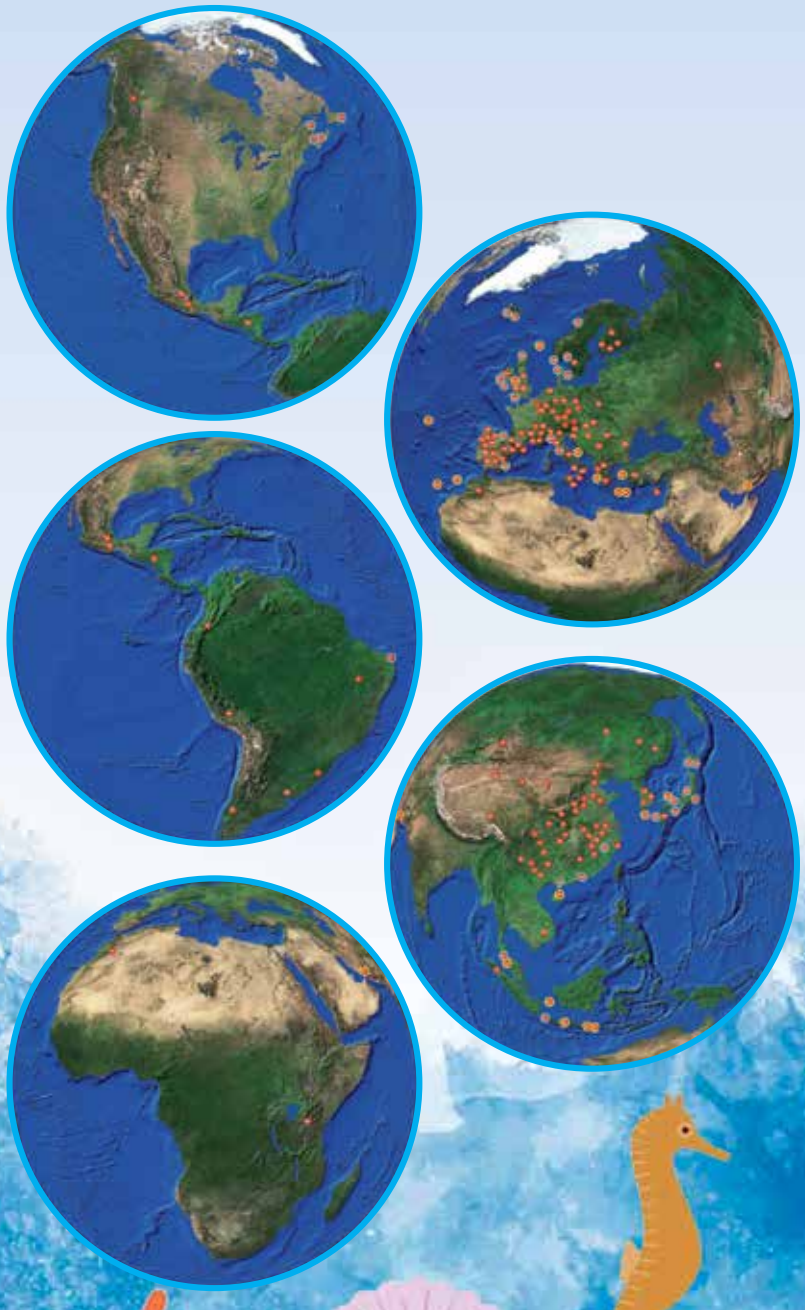
GLOBAL GEOPARKS NETWORK

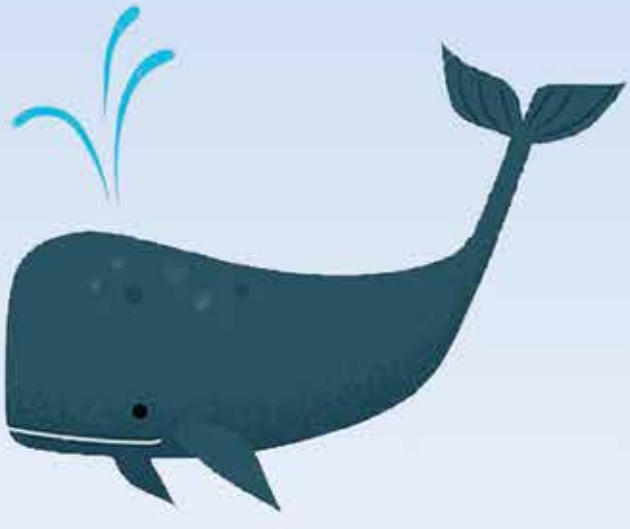
unesco Global Geoparks

14 LIFE BELOW WATER

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

Geoparks & Oceans





Insular & Coastal
UNESCO Global Geoparks

Insular Geopark

a/a	Geopark	Country	time of acceptance of GGN	UNESCO Region
26	Leiqiong UNESCO Global Geopark	China	2006	ASIA
119	Langkawi UNESCO Global Geopark	Malaysia	2007	ASIA
89	Batur UNESCO Global Geopark	Indonesia	2012	ASIA
92	Rinjani Lombok UNESCO Global Geopark	Indonesia	2018	ASIA
114	Oki Islands UNESCO Global Geopark	Japan	2013	ASIA
90	Gunung Sewu UNESCO Global Geopark	Indonesia	2015	ASIA
95	Qeshm Island UNESCO Global Geopark	Iran	2017	ASIA
94	Belitong UNESCO Global Geopark	Indonesia	2021	ASIA
135	Jeju Island UNESCO Global Geopark	Republic of Korea	2010	ASIA
79	Lesvos Island UNESCO Global Geopark	Greece	2001	EUROPE
80	Psiloritis UNESCO Global Geopark	Greece	2001	EUROPE
167	GeoMôn UNESCO Global Geopark	Wales , UK	2009	EUROPE
168	Shetland UNESCO Global Geopark	Scotland , UK	2009	EUROPE
132	Azores UNESCO Global Geopark	Portugal	2013	EUROPE
152	El Hierro UNESCO Global Geopark	Spain	2014	EUROPE
83	Sitia UNESCO Global Geopark	Greece	2015	EUROPE
153	Lanzarote and Chinijo Islands UNESCO Global Geoaprk	Spain	2015	EUROPE
55	Vis Archipelago UNESCO Global Geopark	Croatia	2019	EUROPE
85	Kefalonia-Ithaca	Greece	2022	EUROPE

Coastal Geoparks

a/a	Geopark Name	Country	time of acceptance of GGN	UNESCO Region
35	Ningde Geopark UNESCO Global Geopark	China	2010	ASIA
38	Hong Kong UNESCO Global Geopark	China	2011	ASIA
91	Ciletuh-Palabuhanratu UNESCO Global Geopark	Indonesia	2018	ASIA
109	Itoigawa UNESCO Global Geopark	Japan	2009	ASIA
113	Muroto UNESCO Global Geopark	Japan	2011	ASIA
110	Unzen Volcanic Area UNESCO Global Geopark	Japan	2009	ASIA
112	San'in Kaigan UNESCO Global Geopark	Japan	2010	ASIA
117	Izu Peninsula UNESCO Global Geopark	Japan	2018	ASIA
111	Toya Caldera and Usu Volcano Geopark	Japan	2009	ASIA
116	Mt. Apoi UNESCO Global Geopark	Japan	2015	ASIA
161	Satun UNESCO Global Geopark	Thailand	2018	ASIA
58	Odsherred UNESCO Global Geopark	Denmark	2014	EUROPE
59	Vestjylland UNESCO Global Geopark	Denmark	2021	EUROPE
166	English Riviera UNESCO Global Geopark	England UK	2007	EUROPE
87	Katla UNESCO Global Geopark	Iceland	2011	EUROPE
88	Reykjanes UNESCO Global Geopark	Iceland	2015	EUROPE
96	Copper Coast UNESCO Global Geopark	Ireland	2004	EUROPE
103	Tuscan Mining Park, UNESCO Global Geopark	Italy	2010	EUROPE
125	Gea-Norvegica UNESCO Global Geopark	Norway	2006	EUROPE
99	Beigua UNESCO Global Geopark	Italy	2005	EUROPE
127	Trollfjell UNESCO Global Geopark	Norway	2019	EUROPE
126	Magma UNESCO Global Geopark	Norway	2010	EUROPE
97	Burren and Cliffs of Moher UNESCO Global Geopark	Republic of Ireland	2011	EUROPE
164	North West Highlands UNESCO Global Geopark	Scotland, UK	2005	EUROPE
147	Basque Coast UNESCO Global Geopark	Spain	2010	EUROPE
144	Cabo de Gata UNESCO Global Geopark	Spain	2006	EUROPE
7	Stonehammer UNESCO Global Geopark	Canada	2010	N.AMERICA
10	Cliffs of Fundy UNESCO Global Geopark	Canada	2020	N.AMERICA
11	Discovery UNESCO Global Geopark	Canada	2020	N.AMERICA
9	Percé UNESCO Global Geopark	Canada	2018	N.AMERICA
6	Southern Canyons Pathways UNESCO Global Geopark	Brazil	2022	L.AMERICA

Source: UNESCO Chair on Geoparks and the sustainable development of insular and coastal areas, University of the Aegean

Geoparks & Oceans

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

The Global Geoparks Network, in collaboration with UNESCO, celebrates the World Oceans Day and encourages all UNESCO Global Geoparks management bodies, partners and stakeholders to join the campaign to raise awareness of the challenges the oceans are facing and inspire actions to protect them and their biodiversity and to use marine and water resources sustainably.

The oceans cover over 70% of the Earth's surface and have been associated with human development since ancient times. Today marine life and biodiversity in the oceans are threatened by many human activities like overfishing, pollution, and plastic waste which ends up in the oceans, but also by climate change.

The marine environment is one of the important parts of some UNESCO Global Geoparks. More than 30% of UNESCO Global Geoparks have a maritime component and many of them, despite being located in continental areas, are the guardians of the evolution of former oceans. Activities in Geoparks contribute significantly to SDG 14 (Life Below Water) and to other SDGs, such as SDG 12 (Responsible Consumption and Production), SDG 6 (Clean water and sanitation) and SDG 13 (Climate Action). The marine environment is fully included in the UNESCO Global Geoparks guidelines for the sustainable use of Earth's natural resources.

Geoparks are working towards achieving clean oceans and protecting their biodiversity and geodiversity. They are concerned about how they can interact with the oceans without disturbing the ecosystem, the measures that they need to take for dealing with pollution and how to achieve a balance between human activities and sustainability. Geoparks maintain and promote traditional activities like fishing and implement various good practices which are in line with the United Nations Decade of Ocean Science for Sustainable Development. In collaboration with UNESCO, the Global Geoparks Network presents some of the good examples of activities and good practices in the following video:

https://globalgeoparksnetwork. org/ wp-content/uploads/2022/05/ World-OceansDay4.mp4

We invite you to explore some coastal, insular and continental UNESCO Global Geoparks and their activities which are connected with the Oceans,. We also invite you to join forces, to organize activities, to raise awareness of positive initiatives through networking, to build bridges and, find solutions that give hope to younger generations.

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GLOBAL GEOPARKS NETWORK

Geoparks & Oceans

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Useful information related to UNESCO Global Geoparks can be found on the following websites:
http://www.unesco.org/new/en/naturalsciences/environment/earth-sciences/unesco-global-geoparks

http://www.globalgeoparksnetwork.org
www.visitgeoparks.org

ASO GeoPARK
阿蘇ユネスコジオパーク

Aso UGGp, Japan - Asia

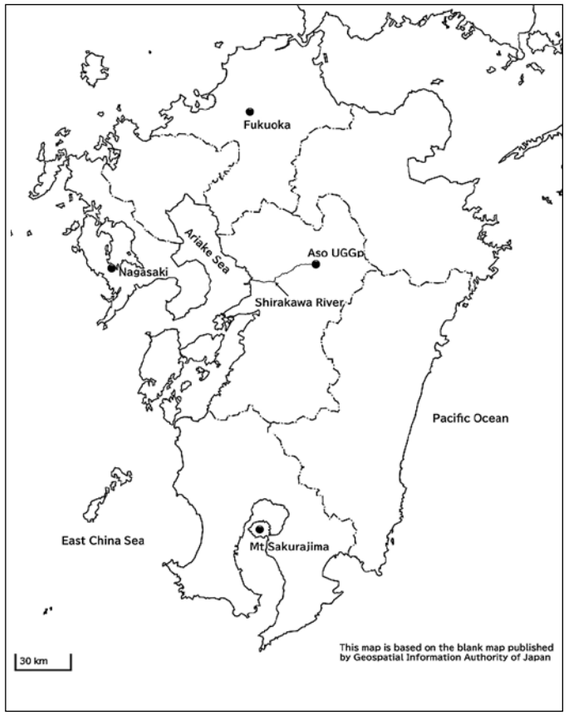
How Volcaniclastic Deposits Are Transported to the Sea

Aso Caldera.

The ocean is a place where various materials are deposited and strata are created. One of the materials that form the strata and continue to mark the history of the earth is the production of "Volcaniclastics", fragments of volcanic rocks produced by volcanoes.

Let's take a look at Aso UNESCO Global Geopark (UGGp) as an example of how volcaniclastic deposits are transported to the sea. Aso UGGp is characterized by its location in a huge caldera, located in the centre of Kyushu Island in Japan. Caldera, large volcanic craters produced by major volcanic eruptions, sometimes form lakes such as the Toba Caldera UGGp and Lake Toya-Usu UGGp. In Aso, however, the lake disappeared when the caldera wall broke creating a gorge due to fault movement. The River Shirakawa flows through the "Tateno Gorge" into the Ariake Sea . Therefore, environmental changes in the Ariake Sea are largely determined by the condition of the Shirakawa river and the rate of the sediment production.

The Ariake Sea is characterized by huge tidal flats and a rich ecosystem which includes the "Mudskipper (Boleophthalmus pectinirostris)". In recent years, however, it has been pointed out that the sand supply has been decreasing and the surface layer has become muddy. Yokose et al. (2015) studied environmental changes in the Ariake Sea over the past 100 years based on sediments, and found that the muddiness of the seafloor surface observed in the Ariake Sea can be interpreted as the product of a change in the sediment supply from rivers. It is clear from this case that even if we are located inland, we cannot be divorced from preserving the oceans.



Map of Aso.

Tateno Gorge.

Aso UGGp has been actively addressing this issue by participating in the exhibition of the 4th Asia-Pacific Water Summit held in Kumamoto City on April 23-24, 2022, making presentations to the Prime Minister of Tuvalu and the Mayor of Kumamoto about the water cycle produced by Aso, and holding discussions with students from the Youth Water Forum Kyushu. What has been particularly well received is our perspective on global issues and our awareness of the geological time scale. We will continue to leverage this strength and our network to address ocean issues.

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Hisayoshi Yokose, Noriyuki Momoshima, Kazumi Matsuoka, Yoshitaka Hase and Eiichi Honza, 2005: Environmental Assessments of Ariake Bay during the Past 100 Years Based on Marine Sediments. Journal of Geography 114(1) 1-20 2005.

Azores UGGp, Portugal - Europe

Nine islands – One Geopark in the centre of the Atlantic Ocean

Dom João de Castro Bank (seamount)

Credits: J. Fontes/ ImagDOP

In the middle of the Atlantic Ocean, the Azores is an archipelago composed of nine islands and several islets, all of volcanic origin. Nine islands – One Geopark is the motto of our UNESCO Global Geopark, involving a network of 121 geosites spread over the islands and the surrounding sea floor. These geosites have conservation strategies protecting the geodiversity which tells the story of the birth of our islands. The natural and cultural aspects associated with the archipelago are enriched by submarine areas of high relevance for scientific, educational and geotourism purposes. Of the 121 geosites, the four submarine areas include the internationally significant MidAtlantic Ridge and associated hydrothermal fields. In addition to this unique submarine geological heritage, the significant geostrategic role of the Azores as a centre for the sailing and shipping traffic between the 15th and the 17th centuries is an important component of the cultural heritage. This heritage is protected by five Archaeological Submarine Parks that protect shipwrecks from different eras and origins. These important educational and scientific tools provide tourists with opportunities for diving. The many geotouristic activities that connect the Azores to the surrounding ocean include whale-watching, swimming with sharks and giant manta rays (jamantas) and volcanic bathing areas. The geomorphological interpretation of the coast can be accessed through many of our partners. Besides promoting these sites, it is important that we consider the preservation of the marine environment and conservation of its biodiversity. The geosite Fajã Lávica da Vila do Corvo, a lava delta located in the Biosphere Reserve of Corvo Island, the smallest island in the, archipelago is a good example of marine conservation. The frontal area of this lava delta is characterized by the occurrence of several coastal lava flows. These are clearly visible underwater and constitute the famous "caneiros" do Corvo. Caneiro dos Meros *(Dusky grouper, Epinephelus marginatus)*, the only voluntary reserve in the Azores was created through the joint efforts of fishermen, divers and other contributors, who in protecting this unique environment, created an opportunity for scientific research and geotourism in the presence of gigantic groupers. Many activities promoted by Azores Geopark and its partners are concerned with coastal cleaning and interpreting the unique biodiversity associated with the coastal habitat. The Atlantic Ocean is the Azoreans backyard, an endangered backyard loaded with a natural and cultural richness that Azores Geopark is committed to protect.

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Coastal cleaning.

Interpretation.

Basque Coast UGGp, Spain - Europe

More than 100 volunteers participated in litter picking organized by the Basque Coast UNESCO Global Geopark

1,500 kilos of waste were collected and a total of 32 big boxes were filled

The litter picking event along the Deba-Zumaia cliffs.

Within the framework of the European Geoparks Week, the Basque Coast Geopark organized a litter picking event along the cliffs of the Deba-Zumaia Biotope, in the Basque Country.

To do this, volunteers from all over the territory came to Geoparkea. Groups of volunteers who participated in this event approached the cliffs from the East and from the West and filled a total of 32 large bags that were later removed by helicopter. In total, 1,500 kilos of waste were removed in ninety minutes.

The objective of this activity was to raise awareness about the environmental value of the area and to achieve the active involvement of the public through volunteering. For this reason, the Basque Coast Geopark invited citizens to participate actively in the cleanup. The main goal is to make people aware of the need to care for our natural heritage.

This was not the only activity in the Basque Coast Geopark aimed raising creating people's awareness in the natural environment. In addition, the Geopark organized a discussion at Itzurun Beach, in Zumaia, to emphasize the problem of coastal litter carried by the waves and tides. Organizations that work in waste management participated in this colloquium. Taking into account the positive response to the cleanup, the objective of the talk was to highlight the problem of waste in the marine environment. There was also time to propose solutions, among other issues., The activities carried out were discussed and the current legislation was analyzed. Each guest speaker explained what is being developed in their field of action and its effectiveness was debated.

The problem is complex and requires a collective response. We must continue to work to preserve our natural, geological and cultural heritage and that is the commitment of the Basque Coast Geopark.

Leire Barriuso, geogarapen@geogarapen.com

Participants in the discussion at Itzurun Beach.

The litter picking event along the Deba-Zumaia cliffs.

Cliffs of Fundy UGGp, Canada - N. America

Living with the World's Highest Tides

Five Islands Provincial Park, showing significant coastal erosion in the Jurassic sedimentary rocks just to the northwest (left) of the dark, basalt headland, viewed during investigations by the Nova Scotia Department of Natural Resources and Renewables and Geopark staff.

Image courtesy of Caleb Grant.

The highest tidal range in the world is recorded in the Cliffs of Fundy UNESCO Global Geopark, along the north shore of the Minas Basin in the Bay of Fundy. The natural pendulum-like resonance attributed to the length of the Bay, and its narrowing and shallowing shape, greatly amplify the height of the oceanic tide as it advances up the Bay. This phenomenon has shaped the way of life around the Bay of Fundy for millennia but, as global sea levels rise and severe weather events increase, coastal communities and ecosystems are increasingly at risk. One particular community within the Geopark is Advocate Harbour, at the mouth of the Minas Basin in Advocate Bay, bounded by the headlands of Cape d'Or and Cape Chignecto. The village is built adjacent to the upper reaches of a tidal marsh reclaimed by early Acadian settlers, who constructed dykes and converted the land for agriculture. As the sea level and tidal range have risen over the past three centuries, Advocate Harbour is now two metres above average sea level and thus several metres below high tide levels. Don Fletcher, a long-time Geopark volunteer from near Advocate Harbour, recounts a 2018 study that concluded "that if the dyke is not raised by a metre by 2030, the community would be in danger of flooding and infrastructure damage. In its last report, the Province of Nova Scotia plans to raise the dyke over the next couple of years, starting in the fall of 2022."

Coastal erosion rates within the Cliffs of Fundy Geopark are among the highest in Atlantic Canada. In Five Islands Provincial Park more than ten metres of red sandstones and mudstones, which underlie the campground and some trails, slid away over two weeks in April 2021. Average coastal erosion rates in many parts of Minas Basin are greater than 0.5 metres/year, threatening Highway 2 and other coastal roads.

The tidal currents created by the high tides funnel driftwood from coastal erosion, ocean debris and garbage into coves and harbours and onto beaches. In accordance with this year's theme for World Ocean's Day, Revitalization: Collective Action for the Oceans, the Cliffs of Fundy Geopark is partnering with the Advocate Harbour school to clean up waste that has accumulated along the beach in Cape Chignecto Provincial Park. The types and quantities of garbage collected will be tallied and submitted to the Great Canadian Shoreline Cleanup, a citizen science initiative to document the ocean waste that accumulates on Canadian shores. This is just one small piece of a larger effort to realize the goal of revitalization for our World's oceans, and the Cliffs of Fundy UNESCO Global Geopark is pleased to be part of this process.

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Volunteers and Cliffs of Fundy Geopark staff hosted a Great Canadian Shoreline Cleanup in September, 2021, at Little Dyke Beach, Nova Scotia.

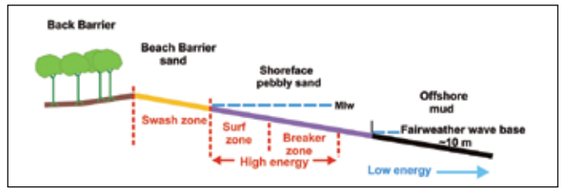
Image courtesy of TruroBuzz.

Barrier beach protecting the community of Advocate Harbour, with reclaimed marshland behind, viewed from coastal bluffs to the west.

Image courtesy of Don Fletcher.

Fforest Fawr UGGp, UK - Europe

Evidence for changing sea levels in the Carboniferous, Namurian Stage deposits of Fforest Fawr UNESCO Global Geopark



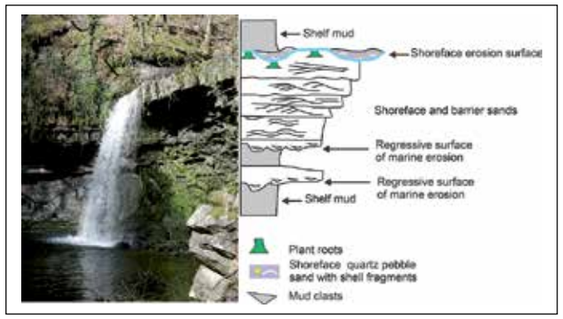
The nature of coastal environments

In Fforest Fawr UNESCO Global Geopark the Carboniferous Namurian Stage (Marros Group) sequence comprises a succession of interbedded sandstones, pebbly sandstones and mudstones. These accumulated as sediments on coastal plains, shallow shelf sea lagoons and bays which fringed the southern margin of a landmass, the Wales-Brabant Massif, between approximately 326 and 313 million years ago. Sand (sandstone) was deposited close to the shore and on coastal plains.

Muds (mudstones) were deposited in restricted lagoons and more open sea conditions to the south.

During Namurian times the area of the Geopark lay close to the equator in what is currently most of northern Europe. Then warm shallow seas were fringed by dense swampy, tropical forests. However, at this time much of the southern Gondwana Supercontinent was subjected to glaciation. In the Geopark the waxing and waning of the southern hemisphere ice sheet during interglacial and glacial intervals is reflected in the Namurian sequence by the migration of shoreline deposits in response to changes in sea level.

At the Scwd Clun Gwyn geosite a hummocky fossil soil with in situ *Stigmaria* roots is overlain by a thin carbonaceous mudstone, an upward coarsening sandstone and a mudstone. The sequence is interpreted as the product of a marine transgression and the creation of a transgressive sand body in which a rise in sea level and the flooding of the soil surface was followed by the shoreward migration of shoreface sands and the deposition of the overlying offshore marine muds.



The Twelve Foot Sandstone sequence at the Sgwd Gwladus geosite.

At the Scwd Gwladus geosite the Twelve Foot Sandstone sequence is interpreted as the product of marine regression and the creation of a regressive sand body which formed in response to a fall in sea level. The regressive surface produced by erosional scour is overlain by upward coarsening and upward shoaling shoreface and barrier sands terminating with a back barrier soil horizon with *Stigmaria* logs. A quartz pebble sand with brachiopod fragments defines a flooding event when, due to sea level rise, high energy surf and breaker zones scoured and eroded the low energy back barrier soil deposits. The scouring event was followed by the deposition of offshore deeper water marine muds.

The Namurian deposits in Fforest Fawr Geopark demonstrate the products and effects of changes in global sea level during the Carboniferous. Like their Pleistocene counterparts Carboniferous glacial and interglacial periods probably formed in response to cyclic changes in the Earth's orbit.

The author is indebted to visits to both geosites with Dr Gareth George and to the account of the Headwaters of the Fiver Neath and River Tawe in his book on the The Geology of South Wales: A field Guide published in 2008.

Dr Tony Ramsay, tonhel@btinternet.com

Evidence for sea-level change at Sgwd Clun Gwyn geosite.

Itoigawa UGGp, Japan - Asia

Reconnecting with Our Sea for the Futureq:

Sea Appreciation Project 2022

Marine Friends Project.

Situated along the Sea of Japan, Itoigawa UNESCO Global Geopark tells the story of this sea's formation and expansion, beginning roughly 20 million years ago. Since prehistor- ic times, the sea has played a central role in Itoigawa's economic and cultural development. To join the celebration of the United Nations

Decade of Ocean Science (Ocean Decade), as well as the Sea to Summit Race to be held in Itoigawa and the Joetsu Region this July organized by outdoor goods manufacturers Mont- bell, Itoigawa UNESCO Global Geopark is plan- ning the following events and activities as part of the Sea Appreciation Project 2022. This aims to help reconnect local people with the sea and better understand the issues faced by our world's seas and oceans.

Planned Projects

1. Sea Art Exhibition with Marine Friends Project

Itoigawa Geopark will collaborate with the Marine Friends Project, a local organization raising awareness about ocean conservation is- sues, to hold an exhibition of artwork made by a local artist with marine litter collected from lo- cal beaches. The exhibition will be held at Fossa Magna Museum from July 1st until August 31st.

2. Marine Litter Art Workshop

Workshops will be held to teach local residents how to make artwork using the marine litter which washes up along the shores of Itoigawa Geopark. These workshops will be held at a local elementary school and also as part of the Sea Art Exhibition.

3. GeoKayaking at Benten-Iwa Rock

Itoigawa Geopark is cooperating with a local marine sports organization to hold sea kayaking events at Benten-Iwa Rock, one of the Geopark's most popular sites. These events will combine marine sports with geoheritage interpretation

Learning to make Marine Litter Art.

GeoKayaking at Benten-Iwa Rock.

4. Zero Marine Litter Event

Events are planned at beaches throughout the Geopark to remove marine litter and use the beaches for beach yoga and other activi- ties. Through these activities participants will learn about the value of keeping our oceans and beaches clean.

5. Marine Seminar

A series of four public lectures will be held to raise awareness of issues related to our seas and oceans.

Through these events and more, we hope to reinvigorate our community's connection with the sea and reinforce our shared commitment to protecting our oceans and beaches.

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Izu Peninsula UGGp, Japan - Asia

Take the SDGs train, save the ocean:

A running gallery for connecting partners

A poster regarding deterioration of marine environment hung on the train.

"Plant a tree in a mountain and save a reef".

This statement shows that the terrestrial and marine environments are interlinked. The Izu Peninsula Geopark and Tourism Bureau launched the Sustainable Development Goals (SDGs) Train Project to showcase this linkage to the public, especially the region's teenagers.

In Izu Peninsula, many parties including the local governments, NGOs, a farmers' association, diving and kayaking guides, and even a supermarket are undertaking various initiatives to achieve the SDGs. For instance, the citizens of a town located in the upstream area of the Geopark regularly organize educational, training, and river clean-up activities to raise awareness in children of SDG 6 (Clean Water) . A farmers' association, located midstream, is diligently working to reduce the use of pesticides and chemical fertilizers and the production of plastic rubbish. In estuaries, diving instructors by removing submerged foreign objects to revitalize corals and seaweed beds contribute to SDG 14 (Life underwater). Despite their significant efforts, unfortunately, these groups are yet to have opportunities to meet and get to know each other. No tangible partnership has emerged, despite some individuals being aware of the importance of ecological connectivity between regions. The Geopark Bureau's Project is an attempt to initiate their collaboration through a series of roundtables.

In this project, a symbolic train crosses the peninsula. We introduce the programmes of each group using three to five posters hung on the

The SDGs train. A fruition of smart partnership between Izukyu Railways Ltd. and the Geopark Council.

Local geoguides regularly clean up the beaches.

side of the train. Each suit of posters contains key phrases that link a specific programme with another programme. The poster sequence is meticulously designed to create a coherent learning context for the passengers: the ecological linkage between the innermost peninsular areas and its touristic beaches, the importance of a concerted effort to mitigate negative impacts on the marine environment, and the need for systemic thinking. The mobile museum that physically connects the northern and southern parts of the peninsula, embodies the core tenet of the SDGs, namely, partnership.

Using a train to showcase SDGs has another significance. Although the Izu Peninsula is highly motorised, the passengers on local trains are mainly teenagers who do not possess driving licenses. Therefore, this mobile exhibition provides a golden opportunity for the council to deliver its message to the local youth. It is our invitation to get on the bandwagon to jointly tackle marine environmental issues.

Effective marine environment protection requires holistic measures and collaboration among citizens. We will continue to serve as a focal point to spearhead efforts that priorities marine safety in this region.

Izu Peninsula UNESCO Global Geopark, Japan
Tsuji Shyuji, info@izugeopark.org

Lanzarote and Chinijo Islands UGGp, Spain - Europe

Monitoring Underwater Geological Heritage

The work of an underwater photographer is very important in monitoring tasks.

On the occasion of the preparation of the Application to become a Geopark, the first inventory of geosites was drawn up thanks to an agreement between the Geopark and the Spanish Geological Survey. This inventory of the geological heritage determined the location of 80 geosites within the Geopark. Thirteen which are located under the waters of the Atlantic Ocean include dikes, caves, lava deltas, submerged volcanic cones, mushroom-shaped structures, lava tunnels or sandy bottoms contribute to the Geopark's geodiversity which can be explored by snorkeling and scuba diving.

Following the completion of the inventory, the Geopark has monitored the state of conservation of the 67 terrestrial geosites, on an annual basis. Thanks to this procedure, problems were detected concerning the state of conservation of these geosites which were related to human activity and also to natural processes such as coastal erosion etc. Subsequently action could be taken to try to resolve these conservation problems.

Due to the intrinsic complexity of carrying out monitoring in the underwater environment, its implementation was delayed for a few years and we finally had the first results of these audits in 2022 when some of these sites were visited. However, auditing of all the marine geosites was concluded in 2022. The team that carried out these tasks included several divers who recorded the data in a template and documented issues such as the presence of garbage, the maintenance of the integrity of the geosite, conservation status of the fauna, anthropic threats, natural threats, proposed corrective measures involving access control, cleaning, surveillance, etc. This working group also involved a photographer who took quality photographs that will be used in creating a travelling exhibition of the "Underwater treasures of the Geopark".

By way of conclusion, we dare to say that this underwater geosite monitoring initiative can be considered as an example of good practice in protecting the geodiversity and biodiversity of the ocean, since it enables the early detection of problems, the search for solutions and the execution of actions that can correct these conservation problems.

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Unfortunately, the beautiful seabed contains a large amount of garbage.

The close relationship between biodiversity and geodiversity allows the monitoring of geosites to also cover their underwater fauna and flora.

Lesvos Island UGGp, Greece - Europe

Conservation and protection of submarine fossil trees

Among the petrified trunks of the "Apolithomeni" beach stands a giant sequoia tree trunk.

Colorful parts of petrified trees are found in a wide area inside the sea.

The geological history, ancient history and the present of Lesvos Island UNESCO Global Geopark are totally connected with the marine environment. Lesvos is located in the North-eastern Aegean Sea and it is one of the biggest islands in the Mediterranean Sea. The sea and nature have been an eternal inspiration to its inhabitants, who have created art and culture and are, in using maritime resources, focusing on sustainable development in harmony with the marine and coastal ecosystem.

In western Lesvos the Lesvos Petrified Forest, which is designated as a protected «Natural Monument» is one of the finest and the most beautiful monuments of our geological heritage worldwide. Its creation was the product of intense volcanic activity during the early Miocene which covered and fossilized trees in their natural growth positions and preserved the remains of a subtropical ecosystem.

Sea tour around Nissiopi with the special glass bottomed boat.

In the marine zone of the Petrified Forest systematic researches carried out by the Natural History Museum of the Lesvos Petrified Forest have indentified five main fossil sites which serve as records of the history of the Earth and the evolution of biodiversity in the past. They also demonstrate how the Lesvos Petrified Forest provides evidence of climatic conditions and the palaeoenvironment of the Aegean region approximately 20 million years ago. Some of these submarine fossil sites contain standing petrified tree trunks while others are lying on the sea floor at a depth of 4 to 5 m. The diameters of the petrified tree trunks in the marine fossils sites ranges from 0.5 to 3 m.

Following the identification of the submarine fossil sites, the Natural History Museum of the Lesvos Petrified Forest a initiates a conservation programme for their protection. The fossils which are in immediate danger of destruction were retrieved from the sea, carefully cleaned of salt and marine organisms, preserved and displayed in the exhibition room of the Museum.

The Museum has also created the Nissiopi Marine Petrified Forest Park, the first fossil marine park in Greece where visitors can enjoy guided tours in a glass bottomed boat. They can tour the sea area around the Nissiopi islet, learn about the important fossil sites, view the benthic fauna in the seagrass meadows and spectacular volcanic, tectonic and coastal geosites of the Marine Park. The Museum also provides educational programmes for school and university students. Various guided tours and activities are also designed to raise awareness about the importance of the fossils, the need to protect them but also the current effects of global climate change. These activities aim to motivate and inspire local people and visitors, especially children and young people.

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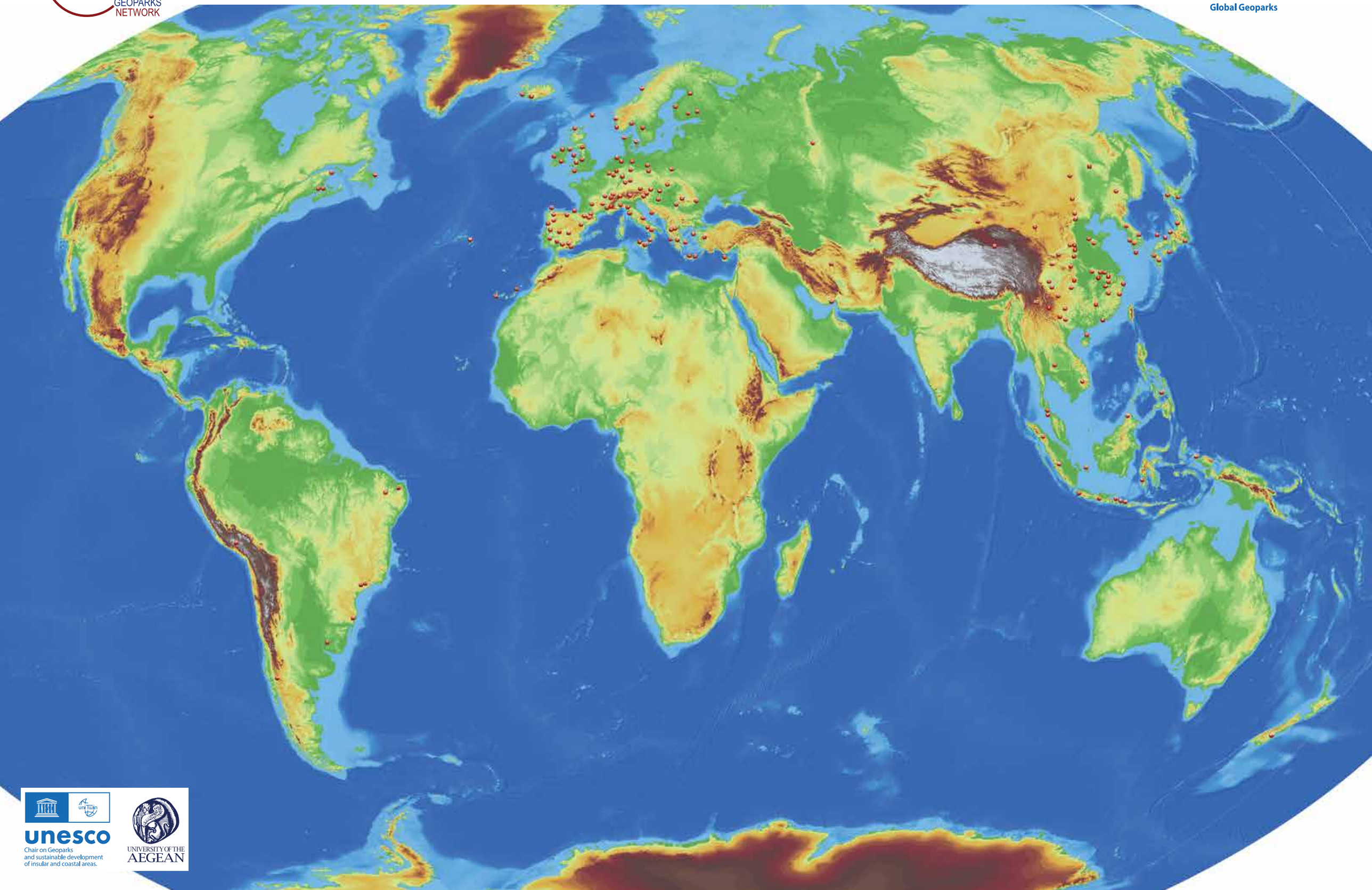
UNESCO Global Geoparks

GLOBAL GEOPARKS NETWORK

unesco
Global Geoparks



unesco
Chair on Geoparks
and sustainable development
of insular and coastal areas.

UNIVERSITY OF THE AEGEAN

List of UNESCO Global Geoparks

195 Geoparks in 48 Countries

No.	Geopark name	Country	Year
1	Lushan Geopark	China	2004
2	Wudalianchi Geopark	China	2004
3	Songshan Geopark	China	2004
4	Yuntaishan Geopark	China	2004
5	Danxiashan Geopark	China	2004
6	Shilin Geopark	China	2004
7	Zhangjiajie Geopark	China	2004
8	Huangshan Geopark	China	2004
9	Haute-Provence Geopark	France	2004
10	Lesvos island	Greece	2004
11	Vulkaneifel Geopark	Germany	2004
12	Psiloritis Natural Park	Greece	2004
13	Terra Vita Geopark	Germany	2004
14	Copper Coast	Ireland	2004
15	Cuilcagh Lakelands	N.Ireland & R.Ireland	2004
16	Madonie Natural Park	Italy	2004
17	Rocca Di Cerere Geopark	Italy	2004
18	Styrian Eisenwurzen	Austria	2004
19	Bergstrasse-Odenwald	Germany	2004
20	North Pennines AONB	England	2004
21	Luberon	France	2005
22	North West Highlands	Scotland	2005
23	Swabian Albs	Germany	2005
24	Harz Braunschweiger Land	Germany	2005
25	Xingwen National Geopark	China	2005
26	Hexigten National Geopark	China	2005
27	Yandangshan National Geopark	China	2005
28	Taining Geopark	China	2005
29	Hateg Country Dinosaur Geopark	Romania	2005
30	Beigua	Italy	2005
31	Fforest Fawr Geopark	Wales	2005
32	Bohemian Paradise Geopark	Czech Republic	2005
33	Sierras Subeticas Geopark	Spain	2006
34	Sobrarbe-Pirineos Geopark	Spain	2006
35	Caba de Gata	Spain	2006
36	Naturtejo Geopark	Portugal	2006
37	Gea-Norvegica	Norway	2006
38	Araripe Geopark	Brazil	2006
39	Fangshan Geopark	China	2006
40	Leiqiong Geopark	China	2006
41	Funiushan Geopark	China	2006
42	Wangwushan-Daimeishan Geopark	China	2006
43	Jingpohu Geopark	China	2006
44	Taishan Geopark	China	2006
45	Papuk Geopark	Croatia	2007
46	Langkawi Geopark	Malaysia	2007
47	English Riviera Geopark	England	2007
48	Longhushan Geopark	China	2008
49	Zigong Geopark	China	2007
50	Adamello Brenta Geopark	Italy	2008
51	Geo Mon	Wales	2009
52	Arouca	Portugal	2009
53	Qinling Zhongnanshan Geopark	China	2009
54	Alxa Geopark	China	2009
55	Itoigawa Geopark	Japan	2009
56	Toya Caldera and Usu Volcano Geopark	Japan	2009
57	Unzen Volcanic Area Geopark	Japan	2009
58	Shetland Geopark	Scotland	2009
59	Chelmos-Vouraikos Geopark	Greece	2009
60	Novohrad-Nograd Geopark	Hungary & Slovakia	2010
61	Magma Geopark	Norway	2010
62	Basque Coast Geopark, Pais Vasco	Spain	2010
63	Cilento, Vallo di Diano e Alburni	Italy	2010
64	Rokua Geopark	Finland	2010
65	Tuscan Mining Park, Toscana	Italy	2010
66	Vikos-Aoos Geopark	Greece	2010
67	Stonehammer Geopark	Canada	2010
68	Leye Fengshan Geopark	China	2010
69	Ningde Geopark	China	2010
70	San'in Kaigan Geopark	Japan	2010
71	Jeju island Geopark	Republic of Korea	2010
72	Dong Van Karst Plateau Geopark	Viet Nam	2010
73	Muskau Arch Geopark	Germany & Poland	2011
74	Sierra Norte de Sevilla Natural Park	Spain	2011
75	Burren and Cliffs of Moher-	R.Ireland	2011
76	Katla	Iceland	2011
77	Massif des Bauges	France	2011
78	Alpi Apuani	Italy	2011
79	Villuercas Ibores Jara	Spain	2011
80	Muroto	Japan	2011
81	Hong Kong	China	2011
82	Tianzhushan	China	2011
83	Chablais Geopark	France	2012
84	Bakony-Balaton Geopark	Hungary	2012
85	Batur Geopark	Indonesia	2012
86	Central Catalonia Geopark	Spain	2012
87	Sanqingshan	China	2012
88	Azores	Portugal	2013
89	Karavanke/Karawanken	Slovenia & Austria	2013
90	Idrija Geopark	Slovenia	2013
91	Oki islands Geopark	Japan	2013
92	Grutas del Palacio	Uruguay	2013
93	Yanqing Geopark	China	2013
94	Shennongjia Geopark	China	2013
95	De Hondsrug Geopark	Netherlands	2013
96	Sesia-Val Grande Geopark	Italy	2013
97	Kula-Salihli Geopark	Turkey	2013
98	Molina and Alto Tajo	Spain	2014
99	Ore of the Alps	Austria	2014
100	Tumbler Ridge	Canada	2014
101	Mount Kunlun	China	2014
102	Dali Mount Cangshan	China	2014
103	Odsherred	Denmark	2014
104	Monts d'Ardeche	France	2014
105	Aso Global Geopark	Japan	2014
106	M'Goun Global Geopark	Morocco	2014
107	Terras de Cavaleiros Global Geopark	Portugal	2014
108	El Hierro Global Geopark	Spain	2014
109	Dunhuang	China	2015
110	Zhijindong	China	2015
111	Troodos	Cyprus	2015
112	Sitia	Greece	2015
113	Reykjanes	Iceland	2015
114	Gunung Sewu	Indonesia	2015
115	Pallino	Italy	2015
116	Mount Apoi	Japan	2015
117	Lanzarote and Chinijo Islands	Spain	2015
118	Arxan	China	2017
119	Las Loras	Spain	2017
120	Cheongsong	Republic of Korea	2017
121	Mixteca Alta	Mexico	2017
122	Keketuohai	China	2017
123	Gausses du Quercy	France	2017
124	Qeshm Island	Iran	2017
125	Comarca Minera, Hidalgo	Mexico	2017
126	Famenne-Ardenne	Belgium	2018
127	Perce	Canada	2018
128	Guangwushan-Nuoshuihe	China	2018
129	Huanggang Dabieshan	China	2018
130	Beaujolais	France	2018
131	Izu Peninsula	Japan	2018
132	Mudeungsan Area	Republic of Korea	2018
133	Origens Geopark	Spain	2018
134	Ngorongoro Lengai	Tanzania	2018
135	Satun	Thailand	2018
136	Non nuoc Cao Bang	Viet Nam	2018
137	Ci letu h-Pala bu hanratu	Indonesia	2018
138	Rinjani Lombok	Indonesia	2018
139	Colca y Volcanes de Andagua	Peru	2019
140	Courel Mountain	Spain	2019
141	Vis Archipelago	Croatia	2019
142	Imbabura	Ecuador	2019
143	Jiuhuashan	China	2019
144	Kütralkura	Chile	2019
145	Yimengshan	China	2019
146	Trollfjell	Norway	2019
147	Cliffs of Fundy	Canada	2020
148	Discovery	Canada	2020
149	Xiangxi	China	2020
150	Zhangye	China	2020
151	Lauhanvuori-Hameenkangas	Finland	2020
152	Toba Caldera	Indonesia	2020
153	Rio Coco	Nicaragua	2020
154	Estrela	Portugal	2020
155	Hantangang river Geopark	Republic of Korea	2020
156	Yangan-Tau	Russian Federation	2020
157	Djerdap	Serbia	2020
158	Granada	Spain	2020
159	Maestrazgo	Spain	2020
160	Black Country	England UK	2020
161	Oak Nang	Viet Nam	2020
162	Holy Cross Mountains	Poland	2021
163	Thuringia Inselberg-Drei Gleichen	Germany	2021
164	Vestjylland	Denmark	2021
165	Saimaa	Finland	2021
166	Aspromonte	Italy	2021
167	Grevena Kozani	Greece	2021
168	Belitong	Indonesia	2021
169	Maiella	Italy	2021
170	Ries	Germany	2022
171	Platäbergens	Sweden	2022
172	Mëllerdall	Luxemburg	2022
173	Buzău Land	Romania	2022
174	Salpausselkä	Finland	2022
175	Kefalonia-Ithaca	Greece	2022
176	Southern Canyons Pathways	Brazil	2022
177	Seridó	Brazil	2022
178	Caçapava	Brazil	2023
179	Quarta Colonia	Brazil	2023
180	Lavreotiki	Greece	2023
181	Ijen	Indonesia	2023
182	Mares Pangkep	Indonesia	2023
183	Merangin Jambi	Indonesia	2023
184	Raja Ampat	Indonesia	2023
185	Aras	Iran	2023
186	Tabas	Iran	2023
187	Hakusan Tedorigawa	Japan	2023
188	Kinabalu	Malaysia	2023
189	Waitaki Whitestone	New Zealand	2023
190	Sunnhordland	Norway	2023
191	Bohol UNESCO	Philippines	2023
192	Jeonbuk West Coast	Republic of Korea	2023
193	Cabo Ortega	Spain	2023
194	Khorat	Thailand	2023
195	Mourne Gullion Strangford	UK & N.Ireland	2023

What is a UNESCO Global Geopark?

UNESCO Global Geoparks are single, unified geographical areas where sites and landscapes of international geological significance are managed with a holistic concept of protection, education and sustainable development.

A UNESCO Global Geopark uses its geological heritage, in connection with all other aspects of the area's natural and cultural heritage, to enhance awareness and understanding of key issues facing society, such as using our earth's resources sustainably, mitigating the effects of climate change and reducing natural disasters-related risks.

By raising awareness of the importance of the area's geological heritage in history and society today, UNESCO Global Geoparks give local people a sense of pride in their region and strengthen their identification with the area.

The creation of innovative local enterprises, new jobs and high quality training courses is stimulated as new sources of revenue are generated through geotourism, while the geological resources of the area are protected.

At present, there are 195 UNESCO Global Geoparks in 48 countries.

All the UNESCO Global Geoparks are institutional members of the Global Geoparks Network.

Global Geoparks Network

The Global Geoparks Network (GGN) is a non-profit and a non-governmental organisation. It was initially founded in 2004 as an international partnership developed under the umbrella of UNESCO, and was officially registered as an association in 2014 subjecting to French law. The Global Geoparks Network is the official partner of UNESCO for the operation of the UNESCO Global Geoparks.

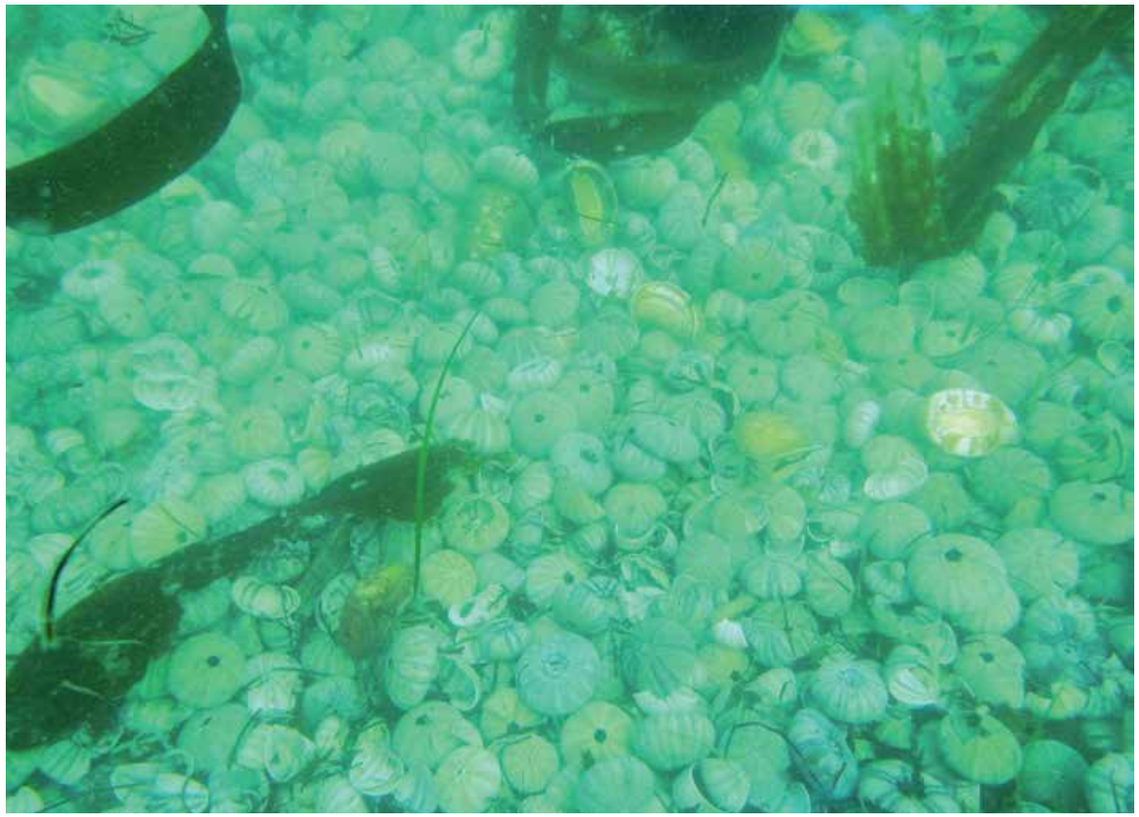
Networking and collaboration among Global Geoparks is an important component of the Global Geoparks Network.

The four GGN Regional Geoparks Networks are the Asia Pacific Geoparks Network (APGN), the European Geoparks Network (EGN), the Latin America and Caribbean Geoparks Network (GeoLAC) and the African UNESCO Global Geoparks Network (AUGGN).

www.globalgeoparksnetwork.org
www.visitgeoparks.org

Mt. Apoi UGGp, Japan - Asia

Underwater Images Before and After a Red Tide



September 28, 2021. Remains of deceased sea urchin along Samani's ocean floor.

Red Tide Event in 2021

At the end of September 2021, a widespread red tide event, which decimated marine life, occurred along the Pacific Ocean coastline of eastern Hokkaido, where the Geopark is located. According to research institutes in Hokkaido, the species of the genus *Karenia (K. mikimotoi and K. selliformis)*, a marine dinoflagellate, was detected in parts of the red tide plankton. Along the Samani coastline, many dead sea urchins and sea whelks were discovered, and it is predicted that some marine life will take approximately 7-10 years to fully recover, creating a very grave situation (2021 Samani Area Marine Vision News). Mt. Apoi Geopark continues to report updated information.

Images Before the Red Tide

A local Hidaka kelp fisherman once said, "kelp grows due to photosynthesis under the rolling waves, creating its own marine ecosystem." In order to better understand these words, we took underwater footage in 2019 and held a movie screening for the local community. This started an open dialogue between locals who knew about kelp fishing and those who did not, and those who knew little about the ocean floor topography, sediment, and marine life. We heard many voices that day, including locals that hope the abundant ocean life will continue for many years to come. We hope to continue to educate and inform our community about the importance of the ocean's ecosystems.

Kelp at Fuyushima district in Samani, Hokkaido.

Satomi Kato, apoi.gvc@iris.ocn.ne.jp

Underwater footage, "Samani's Kelp and Ocean Life" https://www.youtube.com/watch?v=ssfVEescaQ0

Underwater footage, "Samani's Kelp and Ocean Life" https://www.youtube.com/watch?v=ssfVEescaQ0

Muroto UGGp, Japan - Asia

Sustainable Fishery and Local Development in Muroto UNESCO Global Geopark

Fish caught by fixed-net.

On a fishing boat.

Muroto UNESCO Global Geopark which covers the whole administrative area of Muroto Ciy, Kochi Prefecture in Shikoku Island is located in southwest Japan. Since the Muroto Peninsula faces the Pacific Ocean, local residents have lived in harmony with the ocean and accepted its blessings.

Fixed-net fishery, a local traditional industry has established Muroto's economic base. The historical record shows that it started in the late 1700s and thrived in the middle of the 1800s. The western part of Muroto Peninsula has a very unique underwater topography: only 2 to 3km away from the land, and suddenly falls to depths of 700 to 1000-metres. Therefore, a very steep cliff has formed in the ocean. Thanks to the underwater topography, nutrient rich deep-sea water upwells to the surface and provides a rich fishing ground very close to the land.

A large fixed-net, approximately 500-metres long and 90-metres wide, is set on the ocean. Three fishing boats are used to hold the big fishing net with a wide mesh designed to avoid catching young fish and to ensure environmental sustainability. This is why the fishery has thrived in Muroto since the 1700s and still maintains rich fishing grounds. Today, there are four fishing ports engaging in fixed-net fishing in Muroto. Locals at each port usually say that they work very hard to maintain the fishery for the town's sustainable development.

A local fisherman, Mr. Takuya MATSUO started his geo-cruise tour in 2018 by using his own fishing boat (max. capacity: 12). He takes a cruise with passengers to the area where the fixed-net is set and explains how local residents utilize the local natural environment for the sustainable management of the fishery. He also works to conserve Muroto's rich marine ecosystem and biodiversity. Muroto UGGp collaborates with him to organize a special class on the marine ecosystem at a local high school. This involves photographing the deep-sea world environment with an underwater drone and streaming a live video to the high school class. Several deep-sea animals were caught on the video and Mr. Matsuo explains about these animals and Muroto's rich marine ecosystem. The videos recorded by the underwater drone sometimes find illegally dumped garbage in the ocean. Mr. Matsuo uploads those videos on his YouTube channel and shows us this urgent issue which we we should deal with to protect the ocean environment which is literally the basis of our lives in Muroto (https://www.youtube.com/watch?v=ubCrde5b40I). Muroto UGGp works with him to hold events and school classes on the natural environment protection to raise awareness in the local inhabitants.

Geo-cruise tour.

Live-streaming class at high school.

Deep-sea fish taken by underwater drone

Tsubasa Ogasawara, tsubasa@muroto-geo.jp

Oki Islands UGGp, Japan - Asia

Marine Environment Conservation: Initiatives to Continue into Future Generations

The Oki Islands, located in the Sea of Japan, consist of four inhabited and around 180 uninhabited islands. Marine life and the fisheries industry are central to the way of life of the people. In consideration of this, the Geopark includes a marine area extending 1 km from the coastline.

Issues related to the marine environment, especially marine litter, have long been acknowledged as a problem by the residents and the local government, resulting in many coastal clean-up events. To commemorate the designation of the Oki Islands as a UNESCO Global Geopark (UGGp), the day of the designation (9th September) became known as "Geopark Day." On that day, coastal and street clean-up events used to be held in numerous areas, but in recent years we have seen a decline in the number of events. However, thanks to our many partners, we are now experiencing an increase in marine conservation activities.

In 2013, the Geopark introduced a teaching programme in the local Shimane Prefectural Oki High School, which resulted in many Geopark-related activities. Starting from 2019, the school has implemented coastal clean-up activities to raise awareness about marine environment conservation as a part of their education about the UN's Sustainable Development Goals (SDGs).

In August 2020, a loggerhead sea turtle was found washed ashore on one of the islands in a weakened state entangled in marine trash. Its right forelimb was tangled in trash, causing necrosis and making the removal of the limb necessary. This sea turtle was named "Ribu," which is the Japanese transcription of the word "live." Thanks to the cooperation of many people, the turtle was brought back to health in an aquarium, and in 2021 it was transported back to the Oki Islands and returned to the sea. The story of the sea turtle is being used in local schools and preschools to introduce children and their parents to environmental issues, bringing awareness to age groups which until now were not involved in marine conservation.

Ribu, the sea turtle.

2021 marked the start of the United Nations Decade of Ocean Science for Sustainable Development. Consequently, the Japanese Geoparks Network (JGN) has initiated activities, including a kick-off event held in the Oki Islands UGGp in November 2021. During the event, a Declaration of JGN Initiatives for the United Nations Decade of Ocean Science for Sustainable Development was made jointly by local high school students and the president of the JGN.

Following this, the Oki Islands plan to organise a youth symposium in 2023, and continue to work on passing on the introduced initiatives to future generations, and also other geoparks in the Global Geoparks Network through the GGN Working Group on Island and Coastal Areas, Water/Oceans.

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High School Coastal Clean-up Event.

Declaration of JGN Initiatives for the United Nations Decade of Ocean Science for Sustainable Development.

San'in Kaigan UGGp, Japan - Asia

Diverse features of geology, topography, climate and people's lives related to the formation of the Sea of Japan

Kumihama Bay (Kyotango City).

Extending widely from Kyoto Prefecture (Kyotango City) to Hyogo Prefecture (Toyooka City, Kami Town, and Shin'onsen Town), to Tottori Prefecture (Iwami Town and Tottori City) and largely overlapping with San' in Kaigan National Park, the San'in Kaigan Geopark lies about 120 km east-west from the eastern boundary of Kyotango City to the western boundary of Tottori City. With an area 2,458.44 km^2, the Geopark is a little larger than the Tokyo metropolitan area.

The Geopark's diverse geological features and topography are associated with the history of the Sea of Japan from its formation approximately 28 – 18 million years ago to the present day. In the Geopark you can experience events in the biological heritage, lives, culture and history of the people.

One of the outstanding characteristics of the San'in Kaigan Geopark is that it contains many valuable geological and geomorphological features. These include igneous rocks and geological formations, formally a part of the Eurasian continent, and features related to the formation of the Sea of Japan. The diverse coastal terrains, such as the ria coast and sand dunes formed in response to sea-level change and tectonic movements in the Sea of Japan.

Since ancient times, people have inhabited the Geopark area, and we can still observe the culture and history that they developed within its diverse natural surroundings. Making the best of these advantages, the San'in Kaigan Geopark is conducting activities that will lead to the conservation of the natural heritage and regional revitalization through local geotourism.

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Uradome Kaigan Coast (Iwami Town).

Tottori Sand Dunes (Tottori City).

Southern Canyons Pathways UGGp, Brazil - L. America

Geopark Southern Canyons Pathways:

From the top of the mountains to the bottom of the ocean

Fortaleza Canyon, one of the most visited areas of the Global Geopark Southern Canyons Pathways. Priscila Ventura Gamba.

Southern right whale in front of the mountains of the Global Geopark Southern Canyons Pathways. Rodrigo Baleia.

The UNESCO Global Geopark Southern Can yons Pathways (GGSCP) is located in south ern Brazil. It comprises seven counties in the states of Rio Grande do Sul and Santa Cata rina and covers an area of 2,830.8 km². The GGSCP is part of the Serra Geral plateau and its to-pography is formed by a long and mean dering escarpment that defines two zones: the plateau and the coastal plain, with a 1,000 m difference in altitude, in which less than 50 km separates the plateau from the sea. A vigor ous process of erosion has been working over time, sculpting successions of deep and beauti ful canyons, filled with waterfalls and natural pools. Its geological history is related to the complete break-up of the Gondwana Supercon tinent resulting in the up-lift of the east-side of the newly-created South American Continent and the creation of the Ser-ra Geral Formation. This escarpment presents the most expressive features of GGSCP, with several canyons controlled by primary basement structures. The regressive erosion left a residual relief, including basaltic islands, such as "Ilha dos Lobos", a marine protected area and the first marine geosite in Latin America. The rela-tion ship between the age of the rock sequences represents an important event in Earth history. Besides this amazing landscape, the GGSCP has a luxurious vegetation mix which is associated with the Atlantic Forest biome. This ecoregion which is considered as one of the world's rich-est areas of biodiversity includes the dense and mixed Ombrophilous forests, with the magnifi-cent occurrence of the Brazil ian pine tree (Arau-caria angustifolia). Moreover, the local fauna is also very rich, including endangered species such as the cougar (Puma concolor). However, the GGSCP's connection with the ocean is the char-acteristic that makes this Geopark truly special and a unique place in the world. Its coastal zone completes the diver sity and exuberance of this territory, including lagoon complexes interacting with dunefields, sandy beaches, and an estuarine zone, where an important artisanal fishery com-munity is lo cated. From the cliffs at the coast of the Atlantic Ocean it is possible to appreciate the presence of marine species, such as the resident populations of Lahille's bottlenose dolphins *(Tur-siops truncatus gephyreus)* and the southern right whales *(Eubalaena australis)* during its calving season. The beautiful seascape also includes the rocky island of the Wildlife Refuge of Ilha dos Lobos (WRIL) (Fig. 3), which is the northernmost resting site for South American sea lions and fur seals *(Otaria flavecens and Arctocephalus Arc-tocephalus australis, South American fur seal)* in the western South Atlantic. Therefore, the land-scape history and biodiversity of our planet in this Geopark can be recognized and valued from the mountain tops to the bottom of the ocean.

Wildlife Refuge of Ilha dos Lobos (WRIL), the first marine geosite in Latin America. Natália Procksch.

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Swabian Alb UGGp, Germany - Europe

Traces of the Jurassic Sea and its many inhabitants

Merkle quarry in Gerhausen, Swabian Alb Geopark, with reef structures and banked limestone .

(photo: Sandra Teuber).

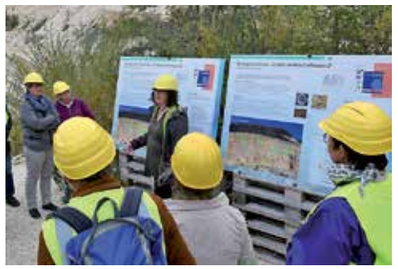
Today's landscape of the Swabian Alb is far from the ocean. However, in the Swabian Alb Geopark, one experiences the former Juras-sic seafloor. The entire escarpment of the Swa-bian Alb was formed 201-145 million years ago, when a tropical sea covered most of today's Central Europe. This marine ecosystem was home to ammonites, belemnites, ichthyosaurs, sponges and corals. The biodiversity of the past is visible throughout the Geopark. It can be ex-perienced in museums and through the project „A Tour through Earth History", which classifies specific geotopes as Geopoints that tell the sto-ry of the Swabian Alb.

One Geopoint, the "Jurassic Window Gerhau-sen 2" (Fig. 1) is located within a quarry. Two signs explain in German and English what the visitor can see (Fig.2). They contain a picture of the quarry wall where color-coding was used to illustrate the different structures. While it is easy for trained geo-scientists and geologically inter-ested laymen to identify the different structures, tourists and inhabitants often have trouble with this. Thus, by using a simple colour-scheme on a picture of the landscape, the Geopark tries to encourage people to engage with the landscape and learn more about its past. They can do this on a self-guided excursion, as the Geopoint within the quarry is open to the public through-out the year. This is a prerequisite for geotopes to become Geopoints. They have to be avail-able to the public and need to have an adequate infrastructure, e.g. a proper trail. Furthermore, the community in which the Geopoint is located needs to support the project "A Tour through Earth History" to prevent inhabitants getting tired of tourists visiting the Geopoint.

On the quarry wall – and on the sign – one can identify reefs and banked limestone. The reefs were built by different species of sponges and microbial mats and were home to mussels and brachiopods. One sponge, Spumispongia merk-lei, was first identified in this quarry and now carries the name of its late owner, as the sci-entists of the University of Erlangen wanted to honour Mr. Merkle for supporting their research. His successor supports education and offered the Geopark to make this geotope available to the public by keeping the quarry wall intact for the next decade.

The Geopoint shows that the Jurassic sea, like todays oceans, was a place full of life. However, today we face the threat of biodiversity loss due to overfishing and pollution. Thus, looking into the past may show humanity that we only exist for a short moment in time and need to reflect on our actions to provide a future for other spe-cies but also for ourselves.

Geopark sign with the standardized Geopoint-logo in the top right corner and explanations in German (left) and English (right). The picture in the bottom left corner of each sign shows the wall as it is visible to tourists and inhabitants (see figure 1), where the different geological structures have been color coded and are explained in the legend.



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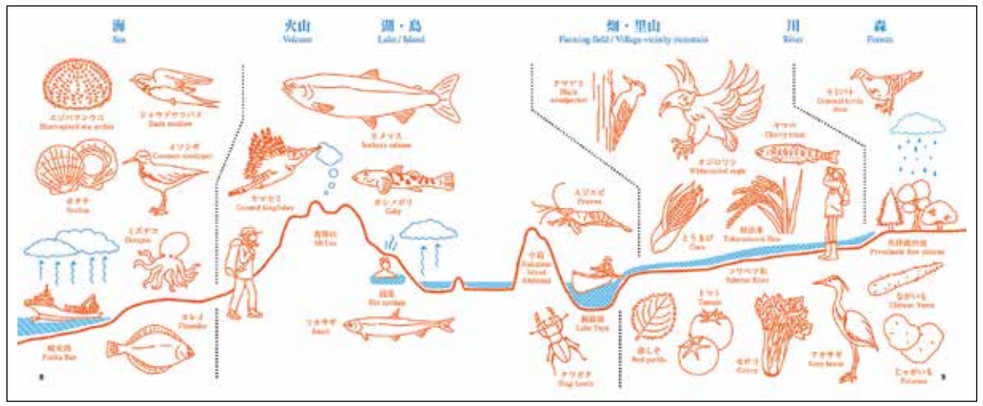
Toya - Usu UGGp, Japan - Asia

Published information used to promote the aquatic environment and the need for the sustainable use of water resources in the Toya-Usu UNESCO Global Geopark



Water Supports Life

Toya-Usu UNESCO Global Geopark is located in Hokkaido, northern Japan. The rain falling on Toya Caldera waters the forests, becomes nutrient-rich, and flows into Lake Toya and Funka Bay via the lake's in-and outflowrivers . The water in the lake and the sea evaporates, and returns falling as rain in the Toya Caldera. The water's journey through the hydrological cycle brings various blessings to creatures and, enriches our daily lives.

Photo: **Naoki Iimu**

A journey of life that returns to "mother water"

Roughly 40 rivers flow into Lake Toya. The foremost in -and outflow river, the Sobetsu river, is the spawning ground for cherry salmon. The life cycle of the cherry salmon is divided into freshwater and marine stages in which salmon that have grown up in Lake Toya move from the freshwater to feeding grounds in the sea. The adult salmon rely on the scent of the Sobetsu river in their migration from the sea to their home river where they spawn.

Water Supports Life (2020).

Troodos UGGp, Cyprus - Europe

Troodos Geopark is the most convincing evidence for the pre-existence of an ancient ocean within the Mediterranean Sea

Touristic Map of Troodos UGGp.

It is well known amongst geoscientists that the Mediterranean Sea is the remnant of an ocean basin called Neotethys which formed during the late Carboniferous to late early Permian, approximately 300 to 270 million years ago. Neotethys occupied an area equivalent to the distance from modern day Australia to the eastern Mediterranean area. The closure of this ocean began some 155 million years ago shortly after the beginning of the major break-up of the continent of Pangea. The present configuration of the Mediterranean Sea has been shaped by the convergence of the African and Arabian Plates with the Eurasian Plate and the final collision of the Arabian Plate with the Eurasian Plate sometime within the Early to Middle Miocene epoch approximately 23 to 15 million years ago.

The Troodos UNESCO Global Geopark, which is located in the heart of the island of Cyprus (Fig.1), hosts the world-renowned Troodos Ophiolite Complex (TOC), which is recognized by the scientific community as a fully developed fragment of oceanic crust and the Earth's upper mantle. The TOC formed approximately 92-82 million years ago in the depths of the Neotethys Ocean during the northward movement of the African plate towards the Eurasian plate in response to the opening of the South Atlantic Ocean. The stratigraphic ally complete well preserved and well-exposed plutonic, intrusive, volcanic rocks and chemical sediments were created in a supra-subduction zone up to 30 kilometers below the ocean seafloor spreading axis. Today, due to the subsequent collision of the two plates, it is located up to 2 kilometers above sea level. Consequently Cyprus serves as a geological model for the better understanding of the evolution of the oceans and our planet in general.

Spectacular exposure of the Lower Pillow Lavas at the Maroullena river.

Sulphide deposits at the Alestos abandoned mine.

Closely associated with the TOC are mineral deposits such as chromite, asbestos, massive sulphide deposits, ochre and umber, which have played a significant role through the centuries in the economic and social development of the island and also in Cyprus's cultural and archaeological heritage. The sulphide deposits have contributed significantly to understanding of the processes in their genesis. Today the sulphide deposits which form in black smokers along the seafloor spreading centres of the Atlantic, Pacific and Indian Oceans are recognized as "Cyprus-type" deposits.

Visitors have an opportunity to discover in the forested Troodos Mountain an outstanding fragment of the Earth's oceanic crust and upper mantle and the unique geological and mining history associated with its rocks and minerals.

Undoubtedly, the genesis of the island of Cyprus is directly related to the genesis and uplift of the TOC and it is the most convincing evidence for the pre-existence of an ancient ocean in the broader area of the easternmost part of the Mediterranean Sea.

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Unzen UGGp, Japan - Asia

Unzen Volcanic Area UNESCO Global Geopark: Local Initiatives to Improve the Marine Environment

Sea of Ariake beyond Mt. Heisei-Shinzan

The Unzen Volcanic Area Geopark, with the Unzen Volcano at its centre and the Sea of Ariake along its eastern coast, is located on the Shimabara Peninsula.

The lives of people in the Geopark have benefited considerably from the fertile land and the rich marine resources, and the fishery has been one of the main industries in this region. However, fish catches have declined during the last 50 years. In order to restore the fertility of the Sea of Ariake, the local fishery associations have undertaken various projects to improve the marine environment. These include protecting and ensuring the recovery of a seagrass meadow and by using seabed tilling to stir-up the seabed deposits and stimulate the growth of plankton.

In 2021, they launched new initiatives to grow oysters, clams and brown seaweeds, which would contribute to improving the quality of the sea water.

Local municipalities and residents have also been working to improve the quality of the marine environment. Their actions include supporting effluent purification measures and afforestation programmes to protect the quality groundwater flowing into the sea.

Mari Takano, info@unzen-geopark.jp

Sea of Ariake seen from Mt. Unzen-Fugendake

Villuercas Ibores Jara UGGp, Spain - Europe

The Rheic Ocean in the Villuercas - Ibores - Jara Unesco Global Geopark:

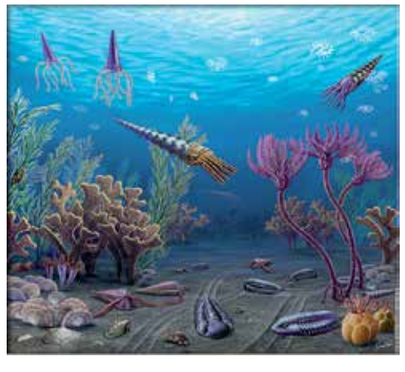
An ancient sea at an altitude of 1,600 meters

Explaining Cruziana Prof. Teodoro Palacios explaining Cruziana trace fossil.

Sands of the Rheic Ocean Interpretive panel on the top of La Villuerca peak (1,600 m. high).

The Rheic Ocean, which existed from late Cambrian–Early Ordovician (497–470 million years) times, with a width of more than 4,000 km was one of the most important oceans during the Palaeozoic. The ocean closed during the late Palaeozoic collision of Gondwana and Laurussia 350 million years ago resulting in the creation of the supercontinent Pangea.

The development of the Rheic Ocean is recorded in the rock succession of the Villuercas-Ibores-Jara UNESCO Global Geopark (a non-coastal Geopark), Extremadura, Spain. Initially sedimentation consisted mainly of fluvial and marginal marine deposits, with abundant Skolithos. Fully marine conditions were developed during the deposition of the Armorican Quartzite Formation, which is rich in sedimentary structures created by storms, tides and biological activity evidenced by abundant trace fossils, particularly Cruziana, Daedalus and Skolithos. The expansion of the Rheic Ocean gave rise to extensive platforms with fine-grained terrigenous sediments yielding a rich record of trilobites, brachiopods, graptolites and other fossils bearing witness to the Great Ordovician Biodiversification. At the end of the Ordovician, the area of the Geopark was located close to the South Pole, where global cooling, resulting in the formation of continental ice sheets, is represented in the Geopark by the occurrence of poorly sorted sediments of glacial origin (diamictites). This climatic change resulted in the extinction of approximately 60% of the Earth's marine genera. Global warming and the disappearance of continental ice sheets during the Silurian Period and the associated rapid rise in sea level resulted in the deposition of distal platform anoxic black shale containing abundant planktic graptolites, followed by a regressive sequence consisting of alternations of shale and sandstone. Younger Palaeozoic rocks are not represented within the Geopark.



Ordovician sea Graphic of Antonio Grajera illustrating an Ordovician marine environment .

Uplift, folding and erosion of the rock succession that had been deposited in the Rheic Ocean resulted in the formation of the Geopark's characteristic Appalachian relief, supported by the resistant Armorican Quartzite. This is the best example of one of the frameworks included in the list of Spanish geological frameworks of international significance.This impressive geological heritage, together with the related natural and cultural heritage, is used by the Geopark to explain to inhabitants and tourists the geological history of the territory, and by extension, of our planet: How that ocean closed and became a mountain range. How geological, physical and chemical processes return those sands to us. How life evolved and almost became extinct. How the formation of the relief determined the location of the villages in the territory. The way fossilized galleries become legends... All this and much more is explained through publications, workshops, games, training for companies, interpretation centres, panels on itineraries and geosites, etc.

Bringing the Rheic Ocean back to life, with all its stories, is also a way of making people aware of current problems such as climate change, loss of biodiversity and the destruction of heritage. This ocean has become an educational tool at all levels, a conservation measure and a driver of sustainable development for the Geopark.

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GLOBAL GEOPARKS NETWORK

unesco Global Geoparks

Useful information related to UNESCO Global Geoparks can be found on the following websites:

http://www.unesco.org/new/en/natural-sciences/environment/earth-sciences/unesco-global-geoparks

http://www.globalgeoparksnetwork.org

www.visitgeoparks.org

World Oceans Day

8 June