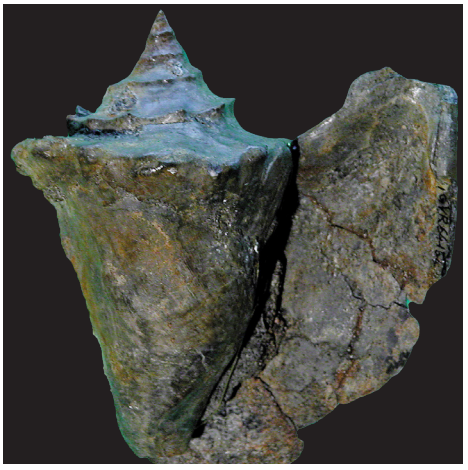
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E DELLA SICUREZZA ENERGETICA

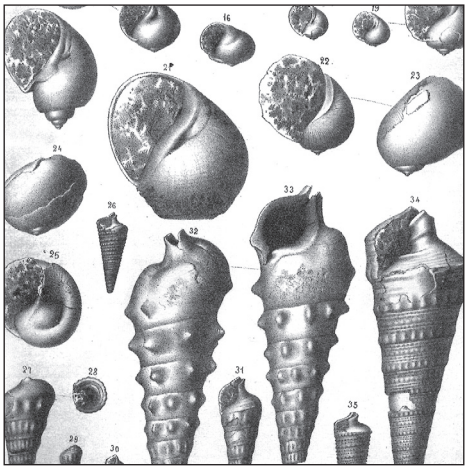
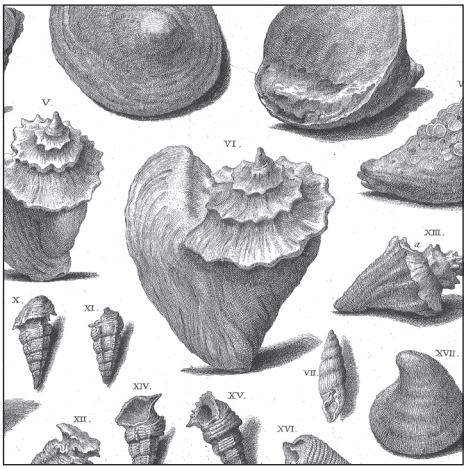
PROPOSAL FOR THE INSCRIPTION ON
THE UNESCO NATURAL WORLD HERITAGE LIST

THE EOCENE MARINE ECOSYSTEM IN THE VAL D'ALPONE

BOLCA, SAN GIOVANNI ILARIONE, RONCÀ





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The Eocene Marine Ecosystem in the Val d'Alpone Bolca, San Giovanni Ilarione, Roncà

Two valleys, one heritage

The Val d'Alpone and the upper Chiampo Valley, the extreme edges of eastern Lessinia, between the provinces of Verona and Vicenza, in the Veneto region, are two wonderful valleys, crossed by rushing torrents of the same name. The two valleys are divided by hilly reliefs made up of volcanic and marine sedimentary rock formations. Precious evidence of life in the different environments that have followed one another has been preserved within them since ancient times. In particular, the marine rocks that are tens of millions of years old and date back to the Eocene preserve fossil remains that allow scholars to delve deeper into aspects of life and the ecosystems of that time. The area of the two valleys, subjected to complex geological events over millions of years, was located in the warm and shallow Tethys Sea during the Eocene, where particular and unique living conditions were created that allowed the development of exceptional biodiversity. In this epoch, different marine and island environments have followed one another, inhabited by a huge variety of fish, molluscs, crustaceans, jellyfish, marine and continental plants, as well as turtles and crocodiles, birds and insects that we find today as fossil remains.

The history of the findings and interpretation of these fossils is also nothing short of exceptional. The first evidence dates back to the mid-sixteenth century; since then, the Eocene fauna of the two valleys has continued not only to be admired for its uniqueness and beauty, but has become an essential scientific reference in the world of paleontology and is a center of international interest for those who study the constitutive and evolutionary characteristics of life on planet Earth, when it was not yet inhabited by man. The excavations and studies conducted for centuries in the fossil deposits of Val d'Alpone and the upper Chiampo Valley, documented by over 1000 publications, have made a significant contribution to the paleontological knowledge of marine life during the Eocene.

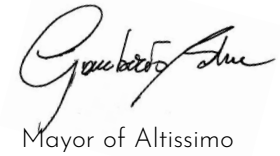
To promote this extraordinary and exceptional heritage as a World Heritage Site, an interdisciplinary working group was formed in 2014, with different professional skills and expertise.

After various meetings and debates with institutions and residents, the working group felt the desire to make known, beyond the mere territorial borders, these invaluable treasures, guarded for us by Mother Nature and the need for the exceptional paleontological heritage of the two valleys to be protected, preserved and enhanced in order to be able to transmit it intact to future generations. In these meetings with administrators and residents, a strong desire for cultural, civil and human growth and an awareness capable of stimulating the pleasure of knowledge and learning were also perceived.

At the end of this patient work, which lasted more than two years, on February 2, 2017, eight municipalities (Monteforte d'Alpone, Gambellara, Roncà, Montecchia di Crosara, San Giovanni Ilarione, Vestenanova, Crespadoro and Altissimo), to which Verona was later added in 2019 and Soave in 2020, the University of Verona, the Lessinia Regional Natural Park, the consortia and the Roads of Lessini Durello, Soave and Gambellara, in addition to the cultural associations "San Zeno" and "Storie di Piccola Patria", established the Temporary Association of Purpose (A.T.S.) "Val d'Alpone – faune, flore e rocce del Cenozoico", with the aim of proposing the candidacy for World Heritage of this extraordinary territory, which has the privilege and responsibility of safeguarding these invaluable treasures.

The 20 signatory bodies were joined as supporting members by the Veneto Region, the Provinces of Verona and Vicenza, BVR Banca - Banche Venete Riunite, the Lions Club of Val d'Alpone, the Rotary clubs of Verona – Soave and Arzignano, Ceratoichthys, Marsec, the Abbey of Villanova for the territory, the GAL Baldo-Lessinia and the Paleontological Association Gruppo Valnera di Roncà.
The first objective of the A.T.S. was to prepare initial documentation to demonstrate the exceptional value of the paleontological heritage, to ask the Ministry of the Environment and Culture to include it in the Italian Tentative List (the tentative list in which the assets for which the State will propose, in the years to come, inclusion in the list of UNESCO sites are reported).
The Dossier was drafted by the working group, in close collaboration with the scientific committee, a body composed some of the best Italian paleontologists and some foreign experts. The project is presented as a nomination for a naturalistic asset, according to criterion VIII provided for by the UNESCO Convention, or as an "exceptional testimony to one of the moments in the history of Planet Earth". Therefore, it considers the structure of the Ministry of the Environment as a referent, in addition to the Ministry of Culture responsible for paleontological heritage.
On 21 May 2021, the Ministry of the Environment included our project "Eocene Biodiversity in the Alpone Valley" in the Italian Tentative List. After the inclusion in the Italian List, the A.T.S. working group and the Scientific Committee met with an international world heritage expert to better define the contents of our nomination. After an intense debate, the proposal "The Eocene marine ecosystem in the Alpone Valley – Bolca, San Giovanni Ilarione, Roncà" was chosen to nominate. This proposal is undoubtedly the most significant for the values present in the Alpone Valley and the most consistent with the indications of the Operational Guidelines for worldwide recognition.
Along these lines, the working group continued to draft this ambitious project, involving the Ministries of the Environment and Culture, the Superintendence of Archaeology, Fine Arts and Landscape for the provinces of Verona, Rovigo and Vicenza as well as, of course, all the municipalities that make up the A.T.S., the University of Verona, the Lessinia Regional Natural Park and all the citizens of this wonderful territory who believe in this extraordinary project.
Finally, the support and sharing of the candidacy project by the municipal administrations of Altissimo, Vestenanova, San Giovanni Ilarione and Roncà and the Lessinia Regional Natural Park is fundamental, as they will guarantee the operation and continuity of the project in the desirable inclusion of the site in the UNESCO heritage list.

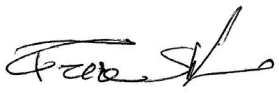
President of the A.T.S. "Val d'Alpone – faune, flore e rocce del Cenozoico"
Giamberto Bochese



Mayor of Altissimo
Omar Loris Trevisan



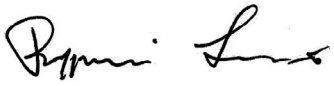
Mayor of Vestenanova
Stefano Presa



Mayor of San Giovanni Ilarione
Luciano Marcazzan



Mayor of Roncà
Lorenzo Ruggeroni



President of the Lessinia Regional Natural Park
Massimo Sauro



Nomination UNESCO
World Heritage List

This report brings together, for the first time, a remarkable amount of scientific and historical information on the Eocene marine ecosystems preserved in the Val d'Alpone.
The fossils collected from the sites of Bolca, Roncà and San Giovanni Ilarione have been studied for more than 500 years, resulting in the description of a thousand species in an impressive number of scientific publications.
Indeed, dozens of museums worldwide hold type specimens – those very important specimens that are used to define the characteristics of new species – from these celebrated Val d'Alpone sites.
One of the most relevant fossiliferous sites of the Val d'Alpone, Bolca, contains some of the world's most beautifully preserved fossils of vertebrate and invertebrate animals and plants. The sites of Bolca, Roncà and San Giovanni Ilarione are among the most productive fossil localities in the world and millions of fossils have been extracted from these deposits over the last five centuries.
Over the history of Val d'Alpone, sediments built up on the bottomof the Tethys Ocean to depths of hundreds of meters in thickness, resulting in pressures necessary to transform the sediments into rocks. Subsequently, mountain uplift and erosion over more than 40 million years eventually brought the fossiliferous deposits to their current position in the Monti Lessini, a southern prolongation of the Southern Alps.
Overall, the fossils of the Val d'Alpone make up a collage of Eocene snapshots documenting biologically hyper diverse tropical marine ecosystems located near the west end of the Tethys Ocean. These extraordinary assemblages of fossils provide us with remarkable data necessary to properly reconstruct the deep history of our planet and to answer numerous evolutionary and geological questions.
Therefore, due to the amazing historical and scientific relevance, it is clear that the serial site of the Val d'Alpone shows all the necessary features in support of its nomination for the inscription within the UNESCO World Heritage List.

Past-President, Società Paleontologica Italiana
Giorgio Carnevale





Executive Summary

State Party
Italy

State, Province or Region
Veneto Region, Province of Verona and Vicenza

Name of nominated property
The proposed name is ***The Eocene Marine Ecosystem in the Val d'Alpone - Bolca, San Giovanni Ilarione, Roncà***

Geographical coordinates to the nearest second
The geographical coordinates of the centre of the nominated property, considered as a whole, are the following:
Latitude: 45° 31′ 10″ N
Longitude: 11° 15′ 42″ E

The geographic coordinates for each of the components of the nominated property are as follows:

ID	Name of the nominated	coordinates of the central point		UTM coordinates (EPSG:32632 - WGS 84 / UTM zone 32N)		SURFACES	
	component part	Latitude	Longitude	X	Y	area of nominated component part	area of buffer zone
01	Bolca	45°36'06" N	11°13'20"E	673316,692	5052191,785	21.00 ha	52.50 ha
02	San Giovanni Ilarione	45°31'09"N	11°15'43"E	676675,274	5043133,193	2.30 ha	21.60 ha
03	Roncà	45°29'35"N	11°17'26"E	678965,166	5040311,233	65.00 ha	142.00 ha
	EME-VdA nominated serial property	45°31'10"N	11°15'42"E	677370,515	5043489,414	**88.30 ha**	**216.10 ha**
						TOTAL AREA (in ha)	

Coordinate reference system: International ellipsoid - World Geodetic System 1984 (WGS84, also called EPSG: 4326.
Values are expressed in sexagesimal degrees (degrees, minutes, seconds) rounded to the nearest second..

Previous page: *Ceratoichthys pinnatiformis*, one of the rarest fossil fishes of Bolca (length 18 cm)

Textual description of the boundary(ies) of the nominated property

The nominated property is located in the North-East of Italy in the Veneto Region. Located in the Val d'Alpone and in the upper Chiampo Valley in its northernmost areas, the property is composed of three components parts: Bolca, San Giovanni Ilarione and Roncà.

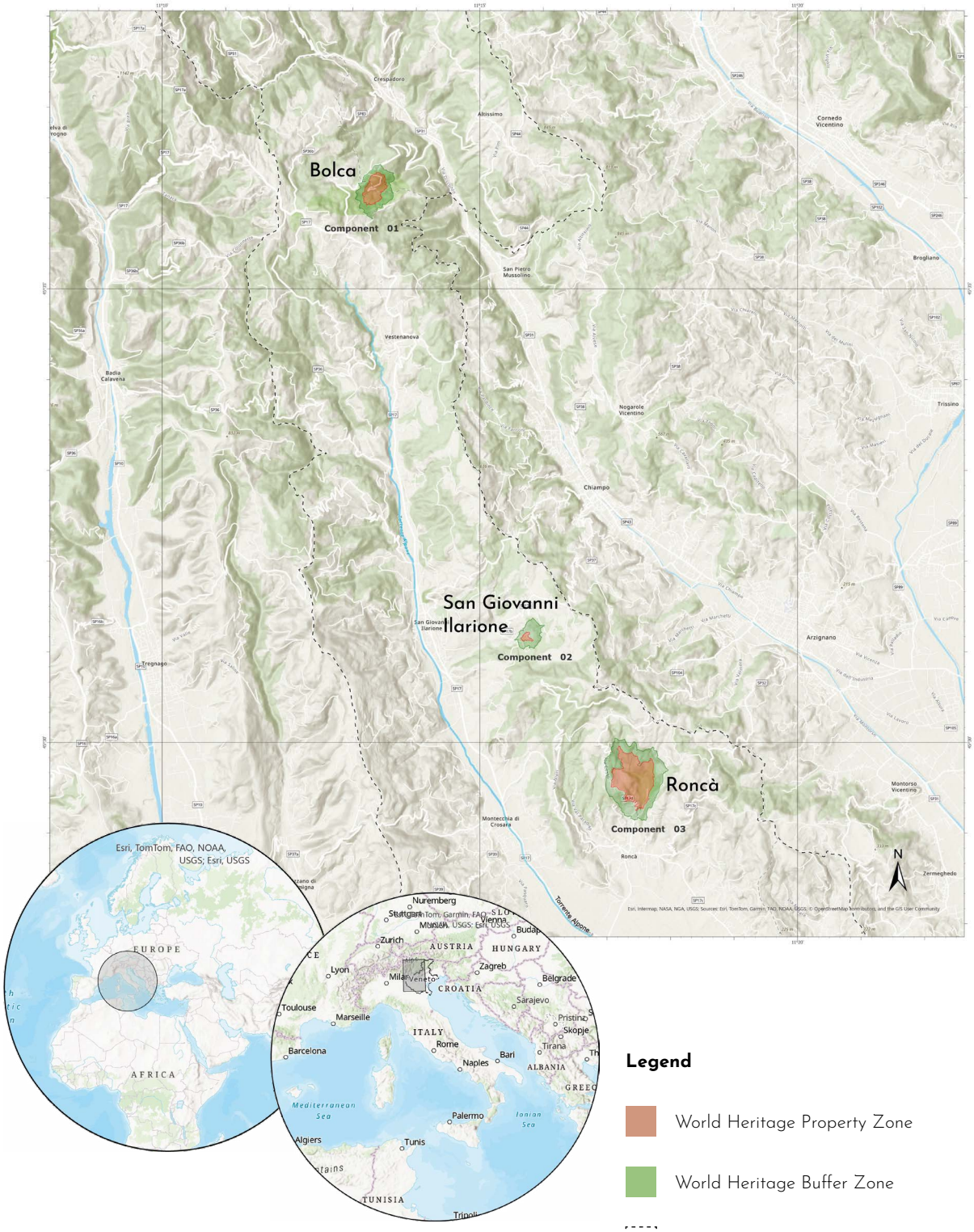
The Bolca component part is located partly in the Municipality of Altissimo in the Province of Vicenza and partly in the Municipality of Vestenanova in the Province of Verona.
The San Giovanni Ilarione component part is located in the Municipality of San Giovanni Ilarione in the Province of Verona.
The Roncà component part is located in the Municipality of Roncà in the Province of Verona.
60% of the nominated property (core zone) and 70% of buffer zone are within the boundaries of the Lessinia Regional Natural Park.
The shape and dimensions of the *buffer zone* are defined in order to protect the deposits and outcrops identified over time. There is a distance of about 13 kilometers between the Bolca component part and the Roncà component part with the San Giovanni Ilarione component part in between.

Next page: Regional setting of the named property.
Below: Some specimens of *Dilatilabrum* found in the Roncà area



A4 or A3 size map(s) of the nominated property, showing boundaries and buffer zone (if present)

(Annex 1 Cartography, map 1.4)

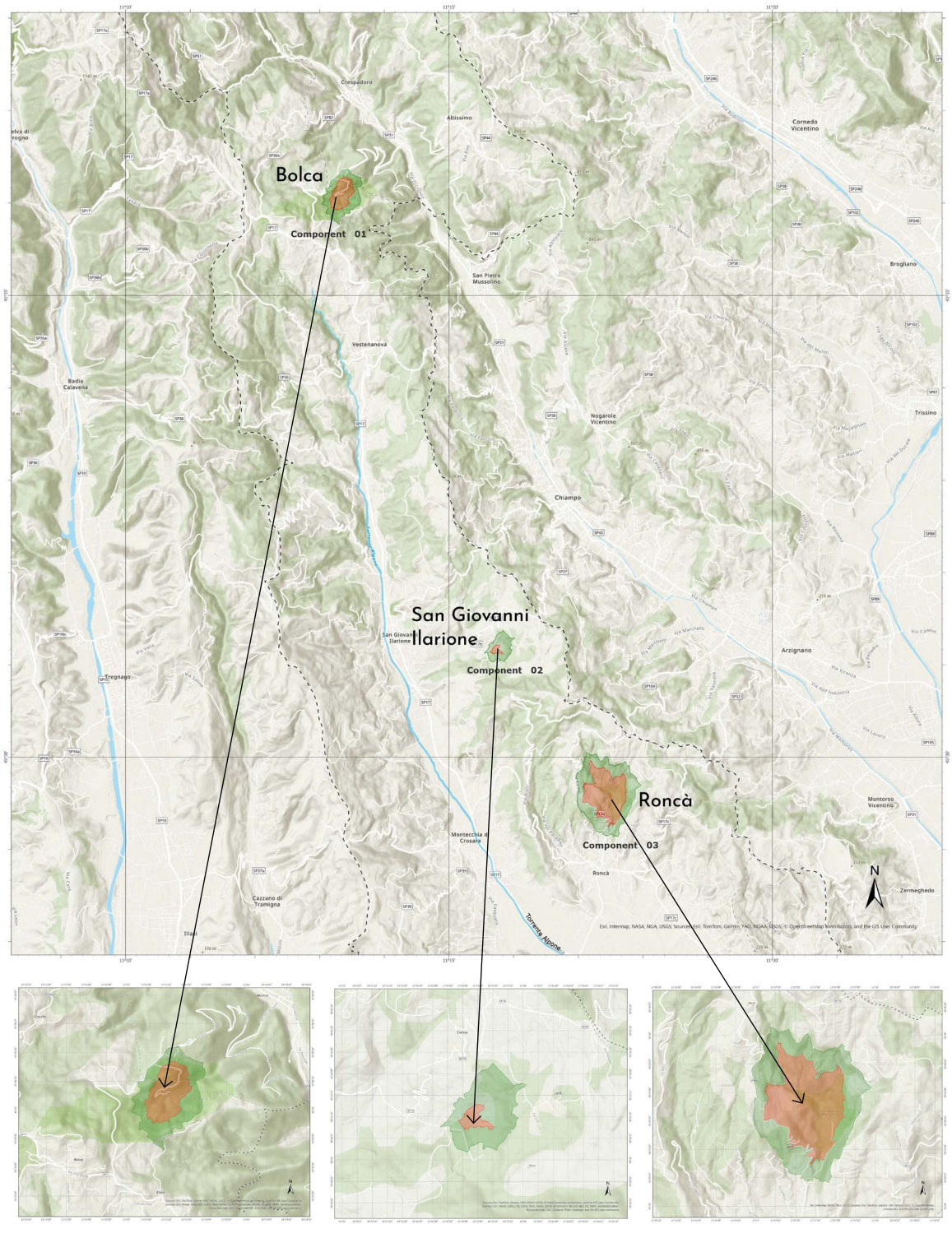


Legend

- World Heritage Property Zone
- World Heritage Buffer Zone
- World Heritage Commitment Area

Spatial Reference
Name: WGS 1984 Web Mercator Auxiliary Sphere
GCS: GCS WGS 1984
Datum: WGS 1984
Projection: Mercator Auxiliary Sphere
Authority: EPSG
WKID: 3857

Physical cartography of the serial nominated property "The Eocene Marine Ecosystem in the Val d'Alpone - Bolca, San Giovanni Ilarione, Roncà" and its component parts



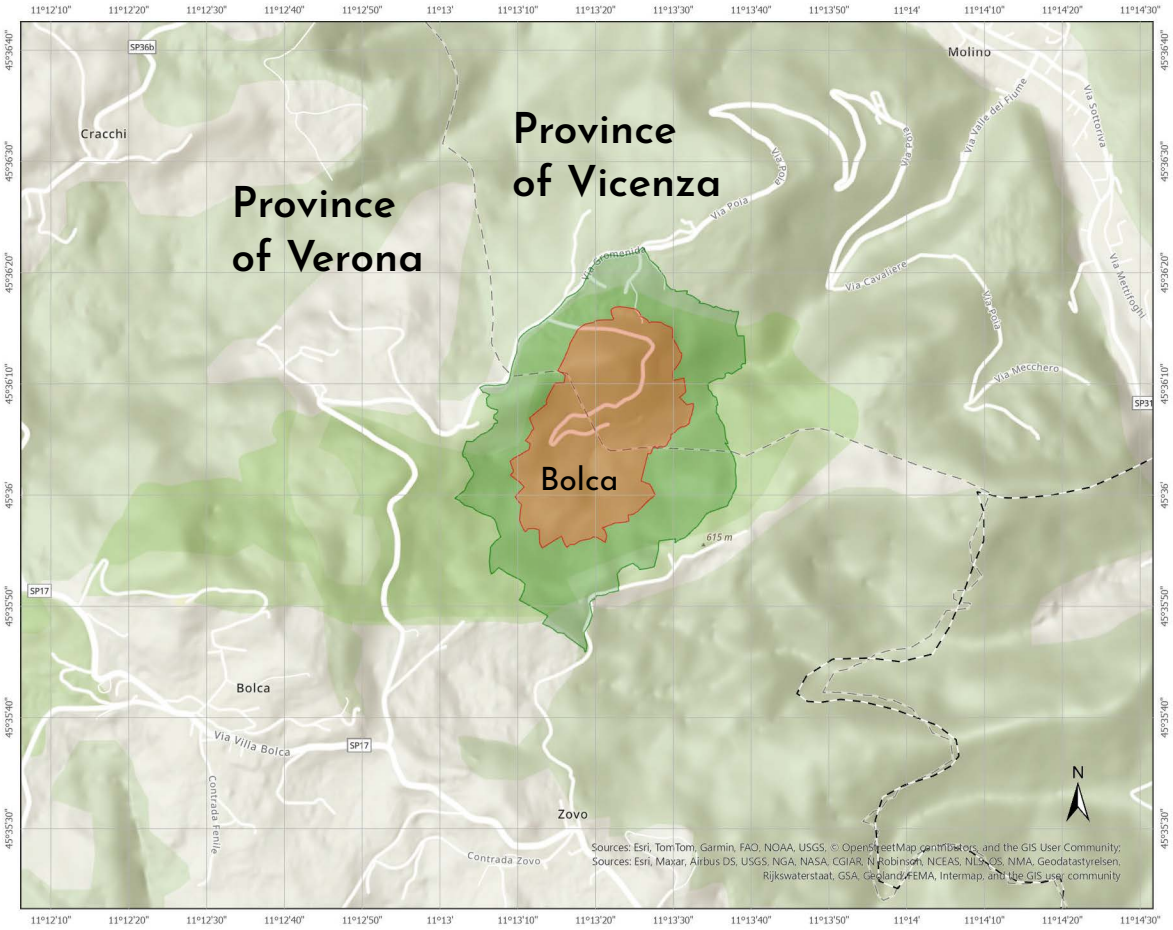
A. Bolca component part

B. San Giovanni Ilarione component part

C. Roncà component part

Physical maps of the three component parts of the nominated property and its buffer zone

Bolca component (01)



Scale 1:15.000

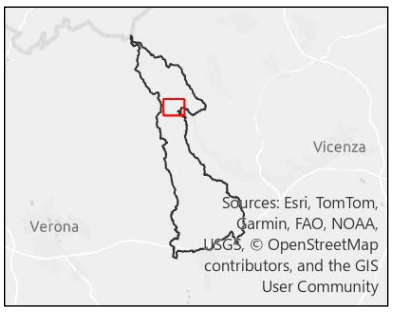
Meters
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Legend

World Heritage Property Zone

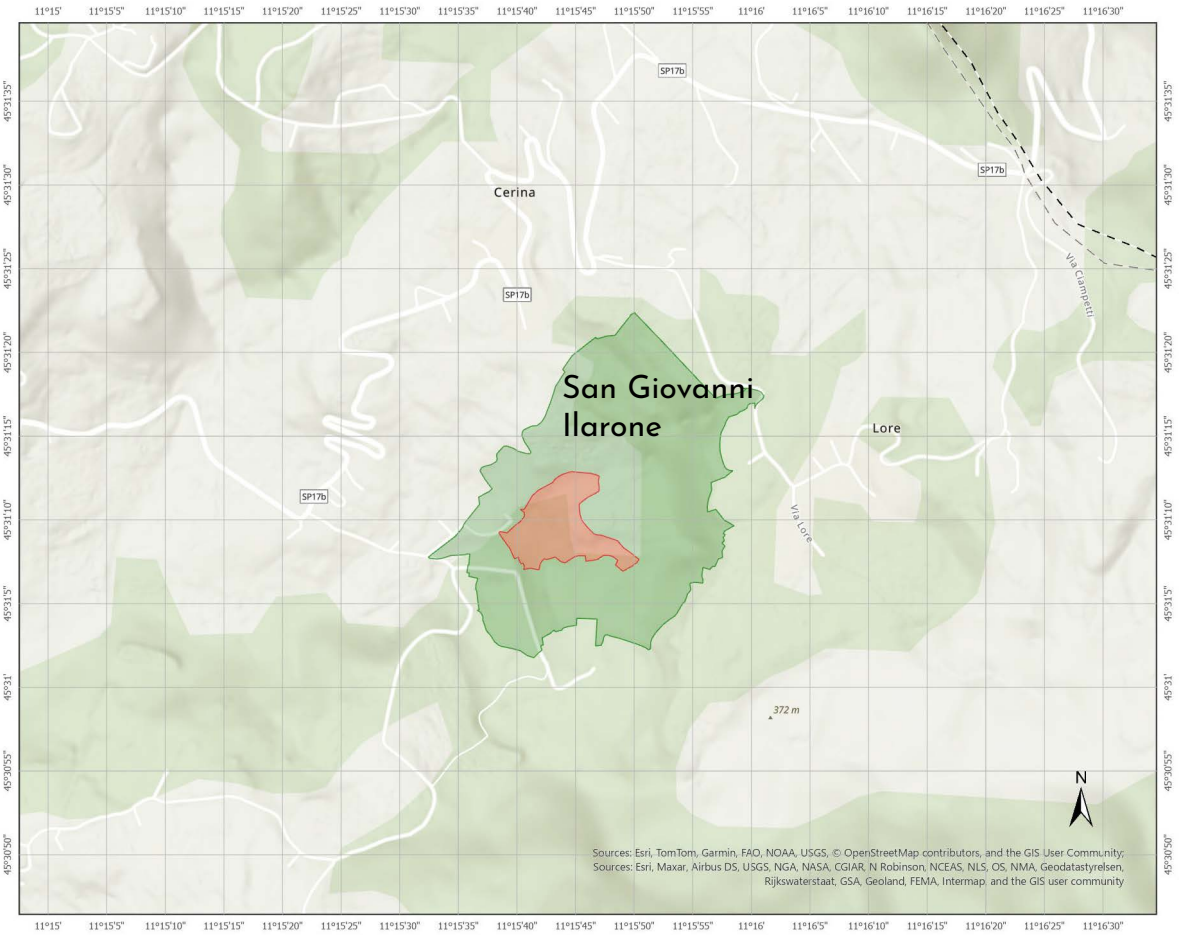
World Heritage Buffer Zone





Spatial Reference
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San Giovanni Ilarione component (02)



Scale 1:10.000

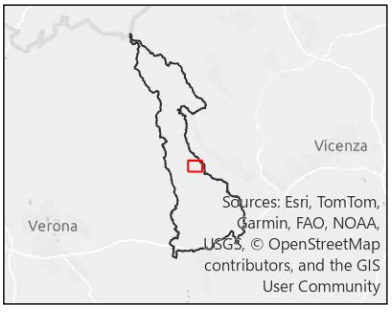
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Legend

World Heritage Property Zone

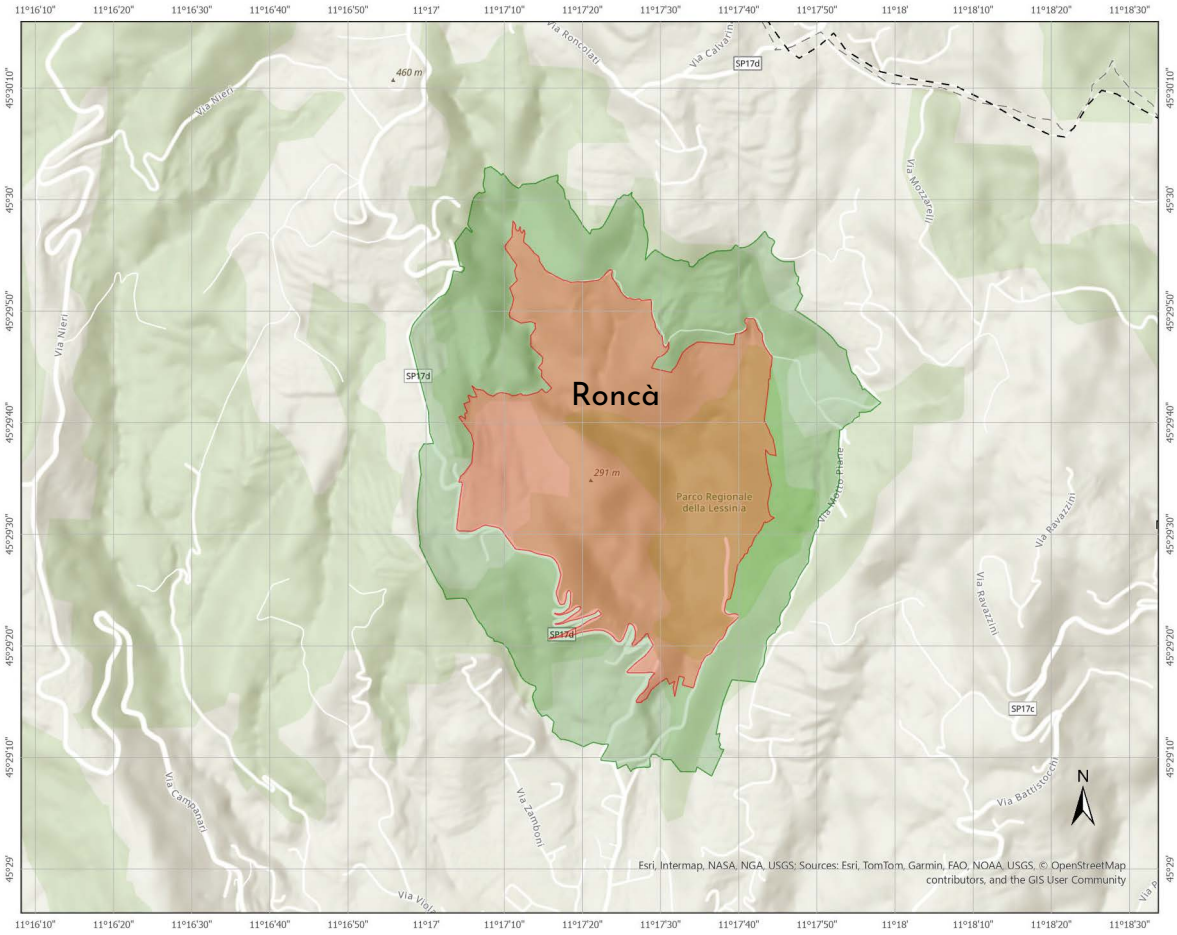
World Heritage Buffer Zone





Spatial Reference
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Roncà component (03)



Scale 1:15.000

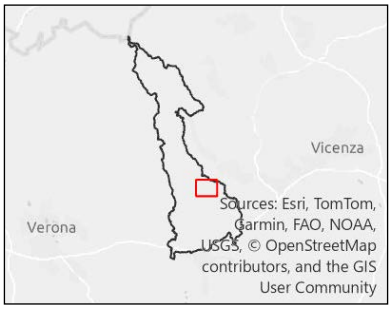
Meters
0 125 250 375 500

Legend

World Heritage Property Zone

World Heritage Buffer Zone





Spatial Reference
Name: WGS 1984 Web Mercator Auxiliary Sphere
GCS: GCS WGS 1984
Datum: WGS 1984
Projection: Mercator Auxiliary Sphere
Authority: EPSG
WKID: 3857

To support the nomination process a Temporary Association of Purpose "Val d'Alpone - faune, flore e rocce del Cenozoico" was established to represent the territory of the Alpone Valley; its members include territorial, cultural and scientific representatives, economic entities and some cultural associations.
This Association has involved, in addition to the Superintendence of Archaeology, Fine Arts and Landscape for the provinces of Verona, Rovigo and Vicenza, also the Veneto Region, as well as the Lessinia Regional Natural Park Authority.

Criteria under which property is nominated (itemize criteria)

The fossil evidence from the deposits of the components of Bolca, San Giovanni Ilarione and Roncà, located in the Val d'Alpone, are unique, irreproducible and irreplaceable natural documents describing of the Eocene marine ecosystem.
The inscription of the site **"The marine ecosystem of the Eocene in the Val d'Alpone - Bolca, San Giovanni Ilarione, Roncà"** is proposed in accordance with criterion (VIII):

"Constitute an extraordinary testimony of the main periods of the evolution of the Earth, including evidence of life, of geological processes in progress in the development of the physical characteristics of the Earth's surface or of significant geomorphic or physiographic characteristics"
The nominated property possesses in the three deposits a unique marine Eocene paleontological heritage and as a whole provides a broad ecological image of the bathymetric gradient in a period in which the Earth experienced very high temperatures, marine biodiversity reached its climax and relatives of the organisms that dominate modern seas established themselves.
The remarkable number of fossils present and their exceptional biodiversity, the extraordinary state of conservation of marine and terrestrial vertebrates and invertebrates, are documented by over five centuries of research and studies.

Cultural Landscape

The property is NOT nominated as a cultural landscape

Draft Statement of Outstanding Universal Value

a) Brief synthesis

The nominated property is located in the North-East of Italy, in the Veneto Region and in the Val d'Alpone area. The serial property is composed of the components of Bolca, San Giovanni Ilarione and Roncà which contain
3 distinct deposits with 14 outcrops whose paleontological content allows us to describe the evolution of marine life on Earth during the Eocene, thanks also to one of the most consistent and complete fossil records in the world.
The Val d'Alpone is crossed by the stream carryng the same name and extends over an area of approximately 16,700 hectares, at altitudes between 30 and 925 m s.l.m. above sea level and is part of the plateau of the eastern Lessini Mountains. This territory is characterized by extensive outcrops of volcanic rocks with gentle and wavy morphologies from which conical shapes and remains of ancient volcanic "buildings" emerge. Marine sedimentary rocks are interspersed with the volcanic rocks. The volcanic rocks, locally fossiliferous, also contain olistoliths of various sizes of carbonate rocks with a rich paleontological content attributable to the Eocene (between 56 and 34 million years ago), an era characterized by important biological, climatic, environmental and geodynamic changes. In the Val d'Alpone, over 40 Eocene fossiliferous outcrops have been recorded, indicating a very high paleontological density for such a small territory, with peculiar characteristics in which marine and terrestrial vertebrates, marine invertebrates and both marine and terrestrial plants can be recognized.
The 3 deposits have a stratigraphic continuity between the lower Eocene (Monte Postale/ Pesciara, about 49 Ma = megaannum, i.e. million years ago) and the middle Eocene (San Giovanni Ilarione and Roncà, about 40 Ma), highlighting a variety of depositional

environments that include intertidal environments (Roncà), shallow subtidal (Monte Postale, environment associated with the "Pesciara di Bolca" deposit) and subtidal with a depth between a few meters and 20-30 meters (San Giovanni Ilarione). Taken together, the three components constitute a "serial property" that provides a complete ecological scenario of the bathymetric gradient in a time interval in which the Earth experienced exceptionally high temperatures and marine biodiversity reached its climax after a long period of recovery after the mass extinction and the groups of organisms that still dominate marine habitats today have established themselves.
The characteristic elements of the three components of the nominated property are described in the following sections.

The Bolca component, with the 8 outcrops of Pesciara and Monte Postale, is one of the most famous locations in the world for ichthyofauna. Past and current excavations have also allowed the recovery of remains of reptiles, birds and a rich association of invertebrates represented by insects, arachnids, jellyfish, crustaceans, bivalves, gastropods, cephalopods, corals, brachiopods, annelids, macroforaminifera, ostracods and bryozoans. Terrestrial plants are also frequent, the latter very often accompanied by flowers and fruits.
Pesciara and Monte Postale are the most famous and important *Fossil-Lagerstätten* in Italy and undoubtedly among those of greatest importance for the entire Cenozoic at a global level. Many of the Bolca fossil fish have "relatives" still living.
Due to the great variety of fish found in the five fossil levels, Pesciara can be considered one of the richest deposits in the world. In fact, during each excavation new finds for science are brought to light. The reconstruction of the ancient living environment of the Bolca fish is rather complex as suggested by the great variety and shapes of the fish.
Some are similar to those that currently live in coral reef environments, others are characteristic of shallow sandy seabeds with meadows of marine plants and algae.
The sedimentation environment of Monte Postale must have been close to the coast, characterized by coral bioconstructions and "mangroves", while recent studies reconfirm the more "traditional" model for Pesciara, with the sedimentation of calcareous muds inside an intra-platform basin, where the existence of anoxic conditions on the seabed and the development of microbial biofilm on the cadavers have allowed the perfect preservation in the fossil state of the rich and varied fauna.

The San Giovanni Ilarione component, with the Ciupìo deposit, documents the high diversity of molluscs, but also of crustaceans.
The fossils are mainly represented by gastropods and bivalves, are found in a relatively small area and are mostly representative of the depositional environment of the open sea.
The shell remains found in San Giovanni Ilarione, particularly important and abundant at various levels of the stratigraphic succession, have been studied for two centuries as a tool for stratigraphic correlation and unique evidence of the maximum values of biodiversity reached on a global scale after the mass extinction at the end of the Cretaceous. San Giovanni Ilarione can also be considered a classic locality for the knowledge of fossil crustaceans from the Middle Eocene of the Veneto Region. Many specimens, almost all found in the Ciupìo tuffs, were the subject of important studies in the 19th century by Bittner and at the beginning of the 20th century by Fabiani. It is a fauna of brachyurans of a marine environment with a good degree of differentiation.

The Roncà component, with its 5 outcrops, is particularly rich in marine gastropods and bivalves representative of intertidal environments. From these contexts, unique information has been obtained and continues to be obtained, thanks to the excavations still in progress, regarding the conspicuous faunal biodiversity.

Each deposit, to a different but complementary extent, continues to contribute to implementing the rich fossil heritage which is collected, restored, studied and exhibited in local national and international museums: the Bolca Fossil

Museum, the Roncà Paleontological Museum, the Civic Museum of Natural History of Verona, the Museum of Nature and Man of the University of Padua and the paleontological collections of many small and large museums around the world.
The richness and uniqueness of the nominated property are highlighted by the interest that these components have aroused over the centuries in philosophers of science and naturalists starting from the eighteenth century, contributing extensively to the debate on the origin and evolution of Earth and on the nature of fossils.

b) Justification for Criteria

Criterion (viii)
The paleontological documentation of the nominated property is central to describing the history of marine geology and evolutionary biology of the Eocene. These are fossil testimonies that identify an ecological scenario of the entire bathymetric gradient, in a period in which Earth experienced exceptionally high temperatures, marine biodiversity reached its climax after a long period of post-mass extinction recovery and the groups of organisms that today populate our seas established themselves.
The extraordinary state of conservation of the fossils (vertebrates, invertebrates and plant remains), the richness of species and forms represented by the high taxonomic diversity, the uniqueness of the fish with anatomical structures and pigmentations that rarely fossilize, constitute the most complete traces of a broad and detailed
picture of marine life of the Eocene.
Furthermore, five centuries of history and over a thousand publications document the exceptional value of the Eocene fossils of the Alpone Valley, the result of a unique combination of taphonomy, stratigraphic and paleogeographic characteristics.

c) Statement of Integrity

The nominated property, consisting of the components of Bolca, San Giovanni Ilarione and Roncà, contains 14 outcrops that are subject to protection for their content of paleontological and natural values.
These components are home to those fossils that in five hundred years have contributed to explaining the evolution of Eocene marine life on Earth. The fossils collected are protected and preserved in local museums and around the world. The integrity of the deposits and their outcrops is not only linked to the conservation and protection reserved for them but also to the factors that contribute to their development. For this reason, the proposed boundaries of the *core zones* areas that contain the outcrops have been defined taking into account the geopaleontology of the places and, to ensure better conservation in the future, three *buffer zones* were created to protect the site.
The delimitation of the latter was also carried out considering the physiographic and cultural limits. Overall, the area of the designated property is 88.3 ha (*core zone*) protected by an external area adjacent to the property boundaries of 216.1 ha (*buffer zone*). Most of this territory is cultivated with coppice and meadows. The deposits and outcrops have only been partially excavated and explored based on ministerial concessions.
The extension of the deposits, the powerful stone and detrital deposits that cover them and the modest excavation volumes prevent the depletion of the fossil horizons and constitute elements in favor of the conservation and protection of the nominated property. In fact, the integrity of the property, with its values and attributes, is guaranteed by the application of cutting-edge excavation and research methods that produce a significant increase in scientific knowledge while guaranteeing a careful and balanced conservation of the heritage. The correct extraction technique and the extraordinary state of conservation of the recovered fossils allow a broad and complete reconstruction of the biotic, climatic and environmental variations and allow us to understand the phylogenetic and paleoecological significance of these fossils.
The abundance of fossil remains extracted in the past and their richness has not

impoverished the deposits, allowing us to continue research with new and modern excavation campaigns, in agreement with the Ministry of Culture - Superintendence of Archaeology, Fine Arts and Landscape for the provinces of Verona, Rovigo and Vicenza.
A part of the invaluable paleontological heritage collected in the past has played a fundamental role in the history of science. Currently, this hetage is preserved in the museum of the Val d'Alpone and in the collections of museums all over the world.
About 60% of the *nominated property* and 70% of the *buffer zone* falls within the area of the Lessinia Regional Natural Park
All the outcrops have been catalogued by the *"Val d'Alpone - faune, flore e rocce del Cenozoico"* On these outcrops, the Superintendence of Archaeology, Fine Arts and Landscape for the provinces of Verona, Rovigo and Vicenza has recognized a preventive protection, in 2020 and in 2023.

d) Requirements for protection and management

All the outcrops of the components of the nominated property have a strong legal protection framework. It consists of a coherent system of measures that link different levels of legislation (European, national, regional and local) and protects the paleontological values and attributes of the property and its natural habitats. The 3 components are subject to the following levels of legislative protection:

- The entire extension of the present and future fossil deposits and outcrops are subject to the the Cultural Heritage and Landscape Code (Legislative Decree no. 42/2004), according to which the fossils found on Italian territory are property of the State and the trade of fossils is prohibited. Paleontological excavations can be carried out but must have preventive permission (by the Ministry of Culture - General Directorate of Archaeology, Fine Arts and Landscape). With the purpose to protect the paleontological and fossil finds contained, the Ministrery of Culture had protected by Ministerial Decree some areas: the Pesciara deposit in 1963 (Ministry of Public Education Ministerial Decree 20.08.1963) and in 1992 (Ministry of Cultural and Environmental Heritage Decree of 22.09. 1992) and an outcrop of Monte Postale in 1992 (Ministry of Cultural and Environmental Heritage Decree of 22.09.1992).
- The Superintendence of Archaeology, Fine Arts and Landscape for the provinces of Verona, Rovigo and Vicenza, responsible for the control, monitoring and supervision of paleontological deposits/outcrops, in 2020 and 2023 has given a positive approval and formal support to this nomination.
- Approximately 60% of the *core zone* and 70% of the *buffer zone* fall within the area of the Lessinia Regional Natural Park. Among the objectives, in addition to the protection of soil, flora, fauna and water, there is also the protection of specific paleontological, geomorphological, anthropological, archaeological, vegetational and faunal peculiarities. The park's environmental plan took into account the objectives and purposes of the European Parliament and of the Council on the conservation of wild birds and on the conservation of natural and semi-natural habitats and of wild flora and fauna.
- The local Municipalities engaged into the nomination process (Altissimo, Vestenanova, San Giovanni Ilarione and Roncà) which have administrative and regulatory competence for urban planning are among the promoters of the nomination and participate in the protection, conservation, enhancement and management of the nominated property.

The deposits of the nominated property are, for the most part, in privately owned areas , but according to the Italian Legislation, fossils finds are owned by the State and the trade is prohibited.
The owners were involved in the nomination process and understand and share its outstanding values; today they carry out a first level of protection, in particular that of custodians of the paleontological outcrops present on their properties.

Furthermore, direct contacts were maintained with public administrators and with the heads of socio-economic and cultural associations in the Val d'Alpone area, with the land owners, with representatives of professional categories, schools and citizens.

The proposed management framework for the nominated property has a governance system aimed to the protection and conservation of paleontological heritage through 4 main points:

- preventive protection action based on national legislation headed by the Superintendence of Archaeology, Fine Arts and Landscape for the provinces of Verona, Rovigo and Vicenza;
- constant monitoring of the territory of the serial site by local administrations and the Lessinia Regional Natural Park Authority;
- surveillance of the outcrops carried out involving landowners;
- periodic checks carried out by expert personnel of the Technical Scientific Committee belonging to the A.T.S. "Val d'Alpone – faune, flore e rocce del Cenozoico". and composed of researchers, scholars and university professors expert in Paleontology.

Tourists and enthusiasts can visit the outcrops independently or accompanied by guides the paleontological and fossil finds are visible in the Bolca Fossil Museum and in the Paleontological Museum of Roncà.
The monitoring system, as laid down in the Management Plan, provides for the verification of a series of key factors which provides a complete overview on the state of conservation and integrity of both the paleontological values and of the surrounding natural environment.



NAME AND CONTACT INFORMATION OF OFFICIAL LOCAL INSTITUTION/AGENCY/ORGANIZATION

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Web site	Sito web: https://www.valdalponeheritage.it

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Mayor of the Municipality of Vestenanova

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Mayor of the Municipality of San Giovanni Ilarione

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Eoplatax papilio found in 1988 excavations on Monte Postale (length 60 cm)

1. IDENTIFICATION OF THE NOMINATED PROPERTY

1.a Country (and State Party if different)

Italy

1.b State, Province or Region

The nominated property is located within the borders of the Veneto Region. The identification of the outermost boundaries (*buffer zone*) of the property "The Eocene marine ecosystem in the Val d'Alpone - Bolca, San Giovanni Ilarione, Roncà" took into account the delimitation and extension of the areas that contain the deposits/outcrops (*core zone*). Therefore, the definition of the boundaries to protect the three components, as far as possible, has taken into account the physiographic limits and the crops in progress. Both of these limits allow for an easy and precise definition of the same on the small-scale cadastral maps (1:2000) that are used in the Italian territory to define the properties and the different purposes of use. Below is a brief description of the three sites:

Bolca. This component part is elongated roughly in a North-South direction. The central-northern portion falls within the Municipality of Altissimo (VI), while the central-southern one falls within the Municipality of Vestenanova (VR). The north-western border coincides with Via Gromenida, a stretch of road that connects the localities of Bolca and Molino while a stretch of the southern corresponds to Via Valecco. For the remaining perimeter, the delimitation is of a cultural type, where the areas cultivated with coppice woodland clearly prevail over the meadows and meadow-pastures.

San Giovanni Ilarione. This component part is located in the Municipality of San Giovanni Ilarione in the Province of Verona in the locality of Ciupìo and is almost delimited by vineyards, with the exception of a few wooded areas confined in the valleys present along the eastern side of the site.

Roncà. This component part is located in the Municipality of Roncà in the Province of Verona and is elongated roughly from North to South. A stretch of the North-West border coincides with Via Roncolati, which connects the centers of Roncà and Brenton, while a long stretch of the eastern perimeter corresponds to Via Buso. The remaining boundaries coincide with the cadastral boundaries of the lands that are mainly cultivated with vineyards, coppice and meadow, pasture meadow

1.c Name of the Nominated Property

The Eocene marine ecosystem in the Val d'Alpone Bolca, San Giovanni Ilarione, Roncà

1 .d Geographical coordinates to the nearest second

The geographical coordinates of the center of the nominated property, considered as a whole, are as follows:
Latitude: 45° 31′ 10″ N Longitude: 11° 15′ 42″ E

Geographic coordinates of each individual part that makes up the property:

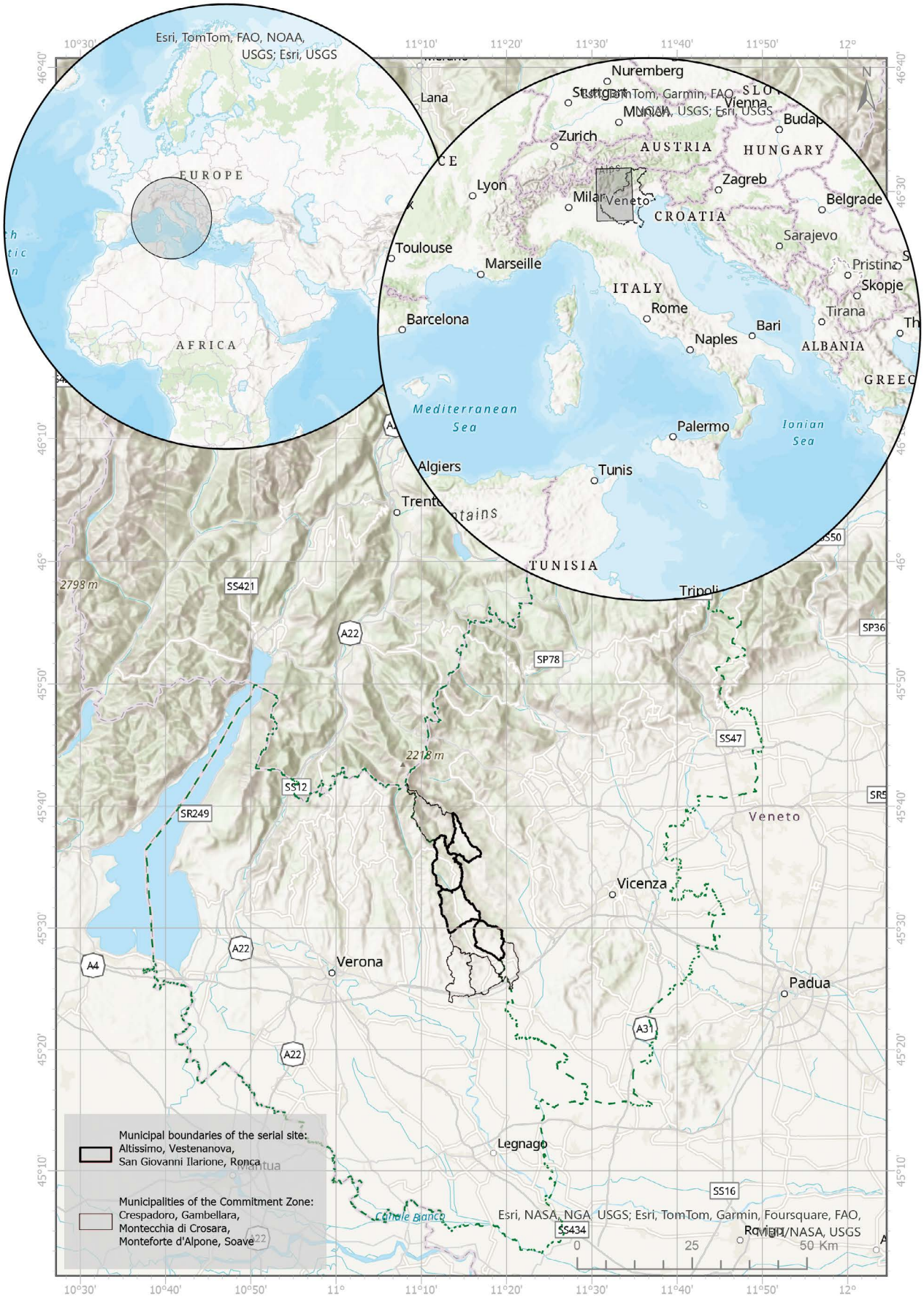
Table I: geographical coordinates

ID	Name of the nominated property		Region / Provinces / Municipalities	coordinates of the central point		UTM coordinates (EPSG:32632 - WGS 84 / UTM zone 32N)		SURFACES		MAPS
	component part	reservoir	Veneto Region	Latitude	Longitude	X	Y	area of nominated component part	area of buffer zone	map n°
01	Bolca	Monte Postale	Vicenza Altissimo	45°36'06'' N	11°13'20''E	673316,692	5052191,785	21.00 ha	52.50 ha	M_cp01
		Pesciara	Verona Vestenanova							
02	San Giovanni Ilarione	Ciupio	Verona San Giovanni Ilarione	45°31'09''N	11°15'43''E	676675,274	5043133,193	2.30 ha	21.60 ha	M_cp02
03	Roncà	Valle della Chiesa	Verona Roncà	45°29'35''N	11°17'26''E	678965,166	5040311,233	65.00 ha	142.00 ha	M_cp03
	EME-VdA nominated serial property			45°31'10''N	11°15'42''E	677370,515	5043489,414	**88.30 ha**	**216.10 ha**	M_all-in
								TOTAL AREA (in ha)		

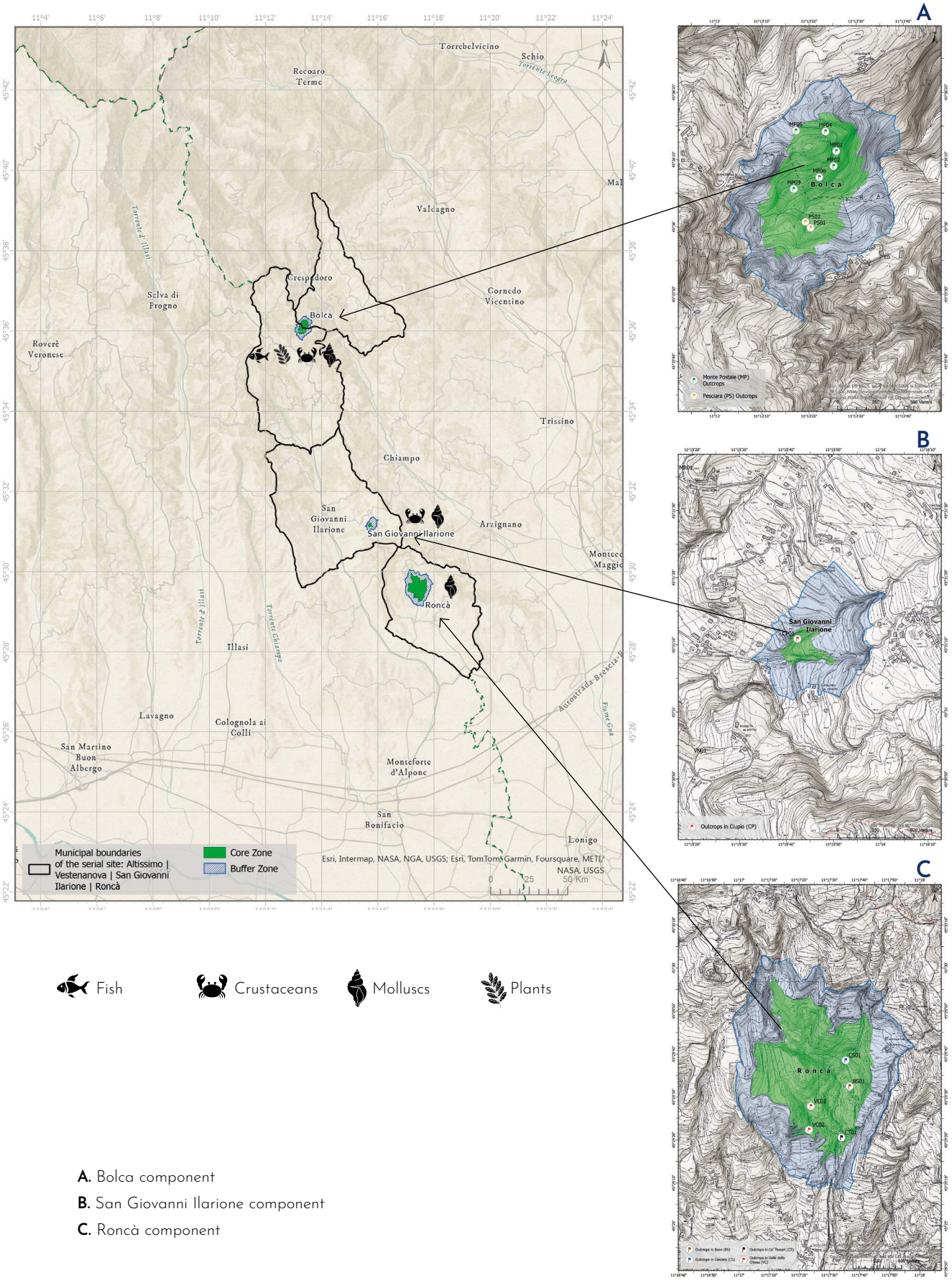
Area of the nominated property and the *buffer zone*

Area of the nominated property: 88.30 ha
Buffer zone area: 216.10 ha
Total area 304.40 ha

Geographical framework of the serial site (municipalities of Altissimo, Vestenanova, San Giovanni Ilarione and Roncà)



Physical map of the serial site and components

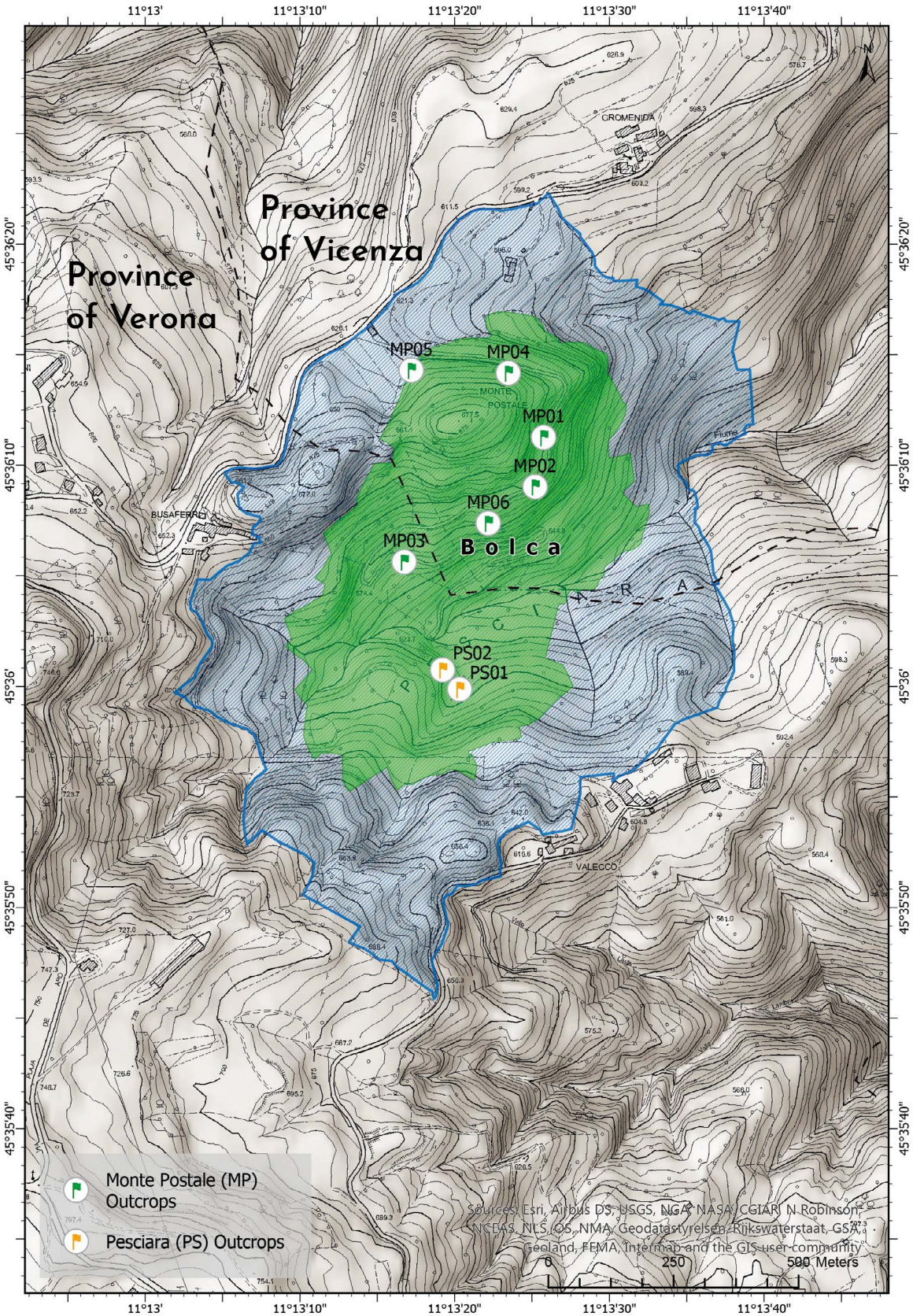


A. Bolca component

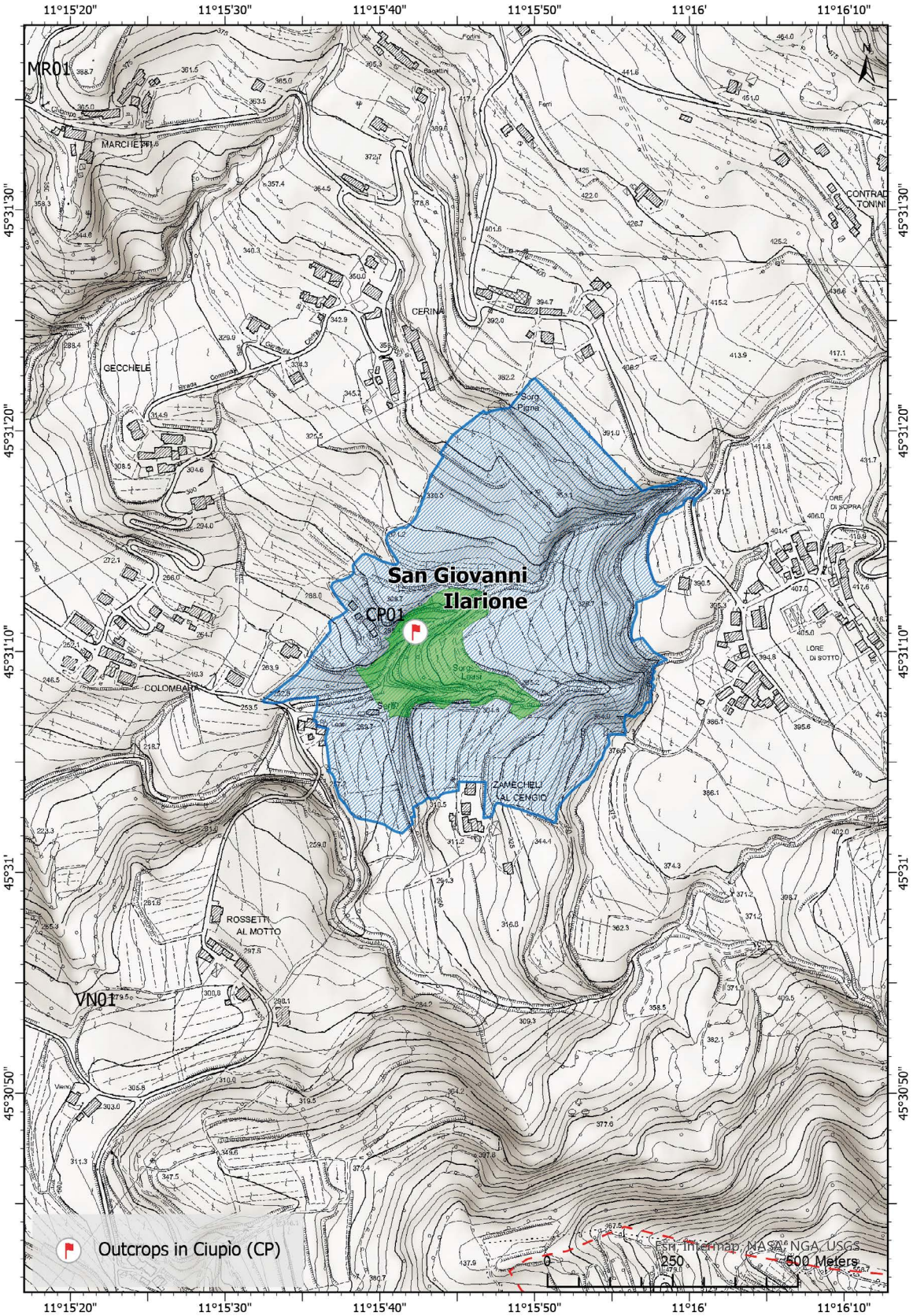
B. San Giovanni Ilarione component

C. Roncà component

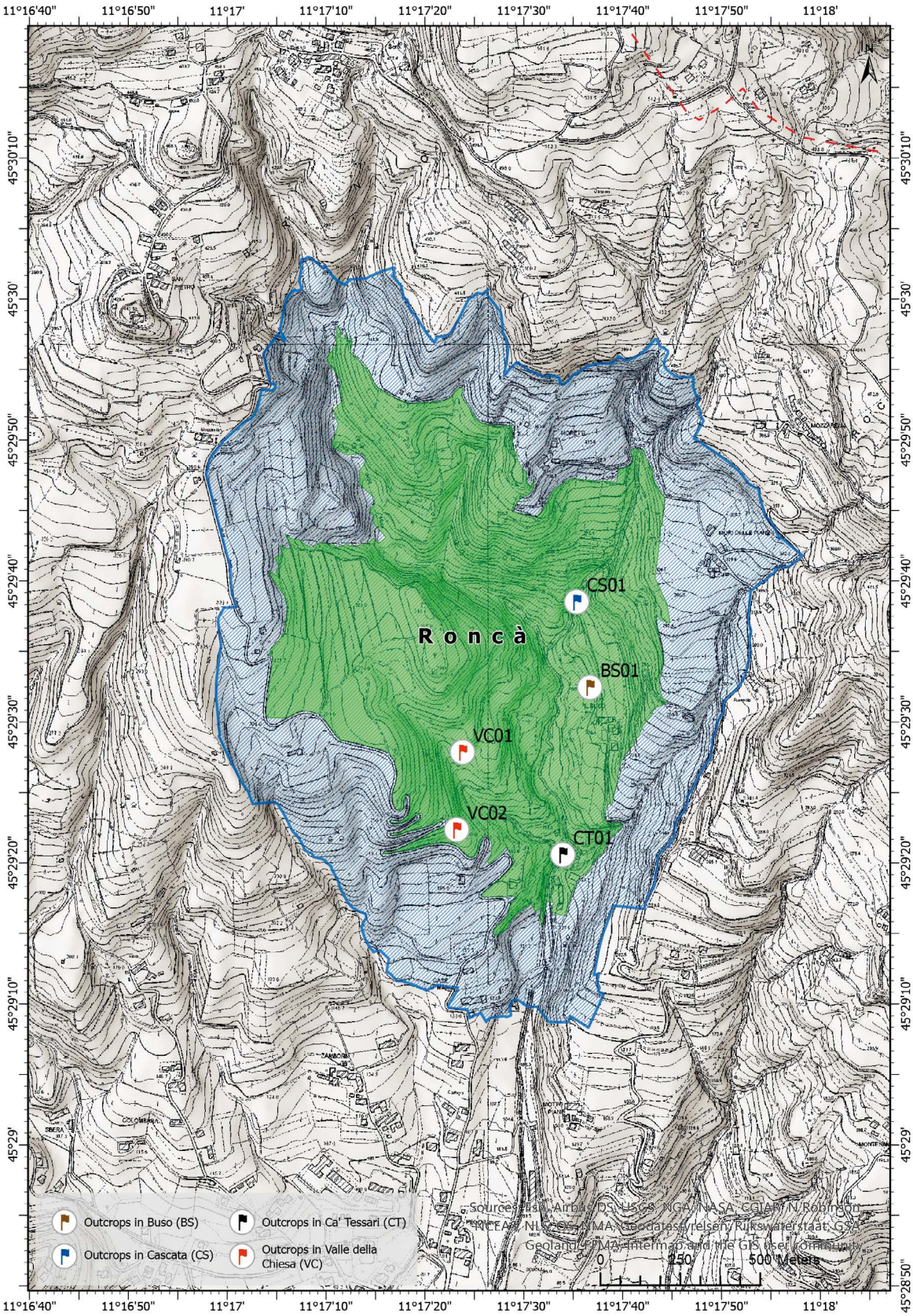
Topographic map of the *core zone* and *buffer zone* of the Bolca component with the fossiliferous outcrops



Topographic map of the *core zone* and *buffer zone* of the San Giovanni Ilarione component with the fossiliferous outcrop



Topographic map of the *core zone* and *buffer zone* of the Roncà component with the fossiliferous outcrops







Eoeuscorpius ceratoi (Massimiliano Cerato collection) found in the Pesciara (length 38 mm)

2. DESCRIPTION

2.a Description of nominated property

The nomination concerns the territories of the Val d'Alpone, in its entire geographical dimension, and the upper Chiampo Valley, in its northernmost areas.
The Val d'Alpone (geographically located in the North-East of Italy, in the Veneto region) is crossed by the stream of the same name and covers an area of approximately 16,700 hectares, an altitude between 30 and 925 m above sea level. It is part of the Monti Lessini plateau. This territory is characterized by extensive outcrops of volcanic rocks with gentle, wavy morphologies from which conical shapes and the remains of ancient volcanic "buildings" emerge. The volcanic rocks are interspersed with marine sedimentary rocks and sometimes contain olistoliths of carbonate rocks of various sizes, within which there are numerous and exceptional rocks containing fossil deposits dating back to the Eocene (between approximately 56 and 34 million years ago), a time interval characterized by important biological, climatic, environmental and geodynamic changes.
In the Val d'Alpone, over 40 fossiliferous sites have been surveyed, indicating a high paleontological density for such a small area, all from the Eocene and with peculiar characteristics in which four main types of fossils can be recognised:

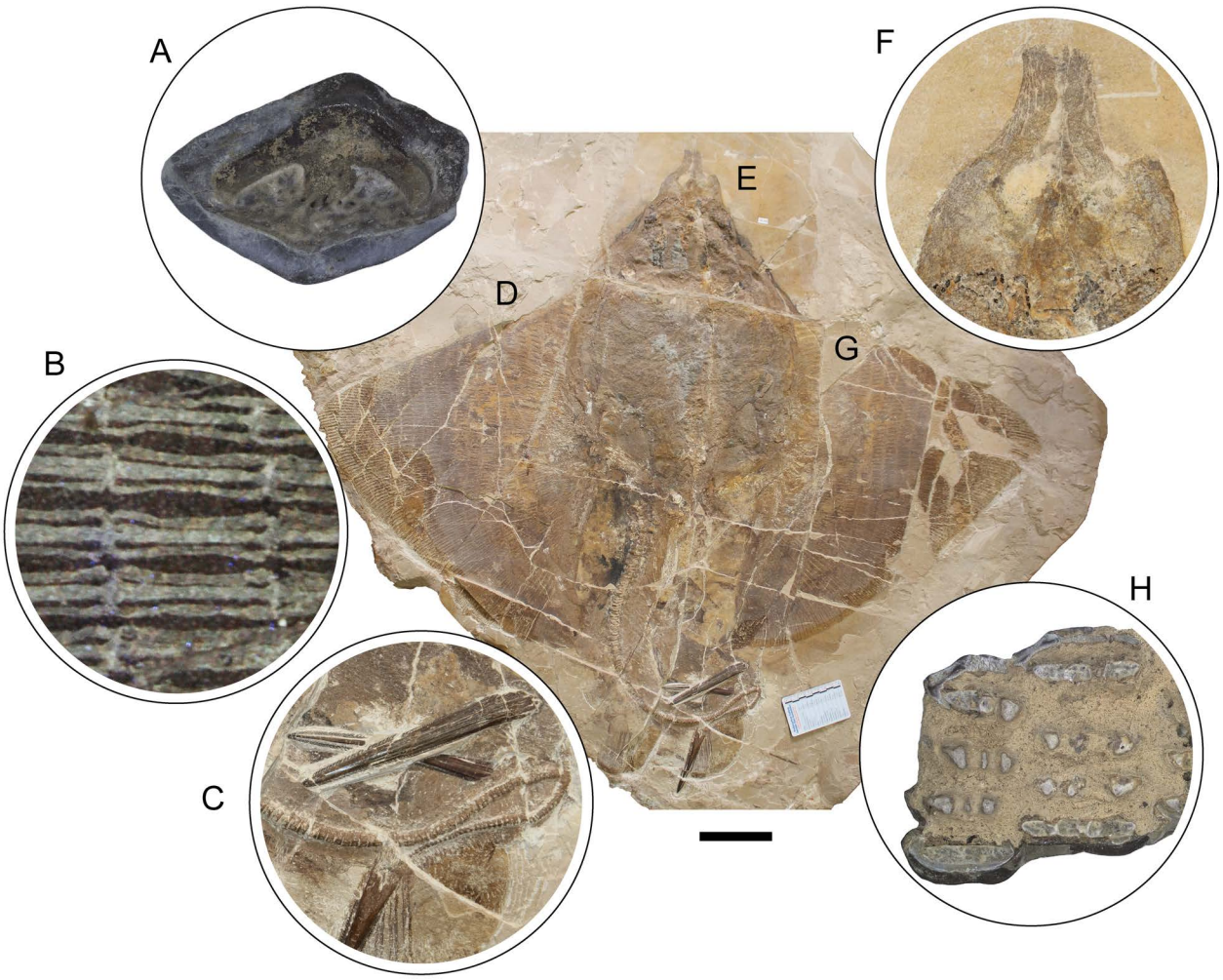
- marine vertebrates;
- terrestrial vertebrates;
- marine invertebrates;
- marine and terrestrial plants.

From a comparative examination of the exposed deposits, three areas of relevant paleontological interest have been identified, which contain the most important fossiliferous deposits: (a) for their historical contribution in the interpretation of the evolution of life on Earth, (b) for the scientific value of exceptionally preserved fossils and (c) for the role that these marine faunas play in phylogenetic, paleoecological, biogeographical and paleoclimatic studies.
These deposits show a stratigraphic continuity between the lower Eocene (Monte Postale/ Pesciara, around 49 Ma) and the middle Eocene (San Giovanni Ilarione and Roncà, around 40 Ma), highlighting a variety of depositional environments which include intertidal environments (Roncà), shallow subtidal environments (Monte Postale, environment associated with the "Pesciara di Bolca" deposit) and of submerged, subtately beach, to normal marine salinity (San Giovanni Ilarione). Taken together, these deposits "constitute a serial site" which provides a complete ecological scenario of the bathymetric gradient, in a time interval in which the Earth experienced exceptionally high temperatures (Zachos *et al.*, 2001), marine biodiversity reached its peak (Lozouet, 2014; Yasuhara *et al.*, 2002b) after a long period of post-mass extinction recovery (Kiessling *et al.*, 2008), and the groups of organisms that still dominate marine habitats today became established.
Considering that the identified components are well defined, independent of each other and easily manageable, the nominated serial property is composed of these three assets which, in a unified way, describe the evolution of the planet's marine life during the Eocene, thanks to paleontological documentation among the most consistent, complete and historically older in the world. This would allow us to complete the cognitive framework of the Eocene, within the World Heritage List, alongside the Messel Pit Fossil Site, included in 1995 in the list List of WH sites for the Eocene terrestrial environment (Lutetian- middle Eocene).
Below is a brief description of the individual components which collects the characteristic data of the nominated property:

Bolca

With its deposits in Pesciara and Monte Postale, is one of the most famous locations for ichthyofauna in the world. The IUCN itself, in the report by Wells, Roderick T.,1996 - Earth's geological history: a contextual framework for assessment of Word Heritage fossil site nominations. IUCN Natural Heritage Program Working Paper, p. 35, highlighted how Bolca represents one of the most important

fossiliferous sites in the world.
Past and current excavations rresulted in the discovery of remains of fishes, reptiles, birds and a rich assemblage of invertebrates, represented by jellyfish, crustaceans, bivalves, gastropods, cephalopods, brachiopods, annelids, foraminiferans, corals, ostracods, bryozoans, insects and scorpions. Pesciara and Monte Postale are the most famous and important Eocene *Fossil-Lagerstätten* in Italy and undoubtedly among those of greatest relevance for the entire Cenozoic at a global level (Carnevale *et al.*, 2014).
Many of the fossil fish from Bolca have "relatives" that are still living.
Due to the great variety of fish found in the five fossiliferous levels, Pesciara can be considered one of the richest deposits in the world. In fact, during each excavation new fish taxa are always discovered.



t *Dasyomyliobatis thomyorkei* gen. et sp. nov. (MCSNV VR.21.107, holotype) showing its peculiar combination of rajobenthic (A-D) and aquilopelagic (E-H) traits: A, small holaulacorhizous lateral teeth arranged in alternating rows; B, pectoral-fin radials with catenated calcification and no cross-bracing; C, free tail vertebrae without cartilaginous rod and caudal fin reduced to ventral fold; D, soft, flexible pectoral disc with convex anterior and posterior margins; E, head protruding from pectoral disc; F, cephalic lobes; G, wing-like pectoral disc with positive FRD; H, enlarged hexagonal symphyseal/parasymphyseal polyaulacorhizous teeth in pavementlike arrangement. Scale bar represents 100 mm. (da Marramà *et al.*, 2023)

The reconstruction of the paleoenvironment of the fishes of Bolca is quite complex as suggested by the great taxonomic and morphological variety. Some are similar to those currently living in coral reef environments, others are characteristic of shallow sandy floors with seagrass meadows.
The sedimentation environment of Monte Postale must have been close to the coast, characterized by coral bioherms and "mangroves", while recent studies reconfirm the more "traditional" model for Pesciara, which involves the sedimentation of calcareous muds within an intra-platform basin, where the existence of anoxic conditions on the bottom and the development of microbial biofilm on the carcasseshave allowed the perfect preservation of the rich and varied fauna.

San Giovanni Ilarione

The faunas of this component document a high diversity and come from the Ciupìo deposits (De Gregorio, 1880). The fossils, mainly represented by gastropods and bivalves, are found in a relatively small area and are mostly representative of the open sea depositional environment.
The shell remains found in San Giovanni Ilarione, particularly important and abundant at various levels of the stratigraphic succession, have been studied for two centuries as a stratigraphic correlation tool and unique evidence of high biodiversity (Sanders *et al.*, 2015; Beschin& Dominici, 2022) at global scale in the aftermath of the end-Cretaceous mass extinction (Yasuhara *et al.*, 2022b).



Ciupìo. *Lophoranina laevifrons* (Museum of Archeology and Natural Sciences "G. Zannato" of Montecchio Maggiore) (length 28 mm)

San Giovanni Ilarione can also be considered a classic location for the knowledge of fossil crustaceans from the middle Eocene of Veneto. Many specimens, almost all found in the Ciupìo tuffs, were the subject of important studies in the 19th century by Bittner (1875, 1883) and at the beginning of the 20th century by Fabiani (1910), representing a well diversified marine brachyuran fauna.

Roncà

This component part is particularly rich in marine gastropods and bivalves representative of an intertidal or subtidal environment. The oldest papers on these fossils are those of the abbot of Arzignano Alberto Fortis, who in 1778 published a memoir entitled *"Of the volcanic-marine valley of Roncà in the Veronese territory"*. Numerous scholars have been interested in the geology and paleontology of Roncà and, in particular, in the rich mollusc fauna (Brongniart, 1823; Lyell, 1833; Vinassa de Regny, 1895-1897; De Gregorio, 1896).

The Eocene faunas enriching the nominated property clearly reveal the unparalleled diversity of the fossil assemblages in terms of number of taxa at the species level, but also the notable disparity (anatomical diversity) and ecological heterogeneity. All of these characteristics are probably linked to the unique paleoenvironmental context, represented by a complex system of tropical palaeobiotopes located in an ancient hotspot of marine biodiversity.

During the Eocene, the nominated property was located along the northern coastline of the ancient Tethys Sea, a vast east-west ocean that extended (using current geographical references) from America to North Africa, up to Indonesia by separating the emerged areas of the northern hemisphere from those of the southern hemisphere and connecting the current Atlantic Ocean with the Indo-Pacific area. The territory of the Val d'Alpone was located at a latitude corresponding approximately that of the current Persian Gulf, affected during the Eocene by the deposition of carbonate sediments and by volcanic activity of varying intensity. Due to the collision between the European plate and the Adria microplate, the area was fragmented into blocks and through the main fractures the magmas flowed from the mantle towardsthe areas of lower pressure (earth crust), determining volcanic cycles with the release of large quantities onto the surface. of basic lavas. The intense volcanic activity is documented by the outcrop of basalts and volcaniclastic rocks; to a lesser extent, rocks of sedimentary origin emerged in what today represents the eastern portion of the Lessini Mountains.

At the same time as the uplift, attributable to the early stages of alpine orogenesis, the entire territory began to be subjected to the action of exogenous agents, which shaped it until it reached its current appearance.

The richness and uniqueness of the nominated property are highlighted by the interest that these places have aroused, over the centuries, in philosophers of science and naturalists that largely contributed to the debate on the origin and evolution of the Earth and on the nature of fossils.

In particular, the Bolca component represents a unique case for Eocene marine fauna both for the preservation of vertebrates and for plant remains, like in no other deposit in the world.

From these contexts, unique information has been obtained and continues to be obtained, thanks to the excavations still underway, regarding the conspicuous faunal and floristic biodiversity. In fact, exceptionally well-preserved fossils have been found, including numerous bony and cartilaginous fish, but also crocodiles, turtles, snakes, birds, gastropods, bivalves, cephalopods, crustaceans, corals, worms, jellyfish, insects, scorpions, algae, marine and terrestrial plants, these the latter very often accompanied by flowers and fruits. The findings of fossils, which began in Bolca already before the mid-16th century (Mattioli, 1550), and the most recent important paleontological research conducted with the most modern methodologies have provided essential contributions to the global knowledge of the evolution of the environments and of the tropical marine biodiversity of the Eocene.


A


B

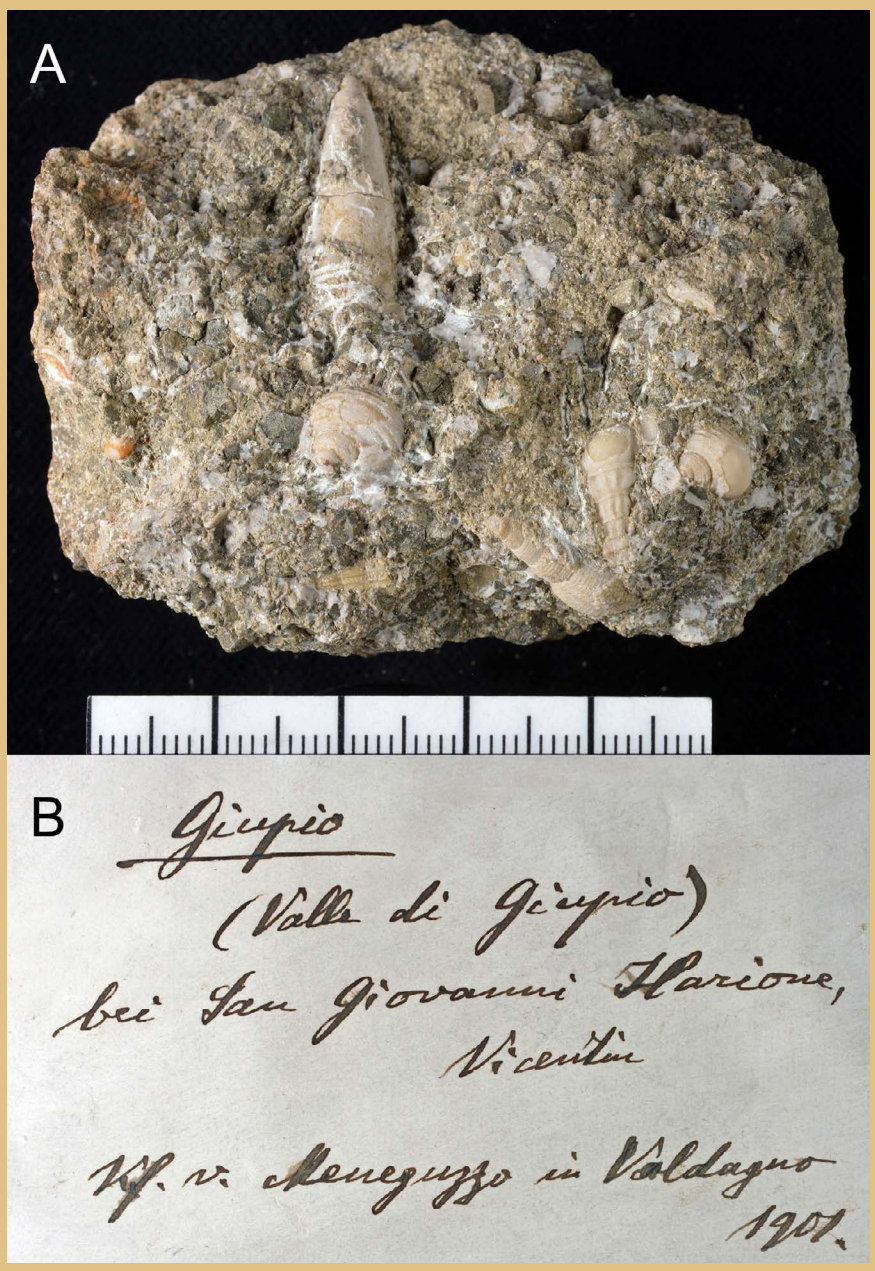

C


D

Fossils found in Pesciara:
A) *Ampelophyllum noeticum* (length 6 cm);
B) *Drepanocarpus sp* (length 11 cm);
C) Jellyfish (length 23 cm);
D) *Ornitholites sp.* (length 7 cm)

As regards, however, the fossils of the San Giovanni Ilarione component, unlike those of Bolca and Roncà, they were first reported by Brongniart (1823) with the mention of the gastropod *Natica cepacea*. Subsequently, Maraschini (1824) reports that in the surroundings of San Giovanni Ilarione "various fossils ... are found there" but "few are those that can be determined". We had to wait almost half a century, when Edmond Hébert (1866) brought to the attention of the scientific world of the time the great abundance of the fauna of what he defined as the "Horizon de San Giovanni Ilarione". In fact, on the eastern side of the Val d'Alpone and in the municipality of San Giovanni Ilarione, four fossiliferous deposits are known, including Ciupìo. Among the first scholars who dedicated themselves with a certain interest to the stratigraphy and paleontology of the so-called "Horizon of San Giovanni Ilarione" we also remember Eduard Suess (1868), Francesco Molon (1882), Ernst Munier Chalmas (1891) and Ferdinand Bayan. The latter, in 1870, collected around fifty different mollusks and recognized 18 new typical species of San Giovanni Ilarione. Munier-Chalmas (1877), reported the presence of abundant remains of corals, echinoderms, crustaceans and cephalopods.
The oldest known collection of fossils from San Giovanni Ilarione is preserved at the Naturhistorisches Museum in Vienna.
A recent comparative study carried out on the fossil molluscs of San Giovanni Ilarione acquired mainly in the second half of the 19th century and preserved in the museums of Florence, Paris and Vienna, highlighted the presence of 186 species in Florence (664 specimens), 89 in Paris (646 specimens) and 238 in Vienna (2064 specimens).
Finally, the first reports concerning the fossils of the Roncà component date back to the 17th century by Martin Lister, geologist and doctor, who in his work "Historia Conchyliorum" of 1685-1692, illustrated the gastropods *Buccinum musicum* and the *Buccinum majus*, found in Val Cunella di Roncà. Antoine-Joseph Dezallierd'Angerville, in his 1742 treatise, described six species of molluscs while Nicolò Gualtieri, again in 1742, illustrated three mollusc specimens from Roncà. In the second half of the 1700s many other authors illustrated species from this locality (Knorr, 1755; Klein, 1770; Martini, 1769; Hacquet, 1780).

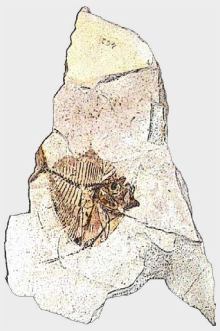
Ciupìo sample preserved in the Naturhistorisches Museum in Vienna



Interest in the Roncà territory increased when, towards the end of the 1700s, the debate between Neptunists and Plutonists expanded, and the mixed volcanic and sedimentary sequences took on a role of primary importance. For these main reasons, Roncà became a destination for pilgrimages of important European naturalists, including Desmarest and Strange, as well as Italian intellectuals, such as Fortis, Breislak and Brocchi (Roghi, 2012; Zorzin & Roghi, 2014).

Nicolas Desmarest, a French volcanologist, visited Italy in 1765 to study the main locations with volcanic rocks and verify the presence of basalts associated with sedimentary deposits. During his stay on the peninsula, accompanied by Alberto Fortis, he visited the Val d'Alpone and some valleys in the Roncà area, remaining fascinated by the columnar basalts (Taylor, 1998).

A



Paleontological excavations of the Natural History Museum of Verona on M. Postale (VI) and in Pesciara (VR)

Excavation	Locality	n° specimens	Financing
1999	M. Postale	210	Municipality of Verona
2000	M. Postale	149	Municipality of Verona
2001 e 2002	Suspension of excavation		
2003	M. Postale	1132	Veneto Region and Munic. of Verona
2004	M. Postale	487	Veneto Region and Munic. of Verona
2005	Pesciara - M. Postale	548	Veneto Region and Munic. of Verona
2006	Pesciara - M. Postale	436	L.R. n. 7 30.06.06
2007	Pesciara	364	L.R. n. 7 30.06.06
2008	Pesciara	248	L.R. n. 7 30.06.06
2009	Pesciara - M. Postale	309	L.R. n. 7 30.06.06
2010	Pesciara - M. Postale	152	L.R. n. 7 30.06.06
2011	Pesciara - M. Postale	385	L.R. n. 7 30.06
2012 – 2017	Suspension of excavation		Reg. Ven. e Com. Ver. (2014)
2018	Pesciara - M. Postale	Indagini stratig.	Municipality of Verona
2019	Pesciara - M. Postale	72	Municipality of Verona
2020	Pesciara - M. Postale	98	Municipality of Verona
2021	Pesciara - M. Postale	240	Municipality of Verona
2022	Pesciara - M. Postale	145	Municipality of Verona
2023	Pesciara - M. Postale	69	Municipality of Verona

Total: n° 5044 specimens found including 24 new to science

B



Paleontological excavation of the Municipality of Roncà on Monte Duello (VR) and in Valle della Chiesa (VR)

Excavation	Locality	n° specimens	Financing
2010	M. Duello Valle della Chiesa	500	Municipality of Roncà
2011	M. Duello Valle della Chiesa	547	Municipality of Roncà
2012	M. Duello Valle della Chiesa	257	Municipality of Roncà
2013	Valle della Chiesa	71	Municipality of Roncà
2014	Valle della Chiesa	108	Municipality of Roncà
2015	Valle della Chiesa	97	Municipality of Roncà
2016	Core drilling		Municipality of Roncà
2017	M. Duello Valle della Chiesa	130	Municipality of Roncà
2018	M. Duello	84	Municipality of Roncà
2019	Valle della Chiesa	51	Municipality of Roncà
2020	Valle della Chiesa	98	Municipality of Roncà
2021	Valle della Chiesa	115	Municipality of Roncà
2022	Suspension of excavation		---
2023	Valle della Chiesa	25	Municipality of Roncà

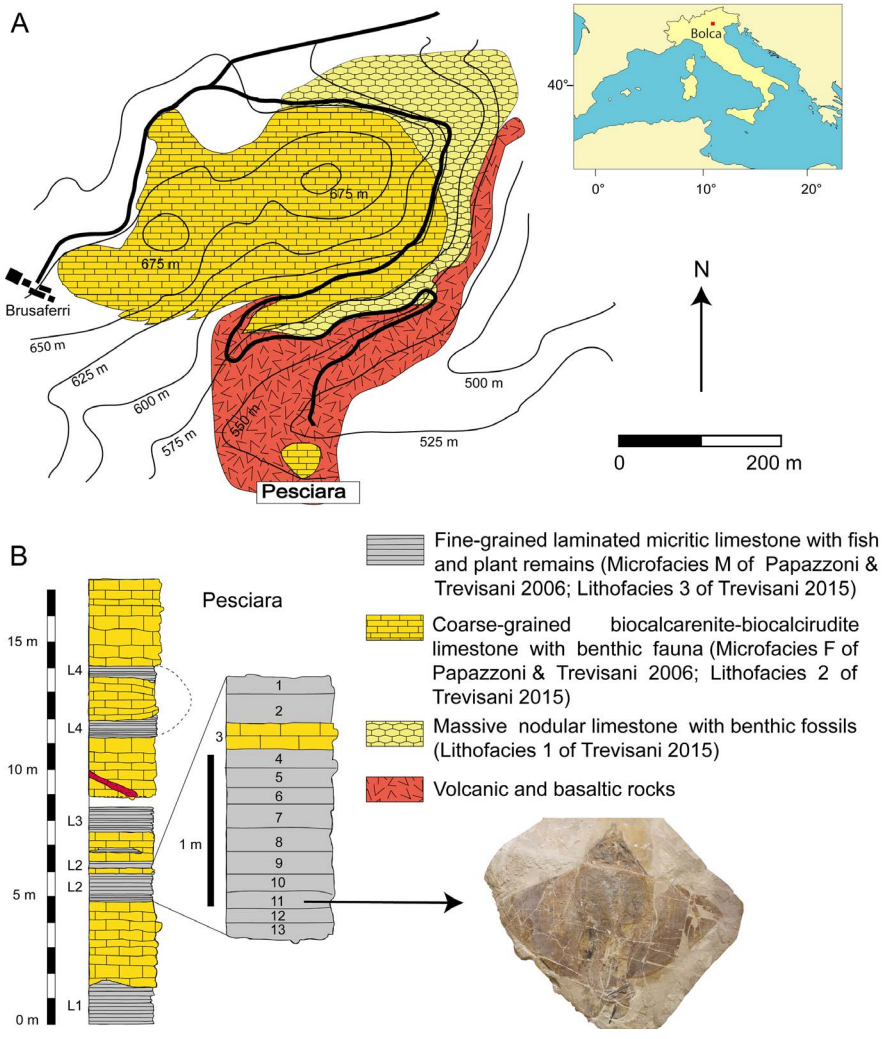
Totale: n° 2108 specimens found

Since the end of the 1990s, the Civic Museum of Natural History of Verona has directed and coordinated research in the Pesciara and Monte Postale deposits. In 2010, however, on the initiative of the municipal administration and with the direction of the Paleontological Museum of Roncà, paleontological excavations in the Valle della Chiesa and Monte Duello began. All these excavations are still active and conducted in collaboration with various Italian universities and foreign specialists.

The exceptional value of the nominated property is definedby the extraordinary state of preservation of vertebrates, invertebrates and plant remains, in the extraordinary diversity and uniqueness of fossil fish and molluscs, in which numerous anatomical structures are recognized only rarely documented in the paleontological record.

Each deposit, to a different but complementary extent, contributes to implementing the rich fossiliferous heritage collected, restored, studied and exhibited in museums around the world.

This is the most complete fossil evidence related to a very important interval in the history of the Earth, the Eocene, which has provided a broad and detailed picture of tropical marine life, in a period of profound renewal of fauna and flora, testifying to the phases of complete recovery of marine biodiversity following the last of the mass extinctions that have characterized the long history of our planet.

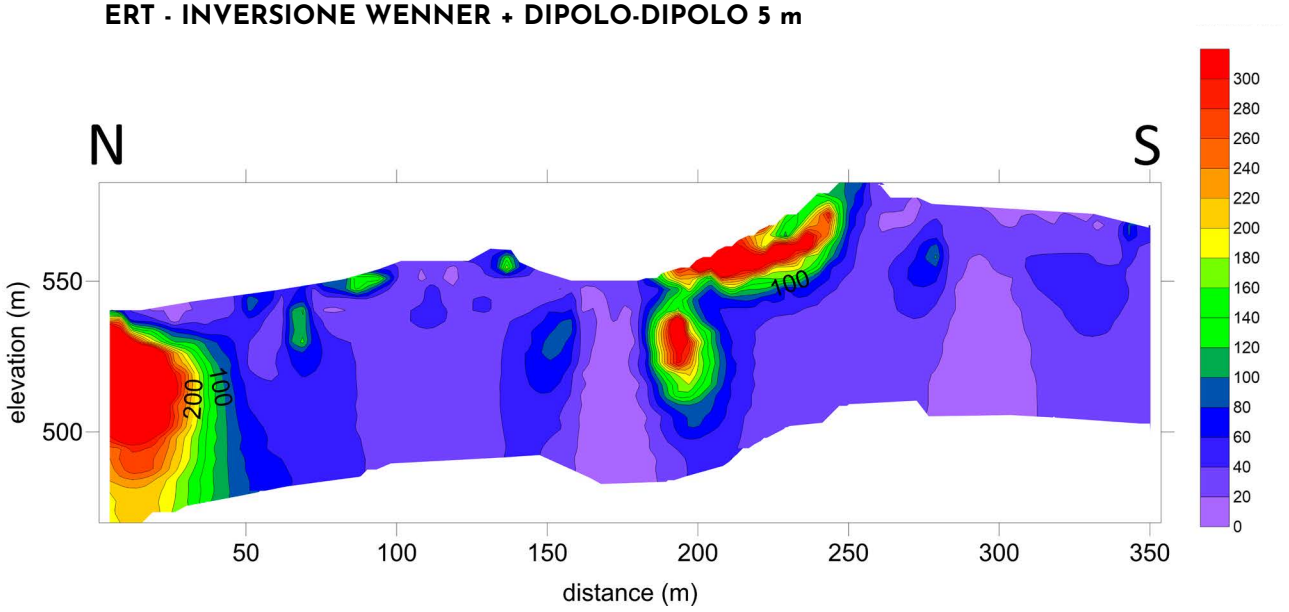


Location of Pesciara and stratigraphic section. The 2020-2021 excavation of layer 11 allowed the recovery of the new parsnip *Dasyomyliobatis thomyorkei* (from Marramà *et al.*, 2023)

Previous page: (above) Summary table of the excavations conducted by the Civic Museum of Natural History of Verona in the Monte Postale and Pesciara deposits. (below) Summary table of the excavations conducted by the Roncà Municipality in Valle della Chiesa and Monte Duello

Since the 2000s, thanks to geological studies carried out with the aid of core sampling and geoelectrical investigations, it has been possible to know the extension, thickness and therefore volume of some portions of the Pesciara component part (PS01-PS02: Zorzin *et al*, 2016; Roghi & Zorzin, 2019).

BOLCA 20-06-2013
ERT - INVERSIONE WENNER + DIPOLO-DIPOLO 5 m



Geoelectrical profile in the Pesciara area

Recently, in the areas surrounding Bolca (Beschin *et al.*, 2016; 2021), abundant fossil crustacean faunas have been identified, often associated with bioconstructions, dating back to the lower Eocene.
Inside these ancient reefs, mainly made up of corals, macroforaminiferans, molluscs and fragments of sea urchins, numerous crustaceans of small or very small size have been found, representing a variety of forms, which have the same age of the fossils of the Pesciara deposit. Among these, new taxa have been recognized that show a clear resemblance to some crustaceans that live today in tropical seas, especially in the Indo-Pacific area.

The following page: opening of the laminated layers inside the Pesciara tunnel


VALEX

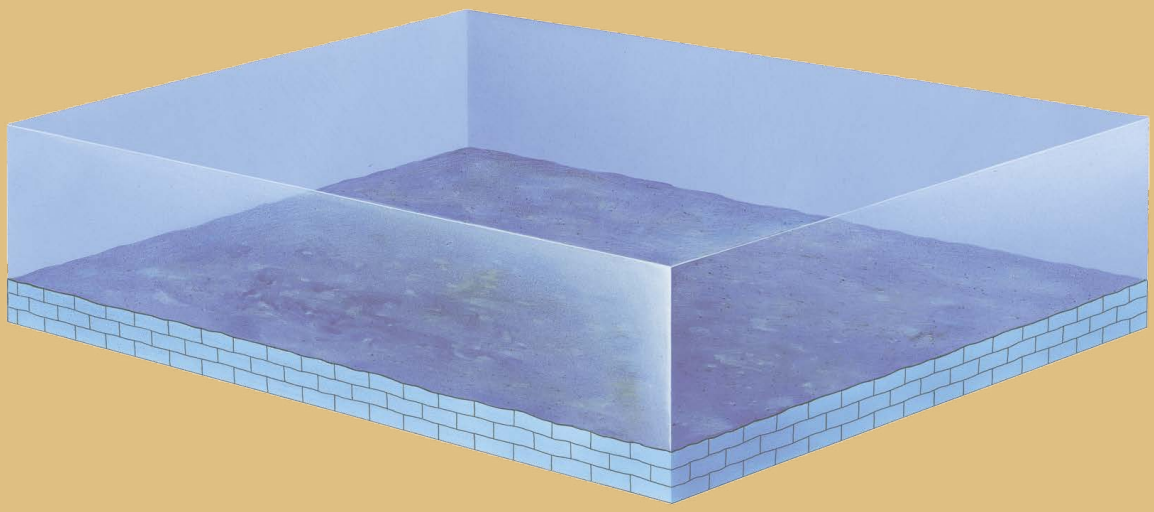
2.b History and Development

2.b.1 The geological history of the territory

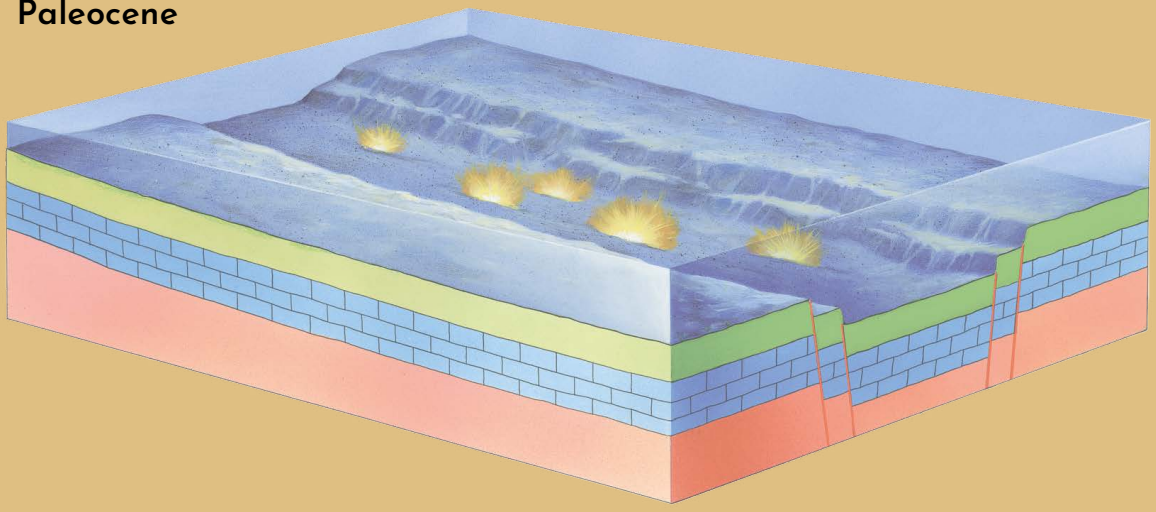
The Val d'Alpone and the upper Chiampo Valley are today hilly and low mountain areas, but millions of years ago the rocks that now emerge on the surface were sediments deposited on the bottom of ancient seas. And it is precisely from these ancient marine environments that the exceptional nature of the nomination area on a global level derives. Below we describe the events that have affected the Val d'Alpone over tens of millions of years and that have "shaped" it with its current morphologies.
We begin from the Lower Jurassic, when our area was part of the so-called "Trento Platform", an area that was partially submerged by a shallow sea.
In the Middle and Upper Jurassic (about 180-135 million years ago), a sharp acceleration of subsidence was observed due to the expansive tectonic movements which determined the collapse of the"Trento Platform", due to the opening of an oceanic arm towards the West, called the "Ligurian-Piedmontese Ocean". The "Trento Platform" transforms into a pelagic plateau, called the "Trento Plateau", with a very slow sedimentation rate (Winterer & Bosellini, 1981).
During the Cretaceous the bathymetry deepens, and the sedimentation takes on a pelagic character (400-500 meters deep, Winterer, 1998) with the deposition of sediments that will give rise to the Maiolica and Scaglia Variegata Alpina formations, originally included in the "Biancone" formation.
The territory of the nominated serial property to candidacy is made up of predominantly volcanic rocks and, subordinately, of carbonate lithotypes ranging in age from the Upper Cretaceous to the Eocene (from approximately 100 to 34 million years).
In the ancient seabeds and nearby continuously sinking coasts, mainly due to the effect of volcanism, a large quantity of sediments was deposited, which became lithified and, subsequently, through the same great thrusts that formed the Alpine Chain, they re-emerged and transformed into valley and mountain landscapes that we see today.
The ancient rocks of the substrate are covered by thick Quaternary covers of various types which represent evidence of the latest events mainly linked to the glaciation period and subsequent erosion events (Zampieri & Zorzin, 1993). The succession of the various sedimentary and volcanic rocks that constitute themountainous reliefs of the territory taken into consideration has a thickness of almost 1000 meters (Antonelli *et al.*, 1990), which is possible to observe in the valley engravings, from the oldest on the bottom of the valleys, up to the youngest, in the ridges, the watershed area between the numerous north-south trending valleys that characterize the Lessini.

Evolution of the Val d›Alpone from the Cretaceous to the Eocene (Dalla Vecchia *et al.*, 2005)

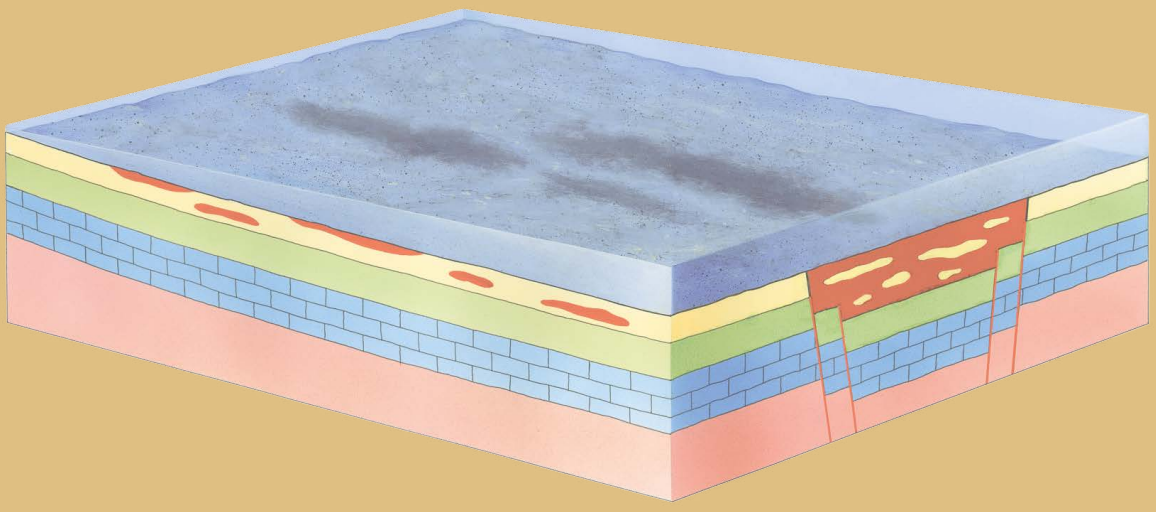
Cretaceous

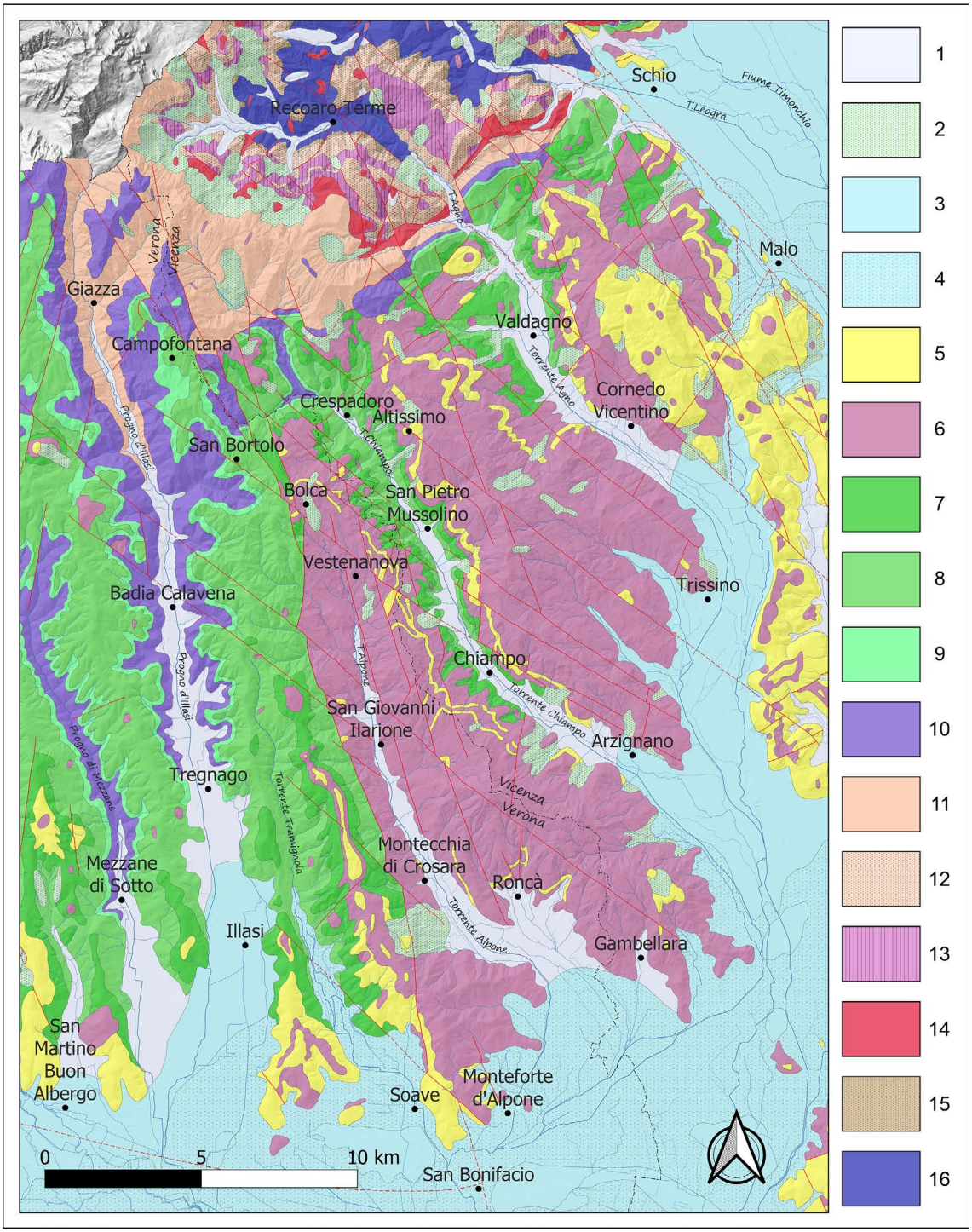


Paleocene



Eocene





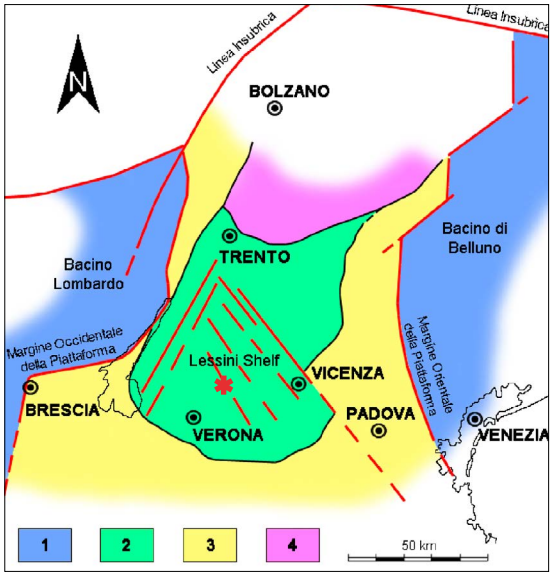
Geological map of the nominated property and the surrounding territory

Legend:
1) Local floods (Quaternary); 2) Moraine, inframorainic, eluvial, colluvial, debris and landslide deposits (Quaternary); 3) Gravelly and sandy alluviums prevalent with silts and clays (Quaternary); 4) Silty and clayey alluviums (Quaternary); 5) Limestones and calcarenites (Miocene – Oligocene – Eocene); 6) Basalts and volcaniclastic rocks (Oligocene-Upper Paleocene); 7) Scaglia Rossa Veneta (Upper Cretaceous period); 8) Maiolica and Scaglia Variegata Alpina (Upper Cretaceous p.p.-Lower Cretaceous p.p.); 9) RossoAmmonitico Veronese (Lower Cretaceous p.p.-Middle Jurassic p.p.); 10) Oolite di S. Vigilio and Calcari Grigi (Middle Jurassic - Lower Jurassic); 11) DolomiaPrincipale (Upper Triassic); 12) Dolomites and limestones with intercalations of marl, shale and chalk (Triassic); 13) Limestones, flinty and bituminous limestones, sandstones, conglomerates and marls (Middle Triassic); 14) Monzonites, andesites and porphyrites (Middle and Lower Triassic); 15) Sandstones, siltstones and conglomerates (Upper and Middle Permian); 16) Phyllades and metabasites (pre-Cambrian - Cambrian).

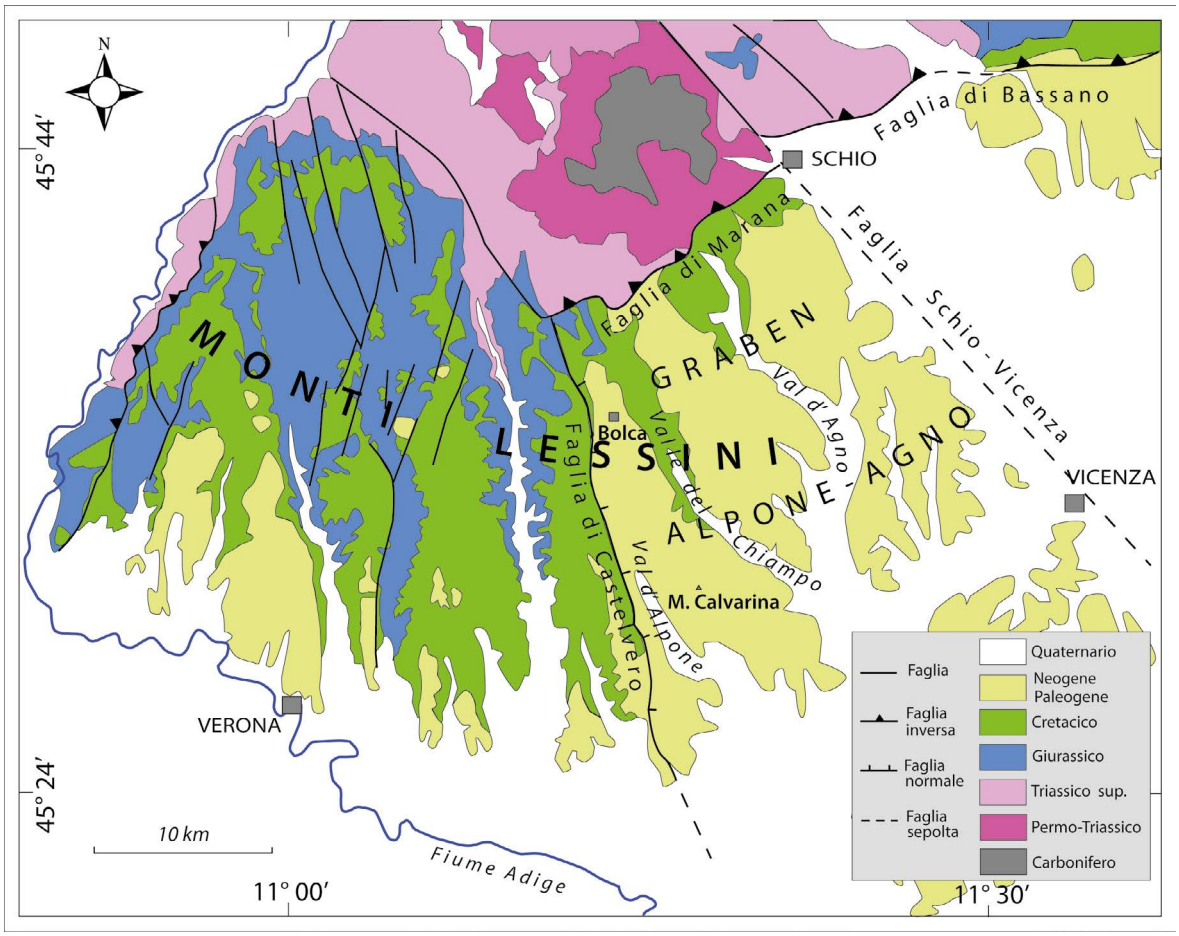
From "Geological Map of the Province of Verona", Department of Environmental and Mobility Policies; Regional Secretariat for Environment and Public Works; Geology and Water Cycle Directorate, Regional Quarry Activity Plan, scale 1:100,000, modified.

2.b.2 Tectonics and volcanism

The candidate territory is part of the Southern Alps or South Alpine tectonic unit.
The Alpine Orogeny, which began in the Cretaceous and developed through several compressive phases with different and well-defined directions, allowed the formation of a complex mountainous structure in whose southern part, below an important tectonic discontinuity called the Insubric Line, the Southern Alps. These tectonics, with peculiar lithological and geomorphological characteristics, tell us a very ancient geological history that starts even in the lower Paleozoic and practically reaches the present day.
The reading of the large sedimentary rock sequences and their relationships with the rocks and volcanic products have made it possible to reconstruct the events that affected this territory starting from the dismantling of a chain preceding the Alpine one. The succession of mostly marine environments, sometimes close to the coastline but also purely continental, find their main evidence, for the Lessini Mountains area, in that paleogeographic unit known as the Trento Platform.
This constituted an elevated area compared to the Lombard and Belluno lateral basins throughout the Lower and Middle Jurassic, when it completely sank, assuming, until the Paleocene, the characteristics of a pelagic plateau affected by the deposition of basinal sediments. During the initial phases of the Alpine orogeny the area responded rigidly to the tectonic stresses to which it was subjected and fractured into blocks which partly rose until they found themselves in shallow sea conditions. Small carbonate platforms took root on these blocks which later gave rise to a single carbonate platform, called Lessini Shelf (Bosellini, 1989).
Due to ongoing tectonics, from the Paleocene to the lower and middle Eocene, the Veneto area was affected by multiple episodes of volcanic activity with emissions of large quantities of basic lava (Brombin*et al.*, 2018), mainly underwater, associated with extensional tectonics. In the upper Eocene, however, when the development of the Euganean and Marostica eruptive cycle began, there was a period of eruptive calm in the Veronese area.
The important volcano-tectonic activity of the Upper Paleocene will lead to the opening of the Alpone-Agno graben (or semi-graben) (Piccoli, 1965; 1966), a large depression elongated in the meridian direction, delimited to the West by the Castelvero Fault and to the east from the Schio-Vicenza alignment. These discontinuities divided the area into different blocks, resulting in a strong lowering of the eastern portion.



Paleogeographic reconstruction of the Lessini Shelf during the Paleogene:
1) deep marine basin;
2) Lessini shelf;
3) Trento Platform;
4) emerged land. Bolca is indicated by the red asterisk

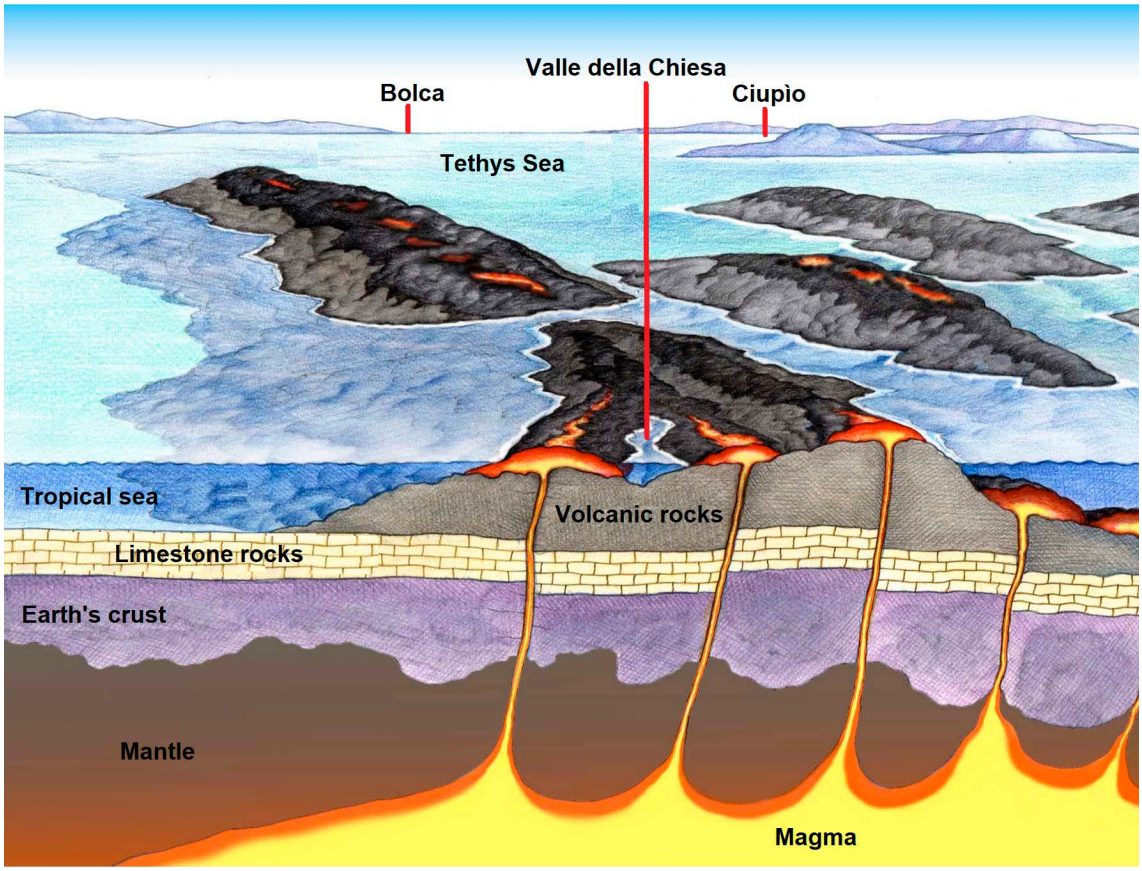


Near the tectonic structure called Castelvero Fault, which in reality represents a bundle of sub-parallel faults with NNW-SSE orientation and dipping to the East with a angle of approximately 50-55°, that vertical space was created, through a constant and gradual collapse of the eastern portion, which allowed the deposition of a thickness of approximately 500 m volcanic materials with basaltic composition (flows, necks, veins and pyroclastic products) (Barbieri *et al.*, 1991; Zampieri, 1995). These environments were populated by a rich fauna represented by crustaceans, bivalves, gastropods, echinids, etc., which have sometimes are exceptionally preserved. At the end of the middle Eocene, both due to the impressive quantity of lava erupted and the decrease in subsidence, the basin (*graben*) filled and large subaerial volcanic systems arose whose products alterations appear to us today with the characteristic reddish colours.
During the upper Paleocene and the Eocene, and in any case in the quiet phases of volcanism, within the graben carbonate sediments, essentially limestones and calcarenites, were cyclically deposited organogenic (Nummulitic limestones), marly limestones, marls alternating with hybrid and volcanogenic sediments (volcanoarenites, tufitic marls, tuffs). These lithotypes, which emerge extensively in the nearby Valle di Chiampo and in the surroundings of Priabona and Monte di Malo, include abundant fossil remains, which are now part of important collections housed in the museums of Chiampo, Priabona, Montecchio Maggiore, Vicenza, Padua and Verona.

Above: Schematic geological and structural map of the Alpone-Agno graben in the context of the Lessini Mountains

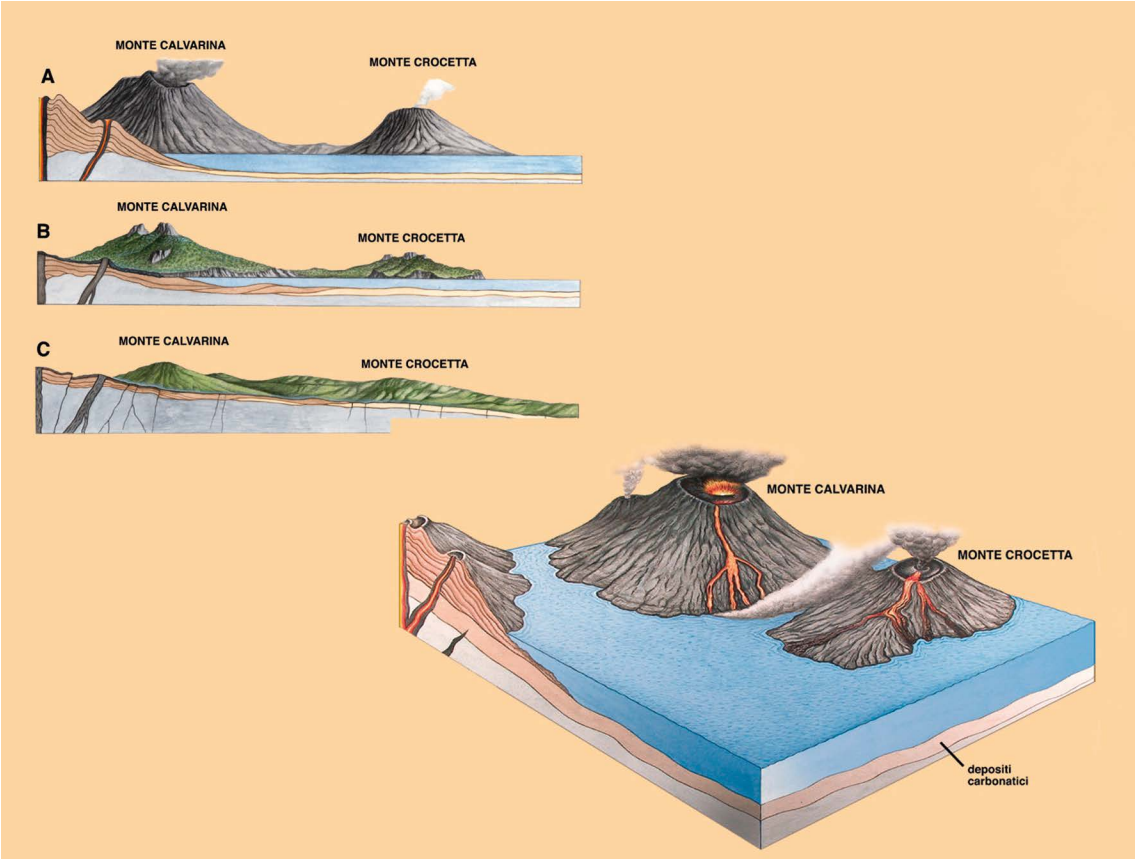
Following page: Terrossa di Roncà: characteristic reddish oxidation of the volcanic rocks in the "la Cappellina" area





Paleogeographic reconstruction of the Val d'Alpone territory during the middle Eocene

Tectonic stresses have resulted in brittle responses on limestone rocks, isolating a series of blocks separated by flat, parallel and inclined faults, with planar rotation movements and "a" effect domino" (Zampieri, 1995 or caused them to collapse during explosive volcanic events, such as olistoliths in the volcanoclastite depositional basin. The most important olistoliths are the "Pesciara" of Bolca and the outcrop of the locality of Brusaferri.
The presence of emerged lands along the Val d'Alpone during the Eocene is documented both by subaerial magmas and by the remains of continental plants.
By making appropriate comparisons with the areas surrounding the candidate area, it is possible to hypothesize that the complete and definitive emergence occurred in the upper Miocene (between approximately 6 and 5 million years ago). Less clear, if not unknown, are the events that occurred in subsequent periods, at least until the Pliocene, when the entire hilly and mountainous belt of the Lessini Mountains had emerged, taking on an appearance quite similar to the current one.
From the Pliocene to today, the effects of the changing climatic conditions that have followed one another have shaped and eroded the territory to its current conformation.
The modeling process, which saw the action of the ice during the various glacial phases as the main protagonist, is still ongoing: the rain, the wind, the temperature changes will continue to erode, alter and disintegrate the rocks that emerge from the plain until their complete dismantling and flattening, opening a new chapter in the history of local geology.
As regards the tectonic structure of the Chiampo Valley, this belongs to the eastern region of the Lessini Mountains which, starting from the nearby right orographic watershed of the Alpone Torrent basin, is lowered by a few hundred meters compared to the central-central one. western due to a system of grafted faults (Castelvero and Campofontana-Roncà and their relatives).

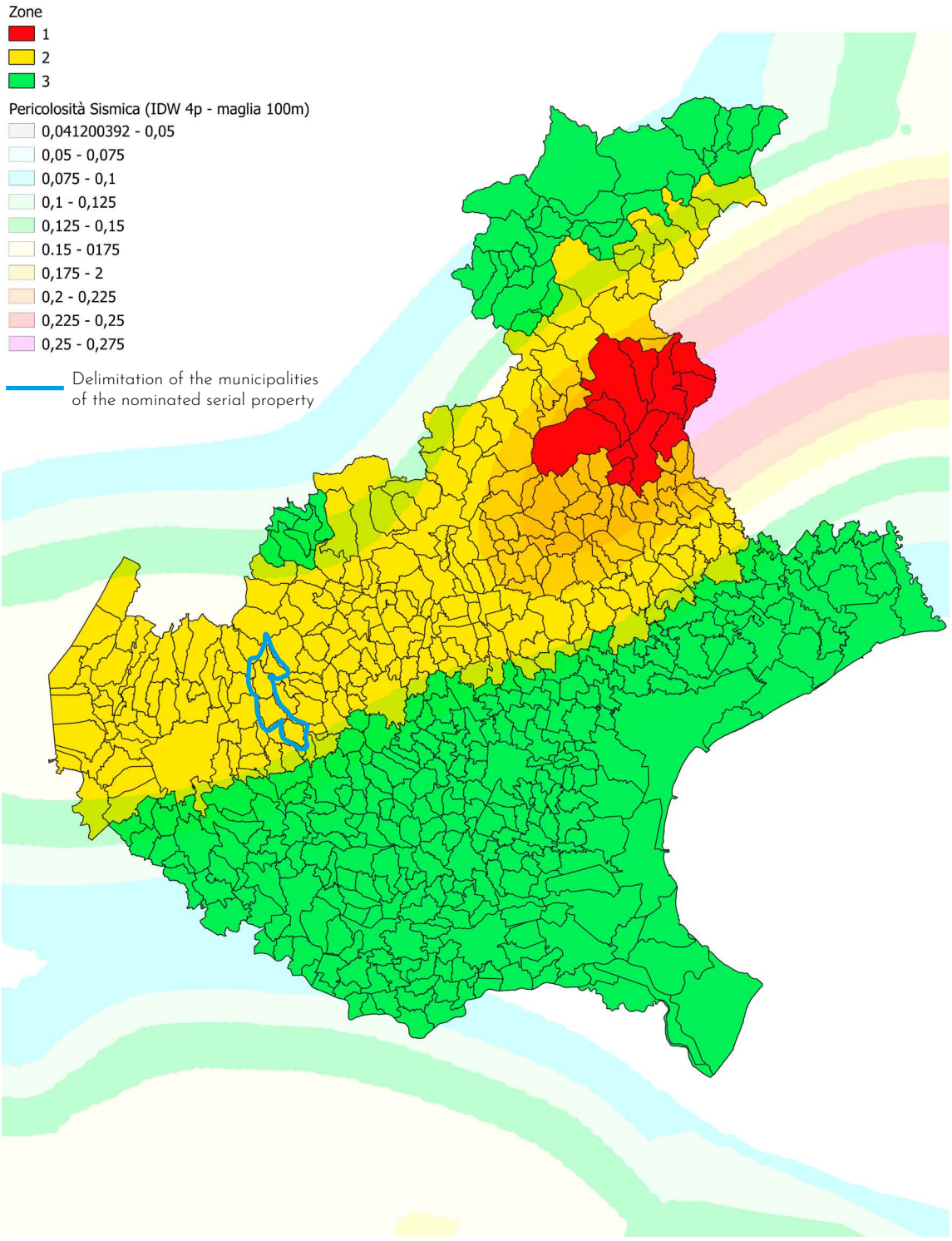


Morphological evolution from the Eocene to the present day of the two main volcanic buildings of the Val d'Alpone

In this lowered block, mainly Paleogene basaltic volcanoes emerge, while in the raised Veronese block, limestones prevail, both from the Paleogene and the Mesozoic era, while eruptive rocks are scarce.
Furthermore, the upper Chiampo Valley is further separated lithologically from the middle-lower one by the Marana-Piovene Fault, which extends from Campofontana to Piovene, passing through Cima di Marana.
This tectonic line vertically shifts the raised northern portion by approximately 1,000 m, exposing the Main Dolomite, compared to the lowered southern portion, where more recent Mesozoic and Paleogene rocks emerge (Barbieri & De Zanche, 1980; Pellegrini, 1988).
At a regional scale, currently, three main areas can be distinguished characterized by significantly different tectonic elements.
The western part is characterized by essentially Giudicarian direction structures (NNE-SSW) including the Garda faults, the Monte Baldo structure, the southern Val Lagarina and the Pastello, all trending ESE. The eastern portion of the territory is delimited to the north by the Valsugana line and to the SW by the Schio-Vicenza fault and related structures, which represent the most significant tectonic element of the area. The third part is included between these lineaments and is characterized by the tabular complex of the Lessini Mountains, inclined towards the south and delimited in the southern portion by the probable Verona fault.
The Benaco territory is subject to a strong and complex deformation which manifests itself with high seismicity especially in the Garda area with strike-slip mechanisms, while the Lessini Mountains are affected, albeit to a lesser extent, by uplift phenomena. From a seismic point of view, the area in question falls within Seismic District L (Lessini-Schio) as indicated in the study "Seismic Districts of Veneto" by Sugan and Peruzza (2011).
This study recognizes nine seismic districts, based on geological-structural elements, seismological data and a series of information

Seismic classification of Veneto.
Seismically dangerous paper

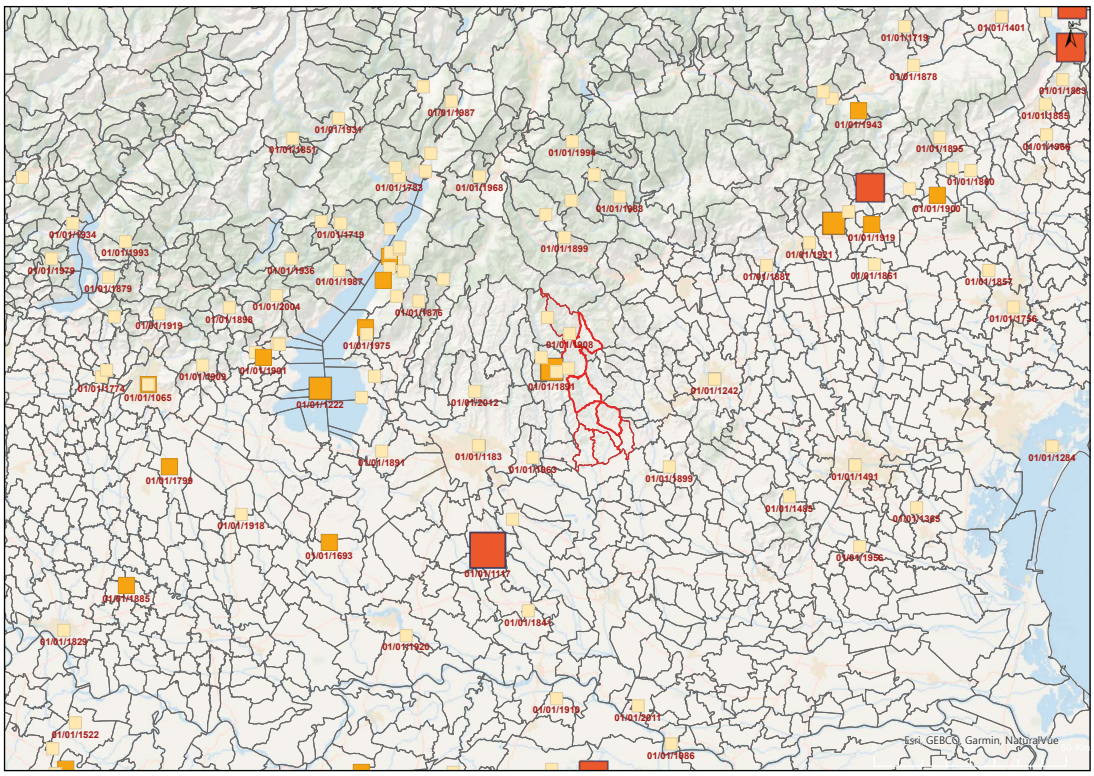
relating to active tectonics and cinematic evolution. The identifying districts are represented graphically in the image below which shows the classification in force before the D.G.V.R. N. 244/2021 following which the update of the seismic zones of Veneto was approved, bringing the entire nominated property from zone 3 to zone 2. Veneto confirms itself as a region with significant seismicity, as documented by the information historical; this aspect is perhaps



not adequately highlighted by the available instrumental data since 1977 and by current seismic regulations. Earthquakes above the perception threshold have affected a large band approximately corresponding to the Venetian Prealps, where there are more indications geomorphological features of an ongoing deformation. Not negligible, although little known and more difficult investigation, is the activity of structures buried in the Venetian plain, both in the eastern and eastern sectors western. The seismicity of the district in which the nominated property falls is characterized by two important factors
medieval earthquakes and some seismic events attributable to VI MCS (Mercalli-Cancani-Sieberg macroseismic scale).
The events of the 3rd fall into this area January 1117 (MW=6.49; 10=IX-X MCS) and those of 25 December 1222 of the Lower Bresciano (MW=6.05; 10=VIII_IX MCS).

A more complete picture of the recent seismic events that have affected the municipalities of the Val d'Alpone yes can obtain from the analysis of earthquake archives and, in particular, from:

1. Catalog of Italian Seismicity (CSI 1.1) of the INGV-CNT which contains the seismic events included among the years 1981 and 2002. From this database the main earthquakes with epicenter in the Verona area and immediate vicinities are as follows: 03/01/1117 epicentral area Veronese, 04/12/1334 epicentral area Verona, 09/21/1365 epicentral area Verona 1402, epicentral area Verona, 01/17/1403 epicentral area Verona, 10/06/1410 epicentral area Verona, 06/04/1465 epicentral area Verona, 21/03/1445 epicentral area Verona, 01/21/1491 epicentral area Verona, 06/07/1891 epicentral area Valle d'Illasi, 03/15/1908 area epicentral Crespadoro.



Map with the location of the epicentres of the earthquakes that caused damage in the nominated property and outside it

M until a 4.0 M from 4.0 to 4.9 M from 5.0 to 5.4 M from 5.5 to 5.9

M from 6.0 to 6.4 M from 6.5 to 6.9 M from 7.0 to 7.3

2. Italian Seismic Bulletin: it is part of the ISIDE (Italian Instrumental and Parametric Seismic Database).
This catalog provides data as of April 16, 2005.

3. Veneto Region, with resolution no. 67 of 3 December 2003 of the Regional Council, approved the new list of seismic municipalities in Veneto. With the Ordinance of the President of the Council of Ministers of 20 March 2003, n° 3274, new technical rules for anti-seismic constructions regarding bridges, foundations and buildings in general were approved. According to OPCM n. 3274 of 03.20.2003, the territory of the municipalities taken into consideration belong to zones 2 and 3.
In particular, the municipalities of Vestenanova and Crespadoro belong to zone 2 while the municipal territories of Altissimo, Gambellara, Monteforte d'Alpone, Montecchia di Crosara, Roncà and San Giovanni Ilarione are classified in seismic zone 3. In reference to the basic seismic hazard map referred to in OPCM n. 3519 of 04.28.2006 these municipalities fall within an ag (gravitational acceleration) range between the values 0.150-0.175 g, calculated in the presence of a flat surface and a rigid substrate with Vs30 > 800 m/s and in reference to a probability of exceeding 10% in 50 years.

Municipality	Province	Area km²	Average altitude m a.s.l.	Climate Class	Seismic zone
Monteforte d'Alpone	Verona	20,47	38	E	2
Soave	Verona	22,67	40	E	2
Roncà	Verona	18,15	78	E	2
Montecchia di Crosara	Verona	21,06	87	E	2
San Giovanni Ilarione	Verona	25,40	194	E	2
Vestenanova	Verona	24,18	515	F	2
Gambellara	Vicenza	13	70	E	2
Altissimo	Vicenza	15,09	672	F	2
Crespadoro	Vicenza	30,20	363	E	2

2.b.3 The multiple values of the Val d'Alpone: geological, environmental, landscape and historical-cultural

Not just fossils. The territory of the Val d'Alpone, in addition to expressing a complete paleontological documentation of Eocene marine fossils, contains other natural values: geological, environmental, landscape, and preserves historical-artistic evidence of its rich past.
These are added values, which enrich and strengthen the territory and the environment that preserves the fossiliferous sites covered by the nomination (Annex 1 Cartography, map 1.9).

2.b.3.1 Geodiversity

Within the concept of natural heritage there is that of geological heritage and that of geodiversity as a direct expression of different geological environments and, for this reason, capable of evidently influencing the biodiversity of the territory. The variations in the bedrock, sedimentary deposits, landforms, endogenous and exogenous processes that have shaped the landscape, are all factors that contribute to geodiversity. It follows the importance of the interaction between organisms and their habitat: plants and animals interact and adapt to the physical environment that hosts them, while the physical environment, in turn, changes depending on the presence of those organisms.
The protection of the paleontological heritage as the geological heritage of the valley is also reflected in the "International Declaration of the Rights of the Memory of the Earth" as a non-renewable natural resource, of scientific, cultural or educational value, which allows

the recognition, study and interpretation of evolution of the geological history of the Earth and the processes that have affected it. For this reason, the geology of the Val d'Alpone must be known, interpreted and valued as a cultural heritage, and therefore not only "physical history", but also History and memory of men. On the other hand, this is a new key that can be exploited to present a more attractive aspect of geology: not only that linked to geological danger and risk, but also that of attraction and history.

2.b.3.2 The landscape

The Val d'Alpone was born in its upper part from the confluence of three small streams, including the Alpone itself, which continues southwards until after the town of Montecchia di Crosara, where, creating a wide bend, it changes direction, now flowing with North-West/South-East axis. At this height it is flanked on the east side by another stream which follows it parallel and in turn flows into the Chiampo.
If the upper part of the valley is quite narrow with canyon characteristics, the terminal part has a wide plain full of watercourses, at the edges of which numerous demic centers arise which partly exploit the ridges and partly the valley floor. Examples are the towns of Monteforte d'Alpone and Terrossa in the valley bottom area; while Gambellara and Costalunga develop by exploiting the type of flat niches, between some lateral offshoots of the ridges. This is in fact a peculiar characteristic of this sector of the valley, where the ridges are characterized by deep torrential incisions, with large, slightly inclined conoids at the foot that create numerous indentations, often chosen as location of extensive anthropic settlements. In the middle and northern part of the valley, the main centers of Montecchia di Crosara and San Giovanni Ilarione are located in the valley floor, while Castelvero, Vestenavecchia and Vestenanova stand in an elevated position at the end of the valley, each near one of the three torrential incisions mentioned above. On both lateral ridges a series of smaller centers develop which, in some cases, can be assimilated to small hamlets, as in the case of Brenton.
As regards internal roads, a route develops that follows the course of the Alpone stream and connects the various centers it touches. Alongside this main road, others develop, approximately in an East-West direction, which unite the centers at opposite ends of the large terminal plain or connect the valley floor with the bordering valleys to the East and West.

2.b.3.3 The fauna

The territory involves various environments that follow one another from South to North, outlining a very diversified picture.
The northernmost portion, which is included in the Alpine biogeographic region, falls within the municipality of Crespadoro and falls with a portion equal to approximately 20% (607.98 km2) within the SCI IT3210040 called "Monti Lessini-Pasubio Small Dolomites of Vicenza". It is a mountainous and hilly area characterized by the presence of a valley crossed by a torrential watercourse and by highly urbanized contexts that develop above all in the flat areas present at the outlet towards the high plain. Due to the available data, it was possible to identify the species characterizing these environments, including those included in the protection lists of the Habitats Directive (92/43/EEC) and the Birds Directive (79/409/EEC).
Among mammals, the five species of bats reported in the area are included in Annexes II and IV of the Habitats Directive. These are: the greater and lesser horseshoe bats (*Rinolophus ferumequinum* and *R. hipposideros*), typical of karst cavities, the black-headed bat (*Pipistrellus kuhlii*), the dwarf bat (*Pipistrellus pipistrellus*) and Savi's bat (*Hypsugosavii*), very frequent in urban environments. The rodents in the Habitat Directive are represented here by the variable hare (*Lepus timidus*), present in forest environments, high altitude grasslands and shrubs, by the common dormouse (*Moscardinusavellanarius*) which nests in the cavities of trunks or among shrubs and by the porcupine (*Hystrix cristata*), a Mediterranean species recently arrived in Lessinia and Veneto. Among the protected carnivores we can mention the marten (*Martes martes*).
In addition to the species mentioned in the directive, the presence of other mammals testifies to the faunal diversity of the area,

among these we can mention the hedgehog (*Erinaceus europaeus*), the mole (*Talpa europaea*), the common squirrel (*Sciurus vulgaris*), the weasel (*Mustela nivalis*), the badger (*Meles meles*), the fox (*Vulpes vulpes*) and the roe deer (*Capreolus capreolus*).
As regards the birds included in the Birds Directive, along watercourses, near canals and ditches and linked to the reedbed environment, we remember the garganey duck (*Anas querquedula*), the gray heron (*Ardea cinerea*) and the purple heron (*Ardea purpurea*), the night heron (*Nycticorax nycticorax*), the little egret (*Egretta garzetta*), the warbler (*Acrocephalus arundinaceus*), the common reed warbler (*Acrocephalus scirpaceus*), the kingfisher (*Alcedo atthis*), the pendulin (*Remiz pendulinus*) and the little grebe (*Tachybaptus ruficollis*).
The shrubs, hedges and in general the vegetation characterized by a notable heterogeneity, is populated by various species of birds, such as the great shrike (*Lanius excubitor*), the little owl (*Athene noctua*), the barn owl (*Tyto alba*) and the padovana gray owl (*Sylvia nisoria*), while in the marginal wooded areas the scops owl (*Otus scops*) and the long-eared owl (*Asiootus)* are quite common. In agricultural and urban areas, quail (*Coturnix coturnix*), house martins (*Delichonurbicum*), swallows (*Hirundo rustica*) and swifts (*Apus apus*) are found.
Among the diurnal birds of prey, the hen harrier (*Circus pygargus*), the peregrine falcon (*Falco peregrinus*), the kestrel (*Falco tinnunculus*), the black kite (*Milvus migrans*) and the buzzard (*Buteo buteo*) can be commonly observed.
There are numerous reptiles present in the Directive whose presence is reported.
Among the lacertids we encounter; the green lizard (*Lacerta bilineata*), present in many open and sunny environments; the wall lizard (*Podarcis muralis*), also present on the walls of inhabited centres. The ophidians are represented by the rat snake (*Hierophis viridiflavus*), present in numerous open and forest environments; from the tassel snake (*Natrix tessellata*), a relative of the more common grass snake (*Natrix helvetica*) which however is not included in the protection lists, as are several other snakes present in the area, including the arrow snake (*Zemenis longissimus*) and the common snake (*Vipera aspis*).
There are numerous amphibians in the annexes of the Habitats Directive present in the area: the yellow-bellied toad (*Bombina variegata*), whose song can be heard at sunset and at night; the Italian green toad (*Bufo balearicus*); the European tree frog (*Hyla perrini*), the agile frog (*Rana dalmatina*), present in wooded and open environments; the Lataste frog (*Rana latastei*), which prefers woodland environments and the common frog (*Rana temporaria*), a species typically linked to mountain or hilly environments. In addition to these,we can mention the fire salamander (*Salamandra salamandra*), the spotted newt (*Lissotriton vulgaris*), the alpine newt (*Ichthyosaura alpestris*) and the common toad (*Bufo bufo*).
The fish community that characterizes torrential waterways is made up of salmon populations



Rhinolophus ferrumequinum

(rainbow trout, brown trout), cyprinicola populations (dog barbel, tench) and goby populations (gobies). Among the protected aquatic invertebrates, we must remember the crayfish (*Austropotamobius pallipes*). Of great ecological and environmental importance are the numerous insects which it would take too long to list in detail, but for which we can mention some of those in the Directive such as: the stag beetle (*Lucanus cervus*); the oak moth (*Cerambixcerdo*) and the ivy moth (*Euplagia quadripunctaria*). The Alpone stream and its tributaries represent ecological corridors oriented in a N-S direction.



The Alpone stream represents an important ecological corridor

The PATI (Intermunicipal Territory Planning Plan) of Alpone identifies the system of core areas of high environmental value, structuring them on regional level: these are areas characterized by a high degree of naturalness capable of hosting stable populations of species of interest and to ensure the maintenance of a good degree of biodiversity. Biological functionality and morphological continuity must be guaranteed within these areas, necessary conditions for the correct functioning of the ecological network. An important element is certainly the integrity of the watercourse, the so-called "river continuum". Already in the mountainous parts of the basins (upper Chiampo Valley and upper Alpone Valley), and then more and more evidently approaching the anthropized areas, the continuity of the water courses has been drastically reduced over time. The main reason is clearly connected to the implementation of hydraulic works and artefacts such as tanks. Currently the ecological connections are quite functional in the northern part while the continuity of the ecological corridor is reduced in the central-southern part as it finds itself in a highly anthropized context. Of great ecological and conservation interest are the underground cavities which, precisely in the area considered and in particular in the cavities of Pesciara di Bolca, host various species of invertebrates endemic or exclusive to these environments, such as the polychaete *Troglochaetus beranecki*, the orthopteran *Troglophilus cavicola* and the trechino *Orotrechus vicentinus*.

2.b.3.4 Vegetation

The vegetation of the Alpone valley presents characteristics that progressively vary as you go up the valley from South to North.
The main factors that determine this gradient are the climate, hotter and drier in the southern part close to the Po Valley, increasingly cooler and rainier as the altitude increases towards the North, and the intensive cultivation mainly of vines, but also of olive trees and cherry trees, which characterize the valley floor and the hilly reliefs almost up to the town of Vestenanova.
From this combination of climate, altitude and anthropic impact, it appears that the vegetation of thesouthernmost part of the valley is markedly thermoxerophilous, with woodland formations made up of Orno-ostrieto on calcareous soil, woods with a prevalence of *Fraxinus ornus* L. (manna ash) and *Ostrya carpinifolia* Scop. (black hornbeam).
In the warmest and sunniest situations, ostrio-oak forests are also quite frequent, with an important component of downy oak (*Quercus pubescens* Willd.): the scotano is also often included in these formations, although to a lesser extent than in the hills of the more western Lessinia, butcher's broom and wild asparagus. These natural or semi-natural woodland formations are mainly found on the steep slopes of the small valleys that flow into the Val d'Alpone and on those slopes

Overview of the central-southern portion of the Val d'Alpone with intense cultivation of vines and cherry trees





Upper Chiampo Valley: overview of Cima Marana seen from Valecco

not affected by the cultivation of vines, or on abandoned land whose natural evolution is bushing and reforestation. Also in the hilly part you can find chestnut groves (*Castanea sativa* Mill.), some of which are managed for food purposes such as those of Monte Calvarina in S. Giovanni Ilarione, which were an integral part of the economy of these areas especially in past years, and other natural chestnut groves especially in the presence of acid soil. In the more sheltered and cooler environments, such as the impluviums, there are also some white hornbeam woods (*Carpinus betulus* L.), although in these areas of western Veneto they are in most cases hornbeam forests mixed with oaks such as downy oak and turkey oak. Especially at these altitudes, the woods are often marked by the presence of *Robinia pseudoacacia* L., an invasive alien species that spreads very quickly also thanks to coppicing, managing to replace the other species and sometimes forming true monospecific woods.
In this medium-low altitude range there are also some interesting rocky outcrops with a typical flora adapted to a poor and arid environment and to a basaltic substrate: here some species are found that are completelyabsent in the rest of Lessinia, such as for example *Asplenium septentrionale* (L.) Hoffm., *Opuntia humifusa* (Raf.) Raf., *Jasionemontana* L., *Trifolium hirtum* All. and *Epilobium lanceolatum* Sebast. & Mauri.
Going up in altitude, in the mountain range you come across beech forests (*Fagus sylvatica* L.) both coppice and high forest, with a fair amount of mountain maple (*Acer pseudoplatanus* L.), while the cultivation of vines gradually becomes less intensive up to be replaced in the uppermost parts of the valley by pastures and mown meadows. Especially the latter, which can present a high number of floristic species, naturally evolve into woodland following abandonment, with the progressive entry of shrub species such as hazelnut (*Corylus avellana* L.), which over time leads to the development of coryletes, woodland formations which in these areas can become rather stable over time. In the highest and most arid-rocky meadows, mountain mountain (*Pinus mugo* Turra) and juniper (*Juniperus communis* L.) take over as pioneer species of shrubs, sometimes also associated with rhododendron and blueberry. In addition to the beech forests, the highest environments of the valley also have some sporadic spruce forests (*Picea abies* (L.) H. Karst.), sometimes associated with the larch (*Larix decidua* Mill.), but these are nevertheless wooded areas of limited extensions.
In the Val d'Alpone, as in the whole of Lessinia, wetlands are rare or almost non-existent: these are limited to the mountain pasture pools in the summit pastures and to some springs and streams that flow into the Alpone. Some species linked to humid or periodically submerged environments, *Alisma plantago-aquatica* L., *Equisetum palustre* L., or *Cyperus* sp., can be found in the Alpone riverbed and in the drainage channels, especially in the flatter part of the valley, at contact with the Po Valley.

2.b.3.5 The hydrographic basin and water circulation

The Alpone Torrent is the main hydrographic element that characterizes the valley and also the major tributary of the Adige River, which it enters at the height of the town of Albaredo d'Adige, after crossing the territory of San Bonifacio and Arcole.
The Alpone hydrographic basin, which is long and narrow, with a predominantly North-South axis, is crossed by numerous waterways arranged in a double fan system and which give rise to water courses that deeply affect the basaltic rocks that emerge widely along the slopes. Due to the narrow and elongated shape of the basin, the secondary streams are generally rather short, with a very limited collecting basin.
The volcanic origin of the rocks also conditions the circulation of water underground and their emergence in the form of springs.
These are quite abundant but with generally small flow rates. The streams that dissect the slopes of the two valleys have an evident and characteristic "V" profile, while the valley floor is wide and sub-flat, locally more or less terraced. On the other hand, the hilly and mountainous areas located to the West of the Val d'Alpone are characterized by the outcropping of carbonate rocks and the presence of a few watercourses that only partially run through the main valleys.
The scarcity of surface water, despite the evidence of the hydrographic network, is the expression of a combination of fluvial and karst-type processes (Mietto & Sauro, 1989).
A particular role in the karstification of the carbonate rocks is also played by the discontinuous and more or less thick covers of the inconsistent type formations variously present within the valley. Generally, these are eluvial-colluvial and landslide deposits, which represent "epikarst water reservoirs", which are slowly transferred to the underlying fractured and karst carbonate rocks. In fact, these materials, which have good permeability, allow rainwater to penetrate deeply, feeding the aquifer contained in the fractured rock mass, made up of carbonate lithotypes belonging to the Cenozoic and Mesozoic series.



Central-northern section of the Val d'Alpone extended in a N-S direction

For this reason, the meteoric waters, after having crossed the most superficial portion of the stratified and karstified carbonate rocks, certainly anhydrous or poor in water, deepen within this until they intercept the aquifer. karst contained in intensely fractured horizons or within karst conduits and/or karst fractures. This aquifer is often supported by variously powerful levels of marly limestone with clayey intercalations acting as a local aquiclude.
Little or nothing is known about the groundwater regime which, however, is certainly and closely linked to the rainfall regime. The direction of flow of the karst aquifer is profoundly conditioned by local structural elements (faults, invoicing, position of the layers, etc.). As regards the karst aquifer, it is generally water that flows from springs with a not very deep hydrogeological

basin. In the valley, wells are also known that drain the deep karst aquifer (bottom phreatic aquifer) or the valley floor flood aquifer: in particular, there are some wells even several hundred meters deep that drain karst aquifers with a flow rate equal to or greater than 5 l/s. The water supply in alluvial aquifers is present throughout the territory but with rather modest flow rates. Wells with high pumping rates are located in the Campitelli area and supply the Roncà and Monteforte aqueducts (average annual flow rates between approximately 10 and 15 l/s). Finally, as regards the springs, the most important is the "Montecchia" spring which has a flow rate of approximately 70 l/s and a chemistry characterized by a high salt content. Given its position and high flow rate, it ispossible to hypothesize that the spring is fed by water drained from the nearby Castelvero Fault. The salt content would indicate a flow of water within the carbonate rocks but close to the contact with volcanic rocks.

2.b.3.6 The climate

The climate varies depending on the relief. Of the three mesoclimatic zones of the Veneto territory, the lower Val d'Alpone falls within the hilly area, the upper Val d'Alpone in the foothills. The climate classification of Italian municipalities, introduced to regulate the operation and operating periods of heating systems to reduce energy consumption, includes 6 zones, indicated with letters from A to F based on degree days. The municipalities interested in the nomination process, on the basis of Presidential Decree no. 412 of 26 August 1993 and subsequent updates, are all included in bands E-F.

Upper Chiampo Valley: winter overview of Cima Marana



2.b.3.7 Pre-and proto-historic frequentations

The evidence of human presence in the pre- and proto-historic era in Val d'Alpone is rather sparse, especially if we compare it, for example, to the more numerous testimonies from central-western Lessinia, which is geomorphologically very similar. This discrepancy could be attributed to a series of factors: the mediocre quality of the flint raw material (Scaglia Rossa) - the exploitation of which is instead the basis of the intense frequentation of the other Lessinian areas - the geolithological nature of the territory (absence of caves or cavities large habitable areas), the limited archaeological research, the profound anthropization of the environment with consequent obliteration of sites pre-existing in the Roman era in the central-southernpart of the valley and, on the contrary, the impervious landscapes which are difficult and/or rarely accessible even in the most recent in the northernmost portion.

In Val d'Alpone archaeological research, although it has taken place discontinuously since the end of the 19th century, has never been conducted in a systematic manner and the information available is almost always attributable to fortuitous discoveries. Most of the evidence is located on the western side of the valley and to a minimal extent on the eastern ridge, favorably exposed, which separates the Val d'Alpone from the Valle di Chiampo and where the sites with the oldest attendance are located. Among these, with the exception of the site of Monte Birone (518 m above sea level) in the municipality of San Giovanni Ilarione, it is necessary to enumerate those of Monte Madarosa (561 m above sea level) and Monte Calvarina (657 m above sea level) where lithic evidence attributable to the Mousteriano is attested (120-35 thousand years ago) and therefore to Neanderthal man, within occupation models better verified in other sites in the area between the Lessini Mountains and the Euganean-Berica area. The research conducted on the top of the Madarosa hill at the end of the 1960s also brought to light Neolithic materials (4th millennium BC), bell-shaped materials (3rd millennium BC), Campignana lithics and ceramics referable to ancient, middle and recent times. Bronze Age (between the 22nd and 12th centuries BC). In this site the presence of decorated Apennine ceramics (15th-14th century BC). In this site, the presence of decorated Apennine ceramics (15th-14th century BC) on the one hand partly frames a function linked to transhumance and on the other attests to extra-regional contacts. Campignana lithic, which can be dated between the Middle Neolithic and the Bronze Age, is also present on Monte Birone and at the Purga di Bolca. During the oldest phase of the Bronze Age (XXII-XVII century BC) the frequentation of the Venetian Prealps mainly favored the hilly areas, as documented by the sites of Monte Bastia (Cazzano di Tramigna) and Vestenanova in the locality of Maccadanzi di Castelvero. A real change in the settlement model occurred during the terminal phase of the Middle Bronze Age and the initial phase of the Late Bronze Age (17th-13th century BC), during which there was a rapid population of the hilly and mountainous sector and the presence in the inhabited areas of perimeter dry-stone walls recognized during the mid-20th century, whose existence, years later, has however never been checked on site and whose antiquity has never been stratigraphically verified nor more or less related to a structured settlement in defensive sense. In the area under consideration, the phenomenon is more rarefied than in the central Lessini, but certainly not of less importance as attested by the sites of Monte Mirabello, Monte Bastia, Castelcerino, Monte Castellaro di Brognoligo, Colle Sant'Antonio, Monte Madarosa and Monte Calvarina. These inhabited areas, mostly located on the tops of low-altitude hills (interpreted in the literature as hillforts), seem to have had a strategic function of controlling the plain area to the south and the accesses to the hilly-mountainous sector and, later, also to the Trentino mineral basins, according to an integrated land management model.

During the Final Bronze Age (12th-10th century BC), in the face of a generalized settlement crisis, the hilly area seemed to hold up despite the halving of the sites as documented by the towns of Tre Punte di Prealta and Monte Soeio sull'Alpone (in the province of Verona) and Monte Madarosa and Monte Calvarina (in the



The relief of Punte di Prealta seen from the Belloca pass

province of Vicenza). The latter would seem to maintain a certain socio-economic vitality by virtue of the activation of relationships with the Trentino populations particularly dedicated to the mining of copper, its processing and distribution.
Also located in a strategically selected position are the sites from the end of the Final Bronze Age and the beginning of the early Iron Age (10th-9th century BC) of Monte Madarosa and in the municipality of Monteforte d'Alpone such as Monte Zoppega, Monte Riondo and Monte Castellaro of Brognoligo, the latter located in an area where the Tramigna and Alpone streams converged. Some of these would seem to continue without interruption even during the Iron Age up to the Romanization era of the 3rd century. B.C.

2.b.3.8 Roman times

For the Roman times, many problems arise in interpreting the general framework of the settlement, based on the minimal data available. However, it must be stated that the lack of systematic research on the territory and stratigraphic investigations certainly have a negative impact on the definition of the dynamics of exploitation of this territory.
The data in our possession comes exclusively from occasional findings and refers to sporadic findings, out of context. We are mostly talking about fragments of epigraphs, coins or isolated clays. Only for the valley floor plain is reference made to funerary evidence, however never investigated in depth and with stratigraphic criteria, as it pertains to findings from the late 19th-early 20th century. However, the presence of such contexts in a strip of territory certainly crossed by the main road routes is not surprising. Also based on a comparison with the data available for the contiguous areas, at the current state of research, for the Roman times, we must therefore ask ourselves whether the lack of data is due to an actual absence of elements or just to a visibility problem in this territory.

2.b.3.9 Medieval period

For the medieval period, in recent years we have been proceeding with a systematization of research, with the study of aerial photography, field reconnaissance, the reading of written sources and local toponymy. An initial investigation with a stratigraphic method was carried out at the site of the Terrossa Castle, with multiple excavation campaigns under the scientific direction of the chair of medieval archeology of the University of Verona (Saggioro, 2021). In the Middle Ages, four fortified settlements along the valley are documented in the Val d'Alpone: San Giovanni Ilarione, Montecchia di Crosara, Roncà/ Terrossa and Monteforte d'Alpone. The first two are located in the respective "Castello" localities upstream of the capital; in the first case the structures are incorporated into the current church of San Giovanni Battista, to the south and west of which the remains of the village can still be seen along the slope.
Only traces of the Montecchia castle remain in the shape of the area now occupied by the cemetery, which also includes the medieval church of San Salvatore.

The castle of Monteforte is documented for the first time in 1045, when it is mentioned in a notarial deed. It rises to the west of the town, on what is now Colle Sant'Antonio, where traces of the perimeter wall structures of the fortress are still evident.
The castle of Roncà/Terrossa, on a raised hill on the western side of the hilly ridge that separates the Val d'Alpone from that of Chiampo, is naturally defended on the north, south and west sides by deep and narrow torrential incisions. Recent archaeological investigations have allowed us to highlight a large part of the structures preserved in the foundation, as well as the entire semicircular wall around the top of the hill, providing an interpretation of the organization and construction phases of the settlement.
The analyzes carried out on the sediments during the excavation campaigns have allowed us to open a window on the evolution of the environment from the protohistoric era up to the present day. The paleobotanical analyzes have in fact made it possible to reconstruct an environment characterized by tree species typical of the Po Valley and humid

Terrossa Castle



environments, which gradually underwent progressive deforestation, starting from the Middle Ages, evidenced by the massive diffusion of the typical indicators of the agricultural development of an area: fruit and cereal tree species.
Along the western ridge, only some information remains of the castle of Castelcerino, built by Ezzelino da Romano and destroyed shortly afterwards by his enemies. Behind the current town, on the hill called Monte Bastiola, stand the remains of this structure, characterized by slopes with moderate slopes, defended by probable ring-shaped ditches, which prelude to an upper curtain wall.
While further north, still on the ridge that separates Val d'Alpone and Val Tramigna, there was the fortress of Bastia, known from documents only from the 15th century, controlling an important saddle, which connects the two valleys. It is formed by an irregular perimeter that adapts to the steep slopes, within which some microrelief traces can be seen, indicating buried buildings.
As regards the structure of the religious buildings and the population, it can be observed that there is a substantial continuity between the original medieval nuclei of the towns and the subsequent evolution of the modern and contemporary age. In the long term, the processes of urban modification result in the abandonment of the most prominent areas, such as those of castles or some cult chapels, for a more stable occupation of the area at the bottom of the valley. This long continuity of occupation of places also seems to be expressed on other fronts, given that many of these sites seem to show traces of occupation since protohistory and therefore be a reference point for the landscape. We know, however, that in Roman times a temporary abandonment or transformation of the areas affected some of these realities, but the archaeological research conducted in these territories is attempting to address the issue.
The first frequentation of Monteforte d'Alpone, for example, does not date back to the early Middle Ages but already to the Middle and Recent Bronze Age, as surface investigations revealed already in the 1950s.
Similarly, the site of Monte Bastia can be observed which has yielded numerous ceramic materials and flints, dating back to the end of the Early Bronze Age and the Late Bronze Age, coming in particular from the areas located to the north and east of the medieval fortification. The structures that remain of the Bastia fort consist of a wall circuit of an elongated elliptical shape, with an internal diameter greater than 70 meters in the south-north direction, on which two towers were built: the first on the north side, quadrangular in shape and a second polygonal on the west side. However, it is not possible to precisely establish the size of the structures on a large part of the eastern side due to the collapses that occurred at an unspecified time. The dating of the site, at least in its original layout, can be traced back to the 15th-16th century phases.
Protohistoric materials also come from the excavation of the castle of Terrossa-Roncà, located on a hill halfway up the eastern side of the Alpone valley at about 300 m above sea level, in a position that dominates the southern sector of the valley. The first occupation seems to date back to the 16th and 12th centuries BC. C. and then continued during the Roman age and part of the Roman one. Between the 2nd AD C. and the 9th/10th century the hill was uninhabited but was reoccupied in the central 10th/11th centuries until the 16th century AD. C.
A small but important site in the panorama of the valley, like others among those briefly described. This research not only allows us to detect and understand the structures but allows us to understand the dynamics of a long and complex population of a valley still little subject to violent urban transformations. These are elements that are the basis of the landscape identity of at least a thousand years and which structure what is the current territorial fabric of the valley. These are sites and places that move over time with their cultural heritage that tells us how man has related to the surrounding space and organized it. The document that talks about the foundation of Roncà in 1300 can perhaps be a clear example of these processes: a clear expression of a transformation of a new construction of the landscape and of changes in management processes.

2.b.3.10 From the first paleontological collections to the current museums of the Val d'Alpone

Verona plays a particularly important role in the field of European naturalism and naturalistic museology: it is in fact the only city on the old continent in which from the second half of the sixteenth century to the present there has been a continuity of collections on display to the public. In them, a leading place goes to the fossils of the Val d'Alpone.
Already in the pioneering naturalistic collection of the Veronese pharmacist Francesco Calzolari, assembled starting from 1571, there were many fossils from Bolca: one of those specimens, recognizable by its characteristic oval cut, is still preserved in the Civic Museum of Natural History of Verona.
The one in Calzolari is considered the first true naturalistic museum in the world: in this area too the fossil sites of the Val d'Alpone boast international primacy. In the eighteenth century Scipione Maffei, leading voice of the culture of the time and owner of Pesciara di Bolca, created a varied collection of specimens; upon his death the rich collection was taken to Nimes, France, by his secretary Jean Francois Séguier, but it did not survive for long, it was in fact dismembered and today only a few examples of that heritage remain in Nimes. Other known fossil collections of the time are those of the Marquis Gian Giacomo Dionisi and Vincenzo Bozza.
In 1787, Count Giovanni Battista Gazola purchased part of the Pesciara deposit and began to conduct excavations on his own and bought the collections of Dionisi and Bozza, creating a collection rich in variety and number of specimens. At the end of the century the Gazola collection formed an important naturalistic museum (it reached 1200 specimens) gathered in five rooms, two of which were specifically dedicated to stone fish.
The beauties of the Gazola collection were known, also thanks to the dissemination that the splendid "Ittiolitologia Veronese" of Giovanni Serafino Volta had made of them and attracted the attention of the Napoleonic armies. In fact, on 17 May 1797 the citizens Berthollet and Appiani, commissioners appointed by General Bonaparte to selectobjects of science and art existing in the city of Verona, went to Palazzo Gazola. There 582 fossils were collected, including 516 fish, 62 plants, an insect and a bird feather. Other fossils were seized from the Marquis Canossa while the Ronconi collection, after having undergone an initial seizure, was later returned. The Gazola collection and the Marquis Canossa's fish were packaged and arrived at the National Museum of Natural History in Paris in 1798. In 1803 Count Gazola went to Paris where he offered his collection as a gift to Napoleon Bonaparte, first consul. Gazola later reconstituted a large collection, and, after his death, his heirs further expanded it.
A nephew, to resume the excavations in Bolca, hired a quarryman originally from the Vicenza area, Giuseppe Cerato, who was already on site because in 1817 he had rented the quarry of the Marquis Antonio Maffei - nephew of Scipione Maffei - located in the eastern part of Monte Postale. Giuseppe Cerato and his descendants have inextricably linked their name to the Bolca site where they continued to work - and still work today as consultants for the Natural History Museum of Verona - and over time they became owners of the quarry and neighboring land, extracting a large number of fossils that are today preserved in museums around the world (Sorbini, 1972; Cerato, 2011).



One of the two rooms of Palazzo Gazola where the fossil fish of Bolca were exhibited



Room of the Civic Museum of Natural History of Verona dedicated to the fossils of Bolca

2.b.3.10.1 Civic Museum of Natural History of Verona (VR)

The privileged place of conservation of the fossil finds of the Val d'Alpone is the prestigious Civic Museum of Natural History, managed by the Municipality of Verona and part of its Network of Civic Museums. It is located on the banks of the Adige in the historic Palazzo Pompei, the majestic building commissioned in the mid-16th century by the Lavezzola family from the architect Michele Sanmicheli and which later became the property of the Pompei family. In 1833 Count Alessandro Pompei donated it to the Municipality of Verona to host prestigious exhibitions, art collections and scientific collections. The original omnibus museum was only later reserved for naturalistic collections. The current exhibition nucleus dates back to the 1960s, when the wall restorations were completed and numerous display cases were reorganised, but overall, it represents the legacy of an ancient tradition of naturalistic collecting, continuously increased thanks to new excavations, the majority of such as carried out in the deposits of the Val d'Alpone. The Museum's collections, organized in the sections of Botany, Geology and Paleontology, Prehistory, Zoology, include over 2 million natural objects in excellent condition, among them there are approximately 200,000 samples of fossil finds, rocks and minerals, corresponding to over 64,000 inventory numbers, divided into thematic collections.

With over 9,500 specimens (part of civic property and part of state property, in storage) from the Pesciara and Monte Postale deposits, it has the most important Bolca collection in the world. The "Fossil fish of Bolca – former Gazola and Accademia collection" collection includes approximately 2,500 specimens, while the "Baja" collection (named after the donor G. Baja) consists of 239 specimens from Bolca, with many rare species and all in excellent state of conservation. Until June 2023, the Natural History Museum housed the offices, laboratories and warehouses of the Prehistory and Botany sections as well as some deposits of the geology, paleontology and zoology sections in the Command Building of the Austrian Arsenal of Verona, not far from Castelvecchio. and library. Currently, the Command Building is undergoing restoration. All the scientific material collected

over the centuries and kept in the Palazzo Pompei and Palazzo Forti locations is prepared, cataloged and studied, as well as collected in the collections in storage and displayed to the public in the rooms.

The Civic Museum of Natural History therefore plays a central role in scientific research and in the dissemination of the paleontological and geological heritage of the Val d'Alpone and, more generally, of the Veronese area.

Civic Museum of Natural History of Verona	
HEAD QUARTERS ADDRESS	Palazzo Pompei, L.ge Porta Vittoria, 9 – Verona
PROPERTY	Municipality of Verona
YEAR OF FOUNDATION	1926
TYPES OF COLLECTIONS	Natural objects and historical artefacts
SURFACE	Exhibition area: 1,660 m^2 in 19 rooms Used for services: 1,881 m^2 partly in Palazzo Pompei and partly in Arsenale (library, warehouses, offices, laboratory for exhibitions, guest quarters, Museum of Romagna in Arsenale, concierge, two conference rooms, atrium and atrium) Used as a warehouse: 1,059 m^2
NUMBER OF FOSSILS	Objects on display (approximately 1%) and in warehouse: more than two million specimens, divided into four sections: 1. Zoology (40%) 2. Botany (15%) 3. Geology and Paleontology (25%) 4. Prehistory (20%)
OPENING HOURS TO THE PUBLIC	Tuesday and Wednesday: 2.00 pm – 6.00 pm Thursday – Sunday: 10.00 – 18.00 Monday closed
TICKET OFFICE AND STORAGE STAFF	12
TYPES OF SERVICES OFFERED TO THE VISITOR	Guide to the museum in Italian and English Conferences Captions (Italian) Sale of museum catalogs and publications Audiovisual supports (teaching room with video) Toilets (n. 2) External signage Guided tours for schools Library and two conference rooms Teaching room with equipment (microscopes, collections) Research laboratories
TECHNICAL SYSTEMS	Volumetric anti-theft device
TICKET PRICE	Full price: 3 euros Reduced: 2 euros Schools, children 8 – 14 years: 1 euro
EDUCATIONAL ACTIVITIES	For schools and adults
RESEARCH ACTIVITIES	Research activity relating to the sections (study of the materials of the sections, increase of collections, floristic and faunal research campaigns, paleontological and prehistoric excavations, scientific publications, scientific collaborations) Scientific museology (scientific publications) Knowledge of the nature and environment of the Verona area Publications (Bulletin of the Civic Museum of Natural History, Memoirs) Studies and research on the tertiary deposits of Bolca, catalogs for the exhibitions, guides for the schools, Classical naturalistic works
CONSERVATION ACTIVITIES	Conservation and restoration of the museum's naturalistic and prehistoric collections Cataloging of materials Specialized library



Room on the first floor of the Fossil Museum of Bolca

2.b.3.10.2 Bolca Fossil Museum (VR)

In 1971 the "Fossil Museum" was inaugurated in Bolca, a small building which exhibited the best finds divided by deposit and flanked by a painting which reconstructed the ancient environment. Over the years, given the ever-increasing scientific importance of the Pesciara and Monte Postale deposits, the growing number of visitors and the quantity and beauty of the finds brought to light during the excavations, the Lessinia Mountain Community has created a new museum structure with all the characteristics of a modern museum for the management of which an agreement was stipulated with the Cerato family, who in turn own the quarries. The new museum is a two-storey building, inaugurated on 28 July 1996, comprising three large exhibition rooms with an adjacent conference room with over 100 seats. The exhibition begins with a geographical and geological overview of the main fossiliferous localities of the Alpone Valley. The stratigraphic series of Pesciara is explained/represented through texts, images and rock samples.

Then passing through the gallery of the people who studied the Bolca fossils we arrive at the second room where numerous fish are systematically displayed; in the center of the room, until a few years ago, there was an aquarium that proposed the tropical marine environment of the time, with species of fish that currently populate the seas of the Indo-Pacific area. In 2009 the central aquarium had been replaced with two large aquariums positioned along one wall. The two aquariums represented the tropical environment similar to that of Bolca 49 million years ago and the temperate one currently present in our latitudes. In 2022 the two aquariums were removed, and work is currently underway on a new setup.

Upstairs, in the large room, the fossils are grouped according to an environmental criterion. The last showcase is dedicated to the display of fossils from the emerged lands, contemporary or slightly more recent than those from the marine environment.

These are crocodile remains, turtles, palm trees, found in the lignite levels of Monte Vegroni and other plant remains found in Pesciara and Monte Postale. A large panel represents,

in a modern way, the reconstruction of the landscape of Bolca 50 million years ago. The display of the finds in this room has remained to be completed since 1996 due to the premature death of Lorenzo Sorbini, at that time director of the Civic Museum of Natural History of Verona, who had wanted the new museum. In July 2014, thanks also to the contribution of the Veneto Region, the Lessinia Regional Natural Park completed the new room dedicated to Massimiliano Cerato, where numerous finds are exhibited, including those found during the last ten years of excavations.

The visit to the museum ideally continues with the "Paleontological walk" which, descending from the town of Bolca, allows the observation of a great variety of rocks, volcanic and sedimentary, fossiliferous and otherwise, of Monte Postale and Pesciara. Finally, we go inside the tunnels of Pesciara where, following an underground route of particular interest, it is possible to have a clear vision of the type of work necessary for the search for fossils and of the hard work carried out by hand by the Cerato family in over the last two centuries (Cerato, 2011).

Bolca Fossil Museum	
HEAD QUARTERS ADDRESS	Bolca Fossil Museum with the annexed Pesciara Via San Giovanni Battista - Bolca - Tel. 045 6565088
PROPERTY	Lessinia Regional Natural Park
YEAR OF FOUNDATION	1971 – 1996
TYPES OF COLLECTIONS	Paleontology
SURFACE	Exhibition: 1,000 m^2 in 3 rooms Used for services: 300 m^2
NUMBER OF FOSSILS	Approximately 400 objects on display
OPENING HOURS TO THE PUBLIC	Monday – Saturday: 9.00–19.00 Sunday: 14.00–19.00
TICKET OFFICE AND STORAGE STAFF	2
TYPES OF SERVICES OFFERED TO THE VISITOR	Opening and closing service of rooms used as museum spaces and of Pesciara Custody, surveillance and access control service to the Museum and Pesciara Ticketing and booking service Reception, welcome and public information service Cleaning service Ancillary services (management and aquariums) Guided tour services and educational activities Conferences Captions (Italian, English) Sale of museum catalogs and publications Audiovisual supports (teaching room with video) Toilets (n. 2) External signage Guided tours for schools Teaching room with equipment (microscopes, collections)
TECHNICAL SYSTEMS	Volumetric anti-theft device
TICKET PRICE	Full: 5 euros – reduced: 4 euros Schools, children aged 8-14: 1 euro
EDUCATIONAL ACTIVITIES	For schools and adults



The Cerato Family Museum on its inauguration day

2.b.3.10.3 "Cerato Family. Three hundred years between fossils and mines". Private museum

The Ceratos are not only the historical custodians of the very particular activity of 'mountain fishing', but for generations they have also been the custodians of many of the finds extracted. Until 1967, Massimiliano Cerato's home was the almost exclusive place of reference for those wishing to see and study fossils. In 1969, thanks to the involvement of eminent scholars but also of fans of Paleontology and naturalists friends of Massimiliano Cerato, it was possible to conclude a twinning between Bolca and Eichstätt (see attached 5 paleontology of deposits, point 7). Probably, this is the only example of partnerships based on paleontology. From 1968 to 1971 the house-museum of Massimiliano was moved to via S. Giovanni Battista 50, where his children still live today, and there, right next to the house, in July 2010 a small private museum dedicated to Waxed. The visit is a journey through time and space. Naturally, the main "protagonists" are the Ceratos. In fact, for about two centuries, from generation to generation, the Cerato family has dealt with the tiring and difficult work of fossil extraction. To increase public interest in the history of the Ceratos, in addition to fish from the private "Massimiliano Cerato" collection, the museum also displays documents from the past that tell of moments of enthusiasm and contacts with scholars of the time (purchase and sale documents, etc.). Furthermore, in the display cases that accompany the illustrative panels you can observe ancient tools found in the abandoned tunnels, tools used in the restoration of fossils from the late 19th and early 20th centuries.

Opening of a laminated layer of the Pesciara





Some acid-treated fossil fish from Bolca
(collection of the Civic Museum of Natural History of Verona)



Paleontological Museum of Roncà. The new layout of the room dedicated to the vertebrates of the Val d'Alpone

2.b.3.10.4 Paleontological Museum of Roncà

Located in the heart of the Val d'Alpone, the territory of Roncà is known to paleontology and geology scholars from all over the world for the extraordinary richness of fossil molluscs from the Eocene and for the great variety of rocks generated by the volcanic phenomena that caused it interested.

The current collection of the Paleontological Museum of Roncà was established in the 1970s, thanks to the collaboration of the Val d'Alpone Paleontological Association, "Val Nera" group. Originally, the collection consisted of around fifty fossil specimens from the Roncà Horizon, represented by vertebrates, invertebrates and phyllites. In 1975 the so-called "Civic Museum" was opened in two rooms made available by the municipal administration. Subsequently, the fossil finds were transferred to the local middle school where they had an important educational role.

In the early 2000s the municipal administration began to restore the building housing the previous "Civic Museum", inside which three large rooms were set up to accommodate various naturalistic materials. Among these, the most important are certainly represented by the 346 paleontological finds from the Roncà Horizon. The fossils in question were inventoried and cataloged during 2003 and subsequently exhibited in a temporary paleontological exhibition which, with municipal resolution no. 37 of 10 September 2009, the Administration established a museum called "Roncà Paleontological Museum". The new structure was recognized as a museum on 2 April 2012 by the Museums Final Commission of the Cultural Heritage Directorate of the Veneto Region. The Paleontological Museum of Roncà hosts, on the ground floor, a diorama which highlights the animal and plant biodiversity present in the municipal area and, in particular, in the so-called "Fossil Park".

A series of display cases and educational panels also illustrate the most common fauna and flora, describing their characteristics, biology and the relationship between living organisms and the natural and rural environment.

The two upper rooms, however, are dedicated to Paleontology and Geology. More precisely, through a well-articulated educational path, the various fossilization processes and the geological history of the Roncà area and the surrounding area are first illustrated, while a large panel schematizes the evolution of life.

Then follows a space dedicated to rocks and the minerals they contain.

Drawings and detailed descriptions are dedicated to the ancient volcano of Monte Calvarina, to the paleoenvironmental reconstructions, to the macroforaminifera and to the molluscs which, due to their beauty and rarity, are the protagonists of the second room together with the stupendous cast of *Prototherium*, whose almost complete skeleton was found in the limestone layers of Monte Duello; the original is preserved in the Museum of Nature and Man of the University of Padua. The last room is, in fact, dedicated to vertebrates and, in particular, to this important marine mammal. A stupendous diorama reconstructs the environment of around 40 million years ago, while a panel represents the distribution of current and past sirenians.
The Paleontological Museum of Roncà, for its collections of Eocene bivalves and gastropods, aims to be a center of documentation, scientific research (paleontological excavations authorized by the Ministry for Culture have been active since 2010) and educational dissemination of fundamental importance for the enhancement of the area.
The visit to the museum ideally continues towards the "Fossil Park". Starting from the museum and following an equipped "nature trail", it will be possible to observe various rocks, volcanic and sedimentary, fossiliferous and non-fossiliferous, as well as a series of historic buildings deeply linked to the territory.

Roncà Paleontological Museum	
ADDRESS	Via Garibaldi, 2 – 37030 Roncà Tel. 045 7460017
PROPERTY	Municipality of Roncà
YEAR OF FOUNDATION	2004
TYPES OF COLLECTIONS	Paleontological
SURFACE	Paleontology exhibition: Approximately 22 m^2 (in 3 rooms) Exhibition Environment: Approximately 8 m^2 (in 1 room) Used for services: Used as a warehouse: 8 m^2
NUMBER OF FOSSILS	Fossils on display (about 5%) and in warehouse: more than 2400 specimens, mainly bivalves and gastropods
OPENING HOURS TO THE PUBLIC	Saturday: 9.00 – 12.00 and 15.00 – 18.00 Sunday: 9.00 – 12.00 and 15.00 – 18.00 Upon reservation, it is also possible to visit the museum on other days of the week
TICKET OFFICE AND STORAGE STAFF	1 person (2 in case of booking with numerous visitors: schools, groups, etc.)
TYPES OF SERVICES OFFERED TO THE VISITOR	Guide to the museum in Italian Guided tours in Italian Conferences Captions (Italian) Sale of catalogs and publications regarding local paleontology Audiovisual supports (video projection on the fossils of the Roncà Horizon) Small library Toilets (n. 1) Restoration laboratory External signage
TECHNICAL SYSTEMS	Volumetric anti-theft device
TICKET PRICE	Full price: 2 euros Reduced: 1 euro Schools, children 8 – 14 years: 1 euro
EDUCATIONAL ACTIVITIES	For schools and adults
RESEARCH ACTIVITIES	Paleontological excavations have been active in Valle della Chiesa and Monte Duello since 2010
CONSERVATION ACTIVITIES	Cataloging and restoration. The municipal administration has appointed a curator who is scientifically responsible for the collections and paleontological excavations

2.b.3.10.5 Other museums in the area between Verona and Padua

The Lessinia Regional Natural Park has given rise to a network today made up of the following museums: Fossil Museum of Bolca, Prehistoric and Paleontological Museum of Sant'Anna d'Alfaedo, Geopalontological Museum of Camposilvano, Ethnographic Museum of the Cimbri – Giazza (municipality of Selva di Progno), Trombini Museum – S. Bortolo delle Montagne (municipality of Selva di Progno). In addition to the museums described above, the neighboring territory which is proposed to be included in the World Heritage List hosts several museums, some of which are specifically dedicated to the geopalaeontological heritage, others custodians of different assets. Below is a brief description of the most important ones located between Val d'Alpone and Padua.



One of the rooms of the "Abate Don Giuseppe Dalla Tomba" Geopaleontological Civic Museum

Civic Geopaleontological Museum "Abate Don Giuseppe Dalla Tomba" of San Bonifacio (VR)

The museum is located inside the Villanova Abbey (municipality of San Bonifacio). The first documented news dates back to the beginning of the 12th century. The abbey complex hosts three distinct museums: "Don Ambrosini Museum", "World Wars Museum" and "Abate Don Giuseppe Dalla Tomba" Geopaleontological Civic Museum. The latter was born from the donation made in 1984 to the municipality of San Bonifacio of the collection Don Giuseppe Dalla Tomba, Abbot in Villanova di San Bonifacio from 1939 until 1980. The donation was conditional on having an adequate exhibition. The finds, represented by minerals and fossils, were initially exhibited in the museum located at the Palazzo della Cultura in via Marconi and inaugurated in October 1994. Subsequently, in October 2003, it was transferred to its current location. Of the 333 finds that make up the Tomb collection, 239 refer to fossils, 78 to minerals, while the remainder refer to heterogeneous materials (prehistoric artefacts, concretions, etc.). The materials on display are distributed within 21 display cases (19 dedicated to fossils and 2 to minerals) divided into two rooms. The Museum illustrates the geological aspects of the territory of

San Bonifacio and, through a rich collection of fossils from different areas (Veronese and foreign), represents all the geological eras (Castellaccio, 1994). Among the fossils on display, around 60 come from the Val d'Alpone (Bolca and Roncà).



Hall of the "Padre Aurelio Menin" Museum where numerous fossils from the Val d'Alpone are exhibited

"Padre Aurelio Menin" Museum of Chiampo (VI)

Inaugurated in 1972 and dedicated to the memory of its founder, friar Aurelio Menin, it is located in the building erected behind the Lourdes Grotto inside the Franciscan sanctuary. The museum is arranged on two floors and consists of 11 sections ranging from musical instruments to the plaster cast collection (works by the blessed Claudio Granzotto), from mineralogy to paleontology, from malacology to zoology and from paleethnology to ethnology and figurative arts. The paleontological section contains the collection resulting from the research, collection and cataloging of the finds by friar Aurelio Menin in the Chiampo Valley, between the 1950s and 1970s. In fact, the religious man had high skills especially in the paleontological and paleethnological fields. Of particular interest is the collection of 74 varieties of "marble" extracted from the quarries in the valley, only some of which are still in operation.

The most important nucleus of fossil finds preserved in the Museum is represented by invertebrates from the lower-middle Eocene coming from various levels of the "Chiampo Marbles", in particular from the *"Lophoranina* Tuff". Among them, one of the paratypes of *Lophoranina maxima* stands out, the largest fossil raninid crab described so far.

The inventorying of the paleontological collection began in 2019, the first important step for the cataloging of the materials which will be the basis for both the scientific and popular valorization of the collection.

During this first phase, the working group in charge cross-referenced the information reported on the tags and labels glued to the finds with a hand-written catalogue, drawn up by Padre Aurelio Menin.



One of the rooms of the "G. Zannato" Museum

Museum of Archeology and Natural Sciences "G. Zannato" of Montecchio Maggiore (VI)

The Civic Museum "G. Zannato", founded by Cav. Giuseppe Zannato preserves and exhibits archaeological and naturalistic evidence relating to the Agno-Chiampo territory, carries out research, teaching and dissemination activities. The Agno-Chiampo Museum System was born in 2001, from a joint initiative of the Superintendency for the Archaeological Heritage of Veneto and the Municipality of Montecchio Maggiore, with the municipalities of Arzignano, Castelgomberto, Montebello, Montorso, Trissino and Zermeghedo, it expanded in 2005 with the accession of Sovizzo and in 2006 with that of Brendola.

It is the common exhibition venue and is the operational center that plans and coordinates all the activities of the Agno-Chiampo Museum System with the aim of optimizing the management of the archaeological and naturalistic heritage of the area. For the management of the Museum System, the participating municipalities have approved a specific agreement. The Agno-Chiampo district in which these municipalities fall constitutes a substantially homogeneous territorial sector from a historical-archaeological point of view, and presents notable cultural testimonies, in particular of an archaeological and naturalistic nature. In almost all municipalities there are local museums that host museum education, temporary exhibitions and public meetings.

In 2007 the "G. Zannato" Museum has been rearranged, doubling its spaces and fully realizing its vocation as an exhibition center for the entire territory of the System. It currently consists of 12 rooms, five of which are dedicated to archeology and seven to natural sciences. The naturalistic collections include, in addition to a small nucleus of botanical and zoological collections, mainly paleontological and mineralogical finds.

The paleontological collection is made up of over 4,000 finds of which approximately 1,400 are represented by fossil crustaceans: 150 of these specimens are holotypes and 480 paratypes. The mineralogical collection, however, is made up of over 4,000 samples. The minerals come mainly from the Vicenza area. Finally, the archaeological collections include finds from

prehistory to the early Middle Ages, all coming from the territory of the Museum System. The most substantial nuclei are made up of mainly ceramic materials from the Bronze Age and the Roman Age.
The "G. Museum" Zannato" in collaboration with the Association "Amici del Museo G. Zannato" has edited the annual edition of the magazine "Studi e Ricerche" since 1998, founded by the Association itself in 1994. The magazine welcomes contributions of a mineralogical, paleontological, fauna, floristics and archaeology concerning the Veneto and in particular the Vicenza area.



Room of the Museum of Nature and Man with numerous plant remains of Bolca

Museum of Nature and Man of the University of Padua (PD)

The Museum of Nature and Man of the University of Padua is located in the sixteenth-century Palazzo Cavalli, a prestigious building in the center of Padua. The museum, whose origins date back to the eighteenth-century nucleus of the collections of Antonio Vallisneri (1661-1730), displays a very rich collection of naturalistic and anthropological finds. These collections have been enriched over the centuries above all thanks to the contribution of the professors and scholars of the University of Padua and testify to the long tradition of the Paduan school in the field of Earth Sciences.
In June 2023, thanks to the merger of the four historical Paduan collections (Mineralogy, Geology and Paleontology, Zoology and Anthropology), the new museum was inaugurated with modern exhibition techniques.
The Museum's geology collections include samples of sedimentary, igneous and metamorphic rocks from the Italian Alps, as well as from other Italian and foreign locations. Worthy of note is the systematic and phenomenological collection of samples from the Adamello massif, collected and studied by Profs. Angelo Bianchi, Giambattista Dal Piaz and their students. The paleontological collections include several tens of thousands of plant and animal fossils, both vertebrates and invertebrates, coming from various locations around the world, although mainly from the Triveneto region, including unique and rare specimens of

inestimable scientific value. The Paleobotany collection has around 5,000 specimens, the oldest dating back over 300 million years and coming from Friuli-Venezia Giulia.
But the most important paleobotanical finds are represented by the Jurassic flora of the Vicenza and Veronese areas, belonging to the historic De Zigno collection, and by the rich collection of palm fronds and fruits similar to coconuts coming from some famous deposits in the Veneto, such as those of 'Eocene of Bolca (Verona) and the Oligocene of the Chiavon Valley (Vicenza). The collection of fossil invertebrates includes thousands of finds from important fossiliferous sites of the Three Venices, such as (Cadore, Val di Fassa, Recoarese, San Cassiano, Monti Lessini, Asiago Plateau, Polcenigo, San Giovanni Ilarione, Roncà, Priabona, Possagno, Montecchio Maggiore), as well as other typical Italian and foreign locations, some of which are no longer accessible today. These peculiarities make this collection very significant from both a scientific and educational point of view.
There are approximately 5,000 fossil vertebrates in the museum. Among the most interesting finds are the fossil fish from Bolca, Monte Postale and Chiavon, many of which derive from nineteenth-century collections.
Some of these fish are important witnesses of sites no longer accessible or existing today, as well as reference specimens for current studies, as they are holotypes. Thanks to modern methodologies developed in the study of fossils, these finds continue to offer new discoveries.
In addition to fossil fish, the museum conserves various vertebrates, among which the Permian reptile *Tridentinosaurus antiquus*, Eocene and Oligocene turtles and crocodiles from Bolca, Roncà (Monte Duello - Verona) and Monteviale (Vicenza) stand out. The large collection of primitive mammals also comes from the latter locality. Furthermore, the museum preserves a unique collection in the world of Miocene Odontoceti from the Belluno area, two complete skeletons of an elephant and one of a hippopotamus from the Sicilian Pleistocene and a complete skeleton of a saber-toothed tiger (*Smilodon fatalis*) from the famous fossiliferous site of Rancho La Brea (California).

2.b.4 The rocks of the Val d'Alpone

The main formations that emerge in the nominated property and in the immediate vicinity are described below, starting from the oldest that are attributable to the Upper Cretaceous.

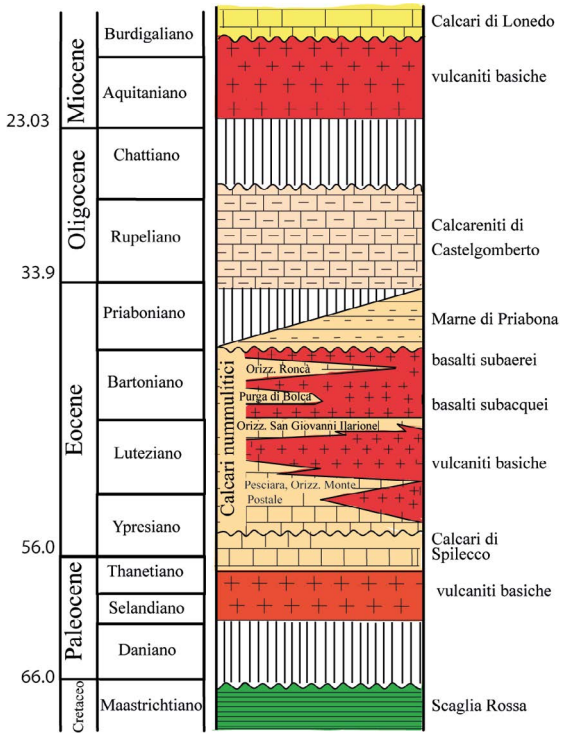
To the south of the Marana Fault, in stratigraphic sequence with the Red Ammonitic Veronese, we find the Maiolica Formation (Upper Tithonian-Aptian), a thickly stratified limestone, of an ivory white color transitioning upwards to grey, rich in nodules and lists of flint that become more and more abundant from bottom to top.

The lower part of the Maiolica was deposited on the Trento Plateau at a paleodepth of around 400-500 m (Winterer, 1998) and locally contains remains of ammonites, haptics and pygopid brachiopods. The thickness of the formation is variable and locally exceeds 150 m.

The Scaglia Variegata Alpina (Aptian first-Cenomanian) rests on the Maiolica. It is an alternation of calcareous layers interspersed with sometimes densely stratified marl of a dark gray color which, proceeding upwards, increases in thickness until it equals that of the limestones, taking on a greenish and wine-red colour. In the Alpine Scaglia Variegata there are planktonic and benthic foraminifera, as well as calcareous nannofossils.

The Scaglia Variegata Alpina is followed by the formation of the Scaglia Rossa (Turonian-Maastrichtian). It is a rock formation mainly made up of pink, reddish and whitish limestones and marly limestones, which also emerges in many areas of central-northern Italy. The lower limit with the Scaglia Variegata Alpina is not clear since, at least in terms of color, the limestones of the Scaglia Variegata slowly fade into those of the Upper Cretaceous where the typical pink color of the Scaglia Rossa does not appear from the first layers but merges with that whitish from the Cenomanian.

The roof of the Scaglia Rossa is characterized by two characteristic surfaces covered with manganeseferous, phosphatic or limonitic crusts (hard-ground) with variable thicknesses. These surfaces are intensely colored red, black or brown and have an irregular pattern.



Stratigraphic column of the eastern Lessini Mountains (from Brombin *et al.*, 2019 - modified)

This unit derives from the accumulation of calcareous muds made up of calcareous nannofossils and planktonic foraminifers and has a maximum thickness of approximately 70-75 m; in the upper Chiampo Valley and in the Alpone Valley the formation emerges for only a few tens of metres. Its characteristic reddish color is due to the presence of hematite, an iron oxide. In some stratigraphic intervals (e.g. "lastame") fossil remains of ammonites, echinids (e.g. *Stenonaster tuberculatus*) and bivalves (rudists and inoceramids) are quite frequent, crinoids being rarer. However, the discovery near Crespadoro of an almost complete rostrum of *Protosphyraena stebbingi*, a longirostrate bony fish, dates back to the second half of the 19th century (De Zigno, 1883; Amalfitano *et al.*, 2019). The rostrum, which is part of the historical De Zigno collection, is preserved at the Museum of Nature and Man of the University of Padua.



2.b.4.1 The Paleocene

The beginning of the Cenozoic of the Lessine area is characterized by important changes in the sedimentation environment.
During the Paleocene, in fact, the Veronese area was affected by tectonic uplift phenomena attributable to the first phases of the Alpine orogeny to which the first Lessine volcanic manifestations are connected (Piccoli, 1966, 1979; Luciani, 1989).
In the Veronese area there are few areas in which the contact between the Upper Cretaceous limestones and the Paleocene age lithotypes can be clearly observed.
This passage is clearly visible in correspondence with the left hydrographic slope of the Vajo Gallina (De Zanche *et al.*, 1977) where the top of the Scaglia Rossa is observed, the characteristic layer of Maastrichtian age delimited by two hard-grounds, followed by approximately 50 centimeters of silty claystones and marls of brown, gray and whitish color which fade upwards into the marly limestones of the lower Eocene. Another section where the Paleocene can be observed is near Bolca where the so-called Spilecco Limestones (upper Paleocene-lower Eocene) emerge. This is a succession of calcareous and marly sediments visible to the south and north-east of Spilecco (Barbieri & Medizza, 1969; Papazzoni *et al.*, 2014).
The thickness is very variable and does not exceed 10-15 m.
In the Paleocene, the so-called Tethys was present, a sea made up of a complex of elongated basins which extended, at the moment of its maximum expansion, from present-day America, to Europe, Africa, Asia, up to Japan and New Zealand, separating the emerged areas of the Northern Hemisphere from those of the Southern Hemisphere.
Even during the Upper Paleogene, Tethys had the characteristics of a warm tropical sea and a certain uniformity of climate, due to its location subparallel to the equator with a West-East trend.

Previous page: Ancient building of the Val d'Alpone built with local rocks (basalts, Eocene limestones and clay)

2.b.4.2 The Eocene

In the central and northern portion of the Lessini Mountains, mainly Mesozoic formations emerge, while the Cenozoic rocks give rise to an extended band in the hilly part close to the Veronese plain. This last portion of the territory is characterized by the presence of numerous tunnel and open-air quarries, evidence of intense extraction activity which occurred mainly in the past (Avesa and Quinzano quarries). The marine carbonate formations, which emerge along the foothills of the province of Verona, have been involved in a series of deformational processes which nevertheless allow the recognition and reconstruction of the local stratigraphic series.
During the Eocene, the entire Verona foothills were affected by the deposition of shallow water carbonate sediments and more or less intense volcanic activity. On the other hand, the eastern Lessini Mountains have been characterized by intense volcanic activity, mainly underwater, associated with extensional tectonics. This important volcano-tectonic activity of the Upper Paleocene is associated with the opening of the Alpone-Agno graben or semi-graben, a large, elongated depression, delimited to the West by the Castelvero Fault. And it is near this line, made up of a bundle of sub-parallel faults oriented NW-SSE, that the maximum subsidence occurred, allowing the deposition of approximately 500 m of basaltic volcanic materials (Zampieri, 1995, Marton *et al.*, 2011).
The volcanic manifestations of the Lessini Mountains (lower and middle Eocene) are part, together with those of the Berici Mountains, Marostica and the Euganean Hills, of the "Venetian Volcanic Province" (Eocene-Oligocene). These are intraplate alkaline volcanic products with a composition varying from basaltic to basanitic. Basanites may contain xenoliths from the mantle (Siena *et al.*, 1989). During the lower and middle Eocene, and in any case during the quiet phases of volcanism, carbonate sediments were cyclically deposited within the graben, essentially organogenic limestones and calcarenites ("Nummulitic limestones"), marly limestones and marls.



Pesciara: continuous core sampling carried out in 2011 in correspondence with the lower tunnel where there is contact between Eocene limestones and volcaniclastic rocks

Despite the intense volcanic activity, a rich fauna lived on the bottom of the graben represented by echinids, crustaceans, bivalves, gastropods, etc., which have been perfectly preserved and abundant in the Eocene tuffites of the Chiampo Valley. The accumulation of considerable volumes of volcanic materials slowly filled the graben, allowing the formation of islands as well as actual volcanoes such as Monte Crocetta and Monte Calvarina (Piccoli, 1979). Volcanic activity continued intense throughout the middle Eocene, until the end of the Bartonian (Piccoli, 1966).
The volcanic materials in subaerial conditions have undergone intense oxidation which has given them the typical red and purple colors (Terrossa, in Valle d'Alpone, takes its name from the intense colors of the surrounding hills).
The reliefs of the Val d'Alpone show different morphologies, with highly steep sections associated with gently sloping wavy sections. In the gentler and undulating parts, conical shapes emerge, locally called "purges" (Purga di Bolca, Purga di Durlo) and remains of ancient volcanoes (Monte Calvarina, Monte Crocetta, Monte Castello, Monte del Diavolo). These are characteristic reliefs, remnants of ancient buildings and volcanic chimneys within which the lava filling in the form of columnar-cracked basalt has often been preserved (Annex 1 Cartography, map 1.9).
In columnar basalts, generally, prisms with a polygonal section, from four to eight sides, are observed. The regular shape assumed by these basalts has always intrigued scholars who have recently found an explanation based on the propagation of fractures that are created during the cooling of the magma.
As the magma rises, its temperature decreases and minerals with higher melting points, especially olivine, begin to crystallize.
At lower temperatures and shallower depths, first pyroxene and then plagioclase crystallize.
On the surface, as it cools, the magma produces a compact, dark gray to black rock, made up of the set of microcrystals formed during ascent and cooling. In some cases, if the latter has been slow, the crystals can also



The church of San Giovanni Battista in Castello is built on the columnar basalts of San Giovanni Ilarione

be visible to the naked eye (phenocrysts). Beautiful olivine phenocrysts can be observed in the basalts of San Giovanni Ilarione and Purga di Bolca. Hydrothermal fill minerals can also be concentrated in the vacuolar cavities (bubbles), present in some basalts, such as: chabasite, natrolite, phillipsite and heulandite (Monte Calvarina).
In stratigraphic order, from the oldest to the most recent, the main marine sedimentary lithological types attributable to the Eocene emerging in the Val d'Alpone are briefly described below (De Zanche *et al.*, 1977):

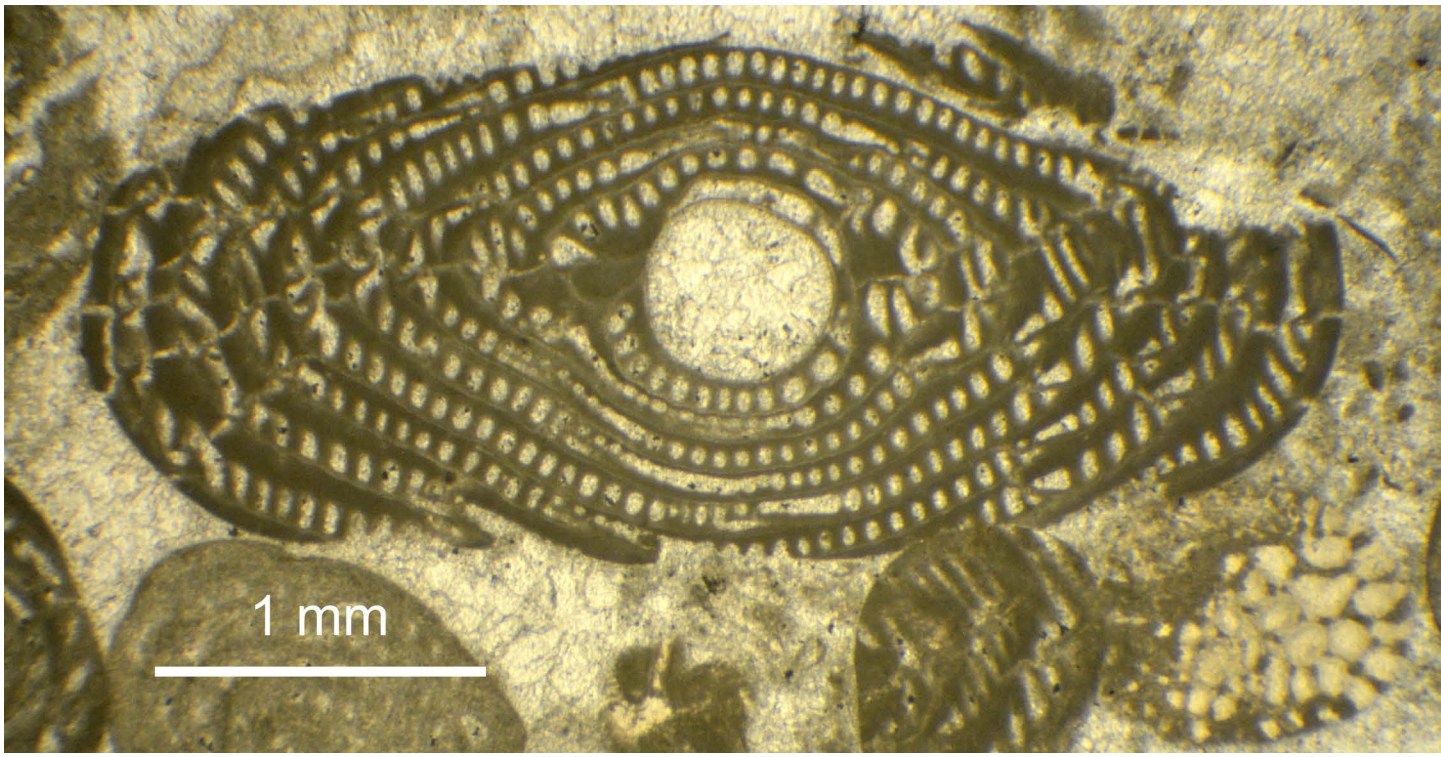
1) Clayey limestones and marls (lower Eocene p.p.). It is a unit made up of thickly stratified marls, often laminated, and clayey limestones in layers with a thickness of between 2 and 10 cm. The overall power of these lithotypes varies from 10 to 20 m. The unit is rich in planktonic foraminifera and benthic microfossils including nummulites.
The presence of these macroforaminifera testifies that the sedimentation environment was changing from pelagic to neritic throughout the western Veneto (Piccoli & De Zanche, 1968).

2) "Nummulitic limestones" (lower and middle Eocene). This is the main formation that emerges in the foothills of Verona which often gives rise to small walls on the sides of the ridges. Its overall power is around 150 m.
The lower portion of the formation is called "Pietra Gallina" (Calcare di Chiusole in the mostrecent literature), while the upper portion is called "Pietra d'Avesa". Locally, the two lithotypes are separated by thin intercalations of

fine volcaniclastic materials, called "tuffs", highly altered and largely argillified, containing fossils. The latter have an age attributable to the Middle Lutetian (Hottinger, 1960; Schaub, 1962). The Nummulitic Limestone formation is very rich in foraminifera (nummulites, assiline, alveoline), corals, bryozoans, gastropods, bivalves, nautiloids, brachyurans, crinoids, echinids, worms, land and sea turtles, palms, large seeds, algae and fish.

3) Priabona Marls (Upper Eocene).
The formation takes its name from "Priabonian", the geological plane that emerges at the Priabona Pass (VI) where a stratigraphic succession has been described which is representative of this geological time interval on a global level. The Priabona Marls generally emerge on the top of the hill ridges; the surfacing power does not exceed 80 m. Locally, in the central Lessini, the formation is covered, often unconformably, by a Miocene arenaceous-calcarenitic unit. The emergence, which practically corresponds to the entire Oligocene, and the consequent erosion that preceded the deposition of the Miocene layers, determined an overall reduction, although to a different extent from place to place, in the thickness of the Priabona Marls. Since no similar comparative successions are recognized in the surroundings of Verona, it is difficult to quantify the missing thickness which can be estimated at approximately one third of the rock unit. The formation is mostly made up of greenish-grey or yellowish-grey marls rich in discocyclines (macroforaminifera).
The paleontological association of the formation indicates a shallow, purely neritic depositional environment (*Nummulites fabianii*, *Sismondia rosacea*, *Ostrea eversa*, *O. martinsi*, *Spondylus podopsideus*, *Clamys biarritzensis*, bryozoans and nullipores), with abundant terrigenous contributions and probably quite close to the it costs.
In the Vicenza area, however, the unit is rich in foraminifera (discocyclines, nummulites), ostracods, bryozoans, coral algae, corals, crinoids, echinids, molluscs (bivalves and gastropods), cephalopods, crustaceans, complete skeletons of sirenids (*Prototherium*) and remains of turtles, dactylopterid fish (Gayet & Barbin, 1985) and teeth of teleosts and sharks (Bosellini & Trevisani, 1992; Mietto, 2001b; Mietto, 2014).
The more carbonate terms are found in the lower portion and appear well stratified while the more marly ones characterize the middle and upper part.

Alveolina postalensis in thin section



2.b.5 Historical cartography and fossiliferous localities of the Alpone and Chiampo valleys

One of the territories with the greatest paleontological content is unquestionably the one outlined in the valleys of the Alpone and Chiampo streams belonging to the provinces of Verona and Vicenza. For centuries this area has provided an enormous quantity of fossils, a unique condition in Italy and which has few equals in the world and in which those of Bolca in the Municipality of Vestenanova stand out, but which is well accompanied by Roncà, San Giovanni Ilarione, Montecchia di Crosara, Monteforte d'Alpone, Chiampo, Altissimo, Crespadoro and Gambellara.

Only the locality of Bolca, which includes the outcrops of Pesciara, Vegroni, Praticini and Spilecco to which is added the adjacent one of Monte Postale in the Municipality of Altissimo (VI), has demonstrated its full potential with a bibliography that exceeds five thousand titles. Pesciara and Monte Postale, the largest and best known, are located right in the Chiampo Valley, while the others are scattered in the Alpone Valley. This context, however, has another excellence which consists in possessing a cartographic apparatus which is also of first rate and of global relevance which will be the subject of a future publication.

Once again Bolca is the leader in this geographical evidence, and this is even more surprising if you consider that this locality made up of a handful of houses and a church is almost always present in the geographical maps involving the countryside of Verona and Vicenza, not to mention wider-ranging cartography which very often did not neglect to highlight this location. It is difficult to attribute the reasons for this success, but one can think that the bell tower of the church of San Giovanni and the nearby Purga di Bolca were very important reference points for mapping and that their visibility even at great distances could not escape the cartographers which for about six hundred years have given a geographical vision of that area of the Lessini Mountains.

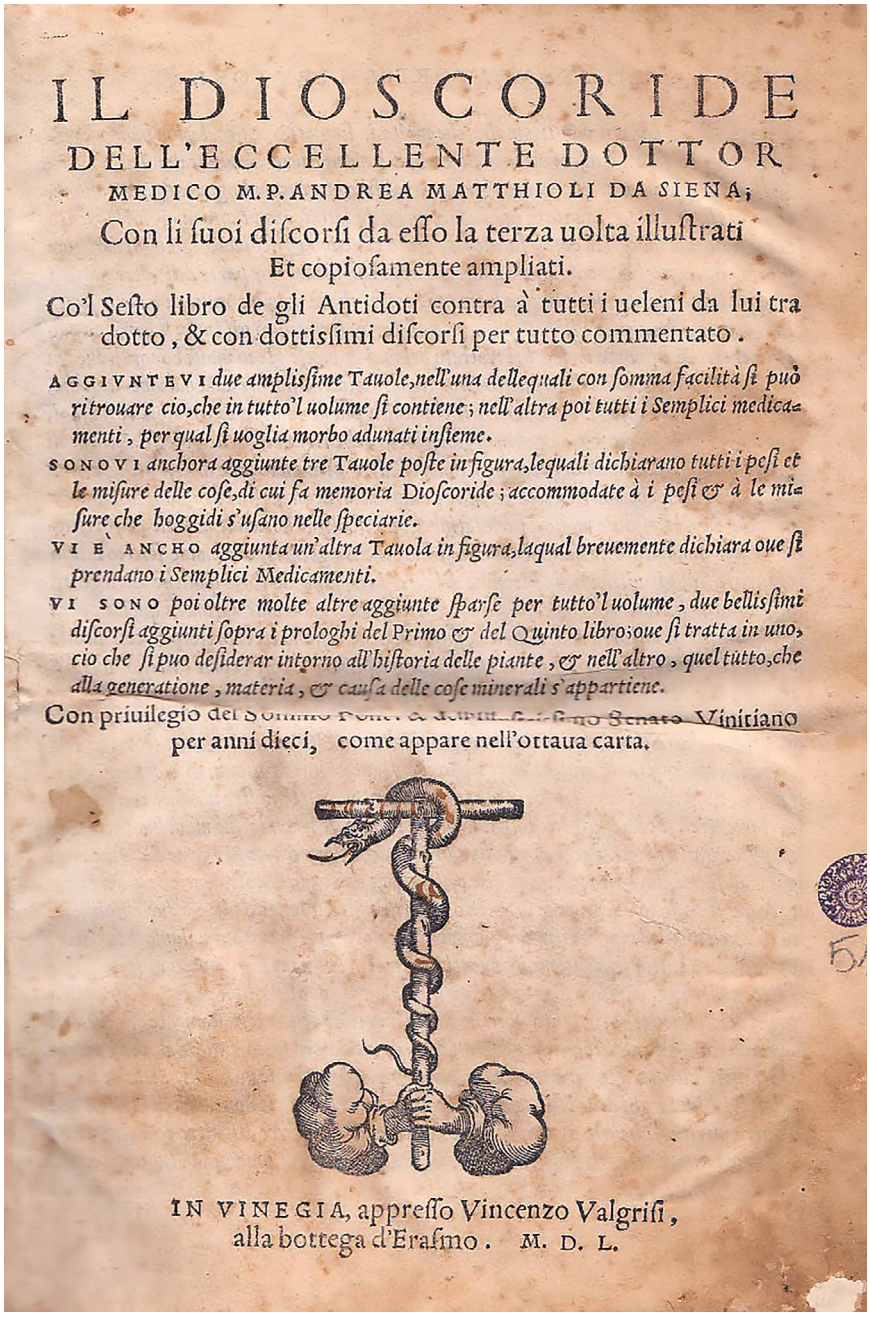
The oldest geographical map of the area which includes the entire Val d'Alpone (F. Alpum) is the so-called Almagià map today preserved in the State Archives of Venice which includes Bolca (Bovolca), Vestenanova (Vestena), Castelvero, San Giovanni Ilarione (S. Johanne de la Rogna), Roncà and reaches Monteforte d'Alpone (Monte Forto) including the territories of Soave and Chiampo in the valley of the same name. This extraordinary, large-sized, membrane-bound map not only provides the position of the aforementioned locations with good approximation, but, with a simple and effective representation, represents the consistency of the locations in houses and churches. This remarkable document is dated from 1420 to 1450 and constitutes the first cartography of the entire Veronese countryside to our knowledge (Varanini & Lodi – ed., 2014).



Map of Almagià
(https://it.wikipedia.org/wiki/File:Carta_Almagi%C3%A0.jpg)

Moving on to the following 16th century, a century which saw the triumph of printing, Paolo Forlani's map dated 1573 and preserved in the Verona Civic Library of the Verona area was printed, the first detailed cartography of that province in which the localities in question are outlined.

Very little time must have passed when the great Flemish cartographer Abramo Ortelio inserted in the *Theatrum Orbis Terrarum* in the 1579 edition the table *VERONAE URBIS TERRITORIUM, Bernardo Brognolo descriptum* compiled precisely by this Veronese cartographer of whom not much is known and oriented East-West: Brognolo points out the localities of Altissimo and others in the Chiampo valley as well as the classic ones in the Verona area. Bear in mind that since 1540 it was known that the Veronese area was rich in fossils as reported by Torello Sarayna in *De origine et amplitudinecivitatis Veronae* (1540) and that since 1550 there was knowledge of extraordinarily petrified fish from the same context as reported by Andrea Mattioli in his *Il Dioscoride*.



IL DIOSCORIDE
DELL'ECCELLENTE DOTTOR
MEDICO M.P.ANDREA MATTHIOLI DA SIENA;
Con li ſuoi diſcorſi da eſſo la terza uolta illuſtrati
Et copioſamente ampliati.
Co'l Seſto libro de gli Antidoti contra à tutti i ueleni da lui tra dotto, & con dottiſſimi diſcorſi per tutto commentato.

AGGIVNTEVI *due ampliſſime Tauole, nell'una dellequali con ſomma facilità ſi può ritrouare cio, che in tutto'l uolume ſi contiene; nell'altra poi tutti i Semplici medicamenti, per qual ſi uoglia morbo adunati inſieme.*

SONOVI *anchora aggiunte tre Tauole poſte in figura, lequali dichiarano tutti i peſi et le miſure delle coſe, di cui fa memoria Dioſcoride; accommodate à i peſi & à le miſure che hoggidi s'uſano nelle ſpeciarie.*

VI È ANCHO *aggiunta un'altra Tauola in figura, laqual breuemente dichiara oue ſi prendano i Semplici Medicamenti.*

VI SONO *poi oltre molte altre aggiunte ſparſe per tutto'l uolume, due belliſſimi diſcorſi aggiunti ſopra i prologhi del Primo & del Quinto libro; oue ſi tratta in uno, cio che ſi puo deſiderar intorno all'hiſtoria delle piante, & nell'altro, quel tutto, che alla generatione, materia, & cauſa delle coſe minerali s'appartiene.*

Con priuilegio del Sommo Pont. & dell'Illuſtriſſimo Senato Vinitiano per anni dieci, come appare nell'ottaua carta.

IN VINEGIA, appreſſo Vincenzo Valgriſi, alla bottega d'Eraſmo. M. D. L.

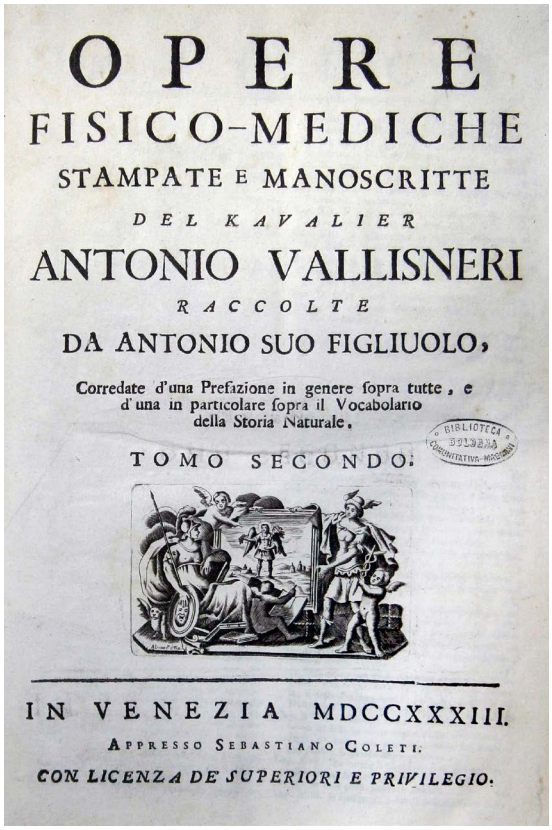
Title page of the fourth edition of "Dioscorides" by P.A. Mattioli, published in Venice in 1550 with the first mention of the fossil fish of Bolca (Biblioteca R. Guerra, Bologna)

In the gallery of geographical maps in the Vatican there is the one entitled *Transpadana Venetorum Ditio* painted starting from 1582 by Ignazio Danti which includes several locations in the two valleys. In the *Valle di Vestena*, there are *Vestena, Roncà, San Giovanni della Rogna* (San Giovanni Ilarione) and *Straforte* (Monteforte d'Alpone) and in the Chiampo Valley *Altissimo* and *Crespadoro*. The presence of these locations in the most beautiful gallery of geographical maps demonstrates how carefully the perticatori (those who measured and surveyed the territories) had mapped the territory.
In the context there are other smaller locations.
From 1585 Gerardo Mercator began the publication of *Atlas sive cosmographicae meditations de fabrica mundi et fabricate figura* in which some localities in question are marked, both in the map entitled VERONAE PRINCIPATUS, VICENTIAE ET PATAVII and in LOMBARDIAE TAB.II., publications which will also continue in next century.
Shortly after, Cristoforo Sorte was entrusted by the Senate of Venice with the mapping of the Mainland Dominion of that Republic: among them there is the oil mapping of the Veronese-Vicentino, preserved in the Correr Museum of Venice, including many of the locations previously mentioned and dated precisely 2 June 1591. At the end of the 16th century, some of the locations in question were mapped in the *VERONA URBIS TERRITORIUM* table of the Itinerariumorbischristiani, a small-format atlas intended for pilgrims traveling around the holy places of Europe. Starting from 1607, minor editions of Atlas minor Gerardi Mercator, reinterpreted by Jodocus Hondius, translated into numerous languages and illustrated the Alpone valleys andI click on the table *VERONA, VICENTIAE ET PATAVIAE DIT.* and *TARAVISINA MARCHIA ET TIROLIS COMITATUS*. In the description of *VERONAE DICTIO* the author writes:
«*cumque in monte foderetur, echini saxeiillic spectanti sint, itemque conchae, ostrea, avium rostra, stellae que pisces, omnia in lapidem versa*», *proving the fame of the Veronese fossils. Based on the Mercator*-Hondius approach, *Teatro delle città d'Italia* was printed in 1616 by the Paduan bookseller Pietro Bertelli and by the Flemish Pietro Berti *Tabularum geograficarum contractarum libri septem*in which the authors reported the same indications on the fossils as the Veronese.
It was in the 1608 edition that Ortelio's cartographic work was published in Italian with the title *Theatro del mondo*.
Credit for the translation goes to Filippo Pigafetta, great-grandson of the great Antonio, Ferdinand Magellan's sailing companion around the world and editor of the chronicle of that extraordinary undertaking.
Filippo Pigafetta was a man of many activities and was also very interested in geography: as proof of these abilities, he included in the edition of the aforementioned *Theatro del mondo* the *Descrizione del territorio et contado di Vicenza* and a paper dedicated to Cardinal Giovanni Dolfin entitled *Novamhanc et accuratissimam Territorii Vicentini descritionem*.
The topography includes *Olca* (Bolca) and the other localities of the context. In the comment Pigafetta writes: «*& ivi presso (di Chiampo) lastrerappresentantipescimarittimi, scaglie, & spine impetrate: un tale scherzo di natura veggendo sianco nel contado di Mansfeld Tedesco*» («there near (of Chiampo) slabs representing maritime fish, scales, & petrified thorns: such a freak of nature can also be seen in the German countryside of Mansfeld»).

This proves that Pigafetta also had the opportunity to admire the fish of Bolca. In 1620 Fabio Magini published the atlas entitled Italia published in Bologna, the first entirely Italian production in which the locations of the geo-palaeontological context of the Alpone and Chiampo valleys are present. The localitiespresent are *Bolcano* (Bolca), *Vestena, San Giovanni della Rogna* (San Giovanni Ilarione), *Roncà, Gambellara* in Val d'Alpone and *Crespadoro, Altissimo* and *Chiampo* in Valle di Chiampo.
In the second half of the seventeenth century, Angelo Giovanni Zanovello was active as a land surveyor in the Vicenza territory, who created a map of *Il territorio vicentino* (the Vicenza territory) of uncertain date in which the administrative affiliation for a part of the Alpone valley of Vicenza is evident: *Bolcha* is located in that area (Bolca), *S. Giovanni Illarione* as well as *Chiampo, Altissimo, Crespadoro*. It is also highlighted that San Giovanni Ilarione had changed its name, having previously been *San Giovanni de la Rogna*. There is a watercolor drawing of this paper engraved by Marco Boschini in a private collection.



Ortelio, *Theatro del mondo*, 1608. Olca, or Bolca, in the panel *Territorii vicentini descriptio* painted by Filippo Pigafetta (courtesy of the University Library of Bologna)


OPERE
FISICO-MEDICHE
STAMPATE E MANOSCRITTE
DEL KAVALIER
ANTONIO VALLISNERI
RACCOLTE
DA ANTONIO SUO FIGLIUOLO,
Corredate d'una Prefazione in genere sopra tutte, e d'una in particolare sopra il Vocabolario della Storia Naturale.
TOMO SECONDO.
IN VENEZIA MDCCXXXIII.
APPRESSO SEBASTIANO COLETI.
CON LICENZA DE SUPERIORI E PRIVILEGIO.

Frontispiece of *"Opere fisico-mediche stampate e manoscritte del kavalier Antonio Vallisneri raccolte da Antonio suo figliuolo"* ("Printed and handwritten physical-medical works of the knight Antonio Vallisneri collected by Antonio his son"), 1733. The work in three volumes also includes "De corpi marini che su' monti fsi trovano" in the 1728 edition (courtesy of the Archiginnasio Library from Bologna)

In many seventeenth-century and early eighteenth-century maps the numerous locations of this Veronese and Vicenza context appear, but to have some representation that goes beyond the wide-ranging map we must wait until 1728.
A few years earlier, Count and General Luigi Ferdinando Marsili, interested in natural sciences, had agreed to the request of Antonio Vallisneri senior, a prestigious doctor of medicine and very passionate about natural sciences, to go to the town of Bolca, revealed about twenty years earlier by Paolo Boccone, like the location of the famous Veronese fossil fish, to report on it, which the count did by sending the Emilian professor who taught in Padua a long and interesting letter in which Marsili gave an account of the place, its fossils and other typical conjectures of those times between the supporters of the universal flood, the carrier of fossils on the mountains and those who did not share this idea. Attached to the report was the plan with some details of *Lastrara*, which therefore appears to be the first detailed cartography of the locality which today is called *Pesciara*, for a few meters in the Veronese territory.
Another contribution to the detailed cartography is that of the priest Gian Giacomo Spada, curate of Grezzana and collector of fossils who in *Corporum lapidefactorum agri veronensi* of 1732 reports a plan with stratifications of the deposits of Bolca based on a survey made by the young Giovanni Arduino and whose original is preserved in the Civic Library of Verona.
A few years later, around 1740 Gregorio Piccoli, also a priest from Erbezzo in the upper Lessini area,outlined a map of the Verona area in which the locality of Bolca was marked with the comment: «*Luogo del Pesce impetrito*» (*«Place of the frozen Fish»*). *Gregorio Piccoli, collaborator of the Marquis* Scipione Maffei and his secretary Jean-François Séguier of Nîmes, outlined a map of Bolca and its surroundings with the paleontological sites, a plan which remained handwritten and preserved in the Séguier collection of Mimes. Séguier was to include it in a study on the fossils of Bolca, but the work was subsequently not published. However, Séguier himself, in a study on the flora of the Veronese area entitled *Plantae veronensesseustirpiumquae in agroVeronensireperiuntur*, inserted a map of the Veronese area in which the mentioned localities are present.
Throughout the 18th century, almost all the localities in the context are present in the maps that include the Alpone and Chiampo valleys. Outside the traditional geographical schemes is the *CARTA TOPOGRAFICA DI BOLCA E VESTENA NUOVA CON PARTE DEI LORO CONFINI* (TOPOGRAPHIC MAP OF BOLCA AND VESTENA NUOVA WITH PART OF THEIR BOUNDARIES) published in the atlas of *IttiolitologiaVeronese* by Giovanni Serafino Volta which demonstrates the various sites that exist in the Reper valley which then flows into the Chiampo river: you can see the various fossiliferous localities discovered by Giovanni Battista Grù on behalf of Volta who is not certain to have ever been to Pesciara.
Even the numerous and much more precise maps

of the two Venetian provinces in question at the turn of the 18th and 19th centuries almost always include the numerous fossiliferous areas of this eastern part of the Lessini.
Decidedly innovative is the plan of Bolca and its surroundings included in *"Dei combustibili fossili esistenti nella provincial veronese e d'alcuni altri loro contigui nella provincial vicentina e nel Tirolo"* (About the fossil fuels existing in the province of Verona and of some others adjacent to them in the province of Vicenza and in Tyrol) by Count Ignazio Bevilacqua Lazise published in 1816. The author presents the first topography of Bolca in an orthogonal sense that goes from the Purga di Bolca to the Chiampo so it is possible to understand the structure of the village, the position of numerous scattered houses, the *contrada di Vallecco, alcuni indizi di Litantrace, la Valletta detta della Pesciara vulcanica nel tratto superiore, Monte Postale calcari o nella parte superior* (*Vallecco district, some clues of Litantrace, the Valletta called volcanic Pesciara in the upper section, Monte Postale limestone in the upper part*) as well as numerous other details. This is a very important representation which also highlights the change in the concepts of topographic surveying.
Also interesting is the cadastral map recovered from the State Archives of Vicenza, dated 1834, which provides a detailed view of the parcels of the area, highlighting the maps of Monte Postale affected by the presence of the famous fossil fish. Comparing the cadastral map of 1834, which shows the writing *Cava dei Pesci Impietriti*, with the topographic map drawn up by Bevilacqua Lazise (1816), the area involved in the excavation of fossil fish was divided into five properties.
Even Abramo Massalongo, in the decade preceding his premature death, was interested in the plan of the Bolca outcrops. Massalongo intended to write a guide to the Bolca deposits and provide it with illustrations: he therefore used the map included in Giovanni Serafino Volta's *Ittiolitologia Veronese*, removing some details and renaming it *Pianta della val Cherpa* (Plan of the Cherpa Valley), shrunken down and adapted to his optics. The paper, printed and never published, is present in the Civic Library of Verona. The Alpone and Chiampo valleys, with their extraordinary paleontological evidence and supported by three fossil museums, have now become an important point of national and international nature tourism and it is now very rare to find geographical and road maps without references to the locality already mentioned.
It is necessary to cite those manuscript documents that deal with the cartography of the Alpone and Chiampo starting from the Almagià map and others described. A small and important contribution comes from the volume *Il Vicentino nelle mappe della biblioteca Bertoliana* (The Vicenza territory in the maps of the Bertoliana library), published and disseminated in 2005 by Il Giornale di Vicenza. In this substantial volume there is a map of the Vicenza area dated 1608 which includes the localities of *Monteforte, Gambellara, Chiampo, S. Zuane della Rogna, Vestena, Bolca, Crespadoro, Altissimo, Roncà*.
Also in the same book is a reproduction of a map by Girolamo Sigismondo Palletti from 1611 with Gambellara and its detailed plan. An interesting map from 1734 illustrates a stretch of the Chiampo river near the town of the same name.
Another manuscript map of the Pesciara valley, probably attached to the sale of part of Paolo Cracco's fossil deposit, is present in *Bolca e il suo territorio* (Bolca and its territory) by Caltran & Zorzin (1998) kept in the Civic Library of Verona with the appurtenances of *Bolca* and *Vestenanova*. In it we find the following writings in addition to orientation information:
Purge of Bolca (with drawing of a small church)
Community of Bolca
Community of Vestena Nova
Stone caves with petrified fish
The following writing is presentBeni Cracco, now Gazola with a quarry containing petrified fishfrom investitures 1780-1788.
(This is in the territory of the Vestena Nova Community. Not in the Bolca Community. Editor's note)
Border of the Veronese with the Vicenza area
Vicenza territory
Relevance of the Most Highthe following writing is present, assets of Paolo Cracco with the stone quarry containing petrified fish as per investiture-1780
In the end
in January 5, 1790



Map of the Bolca deposit dated 1790, attached to the purchase deed of part of the Pesciara deposits (Photo archive of the Civic Museum of Natural History of Verona)

Notice drawing drawn up by me under Pub.co Expert of Monte di Bolca colored green.
The Pertinence of Vestena Nova colored red, thus the site of the stone quarries with petrified fish far from the border of BolcaPertichen.o 320 veronese all in the Veronese territory.
in faith §
Lorenzo dalla Valle Pub.co Expert
It is certain that other manuscript papers, maps, and other documents are hidden in the various libraries and archives, documents that could make a notable contribution to a better knowledge of that territory and its extraordinary geo-palaeontological characteristics.

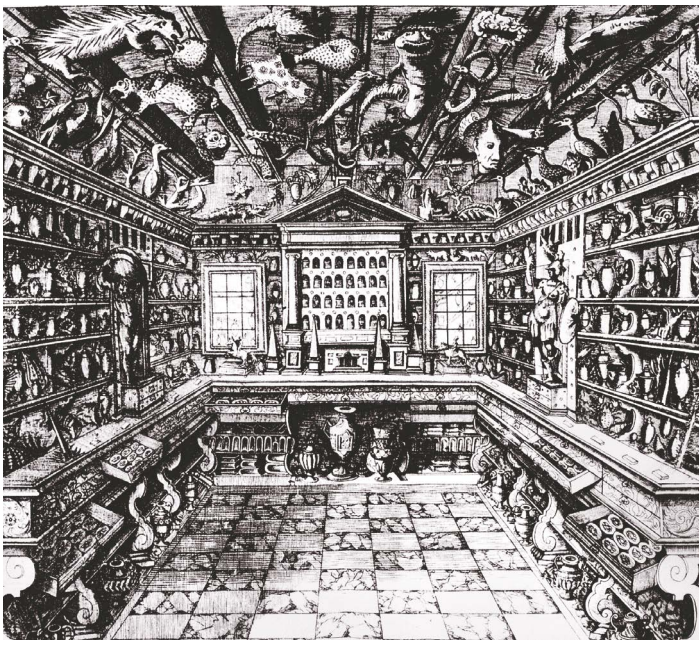
2.b.6 Notes on the history of Paleontology: from the first paleontological discoveries to the present day

Paleontology is the science that studies beings that lived in the past (fossils) and that we find today, with different degree of preservation, predominantly within sedimentary rocks.
The term Paleontology is composed of the following Greek words: *palaios* = ancient, *on* = being, creature, *logos* = speech. The term *fossilia* was used for the first time by Georgius Agricola (1494-1555), considered one of the fathers of Geological Sciences. As we have already seen, fossils are all those remains or simply imprints of organisms, animals and plants, that lived in the past, including traces of their activity, which have been preserved to this day thanks to a series of processes called "fossilization processes".
Fossil is a term that derives from the Latin foedére, which means to dig and therefore originally indicated what is obtained by digging, including minerals. Starting from the eighteenth century (with Antonio Vallisneri senior according to some authors) the term starts to be used in the sense that is usual today. The discovery of fossils allows us not only to know the morphological characteristics of animals that lived in the past but also to reconstruct the biological and geological history of the Earth. Fossils, in fact, are a valid tool for dating rocks, for paleoclimatic and paleoecological studies, as well as an essential component for the interpretation of current geological and biological conditions. Fossils have been the subject of interest since the Upper Paleolithic. In fact, some fragments of minerals and fossils were found in a cave in Arcy (France) mixed with Paleolithic industries, while a necklace made with Cenozoic *Melanopsis* fossil shells was found in the Paleolithic sediments of a tomb in Czechoslovakia. The history of Paleontology can be divided into three periods: classical, medieval and Renaissance, modern.

Classical period: fossils have been the object of curiosity and attention since the first Greek philosophers and naturalists. Xenophanes, Pythagoras, Thales, Strabo and Herodotus, to name a few, had understood that the fossil shells found in the rocks were nothing more than the remains of organisms that lived in a sea that had previously covered that area. Even Aristotle (384-322 BC) was somehow interested in fossils: observing some petrified fish, he explained their presence by the work of a formative vis that developed them from eggs dispersed during the flood within the mud.
If we exclude Titus Livy, Apuleius, Suetonius, Ovid and some others, who only made small references to fossils, Pliny the Elder (23-79 AD), is perhaps the only one of the Roman age to be interested in these remains of the past.
With the completion of his great work Historia Naturalis, Pliny contributed substantially to the knowledge of various natural phenomena, so much so that the work, made up of 37 books, was widely disseminated during the Middle Ages.

Medieval and Renaissance period:
throughout the medieval period the thought of Aristotle and his students took hold. Aristotle's cosmology delayed the development of science until 1600. The Arab Avicenna (980-1037) accepted Aristotle's theories and resumed the hypothesis of spontaneous germination according to which a *"vis plastica"* originated the fossils within the rocky layers without, however, managing to make them alive.
In 1282 the monk Ristoro d'Arezzo, in his manuscript Composition of the World, summarized the cosmological knowledge of his time and made interesting observations and considerations on fossils. For these reasons,

Ristoro can be considered the first medieval writer who recognized an organic and marine origin of fossils. Subsequently, Leonardo da Vinci (1452-1519), Girolamo Fracastoro (1480-1553) and Bernard Palissy (1510-1590) recognized the organic origin of fossils using "rigorously scientific arguments". In particular, Leonardo da Vinci left us a notebook probably written between 1505 and 1510, known as the "Leicester Code" and purchased by Bill Gates in 1994, where the main theme is water with reflections on physics, mechanics, geology and paleontology. In this collection of observations and sketches, in addition to recognizing the organic nature of fossils, where he speaks of *"Del Diluvio e deinichimarini"* (le conchiglie), Leonardo writes *"Dico che'l diluvio no potè portare le cose nate del mare alli monti, se già il mare, gonfiando, non creassi inondazione tant'alta, che superassi tale altezza, insino allilochi sopra detti … si conclude, esso diluvio essere causato dall'acque piovane; e se così è, tutte esse acque corrano al mare, e non corre il mare alle montagne; e s'elle corrano al mare, esse spingano li nichi del lito nel mare, e non li tirano a sé."*("The Flood and the marine nichi" (shells), Leonardo writes "I say that the Flood could not bring the things born of the sea to the mountains , if the sea, by swelling, did not create such a high flood that it exceeded this height, up to the places mentioned above… it is concluded that this flood was caused by rainwater; and if this is so, all these waters flow to the sea, and the sea does not flow to the mountains; and if they run to the sea, they push the fish from the shore into the sea, and do not pull them towards them."). Leonardo, in fact, does not accept the hypothesis of the universal flood to explain the presence of fossil marine shells (nichi) in the mountains of Northern Italy, hundreds of kilometers away from the sea, even if they had fled as the waters advanced "since the "nichi" no longer moved quickly, instead like a snail out of the water … it would have taken in one day to have gone from three to four fathoms: therefore, with such motion, it could not have moved from the Hadrian sea up to Monferrato in Lombardy, which is 250 miles away, in 40 days, as those who took this time into account said".
Around 1517, however, Fracastoro, professor at the University of Padua, recognized as real marine animals "stone echinids, hermit crabs, conche, ostree", fossils found near the Fontana del Ferro in Verona, during the excavation of some foundations. Furthermore, Fracastoro attributed a marine origin to the mountains, stating that they were formed by the sea "by massing and crashing together a lot of sand with its waves, and that where the mountains are now, there had already been the sea, which, leaving little by little, they were left dry."
The first documented report of the fossil fish of Bolca dates back to 1550, in the work of the Sienese doctor Andrea Mattioli "Discorsi sopra Dioscorides", where we read: "… I remember, in addition to having been shown by Mr. Don Diego Urtado of Mendozza, orator Cesareo at that time in Venice, some stone slabs were brought from the Veronese, in which (splitting through the middle) various species of fish are found carved with each of their particles encased in stone": or of such, his Lordship stated, an infinite number could be found where those had been dug out. So great or wonderful are the works of nature…." (Mattioli, 1550). This demonstrates how the Bolca fossils had been known for some time and suggests that they were already part of private collections. In fact, the first naturalistic collections took place in the 16th century.
An important collection by the pharmacist Francesco Calzolari or Calceolari (1521-1600)



The Calzolari Museum in a print from 1622

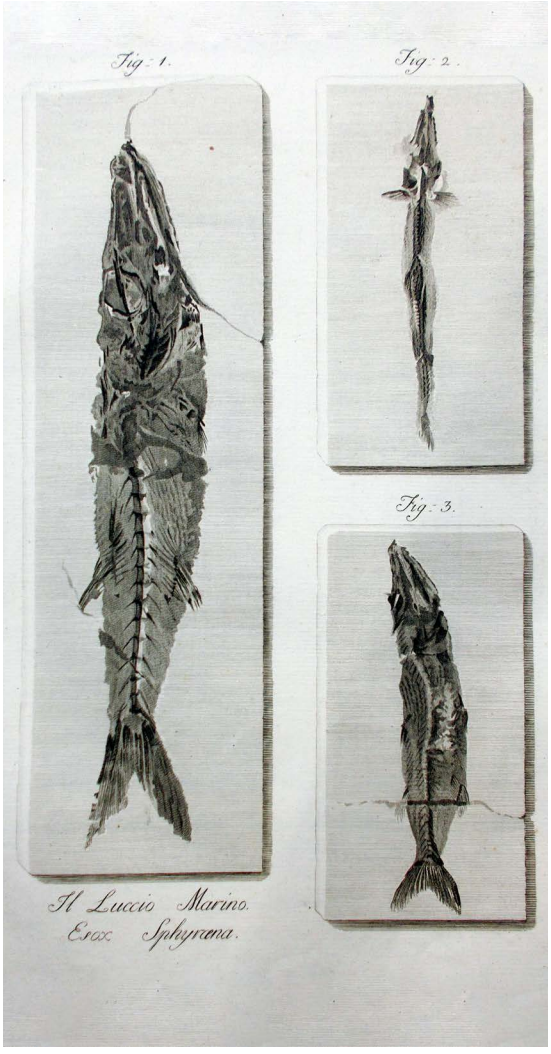


Berybolcensis leptacanthus, specimen preserved at the Civic Museum of Natural History of Verona. It most likely belonged to the Calzolari collection (length 12 cm)

consisting of various materials dates back to 1571, including some fossil fish from Bolca. The Naturalistic Museum of Francesco Calzolari, described in 1584 by the Modenese doctor G.B. Olivi, is today considered one of the oldest in the world. One of the specimens from the Calzolari collection is still preserved in the Geology and Paleontology Department of the Civic Museum of Natural History of Verona.

Fossils, although known since classical antiquity, acquired their modern meaning only in the 17th centurywhen, having recognized their organic origin, they were identified as the remains of organisms that lived in the past. The Italian Fabio Colonna (1567-1650) distinguished terrestrial fossils from marine and freshwater ones, clearly highlighting the differences between current shark teeth and fossil ones. The Danish Nicolò Stenone (1638-1686), on the other hand, differentiated for the first time the lacustrine formations of the Valdarno from the marine ones, providing a series of geological information on the current position of the layers.

In the 18th century, the taste for collecting and preserving fossils and publishing their descriptions developed. Serafino Volta began, in 1789, to illustrate all the Bolca ichthyolites preserved in the private collections that arose in Verona during the 18th century. The work



One of the splendid tables of *Ittiolitologia Veronese*

concluded in 1796 with an important monograph entitled *"Ittiolitologia Veronese"* and illustrated with 76 splendid plates, in which 123 species of fish were described.
The British William Smith (1768-1839) and the French A. Brongniart (1770-1847) demonstrated the importance of fossils for knowing the relative age of rocks.
At the end of the 18th century the foundations of modern systematics were established.

Modern period: Georges Cuvier (1769-1832), with his great work *"Recherches sur les ossements fossiles"* is considered the founder of Vertebrate Paleontology and Comparative Anatomy.
Cuvier deserves credit for having recognised, after a long series of studies, that, for example, oviparous animals appeared on Earth before viviparous animals and that the latter had greater forms in the past than in the present.
Cuvier, not conceiving a progressive mutation of faunas, always invoked his *"Catastrophic Theory"* which predicted general catastrophes that each time destroyed the life of a specific region, which was repopulated by the migration of organisms from neighboring areas.
Jean Baptiste Lamarck (1744-1829) gave a great boost to the systematics of invertebrates, addressing on a scientific basis the problems connected to the origin of organisms through natural and not "catastrophic" diversification.
In the second half of the 19th century, with the very famous work entitled *"The Origin of Species"* by Charles Darwin (1809-1882), modern Paleontology established itself. In 1861, *Archeopteryx lithographica*, a Jurassic fossil which presents characteristics common to birds and reptiles, was discovered in the limestones of Solnhofen, Bavaria. This was the first time that a fossil record allowed us to hypothesize an evolutionary relationship between two classes.
Only two years had passed since the publication of Darwin's work. The second half of the 19th century and the first decades of the 20th should be remembered for their important discoveries and interesting concepts. Among the most important paleontologists we certainly cannot forget Alcide d'Orbigny (1802-1857) for his research on invertebrates, Louis Agassiz (1807-1873) for his monographs on fossil fish, Richard Owen (1804-1892) scholar of Mesozoic reptiles and birds, Édouard Lartet (1801-1871) founder of human Paleontology, Karl Alfred von Zittel (1839-1904) author of an important treatise on Paleontology, Arthur Smith Woodward (1864-1944) valid paleoichthyologist and Othenio Abel (1865-1946) expert in paleobiology and author of the volume*"Animals of the past"*.
The Province of Verona and in particular the Civic Museum of Natural History has a long naturalistic history behind it which reflects the panorama of Italian and European scientific and museological development from its origins to the 19th century, the moment in which the first nucleus of the museum was formed, which dates back to 1853. The history of the Natural History Museum of Verona, however, has much older roots, linked to the first private collections of naturalistic interest created in the city which date back to the 16th century.
We remember the main naturalists who worked, from the oldest to current scholars, in the field of Veronese geology and paleontology (Lazzari, 2014): Girolamo Fracastoro (1478-1553), Andrea Mattioli (1501-1578), Simone Majoli (1520-1597), Francesco Calzolari (1522-1609), Ulisse Aldrovandi (1522-1604), Benedetto Ceruti and Andrea Chiocco (17th century), Valerio Faenzio (16th century), Benedetto Olivi (16th century), Lodovico Moscardo (1611-1681), Luigi Ferdinando Marsili (1658-1730), Antonio Vallisneri (1661-1730), Johann Jacob Scheuchzer (1672-1723), Lorenzo Patarol (1674-1727), Scipione Maffei (1675-1755), Giovanni Giacomo Spada (1679-1749) , Gregorio Piccoli del Faggiol (1680-1755), Jean-Francois Séguier (1703-1784), Giovanni Arduino (1714-1795), Nicolas Desmarest (1725-1805), Giuliano Serpe (1731-1801), Alberto (Giovanni Battista) Fortis (1741 -1803), Barthélemy Faujas de Saint Fond (1741-1819), Scipione Breislak (1750-1826), Serafino Volta (1754-1842), Giovanni Battista Gazola (1757-1834), Bartolomeo Giuliari (1761-1842), Francesco Orazio Scortegagna (1767-1851), George Frédéric Dagobert Cuvier (1769-1832), Giovanni Battista Brocchi (1772-1826), Giovanni Battista Dalla Valle (18th century), Ciro Pollini (1782-1833), Tommaso Antonio Catullo (1782-1869), Jean Louis Rodolphe Agassiz (1807-1873), Achille De Zigno (1813-1891), Abramo Massalongo

(1824-1860), Enrico Nicolis (1841-1908), Luigi Sormani-Moretti (1834-1908), Ramiro Fabiani (1879-1954), Angelo Pasa (1911-1966) and Lorenzo Sorbini (1939-1997).

2.b.6.1 From the first paleontological discoveries in Val d'Alpone to the present day

In 1550 the important printed work "Dioscorides" by the doctor Pier Andrea Mattioli was published in the third edition of a large series, making this book one of the most appreciated medical treatises of the 16th and subsequent centuries. The title of the volume reads as follows:

THE DIOSCORIDE
FROM THE EXCELLENT DOCTOR
DOCTOR M.P. ANDREA MATTHIOLI FROM SIENA.
With his speeches illustrated by it for the third time
And copiously expanded

The relevance of the 1550 edition for the history of science lies in the first report of the fossil fish from the Bolca: *"..., however, no one should be surprised by this, because I already remember having been shown it to me by Mr. Don Diego Ultado of Mendozza Oratore Cesareo at that time in Venice some stone slabs were brought from the Veronese in which (splitting through the middle) various species of fishes are found carved with each of their particles engraved in the stone, and his Majesty affirmed that an infinite number of such were found wherever they were been excavated, so great and marvelous are the works of nature, and this is enough for now for a brief discussion about matter, & the things of metals, & stones."*.

From the realism of the passage cited it can be deduced that Don Diego Hurtado of Mendoza collected from the voice of a witness the description of the opening of the fossiliferous slabs or that he was on site since Mattioli reports "his S. affirmed that he found a number of such where they had been dug was infinite." Starting from 1545, Don Diego was also Emperor Charles V's ambassador to the Council of Trent, so he often had to travel from that city to his Venetian residence.

The main roads that connected Trento to Venice are Valsugana and the Adige valley and both pass approximately 30 kilometers from the Bolca field. It is therefore not impossible that Don Diego was taken there. In any case he can be considered as the first known collector of fossil fish from Bolca. However, the Bolca deposit did not initially have the notoriety that one would expect from this quote, reported in the numerous editions of this work, at a time when naturalistic collecting becomes fashionable. Decades will pass before the Bolca fossils are described again.

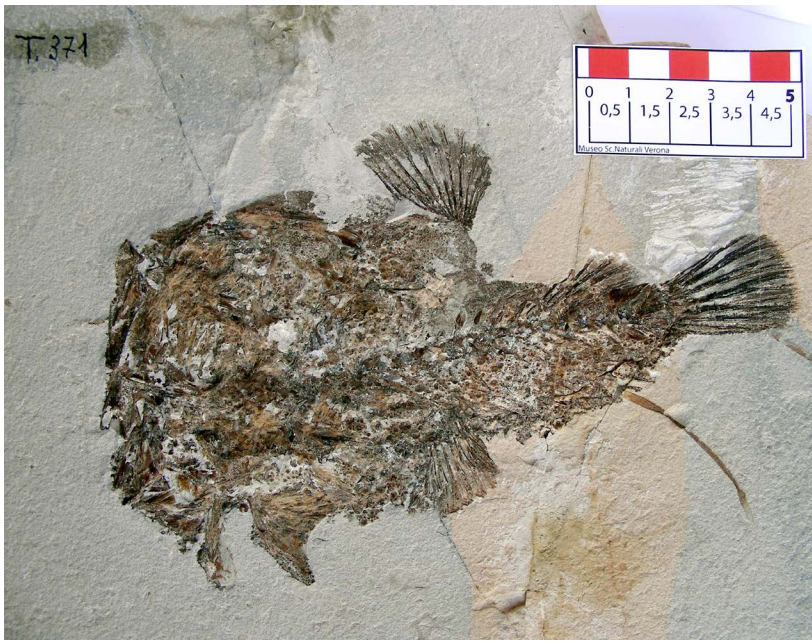
For more than 500 years, fossil remains of animals and plants have been found in the Verona area of the Eastern Lessini Mountains: the ichthyolites represent the best-known and most important finds, as demonstrated by the very name of the "Pesciara" of Bolca, the best-known deposit in the area. Bony and cartilaginous fish, crustaceans, jellyfish, insects, terrestrial and marine plants, etc. have been found - and are still being found, with ever new discoveries with each excavation campaign.

The historic fossiliferous deposits of the Val d'Alpone and those recently reported in the upper Chiampo Valley bear witness to fragments of life from very distant periods, prior to the very appearance of Man on Earth. The question may then arise about the sense of dedicating time and resources to such remote aspects today, about why we should look so far back in time in a historical moment like the current one, in which societies have more pressing urgencies and are running ever faster towards the future.

First of all, it is not just a matter of knowing the past: the fossil marine fauna of the Val d'Alpone dates back to a geological epoch between 50 and 36 million years ago, but it has "relatives" still living and it is precisely for this reason that in the catalogs and inventories of the 1700s and 1800s, alongside the scientific name of the fish, the common name, known and used by fishermen, was often indicated. Among the best known, we remember the "trident" (*Vomeropsis triurus*), the "Indian turbot" (*Mene rhombea*), the "quad" (*Eobothus minimus*), the "British macarello" (*Godsilia lanceolata*), the "cornfish" (*Blochius longirostris*), "the acaruana" (*Proacanthurus tenuis*), the

"whitebait" (*Pterygocephalus paradoxus*), the "winged mollident (*Ceratoichthys pinnatiformis*), the "barbino" (*Galeorhinus cuvieri*), the "spurhead (*Eolates gracilis*), the "butterfly" (*Eoplatax papilio*), and many others (Volta, 1796-1808).





On the left: The "anglerfish" (*Caruso brachysomus*) depicted in Giovanni Serafino Volta's volume *"Ittiolitologia Veronese"* in the Bozziano museum

On the right: A specimen of *Tarkus squire* preserved in the Civic Museum of Natural History of Verona

Bolca taxa, although extinct, have the greatest affinities with forms currently living in the warm seas of the Indo-Pacific. Thanks to studies on these fossils, it is possible to compare the ancient Eocene inhabitants of the Val d'Alpone with some current fauna: the "descendants" of these fish, crustaceans, jellyfish, worms and fossil corals still live in tropical and subtropical seas; others, but in smaller numbers, populate the temperate or warm-temperate waters with shallow sandy seabeds, similar to those of the southern coasts of the Mediterranean.

The very rich ichthyofauna of Bolca is currently being revised.

The results of these investigations, which began about twenty years ago, and intensified in the last decade, have made it possible to significantly modify the previous hypotheses of affinity between the taxa of Bolca and living ones. The fishes of Bolca often retain primitive characteristics that are missing in extant species. For these reasons it was necessary to establish new taxa to highlight, also from a systematic point of view, the real post-Eocene evolution. This is the case, for example, of the study conducted by an international team, led by the University of Vienna and including the universities of Padua, Turin and Florida, which discovered a new genus of myliobathyform race. The new genus and species of fossil race (*Lessiniabatis aenigmatica*) comes from Pesciara di Bolca and presents a peculiar anatomy unknown in the myliobathyform races known so far. The description of this unusual breed to say the least is based on three finds, traced in the nineteenth-century collections preserved in the natural

history museums of Paris, Udine and Florence. The new fossil race represents a "dead end" in the evolution of this group of cartilaginous fish after the mass extinction at the end of the Cretaceous. The study, published at the end of 2019 (Marramà *et al.*, 2019), highlights the importance of studying specimens belonging to old museum collections as these often reserve continuous and unexpected surprises.
The extraordinary Eocene faunas of the Val d'Alpone play a crucial role in phylogenetic studies and in the reconstruction of paleoclimatic, paleoecological and paleobiogeographic aspects of the Tethys area.
For these reasons, the Val d'Alpone can be attributed the denomination of "type territory for Eocene marine fauna", one of the most important in the world. Fundamental for research are the faunas coming from this area and preserved in various Italian and foreign museums (see paragraph 2.b.11), the result of collections conducted over the centuries and a precious research tool, as demonstrated above in the case of the new "fossil race".
During the Eocene, a crucial time interval for the recovery of life after the catastrophic mass extinction of the end of the Cretaceous, the roots of modern marine ecosystems and their biodiversity were intertwined.
The various paleontological deposits of the Val d'Alpone constitute a selected serial nominated property of paleontological exceptionalities characterized by high representativeness. The exceptional state of conservation of the fossils of the Val d'Alpone, their high biodiversity, their phylogenetic and paleoecological significance are the basis of important scientific hypotheses discussed at an international level on the evolutionof the center of marine biodiversity over time. Biodiversity is one of the key values of the nominated property; for this reason, we can consider it as a hotspot of Eocene diversity.



One of the numerous webinars on the fauna of Bolca

To understand how important this aspect is our society, just think that "halting the loss of biodiversity" appears to be a global objective even today, to the point that the UN 2030 Agenda for sustainable development (objective 15) brands it as an unavoidable prerequisite for the development of Man and other living beings as well as ecosystems. Precisely as "petrified" organisms, the fossils of the Val d'Alpone are able to provide valuable information not only on the history of Eocene marine life, but also on rocks and other crucial topics, such as climate changes. Scientists are still debating why so many fishes are present within the laminated layers of Pesciara. As we have already had the opportunity to mention, some authors in the past have explained the large number of fossil fish found by invoking catastrophic theories and only recently of an environment characterized by a very rich fauna subjected to normal mortality rates (Marramà *et al.*, 2016). Although this last hypothesis is shared by many, we still do not know precisely what happened on that seabed about 50 million years ago. Dealing with these cognitive "gaps" and ignoring many aspects of the processes that occurred in the past represents a constant element of research. Excavations and discoveries often answer questions, but just as often they open up new questions or do not find definitive answers. This is the fate of research, which is always provisional and never definitive. Precisely the discussions that guided and still, in part, guide the excavations and studies in Val d'Alpone, precisely the contrasts and controversies that characterized them become important as an educational 'method': they show the study activity as continuous investigation, teach the provisional nature of scientific theories, which must not be accepted dogmatically but systematically subjected to verification. The deposits of the Val d'Alpone are catalysts for new research not only because many questions remain open, but also because with each excavation new finds are brought to light to study, often of species different from those known.



Mene rhombea with bioturbation (length 18.4 cm)

2.b.7 History of the Bolca component

2.b.7.1 *Monte Postale*

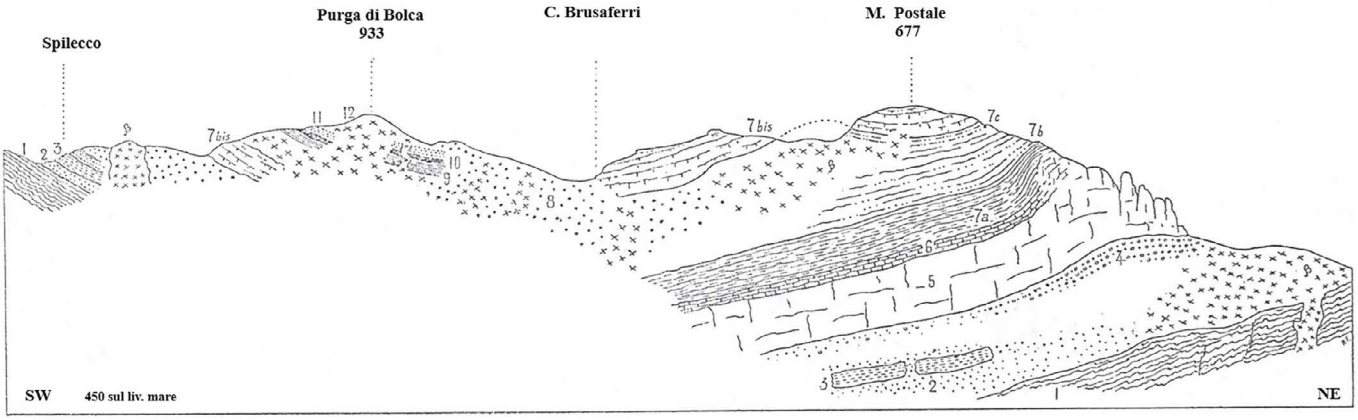
The deposit is located a few hundred meters away from that of Pesciara and at a slightly higher altitude, although it is located in the Vicenza province.
The stratigraphic succession of Monte Postale, over 130 meters thick (Papazzoni *et al.*, 2017), represents the most complete in the Bolca area and contains information on the sedimentation history of this area before the deposition of the laminated limestone of the Pesciara.



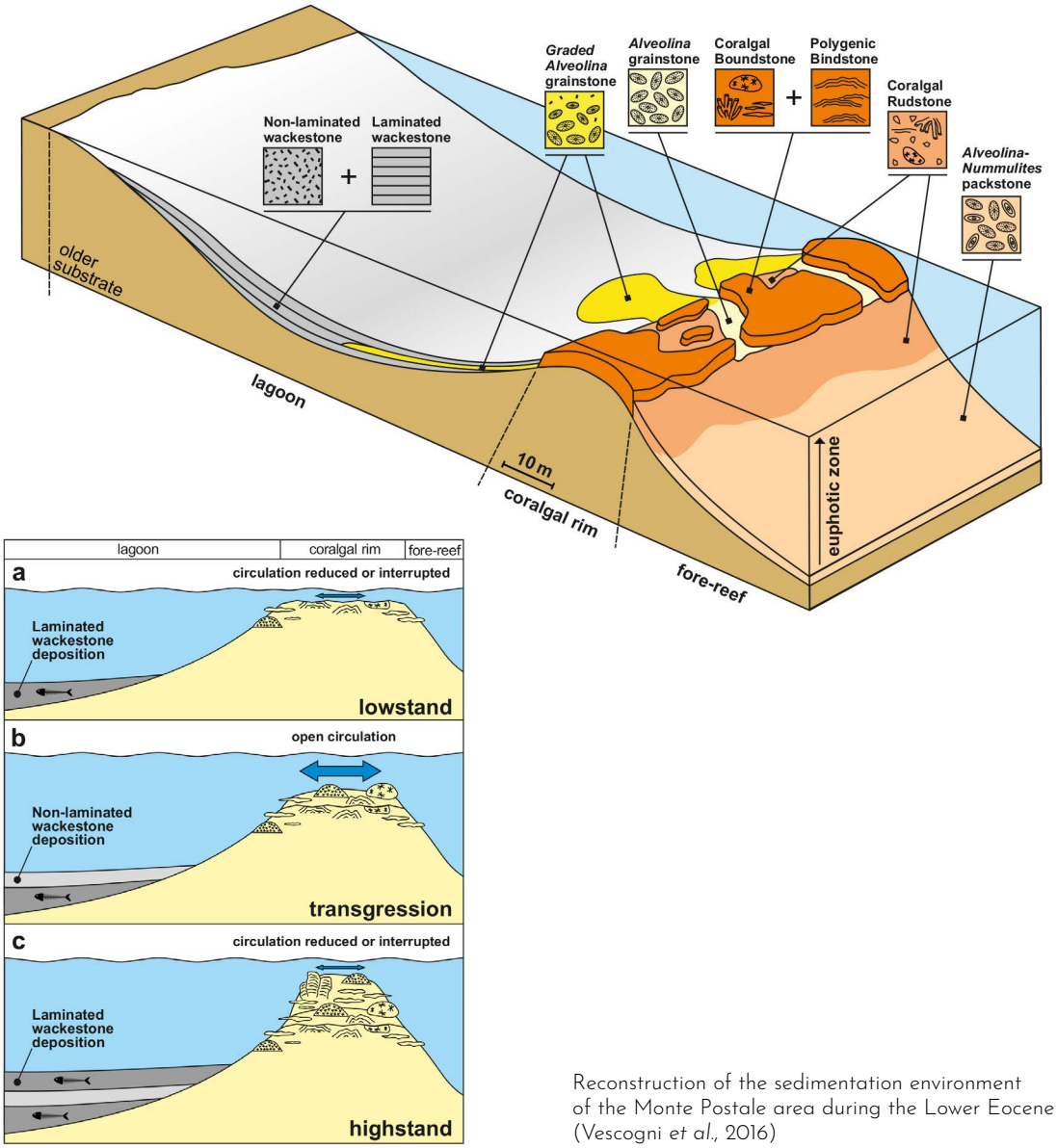
Monte Postale seen from Pesciara

The last detailed studies of the last century are due to Ramiro Fabiani (1914, 1915) who revised the stratigraphy of Monte Postale. Subsequently, Malaroda (1954), after having reviewed all the fauna available in the literature, based on Fabiani's stratigraphy, published an in-depth study on the Postale molluscs present in the collections of the museums of Pisa, Florence, Padua and Verona.

Profile and section of Monte Postale-Purga di Bolca-Spilecco according to Fabiani (1915)



According to this review, the list of mollusc species from the Monte Postale includes 47 bivalves, 120 gastropods and four cephalopods. However, this list also considers many species cited by other authors that Malaroda was unable to find and examine. Malaroda (1954), comparing the lists of species from other European faunas, assigns the molluscs of Monte Postale to the Lutetian (lower part of the middle Eocene).
In 2006 Papazzoni and Trevisani dated the part of the Monte Postale succession underlying the molluscan levels to the late Ypresian. Recent studies conducted by Papazzoni *et al.* (2017) established based on larger benthic foraminiferans and calcareous nannofossils that the uppermost part of the succession also falls within the Late Ypresian.
Recent investigations carried out to update the paleoecological and biostratigraphic knowledge of Monte Postale (Vescogni *et al.*, 2016; Papazzoni *et al.*, 2017) allowed the identification of some in situ massive limestone bodies, within the stratigraphic succession. These are bio-constructed bodies, a few meters thick, with abundant colonies of corals in a growing or fragmented position.
Corals often appear encrusted with red coral algae and green algae (dasycladaceae).
The mapping of these facies and the detailed analysis of these structures allowed the identification of a discontinuous coral belt along the north side of Monte Postale (Vescogni *et al.*, 2016).



Reconstruction of the sedimentation environment of the Monte Postale area during the Lower Eocene (Vescogni *et al.*, 2016)

Furthermore, a recent study conducted in the area immediately surrounding Bolca and which also includes Monte Postale (Beschin *et al.*, 2016), made it possible to report 777 crustacean remains, including around a hundred new species. These crustaceans were collected in small coral and algal domes, which confirm the establishment of a coral environment during the lower Eocene in the Monte Postale area and surrounding areas.
Starting from the 2000s, after a long pause, new paleontological excavations were carried out within the fish laminites, carried out, like those conducted in Pesciara, with modern approaches, but in this case in the open air (Annex 5.4 Excavation, restoration, study and enhancement) and which allowed the recovery of important taphonomic information.



Monte Postale: the excavations opened in 2008 along the road leading to Pesciara

It has been observed, for example, that the fish of Monte Postale (the *Eoplatax* angelfish, the barracuda *Sphyraena*, the *Titanonarke* electric ray, etc.), which are found in calcareous and marly layers, unlike the Pesciara, are often disarticulated and with scales scattered around the body.
This suggests the presence of an environment less favorable to fossilization, characterized by a certain degree of disturbance of the carcasses on the seabed. According to recent studies, based on biostratigraphy integrated with calcareous nannofossils and larger benthic foraminiferans, the highest fish levels of the Monte Postale succession are slightly older than those of the Pesciara (Papazzoni *et al.*, 2017).

2.b.7.2 *Pesciara*

The Pesciara and its fossils have been known for a long time, although it is not known when the deposit was discovered. As we have already seen, the first information on the site dates back to a document from 1550 while to have more precise documentation on the excavations, we must wait until the end of 1700.
In this period, the Marquis Scipione Maffei, Jean-Francois Séguier, his secretary and the archpriest of Grezzana (VR), Gian Giacomo Spada, showed such great interest in the fossils of Bolca that it was decisive for the development of knowledge of the deposit. In the same period, Count Giovanbattista Gazola collected a spectacular collection of fossils that Serafino Volta illustrated in the excellent monograph entitled "Ichthyolithology Veronese", begun in 1789 and considered the first treatise on fossil fish published in the world. The fame of the Bolca fossils soon spread abroad, so much that Napoleon Bonaparte requisitioned the Gazola collection, rich in over 1,200 ichthyolites (stone fish), to transfer it to Paris.



Manopleros gigas in a watercolor once exhibited in the Gazola museum and today visible at the Civic Museum of Natural History of Verona

And it is precisely in this period that the Cerato family, immigrants from the Altopiano dei Sette Comuni, rented the "Cava Maffei" or "lastrara", the future "Pessàra", from the Marquis Antonio Maffei to extract fossils.
More precisely, in 1843 the Gazola family commissioned Giuseppe Cerato to carry out the excavations.
From this moment and for five generations, the Cerato family has passed down the extraordinary skill in the extraction and preparation of fossils which, over time, has become a true art.
In fact, for over 200 years the Cerato family has been engaged in the patient, tiring but equally exciting work of extracting fossil finds from Bolca especially from the Pesciara (Cerato, 2011). This work is difficult and requires a particular excavation technique which involves the separation of the various limestone plates that contain the fossils. In the extraction,

research and restoration of fossils (see Annex 5.4 Excavation, restoration, study and enhancement), the Ceratos have always been specialized professionals as well as the most in-depth knowledge of the territory. This specificity also derives from an oral family tradition, a tradition that has been perpetuated for generations (Cerato, 2011).





Above: Interior of one of the old galleries opened in the 19th century, currently closed for safety reasons
Above: The access staircase to the new Pesciara tunnel, built in 2019

Pesciara can be considered the "icon" of the fossiliferous deposits of Italy, so that the symbol of the Italian Paleontological Society is the carangomorph fish *Ceratoichthys pinnatifoprmis*, one of the most beautiful and characteristic fish found on the site. Starting from the 2000s, after a long pause and thanks to funding from the Veneto Region and the Municipality of Verona, based on the Regional Law. n. 7 of 30 June 2006 "Interventions for the enhancement of the cultural heritage of Bolca", new excavations were carried out using scientific criteria, in the open air on Monte Postale and in tunnels in Pesciara (see Annex 5.4 Excavation, restoration, study and enhancement).
These excavations, still ongoing, are directed by Roberto Zorzin.
Due to the great variety of fish found in the five fossiliferous levels, Pesciara can be considered one of the richest deposits in the world. In fact, with every excavation, new finds are brought to light. Suffice it to remember that Jacques Blot published a catalog in 1980, which updated the previous one drawn up by D'Erasmo (1922), in which he lists 208 nominal species belonging to 117 genera included in not less than 72 families; since then, the diversity of the fish fauna of Bolca has largely changed and significantly expanded by the contributions of various scientists in numerous publications.
The most recent list is due to Bannikov (2014) and Carnevale *et al.* (2014) according to which the Actinopterygian fishes known in the Bolca fauna belong to 19 orders, 91 families, 192 genera (of which 32 are of uncertain family) and at least 220 species; among these, the Acanthomorpha are represented by 11 orders, 78 families, 163 genera and at least 190 species. In the list of bony fishes updated in 2019 there are 21 orders, 93 families, 201 genera and over 229 species.
The research and excavations carried out at the Pesciara, in addition to the large number of fish, made it possible to recover the remains of reptiles (the *Archaeophis* and *Anomalophis* snakes), birds (*Ornitholites* feathers) and a rich "minor fauna". These include jellyfish, insects, scorpions, crustaceans, bivalves, gastropods, cephalopods, brachiopods, annelids, foraminifera, corals, ostracods, and bryozoans (Carnevale *et al.*, 2014; Giusberti *et al.*, 2014b).

Next page: The rich mollusc fauna present in the Roncà Horizon (Valle della Chiesa)


I.G. VR 85429





Finally, Pesciara is also famous for the rich flora of the Ypresian, certainly one of the most important at a European and probably global level. The flora has clear tropical and subtropical characteristics, although some forms seem to show a temperate climatic affinity. Remains of marine and terrestrial plants are preserved within the fossiliferous calcareous laminae.
Red, algae and brown algae are frequent. The most common monocotyledonous angiosperms are marine or brackish water floating forms, although palm fruits are also present. Among the dicotyledonous angiosperms there are numerous leaves and infructescences; the fruits and flowers are rarer (*Getonia*). Preserved plants with roots (*Maffeia*) are also frequent, but the leaves and small branches of terrestrial plants are much more numerous.
The large quantity of fossil fishes (over 100,000 finds) found in the fossiliferous levels of Pesciara has always intrigued scholars and museum visitors.
The most frequent questions that arise when faced with such a large number of fossils are: why did they die? Why have they survived to this day? There have been many answers to these questions, but none of them are yet definitive. The cyclical alternation of very fine-grained limestones, divided into numerous laminae mostly rich in well-preserved fish and plants, with coarse detrital limestones with benthic foraminifera allows us to hypothesize the existence of a depressed intraplatform area characterized by reduced hydrodynamic energy, in where the fine-grained sediments were deposited, but periodically influenced by episodes of highly turbulence derived from coastal reef environments (Marramà *et al.*, 2016).
The reconstruction of the paleoenvironment of the fishes of Bolca is rather complex as the great variety and shapes of the fishes suggest. Some are similar to those that currently live in coral reef environments, others are characteristic of shallow sandy seabeds with macroalgae meadows and seagrasses.
Various hypotheses have been put forward to justify the abundance of fishes within the laminated states of Pesciara through "catastrophic" events that have been repeated over time. One of the first theories invoked the existence of volcanic activity (gas exhalations, eruptions, etc.) to justify the mortality of marine organisms. Actually, in the numerous fish plates there are no traces of ash or other volcanic products.
Another important theory hypothesized, similarly to what still happens today in the

Pesciara: succession of limestone layers that preserve numerous environmental information



quiet bays and lagoons of tropical seas, that in Bolca too there must have occurred those periodic natural poisonings of the water caused by a sudden development of phytoplankton organisms, known as "red tides", with an annual or seasonal cycle and lasting a few days. These phenomena could determine the death of all or most of the organisms present in the area, due to the release of toxins and the accelerated consumption of oxygen from the waters. The presence of weak currents then allowed the transport of dead organisms towards seabeds with oxygen-poor waters where they could be covered by thin limestone mud without being preyed upon by those animals that generally live on the seabed feeding on carcasses. At this point all those processes began that transform a sediment into rock, and the remains of organisms into fossils, which have allowed their conservation up to the present day. The mortality events would have been followed by the return of normal oxygenation conditions which allowed the repopulation of the waters. Despite the large number of fish found in Pesciara, we cannot speak of real mass mortality, as some scholars claim. In fact, in the localities where the occurrence of these catastrophic events has been found, which regularly cause the death of all the organisms present in a given environment, fish tend to accumulate in large quantities within each single plate, with dozenof fish close to each other.

In Pesciara, however, the over 100,000 fish found, considering the large number of plates present and their extension, highlight the presence of one fish every approximately 10 m^2 of plate. This value is characteristic, however, of an environment with a very rich faunal assemblage, characterized by normal mortality, in which the conditions favorable to the start of fossilization processes have been maintained over time. Once dead, the fish must have reached the seabed very quickly, also considering that the skeletons are usually articulated.

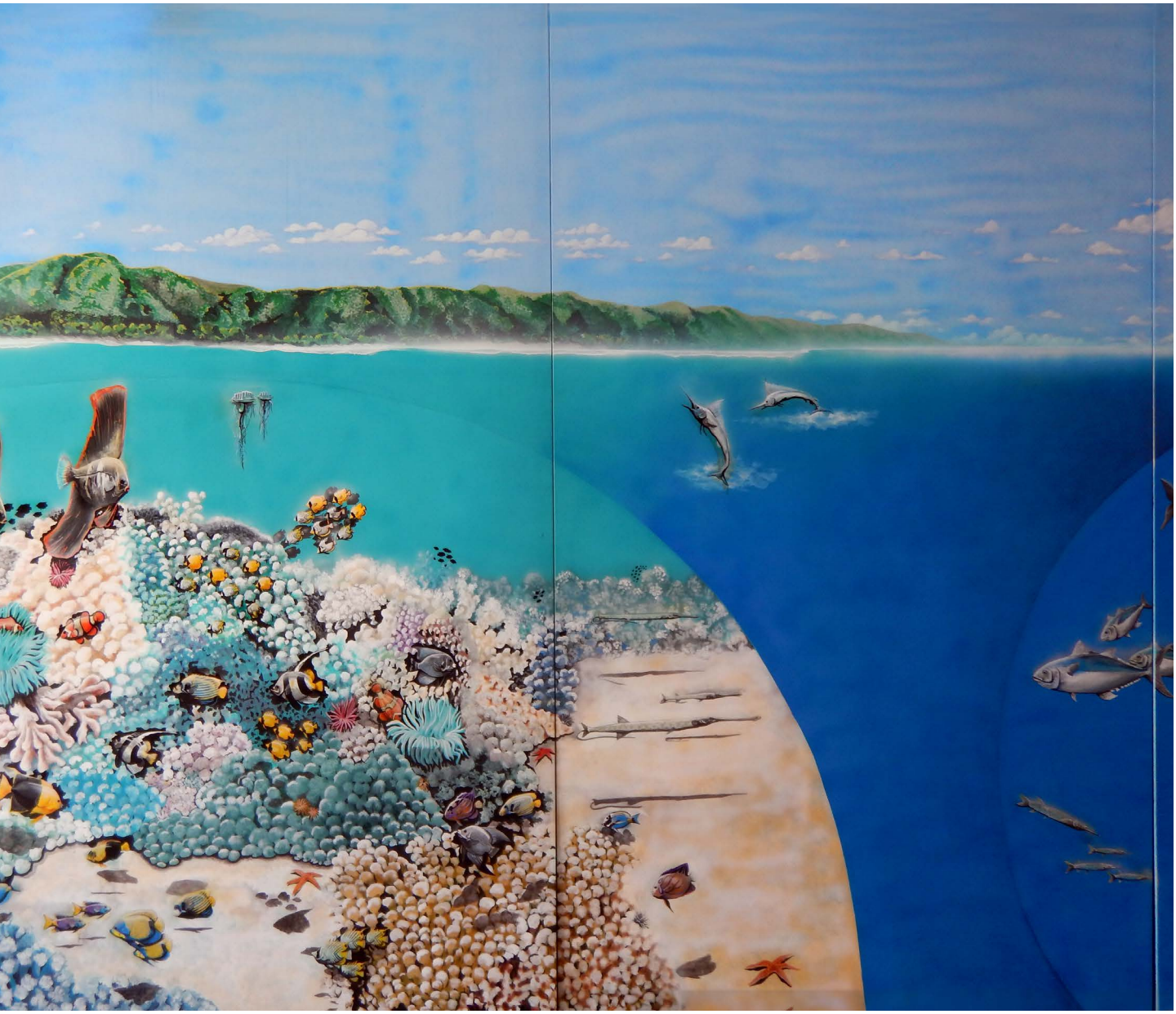
The seabed probably did not have to host a rich community of necrophagous animals that could have fed on the carcasses. In this case it is plausible to hypothesize the presence of poor or oxygen-free waters, or with very high salinity or with rapid sedimentation of the calcareous muds that buried the fish, protecting them from the external environment. Geochemical studies on the organic matter preserved in the laminae did not highlight any indication of high salinity, while they confirmed the probable scarcity or absence of oxygen during the deposition of the laminae themselves (Schwark *et al.*, 2009).



Teleosteo (*Sparnodus*) from Pesciara preserved in anatomical connection (length 21.5 cm)



Painting exhibited at the Fossil Museum of Bolca depicting the environment of about 50 million years ago



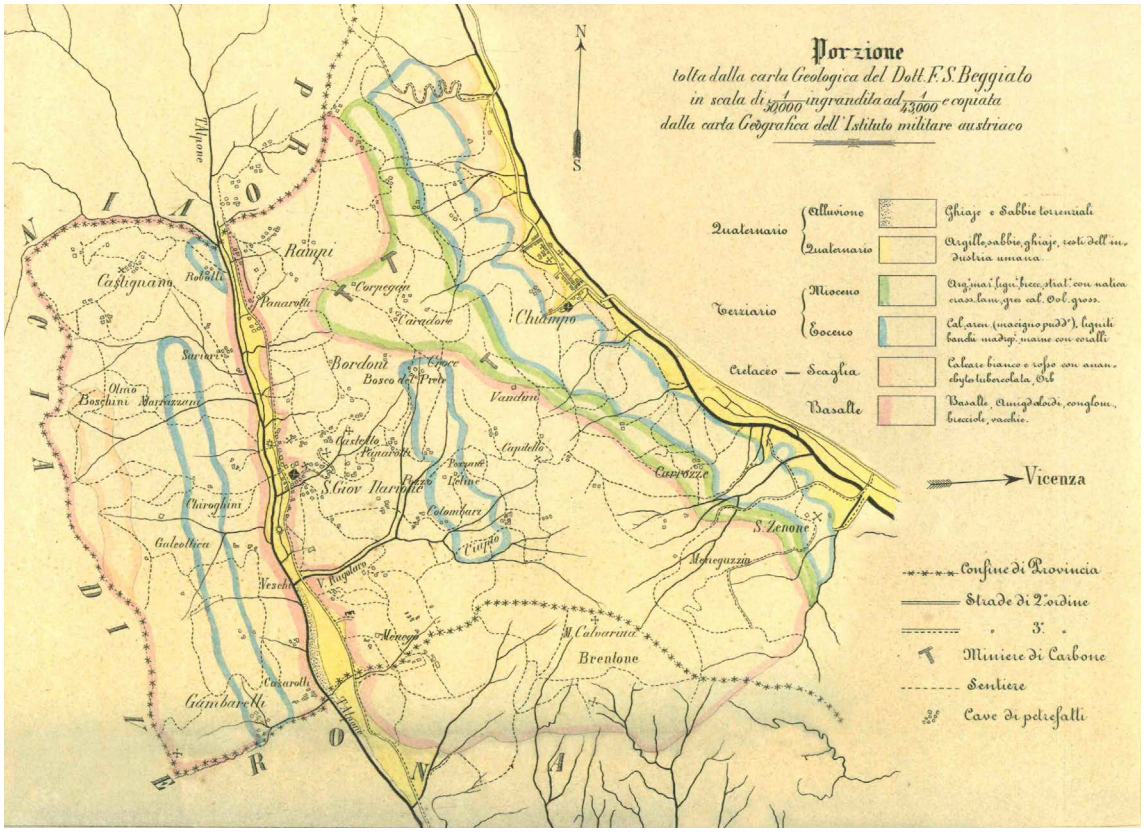
2.b.8 History of the San Giovanni Ilarione component

The fossils of San Giovanni Ilarione, unlike those of Bolca and Roncà, known and illustrated since the mid-16th century, were first reported by Brongniart (1823) with the mention of the Natica cepacea. Subsequently, Maraschini (1824) reports that in the surroundings of San Giovanni Ilarione "various fossils ... are found there" but "few are those that can be determined". It was necessary to wait almost half a century, when Edmond Hébert (1866) brought to the attention of the scientific world of the time the great abundance of the fauna of what he defined as the "Horizon de San Giovanni Ilarione". In fact, on the eastern side of the Alpone Valley and in the municipality of San Giovanni Ilarione, four fossiliferous localities are known: Croce Grande, Case Pozza, Ciupìo and Bosco del Prete.



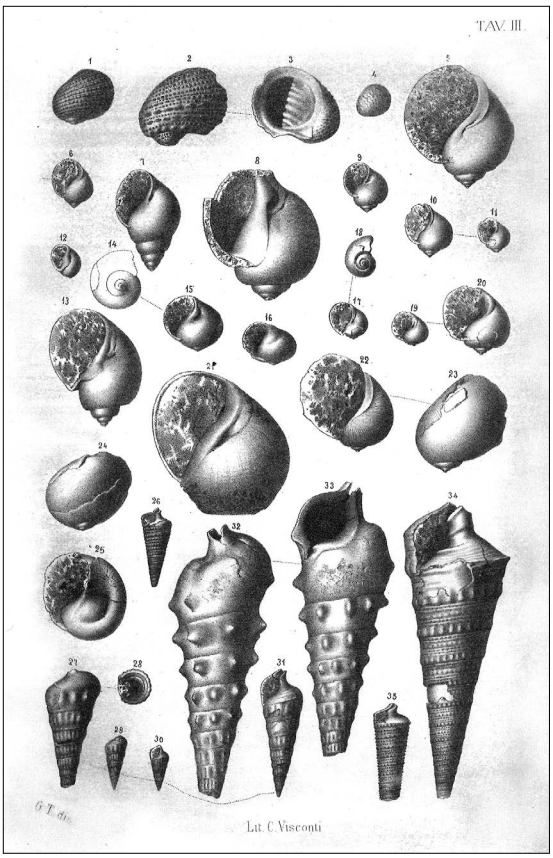
The outcrop of the Horizon of San Giovanni Ilarione as it appears in the Ciupìo area

Among the first scholars who dedicated themselves with a certain interest to the stratigraphy and paleontology of the so-called "Horizon of San Giovanni Ilarione" we also remember Eduard Suess (1868), Francesco Molon (1882), Ernst Munier Chalmas (1891) and Ferdinand Bayan. The latter, in 1870, after a series of investigations, collected around fifty different molluscs, recognizing 18 as new and typical species for San Giovanni Ilarione. Munier Chalmas (1877), however, reported the presence of abundant remains of corals, echinoderms, crustaceans and cephalopods.
At the same time, between 1875 and 1880, De Gregorio collected abundant fossil remains in San Giovanni Ilarione, the subject of his degree thesis (Mellini & Quaggiotto, 1992) which he used in the publication of his monograph "Fauna of San Giovanni Ilarione (Parisiano)". In this work, the Sicilian scholar described four important fossiliferous deposits, three of which are in the surroundings of San Giovanni Ilarione, and one in the Vicenza area (Chiampo).



Geological map of the territory of San Giovanni Ilarione drawn by Francesco Secondo Beggiato and published in a text by A. De Gregorio from 1880

De Gregorio's monograph, which presents some curious "errors" (it has 107 pages and not 110 and is enriched with 7 tables and not 9 as appears in the title), is particularly well illustrated and very rare. The approximately 350 illustrations are due to G. Tambuscio. However, the most extensive treatment of the malacofauna of San Giovanni Ilarione is due to Paolo Vinassa de Regny (1895-1897) who, in addition to splendidly illustrating the fossil finds, described around forty new species of molluscs. Other important contributions to the fauna of the "Orizzonte di San Giovanni Ilarione" and to a more modern stratigraphic interpretation of the outcrops are due to the monographs of Fabiani (1915) and Dainelli (1915).
More recently, thanks to the collaboration of Giuliano Piccoli and Paolo Mietto of the University of Padua, a reapprisal of the Paleogene malacological faunas was possible (Mellini, 1989; Mellini & Quaggiotto, 1988).



One of the 7 iconographic plates of De Gregorio's monograph (1880) depicting the fauna of San Giovanni Ilarione

2.b.9 History of the Roncà component

The first reports concerning the fossils of Roncà date back to the 17th century by Martin Lister, geologist and doctor, who in his work *"Historia Conchyliorum"* of 1685-1692, illustrated the *Buccinum musicum* and the *Buccinum B. majus*, gastropods found in Val Cunella di Roncà. Antoine-Joseph Dezallierd'Angerville, in his 1742 treatise, described six species of molluscs while Nicolò Gualtieri, again in 1742, illustrated three specimens of Conchyliorum from Roncà. In the second half of the 1700s many other authors illustrated species from this locality (Knorr, 1755; Klein, 1770; Martini, 1769; Hacquet, 1780). Interest in the Roncà territory increased when, towards the end of the 1700s, the debate between Neptunists and Plutonists expanded, and the mixed volcanic and sedimentary sequences took on a role of primary importance. For these main reasons, Roncà became a destination for pilgrimages of important naturalists from beyond the Alps, including Desmarest and Strange, as well as Italians, such as Fortis, Breislak and Brocchi (Roghi, 2012; Zorzin & Roghi, 2014).
Nicolas Desmarest, a French volcanologist, visited Italy in 1765 to study the main locations with volcanic rocks and verify the presence of basalts associated with sedimentary deposits. During his stay on the peninsula, accompanied by Alberto Fortis, he visited the Val d'Alpone and some valleys in the Roncà area, remaining fascinated by the columnar basalts. Given the association between the latter and volcanic lavas, it will propose an igneous origin for the columnar basalts (Taylor, 1998).
In the important treatise on volcanic phenomena, Giovanni Strange (1778) described in detail many localities with columnar basalts in Italy and France. In the Veneto he visited numerous areas, including San Giovanni Ilarione, reaching as far as Bolca, the Berici and the Euganean Hills. He wrote only brief notes about Roncà. The person who, however, dedicated himself in greater detail to the Roncà area was Alberto Fortis from Padua. In his work of 1778, *"On the volcanic valley of Roncà in the Veronese territory"*, the stratigraphy of the sedimentary and volcanic rocks emerging in the valleys located between the capital and Monte Calvarina is described in great detail, giving great importance to the study of details and defined the Roncà area as extremely important for the geological studies of the time.
Fortis always uses the same work to criticize practically all the theories of the time, mainly born from ancient conceptions and very few direct observations on the ground.
Thus criticizes Anton-Lazzaro Moro, Georges-Louis Leclerc de Buffon and Nicolas Desmarest.
At the end of the treatise Fortis, metaphorically comparing his work to that small stone that broke away from the mountain that causes the colossal statue of Nabucco to fall, he imagined the effect but also underlines that the various scholars "don't blame me" but everything he said is what is written in the book of nature.
During the nineteenth century there were numerous works concerning the fossil faunas of Roncà. For an exhaustive description, please refer to the monograph by Antonio De Gregorio (1896) where, in part introductory,


DELLA VALLE
VULCANICO-MARINA
DI RONCA'
NEL TERRITORIO VERONESE
MEMORIA ORITTOGRAFICA
DEL SIG. ABATE FORTIS
Socio de' Curiosi della Natura di Berlino, e dell' Academie delle Scienze di Bologna, di Bordeaux, di Lunden, di Siena ec.
IN VENEZIA
MDCCLXXVIII.
Nella Stamperia di CARLO PALESE.

Title page of Fortis' work *"On the volcanic valley of Roncà in the Veronese territory"*, published in Venice in 1778 (Ancient Section of the Library of the Department of Geosciences, University of Padua)

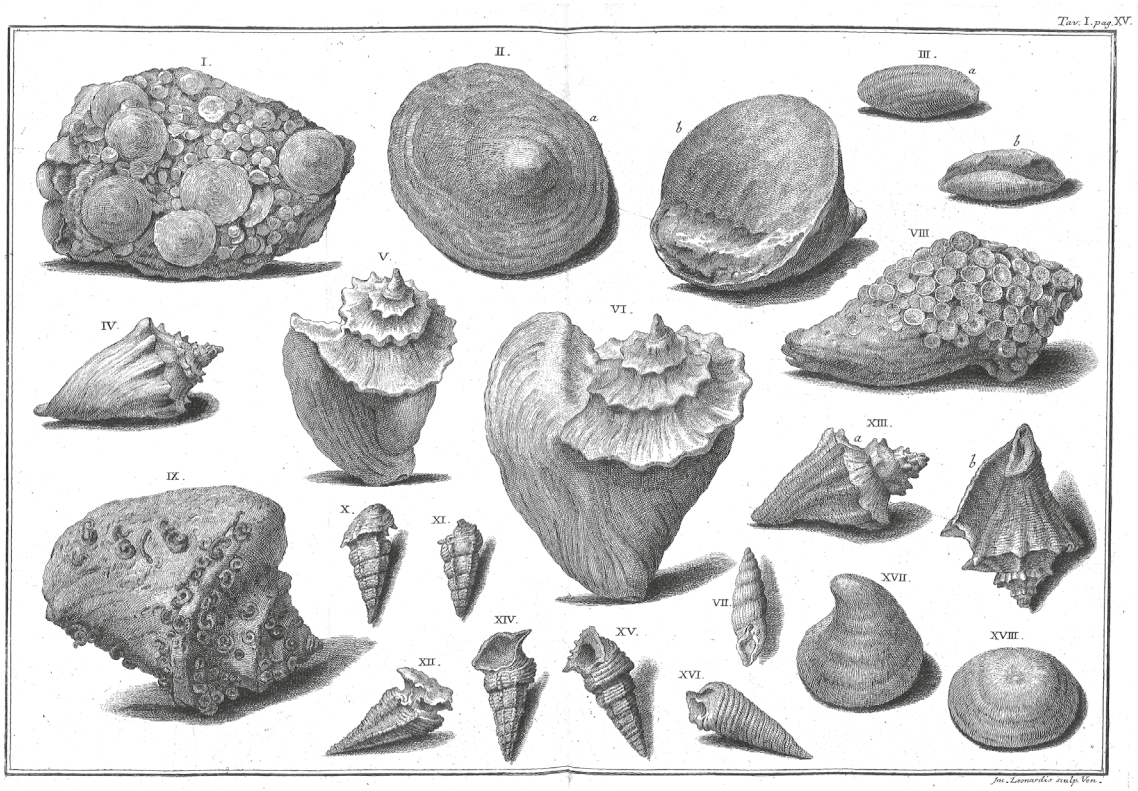
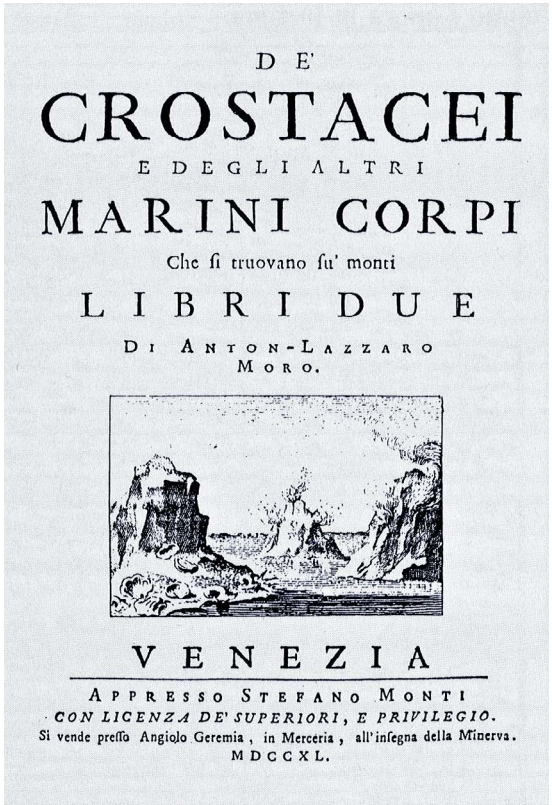


Table I taken from *"On the volcanic valley of Roncà in the Verona area"* by A. Fortis (1778)


D E'

CROSTACEI

E DEGLI ALTRI

MARINI CORPI

Che si truovano su' monti

LIBRI DUE

DI ANTON-LAZZARO MORO.

VENEZIA

APPRESSO STEFANO MONTI

CON LICENZA DE' SUPERIORI, E PRIVILEGIO.

Si vende presso Angiolo Geremia, in Merceria, all'insegna della Minerva.

MDCCXL.

Frontispiece of *"Dé crostacei e degli altri marini corpi"* by Anton-Lazzaro Moro (1740)

the various authors and the relative list of the invertebrate species described are cited. De Gregorio commissioned Vittorio Meneguzzo, his geological guide, to compose a stratigraphy of the Val Nera di Roncà (Roghi, 2012). Brongniart in 1820 accompanied by Domenico Trettenero explored, and described the outcropping limestones in what he calls Valle di Roncà, made up almost entirely of nummulites and prismatic basalts, and proposes a stratigraphic description, illustrating it in one of his works from 1823. The Roncà deposits, known above all for the findings of invertebrate and vertebrate fossils, contain within them also plant fossils found and studied almost exclusively in the 19th century by Abramo Massalongo (1854, 1857a, 1857b, 1858, 1859). A long series of paleontological studies and research by Baron De Zigno on Monte Duello date back to the second half of the 19th century. The Monte Duello (or Zuello) deposit is located west of Roncà in correspondence with the small mountain ridge of the same name, which separates the Alpone torrent from the Rio Fiumicello. Interspersed with the basaltic rocks that make up the western

slope of Monte Duello, there is a series of layers belonging to the middle Eocene, calcareous at the base, more arenaceous above. In the more carbonate levels numerous nummulites are found, which become less and less abundant as we proceed upwards, until they disappear or almost disappear in the arenaceous levels. The latter contains many fossil traces of fishes, reptiles, aquatic mammals and even rare bird remains (De Zigno, 1881, 1884). The fossil vertebrates from this site are preserved at the Museum of Nature and Man of the University of Padua and at the local Paleontological Museum of Roncà.

The organisms preserved within the Monte Duello limestones lived in a marine-brackish environment that gradually transitioned to swamp and dry land conditions. Of particular importance was the discovery of a practically complete skeleton of *Prototherium intermedium* (see De Zigno, 1875), of some isolated vertebrae (De Zigno, 1890b) of a large snake (*Palaeophis oweni*), of two turtle remains (*Trionyx capellinii*) (De Zigno, 1889) and a skull and mandible of *Crocodylus arduini* (De Zigno, 1880). For the latter species Mook (1955) established the genus *Megadontosuchus*, referred to the subfamily Tomistominae (Roccaforte *et al.*, 1994).

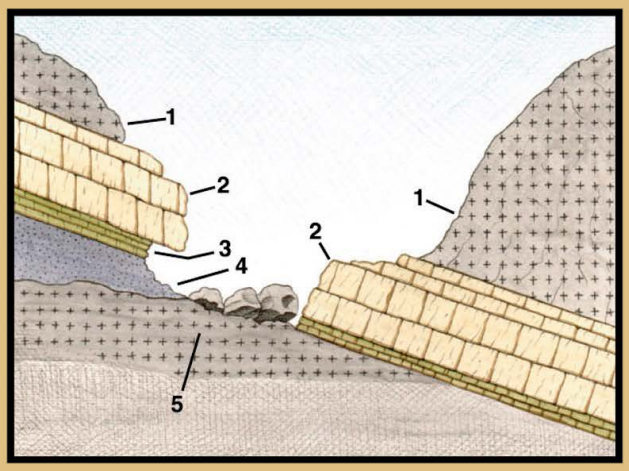
In 1915 Ramiro Fabiani described two stratigraphic successions located approximately 1 km north of Roncà, on the hydrographic right of the Valle della Chiesa, at an altitude of 155 m above sea level, near Casa Tessari (A). The series described, proceeding from above downwards, or from the most recent terms to the oldest ones, are those of "Casa Tessari" (B) and "behind Casa Tessari" (C).



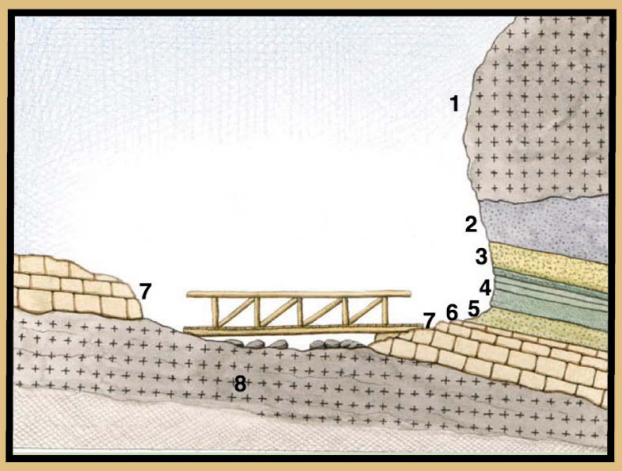
Cast of the *Megadontosuchus arduini* holotype exhibited at the Paleontological Museum of Roncà (length 58,5 cm)



A



B



C

Successionat Casa Tessari (B)

1. Subaerial basalt
2. *Nummulites brongniarti* limestones, *"Corbis" maior* and other molluscs
3. Tufi in *Ostrea*
4. Black tuffs in *Cerithium, Ampullina, Nummulites*, etc.
5. Basalt of underwater environment

Succession behind Casa Tessari (on the hydrographic left of the stream) (C)

1. Subaerial basalt
2. Non-fossiliferous tuffs
3. Layered tuffs
4. Marls with remains of phyllites
5. Marly limestones
6. Earthy horizon with abundant lignite (20-30 cm thick) with crocodile teeth (*"Crocodilus" arduini*), remains of turtles (*Trionyx*), palms and pulmonatemolluscs (*Helix, Cyclostoma, Limnaeus*)
7. *Nummulites brongniarti* limestones. The upper portion has a dark color with fragments of basaltic rock
8. Basalt of underwater environment

More recently, other scholars, both foreign and Venetian, have continued their research on the Roncà Horizon.
The Roncà geological horizon is attributed to the beginning of the Bartonian, about 40 million years ago (upper part of the middle Eocene). This is a series of volcanics that show a rapid transition from submarine to paralic to continental conditions. This evolution is linked to the accumulation of volcanic products.
The paralic facies, which is characteristic of transitional environments, constitute the so-called "Roncà Horizon".
The normal marine carbonate sedimentation (Nummulitic Limestones) that occurred in Roncà during the Bartonian was often interrupted by eruptions of volcanic lava, also submarine. Marine currents dismantled these volcanic deposits which were subsequently redeposited. The tuffites (or loose volcanosedimentary materials) originated from the mixture of these materials. The seabed was rapidly colonized by animal and plant organisms whose remains have been well preserved to this day. These are the famous "fossiliferous tuffs" of the ancient Authors. Molluscs, in this sense, have been privileged to possess robust shells which, through various fossilization processes, have been preserved to this day.
For over a century the Valle della Chiesa and Monte Duello deposits were not excavated. In fact, we will have to wait until 2010 when the municipality of Roncà will obtain an excavation concession that has been renewed, year after year, until 2023.
Since 2010 and, practically without interruption until today, that the municipality of Roncà has financed a series of research and excavations of geological and paleontological interest (see Annex 5.4 Excavation, restoration, study and enhancement) in the locality "Valle della Chiesa" and Monte Duello" (Zorzin & Roghi, 2014). As regards the Valle della Chiesa, the areas affected by the excavations are located on the hydrographic left of a small tributary valley on the right of the Valle della Mola, in the "Cascata" and Casa Tessari localities, as well as in the "il Costo" locality.
Along the road at this last location there





At the top: Preparation of the excavation site in October 2020 in the "Cascata" location (Valle della Chiesa)
On the bottom: *Campanilopsis*. These gastropods are very abundant in some levels of the *"Roncà Horizon"*

are *Dilatilabrum fortisi* tuffs covered by *Nummulites brogniarti* limestones.
The paleontological excavations carried out in Valle della Chiesa have also allowed the recovery of numerous well-preserved remains of *Cerithium*, *Velates*, *Campanilopsis*, *Pyrazopsis*, *Tympanotonos*,*Pseudobellardia*, *Pachycrommium*, *Jponsia*, *Bayania*, *Fimbria* and *Crassostrea*.
As regards, however, paleontological research on Monte Duello (Frisone & Zorzin, 2012; Zorzin *et al.*, 2012), these concern the south-western side of the mountain relief and are located in the municipality of Montecchia di Crosara (VR) near Via Casarotti, at an altitude of approximately 109 m above sea level.

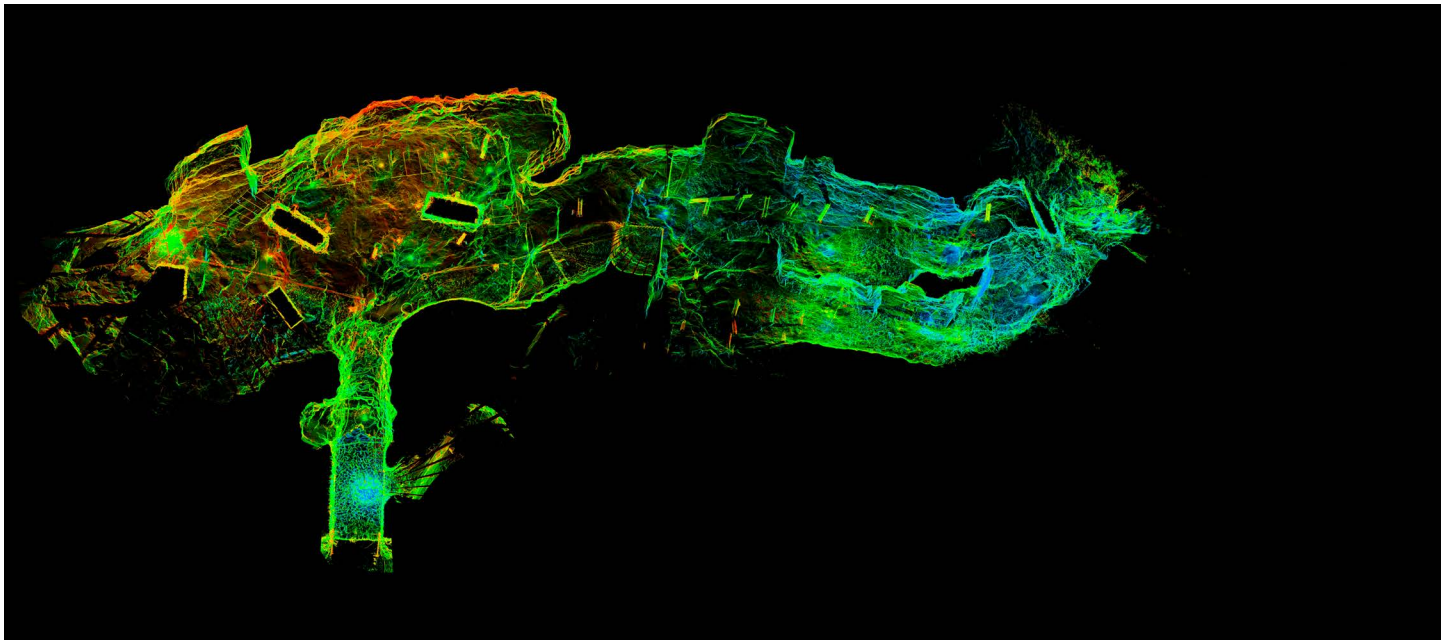
The excavations started in 2010 mainly involved two main areas located on a front of approximately 15 m and a height of approximately 3 m, but close to each other, characterized by a sequence of massive limestones of a yellowish-greyish colour, stratified and alternating with marly limestones and yellowish marl. Some limestone layers of the stratigraphic succession involved in the excavations are particularly rich in fossil remains preserved, in most cases, as internal models or imprints of bivalves and gastropods. These are bivalves (*Venericardia, Venericor, Fimbria, Chama, Cardita, Nemocardium, Arcopagia, Lima, Mylilus, Barbatia, Crassatella, Bicorbula, Crassostrea, Pseudomiltha, Tellina*) and gastropods (*Velates, Tectus, Trochus, Campanilopsis, Ampullina, Eoconus, Seraphs, Cerithium, Campanile, Vicetia, Terebellopsis*). Furthermore, there are numerous foraminifera (Nummulites) and the remains of corals while, rarer, shark teeth (*Oxyrhina)*. The faunal association of Monte Duello is, in many ways, similar to a fossiliferous level identified on the hydrographic left of Valle della Chiesa, a few hundred meters south of the "waterfall" locality.
The paleontological research launched by the Municipality of Roncà in the Valle della Chiesa area and on Monte Duello was carried out using stratigraphic methodologies and was preceded by a series of small "assays". The almost 2000 fossil finds recovered during the excavation campaigns have increased the paleontological heritage preserved at the Paleontological Museum of Roncà (Zorzin & Zannotti, 2018) which aims to be, for its collections of bivalves and gastropods from the upper Eocene (see Appendix 5 Paleontology of the deposits, point 6), an important center of documentation, scientific research, and educational dissemination of fundamental importance for the valorisation of the area and the Val d'Alpone.



Monte Duello horizon characterized by abundant remains of gastropods and bivalves preserved as internal models

2.b.10 The recent history of the deposits

Pesciara is the most famous and important Ypresian paleontological site (Fossil-Lagerstätte) in Italy and certainly among the most relevant worldwide. The Pesciara deposit is made up of a sequence of limestone sediments approximately 19 meters thick and of limited extension (a few hundred m^2). The fossils, mainly represented by fish and plants, are found within five superimposed levels, made up of densely laminated very fine-grained limestones, interspersed with detrital limestone layers within which there are only remains of invertebrates such as macroforaminifera, shells of bivalves and gastropods.
The area immediately surrounding Bolca is rich in fossiliferous sites of different extensions. Below is a brief description, also historical, of the most significant ones, starting from the oldest.

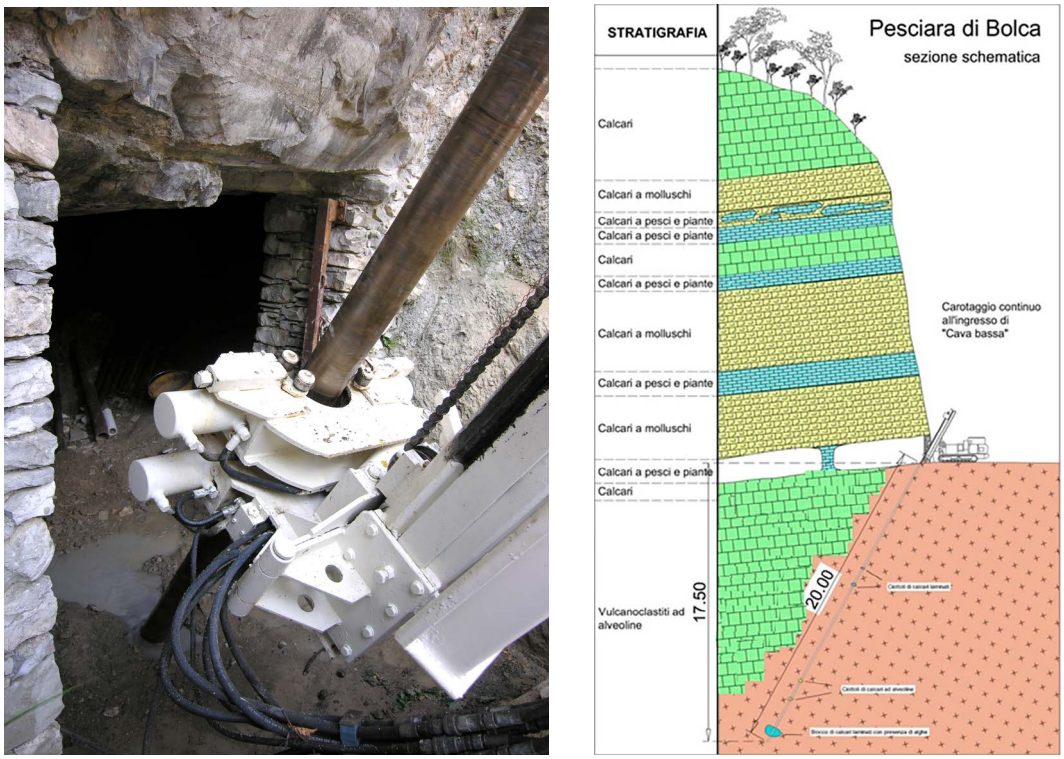


Plan of the tunnel open to the public in Pesciara, created with the laser scanner (survey F. Dalle Pezze, 2015)

2.b.10.1 New stratigraphic data for Pesciara

As we have already mentioned, the Pesciara deposit constitutes an interesting case study from a geological point of view since it is made up of a block of stratified limestone isolated within volcanic and/or volcaniclastic rocks (olistolite).
Until a few years ago, studies were dedicated almost exclusively to fossiliferous calcareous levels, but in recent times investigations have also been aimed at the surrounding volcanic rocks which emerge discontinuously in the middle-upper part of the Val del Fiume (southern sector of the Monte Postale). The outcropping volcanic lithotypes are mainly made up of stratified volcaniclastic rocks (tuffs and products of the reworking of hyaloclastites) and intra- and extradiatremic volcanic breccias (Barbieri & Medizza, 1969). The latter characterize the rocks surrounding Pesciara represented by deposits without stratification, whose

components are mainly basaltic and tufaceous fragments, calcareous and siliceous clasts, and microfossils (mainly alveolines) both isolated and contained within the clasts themselves. While the exposedlimestone sediments show an evident lateral contact with the volcaniclastic rocks, nothing was known about what lay directly below the fossiliferous levels. For this reason, in the summer of 2011, continuous rock core drilling was carried out in front of the entrance to the tunnel opened in the last century. The drilling deepened for 20 m from the ground level and had an inclination of approximately 60° to be as perpendicular as possible to the stratification (Papazzoni *et al.*, 2012).



Pesciara: continuous inclined core drilling carried out in 2011 near the entrance to a tunnel excavated in the 19th century, schematic stratigraphic section (right)

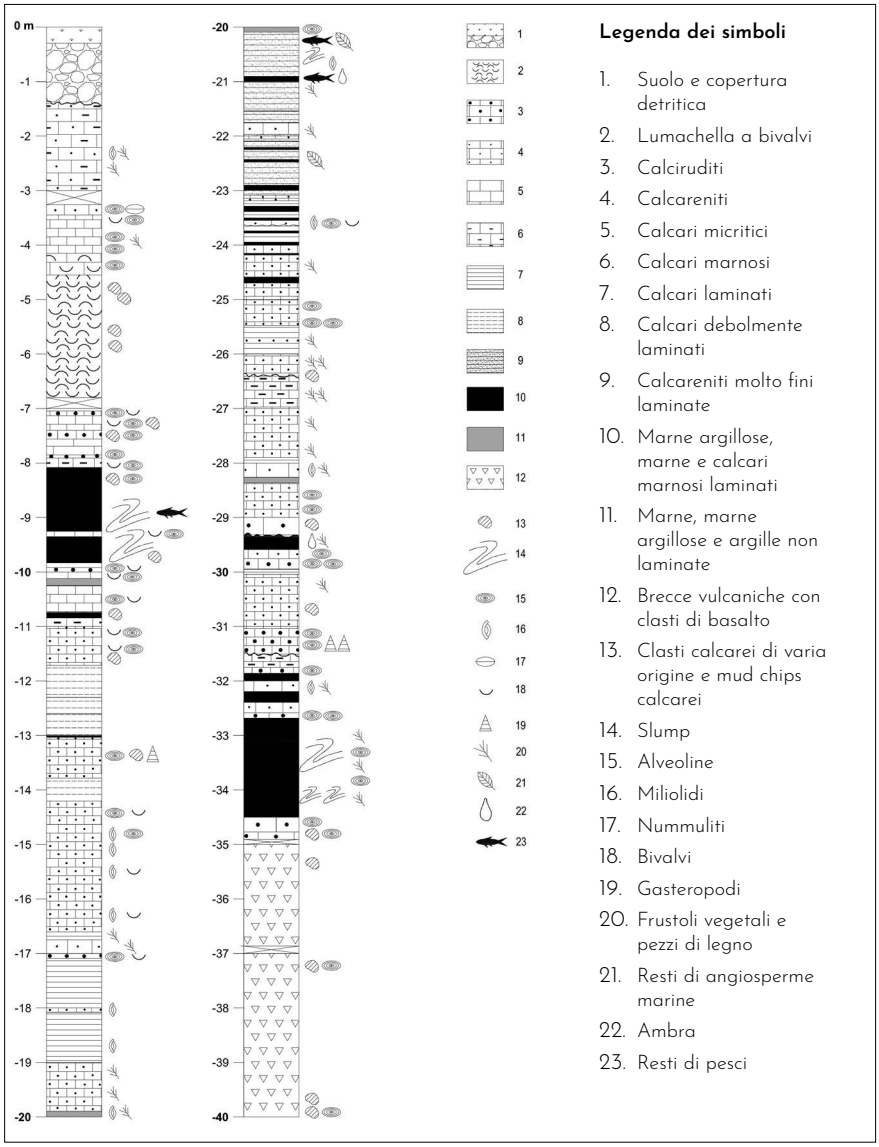
The volcaniclastic rocks crossed by the core sample contain within them fragments of limestone lithotypes, sometimes strongly altered by heat, which probably represent edges of the rocks encasing the volcanic chimney from which the effusive products escaped. Most of these calcareous clasts are coeval with the Pesciara layers, some are slightly older (reworked extraclasts of lower Cuisian limestones had already been reported by Papazzoni & Trevisani, 2006). Rare enigmatic clasts of lithotypes (mudstones) have also been recognized in the core which could represent facies that are no longer outcropping or completely eroded today.
The fact that the isolated alveolines, presumably contemporary with the eruptions, are of middle Cuisian age (upper part of Upper Ypresian), suggests that the pyroclastic products are of the same age (Papazzoni *et al.*, 2012) and further confirms that the eruptions occurred in a submarine environment (Barbieri *et al.*, 1991).

It is possible that the volcanic activity is to some extent also linked to the isolation of the Pesciara limestone block, which may have been detached from the rest of the platform and covered by volcaniclastic material shortly after its deposition.
In light of the new stratigraphic data acquired with core sampling and to better understand the genesis of the Pesciara olistolith and to attempt to reconstruct the complex geological context around it, some geoelectrical investigations were carried out in the second half of 2012 and 2013.
These investigations highlighted the presence of a separate buried body, potentially corresponding to an extension into the Pesciarasubstrate . In order to verify the nature and composition of the buried limestone block, it was decided to carry out a survey precisely on the vertical of the detected anomaly, located on the south-eastern side of the Pesciara di Bolca, near the tourist entrance to the tunnels. The results of the core sampling, carried out in June 2015, confirmed the accuracy of the geoelectrical data, leading to the recovery of a succession of sedimentary rocks which integrates and expands knowledge of the limestone block emerging from Pesciara (Roghi *et al.*, 2015).
In particular, the continuous core drilling, which delved 40 m from the ground level, intercepted a succession of over 30 m of predominantly calcareous sedimentary rocks overlying a substrate made up of volcaniclastic rocks. The recovered sedimentary succession, almost twice as thick as the known one outcropping in Pesciara, contains three main intervals of fossiliferous laminites (with fish, plants and amber), separated by thick calcarenitic and calciruditic intervals, rich in alveolinids and bivalves. By integrating the geoelectrical data already acquired with the sedimentological and stratigraphic data obtained from drilling, it is possible to state that the deposit is still potentially exploitable for future paleontological excavations.





Continuous inclined core drilling carried out in 2015 in front of the entrance open to the public of Pesciara



Complete stratigraphic log of the succession recovered in the core drilling in Pesciara in 2015 (Roghi *et al.*, 2015)

The Val d'Alpone continues to be a source of unexpected paleontological discoveries for both fish and crustaceans, the latter already known and described in the past (Moro, 1740; De Gregorio, 1895).
These new discoveries allow researchers to gain important insights.
In fact, in recent years (Beschin *et al.*, 2015, 2016) abundant assemblages of fossil crustaceans have been found within numerous bioconstructions dating back to the lower Eocene, widespread in the Bolca area, in particular in Vestenanova, Rama, Cracchi, Laisi, Monte Postale, Valecco and Zovo. New crustacean faunas have recently been reported also for the Altissimo (VI) area (Beschin *et al.*, 2021). Within these bioconstructed bodies, made up mainly of corals, calcareous algae, larger benthic foraminiferans, molluscs and fragments of sea urchins, more than 1,000 specimens of small crustaceans, adapted to living in a coral environment, were found, which they are the same age as the much more famous and showy fish found in Pesciara and Monte Postale. Among this rich carcinological material, approximately 140 species have been identified, of which more than 70 are new to science and show a clear relation with the crustaceans that live

in tropical seas today. The presence of the aforementioned organogenic accumulations, not too extensive but widespread, suggests the existence of a large lagoon with small reefs (patch reef) probably separated from the open sea by a real coral reef.
Therefore, we can state with certainty that Bolca is the place in the valley that offers a wide and varied scenario of marine life, in a period of great biotic evolution such as the Eocene.

Winter aspect of Pesciara



2.b.11 The Val d'Alpone collections preserved in Italy, Europe and the rest of the world

The richness and extraordinary paleontological uniqueness of the Val d'Alpone are well documented by the vast spectrum of publications produced over time and by continuous research, which have contributed to increasing knowledge on the various deposits located in the area.

To provide substance and corroborate the systematic investigations conducted to date, there is an extensive material heritage, kept in museums and collections. It is, in part, a true legacy of the past, both the result of collection campaigns and research carried out by the first scholars, and testimony to the lively and heated interest that the fossils of the Val d'Alpone received among collectors in historical times. and the notoriety that made them interesting objects of exhibition and exchange. On the other hand, this heritage continues to be enriched thanks to excavation campaigns, carried out with scientific criteria starting from the second half of the twentieth century and then resumed with new impetus in the last decade. These have made it possible to provide further data for research, as well as reserving surprising new discoveries which have the merit of adding important pieces in the reconstruction of the history of life on Earth.

Given the history of the paleontological deposits of the Val d'Alpone, it is understandably imaginable that the heritage extracted from them over the centuries is extremely notable in quantity and that the material may have found a wide spatial distribution in both public and private collections. If the latter represent, unfortunately, an underwater world that is difficult to explore, for the collections kept in accessible museums and institutions, we wanted to carry out a census that could help define their location and relevance, to determine the state as much as possible current findings and in order to increasingly minimize the gap between hypotheses and objective data.

2.b.11.1 Mapping to build networks: the case of Val d'Alpone

Starting from the awareness that the paleontological collections kept by museum institutions are a fundamental substance for the progress of research and acquire the indispensable value of a new "repository" of data, where the accessibility of the original sites, the detection of their distribution and consistency is limited takes on a fundamental meaning in pursuing the aim of conservation and valorisation of the finds.

This survey is a contribution to encourage the creation of a network of museums for the communication of data relating to collections, ensuring traceability, reducing where possible the loss of information and encouraging the use of the material for study and research purposes.

A project was therefore carried out whose main objective was to create an unprecedented and integrated list of museums with collections relating to the deposits of the Val d'Alpone, providing where possible quantitative information on the material hosted in various institutes.

For this purpose, in 2019 ATS had prepared and sent a short questionnaire, to be filled in, to estimate the presence and consistency of the collections of fossils from the Val d'Alpone present in the collections of the main Italian and foreign museums.

Given the difficulties of filling it out and therefore getting an answer, the questionnaire was drawn up in such a way as to be immediate in reading and easy to complete, leaving the subjects in charge of data collection free to provide an estimate or an objective indication of the substance of the collections, specify their composition and contribute with additional information.

The questionnaire was designed to facilitate collaboration on the part of the institutions as much as possible and facilitate its rapid compilation.

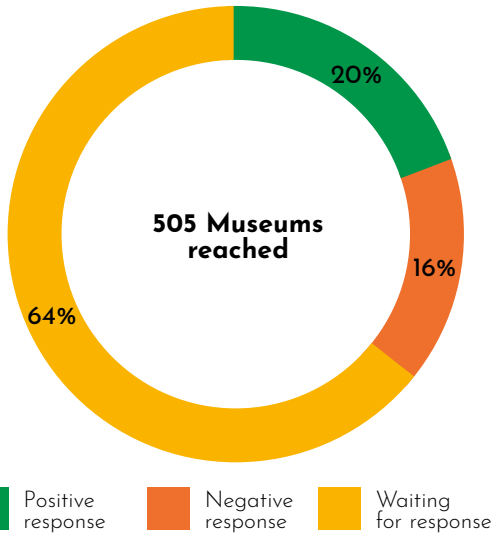


Questionnaire prepared for the collection of data on the presence and consistency of collections of the three components of the Val d'Alpone, sent to Italian and foreign museum institutions

Thanks also to the collaboration of the Civic Museum of Natural History of Verona, starting from September 2020 and lasting one year, the mapping project of the paleontological collections of the Val d'Alpone scattered around the world has restarted.
On the distribution of the Bolca collections, there already existed a non-exhaustive list referring only to fish, published in 1969 by Jacques Blot in his work *"Les poisons fossiles du Monte Bolca"*, which cited 46 Italian and foreign museums that housed the ichthyofauna fossil from this component. This work, combined with bibliographic research on the historical collections relating to the fossils of Bolca (see Annex B), was preparatory for the search for museums and institutes that could possess paleontological material of interest, defining a basis for preparing a list of bodies to contact and to which the request should also be extended for the other two components: Roncà and San Giovanni Ilarione.
Through further online research, the spectrum of possible museums or institutions that host finds from the Alpone Valley was broadened and additional information was found to extend the scope of theinvestigation.
The number of museums and institutions identified as of September 2023 was a total of 505 worldwide. Those that clearly indicated the specific presence of local collections, linked to the territory they belong to, were directly excluded. Attachment A contains the list of museums that responded, specifying the presence or absence of finds from the three macro-areas pertaining to the deposits.
The attachment also shows those museums from which it has not been possible to receive direct communication, but to which it is possible to attribute, albeit with partial data, the location of finds of interest, thanks to the research work carried out over the years by specialists.
The questionnaire was then sent to each selected museum and institute, accompanied by a cover letter.

2.b.11.2 Results

The museums that have actively collaborated in the census are, at present, 183 out of 505 (36%). As specified in the graph below, 81 (16% of the total) declared that they did not possess finds from the Val d'Alpone in their collections, while 102 (20% of the total) confirmed the presence of paleontological objects coming from this area.

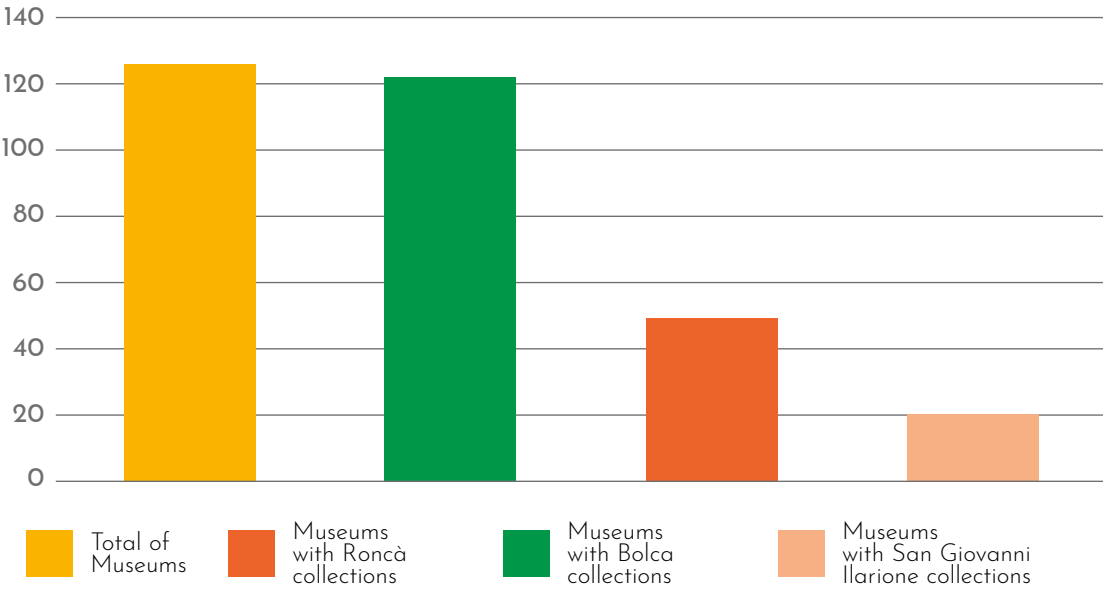


Response percentages of the museums contacted and outcome of the research regarding the presence of fossils from the Val d'Alpone in the collection

Below: Velates. Lateral and basal view of one of the most common gastropods of the "Roncà Horizon" (length 36 mm)

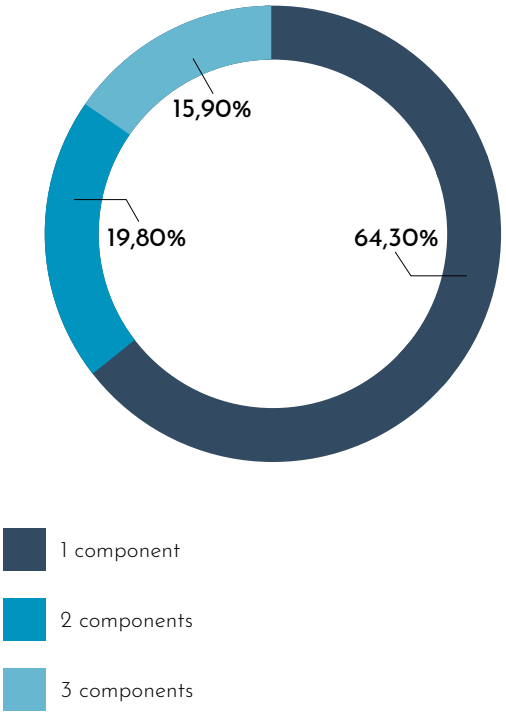


To these 102, 24 museums must be added, reported in Jacques Blot's publication or directly by specialists, whose presence of artefacts in the collection is known, although the data requires integration and updating. Overall, a further distinction can then be made, specifying the number of museums in which it is possible to find collections of Bolca (122), Roncà (50) and San Giovanni Ilarione (20).
It thus emerges that of the 126 museums that provided a positive response, 96.8% possess fossils from Bolca, 38.8% from Roncà and 15.9% from San Giovanni Ilarione.



Distribution of the collections referring to the three components on the total of museums that have confirmed the presence of fossil finds.

On the other hand, of the 126 museums currently known to host the paleontological heritage of the Val d'Alpone, 64.3% have material coming from only one of the three components (60.3% Bolca, 4% Roncà), 19.8% has finds from two components (Bolca and Roncà) and 15.9% houses goods relating to all three components (Bolca, Roncà and San Giovanni Ilarione.



Percentage of museums with the presence of one, two or all three components of the Val d'Alpone in the collection

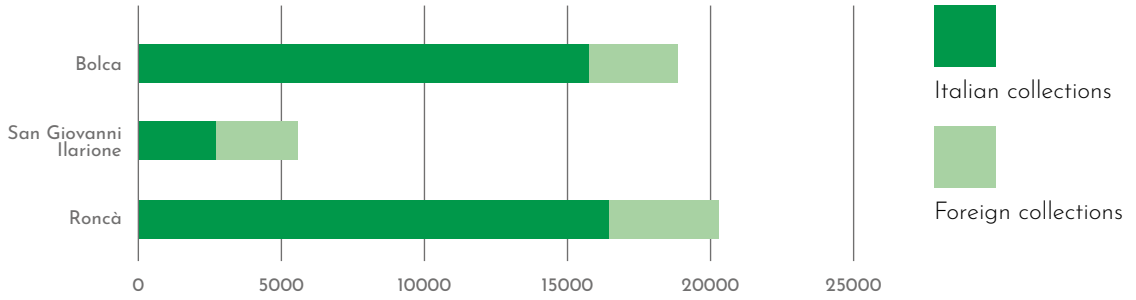
2.b.11.3 The paleontological heritage of the Val d'Alpone: its location

The presence of finds from the Val d'Alpone in collections of Italian and foreign museums depends on various factors.
In encountering collections of fossils from the Val d'Alpone in museums in the Veneto. The same applies to the concentration, in quantitative terms, of paleontological material in the first aggregation center present in the region: the Natural History Museum of Verona. The large collections present here are a legacy of the strong bond built over time between the Val d'Alpone area and the constellation of scholars gravitating around this research site. For the Natural History of Verona, there is also the strong push given by the paleontological excavation campaigns conducted over the years, capable of progressively and continuously increasing the preserved heritage. In general, the distribution of finds in different museums is mainly linked to the acquisition of historical collections or donations made in historical times as in the case of the Bolca finds now present in the Muséum national d'Histoire naturelle of Paris or in the Naturhistorisches Museum of Vienna. In the specific case of the Muséum national d'Histoire naturelle of Paris, the finds arrived at two different times, initially through confiscation by Napoleon's armies, with subsequent compensation to Count Gazola, owner of the collection, and, subsequently, through a donation by Gazola himself to Napoleon. For the Naturhistorisches Museum of Vienna, however, there was a direct offer of some specimens by Baron Achille de Zigno to the young emperor of Austria, Franz Joseph I, who was visiting Verona. In other cases, theavailability of finds in the various museum collections occurred through exchanges between museums, such as that concerning,



Museums with the largest collections relating to the three components of the Val d'Alpone

for example, some specimens of fish from Bolca which took place in 1884 between the museum of Marseille and that of Nimes or more recent donations which took place during the twentieth century. Considering the individual components, however, it is possible to observe that in addition to the aforementioned Natural History Museum of Verona, the finds are concentrated more in certain museums where a sort of "specialization" is highlighted, often due to specific interests on the part of those responsible for the collections and of their collaborators. Then there is the particular case of the museums of Bolca and Roncà where the concentration and type of fossils is closely linked to the territorial character of the collections and specific to these realities. Finally, it can be observed that the fossils which find the greatest and widest diffusion among various museums are understandably those for which the macro-areas of origin are historically famous (fish and plant remains for Bolca, molluscs for Roncà and San Giovanni Ilarione, crustaceans for San Giovanni Ilarione).
The diagram below shows how the collections of the three components are divided between Italian and foreign museums to underline the "specialization" highlighted previously.

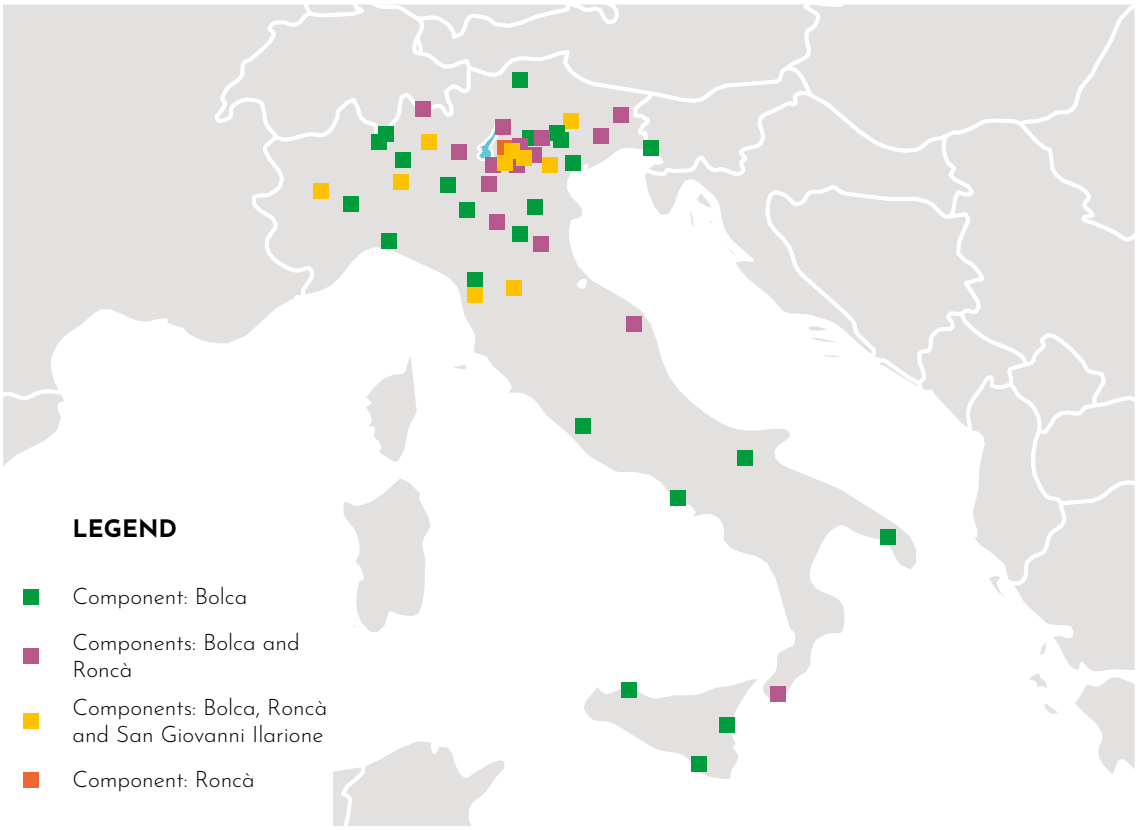


Distribution of collections between Italian and foreign museums

Below: Fossils collected by Giovanni Meneguzzo in 1867 at the outcrops of San Giovanni Ilarione, currently preserved at the Natural History Museum of Florence



The data obtained with the "census" project therefore made it possible to create a first representation of the distribution of paleontological collections on Italian territory and in the world, reported below, with the list below of the names of the museums in which the presence of the paleontological heritage of the Val d'Alpone.



Locations of the paleontological collections of the nominated serial property in Italy

CALABRIA: Museo di Paleontologia e scienze naturali dell'Aspromonte - Bova

CAMPANIA: Museo di Paleontologia – Centro Musei delle Scienze Naturali e Fisiche - Università Federico II

EMILIA ROMAGNA: Museo di Paleontologia dell'Università degli Studi di Parma; Museo civico di storia naturale di Ferrara; Museo di Paleontologia dell'Università degli studi di Modena e Reggio Emilia; Museo «Giovanni Capellini» di Bologna; Museo «Giuseppe Scarabelli» di Imola

FRIULI VENEZIA GIULIA: Museo friulano di storia naturale; Museo civico di storia naturale di Trieste

LAZIO: Museo universitario di Scienze della Terra - Roma

LOMBARDIA: Civico Museo Archeologico di Arsago Seprio; Museo civico di Storia Naturale di Morbegno; Museo di Scienze Naturali «Mario Realini»; Museo civico di Scienze naturali E. Caffi di Bergamo; Museo civico di Storia Naturale di Milano; Museo di Storia Naturale dell'Università di Pavia; Museo civico di Scienze naturali di Brescia; Palazzo Ducale di Mantova; Museo di Storia Naturale di Cremona

LIGURIA: Museo civico di storia naturale «Giacomo Doria»

MARCHE: Museo civico di storia naturale di Macerata

PIEDMONT: Museo regionale di Scienze naturali di Torino; Museo paleontologico territoriale dell'Astigiano

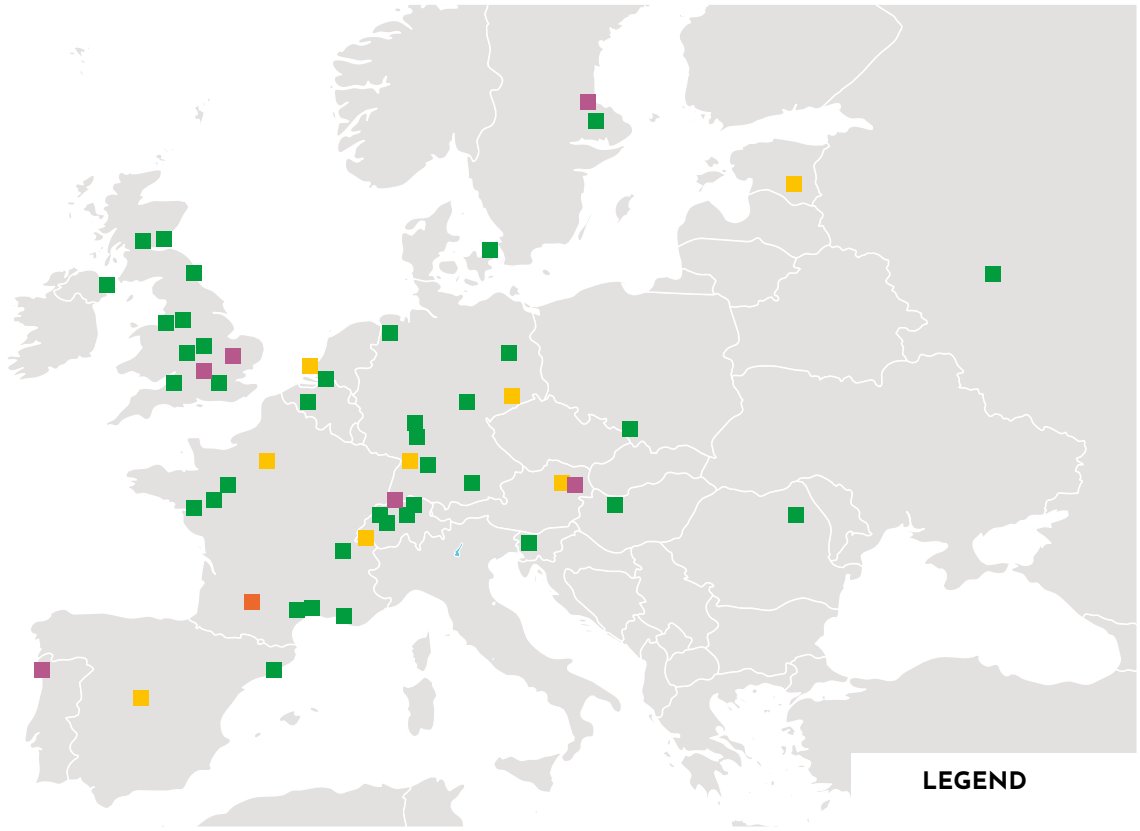
PUGLIA: Museo di storia naturale di Foggia; Museo missionario cinese e di storia naturale di Lecce

SICILY: Museo civico di storia naturale di Comiso; Museo di Scienze della Terra di Catania; Museo geologico G. Gemmellaro di Palermo

TRENTINO ALTO ADIGE: Museo di Scienze naturali di Bolzano; Istituto Salesiano Rainerum di Bolzano; Fondazione Museo Civico di Rovereto

TUSCANY: Museo di storia naturale dell'Università di Pisa; Gabinetto di storia naturale del Liceo classico Macchiavelli di Lucca; Museo di Storia Naturale di Firenze

VENETO: Museo Civico di Storia Naturale di Verona; Museo dei Fossili di Bolca; Museo Paleontologico di Roncà; Museo Geopaleontologico di Camposilvano; Museo civico geopaleontologico di San Bonifacio «Abate don Giuseppe della Tomba»; Museo paleontologico e dell'origine del territorio «Attilio Fedrigo»; Museo «Padre Aurelio Menin» di Chiampo; Museo civico «Domenico Dal Lago»; Museo G. Zannato di Montecchio maggiore; Museo civico di Bassano del Grappa; Museo naturalistico archeologico di Vicenza; Museo storico naturalistico del Seminario Vescovile di Vicenza; Museo del Santuario di Monte Berico; Museo dei fossili di Villa Godi Malinverni a Lugo di Vicenza; Museo della Natura e dell'Uomo dell'Università di Padova; Museo di storia naturale e archeologia di Montebelluna; Museo civico di Crocetta del Montello; Museo di scienze naturali «A.de Nardi»; Museo paleontologico «Michele Gortani» di Portogruaro; Museo di storia naturale di Venezia



Locations of the paleontological collections of the Val d'Alpone nominated serial property in Europe

AUSTRIA: Naturhistorisches Museum Wien

BELGIUM: Institut royal des Sciences naturelles de Belgique - Bruxelles

DENMARK: Statens Naturhistoriske Museum – Copenhagen;

ESTONIA: University of Tartu - Natural History Museum

FRANCE: Muséum national d'Histoire naturelle - Paris; Muséum des Sciences Naturelles d'Angers; Muséum d'Histoire Naturelle de Nantes; Musee Vert du Mans ; Musée des Confluences – Lyon; Institut des Sciences de l'Évolution de Montpellier; Museum d'histoire Naturelle de Toulouse; Muséum d'histoire naturelle de Nîmes; Muséum d'histoire naturelle de Marseille

GERMANY: Übersee-Museum Bremen; Museum für Naturkunde Berlin; Senckenberg Naturhistorische Sammlungen Dresden; Senckenberg Naturmuseum Frankfurt; Hessischen Landesmuseums Darmstadt; Staatliches Museum für Naturkunde Karlsruhe; Naturkundemuseum Stuttgart; Paläontologisches Museum München; Goethe Nationalmuseum - Weimar

HUNGARY: Magyar Természettudományi Múzeum – Budapest

MOLDOVA: National Museum of Ethnography and Natural History - Chișinău

NETHERLANDS: Naturalis Biodiversity Center - Leiden; Oertijdmuseum - Boxtel

POLAND: Nature Education Centre - Jagiellonian University - Kraków

PORTUGAL: Museo de la Historia Natural y de la Ciencia de la Universidad de Porto

RUSSIA: Orlov Paleontological Museum - Moscow

SLOVAKIA: Slovak National Museum - Bratislava

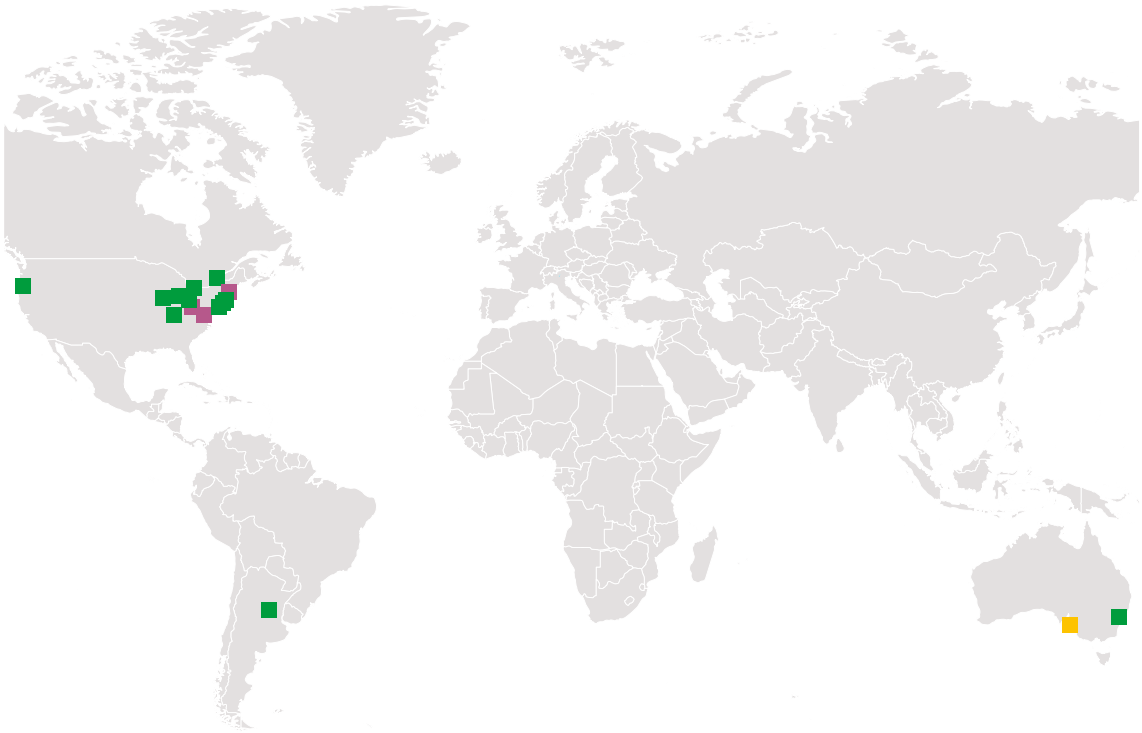
SLOVENIA: Slovenian Museum of Natural History - Ljubljana

SPAIN: Museo Nacional Ciencias Naturales – Madrid; Institut Català de Paleontologia «Miquel Crusafont» - Sabadell, Barcelona

SWEDEN: Uppsala universitet Evolutionsmuseet; Naturhistoriska riksmuseet – Stockholm

SWITZERLAND: Basel University - Institute of Geology and Paleontology; University of Zurich's Paleontological Museum; Natur-Museum Luzern; Naturhistorische Museum Bern; Muséum d'Histoire Naturelle de Neuchâtel; Musée d'histoire naturelle de Fribourg ; Muséum d'histoire naturelle - Geneve

UNITED KINGDOM: Hunterian at Kelvin Hall – Glasgow University; National museum of Scotland - Edinburgh; Sedgwick museum of Earth Sciences – Cambridge University; Great North museum (Hancock & Sunderland); World museum – Liverpool; Manchester museum; Leicester museums & galleries; Bristol museum & art gallery; Natural history museum of London; Museum of natural history – Oxford University; Lapworth Museum of Geology - Birmingham; Ulster museum – National museums of Northern Ireland



Locations of the paleontological collections
of the Val d'Alpone serial site in non-European continents

ARGENTINA: Museo de Ciencias Naturales y Antropológicas «Prof. Antonio Serrano» - Paranà

AUSTRALIA: South Australian Museum - Adelaide; Australian Museum - Sydney

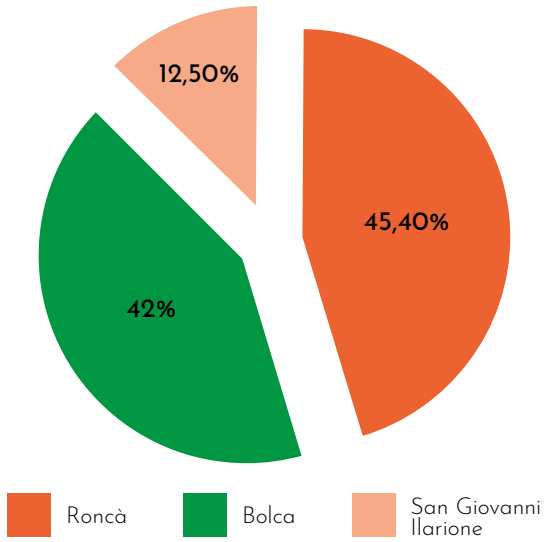
CANADA: Redpath Museum - McGill University - Montréal; Royal Ontario Museum - Toronto

UNITED STATES: Harvard Museum of Comparative zoology - Cambridge; Yale Peabody Museum of Natural History - New Haven; American Museum of Natural History - New York; Smithsonian National Museum of Natural History - Washington; Natural History Museum - Princeton University; Carnegie Museum of Natural History - Pittsburgh; Cleveland museum of Natural History; Museum of Paleontology - University of Michigan; Cincinnati Museum Center; Field Museum - Chicago; Condon Fossil Collection, Museum of Natural and Cultural History - University of Oregon, Eugene

2.b.11.4 The paleontological heritage of the Val d'Alpone: its consistency

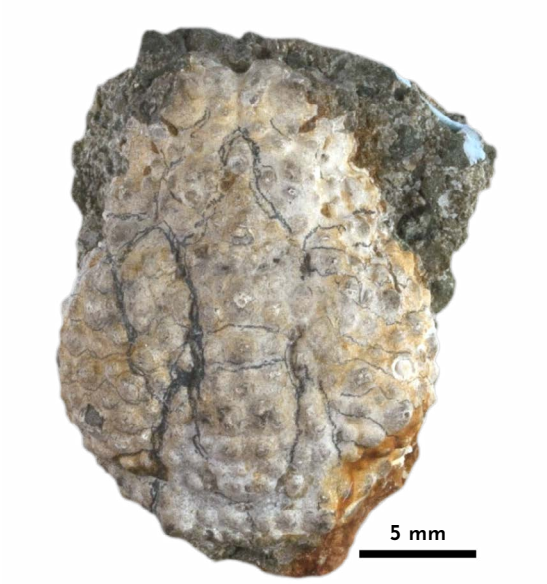
Based on the data collected so far, the paleontological heritage of the nominated property, kept in Italian and foreign museums, amounts overall to over 44,600 finds, of which 45.4% represents the Roncà component, 42% the Bolca component and 12.5% the San Giovanni Ilarione component.

Paleontological heritage of Alpone Valley
More than 44,600 specimens



Percentage distribution of the paleontological heritage of the nominated serial property

Micromaia tuberculata from Ciupìo and preserved at the Naturhistorisches Museum of Vienna

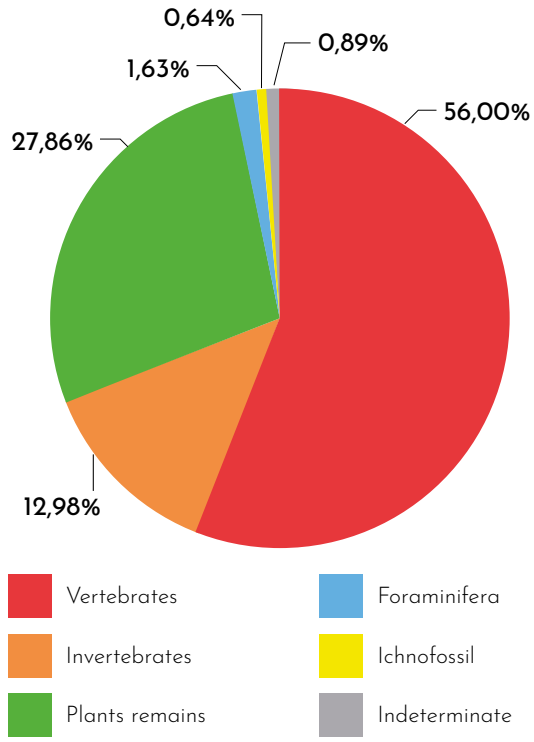


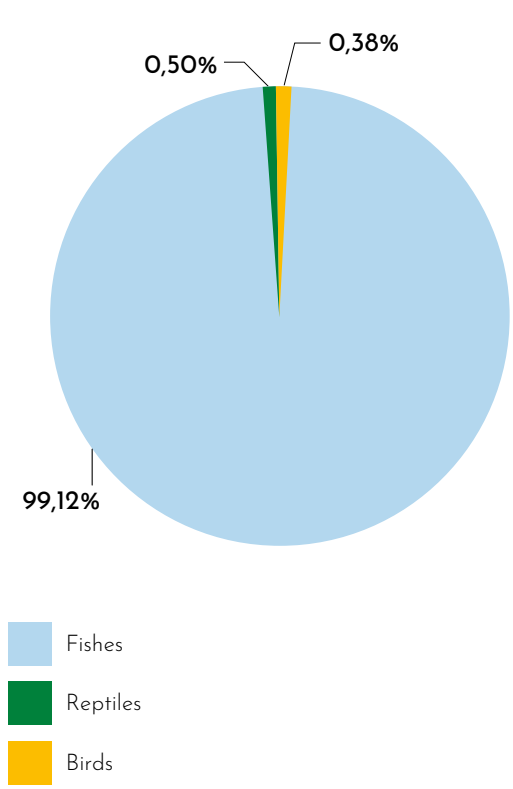
This value, which does not yet reflect the totality of the museums identified, is certainly underestimated compared to the overall heritage that the Val d'Alpone has provided over the centuries, since the extraction and collection of fossils began. Unfortunately, some specimens have been irremediably lost.
In some cases, destroyed forever due, for example, to the bombings of the Second World War which hit the premises of some museum institutes. In other cases, however, the loss of information over time and the various relocations suffered limit the possibility of exhaustively tracing the distribution and consistency of the heritage. In any case, from the sum of the data recovered, it is possible to have a first overall picture of the composition of the collections of the nominated serial property illustrated both in percentage terms and as a function of the number of finds (see diagrams on the following pages).

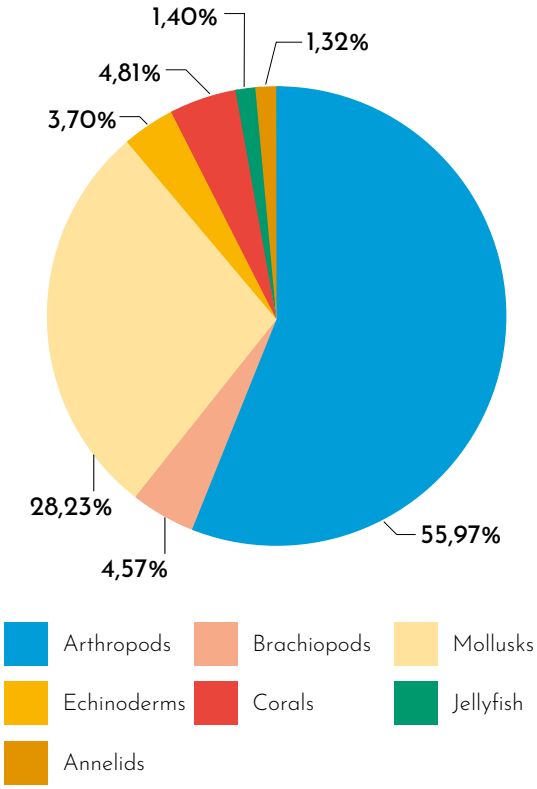
The Bolca heritage preserved in the collections is represented by 56% of the total by fossils of animal organisms, with a clear prevalence of vertebrates and in particular fish (10,428 finds). 28% is made up of plant remains, while the remaining part is distributed among invertebrates (13%), foraminifera (1.6%), ichnofossils (0.6%) and indeterminate specimens (0.9%).

The Roncà heritage is documented for 95.7% by invertebrate fossils, with a decisive dominance given by molluscs (19,023 finds, of which 87% are testified by gastropods, while the remaining share is represented by bivalves and a smaller part from cephalopods). Vertebrates, mostly remains of reptiles and mammals, make up 1.9% of the collection, foraminifera 1.6%, plant remains 0.4%, indeterminate specimens 0.2% and a modest percentage is given by ichnofossils.

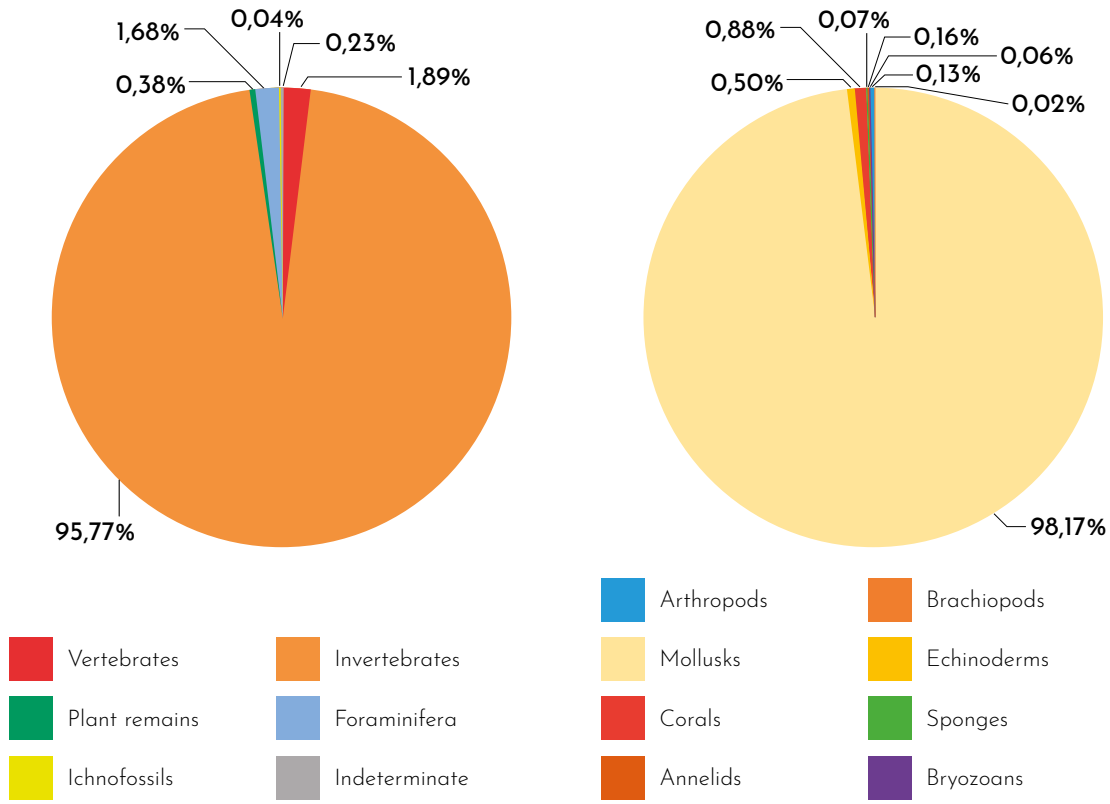
The heritage of San Giovanni Ilarione is almost exclusively composed of invertebrate specimens, with 93.8% of the total finds in the collections. Of these, the majority are molluscs, gastropods and bivalves (4,655 finds).
The remaining part of the heritage is essentially distributed between foraminifera (2.5%) and indeterminate samples (3.6%).



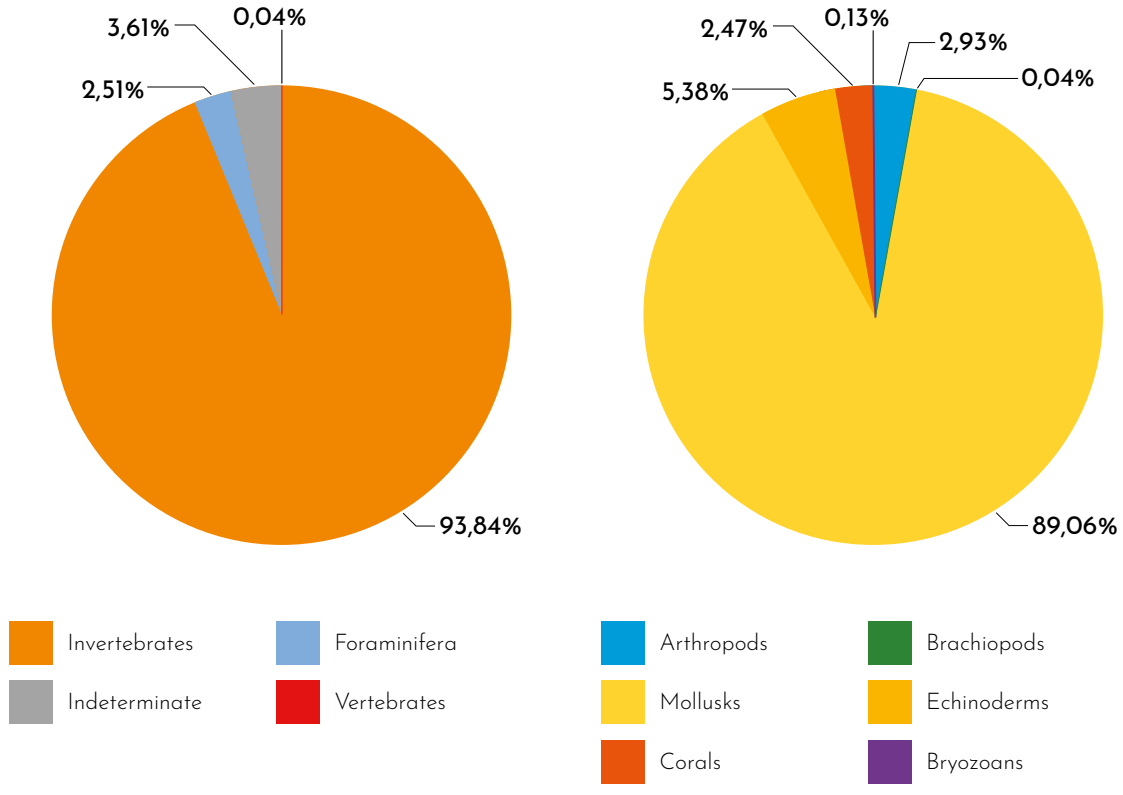




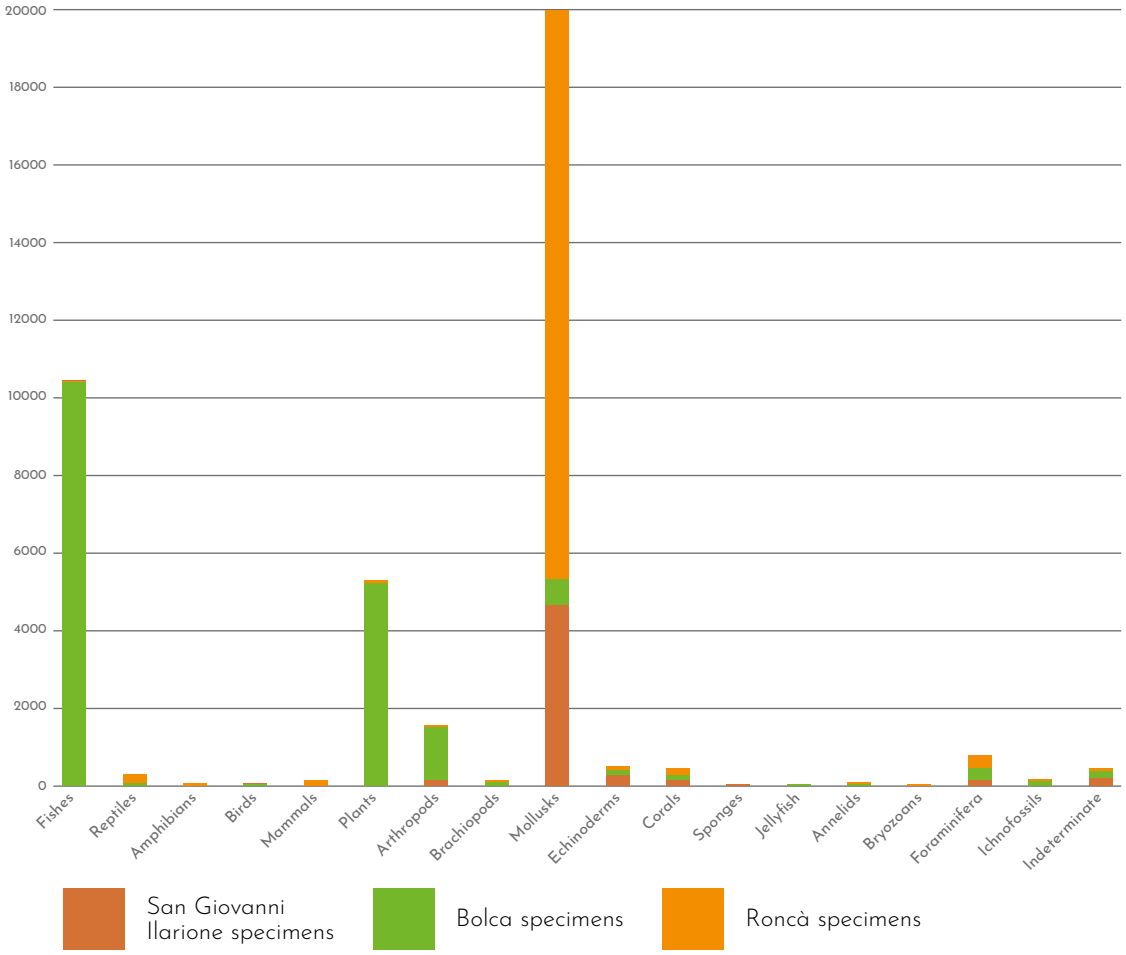
Composition of the paleontological heritage of Bolca in the collections. The relative abundances of the major taxonomic groups are expressed as percentages. The second and third pie charts focus on relative abundances within the vertebrate and invertebrate groups



Composition of the paleontological heritage of Roncà in the collections. The relative abundances of the major taxonomic groups are expressed as percentages. The second pie chart focuses on the relative abundances within the invertebrate group, the most documented



Composition of the paleontological heritage of San Giovanni Ilarione in the collections. The relative abundances of the major taxonomic groups are expressed as percentages. The second pie chart focuses on the relative abundances within the invertebrate group, the most documented



Relative abundance of the main taxonomic groups in the three components, indicated in terms of number of finds

The presence of finds from the three component parts of the Val d'Alpone in various national and international museum collections does not surprise experts but represents further confirmation of the scientific value and ability
of this territory to attract the attention of scholars and enthusiasts throughout the history of paleontological studies.
The desire to estimate the consistency and distribution of these collections, updating and expanding some lists already present in the literature, undoubtedly suffers from the limits due to the incompleteness of the data, which is constantly evolving , and a physiological underestimation linked to the underwater world of the collections private and to the partial inventory of the museological heritage present in many Italian and foreign museums/institutes. However, the nomination aims to assemble basic information that can encourage future collaborations and promote a more integrated recognition of collections to bring out new data, useful for research investigations and for the purposes of scientific. Sharing news is also interesting on a historical level to learn about the movements undergone by the finds over time, identify the location of further historical or private collections, investigating their current position and consistency. The powerful value of the collections is also underlined as a storytelling tool, capable of creating a connection with the territory and involving the general public and citizens.



Campanile defrenatum found in Valle della Chiesa
and exhibited in the Paleontological Museum of Roncà (length 48 cm)

3. JUSTIFICATION FOR INSCRIPTION

3.1.a Brief synthesis

The nomination of the serial property "The Eocene Marine Ecosystem in the Val d'Alpone – Bolca, San Giovanni Ilarione, Roncà" brings together the most significant and best-studied marine Eocene fossil sites in the Val d'Alpone. It is the serial character of the nominated property that conveys the entire Eocene marine ecosystem, within which there is a close interrelationship between living beings and their environment, deriving richness from the high diversity of organisms present (biodiversity). In order to highlight the biodiversity of the Val d'Alpone serial nominated property, those organisms (fishes, molluscs, and crustaceans) that most effectively define it have been identified in terms of their richness and variety at multiple levels (genetic, species, ecosystem). The high biodiversity is documented by the large number of taxa discovered (over 1,560). Of these, 263 are fishes, 756 molluscs, 341 plants, 39 crustaceans, along with many other organisms. Transversal attributes shared by the component parts are summarized as follows:

1. **Palaeontological dimension (knowledge of the marine environment: fishes, crustaceans, molluscs, and marine plants of the Eocene).**
   These are fossil remains of marine organisms that lived in the Eocene, often perfectly preserved, including soft tissues and colour patterns.
   The great variability—and often proximity—of environments present within this limited sector of the Tethys Sea certainly contributed to the exceptional development of diverse organisms. The three component parts (see point 2a, *Description of the nominated property*) together provide an ecological picture of the different environments and of bathymetric and salinity gradients, which can be summarized individually as follows:
   - **Fish-bearing sites of the Bolca component (Pesciara and Monte Postale)** exhibit distinctive taphonomy (exceptional preservation), stratigraphy (close to the extraordinary radiation of acanthomorph fishes and at the dawn of modern coral-reef ecosystems), and palaeogeography. These features make the extraordinary assemblage of ichthyofaunas crucial for interpreting the origin and early evolution of modern tropical fish communities.
   - **Mollusc- and crustacean-bearing sites of the Roncà (Valle della Chiesa) and San Giovanni Ilarione (Ciupìo) components** have drawn national and international interest among naturalists and within the emergent geological and palaeontological sciences since the eighteenth century. Particular interest in molluscs lies in their greater numerical and areal abundance and in the possibility of comparing fossil species with those living in modern seas.

2. **Cultural and scientific dimension (evolution of scientific knowledge and history of studies).**
   These fossils contributed to shaping the European debate on the "Theory of the Earth" and have marked the history of palaeontological research in Italy and abroad. This is demonstrated by over one thousand publications dealing with the Eocene fossils of the Val d'Alpone. The first printed work citing the fossils of Bolca dates to 1550 (see Annex 5 "Palaeontology of the deposits" and Annex 7 "Site bibliography"). Moreover, fossils collected in the past contributed to the history of early research and natural history collections (the Calceolari Museum). Founded by the Veronese Francesco Calceolari, this museum—considered the world's first natural history museum—also housed fossil fishes from Bolca. Finally, present-day palaeontological excavations, conducted with modern methodologies, envisage interdisciplinary studies (see Annex 5, point 5.4 *Excavation, conservation, study and presentation*, and *Inventory of taxa)*.

3. **Geological and landscape dimension (influence of geological structure on the morphology of the present-day landscape).**
   The three component parts are linked to the area's geological history, as each lies near ancient volcanic edifices: Bolca near the homonymous Monte Purga, San Giovanni Ilarione near Monte Castello, and Roncà near Monte Calvarina (see point

2b2 *Tectonics and volcanism*). The serial nominated property and adjacent areas are characterized by rolling landforms punctuated by typical rounded-cone volcanic reliefs, locally called "purghe". This proposal evidences strong interrelations between the valley's geology, its palaeontological heritage, and local communities.
The nominated serial property is situated in north-eastern Italy, in the Veneto Region. The component areas forming the nominated serial property are: Bolca with the Pesciara in the Municipality of Vestenanova (Verona) and Monte Postale in the Municipality of Altissimo (Vicenza); Ciupìo in the Municipality of San Giovanni Ilarione (Verona); and Valle della Chiesa in the Municipality of Roncà (Verona). Compared to the most important global sites of the same age, the three components together present the most complete continuity of stratigraphic character spanning the lower to middle Eocene (approx. 51 to 38.8 million years ago). The succession reveals a variety of depositional environments, including intertidal settings and subtidal settings with depths ranging from a few metres to 20–30 metres.

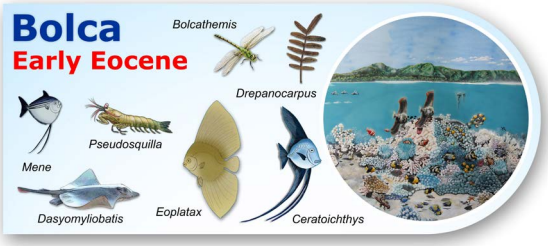


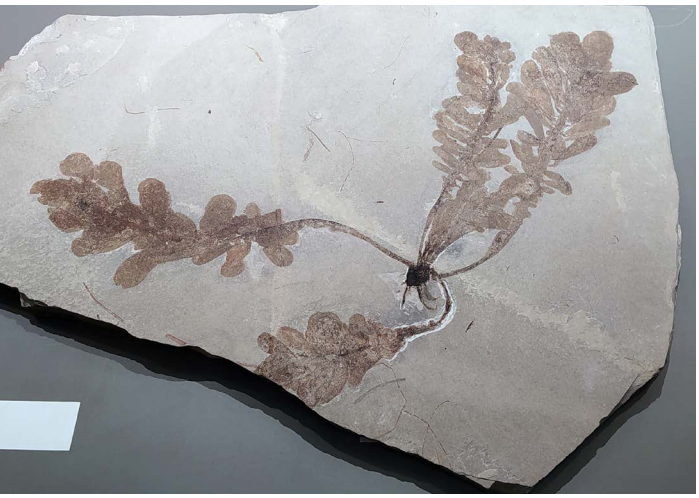
Section of the Bolca Fossil Museum devoted to the exposition of the stratigraphic succession.

The palaeoenvironmental complexity of the Eocene deposits in the Val d'Alpone is such that, even over short distances (from a few hundred metres to a few kilometres), different marine environments occur, influencing distinct faunal assemblages. It is therefore the ensemble of outcrops present in the three component parts of the nominated serial property that provides a complete ecological scenario of the marine bathymetric gradient during a time interval when the Earth experienced exceptionally high temperatures and marine biodiversity peaked following a long post–mass extinction recovery, with the establishment of organismal groups that still dominate marine environments today.
These Eocene faunas—forming the core of the nominated property—clearly display the unparalleled diversity of the fossil biota in terms of the number of taxa at species level (over

1,560), as well as notable anatomical disparity and ecological heterogeneity. Such features are likely tied to a unique palaeoenvironmental context represented by a complex of highly diversified tropical palaeobiotopes situated within an ancient hotspot of marine biodiversity. During the Eocene, the Val d'Alpone lay at a latitude roughly corresponding to the present-day Persian Gulf, an area affected during the Eocene by the deposition of carbonate sediments and volcanism of varying intensity. In this epoch, several short-lived episodes of rapid temperature rise occurred within a warm tropical sea, inhabited by a great abundance of fishes, molluscs, crustaceans, and aquatic plants. The remains of these organisms are preserved in the rocks of the component parts, documenting the evolution of marine life during the Eocene: this constitutes the world's most substantial and complete palaeontological record for that purpose. A brief description of the three components and their palaeontological sites follows.

Bolca – Early Eocene *(Bolcathemis; Eoplatax; Dasyomyliobatis; Ceratoichthys) [alcuni nomi indicano generi esemplificativi citati a margine]*
The Bolca component, with the Pesciara deposit and the outcrops at Monte Postale, is the world's most renowned locality for Cenozoic ichthyofaunas. Many Bolca fossil fishes have extant "relatives". New taxa continue to be discovered during each excavation campaign. The Pesciara is the richest site in the world for the wide variety of fishes recovered across five fossiliferous levels. Its extraordinary biodiversity permits extremely precise documentation of the structural and ecological traits of marine ichthyofaunas ca. 50 million years ago and supports reconstructions of the processes leading to the present configuration of the modern tropical ichthyobiota. The depositional environment at Monte Postale was likely nearshore, characterized by coral bioconstructions and mangrove thickets, whereas that of the Pesciara was an intra-platform basin, at times with anoxic bottom conditions.





Above: Aquatic plant of the genus *Pterigophycos* from the Pesciara (length 59 cm)



At right: Laminated strata of the Pesciara under current palaeontological excavation.

San Giovanni Ilarione – Middle Eocene

(Lunulicardia; Harpactoxanthopsis; Moniquia; Periacanthus; Calliostoma; Tectus; Lophoranina)

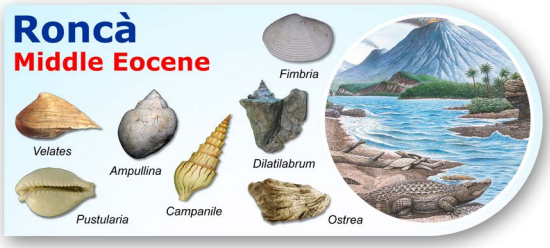
The San Giovanni Ilarione component, with the Ciupìo outcrop, documents a high diversity of marine fossil molluscs, chiefly gastropods and bivalves. The site covers a relatively small surface and is largely representative of a submerged beach, subtidal depositional environment with normal marine salinity. Shell remains are particularly important and abundant at various levels of the stratigraphic succession and have been studied for two centuries as tools for stratigraphic correlation and as unique evidence of peak biodiversity values. The San Giovanni Ilarione component is also representative of a middle Eocene marine brachyuran crustacean fauna exhibiting a good degree of differentiation.





Top: Specimens from San Giovanni Ilarione collected and sold by Giovanni Meneguzzo in 1867 to the Museum of Natural History of the University of Florence, where they are preserved today.
Bottom: Drawer with fossils collected at Ciupìo (San Giovanni Ilarione) by Vittorio Meneguzzo in 1901 and sold to the Naturhistorisches Museum, Vienna, where they are preserved today.





Roncà

The Roncà component, with numerous outcrops in Valle della Chiesa, is particularly rich in marine gastropods and bivalves representative of intertidal or subtidal environments. A distinctive feature of these deposits/outcrops is their setting within volcaniclastic rocks, where the fossil molluscs occur in great numbers and display a coloration ranging from dark brown to nearly black. This is the well-known Roncà Horizon, attested at least since the latter half of the eighteenth century.

The attributes that fully convey the exceptional fossil record of the Eocene marine ecosystem and define its Outstanding Universal Value (OUV) are:

- the broad ecological scenario of the bathymetric gradient (shallow subtidal, subtidal with depths from a few metres to 20–30 m, and intertidal), identified respectively in the Bolca component (Pesciara and Monte Postale), San Giovanni Ilarione (Ciupìo), and Roncà (Valle della Chiesa);
- the inherent characteristics of the fossils and palaeontological contexts, marked by very high representativeness, extraordinary typological variety, exceptional quantitative dimension, and unique taphonomic features;
- the role of studies on the fossils from the Val d'Alpone sites—at least since the first half of the sixteenth century—which have contributed to the wide-ranging debate on

the history of life on Earth. From the earliest studies in the sixteenth century to the most recent research, these component parts have contributed to our understanding of the evolution of marine life and of Eocene marine ecosystems.

The integrity of the three component parts, which convey the geological, palaeontological, and physical values, is summarized by the following characteristics:

1. notable extent and state of knowledge of the palaeontological heritage, with a five-century history;
2. high biodiversity documented by the fossils recovered;
3. quality and preservation of the deposits. Each component, to varying yet complementary degrees, continues to add to the rich fossil heritage that is collected, conserved, studied, and displayed in museums worldwide. This is a genuine natural legacy of the past, shedding light on how our marine ecosystem evolved. This heritage is the result of field campaigns and research by collectors and scholars throughout different historical periods, as objects of exhibition, study, and exchange. Since the latter half of the twentieth century, excavation campaigns—revitalized over the last twenty years—have further enriched this fossil heritage, providing important data for research and yielding new and surprising discoveries that add crucial pieces to the history of marine life on Earth.

Verona, with its prestigious Civic Museum of Natural History, plays a particularly important role in European natural history museology: it is the only city on the continent where, from the second half of the sixteenth century to the present day, there has been continuity in collections open to the public—and the Val d'Alpone fossils have pride of place. Other museums with important Val d'Alpone palaeontological collections include the Museum of Nature and Humankind of the University of Padua, the Bolca Fossil Museum, and the Roncà Palaeontological Museum.





Top: *Fimbria major* recovered in Valle della Chiesa (Roncà).

Bottom: Characteristic gastropods from the Roncà Horizon.

3.1.b Criteria under which inscription is proposed (and justification for inscription under these criteria)

Criterion (viii).

"The Eocene Marine Ecosystem in the Val d'Alpone – Bolca, San Giovanni Ilarione, Roncà" is proposed for inscription on the World Heritage List under criterion (viii) of paragraph 77 of the *Operational Guidelines for the Implementation of the World Heritage Convention*. Through the most important, well-studied and well-known fossil record, the nominated property exceptionally illustrates the history of geology and evolutionary biology of Eocene marine life. The fossil heritage delineates the most complete bathymetric gradient within a time interval

when the Earth experienced exceptionally high temperatures, marine biodiversity reached its climax after the long post–Cretaceous mass extinction recovery, and the organismal groups that dominate modern seas became established. The nominated property has yielded an extraordinary number of well-preserved marine and terrestrial fossils—vertebrates, invertebrates, and plant remains—with high species richness and forms represented by great taxonomic diversity. The remarkable diversity and uniqueness of the fossil fishes and molluscs—often preserving anatomical structures that rarely fossilize—constitute the most complete traces of a broad and detailed picture of tropical marine life in the Eocene. Five centuries of site history and over one thousand publications have built a curated and documented fossil heritage of specimens of exceptional significance, the outcome of a unique and scarcely repeatable combination of taphonomic, stratigraphic, and palaeogeographic features. Consequently, the nominated property is regarded as the primary global reference for present and future discoveries of Eocene marine fossils.

3.1.c Statement of integrity

Within the complementary articulation of its three component parts, "The Eocene Marine Ecosystem in the Val d'Alpone – Bolca, San Giovanni Ilarione, Roncà" includes all elements necessary to substantiate the statement of Outstanding Universal Value. The three component parts identified in the Val d'Alpone are well defined, independent of one another, and readily manageable. The nominated property consists of the deposits within the Bolca, San Giovanni Ilarione, and Roncà components, which together describe the evolution of marine life on Earth during the Eocene. Overall, the designated **core zone** covers 88.3 ha and is protected by an adjacent **buffer zone** of 216.1 ha. Most of this territory is covered by coppice woodland or meadow, land uses that do not conflict with conservation needs. Fossil deposits—which in Italy are per se subject to the highest degree of legal protection (Code of Cultural Heritage and Landscape – Legislative Decree No. 42 of 22 January 2004, as amended)—have not been and are not affected by urbanization or infrastructure, thereby maintaining unchanged the scientific values they embody.
The nominated serial property's deposits have been excavated over centuries in compliance with current regulations, thus preserving outcrops and values. The invaluable palaeontological heritage collected over time plays a fundamental role in the **History of Science**. At present, this heritage is conserved and enhanced in two local museums of the Val d'Alpone (the Bolca Fossil Museum and the Roncà Palaeontological Museum) and in museum collections worldwide. In particular, the Museum of Natural History of Verona and the Museum of Nature and Humankind of the University of Padua hold the world's largest Val d'Alpone collections—both historical and modern—thereby ensuring the integrity of the specimens. Other museums, located in Italy (Bologna, Milan), Europe (Paris, London, Vienna), and the rest of the world (Pittsburgh, Chicago, Cambridge—United Kingdom), possess palaeontological specimens from the Val d'Alpone; lists and documentation concerning the consistence of these collections, often with iconography, are available at the Museum of Natural History of Verona and at the A.T.S.
Current palaeontological excavation and research methods at Bolca and in Valle della Chiesa (see Annex 5.4 *Excavation, conservation, study and presentation*) are state-of-the-art and are producing a significant increase in scientific knowledge while ensuring careful, balanced conservation of the palaeontological heritage. Proper extraction techniques and the exceptional preservation of fossils recovered in the Val d'Alpone allow extensive and complete reconstructions of biotic, climatic, and environmental changes, as well as the phylogenetic and palaeoecological significance of the fossils. The abundance of fossils extracted in the past and their richness have not impoverished the deposits within the nominated property, allowing scientific research to continue with new, modern excavation campaigns. These are conducted in agreement with the Ministry of Culture – Superintendence of Archaeology, Fine Arts and Landscape for the Provinces of Verona, Rovigo and Vicenza.
In every field campaign—especially at the

Pesciara and Monte Postale—specimens new to science are discovered and studied, with the resulting work published, for over fifty years now, in a dedicated journal: *Studi e ricerche sui giacimenti terziari di Bolca – Miscellanea paleontologica*, as well as in major international scientific journals. The Museum of Natural History of Verona maintains an up-to-date list of all types (see Annex 5.3 *List of Bolca fossil types (holotypes and paratypes) conserved at the Civic Museum of Natural History of Verona*), housed in the Geology and Palaeontology collections, as well as records of exhibited and deposited specimens in the Bolca and Roncà museums. Since the 2000s, five continuous-core drillings and several geophysical surveys have been carried out in the Bolca area, defining with high precision the geometry of the Pesciara deposit and allowing volumetric estimates with delineation of its surface and subsurface extent.

3.1.d Statement of authenticity

Not relevant as this nomination is submitted under criterion (viii)

3.1.e Protection and management requirements

Within the nominated serial property "The Eocene Marine Ecosystem in the Val d'Alpone – Bolca, San Giovanni Ilarione, Roncà", actions for the protection and conservation of the nominated property are regulated by national legislation (Code of Cultural Heritage and Landscape), which establishes primary responsibility in State territorial institutions, specifically the Superintendence of Archaeology, Fine Arts and Landscape for the Provinces of Verona, Rovigo and Vicenza. At different geographic scales, other institutional actors hold competences in territorial protection and planning. Cooperation among these bodies is essential to safeguard the nominated property within a pathway of sustainable and shared development.

Owners of areas falling within the three component parts, the municipalities of Altissimo, Vestenanova, San Giovanni Ilarione and Roncà, the Lessinia Regional Natural Park Authority, and local museums conserving and exhibiting the fossils have been engaged in protection measures. Though with differing competences, these actors operate under the same national cultural heritage legislation. Territorial planning of the nominated property's areas (core and buffer zones) is organized through various instruments, beginning with the **Regional Territorial Coordination Plan (PTRC)** (pursuant to Article 24 of Veneto Regional Law No. 11/2004). Levels of competence and intervention include:

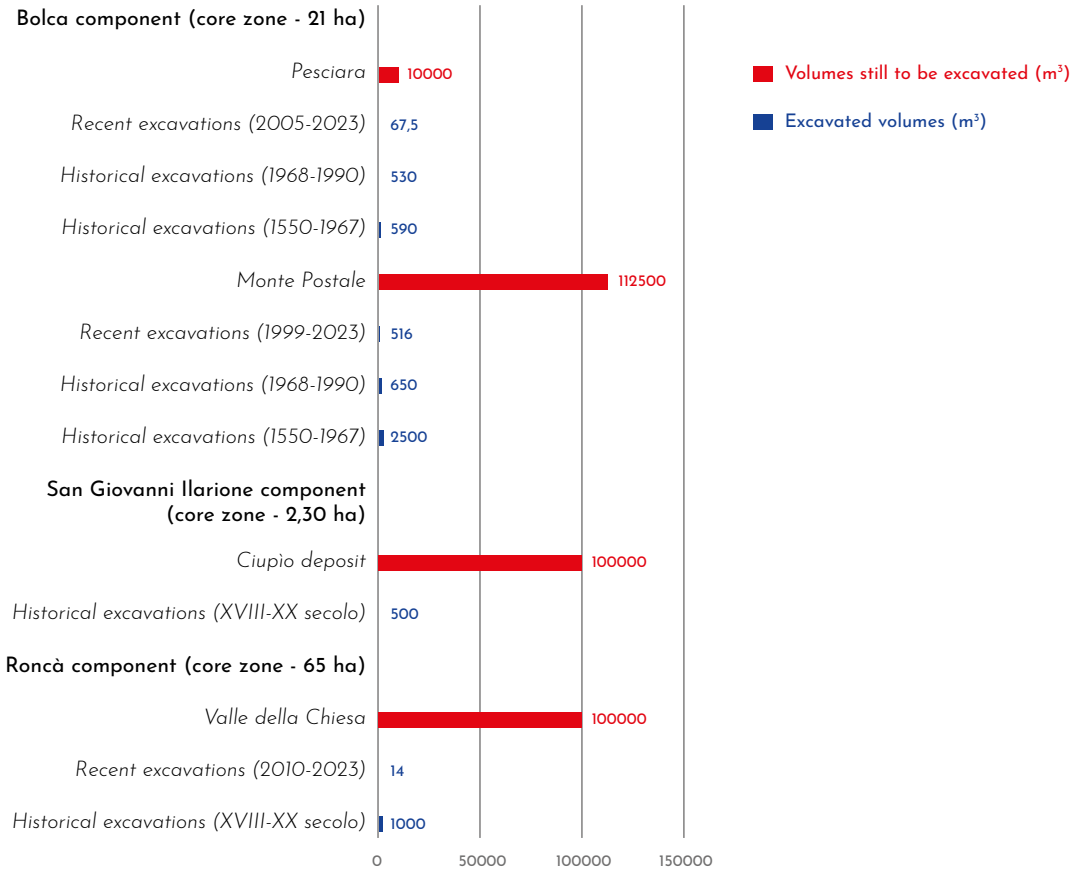
I. **Veneto Region:** regional territorial and urban planning instruments (PTRC) and landscape provisions affecting parts of the nominated property (Park constraints: approx. 60% of the core zone and about 70% of the buffer zone);
II. **Provinces of Verona and Vicenza: Provincial Territorial Coordination Plans (PTCP);**
III. **Municipalities of Altissimo, Vestenanova, San Giovanni Ilarione, and Roncà:** administrative and regulatory competence for urban plans (PATI and PI) pertinent to the protection, conservation, enhancement, and management of the nominated serial property;
IV. **Landowners** of the nominated property and especially of the palaeontological deposits/outcrops, who have been involved through dedicated meetings illustrating the nomination project and the important custodial role they can play.

Accordingly, the nominated property's areas and deposits, beyond being subject to national regulations under the local Superintendence, also undergo strict oversight by territorial entities to prevent unauthorized interventions, alongside closer monitoring by landowners. Protection conditions across the three components are excellent, as the deposits are only partially excavated. A comparison of extracted versus estimated excavation volumes by component is provided below (historical excavation volumes and in situ residual volumes yet to be quarried "in banco" are conservative estimates): The high volumes of fossiliferous rock remaining in situ are evident and will support future research campaigns.

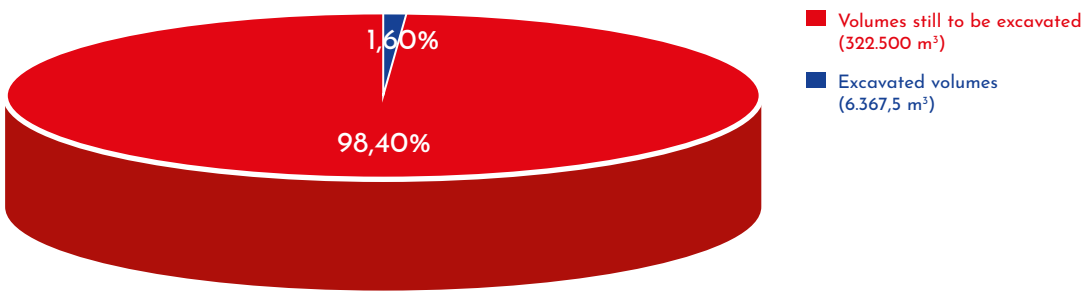
Human activities or physical dynamics that could threaten the nominated property are extremely limited. Clandestine palaeontological excavations are prohibited by law, by site accessibility constraints, and by property characteristics, both within the property and, in general, throughout Italy. All fossils discovered on Italian territory are property of the State, and the trade of Italian fossils is prohibited.

For nominated property management, during the nomination phase, and to facilitate decision-making through shared objectives and stakeholder participation, the association **"Val d'Alpone – faune, flore e rocce del Cenozoico"** was founded in 2017. Supported by its members, the Association represents the Val d'Alpone territory; it includes territorial authorities and representatives of local economic

Estimated volumes of site components and excavation volumes extracted



Serial site, total estimated volumes of the nominated property in m³



The high volumes of fossiliferous rock in situ, still to be excavated, for future research campaigns, are evident.

and cultural associations. Founding members are the municipalities of the nominated property (Altissimo, Vestenanova, San Giovanni Ilarione, Roncà), together with the municipalities of Soave, Monteforte d'Alpone, Montecchia di Crosara, Gambellara, and Crespadoro, which together constitute the *commitment zones*.
In 2019, the Municipality of Verona with the Museum of Natural History also joined. Other founding members are the Mountain Community of Lessinia (now the Lessinia Regional Natural Park Authority), the Department of Culture and Civilisation of the University of Verona, and nine other members representing local cultural and economic associations, in addition to nine supporting members. The Association has informed the Superintendence (positive replies: prot. 12950 of 25/06/2020 and prot. 36873 of 05/12/2023), the Veneto Region (which supports the project: Regional Executive Resolution No. 131 of 7 February 2018), and the Lessinia Regional Natural Park Authority. The Association met with all owners of deposits/outcrops, explaining and sharing the nomination pathway and asking them to act coherently and with respect for the exceptional value.
Concretely, a **pre-inscription governance system** for protection and conservation has been established as follows:

- preventive action based on national legislation under the Superintendence;
- regular monitoring of the nominated serial property's territory by local administrations and the Lessinia Regional Natural Park Authority;
- surveillance of deposits/outcrops involving landowners;
- periodic checks by experts of the Association's Scientific and Technical Committee (*Val d'Alpone – faune, flore e rocce del Cenozoico*), selected according to their competences. University representatives (University of Verona) and scholars from other Italian and European universities also actively contribute within the Committee. Monitoring proposes two categories of indicators: one concerning the integrity of palaeontological values, the other referring to the natural environment that contains them; for each indicator, procedures and focus, periodicity, and the responsible subject(s) are summarized. The participatory process led by the A.T.S. has helped disseminate and share the nominated property's values and to direct and coordinate a series of public events tailored to different audiences.

3.2 Comparative analysis

The comparative analysis for the nominated property was prepared and conducted by specialists of the Scientific Committee of the Association "Val d'Alpone – faune, flore e rocce del Cenozoico". The principal elements considered in developing the global comparative analysis, in relation to the property's potential OUV, are:

a. state of preservation of the fossils; importance of historical collections and modern excavations;
b. species richness and morphological diversity reflected in high taxonomic diversity;
c. the western Tethyan marine biodiversity hotspot;
d. the centrality of studies on the nominated property's fossils to the history of geology and evolutionary biology.

The analysis references the 2021 IUCN report *Geological World Heritage: A revised global framework for the application of criterion (viii) of the World Heritage Convention* (https://doi.org/10.2305/IUCN.CH.2021.12.en), which updated the 2005 framework and assessed the potential impact of the UNESCO Global Geopark designation on future inscriptions under criterion (viii). The report proposed an integrated set of 11 themes to guide application of criterion (viii) and examines comparative analysis processes and integrity issues for sites listed for geological and geomorphological values. The nominated property falls within Theme 1, documenting major events in Earth history and the fossil record of life.
Following inclusion on Italy's Tentative List (21 May 2021) of the nomination proposal "Marine biodiversity of the Eocene sites in the Val

d'Alpone", the A.T.S. Scientific Committee began an in-depth assessment to determine which and how many among the over 40 palaeontological deposits/outcrops initially proposed in the Val d'Alpone possessed the attributes and values for nomination (see Annex 1 Cartography, map 1.9). A major debate ensued, yielding two options:

1. nominate only Bolca for its fish-bearing deposits;
2. identify, among the over forty fossiliferous deposits/outcrops in the Val d'Alpone, those most significant for defining the entire Eocene marine ecosystem.

These options were thoroughly discussed and deepened through a comparative analysis (see Annex 4.1 "Comparative analysis" and 4.2 "Map with comparison sites") and submitted to the assessment of an international expert. Among several names proposed by the Scientific Committee, the choice fell on Prof. John Long (Strategic Professor of Palaeontology, Flinders University, Adelaide), former Chair of the Interagency Reference Group (IRG) for the World Heritage fossil caves of Naracoorte (Australia) and member of the Australian World Heritage Advisory Committee (AWHAC). Prof. Long indicated the Eocene marine ecosystem proposal as the most significant for the values present in the Val d'Alpone and the most consistent with the Operational Guidelines for a global recognition.

The comparative analysis was developed along two lines:

I. **Internal analysis**, considering the set of over forty deposits/outcrops in the Val d'Alpone and evaluating them against the ten questions of the IUCN checklist (Source: Wells, 1996) for fossil deposit/outcrop assessment. This identified those containing elements that express OUV, leading to the selection of fourteen deposits/outcrops representative of the entire Eocene marine ecosystem within the three components: Bolca, San Giovanni Ilarione, and Roncà;
II. **External analysis,** assessing at the global level which palaeontological sites of the same geological age have pertinent affinities with the OUV of the nominated property.

Comparisons were conducted first with fossil sites inscribed on the World Heritage List under criterion (viii) and with sites on national Tentative Lists. Among these, twenty-four sites were examined (see table), with two palaeontologically relevant sites selected for their Eocene fossils (**Wadi al-Hitan** and **Messel Pit Fossil Site**).

Sites inscribed in the World Heritage List based on criterion viii

State(s)	Name	Various tipologies: park, reserve, karst, etc.	Type: paleontological	Type: paleontological (Eocene)
Argentina	Talampaya Natural Parks	X		
Canada	Miguasha National Park	X		
Canada	Joggins Fossil Cliffs		X (Carboniferous)	
Canada	Mistaken Point		X (Ediacarian)	
Canada	Anticosti		X (Ordovician)	
China	Chengjiang Fossil Site		X (Cambrian)	
Denmark	Stevns Klint		X	
Egypt	Wadi al-Hitan (Whale Valley)		X (Eocene)	X (Eocene)
Finland-Sweden	High Coast / Kvarken Archipelago	X		
France	Chaîne des Puys - Limagne fault tectonic arena		X	
Germany	Messel Pit Fossil Site		X (Eocene)	X (Eocene)
Hungary-Slovakia	Karst and Slovak Karst	X		

State(s)	Name	Various tipologies: park, reserve, karst, etc.	Type: paleontological	Type: paleontological (Eocene)
Iceland	Vatnajökull National Park - Dynamic Nature of Fire and Ice	X		
Italiy-Switzerland	Monte San Giorgio		X (Middle Triassic)	
Italy	Aeolian Islands	X		
Italy	Mount Etna	X		
Italy	Evaporitic Karst and Caves of Northern Apennines	X		
Russia	Lena Pillars Nature Park	X		
UK	Dorset and East Devon Coast	X		
USA	Hawaii Volcanoes National Park	X		
South Africa	Vredefort Dome	X		
South Africa	Barberton Makhonjwa Mountains	X		
Switzerland	Swiss Tectonic Arena Sardona	X		
Vietnam	Phong Nha-Ke Bang National Park	X		

Taken from: https://whc.unesco.org/en/list/?search=&id_sites=&id_states=&id_search_region=&search_yearinscribed=&search_yearinscribed_start=&search_yearinscribed_end=&themes=&criteria_restrication=&n8=on&id_keywords=&type=natural&media=&description=&components=1&order=country

The analysis then considered sites recognized as relevant and representative with respect to the values of the present nomination—i.e., organisms (fishes, molluscs, crustaceans) significant for defining the Eocene marine ecosystem (see Annex 4 Global Comparative Analysis)—following the scheme proposed in the 2021 IUCN document. The comparative scope included, for fishes, Western Limfjord (Denmark), Fossil Butte Mb – Green River Formation (USA), Messel Pit (Germany), and Wadi Al-Hitan (Egypt); for molluscs, Grignon (Paris Basin, France), Campo (Pyrenées Atlantiques, France), Mediano (Sobrarbe, Spain), Collio (Friuli Venezia Giulia, Italy), Western Limfjord (Denmark), and Wadi Al-Hitan (Egypt); for crustaceans, Western Limfjord (Denmark), "Budapest Basin" (Hungary), London Clay Formation (United Kingdom), and the South-Pyrenean Central Unit (Spain).

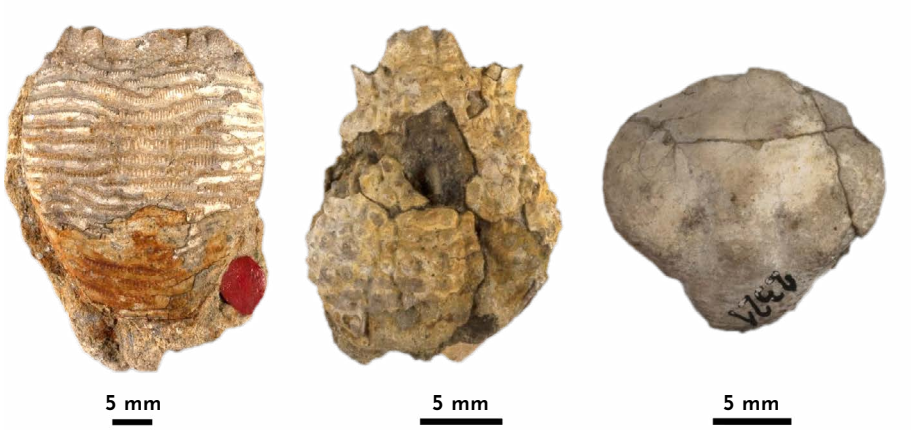
Category 1	Category 2	Category 3
Evaluates the fossil record of Eocene marine fish, crustaceans and molluscs using four criteria: 1. diversity; 2. higher-level taxonomic diversity; 3. abundance of specimens; 4. broader evolutionary significance of fossils.	Evaluates the nature and quality of the fossil archive at each site using five criteria: 5. quality of conservation; 6. exposed stratigraphic interval of the layers containing the fossils; 7. geochronological constraints; 8. age of fossils; 9. spectrum of depositional environments documented by fossils.	Evaluates permanence and scientific impact for each site using separate criteria for: 10. degree of investigation; 11. the centrality of fossiliferous associations to reconstruct the history of modern tropical marine biodiversity; 12. the centrality of the study of fossils for the history of geology and evolutionary biology; 13. scientific impact; 14. site accessibility.

Fish	The comparison involved the Eocene faunas of Mo-Clay (Fur Formation, Denmark), the Green River Formation (USA), the Messel Pit Fossil Site (Germany);
Crustaceans	The comparison involved the faunas of the surroundings of Palermo (Italy), Budapest (Hungary), the Hampshite Basin (UK), Huesca (Aragon, Spain), the Lillebælt Clay Formation (Denmark), the Bateque Formation (Mexico) and of the Carolinas (USA);
Molluscs	The comparison involved the faunas of eastern Collio/Friuli V.G. (Italy), the Paris Basin (France), the Atlantic Pyrenees (France), Sobrarbe (Aragon, Spain) and Wadi Al-Hitan (Egypt).



Above: Location of the Eocene deposits involved in the comparative analysis with definition of the faunas considered

Below: Some Ciupìo crustaceans in storage at the Naturhistorisches Museum in Vienna.

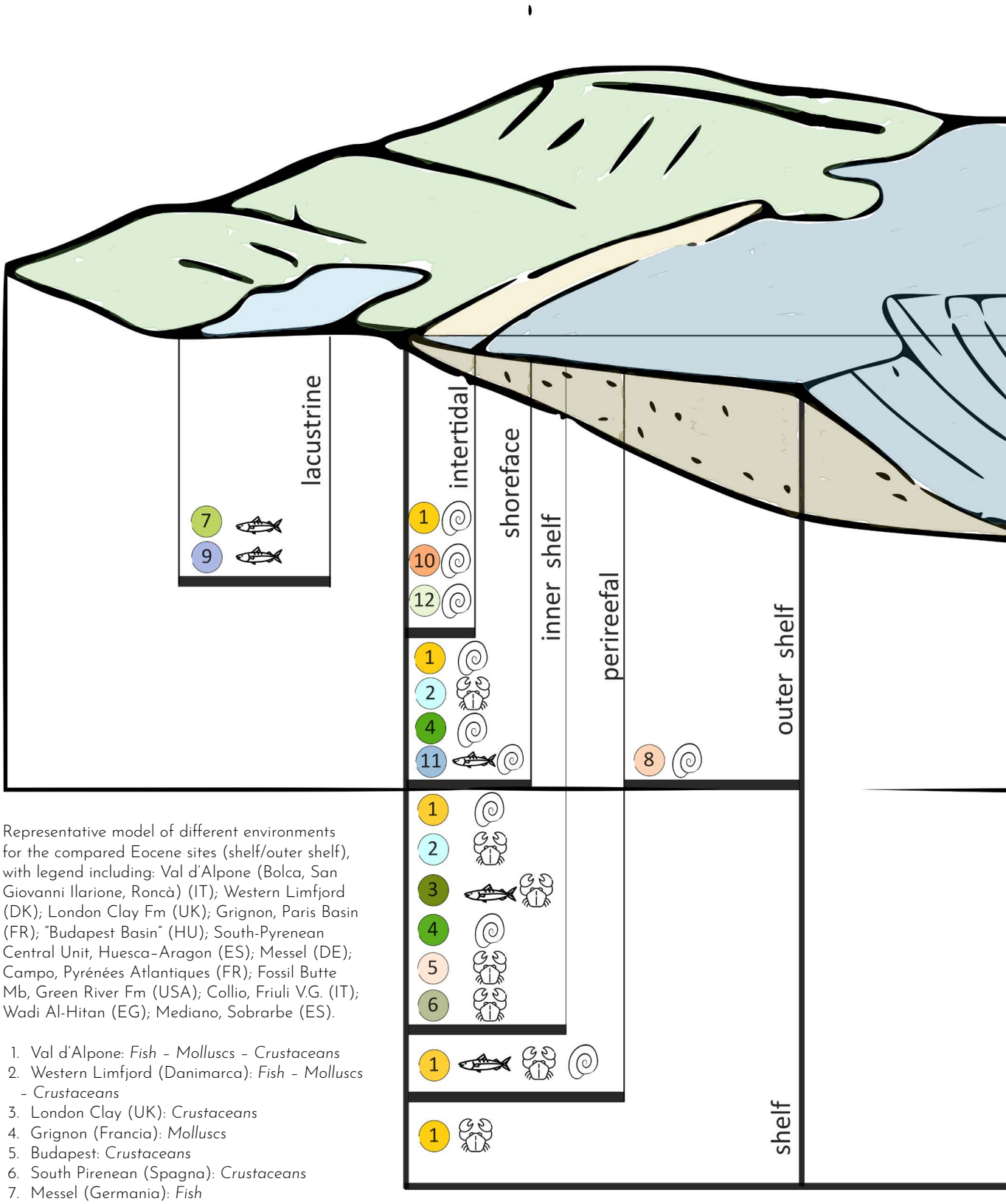


In particular, the analysis of fish-bearing deposits shows that **Fossil Butte Mb (Green River Formation, USA)** and **Messel Pit (Germany)** document tropical **lacustrine** environments and are therefore not comparable with **marine** environments. Western Limfjord indicates a subtropical–temperate open marine context in the ancient North Sea region, whereas Wadi Al-Hitan primarily concerns cetaceans. Regarding mollusc-bearing sites, one of the most famous is **Grignon (Paris Basin)**. Paris Basin deposits, on the Atlantic side of Europe, have been much more intensively studied and preserve small-sized species, presenting high diversity values. However, targeted comparisons show that biodiversity was greater in the western Tethys, coinciding with the region now occupied by the Val d'Alpone. Other well-studied faunas, such as those of **Campo (France)** and **Collio (Italy)**, confirm this trend. Other sites (Western Limfjord, Mediano–Sobrarbe, Wadi Al-Hitan) have relatively recent discovery histories and are characterized by limited numbers of taxa and less in-depth studies. As for crustaceans, comparisons highlight affinities among platform faunas at the global scale, with the greatest diversity in the Val d'Alpone and the "Budapest Basin". Recent studies of outcrops near the Pesciara have revealed highly diversified lower Eocene coral-reef crustacean faunas that are structurally not comparable with others.



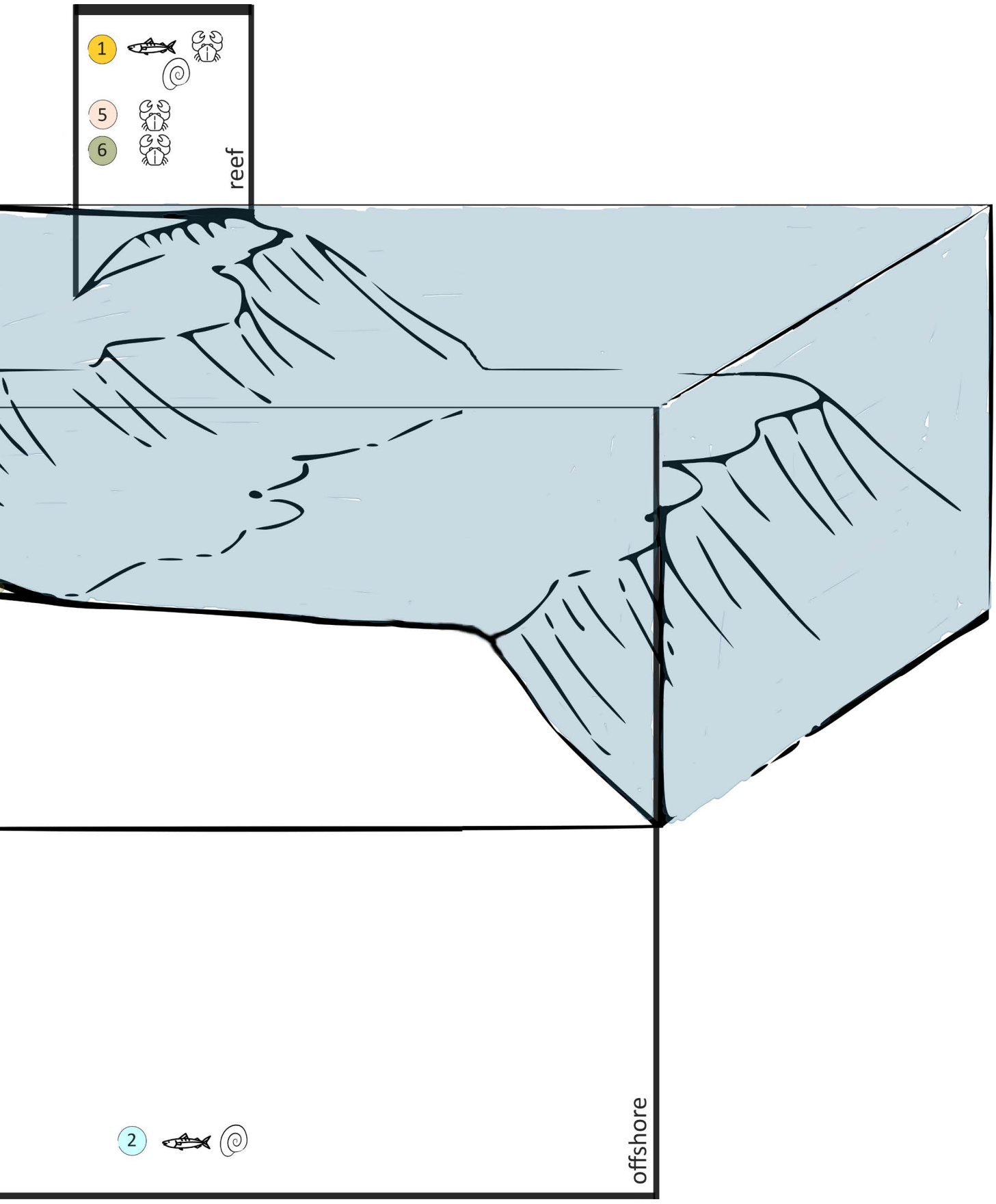
Above: *Galaeorhinus cuvieri*, exhibited at the Bolca Fossil Museum (length 93 cm)
Next page: *Ornitholites* sp. found in the Pesciara (length 7 cm)





Representative model of different environments for the compared Eocene sites (shelf/outer shelf), with legend including: Val d'Alpone (Bolca, San Giovanni Ilarione, Roncà) (IT); Western Limfjord (DK); London Clay Fm (UK); Grignon, Paris Basin (FR); "Budapest Basin" (HU); South-Pyrenean Central Unit, Huesca–Aragon (ES); Messel (DE); Campo, Pyrénées Atlantiques (FR); Fossil Butte Mb, Green River Fm (USA); Collio, Friuli V.G. (IT); Wadi Al-Hitan (EG); Mediano, Sobrarbe (ES).

1. Val d'Alpone: *Fish – Molluscs – Crustaceans*
2. Western Limfjord (Danimarca): *Fish – Molluscs – Crustaceans*
3. London Clay (UK): *Crustaceans*
4. Grignon (Francia): *Molluscs*
5. Budapest: *Crustaceans*
6. South Pirenean (Spagna): *Crustaceans*
7. Messel (Germania): *Fish*
8. Campo (Spagna, Pirenei): *Molluscs*
9. Green River (USA): *Fish*
10. Collio (FVG – Italia): *Molluscs*
11. Wadi Al-Hitan: *Fish – Molluscs*
12. Sobrarbe (Spagna): *Molluscs*


1
5
6
reef
2
offshore

The tables below summarize the results of the comparative analysis of the typologies of the fossils (fish, crustaceans and molluscs) present in the sites considered.

The sites are highlighted with different colors, while **the yellow color identifies the best criterion of evaluation** among the sites taken into consideration.

Fish comparison										Total score
Score:	**1-20=1 21-40=2 41-100=3 101-300=4**	**1-20=1 21-40=2 41-100=3 101-200=4**	**little high=1 moderately high=2 high =3 very high=4**	**not good=1 very good=2 grat=3 exceptional=4**	**1-Ma=1 2-3Ma=2 4-5Ma=3 >5=4**	**one type of environmental=1 two types of environmental=2 three types of environmental=3**	**not very thorough=1 thorough=2**	**potentially relevant=1 relevant=2 very relevant=3 extraordinary=4**	**good in some sities=1 good=2**	
Site or component	**Diversity (taxa)**	**Diversity taxonomic of upper level (Orders)**	**Abundance of specimens**	**Quality of conservation**	**Age Ma**	**Range of environments**	**Degree of investigation**	**Scientific impact**	**Accessibility of the site**	
Val d'Alpone - Bolca (Italy)	about 260	29	very high	exceptional	between 51- 49	1.lagoon behind the cliff 2. coastal environment pericifal with grassland, seagrass and algae 3. reef	thorough	extraordinary	good	
Partial score	4	4	4	4	2	3	2	4	2	29
Messel Pit Fossil Site (Germany)	8	5 or 6	high	great	about 48	1. maar crater lake	thorough	relevant	good in some sities	
Partial score	1	1	3	3	1	1	2	2	1	15
Western Limfjord (Dennmark)	about 80	20	moderately high	very good	between 55.9 - 55	1.pelagic	very limited	potentially relevant	good in Mors island	
Partial score	3	1	2	2	2	1	1	1	1	14
Fossil Butte Mb - Green River Fm (USA)	31	20	high	exceptional	about 52	1.various biotopes of a vast lake context	thorough	very relevant	good in some quarries	
Partial score	2	1	3	4	1	1	2	3	1	18
London Clay Fm (United Kingdom)	about 50	about 20	moderately high	not good	between 54.5 – 51.5	1. offshore	thorough	relevant	good	
Partial score	3	1	2	1	2	1	2	2	2	16
Wadi Al-Hitan (Egypt)	superficial studies on fish	superficial studies on fish	high for whales, little high for fish	exceptional for whales, not good for fish	between 41 - 40	1. shoreface	very limited	potentially relevant	good	
Partial score	1	1	1	1	1	1	1	1	2	10

Comparative Analysis of Fish Fossil Sites

The comparative assessment of fish-bearing fossil deposits underscores the exceptional significance of the Val d'Alpone site at Bolca when compared with other Eocene localities of international importance, such as the Messel Pit (Germany), the Western Limfjord (Denmark), the Green River Formation (USA), and Wadi al-Hitan (Egypt). The evaluation was conducted against multiple parameters: diversity, abundance, preservation, stratigraphic range, environmental settings, scientific investigation, and accessibility.

Diversity and abundance

Bolca records the highest level of taxonomic richness, with approximately 260 taxa across 29 orders, combined with very high abundance of specimens. This scale is unparalleled in the comparative framework. In contrast, the Green River Formation yields 31 taxa within 20 orders, while Mo-Clay in the Limfjord records about 80 taxa, and the Messel Pit only 8 taxa belonging to 5–6 orders. Wadi al-Hitan has only superficial studies on fish, with limited information and low taxonomic resolution. Thus, Bolca represents the most comprehensive ichthyofaunal record among Eocene fish deposits worldwide.

Preservation quality

The exceptional preservation of Bolca specimens, including delicate anatomical features, is a defining attribute of global significance. Green River shares similar qualities of preservation but with lower diversity and abundance. Mo-Clay is rated "very good" and Messel "great," yet both are clearly secondary when compared with Bolca's completeness. Wadi al-Hitan is primarily exceptional for whales, but its fish assemblages are poorly preserved and of little comparative value.

Stratigraphic and environmental framework

Bolca spans between 51 and 49 Ma, corresponding to the Early–Middle Eocene transition, and documents three distinct marine environments: back-reef lagoon, coastal habitats with seagrass and algae meadows, and reefal systems. This environmental variety is unique among the comparative set. Messel Pit represents a maar lake of approximately 48 Ma, entirely lacustrine. Mo-Clay is pelagic in origin (55.9–55 Ma), while the Green River Formation (c. 52 Ma) records a lacustrine system with multiple freshwater biotopes. Wadi al-Hitan corresponds to a shallow marine shoreface of 41–40 Ma but is primarily known for marine mammals. In terms of ecological representativity, Bolca is unmatched in capturing tropical marine ecosystems of the Eocene.

Scientific investigation and impact

Bolca has been studied for centuries and continues to attract international research, with a profound and extraordinary scientific impact. It is considered a reference point for paleontology, evolutionary biology, and geology. The Green River Formation has been the focus of thorough investigation and remains highly relevant, though not at the same level of global significance. Messel Pit is thoroughly documented but primarily valued for its terrestrial and lacustrine fauna, with fish forming a minor component. Mo-Clay remains under-investigated, with only limited studies available. Wadi al-Hitan has received superficial attention for its ichthyofauna, confirming its limited role in this comparative framework.

Accessibility

Bolca is considered reasonably accessible, with specimens distributed across museums and scientific collections, ensuring both preservation and research availability. Messel and Green River provide some access, albeit restricted to certain quarries or sites. Mo-Clay is locally accessible but limited in scope. Wadi al-Hitan is more easily accessible but offers only marginal data on fish assemblages.

Recap

The comparative analysis clearly establishes Bolca as the most outstanding archive of Eocene ichthyofaunas at the global scale. Its superiority lies not in a single parameter but in the combined attributes of:

- extremely high taxonomic richness and

abundance,
- exceptional preservation of delicate anatomical features,
- representation of multiple tropical marine environments,
- profound scientific impact through centuries of study,
- accessibility and conservation within curated collections.

In contrast, other sites provide only partial, specialized, or environmentally restricted records. Messel Pit and Green River Formation are invaluable for lacustrine ecosystems, Mo-Clay for open pelagic settings, and Wadi al-Hitan for marine mammals. However, none of them offer the integrative and comprehensive picture of Eocene marine fish biodiversity documented at Bolca.

Within the framework of World Heritage criterion (viii), Bolca thus emerges as a globally unique testimony of Eocene marine ecosystems and evolutionary history, filling a critical gap in the representation of post-Cretaceous tropical marine faunas on the World Heritage List.

Molluscs comparison										**Total score**
Score:	**unknown=(1) 1-100=2 101-200=3 >200=4**	**unknown=(1) 1-50=2 51-100=3 ->100=4**	**little high=1 moderately high=2 high =3 very high=4**	**only large specimens=1 well preserved=2 very well preserved=3**	**1-2Ma=1 3-5Ma=2 5-10Ma=3 >10=4**	**one type of environmental=1 two types of environmental=2 more than three types of environmental=3**	**pratically zero=1 low=2 high=3**	**absent=0 high=1**	**unknown=(1) partly esposed=2 well exposed=3**	
Site or component	**Diversity (taxa)**	**Diversity taxonomic of upper level (Orders)**	**Abundance of specimens**	**Quality of conservation**	**Age Ma/ Stage**	**Range of environments**	**Degree of investigation**	**Scientific impact**	**Accessibility of the site**	
Bolca San Giovanni Ilarione Roncà (Italy)	65 519 176	36 80 58	little high very high very high	very well preserved	51-49 44.4-42 41-38.8	1.shallow subtidal 2.back-reef lagoon 3.shoreface or inner shelf 4. intertidal or shallow subtidal	1.high: well established species level taxonomy 2.in need of modern revision 3. in need of revision	high impact of older literature. In need of modern, peer-reviewed international studies	1. partly exposed 2.partly exposed 3. partly exposed	
Partial score	4	4	4	3	4	3	3	1	2	28
Western Limfjord (Dennmark)	12	9	little high	well preserved	between 55.9 - 55	1.pelagic	low	Absent in older literature	good in Mors island	
Partial score	2	2	1	2	1	1	2	0	2	13
Grignon - Paris Basin (France)	Ypresian = 600 Lutetian = 1900 Bartonian = 1000	87	very high	very well preserved	middle Lutetian	1.shoreface 2.inner shelf	high: well established species level taxonomy	high impact of older literature. In need of modern, peer-reviewed international studies	well exposed	
Partial score	4	3	4	3	3	2	3	1	3	26
Campo - Pyrénées Atlantiques (France)	184	82	very high	well preserved	Cuisian parastratotype	outer shelf	Low	absent in older literature	unknown	
Partial score	3	3	4	3	3	1	2	0	(1)	19 (20)

Collio - Friuli (Italy)	169	53	very high	very well preserved	49-45.1	1.intertidal 2.shallow subtidal	high: well established species level taxonomy	high impact of older literature. In need of modern, peer-reviewed international studies	partly exposed	
Partial score	3	3	2	3	2	2	3	1	2	21
Wadi Al-Hitan (Egypt)	unknown	unknown	unknown	only larger specimens	41-40	shoreface	pratically zero	absent in older literature	well exposed	
Partial score	(1)	(1)	(1)	(1)	1	1	1	0	3	6 (10)
Mediano - Sobrarbe (Spain)	unknown	unknown	unknown	only larger specimens	Cuisian parastratotype	1.deltaic 2.intertidal	pratically zero	absent in older literature	unknown	
Partial score	(1)	(1)	(1)	(1)	3	2	1	0	(1)	6 (11)

Comparative Analysis of Mollusc Fossil Sites

The comparative assessment of mollusk-bearing fossil sites highlights both the global significance of the Val d'Alpone system (Bolca, San Giovanni Ilarione, and Roncà) and its complementarity with other key Eocene localities in Europe and beyond. The evaluation considered parameters such as diversity, abundance, state of preservation, stratigraphic range, environmental representation, degree of scientific investigation, and accessibility.

Diversity and abundance

The Val d'Alpone sites present moderate to high taxonomic diversity: Bolca with 65 taxa, San Giovanni Ilarione with 519, and Roncà with 176. These values are surpassed by the Paris Basin, where exceptionally high numbers are recorded (600–1,900 taxa depending on the stage), but remain fully comparable with other reference sites such as Friuli (169 taxa) and the Pyrénées Atlantiques (184 taxa). The Western Limfjord, Wadi al-Hitan, and Sobrarbe are either poorly documented or characterized by much lower diversity. Importantly, Val d'Alpone shows a combination of species- and family-level richness across three complementary components, reinforcing its representativity.

Preservation and abundance of specimens

The nominated serial property benefits from very well-preserved mollusk assemblages, a characteristic shared with the Paris Basin and Friuli, and superior to the preservation conditions reported for Huesca-Aragona and Hampshire Basin in comparative datasets. At Wadi al-Hitan and Sobrarbe, preservation is limited to larger specimens only, reducing scientific value. While the Paris Basin is exceptional in abundance (with thousands of bulk samples in historic collections), Val d'Alpone also offers a significant quantitative record across multiple sites.

Stratigraphic and environmental framework

Val d'Alpone covers a wide stratigraphic window, ranging from 51 to 38 Ma, spanning the Early to middle Eocene. The three components document four different marine environments: shallow subtidal, back-reef lagoon, shoreface/inner shelf, and intertidal. This ecological variability is broader than in most comparative sites.
The Paris Basin includes shoreface and inner shelf settings, while the Pyrénées represent an outer shelf parastratotype and Friuli preserves intertidal and shallow subtidal contexts. Wadi al-Hitan and Sobrarbe offer a more restricted range of depositional settings, limiting their capacity to represent Eocene marine biodiversity in its full scope.

Scientific investigation and impact

The Italian sites show a dual pattern: Bolca has a long and well-established taxonomic tradition, whereas San Giovanni Ilarione and Roncà still

require modern revision. This is consistent with most European comparators: the Paris Basin and Friuli have a strong historical record but also call for updated peer-reviewed synthesis. By contrast, the Pyrénées and Sobrarbe have limited or virtually absent scientific coverage. Despite these gaps, the Val d'Alpone nominated property overall holds high potential for further scientific advancement, and its role in the history of paleontology is already significant.

Accessibility and conservation

Accessibility is partial for Val d'Alpone's fossil outcrops, though museum collections provide secure conservation and public visibility. The Paris Basin is well exposed, while Friuli and Limfjord are partly exposed. Sites in Egypt and Spain show variable or limited accessibility. Importantly, Val d'Alpone combines in situ resources with curated collections in local museums, ensuring both protection and international research access.

Recap

The comparative analysis confirms that while the Paris Basin surpasses Val d'Alpone in absolute species numbers, the nominated serial property is unparalleled in combining:

- a broad stratigraphic range from Early to middle Eocene,
- multiple and diverse marine environments,
- exceptional preservation quality,
- high specimen abundance across several fossiliferous localities, and
- an established yet expandable scientific legacy.

These attributes make Val d'Alpone the most comprehensive archive of marine mollusc diversity in the Eocene of the western Tethys. Its value lies not only in diversity metrics but also in the ecological breadth, integrative potential of three complementary components, and its role in understanding post-Cretaceous recovery and marine ecosystem dynamics. In the context of World Heritage criterion (viii), Val d'Alpone offers a uniquely coherent and representative testimony of Eocene marine life, clearly complementing and, in several aspects, surpassing other internationally recognized fossil sites.

Crustaceans comparison										Total score
Score:	**1-30=1 31-50=2 >50=3**	**1-20=1 21-30=2 >30=3**	**not elevated=1 elevated=2**	**not good=1 good=2**	**one stage=1 two stage=2**	**one type of environmental=1 two types of environmental=2 three types of environmental=3**	**need of a modern revision=1 thorough=2**	**medium=1 high=2**	**accessibility not simple=1 accessibility not always simple=2 accessible=3**	
Site or component	**Diversity (taxa)**	**Diversity taxonomic of upper level (Family)**	**Abundance of specimens**	**Quality of conservation**	**Age/Stage**	**Range of environments**	**Degree of investigation**	**Scientific impact**	**Accessibility of the site**	
Val d'Alpone - Pesciara and M. Postale	21	13	not elevated	good	Early Eocene	1.lagon environment 2.patch reef	thorough	high	1.Pesciara is open to the public 2. other sites have limited accessibility	
Val d'Alpone - San Giovanni Ilarione (Italy)	19	11	elevated	good	middle Eocene	3. shelf environment	thorough	high	accessible	

Partial score	2	2	2	2	2	3	2	2	2	19
Western Limfjord (Dennmark)	8	7	not elevated	good	Early Eocene	1. shoreface or inner shelf	need of a further investigation	medium	good in Mors island	
Partial score	1	1	1	2	1	1	1	1	2	11
"Budapest Basin" (Hungary)	more than 60	31	elevated	good	middle and late Eocene	1.reefal 2.inner shelf	need of a modern revision	high	accessibility not simple	
Partial score	3	3	2	2	2	2	1	2	1	18
South-Pyrenean Central Unit (Spain)	27	14	not elevated	good	Early and middle Eocene	1.deltaic 2.reefal 3.inner shelf	need of a further investigation	medium	accessibility not always simple	
Partial score	1	1	1	2	2	3	1	1	1	13
London Clay Fm (United Kingdom)	39	18	elevated	Not good	Early Eocene	1.inner shelf	thorough	high	accessible	
Partial score	2	1	2	1	1	1	2	2	3	15

Comparative Analysis of Crustacean Fossil Sites

The comparative assessment of Eocene crustacean fossil sites underscores the particular significance of the Val d'Alpone system, represented by Pesciara–Monte Postale and San Giovanni Ilarione, in relation to other European and international reference localities such as the Western Limfjord (Denmark), the Budapest Basin (Hungary), the South-Pyrenean Central Unit (Spain), and the London Clay Formation (United Kingdom).

Diversity and abundance

Val d'Alpone sites yield moderate levels of taxonomic richness: Pesciara–Monte Postale with 21 taxa across 13 families, and San Giovanni Ilarione with 19 taxa across 11 families. These figures are lower than the Budapest Basin, which exceeds 60 taxa across 31 families, and the London Clay, with 39 taxa and 18 families. However, the nominated serial property presents a representative spectrum of Early to Middle Eocene crustacean faunas, with consistent preservation and ecological breadth. The South-Pyrenean Central Unit holds 27 taxa across 14 families, while the Western Limfjord records only 8 taxa and 7 families. In terms of abundance, San Giovanni Ilarione is rated "elevated," suggesting a richer assemblage than Pesciara, which is categorized as "not elevated."

Preservation quality

Specimens from Val d'Alpone are generally well preserved, allowing robust taxonomic and ecological interpretation. This quality is comparable to that of Budapest and the South-Pyrenean faunas, and superior to the London Clay, where preservation is described as "not good." The Limfjord sites are considered adequately preserved but remain poorly studied.

Stratigraphic and environmental framework

Val d'Alpone provides stratigraphic coverage from the Early Eocene (Pesciara–Monte Postale) to the Middle Eocene (San Giovanni Ilarione). Importantly, the sites document a variety of depositional settings: lagoonal and patch reef environments at Pesciara, and shelf environments at San Giovanni Ilarione. This breadth of paleoenvironmental representation is broader than most comparative sites. The Budapest Basin spans the Middle to Late Eocene and includes reefal and inner shelf environments, while the South-Pyrenean sites record deltaic, reefal, and inner shelf deposits.

The Western Limfjord provides an Early Eocene shallow marine setting, and the London Clay an inner shelf environment.

Scientific investigation and impact

Val d'Alpone sites are described as "thoroughly" investigated, with consistently high scientific impact. This distinguishes them from Budapest, which despite high diversity still requires modern revision, and from the South-Pyrenean localities, where studies are limited and scientific impact assessed as medium. The Western Limfjord remains under-investigated. Only the London Clay shares with Val d'Alpone the combination of thorough study and high scientific relevance, although its poor preservation reduces comparative value.

Accessibility

Pesciara is open to the public and integrated into museum displays, although other Val d'Alpone sites have more limited accessibility. San Giovanni Ilarione is accessible for research and visitation. In contrast, Budapest is described as "not simple" to access, while the South-Pyrenean sites are "not always simple." The London Clay is readily accessible, whereas the Limfjord is considered accessible only locally.

Recap

Although Val d'Alpone crustacean sites do not surpass Budapest in absolute taxonomic richness, they offer a distinctive and complementary set of attributes:

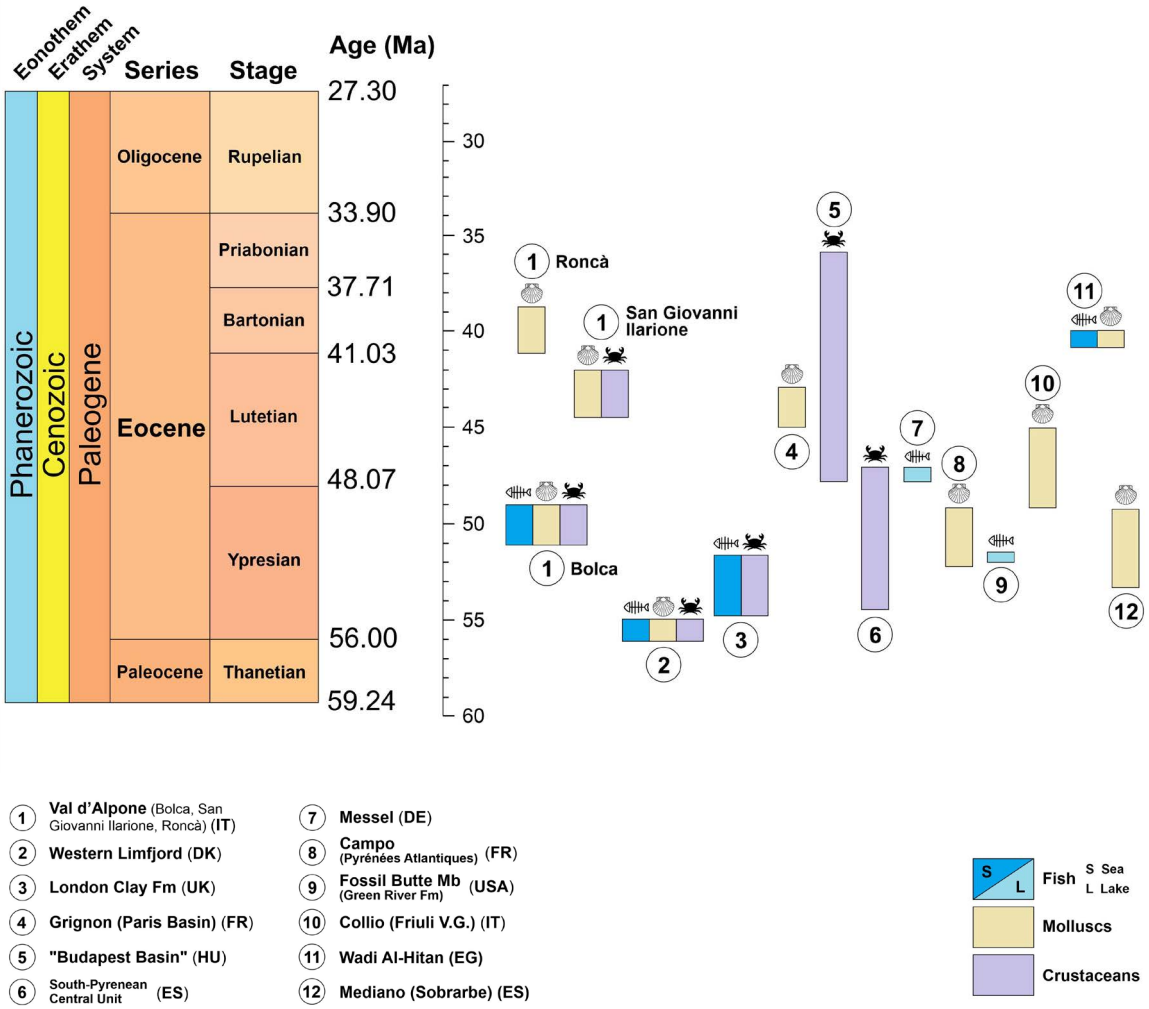
- continuity from Early to Middle Eocene;
- representation of multiple environments (lagoon, reef, and shelf);
- consistently good preservation;
- thorough investigation and high scientific impact;
- accessibility and museum-based valorization.

These attributes confirm the international relevance of the Val d'Alpone system as a benchmark for Eocene crustacean faunas. In contrast, other sites demonstrate limitations: Budapest in need of revision despite its high richness, the South-Pyrenean faunas with restricted impact and accessibility, the Limfjord with very low diversity and insufficient study, and the London Clay hampered by poor preservation.

In the framework of World Heritage criterion (viii), Val d'Alpone thus emerges as a globally significant and representative archive of Early to Middle Eocene crustacean biodiversity. Its integration of diverse environments, robust preservation, and well-documented scientific tradition provides an outstanding and complementary testimony of Eocene marine ecosystems in the western Tethys.

The comparative analysis supports the conclusion that the stratigraphic and palaeontological record of the nominated property is the best archive worldwide for changes in the marine ecosystem during the Eocene. The nomination dossier underscores the global importance of the nominated property, which holds Earth-history evidence relating to the Eocene marine ecosystem, with fossils of high biodiversity, exceptionally preserved, and with a very long and well-documented research history. The nominated property provides a comprehensive testimony to the history of marine life during a crucial period in the evolution of marine faunas after the end-Cretaceous mass extinction. The comparative analysis of Eocene faunas clearly reveals the unparalleled diversity of the Val d'Alpone nominated serial property in terms of species-level taxon counts, as well as notable anatomical disparity and ecological heterogeneity—features likely tied to a unique palaeoenvironmental context represented by a complex of highly diversified tropical palaeobiotopes within an ancient biodiversity hotspot. The components of OUV enable a broad and complete reconstruction and description of marine life on Earth during the Eocene and are unmatched elsewhere for extent, completeness, beauty, scholarship, and history. The good conservation state of the places and the curation and enhancement of fossil specimens in local museums enable full appreciation of this fossil heritage. The nomination is therefore well positioned to complete, under criterion (viii), the global Eocene knowledge framework within the World Heritage List.

The fish and marine ecosystem sites analysed



3.3 Draft Statement of Outstanding Universal Value

a) Brief synthesis

The nominated property is located in the North-East of Italy, in the Veneto Region and in the Val d'Alpone area. The serial property is composed of the components of Bolca, San Giovanni Ilarione and Roncà which contain 3 distinct deposits with 14 outcrops the whose paleontological content allows us to describe the evolution of marine life on the planet during the Eocene, thanks also to one of the most consistent and complete fossil records in the world.

The Val d'Alpone is crossed by the stream of the same name and extends over an area of approximately 16,700 hectares, at altitudes between 30 and 925 m s.l.m. above sea level and is part of the plateau of the eastern Lessini Mountains. This territory is characterized by extensive outcrops of volcanic rocks with gentle and wavy morphologies from which conical shapes and remains of ancient volcanic "buildings" emerge. Marine sedimentary rocks are interspersed with the volcanic rocks.

The volcanic rocks, locally fossiliferous, also contain olistoliths of various sizes of carbonate rocks with a rich paleontological content attributable to the Eocene (between 56 and 34 million years ago), an era characterized by important biological, climatic, environmental and geodynamic changes. In the Val d'Alpone, over 40 Eocene fossiliferous outcrops have been

recorded, indicating a very high paleontological density for such a small territory, with peculiar characteristics in which marine and terrestrial vertebrates, marine invertebrates and both marine and terrestrial plants can be recognized. The 3 deposits have a stratigraphic continuity between the lower Eocene (Monte Postale/ Pesciara, about 49 Ma) and the middle Eocene (San Giovanni Ilarione and Roncà, about 40 Ma), highlighting a variety of depositional environments that include intertidal environments (Roncà), shallow subtidal
(Monte Postale, environment associated with the "Pesciara di Bolca" deposit) and subtidal with a depth between a few meters and 20-30 meters (San Giovanni Ilarione). Taken together, the three components constitute a serial nominated property that provides a complete ecological scenario of the bathymetric gradient in a time interval in which the Earth experienced exceptionally high temperatures and marine biodiversity reached its climax after a long period of recovery after the mass extinction and the groups of organisms that still dominate marine habitats today have established themselves. We describe below the characteristic elements of the three components of the nominated site.

The Bolca component, with the 8 outcrops of Pesciara and Monte Postale, is one of the most famous locations in the world for ichthyofauna. Past and current excavations have also allowed the recovery of remains of reptiles, birds and a rich association of invertebrates represented by insects, arachnids, jellyfish, crustaceans, bivalves, gastropods, cephalopods, corals, brachiopods, annelids, macroforaminifera, ostracods and bryozoans. Terrestrial plants are also frequent, the latter very often accompanied by flowers and fruits.
Pesciara and Monte Postale are the most famous and important Ypresian *Fossil-Lagerstätten* in Italy and undoubtedly among those of greatest importance for the entire Cenozoic at a global level. Many of the Bolca fossil fish have "relatives" still living.
Due to the great variety of fish found in the five fossil levels, Pesciara can be considered one of the richest deposits in the world.
In fact, during each excavation new finds for Science are brought to light. The reconstruction of the ancient living environment of the Bolca fish is rather complex as suggested by the great variety and shapes of the fish.
Some are similar to those that currently live in coral reef environments, others are characteristic of shallow sandy seabeds with meadows of marine plants and algae.
The sedimentation environment of Monte Postale must have been close to the coast, characterized by coral bioconstructions and "mangroves", while recent studies reconfirm the more "traditional" model for Pesciara,
with the sedimentation of calcareous muds inside an intra-platform basin, where the existence of anoxic conditions on the seabed and the development of microbial biofilm on the cadavers have allowed the perfect preservation in the fossil state of the rich and varied fauna.

The San Giovanni Ilarione component, with the Ciupìo deposit, documents the high diversity of molluscs, but also of crustaceans.
The fossils are mainly represented by gastropods and bivalves, are found in a relatively small area and are mostly representative of the depositional environment of the open sea.
The shell remains found in San Giovanni Ilarione, particularly important and abundant at various levels of the stratigraphic succession, have been studied for two centuries as a tool for stratigraphic correlation and unique evidence of the maximum values of biodiversity reached on a global scale after the mass extinction at the end of the Cretaceous.
San Giovanni Ilarione can also be considered a classic locality for the knowledge of fossil crustaceans from the Middle Eocene of the Veneto. Many specimens, almost all found in the Ciupìo tuffs, were the subject of important studies in the 19th century by Bittner and at the beginning of the 20th century by Fabiani. It is a fauna of brachyurans of a marine environment with a good degree of differentiation.

The Roncà component, with its 5 outcrops, is particularly rich in marine gastropods and bivalves representative of intertidal environments. From these contexts, unique information has been obtained and continues to be obtained, thanks

to the excavations still in progress, regarding the conspicuous faunal biodiversity.

Each deposit, to a different but complementary extent, contributes to implementing even today the rich fossil heritage collected, restored, studied and exhibited in the Bolca Fossil Museum, in the Roncà Paleontological Museum, in the Civic Museum of Natural History of Verona and in the Museum of Nature and Man of the University of Padua and in the paleontological collections of many small and large museums around the world.
The richness and uniqueness of the nominated property are highlighted by the interest that these components have aroused over the centuries in philosophers of science and naturalists starting from the eighteenth century, contributing extensively to the debate on the origin and evolution of the Earth and on the nature of fossils.

b) Justification for criteria

Criterion (viii)
The paleontological documentation of the nominated property is central to describing the history of marine geology and evolutionary biology of the Eocene. These are fossil testimonies that identify an ecological scenario of the entire bathymetric gradient, in a period in which the Earth experienced exceptionally high temperatures, marine biodiversity reached its climax after a long period of post-mass extinction recovery and the groups of organisms that today populate our seas established themselves.
The extraordinary state of conservation of the fossils (vertebrates, invertebrates and plant remains), the richness of species and forms represented by the high taxonomic diversity, the uniqueness of the fish in which anatomical structures and pigmentations that are difficult to fossilize are often recognized, constitute the most complete traces of a broad and detailed picture of marine life of the Eocene.
Furthermore, five centuries of history and over a thousand publications document the exceptional significance of the Eocene fossils of the Alpone Valley, the result of a unique combination of taphonomic, stratigraphic and paleogeographic characteristics.

c) Statement of Integrity

The nominated property, consisting of the components of Bolca, San Giovanni Ilarione and Roncà, contains 14 outcrops that are subject to protection for their content of paleontological and natural values.
From these components come those fossils that in five hundred years have contributed to explaining the evolution of Eocene marine life on Earth. The fossils collected are protected and preserved in local museums and around the world. The integrity of the deposits and their outcrops is not only linked to the conservation and protection reserved for them but also to the factors that contribute to their development. For this reason, the proposed boundaries of the *core zone* areas that contain the outcrops have been defined taking into account the geopaleontological of the places and, to ensure better conservation in the future, three *buffer zones* were created to protect the site.
The delimitation of the latter was also carried out considering the physiographic and cultural limits. Overall, the area of the nominatedproperty is 88.3 ha (*core zone*) and is protected by an external area adjacent to the property boundaries of 216.1 ha (*buffer zone*). Most of this territory is cultivated with coppice and meadow. The deposits and outcrops have only been partially excavated and explored with ministerial concessions. The extension of the deposits, the powerful stone and detrital deposits that cover them and the modest excavation volumes prevent the depletion of the fossil horizons and constitute elements in favor of the conservation and protection of the nominated property. In fact, the integrity of the nominated property, with its values and attributes, is guaranteed by the application of cutting-edge excavation and research methods that produce a significant increase in scientific knowledge and also guarantee a careful and balanced conservation of the heritage. The correct extraction technique and the extraordinary state of conservation of the recovered fossils allow a broad and complete reconstruction of the





biotic, climatic and environmental variations and allow us to understand the phylogenetic and paleoecological significance of these fossils. The abundance of fossil remains extracted in the past and their richness has not impoverished the deposits, allowing us to continue research with new and modern excavation campaigns, in agreement with
the Ministry of Culture - Superintendence of Archaeology, Fine Arts and Landscape for the provinces of Verona, Rovigo and Vicenza. A part of the invaluable paleontological heritage collected in the past has played a fundamental role in the history of science. Currently, this heritage is preserved in the two local museums of the Val d'Alpone (the Museum of Fossils of Bolca and the Paleontological Museum of Roncà) and in the collections of museums all over the world. In particular, the Museum of Natural History of Verona and the Museum of Nature and Man of the University of Padua are the two structures of the Veneto Region that at a global level preserve the majority of the historical and modern collections of the Val d'Alpone, certifying that the condition of integrity of the finds is satisfied. About 60% of the *core zone* and 70% of the *buffer zone* falls within the area of the Lessinia Regional Natural Park (Regional Law Veneto n. 1/90).
All the outcrops have been catalogued by the A.T.S. "*Val d'Alpone - faune, flore e rocce del Cenozoico*". On these outcrops, the Superintendence of Archaeology, Fine Arts and Landscape for the provinces of Verona, Rovigo and Vicenza, with prot. 12950 of 06/25/2020 and with prot. 36873 of 12/05/2023, has recognized a preventive protection.

d) Statement of Authenticity

Not relevant as this nomination is summitted under criterion (viii)

e) Requirements for protection and management

All the outcrops of the components of the nominated property have a strong legal protection framework. It consists of a coherent system of measures that link different levels of legislation (European, national, regional and local) and protects the paleontological values and attributes of the nominated property and its natural habitats. The areas of the 3 components are subject to the following levels of legislative protection:

- The entire extension of the present and future fossil deposits and outcrops are subject to the provisions of the Cultural Heritage and Landscape Code (Legislative Decree no. 42 of 22 January 2004 updated with subsequent amendments and additions), according to which the fossils found on Italian territory are the property of the State and the trade in Italian fossils is prohibited. Paleontological excavations can be carried out but must be previously authorised (by the Ministry of Culture - General Directorate of Archaeology, Fine Arts and Landscape), following the submission of a concession application. The Pesciara deposit in 1963 (Ministry of Public Education Ministerial Decree 20.08.1963) and in 1992 (Ministry of Cultural and Environmental Heritage Decree of 22.09. 1992) and an outcrop of Monte Postale in 1992 (Ministry of Cultural and Environmental Heritage Decree of 22.09.1992) were protected by Ministerial Decree for the purposes of protecting the paleontological heritage contained therein.
- The Superintendence of Archaeology, Fine Arts and Landscape for the provinces of Verona, Rovigo and Vicenza, a peripheral body of the Ministry of Culture, responsible for the control, monitoring and supervision of paleontological deposits/outcrops, expressed a positive opinion and formal support for the proposal for the nomination of the site presented by the A.T.S. "*Val d'Alpone – faune, flore e rocce del Cenozoico*" (prot. 12950 of 25/06/2020 and prot. 36873 of 05/12/2023).
- Approximately 60% of the *core zone* and 70% of the *buffer zone* fall within the area of the Lessinia Regional Natural Park (Veneto Region Law no. 1/90).
  Among the objectives, in addition to the protection of soil, flora, fauna and water, there is also the protection of specific paleontological, geomorphological, anthropological, archaeological, vegetational

and faunal peculiarities.
The park's environmental plan took into account the objectives and purposes of Directive 30 November 2009, no. 2009/147/EC, of the European Parliament and of the Council on the conservation of wild birds and Directive 21 May 1992, no. 92/43/EEC of the Council on the conservation of natural and semi-natural habitats and of wild flora and fauna in the following areas: nature reserve areas and agro-forestry-pastoral areas with identification of adjacent areas.

- The territorial bodies of the three components of the nominated property (Altissimo, Vestenanova, San Giovanni Ilarione and Roncà) which have administrative and regulatory competence for the urban planning are among the promoters of the nomination and participate in the protection, conservation, enhancement and management of the site falling within their territory.

From all this it can be deduced that the three components and the paleontological outcrops contained therein enjoy the maximum level of national, regional (constraints of the Lessinia Natural Park Authority) and municipal protection and how no intervention may ever be carried out without the necessary authorization of the Superintendence of Archaeology, Fine Arts and Landscape for the provinces of Verona, Rovigo and Vicenza.
The deposits of the nominated property are, for the most part, in privately owned areas.
The owners of these lands were involved in the nomination process and understood and shared its Exceptional Value and today they carry out a first level of protection, in particular that of custodians of the paleontological outcrops present on their properties.
To support the preparation process of the nomination, in 2017 the Temporary Association of Purpose *"Val d'Alpone - faune, flore e rocce del Cenozoico"* was established, which represents the territory of the Val d'Alpone that contains the nominated property; its members include territorial, cultural and scientific bodies, economic entities and some cultural associations.
The A.T.S. has involved, in addition to the Superintendence of Archaeology, Fine Arts and Landscape for the provinces of Verona, Rovigo and Vicenza, also the Veneto Region, which strongly supports the project (Council Resolution no. 131 of 7 February 2018), as well as the Lessinia Regional Natural Park Authority. Furthermore, direct contacts were maintained with public administrators and with the heads of socio-economic and cultural associations in the Val d'Alpone area, with the owners of the land of the serial site, with representatives of the professional categories, with the world of schools and with citizens.

The management of the three components has a governance system aimed at the protection and conservation of paleontological assets through 4 main points:

- preventive protection action based on national legislation headed by the Superintendence of Archaeology, Fine Arts and Landscape for the provinces of Verona, Rovigo and Vicenza;
- constant monitoring of the territory of the serial site by local administrations and the Lessinia Regional Natural Park Authority;
- surveillance of the outcrops carried out involving landowners;
- periodic checks carried out by expert personnel of the Technical Scientific Committee belonging to the A.T.S. *"Val d'Alpone – faune, flore e rocce del Cenozoico"*. and composed of researchers, scholars and university professors expert in Paleontology.

Tourists and enthusiasts can visit the outcrops independently or accompanied by guides, while Italian law prohibits the collection of fossils, unless authorized, as they are cultural heritage and therefore property of the State.
The fossils of the serial site are visible in the Bolca Fossil Museum and in the Paleontological Museum of Roncà.
The monitoring system, as indicated in the Management Plan, provides for the verification of a series of key factors to have indications on the state of conservation and integrity of the paleontological values as well as on the conservation of the surrounding natural environment.



Bolca Fossil Museum. Lecture given by Prof. Carnevale to the students of the University of Turin

4. STATE OF CONSERVATION AND FACTORS AFFECTING THE PROPERTY

4.a. Present state of conservation

The fossil deposits of the Val d'Alpone, representative of different marine depositional environments of the Eocene, are preserved in the components parts of Bolca, San Giovanni Ilarione and Roncà. The outcrops of these components parts have only been partially explored and excavated with the indispensable ministerial concession; therefore, their fossil content is further protected and preserved by a thick pile of stony rocks as well as by the powerful detrital deposits of cover. From a geological point of view, the Val d'Alpone is located on the southern edge of the Alps, and belongs to the domain of the eastern Lessini Mountains. In the designated area, marine sedimentary formations of an age ranging from the Lower Cretaceous to the Lower Eocene as well as volcanic rocks of the Paleogene emerge. The latter are mainly composed of pyroclastic products and underwater lava flows but also subaerial ones of Eocene and Oligocene age. Furthermore, the volcaniclastic rocks often contain olistoliths of various sizes, including that of Pesciara di Bolca. As regards the landscape, the volcanic rocks have gentle and wavy morphologies, from which conical shapes emerge, locally known as "purghe" and remains of ancient volcanic "buildings". In the Val d'Alpone, over 40 fossiliferous deposits/outcrops have been recorded, indicating a very high paleontological density for such a small territory, all from the Eocene era and with peculiar characteristics. From the comparative examination of the deposits present, three areas of greater paleontological relevance have been identified, which include the most important and significant fossiliferous deposits and which express a marine Eocene fossiliferous heritage unique in quality, quantity and biodiversity of exceptional value. These deposits have a stratigraphic continuity between the Lower Eocene (Monte Postale/Pesciara, about 49 Ma) and the Middle Eocene (San Giovanni Ilarione and Roncà, about 40 Ma). The nominated serial property highlights a variety of depositional environments that include intertidal environments (Roncà), shallow subtidal environments (Monte Postale, environment associated with the "Pesciara di Bolca" deposit) and subtidal with depths ranging from a few meters to 20-30 meters (San Giovanni Ilarione).

Overview of the central and northern portion of the Val d'Alpone. In the foreground the town of San Giovanni Ilarione, in the background on the left that of Vestenanova



4.a (i) State of conservation of the components parts of the nominated serial property

Bolca (component part 01)

With its Pesciara and Monte Postale deposits, it is one of the most famous locations in the world for fish fauna. The sedimentation environment of Monte Postale was probably close to the coast, characterized by coral bioconstructions and "mangroves", while recent studies reconfirm the more "traditional" model for Pesciara, which involves the sedimentation of calcareous muds within an intra-platform basin. Starting from the 2000s, thanks to geological studies carried out with the aid of core sampling and geoelectric surveys, it has been possible to define more precisely the extension, thickness and, therefore, the volume of the Pesciara deposit. These data have not yet been published in scientific journals.

The Bolca component has a surface area of 21.00 ha (*core zone*) and is protected by a *buffer zone* of 52.50 ha. In the *core zone*, six outcrops fall within Monte Postale and two outcrops within Pesciara. The areas of the component are today mainly cultivated with coppice, chestnut groves and meadow-pasture.

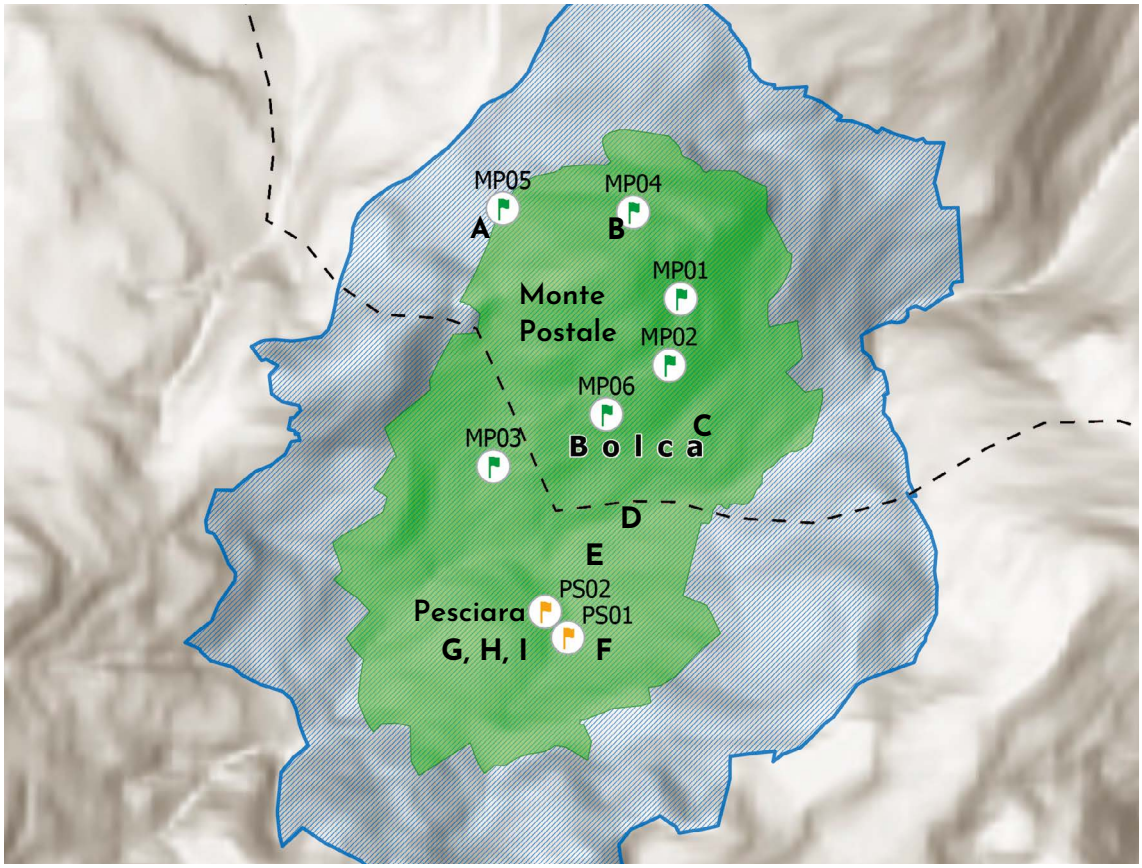
To reach and visit the deposit area coming from the A4 Soave-San Bonifacio toll booth, take the Provincial Road SP77 towards Bolca and, a few hundred meters before reaching the location, follow the signs for Pesciara.

Once you arrive at the *"Alle Castagnare"* location, there is a free car park, equipped with toilets and with a capacity of about 40 cars and 6 buses. Walk along the dirt road that runs slightly downhill along the eastern slope of Monte Postale for about 1.3 kilometers. Along the way, you can see some outcrops that have been the subject of small excavation campaigns. At the end of the road, there is a small square for parking for two/three vehicles used in the free service for the transport of elderly or disabled people.

From here, crossing a small bridge over the stream that runs through Valle del Cherpa, you enter the Pesciara area. Going up the steps that lead to the reception and refreshment point, you skirt the Pesciara deposit where you can see the gated entrances of the old tunnels excavated in the last century. Depending on the time available and your interests, you can stop in the educational area or ask to be accompanied by a guide to visit one of the ancient tunnels that has been duly equipped and made safe. The section open to the public extends for about 50 meters. The laminated layers rich in fossils are clearly visible, as well as two sections of tunnels that still preserve the ancient techniques, artificial and natural, of securing the vault. Once the guided tour is over, you can easily reach the reception point to dedicate yourself to the activities of the educational area. School groups and visitors can safely try out (with goggles, gloves and a hammer) the role of a *"paleontologist"* in search of fossils by opening specially placed foreign fossiliferous rocks or use sieves in some large sandboxes where fossils of shark teeth from North Africa and colored mineral crystals are hidden. These last activities are carried out under the supervision of expert staff.



The Pesciara area with the staircase leading to the gallery open to the public and the reception point. At the bottom right are the entrances to the ancient galleries, now closed





A. Monte Postale car/bus parking lot



B. The path that leads to the area



C. Surfacing



D. Service parking at Pesciara



E. Access steps to Pesciara



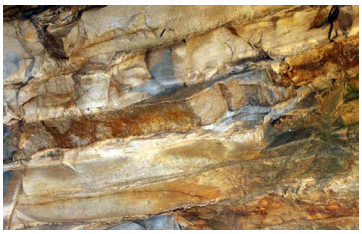
F. Refreshment and reception point



G. Entrance to one of the Pesciara galleries

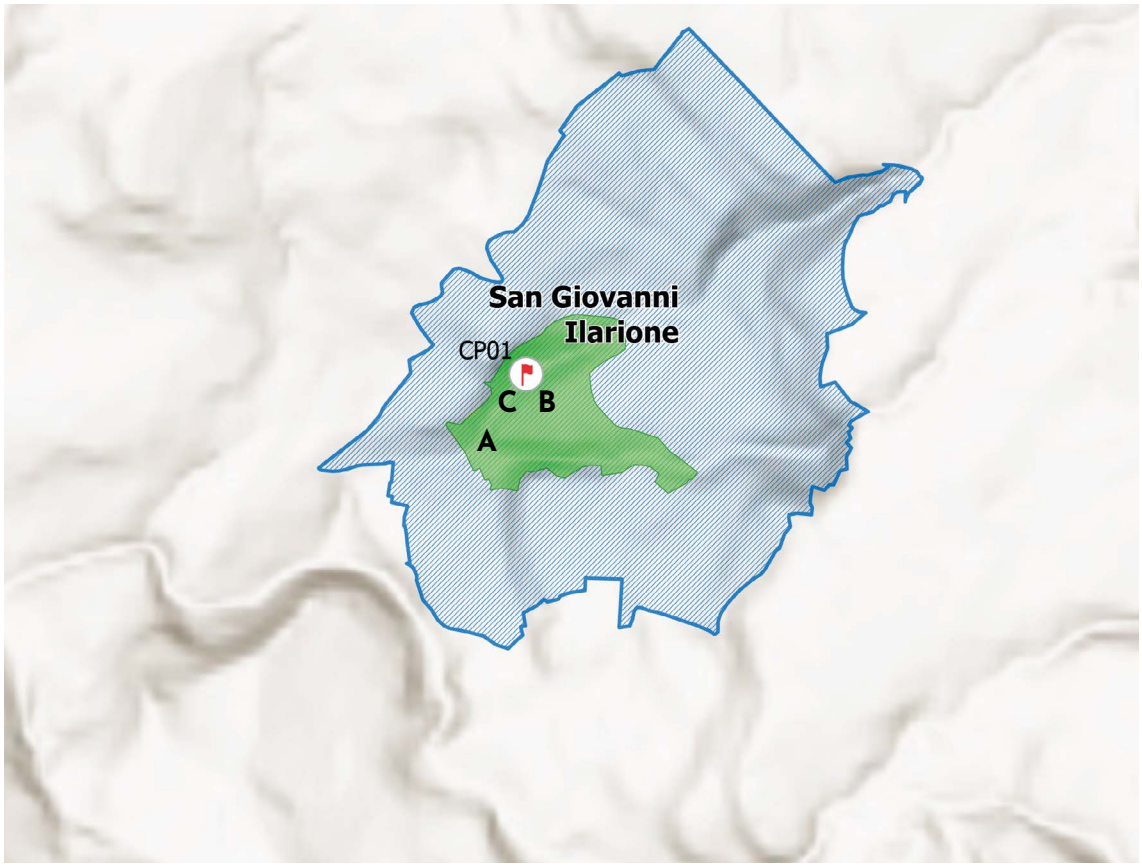


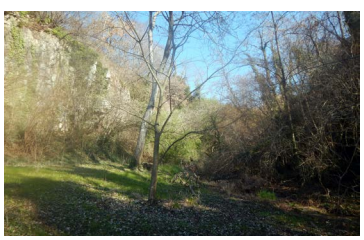
H. Interior of one of the galleries



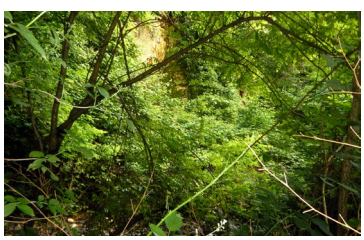
I. The fossiliferous layers

San Giovanni Ilarione (component part 02)
The component includes the Ciupìo deposit, rich in molluscs (gastropods and bivalves) and crustaceans, representative of the submerged beach (subtidal) depositional environment. The *core zone* area is relatively small (2.30 ha) and is almost entirely covered by coppice occupying the bottom and slopes of the local watercourse. On the right and left hydrographic sides, some rocky walls are visible at whose base the tuffaceous unit rich in fossils emerges. To access the outcrop, follow a stretch of Via Ciopii and then continue on the right hydrographic side for a few dozen meters along a dirt road. The deposit is partly on state-owned land (riverbed) and partly private. Given the location of the fossil horizon, before carrying out sampling or small tests, it will be essential to secure the intervention area.
In the vicinity of the deposit there is the district of the same name and some scattered houses. The lands surrounding the component part are cultivated with vineyards, cherry orchards, arable land and permanent meadows.
The protection area (*buffer zone*) extends for 21.60 ha since a greater extension is assumed in the subsoil of the deposit compared to what appears on the surface.





A. Overview of the valley with the watercourse that carved the deposit

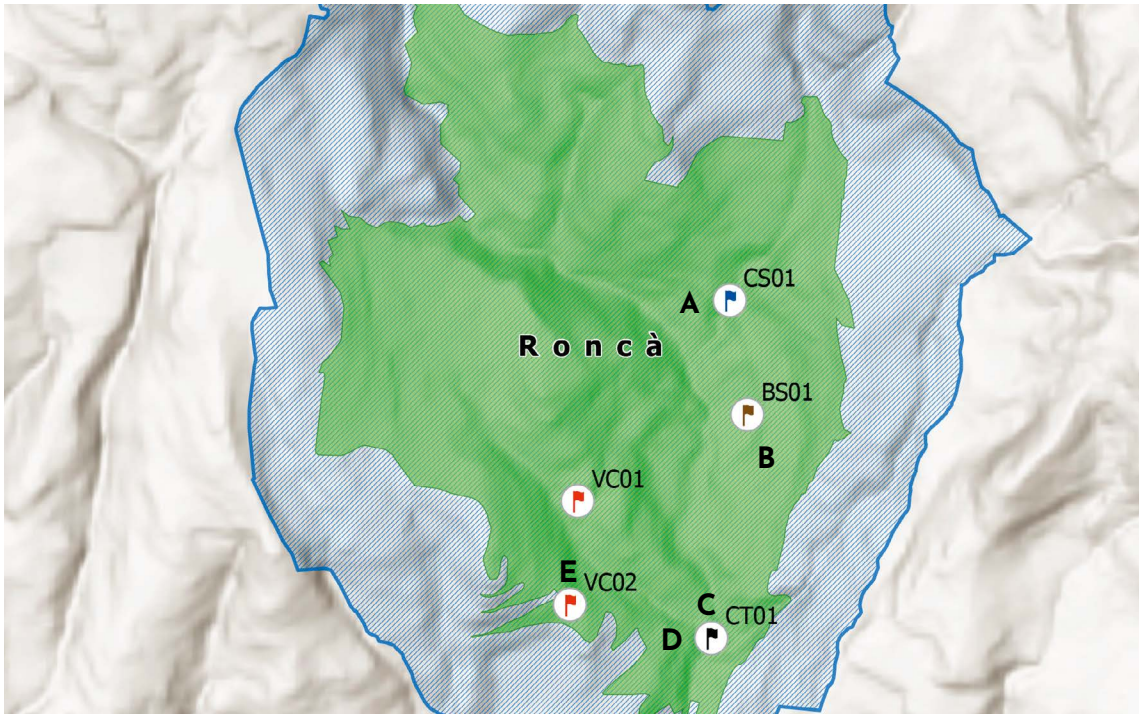


B. The area among the thick arboreal vegetation



C. Ciupìo. The rock face at the base of which are the fossiliferous layers, currently covered by detritus

Roncà (component part 03)
The component is particularly rich in gastropods and marine bivalves representative of intertidal or subtidal environments.
The *core zone* of this component is the largest of the nominated serial site (65.00 ha), protected by a *buffer zone* of 142.00 ha.
The land of this area is cultivated with coppice, vineyards, cherry orchards and arable land.
Next to the church of Roncà, adjacent to the parking area equipped with a camper area, a ring-shaped nature trail begins. The itinerary develops within the so-called "Fossil Park", skirting outcrops of volcanic and sedimentary rocks. The outcrops are located in a lateral position with respect to the path that crosses the wooded valley floor of Valle della Chiesa.
The five fossiliferous outcrops fall under both state and private property.
Although not marked, their protection is not easy because the fossiliferous horizons are rather superficial.

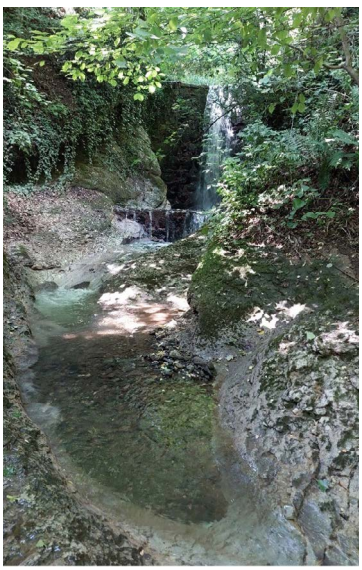




A. Rest area along the nature trail



B. Contrada "Buso" near the fossiliferous outcrop



C. Morphologies in the limestones north of Casa Tessari

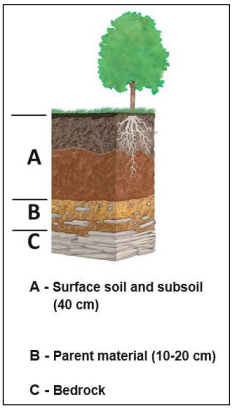


E. Fossiliferous outcrop in the locality "Costo"



D. Fossiliferous outcrop of Casa Tessari

4.a (ii) Factors that interact and influence the nominated property



The exogenous natural processes that affect the deposits/outcrops of the nominated property are those of erosion produced by atmospheric agents: water, sun, ice, etc. Given the morphology of the places, the deposits are not affected by particular urbanization. In fact, the largest extension of the land falls in wooded areas, while the few agricultural activities present are not particularly impactful. The agricultural lands that have been cultivated for a long time with mechanical means do not present particular problems of protection of any fossil horizons present in the subsoil. Only in the case of new fruit tree plantations will it be appropriate to evaluate, from time to time, also in function of the strength of the loose cover and the fossil substrate, the opportunity or not to carry out specific investigations that will have to be authorized and regulated.
The following table summarizes the factors that interact with the designated property according to the areas of agricultural, urban planning and excavation and/or earthmoving intervention, divided by type, risk and competent and controlling subjects. These factors must be monitored over time.

Protection and management within the nominated property

General scope	Scope of intervention	Type of intervention	Risk assessment	Risk	Competent subject to release the authorization or to organize the initiative	Control subject
Agricultural	Woods	Cutting, thinning, possible replacement planting	The intervention does not involve interventions that could compromise any fossil layers since it does not involve new excavations	Null. No excavations are planned	Regional Forestry Service, Regional Natural Park Authority of Lessinia, Municipal Administration	Carabinieri Forestry Unit, Superintendency of Archaeology, Fine Arts and Landscape for the provinces of Verona, Rovigo and Vicenza, Regional Natural Park Authority of Lessinia, A.T.S. New
	Pasture, meadow, wooded meadow, arable land	Change of crop	Possible excavation for planting fruit trees which requires a 50 cm wide and 60 cm deep excavation (double the roots)	Low. The first 30-40 cm are made up of agricultural soil. The underlying rock for at least 30-40 cm is naturally altered and fractured. It is not certain that the excavation will intercept the fossiliferous layers	As above	As above

Agricultural	Orchard (chestnut, olive, cherry, kiwi, etc.), vineyard	Change of crop	The replacement of the orchard typology involves the extraction of the old plants/ stumps	Nothing. The planting of new plants will take place by exploiting the holes left by the extraction of the stumps, therefore without new excavations	As above	As above
	Land improvement	Excavation, backfilling, levelling	The excavation operations could intercept (if present) the fossiliferous layer	Potentially high. However, it is not certain that the excavation will intercept the fossil layer	As above	As above
Urban planning	Agricultural land	Not buildable	No intervention	Null. No excavations are planned	Municipal Administration, Lessinia Regional Natural Park Authority	As above
	Isolated agricultural buildings	Possibility of expansion	The excavation operations could intercept (if present) the fossiliferous layer	Potentially high in proximity to fossiliferous outcrops already recorded	As above	As above
	Isolated inhabited buildings	Possibility of expansion	The excavation operations could intercept (if present) the fossiliferous layer	Potentially high in proximity to fossiliferous outcrops already recorded	As above	As above
	Contrada	Construction of new buildings	The excavation operations could intercept (if present) the fossiliferous layer	Potentially high in proximity to fossiliferous outcrops already recorded	As above	As above
	Existing tourist activities	Possibility of expansion	The excavation operations could intercept (if present) the fossiliferous layer	Potentially high in proximity to fossiliferous outcrops already recorded	As above	As above
Excavations and earthmoving	Forest road	Excavation, backfilling, levelling	The excavation operations could intercept (if present) the fossiliferous layer	Potentially high in proximity to fossiliferous outcrops already recorded	Regional Forestry Service, Regional Natural Park Authority of Lessinia, Municipal Administration	As above
	Local/inter-farm road	Excavation, backfilling, levelling	The excavation operations could intercept (if present) the fossiliferous layer	Potentially high in proximity to fossiliferous outcrops already recorded	Regional Forestry Service, Regional Natural Park Authority of Lessinia, Municipal Administration	As above
	Public roads	Excavation, backfilling, levelling	The excavation operations could intercept (if present) the fossiliferous layer	Potentially high in proximity to fossiliferous outcrops already recorded	Municipal Administration, Lessinia Regional Natural Park Authority	As above

Excavations and earthmoving	Parking	Excavation, backfilling, levelling	The excavation operations could intercept (if present) the fossiliferous layer	Potentially high in proximity to fossiliferous outcrops already recorded	Municipal Administration, Lessinia Regional Natural Park Authority	As above
	Paleontological excavation	Excavation, backfilling and possible levelling	The excavation operations concern the fossiliferous layer	Excavation carried out for scientific reasons. The limited excavation volumes do not impoverish the deposits but allow the recovery of new genera and species.	Ministry of Culture, Superintendence of Archaeology, Fine Arts and Landscape for the provinces of Verona, Rovigo and Vicenza, Regional Natural Park Authority of Lessinia	Superintendence of Archaeology, Fine Arts and Landscape for the provinces of Verona, Rovigo and Vicenza, Regional Natural Park Authority of Lessinia, A.T.S. (C.T.S), University, Museum of Verona, A.T.S. New

[1] Given the geological situation, any expansion of the current infrastructures present in Pesciara would not pose any danger to the fossil deposit since they are all located on landfill materials.

Human impacts

The fossil finds in Val d'Alpone have a long history: for centuries the fossils discovered in this area have been collected for their beauty, to be examined and studied and finally included in the scientific collections of museums. In particular, the fossils of Bolca are the best known and studied.

The deposits/outcrops present in the nominated serial property were described, reported and reported, already in the Venetian era, on historical maps,

an indication of the paleontological richness of the area and the interest they aroused.

Many intellectuals and scholars of the 18th and 19th centuries visited these places and studied these fossils; to this we must add the long history of the excavations conducted by the Cerato family.

Currently this fossil heritage is preserved in the two local museums of Val d'Alpone (Fossil Museum of Bolca and Paleontological Museum of Roncà) and in the collections of numerous Italian and international museums. In particular, the Civic Museum of Natural History of Verona and the Museum of Nature and Mankind of the University of Padua are the two structures that worldwide preserve the majority of the historical collections of the Val d'Alpone.

A human activity that negatively affects the Outstanding Universal Value of the property is the collection of fossils with the collection of the same carried out by unauthorized persons. This also applies in the case of sampling of modest quantities within a very rich deposit. In fact, excavations must be regularly requested and authorized by the competent ministry and conducted by qualified personnel. The legislation of the Italian State is strict in this area and does not allow exemptions. It will therefore be essential for any paleontology enthusiast to carry out personal research to contact universities and/or museums that have stipulated agreements or submitted excavation requests to the Superintendency.

No space is granted for the sale of these cultural property that belong to the State by law.

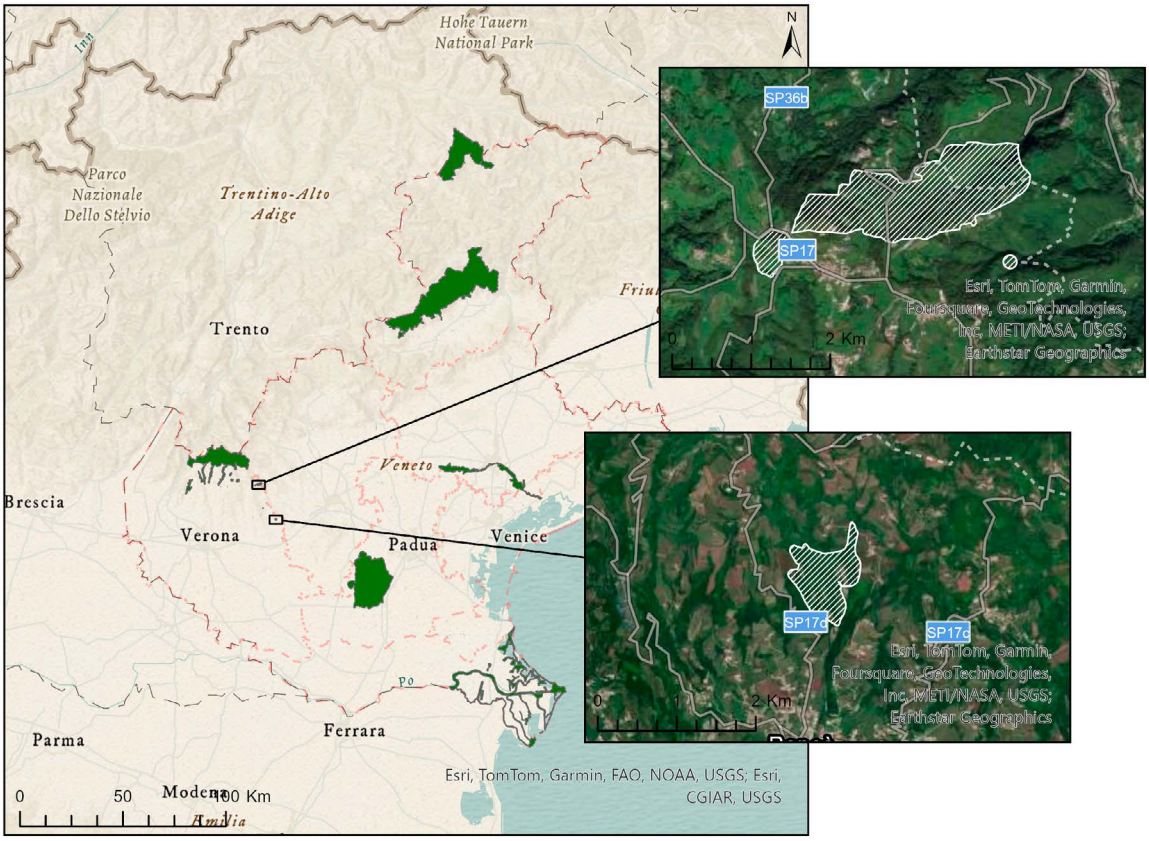
For this reason, both illegal excavations and acts of vandalism on the outcrops of the nominated property are rare today. This is also thanks to the vigilance of the landowners.

4.a (iii) Conservation measures

Legislation and specific constraints

Fossils are the remains of organisms that lived in the past, from the smallest to the largest, or the traces of their activities, which have been preserved to this day. Unlike archaeological finds, the result of human activity, they are present in most rocks and are therefore difficult to protect. The particular nature of these properties makes this category a special case in the context of Italian cultural heritage. Consider how the recovery and collection of fossils, frequently carried out during more or less targeted outings, are perceived as activities that can be easily carried out even as amateurs. The need to normalize and/or regulate this area is strongly felt by specialists in the sector who urge the preparation of effective tools to clarify the terms of the relationship between research and collection, detention and circulation, protection of paleontological finds and sites and the needs related to production activities and "controlled" consumption of the territory. Consider that in other countries, both European and non-European, there is a thriving market linked to both naturalistic collecting and the aesthetic value of fossils, with quotations documented in auction house catalogues or on the web.
This devalues the scientific value of the fossils, on the one hand, because it deprives it of a large part of its stratigraphic and paleoecological context in favour of aesthetic value and rarity, on the other it gives account of the existence of a scale of market values of these paleontological finds.
Recalling the evolution of Italian national legislation starting from the first national law of 1927 and 1939 for the protection of what were initially indicated as things of "historical and artistic interest", it is useful to frame the regulatory evolution on paleontological finds in Italy.
With the constitutional reform of 2001 and the broad recognition of the concurrent regional legislative power in the field of valorization of cultural heritage, a change in the national law on the matter was necessary. Furthermore, there were obligations of adaptation deriving from Community law and international law. The operation was implemented through a delegation law (Law of 6 July 2002 n. 137) to the Government for the codification of legislative provisions on cultural and environmental heritage. In execution of the delegation, Legislative Decree 22 January 2004 n. 42 was issued, known as the Code of Cultural Heritage and Landscape, currently in force with various subsequent amendments. In the code, the reference to paleontological heritage is contained in art. 10 paragraph 4: *"a) things that concern **paleontology**, prehistory and primitive civilizations."*
Therefore, Italian paleontological heritage is to all intents and purposes cultural heritage, owned by the State, with a ban on possession and trade. It should also be considered that the cultural heritage of the State is composed of cultural and landscape assets; therefore, the rules on landscape can also be taken as a reference for the protection of those geological areas and of certain paleontological interest.
The UNESCO Convention, moreover, to which Italy has also adhered, which has the aim of protecting the world's cultural heritage, includes in the list of protected sites, not only works of man, but also of nature.
In particular, we recall Criterion viii *'constitute an extraordinary testimony of the main periods of the evolution of the earth, including evidence of life, significant geological processes in progress for the development of the physical characteristics of the earth's surface or significant geomorphic or physiographic characteristics' which is the one referred to for the inscription in the World Heritage List of "The Eocene marine ecosystem in the Val d'Alpone - Bolca, San Giovanni Ilarione, Roncà".*
With regard to the nominated property, approximately 60% of the *core zone* and 70% of the *buffer zone* fall within the area of the Lessinia Regional Natural Park (Veneto Regional Law no. 12 of 30 January 1990 "Rules for the establishment of the Lessinia Regional Natural Park") and enjoy additional legislative protection. The Park also includes, in whole or in part, the territory of the municipalities of the component parts San Giovanni Ilarione, Roncà, Vestenanova and Altissimo.

In particular, the following areas of the nominated property are included in the perimeter of the Lessinia Regional Natural Park and identified as areas to be subjected to a nature reserve regime due to the exceptional nature and landscape emergencies contained therein: Pesciara di Bolca, Monte Purga and Monte Postale; Roncà strata; columnar basalts of San Giovanni Ilarione.



The two areas of the Lessinia Regional Natural Park that concern the Bolca and Roncà components
Next page: Recent open-air excavation on Monte Postale

In addition, two areas of the Bolca component are also subject to specific constraints: the constraints by the Ministry of Public Education (Ministerial Decree 20.08.1963) and the Ministry of Cultural and Environmental Heritage (Decree of 22.09.1992) for the Pesciara deposit and the constraint by the Ministry of Cultural and Environmental Heritage for the Monte Postale outcrop (Decree of 15.09.1992).
The Decree with which the constraint is applied, in addition to recognizing the particular cultural interest inherent in the property, affects the legal regime of the property. He ownership of the areas containing the deposits/outcrops present in the nominated serial property is almost entirely private. Each owner of the land has been involved in the nomination project and made aware of the need to monitor/control his property from any clandestine excavations. In any case, all the deposits/outcrops with paleontological finds are subject to the legislation for the protection of cultural heritage of the Italian State which is exercised through the territorial offices (Superintendence of Archaeology, Fine Arts and Landscape for the provinces of Verona, Rovigo and Vicenza, peripheral body of the Ministry for Cultural Heritage and Activities).
The management policies and indications on the conservation of fossils are outlined in the Management Plan of the nominated property and have as their purpose the protection of the OUV, the protection and conservation of the site and the valorization of the paleontological heritage.



Fossil Recovery Protocol

The discovery of a fossil in Val d'Alpone, as in the rest of the national territory, can occur by chance, without any prior excavation or through an authorized paleontological excavation campaign. In the first case, the discoverer has the obligation to report the discovery and its location to the competent authorities or to provide for the recovery with the obligation to deliver it within 24 hours to the Superintendency, the Mayor or the public safety authority (art. 90-93 of the CBCP).
In the case of excavation campaigns, these must be previously authorized by the Ministry of Culture which, through the local Superintendency, follows and supervises the work. The fossils found and extracted following modern research rules and systems, are first restored (if necessary), then inventoried and then made available for study and possibly exhibited in local museums that take care of their conservation and enhancement.
Most of the fossils collected during the excavations require cleaning and restoration (see Appendix 5.4 Excavation, restoration, study and enhancement).
One of the characteristics of the nominated property *"The marine ecosystem of the Eocene in the Val d'Alpone - Bolca, San Giovanni Ilarione, Roncà"* is that the discovery of fossils occurs in excavation campaigns both in the open air (Monte Postale and Valle della Chiesa) and in tunnels (Pesciara).

Conservation

Once the preparation of the find is complete, before it becomes part of the museum collections, it is inventoried and classified; only after this phase do the fossils become part of the collections and can be exhibited in the educational circuit of a museum (see Annex 5.4 Excavation, restoration, study and valorization).
At this point, the most interesting fossils can be the subject of studies by specialists, loans or valorization initiatives (publications, guides and information leaflets). Depending on the type of fossils and the matrix, on average once a year, inspections are carried out in the warehouses to verify their state of conservation.

4.b Factors affecting the nominated property

In the nominated property *"The marine ecosystem of the Eocene in the Val d'Alpone - Bolca, San Giovanni Ilarione, Roncà"* there are three areas that have provided over the centuries the most significant and studied fossils of the marine Eocene and that allow us to recognize all the elements that contribute to defining the marine biodiversity of the Outstanding Universal Value of the nominated property. The integrity of the geological and physical characteristics of the fossil deposits allow us to affirm that the conditions that can influence or threaten the components parts are very limited. In fact, the land of the nominated property is largely cultivated with coppice or meadow, a land use that is not in conflict with the need for conservation.
Scrolling through the list of factors that can influence the nominated paleontological site (https://whc.unesco.org/en/ factors/), no particular threats or dangers are detected. The deposit area is not affected by infrastructures that could damage existing outcrops nor by electrical or radio lines.

4.b (i) Development Pressures and management response

The three component parts of the nominated serial property are green areas, partly wooded and partly cultivated, little anthropized, where the development pressure is low. The following table summarizes the elements that define the development pressures highlighting diversified situations.

Types of pressure and development in the nominated serial property

Type of pressure and development		Bolca	San Giovanni Ilarione	Roncà
Infrastructure: roads		A dirt road starts from the parking lot and runs along the southern side of Monte Postale up to Pesciara	Neighborhood municipal road	Neighborhood municipal road
Infrastructure: parking		The parking lot is available for cars and buses for the visit to Pesciara.	No	The parking lot is available for cars and buses for visits to the Fossil Park
Mines/quarries		No	No	No
Renewable energy systems (panels, wind turbines)		No	No	No
Landslides		No	No	No
Land Use	*Core zone*	Coppice, meadow	Coppice	Coppice, vineyard, orchard
	Buffer zone	Coppice, meadow, arable land	Vineyard, orchard, meadow, arable land	Vineyard, orchard, meadow
Types of culture	*Core zone*	Coppice, chestnut grove, potato	Coppice	Coppice, vineyard, cherry orchard, kiwi
	Buffer zone	Coppice, chestnut grove, potato	Vineyard, cherry orchard, meadow, potato	Vineyard, cherry orchard, meadow
Number of private homes present	*Core zone*	1	0	6
	Buffer zone	3	3	27
Number of inhabitants living in the *core* and *buffer* zones in the year 2025		5	5	65

The areas of the component parts have an urban planning destination that does not allow the construction of new buildings or infrastructures. Therefore, the risk factors related to development pressures are almost absent.

4.b (ii) Environmental pressures Natural disasters and risk preparedness

The nominated property presents various environments that follow one another from South to North, outlining a very diversified picture. It is a hilly territory characterized by the presence of a valley crossed by a torrential watercourse and by highly urbanized contexts developed especially in the plain areas present at the mouth of the Val d'Alpone towards the upper Po Valley.
The geographical position of the nominated area and the geomorphological characteristics of the eastern Lessini Mountains do not expose the paleontological site to statistically significant natural risks. The seismic classification of the territory highlights the remote probability of seismic events with high magnitude.
As regards, however, the hydrography of the Val d'Alpone there are no situations that could deteriorate the nominated property. All surface waters are regulated and subjected to periodic checks and maintenance by the competent Water Consortium. Furthermore, the small, temporary watercourses that cross the deposit areas do not have the characteristics to create erosion and/or flooding that could damage the outcrops.
The only potential pressure is represented by the air pollution present in the Po Valley, the result of urban development and intense vehicular traffic that generates, in any case, average levels of pollution; however, the areas of the nominated serial property are not very affected since they are located at a considerable distance from the plain and at higher altitudes.

4.b (iii) Visitation, other human activities and sustainable use

Cultural tourism and ecotourism are two important items in the economy of the municipalities of Altissimo, Vestenanova, San Giovanni Ilarione and Roncà and, in general, for the entire Val d'Alpone.
Overall, the nominated serial property does not have large tourist flows. The most visited destinations are the Fossil Museum of Bolca and Pesciara, followed by the Paleontological Museum of Roncà and the Naturalistic Itinerary with the Fossil Park of Valle della Chiesa.
The current limited number of visitors is due to poor communication by the two museums present in the area.
The serial candidacy, by connecting and jointly promoting visits to the two museums and the outcrops, will be able to direct and orient the visitor throughout the Val d'Alpone area, also encouraging existing cultural knowledge, such as monuments, historic centers and prehistoric sites.

Visitors local museums and deposits/outcrops from 2018 to 2023

Year	Museum of Fossils of Bolca (visitors)	Pesciara (visitors)	Paleontological Museum of Roncà (visitors)	Nature trail and Roncà Fossil Park (visitors)
2018	16,471	8,230	1,100	545
2019	13,743	6,870	813	402
2020	0*	0*	57*	28*
2021	8,941*	4,460*	4*	2*
2022	11,440	5,710	379	185
2023	13,716	6,852	507	251
2024	13,505	7,323	591	314

*Restrictions due to Covid 19 pandemic

Based on the experience of other paleontological sites included in the WHL, if the serial site were to be inscribed on the World Heritage List, an increase in visits to the Pesciara, Monte Postale, Valle della Chiesa and Ciupìo sites as well as to the local museums of Bolca and Roncà is expected. The Management Plan foresees this increase in tourist flows and works to minimize potential negative impacts. Careful monitoring (see Annex 2 Management Plan, section 6) of the various impacts is essential for proper management.
The touristic enhancement and educational use of the paleontological heritage will be developed and allowed where it does not conflict with the general objectives of scientific research conservation.
Taking this into account, the visitors management plan for the nominated property site will be adaptive, also on the basis of the results of scientific research, the opinions of the Technical Scientific Committee and the suggestions of local stakeholders.
The following table summarises the factors that interact with the property designated for tourism, divided by type, risk and control subjects.
These factors will be monitored over time.

Property Protection and Management

General scope	Scope of intervention	Type of intervention	Risk assessment	Risk	Entity competent to issue the authorization or organize the initiative	Control subject
Tourism	Visit to the deposits	Transit along marked paths with stops in suitable lay-bys	The collection of fossils and/or rock samples is not permitted	None, when visitors are accompanied by a guide. Potentially high in the absence of a guide. There is adequate information signage near the deposits. Presence of some video cameras/ photo traps	A.T.S. New	Carabinieri Forestry Unit, Superintendence of Archaeology, Fine Arts and Landscape for the provinces of Verona, Rovigo and Vicenza, Regional Natural Park Authority of Lessinia, A.T.S. New, land owners
	Trails	Transit along marked paths	The collection of fossils and/or rock samples is not permitted	None, when visitors are accompanied by a guide. Potentially high in the absence of a guide. There is adequate informative signage at the start and along the route. Potential fire risk in the Valle della Chiesa "picnic" area	A.T.S. New	As above

Carrying capacity of the nominated property

Various parameters were taken into account to determine the maximum sustainable carrying capacity for the nominated serial property with the aim of not threatening the OUV. Recognizing that "all human activities cause environmental (and social) impacts", visitor management planning was envisaged that defines the "permissible change limits".

Specifically, since it is a paleontological site, the limit is extremely low. Practical considerations related to the organization of guided tours to the component part of Bolca and Roncà impose some limits on its theoretical maximum carrying capacity also defined by their logistical carrying capacity.

Visits to Pesciara are scheduled from March to October, while there are no limits for guided tours to Valle della Chiesa.

Odonteus pygmaeus found in Pesciara (length 4 cm)








16. VR. 71178



Calcare a *Nummulites* sp.

5. PROTECTION AND MANAGEMENT OF THE NOMINATED PROPERTY

5.a Stakeholder

Among the actors involved there are subjects who share an *"active"* interest because they are directly involved in the management processes, others instead have *"passive"* interests and are those who derive material or immaterial benefits from the protection of the nominated property and from the quality of the paleontological heritage and landscape.

The latter are valuable actors because they can be of help in supporting the actions of protection and enhancement through cultural dissemination and the transmission of knowledge of the values contained in the nomination. The role played and the contributions that the various subjects provide to the management of the nominated property are summarized in the following table.

ACTORS	**Main contributions to nominated property management**
Ministry of Culture Superintendence of Archaeology, Fine Arts and Landscape for the provinces of Verona, Rovigo and Vicenza	Knowledge, protection and cultural enhancement of the paleontological heritage The Superintendence is the peripheral body of the Ministry of Culture that carries out the control and protection activity in the territory on which the nominated areas are located. The fossils exhibited in the local museums of Bolca and Roncà are the property of the Italian State.
Ministry of Environment and Energy Security	Knowledge, protection and valorization of the natural and paleontological heritage.
Veneto Region	The nominated property is entirely included in the Veneto Region which issues provisions on planning, cultural, environmental, touristic and economic enhancement. It provides support and contribution to the nomin ation.
Lessinia Regional Natural Park Authority	The Lessinia Regional Natural Park Authority (Regional Law no. 12 of 30 January 1990) carries out protection, conservation and management actions for the archaeological areas within its jurisdiction, including: the Pesciara di Bolca and Monte Postale and part of Valle della Chiesa. The Lessinia Regional Natural Park Authority owns the Bolca Fossil Museum building and manages it.
University of Verona, Department of Cultures and Civilizations	Scientific and cultural knowledge, conservation and valorization.
Municipalities of the site: Bolca component part: Altissimo (VI) and Vestenanova (VR) Component part San Giovanni Ilarione: San Giovanni Ilarione (VR) Component part Roncà: Roncà (VR)	The candidate serial site is located, for the most part, in the province of Verona and, secondarily, in the province of Vicenza. The municipalities involved are: Altissimo (Province of Vicenza), Vestenanova, San Giovanni Ilarione and Roncà (Province of Verona). They are the subjects candidate for the management of the nominated property that will carry out the projects of the Management Plan with the subject in charge of the site. The municipality of Roncà manages the local Paleontological Museum.
Municipality of Verona – Civic Museum of Natural History	The Civic Museum of Natural History of Verona participates as manager of a large paleontological heritage of the Val d'Alpone and as technical scientific support to the nomination.
Temporary Association of Purpose *'Val d'Alpone – faune, flore e rocce del Cenozoico'*	Established in 2017, the Temporary Association of Purpose *'Val d'Alpone – faune, flore e rocce del Cenozoico'* has submitted the nomination for inscription in the Italian National Tentative List of the paleontological site *'Marine biodiversity in the Eocene in Val d'Alpone'* and now the nomination dossier for the inscription in the WHL of this nominated serial property. The Association has a Technical Scientific Committee (C.T.S) and a Territorial Naturalistic Observatory (ONT) to support: the activities and initiatives that concern the three components parts of the nominated area, for contacts with Italian and foreign scholars and specialists and for the control of the activities carried out within the components. In this phase, the Association carries out the functions of managing entity.
The owners of the deposit/ outcrop areas of the nominated serial property	Protection, conservation and economic valorization. They are the owners of the 14 outcrops identified on the component parts. Among these we mention those of the lands affected by the current excavation concessions: the company Ceratoichthys di Cerato Massimo Cipriano e C. S.n.c. owner of some lands on Monte Postale and Pesciara di Bolca and Cerato Giorgio owner of the lands in the Costo area (Municipality of Roncà). They were informed and involved in the nomination process and management of the nominated areas so that they can collaborate with the managing entity in some actions of the Management Plan.

Municipalities of Val d'Alpone Provincia di Verona: Soave, Monteforte d'Alpone, Montecchia di Crosara Province of Vicenza: Gambellara e Crespadoro	The territories of the local administrations of Val d'Alpone, members of the Temporary Association of Purpose *"Val d'Alpone – faune, flore e rocce del Cenozoico"* represent together the territory of the *commitment zone* of the nominated property. They participate in the management of the heritage protection processes, express a broader sharing for a better balance in the development of tourism, agricultural and economic policies of the nominated property. The municipalities involved are also part of it: Altissimo, Vestenanova, San Giovanni Ilarione and Roncà.
Companies and trade associations in the Val d'Alpone area	Cultural and economic conservation and enhancement
Entities, associations and citizens of the Val d'Alpone	Cultural and economic valorization

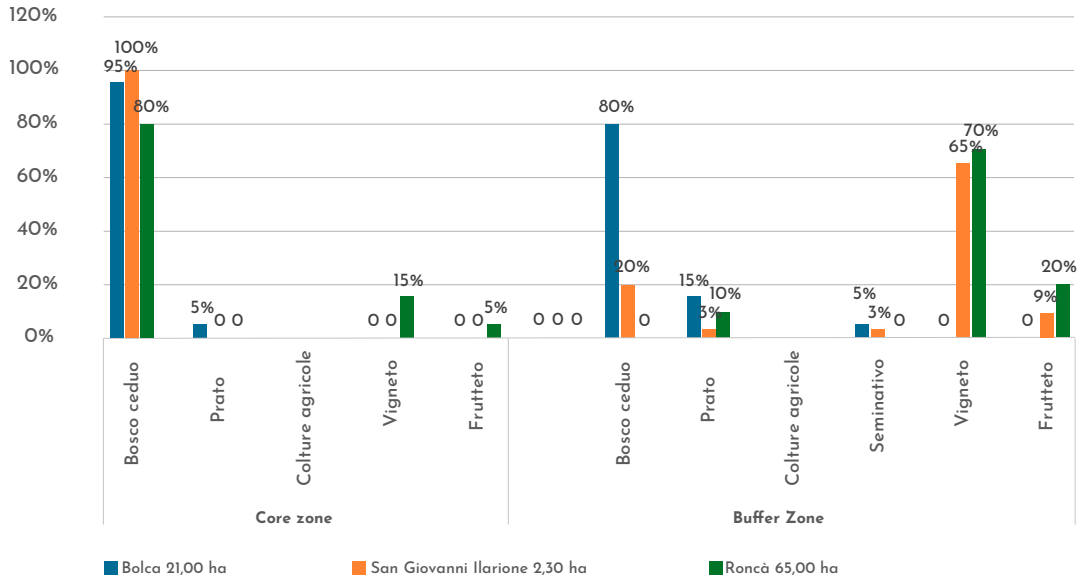
5.a (i) Ownership and inhabitants

Data relating to the population resident on the nominated property in the year 2023 and the surface of the *nominated areas* and *buffer zones* of the three components parts.

		Bolca	**San Giovanni Ilarione**	**Roncà**	**Totale**
Number of private dwellings	*Core zone*	1	0	6	7
	Buffer zone	3	3	27	33
Number of inhabitants	*Core/Buffer zone*	5	5	65	75
Area of the components parts (ha)	*Core zone*	21.00	2.30	65.00	88.30
	Buffer zone	52.50	21.60	142.00	216.10
	Total (ha)	73.50	23.90	207.00	304.40

99% of the nominated property is privately owned and highly parceled out. The table below describes the percentages of land use of the serial nominated property.

Analysis of land use and agricultural pressures in the UNESCO site



5.a (ii) Indigenous people

The nomination does not involve indigenous peoples.

5.a (iii) Participation

The nomination process involves not only the recognition of its exceptional value, but also a strong assumption of responsibility shared with the local administrations and the community that lives there. This is in order to preserve and maintain over time the integrity of the nominated values and achieve sustainable socio-economic development of the territory implemented with participatory processes.
To achieve the goal of registering the fossil heritage of the Val d'Alpone in the WHL, facilitating decision-making processes through the sharing of the management objectives of the property, with the participation of all the representative subjects of the territory, the Temporary Association of Purpose *"Val d'Alpone - faune, flore e rocce del Cenozoico"* was established in 2017.
The Association represents the entire territory of Val d'Alpone (the *commitment zone*) within which the nominated property is located.
All the municipalities that form the *"commitment zone"* are founding members of the A.T.S.: Soave, Monteforte d'Alpone, Roncà, Montecchia di Crosara, San Giovanni Ilarione, Vestenanova (in the Province of Verona), Gambellara, Altissimo, Crespadoro (in the Province of Vicenza) and also the Municipality of Verona with the Civic Museum of Natural History. Other founding members are: the Mountain Community of Lessinia (now the Regional Natural Park Authority of Lessinia), the Department of Culture and Civilization of the University of Verona, the Association of Storie di Piccola Patria, San Zeno-Cultural Association, the Association of the Lessini Durello Monti Lessini Wine Route, the Association of the Soave Wine Route, the Association of the Recioto and Gambellara D.O.C. Wine Route, the Consortium for the Protection of Soave and Recioto di Soave Wines, the Voluntary Consortium for the Protection of wine Lessini Durello D.O.C. and the Voluntary Consortium for the protection of Gambellara D.O.C. and Recioto di Gambellara D.O.C.G. wines.
In 2021, the following joined the A.T.S. as supporting members: the Rotary Club Verona-Soave and the Rotary Club of Arzignano; the Lyons Club Val d'Alpone; the Cassa Rurale di Vestenanova; Ceratoichthys S.n.c.; Marana Space Explorer Center (MarSEC); the Abbey of Villanova for the Territory and the GAL Baldo-Lessinia (Local Action Group).
To facilitate the application process, the A.T.S. also involved the Superintendence of Archaeology, Fine Arts and Landscape for the provinces of Verona, Rovigo and Vicenza (prot. 12950 of 25/06/2020 and prot. 36873 of 05/12/2023), the Veneto Region (Council Resolution no. 131 of 7 February 2018) and the Lessinia Regional Natural Park Authority.
Furthermore, it maintains contacts with the public administrators of the municipalities of Altissimo, Vestenanova, San Giovanni Ilarione and Roncà and the Val d'Alpone area.
The owners of the land where the deposits/outcrops of the property are located and the managers of the socio-economic and cultural associations of the territory, the representatives of the professional categories, the world of schools and the citizens were also involved. Between 2022 and 2023, the municipal administrations organized public meetings to present the the nomination for inscription to the List, involving the resident population to share the project.
These were meetings where some members of the Technical Scientific Committee explained the nomination process and the exceptionality of the fossils present in Val d'Alpone', underlining the importance of protecting and safeguarding the site as required by the Operational Guidelines.
The public present was encouraged to ask questions or to propose activities that would stimulate the participation of the resident citizens.









Other meetings have been activated with the owners of the land belonging to the nominated property and in particular those where paleontological excavation campaigns are underway to update them and involve them in the nomination project, but also in the activities of protection management of the nominated property.
In support of the nomination, since 2019, every year, a scientific conference has been organized with the presence of national and international speakers, open to the public. The main purpose of these meetings is to deepen, inform and disseminate the new paleontological discoveries and, more generally, present the developments of the nomination project.



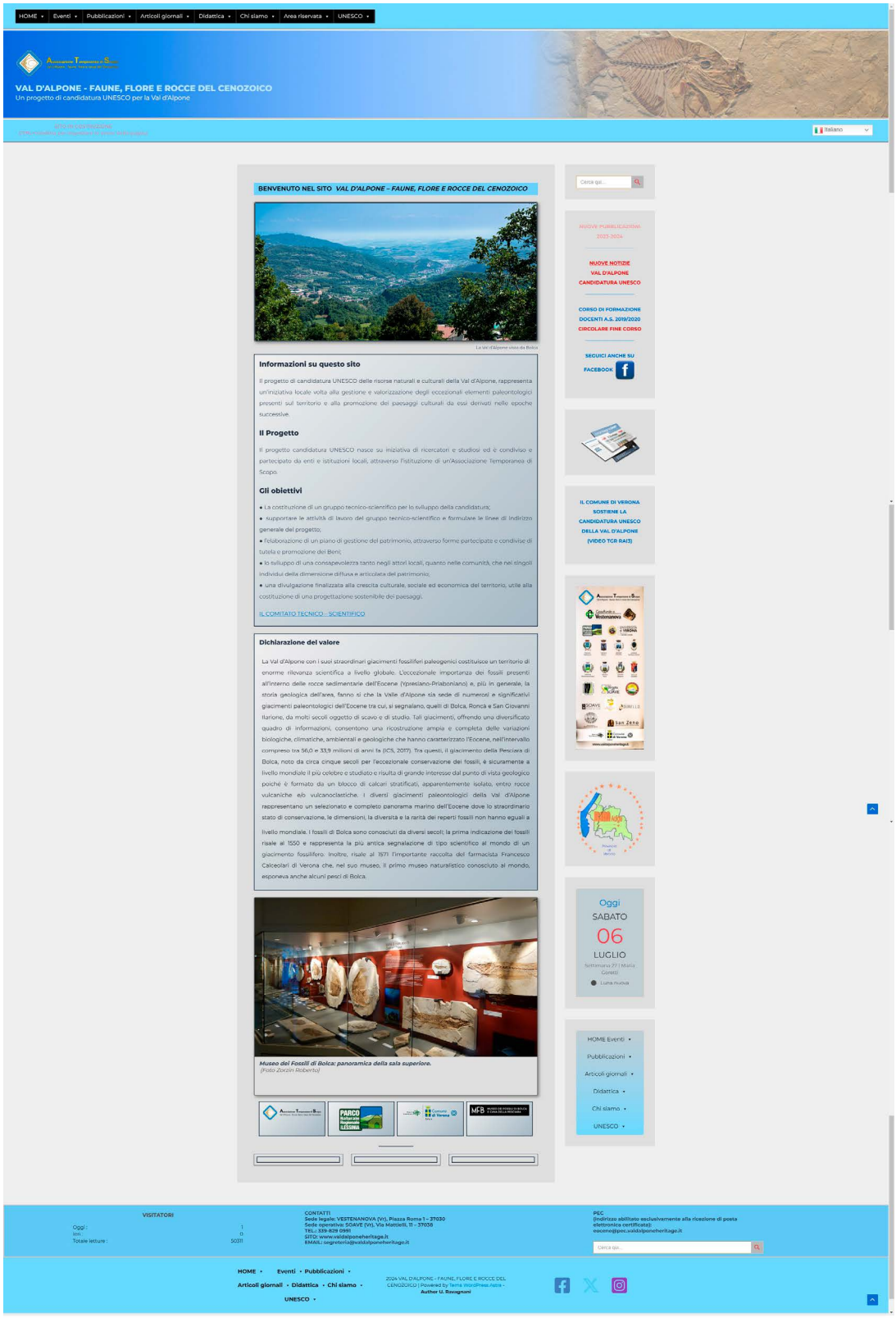


Next: Some of the public meetings organized by the A.T.S. in collaboration with the municipal administrations of Roncà, Vestenanova, Monteforte d'Alpone and San Giovanni Ilarione.

Above: Some moments of the scientific conferences organized by the C.T.S. in collaboration with the A.T.S.

The Association *"Val d'Alpone - faune, flore e rocce del Cenozoico"* manages the website (https://www.valdaponeheritage.it/) where it is possible to follow the initiatives of the Association, have information on the activity, but also make one's action transparent.

Home page of the website of the Temporary Association of Purpose *"Val d'Alpone - faune, flore e rocce del Cenozoico"*



Given the importance of making this paleontological heritage known and understood by the younger generations, in 2020, a training/refresher course dedicated to primary and secondary school teachers was activated for the school. For the former, the aim of the initiative was to provide a general level of information on the paleontology of the Val d'Alpone, while for secondary school, it was to deepen geological knowledge and to enhance the paleontological heritage of the area. In 2023, with the contribution of the Veneto Region and by the Technical Scientific Committee of the A.T.S. it is the booklet "*The fossils of Val d'Alpone and the upper Chiampo Valley – a treasure to be rediscovered and promoted as a world heritage site*" has been published. The booklet is addressed to the world of the Val d'Alpone school with the aim of making known the precious paleontological heritage that it preserves. The publication was presented and distributed, involving teachers, to all the pupils of the Val d'Alpone schools.



Cover and back cover of the publication produced by A.T.S. in 2023 and distributed to primary and secondary schools in Val d'Alpone

5.b Protective designation

The three components of the nominated property are subject to the maximum protection regime provided by Italian legislation (constraints), the main instrument of which is Legislative Decree 22 January 2004 n. 42 (and subsequent amendments) known as the *Cultural Heritage and Landscape Code*.

Restriction regime in the ***Cultural Heritage and Landscape Code***
In the code, the reference to paleontological heritage is contained in art. 10 paragraph 4: *"a) things that concern paleontology, prehistory and primitive civilizations"*.
Although the Code mentions paleontology only in art. 10, there are many other rules referable to this type of heritage that guarantee their protection and enhancement, through a specific reference or through the extended notion of archaeological heritage. Therefore, paleontological heritage are in all respects cultural heritage and, therefore, their protection and enhancement is rightly contained in the Code of Cultural Heritage and Landscape. It should also be considered that the cultural heritage of the State is composed of cultural and landscape heritage; therefore, the rules on landscape can also be taken as a reference for the protection of those geological sites, but of certain paleontological interest.
With reference to the particularity of the paleontological heritage and also of the paleontological site, there may be further acts derived from the norms and/or regulations, with appropriate administrative acts such as the constraint decrees.

The deposits/outcrops present on the nominated property are shown on the site map and described in the 14 sheets of Annex 3 Deposit/outcrop sheets.
In addition to the State-mandated restriction regime, the Italian administrative legal system provides for additional instruments that refer to other entities operating on the territory.
The following protection systems also exist on the site areas:

- The restriction by the Ministry of Public Education (Ministerial Decree 20.08.1963) and the restriction by the Ministry of Cultural and Environmental Heritage (Decree of 22.09.1992) for the Pesciara deposit.
- The restriction by the Ministry of Cultural and Environmental Heritage for the Monte Postale outcrop and (Decree of 15.09.1992).

The Superintendency of Archaeology, Fine Arts and Landscape for the provinces of Verona, Rovigo and Vicenza (prot. 12950 of 06/25/2020 and prot. 36873 of 12/05/2023 has recognized in the fossiliferous outcrops of the nominated serial property all the elements that contribute to defining the Outstanding Universal Value of the nomination.
The activity that the Superintendency Office intends to carry out essentially concerns the strengthening of the protection actions on the territory that will have to be carried out in collaboration with the signatory bodies of the Association *"Val d'Alpone - faune, flore e rocce del Cenozoico"*, its Technical Scientific Committee (C.T.S) and Naturalistic Observatory

Territorial (ONT). These structures support the activities and initiatives that concern the three components, including contacts with Italian and foreign specialists as well as monitoring the activities carried out within the nominated property.

All the deposits/outcrops of the property, with the exception of Ciupìo of the San Giovanni Ilarione component and Costo of the Roncà component, fall within the Lessinia Regional Natural Park.

Protection regime and constraint of the rules of the Veneto Region of paleontological heritage

A) Among the various purposes listed below provided for in the rules of the Lessinia Regional Park, Veneto Region Law no. 12 of 30 January 1990, there is the protection of the paleontological heritage.

Art. 2 - (Purpose).

The purposes of the Lessinia Regional Park are the following:

a) the protection of the soil and subsoil, flora, fauna, water;

b) the protection, maintenance, restoration and enhancement of the natural, historical, architectural and landscape environment considered in its entirety, and the recovery of any altered parts;

c) the protection of the specific anthropological, ***paleontological****, geomorphological, vegetational, faunal and archaeological particularities of the areas;*

d) the use for scientific, cultural and educational purposes;

e) the promotion, also through the provision of adequate technical and financial support, of maintenance activities of the natural and historical elements constituting the Park, as well as of traditional economic, tourist and service activities compatible with the primary need to protect the natural and historical environment;

f) the social, cultural and economic development of the populations included within the Park and gravitating towards it; g) the promotion of service functions for free time and organization of tourist flows;

h) the protection and enhancement of the ethnic, historical, cultural and linguistic heritage of the "Cimbrian" populations.

B) The Law of the Veneto Region n. 17 of 16 May 2019 "Law for Culture" is the current Framework Law on culture. Among the interventions in favor of the specificity of the Veneto cultural heritage, the two points of Article 17 of the Law for Culture are highlighted:

1. The Regional Council supports the activities of conservation and enhancement of movable and immovable heritage that express the cultural specificity of the regional historical, artistic, demo-ethno-anthropological, architectural, archaeological and ***paleontological*** *heritage.*

2. In particular, the Regional Council supports:

.....

c) the activities of conservation and enhancement of the heritage of archaeological and ***paleontological*** *interest of the Veneto, supporting research and excavation activities and campaigns and promoting initiatives of scientific dissemination and information;*

The national system of constraints is then complemented by the territorial governance tools present at the local level: the Regional Territorial Coordination Plan (PTCR) at the regional scale (Veneto) and the Provincial Territorial Coordination Plan (PTPC) at the provincial scale (Vicenza, Verona) and the Intermunicipal Territorial Planning Plan (PATI) at the supramunicipal municipal level.

All these tools, which have been indicated in hierarchical and functional order, guarantee, through a strict limitation of the activities of transformation of the territory, the conservation of the characteristics of the nominated property and the values associated with them. In detail, for the three components parts, the situation of the constraints is that reported in the following table.

Component name	Deposit	Municipality and province	Core zone	*Buffer zone*	Deposits/outcrops code	Law Legislative Decree no. 42/2004	Ministerial Decree	Veneto Region Law n. 12/90 Lessinia Regional Natural Park
Bolca	Pesciara	Vestenanova (Verona)	D.Lgs n. 42/2004 PARK CONSTRAINTS PTCR, PTPC, PATI	D.Lgs n. 42/2004 PARK CONSTRAINTS PTCR, PTPC, PATI	PS01	X	X(1963) X(1992)	X
					PS02	X		X
					MP03	X		X
	Monte Postale	Altissimo (Vicenza)	D.Lgs n. 42/2004 PARK CONSTRAINTS PTCR, PTPC, PATI	D.Lgs n. 42/2004 PARK CONSTRAINTS PTCR, PTPC, PATI	MP01	X	X(1992) X(1992)	X
					MP02	X		X
					MP04	X		X
					MP05	X		X
					MP06	X		X
San Giovanni Ilarione	Ciupio	San Giovanni Ilarione (Verona)	D.Lgs n. 42/2004 PTCR, PTPC, PATI	D.Lgs n. 42/2004 PTCR, PTPC, PATI	CP01	X		
Roncà	Valle della Chiesa	Roncà (Verona)	D.Lgs n. 42/2004 PARK CONSTRAINTS PTCR, PTPC, PATI	D.Lgs n. 42/2004 PARK CONSTRAINTS PTCR, PTPC, PATI	BS01	X		X
					CS01	X		X
					CT01	X		X
					VC01	X		X
					VC02	X		X

	Normative and regulatory references present on the nominated property
D.Lgs n. 42/2004	Legislative Decree 01/22/2004 n. 42 known as the Cultural Heritage and Landscape Code with various amendments and additions
Ministerial Decree	The restriction by the Ministry of Public Education (Ministerial Decree 08.20.1963) and the restriction by the Ministry of Cultural and Environmental Heritage (Decree of 09.15.1992) for the Pesciara deposit. The restriction by the Ministry of Cultural and Environmental Heritage for the Monte Postale outcrop (Decree of 09.22.1992).
Superintendence of Archaeology, Fine Arts and Landscape for the provinces of Verona, Rovigo and Vicenza	Communication: confirmation of positive opinion and formal support for the nomination process (prot. 12950 of 06/25/2020 and prot. 36873 of 12/05/2023
Lessinia Regional Natural Park	Constraint - (Veneto Region Law n. 1/90) protection of the Bolca and Roncà Component
PTCR	Regional Territorial Coordination Plan (PTCR) (Veneto)
PTPC	Provincial Territorial Coordination Plan (PTPC) (Vicenza, Verona)
PATI	Intermunicipal Territorial Planning Plan (PATI) at municipal and supramunicipal level
Memorandum of Understanding between the municipalities of Altissimo, Vestenanova, San Giovanni Ilarione, Roncà and the owners of the lands where the outcrops and/or deposits are present	Memorandum of Understanding which formalizes the collaboration between the Municipal Administrations and the private landowners to allow access to the outcrops and/or deposits and to provide information on their state of conservation, in support of the nomination of the serial site. Annex 6, point 1.6 – Memorandum of Understanding in Support of the Nomination of the Serial Site "The Eocene Marine Ecosystem in the Val d'Alpone – Bolca, San Giovanni Ilarione, Roncà" to the UNESCO World Heritage List.
Memorandum of Understanding between the Region of Veneto and the municipalities of Vestenanova and Altissimo, Regional Natural Park of Lessinia, Veneto Agricoltura, ATS and private actors	Resolution of the Regional Government of Veneto No. 998 of 2 September 2025. Approval of the draft Memorandum of Understanding for the valorisation and usability of the site *"The Eocene Marine Ecosystem in the Val d'Alpone – Bolca, San Giovanni Ilarione, Roncà."* Annex 6, point 1.7 – Resolution of the Regional Government of Veneto No. 998 of 2 September 2025.

As mentioned, not only the fossil outcrops within the nominated property are protected by the Cultural Heritage and Landscape Code, but also all the fossils found in the *commitment zone* are the property of the Italian State as cultural heritage and the trade of Italian fossils is prohibited.
However, the particular nature of the fossils, the methods of finding/discovery of the same make them a special case in the context of cultural heritage since they are very often found by chance, during excursions or excavation work. For these reasons and for the pleasure of seeing them as furnishings, the collection is perceived as an amateur activity. The prohibition of collecting and holding Italian fossils without the appropriate authorizations is reiterated. Penal sanctions are foreseen for those who do not comply with the existing provisions. Article 175 of the Cultural Heritage and Landscape Code (violations in matters of archaeological research) prosecutes *"anyone who carries out archaeological research or in general works for the discovery of things indicated in article 10 without a concession or does not observe the prescriptions given by the Administration"*. Therefore, the excavation and/or collection of fossils is specifically prohibited as are activities that could damage the integrity of the outcrops. Scientific research, educational visits and other uses are all managed through a system of permits or authorizations.

5.c Means of implementing protective measures

The nominated area (88.30 ha) protected by a *buffer zone* area (216.10 ha), contains the fourteen paleontological deposits/outcrops that fully transmit the OUV. All legislative and regulatory provisions for the protection and safeguarding of the paleontological heritage apply to the designated property, which are:

a. The Cultural Heritage and Landscape Code (Legislative Decree no. 42/2004 with various amendments and additions);
b. Laws of the Veneto Region: Park Constraints and urban planning regulations PTCR;
c. Urban planning provisions under the jurisdiction of the provinces of Verona and Vicenza PTPC;
d. Urban planning provisions (PATI and PI) of municipal jurisdiction (municipalities of Altissimo, Vestenanova, San Giovanni Ilarione and Roncà).

This requires the subjects responsible for applying the legislation to adopt the acts and/or adequate measures for the protection and conservation of this heritage.
There are various levels of competence and intervention that can operate according to the protection system in the nominated site:

I. The first concerns the protection measures at a national level for paleontological heritage (Code of Cultural Heritage and Landscape).
II. The second refers to the legislative provisions of the Veneto Region, for a part of the areas of the site there is protection of the territory and landscape (Park constraints) and then the territorial urban interventions of regional jurisdiction.
III. The third is the responsibility of the provinces of Verona and Vicenza with the Provincial Territorial Coordination Plan.
IV. The fourth concerns the three components of the property within the territory of the municipalities of Altissimo, Vestenanova, San Giovanni Ilarione and Roncà, which have administrative and regulatory competence for the urban and functional plans for the purposes of protection, conservation, enhancement and management of the site.

A further level refers to the protection of the owners of the land on the site and in particular those of the paleontological deposits/outcrops. The latter were involved in the project and understood and shared the OUV.
All the fossils found on the site are owned by the State and the trade of such fossils is prohibited. Paleontological excavations can be carried out but must be previously authorised by the Ministry of Cultural Heritage and Activities and Tourism - General Directorate of Archaeology, Fine Arts and Landscape, following the submission of an application for a CBCP regulated concession. The paleontological deposits/outcrops on the site are located on privately owned land, however the fossils contained and extracted are cultural heritage
and by law belong to the Italian State.
Once extracted, the paleontological heritage is catalogued and inventoried and subsequently made available to scholars and exhibited to the public in local museums.
Let's see how these levels of paleontological protection act in compliance with the different competences:

- There is an obligation for the subjects who own the land in the deposit/outcrop areas of the site to adopt measures to protect and conserve the paleontological heritage and to promptly report any tampering to the Superintendency and the site manager.
- The municipalities of Altissimo, Vestenanova, San Giovanni Ilarione and Roncà, in collaboration with the Superintendency and the Lessinia Regional Natural Park Authority, will carefully evaluate any transformation project that concerns the outcrops and areas of the site so that the values contained in this nomination are protected and safeguarded.



- The network of local museums that preserve the fossils are required to operate with specific methods of protection of the heritage, in compliance with the national legislation Cultural Heritage and Landscape Code on cultural heritage.
- The Superintendence of Archaeology, Fine Arts and Landscape for the provinces of Verona, Rovigo and Vicenza has the task of verifying the compatibility of the proposed interventions with the conservation of the values and characteristics of the nominated site. Furthermore, it examines and, if necessary, authorizes all excavation and research activities.

The project for the nomination of the site *"The Eocene marine ecosystem in the Val d'Alpone - Bolca, San Giovanni Ilarione, Roncà"* as a UNESCO World Heritage Site has been supported since its early stages by the Veneto Region (DGR n. 131 of 7 February 2018).
During the process started in 2017 for the recognition as a UNESCO site, the need also emerged to improve and standardize the urban planning tools and the building regulations in force in the municipalities of the site on the basis of the values that will be recognized by UNESCO in function of the objectives of enhancement, protection and safeguard that will derive from it, harmonizing with specific acts of the Veneto Region the contents with the provisions of the regional legislation.
From subsequent meetings with the Planning and Culture offices of the Veneto Region, the willingness to deepen and define a shared discipline to be introduced in the urban planning tools and/or in the building regulations of the municipalities of the component emerged, capable of ensuring better enhancement, protection and safeguard of the nominated site.
Furthermore,
following the registration of the site in the WHL, there is the need and the willingness to approve a technical specification for the conservation of the characteristics of integrity and authenticity of the landscape of the site including the agricultural arrangements and permanent crops, the management of the woods and meadows.

5.d Existing plans related to municipality and region in which the proposed property is located

In addition to the constraint regime in the hands of the State, the Italian administrative legal system provides for other planning tools that refer to the territory of the site that is currently subject to the management of different institutions, each with its own competences:

- the Superintendence of Archaeology, Fine Arts and Landscape for the provinces of Verona, Rovigo and Vicenza, responsible for all activities relating to the knowledge, protection and conservation of the paleontological, archaeological and cultural heritage;
- the Veneto Region, which acts in relation to the activities of enhancement and promotion of this heritage and which is also responsible for the protection of the landscape;
- the provinces of Verona and Vicenza, which have tasks on the road system at provincial level;
- the municipalities of Altissimo, Vestenanova, San Giovanni Ilarione and Roncà which are responsible for urban management, municipal road system and control relating to local public transport.

The following table summarises the main planning tools and the related territorial areas that interact with the site *"The Eocene marine ecosystem in the Val d'Alpone - Bolca, San Giovanni Ilarione, Roncà"* and their respective areas of relevance.

Name of the plan	Relevance scale	Indications regarding the three components
Regional Territorial Coordination Plan (PTRC)	Regional (Veneto)	Safeguarding the territory including historic centers
Provincial Territorial Coordination Plans (PTCP)	Provincial (Verona e Vicenza)	Protection and safeguard of historic centers and architectural landscape emergencies in an integration perspective
Intermunicipal Territorial Planning Plan (PATI)	Municipal / Supra-municipal (municipalities of Altissimo, Vestenanova, San Giovanni Ilarione and Roncà)	Strategic choices of municipal planning with indication of the constraints map
Intervention Plan (PI)	Municipal (municipalities of Altissimo, Vestenanova, San Giovanni Ilarione and Roncà)	Implementation methods and specifications of strategic choices
Rules on regional parks and nature reserves	Municipal (municipalities of Altissimo, Vestenanova, San Giovanni Ilarione and Roncà)	Lessinia Regional Natural Park (Veneto Regional Law n. 1/90). Thirteen deposits/outcrops are included
Specific decrees and constraints	Paleontological deposits/outcrops	Pesciara (decrees of 08.20.1963 and 09.22.1992) Monte Postale (Decree of 09.15.1992)

The planning currently in force in the territory involved in the nomination process is organized in different areas that were completed in 2020 with the approval of the planning also at regional level (PTRC). They are divided into the following levels:

I. I. The Regional Territorial Coordination Plan (PTRC) represents the regional instrument for governing the territory. Pursuant to art. 24 of Regional Law 11/04, *"the regional territorial coordination plan, in coherence with the regional development program (PRS), indicates the objectives and the main lines of organization and planning of the regional territory, as well as the strategies and actions aimed at their implementation"*.The legislative PTRC 42/2004, given the provisions of the regional law, which attributes to it the value of *"urban-territorial plan with specific consideration of landscape values"*. Furthermore, the European and national regulatory instruments for the protection of the nominated property are set out in the landscape territorial planning approved by the Veneto Region, which is committed to *"protecting and regulating the territory to improve the quality of life with a view to sustainable development and in coherence with the processes of integration and development of the European space, implementing the European Landscape Convention promoted by the Council of Europe and signed by Italy in 2000, combating climate change and increasing competitiveness"*. With these aims, in fact, the regional structure has drawn up the Regional Territorial Coordination Plan in accordance with the indications of the socio-economic programming (Regional Development Plan) and in line with the new provisions introduced by the Cultural Heritage and Landscape Code (Legislative Decree 42/04).

II. The Provincial Territorial Coordination Plans (PTCP), provided for by Regional Law 11/2004, of both provinces interested in the nomination, are the planning tools that outline the objectives and fundamental elements of the provincial territorial structure in coherence with the guidelines for the provincial socio-economic development, with regard to the prevalent vocations, its geological, geomorphological, hydrogeological, landscape and environmental characteristics.

III. The Inter-municipal Territorial Structure Plan (PATI), as defined by Article 13 of Regional Law 11 of 2004 which establishes the objectives and conditions

of sustainability of the admissible interventions and transformations and is drawn up by the Municipalities on the basis of ten-year forecasts. The Intervention Plan (PI) as defined by article 17 of the regional law 11 of 2004 on urban reform, is the operational tool that must relate to the multi-year municipal budget, to the three-year program of public works and to the other sectoral municipal tools provided for by state and regional laws.

IV. A fourth level overlaps with the first three in some areas of the nominated property. It is that of the Veneto Region Law no. 40 of 16 August 1984 (New regulations for the establishment of regional parks and nature reserves) to ensure the conservation and enhancement of the environment in areas of particular naturalistic and ecological, historical, environmental and ethnic interest in some areas of the regional territory. In 1990, Regional Law no. 12 established the Regional Natural Park Authority of Lessinia, which covers most of the areas of the site *"The marine ecosystem of the Eocene in the Val d'Alpone - Bolca, San Giovanni Ilarione, Roncà"*.

5.e Property management plan or other management system

During the years preceding the presentation of the project for the nomination of the site *"The Eocene marine ecosystem in the Val d'Alpone - Bolca, San Giovanni Ilarione, Roncà"* the A.T.S. "Val d'Alpone - faune, flore e rocce del Cenozoico" coordinated and developed the activities and discussions with the municipal administrations of Altissimo, Vestenanova, San Giovanni Ilarione and Roncà, the Veneto Region, the Lessinia Regional Natural Park, the Superintendence of Archaeology, Fine Arts and Landscape for the provinces of Verona, Rovigo and Vicenza, the provinces of Verona and Vicenza, the owners of the land of the deposits/outcrops and the stakeholders of the territory, increasing knowledge of the exceptional paleontological value present in Val d'Alpone, but also the awareness of the responsibility to protect, conserve and enhance it. Furthermore, the A.T.S. carried out its *governance action* of the project, coordinating the process and management activities. It did so by making use of a Technical Scientific Committee and a Territorial Naturalistic Observatory. These technical-scientific bodies supported the activities and control initiatives carried out within the property and maintained contact with Italian and foreign specialists who deal with and study the paleontological heritage of the site.
This operating system has consolidated over time and has contributed to the construction of the Management Plan, attached to the dossier, which is summarized in this paragraph.

The management system of the Plan includes three interconnected elements:

1. The legal framework present in the site that justifies its existence;
2. The governance system to address issues relating to the conservation of the Exceptional Value of the site;
3. The resources (human, financial and technical-scientific, etc.) used to make the management system operational.

The planning, implementation and monitoring processes of the actions that guarantee a conservative management of the nominated property and the related values are developed around these three elements.
Once the objectives have been defined, the management system monitors the achievement of the results. All this in response to the gaps or critical issues identified in the management process or in response to new needs.
For an integrated management of the site and its values, we identify the *'substantial'* values, descending from the OUV of the site and the *'complementary'* values that contribute to enriching the natural resource with the environmental and historical cultural elements of the valley.
The complementary values can be of assistance in the construction of the actions for the enhancement and management of the site.

The "**substantial values**", expressed by the deposits of the three components of the serial site, contained in the fossil evidence of the site and the contribution they have given to paleontological and phylogenetic studies, are:

(1) the **historical and cultural contribution** provided by the fossils of Bolca, San Giovanni Ilarione and Roncà to the evolution of theories on life on planet Earth;
(2) the **scientific** values that have allowed paleontological and phylogenetic studies;
(3) the **number of deposits/outcrops** (n. 14) and the **large quantity and quality of the fossils extracted** belonging to the marine environment of a specific geological era, the Eocene;
(4) the **ecological scenario of a wide bathymetric gradient**, in an interval in which the Earth experienced exceptionally high temperatures, marine biodiversity reached its climax after a long period of recovery after the mass extinction of the end of the Cretaceous and the groups of organisms that dominate modern seas established themselves;
(5) the **documentary nature of paleontological excavation** (in tunnels and in the open air) as a research and study activity dedicated to the discovery of fossils and the recovery of lithological, positional, taphonomic, etc. information.

The "**complementary values**" are:

(a). those of a **landscape and environmental nature expressed by the geodiversity of the landscape in Val d'Alpone**. The territory that contains the serial site is not only important for its fossils and rocks but is a valley with a landscape with gentle and wavy shapes, some with conical shapes, the result of a morphological evolution that lasted millions of years;
(b). those **historical, artistic and cultural**. These are values present in the territory of the valley and are part of the historical and cultural identity, each with its own peculiarities: from the most ancient pre- and proto-historic human frequentation, to the Bronze Age, to the Roman era, up to the medieval period.

The Management Plan of the site *"The marine ecosystem of the Eocene in the Val d'Alpone - Bolca, San Giovanni Ilarione, Roncà"* contemplates in its articulation the phases of knowledge, protection/conservation and enhancement of the site. It is a working and guidance tool to protect the paleontological excellence of the Val d'Alpone and to transform them into opportunities for sustainable development. The contents of the nomination dossier, which outline in detail the profile of the proposal, are preparatory and an integral part of the Plan, which remains a guidance document, a guide rather than a legally binding document. It is an open tool and available to be integrated and modified on the basis of the indications that will arrive according to the needs of protection, conservation and enhancement of the nominated property.

Its drafting was prepared by the A.T.S. to which the Technical Scientific Committee contributed. Numerous and continuous informative contacts were made on the progress of the works with the administrators of the local authorities and with the owners of the lands where the paleontological excavation campaigns are underway.
In concrete terms, a system of protection and conservation of the nominated property was created, structured in the following way:

1. legal-regulatory protection of the paleontological heritage present on the site by the Superintendence of Archaeology, Fine Arts and Landscape for the provinces of Verona, Rovigo and Vicenza, the Veneto Region and the territorial authorities;
2. constant monitoring of the territory by the local administrations and the Lessinia Regional Natural Park Authority;
3. surveillance of the outcrops carried out by the owners of the lands;
4. periodic monitoring carried out by the A.T.S. and by the C.T.S. staff.

Below are the individuals directly involved in this nomination proposal and the roles and contributions they have made to the management of the site in the pre-recognition phase.

Actors	**Main contributions to site management**
Ministry of Culture Superintendence of Archaeology, Fine Arts and Landscape for the provinces of Verona, Rovigo and Vicenza	Knowledge, protection and cultural valorization of paleontological heritage. It is the peripheral body of the Ministry of Culture that carries out the control and protection activity in the territory of competence.
Ministry of Environment and Energy Security	Knowledge, protection and valorization of the natural and paleontological heritage.
Veneto Region	Issues provisions on planning, cultural, environmental, touristic and economic enhancement. Provides support and contribution to the nomination.
Lessinia Regional Natural Park Authority	It carries out actions of protection, conservation and management of the archaeological areas falling within the territory of competence and among these the Pesciara di Bolca and the Monte Postale and a part of Valle della Chiesa. The Regional Natural Park Authority of Lessinia manages the Fossil Museum of Bolca and is the owner of the building.
University of Verona, Department of Cultures and Civilizations	Scientific and cultural knowledge, conservation and valorization.
Municipalities of the site: Bolca component: Altissimo (VI) and Vestenanova (VR) **San Giovanni Ilarione component: San Giovanni Ilarione (VR)** **Roncà component: Roncà (VR)**	The nominated serial property is located, for the most part, in the province of Verona and, secondarily, in the province of Vicenza. The municipalities involved are: Altissimo (Province of Vicenza), Vestenanova, San Giovanni Ilarione and Roncà (Province of Verona). They are the subjects candidate for the management of the site and will carry out the projects of the Management Plan with the referring subject. The Municipality of Roncà manages the local Paleontological Museum and is the owner of the property.

Municipality of Verona – Civic Museum of Natural History	Participates as manager of a large paleontological heritage of the Val d'Alpone and as technical scientific support to the nomination process.
Temporary Association of Purpose 'Val d'Alpone – faune, flore e rocce del Cenozoico'	Established in 2017, it has submitted the application for registration in the Italian National Tentative List of the paleontological site 'Marine biodiversity in the Eocene sites in Val d'Alpone' and now the nomination dossier for the proposal for registration in the WHL of the serial site "The marine ecosystem of the Eocene in the Val d'Alpone - Bolca, San Giovanni Ilarione, Roncà". The Association has a Technical Scientific Committee (C.T.S) and a Territorial Naturalistic Observatory (O.N.T.) to support the activities and initiatives that concern the nominated property, for contacts with Italian and foreign specialists and for the control of the activities carried out within the components. In this phase, the Association carries out the functions of the site management body. If the site is registered in the WHL, it will have achieved its mandate and will be replaced by the new management body (A.T.S. New).
The owners of the deposit/ outcrop areas of the serial site	Protection, conservation and economic valorization. They are the owners of the 14 outcrops identified on the site. Among these we mention those of the lands affected by the current excavation concessions: the company Ceratoichthys di Cerato Massimo Cipriano e C. S.n.c. owner of some lands of Monte Postale and Pesciara di Bolca and Cerato Giorgio owner of the lands in the Costo area (Municipality of Roncà). They were informed and involved in the nomination and management of the site so that they can collaborate with the managing entity in some actions of the Management Plan.
Municipalities of Val d'Alpone Province of Verona: Soave, Monteforte d'Alpone, Montecchia di Crosara Province of Vicenza: Gambellara and Crespadoro	The territories of the local administrations of the Val d'Alpone members of the A.T.S. represent together the area of the *commitment zone* of the serial site. They participate in the management of the heritage protection processes, express a broader sharing for a better balance in the development of tourism, agricultural and economic policies of the nominated area.
Businesses and trade associations in the Val d'Alpone area	Cultural and economic conservation and enhancement
Bodies, associations and citizens of Val d'Alpone	Cultural and economic valorization

The possible legal form (Association, Foundation, other) is being studied to allow the precise definition of the subject in charge of the site as required by Law 77/06 *"Special measures for the protection and enjoyment of Italian sites and elements of cultural, landscape and environmental interest, included in the "World Heritage List", placed under the protection of UNESCO"*. The following table describes the new governance structure post-recognition.

ATS New takes over the management of the site *"The Eocene Marine Ecosystem in Val d'Alpone – Bolca, San Giovanni Ilarione, Roncà"*

- **Ministry of Environment and Energy Security**
- **World Heritage Committee**

BOARD OF DIRECTORS
(Steering Committee)

Its main task is to follow the updating and implementation of the Management Plan.

It is composed of members representing the following entities or stakeholders:

(4) Site municipalities: (1) Altissimo, (1) Vestenanova, (1) San Giovanni Ilarione, (1) Roncà

(1) Regional Natural Park Authority of Lessinia

(1) Veneto Region

(1) University of Verona – Department of Culture and Civilisation

(2) Municipalities of the commitment zone

(4) Representatives of the Technical Scientific Committee

(3) Representatives of outcrop/deposit properties (by invitation)

EXECUTIVE COMMITTEE

Implements the Management Plan

(7) Members elected by the Board of Directors (Statute to be defined)

(1) Secretariat

SCIENTIFIC TECHNICAL COMMITTEE
(Technical-scientific body)

Supports the Board of Directors and the Executive Committee.

It is composed of members appointed by the Board of Directors, chosen among experts in geological and environmental matters, and includes:

(1) Palaeontologist (specialist in Eocene marine vertebrates)

(1) Palaeontologist (specialist in Eocene marine mollusks)

(1) Palaeontologist (specialist in Eocene marine crustaceans)

(1) Palaeontologist (specialist in Eocene plants)

(1) Environmental engineer (expert in geotechnics and safety)

(1) Landscape architect

(1) Territorial Naturalistic Observatory (by invitation)

(1) Superintendence (by invitation)

(1) Curator of the Geology and Palaeontology Section of the Natural History Museum of Verona (by invitation)

The Technical Scientific Committee (C.T.S. New) will be formally established after the inscription of the property and will provide technical and scientific advice to the Board of Directors and the Executive Committee (C.E.). The C.T.S. New will examine the research proposals relating to the paleontological heritage of the site and will ensure that the work is scientifically sound and does not cause damage to the outcrops. Furthermore, it will provide information to the Board of Directors (C.D.) and the Executive Committee regarding the correct conservation and management of the site. The C.D., also on the basis of the indications of the C.T.S. New, will develop the projects of the Plan in order to best protect, preserve and promote the candidate paleontological asset nominated property. The C.D. will be composed of representatives of the subjects who have a key role in the management according to the objectives and actions of the Management Plan.

The C.D., the C.E. and the C.T.S. New are a natural evolution of the A.T.S. *"Val d'Alpone - faune, flore e rocce del Cenozoico"* which anticipated the nomination to the List. The other bodies, members of the A.T.S., can play an important role in the realization of the objectives and actions outlined in this Plan, especially in the Val d'Alpone area. Partnerships with museums, schools, local associations, etc. are also planned, to increase knowledge and awareness of the protection of the paleontological values and for its valorization.

For the correct management of the site, the following skills are also considered necessary:

a. Direction of works in the paleontological excavations with experience in excavation techniques and fossil recovery;
b. Curator for the management of the museum collections of Bolca and Roncà with experience in scientific education and paleontological teaching;
c. Administrative manager with at least second level training in the economic and legal fields.

In the context and in compliance with the Italian legislation on tourist guides (2023), the A.T.S. New together with the partner bodies that deal with training, will organize specific courses and training for operators who want to work in the areas of the site. The management strategy was preceded by a SWOT (Strenghts Weaknesses Opportunities and Strengths) analysis summarized in the table below. Some weaknesses and possible critical points emerged and were taken into consideration in the development of the Management Plan.

	Strengths and opportunities	**Weaknesses and Threats**
	Strengths	***Weaknesses***
INTERNAL FACTORS	• Availability of fossil deposits and/or outcrops of international significance • Presence of archaeological sites in Val d'Alpone • Controlled excavations and increase of scientific value • Low anthropic pressure • Two local museums as cultural attractions • Natural resources such as the Regional Natural Park of Lessinia • High-quality cultural/natural heritage not yet fully valorised • Positive short-term tourism trend • Cultural, folkloristic, food and wine events in the territory, capable of attracting numerous visitors • Development and use of new technologies aimed at information and knowledge of the property	• Characteristics of the nominated area with **14 fossil deposits and/or outcrops** • Possible danger of landslides, collapses, erosion • Plurality of institutional competences and fragmentation of property ownership of the deposits and/or outcrops • State of relative abandonment of some areas • Infrastructural deficiencies (parking areas, signage, etc.) • Lack of a global strategy in tourist promotion and educational activities • Scarcity of hospitality services in the area and weak hospitality culture • Uneven availability of human and financial resources
	Opportunities	**Threats**
EXTERNAL FACTORS	• Recognition of the Val d'Alpone as a UNESCO site • Increase of tourist attendance in the site's components and in local paleontological museums • Widespread awareness of UNESCO themes and values	• Illegal excavations and fossil collecting activities • Damages caused by climate change

The sixth part of the Management Plan indicates the main objectives, purposes and actions of the main activities to be developed in collaboration with the subjects and parties interested in the management of the site. For the development of the Plan, the indications of the World Heritage Operational Guidelines and the publications of the World Heritage Centre were taken into consideration, in particular the IUCN Management Planning for Natural World Heritage Properties, Guidance and Toolkit for Impact Assessments (ICOMOS, ICCROM, IUCN).

I.G. VR 85429

The following management principles guide the development of the Plan and its actions:

1. the management of the site must comply with international standards of excellence;
2. the entity responsible for the management (A.T.S. New) will manage, protect and enhance the paleontological site with the supervisory authority (Superintendence of Archaeology, Fine Arts and Landscape for the provinces of Verona, Rovigo and Vicenza), the Veneto Region, the municipalities of Altissimo, Vestenanova, San Giovanni Ilarione and Roncà, the Lessinia Regional Natural Park Authority and the owners of the deposits/outcrops, working cooperatively with the communities, and the stakeholders of the territory;
3. the main objective of the Plan is to address issues directly related to the management of the conservation of the Exceptional Value of the site;
4. the management of the site is by the Board of Directors and the Board of Trustees of the A.T.S. New assisted by the C.T.S. New;
5. the actions undertaken in support of the protection and enhancement of the property will be taken involving local communities and stakeholders;
6. if registered in the WHL, as a member of the World Heritage community, the managing entity (A.T.S. New) will develop and maintain relationships with the World Heritage Committee for decisions on the future protection, conservation and enhancement of the property.

The following objectives developed in the Management Plan (section 6) summarize and define the purpose and actions that will follow the action plans:
Objective 1: Protect the Outstanding Universal Value and the integrity of the property;
Objective 2: Ensure an engaging, enjoyable and educational visitor experience;
Objective 3: Promote knowledge, understanding and awareness of the values of the property and the UNESCO World Heritage programme;
Objective 4: Involve the local community and stakeholders in the management of the property.

To achieve good management it is important to monitor a series of key factors that provide iinformation on the state of conservation of the nominated property. Two categories of indicators are used which are: indicators for the integrity of paleontological values and indicators for the integrity of the natural environment of the site.

The indicators, procedures, focus, periodicity and implementing body are developed in tables in the Management Plan (section 7) and are:

- Indicators used to monitor the state of conservation and increase the paleontological value;
- Indicators used to monitor the natural environmental integrity of the nominated property

5.f Sources and levels of financing

The activities and projects listed in the Management Plan are currently financed by the A.T.S. through daily management or with projects supported by the Veneto Region and other entities involved in individual initiatives.
The financing of measures relating to the protection, conservation, and monitoring of paleontological values is the most important item. This requisite implemented by the A.T.S. and the actors involved in management. We can list the flow of resources linked to the protection, enhancement and management activities activated by the A.T.S. during the nomination process developed with the following items:

- the Association's membership fees;
- the financing of the Veneto Region with the Reg. Law 25 November 2019 n. 44, Connected to the 2020 regional stability law, which provided for "Initiatives aimed at the nomination of the Val d'Alpone to the UNESCO World Heritage List" (art. 24) for the 2020, 2021, 2022, 2023, 2024 financial years. Part of the resources were used for actions to protect and conserve the paleontological heritage of Bolca;
- donations from supporting members.

Other items that fall within the management activities developed by other actors are:

- Management costs of the Bolca Fossil Museum by the Natural Park Authority
- Regionale della Lessinia (owner);
- Expenses for the excavation campaigns in Val d'Alpone (Pesciara and Monte Postale) by the Municipality of Verona - Natural History Museum;
- Expenses for the management of the Pesciara component part by the company Ceratoichthys di Cerato Massimo Cipriano e C. S.n.c.;
- Expenses for the management of the Paleontological Museum of Roncà;
- Expenses for the excavation campaigns in Valle della Chiesa by the Municipality of Roncà;
- Expenses for the maintenance and enhancement of the Naturalistic Itinerary of the Municipality of Roncà.

Compared to the amount paid by each entity in its ordinary management activity in favor of the activities in the nomination process, the Plan will provide, in its entirety, a new budget model with the human and financial resources to carry out the planned activities.
In particular, measures relating to the protection, conservation, monitoring and enhancement of paleontological values must be financed and in particular:

- the organizational structure that guarantees adequate professional and management anchoring;
- the protection and conservation of the paleontological and geological values of the nominated property;
- monitoring of the values;
- facilitating the development of scientific research;
- enhancing the paleontological and geological excellence of museums and deposits.



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

The Technical Scientific Committee of the A.T.S. New will be renewed and formally established after the possible registration of the property in the WHL and will provide technical-scientific advice to the Board of Directors and the Executive Committee of the A.T.S. New. According to the Project of Management Plan, the C.T.S. New will be composed of members appointed by the Board of Directors chosen from experts in vertebrate paleontology, marine molluscs, crustaceans and Eocene plants, as well as an environmental engineer and a landscape architect supported by members of the Technical Scientific Committee and the Territorial Naturalistic Observatory of the A.T.S. New. Upon invitation, officials of the Superintendency and the Curator of the Geology and Paleontology Section of the Natural History Museum of Verona may be requested.
The C.T.S. New will review research proposals relating to the paleontological heritage of the nominated property and ensure that the work is scientifically sound and does not create problems for the outcrops.
In addition, it will provide information to the Board regarding the conservation and management of the outcrops fossiliferous.
There is still a close-knit group of high-level scientific specialists who collaborate with the A.T.S. (Museum of Natural History of Verona and various Italian universities and foreign institutions). The A.T.S. has asked these specialists to be available to be part of the Technical Scientific Committee of the new entity (A.T.S. New) to manage the nominated property.

The following skills are also considered necessary for the correct management of the nominated property:

a. Direction of works in the field of paleontological excavations with experience in excavation techniques and fossil recovery;
b. Curator for the management of the museum collections of Bolca and Roncà with experience in scientific education and paleontological teaching;
c. Administrative manager with at least second-level training in the economic and legal fields.

In the context of and in compliance with the Italian legislation on tourist guides (2023), the A.T.S. New, together with its partner training institutions, will organize specific courses and training for operators who want to work in the nominated areas.

Previous page: Collection of molluscs from Monte Postale (Civic Museum of Natural History of Verona)

Below: Small specimen of *Sphyraena* associated with clupeiforme found in Pesciara (length 22.5 cm)



5.h Visitor facilities and infrastructure

The offer for visiting the deposits/outcrops of the three components parts is different because there are different characteristics for access, the type of services, the organization of hospitality, etc.
Let's look at the components parts in detail:
Bolca, with the Pesciara and Monte Postale deposits and the Fossil Museum is the most structured visitors centre. To visit the two paleontological areas, you can use a large free car park, with toilets (capacity of about 40 cars and 6 buses), built in the *"Alle Castagnare"* area. You then walk along the dirt road that runs slightly downhill along the eastern side of Monte Postale for about 1.3 kilometers.
Along the route, three outcrops are visible that are the subject of small excavation campaigns. At the end of the road there is a small parking lot for two/three vehicles used in the free service for the transport of elderly or disabled people. From here, crossing a small bridge over the stream that runs through Valle del Cherpa, you enter the Pesciara equipped area. Going up the steps that lead to the reception and refreshment point, you skirt the Pesciara deposit where you can see the gated entrances of the old tunnels excavated in the last century. Depending on the time available and your interests, you can stop in the area of education or ask for a guided tour of the only historical gallery equipped for the public. After the guided tour, you can easily reach the reception point to dedicate yourself to the activities of the education area.
School groups and visitors can safely try out (with glasses, gloves and a hammer) the role of a *"paleontologist"* in search of fossils by opening specially arranged foreign fossiliferous rocks or use sieves in some large sandboxes where foreign fossils (shark teeth) and colored mineral crystals are hidden.
These last activities are carried out under the supervision of expert staff.
The excursion to Pesciara and Monte Postale can be completed by visiting the Museum of Fossils of Bolca and the adjacent Museum of the Cerato Family (see chapter 2.b.3.10.3).
The Bolca Fossil Museum (see chapter 2.b.3.10.2) displays a rich paleontological collection consisting mostly of fish found in the Pesciara and Monte Postale excavations. In addition to fish, there are insects, molluscs, crustaceans, algae, marine and terrestrial plants, including palms and coconuts that present themselves to the visitor in all their extraordinary beauty and perfection. Illustrations, drawings, descriptions and captions in Italian and English tell the story of life in Bolca 50 million years ago.
On the ground floor there is a small exhibition with the most representative fossils of the Paleocene-Eocene of other sites in the Val d'Alpone.

A





B



C



D

E



F



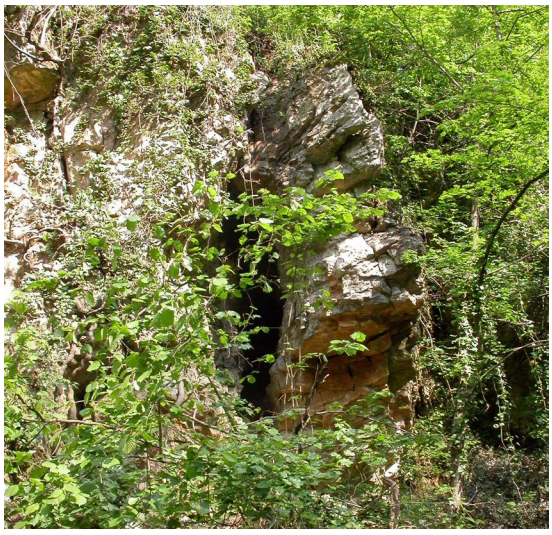
A. Entrance to the Bolca Fossil Museum
B. Car and bus parking area
C. Entrance to the Pesciara gallery
D. Path leading to the Pesciara open to the public
E. Educational area with sandboxes
F. Interior of the gallery open to the public

San Giovanni Ilarione

To access the deposit, you take a stretch of Via Ciopii and then continue on the right bank for a few dozen meters along a dirt road.
At the moment, visits are only possible with a guide. The deposit is located partly on state-owned land (riverbed) and partly on private land. Given the location of the fossil horizon, before opening it to public use, it will be essential to secure the area.
The municipal administration is already preparing a project to arrange the area with a car park and some information signs.

Ciupìo: one of the rock faces to be secured

Below: Valle della Chiesa: outcrop of columnar basalts along the path of the Fossil Park



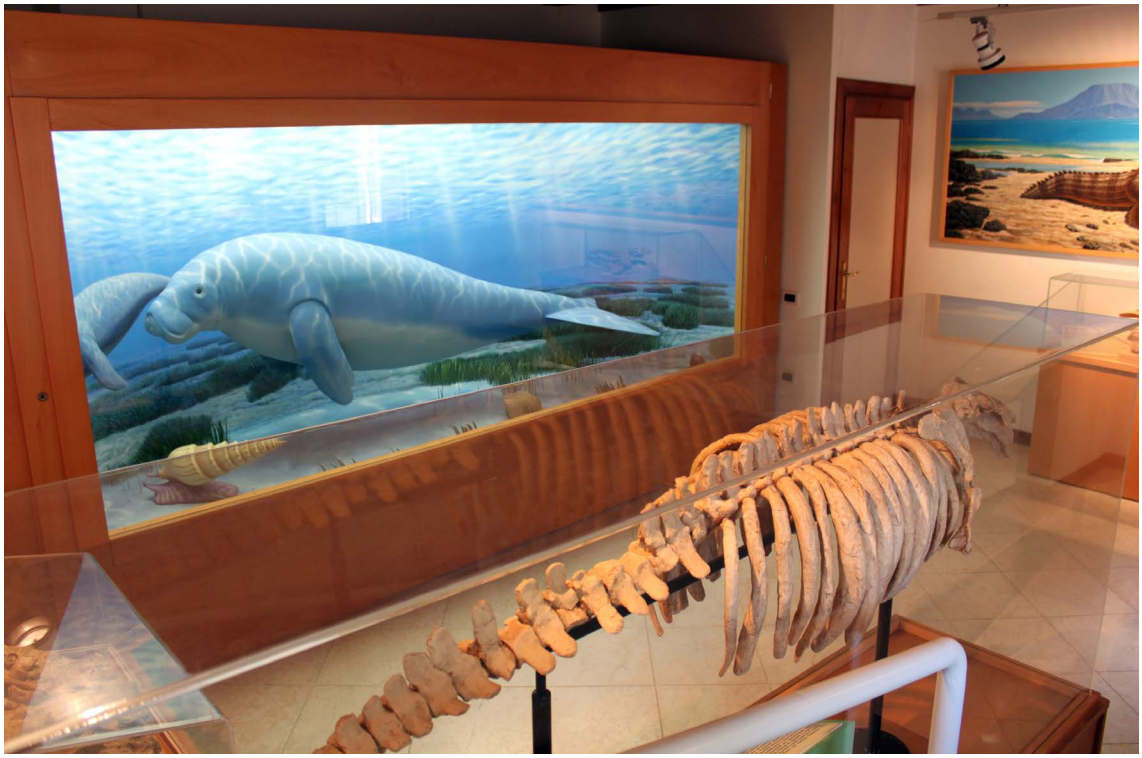


Roncà

The outcrops are located inside Valle della Chiesa and can be reached by following a circular nature trail that runs in multiple directions and with varying levels of difficulty. The nature trail begins next to the church of Roncà, adjacent to the parking area equipped with a camper area. The itinerary runs inside the so-called "Fossil Park", skirting outcrops of volcanic and sedimentary rocks. The outcrops are located to the side of the path that crosses the wooded valley floor.
Along the path you can observe numerous waterfalls of particular beauty, on limestone and basaltic rocks. Visiting the fossil site may be difficult if not accompanied by a guide, since some outcrops are covered with volcanic rocks and debris.
You can also visit the Paleontological Museum of Roncà which since 2004 has had a new layout developed on two floors (see chapter 2.b.3.10.4). The ground floor is dedicated to the naturalistic environment of the Val d'Alpone, while the two rooms on the upper floor are dedicated to molluscs and vertebrates from about 40 million years ago.
The fossil evidence is also exhibited at the Bolca Fossil Museum.

Entrance to the Paleontological Museum of Roncà











Interior of the Paleontological Museum of Roncà with some fossil finds

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

The A.T.S. and the administrations of the municipalities of Altissimo, Vestenanova, San Giovanni Ilarione and Roncà have supported, since the beginning of the nomination process, the promotional initiatives directly and through the local Pro Loco. In particular, the A.T.S., starting from 2018, has organized every year a conference open to the public, inviting national and international speakers, with the aim of deepening, informing and disseminating the fossil heritage of the site and of presenting the results of the paleontological excavations and new scientific discoveries.
Furthermore, the municipal administrations of the nominated serial property, between 2022 and 2023, have been involved in organizing public meetings to present the nomination project, involving the resident population for a sharing of the same.
Some itineraries created before the candidacy project have recently been promoted by the two local museums in initiatives aimed at further enhancing cultural tourism.
As regards the Bolca Fossil Museum, the "Paleontological Walk" is proposed, which offers several itineraries of different lengths and durations. Along the routes there are various stops with some noticeboards that describe the different sedimentary and volcanic rocks present as well as the most common fossils. There are also various panoramic points that allow you to admire the surrounding landscape and the different morphologies.
As regards the Roncà Paleontological Museum,



Some posters produced for the various meetings organised

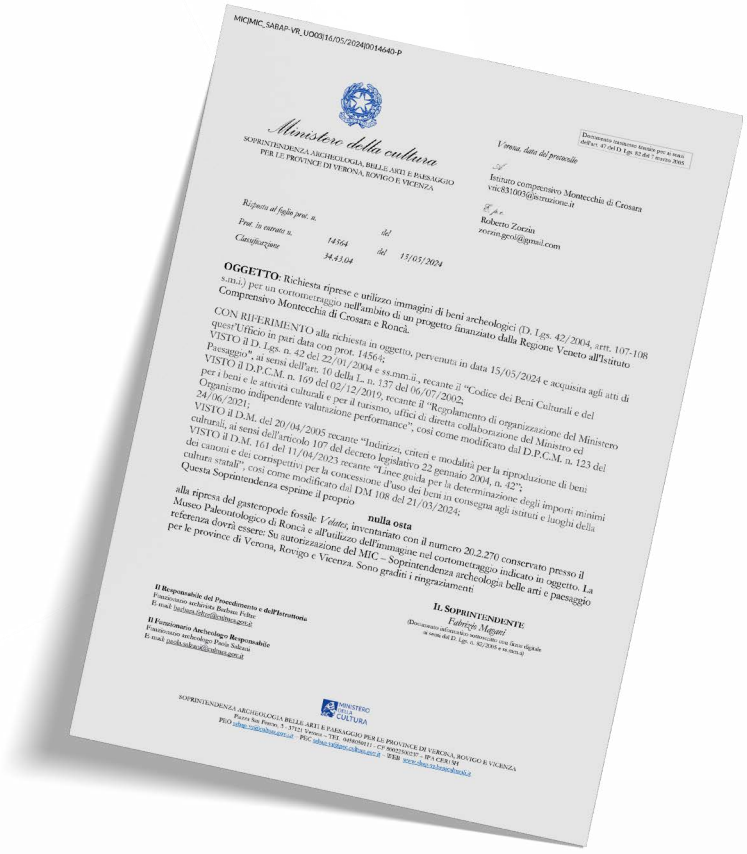
instead, it is possible to book guided visits to the Fossil Park according to itineraries of different lengths. For some years now, the museum, independently or in collaboration with the A.T.S., has participated in the "Planet Earth Week" with various initiatives that promote the candidacy project.

In 2023, the A.T.S., thanks to a contribution from the Veneto Region, was able to produce an informative publication entitled "The fossils of the Val d'Alpone and the upper Chiampo Valley – a treasure to be rediscovered and promoted as a World Heritage Site".
In the first months of 2024, the distribution of the booklet began to all pupils of primary and secondary schools in the territory of the reference area.



Publication produced by A.T.S. in 2023 and distributed to primary and secondary schools in Val d'Alpone

In 2024, the Val Nera Association that manages the Paleontological Museum of Roncà, with the scientific support of A.T.S. collaborated in the filming of the project "Ciak si gira alla scoperta di Roncà", winner of the call for tenders "Interventions for the development of skills in the history and culture of Veneto. DGR n. 1305". The filming was carried out by the teachers while the students of the State Comprehensive Institute of Montecchia and Roncà (primary and secondary school) acted as actors telling a story focused on local fossils. Finally, the A.T.S. manages the website (https://www.valdalponeheritage.it/) where it is possible to follow the initiatives of the Association, have information on new publications and activities, but also involve and make one's action transparent.


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Ministero della cultura

SOPRINTENDENZA ARCHEOLOGIA, BELLE ARTI E PAESAGGIO PER LE PROVINCE DI VERONA, ROVIGO E VICENZA

Verona, data del protocollo

Rispetta al foglio prot. n.
Prot. in entrata n. 14564 del
Classificazione 34.43.04 del 15/05/2024

Istituto comprensivo Montecchia di Crosara
vic83100l@istruzione.it

Roberto Zorzin
zorzin.geol@gmail.com

OGGETTO: Richiesta riprese e utilizzo immagini di beni archeologici (D. Lgs. 42/2004, artt. 107-108 s.m.i.) per un cortometraggio nell'ambito di un progetto finanziato dalla Regione Veneto all'Istituto Comprensivo Montecchia di Crosara e Roncà.

CON RIFERIMENTO alla richiesta in oggetto, pervenuta in data 15/05/2024 e acquisita agli atti di quest'Ufficio in pari data con prot. 14566;
VISTO il D. Lgs. n. 42 del 22/01/2004 e ss.mm.ii., recante il "Codice dei Beni Culturali e del Paesaggio", ai sensi dell'art. 10 della L. n. 137 del 06/07/2002;
VISTO il D.P.C.M. n. 169 del 02/12/2019, recante il "Regolamento di organizzazione del Ministero per i beni e le attività culturali e per il turismo, ufici di diretta collaborazione del Ministro ed Organismo indipendente valutazione performance", così come modificato dal D.P.C.M. n. 123 del 24/06/2021;
VISTO il D.M. del 20/04/2005 recante "Indirizzi, criteri e modalità per la riproduzione di beni culturali, ai sensi dell'articolo 107 del decreto legislativo 22 gennaio 2004, n. 42";
VISTO il D.M. 161 del 11/04/2023 recante "Linee guida per la determinazione degli importi minimi dei canoni e dei corrispettivi per la concessione d'uso dei beni in consegna agli istituti e luoghi della cultura statali", così come modificato dal DM 108 del 21/03/2024;
Questa Soprintendenza esprime il proprio

nulla osta

alla ripresa del gasteropode fossile *Velates*, inventariato con il numero 20.2.270 conservato presso il Museo Paleontologico di Roncà e all'utilizzo dell'immagine nel cortometraggio indicato in oggetto. La referenza dovrà essere: Su autorizzazione del MIC – Soprintendenza archeologia belle arti e paesaggio per le province di Verona, Rovigo e Vicenza. Sono graditi i ringraziamenti.

Il Responsabile del Procedimento e dell'Istruttoria
Funzionario archivista Barbara Fabris
E-mail: barbara.fabris@cultura.gov.it

Il Funzionario Archeologo Responsabile
Funzionario archeologo Paola Salerno
E-mail: paola.salerno@cultura.gov.it

Il Soprintendente
Fabrizio Magani
(Documento sottoscritto con firma digitale ai sensi del D. Lgs. n. 82/2005 e ss.mm.ii.)

SOPRINTENDENZA ARCHEOLOGIA BELLE ARTI E PAESAGGIO PER LE PROVINCE DI VERONA, ROVIGO E VICENZA
Piazza San Fermo, 7 - 37121 Verona - TEL. 0458009411 - C.F. 93025550237 - IPA CENUM
PEO: sabap-vr@cultura.gov.it - PEC: sabap-vr@pec.cultura.gov.it - URL: www.soprintendenza.beniculturali.it


GIUGNO 2024

"Ciak! Si gira alla scoperta di Roncà"
Il cinema come strumento di conoscenza del territorio

Iniziative nel territorio

Il Veneto, terra di emigrazione e immigrazione: continuità e permanenze

IL VENTAGLIO
Notiziario del Gruppo di Lavoro regionale dell'USR sulla storia e cultura del Veneto

Storia e cultura del Convenzione di Faro

STORIA E CULTURA DEL VENETO

Above: The Superintendence's authorization to film the fossils used in the short film
Below: The page of "Il Ventaglio" n. 2 – June 2024, the news bulletin that publishes the short film project

5.j Staffing levels and expertise (professional, technical, maintenance)

Alongside the people who collaborate with the A.T.S. (currently five experts in addition to numerous Italian and foreign specialists in the paleontological field) there are the territorial bodies that make their administrative staff available, the Natural History Museum of Verona and the Superintendency that provide collaboration and support for management. The Lessinia Park Authority manages the Bolca Fossil Museum while the Municipal Administration of Roncà manages the local Paleontological Museum.
In addition, the company Ceratoichthys di Cerato Massimo Cipriano e C. S.n.c. collaborates in the Bolca excavation campaigns, while the Val Nera Association of Roncà collaborates in the excavation campaigns in the Roncà area and in that of Montecchia di Crosara (Monte Duello). Finally, the same owners of the land that falls within the nominated areas carry out a control and custody action. With the inscription in the World Heritage List, the management activity, including personnel and collaborations, would be defined within a new statutory framework (see Table VI - The post-recognition governance structure of the nominated property of the Management Plan).



Detail of the vertebral column of *Paranguilla* sp. found in Pesciara



Guided tour of the MP01 outcrop of Monte Postale

6. MONITORING

6.a Key indicators for measuring state of conservation

The serial nominated serial property *"The Eocene marine ecosystem in the Val d'Alpone - Bolca, San Giovanni Ilarione, Roncà"*, is not only important from a paleontological point of view but also from a landscape one. Therefore, monitoring the state of conservation concerns in the first place the fossils of the three components and the associated geological characteristics and, not secondarily, the ecological conditions and the impact of human activities within the candidate area.
Monitoring helps determine the rate of change and measure the effectiveness of mitigation actions. Taking into account the peculiarities of the three components of the property, we use two categories of indicators for monitoring: the integrity of the paleontological values and the integrity of the natural environment.

- **The integrity of paleontological values**

This category includes the group of most important indicators for monitoring because it is aimed at evaluating the state of conservation of the proposed Exceptional Value and the effectiveness of management practices.
The table with the indicators used to monitor the paleontological conservation status of the nominated property summarizes the procedures, the focus, the periodicity and the entities responsible for monitoring.

The indicators identified are:

1. Monitoring of deposits/outcrops.
2. Paleontological excavation concessions.
3. The excavated fossiliferous material.
4. The restoration of fossils.
5. Scientific study and research activities.
6. Publication of data in scientific and educational journals.
7. The general conditions on the state of conservation of the site's fossils in local museums.
8. Improvement of the state of conservation of fossils.

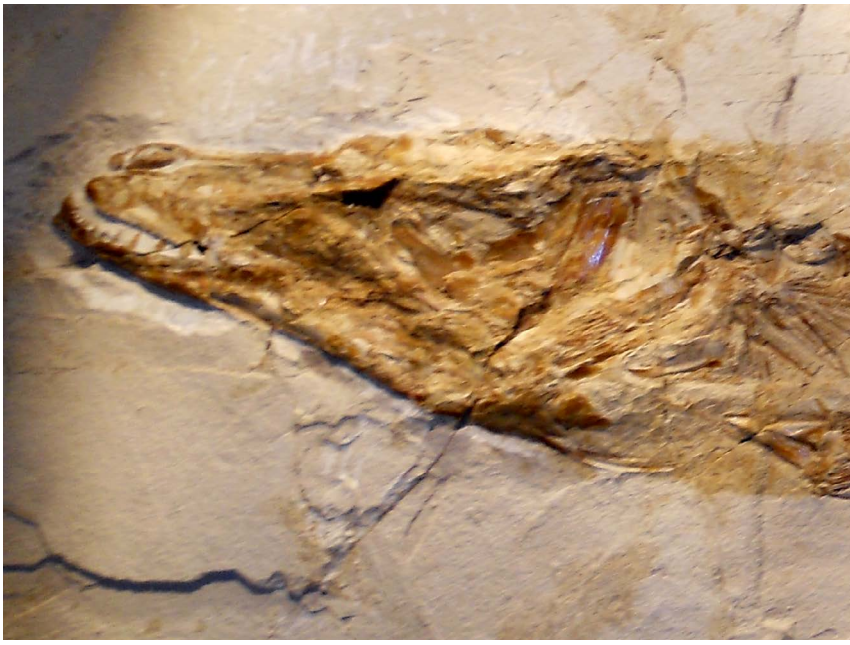
- **The integrity of the natural environment**

The effects of the anthropic impacts of human activities are monitored through a targeted series of indicators for which the procedures, focus, frequency and subjects responsible for monitoring are indicated (part 7 of the Management Plan).

The indicators identified are:

1. Incidences of non-compliance with the legislation and regulations in force on the nominated property (illegal excavation, acts of vandalism, etc.).
2. Land use, agricultural activities, deforestation, etc.
3. Paths and access roads to the fossiliferous outcrops.
4. Flow of visitors to the deposits and museums.
5. Structures and quality of tourist services.
6. Improvement of the proposals and quality of tourist services.

Alongside these indicators there are those linked to the objectives and linked to the actions that must be monitored and evaluated (part 6 of the Management Plan).



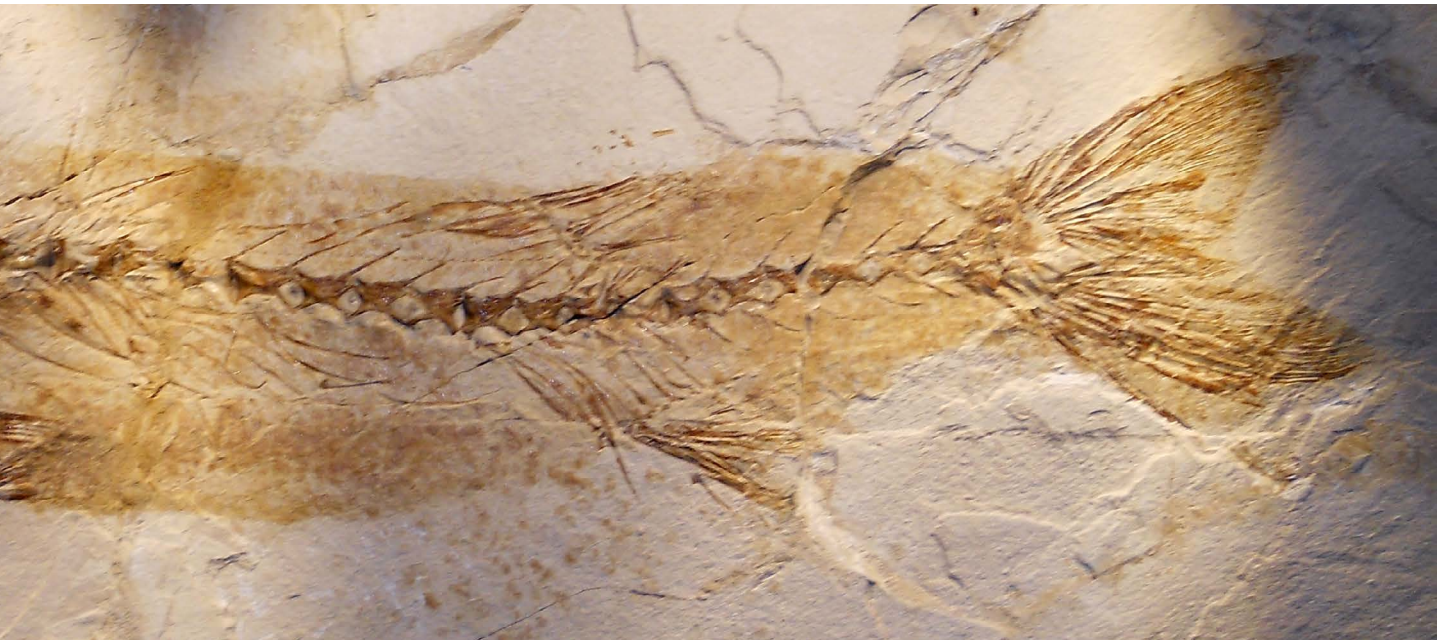
6.b Administrative arrangements for monitoring property

The conservation objectives and frequency of monitoring are established in the Management Plan. In the activities and discussions held with the various subjects during the coordination of the application project, it was deemed appropriate, at least in the initial phase, to apply an integrated monitoring model. The activities relating to the management of fossils, from research to their conservation, are entrusted for competence to the Superintendence, to the reference museum and to the Scientific Technical Committee of the A.T.S. New. The municipalities of the serial property, the Park Authority, the owners of the land with the coordination of C.T.S. New and the Territorial Naturalistic Observatory will develop monitoring for the environmental and naturalistic part of the nominated property. As indicated in part 7 of the Management Plan, all data will be collected and evaluated in an overall monitoring report. The managing entity will report on the results to all those responsible for the conservation and enhancement of the nominated property, involving the local communities. The results, in summary form of the periodic monitoring, will be visible on the manager's website.

6.c Results of previous reporting exercises

No systematic reporting has been done previously.

Sphyraena bolcensis, exhibited at the Fossil Museum of Bolca (length 75 cm)




I.G.146231


I.G.1452



Specialized Miscellany

7. DOCUMENTATION

7.a Photographs and audiovisual image inventory and authorization form

Id. No	Format (slide/ print/ video)	Caption	Date of Photo (mo/yr)	Photographer Director of the video	Copyright owner (if different than photographer/director of video)	Contact details of copyright owner (Name, address, tel/fax, and e-mail)	Non exclusive cession of rights (Yes/No - see Annex 5, Section 7a, of the Operational Guidelines)
1	JPG	*Bery bolcensis leptacanthus*, specimen preserved at the Civic Museum of Natural History of Verona. It most likely belongs to the Calzolari collection	05/2014	Roberto Zorzin		A.T.S. – "Val d'Alpone –faune,flore e rocce del Cenozoico",Piazza Roma – 37030 Vestenanova (VR), (+39)3398290991, segreteria@ valdalponeheritage.it	Yes
2	JPG	(Photo archive of the Natural History Museum of Verona) Map of the Bolca deposit dated 1790, attached to the purchase deed of part of the Pesciara deposit	01/2005	Roberto Lazzarin		Natural History Museum of Verona, Lung. Porta Vittoria 9 – 37129 Verona, (+039)0458079400, mcsnat@comune.verona.it	Yes
3	JPG	Interior of one of the old galleries opened in the 19th century, currently closed for safety reasons	08/2012	Roberto Zorzin		A.T.S. – "Val d'Alpone –faune,flore e rocce del Cenozoico",Piazza Roma – 37030 Vestenanova (VR), (+39)3398290991, segreteria@ valdalponeheritage.it	Yes
4	JPG	Pesciara: the most common equipment used in fossil extraction operations	01/2021	Roberto Zorzin		A.T.S. – "Val d'Alpone –faune,flore e rocce del Cenozoico",Piazza Roma – 37030 Vestenanova (VR), (+39)3398290991, segreteria@ valdalponeheritage.it	Yes
5	JPG	Monte Postale seen from Pesciara	08/2012	Roberto Zorzin		A.T.S. – "Val d'Alpone –faune,flore e rocce del Cenozoico",Piazza Roma – 37030 Vestenanova (VR), (+39)3398290991, segreteria@ valdalponeheritage.it	Yes
6	JPG	Pesciara educational area	08/2012	Roberto Zorzin		A.T.S. – "Val d'Alpone –faune,flore e rocce del Cenozoico",Piazza Roma – 37030 Vestenanova (VR), (+39)3398290991, segreteria@ valdalponeheritage.it	Yes

7	JPG	Excavations in the Pesciara tunnel	11/2022	Roberto Zorzin		A.T.S. – "Val d'Alpone –faune,flore e rocce del Cenozoico",Piazza Roma – 37030 Vestenanova (VR), (+39)3398290991, segreteria@ valdalponeheritage.it	Yes
8	JPG	Room on the first floor of the Fossil Museum of Bolca	08/2020	Claudio Portinari		Claudio Portinari, Via Rio Camparolo – 36045 Lonigo (VI), (+39)3480512791, portinariclaudio@alice.it	Yes
9	JPG	*Sparnodus vulgaris* (Pesciara)	09/2007	Roberto Lazzarin	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza	Natural History Museum of Verona, Lung. Porta Vittoria 9 – 37129 Verona, (+039)0458079400, mcsnat@comune.verona.it	Yes
10	JPG	*Eoplatax papilio* (Monte Postale)	02/2020	Claudio Portinari	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza, Piazza S. Fermo – 37121 Verona, (+39)0458050111, sabap-vr@cultura.gov.it	Yes
11	JPG	*Titanonarke molini* (Monte Postale)	01/2017	Roberto Zorzin	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza, Piazza S. Fermo – 37121 Verona, (+39)0458050111, sabap-vr@cultura.gov.it	Yes
12	JPG	*Sphyraena* sp. (Pesciara)	07/2010	Roberto Lazzarin		Massimo Cerato, Via S. Giovanni Battista – 37030 Bolca di Vestenanova (VR), (+39)3334653861, info@museodeifossili.it	Yes
13	JPG	*Ornitholithes* sp. (Pesciara)	09/2010	Roberto Lazzarin		Natural History Museum of Verona, Lung. Porta Vittoria 9 – 37129 Verona, (+039)0458079400, mcsnat@comune.verona.it	Yes
14	JPG	*Eoeuscorpius ceratoi* found during the excavations that took place at the end of the 1970s ("Massimiliano Cerato" collection)	01/2018	Georg Oleschinski		Massimo Cerato, Via S. Giovanni Battista – 37030 Bolca di Vestenanova (VR), (+39)3334653861, info@museodeifossili.it	Yes
15	JPG	Indeterminate dipteran (Pesciara)	09/2009	Roberto Zorzin	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza, Piazza S. Fermo – 37121 Verona, (+39)0458050111, sabap-vr@cultura.gov.it	Yes

16	JPG	Leaf of *"Dombeyopsis"* (Pesciara)	12/2013	Ente Parco Naturale Regionale della Lessinia		Ente Parco Naturale Regionale della Lessinia, Piazza Borgo 52 – 37021-Bosco Chiesanuova (VR), (+39)0456799211	Yes
17	PG	Ficus sp. (Pesciara)	08/2022	Irene Tomelleri		Natural History Museum of Verona, Lung. Porta Vittoria 9 – 37129 Verona, (+039)0458079400, mcsnat@comune.verona.it	Yes
18	PG	*Bolcathore colorata* (Pesciara)	09/2015	Roberto Zorzin	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza, Piazza S. Fermo – 37121 Verona, (+39)0458050111, sabap-vr@cultura.gov.it	Yes
19	JPG	Monte Postale: outcrop MP 01	03/2022	Elisa Lerco	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza, Piazza S. Fermo – 37121 Verona, (+39)0458050111, sabap-vr@cultura.gov.it	Yes
20	JPG	Monte Postale: outcrop MP 01	03/2022	Elisa Lerco	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza, Piazza S. Fermo – 37121 Verona, (+39)0458050111, sabap-vr@cultura.gov.it	Yes
21	JPG	Monte Postale	03/2022	Elisa Lerco	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza, Piazza S. Fermo – 37121 Verona, (+39)0458050111, sabap-vr@cultura.gov.it	Yes
22	JPG	Monte Postale	03/2022	Elisa Lerco	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza, Piazza S. Fermo – 37121 Verona, (+39)0458050111, sabap-vr@cultura.gov.it	Yes
23	JPG	Monte Postale: outcrop MP 05	03/2022	Elisa Lerco	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza, Piazza S. Fermo – 37121 Verona, (+39)0458050111, sabap-vr@cultura.gov.it	Yes

24	JPG	Monte Postale: outcrop MP 06	03/2022	Elisa Lerco	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza, Piazza S. Fermo – 37121 Verona, (+39)0458050111, sabap-vr@cultura.gov.it	Yes
25	JPG	The limestone outcrop of Pesciara	05/2020	Roberto Zorzin		A.T.S. – "Val d'Alpone –faune,flore e rocce del Cenozoico",Piazza Roma – 37030 Vestenanova (VR), (+39)3398290991, segreteria@ valdalponeheritage.it	Yes
26	JPG	Pesciara, outcrop PS 02: excavation in the tunnel	01/2021	Roberto Zorzin		A.T.S. – "Val d'Alpone –faune,flore e rocce del Cenozoico",Piazza Roma – 37030 Vestenanova (VR), (+39)3398290991, segreteria@ valdalponeheritage.it	Yes
27	JPG	Pesciara: ladder-bridge to PS 02	03/2022	Elisa Lerco	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza, Piazza S. Fermo – 37121 Verona, (+39)0458050111, sabap-vr@cultura.gov.it	Yes
28	JPG	Pesciara: outcrop PS 01	03/2022	Elisa Lerco	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza, Piazza S. Fermo – 37121 Verona, (+39)0458050111, sabap-vr@cultura.gov.it	Yes
29	JPG	Fauna of San Giovanni Ilarione	09/2022	Stefano Dominici		Stefano Dominici, Museo di Storia Naturale, Università di Firenze, Via La Pira 4 – 50121 Firenze, (+39)0552757504, Stefano.dominici@unifi.it	Yes
30	JPG	Ciupìo: sample preserved in the Vienna Museum	11/2022	Stefano Dominici		Stefano Dominici, Museo di Storia Naturale, Università di Firenze, Via La Pira 4 – 50121 Firenze, (+39)0552757504, Stefano.dominici@unifi.it	Yes
31	JPG	The outcrop of the Horizon of San Giovanni Ilarione as it appears in the Ciupìo area	06/2018	Roberto Zorzin		A.T.S. – "Val d'Alpone –faune,flore e rocce del Cenozoico",Piazza Roma – 37030 Vestenanova (VR), (+39)3398290991, segreteria@ valdalponeheritage.it	Yes
32	JPG	Preparation of the excavation site in October 2020 in the "cascata" location (Valle della Chiesa)	10/2020	Roberto Zorzin		A.T.S. – "Val d'Alpone –faune,flore e rocce del Cenozoico",Piazza Roma – 37030 Vestenanova (VR), (+39)3398290991, segreteria@ valdalponeheritage.it	Yes

33	JPG	*Dilatilabrum fortisi* (Valle della Chiesa)	01/2016	Roberto Zorzin	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza, Piazza S. Fermo – 37121 Verona, (+39)0458050111, sabap-vr@cultura.gov.it	Yes
34	JPG	The fauna of Valle della Chiesa	11/2010	Roberto Zorzin	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza, Piazza S. Fermo – 37121 Verona, (+39)0458050111, sabap-vr@cultura.gov.it	Yes
35	JPG	Overview of the central-southern portion of the Val d'Alpone with intense cultivation of vines and cherry trees	05/2020	Roberto Zorzin		A.T.S. – "Val d'Alpone –faune,flore e rocce del Cenozoico",Piazza Roma – 37030 Vestenanova (VR), (+39)3398290991, segreteria@ valdalponeheritage.it	Yes
36	MP4	Core drilling in Pesciara	06/2015	Roberto Zorzin		A.T.S. – "Val d'Alpone –faune,flore e rocce del Cenozoico",Piazza Roma – 37030 Vestenanova (VR), (+39)3398290991, segreteria@ valdalponeheritage.it	Yes
37	MP4	Aerial video of Pesciara	03/2022	Elisa Lerco	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza	MIC – Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Verona, Rovigo e Vicenza, Piazza S. Fermo – 37121 Verona, (+39)0458050111, sabap-vr@cultura.gov.it	Yes
38	MP4	Core drilling in Purga di Bolca	12/2018	Roberto Zorzin		A.T.S. – "Val d'Alpone –faune,flore e rocce del Cenozoico",Piazza Roma – 37030 Vestenanova (VR), (+39)3398290991, segreteria@ valdalponeheritage.it	Yes
39	MOV	Il mondo dei fossili	09/2017	Gigi Palumbo		Massimo Cerato, Via S. Giovanni Battista – 37030 Bolca di Vestenanova (VR), (+39)3334653861, info@ museodeifossili.it	Yes
40	MOV	Velates	08/2024	Salvatore Aiello		Istituto Comprensivo di Montecchia di Crosara e San Giovanni Ilarione, Via Alcide De Gasperi - 37035 San Giovanni Ilarione (VR), (+39) 0457465060, vric831003@istruzione.it	Yes

7.b Texts relating to protective designation

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

For these contents, please refer to Appendix 7 Bibliography of the site

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

Temporary Association of Purpose *"Val d'Alpone - faune, flore e rocce del Cenozoico"*
Headquarters VESTENANOVA (Verona), Piazza Roma, 1- 37030
Tel: 339 829 0991
Email: segreteria@valdalponeheritage.it

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9.
SIGNATURE ON BEHALF OF THE STATE PARTY

The Italian Ministry of the Environment and Energy Security

The President of the Veneto Region

The President of the ATS Val d'Alpone

I.G. VR 85429

Editing September 2025





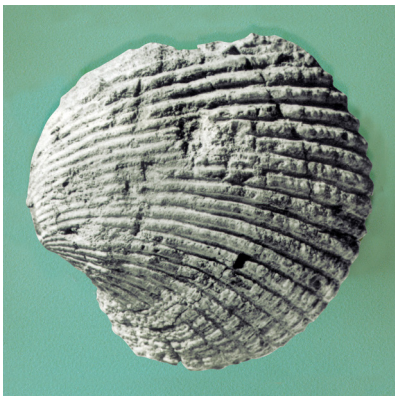














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