Université Mohammed V
Faculté des Sciences
Rabat

thesis for the Master's degree
" Geotourism Ecotourism and Integrated Sustainable Development
Department of Earth and Universe Sciences

EduBioMed

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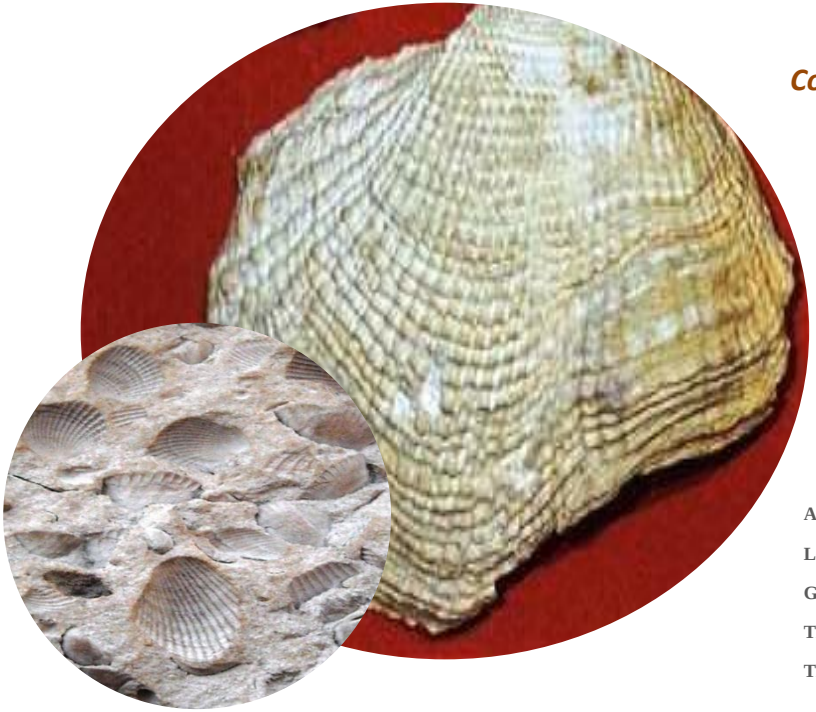


Contribution to the geo-Eco touristic development of fossil and landscape heritage

Case of the Arganeraie Biosphere Reserve RBA

(Province Agadir Ida-Outanane)

Prepared by: Mr. OUCHKAR Abderrahmane

Supervised by : Prof. HAJFANI Miloud

محمية المحيط الحيوي أركان

Réserve de Biosphère de l'Arganeraie

The **Arganeraie Biosphere Reserve** (RBA) was created in **1998** on 8000 km around this endemic forest species of Morocco: the argan tree (Argania spinosa). It constitutes one of the main characteristics of the Macaronesian sector. It is located in the Mediterranean-Saharan transition zone with a varied topography.

On 8th December1998, the first Biosphere Reserve of Morocco was declared by **UNESCO** on an area of about **2.5 million hectares** including the province of Agadir Ida Outanane. The objective is to manage and conserve the economic and ecological system "Arganeraie" while developing the economy of the region. For this, it was decided to give the region a status enabling it to achieve this objective.

The endemic **Argan tree (Argania spinosa)** is a relic of the Tertiary Era (65 million to 1.8 million years ago. The Argan forest is home to several wild species as well as a wide diversity of flora and fauna.

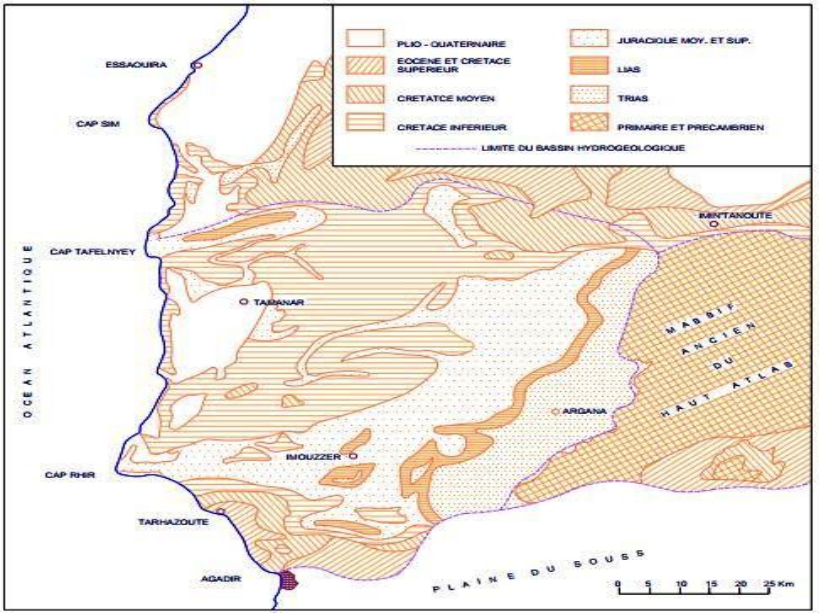
It covers both plains and plateaus (Souss, Massa and Tiznit) and the surrounding mountains (High Atlas in the North) - up to a maximum altitude of 2000 m, Anti-Atlas in the South) with two-thirds of the land having high percentage slopes.

@OUCHKAR Abderrahmane &HAJFANI Miloud, June 2020

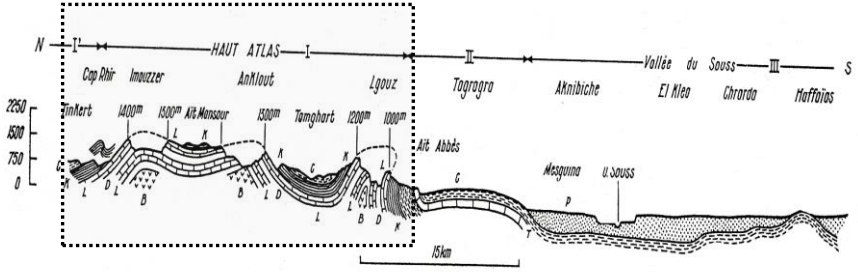
GEOLOGICAL HISTORY OF THE WESTERN HIGH ATLAS

The secondary sediments of the Ida-Outanane represent the plastic sedimentary cover, deposited on the indurated primary material and visible only in the axial zone of the high chain in the Ida- or Mahmoud. This cover was strongly folded during the various stages of the surrection of the atlasic chain in the Tertiary. These folds resulted in the formation of narrow anticlines and wider synclines. The region of Ida Outanane represents the highest and most animated mountainous massif of the Western High Atlas; two main structural lines dominate the relief: in the North the ridge that runs from Cape Ghir to Bigoudine by Jebel Tazenarkt, Imouzzer and Anklout; in the South, the ridge of the AdrarLgouz which extends from the mouth of the AssifTamraghte to Ameskroud. In the North of Ida-Outanane, the relief becomes monotonous and one enters the tabular landscape of Haha. In the South extends the valley of the wadi Souss.

The Eocene is not identified in the Western High Atlas; the Oligocene directly overlaps the Maestrichtian in the Agadir region and takes the form of a whitish cement conglomerate (20-30 m). The Neogene develops mainly along the Atlantic Ocean and is composed of sandy marl, sandstone and sandstone limestone of varying thickness, as well as the marine Quaternary.



Source : R. Ambrogi, 1963



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FOSSIL HERITAGE OF THE TRIAS

The Trias occupies the Ait Moussa valley or Argana corridor which connects with the Souss valley. In the Triassic, a monotonous return of sandstone conglomerates, schists and clays of wine lees which to this day have provided only rare fossils.

- ✓ **Estheria destembesi defretin**
- ✓ **- Estheria munita arberti**
- ✓ **- Voltzia heterophylla**
- ✓ **- Equisetites**

Source : Cliché A. Ouchkar, 2020

FOSSIL HERITAGE OF THE JURASSIC PERIOD

The lower Lias comprises reddish sandstones and conglomerates, then saliferous red clays, all of which are of imprecise attribution due to the lack of paleontological witnesses (up to 200 m thick). The upper Lias is well dated and begins with a cornice of dolomitic limestones, sometimes vacuolar, surmounted by a series of softer limestones, marly limestones and sub-lithographic limestones; limestones and lagoon marls end the Lias (250 m thick).

- **Mytilus Ostrea Nerinea**
- **Natica Cardium Perisphintes (ammonites)**
- **Reineckeia Belemnites Terebratula**
- **Rhynchonella sp Echinodermes Ostrea sp**
- **Polypiers Cidaris(radioles)**
- **Pteroceras. cf oceani**

Source : Cliché A. Ouchkar, 2020

CRETACEOUS FOSSIL HERITAGE

Green sandstones and marls (15 m) then marls and marly limestones (50 m) mark the beginning of the Cretaceous which continues with a marly and marly limestone Valanginien-Hauteri- vien (200 m) and a marly Barrémien-Aptien (100 m). A new marly episode in the Albian and Cenomanian (400 to 700 m) followed by the flinty limestones of the Turonian (30 to 60 m) which constitute a classic landmark and the terminal series of the Cretaceous with a dominant marliness (300 to 600 m thick).

Mytilus
Toxaster
Exogyra
Mytilus sp
Trigonia
Serpula
Pina sp
Ostrea
Nerinea
Natica
Cardium
Reineckeia
Dysaster
Astarte
Lima

Terebratula
Rhynchonella sp
Echinodermes
Ostrea sp
Polypiers
Cidaris(radioles)
Pteroceras. cf oceani
Lucina
Saynella
Arca
Nickelesia
Plicatula
Cardita
Panopea
Plicatula
Nautilus

Source : Cliché A. Ouchkar, 2020

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Branch: Gastéropodes
City and province: Commune Tadrart
Date:2019

A B

Reign: Animalia
Branch: Cnidaires
Class: Anthozoa
Order: Scleractinia
Family: Astrocoeniidae
Genus: A: Stylocoenia B: *Calamophylliopsis*
City and province: Commune Tamri
Date: 2019

Branch: Echinodermes
Class: les Echinoïdes
Order: Cidaroida
Family: Cidaridae
Genus: Cidaris
City and province: Commune Tadrart
Date: 2019

Branch: Mollusques
Class: Bivalve
Order: Pteriida
Family: Plicatulidae
Genus: Plicatula
City and province: Commune Aourir
Date: 2019

Branch: Mollusques
Class: Céphalopodes
City and province: Commune Aqesri
Date: 2019

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The largest and most beautiful cave in North Africa (wintimouine): (hydrological and hydrogeological geo site)

The AssifAlhadcave : (hydrological and hydrogeological geo site

Panoramic view of Tamri (Sedentary geo site)

The beautiful waterfalls of immouzzer Ida ouTanan (hydrological geo site)

The cap Ghir caves

The dinausaur footprint of upper cristaceous dinosaur in the limestones slabs of Anza beach geo (fossil site)

@OUCHKAR Abderrahmane &HAJFANI Miloud, June 2020

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