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AOSHIMA

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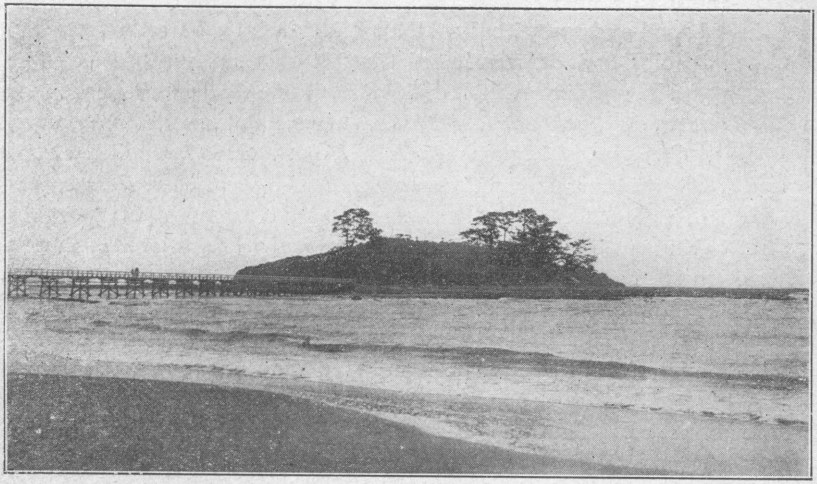

GEOLOGICAL NOTES ON AOSHIMA

By Tsunenaka Iki

Aoshima, literally "Green Island," is an islet situated about 15 km. south of the city of Miyazaki on the southeastern coast of Kyūshū. It is a few hundred meters off the coast, and is connected with the mainland by a long wooden bridge, making it easily accessible by foot. The islet rises only 5.7 m. above the sea-level and is nearly 800 m. in circumference, being fringed to some extent by rocky banks which are exposed above the water at low tide. It has become noted for a luxurious growth of tropical and sub-tropical plants, differing remarkably from those of the neighbouring coast. This lovely islet also attracts the visitor's attention by reason of its picturesque scenery when viewed from the coast. From Ōyodo Station at the south end of Miyazaki, the islet is reached within 40 minutes by a train passing through an alluvial plain at the mouth of the Ōyodo River.

The strata composing the islet are of the Tertiary age. In this district, the Tertiary strata are widely developed along the coast, occupying an area about 10 km. wide and 20 km. long. They are divided into two series, the Younger and the Older. The Younger Series is mainly found constituting the hilly land to the north of Miyazaki. It consists of unconsolidated beds of sand and clay, sometimes with conglomerate. These are very regularly stratified with a slow inclination to the east, and are unconformably overlaid with Diluvial sand and gravel beds. This relation may be seen from the train in a cliff near Kawaminami Station on the Nippō Line. The Series yields various shell remains in different localities, such as *Terebratura, Lima, Pecten, Modiola, Arca, Byssoarca, Pectunculus, Lucina, Cardium, Limopsis, Dosinia, Natica, Cerithium, Columbella, Voluta, Pleurvtoma, Conus, Cancellaria, Drilla, Dentalium, Fussus*, etc.

The Older Series, on the other hand, forms a high mountain tract to the south of Miyazaki, extending for a long distance in the direction of N-S. The strata are highly disturbed, forming some folds and faults. Westward they seem to pass gradually into the so-called "Mesozoic Formation of unknown period." The strata are mainly composed of an alternation of shale and sandstone, with occasional intercalations of conglomerate, limestone and coal seams on the lower horizons. There are also frequent occurrences of marl in the form of lenses and nodules, which contain always some phosphates. A thick sandstone bed, full of *Operculina*, is found in the lower part of the series, extending N-S for a great distance. It is best exposed at the island of Ōshima, where it attains a thickness of 14 m. Besides *Operculina* the bed contains various shell fossils such as *Venus, Dosima, Pecten, Ostrea, Tellina, Natica, Turritella, Dentalium, Toredo* and also other *Foraminiferan* and *Radiolarian* remains as well as sharks' teeth. The stratigraphical relation of the series to the unknown Mesozoic and the Younger Series is not yet well known owing to lack of detailed studies of these districts.

The Tertiary strata exposed at Aoshima belong to the upper parts of the Older Series and consist of an alternation of sandstone and black shale. The rocks are beautifully stratified, presenting a banded appearance, each bed having a thickness of 0.3-1m. The strata are monoclinal with a strike of N.N.E. and a gentle dip of S.E.E. 15°. On the surface of the sandstone are frequently found sun-cracks filled up with calcareous substance. They are pentagonal or hexagonal

having slightly elevated margins, which have been caused by a stronger resistance to erosive action at these points than in the other portions. Occasionally small irregular depressions are observed within these polygons. Several minor faults are met with, running almost parallel in the direction of N. 80° W. and sometimes even step-faultings may be observed. The surface of the islet is covered by a deposit of beach sand on which grow various plants, forming a thick jungle which is almost impenetrable.

The strata composing Aoshima are no doubt a continuation of those exposed on the neighbouring coast and seem to have been insulated by the erosion of the waves.

ON THE VEGETATION OF AOSHIMA

By Harufusa Nakano

In several parts of the coastal regions of the Kyūshū district and the provinces of Kii and Tosa with their scattered islands, we find a remarkable mixture of subtropical and tropical plants. Among these places, Aoshima, literally "Green Island," has recently become quite celebrated, both because it has a luxuriant growth of these plants, and also is easily accessible.

The island of Aoshima belongs to Miyazaki Prefecture, in the Kyūshū district. About ten hours from Shimonoseki by railway brings one to Aoshima station, from which the island may be reached by a ten-minute walk. From the long wooden bridge leading to the island, good views may be obtained of the picturesque scenery of the neighbourhood.

Aoshima is quite a small island, about 800 m. in circumference, and 5.7 m. above sea-level.

The bed of the island is composed of tertiary shale and sandstone, on which quaternary sand has been deposited. These strata are exposed to a great extent in the neighbourhood of the island, and they show, here and there, remarkable examples of sun crack, which are highly appreciated by geologists. The cracks are sometimes hexagonal, sometimes pentagonal, and have slightly elevated margins.[1]

1) D. Sato, Geological observation on Aoshima. (In Japanese). Report of the Research Committee of the Home Department for preserving landscapes and historic and natural monuments, 1920.

The vegetation of Aoshima is quite remarkable. On reaching the island, one is immediately impressed by the fact that the vegetation differs remarkably from that of the neighbouring coast. A thorough study of plant distribution, however, shows that the so-called tropical plants of Aoshima are not always restricted to that island, but that most of them are found, though sparsely, in the coastal region opposite, and some of them even in remote northern districts. The extraordinary aspect of the vegetation of Aoshima is therefore due simply to the fact that the plants concerned are crowded together in a small area.

When undisturbed by man, small uninhabited islands form excellent preserves for vegetation. For this reason, we find a mixed vegetation, with many subtropical and tropical elements not only on Aoshima, but also on other islands under the same conditions. Luckily, the whole island of Aoshima has been for long ages the sacred court of the Shintō temple of Aoshima, for which reason the vegetation has remained untouched.[1)]

Quite recently, the Home Department considered it necessary to take further steps to preserve the island with its trees, flowers and rocks, and laws for this purpose were issued in 1921.

According to the enumeration of Messrs. Shimada and Yoshida, the higher plants (phanerogamic plants and ferns) of Aoshima comprise 71 kinds (species and varieties), belonging to 43 families. Of these the following 12 kinds are considered to represent subtropical and tropical elements.

**Livistonia chinensis* Br. (Biro)
**Alpinia chinensis* Rosc. (Aonokumatakeran)
**Alocasia macrorrhiza* Schott. (Kuwazuimo)
**Arisaema ringens* Schott. var. *Sieboldii* Engl. (Musashiabumi)
Ardisia Sieboldii Miq. (Mokutachibana)
Canavalia lineata DC. (Hamanatamame)
Eurya emarginata Mak. (Hamahisakaki)
Raphiolepis umbellata Mak. (Sharimbai)
Litsea japonica Juss. (Hamabiwa)
Debregeasia edulis Wedd. (Yanagiichigo)
Euphorbia Jolkini Boiss. (Iwadaigeki)
Clerodendron squamatum Vahl. (Higiri)

1) Compare, H. Nakano, On the Preservation of the Vegetation of Aoshima. (In Japanese). Report of the Research Committee of the Home Department for preserving landscapes and historic and natural monuments, 1920.

(Plants marked with an asterisk are conspicuous by their abundance and luxuriance).

Of the eleven species and one variety mentioned above, only one species, *Clerodendron squamatum*, is peculiar to Aoshima, not having yet been found in the Kyūshū district. It would seem, therefore, that this species was formerly transplanted to Aoshima from southern lands (probably from the Yaeyama archipelago or even further south).

The following is a short account of the ecology of the vegetation of Aoshima.

On the sandy shores of the island, we find halophilous plants, such as *Euphorbia Jolkini* Boiss. (Iwadaigeki), *Crinum asiaticum* L. var *declinatum* Kth. (Hamaomoto), *Calystegia soldanella* R. Br. (Hamahirugao), *Lathyrus maritimus* (L.) Bigel. var *Thunbergianus* Miq. (Hamaendo), *Vitex trifolia* L. var *unifoliolata* Schauer (Hamago), *Angelica dahurica* B. et H. (Hamaudo), and *Peucedanum japonicum* Thunb. (Botanbofu).[1)]

On the landward side next to this zone, one finds a bush association, consisting of *Pittosporum Tobira* Ait. (Tobera), *Euonymus japonica* Thunb. var *radicans* Miq. (Masaki), *Elaeagnus macrophylla* Thunb. (Marubagumi), *Eurya emarginata* Mak. (Hamahisakaki) and *Arundo bifaria* Retz. (Danchiku). The last named plant stands isolated from the rest. The growth of this association is mostly so dense that it quite efficiently protects the inner associations from the strong wind.

In the interior part of the island, *Livistonia chinensis* is most prominent, and there are many kinds of underherbs, such as *Alpinia chinensis*, *Alocasia macrorrhiza*, *Arisaema ringens* and many others. The underherbage is generally relatively vigorous, though it is sometimes stunted by the thick shade of its habitat.

NOTES ON THE FAUNA OF KYŪSHŪ

By Hiroshi Ohshima

Among the Japanese islands Kyūshū seems to have been the first to display its fauna for the direct study of Western naturalists.

1) It is worth mentioning that Ipomoea Pes-Caprae was found on the sandy beach opposite Aoshima until a recent date (probably till 1913).

To those pioneers of our biology and medicine, such as E. Kæmpfer (1690–'92), K. P. Thunberg (1775–'76) and P. F. von Siebold (1823–'29 ; 1859–'61), who spent their time mostly in Nagasaki, certainly the nature of Kyūshū was more intimately known than that of any other part of the Japanese Empire.

Later, however, from the time when modern scientific methods were adopted in the study of zoology by Japanese students, the fauna of Kyūshū seems to have received less attention than that of almost any other part of the country. Except for the occasional visits of zoologists from Tokyo who have come to collect specimens, only a few specialists and amateur botanists residing in the island have been able to contribute to the science. Thus meagre and imperfect is our knowledge of the fauna of Kyūshū.

So far as is known, the species of animals peculiar to the island of Kyūshū proper are very few. The fauna here as a whole has much in common with that of the main island of Honshū (Palæarctic). Only in its southern part are found a few species characteristic of the islands further south, such as Amami-Ōshima, the Ryū-Kyū Islands, etc. (Oriental).

I. Mammals.

Game mammals such as the boar, *Sus leucomystax*, and the goat-antelope, *Capricornis crispus*, still frequent the mountain regions of Hiuga and Ōsumi provinces, where other wild beasts are found rather plentifully. Mt. Aso is said to have been the habitat of the last survivals in Kyūshū of the Japanese wolf, *Canis lupus hodophylax*.

Macaca fuscata, or the Japanese macaque, is found here and there in the mountains, notably on Takasaki-yama near Beppu, and on Kawara-daké in Fukuoka Prefecture, both of which were recently made game preserves, and have since come to abound with these monkeys.

The seas off Hirado and the Goto Islands are noted for their whale-fisheries and abound with *Balænoptera musculus*, *B. physalus*, and *B. borealis*.

The species of mammals found in Kyūshū (exclusive of adjoining islands), but not in Honshū, are : the mole shrew, *Urotrichus talpoides talpoides*, musk shrews, *Crocidura cærulea* (imported from the south) and *C. dsinezumi dsinezumi*, the reddish-gray bat, *Myotis nattereri bombinus*, flying squirrels, *Petaurista leucogenys leucogenys* and *Sciuropterus momonga momonga*.

2. Birds.

The most noteworthy event in the bird life of Kyūshū is probably the yearly visit of cranes at Akuné and its environs, Idzumi and Noda. This district is situated near the northwest corner of Satsuma Province. Large and small flocks of cranes, chiefly the white-headed *Megalornis monachus* and white-naped *Pseudogeranus vipio*, and also some few of the sacred crane, *Megalornis japonensis*, are a great attraction to visitors from about the end of October to the early part of March.

The great beach of the inland sea of Ariaké presents a striking appearance at the spring-tide in May on account of the visit of thousands of birds feeding on lingulas, mollusks and crabs. The commonest among them are the turnstone, *Arenaria interpres interpres*, and the golden plover, *Pluvialis dominicus fulvus;* but mingling with them are also seen the gray plover, *Squatarola squatarola hypomelæna*, the curlew, *Numenius arquatus lineatus*, and others. It is also occasionally noticed that near Beppu and in Hakata Bay, when the sea is swarming with the sand-lance, *Ammodytes personatus*, numberless sea-birds such as Bering's guillemot, *Synthliborhamphus antiquus*, and the red-throated diver, *Colymbus stellatus*, are seen in flocks devouring the fish.

Pheasants are not rare, the Amakusa Islands especially being famous for them, while Ariaké Sea is well known for its duck-shooting.

The paradise flycatcher, *Terpsiphone princeps atrocaudata*, and the magpie, *Pica pica sericea*, occur in both Kyūshū and Chōsen. The magpie is found only in some limited localities of Chikugo and Hizen provinces, and is known to have been introduced into Kyūshū from Chōsen by the soldiers of Toyotomi-Hideyoshi at the end of the 16th Century.

The birds peculiar to the island of Kyūshū and to the more southern islands, but not found in Honshū, are: the broad-billed roller, *Eurystomus orientalis*, the owls, *Bubo maximus*, *Scops japonicus elegans* and *Syrnium uralensis fuscescens*, the pygmy woodpecker, *Iyngipicus kisuki nigrescens*, and the Kyūshū green pheasant, *Phasianus versicolor kiusiuensis*.

3. Reptiles and Amphibians.

There is nothing particular to be said about the reptiles of Kyūshū, except that on some southern coasts *Dermochelys schlegelii*,

Caretta olivacea and other marine turtles are occasionally captured. The reptile fauna here is almost identical with that of Honshū, while the southern islands,—Ōshima, Yakushima and the Ryū-Kyū Islands have a rich reptile fauna quite distinct from that of Kyūshū proper.

The amphibian fauna also is similar to that of Honshū. In mountain regions are found frogs, *Rana temporaria ornativentris* and *Polypedates buergerii*, the toad, *Bufo vulgaris formosus*, and at least two species of *Hynobius*, namely, *H. nævius* and *H. nebulosus*. Further, the giant salamander, *Megalobatrachus maximus*, which is well-known in the western half of Honshū, is frequently reported to occur also in some mountain streams of Kyūshū, viz., in the Hayami and Usa districts of Ōita Prefecture, and in the Tagawa district of Fukuoka Prefecture.

4. Fishes and Amphioxus.

Fishes abound all along the coast of Kyūshū, especially off the prefectures of Nagasaki and Kagoshima. The bonito, *Gymnosarda vagans*, and pilchard, *Amblygaster melanostictum*, are perhaps the most important from the economic point of view. Among others, the amber-fish, *Seriola aureovittata*, in Miyazaki Prefecture may be mentioned. About sixty trawlboats from Shimonoseki are operating in the Korean Channel for bottom fishes.

In a well at Kaba Shima, near Cape Nomo, south of Nagasaki, lives a giant eel, 1.5 m. in length, 42 cm. in circumference, and weighing 9 kg. In the same well are many common eels, *Anguilla japonica*, and it is said that this large specimen is the third giant that has appeared among them. It is often referred to as a distinct species, *A. mauritiana*, but it may be a land-locked form of the common eel. Similar examples are also known in Unagi-no-Iké (Eel Pond) near Yamagawa, at the south end of Satsuma, and in Kadzusa, Shimabara Peninsula. Small land-locked forms of the trout, *Onchorhynchus masou*, occur at certain places in mountain regions, e.g., on Mt. Aso.

A species of mud-skippers, *Apocryptes chinensis*, living on the coast of Saga, is well known on account of its peculiar mode of life, as well as its delicate flavour.

Amphioxus, *Branchiostomum nakagawæ*, is known to occur at Gosho-no-Ura in Amakusa, in the Ariaké Sea, off Shimabara and Miiké, and also off Shika-no-Shima near Fukuoka.

5. Insects and Arachnoids.

Of a few forms which are characteristic of the Oriental fauna, but still to be found as far northward as Kyūshū, may be mentioned the following examples: *Papilio doson mikado*, *P. memnon thunbergi*, *Hebomoia glaucippe conspergata*, *Catopsilia pyranthe*, *C. crocale*, *Euplœa mulciber barsine*, *Hypolimnas bolina philippinensis*, *H. misippus*, *Junonia orithya*, *J. almana asterie*, *Cyaniris albocærulea*, *Notocrypta curvifascia*, *Acherontia lachesis*, *Chærocampa silhetensis*, *Dendrolimus iwasakii?*, *Ophideres salaminia*, *Grammodes geometrica*, *Ophiusa melicerte*, *Climaciella habutsuella*, *Myrmecœlurus parvulus*, *Tramea chinensis*, *Orthetrum sabina*, *Calotermes satsumensis*, and *Heterothele kimurai*.

The horse-shoe crab, *Limulus longispinus*, occurs in the Bays of Hakata and Karatsu, where it is said to be much more abundant than in the Inland Sea of Seto.

6. Other Marine Invertebrates.

The marine fauna of Kyūshū is also similar to that of Honshū; but being under the constant influence of the warm waters of the "Kuroshio" (Japan Current), it includes a large number of Indo-Pacific species. This is especially the case along the south and west coasts of the island.

Under mollusks, special mention may be made of a southern representative of the scallops, viz., *Vola laqueata*. This bivalve is known to occur abundantly in Kagoshima Bay, and at Yamagawa in Satsuma there is a regularly established scallop-fishery. Striking is the fact, however, that in some other localities its appearance seems to be intermittent; thus off Kanegasaki and Kōnominato in Fukuoka Prefecture, an unusually dense population of this mollusk was found in the summers of 1886 and 1924, while at Hirado Island a similar phenomenon was observed in 1903.

The coasts of Ariake Bay along the prefectures of Saga and Fukuoka are inhabited by *Pinna japonica*, *Solecurtus constrictus*, and *Ostrea gigas*, all being economically important. The pearl-oyster, *Margaritifera martensii*, is cultivated in the Bay of Ōmura, Nagasaki Prefecture.

Ariake Bay is further noted among zoologists for the fact that it produces markedly large specimens of *Lingula anatina*. An edible jelly-fish, *Rhopilema verrucosa*, found in Ariake Bay, is hardened and preserved with salt and alum and dried for the Saga market.

Fig 1.

Fig. 2.

Fig. 3.

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