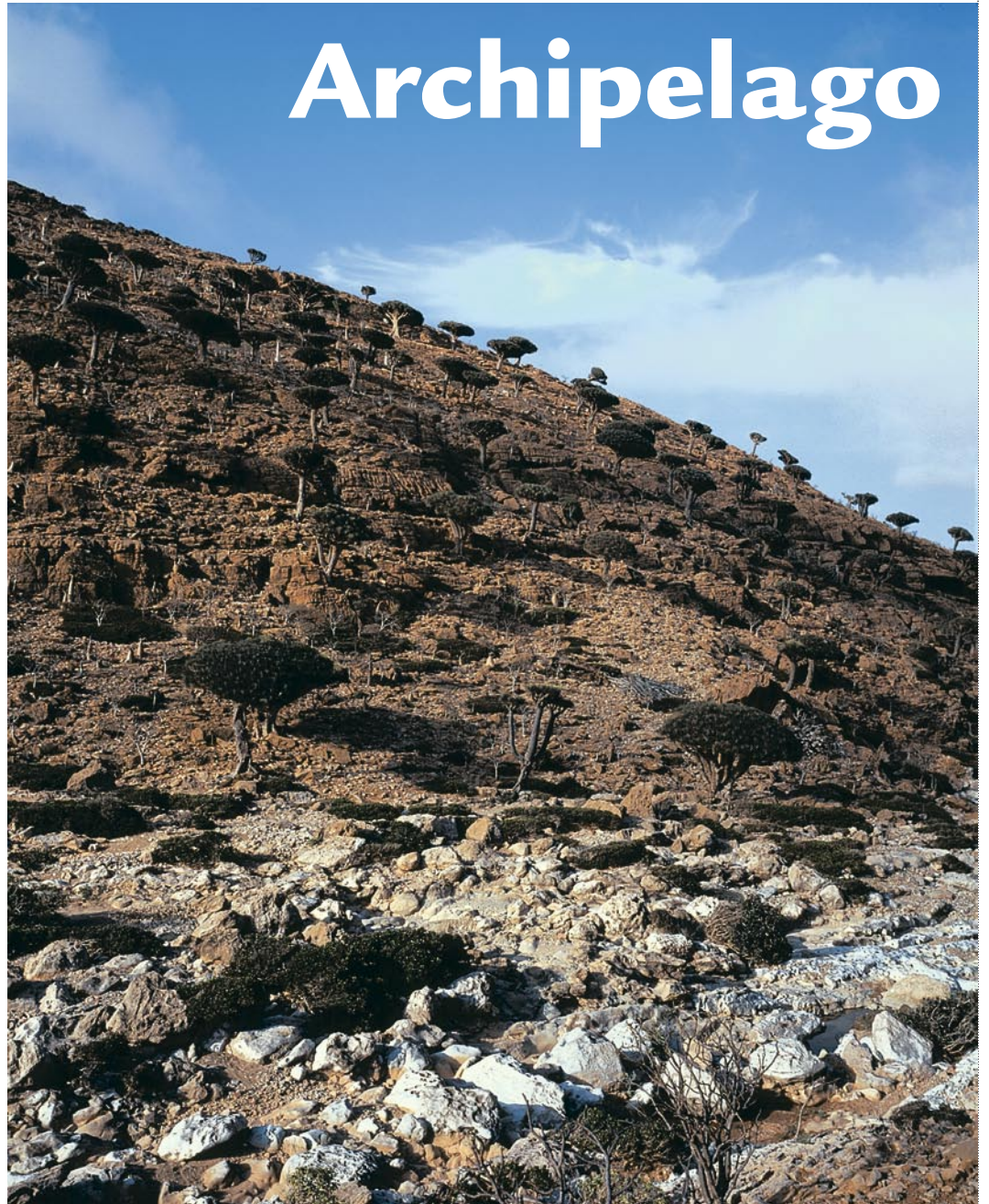


# **SOCOTRA**

# **Archipelago**



**Proposal for inclusion in the  
World Heritage List | UNESCO**

*January 2006*

*cover*

***Dracaena cinnibari***

Photo by Mario Caruso

## INDEX

|    |  |     |
|----|--|-----|
| 0. | Executive Summary . . . . .  | 5   |
| 1. | Identification of the Property . . . . .                             | 9   |
| 2. | Description of the Property . . . . .                                | 21  |
| 3. | Justification for Inscription . . . . .                              | 69  |
| 4. | State of conservation<br>and factors affecting the property. . . . . | 79  |
| 5. | Protection and Management. . . . .                                   | 101 |
| 6. | Monitoring . . . . .   | 127 |
| 7. | Documentation . . . . .  | 135 |
| 8. | Contact Information<br>of responsible authorities . . . . .          | 161 |
| 9. | Signature on behalf of the State Party. . . . .                      | 165 |
| A. | List of annexes . . . . .  | 167 |

## 0.

Executive  
Summary

## State Party

Yemen

## State, Province and Region

Hadramawt

## Name of Property

Socotra Archipelago

Geographical coordinates to the nearest second (*see maps at page 11*)

| ID No.       | Nome of the area | Discript         | Corea Area (ha) |                | Buffer Zone (ha)    |                  | Coordinates                   |
|--------------|------------------|------------------|-----------------|----------------|---------------------|------------------|-------------------------------|
|              |                  |                  | Terrestrial     | Marine         | Terrestrial         | Marine           |                               |
| xxxx-001     | Socotra          | Hadramawt        |                 |                |                     |                  | N 12° 30' 00" - E 53° 50' 00" |
|              |                  |                  | A: 242.903      | a: 2.739       | 1: 64.845           | 840.325          |                               |
|              |                  |                  | B: 17.105       | b: 7.157       | 2: 18.252           |                  |                               |
|              |                  |                  |                 | c: 578         | 3: 8.900            |                  |                               |
|              |                  |                  |                 | d: 1.106       |                     |                  |                               |
|              |                  |                  |                 | e: 30.412      |                     |                  |                               |
|              |                  |                  |                 | f: 764         |                     |                  |                               |
|              |                  |                  |                 | g: 3.098       |                     |                  |                               |
|              |                  |                  |                 | h: 14.187      |                     |                  |                               |
|              |                  | <b>sub-total</b> | <b>260.008</b>  | <b>60.041</b>  | <b>91.997</b>       | <b>840.325</b>   |                               |
| xxxx-002     | Abd Alkuri       | Hadramawt        |                 |                |                     |                  | N 12° 11' 22" - E 52° 14' 21" |
|              |                  |                  | 11.858          | a: 1.885       |                     | 456.179          |                               |
|              |                  |                  |                 | b: 2.351       |                     |                  |                               |
|              |                  |                  |                 | c: 638         |                     |                  |                               |
|              |                  | <b>sub-total</b> | <b>11.858</b>   | <b>4.874</b>   |                     | <b>456.179</b>   |                               |
| xxxx-003     | Samha            | Hadramawt        | 5.063           | 26.917         |                     | 243.083          | N 12° 09' 33" - E 53° 02' 32" |
| xxxx-004     | Darsa            | Hadramawt        | 544             | 17.624         |                     | 109.374          | N 12° 07' 25" - E 53° 16' 24" |
| xxxx-005     | Kalfarun         | Hadramawt        | 31              | 11.072         |                     |                  | N 12° 26' 22" - E 52° 08' 08" |
| xxxx-006     | Sabunya          | Hadramawt        | 8               | 12.420         |                     | 91.997           | N 12° 38' 13" - E 53° 09' 26" |
|              |                  | <b>TOTAL</b>     | <b>277.512</b>  | <b>132.948</b> | <b>91.997</b>       | <b>1.648.961</b> |                               |
| <b>TOTAL</b> |                  |                  | <b>410.460</b>  |                | <b>1,740,958.00</b> |                  |                               |

## Textual description of the boundaries of the nominated property

The Archipelago is located in the North-Western Indian Ocean and includes the main islands of Socotra (or Soqotra), Abd al-Kuri, Samha and Darsa, as well as the smaller islets of Sabuniya and Kal Farun, and other rock outcrops.

The Nominated Property includes approximately 97,5% of the archipelago's total the land area, and the quasi-totality of marine areas, extending for 12 nautical miles around the group of islands.

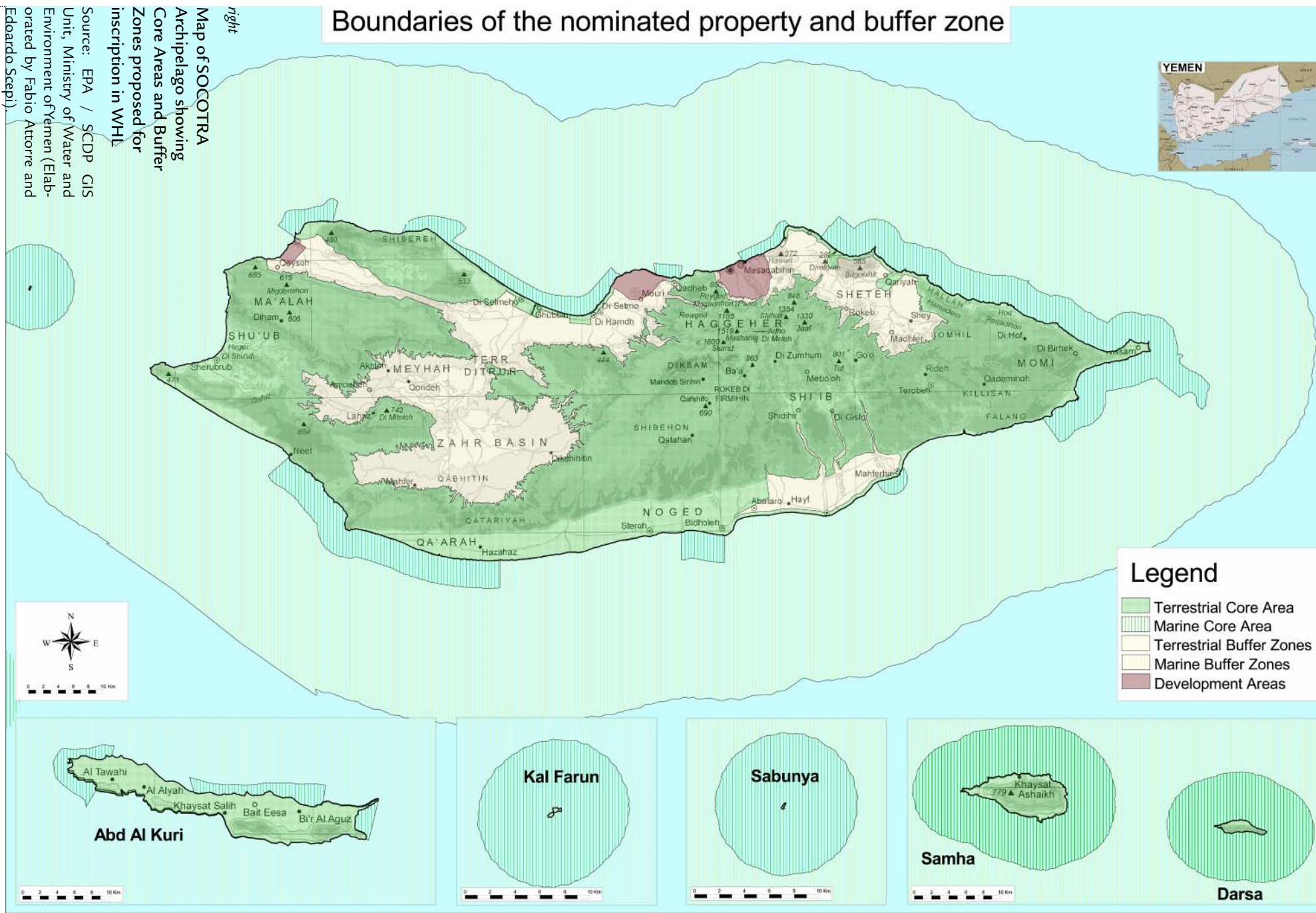


# Boundaries of the nominated property and buffer zone



Map of SOCOTRA Archipelago showing Core Areas and Buffer Zones proposed for inscription in WHL

Source: EPA / SCDP GIS Unit, Ministry of Water and Environment of Yemen (Elaborated by Fabio Attorre and Edoardo Scapi).



### **Justification - Statement of Outstanding Universal Value**

The Socotra Archipelago is one of the most significant and well-preserved island ecosystems in the world, containing a unique assemblage of species and habitats, and representing one of the few surviving examples of local people living in a delicate balance with their natural environment.

Due to the archipelago's relative isolation until recent years, the traditional balance established between people and nature has remained relatively undisturbed, preserving endemic species and their eco-systems. The archipelago's remarkable integrity and comparatively outstanding level of conservation, offer an exceptionally valuable opportunity to study and learn from an exceptional combination of flora and fauna, with its associated unique culture, language and traditions.

Each of the archipelago's three inhabited islands exhibits its own high level of endemism, rendering the archipelago as a whole even more significant.

### **Criteria under which property is nominated**

**CRITERION X** – THE NOMINATED PROPERTY SHALL CONTAIN THE MOST IMPORTANT AND SIGNIFICANT NATURAL HABITATS FOR IN-SITU CONSERVATION OF BIOLOGICAL DIVERSITY, INCLUDING THOSE CONTAINING THREATENED SPECIES OF OUTSTANDING UNIVERSAL VALUE FROM THE POINT OF VIEW OF SCIENCE OR CONSERVATION.

The inscription of the Socotra Archipelago is proposed as a Natural Site as it contains one of the best-conserved and significant island habitats in the world. The site holds unquestioned global importance for in-situ conservation of biological diversity, and it hosts large numbers of rare and threatened endemic species of outstanding universal value (criterion X).

Due to its remote and peripheral location, and to historically difficult accessibility due to meteorological and sea conditions, the natural environment of Socotra has retained an impressive level of integrity till present date, making it the equivalent of a precious Noah's Ark, where ancient flora and fauna, as well as an associated unique culture and traditions, have survived until present day.

### **Name of contact information of official local institution/agency**

#### **Organization:**

Socotra Conservation and Development Programme (SCDP), Ministry of Water and Environment (MOWE) / Environment Protection Authority (EPA), Yemen

**Address:** PO Box 16494, Sana'a, Yemen

**Tel.:** +967 1 425310

**Fax.:** +967 1 425309

**E-mail:** [scdp@y.net.ye](mailto:scdp@y.net.ye) and [aferyani@socotraisland.org](mailto:aferyani@socotraisland.org)

**Web address:** [www.socotraisland.org](http://www.socotraisland.org)

## 1.

Identification  
of the  
Property

## 1a. Country

Yemen

## 1b. State, Province and Region

Governorate of Hadramawt

## 1c. Name of Property

SOCOTRA Archipelago

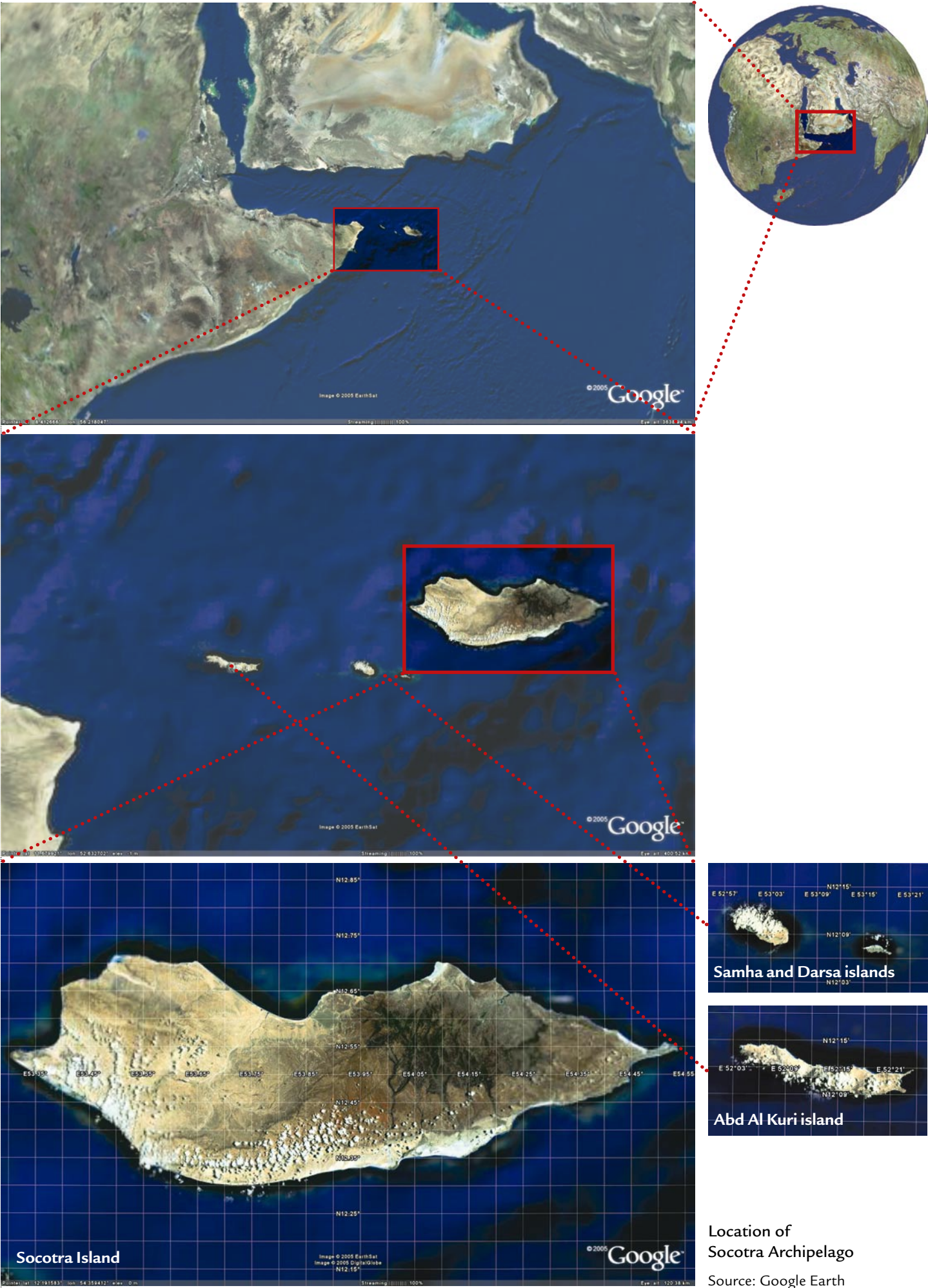
1d. Geographical coordinates  
to the nearest second

| ID No.       | Nome of the area | Discript         | Corea Area (ha) |                | Buffer Zone (ha)    |                  | Coordinates                   |
|--------------|------------------|------------------|-----------------|----------------|---------------------|------------------|-------------------------------|
|              |                  |                  | Terrestrial     | Marine         | Terrestrial         | Marine           |                               |
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|              |                  |                  | A: 242.903      | a: 2.739       | 1: 64.845           | 840.325          |                               |
|              |                  |                  | B: 17.105       | b: 7.157       | 2: 18.252           |                  |                               |
|              |                  |                  |                 | c: 578         | 3: 8.900            |                  |                               |
|              |                  |                  |                 | d: 1.106       |                     |                  |                               |
|              |                  |                  |                 | e: 30.412      |                     |                  |                               |
|              |                  |                  |                 | f: 764         |                     |                  |                               |
|              |                  |                  |                 | g: 3.098       |                     |                  |                               |
|              |                  |                  |                 | h: 14.187      |                     |                  |                               |
|              |                  | <b>sub-total</b> | <b>260.008</b>  | <b>60.041</b>  | <b>91.997</b>       | <b>840.325</b>   |                               |
| xxxx-002     | Abd Alkuri       | Hadramawt        |                 |                |                     |                  | N 12° 11' 22" - E 52° 14' 21" |
|              |                  |                  | 11.858          | a: 1.885       |                     | 456.179          |                               |
|              |                  |                  |                 | b: 2.351       |                     |                  |                               |
|              |                  |                  |                 | c: 638         |                     |                  |                               |
|              |                  | <b>sub-total</b> | <b>11.858</b>   | <b>4.874</b>   |                     | <b>456.179</b>   |                               |
| xxxx-003     | Samha            | Hadramawt        | 5.063           | 26.917         |                     | 243.083          | N 12° 09' 33" - E 53° 02' 32" |
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|              |                  | <b>TOTAL</b>     | <b>277.512</b>  | <b>132.948</b> | <b>91.997</b>       | <b>1.648.961</b> |                               |
| <b>TOTAL</b> |                  |                  | <b>410.460</b>  |                | <b>1,740,958.00</b> |                  |                               |

see maps at page 11



Socotra Archipelago

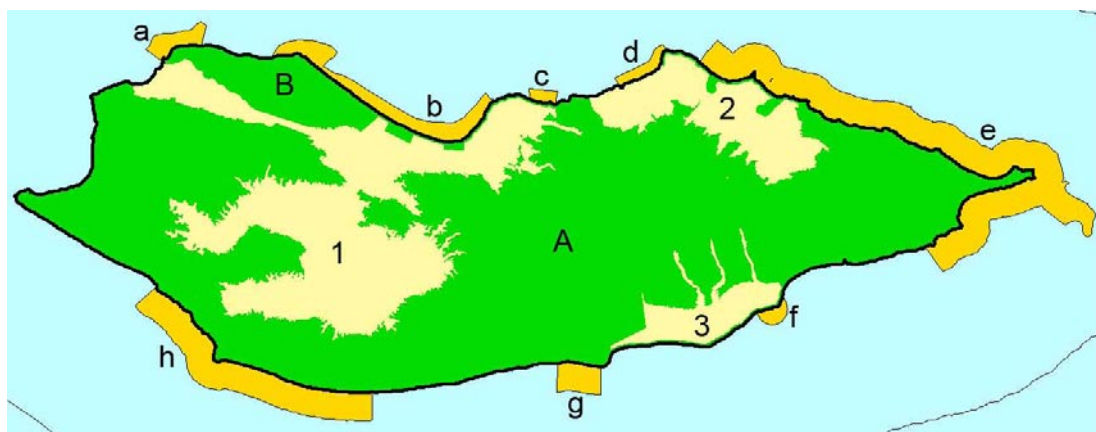


## 1e. Maps and plans, showing the boundaries of the nominated property and buffer zone

| ID No. | Content   | Page  |
|--------|---|-------|
| 001    | Satellite views of Socotra Archipelago, Yemen<br><i>Source: Google Earth</i>  | 10    |
| 002    | Satellite view of Socotra<br><i>Source: Socotra Conservation and Development Programme (SCDP), Environment Protection Authority (EPA) - Ministry of Water and Environment (MOWE), Yemen.</i>                  | 12    |
| 003    | Map of Socotra Archipelago showing core areas and buffer zones for inscription in WHL<br><i>Source: EPA / SCDP GIS Unit, Ministry of Water and Environment of Yemen (Elaborated by Fabio Attorre)</i>         | 6, 13 |
| 004    | Map of Socotra Archipelago<br><i>Source: Socotra Conservation Fund (SCF) &amp; Friends of Socotra (FOS)</i>   | 14    |
| 005    | Map of Socotra Archipelago<br><i>Source: The Royal Geographic Society</i>   | 15    |
| 006    | Socotra Archipelago Master Plan - Main Regions of Socotra<br><i>Source: EU Socotra Masterplan project - Socotra Conservation and Development Programme (SCDP), Ministry of Water and Environment of Yemen</i> | 16    |
| 007    | Socotra Archipelago Master Plan - Socotra Main Features<br><i>Source: EPA/MOWE/SCDP - EU Socotra Masterplan project, Yemen</i>  | 17    |
| 008    | Average Annual Rainfall (2002-2005)<br><i>Source: DSS Unit, EPA-SCDP</i>  | 27    |
| 009    | Socotra Archipelago Master Plan -Existing Agricultural Enterprises<br><i>Source: EPA/MOWE/SCDP - EU Socotra Masterplan project, Yemen</i>   | 88    |
| 010    | Socotra Archipelago Master Plan -Settlements Pattern<br><i>Source: EPA/MOWE/SCDP - EU Socotra Masterplan project, Yemen</i>   | 90    |
| 011    | Socotra Archipelago Master Plan - Tourism Locations and Activities<br><i>Source: EPA/MOWE/SCDP - EU Socotra Masterplan project, Yemen</i>   | 118   |
| 012    | Socotra Archipelago Master Plan - Location of Existing and Proposed Strategic Roads and Tracks<br><i>Source: EPA/MOWE/SCDP - EU Socotra Masterplan project, Yemen</i>   | 122   |

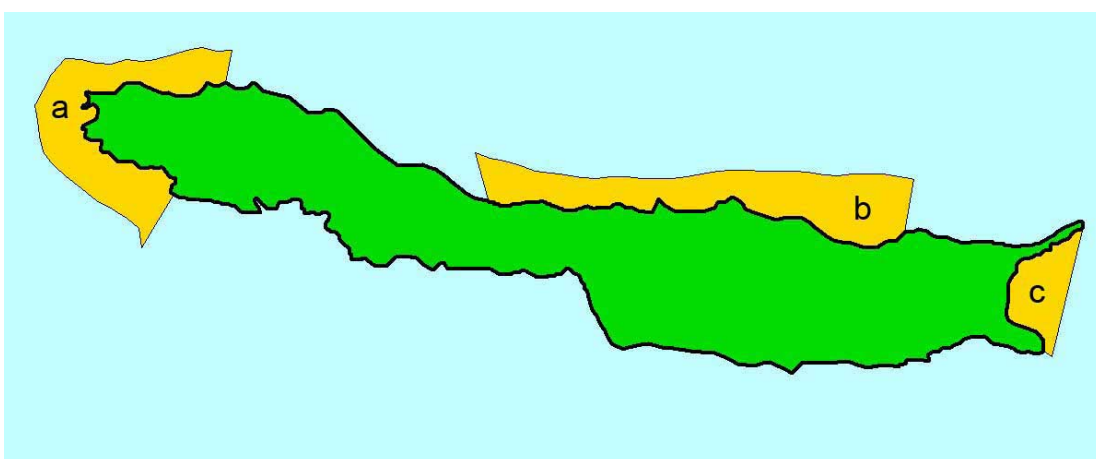
Right

Map of SOCOTRA showing the Core (in green and dark yellow) and Buffer zones (in light yellow and light blue)



Right

Map of Adb Alkuri showing the Core (in green and dark yellow) and Buffer zones (in light blue)





right  
Satellite view  
of SOCOTRA and DARSA  
islands

Source: Socotra Conserva-  
tion and Development Pro-  
gramme (SCDP), Ministry of  
Water and Environment of  
Yemen.

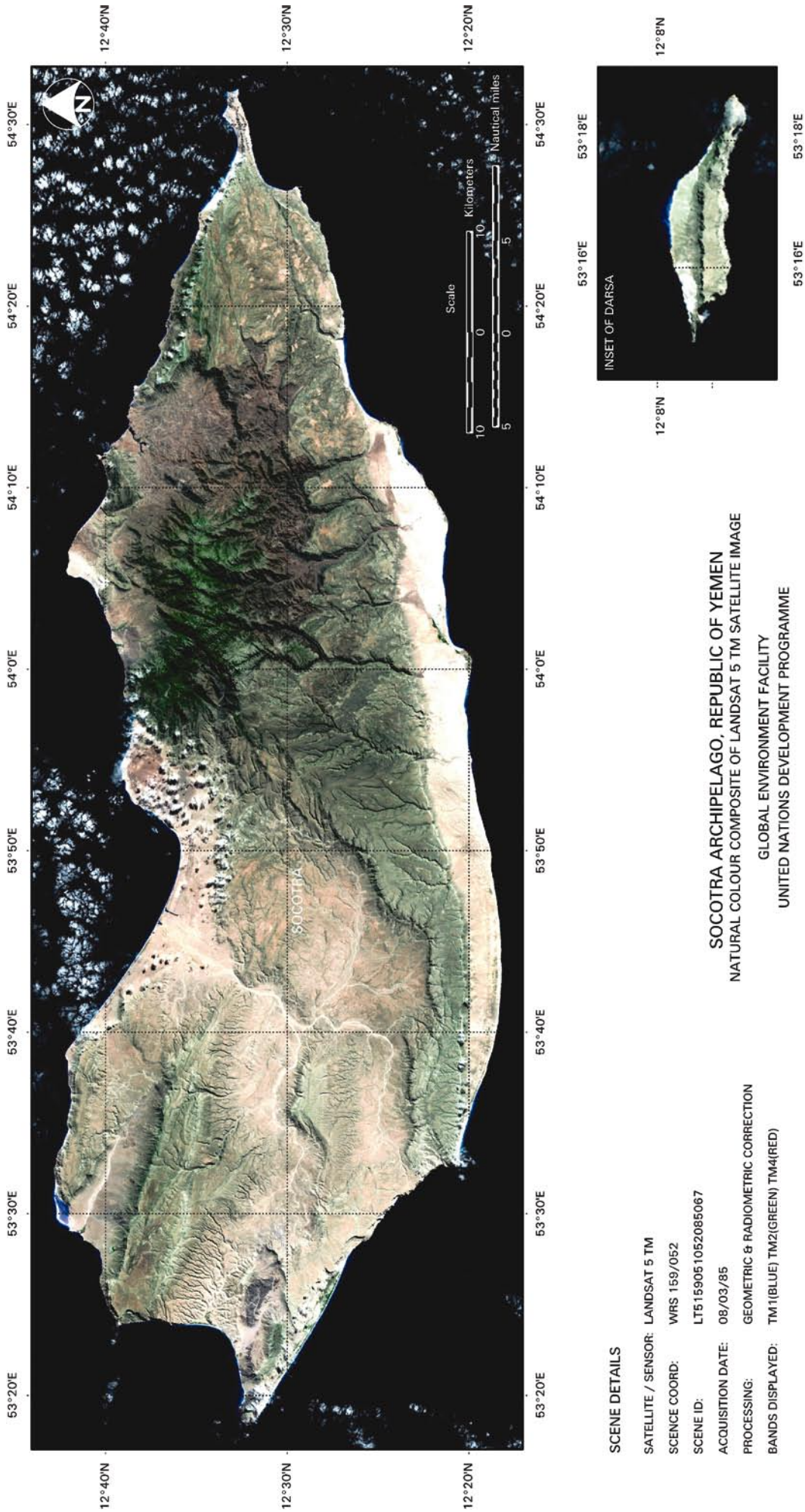


Figure 3: Natural colour composite of the Landsat 5TM image (8th March 1985) of Socotra

Map of SOCOTRA Archipelago showing Core Areas and Buffer Zones proposed for inscription in WHL

Source: EPA / SCDP GIS Unit, Ministry of Water and Environment of Yemen (Elaborated by Fabio Attorre and Leonardo Sestini)

**Legend**

- Terrestrial Core Area
- Marine Core Area
- Terrestrial Buffer Zones
- Marine Buffer Zones
- Development Areas

**Abd Al Kuri**

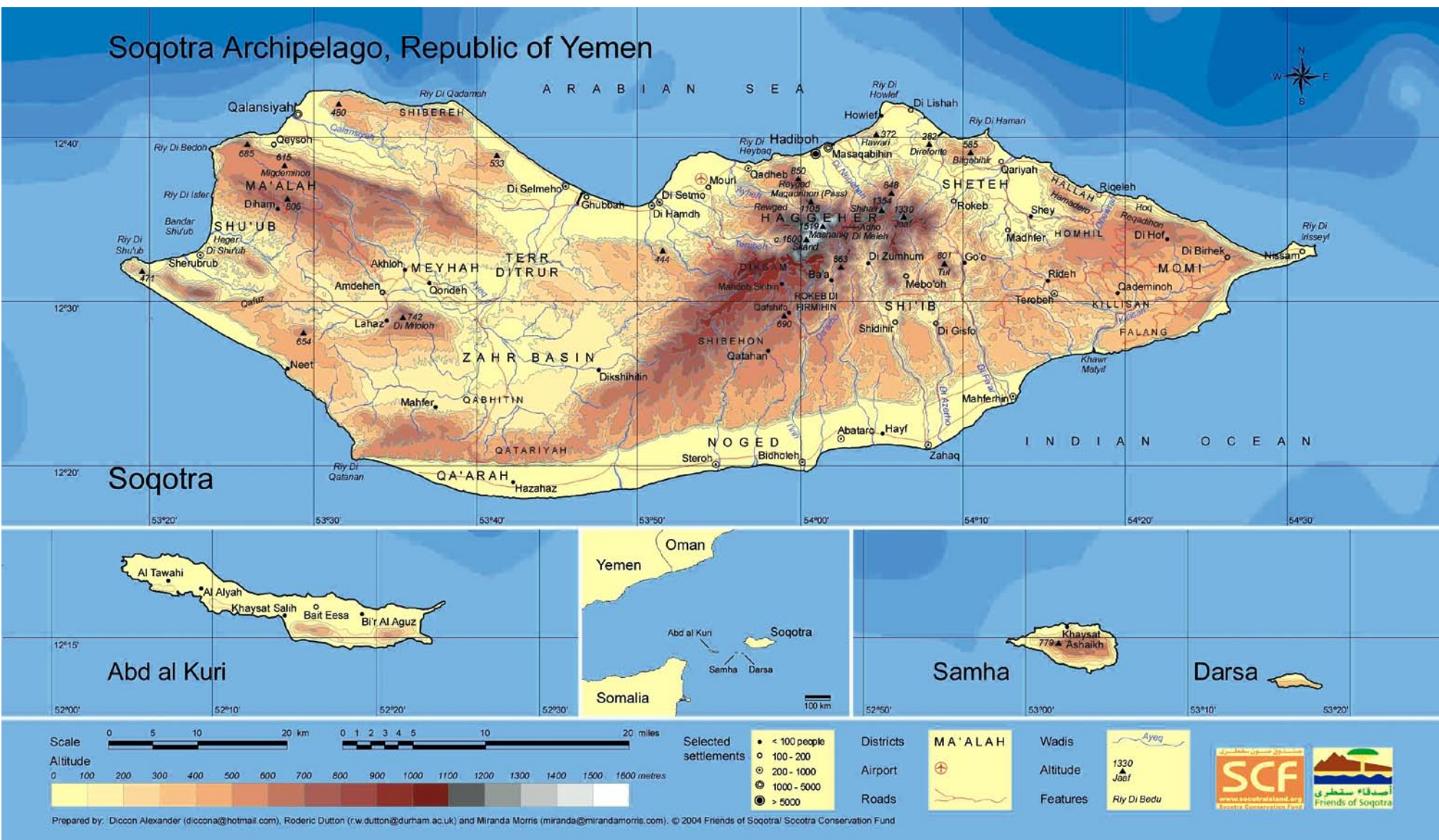
**Kal Farun**

**Sabunya**

**Samha**

**Darsa**





right

Map of SOCOTRA  
Archipelago

Source: SCF & FOS



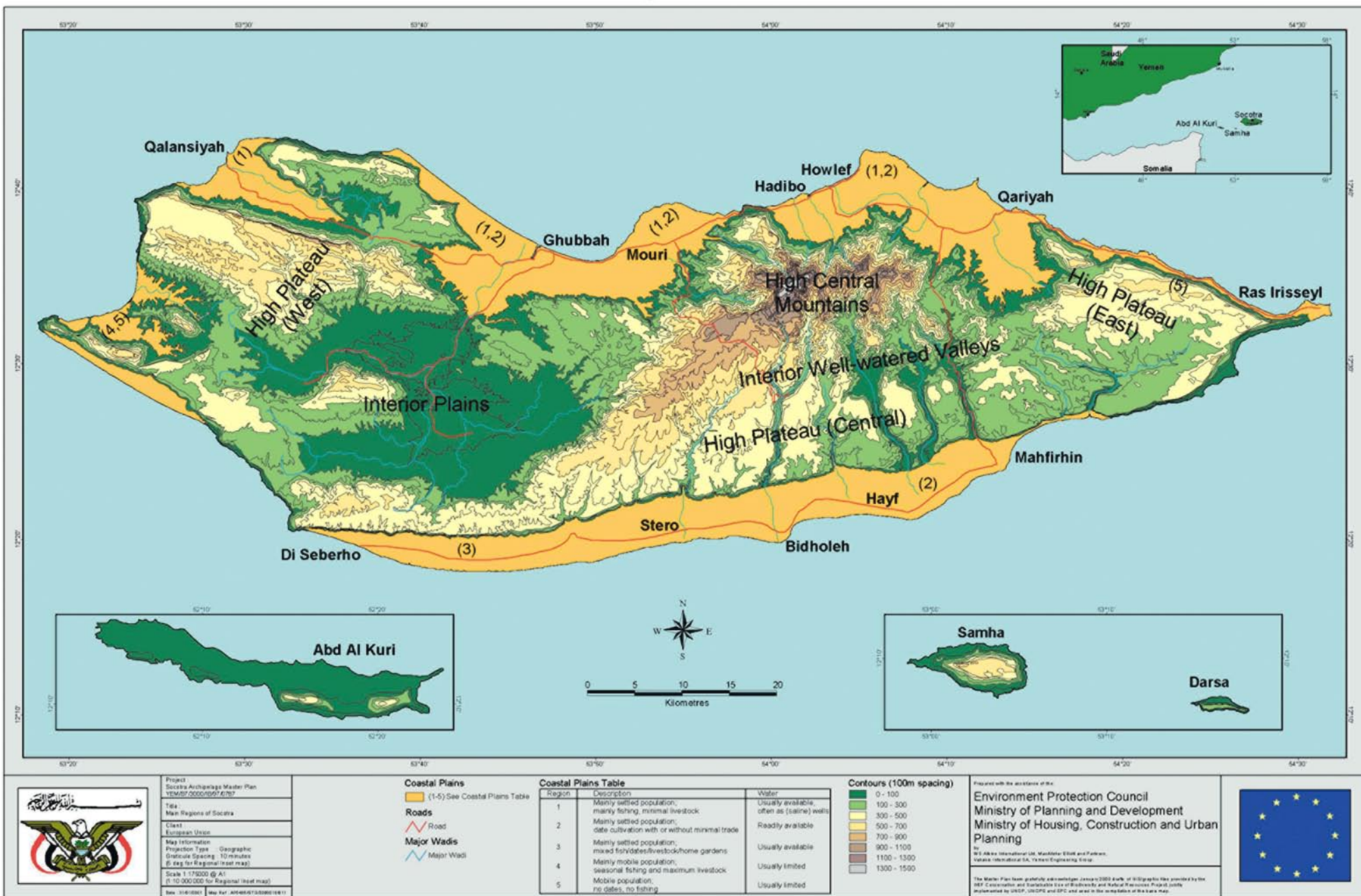


left  
Map of SOCOTRA, SAM-  
HA and DARSA  
Source: The Royal Geograph-  
ic Society



# SOCOTRA ARCHIPELAGO MASTER PLAN

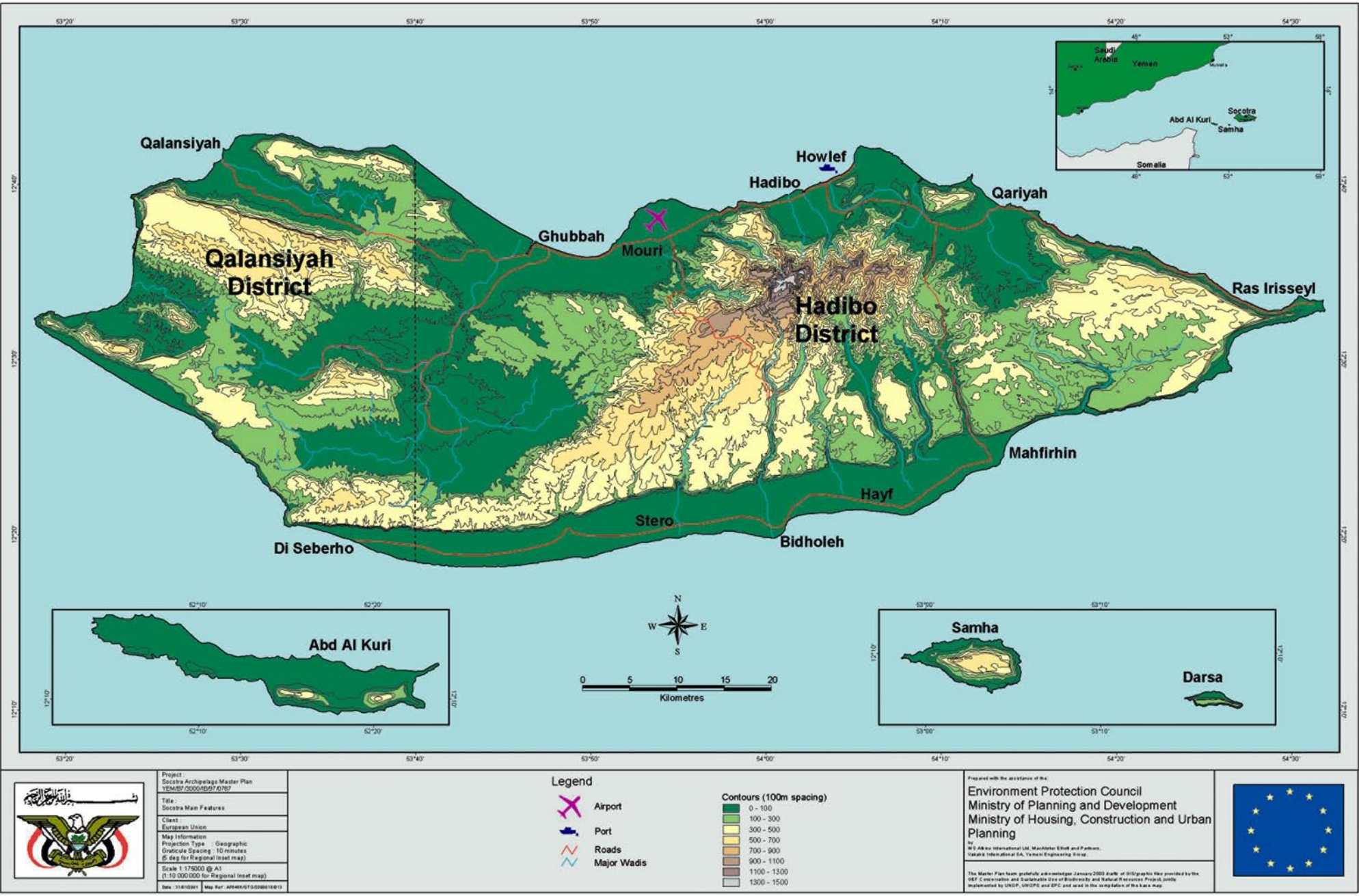
## Main Regions of Socotra





# SOCOTRA ARCHIPELAGO MASTER PLAN

## Socotra Main Features







*above*

*Dracaena cinnibari*

Photo by Mario Caruso

## 1f. Area of nominated property (ha.) and proposed buffer zone (ha.)

Based on the Conservation Zoning Plan (see 1.e and section 5), the areas (in ha.) of the Socotra Archipelago and its different zones were calculated using the Geographic Information System (GIS) of the Environment Protection Authority (EPA), of the Ministry of Water and Environment of Yemen.

These are summarised the following table:

| ID No.       | Nome of the area | Discript         | Corea Area (ha) |                | Buffer Zone (ha)    |                  | Coordinates                   |
|--------------|------------------|------------------|-----------------|----------------|---------------------|------------------|-------------------------------|
|              |                  |                  | Terrestrial     | Marine         | Terrestrial         | Marine           |                               |
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|              |                  |                  |                 | c: 578         | 3: 8.900            |                  |                               |
|              |                  |                  |                 | d: 1.106       |                     |                  |                               |
|              |                  |                  |                 | e: 30.412      |                     |                  |                               |
|              |                  |                  |                 | f: 764         |                     |                  |                               |
|              |                  |                  |                 | g: 3.098       |                     |                  |                               |
|              |                  |                  |                 | h: 14.187      |                     |                  |                               |
|              |                  | <b>sub-total</b> | <b>260.008</b>  | <b>60.041</b>  | <b>91.997</b>       | <b>840.325</b>   |                               |
| xxxx-002     | Abd Alkuri       | Hadramawt        |                 |                |                     |                  | N 12° 11' 22" - E 52° 14' 21" |
|              |                  |                  | 11.858          | a: 1.885       |                     | 456.179          |                               |
|              |                  |                  |                 | b: 2.351       |                     |                  |                               |
|              |                  |                  |                 | c: 638         |                     |                  |                               |
|              |                  | <b>sub-total</b> | <b>11.858</b>   | <b>4.874</b>   |                     | <b>456.179</b>   |                               |
| xxxx-003     | Samha            | Hadramawt        | 5.063           | 26.917         |                     | 243.083          | N 12° 09' 33" - E 53° 02' 32" |
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|              |                  | <b>TOTAL</b>     | <b>277.512</b>  | <b>132.948</b> | <b>91.997</b>       | <b>1.648.961</b> |                               |
| <b>TOTAL</b> |                  |                  | <b>410.460</b>  |                | <b>1,740,958.00</b> |                  |                               |

see maps at page 11

The areas of Core and Buffer Zone correspond to the following classification from the Archipelago's Conservation Zoning Plan\*:

**Core Zone** = total of all Nature Sanctuaries and National Park areas (*terrestrial and marine*)

**Buffer Zone** = total of all Natural Resource Use areas (*terrestrial and marine*)

-----  
 \*An accurate GIS elaboration of areas was conducted by the EPA GIS unit for the purpose of this nomination. A slight difference was noted between the total size of areas presented in this nomination (2006), and the corresponding total areas listed in the CZP (2000). This is due to improvements in the quality of GIS analysis by EPA, subsequently to the approval of the CZP.

GIS data presented here may therefore be considered as more accurate than data available in year 2000. The table and associated map were also elaborated and reviewed with external assistance by Dr. Fabio Attorre of the University of Rome, Italy.

## 2.

## Description

## 2a. Description of Property

### Significant features

The archipelago includes the main island of Socotra and the three smaller islands of Samha and Darsa – also known jointly as “The Brothers” – and Abd al-Kuri. Other minor rock outcrops are Qa’al Fir’awn (Kal Farun), two connected rocks to the north of Abd al-Kuri, and Sabuniya, two connected rocks to the west of Qalansi-yah.

Socotra Island lies in the north-western corner of the Western Indian Ocean, at the junction between the Gulf of Aden and the Arabian Sea at 12°30’N 54°00’E, some 380 km south-east of Ras Fartak on the Gulf of Aden coastline of Yemen and about 250 km east of Cape Guardafui, the tip of the Horn of Africa. The island is approximately 110 km long and about 40 km wide, with a total surface area of 3625 km<sup>2</sup>. Its highest elevation is at Jabal Dryet (1526 m) in the central Haggier Massif.

The rocky island of Abd al-Kuri is almost halfway between Socotra and Cape Guardafui, approximately 80 km east of the cape. It is approximately 33 km in length and about 2-5 km across from north to south, with a total area of about 133 sq km.

The island of Samha, with a total area of about 41 sq km, is located 60 km east from the western tip of Abd al-Kuri.

The smaller and uninhabited island of Darsa lies 17 km east of Abd al-Kuri.

### Physical attributes

#### Socotra

The island of Socotra can be divided into three main zones:

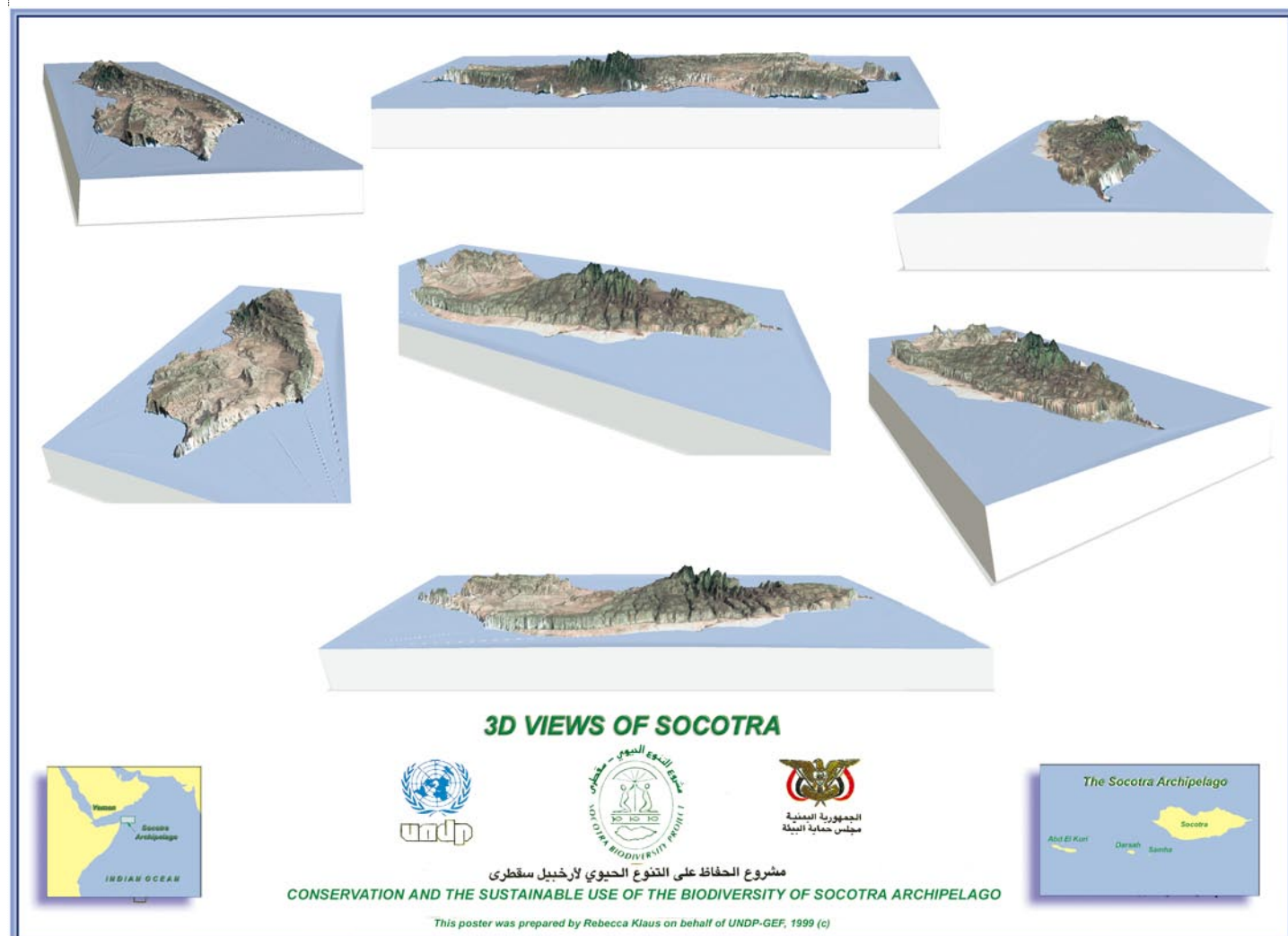
1. The Hajhir Mountains;
2. The limestone plateaux; and
3. The alluvial coastal plains

The backbone of the island is formed by the Haggier mountains located in the northwest of the island. With their jagged granite peaks, these mountains rise dra-

matically along their sheer northern face and slope off more gently along the southern and eastern flanks (PORTER & STONE 1996).

The limestone plateaux surround this elevation to the east, west and south, covering most of the island and averaging 300-700 m in altitude. They drop away at the edges in steep cliffs and are eroded on the surface into a karst topography (PORTER & STONE, 1996).

The southern coastal plain, which is 4-7 km in width, stretches over 60 km along the southern coast. It is terminated northwards by a precipitous escarpment averaging about 400 m in elevation. Southwards it descends in terraces, the marine sediments of which meet a strip of dunes at the shoreline and continue at a shallow gradient over at least 15 km out into sea. A much more irregular coastal plain occurs in the north, backed by the deep slopes of the plateau edge. This plain is less barren than the southern plain and is interrupted to the east by a number of headlands which



break it up into several small enclosed fertile areas to the north of the Hagghier Range (BEYDOUN & BISHAN, 1970; PORTER & STONE, 1996).

### Abd al-Kuri

The island of Abd al-Kuri presents a range of mountains running the length of the island, those on the eastern end with two summits of 576 m and 743 m, and western hills also extending along the southern shore, rising to 268 m. The centre of the island is low lying with lower ranges of hills, outcrops of granite and a conglomerate, on the northern side interspersed with valleys. Level areas of the island consist of

above

3D virtual views  
of Socotra

Source:  
EPA/MOWE/SCDP, Yemen



raised beaches some 10.5 m above the present sea level; these extend to the foothills of the principal mountain range, which consists of granite capped by a layer of limestone. The north coast has sandy beaches with rocky points, whereas the south coast consists of sheer cliffs, except for a wide sandy bay in the centre of the island known as Ayrshire Bay (DOE, 1992).

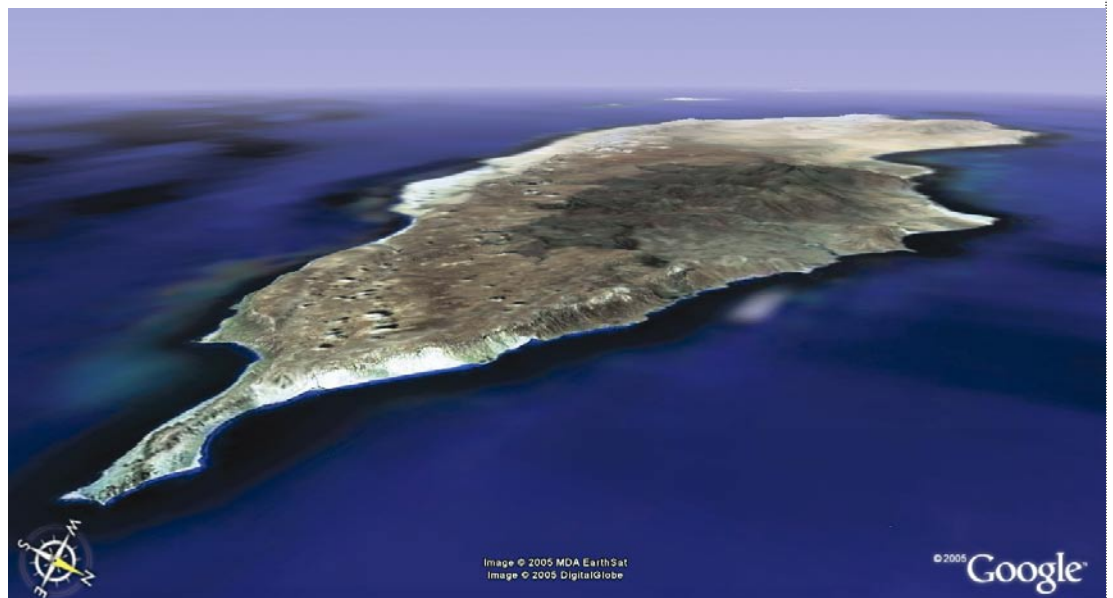
### Samha and Darsa

Samha is largely desertic in aspect. The centre of it is dominated by a flat-topped limestone plateau the summit of which slopes gently upwards from the east to the highest point at c.680m in the west. The plateau is surrounded on all sides by steep cliffs dropping to the boulder-strewn foothills that cover the rest of the island. Along most of the coastline the foothills drop directly to the sea and there is little or no coastal plain, except in the west where a low, sandy peninsula extends c.2km into the sea.

*below*

Satellite 3D view  
of Socotra

Source: Google Earth





View of the Wadi  
Dahero, Mountains

Photo by Nigel Pavitt



## Geology and Paleogeography

Until recently, the geology of the Socotra Archipelago received little attention. Most articles published in the late 19th and early 20th century were mainly descriptions of samples that had been collected by visitors to the islands. Beydoun and Bichan (1970) carried out the first comprehensive study, while Fleitmann et al. (2004) provided the most recent review of the geological history of Socotra.

The Socotran Platform, as part of the supercontinent Gondwana, was, at that time, nearest to Madagascar, India and the east coast of the African mainland. The archipelago, part of the African-Arabian tectonic plate, separated from the horn of Africa during the tertiary, by the same series of dislocation that produce the Gulf of Aden (WRANIK, 1998).

It comprises an igneous and metamorphic basement dating from the Pre-Cambrian Era and a complex of early Paleozoic volcanic rocks, which are overlain by a mantle of limestones, marls and sandstones from the Cretaceous and Eocene age. Intrusive granites of Hajhir massif break through the older metamorphic and magmatic formations. The backbone of Socotra (formed by the igneous Haggier) towers above the surrounding limestone plateau, the surface of which exhibits karst characteristic. Important caves and karstic formations have recently been discovered underlying some sections of the plateaux.

The Late Jurassic to Early Cretaceous break-up of eastern Gondwanaland, the simultaneous failed rifting of the Arabian Peninsula and the Oligocene-Miocene rifting of the Gulf of Aden are the three main tectonic events associated with the movement of the Arabian, African and Indian Plates, which affected the Socotran Platform (Brise et al. 1997). During the Tertiary period, the Socotra Islands were located close to the Hallaniyat Islands off the coast of Dhofar, Oman. Both basal siliciclastic and limestone deposits are continuous with corresponding layers in Somalia and Dhofar, and two major faults occurring in southeastern Socotra represent a continuation of the Masirah Fault in Oman (Samuel et al. 1997, Fleitmann et al. 2004).

Based on depositional evidence it seems likely that the continental promontory on which Socotra is located separated from Africa some 36 million years ago, at about

the same time as the rifting that created the Gulf of Aden, while the archipelago probably detached from Africa about six million years ago (see Beydoun & Bichan 1970, Fleitmann et al 2004 and Klaus & Turner 2004 for more details).



*this page*

Views of Hoq Cave

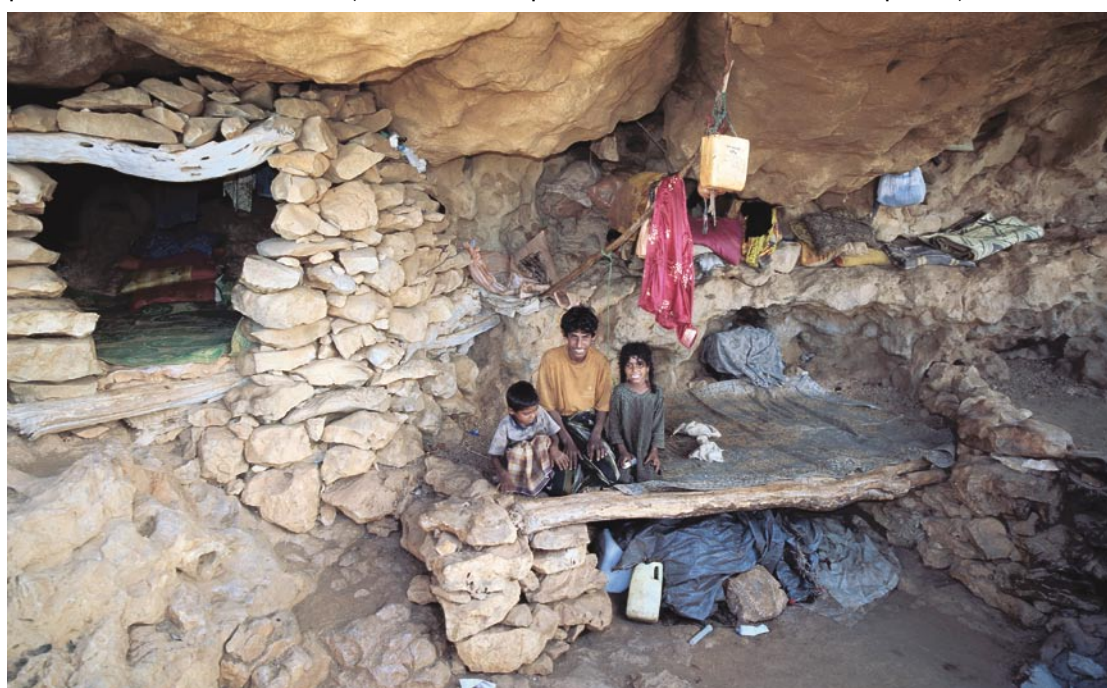
Photos by Peter de Geest

## Cave Systems

Socotra possesses a number of sizable cave systems found within the limestone plateau that stretches over much of the island, averaging between 300-700m in elevation. These have only recently begun to be explored by a team of international scientists in co-ordination with Yemeni authorities and academics. While local inhabitants have made use of smaller caves for centuries, some of the most extensive systems have only been discovered in the last few years, and their importance has yet to be fully ascertained. A total of over 22km of caves has so far been explored for the first

time and mapped in recent years, and therefore are not yet exposed to significant pressure from i.e. visitors (with the exception of the accessible Hoq cave).

| Cave          | Length (in mt)            | Depth | Latitude   | Longitude  | Altitude |
|---------------|---------------------------|-------|------------|------------|----------|
| GINIBA        | 7500                      | -84   | 12 26 06,5 | 53 56 21,4 | 404      |
| HOQ           | 3112                      | 89    | 12 35 11,6 | 54 21 15,4 | 335      |
| PIT           | 1789                      | -145  | 12 25 23,1 | 53 56 41,6 | 400      |
| DILGAGHAI     | 1662                      | -90   | -          | -          | -        |
| EHRER         | 1615                      | -6    | 12 33 00,5 | 54 27 35,6 | 250      |
| KASEKAS       | 963                       | -50   | 12 33 20,0 | 54 18 33,3 | 542      |
| DIGEILEI_HATA | 869                       | -79   | 12 30 31,0 | 53 56 19,0 | 970      |
| DISDAIDE      | 700                       | -47   | 12 33 00,1 | 52 19 92,4 | 508      |
| GUDUM         | 509                       | -109  | 12 38 41,1 | 53 26 07,6 | 525      |
| DILHAILHE     | 454                       | -55   | 12 29 55,4 | 53 56 44,7 | 878      |
| FOSREHER      | 400                       | -100  | 12 37 37,4 | 53 30 44,2 | 626      |
| EHRER CENTRAL | 390                       | 98    | 12 33 0,5  | 54 27 35,6 | 350      |
| STJEETAF CAVE | 376                       | 49    | 12 24 40,4 | 54 01 38,6 | 365      |
| TAITI'S CAVE  | 357                       | -19   | 12 36 57,4 | 53 57 24,4 | 110      |
| DAHAI SI      | 355                       | -15   | 12 34 03,1 | 54 17 21,5 | 588      |
| AFUR NUETET   | 326                       | -7    | 12 39 53,5 | 53 41 19,1 | 10       |
| HARDWICKI     | 143                       | 7     | 12 34 23,5 | 53 55 20,6 | 277      |
| AFUR NABHOR 2 | 125                       | -18   | 12 24 12,1 | 54 06 41,1 | 354      |
| HALAN         | 118                       | -83,5 | 12 27 18,0 | 53 55 59,5 | 683      |
| DEJUB         | 100                       | 14    | 12 23 4,42 | 54 00 56,6 | 130      |
| AFUR NABHOR 1 | 91                        | -58,5 | 12 25 18,8 | 54 06 38,1 | 307      |
| DEGOPAHIR     | 90                        | -40   | 12 30 23,0 | 53 56 12,0 | 964      |
| IRON POLE     | 79                        | -26   | 12 26 11,8 | 53 29 53,2 | 404      |
| DILEUTI       | 60                        | -37   | 12 28 01,6 | 53 59 12,8 | 655      |
| DIHAPAK       | 40                        | -17   | 12 28 36,3 | 53 58 50,7 | 707      |
| DIHAVRHAN     | 35                        | -3    | 12 24 55,5 | 54 07 40,7 | 65       |
| DAHFERHEN     | 23                        | -22,5 | 12 28 12,2 | 54 13 13,8 | 445      |
| BAT CAVE      | 20                        | 1     | 12 30 23,3 | 53 33 27,4 | 175      |
| <b>TOTAL:</b> | <b>22.301 m (22.3 km)</b> |       |            |            |          |



right

People living in a cave

Photo by Nigel Pavitt



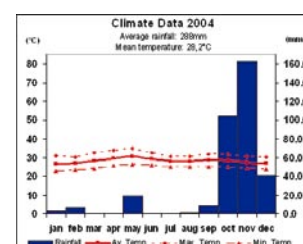
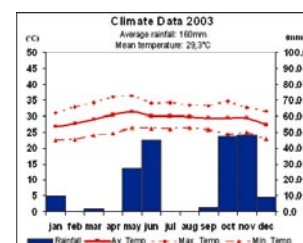
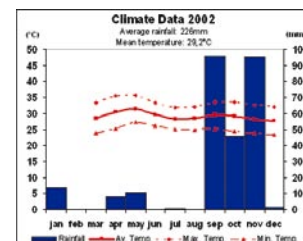
## Climate

Within the Indian Ocean, the archipelago is situated in the rain-bearing monsoon belt (BEYDOUN & BISHAN, 1970), an area where significant air masses merge and are subject to a semi-annual cycle, dependent on the seasonal migration of the Intertropical Convergence Zone (ITCZ).

During the winter months, from October to April, the islands are under the influence of the tropical wet Northeast Monsoon. In November and December, this gentle wind usually brings two hours of rain per day on the northern coasts of the islands, while temperatures range from 18 °C to 27 °C and seas are relatively calm and warm. Occasionally thunderstorms and hurricanes occur and the wadies overflow.

From June to September, the hot dry sub-equatorial monsoon blows from the south-southwest. Especially during July and August, the winds from the Hagghier peaks blow down on the northern plains at 40-60 knots, drying up wadis and most of the exposed vegetation, and forcing the population to migrate to the interior of the island, where climatic conditions are more favorable. The temperature ranges from 30 °C to 45 °C, and rainfall is limited to the southern side of the Hagghier Massif and the central plateaux. Due to the high waves at wind forces of four to six in the Beaufort scale along the southern coasts and almost permanent gale-force winds on the northern coasts, seas around the archipelago are very rough. With the upwelling of deep and nutrient-rich waters, the seawater temperature drops by 2-4 °C during this season. The period of calm winds between the two monsoon seasons in May and June is characterized by increased heat and humidity.

While the average annual rainfall measures 150 mm (data recorded at sea level, Mori Airport meteo station), annual precipitation in the central Hagghier Mountains may increase to approximately 300 mm. Moreover, annual rainfall in the mountain peaks is thought to be as high as 1000 mm, leading to permanently lush vegetation and relatively abundant surface water (PORTER & STONE, 1996).



above

Climate data

Courtesy of Peter de Geest

### Average Annual Rainfall (2002-2005)

Data spatialization procedure:  
Universal kriging with DEM, Slope, Aspect as covariates

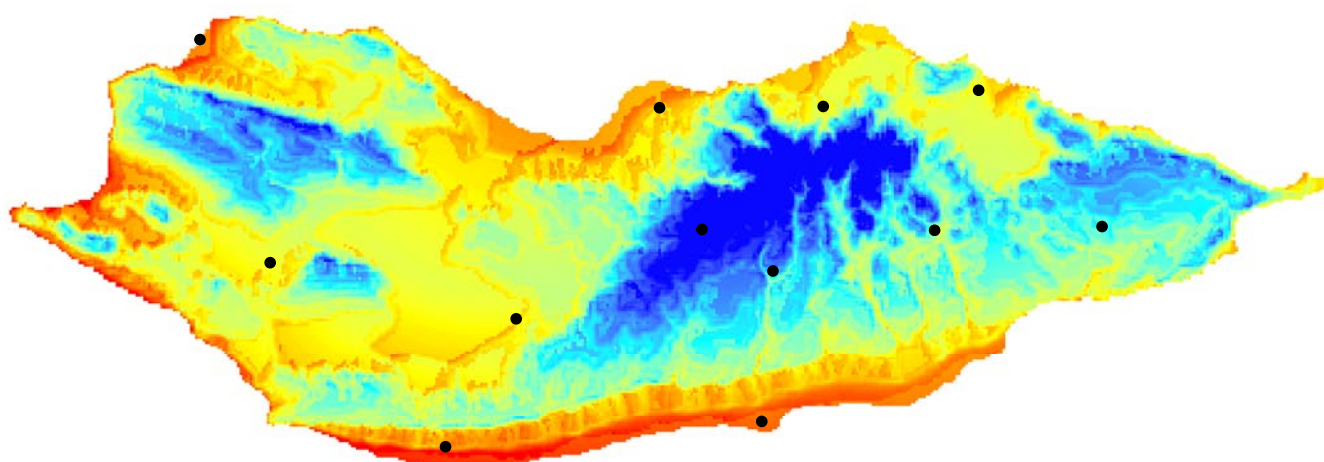
Data Source  
DSS Unit, EPA-SCDP

#### Legend

● meteo stations

Average Annual Rainfall (mm)  
Value

High : 595,000000  
Low : 7,000000





**Croton shrubland of lowland plains**

[illegible]

**Semi-evergreen woodland of lowland escarpments and sheltered ravines**

[illegible]

**Succulent shrubland.**

[illegible]

## VEGETATION TYPES

 Croton shrubland  
 Mangrove  
 Montane mosaic  
 Semi-evergreen lowland woodland  
 Submontane shrubland  
 Succulent shrubland  
 Woody herb

Vegetation types as defined by Miller and Guarino (1992) system, refined by Plana (1995) and Lison (1996).  
 Note: Descriptions still provisional.  
 Data from relevés of 1968 and 1969 not yet incorporated.



*Map showing the distribution of the vegetation types found around Socotra*

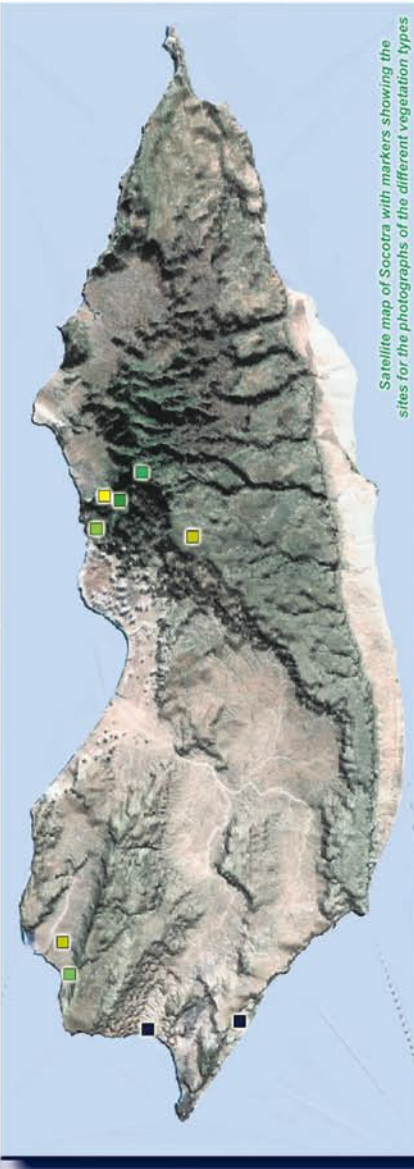
## THE VEGETATION OF SOCOTRA



# CONSERVATION AND THE SUSTAINABLE USE OF THE BIODIVERSITY OF SOCOTRA ARCHIPELAGO

*This poster was prepared by Rebecca Klaus on behalf of UNDP-GEF, 1999. (c)*

Photographs and data courtesy of The Royal Botanic Gardens Edinburgh.



*Satellite map of Socotra with markers showing the sites for the photographs of the different vegetation types*

## Mangroves

[illegible]

Montane mosaic of evergreen woodland, grassland, dwarf shrubland and cushion vegetation

[illegible]

Open and woody-based herb communities of limestone plateau

[illegible]

**■ Submontane shrubland**

[illegible]

## Types of terrestrial vegetation found in the Socotra Archipelago

In general the islands of the Archipelago of Socotra are sparsely vegetated and dominated by xeromorphic lifeforms. The development of the vegetation is strongly influenced by the desiccating winds that sweep the island in summer. In consequence it is only in sheltered valleys, escarpments and the high mountains that woodland develops. In general the exposed summit of the limestone plateau are covered with sparse shrubland or low woody-herb communities, with more luxuriant vegetation developing on cliff and in gullies. The coastal plains are largely subdesertic with open shrubland or in some areas more or less devoid of vegetation.

There are several distinctive vegetation formations on Socotra, particularly with respect to their physiognomy and structure. Perhaps the most famous, because of its

**Vegetation types** (adapted from Miller and Morris, 2004)

**Table 2**

| Types  | Sub-types                        | Topography:   | Altitude:      | Description:   | Dominants:  |
|--|----------------------------------|---|----------------|--|---|
| Coastal vegetation   | Mangroves                        | Coastal inlets and brackish areas   | Sea-level      | Mangrove thicket (5m)  | Avicennia marina  |
| Coastal vegetation   | Vegetation of the coastal plains | Brackish coastal alluvial deposits including muds, sands and gravels.   | Sea level      | Mosaic of low succulent shrubs (1.5m), woody-based herb communities (0.5m), and patches of shrubland (3m).   | Various including: Limonium spp., Tamarix nilotica, Suaeda spp., Atriplex spp.  |
| Croton shrub-land of lowland plains  |                                  | Coastal and inland plains; low rolling inland hills.  | 0-100m         | Deciduous shrub-land (2.5m) with scattered emergents (5m) and open dwarf shrub (1m) layer below. If heavily grazed herb cover is dominated by Cassia holosericea and Tephrosia apollinea.                          | Croton socotranus.  |
| Succulent shrubland  |                                  | Cliffs and limestone escarpments; rocky slopes; rocky granite and limestone hills; steep wadi sides.                        | 0-150 (-500) m | Open deciduous succulent shrub-land (<4m) with emergent trees (<6m) and lower layer (<1m) of cushion vegetation and subshrubs.   | Jatropha unicostata and Croton socotranus with Euphorbia arbuscula, Adenium obesum and Tephrosia apollinea.                                   |
| Semi evergreen woodland of lowland escarpments and sheltered ravines.                    |                                  | Steep limestone escarpments and sheltered parts of limestone plateau, also occasionally occurs on granite outliers (Homhil) | 150-750m       | Semi deciduous thicket (<5m) with emergent trees (<8m).  | Rhus thyrsoflora, Buxanthus pedicellatus, Carphalea obovata, Sterculia africana.  |
| Open and woody-based herb communities of limestone plateau                               |                                  | Limestone plateau   | 500-720m       | Mosaic of woody-based herb communities (<0.5m), cleared grassland and dwarf shrubland (<2m). Relict woodlands, typically with Dracaena cinnabari and Boswellia elongata, are also occasionally found in this zone. | Jatropha unicostata, Lycium sokotranum, Gnidia socotrana, Buxanthus pedicellatus, Croton socotranus, Leucas virgata and Cissus hamaderoensis. |
| Sub-mountain shrubland   |                                  | Granite mountains, slopes and cliffs.   | 150-750m       | Semi-deciduous shrubland (<5m) with emergent Dracaena (<8m) and cleared grassland.   | Dracaena cinnabari, Rhus thyrsoflora, Euryops arabicus, Buxanthus pedicellatus, Gnidia socotrana and Cocculus balfourii.                      |
| Montane mosaic of evergreen woodland, grassland, dwarf shrubland and cushion vegetation. |                                  | Exposed pinnacles, cliff slopes, sheltered ravines and patches of cleared grassland, all on granite.                        | 950-1500m      | Mosaic of dense evergreen woodland and thicket (<5m), patches of cleared grassland, dwarf shrubland (<1.5m) and cushion vegetation on exposed summits.   | Dracaena cinnabari, Rhus thyrsoflora, Hypericum species, Helichrysum species and Euryops arabicus.  |





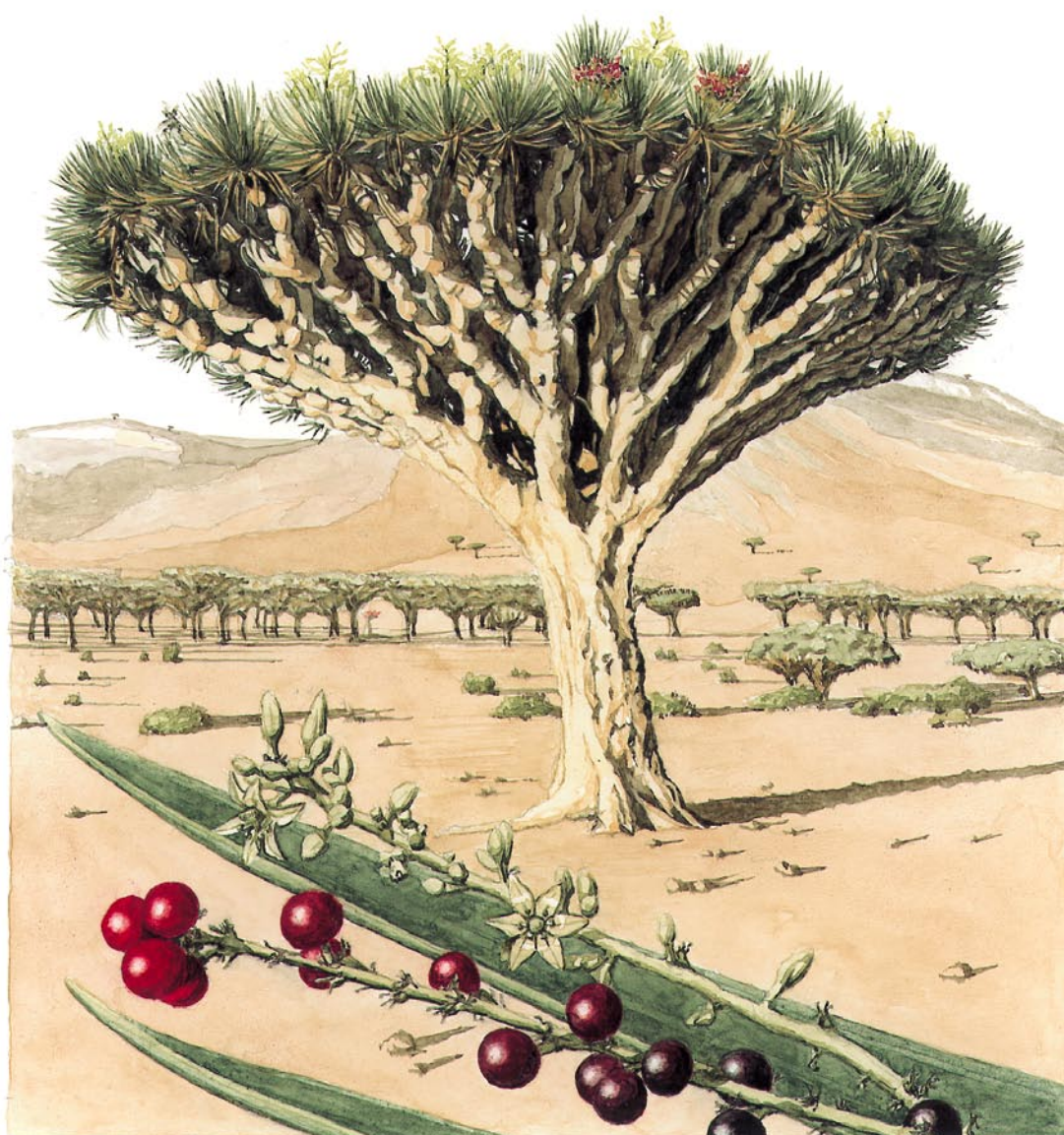


often bizarre appearance, is the shrubland dominated by the trees succulents such as *Dendrosyos socotranum*, *Adenium obesum* subsp. *sokotranum* and *Euphorbia arbuscula*. This occurs mainly on the foothills of the mountains and the limestone escarpments and is the vegetation type for which Socotra is most renowned. Another unique vegetation formation is the evergreen woodland dominated by the dragon's blood tree, *Dracaena cinnabari*, commented upon by White (1983, 1986) as the most 'singular community of Socotra'. The finest examples of this are found on the higher slopes of the limestone mountains, particularly in the center and east of the island.

*opposite page*

### Dragon Blood Trees

Photo by Nigel Pavitt

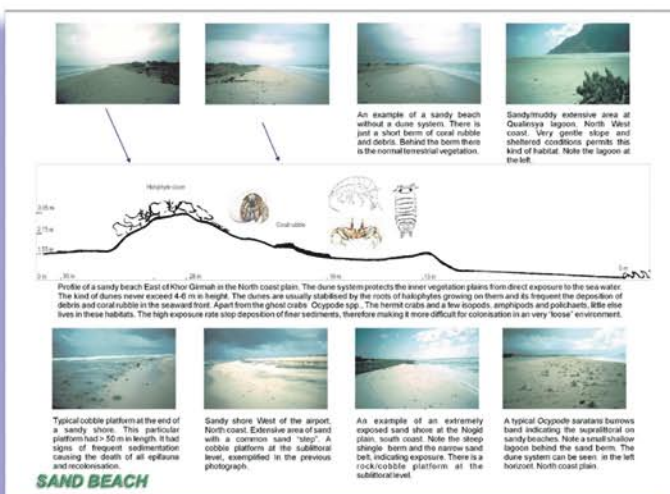
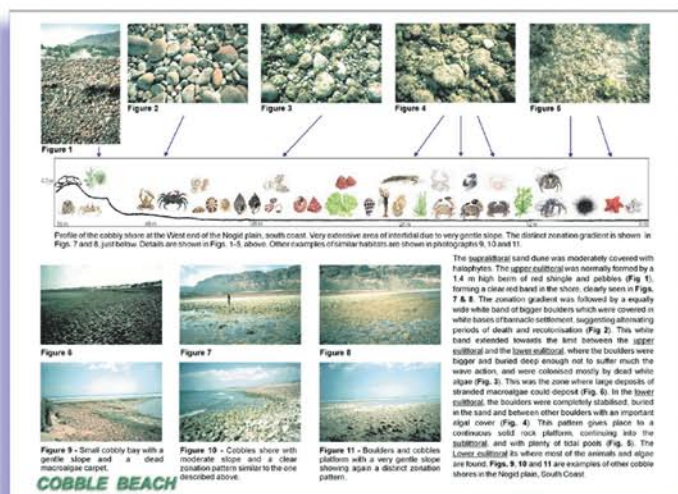
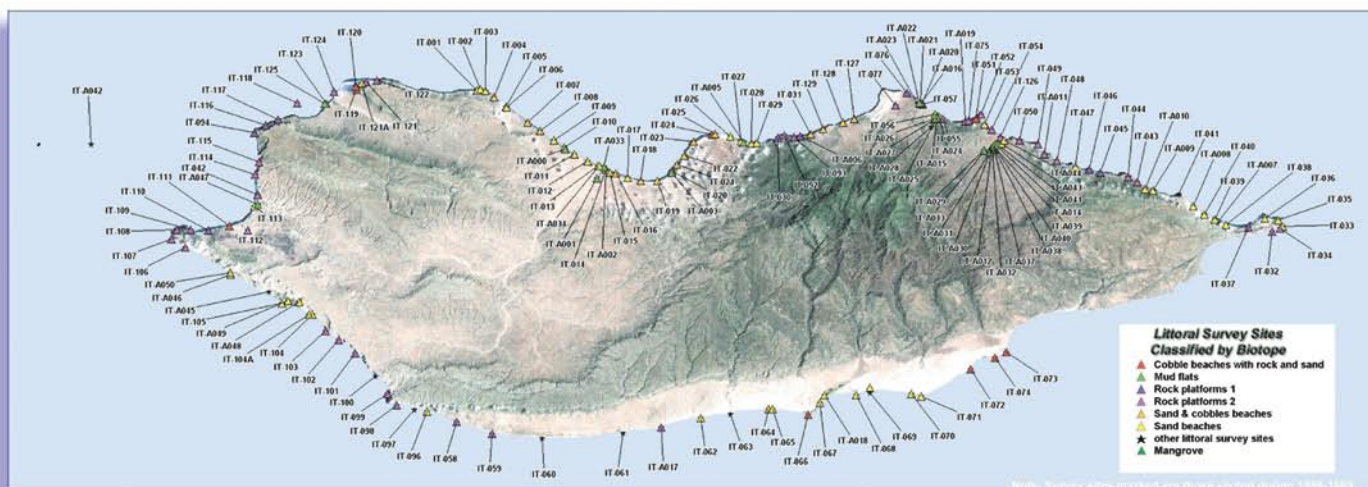
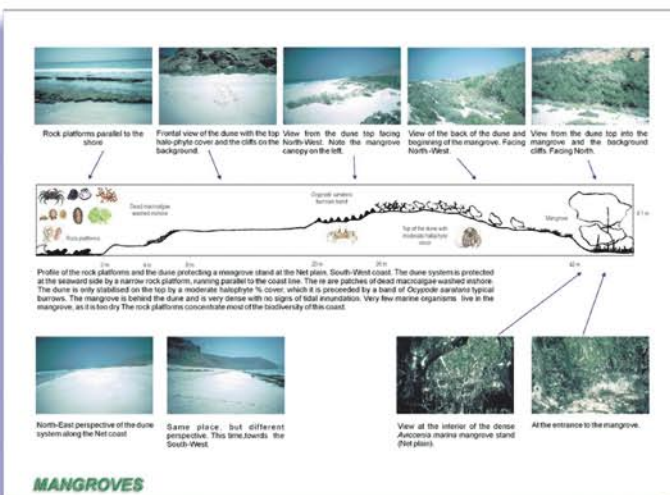
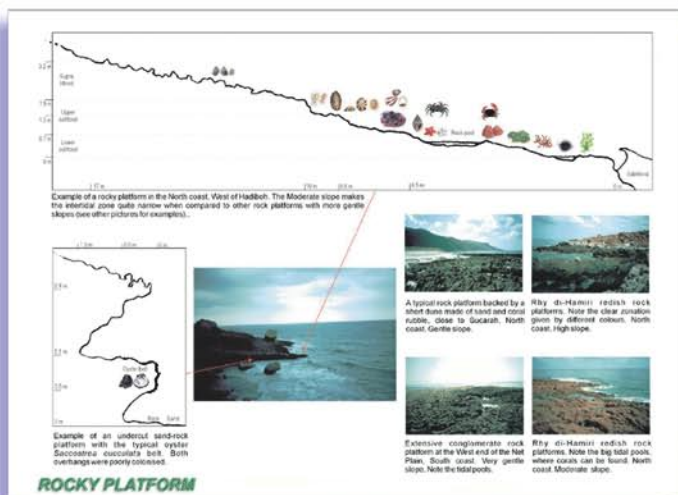


*left*

### Dragon Blood Tree

Illustration by  
Mike Langman





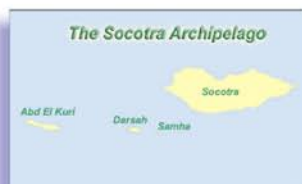
## LITTORAL BIOTOPES OF SOCOTRA



UNOPS



undp



## CONSERVATION AND THE SUSTAINABLE USE OF THE BIODIVERSITY OF SOCOTRA ARCHIPELAGO

Photographs and data presented in this poster were prepared by Nuno Simoes and Rebecca Klaus on behalf of UNDP-GEF, 1999 (c)





### Marine habitat types

(by Catherine Cheung & Lyndon de Vantier)

Like Socotra's unique landscapes with their rich floral and faunal diversity, its coastline and seascapes are no less spectacular and diverse – the sheer, wave-washed cliffs and huge boulders, fossil reef platforms, cobble and sand beaches, sheltered lagoons, seagrass, algae and coral patches. Socotra forms a kind of marine 'cross-roads' where the ocean currents and biogeographic realms of the Arabian Sea, Red Sea, Indian Ocean and wider Indo-Pacific meet.

The seasonally changing currents carry a large array of planktonic larvae from different biogeographic areas. The currents also bring major seasonal changes in temperature and nutrients. The other major factors affecting the structure and diversity of marine life around the islands are substratum – silty, sandy, rocky or coralline – and depth, with its corollaries of changes in illumination and wave energy. This oceanographic and topographic setting has promoted the development of unique marine habitats and communities.

Socotra's littoral and sub-littoral habitats were mapped using 'biotope' classification, based on the interpretation and extensive ground-truthing of LANDSAT satellite imagery. The littoral classification included six major habitat types – sediments, cobble beaches, bedrock, salt marshes, mangroves, khawrs and wadis, supporting 11 biotopes (Simões and Jones, 2000). The sub-littoral classification included a further six major habitats, several of which are shared with the littoral – sediments, cobbles, small rock boulders, large rock boulders, bedrock and cobbles (Klaus and Turner, 2004).

left

Top: Coral community in Socotra

Middle: Coral Community in Socotra

Bottom: The Marine Environment is yet quite intact

All photos: courtesy of EPA/SCDP, by Catherine Cheung



below

## Socotra Sunbird

Illustration by  
Mike Langman

# FLORA AND FAUNA

## Overview of Significant ecological features

The Socotra archipelago is a uniquely preserved living museum and a masterpiece of evolution.

The different sizes of its islands, the position between two continents and three of the world's major biogeographical regions, the uncommon isolation together with the traditional sustainable management by its local people, make this group of islands a survived Arch of Noah as well as a blend of enchanting spirits.

Large and small islands compose the Socotra archipelago, each one showing its own high level of endemism. Located between the Arabian Peninsula and the African continent, distant from the main land, the archipelago broke up from continental landmasses millions of years ago. The islands show a remarkably high degree of isolation from the geological, historical as well as climatic point of view, creating a striking example of how local people have responsibly managed their habitat and lived in harmony with their environment – virtually until present times.

The largest island of Socotra (3.625 sq km) hosts the highest variety of habitats and diverse vegetation types (the eight main vegetation types are described the above section: “Types of terrestrial vegetation found in the Socotri Archipelago”). The island shows an impressive high level of endemism of flowering plants and ferns (37 %); many being remnants of ancient floras, i.e. species which long ago disappeared from African-Arabian mainland.

In addition, each of the archipelago's other three inhabited islands exhibits its own high level of endemism rendering the archipelago as whole even more significant. For instance, the smaller island of Abd Al-Kuri (133 sq km), located closer to main land (only some 90 km from Cape Guardafui, on the horn of Africa), hosts 16 endemic species of plants and 2 endemic species of geckoes. The smaller island of Samha (41 sq km) hosts 8 endemic plants.

Six species of birds are endemic to the archipelago (plus the resident buzzard *Buteo* and scops owl *Otus*, the taxonomy of which are the subject of ongoing research). This is the highest concentration of endemic birds in the Middle East, outside the Yemen high-



lands. Moreover, at least 41 breeding birds are present on the islands, out of a total of 182 species recorded.

Reptiles also provide a clear measure of the conservation importance of the Archipelago: terrestrial reptiles are represented with 30 species, 27 of which are endemic (90 %). Among the different groups, out of the 18 geckoes present on the islands, 15 are endemic.

The first studies on key taxonomic groups of invertebrates show interesting results. The Woodlice (terrestrial crustaceans, isopoda) may be taken as an example to evaluate the presence and importance of the invertebrates' fauna. Recent studies indicate that the rate of endemic woodlice is impressive: 73%, especially considering that it is significantly higher than in the neighbouring and well-studied countries. The absence of some taxa and the presence of others seem to corroborate the faunistic evidence of the long isolation and evolutionary history of the Socotra Archipelago.

The Socotra archipelago is positioned near the junction of three of the world's main biogeographical regions: the Afro-tropical, the Oriental and the Palearctic. In biogeographical terms, terrestrial habitats of the archipelago are in general more closely linked with adjacent parts of Arabia, Horn of Africa, and Ethiopian Region, as well as with the Eremic Zone, i.e. the arid belt separating the above three main biogeographical regions.

The islands support also a highly diverse marine fauna and flora, forming some sort of marine 'cross-roads' where different oceanic currents and biogeographical realms meet. Therefore, in terms of total species and habitats richness, Socotra's marine biodiversity rivals other much larger coastal areas, such as the whole Red Sea.

Long isolation is the key to Socotra's pristine environment.

The breakdown from mainland that is thought to have occurred in the Tertiary Age is the key determining exceptional factor that affected the evolution of the archipelago. The resulting isolation led to the evolution of these group of islands in the absence of land mammals and, therefore holding an impressive percentage of endemism and particularly relict species that were wiped out by mammal presence elsewhere.

Due to high winds and rough seas effectively cutting off these islands from mainland for five months of the year, and the lack of a suitable natural harbour, the archipelago remained one of the most inaccessible and pristine places on earth, until the recent opening of an airport only in the late 90's. The harsh climatic conditions, combined with the absence of natural harbors, actually deterred any long-term external colonization. The Greek (from the 4th century BC), the Portuguese (around



*below*

**Socotra Bunting**

Illustration by  
Mike Langman



1500 AD) and the English (in the last century), never managed to reside more than few years on the island. This factor, once again, contributed to the continued isolation of the archipelago.

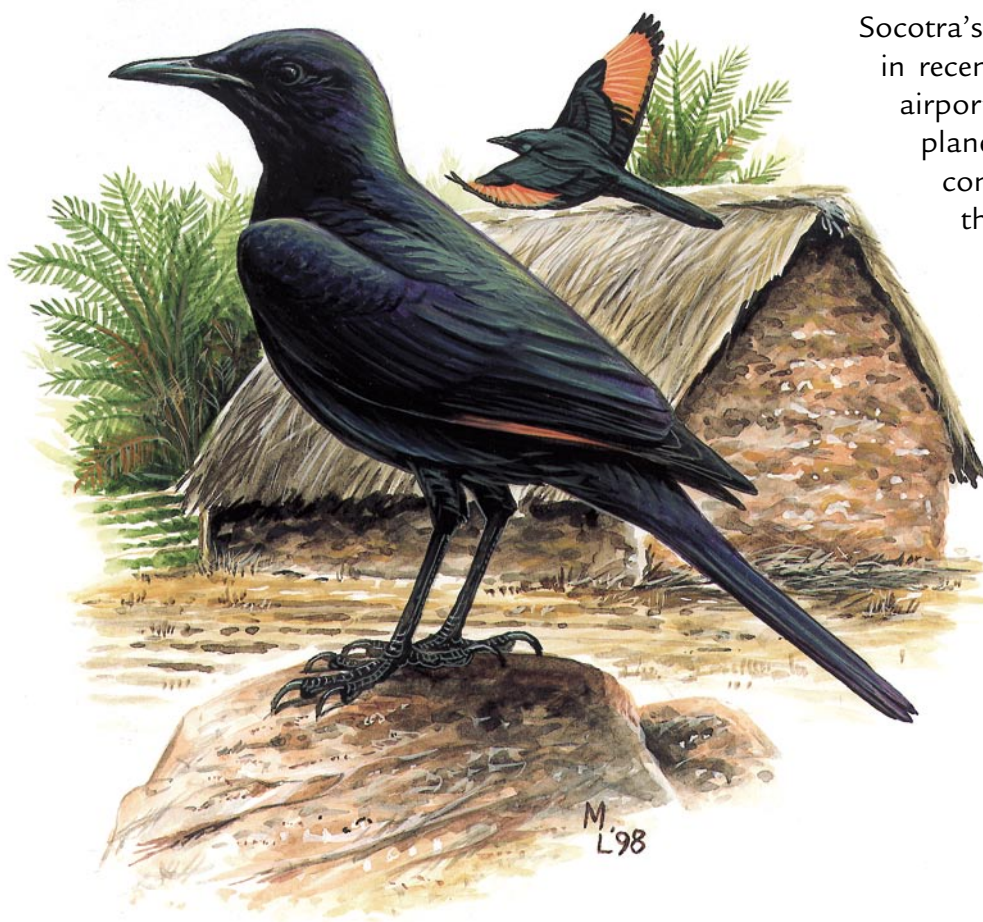
Socotra's isolation has only been affected in recent years, with the opening of the airport in 1999. Previously, only military planes and some rare civilian flights connected Socotra to mainland through a small gravel airstrip.

This high degree of isolation led the Socotran people to establish and preserve a delicate balance with their environment through a set of unique traditional practices aimed at the sustainable use of their natural resources (i.e. establishment of traditional marine protected areas, restrictions in the use of fishing gear at certain time of the year, restrictions on the use of timber and fuelwood, rangeland rotational use, suitable harvesting of resins and medicinal plants allowing plant survival and reproduction, etc. see Miller and Morris 2004). This natural balance

between humans and nature has effectively protected the biological diversity of the island over thousands of years, until present.

As a result human population in the island is currently quite low (approx. 43,000) and intervention on natural habitats of the subsistence pastoralist tribes gradates from none to very limited in most of the archipelago. Intensive human influence can currently be found only in approximately 2-3% of the entire archipelago's land area, and it mostly dates from very recent years (approx. 1998 onwards). Therefore, while Socotra's biological diversity compares very favourably with other islands, it is this striking ancient relationship between people and nature, largely preserved until present, which qualifies the archipelago uniquely for global recognition and support.

Last but not least, the archipelago's ecology cannot be understood without taking the influence of the monsoon into account. Each year, from June until September, the seasonal Southwest monsoon blow, bringing hot and dry winds from Africa. These winds often average 70mph on the north coast of the islands, and generate high seas on the southern coasts. Therefore, until very recently, the island was cut off from the outside world during these periods. The alternance of extreme desiccation and mist, brought about by the seasonal winds had an important effect on the evolution of habitats and vegetation.



above

Socotra Starling

Illustration by  
Mike Langman



## FLORA

*Adapted from Miller and Morris, 2004*

### Flora - Introduction

Biologists find islands such as Socotra irresistible because they are “living laboratories” for the study of evolution and ecology.

Islands represent a small part of the Earth’s land area but a large part of its biodiversity, including about one-sixth of the total flora, so they are critical to global conservation.

These floras are particularly susceptible to extinction. For a start, they often cannot compete with weedy plants brought in from outside. And because they usually evolve in the absence of large grazing animals most of these plants lack anti-grazing defences such as thorns or poisons and are killed by livestock.

Socotra’s rare species have escaped this fate. Relics of ancient species are so abundant that the island looks like most people’s idea of a prehistoric world .

Until at least 10 million years ago Socotra was part of the African mainland and, before that, part of the African-Arabian tectonic plate. Today the ancestors of plants from these ancient landmasses can still be found growing on the island.

Socotra has been famous for its botanical riches for hundreds of years. As well as cinnabar, other products exported to the ancient Mediterranean region included resins of the local Frankincense (*Boswellia*) and Myrrh (*Commiphora*) trees, used in medicines and rituals, and the juice of the native Bitter Aloe (*Aloe perryi*), used as a purgative. By the 19th century news of Socotra’s rich flora had reached the British Association for the Advancement of Science in London.

In 1880 the Association launched the first ever scientific expedition to the island, led by the Scottish botanist Isaac Bayley Balfour who put Socotra on the map. In seven weeks Balfour collected more than 500 plant species, over 200 of which were new to science. But by 1967 a group of British botanists



Isaac Bayley Balfour  
(1853-1922)

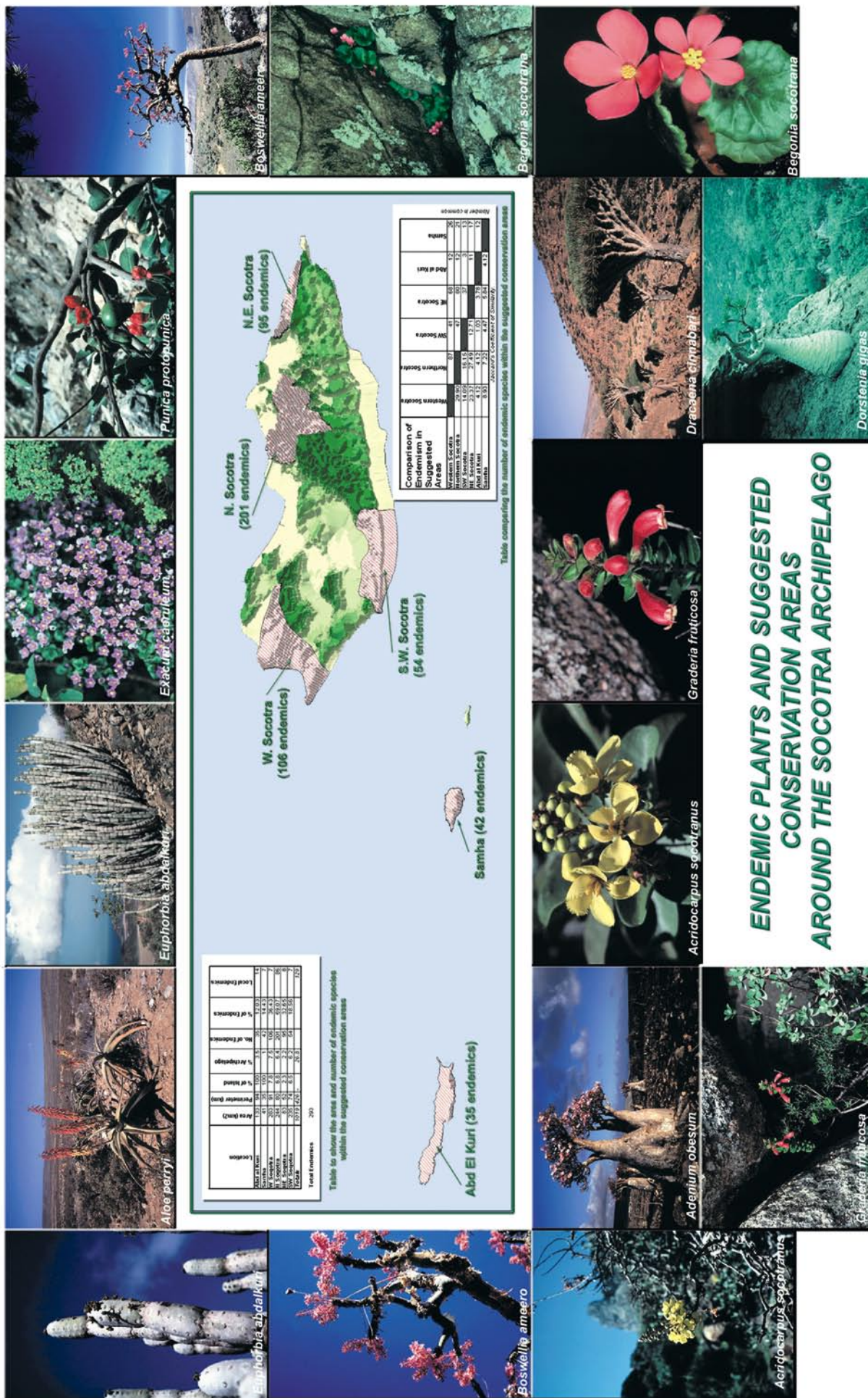
*below*

**Socotran Desert Rose**

Illustration by  
Diccon Alexander









visiting the island came away believing that most species faced imminent extinction for increasing human activity. If unchecked goat grazing and woodcutting would rapidly destroy the natural vegetation. So many botanists gave up hope for the flora and visits to the island dropped.

Then in 1985 the island botanist Quentin Cronk resurveyed Socotra and found that the predictions of earlier scientists had been too pessimistic. Although there were still large herds of livestock and extensive woodcutting, the environment was largely unspoilt. "Having seen the degradation overgrazing can cause," says Cronk, "I was staggered to come across a place which was in all probability substantially the same now as 1000 years ago." His discovery revived international scientific interest in Socotra. Specialists in Arabian flora have found many new species and traced almost

Quentin Cronk  
University of British  
Columbia



above

Socotran Aloe  
*Aloe Perryi*

Illustration by  
Diccon Alexander





all the previously recorded flora, including the only Socotran plant officially recorded as extinct by the World Conservation Union, the pink-flowered shrub, *Taverniera sericophylla*.

Many are the factors that contribute to the surviving of such and ancient flora on the Socotra Archipelago.

| Endemism in oceanic islands |              |                     |          | Table 3    |
|-----------------------------|--------------|---------------------|----------|------------|
|                             | Size (sq km) | Total plant spp.    | Endemics | % Endemics |
| Socotra                     | 3799         | 825                 | 307      | 37         |
| Azores                      | 2235         | 600                 | 55       | 9          |
| Canary Is.                  | 7273         | 2000                | 569      | 28         |
| Madeira                     | 769          | 760                 | 760      | 17         |
| Ascension                   | 94           | 25                  | 11       | 44         |
| St Elena                    | 121          | 320                 | 49       | 15         |
| Mauritius                   | 1865         | 800-900             | 280      | 31-35      |
| Rodriguez                   | 104          | 145                 | 48       | 33         |
| Galapagos                   | 7844         | 543                 | 229      | 42         |
| Norfolk Is.                 | 13           | 174                 | 48       | 28         |
| Juan Fernandez              | 93           | 147                 | 118      | 80         |
| Cape Verde                  | 4033         | 724 (spermatophyte) | 65       | 11.1*      |

*\*From Arechevaleta, m., N. Zurita, M.C. Carrero & J.L. Martin, 2005*

Socotra’s inaccessibility is one factor. The two weekly flights from Yemen to the new airport outside Hadiboh are only active since late 1999. Without an influx of people and technologies the Socotrans have had to use and protect their natural resources. They live by fishing, herding livestock, date cultivation and gathering plant products-a lifestyle that has changed little since the first settlers arrived over 2000 years ago. There is only a small jetty and no natural ports , the first roads are being built since year 2001, no sewerage facilities and limited solid waste management systems are in place on the island, and Hadiboh has electricity for only a few hours a day.

With very little in the way of modern building materials and medicines, wild plant products are crucial to the survival of the Socotran people. So much so that they have developed a system for preventing over-exploitation of the island flora. A network of tribal elders who control, for example, the cutting of live trees and shrubs, enforces these rules. The tribal elders also ensure that livestock are moved from one area to another to prevent overgrazing.

*opposite page*

Cucumber Tree  
*Dendroshykos socotranum*  
Photo by Nigel Pavitt

*right*

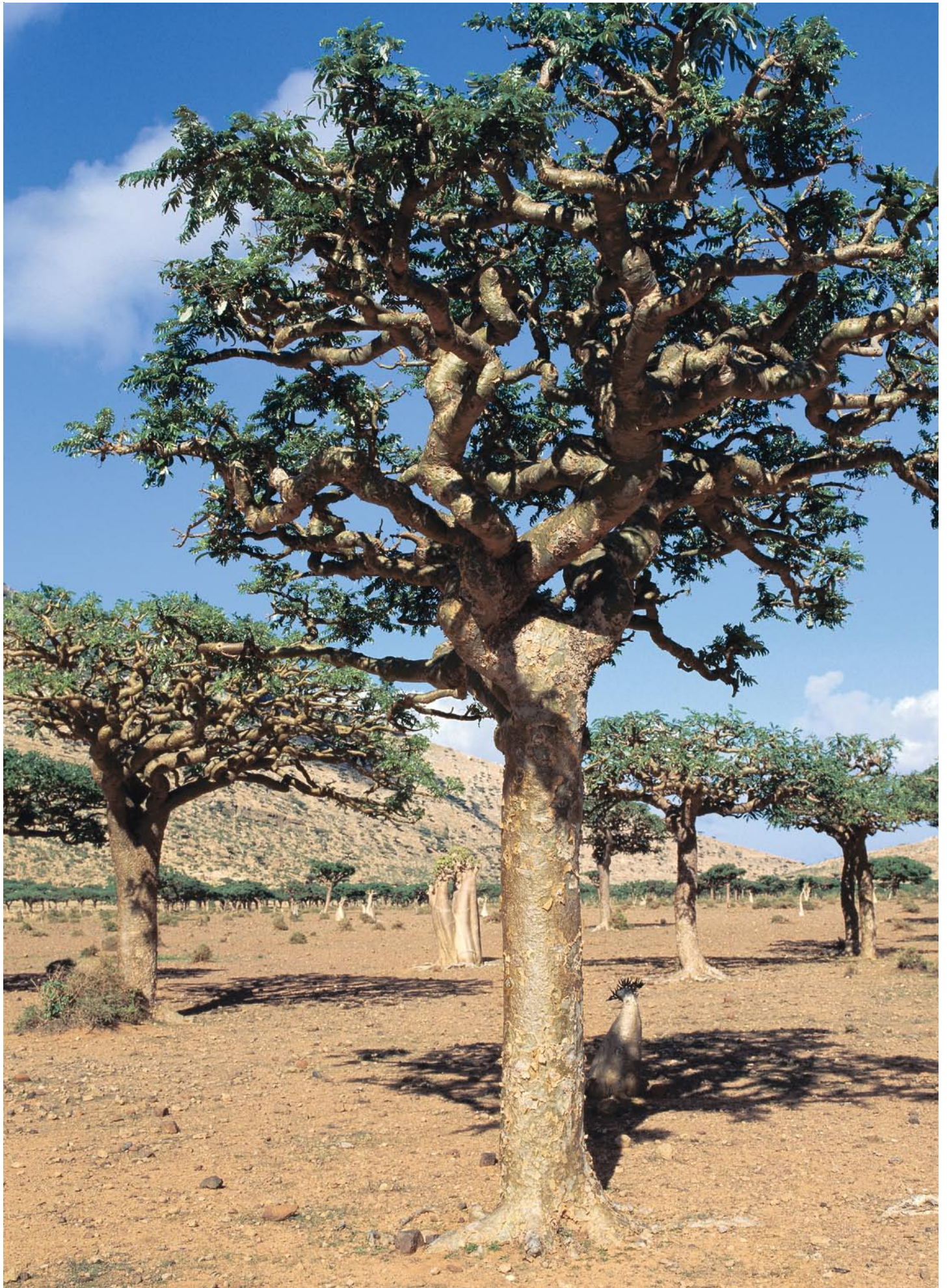
View of Hadibo  
Photo by Nigel Pavitt













### Flora - General

In general a significant amount of data is available on the occurrence and distribution of flowering plants and ferns in the Socotra archipelago and it is now possible to give a fairly accurate estimate of their numbers and distribution.

According to Withe (1983, 1986) the Socotra Archipelago falls within the Somalia-Masai Regional Centre of Endemism and enough species are confined to the islands to make them stand out as a local centre of endemism.

The figures for botanical diversity confirm the Socotra Archipelago's global status as one of world's most botanically important island groups, comparing favourably in floristic richness and endemism with such famous islands as Mauritius, the Galapagos and the Canary islands. (See Table 8 and the comparative analysis in section 3.c).

The essential statistics for the Flora of the Socotra Archipelago are summarised below:

| Flora of Socotra                   |     |
|------------------------------------|-----|
| Flowering plants and ferns species | 850 |
| Flowering plants and ferns genera  | 389 |
| Flowering plant families           | 99  |
| Endemic taxa                       | 293 |
| Endemic genera                     | 12  |

### Flora - Plants of Conservation Importance

The peripheral location of the islands and the strong traditional land-use management practices employed by the indigenous population, have both served to protect the vegetation and biodiversity of the Socotra Archipelago.

The conservation status of the 307 endemic species and seven endemic infraspecific taxa (varieties and subspecies) has been assessed based on the IUCN red list categories and criteria.

The assessments made here are provisional and still have to be approved by the relevant committees of the Species Survival Commission. Plants have been placed in seven categories. The results are summarised below:

| IUCN categories for Socotra Archipelago's endemic plants |     |
|--|-----|
| Extinct  | 4   |
| Critically Endangered                                    | 3   |
| Endangered   | 27  |
| Vulnerable   | 115 |
| Near threatened  | 14  |
| Least Concern  | 118 |
| Data Deficient   | 33  |
| Total  | 314 |

*opposite page*

**Socotran Frankincense**  
*Boswellia Elongata*

Photo by Nigel Pavitt



Flora - Endemic plants

Island endemics make up a third of the world’s threatened plants, and many are already extinct.

The number of endemic plant species on an island depends on its age, size, topography, climate, degree of isolation and geological history.

Broadly there are three types of island endemics-relict species, newly adapted species and adapted-relict species.

Relict species are found on islands, which, like Socotra, were once part of larger landmasses but have become isolated through continental drift and changes in sea level. The species may die out on the mainland, leaving remnants of once widespread ancient floras on the island. Most of the plants of Madagascar and New Caledonia are relicts.

Newly adapted species are the product of accidental colonisation of an island by individual plants, which then adapt to the new environment. This type of endemic is commonly found on islands, which have never been part of larger landmasses and are volcanic in origin, such as the Galapagos and Hawaiian Islands.

The third type of island endemic, adapted-relict species is the result of a second burst of evolution in the relict species.

Many Socotran plants are descendants of ancient species, which have adapted to their new island environment. A varied landscape of semi-desert coastal plains, limestone hills and granite mountains, together with an extreme climate of low rainfall and hot summer winds of up to 70 miles per hour, create countless ecological niches and explain the wealth of endemic plants. Often these are restricted to highly localised habitats.

Socotra has one subendemic family – the Dirachmaceae, which was known only from one Socotran species until recent discovery of a second species in Somalia. There are 15 endemic genera and 307 endemic species. Endemism is not only evenly distributed across plant families. Grasses from the biggest family on the Archipelago, with 112 species, but have only endemic species and no endemic genera. On the other hand Acanthaceae is represented by 34 species and 15 genera, of which 24 species and three genera are endemic.

The Table 4 gives a breakdown of the Socotran flora by species, genera and families, and the distribution of endemics.

| Flora by Species, Genera and Families |        |         |          | Table 4 |
|---------------------------------------|--------|---------|----------|---------|
| Families                              | Genera | Species | Endemics |         |
| Ferns                                 | 10     | 18      | 26       | 1       |
| Gymnosperms                           | 1      | 1       | 1        | ---     |
| Dicots                                | 82     | 312     | 625      | 276     |
| Monocots                              | 21     | 90      | 173      | 30      |
| Total                                 | 114    | 430     | 825      | 307     |

## FAUNA

The Fauna of the archipelago is not yet well studied and documented as its Flora. However recent research has greatly increased our level of knowledge on key taxonomic groups, and a number of important scientific papers are being published as a result of new scientific work carried out in recent years. This section provides a summary of information available to date, focusing on key taxonomic groups that are better documented. Table 5 provides a tentative and preliminary summary of current knowledge on the numbers of species so far recorded in the archipelago.

An outline of current knowledge on key taxonomic groups is provided below. Groups have been selected on the basis of recent studies available, and on their biogeographical significance and conservation importance.



## INVERTEBRATES

### WOODLICE, ONISCIDEA (CRUSTACEA, ISOPODA)

*Adapted from Taiti & Ferrara, 2004*

Among terrestrial fauna, the taxonomic group Oniscidea (Crustacea, Isopoda) of the Socotra Archipelago may be taken as a biological indicator of the special paleo-geographical and geological events that characterised the evolutionary history of these islands.

This taxonomic group does offer a very representative case, as it is relatively well studied in the archipelago itself, as well as in neighbouring archipelagos of the Comoros, Seychelles and Mascarene islands, and nearby mainland (Somalia and Ara-

| Number of species<br>Preliminary summary |  | Table 5           |
|--|--|-------------------|
| GROUPS                                   |  | number of species |
| INVERTEBRATES                            |  |                   |
| Arachnids                                |  | ~ 40              |
| Crustacean                               |  | ~ 45              |
| Myriapods                                |  | ~ 15              |
| Insects                                  |  | ~ 600             |
| Molluscs                                 |  | ~ 65              |
| MARINE LIFE                              |  |                   |
| reef-building coral                      |  | 253               |
| soft corals                              |  | 30                |
| coastal fishes                           |  | 730               |
| marine decapod Crustacea                 |  | 250               |
| inter-tidal molluscs                     |  | 129               |
| macro-algae                              |  | 124               |
| Marine Mammals                           |  | 10                |
| VERTEBRATES                              |  |                   |
| Fresh Water Fishes                       |  | 1                 |
| Reptiles                                 |  | 34                |
| Birds                                    |  | 182               |
| Mammals                                  |  | 14                |

bian Peninsula).

The number of species of Oniscidea found in Socotra archipelago (38) is quite impressive considering the arid climate of the region, and the lack of humid habitat

*above*

*Crocothemis erythraea*

Photo by  
Richard Porter



conditions in most part of the islands, that are both unfavourable factors for the establishment and flourishing of these terrestrial crustaceans.

The rate of Oniscidea endemism in Socotra is an impressive 73%. It is significantly higher than in neighbouring Somalia (52%), Arabia Peninsula (50%), the Seychelles (50%), Comoros (40%) and Mascarene islands (40%).

Other important characteristics include the absence of taxa that are typical of the neighbouring continental areas (Somalia and the Arabian Peninsula) as well as the presence of taxa with biogeographical affinities with both the Afrotropical (East African) and Oriental Regions and, to a lesser extent, with the Mediterranean Region.

These characteristics confirm the long isolation and evolutionary history of the Oniscidean fauna of the Socotra Archipelago. This long isolation favoured speciation events, and probably also permitted the survival of relict taxa that are no longer present on the mainland.



above

*Dioscoridillo melanoleucos* Ferrara & Taiti, 1996 (fam. Eubelidae)  
endemic to Socotra Island

Photo by Stefano Taiti



above

*Dioscoridillo cavicolus* Taiti & Ferrara, 2004 (fam. Eubelidae)  
occurring in some caves in the eastern limestone area of Socotra Island

Photo by Stefano Taiti

**ANTS (HYMENOPTERA: FORMICIDAE)**

*Adapted from Collingwood et Alii, 2004*

The ants on the Socotra archipelago are represented with 18 species.

The only early record of ants was one collected by the 1898/1899 expedition of the Vienna museum. Later on Collingwood, 1985 reported 5 species, collected in 1967. During 1994 a guidebook to the ants of Yemen listed 10 species from Socotra. Two more species were then added in 1996, collected in 1993.

After the recent series of expeditions, it is quite clear that the Archipelago is poor in ant species. While it has turned out that ants are not nearly as numerous on Socotra and its outlying island as in comparable habitats in the African tropics and the Arabian Peninsula, they still occur in all major terrestrial habitats in the island.

Oceanic islands usually support impoverished native ant faunas supplemented with many species introduced by man. As import of ants to areas outside their natural distribution through human influence has been taking place for a long time, it is sometimes difficult to say whether a species recorded on a given island is native there or not. Eight of the 18 ant species recorded on Socotra Island are definitely adventive, as they are well known, mostly cosmopolitan or pantropical tramps, often with uncertainty regarding their native distribution. Six of the total ants found can be regarded as likely native, though that is difficult to prove with certainty.

In any case the number of indigenous species is very low, considering the size of the island and its relative proximity to the African continent. This may be a reflection of a early separation from all major land masses.

More over, the arid climate of the Socotra Archipelago may account for particularly low species richness in comparison with wet tropical islands.

That said, it should be noted that the surveys conducted on Socotra up to now have been largely limited to the more anthropogenically-influenced lowlands. A few specimens of some additional, probably native species indicate that further sampling in remote places is bound to discover more indigenous and possibly endemic ants.

Concluding, at least 8, but probably more, of the 18 species recorded on the islands, have been transferred to the Archipelago by human commerce. There is little evidence that ecosystems have been strongly influenced by alien ants up to now. Those ants most feared globally for their invasive potential and destructive impact on native fauna are yet absent from Socotra. To preserve this situation, diligent quarantine measures are of great importance.





below

Socotra Chamaleon

Photo by Mark Jeffrey

## VERTEBRATES

### REPTILES

*Adapted from Roesler & Wranik, 2004*

Reptiles, on the archipelago of Socotra, have been quite well studied, both from the past expeditions and from the very recent researches.

It is reported in the “Periplus of the Erythrean Sea”, a shipping manual written in the first century A.D. by an unknown Greek sailor, that Socotra had large reptiles, as various tortoises, lizards and crocodiles. No certain traces of them have been

found so far and they are not mentioned in local legends.

On Socotra 34 species are listed. Out of the 30 terrestrial species, the high number of 27 is thought to be endemic, representing a very significant high level of endemism (90%). At the generic level, 42% of the genera are endemic and include *Haemodracon*, *Hakaria*, *Pachycalamus*, *Dityopphis* and *Hemerophis*.

**Summary of Reptiles' Families Table 6**

| Families         | number of species |
|------------------|-------------------|
| Cheloniidae      | 3                 |
| Dermochelyidae   | 1                 |
| Chamaeleonidae   | 1                 |
| Gekkonidae       | 18                |
| Scincidae        | 2                 |
| Lacertidae       | 2                 |
| Trogonophidae    | 1                 |
| Typhlopidae      | 1                 |
| Leptotyphlopidae | 3                 |
| Colubridae       | 2                 |

The Table 6 shows the reptile fauna by families.

The geckos (Gekkonidae) are the most diverse group among recent reptile fauna of the Socotra Archipelago, comprising 18 species, of which 15 are considered endemic. Out of those, 10 are present on Socotra, 2 on Abd Al Kuri, 1 on Socotra and Samha, 1 on Socotra and Abd Al Kuri and 1 on Samha and Darsa.

Only two species of skinks (Scincidae) inhabit the archipelago, and both species are endemic.

The Lacertidae are also represented by two species, both endemics.

The Chamaeleonidae are widespread in Africa, Madagascar, Arabia and Indian sub-continent, having species centres in the first two regions. On the Archipelago, there is only one endemic species known from the main island of Socotra.

This is also the case for the Trogonophidae, which occur in northwestern and northeastern Africa and in southern and eastern Arabia, and for the blind snake family Typhlopidae, found in Africa, Asia and Australia.

Three endemic Socotran species are reported from the Leptotyphlopidae, another blind snake family, known from the Old and the New World.

The widespread colubrid snakes (Colubridae) are represented by two endemic species.

No traces of snakes have yet been found on Abd al-Kuri Island.

The Table 7 shows the endemic figures for each family.

**Endemic species (reptiles) Table 7**

|                  |    |
|------------------|----|
| Chamaeleonidae   | 1  |
| Gekkonidae       | 15 |
| Scincidae        | 2  |
| Lacertidae       | 2  |
| Trogonophidae    | 1  |
| Typhlopidae      | 1  |
| Leptotyphlopidae | 3  |
| Colubridae       | 2  |

At present it appears that the archipelago's reptiles are abundant. Perhaps the only exception to this conclusion is *Pristurus obsti*: if the species is really restricted to mangroves, it must be considered as endangered as is this declining habitat.

On the basis of current information, the reptile fauna of the islands has its closest phylogenetic and zoogeographic relationships to those of Africa and the Arabian Peninsula.

## BIRDS

From Porter, 2005 pers. comm.

Socotra is rich in bird life. Whilst the number of species recorded in the Archipelago is not high at least seven are endemic and many others are also of world importance for conservation. The number of endemic species is the highest concentration in the Middle East outside the highlands of Yemen.

The avifauna of the Archipelago has been studied in detail in recent years, notably by Birdlife International and is summarised in Porter (2003). These studies have identified 22 Important Bird Areas (IBAs), which are recognised as being of world or regional importance for bird conservation, (Evans, 1994). Furthermore, the distribution of all breeding species has been mapped, thus helping to determine those regions of the island that are the most important for wildlife.

In terms of species' numbers, the islands' bird list stands at 182 (with a further nine claims awaiting supporting evidence). Of these 41 are breeders, 88 are regular migrants and 53 vagrants, though several of the latter will doubtless prove to be regular visitors as more observers visit Socotra.

Of the 41 breeding species, ten are seabirds, five raptors, two waders, 16 passerines and two are introduced: the Feral Pigeon *Columba livia* and House Crow *Corvus splendens*. With the exception of the endemics (see below), breeders likely to most interest the visiting birdwatcher or naturalist include Masked Booby *Sula dactylatra*, Jouanin's Petrel *Bulweria fallax*, Persian Shearwater *Puffinus persicus* and Socotra Cormorant *Phalacrocorax nigrogularis* (all regular in the seas around the island, probably for most of the year), Red-billed Tropicbird *Phaethon aethereus* (usually difficult to see) Egyptian Vulture *Neophron percnopterus* (the most conspicuous and tamest bird on the main island) Cream-coloured Courser *Cursorius cursor*, Lichtenstein's Sandgrouse *Pterocles lichtensteinii*, White-browed Coucal *Centropus superciliosus* (very elusive) Nubian Nightjar *Caprimulgus nubicus* (difficult to see due to it being very localised) Forbes-Watson's Swift *Apus berliozi* (in spring it is possible to see large flocks), Somali Starling *Onychognathus blythii* (widespread) Golden-winged Grosbeak *Rhynchostruthus socotranus* (widespread) and African Rock Bunting *Emberiza tahapisi* (also widespread)

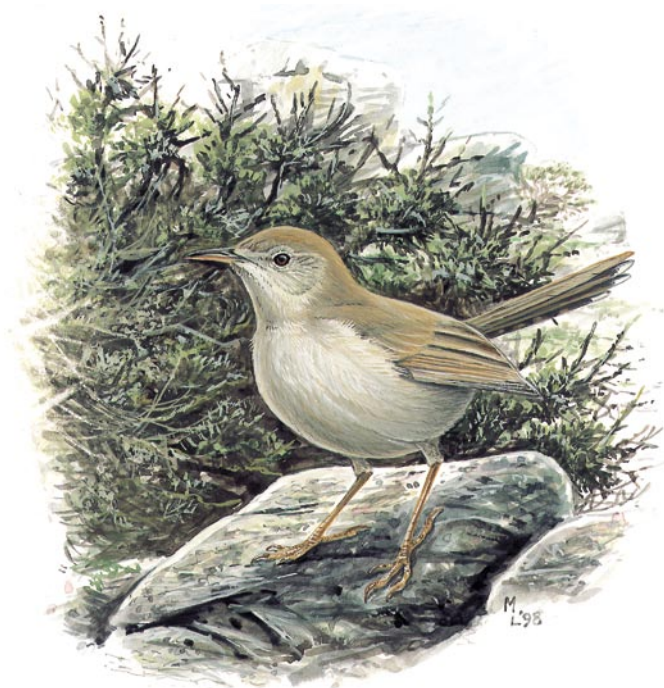


above

Socotra Buzzard

Illustration by  
Mike Langman





above

Socotra Warbler

below

Socotra Cisticola

Illustrations by  
Mike Langman



## Birds of conservation importance

### Globally threatened species

According to the latest assessment by BirdLife International, none of the bird species on Socotra is globally Endangered or Critically Threatened. Three are afforded Vulnerable status, Socotra Cormorant, Socotra Cisticola and Socotra Bunting, and two are considered Near Threatened, Jouanin's Petrel and Persian Shearwater.

### Internationally important populations

By definition, all of the endemics have internationally important populations, as do several other breeders, notably Egyptian Vulture (probably over 1000 individuals on Socotra) and Forbes-Watson's Swift (Socotra is its stronghold). The archipelago is also suspected of harbouring internationally important populations of the following three species: Long-billed Pipit *Anthus similis* (over 100,000 individuals), Southern Grey Shrike *Lanius meridionalis* (over 15,000 individuals) and Golden-winged Grosbeak (over 6000 individuals).

Pride of place, however, probably goes to the seabirds. The following were found to have internationally important populations during 1999 surveys: Masked Booby, Brown Booby *Sula leucogaster*, Persian Shearwater, Red-billed Tropicbird, Sooty Gull *Larus hemprichii*, Bridled Tern *Sterna anaethetus*, Saunders's Tern *S. saundersi* and Common Noddy *Anous stolidus*.

### Endemic birds

Among the breeders, it is the endemics that will undoubtedly attract the birdwatcher to Socotra. The commonest and most widespread is Socotra Sparrow *Passer insularis* with a population of over 200,000 (this and other population assessments are highly provisional calculations from the BirdLife International surveys of 1999–2001, and are presented purely as an indication



*left*

**Egyptian Vulture**

Illustration by  
Mike Langman



*below*

**Egyptian Vulture**

Photo by  
Mario Caruso







above

### Socotra Bunting

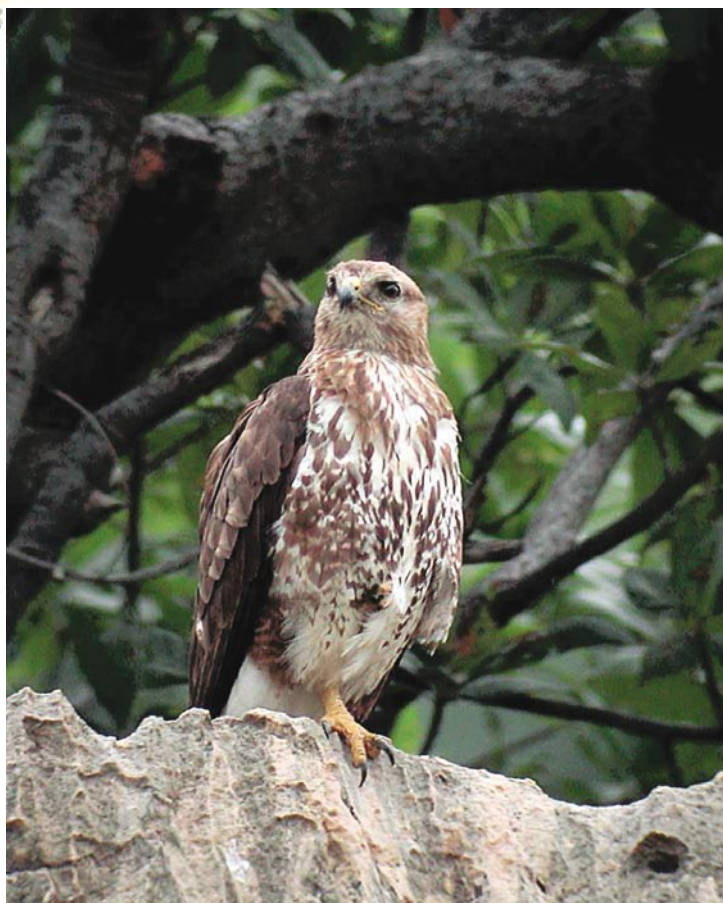
Illustration by  
Mike Langman

right

### Socotra Buzzard

Photo by Richard Porter

of abundance). Next, in terms of numbers and distribution, is Socotra Sunbird *Nectarina balfouri* with over 30,000 individuals. The fruit-eating Socotra Starling *Onychognathus frater* is widely dispersed and numbers c. 14,000 individuals, while the more secretive Socotra Warbler *Incana incana* has a population in the order of 20,000. That of the lowland and coastal plain-dwelling Socotra Cisticola *Cisticola haesitatus* has recently been calculated to be around 3000 pairs, while Socotra Bunting *Emberiza socotrana* (of the highlands) is the rarest of the endemics and probably numbers no more than 1000 individuals; it is also the most difficult to find. The taxonomically enigmatic buzzard and scops owl are widespread, with populations of fewer than 500 pairs; current studies will hopefully determine whether they should be given endemic species status. Finally mention must be made of the Jouanin's Petrel. Whilst this seabird ranges widely in the Arabian Seas, its only known breeding colony in the world was discovered in 2000 on Socotra; it can thus be classed as an island endemic.



## Checklist of the birds of the Socotra Archipelago (at November 2003)

180 species of birds have been recorded on Socotra, its neighbouring islands and rocky outcrops. A records committee to maintain the Socotran bird list has recently been formed (Omar Al-Saghier, Richard Porter, Nadim Taleb and Simon Aspinall).

The committee works on behalf of BirdLife International, the Socotra Conservation and Development Programme (SCDP) and the Yemen Society for the Protection of Wildlife (YSPW).

Observations and papers on the birds of Socotra regularly appear in Sandgrouse, the journal of the Ornithological Society of the Middle East.

### Key:

(B) Breeding species; (E) Endemic; (V) Vagrant; (G) Globally threatened

Species not labelled are migrants or winter visitors to the islands or surrounding ocean. Species in bold have internationally important populations on Socotra

|   |  |  |
|---|--|--|
| Little Grebe <i>Tachybaptus ruficollis</i> (V)              | Red Knot <i>Calidris canutus</i> (V)                         | Yellow Wagtail <i>Motacilla flava</i>                            |
| <b>Jouanin's Petrel</b> <i>Bulweria fallax</i> (B) (G)      | Sanderling <i>Calidris alba</i>                              | Citrine Wagtail <i>Motacilla citreola</i> (V)                    |
| Wedge-tailed Shearwater <i>Puffinus pacificus</i>           | Little Stint <i>Calidris minuta</i>                          | White Wagtail <i>Motacilla alba</i>                              |
| Flesh-footed Shearwater <i>Puffinus carneipes</i>           | Temminck's Stint <i>Calidris temminckii</i>                  | Grey Wagtail <i>Motacilla cinerea</i>                            |
| <b>Persian Shearwater</b> <i>Puffinus persicus</i> (B) (G)  | Curlew Sandpiper <i>Calidris ferruginea</i>                  | Bluthroat <i>Luscinia svecia</i>                                 |
| Wilson's Storm-petrel <i>Oceanites oceanicus</i>            | Dunlin <i>Calidris alpina</i>                                | Black Redstart <i>Phoenicurus ochruros</i>                       |
| Red-billed Tropicbird <i>Phaethon aethereus</i> (B)         | Broad-billed Sandpiper <i>Limicola falcinellus</i> (V)       | Pied Wheatear <i>Oenanthe pleschanka</i>                         |
| <b>Masked Booby</b> <i>Sula dactylatra</i> (B)              | Ruff <i>Philomachus pugnax</i> (V)                           | Isabelline Wheatear <i>Oenanthe isabellina</i>                   |
| <b>Brown Booby</b> <i>Sula leucogaster</i> (B)              | Common Snipe <i>Gallinago gallinago</i>                      | <b>Desert Wheatear</b> <i>Oenanthe deserti</i>                   |
| Socotra Cormorant <i>Phalacrocorax nigrogularis</i> (B) (G) | <b>Pintail Snipe</b> <i>Gallinago stenura</i>                | Blue Rock Thrush <i>Monticola solitarius</i>                     |
| Long-tailed Cormorant <i>Phalacrocorax africanus</i> (V)    | <b>Black-tailed Godwit</b> <i>Limosa limosa</i> (V)          | <b>Socotra Cisticola</b> <i>Cisticola haesitatus</i> (B) (E) (G) |
| Darter <i>Anhinga rufa</i> (V)                              | Bar-tailed Godwit <i>Limosa lapponica</i>                    | <b>Socotra Warbler</b> <i>Incana incana</i> (B) (E)              |
| White Pelican <i>Pelecanus onocrotalus</i> (V)              | Whimbrel <i>Numenius phaeopus</i>                            | Ménétries's Warbler <i>Sylvia mystacea</i>                       |
| Yellow Bittern <i>Ixobrychus sinensis</i> (V)               | Eurasian Curlew <i>Numenius arquata</i>                      | Lesser Whitethroat <i>Sylvia curruca</i>                         |
| Night Heron <i>Nycticorax nycticorax</i>                    | Spotted Redshank <i>Tringa erythropus</i>                    | Common Whitethroat <i>Sylvia communis</i> (V)                    |
| Striated Heron <i>Butorides striatus</i>                    | Common Redshank <i>Tringa totanus</i>                        | Wood Warbler <i>Phylloscopus sibilatrix</i> (V)                  |
| Squacco Heron <i>Ardeola ralloides</i>                      | Marsh Sandpiper <i>Tringa stagnatilis</i> (V)                | Common Chiffchaff <i>Phylloscopus collybita</i> (V)              |
| Madagascar Pond Heron <i>Ardeola idae</i> (V)               | Common Greenshank <i>Tringa nebularia</i>                    | Spotted Flycatcher <i>Muscicapa striata</i> (V)                  |
| Indian Pond Heron <i>Ardeola grayii</i> (V)                 | Green Sandpiper <i>Tringa ochropus</i>                       | <b>Socotra Sunbird</b> <i>Nectarinia balfouri</i> (B) (E)        |
| Cattle Egret <i>Bubulcus ibis</i>                           | Wood Sandpiper <i>Tringa glareola</i>                        | White-breasted White-eye <i>Zosterops abyssinicus</i> (B)        |
| Western Reef Heron <i>Egretta gularis</i>                   | Terek Sandpiper <i>Xenus cinereus</i> (V)                    | Eurasian Golden Oriole <i>Oriolus oriolus</i> (V)                |
| Little Egret <i>Egretta garzetta</i>                        | Common Sandpiper <i>Tringa hypoleucos</i>                    | <b>Southern Grey Shrike</b> <i>Lanius meridionalis</i> (B)       |
| Intermediate Egret <i>Egretta intermedia</i> (V)            | Ruddy Turnstone <i>Arenaria interpres</i>                    | Isabelline Shrike <i>Lanius isabellinus</i>                      |
| Great White Egret <i>Egretta alba</i>                       | Red-necked Phalarope <i>Phalaropus lobatus</i>               | <b>Indian House Crow</b> <i>Corvus splendens</i> (B) Introduced  |
| Black-headed Heron <i>Ardea melanocephala</i> (V)           | Arctic Skua <i>Stercorarius parasiticus</i> (V)              | Brown-necked Raven <i>Corvus ruficollis</i> (B)                  |
| Grey Heron <i>Ardea cinerea</i>                             | White-eyed Gull <i>Larus leucophthalmus</i>                  | <b>Socotra Starling</b> <i>Onychognathus frater</i> (B) (E)      |
| Purple Heron <i>Ardea purpurea</i>                          | <b>Sooty Gull</b> <i>Larus hemprichii</i> (B)                | Somali Starling <i>Onychognathus blythii</i> (B)                 |
| White Stork <i>Ciconia ciconia</i> (V)                      | Lesser Black-backed Gull <i>Larus fuscus</i>                 | European Starling <i>Sternus vulgaris</i> (V)                    |
| Glossy Ibis <i>Plegadis falcinellus</i>                     | Heuglin's Gull <i>Larus (fuscus) heuglini</i>                | <b>Socotra Sparrow</b> <i>Passer insularis</i> (B) (E)           |
| African Spoonbill <i>Platalea alba</i> (V)                  | Baraba Gull <i>Larus (cachinnans) barabensis</i>             | <b>Golden-w Grosbeak</b> <i>Rhynchostruthus socotranus</i> (B)   |
| Greater Flamingo <i>Phoenicopterus ruber</i>                | Caspian Gull <i>Larus (cachinnans) cachinnans</i>            | African Rock Bunting <i>Emberiza tahapisi</i> (B)                |
| Greater White-fronted Goose <i>Anser albifrons</i> (V)      | Black-headed Gull <i>Larus ridibundus</i>                    | <b>Socotra Bunting</b> <i>Emberiza socotrana</i> (B) (E) (G)     |
| Cotton Teal <i>Nettapus coromandelianus</i> (V)             | Gull-billed Tern <i>Sterna nilotica</i> (V)                  |  |
| Eurasian Wigeon <i>Anas penelope</i>                        | Caspian Tern <i>Sterna caspia</i>                            |  |
| Gadwall <i>Anas strepera</i>                                | Lesser Crested Tern <i>Sterna bengalensis</i>                |  |
| Common Teal <i>Anas crecca</i>                              | Swift Tern <i>Sterna bergii</i>                              |  |
| Mallard <i>Anas platyrhynchos</i> (V)                       | Sandwich Tern <i>Sterna sandwicensis</i>                     |  |
| Northern Pintail <i>Anas acuta</i>                          | Roseate Tern <i>Sterna dougallii</i> (V)                     |  |
| Garganey <i>Anas querquedula</i>                            | Common Tern <i>Sterna hirundo</i>                            |  |
| Northern Shoveler <i>Anas clypeata</i>                      | White-cheeked Tern <i>Sterna repressa</i>                    |  |
| Common Pochard <i>Aythya ferina</i> (V)                     | <b>Bridled Tern</b> <i>Sterna anaethetus</i> (B)             |  |
| Ferruginous Duck <i>Aythya nyroca</i>                       | Sooty Tern <i>Sterna fuscata</i>                             |  |
| Tufted Duck <i>Aythya fuligula</i> (V)                      | <b>Saunders's Tern</b> <i>Sterna saundersi</i> (B)           |  |
| Black Kite <i>Milvus migrans</i> (V)                        | Whiskered Tern <i>Chlidonias hybridus</i> (V)                |  |
| <b>Egyptian Vulture</b> <i>Neophron percnopterus</i> (B)    | White-winged Black Tern <i>Chlidonias leucopterus</i> (V)    |  |
| Western Marsh Harrier <i>Circus aeruginosus</i> (V)         | <b>Brown Noddy</b> <i>Anous stolidus</i> (B)                 |  |
| Pallid Harrier <i>Circus macrourus</i> (V)                  | Lichtenstein's Sandgrouse <i>Pterocles lichtensteini</i> (B) |  |
| Steppe Buzzard <i>Buteo buteo vulpinus</i> (V)              | Feral Rock Pigeon <i>Columba livia</i> (B) Introduced        |  |
| <b>Socotra Buzzard</b> <i>Buteo (buteo) sp.</i> (B) (E)     | Laughing Dove <i>Streptopelia senegalensis</i> (B)           |  |
| Osprey <i>Pandion haliaetus</i> (B)                         | Namaqua Dove <i>Oena capensis</i> (V)                        |  |
| Common Kestrel <i>Falco tinnunculus</i> (B)                 | Bruce's Green Pigeon <i>Treron waalia</i> (B)                |  |
| Amur Falcon <i>Falco amurensis</i> (V)                      | Jacobin Cuckoo <i>Clamator jacobinus</i> (V)                 |  |
| Sooty Falcon <i>Falco concolor</i>                          | Common Cuckoo <i>Cuculus canorus</i>                         |  |
| Peregrine Falcon <i>Falco peregrinus</i> (B)                | White-browed Coucal <i>Centropus superciliosus</i> (B)       |  |
| Common Quail <i>Coturnix coturnix</i>                       | <b>Socotra Scops Owl</b> <i>Otus sp</i> (B) (E)              |  |
| Water Rail <i>Rallus aquaticus</i> (V)                      | Nubian Nightjar <i>Caprimulgus nubicus</i> (B)               |  |
| Spotted Crane <i>Porzana porzana</i> (V)                    | European Nightjar <i>Caprimulgus europaeus</i>               |  |
| Common Moorhen <i>Gallinula chloropus</i>                   | <b>Forbes-Watson's Swift</b> <i>Apus berliozi</i> (B)        |  |
| Common Coot <i>Fulica atra</i> (V)                          | Little Swift <i>Apus affinis</i>                             |  |
| Common Crane <i>Grus grus</i> (V)                           | Blue-cheeked Bee-eater <i>Merops persicus</i>                |  |
| Houbara Bustard <i>Chlamydotis undulata</i> (V)             | European Roller <i>Coracias garrulus</i>                     |  |
| Pheasant-tailed Jacana <i>Hydrophasianus chirurgus</i> (V)  | Abyssinian Roller <i>Coracias abyssinica</i> (V)             |  |
| Eurasian Oystercatcher <i>Haematopus ostralegus</i> (V)     | Indian Roller <i>Coracias benghalensis</i> (V)               |  |
| Black-winged Stilt <i>Himantopus himantopus</i>             | Eurasian Hoopoe <i>Upupa epops</i>                           |  |
| Crab Plover <i>Dromas ardeola</i> (V)                       | Black-crowned Finch Lark <i>Eremopterix nigriceps</i> (B)    |  |
| Cream-coloured Courser <i>Cursorius cursor</i> (B)          | Greater Short-toed Lark <i>Calandrella brachydactyla</i>     |  |
| Collared Pratincole <i>Glareola pratincola</i> (V)          | Sand Martin <i>Riparia riparia</i>                           |  |
| <b>Little Ringed Plover</b> <i>Charadrius dubius</i>        | Rock Martin <i>Hirundo fuligula</i> (B)                      |  |
| Common Ringed Plover <i>Charadrius hiaticula</i>            | Barn Swallow <i>Hirundo rustica</i>                          |  |
| Kentish Plover <i>Charadrius alexandrinus</i> (B)           | Northern House Martin <i>Delichon urbica</i>                 |  |
| Lesser Sand Plover <i>Charadrius mongolus</i>               | Tawny Pipit <i>Anthus campestris</i>                         |  |
| Greater Sand Plover <i>Charadrius leschenaultii</i>         | <b>Long-billed Pipit</b> <i>Anthus similis</i> (B)           |  |
| Pacific Golden Plover <i>Pluvialis fulva</i>                | Tree Pipit <i>Anthus trivialis</i>                           |  |
| Grey Plover <i>Pluvialis squatarola</i>                     | Red-throated Pipit <i>Anthus cervinus</i>                    |  |

### Records pending (awaiting evaluation)

Eurasian Spoonbill *Platalea leucorodia*  
 Eleanor's Falcon *Falco eleonorae*  
 Sooty Falcon *Falco concolor*  
 Barbary Falcon *Falco peregrinoides*  
 Caspian Plover *Charadrius asiaticus*  
 Great Knot *Calidris tenuirostris*  
 Crested Coot *Fulica cristata*  
 Hume's Tawny Owl *Strix butleri*  
 Bimaculated Lark *Melanocorypha bimaculata*  
 Willow Warbler *Phylloscopus trochilus*

### Unsubstantiated claims

**Streaked Shearwater** *Calonectris leucomelas*  
**Red-footed Booby** *Sula sula*  
 Great Cormorant *Phalacrocorax carbo*  
**Little Bittern** *Ixobrychus minutus*  
 Lanner Falcon *Falco biarmicus*  
 Harlequin Quail *Coturnix delegorguei*  
 Lesser Noddy *Anous tenuirostris*  
 Common Swift *Apus apus*  
 Pallid Swift *Apus pallidus*  
 Crag Martin *Pyonoprogne rupestris*  
 Little Rock Thrush *Monticola rufocinerea*





## MARINE BIODIVERSITY

*From Cheung, C. and L.M. Levantier, in press.*

Contrary to earlier scientific belief that the islands were poor in tropical marine species (Scheer 1971) because of the absence of coral reefs (Darwin, 1842) and pervading influence of cool water upwelling, the islands support a highly diverse marine fauna and flora, with some 253 species of reef-building coral (DeVantier et al., 2004) and 30 soft corals (Reinicke et al., 2000), 730 species of coastal fishes (Kemp, 1998; Zajonz et al. 2000; Zajonz and Khalaf, 2002), 250 species of marine decapod Crustacea – crabs and allies (Apel, 2000), 129 species of inter-tidal molluscs (Janssen, 2000) and 124 species of macro-algae (Schils and Coppejans, 2003a,b; Schils et al. 2003). Socotra's marine biodiversity rivals other much larger coastal areas, such as the Red Sea, in total richness.

The high tropical marine diversity is related to several factors. Primary among these is oceanographic dispersal bringing larvae from different source areas – East Africa and the western Indian Ocean, Arabian Sea and Gulf, Red Sea, and greater Indo-Pacific; the variety of habitats and gradients in respect of environmental extremes, particularly the strong seasonal upwelling; and the presence of regional endemics.

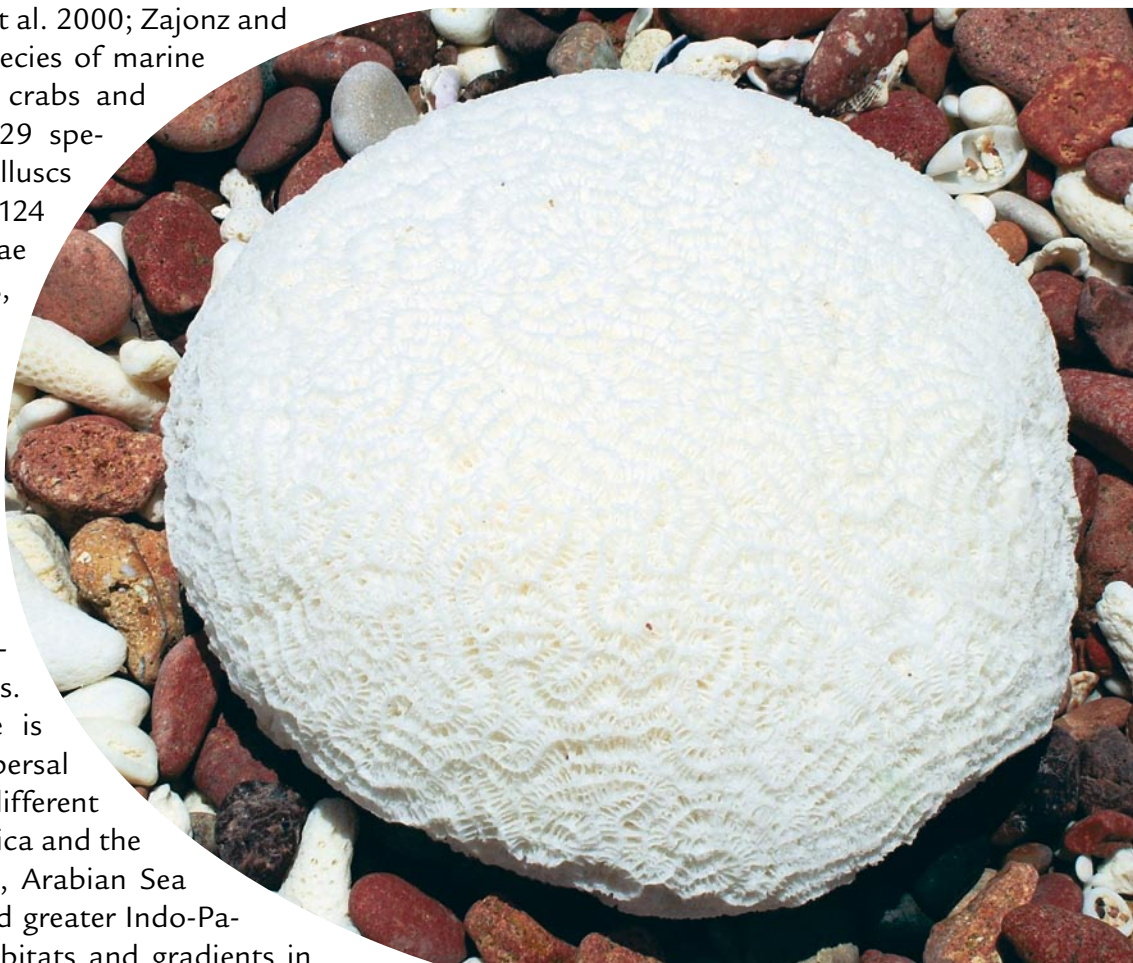
Socotra's marine biodiversity highlights the faunal similarity and close zoogeographic affinities between the archipelago and the Red Sea, the Gulf of Aden and the southern Arabian region, whilst also illustrating oceanographic links with more distant areas. Socotra is the northern, western, southern and eastern most location for many species with distributions otherwise restricted respectively to East Africa, the more eastern Indian Ocean, the Arabian Sea and Red Sea, or further afield.

*“The Archipelago's (marine) species composition has a strong cosmopolitan component, consistent with the islands acting as a ‘trap’ for larvae or rafted recruits that have drifted from various distinct source populations. These populations may be as ‘close’ as the Gulf of Aden, Gulf of Oman, Red Sea, and Somalia, may be further afield in East Africa, Madagascar, the Seychelles and the Maldives or even more distant in the Indian Ocean and West Pacific. The Archipelago lies at a ‘cross-roads’ in surface ocean currents and the different water masses may transport ... larvae from all of these regions at various times. Thus these communities ... may be important ‘stepping stones’ connecting ... populations in the northwestern Indian Ocean” (DeVantier et al., 2004).*

*below*

Di-Hamri  
Corals and stones

Photo by Mario Caruso



*left page*

View of Di-Hamri

Photo by Mario Caruso



## Marine biodiversity of conservation importance

The islands are globally significant for nesting sea birds, important nesting sites for sea turtles, and support numerous cetaceans. Socotra's unique marine biogeographic position makes it particularly important as a 'stepping stone' in maintaining connectivity and gene flow among marine populations in the north-western Indian Ocean and further afield. In the latter respect, all its marine biodiversity is of international conservation importance.



The islands' algal and coral communities and their associated fauna are unique, including many species that are not known to occur anywhere else in the Arabian Seas Region or the western Indian Ocean. The coral communities exhibited high variability in condition in the late 1990s, mostly related to the differential effects of coral bleaching in 1998 (DeVantier et al., in press). Of international importance, coral communities of the outer islands were little or unaffected by the bleaching, in contrast with many other reef areas of the Indian Ocean. From the perspectives of resistance

above

Di-Hamri  
Corals and stones

Photo by Mario Caruso

and resilience in the face of future disturbances, including global change, and of maintenance and replenishment of populations, these communities were afforded high conservation priority in the Conservation Zoning Plan (DeVantier et al., 2004; Di Micco and Zandri, 2004; Klaus and Turner, 2004).

Socotra also hosts a diverse array of apex marine predators, many of which are of increasing conservation importance due to overfishing globally. These include Hammerhead, Tiger and Whaler or Requiem sharks, Marlin (*Makaira* spp.) and other bill-and sailfish. Some of these apex predators are enormous, reaching several metres in length and weighing more than a tonne. Yet these are still just 'small fry' in comparison with the true ocean giants feeding on the plankton in these highly productive waters. These include Manta or Devil Rays *Manta birostris* and *Mobula thurstoni*, Whale Sharks *Rhincodon typus*, and various species of baleen and toothed whales.

## Globally threatened species

Socotra hosts four species of endangered marine turtles - the Loggerhead turtle *Caretta caretta*, the Green turtle *Chelonia mydas*, the Hawksbill turtle *Eretmochelys imbricata* and the rarer Olive Ridley turtle *Lepidochelys olivacea*. Loggerhead and Green turtles nest on various beaches around the islands. No nesting has yet been confirmed for Hawksbill and Olive Ridley turtles. The Leatherback *Dermochelys coriacea* is a rare pelagic visitor to the western Indian Ocean, although it is not known from Socotra (Wranik, 2003). Being migratory, marine turtles require various develop-



mental habitats throughout their range and at each stage of their life cycle - clean beaches free from human encroachment, healthy coral reefs, seagrass beds, and unpolluted open oceans free from debris and fishery pressures. Socotra provides many of these essentials, although local and international pressures pose significant threats.

Socotra also has a diverse and abundant marine mammal fauna, the full species complement of which remains to be determined. The Northwest Indian Ocean hosts some 30 cetacean species and around Socotra there are at least six dolphin species, the Common dolphin *Delphinus delphis*, the Humpback dolphin *Sousa chinensis*, the Spotted dolphin *Stenella attenuata*, the Spinner dolphin *Stenella longirostris*, the larger Bottlenose dolphin *Tursiops truncatus* and Risso's dolphin *Grampus griseus* (Wranik, 2003). Sperm Whales *Physeter macrocephalus* are also present. Adjacent coastal waters of southern Arabia, and particularly Southeast Oman from Masirah Island northeast to Ras Al Hadd, support one of Earth's most diverse and concentrated cetacean assemblages, with some 22 species, two of which may be endemic to the area. The resident population of Humpback Whales *Megaptera novaeangliae* is unique; the only Humpback population in the world that does not migrate to the poles for summer feeding. Characterized by its sedentary behaviour and distinctive songs, these whales are believed to be isolated from other Humpback groups around the world (Baldwin, 2004). Numerous other whales migrate to the area to breed and calve, including the Bryde's, Sperm and Sei Whales.

The importance of its whale populations and continuing poaching and killings, recently under the guise of science, prompted the International Whaling Commission to declare the entire Indian Ocean an international whale sanctuary since 1979. The sanctuary received increased support in 2001, through the Nairobi Convention initiated by the United Nations Environment Programme and ten East African coun-

below

Coral community in Di-Hamri

Photo by Catherine Cheung





tries concerned for the marine environment of the region. Distribution and foraging ranges of many Indian Ocean whale populations are little known at present, and some frequent Socotran waters, including as noted above, one of the world's largest in the Sperm Whale.

### Internationally important populations

These include various endemic species in such diverse marine groups as algae, molluscs, crustaceans, corals and fishes, and the sea turtles and cetaceans. As noted above, species composition of Socotra's marine communities is unique, illustrating its transitional biogeographic location and importance in connectivity.

*"The Socotra Archipelago ... represents a transition zone, in which related but distinct faunal communities overlap. ... It is apparent ... that Socotra will prove to be of pivotal importance for the dispersal of species in the northern and western Indian Ocean, supporting sympatric occurrences of formerly isolated populations or species"* (Zajonz and Khalaf, 2002).

This is particularly well illustrated by Socotra's fish fauna, notably species of Butterfly and Angelfish.

### Endemic species

The Arabian Sea and Red Sea are major centres of marine endemism (Klausewitz, 1989; Randall, 1996; Veron, 2000; Schils and Coppejans, 2003b), and Socotra hosts populations of many regional endemics. Some of Socotra's marine species show significant variations in colour and form from other populations located elsewhere, posing significant taxonomic challenges. Several of the corals, fish, squid, crabs and algae were previously unknown to science, and are, for the present at least, considered endemic (e.g. Khromov, 1988; Apel, 2000; Veron, 2000, 2003; Gill and Zajonz, 2003; Schils and Coppejans, 2003a,b; DeVantier et al., 2004). Other species present show major discontinuities in their distributions, being recorded from the Indian Ocean for the first time, from as far afield as Japan and Hawaii, with notable reproductive and perhaps evolutionary consequences.

For example, discovery of the previously undescribed red alga *Reticulocaulis obpyriformis* extends the distribution range of its genus into the Indian Ocean for the first time, from Hawaii (Schils et al., 2003). Among the corals, many regional endemics, including *Acanthastrea maxima*, *Parasimplastrea sheppardi* and *Fungia puishani*, have important populations around Socotra. Among the decapod crustaceans, some 16 species were new to science (Apel, 2000). Socotra is also the type locality for two species of cuttlefish, *Sepia (Doratosepion) sokotriensis* and *Sepia (Doratosepion) mirabilis* (Khromov, 1988).

## 2b. History and development

The remoteness and inaccessibility of the Socotra Archipelago, in conjunction with the limited information available to travellers and historians, has kept the islands shrouded in an aura of mystery until recent times. Many aspects of the islands' history and culture, such as the very etymology of the name "Socotra", the actual time of human colonization as well as the composition and origins of the population and their religion, are still characterized by a mix of historical evidence, myths and legends.

On the other hand, a series of short scientific expeditions - started in early 19th century - took place for about 200 years, giving us a general account of the biodiversity of the Archipelago. Those activities, culminated in the recent EPA/GEF/UNDP Socotra Biodiversity Project - started in 1997 - supported the most extensive research activities conducted so far on the archipelago and adjacent waters. The results of both terrestrial and marine research brought into being a Conservation Zoning Plan for the entire archipelago, laid out in the "Presidential Decree 275" in 2000.

The archipelago of Socotra reached its present form and condition through the impressive degree of isolation it was subject to, throughout its history. Geological, climatic and historical isolation are the key factors that determined the preservation of its pristine environment; the former two factors are extensively clarified in section 2.a. and this section focuses on the history of the Archipelago.

### Glimpses of History

*(Adapted from Naumkin, 1993)*

The island of Socotra has been known since antiquity, although no one has yet established when and who first inhabited it.

The first record that could be referred to Socotra is by an unknown Egyptian author, dating back in 18<sup>th</sup> century BC. After that, reference to an island that could be identified as Socotra, was made by Herodotus (on the 5<sup>th</sup> century BC), by Indian authors (4<sup>th</sup> century BC), by Diodorus of Sicily (1<sup>st</sup> century BC) and by an unknown Greek sailor (1<sup>st</sup> century AD).

Indians, Arabs and Egyptians ranged extensively across the Indian Ocean expanses and it is well documented that by the middle of the 1<sup>st</sup> millennium BC the south Arabians has established their own ports in the region. By that time Socotra, depending on South Arabians traders, was of major importance as a staging post in the incense trade.

The Yemeni historian al-Hamdani (d. 334/945), and his contemporary al-Mas'udi (d. 345/956), both recorded that Alexander the Great sent a small group of Greeks to Socotra to cultivate the famous aloe. In his

#### Chronological Summary

18th century BC, in an Egyptian document Socotra, as "Pa'-anch", is mentioned as a home of incense.

5th century BC, Herodotus cited Socotra as "Panchaia", the Roman version of Pa'-anch.

4th century BC, Indians referred to Socotra as "Dvipa Sukhadhara", the island Abode of Bliss.

1st century BC, Diodorus of Sicily describes Socotra, Panhaeia, as a source of incense, and its inhabitants as Greek, Indian, and Arab.

1st century AD, unknown Greek sailor, gave a long and detailed description of Socotra, referred as to as Dioscorida.

3rd century AD, Hoq cave a religious site attracting pilgrims from the Middle East and India.

4-6th centuries AD, first evidence of Christianity on the island.

ca. 9th century, first colonization of Socotra by tribes from Mahra region.

Archaeological and Historical records attest to continuous habitation from the 10th century AD onwards.

ca. 1480, Socotra comes under direct rule of the Banu 'Afrar Sultanate in Mahra.

1507-11, brief Portuguese occupation of the island, following which the 'Afrar reassert their control.

1834, Socotra's Sultan rebuffs British advances, though soon after the island falls under British influence.

1876-1967, period of British Protectorate.

1967-1989, Socotra is administrated by the Socialist People's Democratic Republic of Yemen (PDRY), from Aden.

1990-present, Socotra becomes part of a united Republic of Yemen.



Fields of Gold, the latter author adds the detail that it was Aristotle himself he advised Alexander in this matter. Al-Mas'udi also mentioned that Indians had once worshipped idols on the island, a reference that can tentatively be linked to the inscriptions in Indian languages found within Hoq cave. The Greeks are said to have conquered the local Indian population and remained there.

Besides legends of Alexander's interest in the island, Socotra was quite certainly settled at the latest by the first centuries AD by a mixture of Hadrami Arabs and Indians. This was a time when Socotra's inhabitants are thought to have cultivated large quantities of dragon's blood, frankincense and aloe. The archipelago was integrated into the larger Frankincense trade routes, and the products listed here were sought after as luxury goods in Egypt and other affluent countries.

Historical records on Socotra started to be more detailed and numerous around the 10th century AD, by the Arab historian and geographer Al-Hamdani and the medieval geographers Al-Idrisi, Ibn Battuta, Yaqut Al-Hamawi and Al-Muqaddasi.

### Christianity and Islam

A lack of written sources allows this period of Socotra's history to easily merge with legend. Tradition has it that the apostle St. Thomas introduced Christianity to Socotra in the year 52 when he was shipwrecked there, though this report does not necessarily invalidate the possibility that Greeks introduced Christianity in the 4th century.

Tradition suggests that the Greek colonists brought Christianity to Socotra, as referred by Al-Hamdani: "It is said that the people from the Rum country [Greeks] were left there by their Caesar. They were followed by the Mahra tribes, which began to live together with them and, like them, became Christians."

#### The name Socotra

The archipelago has been cited very early in the literature, with many different names, which changed and evolved with different legends.

An Egyptian (18<sup>th</sup> century BC) refers to Pa'-anch, the land of the king of incense, thought to be Socotra.

Later Pliny the Elder and Herodotus (5<sup>th</sup> century BC) passed on the tale of the Arabian Phoenix, a large bird that died in a cinnamon and incense nest. From its bones and marrow sprang a small worm, which turned into a bird. The new bird carried its nest to the city of sun near "Panchaia", the Roman version of Pa'-anch.

In the first century BC, Diodorus of Sicily wrote about the island of "Panhaeia", which according to some scholars shows a certain degree of resemblance to Socotra. The island was said to provide the entire world with incense. The inhabitants were a mixture of aborigines, Greeks, Indians and Arabs.

Before the 4<sup>th</sup> century BC, the island belongs to the Indians, who named it, in Sanskrit language, Dvipa Sukhadhara (the Island Abode of Bliss).

Later on the same century, by the time of Alexander the Great, the Greeks took the island and name it Dioscorida. The name might be a translation from the Sanskrit or derived from the Dioscuri -Castor and Pollux- the twins worshipped for they were said to hold the power of the winds and the waves.

Another theory tells of the name Socotra as derived from the combination of the two Arabic words: suq (marketplace) and qatir (dropping essences).

In 524 AD, Cosmos Indicopleustes visited the islands from Ethiopia and wrote that the Nestorian Church dominated there.

Five hundred years later the people of Socotra were still Christians. This is reported during the 10<sup>th</sup> century by both Al-Hamdani ("people from all the Mahra tribes, including 10,000 fighting men, all of them Christian.") as well as Al-Mas'udi ("The majority of its people are Christian Arabs").

Later, on the 13<sup>th</sup> century, the great Venetian seafarer, Marco Polo, reported: "The inhabitants are baptized Christians and have an archbishop. ... It should explain that the archbishop of Socotra has nothing to do with the pope of Rome, but is subject to an archbishop who lives in Baghdad. ... You should know also that, if the archbishop of Socotra dies, his successor must be sent from Baghdad, otherwise there could never be an archbishop here."

Up to the end of the 15th century Europe received little or no further information about Socotra, by which time it seems probable that the group of Greek, Arab and Indian settlers on the island had ceased to be outsiders and had become Socotrans, adopting the language

and customs of the local people and integrating with them to form a cohesive population.

### The Arabs

In the middle of the 15<sup>th</sup> century, Socotra found itself subordinated to the Sultanate of Fartak, which had been established in South Arabia with its capital at Shihri in the Hadramaut by the Kathiri, a powerful Dhufari tribal alliance. Late in the same century, the Taharids, whose land extended from the Red Sea to Dhufar, took the power on Socotra.

In the late 15<sup>th</sup> and early 16<sup>th</sup> centuries account were given by Ahmad Ibn Majid, the great Arab pilot who guided the ship of Vasco Da Gama from the Somali port of Malindi to the coasts of India. These comments show that Socotra was clearly in Mahri hands, although they had apparently failed to establish direct control of the whole island.



above

Inscriptions at  
Mori Plateau

Photo by Mario Caruso

### The Portuguese

The 16<sup>th</sup> century ushered in a period of Socotran history that is perhaps better known than any other. This was the era of the Portuguese colonial expansion across the Indian Ocean.

During 1497-1498 Vasco Da Gama left Lisbon to sail to India. From the writings of Da Gama's pilot, Ibn Madjid, we learn that the population of Socotra was then Christian, and that its inhabitants were ruled over by a woman who had influence over the island's clergy. He also observed that Christian priests, who lived in churches, controlled the ceremony of marriage.

The opening to a regular sea route from Europe to India was an event of historic significance.

Information about Socotra had reached Portugal, and the island was recognized as potentially one of the key points in trade with the Far East.

Captain Diego Fernandes Pereira, in 1503, was forced by the monsoons to seek shelter on Socotra. He claimed that the locals requested the protection of the King of Portugal and his aid against the Mahri Arabs of Qishn on the mainland. The Portuguese decided to station a garrison on Socotra, and thus hinder the access of the Arab competitors to the Gulf of Aden and the Red Sea.

The Portuguese king, Dom Manoel I, wrote to de Almeida to inform him that Socotra should be seized and fortified because of its good harbours, navigable at any season, and its food supplies. In addition there were many local Christians and not many Moors (Muslims). Therefore, "wishing to have a fortress there and our men, we order Tristao da Cunha and Alfonso de Albuquerque to seize the island and build a fortress there".

In January 1507, the Portuguese arrived on Socotra and were unpleasantly surprised by the Arab fortress at Suq, which was well defended by around 130 men. Da Cunha, after unsuccessful attempt to deal with the locals, decided to attack the fort,





relying on the small number of its garrison. After some months of fear battle, a peace treaty was concluded with the local population, the Arab fort, now called San Miguel, was repaired, and the mosque building was converted into the church of Our Lady of Victory. At the beginning of August Tristan da Cunha sailed to India and Albuquerque sailed to Oman, leaving behind a garrison of one hundred men under the command of Alfonso de Naronha.

Following the Portuguese conquest, the conquerors were unable to convince the local population of their good intentions and suffered repeated attacks and a consistent lack of cooperation. An initial optimism regarding the island and its inhabitants turned into disenchantment, leading the Portuguese's stay on the island to end after only four years.

Early in 1511 two ships were sent to Socotra with orders to raze the fortress and evacuate, together with all the Christians who wanted to leave.

So the Portuguese departed and the island reverted to the control of the Mahrís.

Despite this failed colonization, Portuguese ships continued to stop in Socotra in the following years, often receiving warm receptions from the local population.

During the Portuguese voyage to India in 1541-2, St. Francis Xavier stopped briefly in Socotra. He reported an absence of ordained clergy, and a general ignorance of Christianity. While the sign of the cross was greatly respected, baptism was no longer practiced, though monogamy and circumcision were observed. Of interest is that the Socotris practiced two Lents, during which they fasted from meat, milk and fish. A little later St. Ignatius of Loyola visited the island and similarly deplored the state of the Christianity he found there.

above

View of the bay of Hadi-bu-Suq in January 1541

Source: ROTEIRO DO MAR ROXO

De Dom Joao De Castro  
MS. COTT. TIB. DIX DA  
BRITISH LIBRARY

INAPA, LISBON 1991

In the following century (17<sup>th</sup> century) the islands were visited by Padre Vincenzo, a Carmelite who described the further loss of Christianity. While it was reported that all the women were named Maria and there were still houses of worship, the Socotris were also said to make sacrifices to the moon, to cut off the hands of chosen individuals, offering them to the moon in times of draught.

### The British

From the beginning of the 17<sup>th</sup> century onwards Suq was replaced as the capital of Socotra by Hadiboh, a few kilometers to the west of the former capital on the northern coastal plain of the island. There are records from this period of British visits to the island, seeking the aloes it supplied. These visits ceased by the end of the century as the British found other, more easily accessible sources for these goods. In the 19<sup>th</sup> century interest arose again in Socotra, due to its potential as a fuelling station between Suez and Bombay.

In 1834 the British government reached an agreement with Sultan Ahmed bin Sultan of Fartak and his cousin Sultan bin Amr of Qishn in which the British would be able to land and store coal (for the steamships) on the island. Yet this agreement was never put into effect, as the local ruler of Socotra refused. At that time the ruler of Socotra, Sheikh Omer Abn Tuari, stated: “Your Government wish to purchase Socotra, do they? Socotra! which for to many ages has been the heritage of my fathers? Never! Were they to heap this room with gold, they should not obtain a space equal to its floor’s breath!”

Although Socotra’s ruler changed his mind some years later and opened negotiations with the British, the capture of Aden, with its more suitable harbour, in 1839 by the British rendered Socotra superfluous and unattractive as a fuelling station, also due to lack of a proper all-year round anchorage in the island.

The period of formal British influence in the island didn’t begin until 1876 when they and the Sultan of Qishn agreed that in exchange for an annual fee, Socotra would never be ceded to anyone save the British. In 1886 this relationship was strengthened, when Socotra officially became a British protectorate.

British rule of its Socotra protégées was restricted to despatching occasional shipments of food or medicines at time of famine or epidemic, and there was little interference in the island’s internal affairs. During its period under British rule, Socotra was increasingly visited for purposes of research and scientific exploration. Other than that, during this period contacts with the western world were very limited, with no permanent settlements by outsiders, other than small numbers of camping troops to support a temporary and marginal military airfield set-up during war times.

On 30 November 1967 a detachment of the South Yemeni National Front, which had led the struggle for the liberation of their country from the British, landed on Socotra. The sultanate of Mahra and Socotra was abolished and the island became part of the independent People’s Republic of Yemen that had been proclaimed on the same day.

### The language of Socotra

*(Adapted from Naumkin, 2003 pers. comm.)*

The Socotri language, spoken only in the archipelago, is thought to have derived from an old proto-Semitic language that was the origin of Akkadian (Assyro-Babylonian) and most of the known Semitic languages (Hebrew, Phoenician, Aramaic, Arabic, etc.).

It is the ancestor of some modern ‘relict’ languages, which are still spoken in the Gulf and Yemen and include Mahri, Jibbali, Harsusi, Bethari, Hobyot and Socotri.

Of these Socotri is by far the most thriving, whereas Harsusi and Bethari are almost extinct.

Socotri branched off some time during the first half of the first millennium BC, much earlier than the appearance of Mahri and Jibbali. This was before writing made its appearance, and Socotri has continued until today as a non-written language.

All these factors together have preserved an astonishing archaic language, as revealed in its phonetics, grammar and lexicography.





Between 1970 and 1990 it was a region of the People's Democratic Republic of Yemen, and was used as a military outpost, with restricted access.

In 1990, with the unification of Yemen, and increasingly so following the victory of North Yemen in the civil war of 1994, it came first under the administration of Sana'a, and was then assigned to the governorate of Aden and later to the province of Hadramawt and locally administered from Mukalla, until present.

It is important to note that the Socotran archipelago had until then only

very limited contact with the outside world. This was due to its status as "military zone of restricted access" with only a minor gravel airstrip operational only in suitable weather conditions. Until recently, the island was largely cut off from the outside world during the monsoon season (June-September), until the airstrip was asphalted and extended in 1999, allowing civilian flights of Yemenia airline to land year round, including during the monsoon season (earlier smaller airstrips had been build during the British protectorate and by the PDRY in 1987).

Since unification of the country, the Yemeni government has demonstrated interest in conserving the then little known archipelago's valuable biodiversity and cultural heritage. This first signs of this interest appeared clearly with the resolution following the international Aden Conference on Socotra in 1996, the signature by Yemen of the international Convention on Biological diversity and the subsequent request to the United Nations Development Programme for the establishment of the Socotra Biodiversity Project (SBP), funded by the Global Environment Facility (GEF).

Under the SBP, a process of gradual strengthening of the local branch of the Environment Protection Authority (EPA) was initiated and is yet ongoing. The EPA led an extensive community consultation process and the first systematic terrestrial and marine surveys of Socotra. This significant effort led to the layout of an initial draft of the Conservation Zoning Plan for the entire archipelago. Following a presentation of this plan to local authorities and community leaders on Socotra, a meeting was held between local and national authorities in 1999 in Sana'a. A final version of the Zoning Plan proceeded from this meeting, and was then ratified and signed by the Yemeni President 'Ali 'Abd Allah Saleh in 2000 as Presidential decree 275. This Zoning Plan is currently being implemented by the EPA (now part of the Ministry of Water and Environment), and constitutes the basis of future plans for the management of the island .

The SBP was replaced in 2001 by the expanded Socotra Conservation and Development Programme (SCDP), which has a broader mandate to support donor coordi-

*above*

**Traditional Socotran greetings**

Photo by Nigel Pavitt

nation, local NGOs and has direct programmes in the health, education, agriculture and local governance sectors in the island.

In 2003 the Socotra Archipelago was designated by UNESCO's as a Man and the Biosphere Reserve – the result of local and global efforts for the recognition of the value of Socotra's unique ecology. In recent years, Socotra's status as a site of global conservation importance and a centre of high endemism and biological diversity has been increasingly recognised by Yemeni institutions, UNDP/GEF, WWF, UNESCO, IUCN, Birdlife International, and the International Plant Genetic Resources Institute (IPGRI), all of which have documented and reconfirmed this on the basis of historic and recent scientific surveys.

Since the opening of the airport in late 1999, development has rapidly been reaching the island: several new asphalt roads are being built (often without proper planning and Environmental Impact Assessments), a new port is planned, and communications, fuels supply and trade have significantly increased in only a few years. This is having a significant impact on the fragile balance between the people of the island and their natural habitats that had so far survived for thousands of years. At the time of writing (2005), Socotra is at a critical point in its history: a crossroads between becoming a well managed and preserved prime eco-tourism destination at international level, or becoming just another biodiversity-impooverished island like many others, dependent on external and government help, due to the irreversible loss of its main assets: its uniquely preserved nature and culture.

### The scientific exploration of Socotra

*(Adapted from Wranik, 2003)*

Following the 1876 agreement between the Sultan of Qishn and the British government, the scientific exploration of the archipelago was greatly facilitated.

The first scientific expedition on Socotra Archipelago can be considered the one that took place in 1880, led by Prof. I.B. Balfour. Balfour's team focused on botany, but also conducted zoological and geological studies, resulting in a first botanical account with a description of more than 200 plant species new to science. Balfour was later named the Regius Keeper of the Royal Botanic Garden (RBG) in Edinburgh, which became the holder of his specimens and began the relationship of the RBG with Socotra that continues until today.

One year later, two German naturalists, G.A. Schweinfurth and E. Riebeck, spent six weeks on Socotra studying people and the Socotri language and, to a lesser extent, flora and fauna.

The British archaeologists T. and M. Bent visited Socotra in 1896/97, accompanied by E.N. Bennett. Their expedition yielded some important plant and animal collections.

### Overview of the most important scientific expeditions to Socotra *(Adapted from Wranik, 2003)*

|           |  |
|-----------|--|
| 1834      | J.R. Wellsted  |
| 1847      | L.H. Boivin  |
| 1876      | W. Perry   |
| 1877      | J. Collins   |
| 1880      | I.B. Balfour   |
| 1881      | G.A. Schweinfurth and E. Riebeck   |
| 1896-97   | J.T. Bent, M.V.A. Bent and E.N. Bennett  |
| 1898      | W.R. Ogilvie-Grant and H.O. Forbes   |
| 1898      | D.H. Muller, S. Paulay, F. Kossmat, O. Simony and A. Jahn  |
| 1950 c.a. | G.B. Popov   |
| 1956      | D. Botting and M.D. Gwynne   |
| 1964      | A.D. Forbes-Watson   |
| 1964-65   | P. Boxhall, A. Radcliffe-Smith, J. Lavranos and K.M. Guichard  |
| 1982      | Scientific mission from the Univ. of Aden  |
| 1985      | Q. Cronk   |
| 1990's    | several short missions with the participation of FAO and UNESCO, such as: <ul style="list-style-type: none"> <li>- The Royal Botanic Garden Edinburgh</li> <li>- Bird-Life International</li> <li>- Aden University and Yemen Ministry of Agriculture</li> <li>- Forschungsinstitut Senckenberg Frankfurt</li> <li>- Rostock University with Museum Fur Tierkunde Dresden</li> </ul> |
| 1998-2005 | first permanent international team stationed full-time on the island, and several missions under the Conservation and Sustainable Use of the Biodiversity of Socotra Archipelago (UNDP, Project YEM/96/G32) and the Environmental Protection Council first, and the Socotra Conservation Development Program and the Environmental Protection Authority after.                       |





above

Inscriptions at  
Delisha

Photo by Mario Caruso

logical surveys.

In spring 1967, the British Middle East Command conducted an interdisciplinary expedition to Socotra, in which the botanists A. Radcliffe-Smith and J. Lavranos and the entomologist K.M. Guichard participated.

In 1982, the University of Aden sent a scientific team to Socotra that was led by the German zoologist W. Wranik.

The Royal Botanic Garden of Edinburgh's team renewed their research on the island's flora in the 1980s as well, and was instrumental in mobilizing international attention to the conservation of the archipelago's unique wildlife and culture.

After the unification of North and South Yemen, systematic research on the flora and fauna of Socotra by Yemeni and international teams of scientists was initiated under the auspices of the Environmental Protection Authority (EPA), with the support of several international organizations.

These activities culminated in the Socotra Biodiversity Project (supported by the UNDP Global Environment Facility - GEF), which has supported the most

In 1898 and 1899, W.R. Ogilvie-Grant of the British Museum in London and H.O. Forbes of the Liverpool Museum spent three months on Socotra and Abd al-Kuri. Forbes published the results of their zoological survey in 1903.

At the same time, a team of scientists from the Vienna Academy of Sciences conducted the Austrian expedition to Southern Arabia and the Socotra Archipelago, collecting large numbers of insects, reptiles and fishes. Their geological and biological results were published in a special volume of the "Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften".

Half a century later, the British entomologist G.B. Popov studied locusts of Socotra and carried out eco-

### Recent Archaeological Findings

#### Eriosh Petroglyphs

Recent evaluations of the petroglyphs at Eriosh suggest that this site contains the earliest evidence of the presence of Christianity on the island, dating back to the 4-6<sup>th</sup> centuries AD - although earlier scholarship has argued that these symbols may be a thousand years older. When considered in conjunction with a tablet recently found in the Hoq cave that has been dated to 258 AD, the little studied Eriosh site offers the promise of information that will help elucidate patterns of trade and migration linking India to the Red Sea.

#### Hoq Cave and the Tablet

Additionally, a number of so far little studied inscriptions in a variety of languages (Syriac, Ethiopian, pre-Arabian, pre-Indian) were also found in the Hoq cave, along with well preserved pottery, will help shape our understanding of a period of both Socotri and world history for which we have few written sources. A perfectly preserved wooden tablet bears the text (Gorea, 2003):

"In the month of Tammuz (July), the 25<sup>th</sup> day of the year 569 (258 AD), I, Abgar son of 'Absmaya, came to the country of nysy, to this place; may the god who dwells here bless you, you who will read this tablet, he will bless me and leave the tablet in its place".

This evidence found in the Hoq cave corroborates earlier archaeological finds at Harjya, two kilometers south of Suq (Socotra's medieval capital), where a Roman amphora handle was found, and strongly suggesting settlement during the Late Antique if not Classical period. At both Harjya and the western city of Qalansiyya evidence of 10<sup>th</sup>-14<sup>th</sup> century settlements has also been found, suggesting that the island was continually inhabited from the early centuries AD until the present day. The full significance of Socotra's archaeological sites, including the Hoq, Eriosh, and Harjya areas, should be revealed through research during the coming years.

#### Delisha Stones

In early 2005, a number of stones near Delisha on the north shore of the island were uncovered, bearing inscriptions in a number of languages. Future research should explain if and how these inscriptions relate to those found at Hoq and Eriosh.

Surveys of the rest of the island have revealed many sites of additional archaeological and historic interest, including graves, houses, forts and long walls or demarcations that stretch over much of the island of Socotra and are thought to be possibly related to a period when Socotra produced large commercial quantities of incense and aloë.

extensive research activities conducted so far on the archipelago and adjacent waters. In the framework of this project, a multi-disciplinary zoological and botanical expedition was conducted in February and March 1999. This venture co-ordinated by the Royal Botanic Garden Edinburgh, United Kingdom, and the local project team, was the largest ever undertaken on the island and aimed to provide as comprehensive an inventory as possible of the archipelago's terrestrial fauna. In total, 3,956 animal specimens were collected by the expedition, representing four phyla, at least 10 classes, 33 orders and 64 families.

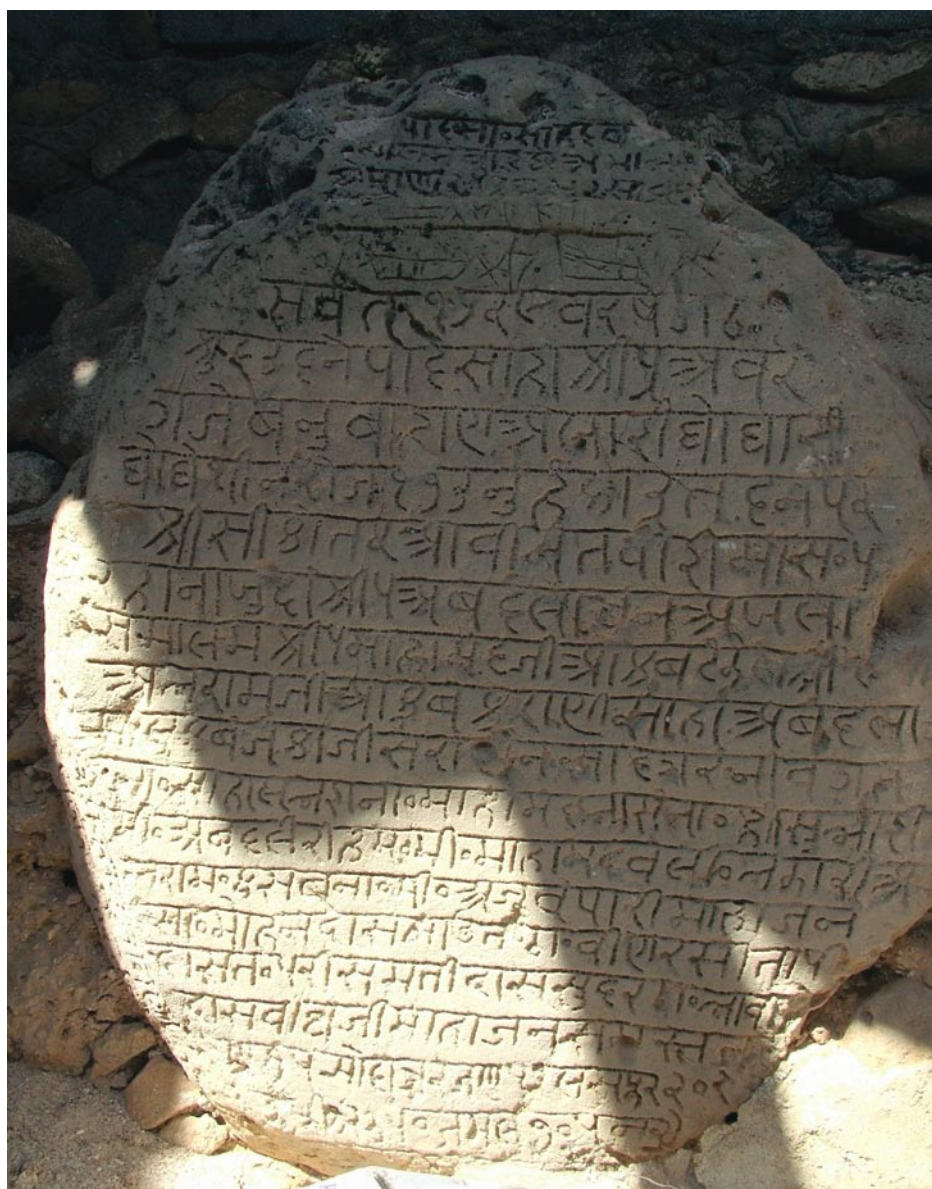
These numbers are remarkable, considering the fact that the areas surveyed were limited to the eastern part of Socotra Island, its north and south coasts (excluding the West) and the outer islands of Abd al-Kuri and Samha (excluding Darsa Island). Not surprisingly, 89 % of the specimens collected were invertebrates.

Simultaneously, in the framework of the same GEF project, an international multi-disciplinary team of scientists led by the Senckenberg Research Institute in Frankfurt, Germany, in partnership with Hariri & Associates in Sana'a, Yemen, the Marine Science Station in Aqaba, Jordan, and the Red Sea University in Port Sudan, Sudan, conducted extensive marine habitat, biodiversity and fisheries surveys. This study resulted in the compilation of information regarding the differing types of biotopes present on the Socotran coastline.

This effort was combined with extensive community consultation and dialogue with local authorities conducted by the EPA and GEF team on the island, and led to the establishment of a Conservation Zoning Scheme for the Socotra archipelago. This zoning scheme then played an critical role in the development of the archipelago, and was approved Presidential Decree 275 in the year 2000.

Currently the island became far more accessible for visitors, and Yemeni and international biologists, anthropologists, geologists, linguists, and archaeologists are able to carry out work on Socotra with support from the local offices of the Environment protection Authority. This in the coming years will doubtlessly increase our understanding and appreciation of the archipelago's value.

Both national and international researchers are currently coordinated by the EPA with support from the Socotra Conservation and Development Programme, informing ongoing efforts towards conservation and development.



above

Inscriptions at  
Delisha

Photo by Mario Caruso



## 3.

Justification  
for  
Inscription**3a.** Criteria under which inscription is proposed (and justification for inscription under these criteria)

CRITERION X – THE NOMINATED PROPERTY SHALL CONTAIN THE MOST IMPORTANT AND SIGNIFICANT NATURAL HABITATS FOR IN-SITU CONSERVATION OF BIOLOGICAL DIVERSITY, INCLUDING THOSE CONTAINING THREATENED SPECIES OF OUTSTANDING UNIVERSAL VALUE FROM THE POINT OF VIEW OF SCIENCE OR CONSERVATION.

The inscription of the Socotra Archipelago is proposed as a Natural Site as it contains one of the best-conserved and significant island habitats in the world. The site holds unquestioned global importance for in-situ conservation of biological diversity, and it hosts large numbers of rare and threatened endemic species of outstanding universal value (criterion X).

Due to its remote and peripheral location, and to historically difficult accessibility due to meteorological and sea conditions, the natural environment of Socotra has retained an impressive level of integrity till present date, making it the equivalent of a precious Noah's Ark, where ancient flora and fauna, as well as an associated unique culture and traditions, have survived until present day.

**Biogeographic features**

Situated at the junction between the Red Sea and Gulf of Aden, the Indian Ocean and the Arabian Sea, and long separated from the main African and sub-Arabian continents, the Archipelago is a recognised globally significant terrestrial and marine biological system. In view of its geological isolation, geographical position, land topography and morphology and evolutionary history, the Socotra Archipelago supports a wide range of unique habitats and a high number of endemic plant and animal species. Some of these habitats and species are still pristine and have seen little human impact. Such high level of endemism ranks Socotra among the top 10 islands in the world in terms of botanical conservation importance (Miller, 1996; see also section 3.c).

**Recognized Global Conservation Importance**

The Archipelago's global conservation importance was recently highlighted by the inscription as the first UNESCO Man and Biosphere Reserve in Yemen (UNESCO

MAB, 2003). The IUCN recognizes Socotra as a globally important center of endemism and is actively supporting its conservation. Birdlife International has been actively involved and recognizes 22 Important Bird Areas in Socotra (Important Bird Areas in the Middle East, 1994). The WWF lists the archipelago among the most important sites in the world (WWF - Global 200 Eco-regions) Conservation International has recently included Socotra in the global network of “Biodiversity Hotspots”. The Archipelago is also part of the regional (Red Sea and Gulf of Aden) network of important Marine Protected Areas (PERSGA, 1998).

The island’s high conservation importance was fully recognized by the Global Environment Facility’s (GEF) attention and support since 1996, while recent baseline surveys, largely funded by GEF-UNDP, have greatly enhanced its ranking among the most important conservation areas in the world. Recent floristic studies concluded that as many as 10 plant genera of 300 species, 7 species of birds and 12 subspecies, 24 reptiles, and over 300 invertebrates are endemic to and only found in the Archipelago. The fauna is almost entirely endemic (see section 2.a for more details)

### Marine biodiversity

The marine biodiversity of the Archipelago is characterised by unique mixture of species from different bio-geographic regions: Western Indian Ocean, Red Sea, Arabia, East Africa and the wider Indo-Pacific. The first surveys conducted during the GEF project (1998-9) concluded that the numbers of species of hard corals and fish in Socotra are comparable to those of the Red Sea despite the smaller size of the island. A variety of new species have been discovered, and their distribution ranges, including

those previously thought to be endemic to the Red Sea and Arabia have been documented. In addition, the Archipelago may provide the crucial link for some marine species in maintaining their distribution governed by current patterns and the duration of their planktonic larval stages.

### The natural Balance between People and Nature

Humans have lived in balanced harmony with the natural habitat of Socotra since their settling of the archipelago, contributing to the preservation of the islands’ varied and rich ecology and to the associated development of a unique culture and traditions, rotating around the sustainable use of natural resources and biodiversity. With less than 2% of the archipelago’s land currently under intensive human use, and the rest occupied by a small population of subsistence pastoralist tribes, the environment remains comparatively undisturbed and this represents one of the archipelago’s greatest assets, requiring careful protection and appropriate development.

below

Traditional land use

Photo by Mark Jeffrey





### 3b. Proposed Statement of Outstanding Universal Value

The Socotra Archipelago is one of the most significant and well-preserved island eco-systems in the world, containing a unique assemblage of species and habitats, and representing one of the few surviving examples of local people living in a delicate balance with their natural environment.

Due to the archipelago's relative isolation until recent years, the traditional balance established between people and nature has remained relatively undisturbed, preserving endemic species and their eco-systems. The archipelago's remarkable integrity and comparatively outstanding level of conservation, offer an exceptionally valuable opportunity to study and learn from an exceptional combination of flora and fauna, with its associated unique culture, language and traditions.

Each of the archipelago's three inhabited islands exhibits its own high level of endemism, rendering the archipelago as a whole even more significant.

*below*

**Dragon Blood Trees**

Photo by Mario Caruso



### 3c. Comparative analysis (including state of conservation of similar properties)

The relative importance of the Socotra Archipelago is well recognised by several authors and conservation organizations worldwide, and is well summarised by Miller and Morris: “The figures for botanical diversity confirm the Socotra Archipelago’s global status as one of the world’s most botanically important island group, comparing favourably in floristic richness and endemism with such famous island as Mauritius, the Galapagos and the Canary Islands”. (Miller and Morris, 2004)

| Endemism in oceanic islands |                        |                     |            |            | Table 8   |
|-----------------------------|------------------------|---------------------|------------|------------|-----------|
|                             | Size - km <sup>2</sup> | Total plant - spp.  | Endemics   | % Endemics |           |
| Juan Fernandez              | 93                     |                     | 147        | 118        | 80        |
| Ascension                   | 94                     |                     | 25         | 11         | 44        |
| Galapagos                   | 7844                   |                     | 543        | 229        | 42        |
| <b>Socotra</b>              | <b>3799</b>            |                     | <b>825</b> | <b>307</b> | <b>37</b> |
| Mauritius                   | 1865                   | 800-900             | 280        |            | 31-35     |
| Rodriguez                   | 104                    |                     | 145        | 48         | 33        |
| Canary Is.                  | 7273                   |                     | 2000       | 569        | 28        |
| Norfolk Is.                 | 13                     |                     | 174        | 48         | 28        |
| Madeira                     | 769                    |                     | 760        | 760        | 17        |
| St Elena                    | 121                    |                     | 320        | 49         | 15        |
| Cape Verde                  | 4033                   | 724 (spermatophyte) | 65         |            | 11.1*     |
| Azores                      | 2235                   |                     | 600        | 55         | 9         |

*Table from Miller and Morris, 2004 – \*data for Cape Verde from Arechevaleta, M., N. Zurita, M.C. Carrero & J.L. Martin, 2005*

The above table illustrates how the Socotra archipelago is ranked in the fourth place globally, in terms of botanical conservation importance. However an accurate comparative analysis among different islands or archipelagos in the world is a complex exercise. The different Archipelagos that were taken into consideration belong to different biomes, are dissimilar in size, show a variety of geological and climatic features. Their history of human habitation and current population and development pressures are different, and not all island groups were studied to the same degree.

There are however some common features that are worth comparing and that clearly highlight the international importance of Socotra. For this purpose we may take into consideration the archipelagos of the Galapagos, the islands of Macaronesia (Canary Islands, Madeira, and Cape Verde) and the Mascarene. In all these archipelagos, the impact of European colonization has severely affected the survival of original endemic species and unique habitats. The level of extinction of endemics has been very significant over the past few centuries, and was largely due to loss of habitat, introduction of alien and invasive species of animals and plants, and to human activities in general.



| Name           | Location  | Biome   | Size (km <sup>2</sup> ) | Conservation Status          |
|----------------|---|---|-------------------------|------------------------------|
| <b>Socotra</b> | <b>Islands east of the Horn of Africa and south of Yemen</b>  | <b>Deserts and Xeric Shrublands</b>               | <b>3,788</b>            | <b>Critical / Endangered</b> |
| Galapagos      | Galápagos Islands, off the coast of Ecuador                   | Deserts and Xeric Shrublands                      | 7,844                   | Critical / Endangered        |
| Mascarene      | Islands of Réunion and Mauritius, east of Madagascar          | Tropical and Sub-tropical Moist Broadleaf Forests | 4,900                   | Critical / Endangered        |
| Canary         | Atlantic Ocean, out of the northwest coast of Africa.         | Mediterranean Forests, Woodlands, and Scrub       | 7,273                   | Critical / Endangered        |
| Madeira        | Atlantic Ocean, out of the coast between Morocco and Portugal | Temperate Broad-leaf and Mixed Forests            | 769                     | Critical / Endangered        |
| Cape Verde*    | Atlantic Ocean, West of Senegal                               | Tropical and Sub-tropical Dry Broad-leaf Forests  | 4033                    | Critical / Endangered        |

Table – data sources: WWF Global 200 eco-regions and \*Edoardo Zandri pers.comm.

Today, in all these islands, examples of original vegetation types survive only in very small and inaccessible areas, and have been largely replaced in the past 4-5 centuries by alien introduced species that dominate the landscape. The administrations of all these archipelagos are currently all struggling to preserve remaining patches of natural habitats, and eradicating introduced species that affect the functionality of the ecosystem.

In Socotra, a combination of historic factors has instead resulted in the preservation of the islands' natural and cultural heritage almost intact until present days. These key factors include i.e. inaccessibility by sea/air for extended periods, lack of any significant European occupation until present (and associated over-exploitation of natural resources and introduction of invasive alien species), the low number of local inhabitants (up to 10 times lower in Socotra than in most the above comparable archipelagos), as well as the recent (until 1994) status of military restricted area.

Therefore, beyond the sheer comparison of available figures on population and wild-life species, the archipelago of Socotra stands out for its unique degree of conservation of the natural ecological balance between biodiversity and indigenous people. A very fragile balance that has long been lost in all other comparable archipelagos taken into consideration. A fragile balance that is now under severe threat, as the islands are opening up to outside influences.

### Similar Archipelagos compared with Socotra at a glance

(from WWF Global 200 Eco-regions, and E. Zandri Pers. Comm.)

The **Galapagos** Archipelago is almost twice as large, and belongs to the same Biome as Socotra: Desert and Xeric Shrubland. The biodiversity of these previously uninhabited islands was well studied since the visits by C. Darwin in the 19th century, and the site is a National Park since 1968.

Endemism is high in all taxonomic groups, and the variation in elevation, size, and distance between the islands has contributed greatly towards the species diversity and level of endemism on each island.

The state of this eco-region has been deteriorating since humans first began visiting the islands in the 1800's, introducing alien species such as goats, rats, pigs, cats, dogs, horses, donkeys, cattle, sheep and mice. These introduced species are damaging and out-competing native species, causing population reduction and in some cases extinction. This is currently a major issue that conservation scientists struggle to control. The example of goats is prominent: today, the goats pose severe threat to the natural vegetation of Galapagos and their number is currently estimated near 125,000 on Isabela Island alone – a multi-million dollar eradication programme is ongoing. In comparison, Socotra currently hosts an estimated (and traditionally managed) total population of 30,000 goats, 7,000 sheep, 2,500 cattle and 400 camels (WS ATKINS INTERNATIONAL, 2001. Socotra Archipelago Master Plan, SAMP).

Introduced plants species, now outnumbering native species, represent a major problem in the Galapagos as they compete with native vegetation, taking over habitats more quickly than the native vegetation can adapt to these assailants.

Tourism is rapidly becoming a significant source of income that is driving people to immigrate and settle in these islands, increasing pressure on available natural resources. When organised tourism began in 1969, the National Park Service enacted strict rules to prevent visitors from damaging the ecosystems and wildlife. Current number of visitors for Galapagos is approximately 60,000 per year, while in Socotra visitor numbers stand at 450 (in 2004).

**Mascarene** Islands (Reunion, Mauritius, and Rodrigues) fall in the Tropical and Subtropical Moist Broadleaf Forests Biome. They have otherwise a comparable size and are the closest geographical location to the Socotra Archipelago (although in the southern hemisphere).

While the Mascarenes still support many endemic species, they are as well known for the large number of species that have become extinct since human occupation in the 1600's. The vast majority of original forest habitat has been lost to agriculture and tourist development and little remains for the native species (Stuart et al. 1990). **Mauritius** has one of the highest human population densities in the world, 634 persons/km<sup>2</sup> (CIA 2000). On all of the Mascarene Islands, there has been a vast loss of the original forest habitat. On **Reunion**, it is estimated that currently less than 40% of the island is covered with natural vegetation; on Mauritius, only about 5% of the natural vegetation survives; and on **Rodrigues**, the natural vegetation covers around 1% of the total land area. The natural habitats of these islands are heavily fragmented due to the anthropogenic activities that have continued since the 17th century. On Reunion, most of the remaining larger habitat blocks are found at higher elevations. The habitats of this eco-region are greatly under-protected, even though little habitat remains. There are several protected areas on Reunion, but only three are greater than 10 km<sup>2</sup>.

In comparison, Socotra is almost entirely (95%) covered with natural vegetation dominated by endemic species and conserved by local ancient traditional practices, it has a relatively low population (43,000, with a density of approx 12 person/km<sup>2</sup>), and the protection status granted by recent legislation covers 97.5% of the islands' land area and the 12 nautical miles marine zone around it.

The **Macaronesia** includes the oceanic islands groups of the Canary islands, Madeira and Cape Verde.

**Canary Islands** fit in to the Mediterranean Forests, Woodlands, and Scrub Biome, and, as for Mascarene, have a comparable size to Socotra, and through the UNESCO MAB (Man and Biosphere) programme, three reserves have been declared in the Canaries.

Canary and Madeira Islands support remnants of laurel forest, considered a Tertiary relict vegetation type, having once extended across southern Europe and northwest Africa. This unique subtropical humid forest (very similar to permanent mountain cloud forest) constitutes an extremely important ecosystem type that is rare worldwide. Tall tree species compose the canopy; most belong to the Lauraceae family and are endemic to Macaronesia.

However these natural habitats of the Canary Islands today are mostly surviving in inaccessible places such as cliffs, highest mountains, or rocky isles. Moreover the development of mass tourism in the Canary Islands in recent years has led to enormous habitat loss, as natural areas are cleared for beach houses and resorts.

**Madeira** belongs to the Temperate Broadleaf and Mixed Forests Biome is much smaller than Socotra in size and is part of the Natural World Heritage List of UNESCO since 1999

On Madeira the habitats of the eco-region are threatened by a variety of human activities, from clearing land for agriculture to urban development. Today, only scattered fragments remain of the once common dry evergreen forests. The native laurisilva forests have been greatly reduced in extent and however continue to recover from over-use, currently covering about 16 % of the island.

In **Cape Verde** is located at a similar latitude to Socotra and belongs to the Tropical and Subtropical Dry Broadleaf Forests Biome. The original natural vegetation has essentially been wiped out since the start of human occupation in the late 16th century: forests were cleared for timber, coal and firewood production, alien grazing animals were released into the islands, water resources were over-utilized and agricultural fields have now reached the highest slopes, causing soil erosion on a large scale. Protected areas are currently being established in existing forestry reserves that were planted with exotic species for decades, however these protected areas are very small in size (approx. 3% of land is so far protected) (compared to 97.5% in Socotra). These main conservation issues in these protected areas is that they are dominated by exotic species, crowded by alien invasive species and do not hold viable populations of endemic species any longer. The human pressure on the environment is extremely high, with a resident population of Cape Verde now amounting to some 432,000, with a population density of approx 107 pers./km<sup>2</sup>.

In comparison, Socotra has virtually not suffered and is yet almost untouched by external development influence that has affected so much all islands of Macaronesia for the past 4 centuries, and has effectively started in Socotra only in 1999. In Socotra the landscape is at present entirely dominated by ancient endemic species that have been preserved until present by traditional practices of the local people. Natural and semi-natural habitats are largely in balance with existing local population that has a density (12 pers./km<sup>2</sup>) at least 10 times lower than in most Macaronesian islands. The introduction of invasive alien species is a potential problem, that will need to be addressed with adequate preventive action, however no irreversible damage has been caused by this factor as yet. The principal cause of the above striking differences is the fact that Socotra was occupied for millennia by an indigenous population that relied on the sustainable use of its natural resources, with limited and controlled introduction of alien species (including grazing animals) – therefore the severe over-exploitation associated with European colonization has essentially never touched these islands until present.



## 3d. Integrity

### **(i) The Nominated Site includes all elements necessary to express its outstanding universal value**

The Socotra Archipelago Conservation Zoning Plan (see section 5.d) identifies approximately 97,5% of its land (as well as the 12 nautical miles zones surrounding the islands) for the preservation of biological diversity, landscapes and associated traditional culture, language and traditions. Only the remaining 2,5% of the islands' land area is allocated for intensive human use and development.

The conservation of the archipelago in its almost entirety ensures the inclusion of all necessary elements to preserve the Archipelago's outstanding universal value.

### **(ii) The nominated site is of adequate size to ensure the complete representation of features which convey the property's significance.**

As stated in section (i), the objective of the Government of Yemen is the conservation and appropriate development of the archipelago as a whole. This entails that the maximum possible size (approx. 97,5% of land area) has been allocated for the conservation of biodiversity and associated sustainable community development purposes.

*below*

Traditional fishing system

Photo by Nigel Pavitt







*above*

Wadi Dahero

Photo by Mario Caruso

This entails the inclusion of all areas containing outstanding natural features, and provides the largest possible size to ensure the complete representation of all natural and cultural features that convey the sites's significance.



**(iii) The degree to which the Socotra Archipelago suffers from the adverse impact of development and/or neglect is among the most limited in the world, for islands with a comparable size.**

The Socotra archipelago has enjoyed a high level of integrity in recent history, resulting from a well-established natural equilibrium between people and environment. This is fully recognised by the listing as UNESCO Man and Biosphere Reserve (2003). Difficult access by sea, the lack of a safe port and civil airport, and the archipelago being designated as a military zone of strategic importance, were all critical factors that contributed to preserving the archipelago's historic isolation. This started to change significantly only less than a decade ago: the first landing dock was built in 1997, and the civil aviation airport opened in mid 1999. The islands are now undergoing the fastest and most dramatic changes in their history, and will face their greatest challenge in the coming years as they come under the growing external pressures of development.

**Natural Balance between people and nature**

As noted by Miller and Morris (2001), man has inhabited the island along with livestock (including goats, sheep, camels, donkeys and cows) for at least two thousand years. This has resulted in the establishment of a natural balance between local people and the islands' endemic flora and fauna, including marine life. The Local population has historically occupied the island in relatively limited numbers, adapting their traditional land and sea management practices to the harsh conditions dictated by this dry environment. Due to their complete isolation for extended period of the year, the careful and sustainable use of the limited terrestrial and marine resources available became an integral part of the islander's way of life. There is no evidence to suggest that exiting traditional land and sea management practices have changed over the past few hundred years. However unless properly conserved, this pattern of traditional use is now likely to change due to external influences and foreseen population increase. Hence, the integrity of Socotra's environment is at present considered remarkably high (probably the highest in the world) when compared with other similar inhabited islands. It is however under threat and requires immediate protection (see section 5.d)

The Yemeni government's and international community's ongoing efforts to conserve the island's environment and biodiversity, as detailed in the relevant sections of this document, attest to the significant national and international commitment to preserving Socotra's integrity, however highlighting the need for consistent and increased support for this unique site.

**(iv) The site is among the most biologically diverse and representative island ecosystems in the world**

The comparative tables provided in section 3.c highlight the high relative importance of Socotra when compared with similar islands around the world. When compared with other inhabited islands (see also section 3.c), the importance of Socotra ranks significantly higher, placing it amongst the top ten islands in the world in terms of biodiversity conservation importance.

97,5% of the entire archipelago is nominated as a WHS, ensuring the maintenance of its ecosystems' integrity and consequent ability to support islands' endemic biota.

## 4.

State of  
Conservation  
and factors  
affecting  
the Property**4a. Present state of conservation****Data on Species Trends and Integrity of Ecosystems**

For most species of wildlife in the archipelago, the first systematic studies were carried out only in recent years (1994-2004). This effort built upon the very important however yet relatively limited (with the notable exception of the islands' Flora) prior research carried out until then. This recent effort resulted in the publication of a large number of scientific papers and survey reports (see section 6.c) on key taxonomic groups, increasing the knowledge on the islands' biodiversity by over 500%.

Recent and prior studies focused mostly on the identification and description of new species to science, the production of species lists with species distribution maps, and the documentation of traditional practices and uses of plants. Very limited work has been possible on the ecology of species, and on species and habitats conservation trends.

Permanent monitoring programmes for terrestrial vegetation types, bird populations, underwater habitat types, nesting of marine turtles, fishing efforts, cave systems, meteorology, etc. have been initiated by EPA (in collaboration with several international institutions) in the period 1999-2001, and are ongoing, however at their very initial stages.

The above studies were designed to provide a "baseline scenario" on which to monitor future changes in species status and distribution, as well as the status of key ecosystems. Currently a Decision Support System (DSS) – a powerful database that will enable cross referencing of all environmental and development data related to the archipelago – is being developed by the EPA with support from the UN and IUCN, and in the future this is expected to enable greater precision and power in analyzing data collected in monitoring activities.

The baseline information available has also provided the basis for the preparation of the present nomination file, and is therefore largely presented in section 2.

The archipelago's present state of conservation is therefore discussed below in general terms, and considering the fact that any assessment of species or habitat trends may only be regarded as preliminary at this stage.



Sub-Sections:

- 1. General Ecology
- 2. Flora and Fauna
- 3. Marine Biotopes
- 4. Cave Systems

Important recent publications

Socotra has been fortunate to have had two exceptional scientific monographs recently published on the subject of its flora and fauna. The *Ethnoflora of the Soqotra Archipelago* (Edinburgh, 2004) was authored by Anthony G. Miller, Miranda Morris, Diccon Alexander and Ruth Atkinson and contains the results of several years of research by Miller and Morris. The volume contains a detailed documentation of the archipelago’s flora along with ethnographic notes on the uses of each plants. Similarly, the *Fauna of the Socotra Archipelago: Field Guide* (Rostock, 2003), authored by Wolfgang Wranik, O.S. al-Saghier, S. Aspinall, R.F. Porter and H. Rösler, provides general information on the animals of the archipelago. Volumes 19 and 20 of the scientific journal “*Fauna of Arabia*” are largely or entirely (Vol 20) dedicated to publications about Socotra, and contain the most recent and accurate accounts of recent scientific work conducted in the archipelago. Also the book “*Socotra: A Natural History of the Islands and their People*”. By Catherine Cheung & Lyndon DeVantier. Science Editor: Kay Van Damme (in press.) provides a comprehensive account on current knowledge on the archipelago’s fauna and flora and conservation issues

1. General Ecology

The general isolation of Socotra for the past centuries and the balance with the surrounding environment achieved by the local population have resulted in the archipelago’s ecology enjoying a relatively high degree of conservation and protection (Miller/Morris 2004). Monitoring activities carried out by the Environment Protection Authority (EPA) with support from the UN and in collaboration with major international research institutions funded under the UNDP-GEF project, over the past nine years have shown that the integrity of the island’s ecology is yet almost intact .

2. Fauna and Flora

Recent studies by Miller, Morris, Wranik, and many others on the rich flora and fauna of the archipelago have all been positive in their conclusions on the present status of key taxonomic groups and habitats. There is general concurrence that – should current conservation measures be maintained and consistently improved as done so far – the majority of Socotra’s flora and fauna may be able to withstand the potential severe pressures which threaten them.

Flora

The following table gives an overview of the status of the archipelago’s endemic plants which number 307, with an additional 7 varieties and subspecies, (following the most recent studies) according to the criteria of the World Conservation Union (IUCN):

| Table comparing the application of IUCN status based on the 1994 version and the 1999 review |              |             |             |
|--|--------------|-------------|-------------|
| IUCN Status  | 1994 Version | 1999 Review | 2001 Review |
| Extinct  | 0            | 0           | 4           |
| Critically Endangered  | 4            | 4           | 3           |
| Endangered   | 15           | 15          | 27          |
| Vulnerable   | 203          | 138         | 115         |
| Near Threatened  | 8            | 8           | 14          |
| Least Concern  | 44           | 111         | 118         |
| Data Deficient   | 23           | 23          | 33          |
| (taken from Miller/Morris 2001 and Miller/Morris 2004)                                       |              |             |             |

##### Fauna

Present knowledge on the archipelago's fauna and conservation status of key species is relatively well documented for birds, and significantly less for other zoological groups. This is due to the fact that, compared to the Socotra's flora, the island's fauna has been studied far less and further research in this field is greatly desirable. While it is quite possible that new species of flora may yet be found on Socotra, a greater number of new discoveries is likely to belong to the island's fauna. The most comprehensive recent survey of the island's zoology in 1999 resulted in the identification of, among other taxa, four new species of endemic gecko and one of freshwater crab, along with hundred of new invertebrates, in all cases species that are unknown elsewhere in the world.

Further studies are therefore required to allow a much more precise evaluation of the number of species of fauna on the island and the degree to which they are endangered. Currently, endangered animals include three bird species (the Socotra Starling *Onychognathus frater*, Socotra Cisticola *Cisticola haesitatus* and Socotra Bunting, *Emberiza socotrana*) that are at risk of global extinction, and three species of turtles (Hawksbill Turtle *Eretmochelys imbricata*, Green Turtle *Chelonia mydas*, and Loggerhead Turtle *Caretta caretta*) that are globally threatened. The Socotra Conservation and Development Programme (SCDP) has made it a priority to educate both local residents and tourists as to the status of the turtles and the importance of conserving their habitat.

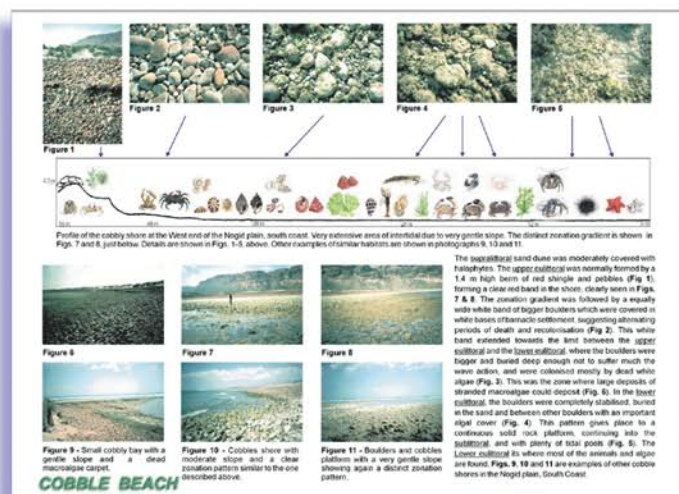
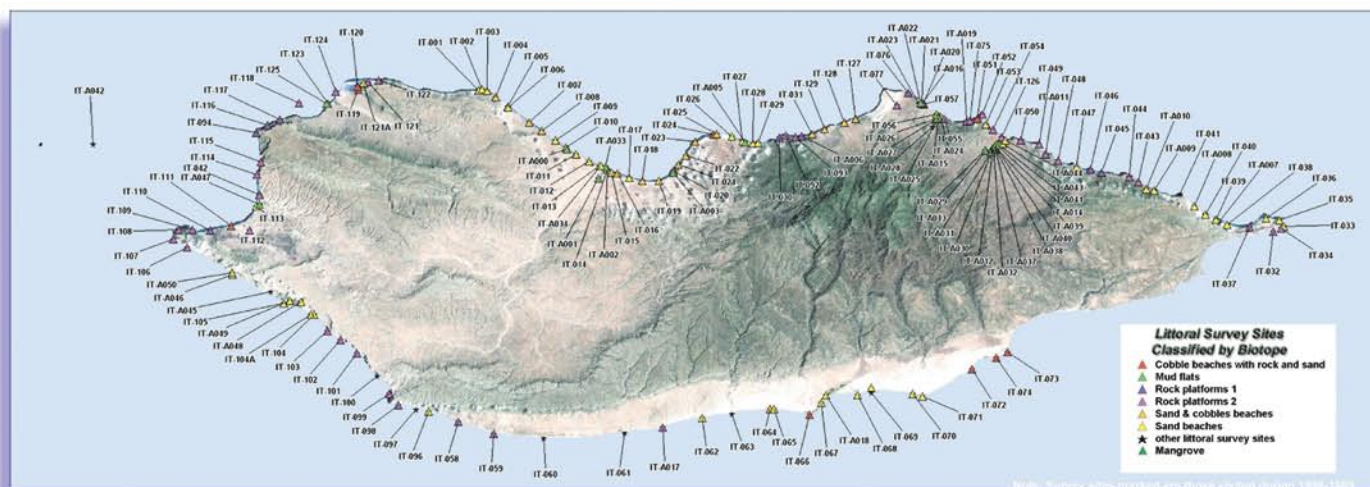
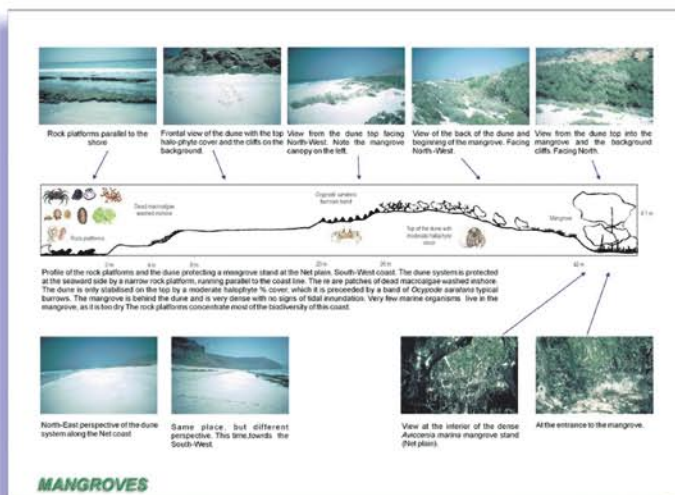
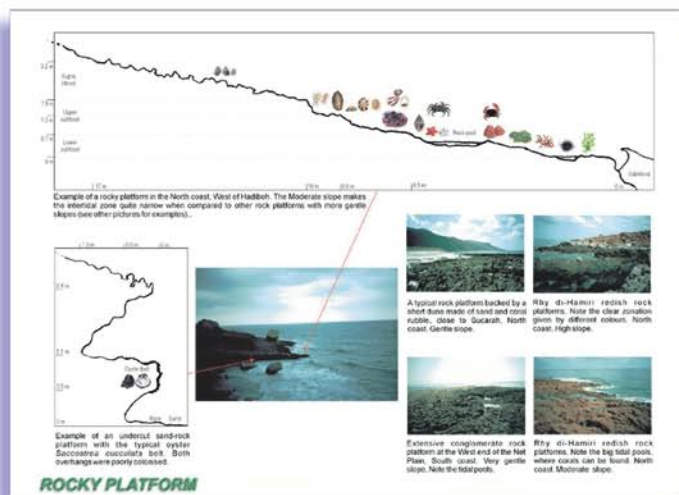
below

Socotra Starling

Photo by Richard Porter







### 3. Marine Biotopes

The coral associated fish communities of Socotra are unique, representing an overlap between east Africa and Arabian assemblages and playing an important role in facilitating gene flow between the Red Sea, the Gulf of Aden and the Indian Ocean.

The littoral and sub-littoral biotopes and especially coral communities of the archipelago have so far suffered minimal disturbance by human impact, particularly on the outer islands of Abd al-Kuri, Samha, Darsa and Kal Farun. Indeed, recent surveys indicate that the highest biodiversity with regard to coral reef fishes is to be found in the waters around Abd al-Kuri island. The stark contrast between the excellent conservation status of coral communities of Socotra and many other tropical areas deserves mention, for coral reef ecosystems globally are suffering from destructive fishing, pollution, sedimentation, port development and heat-induced bleaching, among other harmful practices. Socotra thus represents a rare opportunity to researchers to study intact coral communities and fish assemblages as well as to evaluate the impact of local, regional, and global environmental changes.

As Socotra is increasingly subject to the pressures of development, its marine biotopes have also been affected. Reef fish are increasingly sought out by fishermen, due to both national and international demand. The rise in tourism and the development of infrastructure may likewise prove detrimental for both coral communities as well as fish assemblages. The establishment, therefore, of marine protected areas according to the Zoning Plan of 2000 and the UNESCO Man and Biosphere Reserve of 2003, work to protect both coral and fish from these pressures and to maintain their status as reservoirs of biodiversity and replenishment.

### 4. Cave Systems

Socotra possesses a number of sizable cave systems found within the limestone plateau that stretches over much of the island, averaging between 300-700m in elevation. These have only recently begun to be explored by a team of international scientists in coordination with Yemeni authorities and academics. While local inhabitants have made use of smaller caves for centuries, some of the most extensive systems have only been discovered in the last few years, and their importance has yet to be fully ascertained. A total of over 22km of caves has so far been explored for the first time and mapped in recent years, and therefore are not yet exposed to significant pressure from i.e. visitors (with the exception of the accessible Hoq cave).

As the exploration of the caves continues, it is vital that attention be paid to their conservation and that access to them be monitored and limited. Failure to adequately protect these cave systems may result in these delicate environments suffering irreversible damage in the coming years.







## 4b. Factors affecting the Property

### (i). Development Pressures (e.g., encroachment, adaptation, agriculture, mining)

Precisely because of Socotra's isolation, the greatest danger the island will face in the near future is that of development and associated population increase and changes in traditional land management practices. The implementation of substantial additions to the island's infrastructure, including a road circling the island and a new expanded port will doubtlessly place increased stress on Socotra's environment. Following the opening of the expanded airport in 1999, the island has become accessible year round and while this has brought many welcome advantages, it has also increased the potential for immigration as well as external investment. It is the task of the Government of Yemen to manage the addition of infrastructure of Socotra in the coming years so as to minimize the negative effects of a process of development that is much desired by the local population.

The survival of the islands' wildlife and culture until now, doesn't imply there is any room for complacency. Even with built in safeguards, the balance between islanders and their environment is precarious. The problem is that Socotra's people are increasingly calling for the benefits that development would bring. Famine used to claim many lives during each summer drought-imports of milk powder, flour, cooking oil and rice, which began in the early 1970s, have largely put an end to that. But malaria and tuberculosis are still widespread and the infant mortality rate is 131 per 1000 (one of the highest in the world.)

In general, it can be stated that the more access is increased to different parts of the island (through improvements to roads, the building of a new port, the expansion of the airport), the more stress will be placed on the archipelago's environment. Development and construction projects could pose threats to the archipelago's indigenous and endemic species, if not carefully managed. In part to address this issue the Yemeni government approved the Conservation Zoning Plan for the Development of Socotra on the year 2000 (section 5.d).

The Environment Protection Authority (EPA) of the Ministry of Water and Environment, with support from the UN-led Socotra Conservation and Development Programme (SCDP) is mandated with overseeing and closely monitoring such dangers and working with developers to minimize the damage to the environment. Its current capacity does not however equate to the complex tasks that lie ahead, and recent UN assessments (SCDP project document YEM.03.004) indicate that the EPA and local government will require consistent improvement and international support over an extended period of time.

The main threatening processes identified for the islands include:



*above*

**Socotra port**

Photo by Mario Caruso

*below*

**Treatment for prevention of malaria**

Photo by Mark Jeffrey







above

Socotra Conservation and Development Programme (SCDP)  
Hadibo Headquarter

Photo by Mario Caruso

1. Habitat destruction (road, housing and infrastructure construction)
2. Direct species loss (timber collection for housing and urban fuelwood demand, grazing, fishing, invasive species)
3. Habitat degradation (grazing pressure and changes to traditional rangeland management practices, over-exploitation of water resources, climate change, waste disposal, erosion, soil degradation)

## Agents of change/Causes of threats

### Development planning and investments

In July of 1999, a new airport opened on Socotra. This new facility has made the archipelago easily accessible after centuries of virtual isolation. Other recent developments include the first paved roads, a port jetty, fuel storage facilities, new schools, improved telecommunication facilities, limited power supply in the central village of Hadibu, and the opening of small rest-houses. These developments and others have already brought positive changes to the lives of local people. Uncontrolled or inappropriate construction and investments, however, especially threaten the coastal zone. Unplanned infrastructural development is closely linked to poor governance, such as in the case of the expansion of the island's road system without undertaking proper environment impact assessments, and in spite of EPA's consistent efforts to mitigate the damage to natural habitats.



of Hadibu, and the opening of small rest-houses. These developments and others have already brought positive changes to the lives of local people. Uncontrolled or inappropriate construction and investments, however, especially threaten the coastal zone. Unplanned infrastructural development is closely linked to poor governance, such as in the case of the expansion of the island's road system without undertaking proper environment impact assessments, and in spite of EPA's consistent efforts to mitigate the damage to natural habitats.

### Population increase.

Determined by natural population growth, as well as by immigration, this is not a cause for immediate concern, but it represents an important factor to be kept in mind in all planning efforts and in future years .

The progression of development among local communities

Perhaps the most complex "agent of change" to appreciate in terms of its relationship to biodiversity conservation is the rising trajectory of human development on Socotra. This agent is driven by a multitude of factors: increased involvement with the outside world through



above

School and schoolchildren

Photos by Mario Caruso and Mark Jeffrey

political changes and development investments (particularly the airport); poverty alleviation support from national and donor interventions; improved education; globalization and improved communication (mobile telephone coverage of the island is in place as of mid 2005); migration of Socotris to the Gulf region; urban in-

migration; trade and interaction with coastal immigrants from the mainland – just to name a few.

Most Socotris still lag behind in most measures of human development. They live largely without access to safe drinking water, electricity, only rudimentary education, very limited health care, basic sanitation and means of transport. According to the UNDP Project Document Sustainable Development and Biodiversity Conservation for the People of Socotra Islands (YEM/03/004/A/01/99), Socotra is probably the poorest and most disadvantaged area in Yemen. Yet things are changing and Socotra's communities are opening up to new opportunities and new influences. While it is hoped this will bring sustainable human development, there is a risk that it could be achieved at the expense of globally significant biodiversity values, or even worse for Socotris – result in loss of ecosystem functions and services that will jeopardize any development gains.

The population of Hadibo – the main town – has increased significantly in the last decade.

Another example can be seen with communities that were traditionally cave-dwellers. Few of the upcoming generations wish to live in caves and are building new houses. The shift to urbanized, sedentary lifestyles bring new comforts but also erode traditional practices (including rangeland management) and place increased pressure on forest wood supplies for housing construction.

What is critical is the type of development brought to Socotra. The principal “development paradigm” (and source of development funding) for many local communities is the one they receive from relatives returning from the Gulf. This paradigm often translates into “big is better” – wider roads, larger constructions, more cleared areas – with engineered solutions for natural resource management and ecosystem services.

#### **Changes in traditional rangeland management practices**

Important reviews of rangeland practices on Socotra indicate that vegetation is still in quite good condition (Miller and Morris 2004). Socotra has been suggested as one of the best preserved semi-arid tropical islands in the world. This has led to the conclusion by some that islanders are managing the rangelands sustainably and that current levels of livestock (goats in particular) are not affecting flora composition of the limestone plateau and Hagghier mountains. However, it is becoming increasingly difficult to find seedlings and young trees of many important species, including *Dendrosychnus socotranus* and *Dracaena cinnabari*. Some endemic and endangered tree succulents are used as drought fodder. Although there is no information on how current livestock numbers compare to historical levels, with the growing population it can be assumed livestock numbers are historically high and therefore disrupting traditional equilibriums. In addition, many of the endemic tree succu-



*above*

**One of the new roads**

Photo by Mario Caruso

*below*

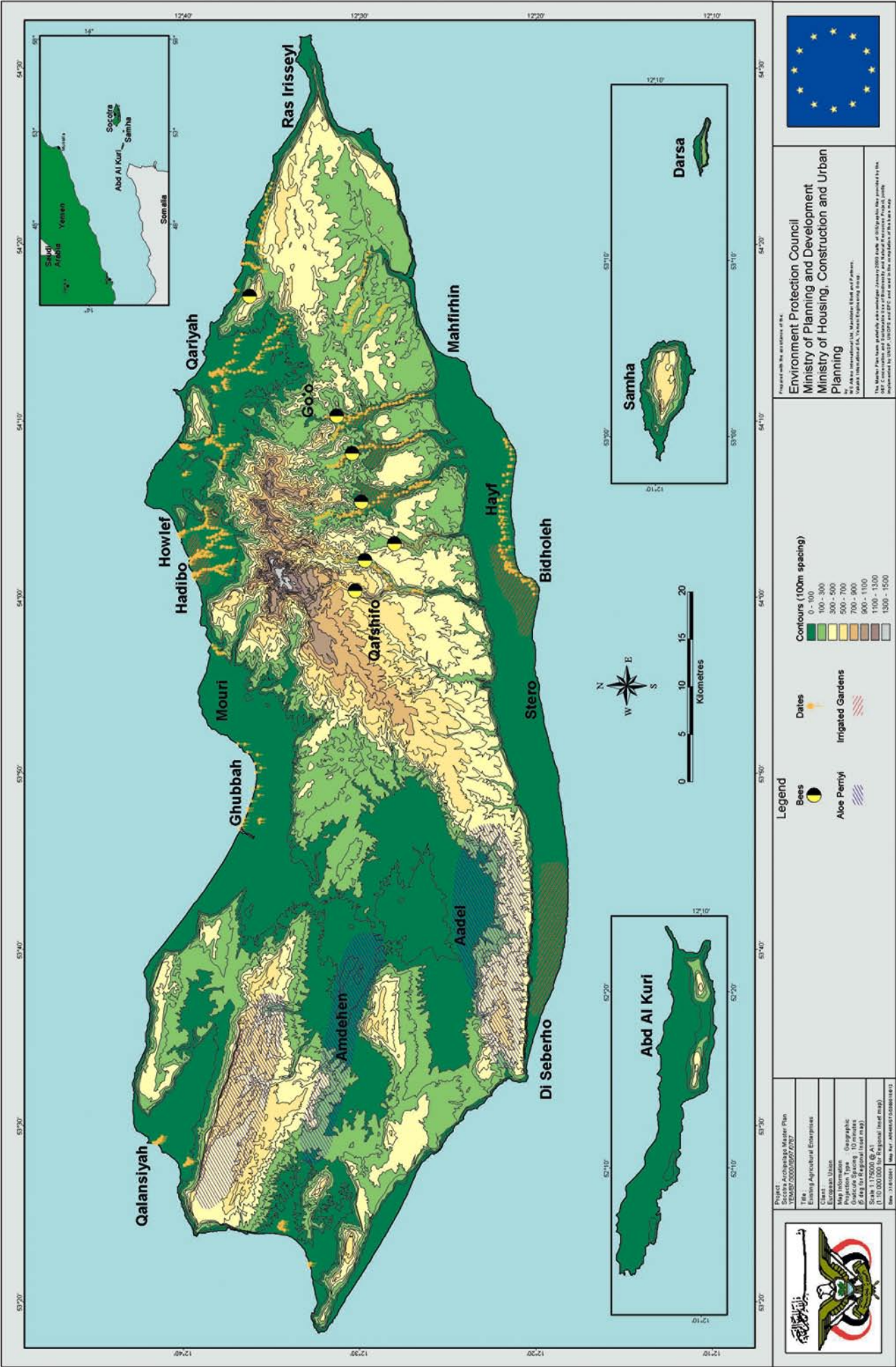
**Goats**

Photo by Mark Jeffrey





SOCOTRA ARCHIPELAGO MASTER PLAN  
Existing Agricultural Enterprises



### The principal threats to the unique vegetation of Socotra have been identified as follows

(Adapted from Miller and Morris, 2004)

1. Development of infrastructures
  - Uncontrolled and unmonitored sinking of wells
  - Construction of rainwater catchments
  - Piping water from the springs
2. Breakdown of traditional land management practices
  - Timber and fuel extraction
  - Plant products
  - Livestock and water management
3. Introduction of exotic plants
4. Plant collecting

Discussion of some of the likely impacts of these threats on the vegetation of Socotra:

#### 1. Development of infrastructures

The most obvious direct consequences of development are the immediate destruction of habitats, for instance by the clearance of vegetation for building, road construction, new date palm plantation and other cultivation.

There are more subtle (and difficult to predict) effects caused by changes in land use such as traditional areas of rangeland being denied to livestock and the widespread sinking of wells and installation of pumps to create new date gardens.

The effect of this new water management on the availability of water elsewhere and its possible effects on the vegetation should be carefully monitored. At present the direct effects of development are most evident on the coastal plains, particularly near large settlements, but they are spreading to other areas of the coast as people from the interior start to spend increasing amounts of time engaged fishing – currently the only profitable activity on the island. The adverse effects of development on vegetation are likely to be felt over a wider area and increasingly into the interior as new roads are constructed and older roads improved.

Another potential threat is likely to be destruction of the vegetation as direct consequence of new experiments in agriculture, which often involve heavy use of water, insecticides and chemical fertilizers and many introduce alien species that could pose a threat to the native vegetation. These are so far limited to the General Use Zones identified in the Conservation Zoning Plan (2000).

#### 2. Breakdown of traditional land management practices

The traditional land-use management practices employed by the indigenous population play a vital role in protecting against the overexploitation of natural resources and the diminution of biodiversity.

However, as people increasingly cluster together in hamlets, villages and town, many traditional land management practices are being modified or abandoned altogether.

This, together with the higher concentration of population in the larger settlements, increases local pressure on timber, fuel, water and livestock grazing.

#### Grazing

Pastoralists have an intimate knowledge of the island's vegetation, and appreciate its crucial importance to their continued survival. Livestock are grazed within traditional tribal boundaries, alternating between lowland and upland grazing at different seasons and thus allowing exhausted pastures a period of recuperation. However, changes caused in part by changing expectations as regards standards of living, and in part by a decline in the economic importance of the livestock sector, are already happening. In some areas signs of overgrazing are apparent, especially around the larger coastal settlements but also in other areas of the coast, as more people from the interior spend increasing amount of time engaged in fishing.

In some areas of the island, and on the outer islands, as livestock decrease in importance, increasing numbers of sheep and goats are left unattended the year round. This could quickly lead to overgrazing and even the eradication of vulnerable species from all but the most inaccessible ledges.

#### Timber and fuel extraction

Traditional rules, supported by the government, exist about cutting the more valuable species of live trees for building and other purposes – genuine need must be proved to the local community, and permission is not always given. However, enforcement of such rules is patchy and lopped branches are in great demand for a variety of building purposes, and there is no doubt that this poses a serious threat to the vegetation. Imported wood is expensive and not always readily

available, and local woods command a good price. There has been a building boom on the island since the 1970s and consequent pressure on timber resources. Disputes over land ownership and consequent breakdown of traditional controls is likely to place an increasing pressure on all trees.

Most of the people on the islands rely to a lesser or greater extent on wood for their heating and cooking requirements. Pestoralists in addition burn certain wood for the abundant smoke they produce as livestock smudges. However, the lack of other form of fuel, the rapid growth of many coastal settlements and the rise of new ones poses an obvious threat to the vegetation. In some of the inland villages the inhabitants have to go further and further in their search for fuel wood.

#### Plant products

The commercial exploitation of the vegetation is limited to certain resins and gums for local sale, some fruits and roots, various lichens, dracaena products for export, products from *Boswellia* species, certain scented wood, aloes and wood for building and fuel. With the possible exception of aloes and wood for building and fuel, we do not consider the current rate of extraction for commercial purposes to pose any threat to the vegetation.

Bitter aloes – the juice of *Aloe pernyi* – has important pharmaceutical and medicinal uses. At present this species is widespread and abundant in places and is not threatened by the sustainable, small-scale traditional exploitation. However, there is a real threat of overexploitation leading to extinction if the market for it opened up further.

A potential threat to the long-term survival of *Dracaena cinnabari* is the overexploitation of “dragon's blood” – a resin obtained from the bark of the tree. At present the demand is small but a major increase in demand could be very damaging. Another threat is from the use of the trunks to make beehives. There was recently a case when over 20 trees were felled to make beehives for export to mainland. This incident was generally condemned on the island but illustrates how a breakdown in traditional practices poses a very real threat to species on the island.

#### Livestock management

Livestock are currently carefully managed but if traditional controls are relaxed or lost there is a great risk to vegetation and environmental quality on the island.

The main threats are associated with :

- Uncontrolled breeding.
- Rises in livestock numbers due to supplementary cereal feed and rearing male young rather than slaughtering them.
- Livestock running free rather than being closely herded.
- Human population movements to larger settlements, where practice of keeping a household herd in addition to the main one increases the pressure on grazing around these settlements.

#### 3. Introduction of exotic plants

At present introduced exotic plants pose no threat to the vegetation. However, with the opening up of the island, they could become a problem. Examples abound on other islands where introduced plants have invaded and outcompeted the native vegetation. The introduction of living plants (including seeds) should be closely monitored. There are already examples of an introduced species of legumes near the airport. This legume is a major problem on the near by mainland. A program to eradicate the species on the island has been undertaken.

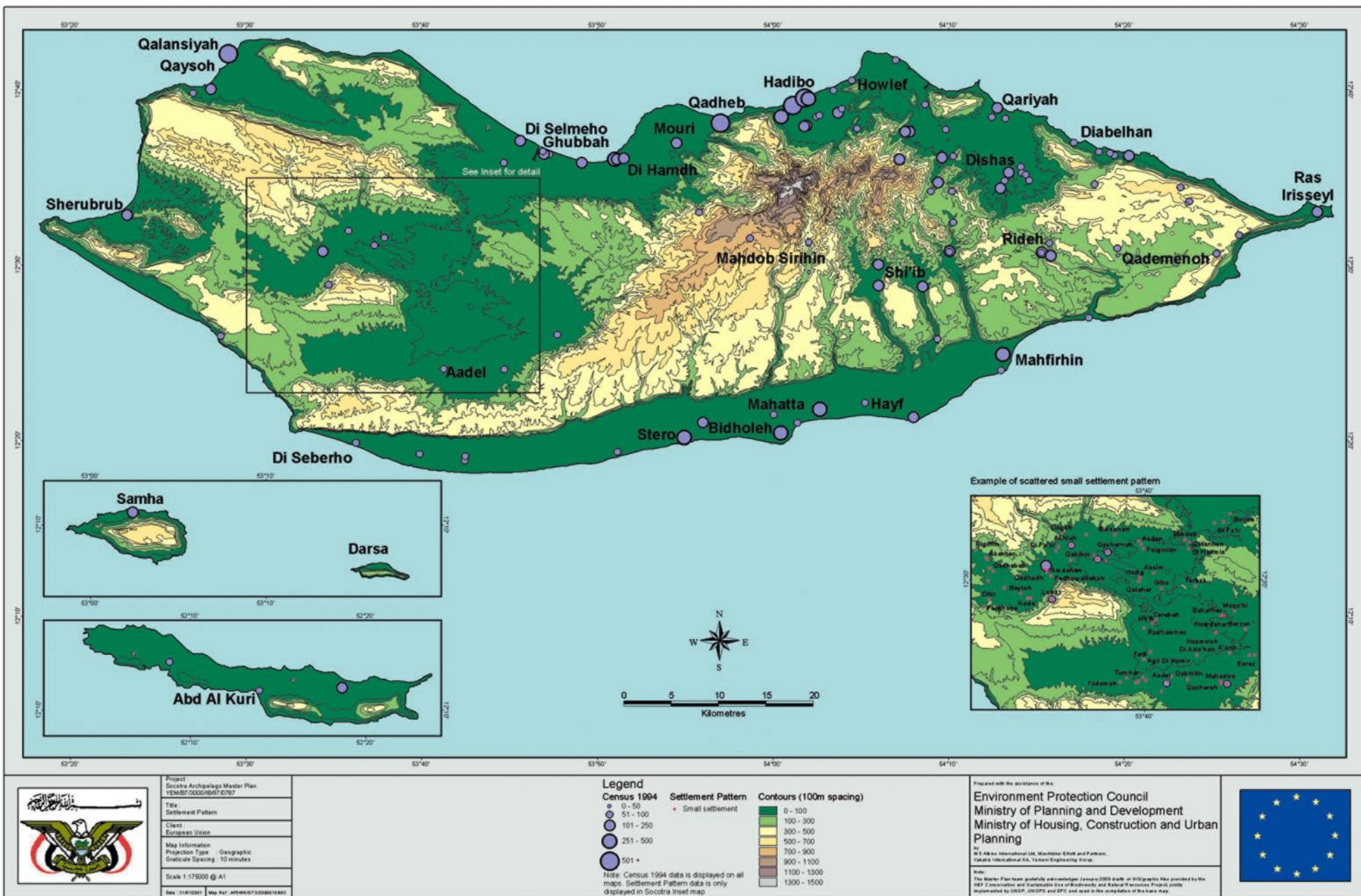
#### 4. Plant collecting

The uncontrolled collection of plants by amateur and professional collectors for private collections is a potential threat to certain succulent species.



# SOCOTRA ARCHIPELAGO MASTER PLAN

## Settlement Pattern





lents have very long life cycles and changes in ecosystem species composition may be slow to become evident. Grazing pressure are generally considered a threat.

Even if grazing is not directly causing the loss of globally significant species there is likely to be indirect effects, as Socotra's soils may be vulnerable to the degrading impacts of cloven-hoofed ruminants.

#### **Records on the Impact of Livestock on Vegetation**

Following the somewhat pessimistic reports of the Radcliffe-Smith and Lavranos expedition to the archipelago in 1967, it was feared that the vegetation was suffering from over-harvesting and the uncontrolled grazing of goats. Yet, in 1985 when Quentin Cronk of Cambridge University visited the island he estimated that the vegetation had changed little if at all since Balfour's expedition in 1880. Indeed, recent records (Miller & Morris, 2004) seem to indicated that the tendency of visitors newly arrived on the island to attribute a decline in the vegetation only to goats should be considered as overly hasty.

#### **Marine biotopes**

As Socotra is increasingly subject to the pressures of development, its marine biotopes have also been affected. Reef fish are increasingly sought out by fisherman, due to both national and international demand. The foreseen rise in tourism and the development of infrastructure may likewise prove detrimental for both coral communities as well as fish assemblages.

A detailed account on the principal identified threats to the vegetation of Socotra is provided by Miller and Morris (2004) and is summarised in the box at page 93.

*below*

**Livestock**

Photo by Mark Jeffrey







*above*

Socotri shepherd

Photo by Mark Jeffrey



## Introduction of invasive species

### Animals

A danger that is especially pertinent to islands such as the Socotra archipelago is that of the introduction of non-native species. It has been observed that the indigenous *Hemidactylus* gecko is no longer found in the capital Hadibo, due the presence of the non-native *H. flaviviridis* and *H. turcicus*, which have presumably filled the ecological niche of the native species. Additionally, in the 1990s the Indian House Crow (*Corvus splendens*), was found living near the airport. Efforts are currently underway to eradicate the crow as it could pose a threat to native wildlife.

### Plants

Earlier attempts to eradicate introduced plants have been successful for the most part (i.e. *Prosopis juliflora*), although EPA/SCDP is still struggling with the invasive species *Argemone Mexicana*, *Calotropis procera*, *Leucaena Leucocephala* and *Parkinsonia aculeata*.

### Control Measures

The threats here listed represent the main challenge faced by the various monitoring and education/awareness programs implemented by the EPA / SCDP, including a web of extension officers who work locally within communities over the entire island and report threats to the environment and changes in traditional customs to representatives of EPA / SCDP.

Traditional Socotri customs related to conservation are strongly tied to the non-urban lifestyles of the inhabitants with their ties to, on the one hand, the herding of sheep, cattle and goats, and on the other, to fishing. These customs have been observed to gradually disappear in the large settlements, suggesting that future conservation efforts within the archipelago will be negatively effected in two fashions by the rapid expansion of urban areas:

- (1) the direct damage caused to the ecology itself
- (2) the damage caused by the loss of traditional social values which functioned to conserve the environment

The Zoning Plan of the Archipelago foresees the ongoing participation of the local community in the island's conservation. To counter these threats to the environment, the Awareness and Education branch of the EPA holds local meetings in communities across the island and plans and carries out school visits to heighten the awareness of the next generation regarding the importance of the environment. Working with a network of 35 local extension officers, this branch is able to carry out over 70 meetings with local communities each month, imparting relevant information regarding the environment and ascertaining what threats or stresses may have arisen with regard to the community and its environment.

#### The Impact of introduced Indian House Crow (*Corvus splendens*)

By Richard Porter

The House Crow if not controlled could have adverse impact on Socotra native fauna, and even on agricultural practises and animal husbandry. It is good that EPA Socotra has an active control programme and this must be encouraged.

The House Crow is a noisy, aggressive omnivore and predator that feeds largely on human scraps, fish scraps, small reptiles, invertebrates, eggs, nestlings, grain and fruits. House Crows will take young domestic fowl and raid the nests of native birds.

If not controlled House Crows can reach high population densities in urban areas, especially where introduced (when they seem to breed more readily) and large groups may gather at sources of food. They are noisy and can be very aggressive over food or when defending breeding territory or young. If alarmed their cries will quickly attract other crows.

They will mob birds of prey relentlessly and thus could impact on the breeding success of the native Egyptian Vulture, Kestrel and endemic Buzzard.

House Crows' close association with man often leads to them achieving pest status. Their main impact in areas where they have been introduced is: human food theft, damage to crops, poultry and livestock, predation of native birds and their eggs, noise and also their potential health risk.



## 4b. Factors affecting the Property

### (ii). Climate change

Long- and medium-term climatic change in the region leading to a gradual drying of the Archipelago is an unproven but likely scenario. The evidence for increasing aridity is indirect. No direct paleoclimatic data are available for Socotra, but there is strong evidence that the islands have been getting drier over the last few hundreds of years. In some areas of Socotra there are disused field systems with associated farmsteads, sophisticated irrigation networks and laboriously constructed thoroughfares linking the main region of the island. Archaeological activity is still in its infancy on the island but these structures suggest that there used to be farms with rain fed agriculture in these areas, which would have required more rain than falls at present. The impact of increasing aridity is lessened on Socotra by organic rainfall (caused by the mountains standing in the path of moisture-laden air) and the buffering effect of the surrounding seas. Furthermore, many plants on the islands are adapted to xerophytic condition. Extinctions caused by drying may not be on a catastrophic scale and are beyond control, however many species could experience a drastic reduction in the size and extent of their population. Such a decline for species such as *Dracaena cinnabari*, which characterize the vegetation, would have a major impact on the ecology of Socotra.

### Pollution

At present there are no significant local or nearby sources of major environmental pollution. However the archipelago lies close to important shipping lines, and therefore the risk of pollution (i.e. oil spill) linked to a shipping accident is a possibility that should not be excluded. There are currently no specific risk preparedness measures put in place by the Government of Yemen in this respect.

*brlow*

Haggier Mountains

Photo by Nigel Pavitt





## 4b. Factors affecting the Property

### (iii). Natural disasters and risk preparedness

(earthquakes, floods, fires, etc.)

At the present state of knowledge, Socotra does not stand at any significant risk from earthquakes and major natural disasters. The natural flash-flooding of dry river beds (wadi) that occurs seasonally is a natural reflection of Socotra's annual weather patterns. Seasonal flash-floodings have caused significant damage to man-made structures that were built along the dry wadi beds (last major flooding event recorded in Dec 1999)

*brlow*

Deksam

Photo by Nigel Pavitt

The south and south-western coasts of Socotra was affected by the recent Tsunami of December 26th, 2004, with severe damage to buildings along the coastline and loss of boats and fishing equipment estimated at approx. \$170'000 (*See also National Rapid Environmental Assessment – The effects of the Tsunami on Yemen, UNDP, 2005*).





## 4b. Factors affecting the Property

### (iv). Visitor/tourism pressures



above

Plate at Homil campsite

Photo by Mario Caruso

below

Homil campsite

Photos by Mario Caruso



An important pillar of the development strategy of Socotra is its consolidation as an ecotourism destination as a vehicle for job creation and poverty reduction on the island. Well-planned and properly managed eco-tourism is generally not looked at as a threat, but rather as an opportunity for supporting local livelihoods. A number of initiatives have been undertaken by the Government of Yemen with support from various donors, led by the UN SCDP, to develop the island as an ecotourism destination, these include:

- A number of baseline studies on tourism development issues (Ceballos-Lascurain H., 1999; WS Atkins International 2001; Ecotourism Development Strategy, P. Mackay, 2003; J. Jessamine, 2005)
- The construction of two tourist campsites, with funding support from the German and Japanese Embassy in Yemen
- The establishment of the Socotra Ecotourism Society, as an Ecotourism and conservation NGO based on Socotra
- The establishment of village tourism associations related to ecotourism sites
  - The construction of tourist information centres at the airport and in Hadibo
  - The training of ecotourism guides and drivers
  - The training of specialist diver guides for marine protected areas
  - Language training for tourism staff

At present visitor arrivals to Socotra are yet very low, numbering no more than 450 tourists in 2004. In addition the profile of the majority of arriving visitors does not yet correspond to the target ecotourist segment. Many of the tourists are general cultural or adventure tourists motivated by visiting a new destination and in particular the island's many fine and deserted beaches, they exhibit little interest in the specialised environmental aspects of Socotra.

Internationally it has been estimated by the WTO that nature tourism some generated 7% of all international travel expenditure. While, in 1997, tourism was enjoying global growth of 4% nature tourism was growing at a rate of between 10% and 30%. While these figures are global averages and identifying the market potential of Yemen, and Socotra in particular, will require detailed study they provide a broad measure of the potential for ecotourism in the country. With 154,000 arrivals in 2003 some 10,000 were potentially ecotourists, as the

#### 4. State of Conservation and Factors affecting the Property

prime ecotourism attraction in Yemen one would expect Socotra to attract a higher proportion of these visitors.

The current slow pace of tourism development on the island is therefore not yet posing a significant threat to the environment of the island. However there is at present a great deal of uncertainty over the scale of eco-tourism development on Socotra. In the absence of clear development parameters there is evidence that coastal land speculation is now being experienced on the island in anticipation of large-scale development. At the same time there is growing concern amongst the local community that the tourism industry will overwhelm their traditional lifestyle and values.

The development of a proper ecotourism development strategy is therefore urgent and of paramount importance to prevent potential negative impacts on the islands' unique natural and cultural heritage. While an extensive series of studies have been undertaken to develop tourism infrastructure and train local guides, no marketing studies or initiatives have been undertaken for the island.

In many respects to situation on Socotra mirrors the national picture: little or no contribution is made by the Yemen Tourism Promotion Board to marketing Socotra as an exceptional ecotourism destination. In addition, the investment promotion

*below*

**Dive guides**

Photo by Mark Jeffrey



*below*

**Erreher**

Photo by Mario Caruso





activities of the General Tourism Development Authority appear to conflict with the objective of developing a sustainable ecotourism destination of Socotra.

Although Socotra has been identified as an ecotourism destination aimed at the highly specialised development of 'ecolodges' for limited, and possibly restricted, numbers of visitors the investment promotion agency, the Yemeni General Tourism Development Authority (GTDA), appears to promote the island as a resort destination to potential investors. This uncoordinated approach has led to some concern on the island about the possibility of it being developed as a mass tourism destination to the detriment of its unique environment and social structures.

Specific recommendations were recently made for the development of ecotourism on Socotra (Jessamine, J., 2005). Confirming that as a matter of some urgency a study should be undertaken to prepare a development strategy for ecotourism on the island. Key elements of this proposed study are:

- The identification of the tourism carrying capacity of the island, to determine the quantum of tourism development that should be permitted on Socotra.
- Ecotourism product identification and development
- Ecotourism marketing, to identify key source markets and operators
- The preparation of a short-term action plan for marketing the destination as well as a long-term marketing and communications strategy for the island.
- The preparation of a Human Resources Development Strategy for ecotourism on Socotra.

No additional legislation is required for environmental protection or tourism development as sufficient legal powers exist in the Environmental Protection Law and Presidential Decree 275 of the year 2000 declaring the island to be a special protected area. Enforcement of existing legislation and guidelines is however poor and efforts should be made to reinforce the capabilities of both the Environmental Protection Authority and the Ministry of Tourism on Socotra.

In order to generate income in support of ecotourism development activities it is also recommended that a Tourism Fee of \$50 per visitor be levied on tourist arrivals to Socotra. Income derived from this fee should be managed by the Socotra Conservation Fund and distributed to local environmental NGOs, such as the Socotra Ecotourism Society, as well as being used to fund local community development programmes.

It is further recommended that a Socotra Tourism Steering Committee be established to coordinate the activities of all agencies and liaise with local government. As, over the medium term, stronger and more coordinated national tourism structures are formed the need for this committee may be reviewed.

## 4b. Factors affecting the Property

### (v). Number of inhabitants within the property and the buffer zone

Recent reliable estimates (WS Atkins International, 2001; UNDP, project YEM /03/004, 2003) placed the population of the archipelago at ca. 44.000, roughly half of which live in the two main settlements of Hadibo and Qalansiyya. Numbers from the 1994 census indicated approximately 36.000 and official figures from the 2004 census confirmed a population of approximately 43,000 (see table below).

| Official Figures, Population Census 2004 (source: SCDP) |           |             |        |          |        |
|---|-----------|-------------|--------|----------|--------|
| Districts   | N. houses | N. families | N male | N female | Total  |
| Hadibu  | 5.663     | 4.410       | 16.953 | 15.332   | 32.285 |
| Qalansia & AbdelKuri                                    | 942       | 1.125       | 5.748  | 4.809    | 10.557 |
| TOTAL Archipelago                                       | 6.605     | 5.535       | 22.701 | 20.141   | 42.842 |

A variety of other (generally higher) figures for the population of the archipelago can be found in several documents, however none of these are based on reliable sources. The figures cited in this form are the only ones based on official censuses and well documented field work and associated findings or direct estimates, conducted in recent years by the Government of Yemen (EPA) with UN and EU technical support.

*below*

Village near Qalansiyyah

Photo by Nigel Pavitt





# 5.

## Protection and Management of the Property

### 5a. Ownership

The Socotra Archipelago is territory of the Republic of Yemen. It is part of the Governorate of Hadramawt, and includes two Districts (Hadibo and Qalansiyya).

Outside the few urban areas of Hadibo, Qalansya and some other small centres, traditional land use rights apply (see recent letter from the Ministry of Land, ANNEX A.1). The absence of private ownership rights on land is common to most rural areas in Yemen, and implies that the land and its resources, are commonly owned by tribal groups, that manage them according to centuries old traditions.

## 5b. Protective designation

The basis for the conservation and management of the archipelago rests in the Zoning Plan (Presidential Decree 275, issued in September 2000 - *See 7.b*).

The implementing authorities for the measures outlined in the Conservation Zoning Plan are the Environment Protection Authority (EPA), of the Ministry of Water and Environment (MOWE). In collaboration with the Ministry of Housing and Public Works, the Local District Councils, and all other relevant government stakeholders.

The legal basis for the Zoning plan can be found in Yemen's Environmental Protection Law (no. 26) of 1995 (see annex A.2), which lays out the legal framework for

The Zoning Plan divides the archipelago into the following areas:

### First:

#### **(a) Resource Use Reserve:**

The objectives of these areas are as follows:

- To protect and maintain the unique biological diversity of the Socotra islands, as well as other natural and cultural sites of interest.
- To maintain and, where appropriate, enhance the existing traditional management practices for the sustainable use of natural resources.
- To protect the natural resource base from being alienated for other land and resource use purposes and other development activities.

Areas:

- Approximate Total Area covered (terrestrial): 890 km<sup>2</sup>
- Percentage of Total Land Area: 23.5%
- Approximate Total Area Covered (marine): 16498 km<sup>2</sup>

#### **(b) General Use Zone:**

The objectives of these areas are as follows:

- To allow for the development of essential infrastructure required to improve the standard of living of the local community (i.e. roads, power lines, and commercial development) while doing the utmost to minimize negative impact of the environment.

Areas:

- Approximate total area covered (terrestrial): 55km<sup>2</sup>
- Percentage of total land area: 1.4%
- Approximate total area covered (marine): 1 km<sup>2</sup>

### Second: National Parks

The objectives of these areas are as follows:

- To protect the unique natural habitats and landscapes of Socotra islands, which are of substantial national and international significance for scientific, educational, and ecotourism purposes.
- To perpetuate representative examples of the unique biotic communities, genetic resources, and endemic species, found in the Socotra islands, and to maintain biodiversity.
- To manage these areas in a sound environmental manner for educational, cultural and recreational purposes.

Areas:

- Approximate total area covered (terrestrial): 2748 km<sup>2</sup>
- Percentage of total land area: 72.6%
- Approximate total land area covered (marine): 1514 km<sup>2</sup>

### Third: Nature Sanctuary

The objectives of these areas are:

- To preserve rare and fragile habitats, ecosystems, species and unique landscapes in as undisturbed a state as possible.
- To maintain the essential natural attributes and qualities of the environment over the long term for future generations.

Areas:

- Approximate total area covered (terrestrial): 95 km<sup>2</sup>
- Percentage of total land area: 2.5%
- Approximate total area covered (marine): 154 km<sup>2</sup>.

Additional protective designation include:

1995 - ENVIRONMENT PROTECTION LAW No. (26) of the Republic of Yemen

2003 declaration of Socotra archipelago as a Man and Biosphere Reserve

2004 Cabinet Decree no 47, endorsing the archipelago development Masterplan (prepared by EPA with EU support, in consistency with the Conservation Zoning Plan)

A wide range of Local and central Government Decrees have been issued in support of the above general protective designations, including:

- land ownership and investment regulations (2005)
- restrictions on collection of dead coral (2004)
- regulation of lobster fishing (2004)
- regulation on Export and import of biological material from the archipelago of Socotra
- regulatory agreement for the implementation of applied biodiversity research in the archipelago (EPA, 2000)



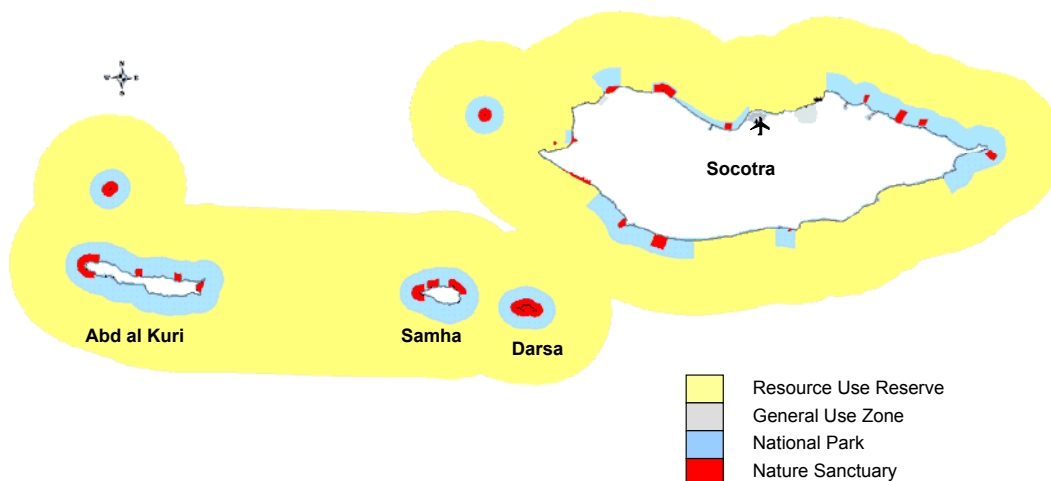
the establishment of protected areas and their administration. In light of this law, the Zoning plan gives EPA/MOWE the legal authority to administer the environment of the Socotra archipelago and requires that it be consulted for an Environmental Impact Assessment (EIA) with regard to any planned construction within the archipelago.

The Conservation Zoning Plan - *See annex A.8* (in effect since 2000 as per the Presidential Decree No. 275)

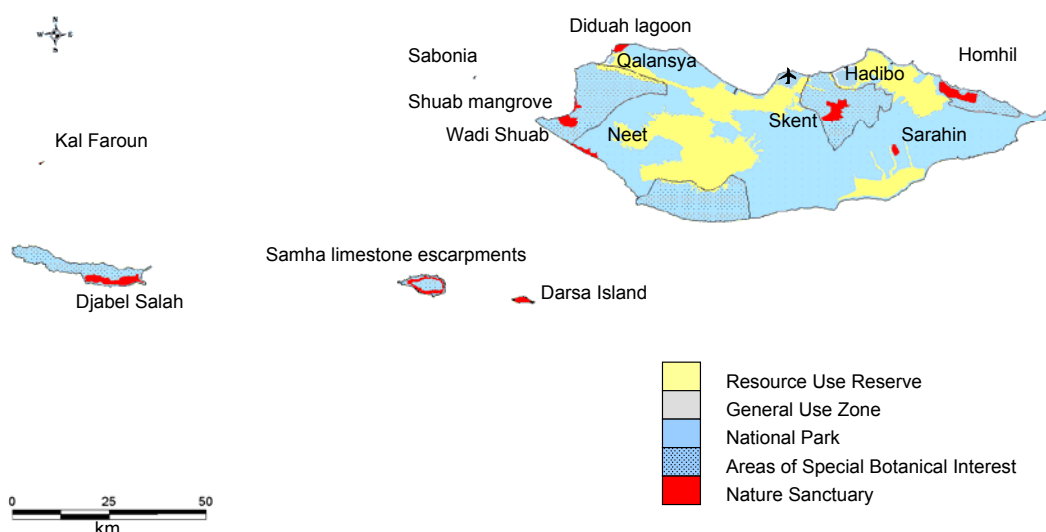
The Conservation Zoning Plan of Socotra Archipelago was prepared on the basis of (a) all previously existing studies on the archipelago, and (b) extensive fieldwork and data collection carried out on site by the EPA/UNDP/GEF Socotra Biodiversity Project. This was parallel to an extensive consultation process with the local community, throughout the archipelago.

A total of 31 Yemeni and 29 International experts from a wide range of regional and European institutions joined forces with the GEF project team and mapped the terrestrial and marine biodiversity of the archipelago into different zones: Resource Use Reserve, General Use Zone, National Park (including areas of special botanical interest for terrestrial areas) and Nature Sanctuaries.

**Marine Conservation Zoning Plan for the Socotra Archipelago**



**Terrestrial Conservation Zoning Plan for the Socotra Archipelago**



## 5c. Means of implementing protective measures.

As stated above, the EPA/MOWE are empowered through the Environmental Protection Law of 1995 and the Zoning Plan of 2000 to take every necessary step to protect and conserve the unique environment of Socotra.

In the event of an infringement of these laws, EPA / MOWE can order the activity in question to be stopped and bring it to the attention of local and national authorities (refer to articles 75 through 95 of Yemen's Environmental Protection Law). This has been confirmed in recent Government decrees of 2004, largely focusing on the procedures to be followed during the construction of new roads on the island.

The ongoing improved cooperation between EPA/MOWE, relevant line Ministries and on-site contractors responsible for the construction of Socotra's road network and port is a result of years of conflict and confrontation. However, the performance of appropriate EIA for development projects is a major issue in Yemen in general, and even more critical in the sensitive habitats of Socotra. The capacity of the EPA to supervise and enforce existing legislation on EIA is yet suboptimal, and several major development projects are yet being implemented by the government itself, without proper prior studies. It is only in the case of Socotra that some major road plans have been adapted to the conservation zoning plan (2003), and this has set an important precedent for other parts of the country.

The lack of EIA enforcement capacity within MOWE/EPA, and the poor project planning capacity of relevant Yemeni ministries (namely housing and construction), is resulting in adverse impacts on the habitats of Socotra related to the construction of new infrastructure. Major donors are supporting the strengthening of EIA capacity in Yemen (i.e. the World Bank), as part of their efforts to help Yemen develop a suitable network of infrastructure.

### Article 75 of the Environmental Protection Law (no.26)

The environmental inspectors shall be entitled to perform the capacity of judicial apprehension.

### Article 76 of the Environmental Protection Law (no.26)

Inspectors of all concerned environmental bodies who have the judicial capacity in accordance with the provision of the previous article shall undertake the checking of violations and crimes related to the environment, and shall write the minutes of apprehension specifying the type of violation or the crime and the offender of such, and the date of the apprehension and its findings including the place of its occurrence.

They shall also be entitled to inspect the establishments and installations if there are evidences that one of the following cases exists:

- Activity that will harm the environment.
- An establishment or project that is operating without obtaining the environmental license.
- Discharge in contravention to the law.
- Assault on marine and terrestrial life or terrestrial flora or the natural protected areas.
- Having not obtained the license, the documents and records that are related to the implementation of the rules of this law.

Addressing this issue will require significant improvement of EIA and law enforcement capacity, as well as strengthening of local and central governance. While Yemeni Government and donor efforts are now consistently focused in this areas, it is recognised that this capacity building process will require an extended period of time (10-20 years). During this period, the survival of the unique habitats of Socotra will yet largely rely on the combined efforts of the Yemeni Government and the international community.

Existing protective legislation represents a suitable basis for the sound development of the islands. However this is not yet matched by adequate professional capacity and financial resources within the Government of Yemen, to ensure appropriate implementation of the conservation plans.

The Government of Yemen has found difficulties in allocating sufficient financial resources for the long-term



conservation of the archipelago, due to its relatively limited population and peripheral location. This has resulted in the sub-optimal allocation of resources to the archipelago, which remains the poorest area with lowest development indicators in a very poor country like Yemen. In this context, the attention assigned by the international community and UNESCO to the preservation of the unique natural and cultural heritage of the islands play a critical role in supporting the mobilization of required financial resources (nationally and internationally) for the appropriate development of island.

The Environment Protection Agency and existing capacity to implement the Conservation Zoning Plan

### **Background**

The EPA is part of the Ministry of Water and Environment and it is the national government body mandated with a wide range of tasks related to environmental protection.

The EPA first established a one-man branch in Socotra in 1996, and has since then received significant government and donor assistance to develop the essential capacity and infrastructure required for the long-term conservation of the archipelago. A significant effort was performed to build local professional capacity in the field of environmental conservation. The results have been strikingly positive, especially in consideration in the context of Yemen and Socotra in particular, where no such capacity existed before.

### **Staffing, Facilities & Equipment**

At time of writing (2005) the EPA branch in Socotra includes over 80 qualified staff in the island, and this team is supported by a team of 5 staff in the capital Sanaa. The staff of EPA is posted throughout the archipelago (including all inhabited outer islands), and is almost entirely composed of local Socotri staff.

The EPA branch in the island has offices in Hadibu and Qalansya (district capitals) with well-equipped facilities including computers, email connections, laboratories, diving equipment, various research equipment, herbarium, education/training centre, library, communication equipment and 5 4WD vehicles.

The EPA therefore represents by far the best-equipped and staffed government entity on the island, with all other government bodies (with the notable exception of Health, Education and Agriculture) being represented by few staff, with very limited professional capacity.

### **Technical know-how**

All professional staff of the EPA has been recruited and trained in the period 1998-2005 in the framework of donor-assisted conservation projects implemented by UNDP and funded by mainly by the GEF, Netherlands, and Italy (ongoing).

At the outset of such training and capacity building programmes, the professional capacity of islanders in general was extremely low, and a significant effort was performed in recent years to create a committed team of local professionals. This successful process is however yet ongoing, and it is expected that several years will be required before the local EPA team will be fully independent from external (largely international) technical support to perform the many critical tasks that lie ahead to steer the development of the island in the right direction.

### **Institutional issues**

The EPA at national level is yet a relatively weak organization, struggling to gain political clout and recognition. The relatively recent (2001) incorporation into the Ministry of Water and Environment as somehow strengthened the institution. However the professional capacity and resources available within the EPA at national level are yet well below the minimum required to effectively perform their mandate.

This fact is widely recognised in all recent Government and Donor assessments, which all agree in the need to provide technical and financial support to this important however yet weak institution.

### **EPA Training Needs**

A comprehensive training needs assessment for the EPA team of the Socotra Branch was conducted in 2004, and the EPA is going through a process of change to be able to cope with a new set of more complex tasks. To support this change the UN-led EPA/SCDP is implementing a comprehensive training programme, to consolidate the professional capacity of the EPA staff and local partners in their relevant fields.

It has been widely recognised that the EPA achieved an enormous amount in terms of staff development, considering the low staff educational baseline from which it started. The very existence of the ongoing donor assisted projects is itself the greatest testimony to what the EPA has achieved in recent years, in terms of human resources development. However, the upcoming challenges of the EPA raise the required skills bar much higher.

It is clear that the management skills and competencies required for the EPA to achieve its objectives are going to be very different and of a significantly higher level, than those developed during recent years and currently existing. Training to upgrade these skills will therefore be the management priority for the ongoing SCDP/EPA project (2003-2008).

The key identified priority training needs for the EPA team are to improve generic skills in management at all levels and particularly amongst programme management and section heads. It is also critical that EPA creates a professional capacity to grasp the complex and sometimes seemingly conflicting development issues in which the EPA Programme is engaged. In addition, an ongoing programme of more focussed English language development is of high priority.

This training should allow a proposed reorganisation of the EPA Socotra Branch and SCDP programme management to achieve its necessary objectives, of increased delegation, allowing more management effort to be directed to the new and challenging programme activity streams (community development and governance) whilst building protected area management and eco-tourism on the more established 'scientific' knowledge base. The proposed training will also create a greater capacity for coordination, programme monitoring and strategic planning, all pre-requisites to meeting the EPA/SCDP programme objectives.



## 5d. Existing plans related to municipality and region in which the proposed property is located (e.g., regional or local plan, conservation plan, tourism development plan)

In addition to the Conservation Zoning Plan, other important plans which relate to the future management and conservation of Socotra include:

1. The Socotra Archipelago Development Masterplan (2001)
2. The Socotra Archipelago nature-based Tourism Development Plan (2003)
3. The SCDP Project Support Document (2003)

### 1. The Socotra Archipelago Master Plan

The EU-sponsored SAMP project was implemented under the umbrella of the MOPD, by a consortium of national and international consultants, led by WS Atkins (UK). The project entailed a comprehensive planning process, which was implemented from October 1999 and final results were produced by mid 2001. The project entailed two distinct phases:

#### Phase 1

Comprehensive review and updating of existing information on the islands, resulting in a set of sector reports that present and analyse information gathered, and recommend a set of projects for future implementation. Sector reports covered the following areas:

- Agriculture and Livestock
- District Institutional Development
- Economic Development and Recommended Development Projects
- Education
- Fisheries
- Health
- Infrastructure and Utilities
- Land Use Planning
- Population and Community
- Tourism
- Water Resources
- Wildlife and Environment

#### Phase 2

Among the 69 possible projects recommended by the consultants in phase one, a set of projects were selected and full fledged proposals are being developed by the consultants. These are :

- Support to Local Authorities
- Arrangements for Environmental Management
- Preparation of Structure Plans and Regulations for the General Use Zones (GUZ)
- Roads Plan
- Fisheries Feasibility Studies

- Tourism
- Livestock Development

The GOY agreed to use the proposals as a basis to seek funding for their implementation, possibly from GOY funds, the EU and other donors (cabinet decree no. 47, march 2004).

It should be noted that the SAMP has been largely based on the findings, maps and reports produced by the EPA/UNDP-GEF Socotra Biodiversity Project, and that the development Master-planning process was entirely based on the Socotra Conservation Zoning Plan prepared by EPC/UNDP-GEF and approved by the GOY prior to the implementation of the SAMP. The SAMP consultant team worked very closely with the EPA / UNDP-GEF team in Socotra, and this provided a good basis for achieving the principal GOY goal of an environmentally sound development plan for Socotra archipelago.

## **2. The Nature-Based Tourism Development Program**

This is an internal document adopted by the EPA/MOWE, covering the period 2003-2006 . It identifies Ecotourism, along with sustainable fishing, as one of the two engines of economic growth, which is likely to play a vital role in the future of the island. This document situates the possibilities for ecotourism on Socotra within a global context and provides a framework with which future development of tourism can take place.

This document has been recently supplemented by a review of the current status of Ecotourism development in Socotra, conducted by an independent international consultant for EPA.

*See Annex A.7*

## **3. The Socotra Conservation and Development Program (SCDP), project support document.**

Prepared by UNDP and the Government of Yemen, the document charts the efforts of the Government of Yemen to support the appropriate management of the Archipelago in the period 2003-2008 , through the implementation of the Conservation Zoning Plan. The principal partners in this effort include the EPA/MOWE and the Local District Councils, for which a significant institutional strengthening component is foreseen. This document contains the work plan of SCDP over a five-year period, including background on development in Yemen and a detailed breakdown of SCDP's budget .



## 5e. Property management plan or other management system

### 1. Basis for property management:

The basis for the management of the Archipelago is to date essentially represented by the Conservation Zoning Plan and associated development Masterplan, and all supporting legislation.

The key documents listed above and included in Annex A.11 are fully adopted by the Government of Yemen and represent the legal and management base for the conservation and development of the Socotra Archipelago. It should be noted that no other areas in Yemen are equipped with such detailed and site-specific legal and planning instruments as Socotra is at present. The support received from the international community in recent years, and the political will of the Government of Yemen, have allowed this important achievement.

### 1. Responsibility for Site management

With over 97,5% of the archipelago's land and all its surrounding waters designated as a protected area, the principal responsibility of the Management of the Socotra Archipelago currently lies in the hands of the local Branch of the Environment Protection Authority, in combination with other key relevant government authorities.

However the capacity of the EPA to fulfil this complex task does not yet equate to the challenges that lie ahead. The consistent donor support received in recent years, and increased government commitments are key positive factors that allow room for optimism. In particular:

- The staff capacity of EPA increased from 1 to 85 staff over past 7 years
- EPA Budget allocations and implementation capacity increased from virtually zero in 1998, to over 1M US\$ per year (largely through donor and government support) over the past 7 years
- EPA essential equipment and technical capacity is now place as by far the strongest civilian government entity in the archipelago, and leading group in environmental conservation at national level.
- Several new environmental NGOs were established in the island and internationally, to significantly complement EPA work in environmental conservation through advocacy, fund-raising, conservation and ecotourism projects implementation, and protected areas management. These include i.e. the Socotra Conservation Fund (SCF), Friends of Socotra (FOS), the Socotra Ecotourism Society (SES), the Socotra Women's development Association (SWDA), various Protected Areas Associations, etc.
- Development of Site-specific Management Plans

As part of the initial stage of the implementation of the Archipelago's Conservation Zoning Plan, a total of 4 detailed Management Plans have been developed by the

# THE TERRESTRIAL ZONING PLAN

Zoning Plan for Socotra Archipelago for the Conservation and Sustainable Use of Biodiversity and Natural Resources



## Resource Use Reserve

### Definition

Areas managed to ensure long-term protection of the unique biological diversity of Socotra Archipelago while providing, at the same time, a sustainable flow of natural products and services to meet community needs. Within the Resource Use Reserve, traditional practices are in place for the sustainable use of natural resources. Such practices are effectively implemented by the community itself, and will be supported by the establishment of the Reserves. These areas are large enough to absorb natural resource uses without detriment to its overall long-term natural values. For the marine component, all waters within the 12 nautical miles around all the islands of the archipelago, form the Resource Use Zone.

Approximate area covered: 890 square km  
Percentage of Total Land Area: 23.5%

### Objectives

- To protect and maintain the unique biological diversity of Socotra Archipelago, as well as other natural, cultural and landscape values of the area in the long term.
- To maintain and, where appropriate, enhance the existing traditional management practices for the sustainable use of natural resources.
- To protect the natural resource base from being alienated for other land and resource use purposes that would be detrimental to the unique biological diversity, and to the subsistence of the local community who rely on it.

## General Use Zone

### Definition

Within the Resource Use Reserve, the General Use Zone includes sites where a significant level of habitat modification and/or resource exploitation has already occurred, or is required to support some essential social and economic interests of the community of the archipelago.

Approximate Area Covered: 55 square km  
Percentage of Resource Use Reserve: 6.14%  
Percentage of Total Land Area: 1.4%

### Objectives

- To allow for the development of essential infrastructure required to improve the standard of living of the local community (i.e. roads, power lines, transportation & health facilities etc.)
- To focus infrastructure & commercial development efforts to suitable areas, thus limiting damage to the environment to an acceptable level.
- To regulate and guide infrastructure and commercial development, so as to minimize environmental damage to neighboring protected areas and natural landscapes and to the minimize negative impact on natural terrestrial and marine habitats (i.e. compulsory Environmental Impact Assessment, Coastal Zone development guidelines).

This poster was produced by Rebecca Klaus,  
on behalf of UNDP-GEF, October 1999 (c)



Boundaries of each area to be refined on approval of the zoning plan.

## SUMMARY ACTIVITY GUIDE FOR THE TERRESTRIAL ZONING PLAN

Management guidelines will be developed specifically for each area on approval of the zoning plan.

|                           | Resource Use Reserve | General Use Zone | National Park | Nature Sanctuary |
|---------------------------|----------------------|------------------|---------------|------------------|
| Industrial development    | ✓                    | ✓                | ✗             | ✗                |
| Airport                   | ✗                    | ✓                | ✗             | ✗                |
| Hospital                  | ✓                    | ✓                | ✓             | ✗                |
| Road construction         | ✓                    | ✓                | ✓             | ✗                |
| Intensive agriculture     | ✗                    | ✓                | ✗             | ✗                |
| Controlled grazing        | ✓                    | ✓                | ✓             | ✗                |
| Traditional plant use     | ✓                    | ✓                | ✓             | ✗                |
| Ecotourism infrastructure | ✓                    | ✓                | ✓             | ✗                |
| Research and education    | ✓                    | ✓                | ✓             | ✓                |

|                             |                              | TERRESTRIAL CRITERIA FOR SELECTION |        |           |                |                 |                  |                       |                            |             |             |
|-----------------------------|------------------------------|------------------------------------|--------|-----------|----------------|-----------------|------------------|-----------------------|----------------------------|-------------|-------------|
|                             |                              | Diversity                          | Rarity | Fragility | Endemic plants | Endemic animals | Flagship species | Important Birds Areas | Intrinsic appeal/landscape | Naturalness | Typicalness |
| <b>N.S Nature Sanctuary</b> |                              |                                    |        |           |                |                 |                  |                       |                            |             |             |
| 1                           | Homhil                       | ✓                                  | ✓      | ✓         | ✓              | ✓               | ✓                | ✓                     | ✓                          | ✓           | ✓           |
| 2                           | Skent                        | ✓                                  | ✓      | ✓         | ✓              | ✓               | ✓                | ✓                     | ✓                          | ✓           | ✓           |
| 3                           | Sarahin                      | ✓                                  | ✓      | ✓         | ✓              | ✓               | ✓                | ✓                     | ✓                          | ✓           | ✓           |
| 4                           | Neet                         |                                    | ✓      | ✓         | ✓              | ✓               | ✓                | ✓                     | ✓                          | ✓           | ✓           |
| 5                           | Wadi Shuab                   |                                    | ✓      | ✓         | ✓              | ✓               | ✓                | ✓                     | ✓                          | ✓           | ✓           |
| 6                           | Shuab Mangrove               |                                    | ✓      | ✓         | ✓              | ✓               | ✓                | ✓                     | ✓                          | ✓           | ✓           |
| 7                           | Tatwah                       |                                    |        | ✓         | ✓              | ✓               | ✓                | ✓                     | ✓                          | ✓           | ✓           |
| 8                           | Djabal Salah                 | ✓                                  |        |           | ✓              | ✓               | ✓                | ✓                     | ✓                          | ✓           | ✓           |
| 9                           | Samha - limestone escarpment | ✓                                  |        | ✓         | ✓              | ✓               | ✓                | ✓                     | ✓                          | ✓           | ✓           |
| 10                          | Darsa                        |                                    |        |           | ✓              | ✓               | ✓                | ✓                     | ✓                          | ✓           | ✓           |
| 11                          | Kaal Faraon                  |                                    | ✓      |           | ✓              | ✓               | ✓                | ✓                     | ✓                          | ✓           | ✓           |
| 12                          | Sabonia                      |                                    |        | ✓         | ✓              | ✓               | ✓                | ✓                     | ✓                          | ✓           | ✓           |

## National Park

### Definition

Natural areas of land and sea, designated to (a) protect the ecological integrity of the unique ecosystems of Socotra Archipelago for present and future generations, (b) exclude exploitation or occupation inimical to the objectives of conservation of biodiversity and of the preservation of natural landscapes, and (c) provide foundation for scientific, educational, recreational and physical opportunities, all of which must be environmentally and culturally compatible.

Approximate Area Covered: 2748 square km  
Percentage of Total Land Area: 72.6%

### Objectives

- To protect the unique natural habitats and landscapes of Socotra Archipelago, which are of high international and national significance for scientific, educational, recreational or ecotourism development purposes.
- To support the needs of the local community, and subsistence resource users in particular, insofar as this will not adversely affect the objectives of biodiversity conservation.
- To perpetuate, in as natural a state as possible, representative examples of the unique biotic communities, genetic resources, and species, found in the Socotra Archipelago, and to provide ecological stability and maintain biodiversity.
- To manage visitor use for educational, cultural and recreational purposes, at a level which will maintain the area in the current natural or near-natural state.

## Areas of Special Botanical Interest

These areas fall within the National Park and do contain the highest concentration of rare and endemic plants of the archipelago. General Management Guidelines will follow those of the National Park, however special attention will be paid to the conservation of this unique heritage by assigning priority to the management and protection of these areas. Other areas of high conservation importance for key zoological groups fall within the boundary of the National Park, and will be mapped in detail later.

## Nature Sanctuary

### Definition

These are areas of unmodified or slightly modified land, and sea, retaining their natural character and influence, without permanent or significant habitation, which will be protected and managed so as to preserve natural or near-natural condition. These sites are strategically located for the recruitment of plants and animals, into other areas, through the dispersal of seeds, eggs and larvae by wind and water, and host important breeding areas. These areas are susceptible to degradation by natural events or activities of people, and the risk of irreversible environmental damage is high, unless the site is strictly protected.

Approximate Area Covered: 95 square km  
Percentage of Total Land Area: 2.5%

### Objectives

- To preserve rare and fragile habitats, ecosystems, species and unique landscapes in as undisturbed a state as possible.
- To ensure that future generations have the opportunity to experience understanding and enjoyment of areas that have been largely undisturbed by human action over a long period of time.
- To maintain the essential natural attributes and qualities of the environment over the long term.
- To enable the existing local community living at low density and in balance with the available resources to maintain their lifestyle.



local EPA team in consultation with the local community groups resident within and around pilot designated Nature Sanctuaries in the island. These Management Plans have been developed on the basis of EPA field research and on an entirely community-led process, in which each protected area (and associated visitor services) is now essentially managed by a local community association. This community-led approach is being tested in a limited number of Pilot Protected Areas.

- Detailed conservation Plans are being developed for the island's Karstic system in collaboration with international specialised research institutions.

The above represent only the initial steps in the direction of achieving a comprehensive Management Plan for the entire archipelago. This will largely depend on a set of key issues that require significant improvement, as outlined the following section.

### **Issues that need improvement:**

Existing key legal and planning documents are now supported by a strengthened EPA Branch in Socotra, and by a significantly increased awareness at central government level on the importance of the Archipelago. However, it is recognised that the existing situation is far from being ideal, and that such legal and planning instruments require further action to become fully operational. The key priority actions identified include:

#### 1. Improving the current institutional set-up for the management of the archipelago.

The recommendation for the establishment of a centralized government body responsible for all conservation and development policy and programmes in the archipelago has been widely recognized and advocated in recent years (GEF-UNDP 1996, UNDP-MOWE 2001, UNESCO 2003, Aden Symposium 2004). At present the EPA has received a mandate to oversee the implementation of the Conservation Zoning Plan, however the institutional context calls for the involvement of several other government and non-government institutions, (i.e. local district governments, line ministries, island development authority, national and local NGOs, etc.) each having its own and sometimes conflicting objectives.

The creation of a central "Socotra Management" body is therefore identified as a vital step towards the safe implementation of the expressed Government vision for the archipelago. This however will entail a significant effort to integrate all national interests in such a new and important political entity, that should provide adequate representation for the local population of the island. This will be achieved through a gradual and long process, that should however not distract the Government from steering development in the island in the right direction over the coming years.

#### 2. Improving the enforcement capacity of EPA and local government in the island

In combination with above centralized authority, the enforcement capacity of key bodies (i.e. EPA and such "Socotra Management" authority, combined with the local government) should be gradually however significantly strengthened to cope with the complex challenges that lie ahead.

This will require significant improvement of the financial allocation and Technical Advisory support for the local and central authorities charged with the management of the island. In the short and medium-term context of Yemen, this important objective can probably be achieved only with increased Government commitment, combined with international donor support.

# THE MARINE ZONING PLAN

## Zoning Plan for the Conservation and Sustainable Use of the Marine Biodiversity and Resources of the Socotra Archipelago



### Resource Use Reserve

#### Definition

Areas managed to ensure long-term protection of the unique biological diversity of Socotra Archipelago while providing, at the same time, a sustainable flow of natural products and services to meet community needs. Within the Resource Use Reserve, traditional practices are in place, for the sustainable use of natural resources. Such practices are effectively implemented by the community itself, and will be supported by the establishment of the Reserves. These areas are large enough to absorb natural resource uses without detriment to its overall long-term natural values. For the marine component, all waters within the 12 nautical miles around all the islands of the archipelago, form the Resource Use Zone.

Approximate area covered: 16498 square km

#### Objectives

To protect and maintain the unique biological diversity of Socotra Archipelago, as well as other natural, cultural and landscape values of the area in the long term.

To maintain and, where appropriate, enhance the existing traditional management practices for the sustainable use of natural resources.

To protect the natural resource base from being alienated for other land and resource use purposes that would be detrimental to the unique biological diversity, and to the subsistence of the local community who rely on it.

### General Use Zone

#### Definition

Within the Resource Use Reserve, the General Use Zone includes sites where a significant level of habitat modification and/or resource exploitation has already occurred, or is required to support some essential social and economic interests of the community of the archipelago.

Approximate Area Covered: 1 square km

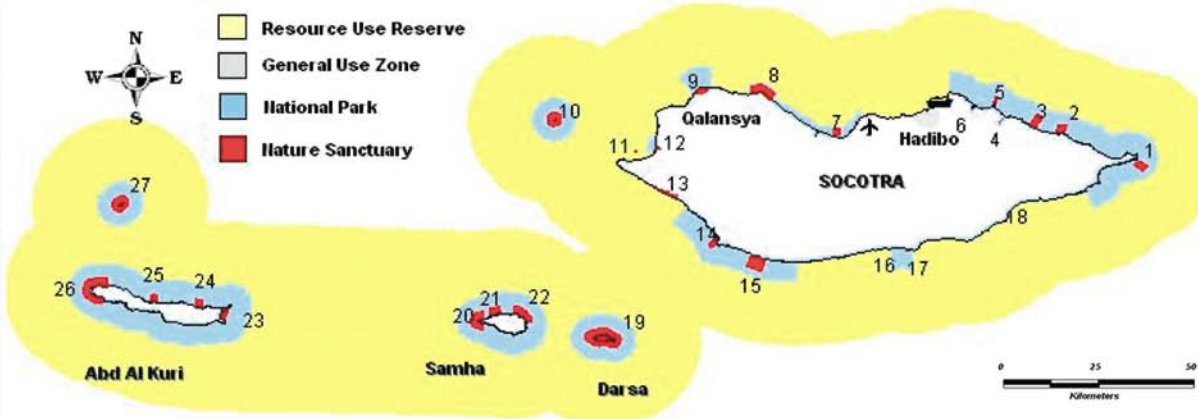
#### Objectives

To allow for the development of essential infrastructure required to improve the standard of living of the local community (i.e. roads, power lines, transportation & health facilities etc.)

To focus infrastructure & commercial development efforts to suitable areas, thus limiting damage to the environment to an acceptable level.

To regulate and guide infrastructure and commercial development, so as to minimize environmental damage to neighboring protected areas and natural landscapes and to the minimize negative impact on natural terrestrial and marine habitats (i.e. compulsory Environmental Impact Assessment, Coastal Zone development guidelines).

This poster was prepared by Rebecca Klaus in October 1999, and subsequently revised by the Project Team in September 2000.



### SUMMARY ACTIVITY GUIDE FOR THE MARINE ZONING PLAN

Management guidelines will be developed specifically for each area on approval of the zoning plan.

|                        | Resource Use Reserve | General Use Zone | National Park | Nature Sanctuary |
|------------------------|----------------------|------------------|---------------|------------------|
| Sea Port               | ✓                    | ✓                | ✗             | ✗                |
| Ballast disposal       | ✗                    | ✗                | ✗             | ✗                |
| Trawling               | ✗                    | ✗                | ✗             | ✗                |
| Shark fishing by net   | ✓                    | ✓                | ✗             | ✗                |
| Hook and line          | ✓                    | ✓                | ✓             | ✗                |
| Turtle exploitation    | ✗                    | ✗                | ✗             | ✗                |
| Managed ecotourism     | ✓                    | ✓                | ✓             | ✓                |
| Research and Education | ✓                    | ✓                | ✓             | ✓                |

|  |                         | biotope                                       | algae / seagrass | coral | fish | birds | crustaceans & molluscs | mangrove | turtle | lobster | proposed by local villagers | natural beauty |
|--|-------------------------|---|------------------|-------|------|-------|------------------------|----------|--------|---------|-----------------------------|----------------|
| <b>National Park</b>                     | <b>Nature Sanctuary</b> |   |                  |       |      |       |                        |          |        |         |                             |                |
| East Socotra - Ras Momi & Cliffs         | 1                       | Gales   |                  |       |      |       |                        |          |        |         |                             |                |
| North East Socotra - Halaib to Port Area | 2                       | Rioch   |                  |       |      |       |                        |          |        |         |                             |                |
|  | 3                       | Rioch di Adhoh to Di Timel                    |                  |       |      |       |                        |          |        |         |                             |                |
|  | 4                       | Khor Qayyih                                   |                  |       |      |       |                        |          |        |         |                             |                |
|  | 5                       | Rioch di Hamri                                |                  |       |      |       |                        |          |        |         |                             |                |
|  | 6                       | Khor Di-Lushah                                |                  |       |      |       |                        |          |        |         |                             |                |
| North Socotra - Qadhob to Ras Qadama     | 7                       | Ras Qadama - Alama                            |                  |       |      |       |                        |          |        |         |                             |                |
|  | 8                       | Qadama and Medina                             |                  |       |      |       |                        |          |        |         |                             |                |
| North West Socotra - Diduah Lagoon       | 9                       | Diduah Lagoon                                 |                  |       |      |       |                        |          |        |         |                             |                |
| Sabunya 3km Buffer                       | 10                      | Sabunya (Islands to 1 nautical mile offshore) |                  |       |      |       |                        |          |        |         |                             |                |
| West Socotra - Ras Bidoh to Shuab        | 11                      | Shuab Marbab (reef)                           |                  |       |      |       |                        |          |        |         |                             |                |
|  | 12                      | Shuab Mangrove                                |                  |       |      |       |                        |          |        |         |                             |                |
| South West Socotra - Neet to Qatanin     | 13                      | Neet Mangrove                                 |                  |       |      |       |                        |          |        |         |                             |                |
|  | 14                      | Qatanin                                       |                  |       |      |       |                        |          |        |         |                             |                |
| South Socotra - Qara                     | 15                      | Mufaz (Barabar) - Zingish                     |                  |       |      |       |                        |          |        |         |                             |                |
| South Socotra - Maharef to Bidholah      | 16                      | Qashor  |                  |       |      |       |                        |          |        |         |                             |                |
|  | 17                      | Qasharin of Maharef                           |                  |       |      |       |                        |          |        |         |                             |                |
| South Socotra - Mahferhin                | 18                      | Qasharin of Mahferhin                         |                  |       |      |       |                        |          |        |         |                             |                |
| Dar sa 3km Buffer                        | 19                      | Dar sa (Islands to 1 nautical mile offshore)  |                  |       |      |       |                        |          |        |         |                             |                |
| Samha 3km Buffer                         | 20                      | West Samha                                    |                  |       |      |       |                        |          |        |         |                             |                |
|  | 21                      | North Samha                                   |                  |       |      |       |                        |          |        |         |                             |                |
|  | 22                      | East Samha                                    |                  |       |      |       |                        |          |        |         |                             |                |
| East Abd El Kuri and highlands           | 23                      | Anjara Bay                                    |                  |       |      |       |                        |          |        |         |                             |                |
| North Abd El Kuri                        | 24                      | Bir Al Agnor Area                             |                  |       |      |       |                        |          |        |         |                             |                |
|  | 25                      | Bayt Eissa Area                               |                  |       |      |       |                        |          |        |         |                             |                |
| West Abd El Kuri                         | 26                      | Kharakat an Naum Area                         |                  |       |      |       |                        |          |        |         |                             |                |
| Kal Faroun 3km Buffer                    | 27                      | Kal Faroun (Islands up to 3km offshore)       |                  |       |      |       |                        |          |        |         |                             |                |

### National Park

#### Definition

Natural areas of land and sea, designated to (a) protect the ecological integrity of the unique ecosystems of Socotra Archipelago for present and future generations, (b) exclude exploitation or occupation inimical to the objectives of conservation of biodiversity and of the preservation of natural landscapes, and (c) provide foundation for scientific, educational, recreational and physical opportunities, all of which must be environmentally and culturally compatible.

Approximate Area Covered: 1514 square km

#### Objectives

To protect the unique natural habitats and landscapes of Socotra Archipelago, which are of high international and national significance for scientific, educational, recreational or ecotourism development purposes.

To support the needs of the local community, and subsistence resource users in particular, insofar as this will not adversely affect the objectives of biodiversity conservation.

To perpetuate, in as natural a state as possible, representative examples of the unique biotic communities, genetic resources, and species, found in the Socotra Archipelago, and to provide ecological stability and maintain biodiversity.

To manage visitor use for educational, cultural and recreational purposes, at a level which will maintain the area in the current natural or near-natural state.

### Nature Sanctuary

#### Definition

These are areas of unmodified or slightly modified land, and sea, retaining their natural character and influence, without permanent or significant habitation, which will be protected and managed so as to preserve natural or near-natural condition. These sites are strategically located for the recruitment of plants and animals, into other areas, through the dispersal of seeds, eggs and larvae by wind and water, and host important breeding areas. These areas are susceptible to degradation by natural events or activities of people, and the risk of irreversible environmental damage is high, unless the site is strictly protected.

Approximate Area Covered: 154 square km

#### Objectives

To preserve rare and fragile habitats, ecosystems, species and unique landscapes in as undisturbed a state as possible.

To ensure that future generations have the opportunity to experience understanding and enjoyment of areas that have been largely undisturbed by human action over a long period of time.

To maintain the essential natural attributes and qualities of the environment over the long term.

To enable the existing local community living at low density and in balance with the available resources to maintain their lifestyle.





### Definition and application of regulatory tools

Contextually with the setting-up of a capable “Socotra management” authority, a comprehensive set of regulatory instruments and detailed management plans should be developed to support the actual implementation of the Conservation Zoning Plan of 2000.

### 3. Mobilizing adequate Financial resources

Yemen is one of the poorest and most disadvantaged countries in the Arab Region (human development index n. 144). In this context, the financial resources required to support the conservation and appropriate development of the Socotra Archipelago have so far largely relied on international support, mobilized by the Government of Yemen in recognition of the importance of the site.

It is however fully recognized that the government will gradually identify and develop ways to channel adequate resources to the island. Several options for ensuring the financial sustainability of ongoing conservation efforts are being investigated, including the setting-up of a visitor entry tax to the island. These measure will however largely depend on the appropriate development of the ecotourism sector in Yemen and in Socotra, and this is an ongoing challenge for the whole country.

## 5f. Sources and levels of finance

The Environmental Protection Authority (EPA) currently receives very limited annual budget allocation from the central Government, sufficient to cover staff salaries and some operational costs. However, since late 1997, the Government of Yemen has managed to mobilize significant additional support for the Socotra Branch of EPA, in recognition of the national and international conservation importance of the site.

| Summary of funding in support of EPA for the period 1997-2008 |                                    |                          |
|---|------------------------------------|--------------------------|
| <i>Period</i>   | <i>Source</i>                      | <i>Funding (Approx.)</i> |
| 1997-2001   | Global Environment Facility - UNDP | 5,000,000\$              |
| 2001-2003   | Netherlands, UNDP                  | 1,350,000\$              |
| 2003-2008   | GOY, Italy, UNDP                   | 5,500,000\$              |

The table shows how international donor support has been consistent in recent years. Yemeni government direct support to the EPA has been gradually increasing, with all newly recruited EPA staff being gradually absorbed into the government budget, increased annual allocations, and the first direct in-cash government contribution being allocated to the ongoing SCDP programme in the island.

Following the end of the Government of Italy/UNDP funded Socotra Conservation and Development Program in 2008, it is envisioned that additional donor financing will be mobilized to support the ongoing capacity building effort of the EPA and other relevant government bodies involved in the development of the archipelago.

### The Socotra Conservation Fund

The Socotra Conservation Fund (SCF) is an NGO registered in Yemen and the UK on a project by project basis. The SCF was incorporated in the UK in 2002 and formally registered as an NGO in Yemen in 2003. It is a flexible, democratic and participatory organisation, owned and controlled by the Full Members through the General Assembly, which is open to eligible individuals and representatives of properly constituted, non-statutory organisations and community groups, at the discretion of the management committee. The General Assembly holds most of the power for setting the direction and implementing the Objects of the organisation. Through the General Assembly, the Full members vote to elect the Management Committee, which administers the organisation's activities. Non-voting Associate Membership is open to other interested individuals and organisations, including relevant statutory agencies and corporate bodies. Advisory Status to the SCF may be offered at the discretion of the management committee.

The SCF was born as the result of work conducted in the first GEF project (1997-2001), and is currently entirely run with the generous support of private donations, work of volunteers who are also staff of the EPA and SCDP, and international advisors. The SCDP/EPA are providing the SCF with office space and equipment in Sanaa and Socotra, and are providing technical assistance to the extent possible. Additional details and full background information can be found in [www.socotraisland.org/fund](http://www.socotraisland.org/fund). Past donors include the Government of Japan, the Government of Holland, UK, the Government of Poland and HRH Charles, Prince of Wales. These private donations are directed towards the conservation of the island, based on projects that have been developed with local communities.

In parallel to the above Government effort, a network of local non-governmental organizations (NGOs) was established in recent years in the framework of the UN led programme. These NGOs, will play an important role in supporting EPA's ongoing development and conservation work on the island. The Socotra Ecotourism Society (SES), the Women's Association and the Socotra Conservation Fund (SCF) are currently provided with logistic and financial support by the UN project and other bilateral donors, however they aim at becoming financially independent. Of these, the Socotra Conservation Fund is the most important, when considering both current and future sources of finance for conservation and development efforts. Recent ecotourism development studies (Jessamnie 2005) identify the SCF as the most reliable vehicle for channeling funds to the island deriving from i.e. a visitor entry tax.



## 5g. Sources of expertise and training in conservation and management techniques

The Socotra Archipelago was the first Protected Area established in Yemen. This implied that effectively no prior experience nor national know-how in protected areas management existed in the country. Therefore, during the period 1998-2005, an intensive training effort for local staff of EPA in the island was carried out and is yet ongoing, mainly drawing from the following sources of expertise and training in conservation and management techniques:

**International advisors:** since 1997, a minimum of 2 to 4 full-time in UN international advisors were deployed in the island, to conduct on-the-job training and assist in the implementation of the UN programme with the EPA. These were assisted by a large number of additional short-term trainers and advisors (including consultants and volunteers) in various sectors (i.e computer use, English language, principles of ecology, herbarium preparation, birds identification and surveys, eco-tourism development, underwater research techniques, wildlife survey techniques, protected areas management, use of Geographical Information Systems, caving, etc.)

**Regional Expertise:** a significant source of expertise in all the above fields has been drawn regionally, especially from Jordan, where a partnership with the Royal Society for the Conservation of Nature has been established, with frequent exchanges of know-how.

### **IUCN:**

The new regional office of the IUCN is also in close contact with the EPA branch in Socotra, providing consistent support through the new Protected Areas management section of IUCN Amman. Also, the IUCN is providing support to the EPA in the development of an integrated Decision Support System.

### **Socotra-Galapagos Partnership Initiative:**

A partnership initiative between the Galapagos and Socotra national parks is active under the ongoing SCDP/EPA project. Funding is available for exchange of know how and training between technical staff from the two sites, as well as exchanges of visits between high-level decision makers responsible for the development of the two sites.

### **Scholarships:**

The EPA/SCDP has been successful in mobilizing full-scholarships for key members of the EPA Socotra team: two Masters degrees in UK, two PhDs in Italy and one Master in Check Republic were assigned in recent years.

### **EPA Socotra as a source of Training for other PA project in Yemen:**

It should be noted that selected members of the national team of EPA Socotra have provided training, participated in survey work and presented their original research work to other upcoming conservation projects in the country, as well as at several regional and international seminars in recent years.

## 5h. Visitor facilities and statistics

*Source: J. Jessamine 2005*

### Visitor Facilities

#### Hotels:

There are currently four tourist hotels, with a total of 58 rooms, operating on Socotra, they are:

- Summerland Hotel, 12 rooms
- Taj Socotra Hotel, 24 rooms
- Hajef Hotel, 16 rooms
- Jazeera Hotel, 6 rooms

All the hotels are located in Hadibo, the island's administrative centre, and are of a basic standard of accommodation. The Summerland and Taj Socotra have restaurants, while only the Taj Socotra has air-conditioned rooms. In addition a new hotel is being constructed adjacent to the airport, although only four rooms are available.

#### General visitor facilities:

Though the three main hotels have their own generators, they do not offer 24-hour electricity, and it is not possible to make international phone calls from them. International and local calls can be made from telephone centers in the town's central market. Teleyemen mobile phones now work in the main centres of Hadibo and Qalansiyya. Email is available only at Summerland hotel. The restaurants available, with the possible exception of Summerland Hotel, offer basic local cuisine.

The city of Hadibo has a government hospital with very limited facilities, a bank where money can be exchanged, and a tourist information center run by the Socotra Ecotourism Society. Only Hadibo and Qalansiyya have electricity supplied to it by the local authorities for twelve hours a day, although some other major towns and villages own generators that they manage privately. Electricity and running water are not available in all the rest of the island.

In addition, the following services and facilities were recently developed, with the aim of improving the experience of visitors and helping the local communities:

#### The Socotra Ecotourism Society (SES)

The Socotra Ecotourism Society (SES) is a non-governmental organization, registered in Yemen, and created in Socotra in March 2003 on the initiative of the SCDP. It is managed independently entirely by Socotri staff with the objective of developing ecotourism as a means of sustainable development for the island. The SES maintains an office in the main street of Hadibo, the island's principal town, and an information centre at Socotra Airport. With the support of the SCDP and SCF,



the SES has trained ecotourism guides and drivers, as well as participating in language training. The society has professional field guides, trained naturalist guides, and drivers whose services it offers to tourists and tour operators. In addition the SES arranges for hotel accommodation on the island, campsites in protected areas, meals, and specialist tours in areas such as ornithology.

### **Visitor Information Centres:**

Two Visitor Information Centres and local handicrafts/book shops are currently managed by the Socotra Ecotourism Society and located at the airport and in the centre of Hadibu.

### **The Socotran Women's Association (SWA)**

The Socotra Women's Development Association (SWDA) was established in 2001 on the initiative of the SCDP. The SWDA organises training and education for women on the island as well as undertaking small development projects with the aid of the Socotra Conservation Fund (SCF). A core activity of the association has been the establishment of handicraft shops, in Hadibo and at the airport, to sell local craft items to tourists. A range of items including pottery, woven rugs, resins, and honey are produced by the association for this purpose.

### **The Protected Area (PA) associations:**

in order to facilitate the experience of tourists and to ensure benefit for local communities, EPA/SCDP worked with the communities living in protected areas to establish associations that could manage campsites and provide guides to the surrounding areas

Tourist camps have been constructed in a two of protected areas, including the Di Hamri Marine Protected Area and Homhil PA. On completion these simple facilities, which include camping area, parking, toilets, kitchen and shaded eating were handed over to the local community. These communities have established village associations to run the ecotourism campsites and have received training from the SCDP/SCF to assist them. In the case of marine areas this training has extended to training local divers to accompany groups of tourists.

### **Ministry of Tourism:**

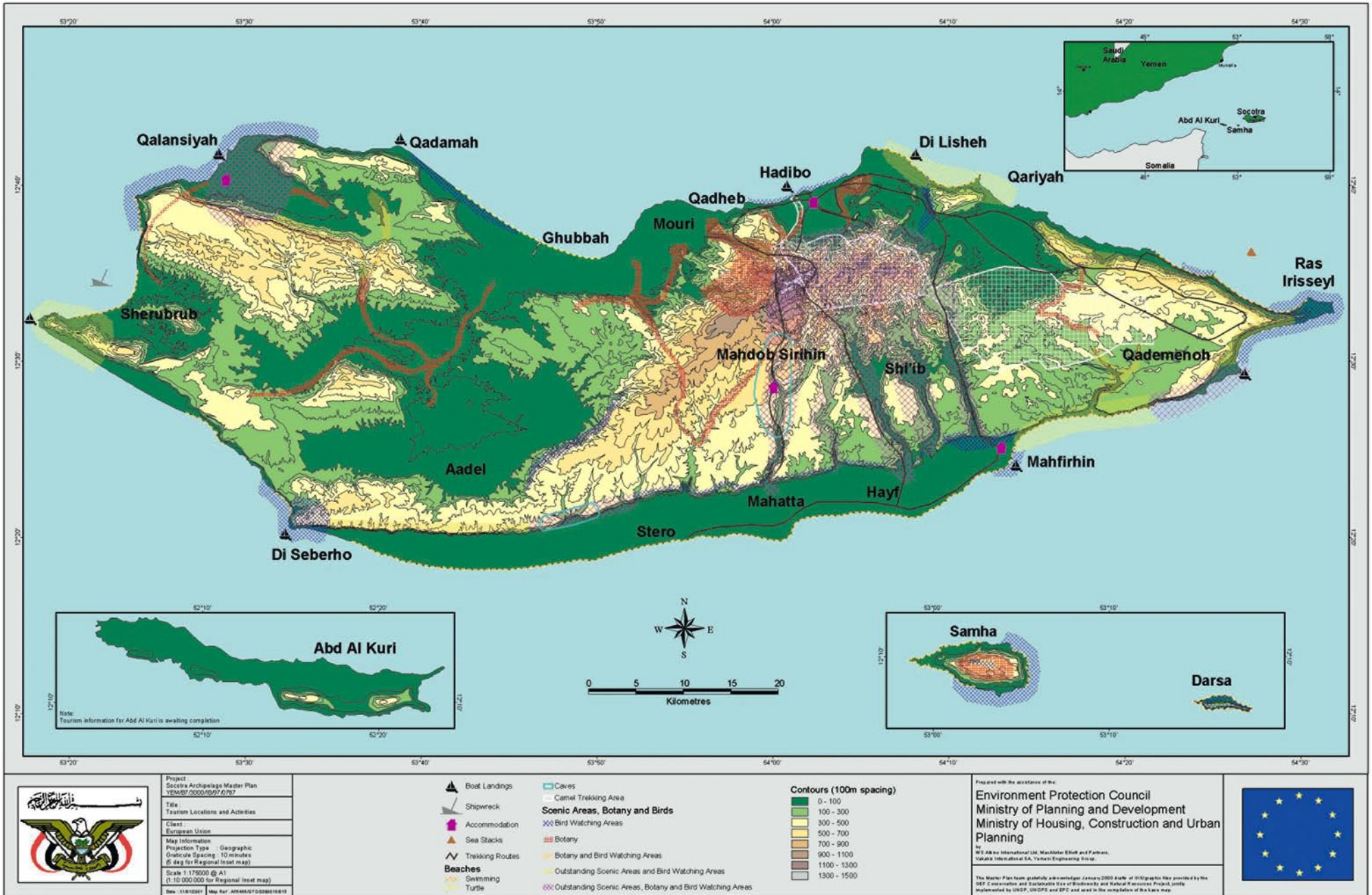
The Ministry of Tourism and Culture is represented on Socotra by a single officer. This officer is charged with administering tourism on the island under the terms of the 1999 Law on Tourism; as such his functions are related to the licensing of tourist accommodation, tour operators, and guides. In practice however activities would appear to be limited to preparing monthly statistical returns of tourist arrivals based upon an arrival survey carried out by the Tourist Police at the airport.

### **Tour Operators:**

Up to 10 tour operators on the Yemen mainland, acting as local agents for overseas outbound operators, are currently offering tours of Socotra to foreign tourists as an element of a Yemen holiday. Tourists are generally in groups and remain on the island for around five days. There is no evidence that the island is being promoted as an ecotourism destination but is attracting 'adventure' tourists whose interest in the environment is limited. Anecdotal evidence suggests that many of these groups are primarily interested in visiting the island's pristine beaches.

# SOCOTRA ARCHIPELAGO MASTER PLAN

## Tourism Locations and Activities





While some of these tour operators dispatch tour guides from the mainland to accompany tourists many now utilise the services of the Socotra Ecotourism Society (SES) to provide tour guides and vehicles, in addition the SES can look after hotel, catering and equipment arrangements for tour groups.

## Visitor Statistics:

### Yemen in General:

Tourism in Yemen is a relatively recent activity and has only emerged with the unification of the country in 1990, its growth however as been hampered by security concerns. The government approved a tourism policy in February 1997 setting out broad objectives for the development of tourism in Yemen. Table T.1, set out below clearly shows Yemen's relative position as a Middle East destination. In spite of its extensive resources, including a number of World Heritage sites, Yemen attracts only around 0.4% of tourists in the region. In 2002 it attracted a total of 98,000 visitors while Oman attracted 620,000 and Egypt 4.9 million. The leading position of Saudi Arabia, with 7.5 million arrivals, may to some extent be discounted due to its unique position as a pilgrimage destination for the Moslem world.

In recent years the Yemen tourist industry has been negatively impacted by the war in Iraq and a number of local security incidents. Concerns over security and travel advisories issued by a number of foreign governments and the country's resultant poor image in the western media led to a dramatic fall in arrivals for 2002-03. It has been reported that the industry staged a recovery in 2004 with arrivals in the first six months of the year exceeding 70,000 tourists.

| <b>Table T.1 - Middle East Tourist Arrivals 1990-2002</b> |                                       |       |       |       |       |                           |      |
|---|---------------------------------------|-------|-------|-------|-------|---------------------------|------|
|   | International Tourist arrivals (1000) |       |       |       |       | Regional Market Share (%) |      |
|   | 1990                                  | 1995  | 2000  | 2001  | 2002  | 1995                      | 2002 |
| Bahrain   | 1376                                  | 1396  | 2420  | 2789  | 3167  | 10.2                      | 11.5 |
| Egypt   | 2411                                  | 2871  | 5116  | 4357  | 4906  | 21.1                      | 17.8 |
| Iraq  | 748                                   | 61    | 78    | 127   | -     | 0.4                       | -    |
| Jordan  | 572                                   | 1074  | 1427  | 1478  | 1622  | 7.9                       | 5.9  |
| Kuwait  | 15                                    | 72    | 78    | 73    | -     | 0.5                       | -    |
| Lebanon   | -                                     | 450   | 742   | 837   | 956   | 3.3                       | 3.5  |
| Libya   | 96                                    | 56    | 174   | -     | -     | 0.4                       | -    |
| Oman  | 149                                   | 279   | 571   | 562   | 602   | 2.0                       | 2.2  |
| Palestine   | -                                     | -     | 330   | 7     | -     | -                         | -    |
| Qatar   | 136                                   | 294   | -     | -     | -     | 2.2                       | -    |
| Saudi Arabia  | 2209                                  | 3325  | 6585  | 6727  | 7511  | 24.4                      | 27.2 |
| Syria   | 562                                   | 815   | 1416  | 1318  | 2809  | 6.0                       | 10.2 |
| UAE   | 973                                   | 2315  | 3907  | 4134  | 5445  | 17.0                      | 19.7 |
| Yemen   | 52                                    | 61    | 75    | 76    | 98    | 0.4                       | 0.4  |
| TOTAL   | 9689                                  | 13663 | 23969 | 23646 | 27594 |                           |      |

Source: *Jessamine, 2005*

The major source regions for Yemen's tourism are Western Europe and the Middle East. In 2001 European visitors accounted for 34% of all arrivals. Recent years have seen a dramatic growth in tourist arrivals from the Middle East, rising from 46% of

the total in 2001 to 68% of all arrivals in 2003. During the same period, as set out below in Table T.2, European arrivals fell to 8% of arrivals.

| <b>Table T.2 - Tourist Arrivals by Region of Origin 2001-2003</b> |       |       |        |
|---|-------|-------|--------|
| Region  | 2001  | 2002  | 2003   |
| Europe  | 25857 | 15826 | 13733  |
| Asia  | 5763  | 10835 | 15589  |
| N and S America   | 3509  | 4429  | 12932  |
| Africa  | 4867  | 1573  | 6752   |
| Australia   | 446   | 468   | 377    |
| Middle East   | 34704 | 64887 | 105284 |
| Total   | 75146 | 98020 | 154667 |
| <i>Source: Yemen Ministry of Tourism</i>                          |       |       |        |

The regional market is dominated by arrivals from Saudi Arabia, which in 2003 accounted for 57% of regional tourist arrivals, a growth of over 400% in the period 2001 to 2003. Regional arrivals by nationality are set out below in Table T.3. As a whole the regional market seen considerable growth aided by the waiving of visa requirements for citizens of the Gulf states.

| <b>Table T.3 - Arab Tourists by Nationality 2001-2003</b> |       |       |        |
|---|-------|-------|--------|
| Nationality   | 2001  | 2002  | 2003   |
| Egyptian  | 2517  | 2509  | 3677   |
| Jordanian   | 2569  | 2385  | 2689   |
| Saudi   | 14404 | 38252 | 59669  |
| Iraqi   | 3988  | 1691  | 2846   |
| Syrian  | 3040  | 3727  | 6780   |
| Sudanese  | 2009  | 1472  | 1875   |
| Others  | 8186  | 14849 | 27748  |
| Total   | 36713 | 64887 | 105284 |
| <i>Source: Yemen Ministry of Tourism</i>                  |       |       |        |

While less significant than it once was, due to security concerns, Europe remains a key market for Yemen's tourism industry and is the most significant in terms of generating demand for hotel accommodation and tourist facilities. Key source markets, as set out below in Table T.4, are the United Kingdom, France, Germany and Italy.

| <b>Table T.4 - European Tourists by Nationality 2001-2003</b> |       |       |       |
|---|-------|-------|-------|
| Nationality   | 2001  | 2002  | 2003  |
| German  | 5721  | 2772  | 1894  |
| French  | 4653  | 2793  | 1882  |
| Italian   | 6073  | 2352  | 1731  |
| British   | 1469  | 1951  | 1640  |
| Swiss   | 619   | 654   | 229   |
| Dutch   | 1317  | 654   | 229   |
| Others  | 6005  | 4614  | 2556  |
| Total   | 25857 | 15828 | 13733 |
| <i>Source: Yemen Ministry of Tourism</i>                      |       |       |       |

### **Socotra:**

in spite of the extensive work undertaken over a six to seven year period and the unique nature of attractions on the island the level of tourism development remains very low. In 2004 a total of 450 foreign tourists visited Socotra. In addition it has been estimated that some 250 Yemeni nationals visited the island, although most of



these are believed to be business travellers. While it is recognised that the country has been experiencing difficulties in developing the tourism sector, due in large part to security concerns, arrivals on Socotra represent less than 0.5% of all visitors to Yemen.

Internationally it has been estimated by the WTO that nature tourism some generated 7% of all international travel expenditure. While, in 1997, tourism was enjoying global growth of 4% nature tourism was growing at a rate of between 10% and 30%. While these figures are global averages and identifying the market potential of Yemen, and Socotra in particular, will require detailed study they provide a broad measure of the potential for ecotourism in the country. With 154,000 arrivals in 2003 some 10,000 were potentially ecotourists, as the prime ecotourism attraction in Yemen one would expect Socotra to attract a higher proportion of these visitors.



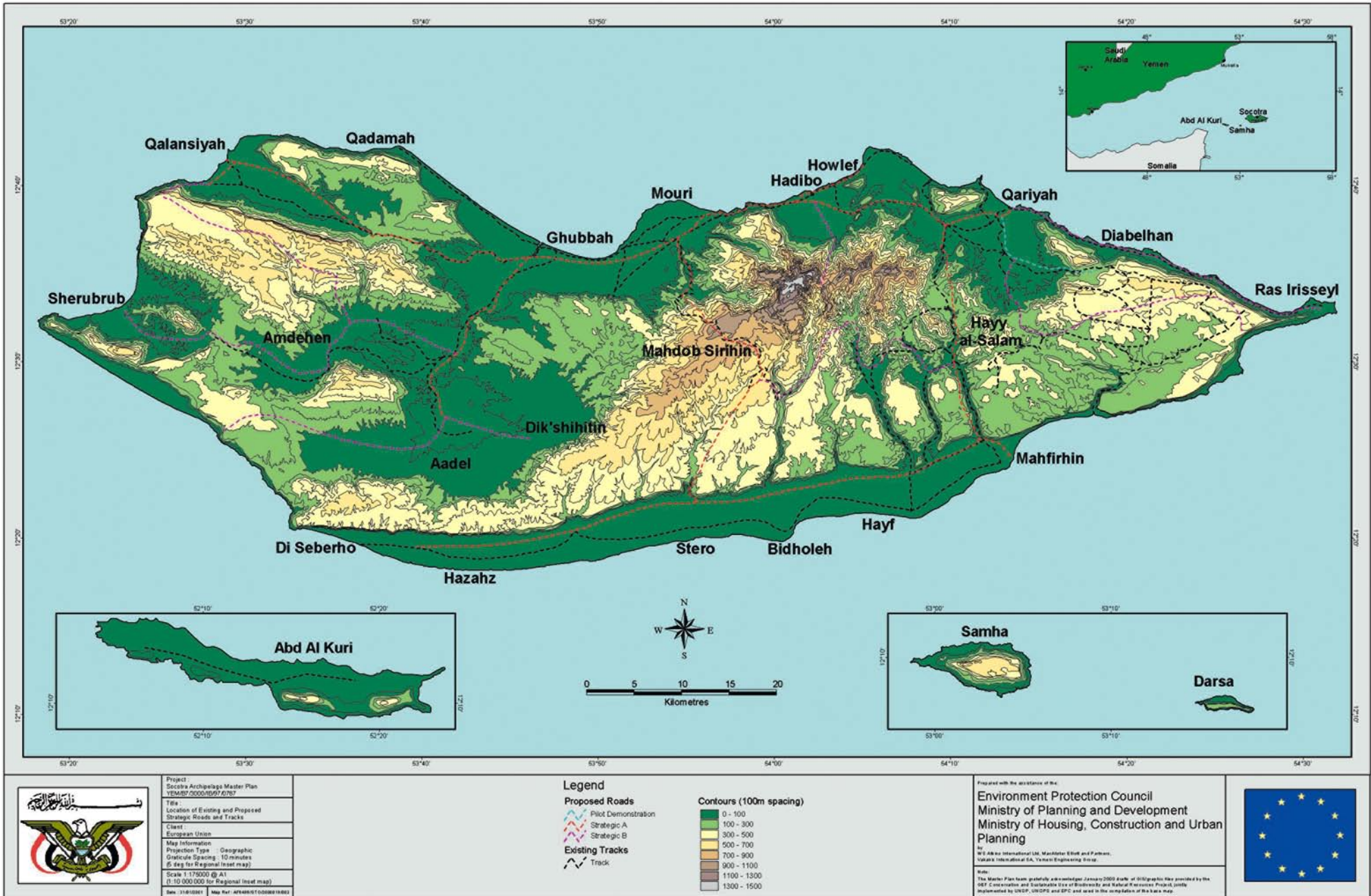
*left*

View of Di-Hamri

Photo by Mario Caruso

# SOCOTRA ARCHIPELAGO MASTER PLAN

## Location of Existing and Proposed Strategic Roads and Tracks





## 5i. Policies and programmes related to the presentation and promotion of the property

The Government of Yemen has indeed yet very limited capacity and plans to present and promote the Socotra Archipelago at national, regional and international level. Ongoing initiatives are largely supported by the Socotra Conservation and Development Programme of UNDP in collaboration with the Environment Protection Authority of Yemen and other relevant ministries. It is envisaged that significant external advice will be required from UNESCO to the Government of Yemen in this field.

### **Tourism promotion** (*Source: Jessamine 2005*)

Under the current administrative arrangements for tourism promotion both marketing and investment promotion are the responsibility of autonomous agencies of the Ministry of Tourism. Marketing is undertaken by the Yemen Tourism Promotion Board (YTPB), while the General Tourism Development Authority (GTDA) is charged with attracting investment, and in particular foreign investment, into the tourism industry.

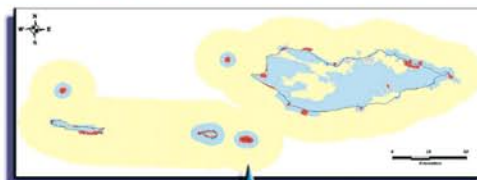
On examining the administration, promotion and development of Socotra levels of coordination among the Ministry of Tourism, the YTPB and the GTDA would appear to be very low. Although images of the island are frequently employed in promotional material no specific ecotourism products or campaigns have been developed by the YTPB to promote Socotra. The focus of most of the promotional effort undertaken appears to be towards cultural tourism, which is of little relevance to the island.

Although Socotra has been identified as an ecotourism destination aimed at the highly specialised development of 'ecolodges' for limited, and possibly restricted, numbers of visitors the investment promotion agency, the GTDA, appears to promote the island as a resort destination to potential investors. This uncoordinated approach has led to some concern on the island about the possibility of it being developed as a mass tourism destination to the detriment of its unique environment and social structures.

# THE MAKING OF THE ZONING PLAN

THE ZONING PLAN FOR THE CONSERVATION AND SUSTAINABLE USE OF THE BIODIVERSITY AND NATURAL RESOURCES OF THE SOCOTRA ARCHIPELAGO

UNOPS  undp



Review of the Draft Zoning Plan by local authorities and directors



Broad Based Public Consultation  
and Revision of the Draft Zoning Plan



Review of the Draft Zoning Plan by local villagers and community leaders



Workshop in Sana'a to incorporate zoning plan proposals from scientists and the local team to produce the Draft Zoning Plan

Integration of the Scientific and Social  
Information to Formulate the  
Draft Zoning Plan



Preparation of a Zoning Plan by the local team, based on community views

## Scientific Biodiversity Inventory and Studies



Terrestrial zoological surveys



Seabird and landbird surveys



Terrestrial botanical surveys



Mapping marine and terrestrial habitats using satellite imagery and GIS



Marine turtle surveys and tagging program



Marine biodiversity and habitat surveys



Coastal biodiversity and habitat surveys

## Environmental Education and Awareness Campaigns

Village meetings to promote biodiversity conservation and sustainable resource use concepts



Training course on Zoning Plan for environmental extension officers



Expert visits to villages to raise awareness of specific issues (e.g. problems of lobster fisheries)



School visits to develop environmental awareness from a young age

Regular directors meeting to brief and update local authorities on project activities



Dialogues with high level government officials to seek understanding and support for the zoning plan process



Presentation on ecotourism and relevant guidelines



## Documentation of Traditional Resource Uses and Development Needs



Identifying ways to improve the water supply



Traditional plant use practices



Management of livestock grazing



Planning road construction to minimise environmental impact



Recording of fisheries activities



Potential impact of port development and marine traffic



Assessing the need to collect fire wood



## 5j. Staffing levels (professional, technical, maintenance)

The current staffing levels of the Environment Protection Authority branch in Socotra is summarised below, based on data from end of 2004 (source SCDP/EPA project YEM.03.004):

17 Technical & Management Staff: the core technical team is based at EPA Socotra headquarters in Hadibu and at the new office in Qalansya. Professional skills existing on location include: terrestrial & marine research and surveys, (including management team and technical specialists in i.e. herbarium curation, bird, invertebrates, reptiles, sea turtles, lobster, shark coral, fisheries resources, Geographical Information Systems, water wells monitoring, meteorology, etc. al.), protected areas management, environmental education and awareness (including i.e. capacity to develop and produce educational materials locally), community development (i.e. support to local NGOs, primary health care, water supply systems, renewable energy, handicrafts, ecotourism, etc.). This group of professionals is composed by 80% of local Socotri staff and the rest by Junior Yemenis from mainland, who were all recruited and trained in the framework of the ongoing Socotra Conservation and Development programme (1998-2005). Their professional skills started at a very low level, and have consistently improved in the above period. However in many fields, local staff does yet require external technical assistance.

Approx. 40 Environmental Education & Extension Officers of the EPA and Socotra Conservation Development Programme are stationed at their villages, located throughout the archipelago, including all inhabited outer islands.

10 meteorological stations Officers of the EPA and Socotra Conservation Development Programme are stationed throughout the archipelago at manual meteo-stations

20 support staff of the EPA and Socotra Conservation Development Programme are based in Socotra and in the capital Sana'a. These include: administration, logistics, drivers, guards, cleaners, mechanics etc.

*below*

Part of the EPA/UNDP-GEF Multi-disciplinary Baseline Biodiversity Research Team, Hadibu, Socotra 1998

Photo: courtesy of RBGE and EPA/SCDP



# 6.

## Monitoring

### 6a. Key indicators for measuring state of conservation

The EPA branch in Socotra, in collaboration with major international research institutions and international UN and IUCN advisors, has developed and is consistently upgrading a research and monitoring plan to measure the state of conservation of key habitats in the archipelago. This effort was initiated as part of the baseline ecological assessments conducted in the period 1998-2001 with GEF-UNDP support, and is yet ongoing.

The research conducted in that period included the setting-up of permanent monitoring programmes on key marine and the terrestrial habitats, and included the provision of training for the local team of EPA on all associated monitoring techniques. The monitoring programmes are focused on key indicator.

#### Terrestrial habitats

**Vegetation Monitoring:** A comprehensive set of baseline research and inventories was conducted in recent years, representing a sound basis to monitor the state of conservation of the site. As integral part of the baseline

Baseline, a detailed vegetation survey was conducted by the Royal Botanic Gardens of Edinburgh, with support from EPA, UNDP-GEF and Darwin Initiative. This effort included:

- Network of permanent monitoring plots (marked with GPS) complemented with diagram description and 360° photo-panoramas to monitor the state of vegetation
- Socotra Herbarium including over 700 species of plants (gradually being completed by the local team)
- Guidelines for monitoring key and flagship plant species including Dragon Blood tree and *Dendrosyochos socotranum* – to be implemented by the EPA
- GIS Vegetation Map of the Archipelago and associated plant species database
- Production of the “Ethnoflora of Socotra”, with comprehensive records of plant species, vernacular names, distribution, ecology and traditional uses

**Dragon Blood trees:** Detailed survey on the status of *Dracaena cinnabari* was conducted in 1999-2000 by EPA team and international PhD student, providing important baseline information on the status of this flagship species. To be repeated periodically by EPA.



Grazing Enclosures: two permanent enclosures were established by EPA in collaboration with international researchers, and are currently maintained to monitor the effect of grazing exclusion on the vegetation of highlands.

### **Birds**

Bird Atlas: the EPA with Birdlife International developed a bird atlas for the archipelago, in consistency with the Bird Atlas of the Middle East. A computer based mapping system is used to record the results of field surveys conducted across the archipelago to monitor the status of bird populations with special attention to all resident species and endangered endemics.

### **Meteorology**

An essential network of automated and manual station for recording key meteorological data (rainfall, temperature, wind, clouds cover etc.) was established by the EPA during the period 2000-2005 with support from the SCDP and various international research institutions. The results of this effort provide only preliminary information, and will require upgrading and adjustments (especially the manual data collection systems). However this will represent the first reliable database for meteorological data in the islands.

### **Marine Biodiversity**

Fixed underwater transects: a network of 18 permanent underwater transects was fixed in Socotra and all outer islands in 1998-1999 in collaboration with the Senckenberg Institute (Germany). This is now regularly monitored by the EPA marine team to assess change in the status of key marine habitats (i.e. focusing on fish species and coral cover).

Tidal and sub-tidal habitats: the baseline survey of tidal and sub-tidal habitats was conducted in by the EPA team in collaboration with the University of Wales (UK) and the Senckenberg Institute (Germany). The results of these surveys include detailed mapping and description of the status of marine habitats. These base maps represent the base for future ecological monitoring of the status of key habitats that will serve as indicators of the status of the underwater environment around the archipelago.

### **Turtle monitoring**

A program for the monitoring and tagging of sea turtles at key nesting sites is ongoing since 1999. Initiated with assistance from the IUCN specialist group, the programme is now managed entirely by the local team, and results are regularly shared with the international network of turtle specialists.

### **Fishing effort**

The EPA's island-side network of extension officers located along coastal areas has been collecting a significant amount of data on fishing efforts in the archipelago, since 1998. the database contains over 25,000 record sheets with information on the species of fish, quantity, size and other parameters of fishing effort that will allow a constant monitoring of the status of key fishing resources (i.e. lobster, shark, sea-cucumber, key species of reef-fish and other threatened marine species)

It should be noted that special measures are being taken by EPA is the establishment and monitoring of pilot protected areas in the island. The EPA there operates with local associations that act as registered local NGOs, holding joint responsibility with the EPA for the management and monitoring of their respective sites. Two sites are currently administered in this fashion (Homhil and DiHamri protected areas), and they represent a first pilot exercise for an innovative way of managing and monitoring protected areas in the region.

The local population is also currently actively involved in several biodiversity monitoring programmes conducted by the EPA, and namely i.e.: sea turtles monitoring and tagging, monitoring of fishing efforts, management of grazing exclosures and manual meteo-stations, control of invasive species.



## 6b. Administrative arrangements for monitoring property

The EPA is primarily responsible for establishing and maintaining an integrated program to monitor the state of the archipelago's environment, including its flora and fauna. This involves tracking the situation of vulnerable and endangered species, as well as working closely with infrastructure developers to mitigate the impact of construction on the island's ecology.

The local EPA branch is mandated to operate in collaboration with the local government and other relevant government bodies, towards the implementation of the Socotra Conservation Zoning Plan, which includes the monitoring of the site. Government funding for the activities of EPA is allocated in the annual budget, and channelled from the Central Bank of Yemen to the central account of the Ministry of Water Environment and then to EPA. However currently a large proportion of funds supporting the ongoing EPA programme (including the ecological monitoring programme) in Socotra is administered jointly by EPA and the UN Development Programme, through the "Socotra Conservation and Development Programme".



## 6c. Results of previous reporting exercises

In recent years the EPA (with support from UNDP, GEF and wide range of international research institutions) has led the preparation of a wide range of technical reports aiming at the inventory and mapping of the island's flora, fauna, marine life, potential for eco-tourism, etc. These reports are all available at the EPA library in Socotra. A list of the most relevant reports is provided below:

| Date      | Title   |
|-----------|---|
| 1999      | <p>SENKENBERG RESEARCH INSTITUTE. 1999a. <i>Marine Biotopes Classification Manual</i>. Unpublished Report, SCDP/EPA, Sana'a, Yemen.</p> <p>Developed by the Senkenberg research Institute (Frankfurt, Germany) in collaboration with the EPA and with funding from the UNDP-GEF Socotra Biodiversity Project. The manual contains detailed mapping and description of marine biotopes of the entire archipelago developed with a combination of remote sensing and underwater survey techniques. Methodology and results have recently been published in Vol. 20 of "Fauna of Arabia" (see also below)</p>  |
| 1999      | <p>ROYAL BOTANIC GARDENS. 1999. <i>Final Report on Multidisciplinary Expedition to the Soqotra Archipelago</i>. Unpublished Report, SCDP/EPA, Sana'a, Yemen.</p> <p>The report outlines the preliminary findings of the first field expeditions conducted by the Royal Botanic Gardens of Edinburgh in collaboration with the EPA team and several international and national specialists in the botany and zoology of the archipelago. Final results published later in 2000 and as part of scientific articles published in volumes 19 and 20 of "Fauna of Arabia".</p>   |
| 1999      | <p>SENKENBERG RESEARCH INSTITUTE. 1999b. <i>Marine Habitat, Biodiversity and Fisheries Surveys and Management (Report of Phase I)</i>. Unpublished Report, SCDP/EPA, Sana'a, Yemen.</p> <p>The report outlines the findings and recommendations of a wide range of marine biodiversity conservation activities conducted by the Senkenberg Institute (Frankfurt, Germany) in collaboration with the EPA as well as national and international scientists, with funding from the UNDP-GEF Project. These include i.e.: baseline survey of coral distribution and reef fish diversity, establishment of the permanent underwater monitoring transects, mapping of tidal and sub-tidal habitats, sea turtles monitoring programme, fisheries development studies, and training on marine biodiversity conservation and fisheries improvement, etc.</p> |
| 1999      | <p>CEBALLOS-LASCURAIN, H. 1999. <i>Ecotourism Development Plan for Socotra Archipelago, Yemen</i>. Unpublished Report, SCDP/EPA, Sana'a, Yemen.</p> <p>Developed by the international consultant Hector Ceballos-Lascurain, the reports the findings and recommendations of two successive missions to the island by the famous eco-tourism development expert who is known to have coined the term "ecotourism". The recommendations were however produced at a very early stage in the development history of the island (i.e. prior to the opening of the civilian airport), and therefore are now largely outdated.</p>   |
| 1999-2000 | <p>PETRONCINI, S. 1999/2000. <i>Surveys and Monitoring of Dracaena cinnabari</i>. Unpublished Report, SCDP/EPA, Sana'a, Yemen.</p> <p>The Italian PhD student Serene Petroncini worked with the EPA team to conduct a detailed assessment of the status of the population of the Dragon Blood tree (<i>Dracaena Cinnabari</i>), adapting the methodology developed by the Royal Botanic gardens of Edinburgh. The report outlines also the preliminary results of lab germination tests conducted for Dragon blood's seeds.</p>   |
| 2000      | <p>ROYAL BOTANIC GARDENS. 2000. <i>Conservation and Sustainable use of the Biodiversity of Socotra Archipelago (Final Report: Target Areas)</i>. Unpublished Report, SCDP/EPA, Sana'a, Yemen.</p> <p>This is the final report produced by the Royal Botanical Gardens of Edinburgh as a result of their survey work in the island conducted with EPA in the framework of the UNDP-GEF Biodiversity project. It contains detailed description and mapping of the archipelago's vegetation, taxonomic review and updated list of plant species, detailed description of the permanent vegetation monitoring programme set-up in the island using 360° photos and standard methodology that can be repeated by the EPA team in the island.</p>   |
| 2000      | <p>EVANS, M.I. 2000. <i>Royal Botanic Gardens of Edinburgh, UK. Multidisciplinary expedition final report – zoology</i>. UNDP-GEF-EPA Project YEM/96/G32. Unpublished Report, SCDP/EPA, Sana'a, Yemen.</p> <p>This reports was edited by M. Evans and summarises the preliminary findings of zoological surveys focusing mostly on birds, reptiles and some groups of invertebrates. The report includes preliminary list of animal species recorded in the archipelago. However, due to the fact that a great proportion of the species recorded during the surveys were new to science, the scientific results of the surveys have mostly been published later as scientific articles with detailed species descriptions (see "Fauna of Aarabia" Vols 19 and 20).</p>   |



- 2000 SENKENBERG RESEARCH INSTITUTE. 2000a. *Marine Habitat, Biodiversity and Fisheries Surveys and Management (Report of Phase II)*. Unpublished Report, SCDP/EPA, Sana'a, Yemen.  
The report outlines the findings and recommendations of the second phase of a wide range of marine biodiversity conservation activities conducted by the Senkenberg Institute (Frankfurt, Germany) in collaboration with the EPA as well as national and international scientists, with funding from the UNDP-GEF Project. These include i.e.: baseline survey of coral distribution and reef fish diversity, establishment of the permanent underwater monitoring transects, mapping of tidal and sub-tidal habitats, sea turtles monitoring programme, fisheries development studies, and training on marine biodiversity conservation and fisheries improvement, etc.
- 2000 SENKENBERG RESEARCH INSTITUTE. 2000b. *Marine Habitat, Biodiversity and Fisheries Surveys and Management (Progress Report of Phase III)*. Unpublished Report, SCDP/EPA, Sana'a, Yemen.  
The report outlines the findings and recommendations of the final phase of a wide range of marine biodiversity conservation activities conducted by the Senkenberg Institute (Frankfurt, Germany) in collaboration with the EPA as well as national and international scientists, with funding from the UNDP-GEF Project. These include i.e.: baseline survey of coral distribution and reef fish diversity, establishment of the permanent underwater monitoring transects, mapping of tidal and sub-tidal habitats, sea turtles monitoring programme, fisheries development studies, and training on marine biodiversity conservation and fisheries improvement, etc.
- 2001 SENKENBERG RESEARCH INSTITUTE. 2001. *Marine Habitat, Biodiversity and Fisheries Surveys and Management (Final Report)*. Unpublished Report, SCDP/EPA, Sana'a, Yemen.  
The report outlines the proposal for a comprehensive Fisheries Management Plan for the Socotra Island Group. It forms integral part and builds upon the findings and recommendations of the final phases of marine biodiversity conservation activities conducted by the Senkenberg Institute (Frankfurt, Germany) in collaboration with the EPA as well as national and international scientists, with funding from the UNDP-GEF Project.
- 2001 WS ATKINS INTERNATIONAL. 2001. *Socotra Archipelago Master Plan (SAMP). Phase I final reports*. EU Project YEM/B7-3000/IB97/0787. Sana'a, Yemen.  
This report was produced as a first result of a major project sponsored by the EU and Government of Yemen (through the EPA). It contains a detailed and quantified assessment and mapping of the situation in the archipelago in all key development sectors, including: local governance, agriculture and livestock, tourism potential, socio-economic development, health, education, infrastructure and utilities, and fisheries. The report provides a comprehensive and updated picture of the development context of the island in all above fields, and it is developed on the basis of the archipelago's Conservation Zoning Plan (presidential decree 275, 2000). A list and brief description of 76 proposed development projects is provided.
- 2002 CHRISTIE, S. ET AL. 2002. *An Ecological Survey of Aloe perryi on Socotra island*. Unpublished Report, SCDP/EPA, Sana'a, Yemen.  
The report outlines the conservation status, traditional uses and conservation issues of this important succulent species of potentially significant development potential for the islanders.
- 2002 WS ATKINS INTERNATIONAL. 2002. *Socotra Archipelago Master Plan (SAMP). Phase II final reports*. EU Project YEM/B7-3000/IB97/0787. Sana'a, Yemen.  
These reports were produced as a final result of a major project sponsored by the EU and Government of Yemen (through the EPA). It contains a detailed and quantified description of six proposed priority development projects for the archipelago, focusing on key development sectors: including: local governance, agriculture and livestock, tourism, roads, and fisheries. The report provides a comprehensive and updated evaluation of development options in the above fields, and it is developed on the basis of the archipelago's Conservation Zoning Plan (presidential decree 275, 2000). The report does also contain a series of maps summarizing key findings of the masterplan (i.e. population distribution, mapping of health, education and fisheries facilities, proposed roads plan, proposed tourism development plan, topographic map of the island).
- 2003 MACKAY, P. 2003. *Nature-Based Tourism Development Program 2003-2006*. Unpublished Report, SCDP/EPA, Sana'a, Yemen.  
The UNDP short-term consultant Peter Mackay spent four months with the EPA team and the Socotra Ecotourism Society in the island. In this report he outlines the strategy for the nature-based tourism development, that is currently being implemented in the framework of the EPA and SES programmes.
- 2003 ENVIRONMENTAL PROTECTION AUTHORITY. 2003. *Homhil Protected Area – Management Plan (English)*. Unpublished Report, SCDP/EPA, Sana'a, Yemen.  
The first Management Plan for a protected Area produced entirely by the local EPA team with minor external support. It includes a detailed survey of the site, and identification of priority management actions.
- 2003 GOVERNMENT OF YEMEN. 2003. *Socotra Archipelago: UNESCO – MAB Biosphere Reserve Nomination Form*. UNESCO.  
The UNESCO MAB nomination file was prepared by the Government of Yemen on the basis of draft produced by the EPA and SCDP team in Socotra, and containing all available and updated information on the wildlife and people of the islands, as of 2002. Socotra was nominated a MAB Reserve by UNESCO in July 2003.

- 2003 UNDP, PROJECT YEM/03/004. 2003. *Sustainable Development and Biodiversity Conservation for the People of Socotra Islands, Yemen: 2003-2008*. Unpublished Report, SCDP/EPA, Sana'a, Yemen.  
This technical programme support document outlines the general conservation and development strategy for the period 2003-2008 that is being implemented by the EPA in the island.
- 2004 ABDELAZIZ, M. 2003. *Qalansiyah Coastal Road: Socotra Island, Yemen: Environmental Impact Statement*. Unpublished Report, SCDP/EPA, Sana'a, Yemen.  
The first EIA conducted for a road in the island, by an EPA Trainees (Master student in UK). The road project analysed in this report has been subject to intense debate that resulted in the diversion of the road to avoid environmentally sensitive areas in 2003.
- 2004 LEWLLIN, P. AND AL SAGHIR O. 2004. *Training Needs Assessment and Development of a Staff Training Plan*. Unpublished Report, SCDP/EPA, Sana'a, Yemen.  
A comprehensive account on the current professional capacity and training needs for the EPA team in the island.
- 2004 SCDP/EPA. 2004. *The effects of the Tsunami on Yemen*. Unpublished Report, SCDP/EPA, Sana'a, Yemen.  
Includes an account of Tsunami-related damage occurred in Socotra in Dec 2004.
- 2004 MILLER, T. AND MORRIS, M. 2004. *The Ethnobotany of Soqatra*, Edinburgh.  
This 759 pages fully illustrated volume contains the most comprehensive account on the vegetation of and unique flora of the island, its traditional uses and a fully illustrated plant identification manual. This work represents the results of decades of work conducted by the authors in the island, supported in its final stages by the UNDP-GEF Socotra Biodiversity project and Darwin Initiative. It constitutes a unique and very detailed documentation of traditional plant names, ancient land uses and practices maintained by the population of Socotra until present.
- 2005 SOCOTRA KARST PROJECT. 2005. *Soqatra Karst Project 2000-2004: Speleologische expedities naar het eiland Soqatra, Jemen*. Unpublished Report, SCDP/EPA, Sana'a, Yemen.  
The Socotra Karst project started in 2000 under the leadership of Peter De Geest, who was the first to explore and initiate the mapping of the extensive Karstic system of Socotra, which is now known to be one of the most impressive in the region. The results of the cave explorations are consistently reported and updated on the SKP website <http://www.speleo.be/socotra/>
- 2005 JESSAMINE, J. 2005. *Tourism development in Socotra. WTO (World Tourism Organization)*. Unpublished Report, SCDP/EPA, Sana'a, Yemen.  
The report was prepared by WTO (World Tourism Organization) consultant J. Jessamine, who assesses the eco-tourism development potential for Socotra and for Yemen in general and provides most recent data on visitor numbers and facilities.



# 7.

## Documentation

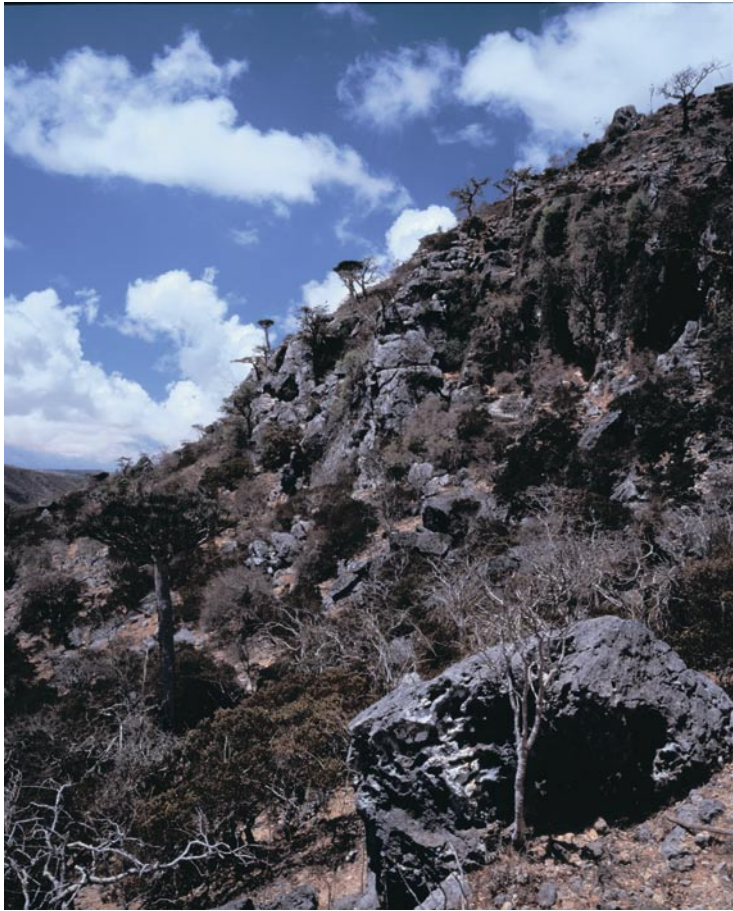
### 7a. Photographs, slides, image inventory and authorization table and other audiovisual materials

| Id. No. | Format | Caption  | Date of Photo (mo/yr) | Photographer | Contact Detail  | Non exclusive session of rights |
|---------|--------|--|-----------------------|--------------|---|---------------------------------|
| 1       | Slide  | Landscape near Deksam                                    | 04/2005               | Mario Caruso | Mario Caruso<br>Via Rua S. Antonio, 18<br>95030 Pedara CT ITA<br><br>m.caruso@mariocaruso.it<br>Phone: +39 095 7801077<br>Fax: +39 095 7805467<br>M. Ph.: +39 338 5975715 | YES                             |
| 2       | " "    | Wadi Hayaft  | " "                   | " "          | " "   | " "                             |
| 3       | " "    | View of Haggier Mountains                                | " "                   | " "          | " "   | " "                             |
| 4       | " "    | Wadi Dahero  | " "                   | " "          | " "   | " "                             |
| 5       | " "    | Landscape near Di-Lishah                                 | " "                   | " "          | " "   | " "                             |
| 6       | " "    | Socotran Desert Rose<br><i>Adenium obesum sokotranun</i> | " "                   | " "          | " "   | " "                             |
| 7       | " "    | Socotran Desert Rose<br><i>Adenium obesum sokotranun</i> | " "                   | " "          | " "   | " "                             |
| 8       | " "    | Homil Protected Area                                     | " "                   | " "          | " "   | " "                             |
| 9       | " "    | Landscape near Hadibo Port                               | " "                   | " "          | " "   | " "                             |
| 10      | " "    | Dragon's Blood Trees<br><i>Dracaena cinnabari</i>        | " "                   | " "          | " "   | " "                             |
| 11      | " "    | Dragon's Blood Tree<br><i>Dracaena cinnabari</i>         | " "                   | " "          | " "   | " "                             |
| 12      | " "    | Landscape near Di-Hamri Protected Area                   | " "                   | " "          | " "   | " "                             |
| 13      | " "    | Di-Hamri Protected Area                                  | " "                   | " "          | " "   | " "                             |
| 14      | " "    | Qalansiyah lagoon  | " "                   | " "          | " "   | " "                             |
| 15      | " "    | Homil Protected Area                                     | " "                   | " "          | " "   | " "                             |

1

Landscape near Deksam

Photo by Mario Caruso



2

Wadi Hayaft

Photo by Mario Caruso







**3**

View of Haggier Mountains

Photo by Mario Caruso



**4**

Wadi Dahero

Photo by Mario Caruso

5

Landscape near  
Di-Lishah

Photo by Mario Caruso



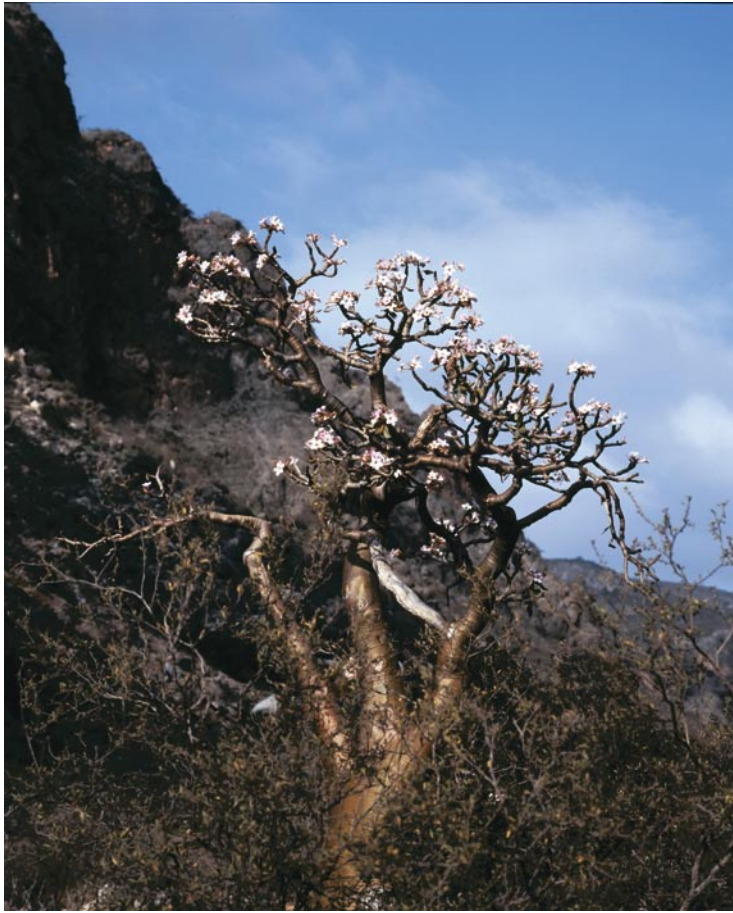
6

Socotran Desert Rose  
*Adenium obesum sokotranum*

Photo by Mario Caruso







7

Socotran Desert Rose  
*Adenium obesum sokotranum*

Photo by Mario Caruso



8

Homil Protected Area

Photo by Mario Caruso



9

Landscape near  
Hadibo Port

Photo by Mario Caruso



10

Dragon's Blood Trees  
*Dracaena cinnabari*

Photo by Mario Caruso







11

Dragon's Blood Tree

*Dracaena cinnabari*

Photo by Mario Caruso



12

Landscape near  
Di-Hamri Protected  
Area

Photo by Mario Caruso

13

Di-Hamri Protected  
Area

Photo by Mario Caruso



14

Qalansiyah lagoon

Photo by Mario Caruso







15

Homil Protected Area

Photo by Mario Caruso





## AUTHORIZATION

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Pedara - CT - ITA, January 9th 2006

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## **7b.** Texts relating to protective designation, copies of property management plans or documented management systems and extracts of other plans relevant to the property

### **The Conservation Zoning Plan for the Socotra Presidential Decree 275 of year 2000**

THE REPUBLIC OF YEMEN  
PRESIDENTIAL DECREE  
NUMBER 275 OF YEAR 2000

Regarding the conservation zoning plan for Socotra Islands (Socotra, Samha, Darsa, Abd Al-Kuri and the associated small islands, rocks and rock outcrops) into areas for conservation and development.

#### **DECREE**

##### **PART ONE**

Names and Definitions

##### **Article (1)**

This decree is called the conservation zoning plan for Socotra islands (Socotra, Samha,, Darsa, Abd Al-Kori, and the associated small islands, rocks and rock outcrops) into areas for conservation and development.

##### **Article (2)**

For the purpose of executing this law, the following words and phrases are assigned the meanings indicated in front of each of them unless otherwise expressed by the text:

The republic: The Yemeni Republic

The responsible authority: ministries or departments or public institutions and Environment Protection Council

The council: The Environment Protection Council

Socotra islands: Socotra group of islands including the islands of Socotra, Samha, Darsa, Abd Al-Kori, and the associated small islands, rocks and rock outcrops

Resource Use Reserve: An area managed to ensure long-term protection of the unique biological diversity of Socotra islands while providing, at the same time a sustainable flow of natural products and services to meet community needs and appropriate development activities.

General Use Zone: it is located within the resource use reserve and includes sites where a significant level of habitat modification has occurred and is designated for appropriate general development purposes.



National Park: natural areas of land or sea designated to protect the ecological integrity of the unique ecosystems of Socotra islands for present and future generations to provide a foundation for scientific, educational, and recreational opportunities, beside the appropriate development activities for ecotourism.

Nature Sanctuaries: these are areas of land or sea characterized by rare plant or animal species still retaining their natural character set aside for scientific research.

## PART TWO

### Objectives

#### Article (3)

The purpose of this law is to fulfil the following objectives:

1. Protect the biodiversity of Socotra islands.
2. Achieve a balance between the population needs in development and the available natural resources such that they are not negatively impacted.
3. Preserve the traditional practices in management of natural resources.
4. Protect the nature sanctuaries of national and international importance in Socotra islands.
5. Protect the genetic material of rare and endemic species in Socotra islands.
6. Exercise a sound environmental management in these areas to protect natural resources from negative impact of development activities.

## PART THREE

### The Zoning of Socotra Islands

#### Article (4)

Socotra islands are divided into three main areas as follows:

First:

##### (a) Resource Use Reserve

The objectives of these areas are as follows:

- To protect and maintain the unique biological diversity of Socotra islands, as well as other natural, cultural and landscape values of the area in the long term.
- To maintain and, where appropriate, enhance the existing traditional management practices for the sustainable use of natural resources.
- To protect the natural resource base from being alienated for other land and resource use purposes and other development activities.

Areas:

- Approximate Total Area Covered (terrestrial): 890 km<sup>2</sup>
- Percentage of Total Land Area: 23.5%
- Approximate Total Area Covered (marine): 16498 km<sup>2</sup>

(b) General Use Zone:

The objectives of these areas are as follows:

To allow for the development of essential infrastructure required to improve the standard of living of the local community (i.e. roads, power lines, and commercial development) to minimize negative impact on the environment to an acceptable level.

Areas:

- Approximate total area covered (terrestrial): 55 km<sup>2</sup>
- Percentage of Resource Use Reserve (terrestrial): 6.14%
- Percentage of total land area: 1.4%
- Approximate total area covered (marine): 1 km<sup>2</sup>

Second: National Parks

The objectives of these areas are as follows:

- To protect the unique natural habitats and landscapes of Socotra islands, which are of high national and international significance for scientific, educational, recreational or ecotourism development purposes.
- To perpetuate representative examples of the unique biotic communities, genetic resources, and endemic species, found in the Socotra islands, and maintain biodiversity.
- To manage these areas in a sound environmental manner for educational, cultural and recreational purposes.

Areas:

- Approximate total area covered (terrestrial): 2748 km<sup>2</sup>
- Percentage of total land area: 72.6%
- Approximate total area covered (marine): 1514 km<sup>2</sup>

Third: Nature Sanctuary

The objectives of these areas are:

- To preserve rare and fragile habitats, ecosystems, species and unique landscapes in as undisturbed a state as possible.
- To maintain the essential natural attributes and qualities of the environment over the long term for future generations.

Areas:

- Approximate total area covered (terrestrial): 95 km<sup>2</sup>
- Percentage of total land area: 2.5%
- Approximate total area covered (marine): 154 km<sup>2</sup>

**Article (5)**

The boundaries of the areas in article (4) of this law are determined according to the following attached maps:



- (a) Map number (1) of the terrestrial protected areas in Socotra islands.
- (b) Map number (2) of the marine protected areas in Socotra islands.

## PART FOUR

### Management and Implementation

#### Article (6)

Environment Protection Council and the Ministry of Construction and Housing and Urban Planning oversee the implementation of the conservation zoning plan for primary and secondary areas included in this law and send regular periodical reports to the Council of Ministers on the achieved results.

#### Article (7)

The Environment Protection Council and the responsible authorities must develop plans and guidelines necessary to manage these areas and organize activities within them each within its jurisdiction according to the provisions of this law.

#### Article (8)

Travel to and from the Socotra islands should be regulated according to the capacity of these islands.

## PART FIVE

### Concluding Provisions

#### Article (9)

Every citizen or any person is prohibited from hunting with firearms or any other means without permit from the responsible authorities; or cause any harm to the environment in the areas determined by this law according to the attached maps.

#### Article (10)

Importing seeds, seedlings, pesticides or fertilizers into the Socotra islands is prohibited unless the responsible authorities have conducted the necessary analysis and examination and issued permits in coordination with the council.

#### Article (11)

It is prohibited to import qat seedlings to cultivate in all parts of Socotra islands.

#### Article (12)

Socotra conservation zoning plan becomes part of the master plan for the development of Socotra islands under preparation.

#### Article (13)

New protected areas can be declared, or the borders of existing ones be expanded, by a decree from the Council of Ministers as needed for environmental management

and development, on a recommendation from the Environment Protection Council.

**Article (14)**

All ministries, departments, public and private institutions must conduct an environmental impact assessment for all projects and activities they implement or supervise their implementation according to environment protection act number (26) for the year 1995.

**Article (15)**

The government should provide sufficient financial resources to allow the implementation of the plan and fulfil the objectives of this law within the budget of the council.

**Article (16)**

The council will issue the necessary regulations to implement this law in coordination with the responsible authorities.

**Article (17)**

All ministries and institutions involved in the development of Socotra islands adhere to the implementation of the conservation zoning plan each in their areas of specialization.

**Article (18)**

All ministries and concerned institutions develop plans and programs for the development of Socotra islands according to the conservation zoning plan.

**Article (19)**

The conservation zoning plan is the prerequisite for the declaration of Socotra islands as a biosphere reserve.

**Article (20)**

Socotra conservation zoning plan is part of the master plan for the social and economic development of Socotra islands.

**Article (21)**

This law goes into effect starting on 18/4/2000 and be published on the official paper.

Issued at the presidency in Sana'a

*Date: 29 Jumada Thani /1421, 28 September 2000*

Ali Abd-Allah Salih  
The President

Dr. Abd Al-Karim Al-Iriany  
The Prime Minister



## 7c. Form and date of most recent records or inventory of property

The most recent records and inventory of the biodiversity of the archipelago are summarised in a series of unpublished reports by the Environment Protection Authority and Socotra Conservation and Development Programme, as well as in authoritative international scientific publications. A list of key documentation is provided below, in reverse chronological order:

### INVENTORY OF TERRESTRIAL HABITATS

| Date      | Title   |
|-----------|---|
| 2005      | <b>SOCOTRA KARST PROJECT, 2005. <i>Socotra Karst Project 2000-2004: Speleologische expedities naar het eiland Soqatra, Jemen</i>. Unpublished Report, SCDP/EPA, Sana'a, Yemen.</b><br>The Socotra Karst project started in 2000 under the leadership of Peter De Geest, who was the first to explore and initiate the mapping of the extensive Karstic system of Socotra, which is now known to be one of the most impressive in the region. The results of the cave explorations are consistently  |
| 2004      | <b>MILLER, T. AND MORRIS, M., 2004. <i>The Ethnoflora of the Soqatra Archipelago</i>. Royal Botanic Garden of Edinburgh.</b><br>This 759 pages fully illustrated volume contains the most comprehensive account on the vegetation of and unique flora of the island, its traditional uses and a fully illustrated plant identification manual. This work represents the results of decades of work conducted by the authors in the island, supported in its final stages by the UNDP-GEF Socotra Biodiversity project and Darwin Initiative. It constitutes a unique and very detailed documentation of traditional plant names, ancient land uses and practices maintained by the population of Socotra until present.                                   |
| 2004      | <b>A.A.V.V. "Fauna of Arabia" Vol 20</b><br>This 548 pages fully illustrated volume is entirely dedicated to Socotra, and contains 25 scientific articles with the findings of recent studies on the terrestrial and marine fauna of the island, resulting from several expeditions conducted mostly in the framework of the UNDP-GEF Socotra Biodiversity Project.   |
| 2002      | <b>CHRISTIE, S. ET AL., 2002. <i>An Ecological Survey of Aloe perryi on Soqatra island</i>. Unpublished Report, SCDP/EPA, Sana'a, Yemen.</b><br>The report outlines the conservation status, traditional uses and conservation issues of this important succulent species of potentially significant development potential for the islanders.   |
| 2000      | <b>ROYAL BOTANIC GARDENS., 2000. <i>Conservation and Sustainable use of the Biodiversity of Socotra Archipelago (Final Report: Target Areas)</i>. Unpublished Report, SCDP/EPA, Sana'a, Yemen.</b><br>This is the final report produced by the Royal Botanical Gardens of Edinburgh as a result of their survey work in the island conducted with EPA in the framework of the UNDP-GEF Biodiversity project. It contains detailed description and mapping of the archipelago's vegetation, taxonomic review and updated list of plant species, detailed description of the permanent vegetation monitoring programme set-up in the island using 360° photos and standard methodology that can be repeated by the EPA team in the island.                  |
| 2000      | <b>EVANS, M.I., 2000. <i>Royal Botanic Gardens of Edinburgh, UK. Multidisciplinary expedition final report – zoology</i>. UNDP-GEF-EPA Project YEM/96?G32 Unpublished Report. Sana'a, Yemen.</b><br>This reports was edited by M. Evans and summarises the preliminary findings of zoological surveys focusing mostly on birds, reptiles and some groups of invertebrates. the report includes preliminary list of animal species recorded in the archipelago. However, due to the fact that a great proportion of the species recorded during the surveys were new to science, the scientific results of the surveys have mostly been published later as scientific articles with detailed species descriptions (see "Fauna of Aarabia" Vols 19 and 20). |
| 1999/2000 | <b>PETRONCINI, S., 1999/2000. <i>Surveys and Monitoring of Dracaena cinnabari</i>. Unpublished Report, SCDP/EPA, Sana'a, Yemen.</b><br>The Italian PhD student Serene Petroncini worked with the EPA team to conduct a detailed assessment of the status of the population of the Dragon Blood tree ( <i>Dracaena Cinnabari</i> ), adapting the methodology developed by the Royal Botanic gardens of Edinburgh. The report outlines also the preliminary lab germination tests conducted for Dragon blood's seeds.   |

## INVENTORY OF MARINE HABITATS

| Date | Title  |
|------|--|
| 2004 | <p><b>A.A.V.V. “Fauna of Arabia” Vol 20</b></p> <p>This 548 pages fully illustrated volume is entirely dedicated to Socotra, and contains 25 scientific articles with the findings of recent studies on the terrestrial and marine fauna of the island, including the description of marine biotopes, resulting from several expeditions conducted mostly in the framework of the UNDP-GEF Socotra Biodiversity Project.</p>   |
| 2000 | <p><b>SENKENBERG RESEARCH INSTITUTE, 2000b. <i>Marine Habitat, Biodiversity and Fisheries Surveys and Management (Progress Report of Phase III)</i>. Unpublished Report, SCDP/EPA, Sana’a, Yemen.</b></p> <p>The report outlines the findings and recommendations of the final phase of a wide range of marine biodiversity conservation activities conducted by the Senkenberg Institute (Frankfurt, Germany) in collaboration with the EPA as well as national and international scientists, with funding from the UNDP-GEF Project. These include i.e.: baseline survey of coral distribution and reef fish diversity, establishment of the permanent underwater monitoring transects, mapping of tidal and sub-tidal habitats, sea turtles monitoring programme, fisheries development studies, and training on marine biodiversity conservation and fisheries improvement, etc.</p> |
| 2000 | <p><b>SENKENBERG RESEARCH INSTITUTE, 2000a. <i>Marine Habitat, Biodiversity and Fisheries Surveys and Management (Progress Report of Phase II)</i>. Unpublished Report, SCDP/EPA, Sana’a, Yemen.</b></p> <p>The report outlines the findings and recommendations of the second phase of a wide range of marine biodiversity conservation activities conducted by the Senkenberg Institute (Frankfurt, Germany) in collaboration with the EPA as well as national and international scientists, with funding from the UNDP-GEF Project. These include i.e.: baseline survey of coral distribution and reef fish diversity, establishment of the permanent underwater monitoring transects, mapping of tidal and sub-tidal habitats, sea turtles monitoring programme, fisheries development studies, and training on marine biodiversity conservation and fisheries improvement, etc.</p> |
| 1999 | <p><b>SENKENBERG RESEARCH INSTITUTE, 1999b. <i>Marine Habitat, Biodiversity and Fisheries Surveys and Management (Progress Report of Phase I)</i>. Unpublished Report, SCDP/EPA, Sana’a, Yemen.</b></p> <p>The report outlines the findings and recommendations of a wide range of marine biodiversity conservation activities conducted by the Senkenberg Institute (Frankfurt, Germany) in collaboration with the EPA as well as national and international scientists, with funding from the UNDP-GEF Project. These include i.e.: baseline survey of coral distribution and reef fish diversity, establishment of the permanent underwater monitoring transects, mapping of tidal and sub-tidal habitats, sea turtles monitoring programme, fisheries development studies, and training on marine biodiversity conservation and fisheries improvement, etc.</p>                      |
| 1999 | <p><b>SENKENBERG RESEARCH INSTITUTE, 1999a. <i>Marine Biotopes Classification Manual</i>. Unpublished Report, SCDP/EPA, Sana’a, Yemen.</b></p> <p>Developed by the Senkenberg research Institute (Frankfurt, Germany) in collaboration with the EPA and with funding from the UNDP-GEF Socotra Biodiversity Project. The manual contains detailed mapping and description of marine biotopes of the entire archipelago developed with a combination of remote sensing and underwater survey techniques. Methodology and results have recently been published in Vol. 20 of “Fauna of Arabia” (see also below)</p>  |

## INVENTORY OF DEVELOPMENT PARAMETERS

| Date | Title   |
|------|---|
| 2005 | <p><b>JESSAMINE, J., 2005. <i>Tourism development in Socotra</i>. WTO (World Tourism Organization). Unpublished Report, SCDP/EPA, Sana’a, Yemen.</b></p> <p>This report provides the most updated picture of the tourism development context in the island, providing recent visitor numbers, assessment of present and likely impacts, and priority actions.</p>   |
| 2003 | <p><b>GOVERNMENT OF YEMEN, 2003. <i>Socotra Archipelago: UNESCO – MAB Biosphere Reserve Nomination Form</i>. UNESCO.</b></p> <p>The UNESCO MAB nomination file was prepared by the Government of Yemen on the basis of draft produced by the EPA and SCDP team in Socotra, and containing all available and updated information on the wildlife and people of the islands, as of 2002. UNESCO nominated Socotra a MAB Reserve in July 2003.</p>       |
| 2003 | <p><b>MACKAY, P., 2003. <i>Nature-Based Tourism Development Program 2003-2006</i>. Unpublished Report, SCDP/EPA, Sana’a, Yemen.</b></p> <p>The UNDP short-term consultant Peter Mackay spent four months with the EPA team and the Socotra Ecotourism Society in the island. In this report he outlines the strategy for the nature-based tourism development that is currently being implemented in the framework of the EPA and SES programmes.</p> |
| 2003 | <p><b>ENVIRONMENTAL PROTECTION AUTHORITY, 2003. <i>Homhil Protected Area – Management Plan (English)</i>. Unpublished Report, SCDP/EPA, Sana’a, Yemen.</b></p> <p>The first Management Plans for Protected Areas produced entirely by the local EPA team with minor external support. They include a detailed wildlife inventory of the sites, and identification of priority</p>   |



management actions.

- 2002**      **WS ATKINS INTERNATIONAL, 2002. *Socotra Archipelago Master Plan (SAMP). Phase II final reports.* EU Project YEM/B7-3000/IB97/0787. Sana'a, Yemen.**  
 These reports were produced as a final result of a major project sponsored by the EU and Government of Yemen (through the EPA). It contains a detailed and quantified description of six proposed priority development projects for the archipelago, focusing on key development sectors: including: local governance, agriculture and livestock, tourism, roads, and fisheries. The report provides a comprehensive and updated evaluation of development options in the above fields, and it is developed on the basis of the archipelago's Conservation Zoning Plan (presidential decree 275, 2000). The report does also contain a series of maps summarizing key findings of the masterplan (i.e. population distribution, mapping of health, education and fisheries facilities, proposed roads plan, propose tourism development plan, topographic map of the island).
- 2001**      **WS ATKINS INTERNATIONAL, 2001. *Socotra Archipelago Master Plan (SAMP). Phase I final reports.* EU Project YEM/B7-3000/IB97/0787. Sana'a, Yemen.**  
 This report was produced as a first result of a major project sponsored by the EU and Government of Yemen (through the EPA). It contains a detailed and quantified assessment and mapping of the situation in the archipelago in all key development sectors, including: local governance, agriculture and livestock, tourism potential, socio-economic development, health, education, infrastructure and utilities, and fisheries. The report provides a comprehensive and updated picture of the development context of the island in all above fields, and it is developed on the basis of the archipelago's Conservation Zoning Plan (presidential decree 275, 2000). A list and brief description of 76 proposed development projects is provided.

## 7d. Address where inventory, records and archives are held

All inventory and records, herbarium, specimens' collection and Geographical Information System maps are held at the offices and library of the Environmental Protection Authority in Hadibu, Socotra, Yemen.

The coordination office of the EPA/Socotra Conservation and Development Programme (SCDP) in the capital Sana'a (Yemen), also holds copy of most recent records and reports. For updates contacts and address: [www.socotraisland.org](http://www.socotraisland.org)

Most Important original records of the Flora and Fauna of the archipelago are also held at:

- Royal Botanic Gardens of Edinburgh, UK (flora)
- Senckenberg Museum, Germany (marine life)

Various other research institutes and universities in Europe contain specialistic collections of selected taxonomic zoological groups (mostly invertebrates). These include:

- Rostok University, Germany
- La Specola Museum, Florence, Italy
- University of Prague, Czech Republic



## 7e. Bibliography

A complete bibliography on Socotra, was recently published by the Royal Botanic Gardens of Edinburgh, (lead authors M. Gwyne) in the framework of the GEF Socotra Biodiversity Project and Darwin Initiative. The Bibliography (115pp, 681 records), was pulished in 2001, and therefore does not contain most recent scientific publications, which have added significantly to the amount of knowledge on the archipelago. However it represents a comprehensive account on all publications concerning the island, and it includes the following main sections (a full version of the Bibliography is provided in Annex A.16)

The following selected bibliography, was adopted to prepare the present nomination file.

ABDELAZIZ, M. 2003. Qalansiyah Coastal Road: Socotra Island, Yemen: Environmental Impact Statement. Unpublished Report, SCDP/EPA, Sana'a, Yemen.

APEL, M. & K.I. HARIRI (eds), 2001. Conservation and Sustainable Use of the Biodiversity of Soqotra Archipelago. Marine Habitat, Biodiversity and Fisheries Management. Progress Report of Phase III. 191pp. Senkenberg Research Institute; Frankfurt a. M. Germany. Unpublished Report, SCDP/EPA, Sana'a, Yemen.

APEL, M., 2000. Survey of the decapod Crustacea of Socotra. In: Hariri, K.I. and F. Krupp (eds) Conservation and Sustainable Use of Biodiversity of Socotra Archipelago - Marine Habitat, Biodiversity and Fisheries Surveys and Management – Progress Report of Phase II (September 2000). Senckenberg Research Institute and Natural History Museum, Frankfurt am, Germany.

ARECHEVALETA, M., N. ZURITA, M.C. CARRERO & J.L. MARTIN (EDS.) 2005. Lista preliminar de especies silvestres de Cabo Verde (hongos, plantas y animales terrestres) 2005. Consejería de Medio Ambiente y Ordenación Territorial, Gobierno de Canarias, 155pp.

AYYAD, M.A., 1998. Preparing an action plan for Yemen natcom and revising nomination of Socotra as Biosphere Reserve. UNESCO, Cairo. Unpublished mission report.

BALDWIN, R., 2004. New Songs from Arabian Sea. Arabian Wildlife (viewed in April 2004) Trident Press Ltd. [www.arabianwildlife.com/current/whale.html](http://www.arabianwildlife.com/current/whale.html)

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|  |  |
|--|--|
| <b>1. General</b>                              |  |
| <b>2. The people of Soqotra</b>                |  |
| 2.1 Ethnology                                  |  |
| 2.2 Medical matters                            |  |
| 2.3 Language, literature and music             |  |
| 2.4 Social, economic and political conditions  |  |
| <b>3. Archaeology</b>                          |  |
| <b>4. History and myth</b>                     |  |
| <b>5. Explorations, travels and narratives</b> |  |
| 5.1 Pre-nineteenth century                     |  |
| 5.2 Nineteenth century                         |  |
| 5.3 Twentieth century                          |  |
| <b>6. Geography</b>                            |  |
| 6.1 Narratives and analyses                    |  |
| 6.2 Maps                                       |  |
| <b>7. Geology and geophysics</b>               |  |
| <b>8. Seas and sea lanes</b>                   |  |
| <b>9. Ecology and conservation</b>             |  |
| 9.1 Terrestrial environment                    |  |
| 9.2 Marine environment                         |  |
| <b>10. Zoology</b>                             |  |
| 10.1 General                                   |  |
| 10.2 Mammals                                   |  |
| 10.3 Birds                                     |  |
| 10.4 Reptiles and amphibians                   |  |
| 10.5 Molluscs                                  |  |
| 10.6 Arthropods and arachnids                  |  |
| 10.7 Insects                                   |  |
| 10.7(a) General                                |  |
| 10.7(b) Diptera                                |  |
| 10.7(c) Hemiptera                              |  |
| 10.7(d) Hymenoptera                            |  |
| 10.7(e) Lepidoptera                            |  |
| 10.7(f) Odonata                                |  |
| 10.7(g) Orthoptera                             |  |
| 10.8 Marine life and environment               |  |
| <b>11. Botany</b>                              |  |
| 11.1 General                                   |  |
| 11.2 Flowering plants                          |  |
| 11.2(a) General                                |  |
| 11.2(b) Flowering plant families               |  |
| 11.3 Non-flowering plants                      |  |
| 11.3(a) General                                |  |
| 11.3(b) Algae                                  |  |
| 11.3(c) Bryophytes                             |  |
| 11.3(d) Ferns                                  |  |
| 11.3(e) Fungi                                  |  |
| 11.3(f) Lichens                                |  |
| <b>Indexes</b>                                 |  |
| 1. People                                      |  |
| 2. Organisations                               |  |

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