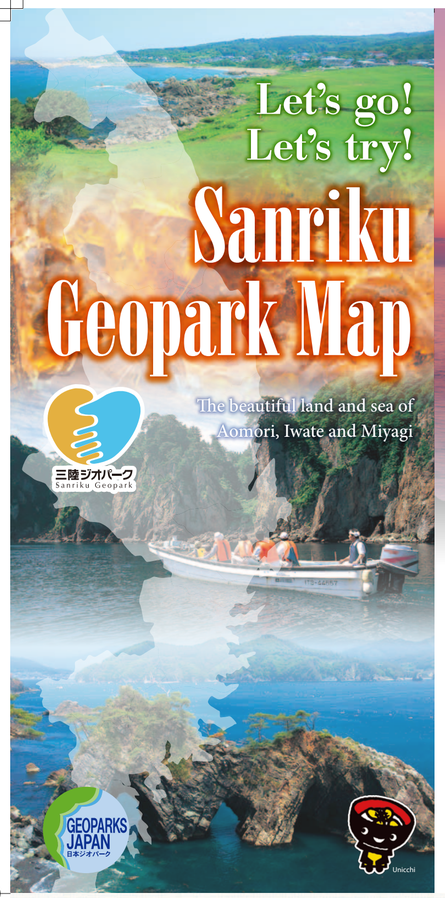


Living together with the land and sea of Sanriku

A Geopark is an outdoor museum where you can experience living as a human in symbiosis with nature's combination of bountifulness and harshness

Sanriku, facing the Japan Trench, where the Pacific tectonic plate subducts, is an important area because, as the so called origin point of the Japanese archipelago, it contains a continuous record of the 500 million years of the land.

Also, it is a region that has experienced several historically notable strong earthquakes and the resulting tidal waves, including the Tohoku Earthquake and Tsunami in March 2011 (the 3.11 Disaster). It is our mission to communicate to future generations about the activities of previous generations in face of these natural disasters, and our experiences of the 3.11 disaster.

In 2013, the Sanriku Geopark received certification from the Japan Geoparks Network as a learning center to teach future generations about the history of the Earth and to pass down the memories of the area's natural disasters.

We wish to love, protect and ultimately live in harmony with Sanriku's land and ocean waters.

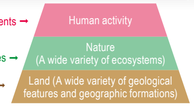
Karakuwa Peninsula Oreishi MAP:3-K

What's required of a Geopark

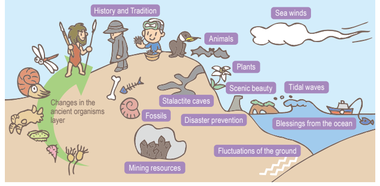
A Geopark features not only amazing geological sights, but it also must engage in activities to help local residents nurture an understanding of the animals and plants that live on the land, the climate and natural features, as well as the history and culture of the people who share that land.

Hayachine-usuyukiso (Leontopodium hayachinense)

The Geopark philosophy



The climate of Sanriku is strongly associated with the history of the land.



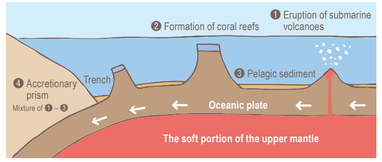
How was Sanriku created?

1 A long time ago, Sanriku was actually at the bottom of the sea!

The land of Sanriku traces its long history back to about 500 million years ago when it was formed, but it was almost entirely created at the bottom of the sea.

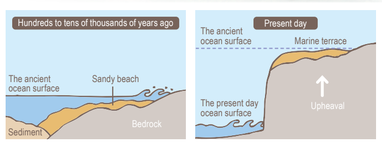
Fossilized coral, ammonites and sea lilies that can be found in limestone and sandstone are organisms that lived in the sea. Almost all of the sand, mud and the rocks created from materials ejected by submarine volcanoes, accumulated in the ocean.

The rocks that were create on the ocean floor appeared on the ground due to changes in the Earth's crust and plate movements.



2 How were the marine terraces formed?

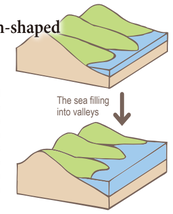
Marine terraces are formed when a flat area is created on the ocean bottom by the erosion action of waves, after which they appear on land due to upheavals and a lowering of the ocean level. The marine terraces created hundreds to tens of thousands of years ago can be seen throughout the Sanriku coast, and these risen flat areas have been used for cattle farming and other purposes.



Kitayamazaki MAP:4-E

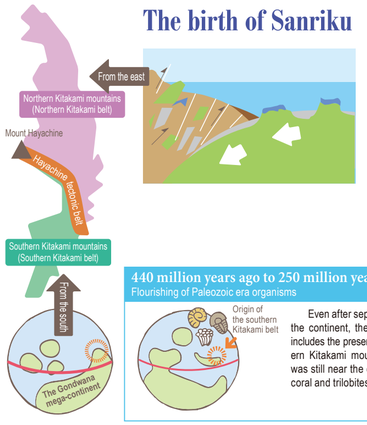
3 How were the sawtooth-shaped (also known as 'rias') coastlines formed?

After the glacial period, the ocean level rose, and when the valleys of the land were flooded, they formed the sawtooth (rias) coastlines. These are often seen in the southern part of Sanriku, and although land formations with many capes and inlets can increase the height of tidal waves, the area inside calm bays is suitable for the aquaculture cultivation of oysters and other shellfish.



Yamada Bay MAP:4-H

The birth of Sanriku



1 The southern Kitakami mountains used to be near the equator

The Kitakami mountain area is divided into north and south in the Mount Hayachine area, and the formation of the land in each area is very different.

About 400 million years ago, the southern part of the Kitakami mountains were part of the Gondwana continent which was located near the present day equator, and after they separated from the continent, they were carried north by plate movement.

2 The northern Kitakami mountains were created by a mixture of oceanic accumulations

About 320 to 140 million years ago, the northern part of the Kitakami mountains were formed when the accumulation on the deep ocean floor and submarine mountains were moved by the plates on which they rested, which was then pushed up against the continent's land from about 180 million years ago and then became part of it. In this way, geological formations comprising a complex mixture of material accumulated in the sea from various locations and depths were formed.

3 The variety of landscapes created by magma activity

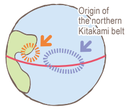
The northern and southern geological formations which were created in totally different environments met about 110 million years ago due to the movement of the tectonic plates.

After that, the beautiful landscapes that define Sanriku, such as the Tanesashi Coast (Map:3-A), the Kosode Coast (Map:4-D) and Jodogahama Beach (Map:4-G), were born from the rocks created by large-scale magma activity.

440 million years ago to 250 million years ago
Flourishing of Paleozoic era organisms

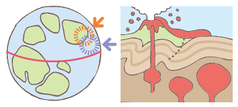
Even after separating from the continent, the region that includes the present-day southern Kitakami mountain range was still near the equator, and coral and trilobites flourished.

320 million years ago to 140 million years ago
Movement of the oceanic plates



In the ocean on the opposite side of the continent, a wide variety of marine sediment had accumulated on the ocean floor and was transported by movements in the oceanic plates.

140 million years ago to 120 million years ago
The land changes violently as north and south meet



The current formation of north and south Kitakami belts is nearly completed. At the time, it was at the eastern edge of the Asian continent. Magma was very active across the entire Kitakami mountain range.

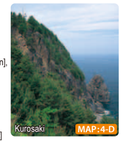
History of the land of Sanriku

(Note) Major events in the history of the Earth
● Main geosites

Cenozoic Era

Quaternary Period

From 2.59 million years ago
Homosapiens appear
- ● **Stalactite caves…Uchimagido Cave** [Kuji City], **Rokando Cave** [Sumita Town]
- ● **Marine terraces… Ono kaiseidankyu (Ono coastal terrace)** [Hirono Town], **Kurosaki** [Fudai Village]
- ● **Sawtooth coastline…Yamada Bay** [Yamada Town], **Namita Coast** [Otsuchi Town]
- ● **Singing sand…**[Hachinohe City], **Kukunakihama** [Kesennuma City],
- ● **Shiofukiana (Tide spouting hole)…**[Miyako City], **Shiofukiwa (Tide spouting rocks)** [Kesennuma City]


Kurosaki MAP:4-D

Neogene Period

23 million years ago to 2.59 million years ago
Formation of the Japanese archipelago, the birth of humanity

Paleogene Period

66 million years ago to 23 million years ago
Mammals flourish
- ● **Jodogahama…**[Miyako City]

Jodogahama MAP:4-G

Mesozoic Era

Cretaceous Period

145 million years ago to 66 million years ago
Angiospermous plants flourish
- ● **Amber…**[Kuji City]
- ● **Haipe and Koikorobe (unique rock outcroppings)…**[Tanohata Village]
- ● **Moshiryu fossil site…**[Iwaizumi Town]
- ● **Horajima Island…**[Otsuchi Town]
- ● **Granodiorite…**[Hashikami Town]
- ● **Mining resources… Remains of molybdenum mine** [Kuji City], **Remains of the Noda Tamagawa Mine** [Noda Village], **Kamaishi Mine** [Kamaishi City], **Remains of the Otani Mine & Shishiori gold mine** [Kesennuma City]
- ● **Anatoshi-iso (pierced rocks)…**[Ofunato City]
- ● **Site of Omoto plant fossils…**[Iwaizumi Town]
- ● **Kabushima Island…**[Hachinohe City]

Mount Plastikamidake MAP:3-B

Jurassic Period

201 million years ago to 145 million years ago
Giant dinosaurs flourish, avian species appear
- ● **Haratai intermingled rocks…**[Miyako City]
- ● **Toyomane River chert clastic rock sequence…** [Yamada Town]

Toyomane River MAP:4-H

Triassic Period

252 million years ago to 201 million years ago
Age of the dinosaurs begins, mammals appear
- ● **Pillow lava & slickenside rocks…**[Kuji City]
- ● **Misaki…**[Kesennuma City]

Misaki MAP:3-K

Paleozoic Era

Permian Period

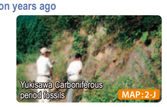
299 million years ago to 252 million years ago
Birth of the Pangaea mega-continent
- ● **P-T boundary layer…**[Iwaizumi Town]
- ● **Ogama and Oreishi, Hanzo, Dairiseki Coast…**[Kesennuma City]
- ● **Site of Permian period fossils… Yahagi Town** [Rikuzentakata City], **Iwaisaki** [Kesennuma City]

P-T boundary layer MAP:3-D

Karakuwa Peninsula Oreishi MAP:3-K

Carboniferous Period

359 million years ago to 299 million years ago
Plants flourish, reptiles appear
- ● **Site of Yukisawa Carboniferous period fossils…**[Rikuzentakata City]


Yukisawa Carboniferous period fossils MAP:2-J

Devonian Period

419 million years ago to 359 million years ago
Amphibians appear
- ● **Site of Senjogataki Lepidodendron (scale trees) fossils…**[Kamaishi City]
- ● **Paleozoic outcropping along the Omori forest road**

Senjogataki Lepidodendron (scale trees) fossils MAP:3-I

Silurian Period

443 million years ago to 419 million years ago
Insects and plants move to dry land
Fish with jaws appear
- ● **Paleozoic outcropping along the Omori forest road…**[Ofunato City]
- ● **Site of the Higuchizawa Gotlandian fossils…**[Ofunato City]

Higuchizawa MAP:3-J

Ordovician Period

485 million years ago to 443 million years ago
Aquatic life appears
- ● **Hikami granite and Tsubono-sawa metamorphic rocks…**[Rikuzentakata City]
- ● **Mining resources… Remains of the Tamayama gold mine** [Rikuzentakata City]
- ● **Yakushigawa mountain stream Paleozoic…** [Miyako City]
- ● **Mount Hayachine…**[Miyako City]

Mount Hayachine MAP:2-G

Cambrian Period

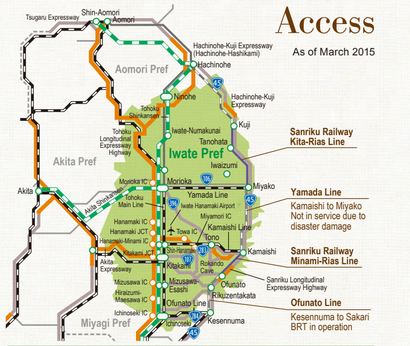
541 million years ago to 485 million years ago
Explosion of organic evolution
- ● **Tsubono-sawa metamorphic rocks…** [Rikuzentakata City]

Tsubono-sawa metamorphic rocks MAP:3-J

This diagram is meant to be read from the bottom up

Access

As of March 2015



Travel to Sanriku by JR Rail

Hachinohe Station to Kuji Station (JR Hachinohe line)	Approx. 1 hour 45 min.
Morioka Station to Miyako Station (JR Yamada line)	Approx. 2 hours 10 min.
Hanamaki Station to Kamaishi Station (JR Kamaishi line)	Approx. 1 hour 50 min.
Ichinoseki Station to Kesennuma Station (JR Ofunato line)	Approx. 1 hour 20 min.
Shin-Aomori Station to Morioka Station (JR Tohoku Shinkansen)	Approx. 55 min.
Akita Station to Morioka Station (JR Akita Shinkansen)	Approx. 1 hour 30 min.
Sendai Station to Morioka Station (JR Tohoku Shinkansen)	Approx. 40 min.
Tokyo Station to Morioka Station (JR Tohoku Shinkansen)	Approx. 2 hours 20 min.

Travel to Sanriku by Car

Ninohe to Kuji (National Route 395)	Approx. 1 hour 30 min.
Morioka to Miyako (National Route 106)	Approx. 2 hours
Hanamaki to Kamaishi (National Route 283)	Approx. 2 hours
Oshu to Ofunato (National Route 394, 107)	Approx. 1 hour 30 min.
Ichinoseki to Rikuzentakata (National Route 343)	Approx. 1 hour 45 min.
Hachinohe to Kuji (National Route 45)	Approx. 1 hour 10 min.
Ichinoseki to Kesennuma (National Route 284)	Approx. 1 hour 10 min.

Travel to Sanriku by Air

From Sapporo (New Chitose Airport) to Iwate Hanamaki Airport	Approx. 55 min.
From Nagoya (Nagoya Airfield) to Iwate Hanamaki Airport	Approx. 70 min.
From Osaka (Itami) to Iwate Hanamaki Airport	Approx. 80 min.
From Fukuoka to Iwate Hanamaki Airport	Approx. 120 min.

Sanriku Geopark Promotion Conference

1-20 Satsukicho, Miyako City, Iwate Prefecture,
inside the Miyako District Government Complex
TEL: 0193-64-1230 FAX: 0193-64-1234
http://sanriku-geo.com

March 2015

Touring Sanriku's Geoparks Example Driving Routes

1 Hachinohe to Kuji Route

A trip where you can meet black-tailed gulls, take the time to enjoy the sea breezes as they wash over you, and learn about the mysteries of 100 million year old amber.

Hachinohe Station → Kawarajima Island (Kawarajima Shrine) 25 min. by car → Kawarajima Island (Kawarajima Shrine) → Tanesashi Coast 20 min. by car → Tanesashi Coast (MAP:3-A) → Hashikami Rest Area 25 min. by car → Hashikami Rest Area → Mount Hashikamidake 35 min. by car → Mount Hashikamidake → Tanechi Seaside Park 50 min. by car → Tanechi Seaside Park → Kuji Amber Museum 55 min. by car → Kuji Amber Museum → Rest Area, Kuji Yunaai Dokkan 15 min. by car → Rest Area, Kuji Yunaai Dokkan

2 Kuji to Iwaizumi Route

A trip where you can say hello to traditional female divers (*ama*), feel the force the sea winds, and experience the seemingly endless expanse of physical beauty.

Kosode Coast (MAP:4-D) → Noda Papuri Rest Area 25 min. by car → Noda Papuri Rest Area → Marine Rest Noda Tamagawa 10 min. by car → Marine Rest Noda Tamagawa → Fudo Rock gates 20 min. by car → Fudo Rock gates → Kurosaki / Kitayamazaki 25 min. by car → Kurosaki / Kitayamazaki → Tanohata Rest Area 45 min. by car → Tanohata Rest Area → Unosu precipice 40 min. by car → Unosu precipice → Iwaizumi Rest Area 55 min. by car → Iwaizumi Rest Area → Ryusendo Cave 10 min. by car → Ryusendo Cave

3 Kamaishi to Miyako Route

A trip to learn about the lives of people through the history of iron, reflect on the Sanriku's disasters, and be filled with the beauty of Jodo, the so-called Pure Land.

Site of the Haipe and Koikorobe Cretaceous period fossils → Horajima Island 70 min. by car → Horajima Island → Namita Coast 15 min. by car → Namita Coast → Yamadai Rest Area 10 min. by car → Yamadai Rest Area → Yamadai City 10 min. by car → Yamadai City → Miyomonado Rest Area 40 min. by car → Miyomonado Rest Area → Jodogahama 10 min. by car → Jodogahama → Taro seawall 25 min. by car → Taro seawall → Sanno-iwa Rock (MAP:4-F) 5 min. by car → Sanno-iwa Rock → Taro Rest Area 10 min. by car → Taro Rest Area

4 Kesennuma to Ofunato Route

A trip where you can learn about the formation of the rias coastline, pay homage at the Miracle Lone Pine, and walk in the footsteps of the poets Takuboku Ishikawa and Kenji Miyazawa.

Oya-Kaigan Rest Area → Iwaisaki (MAP:3-K) 15 min. by car → Iwaisaki → Karakuwa Peninsula 35 min. by car → Karakuwa Peninsula → The Miracle Lone Pine 25 min. by car → The Miracle Lone Pine → Ofunato City Museum 40 min. by car → Ofunato City Museum → Goishi Coast 40 min. by car → Goishi Coast → Sanriku Rest Area 75 min. by car → Sanriku Rest Area → Rokando Cave

Geoparks Have Bountiful Fossils and Mining Resources

In the off-shore waters of the Sanriku region, warm currents and cold currents meet, allowing for a wide variety of organisms to thrive, while inland area is blessed with bountiful mining resources such as iron mines, granite and limestone. Even now, cement refining and other mining work supports Tohoku's industry. The gold mines that dot the entire Tohoku region attest to the lavish "gold culture" created by the Oshu Fujiwara clan 900 years ago.

MAP:3-D

Kuji Amber

Amber is the fossilized sap of trees that once flourished on the land. The amber from Kuji is believed to have been created from the sap of Araucariaceae trees about 85 million years ago.

Ruins of the Hashino blast furnace (No.1 blast furnace) MAP:3-H

The origin site for the modern iron industry

In addition to high quality iron, the Kamaishi mining area also produces copper and gold. In 1857, Takato Oshima, a retainer of the Nambu clan, succeeded in continuous molten pig iron tapping using a western-style blast furnace with iron ore. In the Meiji period, he started the Kamaishi Ironworks, and the town flourished as a center of iron production.

MAP:4-E

Site of the Haipe and Koikorobe Cretaceous period fossils

Cretaceous period stratum called the Miyako group dot the landscape between Tanohata Village and Miyako City. The Haipe and Koikorobe coastal features near Tanohata Village include a large number of ammonite and coral fossils, and is considered an important fossil site.

Site of Moshiryu discovery on the Moshi Coast MAP:4-F

Moshiryu

The Moshiryu was discovered near Moshi, Iwaizumi Town, and it is the first dinosaur fossil found in Japan.

Remains of the Imadeyama gold mine MAP:3-J

Kesen's Bountiful Gold Mining

There are many remains of gold mines in the Kesen area, but the gold deposits in the remains of the Tamayama gold mine (Rikuzentakata City) are the oldest, at 450 million years old, and they were mined along with crystals. The gold in surrounding mines was deposited about 120 million years ago.

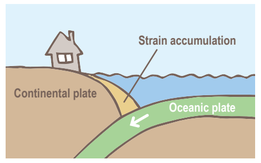
Ryusendo Cave MAP:3-E

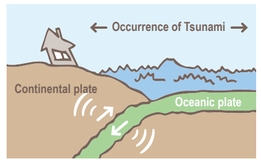
Mysteries from the Depths of the Earth

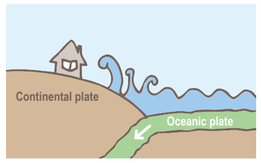
There are many places in Sanriku where you can see limestone that shows how the land was created from the ocean floor. There are many stalactite caves in limestone, including Uchimagido in Yamagata, Kuji City, Ryusendo, Akkado in Iwaizumi, and Rokando in Sumita Town.

Plate Boundary-Type Earthquakes are Trigger Mechanism for Large Earthquakes

The world's largest tectonic plate, the Pacific plate, subducts under the Japan Trench, just off the Pacific coast of the Tohoku region, and it continues to subduct even now. The 2011 earthquake occurred in this subduction zone. Due to changes in the sea bed of the plate upon which eastern Japan rests caused by the violent slippage in the earthquake, an extremely large tsunami was generated, which caused terrible damage.







The History of Tsunami Disasters in Sanriku

Jogan Earthquake	July 9, 869	
Keicho Sanriku Earthquake	December 2, 1611	
Meiji Sanriku Earthquake	June 15, 1896	21, 959 dead
Showa Sanriku Earthquake	March 3, 1933	3, 064 dead and missing
Chili Earthquake Tsunami	May 23, 1960	142 dead and missing
Tohoku-Pacific Ocean Earthquake	March 11, 2011	18, 958 dead and 2, 655 missing

(The disaster caused by this earthquake is called the Great East Japan Earthquake Disaster)

The memories of natural disasters which should be passed down to future generations

For those of us who enjoy the blessing of nature in Sanriku, the Great East Japan Earthquake served as a reminder that sometimes nature can also pose a great threat. We wish to pass along our memories of the disaster to future generations so that it might serve as a way of reevaluating how we can live together with nature and the importance of human relationships.

The Miracle Lone Pine MAP:3-J

Taro Kanko Hotel MAP:4-F

Preserving Relics of the Disaster

The Miracle Lone Pine in Rikuzentakata City and the Taro Kanko Hotel in Miyako City will be saved and preserved to pass on the memories of the earthquake and the lessons we learned.

Storyteller Tour

Starting in Rikuzentakata City and Taro, Miyako City, locals from around the prefecture, known as "storytellers", lead participants on "storyteller tours" through areas affected by the disaster, and pass on the memories and experiences of those who experienced it.

Tsunami rock in Ofunato City, Sanriku Town Yoshihama MAP:4-J

Tsunami rock

This giant rock which was moved inland from the ocean and coast by a tidal wave is called the "tsunami rock." People can view a number of tsunami rocks around the entire Sanriku coast, including those from the Great East Japan Earthquake.