

Nagashima Island:

A Biodiversity **Hotspot** Endangered by
Kaminoseki Nuclear Power Plant Project



The Association for Conservation of Nagashima Island





With crystal clear waters over 15 meters deep, and 75% of its natural shoreline remaining untouched (average rate of untouched natural shoreline along the Seto Inland Sea is only 21.4%), Nagashima Island (Yamaguchi Prefecture, Japan) has miraculously escaped from the crisis of rapid economic development, and much of its ecosystem thrives as it did 50 years ago.

However, Chugoku Electric Power Company (CEPC) has launched a plan to build a nuclear power plant, which would require it to reclaim land from Tanoura Bay, located at the tip of Nagashima Island.

This guidebook introduces the magnificent flora and fauna of Nagashima Island and its vicinity. It is presented with our sincere wish to pass this biodiversity on to our future generations.



Location of Nagashima Island in Seto Inland Sea, Western Japan

Environment around Tanoura Bay, Nagashima Island

●Submarine Spring Water in Tanoura

Fresh water that permeates into underground and springs up from a lakebed is called spring water. Another kind of spring water is created by seawater, which, not only permeates underground at the seabed, but also soaks the land at high tide, permeates underground and merges with fresh groundwater.

Tanoura Bay is known to preserve the original scenery of the Seto Inland Sea. The area within 50 meters from the Tanoura seashore holds a large body of submarine spring water which can be measured in terms of the annual precipitation rate of as much as 70 cm (see diagram). When the outflow of this water exceeds 30 cm, organic particles and mud are washed away, and with an outflow of 90 cm or more, silt is also washed away, and the sandy seabed is maintained. The photo on the right shows the color layers of the seabed in Tanoura Bay. In the white area, the magnitude of outflow is high, and other areas are dark because the flow is low and detritus covers the seabed.

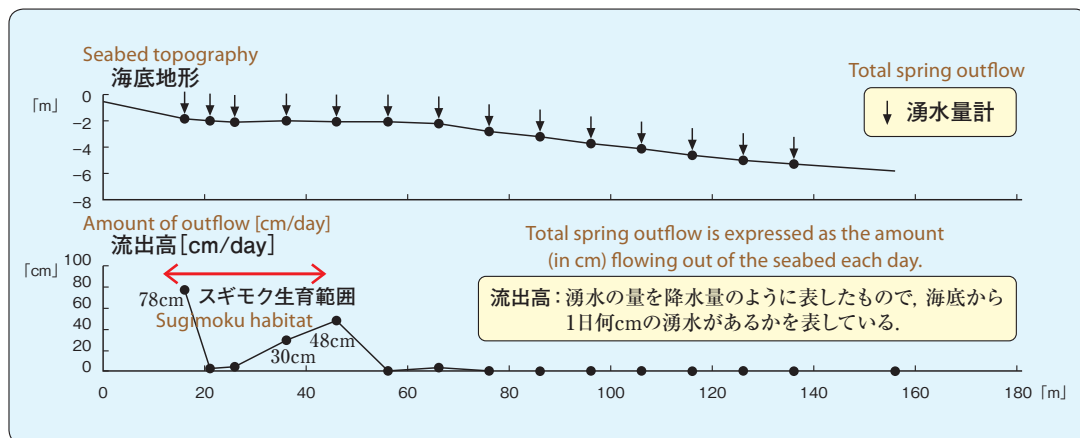


Aerial view of Nagashima
Tanoura Bay

●Sanctuary: A bay filled with rich spring water

Organic matter in groundwater is filtered underground, and the oxygen in groundwater suppresses sulfuration of the seabed. Tanoura Bay's natural configuration tends to hold this spring water, resulting in a crystal clear "beautiful sea." During storms, the clear water in the bay mixes with water from outside, with its dissolved organic particles. However, when the sea calms down, the bay quickly returns to its original state thanks to its rich source of spring water. Therefore, in Tanoura Bay, the seabed—sand, conglomerate, or shore reef area—stays mostly clear of mud, allowing floating larvae to thrive and seaweed to firmly attach to a base. Such an environment is crucial for the survival of many living organisms around the island.

In other parts of the Inland Sea, the amount of organic particles in the water is increasing, but Tanoura Bay, nourished as it is with natural spring water, has become a refuge for many rare species. For instance, today in Tanoura Bay we can find **Kasashamisen** (a brachiopod, *Discinisca* sp.), which used to be widely found over the Seto Inland Sea until 40 years ago. Seaweed, **Sugimoku** (*Cocophora langsdorfii*, see p.5), is another rare species found in Tanoura. This species typically resides around areas with abundant spring water. The magnitude of outflow is strongly influenced by conditions around the water source, and land development, especially deforestation, can have a great impact. Thus, in order to ensure the biodiversity of Tanoura Bay, it is vital to preserve geographical features and vegetation of the drainage basin of Nagashima Island.



Vertical distribution of the spring flow

Sugimoku (*Coccophora langsdorfii*) forms a golden flower garden

●What is Sugimoku (*Coccophora langsdorfii*) ?

This seaweed belongs to Fucales, Phaeophyceae, and is found throughout the Sea of Japan: on coasts from northern Kyushu through northern Hokkaido, and along the coasts of Korea and Russia as well. Measuring 20-40 cm, it is the shortest variety in the family Sargassaceae, which is found in waters beyond the tidal line.

The habitat of Sugimoku is at a depth of 1.5-2 meters, in crevices among rocks and pebbles in the sandy bottom, and where the salt content of the water sometimes drops—a relatively unstable environment. The bottom portion of the Sugimoku is buried in the sand, and it can remain alive even when other species of the family Sargassaceae have withered. Because it is short, it is at a disadvantage for photosynthesis when it is surrounded by other related species, but because it is able to exist in harsh environment where other competing species cannot, it manages to receive enough sunlight.

From early summer through autumn, the Sugimoku lies flat on the ocean floor, with its “leaves” in a thin wishbone shape. From winter through spring it grows new leaves that are shaped like those of a Japanese cedar and contain fertile cavities which float the leaves upright. When the fertile cavities are hit by sunlight, they appear to shine with a golden color. Areas where the Sugimoku are concentrated look like the golden fields that appeared in the last scene of Miyazaki Hayao’s animated film *Warriors of the Wind*, but this beautiful scene can only be seen for two short weeks in March in Nagashima Tanoura Bay.

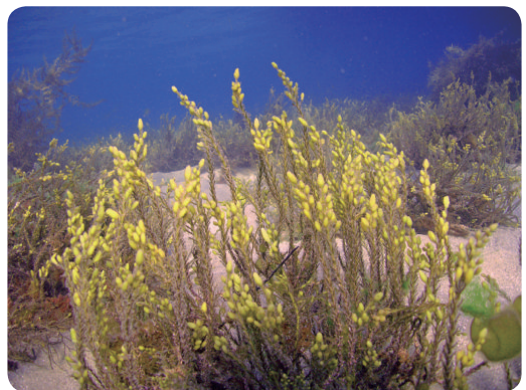
●The Sugimoku of Nagashima Tanoura

Sugimoku has been believed to be a species endemic to the Sea of Japan, but from May to August 2005, a 300-meter-long field of **Sugimoku** was observed at Nagashima Tanoura. This was the rediscovery after 30 years since that this species had been found in the Inland Sea. Not only was it at the farthest reach in the Sea of Japan, it also covered a very large area compared with the usual occurrences in the Sea of Japan, so it was thought to be particularly important. In the Seto Inland Sea, Sugimoku inhabits only two places, Nagashima (Tanoura) and Himeshima (Nishiura) in Oita Prefecture. This population as the southernmost distribution of the species.

However, CEPC is planning to carry out land reclamation in the part of Tanoura Bay that is the habitat of **Sugimoku**, in order to build the Kaminoseki nuclear power plant.



Sugimoku in its usual state (November 2006)



Sugimoku erected by inflatable bladders (March 2008)

Mollusks

The survey in August-October of 1999, 183 species of marine shellfish were found in Tanoura. Among them were eight species listed as endangered species in “The tidal flats and benthic fauna of Japan” (World Wide Fund for Nature Japan Science Report, vol. 3). The ocean area around Nagashima Tanoura is rich in biodiversity. It is common to find species there, which are close to disappearing in other parts of Japan or have already disappeared, and each survey conducted there discovers rare or heretofore unknown species.

● Closely related species of *Yashimaishin* (*Tomura cf. yashima*)

Tomura cf. yashima is a small sea snail (shell width *ca* 1.3mm) of the family Cornirostridae, which is an important group for the study of the evolution of gastropods (sea and land snails). Gastropods can be classified into two large groups, a more primitive one which includes abalone, turban shell, trumpet shell, etc., and one which is derivative, and includes sea slugs, land snails, etc. For many years, no species had been found of the “missing link,” i.e, forms intermediate between these two, but when Cornirostridae was discovered in Australia in 1990, it was found to have such an intermediate structure intermediate. This discovery was of great interest to scientists around the world who study shellfish. But very few examples were subsequently discovered.

Yashimaishin (*Tomura yashima*) found in 1997 from Yashima Island near Tanoura was the first record of Cornirostridae in the northern Pacific. Moreover, *Tomura cf. yashima* of Tanoura is different in shell characteristics from *Tomura yashima*, *Tomura himeshima* of Himeshima Island in Oita Prefecture, and the later-reported *Tomura* species found in Ushima Island, Hikari City, and Hirashima Island, Hofu City. It is suggested that in the Suo Nada Sea, *Tomura* species are evolving into a different species in each of the islands.

The following list is the record of *Tomura cf. yashima* that have been found in tide pools around the projected construction site of the Kaminoseki Tanoura nuclear power plant:

8/23/1999	1 living individual
9/7/1999	1 living individual
5/5/2002	1 living individual
5/4/2004	1 egg mass
4/29/2006	2 egg masses
5/6/2006	4 egg masses



Tomura cf. yashima



Nagashimatsubo
(*Ceratia nagashima*)

Within Japan, this is a record for the number of living organisms and egg masses found in one location. Further, it is significant that these observations have been made over a period of years, and that egg masses have also been found, indicating that this is a stable habitat and breeding ground.

● Nagashimatsubo (*Ceratia nagashima*)

Ceratia nagashima (shell length 3.2 mm) is a species found in the anaerobic tide pools of Tanoura, and is described as a new species of the family Iravadiidae. Genus *Ceratia* is new to the Pacific. The only specimen known so far is the one found at Tanoura.

● The other important species

A survey conducted from May 2000 to May 2001 explored the ocean floor at a depth of 5-10 meters in the area scheduled for land reclamation, and found rare live specimen of *Eulima maria* (Eulimidae), as well as a similar species of *Roboastrea gracilis* (Polyceridae) that may even be a new species.

Namekujiuo (a lanceolet, *Branchiostoma japonicum*): ancestor of vertebrates

●What is a lanceolet ?

The lanceolet is a small organism that resembles a fish. It belongs to a group called the “chordates,” the closest relatives of vertebrates such as fish and humans, and for that reason it is invaluable for tracing the history of animal evolution. In contrast to fish, the lanceolet has no backbone or skull. Its whitish semi-translucent body grows slowly—approximately 1 cm. per year—to a maximum length of 6 cm.



Branchiostoma japonicum

Lanceolets live in shallow warm ocean waters.

There are approximately 40 known species, 4 of which are found in Japan. One of those lives in the Inland Sea, and is called “Namekujiuo” (*Branchiostoma japonicum*), or, recently, by its Japanese name of “Higashi-namekujiuo”. This species is distributed from Kanto through Central Kyushu, in the shallow waters from the intertidal zone (the area of the shore uncovered by the ebb tide) out to a depth of about 50 meters, in sea bottom which is washed by the tides and contains fine sand with almost no silt.

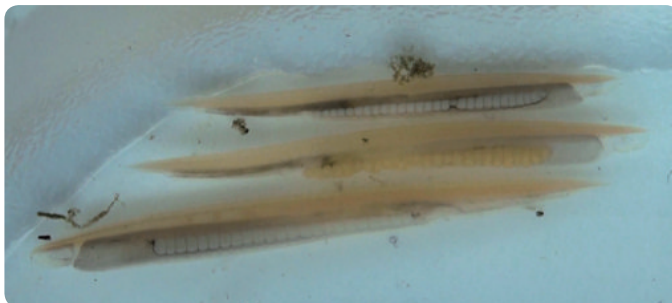
The lanceolet usually hides under the top layer of sand, and appears to eat the tiny pieces of organic matter found between or on the surface of the grains of sand; however, it is not known what constitutes the most important food for this organism. It spawns in summer; the newly-hatched fry floats in the water until they reach a length of about 1 cm, then burrow into the ocean floor.

●The lanceolet today

It is said that formerly lanceolets were so numerous in many areas that if one poked a stick into the tidal flats at low tide, they would pop up all over. However, their numbers have declined drastically in recent years, and it is thought that they are practically non-existent on the shore. This is true even in Hiroshima and Aichi Prefectures, where they are designated as a protected species. Areas with the kind of clean sandy bottom required by the lanceolet have almost disappeared due to “harvesting” of ocean sand, land reclamation projects, toxic pollution and eutrophication, changes in tidal currents caused by shoreline development, and silting of the ocean floor. However, the ocean around Nagashima and Iwaishima has so far escaped from the effects of large development projects, and the natural environment has been miraculously preserved. This makes it an irreplaceable treasure, one proof of which is that the lanceolet is still alive.

●The lanceolet of Nagashima Tanoura

At Tanoura Bay on Nagashima Island, researchers from the Ecological Society of Japan and the Japanese Association of Benthology, along with members of the Association for Conservation of Nagashima Island conducted underwater studies between 2000 and 2009, and were always able to confirm that the lanceolet was still flourishing there. However, (now the amphioxus are in danger because) the CEPC is planning to fill in (part of) Tanoura Bay in order to build a nuclear power plant.



Mature lanceolets having eggs

Sunameri (finless porpoise): The smallest whale in the world

●What is Sunameri ?

The finless porpoise (*Neophocaena phocaenoides*) is a member of the Phocoenidae family of the toothed whale suborder. It is the smallest of the porpoise family found in Japan, and one of the smallest in the world. An adult finless porpoise measures 1.5-1.8 meters, and weighs around 60 kilograms, making it approximately the size of an adult human being.

Lacking a dorsal fin, it has a grey body and roundish head, with a “cute” face. It has a blowhole on the top of its head, with conduits that split to the right and left under the skin and lead to the throat. Behind its eye it has a tiny pencil-point-like indentation which is its ear. It has 15-20 numbers of small teeth.

●Where can the finless porpoise be found?

The finless porpoise prefers shallow water less than 50 meters deep, and inhabits waters from the Persian Gulf on the west through India, Southeast Asia, and the Yellow Sea; in Japan it is found in Sendai Bay and along the San-in Coast. Finless porpoises originally preferred warm waters, but the northern variety has adapted to the cold and can live in places like the Yellow Sea, where the water temperature drops down below 5 C, as well as in the waters around Japan. After reaching adulthood at the age of 5 or 6 years, the females bear one calf every one or two years. Finless porpoises live for 15-20 years.

Since finless porpoises do not migrate, they have little opportunity to breed with others of their species living at a distance. Therefore, the species differs from area to area. In Japan, two groups bear their young in the fall: those that live in Omura Bay on the west coast of Kyushu and those in the Sea of Ariake. Three other groups, in Ise Bay and Mikawa Bay of the Inland Sea and in Tokyo Bay, have their young in early summer. There are also subtle differences in the DNA and the skulls of the different groups.



Finless porpoise



Finless porpoise with young
(photographed off Nagashima Island in March 2001)

●The finless porpoises of Nagashima

In the years around 1976-79, from April or May to fall, it was possible to see black finless porpoise newborns swimming with their grey mothers. However, by the time a survey was done in 1999-2001, the number of finless porpoises in the waters off Suo Nada (Yamaguchi Prefecture) was down to 70-80% of the former total, and in other places the number had dropped to less than 10% compared to previous years. This decline can perhaps be attributed to the destruction of the porpoises' habitat through land reclamation and sand “harvesting.” In the past, the seas off Takehara in Hiroshima Prefecture were filled with these animals, and in 1930 that area of the ocean was named as a natural monument; but today, finless porpoises are rarely seen there. However, many of these creatures still gather near Nagashima from April through June to bear and raise their young. It is likely that this area, with its abundant food sources—small fish, shrimp, squid, etc.—is the last remaining part of the Inland Sea where these porpoises safely reproduce themselves.

Kanmuri-Umisuzume (the Japanese Murrelet, *Synthliboramphus wumizusume*)—One of the most endangered sea birds in the world

● Characteristics of the Japanese Murrelet

This bird is approximately 24 cm in length, with a black crest and face. The back of its head and its chest and stomach area are white; its back is dark bluish grey; and its beak is bluish grey. The crest from which it gets its name (kanmuri means crest in Japanese) is usually unobtrusive, lying flat to its head. The bird is a strong swimmer that dives using its wings. It feeds on plankton and other small organisms.

The species is found in the waters near Japan, and is the only murrelet that breeds in warm waters. It is estimated that there are approximately 5000 of these birds, making it one of the most endangered murrelets in the world, requiring international protection. It has been designated an endangered species by the IUCN (International Union for Conservation of Nature). It is also a Protected Species in Japan.

During breeding season the murrelet nests in rock crevices and other small spaces and lays two large eggs directly on the ground. Chicks take to the water within two days after hatching. Outside the breeding season, these birds live on the ocean far from land, making them difficult to observe; thus, little is known of their habits during the period from June through January.



Japanese murrelets near Nagashima

● Japanese murrelets near Nagashima

In the spring of 2008, Japanese murrelets were observed in the waters near Nagashima. ACNI has confirmed adult birds with chicks, and of birds feeding during periods other than the breeding season (including during the molting season). For this reason, we believe that the birds are present in the area year round, and have called for a long-term study. Japanese murrelets' ability to fly is hampered during the molting season (the period of summer when the breeding season has finished and the birds are changing from summer to winter plumage). Thus at this time they particularly need a safe environment where they can easily find food. Previous to 2007, their whereabouts outside the breeding season were unknown. However, in 2007 it was confirmed that they are present year-round in the Inland Sea and in the area around Nagashima. This was an extremely important discovery.

In September 2008 the Ornithological Society of Japan held a general meeting and made the following resolutions, which were communicated to the national and prefectural governments and to the CEPC:

1. It is possible that the habitat of this bird, both in and out of the breeding season, includes the natural environments near or in Nagashima, and there is concern that after construction of the Kaminoseki nuclear power plant, the warm waste water produced by plant operations may affect the birds' food sources.

2. As part of the environmental assessment preceding construction of the reactor, it is necessary to clearly determine how the Japanese murrelet breeds and uses the ocean waters.

Research on the murrelets around Nagashima has just begun, and because it is possible that they do not breed every year, study of their breeding habits may require an extended period of time.



An adult flapping its wings



Adult and partly-grown chick



Family group (adult on left)

Kasashamisen (a discinid brachiopod): A living fossil

●What is Kasashamisen ?

The ancient phylum of brachiopods, once common on the earth, is still represented by a very few species living in the ocean. One of those is the discinid brachiopod, found at Tanoura Bay in Nagashima.

Brachiopods resemble bivalve mollusks, but while bivalve mollusks have shells on the left and right, shells of brachiopods are on top and bottom. The lower shell of the discinid brachiopod is like a membrane, and the upper shell is shaped like an umbrella. The lower shell has a round hole from which a stalk protrudes and attaches the animal to rocks. Its size is 1 cm or less.

Its filtering efficiency is far less than that of bivalve mollusks; it grows slowly; and it is particularly sensitive to degradation of the waters it lives in. Thus, the presence of the discinid brachiopod in a particular area indicates that the waters there are relatively free of pollution.



a discinid brachiopod

●The discinid brachiopod in Nagashima

There seem to be several species of discinid brachiopods, and it has not yet been determined which one the Kasashamisen belongs to. Past records show that the discinid brachiopod existed in various parts of the Inland Sea, but now it has almost become a “phantom species.” The fact that it has been found at Nagashima is a miracle, that demonstrates the original landscape of the Seto Inland Sea.

Mimizuhaze (*Luciogobius* spp.): How many vertebrae?!

●What kind of a creature is Mimizuhaze ?

Most members of the Gobiidae have 26 vertebrae, but those of the genus *Luciogobius* have as many as 38-50. It has been recognized that this unusual increase in the number of vertebrae is strongly related to the fact that this fish has adapted to a particular environment, one in which it lives in the crevices among gravel. Thirteen species of the genus *Luciogobius* have been recorded in Japan, but many others have also been discovered. It appears that the genus *Luciogobius* has only flourished on the shores of the Japanese archipelago. Most of *Luciogobius* species live on pebbly beaches near the waterline. They can survive in the cracks between pebbles even when the water has receded at the time of ebb tide. The particular species of *Luciogobius* found in a certain place varies depending both on the size and uniformity of the pebbles.

The *Luciogobius* species feed on interstitial organisms that live among the pebbles: gammaridean amphipods (a small shrimp-like creature), harpacticoids, polychaetes, *Brochina glabella*, etc. Their breeding takes place from spring through early summer, but little is known about it.

●The Mimizuhaze in Nagashima Tanoura

Eight species of the **Mimizuhaze** live around Nagashima Tanoura, including the **Mimizuhaze** (*Luciogobius guttatus*), **Oomimizuhaze** (*Luciogobius grandis*), **Yarimimizuhaze** (*Luciogobius platycephalus*), **Nagamimizuhaze** (*Luciogobius elongates*), **Komahaze** (*Luciogobius koma*), **Higemimizuhaze** (*Luciogobius saikaiensis*), and **Nansenhaze** (*Luciogobius parvulus*). That so many varieties can exist in one place testifies to the fact that this area provides an extremely rich habitat.



Luciogobius guttatus

Akategani (*Chiromantes haematocheir*): a sesarmid crab that comes and goes between sea and land

●What type of crab is **Akategani** ?

Akategani is a species of the Japanese sesarmid crabs that is adapted to terrestrial life, and the adult lives on land some distance from the ocean. However, it is not completely separated from the ocean because in its larval stage it lives in seawater as a form of plankton.

It spawns from June to September. After copulation, the female holds the fertilized eggs in her stomach and returns to the ocean to release the hatching larvae. This often takes place around high tide of a night in spring (around full moon or new moon). The female repeats incubation and larva discharge two or three times per summer. It is estimated that the female lives from seven to eight years and the male about ten years.

●**Akategani** in Tanoura, Nagashima

Around Tanoura, Nagashima, many nest holes of **Akategani** can be found at the foot of trees in groves near the shore. The **Akategani** moves between sea and land. It seems that construction projects (levees, dikes, roads, etc.) in the coastal areas of various regions in Japan have disturbed the activities of **Akategani** and deprived them of their land habitat. At present, along the coast of the Inland Sea, there are few places which offer access from coast to forest unobstructed by artificial artifacts, and Nagashima is almost the only place where mass mating can be observed. This fact testifies to the value of Nagashima as a habitat.

In addition, in areas of Tanoura, which have water flowing from springs, we find large males of another species of crab **Kurobenkeigani**, *Chiromantes dehaani*. This species typically lives in the brackish waters of estuaries, so this species which lives in the spring of a swamp in Tanoura Bay, Nagashima is worthy of special mention.



Chiromantes haematocheir during mass mating

Kusafugu (*Takifugu niphobles*): small grass puffer that lay eggs in groups

The grass puffer is a small puffer fish 16 cm or less in length. It is notable for its mating behavior: at high tide from May to August, large groups of the fish swarm onto pebbled beaches which are washed by the tide, to lay eggs and fertilize them. A quality fish **Torafugu**, Japanese pufferfish (*Takifugu rubripes*), belong to the same genus with **Kusafugu**. It contains a virulent poison, but the toxicity in its muscles is comparatively weak and the fish is apparently edible in small amounts. In Hikari City, on the shore opposite Nagashima, the spawning of the grass puffer has been designated a natural monument of Yamaguchi Prefecture, and equal protection should probably be extended to the population in Tanoura as well.



Grass puffer laying eggs

Plants

The rich natural heritage of Nagashima has been bequeathed to us by the people who have continually made their living from the sea and the hills. In the hills, diverse green plants can be seen throughout the cycle of seasons: forests of dark evergreen *Castanopsis* and *Machilus thunbergii*, bright deciduous **Konara** (*Quercus serrata*) and Oriental oak woods, red pine woods, bamboo groves, terraced paddy fields, and orchards.

●Shore, coastal forest, and SATOYAMA

There is a 300 meters long sand beach in Tanoura, home to sea bindweed, beach pea, *Canavalia lineata*, beachwort and New Zealand spinach. Chestnut tiger butterflies flock to white flowers of Siberian sea rosemary. Near rocky stretches grow Japanese wild raddish, **Hamanadeshiko** (*Dianthus japonicus*), **Hamatsumekusa** (*Sagina maxima*), **Hamabossu** (*Lysimachia mauritiana*) and **Nojigiku** (*Chrysanthemum occidentale japonense*). In rocky stretches, **Iwataigeki** (*Euphorbia jokinii*), **Botanboufuu** (*Peucedanum japonicum*), **Kusasugikazura** (*Asparagus cochinchinensis*), and **Hitomotosusuki** (*Cladium chinensis*) grow in clusters on the rocks where spring water collects. Abandoned rice fields become marshes, home to **Himegama** (small reedmace) and **Hangeshou** (lizard's tail). On slopes facing the sea are found stands of juniper, the town tree of Kaminoseki. In coastal woods grow **Tobera** (*Pittosporum tobira*), **Hamahisakaki** (*Eurya emarginata*) and Yeddo hawthorn, etc., enduring the sea winds by limiting their height.

Facing the coast in Tanoura is a splendid forest of laurel trees reaching 20 meters in height. Various evergreens cast cool shadows: **Sudajii** (*Castanopsis sieboldii*) and **Tabunoki** (*Machilus thunbergii*), **Kagonoki** (*Litsea coreana*), **Shirodamo** (*Neolitsea sericea*), **Yabunikkei** (wild cinnamon), **Kuroki** (*Symplocos lucida*), **Himeyuzuriha** (*Daphniphyllum teijismannii*) and **Mochinoki** (*Ilex integra*). The forest floor is covered with thick leaf mold, the underbrush is sparse, and visibility is good. Here and there are found flowers of the orchid and lily families, such as **Shunran** (riverstream orchid), **Oobanotonbosou** (*Platanthera minor*), **Miyamauzura** (*Goodyers schlechtendaliana*), **Nagabajanohige** (*Ophiopogon japonicus* var. *umbrosus*) and **Koyaburan** (*Liriope spicata*). Clusters of **Tabunoki** and **Himeyuzuriha** seedlings indicate places used by raccoons as their communal “toilets.”

Behind the forest is an area of undeveloped woodland. Along the road connecting terraced paddy fields are found many dividing **Konara** (*Quercus serrata*) and **Abemaki** (oriental oak) that are split at the root because they are growing back after the trees had been harvested for charcoal making. The fresh green forest is bright in spring. On both sides of the paths created by human feet bloom **Tachitsubsumire** (*Viola grypoceras*), White deadnettle, **Kobanotatsunamisou** (*Scutellaria indica* var. *parvifolia*), **Hitorishizuka** (*Chloranthus japonicus*) and various endangered wildflower species that were once found in abundance, such as **Kinran** (*Cephalanthera falcata*), **Ginran** (*Cephalanthera erecta*) and **Kikeman** (*Corydalis heterocarpa* var. *japonica*). Also flowering are species which since long ago have only been found in this area: **Juunihitoe** (*Ajuga nipponensis*) and **Yamahakobe** (*Stellaria uchiyamana*). Making our way into the hills, we find deciduous trees such as **Kobanogamazumi** (*Viburnum erosum punctatum*), Korean juneberry, **Yamazakura**, **Yabumurasaki** (*Callicarpa mollis*) and **Inubiwa** (*Ficus erecta*), and evergreen trees such as **Shashanbo** (*Vaccinium bracteatum*), Japanese privet, **Kakuremino** (*Dendropanax trifidus*) and *Camellia*. We can see various animals such as insects and birds come to the mountain when flowers are blooming from spring to summer, and when nuts are ripening from autumn to winter.



Siberian sea rosemary
and Chestnut tiger



Kinran
(*Cephalanthera falcata*)



Kikeman (*Corydalis*
heterocarpa var. *japonica*)



Juunihitoe
(*Ajuga nipponensis*)

Birds

●Sea birds

The sea around Nagashima abounds in living creatures and plants that provide food for the many sea birds which can be found hibernating and breeding in Western Japan. In January 2009 we surveyed the area and recorded groups of 3 to 8 individual **Umisuzume** (the murrelet, *Synthliboramphus antiquus*) (Ministry of Environment's Red List: I A - Endangered Species) feeding there.

In April of the same year on numerous occasions they recorded confirmation of **Utou** (the hornbilled puffin, *Cerorhinca monocerata*), which normally breed in the Northern Islands of Japan and usually come only a little to the south of that in the winter months. These birds were previously thought not to be found in the Seto Inland Sea. Every year between February and April we can see packs of **Oohamu** (*Gavia arctica*) and **Shiroeriohamu** (*Gavia pacifica*) hunting for sand eels. These species have been continuously diminishing in the Inland Sea. Although **Oomizunagidori** (*Calonectris leucomelas*) had not previously been on record as breeding in the Inland Sea, our survey confirmed it living in the area. And in September of 2009 we also confirmed the presence of a fledgling on Uwajima Island 6 kilometers out of Nagashima Island. We can also see a rare species **Kurosagi** (Eastern Reef Heron, *Egretta sacra*) and **Misago** (Osprey, *Pandion haliaetus*, a semi-endangered species), which is a raptor.



Calonectris leucomelas



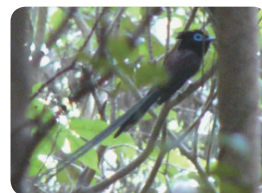
Egretta sacra

●Mountain Birds

Because the climate of Nagashima Island is temperate even in winter, it is a suitable hibernation area for birds. Moreover, because many trees and bushes like the **Karasuzansho** (*Zanthoxylum ailanthoides*) and **Yamahaze** etc. provide berries, many birds such as the **Hiyodori** (Brown-eared Bulbul), the **Mejiro** (Japanese White-eye), the **Shirohara** (Pale Thrush) and the **Tsugumi** (Dusky Thrush) gather here in winter. This in turn means that the **Hayabusa** (Peregrine Falcon, II Class Endangered Species), which breeds from February onwards, has no trouble finding food. The **Karasubato** (*Columba janthina*) (Semi-endangered Species), a National Natural Treasure, generally lives on outlying islands with dense evergreen broad-leaved forests, and Ushima Island (to the west of Nagashima) is well known as its breeding ground. In Nagashima and all the islands in its vicinity: Iwashima, Koiwaijima, Uwajima, Amatajima and Hanagurijima Islands, we confirmed the calls of these birds. Therefore all of these islands, as habitats and possible breeding grounds for these birds, should be protected from destruction.



Peregrine Falcon



Black Paradise Flycatcher

●Wild Birds Recorded in Nagashima and its Surrounding Sea

Previously 43 families and 137 species of wild birds (two of which were from other countries) have been recorded here. Those mentioned in the "Endangered Wild Animals of Yamaguchi Prefecture" are as follows. (Categories in brackets are those used by Yamaguchi Prefecture)

[Endangered Species IA] **Koonotori** (Stork, recorded in the winter of 1974-75), **Umisuzume** (Murrelet), **Kanmuri-Umisuzume** (Japanese Murrelet),

[Endangered Species IB] **Yamadori** (Copper Pheasant)

[Endangered Species II] **Ootaka** (Goshawk), **Sashiba** (Grey-faced Buzzard Eagle), **Hayabusa** (Peregrine Falcon), **Karasubato** (*Columba janthina*).

[Semi-endangered Species] **Oomizunagidori** (*Calonectris leucomelas*), **Himeu** (*Phalacrocorax pelagicus*), **Sasagoi** (*Butorides striatus*), **Kurosagi** (Eastern Reef Heron, *Egretta sacra*), **Misago** (Osprey), **Hachikuma** (Honey Buzzard), **Tsumi** (Japanese Lesser Sparrow Hawk), **Haitaka** (*Accipiter nisus*), **Nosuri** (Buzzard), **Haiirochuuhi** (*Circus cyaneus*), **Choogenbou** (Common Kestrel), **Hikuina** (Ruddy-breasted Crane), **Umineko** (Black-tailed Gull), **Kakko** (Common Cuckoo), **Ookonohazuku** (*Otus bakkamoena*), **Aobazuku** (Brown Hawk Owl), **Fukurou** (Ural Owl), **Amatsubame** (Northern White-rumped Swift), **Yamasemi** (Greater Pied Kingfisher), **Akagera** (Great Spotted Woodpecker), **Sanshoukui** (Ashy Minivet), **Komadori** (Japanese Robin), **Koruri** (Siberian Blue Robin), **Toratsugumi** (White's Ground Thrush), **Kurotsugumi** (Grey Thrush), **Ooyoshikiri** (Great Reed Warbler), **Sendaimushikui** (Crowned Willow Warbler), **Ooruri** (Blue-and-White Flycatcher), **Kosamebitaki** (Brown Flycatcher), **Sankouchou** (Black Paradise Flycatcher), **Tsurisugara** (*Remiz pendulinus*), **Kuroji** (*Emberiza variabilis*).

* Although not mentioned in the Yamaguchi Prefectural Publications of the RDB, the Japanese native species **Nojiko** (Japanese Yellow Bunting) is also recorded in the Ministry of Environment's Publications as a semi-endangered species.

Construction Plans for Kaminoseki Nuclear Power Plant

Two reactors of ABWR with an output of 1,373,000 kW each are being planned for Kaminoseki. Since the plans were first announced in 1982, public opinion has been about 60% for and about 40% against the project. There are, however, some places like Iwashima, only 3.5 km away on the opposite bank (just across from Nagashima), where 90% of the residents are against the construction.

If the nuclear power plant is constructed at Kaminoseki, 190 tons of water, 70 C higher than sea temperature, will be pumped into the sea every second. Moreover this wastewater will contain a chemical called sodium hypochlorite that will kill off the small fish, the spawn and the plankton. The construction of a nuclear power plant at Kaminoseki is not only a problem for the people in Kaminoseki Town but will have ramifications for the Bay of Hiroshima and indeed for the whole area of the Seto Inland Sea.

Nagashima is situated just at the point where the Kuroshio Current coming from the Bungo Straits begins its journey into the Hiroshima and Okayama areas. If a nuclear power plant is built at Nagashima the natural ecology of the sea in the vicinity will certainly be destroyed, and we can expect that the effects will be felt by the whole of the Inland Sea. If in the future the power plant faces potentially emergency situations like radioactive leaks etc., the Inland Sea, which is closed off from other seas, will without doubt become a hotbed of radioactivity. However the governor of Yamaguchi Prefecture has issued a permit to landfill public waters, and now the natural surroundings of Nagashima are in real danger of destruction. If Tanoura Bay is forcibly filled in, the wonderful natural environment and the whole ecology of Nagashima will be lost. A whole range of different species, which could have been the source for the regeneration of a great variety of living creatures in the Seto Inland Sea, will be obliterated from the face of the earth.

Data

Construction Plans of Kaminoseki Nuclear Power Plant (after the website of CEPC)

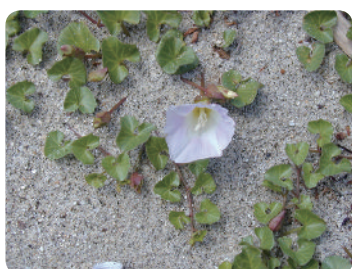
Location: Yamaguchi prefecture, Kaminoseki-cho, Nagashima
Area of land to be used: 1,600,000 sq. meters
Area of the construction site: 330,000 sq. meters
Sea water to be heated: 190 cubic meters per second (2 reactors)
Pumping method: Deep level Pumping
Water discharge method: Underwater discharge
Starting construction: (Plant 1) 2012 (scheduled as of Mar. 2011)
(Plant 2) 2017 (scheduled)
Planned start of operations: (Plant 1) 2018 (scheduled)
(Plant 2) 2022 (scheduled)



Tanoura Bay: the sea of miracles



An aerial photograph of Tanoura, Nagashima



A profile for the Association for Conservation of Nagashima Island (Chairperson: Midori Takashima)

The Association was established in Sept 1999 by eight members in order to protest against that in the plans for the construction of the nuclear power station at Kaminoseki, the environmental assessment had not been properly carried out, and to preserve the precious natural environment and ecology of Nagashima, Kaminoseki Town, Yamaguchi Prefecture, the intended location of the plant.

In cooperation with researchers from the Ecological Society of Japan and other organizations, the association conducted a scientific survey of the area. Based on this the group has appealed to Chugoku Electric Power Co. and the concerned government offices to stop the plans for a nuclear power plant at Kaminoseki. This was done in combination with a project to hold a photographic exhibition explaining the importance of the precious natural environment of Nagashima. Also, as part of an effort aiming at creating a town capable of coexisting with its natural environment, the Association has sponsored various other events such as finless porpoise watching and loquat-picking tours. New members are always welcome to join such activities.

★ Blog: <http://nagashimanoshizen.soreccha.jp/>

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Membership fee & Donations to:

Postal Account No: 01340-8-44688

Account Name: Nagashima no Shizen o Mamoru Kai

Plaintiff Group of the “Lawsuit for the Natural Rights of Kaminoseki”

The Association for Conservation of Nagashima Island is engaged in a “lawsuit for the Rights of the Nature” aimed at revocation of the Yamaguchi Prefectural Government’s license for land-filling the sea as part of Chugoku Electric Power Company’s construction of the Kaminoseki Nuclear Power Plant. In order to cover the legal expenses of this lawsuit the group is soliciting donations.

Donations can be sent to the following Postal Account:

Postal Account Number: 01330-0-52815

Account Name: Plaintiff Group of Lawsuit for the Natural Rights of Kaminoseki.

Flowers of Nagashima

From top to bottom: **Biwa** (*Eriobotrya japonica*),
Kobanotatsunamisou (*Scutellaria indica* var. *parvifoli*),
Yamahakobe (*Stellaria uchiyamana*),
Odorikosou (*Lamium album* var. *barbatum*),
Iwataigeki (*Euphorbia jolkinii*), and
Hamahirugao (*Calystegia soldanella*)



Nagashima Island: A Biodiversity Hotspot Endangered by Kaminoseki Nuclear Power Plant Project

Published by the **Association for Conservation of Nagashima Island** (Chairperson: Midori Takashima),
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