

International Foundation *pro Herbario Mediterraneo*

Proceedings of the event *Socotra in Sicily*

Botanical Garden of the University of Palermo- Villa Whitaker in Malfitano

Palermo, September 26th-29th 2019

Edited by

F.M. Raimondo, M. Livadiotti, F. Attorre & K. Van Damme

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Presentations

Why Socotra in Sicily?

Today Palermo, the city of exotic gardens and of African light, hosts Socotra and in Palermo, Sicily offers Socotra its help. A rich and unique biodiversity links the two islands although they are quite different from a biogeographic and taxonomic point of view. Socotra is today under threat together with its inhabitants, its memory and its natural and cultural heritage. One of the most, beautiful and amazing places in the world risks to be damaged irreparably. Nowadays losing Socotra means losing a real open-air laboratory of natural evolution which came relatively untouched up to a few decades ago. Saving Socotra's natural and cultural heritage can be still possible, maybe. The Archipelago is still relatively in a good state in comparison to other islands in the world with uncontrolled development and growth, however changes are happening fast, with irreversible consequences. A miracle to be perpetuated, a patrimony that we must preserve closely at the request of local communities. The Palermo conference aims at bringing together these two beautiful and ancient islands - Sicily in the Mediterranean Sea and Socotra in the Indian Ocean - trying to connect Socotra to the world, launching a message of peace and conservation for this small great island so important for the history of mankind and for the future of its inhabitants. Socotra today could become the symbol or even the beginning of a race against time to save the Planet. Socotra belongs to the Socotri and to Yemen but to Mankind too as a World Heritage, and today Sicily, ancient crossroad of the Mediterranean Sea, helps Socotra - ancient crossroad of the Indian Ocean - to look forward. The project Socotra in Sicily was born from this assumption; around the **FoS** (Friends of Soqotra) conference in Palermo, other events will be held regarding different aspects of Socotra and in general Yemen's culture, history, traditions and beauty. Our aim is to introduce Socotra, one of Yemen's most precious jewels and its treasures to the unaware public, as well as threats to the nature and culture, with the aim of promoting the awareness for saving its identity, culture and biodiversity through an International appeal.

It was a great pleasure for me when I was approached by the Friends of Soqotra association **FoS** declaring their interest to have the 18th **FoS** International Conference and Annual General Meeting in Sicily; I thought immediately what a beautiful idea to combine the charm of the two islands: Socotra in Sicily! In this regard, it's worth mentioning that Socotra Archipelago was recognized by UNESCO as a world heritage site for its exceptional biodiversity in many territorial, marine groups of organisms and its high importance for bird species as well.

People who visited Socotra always demonstrate how shocked they were when they encountered such pure and virgin beauty and most of them after their visit could understand why Socotra has been called the Galápagos of the Indian Ocean. I personally think that it is of highly importance to provide a platform to highlight the significance of Socotra to world heritage in terms of its uniqueness, particularity and bewitching beauty. To this end, the 18th **FoS** conference indeed provides such a platform that contributes to drawing the attention to the treasures of Socotra and to reinforce the need to further protect Socotra as a collective responsibility towards conserving and safeguarding world heritage as such site incorporate local, national, regional and international value. I would like to seize the opportunity to thank **FoS** and the Socotra in Sicily team and organizers for their endeavor to keep the momentum of the importance to safeguard the natural and cultural heritage of beautiful Socotra and I wish success to this conference and its deliberations.

Asmahan Abdulhameed Altoqi
Ambassador of the Republic of Yemen to Italy



Expressive landscape of the Socotra Island: in the foreground a young plant of *Dracaena cinnabari*.

The island of Socotra, although less extensive than our island of Sicily, has the advantage of not having had an anthropization that could transform its natural features. Its environment has been kept almost intact and thus its extraordinary biodiversity. This, in particular, has had the opportunity to evolve undisturbed, giving humanity a biological heritage of extraordinary preciousness and beauty. For centuries, from that island immersed in the waters - not always peaceful - of the Indian Ocean, resins such as frankincense, myrrh and cinnabar were all sought after by us, all products derived from local communities from native plants of the island - one, *Dracaena cinnabari* (Dragon tree) truly extraordinary - thus fueling intense exchanges and fruitful trade. On that island, unlike Sicily, it was not man but nature that continued to shape his landscape. The man has kept to the margins, drawing only the vital minimum. This is why its landscape has remained intact in its physical and biological features. Reversing this natural vocation, by introducing disturbing factors to the island, worries all those who have had the opportunity to know it directly or even only through reading or the photographic documents proposed at various levels. Therefore, moments of attention to the island of Socotra and its Archipelago are welcome, only apparently lost in that stretch of ocean in front of the Horn of Africa. Let the spotlight on the dangers to its rich natural and cultural heritage light up. We are ready to press the switch! The Palermo conference - enthusiastically supported by our Foundation and various other organizations - will be an important opportunity for meeting, discussion and discussion, not to denounce something or someone but to sensitize society and the governed to strive to ensure that the common good is defended and preserved over time, finding the most suitable and leading route. To the Friends of Socotra, to the authorities expected, to the representatives of the Yemeni Community and of Socotra, to all the participants and supporters of the event "Socotra in Sicily", I offer a warm welcome and good wishes for good work.

Amedeo di Savoia
President of the International Foundation
pro Herbario Mediterraneo

While we still have yet to discover new species and new forms of life, the 2019 Global Assessment Report on Biodiversity and Ecosystem Services warns us that 1,000,000 species are threatened with extinction. Today, and despite our efforts, biodiversity loss and nature's degradation are occurring at unprecedented rate and scale around the globe. The Socotra Archipelago in the Republic of Yemen, although it has been inscribed as Man and Biosphere reserve (2003) and Natural UNESCO World Heritage site (2008) is no exception to this trend where its exceptional marine ecosystem and fascinating plant species are in great danger and threatened by climate change, unsustainable use of its natural resources and man-made activities. The Socotra in Sicily events including the Friends of Soqotra conference, is a proven track of the global community commitment to halt nature's degradation in the Socotra Archipelago. It urges the international community to take urgent actions to preserve this outstanding site of global significance for its unique natural treasures but also for its cultural values.

Anna Paolini
Director UNESCO Doha office
Representative in the countries of the Gulf and Yemen



Common incense plant on Socotra Island, anchored to the bare rock.

Around the world, islands have been historical yet tragic examples of rapid losses of biodiversity and culture. Insular ecosystems and the people that form a part of them are under pressure from human-mediated impacts, including climate change. The Socotra Archipelago, a UNESCO Natural World Heritage Site since 2008, is not unique in this aspect. Impacts are global yet they assume different shapes and forms locally. On Socotra, climate change has manifested itself as devastating cyclones and droughts, directly impacting people's livelihoods as well as biodiversity. Other challenges include general land degradation resulting in a lack of regeneration in the terrestrial ecosystems. For 18 years, the charity Friends of Soqotra (**FoS**) has been organising annual meetings where people can share research, experiences and activities carried out on Socotra in an international, friendly and multidisciplinary atmosphere. The outputs of these meetings and an overview of the activities on Socotra are shared on the website and in the **FoS** newsletter called Tayf. Socotra is very well studied in many aspects - at the annual meetings attendants can taste a bit of the diversity of topics for which this Indian Ocean archipelago is known. The meetings are yearly opportunities to perpetuate awareness about the unique ecosystems and culture of Socotra, emphasizing the importance of the links between people and environment, and the global challenges that affect us all on a larger scale. By feeling connected to Socotra's beautiful environment and unique culture, we hope that an understanding of the fragility and vulnerability of island ecosystems is passed on as well, and the need to help local communities to preserve their future resources. The 18th Annual General Meeting of **FoS** takes place this year at the beautiful Orto Botanico di Palermo at which the first ever UNESCO awareness campaign for the archipelago, entitled Connect 2 Socotra (#connect2socotra), will be launched. As **FoS**, we are very grateful to the organizers and hosts realising this year's meeting. To all who attend: please enjoy a brief moment connecting to Socotra's beautiful nature and culture, which will need global efforts to survive the next centuries.

Kay Van Damme
Honorary Chairperson
Friends of Soqotra

Promoting Institutions

Friends of Soqotra (FoS -Association of Friends of Soqotra)

The **FoS** (Friends of Soqotra) association is a non-profit organization created entirely by volunteers to promote the sustainable use and conservation of the natural heritage of the Socotra archipelago and to support and assist sustainable development in the life of its communities and its inhabitants throughout the archipelago. **FoS** is based in the UK and consists of members from different European countries, the Middle East, Africa, Australia and the United States. The association was created in 2000 with the aim of bringing together researchers and scholars working on the island of Socotra, with all those who have a particular interest in Socotra and its archipelago and to raise awareness and make them aware in order to protect and preserve the natural and cultural heritage of the island. Every year the members of **FoS** gather in a city of the world where method, research, conservation and sustainable development for the island and its future are discussed. The meeting or conference is open for two days where anyone interested in Socotra and its assets can participate in the discussion forum. Every year, **FoS** produces the Socotra newsletter (Tayf) with articles and reports of projects and activities in the Archipelago by various organizations and with news on the latest research on the Island. **FoS** actively promotes cooperation with other international organizations and local NGOs and depends exclusively on the fees and contributions of its members to finance its projects. Information on **FoS** its activities and Tayf editions can be found on the site: www.friendsofsocotra.org

The Foundation and purposes

The International Foundation *pro Herbario Mediterraneo* was established with public and private capital in 1992 and was recognized by the Ministry of University and Scientific and Technological Research (MURST) with a Decree of 1 March 1995. The Foundation is based at the Botanical Garden of the University of Palermo. Presides over the S.A.R. Prince Amedeo of Savoy-Aosta. Director (in his capacity as Managing Director delegate) is Prof. Francesco M. Raimondo.

- The Scientific Committee is chaired by Prof. Benito Valdés. Institutional goals are:
- promote studies on the Mediterranean flora and the realization in Palermo of the Herbarium Mediterraneo;
 - the publication and distribution of two scientific journals: *Flora Mediterranea* and *Bocconea*, which reached the 29th and 28th volumes respectively;
 - the attribution of recognitions for specific studies on the Mediterranean flora or for actions aimed at protecting the Mediterranean botanical heritage, including recently the Teophrastos Prize which is awarded annually to personalities who have contributed with original studies or inventions to scientific progress concerning botany and to the use of Mediterranean plants or their products;
 - the granting of scholarships to young Italian and mainly foreign researchers for attending the University Herbarium Mediterraneo in Palermo;
 - the organization of exhibitions and scientific meetings on Mediterranean plants;
 - the realization of scientific expeditions aimed at completing the phyto-taxonomic and phytogeographic exploration of the flora of the Mediterranean Basin, with the collection and preparation of collections intended to enhance the Herbarium Mediterraneo of Palermo.

Presentation of Socotra

Socotra world heritage

By inscribing Socotra on UNESCO's World Heritage List in 2008, the World Heritage Committee recognized the Archipelago's global importance for biodiversity conservation because of its exceptional level of biodiversity and endemism in many terrestrial and marine groups of organisms (data from 2008, see <https://whc.unesco.org/en/list/1263>): - Socotra is particularly important for its diversity of plants and has 825 plant species of which 307 (37%) are endemic.

- The Island has high importance for bird species as underlined by the identification by Birdlife International of 22 Important Bird Areas on Socotra (note: updated now, see Porter & Suleiman, 2016).
- Socotra also supports globally significant populations of other land and sea birds, including a number of threatened species.
- Extremely high levels of endemism occur in Socotra's reptiles (34 species, 90% endemism) and land snails (96 species, 95% endemism).
- The marine life of Socotra is also very diverse, with 253 species of reef-building corals, 730 species of coastal fish and 300 species of crab, lobster and shrimp, and well represented in the property's marine areas.

At the time of inscription, the Committee not only recognised Socotra's outstanding universal value, but also referred to requirements for its protection and management. The Committee highlighted the need to strengthen the legislative framework, and management capacity, in view of dealing with threats such as roading, overgrazing and overharvesting of terrestrial and marine natural resources. The Committee also indicated that the impacts of potential threats like unsustainable tourism and invasive species on Socotra's biodiversity need to be closely monitored and minimized. At its most recent meeting (2018), the World Heritage Committee expressed its concern about the casualties and flash flooding caused by Cyclone Mekunu that hit the property at the end of May 2018 and called on all UNESCO Member States to support emergency safeguarding measures at the property, including through the UNESCO Heritage Emergency Fund. At the same time, the Committee also considered that uncontrolled developments, unsustainable use of natural resources, and the absence of adequate biosecurity measures to avoid the introduction of invasive alien species represent a potential danger to the outstanding universal value of the archipelago. The Committee therefore urged to halt any activity that may have a potential impact on the property's value and to refrain from allowing any further unsustainable development, until planned activities and projects have been submitted to UNESCO's World Heritage Centre, for review by IUCN.

International cooperation

Since the end of 1990's, the Directorate General for Development Cooperation, under the Italian Ministry of Foreign Affairs, in cooperation with UNDP and the Yemeni central government, supported the preparation of the Master Plan and a Zoning Plan of the island. The plans were elaborated with the participation of the Universities of Rome (La Sapienza), Pavia and Venice. These efforts, combining expertise from several institutes in Germany, Belgium, UK, and Yemen among others, led to the adoption of the Socotra Conservation Zoning Plan (Pres. Decree n° 275) allowing the development and implementation of conservation and protection measures in the archipelago's different zones (General Use Zones, Resource Use Reserves, National Park and Nature Sanctuaries). For more information on the Zoning Plan see <http://www.friendsofsocotra.org/Bibliography/pdfs/Zoning%20plan%202000.pdf>

The Yemeni government made Socotra its banner to raise ecological awareness in the country and to undertake a serious politics of environmental protection. From the late 1990s to now, several globally known nature conservation and sustainable development organizations have been active on Socotra, such as UNDP, UNEP, GEF and GIZ, in parallel to development projects funded by donor countries including Italy, France and Czech Republic. For a while the island became almost like an interactive workshop where researchers and scientists from all over the world met and worked together with local communities and local conservationists to stimulate sustainability and nature conservation. Up to 2014, development, sustainability, conservation, ecotourism and research appeared to co-exist in an apparently healthy and serene equilibrium on Socotra among the many obstacles and difficulties, through perseverance and passion. In a more recent time of political turmoil in Yemen, efforts to help the survival and health of Socotra's ecosystems and of the island's unique culture, are important to raise awareness on, and several international donors and organizations have continued to support Socotra biodiversity and sustainable development in difficult circumstances. A recent new project by the British Council also focuses on Socotra's tangible and intangible culture. Those conservation efforts led to the declaration in 2003 of Socotra as a UNESCO Man and Biosphere, and later to its inclusion in the UNESCO World Heritage List because of its exceptionally rich and distinct marine and terrestrial biodiversity. A unique biodiversity hotspot together with Galapagos, Canaries, Hawaii, Madagascar, New Zealand.

Biodiversity

Thanks to its extraordinary biodiversity, Socotra Island, apart from being among the few and rare sites in the world to be a Man and Biosphere Reserve (MAB) (2003), was inscribed on UNESCO's World Heritage List in 2008. Both fauna and flora have a high percentage of rare and endemic elements. As regards vascular plants, they are well known and exhaustive data is available. In fact, plant species are about 800 and, among these, about 37% are endemic. They are distributed in 443 genera (15 of which are endemic); and belong to 114 botanic families. Some of these endemics are really peculiar and unique in the world. This is the case with the Cucumber Tree (*Dendrosicyos socotranus*) or a succulent *Moraceae* (*Dorstenia gigas*). This extraordinary little tree, sometimes only a shrub, is

a close relative, perhaps the ancestor of the pomegranate (*Punica granatum*) and received the evocative scientific name: *Punica protopunica*. The Palermo Botanic Garden hosts a specimen of this species, very rare in Socotra, perhaps the only one cultivated outside this restricted range on the other hand. A genus rich of species outside the island, widely cultivated for ornamental purposes and the mother plant of all begonias currently in horticulture, is the beautiful, very rare and threatened *Begonia socotrana*. Some genera such as *Boswellia* (frankincense trees) and *Commiphora* include famous representatives having cultural and economic importance, producing incense and myrrh. Other plants producing famous resins are aloe (*Aloe perryi*) and one Dragon's Blood Tree species (*Dracaena cinnabari*), a beautiful umbrella-shaped plant; engraving the trunk of the latter the red resin, or dragon blood is obtained. A related species, originating in the Canary Islands (*Dracaena draco*), has been cultivated in some gardens of Palermo since the early nineteenth century. The succulent *Adenium besum* subsp. *sokotranum* is frequent and characteristic, as well as the monumental tamarind trees (*Tamarindus indica*) imported during ancient times, growing in the vicinities of small villages, often meeting place of indigenous communities and favourite places of children playing. Only partial data is available about fauna and investigations by different groups of scientists are in progress. Apart from the few mammals such as an endemic bat species, several endemic species of birds and reptiles are known among the vertebrates; the invertebrate fauna is rich in endemic genera and species, only partly discovered and described recently. The marine fauna is rich and diverse with more than 230 species of corals, 730 species of fish and more than 300 species of molluscs and crustaceans, among which crabs, shrimps and lobsters.

Oral traditions

Soqotri is one of the Modern South Arabian Languages MSAL, Mehri, Soqotri, Šherrt, Ḥarsūsi, Hobyōt and Baḥari. These are unwritten Semitic languages spoken by minority populations in south-east Yemen, southern Oman and the fringes of southern and eastern Saudi Arabia. The name 'Modern South Arabian' is somewhat confusing, as these unwritten languages are neither 'modern' nor comprehensible to an Arabic speaker. They are called 'Modern South Arabian' languages (hence for the referred to as MSAL) to differentiate them from 'Old South Arabian', which refers to the four related languages which were written in the Ancient South Arabian script and are now extinct. The MSAL belong to the South Semitic branch of the Semitic language family, which also includes Ethiopian Semitic. This is distinguished from the Central Semitic branch, which includes the more widely known Arabic, Aramaic, and Hebrew. The MSAL are believed to be the remnants of a pre-Arabic substratum that once stretched over the whole of southern Arabia, and across the Red Sea, into the highlands and littoral of East Africa. The areas in which the MSAL are still spoken are the only regions within the Arabian Peninsula to have retained the Semitic languages spoken prior to the spread of Islam and subsequent Arabisation of the Peninsula. In all other communities, Arabic appears to have superseded the original languages.

Through tales, myths and legends

Millions and millions of years ago the Socotra archipelago started to break apart from the Arabian Peninsula and from the African Continent. It seems that at least 18 million years ago the archipelago was already strongly isolated. But the theories are varied. Together with Madagascar, Socotra is considered among the most ancient continental islands in the world. Mysteries and legends have always shrouded this ancient land, placed only a few hundred miles from the coastlines of Africa and Arabia. Socotra is the biggest island in the archipelago and the largest island in Arabia. Socotra is a magical place, a botanical and zoological sanctuary, almost with a seemingly extra-terrestrial look, full of mysteries and legends belonging to ancient civilizations. It is an open-air insular laboratory of nature in the middle of the ocean, where the local biota follows the natural rhythm of life. There are many traces of ancient civilizations and others having yet no recognized origin. In Sanskrit it was called Sukhandara; in The Periplus of the Erythraean Sea of the first century B.C. it is mentioned as a multi-ethnic emporium. Virgil likely called it Panchaia, linked to the Phoenix myth, the Greeks Dioscorida; the ancient people knew it as the land of the Phoenix, to the Portuguese it was known as Zocotora. Dante mentioned it in his Divine Comedy alluding to the Phoenix bird's refuge: "the Arabic phoenix feeding on incense and myrrh..." Stradivarius' violin was told to be lined inside with resin coming from *Dracaena cinnabari* or Dragon blood tree from Socotra. Moravia wanted to go there before dying and that was his last journey, while Pasolini, enchanted too, did not succeed in going there, unfortunately. Today it is known as Socotra or Socotra and it belongs to the Republic of Yemen.

Crossroad, emporium and refuge

Aristotle allegedly recommended Alexander the Great to conquer the island in order to control the aloe trade. Since ancient times, the island was known for the excellent qualities of aloe, as well as incense, myrrh and dragon's blood - the red resin considered till today a panacea obtained from the symbolic tree of the island, dracaena (*Dracaena cinnabari*) and known as the Dragon Blood Tree. Since antiquity, dragon's blood was used for many purposes: lacquering wood, in medicine, in cosmetics and in dyes; Romans may have appreciated it to stain fabric. Therefore, there was a real trade of aloe, dragon's blood, incense and myrrh from Socotra: it started from the coasts of Arabia Felix, today's Yemen, and then was carried to the Mediterranean stores by desert caravans. In the sixteenth century the Portuguese occupied Socotra. Vasco de Gama sailed the surrounding seas several times but he never landed there; Alfonso de Albuquerque was the first explorer to reach it in 1507. In the nineteenth century the British took possession of Socotra together with Aden, and kept it until 1967, when the island became part of People's Republic of South Yemen. But the modern history of Socotra begins in 1990 when, after centuries, the unification of the two Yemen's (Northern Yemen Democratic Republic and Southern Yemen Democratic Republic) took place. Since the advent of Islam, Socotra has always been part of the South Arabia Sultanates, and, before, of the South-Arabian Kingdoms, the famous Arabia Felix. Its complete history must still be written and researched among several

ancient documents dealing about it in Greek, Latin, Syrian, Aramaic, Arabic, Portuguese, English, French, Chinese and other sources, some of which written in the unique caves of Socotra. Just as Sicily was the crossroad and the emporium of the Mediterranean Sea since ancient times, Socotra was the crossroad and the emporium between the Arabian Sea and the Indian Ocean for centuries. Its economically strategic position relative to Africa, Arabia and Asia allowed important trade connections with Ancient Egypt, Mesopotamia, Arabia Felix, but also for the routes starting from the Mediterranean Sea towards India.

Climate - economy - eco tourism

Socotra is part of the Archipelago to which it gave its name, together with three smaller islands and it stretches over a territory of 3600 km² where about 80,000 inhabitants live. Among the indigenous Socotri, many are livestock breeders and fishermen, partly nomadic. Its highest mountains, the Hagher Mountains, reach up to ca.1,500 m and they are the source of wealth and the guardians of its secrets; from them emerge the springs, bringing fertility throughout of the mountains and feeding many wadis in the eastern part of the island. Humidity and fog coming from the sea are trapped from the high mountains. From May to September the great monsoon hits the Socotra archipelago causing rainfalls and very strong winds. Because of the strong monsoon winds blowing on its islands, the Socotra archipelago is often inaccessible from May to September, preserving its isolation through the centuries. The powerful strength of nature dominating without hindrance from its coasts to its mountains allowed the development in ancient times of an environment and a biodiversity unique in the world. Its inhabitants live mainly of eco tourism, building, regional trade, animal husbandry and fishing. Until several decades ago the inhabitants have always lived their lives in a certain balance with the island's natural resources following traditional rules favoring and protecting the survival of Socotra's natural environment. Activities for an eco-sustainable tourism started in the 1990's. Visits and explorations to the island suddenly brought it to the limelight. The limited adventurous ecotourism, not mass tourism, allowed Socotra at the time to remain relatively unspoiled in comparison to many other islands in the world. It is an ideal place for environmentally friendly investments such as eco-tourism, avoiding the mistakes made in the Galapagos or in Madagascar or in other biodiversity hotspots on our planet, leading to negative ecological impacts. In 2008/2010 Socotra opened itself up even more to the world. Tourists are limited, with a spike of 5,000 tourists in 2010 and currently much less of course, but enough to encourage its inhabitants to devote themselves to new activities but at the same time without destroying its habitat and its natural treasures, and raising natural awareness. Above all, the Socotri are conscious of the value of their unique land and environment.

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Programme

DAY 1. THURSDAY SEPTEMBER 26TH, 2019 - SALA LANZA, BOTANIC GARDEN,

10.30 - 16.30 Open registration at the Botanic garden

16.30 - 18.00 Welcome address by:

International Foundation *pro Herbario Mediterraneo*

UNESCO GCC and Yemen office

Yemeni government authorities

University of Palermo

City of Palermo

Sicilian Region

Yemen Embassy to Italy

Friends of Soqatra

18.00 - 19.30 Tour of the side events and Socotra exhibitions

DAY 2. FRIDAY SEPTEMBER 27TH, 2019 - VILLA WHITAKER IN MALFITANO

8.00 - 9.00 Registration

Session 1. Systematics & evolution - Chairperson Francesco M. Raimondo

9.00 - 9.20 Francesco M. Raimondo - Results of scientific expeditions carried out in Socotra (Yemen) in 2008 and 2014 by the Botanical Garden and Herbarium Mediterraneo of the University of Palermo

9.20 - 9.40 Franco Palla - Preliminary genome survey of *Dracaena cinnabari* and *Punica protopunica*, two emblematic flowering plants endemic to Socotra

9.40 - 10.00 Gianniantonio Domina - Molecular and morphological data on *Turraea socotrana* (*Meliaceae*) from Socotra (Yemen)

10.00 - 10.20 Raquel Vasconcelos - Insights on island diversification from the endemic haemodracon geckos of the Socotra archipelago

10.20 - 10.40 Attilio Carapezza - Heteroptera (Arthropoda: Insecta) of the Socotra archipelago

10.40 - 11.00 break

Session 2. Land management - Chairperson Petr Maděra

11.00 - 11.20 Petr Maděra - Development of the *Boswellia elongata* population in homhil nature sanctuary

11.20 - 11.40 Abduraqeb al-Okaishi - Local management system of Dragon's blood tree (*Dracaena cinnabari*) resin in firmihin, Socotra island

11.40 - 12.00 Marcelo Rezende - Land productivity dynamics in Socotra (Yemen): an indicator of land degradation

12.00 - 12.20 Petr Vahalík - Mapping of the Socotra archipelago for the purpose of sustainable land management - a demographic survey

12.20 - 14.00 break

Session 3. Conservation & development - Chairperson Kay Van Damme

- 14.00 - 14.20 Kay Van Damme - The aquatic ecosystems of Socotra: diversity and challenges
- 14.20 - 14.40 Salem Hamdiah - Rehabilitation and conservation of *Boswellia* species on Socotra island by indigenous people
- 14.40 - 15.00 Anna Paolini - The wh and mab site of Socotra - an irreplaceable wealth for humanity
- 15.00 - 15.20 Haifaa Abdulhalim - Sustainable development as good practice for disaster resilience
- 15.20 - 15.40 break

Session 4. Ecology - Chairperson Fabio Attorre

- 15.40 - 16.00 Martin Rejžek - The change of plant community composition and diversity following loss of *Dracaena cinnabari* acting as a nurse tree
- 16.00 - 16.20 Fabio Attorre - The role of *Dracaena cinnabari* forest on the hydrogeological system of Socotra island
- 16.20 - 17.40 Alfredo Guillet - Toward a viable management of the water cycle: follow-up to a case of application in Socotra of the system approach
- 17.00 - 17.20 break
- 17.20 - 19.00 Socotra documentary/movie (tbd)

DAY 3. SATURDAY SEPTEMBER 28TH, 2019 - SALA LANZA, BOTANIC GARDEN

Session 5. Chairperson Kay Van Damme

- 09.20 - 09.40 launch of the connect 2 socotra campaign (unesco-FoS)
- 09.40 - 10.00 break
- 10.00 - 12.30 annual general meeting **FoS** - activities 2019, current and future projects, reports, round table discussions (including powerpoint presentations on local projects) - open to all attendants
- 12.30 - 14.00 break
- 14.00 - 18.00 annual general meeting **FoS** - activities 2019, current and future projects, reports, round table discussions (cont.)
(with break at 16.00) - open to all attendants
- 18.00 - 19.00 closing remarks of the conference

DAY 4. SUNDAY SEPTEMBER 29TH, 2019 - VISIT TO THE CITY OF PALERMO AND SURROUNDINGS

SOCOTRA IN SICILY – OPENING CERIMONY

Welcome address

Amedeo di Savoia Aosta, President of International Foundation pro Herbario Mediterraneo (Palermo)

Anna Paolini, UNESCO Office GCC and Yemen (Doha)

Abdulrahman El Eryani, Minister of Tourism (Yemeni Government Authorities, Sanaa)

Paolo Inglese (Director of SIMUA, University of Palermo)

Adelaide Catalisano (Sicilian Region, Sicilian Department of Cultural Heritage and Identities)

Fhami J. Azazi (Yemen Embassy to Italy)

Kay Van Damme (Honorary President of Friends of Soqotra)



Opening moment of the “Socotra in Sicily” event - 18th International Conference of Friends of Socotra (FoS). Presidency table: in the center Amedeo di Savoia Aosta (President of the International Foundation pro Herbario Mediterraneo); on his left Kay Van Damme (Honorary President of FoS); on his right Paolo Inglese (Director of the Museum system of the University of Palermo and Adelaide Catalisano (representing the Regional Department of Cultural Heritage and Sicilian Identity).



Opening moment of the "Socotra in Sicily" event - 18th International Conference of Friends of Socotra (FoS). Presidency table: in the center Amedeo di Savoia Aosta (President of the International Foundation pro Herbario Mediterraneo); on his left Kay Van Damme (Honorary President of FoS); to his right Anna Paolini (UNESCO - Doha) and Mahroos Ramzi (Governor of Socotra).



Sala Lanza of the Botanical Garden: greetings from Paolo Inglese, director of the Museum System Center of the University of Palermo (SIMUA).



Group photo of the participants at the end of the opening ceremony of the event, on the staircase of the Gymnasium of the Botanical Garden of the University of Palermo and in evidence the poster of the event.

Proceedings of the event *Socotra in Sicily*

18th International conference and AGM of the Friends of Soqotra (FoS)

SCIENTIFIC MEETING

Systematics & Evolution, Land Management, Conservation &
Development, Ecology

Abstracts of the lectures given

Haifaa Abdulhalim, Ismael Salem Mohamed & Kay Van Damme

Sustainable development as a good practice for disaster resilience

Abdulhalim, H., Ismael Salem, M. & Van Damme, K.: Sustainable development as a good practice for disaster resilience. — 31.

Key words: green economy, hotspot biodiversity, ecosystem conservation, vulnerable land, Socotra.

Sustainable Development in itself is a term to express an approach that seeks to maintain an ideal balance between three primary pillars: environment, economy and human wellbeing. Sustainable Development in itself it is not a goal, but it is a tool to maintain that balance.

Most activities that adopt the Sustainable Development approach are implemented at local levels. Therefore mostly we think that its impact is localised to a limited project target area, but it is not-localised projects go far beyond that. The Sustainable Development approach also shows that it is one of the good practices to respond to urgent needs after disasters, such as impacts from climate change.

On November 2015, two cyclones hit the Socotra Archipelago (Yemen), causing devastating damage to buildings, environment, even human losses. Therefore, different interventions have been proposed to respond to the cyclone impacts. Several projects that have been implemented (with the help of FoS) are linked to at least two of the pillars of Sustainable Development: environment and human wellbeing. This in light of the need to relieve the Socotri people and protect their environment as it forms a significant support to their well-being through ecosystem services. Therefore disaster relief projects can use the Sustainable Development approach to increase disaster resilience.

A case study and example presented herein, is the Mangroves Ecosystem Plantation project in Ghubbah, Socotra, initiated and jointly funded by the Friends of Socotra (FoS) and the Arab Regional Centre for World Heritage (ARC-WH). This project, which started effectively on the ground on Socotra in 2018, is low-cost yet high-yield: it is highly sustainable through full involvement and the enthusiastic implementation by local communities with full ownership of the activities in the mangrove area. The intervention has resulted in the first 80 young healthy mangrove trees growing in the wild in the north coast of Socotra, derived from local mangrove seedlings. The new mangrove increases the resilience of the area against future climate impacts, while stimulating pride of the local communities in their efforts.

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Abdulraqeb Al-Okaishi

Local management system of Dragon's blood tree (*Dracaena cinnabari* Balf. F.) resin in Firmhin, Socotra Island, Yemen

Al-Okaishi, A.: Local management system of Dragon's blood tree (*Dracaena cinnabari* Balf. F.) resin in Firmhin, Socotra Island, Yemen. — 33.

Key words: environmental compatibility, native plant, production, endemism, conservation, Socotra.

Various non-timber forest products (NTFPs) are produced from the forests and woodlands of Yemen. Dragon's Blood Tree resin is one of commercial NTFPs in Yemen produced by tapping *Dracaena cinnabari* trees, which is listed as vulnerable in IUCN red list.

By applying forest resources assessment, the present study inventoried the *Dracaena cinnabari* forest with the aim of identifying and evaluating its structure, harvesting status of its resin and current management system. The study was conducted in Firmihin forest, Socotra Island, Yemen Republic. The forest resource assessment had been done through forest inventory by measuring trees from 12 plots following stratified random sampling.

A total of 819 trees relevant parameters were measured, including tree height, stem height to lowest branches, height to the highest wound, diameter breast at height (DBH) and presence of wounds. The wounds have been measured from a total of 401 trees. Value chain analysis (VCA) was used for clarifying the flow of Dragon's Blood Tree resin from the producers to local, national and international market. Traditional management has been examined by questionnaires in the case study area and surrounding villages. There are two tapping techniques collecting the pure Dragon's Blood Tree resin and cutting part of the bark with the pure resin, the second technique resulted on 84% of the trees with wounds. Tappers are mostly from the community in the forest and around. The study found that the traditional management system of tapping Dragon's Blood Tree resin is not sustainable.

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Fabio Attorre, Alfredo Guillet, Peter De Geest, Michele De Sanctis & Kay Van Damme

The role of *Dracaena cinnabari* forest on the hydrogeological system of Socotra Island

Attorre, F., Guillet, A., De Geest, P., De Sanctis, M & Van Damme, K.: The role of *Dracaena cinnabari* forest on the hydrogeological system of Socotra Island. — 35.

Key words: plant ecology, arid land, vulnerable ecosystems, endemism, Socotra.

Dracaena cinnabari is one of the most iconic endemic species of Socotra Island. Up to now its importance has been recognized as it provides significant services to the livelihood of local people. According to the Common International Classification of Ecosystem Services, *Dracaena cinnabari* provides a provisioning service through the exploitation of its resin for the traditional medicine and pottery production, a regulating service acting as habitat for other important species, e.g. snails and reptiles, and a cultural service being one of the most important eco-tourism attractors. In our work we highlight a new fundamental regulating service provided by the *Dracaena cinnabari* forest in the Haggier mountain linked to the hydrogeological system of Socotra island. where one of the most limiting factors for the sustainable development is the availability of freshwater. Based on an extensive water survey, we are able to quantitatively demonstrate that due to the temporal and spatial erratic pattern of the precipitation and the permeability of the lime- stone substratum, the main source of freshwater recharge is related to the capacity of *Dracena cinnabari* forest to trap and slowly release to the soil the humidity brought by sea winds. Without strict conservation and effective restoration actions, the combined effect of climate change and lack of regeneration due to grazing by goats, not only will threat the survival of an unique biodiversity hotspot, but will make the living conditions in the Island rapidly unsustainable also considering the increasing exploitation of the scarce and localized freshwater resources.

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Attilio Carapezza, Petr Kment, Pierre Moulet & Leonidas R. Davranoglou

Heteroptera (Arthropoda: Insecta) of the Socotra Archipelago

Carapezza, A., Kment, P., Moulet, P. & Davranoglou, L. R.: Heteroptera (Arthropoda: Insecta) of the Socotra Archipelago. — 37.

Key words: biogeography, taxonomy, endemism, animal biodiversity, Soqotra.

According to published literature, 61 species of Heteroptera (Arthropoda: Insecta) were recorded from the Socotra Islands, classified in 52 genera and 22 families. Out of them, one genus (*Socantestia*) and 16 species (i.e. 26%) were considered endemic. Based on the recently acquired material, the knowledge of Heteroptera of Socotra Archipelago has substantially increased. We currently register 209 species in 158 genera and 31 families, with a high proportion of endemics - 12 genera and 61 species (i.e. 29%). Among the plant feeding Miridae and Tingidae the endemism rate reaches 52%. First data on host plants of the phytophagous Heteroptera are given; some species seem polyphagous, but some of the endemic Tingidae and Miridae were found to be associated with a single endemic plant taxon. First cases of probable adaptive radiations are documented in Miridae (e.g., seven endemic genera of *Orthotylinae*, *Volumnus* - 5 endemics, *Isometopus* - 3 endemics) and Tingidae (*Cysteochila* - 2 endemics on *Cissus*). From a zoogeographical point of view, most of the collected taxa represent the following elements: Eremian (Saharo-Sindian) element, followed by the Afrotropical (mainly in mountain forests) and Mediterranean (mostly in coastal regions); a minority of the species has relations to Indian fauna.

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One of the scientific lectures of the 18th International conference of FoS in Villa Whitaker.



18th International conference of FoS in Villa Whitaker: conclusion of Attilio Carapezza's scientific lecture.

Antonio Giovino, Sergio Saia, Francesco M. Raimondo, Luigi Guiglia & Gianniantonio Domina

Molecular and morphological data on *Turraea socotrana* (Meliaceae) from Socotra (Yemen)

Giovino, A., Saia, S., Raimondo, F. M., Guiglia, L. & Domina, G.: Molecular and morphological data on *Turraea socotrana* (Meliaceae) from Socotra (Yemen). — 39.

Key words: plant biodiversity, conservation, endemism, *Turraea*, Socotra.

In the course of a project for the assessment of plant biodiversity in Socotra carried out by the Botanical Garden and Herbarium of Palermo (Italy), the relations of two geographically and ecologically separated populations of *Turraea socotrana* (Meliaceae), a very rare and scattered tree from the island of Socotra (Yemen), were analysed through morphological and molecular analyses. The plastid regions *matK*, *rbcL* and *trnH-psbA* and the nuclear ribosomal ITS region were adopted to screen the level of genetic divergence of *T. socotrana* from ecologically distant localities in comparison to other species of *Turraea* and close-related genera. The population from Qalansiya grows on lithosoil slopes directly exposed to moist winds coming from the sea, whereas the population of Diksam occurs on arid cliffs overlooking the inland of island. The individuals from the inland (Diksam) differ from the coastal ones (Qalansiya) by vegetative characters and by the *rbcL* gene. The ITS sequences clustered together with all the studied populations from Socotra and clearly separated them from the morphological and geographically close *T. floribunda*. Considering the differences recorded in the *rbcL* gene we suggest that all the known populations of *T. socotrana* should be considered separately for conservation purposes.

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Alfredo Guillet & Fabio Attorre

Toward a viable management of the water cycle: follow-up to a case of application in Socotra of the system approach

Guillet, A. & Attorre, F.: Toward a viable management of the water cycle: follow-up to a case of application in Socotra of the system approach. — 41.

Key words: arid land, integrated approach, training programme, Socotra.

This communication refers to the application in Socotra of the integrated approach focusing on the water cycle and biodiversity binomial. The successful outcomes of such a work has encouraged us to engage in the preparation of a novel training programme. This will be primarily aimed at consolidating the capacity of the local institutions responsible for natural resources and the environment, when interacting with development investors and related administrative processes. Consistently with the integrating system approach, the focal sectors of infrastructural development, water and biodiversity will be tackled in the interdisciplinary context of the current social and economic changes that Socotra is going through.



Image of an infrequent persistent stream on Socotra Island.

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Salem Hamdiah

Rehabilitation and conservation of *Boswellia* species on Socotra Island by indigenous people

Hamdiah, S.: Rehabilitation and conservation of *Boswellia* species on Socotra Island by indigenous people. — 43.

Key words: natural resources, biodiversity, plant management, conservation, ethnobiology, training programme, Socotra.

For thousands of years, the indigenous people of Socotra have taken care of their biodiversity, natural resources, and environment using their traditional knowledge and the experience of their ancestors. Their knowledge and experience on the biodiversity conservation represent one of the oldest traditionally valuable systems in Socotra island and their socio-cultural relationship with biological systems have largely been contributing to sustainable conservation of biodiversity and management of natural resources. Frankincense trees in Socotra are divided into two groups. Species from the first group belong to ground rooted trees (*B. ameero*, incl. *B. sp. A*, *B. elongata* and *B. socotrana*). The second group is composed of cliff-rooted species (*B. popoviana*, *B. dioscorides*, *B. bullata* and *B. nana*). Generally, ground-rooted species are more endangered. In past decades a decline of frankincense and myrrh tree populations has become evident, due to the lack of the regeneration of ground-rooted species caused by livestock grazing or other natural impacts. There is also a lack of systematic studies that could examine the population status of the species and that could lead to improved management and conservation. In 2015, two cyclones struck the Archipelago, which caused damage and uprooted over 50% of the *Boswellia elongata* population at Homhil nature sanctuary. The situation is maybe similar to the other parts of Socotra Island.

In 2016, the Socotra Al-Ata'a Foundation (SAF) and the Environment Protection Authority (EPA) planted around 70 home gardens with International Assistance Financing by the UNDP/SGBP project for the indigenous people and local communities to rehabilitate branches and seedlings of *Boswellia* species at Shata Qalansiya. The project also sought to increase awareness within the indigenous people and local communities about these species and the unique biodiversity of Socotra and refreshed their traditional knowledge and experience on the biodiversity conservation. Eighty participants of local communities and indigenous people participated in a training course and fieldwork for the rehabilitation of *Boswellia* species in these home gardens. This initiative will encourage the indigenous people and local communities to take care of their biodiversity and sustainable use of the environment and natural resources.

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Mohammed Ahmed Bin Khalifah

Our school as a friend of environmental education - Socotra Island (Yemen)

Bin Khalifah, M. A.: Our school as a friend of environmental education - Socotra Island (Yemen). — 45.

Key words: environment, biodiversity, protection, education, Soqotra.

The role of the Socotri people in preserving their environment and biodiversity in Socotra is to preserve the place in which they live, and to protect Socotra's ecological diversity by instilling a culture of awareness among individuals and education about the environment, the marine and coastal environment, and the beaches, and the surrounding land, air and water.

Socotra has a unique and rare nature, and white sand, intended for citizens, residents, living in it, and ecotourists for the purpose of recreation, visiting, listening to its cleanliness and purity of air. So we should not spoil this environment by throwing rubbish. To reach this achievement, the goal is by not spoiling the environment in Socotra and not polluting it, contributing to protecting it from environmental damage, cleaning it and save it from rubbish, and free from plastic.

In a series of awareness events under the title "*Our School as a Friend of Environmental Education*", we involved local teachers and schools in different areas on Socotra to discuss the connections between human health and that of our environment. The importance of our biodiversity and its importance for visitors as well as the need for maintaining it, were discussed in our Socotri language. In particular, concerns and potential solutions related to plastic waste and rubbish were important topics to discuss with the youth of Socotra.

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Samuel Lvončík, Petr Vahalík, Karolína Hušková, Julian Jansen Van Rensburg, Salem Hamdiah & Petr Maděra

Development of the *Boswellia elongata* population in Homhil Nature Sanctuary

Lvončík, S., Vahalík, P., Hušková, K., Jansen Van Rensburg, J., Hamdiah, S. & Maděra, P.: Development of the *Boswellia elongata* population in Homhil Nature Sanctuary. — 47.

Key words: endemism, vulnerable species, environmental disasters, landscape, protection, Soqotra.

The development of *Boswellia elongata* was evaluated based on old photographs, aerial photographs and direct field measurements. The influence of the cyclones affecting Socotra in 2015 on these endemic frankincense trees was also evaluated.



Characteristic branching in *Boswellia elongata* from Socotra.

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Franco Palla, Roberta Russo & Francesco M. Raimondo

Preliminary genome survey of *Dracaena cinnabari* and *Punica protopunica*, two emblematic flowering plants endemic to Socotra

Palla, F., Russo, R. & Raimondo, F. M.: Preliminary genome survey of *Dracaena cinnabari* and *Punica protopunica*, two emblematic flowering plants endemic to Socotra. — 49-50.

Key words: endemism, plant biodiversity, genetic research, molecular approach, Socotra.

Dracaena cinnabari Balf. f. (Asparagaceae) and *Punica protopunica* Balf. f. (Lythraceae) constitute two endemic plants in Socotra island (Yemen). Taxa related to these two different species are from Canaries (*Dracaena draco* L. *draco*) and from Morocco (*D. draco* subsp. *ajgal* Benabid et Cuzin); *Punica granatum* L., are woody species cultivated in the last decades all over the world, actually utilized for alimentary, nutraceutical or ornamental purposes. The three taxa of *Dracaena* have awakened great decorative interest because of their branches and are, partially, introduced in some tropical and sub-tropical countries. In their homeland “Dragon trees” (name used to identify arborescent *Dracaena* species) represent sources of cinnabar (vermillion), a product obtained from incisions of the plant, used in several sectors from pharmaceutical, cosmetic one up to paints industry.

The study of two Socotra species has started in order to perform a genetic characterization as well as to define potential genetic relationships with related species; particularly, *Dracaena cinnabari* with the typical *D. draco* of Canary’ islands and *D. draco* subsp. *ajgal*, (Anti-Atlas mountains) and *Punica protopunica* with *Punica granatum*, the second species of the genus. With that purpose, genomic DNA was extracted from fresh samples, through ad hoc protocols, in relationship with: i) samples of centenary leaves of *Dracaena draco*, cultivated in the Palermo Botanic Garden, and from a young plant, *Dracaena cinnabari*, which seeds were collected, from one of the authors during a scientific expedition in Socotra island (2008) and cultured in the same garden; ii) from leaves’ samples of two congeners taxa, *Punica protopunica* and *P. granatum*, one of them cultivated in the botanic garden which seeds were collected in 2008 as for *Dracaena*, and others from the botanic garden and from plants nearby the town of Palermo (fruits and ornamental plants).

The DNA was the template molecule for PCR reactions, using nuclear and chloroplast molecular markers. These investigations allow obtaining information of the genetic variety (partially already investigated by other authors) and establishing biogeographical relationships between *Dracaena* plants from Atlantic Islands (Canaries), from North-West Africa land (Morocco) and Socotra Island; supporting the APG (Angiosperm Phylogeny Group) classification, including *Dracaena* genus in the Asparagaceae instead of the Agavaceae family.

In order to define the gene-based relations of *Punica protopunica*, retained progenitor of pomegranate (*P granatum*), in addition to categorizing the endemic Socotra taxon,

this study will notice information to support or disregard this statement.



Isolated tree of *Dracaena cinnabari* (left) and the fruit of *Punica protopunica* (right).

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Anna Paolini

The wh and mab site of Socotra - an irreplaceable wealth for humanity

Paolini, A.: The wh and mab site of Socotra - an irreplaceable wealth for humanity. — 51.

Key words: endangered species, climatic change, international cooperations, biodiversity conservation, Socotra.

In May 2019 the world was in shock for the reality check on the status of global biodiversity presented in the IPBS report: 1 million species threatened with extinction!

The why is found in global cyclical causes but the dramatic acceleration is by man-made causes. Climate change events are getting more frequent and dramatic; pollution of air, soil and water reaches limits to harm the life of millions if not of everybody; production practices are reaching unimaginable levels just to keep up with the present way of living of the human race, which goes beyond sustainability; political decisions that do not respect the natural environment we have been given to live in and with, have been, and are being made. On top of all these frightening reasons, which alone shall alarm and concern every single each of us, wars and armed conflicts around the world are irrationally disrespectful of the human being and its environment.

The UN Secretary General and many world leaders make one of their top urgent priorities to fight against this degradation of our planet but there is unfortunately still much to do and this concerns all of us.

The beautiful and once pristine island of Socotra is unfortunately is also affected. Maybe not in such a dramatic way to feel immediately threatened but it is a reality that the risk of losing part of its unique biodiversity and cultural values is behind the corner.

Global international conventions and treaties which aim at protecting biodiversity of the island have been ratified. The Socotra Archipelago is a Man and Biosphere Reserve, a Natural World Heritage Site and Ramsar site (Detwah) but how this translates into real practice is something that still needs attention, and more efforts by the Yemeni and International community together, in a constructive way. It is also a moral ethic responsibility toward the entire world community to protect one of the most striking archipelagos in the world, which harbors a unique yet very vulnerable flora and fauna which loss would be irreplaceable and in the long term a crime for the human race.

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Francesco M. Raimondo, Emanuele Schimmenti, Giovanni Scafidi, Eugenia Schimmenti & Giannantonio Domina

Results of the scientific expeditions carried out in Socotra (Yemen) in 2008 and 2014 by the Botanical Garden and Herbarium Mediterraneum of the University of Palermo

Raimondo, F. M., Schimmenti, E., Scafidi, G., Schimmenti, E. & Domina, G.: Results of the scientific expeditions carried out in Socotra (Yemen) in 2008 and 2014 by the Botanical Garden and Herbarium Mediterraneum of the University of Palermo. — 53-54.

Key words: plant collections, herbaria, floristic studies, taxonomy, Soqotra.

The Botanical Garden of the University of Palermo, at the time belonging to the Department of Botanical Sciences, promoted two scientific expeditions on the Island of Socotra in 2008 and 2014 aimed not only at knowing the flora and vegetation of that island, but also to find study materials for specific research projects. The first expedition, in 2008, was realized thanks to the support of a passionate medical-naturalist, Dr. Luigi Guiglia from Turin, who over the years, had acquired so much competence on the environment and plants of the island visited with prolonged annual stays. This first expedition was attended by a large group of researchers and technicians including botanists, an ornithologist and an entomologist. On that occasion the collections of *exsiccata* (dried herbarium specimens) done are partly already studied. The curiosity to observe and collect plants in bloom in a different season, led to organize a second visit, carried out in 2014, this time attended only by two of the authors (F. M. Raimondo and G. Domina) and A. Carapezza (the entomologist). On this second occasion, attention was paid to collect herbarium specimens.

The result of the first studies of the collections were the publication of two taxonomic contributions aimed at the description of two taxa new for Science: *Limonium guigliae* Raimondo & Domina and *Portulaca socotrana* Domina & Raimondo. Further studies that have not yet been completed have also led to the identification of taxa new for the vascular flora of the Archipelago which will be published as soon as the identification work, undertaken in recent months, in view of this meeting, has been completed. Taxonomically critical are some specimens related to the different genera of *Acanthaceae*, *Cyperaceae*, and *Convulvulaceae*.

Overall, the *exsiccata* housed in the Herbarium *Mediterraneum Panormitanum* (PAL) sum up to around 600 *specimina* related to over 500 taxa. Living plants for the enhancement of the Garden's living collections and for the documentation of the peculiar vascular flora of the Archipelago of Socotra, initially more than ten taxa was reduced to only seven. On the herbarium materials and on the living plants of the Botanical Garden, taxonomic and genetic studies are underway, partly subject to other communications presented in this meetin



A break of the first expedition (2008) in the shadow of a monumental tree of *Dracaena cinnabari*.



Isolated tree of *Sterculia africana* subsp. *socotrana*.



Calotropis procera (Apocynaceae), frequent shrub in tropical regions.

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Marcelo Rezende, Fabio Attorre & Tullia Riccardi

Land productivity dynamics in Socotra: an indicator of land degradation

Rezende, M., Attorre, F. & Riccardi, T.: Land productivity dynamics in Socotra: an indicator of land degradation. — 55.

Key words: soil productivity, indicators, ecological methodologies, Socotra.

The land productivity dynamics indicator is a map of persistent decline/stress, stability and gain of land productivity, strictly during the observation period from 2001 to 2018 generated through the interaction of three NDVI-based indicators: Trajectory, state and performance.

Trajectory measures the rate of change in primary productivity over time. The state indicator allows for the detection of recent changes in primary productivity as compared to a baseline period. The performance indicator measures local productivity relative to other similar vegetation types in similar land cover types or bioclimatic regions throughout the island. These three sub-indicators are then combined to describe each pixel from increasing to declining productivity.



Xerophilous bush with *Commiphora* sp. pl. and *Acacia* sp. pl..

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Martin Rejžek

The change of plant community composition and diversity following the loss of *Dracaena cinnabari* acting as a nurse tree

Rejžek, M.: The change of plant community composition and diversity following the loss of *Dracaena cinnabari* acting as a nurse tree. — 57.

Key words: endemic plants, environmental disaster, habitats reduction, biodiversity in danger, landscape change, Soqotra.

Dracaena cinnabari is the dominant endemic tree of limestone plateaus of Socotra Island in Yemen. Environmental conditions prevailing beneath *Dracaena* canopies differ from those in open areas and enable the presence of plant species which are less likely to survive outside the area with tree influence. At the landscape level, the presence of *Dracaena* trees enhances the heterogeneity of environment and diversity of vegetation. However, the remaining *Dracaena* stands are currently experiencing severe decline and almost completely lack any regeneration due to overgrazing and long-term aridification. This adverse situation has been recently worsened by cyclones, which killed or damaged a high number of the remaining *Dracaena* trees. As *Dracaena* acts as an important nurse plant, its loss may have impacts beyond the mere disappearance of this unique tree species, because it could lead to the disappearance of habitats for a vast array of other plants.

A study was conducted in Shibehon area of Dixam plateau in the central part of Socotra to evaluate the amount and speed of change in vegetation composition and diversity following *Dracaena* death. The population of *Dracaena* in this area was seriously affected by cyclones in November 2015 when many trees were windthrown and died. The study was carried out in October 2016 when data on composition and diversity of vegetation beneath standing live *Dracaena* trees, in open areas, and in the vicinity of windthrown dead trees were collected. The analysis revealed substantial change of former understorey vegetation after one year since the death of the trees. The amount and speed of vegetation change underlines the importance of *Dracaena* trees for maintaining plant diversity as the former understorey vegetation is quickly replaced by vegetation of open sites. This quick change is inconsistent with studies describing gradual change and long lasting effects of trees on associated vegetation which persist several years following the death or removal of trees in arid environments.

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Karin Tamar, Marc Simó-Riudalbas, Joan Garcia-Porta, Xavier Santos, Gustavo Llorente, Raquel Vasconcelos & Salvador Carranza

Insights on island diversification from the endemic *Haemodracon* geckos of the Socotra Archipelago

Tamar, K., Simó-Riudalbas, M., Garcia-Porta, J., Santos, X., Llorente, G., Vasconcelos, R. & Carranza, S.: Insights on island diversification from the endemic *Haemodracon* geckos of the Socotra Archipelago. — 59.

Key words: biogeography, animal biodiversity, endemism, speciation, Socotra.

The Socotra Archipelago (Yemen) is one of the most isolated landforms on earth and an important centre of endemism. In this presentation, we provide an integrative study on *Haemodracon* geckos, the sole genus of geckos strictly endemic to the archipelago. The distribution of *Haemodracon riebeckii* and *H. trachyrhinus* in the same area (sympatric distribution) on Socotra Island provides a unique opportunity to explore evolutionary relationships and speciation patterns.

We used DNA to infer the evolutionary relationships between these species, the timeframe of their diversification, and for species delimitation analyses. We performed multivariate statistics to analyse morphological data, and we used species distribution models and observations of micro-habitat use to compare the ecological niches of the two species.

The two *Haemodracon* species exhibit great levels of intraspecific genetic diversity. Our calibration estimates revealed that this genus diverged from its closest relative, the mainland *Asaccus* geckos, in the Eocene, before the detachment of the archipelago from Oman. The ancestral of these species diversified already on Socotra Island during the Middle Miocene, after the isolation of the archipelago, into the two recognised species. Their divergence is mainly associated with remarkable body size differences and micro-habitat segregation, with low levels of climatic and body shape divergences within their sympatric distributions. These results display how ecological, sympatric speciation, and speciation related to geographic isolation (allopatric), may both have varying roles at different evolutionary phases.

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Petr Vahalík, Peitr Maděra, Abdullateef Saad, Mohammed Amar Zrkine, Samuel Lvončík

Mapping of the Socotra Archipelago for the purpose of sustainable land management - a demographic survey

Vahalík, P., Maděra, P., Saad, A., Amar Zrkine, M. & Lvončík, S.: Mapping of the Socotra Archipelago for the purpose of sustainable land management - a demographic survey. — 61.

Key words: land use, critical environments, human impact, monitoring, Soqotra.

Study and realization of sustainable land use management strongly demand high-quality data and information in the form of maps, statistical outputs, and analysis. In the period of the years 2018 - 2019 a demographic survey of Socotra island was performed. The main aim of the field research was to acquire basic information about: number, density and spatial distribution of inhabitants; position and names of cities/villages/settlements, number of houses; number, density and distribution of livestock and other parameters. To obtain demanded data, all the settled places across the whole island were visited and people were interviewed with pre-prepared questionnaires. The field survey was technically managed using the cloud technology based on a Web mapping server connected with a mobile application. All the field data was created in the form of geographically coded shapefiles. Data were processed to get maps of settlements, people and livestock density for the purpose of sustainable land management.



Much grazed appearance of the xerophilous bush with *Croton socotranus* dominance.

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Kay Van Damme & Une-Gef-Epa Project Team

The aquatic ecosystems of Socotra - biodiversity and challenges

Van Damme, K. & Une-Gef-Epa Project Team: The aquatic ecosystems of Socotra - biodiversity and challenges. — 63.

Key words: aquatic systems, management, animal biodiversity, endemism, freshwater fauna, bioindicators, Soqotra.

Conservation efforts in the Socotra Archipelago (Yemen) focus entirely on the marine and the strictly terrestrial realms, yet the aquatic ecosystems receive little attention or management. Nevertheless, health of the freshwater ecosystems, water as a resource and its biodiversity are inevitably linked to human well-being and vice versa. Aimed protection measures are not specified in Socotra conservation management plans (Socotra Conservation Zoning Plan) and environmental awareness campaigns dealing with freshwater habitats are needed. The importance of the surface waters on Socotra, the current threats and the need for conservation action, are underlined here. Special attention is given to the endemic dragonflies and the freshwater crabs, which may be considered as flagship species. The subterranean freshwater ecosystems deeply hidden in the karstic limestone on Socotra are important for biodiversity and strongly linked to drinking water resources. Local endemic species are often the first indicators of water being in a bad condition, and therefore conserving them directly benefits the quality of vital resources.

The knowledge of the freshwater fauna of the Socotra Archipelago (Yemen) is reviewed herein. A checklist of the extant freshwater fauna contains 154 species so far, including five endemic genera, 40 endemic species and two endemic subspecies from freshwater and brackish ecosystems. 88% of the freshwater endemics known from Socotra have been described after the year 2000, despite the archipelago having been explored intensively since the late 19th century. The karstic/subterranean environment harbours most of the endemics, acting as a refuge, and several endemics can be considered as indicators of pristine aquatic environments.

Challenges to these important ecosystems and biodiversity include exotic species, fragmentation/blocking of waterways and lagoons, extraction, direct pollution (chemicals and waste), climate effects and lack of capacity/funding for management. Even overgrazing may affect freshwater environments on Socotra due to erosion and sedimentation.

A very hopeful sign, is that a unique, endemic freshwater invertebrate was rediscovered this year for the first time since the late 19th century, hitherto even considered as potentially extinct. The area where it is found, should be a priority for conservation and discussed with the local communities for its importance beyond biodiversity.

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Interior of Villa Whitaker in Malfitano: participants in the conference during the morning break.



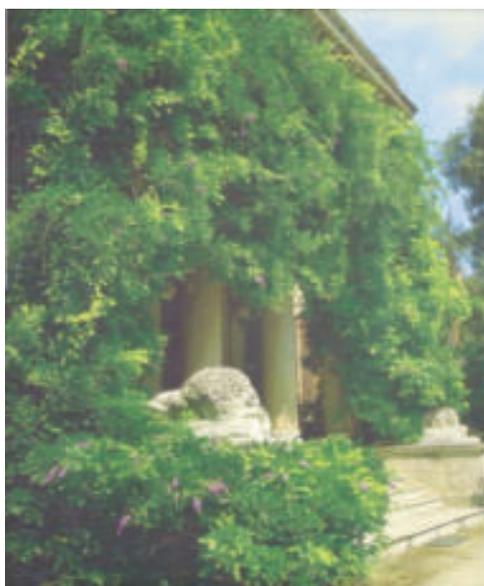
Final evening of the works at Villa Whitaker: Yemeni delegation with Kay Van Damme, Honorary President of FoS (bottom right).



Villa Whitaker: overview of the garden during a break of the works.



Interior of Villa Whitaker in Malfitano.



Villa Whitaker: colonnade overlooking the garden covered by *Wisteria sinensis* vines.

EXHIBITION

Connect2Socotra

Section 1: Photographic exhibition of the representative plants of Socotra vascular flora (*in situ*)

Section 2: Living scientific collections: botanic cards of exposed plants

Section 3: Botanic collections (*exsiccata*): list of the exhibits with their respective data of collection

Section 4: Photographic exhibition of the Island

Section 1 - Photographic exhibition of the representative plants of Socotra vascular flora (*in situ*)

(by Eu. Schimmenti, Em. Schimmenti and F.M. Raimondo)

This exhibition presents images of the most expressive plants of Socotra flora photographed during the scientific expedition carried out by the Department of Botanical Sciences in the years 2008 and 2014. The photographic images gathered in the panels are by Eugenia Schimmenti

List of the exposed images

1. *Acacia edgeworthii* T. Anderson

Family: *Mimosoideae*

Description: Shrub to 1.5 m. Bark smooth with prominent lenticels. Spines straight. Leaves 2-5 cm long, 4 to 12 pairs of pinnae. Pods thick, woody, straight and dehiscent.

Distribution: Yemen, Somalia, NE Kenya, Ethiopia

Conservation status: not assessed

2. *Acridocarpus socotranus* Oliv.

Family: *Malpighiaceae*

Description: Small tree to 5 m. Leaves alternate, elliptic to obovate. Flowers yellow in terminal racemes. Petals fringed and clawed. Stamens 10. Fruit winged.

Distribution: endemic to Socotra.

Conservation status: Least Concern (LC). Common in several vegetation types.

3. *Adenium socotranum* Vierh.

Family: *Apocynaceae*

Description: Succulent shrub with bottle-like trunks. Leaves spirally arranged, obovate. Flowers pink. Fruit a pair of cylindrical follicles.

Distribution: endemic to Socotra.

Conservation status: Least Concern (LC). Common in several vegetation types.

4. *Aerva microphylla* Moq.

Family: *Amaranthaceae*

Description: Shrub to 60 cm. Stems and leaves glabrous except for tufts of hairs in the leaf axils. Flowers solitary or clustered at the ends of branches. Style short, stigma bifid.

Distribution: endemic to Socotra.

Conservation status: Least Concern (LC). Common in several vegetation types.

5. *Aloe jawiyon* Christie, Hannon & Oakham

Family: *Aloaceae*

Description: Succulent perennial. Stem decumbent. Leaves (20-30 cm) in rosettes, weakly recurved at tip, margin toothed. Inflorescence unbranched, 10-20 cm long.

Distribution: endemic to Socotra.

Conservation status: Near threatened (NT)



1. *Acacia edgeworthii* in habitat.



2. *Acridocarpus socotranus* in habitat.



3. *Adenium socotranum* in habitat.



4. *Aerva microphilla* in habitat.



5. *Aloe jawiyon* in habitat.



5. *Aloe jawiyon* (in flower).

6. *Aloe perryi* Baker**Family:** *Aloaceae***Description:** Succulent perennial. Stem decumbent, occasionally perty upright. Leaves (20-45 cm) in a basal rosette, weakly recurved at the tip. Inflorescence branched.**Distribution:** endemic to Socotra.**Conservation status:** Near threatened (NT)**7. *Ballochia amoena*** Balf.f.**Family:** *Acanthaceae***Description:** Intricately branched shrub to 2 m. Leaves small, narrowly elliptic and fasciculate. Calyx generally glabrous. Corolla red to orange.**Distribution:** endemic to Socotra**Conservation status:** Data deficient (DD)**8. *Barleria tetraantha*** Balf.f.**Family:** *Acanthaceae***Description:** Shrub with short axillary branches terminated by stellate spines. Leaves ovate or elliptic, spine-tipped. Flowers solitary in leaf axils. Corolla with 5 equal lobes. Fruit 2-seeded.**Distribution:** endemic to Socotra.**Conservation status:** Least Concern (LC). Common in several vegetation types.**9. *Begonia socotrana*** Hook.f.**Family:** *Begoniaceae***Description:** Perennial, fleshy herb to 45 cm.

Leaves orbicular. Male flowers pink with tepals sub-equal or equal and anthers yellow. Female flowers pink with tepals sub-equal and styles yellow

Distribution: endemic to Socotra.**Conservation status:** Least Concern (LC). Common in several vegetation types.**10. *Boswellia elongata*** Balf.f**Family:** *Burseraceae***Description:** Tree to 8 m, trunk pale brown, strongly flaking bark. Leaves white-tomentose below, pinnate, sometimes simple, winged rhachis absent. Flowers in long panicle or racemes**Distribution:** endemic to Socotra.**Conservation status:** Vulnerable (VU B2 a bii)**11. *Boswellia socotrana*** Balf.f.**Family:** *Burseraceae***Description:** Tree to 5 m, trunk grey or reddish brown, smooth or somewhat flaking. Leaves pinnate, winged rhachis present. Flowers in short, sparse panicle.**Distribution:** endemic to Socotra.**Conservation status:**



6. *Aloe perryi* in habitat.



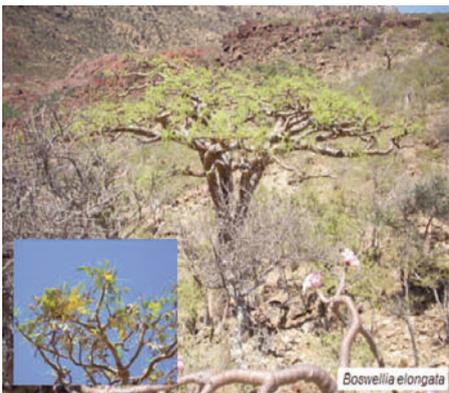
7. *Ballochia amoena* in habitat.



8. *Barleria tetraacantha* in habitat.



9. *Begonia socotrana* in habitat.



10. *Boswellia elongata* in habitat.



11. *Boswellia socotrana* in habitat.

Vulnerable (VU B2 a bii)

12. *Capparis cartilaginea* Decne.

Family: *Capparaceae*

Description: Evergreen shrub to 2 m. Leaves leathery, broadly ovate to orbicular with a small-recurved spine inserted below the tip. Flowers solitary, on stout pedicels. Petals white or cream, often becoming pink with age, the upper pair appearing fused. Stamens many. Fruit bright red, obovoid.

Distribution: ESW Africa, E Arabia, India

Conservation status: not assessed

13. *Caralluma socotrana* (Balf.f.) N.E.Br.

Family: *Asclepiadaceae*

Description: Stems erect to 45 cm, rooting from the central stem only. Pedicels 1-3 mm long. Corolla 1.5-2.5 cm with cup-shaped tube. Fruit erect to 10 cm long.

Distribution: Somalia and Socotra.

Conservation status: not assessed

14. *Commiphora orniflora* (Balf.f.) Gillett

Family: *Burseraceae*

Description: Tree to 5 m, branches rather tortuous, bark smooth, grey. Leaves clustered, pinnate, entire, glabrous, and thinly hairy to velvety. Flowers in raceme-like cymes. Fruit globose, apex rounded

Distribution: endemic to Socotra.

Conservation status: Near threatened (NT)

15. *Croton socotranus* Balf.f.

Family: *Euphorbiaceae*

Description: Dioecious shrub or small tree to 3m. Leaves cordate, thinly hairy and not strongly discoloured. Flowers cream or white, in umbel-like racemes. Fruit subglobose with stalked stellate hairs.

Distribution: endemic to Socotra.

Conservation status: Least Concern (LC). Common in several vegetation types.

16. *Dendrosicyos socotranus* Balf.f.

Family: *Cucurbitaceae*

Description: Bottle-shaped tree to 6 m tall with a swollen trunk and pendant branches. Tendrils absent. Leaves ovate, round or kidney-shaped; hairy, margin spine-toothed.

Distribution: endemic to Socotra.

Conservation status: not assessed

17. *Dichrostachys dehiscens* Balf.f.

Family: *Mimosoideae*

Description: Small tree to 5 m. Leaves with 3-5 pairs of pinnae. Flowers in spikes, the lower sterile, pink, the upper fertile, yellow.

Distribution: endemic to Socotra.



12. *Capparis cartilaginea* in habitat.



13. *Caralluma socotrana* in habitat.



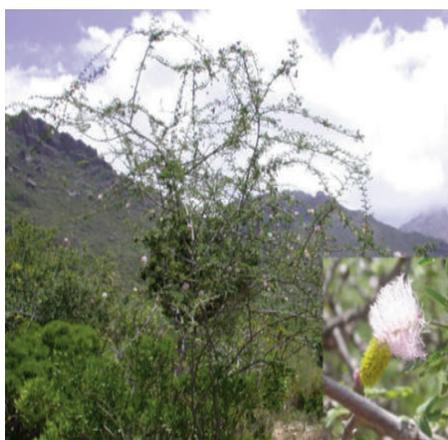
14. *Commiphora orniflora* in habitat.



15. *Croton socotranus* in habitat.



16. *Dendrosicyos socotranus* in habitat.



17. *Dichrostachys dehiscentis* in habitat.

Conservation status: Vulnerable. Rare, with a very limited area of occupancy

18. *Dorstenia gygas* Schweinf. ex Balf.f.

Family: *Moraceae*

Description: Shrub to 2.5 m with bottle-shaped swollen stems. Leaves narrowly obovat. Receptacle circular.

Distribution: endemic to Socotra.

Conservation status: Near threatened (NT)

19. *Dracaena cinnabari* Balf.f.

Family: *Dracaenaceae*

Description: Tree to 10 m, branched above to form a dense crown. Leaves in dense rosettes. Flowers in large terminal panicles. Fruit a berry, globose.

Distribution: endemic to Socotra.

Conservation status: Vulnerable (VU B2 a b).

20. *Euphorbia schimperi* Presley

Family: *Euphorbiaceae*

Description: Shrub lacking a distinct trunk branched from the base. Leaves grouped at the end of the branches, oblanceolate, acute. Cyathia in umbels with 4 glands. Fruit erect.

Distribution: S Arabia, NE Africa

Conservation status: not assessed

21. *Exacum affine* Balf.f. ex Regel

Family: *Gentianaceae*

Description: Plant erect to 30 cm. Leaves thin, ovate to elliptic. Flowers violet. Calyx lobes caudate with free tip distinct.

Distribution: endemic to Socotra.

Conservation status: Least Concern (LC). Common in several vegetation types.

22. *Heliotropium socotranum* Vierh.

Family: *Boraginaceae*

Description: Prostrate or ascending woody-based herb with dense indumentum hairs. Flowers yellow or white; Fruit splitting into 2 pairs of nutlets glabrous or hairy.

Distribution: endemic to Socotra.

Conservation status: Least Concern (LC). Common in several vegetation types.

23. *Indigofera pseudointricata* J.B.Gillett

Family: *Papilionoideae*

Description: Erect, densely branched, silvery shrub to 50 cm. Leaves simple, linear. Flowers solitary. Pods straight, long.

Distribution: Somalia and Socotra.

Conservation status: not assessed



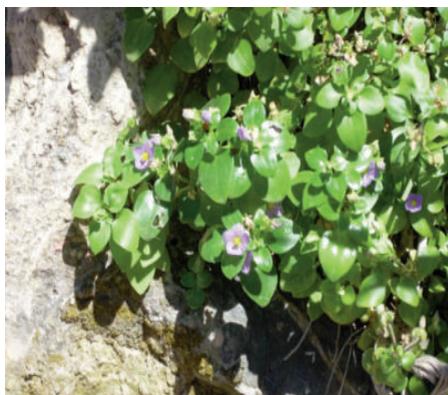
18. *Dorstenia gygas* in habitat.



19. *Dracaena cinnabari* in habitat.



20. *Euphorbia schimperi* in habitat.



21. *Exacum affine* in habitat.



22. *Heliotropium socotranum* in habitat.



23. *Indigofera pseudointricata* in habitat.

24. *Kalanchoe farinaceae* Balf.f.**Family:** *Crassulaceae***Description:** Shrub to 30 cm. Leaves erect, imbricate, obovate. Petiole not broadened at base. Flowers erect.**Distribution:** endemic**Conservation status:** Least Concern (LC). Common in several vegetation types.**25. *Limonium socotranum*** (Vierh.) Radcl.-Sm.**Family:** *Plumbaginaceae***Description:** Shrub to 1.5 m. Leaves linear-cylindrical. Bracts reddish. Corolla pink.**Distribution:** endemic to Socotra.**Conservation status:** Least Concern (LC). Common in several vegetation types.**26. *Oldenlandia pulvinata*** (Balf.f.) Bremek.**Family:** *Rubiaceae***Description:** Cushion-forming herb to 5 cm. Leaves linear. Flowers solitary. Calyx tube 0.8 mm long with a green midrib.**Distribution:** endemic to Socotra.**Conservation status:** Least Concern (LC). Common in several vegetation types.**27. *Pulicaria stephanocarpa*** Balf.f.**Family:** *Asteraceae***Description:** Shrub to 50 cm. Leaves spatulate, entire or coarsely dentate, densely glandular.**Distribution:** endemic to Socotra.**Conservation status:** Least Concern (LC). Common in several vegetation types.**28. *Punica protopunica*** Balf.f.**Family:** *Punicaceae***Description:** Shrub or small tree to 5 m. Leaves opposite. Flowers bright red, thick-textured, with many stamens and tiny petals. Fruit globose, ripening brownish red.**Distribution:** endemic to Socotra.**Conservation status:** Vulnerable (VU D2).**29. *Tamarindus indica*** L.**Family:** *Caesalpinioideae***Description:** Evergreen tree to 25 m. Leaves 20 to 40-foliolate. Petals reddish brown. Pods thick and pulpy**Distribution:** not completely known**Conservation status:** not assessed



24. *Kalanchoe farinacea* in habitat.



25. *Limonium socotranum* in habitat.



26. *Oldenlandia pulvinata* in habitat.



27. *Pulicaria stephanocarpa* in habitat.



28. *Punica protopunica* in habitat.



29. *Tamarindus indica* in habitat.

30. *Turraea socotrana* Styles & F. White

Family: *Meliaceae*

Description: Small tree to 2 m. Leaves entire clustered on spurs. Flowers cream with linear petals. Calyx cup-shaped, shallowly toothed. Stamens 10, united into a tube. Fruit a globose-leathery capsule.

Distribution: endemic to Socotra.

Conservation status: Vulnerable (VU D2).



30. *Turraea socotrana* in habitat.



Participants in the expedition under a centuries-old tamarind tree.



Crossing of the participants by offroad vehicles of the *Acacia* bushland in the coastline of the Soqatra island.



Different operational moments of the first expedition supported by the former Department of Botanical Sciences of the University of Palermo, in 2008, on the island of Socotra.



Collection by G. Domina of a sample of *Limonium* investigated in Palermo and subsequently described as new species (*Limonium guigliae*).



Small group of participants admiring the only plant of *Parkinsonia aculeata* observed in the Socotra island.



Part of the group in the *Buxanthus pedicellatus* bushland.



F.M. Raimondo, E. Schimmenti and, in the middle, a local guide in the shade of an incense tree (*Boswellia elongata*).

Section 2 - Living scientific collections: botanic cards of exposed plants

(by G. Scafidi, M. Speciale, R. Schicchi and F.M. Raimondo)

The botanical collections of Socotra, present in the scientific heritage of the Botanical Garden and Herbarium Mediterraneum of the University of Palermo, derive from two expeditions (2008 and 2014) promoted by the then Department of Botanical Sciences (including also the Botanical Garden and Herbarium Mediterraneum). Sample collecting have been authorized by local institution in compliance with the regulations in force in 2008 and in 2014, and utilized only for scientific purposes.

ABBREVIATIONS

IUCN risk category

VU: vulnerable

CR: critical

LC: locallycritical

Adenium socotranum Vierh.

Family: *Apocynaceae*

Description: Linear leaf blade, up to 20 x 3 cm, simply picking; fins in the form of a sub orbicular fan. Fronds monomorphic, closely spaced. Stipe up to 8 cm long, dark brown to black, hairless.

Distribution: W. Trop. Africa to Arabian Pen. and Tanzania.

Conservation status: LC

Adiantum balfourii Bak.

Family: *Adiantaceae*

Description: Leaf-blade linear, up to 20 x 3 cm, simply pinnate; pinnae fan-shaped to sub-orbicular, up to 1.5 x 1.8 cm, shortly stalked, sterile ones denticulate and sometimes shallowly lobed along upper margin, glabrous.

Distribution: Djibouti; Ethiopia; Sudan; Abd al Kuri; Socotra.

Conservation status: not assessed.

Aloe squarrosa Baker ex Balf.

Family: *Asphodelaceae*

Description: Leaves lanceolate with toothed margins. The flowering, which can be admired from June to September, has panicles of red flowers 10-25 cm long.

Distribution: W. Socotra

Conservation status: VU

Crinum balfourii Baker

Family: *Amaryllidaceae*

Description: Bulbous plants with leaves in a basal rosette or rarely distichously arranged; Flowers regular to slightly irregular, sometimes pure white or pink; Leaves strap-shaped, lanceolate or linear.

Distribution: Socotra.

Conservation status: not assessed.

Dorstenia gigas Schweinf. ex Balf. f.

Family: *Moraceae*

Description: Shrub plants or small trees, monoecious. It is a particularly bulky caudiciform species such as *Dendrosicyos* and *Adenium*. The stem is swollen, poorly ramified; Leaves lanceolate of 10-20 cm of length. Inflorescences with compound receptacle bearing flowers minutes.

Distribution: Socotra

Conservation status: not assessed.

Dracaena cinnabari Balf. f.

Family: *Asparagaceae*

Description: This evergreen species is named after its dark red resin, which is known as “dragon’s blood”. Along with other arborescent *Dracaena* species it has a distinctive growth habit called “dracoid habitus”. Its leaves are found only at the end of its youngest branches and are all shed every 3 or 4 years before new leaves simultaneously mature. It branches at maturity to produce an umbrella-shaped crown, with leaves that measure up to 60 cm long and 3 cm wide.

Distribution: Socotra

Conservation status: VU

Duvalandria dioscoridis (Lavrinos) M.G. Gilbert

Family: *Asclepiadaceae*

Description: Low succulent plant, create large and dense, colonies up to 1 meter through groups. Stems: prostrate, quadrangular cross-section. Leaves: none. Inflorescence: lateral, sessile or short and widely peduncular, with bracts of a few minutes, mostly with only one flower.

Distribution: Socotra

Conservation status: CR

Punica protopunica Balf. f.

Family: *Lythraceae*

Description: The tree, often thorny, attains a height of 2.5 to 4.5 meters. It has reddish-brown bark when young, fading to grey as its ages. Leaves are dark green, glossy and opposite. Fruit globose, 2-3 cm in diameter. Flowers and fruits from December and January through to the summer.

Distribution: Socotra.

Conservation status: VU

Boswellia elongata Balf.f.

Family: *Burseraceae*

Description: Tree to 6-8 m. Trunk 1 m in diameter. Branches are swollen and thin leaves pinnate 30 cm long, dark green to glabrous. The colour of the leaves varies from grey, to purple, to light green with pale undersides depending on the environment. **Distribution:** Yemen, Somalia, NE Kenya, Etiopia.

Distribution: Yemen, Somalia, NE Kenya, Etiopia.

Conservation status: VU

Boswellia socotrana Balf.f.**Family:** *Burseraceae***Description:** *Boswellia socotrana* appears as a vertically spreading shrub or small tree depending on growing condition. The tree can be quite variable in its look. The tree differs from all other *Boswellias* on the island by the small leaves which have winged stalks and numerous, small leaflets and the inconspicuous pale greenish-yellow flowers which are borne in short, sparse panicles.**Distribution:** Yemen, Somalia, NE Kenya, Etiopia.**Conservation status:** VU***Euphorbia schimperi*** C. Presl**Family:** *Euphorbiaceae***Description:** A succulent bush up to 2 meters, leafless except on the very young branches, spineless, glabrous. Leaves deciduous, when young with a whorl of thin green oblong acute bracts.**Distribution:** Eritrea; Ethiopia; Oman; Saudi Arabia; Socotra; Yemen.**Conservation status:** not assessed.

Different perspectives of the only *Punica protopunica* plant bred at the Botanical Garden of Palermo and presented in the exhibition.



Images of other endemic species of Socotra bred in the Botanical Garden of Palermo and presented in the exhibition.

Section 3 - Botanic collections (*specimens*): list of the exhibits with their respective data of collection

(by Em. Schimmenti, A. Carratello, G. Domina and F.M. Raimondo)

The botanical collections of Socotra, of the scientific heritage of the Botanical Garden and Herbarium mediterraneum - University of Palermo, derive from two expeditions (2008 and 2014) promoted by the then Department of Botanical Sciences (including also the Botanical Garden and Herbarium). Sample collecting have been authorized by local institution in compliance with the regulations in force in 2008 and in 2014, and utilized only for scientific purposes.

After that the study and identification of the 2008-2014 collections will be concluded, a duplicate specimens series will be donated to the herbarium of the botanical institution in Socotra (Yemen).

Year 2008

Acacia edgeworthii T.Anderson

Socotra: Di Lisha

4.4.2008

Leg. F.M. Raimondo & al.

Actiniopteris semiflabellata Pic. Serm.

Socotra: Wadi Ayhev

10.4.2008

Leg. F.M. Raimondo & al.

Aerva revoluta Balf.f.

Socotra: Di Lisha

4.4.2008

Leg. F.M. Raimondo & al.

Aizoon canariense L.

Socotra: Dehemri

9.4.2008

Leg. F.M. Raimondo & al.

Buxanthus pedicellatus Tiegh.

Socotra: Wadi Ayhev

10.4.2008

Leg. F.M. Raimondo & al.

Corchorus erodioides Balf.f.

Socotra: Di Lisha

4.4.2008

Leg. F.M. Raimondo & al.

***Corchorus tridens* L.**

Socotra: Zhamhom

7.4.2008

Leg. F.M. Raimondo & al.

***Cucumis prophetarum* L.**

Socotra: Zhamhom

8.4.2008

Leg. F.M. Raimondo & al.

***Indigofera spinosa* Forssk.**

Socotra: Darho

8.4.2008

Leg. F.M. Raimondo & al.

***Indigofera tinctoria* L.**

Socotra: Shata Qalansia

6.4.2008

Leg. F.M. Raimondo & al.

***Jasminum fluminense* Vell.**

Socotra: Diksam

8.4.2008

Leg. F.M. Raimondo & al.

***Kalanchoe farinacea* Balf.f.**

Socotra: Homhill

5.4.2008

Leg. F.M. Raimondo & al.

***Limonium cylindrifolium* Verdc.**

Socotra: Shuab

6.4.2008

Leg. F.M. Raimondo & al.

***Maerua angolensis* DC.**

Socotra: Hooq

9.4.2008

Leg. F.M. Raimondo & al.

***Portulaca socotrana* Domina & Raimondo**

Socotra:

Leg. F.M. Raimondo & al.

Poskea socotrana (Balf.f.) G.Taylor

Socotra: Darmor

8.4.2008

Leg. F.M. Raimondo & al.

Punica protopunica Balf. f.

Socotra: Homhill

5.4.2008

Leg. F.M. Raimondo & al.

Senna holosericea (Fresen.) Greuter

Socotra: Di Lisha

4.4.2008

Leg. F.M. Raimondo & al.

Senna socotrana (Serrato) Lock

Socotra: Gabal Malah

6.4.2008

Leg. F.M. Raimondo & al.

Tricocalyx obovatus Balf. f.

Socotra: Gabal Malah

6.4.2008

Leg. F.M. Raimondo & al.

Year 2014

Commiphora ornifolia (Balf.f.) J.B.Gillett

Socotra: Qalansya

19/01/2014

Leg. F.M. Raimondo & G. Domina

Commiphora socotrana (Balf.f.) Engl.

Socotra: Ayefh (3 siti)

23/01/2014

Leg. F.M. Raimondo & G. Domina

Eragrostis ciliaris (L.) R.Br.

Socotra: Ayefh (2°sito)

23/01/2014

Leg. F.M. Raimondo & G. Domina

Seddera glomerata O.Schwartz

Socotra: Di Lisha

23/01/2014

Leg. F.M. Raimondo & G. Domina

Diodia aulacosperma K. Schum.

Socotra: Ayefh (2° sito)

23/01/2014

Leg. F.M. Raimondo & G. Domina

Tephrosia odorata Balf.f.

Socotra: Ayefh (3° sito)

23/01/2014

Leg. F.M. Raimondo & G. Domina

Lindenbergia sokotrana Vierh.

Socotra: fiume Nogged

21/01/2014

Leg. F.M. Raimondo & G. Domina

Heliotropium sokotranum Vierh.

Socotra: spiaggia Nogged

21/01/2014

Leg. F.M. Raimondo & G. Domina

Polycarpaea hayoides D.F.Chamb.

Socotra: spiaggia Nogged

21/01/2014

Leg. F.M. Raimondo & G. Domina

Adiantum balfourii Bak.in Hk.

Socotra: Dixam

18/01/2014

Leg. F.M. Raimondo & G. Domina

Aristida adscensionis L.

Socotra: porto Siak

23/01/2014

Leg. F.M. Raimondo & G. Domina

Osyris quadripartita Salzm. ex Decne.

Socotra: Ayefh (3° sito)

23/01/2014

Leg. F.M. Raimondo & G. Domina

Acanthospermum hispidum DC.

Socotra: Ayefh (3° sito)

23/01/2014

Leg. F.M. Raimondo & G. Domina

Cyanthillium cinereum (L.) H.Roth.cfr.

Socotra: Ayefh (1° sito)

23/01/2014

Leg. F.M. Raimondo & G. Domina

Cyperus amabilis Vahl.

Socotra: Ayefh (3° sito)

23/01/2014

Leg. F.M. Raimondo & G. Domina

Bacopa monnieri (L.) Wettst.

Socotra: fiume Nogged

21/01/2014

Leg. F.M. Raimondo & G. Domina

Viola cinerea Boiss.

Socotra: Ayefh

23/01/2014

Leg. F.M. Raimondo & G. Domina

Polygala erioptera DC.

Socotra: Ayefh

23/01/2014

Leg. F.M. Raimondo & G. Domina

Frimbristylis ferruginea (L.) Vahl

Socotra: fiume Nogged

21/01/2014

Leg. F.M. Raimondo & G. Domina

Section 4 - Photographic exhibition of the Island

September 27th - October 6th

Jordi Esteva, Catalina Martin-Chico, Vladimir Melnik, Martin Rejzek.



Some photographs of the exhibition exposed in the historic *Gymnasium* of the Botanical Garden of Palermo.

Jordi Esteva

(Barcelona 1951) is a writer and photographer who has always been fascinated by Africa and the Middle East, thus concentrating most of his activity as a journalist and photographer on this part of the world. Born in Barcelona in 1951, writer and photographer, he is passionate about Eastern and African cultures to which he devotes most of his journalistic and photographic work. In October 2017, Atalanta ediciones publishes Socotra, a book of black and white photographs that includes the DVD of the film. In March 2019, RM and Museu Egipci de Barcelona published The Oasis of Egypt in a bilingual edition, English and Spanish, with new texts and new images.

Vladimir Melnik

Vladimir is a passionate photographer and traveler with experience of about hundred countries in the World. His favorite is taking pictures of people in remote and inaccessible locations, ethnographic portraits and unexplored landscapes in the middle of nowhere from the high Arctic to equatorial islands. He has numerous publications in Russian and international media, travel documentary; award winner of the national and international photo contests.

Catalina Martin-Chico

French & Spanish photographer. Catalina Martin- Chico studied at the International Center of Photography in New York. She has been documenting Yemen and The Middle East for eight years. Catalina works for numerous French publications including GEO, Le Monde, ELLE, Le Figaro, VSD, as well as for the New York Times, Sunday Times, and Der Spiegel, amongst others. Catalina won the VISA d'Or Humanitaire of the ICRC at Visa pour image festival.

Martin Rejzek

Researcher at Mendel University in Brno, Department of Forest Botany, Dendrology and Geobiocoenology. He devoted to investigations about Socotra plants, representing also photographically plant and landscapes of the island.

Proceedings of the event *Socotra in Sicily*

Socotra in Sicily

Presentation of the locations of the principal events

The Botanical Garden of the University of Palermo*

A brief history

The massive *Magnoliodes* fig tree with its tangle of roots running over and under the streets of the city is the perfect symbol for Palermo's Botanical Garden (Fig. 1), the most closely related to local culture of all the Sicilian scientific institutions.

From its foundation in 1789 to 1795, the Garden has been visited by experts interested in all aspects of botany and biological phenomena, as well as by people who have found inspiration and peace in its lovely surroundings.

Exotic and native plants typify the tropical and subtropical features of the Garden - a place where natural beauty gives birth to creativity and harmony.

The Palermo Botanical Garden is part of the Museum system of the University of Palermo directed by Prof. Paolo Inglese. Director of the Botanical Garden is Prof. Rosario Schicchi. It is placed in Piano di Sant'Erasmus, next to the first public garden - the present Villa Giulia - built up in 1777-1778. It is accessed by Via Lincoln (Fig. 2).

So the present Botanical Garden is a product of the prevailing artistic climate at the close of the eighteenth century - "the expression of reformism and illuministic scientism" as Valeria Sconzo wrote; a place of learning set up by the Palermo Deputazione degli Studi and Palermo Senato under the Bourbon Ferdinand II.

It received various contributions including the king's, the Municipality's, and one from the viceroy Francesco d'Aquino, Prince of Caramanico in power from 1786 - 1794. There were numerous other gifts from wealthy patrons and city prelates as well as help from the unassuming brother Bernadino di Ucria working under Giuseppe Tineo. The Garden was to subsidise higher education and research, provide fresh impetus to industry and agriculture, improve the appearance of the city and confer prestige on its administrators.

The Palermo Botanical Garden differed from others of the time in Italy and abroad in that it had been specifically designed by the most celebrated architects of the day. After Salvatore Attinelli it was the turn of the Parisian Leon Dufourny who was in Sicily studying Greek antiquities.

The present buildings were almost exclusively designed by these two men as was the original lay-out of the garden.

One of the most significant features here is the link between the artificial and the natural. In the design of the garden, Dufourny proposed going beyond the Renaissance idea which inspired the geometrical lay-out of Villa Giulia. As Piero Burzotta points out, he proposed that the four quartini should be "a design open to the whole surrounding landscape in which the geometrical network becomes the ordering element of nature as a whole, and at the same time a logical category able to set up relationship and meaning between natural and artificial elements, drawing them together in a common context rendered homogeneous by the superiority of geometry".

*Resumed and partially reprocessed from Raimondo, F.M., Mazzola, P., & Di Martino, A. 1997: The Palermo Botanical Garden. – Edizioni Arbor, Palermo. Pp. 117-129.

Clearing work began on 23 February 1789. The area, just over 3 tumoli in size, was divided up into four large rectangles or quartini which were separated by the Central Avenue and the Palm Avenue set at right angles to each other, the latter running from the original entrance to the Carolina Hothouse. Collections were to be grown in the quartini under the Linnaean system just as father Bernardino d'Ucria had planned.

Fountains and pools were added to the design including the magnificent Aquarium in the extreme eastern part of the Garden. This was financed by don Filippo Lopez y Royo of the duke of Taurisani, archbishop of Palermo and Monreale and from 1794 to 1798, president and captain general of the kingdom of Sicily. The Aquarium had three large concentric basins of varying depths, each of which was subdivided up into 24 sections to cater for the different needs of the numerous aquatic plants.

The building of the neoclassical architectural structure of the Garden was completed in 1795. It consisted of a central building or *Gymnasium* (Fig. 3), embellished by various artists including Giuseppe Velasco from Palermo who painted the frescoes on the cupola and tetrastyle. The Gymnasium houses the *Schola Regia Botanices*, *Herbarium*, *Library* and director's rooms. The sculptor Gaspare Ferriolo carved the statues of the four seasons above the *Gymnasium*, while the two sphinxes on either side of the back flight of steps - now giving on to Via Lincoln - are by Vitale Tuccio. They were donated by the Prince of Galati and the Duke of Terranova.

The two statues of Dioscorides and Theophrastus on top of the two columns at the original entrance opposite the Fonte Palermo clearing in Villa Giulia are the work of Domenico Dané.

It was Dufourny who designed both the *Calidarium* and the *Tepidarium* on either side of the *Gymnasium*, not, as was thought, the Palermo architect Venanzio Marvuglia. The basreliefs on the façades of the two smaller buildings are by Domenico Dané.

The Garden was completed in the spring of 1795 and opened with great pomp on 9th December of the same year. Two hundred years have now passed since it began the study and promotion of the many plant species from the subtropical and tropical regions of the world, subsequently made known in Palermo and throughout Sicily and Europe.

In 1814 the first director Giuseppe Tineo was succeeded by his son Vincenzo (1791 - 1856), who unlike his father, did a great deal to develop the Garden and set it on the map.

He began by putting together a herbarium, later to be added to by Agostino Todaro his successor. Todaro began his botanical career in 1848 as demonstrator of plants under Tineo's directorship.

Political events in 1860 gave Todaro the chance of starting expansion work on the Garden. An eminent botanist, jurist and senator of the realm, he took over the Vigna del Gallo land which had been purchased by the Deputazione degli Studi a long time before to make an experimental farm. The absence of funds and other impediments had to be taxed. The aggregation, strenuously championed by his predecessor Tineo was solemnly sealed by a decree on 17th October 1860.

Todaro's second plan to extend the Garden involved setting up an exchange system with more of the dukes of Archirafi land. The undertaking was successfully completed in 1892 thanks to Todaro's successor, the eminent and farsighted botanist Antonino Borzi to whom we owe the present-day layout of the Garden.

Borzi was responsible for the building sited at the opposite end of the original nucleus of



Fig. 1 - *Ficus macrophylla* f. *columnaris* (= *F. magnolioides*) emblematic tree of the Botanical Garden of the University of Palermo.



Fig. 2 - Via Lincoln in Palermo: in evidence part of the museum buildings of the Botanical Garden of the University.



Fig. 3 Main front of the *Gymnasium* of the Botanical Garden.

the Garden with its laboratories and lecture rooms. These had become a necessity after the growth in interest in teaching and scientific studies and the creation of the Colonial Garden in 1913. And it was with the latter that the Botanical Garden itself became a symbol of Italian expansionism and a vigorous centre of agricultural experimentation.

The scientific impact of the Botanical Garden can be attributed both to Borzì and to his successor Luigi Montemartini, a tireless phytopathologist exiled to Palermo for his anti-fascist beliefs.

After the long period of crisis that followed and the threat to the Gardens's existence during the last war, it was the tenacity of Professor Francesco Bruno - last in the line of the historic directors - that enabled the collections and archives to be refurbished. He also put an end once and for all to the risk of the break-up of the Garden, something which had been troubling people since Todaro's time.

Since 1984 and the closing down of the Institute of the Botanical Garden in favour of the present Department of Botanical Science, the Garden has become the most important centre for teaching and scientific studies, and, at the University, the historical nucleus of academic botany - meeting place of the various scholars of plant biology working in the city.

What makes the Garden so fascinating is the remarkable development of some of its specimens. Some of these have grown as though in their native countries, gradually swamping other nearby plants and giving the original design of the Garden its uniquely uncultivated appearance.

A case in point is the huge *Ficus magnolioides* (= *F. macrophylla* f. *columnaris*) (Fig. 1) whose massive umbrella of foliage and ground and aerial roots is an extraordinary example of tropical vitality of growth in the heart of the Mediterranean.

Palermo's favourable climate with its rare cold winters means the Botanical Garden is able to grow over ten thousand plant species outdoors, many of them in pots.

Lack of space prevents these from being planted out in open ground where they could reach their full growth, but work is going on in the Garden to find more room for some of its collections. Two of these plots is the *cycadetum* (Figs. 4-5) and the *palmetum* (Fig. 6) - now almost finished - in the middle of the Garden where part of what was known as the exotic wood used to be. Other areas given over to conifers and Mediterranean species are nearby.

Streams and small areas of wetland are being created round a nearby well so that, bryophytes ferns and hygrophilous phanerogams can be planted out, and a "berceau" for a collection of lianas and climbing plants is also planned along the avenue to the east of the Engler system.

Like all academically based botanical gardens, Palermo was primarily created and developed for university teaching, and for basic and applied research there.

The present set-up means it cannot deal with the various requests it receives (organized parties of schoolchildren and especially the visiting public) and it is also unable to carry out some of the duties of other modern botanical gardens less closely connected to universities. Lack of funding and qualified personnel is also a problem.

Every year the Botanical Garden publishes its *Index Seminum* or catalogue of the native and exotic plants grown in the Sicilian region. It is exchanged with over 600 mostly foreign institutions with whom the Garden keeps in constant contact on matters of scientific interest.

Lay-out and distribution

Today, the Palermo Botanical Garden reflects its many activities, the systematic policy and method of planting out adopted from its outset, and the stamp given it by its directors, Giuseppe and Vincenzo Tineo, Agostino Todaro, Antonino Borzì, Luigi Montemartini and Francesco Bruno.

You can see quite clearly from the buildings erected between 1789 and 1838 the rather imposing regal appearance the Bourbons intended the Garden to have and how they considered this fitting for a European capital. Here was a classic example of a botanical garden in which everything from the lay-out, avenues, hothouses and other structures, blended perfectly together and where everything was tailored to the teaching and scientific aims of an academic institution and to its developments in the field of biology. A garden to be enjoyed by everyone who visited it.

An overall look at the organization of the Garden shows how it comprises systematic, bio-ecological and geographical lay-outs, an area given over to useful plants, and the former Colonial Garden now used for experimental purposes. There is also a series of hothouses, ponds and aquatic gardens. A map of the Garden can be seen at the end of the text.

Apart from the buildings, the oldest section here houses the Linnaean system planted out by Father Bernardino da Ucria between 1789 and 1791 in which collections are laid out according to Linnaeus' biological nomenclature and classification. The quartini arranged as rectangular beds on an open plan have plants both in pots and open ground. The latter are what remains of the original layout which altered quite a bit over the years as the stronger plants developed at a faster rate than the others and gradually took them over.

Attempts at phylological restoration were begun twenty years ago but abandoned when the fight for survival of the stronger plants, the disappearance of others and the accidental introduction of even more which grew to gigantic proportions over the years, made it impossible to continue. However work has now started again.

Although the overall appearance has changed, a few elements of the original planting-out can still be seen; in the I quartino for instance are *Ginkgo biloba*, *Taxus canadensis*, *Fraxinus salicifolia*, *Myoporum montanum*. *Piper geniculatum*, *Olinia cymosa*, *Villaresia citrifolia*, *Cordia francisci*, *Gevuina avellana*, *Pavetta indica*, *Eheretia tinifolia*, *Bourreria succulenta* and *Nolina recurvata*. The II quartino contains *Dracaena draco*, *Aralia dactylifolia*, *Erythrina humeana*, *Erythrina bellangeri*, *Fatsia papyrifera*, *Tamarix chinensis*, *Gleditschia triacantha*, *Castanospermum australe*, *Yucca conspicua*, *Yucca draconis*, *Mahonia glumacea* and *Phytolacca dioica*. In the III quartino you can see *Aesculus pavia*, *Erythrina crista-galli*, *Melaleuca glabrescens*, *Carya olivaeformis*, *Trema orientalis*, *Celtis kraussiana*, *Royena pallens*, *Casuarina tenuissima*, *Podocarpus neriifolia*, *Pinus canariensis* and *Phoenix rupicola*.

Finally, the IV quartino has the magnificent *Tipuana speciosa*, *Erythrina corallodendron*, *Erythrina crista-galli*, *Ficus altissima*, *Tilia argentea*, *T. americana*, *T. platyphylla*, *T. cordata*, *Catalpa speciosa*, *Brachychiton diversifolium*, *B. platanoides*, *Albizia versicolor* and *Albizia saponaria*.

One of the most distinctive features of the old Linnaean garden is the square where the central and palm avenues cross. The latter, at right angles to the first, runs towards the original entrance from Villa Giulia to the winter garden.

There are several collections in open ground and in pots on the outside of the Linnaean garden. This is the part which used to separate the Botanical Garden from Villa Giulia before 1798. Don't miss the rare specimen of *Bombax ceiba* or true kapok, from South America with its distinctive blossoms appearing in spring.

The area along viale Tineo is bordered on the inside by a number of mature oak trees including *Quercus glauca*, *Q. castaneaefolia*, *Q. lusitanica*, *Q. aegilops*, *Q. lanuginosa*, *Q. myrsinaefolia*, *Q. pedunculata*, *Q. ilex*, *Q. sessiliflora*, *Q. cerris* and *Q. pseudo-suber*. You can also see *Casuarina paludosa*, *Calliandra portoricensis*, *Lagerstroemia indica*, *Phillyrea latifolia*, *Pachira aquatica*, *Phyllanthus grandifolius*, *Maclura pomifera*, *Melaleuca acuminata*, *M. thymifolia*, *M. glaberrima*, *M. linarifolia*, *Celtis bungeana*, *Corynocarpus laevigata*, *Solanum giganteum*, *Osteomeles schweriana* and *Hymenosporum flavum*. The soap tree (*Sapindus mukorossii*), a curious plant from the East, is a sapindaceae whose saponin-rich fruits have lathering and cleansing properties.

The systematical arrangement in the most recent part of the southern end of the Garden is based on the Engler classification. It was set up during this century and is based on the phylogenetic relationships of the various taxonomic groups. Inside, one area is given over to the Gymnosperms, another the Angiosperms (Dicotyledons) and a third to the Angiosperms (Monocotyledons).

The first and third areas form part of the original site which was reduced in size when extension work was carried out in the nineteen fifties. This was on the building Borzi had erected to house the lecture rooms and laboratories needed for the growing interest in teaching and scientific activities. The forecourt was also developed.

The first area includes representatives of the principal families of Gymnosperms such as the *Cycadaceae*, *Taxaceae*, *Pinaceae* and *Cupressaceae*. The section dedicated to the *Dicotyledoneae* starts with *Casuarina torulosa* and *Magnolia grandiflora*, representatives of the "apetalae aperiinthatae", continues with the almost exclusively exotic examples of diapetalous and gamopetalous species and ends up with the *Compositae*. Engler placed these last ones at the top of the evolutionary scale of the class better known today as the *Magnoliopsida*.

Although the third section containing the Monocotyledons is less varied, it does have some interesting specimens of the *Yucca*, *Aloe*, *Dracaena* (Fig. 8), and a number of magnificent palm trees. Some of the trees still bear signs of the 1943 bombardment which damaged the Botanical Garden and other areas of Palermo.

The long, shaded viale Montemartini runs down one side of the Engler system, while opposite are some of the bio-ecological systems including the succulent garden where you can see several species of *Aloe*, *Cereus*, *Crassula*, *Euphorbia* and *Opuntia*. Further on is the exotic wood stretching as far as the enormous *Ficus magnolioides* tree. *Ficus rubiginosa*, another very old fig tree growing among the succulents here has a thick jungle-like tangle of roots.

Re-planning work is now under way after it was realized - and after a number of visitors had pointed it out - that certain improvements could be made to the wood. What is now being done is firstly to set up a *palmetum* incorporating systematic-taxonomical, ecological and phytogeographic features, and secondly, to create an area for the typical local Mediterranean vegetation and to plant out a number of Gynosperms which can no longer be kept in pots.

The “Mediterranean hill” is in the eastern part of the Garden behind the gasometer near the wall separating the Garden from Via Tiro a Segno. Several local wild flowers flourish here including *Phlomis fruticosa*, *Urginea maritima*, *Euphorbia rigida*, *Euphorbia dendroides* and *Rhus pentaphylla*.

Both the utilitarian plants and the Garden’s experimental section are found at the back of the Via Archirafi university buildings. This is where the old Colonial Garden used to be before it was unfortunately closed down in the seventies. The medicinal plants are particularly interesting here and you can also see other collections of plants used for their rubber, resin, oil, essential oil, bark and textile properties.

The experimental zone, an open-air laboratory, has made possible to introduce and preserve an enormous number of decorative and economically-important species, some of which have played a key role in the agricultural economy of the region. Its significance spreads far beyond the Garden itself and its experiments have been carried out here on tropical and subtropical including cotton, ramie, banana, citrus fruits, sugar cane, aleurites, sweet sorghum, and more recently, *Carica quercifolia*, *Paulownia tomentosa* and *Citrullus colocynthys*.

The area is crossed by viale Francesco Bruno, with its towering *Washingtonia* and *Sabal* palms, and by the equally impressive viale delle chorisie. This was dedicated by the present administration to Professor Antonino De Leo, Bruno’s successor to the directorship of the Garden under whose guidance some of the most important experimental work was carried out.

Of all the glasshouses the winter garden or “Carolina Hothouse” (Fig. 7) deserves a special mention here. It takes its name from the original construction in wood and iron commissioned in England by Queen Maria Carolina di Borbone for the royal palace in Caserta. Donated in 1799 to the Botanical Garden, it was erected in 1823. Besides sheltering numerous pot-grown varieties in winter, it also houses some quite remarkable tropical species.

Here for instance, besides *Clerodendron splendens*, *Plumeria acutifolia*, *Pavetta indica*, *Tabernaemontana dichotoma*, *Pimenta acris*, *Tecoma leucophaeos*, *Bahinia porrecta*, *Ficus heterophylla*, *Ficus aspera* “*parcellii*”, *Musa mannii*, *Malpighia fucata* and several others, is the coffee plant (*Coffea arabica*), the strophanthus (*Strophanthus scandens*), the *Crescentia alata* and one of the sensitive mimosas (*Mimosa spegazzinii*).

The plants that really stand out here though, are the four mature multi-coloured bougainvilleas whose branches arch gracefully up into to the roof and down again.

Another glasshouse worth visiting is the one given over to the succulents sited parallel to Via Lincoln at the back of the future *Herbarium Mediterraneum* building. Some of the species you can see here in pots and open ground, include *Cactaceae*, *Euphorbiaceae*, *Crassulaceae*, *Asclepiadaceae*, *Aizoaceae*, *Liliaceae* and *Agavaceae*. However, most of the succulents are just outside the glasshouse.

The hothouses are right in the middle of the experimental area at the back of the university buildings in Via Archirafi. One is for orchids, another, the largest, known as “*serra della regione*” has *Araceae*, species of *Croton* and *Pandanus*. This hothouse is now totally inadequate for the size of its collections and a larger one may eventually be built in its place.

The marsh lying on viale Tineo and the more conventional *Aquarium* (Fig. 9) opposite it, comprise the water gardens. The papyrus (*Cyperus papyrus*) (Fig. 10) *Xanthosoma vio-*

lacea, *Pontederia cordata*, *Nelumbo nucifera*, *Cladium germanicum*, hippo grass (*Pistia stratioides*) and *Colocasia esculenta* are some of the plants which thrive in the marsh.

But the *Aquarium* is the most famous landmark in the two hundred-years old Garden. The large circular pool between the old system and the vast *Ficus magnolioides* was donated by Mons. Lopez-Royo, archbishop of Palermo and Monreale, and has three concentric basins divided up into twenty-four smaller compartments. Numerous varieties of water lily grow here as well as the Indian lotus *Nelubium nucifera*, *Nuphar luteum*, *Sagittaria lancifolia* and even *Victoria cruziana*.

The pool's surroundings make it an even lovelier spot with the great *Ficus* trees on one side and the massive stems of the bamboos - some of them over 10 metres high - arching over the water on the other. These bamboos include *Bambusa macroculmis* which can grow up to 15 metres in height and 25 centimetres in diameter, the *Bambusa vulgaris*, *Bambusa gracilis*, *Bambusa spinosa* and *Ophiopogon japonicus*.



Figs. 4, 5 - Representative species of the *Cycadatum* of the Botanical Garden: *Encephalartos ferox* (on the left) and *Lepidozamia peroffskyana* (on the right).



Fig. 6 - A representative species of the *Palmetum* of the Botanical Garden: *Bismarckia nobilis*.



Fig. 7 - A glimpse of the suggestive square in front of the Carolina greenhouse.



Fig. 8 - A representative Canary dragon tree (*Dracaena draco*) in the Botanical Garden of Palermo before its partial damage caused by the fall of the tree next to the left.



Fig. 9 - Sectoral image of the historic *Aquarium* of the Botanical Garden.



Fig. 10 - *Cyperus papyrus* and *C. alternifolius* in the pond of the Botanical Garden.



Caralluma europaea (Asclepiadaceae), rare succulent plant endemic to the island of Lampedusa, cultivated in the Botanical Garden of Palermo.



Original entrance to the Botanical Garden of Palermo connected to the garden of Villa Giulia.



Distinguished representatives of the Yemeni government visiting the Botanical Garden at the end of the event.

The Villa Whitaker Garden in Malfitano*

Introduction

Thanks to the favourable climate and fertile soil, Palermo and its environs give hospitality to numerous exotic plants from the tropical regions of various continents. Out in the open air they succeed in flowering and fructifying abundantly, arousing wonder in foreigners visiting the city, as some of these plants, which here grow vigorously and luxuriantly, on the mainland and in the rest of Europe have difficulty in growing and flowering.

In these propitious conditions in Palermo there arose luxuriant gardens and magnificent villas, so splendid and recherche as to arouse an almost phantasmagoric impression of a tropical place.

Villa Giulia, in the Sant'Erasmo area near the sea, Giardino Garibaldi in Piazza Marina, the English Garden in Via Libertà, the Trabia, Tasca, Niscemi, Varvaro and Sofia villas and many others scattered around in the city and in the immediate suburbs, though partly abandoned or even taken to pieces, constitute the most evocative examples. These places are also the most significant testimony to a very different social, economic and cultural condition in Palermo which developed in the nineteenth century and remained almost unaltered until World War II. One of the fruits of these propitious environmental and social conditions is Villa Whitaker Malfitano. Its park, today, can be defined a particular kind of botanic garden, as it is a real arboretum on account of the nature of its florula, which is prevalently arboreal. There is greenery which only in a few cases shows signs of suffering, due not to neglect but to the normal physiological evolution of the most adult plants.

The Villa Malfitano Garden - made available for enjoyment by a bigger and bigger public so as to contribute to growing attention to green spaces - is by its nature characterised by living material, and hence is to be visited with appropriate attitudes, that is to say with respect for exotic nature, which is apparently exuberant but nonetheless fragile.

Layout and organisation of the greenery

Villa Whitaker, in the Malfitano all'Olivuzza area, is one of the most outstanding examples of what a family of English merchants, the Whitakers, who settled in Palermo in the second half of the nineteenth century, were able to achieve, influencing the city's economy and decoration and taste in it and, subsequently, in other places on the island, becoming more than a local reference point.

The extent of this contribution can particularly be appreciated by identifying the Whitakers as the archaeologists who discovered and brought to light Motya, and the people who built up important nature collections, and built Villa Whitaker in the old

*Resumed and partially reprocessed from Raimondo, F.M. 1995: The Villa Malfitano Garden. – In: Il Giardino di Villa Malfitano, Fondazione Giuseppe Whitaker, Palermo. Pp. 85-86.

part of the city, Villa Sofia and Villa Whitaker a Malfitano, buildings which were among the finest in Palermo and indeed in all Italy. This refers not only to the architectural and aesthetic aspects, or the thousand fineries and cultural treasures inside, but also to the richness of the flora and the monumental quality of the gardens and connected parks.

The land for building the villa was purchased in 1885. Building work began immediately. The laying out of the park was begun the following year with the levelling of the ground around the mansion.

Of the total surface area of over 7 hectares (17 acres), over 5 were destined to the park and building complex, while the rest of the land continued to be used for citrus fruit trees. The park alone, today, Occupies a surface area of over 4 hectares (10 acres).

In the front part, looking out on Via Dante, the paths were organised in the English fashion so as to alternate open spaces with big plant masses and pools. Afterwards, the stretch beside the back part of the edifice was mainly designed Italian style, with little paths and plant elements placed geometrically and in symmetry with the marginal distribution of the main masses, creating a courtyard around the central building. In accordance with this criterion, and in order to mask the service facilities, in the flowerbeds and along the perimeter paths arboreal species were placed, while the central beds were prevalently occupied by herbaceous elements and shrubs and by isolated groups of smallish trees. In continuity with the Italian-style garden but in a marginal and somewhat sheltered position, there was set out a corner rich in romantic elements which are still partly extant: a hillock, a rivulet, a pool and even a little underground maze, probably made out of something previously existing.

The first plants put in the garden were brought directly by Joseph Whitaker (Pip) from Tunisia, Sumatra, Australia and various other exotic countries and planted by the first head gardener, Emil Kunzman, of German origin.

After being set out, the park continued to receive assiduous attention until the death of Delia, the last member of the Whitaker family, in 1971. Today the whole complex is run by the Giuseppe Whitaker Foundation, set up in 1975 in Pip's honour. In this period the plants in the park had the chance to develop fully, some of them reaching monumental dimensions. This development did not substantially interfere with the structure of the villa, thanks to the happy design of the greenery.

At present all over the park the signs of the passing of time are appearing: not only symptoms of the physiological decline of some plants but also the accentuated vitality of exemplars whose exuberance often raises the problem of containing them.

In some parts, like the little romantic garden, the greenhouses and the edges of the villa, the visitor may have an impression of neglect; this may also correspond to a real condition, but it could better be attributed to the real difficulties involved in managing such a big and complex structure, especially as concerns the various needs of such a big number of species. If we consider the staff ordinarily looking after the garden, 3 to 5 people, Villa Malfitano in Palermo is certainly a happy oasis.

Dendroflora

The flora contingent now present in the Villa Malfitano garden, as a whole, expresses the quality linked to when it was first laid out. Hence the florula has remained rather stable in terms of both quality and quantity. The most marked variations probably refer to the last few decades, although there is no valid documentation in this connection. Certainly the herbaceous and fruticose contingent could even have been richer and this also goes for the arboreal component; a few years ago there occurred the death of a magnificent exemplar of *Callitris quadrivalvis* - a rare cypress from North Africa - and of a fine and ancient Lebanese cedar (*Cedrus libani*).

Still today, the peculiar characteristic of the flora in the park is its originality. To the careful placing of the individuals that mark the garden with respect to other Palermo examples, despite the richness of the latter, there corresponds a major search for quality, accentuated by the monumental quality of many plants and the rarity of some of them.

Among individuals especially worthy of mention there is an elegant and rare form of *Ficus magnolioides*, an isolated and very rare exemplar of *Araucaria rulei* - a species originating from New Caledonia and so far not expressly reported in the flora of other European gardens - as well as an outstanding exemplar of *Yucca australis*, an agavaceous plant from Mexico which together with another exemplar at Villa Sofia certainly documents the first case of this species being introduced to the European continent. The only exemplar at the University Botanic Garden, much younger than those previously mentioned, probably came from the Whitaker gardens. Also unique is the exemplar of *Yutia yatai* which one can admire among the palm trees near the path leading from the entrance to the mansion.

But also noteworthy at Villa Malfitano is the presence of *Jubaea spectabilis* - the coquito palm tree from Mediterranean Chile, very rare in other Palermo gardens, as well as that of *Phoenix reclinata*, of *Nolina longifolia* and *N. stricta*, respectively from Central and South America, of *Dioon edule*, also represented by a mature male exemplar, and of numerous other cycadaceae. Also represented are some very fine dracaenas, frequent among which is "dragon's blood" from the Canary Islands, with the expressive characteristic look conferred on it by the double ramifications. Also noteworthy are some conifers like *Thuja gigantea*, *Pinus banksiana* and *Sequoia sempervirens*.

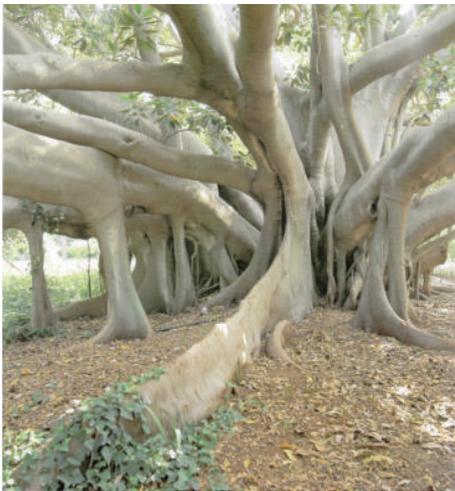
Altogether in the park flora there are about 250 species, mostly from tropical and subtropical countries. However, there is no lack of Mediterranean species like ilex (*Quercus ilex*), *Viburnum tinus* and colonies of dwarf palms (*Chamaerops humilis*). The most representative of them, recently catalogued, are attributed to a little over 170 species belonging to 120 genera of 61 families. Inside the park, palm trees, yucas and dracaenas, with their frequency and their almost universal distribution, work out the weft of the greenery; other agavaceae, like the regularly present and expressive nolinias, help to make the park's appearance refined.

But the element which is absolutely unique about this park is the remarkable *Ficus*, an expression of the flora of that little continent immersed in the waters of the Pacific.

On account of the tropical character of the most common constituents of the flora represented there, and also on account of some peculiarities, the Villa Malfitano park is one of the most interesting Sicilian gardens and, certainly, Italian ones too. It is an arboretum of scientific interest which complements and completes, in its spacious configuration, the Botanic Gardens of our University, with which it has long had an active relationship.



The magnificent tree of *Ficus macrophylla* of the garden of Villa Whitaker in Malfitano.



Tabular roots of *Ficus macrophylla*.



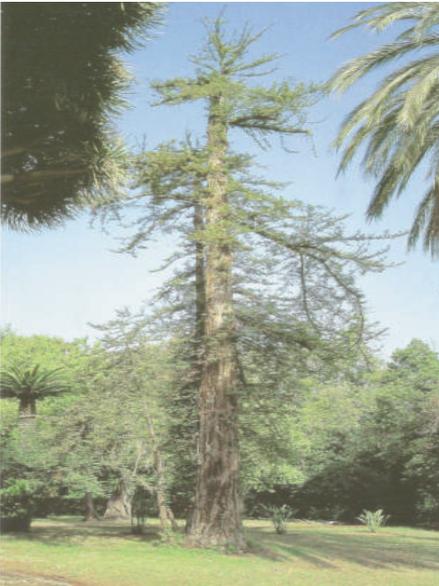
Old tree of *Dracaena draco* before restoration.



The rare *Xanthoceras sorbifolium* of the garden.



Fruiting of *Xanthoceras sorbifolium* in the garden.



Tree of *Sequoia sempervirens* before its partial desiccation.



Araucaria rulei from New Caledonia, unique sample of the species growing in European gardens.



Chilean palm (*Jubaea chilensis*) before its partial death caused by *Rynchoophorus ferrugineus*.



Beaucarnea recurvata, characteristic plant of the garden



View of the rear prospectus of the liberty building of Villa Whitaker in Malfitano.

and hope is mutual. I try to go back to its magical islands every year. It is a place of constant discoveries and mysteries, extraordinary beauty and amazing people. I feel at home there. I feel happy there. I am still in love with Socotra”.

Oliver Wilkins

Oliver Wilkins is a British director who won an independent Emmy award. He has produced documentary films all over the world, focusing on identity, human rights, marginalization and inequality. He has designed and produced film projects in collaboration with Yemen, Palestine, Colombia and Iceland. A TV journalist in Cairo, he quickly established himself as a director for organizations and broadcasters seeking to produce audiovisuals on subjects of social interest in the Middle East and Africa. In 2002 he produced a documentary on AIDS with the UNDP and in 2003 he made a documentary with the International Organization of Migration on Child Trafficking between Yemen and Saudi Arabia. In Colombia he worked with indigenous groups involved in the crossfire of the civil war. In India he focused on Dalit girls fighting for their rights and in Palestine he shot a film with the cultural resistance group Freedom Theater. Wilkins is currently developing a project to protect heritage sites in the Middle East, in collaboration with the British Museum and Cambridge University. As director of photography Wilkins has collaborated with Egyptian and British directors to shoot short films, music videos and commercials. In 2015 his first fiction short film, *Eternal Insatisfait* in French, won the jury prize at the SF48.

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