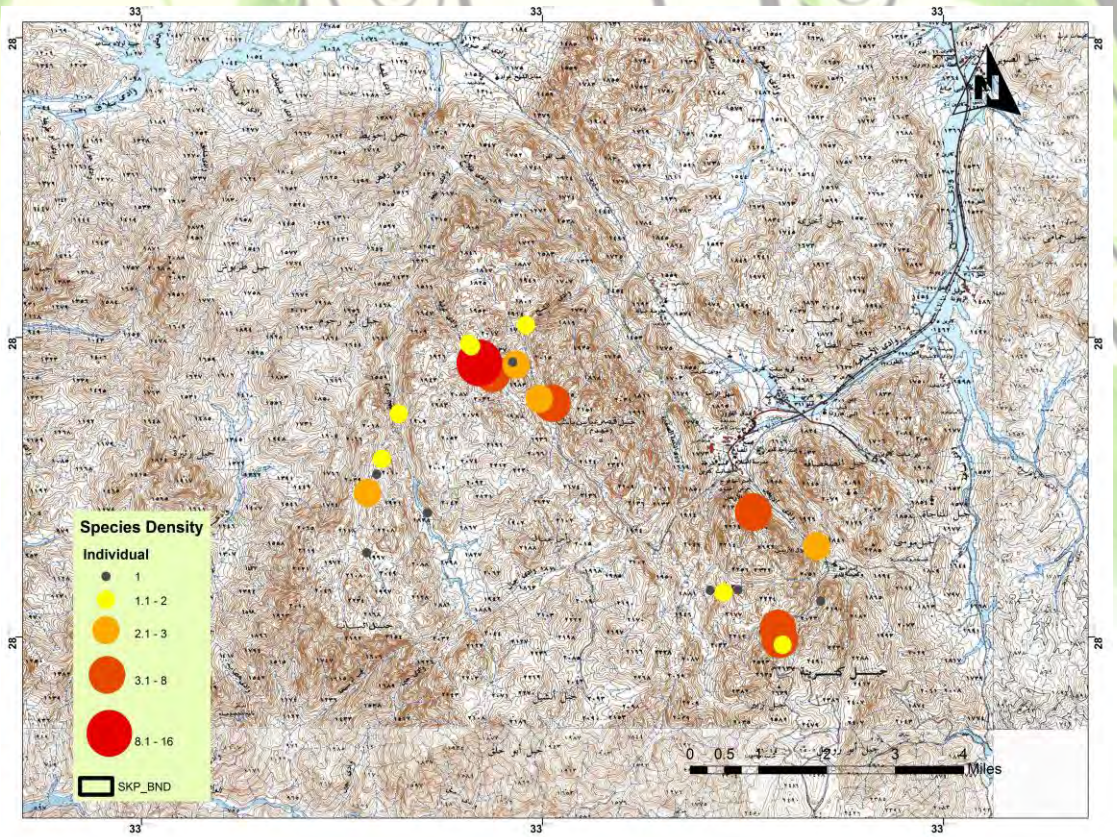


Population structure of *Rosa arabica* inside St. Katherine Protectorate

It was recorded that Abu Tweita, Gabal Katherine, Elagabal Elahmar are the most sites for species in density and frequency.



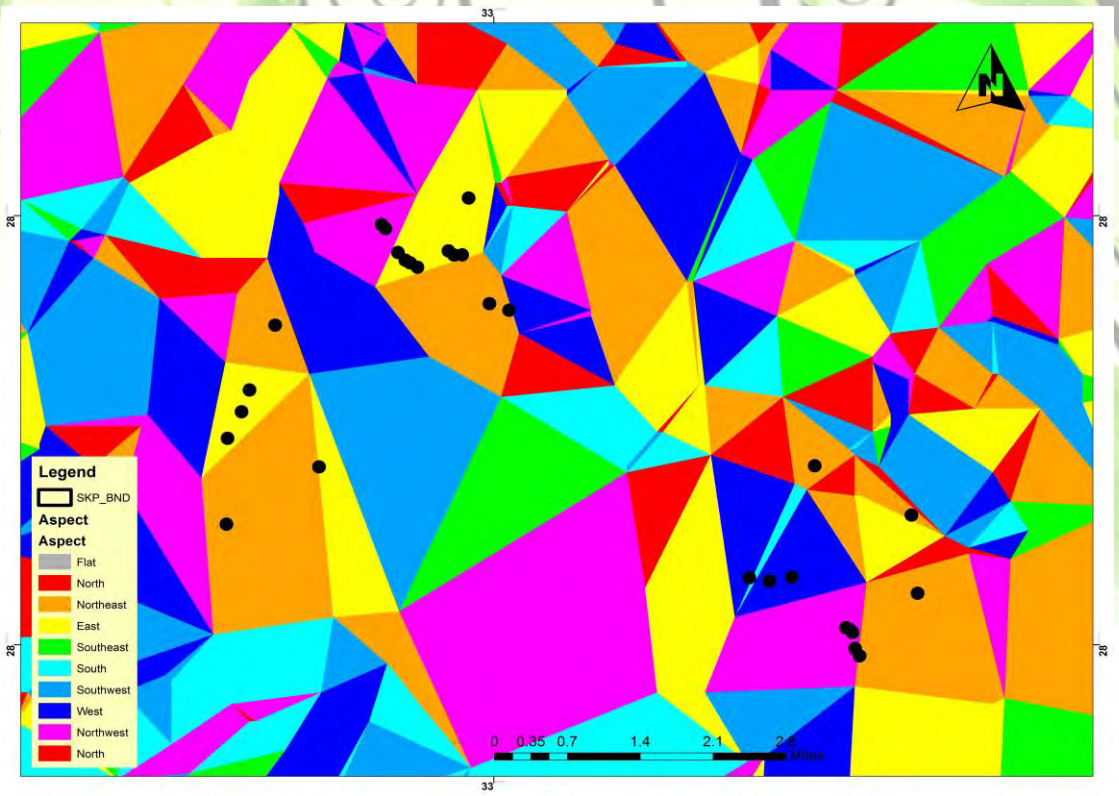
Frequency of *Rosa arabica* among different sites in St. Katherine Protectorate



Density of *Rosa arabica* inside St. Katherine Protectorate

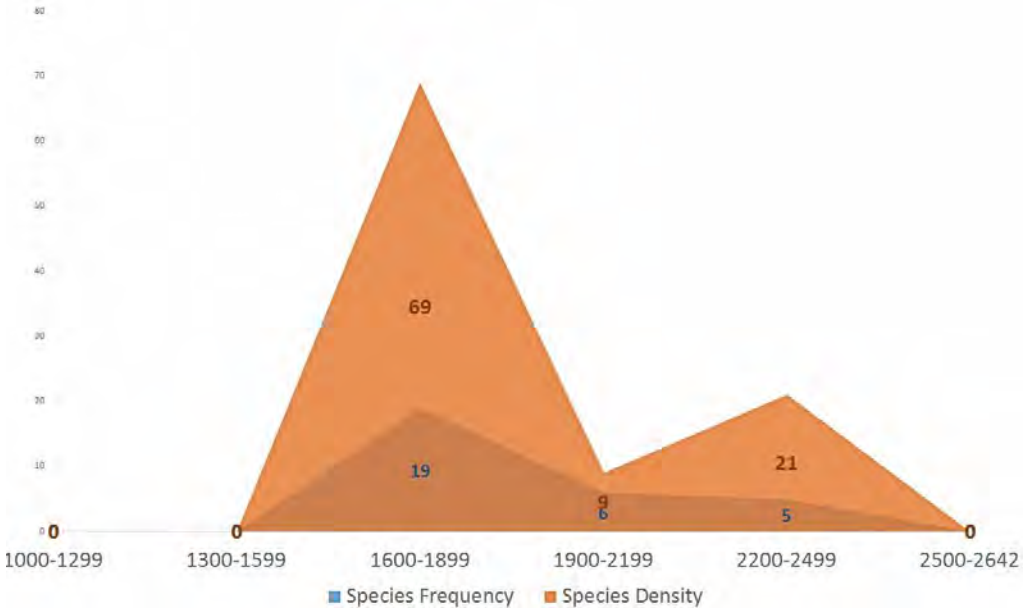
HABITATS AND ECOLOGY:

Rosa arabica is a perennial shrub with stems up to three meters long, glandular and with all prickles alike. The leaflets are obovate, deeply double-serrate, sparsely glandular on the upper surface and not hairy. It flowers in late spring and reproduction is by seed in late summer. It is restricted to montane wadis with rocky ground of mountain, especially gorges and wadi beds with steep slopes of up to 90° on west- (40%) and northwest-facing (20%) granite. It was recorded that the optimum frequency for this species is between elevation 1600 to 1900 m and slightly from 2200 to 2500 m. The cold winter climate (minimum temperature can reach -10°C) and cool summers (maximum temperature can reach about 29°C) of the high elevations of St. Catherine Mountain are the coolest on the peninsula (Omar *et al.* 2013). The arid climate has a mean annual rainfall of about 37.5 mm (between 1971-2015), some in the form of snow, but there is great inter-annual variation with up to 300 mm in any one year, usually between October and May. Relative humidity is low, ranging from 10-35% (data for 2005-2015), and potential evaporation rates are very high, in excess of 20 mm/day during August.



Slope Aspect map of *Rosa arabica* inside St. Katherine Protectorate

This species has been recorded to grow in soils that are gravelly in wadis and plains, rocky mountains surface soils, those which are sand to loamy sand in texture, slightly alkaline, non-saline to slightly saline, and in soils that are characterized by low content of essential nutrients and cation exchange capacity (CEC). It is recorded that the species most associated with *Rosa arabica*are *Achillea fragrantissima, Juncus rigidus, Phlomis aurea, Tanacetum sinaicum* and *Menthe longifolia.*



Relation between elevation and *Rosa arabica* density and frequency

Habitat of *Rosa arabica* based on IUCN Habitats Classification Scheme

Code	Threats	Season	Suitability	Major Importance?
6.	Rocky areas (eg. inland cliffs, mountain peaks)	resident	Suitable	Yes
7.1.	Caves and Subterranean Habitats (non-aquatic) - Caves	resident	Suitable	Yes
8.2.	Desert -> Desert - Temperate	resident	Suitable	Yes

Continuing decline in area, extent and/or quality of habitat? Yes – Observed
System: Terrestrial

TRADE AND USES:

This species is collected for subsistence traditional treatments; the flowers and leaves used as an analgesic for menstrual pain. It also has an ethno-veterinary use; the whole plant is used for treatment of reproductive troubles in sheep, goats, equines and camels (Pieroni et al. 2006). In addition, it is collected as fuel and it also has an economic importance as a pastoral plant for camels and donkeys.

THREATS:

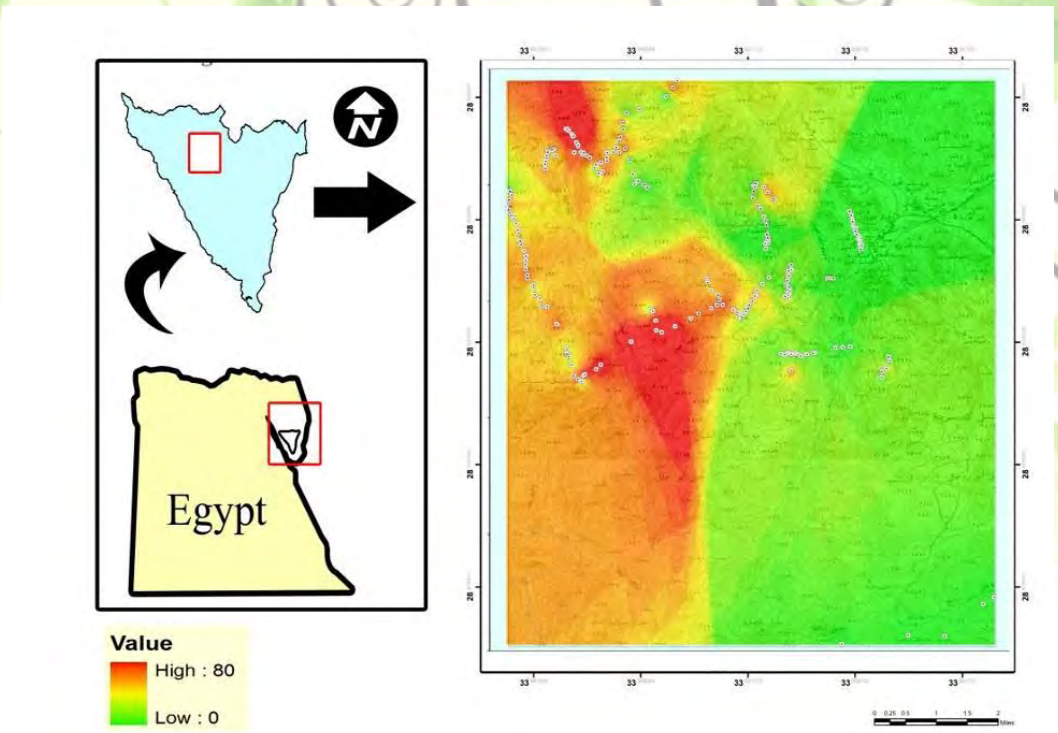
The vegetation in St. Katherine Protectorate (SKP) has been subjected to disturbance through human activities including "overgrazing, uprooting, tourism, quarrying and over-exploitation" (Mosallam 2007, Khafagi *et al.* 2012). The threat from feral Donkeys (*Equus asinus*) is aggravated by the fact they cause destruction to a variety of plant species through trampling (Khafaja *et al.* 2006). However, much more research is needed in this field, especially regarding distribution dynamics, hotspots and direct and indirect effects on plant species distribution. Bedouins consume many plants in SKP, mainly as herbal infusions (Khafaja *et al.* 2006, Khafagi *et al.* 2012).
Due to climate change, the wild population of this species could be in extreme danger in the relatively near future. The most important natural threats are the long-lasting droughts, the difficulties of seed germination, the scarce and irregular precipitation during the year, habitat fragmentation, and the possibility that rare floods may cause harm such as uprooting (5% loss observed). Apart from climate change, the most important human impacts are over-collection for traditional therapy and for fuel. Water is being relocated in some localities from elevated wadis which are rich in water to supply to low wadis. This activity leads to consumption of water from wells and results in habitat deterioration and declines in population size.
In general, this species is severely threatened by factors that are both natural (aridity of the area and climate change) and human (over collection, scientific research and over-grazing by feral Donkeys). All these factors are pushing *R. arabica* to the brink of extinction.

Threats on *Rosa arabica* based on IUCN Threats Classification Scheme

Code	Threat	Timing	Scope	Severity	Impact Score
1.3.	Residential & commercial development -> Tourism & recreation areas	Ongoing	Minority (<50%)	Causing/Could cause fluctuations	Low Impact: 5
2.3.1.	Agriculture & aquaculture -> Livestock farming & ranching -> Nomadic grazing	Ongoing	Minority (<50%)	Causing/Could cause fluctuations	Low Impact: 5
5.2.1.	Biological resource use -> Gathering terrestrial plants -> Intentional use (species is the target)	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
6.3.	Human intrusions & disturbance -> Work & other activities	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
7.2.5.	Natural system modifications -> Dams & water management/use -> Abstraction of ground water (domestic use)	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
8.1.2.	Invasive and other problematic species, genes & diseases -> Invasive non-native/alien species/diseases -> Equus asinus	Ongoing	Minority (<50%)	Causing/Could cause fluctuations	Low Impact: 5
11.2.	Climate change & severe weather -> Droughts	Ongoing	Whole (>90%)	Very Rapid Declines	High Impact: 9
11.3.	Climate change & severe weather -> Temperature extremes	Ongoing	Whole (>90%)	Very Rapid Declines	High Impact: 9
11.4.	Climate change & severe weather -> Storms & flooding	Ongoing	Whole (>90%)	Very Rapid Declines	High Impact: 9

Threat Assessment (TA):

- **Feral Donkeys:**
  - It was observed that donkey's distribution affected by vegetation cover (donkeys concentrated on areas with high vegetation cover) which actually affected by good water supply and showed negative relation with Bedouin community distribution (distributed away from human presence). Sites located within elevations ranging from 1800 m to 2000 m such as Abu Tweita, Wadi Gebal, Farsh Elromana and Farsh Messila recorded the highest presence for donkeys.
  - Grazing by these usually causes uprooting of the plants as indicated by Bedouins and field observations and this prevents plant regrowth. Soil compaction is associated with use by these animals and causes destruction to a variety of plant species through continuous trampling (Khafaja et al., 2006). The field observations showed that feral donkeys grazed on a very wide spectrum of plant species as compared with goats and camels; however, the numbers of feral donkeys have decreased sharply compared with the results of Assi (2007). The local community explained this was due to the sharp decrease in water supply.



Distribution map of feral donkeys within study area

Feral donkeys dung observed in the study area

Root causes:

- Bedouins, after recent settlement around SK City, have left the donkeys neglected in the mountains.
- Those animals require high amount of feeding and were largely replaced by camels.
- The recent use of trucks for water transport.

Barriers:

- Lack of strategy to deal with invasive species.
- Insufficient awareness on possible damages resulting from invasive species.
- Lose of sufficient money for start the way to decrease its numbers.

Solutions:

- Use conventional methods of control including soft catch traps and hunting.
- Increase awareness of Bedouins about the impacts (and potential impacts) of feral species on their environment and their culture emphasizing the importance of eradication and management.
- Establish a comprehensive strategy, using a participatory approach with the local Bedouins, to deal with possible future colonization.
- Establish a strategy to prevent and control invasive species.
- However drought is the major factor controlling the distribution of feral donkeys, results showed that these animals decreased from 2007 with about 40% without achieving any of the above.

- **Over collection:**
  - Locations like Abo Hebik, Elgalt Elazrak, Abu Tweita, Sherige, Shak Musa, Elmesirdi and wadi Eltalaa are most targeted for collection. These sites are characterized by water supply and high plant biomass; however, plant collection increases with precipitation and is usually heavily between March and December each year (flowering season). It was observed that plants collection may be affected by economic factors. In other words, when tourism levels fall, Bedouin themselves start to collect plants for income. Local communities mentioned that women are the most common collectors of plants, and they collect 5 times per season. Although the reasons for collecting these plants are always for trade or personal use as fuel, the use of plants as fuel has decreased sharply with the advent of butagaz.
  - Results showed that Origanum syriacum, Mentha longifolia, Salvia multicaulis, Chiliadenus montanus, Crataegus x sinaica and Thymus decussatus are the most collected species for trade within study area because of their medicinal value (Assi, 2007). Cotoneaster orbicularis, Phlomis aurea, Crataegus x sinaica, Ziziphus spina-christi, Rhamnus dispermus and Globularia arabica are the most species used as fuel.
  - It was observed that most collectors collect species with medicinal or economic value for personal consuming; however the amount of collection for this purpose is so small compared with the amount collected for trades. Rosa Arabica recorded to be collected by Local community for its medicinal importance.

- **Tourists Intrusions.**
  - Wadi Gebal, Farsh Elromana, Elgalt Elazrak, Abu Tweita, Wadi Tenia, Wadi Sherige and Wady Eltalaa are the most sites represented the highest presence for tourism activities. About 3 million person from about 51 nationalities visit SKP from 2003 to 2011 with mean 335.000 people per year, most of them focused on northern part of SKP specially world heritage site. Many of the tourists do safari and camping in remote areas; usually safaris extend for many days using different camping points; the most camping sites are located in Firsh Elromana, Wadi Tenia and Wadi Gebal.
  - Some of the negative impacts come from tourists in the way of collecting medicinal plants as a souvenir from the SKP beside collection for fuel. Soil compaction of trespassing leads to poor vegetation cover comes from continuous walking. On other hand camping take place in shelter sites which give water source for tourists and this led to water consuming and direct effect on vegetation community.

- **Over-Grazing:**
  - The mean number of animal droppings at each location showed variation among the different locations. Elmesirdi, Sheiage, Elahmar and Shak Musa are the most sites represented the highest presence for goats which can explain by it are the closest sites to local communities' settlements.
  - Elawitein, Wadi Gebal, Wadi Tenia, Abu Tweita and Farsh Elromana are the most sites represented the highest presence for camels which can explained by the easily accessible and heavily used by tourists for camping which camel take place in transportation. Ibex dung was found in low quantities at specific locations like Emesirdi, Shak Musa and Elahmar, the presence of these animals was depended on the presence of water. The largest amounts of dung came from domestic grazing animals goats (58%) and camels (39%), while moderate amounts of dung came from native animals ibex (3%). There was significantly more domestic mammal dung encountered than native mammal dung and this agrees with results observed by Guenther et al., (2005) and Omar et al., (2012).
  - There are 18 plant families that showed heavy grazing; Asteraceae (33.3%), Lamiaceae (22.2%), Brassicaceae (16.6%) and Caryophyllaceae (16.6%) represented the dominant families in this issue. It was observed that the following plants within those families are being negatively affected by heavy grazing: Juncus rigidus, Hypericum sinaicum, Galium sinaicum, Zilla spinosa, Mentha longifolia, Anarrhinum pubescens and Scrophularia libanotica.
  - Results showed that Tebok, Abo Twita, Ain Shekia, Shak Sakr and Elmesirdy represent the highest number of grazed individuals among the different locations, because these locations are stressed by tourism and human activity which are combined by the presence of camels and donkeys as transportation tools to and from historical sites, Bedouin

communities are also settled beside these locations and this gives goats high presence in these locations. Results showed that there is a high grazing pressure observed on R. arabica especially by donkeys and camels.

- **Collection for Scientific Research:**
  - A very low sits were affected by collection for scientific researches (Herbarium, phytochemistry and genetics), the most affected research was the collection of specimen for herbarium because the collectors sometimes collect a big amount of plants with flowering parts and roots which may lead to decrease of future population. Also collection for phytochemistry requires more than kilo for good extraction. Results showed that the most affected sits were Wadi Tennia, Abu Tweita, Elmesirdi, Abu Kasaba, Shak Musa and Elgalt Elazrak. Rosa arabica is an important target for collection for scientific research. The most organizations showed highest presence in this issue was Egyptian research centers (Desert research center and National Research Center), Egyptian Universities (Cairo Univ. and Ain Shams) and scholarships from foreign Universities (Nottingham Uni.).

- **Urbanization and Settlements Expansion:**
  - All study area is located within high mountain area, which is far from the city and Bedouin settlements. Within this study, human activates includes destruction of rocks for building gardens and digging wells were recorded; the most sits recorded that was Abu Twita and Zawitein. Also another activity was the extents of water cannons from high elevated wadies rich by water supply to other low wadies, these methods may lead to consume and lose of water from wells which directly affect the plant community health. This are observed clearly in Wadi Gebal, Farsh Elromana, Wady Tenia and Abu Tweita.
  - Main roads (Asphalt roads) located and end in SK City and also far from study area. Bedouin gardens distributed at all sites within study area with high frequency at **Wadi Gebal, Farsh Elromana, Wadi Tenia,** and **Farsh Messila**. These gardens some times when Bedouin didn't used it as reception for tourists camping may be as a tool for *in-situ* conservation because it prevent grazers from grazing and also because the continuous water supply. Results showed that gardens present a very good shelter for *Rosa* where the water and protection are presence; also it was showed that *R. arabica* cover increased inside gardens comparing with the outside.

- **Quarries.**
  - No quarries recorded within study area; all quarries are concentrated at the southern part of SKP (Wadi Elkabila, Wadi Elsamaa, Wadi Om Adawy and Al-Nheid).

CONSERVATION ACTIONS:

The entire global distribution of Rosa arabica is inside the St. Katherine Protectorate (SKP). Parts of three subpopulations (Wadi Alarbeen, St. Catherine Mountain, Abu Tweita) are already protected by five fenced enclosures, and regular monitoring by SKP rangers takes place every two years to detect the effect of this protection on population trends (Shabana et al. 2011). On average 20 checks are made every year to keep a watch on the current situation for the plant and its habitat, and to record any detrimental activities. Funded by UNEP, the Medicinal Plants Conservation Project tried to conserve some important species, R. Arabica among them, using cultivation inside greenhouses and ground layering propagation in fields, as well as storing its seeds for future use. Much more is needed, however.

Conservation Actions In-Place for *Rosa arabica* inside the St. Katherine Protectorate

No.	Conservation Actions In-Place	Justification
1	Occur in at least one PA	Yes
2	Percentage of population protected by PA (0-100)	91-100%
3	In-situ Conservation	Partly Yes
4	Ex-situ Conservation	Yes – inactivated
5	Monitoring	Partly Yes

Important Conservation Actions Needed for *Rosa arabica*

Code	Conservation Actions	Specific Conservation Actions
1.1.	Land/water protection	Site/area protection
1.2.	Land/water protection	Resource & habitat protection
2.1.	Land/water management	Site/area management
2.3.	Land/water management	Habitat & natural process restoration
3.2.	Species management	Species recovery
3.4.2.	Species management	Ex-situ conservation -> Genome resource bank
4.2.	Education & awareness	Training
5.1.1.	Law & policy	Legislation -> International level
5.4.1.	Law & policy	Compliance and enforcement -> International level

Important Research Needed for *Rosa arabica*

Code	Research Needed	Justification
1.2.	Research	Population size, distribution & trends
1.5.	Research	Threats
2.1.	Conservation Planning	Species Action/Recovery Plan
2.2.	Conservation Planning	Area-based Management Plan
3.1.	Monitoring	Population trends
3.4.	Monitoring	Habitat trends

IUCN RED LIST ASSESSMENT RATIONALE:

Rosa arabica qualifies as Critically Endangered because it is endemic to a tiny area, with an extent of occurrence (EOO) of 40 km^2, of the high mountain area of the St. Katherine Protectorate in southern Sinai, Egypt. The total population size is 90 mature individuals, distributed among 13 subpopulations. As the main threats are drought and climate change, effectively there is only one location. There is a continuing decline in habitat quality for this species, with evidence of declines in subpopulation numbers and numbers of mature individuals. The number of mature individuals in each subpopulation is less than 50. Climate change is projected to further reduce the available habitat of this high-elevation specialist.

Community engagement, educational and awareness activities:

Background:

Community involvement is a very important aspect of real conservation for any community, no matter what size. Without community buy-in, a project may never get off the ground or will not be accepted once it is completed. Community involvement should be used to generate not only ideas for conservation projects and their implementation, but also ideas to further improve existing project features. Conservation can be facilitated and enhanced by finding out what the community needs, what will benefit the community, what has been tried in the past, and what could be done to improve past ideas.

Community members, when given an opportunity to be informed and involved in the process, are or can be a critical factor to a project's success. Community members may have special issues or concerns that, if incorporated into a project at the outset, may help to reduce the likelihood of challenges to risk assessment results, and potential remediation or revitalization plans. Successful community involvement is based upon information and dialogue. Only an informed community can be part of the decision- making process, which then will lead to a sustainable project. Community members who contribute to the planning process will better understand the process and will be more likely to support a project they had input in.

Local communities within St. Catherine Protectorate[1]:

Today, Sinai's fifty thousand Bedouins are divided into fourteen tribes or sub-tribes, which evolved as different groups arrived and merged with each other. The Bedouins living in north and central Sinai consist of four large tribes and a number of lesser tribes and clans. In South Sinai the Bedouin population and tribal territories are smaller than in the north. However, like their brethren in the north the seven tribes of the south have varied origins but are collectively referred to as Towaras, or Arabs of El Tur, formerly a major port and now South Sinai's regional capital. Although the Aleiqat and various clans of the Suwalha were the first Bedouin tribes to settle in Sinai at the time of the Islamic conquest of Egypt, the largest tribe now is the Muzeina, who occupy the most southern part of Sinai along the coastal areas from Sharm El Sheikh to Nuweiba. Each tribe has one or more traditional territories (dirha), which are still recognised, although nowadays different tribes live together, e.g. in Feiran.

Within the study area, one tribe, the Gebeliya, comprised of about 1,500 persons, has played an integral part in the life of the Monastery since its beginning. The Gebeliya are not of Arab descent but are descendants of Macedonian people sent by the Emperor Justinian to build, protect and serve the Monastery in the sixth century A.D. Over the years the monks and the Gebeliya have established a symbiotic relationship. During the Israeli occupation of Sinai, beginning in 1967, the traditional nomadic lifestyle of the Bedouin changed and this caused a gradual move away from the traditional tent settlements to more permanent stone housing. It is this that is mostly seen in the Sinai now.

[1] Skp management plan 2004

The Bedouin are a conservative people with a rich culture, a reputation for hospitality and a profound knowledge of their land. Wild plants and animals have traditionally supplemented their diet, health, income and material culture. Many Bedouin men work in non-traditional activities, mainly in tourism enterprises as guides or cameleers, although some continue to cultivate mountain gardens. The women herd the livestock and produce traditional craft items.

The traditional conservation ethic is deep-rooted, with the tribal system of el hilf (the agreement) to control seasonal use of pasture or personal action, dakhl (essence), normally to protect trees. These systems were enforced by tribal law (‘urf) so when a person pledges to uphold a principle that all tribes people regard as just, acting against it violates both his personal honour and ‘urf itself. Although traditional conservation systems are now largely vestiges of the past, ‘urf still applies and during the inception mission several Bedouin claimed a traditional responsibility for wildlife protection in some areas.

The local Bedouin communities are the traditional users of the natural resource base and as such are among the main stakeholders in the Protectorate; their understanding and support of the Protectorate’s objectives and close involvement in planning and implementing management interventions are critical. Local communities should be enabled to manage their own resources locally but as local communities may have to restrict their activities and so pay the opportunity costs for conservation, they should be entitled to share tangible benefits from the management of the Protectorate to offset such costs and ensure their support.

Since the first moment of the declaration of the St. Catherine Protectorate the local community encouraged and assisted to undertake local conservation initiatives and community development projects through self-help projects. More than 50 direct persons from the locals are working with the protected area as local community guard and their primary functions ate to extend monitoring and regulatory activities to the more remote parts of the Protectorate. They report to Rangers. The community guards carry identification cards and wear a National Park badge. The community guards assist the Ranger force in the execution of their duties by:

- Reporting any hunting, killing, disturbance or collection of wild species (including plants) in or around the Protectorate and monitoring and reporting on wildlife populations particularly of large mammals species.
- Reporting any developments such as building or quarrying in their area and monitoring development activities.
- Guiding and assisting Rangers, orientating visitors within their area of responsibility and assisting with mountain rescue and other emergency responses.
- Liaising with Rangers working on activities associated with the Bedouin Support Programme particularly with regard to informing local communities of scheduled visits by doctors and veterinarians.
- Reporting on the condition of trails and paths and undertaking or arranging necessary maintenance.

- Looking after any established monitoring sites and equipment, wildlife watering points and manning established satellite centers or other Protectorate property.
- Promoting any Protectorate regulations regarding resource conservation, e.g. grazing exclusion areas etc. within the local communities.
- Monitoring tourism activities within the area (i.e. recording visitor numbers, tour companies, dates etc.) and checking on and regulating visitor behavior to prevent visitors from cutting vegetation, discarding rubbish, writing graffiti etc.
- Cleaning visitor campsites of refuse and removing graffiti.
- Promoting local community conservation and development initiatives, e.g. establishing local conservation areas, waste management, social programmes etc.

Current situation:

One of the aims that the protectorate established to bring benefits to and to contribute to the welfare of the local community through the provision of natural products (such as medicinal plants) and services (such as income derived from sustainable forms of tourism). Regarding to weak financial support to the St. Catherine protectorate, in addition to lack of qualified staff in addition to inactive educational and awareness program; the previous and other activities for supporting the community needs deactivated by time and the linkage between the protectorate and the community deteriorated and the trust gap increased. By time the challenge increased and community needs duplicated with limited budget for support. All these push the locals to break the rules of conservation as a result from:

- Needs for life
- High incidence of child malnutrition.
- Limited access to, and high cost, of supplementary animal feed.
- Acculturation and loss of traditional knowledge and skills.
- Few benefits from commercial exploitation of indigenous knowledge, e.g. medicinal plants.

Community involvement challenges:

We had faced many challenges to achieve this object; this can be summarizing as follow:

- Reaching consensus from diverse backgrounds and needs
- Accommodating interests when feasible and within the goals of the project
- Conducting community involvement or participation among the local residents, who have competing priorities/language barriers
- Building trust among various stakeholders
- Effectively conveying to local residents other stakeholders' involvement and support of the conservation process
- Educating residents about the goals of the project/process
- Communicating technical information in an easy to understand manner
- Identifying stakeholders that can represent a diverse constituency, and represent these constituencies at public meetings and planning sessions.

Why we involve the community in our project:

The following are reasons why community involvement is important in our project:

- Community members may have useful information about the site's history, past land uses and associated threats
- Community members may have special issues or concerns that, if incorporated into a project at the outset, may help to reduce the likelihood of challenges to risk assessment results, and potential remediation or revitalization plans
- Community members who contribute to the revitalization planning process will better understand the process and will be more likely to support a project they had input in, thus creating a sustainable project.
- Community involvement provides a forum for residents to become informed about conservation of their natural resources and actively involved in making decisions that ultimately impact their community.

Aim:

- Enhance the knowledge about importance of conservation of threatened plants in the study area
- Enhance the linkage and reduce the conflicts between the local community and the protectorate through a series of educational and awareness activities about Rosa Arabica conservation
- Capacity building for local communities (guards), PA staff and universities students about conservation planning and technics
- Raise the awareness about threatened plants conservation for school children.

Methodology:

In order to strengthen the capacities and enhance and raise the educational and awareness levels about our work and to ensure the participation and involvement of local communities within the conservation practices we did the following activities:

1. Community Involvement

Community Assessment

Community assessment answers the basic questions: Who is the community? Where do they live and work? Who will most directly be impacted by the conservation project? We set a series of items for this assessment like:

- Identify stakeholders and categorize them according to their influence
- Establish realistic expectations for the community input
- Identify community goals and aspects for the future of the community
- Educate residents on the process of project development

- Identify specific aspects of the project that can accommodate some of the community goals
- Start the communication process by fostering a dialogue, seeking community interest and support, and sharing information, remediation, and redevelopment issues

Target stakeholders for our project:

- Local community:
  - Plant collectors
  - Community guards
- Decision makers (PA management team)
- NGOs
- Governmental bodies

Invitations were sent to the target stakeholders to attend the following events:

- A total of 3 workshops with PA management staff, rangers, NGOs, community guards, plant collectors, decision makers to discuss:
  - Background knowledge about species and its distribution and importance
  - Threats on target species,
  - Threats root causes and solutions (problem tree analysis, treat reduction assessment)
  - Suggests action plans for facing such threats.
- A total of 2 meetings with local community to extract the suitable management options for conserving the target species.

2. Educational and Awareness Activities

Target audience for our project:

- Local community:
  - Plant collectors
  - Community guards
- Decision makers (PA management team)
- University's students and staff
- School children

Reason for choice:

- *Plant collectors*: To reduce the over collection threats on the target species
- *Community guards*: to enhance and strengthen the treats observation abilities
- *Decision makers* (PA management team): improve the knowledge and facilitate the decision making
- *University's students and staff*: building the capacities of the young researchers, and increase the linkage between pure science and applied one
- *School children*: Instill the principle of conservation inside the minds of the protectors of the future

Activities:

- A total of 2 training course on IUCN Red List Assessment, threat mapping and GIS for researchers, undergraduate students, and the course structure involves seven modules:
  - Module 1: Introduction to the IUCN Red List.
  - Module 2: IUCN Red List Assessments.
  - Module 3: IUCN Red List Categories and Criteria.
  - Module 4: Supporting Information for IUCN Red List Assessments.
  - Module 5: IUCN Red List Mapping Protocols. Module 6: IUCN Species Information Service.
  - Module 7: Regional IUCN Red List Assessments.
  - Questioner after and before the activity to measure the level of enhancement.
- A total of 2 fieldwork training (researchers, undergraduate students) on data collection
  - Pre-field work review and planning
  - Fieldwork skills and threat observations
  - Data collection based on IUCN red list scheme
  - Data needed for analysis
  - Questioner after and before the activity to measure the level of enhancement.
- Awareness activities for school children
  - A total of 2 field trips for 40 children
  - Stories about target species and its distribution, threats and importance were told to 40 children in the field
  - Drawing activities for 40 children about target species, clp logo and habitat
  - Questioner after and before the awareness to measure the level of awareness.

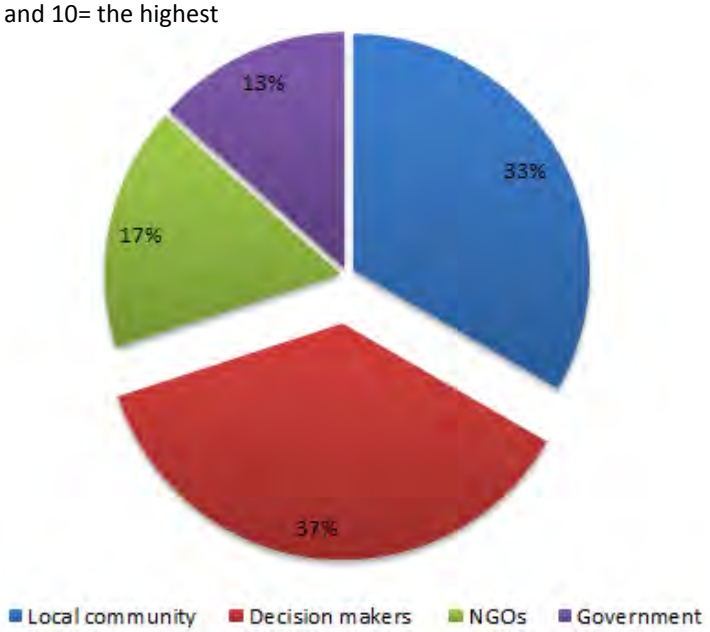
Results:

1. Community Involvement

- A total of 70 persons (Local community, decision makers (PA management team), NGOs, governmental bodies) were participated in this activities.
- Using problem tree analysis, conflict analysis, threat reduction assessment and problem solving we succeeded to extract the main data required for the conservation of this species.
- Data extracted from these discussions are presented in the threat analysis part.
- Knowledge about the importance of conservation of the target species and the threats and its root causes were enhanced
- Problem tree analysis was one of the best interactive method for extracting the main problem from different stakeholders
- Conflicts between the different stakeholders were reduced partly in the part of managing human use for the sustainability of the target species.
- Local community feels happy that they participate actively to solve a main problem in their area.
- Solutions and action plans were extracted from these discussions and presented in the threat analysis part.
- Level of participation from target stakeholders in different discussions could be summarized as follow:

Aspect	Local community (Plant collectors, Community guards)	Decision makers (PA management team)	NGOs	Governmental bodies
Threats on target species,	8	6	3	3
Threats root causes and solutions (problem tree analysis, treat reduction assessment)	7	7	4	2
Suggests action plans for facing such threats.	5	9	3	3
total	20	22	10	8

Note; 1= lowest degree and 10= the highest

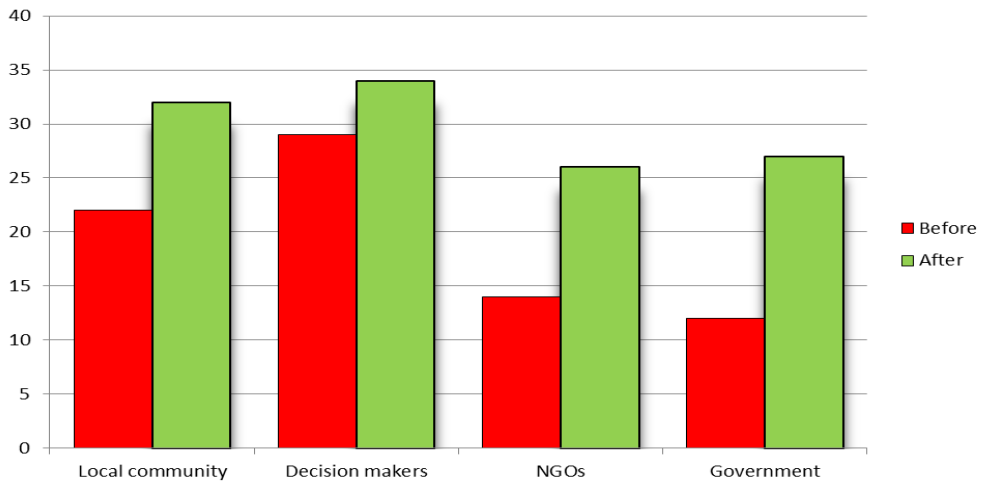


Level of stakeholders' participation

- The level of knowledge gained by target stakeholders from the different discussions can be summarized as follow:

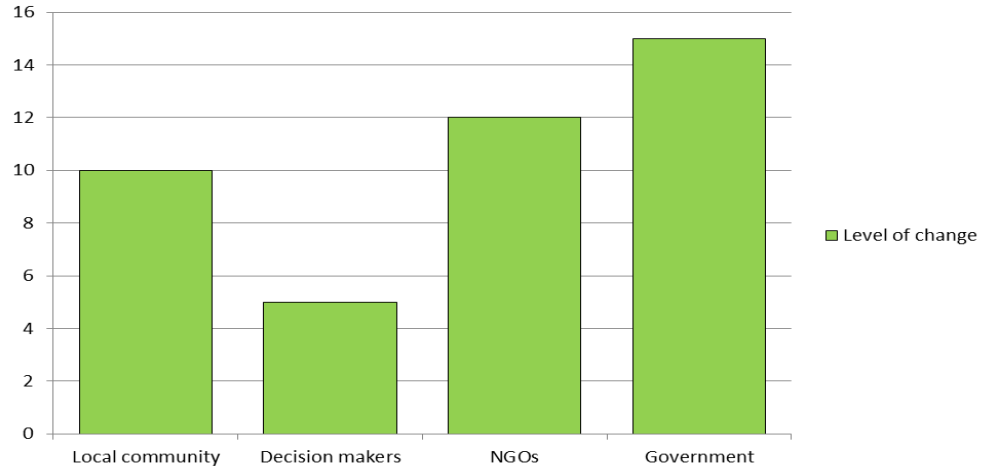
Aspect	Local community (Plant collectors, Community guards)		Decision makers (PA management team)		NGOs		Governmental bodies	
	Before	After	Before	After	Before	After	Before	After
Threats on target species,	6	8	7	8	4	8	3	6
Threats root causes and solutions (problem tree analysis, treat reduction assessment)	6	8	7	8	4	7	3	7
Suggests action plans for facing such threats.	6	8	8	9	4	5	4	9
Target species importance and conservation efforts	4	8	7	9	2	6	2	5
total	22	32	29	34	14	26	12	27

Note; 1= lowest degree and 10= the highest



The level of knowledge gained

It was found that governmental bodies and NGOs as well as local community were the most benefited from these discussions.



Level of change in knowledge

2. Educational and Awareness Activities

- A total of 40 people from the local community (plant collectors, community guard) were benefited from education and awareness activities about target species distribution, methods of monitoring, threats observation and field work skills.
- Most of them not have background about this species and the importance of conserving it before the educational activities.
- Knowledge gained from these activities will ensure the sustainability of our work (conservation of Rosa Arabica and community involvement).
- The background knowledge about the our work were measured before and after the educational activities and the results showed a great improvement and enhancement in such knowledge as illustrated in the following table:

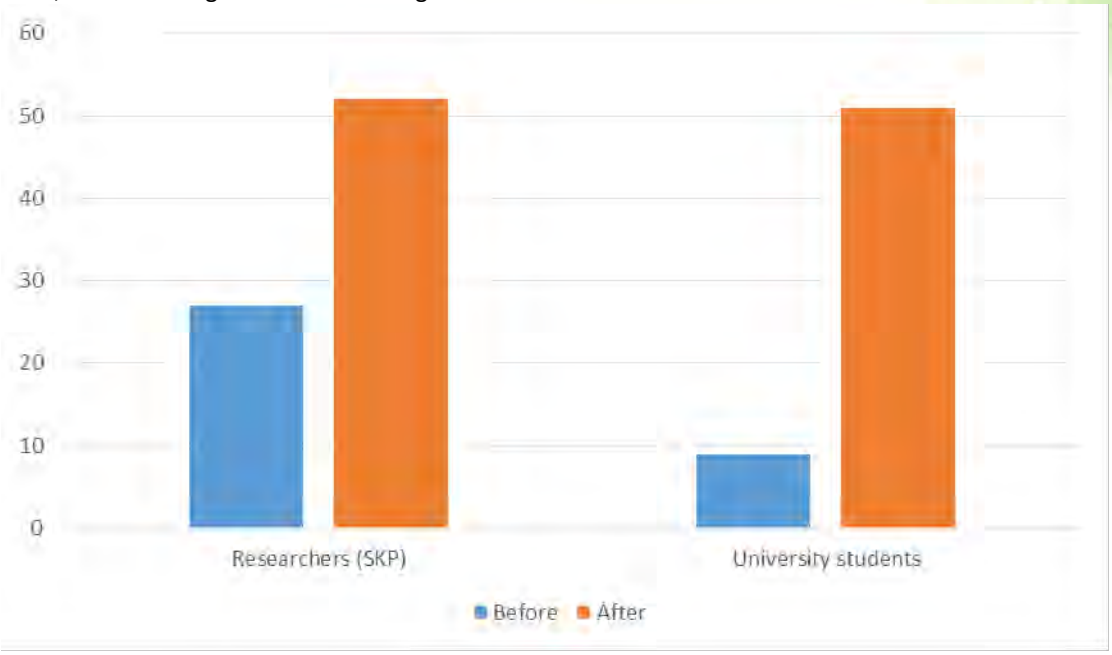
Educational activities	Local community (Plant collectors, Community guards)	
	Before	After
Pre-field work review and planning	3	8
threats observation and field work skills	4	8
methods of monitoring	2	8
Target species importance and conservation efforts	3	8
total	12	32

Note; 1= lowest degree and 10= the highest

- A total of 30 university students (under and postgraduates) were trained on IUCN Red List Assessment, data collection, and data analysis.
- Students become have an ability to collect data about species distributions habitat and ecology, threats, population characteristics and conservation requirements from field.
- Students become have a good understanding about GIS and its applications in plant conservation.
- Students, researchers, local community guards, and rangers were trained within the field on data collection (threats, IUCN RL).
- The trainings were the first for these students in these subject and the Knowledge gained started zero.
- Students expressed their happiness about the new skills they acquired through training and they believe that it will help them significantly in their future
- The background knowledge about the our work were measured before and after the educational activities and the results showed a great improvement and enhancement in such knowledge as illustrated in the following table:

Educational activities	Researchers (SKP)		University students	
	Before	After	Before	After
Pre-field work review and planning	5	8	1	7
Threats observation and field work skills	5	8	2	8
methods of monitoring	4	8	3	8
IUCN Red List Assessment	2	7	0	7
Data collection (IUCN RL)	1	6	0	6
Data analysis (GIS, R)	3	7	2	7
Target species importance and conservation efforts	7	8	1	8
total	27	52	9	51

Note; 1= lowest degree and 10= the highest

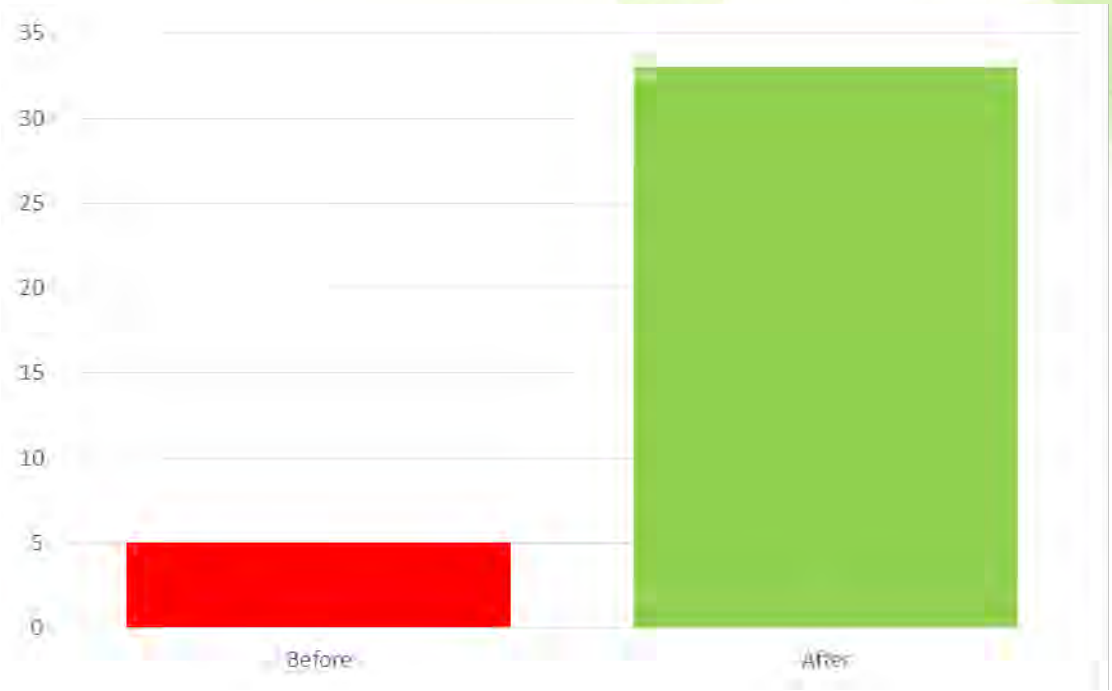


The level of knowledge gained

- A total of 40 school children were chosen from different schools based on their personal success in their education to attend 2 field trips to discover more about nature and conservation efforts.
- With the project t-shirts and within each field trip number of activities were done like drawing (Rosa, landscape, CLP Logo), playing, stories about species importance and conservation efforts.
- Children were very excited and participate actively in all activities and ask for more and more.
- The background knowledge about the our work were measured before and after the awareness activities and the results showed a great improvement and enhancement in such knowledge as illustrated in the following table:

Educational activities	School children	
	Before	After
Nature and conservation	2	7
Rosa Arabica distribution and importance	0	7
Protected areas and why we conserve nature	2	7
The role of researchers and rangers	1	7
CLP role in conservation	0	5
total	5	33

Note; 1= lowest degree and 10= the highest



The level of knowledge gained

Main outputs:

- Public expectation increased: The public now has a much greater understanding of conservation issues especially the conservation of Rosa arabica. This has generated a movement towards more active involvement in conservation activities.
- Conflicts has significantly reduced between the different stakeholders in area of conservation vs development
- Risk management: Participative approaches are helped as minimizing the risk of social, economic and environmental damage that can result from complex development projects. Incorporating diverse perspectives results in a better knowledge base, particularly where they include the life experiences of those affected.
- Good governance: best practice in governance (transparency, trust, empower, involvement) was obtained from the increase of levels of public participation. And this widely recognized as representing both internationally, and locally.

- Involvement of public in the decision making and conservation activities will reduce the costs of conservation results from community behavioral changes

Achievements and Impacts:

From June 2015 to date the team success to determain the following:

1. Geographical distribution of R. Arabica (Number of locations, distribution range, extent of occurrence, area of occupancy) were determined and distribution maps were produced.
2. Population characteristics of R. Arabica (Number of populations, number of subpopulations, population dynamics, population size, Number of mature individual, fluctuation and decline status were determined.
3. Eco geographical characteristics (topographic, ecological, and climatic attributes) that control the distribution of our target species were extracted and analyzed.
4. Preferable suitable habitat and microhabitat for growth of this species were extracted.
5. Morphological and reproductive characteristics of this species were recorded.
6. With the help of local community field experiences and our field observations the major threats on target species were Identified and ranked based on the score of threat timing, severity, scope, and urgency, and their underlying root causes and barriers to solutions were also identified.
7. Former conservation actions for this species were recorded and future needed actions, and researches were suggested.

- Based on all the above, an IUCN Red List draft assessment for this species were done and sent to IUCN RL Unit. According to IUCN RL Categories the species had been listed as Critically Endangered plant species. “The assessment now is in the reviewing stage”.
- Local community, park rangers, and decision makers were involved directly in the project preparation and implementation stages and better awareness towards plant conservation were strengthened.
- All these achievements directly support our project aim “With the help of local community and other stakeholders, we will assess the ecological and conservation status of Rosa arabica within SKP as a first step for entire conservation program.”
- Th project had a powerful positive impact especially within the implementation stage (fieldwork, training, and workshops) on participants (local community, park rangers, undergraduate students, and decision makers) in the form of raising awareness, conflict solving, management modifications, and capacity building.

SECTION 3:

Conclusion:

1. Most of the Target species subpopulations are small to very small, with individual plants occurring sporadically in space in little groups where the soil is gravelly and rocky. The number of mature plants has been observed to decline as a result of several threats mainly, drought, over collection, over grazing, feral donkeys etc. The total global population size estimate for endemics was very small (90 mature individual). There are clearly separate subpopulations. During the last 10 years these subpopulations have been observed to have large changes in the total number of individuals, cover and density, due to over grazing by domestic and feral donkeys.
2. Regarding to the Extent Of Occurrence (EOO) R. Arabica found as 40 km^2 and its Area Of Occupancy (AOO) was 36 km^2
3. The population of the target species is considered severely fragmented as the mountainous habitat acts as a barrier between the small subpopulations, and as many of these subpopulations have low viability due to destructive overgrazing causing loss of reproductive organs in some cases. Several studies on the genetic variability of some endemic and near endemic species in the same area concluded that there are a great polymorphism between different subpopulations may come from the variation in topography and climatic conditions and confirm the presence of isolation between different subpopulations that cause the real fragmentation.
4. Due to climate change, the wild population of these species could be in extreme danger in the relatively near future. The most important natural threats are the long-lasting droughts, the difficulties of some species to reproduce new generations as a result of long seed dormancy (Rosa arabica), or overgrazing by herbivores that even eat the reproductive organs and decrease the chance for the possibility for creating new generation, the very scarce irregular precipitation during the year, the fragmentation inherent to its habitat, and the possibility that rare floods may cause harm such as uprooting (1-5% loss observed). Water is being relocated in some localities from elevated wadis which are rich in water to supply to low wadis. This activity leads to consumption of water from wells and results in habitat deterioration and declines in population size. This are observed clearly in Wadi Gebal, Farsh Elromana, Wady Tenia and Abu Tweita.
5. Most of threats root cases comes from lack of awareness, weak law enforcement, lack of suitable strategies, weak financial support and lack of stakeholders cooperation.

6. In general, the target species is severely threatened by both natural (aridity of the area and climate change-flooding) and human factors (over-grazing by domestic animals and feral donkeys, over-collection, and unmanaged tourism activities). All these factors are pushing Target species to the brink of extinction.
7. The distribution, population size, demography, reproduction, and threats of restricted plant species like target species seems to be highly affected by environmental variation like topography, climate, and soil properties. In the regions characterized by topographic and physiographic heterogeneity, like the mountainous region in Saint Katharine, the variation in microclimate plays the major role in governing the natural vegetation and irregularity of rainfall may lead to fluctuations in all species aspects.
8. *Rosa arabica* qualifies as Critically Endangered because it is endemic to a tiny area, with an extent of occurrence (EOO) of 40 km^2, of the high mountain area of the St. Katherine Protectorate in southern Sinai, Egypt. The total population size is 90 mature individuals, distributed among 13 subpopulations.
9. Rosa arabica have the first priority when species recovery takes place through rehabilitation, restoration, reintroduction, and benign introduction in areas that have similar environmental conditions extracted from this study.
10. Although the target species are mostly covered by protected area and partly conserved through in situ and ex situ technics in the past within the regulations and policies of the park, much more however is urgently needed.
11. IUCN Red List assessment is a simple and effective tool for conservation status determination especially for restricted range species. With small accurate data about your target species focused on its geographical range, population, habitat, and threats it's easy to rank your species in suitable level as a first point for complete conservation process.
12. It's not needed to collect all data required for IUCN assessment; for example you can list your species as Critically Endangered species if you have only data about its geographical range. However it's preferable to collect data as you can to cover all criteria to reflect a good detailed picture about the species situation on land in order to start a perfect conservation planning and design suitable actions.
13. The outcome of the undertaken study; A general model is presented describing ecosystem degradation to help decide when restoration, rehabilitation, or reallocation should be the preferred response.

Problems encountered and lessons learnt:

Which project activities and outcomes have been problematic and in what way, and how has this been overcome?

- Up to this point we have never had any real problems in the implementation of the objectives and activities of the project. Incorporating of many stakeholders in the implementation stage and discussion process (workshops and meetings) was sometimes difficult in terms of arrangement, timing and simplicity of dialogue resulting from the conflicts between different parties especially between local community (land owners) and management team of St. Catherine Protected area. By the end of these events we got a good impression and feedback from all parties as a result of our use of simple ways and clear methodology to explain the problem and its causes and impediments solutions. This persuaded many of them.
- Given the current conditions in Egypt, especially Sinai (the study area) that cause activities restrictions (especially outreach activities), the team work had set strategies to address these limitations as follow:
    - We divided the activities into several small parts
    - We've integrated some of the activities in subsidiaries of nature reserves activities in South Sinai
    - We used every available opportunity to present the goals and results of our project to stakeholders in the study area

Please state important lessons which have been learnt through the course of the project so far.

- Team work is the main tool for project success; team should include members from different aspects with many capacities to achieve the main goal. All members should work as one.
- In the project preparation stage, problems should be presented clearly and several plans and strategies (A, B, and C) for solution should be extracting.
- The greater the number and diversity of stakeholders involved in the implementations and discussions process whenever it grew evidence and got an accurate results.
- Different methodologies should be ready in your pocket in case if you find obstacles with one you can use another.
- Simplicity and honesty is the direct way to solve the conflict between different parties.

Future planned activities:

Recommendations:

1- Focus on human resource development in the first and concerning by updating their abilities in order to achieve sustainable development.
2- Strengthening the scientific aspects of PA rangers in the field of Assessing extinction risk using IUCN Red List Categories and criteria, species conservation prioritization, genetic preservation and mapping.
3- There is an urgent need to integrate the knowledge derived from ecological, demographic and genetic approaches to species conservation in order to be able to formulate management strategies that take into account all different considerations.
4- It's highly recommended to use the presented information about the target species requirements when conservation actions take place.
5- Species recovery is highly recommended through rehabilitation, restoration, reintroduction, and benign introduction in areas that have similar environmental conditions.
6- There is an urgent need to conserve the target species outside its habitat (Ex situ) though seed collection, artificial propagation from seeds, botanical garden, seed storage, tissue culture, cultivation, seed bank, freezing cuts from the plant, or stocking the seeds, Tissue bank, Cryobank, Pollen bank, and Field gene bank.
7- Regarding to threats levels and urgency of taking an rapid action to stop or reduce the negative impacts of these threats on the biodiversity inside the target Pas.
8- Raising awareness through biodiversity information: Effective educational programmes with special focus on children need to be implemented in order to raise awareness about the importance of threatened species, their habitats' conservation and the threats increasingly faced by this biome. Moreover, educational projects oriented to all the population levels about the value of species and conservation and the need of more efficient techniques for the utilization of this resource are needed (Highly recommended by IUCN).
9- Data deficiency and research: Research efforts focusing on species for which there is currently little knowledge must be dramatically increased. A Data Deficient listing does not mean that species are not threatened. In fact, as knowledge improves, such species are often found to be amongst the most threatened (or suspected as such from available evidence). It is therefore essential to direct research efforts and funding towards these species as well as those in threatened (Highly recommended by IUCN).

10- There is an urgent need to carry out annual monitoring on species population and habitat trend, habitat trend, fluctuations, and reduction probability to fellow up its situation.

11- **It is recommend using this study specially this species as a base line to detect the effect of global warming on species distribution by annual monitoring.**

12- **It's very urgent to carry out detailed study about endemic species in such PA to clearly identify their distributions, interactions, dynamics, threats level and mapping as well as conservation assessment in order to have a clear vision about the situation in such place for complete conservation program.**

13- **It is essential to carry out such study to cover all threatened species and all Protected Areas of Egypt and the priority must be directed to the most threatening PAs.**

14- Ensure staff has access to training programs that will enable them to effectively carry out their duties. Researchers are one of the most important circles inside the conservation process and capacity building for PAs management staff is an urgent step towards best conservation practices and suggested training topics within the study should be considered when actions take place.

15- Encourage popular participation by raising awareness through the dissemination of information and to provide access.

SECTION 4:

Appendix:

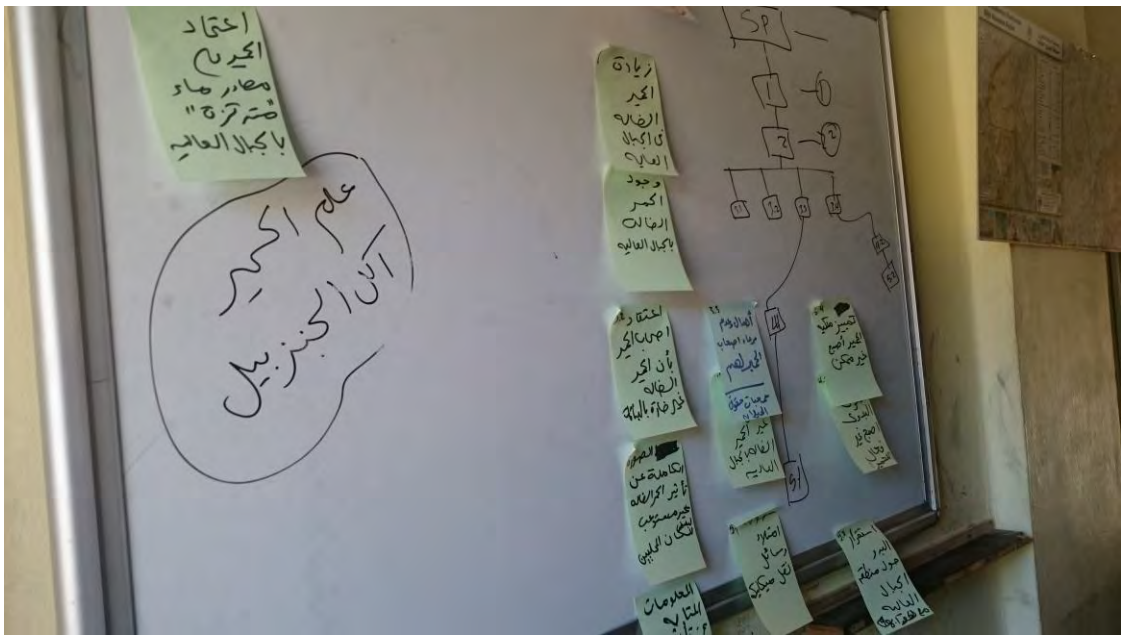
PHOTOS:

Field work activities:

Morphology:

Threats (cutting, grazing, fire):

Workshops and Field training:


علم الكبير
آمن الكنز بيل


Aman


Sinai Rose
Rosa Arabica
Ecological and Conservation Assessment


Wilson

Education and awareness activities:


Let's Conserve
Sinai Wild Roses
Rosa arabica


Let's Conserve
Sinai Wild Roses

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