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Европейски земеделски фонд за развитие на селските райони: Европа инвестира в селските райони

GUIDELINES

FOR ESTABLISHMENT AND MANAGEMENT OF PARK-TYPE AREAS FOR GEOTOURISM DEVELOPMENT

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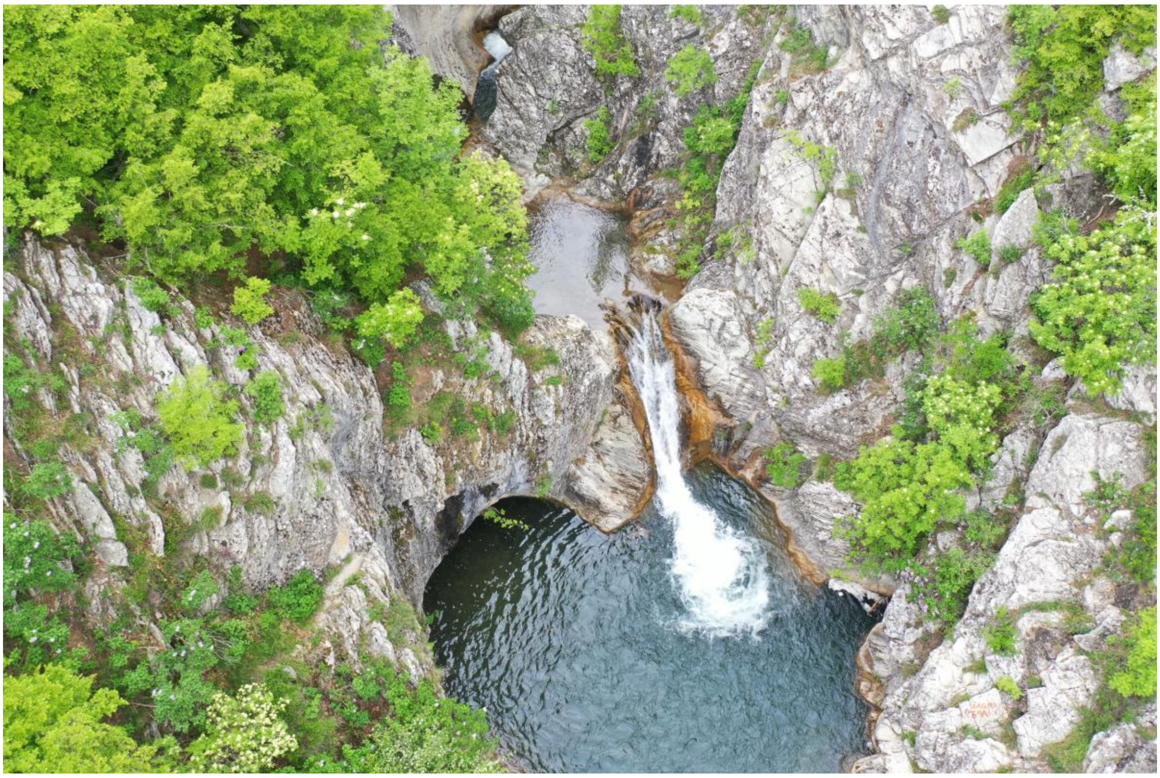

ГЕОПАРК ПОМОРИЕ
СВЪРЗАНА ОБЩНОСТ С ГЕОЛОЖКО НАСЛЕДСТВО

ГЕОПАРК ИЗТОЧЕН БАЛКАН

SOFIA 2025

Association for Preservation of the Bulgarian Geodiversity
European Agricultural Fund for Development of Rural Regions

GUIDELINES FOR ESTABLISHMENT AND MANAGEMENT OF PARK-TYPE AREAS FOR GEOTOURISM DEVELOPMENT

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Contract № РД50-4/19.3/У02/01.03.2024. Project № BG06RDNP001-19.607-0010-C01 "ROADS: Roads to a sustainable geotourism " in the frame of the administrative contract № РД50-4/10.01.2024 г.

Sofia, 2025

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1. Introduction

Geoparks are territories with significant examples of geological heritage, where efforts are made to promote knowledge about the Earth through geotourism - an economic, success-oriented and fast-moving tourist business sector involving strong multidisciplinary cooperation. Geology, studying the rocks and processes in the earth's crust, is a source of knowledge about the structure and history of our planet. It is a relatively new field of knowledge, distinguished as an independent science only in the 19th century with the capital work of the father of geology Charles Lyell "Principles of Geology" (Lyell, 1830-1833). At the dawn of industrial society, it developed intensively as a modern and perspective system of knowledge, the importance of which grew with the increase in raw material needs of humanity. Its role in the search for natural wealth made it romantic and attractive, and large-scale geological exploration in the 20th century provided new and new mineral and energy resources that were synonymous with economic prosperity. Over time, industrialization gave rise to environmental problems, and geology began to identify with the negative consequences of mining activities.

However, geology also includes elements of aesthetic and cognitive value that are part of the geological heritage of the planet without being subject to exploitation and deserve to be preserved for future generations through geoconservation. The priority of this direction is the preservation of minerals, rocks and fossils in a museum environment, as well as the preservation of geological sites in the field. It presents geology not as a key to the utilization of natural resources for the needs of humanity, but as a science for the aesthetic perception of inanimate nature. At the end of the 20th century, geoconservation was established as a methodology for the protection of the geological heritage in accordance with the UNESCO Convention on the World Cultural and Natural Heritage (UNESCO General Conference, 1972) and the principles of sustainable development that aims to meet the needs of the present without compromising the ability of future generations to meet their own needs (UN General Assembly, 1987). In many countries around the world, geoconservation is now a recognized necessity for promoting natural and cultural heritage with the aim of reviving heritage values, revitalizing the local economy and improving the living environment through geotourism and its related activities.

Nothing can stimulate a country's economy like the development of new energy sources, new technologies and new tourist destinations and products. Based on the state of the Bulgarian economy, it seems that the future of Bulgarian geology will be more closely related to tourism than to industry. The development of geotourism in Bulgaria requires enormous efforts and resources. A prerequisite for the implementation of this economically important step for the country is in the hands not only of the central authorities, but also of the local communities, whose vocation is to recognize the geological heritage as an important element of the territory they inhabit and to promote it through the tools of the Global Geoparks Network. The realization of the strategic goals of the Bulgarian geoconservation will bring Bulgaria the much-desired global promotion of its natural landmarks to attract a year-round tourist flow from all continents of the world. The establishment of a National Geoparks Network is a strategic task of the Association for Preservation of the Bulgarian Geodiversity. This is a step towards uniting the efforts of individual regions to protect their geodiversity and its national and international promotion.

2. Geoheritage, geodiversity, geoconservation and geotourism

2.1. Geoheritage

Geoheritage includes those particular examples or elements of natural geodiversity which are of significant value to humans for non-depleting purposes which do not decrease their intrinsic or ecological values (Sharples, 2002). According to the author, this term is more comprehensive than the term geological heritage, which does not include soil features.

Conservation of geoheritage is an integral part of education, culture, tourism, planning and management of many areas around the world. Its principles were formulated at the end of the last century mainly by British and Australian (Tasmanian) geoconservationists. Wimbledon et al. (1995) consider that the geology of a country (or continent) can be represented by individual sites of special interest. They introduce the concept of 'sites demonstrating key stages and features of the geological development of Britain'. Sharples (2002) defines the terms 'geodiversity', 'geoconservation' and 'geoheritage', which are closely related to the conservation of geological phenomena in the field: geodiversity is the quality we try to preserve, geoconservation is the effort to preserve it, and geoheritage includes specific examples that can be identified as sites of conservation significance. These examples or sites, called geotopes, are spatial expressions of relict and active geo(eco)systems that are integral components of our today's landscape (Stürm, 1992). They are distinct parts of the geosphere which document the Earth's history, the evolution of life, climate or landscape in a clear and impressive way or give a good insight into ongoing processes of landscape formation (Stürm, 1996).

2.2. Geodiversity

Geodiversity includes the entire complex of geological (rocks, minerals and fossils), geomorphological (landforms and landscapes) and soil features, systems and processes related to the evolution of the planet. Like the term 'biodiversity', which reflects the diversity of the organic world, the twin term 'geodiversity' refers to the various geological and geomorphological elements of nature that are subject to conservation through a complex of activities in a field or museum environment. It was introduced in Australian and European literature in the nineties. Sharples (1995) defined it as a complex (or variety) of geological (bedrock), geomorphological (landform) and soil features, systems and processes.

The geological heritage includes specific examples from the natural geodiversity demonstrating processes and phenomena related to the 4.5 billion year long history of the planet: cosmic disasters, magma crystallization, mineral composition of the earth's crust, the earth's magnetic field, tectonic plates movement, volcanic activity, mountain formation, the formation of the oceans, earthquakes, and evolution of life, climate changes (glacial and interglacial), sea level fluctuations, etc.

As an element of the natural landscape, the geological heritage is part of the World Natural Heritage, which also includes the category of "geological and physicogeographic formations" (UNESCO World Heritage Convention, 1972). It brings together all aspects of geodiversity that are of significant value to humans for non-depleting purposes which do not decrease their intrinsic or ecological values (Sharples, 2002). These purposes may include scientific research, education, history, culture, aesthetic enjoyment, recreation and a sense of place.

2.3. Geoconservation

Geoconservation aims to protect geodiversity for its intrinsic, ecological and (geo)heritage value (Sharples, 2002). It is the practice of identifying, protecting and managing geological heritage sites that have geological and/or geomorphological value. It is aimed at maintaining the natural diversity of geological, geomorphological and soil features, systems and processes, through the preservation of minerals, rocks and fossils in a museum or natural environment.

Historically, the first attempts at conservation of geoelements were the so-called 'cabinets of curiosity' or 'rooms of wonders', which appeared in Europe in the 16th century as predecessors of natural history museums. They arose in countries with developed natural sciences for the preservation of objects of natural history - geology, archeology, history, ethnography, works of art and antiquities. The first "Museum of Practical Geology" was founded in 1837 in London. According to its curators Hunt & Rudler (1867), it was intended "to exhibit the rocks, minerals, and organic remains illustrative of the maps and branches of the Geological Survey of the United Kingdom".

Today, there are natural history museums all over the world. In addition to representatives of modern flora and fauna, they store unique fossil finds, minerals and rocks. Apart from a museum environment, geoconservation also aims to preserve the dynamically changing geological, geomorphological and soil processes in a natural environment. At the end of the 20th century, the conservation of non-living nature acquired institutional dimensions through a number of international initiatives, including those under the auspices of UNESCO. According to the Digne Declaration on the Rights of Memory of the Earth by the European Association for the Preservation of the Geological Heritage ProGEO, "Earth's past is no less important than man's past, and the time has come to protect our natural heritage" (Digne Declaration, 1991).

Subject of geoconservation are samples of non-living nature that shed light on important events in the geological history of the Earth or demonstrate modern geological processes and phenomena of interest to the general public. Their conservation significance is assessed by qualified experts with different geological specialties based on a set of criteria and indicators for their aesthetic and/or scientific value and their potential for developing geotourism. Geotopes can be emblematic places of high aesthetic value (chasms, canyons, fjords, cirques, waterfalls, caves, rock pinnacles) or sites of special scientific interest, containing evidence of the organic and inorganic evolution of the Earth (rifts, volcanoes, faults, rocky formations, minerals, fossils).

Aesthetic (recreational) value is a criterion that includes the attractiveness and ability of sites to influence people's aesthetic perceptions. Natural beauty is one of the most frequently used indicators in the evaluation of geosites as objects for geoconservation and developing geotourism. Whether or not they are interested in geology, people perceive scenic rock formations as valuable for their aesthetic impact. Moreover, in many cases they associate them with their history and culture, which in turn predetermine local customs and traditions. At the dawn of human civilization, natural landmarks were associated with religious beliefs and used for ritual ceremonies. Thus, many geological phenomena became sacred places and any encroachment on them was considered sacrilege. To this day, legends are told about each local natural landmark, which has become an integral part of the life of the local population. Therefore, generations, since ancient times, have perceived the objects of geological heritage as part of their lives and relationships between people.

The history of mankind shows that the conquerors impose their culture by destroying the carriers of the old culture - temples, books, spiritual and religious symbols, architecture, etc. However, no one interferes with the geological phenomena. On the contrary, they are perceived as emblematic of the given regions, and the new societies integrate them into their way of life and culture. For example, the majestic Rocky Mountains, the Grand Canyon, Monument Valley and other remarkable landscapes of North America, from a home for the native Indians became a brand of the New World.

The scientific (research, educational) value lies in the importance of geosites for the general understanding of the organic and inorganic evolution of the planet in the form of unique finds, relationships and processes (rare minerals and fossils, catastrophic events, astronomical cycles, crustal movements, magmatic and metamorphic processes) that can be the subject of educational demonstrations, interpretations and tourist attractions.

With the establishment of geology as a science in the 19th century, the sites where pioneer explorers James Hutton, William Smith, Georges de Cuvier, Charles Lyell and other luminaries of geology made their first observations and formulated fundamental geological principles acquired historical value for the science. Today they are classic geosites immortalized on the pages of geology and natural science textbooks.

World-famous fossil deposits such as Ediacara in Australia, Burgess Shale in Canada, Solnhofen in Germany, etc. gain worldwide fame with the key role of the fossils found in them for the organic evolution of the planet. Extensive fossil fields in the natural parks 'Petrified Forest' in Arizona, 'Dinosaur Park' in Utah and Colorado, 'Cretaceous Park' in China, etc. are subject to year-round tourism. Volcanoes are also an object of tourism, where the products of volcanism (craters, calderas, lava flows) or accompanying geothermal activity (geysers, hot springs and fumaroles) attract thousands of visitors with an interest in modern geological processes or simply in the healing properties of mineral waters. In this connection, in the nineties of the last century, the term "geotourism" appeared, used by National Geographic as an abbreviation of "geographic tourism".

These examples are only a small illustration of the modern economic dimensions of geoconservation, directly related to the use of geological phenomena for the sustainable development of regions through geotourism and related forms of sustainable tourism - ecotourism, ethnotourism, rural tourism, wine tourism, culinary tourism, etc.

2.4. Geotourism

Geotourism was first defined by Hose (1995) as the provision of interpretive facilities that enable tourists to gain knowledge and understanding of the geology and geomorphology of a place beyond the level of ordinary aesthetic value. According to National Geographic, it is a type of sustainable tourism that maintains or enhances the geographical character of a place, its environment, culture, attractiveness, heritage and the well-being of its inhabitants. Hose (2008) believes that geology-based tourism in England (caves, waterfalls, etc.) dates back to the late 17th century. Interest in natural landmarks and volcanoes is indeed related to geology, but it did not yet exist as a science. At the end of the 18th century, the leading geological schools, the **neptunism** of the professor of Freiberg Mining Academy Abraham Werner, according to which all rocks were formed by sedimentation at the bottom of the World Ocean (Werner, 1795), and the **plutonism** of the Scottish scientist James Hutton, who considered that they were formed in magmatic way (Hutton, 1795), are still too naïve and could not play any role in tourism activities. Then the German researcher Georg Friedrich Fuchsel formulated one of the fundamental geological principles - the **principle of actualism**, which is an excellent basis for interpreting geological processes and phenomena in a language accessible to the general public: *"The way in which even now nature still acts and creates bodies must be accepted as a rule in our explanations; we don't know otherwise"* (Füchsel, 1761 in Dunbar & Rogers, 1957). This principle is still attributed to Hutton, who much later expressed the idea of the uniformity (**uniformitarianism**) of geological processes (Hutton, 1795). According to another great fallacy, the father of geology, Charles Lyell, developed Hutton's idea of uniformitarianism, but following the citations in 'Principles of Geology' (Lyell, 1830–1833) it appears that he had not even acquainted with Hutton's original and was not at all familiar with Füchsel's work.

Earliest theoretical concepts in geology can hardly be the subject of geotourism, unless it concerns a particular place that inspired a scientist for his ideas, such as Salisbury Crag near Edinburgh, where Hutton observed dolerite sills in the sedimentary rocks, or Sikar Point with the famous angular unconformity. The first geological field guide published by the famous English paleontologist Gideon Mantell (Mantell, 1847) which was intended to popularize the geology of the Isle of Wight among *"well-informed, but unscientific visitors"* can now definitely be considered the first step in geotourism. This is a richly illustrated guide to the geology of southern England with wonderful outcrops along the London-Southampton railway line of the famous English chalk, the well-known 'London Clays', the artesian wells and the popular Isle of Wight in the English Channel opposite Portsmouth.

Many geological sites around the world were identified in the 20th century as sites of recreational value. In the middle of the century, the Hollywood film industry popularized the natural attractions of the 'wild west' and the spectacular geological phenomena of the Grand Canyon and Monument Valley became a national brand of America and an attractive tourist destination for people from all over the world. With the rapid development of geotourism at the beginning of the 21st century, its principles and methods were defined (Hose, 2008; Newsome, Dowling, 2006, 2010). This became possible only after the clear formulation of the principles and goals of geoconservation, which presents geology not only as a key to the study of mineral resources, but also as a science contributing to the aesthetic perception of inanimate nature and its preservation for future generations.

In addition to museums and natural discoveries, old quarries, open pit mines, or even sections of operating underground mines adapted for tourist purposes (mining tourism) are also becoming geotourism sites, where safe conditions are created to familiarize visitors with the technology of open pit and underground mining. Where an area contains outstanding examples of geological heritage, it can be developed as a park-type area where sites and landscapes of international geological significance are managed with a holistic concept of protection, education and sustainable development. Such areas began to function as a variety of natural parks in some European countries as early as the 1990s and laid the foundations for a new category of protected area – a geopark, which in 1998 became the subject of a joint initiative of UNESCO and the International Union of Geological Sciences called "GEOPARK".

3. Nature of Geoparks

3.1. What is Geopark?

Geopark is defined as a nationally protected area containing multiple geological heritage sites of special significance, rarity or beauty that are part of an integrated concept of protection, education and sustainable development. The definition of a European Geopark is a territory combining the protection and promotion of geological heritage with sustainable local development (Zouros, 2004). It is a geographical area that includes geotopes of high aesthetic value or of special scientific interest, representative of the geological history of a given region or of the events and processes that occurred during its geological past (Global Geoparks Network, 2010). According to the International Geosciences and Geoparks Program (IGGP), a UNESCO Geopark must contain "geology of international importance".

A geopark is not a specific new category of protected area, but it can differ significantly from a fully protected and regulated nature or national park. Responsible management of the Geopark ensures the protection of the geological heritage according to local traditions and legislation, promoting socio-economic development by stimulating local economy and tourism without imposing additional restrictions on traditional activities.

The designation of a Geopark does not lead to any restrictive regime and does not impose new legal measures for the protection of the natural environment, nor additional taxation. It does not lead to new restrictions for owners, contractors or people who are practicing outdoor activities. The designation of a given territory as a Geopark does not in any way lead to a change in the legal status of the land and its ownership.

Geoparks in Europe date back to the 1980s, but the idea of creating a European Geoparks Network arose in 1996 in a discussion between Guy Martini and the current president of the Global Geoparks Network, Nicolas Zouros, during the Geological Conservation Symposium legacy of the 30th International Geological Congress in Beijing (Zouros, 2004). Meanwhile, in 1998, UNESCO launched an initiative to create a global network of natural parks of "significant geological features", the history of which is discussed in the next section. Despite the official failure of this initiative within UNESCO, thanks to the LEADER+ program in collaboration with the International Union of Geological Sciences of UNESCO, four areas of significant geological heritage have been developed (Martini, 2009): the Geological Reserve of Haute-Provence (France), the Petrified Forest (Greece), Vulkaneifel (Germany) and Maestrazgo (Spain), which in 2000 laid the foundation of the European Geoparks Network (EGN) in the Petrified Forest Geopark on Lesbos island.

In February 2004, under the auspices of UNESCO in Paris, the Global Geoparks Network (GGN) was founded, uniting 17 European and 8 Chinese geoparks, which met for the first time in June of the same year at the first International Conference on Geoparks in Beijing (McKeever & Zouros , 2005). In the same year, the Committee of Ministers of the Council of Europe adopted Recommendation Rec (2004)3 on the protection of the geological heritage in areas of special geological interest in the territory of Europe, which gave specific recommendations to the governments of the member states for the development of national strategies and guidelines for the conservation and management of these areas.

A UNESCO Global Geopark must have clearly defined boundaries, and a geological heritage of international importance established by scientific experts. Its territory should be large enough to serve local economic and cultural development mainly through geotourism. The Geopark is not for geologists, but is created by experts in various fields of geology used as a unifying element around which a sustainable concept for socio-economic development of the area is formed. It should cover the entire complex of geographical conditions of the region and should not include only sites of geological importance. The main priority of geoparks is the dissemination of knowledge about geological processes and phenomena among visitors and the local population in a language accessible to the general public. Non-geological topics, however, are an integral part of the Geopark agenda, especially when the relationship between geology on the one hand and contemporary landscapes, architecture, history and culture on the other can be demonstrated. For this reason, geoparks also include sites of ecological, historical, cultural and spiritual value related to traditional local crafts, customs and history. In many societies, natural, cultural and social history are inextricably linked and should not be separated. It is useful to remember again and again that the focus of the successful construction and maintenance of the geopark is the local people with their way of life, culture, traditions and aspirations.

During the first years of the current century, geoparks activities have been developed with the informal support of UNESCO, until in November 2015 the 38th session of the organization (UNESCO General Conference, 2015) adopted the International Geosciences and Geoparks Program (IGGP), which gave official international status to the Global Geoparks Network. According to UNESCO Global Geoparks Brochure (2016) UNESCO Global Geoparks are self-contained geographical areas where sites and landscapes of international geological significance are managed through a comprehensive concept of protection, education and sustainable development. They become UNESCO sites with the aim of raising awareness of geodiversity and promoting good practices for protection, education and tourism, and together with World Heritage sites and biosphere reserves, the IGGN forms a full range of tools for sustainable development with a significant contribution to the realization of the "Sustainable Development Goals 2030" Program. UNESCO Global Geoparks thus become the youngest category of UNESCO sites.

3.2. The dramatic early history of UNESCO's Geopark Initiative

In 1998, the Department of Earth Sciences of UNESCO launched a program for the creation of UNESCO Geoparks, which was announced publicly at the seminar of the European Association for the Protection of the Geological Heritage (ProGEO) in Belogradchik in response to the *"numerous requests of the countries-member states expressing their interest in improving the international recognition of their national geological heritage"* (Patzak & Eder, 1998). Thus, the UNESCO-Geopark program was launched as a joint initiative of UNESCO and the International Union of Geological Sciences. It proclaimed the designation of territories containing sites with special geological significance, rarity or beauty representative of a region and its geological history.

The idea is first hinted at in the 1998-1999 Draft Program and Budget (document 29 C/5, p. 38) as an initiative to create a *"global network of geographical sites with special geological features"* (UNESCO General Conference , 1997). At its 156th session (UNESCO Ex. Board, 1999a) the Executive Board initiated the creation of geoparks in which to preserve significant examples of geological heritage contributing to local sustainable development. Appreciating the need for international recognition of the Earth's geological heritage, promoting knowledge of the Earth's history and supporting local sustainable development, the Executive Board invited the Secretary-General to organize a program to develop geoparks *"building on or in cooperation with existing divisions and relevant committees within the Organization".*

According to this document, the Geoparks program is envisaged as a separate project complementary to the World Heritage Convention and the Man and the Biosphere (MAB) program, initially using the existing structures of the IGCP program to develop the new initiative. The "nature parks" intended for the integration of geo- and bioconservation must be under the exclusive guardianship of the governments of the countries in which they are located. In other words, the Geopark initiative aims to promote the identification of geodiversity in nature parks with established infrastructure, budget and management plans to provide a geological framework for their natural heritage.

In 1999, on the recommendation of the 29th Session (UNESCO General Conference, 1997) and according to document 156 EX/11 Rev. of the Executive Board (UNESCO Ex. Board, 1999a), at its 30th session (UNESCO Ex. Board, 1999b) UNESCO invited the Secretary-General to prepare an adequate plan of action by appointing a preliminary study to develop a geosites/geoparks program and to propose it to the Executive Board, confirmed by decision 3.3.4 of the same year (UNESCO Ex. Board, 1999c, p. 11).

The result of the study was reported to the 160th session of the UNESCO Executive Board in 2000 (UNESCO Ex. Board, 2000a) with the conclusion that the promotion of geological heritage is a recognized need and that the World Heritage List needs an alternative identification of geological/geomorphological sites of national, regional and international importance that do not meet the "outstanding universal value" criteria for World Heritage. After discussing the different approaches to the protection of geological heritage and based on the support expressed by governmental and scientific organizations in many countries, the recommendation of the preliminary study is that the geopark activity be integrated into the World Network of Biosphere Reserves within the framework of the "Man and the Biosphere" program by creating a "Seal of Excellence". It should have three main objectives: 1) using geological sites to educate the general public, 2) exploiting their potential as a means of ensuring sustainable development, and 3) preserving the geological heritage for future generations. By decision of the 160th session of the Executive Board (UNESCO Ex. Board, 2000b c. 8), the Secretary-General is invited to ensure consideration of the preliminary study at the 16th session of the MAB International Coordinating Board in November 2000.

At this session, some delegations agreed with the importance of protecting geological sites, but did not allow this activity to be part of the functions of the World Network of Biosphere Reserves. Thus, the MAB International Coordinating Board opposed the inclusion of the Geoparks program as part of UNESCO's World Network of Biosphere Reserves. The Secretary-General reported the results to the 161st session of the Executive Board on 11 April 2001 (UNESCO Ex. Board, 2001a). Following the decision of the MAB at its 161st session on 11 June 2001, the Executive Board invited the Secretary-General **not to pursue** the development of the geosites/geoparks program, but instead to support "ad hoc" efforts by individual Member States as he saw fit (UNESCO Ex. Board, 2001b, p.7).

This brief but dramatic period in the early history of UNESCO's Geopark initiative is indicative of the enormous difficulties faced by its supporters in UNESCO's member states. Nevertheless, the avalanche of growth of the Global Geoparks Network continued with the informal support of UNESCO. As a logical result of efforts in many member countries, at the 38th session of UNESCO in November 2015 (UNESCO General Conference, 2015) the International Geosciences and Geoparks Program (IGGP) was adopted, giving official international status to the Global Geoparks Network and Global Geoparks become UNESCO sites.

The Geopark initiative added a new perspective to the UNESCO Convention by placing the geological heritage on an equal footing with the biological, cultural and historical heritage of the planet and outlined the enormous potential of the relationship between the protection of the natural environment and the socio-economic and cultural development of the regions. The Global Geoparks Network is a selection of sites outside the UNESCO World Cultural and Natural Heritage List, bringing together geological and geomorphological sites of international significance, important for understanding the processes and phenomena that led to the formation of modern landscapes. In other words, geoparks, representing a mixed natural-cultural heritage category, are offered as an alternative form of protected areas by UNESCO, since not all sites of global scientific or historical value can meet the criteria of the World Heritage Convention.

The new IGGP program recommends that Member States play an active role in the development of UNESCO Global Geoparks by establishing competent national bodies (national geopark commissions or working groups) to coordinate national activities for the protection and promotion of geological heritage in individual countries.

Bulgaria was one of the first European countries to embrace the idea of creating geoparks as the host of the ProGEO-98 meeting in Belogradchik. According to Наков (2008), the preservation of the Bulgarian geological heritage is a fundamental element of the overall nature conservation activity and has important scientific, cognitive, educational and potentially economic significance, so this activity should be set at a professional level. In 1999 the Ministry of Environment and Water financed the creation of the Register and Cadastre of Geological Phenomena in Bulgaria, within the framework of which the first Bulgarian geopark 'Iskar Gorge' was developed (Jelev et al., 2002). Unfortunately, the Directorat “Earth's bowels and Underground Resources” was closed in 2009, and Bulgaria remained the only country in Europe without a National Geological Survey. Thus, from a leading country in the field of geoconservation, in a few years it fell sharply behind other European countries, and the Iskar Gorge Geopark remained in working order.

Subsequently, the initiative was taken by the Belogradchik rocks, for which a complex database was developed under a project of the Scientific Research Fund of the Ministry of Education (Sinnyovsky, 2011, Tronkov & Sinnyovsky, 2012), but without state support, this initiative suffered two unsuccessful UNESCO applications in 2010 and 2015. However Geopark „Belogradchik rocks“ acquired the status of UNESCO Aspiring Geopark (Sinnyovsky et al., 2015). At the same time, on the initiative of the Samokov municipality in 2013, a complex database for the Rila Geopark was developed, including two PhD theses (Sinnyovsky et al., 2020), but this initiative also remained without funding and, for now, there are no real prospects for applying to UNESCO.

After the announcement of the MPGG Program, on the recommendation of the National Commission for UNESCO, the Ministry of Energy proceeded to form a National Council for Geodiversity and Geoparks, whose staff was determined at the end of 2017, but it never received an official appointment. For this reason, in 2022, the Association for Protection of the Bulgarian Geodiversity (AOBG) was established, which assumed the functions of a national organization for the implementation of the principles of the IGGP on the territory of the country. The main priorities of AOBG are the development of a national policy for the protection and promotion of the geological heritage and the creation of a National Geoparks Network.

The latest initiatives to create geoparks and develop geotourism in Bulgaria provided the identification of geodiversity on the territory of the municipalities of Kotel and Pomorie. In close cooperation with AOBG, dozens of geosites suitable for tourist purposes have been characterized over the past three years. Thanks to Project No. BG06RDNP001-19.607-0010-C01 "ROADS: Roads to Sustainable Geotourism" within the framework of Administrative Contract No. RD50-4/10.01.2024 under the LEADER program, joint activities were carried out to build a geodatabase and field infrastructure for the development of geotourism by creating the "East Balkan" Geopark (Kotel) and the "Pomorie" Geopark. The results of the project allowed the development of the current joint product, which is a roadmap for the development of national geoparks and their nomination for the UNESCO Geopark category.

3.3. Objectives of Geoparks

Geoconservation. The value of the Earth's geological heritage has various aspects. The concept of anthropocentric or utilitarian value in geology is reduced to the specific benefit of mineral and energy raw materials for the development of human civilization, which humanity uses by right as an inhabitant of the planet. The concept of true or intrinsic value simply means that the existence of a thing may be of value in itself, not because of any benefit to people (Sharples, 2002). This concept contains the notion that things do not need human judgment to prove their right to exist. The value of a geological phenomenon is that it should be conserved because it is a good example of its type, regardless of whether humans actually scientifically study or even look at it. The fundamental principle of geoconservation consists in the awareness of the need for a reasonable exploitation of natural resources, the use of which should not take place in such a way that the natural diversity of geological features is reduced by the destruction of entire material classes (Sharples, 2002). In line with the concept of sustainable development, the main goal of geoconservation is to preserve geological heritage for future generations and to involve people in the conservation of planetary geodiversity.

Economic prosperity. Geoparks can be an important tool for stimulating the local economy. The main activities related to geoconservation - studying, protecting and promoting the geological heritage and integrating it with all aspects of the natural, cultural and spiritual heritage can be used for the economic prosperity of the area through geotourism. In this respect, Geopark can play a significant role in achieving sustainable local development. The focus of the Geopark is the well-being of the local population, as geoconservation concerns not only the preservation of the remarkable geological formations and landscapes but also aims at their sustainable use for the purposes of the local economy, which has a direct impact on the living conditions. This approach is particularly beneficial for underdeveloped regions and contributes to the inclusion of the local population in the restoration of heritage values and its direct participation in cultural and spiritual revival by improving living conditions in rural and urban environments. Through a balanced long-term policy, the Geopark can stimulate the building of a sense of "pride of the native place" and initiatives for the cultural and spiritual development of the region by organizing community meetings, thematic cultural days, concerts, exhibitions, bazaars, folklore festivals, culinary gatherings, religious holidays, sports events, etc., which emphasize the connection of cultural and spiritual values with the geological heritage of the region. All this contributes to the development of the area as a tourist destination, which generates employment and various economic activities by stimulating new priorities in the development of local crafts and sustainable production of local tourists and eco-products - souvenirs, food, drinks, herbs, etc. with the Geopark logo, recognizable as an ecological certificate of high quality on a wide range of products.

Education. According to the IGGP, *“Education at all levels is at the heart of the UNESCO Global Geopark concept. From university researchers to local community groups, UNESCO Global Geoparks promote awareness of the Earth's history as recorded in rocks, landscapes and ongoing geological processes”* (UNESCO General Conference, 2015, Annex 1). Until the Statutes was created, there was a tacit belief among the evaluators of the Global Geoparks Network that the main priority of Geoparks is interpretation. However, interpretation is a tool, while education is a mission that includes all tools for disseminating geological knowledge to the general public.

Geopark develops tools and activities to disseminate geoscientific knowledge and environmental and cultural concepts to the public through museums, visitor centers, popular literature, maps, films, mobile applications, etc. It also supports research and collaboration with universities and research institutes, organizing broad joint discussions between the scientific community and the local population.

Museums are scientific units that are an integral part of geoparks. They preserve the cultural and natural heritage of the region. There is no better way to preserve geological history under one roof than a rich and representative museum exhibition. The establishment of a geological museum within Geopark is an appropriate way to preserve in situ the local geodiversity and create a center for dissemination of geoscientific knowledge to the general public. By organizing annual thematic events, museums and visitor centers can generate various educational programs for the local population and visitors to the geoparks.

Among the tools available for knowledge transfer are events such as school trips, seminars, workshops and scientific lectures by guest lecturers on the environment, natural and cultural heritage intended for local residents, who in turn are happy to share this information with tourists. One of the main outcomes is the linking of geoeducation to the local context, thus enabling learners to understand the importance of their geological heritage in order to promote it to Geopark visitors.

Geoparks can be perfect educational grounds at the local and national level, which at the same time serve as a tool for practical training of our and foreign students, scientific research and exchange of scientific information at the international level. For this purpose, it is necessary to establish and maintain contractual relationships with scientific institutions and universities from the country and abroad, with the help of which to create natural science curricula for primary and secondary schools using local information on geology, geomorphology and geography. Geo-education should be seen in the local context so that students learn about geological heritage in its interrelationship with biodiversity and local cultural and spiritual heritage, while emphasizing the national and international significance of local geological phenomena.

For the promotion of the principles of conservation of the geological heritage within the educational concept of the geopark, laboratories for the study of rocks, minerals and fossils, "discovery centers" and specialized outdoor games using satellite navigation systems, orthophoto documentation of the earth surface by unmanned aerial vehicles (drones) and other innovative methods for studying geological and geomorphological processes and phenomena.

The success of educational activities depends not only on the content of tourism programs, competent staff and logistical support for visitors, but also on direct contact with the local population, media representatives and decision makers. Aspects of broad public participation and capacity building at local level (e.g. training of tourist guides) help to widely adopt the philosophy of the Geopark by the population (transfer of geo-knowledge and geo-information). Again we repeat that the local people are the focus of the successful establishment and functioning of the Geopark.

Geotourism. Geotourism is among the main priorities of any Geopark. According to the guidelines of the Global Geoparks Network (UNESCO Global Geoparks Network, 2008) geotourism is a successfully oriented and rapidly developing new tourism business sector involving intensive multidisciplinary cooperation. In Newsome & Dowling's (2006) definition, the prefix 'geo-' refers to geology and geomorphology, the natural resources of the landscape, landforms, fossil beds, rocks and minerals, with an emphasis on evaluating the processes that create or have created these features, while the suffix '-tourism' refers to visiting geotopes for the purpose of passive recreation, provoking feelings of wonder, judgment and knowledge. With increased interest, regular tours, specific activities and even the provision of accommodation can be organized, which requires different forms of planning and management of such places. When implementing geotourism, the principles of responsible tourism formulated in the Cape Town Declaration for Responsible Tourism (Cape Town Declaration, 2002) must be respected:

Geotourism. Geotourism is among the main priorities of any Geopark. According to the guidelines of the Global Geoparks Network (UNESCO Global Geoparks Network, 2008) geotourism is an economic, success-oriented and fast-moving discipline, a new tourist business sector involving strong multidisciplinary cooperation. In Newsome & Dowling (2006) definition, the prefix 'geo-' refers to geology and geomorphology, the natural resources of the landscape, landforms, fossil beds, rocks and minerals, with an emphasis on evaluating the processes that create or have created these features , while the suffix '-tourism' refers to visiting geotopes for the purpose of passive recreation, provoking feelings of wonder, judgment and knowledge. With increased interest, regular tours, specific activities and even the provision of accommodation can be organized, which requires different forms of planning and management of such places. When implementing geotourism, the principles of responsible tourism formulated in the Cape Town Declaration for Responsible Tourism (Cape Town Declaration, 2002) must be respected:

- To minimize negative economic, environmental and social impacts;
- To generate greater economic benefits for local people and increase the welfare of host communities, to improve working conditions and access to industry;
- To involve local people in decisions that affect their lives and life chances;
- To make a positive contribution to the preservation of natural and cultural heritage, to maintain global diversity;
- To provide more enjoyable experiences for tourists through more meaningful connections with local people and a better understanding of local cultural, social and environmental issues;
- To provide access for people with mobility disabilities;
- To engender respect between tourists and hosts and contribute to building a sense of pride and confidence among local people.

This type of tourism can only be realized in geoparks with well-characterized geosites and good infrastructure adapted to practice sustainable tourism by attracting people with an interest in geological and geomorphological landscapes. The pursuit of sustainable tourism is the responsibility of all stakeholders within Geopark and their commitment to follow the principles of responsible tourism based on local customs and traditional cultural, architectural and spiritual trends. The development of geotourism should benefit local communities by minimizing negative impacts on local livelihoods (e.g. through prohibitions of traditional activities or livelihoods). It must be in sync with activities peculiar to the local economy with the presumption that tourism is not always the most appropriate form of local economic development. In these cases, a very careful approach to the local community is necessary, which must be convinced of the benefits of using the natural landmarks for tourist purposes and initiate activities to protect the local geodiversity.

The short-term goals of the geopark are focused in activities that fit within 3-4 years: construction of a specialized database for the geological structure of the area and tourist infrastructure for access and promotion of geosites of international significance, helping tourists to get acquainted with the geological history of the region and to understand the geological processes and phenomena that led to the formation of modern landscapes and their significance for the inhabitants of the region:

- Compilation of a geological map of the geopark in GIS environment accompanied by geological sections, schemes, graphic applications and interpretation materials;
- Establishment of individual contractual relationships with experts (including foreign ones) for professional identification and expert assessment of geosites of local, national and international significance;
- Developing geosites and geotrails with information panels for the geological structure of the area;
- Establishment of visitor centers to promote geodiversity by forming museum collections of local minerals, rocks and fossils;
- Development of a website and pages in social networks to promote the main activities and attract followers to realize the goals of the Geopark;
- Publication of scientific articles dedicated to the main geological landmarks and the relationship of geology with the cultural and spiritual heritage of the region;
- Participation in the events of the European and Global Geoparks Networks.

The long-term goals of Geopark may include the construction of tourist attractions and structures (observation platforms, lifts, elevators, observation lift platforms, bridges, etc.) facilitating the access of tourists to the geotopes. The main policies for realizing the long-term goals include:

- Establishment of a management body of the Geopark (University, Museum, Tourist Office, NGO or Municipal organization);
- Staff of a team of employees and experts on a permanent employment contract.
- Establishment of Geopark structure (organizational chart) and the functions of the Management Board, the Director and the Working Groups.
- Provision of financial resources through sponsorship and donation policies, and participation in national and European programs;
- Engaging institutions: universities, scientific institutes and professional organizations such as the Association for Protection of the Bulgarian Geodiversity and the Bulgarian Geological Society, guaranteeing professional consulting on the identification, evaluation and protection of the geological heritage;
- Developing geo-education programs aimed at wide range ot age groups and professions, promoting scientific research and collaboration with universities and scientific institutions, as well as between scientists and local population.
- Establishing and maintaining connections and formal contractual relationships with foreign geoparks.

A logical extension of the efforts to establish each National Geopark and its future development is the application to join the European Geopark Network, which acts as an integrated organization of the Global

Geopark Network of UNESCO for the European continent. The recommendations of the Council of Europe for the protection of geological heritage (Council of Europe, 2004) state that European geoparks aim to improve the socio-economic parameters of regions and promote the regeneration of rural areas within Europe. In this respect, geotourism may prove to be the only option for the revival of the areas that fell victim to rural depopulation in the second half of the last century.

3.4. Management and Economic Development

By definition, a geopark must include geotopes of international significance. By itself, however, the presence of impressive geological phenomena is not enough. A successful Geopark concept should bring together geological and non-geological features of the area that are accessible to visitors and interconnected in a single concept of a formally managed park-type environment incorporating all the natural and cultural heritage of the region. The main prerequisites for the successful establishment of a UNESCO Geopark are the existence of a governing body, clear sources of funding and a management plan consistent with the territorial policy for sustainable socio-economic and cultural development to promote ecological (sustainable) tourism and measures for promoting education and research.

The management body of the Geopark is a legally recognized governing body according to national legislation, which has an established management infrastructure, qualified personnel and adequate financial support. In many cases, geoparks are managed by regional museums, tourist centers or universities, which have staff assigned on a permanent employment contract and clear funding. Geopark must develop and support policies and actions for sustainable regional socio-economic and cultural development of the territory. The management body shall determine adequate protection measures, in coordination with relevant local and central authorities, to ensure effective conservation and physical maintenance of geosites, cultural and historical landmarks, and tourist infrastructure.

The management and development plan of Geopark is a basic document that regulates its activity for a certain period of time. It includes all measures for the protection, conservation and promotion of the geological, cultural and historical landmarks in the area. The management plan is consistent with the preservation of local landscapes, with the social and economic needs of the local population, and its cultural identity. Through the management plan, Geopark provides organizational measures for the inclusion in the organization and management of the territory of all stakeholders: local authorities, local communities, public organizations, local producers, the tourist business, research and educational institutions.

Geopark funding should be based on a national policy similar to the funding of nature and national parks. A state subsidy is needed to maintain a minimum staff of qualified employees, to be supplemented with municipal funds. Funds from projects under the European programs for regional development are a good source for implementing protective environmental measures, building adequate tourist infrastructure and developing geotourism. Since geoparks are not a nationally recognized protected category, the most convenient way is to establish them on the territory of nature or national park. However, it is difficult to implement due to the large discrepancy between the restrictions imposed on the territories of this type of protected areas and the main objectives of Geopark, namely wide access and development of geotourism.

The establishment of Geopark should be based on a strong multi-purpose concept and political will with long-term financial support and a professional management structure. The identity of the geopark should be clearly defined for visitors. This is achieved through a good public relations concept, including uniform marking/branding of the Geopark sites, publications and all Geopark activities. With respect to the protection of the environment, Geopark should stimulate innovative local enterprises, small businesses, home industries, professional training courses and the creation of new jobs by generating new sources of income mainly from geotourism and other alternative forms of tourism - ecotourism, cultural tourism, rural tourism, culinary tourism, wine tourism, sports tourism, etc.

3.5. Local involvement

The creation of a Geopark is a "bottom-up" process. The initiative to create a Geopark must come from local communities and meet the economic needs of the local population and the preservation of the landscape. It must have the full support of local political and community leaders, including in terms of providing the necessary financial resources. Therefore, the initiative to create a Geopark must come from the local communities/authorities with a firm commitment to develop and implement a management plan that meets the community's and economic needs of the local population.

Sustainable tourism and other economic activities within Geopark will only succeed if they are carried out in cooperation with local communities. Tourist activities must be designed in such a way that they correspond to the specific conditions and the natural and cultural appearance of the territory and necessarily respect the traditions of the local population. Demonstrated respect, promotion and protection of local cultural values is an extremely important part of sustainable development efforts.

Regardless, the initiative must be approved at the national level by the AOBG and the National Commission for UNESCO (when applying for a UNESCO Geopark). At the planning stage, AOBG carries out consulting and expert work on the identification of local geodiversity and the establishment of a clear and sustainable concept for the future Geopark, which will take a worthy place in the National Geoparks Network. At the stage of preparation for EMG membership, the applying Geopark must inform the above-mentioned institutions, which will assess the degree of readiness for application and provide assistance in the development of the application dossier.

3.6. Requirements for Geoparks

Each territory applying for a UNESCO Geopark must have clearly defined boundaries and a large enough area to carry out the activities described in the previous section. The applying Geopark should demonstrate, through a series of remarkable geological sites (geotopes) of international, regional and/or national importance, the geological history of the area and the processes that took place in the geological past.

Geotopes can be of aesthetic and/or scientific value. These are rock pinnacles, rock canyons and gorges, rock ranges, karst and mineral springs, lakes, swamps, waterfalls, glacial forms, fjords, volcanoes, mineral and fossil deposits, tectonic phenomena, evidence of global disasters, etc., impressive with their shapes, size or scientific dimension. They are evaluated according to the original Bulgarian methodology for the evaluation of geological phenomena, developed under the project of the Ministry of Education and Culture to create the Register and Cadastre of geological phenomena in Bulgaria. In addition to aesthetic and scientific value, the criteria for evaluating geological sites also include educational, research, ecological, spiritual, ethnographic, social, identity and entertainment value.

The scientific evaluation of geotopes gives a real and unbiased view of the advantages of the sites, depending on which they fall into different levels of importance on a geographical context - local, national, regional, continental and global importance. According to UNESCO Global Geopark application requirements, within a Geopark there must be at least 40 geosites of aesthetic, scientific, cultural or historical value.

The "Geopark" label does not formally imply great scientific or heritage value, but the capacity and utility of the territory should be sufficient to demonstrate the geological features of the area and the influence of geological processes and phenomena on the landscape and people's lives. Apart from aesthetic appeal, ecological impact and educational benefit, the activity of Geopark should also bring socio-economic dividends for the local population. On the other hand, the label "UNESCO Global Geopark" brings popularity and pride, which is why the goal of each National Geopark is to be nominated and accepted in the Global Network, membership in which is also a great responsibility. It brings to its territory and country not only dividends, but also commitments, the fulfillment of which, according to the status of Global Geoparks, must be proven every 4 years.

4. Activities for Geoparks establishment

The establishment of Geoparks requires the involvement of both local institutions and scientific organizations and experts at the national level. The preparation of a possible application for UNESCO Global Geopark status goes through the following stages: preliminary project preparation, field work, cameral processing, interpretation and promotion of data, revealing the connections between the geological and cultural/historical/spiritual heritage of the area, educational and geoconservation measures, and development of a park management plan.

4.1. Preliminary preparation

Preliminary preparation of the project requires defining the parameters of the future Geopark. For this purpose, it is imperative to establish contact with the Association for Preservation of the Bulgarian Geodiversity (AOBG), whose mission is to consult and regulate the activities on the establishment of geoparks on the territory of the country and the implementation of all necessary legal and factual actions for the nomination of the Bulgarian geoparks with international significance for UNESCO Global Geoparks. It has a methodology for scientific identification, evaluation and valorization of geological heritage (Appendix 1) and works in close cooperation with scientific organizations and relevant institutions in the country. The preparation includes three main activities - clarifying the main theme of Geopark, defining the territory of Geopark, planning the main activities and developing a strategy for their financing.

The main theme of Geopark is determined by the nature of the geological heritage, which will be the subject of preservation and promotion. It should be sufficiently clear and recognizable for the general public. For example, the main theme of the Geopark Belogradchik rocks are the rock pinnacles, which gained European fame as early as the middle of the 19th century. According to the methodology applied in the existing Bulgarian projects, the determination of the main topic is of particular importance for the theoretical development of the Geopark. It is based on the so-called "thematic geodiversity" (Sinnyovsky et al., 2019), which emphasizes the individual approach to each individual Geopark, considering its geodiversity, geomorphological characteristics, ecological conditions and socio-economic prerequisites in line with geotourism and balneological potential. A clearly defined main theme on which the Geopark concept is built, and secondary themes contributing to its geodiversity are required. In some cases, there may be two main themes, when it is difficult to judge which, one is more important or more recognizable to the general public.

The territory is usually defined administratively along the borders of the municipalities participating in the project. This is followed by an analysis of the main literature sources on geology, geomorphology, hydrology and climatic features, since the potential of the given area for the development of a Geopark is assessed. If the necessary prerequisites for the implementation of such a project are established, the development of the concept of Geopark will proceed. First of all, the main and secondary themes of the Geopark are determined and then connections are established with scientific organizations (scientific societies, universities, institutes of the BAS) to carry out specialized consulting activities.

The planning of the main activities requires drawing up a road map for the development of the Geopark, which includes preparing a preliminary list of geotopes, validating a methodology for identifying and evaluating geotopes in a park environment, drawing up a schedule for field mapping and characterization of the geotopes, and development of a geodatabase based on a multilayer map in ArcGIS environment (including geological, topographic, landscape, etc. maps).

The strategy for financing the activities for the establishment of Geopark is developed according to the opportunities for participation in municipal, national and European programs. This is the main activity without which the initiative to create a Geopark is doomed to failure. Investments in Geopark do not guarantee returns from geotourism, but they provide results that are worth doing - restoration of local communities, cultural and spiritual revival of the area and stimulation of the sense of place (belonging to the native land). A UNESCO Global Geopark is a means of launching local customs, traditions, celebrations, initiatives and natural attractions into a global orbit, thus becoming visible to the whole world.

4.2. Field work

The field work is the second important activity after securing project funding. Identifying the geological landmarks in the field is a difficult and highly qualified activity that takes a lot of time and needs extremely expert involvement. It includes field mapping - compilation of a geological, geomorphological and landscape map, assessing geoconservation significance of the geotopes, GPS-documentation of prospective outcrops, geological description (measurement, sketches, schemes, geological sections, sampling for sedimentological and paleontological analyses), drone documenting for the purpose of electronic promotion of geotopes. The field assessment of the geoconservation significance of the geotopes is certified by means of an expert card for the evaluation of geotopes and a Form for genetic characteristics according to the model of the Ministry of the Environment. An important part of the field activity is the marking of passable paths for access to remote geotopes and the marking of tracks for the development of tourist geotrails and bicycle trails, as far as field observations are the most reliable source for the passability of the terrain.

4.3. Cameral processing of the field information

The cameral processing of the field information consists of compilation of a geodatabase for the territory of the future geopark - the development of scientific dossiers of the geotopes in Bulgarian and English according to a previously developed standard including: 1) administrative data for the geotopes according to the Ministry of Environment and Waters - name, boundaries (forest or land property), forestry, land, locality, belonging to a national or nature park, reserve, hunting farm, municipal recreation area, etc.; 2) geological characteristics according to the Ministry of Environment and Waters- stratigraphic and tectonic setting, history of geological development, graphics, maps and photo tables, vulnerability and protection measures, laboratory analyses, electronic processing and GIS-analyses of field data; 3) Expert card for assessment of geoconservation significance.

4.4. Assessment of the geoconservation value

The assessment of the geoconservation value of the territory is the main result of the field and cameral work. It includes an individual assessment of each geotope and the territory of Geopark as a whole. The methodology for the evaluation of geotopes in a park environment (Sinnyovsky, 2024) is represented in the form of an expert card released from some general criteria, included in the expert card for national evaluation of geotopes in the Register and Cadastre of Geological Phenomena in Bulgaria (Sinnyovsky et al., 2002). (Appendix 1). It was developed specifically for the purposes of the Bulgarian geoparks according to the "thematic geodiversity" approach (Sinnyovsky et al., 2019), which consists of formulation of one leading theme emblematic of the entire area of the Geopark (morphological features, glacial activity, volcanic terrain, karst formations, coastal landscapes, etc.), supplemented with significant geological features of scientific, educational and cultural value. The expert card is intended for park managers and evaluators in the field identification of the geoconservation significance of geotopes according to the main evaluation criteria: "scientific value" (representativeness, rarity, completeness) and "additional values" - scenic/didactic potential, ecological, cultural and geotourism impact.

4.5. Interpretation and promotion

The interpretation and popularization of geological data is a way of presenting strictly specialized geological information in a language accessible to the general public. At this stage, it is most often a question of adapting scientific analyzes and models to texts in a popular science style and bringing the primary information into a form suitable for perception by the highest possible percentage of the general audience. Interpretation concerns the presentation of the geological processes and phenomena typical of the area during the geological past: ancient basins, sedimentary structures and textures, fossilization of the organic remains, faulting and folding of the earth's layers, erosional processes, karstification, volcanic structures, etc. Especially suitable for this purpose are the models of the geological development of the area, paleogeographical reconstructions of the land, the sea and their inhabitants, three-dimensional models of geological structures, etc. The modeling and presentation of catastrophic events - risk processes and phenomena (earthquakes, landslides, collapses, floods) are of particular importance for areas prone to similar phenomena.

The promotion of geological phenomena in an electronic environment requires the creation of a website and Facebook page of the Geopark. For this purpose, video materials (including drone documenting) must be developed for geological phenomena and landscapes, maps on a territorial (for individual settlements) or thematic principle (a certain theme of the Geopark). The publication of well-illustrated tourist guides in Bulgarian and English is extremely useful. Promotion through the national media is also of particular importance.

The preparation for the integration of the Geopark into the European and Global Geopark Networks requires participation in national and international events, in conferences and symposia dedicated to the protection and promotion of geodiversity and publication of data about the Geopark in prestigious national and international issues, attendance at the annual events of the European Association for Preservation of Geological Heritage ProGEO, the European and Global Geopark Networks, establishment of official relations with UNESCO Geoparks and provision of exchange of experts for consultations on the establishment of the Geopark.

4.6. Relationships between geological and cultural-historical-spiritual heritage

The relationships between the geological and cultural/historical and spiritual heritage of the area must be demonstrated in an attractive way through publications, leaflets, information panels, etc. On the one hand, these are archaeological and historical monuments, artifacts from prehistoric settlements (caves, prehistoric settlements, etc.), ancient remains from the Roman age (fortresses, strongholds, Roman roads, etc.), medieval landmarks (fortresses, churches, monasteries, schools, etc.) and last but not least, remains and landmarks from the recent history of the area (the Balkan Wars, the First and Second World Wars, the communist past of the area).

On the other hand, these can be geological sites (rock ranges, rock pinnacles, caves, mineral springs) related to local folklore (myths, legends, folklore assemblies, festivals, biennales) or old quarries from which materials for the construction of architectural landmarks were extracted (monasteries, churches, bridges, houses, administrative buildings, etc.).

4.7. Educational impact

The educational impact is based on the development of educational programs for children and adults. Geo-education at all levels is an important element of the Geopark concept. Efforts to introduce geological topics into the curricula of primary and secondary schools are highly appreciated. Geo-education is focused on the dissemination of geological knowledge through school curricula, management courses, evening courses, outdoor classrooms, etc. Educational materials for adolescents most often include geoscience curricula for middle and elementary school students or games for children (geodetectives, GPS-orientation with search for mineral treasures, etc.). School courses are aimed at both children and their teachers.

Educational programs for adults can be in the form of geoscience courses for training geopark staff or existing natural history museums, local tour guides and visitor center curators, as well as for nature lovers, mountaineers, conservationists, etc. Geoparks must engage with educational institutions - universities, specialized schools and scientific societies such as the Bulgarian Geological Society and the Association for the Preservation of Bulgarian Geodiversity, to provide methodical assistance in educational events. Developing guidebooks with geological descriptions of geotopes and geotrails is a good practice to help teachers and tour guides. The geo-educational activity must be under the strict control of the geopark management.

4.8. Geoconservation activities

The geoconservation activities are the main part of the preparation of Geopark before its presentation to the general public. Museums are an integral part of geoparks that preserve cultural and natural heritage. The geological museum within Geopark is the perfect way to preserve the local geodiversity in situ. The creation of museums, visitor centers, mineral and fossil collections in the populated areas of Geopark is a significant part of the geoconservation activities, which requires the participation of experts in various fields of geology - mineralogy, petrology, lithology, paleontology, tectonics and museum work. The next very important stage is the development of rich illustrative materials in different languages for electronic basing (internet sites, social networks) or field promotion of the geological heritage through information panels, boards, billboards and signposts. They should present the geological history of the area in an accessible popular scientific language with many examples of the relationships of geology with local landscapes, architecture, customs, folklore, cultural and spiritual traditions, myths and legends.

The approach to the protection of the geological heritage and the identification of the geoconservation characteristics of the territory of a given Geopark includes the following main components:

National legislation. In most European countries, as well as in Bulgaria, geoparks are not among the protected areas according to national legislation. Although much can be achieved even without a specific legislative basis, the existence of such legislation would be helpful for implementing the methodology of geological heritage management.

Administrative tools and procedures. The engagement of local authorities with the problems of geoconservation is of crucial importance in providing funds and facilities for the implementation of geoconservation measures. It provides the necessary tools to inform landowners and land managers about geoconservation purposes.

The strategic approach to achieve a balance between conservation measures and local business interests requires a significant commitment of time, funds and personnel to raise awareness of the local community about the benefits of developing Geopark.

The local initiative is an important prerequisite for creating the necessary social conditions for the implementation of the policies for the identification, protection and promotion of the geological heritage. In order to gain support for the implementation of geoconservation goals and to ensure effective practical geoheritage management, it is necessary to cultivate awareness of the need for geoconservation at two levels: 1) the local community and its political representatives, and 2) local managers responsible for the practical field implementation of geological heritage protection policies.

Training courses and seminars are among the most important formal means of raising awareness among landowners and managers. The provision of mandatory landform conservation courses for the training of forest officials, including specific materials for individual geotopes, is an important element of geological site conservation activities.

Regular informal discussions between geoconservation experts and forest and land managers are an important means of raising awareness of the status of geotopes in the field. Such discussions may be initiated by geopark staff and field managers regarding current or upcoming field activities.

The availability of standard guides as a source of information for field managers and forest officials contributes to a better assessment of geoconservation problems and joint search for solutions.

Meetings with the public are a mandatory element of geological heritage management, as the Geopark initiative is a bottom-up process. Local community support and local involvement is critical to the conservation and promotion of the area's geological heritage.

The creation of real databases and their availability to field managers and the general public, including the main parameters of geoconservation, are of particular importance for the protection of the geological heritage within the given territory.

The construction of geological museums in Geopark is of particular importance. Museums are scientific units that preserve the cultural and natural heritage of the region, and their construction is an appropriate way to preserve in situ the local geodiversity. They are centers of geo-education and geo-tourism and are particularly important for the dissemination of geo-scientific knowledge to a wider audience.

The creation and maintenance of websites and pages in social networks are of great importance for the global promotion of Geopark's geological heritage, and the publication of scientific and interpretive materials is a powerful tool for attracting the attention of the general public.

The funding sources of Geopark are crucial to its existence, as its operation is based on the costs of personnel on a permanent employment contract. The main source of funds are the national and European programs, as well as the targeted municipal funds. A major role in the identification of the geological heritage in the municipalities of Kotel and Pomorie under the present project, as well as in many European Geoparks, is played by the Leader program, under whose auspices the European Geoparks Network is founded at Lesvos Island in 2000.

Partnerships with organizations at different levels is essential for realizing the specific goals of Geopark. First of all, the professional identification and description of geological heritage sites require cooperation with scientific organizations (universities, scientific institutes and museums). The partnership with related geoparks abroad is useful for the proper management of the Geopark, and consultations with the Association for Preservation of the Bulgarian Geodiversity and the European Geoparks Network are inevitable in the preparation of the territory for acquiring the status of "UNESCO Geopark".

4.9. Creation of a management body

A prerequisite for any successful Geopark proposal is the establishment of a management body. The presence of impressive geological phenomena itself is not enough. The geological features of the area should be linked and protected in a formally managed park-type environment.

Geopark is managed by a designated local authority or authorities that have the appropriate management infrastructure, qualified staff and adequate financial support. This can be a regional university, a regional or municipal museum, a tourist agency, a non-governmental organization or a municipal structure with appointed staff on a permanent employment contract. In many cases, the borders of geoparks coincide with the borders of national or nature parks and their management is carried out by their directorates. Good practices in this direction also exist on the part of Local Initiative Groups, which coordinate their activities with those of Geoparks.

The management body of Geopark must provide adequate conservation measures, after consultation with the relevant legal authorities, ensure effective protection and provide funds for the physical maintenance of Geopark. It decides how to protect certain sites or areas, in accordance with national legislation or by-laws, whose protection measures are listed in the Geopark management plan.

The management body must not be directly involved in the sale of geological objects such as fossils, minerals, polished and decorative rocks, usually found in the so-called "rock-shops" within the Geopark (regardless of their origin) and must not in any way stimulate the unsustainable trade in geological materials in general.

Coordinating the interests of stakeholders is a difficult but inevitable and responsible activity in the creation and management of a geopark. As a bottom-up initiative, the establishment of a Geopark depends above all on the involvement of local communities. Sustainable tourism and other economic activities within

Geopark can only be successful if they are carried out in cooperation with local communities. Tourist activities must be designed to meet local conditions, the natural and cultural character of the territory and fully respect the traditions of the local population.

An important part of sustainable development efforts is to respect, preserve and enhance local cultural values. In this respect, it is necessary to actively involve the local population in the management of Geopark. The initiative to create Geopark should include not only the preservation of expressive examples of geological heritage but also considering all the advantages and disadvantages of geoconservation that would benefit or harm the local economy. Combining the protection of the geological heritage with good practices in tourism is a necessary element for the successful management of Geopark and satisfying the expectations of the local population from this activity. Geopark promotes partnership between different groups that have direct interests in the area and motivates local authorities, local communities and businesses to join efforts in the name of a common goal - to use the geological heritage of the area to stimulate socio-economic development and improve living conditions.

4.10. Development of a management plan

The management of Geopark is based on criteria showing how much the territory consists of geotopes worthy of conservation and development of geotourism infrastructure. The conservation and management plan must be conformed to the social and economic needs of the local population. It includes the design, implementation and monitoring of conservation activities aimed at using the geological and cultural-historic heritage to develop geotourism and other forms of sustainable tourism. Its purpose is to add practicality to the territory and provide a strategic approach to achieve a balance between conservation measures and tourism activities. Such an approach can be applied only in areas with a developed geological database. The availability of initial data on the geological structure of the area is the starting point for the identification of geoconservation values and precedes all other activities.

The main parameters of the Geopark Management Plan should include improvement of measures for the protection of natural and cultural heritage with an emphasis on geological heritage, identification and assessment of geotopes with high tourist potential, improvement of infrastructure, development of promotional activities, educational programs, tools to support local businesses (supporting local communities) and activities to promote geotourism and other alternative forms of sustainable tourism.

Trends in the development of geotourism worldwide show an expansion of tourist destinations in the direction of geological landmarks. For the proper development of geotourism, it is necessary to analyze the following factors:

- Size of the geotourism market at the regional and national level;
- Successes and limitations, opportunities and challenges in the geotourism market;
- Opportunities and threats in the geotourism market;
- Prospective products for sustainable growth, market share of geotourism compared to other forms of tourism;
- Marketing and distribution;
- Market trends influencing the growth of the geotourism;
- Geotourism market opportunities, market risk and market overview.

The implementation of the main activities is preceded by a mandatory inventory of the protected sites in the area, declared according to the Law on Protected Territories: reserves, protected areas and natural landmarks and the Law on cultural heritage: archaeological, historical and ethnographic sites in order to maintain the regimes and regulations for their functioning.

In order to ensure proper management of the territory, a list of priority geological heritage sites that require the construction of special infrastructure must first be drawn up. For these geotopes, it is necessary to develop a platform for educational and touristic use, which should not be in conflict with the intended protection measures.

For the buffer zones around the geotopes, a wider range of activities can be foreseen, which allow a free mode of access and the construction of recreational areas with signposts and information panels. To maintain the natural parameters of the geotopes, constant monitoring of the state of the main conservation parameters is necessary, including evaluation of the protocols for each site and evaluation of the implementation of the conservation goals.

The planned periodical evaluation of the objects guarantees their proper management and protection. To maintain tourist interest in geotopes, it is necessary to provide permanent physical access to them with appropriate observation points and tourist facilities, as well as electronic access to specialized information interpreted for the general public. An important element in the Geopark management plan is the maintenance and improvement of tourist infrastructure: facilitating safe access to remote geotopes by building paths, stairs, safety railings, ropeways, cable cars, etc.

Exposing museum collections of geological specimens in natural history museums on the territory of the Geopark is a good practice that fits into the main priorities of geoconservation - scientific research, protection, interpretation and popularization of geological phenomena, preservation of rocks, minerals and fossils, creation of parks for visiting and a network of footpaths connecting interesting geotopes with ecotourism infrastructure, developing geoeducational programs, organizing scientific and cultural events to popularize geoheritage and its connection with local cultural, historical and spiritual heritage as a prerequisite for creating a complex tourist product.

4.11. UNESCO Global Geopark application process

The logical conclusion of the development of a given Geopark is an application for a UNESCO Geopark. The UNESCO Global Geopark application process includes four phases within three years https://www.unesco.org/en/iggp/geoparks/proposals.

Phase Preparation starts by contact with the National Geopark Committee (Association for preservation of the Bulgarian Geodiversity, APBG), European Geoparks Network (EGN) and Global Geoparks Network (GGN). Recommended autopreparation toolkits are Self-Evalution Checklist for Aspiring UNESCO Global Geoparks and Self-Evaluation Checklist Explanatory Notes for Aspiring UNESCO Global Geoparks. The checklist serves to assess if Geopark is ready to apply. It is strongly recommended to attend activities organized by UNESCO Global Geoparks, regular short courses, tranings, mentorship and knowledge exchange programmes, as well as UNESCO and Regional Geopark Network activities and conferences.

Year 1. Phase: expression of interest.

Before June: Letter of intrest should be sent from the National Commission for UNESCO or the government body in charge of relations with UNESCO to the Secretariat at the same year that the dossier is sent.

1-st October-30 November. Application Dossier: 1. Letter of Intrest2. Application Dossier (in English). 2.A General information. 2.B Document checklist. 2.C Location of the area. 2.D Main geological highlight and other elements. 2.E Verification of UNESCO Global Geoparks Criteria. 2.F Interest and arguments for becoming a UNESCO Global Geopark. 3. List of Mandatory Annexes: 3.1 Self-evaluation document, 3.2 An additional and separate copy of Section E1.1 "Geological heritage and Conservation", 3.3 An explicit endorsement of any relevant local and regional authorities and a letter of support from the National Commission for UNESCO or the government body in charge of relations with UNESCO, 3.4 A large scale of map, 3.5 One-page geological and geographic summary, 3.6 Complete bibliography of the area in Earth Sciences highlighting international publication.

December. Completeness check by the UNESCO Secretariat.

Year 2. Phase: evaluation.

First part of year: New Applications formally presented to Member States at the International Geosciences Programme (IGCP); Desktop reviews by the International Union of Geological Sciences (IUGS), accompaning by map & one-page summary.

Second part of year: Evaluation Mission: UNESCO uses a unique procedure of field evaluation and revalidation missions to ensure that areas fulfil or keep on fulfilling the criteria of UNESCO Global Geoparks. These assessments are carried out by two evaluators, which are chosen from the official “Roster of Evaluators”. In accordance with the Statutes and the Operational, UNESCO in conjunction with the Global Geoparks Network (GGN) maintains this roster of evaluators who undertake field evaluations of new applications for and revalidation missions of established UNESCO Global Geoparks. These evaluators have combined and proven professional experience relevant for UNESCO Global Geoparks development (geological heritage, conservation, sustainable development, tourism development and promotion, and environmental issues). They can bring a global perspective to the individual area.

Based on the filed evaluation report, there are 3 possible outcomes:

ACCEPT: Move on to the Nomination Phase next year.

DEFER: Need to improve the condition during the next 2 years. A report is required to identify the improvement. Doesn't need to reapply or have another evaluation mission.

REJECT: In case of non-compliance with the requirements. Need to start the application again.

Year 3. Phase: Nomination.

April-May: Item on the agenda of the Executive Board Spring Session proposing to endorse the recommendations of the Council.

Every four years: Phase: Revalidation.

Every four years the UNESCO Global Geopark is subject to revalidation procedure by the UNESCO Secretariat, requiring a One-page summary, Progress report, and Forms for Revalidation (Form A and B).

5. „East Balkan“ Geopark

5.1. Concept

According to the principle of “thematic geodiversity” (Sinnyovsky et al., 2019), the main theme of each Geopark defines its identity, and secondary themes complement its geodiversity. The project to develop a Geopark on the territory of the Eastern Balkan includes the municipalities of Kotel and Sliven. The focus of the Geopark on the territory of Kotel municipality is the karst landscape - caves, rock ranges, karst springs and waterfalls, 28 of which are included in the Register of Natural Landmarks, supplemented by 3 protected areas and 2 reserves (Синьовски & Стоилов, 2021). Geotopes with scientific and historical value for Bulgarian geology are also of particular priority - fossil deposits (Синьовски & Стоилов, 2022), remarkable facial horizons (Синьовски & Вангелов, 2022), olistoliths and olistostromes, tectonic phenomena, geological cycles and events.

The management body of the Geopark is a legally recognized governing body of the Local Action Group under LEADER+ Programme (LAG Kotel, Sungurlare, Varbitsa), which is housed in the renovated building of the Tourist Information Center (Fig. 5-2-1a) with an established management infrastructure, qualified staff and adequate financial support, with which the current guide was developed.

In Kotel and around Kotel, everything is history - from Khan Krum's victory over Emperor Nicephorus in 811, Ivailo's pogrom over the Byzantines in the Demirkapiya pass in 1279, and all the way to the end of the Renaissance. However, the town has two geotopes of cultural and spiritual value, whose direct relationship with geology adds geoheritage value as well. These are the medieval Orthodox churches "St. Peter and Pavel" and "St. Trinity". The first one (fig. 5-1b,c) was built in 1836 on the site of an older orthodox church, in which priest Stoiko Vladoslavov wrote the first copy of the Istoria Slavyanobulgarskaya, brought here in 1765 by Paisii Hilendarski himself (fig. 5-1d). It was designed by an Italian architect, so it has the appearance of a Catholic church. The second temple was built in 1871 after a sultan's decree obtained by Gavril Krastevich (Fig. 5-1e). What they have in common are the sandstone building blocks with which their walls are built. It was assumed that the building blocks were from the Eocene sandstones near the village of Kipilovo, formed 40-50 million years ago. However, on the southern wall of the "St. Trinity" church, an ammonite imprint was found, determined by prof. K. Stoykova as a representative of the genus *Hamites* (Fig. 5-1f), which existed in the Middle Cretaceous (Aptian-Cenomanian). Apart from it, the walls also contain imprints of the typical Cenomanian clam *Exogyra columba* (Fig. 5-1g), and many trace fossils (Fig. 5-1h). The fossils, structure and color of the rocks pointed us to an old quarry on the north-eastern slope of the "Komincheto” (“The Chimney") hill, where scattered blocks from their mining and processing are still available. They were formed 95-100 million years ago in the coastal zone of the Cenomanian Sea, inhabited by the emblematic of Kotel large foraminifera *Orbitolina concava*.

Geological phenomena are grouped into several "clusters" with similar geoconservation characteristics and common access. The most accessible are the geotopes from the Kotel Group, which are within the town of Kotel and its nearby surroundings: the Kotelka karst spring (Izvorite park), the fossil sites, the olistoliths, the Natural history museum with the new geological exposition and the medieval churches built with blocks from Cenomanian sandstones. Another group of geotopes are the caves, west of Kotel town, along the Sukhoika river valley: "Dryanovska", "Duhloto", "Prikazna", "Billernika", "Bloody Puddle", "Lucifer" and "Orlova Cave".

The Medven karst includes several karst phenomena - the “Orlitsa” rock ridge, the “Sini Vir” waterfall, the Medven springs and the caves "Lednitsa", "Tsarevets", "Chernite Izvori", "Maarata" and "Malkata Maara". “Orlitsa“ has had the status of a natural landmark since 1968, but in 1984 the surrounding area with an area of 566.5 ha was declared a reserve with a recommendation to expand it to the areas of Zlosten and Ali Baba. In 2007, the buffer zone was recategorized into a protected zone "Medven Karst".

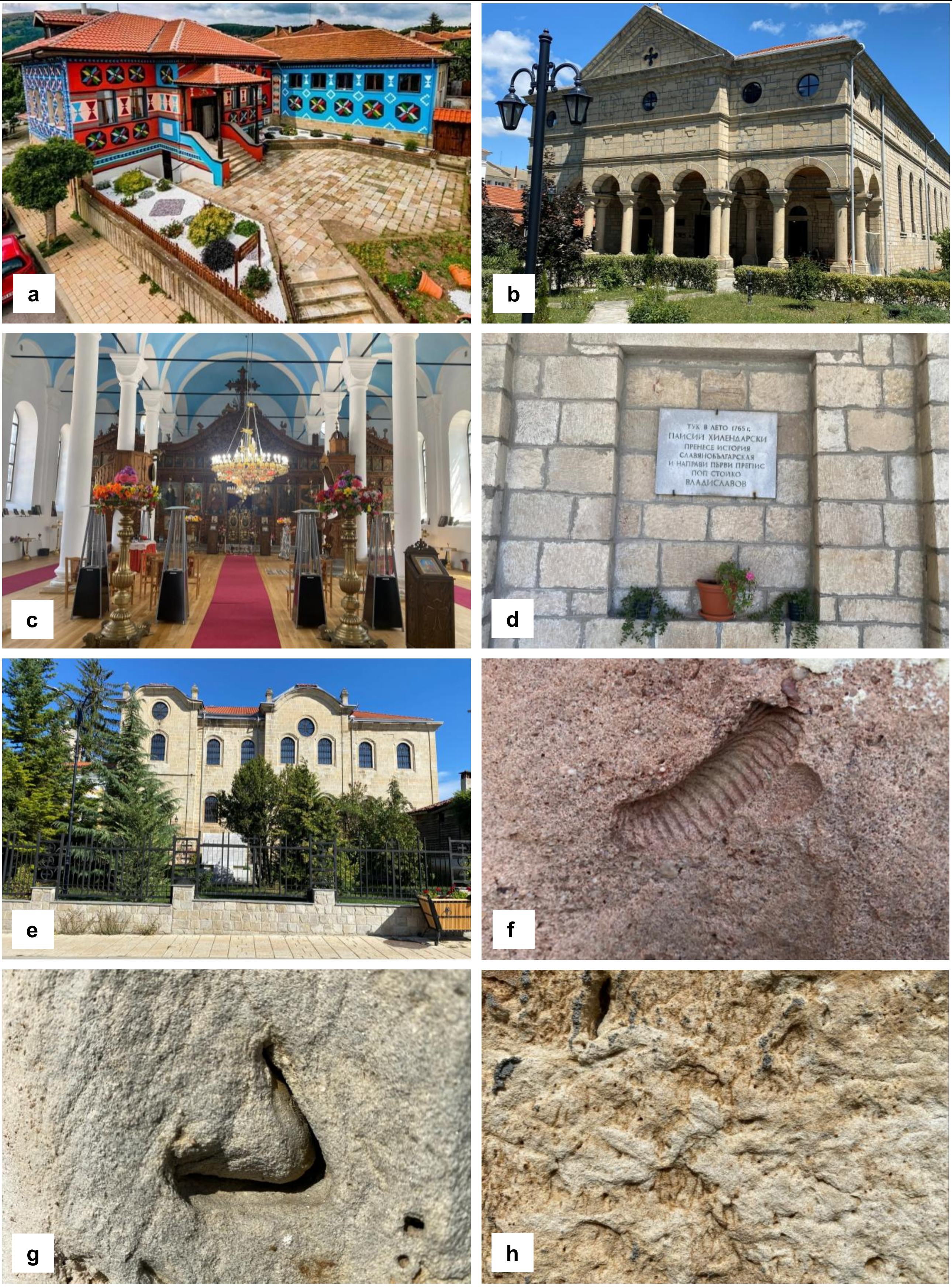


Fig.5-1: a, *The building of LAG Kotel, Sungurlare, Varbitsa, which houses the management of the "East Balkan" Geopark;* ***b,c,*** *The Orthodox Church "St. St. Peter and Paul";* ***d,*** *The commemorative plaque for the first copy of "Istoria Slavyanobulgarskaya";* ***e,*** *The Orthodox Church "St. Trinity';* ***f-h,*** *Fossil imprints on the south wall of "St. Trinity' temple: f- of Mid Cretaceous ammonite genus Hamites,* ***g,*** *Cenomanian clam Exogyra columba,* ***h,*** *Trace fossils.*

Another cluster of geotopes, the "Zlosten" protected area, is a dizzying karst chasm with many caves, including Rakovski's cave, "Akademik", "Misty", "Horror of treasure hunters", "Subatta", "Forty troughs" and karst caves springs in Kayadere. The rock phenomena north of the Kotel can be combined in a separate cluster - Yurushka wall, Voynishki kamak (Talim-tash), Chobra-tash, the cave "Lednika" with the Roman clay and the Varbishka ridge, on which Upper Cretaceous-Paleocene limestones of the Kailaka Formation overlie the Eocene sandstones of the Dvoynitsa Formation.

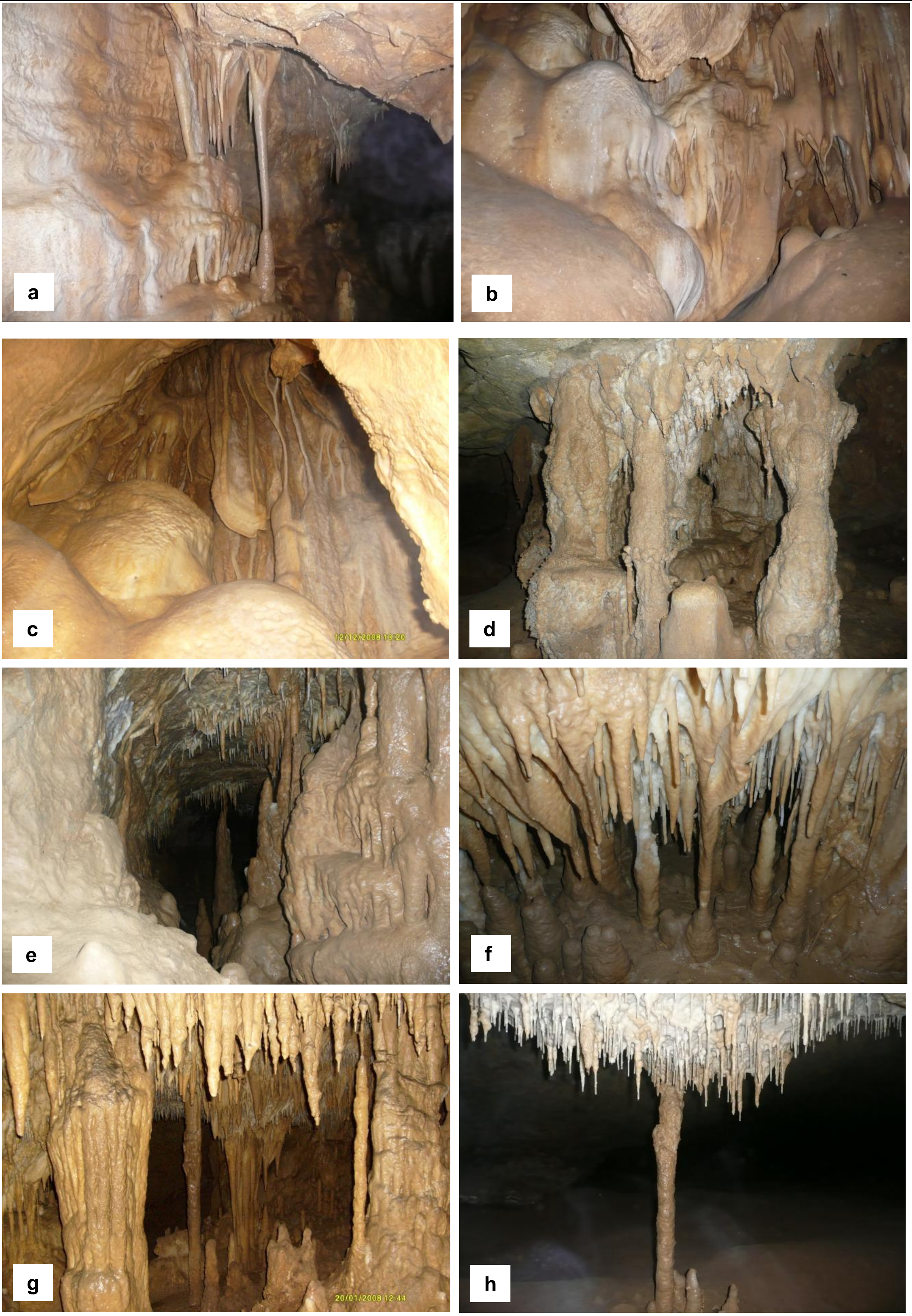
The Kipilovo Group of geotopes consists of a variety of sites - from predominantly landscape sites such as "Kersenlika" in the maintained "Ardachlaka" Reserve, to cultural and historical ones, such as "Borinata" with the late antique Kipilovo mudflats and the medieval Kharsovgrad. The remaining geotopes are the Eocene rocks with nummulites near the village of Kipilovo and the mapped caves in the picturesque Boazdere Pass - "St. 40 Martyrs", "Big Spring" and "Goat's Cave".

Geotourism, as a key element in the strategy of the future Geopark, includes the connection of geology with the rich cultural and spiritual heritage of the area. In the 18th and 19th centuries, Kotel was an important cultural and educational center with developed craftsmanship. A number of Bulgarian revivalists were born here - Petar Beron, Georgi Sava Rakovski, Sofronii Vrachanski and others. The Renaissance architecture and historical sites have made it a preferred tourist destination. The architectural reserve "Zheravna", where Yordan Yovkov's native house is, and Medven with Zahari Stoyanov's native house are also tourist villages. The lifestyle and traditions of the Karakachan minority, the annual festivals of local crafts and the festival of folk costumes, representing a permanent cultural heritage, shape the original identity of the Geopark as a unity between geodiversity, centuries-old history and indigenous culture.

The study of geodiversity in the Kotel municipality led to the identification of over 50 geotopes, documented according to the geomorphosite description methodology applied in the Rila Geopark (Sinnyovsky et al., 2020). The addition of the “Blue Stones” Natural Park and another 10-15 geotopes in the Sliven Balkan will close the main theme and will complement the geodiversity with mineral springs, igneous and volcanic rocks. The inextricable connection between natural, cultural and spiritual heritage in the area is an excellent prerequisite for the development of a modern Geopark, which, after meeting the necessary conditions, will be completely prepared for a successful application for membership in the UNESCO Global Geopark.

5.2. Key geotopes

5.2.1. "Prikazna” (“Fairy Tale") cave is undoubtedly the most impressive natural landmark on the territory of the Kotel municipality. It is extremely beautiful and of high aesthetic value - a remarkable karst phenomenon carved out in the Upper Cretaceous limestones of the Mezdra Formation as a result of their dissolution by surface and underground waters. The cave has the status of a natural landmark according to Order 3702/29.12.1972 of the Ministry of Forestry and Forest Industry, under No. 154 in the Register of Protected Areas and Protected Zones in Bulgaria. "Prikazna" is a multi-storey branched horizontal cave with well-explored galleries with a total length of 4782 m, an elevation of 37 m and an elevation of entrance 745 m, the sixth longest cave in Bulgaria. It has beautiful sand halls, meandering halls and deep wells. The throat at the entrance is very narrow, and a metal grate is placed over the entrance of the cave, since the first 8-10 m are vertical. Then there is a spacious sand hall called "Sahara" and numerous branches filled with amazingly beautiful cave formations (Fig. 5-2-1a-h). Such a beautiful cave within the Geopark is a gift from nature. On his first visit to the area in 1890, the famous Viennese professor Franz Tula called it "the most beautiful stalactite cave in the Balkans" (Toula, 1890). This remote in time, independent European assessment is much more important than any scientific (methodical) assessment and is the basis of the concept of the "East Balkan" Geopark.



Фиг.5-2-1: a-h *– Cave formations in Prikazna Cave (Photo courtesy: Zheyno Kutsarov)*

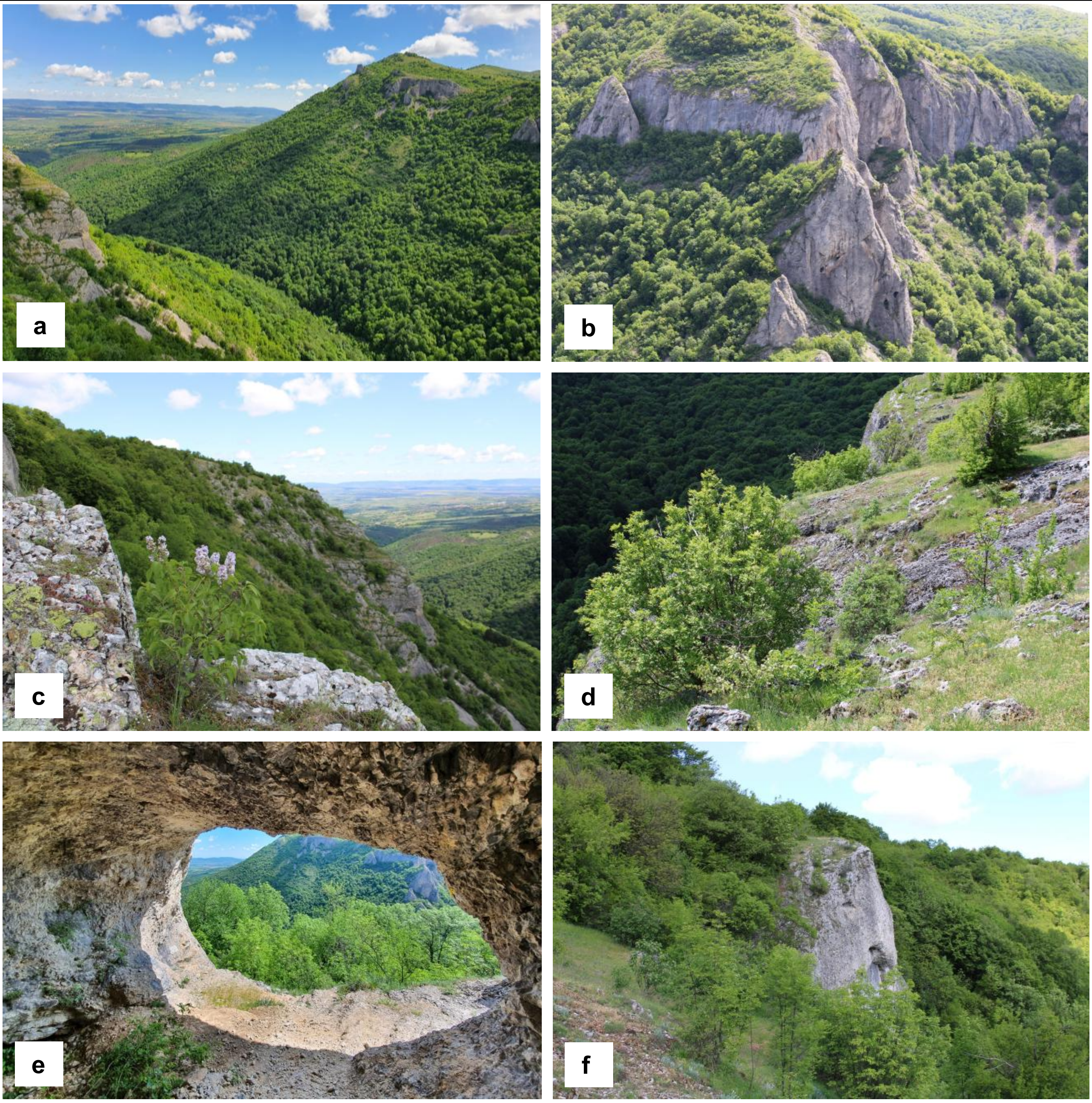


Fig. 5-2-2: a*, Zlosten: limestone cliff of the Mezdra and Kailaka Formations divided by the Kayadere river valley into a western and an eastern part;* ***b,*** *The eastern slope of the rock ridge;* ***c,*** *The western slope of the rock ridge;* ***d,*** *The western edge of the dizzying karst chasm "Zlosten";* ***e,*** *A rock niche in the limestones of the Mezdra Formation, confused with the Rakovski's cave;* ***f,*** *The rock under which the rock niche is located.*

Its adaptation for tourist purposes with easy access to the entrance, adequate lighting and safety equipment for visitors will make it the pearl of the future Geopark, is the core around which the overall concept for the conservation and promotion of the natural and cultural heritage of the area will be developed.

5.2.2. Zlosten is a geotope with aesthetic and ecological value - a karst chasm formed in the Upper Cretaceous-Paleocene limestones along the northern edge of the Kotel Balkan as a result of the erosion activity of the waters of the Zlosten River (Kayadere), a right tributary of the Golyama Kamchia River (Fig. 5-2-2a, b).

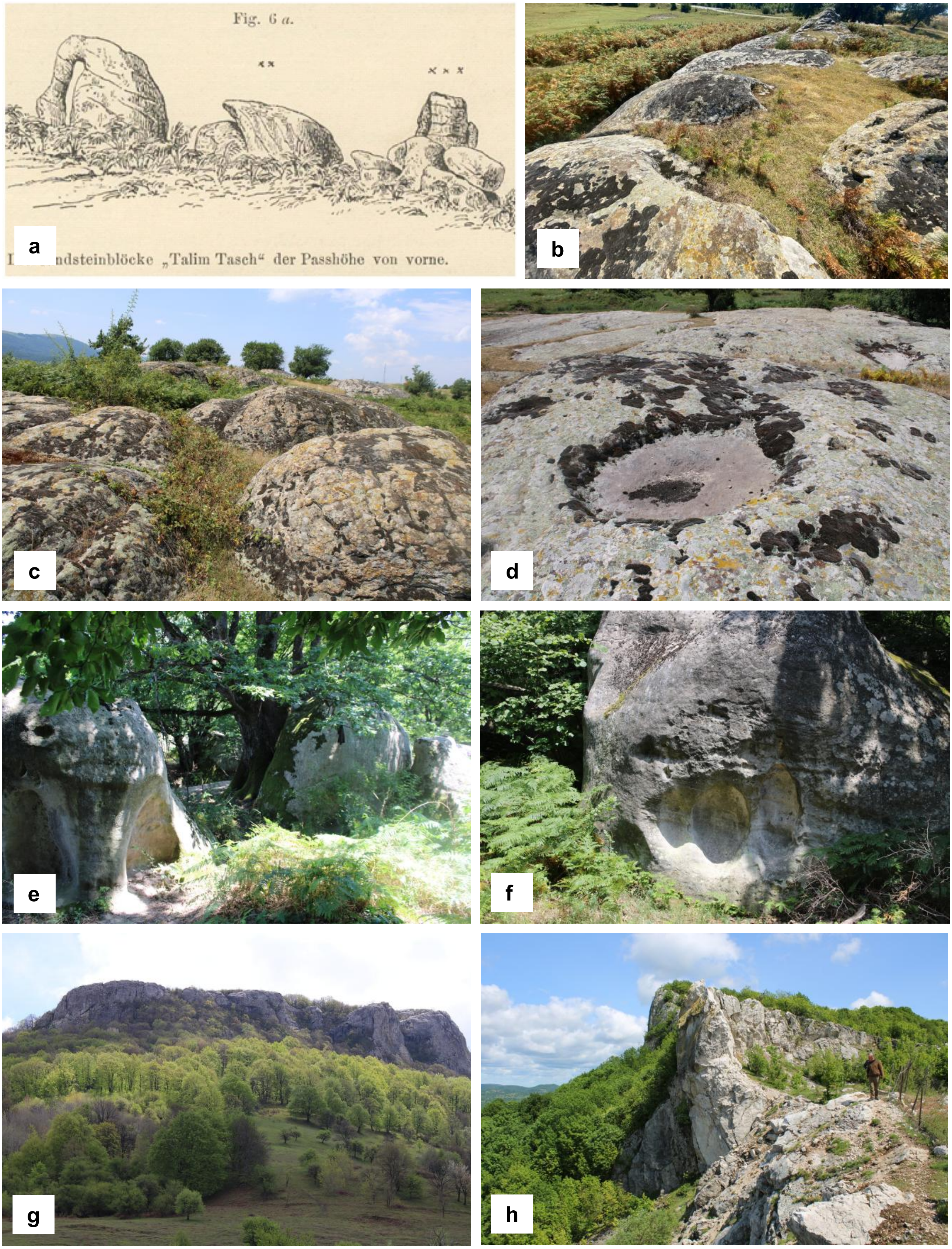


***Fig. 5-2-3: a**, Sketch of the Talim-Tash rock domes by Franz Toula (1890); **b,c**, The rock domes formed among the Eocene sandstones of the Dvoinitsa Formation; **d,** Natural negative forms of weathering on the rock domes in Talim-Tash geotope, interpreted as "sacrificial baths"; **e,f** Natural weathering niches in the rock domes in "Chobra-Tash" geotope interpreted as attributes of Thracian sanctuaries; **g,h** "Urushki rocks" cliff built of the Paleocene limestones of the Kailaka Formation.*

Remarkable mapped caves within the protected area – “Rakovski”, "Akademik", "Subatta", "Forty Troughs" and "Maglivata" are included in the Register of Natural Landmarks. The "Zlosten" karst with an area of 358 ha has been declared a natural landmark by order of the Committee for the Protection of the Natural Environment No. 132/22.02.1985, code 477 in the Register of Protected Areas and Protected Zones in Bulgaria. The geotope covers the remarkable rocky ridge and the dizzying chasm formed in the strong limestones of the Mezdra and Kailaka Formations along the northern edge of the Kotel Balkan (Fig. 5-2-2c,d). To the east of Zlosten, the edge is separated into a single hill called Sakar Balkan. There is a rock niche on the western slope of Zlosten that has been confusingly identified with Rakovski's cave (Fig. 5-2-2e,f). Geotope illustrates the high recreational potential of the impressive karst landscape, which, with appropriate promotion and construction of tourist infrastructure, can become an object of special tourist interest. For this purpose, at least two geotrail should be developed: from the Kotel Pass and from the village of Yablanovo with signposts and information panels about the formation of the karst gap. The remarkable cave complex, the cold karst springs and the beautiful mountain landscape offer great conditions for recreation and mountain tourism. The development of bicycle trails, as part of a complete circular cycle route within Geopark, can further increase the recreational potential of the geotope, which is located 10 km NE of the Kotel. It can be reached on a dirt road with an offroad vehicle. Access from the north from the villages of Filaretovo, Malko selo and Yablanovo is possible on a dirt road to the foot of the rock ridge or on foot along Kayadere.

5.2.3. Urushki rocks-Talim Tash-Chobra Tash complex is located 5 km north of the town of Kotel on the road to Omurtag town, where the Eocene sandstones of the Dvoynitsa Formation are exposed (Fig. 5-2-3a,b), forming impressive rock domes and rock niches known as "Talim-Tash" and "Chobra-Tash" . They were first described and sketched by the Viennese professor Franz Tula (Toula, 1890) (Fig. 5-2-3c). "Talim-Tash" geotope is also known as "Soldier's Stone", as it was a training ground for Turkish soldiers before the Liberation. The round recesses in some of the domes are considered to be "sacrificial tubs" (fig. 5-2-3d) and together with the side niches in "Chobra-Tash" (fig. 5-2-3e,f) are perceived as remains of a Thracian sanctuary. Usually, such erosional forms are identified with people, animals and mythical creatures. At “Chobra-Tash”, there is indeed a man-made dome that could be interpreted as an altar, but most of the rock niches are natural weathering forms characteristic of Dvoinitsa Formation sandstones throughout the Eastern Balkan. The rock domes of “Talim-Tash” are geological phenomena of local significance. To the south of this place, there is a wonderful view of the Urushki rocks - a rock crown of Maastrichtian-Paleocene limestones, dragged along the Varbitsa Thrust on the Eocene sandstones of the Dvoinitsa Formation. Due to their higher stability, the limestones form a rock crown that extends for tens of kilometers along the northern edge of the Kotel Balkan (Fig. 5-2-3g,h).

This geotope was declared a natural landmark by Order No. 995/21.04.1971 of the Ministry of Forestry and Forest Industry, SG No. 43/1971, code 197 in the State Register of Natural Landmarks. The afforestation and improvement of this place, the marking of a tourist trail to the adjacent naturally forested geological phenomenon "Chobra-Tash" and a geotrail to the Urushka Wall would make it a site of national tourist importance.

5.2.4. Fossil deposit of corals and hydrozoan near the town of Kotel is named after the professor from the Vienna Polytechnics Franz Tula (Franz von Toula, 20.12.1845-03.01.1920) (Figs. 5-2-4-1a,c), who made a huge contribution to the Bulgarian geology. He began his career at the Vienna Polytechnics as an assistant to another explorer of the Bulgarian lands, Ferdinand von Hochstetter. With his routes through our lands in the seventies and eighties of the 19th century, he laid the foundations of Bulgarian geology. In 1875, he undertook route geological surveys in the Western Balkans, during which he determined several species of Carboniferous ferns and lepidophytes in the "Zelenigrad" coal mine near Belogradchik, and on the way to Vidin he established Triassic brachiopods, mussels and crinoids.

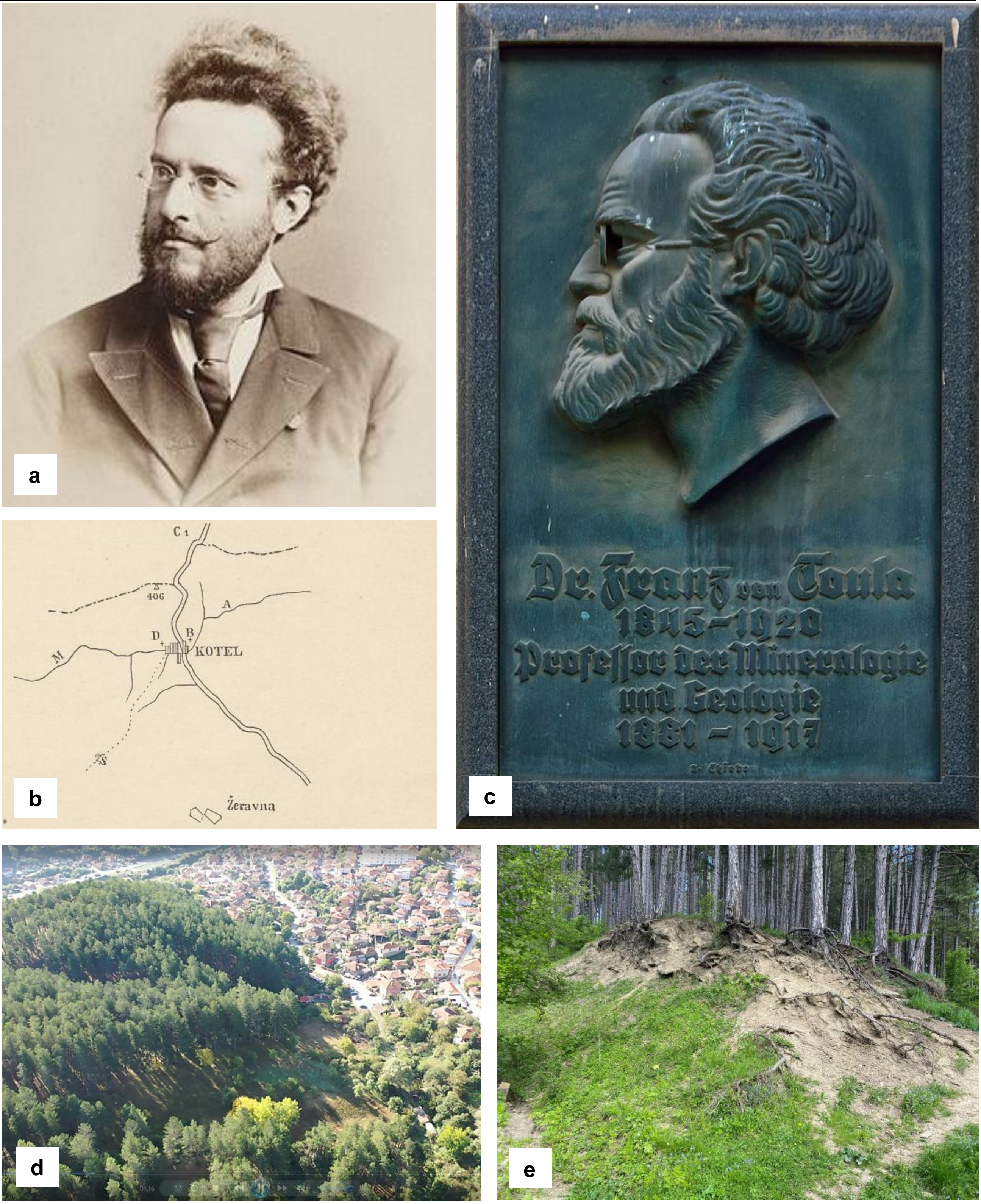


Fig. 5-2-4: ***a,*** *Franz von Toula (20.12.1845-03.01.1920) professor of mineralogy and geology at the Technical University of Vienna (Technische Hochschule Wien 1881-1917);* ***b,*** *sketch of the outcrops in the vicinity of the town of Kotel visited by Toula (1890), the fossil locality is marked "B";* ***c,*** *bas-relief of Prof. Franz von Toula in the courtyard of the Vienna Technical University;* ***d,*** *Garnyovitsa hill at the foot of which in August 1888 Toula found the first fossils in the vicinity of Kotel;* ***e,*** *The outcrop of the huge olistolith of Triassic marl at the end of "Iglika" street.*

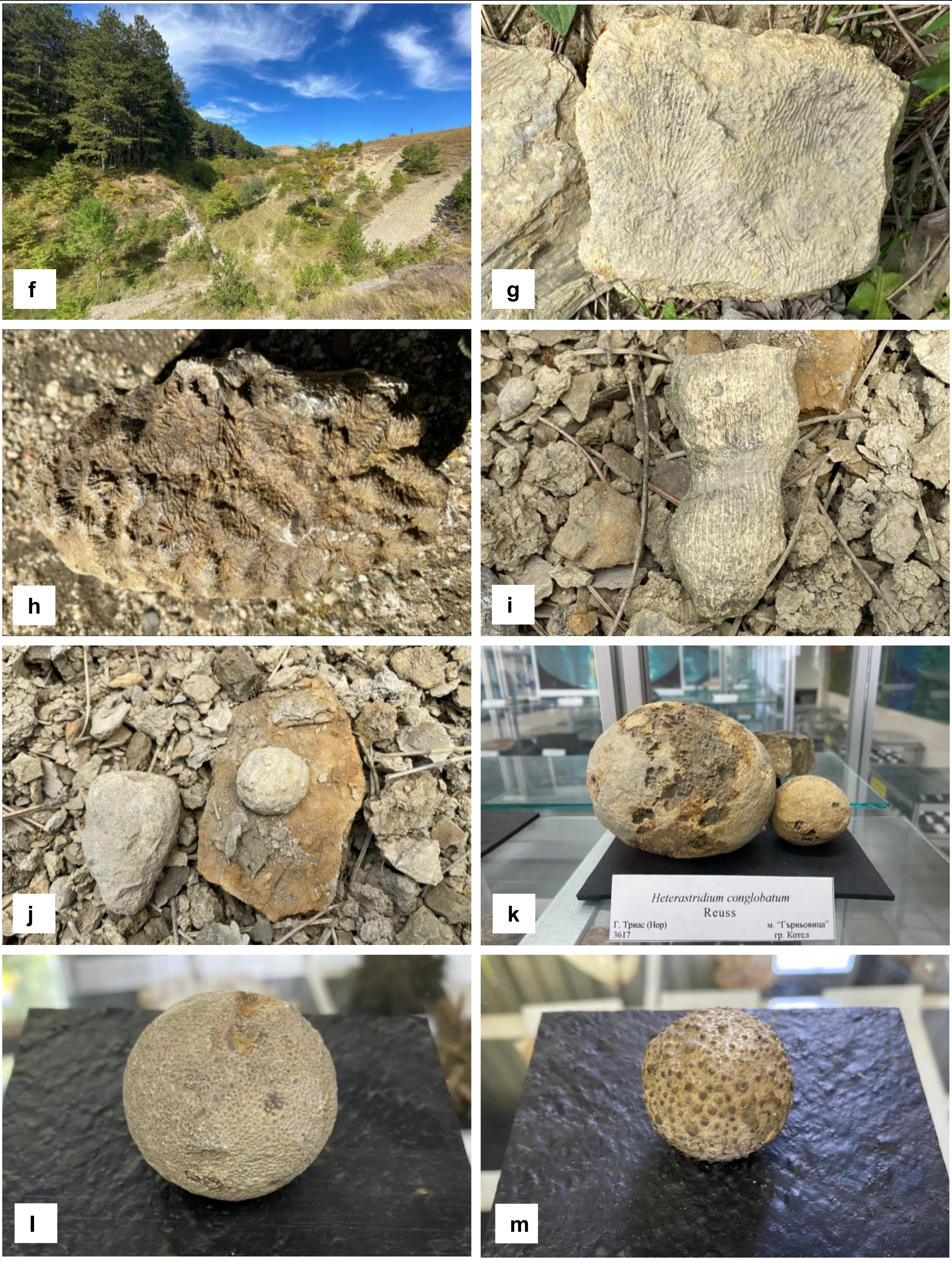


Fig. 5-2-4 (continuation): f, *Outcrop of the Upper Triassic olistolith on the eastern slope of Garnyovitsa hill;* ***g,*** *Fragment of a hexacoral colony of the species Astraeomorpha koteli Toula, 1890, determined and named by Franz Tula of the town of Kotel;* ***h,*** *Whole hexacoral colony of the species Latimaeandra koteli Toula, 1890, determined and named by Franz Tula of the town of Kotel;* ***i,*** *Single hexacoral;* ***j,*** *Single hexacoral (left) and Heterastridium sp. (right);* ***k-m,*** *Heterastrids from the Tula's site preserved in the Museum of Geology and Paleontology of the University of Mining and Geology "St. Ivan Rilski": k-Heterastridium conglobatum Reuss, l-Heterastridium monticularium Dunc., m-Heterastridium intermedium Dunc.*

These geotopes are of historical value for Bulgarian science as the first fossil deposits in Bulgaria, and the fossils found in these outcrops have been published and illustrated in the scientific journals of the Austrian Academy of Sciences (Toula, 1877, table III, IV).

The fossil deposit of corals and heterastrids is located in Garnyovitsa area, north-east of the town of Kotel (Fig. 5-2-4d,e, 5-2-4f). It is in a huge hundreds of meters large block of beige Upper Triassic marls, embedded in the Middle Jurassic turbidites of the Kotel Formation. In this place in August 1888, Franz Tula found the first fossils - corals and hydrozoans that inhabited the Late Triassic Sea more than 220 million years ago. At first, he assigned the spherical hydrozoan to the Cretaceous genus *Parkeria* and accepted Neocomian age of the rocks (Toula, 1890). Later, however, he provided the fossils to his colleague at the Vienna Academy of Sciences, Gustav Steinmann, who identified them as representatives of the Triassic hydrozoan genus *Heterastridium* (Steinmann, 1893). These are marine colonial hydrozoan called "drifters" because they roll freely on the sea bottom. Members of the genus *Heterastridium* are among the key fossils for Mesozoic stratigraphy used to correlate Upper Triassic rocks on a global scale. The site is of historical value for Bulgarian science and should be considered a key geotope in the "East Balkan" Geopark. Colonial (Figs. 5-2-4g,h) and single (Figs. 5-2-4i,j) corals, and poorly preserved heterastrid (Figs. 5-2-4f) were collected from the geotope. Well-preserved specimens from the locality are kept in the Museum of Geology and Paleontology of the University of Mining and geology "St. Ivan Rilski" (Figs. 5-2-4k-m). Two of the colonial corals described and named by Toula after the town of Kotel in his late 19th-century survey (Toula, 1890, Taf. VI) are also found in the present study (Figs. 5-2-4g,h). They are cataloged and exhibited in the geological collection of the Natural History Museum in Kotel.

5.2.5. "Orlitsa" rock is a geotope of aesthetic and ecological value, geomorphological class, representing a high rock escarpment on the western slope of the hill of the same name with the highest elevation Orlitsa (917.1) (Fig. 5-2-5a). The rock is built of Upper Cretaceous limestones of the Vetrila Formation as a result of erosion activity of the Black River, a left tributary of the Medven River. The reserve of the same name "Orlitsa" with an area of 566.5 ha was declared by order No. 791/10.08.1984 of the Committee for the Protection of the Natural Environment, SG No. 71/1984, code 41 in the Register of Protected Territories and Protected Zones in Bulgaria, category "Reserves", but the "Orlitsa" rock itself was declared a natural landmark as early as 1968. The geotope is entirely among the limestones of the Vetrila Formation exposed in the Kotel Unit of the East Balkan Structural Zone.

Toula (1890) first noted several key geotopes in the Kotel area, including "Talim-Tash", "Kotelka" ("The Springs"), *"the most beautiful cave in the Balkans"* ("Pikazna"), Razboyna and Demirkapiya, west of Orlitsa . Zlatarski (1905, 1910) referred to the limestone zones north and south of Kotel to the southern Senonian type and called the southern zone near Demirkapiya *"variegated marly limestones"*. Kossmat (in Kockel, 1927) calls them *"ringing calcareous marls"* and refers them to the Upper Senonian. The Kotel-born Bulgarian geologist prof. Бакалов (1942) called them *"thick-plate marly limestones"* and, based on globigerinas and inoceramids, determined their age as late Senonian or even Maastrichtian. Кънчев (1964) described them as dense, strong, calcareous marls and flint marls and referred them to the Upper Senonian too. The rocks are defined as low-density carbonate turbidites. They are thin-bedded to thick-bedded, and in places the base of the turbidite rhythms is made up of calcareous sandstones and even unsorted fine-grained conglomerates. On the Map of Bulgaria at a scale 1:100 000, map sheet Nova Zagora (Цанков et al., 1995) they are designated as the “Vetrila Formation”, a name introduced by Ст. Бончев (1927) with the rang of a formal unit pointed out by Паскалев (1983).

The Vetrila Formation (Upper Campanian-Maastrichtian) is represented by thin-bedded limestones (Figs. 5-2-5b-d) demonstrating turbidite attributes (Figs. 5-2-5e,f). They are distinguished by the abundant presence of flint concretions arranged in layers (Fig. 5-2-5g) or chaotically. This formation abounds in synsedimentary folds, making it difficult to accurately determine the thickness between 250 and 600 m.

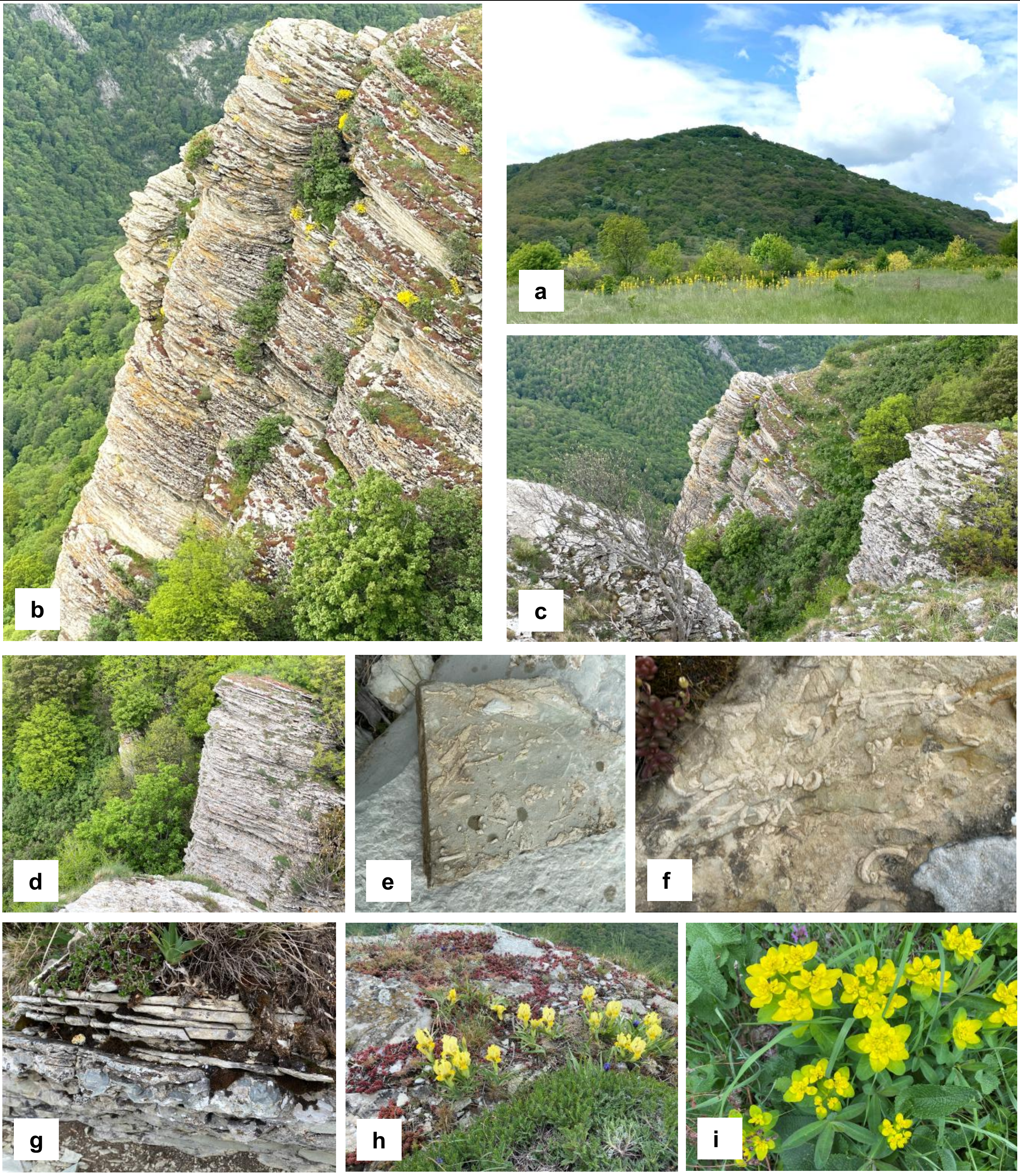


Fig. 5-2-5: a, *View of the "Orlitsa" hill (917.1) from the east;* ***b,*** *The impressive rock escarpment "Orlitsa" with a height of more than 100 m on the western slope of the elevation built of thin-bedded limestones of the Vetrila Formation;* ***c,d,*** *Thin-bedded limestones of the Vetrila Formation with features of carbonate turbidites;* ***e,*** *Bioglyphs and mechanoglyphs on the lower bedding surface of a limestone layer of the Vetrila Formation;* ***f,*** *Bioturbated lower bedding surface;* ***g,*** *Layered flint concretions in thin-bedded limestone of the Vetrila Formation;* ***h,i,*** *Representatives of biodiversity in the "Orlitsa" nature reserve: h-Reichenbach's iris (Iris reichenbachii Heuff.), i- Euphorbia epithymoides L.*

The access to “Orlitsa” rock and the reserve in general is difficult. The hill can be reached by a road with a crushed stone surface from the village of Medven to the "Tsarevets" forest post, which branches off to the left from the road to the village of Sadovo. Just after 6 km at Susenov mound (682.5) there is a fork to the left along a dirt road to the Zvanilitsa hill (829.4), which ends after 3 km at the foot of the Orlitsa hill (Fig. 5-2-5a). In the vicinity of the reserve there are a number of natural attractions such as the Medven springs, the Black and White springs, the Medven waterfalls, the Sini Vir waterfall, the caves "Maarata", "Malkata Maara", "Lednitsa" and "Tsarevets", most of which are included in the Register of the natural landmarks. In 1984, the buffer zone of the reserve was recategorized into a protected area under the name "Medven Karst" with the recommendation that it be expanded, including the protected area "Zlosten" and "Ali Baba" area on the eastern continuation of the rock crown.

There is no evidence of cultural and historical landmarks, except for the old Roman road that ran between Orlitsa and Tsarevets, and north of Zvanilitsa went down the ravine to the Black River. The "Orlitsa" reserve is included in many tourist routes and is suitable for visiting almost all year round. The numerous natural attractions and protected areas in the reserve are complemented by objects of spiritual, revival and ancestral value. The development of geotrails based on the existing tourist eco-trails, the installation of information panels with data on the extremely interesting geological structure of the area and the possibility of observing interesting plant species such as Reichenbach's iris (*Iris reichenbachii* Heuff.) (Fig. 5-2-5h), multi-colored milkweed (*Euphorbia polychroma* L.) (Fig. 5-2-5i), common buttercup (*Ranunculus acris*) and many others, will turn the reserve and its surroundings into a key cluster of geotopes in the “East Balkan” Geopark.

The Medven and Kotel karsts with their numerous caves and beautiful mountain landscapes are nationally significant tourist sites. According to the methodology for determining the geoconservation value of geotopes in park environment, the "Orlitsa" reserve has the quality of a geosite of national importance. It is an important element in the overall concept of Geopark, reflecting its main theme - the impressive mountain landscapes and karst terrains predetermined by the diverse and complicated geological structure of the Kotel Balkan.

5.2.6. „Sini Vir“ Waterfall is one of the most popular natural landmarks in the area, declared by Order No. 1573/02.09.1968 of the Ministry of Forestry and Forest Industry, State Gazette No. 33/1969, registered under No. 222 in the Register of Protected Areas and Protected Zones in Bulgaria. It is formed in the rocks of the Vetrila Formation, made up of alternating thin- to thick-bedded bioclastic and micritic limestones and marls, which are distinguished by the presence of cherty concretions or interlayers between the beds. The rocks are defined as carbonate, low-density turbidites. The river flow is oriented across the vertical limestone beds (Fig. 5-2-6a), which favors the formation of waterfalls. In fact, the geotope is a cascade of waterfalls in a short karst gorge in the riverbed of the Medven river, which begins and ends with 3-4 m high waterfalls. It is 50-60 m long and 15-20 m deep (Figs. 5-2-6b-d). The highest waterfall, "The Jumps", which is at the beginning of the gorge, is only visible from the air so it remains hidden from visitors (Fig. 5-2-6d). Several more waterfalls follow (fig. 5-2-6d) the last of which, the "Sini vir” (“Blue Pool"), forms a small pool from which its name originates (fig. 5-2-6e,f). It is not high in itself, but the overall landscape with the narrow karst gorge, the blue pool below it and the beautiful centuries-old beech forest give this place a fabulous beauty and an extremely high tourist potential.

The narrow karst gorge is the result of the continuous efforts of the Medven river to equalize the level of its mountain course in the narrows between Pleshivitsa and Orlitsa, where the raging current forms a series of mountain waterfalls, with that of the Medven field, where the river calmly continues its way to Luda Kamchia River. This took at least a million years, and at the place of the gorge there probably existed a 20-25 m high raging mountain waterfall. Over time, the waters of the river have gradually cut into the limestones of the Vetrila Formation, forming a narrow gorge, and only a few small waterfalls remain from the high waterfall.

The "Sini vir" waterfall is close to the "Orlitsa" reserve, which is of national fame. However, it, in itself, is also quite famous and many visitors learn about the reserve precisely after visiting the waterfall, which is located 2 km north of the village of Medven and is easily accessible on the eco-path along the river (Fig. 5-2-6g). There are many houses in the Revival style in the village of Medven including the Zahari Stoyanov's native house (fig. 5-2-6h).

5.2.7. Orbitolina fossil deposit in the "Three Winds" locality (Fig. 5-2-7a) is a geotope of scientific value, paleontological class: a deposit of well-preserved representatives of the Cretaceous foraminiferal genus *Orbitolina concava* (Lamarck, 1816), the type species of the genus *Orbitolina* d'Orbigny, 1850.

Foraminifera are unicellular organisms that typically build microscopically sized shells. Orbitolines are representatives of the so-called "large foraminifera", which have multi-chambered shells with "giant" sizes for unicellular organisms reaching up to 10-12 cm in diameter, with the shape of a concave underneath "Chinese hat" with a perfectly round rim, and a sharp tip (Fig. 5-2-7b-e). They lived individually without forming colonies. They had tentacles (pseudopods) with which they could move for short distances along the bottom. They are benthic (bottom) organisms, most of which are attached to the bottom and fed on unicellular algae and other food particles in seawater. Their abundance in the outcrops of the Cenomanian rocks in Kotel area characterizes them as an inexhaustible source of fossil material, allowing them to be collected by visitors to Geopark.

Orbitolines are an emblematic fossil for the Kotel Balkan, first described by Toula (1890) during his routes in the vicinity of Kotel. They existed between 120 and 90 million years ago during the Barremian, Aptian and Albian ages of the Early Cretaceous and the Cenomanian age of the Late Cretaceous. According to most studies from 19th century until now, *Orbitolina concava* (Lamarck, 1816) is an index fossil for the Cenomanian stage of the Upper Cretaceous. These orbitolines occur abundantly also in the Cenomanian sediments of the Mediterranean type Upper Cretaceous in southern Bulgaria, where they indicate a warm tropical climate. They inhabited the coastal zone of the Tethys Ocean, remnants of which are the Mediterranean Sea, the Black Sea and the Caspian Sea. In the middle of the Cretaceous, global cooling began, ending the "great summer" that lasted more than 100 million years during the Jurassic and Early Cretaceous. Back then, Earth's climate was so warm that there were no ice caps at the poles, and the global sea level was 200 m higher than now. Thus, the littoral beach of the warm Cenomanian Sea around Kotel town (Fig. 5-2-7f) was massively populated with large forams Orbitolina, according to Бакалов (1942) *"literally fill the rock in some places"*.

5.2.8. Geotop „Izvorite" ("The Springs") is an emblematic geotope for the town of Kotel with the status of a natural landmark according to order 995/21.04.1971 of the Ministry of Forestry and Forest Industry, SG No. 41/1971, code 198 in the Register of Protected Territories and Protected Zones in Bulgaria. It is located in the renovated park "Izvorite" in the northwestern part of the town of Kotel.

This karst spring is a system of jumped, overflowing into each other karst vessels, one of which is "hidden" inside the rock, and the other one is an open lake, which is the head of the karst spring (Figs. 5-2-8a,b). These jumped vessels are abundantly filled with water and have a large flow during the intense spring inflow from their adjacent karst system. Цанков (1940) considers the highly fractured Upper Cretaceous limestones as *"massive reservoir for water, which, filling its cracks in depth, eventually overflows at the border between the limestone and the underlying clay conglomerate of Mesozoic strata in the form of gushing springs".*

Access to the inner lake is through the entrance to the "Izvorite" cave (Fig. 5-2-8c). "Izvorite" Park has been transformed into an attractive place for recreation against the background of the picturesque karst terrain (Figs. 5-2-8d,e). It naturally and imperceptibly passes into the centuries-old beech forests in the vicinity of the town of Kotel. Here is the alley of the revivalists, on which the names of dozens of Kotel residents who contributed to the Bulgarian revival are immortalized: Captain Georgi Mamarchev, Georgi S. Rakovski, Sofroniy Vrachanski, Neofit Bozveli, Dr. Petar Beron, Gavril Krastevich, Stefan Bogoridi and many others (Fig. 5-2-8f).

Fig. 5-2-6: a, *The flow of the Medven River crosses the vertical layers of the Vetrila Formation;* ***b, c,*** *The narrow gorge incised in the limestones of the Vetrila Formation by the Medven River;* ***d,*** *The cascade of waterfalls including the highest one, "The Jumps";* ***e,f,*** *The lowest waterfall known under the name "Sini vir" waterfall;* ***g,*** *Eco-trail from Medven to the waterfall;* ***h,*** *The Zahari Stoyanov's native house in the village of Medven.*

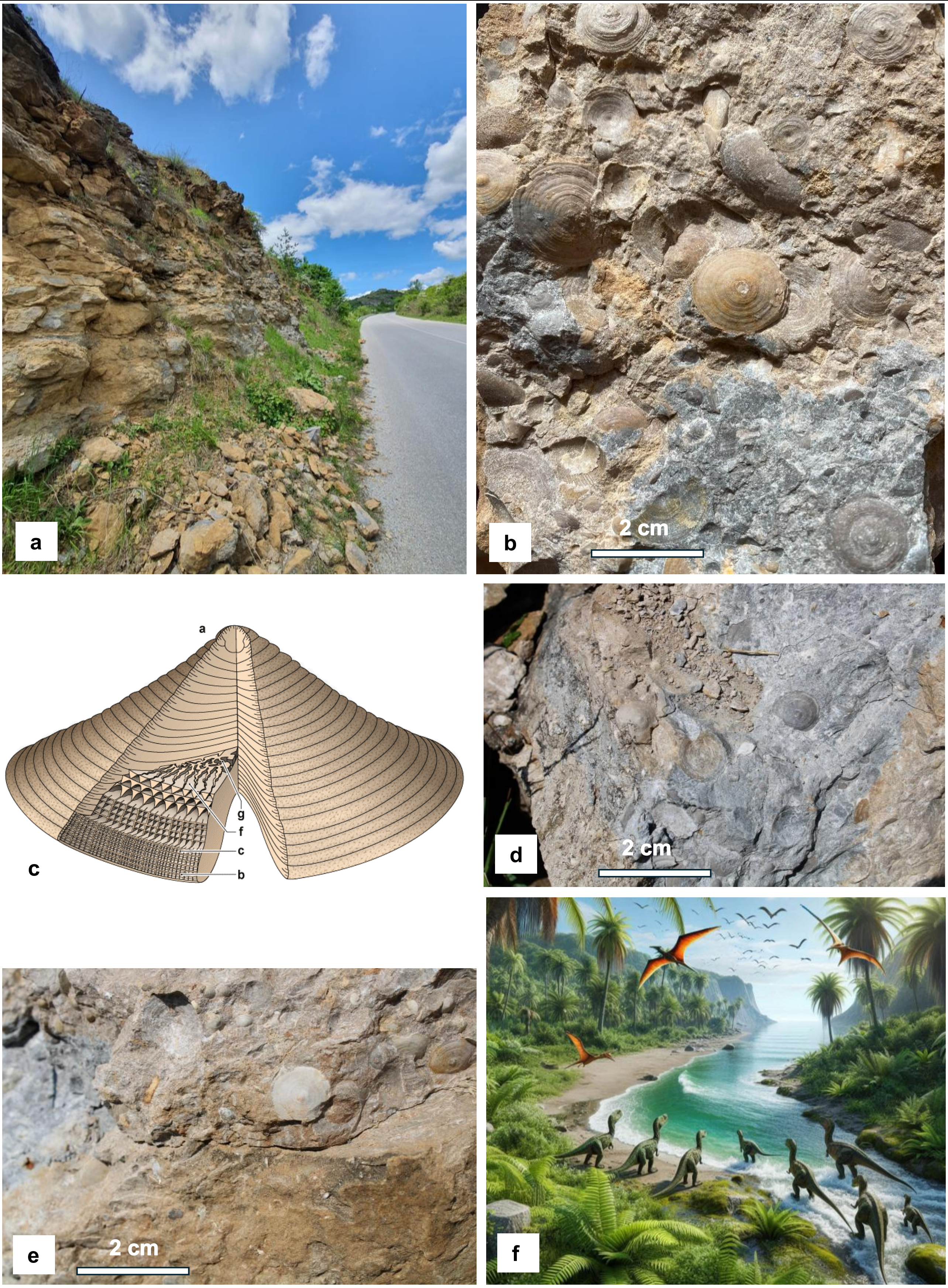


*Fig. 5-2-7: **a,** Geosite „Three winds" near the road to Omurtag town; **b,d,e** Fossilized shells of Orbitolina concava Lamarck, 1816 in Cenomanian sandstones at the locality "Three winds"; **c,** Cross section of the shell of Genus Orbitolina (after Mathieu et al. 2011): apex (a), axial (b) and radial (c) peripheral partitions, continuation of the radial partitions (f) in toller and wave shaped lamellae; inner zone (g) where the radial partitions are joined; **f,** Nearshore environment in the Tethys Sea during the Cenomanian age in the East Balkan region.*

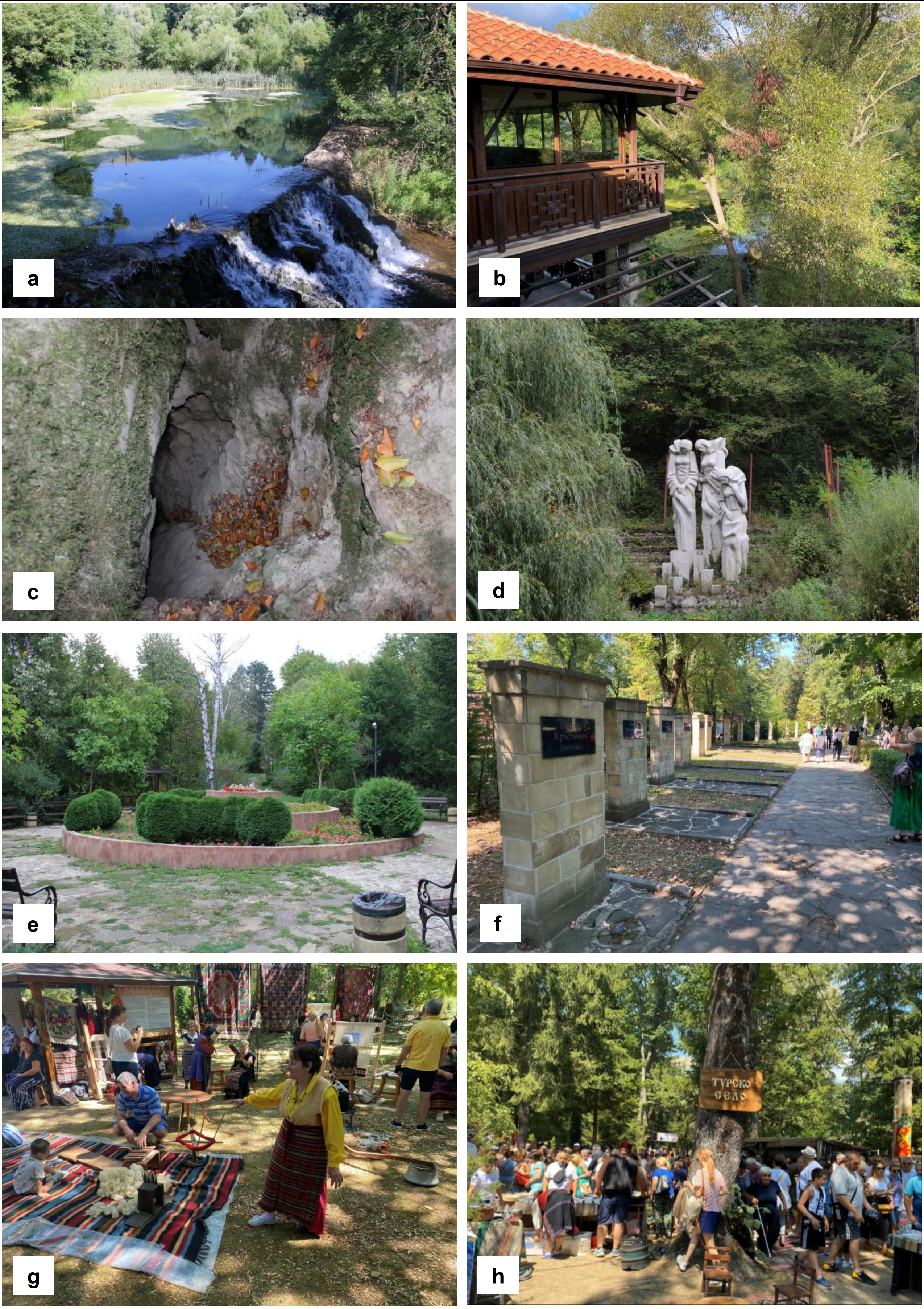

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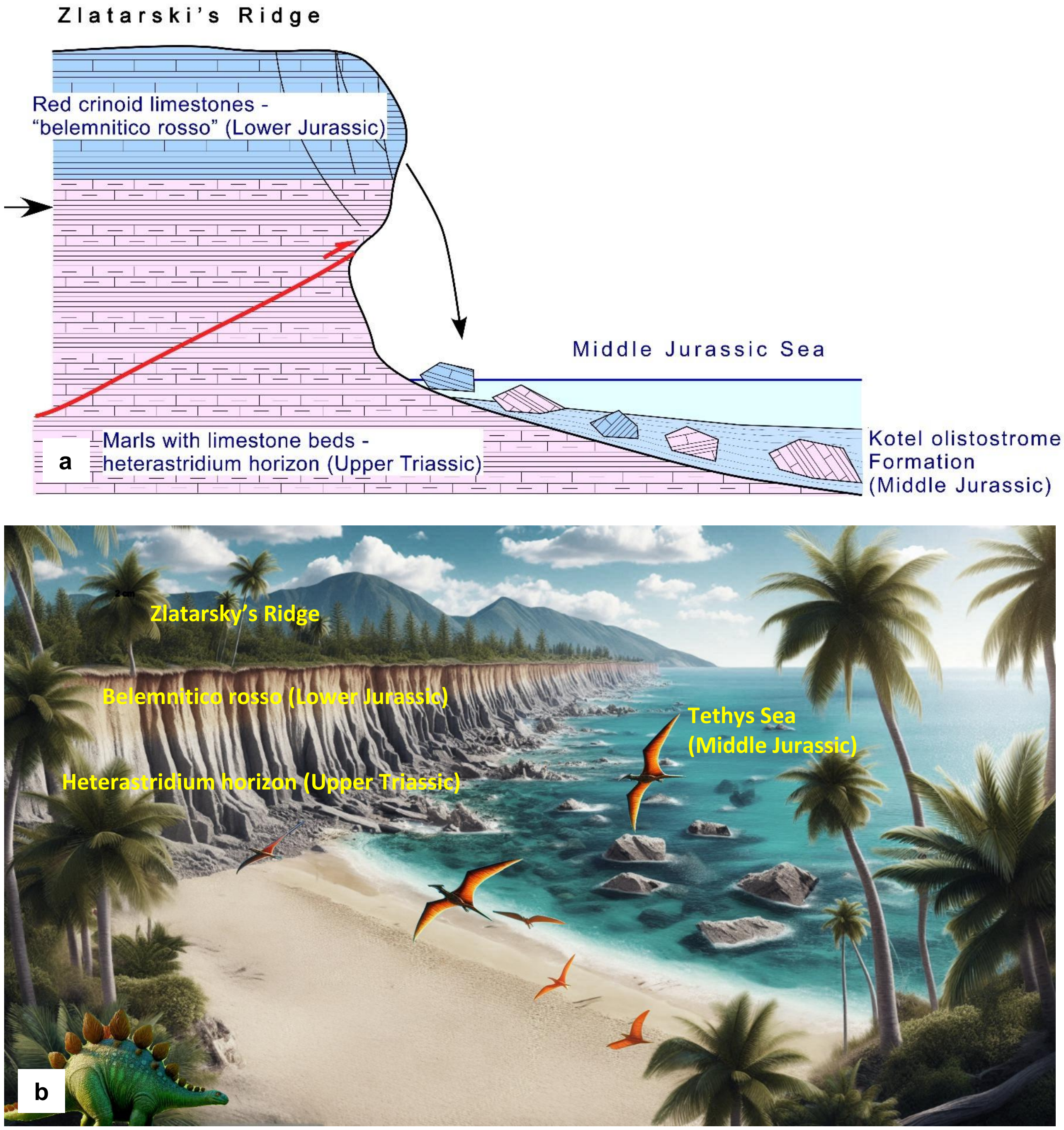
Fig. 5-2-8: a,b *Karst springs – "Izvorite"; **c,** "Izvorite" cave - the entrance to the inner lake; **d,e,** "Izvorite" Park; **f,** Alley of the Revivalists; **g-j,** The Festival of Ethnicities, Colors and the Kotel Carpet: g-Bulgarian village; h-Turkish village; i-Gypsy katun; j-Karakachan village; **k**-Natural History Museum; **l**, The Springs from the top.*

Every summer at the end of July, the Festival of Ethnicities, Bagras and the Kotel Carpet takes place here, where the four main ethnic groups in the town demonstrate their customs and costumes: Bulgarians (Fig. 5-2-8g), Turks (Fig. 5-2-8h), Gypsies (Fig. 5-2-8i) and Karakachans (Fig. 5-2-8j). This place also houses one of the largest natural history museums in the country with over 30,000 prepared specimens of the local flora and fauna, which also exhibited a rich collection of rocks and fossils illustrating the geological structure of the area (Fig. 5-2-8k). The park is the starting point of several eco-trails to the nearest natural attractions around the town: Orlova Skala and the caves "Prikazna", "Orlovata Cave", "Bilernik" and "Malak Bilernik". Geotop "The Springs" (Fig. 5-2-8l) is of local importance, but as a natural landmark emblematic of Kotel town, it should be evaluated as an important element in the overall concept of "East Balkan" Geopark reflecting the main theme of the Geopark – the impressive karst landscape determining the diverse geological structure of the Kotel Balkan.

5.2.9. „Belemnitico rosso" is a Lower Jurassic facies in the East Balkan represented by red limestones with brachiopods, crinoids and belemnites, which occur as olistoliths among the shales of the Kotel Olistostrome Formation. Tchoumatchenko (1988) was the first to draw an analogy between the abundance of belemnites in these limestones with the abundance of ammonites in the world-famous Tethyan "ammonitico rosso" facies: *"They contain many belemnites, which can serve as a diagnostic marker for this type of sediments, as ammonites for the facies "ammonitic rosso".* For the designation of this remarkable facies, Dian Vangelov (Синьовски & Вангелов, 2022) proposed the term "belemnitico rosso".

Toula (1890) was the first to describe these rocks in the Garnyovitsa area. The mixture of Triassic, Jurassic and Cretaceous rocks in the area has for many years puzzled geologists, who explained it with intensive tectonic movements. It was only in the middle of the last century that Kanchev (Енчева & Кънчев, 1962) indicated fossil landslides as the cause of the rock melange. The huge blocks of older rocks have been excavated from the steep southern coast of the Middle Jurassic Sea called "Zlatarski's Ridge" (Чумаченко & Чернявска, 1989) (Fig. 5-2-9a). It was built of Upper Triassic "heterastridium horizon" and Lower Jurassic "Belemnitico rosso" horizon (Fig. 5-2-9b). The host Middle Jurassic turbidites were united by Начев et al. (1967) into the Kotel Olistostrome Formation of Aalenian-Bathonian age (Чумаченко & Чернявска, 1989), and the red limestones are dated as Liasic (Late Sinemourian-Late Pliensbachian Tchoumatchenko, 1988). The last author describes several olistoliths in the localities of Garnyovitsa, Cherkovishte and Buykov dol, from which he collected over 150 fossil belemnites, brachiopods and crinoids, handed over under the current project for storage in the Museum of Natural History of the town of Kotel.

The outcrops of these rocks are fossil deposits of belemnites (Fig. 5-2-9c-e), brachiopods (Figs. 5-2-9f,g), crinoids (Fig. 5-2-9h), and even ammonites (Fig. 5-2-9i) with high scientific and educational value. In previous works, the red rocks are defined as limestones or marls, but a large part of them are calcareous sandstones (calcarenites) and were used as building slabs in the past (Figs. 5-2-9j,k).



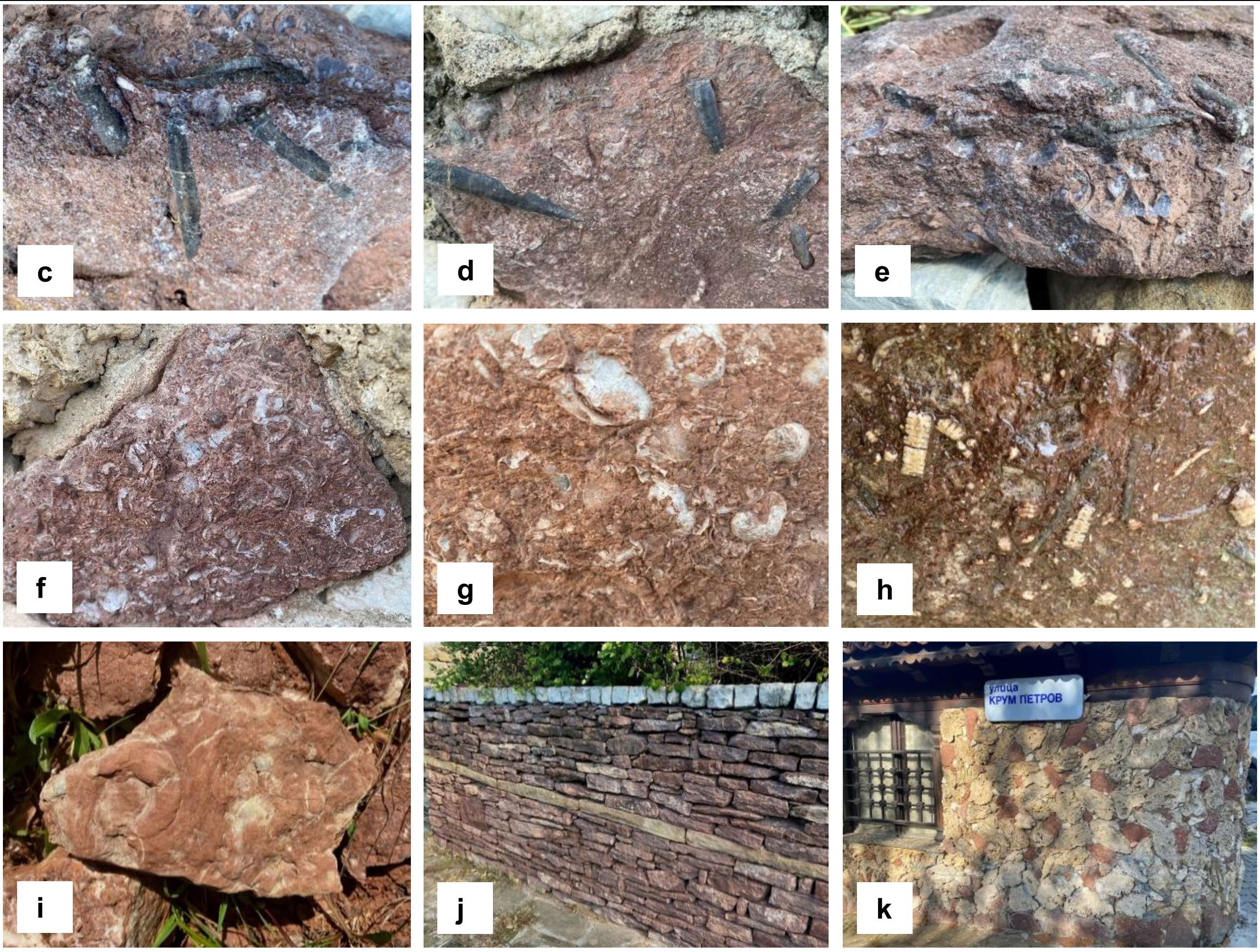


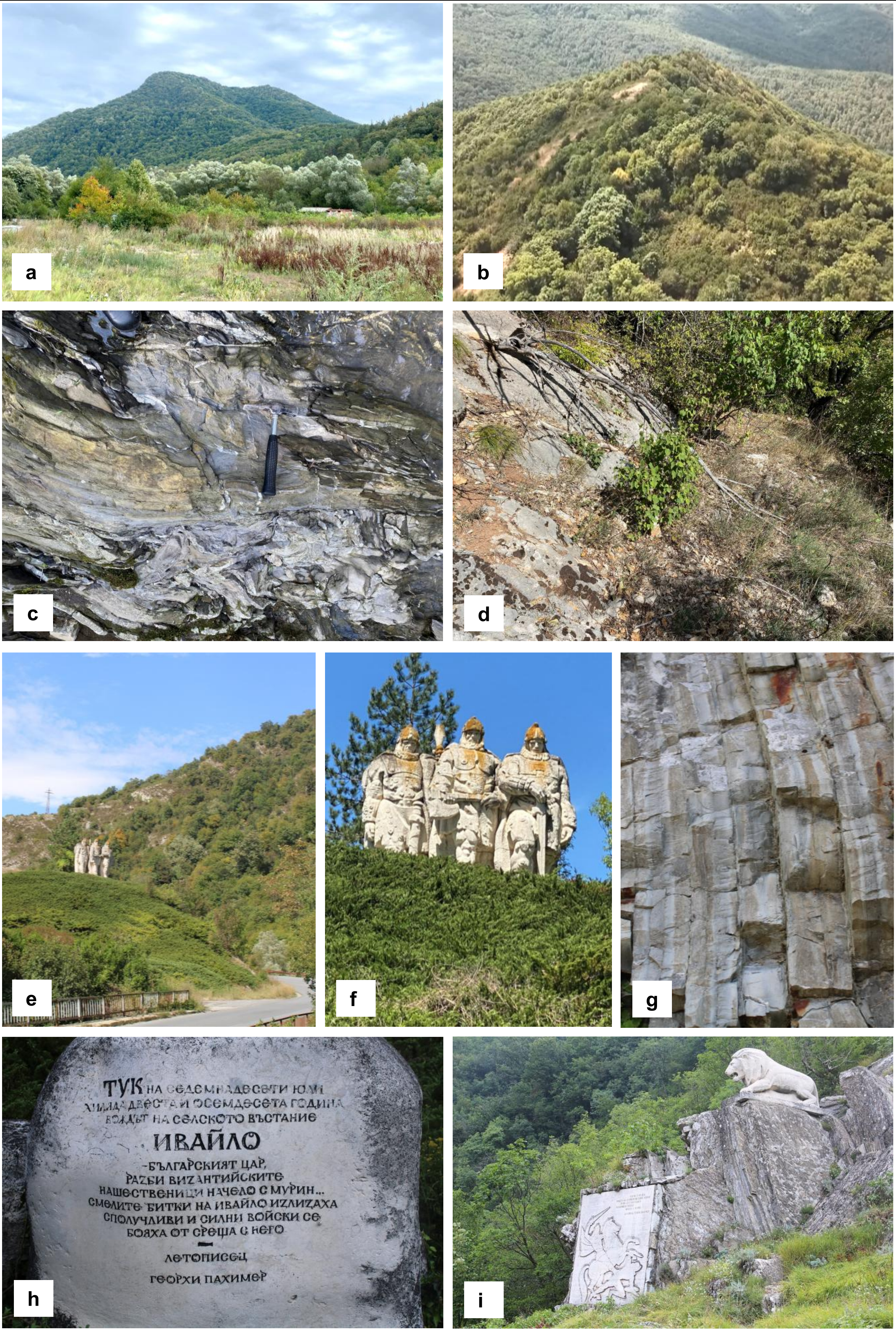
Fig. 5-2-9: a-b *Paleoenvironment in the Kotel Balkan during the Middle Jurassic: blocks of Upper Triassic (Heterastridium horizon) and Lower Jurassic ("belemnitico rosso") rocks fall along a sloping fault into the sea;* ***c-e,*** *"Belemnitico rosso" with belemnite rostra;* ***f-g****, "Belemnitico rosso" - brachiopod limestone built into the walls of some houses in Kotel;* ***h****, "Belemnitico rosso" -crinoid limestone;* ***i,*** *"Belemnitico rosso" with an ammonite mould;* ***j,*** *Massive wall made of fence blocks of "belemnitico rosso";* ***k,*** *Wall with decorative elements of "belemnitico rosso".*

Along with the Cenomanian sandstones, which are the source for building stones for the two medieval churches "St. St. Peter and Pavel" and "St. Trinity", these limestones are the most used building material for walls and fences in the town.

"Belemnitico rosso" represents a perfect, easily distinguishable bio-lithostratigraphic facies. The close analogy with the internationally established "ammonitico rosso" facies makes it promising for adoption by geological professionals. Its discoveries in the area of the town of Kotel have a huge interpretive potential and through Geopark the new term can also gain international fame. At a certain point, the roles may be reversed and the term, which has already gained popularity in scientific circles, may function as a means of globally promoting Geopark where it was first described.

5.2.10. Demirkapiya-Vida-Korenik complex is a set of geomorphological, ecological and historical sites included in the Register of Protected Territories and Protected Areas in Bulgaria. The narrowest part of the Kotel Pass known as "Demirkapia" or "Iron Gate", located 4.5 km southeast of the town of Kotel on the road to the Thrace highway. To the west of it rises the Vida height with the "Diavena" fortress, and to the south is the "Korenik" protected area.

In geological terms, the earliest data on the area belong to Toula (1890), who described the rocks in the *"rocky Demir Kapu gorge"* as light gray, dense calcareous marls, called by Ст. Бончев (1927) *"Vetrila marls"*.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ВОДАЧЪТ НА СЕЛСКОТО ВЪСТАНИЕ
ИВАЙЛО
-БЪЛГАРСКИЯТ ЦАР,
РАЗБИ ВИЗАНТИЙСКИТЕ
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СМЕЛИТЕ БИТКИ НА ИВАЙЛО ИЗЛИЗАХА
СПОЛУЧЛИВИ И СИЛНИ ВОЙСКИ СЕ
БОЯХА ОТ СРЕЩА С НЕГО
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***Fig. 5-2-10: a,b** – Vida Peak with the "Diavena" fortress is a naturally inaccessible elevation, which during the Middle Ages served as protection from Byzantine invasions; **c,** Exposure of Triassic limestone on the right bank of the Kotlenska River in the "Korenik" area; **d,** The old Roman road through the Korenik area in the Vetrila limestone on the southern slope of Vida; **e,** Demirkapia Pass ("Iron Gate"); **f,** The Stone Guard of Ivaylo's Warriors; **g,** Vertical layers of the limestones of the Vetrila Formation; **h,i,** Memory of the battle in 1279, when Ivaylo's warriors defeated a 10,000 strong Byzantine army led by the general Murin.*

Later these limestones were united in the Vetrila Formation, whose rank was pointed by Паскалев (1983). A more detailed literature review and description of these rocks is provided in chapter 5.2.5.

The "Vida" mount is a rocky peak among the Vetrila limestones (Figs. 5-2-10a,b), on which ruins of the ancient fortress "Diavena" have been preserved. The site has the status of a protected area with an area of 2.0 ha according to Order No. 311/31.03.2003 of the Ministry of Environment and Water, State Gazette No. 42/2003, code 215 in the Register of Protected Territories and Protected Zones in Bulgaria, category of protected areas.

Along the southern slope of "Vida" lies the "Korenik" area. It is a geotope with scientific and ecological value, class geomorphological - a romantic valley among an ancient beech forest in a Triassic terrain (Fig. 5-2-10c) with olistoliths among the limestones of the Vetrila Formation, where the old Roman road passes (Fig. 5-2-10d). The site has the status of a protected area with an area of 0.1 ha according to Order No. 308/31.03.2003 of the Ministry of Environment and Water, State Gazette No. 42/2003, code 213 in the Register of Protected Territories and Protected Zones in Bulgaria, category of protected areas. In addition to their high ecological value, the Demirkapia Pass, the Vida Peak and the Korenik area, where the old road through the Kotel Pass passed, are natural strategic places with important defensive functions in Antiquity and the Middle Ages.

The narrow rocky gorge "Demirkapia" ("Iron Gate") is a geotope with aesthetic and historical value (Figs. 5-2-10e,f). This is the narrowest part of the Kotel Pass carved by the Kotlenska River in the Vetrila limestones (Fig. 5-2-10g) between the peaks "Vida" (861.4) from the west and "Momina Mogila" (952.3) from the east. It has the status of a protected area with an area of 0.1 ha according to Order No. 311/31.03.2003 of the Ministry of Environment and Waters, State Gazette No. 42/2003, code 215 in the Register of Protected Territories and Protected Zones in Bulgaria, category of protected areas.

Along the northeastern slope of Vida Peak to the riverbed, a late antique and medieval partition wall, built for protection from the north with a thickness of 1.5 m, descends. 50 m west of the road, there are ruins of the wall, in which there was a portal through which a passage regime was carried out. East of the gate there are remains of a semicircular tower, brought out 4 m in front of the front of the wall. East of the tower, ruins of a small building have been preserved. In this part, the wall is 2.5 m thick and is built of flat pieces of limestone of the Vetrila Formation, bonded with red mortar. In addition to its high ecological value, this area has preserved deep traces of the earliest history of the Bulgarian State. According to the Byzantine chronicles of Theophanes the Confessor, the Stara Planina passes in the area played an important role in the military operations between Bulgaria and Byzantium at the beginning of the 9th century. Northwest of "Vida" is the deep Greek (Grushki) Valley, where the Kotel Pass actually passed during the Middle Ages. It is mentioned in the work of Бакалов (1942) as one of the places where, according to tradition, the troops of Khan Krum defeated those of Nikephorus in 811.

The background to this battle relates to the failed punitive campaign of Nikephoros against Bulgaria in 807, in response to which in 809 Krum captured Serdica. In 811, Nikephoros gathered a large elite army and undertook a new campaign against Bulgaria. Krum judged that he could not oppose such an army and offered peace, but according to Theophanes' chronicles, Nikephoros, blinded by his own malice and the suggestions of his advisors, refused. Krum left the capital Pliska and the Byzantines easily captured it, plundering, burning and killing the civilian population. Nikephoros planned to triumphantly pass through Moesia, but his advisors convinced him to return to Constantinople by withdrawing his army through the passes of Stara Planina, as the Byzantines had not yet faced the regular Bulgarian army. At dawn on July 26, 811 Krum's troops surrounded the main forces of the Byzantines in the neighboring Varbitsa Pass, defeated the army and killed the emperor. It is assumed that in "Grushki dol" north of "Vida" another large detachment of the Byzantine army was defeated, and Nikephoros was beheaded in the area of Mira, east of Kotel.

The so-called "Hambarli inscription" testifies to Krum's military exploits, found by the Shkorpil brothers next to the village fountain in the village of Hambarli (Malomirovo, Elhovo region) and transferred to the Varna Archaeological Museum, where it is kept to this day. After a new victory on June 22, 813, in the Battle of Versinikia (Melnitsa village, Elhovo region), Krum conquered Adrianople and all of Thrace, and in July 813 he was already at the gates of Constantinople. A week after the coronation of Leo V the Armenian, Krum made a proposal for peace negotiations, which was accepted by arranging a meeting on the shore of the Golden Horn in front of the walls of Constantinople without guards and without weapons. At the meeting, an assassination attempt was made against Krum and his companions, but he managed to escape. Angered by the Roman treachery, the Bulgarian ruler embarked on a punitive campaign and burned down all the churches, monasteries and fortresses around the Roman capital, the Sea of Marmara and all of Adrianople. He returned to Bulgaria and began preparations for the capture of Constantinople. Unfortunately, on April 13, 814, Krum the Terrible died of a stroke near the village of the Hambarli inscription - Malomirovo, where the military camp of the Bulgarian army was established.

In 1279 in "Demirkapiya" another historical battle for the Bulgarian State took place, the memory of which has been preserved to these days (Figs. 5-2-10d,e). Here Ivaylo's approximately 5 000-strong army defeated an army twice as numerous led by the Byzantine commander Murin, which on its way to the capital Tarnovo besieged the fortress of Diavena with a garrison of no more than 1000 people. After this battle Ivaylo became famous for his cruelty, having killed all the prisoners. Although it may seem cruel, this was the only way out for the Bulgarians, who did not have the opportunity to guard and feed the captured soldiers, who outnumbered the Bulgarian army.

This complex of geotopes is an example of an incredible combination of geological, ecological and cultural-historical heritage: from the complex geological structure, through the exceptionally beautiful natural landscape characteristic of the surroundings of Kotel and Zheravna to some of the most important battles for the defense of the First and Second Bulgarian States. To the east of "Vida", "Demirkapiya" and "Korenik" is the nature reserve "Orlitsa" and the Medve Karst, which include a number of caves listed as natural landmarks in the Register of Protected Territories and Protected Areas in Bulgaria: "Lednitsa", "Maarata", "Malkata Maara", "Tsarevets", "Chernite Izvori", "Medveni Izvori", the waterfall "Sini Vir" and others.

According to the methodology for determining the geoconservation value of geotopes in park environment, the geotopes "Iron Gate" and "Vida" are sites of national historical significance and, together with the "Orlitsa" reserve, the caves and other natural landmarks in the area, are an important element of the overall concept of the "East Balkan" Geopark, reflecting the relationships between geology and the cultural-historical heritage of the area.

6. „Pomorie“ Geopark

6.1. Concept

The idea of creating the "Pomorie" Geopark arose during the geological survey of the Kableshkovo volcano carried out by Venelin Zhelev and Dimitar Sinnyovsky on the day of the 1100th anniversary of the Battle of Acheloi on August 20, 2017. On this date, on Mount Golyama Biberna, from where Tsar Simeon I the Great observed the theater of the battle, the idea was born to create a park-type protected area in which historical, cultural and natural heritage of the Pomorie region will be managed through a holistic concept of protection, education, research and global promotion.

This policy is currently implemented by the Local Initiative Group, whose renovated building is located in the center of the town (Fig. 6-1a). Its qualified staff make efforts to popularize the geodiversity of the territory and to create a database of the geological heritage of the area developing promotional materials for the general public, geological museum in the Pomorie Lake Visitor Center (Fig. 6-1b), etc.

As noted in Chapter Two (Wimbledon et al., 1995) the geology of any region can be represented by individual sites of special interest (geotopes). Unlike the „East Balkan“ Geopark, the „Pomorie“ Geopark has two main themes: the Late Cretaceous volcanism and the Quaternary Sea level fluctuations, that have led to the formation of the Pomorie Lagoon and associated ancient Anchialo’s salt extraction technology – an intangible cultural heritage of the town of Pomorie. The monastery "St. George" (fig. 6-1c) and the unique in Eastern Europe Salt Museum (fig. 6-1d) are emblematic of the town.

Fig. 6-1: a, *The renovated building of the Local Initiative Group;* ***b,*** *The Pomorie Lake Visitor Center, which houses the geological museum;* ***c,*** *"St. George" monastery;* ***d,*** *The Salt Museum.*

Three volcanic centers have been established on the territory of the Geopark: Dabnik, Kableshkovo and Kamenar, whose lavas are widely exposed between the village of Bata and the town of Pomorie. They were formed during the Cretaceous period at the bottom of the Tethys Ocean more than 80 million years ago. Volcanic products have penetrated deeply into the life of the local population: the mineral springs, the panels of the houses, the road surface, the sidewalks, the magnetite sand, the dam of the lake, the piers - everything is from volcanic rocks.

Apart from their practical importance, the Upper Cretaceous volcanics are of exceptional geoheritage value. Here are described two rock types new to science - "bulgarite" and "burgazite" published and confirmed in the petrographic nomenclature by Prof. Ivan Borisov as early as 1965. The first one is named after the village of Bulgarovo, and the second one- after the city of Burgas.

An important part of the geographical diversity of the region are also the old marine terraces, delineating ancient coastlines of the Black Sea basin: the Nymphaean, the Novochernomorian, the Karangatian, the Old Euxinian and the Chaudinian. Historical roots of salt mining and mud treatment in Pomorie embody the inextricable link between the natural and cultural heritage of the region. The Pomorie lagoon is unique in the Balkans with the balneotherapy properties of its salty waters and anaerobic mud deposits. Its formation is related to the Holocene fluctuations of the sea level, which affect not only the local landscape, but also the ancient civilizations that inhabited the Black Sea coast for several millennia.

The Pomorie Lagoon is part of the Burgas Lakes complex. It is a remarkable Ramsar site of international importance as a waterfowl habitat and part of the Via Pontica wild bird migration route between Europe and Africa. More than 250 species of birds reside in the lake, including rare species such as the saber beak *(Recurvirostra avosetta)*, stilt-foot *(Himantopus himantopus)*, maned tern *(Sterna sandvicensis)* and exotic species such as the pink flamingo.

The ancient breakwater of Anhialo, called "Rehata" by the locals, which is now below the modern sea level, is attractive ancient evidence of the rate of subsidence of the seacoast from antiquity to the present day and an extremely relevant example of the connection between human history and geological processes.

Other attractive geotopes are the iridium layer at the Cretaceous/Tertiary boundary, formed by the meteorite impact at the end of the Cretaceous, also known as "the asteroid that killed the dinosaurs", the ginkgo alley in the center of Pomorie, which demonstrates the persistence of the living fossil *Ginkgo biloba* lived over 170 million years, or one of the deepest boreholes in Bulgaria carried out in the area northwest of the village of Kozichino. In the drilling cuttings of this borehole three new to science species of unicellular algae were determined, which are among the first representatives to appear on earth belonging to Order *Coccolithophorida* 215 million years ago.

6.2. Key geotopes

6.2.1. Volcanic rocks are among the most remarkable geological formations in Geopark “Pomorie”. The territory of the Geopark is part of the type area of two Bulgarian rock types - bulgarites and burgazites named after the village of Bulgarovo and the city of Burgas. Therefore, some of the most important geotopes are related to the volcanic terrains, which occupy more than half of the territory of the Pomorie municipality.

Volcanism is a remarkable geological phenomenon occurring permanently in the 4.5 billion years long history of the Earth. It is caused by the movement of igneous magma from the mantle to the Earth's surface, where it erupts through vents in the Earth's crust called volcanoes. In addition to lava, volcanoes also release huge amounts of poisonous gases and ash into the atmosphere (Fig. 6-2-1a). Volcanic lava can be subaerial and underwater. Subaerial lava is ‘aa’, ‘pahoehoe’ and blocky. The ‘aa’ lava (Fig. 6-2-1b) is made up of rough and angular lumps (slags) called clinkers. ‘Pahoehoe’ lava (Fig. 6-2-1c) has a smooth, wavy, or rope-like surface, and blocky lava (Fig. 6-2-1d) is also composed of angular blocks of more viscous lava than the basaltic ‘pahoehoe’ and ‘aa’ that often occur together.

The most attractive underwater lava is the pillow lava, which is basaltic and andesitic in composition. These are spherical "tongues" of lava resembling giant pillows measuring 1-2 m (Fig. 6-2-1e). Upon contact with water, the lava becomes covered with a thick glassy crust (Fig. 6-2-1f) and continues to swell until it ruptures at a specific location called “keel” and a new pillow begins to form (Fig. 6-2-1g,h).


a
b
c
d
e
f
g
h
rounded apex
individual pillow
keel
core
radial cooling fractures
cooled periphery
chilled zone (fine-grained glassy rind)

Fig. 6-2-1: a, *Modern hydrothermal activity, volc. Mutnovsky, Kamchatka;* ***b,*** *"Aa" lavas, Klyuchevsky volc., Kamchatka (photo I. Demyanchuk);* ***c,*** *"Pahoehoe" lavas, Plosky Tolbachik volc., Kamchatka;* ***d,*** *Blocky lavas, Mutnovsky volc., Kamchatka;* ***e,f,*** *Bulgarite pillow lavas, Trachyte quarry, Bata village;* ***g,h,*** *Photo and sketch with pillow lavas terminology, Trachyte Quarry, Bata Village;* ***i,*** *Bulgarite pillow lavas on burgasite tuffs in Kamenar quarry;* ***j,k,*** *Radial jointing in trachyandesites, Kamenar quarry;* ***l,*** *Lapilly tuff, Kamenar quarry.*

Bulgarites are composed of potassium-alkaline lava with abnormally high contents of alkaline oxides and aluminum, which makes them unique not only for Bulgaria, but also in the world petrographic nomenclature. They were described and published by Prof. Иван Борисов (1965). On the territory of the municipality of Pomorie, exceptionally well-preserved and accessible for observation bulgarite pillow lavas are exposed in the quarries near the village of Bata (fig. 6-2-1e-g) and Kamenar quarter (fig. 6-2-1i). They were formed at the bottom of the Tethys Ocean during the Late Cretaceous about 80 million years ago. In these lava flows, characteristic radial and vertical jointing is observed (Fig. 6-2-1j,k). Psammite, lapilli and bomb tuffs are predominant among the burgazite flows (Fig. 6-2-1l).

6.2.2. Pomorie Lake is part of the Burgas Lakes complex, which consists of three estuaries (limans) - Mandra, Burgas and Atanasovsko lakes and the Pomorie lagoon, located near the coast between the town of Pomorie and the town of Acheloi. It is 6 km long, 1.6 km wide in the middle and 1.6 m deep. Unlike limans, which are submerged estuaries connected to the sea, a lagoon has no natural connection to the sea. However, seawater seeps through the sandbar and replenishes the lake, which evaporates more intensively than the sea. Therefore, the salinity of the lagoon is higher and reaches 60 ppm in the summer. This feature is a prerequisite for the birth of ancient Anchialo's technology for salt extraction by evaporation, which is an intangible cultural heritage of the town of Pomorie. The black bituminous mud formed at the bottom by algae has healing properties that have been known for centuries.

The Pomorie Lagoon is a double tombolo. Tombolo is a term used to refer to a spit of sand connecting a coastal island to the mainland. Since Pomorie island is connected to the mainland by two sandbars, the lagoon bounded by them is defined as a double tombolo. It is difficult to say exactly when it was formed, but it certainly happened after the Novochernomorian transgression (Федоров, 1956), when the sea level was 4 m above the present sea level, and the Old Town was a small island of Neogene limestone. About 3000 years ago, it began to fall and Pomorie island expanded its area with the drainage of the Novochernomorian terrace, located 4 m above the modern sea level, on which the town of Pomorie is situated. The island is rapidly connected to the mainland to the west by a sand tombolo (Fig. 6-2-2a).

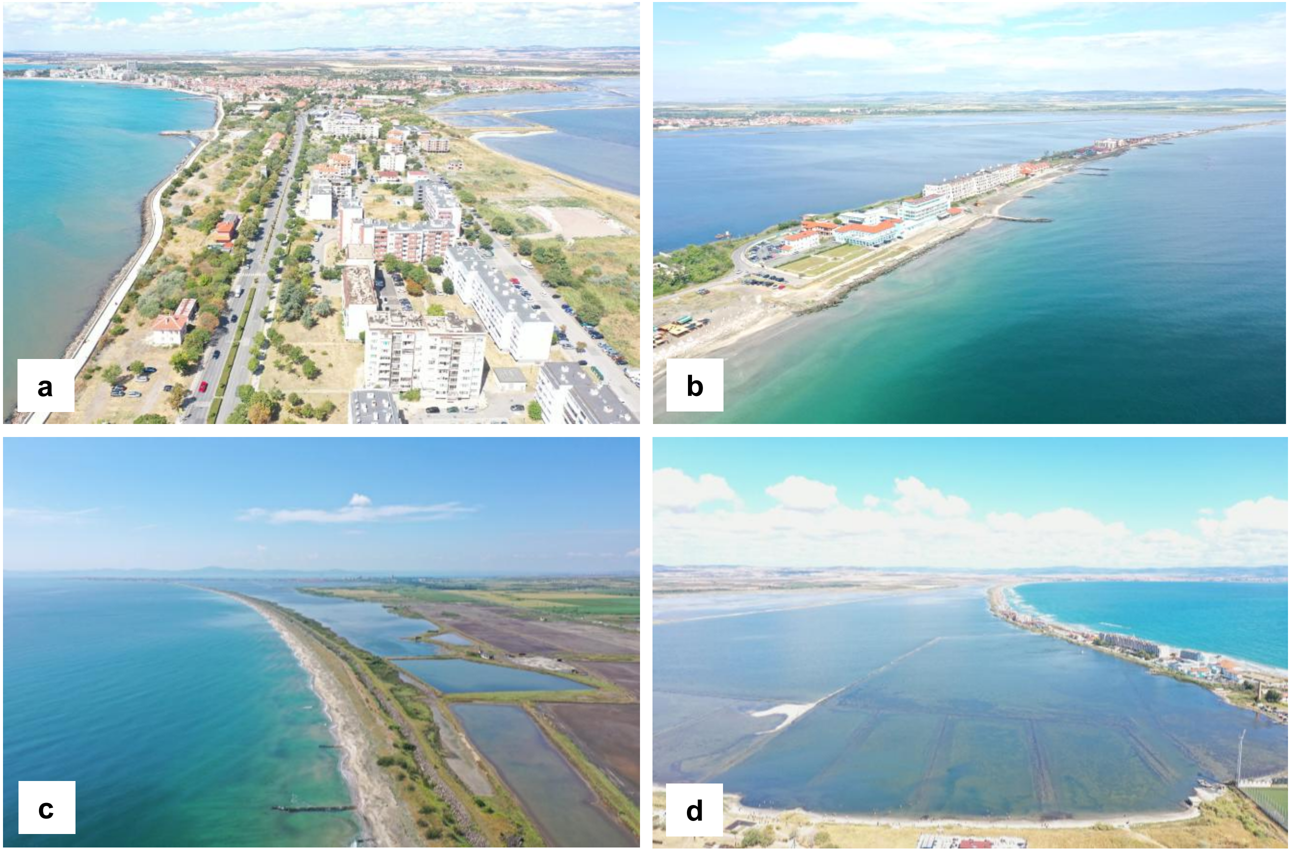


Fig. 6-2-2: a, *The southern tombolo, connecting the old town with the "St. George" quarter;* ***b,*** *The Northern tombolo is the is 6 km long sandbar between the lake and the sea;* ***c,*** *The northern end of the Pomorie Lagoon, where the northern sand tombolo reaches land almost to the mouth of the Acheloi River;* ***d,*** *Pomorie Lagoon.*

Another sand tombolo is formed to the north (Fig. 6-2-2b) connecting land south of the mouth of the Acheloi River (Fig. 6-2-2c). Thus, two sandbars form a double tombolo, cutting off the bay behind Pomorie Island from the open sea and turning it into a small lagoon (Fig. 6-2-2d).

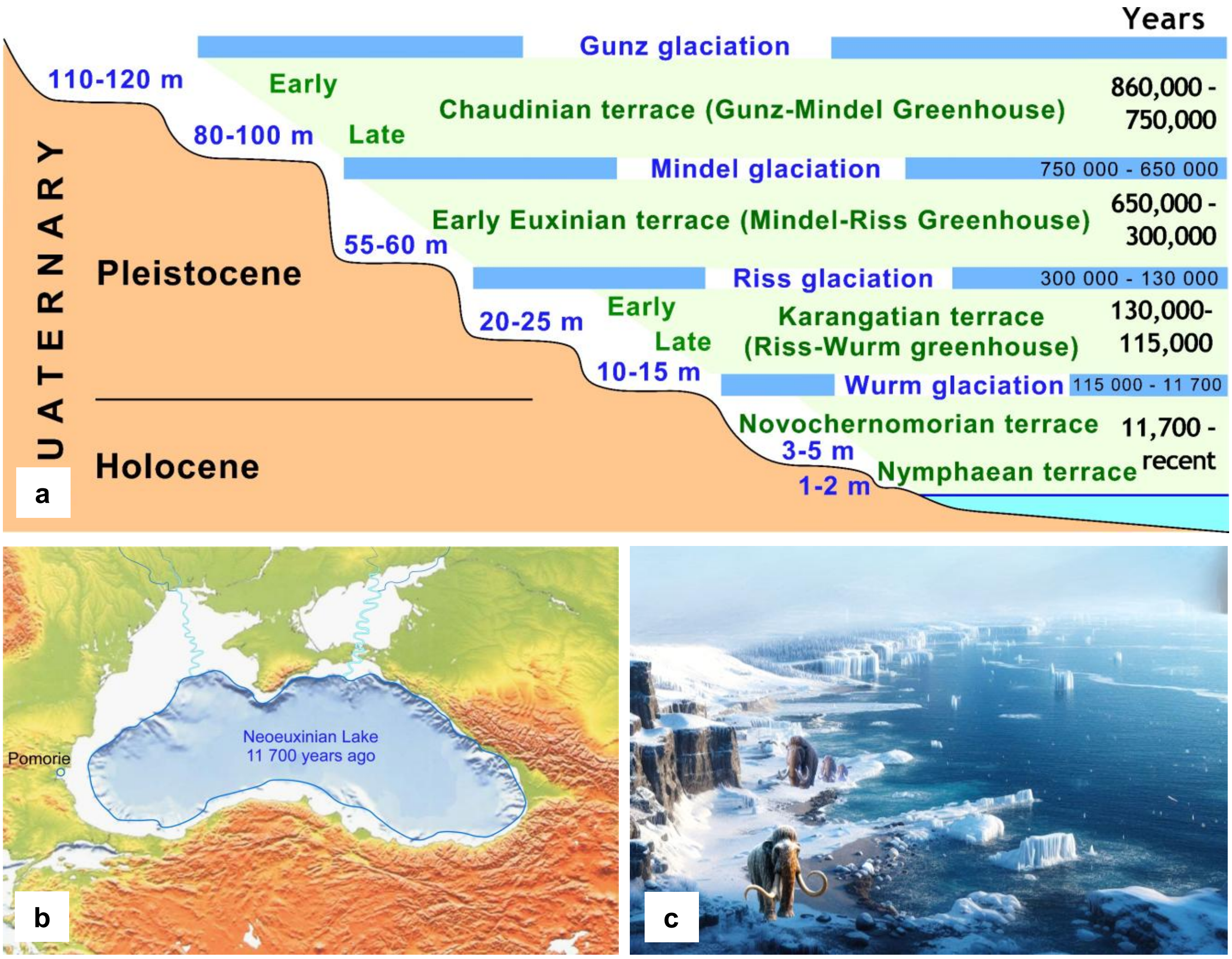
6.2.3. Marine terraces are formed when the sea level remains constant for a longer period (tens of thousands of years), and the sea exerts the coast to continuous abrasion. They are excellent indicators of the level of the Global Ocean through the geological past and showing its high and low levels. Their formation is directly related to the glacial and interglacial ages. During the Ice Ages, sea level is low as water accumulates at the poles in the form of ice caps. Conversely, during interglacial periods, glaciers melt and global sea level rises.

The cyclic freezing and melting of the polar ice caps cause changes in global sea level on the order of tens and hundreds of meters. The terraces formed at high sea levels during the interglacial periods are above the modern sea level, and those formed during the ice ages at low sea levels are below the modern sea level. They are erosional and accumulative. In erosional terraces, marine abrasion "cuts" the bedrock and forms extensive flat surfaces around the coast. Accumulative terraces are also flat surfaces, but they are built of loose sediments, usually in low-lying areas of the seashore – bays, lagoons and estuaries.

Cyclic fluctuations of the global sea-level are due to periodic changes in the parameters of the Earth's orbit, which repeat every 20,000 (precession cycles), 40,000 (ecliptic cycles) and 100,000 (eccentricity cycles) years. They were proved mathematically by the Serbian geophysicist Milutin Milankovitch (Milanković, 1941). Later, the 400,000 years cycles were added to the frequency band of Milankovitch, which, like the 100,000 cycles, are due to a change in the eccentricity of the earth's orbit.

During the Quaternary, four ice ages are known: Günz, Mindel, Ries, and Würm (Fig. 6-2-3a), the last of which ended 11,700 years ago. Then began the modern interglacial age, coinciding with the last geological epoch - the Holocene. During the Würm Ice Age, the Black Sea was a fresh-water basin - Neoeuxinian Lake fed by fresh water from the ice sheet around the North Pole, which reached as far south as Poland and Ukraine. Then the Pomorie area was tens of kilometers from the coastline (Fig. 6-2-3b), since the sea level of the Black Sea and Mediterranean Sea was 90-100 meters below its present level, and Bosphorus was a land isthmus between Asia and the Balkan Peninsula, through which representatives of *Homo sapiens* migrated to Europe and mixed with the indigenous inhabitants of Europe, the Neanderthals *Homo neanderthalensis*. At that time, a low-level marine terrace formed (Fig. 6-2-3c,d), which is below sea level today, and north in Scandinavia, glaciers flowing into the ocean formed fjords (Fig. 6-2-3e).

As the ice sheet around the North Pole began to melt, the Black Sea Basin began to fill with fresh water and flow through the Bosphorus into the Mediterranean Sea, which in turn is filled with ocean water via Gibraltar. Thus, an exchange of fresh and salt water was established through the Bosphorus, which continues to this day. About 8000 years ago the modern sea level was reached, and 6000 years ago it rose to 4-5 meters above it and the Old Town remained an island. Then, during the Novochernomorian transgression (Федоров, 1956), the Novochernomorian terrace was formed, on which the modern town of Pomorie is located. Even further back in time during the Riss-Würm Interglacial, 115-130 thousand years ago, the entire peninsula was underwater, as the sea level was 12 meters above the present sea level in tropical climate (Fig. 6-2-3f). Then the Late Karangatian terrace was formed, on which the Old Town of Pomorie is located.



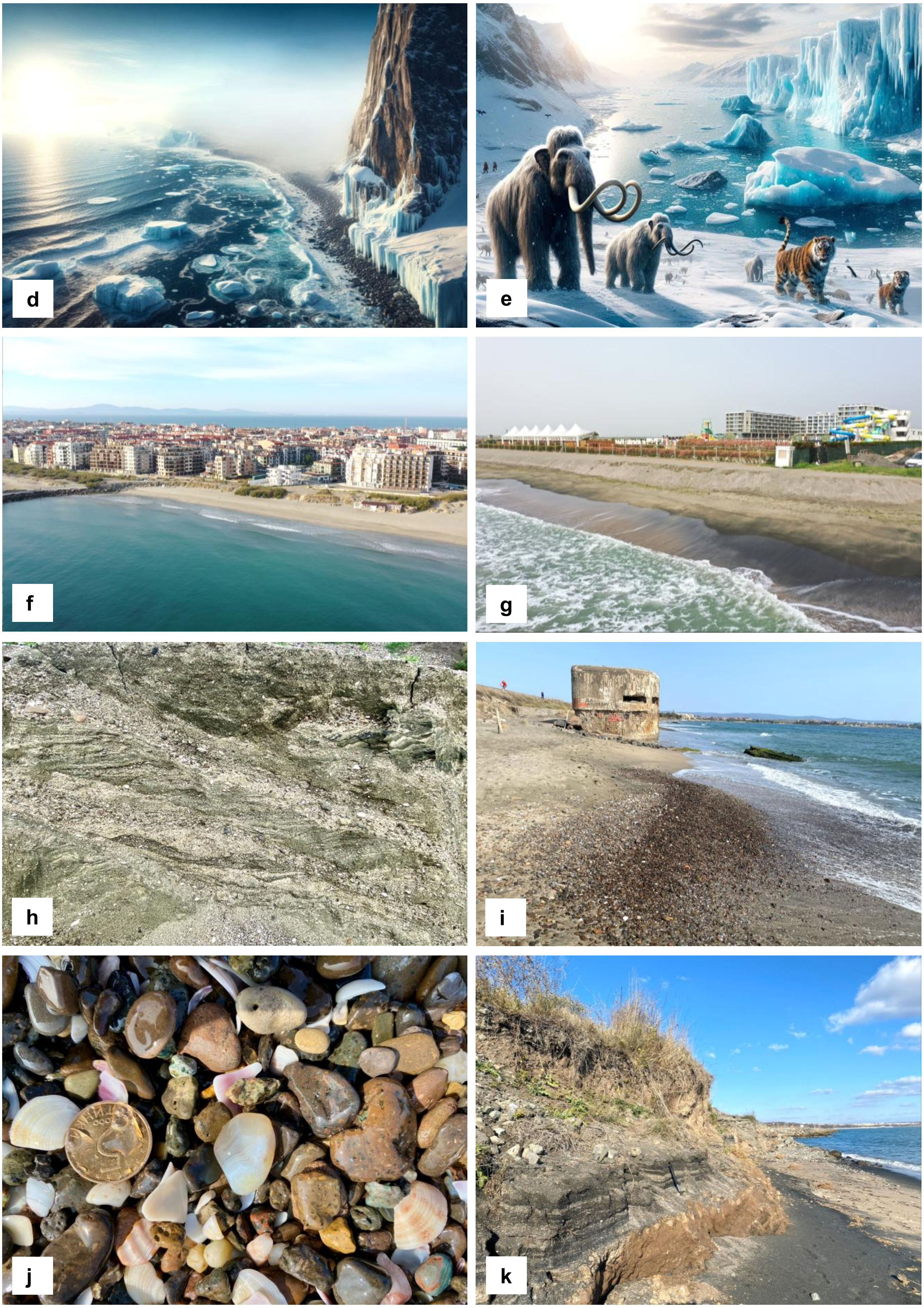


Fig. 6-2-3: a, *Scheme of the Quaternary glacial and interglacial ages;* ***b,*** *Area of the Neoeuxinian Basin at the end of the Würm Ice Age 11700 years ago;* ***c,d*** *Low sea level terrace formation during the Würm Ice Age;* ***e,*** *Fjord formation during*

*the Würm Ice Age; **f,** Novochernomorian terrace on which Pomorie town is situated; **g,** Accumulative Novochernomorian terrace at the old mouth of Acheloi River in front of Wave Resort; **h,** Alternation of layers with parallel lamination and storm layers among the sands of the Novochernomorian terrace; **i,** Polygenic gravel redeposited in the modern beach from the Novochernomorian terrace; **j,** Rounded particles of trachyandesites, quartz, magnetite, jasper, and even naturally polished agates transported by Acheloi River from the volcanic terrains through which it flows; **k,** Accumulative Nymphaean terrace south of Sarafovo quarter – magnetite beach sand 2 m above the modern sea level.*

The only place where deposits of an accumulative Novochernomorian terrace are exposed is the old mouth of the Acheloi River, where during the Novochernomorian transgression magnetite sands were accumulated to a height of up to 4 m above modern sea level (Fig. 6-2-3g). In these deposits alternation of layers with parallel lamination and storm layers with randomly arranged larger fragments and shells are available (Fig. 6-2-3h) with a predominance of materials from the volcanic terrains through which the river flows: trachyandesites, quartz, magnetite, jaspers and even naturally polished agates. Since they are not cemented, they are reworked in modern beach sands (Fig. 6-2-3i,j).

Within the Geopark, an accumulative Nymphaean terrace is preserved at "Europe" campsite, south of Pomorie, and on the beach south of Sarafovo quarter (Fig. 6-2-3k), where 2 m above modern sea level, beach magnetite sands deposited during the high sea level in the Middle Ages are preserved. The terrace is also preserved along the western shore of the Pomorie Lagoon, where it is overgrown with reeds. It is associated with global warming after AD, which lasted until the 14th century. Then the so-called "Mini Ice Age" began, which lasted until the middle of the 19th century.

6.2.4. Old Mouth of Acheloi River existed 4-5000 years ago at the time of the Novochernomorian transgression, when the sea level was 4 m above the modern one. The riverbed is parallel to the seacoast, and its mouth was 1 km south of the present one. It is well-preserved and can be traced to the accumulative Novochernomorian terrace formed by the sediments of the river (Fig. 6-2-4a,b).

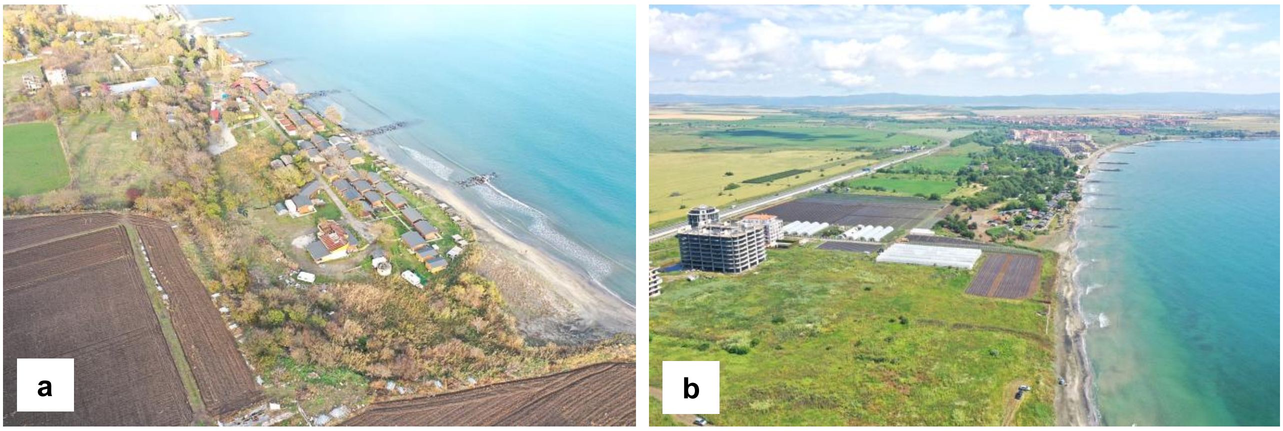


***Fig. 6-2-4: a,** The old riverbed of Acheloi River - the forest strip between the farmland and the campsite "Anastasia"; **b,** The Novochernomorian terrace south of Acheloi.*

This geotope, in addition to its scientific value, also has high cultural and historical value. The Acheloi River is an emblematic place on the map of Bulgaria, and August 20, 917 is one of the sacred dates in Bulgarian history. Then in this place the troops of Tsar Simeon I the Great defeated the Byzantine army, and he proclaimed himself Vasilevs of Bulgarians and Romans.

The Acheloi battle remains in history as the apotheosis of the Golden Age, during which the Bulgarians acquired writing and religion, and the Bulgarian state was established as a medieval empire. In addition to the historical facts about the Acheloi battle, the medieval sources also contain indirect data about the geological setting at that time. They state that during the retreat of the Byzantines to Mesembria, many of them perished in the marshes around the Acheloi River. This means that the level of the Black Sea was at least 2 m above the present level and is probably the only documented written confirmation of the Nymphaean transgression in the Middle Ages.

6.2.5. Golyama Biberna Peak north of the town of Kableshkovo is also a geotope with scientific and cultural-historical value (fig. 6-2-5a). It is located in the northern periphery of the caldera of the Kableshkovo volcano (Fig. 6-2-5b) and unites several small quarries with outcrops of nepheline trachyte (Fig. 6-2-6c,d). According to historical sources, from this place Tzar Simeon I the Great observed the theater of the Acheloi Battle on August 20, 917. Exactly 1100 years later, on August 20, 2017, during the geological survey of the Kableshkovo volcano conducted by Venelin Zhelev and Dimitar Sinnyovsky, the idea was born to create a protected park-type area in which historical, cultural and natural heritage will be managed within a holistic concept of protection, education, scientific research and global promotion.

Based on the features of the lava rocks and geophysical structures with increased density in depth, Желев (in Желев & Синьовски, 2024) defines two new paleovolcano centers - Kableshkovo and Kamenar. The "Golyama Biberna" geotope is located in the highest northeastern periphery of the caldera of the newly nominated Kableshkovo volcanic center.

The nepheline trachytes forming Golyama Biberna peak are part of the lava rocks of the Draganovo Formation, a product of the Kableshkovo paleovolcano. They cut through lapilli and bomb tuffs of the Medovo Formation with pieces of burgazites, as well as silty-psammitic and lapilli tuffs, cut by quartz-carbonate veins, which are exposed on the southern slope of the peak. From the elevation, a wonderful view opens to the west-northwest towards Sivribair - the northern periphery of the caldera of the Kableshkovo volcano (Fig. 2-5b).

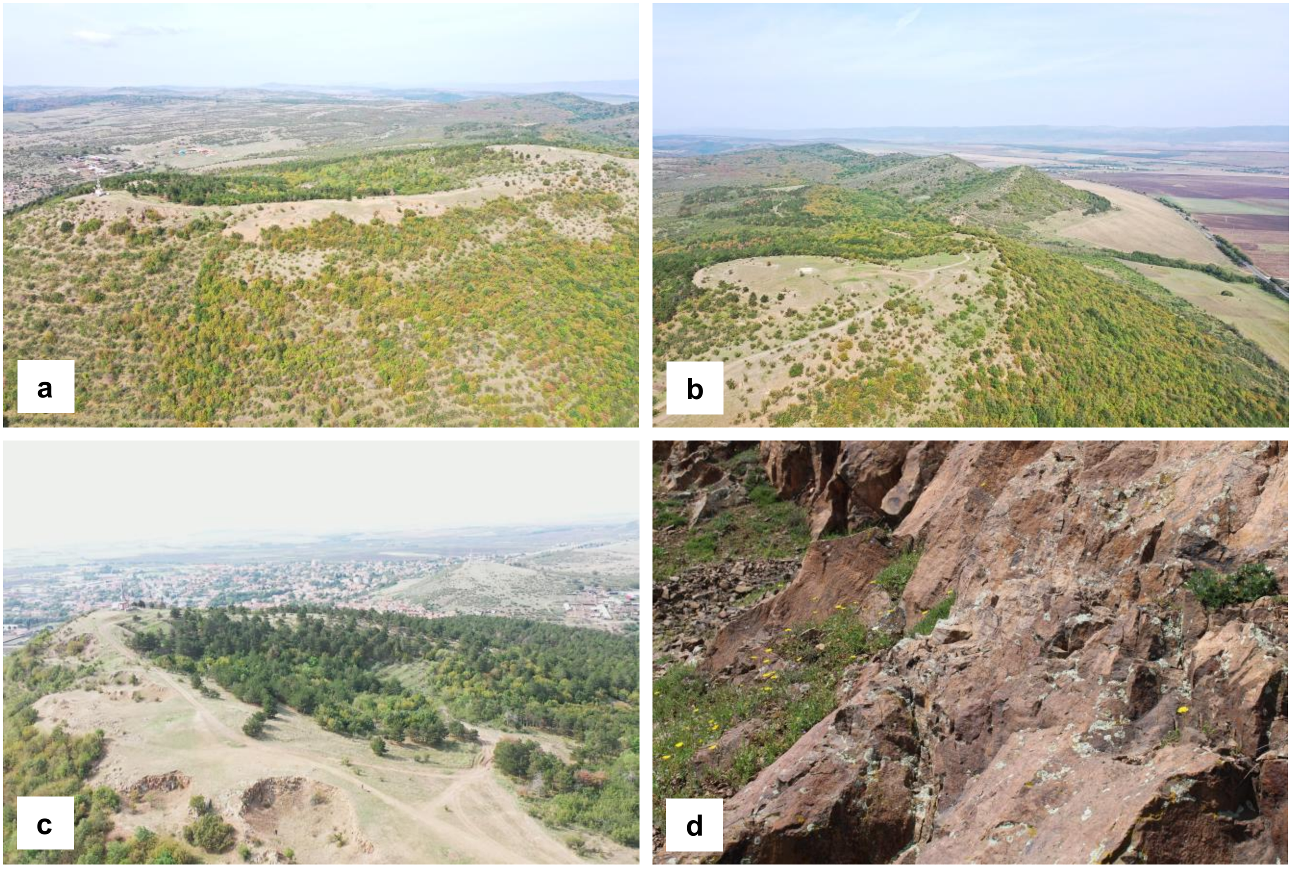


Fig. 6-2-5: a, *View from the north towards the caldera of the Kableshkovo volcano and the Golyama Biberna peak, from where Tzar Simeon I the Great watched the theater of the Acheloi Battle on August 20, 917;* ***b,*** *Sivribair ridge - the northern caldera rim;* ***c,*** *The small quarries in the nepheline trachyte on the ridge of Golyama Biberna peak, north of Kableshkovo;* ***d,*** *Outcrop of nepheline trachyte in a quarry on the Golyama Biberna peak.*

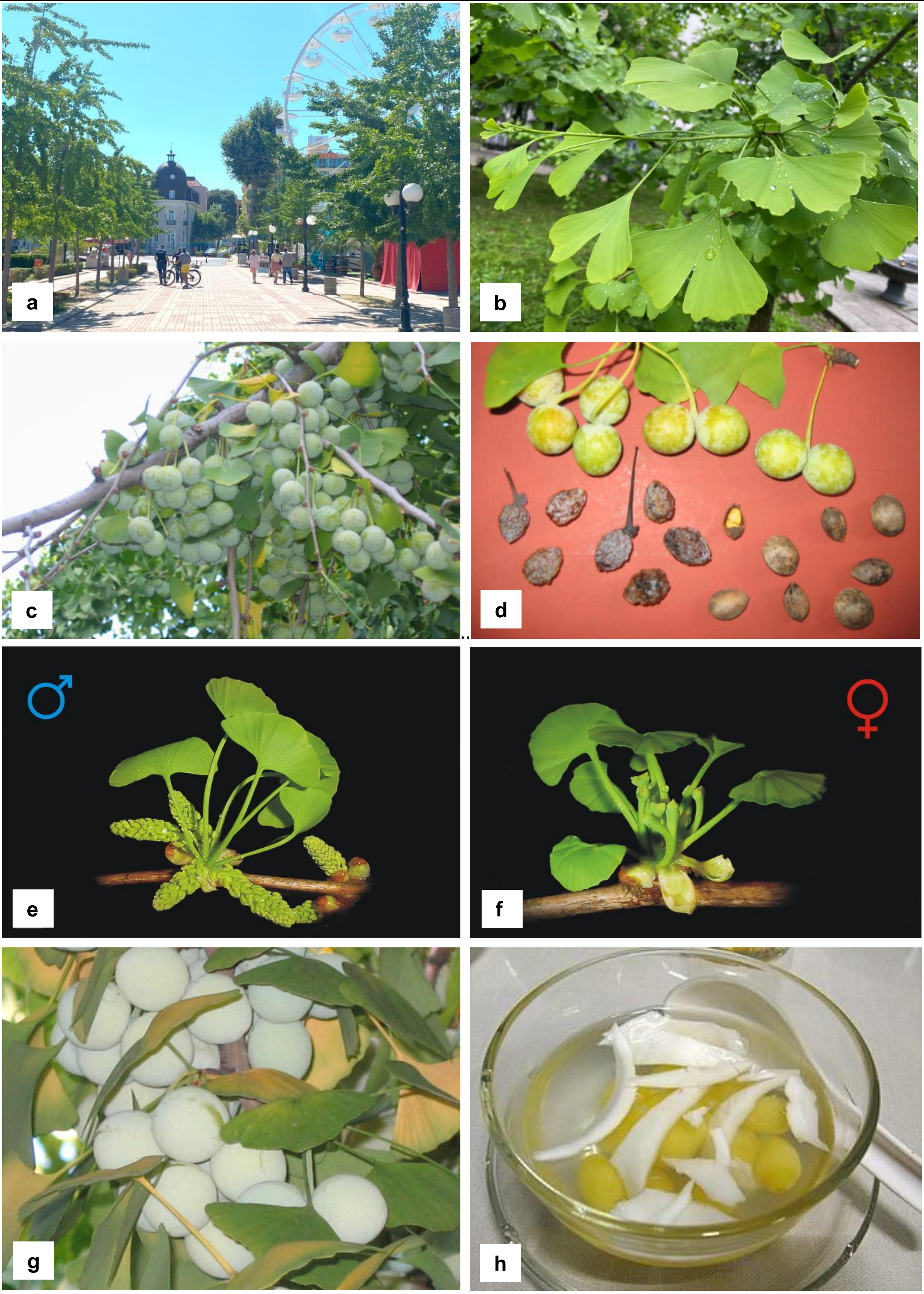


Fig. 6-2-6: a, *Ginkgo Alley in the center of Pomorie;* ***b,*** *The forked leaf petiole of Ginkgo biloba;* ***c,d,*** *Seeds two per stalk;* ***e,*** *Male cones with sporophylls;* ***f,*** *female seed buds;* ***g,*** *The seeds and leaves are used medicinally, and the "nuts" have a hazelnut's flavor;* ***h,*** *Thai ginkgo and coconut dessert.*

6.2.6. The alley of Ginkgo in the center of the town of Pomorie (fig. 6-2-6a) is a unique opportunity to demonstrate one of the most interesting trees on earth, which appeared more than 170 million years ago. *Ginkgo biloba* is a modern tree species recognized as a living fossil. Living fossils are taxa that resemble related species known only as fossils. In evolutionary biology, living fossils are considered species that meet criteria such as a long range compared to similar forms, slow evolutionary changes, similarity to a fossil ancestor, low taxonomic diversity compared to the past, etc. (Lidgard & Love, 2021). It is the last of the Order *Ginkgoales* that appeared 300 million years ago during the Permian period of the Paleozoic.

Fossil leaves of the species are known from the Middle Jurassic. It was described by the famous Swedish biologist Carl Linnaeus in 1771. The specific epithet biloba (bi-lobus) comes from the Latin "two-lobed", because of the shape of the leaves (Fig. 6-2-6b), but more likely refers to the "fruits“, which are always two on one stalk (Fig. 6-2-6c,d). Ginkgo biloba is a deciduous dioecious plant. Male trees form small cones with sporophylls, with two microsporangia each (Fig. 6-2-6e). Females produce two ovules (Figs. 6-2-6f) which, after wind pollination, develop into fruit-like seeds whose fleshy casing decomposes with a vomit-like odor to repel seedeaters. This invention turns out to be an evolutionary failure compared to the tasty fruits of flowering plants, which attract animals to disperse their seeds.

This is probably also the reason for its disappearance in the wild at the end of the Holocene. However, it has provided it with exceptional geological resistance from the Jurassic to the present day, which no forest tree possesses. It was widespread in the Northern Hemisphere, but by the end of the Cenozoic it was restricted to East Asia. Due to its medicinal properties, it was cultivated in the gardens of ancient Chinese emperors, and thanks to its long-life cycle of 1500-2000, it was preserved until the Middle Ages, when people planted it on other continents. Thus, *Ginkgo biloba* remains for now the only proven species saved for nature by man. *Ginkgo biloba* seeds and leaves (Fig. 6-2-6g) have been used in traditional Chinese medicine since ancient times. The nuts are also edible with taste like hazelnuts. Gingko dishes are served on special occasions such as Chinese New Year. They are also used as a delicacy in Asian cuisine (Fig. 6-2-6h). Ginkgo's incredible history has inspired extensive research into its iconic role as a geographic relic, with countless fossil analyses, morphological and molecular studies.

6.2.7. Cretaceous/Tertiary boundary near the village of Kozichino is a geotope associated with a global event: a thin iridium layer formed during the great cosmic disaster at the end of the Mesozoic era. Then the Earth was hit by a space body known as the "Chicxulub meteorite" or "the meteorite that killed the dinosaurs". Near the village of Kozichino, the iridium layer was discovered in 2002 under the project of the Ministry of Environment and Waters to compile a Register and Cadastre of geological phenomena in Bulgaria.

At the end of the Cretaceous period of the Mesozoic Era, 65 million years ago, a giant meteorite approached Earth at 40,000 miles per hour (Fig. 6-2-7a). It passes through the atmosphere and, heated to melting, hit the Earth's surface near the Yucatan Peninsula (Fig. 6-2-7b), causing the greatest catastrophe in the history of the planet. The meteorite disappeared within seconds into the Earth's crust, and immediately after the impact a cloud of heated dust, ash, and steam erupted back out of the crater, rising into the stratosphere (Fig. 6-2-7c). Then a rain of molten rock (tektites) started to fall from the sky, causing global fires. A giant shock wave caused by the impact spread across the Earth's surface (Fig. 6-2-7d), and a powerful megatsunami penetrated hundreds of kilometers inland (Fig. 6-2-7e).

Confirmation of this story occurred in the late 1970s, when the American geophysicist Glenn Penfield discovered a large ancient crater next to the Yucatan Peninsula with a diameter of 180 km. Astrophysicists suggested that the diameter of an asteroid that caused such a crater was at least 10 km. At first glance, that's not much for a space body, but placed next to the Himalayas it would be higher than Everest. Nobel Laureate Luis Alvarez suggested that this is the crater of the meteorite that hit the earth at the end of the Cretaceous. Alvarez et al. (1980) discovered a thin layer at the Cretaceous-Tertiary boundary with a high content of iridium, which is very rare in the Earth's crust but occurs in meteorites.

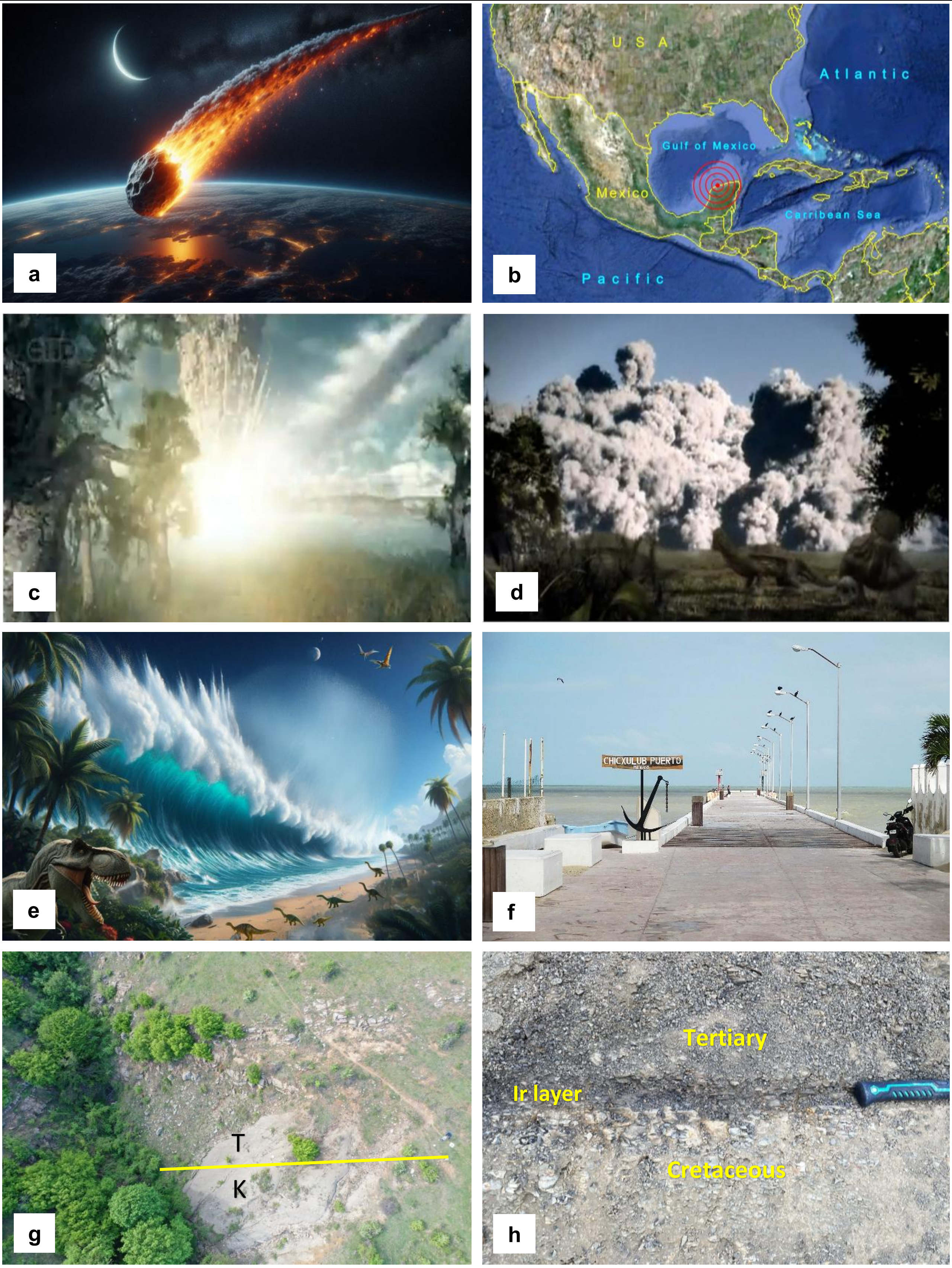


Fig. 6-2-7: a, *At the end of the Cretaceous period, 65 million years ago, a giant meteorite entered the Earth's atmosphere and landed in the Gulf of Mexico;* ***b,*** *The place of the meteorite landing near Yucatan peninsula in Mexico;* ***c,*** *After the impact, a cloud of superheated dust, ash, and steam erupted back from the crater, rising into the stratosphere;* ***d,*** *The impact caused a giant shock wave that spread across the globe;* ***e,*** *A powerful megatsunami penetrated hundreds of kilometers inland;* ***f,*** *Chicxulub town in Mexico;* ***g,*** *Location of the geotope south of Kozichino village;* ***h,*** *Close-up of the iridium layer.*

Thus, science unraveled the cause of the mass extinction at the end of the Cretaceous, when entire groups of organisms such as dinosaurs, pterosaurs, marine reptiles, ammonites, belemnites and many unicellular animals disappeared forever from the face of the earth, and the meteorite was named after the small Mexican town of Chicxulub, where landed 65 million years ago (Fig. 6-2-7f). The explosion in the collision exceeds 10,000 times the potential of all modern nuclear weapons. The vast amount of dusty material that envelops the entire globe blocked out the sun for years. This led to a change in climate and photosynthetic regime, affecting over 90% of unicellular planktonic flora and fauna, 60% of angiosperms and many groups of echinoids, corals, thermophilic mollusks and primitive mammals. The most vulnerable were unicellular golden algae (coccoliths) and foraminifera, which are at the beginning of the food chain. Ultimately, this global ash fallout formed a thin, dark iridium-rich layer on the ocean floor. The content of iridium in the earth's crust is negligible, since the iridium and its similar elements are concentrated in the earth's core.

However, iridium is present in normal amounts in meteorites. Its presence in the Cretaceous/Tertiary boundary layer proves the cosmic origin of this catastrophe. Microscopic coccoliths, whose great change coincides with the Cretaceous/Tertiary boundary, are a perfect tool to establish the iridium layer under a microscope with centimeter accuracy.

Besides iridium, the boundary layer contains other evidence of the event: shock quartz, microtektites and rare minerals. Shock quartz is often found in rocks around meteorite craters. It is so called because the high pressure of the impact causes its crystal structure to deform along the crystallographic surfaces within the crystal. Microscopic quartz particles spread along with the dust cloud across the globe and are deposited on the bottom of the seas and oceans in the boundary iridium layer. It contains also microtektites - molten microscopic glass spherules distributed worldwide with the cloud of heated dust particles ejected into the stratosphere after the impact and iridium-rich micrometeorites accompanying the main meteorite body.

The section in which the iridium layer was found on the territory of Geopark “Pomorie” is located SW of the village of Kozichino among fine-grained turbidites of the Emine Flysch Formation (Fig. 6-2-7g,h). It is 4 cm thick and well distinguishable from the underlying marl. The host rock is a dark, low-carbonate, coccolith-poor marl.

The abrupt change in the nannofossil composition occurs at the base of this layer, when the explosion has already taken place and the sedimentation of the ash material from the giant cloud enveloping the entire globe has already begun. In the iridium layer and above it, rare redeposited Cretaceous species are encountered, as well as the first representatives of the Paleogene nannofossils *Cyclagelosphaera alta* Perch-Nielsen and *Biantholithus sparsus* Bramlette & Martini. This interval is characterized by the predominant presence of *Thoracosphaera operculata* Bramlette & Martini, which survived the great catastrophe and occupied the ecological niche vacated by the Cretaceous species. Other survivors such as *Markalius inversus* (Deflandre in Deflandre & Fert) Bramlette & Martini and *Cyclagelosphaera reinhardtii* (Perch-Nielsen) Romein are also found.

6.2.8. R-1 Golitsa Borehole. In 2007, a British company drilled the deepest borehole in Bulgaria at that time, just 7 km northwest of the village of Kozichino, the technical implementation of which was carried out by an international team (Fig. 6-2-8-1a-d). The borehole penetrated Paleogene, Cretaceous and Jurassic rocks, which are repeated in the section due to their overthrusting along the surface of "Wonderful Walls" dislocation. Beneath the Jurassic rocks, the drilling penetrated almost the entire Triassic System with a top depth of 4,600 m in red Lower Triassic conglomerates and sandstones belonging to the famous continental Buntsandstein facies.

The lithological column of the R-1 Golitsa borehole (Fig. 6-2-8-2) was made by Yavor Stefanov and dated using calcareous nannofossils by Dimitar Sinnyovsky based on mud samples every 10 m from 0 to 3400 m and every 5 m to the maximum depth of 4600 m.

Fig. 6-2-8-1: a, *The Romanian drilling rig of „Dafora" Company;* ***b,*** *Vehicle with geophysical equipment of Schlumberger;* ***c,*** *Bulgarian-Polish team for determining lithology and geological age of the rocks;* ***d,*** *The Italian team's electronic equipment for determining the depth of the drilling head.*

Calcareous nannofossils are fragments of unicellular golden algae called Coccolithophores that exist from Late Triassic to present. In the Upper Triassic interval composed of limestones and marls belonging to the Omurtag Formation, five species of calcareous nannofossils are determined (Fig. 6-2-8-3a-h) including one new combination *Obluquipithonella wombatensis* (Brallower et al., 1991) Sinnyovsky 2016 (Fig. 6-2-8-3c), and three new to science, which are among the first algae of this order to appear on earth: *Obliquipithonella balcanica* Sinnyovsky 2016 (Fig. 6-2-8-3d), *Obliquipithonella oviformis* Sinnyovsky 2016 (Fig. 6-2-8-3e,f) and *Polycostella triassica* Sinnyovsky 2016 (Fig. 6-2-8-3g,h).

They are published in the international WEB directory Nannotax (https://www.ucl.ac.uk/earth-sciences/research/micropalaeontology/ research/nannotax) which is a prestigious reference book on the biodiversity and taxonomy of coccolithophores in which all new taxa of Order *Coccolithophoridae* are published. The discovery of new species among the first representatives of these photosynthetic unicellular organisms, which appeared in the Triassic seas about 230 million years ago, is extremely important for science, as they are at the beginning of the food chain.

Coccolithophores inhabit the upper 50 m (photic zone) of ocean water. After completing their life cycle of several weeks, they settle down and form calcareous mud, which, when consolidated, turns into chalk. This is a soft, porous variety of limestone, made up mainly of small calcite plates (coccoliths) measuring 5-10 µm, which cover the cells of the coccolithophores. They leave deep traces in the post-Triassic history of the Earth.

During the Late Cretaceous, between 90 and 65 million years ago, a major transgression took place on vast territories of the continents in the northern hemisphere, which led to a significant increase in the platform seas, and they gained an unprecedented flourishing. In the territory of Northern Europe, during the Late Cretaceous, a thick sequence of chalk was formed, which is also widespread in North Bulgaria.

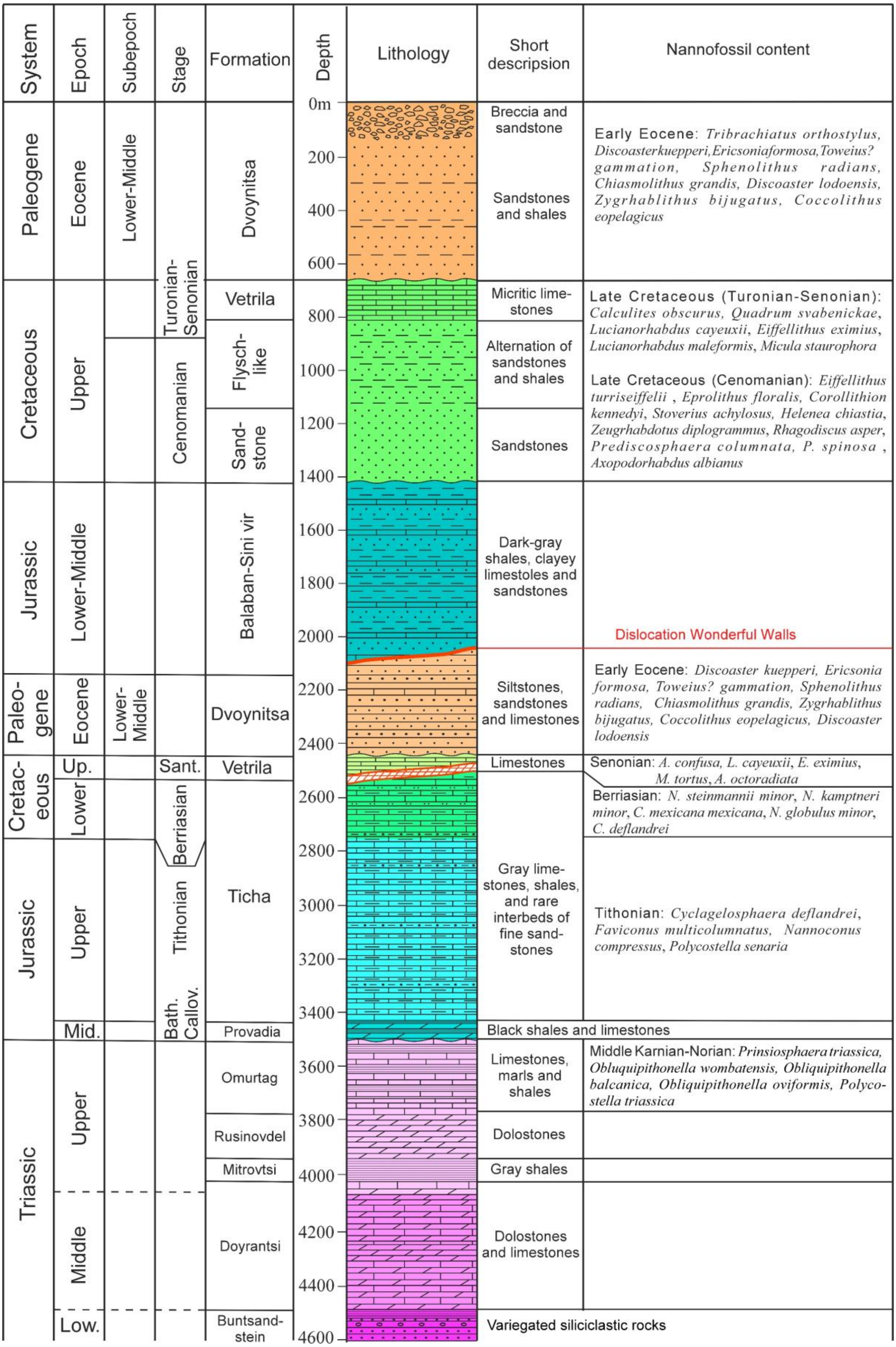


***Fig. 6-2-8-2**. Section of the penetrated interval of 4600 m in R-1 Golitsa borehole in the East Balkan, samples of which are stored in the geological museum of the Pomorie Lake Visitor Center in the town of Pomorie.*

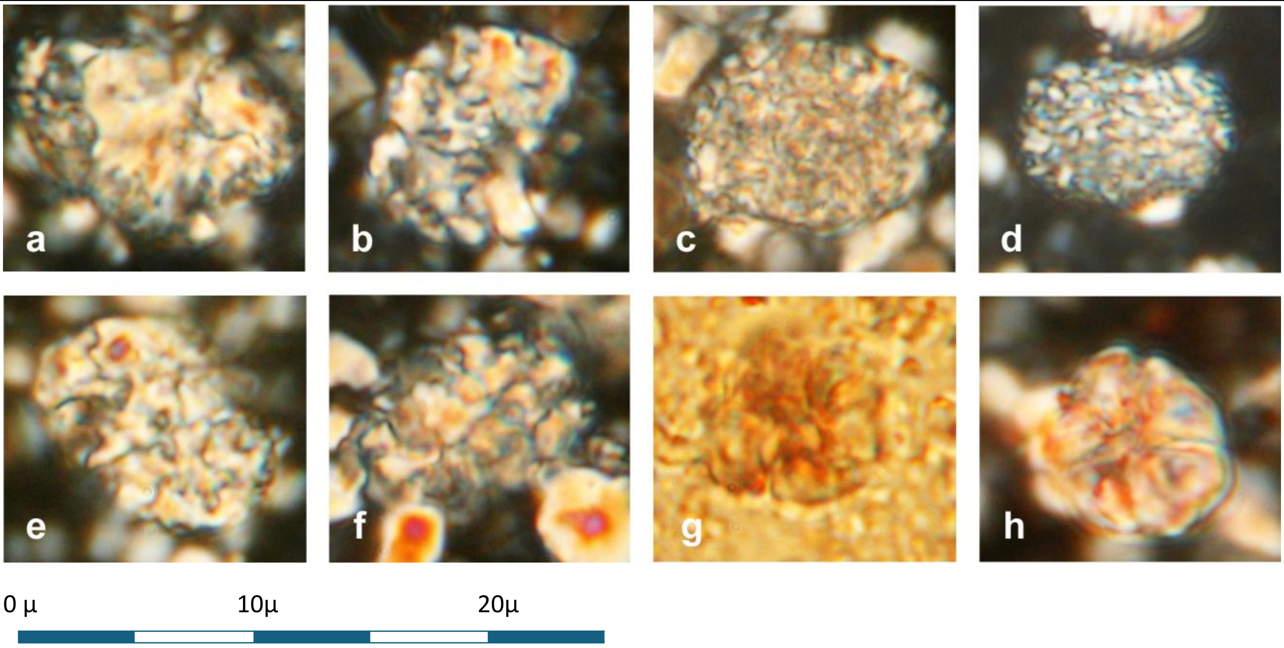


Fig. 6-2-8-3. *Microphotographs of the Late Triassic nannofossils identified in the Omurtag Formation (Magnification x1250).*
a,b *Prinsiosphaera triassica Jafar, 1983, X-nicols; a-3645 m, b-3495 m.*
c, *Obluquipithonella wombatensis (Brallower et al., 1991) Sinnyovsky 2016, X-nicols, 3580 m.*
d, *Obliquipithonella balcanica Sinnyovsky 2016, X-nicols, 3520 m.*
e,f *Obliquipithonella oviformis Sinnyovsky 2016, X-nicols, e-3495 m; f-3655 m.*
g,h *Polycostella triassica Sinnyovsky 2016, g, normal light; h, X-nicols, 3495 m.*

The first representatives of these unicellular algae in the Late Triassic are very rare and their preservation in a fossil state is an unusual phenomenon. Due to their older age, Triassic rocks have a higher degree of lithification than younger Jurassic and Cretaceous rocks, which is why Triassic chalk is rather rare. Triassic limestones recrystallize, and microscopic nannofossils fuse with the micrite matrix of the rock, so their identification is a real stroke of luck. Due to the conserving role of the clay component, marls are most favorable for preserving these microscopic remains.

During the lithification of the rocks of the Omurtag Formation, there were obviously suitable conditions for the preservation of some of the first coccoliths on the planet, and after 220 million years we found them at a depth of 3600 m in the state in which they settled down at the bottom of the Triassic Sea. Rock samples from the entire borehole interval (Fig. 18i) are stored in the geological museum in Pomorie Lake Visitor Center in "Pomorie" Geopark, including the samples in which the new Upper Triassic nannofossil species are determined.

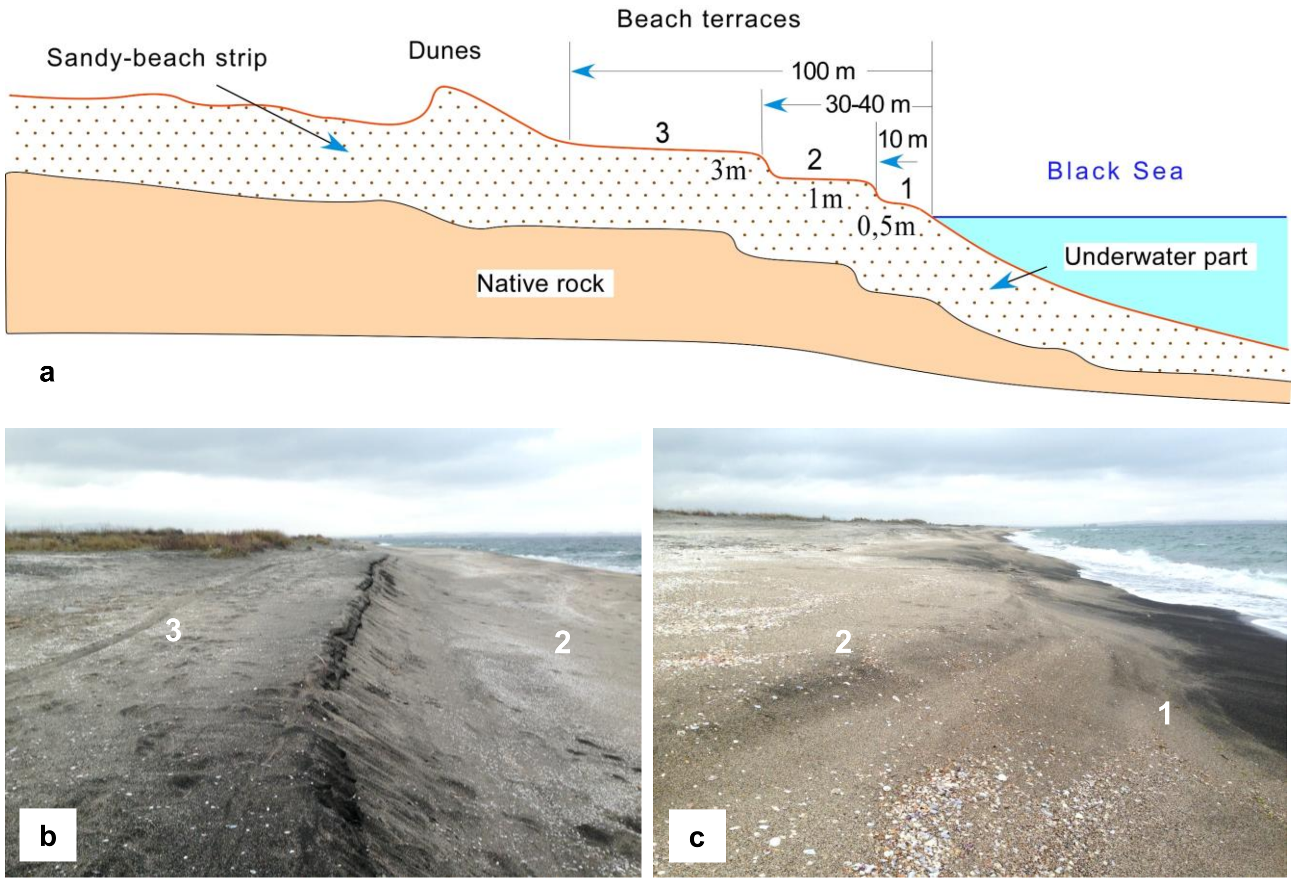
6.2.9. Beach terraces and dunes. The sandy-beach strip is the most widespread accumulation form along the Black Sea coast, which is modeled by wave activity. It consists of an underwater and an above-water part. The destructive activity of sea waves continuously generates sand made up of fragments of bedrock and crushed shells of marine mollusks, which makes the beach an inexhaustible source of sand. The underwater part covers the sand deposits at a depth of up to 10-15 m - the lower limit of the active surf, where the surf waves originate. The surface part is also formed by these waves, which sometimes penetrate hundreds of meters inland. It covers the sands from the coastline to the maximum range of storm waves in the direction of land.

Based on their many years of observations in the coastal part of the sandy beach strip, Попов & Мишев (1974) distinguished three clearly distinct beach terraces (Fig. 6-2-9a), which are also noticeable on the sandy bar between Pomorie Lake and the sea (Fig. 6-2-9b,c). To varying degrees, they are expressed almost all year round: a low beach terrace (1) with a height of up to 0.5 m above sea level, formed during weak waves (Fig. 6-2-9c), a medium beach terrace (2) with a height of up to 1 m above sea level, which is formed during stronger waves throughout the year (Fig. 6-2-9b,c) and a high beach terrace (3) located 2-3 m above sea level, which is formed by storm waves usually occurring during the autumn-winter period of the year (Fig. 6-2-9b,g).

Behind the high beach terrace, dunes are often formed by wind activity. Dunes are modern dynamic three-dimensional geological bodies with an unstable shape, size and location. These are sand hills with well-defined ridges, slopes and a characteristic internal structure – cross bedding (Fig. 6-2-9d). Dune sands are an integral part of the sandy beach strip and give the coastal landscape an exotic look. In many cases, they are part of protected areas – natural landmarks, habitats of rare and protected species, Ramsar sites, managed and biosphere reserves, etc., the protection of which is predominantly based precisely by the presence of dunes.

The predominant north-easterly winds play a major role in the formation of dunes on the Bulgarian Black Sea coast. In the Pomorie region, well-formed dunes are only found on the Central Beach (Fig. 6-2-9e), as there are favorable conditions for the north-east winds to blow sand from the beach inland. This is the reason why dunes are not present on the southern beach, which is sheltered from the wind by the Pomorie peninsula (Fig. 6-2-9f).

There are no dunes also on the sandbar between the lagoon and the sea, although it is open to the northeast. The sand hills with plant tufts on the Pomorie sandbar (Fig. 6-2-9g), often called dunes (Pomorie Lake, 2013), are not dunes because during the autumn-winter period of the year the sand strip is flooded by storm waves, and the sand drifts are regularly destroyed.



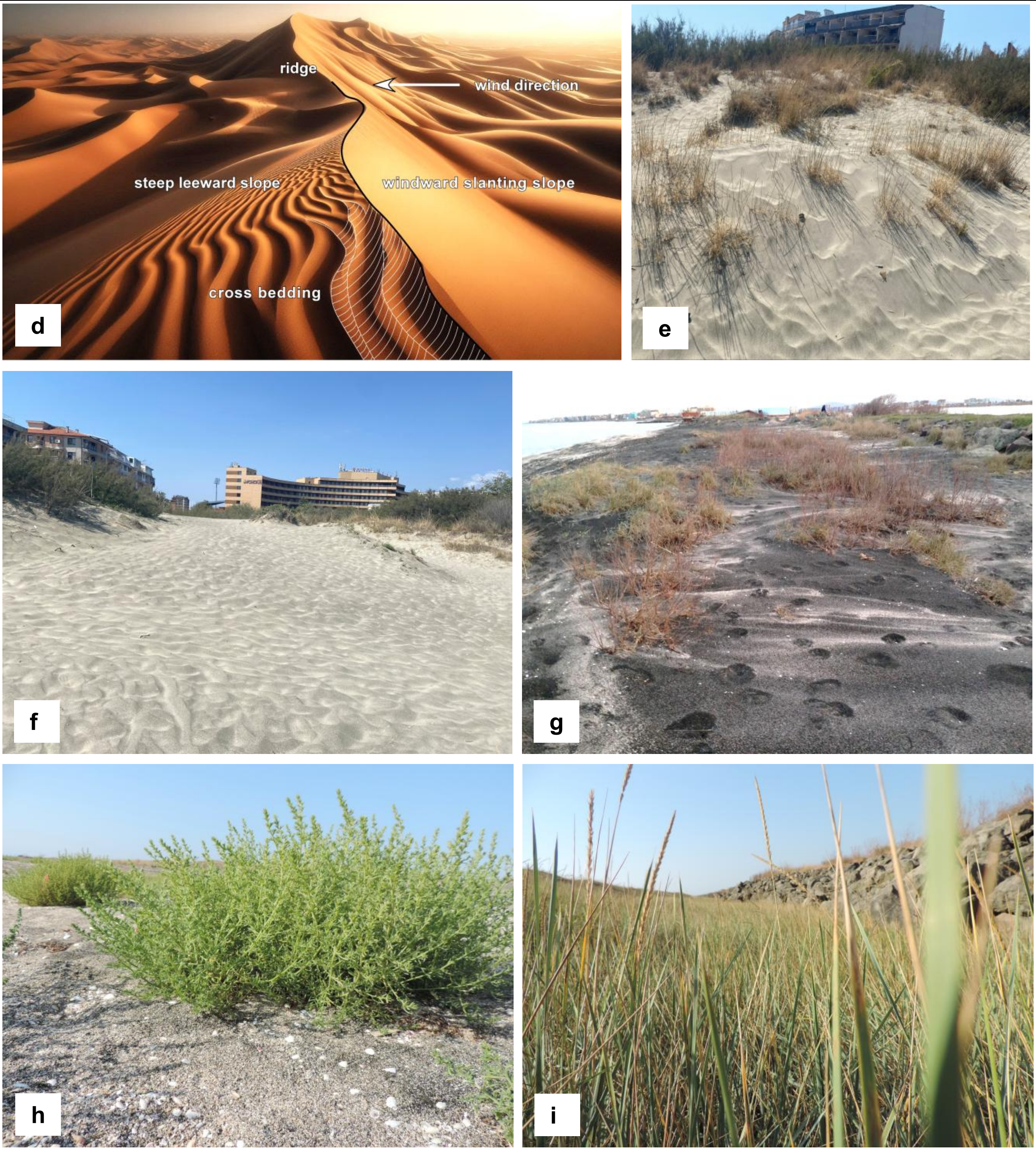


Fig. 6-2-9: ***a,*** *Cross-section and characteristic elements of the sand-bar strip: 1-low beach terrace, 2-middle beach terrace, 3-higher beach terrace;* ***b,*** *Middle (2) and higher (3) beach terraces of the northern tombolo - the sandbar between the lake and the sea;* ***c,*** *Low (1) and middle (2) beach terrace of the northern tombolo – the sandbar between the lake and the sea;* ***d,*** *Dune terminology;* ***e,f,*** *Dunes on Central beach in Pomorie;* ***g,*** *This is what the "dunes" on the sandbar between the lake and the sea look like after a winter storm;* ***h,*** *The glasswort (Salicornia) is a common succulent species on the higher beach terrace of the sand strip;* ***i,*** *Sand ammophyla (Ammophyla arenaria) together with common reed quickly suffocate the remaining drought-loving vegetation on the sand strip towards the lagoon.*

This was noted by Канев (1988) according to whom *"during a storm, sea waves tear the sand spit of the lagoon and enter the lake".* Evidence of this is the whole mussel shells carried on the sand hills by storm waves. Often, after a storm, a large part of the beach sand is "swallowed" by the sea, as a result of which the area of the beach is drastically reduced in literally a matter of days.

However, this process is two-way, because soon or later these sands are pushed back onto the beach, and the beach strip is restored or even expanded towards the sea. It is absurd to draw conclusions about a "sea-level rise" or to associate these events with the topic of "global warming", as suggested by Baltakova (2023). It is not necessary to read thick volumes to get an idea of the dynamics of the sandy beach strip. If you do not live near the sea, it is enough to read the popular scientific works of Попов & Мишев (1974) or Канев (1988), which explain in a language accessible to the general public the main phenomena related to the formation of the modern coast.

Storm surges are generated by large-scale atmospheric systems characterized by low pressure and strong, sustained winds. When a storm approaches from the sea, it mobilizes a huge amount of water that can penetrate deep into the land and cause serious flooding, as in 2007, when the water reached the Kuban Hotel in Sunny Beach. Conversely, if the storm is in the direction of the sea, it can lead to a temporary drop in sea level, like low tide, which occurred on the Southern Black Sea coast on September 18, 2022.

Dunes are indeed natural landmarks, but not all sands are dunes, and not all dunes are subject to protection. If that were the case, Sahara would be the largest geopark in the world. Since they are composed of loos sand, they easily degrade and lose their geoconservation value. When compiling the Specialized Map of the Black Sea Coast in our country, the vicious practice of identifying dunes by the so-called "dune habitats" was introduced - a term for places with drought-resistant plants. However, these plants vegetate not only on dunes, but on all kinds of sands, therefore such places should be called "sand" habitats, not "dune" habitats, and should not be used to identify geological formations such as dunes, because this contradicts elementary human logic.

The term "habitat" means an area with a specific combination of environmental conditions inhabited by a population of a given species. The term "dune habitats" is used by biologists to characterize biotopes that include arid plants. They are inhabited by rare and endangered species, but at the same time they are also territories for practicing certain human activities such as salt mining, mud therapy, spa and coastal tourism, which are an important part not only of the livelihood of the local population, but also an important item of the national budget. From this point of view, opposing "nature conservation" activities to the traditional livelihood of the local population are of no use to anyone, especially when the protection of natural sites is based on untenable arguments such as: "These sands are dunes because succulent grasses grow on them".

UNESCO's Man and the Biosphere Programme, which brings together the natural and social sciences, economics and education to ensure the sustenance of mankind and the protection of natural ecosystems, promotes the development of biosphere reserves - territories including terrestrial, marine and coastal ecosystems. Contrary to the widespread belief that these areas are intended only for the protection of rare and endangered species in an environment completely isolated from anthropogenic activity, biosphere reserves are created to promote the reconciliation of biological diversity with its sustainable use.

The essence of the biosphere reserve coincides with a multifunctional area, including part of the human living space and the living space of other living beings (plants and animals). Its true purpose is to serve for the implementation of different approaches for interaction between social and ecological systems and for the practical implementation of good practices in over 700 reserves in 120 countries around the world. The philosophy of bioreserves is that animals and plants should not be isolated from human activities, because this contradicts the principles of biological evolution, which is based on adaptation to the environment. Through it, organisms carry out the mutations necessary for their survival, which are the driving force of evolution. They are the basis of the struggle for existence, in which the winners are the quickly adapting organisms, not the conservative and specialized forms. In this sense, efforts to conserve protected species by encapsulating them in their private habitat do them a disservice weakening their adaptability, since isolated from the dynamically changing environment, these organisms are condemned by evolution to extinction.

The so-called “dune habitats” are characterized by xerophytic plants growing on sands. In general, xerophytic plants survive in an arid environment in steppe, semi-desert and desert areas, where the development of other vegetation is unthinkable, but they are also found in normal conditions, and it is more correct to call them drought tolerant. These are highly specialized plants, found not only on sand or dunes, but also in any type of arid environment. For example, the glasswort (Salicornia) (fig.6-2-9h) grows on saline soils in addition to salty sands. In this sense, the term “dune habitats” has no geological meaning and is in no way a criterion for determining geological formations. It also has no ecological meaning, since a biotope defined on the basis of drought-tolerant plants does not include only the protected ones, but also all other species, some of which can change the landscape beyond recognition. For example, the invasive wheat plant sand ammophila - *Ammophila arenaria* (Linnaeus) Link (Fig. 6-12i) together with common reed in a few years covered a large part of the sands on the western slope of the Pomorie sandbar and suffocated the other drought-tolerant vegetation. Here, before the brutal intervention of man in the eighties of the last century with the construction of the stone dike, a variety of drought-resistant plants vegetated, while now the reed and sand ammophila have practically conquered the entire biotope.

Identifying dunes based on sand phytocoenoses is as logical as defining phytocoenoses by the type of rocks they grow on. Such an approach leads to the declaration of protected areas under the Biodiversity Act, but with geological arguments. In addition to contradicting all logic, this also creates unnecessary problems in the use of the coastal beach strip for practicing the traditional livelihood of the local population.

To avoid such misunderstandings, served to the general public as “scientific” information in visitor centers, websites and social networks, the identification of dunes should be based on their geological attributes, not on hybrid geo-biological phrases such as “white dunes”, “gray dunes”, “emerging dunes”, etc., freely used by specialists without geological education in protected area management plans, expert reports of ministries and websites of various “nature conservation” organizations. The free use of such phrases changes the meaning of this purely geological term and confuses people's ideas about the value of dunes as geological phenomena.

6.2.10. Mineral waters. The volcanic terrain is a prerequisite for the presence of mineral waters, which reach the surface in the form of dozens of mineral springs and artificial wells. The most popular of them are east of the town of Kableshkovo, west of the village of Medovo and the wells around the Kamenar district. They have alkaline mineralization, characteristic of the volcanic rocks they pass through before reaching the earth surface.

The mineral spring in the village of Kamenar "Borehole No. B-53" (Fig. 6-2-10a) was designated as exclusive state property by Act No. 152/14.04.1997 and approved as an exploitation resource by Order RD 703/10.09.2014. The depth of the borehole is 247.8 m. The catchment was built in 1971 as a rectangular reinforced concrete chamber, which is equipped with an outlet pipe for filling water outside the catchment basin.

The mineral spring west of the village of Medovo "Borehole No. B-72" (Fig. 6-2-10b) was designated as exclusive state property by Act No. 1611/08.08.2011 and approved as an exploitation resource by Order RD 483/02.08.2018. It is 253 m deep and was built in 1976-77 as a rectangular reinforced concrete shaft with a discharge pipe for water filling outside the catchment.

Since Bulgaria is the country with the most thermal springs in the world after Japan and Iceland, special attention is paid to the geothermal characteristics of each of the Bulgarian Geoparks. The high spa potential, used by people since the Roman age, is a leading topic in a number of regions of Bulgaria, including the Burgas region. The Municipality of Pomorie is no exception to this rule and, in addition to being part of the spiritual heritage of the region (Fig. 6-2-10c), the mineral water is now also used for balneological purposes (Fig. 6-2-10d).

Figure 6-2-10: a, *The mineral source „Well № Б-53“ in Kamenar quarter;* ***b,*** *The mineral source „Well № Б-72“ west of Medovo village;* ***c,*** *The "Ayazmo" in the courtyard of the "St. George the Victorious" monastery in the town of Pomorie, whose healing mineral water is associated with medieval legends;* ***d,*** *The tourist spa complex "Old Houses" at the foot of the Kableshkovo volcano.*

Discussion

According to the Statutes of the International Geosciences and Geoparks Programme, *"Education at all levels is at the heart of the UNESCO Global Geoparks concept. From university researchers to local community groups, UNESCO Global Geoparks promote awareness of the history of the planet as recorded in rocks, landscapes and ongoing geological processes"* (UNESCO General Conference, 2015). Until the Statutes was created, there was a tacit belief among the evaluators of the Global Geoparks Network that the main priority of geoparks is interpretation. However, interpretation is a tool, while education is a mission that includes all tools for disseminating geological knowledge to the general public.

Pomorie Lake is a great place to demonstrate the links between climate and the environment within a permanent educational programme for students and adults. Responsible dissemination of knowledge about climate change in the geological past and present is one of the main tasks of Geopark. To the extent that the formation of the double tombolo is related to the manifestation of global climate changes in the geological past, possible cultural and educational significance can be sought in clarifying the causes and indicators of global warming as a geological phenomenon.

Geological processes and phenomena can be gradual (continuous), which occur in time intervals that are difficult for humans to perceive – hundreds of thousands and millions of years, such as sea level fluctuations, and sudden (catastrophic) with a duration of seconds or minutes, such as meteorite impacts, volcanic eruptions and earthquakes.

Many geological phenomena lasting from hundreds to tens of thousands of years have a cyclic manifestation. Among them are the global climate changes, causing glacial and interglacial periods, which are due to astronomical causes established by the Serbian geophysicist Milutin Milankovitch (Milanković, 1941). He mathematically proved global climate changes every 20,000, 40,000 and 100,000 years associated with periodic changes in the parameters of the Earth's orbit. Later, climate changes above and below these frequency intervals were also established.

The shortest temperature changes due to the rotation of the Earth around the Sun are diurnal and annual. The shortest geological changes, however, last hundreds of years and although they are short-lived in a geological sense, they do not fit into human concepts of short-termism and are incomparable with human life. Therefore, it is not correct to scare people with apocalyptic predictions about the imminent sinking of coastal cities as a result of global warming, which is a geological process. Such predictions come from people without geological education, who cannot imagine the immense duration of geological processes over time.

It is widely known that the best lie is half the truth. Based on mass measurements of temperatures from stations in different regions of the world, "scientific" models are constantly being created that predict an apocalyptic picture by the end of the century: shrinking glaciers, powerful cyclones, prolonged droughts, submerged cities, destroyed crops, fires, floods, deforestation, misery and famine. Speculating on strict scientific facts, such as the ratio of greenhouse gases in the atmosphere, most of these models do not include the huge contribution to the absorption of CO_2 by the oceans but concentrate on the industrial release of heat-trapping greenhouse gases into the atmosphere, which has a negligible contribution to the concentration of CO_2 in the atmosphere.

An emanation of this paranoic theater is the film "An Inconvenient Truth" directed by Davis Guggenheim and wrote by the former voce-president of the USA Albert Gore (Guggenheim & Gore, 2006), which received exceptional international recognition, incl. Oscar for Best Documentary in 2007. It contains many half-truths, presented with the artistic techniques of modern cinema in a way that convinces people that all modern troubles come from the greenhouse effect caused by the increasing concentration of CO_2 in the atmosphere as a result of human activity. Geological processes are viewed through the prism of human notion of time, as the enormous duration of their action, which surpasses the existence of humanity, is reduced to a matter of years. It even speculates on the laws of statistics, as some temperature peak is effectively played out with a stage elevator that raises the author to his maximum. However, statistics eliminate such peak values using various methods, the simplest of which is the moving average method.

In fact, global warming is not measured in degrees, but in millimeters, indicating the rise in sea level due to the melting of glaciers. Such a rise is usually of the order of a few millimeters per year and is not capable of causing catastrophic processes. In addition, the accuracy of such measurements is difficult to achieve, since sea level fluctuations are comparable to the subsidence of the coastal land. If it is positive, it will compensate for the sea level rise, but if it is negative, it will increase its value. It is known that the southern Black Sea coast is sinking by 2-3 mm per year, which has led to the sinking of river mouths and formation of estuaries (Burgas Lakes, Ropotamo River, Devil's River, Veleka River). However, this was not enough to compensate for the decrease in sea level from the cooling after the 14th century, thanks to the so-called "Mini-Ice Age", as a result of which it has dropped by 2 m.

After the end of this era, around the middle of the 19th century, even before the industrial era, a new global warming began (Robinson et al., 2007, Platt et al., 2017, etc.), which excludes human activity as a factor in this process. While preparing the article “Kamchatka – the Cold and the Heat of the Earth” Sinnyovsky et al. (2023) came across a surprising study from the 1970s, when there was no mention of global warming at all. Studying the glaciers of the Avacha group of volcanoes, which are located right next to the capital city Petropavlovsk-Kamchatsky, scientists from the Kamchatka branch of the USSR Academy of Sciences came to an interesting fact. Виноградов (1970) noted that the firn line (the line above which the snow does not melt in summer, but turns into granular ice-firn) is at 1800-2200 m, depending on whether it is NE or SW facing. The Avacha volcano is of the "somma" type, with a young cone (somma) in its caldera and an annular valley (atrio) between the young cone and the outer rim. Виноградов & Будников (1977) established that most glaciers fill the circular valleys "atrio" and, based on moraine deposits, concluded that in the middle of the nineteenth century the total area of glaciers in the Avacha group was 35.2 km², and at the time of their study the glaciation was represented by 24 glaciers with a total area of 16.4 km². Therefore, in a little over a hundred years, the area of glaciers has decreased by half.

Ordinary people are not experts and find it difficult to navigate the avalanche of information about global warming. They take the apocalyptic predictions for granted and believe that they must participate in the “salvation of future generations”, according to the principle of sustainable development from “Our Common Future” of the Brundtland Commission (UN World Commission on Environment and Development. 1987) according to which “the present generation meets its needs without compromising the ability of future generations to meet their own needs”. The truth is that man cannot influence such global processes and even if there is global warming, he cannot fight it in any way. Remember the ozone hole, because of which we had to feel guilty for using deodorants. At the beginning of the century, it was conveniently replaced by global warming.

Conclusion

Two ancient human activities are associated with Pomorie Lake, representing an enduring cultural heritage for the region: the ancient Anchialo technology for salt extraction and the use of black bituminous mud, lye, hypersaline water and the marine climate for balneotherapy. The development of the Pomorie Geopark will create favorable conditions for combining traditional coastal and balneological tourism with specialized geotourism by developing geological routes presenting the geological history of the region, which is no less interesting than human history, in a language accessible to the general public.

The successful combination of the geological features of the region with its ecological, historical and cultural landmarks is in the spirit of the UNESCO Man and the Biosphere Programme, which unites natural and social sciences, economics and education to ensure the sustenance of humanity and the protection of natural ecosystems, and encourages the development of biosphere reserves - territories including terrestrial, marine and coastal ecosystems. Contrary to the widespread belief that these areas are intended only for the protection of rare and endangered species in an environment isolated from anthropogenic activity, biosphere reserves were created to promote the reconciliation of biological diversity with its sustainable use for the needs of the local population. This mission is the focus of the Pomorie Geopark with all the advantages and disadvantages accompanying innovative ideas for the development of a given region.

As the processes and phenomena related to the geological activity of the sea are among the main topics of the Pomorie Geopark, the other main goal of geo-education is to raise awareness among the population about sea-level fluctuations over the last 11,700 years as a result of climate changes during the Holocene. The dissemination of knowledge about these changes aims to mitigate the anxiety instilled among the population by the apocalyptic predictions of ignorant oracles about the flooding of the ocean coast, which unfortunately also include some scientists with geological education.

The explanatory activity in the Pomorie Geopark should contrast the scientific facts of the recent geological past with the paranoia about a global apocalypse fanned by the media and the imputation of a sense of guilt among the population because of climate change. The futility of the so-called "fight against global warming" must be explained in a particularly clear and well-reasoned manner, which in its inefficiency can only be compared to "fight against volcanism". The fight against such geological phenomena is not and never will be within the power of man. The huge funds allocated to combat global warming can be used to mitigate the consequences of this phenomenon or for meaningful social activities that benefit people and not be poured into pseudo-scientific projects to prevent the phenomenon itself and transformed into the accounts of various "environmental" organizations.

The mission of the Geopark is to popularize the truth about global climate change as a natural phenomenon among all age groups and at all information levels, including among decision-makers in ministries and departments, on whom the preservation of geological phenomena along the Black Sea coast depends, with the message that many people have died from hunger and wars, but no one has died from global climate change in the historical past. On the contrary, the greatness of the First Bulgarian State coincides with the Nymphaean warming - its creation in the 7th century, the saving of Europe from the invasion of the Saracens by Tervel in the 8th century, the creation of Cyrillic and the adoption of Christianity in the Golden 9th Century, and the brilliant military victories of Simeon I the Great in the 10th century, making Bulgaria an empire on three seas.

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Appendix 1

Methodology for estimation of geosites in a park environment

The assessment of the geological heritage of a given territory on a national, regional or local scale begins with the compilation of a list of potential geotopes that represent the geological history of the area as faithfully as possible. For the correct evaluation of the geological objects in a park environment, a methodology is needed, based not only on the "classical" criteria for geoconservation significance, but also on some more specific indicators corresponding to the main themes of the Bulgarian geoparks, which have radically different priorities. It is based on the so-called "thematic geodiversity" (Sinnyovsky et al., 2019), which emphasizes the individual approach to each Geopark depending on its geological and geomorphological characteristics, ecological conditions and socio-economic prerequisites, as well as on its geotourism and balneological potential. The methodology includes the main evaluation criteria in the category of scientific value (representativeness, completeness, rarity) and some additional criteria such as picturesque/didactic, ecological, cultural and tourist potential, used in the expert card for the evaluation of geotopes in the Register and Cadastre of Bulgarian Geological Phenomena (Синьовски и др., 2002), the fossil and coastal geosite methodology (Sinnyovsky, 2023) and the fossil geosite expert card (Sinnyovsky, 2023). In contrast, the methodology for evaluating geosites in a park environment (Sinnyovsky, 2024) emphasizes their contribution to the main theme of Geopark and how they complement it with other significant geological features. It aims to minimize the interpretation of the explanatory text to the individual indicators.

The expert card includes 12 criteria with different weights. For the evaluation of each criterion, from 4 to 7 indicators are used, the numerical expression of which starts from zero, corresponding to a complete lack of geoconservation value. The 'zero' level is necessary because if the numerical scale starts at '1' then even places with no geoconservation value will add a point to their total score. The zero level should be clearly defined and distinguished from the next level so as not to create difficulties for evaluators. For example, the distinction between ‘0’ and ‘1’ of the lowest numerical indicators of unnamed outcrops of scenic value is based on the presence or absence of the site on the topographic maps, which can be easily verified.

Outcrops representing geological features in the context of the main theme should be considered as key sites to understanding the geological history of the area (e.g. cirques and U-shaped valleys in the Rila Geopark - evidence of Quaternary glacial activity or ancient marine terraces, evidence on the Quaternary fluctuations of the sea level in Geopark “Pomorie”). Outcrops containing a record of global cycles and events such as Milankovitch cycles, meteorite impacts, and other phenomena of special scientific interest that can be presented to the general public in an attractive form, are welcome as long as they can be identified in the area regardless of the Geopark topics. For this reason, the weight of the scientific value in the expert card is higher than that of the other criteria (with maximum 6 indicators against 3 or 4 for the other criteria). For the same reason, the weight of the scenic value is increased to better reflect the geotourism significance.

Geosites with high interpretive potential, especially where the relationship between geology and human history/culture can be demonstrated, should also be prioritized for listing in Geopark inventories. The expert card is intended for field evaluation by one or more geologists. The aim is to assess whether a site has the required average degree of excellence to be described and included in the Geopark inventory. It is developed to reduce subjective opinion and achieve a realistic assessment of geosites escaping professional or geographical bias. It does not provide 100% objectivity, but once it is filled in correctly according to the explanatory text of indicators of each criterion, it gives the most realistic notion of the geoconservation value of the geological sites, which cannot be achieved by any ad hoc assessment. It should not be the only basis on which to decide the fate of a geosite. The conclusion should be reached on the basis of a consensus involving experts and geopark staff to minimize the possibility of a wrong decision.

The minimum number of 12 points (of total 48) required to overcome the ‘threshold of significance’ is formed by the first six criteria. It provides the necessary level of excellence against which the site should be considered geologically significant and worthy of inclusion in the Geopark list. Insofar as the assessment of geosites in the Geopark does not require comparison with global examples, the categories of 'global' and 'continental' value in the Expert Card of national assessment have been replaced by 'international significance', according to 'UNESCO Global Geoparks Part B' (UNESCO General Conference, 2015). The scale of significance ranges from local (12-20) to regional (21-30), national (31-40) and international (41-48). Achieving the maximum number of points is almost impossible, as a geotope rarely has both scientific (1) and aesthetic (5) value. When a geosite is properly assessed and included in the Geopark inventory, it should be scientifically described by experts in the relevant scientific field. In this regard, a standard model for describing geosites would be very useful for both Geopark managers and evaluators. Such a standard model for describing geomorphosites in the glacial terrains of the Rila Geopark is proposed by Sinnyovsky et al. (2020).

Criteria, indicators and numerical score for evaluating geological sites in a park environment

1. Scientific, research, and educational values: degree of excellence with which a feature is considered to show aspects of nature and development of geological, landform or soil systems in the region (Sharples, 2002). This criterion reflects the importance of the site for understanding the organic and inorganic evolution of the planet - tectonic processes, intrusive and volcanic activity, mineral formation, fossils, astronomical cycles, and events.

0. None. Outcrops of common rocks without any remarkable mineralogical, paleontological, structural, textural, and other features.
1. Doubtful. Outcrops of common rocks with normal composition and structure (crystalline structure in igneous rocks, horizontal bedding in sedimentary rocks, foliation in metamorphic rocks) of no particular interest to science or education.
2. Minor. Common outcrops with some specific rock features: veins (Pl. 1a), dikes, cracks, structures, textures, fossils (Pl. 1b), karst (Pl. 1c), and others with low interpretive potential.
3. Low. Common outcrops of petrographic units (Diabase-phyllitoid formation, Ca-alkaline formation), fossil-bearing levels such as Orbitolina limestones (Pl. 1d) or Pycnodonta beds (Pl. 1e), folds (Pl. 1f), faults and others, with potential for interpretation of geological processes on a local level.
4. Moderate. Rare or unique outcrops of mineralogical and petrographic features, fossil deposits, glacial formations, volcanic structures, with high interpretive potential or historical value for the Bulgarian geology such as bulgarites and burgasites in Burgas District (Pl. 1g), Franz Toula's fossil site near Kotel (Pl. 1h), Maritsa cirque in Rila Mountain (Pl. 1i), etc.
5. High. Outcrops demonstrating interregional geological phenomena - tectonic processes, famous facies (Pl. 1j), paleobasins, volcanic arcs, fragments of ancient continents, ophiolite formations, etc., such as the Kurilo threshold (Pl. 1k), Peri-Gondwana graptolite shales (Pl. 1l), or Kopilovtsi cumulative gabbro in the Chiprovtsi Balkan with the potential to demonstrate ancient regional-geological processes.
6. Particularly high. Outcrops demonstrating global geological phenomena: eustatic sea-level fluctuations, global disasters, unique fossils, system boundaries, astronomical cycles, such as Milankovitch cycles (Pl. 1m), event deposits: olistostromes, tempestites, inundites, impact beds (Pl. 1n), orogenic belts, subduction zones) with the potential to demonstrate global geological processes and events.

2. Representativeness: appropriateness of the geosite illustrating geological processes or features that contribute significantly to the understanding of the main Geopark themes.

0. None. A site that is not suitable for demonstrating geological processes or features that contribute to the understanding of the main Geopark themes.
1. Low. A site which is suitable but not a good example of geological processes or features relevant to the leading Geopark themes (Pl. 1o).
2. Moderate. A geosite which is representative of intermediate stages or incomplete geological features, not so attractive to the public, e.g. periglacial formations in glacial landscapes (Pl. 1p), sinkholes and ponors (swallow holes) in karst terrains (Pl. 1q), etc.
3. High. A geosite which is representative of geological processes and features related to the leading Geopark themes, e.g. rock arcs in gorges or canyons (Pl. 1r), vertical or radial jointing in lava flows in volcanic terrains (Pl. 2a), caves in karst terrains (Pl. 2b), cirques in glacial landscapes (Pl. 2c), etc.
4. Very representative. A geosite which is among the best examples in Geopark representing rare and attractive geological phenomena related to the leading Geopark themes, e.g. buttes (single massive rocks) among rock pinnacles (Pl. 2d), volcanic craters in volcanic terrains (Pl. 2e), U-shaped trough valleys in glacial landscapes (Pl. 2f), karst canyons in karst terrains (Pl. 2g), etc.

3. Integrity: reflects the degree of preservation of specific features of the site as a geological phenomenon: actual condition and nature conservation status, considering natural processes and human activity.

0. Bad. Poorly preserved or highly degraded geological features: overly altered or obliterated structures and textures, weathered minerals, rocks and fossils that are not subject to conservation.

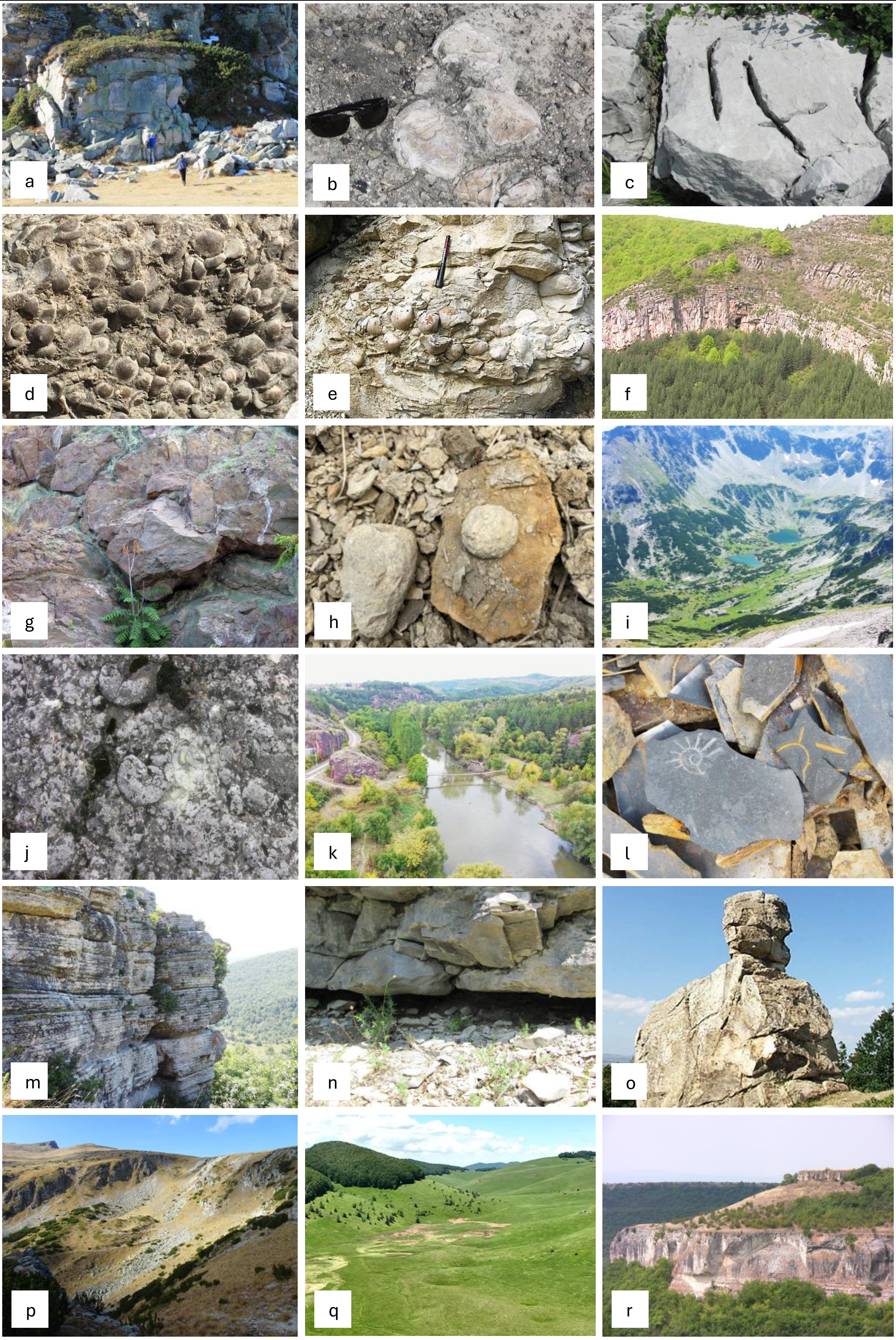
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Plate 1: a, *Pegmatite veins in pegmatoid-aplitoid granite of the IV sequence of the Rila-West Rhodope batholith near the Seven Rila Lakes;* ***b,*** *Shells of the bivalve Ostrea rarelamella in the Eocene limestones of the Dikilitash Formation, Beloslav quarry, Varna region;* ***c,*** *Karrens in the Lower Cretaceous Cherepish limestones near the village of Lyutibrod, Vratsa district;* ***d,*** *Aptian orbitolina limestone in the Urgonian strata of "Ritlite" near the village of Lyutibrod, Vratsa district;* ***e,*** *Layer with Pycnodonta vesicularis in the Campanian chalk of the Nikopol Formation near the village of Novachene, Pleven district;* ***f,*** *Mesoscopic fold in the Upper Jurassic limestones of the Gintsi Formation near Gintsi village, Sofia district;* ***g,*** *Pillow lavas, defined as a separate rock type 'bulgarite' near the village of Bulgarovo, Burgas district;* ***h,*** *Upper Triassic heterastrids and corals from the Franz Tula's fossil site near Kotel town;* ***i,*** *Maritsa cirque with the Maritsa lakes, the largest cirque in Rila, carved out of a cirque glacier that fed the Maritsa glacier during the last ice age;* ***j,*** *The famous 'ammonitico rosso' facies in the Upper Jurassic limestones of the Gintsi Formation near the village of Gintsi, Sofia district;* ***k,*** *The Kurilo threshold, through which Sofia Lake drains to the north and forms the Iskar Gorge;* ***l,*** *Silurian graptolite shales, fragment of the Gondwana supercontinent, with Cyrtograptus and Monograptus near the village of Vlado Trichkov, Sofia district;* ***m,*** *Milankovitch climatic cycles in the Upper Jurassic limestones of the West Balkan Group near 'Kozarnika' cave, Gara Oreshets village, Vidin district;* ***n,*** *The iridium layer at the Cretaceous/Tertiary boundary in Kamenitsa River valley near the village of Moravitsa, Vratsa district;* ***o,*** *Badjala Kaya near Yablanovo village, Kotel municipality;* ***p,*** *Northern Ropalitsa cirque, a cryonival cirque of the Ropalitsa cirque complex fed the Ropalitsa glacier during the last Pleistocene glaciation in Central Rila;* ***q,*** *A sinkhole in Triassic limestones in the Ponor Mountain, Sofia Stara Planina;* ***r,*** *A rock cliff in the Santonian sandstones of the Shumen Formation in the Provadia Canyon, Provadia town, Varna district.*

1. Low. Special features in an advanced stage of degradation, allowing conservation in situ or in a museum environment (Pl. 2h).
2. Moderate. Poorly exposed but well-preserved elements with the potential to expand access with controlled excavation, such as the lycopodium stems near the town of Svoge in the small quarry before the big turn on the road to Sofia (Pl. 2i).
3. Good. Well-preserved and well-exposed geological features (Pl. 2j), which after appropriate conservation measures (construction of light roof structures, sheds, waterproofing, etc.) can retain their main characteristics and serve the purposes of the Geopark.
4. High. Extensive areas of well-preserved and widely exposed special features with the possibility of controlled collecting at sites designated by the park management, such as the nummulites among the columns of the Pobiti kamani (Pl. 2k), whose maintenance is restricted simply in prohibition of extracting aggregates and violating the integrity of the geological formations.

4. Replication: refers to the number of examples of a feature which are specifically identified as requiring protective management (Sharples, 1993). It does not refer to the number of times it occurs in the area. It is generally appropriate that more than just a single example of any particular type of feature or system be identified as significant and, if necessary, protected for geoconservation purposes (Sharples, 1995). The main factors which need to be considered are rarity, sensitivity, scientific significance and ecological importance. This is a complex criterion including diverse sub-criteria requiring following degrees of replication:

0. No need for replication. Common feature in hard-to-degrade rocks, revealing uniformly recurring phenomena with low impact on ecosystems throughout the Geopark area.
1. Low. Common features in hard-to-degrade rocks, revealing specific phenomena whose degradation would lead to partial biodiversity loss.
2. Moderate. Rarely encountered features in relatively erosion-resistant rocks revealing specific phenomena whose degradation decreases the possibility to use them for education purposes (Pl. 2l).
3. High. Rare geological phenomena in sensitive rocks which need a higher degree of replication because of the higher risk of deterioration of their special features whose degradation of which would lead to a loss of biodiversity and/or take away opportunities for research and education (Pl. 2m).
4. Ultimate. Easily vulnerable, sensitive features, whose degradation will cause significant biodiversity loss, requiring as much replication as possible that will ensure the phenomenon remains available for research and education (Pl. 2n).

5. Scenic (aesthetic) value: reflects the attractiveness of a geosite and its ability to influence people's aesthetic perceptions. Formally, it is expressed in public recognition: presence in Internet environment, publications, films, advertising materials, postcards, etc.

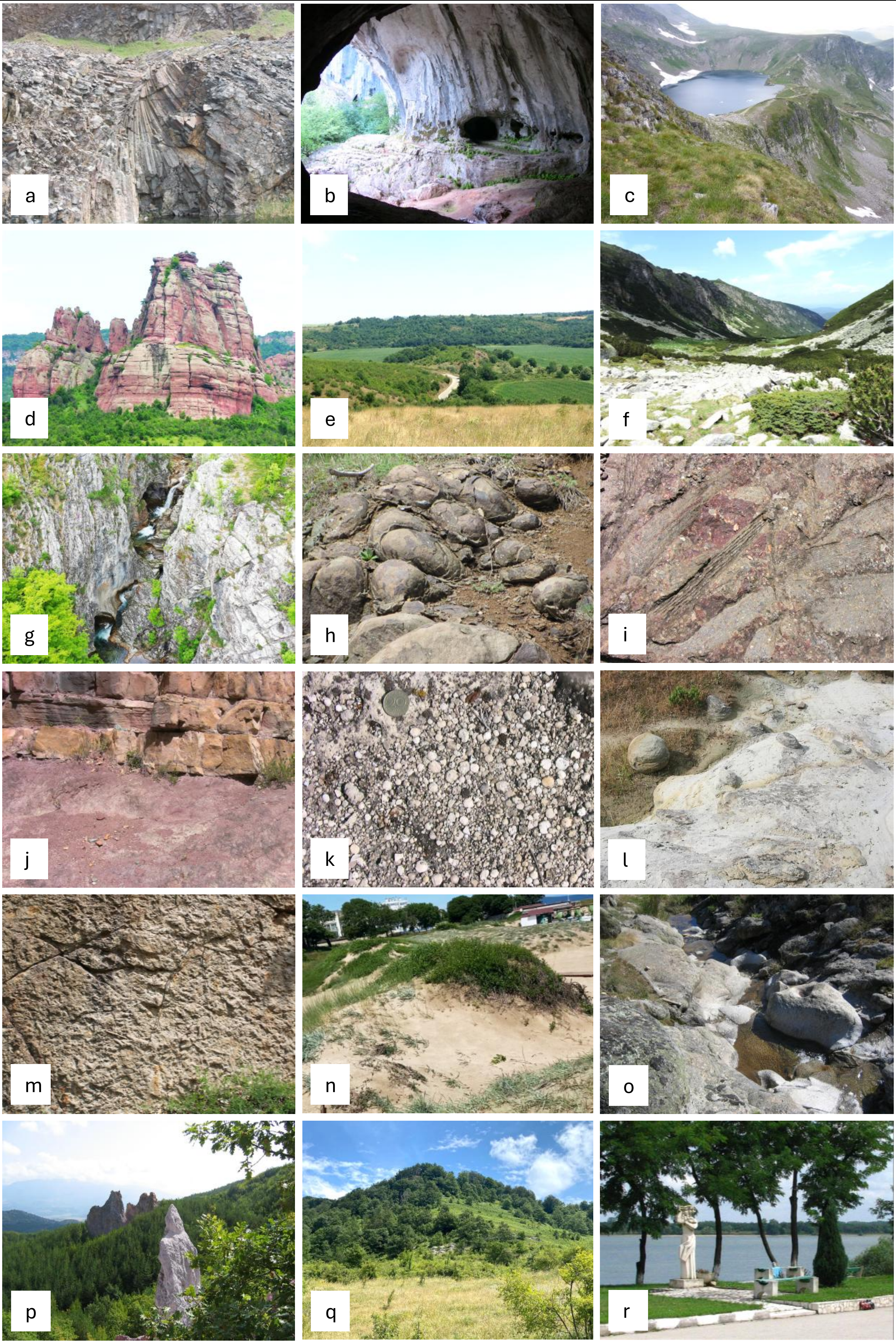

Plate 2: a, *Radial jointing in Campanian trachyandesites of the Draganovo Formation, Kamenar quarter of Pomorie town;* ***b,*** *"Prohodna" cave, formed in the Maastrichtian limestones of the Kailaka Formation by Paleo-Iskar river during*

the Pliocene epoch near Karlukovo village, Pleven district; ***c,*** *"Okoto" tarn - part of the paternoster cirque of the Seven Rila Lakes in the Malyovitsa part of Rila;* ***d,*** *"Borovitsa stone", a typical butte (massive single rock) on the background of the stone pinnacles in the Belogradchik rocks;* ***e,*** *The crater of the Upper Cretaceous Zidarovo paleovolcano, preserved in the modern landscape near the village of Zidarovo, Burgas district;* ***f,*** *U-shaped glacial valley of the Malyovitsa glacier in Rila Mountain;* ***g,*** *"Sini vir" karst gorge near the village of Medven, Kotel municipality;* ***h,*** *Concretions in Santonian tuffs of the Rosoman Formation, Logator village, Pernik district;* ***i,*** *Imprints of Lycopodium stems in Carboniferous sandstones near the town of Svoge, Sofia district;* ***j,*** *An impressive nonconformity between Upper Carboniferous granite and Lower Triassic (Buntsandstein) sandstones near Gara Bov village, Sofia district;* ***k,*** *Nummulite deposits in the "Pobiti kamani" area, Beloslav quarry, Varna district;* ***l,*** *Sandstone concretions separated through weathering of Eocene sandstones of the Suhostrel Formation, Brestovo village, Blagoevgrad district;* ***m,*** *Lower bedding surface with trace fossils in the Cenomanian sandstones near the town of Kotel, which needs conservation (roof structure);* ***n,*** *An active dune on the Lozenets beach, whose degradation would lead to the loss of the phytocenosis that inhabits it;* ***o,*** *Outcrops of Upper Eocene conglomerates with granite boulders, Gradinishte Formation, north of the village of Dobarsko, Razlog municipality;* ***p,*** *Impressive landscape - rock pinnacles in the Lower Triassic quartz sandstone of the Marvodol Formation near the village of Tsiklovo, Kyustendil district;* ***q,*** *"Komincheto" ("The Chimney") east of the town of Kotel, built of Cenomanian sandstones source of building stones for two medieval churches in the town "St. Trinity" and "St. St. Peter and Pavel";* ***r,*** *"Kamaka" ("The Stone") locality on the Danube riverbank near the village of Novo Selo, Vidin district.*

0. None. Nameless outcrops without remarkable landforms, regardless of whether they possess other special features: petrographic composition (Pl. 2o), fossil content, structures, textures.
1. Doubtful. Nameless landforms marked on topographic maps as relief irregularities, separate rock groups, steep slopes, etc. (Pl. 2p).
2. Minor. Common landforms of local prominence which are present on topographic maps under common names, most often as localities or named elevations, e.g. 'The Chimney' (Pl. 2q), 'The Stone' (Pl. 2r), 'Kreshta' (Pl. 3a).
3. Low. Singular landforms with proper names related to legends or real events and heroes from the history of the region and local folklore, e.g. the 'Black Rock' (Pl. 3b), 'Talim Tash' (Pl. 3c), 'Haydut Velko' (Pl. 3d).
4. Moderate. Picturesque landforms promoted in publications about the geodiversity, folklore, culture, and history of the area, and/or in works of art, postcards, advertising brochures, such as Wonderful Rocks (Pl. 3e), Cherepish Rocks (Pl. 3f), Ritlite (Pl. 3g), etc.
5. High. Remarkable landforms recognized in town names, documentaries, photographs, travel guides, etc., such as Vratsata (Pl. 3h), Lakatnik Rocks (Pl. 3i), Wonderful bridges (Pl. 3j) with the potential for international promotion of the Geopark.
6. Particularly high. Large-scale landscapes recognized in documentaries, pictures, tourist guides, etc., that have been subject to the initiatives of ProGEO, the European and Global Geoparks Networks or the World Cultural and Natural Heritage, such as the Belogradchik Rocks (Pl. 2d, Pl. 3d,k), Iskar Gorge (Pl. 3i,l), Melnik Pinnacles (Pl. 3m), Rila (Pl. 1a,l,p, 2c,f, 3n) with potential for global promotion of the geopark through UNESCO structures.

6. Degree of compliance with the main Geopark theme

0. None. The theme of the geosite has nothing to do with the main theme of Geopark (e.g. petrographic features in a glacial landscape).
1. Low. Features that are indirectly related to the main theme of the Geopark (e.g. faults and folds in karst terrains or fossil sites).
2. Moderate. Features contributing to the understanding of processes related to the main theme of the Geopark (lithological/structural/fossil features responsible for the formation of the main geosite features, e.g. the large stones at the top of the rock pillars in the land pinnacles (Pl. 3o), joint sets in the massive conglomerates of the Belogradchik rocks (Pl. 3p), etc.
3. High. Features that are closely related to the main theme of the Geopark e.g. petrographic features in mineralogical sites (Pl. 3q), lithological features or fossils in stratigraphic sites (Pl. 1e).
4. Full. Features that perfectly match the main theme of the Geopark, e.g. lagoons and estuaries in Geopark 'Pomorie' (Pl. 4r) caves and karst sources in Geopark East Balkan (Pl. 4a), relict glacial landforms in 'Rila' Geopark (Pl. 2c,f, 3n, 4b).

7. Conservation status: reflects the current conservation status of a geosite, taking into account both natural processes and human activities.

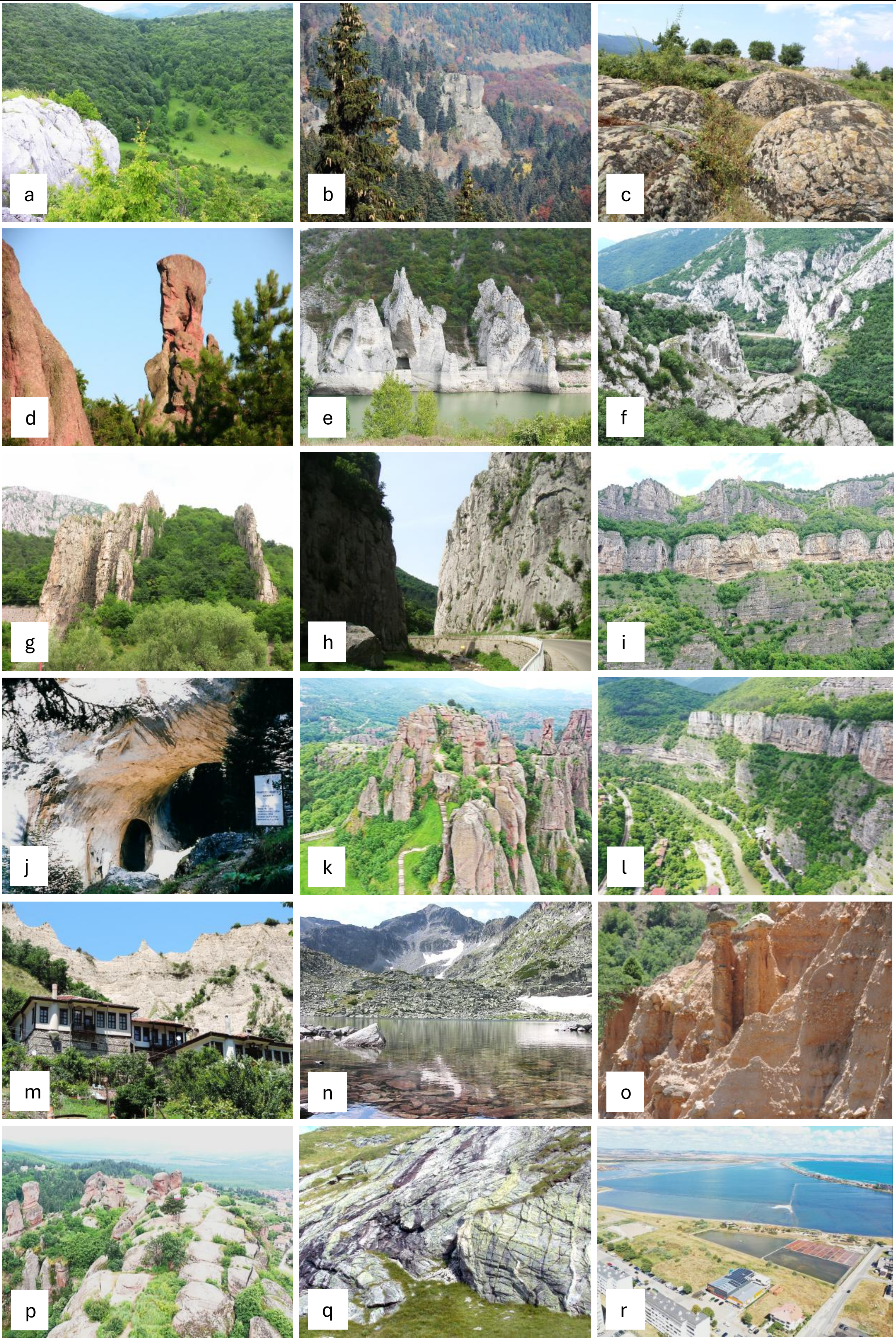

Plate 3: a, *'Kreshta' - a karst field in Cherepish limestones south of Chelopek village, Vratsa Balkan;* ***b,*** *The "Black Rock" in the Maritsa River valley, Rila Mountain;* ***c,*** *"Talim Tash" domed weathering in the Eocene sandstones of the Dvoynitsa*

Formation in the Kotel Pass; ***d,*** *"Haydut Velko" part of "Kaleto" rock complex at the top of the Belogradchik rocks;* ***e,*** *"Wonderful rocks" in Paleocene limestones on the right bank of the Tsonevo dam near the village of Asparuhovo, Varna district;* ***f,*** *Cherepish Rocks – the northern portal of the Iskar Gorge cut among the Lower Cretaceous limestones of the Cherepish Formation;* ***g,*** *"Ritlite", upright beds of Aptian limestones and sandstones of the Lyutibrod Formation near the village of Lyutibrod, Vratsa district;* ***h,*** *"Vratsata", the narrow gorge of the Leva River carved out among the Upper Jurassic limestones of the Glozhene Formation;* ***i,*** *Lakatnik Rocks built of Triassic limestones, Lakatnik railway station, Sofia district;* ***j,*** *"Wonderful Bridges" in the Neoproterozoic Dobrostan marbles near the village of Zabardo, Smolyan district;* ***k,*** *"Kaleto" rock complex and the Roman fortress on top of the Belogradchik rocks;* ***l,*** *Iskar Gorge near Lakatnik station, Sofia district;* ***m,*** *"Melnik Pinnacles" near the town of Melnik, a complex of land pinnacles formed among weakly cemented Meotian-Dacian conglomerates and sandstones of the Sandanski and Kalimantsi Formations;* ***n,*** *Musala Peak (2925 m) in Rila Mountain, the highest peak in the Balkans: view from Aleko Lake in the Musala cirque complex;* ***o,*** *"Stob Pinnacles", land pinnacles near the village of Stob, Blagoevgrad district, formed among weakly cemented Meotian-Dacian conglomerates and sandstones of the Sandanski and Kalimantsi Formations with preserved stone boulders on tops responsible for their formation;* ***p,*** *A fracture systems in the massif of the Belogradchik rocks, responsible for the formation of the rock pinnacles;* ***q,*** *Pegmatite veins in the Chepelare metamorphites in the "Urdini Lakes" mineralogical geosite containing 80 minerals, among them rare precious varieties such as beryl, emerald and alexandrite;* ***r,*** *Pomorie Lagoon – a unique double tombolo formed during the Holocene epoch.*

0. None. Without conservation status - no data about the natural processes or human activity in the geosite area.
1. Low. A geosite area where natural processes and human activities are subject to inconsistent monitoring by local authorities and do not meet the management requirements of a particular feature, and particularly the degree of disturbance (if any) that it can withstand without degradation.
3. Institutional. A geosite area included in the Register of the natural landmarks with special protection measures meeting the management requirements of a geosite, particularly the degree of disturbance (if any) which it can sustain without degradation (Pl. 4c).
4. High. A geosite area part of a nature park, national park, natural or biosphere reserve with special protection measures, monitoring, and protection initiatives as part of the integral conservation policy (Pl. 4d).

8. Geotourism value: reflects the potential for organizing tourism activities and/or the inclusion of local communities and indigenous peoples as key stakeholders in the Geopark area.

0. None. Common outcrops of rocks without any perspectives for development of tourism, sports, or entertainment events.
1. Doubtful. Rocky landscapes of limited interest mainly as places for local recreation and tourism, without special facilities (visited during local holidays, school trips or occasional gatherings).
2. Low. Geological/geographical sites of tourist interest due to proximity to populated areas and/or well-developed areas for recreation, tourism, mountaineering, hang-gliding, caving, national tourist sites or sites included in national tourist routes (Kom-Emine, cycling routes, historical routes, huts, resorts, etc. (Pl. 4e).
3. Moderate. Geological/geographical sites used in partnership with local communities needing to develop and implement a co-management plan with a regional label for a service/product that provides for the social and economic needs of the local population.
4. High. Rock assemblages, canyons, caves, geothermal sources, peaks, etc. of international importance, involving all relevant local and regional actors and authorities and attracting many tourists from the country and abroad: Belogradchik Rocks (Pl. 2d, 3d,k,p, 4f), Melnik Pinnacles (Pl. 3m), Pobiti Kamani (Pl. 4g), Musala Peak (Pl. 3n), etc.

9. Potential for involvement in Geopark events: reflects the possibility of integrating geosite into geotrails or educational events and geotourism.

0. None. A remote or isolated geosite without potential for integration into a geotrail or educational events and geotourism.
1. Low. Site with a certain scientific or aesthetic value without infrastructure but with potential for inclusion in geotrails, educational events and geotourism.
2. Moderate. Site which is part of a geotrail with a developed infrastructure, allowing its use for guided tours, educational events and geotourism (Pl. 4h).

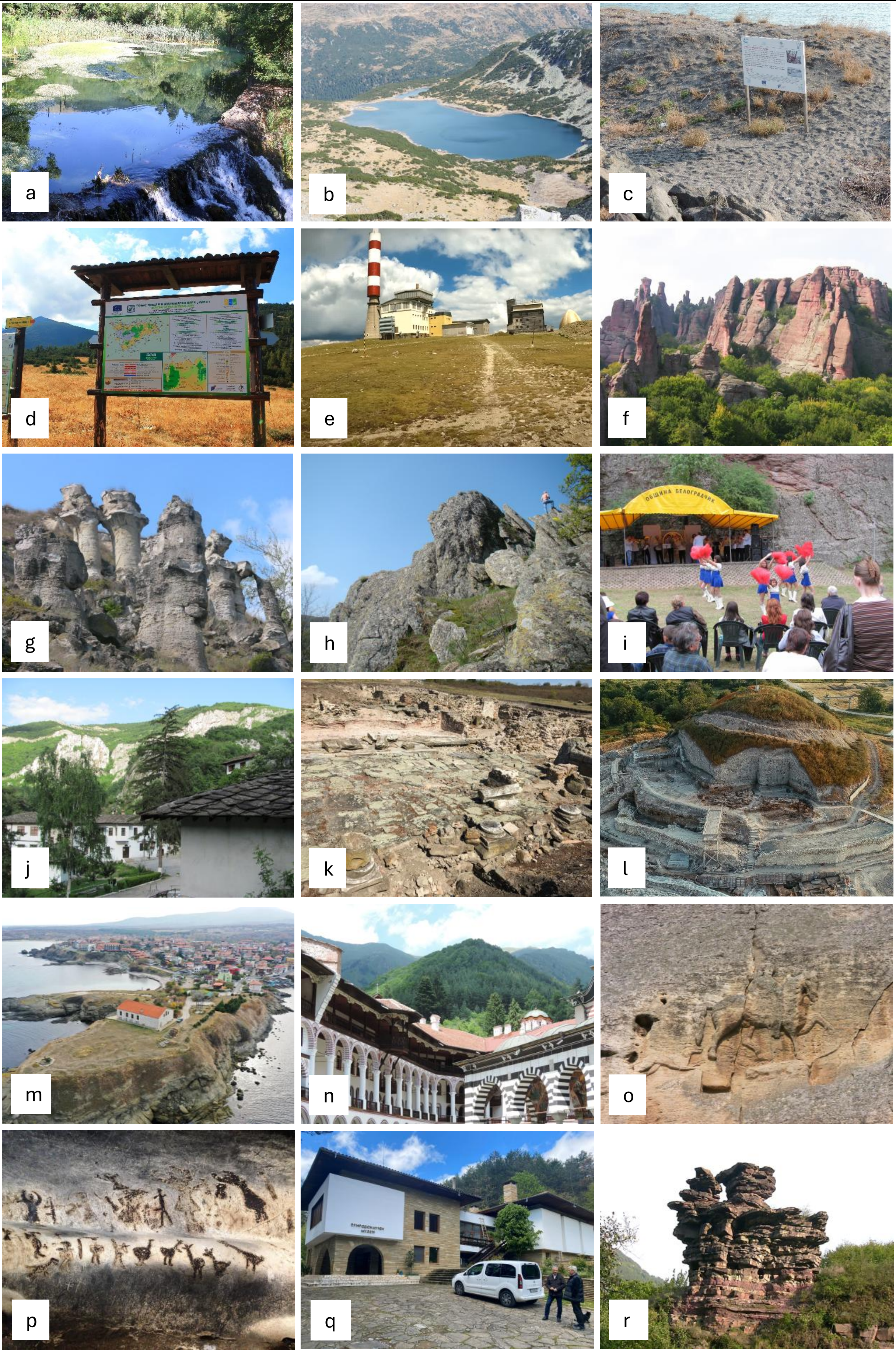
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***Plate 4: a,** “Kotelka” karst spring (“The Springs”) among the Maastrichtian limestones of the Mezdra Formation in the town of Kotel; **b,** “Stinking Lake” cirque, the largest tarn in the Balkans, carved into the granitoids of the Rila-West Rhodope Batholith in SW Rila along the left slope of the Manastirska River; **c,** Information board about the natural habitats in the Pomorie Lake protected area; **d,** Information panel on the Kaiser’s road in Rila National Park with data on the geomorphology, protected areas and tourist routes in the Borovets Park section; **e,** Botev Peak (2376 m), the highest peak of Stara Planina, on the Kom-Emine route; **f,** Belogradchik Rocks, impressive rock pinnacles formed among Lower Triassic sandstones and conglomerates of the Belogradchik Formation; **g,** “Pobiti kamani”, columnar algal bioherms formed by vertical growth of miniatolls in Eocene sands of the Dikilitash Formation, Beloslav quarry, Varna district; **h,** “Black Stones” rocks formed in metamorphic Triassic pebblestone of the Paliokastro Formation near Topolovgrad town; **i,** Holiday of Belogradchik town, Petrovden, in the Romantic valley; **j,** Cherepish Monastery among the Cherepish Rocks; **k,** Ancient Roman port of Deultum on the Novochernomorian terrace near the village of Debelt, Sredets municipality; **l,** Mirovo salt deposit and the archaeological site “Provadia-Solnitsa”; **m,** “St. Uspenie Bogorodichno” temple on the Late Karangatian terrace in Vasiliko quarter, Tsarevo town; **n,** Rila Monastery, a UNESCO World Heritage Site on the background of the Rila alpine landscape; **o,** Madara Horseman, a UNESCO World Heritage Site, sculpted in the Cenomanian sandstones of the Madara Formation, in the imposing ‘Madara Rocks’ near the village of Madara, Shumen district; **p,** The famous wall paintings in Magura Cave, an intangible cultural heritage in “Belogradchik Rocks” geopark; **q,** Natural history museum in Kotel town; **r,** “Djuglata”, a single rock in Tserovo village, Svoge Municipality.*

3. High. Site located in an area with a developed tourist infrastructure, which is part of geotrails and permanent tourist and educational events, guided tours by Geopark’s staff, and tourist, educational or sport events and holidays (Romantic valley near Belogradchik town Pl. 4i).

10. Cultural value: reflects cultural, historical, ethnographic, or spiritual importance of the sites, evidenced by the relation to archaeological remains, historical ruins, myths and legends, customs, spiritual heritage, etc.

0. None. Site unrelated to the cultural and historical heritage of the area.
1. Low. Rock landscape which is indirectly related to the cultural heritage of the area, e.g. by myths and legends, minority customs, annual folklore festivals, holidays of wine, rose, chocolate, wear, carpets, etc.
2. Moderate. An outcrop or landscape which is related to historical and cultural heritage of the area proved by historical documents - annals, chronicles, works of art, archaeological/historical remains such as Cherepish rocks and Cherepish monastery (Pl.4j), Roman Deultum port on the Novochernomorian terrace near Debelt village (Pl.4k), Mirovo salt deposit and Provadia-Solnitsata (Pl.4l), “St. Uspenie Bogorodicho’ temple on the Young Karangatian terrace in Tsarevo town (Pl.4m).
3. High. Rock landscape associated with cultural, historical, and spiritual monuments of national or international importance, such as UNESCO World Natural and Cultural Heritage, e.g. Rila monastery (Pl.4n), Madara horseman (Pl.4o), Magura cave (Pl.4p), Rock-hewn churches of Ivanovo.

11. Social value: reflects the significance of the site to support socio-economic development of the region. It is expressed by the direct involvement of local people in the maintenance of geological phenomena or indirect impact on livelihoods by attracting tourists.

0. None. Site irrelevant to the livelihoods and economy of the Geopark area.
1. Low. Site not contributing to increasing employment (does not need maintenance) but attract seasonal tourists by information panels within the area.
2. Average. Site contributing to increasing employment (needs maintenance) and attracting seasonal tourists (information centre, tourist bureau).
3. High. Site that maintains stable employment (needs year-round maintenance) and attracts tourists throughout the year, e.g. museum within the area managed by the Geopark (Pl. 4q).

12. Accessibility: remoteness of the geosite from the roads.

0. Inaccessible. Site which is too far from a sealed roads, inaccessible by offroad cars or tourist transition.
1. Difficult access. Site accessible only by off-road car + well equipped tourist transition.
2. Accessible by car. Site situated not far from a paved road accessible by vehicle and short tourist transition.
3. Easily accessible. Site is located near a paved road or in a settlement (Pl. 4r).

Plate 1

ASSOCIATION FOR PRESERVATION OF THE BULGARIAN GEODIVERSITY

EXPERT CARD

FOR EVALUATION OF GEOSITES IN A PARK ENVIRONMENT

NAME:
....

LOCALITY: District .... Settlement ....

Coordinates: .... N .... E

CRITERIA							
1. Scientific, research and educational value	0	1	2	3	4	5	6
2. Representativeness	0	1	2	3	4		
3. Integrity	0	1	2	3	4		
4. Replication	0	1	2	3	4		
5. Scenic (aesthetic) value	0	1	2	3	4	5	6
6. Degree of compliance with the main geopark theme	0	1	2	3	4		
7. Conservation status	0	1	2	3	4		
8. Geotourism value	0	1	2	3	4		
9. Potential for involvement in geopark events	0	1	2	3			
10. Cultural value	0	1	2	3			
11. Social value	0	1	2	3			
12. Accessibility	0	1	2	3			

Total: .... (max. 48)

Significance:	International	(41-48)
	National	(31-40)
	Regional	(21-30)
	Local	(12-20)
Threshold of significance (on the first 6 criteria)		
	Not meet the requirement (<12)	

Date: ....

Expert: ....

Signature: ....

This publication was created with the financial support of the European Union through the European Agricultural Fund for Rural Development in implementation of Contract No. RD 50-4/10.01.2024 for the project "ROADS: Roads to Sustainable Geotourism" concluded with the Ministry of Agriculture of the Republic of Bulgaria under procedure No. BG06RDNP001-19.607 for the selection of projects for intra-territorial and transnational cooperation under sub-measure 19.3 "Preparation and implementation of cooperation activities with LIG" of measure 19 "CLLD" of the Rural Development Programme for the period 2014-2020