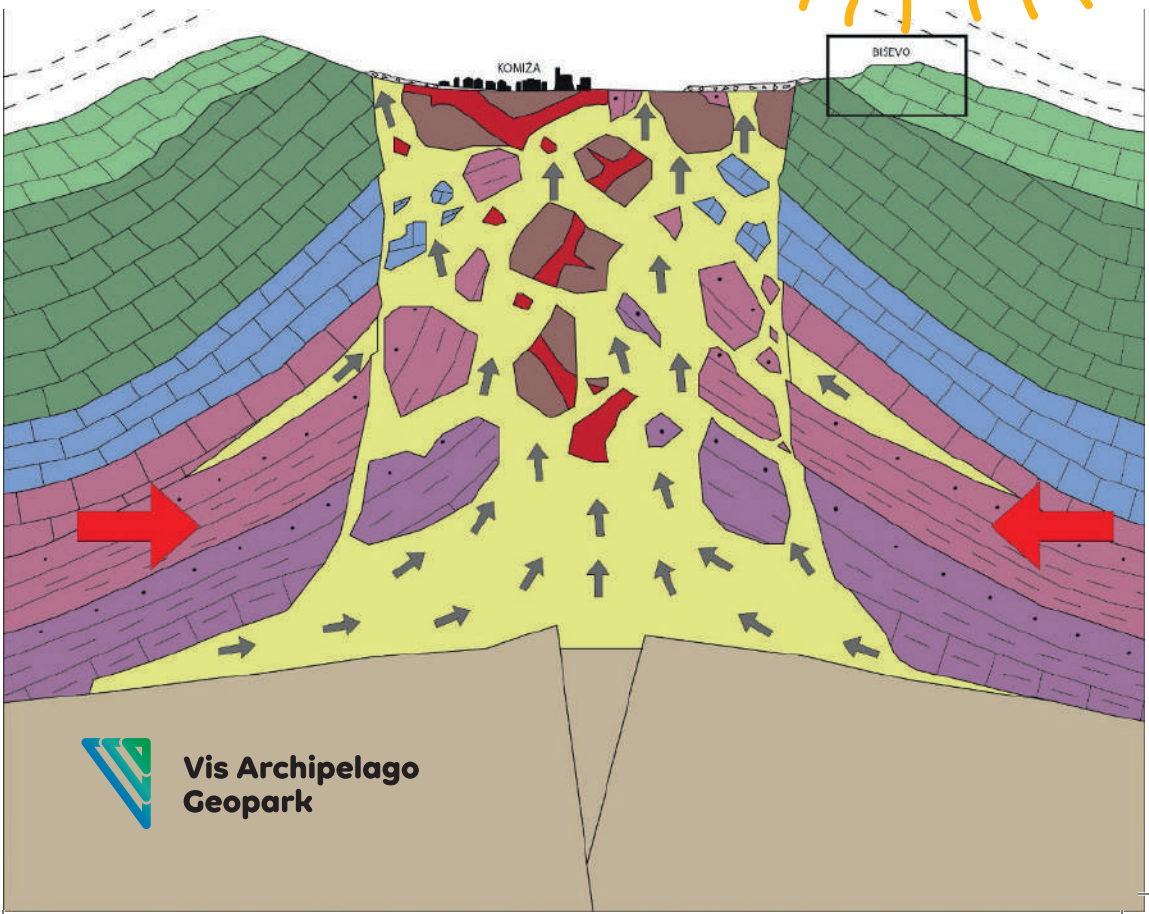
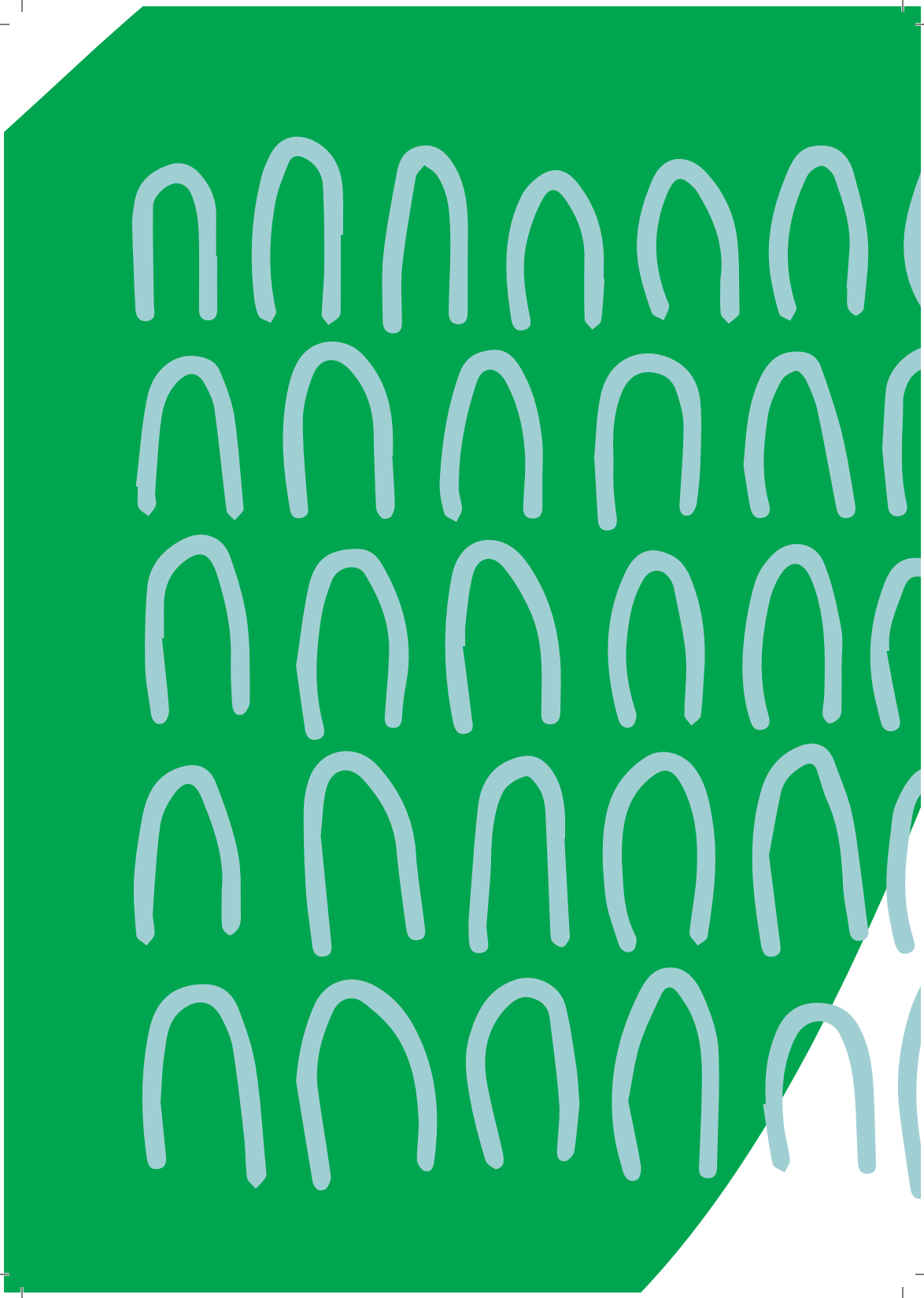
BIŠEVO GEOLOGY

THE STORY OF THE ORIGIN OF THE ISLAND



Vis Archipelago Geopark



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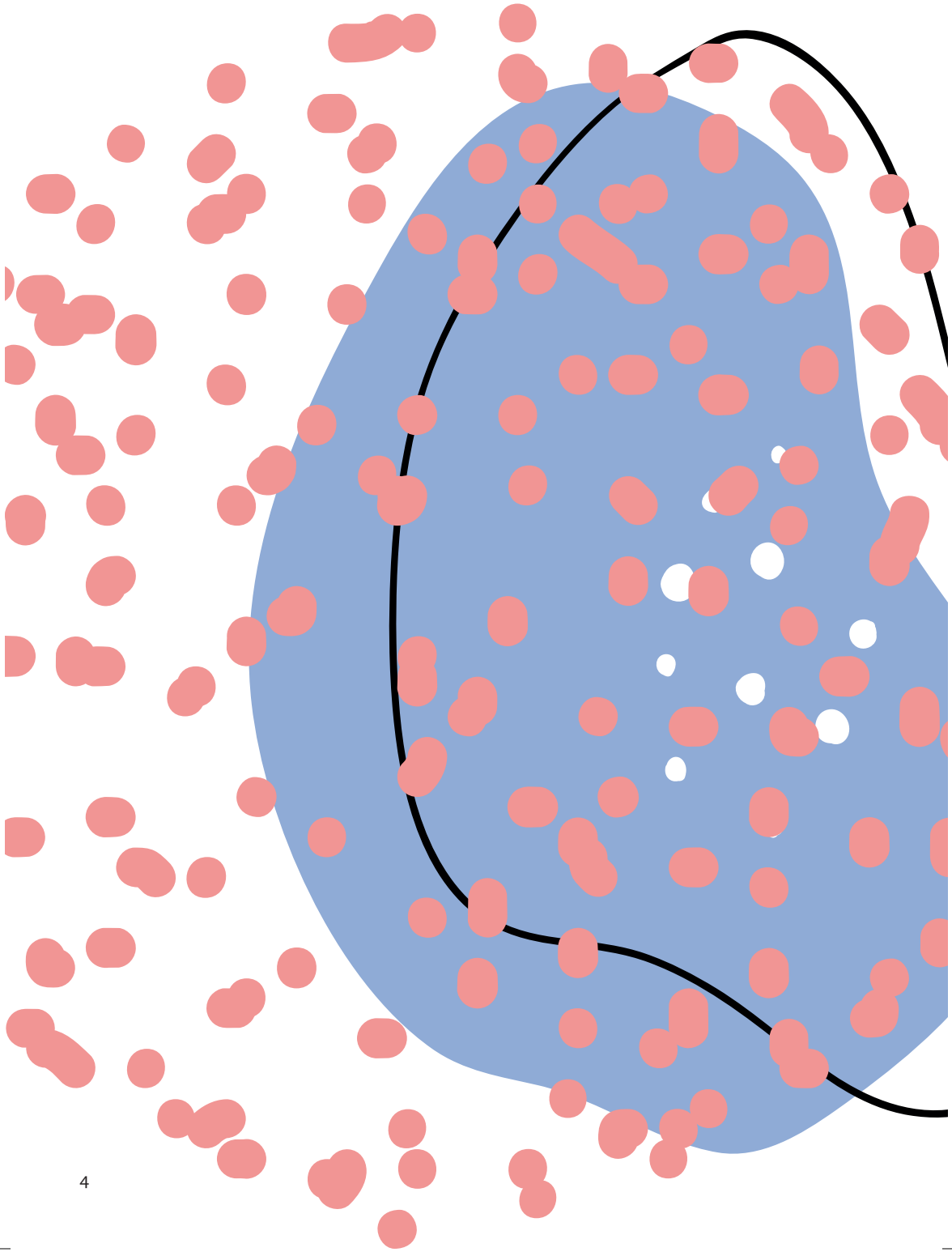

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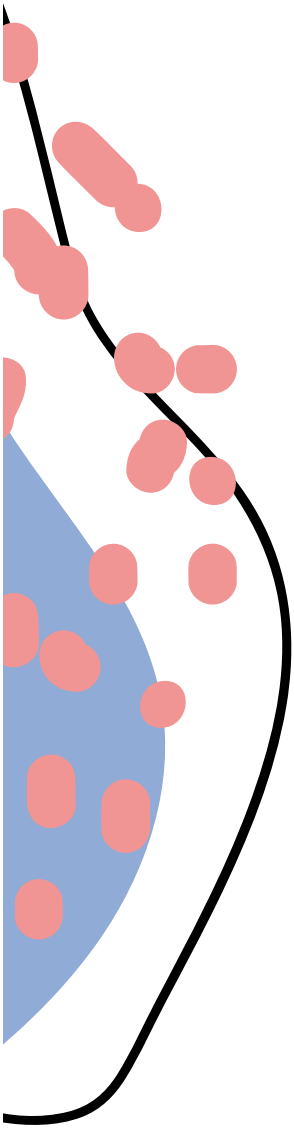


Introduction

At the end of the Age of Dinosaurs - Mesozoic era (Fig. 1), the wider area of today's Adriatic was located about 20 degrees south, in the subtropical belt on the edge of the ancient Tethys Ocean. On the small mobile continent between Africa and Europe, which we call the Adria (Fig. 2), there were several shallow-water carbonate platforms, similar to the present-day Bahamas. Today's Dalmatia was then a flat area called the Adriatic Carbonate Platform (ACP), covered with shallow warm sea and low sandy islands with tropical vegetation.

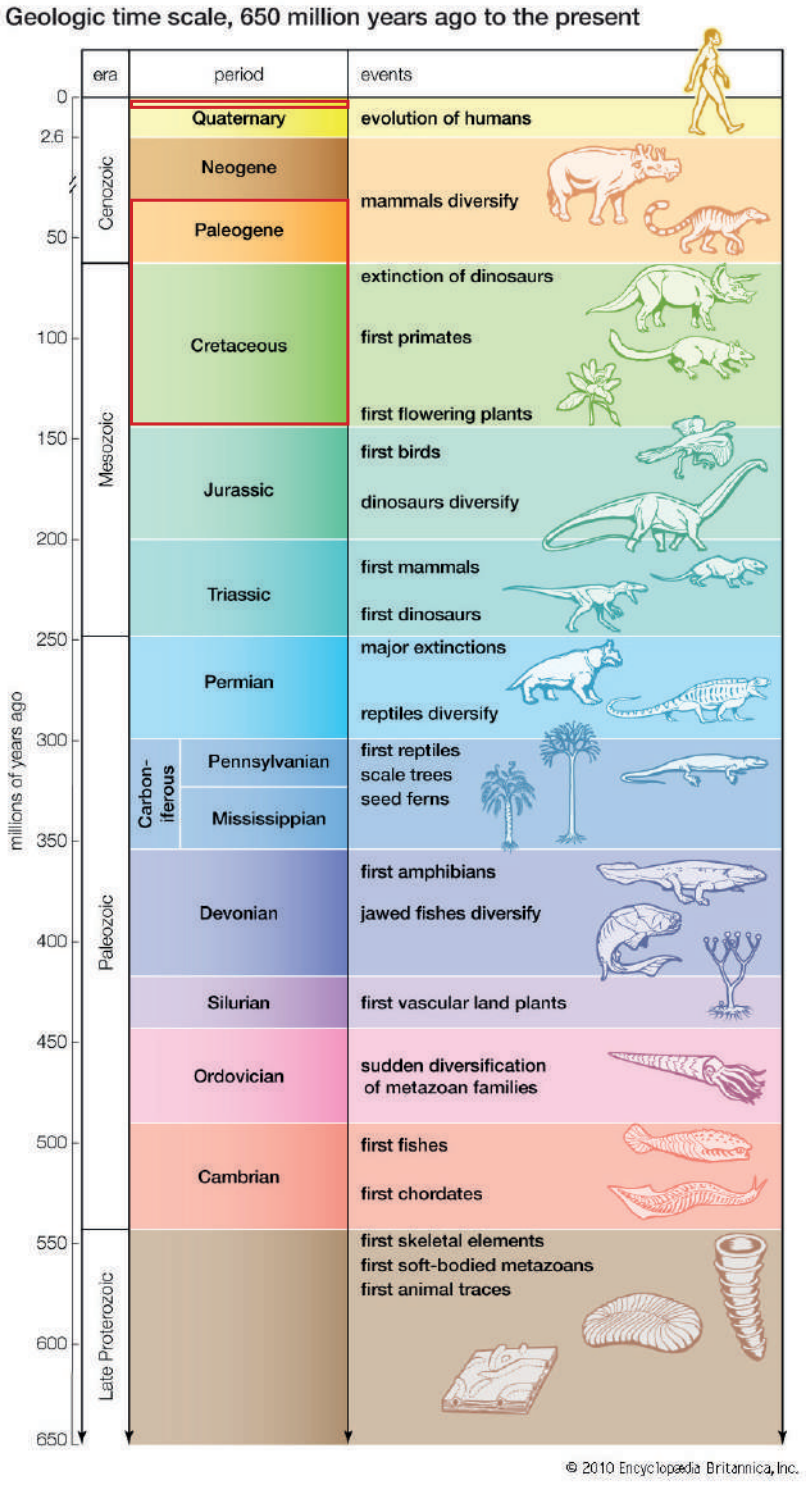


Fig. 1. An overview geological column showing the evolution of living beings on Earth through geological periods. The age of the geological deposits on Biševo is marked with red frames.

Fig. 2. Paleogeographic map with the position of the Adriatic Carbonate Platform (ACP) and today's Vis archipelago (red arrow) 66 million years ago.

In these shallows lived numerous organisms that produced smaller or larger shells of calcium carbonate. After the death of organisms, whole and crushed carbonate shells were deposited on the seabed, resulting in silt and sand, which, in the process of petrification (lithification), formed layers of solid carbonate rocks - limestone. Over millions of years, a few kilometers thick stone "cake" was built from the layers of carbonate rocks that make up the upper part of the Earth's crust in this area.

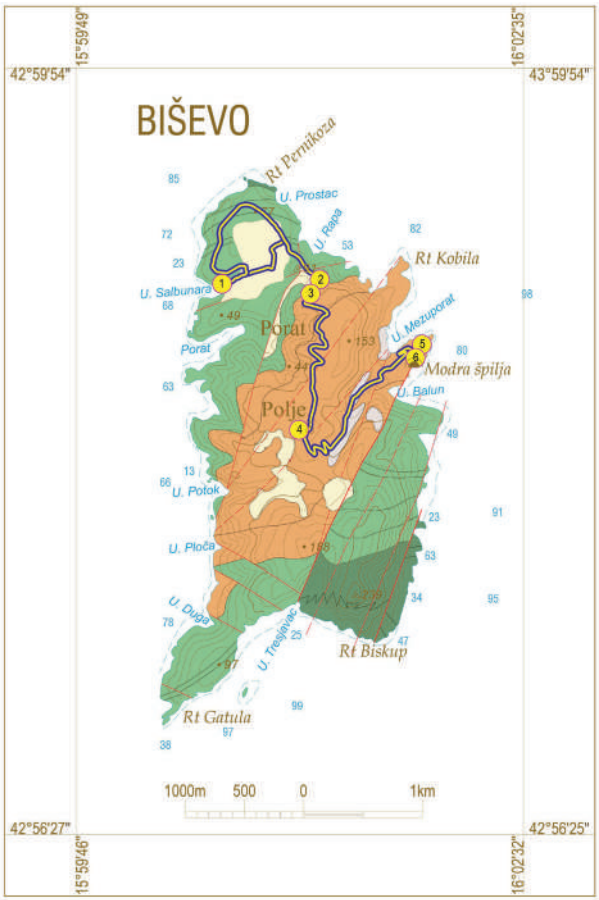
The Earth's crust was deformed during the slow "collision" of the Adria and Europe, during which a tectonic uplift occurred, so the Dinaric Mountains were created. Biševo was raised from the Earth's crust only a few million years ago due to tectonic movements witnessed by the geological structure of Biševo and cracks and faults in the rocks (on the geological map the faults are marked with red lines, Fig. 3).

The island of Biševo is built mainly of layers of sedimentary rocks formed at the end of the Age of Dinosaurs – Cretaceous, and on the

beginning of the Age of Mammals - Paleogene (Fig. 3). Between the rocks there is a thin layer of reddish deposit formed during the so-called terrestrial (land) phase. In this layer of ancient soil we can find fossil bones of terrestrial animals that lived at the turn of these two geological periods on a large island located on the edge of the Tethys.

In the youngest geological period - the Quaternary (Fig. 1), during which cold and dry ice ages prevailed, the sea level was up to 120 meters lower than today, so today's islands were hills surrounded by land.

Fig. 3. Geological map with the legend of geological units (according to the age of the rocks) and the most popular trail with geological info-points (1: Salbunara bay-rudists, 2: Upper Salbunara-eolian sand, 3: Upper Salbunara-land phase-paleosoil, 4: Polje – houses built of stone from the Age of Dinosaurs, 5: Mezuporat- "spherical" limestones, 6-Blue Cave Fault).



TUMAČ OZNAKA:
LEGEND:

Kvartar: padinske naslage (sipari i breče).
Quaternary: *Colluvial deposits (rockfall and breccia).*

Kvartar: eolski pijesci.
Quaternary: *Aeolian sand.*

Paleogen: vapnenac.
Paleogene: *Limestone.*

Gornja kreda: vapnenac i dolomit.
Upper Cretaceous: *Limestone and dolomite.*

Donja kreda: dolomit i vapnenac.
Lower Cretaceous: *Dolomite and limestone.*

geološke granice
geological boundaries

rasjedi
faults

STONE "BOOK" FROM THE AGE OF DINOSAURS

Pernikoza - Salbunara

The spectacular steep shores (cliffs) of Biševo are built of layers of carbonate rocks from the Cretaceous period (Fig. 4). Each layer (slab) of limestone rock contains geological records of events from the time of rock formation, and each subsequent layer is on average several thousand years younger than the one below it (Fig. 4B).

Fig. 4 and 4B. Stone "Book" (Libri) - layers of carbonate rocks formed during the dinosaur era (Cape Pernikoza).

Younger "pages" of the stone "book" are available along the shores of Salbunara Bay, where in this petrified mud and sand from the bottom of the tropical sea, i.e., in the limestone rock, there are captured unusual fossil shellfish - rudists (Fig. 5).

Rudists are shellfish that built their shells out of calcium carbonate ($CaCO_3$) and became extinct along with dinosaurs due to an asteroid impact 66 million years ago. The rudists lived in shells that were partly buried in the mud at the bottom of the warm sea in the shallows of the ancient Adriatic Carbonate Platform (Fig. 6).

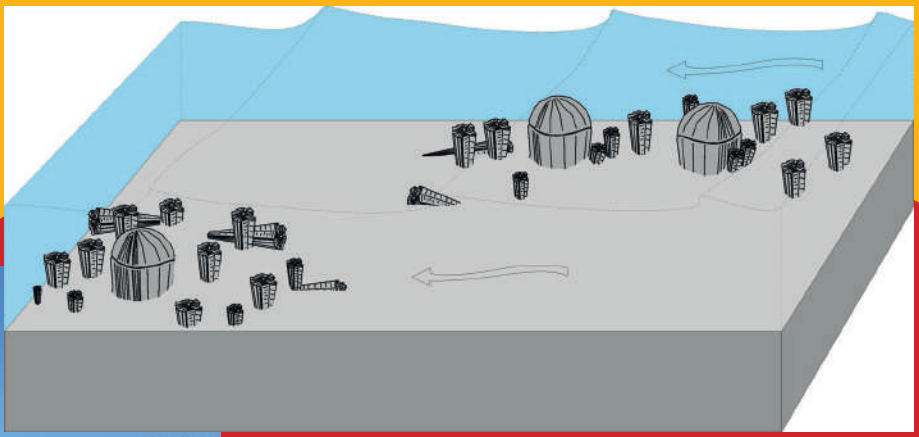


Fig. 6. Illustration of the way of life of mussels from the age of dinosaurs - rudists, in the mud from which the carbonate rock (limestone) was formed.

Fig. 5. The shells of extinct shellfish (rudists) in the limestone rock (Salbunara).

FOSSIL BONES ON THE ISLAND FROM THE EDGE OF THE TETHYS OCEAN / VIA POLJE

2 Put Polja

The wider area around the island of Vis emerged at the end of the dinosaur era, i.e., the geological period of the Cretaceous. In terrestrial conditions, carbonate rocks were partly dissolved, and cavities were filled with reddish-brown soil formed by accumulated dust brought by wind from distant

Fig. 7. Illustration of the terrestrial phase from the end of the Cretaceous period - the age of dinosaurs.

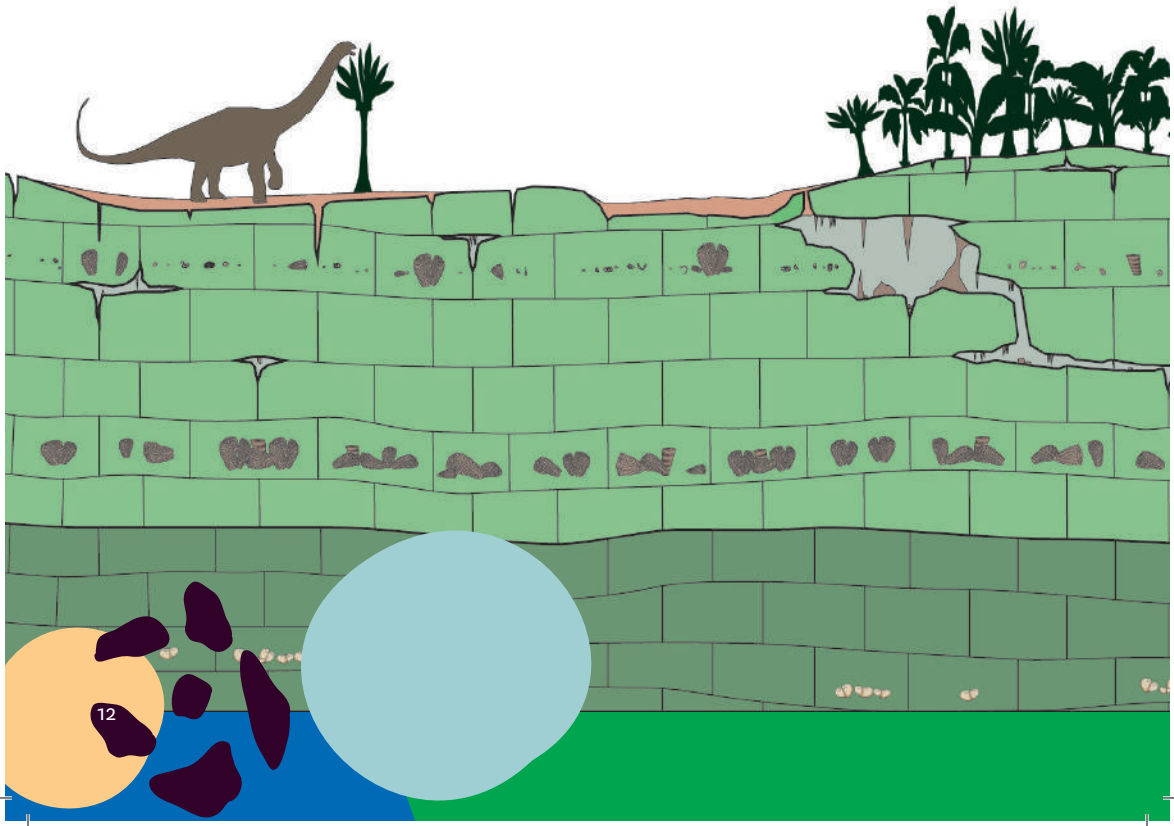
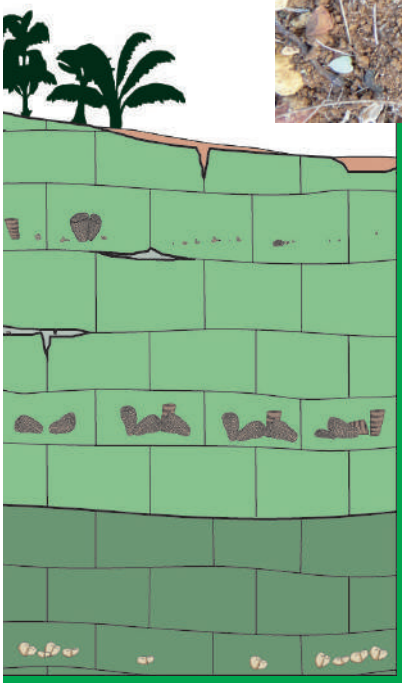


Fig. 8 and 9. Photographs of reddish-brown deposits of the terrestrial phase with fragments of vertebrate bones in the paleosoil deposited during the end of the Cretaceous (Dinosaur Age) and the beginning of the Paleogene (Mammalian Age).



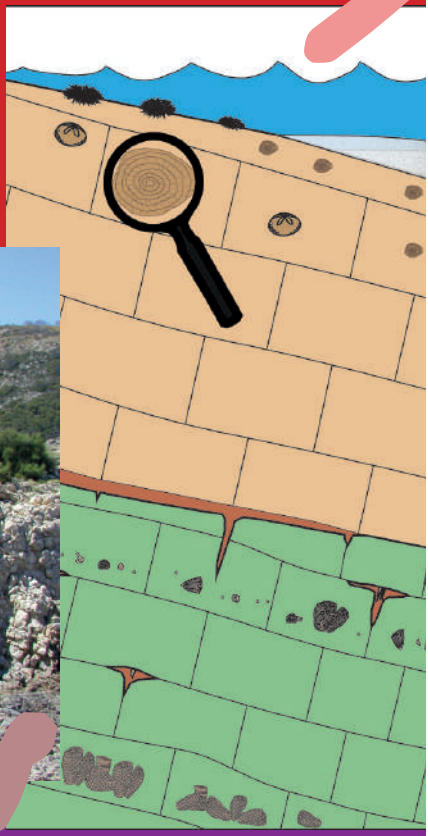
land areas, much like today's "dirty" rains bring dust from the Sahara. This large island from the edge of the Tethys Ocean (Fig. 2) was inhabited by dinosaurs (Fig. 7), reptiles and terrestrial mammals, so their bones can be found in the reddish-brown petrified paleosoil (Figs. 8 and 9).

STONE BALLS FROM THE BOTTOM OF THE ANCIENT SEA

Mezuporat

Marine life flourished again after the area was flooded again during the Paleogene, so limestones formed from fossil remains of completely different organisms than those from the Cretaceous period, and were deposited over the paleosoil deposits. Therefore, the youngest rocks from the stone "book" of the island of Biševo are Paleogene limestones formed in the sea at the beginning of the mammalian age (Fig. 10). These unusual rocks have a "spherical" stratification (Fig. 11), and

Fig. 10. Illustration of the deposition of spherically layered limestone on the seabed during the Paleogene.



Sl. 11. "Spherically" layered Biševo limestone (Mezuporat).

are composed of millions of carbonate shells of small protozoa (foraminifera), algae, sea urchins and shells and their fragments (Figs. 12 and 12B), so we call them Foraminiferal limestones. During the Paleogene period, these organisms excreted shells and skeletons of calcium carbonate, which after the death of the organism decomposed and precipitated in the form of sand at the bottom of the ancient sea. The accumulated grains of sand were bonded with crystallized carbonate cement, which formed a solid rock - limestone.

Fig. 12. Photograph of a sea urchin shell in the Paleogene Foraminiferal limestone of Biševo. B) Small shells of foraminifera fossils are better seen under a magnifying glass (Mezuporat, island of Biševo).

SALT DIAPIR

4 Biševo underground

Ancient sea salt was buried 200 million years ago in the earth's crust in the area of present day central Adriatic, and a few million years ago began to rise from the depths through younger carbonate rocks deposited over them. This is how specific geological structures that we call salt diapirs were created. Today, Biševo is located on the edge of one such kilometers in size underground salt diapir, which raised carbonate plates - layers of sedimentary rocks, and built the island (Fig. 13).

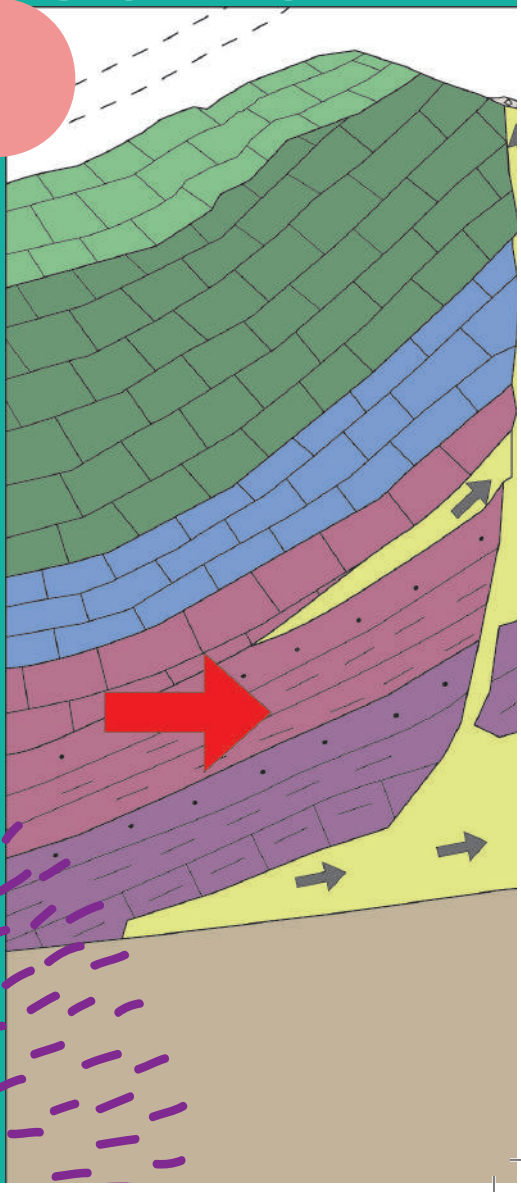
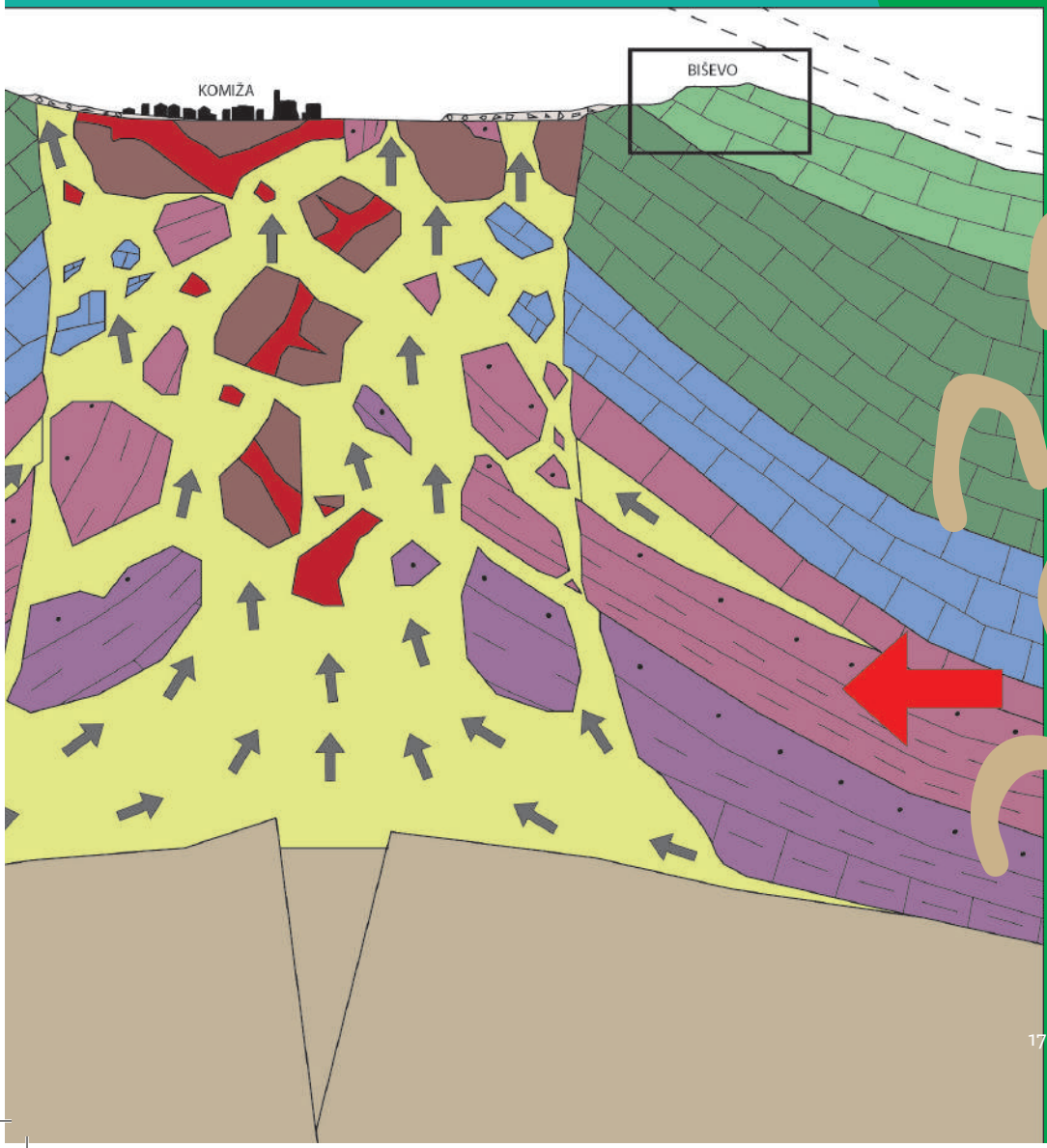


Fig. 13. The cross-sectional illustration of the Earth's crust shows the Komiža salt divert (yellow) - a kilometer-long underground structure of the oldest rocks in the Adriatic that raised layers of younger carbonate rocks from dinosaurs and mammals, creating islands.

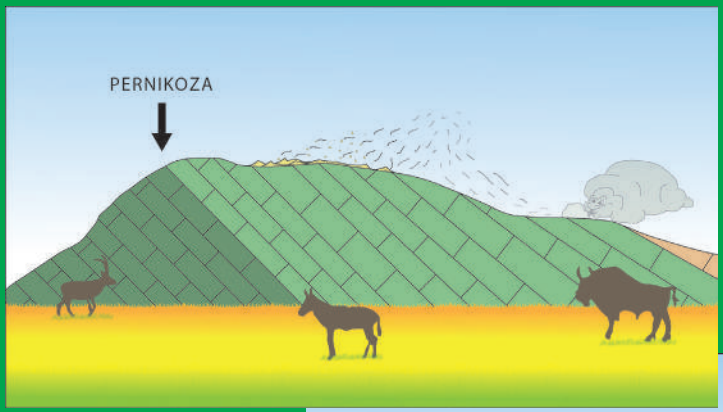


EOLIAN SAND FROM THE ICE AGE

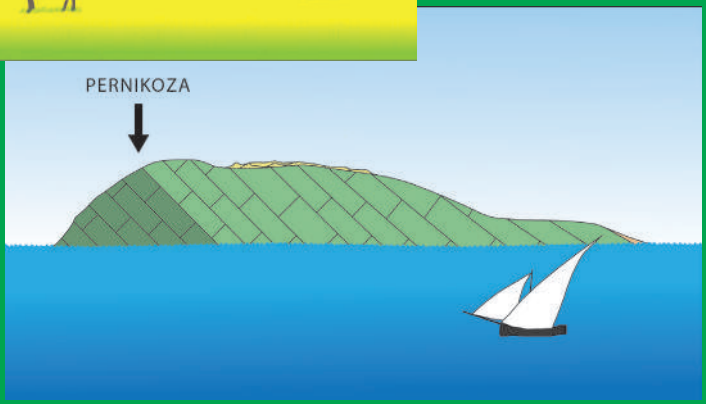
Salbunara - Porat

Twenty thousand years ago (late Quaternary), the sea was up to 120 meters lower than today, so today's islands were hills surrounded by a dry plain - steppe (Fig. 14). The wind blew sand on the surrounding hills (Fig. 15) where it accumulated for thousands of years, creating sand covers. Geological deposits formed by the wind are called Aeolian deposits, according to the Greek god of wind - Aeolus.

Fig. 14. At the end of the ice age, the sea level was about 120 m lower than today, so today's islands were hills in the middle of the Adriatic plain (steppe) along which rivers flowed.



Figs. 15A and 15B. The wind blew sand from the steppe to the hill, which is today the island of Biševo.



Today, the Biševo eolian sand is a substrate to the highest quality vines and is home to a large population of terrestrial snails (Fig. 16).

Fig. 16. Snail shells in the sand from the ice age (Upper Salbunara).

The sand was washed away by torrents into the valleys that were flooded by the sea after the last ice age, so in these deep bays today we find some of the most beautiful beaches on the island of Biševo: Porat (Fig. 17) and Salbunara.

Fig. 17. Porat - a deep bay filled with sand from the ice age, which the sea transforms into a beautiful sandy beach.

WAVES CUT CAVES ALONG THE FAULTS

6 Sea caves of Biševo

During the youngest geological period - the Holocene (last 12,000 years), the sea rose to today's level, and still rise. Along the coast, rocks collapse and cliffs form. Strong waves from the south hit the rocks, and where the rocks are most broken - along the faults (Fig. 3), the waves cut the caves. The most famous and largest are the Blue and Monk Seal caves, but along the coast there are several more.

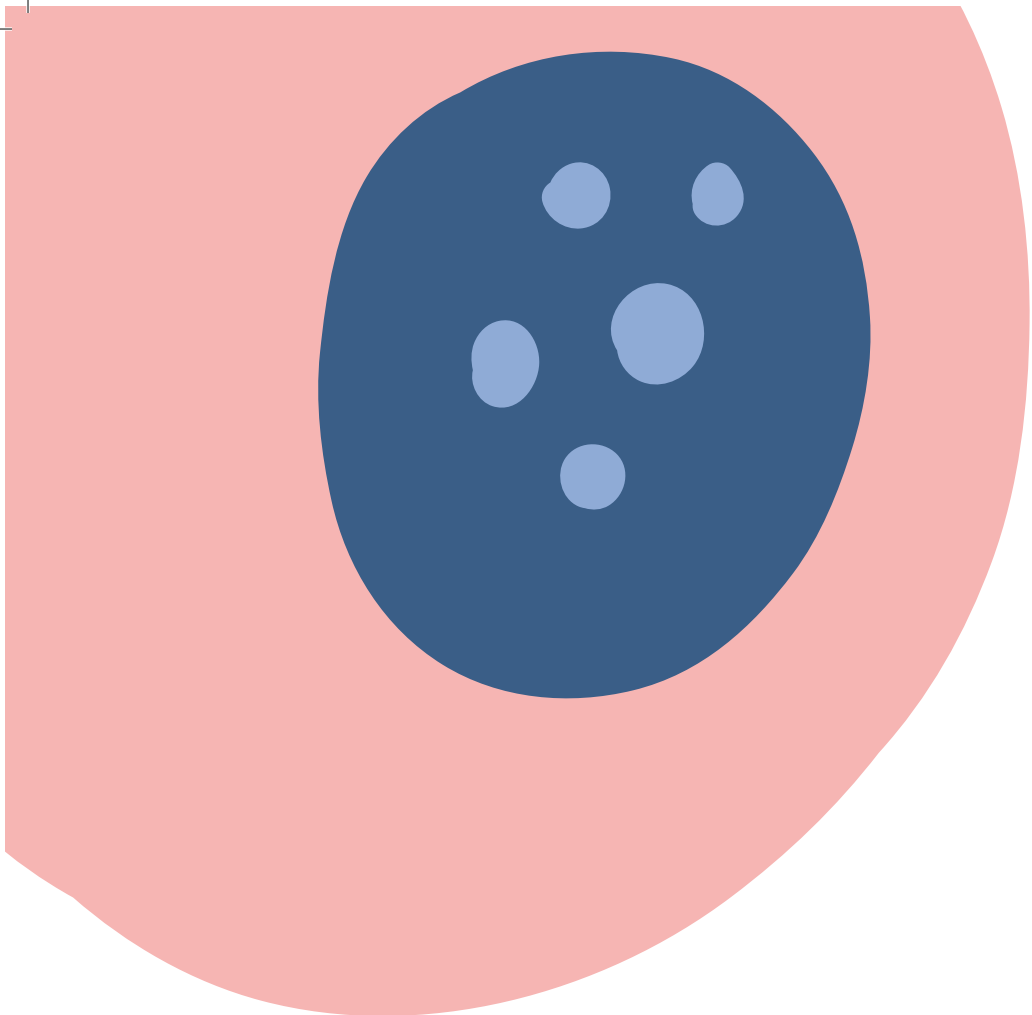
The Blue Cave was formed along the fault of the same name (Fig. 18), and is best known for its unusual blue color created by the morning sun light reflected from the sand at the bottom of the main hall (Fig. 19).

Fig. 19. Submerged entrance to the main hall of the Blue Cave.

Fig. 20. Entrance to Monk Seal cave at the intersection of faults.

Fig. 18. Blue Cave Fault above the cave entrance.

At the entrance to the Monk Seal cave (Fig. 20) there is a fault plane of impressive dimensions - the so-called Tectonic gate, on which traces of rock-to-rock scraping can be seen.



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