

Takasi TUYAMA\*: **Botanical exploration of  
Isl. San Augustino or Minamiiwoto**

津山 尚\*: 南硫黄島の植物学的探検

The aim of this article is to explain the botanical exploration of Isl. San Augustino of the Volcano chain, south of the Bonin group, carried out in March of 1936. The list of plants based on the extant specimens is published here. Novelities obtained from the expedition were already published by me fragmentarily in the Botanical Magazine Tokyo from 1937 to 1939. The reason why the list has not been published yet until now will need explanation. Late Mr. Masayoshi Okabe, a forestry officer working at the Bonin Islands became my intimate friend through his aid in collecting plants for my investigation. In October 1935, he independently planned to explore the island, but he could not reach the virgin forest topping the island. In April of the next year, shortly after our success of the exploration, he compiled a paper on the flora of the Volcano chain including that of San Augustino Island. This was published in Japanese with the plant names also in Japanese. I gave him advices in compiling his paper in the last moment, but my botanical identification was not always in time. Moreover as the war was coming nearer and the collection of plants in the Bonin Islands became more restricted. After the Pacific War, I could not botanize the islands for more than twenty years, and my botanical interest was directed to the other subjects leaving behind my interest in Ins. San Augustino. Several years ago, the forest of this uninhabited island was designated by the Japanese Government as one of the three primary forest reserve in Japan. The island absorbed the interest of the people much more than ever. Recently, two parties attempted to explore the island, but failed to get the summit.

Isl. San Augustino lies about 1350 km due south of Tokyo, and about 300 km south of the main Bonin Islands group in the north eastern Pacific. It is the southernmost member of the Volcano Island chain that is consisted of Isl. San Alessandro, Sulphur Isl. and this island from north to south. Its summit is 918 m above the sea level and can be observed plainly from Sulphur Isl. only in fine days as its upper portion is nearly always covered with the thick cloud

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caused by the evaporation from the dense vegetation topping the summit. This island is considered to be a rather new extinct volcano of Pleistocene period of conical shape a little elongate from north to south. It had never been explored previously to the summit owing to the steep sea-wind eroded precipices attaining up to 200 to 300 m from the sea level. Fisherman occasionally visited the island to take rest on the pebbly seashore. Since the time of its discovery by the Spanish navigator in 1543, it remained uninhabited. The only exception was that a group of nine Japanese passengers who started from the island of Hakkaido and drifted ashore to the island in 1885 was reported to have survived three and a half years by themselves. They lived in a large cave hollowed out at the base of the cliff a little behind the seashore. They were finally rescued from the island and brought back to Isl. Hahajima of the main group of the Bonins. Their stories of the stay for severe years passed on the island were recorded at the police office there. After this incident, before the Pacific War, compulsory liner entering service from Tokyo six times a year to Sulphur Isl. was reported to have been ordered by the Japanese Government to make round navigation once a year around the island, blowing whistle in search of wretched people.

For the study of the Bonin Islands flora, it was essential for me to make vegetational survey of the island. In 1936, as a post graduate student, I planned to explore the island. The trigonometrical point on the island made by the Land Surveying Department of the Japanese Army was only at 45.4 m above the sea level. The top of the island had never been trodded by the human foot. The island had generally been deemed to have no benefit to the human life. It was included, however, in the strategic zone of the Japanese Army, then perhaps in merely a desk plan.

Early in 1936, I wrote to Dr. Yoshio Horikawa, then the assistant professor of Hiroshima University for aid in fund of my project. The total budget was 300 yen, and the half of the expenditure was defrayed from his side. It was not so small amount considering the value of the money at that time. Dr. Yosio Kobayasi, my senior friend, a mycologist and then an assistant botanist of Tokyo Bunrika Daigaku (University) was invited to join us at his proposal. At Chichijima, the political centre of the Bonins, we hired a iron-shelled steamer named Kaiko-maru (海幸丸) of 42 tonnage. In advance of our departure, several officers in charge of the islands proposed to join our party. Six persons

# 島黃硫南

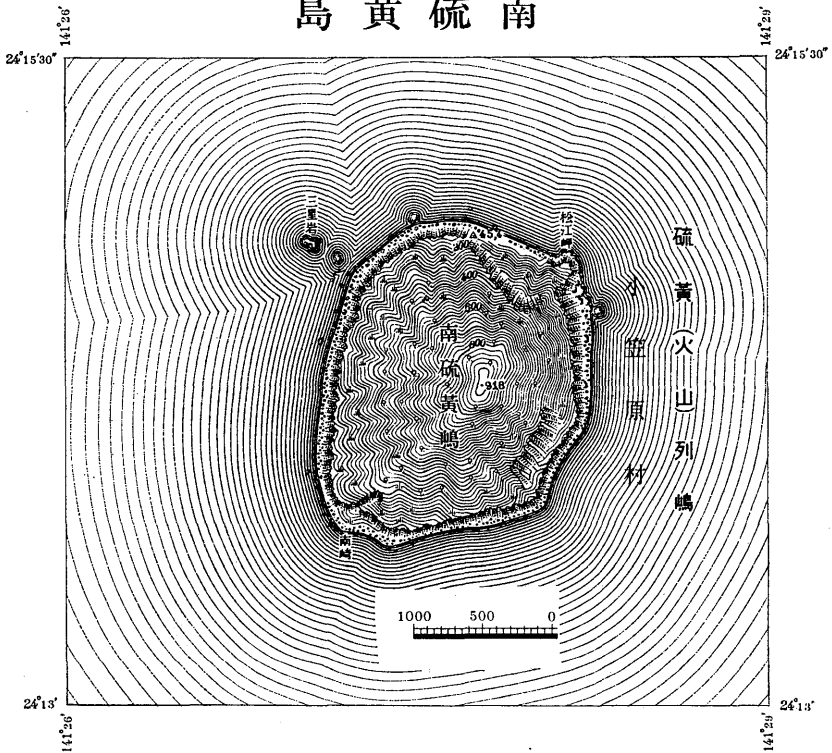


Fig. 1. A map of Ins. San Augustino. Scale, 1: 50,000.

including members from the Command of Army of the Bonins were accepted. We felt that they will assist us physically in climbing the summit. When all preparation was finished, I heard that a typhoon is coming to the Volcano Islands. I at once telegraphed to Dr. Horikawa whether we should carry out the project as scheduled or not. The answer was 'will carry out under any weather'. Fortunately enough for us, as we were coming nearer to the island, the typhoon turned aside, and weather around the island became exceptionally fine. To our great delight, the summit of the island was unveiled. After round navigation, we decided to take our route along a rather shallow valley running down to the south-west of the island. All the other sides of the island

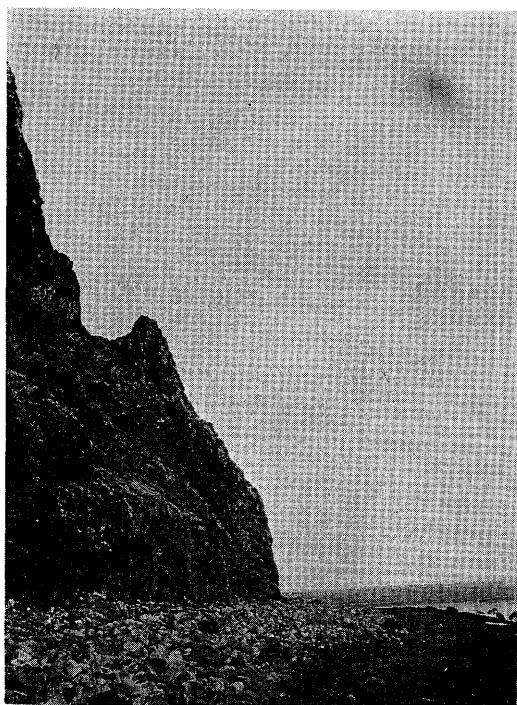


Fig. 2. Sea-wind eroded cliff of Ins. San Augustino; to the lefthand members of the party are seen on work. March 29, 1935.

were too steep to climb up, and especially the lower wind-eroded cliffs seemed very dangerous. The valley was afterwards named Kaiko-dani (Kaiko Valley) in memory of our success on the island. At near the base of our estimated route, we found a large cave in which the wretched people above mentioned might have lived. On the day of arrival, March 29, 1936, we took rest in that cave. I and two persons were different. The three began to scale up the cliff on hands and knees to climb higher up as possible before dark, hanging our bodies at some moment on uncertain root stocks of such as *Miscanthus* or *Boehmeria*. Towards evening, we followed the steep but rounded ridge line scantily covered with small bush or weeds.

When getting dark, each of us barely took rest on the space between the lower parts of the trunk of small trees leaning out from the steep slope and

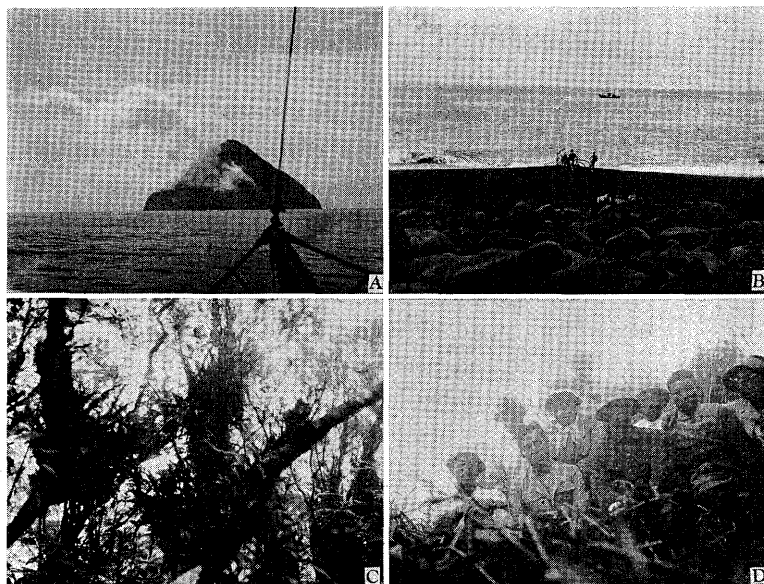


Fig. 3. Ins. San Augustino. A. A view from on board the steamer Kaiko-maru. B. Landing on the island from the south-western side. C. Mossy forest at the summit of the island. D. The party at near the top of the island, among *Miscanthus* bush. Front row from left Dr. Kobayasi, Mr. Machida, the captain of Kaiko-maru, captain of Chichijima Fortress. leftiest Tuyama. Second row second from left Dr. Horikawa. A, B: Photographed on 29 March, 1936. C, D: On 30 March, 1936.

the ground surface. We fell asleep in the cold weather. At about 4 o'clock, we were astonished by the small sea-birds coming out of the underground nests all around. We knew that we had slept on the bird-nests.

In the next morning, the rest of our party overtook us and began to get higher up altogether. Fortunately there was no mist as on the day before and we could see the sea surface downwards in the distance of about 600 or 700 m. It was very interesting that a couple of whales were strongly beating the sea surface by their rear fins raising rapidly their bodies in the air with both of their abdomens in contact in the shape of inverted V letter. Then they fell down gradually into the sea still resuming the shape of V letter but with growingly wider angle between each other and keeping still their contact at the more upward portions of the bodies. After 2 or a little more

than 2 seconds, the sound of the beat reached to our ears.

At about 800 m or so, we could see the sea no more and the slope become markedly gentle. The vegetation became more thicker than the lowerslope, but it was far poorer than the primary forest we have expected to exist in advance. Thickets purely consisted of tall *Miscanthus* were abundant, and the height of mixed evergreen forest was less than 2 m in average. Suddenly we saw a small dome of soil about 20 m in diameter. It was the summit. Dr. Horikawa hastily get ahead of me. He was the first man to stand on the virgin summit. Dominating element of the vegetation on the dome was the branching *Cyathea*. They were by no means abnormal or monstrous forms. The ground surface was soft and humid. I collected fern and orchids which I have never before observed in the Bonin and the other part of Volcano groups. In fact, mossy forest of a small scale was flourishing. On the branch and leaves of trees, *Floribundaria*-like mosses were found hanging or entangling, with epiphytic fern or fern allies such as *Grammitis* and *Lycopodium*. Dr. Kobayasi noted *Dendroceros* among them. There was rather a deep valley in the direction different from the route we have followed up. Owing to the thick vegetation, we could not get the general concept of topography over there, but some of us imagined that we stood at the rounded edge of strongly slant crater. In the valley we could see the bigger stands of *Machilus*, but the time did not allow us to examine the basin. After 30 minutes stay at the summit, we got down along the same route as we had climbed up.

Here I will shortly review the history of botanical collection on the island. In 1930 the first botanically significant collection was made by Mr. Senzo Aoki (青木専蔵), the managing director of the Sulphur Island Colonization and Sugar Making Company. The shrub collected by him was named *Chryso-phyllum Augustini* Nakai, which later proved to be nothing more than *Maesa tenera* Mez. The second and purely botanical collection was actually led by Mr. Okabe with several other officers belonging to the different division from Chichijima on 21-22 October, 1935. Among the party, Mr. Taira Ishida (石田平) was included, who made also a small collection of plants. According to Mr. Okabe's paper, he succeeded to attain to 80% of the total height of the island. His result was published as mentioned above in the bulletin Tokyo Forestry Station, and entitled "General aspects of the Volcano Islands and its botanical survey". Naturally my results obtained from the island were included

in it. He was so hasty in publishing the paper for some unknown reasons, his enumeration of the Ins. Augustino plants includes many undetermined species. On distributing his reprints, he added hand-written species names which I have informed him by letter after his publication. Prior to his publication, when I came back from the island to Chichijima, we together examined all the specimen of the island collected by both of us. Most of specimens especially those I have not collected were given to me for further investigation. His specimen along with mine were all deposited in the herbarium of University of Tokyo (TI).

The following list is a preliminary list of plants of Ins. San Augustino based on the extant specimens deposited in TI. The letter I, O and T denote the collector T. Ishida, M. Okabe and T. Tuyama respectively, and the number after the hyphen shows the number of specimen sheets collected by individual person. Most of the identification in the list seems to be somewhat outdated, and the critical study on some of the species mentioned will be published later.

Okabe's specimen left at Chichijima seems to be lost through the wartime irregularities. The bryophyte collection of Dr. Horikawa which he so eagerly wanted to investigate for the purpose of mapping every Japanese species were wholly lost by the atomic bombardment at Hiroshima. Among the fungous collection of Dr. Kobayasi, *Dacrymyces san-augustinii* Kobayasi in Sci. Rep. Tokyo Bunrika Daigaku B, 4: 122 pl. 9, fig. F (1939) was his only result obtained from the expedition. This species was later reported by Dr. Olive in Bull. Torrey Bot. Club 85: 106 (1958) to occur in the Tahiti Islands.

At the end of this report, I would like to express my deep sense of gratitude to Dr. Y. Kobayasi for his letter to me remembering the days of difficult expedition with 5 photographs enclosed within.

#### A tentative list of plants of Minami-iwoto (Isl. San Augustino)

Piperaceae コショウ科

*Peperomia boninsimensis* Makino T-3 シマゴショウ

*Piper kadzura* (Choisy) Ohwi フウトウカズラ

Ulmaceae ニレ科

*Trema orientalis* (L.) Bl. var *argentea* (Planch.) Laut. O-1, T-1 ウラジロエノキ

Moraceae クワ科

*Ficus boninsimae* Koidz. O-1, T-2 トキワイヌビワ

Urticaceae イラクサ科

- Boehmeria boninensis* Nakai O-1 オガサワラモクマオ
- Amaranthaceae ヒユ科
- Achyranthes obtusifolia* Lam. O-2, T-1 シマイノコヅチ
- Nyctaginaceae オシロイバナ科
- Boerhaavia diffusa* L. O-2 ナハカノコソウ
- Portulacaceae スベリビユ科
- Portulaca australis* Endl. O-2 ケヅメグサ
- P. oleracea* L. O-1 スベリビユ
- Lauraceae クスノキ科
- Machilus kobu* Maxim. O-1, T-4 コブカン
- Saxifragaceae ユキノシタ科
- Hydrangea macrophylla* Ser. form. *normalis* (Wilson) Hara T-2 ハマアジサイ
- Rosaceae バラ科
- Rubus tuyamae* Hatusima O-1, t-5 イオウトウキイチゴ
- Leguminosae マメ科
- Caesalpinia bonduc* (L.) Roxb. O-1 シロツブ
- Canavalia lineata* (Thunb.) DC. O-1 ハマナタマメ
- Rhynchosia minima* (L.) DC. O-1, T-1 ヒメノアズキ
- Vigna marina* (Burm. f.) Merr. O-1, T-1 ハマアズキ
- Oxalidaceae カタバミ科
- Oxalis corniculata* L. var. *trichocaulon* Lév. O-1, T-1 ケカタバミ
- Rutaceae ミカン科
- Boninia grisea* Planch. O-1, T-2 オオバンロウ
- Meliaceae センダン科
- Melia azedarach* L. T-1 センダン
- Elaeocarpaceae ホルトノキ科
- Elaeocarpus pachycarpus* Koidz. T-2 チギ
- Malvaceae フオイ科
- Abutilon asiaticum* G. Don O-1, T-1 シマイチビ
- Hibiscus mutabilis* L. O-1 フヨウ
- Sterculiaceae アオギリ科
- Melochia odorata* L. f. I-1, O-2, T-3 キダチノジアオイ
- Teaceae ツバキ科
- Eurya japonica* Thunb. O-2, T-3 ヒサカキ
- Melastomataceae ノボタン科



- Melastoma* sp. T-3 ノボタン属の1種
- Araliaceae ウコギ科  
*Fatsia oligocarpella* Koidz. I-1 ムニンヤツデ
- Plumbaginaceae イソマツ科  
*Limonium wrightii* (Hance) OK. O-1 イソマツ
- Myrsinaceae ヤブコウジ科  
*Maesa tenera* Mez A-2, O-2, T-5 シマイズセンリョウ
- Sapotaceae アカテツ科  
*Pouteria obovata* (R. Br.) Baehni O-1, T-3 アカテツ
- Oleaceae モクセイ科  
*Osmanthus insularis* Koidz. O-1 ホソバヤロード
- Apocynaceae キョウチクトウ科  
*Ochrosia hexandra* Koidz. ホソバヤロウド
- Convolvulaceae ヒルガオ科  
*Ipomoea indica* (Burm.) Merr. O-2, T-2 ナンヨウアサガオ  
*Stictocardia tiliifolia* (Desr.) Hallier O-1 オニヒルガオ
- Verbenaceae クマクヅラ科  
*Callicarpa subpubescens* Hook. et Arn. T-1 オオバンナムラサキ
- Solanaceae ナス科  
*Solanum boninense* Nakai ex Tuyama T-1 ムニンホウズキ
- Rubiaceae アカネ科  
*Hedyotis pachyphylla* Tuyama O-1 アツバンマザクラ  
*Morinda citrifolia* L. O-1, T-1 ヤエヤマアオキ
- Campanulaceae キキョウ科  
*Wahlenbergia marginata* (Thunb.) A. DC. O-1 ヒナギキョウ
- Goodeniaceae クサトベラ科  
*Scaevola taccada* (Gaertn.) Roxb. T-1 クサトベラ
- Compositae キク科  
*Adenostemma lavenia* (L.) OK. T-1 スマダイコン  
*Crossostephium chinense* (L.) Makino O-1 モクビャッコウ  
*Erechtites hieracifolia* (L.) Raf. var. *cacalioides* (Fisch.) Griseb. O-1  
ウシノタケダグサ  
*E. valerianifolia* (Wolf) DC. O-1 タケダグサ  
*Glossogyne tenuifolia* (Labill.) Cass. O-1 セリバセンダングサ
- Pandanaceae タコノキ科

*Pandanus boninensis* Warb. タコノキ (no specimen in TI)

Gramineae イネ科

*Capillipedium parviflorum* (R. Br.) Stapf T-1 ヒメアブラサスキ

*Eleusine indica* (L.) Gaertn. O-1 オヒシバ

*Digitaria sanguinalis* Scopoli O-1 メヒシバ

*D. sp.* O-1 メヒシバ属の 1 種

*Garnotia acutigluma* (Steud.) Ohwi T-1 ナンヨウカモジグサ

*Miscanthus sinensis* Anderss. var. *condensatus* (Hack.) Makino O-1, T-1  
ハチジョウススキ

*Oplismenus compositus* (L.) Beauv. O-1, T-1 エダウチチジミザザ

*Stenotaphrum subulatum* Trin. T-1 シマキビモドキ

*Zoysia tenuifolia* Willd. T-1 コウライシバ

Cyperaceae カヤツリグサ科

*Carex augustini* Tuyama T-5 ウミノサチスゲ

*C. boottiana* Hook. et Arn. O-1 ヒゲスゲ

*Cyperus javanicus* Houtt. T-1 オニクダ

*C. polystachyos* Rottb. O-2 イガガヤツリ

*Fimbristylis diphylla* Vahl T-3 オテンツキ

Zingiberaceae ショウガ科

*Alpinia nakaiana* Tuyama O-1, T-1 イオウトウクマタケラン

Orchidaceae ラン科

*Calanthe triplicata* Ames T-2 ツルラン

*Goodyera augustinii* Tuyama T-2 ナンカイシュスラン

*G. procera* Hook. f. T-1 キンギンソウ

*G. sp.* (no specimen in TI) シュスラン属の 1 種, 全体紫色ノ葉, 枯死

*Liparis hostifolia* Koidz. ex Tuyama T-2 シマクモキリソウ

Lycopodiaceae ヒカゲノカズラ科

*Lycopodium hamiltonii* Sp. T-2 マツバナナンカクラン

Pteridaceae ワラビ科

*Adiantum diaphanum* Bl. T-2 スキヤクジャク

*Histiopteris incisa* (Thunb.) J. Sm. T-2 ユノミネンダ

*Pteris boninensis* H. Ohba O-1 オガサワラハチジョウシダ

*Sphenomeris chinensis* (L.) Maxon T-2 ホラシノブ

Dennstaedtiaceae コバノイシカグマ科

*Hypolepis tenuifolia* (Forst.) Bernh. T-3 セイタカイワヒメワラビ

## Aspleniaceae トラノオンダ科

*Asplenium excisum* Presl T-5 ラハオンダ*A. nidus* L. O-1, T-9 シマオオタニワタリ*A. micantifrons* (Tuyama) Tuyama ex H. Ohba T-6 ナンカイシダ*A. polyodon* Forst. O-1, T-1 ムニンシダ*A. ritoense* Hayata O-1, T-2 コウザキンダ*A. unilaterale* Lam. T-1 ホウビシダ

## Cyatheaceae ヘゴ科

*Cyathea mertensiana* (Kunze) Copel. T-3 マルハチ*C. spinulosa* Wall. ex Hook. var. *ramosa* (Tuyama) Tuyama T-6 エダウチ  
ムニンヘゴ

## Davalliaceae タマシダ科

*Humata trifoliata* Cav. O-1 シマキクシノブ*Nephrolepis cordifolia* (L.) Presl O-1, T-1 タマシダ

## Aspidiaceae オンダ科

*Cornopteris fluvialis* (Hayata) Tagawa T-5 オオバミヤマイヌワラビ*Ctenitis lepigera* (Bak.) Tagawa O-1, T-5 キンモウイノデ*Cyclosorus parasiticus* (L.) Farw. T-1 ケホシダ*Diplazium virescens* Kunze T-5 コクモウクジャク*Lunathyrium bonincola* (Nakai) H. Ohba T-1 オオシケンダ*Thelypteris ogasawarensis* (Nakai) H. Ito ex Honda T-3 ムニンヒメワラビ

## Polypodiaceae ウラボシ科

*Grammitis tuyamae* H. Ohba T-2 ナガバコウラボシ*Lepisorus boninensis* (Christ) Ching O-1, 1-1, T-3 ホソバクリハラシ

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南硫黄島の初登頂とその時の植物調査についてややくわしくのべた。この探険は1936年3月29~30日に行われたが、今まで種々の事情でその報告はなされていなかった。最近この島の調査がやや世の注目をひくようになったのを機会にここにまとめて発表した。近年は外国からもこれらの経緯を知りたいとの要望もある。同島の植物については東大腊葉室 (TI) に現存する標本をもとにしてリストを作成した。附図の乾板写真はこの登頂に参加された小林義雄博士の撮影によるものである。