Nomination of

Amami-Oshima Island
Tokunoshima Island
The Northern Part of Okinawa Island, and
Iriomote Island

for Inscription on the World Heritage List

GOVERNMENT OF JAPAN

January 2017

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Table of Contents

GLOSSARY

- Terms used to indicate localities in this document:

  1) Nominated property:

  - The 24 component parts in four regions included in this serial nomination, i.e. nominated areas on Amami-Oshima Island, Tokunoshima Island, the northern part of Okinawa Island, and Iriomote Island.

  2) The four regions containing the nominated property:

  - The whole area of Amami-Oshima, Tokunoshima, Iriomote Islands, and three Yambaru villages in the northern part of Okinawa Island. Each region includes the nominated areas, buffer zones and neighboring areas.
  - "Three Yambaru villages" means the area comprising Kunigami Village, Ogimi Village, and Higashi Village in the northern part of Okinawa Island. Yambaru means the wide forest area in mountains in Okinawa language.

  3) The four islands containing the nominated property:

  - The whole area of Amami-Oshima, Tokunoshima, Okinawa, and Iriomote Islands including the nominated areas, buffer zones, and neighboring areas.

- Names and classification of islands used in this document are shown in a figure on the next page.
- Endemic species in this document refers to a species, whose geographic distribution is confined to Central and/or South Ryukyus unless otherwise specified.
- Relict endemic species refers to an endemic species, whose extant sister lineage (i.e., group of phylogenetically closest relatives) does not occur in the vicinity of the Ryukyu Chain.
- New endemic species refers to an endemic species, whose extant sister lineage (i.e., group of phylogenetically closest relatives) occurs in the vicinity of the Ryukyu Chain.
- Globally threatened species indicate the species listed as Critically Endangered (CR), Endangered (EN) or Vulnerable (VU) on the IUCN Red List.
  - The assessment of IUCN Red List is basically at the species level, but some are assessed at the subspecies level.
- Japanese threatened species indicate the species listed as CR, EN or VU on the Red List of Japan produced by the Ministry of the Environment (MOEJ-Red List).
  - The assessment of MOEJ-Red List is usually at the subspecies level. Only plants are assessed at the subspecies and variety levels.

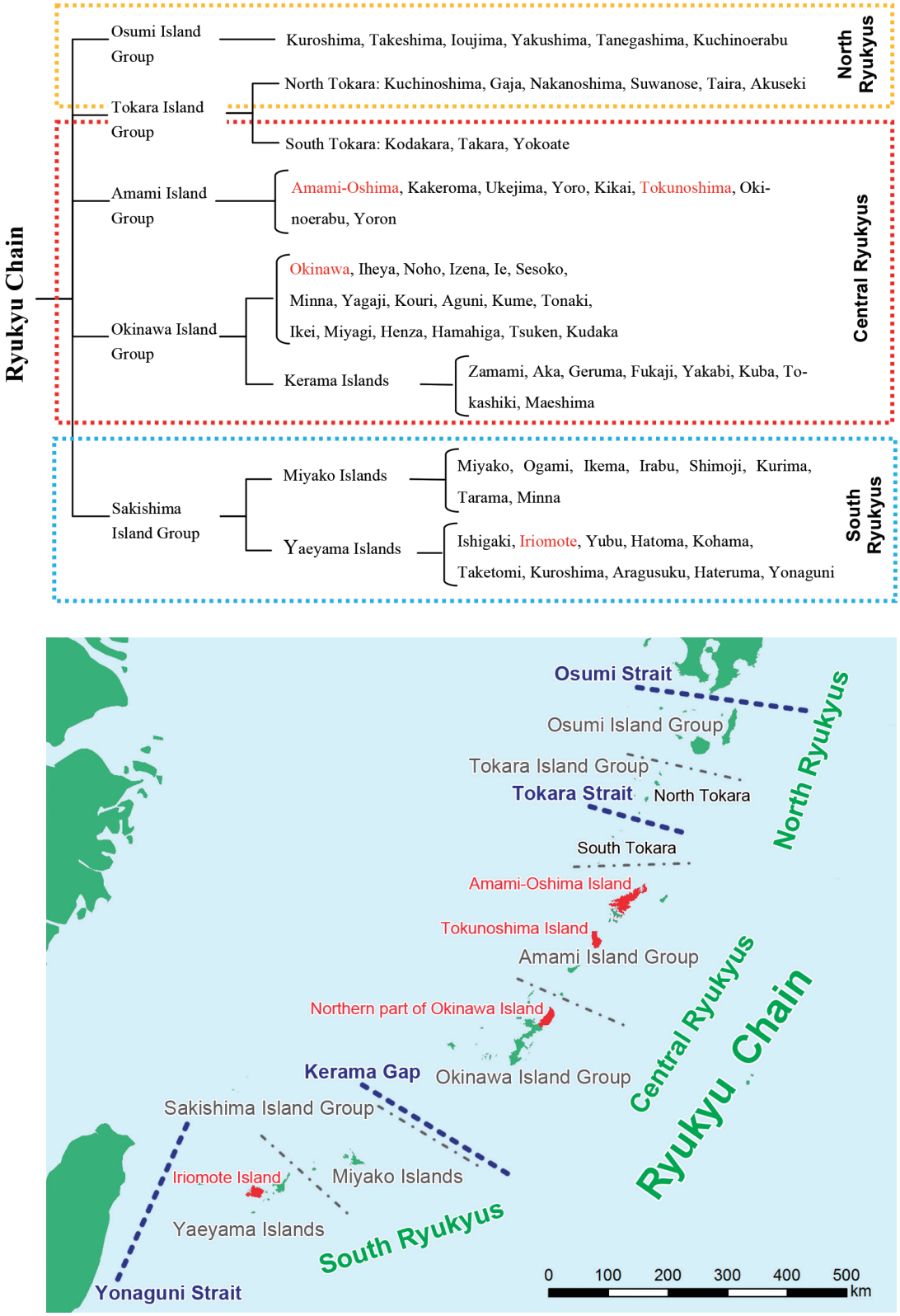


Figure: Names and classification of islands used in scientific fields, especially biology (based on Toyama 2014). Red letters indicate the islands in which the nominated property is included.

1. The marine area between Yonaguni Island and Taiwan is not explicitly named and is described as "between Taiwan and Yonaguni Island" by Geospatial Information Authority of Japan and Japan Coast Guard. In this document, the area is called "Yonaguni Strait" for descriptive purposes as it appears repeatedly.

Executive Summary

State Party

Japan

State, Province or Region

Kagoshima Prefecture and Okinawa Prefecture

Name of Property

Amami-Oshima Island, Tokunoshima Island, the northern part of Okinawa Island, and Iriomote Island

Geographical Coordinates to the Nearest Second

Latitude/longitude of each component part of the nominated property

ID	Name of the component parts		Region/ District	Coordinates of the central point	Area of nominated component of the property (ha)	Area of the buffer zone (ha)	Map No. (Appendix 5-1)
1	Amami-Oshima Island	a	Kagoshima Prefecture	N28° 16′ 44.969″ E129° 22′ 41.886″	9,299	14,468	AMA_2 AMA_3
2		b		N28° 12′ 26.893″ E129° 25′ 35.112″	1,752		AMA_3
3		c		N28° 16′ 40.687″ E129° 25′ 26.504″	164		AMA_3
4		d		N28° 15′ 20.993″ E129° 22′ 49.542″	96		AMA_3
5		e		N28° 11′ 27.022″ E129° 23′ 35.690″	72		AMA_3
6		f		N28° 16′ 53.282″ E129° 24′ 54.518″	49		AMA_3
7		g		N28° 15′ 35.162″ E129° 23′ 42.903″	45		AMA_3
8		h		N28° 14′ 11.265″ E129° 24′ 32.565″	41		AMA_3
9		i		N28° 13′ 18.441″ E129° 26′ 08.388″	26		AMA_3
Amami-Oshima Island area (ha)					**11,544**	**14,468**	
10	Tokunoshima Island	1	Kagoshima Prefecture	N27° 45′ 48.136″ E128° 58′ 01.962″	1,643	1,853	TOK_2
11		2		N27° 51′ 56.053″ E128° 55′ 33.394″	791	999	TOK_1
Tokunoshima Island area (ha)					**2,434**	**2,852**	
12	Northern part of Okinawa Island	1-a	Okinawa Prefecture	N26° 43′ 29.212″ E128° 13′ 12.382″	4,219	2,385	NPO_2 NPO_4
13		1-b		N26° 39′ 03.653″ E128° 11′ 41.015″	34		NPO_4
14		1-c		N26° 39′ 19.626″ E128° 11′ 29.668″	6		NPO_4

ID	Name of the component parts		Region/ District	Coordinates of the central point	Area of nominated component of the property (ha)	Area of the buffer zone (ha)	Map No. (Appendix 5-1)
15		1-d		N26° 39′ 21.979″ E128° 11′ 43.241″	5		NPO_4
16		1-e		N26° 39′ 01.906″ E128° 12′ 02.403″	3		NPO_4
17		2		N26° 45′ 52.953″ E128° 17′ 19.942″	355	131	NPO_2
18		3-a		N26° 43′ 36.353″ E128° 16′ 26.244″	229	184	NPO_2
19		3-b		N26° 43′ 25.308″ E128° 15′ 26.700″	77		NPO_2
20		4-a		N26° 41′ 06.970″ E128° 08′ 40.088″	84	327	NPO_2
21		4-b		N26° 40′ 44.575″ E128° 07′ 37.115″	65		NPO_2 NPO_3
22		5		N26° 51′ 15.715″ E128° 15′ 17.122″	56	241	NPO_1
Northern Part of Okinawa Island area (ha)					**5,133**	**3,268**	
23	Iriomote Island	a	Okinawa Prefecture	N24° 19′ 34.257″ E123° 48′ 31.486″	18,829	5,542	IRI_1 IRI_2 IRI_3
24		b		N24° 18′ 28.492″ E123° 54′ 03.246″	6		IRI_2
Iriomote Island area (ha)					**18,835**	**5,542**	
Total area (ha)					**37,946**	**26,130**	

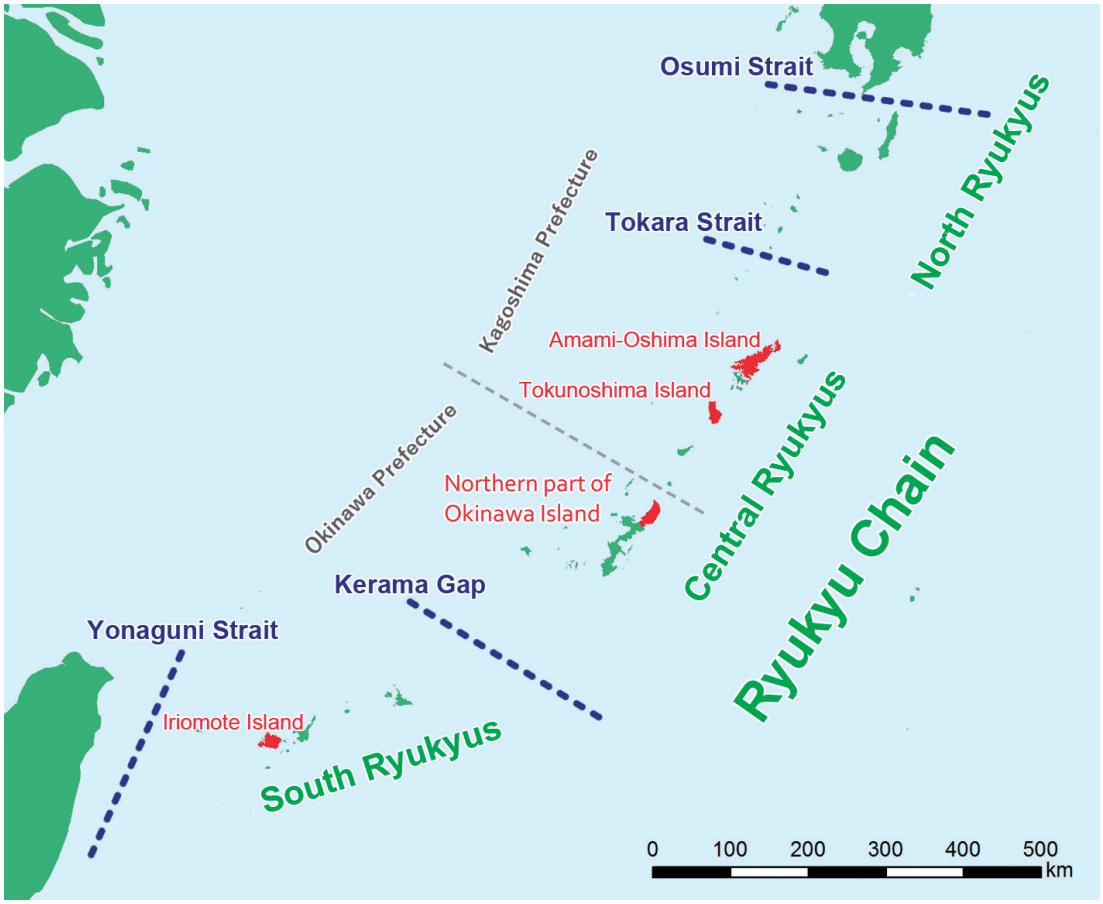
Textual Description of the Boundaries

The nominated property is part of the Ryukyu Chain scattered in an arc, about 1,200 km long, lying between the south end of Kyushu of the Japanese Archipelago and Taiwan. It is a serial property consisting of four islands: Amami-Oshima Island, Tokunoshima Island, Okinawa Island (in the Central Ryukyus), and Iriomote Island (in the South Ryukyus).

The nominated property which demonstrates Outstanding Universal Value for inscription on the World Heritage List is to be limited, in light of scientific examination, only to these four islands.

The nominated property is part of the areas strictly protected by the Special Protection Zone and the Class I Special Zone in the Amami Gunto National Park, Yambaru National Park, and Iriomote-Ishigaki National Park as well as the Preservation Zone in the Amami Gunto Forest Ecosystem Reserve and Iriomote Forest Ecosystem Reserve (for the zoning system of protected areas, see Tables 5-2-1 to 5-2-4, 5-3, and 5-4).

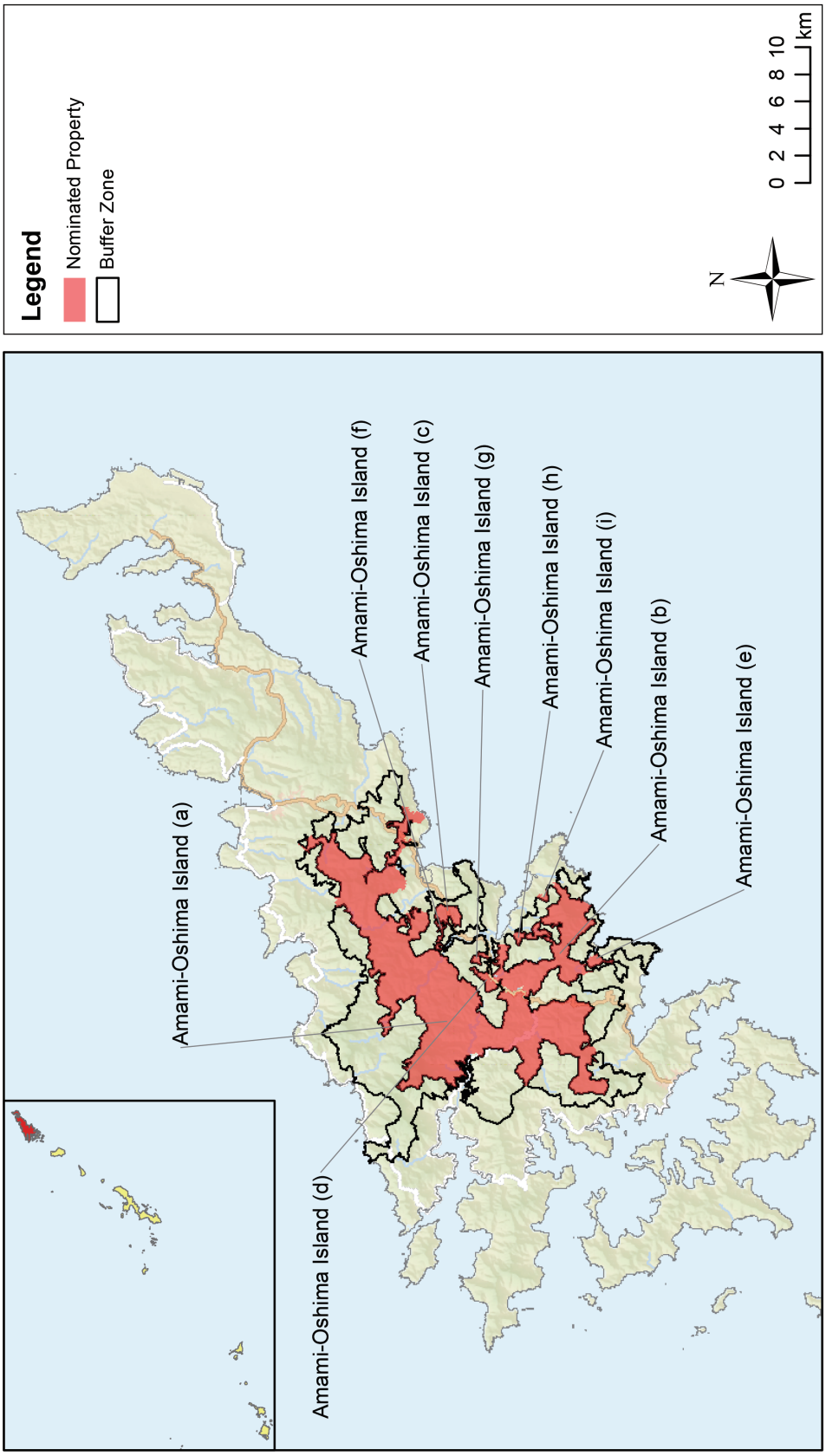
The buffer zones are mainly parts of the areas protected by the Class II Special Zone in the above national parks as well as the Conservation and Utilization Zone of the above Forest Ecosystem Reserves.



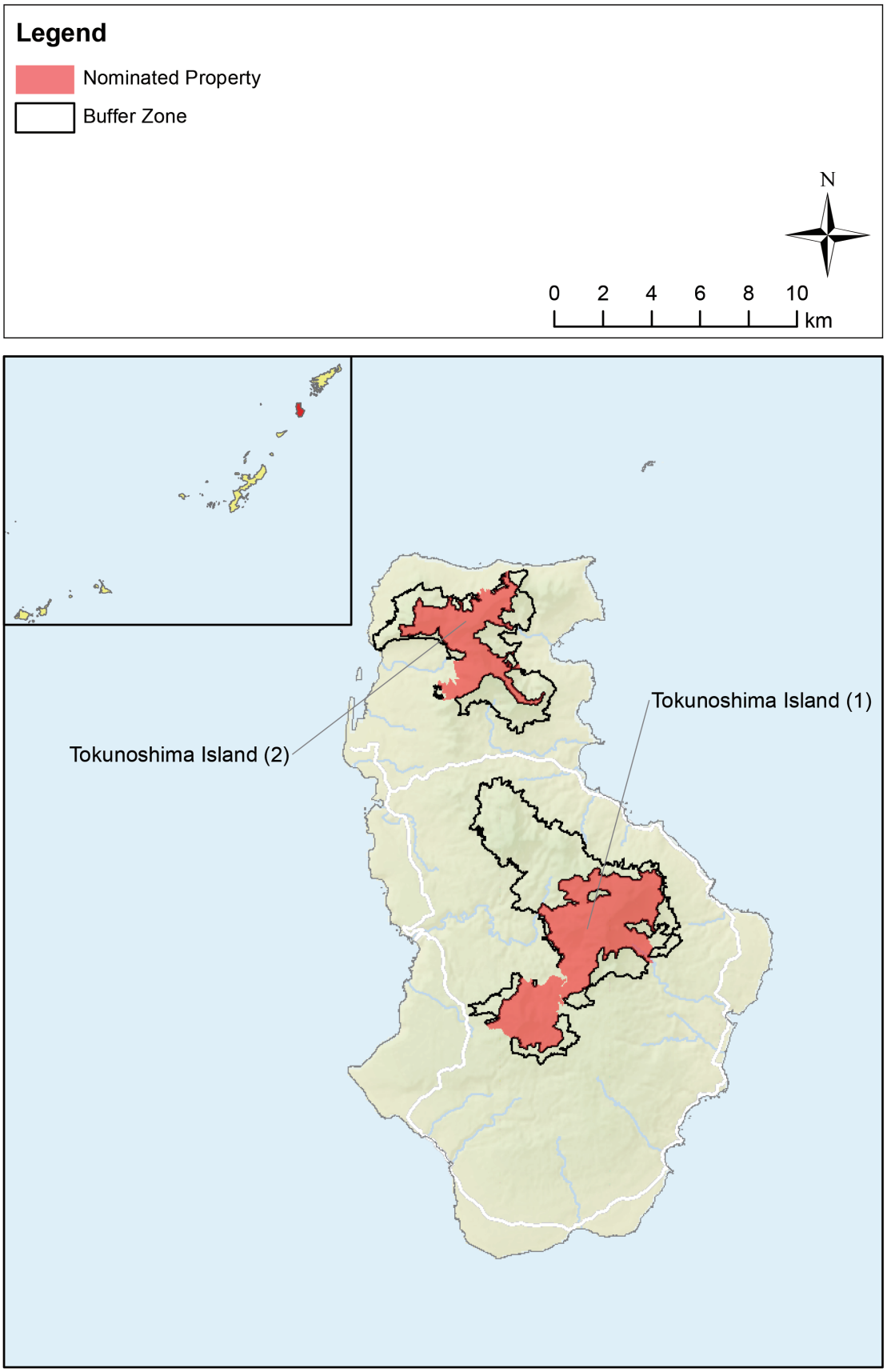
Regional classification of the Ryukyu Chain including the nominated property

Subtropical rainforest (Photo: MOEJ)

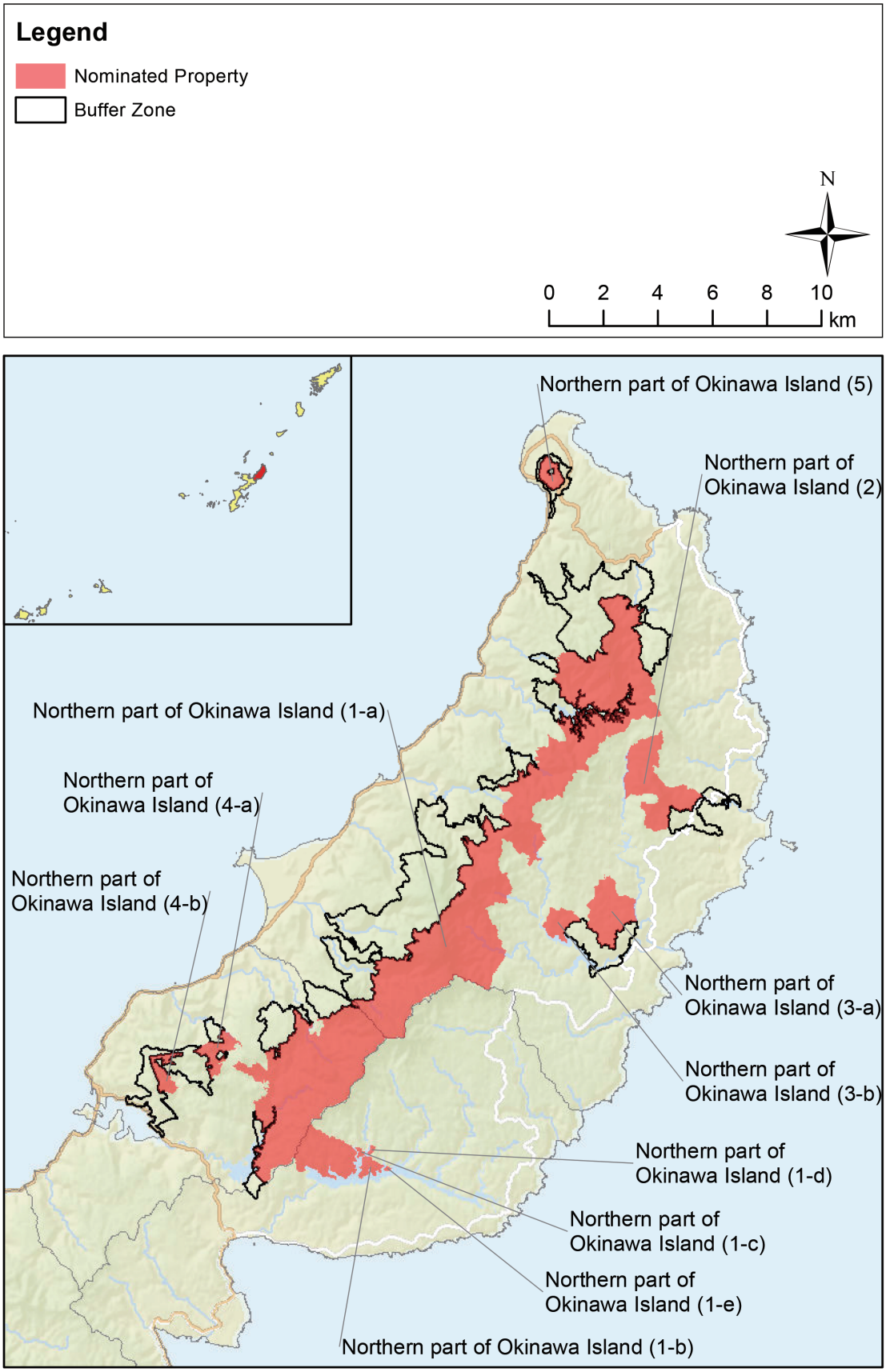
Maps of the Nominated Property, Showing Boundaries and Buffer Zone



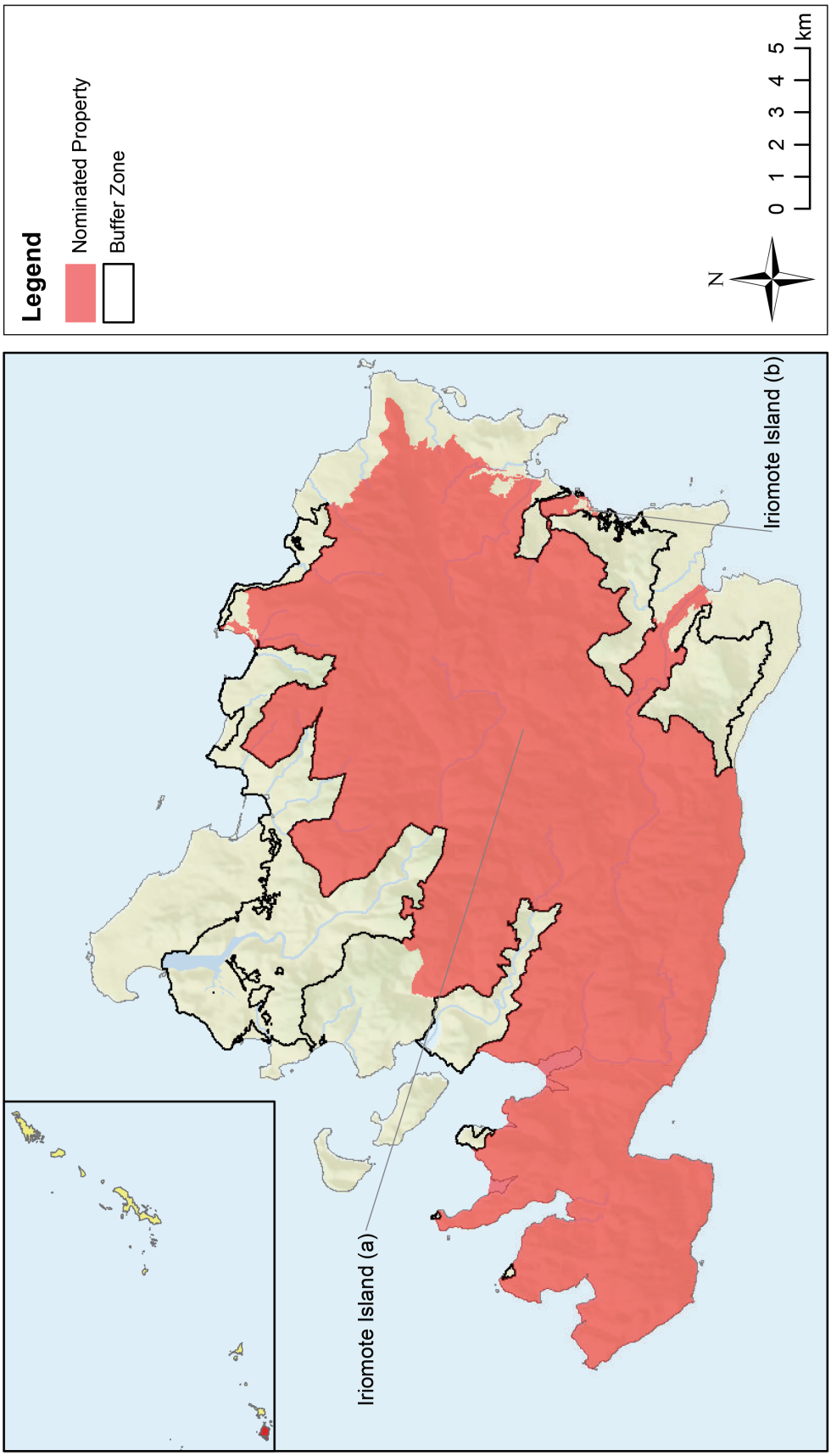
Boundary of the nominated property (Amami-Oshima Island)



Boundary of the nominated property (Tokunoshima Island)



Boundary of the nominated property (Northern part of Okinawa Island)

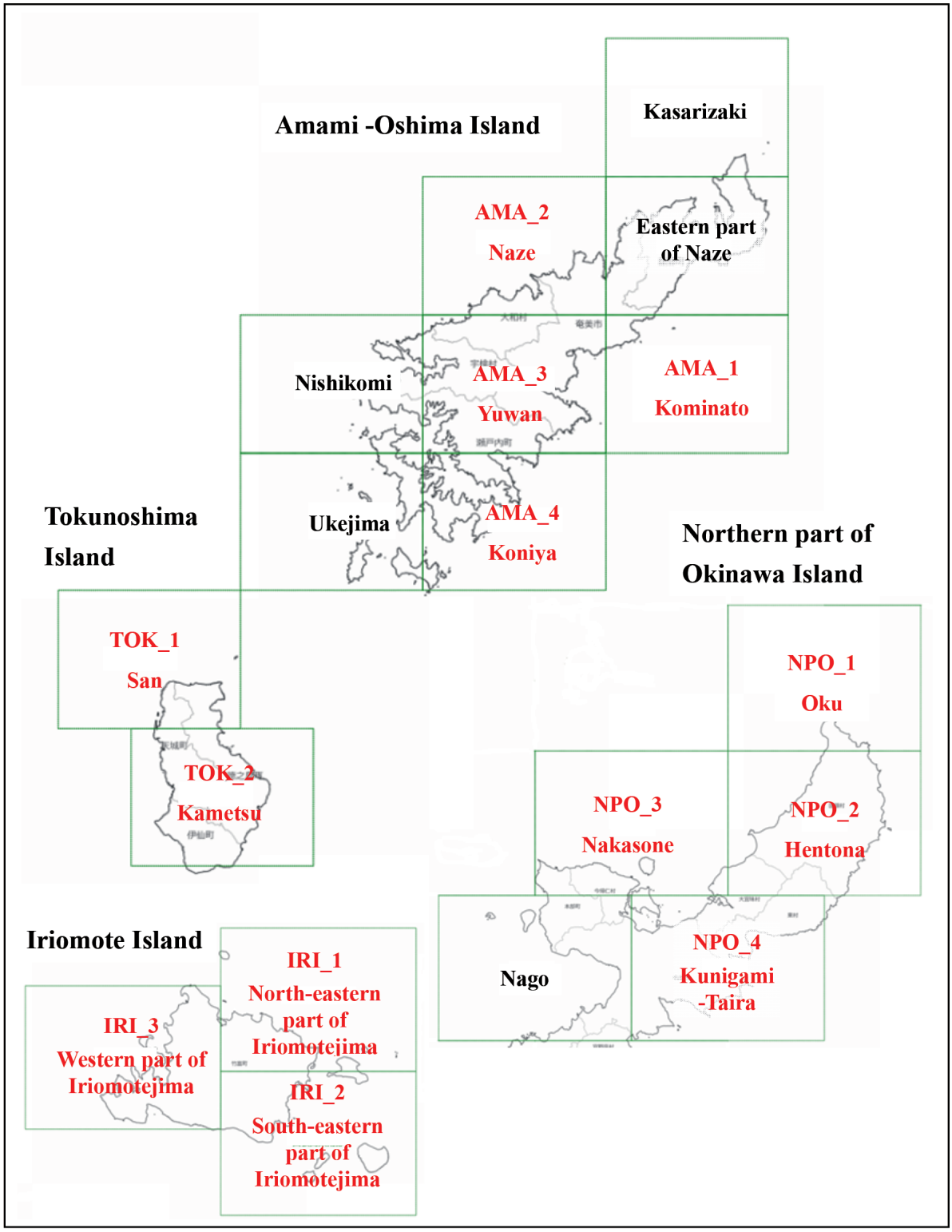


Boundary of the nominated property (Iriomote Island)

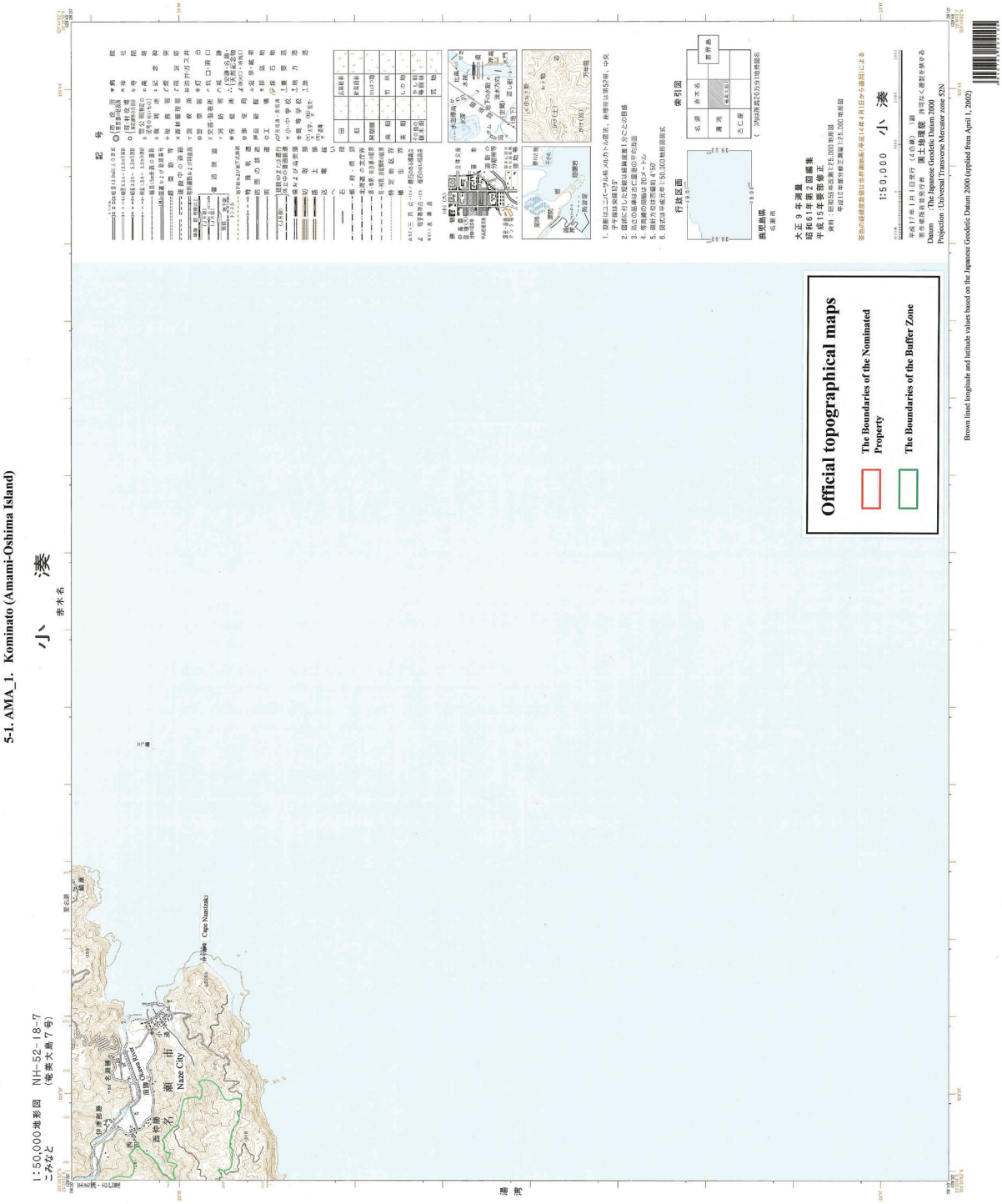
Boundaries of 1:5000 topographical maps including the nominated property and buffer zones

(Source: Geospatial Information Authority of Japan)

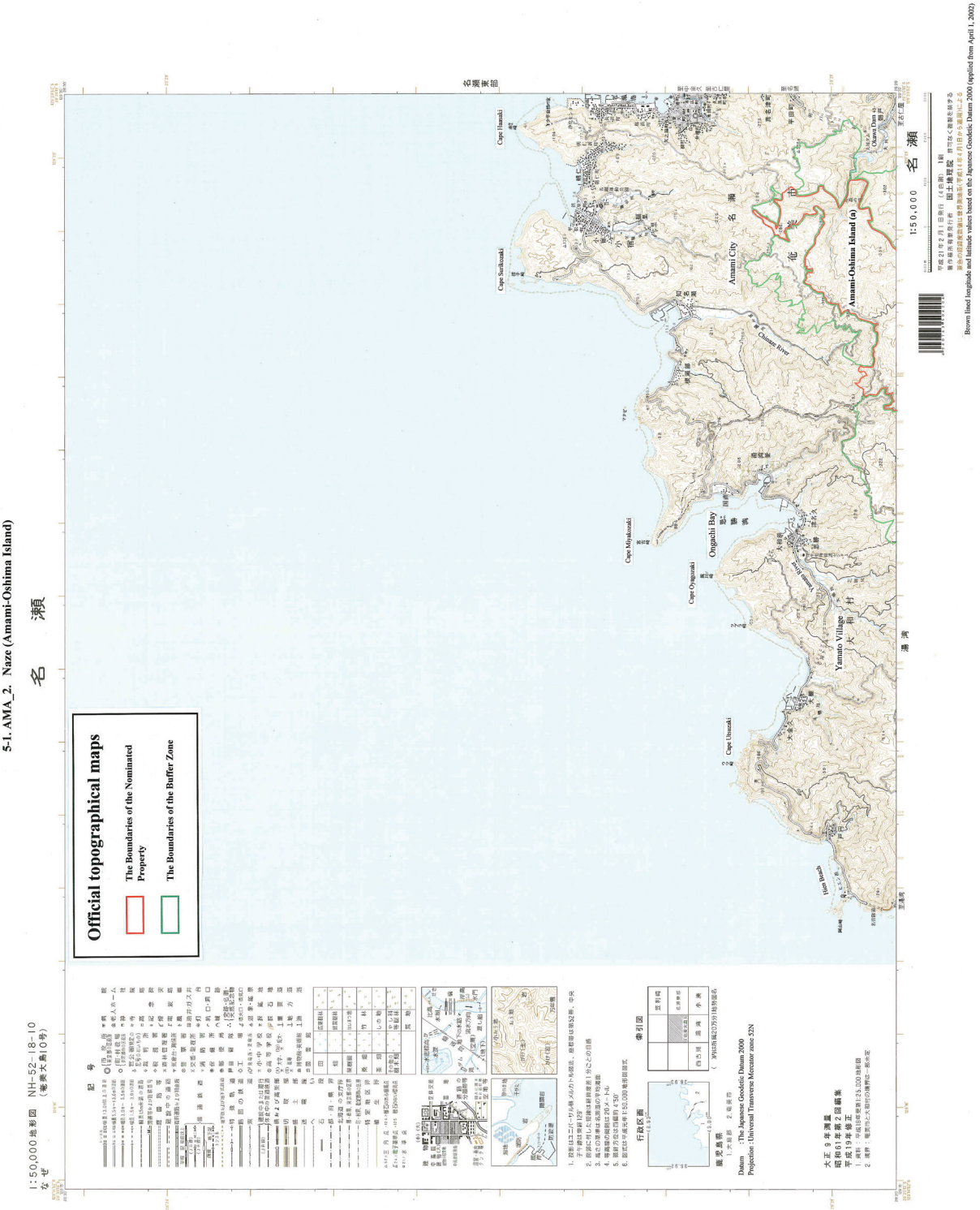
Red letters indicate the map numbers and names in which the nominated property is included.



AMA_1　Kominato (Amami-Oshima Island)

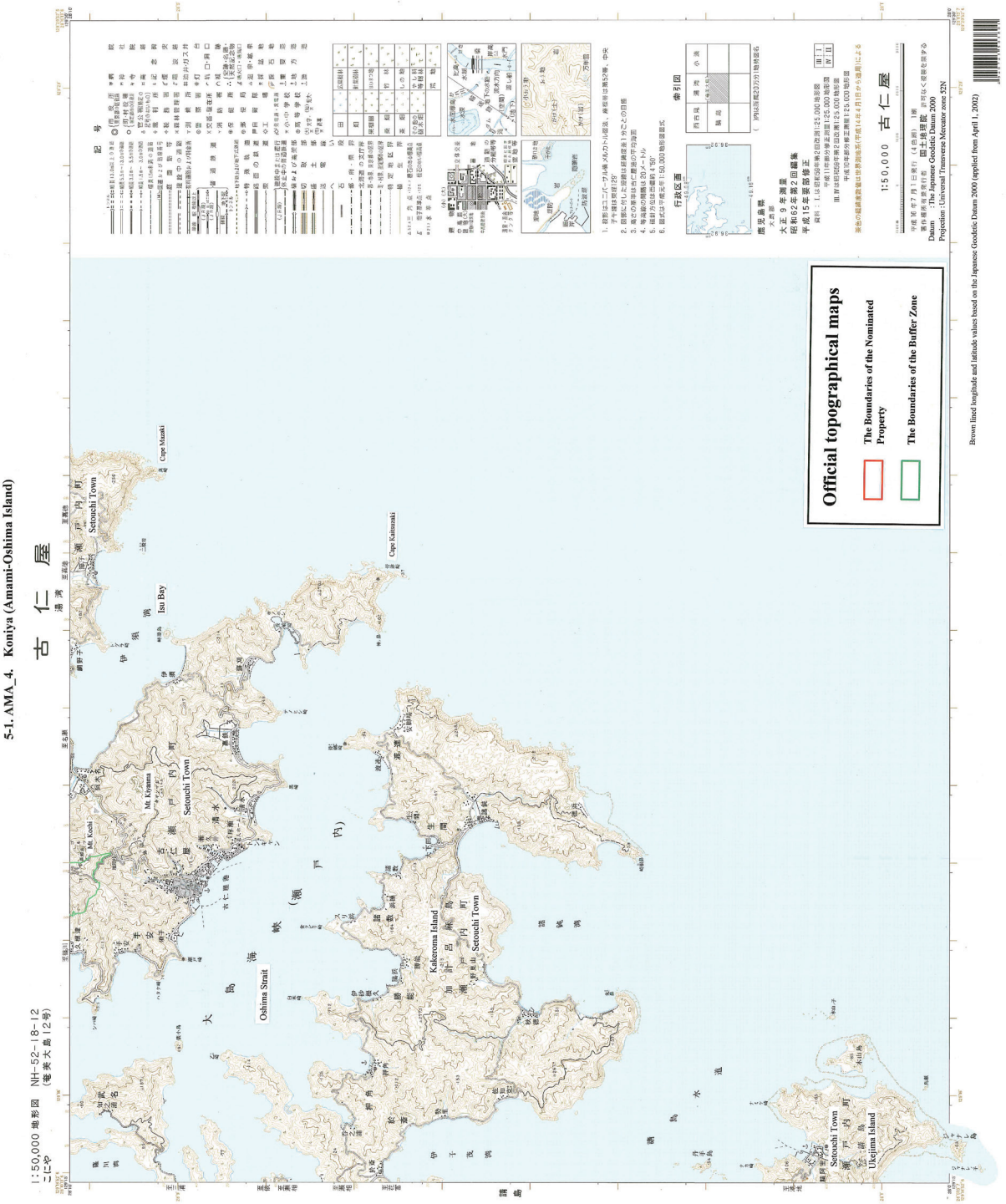


AMA_2　Naze (Amami-Oshima Island)



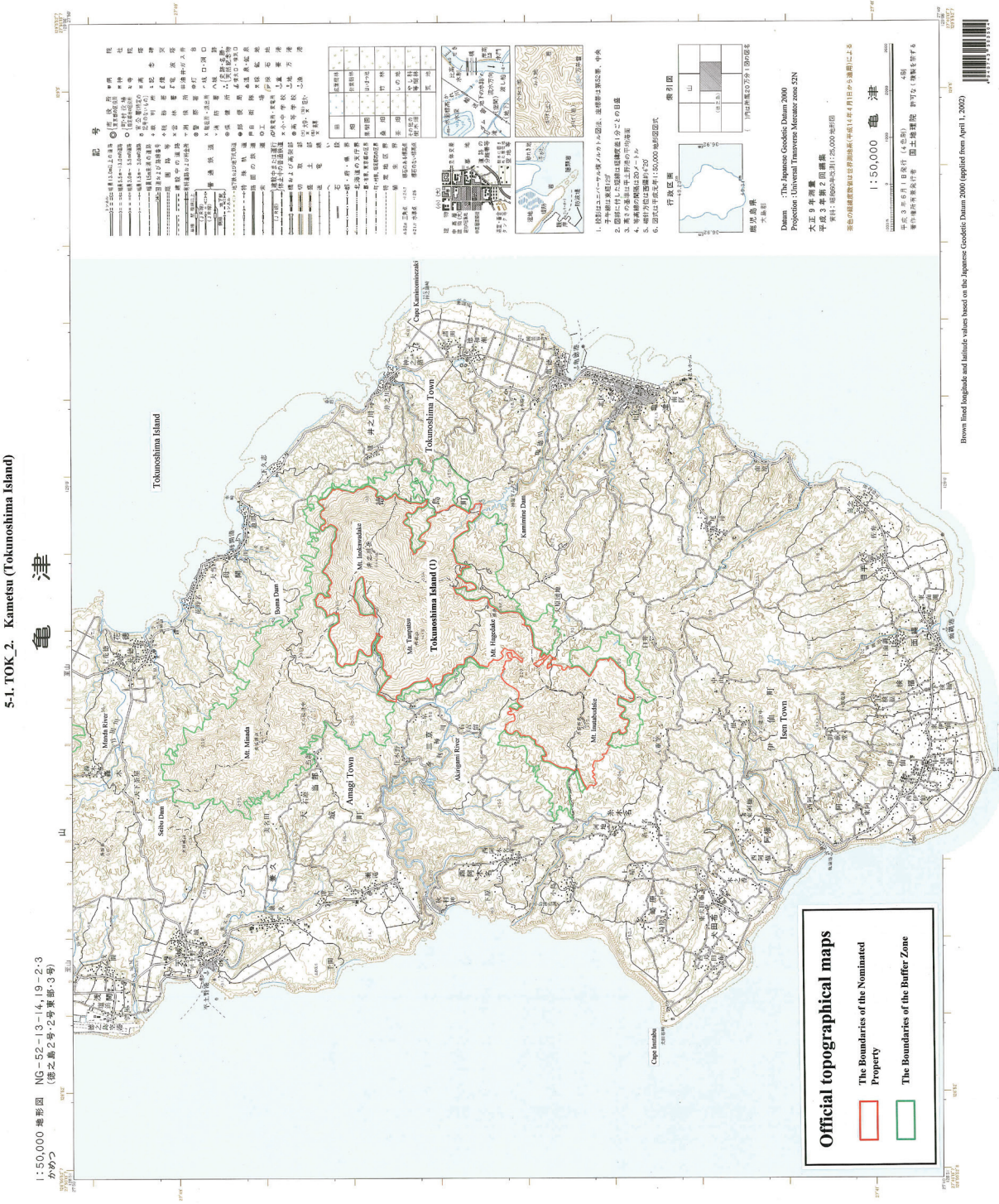
AMA_3　Yuwan (Amami-Oshima Island)

AMA_4 Koniya (Amami-Oshima Island)

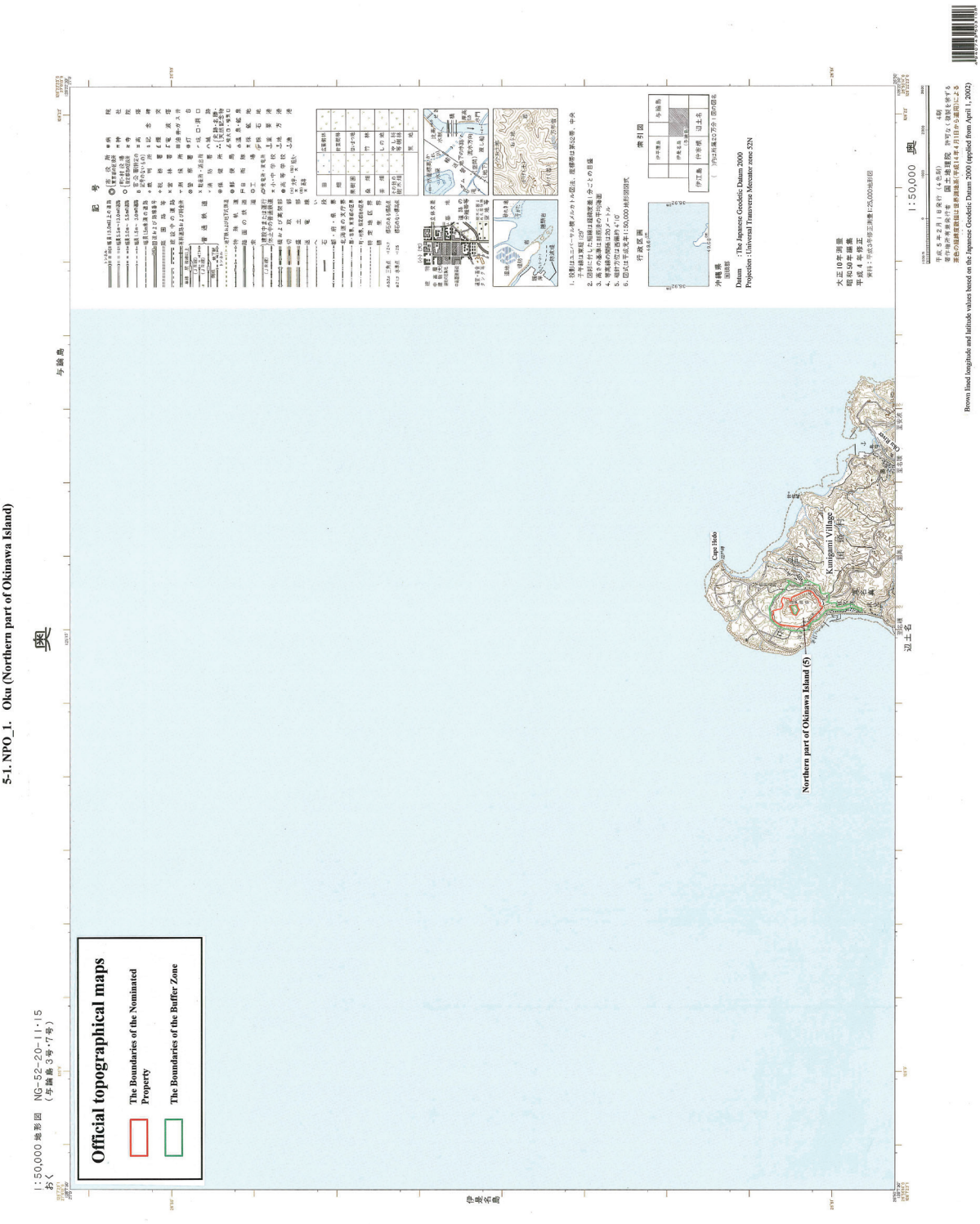


TOK_1　San (Tokunoshima Island)

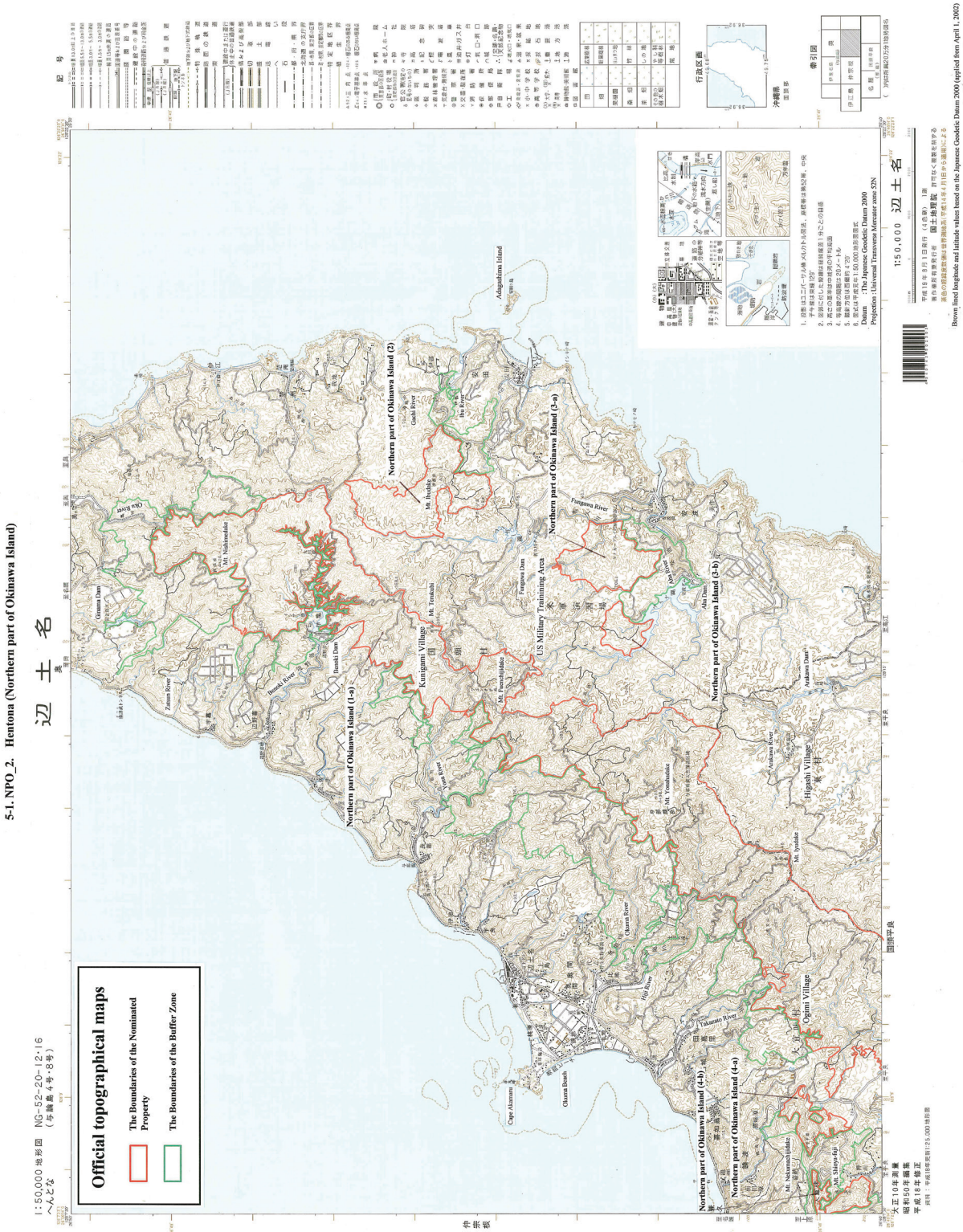
TOK_2　Kametsu (Tokunoshima Island)



NPO_1 Oku (Northern part of Okinawa Island)

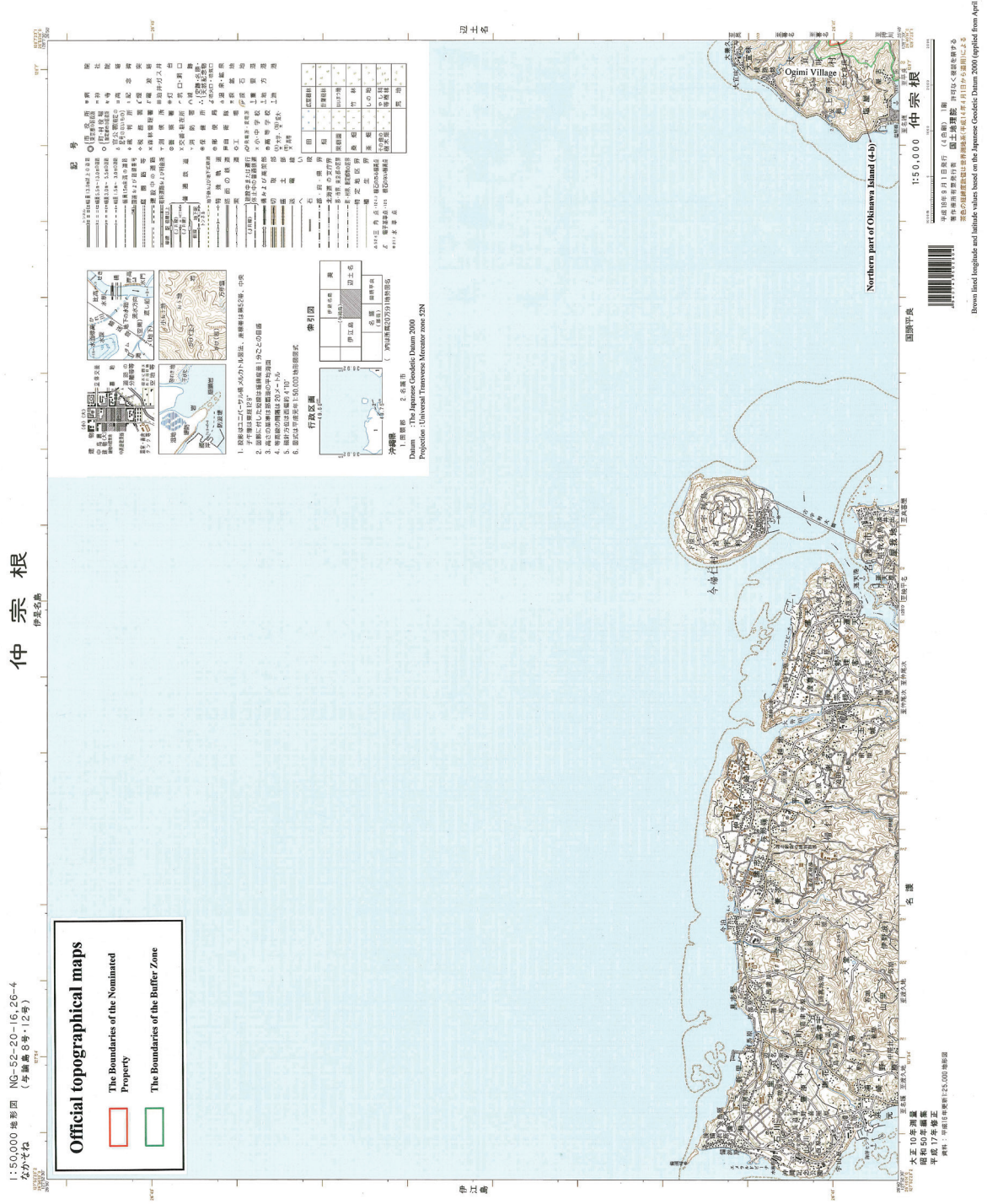


NPO_2 Hentona (Northern part of Okinawa Island)

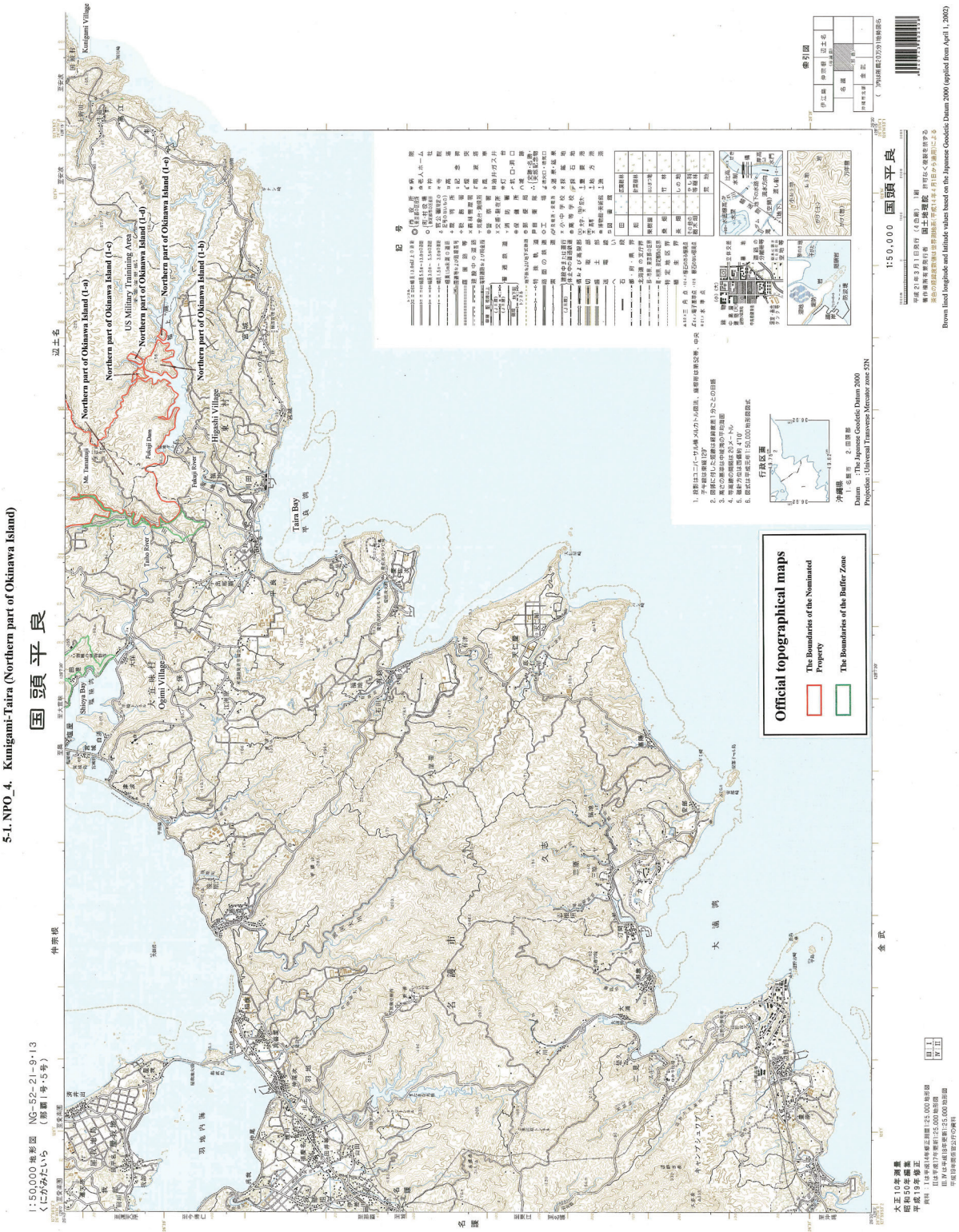


NPO_3 Nakasone (Northern part of Okinawa Island)

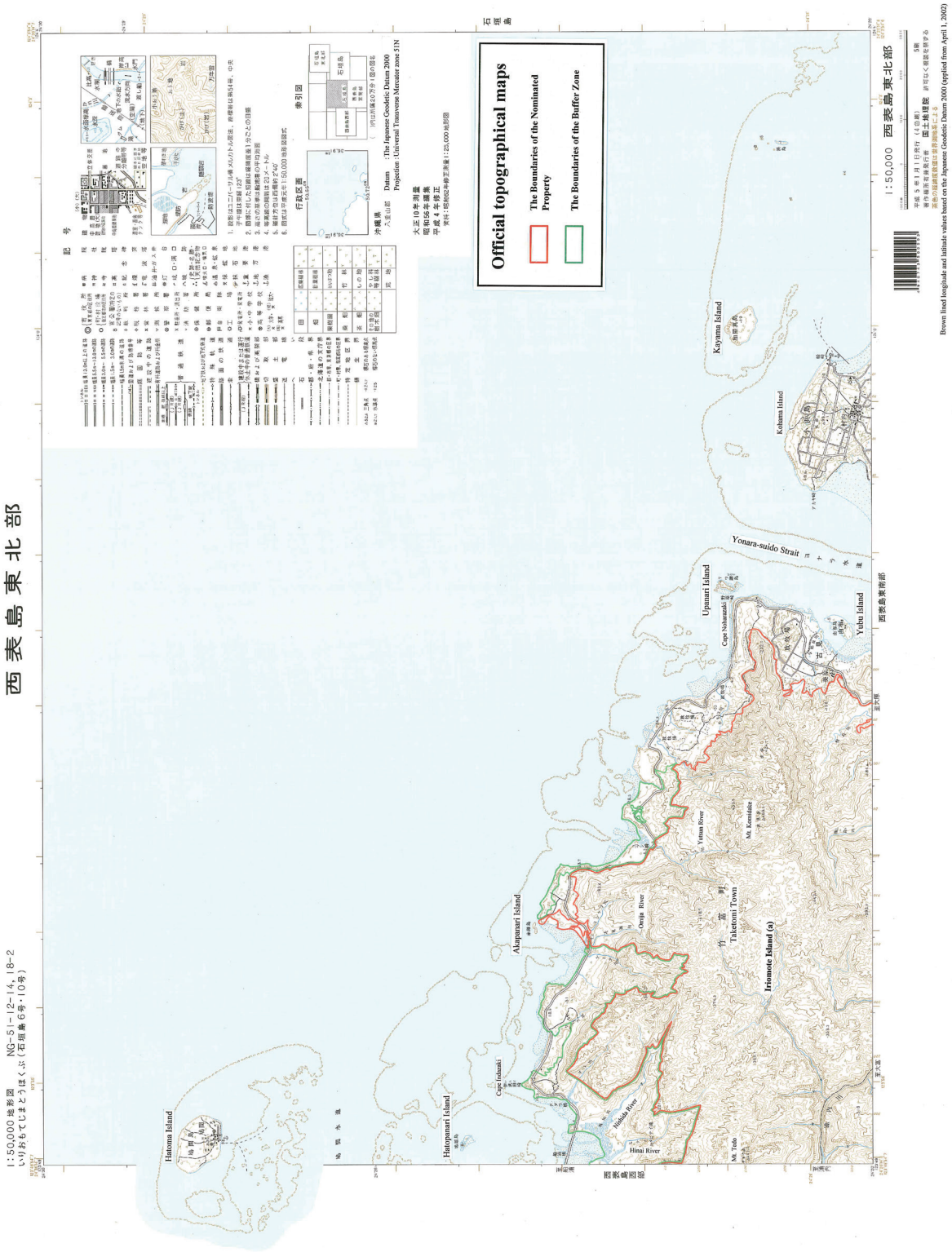
5-1. NPO_3. Nakasone (Northern part of Okinawa Island)



NPO_4　Kunigami-Taira (Northern part of Okinawa Island)

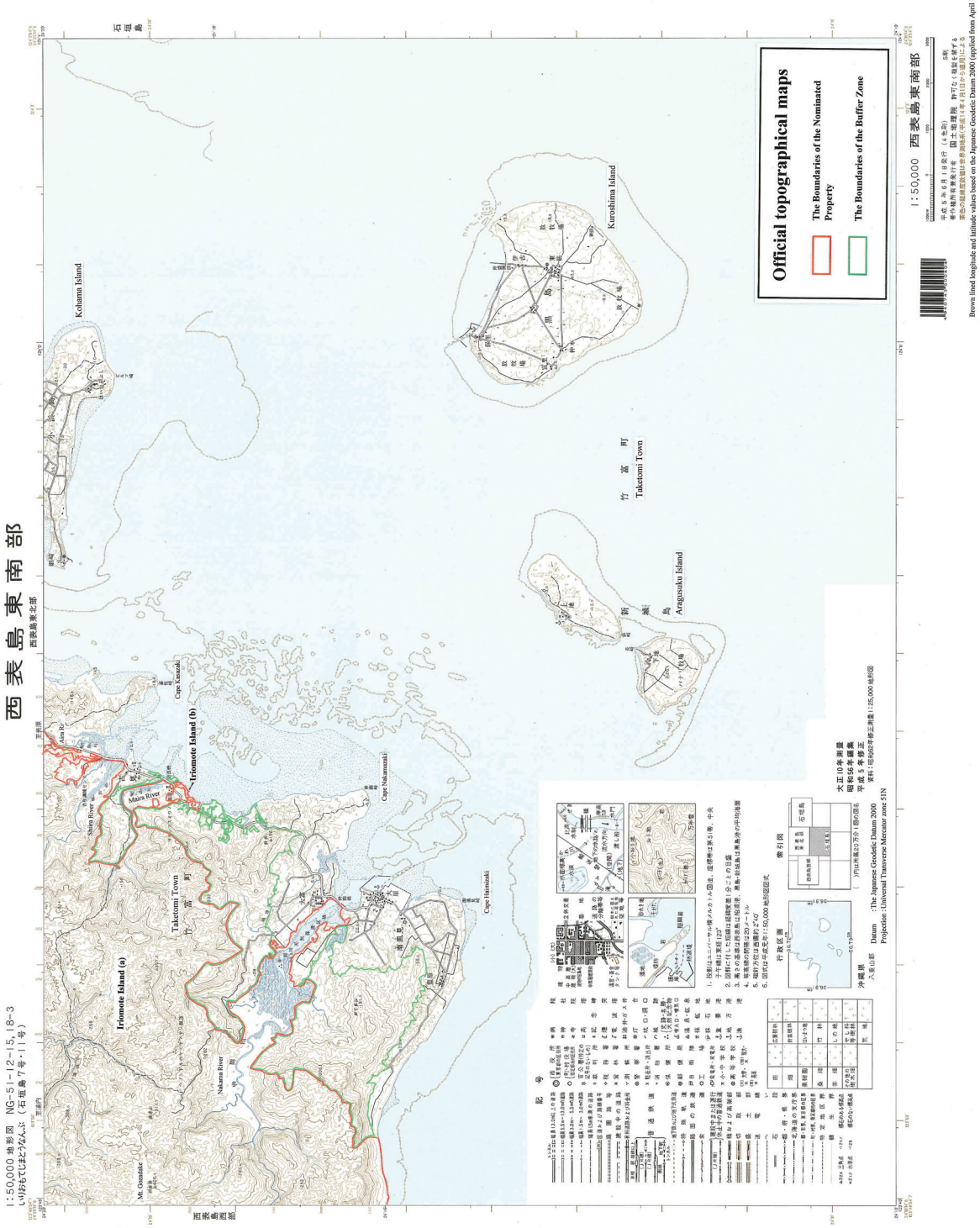


IRI_1 North-eastern part of Iriomotejima (Iriomote Island)

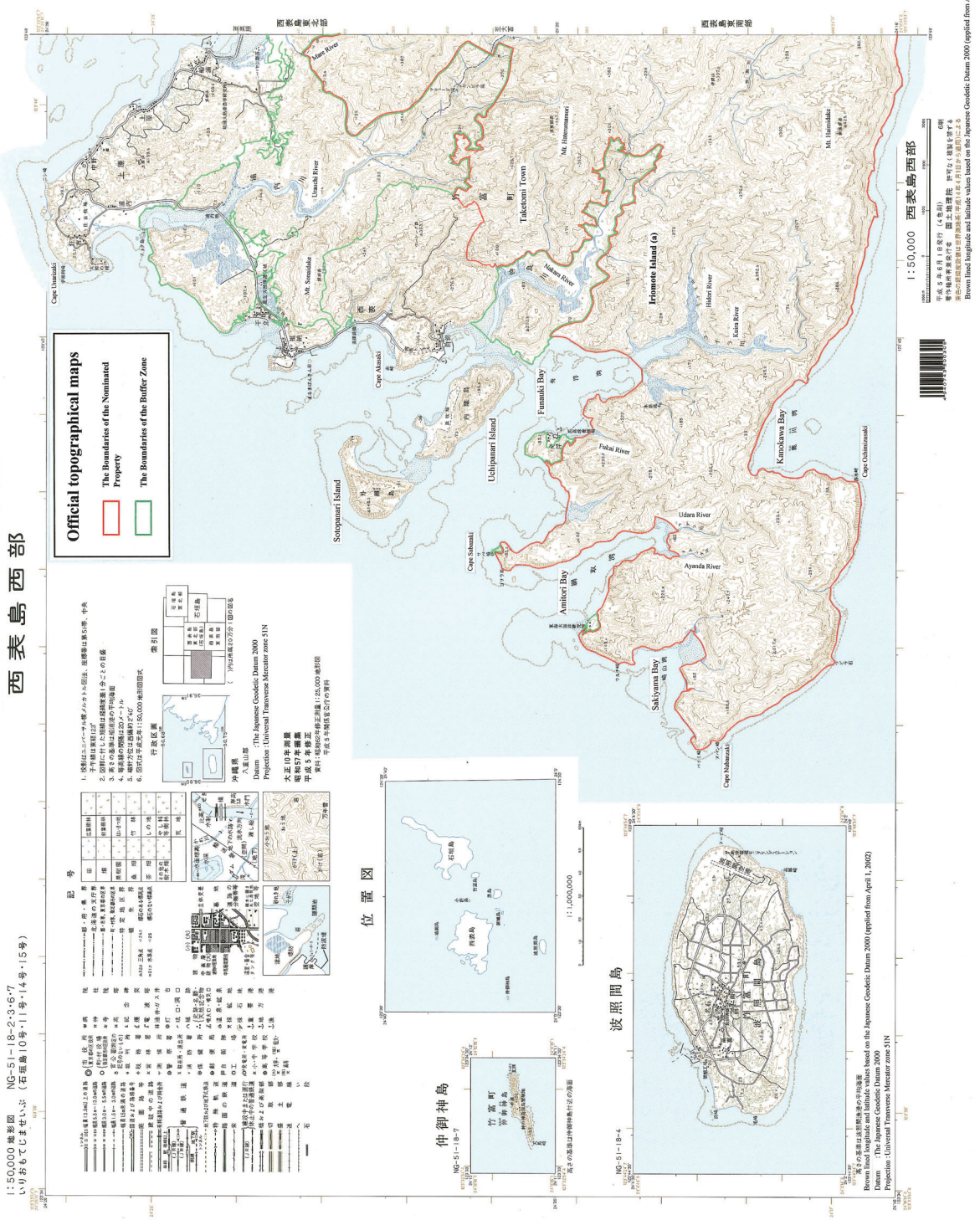


IRI_2 South-eastern part of Iriomotejima (Iriomote Island)

5-1. IRI_2. South-eastern part of Iriomotejima (Iriomote Island)



IRI_3 Western part of Iriomotejima (Iriomote Island)



Criteria Under Which Property Is Nominated

Criterion (ix): to be outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals.

Criterion (x): to contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of Outstanding Universal Value from the point of view of science or conservation.

Draft Statement of Outstanding Universal Value

a) Brief synthesis

Belonging to the Ryukyu Chain located at the south end of the Japanese Archipelago, the nominated property has a land area of 37,946 ha comprising of four regions: Amami-Oshima Island, Tokunoshima Island and the northern part of Okinawa Island in the Central Ryukyus; and Iriomote Island in the South Ryukyus. Influenced by the Kuroshio Current and subtropical high-pressure, the nominated property is in warm, humid subtropical climate and covered mainly with evergreen broadleaved rainforests.

The Ryukyu Chain is believed to have been formed through the formation and expansion of the Okinawa Trough and associated tectonic uplift and subsidence caused by subduction of the Philippine Sea plate beneath the Eurasian plate that had occurred since the middle Miocene of the Neogene. The Ryukyu Chain was then divided into the North Ryukyus, the Central Ryukyus and the South Ryukyus by deep straits lying between islands. Then since the early Pleistocene of the Quaternary, sea-level changes repeated the process of separation and unification of neighboring islands.

This geological history created opportunities for speciation and endemism for non-flying terrestrial creatures in the Central and South Ryukyus. Also, the Central and South Ryukyus have differences in their patterns of speciation and endemism in the terrestrial biota because of differences in the distance from the continent and the timing of separation. The nominated property comprises representative four regions of the Central and South Ryukyus which are home to particularly large number of endemic species and subspecies of various organisms. By examining them collectively, we can understand the ongoing processes of speciation and diversification of evolutionary lineages that reflect the geological history of the entire Ryukyu Chain.

The nominated property is also an irreplaceable habitat for at least 1,808 vascular plant species, 740 terrestrial and freshwater vertebrate species, 6,148 insect species, 47 freshwater decapod species, and 88 threatened species listed on the IUCN Red List.

As such, the nominated property is a good example of the ongoing process of speciation and endemism that reflects its formative history as a continental island involving long-period isolation. It also has an invaluable natural environment, including habitats for various endemic species and threatened species of international

significance.

b) Justification for criteria

Criterion (ix)

As part of the Eurasian Continent, the Central and South Ryukyus containing the nominated property used to share the same continental terrestrial biota. Thereafter, in the process of separation from the continent driven by the formation of the Okinawa Trough and two deep straits and in the repeated process of separation and unification of islands affected by sea-level changes, the nominated property has given rise to speciation and endemism in various evolutionary lineages.

In the Central Ryukyus, which were separated from the continent around the late Miocene of the Neogene, many relict endemic species, whose related species cannot be found in the neighboring regions, still survive on the islands. The South Ryukyus, which separated from Taiwan and the continent during the Pliocene, have endemic species and subspecies with their related species distributed in Taiwan and the continent. Those processes are particularly evident in plants and non-flying terrestrial vertebrates that cannot easily cross the ocean gaps. Various patterns of endemism and each stage of speciation on the continental islands can be seen in the area.
The nominated property comprises four regions that characterize the Central and South Ryukyus, and is an outstanding example clearly representing distinctive, ongoing processes of speciation and diversification of evolutionary lineages on the continental islands that reflect the geological history of the entire Ryukyu Chain. It can be deemed as one of the best natural laboratory in the world for studying the relation of the formation history of continental islands and biological evolution processes.

Criterion (x)

The nominated property is a crucial area from the viewpoint of biodiversity conservation, as it constitutes an irreplaceable habitat for threatened and endemic species that are of global importantance. There are 88 threatened species listed on the IUCN Red List, and 70 of these are endemic to Central and South Ryukyus.

Reflecting its geological history, the nominated property shows diverse examples of relict and new endemic species. Among others, five mammal species, three bird species, and three amphibian species have been identified as Evolutionarily Distinct and Globally Endangered (EDGE) species.

One example of the EDGE species is the Amami rabbit (*Pentalagus furnessi*) in Amami-Oshima Island and Tokunoshima Island, it comprises a genus by itself with no other related species. The Okinawa rail (*Gallirallus okinawae*) in the northern part of Okinawa Island is one of the non-flying species of the rail family on an island, which is known to be prone to extinction. *Tokudaia* is an endemic genus of spiny rats, with three species endemic to each of the three regions in the Central Ryukyus. Iriomote cat (*Prionailurus bengalensis iriomotensis*) only inhabits Iriomote Island, the world's smallest island inhabited by wildcats.

Further, the nominated property has high levels of diversity within its vascular plants and insects. On each of the four regions containing the nominated property, there are 950 to 1,300 species of vascular plants; these represent about 20 % of threatened vascular plant species of Japan. There are also more than 1,000 to 3,000 insect species;

these represent about 10 % of the threatened insect species in Japan.

c) Statement of integrity

The nominated property includes Amami-Oshima Island, Tokunoshima Island, and the northern part of Okinawa Island in the Central Ryukyus; and Iriomote Island in the South Ryukyus. It contains about 90% of the endemic and threatened species in Central and South Ryukyus and their important habitats, and thus includes all elements necessary to express its Outstanding Universal Value as serial World Heritage islands. All the components of the property are complementary to one another and if any of the four regions were to be omitted, it would be impossible to understand the whole picture of the ongoing evolutionary and ecological processes of the Ryukyu Chain or conserve the biodiversity of the area.

Also, the nominated property consists of islands that are large in comparison with other islands in the Central and South Ryukyus, and subtropical rainforests exist there in large clusters. The property contains diverse habitat environments, including different geologies, cloud belts around the summit areas, mountains and hills involving complex microtopographies and hydrological systems, and swamps. It has adequate buffer zones. As such, it is of sufficient size and sound environmental conditions to ensure the complete representation and long-term conservation of its Outstanding Universal Values.

While there is some impact from alien species, traffic accidents involving wild animals, and illegal collection of wild species, the risks are prevented or mitigated through coordinated efforts by relevant administrative organs (Ministry of the Environment, Forestry Agency, Agency for Cultural Affairs, Kagoshima Prefecture, Okinawa Prefecture, and local municipalities) and civilian organizations.

d) Statement of authenticity

Not applicable because this nomination does not claim cultural values.

e) Requirements for protection and management

The nominated property is designated as Special Protection Zone or Class I Special Zone of National Park; or Presearvation Zones of Forest Ecosystem Reserve. In addition, it is designated as National Wildlife Protection Area or Natural Monument (see Chapter 5). These are systems for protecting the excellent natural environment of Japan, regulating development projects in a strict legal manner. By these designations, the nominated property is ensured of long-term appropriate protection. Most parts of the nominated property are national or municipal lands owned and managed by national or local governments.

The four islands containing the nominated property are inhabited by people, and the places for residents' lives and industrial activities are close to habitats for endemic species and rare species. To carefully protect the property and enable the coexistence with people's livelihoods, buffer zones were set up mainly in Class II Special Zone of the National Park or Conservation and Utilization Zone of the Forest Ecosystem Reserve, adjacent to the nominated property.

In order to facilitate the multi-layered management and protection of protected areas and designated species, the

relevant administrative organs have estabished the “Regional Liaison Committee” and prepared the “Comprehensive Management Plan” describing the management policy common in the four regions. In addition, four sub-local meetings have been set up under the Regional Liaison Committee, and they formulate regional action plans to effectively carry out the conservation and management of each region containing the nominated property through collaboration and cooperation with the local stakeholders. The “Scientific Committee” comprised of academic experts and its subsidiary “Local Working Groups” have been established to provide scientific advice and promote adaptive conservation and management in light of scientific knowledge and insight.

In addition, major endemic threatened species in the nominated property such as the Amami rabbit, Okinwana rail, and Iriomote cat are legally protected by designation of National Endangered Species and Natural Monuments. Monitoring of these species will be continued as part of protection and recovery program of the National Endangered Species and/or the mongoose control program.

Mountain stream zone with many endemic and threatened species (Photo: MOEJ)

Name and Contact Information of Official Local Institution/Agency

Amami Ranger Office for Nature Conservation, Ministry of the Environment
Address: 551 Koshinohata, Ongachi, Yamato Village, Oshima County, Kagoshima Prefecture 894-3104
TEL: +81-997-55-8620 FAX: +81-997-55-8621

Tokunoshima Ranger Office for Nature Conservation, Ministry of the Environment
Address: Amagi Town Office, 2691-1 Hetono, Amagi Town, Oshima County, Kagoshima Prefecture 891-7612
TEL: +81-997-85-2919 FAX: +81-997-85-2045

Yambaru Ranger Office for Nature Conservation, Ministry of the Environment
Address: 263-1 Hiji, Kunigami Village, Kunigami County, Okinawa Prefecture 905-1413
TEL: +81-980-50-1025 FAX: +81-980-50-1026

Iriomote Ranger Office for Nature Conservation, Ministry of the Environment
Address: Komi, Taketomi Town, Yaeyama County, Okinawa Prefecture 907-1432
TEL: +81-980-84-7130 FAX: +81-980-85-5582

Kagoshima District Forest Office, Kyushu Regional Forest Office, Forestry Agency
Address: 12-1 Hama-machi, Kagoshima City, Kagoshima Prefecture 892-0812
TEL: +81-99-247-7111 FAX: +81-99-247-6571

Okinawa District Forest Office, Kyushu Regional Forest Office, Forestry Agency
Address: Tsubogawa Building, 3-2-6 Tsubogawa, Naha City, Okinawa Prefecture 900-0025
TEL: +81-98-918-0210 FAX: +81-98-918-0211

Naze Forest Office, Kagoshima District Forest Office, Kyushu Regional Forest Office, Forestry Agency
Address: 1-17 Naze Manatsu-machi, Amami City, Kagoshima Prefecture 894-0015
TEL: +81-997-52-4531 FAX: +81-997-52-4531

Tokunoshima Forest Office, Kagoshima District Forest Office, Kyushu Regional Forest Office, Forestry Agency
Address: 7111-2 Kametsu, Tokunoshima Town, Oshima County, Kagoshima Prefecture 891-7101
TEL: +81-997-82-0027 FAX: +81-997-82-0027

Takae Forest Office, Okinawa District Forest Office, Kyushu Regional Forest Office, Forestry Agency
Address: 466-1 Takae, Higashi Village, Kunigami County, Okinawa Prefecture 905-1201
TEL: +81-980-43-2123 FAX: +81-980-43-2123

Sonai Forest Office, Okinawa District Forest Office, Kyushu Regional Forest Office, Forestry Agency
Address: 689 Iriomote, Taketmomi Town, Yaeyama County, Okinawa Prefecture 907-1542
TEL: +81-980-85-6201 FAX: +81-980-85-6201

Ohara Forest Office, Okinawa District Forest Office, Kyushu Regional Forest Office, Forestry Agency
Address: 201 Haemi, Taketmomi Town, Yaeyama County, Okinawa Prefecture 907-1434
TEL: +81-980-85-5308 FAX: +81-980-85-5308

Oshima Branch Office, Kagoshima Prefecture
Address: 17-3 Naze Nagata-cho, Amami City, Kagoshima Prefecture 894-8501
TEL: +81-997-52-5411 FAX: +81-997-53-7874

Yaeyama Regional Public Works Office, Okinawa Prefecture
Address: Yaeyama Godochosha, 438-1 Maesato, Ishigaki City, Okinawa Prefecture 907-0002
TEL: +81-980-82-2217 FAX: +81-980-82-1954

Amami City
Address: 25-8 Naze Saiwai-cho, Amami City, Kagoshima Prefecture 894-8555
TEL: +81-997-52-1111 FAX: +81-997-52-1354

Yamato Village
Address: 100 Yamatohama, Yamato Village, Oshima County, Kagoshima Prefecture 894-3192
TEL: +81-997-57-2111 FAX: +81-997-57-2161

Uken Village
Address: 915 Yuwan, Uken Village, Oshima County, Kagoshima Prefecture 894-3392
TEL: +81-997-67-2211 FAX: +81-997-67-2262

Setouchi Town
Address: 23 Koniya-Funatsu, Setouchi Town, Oshima County, Kagoshima Prefecture 894-1592
TEL: +81-997-72-1111 FAX: +81-997-72-1120

Tatsugo Town
Address: 110 Ura, Tatsugo Town, Oshima County, Kagoshima Prefecture 894-0192
TEL: +81-997-62-3111 FAX: +81-997-62-2535

Tokunoshima Town
Address: 7203 Kametsu, Tokunoshima Town, Oshima County, Kagoshima Prefecture 891-7101
TEL: +81-997-82-1111 FAX: +81-997-82-1101

Amagi Town
Address: 2691-1 Hetono, Amagi Town, Oshima County, Kagoshima Prefecture 891-7612
TEL: +81-997-85-3111 FAX: +81-997-85-3110

Isen Town
Address: 1842 Isen, Isen Town, Oshima County, Kagoshima Prefecture 891-8201
TEL: +81-997-86-3111 FAX: +81-997-86-2301

Kunigami Village
Address: 121 Hentona, Kunigami Village, Kunigami County, Okinawa Prefecture 905-1495
TEL: +81-980-41-2101 FAX: +81-980-41-5910

Ogimi Village
Address: 157 Oganeku, Ogimi Village, Kunigami County, Okinawa Prefecture 905-1392
TEL: +81-980-44-3001 FAX: +81-980-44-3139

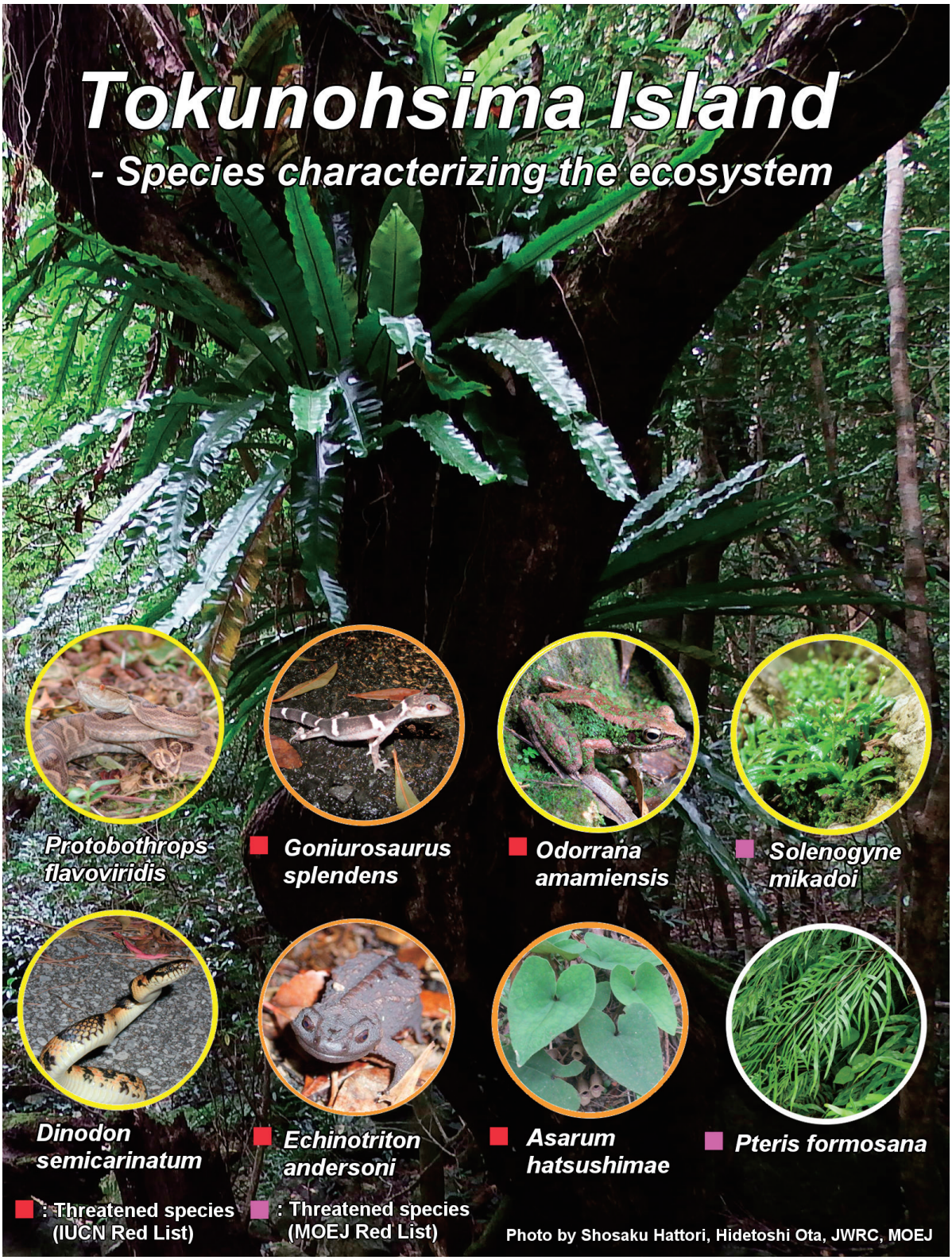
Higashi Village
Address: 804 Taira, Higashi Village, Kunigami County, Okinawa Prefecture 905-1292
TEL: +81-980-43-2201 FAX: +81-980-43-2457

Taketomi Town
Address: 11-1 Misaki-cho, Ishigaki City, Okinawa Prefecture 907-8503
TEL: +81-980-82-6191 FAX: +81-980-82-6199


Amami-Oshima Island
- Species characterizing the ecosystem
Asiagomphus amamiensis amamiensis
Luscinia komadori komadori
Pentalagus furnessi
Protobothrops flavoviridis
Neolucanus protogenetivus protogenetivus
Scolopax mira
Tokudaia osimensis
Dinodon semicarinatum
: Relict endemic species
: Endemic species (including subspecies, varieties)


Diplothrix legata
Myotis yanbarensis
Garrulus lidthi
Zoothera dauma major
Dendrocopos leucotos owstoni
Liparis viridiflora
Odorrana splendida
Odorrana amamiensis
Asarum fudsinoi
Viola amamiana
Babina subaspera
Cynops ensicauda
Echinotriton andersoni
Cardiandra amamiohsimensis
: Threatened species (IUCN Red List)
: Threatened species (MOEJ Red List)
Photo by Hidetoshi Ota, JWRC, MOEJ


Diplothrix legata
Myotis yanbarensis
Polypodium amamianum
Matrona basilaris japonica
Luscinia komadori namiyei
Pentalagus furnessi
Neolucanus protogenetivus protogenetivus
Scolopax mira
Tokudaia tokunoshimensis
: Relict endemic species
: Endemic species (including subspecies, varieties)


Tokunohsima Island
- Species characterizing the ecosystem
Protobothrops flavoviridis
Goniurosaurus splendens
Odorrana amamiensis
Solenogyne mikadoi
Dinodon semicarinatum
Echinotriton andersoni
Asarum hatsushimae
Pteris formosana
: Threatened species (IUCN Red List)
: Threatened species (MOEJ Red List)
Photo by Shosaku Hattori, Hidetoshi Ota, JWRC, MOEJ


Northern Part of Okinawa Island
- Species characterizing the ecosystem
Dendrobium okinawense
Luscinia komadori namiyei
Sapheopipo noguchii
Pieris japonica var. koidzumi
Rhipidolestes shozoi
Gallirallus okinawae
Odorrana ishikawae
Odorrana narina
: Relict endemic species
: Endemic species (including subspecies, varieties)
: Threatened species (IUCN Red List)
: Threatened species (MOEJ Red List)
Photo by Hidetoshi Ota, MOEJ


Diplothrix legata
Pteropus dasymallus inopinatus
Myotis yanbarensis
Tokudaia muenninki
Cheirotonus jambar
Neolucanus okinawanus
Limnonectes namiyei
Protobothrops flavoviridis
Goniurosaurus kuroiwae
Cynops ensicauda
Babina holsti
Dinodon semicarinatum
Geoemyda japonica
Echinotriton andersoni


Iriomote Island
- Species characterizing the ecosystem
Barringtonia racemosa
Heritiera littoralis
Nypa fruticans
Sus scrofa riukiuanus
Odorrana supranarina
Elaphe taeniura schmackeri
Scincella boettgeri
Plestiodon kishinouyei


Pteropus dasymallus yayeyamae
Spilornis cheela perplexus
Ochlodes asahinai
Odorrana utsunomiyaorum
Begonia fenicis
Neolucanus insulicola insulicola
Prionailurus bengalensis iriomotensis
Cuora flavomarginata evelynae
: Relict endemic species
: Endemic Species (including subspecies, varieties)
: Threatened species (IUCN Red List)
: Threatened species (MOEJ Red List)
Photo by JWRC, MOEJ

1

Identification of the Property

1.a. Country

1.b. State, Province or Region

1.c. Name of Property

1.d. Geographical Coordinates to the Nearest Second

1.e. Maps and Plans, Showing the Boundaries of the Nominated Property and Buffer Zone

1.f. Area of Nominated Property and Proposed Buffer Zone

Mountains of fresh green, Amami-Oshima Island (Photo: MOEJ)

1. Identification of the Property

1.a. Country

Japan

1.b. State, Province or Region

Kagoshima Prefecture and Okinawa Prefecture

1.c. Name of Property

Amami-Oshima Island, Tokunoshima Island, the northern part of Okinawa Island and Iriomote Island

1.d. Geographical Coordinates to the Nearest Second

Center of the nominated property:

This is a serial nomination consisting of 24 component parts on four regions shown in Table 1-1.

Table 1-1: Lat/long and area of the nominated property

ID	Name of the component parts		Region/ District	Coordinates of the central point	Area of nominated component of the property (ha)	Area of the buffer zone (ha)	Map No. (Appendix 5-1)
1	Amami-Oshima Island	a	Kagoshima Prefecture	N28° 16′ 44.969″ E129° 22′ 41.886″	9,299	14,468	AMA_2 AMA_3
2		b		N28° 12′ 26.893″ E129° 25′ 35.112″	1,752		AMA_3
3		c		N28° 16′ 40.687″ E129° 25′ 26.504″	164		AMA_3
4		d		N28° 15′ 20.993″ E129° 22′ 49.542″	96		AMA_3
5		e		N28° 11′ 27.022″ E129° 23′ 35.690″	72		AMA_3
6		f		N28° 16′ 53.282″ E129° 24′ 54.518″	49		AMA_3
7		g		N28° 15′ 35.162″ E129° 23′ 42.903″	45		AMA_3
8		h		N28° 14′ 11.265″ E129° 24′ 32.565″	41		AMA_3
9		i		N28° 13′ 18.441″ E129° 26′ 08.388″	26		AMA_3
Amami-Oshima Island area (ha)					**11,544**	**14,468**	
10	Tokunoshima Island	1	Kagoshima Prefecture	N27° 45′ 48.136″ E128° 58′ 01.962″	1,643	1,853	TOK_2
11		2		N27° 51′ 56.053″ E128° 55′ 33.394″	791	999	TOK_1
Tokunoshima Island area (ha)					**2,434**	**2,852**	
12	Northern part of Okinawa Island	1-a	Okinawa Prefecture	N26° 43′ 29.212″ E128° 13′ 12.382″	4,219	2,385	NPO_2 NPO_4
13		1-b		N26° 39′ 03.653″ E128° 11′ 41.015″	34		NPO_4
14		1-c		N26° 39′ 19.626″ E128° 11′ 29.668″	6		NPO_4

ID	Name of the component parts		Region/ District	Coordinates of the central point	Area of nominated component of the property (ha)	Area of the buffer zone (ha)	Map No. (Appendix 5-1)
15		1-d		N26° 39′ 21.979″ E128° 11′ 43.241″	5		NPO_4
16		1-e		N26° 39′ 01.906″ E128° 12′ 02.403″	3		NPO_4
17		2		N26° 45′ 52.953″ E128° 17′ 19.942″	355	131	NPO_2
18		3-a		N26° 43′ 36.353″ E128° 16′ 26.244″	229	184	NPO_2
19		3-b		N26° 43′ 25.308″ E128° 15′ 26.700″	77		NPO_2
20		4-a		N26° 41′ 06.970″ E128° 08′ 40.088″	84	327	NPO_2
21		4-b		N26° 40′ 44.575″ E128° 07′ 37.115″	65		NPO_2 NPO_3
22		5		N26° 51′ 15.715″ E128° 15′ 17.122″	56	241	NPO_1
Northern Part of Okinawa Island area (ha)					**5,133**	**3,268**	
23	Iriomote Island	a	Okinawa Prefecture	N24° 19′ 34.257″ E123° 48′ 31.486″	18,829	5,542	IRI_1 IRI_2 IRI_3
24		b		N24° 18′ 28.492″ E123° 54′ 03.246″	6		IRI_2
Iriomote Island area (ha)					**18,835**	**5,542**	
Total area (ha)					**37,946**	**26,130**	

1.e. Maps and Plans, Showing the Boundaries of the Nominated Property and Buffer Zone

Table 1-2: Map list (List of maps included in this document)

No.	Name (type)	As of	Page
	Name and classification of islands used in scientific fields	2016	ii
Figure 1-1 and 1-2	Location of the nominated property	2016	4-5
Figure 1-3 to 1-6	Boundary of the nominated property	2016	vi-xxiii, 6-9, Appendix 5-1
Figure 2-1 and 2-2	Geology of the four islands containing the nominated property	2016	13, 17
Figure 2-9 to 2-12	Vegetation of the nominated property	2016	33-36, Appendix 2-1
Figure 5-1-1, 5-1-2, 5-1-6, 5-1-8, 5-1-11, 5-1-12	National Park	2016	164, 169, 172, 176
Figure 5-1-3, 5-1-7, 5-1-13	Forest Ecosystem Reserve	2016	165, 170, 177
Figure 5-1-4, 5-1-9, 5-1-14	National Wildlife Protection Area	2016	166, 173, 178
Figure 5-1-5, 5-1-10, 5-1-15	Natural Monument	2016	167, 174, 179

1.f. Area of Nominated Property and Proposed Buffer Zone

Area of the nominated property:	37,946	ha
Area of the buffer zone:	26,130	ha
Total:	64,076	ha

Please see Table 1-1 for the area of each component part.

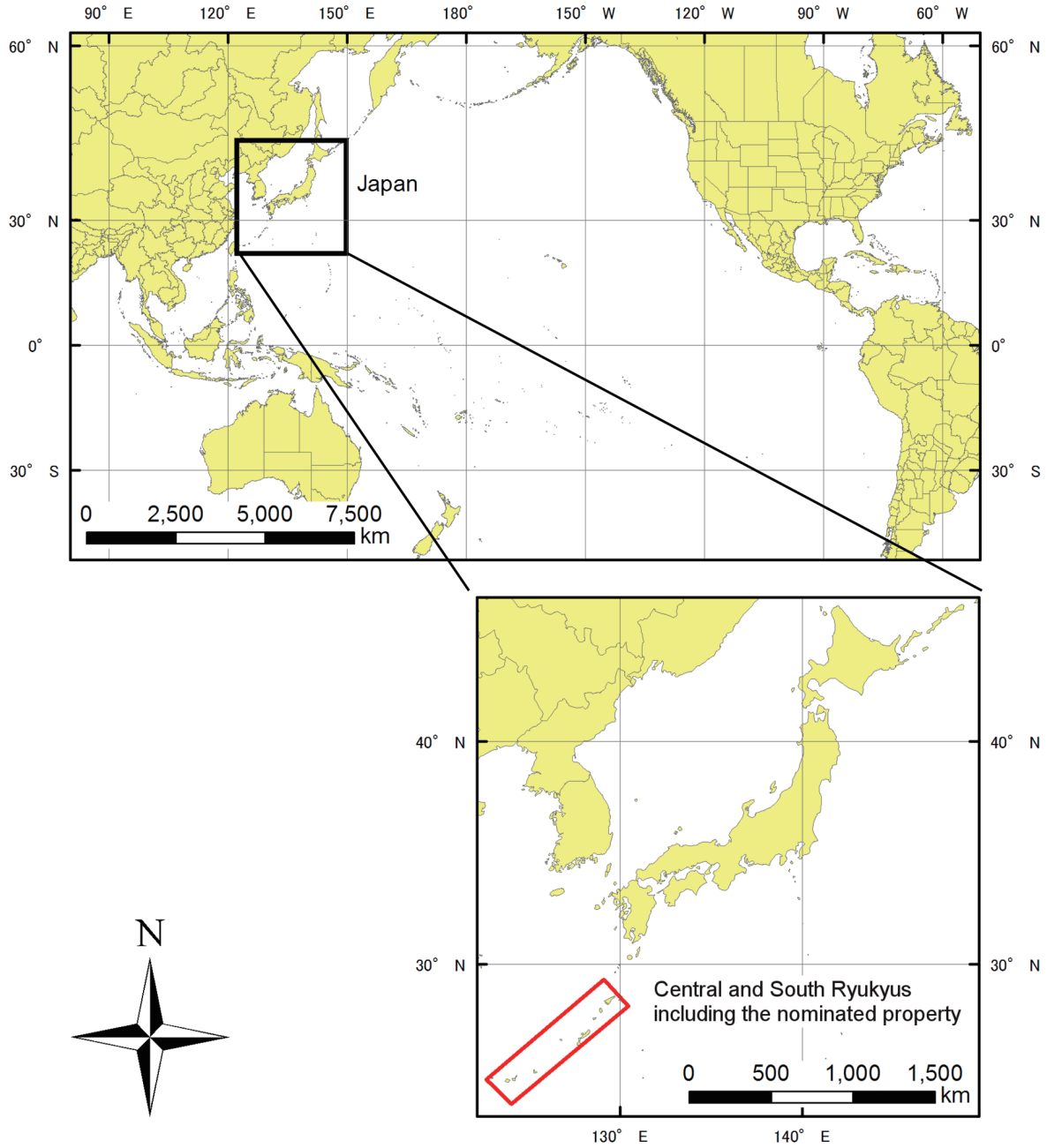


Figure 1-1: Location of the nominated property (Global and domestic)

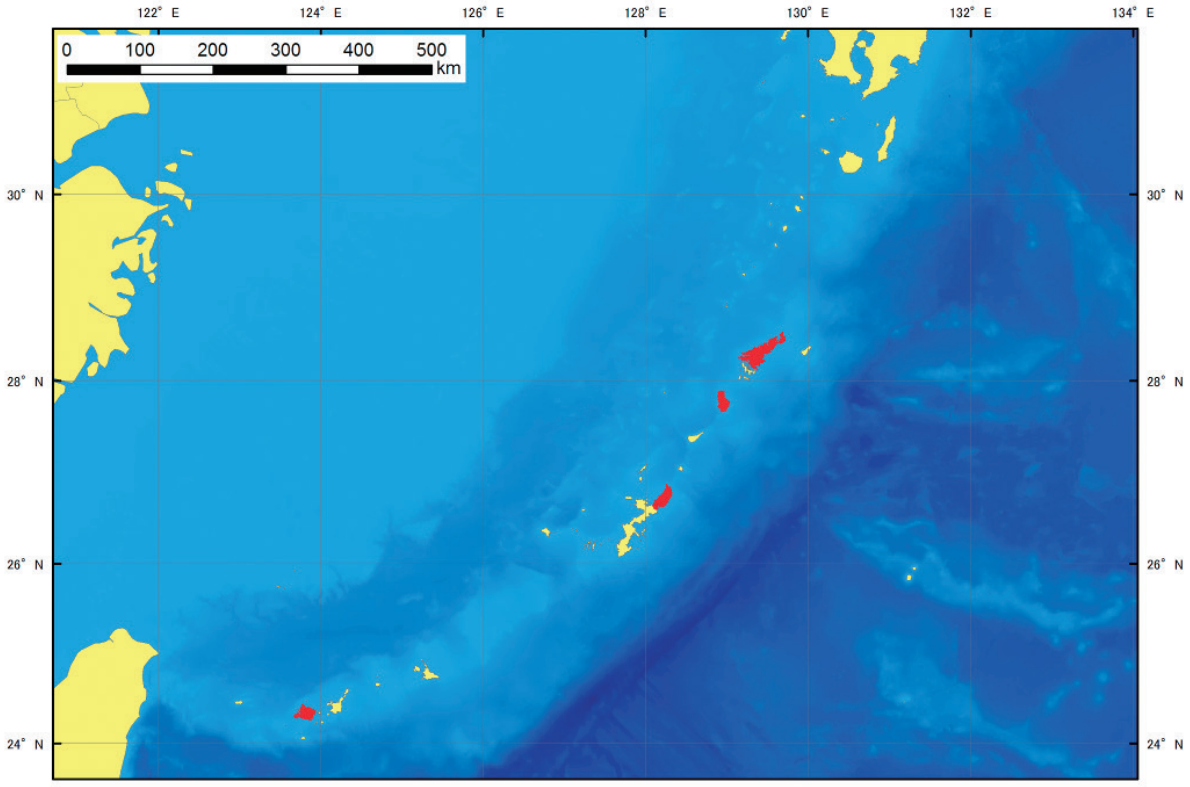


Figure 1-2: Location of the four regions of the nominated property in the Ryukyu Chain

Mountain range of evergreen broadleaved forests, Amami-Oshima Island (Photo: MOEJ)

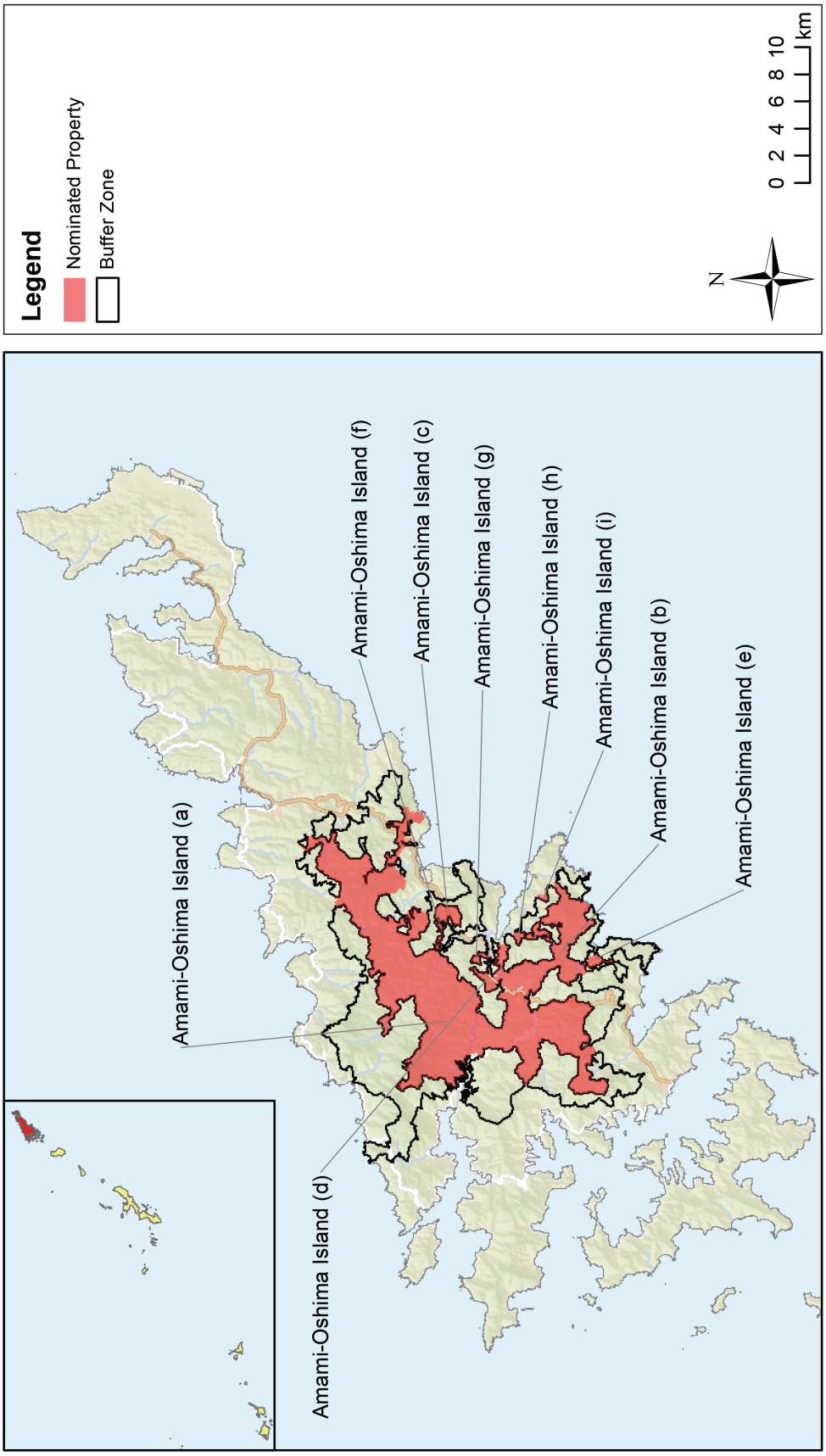


Figure 1-3: Boundary of the nominated property (Amami-Oshima Island)

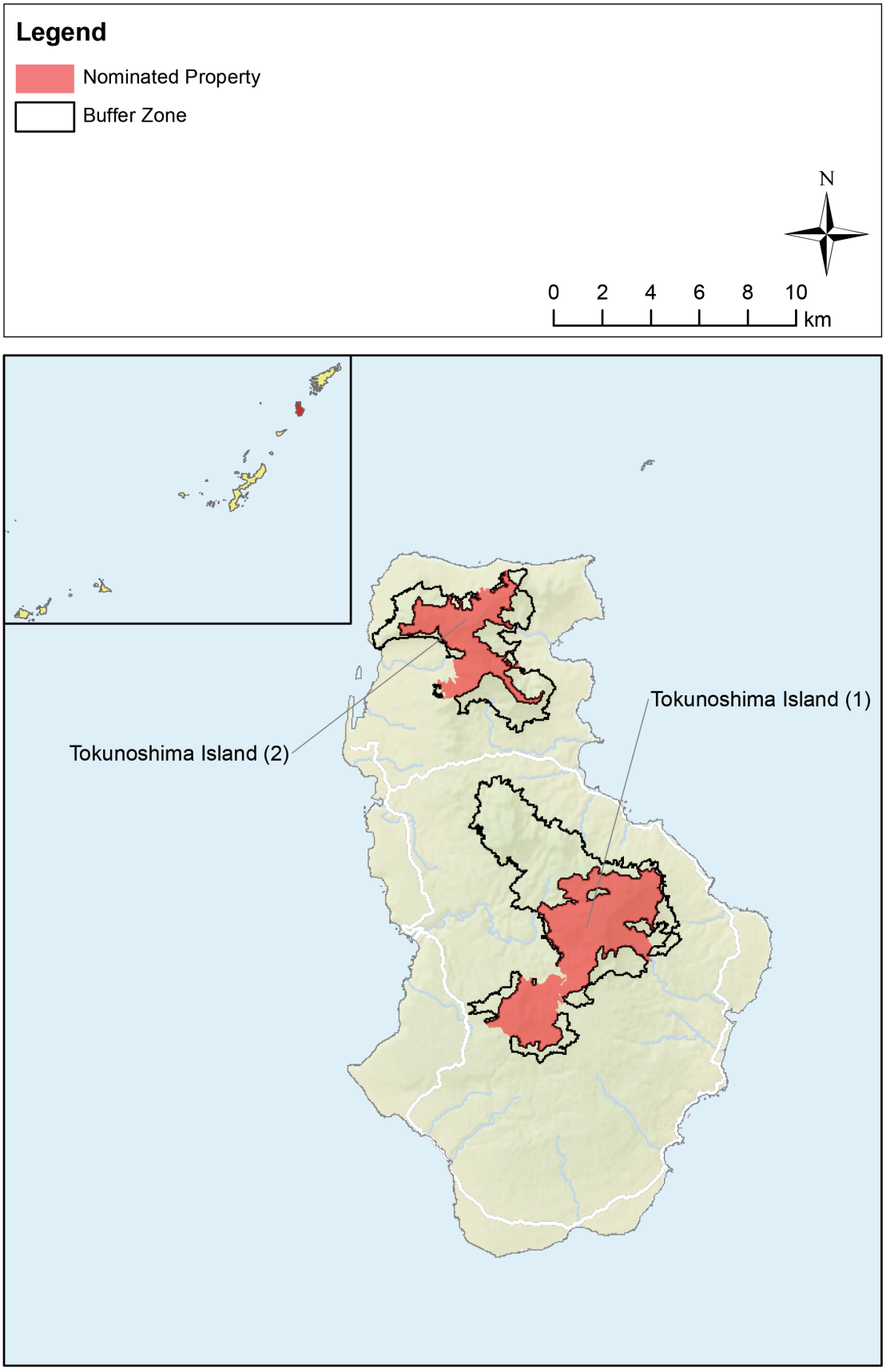


Figure 1-4: Boundary of the nominated property (Tokunoshima Island)

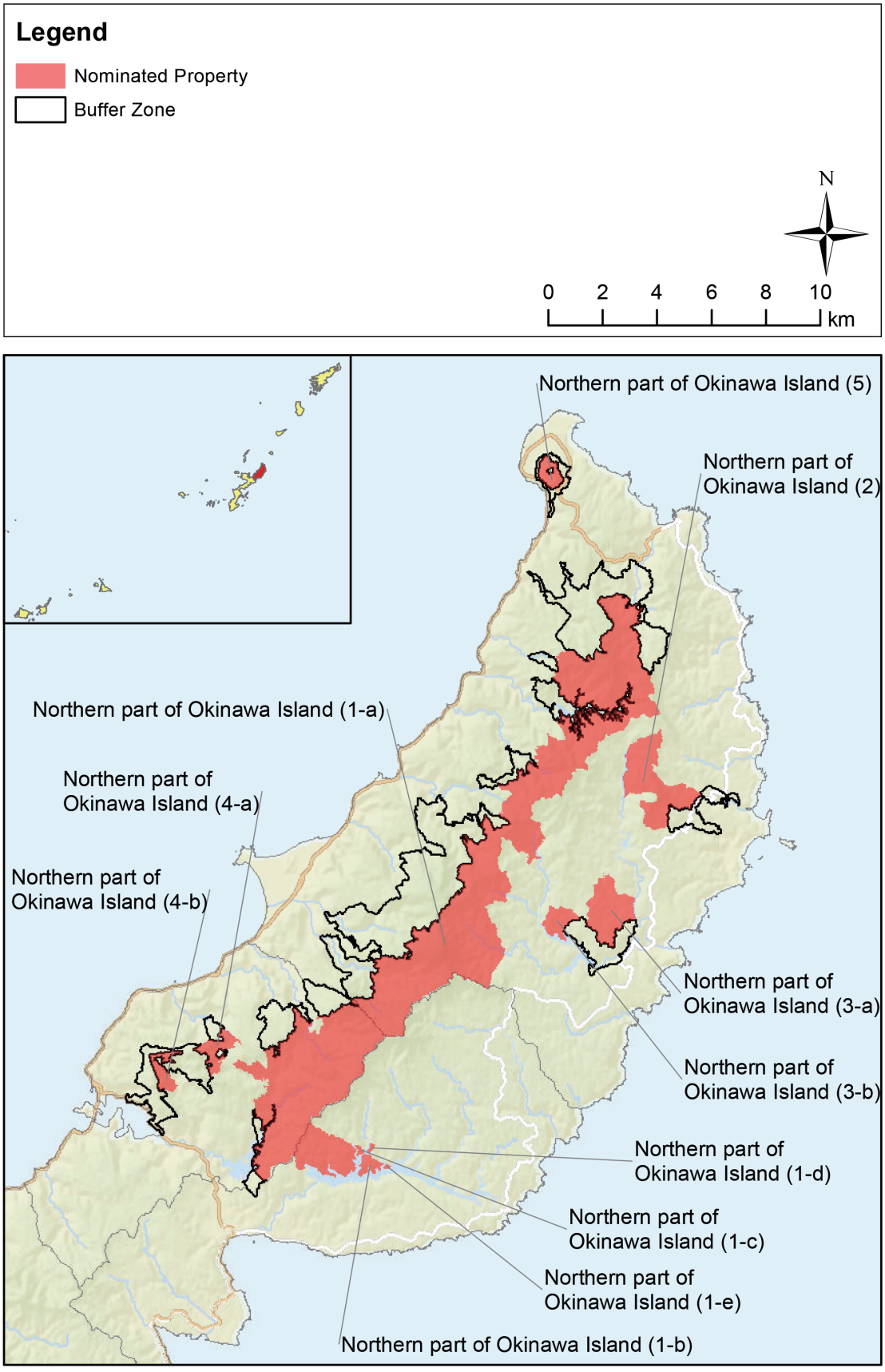


Figure 1-5: Boundary of the nominated property (Northern part of Okinawa Island)

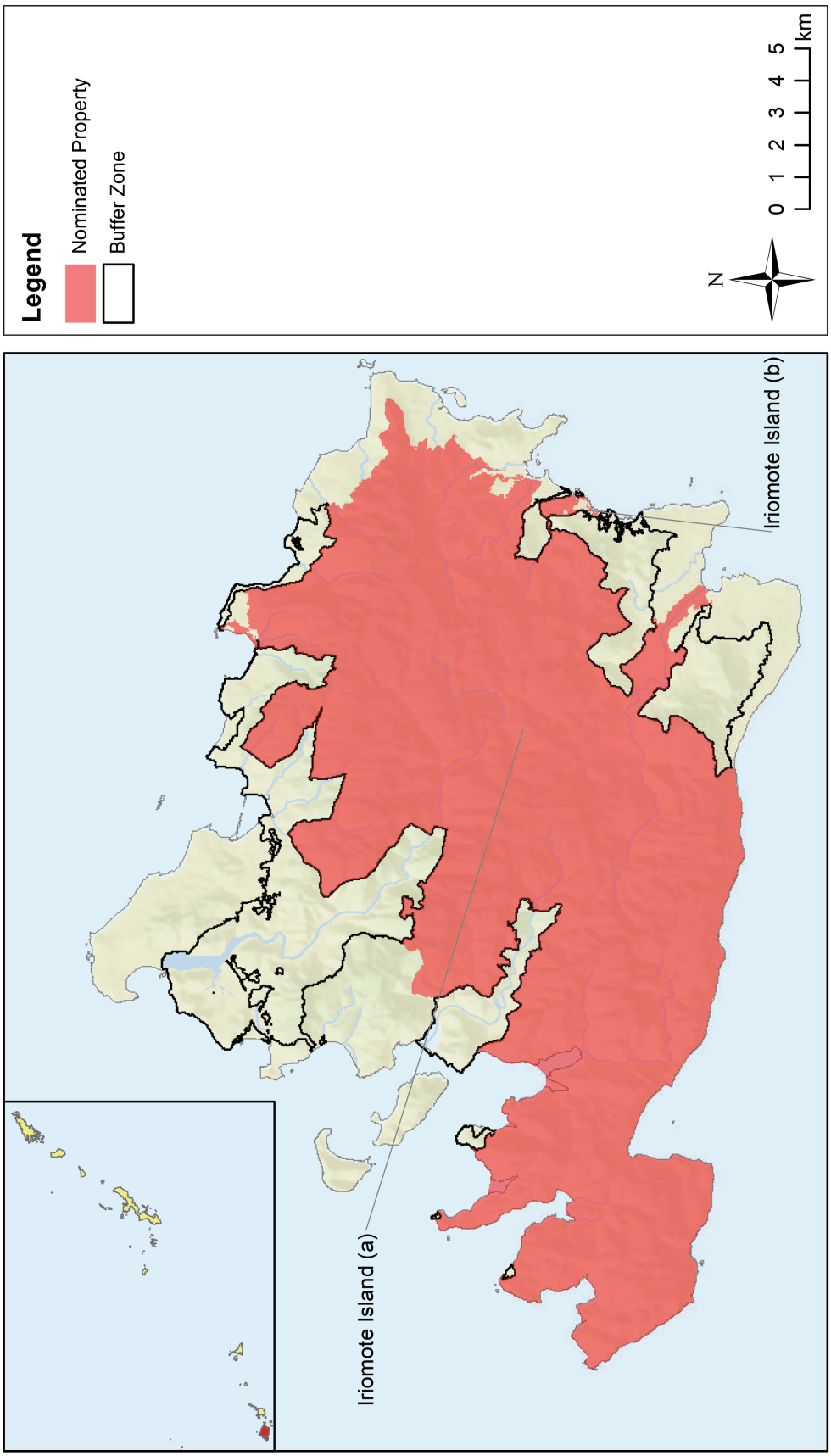


Figure 1-6: Boundary of the nominated property (Iriomote Island)

Tree fern (*Cyathea lepifera*) (Photo: Japan Wildlife Research Center)

2

Description

2.a. Description of Property

2.b. History and Development

View from the summit of Mt. Inokawadake, Tokunoshima Island (Photo: MOEJ)

2. Description

2.a. Description of Property

2.a.1. Overview of the natural environment of the nominated property

2.a.1.1. Geology and geography

2.a.1.1.1. Geology and geography of the Ryukyu Chain

The nominated property is part of the Ryukyu Chain comprising more than 900 large and small islands, including about 70 inhabited islands, scattered in an arc, about 1,200 km long, lying between the south end of Kyushu and Taiwan. It consists of four islands: Amami-Oshima Island and Tokunoshima Island in the Amami Island Group, Okinawa Island in the Okinawa Island Group, and Iriomote Island in the Sakishima Island Group (Figure 1-1 to 1-6).

Although the World Geographical Scheme for Recording Plant Distributions (Brummitt 2001) uses the name Nansei-shoto for this area, Nansei-shoto is not actually equal to the Ryukyu Chain. The Daito Islands and other islands whose formation process is different are excluded from the Nansei-Shoto Islands to make for the Ryukyu Chain. How we call these islands is not necessarily uniform (Mizutani 2009; Ajiro and Warita 2009), but this document calls the so-called Ryukyu island arc the Ryukyu Chain (see page ii), following the names and classification proposed to be used in scientific papers (Toyama 2014 partially altered). Located at the boundary of the Eurasian Plate and the Philippine Sea Plate, the Ryukyu Chain is thought to have been generated by tectonic deformation associated with the subduction of the Philippine Sea Plate under the Eurasian Plate in Ryukyu Trench that happened sometime after the late Miocene (Machida et al. 2001; Hase 2010). Located in an arc from the Pacific Ocean side to the Continental side are the Ryukyu Trench (5,000–7,000 m deep), Ryukyu outer arc slope, Ryukyu non-volcanic outer arc swell, Ryukyu volcanic inner arc swell, Okinawa Trough (1,000–2,000 m deep), and East China Sea continental shelf (less than 200 m deep), forming a typical arc-trench system (Figure 2-1). The nominated property is part of islands formed on the Ryukyu non-volcanic outer arc.

The north end of the Ryukyu Chain, the Osumi Island Group, is separated from mainland Kyushu by the Osumi Strait, and the south-west end, Yonaguni Island, is separated from Taiwan by the Yonaguni Strait. The Tokara Strait and the Kerama Gap are both more than 1,000 m deep and 50 km wide, dividing the Ryukyu Chain geological structurally (Figure 2-1). These straits (gaps) are known to be effective as the boundaries of biogeography as well (Mizutani 2009). From geological, geomorphological and biogeographical perspectives, the Ryukyu Chain can be divided into three areas: the North Ryukyus, the Central Ryukyus, and the South Ryukyus (see page ii) (Toyama 2014).

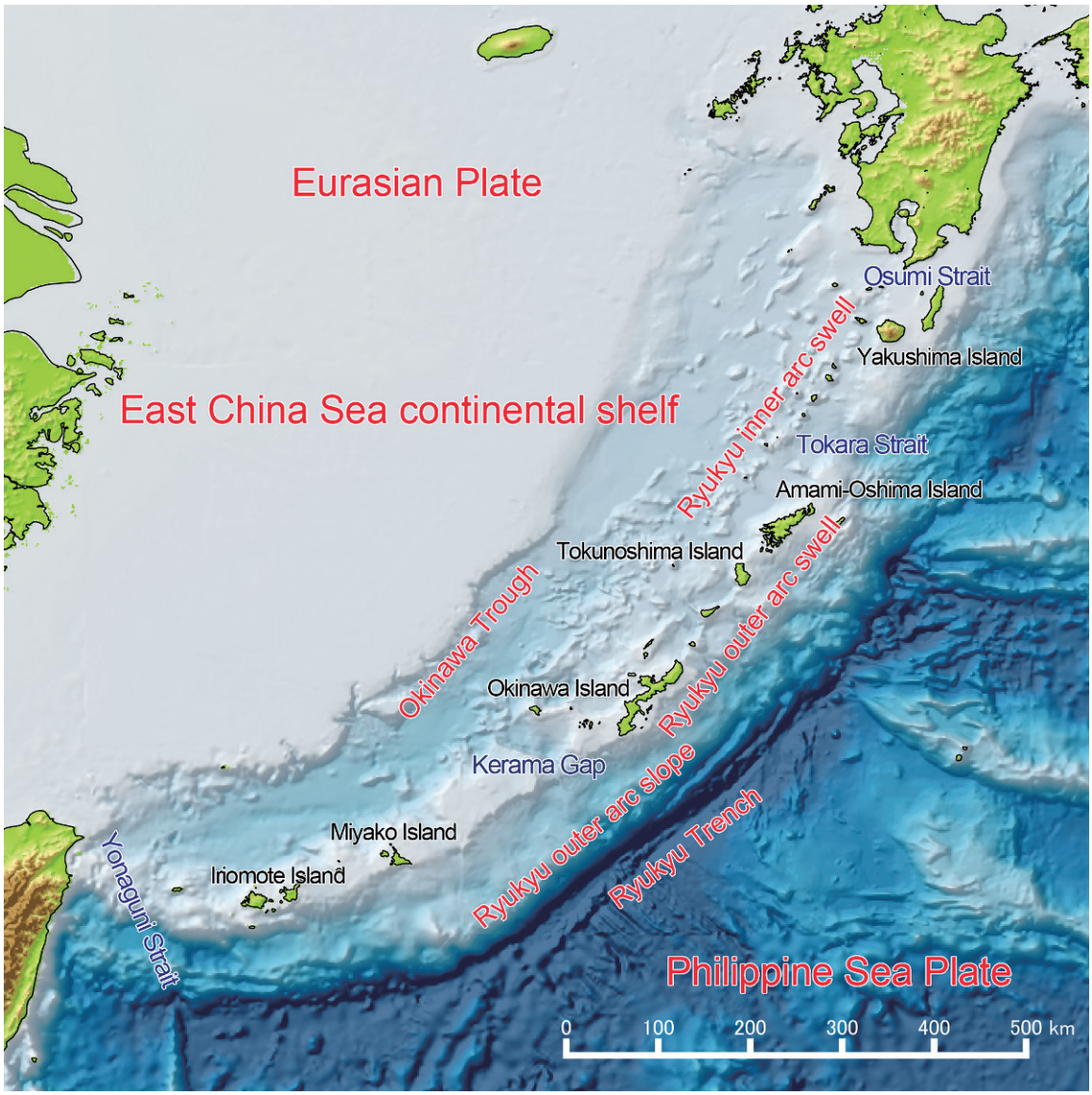


Figure 2-1: Bathymetric map of the area around the nominated property (prepared by using NOAA data)

The terrain of the islands in the Ryukyu Chain can be classified into several types, depending on the geological history, size, and shape. Among others, the islands on the non-volcanic outer arc swell are roughly divided into those with higher altitudes that comprise mountains and hills and those with lower altitudes that are covered with coral reef terraces. The former were formed in older days, and all the four regions containing the nominated property belong to this type.

Table 2-1 shows the difference of the geology of the Ryukyu Chain.

Table 2-1: Geology of the Ryukyu Chain

Area	Scope	Surface and basement geology
The North Ryukyus	Osumi Island Group, North Tokara	Miocene plutonic rocks Paleogene accretionary complex Miocene shallow-marine sediments Neogene to Quaternary volcanic rocks
The Central Ryukyus	South Tokara, Amami Island Group, Okinawa Island Group	Cretaceous to Neogene plutonic rocks Jurassic to Paleogene accretionary complex Paleogene fore-arc basin deposits / Pliocene sand and gravel sediments Marine sediments and coral reef limestones since the late Miocene Neogene to Quaternary volcanic rocks
The South Ryukyus	Sakishima Island Group (Miyako Islands, Yaeyama Islands)	Triassic to Jurassic metamorphic rocks Jurassic accretionary complex Eocene to Oligocene plutonic rocks Marine sediments and coral reef limestones since the Eocene

2.a.1.1.2. Geology and geography of four islands containing the nominated property

1) Amami-Oshima Island

Amami-Oshima Island is about 200 km south-southwest of Yakushima Island across the Tokara Strait. Amami-Oshima Island is the second largest island in the Ryukyu Chain, behind Okinawa Island. Its general landform is undulating and complex, cut by convoluted valleys, while eroded low-relief surfaces, about 300 m high, spread over the mountain ridges (Machida et al. 2001). Amami-Oshima Island is surrounded by complex ria coasts, and marine terraces and lowlands are rarely found in the island. Marine terraces are focused, if any, in the north-east part of the island, and the east side is tilted because of the uplift since the late Pleistocene (Ikeda 1977).

Amami-Oshima Island is mainly comprised of Mesozoic accretionary complex, and very few Miocene to recent marine sediments and coral reef limestones are found. The nominated property corresponds to the mountains at the center of the island. It is mainly comprised of Cretaceous accretionary complex composed of mudstone, basalt, sandstone, and alternation of sandstone and mudstone (Sakai 2010b).

2) Tokunoshima Island

Tokunoshima Island is located about 45 km south-west of Amami-Oshima Island. The central to north part of the island is the mountain area while the south to west part is dominated by low-lying slopes and well-developed marine terraces.

The gently sloping area surrounding the mountains consists of not only bedrocks but also middle Pleistocene sedimentary rocks (coral reef complex deposits) at the height lower than 210 m (Yamada et al. 2003). The nominated property corresponds to the mountains in the central to north area, where Cretaceous accretionary complex composed of slate, sandstone and basalt, and late Cretaceous to Palaeocene plutonic rocks (granites) that intruded into the accretionary complex are exposed (Kawano and Kato 1989; Kawano and Nishimura 2010; Saito et al. 2010). Most accretionary complex has been subject to contact metamorphism due to the intrusion of granites and thus difficult to be eroded. That is thought to be why they have remained as mountains (Saito et al. 2010).

3) Okinawa Island

Okinawa Island is located about 100 km south-west of Tokunoshima Island. Stretching from north and south, Okinawa Island is the largest island in the Ryukyu Chain. In the north area of the island, mountains and marine terraces are widely distributed and Paleogene and older bedrocks are exposed. The south area is comprised of late Miocene to recent sedimentary rocks and Quaternary coral reefs and shelf deposits. Many marine terraces are seen in this area, but they are located at lower altitudes and became emergent later than those in the north area (Machida et al. 2001).

The nominated property is the mountain area in three Yambaru villages. Its general landform is undulating, and valleys are highly convoluted. The main ridge line, the altitude of about 400 m, runs from north-east to south-west, and its peak, Mt. Yonahadake, is also the highest place in Okinawa Island. There are several steps of marine terraces at the height lower than the altitude of 240 m (Koba 1980).

The bedrocks of the nominated property are mostly comprised of Mesozoic to Eocene accretionary complex, including black schist, phyllite, sandstone, and alternation of sandstone and mudstone. Jurassic accretionary complex such as limestone blocks are sometimes found (Sakai 2010b; Takeuchi 2010).

4) Iriomote Island

Iriomote Island is about 400 km southwest of Okinawa Island. The whole island constitutes a low relief surface, 300–450 m high, except for the east end. Rivers such as the Urauchi River and the Nakama River erode the mountains, where the low relief surface is located, forming deep gutter-shaped valleys. Large brakish water area is developed at the river mouths because of the tides. The south side of this mountainous island are sea cliffs while there are lowlands near river mouths and marine terraces in the north to southeast part of the island (Machida et al. 2001). Its geology is older in the east area and younger toward the northwest area.

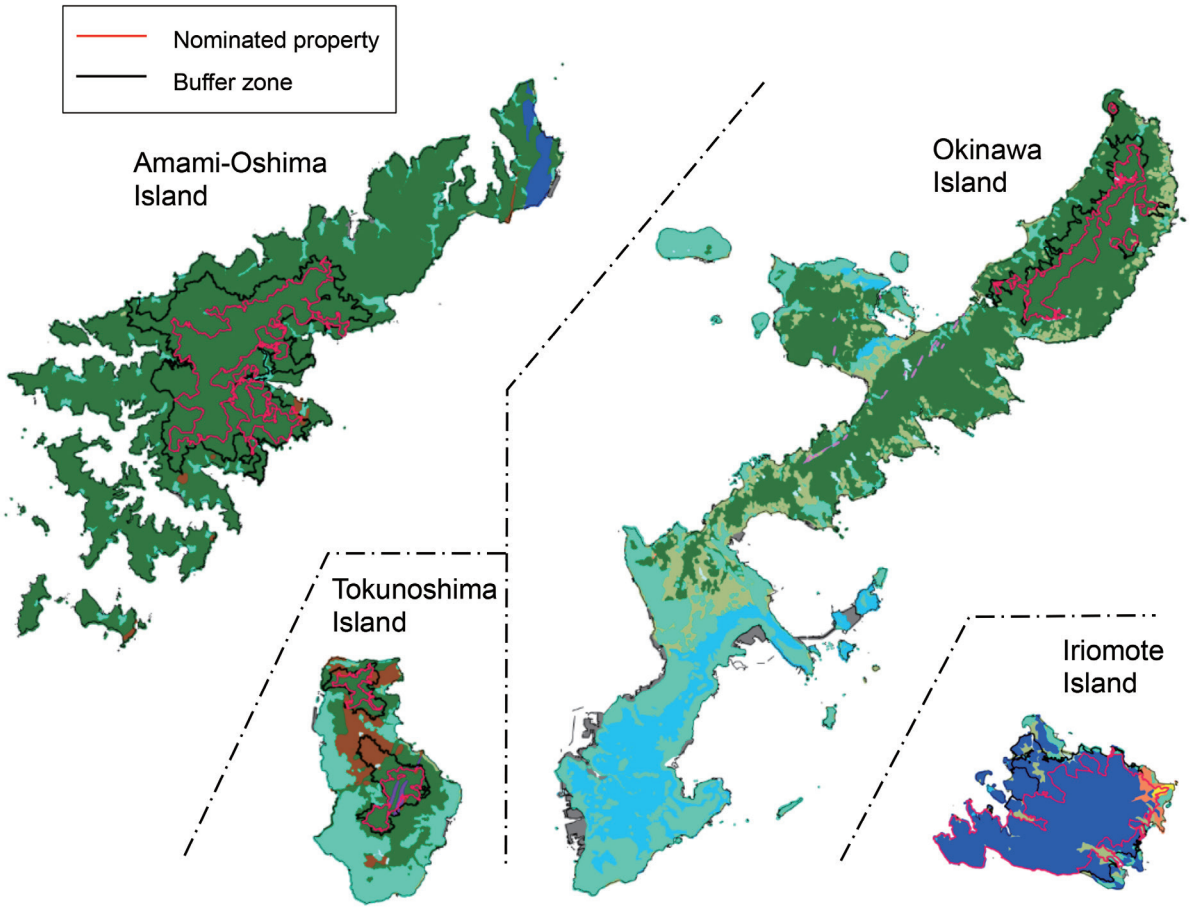
The nominated property corresponds to most of the mountains in the island. Its surface geology is dominated by Miocene shallow-marine or terrestrial sedimentary rocks—mostly conglomerate, sandstone, mudstone, and alternation of sandstone and mudstone, and between those are found coal seam and sandy limestone (Nakagawa et al. 1982; Kaneko 2007; Iryu and Matsuda 2010). At the northeast corner, Triassic to Jurassic metamorphic rocks and Eocene shallow marine sediments and volcanic rocks are exposed on a small scale (Nakagawa et al. 1982; Kaneko 2007). Also, terraces in the north to southeast area are comprised of Pleistocene sedimentary rocks (Nakagawa et al. 1982).

Table 2-2: Area of the four islands containing the nominated property and their highest altitudes

	Area of island	Peak
Amami-Oshima Island	71,235 ha	694 m (Mt. Yuwandake)
Tokunoshima Island	24,785ha	645 m (Mt. Inokawadake)
Okinawa Island	120,696ha	503 m (Mt. Yonahadake)
Iriomote Island	28,961ha	470 m (Mt. Komidake)

Source: Statistical reports on the land area by prefectures and municipalities in Japan, 2015 by Geospatial Information Authority of Japan

Sea cliff of Ryukyu limestone, Tokunoshima Island (Photo: MOEJ)



Island	Classification	Legend (Colors correspond to the map above)
Amami-Oshima Island	Plutonic rocks	Eocene plutonic rocks
	Accretionary rocks	Mesozoic accretionary complex
	Sedimentary rocks	Eocene sedimentary rocks
		Pleistocene to Holocene sedimentary rocks
		Pleistocene to Holocene terrace/sand dune deposits
Tokunoshima Island	Plutonic rocks	Ultramafic rocks
		Cretaceous to Palaeocene plutonic rocks
	Accretionary complex	Cretaceous accretionary complex
	Sedimentary rocks	Pleistocene to Holocene sedimentary rocks
		Pleistocene to Holocene sand dune deposits
Okinawa Island	Volcanic rocks	Oligocene volcanic rocks
		Miocene volcanic rocks
	Accretionary complex	Mesozoic to Eocene accretionary complex
	Sedimentary rocks	Late Miocene to early Pleistocene sedimentary rocks
		Pleistocene to Holocene sedimentary rocks
		Pleistocene to Holocene terrace/sand dune deposits
Iriomote Island	Metamorphic rocks	Triassic to Jurassic metamorphic rocks
	Volcanic rocks	Eocene volcanic rocks
	Sedimentary rocks	Eocene to middle Miocene sedimentary rocks
		Middle Miocene to early Pleistocene sedimentary rocks
		Pleistocene to Holocene sedimentary rocks
		Pleistocene to Holocene sand dune/swamp deposits
Over-all	Other	Lake, river, etc.
		Reclaimed land

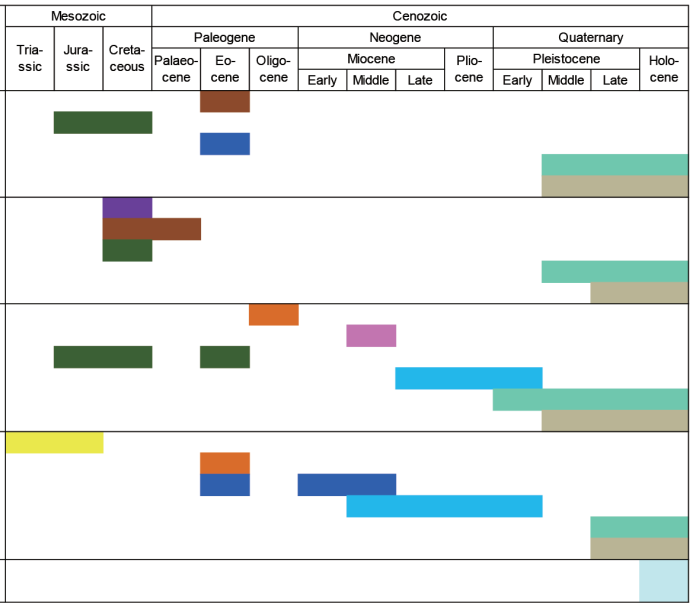


Figure 2-2: Geology of four islands containing the nominated property

This geological map was prepared and adapted based on "1:200,000 Seamless Geological Map of Japan" by Geological Survey of Japan, AIST (https://gbank.gsj.jp/owscontents/index_en.html) and Creative Commons Attribution NoDerivs 2.1 Japan (https://creativecommons.org/licenses/by-nd/2.1/jp/deed.en) as well as Takeuchi 1993; Nakae et al. 2009; Saito et al. 2009; Iryu and Matsuda 2010; Kawano and Nishimura 2010; Nakae et al. 2010; Sakai 2010a, b.

2.a.1.2. Climate

The nominated property belongs to subtropical climate, which has hot summers like those in tropical climate and relatively mild winters. Subtropical climate is characterized by the fact that it is controlled by subtropical high-pressure belts and tropical air masses derived from them, roughly covering the area between 20–30°N and 20–30°S. It is further classified into humid climate and dry climate depending on precipitation. Much of the subtropical part of the world is in the mid-latitude dry zone with low precipitation. Its vegetation is mostly dry, including monsoon forest, savanna, steppe, and desert (Shimizu 2014) (Figure 2-3).

The nominated property is located in the subtropical area, but its climate is called subtropical marine climate, which has precipitation of more than 2,000 mm per year, influenced by the warm Kuroshio Current flowing nearby and monsoons (Figures 2-4 and 2-5). This makes the area a globally rare place where rainforests are found in the subtropical zone. Climate is not so different among the component parts of the nominated property (Table 2-3 and Figure 2-6).

Figure 2-3: Vegetation landscape of global subtropical areas of the same latitude as the nominated property (Website of Yambaru Wildlife Conservation Center)

Ainsliaea macroclinidioides var. *oblonga*
(Photo: JWRC)

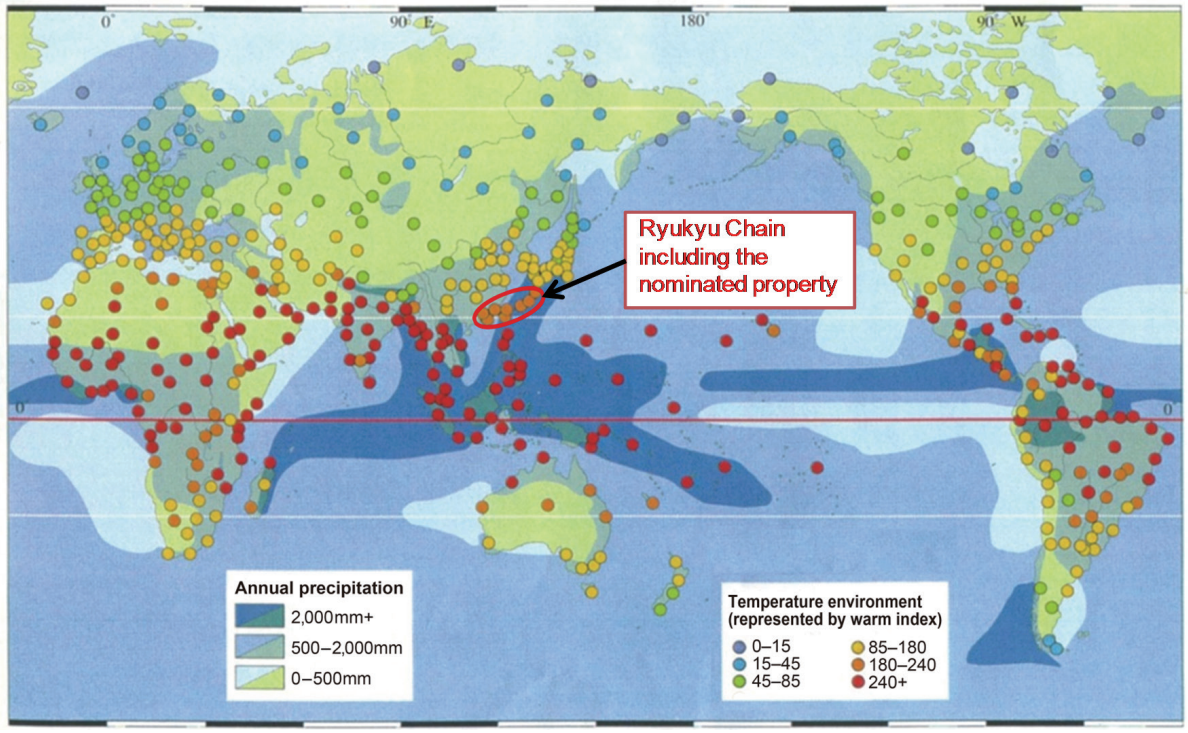


Figure 2-4: Distribution of temperature environment and precipitation on the earth (based on Hotta 1997)
The temperature environment shown in Figure 2-5 is represented by the warm index of Kira (1977).
The index of 180–240 is equivalent to the subtropical zone.

Subtropical rainforest, Iriomote Island (Photo: MOEJ)

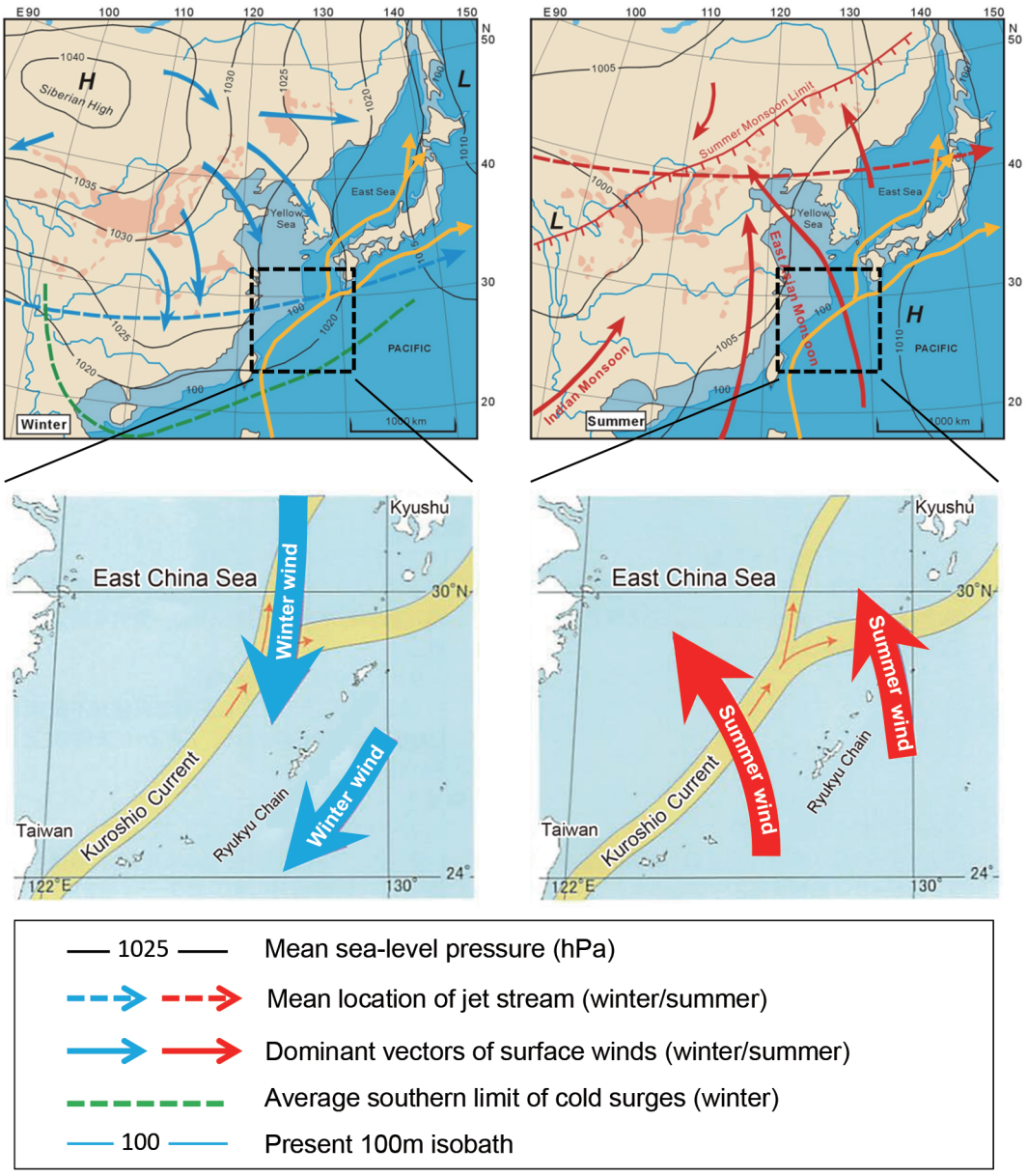


Figure 2-5: Relationship between pressure patterns and monsoons in summer and winter in the nominated property
Left: Pressure pattern in winter; Right: Pressure pattern in summer
Upper: Yi 2011 with added information; Lower: Based on Takara and Sasaki 1990

Orange oakleaf (*Kallima inachus eucerca*)
(Photo: MOEJ)

2.a.1.2.1. Temperature and precipitation

In the nominated property, which is located in the subtropical zone between the tropical and temperate zones, there are six to eight months in a year when the average temperature is over 20°C. Its annual average temperature is 21–24°C. In summer, the average temperature reaches 27–29°C; days with the minimum night-time temperature above 25°C continue for about three months partly because the diurnal range of temperature is small in these islands surrounded by the sea (Yamazaki et al. 1989). Even in winter, the climate is warm with the average temperature of 15–18°C. The annual range of temperature is also small in the nominated property area (Yamazaki et al. 1989). However there is a temperature gradient of 3.5°C between the northern and southern islands in the nominated property in the coldest month (Table 2-3 and Figure 2-6).

It rains all through the year in the nominated property, with the annual precipitation of 1,900 to 2,800 mm, which is greater than in mainland Japan (Tokyo: 1,528.8 mm). The rainfall is especially heavy in the rainy season (mid May to late June) and in the typhoon season (July to October); the total precipitation in the rainy and typhoon seasons accounts for about 60% of the annual precipitation (Okinawa Regional Headquaters, JMA (ed.) 1998). The annual average relative humidity is 74% in Amami-Oshima Island and 79% in Iriomote Island—more than 10 points higher than in mainland Japan (Tokyo: 62%) (Table 2-3 and Figure 2-6).

Table 2-3: Temperature and precipitation in the nominated property; comparison with mainland Japan (Tokyo)

	Amami-Oshima Island	Tokuno-shima Island	Northern part of Okinawa Island	Iriomote Island	Mainland Japan (Tokyo)
Altitude of observation site (m)	2.8	44	232	9.9	25.2
Annual average temperature (°C)	21.6	21.6	20.7	23.7	16.3
Average temperature in the hottest month (°C) *1	28.7	28.2	26.7	28.9	27.4
Average temperature in the coldest month (°C) *1	14.8	14.9	14.5	18.3	6.1
Annual average precipitation (mm)	2,837.7	1,912.3	2,501.5	2,304.9	1,528.8
Annual average relative humidity (%) *2	74	–	–	79	62

Source: Japan Meteorological Agency data (1981 to 2010)
*1: The hottest month is July in the nominated property and August in mainland Japan (Tokyo); the coldest month is January.
*2: Depending on the type of observatory, some observation items are not addressed.

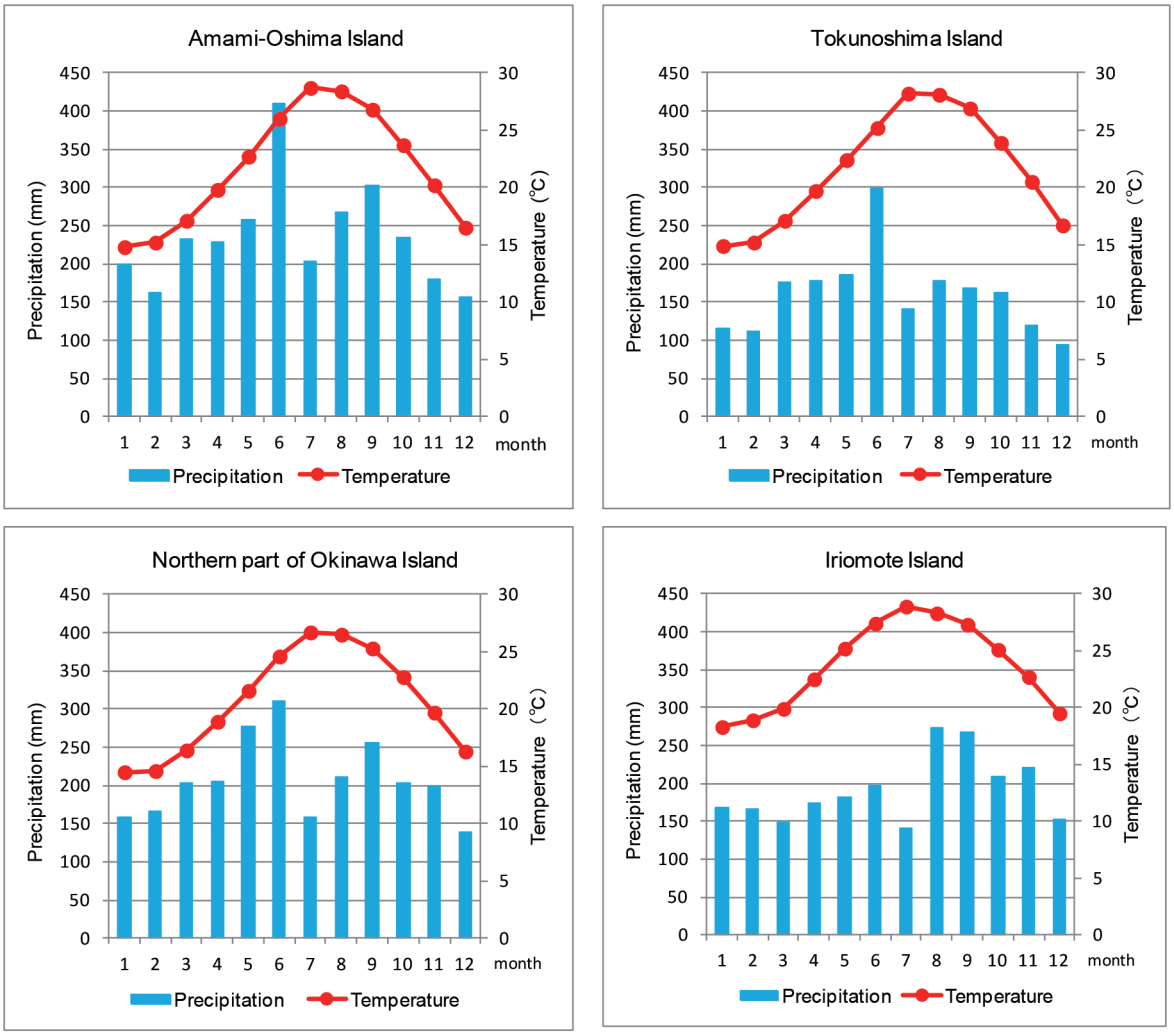


Figure 2-6: Average monthly temperature (line chart) and average monthly precipitation (bar chart) in the four regions
Source: Previous meteorological data (1981 to 2010) at http://www.jma.go.jp/jma/indexe.html

2.a.1.2.2. Typhoon

Figure 2-7 shows the birthplaces and tracks of all tropical depressions and storms in the world that have been recorded since the 1850s. The strongest tropical storms (scales 4–5) occur on the oceans east of the Philippines and around the Mariana Islands, and their tracks are focused on the ocean south of Japan. The nominated property is one of the areas prone to the strong tropical storms[2] (typhoon) in the world.

Figure 2-8 shows the annual number of typhoons occurring and those approaching Japan, and the percentage of those approaching the nominated property since 1951. Although the number of typhoons varies annually, the annual average is 26 (14 to 39) and 12 (4 to 19) of them approach Japan. On average, 7.6 (3 to 15) typhoons approach the nominated property annually—about 30% (13–52%) of the typhoons occurring.

2 Japan Meteorological Agency (JMA) calls tropical storms with the maximum wind speed near its center of 17.2 m/s (34 kn/s) or above *taifu* [typhoon]. Depending on regions of the world, tropical storms have various names but in any case, the maximum wind speed of 64 kn/s (32.9 m/s) or above is necessary. It is equivalent to what JMA calls "strong *taifu*."

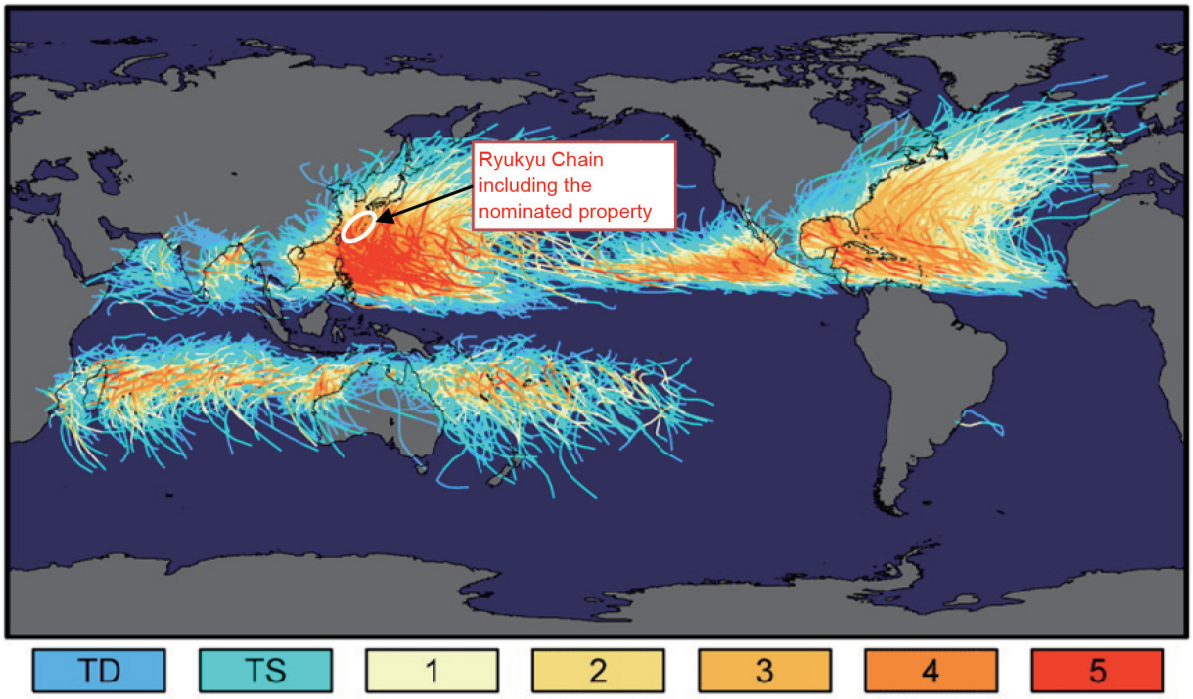


Figure 2-7: Birthplaces and tracks of all tropical storms in the world that have been recorded since the 1850s

Global Warming Art. Prepared on October 7, 2006. http://www.globalwarmingart.com/

Data on the tracks of tropical storms is based on National Hurricane Center (America) for the north Atlantic and the east Pacific; Joint Typhoon Warning Center (America) for the Indian Ocean and the northwest Pacific; and Gary Padgett's April 2004 Monthly Tropical Cyclone Summary and Roger Edson at University of Guam for Hurricane Katrina in the south Pacific.

Saffir-Simpson Hurricane Intensity Scale
TD (Tropical Depression): wind speed of 0–38 mph (0–17 m/s)
TS (Tropical Storm): 39–73 mph (17–33 m/s)
Category 1: 74–95 mph (33–42 m)
Category 2: 96–110 mph (33–49 m/s)
Category 3: 111–130 mph (49–58 m/s)
Category 4: 131–155 mph (58–69 m/s)
Category 5: 155 mph (69 m/s+)

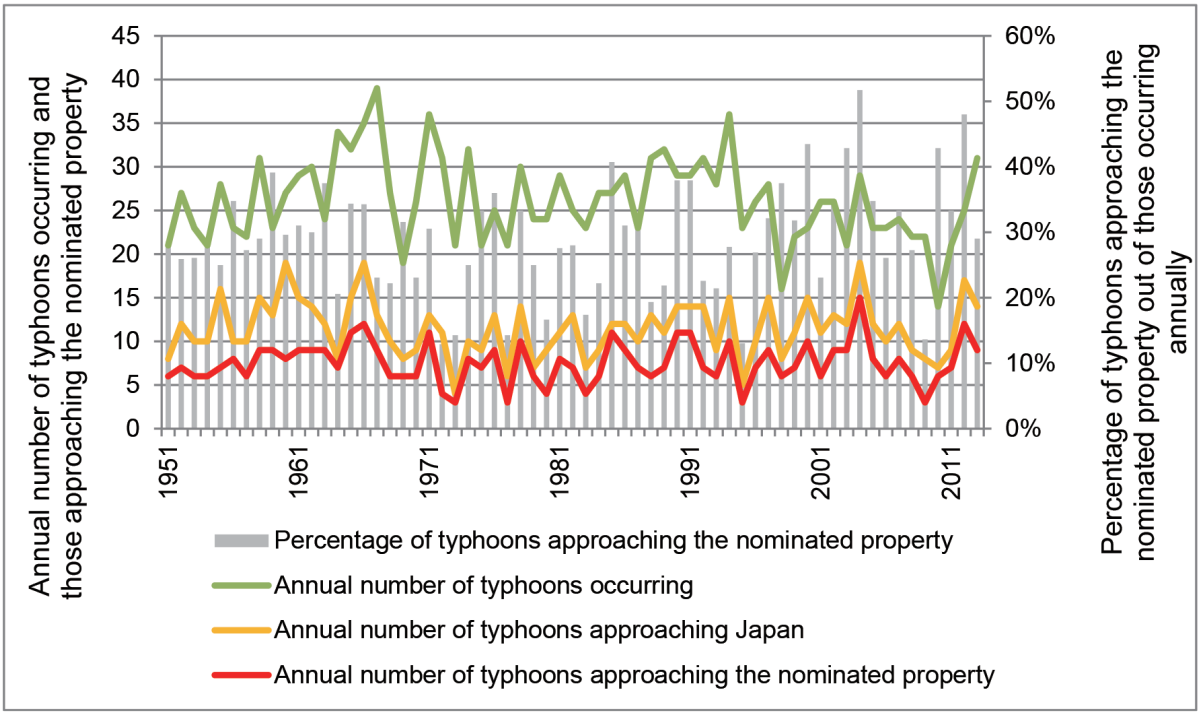


Figure 2-8: Annual number of typhoons occurring and those approaching Japan, and the percentage of those approaching the nominated property
Source: Statistics on typhoons at http://www.data.jma.go.jp/fcd/yoho/typhoon/statistics/index.html

Strong tropical storm (typhoon) (Photo: MOEJ)

2.a.1.3. Vegetation

The dominant natural vegetation of the nominated property is mountainous forests—evergreen broadleaved forests developed in the humid subtropical zone. Trees dominating the upper layer include oaks, Ryukyu pines (*Pinus luchuensis*) (Pinaceae), and camphor trees (Lauraceae); its vegetation landscape is similar to that of evergreen broadleaved forests in the warm temperate zone north of Yakushima Island (Aiba 2011). However it has diversed tree species, including tree ferns, marlberry species, some *Ardisia* species growing as tall as semi-tall trees, strangler figs, and palm trees, which are different from those found in forests in the warm temperate zone. On the other hand, the coasts of this area are home to tree species of coastal vegetation in tropical and subtropical regions, including mangroves, Tahitian screwpine (*Pandanus odoratissimus*), tropical almond (*Terminalia catappa*), *Argusia argentea*, powder-puff tree (*Barringtonia racemosa*), and *Hernandia nymphaeifolia* (Hotta 1974; Kira 1989). In this way, the lowlands contain species found in the tropical zone while the mountains contain diverse subtropical evergreen broadleaved trees, including Castanopsis (*Castanopsis sieboldii*) and oak (*Quercus miyagii*). This kind of mixed forest is called the subtropical rainforest in this document (Kira 1976; Aiba 2011).

Many of these southern plants in understory and coastal areas are dispersed relatively quickly; for example, their seeds and spores are carried by wind, ocean currents, and birds. Conversely, the mountainous tall trees like Castanopsis and *Quercus miyagii* are not good at spreading their seeds into distant areas across the sea. They are thought to date back to old times when this area was low in temperature and connected with the Continent and mainland Japan by land (Hotta 1974; Kira 1989; Ohno 1997).

2.a.1.3.1. Vegetation of the nominated property

1) Evergreen broadleaved forest

(Photo: MOEJ)

The largest vegetation in the nominated property is the natural and secondary evergreen broadleaved forests, whose tree layers are dominated by Castanopsis. According to Miyawaki (ed.) (1989), these forests are developed on the non-limestone region and classified phytosociologically as Psychotrio-Castanopsion sieboldii (alliance). The natural forests include Lasiantho-Castanopsietum sieboldii (association) that mainly occurs in Amami-Oshima Island and Tokunoshima Island, Illicio anisati-Castanopsietum sieboldii (association) that widely occurs in mountains in northern and central Okinawa Island, and Adinandro yaeyamensis-Castanopsietum sieboldii (association) seen in mountains in Iriomote Island. The secondary forests include Tarenno-Castanopsietum sieboldii (association). In mesic areas along the valleys, Quercetum miyagii (association) dominated by *Quercus miyagii* occurs in relatively wide areas. On the other hand, in the limestone region, subtropical coastal plants and species specific to the limestone land form another

unique plant community, including Fico microcarpae-Pongamietum pinnatae (association) on the raised coral reef as well as Macarango-Bischoffietum (association).

In the nominated property, periodic disturbances caused by frequent typhoon attacks (see Figure 2-7 and 2-8) and complex landform where small ridges and valleys occur (see 2.a.1.1.2) help promote the diversification of the environment, making component species in the forests more diversified (Kubota et al. 2004; Yoneda 2016). As an example, research conducted in the forests of the northern part of Okinawa Island dominated by Castanopsis shows that the forests in the nominated property have greater diversity of tree species (Ito 1997) and that the diversity and productivity of woody species is higher in ridges than in valleys and slopes (Kubota et al. 2004). That is probably because ridges are affected powerfully by frequent typhoons and fallen trees create canopy gaps. This helps avoid competition for light between tree species in tree layers and those in subtree layers, enabling various tree species to coexist (Kubota et al. 2004). According to research targeted at the natural forests in Tokunoshima Island, forest floor vegetation in valleys is characterized by herbaceous, fern and climbing plants rather than woody plants; it is thought that disturbances caused by typhoon rains are more intense in valleys than in ridges (Yoneda 2016).

2) Cloud forest

Mt. Yuwandake (694 m) in Amami-Oshima Island is the highest peak in the nominated property, and Tokunoshima Island has Mt. Inokawadake with an altitude of 644 m. The forests of these mountains that are located at the height of 500–600 m or more constitute cloud belts, where sunlight is limited and air humidity is high (Suzuki 1979; Miyawaki (ed.) 1989; Onishi et al. 2012) and Arisaemato heterocephali-Castanopsietum sieboldii (association) is found (Suzuki 1979; Miyawaki (ed.) 1989). On top of the trees are unique epiphytes such as an epiphytic fern (*Polypodium amamianum*), and orchid (*Liparis viridiflora*), and on the humid forest floors, fern plants such as *Bolbitis subcordata* and *Ctenitis subglandulosa* flourish (Miyawaki (ed.) 1989). Bryophytes are also rich in diversity; for example, there are over 120 species near the peak of Mt. Inokawadake (altitude of above 500 m) (Onishi et al. 2012).

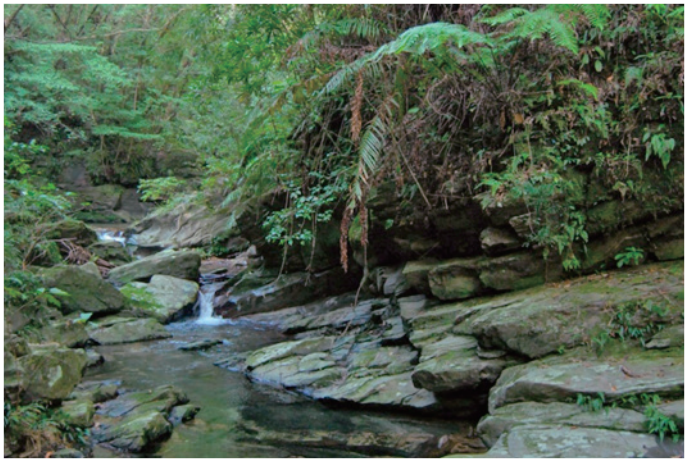
(Photo: JWRC)

Similarly, on the slopes located at an altitude above 450 m of Mt. Yonahadake (503 m), the highest peak in Okinawa Island, there are cloud forests whose abundant annual precipitation exceeds 3,000 mm, constituting the *Microlepia hookeriana-Castanopsis sieboldii* community (Niiro 2015). With the tree layers dominated by Castanopsis, these forests are rich with bryophytes, epiphytic and ground orchids, and fern plants, reflecting high air humidity (Miyagi 1990; Makita 1998). Near the peak of Mt. Komidake (469.5 m), the highest peak in Iriomote Island, the *Woodwardia harlandii-Pleioblastus linearis* community occurs. Swept by wind from the coasts, in this area develops *Pleioblastus linearis* forest, which is resistant to wind. The summit area is like a

cloud belt, home to *Skimmia japonica* var. *lutchuensis*, *Woodwardia harlandii*, *Goodyera foliosa* var. *commelinoides*, and Iriomote false holly (*Osmanthus heterophyllus* var. *iriomotensis*) (Niiro et al. 1974; Shimabukuro 2015).

3) Mountain stream zone

In humid tropical regions, high and low waters of rivers appear cyclically due to frequent rainfalls. At the upstream and midstream, riverbeds and riversides are flooded periodically for a certain time between high and low waters. These places are called mountain stream zones, with a difference in water level of 2–3 m in tropical regions. Although the nominated property consists of islands with relatively small water catchment areas, frequent rainfalls allow it to have mountain stream zones with a difference in water level as much as that in tropical regions (Kato 2003).



(Photo: JWRC)

Plants growing in this kind of environment are called rheophytes (Hotta 2002; Kato 2003). They adapt to the unusual environment where they are exposed to torrents during heavy rainfalls and dried during the low-water period (Hotta 2002). Some of them have slender or small leaves so as to reduce resistance to water flow; some stick to rocks with their roots or rhizomes; and some have leaves with fewer trichomes so that muddy water dries quickly (Yokota 1997).

As for the vegetation of mountain stream zones, in the northern part of Okinawa Island and Iriomote Island, the *Lindsaea odorata* var. *japonica-Salvia pygmaea* community is known, in which small and dwarf herbs stick to somewhat shaded rocks. Also, Pileo-Arundetum formosae is seen at waterfalls and cliffs in Iriomote Island, and the *Rhododendron scabrum-Farfugium japonicum* var. *luchuense* community consisting of ericaceous plants and evergreen low trees is seen on the rocks on the riversides in Kunigami Mountains (Miyawaki (ed.) 1989; Miyagi 1990).

At the upstream and midstream of the Sumiyo River in Amami-Oshima Island are communities dominated by *Rhododendron scabrum* on the rocks. In the nominated property, many rheophytes grow, including *Salvia pygmaea*, *Solenogyne mikadoi*, *Lysimachia liukiuensis*, and *Viola amamiana*. These include a number of threatened plants endemic to the Ryukyu Chain (Hotta 2002; Kawanishi 2016). Besides, *Platanthera sonoharae* found in the northern part of Okinawa Island is a relict endemic species, which survived only in this area after having been isolated from the Continent. Many of the rheophytes are thought to have newly evolved in this area, including *Polystichum hancockii* var. *yaeyamense*, *Farfugium japonicum* var. *luchuense*, *Ainsliaea macroclinidioides* var. *oblonga*, and *Eurya emarginata* var. *ryukyuensis* (Yokota 1997).

4) Mangrove forest

(Photo: MOEJ)

Mangroves mean groups of unique plants growing in muddy wetlands near sea shores or river mouths in tropical or subtropical regions that are affected by salt water (Nakasuga 1995). One of their major habitats is tropical Asia, from Southeast Asia to East Asia, the Central and South Ryukyus, which is the northern limit (Miyawaki (ed.) 1989). In Japan, mangrove forests covering a decent amount of space can be seen only in the Ryukyu Chain in which the nominated property is included. Among them, the mangrove forest at the mouth of the Sumiyo River in Amami-Oshima Island is the most northern. In Iriomote Island, mangrove forests are found at the mouths of the Nakama River, the Urauchi River, and the Shiira River, etc.

Mangrove forests are simpler in species composition and scrubbier in structure than those in tropical Asia (Miyawaki (ed.) 1989). Those in Amami-Oshima Island are comprised of *Kandelia obovata* and oriental mangrove (*Bruguiera gymnorhiza*), and Iriomote Island has four more species: Asiatic mangrove (*Rhizophora stylosa*), gray mangrove (*Avicennia marina*), black mangrove (*Lumnitzera racemosa*), and *Sonneratia alba*. The occurrence of species in the forests varies with frequency and intensity of tides, soil substrate, landform, and salinity (Miyawaki et al. 1983); from riversides toward inner lands, component species gradually change, forming zonal vegetation (Nakanishi 2005). As an example, the Urauchi River in Iriomote Island shows a zone comprising the *Sonneratia alba*, Asiatic mangrove, *Kandelia obovata*, and oriental mangrove communities that develop in this order from the riverside to inland (Nakanishi 2005).

The wetland on the landward side from the mangrove forests in Iriomote Island exhibits a mosaic sequence, in which *Barringtonia racemosa* forests are found in depressions where forest floors are flooded during high tides and rainfalls, and looking-grass tree (*Heritiera littoralis*) forests are found in slightly elevated places that are always above water (Miyawaki (ed.) 1989).

Back marsh of mangrove forest (Photo: MOEJ)

2.a.1.3.2. Vegetation of four regions of the nominated property

1) Amami-Oshima Island

In Amami-Oshima Island, an island with relatively high mountains, more than 80% of its whole area is covered with forests. The secondary forests of evergreen broadleaved trees, such as coppice forests of oaks, account for 61% of the island (Table 2-4). The Ryukyu pine community accounts for nearly 20%; half of it was created by planting after logging and the other half was regenerated naturally (Yoneda 2016).

Ilex dimorphophylla (Photo: MOEJ)

The nominated property corresponds to the mountainous backbone running from the Kinsakubaru national forest in the mid-island to Mt. Yuwandake in the southwest, the Kamiya national forest, Mt. Torigamine and Mt. Eboshidake in the southeast. Large, almost natural forests, including Castanopsis forests, are concentrated in this area. In the middle mountainsides is Lasiantho-Castanopsietum sieboldii while at the higher level (around 400 m) Arisaemato heterocephali-Castanopsietum sieboldii develops. The summit area of Mt. Yuwandake, the highest peak in Amami-Oshima Island, makes up wind-swept scrub forests, about 8 m tall, comprised of Ilici dimorphophyllae-Symplocosetum confusae specific to this region; on the mountainside, 300–600 m high, is Arisaemato heterocephali-Castanopsietum sieboldii, which is like a cloud forest. Furthermore, the rocky area with springs is home to the woody fern (*Cyathea lepifera*) community while *Quercus miyagii* is scattered around the mesic areas along the valleys and at the mountain foot.

2) Tokunoshima Island

Despite being an island with high mountains, Tokunoshima Island has a wealth of arable land, with its mountains full of Castanopsis forests surrounded by raised coral reef terraces. Forests and arable land divide the island area almost into two halves. Most of the forests are evergreen broadleaved forests or secondary Ryukyu pine forests. About 30% of the Ryukyu pine community was created by planting after logging and 70% was regenerated naturally. The *Quercus glauca* var. *amamiana* community is found on the raised limestones in the hilly area (Table 2-4) (Miyawaki (ed.) 1989; Kagoshima Prefecture 2012; Kyushu Regional Forest Office, Forestry Agency 2012).

Quercus miyagii (Photo: MOEJ)

The nominated property corresponds to the mountains ranging from Mt. Amagidake to Mt. Sasontsujidake in the north and the mountains ranging from Mt. Inokawadake to Mt. Tanpatsu, Mt. Hagedake and Mt.

Inutabudake in the south-central. These mountains are full of Castanopsis and other forests. As is the case with Amami-Oshima Island, Lasiantho-Castanopsietum sieboldii is present in the lower mountains while Arisaemato heterocephali-Castanopsietum sieboldii is seen at the higher level. The summit area of Mt. Inokawadake, the highest peak in the island, constitutes wind-swept scrub forests comprised of Ilici dimorphophyllae-Symplocosetum confusae; on the mountainside, 300–600 m high, is Arisaemato heterocephali-Castanopsietum sieboldii, which is like a cloud forest. Near Mt. Amagidake in the north and in Mt. Tanpatsu and Mt. Inutabudake in the south-central, a mature forest stand of *Quercus miyagii* is present (Miyawaki (ed.) 1989; Kyushu Regional Forest Office, Forestry Agency 2016).

3) Northern part of Okinawa Island

The northern part of Okinawa Island has been traditionally called by local residents "Yambaru," which is said to mean the mountainous region full of forests. Its area is not clearly defined, but this document calls Kunigami Village, Ogimi Village, and Higashi Village in the northern part of Okinawa Island three Yambaru villages, which keep in relatively healthy condition the forests where Okinawa rails (*Gallirallus okinawae*) and many other endemic plant and animal species occur. Both tree species characteristic of the temperate zone and those characteristic of the tropical zone coexist in the forests of these three villages, with Castanopsis being dominant (Table 2-4). In the mountains of three Yambaru villages, especially in the backbone area, forests of over 50 years old with many endemic plants widely occur, providing a unique landscape.

Schima wallichii ssp. *liukiuensis* (Photo: JWRC)

Forests comprise about 80% of the vegetation in three Yambaru villages. Illicio anisati-Castanopsietum sieboldii (evergreen broadleaved plants of natural vegetation) accounts for 41.6% in terms of area; it especially prevails in Kunigami Village, the largest in area of the three villages. Then it is followed by Tarenno-Castanopsietum sieboldii (secondary vegetation of evergreen broadleaved forest) (18.9%) and the Ryukyu pine community (secondary evergreen conifer forest) (12.3%).

Illicio anisati-Castanopsietum sieboldii widely occurs in the mountain areas with an altitude of above 200 m of Mt. Nishimedake, Mt. Ibudake, Mt. Terukubi and Mt. Yonahadake, all of which are located in the nominated property. The summit area of Mt. Yonahadake constitutes a cloud forest filled with bryophytes, epiphytic and ground orchids, and fern plants. In the summit areas, wind-swept sites around the ridges, and south-facing dry sites of Mt. Nishimedake and Mt. Ibudake, Ainsliaeo okinawaensis-Pasanietum (association), a scrub forest not more than 6 m tall, is occurring (Miyawaki (ed.) 1989). In the mountains whose bedrocks include palaeozoic limestones of about 200 million years old, such as Mt. Nekumachijidake and Mt. Shioya-Fuji in Ogimi Village, mixed forests comprising both evergreen broadleaved trees such as *Quercus glauca* var. *amamiana*, *Acer oblongum* var. *itoanum*, *Elaeocarpus sylvestris* var. *ellipticus*, *Schefflera octophylla*, and *Daphniphyllum teijsmannii* and deciduous broadleaved trees such as *Fraxinus floribunda*, *Rhus succedanea*, *Euonymus tanakae*,

Fraxinus griffithii, and *Celtis boninensis* exist (Board of Education, Ogimi Village 1997).

4) Iriomote Island

Forests comprise about 90% of the island. It is the most untamed in the four regions containing the nominated property, with a lot of mountain stream zones and mangroves growing on it.

Iriomote Island is widely covered with evergreen broadleaved forests. Adinandro yaeyamensis-Castanopsietum sieboldii accounts for 67% in terms of area. Taking also into account the mangrove forests at the river mouths, about 70% of the island is covered with natural vegetation of evergreen broadleaved trees (Table 2-4).

Barringtonia racemosa (Photo: MOEJ)

In the non-limestone region spreading from hills to mountains in the nominated property, Adinandro yaeyamensis-Castanopsietum sieboldii widely occurs while the mesic areas next to the valleys occur Quercetum miyagii. In some places along the Nakama River where raised limestones are exposed, Macarango-Bischoffietum, etc. is observed and Castanopsis is not dominant. The vale areas downstream of the Nakama River have humid forests dominated by looking-grass tree and powder-puff tree; on the natural banks, riparian forests comprised of Melicopo triphyllae-Perseetum thunbergii, etc. develop. At the mouths of the Nakama River and the Shiira River, there are the largest mangrove forests in Japan. Hernandietum sonorae (association) dominated by *Gettarda speciosa* is found on the coastal dunes, and Planchonello-Litseetum japonicae is seen in the wind-swept areas on the coastal cliffs. The valley in the upstream Urauchi River has variously sized waterfalls and cliffs, where the mountain stream side vegetation like Pileo-Arundetum formosae is found (Miyawaki (ed.) 1989). Around the summit area of Mt. Komidake, the highest peak in Iriomote Island, the *Woodwardia harlandii-Pleioblastus linearis* community exhibits a wind blown form, 2.5–3 m tall. On the lower mountainside, cloud forests are formed where tall trees such as Castanopsis and epiphytes prevail.

Nipa palm (*Nypa fruticans*) (Photo: MOEJ)

Table 2-4: Percentage of area by vegetation type in the four regions containing the nominated property

	Area (ha)	Percentage (%) of area by vegetation type										Year of vegetation map prepared
		Natural evergreen broadleaved forest	Mangrove forest	Secondary evergreen broadleaved forest	Ryukyu pine community	Secondary deciduous broadleaved forest	Secondary grass-land	Bamboo/ dwarf-bamboo community	Planted forest	Arable land	Other	
Amami-Oshima Island	71,235	6.0	0.1	55.1	19.8	4.8	0.6	0.0	1.0	6.5	6.1	2009
Tokuno-shima Island	24,785	3.5	0.0	25.1	16.4	0.9	0.1	0.0	0.2	45.0	8.8	2009
Northern part of Okinawa Island	34,023	41.6	0.0	21.8	12.1	5.8	1.6	0.0	0.9	11.3	4.8	2000-01
Iriomote Island	28,961	67.6	3.0	8.2	9.3	3.4	0.3	0.3	0.3	4.6	3.0	2006

Area of the islands/region is based on the statistical reports on the land area by prefectures and municipalities in Japan, 2015 by the Geospatial Information Authority of Japan. The area of the northern part of Okinawa Island represents the total of three Yambaru villages (Kunigami, Ogimi, and Higashi).
Percentage of area by vegetation type is calculated based on the vegetation surveys in the Sixth and Seventh Rounds of the National Survey on the Natural Environment (1999–) by the Ministry of the Environment, using GIS.

Evergreen broadleaved forest (Photo: MOEJ)

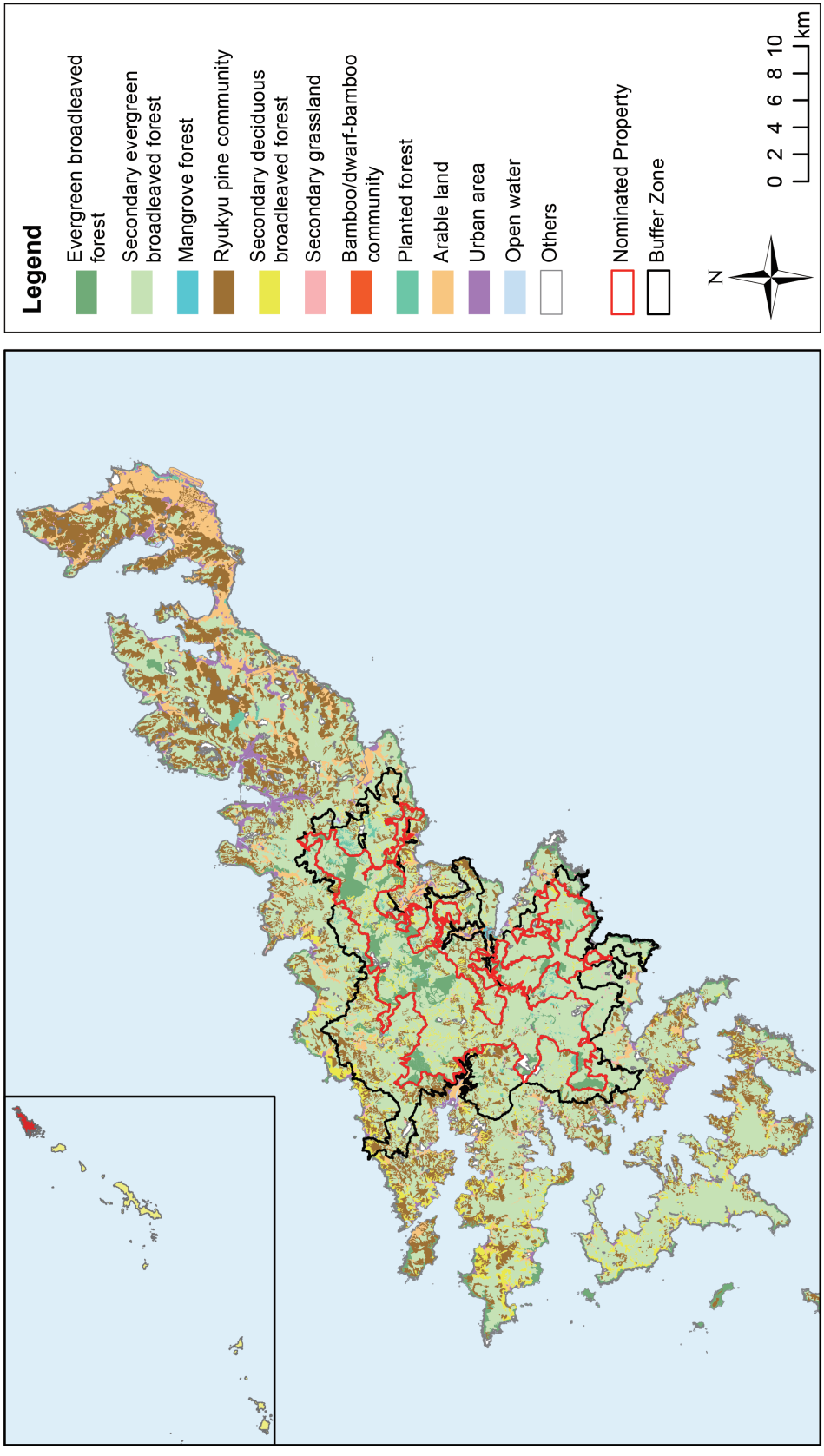


Figure 2-9: Vegetation of the nominated property (Amami-Oshima Island)
The Sixth and Seventh Rounds of the National Survey on the Natural Environment (vegetation surveys) by the Ministry of the Environment

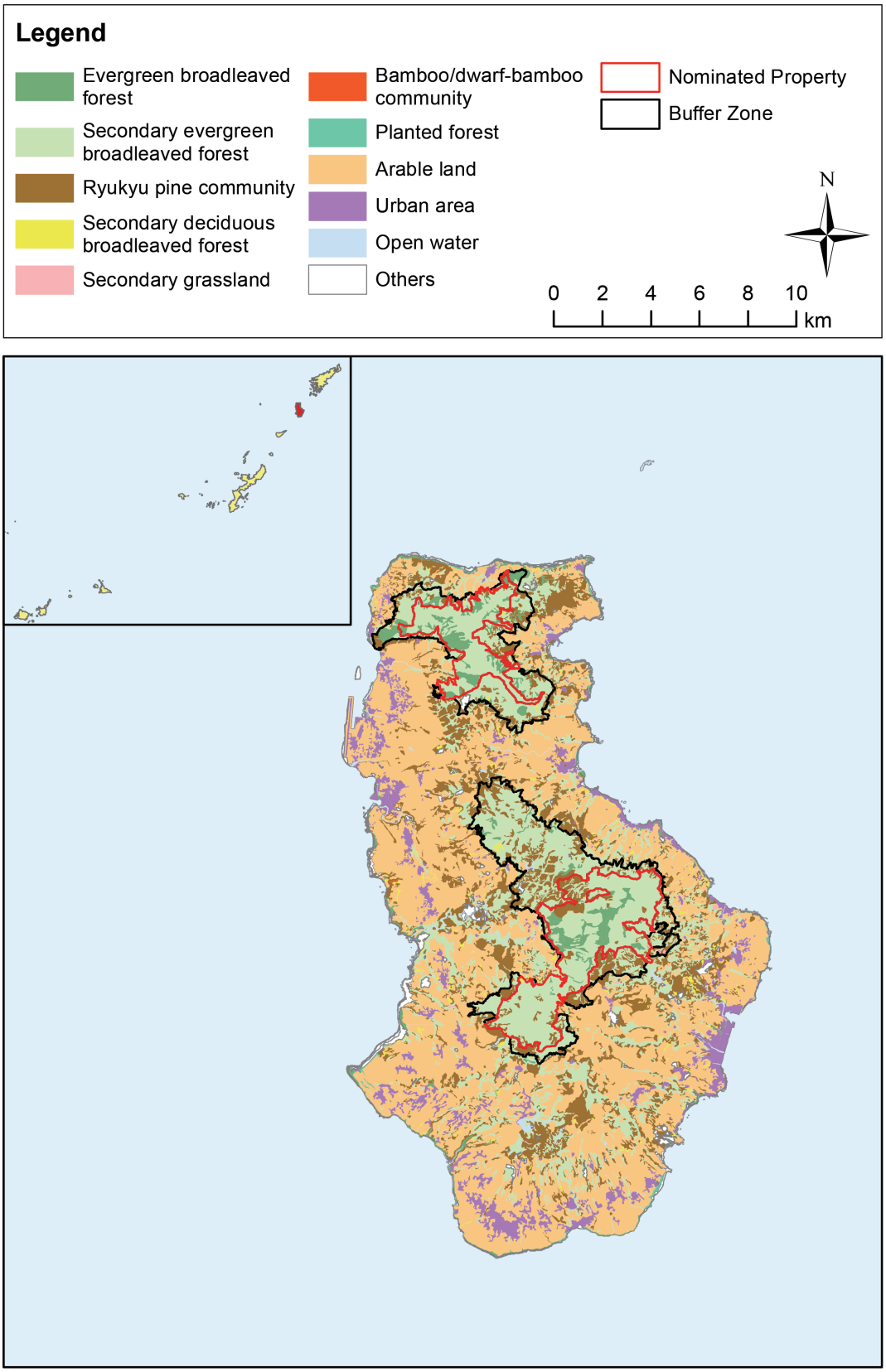


Figure 2-10: Vegetation of the nominated property (Tokunoshima Island)
The Sixth and Seventh Rounds of the National Survey on the Natural Environment (vegetation surveys) by the Ministry of the Environment

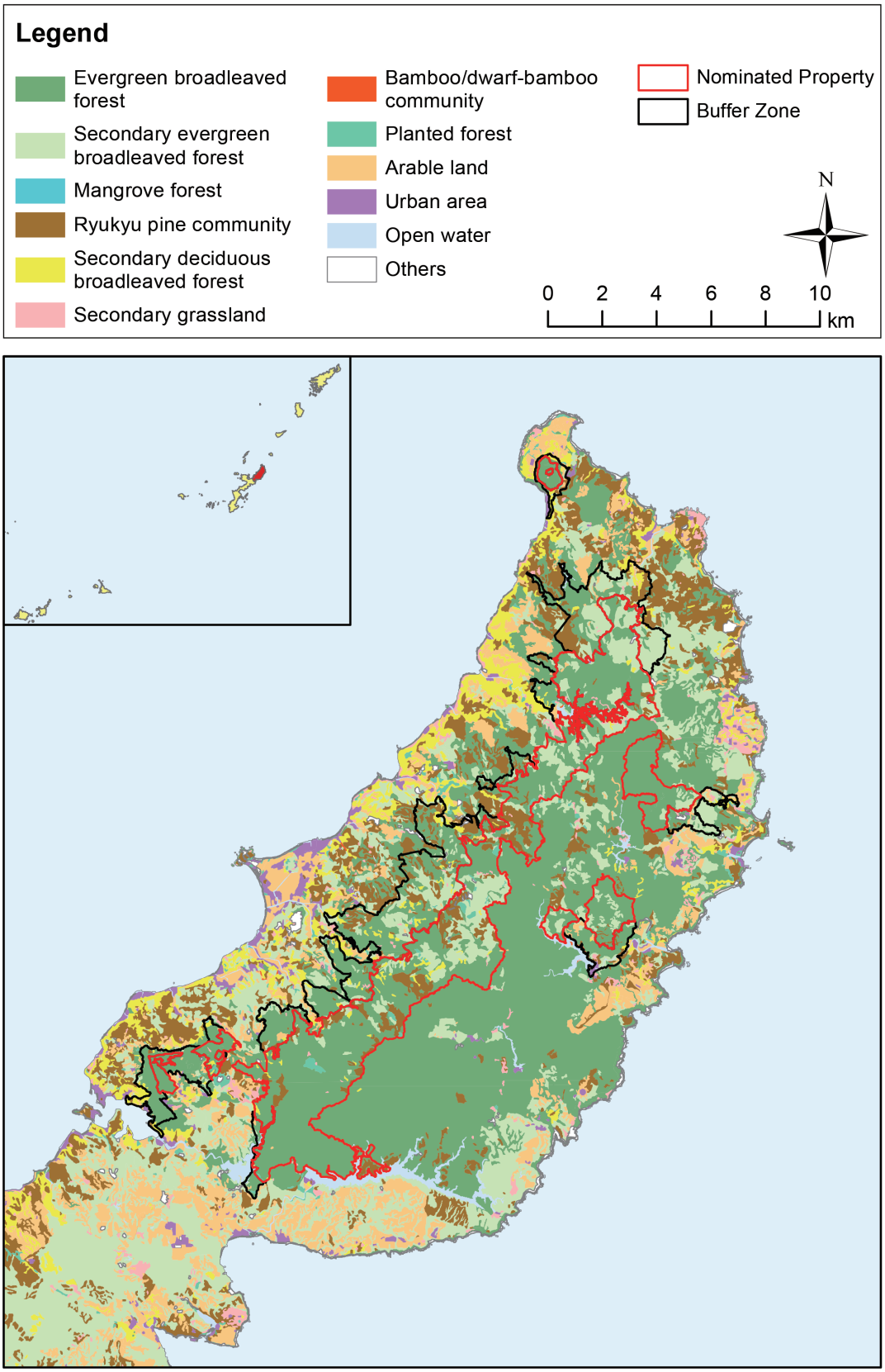


Figure 2-11: Vegetation of the nominated property (Northern part of Okinawa Island)
The Sixth and Seventh Rounds of the National Survey on the Natural Environment (vegetation surveys) by the Ministry of the Environment

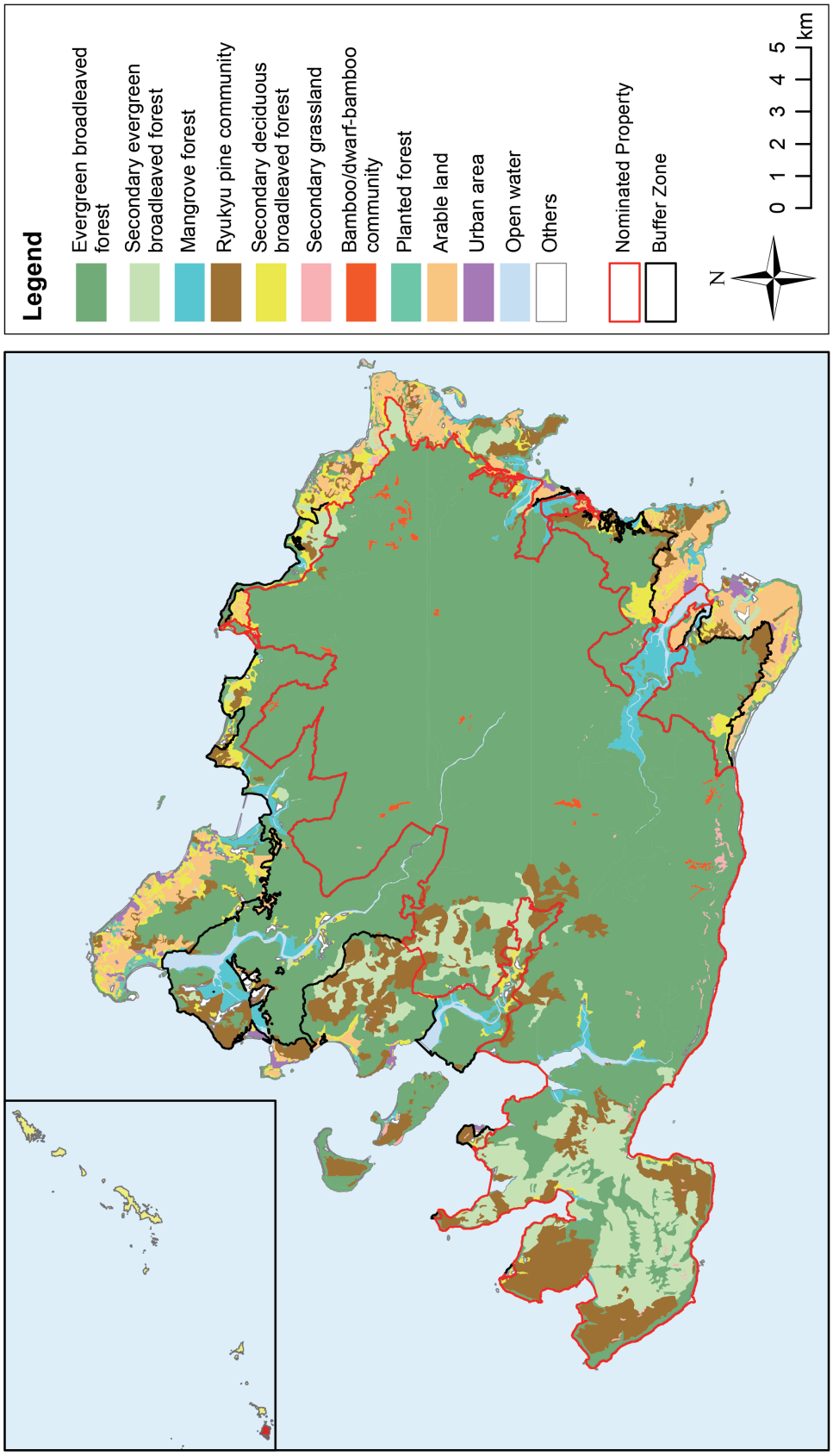


Figure 2-12: Vegetation of the nominated property (Iriomote Island)
The Sixth and Seventh Rounds of the National Survey on the Natural Environment (vegetation surveys) by the Ministry of the Environment

2.a.2. Biota

The Ryukyu Chain is home to a particularly large number of endemic species and subspecies of non-avian vertebrates, reflecting the formation process of the continental islands, namely, separation and isolation from the Continent caused by plate motions, followed by the formation of a land bridge and subsequent fragmentation into islands as a result of periodic sea-level fluctuations between the glacial and interglacial periods (to be detailed in "2.a.3. Geological History and Speciation"). Studies on distribution patterns of amphibians and reptiles have shown that the herpetofauna in the Central Ryukyus is closer to that of the South Ryukyus and southward than to that of the North Ryukyus (Ota 2000), but the Central and South Ryukyus exhibit different patterns of endemism (Hikida and Ota 1997; Ota 1998; Okamoto 2017). Therefore, many of the non-avian terrestrial vertebrate species inhabiting the Central and South Ryukyus are considered to be of subtropical origin and have many evolutionary sister groups and stem groups in Taiwan and the southeastern part of the Eurasian Continent (Ota 2009).

In addition, the Ryukyu Chain also exhibits characteristics similar to those of the establishment of organisms observed in oceanic islands and its biota is composed of plants and animals that arrived via various routes and processes, reflecting various geographic and climatic characteristics which include the following: it is a chain of islands located in the northwestern Pacific Ocean, lying like stepping stones over a stretch of waters extending approximately 1,200 km in parallel to the east coast of the Eurasian Continent; it is washed by the Kuroshio Current, one of the world's major warm ocean currents, which flows northward in the East China Sea; strong typhoons formed over the ocean east of the Philippines frequently hit the archipelago; and it is situated along a migration route for birds travelling a long distance between the Northern and Southern Hemispheres (Figure 2-13 and Table 2-5).

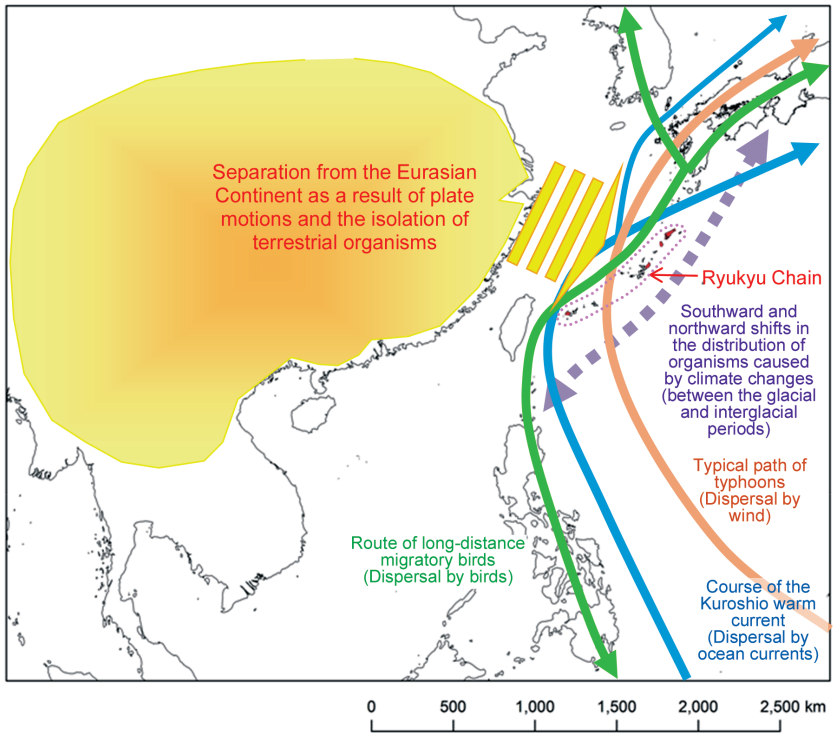


Figure 2-13: Diverse processes of biota development in the nominated property (Image)

Table 2-5: Patterns of biological dispersal, etc. associated with biota development in the Ryukyu Chain and examples

Patterns of biological dispersal, etc. in the Ryukyu Chain	Examples
Separation and isolation from the Eurasian Continent caused by plate motions and the speciation of species	Detailed in 2.a.3. Geological History and Speciation
Migratory birds that stopped over while travelling from the south along the archipelago lost their flight ability and evolved into endemic species	Okinawa rail (*Gallirallus okinawae*) (Matsuoka 2003; Ozaki 2005; Kirchman 2012)
Southward and northward shifts in the distribution of organisms caused by climate changes (between the glacial and interglacial periods) and refuges	・Relicts of temperate species of organisms that migrated southward during the glacial period Asahina's skipper (*Ochlodes asahinai*) (Chiba and Tsukiyama 1996) *Dendranthema crassum, Euphorbia sieboldiana* (Hotta 2003b), etc. ・Safe refuges for plants of tropical origin that had migrated northward before the glacial period *Begonia fenicis* (Nakamura et al. 2014)
Dispersal by ocean currents such as the Kuroshio	Weevil (*Pachyrhynchus infernalis*) (Kohama 2015) Stick insect (*Megacrania tsudai adan*) (Yamasaki 1991) Nipa palm (*Nypa fruticans*) (Sugai et al. 2015) Asiatic mangrove (*Rhizophora stylosa*) (Ng W. L. et al. 2015) *Kandelia obovata* (Giang et al. 2006) *Entada phaseoloides* (Wakita et al. 2008; Tateishi et al. 2008)
Dispersal by wind such as typhoons	Common rose (*Pachliopta aristolochiae interposita*), striped blue crow (*Euploea mulciber barsine*), crimson marsh glider (*Trithemis aurora*), amber-winged glider (*Hydrobasileus croceus*) (Kohama 2015)
Dispersal by birds such as migratory birds	*Solenogyne mikadoi* (Nakamura et al. 2012) *Lobelia loochooensis* (Kokubugata et al. 2012)

As a result, the four regions containing the nominated property together account for only 0.4% of the total land area of Japan, a biodiversity hotspot by Conservation International, are home to 26% of vascular plant species of Japan, 7% of the endemic species of Japan, 20% of those listed as threatened (on the MOEJ Red List). They are also a habitat for 58% of all of the vertebrates in Japan, 44% of endemic species of Japan (excluding inland water fish), and 30% of species listed as threatened (on the IUCN Red List). Also, 20% of the insect species inhabiting Japan and 53% of those threatened as well as 64% of the inland decapod crustacean species inhabiting Japan and 39% of endemic species are found in the regions (Table 2-6).

Dendranthema crassum (Photo: MOEJ)

*Lobelia loochooensi*s (Photo: JWRC)

Table 2-6: Numbers of species inhabiting the four regions containing the nominated property and the rates of endemic and threatened species

Taxonomic group	Number of species in Japan	Number of species endemic to Japan*	Rate of endemic species to total species in Japan	Number of threatened species in Japan (IUCN-RL)*1	Number of threatened species in Japan (MOEJ-RL)	Number of species inhabiting the nominated property (Rate to total species in Japan)	Number of species endemic to the nominated property (Rate to total endemic species in Japan)	Rate of endemic species to total species in the nominated property	Number of threatened species inhabiting the nominated property (IUCN-RL) (Rate to total endangered species in Japan)	Number of threatened species inhabiting the nominated property (MOEJ-RL) (Rate to total endangered species in Japan)	Sources
Vascular plants*2	Approx. 7,000	Approx. 2,800	Approx. 40%	43	1,779	1,808 (26%)	185 (7%)	10%	24 (56%)	334 (19%)	1)
Terrestrial mammals	109	42	39%	24*1	33	22 (20%)	13 (31%)	59%	10 (42%)	13 (39%)	2)
Birds*3	633	11	2%	58	97	394 (62%)	4 (36%)	1%	12*3 (65.5%)	36*3 (37%)	3)
Terrestrial reptiles	72	47	65%	9	36	36 (50%)	23 (49%)	64%	5 (56%)	13 (36%)	4)
Amphibians	71	61	86%	20	22	21 (30%)	18 (30%)	86%	12 (60%)	10 (45%)	4)
Inland water fishes	Approx. 400	–	–	41*1	167	267 (68%)	13 (?%)	5%	6 (15%)	64 (38%)	5)
Vertebrates*4	Approx. 1,285	161*4	13%*4	152	355	740 (58%)	71 (36%)*4	10%	45 (30%)	136 (38%)	–
Insects	Approx. 30,000	–	–	36*1	358	6,148 (20%)	1,062 (?%)	17%	19 (53%)	36 (10%)	6)
Inland decapod crustaceans	73	38	52%	2	22	47 (64%)	15 (39%)	32%	0 (0%)	5 (23%)	7)

Source: 1) Kagoshima University (2012), Ministry of the Environment (2014a), and Nature Conservation Division, Department of Environmental Affairs, Okinawa Prefecture (2014);
2) Abe (2008) and Odachi et al. (2015);
3) Takagi (2007) and Ornithological Society of Japan (2012)
4) Herpetological Society of Japan (2015);
5) Yoshigo (2014) and Ministry of the Environment (2014b);
6) Azuma (2002) and Biodiversity Center of Japan, Ministry of the Environment (2010); and
7) Hayashi (2011)

*1: The numbers of species for the IUCN Red List are based on species-level assessments. However, the Iriomote cat and the Steller sea lion, which are subspecies of mammals, as well as the Ryukyu ayu-fish and Japanese rosy bitterling, which are subspecies of inland water fishes, are counted as species as they have been assessed at a subspecies level and there are no other threatened subspecies belonging to the same species in Japan. Likewise, each subspecies of insects is counted as one species because insects are assessed only at the level of subspecies, not at the level of species.

*2: The numbers of plant species include subspecies, varieties, and hybrids (excluding those listed on the IUCN Red List).

*3: The numbers of threatened species of birds inhabiting the nominated property do not include those recorded as vagrants.

*4: For vertebrates, the number of species endemic to Japan, the rate of endemic species to total species in Japan, and the rate of species endemic to the nominated property to total endemic species in Japan do not include inland water fishes.

2.a.2.1. Flora

The four regions containing the nominated property are home to 1,808 indigenous species of vascular plants (including subspecies, varieties, and hybrids; hereinafter the same), consisting of 300 species of ferns and 1,508 species of seed plants (calculated based on Kagoshima University (2012) and Nature Conservation Division, Department of Environmental Affairs, Okinawa Prefecture (2014)) (Table 2-7).

Table 2-7: Numbers of indigenous species of vascular plants (including subspecies, varieties, and hybrids) in the four regions containing the nominated property

	Four regions containing the nominated property	Amami-Oshima Island[*1, 2]	Tokunoshima Island[*2]	Northern part of Okinawa Island	Iriomote Island
Psilotales	1	1	1	1	1
Lycopodiales	11	9	6	6	7
Selaginellales	9	6	5	4	7
Equisetales	1	1	0	0	0
Ophioglossales	6	5	2	2	4
Marattiales	2	2	2	1	2
Filicales	267	180	139	179	167
Marsileales	2	2	2	1	2
Salviniales	1	1	0	1	1
Cycadales	1	1	1	1	1
Coniferales	4	4	4	4	3
Magnoliales	28	21	18	20	20
Piperales	4	3	4	3	3
Aristolochiales	18	12	5	1	4
Rafflesiales	1	1	1	0	1
Ranunculales	22	19	14	13	15
Guttiferales	31	19	16	21	23
Malvales	17	14	10	12	14
Papaverales	13	11	8	9	8
Violales	18	11	8	6	9
Cucurbitales	9	8	4	6	5
Caryophyllales	26	12	17	16	20
Polygonales	28	23	12	15	12
Hamamelidales	19	14	9	8	9
Sarraceniales	2	1	1	1	2
Rosales	95	62	54	48	65
Geraniales	3	3	1	1	1
Rutales	22	16	10	14	17
Sapindales	12	9	8	5	8
Celastrales	29	25	19	20	20
Rhamnales	16	14	11	9	13
Oleales	11	9	7	7	6
Umbelliflorae	29	22	16	21	16
Sapindales	34	24	18	20	23
Urticales	50	35	29	31	37
Myricales	1	1	1	1	1
Fagales	10	7	6	6	2
Proteales	1	1	1	1	1
Santalales	5	4	4	2	4
Balanophorales	3	2	2	1	2

	Four regions containing the nominated property	Amami-Oshima Island[*1, 2]	Tokunoshima Island[*2]	Northern part of Okinawa Island	Iriomote Island
Euphorbiales	37	26	24	28	28
Haloragales	5	4	1	3	3
Primulales	15	15	13	11	11
Plumbaginales	3	2	2	1	3
Ericales	18	13	6	8	7
Ebenales	19	13	13	16	14
Gentianales	27	17	18	14	15
Rubiales	66	48	41	44	42
Solanales	136	101	66	68	93
Campanulales	8	8	6	5	4
Asterales	91	68	51	50	57
Alismatales	4	3	4	2	3
Hydrocharitales	16	14	6	2	11
Helobiae	15	13	5	2	11
Principes	5	2	2	2	4
Pandanales	5	1	1	1	5
Spathiflorae	19	11	9	8	11
Typhales	2	2	1	1	1
Triuridales	3	3	0	3	1
Liliiflorae	41	34	24	21	21
Iridales	6	5	1	4	2
Microspermae	126	78	47	38	68
Scitamineae	5	3	1	3	3
Commelinales	12	10	8	9	7
Eriocaulales	8	6	4	6	2
Juncales	6	3	2	5	1
Cyperales	114	82	55	64	79
Restionales	1	0	1	1	1
Graminales	134	106	68	91	98
Total	1,808	1,306	956	1,029	1,162

The numbers are based on Kagoshima University (2012) and Nature Conservation Division, Department of Environmental Affairs, Okinawa Prefecture (2014).

*1: The numbers for the Amami-Oshima Island include those found on islands in the neighboring area (Kakeroma Island, Ukejima Island, and Yoro Island) because they cannot be distinguished from those of the Amami-Oshima Island based on data contained in source documents.

*2: Those for whose area of distribution is defined simply as the "Amami Island Group" in the source documents are regarded as inhabiting all of the Amami Island Group.

The flora of these regions is considered to have the historical backgrounds and components shown in Table 2-8, reflecting their geological history, climate changes in the past, and geographic conditions such as how the islands are positioned relative to ocean currents (Hatsushima 1975). It is believed that the mountain floras of the regions have a high degree of affinity to those of the Eurasian Continent and the main islands of Japan, whereas the floras found in the regions' forest floors, lowlands, and coastal areas are closely related to those found in tropical Asia (Tateishi 1998). The Ryukyu Chain containing the nominated property is located in a subtropical zone, i.e., in between tropical and temperate zones, with a chain of islands extending about 1,200 km from north to south. Therefore, the distribution pattern of plants is influenced by the temperature gradient between the islands located in the northern part of the archipelago and those in the southern part (see 2.a.1.2.1 and Column 1), and many species have their northern or southern limits in the archipelago (Hotta 2003).

Table 2-8: Factors influencing the floras of the Central and South Ryukyus

Components	Description	Proportion	Examples
(1) Ryukyu-indigenous components that have been in existence since before the formation of the islands	Believed to have been in existence since the age when the present Central and South Ryukyus were part of the east coast of the Eurasian Continent. Many of them are relict endemic species.	Large	*Elatostema oshimense* (Urticaceae); *Vaccinium emarginanum* (Ericaceae); *Platanthera sonohara*e (Orchidaceae); *Polystichum obae* (Dryopteridaceae); Genus *Asarum* (Aristolochiaceae); *Arisaema heterocephalum* (Araceae); etc. (Hatsushima 1975: 1980)
(2) Components originated from the southeastern part of the Eurasian Continent	Believed to have travelled from southern China, through Taiwan, to enter the regions.	Large	*Ophiorrhiza japonica* (Rubiaceae) (Nakamura et al. 2010) Genus *Pieris* (Setoguchi et al. 2008) Genus *Lysimachia* Sect, *Nummularia* (Kokubugata et al. 2010) Genus *Lysionotus* (Kokubugata et al. 2011)
(3) Components of Palearctic origin	Believed to have survived the last glacial period after arriving the regions by traveling southward from the main islands of Japan during the glacial period from the late Pliocene to the early Pleistocene.	Rather small	*Chrysanthemum crassum*, *Sigesbeckia glabrescens* (Asteraceae); *Diplomorpha phymatoglossa* (Thymelaeaceae); *Stachyurus praecox* var. *lancifolia* (Stachyuraceae); *Securinega suffruticosa* var. *amamiensis* (Phyllanthaceae); *Sapium japonicum*, *Euphorbia sieboldiana* var. *amamiana* (Euphorbiaceae); *Solidago yokusaiana* (Asteraceae); *Desmodium podocarpum* subsp. *oxyphyllum* (Fabaceae); *Adenophora triphylla* (Campanulaceae); *Rhamnella franguloides* var. *inaequilatera*, *Berchemia racemosa* f. *stenosperma* (Rhamnaceae); *Lilium alexandrae* (Liliaceae); etc. (Hatsushima 1975; Hotta 2003b; Okuyama 2016)
(4) Components originated from Malaysia	Believed to have arrived the regions after traveling northward from Malaysia along the east coast of Taiwan. It is believed that most of them were carried in by ocean currents, birds, or winds.	Rather small	*Begonia fenicis* (Begoniaceae); *Nypa fruticans* (Arecaceae); *Rhizophora stylosa*, *Kandelia obovata* (Rhizophoraceae); *Vitex trifolia* var. *bicolor* (Verbenaceae); *Ixeris laevigata* (Asteraceae); *Fimbristylis umbellaris* (Cyperaceae); *Macodes petola* (Orchidaceae); etc. (Nakamura et al. 2014; Sugai et al. 2015; Ng W. L. et al. 2015; Sheue et al. 2003; Giang et al. 2006; Nature Conservation Division, Department of Environmental Affairs, Okinawa Prefecture 2006)
(5) Components originated from the Pacific Islands	Believed to have been carried in by ocean currents, birds, or winds.	Very small	*Limnophila fragrans* (Scrophulariaceae) (Hsu et al. 2009)
(6) Components originated from Australia	Believed that seeds have been carried in and dispersed by migratory birds	Very small	*Solenogyne mikadoi* (Asteraceae); *Lobelia loochooensis* (Campanulaceae); etc. (Nakamura et al. 2012; Kokubugata et al. 2012)

Examples of the flora of the Central and South Ryukyus.
Numbers correspond to Table 2-8.

(1) *Platanthera sonoharae* (Photo: MOEJ)

(2) *Ophiorrhiza japonica* var. *amamiana* (Photo: JWRC)

(3) *Euphorbia sieboldiana* (Photo: MOEJ)

(4) *Begonia fenicis* (Photo: MOEJ)

(5) *Limnophila fragrans* (Photo: Masatsugu Yokota)

(6) *Solenogyne mikadoi* (Photo by MOEJ)

Table 2-9: Numbers of endemic and threatened species of vascular plants (including subspecies, varieties, and hybrids) in the four regions containing the nominated property

	Four regions containing the nominated property	Amami- Oshima Island	Tokunoshima Island	Northern part of Okinawa Island	Iriomote Island
Number of indigenous species	1,808	1,306	956	1,029	1,162
Number of endemic species	185	124	79	71	58
Rate of endemic species (%)	10	9	8	7	5
Number of species listed on IUCN-RL (2016)	24	13	7	6	5
Number of species listed on MOEJ-RL (2015)	335	194	105	122	176
Rate of species listed on MOEJ-RL (%)	20	15	11	12	15

The numbers and calculations are based on: Kagoshima University (2012); and Nature Conservation Division, Department of Environmental Affairs, Okinawa Prefecture (2014).

Table 2-9 shows the numbers of endemic and threatened species of vascular plants in the four regions containing the nominated property. Out of a total of 1,808 species (including subspecies, varieties, and hybrids) of vascular plants, 185 species (10%) are endemic. The rate of endemic species is not so high, for instance, compared to oceanic islands such as Hawaii and the Galápagos Islands, where the rate of endemic plant species ranges from 40% to nearly 80% (Ito 1996). However, as explained in the geological history of the regions, in the Central and South Ryukyus, which were an eastern margin of the Eurasian Continent and hence inherited the rich flora of the continent, some of the inherited species have survived only in the regions under isolation (relict endemism) or differentiated into an entirely new endemic species (new endemism) (Hotta 2003a).

Among the vascular plant species found in the nominated property, 24 species are listed as globally threatened on the IUCN Red List (Tables 2-9 and 2-10). Meanwhile, approximately 7,000 species (including subspecies and varieties) of vascular plants in Japan were assessed for the MOEJ Red List (2015), and 1,779 species (approximately 25%) were determined as threatened. In the four regions containing the nominated property, 355 species (including subspecies and varieties) are listed as endangered (Table 2-9), meaning that 20% of threatened plant species in Japan are found in the four regions that together represent only 0.4% of the total land area of Japan (Table 2-6).

A joint study conducted by the Ministry of the Environment, the National Institute for Environmental Studies, Kyushu University, and other research groups, in which they assessed the extinction risks of species listed on the MOEJ Red List, cited the nominated property along with two of Japan's listed natural heritage sites—the Ogasawara Islands and Yakushima—as areas that are highly non-substitutable in terms of conserving Japanese vascular plant species and have conservation priority (Ministry of the Environment 2011; Kadoya et al. 2014) (Figure 2-14).

Table 2-10: Globally threatened vascular plant species in the four regions containing the nominated property

	Threatened species	Distribution	IUCN	MOEJ
Dryopteridaceae	*Dryopteris hasseltii*	Northern part of Okinawa Island	EN	–
Aristolochiaceae	*Asarum gusk*	Amami-Oshima Island	CR	CR
	A. monodoriflorum	Iriomote Island	CR	CR
	A. pellucidum	Amami-Oshima Island	CR	CR
	A. tabatanum	Amami-Oshima Island	CR	CR
	A. celsum	Amami-Oshima Island	EN	EN
	A. hatsushimae	Tokunoshima Island	EN	EN
	A. lutchuense	Amami-Oshima Island, Tokunoshima Island	EN	EN
	A. nazeanum	Amami-Oshima Island	EN	EN
	A. trinacriforme	Amami-Oshima Island	EN	EN
	A. fudsinoi	Amami-Oshima Island	VU	VU
	A. simile	Tokunoshima Island	VU	VU
Violaceae	*Viola amamiana*	Amami-Oshima Island	CR	CR
Saxifragaceae	*Cardiandra amamiohsimensis*	Amami-Oshima Island	EN	EN
	Deutzia yaeyamensis	Iriomote Island	EN	EN
Leguminosae	*Intsia bijuga*	Iriomote Island	VU	CR
Aquifoliaceae	*Ilex liukiuensis*	Amami-Oshima Island, Tokunoshima Island, Northern part of Okinawa Island, Iriomote Island	EN	–
Combretaceae	*Terminalia nitens*	Iriomote Island	VU	CR
Compositae	*Aster miyagii*	Amami-Oshima Island, Tokunoshima Island, Northern part of Okinawa Island	VU	VU
Araceae	*Arisaema kawashimae*	Tokunoshima Island	CR	CR
	A. heterocephalum	Amami-Oshima Island Tokunoshima Island	EN	–
Burmanniaceae	*Oxygyne shinzatoi*	Northern part of Okinawa Island	CR	CR
Orchidaceae	*Eulophia taiwanensis*	Northern part of Okinawa Island	EN	CR
Cyperaceae	*Carex collifera*	Northern part of Okinawa Island	CR	CR

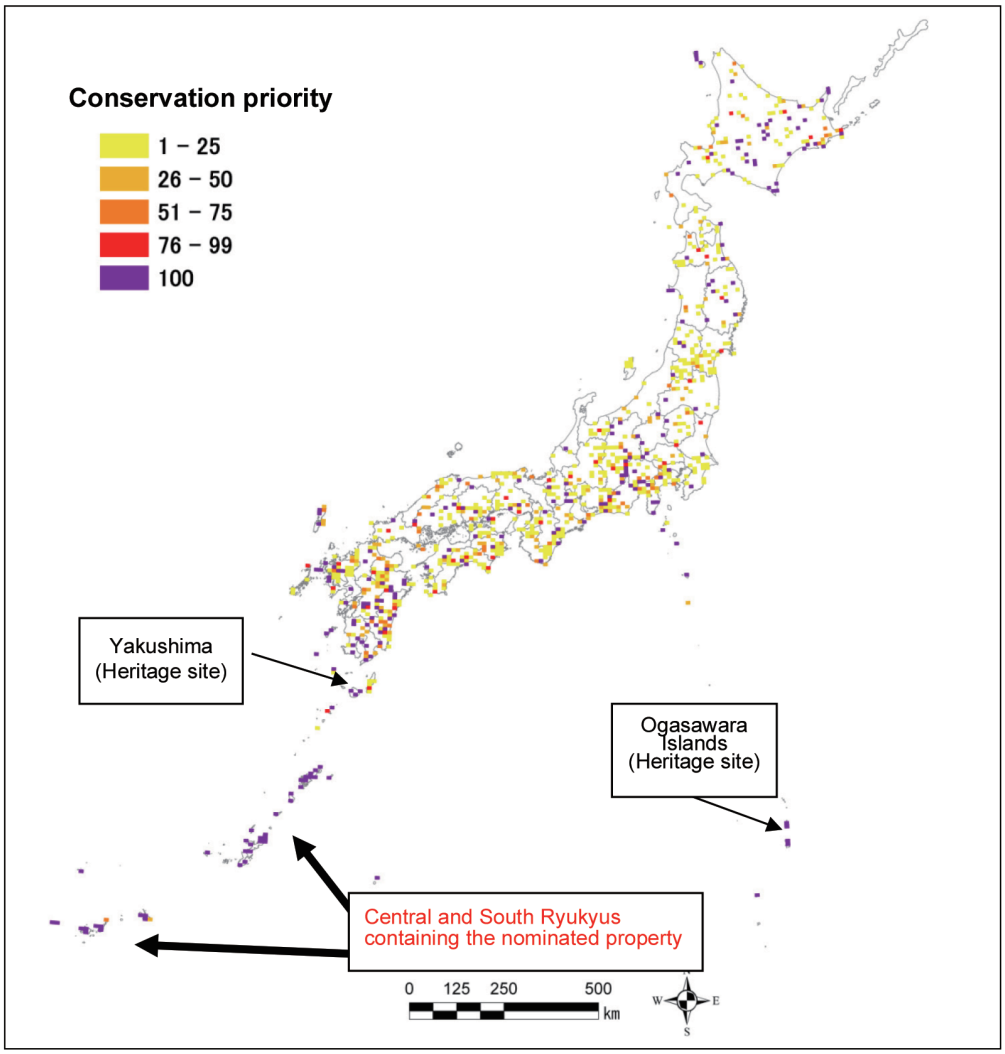


Figure 2-14: Priority areas for conservation of the threatened vascular plant species in Japan (Ministry of the Environment 2011)

Conservation priority: The number of times each area was selected as a priority conservation area in a complementary analysis performed 100 times on the 1,219 vascular plant species listed on the MOEJ Red List for which distribution data are available. The value of each grid cell of 10km x 10km represents how many times the corresponding area was selected. The greater the value (closer to purple), the more difficult is it to find a substitute for the area and the more critical is it to the efficient conservation of target species.

Viola amamiana (Photo: MOEJ)

Cardiandra amamiohsimensis (Photo: MOEJ)

Dendrobium okinawense (Photo: MOEJ)

Colum 1. Mangrove forests in the northern and southern parts of the Ryukyu Chain are quite different in species composition

The influence of the temperature gradient between the northern and southern parts of the Ryukyu Chain on the distribution of plants is typically observed in differences in the species composition of mangrove forests formed by tropical trees and shrubs that are dispersed by ocean currents.

In Asia, the Ryukyu Chain containing the nominated property is about the northern limit of mangrove species. Within the archipelago, the most extensive mangrove forests are found on Iriomote Island. Table 2-11 shows seven major species found in mangroves in the Ryukyu Chain.

All of the seven species are distributed on Iriomote Island. However, the more northerly the island, the less species are found with only one species found on Yakushima Island. The difference in temperature between the northern and southern ends of the archipelago is believed to be the biggest factor preventing seeds from taking root on the northerly islands even if they manage to get carried by the Kuroshio current all the way up there (Shimabukuro 1990).

Table 2-11: Major islands of the Ryukyu Chain and the distribution of major species composing mangrove forests

	Iriomote Island	Miyako Island	Okinawa Island	Amami-Oshima Island	Yakushima
Latitude	N24°30′	N24°45′	N26°	N28°	N30°
Kandelia obovata	○	○	○	○	○
Bruguiera gymnorhiza	○	○	○	○	–
Rhizophora stylosa	○	○	○	–	–
Lumnitzera racemosa	○	○	○	–	–
Avicennia marina	○	○	–	–	–
Sonneratia alba	○	–	–	–	–
Nypa fruticans	○	–	–	–	–

Source: Shimabuku (1990) with some information added.

Rhizophora stylosa
(Photo: MOEJ)

2.a.2.2. Fauna

From the biogeographic viewpoint, the Watase Line, which coincides with the Tokara Strait, has been proposed as a boundary between the Palearctic and Indomalaya ecozones for the distribution of mammals, reptiles, and amphibians (Tokuda 1969), while the Hachisuka Line at the Kerama Gap has been proposed as a boundary for the distribution of birds (Yamashina 1955). Thus, from a phylogeographical point of view, the nominated property is located in-between the two areas that retain very different faunas and can be defined as a geographical transition zone (Motokawa 2000; Ota 2000; Takagi 2009).

2.a.2.2.1. Terrestrial mammals

It has been confirmed that 22 species of indigenous terrestrial mammals inhabit the nominated property (Table 2-12), accounting for 20% of the total 109 indigenous species found across Japan (calculated based on Abe 2008 and Ohdachi et al. 2015).

Since the four islands containing the nominated property are small with the Okinawa Island, the largest among them, having a land area of 120,696 ha, there are only few species of large- and medium-sized indigenous mammals, i.e., only one species from each of the orders Carnivora, Artiodactyla, and Lagomorpha, and none from Primates. As such, the relatively large proportion of small-sized species such as those belonging to Chiroptera and Rodentia thanks to the limited presence of apex predators and large- and medium-sized species is one of the characteristics of the mammalian fauna of the nominated property.

Table 2-12: Numbers of indigenous terrestrial mammal species in the nominated property

(The numbers in the parentheses include subspecies)	Nominated property	Component parts			
		Amami-Oshima Island	Tokunoshima Island	Northern part of Okinawa Island	Iriomote Island
Insectivora					
Soricidae	3	3	3	2	1
Chiroptera					
Pteropodidae	1 (2)	0	0	1	1
Rhinolophidae	3	1	1	1	1
Hipposideridae	1	0	0	0	1
Vespertilionidae	5	5	5	4	2
Molossidae	1	1	0	0	0
Carnivora					
Felidae	1	0	0	0	1
Artiodactyla					
Suidae	1	1	1	1	1
Rodentia					
Muridae	5	2	2	3	0
Lagomorpha					
Leporidae	1	1	1	0	0
Total	22 (23)	14	13	12	8

The numbers are based on Abe (2008) and Ohdachi et al. (2015).
*: The numbers include Ryukyu mouse (*Mus caroli*), a possible alien species (Suzuki 2016).

Out of the 22 species of terrestrial mammals found in the nominated property, 13 species (59%) are endemic. When endemic subspecies such as the Iriomote cat (*Prionailurus bengalensis iriomotensis*) and Ryukyu wild boar (*Sus scrofa riukiuanus*) are included, there are a total of 23 species and subspecies, of which 18 (78%) are endemic to the nominated property, showing a very high rate of endemic species (Table 2-13).

Among the terrestrial mammals found in the nominated property, a total of 10 species and subspecies (45%) are listed on the IUCN Red List as globally threatened (three categorized as CR and seven as EN) (Tables 2-12 and 2-13). Also, a total of 13 species and subspecies (57%) are listed on the MOEJ Red List as Japanese threatened species, three categorized as CR, nine as EN, and one as VU (Tables 2-13 and 2-14), of which five are classified as Evolutionarily Distinct and Globally Endangered (EDGE) species[3] by the Zoological Society of London (Table 2-14).

Table 2-13: Numbers of endemic and threatened species of terrestrial mammals in the nominated property

(The numbers in the parentheses include subspecies)	Nominated property	Component parts			
		Amami-Oshima Island	Tokunoshima Island	Northern part of Okinawa Island	Iriomote Island
Number of indigenous species	22 (23)	14	13	12	8
Number of endemic species	13 (18)	8 (10)	8 (10)	7 (9)	3 (6)
Rate of endemic species (%)	59 (78)	57 (71)	62 (77)	58 (75)	38 (75)
Number of species listed on IUCN-RL (2016) *	10	7	7	5	2
Rate of species listed on IUCN-RL (%)	45	50	54	42	25
Number of species listed on MOEJ-RL (2015) *	13	8	8	6	3
Rate of species listed on MOEJ-RL (%)	57	57	62	50	38

The numbers are based on Abe (2008) and Ohdachi et al. (2015).

*: The numbers of those listed on the IUCN Red List are, in principle, based on species-level assessments. However, the Iriomote cat, which has been assessed at a subspecies level, is counted as one species as there are no other subspecies belonging to the same species in the nominated property.

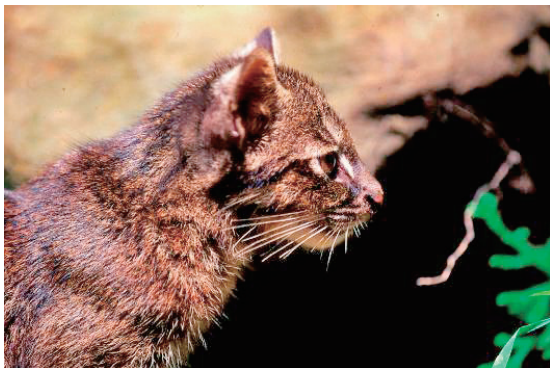
Yanbaru whiskered bat (*Myotis yanbarensis*)
(Photo: MOEJ)

3 Species ranked and selected in the order of conservation priority based on scores calculated according to their unique evolutionary history (Evolutionary Distinctiveness: ED) and conservation status (Global Endangerment: GE) under the EDGE of Existence program of the Zoological Society of London. EDGE species have no or very few close evolutionary relatives, and the extinction of these species means that there will be no similar species left on the globe.

Table 2-14: Globally threatened terrestrial mammal species inhabiting the nominated property

Threatened species	Distribution	IUCN	MOEJ	EDGE rank
Yanbaru whiskered bat (*Myotis yanbarensis*)	Amami-Oshima Island, Tokunoshima Island, northern part of Okinawa Island	CR	CR	–
Iriomote cat (*Prionailurus bengalensis iriomotensis*)	Iriomote Island	CR	CR	–
Okinawa spiny rat (*Tokudaia muenninki*)	Northern part of Okinawa Island	CR	CR	48
Orii's shrew (*Crocidura orii*)	Amami-Oshima Island, Tokunoshima Island	EN	EN	–
Ryukyu bent-winged bat (*Miniopterus fuscus*)	Amami-Oshima Island, Tokunoshima Island, northern part of Okinawa Island, Iriomote Island	EN	EN	306
Ryukyu tube-nosed bat (*Murina ryukyuana*)	Amami-Oshima Island, Tokunoshima Island, northern part of Okinawa Island	EN	EN	–
Amami spiny rat (*T. osimensis*)	Amami-Oshima Island	EN	EN	214
Tokunoshima spiny rat (*T. tokunoshimensis*)	Tokunoshima Island	EN	EN	–
Ryukyu long-haired rat (*Diplothrix legata*)	Amami-Oshima Island, Tokunoshima Island, northern part of Okinawa Island	EN	EN	282
Amami rabbit (*Pentalagus furnessi*)	Amami-Oshima Island, Tokunoshima Island	EN	EN	42

Amami rabbit (*Pentalagus furnessi*) (Photo: MOEJ)



Iriomote cat (*Prionailurus bengalensis iriomotensis*) (Photo: MOEJ)

Ryukyu long-haired rat (*Diplothrix legata*) (Photo: MOEJ)

Okinawa spiny rat (*Tokudaia muenninki*) (Photo: MOEJ)

2.a.2.2.2. Birds

A total of 394 species of birds from 71 families and 22 orders are recorded as inhabiting the four regions containing the nominated property (Table 2-15). With those accounting for 62% of all avian species in Japan, a total of 633 species from 81 families and 24 orders (Table 2-6), it is fair to say that the nominated property can be described as having a very rich avifauna (calculated based on Ornithological Society of Japan (2012) and Nature Conservation Division, Department of Environmental Affairs, Okinawa Prefecture et al. (2015)).

Table 2-15: Numbers of indigenous species of birds in the four regions containing the nominated property*

(The numbers in the parentheses include subspecies.)	Nominated property	Amami-Oshima Island	Tokunoshima Island	Northern part of Okinawa Island	Iriomote Island
Anseriformes	30 (32)	26 (28)	14	18	26 (27)
Podicipediformes	4	4	2	2	3
Phaethontiformes	2	1	0	0	1
Columbiformes	7 (10)	5	3	4 (5)	6 (8)
Gaviiformes	2	2	2	0	0
Procellariiformes	9	7	3	1	5
Ciconiiformes	2	1	1	1	2
Suliformes	7 (8)	7 (8)	3	2 (7)	5
Pelecaniformes	25	19 (20)	12 (13)	15	22 (23)
Gruiformes	16 (17)	11 (12)	8 (9)	7	10 (11)
Otidiformes	1	0	0	1	0
Cuculiformes	6	3	3	4	5
Caprimulgiformes	1	1	1	1	1
Apodiformes	3	3	3	3	3
Charadriiformes	91 (92)	83 (84)	58	36	70 (69)
Accipitriformes	21 (22)	16	8	8 (10)	18 (19)
Strigiformes	8 (10)	6 (8)	4	2 (3)	7 (8)
Bucerotiformes	1	1	1	1	1
Coraciiformes	6	4	3	3	6
Piciformes	4 (6)	3	1	2	1
Falconiformes	6 (7)	4	2	4	6 (7)
Passeriformes	142 (171)	108 (123)	64 (69)	80 (88)	114 (128)
Total	394 (437)	315 (338)	196 (203)	195 (207)	312 (333)

The numbers are based on Ornithological Society of Japan (2012) and Nature Conservation Division, Department of Environmental Affairs, Okinawa Prefecture et al. (2015).

*: Information on the distribution of species and subspecies by island is not necessarily consistent because the preciseness of the information varies depending on the literature (e.g., species level versus subspecies level).

As for the migratory status of birds recorded in the four regions containing the nominated property, migratory birds—i.e., summer visitors, winter visitors, and other passage migrants—and vagrants make up the vast majority of the avifauna. Meanwhile, resident birds, totaling 49 species (63 species and subspecies), account for approximately 11% (Figure 2-15). Factors behind this include that the Central and South Ryukyus, which are a chain of islands lying like stepping stones over a stretch of water extending approximately 1,200 km from the southern tip of Kyushu to Taiwan, serve as a safe route for migratory birds traveling between the Northern and Southern Hemispheres, and that the archipelago, which has a subtropical climate and is warm even in winter, is abundant in insects and amphibians, providing sufficient food for birds (Okinawa Wild Bird Research Association 2002).

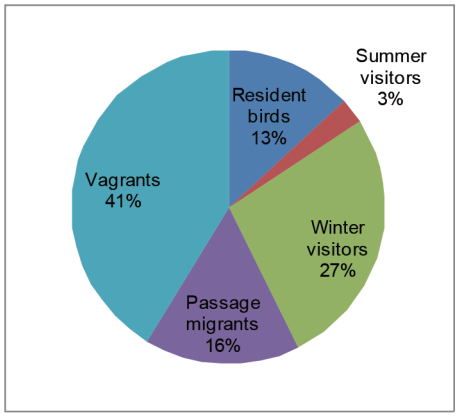


Figure 2-15: Migratory status of birds recorded in the four regions containing the nominated property

Japan has a total of 11 endemic species of birds (Takagi 2007) and five of them inhabit the nominated property. Among them, the Ryukyu robin (*Luscinia komadori*) is also found on the Danjo Islands, Nagasaki Prefecture (Kyushu), but the remaining four—i.e., the Amami jay (*Garrulus lidthi*), the Amami woodcock (*Scolopax mira*), the Okinawa woodpecker (*Sapheopipo noguchii*), and the Okinawa rail—are endemic to Central and South Ryukyus containing the nominated property (Table 2-16). However, some including BirdLife International believe that the white-backed woodpecker (*Dendrocopos leucotos owstoni*), a subspecies endemic to the Amami-Oshima Island, should be recognized as a separate species and thus referred to as Amami woodpecker (*Dendrocopos owstoni*) (Hoyo and Collar 2014). Based on this classification, the number of species endemic to the Central and South Ryukyus is five. Because of the inhabitation of those endemic species of birds, all islands lying between Kyushu and Taiwan, including the nominated property, are listed as Endemic Bird Area (EBAs) by BirdLife International under the name of "Nansei Shoto."

Among the species of birds found in the four regions containing the nominated property, 12 species are globally threatened species listed on the IUCN Red List (2016), two as CR, five as EN, and five as VU, while 36 species and subspecies are Japanese threatened species listed on the MOEJ Red List, four categorized as CR, 11 as EN, and 21 as VU (Table 2-16). All of the four species that are endemic to the nominated property are globally threatened species listed on the IUCN Red List, of which three are classified as EDGE species by the Zoological Society of London (Table 2-17).

Table 2-16: Numbers of endemic and threatened species of birds in the four regions containing the nominated property*1

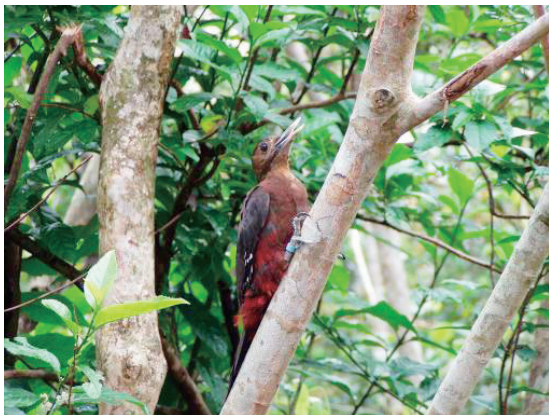
(The numbers in the parentheses include subspecies)	Four regions containing the nominated property	Amami-Oshima Island	Tokunoshima Island	Northern part of Okinawa Island	Iriomote Island
Number of species	394 (437)	315 (338)	196 (203)	195 (207)	312 (333)
Resident birds	49 (63)	42	38 (36)	38 (40)	44 (46)
Migratory birds (summer/ winter visitors and passage migrants)	167 (178)	158 (166)	127 (134)	97 (106)	155 (165)
Vagrants	178 (196)	115 (130)	31 (33)	60 (61)	112 (122)
Number of endemic species*2	4 (30)	2 (12)	1 (7)	3 (12)	0 (17)
Rate of endemic species (%)*2	8 (48)	5 (29)	3 (19)	8 (30)	0 (37)
Number of species listed on IUCN-RL (2016)	12	10	6	4	8
Rate of species listed on IUCN-RL (%)	6	5	4	7	4
Number of species listed on MOEJ-RL (2015)	36	25	15	19	29
Rate of species listed on MOEJ-RL (%)	15	12	9	13	14

The numbers are based on the Ornithological Society of Japan (2012) and Nature Conservation Division, Department of Environmental Affairs, Okinawa Prefecture et al. (2015).

*1: Information on the distribution of species and subspecies by island is not necessarily consistent because the preciseness of the information varies depending on the literature (e.g., species-level versus subspecies level, inconsistent migratory status between species- and subspecies levels).

*2: The numbers and rates of endemic species are those of resident birds.

Okinawa rail (*Gallirallus okinawae*) (Photo: MOEJ)



Okinawa woodpecker (*Sapheopipo noguchii*) (Photo: MOEJ)

Table 2-17: Globally threatened species of birds inhabiting or visiting the four regions containing the nominated property

Species	Distribution	IUCN	MOEJ	EDGE rank	Migratory status*1
Okinawa woodpecker (*Sapheopipo noguchii**2)	Northern part of Okinawa Island	CR	CR	–	Rb
Okinawa rail (*Gallirallus okinawae**3)	Northern part of Okinawa Island	EN	CR	409	Rb
Amami woodcock (*Scolopax mira*)	Amami-Oshima Island, Tokunoshima Island, northern part of Okinawa Island	VU	VU	586	Rb*4
Amami jay (*Garrulus lidthi*)	Amami-Oshima Island	VU	–	620	Rb
Spoon-billed sandpiper (*Eurynorhynchus pygmeus*)	Amami-Oshima Island, Iriomote Island	CR	CR	–	Pm/Wv
Black-faced spponbill (*Platalea minor*)	Amami-Oshima Island, Tokunoshima Island, Iriomote Island	EN	EN	–	Wv
Japanese night heron (*Gorsachius goisagi*)	Amami-Oshima Island, northern part of Okinawa Island, Iriomote Island	EN	VU	–	Wv/Pm
Far Eastern curlew (*Numenius madagascariensis*)	Amami-Oshima Island, Tokunoshima Island, Iriomote Island	EN	VU	–	Wv
Great knot (*Calidris tenuirostris*)	Amami-Oshima Island, Tokunoshima Island, Iriomote Island	EN	–	–	Pm
Saunders's gull (*Larus saundersi*)	Amami-Oshima Island, Tokunoshima Island, Iriomote Island	VU	VU	–	Wv
Common pochard (*Aythya ferina*)	Amami-Oshima Island, Tokunoshima Island, Iriomote Island	VU	–	–	Wv
Chinese egret (*Egretta eulophotes*)	Amami-Oshima Island, Iriomote Island	VU	–	–	Pm

*1: Migratory status: Rb = resident birds (which inhabits the area throughout the year); Wv = winter visitor (which overwinters in the area); Pm = passage migrant (which visits the area on the way of migrating between breeding and wintering grounds). The migratory status is assessed for the whole Central and South Ryukyus and does not necessarily correspond to each island.

*2: Following Ornithological Society of Japan (2012), *Sapheopipo noguchii* is provided as the scientific name of the Okinawa woodpecker but *Dendrocopos noguchii* (Hoyo and Collar 2014) is used on the IUCN Red List.

*3: Likewise, *Gallirallus okinawae* is provided as the scientific name but *Hypotaenidia okinawae* (Hoyo and Collar 2014) is used on the IUCN Red List.

*4: The Amami woodcock, which has been confirmed to be breeding in the Amami-Oshima Island and its nearby islands as well as in the Tokunoshima Island, visits the Kikai Island, the Okinoerabu Island, the Okinawa Island, and the Kerama Islands in winter.

Amami jay (*Garrulus lidthi*) (Photo: MOEJ)

Amami woodcock (*Scolopax mira*) (Photo: MOEJ)

2.a.2.2.3. Terrestrial reptiles

A total of 72 indigenous species (82 species and subspecies) of terrestrial reptiles from 15 families and two orders are distributed across Japan. The nominated property is home to 36 species (38 species and subspecies) or 50% of the national total (Tables 2-6 and 2-18), serving as a major habitat for terrestrial reptiles in Japan.

Table 2-18: Numbers of indigenous species of terrestrial reptiles in the nominated property

(The numbers in the parentheses include subspecies)	Nominated property	Component parts			
		Amami-Oshima Island	Tokunoshima Island	Northern part of Okinawa Island	Iriomote Island
Testudines					
Geoemydidae	3	0	0	1	2
Squamata					
Lacertilia					
Eublepharidae	2	0	1	1	0
Gekkonidae	4	3	3	3	2
Agamidae	1 (2)	1	1	1	1
Scincidae	7	3	3	3	3
Lacertidae	2	1	1	1	1
Serpentes					
Typhlopidae	1	1	1	1	1
Pareatidae	1	0	0	0	1
Xenodermatidae	2	1	1	1	1
Colubridae	8	3	3	3	5
Elapidae	2 (3)	1	1	1	1
Viperidae	3	2	2	2	1
Total	36 (38)	16	17	18	19

The numbers are based on Herpetological Society of Japan (2015).

The nominated property is very rich in endemic species of terrestrial reptiles. Out of the total 36 species of terrestrial reptiles distributed in the nominated property, 23 species (64%) are endemic. As those terrestrial reptiles are under an ongoing process of differentiation and speciation among different islands, the nominated property hosts extremely rich endemism with a total of 33 species and subspecies (87%) endemic to the nominated property (Table 2-18).

Among those distributed in the nominated property, five species (14%) are globally threatened species listed on the IUCN Red List (2016), four categorized as EN and one as VU (Table 2-19). Meanwhile, a total of 13 species and subspecies (34%) are listed as threatened on the MOEJ Red List (2015), one species categorized as EN and 12 species and subspecies as VU (Tables 2-19 and 2-20). Many of those threatened species primarily inhabit relatively moist evergreen broadleaved forests (Ota 2000), and such environments are preserved in good conditions in the nominated property.

Table 2-19: Numbers of endemic and threatened species of terrestrial reptiles in the nominated property

(The numbers in the parentheses include subspecies)	Nominated property	Component parts			
		Amami-Oshima Island	Tokunoshima Island	Northern part of Okinawa Island	Iriomote Island
Number of indigenous species	36 (38)	16	17	18	19
Number of endemic species	23 (33)	10 (11)	11 (12)	13 (14)	8 (16)
Rate of endemic species (%)	64 (87)	63 (69)	65 (71)	72 (78)	42 (84)
Number of species listed on IUCN-RL (2016)	5	1	2	3	2
Rate of species listed on IUCN-RL (%)	14	6	12	17	11
Number of species listed on MOEJ-RL (2015)	13	3	4	6	3
Rate of species listed on MOEJ-RL (%)	34	19	24	33	16

Table 2-20: Globally threatened species of terrestrial reptiles inhabiting the nominated property

Threatened species	Distribution	IUCN	MOEJ
Asian brown pond turtle (*Mauremys mutica*)	Iriomote Island	EN	–
Yellow-margined box turtle (*Cuora flavomarginata*)	Iriomote Island	EN	VU*1
Ryukyu black-breasted leaf turtle (*Geoemyda japonica*)	Northern part of Okinawa Island	EN	VU
Kuroiwa's ground gecko (*Goniurosaurus kuroiwae*)	Northern part of Okinawa Island	EN*2	VU*3
Ryukyu odd-scaled snake (*Achalinus werneri*)	Amami-Oshima Island, Tokunoshima Island, northern part of Okinawa Island	VU	–
Banded ground gecko (*Goniurosaurus splendens*)	Tokunoshima Island	EN*2	EN

*1: One of its subspecies, the Yaeyama yellow-margined box turtle (*C. flavomarginata evelynae*) is categorized as VU.
*2: The banded ground gecko (*G. splendens*), which is treated as a separate species in Honda et al. (2014), is included.
*3: One of its subspecies (*G. kuroiwae kuroiwae*) is categorized as VU. Other subspecies inhabiting some islands near the Okinawa Island, other than the nominated property—i.e., *G. k. toyamai* and *G. k. yamashinae* are categorized as CR, and *G. k. orientalis* as EN.

2.a.2.2.4. Amphibians

A total of 71 species (76 species and subspecies) of amphibians from nine families and two orders have been recorded as inhabiting Japan (calculated based on Herpetological Society of Japan (2015)). The nominated property is home to 21 species (22 species and subspecies) or 30% of the national total. Those belonging to the order Anura include one species from the family Hylidae, 11 species from the family Ranidae, two species from the family Dicroglossidae, four species (five species and subspecies) from the family Rhacophoridae, and one species from the family Microhylidae, together accounting for more than half (54%) of those indigenous to Japan, i.e., 39 species from seven families within the order Anura. Meanwhile, those belonging to the order Caudata include only two species from the family Salamandridae and none from the family Hynobiidae, which has an extremely large number of species on the main islands of Japan (Table 2-21).

Because of the scarcity of inland water bodies, small islands in general do not provide a desirable habitat for amphibians, which require sizable water bodies to breed (in egg-laying and larval stages). However, the Central and South Ryukyus harbor a rich amphibian fauna thanks to the formation and presence of moist, subtropical rainforests, which is attributable to the influence of the monsoon climate, typhoons, ocean currents, and other unique conditions not seen in other regions located at the same latitude.

Table 2-21: Numbers of indigenous species of amphibians found in the nominated property

(The numbers in the parentheses include subspecies)	Nominated property	Component parts			
		Amami-Oshima Island	Tokunoshima Island	Northern part of Okinawa Island	Iriomote Island
Caudata					
Salamandridae	2	2	1	2	0
Anura					
Hylidae	1	1	1	1	0
Ranidae	11	4	2	4	3
Dicroglossidae	2	0	0	1	1
Rhacophoridae	4 (5)	2	2	2	3
Microhylidae	1	1	1	1	1
Total	21 (22)	10	7	11	8

The numbers are based on the list of amphibians and reptiles of Japan (Herpetological Society of Japan 2015).

Amphibians inhabiting the nominated property show extremely high endemism with 18 species (19 species and subspecies) or 86% of the total species being endemic to the nominated property (Table 2-22).

Out of the total 21 species (22 species and subspecies) of amphibians inhabiting the nominated property, 12 species (55%) are listed as EN on the IUCN Red List (2016). Three of them are also classified as EDGE species by the Zoological Society of London (Table 2-23). Meanwhile, 10 species (43%) are listed on the MOEJ Red List (2015), six categorized as EN and four as VU. As is the case with reptiles, the nominated property is serving as a major habitat for those threatened species of amphibians, as it preserves evergreen broadleaved forests with relatively moist floors, an ideal habitat for most of the species (Ota 2000).

Table 2-22: Numbers of endemic and threatened species of amphibians in the nominated property

(The numbers in the parentheses include subspecies)	Nominated property	Component parts			
		Amami-Oshima Island	Tokunoshima Island	Northern part of Okinawa Island	Iriomote Island
Number of indigenous species	21 (22)	10	7	11	8
Number of endemic species	18 (19)	9	6	10	5
Rate of endemic species (%)	86 (8)	90	86	91	63
Number of species listed on IUCN-RL (2016)	12	5	2	6	3
Rate of species listed on IUCN-RL (%)	55	45	25	50	38
Number of species listed on MOEJ-RL (2015)	10	4	2	5	2
Rate of species listed on MOEJ-RL (%)	43	36	25	42	25

Table 2-23: Globally threatened species of amphibians inhabiting the nominated property

Threatened species	Distribution	IUCN	MOEJ	EDGE rank
Anderson's crocodile newt (*Echinotriton andersoni*)	Amami-Oshima Island, Tokunoshima Island, northern part of Okinawa Island	EN	VU	263
Sword-tailed newt (*Cynops ensicauda*)	Amami-Oshima Island, northern part of Okinawa Island	EN	–	313
Amami tip-nosed frog (*Odorrana amamiensis*)	Amami-Oshima Island, Tokunoshima Island	EN	VU	–
Amami Ishikawa's frog (*Odorrana splendida*)	Amami-Oshima Island	EN	EN	–
Greater tip-nosed frog (*Odorrana supranarina*)	Iriomote Island	EN	–	–
Okinawa Ishikawa's frog (*Odorrana ishikawae*)	Northern part of Okinawa Island	EN	EN	–
Utsunomiya's tip-nosed frog (*Odorrana utsunomiyaorum*)	Iriomote Island	EN	EN	–
Okinawa tip-nosed frog (*Odorrana narina*)	Northern part of Okinawa Island	EN	VU	–
Otton frog (*Babina subaspera*)	Amami-Oshima Island	EN	EN	–
Holst's frog (*Babina holsti*)	Northern part of Okinawa Island	EN	EN	–
Yaeyama harpist frog (*Nidirana okinavana**)	Iriomote Island	EN	VU	–
Namie's frog (*Limnonectes namiyei*)	Northern part of Okinawa Island	EN	EN	291

*: On the IUCN Red List, the scientific name of the Yaeyama harpist frog is given as "*Babina okinavana*" and it is stated that the species also inhabits Taiwan. However, it is treated as "*Nidirana okinavana*" that belongs to a separate genus in Herpetological Society of Japan (2015).

Herpetofauna of the nominated property

Ryukyu black-breasted leaf turtle (*Geoemyda japonica*)
(Photo: MOEJ)

Amami Ishikawa's frog (*Odorrana splendida*)
(Photo: MOEJ)

Yellow-margined box turtle (*Cuora flavomarginata*)
(Photo: JWRC)

Namie's frog (*Limnonectes namiyei*) (Photo: MOEJ)

Kuroiwa's ground gecko (*Goniurosaurus kuroiwae*)
(Photo: MOEJ)

Anderson's crocodile newt (*Echinotriton andersoni*)
(Photo: MOEJ)

2.a.2.2.5. Inland water fish

A total of 567 indigenous species of fish from 99 families and 25 orders have been recorded as inhabiting the inland waters of the four islands containing the nominated property (Yoshigo 2014). However, more than half of these species are marine vagrants, which accidentally entered the area. Those include the following (Table 2-24):

- Freshwater fish, which are confined to freshwater throughout their lives: nine species (1%)
- Diadromous fish, which regularly migrate between rivers and the sea during certain periods of their life cycle: 53 species (9%)
- Brackish water fish, which spend their lives in and around brackish water bodies except for the planktonic stage: 130 species (23%)
- Peripheral freshwater fish, which mainly inhabit the sea but spend part of their lives in inland waters: 75 species (13%)
- Marine vagrants, which typically inhabit the sea but accidentally enter freshwater habitats: 301 species (53%)

Thus, it is considered that a total of 267 species from 57 families and 18 orders, which exclude marine vagrants, represent the true ichthyofauna of the inland waters of the four islands containing the nominated property.

Table 2-24: Number of indigenous species of fish in the inland waters of the four islands containing the nominated property (classified by life form)*

	Four islands containing the nominated property	Amami-Oshima Island	Tokunoshima Island*2	Okinawa Island	Iriomote Island
Freshwater fish	9	7	2	9	5
Diadromous fish	53	38	14	44	48
Brackish water fish	130	68	18	85	120
Peripheral freshwater fish	75	41	0	63	73
Marine vagrants	301	67	4	177	226
Total	568	221	38	378	472

The numbers are based on Yoshigo (2014).
*: The species inhabiting the Tokunoshima Island have not been fully surveyed and considered as lacking sufficient information.

Only nine species of freshwater fish inhabit the four islands containing the nominated property. In contrast to the main islands of Japan, Taiwan, the Philippines, and Indonesia where large populations of freshwater fish—such as those belonging to the families of Cyprinidae, Siluridae, and Cobitidae—are found in inland waters, the nominated property is characteristic in that while it has few such species, many species of brackish water and marine fish are found in freshwater bodies (Table 2-24).

One reason behind the formation of this unique ichthyofauna of inland waters is the characteristics of rivers in the nominated property, which are mostly short and steep. When swollen, those rivers flow rapidly in their entire length, making it difficult for freshwater fish species—those that do not tolerate any salinity—to inhabit. Also, in the Central and South Ryukyus, rivers with tidal areas forested by mangroves as well as seagrass beds and coral reefs in adjacent sea areas are preserved in relatively good conditions, providing secure habitats for many species of diadromous fish, peripheral freshwater fish, brackish water fish, and so forth (Tachihara 2003).

Although diadromous fish and brackish water fish can disperse through the sea, they require freshwater in certain stages or periods of their life cycle. Therefore, they are able to inhabit only those islands with sizable rivers. It is assumed that the smaller the number of inhabitable islands, the greater is the distance between habitats and the more likely are those species to be geographically isolated from one another (Mukai 2010). In the four islands containing the nominated property, a total of 14 endemic species and subspecies are distributed, namely, the Ryukyu ayu-fish (*Plecoglossus altivelis ryukyuensis*), one species each from the genera *Carassius* and *Monopterus*, and 11 species of gobies (Sakai et al. 2001; Nakabo (ed.) 2013).

Among the inland water fish inhabiting the four islands containing the nominated property, six species and subspecies are listed on the IUCN Red List (2016) as globally threatened species (Tables 2-25 and 2-26). Meanwhile, a total of 64 species and subspecies—37 species and subspecies categorized as CR, 14 species as EN, and 13 species as VU—are listed on the MOEJ Red List (2015), accounting for 38% of the total 167 threatened species of inland water fish in Japan (Tables 2-6 and 2-25). In particular, 54% of those categorized as CR inhabit the four islands containing the nominated property, making those islands home to large populations of many rare species of inland water fish.

Swamp eel (*Monopterus* sp.) (Photo: MOEJ)

Freshwater goby (*Rhinogobius* sp. BB) (Photo: MOEJ)

Table 2-25: Numbers of endemic and threatened species of inland water fish in the four islands containing the nominated property*1

(The numbers in the parentheses include subspecies)	Four islands containing the nominated property	Amami-Oshima Island	Tokunoshima Island	Okinawa Island	Iriomote Island
Number of indigenous species	267	154	34	201	246
Number of endemic species*2	13 (14)	9 (10)	2	10	9
Rate of endemic species (%)	5	6	6	5	4
Number of species listed on IUCN-RL (2016)*2	6	5	1	4	5
Number of species listed on MOEJ-RL (2015)	64	35	3	38	58
Rate of species listed on MOEJ-RL (%)	24	23	9	19	24

*1: Marine vagrants are excluded.
*2: Assessments for the IUCN Red List are conducted at a species level. However, the Ryukyu ayu-fish, which has been assessed at a subspecies level, is counted as one species because there are no other subspecies belonging to the same species in the nominated property.

Table 2-26: Globally threatened species of inland water fish inhabiting the four islands containing the nominated property

Threatened species	Distribution	IUCN	MOEJ	Life cycle*1
Japanese eel (*Anguilla japonica*)	Amami-Oshima Island, Tokunoshima Island, Okinawa Island, Iriomote Island	EN	EN	D
Ryukyu ayu-fish (*Plecoglossus altivelis ryukyuensis*)	Amami-Oshima Island, Okinawa Island*2	EN	CR	D
Spotted seahorse (*Hippocampus kuda*)	Amami-Oshima Island, Okinawa Island, Iriomote Island, Ishigaki Island	VU	–	B
Okinawa seabream (*Acanthopagrus sivicolus*)	Amami-Oshima Island, Okinawa Island, Iriomote Island	VU	–	P
Stiphodon imperiorientis	Amami-Oshima Island, Okinawa Island	VU	CR	D
Pink whipray (*Himantura fai*)	Iriomote Island	VU		P

*1: D = diadromous fish, B = brackish water fish, P = peripheral freshwater fish
*2: The distribution on the Okinawa Island is a result of the reintroduction of the species from the Amami-Oshima Island.

Ryukyu ayu-fish (*Plecoglossus altivelis ryukyuensis*)
(Photo: MOEJ)

2.a.2.2.6. Insects

Azuma et al. (eds.) (2002) provides a comprehensive view of the insect fauna of the Central and South Ryukyus. However, a number of species and subspecies have been described and recorded after its publication. There are some insect groups that are yet to be studied taxonomically, while some areas remain unsurveyed and offer only limited information. Thus, the number of insect species in the nominated property is expected to increase as relevant studies make progress.

A total of 6,148 species (6,447 species and subspecies) of insects inhabit the four islands containing the nominated property[4] (Table 2-27). Among the insect fauna, the order Coleoptera (beetles) has the largest number of indigenous species totaling 1,924 species (2,122 species and subspecies), followed by the order Lepidoptera (moths and butterflies) at 1,221 species (1,239 species and subspecies), together accounting for roughly half of the total indigenous species (Table 2-27).

Based on a survey on the distribution of some 7,500 species of insects in the Central and South Ryukyus, Azuma (2013) showed that those of Indomalayan origin are the largest group accounting for 39.8%, followed by those indigenous to the Central and South Ryukyus at 26.7% and those indigenous to Japan and found also in the main islands at 13.2%, while those of Palearctic origin account for only 5.5%. This tendency is particularly conspicuous in butterflies as well as in beetles (Kohama 2015).

Yanbaru long-armed scarab beetle (*Cheirotonus jambar*) (Photo: MOEJ)

Stag beetle (*Neolucanus okinawanus*) (Photo: MOEJ)

4 Among the species listed in Azuma et al. (eds.) (2002), those for which the definition of the geographic area of distribution does not provide the names of islands (simply stating the Amami Island Group, the Okinawa Island Group, the Yaeyama Island Group, etc.) are excluded. Therefore, the actual numbers of species are greater than those listed on Table 2-27.

Table 2-27: Numbers of insect species on the four islands containing the nominated property*1

(The numbers in the parentheses include subspecies)	Four islands containing the nominated property	Amami-Oshima Island	Tokunoshima Island*2	Okinawa Island	Iriomote Island
Archaeognatha	4	4	0	3	1
Thysanura	7	4	0	6	2
Ephemeroptera	14	6	0	11	9
Odonata	84 (92)	46 (48)	35	49 (50)	64 (66)
Plecoptera	15	5	4	10	4
Blattaria	33 (35)	17	9	17	25
Mantodea	7	4	5	7	7
Isoptera	14 (17)	5 (6)	2	10 (11)	10 (12)
Orthoptera	149 (153)	94	51	99 (101)	95 (96)
Phasmida	10	6	4	6	6
Dermaptera	11	4	0	8	4
Psocoptera	10 (16)	7 (9)	0	5 (8)	5 (7)
Mallophaga	3	3	0	0	0
Anoplura	2	2	0	2	2
Thysanoptera	58 (70)	23 (25)	0	43 (52)	27 (31)
Homoptera	467 (476)	223 (224)	86 (88)	359 (363)	262 (267)
Heteroptera	384 (389)	195 (196)	97	278 (282)	280 (283)
Neuroptera	56	17	4	35	28
Coleoptera	1,924 (2,122)	1,085 (1,119)	372 (385)	1,041 (1,073)	869 (899)
Strepsiptera	8	3	1	2	7
Hymenoptera	752 (785)	410 (414)	138 (140)	455 (460)	313 (316)
Mecoptera	1	1	0	0	0
Diptera	872 (874)	436 (438)	50	545	295
Trichoptera	41	15	1	31	5
Lepidoptera	1,221 (1,239)	637 (640)	150 (151)	802 (804)	747 (751)
Total	6,148 (6,447)	3,252 (3,304)	1,009 (1,027)	3,824 (3,887)	3,067 (3,123)

*1: Among those listed in Azuma et al. (eds.) (2002), three orders (Collembola, Diplura, and Protura) in the class Entognatha are excluded. Data from other sources were used to supplement data on the distribution of those taxa that have been subjected to major reclassification (e.g., Odonata) and that of the alien species. The numbers provided above do not include those for which the definition of the geographic area of distribution does not include the names of islands (simply stating the Amami Island Group, the Okinawa Island Group, the Yaeyama Islands, etc.). Therefore, the actual numbers of species are greater than those listed above.

*2: The species inhabiting the Tokunoshima Island have not been fully surveyed and considered as lacking sufficient information.

The four islands containing the nominated property are home to a total of 1,602 endemic insect species, accounting for 26% of the total insect species inhabiting the islands. Those insect species are under an ongoing process of differentiation and speciation among different islands, resulting in the significant presence of subspecies endemic to each island, which is one of the characteristics of the Central and South Ryukyus. The number of species and subspecies totals 1,997, accounting 31% of total species and subspecies (Table 2-28).

Table 2-28: Numbers of endemic and threatened insect species on the four islands containing the nominated property*1

(The numbers in the parentheses include subspecies)	Four islands containing the nominated property	Amami-Oshima Island	Tokunoshima Island	Okinawa Island	Iriomote Island
Number of indigenous species	6,148 (6,447)	3,252 (3,304)	1,009 (1,027)	3,824 (3,887)	3,067 (3,123)
Number of endemic species	1,602 (1,997)	693 (836)	173 (242)	740 (906)	647 (789)
Rate of endemic species (%)	26 (31)	21 (25)	17 (24)	19 (23)	21 (25)
Number of species listed on IUCN-RL (2016)*2	19	4	2	9	7
Number of species listed on the MOEJ-RL (2015)*3	36	19	13	18	18

*1: Among the species listed in Azuma et al. (eds.) (2002), those for which the definition of the geographic area of distribution does not include the names of islands (simply stating the Amami Island Group, the Okinawa Island Group, the Yaeyama Islands, etc.) are excluded. Therefore, the actual numbers of species are greater than those listed above.

*2: Assessments for the IUCN Red List are, in principle, conducted at a species level. However, no species-level assessment data are available for some dragonflies and damselflies, as they have been assessed only at a subspecies level. Therefore, the numbers of species shown above are the numbers of subspecies. Meanwhile, the assessment of *Rhipidolestes okinawanus* was conducted in 1996 and the geographic area of distribution is simply defined as "Nansei Shoto." Therefore, it is believed that this includes three species and two subspecies, which were subdivided from *Rhipidolestes okinawanus* in and after 2005.

*3: The numbers represent the sum of threatened species categorized as CR, EN, and VU. Assessments for the MOEJ Red List are, in principle, conducted at a subspecies level.

Six insect species—the Yanbaru long-armed scarab beetle (*Cheirotonus jambar*) and five species of stream dragonflies and damselflies—are listed on the IUCN Red List (2016) and the number goes up to 19 when those assessed at a subspecies level are included[5] (Tables 2-28 and 2-29). Meanwhile, the MOEJ Red List (2015), for which some 32,000 species (including subspecies) of insects in Japan have been assessed, lists 358 species (approximately 1%) as threatened (Table 2-6). Among those inhabiting the four islands containing the nominated property, 36 species and subspecies of insects are designated as threatened (Tables 2-6 and 2-28), meaning that those islands, which together represent only 0.4% of the total land area of Japan, are home to 10% of the national total.

Matrona basilaris japonica (Photo: MOEJ)

5 Assessments for the IUCN Red List are conducted at a species level. However, no species-level assessment data are available for some dragonflies and damselflies (e.g., *Chlorogomphus brunneus brunneus*, *Coeliccia ryukyuensis ryukyuensis*, *C. ryukyuensis amamii*), as they have been assessed only at a subspecies level, while the results of species- and subspecies-level assessments are inconsistent for some others (e.g., the species *Asiagomphus amamiensis* is categorized as NT, but both of its known subspecies, *A. amamiensis amamiensis* and *A. amamiensis okinawanus*, are categorized as EN).

Table 2-29: Globally threatned species of insects inhabiting the four islands containing the nominated property

Threatened species	Distribution	IUCN	MOEJ	Remarks
Chlorogomphus brunneus brunneus	Okinawa Island	EN	–	*2
Matrona basilaris japonica	Amami-Oshima Island, Tokunoshima Island, Okinawa Island	EN	–	*1
Rhinocypha uenoi	Iriomote Island	EN	–	
Rhipidolestes okinawanus	Amami-Oshima Island, Tokunoshima Island, Okinawa Island, Iriomote Island	EN	–	*3
Coeliccia flavicauda masakii	Iriomote Island	EN	–	*1
C. ryukyuensis amamii	Amami-Oshima Island, Tokunoshima Island	EN	–	*2
C. ryukyuensis ryukyuensis	Okinawa Island	EN	–	*2
Asiagomphus amamiensis amamiensis	Amami-Oshima Island	EN	–	*1
A. amamiensis okinawanus	Okinawa Island	EN	–	*1
A. yayeyamensis	Iriomote Island	EN	–	
Stylogomphus ryukyuanus asatoi	Okinawa Island	EN	–	*2
S. shirozui watanabei	Iriomote Island	EN	–	*2
Chlorogomphus okinawensis	Okinawa Island	EN	VU	
Planaeschna ishigakiana ishigakiana	Iriomote Island	EN	–	*2
P. ishigakiana nagaminei	Amami-Oshima Island	EN	–	*2
P. risi sakishimana	Iriomote Island	EN	–	*1
Hemicordulia mindana nipponica	Iriomote Island	EN	VU	*1
Macromia kubokaiya	Okinawa Island	EN	–	
Cheirotonus jambar	Okinawa Island	EN	EN	

*1: Assessed at a subspecies level for the IUCN Red List (categorized as LC at a species level).
*2: Assessed only at a subspecies level for the IUCN Red List.
*3: The distribution is simply defined as "Nansei Shoto" and the assessment was conducted in 1996. It may include the following species and subspecies that were subdivided from *Rhipidolestes okinawanus* in and after 2005: *Rhipidolestes aculeatus*, *R. shozoi*, *R. amamiensis amamiensis*, and *R. amamiensis tokunoshimensis*.

Damselfly (*Rhinocypha uenoi*) (Photo: MOEJ)

2.a.2.2.7. Inland water decapod crustaceans

A total of 73 indigenous species of inland water decapod crustaceans have been recorded in Japan (Hayashi 2011). The four islands containing the nominated property harbor 47 species of them, accounting for 64% of the national total (calculated based on Kagoshima University (2014)) (Tables 2-6 and 2-30).

Table 2-30: Numbers of indigenous species of inland water decapod crustaceans in the four islands containing the nominated property

	Four islands containing the nominated property	Amami-Oshima Island	Tokunoshima Island	Okinawa Island	Iriomote Island
Atyidae	18	6	6	13	14
Palaemonidae	14	2	2	11	11
Alpheidae	1	0	0	1	0
Potamidae	10	3	3	5	3
Varunidae	4	3	1	3	3
Total	47	14	12	33	31

The numbers are based on Kagoshima University (2014).

Out of the total of 47 indigenous species of inland water decapod crustaceans found in the four islands containing the nominated property, 15 species or 32% are endemic. In particular, those of the family Potamidae are endemic, which inhabit freshwater and land, are unable to disperse through the sea because their eggs and larvae cannot survive in seawater (Shokita 1996), and thus all of the 10 species (100%) belonging to this family are endemic. Five of the Potamidae species are listed as threatened on the MOEJ Red List (2015) (Tables 2-6 and 2-31).

Table 2-31: Numbers of endemic and threatened species of inland decapod crustaceans in the four islands containing the nominated property

(Potamidae species in the parentheses)	Four islands containing the nominated property	Amami-Oshima Island	Tokunoshima Island	Northern part of Okinawa Island	Iriomote Island
Number of indigenous species	47 (10)	14 (3)	12 (3)	33 (5)	31 (3)
Number of endemic species	15 (10)	3 (3)	3 (3)	6 (5)	7 (3)
Rate of endemic species (%)	32 (100)	21 (100)	25 (100)	18 (100)	23 (100)
Number of species listed on IUCN-RL (2016)	0	0	0	0	0
Number of species listed on MOEJ-RL (2015)*	5	1	1	4	0
Rate of species listed on MOEJ-RL (%)	11	7	8	12	0

2.a.3. Geological history and speciation

2.a.3.1. Geological history

The current landform of the nominated property is considered to have been developed through the processes described below (Figure 2-16).

1) Period when it was part of the Eurasian Continent: Before middle Micene (before 11.63 Ma)

During the Cretaceous and Palaeogene, the current Ryukyu Arc was located at the eastern edge of the Eurasian Continent and formed a part of the continent. The subduction of the oceanic Pacific plate beneath the Eurasian plate from the southeast caused the formation of accretionary complex (Machida et al. 2001) and metamorphic rocks and the intrusion of granite (Kawano and Nishimura 2010; Nishiyama 2010). Then, in the Eocene, the spreading of the Philippine Basin eventually brought the Philippine Sea plate and the Eurasian plate together. Yet, no plate subduction had occurred at that time and crustal movements are considered to have been inactive (Machida et al. 2001).

2) Formation of Island Arc—Separation from Continent: late Micene to early Pleistocene (11.63 to around 2 Ma)

During this period, a series of large-scale crustal movements occurred, which transformed an area on the Continent's margin into an island arc. First, around 6 Ma or 10 Ma, the Philippine Sea plate, which had made no major movements until then, began to subduct beneath the Ryukyu Trench (Kamata and Kodama 1993; Machida et al. 2001). This subduction caused the Okinawa Trough to start opening between the late Miocene and the early Pleistocene, leading to the formation of the Ryukyu Arc (Miki et al. 1990; Kamata and Kodama 1993; Machida et al. 2001; Iryu and Matsuda 2010; Gungor et al. 2012; Osozawa et al. 2012; Gallagher et al. 2015). It is considered that in this process, the Tokara Strait and the Kerama Gap were formed and the Central Ryukyus isolated. Furthermore, it is supposed that the Yonaguni Strait was created, separating the South Ryukyu from Taiwan. However, there are a number of different theories, primarily from biogeographical perspectives (Kizaki and Oshiro 1977, 1980; Ota 1998, 2002, 2005, 2009, 2012; Ota and Takahashi 2006; Koizumi et al. 2014; Yoshikawa et al. 2016; Okamoto 2017), as to when and in what order these individual events occurred, which have yet to be clarified sufficiently.

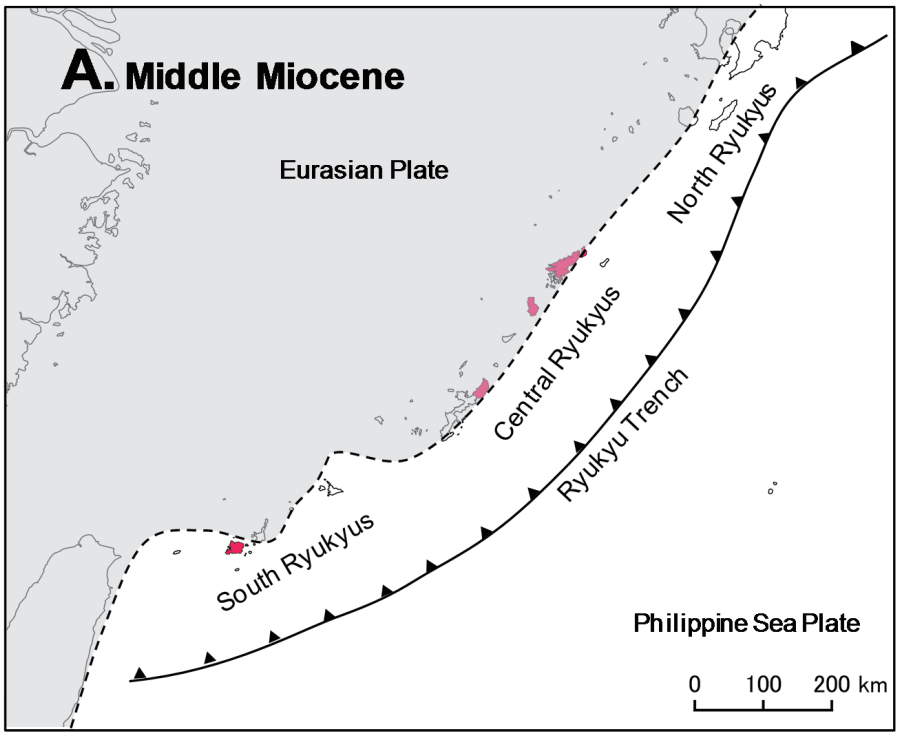
3) Period of repetitive conjunctions and separations of neighbouring islands due to changes in sea surface: early Pleistocene to late Pleistocene (around 2 million to 1.2 thousand years ago)

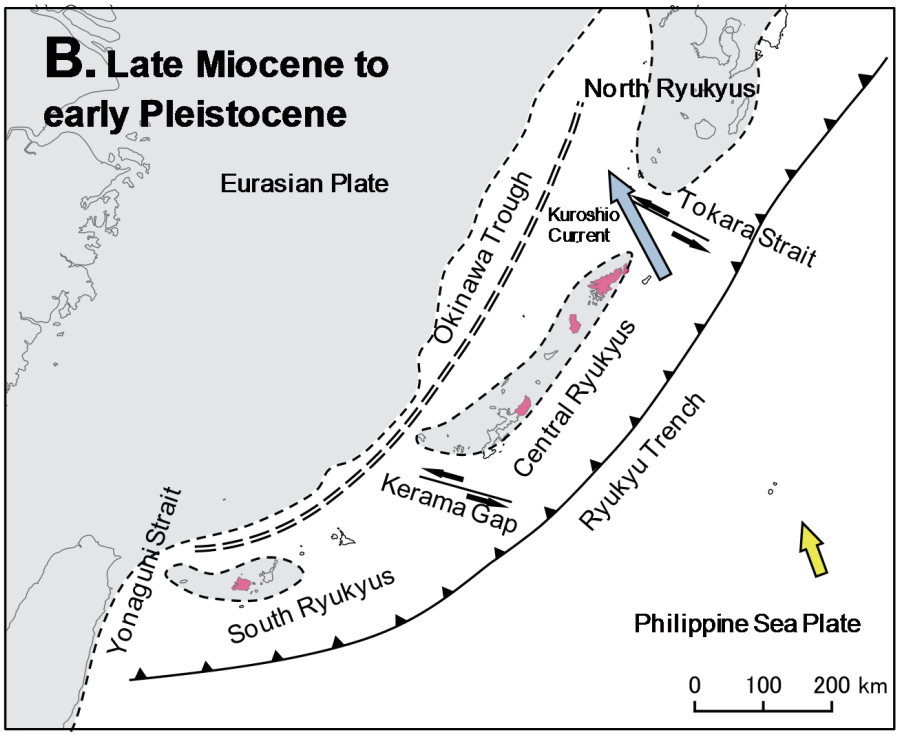
A group of neighbouring islands that constitute the Ryukyu Chain were repeatedly joined together and separated from each other during the Pleistocene due to sea surface changes associated with the glacial-interglacial cycles of the period.

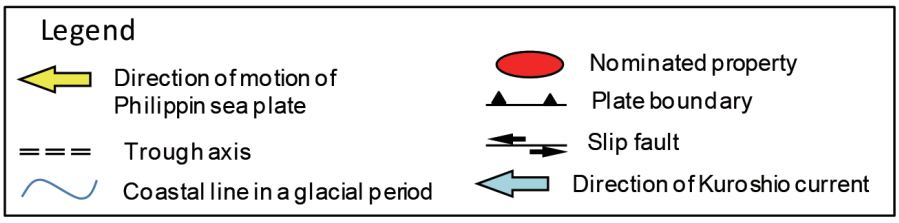
At around 1.8 Ma, the Kuroshio Current began to flow into the back arc side of the Ryukyu Arc through the

Yonaguni Strait (Iryu et al. 2006) and then into the Pacific Ocean through the Tokara Strait. Consequently, the Central and South Ryukyus became isolated from Taiwan and the North Ryukyus by the fast-flowing Kuroshio Current. At the same time, the effect of the warm Kuroshio Current, as well as the discontinuation of the sedimentation of clastics from the continent as a result of the opening of the Okinawa Trough, resulted in the formation coral reefs around many islands of the Central and South Ryukyus from around 1.71 to 1.39 Ma (Iryu et al. 2006; Saito 2009; Iryu and Matsuda 2010).

Ria coast of the Oshima Strait, Amami-Ohisma Island (Photo: JWRC)


A. Middle Miocene
Eurasian Plate
North Ryukyus
Central Ryukyus
Ryukyu Trench
South Ryukyus
Philippine Sea Plate
0 100 200 km


B. Late Miocene to early Pleistocene
Eurasian Plate
North Ryukyus
Okinawa Trough
Kuroshio Current
Tokara Strait
Central Ryukyus
Kerama Gap
Ryukyu Trench
Yonaguni Strait
South Ryukyus
Philippine Sea Plate
0 100 200 km


Legend
Direction of motion of Philippin sea plate
Trough axis
Coastal line in a glacial period
Nominated property
Plate boundary
Slip fault
Direction of Kuroshio current

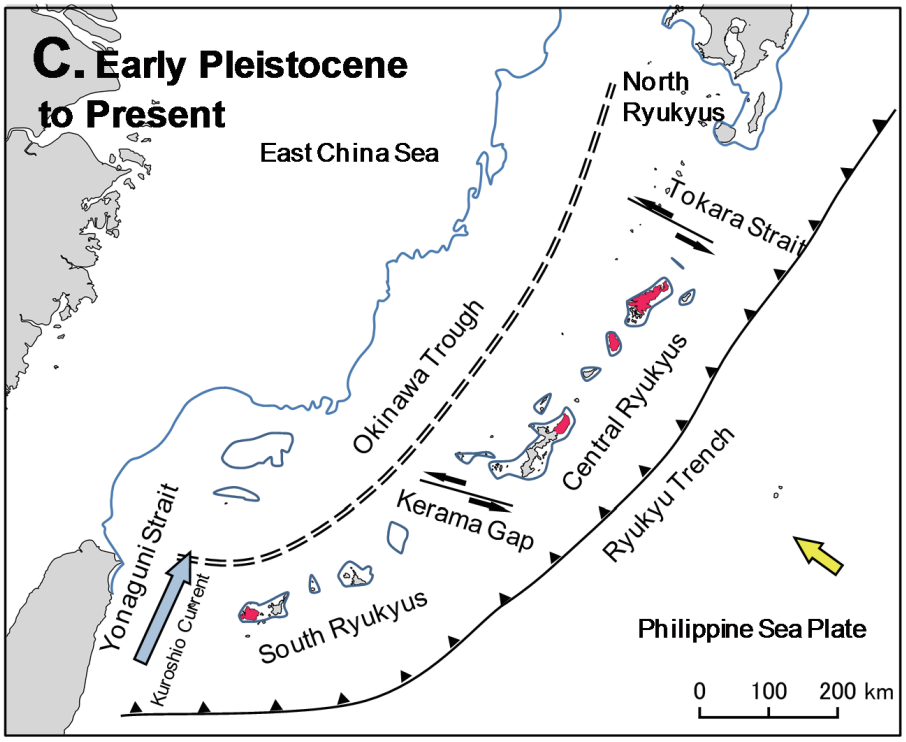


Figure 2-16: Historical development of Ryukyu Arc

The Figure was prepared by referring to the following: Koba, 1992; Kamata and Kodama, 1994; Park et al., 1998; Kamata, 1999; Machida et al., 2001; Inoue, 2007; Sato et al., 2009; Hase, 2010; Nishiyama, 2010; Kawano and Nishimura, 2010; Sakai, 2010 a, b; Takeuchi, 2010; Isozaki et al., 2011; Iryu and Matsuda, 2011; Gungor et al., 2012; Gallagher et al., 2015, and Iryu's personal communications 2016.

A: Before middle Miocene (Before 11.63 Ma)
From the Cretaceous to early Miocene, the Ryukyu Arc was located on the eastern margin of the Eurasian Continent and formed a part of the continent. The subduction of the plate led to the formation of accretionary complex and metamorphic rocks, as well as intrusion of granite providing the bedrock of the Ryukyu Arc. The current Ryukyu Arc was located on the eastern margin of the continent. While the North and Central Ryukyus were subaerial, the South Ryukyus were partly subaerial and surrounded by shallow water.

B: Late Miocene to early Pleistocene (around 11.63 to 2 Ma)
The Philippine Sea plate moved north-northwest and began to subduct in the Ryukyu Trench. This opened the Okinawa Trough and resulted in the formation of the island arc. Furthermore, the Tokara Strait, Kerama Gap, and Yonaguni Strait formed, and the Central and South Ryukyus were separated from the continent. The Yonaguni Strait was not as wide as it would later become and the Kuroshio Current began to flow into the back arc side through the Tokara Strait around 4.0 Ma or later.

C: Early Pleistocene to Present (around 2 Ma onwards)
The Philippine Sea plate changed its direction to the northwest. Expansion of the Yonaguni Strait allowed the Kuroshio Current to flow into the back arc side. As a result, coral reefs grew around a number of Central and South Ryukyu islands starting from around1.71 to 1.39 Ma.
In addition, the glacial-interglacial cycles caused repetitive sea regressions and transgressions.

2.a.3.2. Geological history and speciation of terrestrial fauna

The Ryukyu Chain is considered to have once been part of the edge of the Eurasian Continent and later divided into the North Ryukyus, Central Ryukyus, and South Ryukyus by channels, straits, etc. The terrestrial biota of the North Ryukyus (Palearctic) is distinctly different from those of the Central and South Ryukyus, which are separated by the Tokara Strait. There is also more than a slight difference in biota between the Central Ryukyus and the South Ryukyus.

The terrestrial biota of the nominated property has two characteristics. The first is the richness of its relict endemic species that have ancestor species once widely distributed across the continent and the mainland of Japan, but which can now be found only on the Ryukyu Chain. Their speciation reflects the nominated property's geological history of being formed as continental islands. There are also the new endemic species that have further speciated after having been isolated on the Ryukyu Chain. The second charcteristic is the difference in the pattern of endemism between the Central Ryukyus and the South Ryukyus on individual islands or island groups. Table 2-32 shows the speciation patterns on Amami-Oshima Island, Tokunoshima Island, and the northern part of Okinawa Island (Central Ryukyus) and on Iriomote Island (South Ryukyus) within the nominated property based on molecular phylogenetic analyses of typical terrestrial species and the distribution of closely-related species.

1) The Central Ryukyus—High relict endemism

(Amami-Oshima Island, Tokunoshima Island, and the northen part of Okinawa Island)

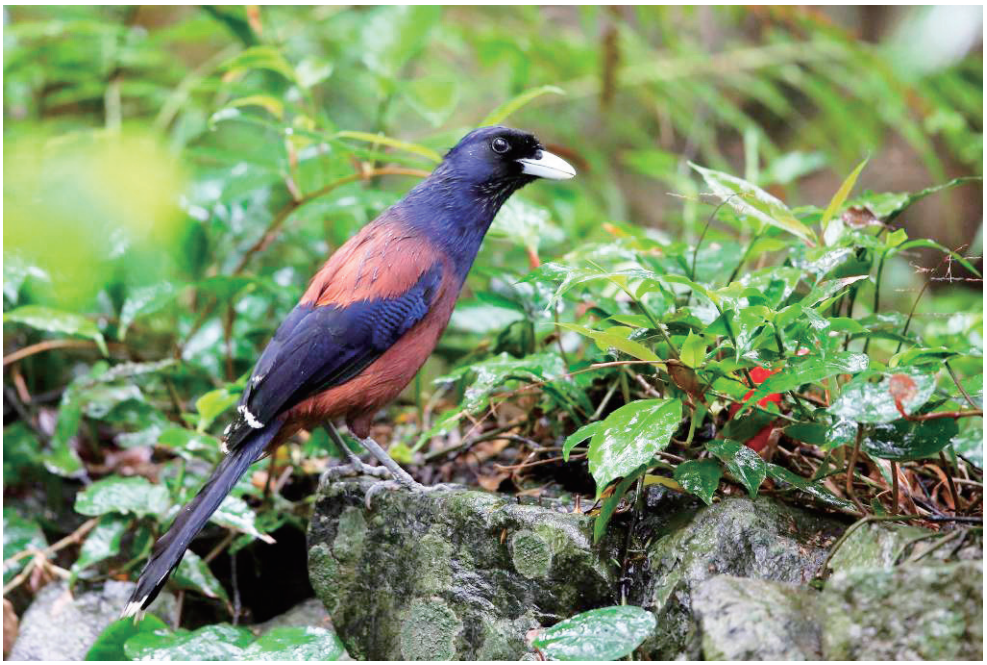
1)-1. Relict endemic species

In view of the results of molecular phylogenetic analyses and the distribution of closely-related species, it is considered that the terrestrial fauna of the Central Ryukyus became isolated from those of the Eurasian Continent, the North Ryukyus, and the South Ryukyus at least by the late Miocene (11.63–5.33 Ma) during the course of the transformation of the continent's eastern periphery into a group of islands, and continued to remain in the isolated state (Okamoto 2017). In the fauna of the Central Ryukyus, some species and their closely-related species, which had initially been distributed on the continent and neighbouring areas, gradually became extinct due to the emergence of new predators and competitors, making the remaining species endemic to the Central Ryukyus. These species are relict endemic species in that they do not have any conspecific or congeneric species in the neighbouring Northern and South Ryukyus, but only in remote places such as the Eurasian Continent. This relict endemism is particularly evident in flightless terrestrial animals. Representative species of this pattern including the Amami rabbit (*Pentalagus furnessi*) on Amami-Oshima and Tokunoshima Islands are listed in Table 2-32.

While most of the listed species became isolated on the Central Ryukyus during the late Miocene, the ground geckoes (*Goniurosaurus*; described below) on Tokunoshima Island, Okinawa Island, and other neighbouring islands and the Ryukyu black-breasted leaf turtle (*Geoemyda japonica*) in the northern part of Okinawa Island have more ancient origins and are considered to have already been separated from their relatives on the continent species due to geographical and environmental reasons in the period from the Palaeocene to the Eocene (56.4–33.9 Ma), before the separation of the Central Ryukyus from the continent

(Honda et al. 2014; Okamoto 2017).

The relict endemism is also seen among avian species with flight ability. Some molecular phylogenetic analyses and morphological analyses have shown that the Amami jay (*Garrulus lidthi*), a species endemic to Amami-Oshima Island, is remotely related to the Eurasian jay (*G. glandarius*) occurring in a vast region from mainland Japan to the Eurasian Continent, and its closest relative is the black-headed jay (*G. lanceolatus*) found in a narrow area around the Himalayas (Kajita et al. 1999). It is considered that the common ancestor of the Amami jay and the black-headed jay had once been distributed in a wider area than today, but in later days, its distribution became limited to Amami-Oshima Island and the Himalayan region for some reason, and the populations that remained and survived in these two regions have evolved in their own way (Kajita et al. 1999). This theory is supported by the fact that the fossils of the Amami jay have been found in a wider area of the Ryukyu Chain (Matsuoka, 2000).



Amami jay (*Garralus lidthi*) (Photo: MOEJ)

Column 2. Amami rabbit (*Pentalagus furnessi*)

The Amami rabbit, a member of the rabbit family (Leporidae), is a monotypic genus endemic to Amami-Oshima Island and Tokunoshima Island. The lack of its closely related species (or genus) seems attributable to its early phylogenetic differentiation. Fossils of the genus *Pentalagus* have also been found in Okinawa Island from the 1.7 to 1.3 Ma and 0.4 Ma strata (Ozawa, 2009).

The subfamily Leporinae has 11 genera in the world, including the Amami rabbit. Matthee et al. (2004) estimates that the Amami rabbit and its allied genera (*Oryctolagus, Bunolagus*, etc.) diverged from each other approximately 9.44 Ma ± 1.15 Ma (Figure 2-17). This is consistent with the palaeogeography explanation that Amami-Oshima Island and Tokunoshima Island had been part of the Eurasian Continent during the middle- to late Miocene, but became separated from the continent in the Pliocene. From a palaeontological point of view, the ancestor of this species is considered to be the fossil species (genus) *Pliopentalagus*, whose fossils were previously found in Eastern Europe but recently in the Eurasian Continent's Yangtze River basin (Tomida and Jin 2002).

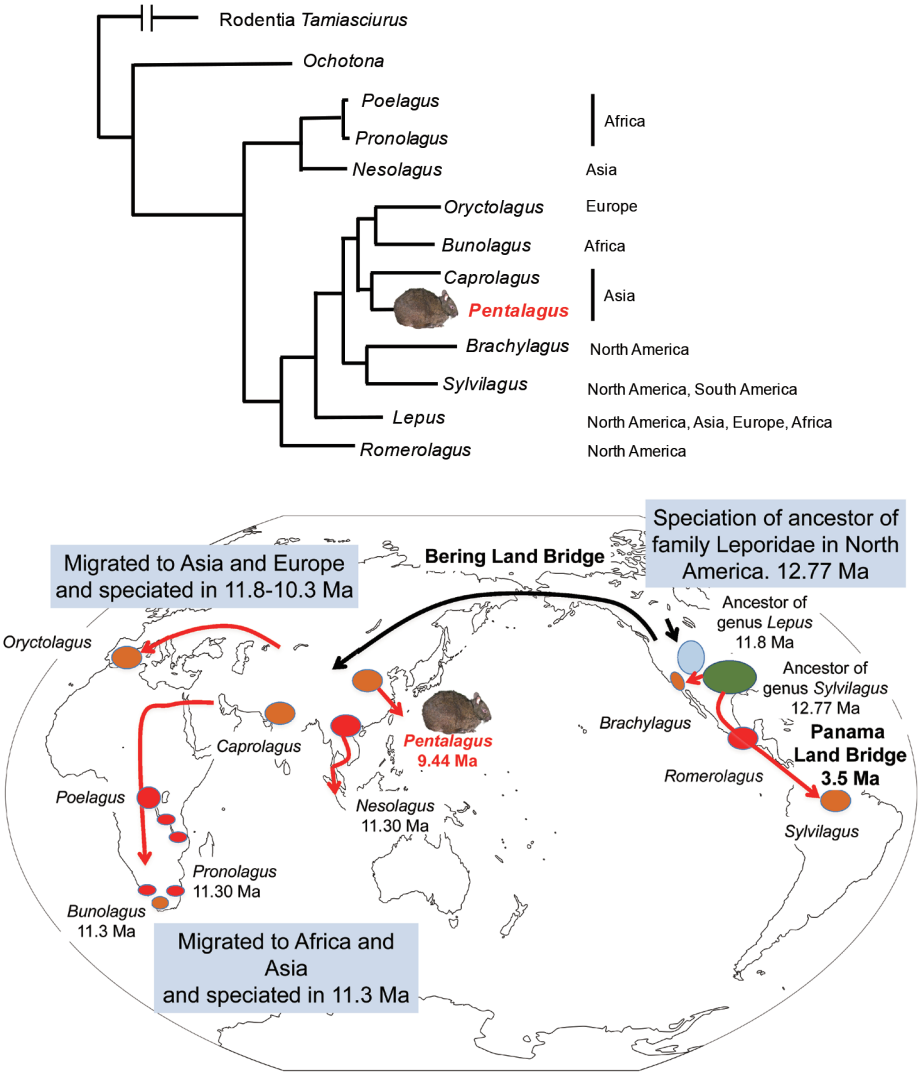


Figure 2-17: Phylogenetic tree of Leporidae based on the molecular phylogenetic analyses with morphological and biogeographic information (above), and the origin and speciation processes of *Oryctolagus* (below). (based on Yamada 2017. Illustrated from Matthee et al. 2004; Robinson and Matthee 2005).

1)-2. Relict endemic and new endemic lineages

It is considered that climate changes and associated sea surface changes from around the late Pliocene (3.6-2.58 Ma) to the Pleistocene (2.58–0.012 Ma) caused repeated connections and separations of the neighbouring islands, resulting in a divided distribution of organisms and advances in speciation on individual islands, which facilitated evolution to new endemic species and subspecies. In particular, some relict endemic lineages in the Central Ryukyus diverged further and evolved into different new endemic species between the Amami Island Group and Okinawa Island Group. Table 2-32 shows three species in the spiny rats (*Tokudaia*) and other typical species in the aforementioned category.

It should be noted that the divergence of the ground geckoes (*Goniurosaurus*) in the Central Ryukyus dates back even further; as a result of molecular phylogenetic analyses, it was found that their ancestor species had already diverged from a group of related continental species due to geographical and environmental reasons at least by the Eocene (65 to 40 Ma), when the Ryukyu Chain had still been part of the Eurasian Continent. In the Miocene (20 Ma to 10 Ma), when most of the Central Ryukyu species are considered to have been isolated from their continental kin, the banded ground gecko (*Goniurosaurus splendens*) on Tokunoshima Island and the Kuroiwa's ground gecko (*G. kuroiwae*) on the Okinawa Island Group diverged from each other, resulting in the differentiation of subspecies on Okinawa Island and surrounding islands from late Miocene to around Pliocene (6 to 3.9 Ma) (Honda et al. 2014; Okamoto 2017).

Such advances in speciation of relict endemic lineages among different islands suggest that the biota of the Central Ryukyus has been segregated for an extended period of time.

Otton frog (*Babina subaspera*), Amami-Oshima Island (Photo: MOEJ)

Holst's frog (*Babina holsti*), Northern part of Okinawa Island (Photo: MOEJ)

Column 3. Three spiny rat species belonging to the genus *Tokudaia*

The genus *Tokudaia* has only three species—the Amami spiny rat (*T. osimensis*) on Amami-Oshima Island, the Tokunoshima spiny rat (*T. tokunoshimensis*) on Tokunoshima Island, and the Okinawa spiny rat (*T. muenninki*) in the northern part of Okinawa Island. All of these three species are endemic to their respective islands (Ohdachi et al. 2015). They were initially described as a single species of spiny rat under the name of *T. osimensis* (Abe 1933), and later classified into different species according to their range island, based on the results of morphology, karyology, and molecular phylogeny (Tsuchiya et al. 1989; Suzuki et al. 1999; Kaneko 2001; Endo and Tsuchiya 2006).

Phylogenetic analyses of IRBP genes suggest that the genus *Tokudaia* diverged from the allied genus *Apodemus* and other species of the Murinae linage around 8 Ma to 6.5 Ma (Sato and Suzuki 2004) and evolved into a distinct taxon as a result of being isolated on the Central Ryukyus and becoming a relict species endemic to the group of islands.

At the same time, differences exist within these three species in terms of karyotype and karyomorph. For example, the karyotype of Tokunoshima spiny rats, Amami spiny rats, and Okinawa spiny rats is 2n=45, 2n=25, and 2n=44, respectively (Tsuchiya et al. 1989). As to their divergence dates, it was found that Okinawa spiny rats diverged from the ancestral lineage about 2.5 Ma, while Tokunoshima spiny rats and Amami spiny rats branched out from the lineage about 1 Ma (Murata et al. 2010, 2012). Based on the study results, it appears that these three new endemic species speciated as they were isolated from each other, along by the separation of Okinawa and Tokunoshima Islands and following separation of Tokunoshima and Amami-Oshima Islands, on the three islands within the Central Ryukyus.

In addition, the genus *Tokudaia* has a unique sex-determining mechanism. Usually, mammals have either XX or XY sex chromosomes. However, Amami spiny rats and Tokunoshima spiny rats do not have a Y chromosome, and have the XO/XO sex chromosome type in both sexes (Honda et al. 1977, 1978). Okinawa spiny rats are thought to have an XX/XY system, but their X and Y chromosomes are not clearly distinct from each other (Tsuchiya et al. 1989). Furthermore, Tokunoshima spiny rats and Amami spiny rats have lost their Sry gene along with the Y chromosome (Murata et al. 2010, 2012; Figure 2-18). The Y chromosome of these two species is considered to have been lost when a new sex-determining gene appeared and a part of the Y chromosome was translocated to the X chromosome (Murata and Kuroiwa 2011). Because of their sex-chromosome structure differerent from that of normal mammalian, their sex-determining mechanism has received a great deal of interest from researchers and a number of studies have been initiated.

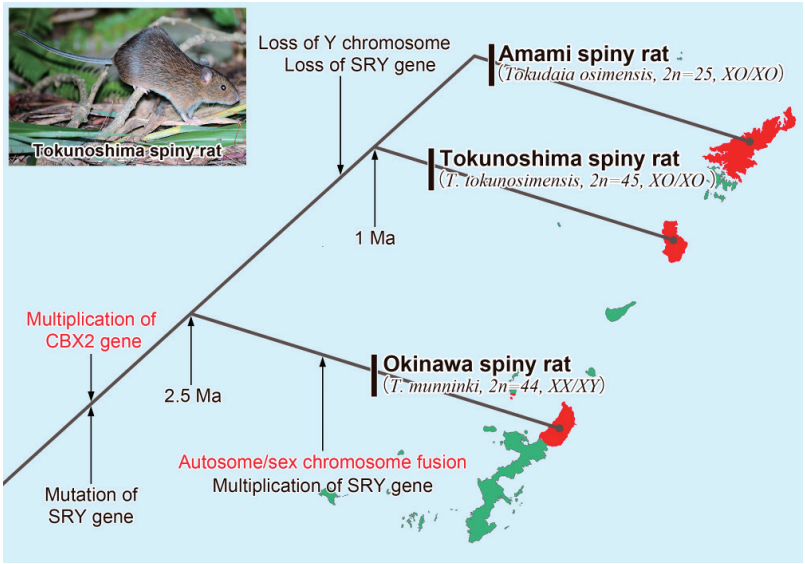


Figure 2-18: Genus *Tokudaia's* speciation and evolution of sex chromosomes and Sry/CBX2 genes (Prepared based on Murata et al. 2012)

2) South Ryukyus—New endemic lineages between Taiwan and the Eurasian Continent

(Iriomote Island)

As described in 1) above, considering the results of molecular phylogenetic analyses and the distribution of closely-related species, the terrestrial fauna on the South Ryukyus appear to have been formed after having been isolated from their counterpart in Taiwan and the Eurasian Continent during the Pliocene (5.33–2.58 Ma) after the South Ryukyus was separated from the Central Ryukyus in the late Miocene (Okamoto 2017). This explains the reason why the South Ryukyus' fauna does not have their relatives on the Central Ryukyus but have very closely-related species and subspecies mostly in Taiwan and the eastern part of the continent (Ota 1998, 2012; etc.). Table 2-32 shows typical species.

Molecular phylogenetic analyses indicate that, unlike other terrestrial animals on the South Ryukyus, the Iriomote cat (*Prionailurus bengalensis iriomotensis*) diverged from related subspecies (*P. b. Chinensis*) distributed in Taiwan and southern China during the relatively recent period of the late Pleistocene (90,000 years ago) (Tamada et al. 2008), and then migrated into Iriomote Island via Taiwan in the era when the exposed land in the South Ryukyus extended closer to Taiwan and the continent due to the lowering of sea levels during a glacial period (Yasuma 2016).

3) New endemic lineages across Central and South Ryukyus

(Amami-Oshima Island, Tokunoshima Island, the northern part of Okinawa Island, and Iriomote Island)

On the Central and South Ryukyus, there are a number of lineages of endemic species that have speciated within the respective regions. Table 2-32 shows such typical species including the group of tip-nosed frogs that belong to the genus *Odorrana*. These species represent a combination of geographic variations of speciation described above in 1) and 2). The existence of these speciation variations explains well that the biota of the South Ryukyus was isolated from that of the Central Ryukyus in older times and isolated from those of Taiwan and the eastern part of the Eurasian Continent in more recent times.

This suggests that in the late Miocene (11.63–5.33 Ma), common ancestor species that had been distributed across the entire Central and South Ryukyus, Taiwan, and the continent became isolated on the Central Ryukyus. Later, ancestor species were separated from Taiwan and the continent, and became isolated on the South Ryukyus during the Pliocene (5.33–2.58 Ma). They gradually speciated and became endemic to each region (Okamoto 2017). As a result, no relict endemic species like those on the Central Ryukyus are found among the endemic species and subspecies on the South Ryukyus.

As an exception, Ishigaki blue-tailed skink (*Plestiodon stimpsonii*) on the South Ryukyus has closely-related species on the North Ryukyus (Kuchinoshima Island, the Tokara Island Group). Molecular phylogenetic analyses found that this case was a long-distance dispersal event driven by the Kuroshio Current during the early period of the Pleistocene (1.8–1.4 million year ago) (Kurita and Hikida 2014; Okamoto, 2017).

Column 4. Tip-nosed frogs (*Odorrana*)

Endemic species of frogs belonging to the genus *Odorrana* include the Amami tip-nosed frog (*Odorrana amamiensis*) on Amami-Oshima Island and Tokunoshima Island (Central Ryukyus), the Okinawa tip-nosed frog (*O. narina*) on Okinawa Island, and the Utsunomiya's tip-nosed frog (O. utsunomiyaorum) and the greater tip-nosed frog (*O. supranarina*) on Iriomote Island and Ishigaki Island (South Ryukyus). In Taiwan, the Taiwan odorous frog (*O. swinhoana*), a species that is morphologically similar to the frogs above, is distributed (Figure 2-19).

Mitochondrial DNA (mtDNA) analyses showed that tip-nosed frogs' ancestral species, which had been distributed in the Continent, including Taiwan and the Ryukyu Chain, were separated from the continent during the late Miocene (12.3–5.4 Ma). They then divided into the two groups of the Central Ryukyu population and the Southern Ryukyu/Taiwan population from the late Miocene through the early Pliocene (9.3–4.1 Ma) (Matsui et al. 2005). It is considered that greater tip-nosed frogs diverged from the Central Ryukyus pupoulation in the early Pliocene, and that Amami tip-nosed frogs and Okinawa tip-nosed frogs speciated from the same population in later days. In the meantime, the South Ryukyus' Utsunomiya's tip-nosed frogs and Taiwan odorous frogs appear to have speciated from the Southern Ryukyus/Taiwan population in the Pleistocene (Matsui et al. 2005). Greater tip-nosed frogs are considered to have entered the South Ryukyus, where Utsunomiya's tip-nosed frogs had already existed, in the Pleistocene. While Utsunomiya's tip-nosed frogs occur in mountain and forest stream areas, greater tip-nosed frogs' habitat extends to downstream areas, up to near the border between mountains and plains (Toyama and Ota 1990; Ministry of the Environment 2014). It is estimated that the coexistence of these two species on the South Ryukyus is made possible by the absence of ecological competition due to the differences in their body size and entry age and by the segregation of their habitats (Matsui 1994).

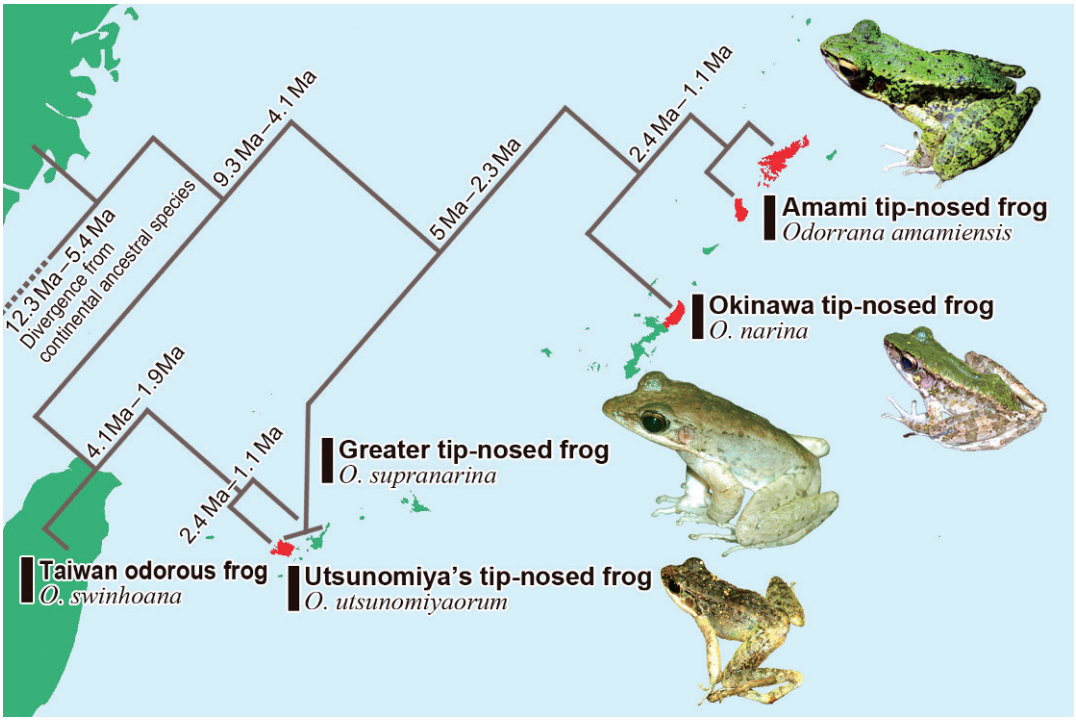


Figure 2-19 Distribution and phylogenetic relationships of Okinawa tip-nosed frogs prepared based on Matsui et al. 2005.

Figure 2-20 shows the Ryukyu Chain's position in the palaeogeographical map and biological dispersion estimated from the nominated property's geological history (see 2.a.3.1.) and the speciation patterns of terrestrial animals on the Central and South Ryukyus.

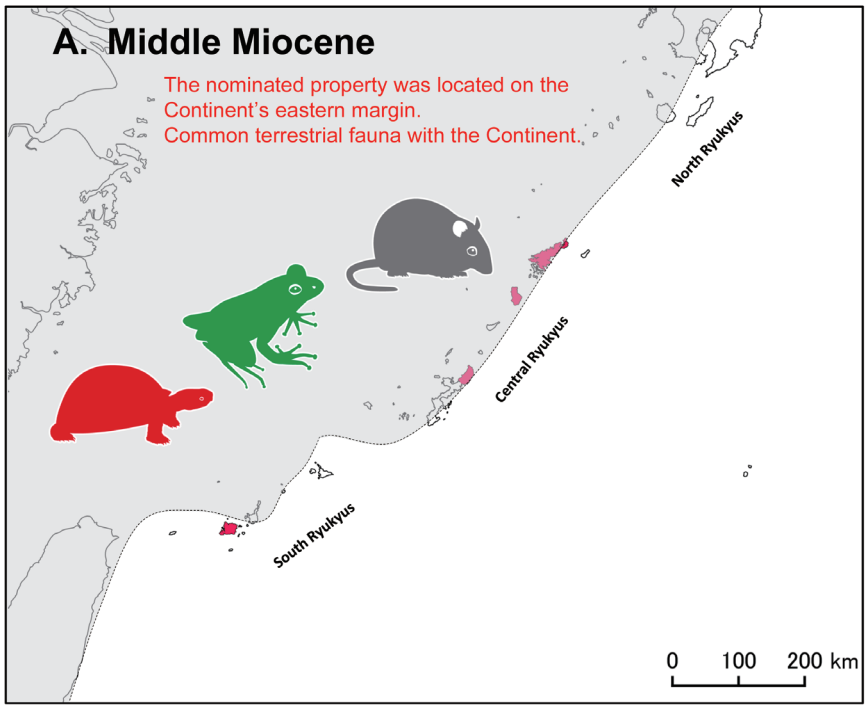
As to a link between the flora and the geological history of these islands, analysis of 1,815 species of seed plants on the Ryukyu Chain identified floristic speciation between the North, Central, and South Ryukyus on the whole (Nakamura et al. 2009; Nakamura 2012), and it is suggested that not only the geological history of the formation of the gaps (straits) between the islands but also modern environmental factors such as the influence of the distance between the islands and their different sizes must be taken into account in understanding the floristic speciation patterns on the Central and South Ryukyus (Nakamura et al. 2009). Furthermore, analyses of 513 species of woody plants within the Ryukyu Chain indicated that, when the phylogenetic relationships between the islands are considered, the most significant impact on the inter-island differences in species composition is the geographical distance between the Tokara Strait and the islands, and that such differences are reflected in the phylogenetic structure of the present-day flora of the individual islands (Kubota et al. 2011).

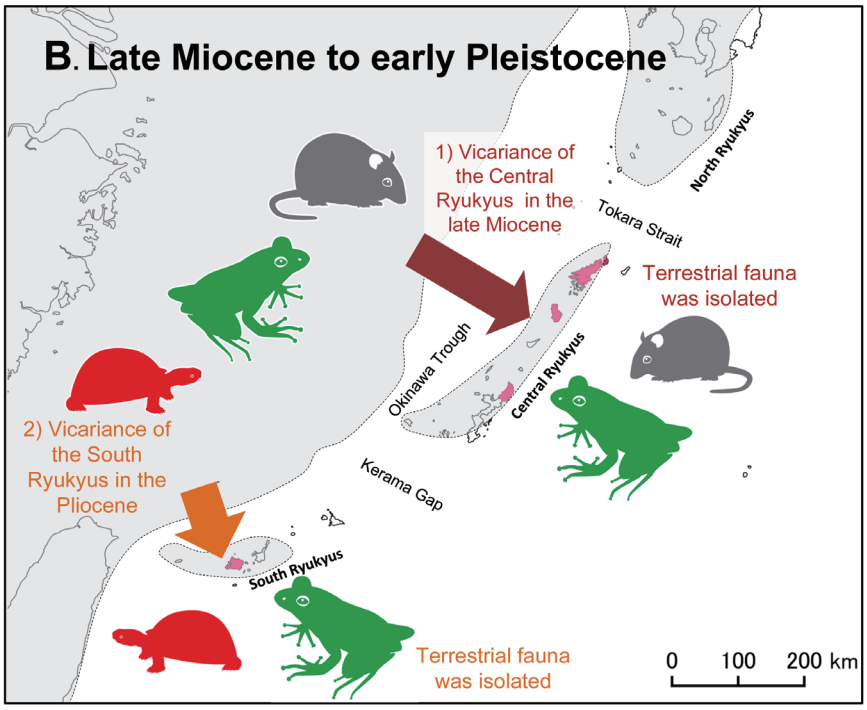
Habu viper (*Protobothrops flavoviridis*) (Photo: Hidetoshi Ota)

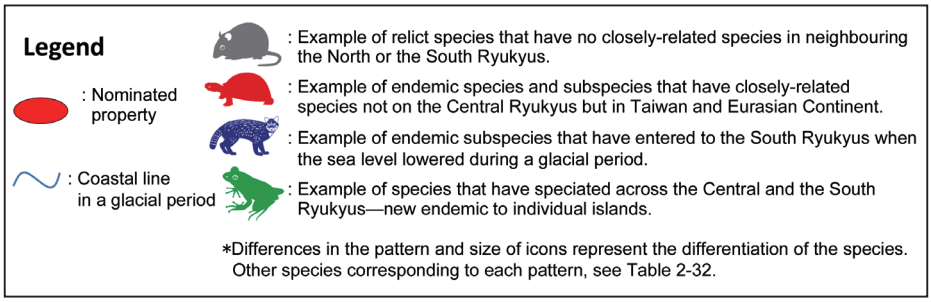
Table 2-32: Central and South Ryukyus' speciation patterns and typical terrestrial animal species on nominated property

Central Ryukyus				
Amami Oshima Island	**Tokunoshima Island**	**Northern part of Okinawa Island**	**Distribution of closest sister lineage**	**Period of divergence from sister lineage** (1 Ma=one million years ago)
1)-1. Relict endemic species				
Amami rabbit (*Pentalagus furnessi*)		–	Eurasia	10.6–8.3Ma (*Oryctolagus* and *Bunolagus*)
Ryukyu long-haired rat (*Diplothrix legata*)			Eurasia	3–4 Ma (*Rattus*)
Amami jay (*Garrulus lidthi*)	–	–	Himalayas	Unknown
–	–	Ryukyu black-breasted leaf turtle (*Geoemyda japonica*)	Southern China	56.4–33.9 Ma
Hime habu viper (*Ovophis okinavensis*)			Taiwan	14–5 Ma
Barbour's blue-tailed skink (*Plestiodon barbouri*)			Mainland Japan	14–5.5 Ma
Sword-tailed newt (*Cynops ensicauda*)	–	Sword-tailed newt (*C. ensicauda*)	Mainland Japan	10–6.4 Ma
Anderson's crocodile newt (*Echinotriton andersoni*)			Southern China	8.5–5.5Ma
–	–	Namie's frog (*Limnonectes namiyei*)	Taiwan	Unknown
–	–	Yanbaru long-armed scarab beetle (*Cheirotonus jambar*)	Southern China	Unknown
1)-2. Relict endemic AND new endemic lineages				
Amami spiny rat (*Tokudaia osimensis*)	Tokunoshima spiny rat (*T. tokunoshimensis*)	Okinawa spiny rat (*T. muenninki*)	Eurasia	8–6.5 Ma (*Apodemus*)
–	Banded ground gecko (*Goniurosaurus splendens*)	Kuroiwa's ground gecko (*G. kuroiwae*) (3 subspecies in nearby islands)	Southern China	65–40 Ma (Congeneric species)
Amami coral snake (*Sinomicrurus japonicus japonicus*)	Okinawa coral snake (*S. japonicus boettgeri*)		Taiwan	Unknown
Amami Ishikawa's frog (*Odorrana splendida*)	–	Okinawa Ishikawa's frog (*O. ishikawae*)	Eurasia	18–7.9 Ma (Other species on the continent)
Otton frog (*Babina subaspera*)	–	Holst's frog (*Babina holsti*)	Unknown	Unknown
Amami brownn frog (*Rana kobai*)		Okinawa brown frog (*R. ulma*)	Tsushima	Unknown
2) New endemic lineages between Taiwan and the Continent				
–	–	–	–	–
–	–	–	–	–
–	–	–	–	–
–	–	–	–	–
–	–	–	–	–
–	–	–	–	–
–	–	–	–	–
–	–	–	–	–
3) New endemic lineages across the entire Central and South Ryukyus				
Amami tip-nosed frog (*Odorrana amamiensis*)		Okinawa tip-nosed frog (*O. narina*)	South Ryukyus	12.3–5.4 Ma (Central/South/Taiwan vs. Continent)
Habu viper (*Protobothrops flavoviridis*) (South Tokara: Tokara habu viper (*P. tokarensis*))			South Ryukyus, Taiwan, Southern China	17–6 Ma (Central vs. South/Taiwan)
Pryer's keelback (*Hebius pryeri*)			South Ryukyus	7.5–12 Ma (Central/Miyako vs. Yaeyama/Taiwan)
Oshima blue-tailed skink (*Plestiodon oshimensis*)		Okinawa blue-tailed skink (*P. marginatus*)	South Ryukyus	7.3–3 Ma (Central vs. South)
Okinawa tree lizard (*Japalura polygonata polygonata*)			South Ryukyus	Unknown
Green grass lizard (*Takydromus smaragdinus*)			South Ryukyus	18–5 Ma (Central vs. South/Taiwan/Continent)
Stag beetle (*Neolucanus protogenetivus protogenetivus*) (Ukejima Is.: *N. protogenetivus hamaii*)		Stag beetle (*N. okinawanus*)	South Ryukyus	Unknown
Funnel web spider (*Macrothele amamiensis*)		–	South Ryukyus	ca. 10.4 Ma (Central/South/Taiwan vs. Continent) ca. 9.3 Ma (Central vs. South/Taiwan)

South Ryukyus			Literature
Iriomote Island	**Distribution of closest sister lineage**	**Period of divergence from sister lineage** (1 Ma=one million years ago)	
1)-1. Relict endemic species			
–	–	–	Matthee et al. (2004), Robinson and Matthee (2005)
–	–	–	Suzuki et al. (2000)
–	–	–	Kajita et al. (1999)
–	–	–	Okamoto (2017)
–	–	–	Okamoto (2017)
–	–	–	Okamoto (2017)
–	–	–	Tominaga et al. (2014)
–	–	–	Honda et al. (2012)
–	–	–	Emerson and Berrigan (1993)
–	–	–	Hosoya and Araya (2010)
1)-2. Relict endemic AND new endemic lineages			
–	–	–	Sato and Suzuki (2004), Murata et al. (2012)
–	–	–	Okamoto (2017)
–	–	–	Okamoto (2017)
–	–	–	Kuramoto et al. (2011)
–	–	–	Tominaga et al. (2014)
–	–	–	Matsui (2011), Eto and Matsui (2014)
2) New endemic lineages between Taiwan and the Continent			
Iriomote cat (*Prionailurus bengalensis iriomotensis*)	Taiwan and Southern China	0.09 Ma	Tamada et al. (2008)
Yaeyama pond turtle (*Mauremys mutica kami*)	Taiwan and Southern China	7.3–4.4 Ma	Okamoto (2017)
Yaeyama yellow-margined box turtle (*Cuora flavomarginata evelynae*)	Taiwan and Southern China	3–1.8 Ma	Okamoto (2017)
Sakishima beauty snake (*Elaphe taeniura schmackeri*)	Taiwan and Southern China	Unknown	Okamoto (2017)
Kishinoue's giant skink (*Plestiodon kishinouyei*)	Taiwan and Southern China	5–1.5 Ma	Okamoto (2017)
Sakishima smooth skink (*Scincella boettgeri*)	Taiwan	8–4.1 Ma	Okamoto (2017)
Iwasaki's slug snake (*Pareas iwasakii*)	Taiwan	4.2-1.6 Ma	Ota, from You et al. (2015)
Owston's green treefrog (*Rhacophorus owstoni*)	Taiwan	Unknown	Ota (1998)
3) New endemic lineages across the entire Central and South Ryukyus			
Utsunomiya's tip-nosed frog (*Odorrana utsunomiyaorum*) Greater tip-nosed frog (*O. supranarina*)	Taiwan	9.3–4.1 Ma (Central vs. South/Taiwan)	Matsui (1994)
Sakishima habu viper (*Protobothrops elegans*)	Taiwan/Southern China	ca. 3 Ma (South vs. Taiwan)	Okamoto (2017)
Yaeyama keelback (*Hebius ishigakiense*) (Miyako Is.: Miyako keelback (*H. concelarum*))	Taiwan(Undescribed species)	3–6 Ma (Yaeyama vs. Taiwan)	Kaito and Toda (2016)
Ishigaki blue-tailed skink (*Plestiodon stimpsonii*) (Kuchinoshima Is.: Kuchinoshima blue-tailed skink (*P. kuchinoshimensis*))	Taiwan/Southern China North Tokara	5–1.5 Ma (South vs. Taiwan/Continent) 1.4–1.8 (South vs. Tokara)	Brandley et al. (2011, 2012)
Sakishima tree lizards (*Japalura polygonata ishigakiensis*) (Yonaguni tree lizard (*J. polygonata donan*))	Taiwan	Unknown	Okamoto (2017)
Yaeyama grass lizard (*Takydromus dorsalis*) (Miyako Is.: Miyako grass lizard (*T. toyamai*))	Southern China	9–2.9 Ma (South vs. Continent)	Okamoto (2017)
Stag beetle (*Neolucanus insulicola insulicola*) (Yonaguni Is.: *N. insulicola donan*)	Taiwan/Southern China	Unknown	Hosoya and Araya (2006)
Funnel web spider (*Macrothele yaginumai*)	Taiwan	ca. 8.3 Ma (South vs. Taiwan)	Su et al. (2016)


A. Middle Miocene
The nominated property was located on the Continent's eastern margin.
Common terrestrial fauna with the Continent.
North Ryukyus
Central Ryukyus
South Ryukyus
0 100 200 km


B. Late Miocene to early Pleistocene
1) Vicariance of the Central Ryukyus in the late Miocene
Tokara Strait
North Ryukyus
Terrestrial fauna was isolated
Okinawa Trough
Central Ryukyus
2) Vicariance of the South Ryukyus in the Pliocene
Kerama Gap
South Ryukyus
Terrestrial fauna was isolated
0 100 200 km


Legend
: Nominated property
: Coastal line in a glacial period
: Example of relict species that have no closely-related species in neighbouring the North or the South Ryukyus.
: Example of endemic species and subspecies that have closely-related species not on the Central Ryukyus but in Taiwan and Eurasian Continent.
: Example of endemic subspecies that have entered to the South Ryukyus when the sea level lowered during a glacial period.
: Example of species that have speciated across the Central and the South Ryukyus—new endemic to individual islands.
*Differences in the pattern and size of icons represent the differentiation of the species. Other species corresponding to each pattern, see Table 2-32.

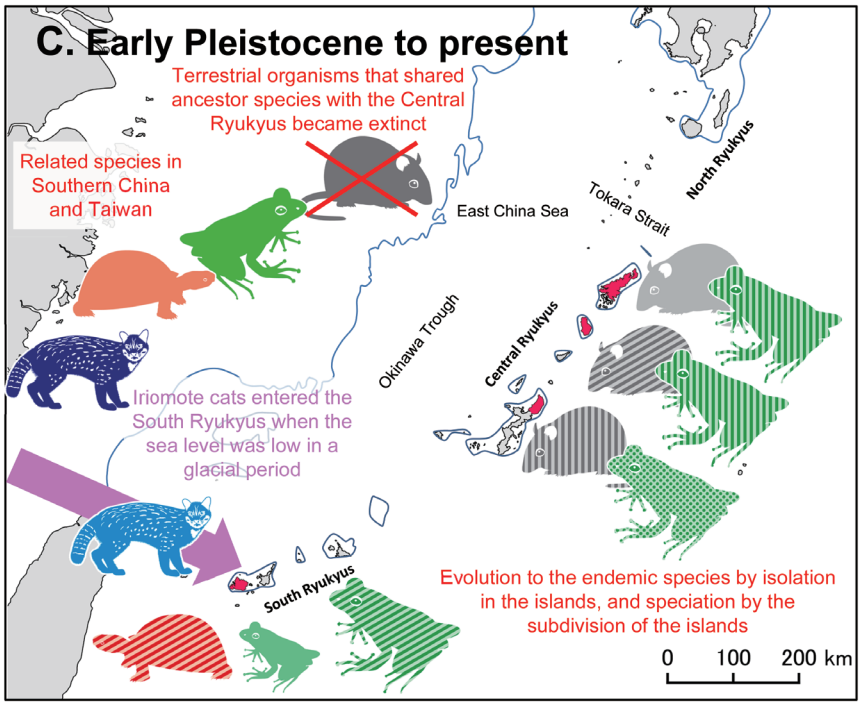


Figure 2-20: Ryukyu Archipelago's ancient geography and biological trends (Estimates)

The figures were prepared based on the following: Hypothesis established by Kizaki and Oshiro (1977), which is based on the geology and biological fossil information; hypothetical paleogeographic maps of the Nansei-Shoto Islands, which were estimated based on the comprehensive information about the phylogeography of the reptile and amphibian lineages (Ota 1998); findings of recent molecular biology (Tokuda 1969; Sato and Suzuki 2004; Koizumi et al. 2014; Yoshikawa et al. 2016; Okamoto 2017), findings of fossilology (Ota 2013, Ikeda et al. 2016; Nishioka et al. 2016), and findings of geology (Koba 1992; Kamata and Kodama 1994; Park et al. 1998; Kamata 1999; Machida et al. 2001; Inoue 2007; Sato et al. 2009; Kawano and Nishimura 2010; Hase 2010; Iryu and Matsuda 2010; Nishiyama 2010; Sakai 2010 a, b; Takeuchi, 2010; Isozaki et al. 2011; Gungor et al. 2012; Gallagher et al. 2015; and Iryu's personal communications 2016).

A: Before middle Miocene (Before 11.63 Ma)

The current Ryukyu Archipelago including the nominated site was apparently located on the eastern margin of the Eurasian Continent and shared a common terrestrial biota.

B: Late Miocene to early Pleistocene (11.63 to 2 Ma)

The Okinawa Trough began to expand. Tokara Strait and Kerama Gap were formed.

The fauna on the Central and South Ryukyus started to follow a unique evolution process after the former group of islands had been separated from the continent with their terrestrial biota consisting of Amami rabbits, spiny rats, ground geckoes, habu vipers, tip-nosed frogs, etc. in the late Miocene (11.63–5.33 Ma). The latter group of islands had been isolated from Taiwan and the continent with its terrestrial biota consisting of Yaeyama yellow-margined box turtles, Kishinoue's giant skinks, Sakishima habu vipers, tip-nosed frogs, etc. in the Pliocene (5.33–2.58 Ma).

C: Early Pleistocene to present (2 Ma onwards)

The terrestrial organisms that shared ancestor species with those on the Central Ryukyus became extinct gradually on the continent, leaving a relict and endemic terrestrial biota on the Central Ryukyus.

Sea level changes associated with climate changes (glacial-interglacial cycles) caused repeated connections and separations among neighbouring islands. As a consequence, these islands' biological distribution was fragmented and island-specific speciation was accelerated. When the sea level lowered during a glacial period and the distance between the South Ryukyus and the Eurasian Continent/Taiwan was shortened to a minimal level, Iriomote cats seem to have entered the South Ryukyus (0.09 Ma).

2.a.4. Adaptive evolution of animals in island ecosystems

In the nominated property, the Central and South Ryukyus have certain differences in the existence of high-level predators as a component of the islands' ecosystems. High-level predators, such as carnivorous mammals and large-sized resident raptors, have not existed at all or been absent for a long period of time on Amami-Oshima Island, Tokunoshima Island and northern Okinawa Island of the Central Ryukyus. The biological communities, which contain a number of relict endemic species, have created a unique ecosystem topped by large-sized snakes, with animals having evolved in an adaptive way to the ecosystem. On the other hand, Iriomote Island of the South Ryukyus has Iriomote cats, the only carnivore in the nominated property. The scale of the Island's environment is considered to be too small to allow medium-sized carnivores to live for a long period of time, but it is observed the cats have evolved to adapt to such a small-scale island environment.

1) Central Ryukyus—Mammals, birds, and reptiles adapted to ecosystems without high-level predators and evolved in a unique way

On Amami-Oshima Island, Tokunoshima Island, and the northen part of Okinawa Island in the Central Ryukyus, the absence of carnivores and large raptors has helped habu vipers (*Protobothrops flavoviridis*), which grow up to about two meters long, and Ryukyu odd-tooth snakes (*Dinodon semicarinatum*) to establish themselves as the apex predators in the ecosystem by growing to the largest body size in their genus (Mori and Moriguchi 1988; Hamanaka et al. 2014). Nocturnal animals living on the ground, the Amami rabbit (endemic to Amami-Oshima Island and Tokunoshima Island) and three species of the spiny rats (endemic to Amami-Oshima Island, Tokunoshima Island, and northern part of Okinawa Island) are highly exposed to the risk of encountering a habu, but have adapted in a way to avoid such risk of the habu (Hattori, 2002). For example, Amami rabbits excavate a birthing burrow on a steep slope, and feed themselves and defecate feces in a rocky field or riverside with a good and wide view of surrounding areas. Spiny rats jump a vertical distance of approximately 50 centimetres to dodge an attack of a habu. Thanks to this ability, spiny rats are rarely included in habus' prey animals (Hattori 2002). On the other hand, Ryukyu odd-tooth snakes, a species that has a nocturnal habit similar to habus, rarely prey on mammals, as is the case with other species of the genus *Dinodon*. However, their stomach contents often consist of a variety of other reptiles (including habus) and birds (Mori and Moriguchi 1988; Hamanaka et al. 2014). Further, on sandy beaches on the northern part of Okinawa Island and peripheral remote islands, the Ryukyu odd-tooth snakes exhibit a distinctive behavior; they eat hatchlings and eggs of sea turtles that come up to the beach for oviposition. This quite exceptional conduct for a snake constitutes a part of the food web and material cycle that is unique to the islands (Mori et al. 1999; Sato 2015).

The Okinawa rail (*Gallirallus okinawae*), a species endemic to northern part of Okinawa Island, is considered to be almost flightless from an anatomical perspective in view of their wings' structure and muscles (Kuroda 1993; Kuroda 1995). In Okinawa Island, fossils of rails have been found in geological strata from ca. 18,500 years ago, indicating that these rails had shorter legs and might have had higher flight ability than modern Okinawa rails (Matsuoka 2000; Ozaki 2005). Considering the fact that the barred rail (*G. torquatus*), a relative species distributed in the Philippines and Indonesia, has flight ability, it is believed that ancestral species that flew to Okinawa Island from the south tens of thousands of years ago may have gradually acquired the ability to run on the ground and ultimately transformed themselves into the

current-day Okinawa rails (Matsuoka 2003; Ozaki 2005; Kirchman 2012). Factors that facilitated this process include the lack of indigenous carnivores on Okinawa Island who could have acted as a dominant predator, the diversisty of organisms in subtropical evergreen broadleaved forests, the abundance of small animals on the ground that can provide a prey, and other conditions that have made it possible to have enough food even for flightless birds (Ozaki 2005).

Ryukyu odd-tooth snake (*Dinodon semicarinatum*), one of the apex predators of the Central Ryukyus, including Amami-Oshima, Tokunoshima Islands and the northern part of Okinawa Island (Photo: Hidetoshi Ota)

The Okinawa woodpecker (*Sapheopipo noguchii*), a species endemic to northern part of Okinawa Island, flies down to the ground and digs arthropods lurking from the ground to feed their chicks (Kinjo 1997; Kotaka et al. 2006). There have been a number of reports concerning woodpeckers that have adapted to capture ants and forage on the ground. However, no woodpeckers other than the Okinawa woodpecker, have been reported to dig up and peck underground arthropods as their main diet. This is considered to be one of the most critical adaptive behaviours by the Okinawa woodpecker, which allowed the species to survive on the island with no carnivorous mammalian predators and only limited areas of forests (Kotaka et al. 2009, Kotaka 2011).

2) South Ryukyus—Ecosystem bounty that supports "world's smallest island with wildcats"

In general, the smaller the island's area, the smaller its food chain pyramid becomes and the lesser the number of high-level predators such as Carnivora (Holt, 2009). However, Iriomote Island in the South Ryukyus is home to Iriomote cats, the only Carnivora living in the nominated property. The island covers an area of only 28,961 ha, far smaller than overseas islands inhabited by related species belonging to the Felidae family (Imaizumi 1994) and too small for medium-sized carnivores to inhabit for a long period of time. In addition, while most of the similar-sized Felidae animals in the world prey on small rodents as their principal food supply (Watanabe and Izawa 2003; Nakanishi and Izawa 2015), the only rodent currently existing in Iriomote Island is an alien species of black rat.

Iriomote cat (*Prionailurus bengalensis iriomotensis*), the only Carnivora in the nominated propery (Photo: MOEJ)

Iriomote cats do feed on a limited number of mammals, such as the indigenous flying fox and black rat, as well as other animals in a variety of taxa, including birds, reptiles, amphibians, insects and crustaceans, according to the cycle of the seasons. So far, as many as approximately 80 species of prey animals have been identified (Nakanishi and Izawa 2015), indicating Iriomote cats' extremely wide variety of feeding habits compared to other species in the Felidae family (Sakaguchi and Ono 1994; Watanabe and Izawa 2003). Their frequently used feeding grounds include forest edges, lowlands, riverside, wetlands, and other water-rich areas that are abundant in small animals and rich in diversity among other locations on the island (Sakaguchi 1994; Watanabe et al. 2002). They also use mangrove forests, areas surrounding agricultural lands and coastal areas (Okinawa Prefecture 2006; Ministry of the Environment 2014). It is notable that, on Iriomote Island, there are eight species of frogs that have different breeding times and thereby can serve as a year-round source of prey for Iriomote cats. Another point is that the island's estimated annual average of biomass derived from frogs (11,460 g/ha) is much larger than those of Latin American tropical forests (781 g/ha to 1,150 g/ha) (Watanabe and Izawa 2005; Watanabe et al. 2005), providing an important source of food for Iriomote cats (Nakanishi and Izawa, 2016).

The factors that have allowed Iriomote cats to have an extremely extended range of habitat and source of preys and enabled them to adapt to the small-scale insular environment is considered that the existence of a wet and humid environment such as sub-tropical rainforests, highly-developed river systems, and back marsh at the mouth of those rivers provide habitats to the Island's abundant and diverse organisms.

2.a.5. Utilization of natural resources

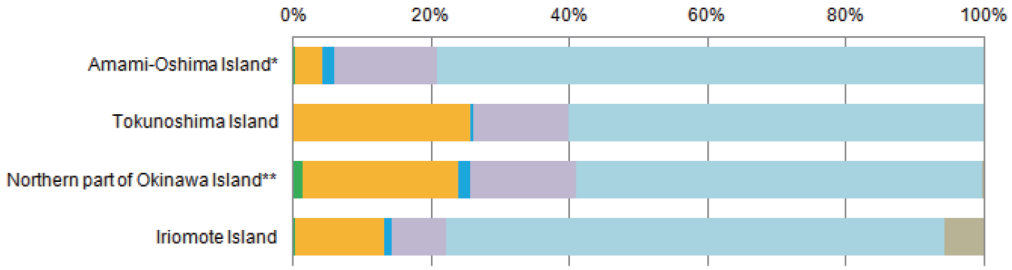
The four regions containing the nominated property are all inhabited. Table 2-33 below shows the numbers of residents.

Table 2-33: Populations and numbers of households in four regions containing the nominated property

Name of island (region)	Population	Number of households	Year of survey	Sources
Amami-Oshima Island*1	67,199	41,544	2016	1), 2)
Tokunoshima Island	24,741	12,738	2016	1)
Northern part of Okinawa Island*2	10,039	4,987	2016	1)
Iriomote Island	2,402	1,289	2016	3)

Sources: 1) Statistics Bureau, Ministry of Internal Affairs and Communications (2016); 2) Setouchi Town (2016); 3) Taketomi Town (2016)
*1: Excludes Kakeroma Island, Ukejima Island, and Yoro Island.
*2: Three villages: Kunigami Village, Ogimi Village, and Higashi Village

Figure 2-21 illustrates the number and percent distribution of the working population by industry in the four regions containing the nominated property. All of the four nominated islands (region) have a low percentage of workers in the primary industry relating to the use natural resources; i.e. 6.0% (1,661 people) for Amami-Oshima Island, 26.0% (2,865 people) for Tokunoshima Island, 25.5% (1,158 people) for northern part of Okinawa Island, and 14.3% (189 people) for Iriomote Island. In the primary industry, agriculture has the largest share of workers across all the islands. The overview of each of the agriculture, forestry, and fishery sectors is shown on the next item.



	Amami-Oshima Island*	Tokunoshima Island	Northern part of Okinawa Island**	Iriomote Island
Forestry	103	14	59	3
Agriculture	1,039	2,814	1,024	171
Fishery	519	37	75	15
Secondary Industry	4,096	1,521	696	105
Tertiary Industry	21,757	6,645	2,670	953
Others	0	0	11	77
Total	27,630	11,039	4,535	1,324

Figure 2-21: Rate of population by industry (above) and actual number (below) in the four regions containing the nominated property

Source: 2010 Census by the Bureau of Statistics, Ministry of Internal Affairs and Communications (employed person by age group, 15 years-old and over)

* Includes Kakeroma Island, Ukejima Island, and Yoro Island.

** Three Yambaru villages.

Sugar cane field (Photo: MOEJ)

2.a.5.1. Agriculture

Among the four regions containing the nominated property, Tokunoshima Island has a certain area of arable land in the flat land at the foot of the mountains located at the centre of the island. However, the other three regions have vast mountain areas and only limited areas for cultivation (Table 2-34).

Table 2-34: Arable land area of four regions including nominated property

	Island Area (ha)	Paddy field (ha)	Farmland (ha)	Total (ha)	Arable land (%)	Year
Amami-Oshima Island*	82,107	58	2,112	2,172	2.6	2015
Tokunoshima Island	24,785	2	6,880	6,882	27.8	2015
Northern part of Okinawa Island	34,023	16	1,355	1,371	4.0	2015
Iriomote Island	28,961	89	565	654	2.3	2010

Land area data for the islands and regions was collected from the Land Area by Island and the Land Area by Municipality sections of the 2015 Statistical Reports on the Land Area by Prefectures and Municipalities in Japan by the Geospatial Information Authority of Japan. The figure for northern part of Okinawa Island shows a total area of the three Yambaru villages.
Arable land area was calculated, based on the results of the cultivated acreage survey by Ministry of Agriculture, Forestry and Fisheries of Japan (2015) for Amami-Oshima Island, Tokunoshima Island and the northern part of Okinawa Island; and on FY2015 Yaeyama Digest by Okinawa Prefectural Government Yaeyama Office for Iriomote Island.

*: Amami-Oshima includes Kakeroma Island, Ukejima Island, Yoro Island and other peripheral islands.

2.a.5.2. Forestry

1) Amami-Oshima Island and Tokunoshima Island

Forest area of Amami Island Group accounts for 66% (81,177 ha) of the Island Group's total area (123,144 ha) (Oshima Branch Office, Kagoshima Prefecture 2014), and about 87% (70,510 ha) of the forest area is distributed on the Amami-Oshima Island and Tokunoshima Island including the nominated property. The rate of forest area to land area of Amami-Oshima Island and the Tokunoshima Island are about 84% and 44%, respectively. One of the characteristics of these forests is that most of them are privately-owned forests (about 70% and 58%, respectively) (Table 2-35).

Logging for timber production is not implemented within the nominated property. Forest operations in the buffer zones are allowed only within the scope authorized under the Natural Parks Act.

2) Northern part of Okinawa Island and Iriomote Island

Okinawa Island's forest area accounts for 46% (56,897 ha) of the Island's total area (124,363 ha) (Forests Management Division, Department of Agriculture, Forestry, and Fisheries, Okinawa Prefecture 2014), and about 60% (33,975 ha) of the forest area is distributed in the northern part of Okinawa Island containing the nominated property (three Yambaru villages). The forest area of three Yambaru villages accounts for about 91% of the total area. One of the characteristics of these forests is that most of them are municipal forests (31%) (Table 2-35).

Partly for historic reasons, forests in the three Yambaru villages including the nominated property have been used as the basis of the Okinawa Prefecture's forestry industry (see 2.b.). The Okinawa Prefecture developed the "Policy for the Promotion of the Yambaru Model Forestry," a policy for treating the forests of the three Yambaru villages, with the aim of promoting the Yambaru-type forest and forestry industries, which combines an environment-friendly sustainable forest management (SFM) system, the recirculating forest products usage via the life cycle and environment-conscious nature experience activities. Logging for timber production is not implemented within the nominated property. Forest operations in the buffer zones are allowed only within the scope authorized under the Natural Parks Act.

The Yaeyama Islands' forest area accounts for 62% (36,716 ha) of the Islands' total area (59,198 ha) (Forest Management Section, Department of Agriculture, Forestry, and Fisheries, Okinawa Prefecture 2014), and about 73% (26,696 ha) of the forest area is distributed on Iriomote Island. Iriomote Island has a forest area to land area rate of approximately 92%, and is characterised by the largest proportion of national forests (94%) (Table 2-35). Logging for timber production is not implemented either in the nominated property or buffer zones on Iriomote Island.

Table 2-35: Forest area by owner of four regions containing the nominated property (ha: upper) and breakdown (in the parentheses: lower)

	Area	Forest Area	Rate of Forest (%)	National Forest	Prefectural Forest	Municipal Forest	Privately-Owned Forest
Amami-Oshima Island	71,235	59,718	83.8	4,386 (7.3)	249 (0.4)	13,498 (22.6)	41,585 (69.6)
Tokunoshima Island	24,785	10,792	43.5	3,825 (35.4)	9 (0.1)	667 (6.2)	6,291 (58.3)
Northern part of Okinawa Island	34,023	30,789	90.5	10,946 (35.6)	3,885 (12.6)	9,465 (30.7)	6,494 (21.1)
Iriomote Island	28,961	26,696	92.2	24,970 (93.5)	1 (0.0)	689 (2.6)	1,036 (3.9)

Areas of the islands and regions were obtained from the Land Area by Island and the Land Area by Municipality sections of the 2015 Statistical Reports on the Land Area by Prefectures and Municipalities in Japan by the Geospatial Information Authority of Japan. The area of the northern part of Okinawa Island was obtained by aggregating the areas of the three Yambaru villages.
The forest land area by owner was calculated using forestry records for state-owned forests held by the Forestry Agency and the GIS and forestry records for prefectural, municipal, and privately-owned forests held by the Kagoshima and the Okinawa Prefectures.

Column 5. Highly resilient forest dominated by Castanopsis

The four regions containing the nominated property are high in biodiversity and essential as habitats to endemic species and rare species. On the other hand, on Amami-Oshima Island and in the north of Okinawa Island, local forest resources have been used for timber, fuel wood, etc, since old times, and a certain level of forestry operations are conducted around the nominated property. The reasons for the two islands having been successful in both conserving endemic/rare species and engaging in the forestry industry include the high regeneration ability of the forests dominated by Castanopsis, a tree species with a strong sprouting power (Hirata et al. 1979). For example, a study was conducted to examine the sprouting ability of Okinawa's Castanopsis forests. The following is a report about the recovery process of a forest located in a former logging site in the north of Okinawa Island (Osawa et al. 2003).

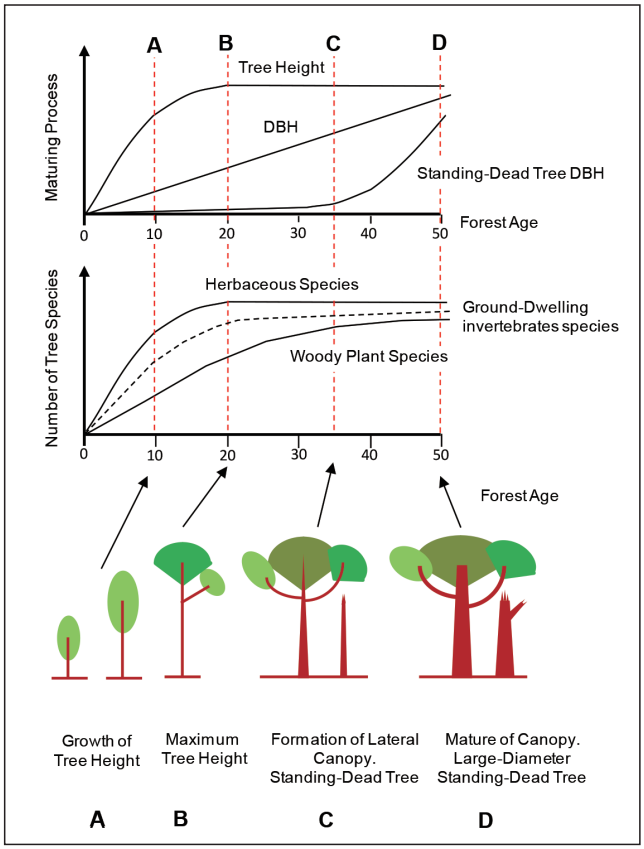


Figure 2-22: Regeneration Process and Structural Characteristics of Forests on Northern Okinawa Island (Osawa et al. 2003, partly modified)

Immediately after logging, pioneer broadleaved trees are dominant. Castanopsis appear from the 10th year and their height and stem diameter (diameter at breast height; DBH) increase year after year, up to around the 20th year since the deforestation (A and B in Figure 2-22).

Around the 20th to 30th year since the deforestation, the accumulated number of species constituting the forest canopy reaches the upper limit at 80 to 85. The broadleaved trees are replaced by new dominant species, such as Castanopsis, *Schima wallichii* ssp. *liukiuensis*, Japanese snowbell (*Styrax japonica*), and *Distylium racemosum*. While the tree height almost reaches the upper limit of 15 m, DBH (diameter at breast height: ca. 25 cm at this stage) continues to increase. This is the stage when the growth of DBH outperforms that of tree height (C in Figure 2-22).

Around the 35th year after the deforestation, the structure of the forest layers consisting of canopy, subcanopy, and understory trees becomes clearer. Castanopsis and other canopy trees stretch their lateral branches further, while increasing the stem diameter (at this stage, DBH reaches around 30 cm at the maximum). As a forest tree community enters an adjustment phase, small-diameter trees are thinned out, and a rapidly increasing number of standing-dead trees begin to stand out (C and D in Figure 2-22). At this stage, a forest becomes able to meet habitat requirements of certain endemic/rare species such as Okinawa woodpeckers, which need, for nest building, large-diameter (DBH ≥ 20 cm) and rotten-centre trees.

After 50 or more years have passed since deforestation, a forest has become composed of large-diameter trees with DBH of around 65 cm at the maximum, and there may be some changes in their physical structure, such as hollows and shoots arising from thick lateral branches. A forest structure diversifies further, and some of large diameter

trees having DBH of around 60 cm become snags (D in Figure 2-22). At this stage, a forest becomes able to meet habitat requirements of certain endemic/rare species such as Yanbaru long-armed scarab beetles, which need tree hollows that have a sufficient level of humic substances to feed their larvae.

Amami-Oshima Island's chinquapin forests always recover from logging and restore itself in a relatively short period of time. However, large-diameter trees need a longer span of time to recover, and approximately 80 years after a selective cutting and approximately 110 years after a complete cutting are required to return to a state similar to that of the original primary forest (Shimizu et al. 1988).

It should be noted that the rapid sprout regeneration and growth of underbrush help prevent sediment runoff and contribute to the smooth restoration of forest.

2.a.5.3. Fishery industry

1) Amami-Oshima Island and Tokunoshima Island

The Amami Island Group, which includes Amami-Oshima Island and Tokunoshima Island, is surrounded by coral reefs and a number of natural patch reefs in adjacent waters, forming generous fishing grounds. Types of fishery operated there include vessel-based fishery (hook-and-line fishing such as single-hook fishing, trawl fishing, longline fishing, and drop-line fishing), net fishery (lift net fishing, gill net fishing, etc.) and diving apparatus fishery. Production volume of the vessel-based fishery in the Amami Island Group in 2010 was 2,025 tons (Oshima Branch Office, Kagoshima Prefecture 2014). In addition, the mild climate and warm seawater temperature allow the breeding of aquaculture species such as fish, pearl oyster and Japanese tiger prawn. (Oshima Branch Office, Kagoshima Prefecture 2014). However, the Amami Island Group's fishery industry is characterised by its small scale, with fishing boats weighing less than 10 tons accounting for 97% (1,924 boats) of all fishing fleet, and private operators accounting for 96% (786 operators) of all fishery businesses (Oshima Branch Office, Kagoshima Prefecture 2014).

The Amami Island Group —in particular, Amami-Oshima Island—has varied and irregular coastlines. Therefore, a number of fishing ports and harbours are situated in coves. As of 2013, Amami-Oshima Island and Tokunoshima Island have 23 and 4 fishing ports, respectively (Oshima Branch Office, Kagoshima Prefecture, 2014), but none of them are located within the nominated property or buffer zone.

2) Northern part of Okinawa Island and Iriomote Island

The coastal areas of Okinawa Prefecture, including the nominated northern part of Okinawa Island and Iriomote Island, have expansive reef flats formed by highly developed coral reefs. The ocean floor topography along the areas is characterised by the narrow sea shelves, with the Ryukyu Trench being located on the east side of the reef flats and the Okinawa Trough being laid on the western side. Such characteristics of the ocean area have encouraged people to operate offshore fishery, including pole and line fishery targeting diadromous fish (e.g. tuna and bonito), fishery using floating fish rafts (Payaos), and drop-line squid fishery, as well as continental shelf and coral reef fishery, such as bottom angling and spearfishing using diving apparatus (Department of Agriculture, Forestry and Fisheries 2014a, b; Okinawa Prefecture 2014; Okinawa General Bureau, Cabinet Office, Government of Japan 2014).

Okinawa Prefecture's fishery industry is characterised by its small scale, with fishing boats weighing less than 10 tons accounting for 95% (2,787 boats) of all fishing fleet, and private operators accounting for 99% (2,583 operators) of all fishery businesses. However, various measures have been implemented to promote the fishery industry and establish the basis for fishery production since FY1972, immediately after the return of Okinawa to Japan. At the same time, the "Resource-Controlling Fishery" and "Cultivation-Centric Fishery" projects have been launched to develop aquacultural basis for mozuku (*Nemacystus decipiens*), Japanese tiger prawn, sea grape, and *Monostroma nitidum* (Department of Agriculture, Forestry and Fisheries a, b, Okinawa Prefecture 2014; Okinawa General Bureau, Cabinet Office, Government of Japan 2014). The production volume of Okinawa Prefecture's fishery industry in 2012 was 15,295 tons and 17,458 tons for marine fishery and marine aquaculture, respectively.

Catch landing (Photo: MOE)

As of 2014, Okinawa Prefecture had 88 fishing ports, including 7 ports located in the northern part of Okinawa Island (the three villages of Kunigami Village, Ogimi Village, and Higashi Village) and one port located in Iriomote Island (Department of Agriculture, Forestry and Fisheries 2014c, Okinawa Prefecture 2014), but none of them are located within the nominated property or buffer zone.

2.b. History and Development

2.b.1. History

The geological history of the nominated property is described in the preceding section 2.a.7.1. This section provides an overview of the history after the emergence of mankind.

The Ryukyu Chain was first populated by mankind in the Paleolithic, or 30,000 years ago, at the latest. Some ancient human bones of the Yamashita Cave Man, discovered in the Yamashita Cave located close to the Naha city center on Okinawa Island, were subjected to a dating process using specimens collected from the site. As a result, they were estimated to date back 32,000 to 37,000 years. An early human settlement estimated to be 30,000–35,000 years old was found in Sakitari-do, another cave located in the southern part of the Okinawa Island. The cave also contained the world's oldest fishhooks and other artifacts, illustrating that people who lived in the cave led a life well adapted to the insular and oceanic environment (Fujita et al. 2016). The bones of the Minatogawa People, unearthed in the southern part of the Okinawa Island, too, were dated through the radioactive carbon dating method and estimated to be 16,000 to 18,000 years old. Geologists say that the Minatogawa People are close to the Jomon people (about 16,500 to 2,300 years ago) in mainland Japan and the Neolithic people from southern China to northern Indochina. There was no earthenware excavated from the ruins, but the People seem to have been able to use fire. (Hokama 1986; Takara 1993; Asato and Doi 1999; Hayaishi 2011).

After the Paleolithic Age, there is a long span of time for which no records exist. In the Ryukyu Chain, the Shell Midden Period apparently started some 6,000 years ago, under the influence of the Jomon culture. The Shell Midden people are considered to have had the ability of using earthenware and ground stones. They seem to have followed a lifestyle similar to that of the Paleolithic Age, sourcing their food from the nature, including seafood from coral reefs and plants and animals from the land (Hokama 1986; Takara 1993). At least by the middle of the Shell Midden Period (some 3,000 years ago), groups of settlements had been established at many locations of the Ryukyu Chain (Asato and Doi 1999; Hayaishi 2011).

Certain studies on animal fossils (Matsuoka 2000; Nakamura and Ota 2015) and analyses of the number of tree species constituting an evergreen broadleaved forest, island area, and forest area (Hattori 2014) suggest that, up to around this Period, evergreen broadleaved forests had been better developed than today in locations other than the nominated property, including the central and southern parts of Okinawa Island, Miyako Island, and other Central and Southern Ryukyu islands. They also suggest that, while these evergreen broadleaved forests provided habitats to species commonly shared with the nominated property (northern part of Okinawa Island and Amami-Oshima Island)—such as mountain-stream frogs, Okinawa woodpeckers, Okinawa rails, Amami jays, and Amami thrushes, increasingly dynamic human activities had caused a significant change in the vegetation and the fauna at such locations.

On Okinawa Island, influential families, who obtained ruling power through battles during the 12th to the 16th centuries and played a role as a local lord, built castles called *Gusuku* for residential and defense purposes, based on the self-defensive rural settlements established during the 10th to the 12th centuries. This period is referred to as the "Gusuku Period". Later, mega-sized Gusukus started to be built, and the Ryukyu Kingdom was established in 1429 (Government of Japan 1996). These Gusukus constitute the Cultural World Heritage, "Gusuku Sites and Related Properties of the Kingdom of Ryukyu." Incidentally, this cultural heritage does not have any overlap with the nominated property.

The Ryukyu Kingdom placed Amami-Oshima Island and Tokunoshima Island under its control by 1447 A.D., and Iriomote Island by 1500 A.D. However, in the 1600s, the Amami Island Group was separated from the Kingdom and belonged to the Satsuma Domain (current Kagoshima and Miyazaki Prefectures).

From 1944 to 1945, Okinawa Island became a World War II battlefield. After the war, the Amami Island Group and Okinawa Prefecture were placed under the administrative authority of the US military. It was in 1953 when the administrative rights were returned to the Amami Island Group and in 1972 to Okinawa Prefecture (Government of Japan 1996; Oshima Branch Office, Kagoshima Prefecture 2014). In 1953, when the US military had the administrative authority, the United States Civil Administration of the Ryukyu Islands promulgated the "Land Acquisition Procedure" and seized land in the main areas of the prefecture to construct military bases. As a result, as of 1972, the area of the US military installations located within the prefecture was as large as 28,660.8 ha, or approximately 12% of the prefecture's land area (Military Base Affairs Division, Executive Office of the Governor, Okinawa Prefecture, 2016).

The US military bases in Okinawa Prefecture have reduced approximately 34% since the prefecture's return to Japan. As of December 2016, the US military bases within Okinawa Prefecture cover an area of 18,822 ha, which accounts for 8% of the prefecture's total area. In particular, the US military installations in Kunigami Village and Higashi Village, located in the northern part of Okinawa Island containing the nominated property, occupy an area of 1,446 ha (7% of the village's land) and 2,267 ha (28% of the village's land), respectively. Much of the areas, or 3,658 ha, is used for the Camp Gonsalves (also known as Northern Training Area).

After the return of the Amami Island Group to Japan, a series of projects for reconstruction, growth, promotion, and development were launched for the area under special measures acts and plans based thereon, in light of its historical background and the gap with the mainland arising from its geographical and natural constraints (Table 2-36). Also in Okinawa Prefecture, promotion, development and growth projects were undertaken in accordance with special measures acts and plans based thereon in light of its historical background, the gap with the mainland arising from its geographical and natural constraints, as well as its societal circumstances, including the concentration of the US military installations.

As a result of recent legal revisions, the responsibility to develop promotion and development plans was transferred from the central government to the two prefectural governments, and relevant local municipalities developed plans on their own initiative with the participation of local residents (Okinawa Prefecture 2012; Kagoshima Prefecture 2014). These plans explicitly states their commitment to engaging in various measures designed to properly conserve and make the best use of the natural environment so that the value of the property as a natural World Heritage candidate will be preserved for the future. These plans have accomplished certain results in facilitating tourism promotion and exchange activities designed to achieve a shift to self-sustaining development while conserving the local natural environment and respecting traditional culture.

Nakama River, Iriomote Island (Photo: MOEJ)

Table 2-36: History of Special Measures Acts in Amami Island Group and Okinawa Prefecture

	Amami Island Group (Kagoshima Pref.)		Okinawa Pref.	
	Amami-Oshima Island	Tokunoshima Island	Northern part of Okinawa Island	Iriomote Island
1953	Amami Island Group returned to Japan		–	
1954	Act on Special Measures concerning the Reconstruction of the Amami Island Group (The Act has been amended and extended about every five years.)		–	
1964	Act on Special Measures concerning the Promotion of the Amami Island Group (renamed)		–	
1971	–		Act on Special Measures concerning the Promotion and Development of Okinawa (The Act has been amended and extended about every five years.)	
1972	–		Okinawa Prefecture returned to Japan	
1974	Act on Special Measures concerning the Promotion and Development of the Amami Island Group (renamed)		–	
2002	–		Act on Special Measures for the Promotion of Okinawa (renamed)	

"Sinugu" ceremony in Ada Village of northern part of Okinawa Island. One of the traditional events derived from local people's deep involvement in nature (see Column 6) (Photo: MOEJ)

Column 6. Local residents' traditional view of nature and landscape

The forests of the nominated property include only small areas of pure primeval sub-tropical rainforests, and most of them have been exposed to a certain level of human interference since old times. Still, they provide nurseries and habitats for a number of highly-endemic, rare species of plants and animals. The factors making this possible are local residents' recognition about nature and landscape, which they have fostered, over a long period of time, by making use of natural resources including endemic plants and animals in their daily life, their way of interacting with nature based on the recognition, and their lifestyle and culture they have developed therefrom and handed over from generation to generation (Environment Agency 1999; Kagoshima Prefecture 2003; Kagoshima University 2013).

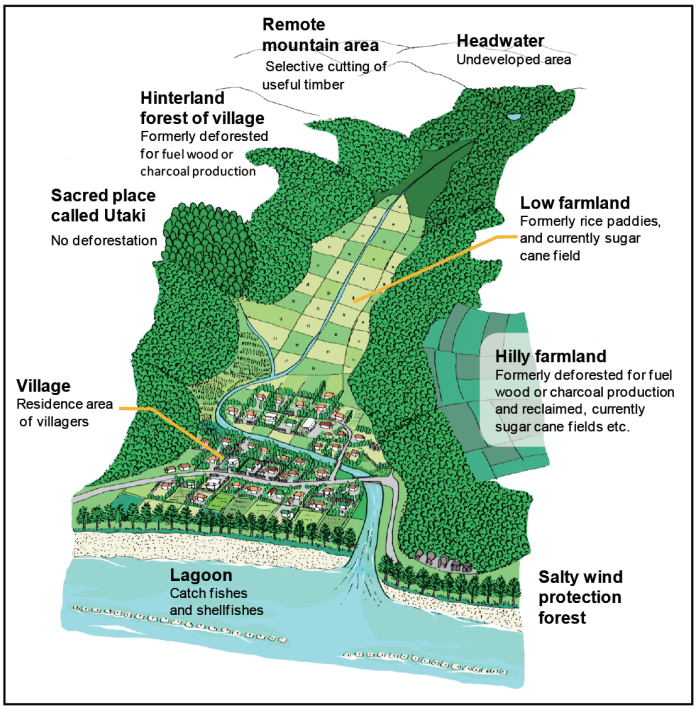


Figure 2-23: Schematic view of northern part of Okinawa Island's village and use of lands
Source: Nago City History Compilation Committee (1988)

Traditionally, people on the Central and South Ryukyus led their life in a close relationship with the surrounding nature. Their villages were unable to be separated from the sea and surrounding mountains in the sense that a village served as the basis of villagers' activities. They caught fish and shellfish in the sea in front of the village, washed things and caught Tanaga (a dialect of Tenaga-ebi, or freshwater prawn), cultivated land in the fields and mountains behind the village, and collected firewood and lumber therefrom as a way of living.

People believed that, beyond the sea, there was a paradise where gods lived (called by different names depending on the region, such as Neriya-Kanaya, Nirai Kanai, Ryugu, etc.), and the gods brought fertility and disaster to the people. During the age of the Ryukyu Kingdom, the "Noro" system was established. A Noro (which means a priestess) was in charge of performing rituals, farming rites and annual events to welcome gods and send them back. Various types of events and performing arts that are presumed to have been created in that era remain as the village's tradition, although they have been simplified and affected by the phenomenon of depopulation associated with the ageing of the local population and the declining number of young people. These traditional events and arts constitute the culture that is deeply rooted in the natural environment and is still prevalent.

In addition, religious beliefs have also influenced the structure of villages. For example, in the northern part of Okinawa Island, it was believed that gods, after welcomed by a Noro, would descend to a mountain, and then come down to the village along the mountain's ridge line. With such a belief, people imagined a sacred space composed of a Kami-yama (the mountain to which gods descend), Kami-michi (the road through which gods come to their village), and Myah (an open space located at the village centre to perform rituals) and formed a space (landscape) of their village as an integral part of the ocean in front of it and mountains behind it. A village faces the sea along the axis of a water system, and is separated from neighbouring villages by mountain ridges. Within the village, there are stone walls made of coral limestone and windbreak hedges made of Fukugi trees, which have been maintained

to protect houses from typhoons and tidewater damage (Figure 2-23). These traditional village landscapes are relatively well preserved in the north of Okinawa Island.

A village's lands have been used rationally for diffrent purposes, divided into the cultivation area, the fuel wood area, the building materials are, and the undeveloped remote headwaters area, which were placed in a concentric circle centred on the village. Such land use is based on a space concept focused on the protection of headwater areas. People who were engaged in forestry work designated the "day of the god of mountains" to express their gratitude to mountain gods, and observed the custom of staying away from mountains on the day. Such taboos and rules were designed to control access to a sacred domain, and created myths about encounters with holy spirits (called by different names depending on the region, such as Kenmun, Kijimunah, Bunagaya, etc.) and gods of mountains, as well as the existence of divine spaces. These myths have been handed down and protected among villagers in a variety of forms.

In this way, on the Central and South Ryukyus, people recognize that all the surrounding mountains, forests, and the sea are part of their sphere of life and this natural environment plays an integral role in their lives.

2.b.2. History of major industries

2.b.2.1. Agriculture

1) Amami-Oshima Island and Tokunoshima Island

The municipalities of the Amami Island Group, including Amami-Oshima Island and Tokunoshima Island of the nominated property, implemented land improvement projects during both the prewar and the postwar periods, mainly with the aim of improving paddy fields and promoting rice cultivation. As of 1953, when the Amami Island Group was returned to Japan, the arable land area of the Island Group as a whole was 16,376 ha, which was not enough to provide stable agricultural production. In order to improve the poor land conditions swiftly and ensure the stability of farm management, municipalities carried out the development of agricultural infrastructure through reconstruction and promotion projects from 1954 onward. The paddy field area was reduced from 4,252 ha in 1963 to 87 ha in 1998 for such factors as the special measure projects designed to convert paddies into dry fields, ageing of farmers, reversion of paddy fields to wild land due to lack of successors. On the contrary, dry fields cover 16,800 ha, accounting for 99.4% of the total cultivated land. Currently, the main crop of the Island Group is sugar cane. Cultivation of vegetables, flowers, and fruits is also carried out in addition to animal husbandry (Oshima Branch Office, Kagoshima Prefecture 2014).

2) Okinawa Island and Iriomote Island

The arable land area across Okinawa Prefecture was 45,940 ha as of 1972, the year when the prefecture was returned to Japan. Arable land continued to decrease up until 1977 due to the influence of land conversion associated with the Okinawa Ocean Expo and the buying up of land by businesses. However, from 1978 onward, the arable land area began to increase owing to government-subsidised farmland/grassland development projects and the buying back of farmland lost through the buying up, before reaching a post-return high of 47,100 ha in 1992. However, after that, the arable land area continued to decrease, affected by the increasingly severe agricultural environment surrounding Okinawa Prefecture, such as import liberalization of canned pineapples and pineapple juice, and increased abandonment of cultivated land by aged farmers. As a result, the arable land area diminished to 38,900 ha in 2012. By land type, paddy fields decreased by 65% (1,590 ha) from 2,440 ha in

1972 to 851 ha in 2012. Similarly, dry fields decreased by 12% (5,400ha) from 43,500 ha to 38,100 ha. What is to be noted here is that pasture land increased by 1,260% (5,500 ha), while fruit tree orchards decreased by 65% (3,800 ha) (Okinawa General Bureau, Cabinet Office, Government of Japan 2012).

2.b.2.2. Forestry

In the Central and South Ryukyus, firewood has long been used in daily life, and for the production of salt, sugar, and dried bonito, etc. Also, timber, railroad ties, and charcoals for shipment have been produced from forests. In recent years, construction materials such as structural materials for buildings and laminated woods, as well as wood chips for muchroom production and livestock raisingare are the main forest products.

Castanopsis (*Castanopsis sieboldii*), which characterizes the region's subtropical rainforest, has a great capacity for sprouting and regeneration, and enables to balance forestry with conservation of landscapes and biodiversity (See Column 5: Resilient forest dominated by Castanopsis).

1) Amami-Oshima and Tokunoshima Islands

As the government took measures in line with its promotion plan to develop industry and social infrastructure in the Amami Island Group, following their reversion to Japan in 1953. Part of Amami-Oshima and Tokunoshima Islands was deforested to develop farmland and construct dams and roads. At the same time, forestry was developed primarily in prirvate forests in Amami-Oshima Island. Wood chips have been produced since the 1960s, leveraging natural regeneration of evergreen broadleaved trees, which takes place on a 35- to 45-year cycle. The timber production, however, has decreased by one half (about 0.1 million m^3) after peaking (about 0.2 million m^3) in the early 1970s, with no logging conducted on a large scale since the mid-1990s (Yoneda 2016).

Agriculture has long been an important industry in Tokunoshima Island, where forest resources are used in the daily life of local communities. With no industrial forestry, main forest products still constitute a major part of the island's forestry production. Timber production has dropped to almost one twentieth in recent years, from approximately 8,400 m^3 in the early 1970's (Shinohara 1975) to current 480 m^3. Moreover, forestry production today is mostly limited to main forest products. Therefore, most of the highland forests in the nominated region are maintained in good condition (Kyushu Regional Forest Office, Forestry Agency 2010).

2) Okinawa and Iriomote Island

The government took measures in line with its promotion plan to develop industry and social infrastructure in Okinawa Prefecture as well, following its reversion to Japan in 1972. As a result, part of Okinawa Island was also deforested to develop farmland and construct dams and roads. On the other hand, prefectural and municipal forests played a key role in developing forestry, with raising of seedling and afforestation done in parallel with logging and timber production. In fact, the forests in the northern part of Okinawa Island have recovered from the devastation in the postwar reconstruction period and are in better condition than ever before (Forest and Greenery Division, Agriculture, Forestry and Fisheries Department, Okinawa Prefecture 2013).

Iriomote Island, where malaria was once rampant, although it is now declared malaria-free, had long been unsuitable for settlement, which inhibited its development. For the most part, forest resources are used in the

daily life of local communities. With no industrial forestry, Iriomote Island remains largely intact with rich natural surroundings (Marusugi 1994, Kagoshima University 2013).

Column 7. *Somayama* system

In the 18th century, the Ryukyu Kingdom Government introduced the *Somayama* system through establishment of forest policy regulations regarding forest management and use. The government was also engaged in the protection, fostering, and recovery of forests in the northern part of Okinawa Island.

The *Somayama* system was intended to allow local residents to undertake the management of government-owned lands, and at the same time use the lands to a certain extent (Forest and Greenery Division, Department of Agriculture, Forestry and Fisheries, Okinawa Prefecture 2013). Furthermore, the government redrew boundaries between administrative districts to allocate forests and mountains to each district (Miwa 2011), established management rules and limitations as well as penalties for violations, developed hierarchical monitoring system, and implemented various systems including the "Mountain Game," in which villages competed with each other for forestry business performance (Nakama 1984). The government also provided a wide range of technical guidance concerning forest management. It has been confirmed that in the northern part of Okinawa Island, these systems had been maintained in a self-sustaining way almost up until the return of Okinawa Prefecture to Japan in 1972. It is believed that local communities had used and made necessary changes to these systems and practices to better manage their own resources (Miwa 2011).

Flowers of *Castanopsis sieboldii* (Photo: MOEJ)

Riparian forest, Tokunoshima Island (Photo: MOEJ)

3

Justification for Inscription

Mountain stream of the Okuma River, the northern part of Okinawa Island (Photo: MOEJ)

3. Justification for Inscription

3.1.a. Brief synthesis

The nominated property comprises four regions, Amami-Oshima Island, Tokunoshima Island, the northern part of Okinawa Island in Central Ryukyus; and Iriomote Island in South Ryukyus. The four islands containing the nominated property are members of the Ryukyu Chain at the southern tip of the Japanese Archipelago aligned in an arc shape along the eastern rim of the Eurasian Continent. The nominated property is a terrestrial site covering 37,946 ha located between 24°20′ and 28°19′ north latitudes. Influenced by the Kuroshio Current and the Ogasawara High (subtropical high cell) that sits over the west part of north Pacific Ocean, it has a warm and humid subtropical climate and is covered mainly with evergreen broadleaved subtropical rainforests.

The Ryukyu Chain as it exists today is believed to have been formed through the formation and expansion of the Okinawa Trough and associated tectonic uplift and subsidence caused by subduction of the Philippine Sea plate beneath the Eurasian plate at the Ryukyu Trench that occurred since the middle Miocene (Neogene, approx. 15 Ma) of the Cenozoic, combined with changes in sea level due to climate change during the early Pleistocene (Quaternary, approx. 2 to 1.7 Ma) and deposition of Ryukyu limestone associated with the development of coral reefs (see 2.a.3.1. Geological history: Figure 2-16).

As the archipelago was separated from the Eurasian Continent by Okinawa Trough, the biota of the North Ryukyus, the Central Ryukyus and the South Ryukyus developed in isolation from each other by deep straits that run between the islands and by the Kuroshio Current. Some neighboring islands became connected and separated repeatedly according to fluctuations in the sea level. These changes in the distribution of land and water provided unique opportunities for speciation and endemism to the terrestrial creatures of the Central and South Ryukyus in which the nominated property is included. Moreover, the terrestrial biotas of the Central and South Ryukyus show different patterns of speciation and endemism stemming from the difference in the distance and timing of separation from the continent. As a result of diverse speciation across a wide variety of taxonomic groups, an exceptionally large number of endemic species and subspecies can be observed in the nominated property.

The nominated property is home to 1,808 vascular plant species (including subspecies, varieties, and hybrids), 22 terrestrial mammal species, 394 bird species, 36 reptile species, 21 amphibian species, 267 inland water fish species, 6,148 insect species and 47 freshwater decapod crustacean species, including 88 threatened species listed on the IUCN Red List (2016). It can be well said that the site provides an irreplaceable natural habitat for these creatures and for in-situ conservation of biological diversity.

Reflecting its geological history as a continental island group with a long history of isolation, the nominated property presents outstanding examples representing on-going processes of speciation of various endemic species/subspecies and valuable natural environment including habitats of many internationally recognized threatened species as well as endemic species.

3.1.b. Criteria under which inscription is proposed

Criterion (ix)

The Central and South Ryukyus which include the nominated property have given rise to numerous endemic species through speciation in various evolutionary lineages that occurred alongside the geological processes of separation from the continent and repeated joining and separation among the islands. In the Central Ryukyus, which were separated from the continent around the late Miocene (Neogene, approx. 11 to 5 Ma), relict endemic species, whose related species cannot be found in the neighboring regions, still survive on the islands. The South Ryukyus, which separated from Taiwan and the continent during the Pliocene (approx. 5 to 2.6 Ma), have many endemic species/subspecies with the most closely related species distributed in Taiwan and the continent. The nominated property is an outstanding example clearly representing unique processes of speciation and diversification of evolutionary lineages reflecting its geological history.

The Ryukyu Chain was part of the Eurasian Continent at its eastern rim until the middle Miocene (Neogene, approx. 15 Ma) and thus the terrestrial biota of this area was common with that of the neighboring parts of the continent. Later, as it became separated from the continent and formed an archipelago of small islands through the development of Okinawa Trough and two deep ocean gaps, the terrestrial creatures that then inhabited the islands became isolated from the other pieces of land, thereby segmenting their distribution and driving unique processes of evolution.

Those processes are particularly evident in non-flying terrestrial vertebrates that have low dispersal capacity and cannot easily cross the ocean gaps. Among them, many relict endemic species can be seen in the Central Ryukyus. Relict endemic species are the descendants of ancient species that have survived on the islands isolated by ocean gaps, while their conspecifics and related species and lineages that used to inhabit the neighboring areas have been driven extinct by predators or fierce competition on the continent. Relict endemic species generally have large genetic differences with their related species and lineages that inhabit other areas and are characteristically distributed in discontinuous areas. Representative examples of relict endemic species in the nominated property include monospecific Amami rabbit (*Pentalagus furnessi*) that occurs only on Amami-Oshima and Tokunoshima Islands (see 2.a.3.2.: Column 2); Amami jay (*Garrulus lidthi*) on Amami-Oshima Island; Ryukyu black-breasted leaf turtle (*Geoemyda japonica*) and Namie's frog (*Limnonectes namiyei*) in the northen part of Okinawa Island; and Ryukyu long-haired rat (*Diplothrix legata*) and Anderson's crocodile newt (*Echinotriton andersoni*) distributed on nominated three islands. There are also plant relict endemic species such as *Arisaema heterocephalum* (Araceae)*, Viola amamiana* (Violaceae), *Polystichum obae* (Dryopteridaceae) and *Platanthera sonoharae* (Orchidaceae).

The Central Ryukyus also offers examples of relict species that have speciated into different species or subspecies now endemic to individual islands. One example is the spiny rats which separated into a different endemic species on each of Amami-Oshima Island, Tokunoshima Island and Okinawa Island (see 2.a.3.2.: Column 3). Another example is the species group of Ryukyu ground gecko which separated into different endemic species and subspecies in each of Tokunoshima Island, Okinawa Island (which are both included in the nominated property) and the surrounding islands. On the other hand, there are no relict endemic species in the South

Ryukyus, but instead, many endemic species and subspecies closely related to those in Taiwan and the continent can be found, showing evidence of speciation between neighboring islands. Many species of this kind are seen in Iriomote Island. Speciation between populations that inhabit different islands is still ongoing to this date. As a result of genetic differentiation caused by isolation into different geographic populations through the geological formation of the islands, various examples of speciation and endemic species/subspecies specific to each individual island can be seen across the Central and South Ryukyus. A typical example is the group of tip-nosed frogs, that have speciated into five different species in the area from the Amami Island Group to Taiwan (see 2.a.3.2; Column 4). Among them, four species are seen in the nominated property. Other examples of diverse speciation involving various animals from invertebrates to mammals as well as plants are abundant in the nominated property.

Reflecting these biological processes, the rate of endemic species is remarkably high in the terrestrial mammals, terrestrial reptiles, amphibians and Japanese freshwater crabs (Potamidae) (a type of inland decapod crustacean) of the nominated property. Among terrestrial mammals, 13 (18, hereinafter figures in parentheses include subspecies) out of 22 (23) native species are endemic to Central and/or South Ryukyus, meaning that the endemic rate is 59% (78%). Likewise, 23 (33) out of 36 (38) native terrestrial reptile species are endemic, meaning an endemic rate of 64% (87%); 18 (19) out of 21 (22) native amphibian species are endemic, meaning an endemic rate of 86% (86%); and all the 14 Japanese freshwater crab species are endemic meaning that the endemic rate is 100%. As for the flora, 950–1,300 vascular plant species (including subspecies, varieties and hybrids) grow in each of the four regions containing the nominated property, and of these, a total of 180 species are endemic.

Based on these facts, the nominated property is recognized as an important and significant area for in-situ conservation of biological diversity from a global perspective as follows;

1) Birdlife International has identified “Nansei Shoto” (islands lying between Kyushu and Taiwan including the nominated property) as one of the “Endemic Bird Areas of the World” in consideration of the fact that the area is home to various endemic bird species like Okinawa rail (*Gallirallus okinawae*) and Amami woodcock (*Scolopax mira*).

2) WWF has identified the forest ecosystems of the Nansei-Shoto Islands including the nominated property as “Nansei Shoto Archipelago Forests” ecoregion, one of the Global 200: Priority Ecoregions for Global Conservation.

3) Conservation International has identified the Japanese archipelago as a Biodiversity Hotspot with a particular mention for the numerous endemic species that inhabit the nominated property.

The Central and South Ryukyus respectively show different processes of speciation, and by considering the different processes together from a larger perspective, we will be able to understand the whole picture of the ongoing speciation and phylogenetic differentiation reflecting the geological history of the entire Ryukyu Chain. This will in turn lead to deepened understanding of the diverse speciation processes that take place on the continental islands not only in East Asia but in the world. The nominated property can thus be deemed as one of

the best natural laboratories in the world for studying the formation history of continental islands and biological evolution processes therein. The details of the formation history and the precise age of each island have yet to be elucidated, but research areas such as phylogeography, geology and palaeontology are being actively pursued at the moment. It is expected that the whole picture will be revealed in the future by accumulating and comprehensively integrating findings from the latest studies.

Criterion (x)

The nominated property provides important and significant natural habitats for many globally threatened species listed on the IUCN Red List. It also provides irreplaceable habitats for relict and new endemic species, such as the diverse examples seen among non-flying lineages dependent on the inland water environment. Typical examples are the amphibians which have very limited chances of dispersing across the sea due to physiological reasons, thereby reflecting the property's geological formation processes as a continental island group. The nominated property is recognized as an important area for in-situ conservation of biological diversity from a global perspective.

More specifically, the nominated property provides important and irreplaceable natural habitats for numerous terrestrial creatures, including 88 threatened species on the IUCN Red List of which 70 species (80%) are endemic species. For example: Iriomote cat (*Prionailurus bengalensis iriomotensis*) (classified as CR in IUCN Red List 2016, "IUCN Red List 2016" omitted hereunder); Amami rabbit (EN); Okinawa spiny rat (*Tokudaia muenninki*) (CR); Amami spiny rat (*Tokudaia osimensis*) (EN); Tokunoshima spiny rat (*Tokudaia tokunoshimensis*) (EN); Ryukyu long-haired rat (EN); Okinawa rail (EN); Okinawa woodpecker (*Sapheopipo noguchii*) (CR); Amami jay (VU); Ryukyu black-breasted leaf turtle (EN); Yaeyama yellow-margined box turtle (*Cuora flavomarginata evelynae*) (EN); Kuroiwa's ground gecko (EN); Anderson's crocodile newt (EN); Okinawa Ishikawa's frog (*Odorrana ishikawae*) (EN); Amami Ishikawa's frog (*Odorrana splendida*) (EN); Utsunomiya's tip-nosed frog (*Odorrana utsunomiyaorum*) (EN); Ryukyu ayu-fish (*Plecoglossus altivelis ryukyuensis*) (EN); Yanbaru long-armed scarab beetle (*Cheirotonus jambar*) (EN); an endemic dragonfly (*Chlorogomphus brunneus brunneus*) (EN); 11 species of wild gingers (*Asarum*, Aristolochiaceae) (3 CRs, 6 ENs, 2 VUs); and two species of the plants of genus *Arisaema* (Araceae) (1 CR and 1 EN).

Among the species listed above, Okinawa rail is one of the 19 non-flying species of the rail family that still remains in the world to date. Iriomote cat is a wildcat that only inhabits Iriomote Island. It has the smallest distribution in the world among species of the Felidae family. Five mammal species, three bird species, three amphibian species have been identified from the nominated property as Evolutionarily Distinct and Globally Endangered (EDGE) species by the Zoological Society of London. Of these, the Amami rabbit and Okinawa spiny rat are ranked (Amami rabbit: 42nd, Okinawa spiny rat: 48th) in the Top 100 EDGE Species given the highest priority for conservation among all mammals (Zoological Society of London, http://www.edgeofexistence.org/species/).

The biological composition of the area, particularly the flora and insects of the nominated property make up a characteristic biota displaying a mixture of elements of East Asia, Southeast Asia and Oceania. This biota reflects the subtropical climatic conditions, the history of separation from the continent and past climate changes

(glacial-interglacial periods), the history of diverse dispersion mediated by the Kuroshio Current and migratory birds, and the geographical position of the islands in a biogeographic transition zone. In particular, the flora of the nominated property is extremely diverse with 950 to 1,300 species of vascular plants on each of the four regions within the nominated property. Despite the four regions having a land area of less than 1 % of the total national land of Japan, approximately 19% of threatened vascular plant species in Japan inhabit the area. Therefore, the area is recognized as one of the most important areas for conservation of threatened plant species in Japan. Likewise, more than 1,000 to 3,000 insect species inhabit each of the four regions containing the nominated property, representing about 10% of threatened insect species in Japan.

In addition, the nominated property is internationally recognized as a global conservation priority as follows;

1) Alliance for Zero Extinction (AZE) has identified Tokunoshima Island (as a habitat of the Tokunoshima spiny rat) and the northern part of Okinawa Island (as habitats of the Okinawa spiny rat, Okinawa rail, Okinawa woodpecker, Okinawa tip-nosed frog and Namie's frog) as AZE sites for conservation priorities.

2) Birdlife International has identified the three areas of Amami Islands, Yambaru–northern Okinawa forest and Yaeyama Islands (all three overlapping the nominated property) as Important Bird Areas (IBA). IBAs are chosen on the basis of occurrence of key bird species that are vulnerable to global extinction or whose populations are otherwise irreplaceable including important stopover points or wintering spots for migratory birds.

3) Based on above identification as AZE and IBA sites, Conservation International advocates the designation of Amami Islands, Yambaru and Yaeyama Islands, all including the nominated property, as Key Biodiversity Areas (KBA) (Natori et al. 2012).

As demonstrated above, the nominated property is a globally unique area and home to many threatened and endemic species, containing extremely important natural habitats for in-situ conservation of biological diversity.

Arisaema heterocephalum var. *majus* (Photo: Shosaku Hattori)

3.1.c. Statement of integrity

As described below, the nominated property includes all the elements necessary to express its Outstanding Universal Value as a serial nomination, is of adequate size to ensure the complete representation of its biodiversity values, and does not suffer from adverse effects of development or neglect. As such, it satisfies the conditions of integrity for inscription on the World Heritage List, as described in Paragraphs 87–95 of the Operational Guidelines.

3.1.c.1. Scope of the nominated property

This is a serial nomination under criteria (ix) and (x). The nominated property comprises four regions: Amami-Oshima Island and Tokunoshima Island which belong to the Amami Island Group of the Central Ryukyus, the northern part of Okinawa Island which belongs to the Okinawa Island Group of the Central Ryukyus, and Iriomote Island which belongs to the Sakishima Island Group of the South Ryukyus. It does not include the North Ryukyus which, separated by the Tokara Strait, belong to a considerably different biogeographic region from the rest of the Ryukyu Chain.

The key values of the nominated property lie in that it presents outstanding examples of distinct and unique processes of biological evolution and speciation that are different between the Central and South Ryukyus. This is due to: the difference in the period of separation from the continent (reflecting the geological history of the Ryukyu); and its important and significant habitats for many endemic and threatened species that have evolved through the above mentioned processes. By including both the Central and South Ryukyus (each with rather different characteristics), and by selecting the four regions of Amami-Oshima Island, Tokunoshima Island, the northern part of Okinawa Island and Iriomote Island that have abundant endemic and threatened species and concentration of typical species demonstrating the outstanding universal value of the property, it helps comprehensive understanding of the diverse patterns and processes of speciation that take place on continental islands (see Table 2-32 for the speciation patterns and typical species of each island). As such, all the elements of the property are complementary to one another and if any of the four regions were to be omitted, it would be impossible to understand the whole picture of the ongoing evolutionary and ecological processes or conserve the biodiversity of the area.

The four regions containing the nominated property are large in size among the numerous islands of the Central and South Ryukyus and are inhabited by approximately 90% of the native species including the largest number of endemic species and threatened species (Table 3-1 and Figure 3-1). These islands consist of mountains and hills with relatively high altitudes, meaning that rivers and streams are well developed, and the subtropical rainforests, which are the main habitats for endemic or endangered species, exist in relatively large clusters. Some parts of these rainforests have been affected by human activities in the past, but have recovered to an almost natural state, thanks to the vigorous germination capacity of the dominant species, *Castanopsis sieboldii*. They provide habitats to rare species.

Each component of the nominated property is located at the core of the subtropical rainforest, and encompasses a wide variety of environments including: non-limestone areas from the Mesozoic/Cenozoic and limestone areas from the Palaeozoic/Mesozoic; cloud forests at the top of the mountains; mountains/hills with intricate mazes of small ridges, valleys and rivers; and lowland wetlands around river mouths. It contains habitats of about 90% of

all the endemic species of vascular plants, terrestrial mammals, birds, reptiles, amphibians, inland fish, insects and inland water decapod crustaceans and over 90% of threatened species on the IUCN Red List 2016 that inhabit the Central and South Ryukyus. It also contains extremely important areas where 20% of all threatened plant species in Japan (listed on MOEJ-Red List 2015) are concentrated.

Liparis viridiflora (Photo: JWRC)

Table3-1: Number and rate of indigenous, endemic, and endangered species in the Central and South Ryukyus

	Number of indigenous species			Number of endemic species			Number of endangered species (IUCN-RL)		
	Central & South Ryukyus	Four islands	Proportion of four islands (%)	Central & South Ryukyus	four islands	Proportion of four islands (%)	Central & South Ryukyus	Four islands	Proportion of four islands (%)
Terrestrial mammals	24	22	92	14	13	93	10*	10	100
Birds	469	394	84	4	4	100	12	12	100
Terrestrial reptiles	46	36	78	29	23	79	7	5	71
Amphibians	22	21	95	18	18	100	12	12	100
Inland water fishes	268	267	99.6	13	13	100	6*	6	100
Insects	6,780	6,148	91	1,844	1,602	87	20*	19	95
Inland water decapod crustaceans	61	47	76	27	15	56	2	0	0
Vascular plants*	2,059	1,808	88	207	185	90	27	24	88
Total	9,729	8,743	90	2,156	1,873	87	96	88	92

* : including subspecies, varieties, and hybrids

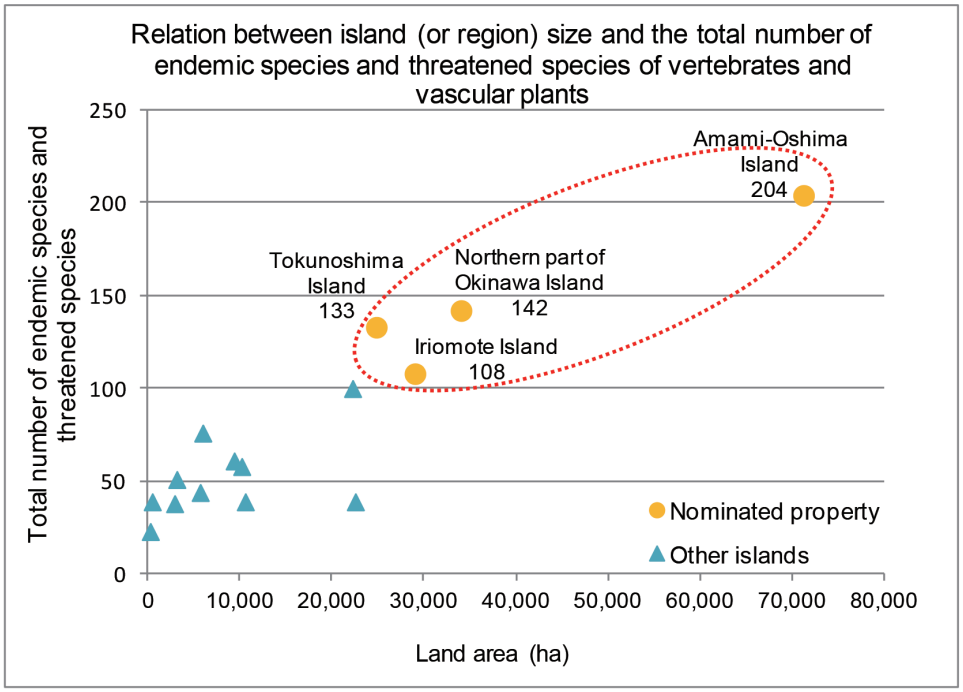


Figure 3-1: Comparison of area and the total number of endemic species and threatened species among islands (except for Okinawa Island which shows only northern part of the island) in the Central and South Ryukyus.
The symbols mark the total number of endemic species and threatened species (on IUCN Red List) of vertebrates and vascular plants.

3.1.c.2. Controlling threats to integrity of the property

Key threats to the biodiversity of the nominated property include: the impact of alien species such as small Indian mongoose and cats; traffic accidents; and the illegal collection of wild species. While there is some impact from these threats, the risks are prevented or mitigated through the following measures implemented through collaboration between related administrative organs and civilian organizations (see 4.a.2 for details).

- Small Indian mongoose control projects on Amami-Oshima Island and the northern part of Okinawa Island.
- Ordinances regulating the safe keeping and management of pet cats and measures to control feral cats in habitats of rare species (in forests) on the four islands.
- Designation of protected species based on laws and ordinances, and monitoring/patrols to control illegal harvesting on the four islands.

The four regions, namely Amami-Oshima Island, Tokunoshima Island, the northern part of Okinawa Island and Iriomote Island, are rather small islands containing human inhabitants. Residents have settled down on these islands for generations, engaging in agriculture and forestry as the islands' main industries. Tourism such as eco-tours has also become a major industry in recent years. Some of the endemic and threatened species of the nominated property, such as Iriomote cat, Amami jay, Okinawa rail and Okinawa woodpecker, appear not only in the nominated areas (which are the main habitats for them) but also in the surrounding secondary forests and farmlands. Therefore, the secondary natural environment surrounding the nominated property will be managed as buffer zones. In the buffer zone, industrial activities will be carried out using sustainable methods so as to avoid direct impact on the nominated property, aiming to balance the conservation of the World Heritage property and residents' livelihood (see Chapter 5 for details).

3.1.d. Statement of authenticity

Not applicable because this nomination does not claim cultural values.

3.1.e. Protection and management requirements

The nominated property is appropriately managed based on relevant Acts and regulations. The area is designated as Special Protection Zone and Class I Special Zone of National Park of Amami Gunto National Park, Yambaru National Park, and Iriomote-Ishigaki National Park; and Presearvation Zones of Forest Ecosystem Reserve of Amami Gunto Forest Ecosystem Reserve and Iriomote Forest Ecosystem Reserve. In addition, it is designaged as National Wildlife Protection Area and Natural Monument Protectioin Area (Table 3-2) (See Chapter 5 for details). The nominated property is thereby protected by the highest-ranked strict protection measures in the Japanese system, and ensured of long-term appropriate protection. Moreover, most parts of the four region of the nominated property are national, prefectural or municipal lands owned and managed by a public body (national or local government). Although Amami Gunto National Park currently includes some private lands, these will gradually be transitioned to public ownership. The four islands containing the nominated property are inhabited by people, and the places for residents' lives and industrial activities are close to habitats for endemic species and rare species. To carefully protect the property and enable the coexistence with people's livelihoods, buffer zones were set up mainly in the Class II Special Zone of the National Park and Conservation and Utilization Zone of the Forest Ecosystem Reserve, adjacent to the nominated property.

Many of the endemic threatened species that inhabit the nominated property, including the Amami rabbit, Okinawa rail and Iriomote cat are designated as National Endangered Species of Wild Fauna and Flora or National Natural Monuments, and are subject to legal protection. In addition, monitoring is conducted as part of the protection and recovery program of the National Endangered Species and the program for controlling mongoose.

The nominated property is a serial property covered by multiple legal protection schemes. The administrative organs responsible for each scheme have established the "Regional Liaison Committee for Natural World Heritage Nominated Property". They are managing the nominated property in a consistent manner based on "Comprehensive Management Plan for Natural World Heritage Nominated Property." In addition, four sub-local meetings have been set up under the Regional Liaison Committee to effectively carry out conservation and management of the nominated property through collaboration and cooperation with the local stakeholders. The "Scientific Committee for World Heritage Nominated Property" comprised of academic experts and "Local Working Groups" have been established to provide scientific advice to the Regional Liaison Committee and promote adaptive conservation and management in light of scientific knowledge and insight (Figure 3-2).

Evergreen broadleaved forest, Northern part of Okinawa Island (Photo: MOEJ)

Table 3-2: Protection and safeguarding measures of the nominated property

	Designation for protection
Amami-Oshima Island	Amami Gunto National Park Mt. Yuwandake National Wildlife Protection Area Amami Gunto Forest Ecosystem Reserve Kamiya and Mt. Yuwandake Natural Monument
Tokunoshima Island	Amami Gunto National Park Amami Gunto Forest Ecosystem Reserve
Northern part of Okinawa Island	Yambaru National Park Yambaru National Wildlife Protection Area Mt. Yonahadake Natural Monument Protection Area
Iriomote Island	Iriomote-Ishigaki National Park Iriomote National Wildlife Protection Area Iriomote Forest Ecosystem Reserve Nakama River Natural Monument Protection Area Natural Monument: Ubundul *Satakentia liukiuensis* community

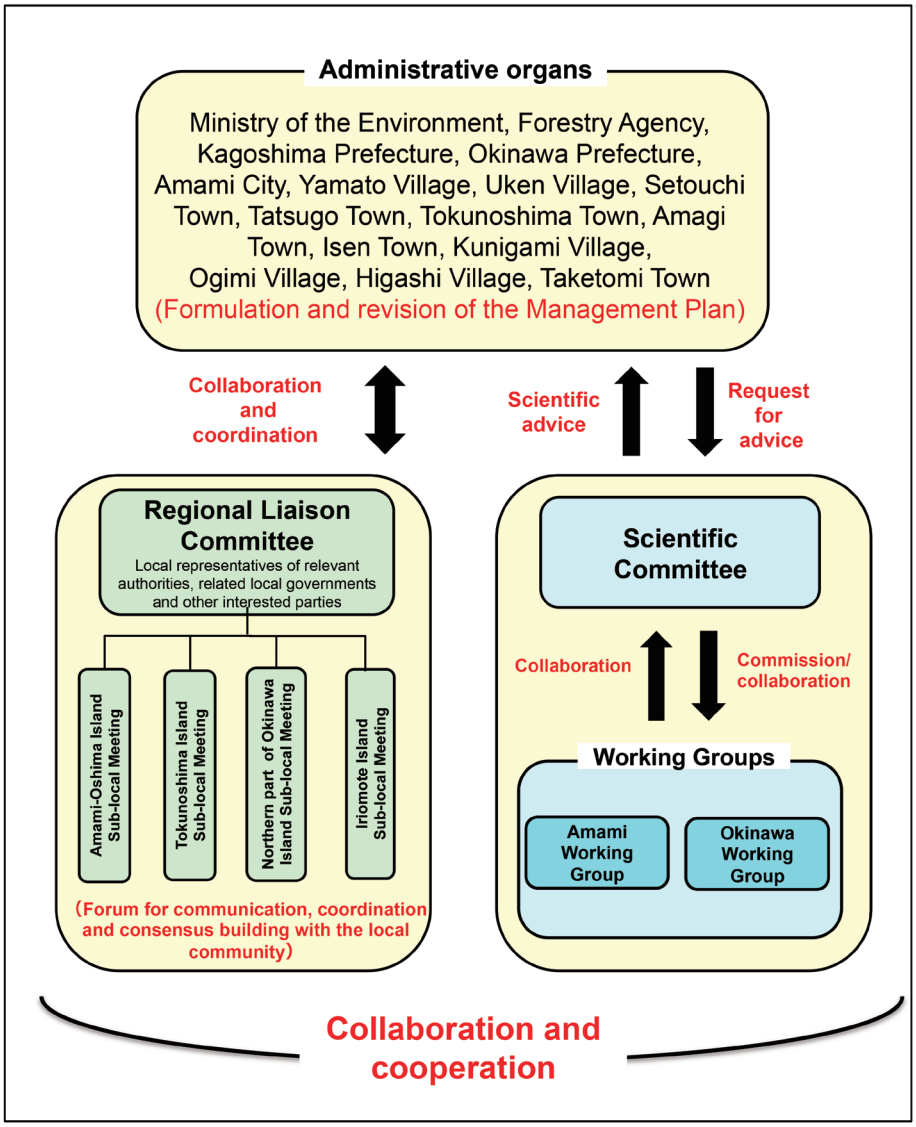


Figure 3-2: Management system of the nominated property

3.2. Comparative Analysis

A comparative analysis is conducted between the nominated property and existing World Heritage properties that are similar to the nominated property. Comparative properties are indicated in Figure 3-3.

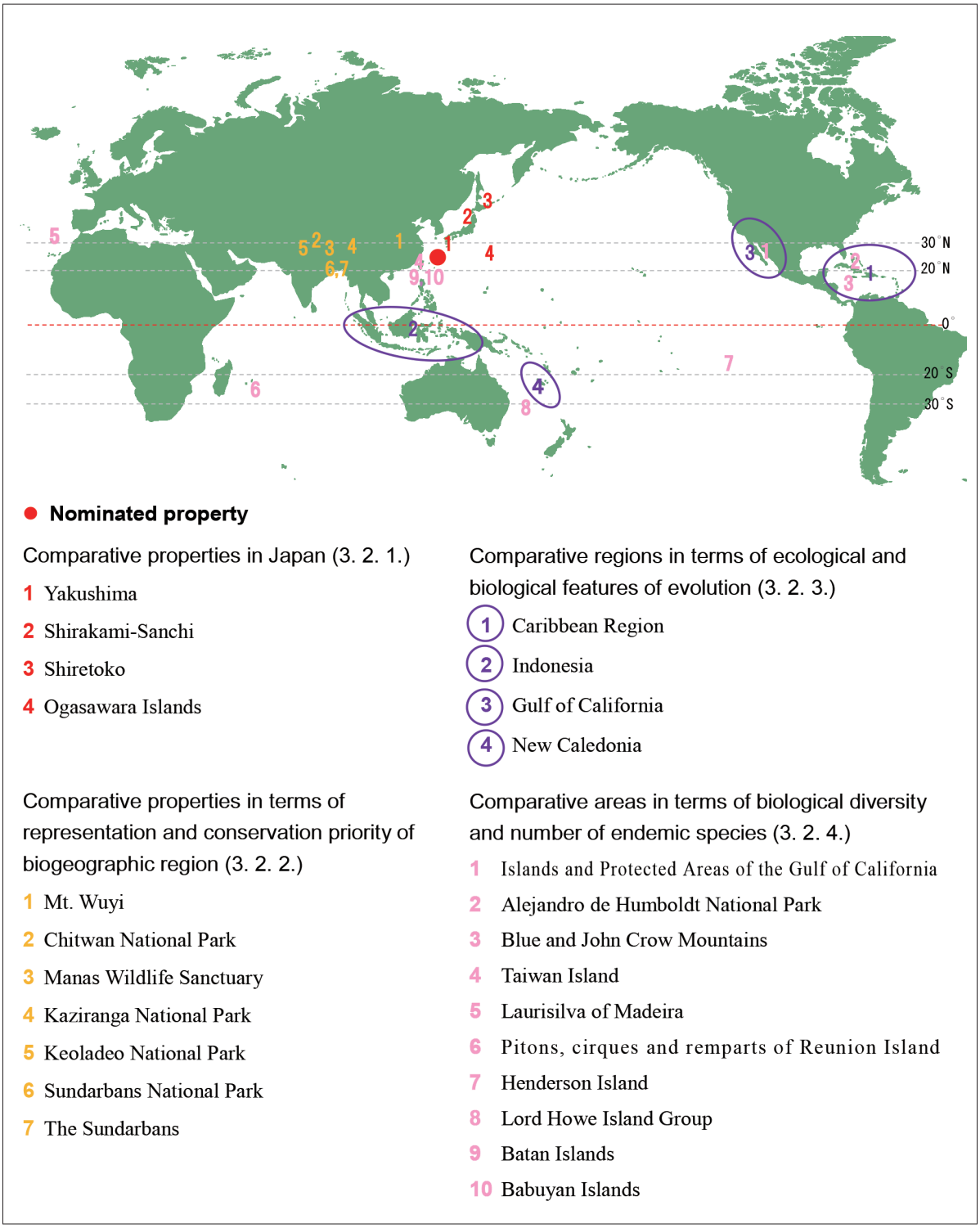


Figure 3-3: Distribution of comparative properties covered in the comparative analysis

3.2.1. Comparison within Japan

1) Yakushima

Among the islands of the Ryukyu Chain (including the nominated property), Yakushima (part of the North Ryukyus) is already inscribed on the World Heritage List under criteria (vii) and (ix). It is considered that, by the late Miocene (approximately 11.6 to 5.3 Ma), the biota of Yakushima Island had already been separated from that of the Central Ryukyus by the Tokara Strait which is over 1,000 m in depth (Okamoto 2017). On the other hand, the strait between Kyushu and Yakushima Island is only around 100 m deep, and it is thought that Yakushima Island became connected with mainland Kyushu during the last glacial period which occurred about 20 thousand years ago, when the sea surface declined by 120 to 140 m (Kaizuka and Naruse 1977; Tsukada 1983). Therefore, the biota of Yakushima Island has a strong relation with Kyushu and other parts of mainland Japan, and represents a subset of the biota of Kyushu. The terrestrial biota of the nominated property clearly differs from that of Yakushima Island in North Ryukyu divided by the Tokara Strait. From a regional biogeographic perspective, the Watase Line, which coincides with the Tokara Strait, has been proposed as a boundary between the Palearctic and Indomalayan zones for the distribution of mammals, reptiles, and amphibians (Tokuda 1969).

The Outstanding Universal Value of Yakushima lies in that a distinct vertical distribution pattern in the vegetation and biotic communities of the island (from the subtropical zone along the coast to the subarctic zone on the mountain tops) and in the stunning natural scenery dominated by huge and ancient specimens of Yakusugi (Japanese cedar, *Cryptomeria japonica*) which are several thousand years old. These biodiversity features and natural phenomena are quite different from the values of the nominated property.

According to the Udvardy's biogeographic classification system (1975) which was based on Numata (1969), the Amami Island Group and the Okinawa Island Group are classified as "Ryukyu Islands province of Palaearctic Realm, of the mixed island system biome" whereas Yakushima Island is classified under "Japanese evergreen forest province of Palaearctic Realm, biome of subtropical and temperate rain forests or woodlands (2.2.2)." This means that although they fall under the same realm, the province and biome are different. However, there are various theories concerning the biogeographic classification of the Amami and Okinawa Island Groups. The terrestrial vertebrate fauna of the Amami and Okinawa Island Groups are considered of southern origin (the Indomalayan Realm) suggesting that the biogeographic classification may also be different from that of Yakushima Island at the realm level (Ota 2009). Meanwhile, when categorizing the area based on the concept of terrestrial ecoregion (Olson et al. 2001), the entire Ryukyu Chain including Yakushima Island is classified in the Indomalayan Realm based on its flora (Miyawaki 1975).

2) Ogasawara Islands

The Ogasawara Islands, which are another island group in the subtropical region in Japan with a unique endemic biota and ecosystem, are also inscribed on the World Heritage List under criterion (ix). They are in a relatively dry subtropical island chain belonging to "Micronesia province of Oceanian Realm, biome of mixed island system (5.2.13)" according to the Udvardy's biogeographic classification (1975), differing in realm and province from the nominated property which has a different set of climatic conditions and ecosystems.

The Ogasawara Islands were inscribed on the basis of the Outstanding Universal Value of the process of biological evolution on oceanic islands, particularly the significant and ongoing ecological process of speciation through adaptive radiation in land snails and plants. While the nominated property is similar to the Ogasawara Islands in that it represents ongoing speciation processes on the islands, it differentiates itself from the Ogasawara Islands by excellent examples of speciation resulting from vicariance, with endemic species (both relict and new) reflecting the geological history of continental islands. Moreover, it represents ecological processes different from those of the Ogasawara Islands, particularly its high biological diversity due to its humid climate and its geological evolution as a group of continental islands.

3) Comparison of the number of species with other natural World Heritage sites in Japan

The nominated property is home to one of the largest number of species in Japan including endemic and endangered species (see Table 2-6). Comparing the number of resident species with the existing four Natural World Heritage properties, the nominated property has the second largest number of plant species next to Yakushima and terrestrial mammals next to Shiretoko, and the largest number of species of other taxonomic groups, demonstrating its biological diversity (Table 3-3).

Table 3-3: Comparison of the number of species inhabiting Natural Heritage properties in Japan

Name of property	Udvardy's biogeographic classification	Area (ha)	Criteria	Vascular plants	Terrestrial mammals	Birds	Reptiles	Amphibians	Inland water fish	Insects
Nominated property	2.41.31 4.27.13	37,946	(ix, x)	1,808	22	394	36	21	267	6,148
Yakushima	2.2.2	10,747	vii, ix	> 1,900	16	150	15	8	–	1,900
Shirakami-Sanchi	2.15.6	16,971	ix	> 500	14	84	7	9	–	> 2,000
Shiretoko	2.14.5	71,100	ix, x	817	35	264	7	3	42	2,500
Ogasawara Islands	5.2.13	7,939	ix	441	1	195	2	0	40	1,380

* Information on existing heritage properties is based on relevant nomination documents.

3.2.2. Biogeographical representativity and conservation priority

According to the biogeographic classification by Udvardy (1975), Amami-Oshima Island, Tokunoshima Island and the northern part of Okinawa Island are included in the "Ryukyu Islands Province of Palaearctic Realm, biome of mixed island system (2.41.13)" while Iriomote Island belongs to "Taiwan province of Indomalayan Realm, biome of mixed island system (4.27.13)." There are no inscribed World Heritage properties or properties included in the Tentative List in these provinces at present (Table 3-4).

Table 3-4: Biogeographic representativeness

	Nominated property	Existing World Heritage properties in the same region	Properties on the Tentative List assumed to be in the same region
Udvardy's biogeographic classification (province)	・Ryukyu Islands (2.41.13) ・Taiwan (4.27.13)	・None	・None
Terrestrial realm - system (Olson et al. 2001)	・Indo-Malayan Realm Tropical and subtropical moist broadleaved forests *	・Mt. Wuyi ・Chitwan National Park ・Manas Wildlife Sanctuary ・Kaziranga National Park ・Keoladeo National Park ・Sundarbans National Park ・The Sundarbans	
Terrestrial ecoregion (Olson et al. 2001)	・East Asia: Nansei-Shoto (Ryukyu) Islands in the south of Japan	・None	・None

* Since there are many existing World Heritage properties in this system, those properties in the same latitude region (at latitude 20°N to 30°N) listed under criteria (ix) and/or (x) are listed here.

According to a classification based on terrestrial ecoregion (Olson et al. 2001), the entire Ryukyu Chain is classified as a unique ecoregion named "Nansei Shoto" belonging to the Indo-Malayan Realm (Table 3-4). Areas classified as tropical and subtropical moist broadleaved forests of the Indo-Malayan Realm are distributed across India, Southeast Asia and China, but when narrowed down to the subtropical portion (latitude 20°N to 30°N), there are seven existing World Heritage properties listed under biodiversity criteria (ix) and/or (x) as listed in Table 3-4, all of which are located in the Eurasian Continent and none on islands.

When comparing the main vegetation and number of species components against these seven existing World Heritage properties, the nominated property shows the distinct characteristics of an island ecological system (Table 3-5). While subtropical moist evergreen broadleaved forests dominate Mt. Wuyi, similar to the nominated property, Mt. Wuyi is a continental inland site encompassing a wide area and difference of elevation with a large number of resident species inhabiting the area including large carnivores such as leopards. The other properties consist of semi-evergreen forests, a mixture of tropical/subtropical deciduous forests and grasslands and savannas, or mangrove wetlands, where large mammals like rhinoceros, tigers and elephants commonly inhabit. In contrast, the nominated property has an ecological system dominated by subtropical moist evergreen broadleaved forests mainly inhabited by small and medium-sized endemic mammals such as Amami Rabbit (*Pentalagus furnessi*), Ryukyu long-haired rat (*Diplothrix legata*) and genus *Tokudaia*, lacking any apex predator

carnivores other than the Iriomote cat (*Prionailurus bengalensis iriomotensis*) on Iriomote Island.

Table 3-5: Comparison of main vegetation and number of resident species against existing World Heritage properties in the same latitude in "tropical and subtropical moist broadleaved forests systems" of Indo-Malayan Realm*

Name of property	Nation	Area (ha)	Criteria	Main vegetation	Vascular plants	Terrestrial mammals	Birds	Terrestrial reptiles	Amphi-bians	Inland water fish	Insects
Nominated property	Japan	37,946	(ix, x)	Subtropical moist evergreen broadleaved forest	1,808	22	394	36	21	267	6,148
Mt. Wuyi	China	99,975	vii, x	Subtropical moist evergreen broadleaved forest	2,888	71	256	73	35	40	4,635
Chitwan National Park	Nepal	93,200	vii, ix, x	Subtropical deciduous forest, wet grassland	–	56	565	47	–	126	–
Manas Wildlife Sanctuary	India	39,100	vii, ix, x	Semi-evergreen forest, moist and dry mixed deciduous forest, wet grassland	513	55	450	50	3	–	–
Kaziranga National Park	India	42,996	ix, x	Wet grassland, savanna woodland, tropical moist deciduous forest, semi-evergreen mixed forest	–	35	> 300	–	–	–	–
Keoladeo National Park	India	2,873	x	Tropical dry deciduous forest, dry grassland and savanna	350	29	375	25	7	50	–
Sundarbans National Park	India	133,010	ix, x	Mangrove wetland	334	49	315	53	8	400	–
The Sundarbans	Bangladesh	139,500	ix, x	Mangrove wetland	334	49	315	53	8	400	–

* Source of vegetation and species information on existing heritage properties: UNEP-WCMC (2016) World Heritage Information Sheets. Sections marked "–" indicate that data on the number of resident species was not available.

The nominated property has also been selected among the Global 200 Ecoregions and Endemic Bird Areas as areas to be prioritized for global conservation (Table 3-6).

Ryukyu long-haired rat *(Diplothrix legata)*
(Photo: MOEJ)

Table 3-6: The nominated property and the global conservation priorities

Priority areas classification	Nominated property	Exisiting World Heritage properties in the same priority area	Properties on Tentative List assumed to be in the same priority area
Terrestrial hotspots	・Japan	・Yakushima ・Ogasawara Islands ・Shirakami-Sanchi ・Shiretoko	・None
High Biodiversity Wilderness Areas	Not applicable	–	–
The Global 200: Priority Ecoregions - Terrestrial Realm (Olson and Dinerstein 2002)	・32 Nansei Shoto Archipelago Forests	・Yakushima	・None
The Global 200: Priority Ecoregions - Freshwater Realm (Olson and Dinerstein 2002)	Not applicable	–	–
The Global 200: Priority Ecoregions - Marine Realm (Olson and Dinerstein 2002)	Not applicable (217 Nansei Shoto (Tropical Coral))	–	–
Global Priorities for Marine Biodiversity Conservation (Selig et al. 2014)	Not applicable (Japan (EEZ))	・(Shiretoko) ・(Ogasawara Islands)	–
EBA (Endemic Bird Areas of the World)	・148 Nansei Shoto	・Yakushima	・None
Centers of Plant Diversity	Not applicable	–	–

The nominated property have been identified as priority areas for conservation, including Alliance for Zero Extinction (AZE) sites and Important Bird Areas (IBA) (Table 3-7).

Table 3-7: The nominated property in the context of site-scale global conservation priorities

	Nominated property
AZE sites	Tokunoshima Island, Yambaru
KBAs other than AZE sites: IBA, etc.	IBA JP158 Amami islands IBA JP159 Yambaru, northern Okinawa forest IBA JP166 Yaeyama islands

3.2.3. Comparison of ecological and biological features of evolution

Comparison was also tried between the nominated property and other regions of the world representing ongoing speciation processes reflecting the geological history of islands. Other such regions of the world are considered to be the Caribbean Region, Indonesia, Gulf of California and New Caledonia.

1) Caribbean Region

The Caribbean Islands are an arc of continental islands formed on the boundaries of three tectonic plates, the North American Plate, Caribbean Plate and South American Plate. The region has a unique ecological system and rich biodiversity that evolved in association with the geological formation process of the islands. Particularly, reptiles and amphibians inhabiting these islands are highly specific to the region, with 494 (95%) out of 520 reptile species and all of 189 amphibian species being endemic to the islands, indicating a large scale example of adaptive radiation (Critical Ecosystem Partnership Fund 2010). While the above described characteristics of the

Caribbean Islands are very much similar to the biological invasion, isolation and speciation processes of continental islands claimed for the nominated property, there is ongoing academic debate about the relation between the formation of the island arc and biological invasion and isolation of the Caribbean Islands, because new findings have been reported that suggest the possibility of dispersed distribution that may have occurred across the sea in a more recent period (middle Eocene (37–49 Ma) or later) than can be inferred from geological history (Heinicke et. al. 2007; Ricklefs and Bermingham 2008).

On the other hand, the nominated property can be characterized by a simpler and well-studied model of geological formation and biological evolution, given the north-south linear alignment of the island arc and the Kuroshio Current that ensures the surrounding waters flow in the same direction. Therefore the nominated property can present the geological formation and biological evolution of an island arc in a scientific and specific way.

Existing World Heritage properties in the Caribbean Region inscribed under criterion (ix) include Alejandro de Humboldt National Park (Cuba, criteria (ix) and (x)). This property was inscribed for its size, altitude range, landform diversity, and complex lithology that gave rise to its diverse ecosystems and biodiversity. It provided a safe haven for flora and fauna of the Caribbean Region during the glacial age from Miocene to Pleistocene and served as the center of the subsequent biological distribution and evolution. The site is considered as an area showing one of the world's highest plant endemism richness, with more than 70% of the flora endemic to the area. One of the factors behind this high endemism rate is the unique ongoing adaptive evolution of plant species and plant associations. Many of the underlying rocks are toxic to plants, so species have had to adapt to survive in these hostile conditions (UNEP-WCMC 2012). However, this is a different evolutionary process from the endemism and speciation of species associated with the geological island formation claimed for the nominated property.

Of the three Caribbean properties listed on the Tentative List of the World Heritage claiming for criterion (ix), Tobago Main Ridge Forest Reserve (Trinidad and Tobago) suggests as its outstanding universal value, endemism associated with the geological history of the island. First born as a volcanic island, Tobago was once joined to the South American continent and separated from it some one million years ago, more recently than the nominated property. The other nominated properties consist of mangrove wetlands and coastal ecosystems. They do not present their Outstanding Universal Value as the ecological process of speciation that occurred in association with isolation from the continent and the process of repeated separation and joining of the islands which yielded many endemic species including relict ones as in the case of the nominated property.

2) Indonesia

Indonesia is comprised of numerous islands spreading 5,000 km east to west in the tropical region of Southeast Asia and Oceania, and is rich in biodiversity. Its biota has been formed through the process of isolation and speciation associated with geological interaction between continents and nearby islands. Many of Indonesia's islands were joined to the continent during the Pleistocene glacial period, meaning that its history of geographic isolation and speciation is relatively young. In western Indonesia, Sumatra, Java, Borneo and other islands located on the Sunda Continental Shelf used to be connected to the Malay Peninsula, thereby having a biota common to the Eurasian Continent. Likewise, New Guinea Island in eastern Indonesia, located on Sahul

Continental Shelf, was connected to Australia while the sea levels fell in the glacial period, allowing it to share a common biota with Australia. Sulawesi and Lesser Sunda Islands in central Indonesia were the only islands that stayed isolated even during the glacial period, because they are not located on any continental shelf.

Currently, there are four existing natural World Heritage properties in Indonesia, and the Tropical Rainforest Heritage of Sumatra and Lorentz National Park are the ones inscribed under criterion (ix).

Of these two, the Tropical Rainforest Heritage of Sumatra is a serial property comprising three national parks on Sumatra Island inscribed under criteria (vii), (ix) and (x). It is highly valued for its critical importance for the conservation of lowland and montane tropical rainforests rich in endemic species and biodiversity. One factor that gave rise to the highly endemic biota of this area is said to have been the process of formation of land bridges and barriers between Sumatra and the Eurasian Continent due to changes in sea level during the Pleistocene glacial period. In the case of the nominated property, the separation from the continent due to plate movements occurred from late Miocene to Pliocene in the Tertiary Period, and the isolation of the site's biota happened much earlier than Sumatra and followed a different process.

Lorentz National Park is located in western New Guinea Island. It includes a glacier-covered mountain range nearly 5,000 m high, formed by tectonic plate collision. The flora and fauna of the high altitude area are highly endemic. These endemic species, such as the ancient plants of Gondwanaland (e.g., Nothofagaceae), were isolated in the high altitude area of the tropics as refugia during the warmer interglacial periods that occurred intermittently until the most recent glacial period. Their isolation were also affected by the ongoing orogenic movements. This represents a different process from that of the nominated property.

3) Gulf of California

Like the nominated property, the Islands and Protected Areas of the Gulf of California (Mexico, criteria (vii), (ix) and (x)) is located in the subtropical latitude zone and is a serial property comprising over 200 islands in nine protected area clusters. The Outstanding Universal Value of this property lies in that it contains ecologically distinct "bridge islands," populated across past land bridges created during the Pleistocene glacial period when sea levels were low, and "oceanic islands" populated by sea and air.This represents a different evolutionary and ecological process from the endemism and speciation of species associated with the continental island formation claimed for the nominated property. In addition, the depth and distance of the sea that lies between the islands of the Gulf of California and the North American Continent is shallow and short. The bridge islands were populated across land bridges mainly during the Pleistocene glacial period when sea levels were low, meaning that its history of isolation of species on the islands started some 150 thousand years ago, relatively recent in age. The islands experienced waves of invasion by predators and competing species while the land bridges were formed, so the ancient lineages of species could not persist to form endemic species. In addition, the climate of the area falls under the desert type, largely different from the humid rainforests of the nominated property.

4) New Caledonia

The Lagoons of New Caledonia: Reef Diversity and Associated Ecosystems (France, criteria (vii), (ix) and (x)) feature an exceptional diversity of coral and fish species and a continuum of habitats from mangroves to seagrasses with the world's most diverse concentration of reef structures. The lagoons display intact ecosystems, with healthy populations of large predators, and a great number and diversity of big fish. They provide habitat to a number of emblematic or threatened marine species such as turtles, whales or dugongs whose population here is the third largest in the world. Their outstanding universal values as described above are all related to the coastal and sea areas, whereas the outstanding universal values of the nominated property are based on the terrestrial ecosystems and biological evolutionary processes.

Taking a look at the genesis of the Islands of New Caledonia and their terrestrial biota, they were formed from part of the Gondwanaland that separated 80 Ma. They have never become connected with a continent ever since. Therefore the terrestrial biota of the islands is of extremely old origin and has been formed through a very unique and isolated path of biological evolution, resulting in numerous examples of endemic and endangered species. However, no native mammals or amphibians inhabit the Islands of New Caledonia except bats that can fly as in the case of oceanic islands, and geological studies suggest the possibility that the islands may have submerged under sea level multiple times and for extended periods of time in the past (Trewick et al. 2007). Moreover, molecular phylogenetic studies of several taxonomic groups (reptiles, beetles, etc.) suggest that the speciation of those species occurred rather recently (Grandcolas et al. 2008). Based on these findings, it has been proposed that the Islands of New Caledonia should be considered as extremely old "Darwinian islands" (Gillespie et al. 2002), for although they were initially formed from "pieces" of Gondwanaland 80 Ma, their terrestrial biota started to form all over again following submersion 37 Ma (Grandcolas et al. 2008). This represents a different evolutionary and ecological process from the endemism and speciation of species associated with continental island formations claimed for the nominated property.

Okinawa tip-nosed frog (*Odorrana narina*)
(Photo: MOEJ)

3.2.4. Comparison of biodiversity

There are 49 existing island World Heritages properties, 31 of which fall under Biome 13 (mixed island system) and 18 belong to other types of biomes based on Udvardy's biogeographic classification (1975). Of these 49, there are 23 properties that have been inscribed under criterion (x) for their terrestrial biodiversity. Among these 23 properties, seven are located in the zone between latitudes 20 and 30, roughly corresponding to the subtropical region in which the nominated property is located. Thsese incude: Islands and Protected Areas of the Gulf of California (Mexico); Alejandro de Humboldt National Park (Cuba); Blue and John Crow Mountains (Jamaica); Laurisilva of Madeira (Portugal); Pitons, cirques and remparts of Reunion Island (France); Henderson Island (United Kingdom of Great Britain and Northern Ireland); and Lord Howe Island Group (Australia). In addition to these seven World Heritage properties, some other islands in the neighboring areas of the nominated property were included in the comparison analysis: Taiwan Island (continental island); Batan Islands (oceanic islands of Philippines, included in the Tentative List in 1993); and Babuyan Islands (oceanic islands of Philippines). Table 3-8 shows the respective area, island type, and number of resident species of the nominated property and comparison properties. The number of resident species of each island represents the number of terrestrial native species (to the best possible extent) based on source literature. However, comparison could not be performed for some areas and taxonomic groups because detailed information was not available.

As Table 3-8 shows, the nominated property consisting of continental islands has a greater number of resident species in all taxonomic groups compared to oceanic islands inscribed on the World Heritage List in the same latitude zone (4 sites, i.e. Laurisilva of Madeira; Pitons, cirques and remparts of Reunion Island; Henderson Island; and Lord Howe Island Group) and neighboring oceanic islands chosen for comparison (2 sites, i.e. Batan Islands; and Babuyan Islands). Therefore the following detailed comparison focused on the three areas (i.e. Islands and Protected Areas of the Gulf of California; Alejandro de Humboldt National Park; and Blue and John Crow Mountainsas continental island groups) inscribed on the World Heritage List in the same latitude zone and a neighboring continental island (one site, i.e. Taiwan Island). The comparison was made in vascular plants, terrestrial mammals, birds, terrestrial reptiles and amphibians for which information on the number of resident species, endemic species and rate of endemic species is available.

Barbour's blue-tailed skink (*Plestiodon barbouri*)
(Photo: MOEJ)

Table 3-8: Comparison of biodiversity among nominated property, existing World Heritage properties and neighboring island areas[*1]

Name of property	Country	Land area[*2] (ha)	Criteria[*3]	Latitude	Island type[*4]	Vascular plants	Terrestrial mammals	Birds[*5]	Terrestrial reptiles	Amphi-bians	Source
Nominated property	Japan	37,946	(ix, x)	N24°-28°	C	1,808[*6]	22	394	36	21	1)
Islands and Protected Areas of the Gulf of California	Mexico	382,841	vii, ix, x	N27°	C, O	695	45	154	115	–	1), 2)
Alejandro de Humboldt National Park	Cuba	68,572	ix, x	N20°	C	1,447	10	95	45	21	2)
Blue and John Crow Mountains	Jamaica	26,252	x	N18°	C	1,620	10	101	20	13	1), 2)
Taiwan Island	Taiwan	3,598,000	–	N23°	C	4,077	78	534	89	37	3), 4), 5), 6)
Laurisilva of Madeira	Portugal	15,000	ix, x	N32°	O	150	2	43	1	–	2)
Pitons, cirques and remparts of Reunion Island	France	105,838	vii, x	S21°	O	840	5	78	6	–	2)
Henderson Island	UK	3,700	vii, x	S24°	O	71	0	23	4	–	2)
Lord Howe Island Group	Australia	1,540	vii, x	S31°	O	241	1	168	2	–	2),7)
Batan Islands	Philippines	23,347	–	N20°	O	–	10	60	16	1	8), 9), 10)
Babuyan Islands	Philippines	58,200	–	N19°	O	–	13	126	44	4	8), 9), 11)

*1: The number of resident species represents the number of terrestrial native species (to the best possible extent). "–" indicates that data on the number of resident species was not available.
*2: "Land area" represents land area of the specified site for nominated property and existing World Heritage properties, and land area of the entire islands for Taiwan, Batan and Babuyan Islands.
*3: Only the criteria for natural values are indicated for mixed World Heritage sites.
*4: C: Continental island, O: Oceanic island
*5: Number of identified species (including vagrants)
*6: Includes subspecies, variant species and crossbred species
1) Annexes of respective nomination documents, 2) UNEP-WCMC 2016, 3) Peng and Ynag 2008, 4) Lin 2008,
5) Yan 2008, 6) Lue et al. 2008, 7) Australian Government 2007, 8) Heaney et al. 2010,
9) Oliveros et al. 2011, 10) Gonzalez et al. 2008, 11) Brooke et al. 2004.

1) Vascular plants

Table 3-9 shows the number of resident species, endemic species, and rate of endemic species of vascular plants of the four areas for comparison. The nominated property has 1,808 vascular plant species of which 185 are endemic (endemic rate of 10%). Taiwan Island has 4,077 species, outstanding from the rest of sites compared. This is considered because the land area and altitudinal range are remarkably larger than the other sites compared. When comparing the nominated property with the three existing World Heritage properties, the nominated property has the largest number of resident vascular plant species. As for the rate of endemic species, Alejandro de Humboldt National Park of Cuba stands out at 63%, as it is known to have one of the highest endemic rate of vascular plants in the world. The rate of endemic vascular plant species of the nominated property is lower compared to Blue and John Crow Mountains and Taiwan Island at 20% and 26% respectively. This is because the flora of the nominated property is diverse in origin reflecting the geological history, past climate changes, and geographical arrangement of the islands and Kuroshio current as mentioned in Chapter 2. a. 2. 1. However, when compared to the Islands and Protected Areas of the Gulf of California, where species have become established through both continental and oceanic island processes as with the nominated property, it has a higher number of resident species, number of endemic species, and endemic rate (2.6 times for the number of resident species and endemic rate, 6 times or above for number of endemic species).

Table 3-9: Comparison of vascular plant species diversity among nominated property, existing World Heritage properties and neighboring island areas *1

	Nation	Land area (ha) *2	Altitude (m)*3	Criteria*4	Vascular plant species	Endemic species	Endemic rate	Source
Nominated property (total of four regions)	Japan	37,946	0 – 694	(ix, x)	1,808*5	185*5	10%	1)
Amami-Oshima Island	–	11,544	0 – 694	–	1,306*5	124*5	9%	1)
Tokunoshima Island	–	2,434	60 – 645	–	956*5	79*5	8%	1)
Northern part of Okinawa Island	–	5,133	100 – 503	–	1,029*5	71*5	7%	1)
Iriomote Island	–	18,835	0 – 470	–	1,162*5	58*5	5%	1)
Islands and Protected Areas of the Gulf of California	Mexico	382,841	0 – 990	vii, ix, x	695	28*5	4%	1), 2)
Alejandro de Humboldt National Park	Cuba	68,572	220 – 1,168	ix, x	1,447	905	63%	2)
Blue and John Crow Mountains	Jamaica	26,252	850 – 2,250	iii, vi, x	1,620	316	20%	1), 2)
Taiwan Island	Taiwan	3,598,000	0 – 3,952	–	4,077	1,067	26%	3)

*1: The number of resident species represents the number of terrestrial native species to the best possible extent.
*2: "Land area" represents land area of the specified site for nominated property and existing World Heritage properties, and land area of the entire island for Taiwan.
*3: The lowest-highest altitudes for nominated property and existing World Heritage properties, and coastal line-highest altitude for Taiwan.
*4: Only the criteria for natural values are indicated for Mixed Cultural and Natural Heritage sites.
*5: Includes subspecies, variant species and hybrid species.
1) Appendices of respective nomination documents, 2) UNEP-WCMC 2016, 3) Peng and Yang 2008.

2) Mammals

Table 3-10 shows the number of resident species, endemic species, and rate of endemic species of terrestrial mammals of the four areas for comparison. The nominated property has 22 terrestrial mammal species of which 13 are endemic (endemic rate of 59%). Taiwan Island and the Islands and Protected Areas of the Gulf of California have a large number of terrestrial mammal species as their land areas are much larger than the other sites compared, but have a low rate of endemic species at 27% and 7% respectively. This is thought to be because many mammal species migrated from the continent to these islands via land bridges during the last glacial period when the sea level declined. Both Alejandro de Humboldt National Park and Blue and John Crow Mountains have 10 mammal species and an endemic rate of 30%. The nominated property has about twice as much terrestrial mammal species and endemic rate compared to these two existing World Heritage properties.

Table 3-10: Comparison of terrestrial mammal diversity among nominated property, existing World Heritage properties and neighboring island areas *1

	Nation	Land area (ha) *2	Altitude (m)*3	Criteria*4	Terrestrial mammal species*5	Endemic species	Endemic rate	Source
Nominated property (total of four regions)	Japan	37,946	0 – 694	(ix, x)	22	13	59%	1)
Amami-Oshima Island	–	11,544	0 – 694	–	14	8	57%	1)
Tokunoshima Island	–	2,434	60 – 645	–	13	8	62%	1)
Northern part of Okinawa Island	–	5,133	100 – 503	–	12	7	58%	1)
Iriomote Island	–	18,835	0 – 470	–	8	3	38%	1)
Islands and Protected Areas of the Gulf of California	Mexico	382,841	0 – 990	vii, ix, x	45	3	7%	1), 2)
Alejandro de Humboldt National Park	Cuba	68,572	220 – 1,168	ix, x	10	3*6	30%	2)
Blue and John Crow Mountains	Jamaica	26,252	850 – 2,250	iii, vi, x	10	3	30%	1), 2)
Taiwan Island	Taiwan	3,598,000	0 – 3,952	–	78	21	27%	3)

*1: The number of resident species represents the number of terrestrial native species to the best possible extent.
*2: "Land area" represents land area of the specified site for nominated property and existing World Heritage properties, and land area of the entire island for Taiwan.
*3: The lowest-highest altitudes for nominated property and existing World Heritage properties, and coastal line-highest altitude for Taiwan.
*4: Only the criteria for natural values are indicated for Mixed Cultural and Natural Heritage sites.
*5: The original literature only gave the rate of endemic species. The number of endemic species was calculated from the number of resident species and the rate of endemic species.
1) Appendices of respective nomination documents, 2) UNEP-WCMC 2016, 3) Lin et al. 2008.

3) Birds

Table 3-11 shows the numbers of recorded species, resident species, endemic species and rate of endemic species of birds of the four areas for comparison. 394 bird species have been identified in the nominated property, of which 49 are resident bird species and four are endemic species (endemic rate of 8%). Taiwan has a large number of both recorded and endemic species. This is considered because the land area and altitudinal range are remarkably larger than the other sites compared. Regarding the rate of endemic species, however, the nominated property and Taiwan are roughly the same level at 8% and 9% respectively. This is probably because the two sites both have a high rate of migratory birds and vagrants in the bird fauna, given that they are both located on the same bird migratory pathways and typhoon routes.

The other three sites compared have a rather high rate of endemic species with Blue and John Crow Mountains at the highest at 56% (32 species), followed by Islands and Protected Areas of the Gulf of California at 25% (12 species) and Alejandro de Humboldt National Park at 21% (20 species). The number of recorded species, however, is as low as between one fourth (95 species) to half (181 species) of that of the nominated property (394 species) whereas the number of resident species is roughly at the same level. Thus it can be concluded that the rate of migratory birds in the bird fauna is relatively low in these existing World Heritage properties, meaning that the bird fauna of these sites is different from that of the nominated property in terms of the life history (migratory or not) of the birds.

Table 3-11: Comparison of bird species diversity among nominated property, existing World Heritage properties and neighboring island areas [*1]

	Nation	Land area (ha) [*2]	Altitude (m)[*3]	Criteria[*4]	Recorded bird species	Resident species	Endemic species	Endemic rate[*5]	Source
Nominated property (total of four regions)	Japan	37,946	0 – 694	(ix, x)	394	49	4	8%	1)
Amami-Oshima Island	–	11,544	0 – 694	–	315	42	2	5%	1)
Tokunoshima Island	–	2,434	0 – 645	–	196	38	1	3%	1)
Northern part of Okinawa Island	–	5,133	0 – 503	–	195	38	3	8%	1)
Iriomote Island	–	18,835	0 – 470	–	312	44	0	0%	1)
Islands and Protected Areas of the Gulf of California	Mexico	382,841	0 – 990	vii, ix, x	181	48	12	25%	1), 2)
Alejandro de Humboldt National Park	Cuba	68,572	220 – 1,168	ix, x	95	–	20[*6]	21%	2)
Blue and John Crow Mountains	Jamaica	26,252	850 – 2,250	iii, vi, x	100	57	32	56%	1), 2)
Taiwan Island	Taiwan	3,598,000	0 – 3,952	–	534	156	14	9%	3)

*1: The number of resident species represents the number of terrestrial native species to the best possible extent.
*2: "Land area" represents land area of the specified site for nominated property and existing World Heritage properties, and land area of the entire island for Taiwan.
*3: The lowest-highest altitudes for nominated property and existing World Heritage properties, and coastal line-highest altitude for Taiwan.
*4: Only the criteria for natural values are indicated for Mixed Cultural and Natural Heritage sites.
*5: The rate of endemic species was calculated against resident birds that stay in the area all year long.
*6: The original literature only gave the rate of endemic species. The number of endemic species was calculated from the number of resident species and the rate of endemic species
1) Appendices of respective nomination documents, 2) UNEP-WCMC 2016, 3) Yan et al. 2008.

4) Terrestrial reptiles

Table 3-12 shows the number of recorded species, endemic species, and rate of endemic species of terrestrial reptiles of the four areas for comparison. The nominated property has 36 terrestrial reptiles of which 23 are endemic (endemic rate of 64%). Taiwan and the Islands and Protected Areas of the Gulf of California have the first and second largest land area among the sites compared and large numbers of reptile species accordingly, but have a low rate of endemic species (89 species, 24% and 115 species, 42% respectively). This is thought to be because many reptile species migrated from the continent to these islands via land bridges during the last glacial period when the sea level declined.

Alejandro de Humboldt National Park and Blue and John Crow Mountains in the Caribbean Region have roughly the same level of reptile species as the nominated property (36 species) at 45 and 20 species respectively, but their rate of endemic species is higher than that of the nominated property (64%) at 90% and 83%, reflecting the length of history since isolation of the fauna. In comparison, one of the characteristics of the nominated property is that it clearly represents ongoing speciation processes taking place on the islands, demonstrated by the high rate of endemic species of 87% (as high as the endemic rate of the Caribbean sites), when endemic subspecies are included in the count.

Table 3-12: Comparison of terrestrial reptile diversity among nominated property, existing World Heritage properties and neighboring island areas [*1]

	Nation	Land area (ha) [*2]	Altitude (m)[*3]	Criteria[*4]	Terrestrial reptile species	Endemic species	Endemic rate	Source
Nominated property (total of four regions)	Japan	37,946	0 – 694	(ix, x)	36 (38)[*5]	23 (33)[*5]	64% (87%)[*5]	1)
Amami-Oshima Island	–	11,544	0 – 694	–	16	10	63%	1)
Tokunoshima Island	–	2,434	60 – 645	–	17	11	65%	1)
Northern part of Okinawa Island	–	5,133	100 – 503	–	18	13	72%	1)
Iriomote Island	–	18,835	0 – 470	–	19	8	42%	1)
Islands and Protected Areas of the Gulf of California	Mexico	382,841	0 – 990	vii, ix, x	115	48	42%	1), 2)
Alejandro de Humboldt National Park	Cuba	68,572	220 – 1,168	ix, x	45	37[*6]	83%	2)
Blue and John Crow Mountains	Jamaica	26,252	850 – 2,250	iii, vi, x	20	18	90%	1), 2)
Taiwan Island	Taiwan	3,598,000	0 – 3,952	–	89	21	24%	3)

*1: The number of resident species represents the number of terrestrial native species to the best possible extent.
*2: "Land area" represents land area of the specified site for nominated property and existing World Heritage properties, and land area of the entire island for Taiwan.
*3: The lowest-highest altitudes for nominated property and existing World Heritage properties, and coastal line-highest altitude for Taiwan.
*4: Only the criteria for natural values are indicated for Mixed Cultural and Natural Heritage sites.
*5: Figures in parentheses indicate the number/rate of species including endemic subspecies.
*6: The original literature only gave the rate of endemic species. The number of endemic species was calculated from the number of resident species and the rate of endemic species.
1) Appendices of respective nomination documents, 2) UNEP-WCMC 2016, 3) Lue et al. 2008.

5) Amphibians

Table 3-13 shows the number of recorded species, endemic species, and rate of endemic species of amphibians of the four area for comparison. The nominated property has 21 amphibian species of which 18 are endemic (endemic rate of 86%). Taiwan has by far the largest land area among the sites compared and a large number of amphibians accordingly, but has a low rate of endemic species (89 species, 21%). This is thought to be the same reason as reptiles.

Alejandro de Humboldt National Park and Blue and John Crow Mountains in the Caribbean Region have roughly the same level of amphibian species as the nominated property (21 species) at 21 and 13 species respectively, but their rate of endemic species is higher than the nominated property (86%) at 96% and 92%, reflecting the length of history since isolation of the fauna. When looking at the endemic rate of individual islands including the nominated property, the endemic rates for Amami-Oshima Island and the northern part of Okinawa Island are approximately 90%, almost as high as the Caribbean sites. This reflects the fact that the nominated property is a serial property comprised of two distinct parts: the Central Ryukyus (Amami-Oshima Island, Tokunoshima Island and the northern part of Okinawa Island) with a long history of isolation from the continent and rest of Japan and high endemism; and the South Ryukyus (Iriomote Island) that have a relatively recent history of separation from the continent and Taiwan with subspecies and related species distributed in Taiwan and the continent.

Although information on the specific number of resident and endemic amphibian species could not be obtained for the Islands and Protected Areas of the Gulf of California, it is assumed that amphibians are very few in this site because it belongs to dry desert climate.

Table 3-13: Comparison of amphibian diversity among nominated property, existing World Heritage properties and neighboring island areas [*1]

	Nation	Land area (ha) [*2]	Altitude (m)[*3]	Criteria[*4]	Amphibian species	Endemic species	Endemic rate	Source
Nominated property (total of four regions)	Japan	37,946	0 – 694	(ix, x)	21	18	86%	1)
Amami-Oshima Island	–	11,544	0 – 694	–	10	9	90%	1)
Tokunoshima Island	–	2,434	60 – 645	–	7	6	86%	1)
Northern part of Okinawa Island	–	5,133	100 – 503	–	11	10	91%	1)
Iriomote Island	–	18,835	0 – 470	–	8	5	63%	1)
Islands and Protected Areas of the Gulf of California	Mexico	382,841	0 – 990	vii, ix, x	–	–	–	1), 2)
Alejandro de Humboldt National Park	Cuba	68,572	220 – 1,168	ix, x	21	20[*5]	96%	2)
Blue and John Crow Mountains	Jamaica	26,252	850 – 2,250	iii, vi, x	13	12	92%	1), 2)
Taiwan Island	Taiwan	3,598,000	0 – 3,952	–	89	21	24%	3)

*1: The number of resident species represents the number of terrestrial native species to the best possible extent.
*2: "Land area" represents land area of the specified site for nominated property and existing World Heritage properties, and land area of the entire island for Taiwan.
*3: The lowest-highest altitudes for nominated property and existing World Heritage properties, and coastal line-highest altitude for Taiwan.
*4: Only the criteria for natural values are indicated for Mixed Cultural and Natural Heritage sites.
*5: The original literature only gave the rate of endemic species. The number of endemic species was calculated from the number of resident species and the rate of endemic species.
1) Appendices of respective nomination documents, 2) UNEP-WCMC 2016, 3) Lue et al. 2008.

3.3. Proposed Statement of Outstanding Universal Value

a) Brief synthesis

Belonging to the Ryukyu Chain located at the south end of the Japanese Archipelago, the nominated property has a land area of 37,946 ha comprised of four regions: Amami-Oshima Island, Tokunoshima Island and the northern part of Okinawa Island in the Central Ryukyus; and Iriomote Island in the South Ryukyus. Influenced by the Kuroshio Current and subtropical high-pressure, the nominated property is in warm, humid subtropical climate and covered mainly with evergreen broadleaved rainforests.

The Ryukyu Chain is believed to have been formed through the formation and expansion of the Okinawa Trough and associated tectonic uplift and subsidence caused by subduction of the Philippine Sea plate beneath the Eurasian plate that had occurred since the middle Miocene of the Neogene. The Ryukyu Chain was then divided into the North Ryukyus, the Central Ryukyus and the South Ryukyus by deep straits lying between islands. Then since the early Pleistocene of the Quaternary, changes repeated the process of separation and unification of neighboring islands.

This geological history created opportunities for speciation and endemism for non-flying terrestrial creatures in the Central and South Ryukyus. Also, the Central and South Ryukyus have differences in their patterns of speciation and endemism in the terrestrial biota because of differences in the distance from the continent and the timing of separation. The nominated property comprises representative four regions of the Central and South Ryukyus which are home to especially large number of endemic species and subspecies of various organisms. By examining them collectively, we can understand the ongoing processes of speciation and diversification of evolutionary lineages that reflect the geological history of the entire Ryukyu Chain.

The nominated property is also an irreplaceable habitat for at least 1,808 vascular plant species, 740 terrestrial and freshwater vertebrate species, 6,148 insect species, 47 freshwater decapod species, and 88 threatened species listed on the IUCN Red List.

As such, the nominated property is a good example of the ongoing process of speciation and endemism that reflects its formative history as a continental island involving long-period isolation. It also has an invaluable natural environment, including habitats for various endemic species and threatened species of international significance.

b) Justification for criteria

Criterion (ix)

As part of the Eurasian Continent, the Central and South Ryukyus containing the nominated property used to share the same continental terrestrial biota. Thereafter, in the process of separation from the continent driven by the formation of the Okinawa Trough and two deep straits and in the repeated process of separation and unification of islands affected by sea-level changes, the nominated property has given rise to speciation and endemism in various evolutionary lineages.

In the Central Ryukyus, which were separated from the continent around the late Miocene of the Neogene, many relict endemic species, whose related species cannot be found in the neighboring regions, still survive on the islands. The South Ryukyus, which separated from Taiwan and the continent during the Pliocene, have endemic species and subspecies with their related species distributed in Taiwan and the continent. Those processes are particularly evident in plants and non-flying terrestrial vertebrates that cannot easily cross the ocean gaps. Various patterns of endemism and each stage of speciation on the continental islands can be seen in the area.

The nominated property comprises four regions that characterize the Central and South Ryukyus, and is an outstanding example clearly representing distinctive, ongoing processes of speciation and diversification of evolutionary lineages on the continental islands that reflect the geological history of the entire Ryukyu Chain. It can be deemed as one of the best natural laboratory in the world for studying the relation of the formation history of continental islands and biological evolution processes.

Criterion (x)

The nominated property is a crucial area from the viewpoint of biodiversity conservation, as it constitutes an irreplaceable habitat for threatened and endemic species that are of global importantance. There are 88 threatened species listed on the IUCN Red List, and 70 of these are endemic to Central and South Ryukyus.

Reflecting its geological history, the nominated property shows diverse examples of relict and new endemic species. Among others, five mammal species, three bird species, and three amphibian species have been identified as Evolutionarily Distinct and Globally Endangered (EDGE) species.

One example of the EDGE species is the Amami rabbit (*Pentalagus furnessi*) in Amami-Oshima Island and Tokunoshima Island, it comprises a genus by itself with no other related species. The Okinawa rail (*Gallirallus okinawae*) in the northern part of Okinawa Island is one of the non-flying species of the rail family on an island, which is known to be prone to extinction. *Tokudaia* is an endemic genus of spiny rats, with three species endemic to each of the three regions in the Central Ryukyus. Iriomote cat (*Prionailurus bengalensis iriomotensis*) only inhabits Iriomote Island, the world's smallest island inhabited by wildcats.

Further, the nominated property has high levels of diversity within its vascular plants and insects. On each of the four regions containing the nominated property, there are 950 to 1,300 species of vascular plants; these represent about 20 % of threatened vascular plant species of Japan. There are also more than 1,000 to 3,000 insect species; these represent about 10 % of the threatened insect species in Japan.

c) Statement of integrity

The nominated property includes Amami-Oshima Island, Tokunoshima Island, and the northern part of Okinawa Island in the Central Ryukyus; and Iriomote Island in the South Ryukyus. It contains about 90% of the endemic and threatened species in Central and South Ryukyus and their important habitats, and thus includes all elements necessary to express its Outstanding Universal Value as serial World Heritage islands. All the components of the property are complementary to one another and if any of the four regions were to be omitted, it would be impossible to understand the whole picture of the ongoing evolutionary and ecological processes of the Ryukyu Chain or conserve the biodiversity of the area.

Also, the nominated property consists of islands that are large in comparison with other islands in the Central and South Ryukyus, and subtropical rainforests exist there in large clusters. The property contains diverse habitat environments, including different geologies, cloud belts around the summit areas, mountains and hills involving complex microtopographies and hydrological systems, and swamps. It has adequate buffer zones. As such, it is of sufficient size and sound environmental conditions to ensure the complete representation and long-term conservation of its Outstanding Universal Values.

While there is some impact from alien species, traffic accidents involving wild animals, and illegal collection of wild species, the risks are prevented or mitigated through coordinated efforts by relevant administrative organs (Ministry of the Environment, Forestry Agency, Agency for Cultural Affairs, Kagoshima Prefecture, Okinawa Prefecture, and local municipalities) and civilian organizations.

d) Statement of authenticity

Not applicable because this nomination does not claim cultural values.

e) Requirements for protection and management

The nominated property is designated as Special Protection Zone or Class I Special Zone of National Park; or Presearvation Zones of Forest Ecosystem Reserve. In addition, it is designated as National Wildlife Protection Area or Natural Monument (See Chapter 5). These are systems for protecting the excellent natural environment of Japan, regulating development projects in a strict legal manner. By these designations, the nominated property is ensured of long-term appropriate protection. Most parts of the nominated property are national or municipal lands owned and managed by national or local governments.

The four islands containing the nominated property are inhabited by people, and the places for residents' lives and industrial activities are close to habitats for endemic species and rare species. To carefully protect the property and enable the coexistence with people's livelihoods, buffer zones were set up mainly in Class II Special Zone of the National Park or Conservation and Utilization Zone of the Forest Ecosystem Reserve, adjacent to the nominated property.

In order to facilitate the multi-layered management and protection of protected areas and designated species, the relevant administrative organs have estabished the "Regional Liaison Committee" and prepared the "Comprehensive Management Plan" describing the management policy common in the four regions. In addition,

four sub-local meetings have been set up under the Regional Liaison Committee, and they formulate regional action plans to effectively carry out the conservation and management of each region containing the nominated property through collaboration and cooperation with the local stakeholders. The "Scientific Committee" comprised of academic experts and its subsidiary "Local Working Groups" have been established to provide scientific advice and promote adaptive conservation and management in light of scientific knowledge and insight.

In addition, major endemic threatened species in the nominated property such as the Amami rabbit, Okinwana rail, and Iriomote cat are legally protected by designation of National Endangered Species and Natural Monuments. Monitoring of these species will be continued as part of protection and recovery program of the National Endangered Species and/or the mongoose control program.

Heritiera littoralis (Photo: MOEJ)

4

State of Conservation and Factors Affecting the Property

4.a. Present State of Conservation

4.b. Impacting Factors

View from the Funaura Bay, Iriomote Island (Photo: MOEJ)

4. State of Conservation and Factors Affecting the Property

4.a. Present State of Conservation

Among the endemic species and threatened species that indicate the value of the nominated property, this chapter describes the current conservation status of the targetted monitoring species shown in Chapter 6.

4.a.1. Present conservation state of species subject to monitoring

1) Amami rabbit (*Pentalagus furnessi*)

The Amami rabbit is a monospecific endemic speciess that is found only on Amami-Oshima Island and Tokunoshima Island. This species makes burrows mainly on slopes in primary forests and uses adjacent streams and secondary forests, etc., where many herbaceous plants and other food can be found, as a feeding ground (Sugimura 1990; Ministry of the Environment 2014).

(Photo: MOEJ)

Their distribution range of the Amami rabbit is estimated to be about 37,000 ha on Amami-Oshima Island and about 6,700 ha on Tokunoshima Island. On Amami-Oshima Island, the distribution range has been diminished in comparison to the 1970s, while the range of this animal is fragmented into two areas on Tokunoshima Island (Ministry of the Environment 2014).

It is estimated that the population of the Amami rabbit on Amami-Oshima Island, which ranged from 2,500 to 6,100 in 1993 to 1994, dropped to 2,000 to 4,800 in 2002 to 2003, while their population on Tokunoshima Island, which ranged from 120 to 300 in 1998, dropped to 100 to 200 in 2003 to 2004 (Sugimura and Yamada 2004; Ministry of the Environment 2014). Their population on Amami-Oshima Island is on track to recover due to positive results from mongoose control measures that started in 2000 (Watari et al. 2013). There have been indications of decreasing population size in some areas of Tokunoshima Island, but it was reported from unknown habitats in recent years, suggesting expansion of the distribution range.

The Amami rabbit is listed as EN in the IUCN Red List (2016) and MOEJ Red List (2015). The factors threatning this species are thought to be their predation by mongooses, an invasive alien species, and forest operations in its habitats, recently coupled with growing problems of predation by feral cats (*Felis catus*) and feral dogs (*Canis familiaris*), and an increasing number of traffic accidents.

The Ministry of the Environment, Foresty Agency and other relevant agencies developed a plan for a protection and recovery program in 2004 under which a variety of efforts have been underway. These include the work of monitoring to track the distribution range and habitat density status, tracking ecological data (including breeding season estimation), taking traffic accident prevention measures, and implementing mongoose control projects on Amami-Oshima Island.

2) Okinawa rail (*Gallirallus okinawae*)

The Okinawa rail is an almost flightless rail that was inscribed as a new species in 1981 (Yamashina and Mano 1981), and a species endemic to the northern part of Okinawa Island (Ornithological Society of Japan 2012). They live year-round as resident birds on the forest floor of evergreen broadleaved forests or surrounding grasslands.

(Photo: MOEJ)

In 1985, the area of Okinawa rail distribution was approximately 320 km^2 and their population was estimated to be 1,500 to 2,100, but both the distribution range and estimated population fell thereafter until 2005. It was estimated that over the course of 20 years, their inhabitable range dropped by about 34% and their population dropped by about 40% (580 to 930 birds) (Ministry of the Environment 2014). Starting in 2011, a trend of recovery has been observed in the distribution range and estimated population of Okinawa rail, due to positive results from mongoose control and other measures, resulting in the estimated population in subsequent years hovering around 1,500.

The species is listed as EN in the IUCN Red List (2016) and as in the MOEJ Red List (2015). While the main threat to this species is believed to be predation by mongooses, feral cats, feral dogs and other such animals, the increasing number of traffic accidents in recent years is also considered one of the factors causing the decline.

Relevant government agencies including the Ministry of the Environment and Okinawa Prefecture jointly embarked on an effort to deal with mongooses in 2000, and feral cats in 2002. The Ministry of the Environment, Forestry Agency and other relevant agencies developed a plan for a protection and recovery program in 2004 under which they have been conducting studies and research, conservation activities, the rehabilitation of injured and sick animals, captive breeding, and other actions in cooperation with municipal governments and NPOs.

3) Iriomote cat (*Prionailurus bengalensis iriomotensis*)

The Iriomote cat, a leopard cat (*Prionailurus bengalensis*) subspecies endemic to Iriomote Island, is adapted to the small environment of Iriomote Island, where there are no small mammals native to the island. These cats typically feed on native flying foxes and alien black rats (*Rattus rattus*) as well as birds, reptiles, amphibians, insects, crustaceans, etc. in different combinations according to the season. Approximately 80 species have been confirmed as being their prey (Nakanishi and Izawa 2015).

(Photo: MOEJ)

The Iriomote cat prefers environments with hydrological systems, such as forest peripheries, lowland areas, riversides, and wetlands, and also uses mangrove forests and areas in the vicinity of agricultural land to the seashore (Okinawa Prefecture 2006; Ministry of the Environment 2014). Ecological data used to be skewed towards lowland areas on the coastal side and, accordingly, the Iriomote cat population was estimated to be around 100; however, recent studies have reported that there is a resident and breeding population also living in mountainous land on the inland side (Izawa et al. 2003; Nakanishi and Izawa 2014), with implications suggesting a similar level of habitat density distribution as in the lowland areas.

While the IUCN Red List (2016) categorizes the leopard cat as LC, its subspecies—the Iriomote cat—is listed as CR and the MOEJ Red List (2015) lists it under CR. The factors threatening their habitation include traffic accidents, the disappearance or modifications of favorable habitats, and transmission of diseases from domestic cats (*Felis catus*) and competition with them.

The Ministry of the Environment, Forestry Agency and other relevant agencies developed a plan for a protection and recovery program in 1995, under which they have been implementing in cooperation with researchers, studies and research, conservation activities, the rehabilitation of injured and sick Iriomote cats, and other actions.

4.a.2. Major current threats and countermeasures

The major current threats are the predation and competition caused by alien species, traffic accidents, and illegal capture and collection.

4.a.2.1. Invasion of alien species

A large number of endemic species occur in the Central Ryukyus and the South Ryukyus, both being isolated island groups. In particular, the Central Ryukyus can be characterized by an ecological system that lacks high-level predators and consequently are very vulnerable to highly predacious alien species. This section provides a summary description of the steps taken to deal with mongooses and feral cats, both of which have been found to have a strong impact on native species, including endemic species, and are currently subject to control.

1) Small Indian mongoose (*Herpestes auropunctatus*)

The small Indian mongoose is native to the region extending from West Asia to Southeast Asia, and designated as a Specified Invasive Alien Species under Act on the Prevention of Adverse Ecological Impacts Caused by Specified Invasive Alien Species (Specified Invasive Alien Species Act). With the aim of eliminating habu vipers (*Protobothrops flavoviridis*) and rats, small Indian mongooses were released on Okinawa Island and Amami-Oshima Island, where there were no native carnivorous mammals, without sufficient impact studies being conducted. As a result, on both islands, the expected effect could not be obtained, and endemic species and rare species have been seriously impacted.

Mongoose Busters setting a trap (Photo: JWRC)

Efforts to capture small Indian mongooses began around 2000 in an attempt to eliminate them, and since the enactment of the Specified Invasive Alien Species Act in 2005, their capture has been performed both strategically and systematically pursuant to a control plan. A team consisting of about 40 project staff members was formed on each island (Mongoose Busters), and they now carry out capture according to the plan and also engage in awareness-raising activities. As the project outcomes and progress are scientifically assessed by a review committee on a regular basis, the control project is implemented adaptively with improvements being made to both plans and methods such as use of search dogs. The project has been underway for over 10 years and is now producing good results including expansion of the Amami rabbit and Okinawa rail distribtution. Table 4-1 lists the developments of the control project. Efforts will be continued to eradicate mongooses. In the northern part of Okinawa Island in particular, monitoring to prevent re-invasion will be implemented after eradication is completed, and immediate dispersion prevention measures will be taken in case re-invasion is confirmed.

Table 4-1: Developments of the mongoose control project on Amami-Oshima Island and Okinawa Island*

Event	Amami-Oshima Island	Okinawa Island
Introduction	Introduced from Okinawa Island in 1979; 30 mongooses released in the northwestern part.	Introduced from Bangladesh in 1910; 17 mongooses released in the southern part of Okinawa Island.
Study started	Impact study started in 1989 by a study group. Distribution spread eastwards and westwards from the spot where they were introduced.	Basic study started in 1985. Mongooses reached the northern part of Okinawa Island at the beginning of the 1990s; distribution spread further north.
Elimination started	Capture by municipal governments started in 1993. Capture by the prefecture started in 1996. Study by the Environment Agency and the prefecture started in 1996.	Capture by the prefecture started in 2000.
Elimination project fully underway	Elimination project by the Environment Agency started in 2000. Estimated number of mongooses: approximately 10,000	capture project by the Ministry of the Environment started in 2001.
Control plan	Developed in 2005.	Developed in 2005.
Control project	Amami Mongoose Busters formed in 2005. Search dogs introduced in 2007. Population growth of Amami rabbits, Amami spiny rats (*Tokudaia osimensis*), Ryukyu long-haired rats (*Diplothrix legata*) and endemic frogs reported from 2003 to 2011 (Fukasawa et al. 2013; Watari et al. 2013). Estimated number of mongooses in 2012: less than 300	Erection of first northward migration prevention fences completed in 2006. Yambaru Mongoose Busters formed in 2008. Search dogs introduced in 2009. Number of captures dropped in and after 2010; Okinawa rail distribution expanded. Erection of second northward migration prevention fences completed in 2013.
Phase 2 control plan	Started in 2013; aiming to achieve complete elimination from Amami-Oshima Island by FY2022. Estimated number of mongooses in 2016: less than 100	Started in 2013; aiming to achieve eradication from the northern part of Okinawa Island by FY2022.

*: Compiled with reference to the brochures below.
http://kyushu.env.go.jp/naha/files/mongoose_amami_E.pdf
http://kyushu.env.go.jp/naha/files/mongoose_yambaru_E.pdf

Mongoose search dogs with handlers (Photo: MOEJ)

2) Feral cats (*Felis catus*)

Captured feral cat (Photo: MOEJ)

Feral cats have been spotted in mountains located away from human dwellings on Amami-Oshima Island, Tokunoshima Island, and the northern part of Okinawa Island, where there are no carnivorous mammals. As a result of fecal pellet analyses and automatic photography-based studies, it has been confirmed that rare endemic species, including the Amami rabbit, Ryukyu long-haired rat, Amami spiny rat, and Okinawa rail, are preyed on. On Iriomote Island, there are also concerns over such issues as the competition between Iriomote cats and feral cats, and the transmission of diseases from feral cats to Iriomote cats. For those reasons, each island has actions underway, in cooperation with related organizations, which include capturing feral cats in the habitat range of rare species and promoting the appropriate keeping of pet cats as a step to deal with their source origin (making it obligatory by an ordinance to register pet cats; recommending neutering them and keeping them indoors; and prohibiting abandonment) (Table 4-2). However, the removal from the wild has been suspended on Amami-Oshima Island since 2014 due to the difficulties in dealing with individuals captured, and efforts are undertaken to resolve the problem.

Table 4-2: Countermeasures against feral cats in four regions containing the nominated property

Region	Promotion of appropriate keeping	Implementation status of feral cat capture and estimated number in rare species habitats (in forests)
Amami-Oshima Island	Ordinance on the Proper Keeping and Management of Pet Cats (five municipalities 2011)	2009 to 2013 Estimated number of feral cats: 600 to 1,200 (2014)
Tokunoshima Island	Ordinance on the Proper Keeping and Management of Pet Cats (three municipalities 2014)	2014 - Estimated number of feral cats: 150 to 200 (2014)
Northern part of Okinawa Island	Regulation Concerning Cat Keeping (Ada-Ku, Kunigami Village, 2002) Ordinance on Cat Welfare and Management (three villages 2004)	2001 -
Iriomote Island	Taketomi Town Ordinance on the Keeping of Cats (Taketomi Town 2001, revised 2008)	Currently feral cats are not confirmed in rare species habitats (in forests)

4.a.2.2. Traffic accidents, etc.

Impacts brought by road development might include environmental changes to the land form, etc., traffic accidents involving animals, fragmention of habitats, etc., water contamination resulting from landslides at the time of construction, and alien species and illegal collectors gaining easier access. Table 4-3 shows the road development status on the four regions containing the nominated property.

Table 4-3: Road development status in four regions containing the nominated property

	National roads (km)*1 (Number of routes)	Prefectural roads (km) (Number of routes)	Municipal roads (km)	Public road density*2 (m/ha)	Forest roads*3 (km)	Forest road density*4 (m/ha)	Sources
Amami-Oshima Island*5	73.0 (1)	286.3 (14)	1,093.1	18	364.5	4 (5)	1)
Tokunoshima Island	–	98.6 (6)	918.8	41	35.6	1 (3)	1)
Northern part of Okinawa Island	60.6 (2)	75.8 (22)	212.0	10	155.5	5 (6)	2), 3), 4)
Iriomote Island	–	54.2 (1)	43.9	3	–	–	5)

*1: Of a road segment for which public notice of commencing services has been given pursuant to the provisions of the Road Act, the actual length counted as its total length minus any length that overlaps with another route, is not available for service yet or is ferry-serviced.
*2: Road density is the density relative to the area of the island.
*3: "Forest roads" applicable herein are only those pursuant to the forest road standards of the Forestry Agency and do not include any skid roads or skid trails. A figure that represents the total of prefecture-operated and municipality-operated forest roads.
*4: Forest road density is the density relative to the area of the island or the density relative to the area of the forest (in brackets).
*5: This includes Kakeromajima Island, Ukejima Island, and Yorojima Island.
Sources: 1) Oshima Branch Office, Kagoshima Prefecture (2015); 2) Civil Engineering and Construction Unit, Okinawa Prefecture (2014); 3) Okinawa General Bureau, Cabinet Office (2009); 4) Local Regions and Remote Islands Promotion Division, Okinawa Prefecture (2014) and; 5) Yaeyama Office, General Affairs Department, Okinawa Prefecture (2013)

Traffic accidents have occurred in and around the nominated property involving endemic species and rare species, such as the Amami rabbit, Ryukyu long-haired rat, Okinawa rail, Iriomote cat, and crested serpent eagle (*Spilornis cheela perplexus*), along with such small animals as Okinawa rail chicks, Anderson's crocodile newt (*Echinotriton andersoni*), the Ryukyu black-breasted leaf turtle (*Geoemyda japonica*), and the Yaeyama yellow-margined box turtle (*Cuora flavomarginata evelynae*) falling into roadside ditches. To address these circumstances, a series of actions has been taken in the four regions of the nominated property in collaboration with related organizations.

With respect to impacts arising from the road structure, related sections of the national and prefectural governments have formulated guidelines for public works with consideration given to the natural environment and developed written instructions, etc. that specifically set out actions in terms of planning, design, and construction work (North National Road Office, Okinawa General Bureau 2008; Yaeyama Regional Public Works Office, Civil Engineering and Construction Unit, Okinawa Prefecture 2009). Pursuant to those instructions, etc., they are working to make improvements to the road structure, including creating underpasses for animal crossings and ditches that are sloped in a way that small animals may crawl out.

The following gives an overview of the status of traffic accidents involving major rare species, along with countermeasures.

1) Amami rabbit

On Amami-Oshima Island and Tokunoshima Island, the Amami Island Group Rare Wildlife Protection Program Council, formed by 16 relevant organizations, including the Ministry of the Environment, Forestry Agency, local governments, and the Amami Nature Experience Promotion Council, formed by 14 organizations, have been running campaigns since 2009 that target islanders, tourists, etc. of both islands for the prevention of traffic accidents involving Amami rabbits and other wildlife. Various actions have been taken, including erecting signs intended to prevent accidents at locations where traffic accidents occur frequently. As a result, fewer incidences of roadkill have been reported since 2009 (Figure 4-1). The Ministy of the Environment and local concerned people are collaborating in rescue and rehabilitation of injured and sick animals.

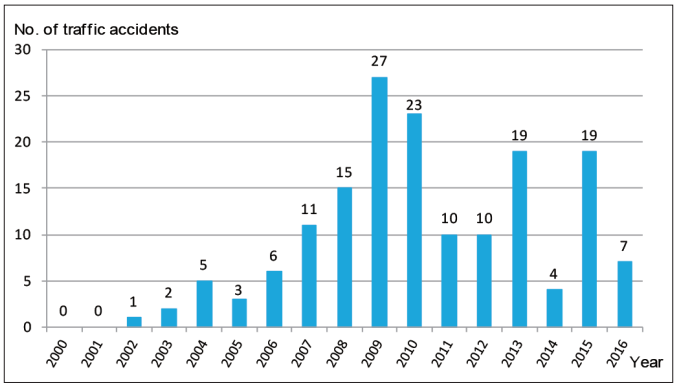


Figure 4-1: Shifts in number of traffic accidents involving amami rabbits (since January 2000 as of June 1, 2016) (Based on data by the Ministry of the Environment 2010)

Traffic accident prevention campaign (Photo: MOEJ)

2) Okinawa rail

As the Okinawa rail population has increased thanks to positive results from actions dealing with alien species, the number of traffic accidents involving this bird is also rising (Figure 4-2).

In the northern part of Okinawa Island, the Liaison Council on Yambaru Region Roadkill Prevention, formed by 25 relevant organizations, including the Ministry of the Environment, Forestry Agency and local governments, engages in the collection and analysis of accident information, placing of warning signs along routes with frequent accidents, and improvement of the road structure, such as creating fences and underpasses to prevent Okinawa rails from entering the road (Nakamatsu and Kinjo 2014). It also takes actions in buffer zones and the living domain of residents, such as traffic accident prevention campaigns targeting islanders, tourists and others. There are also rescue and veterinary care operations for animals involved in an accident that are managed in collaboration between the Ministry of the Environment and the Conservation & Animal Welfare Trust.

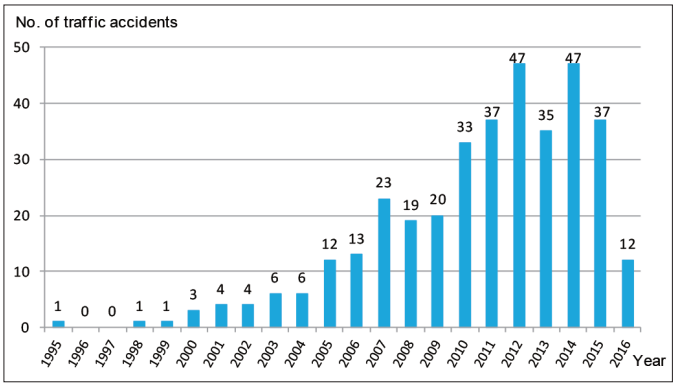


Figure 4-2: Shifts in number of traffic accidents involving Okinawa rails (since 1995 as of June 1, 2016)
(Developed in reference to the website of Yambaru Wildlife Protection Center, the Ministry of the Environment)

Warning sign along routes
(Photo: MOEJ)

3) Iriomote cat

As Iriomote cats have a broad home range, stretching from forests in mountain foothill areas to lowland areas adjacent to agricultural land, etc. to the living domain of residents and coastal areas, there are roads running in their home range. Figure 4-3 shows the number of traffic accidents involving Iriomote cats.

On Iriomote Island, the Liaison Council on Prevention of Traffic Accident Occurrences Involving Iriomote Cats, formed by 23 relevant organizations, including the Ministry of the Environment, Forestry Agency and local governments, works to share information and maintain collaboration so that actions implemented by the respective relevant organizations and others in connection with nature conservation, road administration, road use, etc. may be carried out effectively. It also takes various actions that include placing road signs intended to prevent traffic accidents involving Iriomote cats, making useful changes to the road structure by adding underpasses, anti-vibration pavement, etc. to arterial roads, and running traffic accident prevention campaigns

targeting tourists, residents and others. The Ministry of the Environment and private organizations are also operating programs for accommodating, rehabilitating back to the wild, and monitoring injured and sick animals.

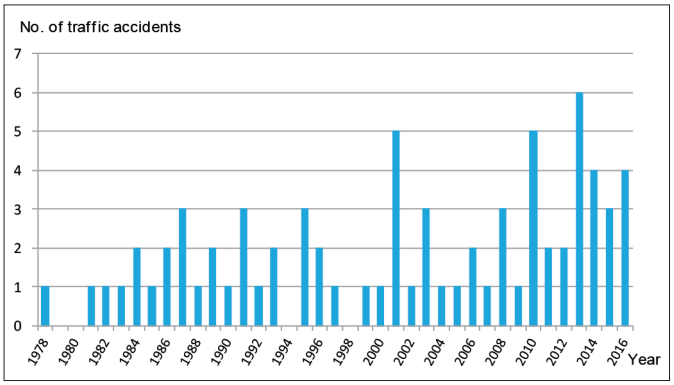


Figure 4-3: Shifts in number of traffic accidents involving Iriomote cats by year (since 1978 as of June 1, 2016)
(From the website of Iriomote Wildlife Protection Center, the Ministry of the Environment)

Example of improvement of road structure (adding an underpass) (Photo: JWRC)

4.a.2.3. Illegal capture and collection

As the Central Ryukyus and the South Ryukyus have many endemic species that are found only in those regions, and because those species have further differentiated into distinct species or subspecies within islands, both regions are the target destinations for amateurs and other interested parties to collect plants as well as animals (to keep or grow, or to collect specimens). Another factor contributing to the escalating collection activities is the development of a road network that has reached forestland areas, thus providing easier access to spots where endemic species and rare species live or grow. The national, prefectural and municipal governments, related local organizations, local NPOs, and others are working in collaboration to address this issue (Table 4-4).

In addition to the statutory protection of the species by the national government discussed in Chapter 5: Protection and Management of the Property, there are municipal systems in place in the Amami Island Group. The Ordinance to Protect Endangered Wild Fauna and Flora which was established by Kagoshima Prefecture, five municipalities of Amami-Oshima Island, and three towns of Tokunoshima Island, respectively, designates particularly important species as “endangered species of wild fauna or flora ” and prohibits the collection thereof (Table 4-5).

Table 4-4: Measures against illegal collection

Region	Actors	Actions
Amami-Oshima Island Tokunoshima Island	Amami Island Group Rare Wildlife Protection Program Council Ministry of the Environment Forestry Agency Kagoshima Prefecture Municipalities Related local organizations Local NPOs, etc.	Placing spotters Installing surveillance cameras Joint patrol Campaigns against illegal collection Making awareness-raising guidebooks
Northern part of Okinawa Island	Local residents, local forestry businesses, Ministry of the Environment	Forest road patrol, information collection
	Yanbaru Long-Armed Scarab Beetle Poaching Prevention Council Ministry of the Environment Forestry Agency Okinawa Prefecture three Yambaru villages Nago City Police Related local organizations, etc.	Forest road patrol Making awareness-raising posters
Iriomote Island	Forestry Agency	Collecting information on the distribution of rare plants, mainly arboreal plants
	Taketomi Town	Rare species protection, alien species control by amending Natural Environment Protection Ordinance

Table 4-5: Number of designated endangered species of wild fauna and flora in the nominated property under the ordinance to protect endangered wild fauna and flora

Local governments	Number of species
Kagoshima Prefecture	22
Five municipalities on Amami-Oshima Island	57
Three towns on Tokunoshima Island	31

Asarum tabatanum (Photo: MOEJ)

4.b. Impacting Factors

This section describes the factors having potential impacts on the nominated property.

4.b.(i) Development pressures

The nominated property is appropriately protected as Special Protection Zone or Class I Special Zone within National Park where any development activities are regulated. The following describes the possible impacts resulting from development activities in and around the nominated property.

1) River and dam construction

As a feature of an island region where the river size is small and rainwater therefore flows out into the ocean in a relatively short time, it is extremely important to secure water for the people living there. In particular, the Central Ryukyus and the South Ryukyus, though being pluvial regions, are relatively affected by frequent droughts. For that reason, coupled with the growing demand for water due to human activities (agriculture, tourism activities, etc.), dam construction has been implemented.

While dams on Amami-Oshima Island, Tokunoshima Island, and Okinawa Island have previously impacted the habitats and breeding sites of animals and plants, development plans administered by the national and prefectural governments have been completed, and there is no construction plan for the future in the nominated property.

Although there is no large dam on Iriomote Island, where water is taken from five water sources (rivers) within the island by building weirs, the island is often exposed to drought and a new water source development project may be planned in order to address the tight water supply. In such a case, it will be necessary to pay attention in terms of planning (site selection and size) and construction methods, etc. so as to eliminate any possible impact inside the nominated property and on the animals and plants that live or grow there.

2) Alien species

The following alien species have invaded into the four regions containing the nominated property and their surrounding islands, as well as the central and southern parts of Okinawa Island. While impact of such species on the nominated property remains unclear, any future impact and further invasion is a concern, which points to the need to monitor and take action to prevent the invasion and spread of alien species.

Species that have invaded into the four regions containing the nominated property, for which there are concerns over future impacts despite not currently having a major effect

• Feral goat (*Capra hircus*)

Goats as livestock have been kept domestically and otherwise as an important source of protein on islands of the Ryukyu Chain, but some have become feral. On Amami-Oshima Island and its surrounding islands, feral goats live mainly in cliff areas along the coast. In some places outside of the nominated property, such as sharply inclined slopes and headlands exposed to the open sea, they have had vegetation destroyed and soil runoff occur as a result their feeding damage. On Amami-Oshima Island, four municipalities are operating feral goat damage control projects.

• Feral dog (*Canis familiaris*)

Feral dogs are found in the habitats of rare species on Amami-Oshima Island, Tokunoshima Island and the northen part of Okinawa Island. Their predation on small and mid-sized endemic mammals and bird have been confirmed, and there are growing concerns about their impacts. Dogs that are not registered by owners or tagged according to the prescribed measures must be removed from the wild based on the Rabies Prevention Act. Local governments are implementing captures and other countermeasures against these dogs.

• Black rat (*Rattus rattus*)

In the northern part of Okinawa Island, black rats have been frequently spotted in the habitat of Okinawa spiny rats, an endemic species, thereby suggesting the possibility of their overlapping habitats and active hours impacting the Okinawa spiny rats (Yamada and Kawachi 2009), which may possibly be replaced by black rats (Ota's personal correspondence 2016).

• White-lipped treefrog (*Polypedates leucomystax*)

Native to Southeast Asia. The white-lipped treefrog is a Specified Invasive Alien Species designated under the Specified Invasive Alien Species Act (see 5.c.6). This species has invaded into many islands in the Okinawa Island Group and the Miyako Islands and became widespread; it has also been spotted in the northern part of Okinawa Island. This species was found on Ishigaki Island in 2007 and, for the first time ever, its invasion into Iriomote Island was confirmed in August 2015 (Ministry of the Environment 2015). There are concerns over competition with Owston's green treefrog (*Rhacophorus owstoni*), an endemic species with a similar life pattern. The Ministry of the Environment has been examining ways to control white-lipped treefrogs and making awareness-raising efforts so as to prevent their spread, and has engaged in various actions on Iriomote Island, including monitoring studies, captures, and removal of eggs masses. As a result, the population of this species is decreasing.

• Lanceleaf tickseed (*Coreopsis lanceolata*)

Native to North America. This species is a Specified Invasive Alien Species designated under the Specified Invasive Alien Species Act. The species had been used for road slope greening purposes or for gardening and spread all over Japan. It is established on Amami-Oshima Island and Tokunoshima Island, and there is a record confirming its existence on Okinawa Island as well. However, it has yet to be spotted on the Yaeyama Islands. Given the concerns over its competition with endemic plants, local environmental NPOs, businesses, local residents, Kagoshima Prefecture, and others annually engage in work to remove this species, which also serves as an awareness-raising activity for residents.

• Bay Biscayne creeping-oxeye (*Sphagneticola trilobata*)

Native to South America. This species is a Specified Invasive Alien Species designated under the Specified Invasive Alien Species Act. The species became rampant after being used for road slope greening purposes, and has been spotted in the four regions containing the nominated property. There are concerns over its effect of suppressing endemic plants, as well as competition and hybridization with endemic plants. Particularly in the case of Iriomote Island, its impacts on communities of *Acrostichum aureum* that is believed to be an endemic new species (Yokota's personal correspondence 2014). Local environmental NPOs, businesses, local residents,

Kagoshima Prefecture, and others annually engage in work to remove this species, which also serves as an awareness-raising activity for residents.

• Mile-a-minute (*Mikania micrantha*)

Native to South and North America. This species is a Specified Invasive Alien Species designated under the Specified Invasive Alien Species Act. This species has been spotted in the part of Okinawa Island and on Iriomote Island (Yokota's personal correspondence). There are concerns over its effect of suppressing endemic plants, as well as competition and hybridization with endemic plants, and over its possible wider distribution in the future (Yokota's personal correspondence 2014).

Removal of alien plants by participation of school children (Photo: MOEJ)

Species that have encroached into islands surrounding the four regions containing the nominated property, for which there are concerns over possible future impacts

• Japanese weasel (*Mustela itatsi*)

Domestic alien species. This species was introduced for the purpose of rat control and has become established on relatively small islands in the Ryukyu Chain. Should this animal encroach into the nominated property, it might prey on endemic small mammals, birds, amphibians, reptiles, insects, and other small animals.

• Indian peafowl (*Pavo cristatus*)

Native to South Asia. This species became established on Ishigaki Island and its adjacent islands. Should this bird encroach into Iriomote Island, it might prey on endemic amphibians, reptiles, insects, and other small animals. The Ministry of the Environment engages in various activities that include studying the status and impacts of this species on the ecosystem, and testing capture methods. Since FY2006, the Ministry has also been implementing a control project on Aragusuku Island, located about 6 km south-east of Iriomote Island. In order to prevent invasion into Iriomote Island by this species, Taketomi Town has been conducting basic studies since 2014 to identify its range and egg-laying sites, as well as implementing a removal project since 2015.

• Green anole (*Anolis carolinensis*)

Native to North America. This species is a Specified Invasive Alien Species designated under the Specified Invasive Alien Species Act. The species has been confirmed in the southern part of Okinawa Island and on the Kerama Islands. It is feared that if these lizards make an inroad to the northern part of Okinawa Island, they might prey on endemic insects and compete with indigenous lizards. In addition to a control project in the area in which they became established, the Ministry of the Environment and Okinawa Prefecture have been investigating the distribution of this species and engage in awareness-raising activities to prevent the spread thereof.

• Green iguana (*Iguana iguana*)

Native to Latin America. This species became established on Ishigaki Island. Should these lizards encroach into Iriomote Island, they might prey on indigenous insects. The Ministry of the Environment tracks the status of this species, engages in trial control, and is examining effective capture methods.

• Taiwan beauty snake (*Elaphe taeniura friesi*)

A Taiwanese-origin distinct subspecies of the Sakishima beauty snake (*E. t. schmackeri*) that lives on the Yaeyama Islands. This species is a Specified Invasive Alien Species designated under the Specified Invasive Alien Species Act. The Taiwan beauty snake has become established in the central part of Okinawa Island. Should this snake make an inroad to the northern part of Okinawa Island, it might prey on endemic small mammals, birds, amphibians and reptiles, and compete with indigenous snakes. The Ministry of the Environment and Okinawa Prefecture track the status of this species, engage in capture tests, etc., and are examining possible actions to take.

• Taiwan habu viper (*Protobothrops mucrosquamatus*)

Distributed in Taiwan, southern and eastern China, and northern Vietnam. The species is a Specified Invasive Alien Species designated under the Specified Invasive Alien Species Act. It is established in the cetral Okinawa Island (Onna Village and Nago City). Shoud this species intrude into the northen part of Okinawa Island, there are concerns they may prey on endemic small mammals, amphibians, reptiles, and birds, and may compete with the indigenous snakes.

• Cane toad (*Rhinella marina*)

Native to Latin America. This species is a Specified Invasive Alien Species designated under the Specified Invasive Alien Species Act. These toads live in almost all parts of Ishigaki Island. On Iriomote Island, unintentionally introduced cane toads have been found, but have yet to be established. Should these toads become established, they might prey on endemic insects and small animals, compete with indigenous amphibians and reptiles, and their venom might affect crested serpent eagles and Iriomote cats, both of which are higher-level predators on the island. The Ministry of the Environment developed the Cane Toad (*Rhinella marina*) Control Plan for the Yaeyama Region of Okinawa Prefecture in an attempt to reduce the density of this species on Ishigaki Island, and monitors their potential invasion into other islands, including Iriomote Island.

3) Genetic disruption

As there are many endemic species in the nominated property, the introduction of any related species or any group with different genetic traits even if belonging to the same species from mainland or another island in the Central Ryukyus and the South Ryukyus might cause genetic disruption as a result of hiybridization.

For example, there are cases of genetic disruption on Tokunoshima Island, the northern part of Okinawa Island, and Iriomote Island that occurred as a result of bybridization between the Ryukyu wild boar (*Sus scrofa riukiuanus*), a subspecies endemic to the region, and livestock pigs and wild boars from the mainland (*Sus scrofa leucomystax*) (Hayashi et al., 2014; Murakami et al., 2014; Ota's personal correspondence 2013, 2014). The Yaeyama yellow-margined box turtle (*Cuora flavomarginata evelynae*) and the Yaeyama pond turtle (*Mauremys*

mutica kami), both of which are distributed naturally on the Yaeyama Islands, had been brought into Okinawa Island and the surrounding islands. Consequently, a hybrid of the Ryukyu black-breasted leaf turtle (*Geoemyda japonica*), a species endemic to the northern part of Okinawa Island, with the yellow-margined box turtle has been found (Otani, 1995), and another hybrid with the Yaeyama pond turtle has been found (Ota and Hamaguchi 2003), indicating that genetic disruption may have occurred relative to the population of the Ryukyu black-breasted leaf turtle. Whenever a hybrid or an alien species is found, control procedures are implemented.

Ryukyu wild boar (*Sus scrofa riukiuanus*) (Photo: MOEJ)

4.b. (ii) Environmental pressures

1) Climate change

It is predicted that effects of climate change on the nominated property include warming temperatures, rainfall shortages, typhoons, and torrential rains (Kyushu Regional Environmental Office, Ministry of the Environment 2012; Fukuoka Regional Headquaters, JMA 2015; Japan Meteorological Agency 2015; Okinawa Regional Headquaters, JMA 2015).

• Warming temperatures

Warming temperatures might cause the southernmost range of species for which the nominated property marks a reduction or northward shift thereof, or a new competitive relationship to be generated as a result of animals of a southern origin making inroads (alien species, etc.), with particularly significant impacts likely to be brought to endemic species and any species having a limited range of distribution.

• Changes in trends of rainfall shortages and droughts, etc.

If the occurrence of rainfall shortages and droughts were to become more frequent as a result of climate change, it would likely become a factor that would pose a direct threat to the habitation of such animals as endemic amphibians that inhabit inland waters and endemic rheophytes that are adjusted to the rhithron zone.

• Typhoons and torrential rains

As has been discussed in 2.a. Description of the Property, the Central Ryukyus and the South Ryukyus constitute one of the zones most vulnerable to tropical cyclones (typhoons) that are among the most powerful even on a global scale; these areas are hit by typhoons very frequently every year, with an annual average over the past approximately 60 years amounting to 7.6 times (with a maximum of 15 times and a minimum of three). Organisms and ecosystems in this region have adapted themselves to those frequent strikes of typhoons and torrential rains over a long period of time, but potential increases in the frequency of powerful typhoons, torrential rains, and other consequences thereof are predictable, as future climate change might cause a greater disruption to forests, rhithron zones, and other environments.

Meteorological data accumulation and analysis will be a critical matter for the purpose of predicting future changes to insular ecosystems caused by climate change that could occur. The Japan Meteorological Agency has been constantly engaged in highly accurate observations over a long period of time in cooperation with the World Meteorological Organization (WMO) and other national and international organizations to monitor climate change by means of data accumulation and analysis. The work of analysis and prediction using such data is performed by organizations and researchers from a wide variety of fields, including disaster prevention, agricultural, forestry and fisheries, and ecological system conservation (Ministry of Education, Culture, Sports, Science and Technology, Japan Meteorological Agency, Ministry of the Environment 2013; Climate Change Impact Evaluation Subcommittee, Global Environment Committee of the Central Environment Council 2015).

2) Acid rain

The Ministry of the Environment is constantly engaged in the wide-area, long-term monitoring of acid rain in

cooperation with national and international organizations, including mainly the Acid Deposition Monitoring Network in East Asia (EANET), with an observation point for the Central Ryukyus and the South Ryukyus, which contains the nominated property, built at Cape Hedo in the northern part of Okinawa Island. While no impact from acid deposition, such as arboreal degradation or soil acidification, has been recognized so far, it is feared that an impact originating in East Asian countries, where air pollutant emissions are rising sharply as a result of rapid economic growth, might become evident in the future (Ministry of the Environment 2014).

4.b. (iii) Natural disasters and risk preparedness

• Earthquakes and Tsunamis

Great East Japan Earthquake in 2011, there is a renewed awareness in Japan of the importance of learning from the history of past earthquakes and tsunamis. The following record exists regarding the earthquakes and resultant tsunamis that have caused relatively serious damage in the vicinity of the nominated property (Table 4-6).

Table 4-6: Earthquakes and tsunamis that caused relatively serious damage in the vicinity of the nominated property

Year	Epicenter	Earthquake scale	Seismic intensity	Tsunami runup height	Notes
1771	Sea near Ishigaki Island	M 7.4 (estimate)	4 (estimate)	Approximately 30 m	Commonly known as the "Great Meiwa Tsunami." Casualties reached approximately 12,000.
1911	Sea near Kikai Island	M 8.0	6	Approximately 5 m	
1960	Off the Chilean coast	M 9.5	–	4.4 m	
1995	Sea near Amami -Oshima Island	M 6.9	5	2.7 m	12- to 24-cm tsunami observed in various locations between Kyushu and Izu Oshima Island.

Sources: Websites of the Naze Weather Station, Okinawa Regional Headquarters, JMA, and Ishigaki Local Meteorological Observatory.

Ryukyu kajika frog (*Buergeria japonica*)
(Photo: MOEJ)

Although according to Goto et al. (2013), boulders brought by tidal waves during a typhoon can be found throughout the Central Ryukyus and the South Ryukyus, tsunami rocks (boulders found on coral reefs or in coastal areas) are only found in the Sakishima Island Group of the South Ryukyus, which suggests that there are no signs indicating that Amami-Oshima Island and the Okinawa Island Group have seen any mega-tsunami large enough to push up a tsunami rock the size of at least 1 m in diameter onto the shore in the past 200 to 300 years. In the meantime, massive tsunamis have repeatedly hit the Sakishima Island Group, with implications of the recurrence period being 150 to 400 years (Araoka et al. 2013).

To address natural disasters, including earthquakes, tsunamis, typhoons and torrential rains (see 4.b.(ii) Environmental Pressures), Kagoshima Prefecture and Okinawa Prefecture have developed disaster prevention plans, respectively, for disaster prevention purposes in an attempt to stay prepared for responding to emergency situations once a disaster strikes (Kagoshima Prefecture Disaster Prevention Council 2015; Okinawa Prefecture Disaster Prevention Council 2015).

Pieris japonica var. *koidzumi* (Photo: MOEJ)

4.b. (iv) Responsible visitation at World Heritage sites

Of the nominated property, Amami-Oshima Island, Tokunoshima Island, and Okinawa Island have regular flight and ferry services from the mainland, and also have a road network in place, including highways on Okinawa Island, for traveling from the airport or seaport. In the case of Iriomote Island, there are regular flight and ferry services from the mainland as well as from Okinawa Island to Ishigaki Island, an island located in its vicinity, from where regular ferry service to Iriomote Island is operated; therefore, any of the islands provides easy access to visit the nominated property.

Factors that might have a negative impact on the nominated property include a sharp increase in visitors, the concentration of visitors in some locations, and traffic accidents involving wildlife as a result of car traffic (see 4.a.2.2).

1) Tourism statistics from the past several years

Table 4-7 shows statistics on the status of visits to the nominated property. There is a substantial difference between the Amami Island Group, which contains Amami-Oshima Island and Tokunoshima Island, and Okinawa Prefecture, which contains the northern part of Okinawa Island and Iriomote Island, in terms of circumstances associated with tourism. While no accurate statistical data exists on the number of tourists in the Amami Island Group, the number of inbound visitors and travelers in 2015, including local residents and business travelers, was approximately 760,000 for the island group as a whole, about 420,000 for Amami-Oshima Island, and about 130,000 for Tokunoshima Island (Oshima Branch Office, Kagoshima Prefecture 2016a, b).

Meanwhile, tourism is positioned as a key industry in Okinawa Prefecture, with the number of inbound tourist visitors to the prefecture in 2015 marking an all-time high of approximately 7.76 million (Okinawa Prefecture Tourism Policy Division 2016). There is no accurate statistical data on how many of those tourists visited the northern part of Okinawa Island (three Yambaru villages); it is estimated that approximately 8% of inbound tourists to Okinawa Prefecture (around 600,000 to 700,000) visited the three Yambaru villages (Okinawa Prefecture Department of Culture, Tourism and Sports 2015). The number of tourists who visited Iriomote Island in 2015 totaled about 390,000 (Taketomi Town Commerce and Tourism Department 2016).

Flower chafer (*Paratrichius duplicatus okinawanus*)
(Photo: MOEJ)

Table 4-7: Changes in number of visitors* in four regions of the nominated property in the past five years

	2011	2012	2013	2014	2015	Source
Amami-Oshima Island	357,103	361,252	370,360	393,654	422,527	1)
Tokunoshima Island	127,290	125,110	126,345	124,275	129,806	1)
Okinawa Island	5,415,500	5,835,800	6,413,700	7,058,300	7,763,000	2)
Iriomote Island	254,011	284,995	346,401	379,727	387,952	3)

Sources: 1) Oshima Branch Office, Kagoshima Prefecture (2016a, b); 2) Okinawa Prefecture (2015), Tourism Policy Division, Okinawa Prefecture (2016); 3) Commerce and Tourism Department, Taketomi Town (2016).

* The number of visitors means: in source 1), the number of inbound visitors and travelers (sum total of the number of people who entered any island of the Amami Island Group from outside of the island group and the number of people who travelled within the island group); in source 2), the number of inbound tourist visitors to Okinawa Prefecture from outside of the prefecture and; in source 3), the number of inbound tourist visitors to Iriomote Island from outside of the island.

2) Major site use

Although circular tourism visiting sightseeing sites and facilities is the main utilization form, in the Amami Island Group and Okinawa Prefecture, ecotourism and other forms of tourism characterized by hands-on experience and extended stays that take advantage of their resources, such as abundant nature and indigenous culture, have been promoted in recent years.

2)-1. Amami Island Group

Major categories of inbound visitors and travelers to the Amami Island Group are local residents and business travelers, and the percentage of tourists is believed not to be substantial (Development Bank of Japan 2014). Figure 4-4 shows the major locations and site use on Amami-Oshima Island and Tokunoshima Island.

- Amami-Oshima Island

  In addition to group sightseeing tours using a large bus, individual tourists renting a car are increasing. Many tourists enjoy visiting natural scenic sites and visitor facilities while others enjoy marine activities such as diving and surfing. The main guided tours include canoeing in mangrove forests and wildlife observations at night. The major visitor destinations and site use on Amami-Oshima Island are shown in Figure 4-4.

- Tokunoshima Island

  In regard to the form of tourism on Tokunoshima Island, there are a number of individual tourists renting a car to visit natural scenic places, while others enjoy marine activities such as diving. In recent years, guided terrestrial ecotours and development of wildlife observation facilities are being promoted. The major visitor destinations and site use on Tokunoshima Island are shown in Figure 4-4.

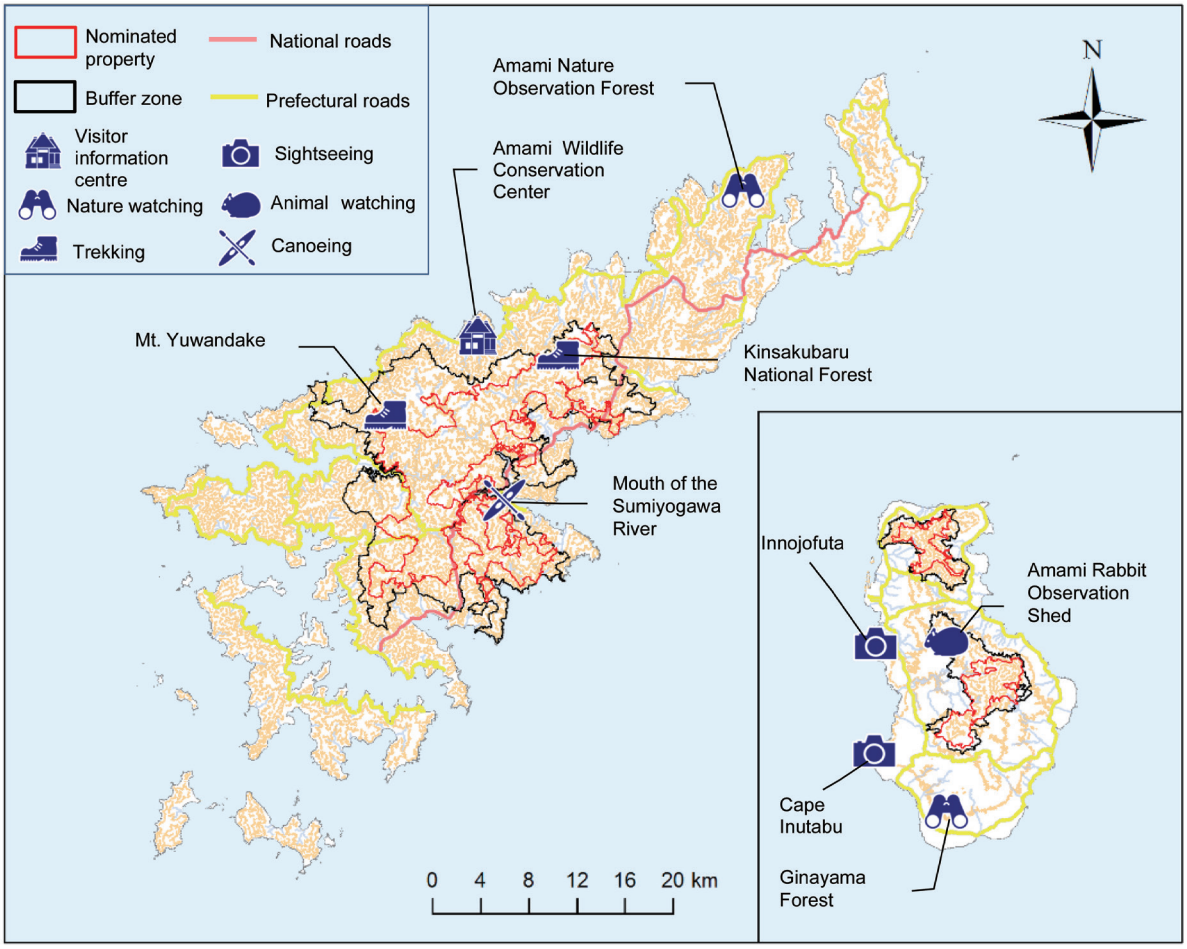


Figure 4-4: Major locations and site use forms on Amami-Oshima Island

2)-2. Okinawa Prefecture

Known as a tourism-oriented prefecture, Okinawa Prefecture has seen more than a tenfold growth in about 40 years since its reversion to Japan in 1972 in terms of the number of inbound tourist visitors to the prefecture as well as its tourism revenues. Over the course of those years, the forms of tourism within Okinawa Prefecture have been constantly changing along with the progress of developments shown in Table 4-8. In the late 1990s, an effort was begun to offer ecotourism and other forms of tourism characterized by hands-on experience and extended stays that take advantage of Okinawa's abundant nature and indigenous culture, driven by private businesses, local public agencies and others, with actions being written into the Act on Special Measures for Okinawa Promotion, including a master plan developed by the Okinawa Prefecture and the formation of a promotional organization.

Table 4-8: Changes in tourism and developments of ecotourism promotion in Okinawa Prefecture

Year	Events - Actions
1972	Reversion to Japan. Number of inbound tourist visitors to Okinawa reaching 560,000, tourism revenues reaching 32.4 billion yen.
1975	Okinawa International Ocean Expo held. Main forms of tourism: multi-stop sightseeing group tours to visit historical sites and battle sites in Naha City and the south-central part of Okinawa Island
1987	Act on Development of Comprehensive Resort Areas enacted. A large number of resort hotels built, particularly in the south-central part of Okinawa Island, leading to dramatic increases in the number of inbound tourist visitors.
1990 -	Number of tourists skyrocketed as a result of airfare deregulation and travel product price reduction. Multi-stop sightseeing tourism in and around Naha City ↓ Tourists spread out to the northern part of Okinawa Island and to isolated islands; repeat visitors increased. Multi-purpose, independent style of tourism taking root.
2002	Act on Special Measures for the Promotion and Development of Okinawa revised. Revised to create provisions on the promotion of environmentally-friendly hands-on nature activities (ecotourism) and on a program for the accreditation of conservation and utilization agreements.
2004	Master Plan "Okinawa Prefecture Eco-Tourism Promotion Plan" developed.
2006	NPO Eco-Tourism Promoting Council Okinawa established.
2015	Number of inbound tourist visitors: 7.76 million; tourism revenues: 591.3 billion yen

Canoe tour on the Nakama River, Iriomote Island (Photo: MOEJ)

The situations in the northern part of Okinawa Island and Iriomote Island, which the nominated property contains, are described below.

• Northern part of Okinawa Island

Multi-stop sightseeing trips represent the major form of tourism in the northern part of Okinawa Island whereby tourists staying in the south-central part of Okinawa Island take day trips to visit tourist sites and establishments, such as Cape Hedo and Hiji-otaki Falls; other patterns include staying in resort establishments in Kunigami Village (approximately 140,000 people per year) and ecotouring that offers hands-on experience in nature, local life and culture. There are probably also a good number of Okinawa Prefecture residents who visit the area as a driving or recreational destination. Figure 4-5 shows the major locations and site use in northern part of Okinawa Island.

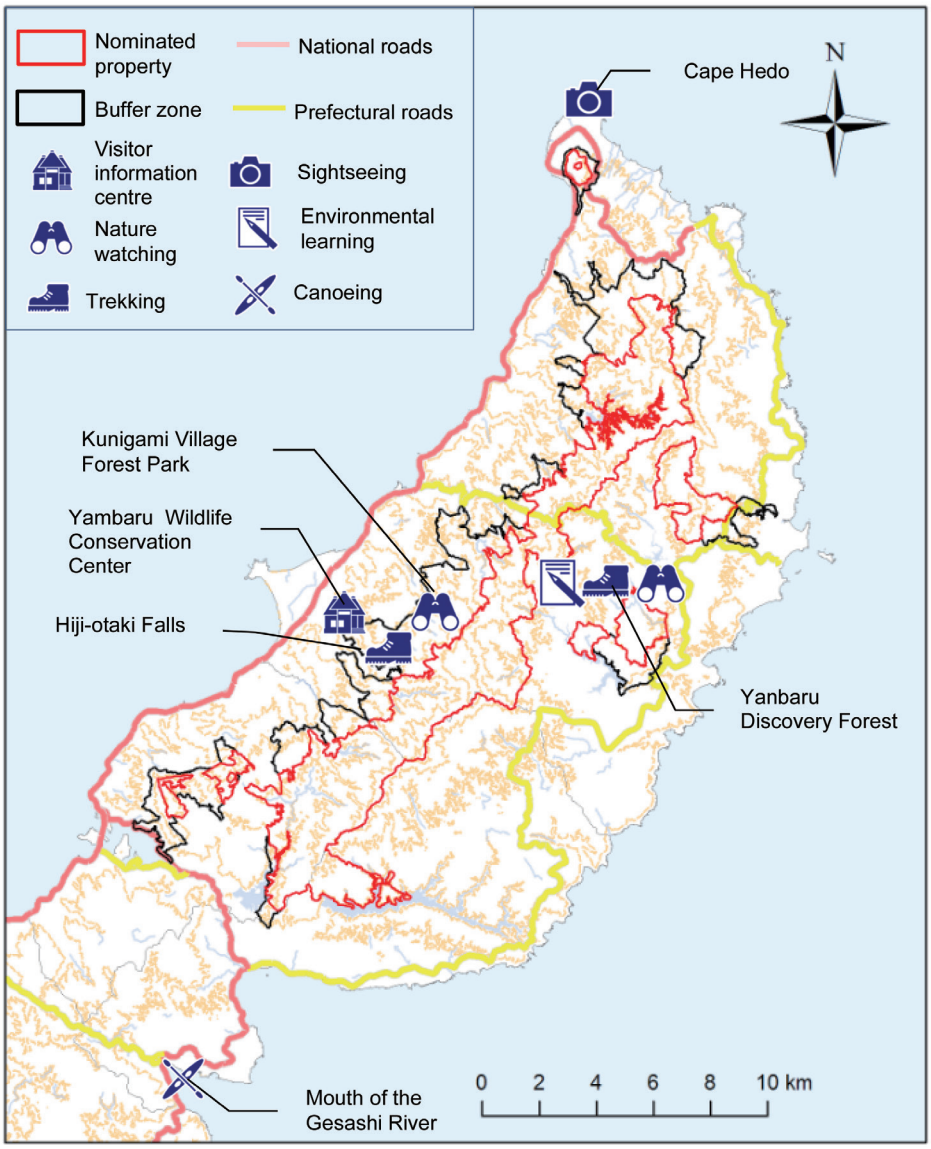


Figure 4-5: Major locations and site use forms in the northern part of Okinawa Island

• Iriomote Island

The features of tourism on Iriomote Island include the presence of many group travelers in wintertime and the prevalence of multi-stop sightseeing trips whereby tourists, during their stay on Ishigaki Island, visit Iriomote Island on day trips to take a boat tour on the Nakama River or the Urauchi River and then move on to another island (Okinawa Development Finance Corporation 2014; Department of Environmental Affairs, Okinawa Prefecture, etc. 2015). Another feature is the growing number of ecotour participants since the mid-1990s, though the percentage to total tourists is small: around 50,000 people per year (Department of Environmental Affairs, Okinawa Prefecture, etc. 2015). Figure 4-6 shows the major locations and site use on Iriomote Island.

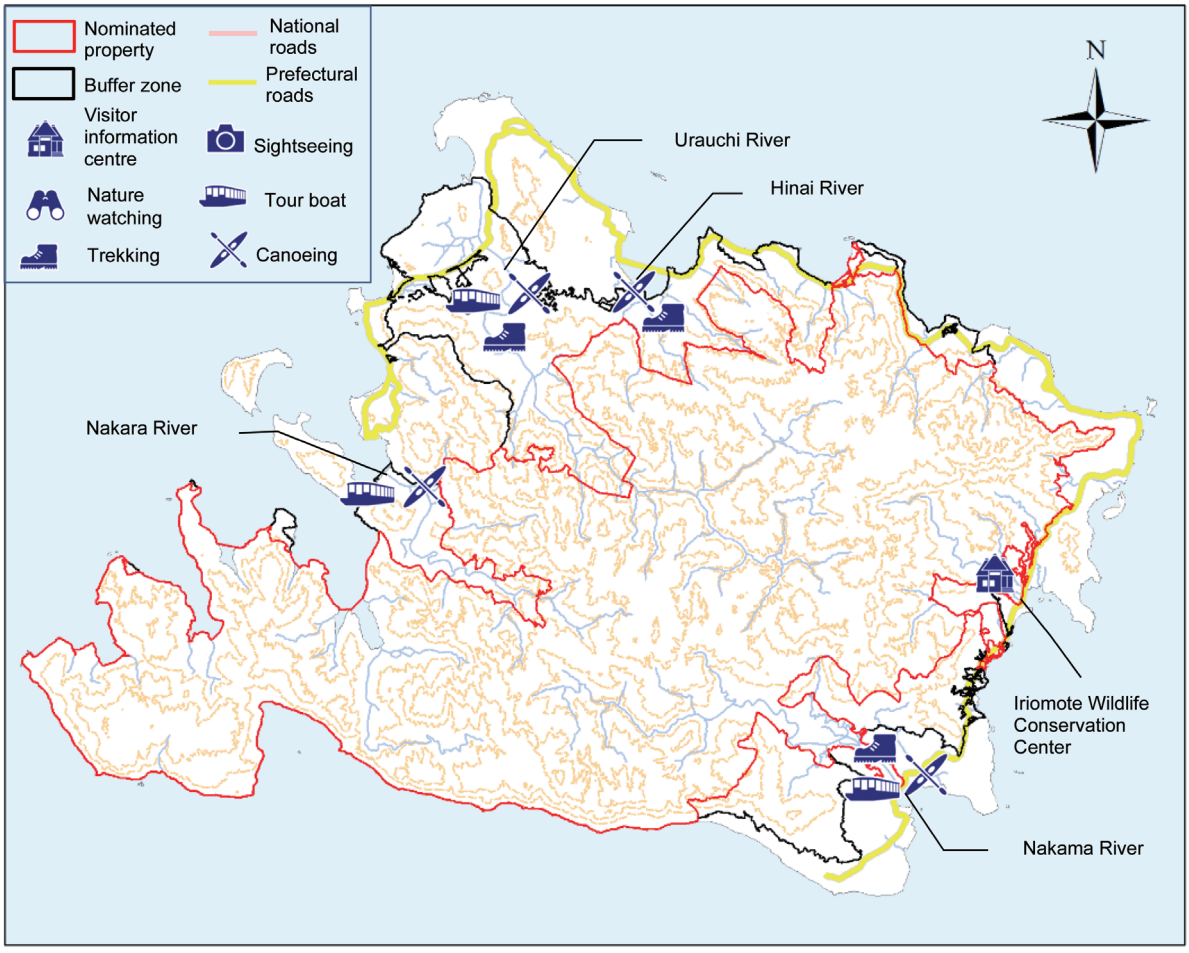


Figure 4-6: Major locations and site use forms on Iriomote Island

3) Promotion of appropriate sustainable use

Increases in tourism visits to the nominated property due to their higher profile as a result of being inscribed on the World Heritage list, and steps to keep them at an appropriate level, are considered one of the critical issues for the purposes of maintaining their heritage values and ensuring sustainable utilization (Kagoshima Prefecture 2015; Okinawa Prefecture 2015). Following the inscription as a World Heritage site, efforts to reduce impact on the natural environment and provide opportunities for deeper natural experiences will be undertaken, such as promoting ecotourism and other types of experience-focused residential tourism in the nominated property and leading round-trip tourists who participate in mass tourism to be accepted in buffer-zones and peripheral areas. With respect to their expected environmental carrying capacity and visitor management, Kagoshima Prefecture and Okinawa Prefecture are in the process of giving specific deliberations to comprehend the actual status of utilization, sorting out issues concerning the conservation and utilization, predicting future utilization, and determining necessary actions. The existing and ongoing actions intended to ensure sustainable tourism utilization in the nominated property are described below.

Amami-Oshima Island and Tokunoshima Island, ecotourism is in its early stage, with a variety of activities currently underway by municipalities, tourism industries, guides and others in an attempt to ensure sustainable utilization, including mainly formulating the "overall concept for promoting Ecotourism of the Amami Island Group" pursuant to the Ecotourism Promotion Act, as well as developing guidelines and voluntary rules, investigating resources and creating programs, developing human resources, and examining a guide certificate system (Table 4-9).

Table 4-9: Status of actions for ecotourism promotion on Amami-Oshima Island and Tokunoshima Island

Year	Actions
2008	Amami-Oshima Island Ecotour Guide Liaison Council established.
2012	Tokunoshima Island Ecotour Guide Liaison Council established.
	Amami-Oshima Island Ecotourism Promotion Council and Tokunoshima Island Ecotourism Promotion Council established.

The Okinawa Prefecture Department of Environment, together with others, declared the following (in 2015): While it is difficult to perform a numerical prediction as to how much growth in demand for inbound tourism should be anticipated by the respective regions following their inscription on the natural World Heritage list, it will presumably be necessary to have examined a variety of steps by assuming, as one measure, the possibility of an approximately 1.5-fold increase in demand in comparison to the present status (approximately 800,000 visitors in the northern part of Okinawa Island and approximately 500,000 visitors on Iriomote Island).

In the northern part of Okinawa Island, promotional organizations have been established by Kunigami Village, Ogimi Village, and Higashi Village, respectively, and are engaged in a variety of actions suited to the actual circumstances of each area, with the aim of ensuring sustainable utilization, including signing conservation and utilization agreements, developing guidelines and voluntary rules, investigating resources and creating programs, and developing human resources (Table 4-10).

Table 4-10: Status of actions for ecotourism promotion in the northern part of Okinawa Island

Year	Actions
1999	Higashi Village Ecotourism Association established.
2001	NPO Kunigami Tourism Association established.
2007	Kunigami Village Environmental Education Center "Yanbaru Discovery Forest" established (operated by Kunigami Tourism Association). Ogimi Village prohibited access to Mt. Tamachiji, for which there were concerns over the issue of overuse.
2008	NPO Ogimi Inside Out Tourism Association established.
2010	NPO Higashi Village Tourism Promotion Council established.
2014	Mt. Ibudake District Conservation and Utilization Agreement (on the specification of an appropriate number of visitors, location-specific rules, donation of environment support funds to the district, etc.) signed between the Ada district of Kunigami Village and an eco-tour operator (a single business), and accredited.

On Iriomote Island, an ecotourism promotional organization was established, which currently has a variety of actions underway with the aim of ensuring sustainable utilization, including signing conservation and utilization agreements, developing guidelines and voluntary rules, investigating resources and creating programs, and developing human resources (Table 4-11).

Table 4-11: Status of actions for ecotourism promotion on Iriomote Island

Year	Actions
1996	Iriomote Island Ecotourism Association established.
1999	Iriomotejima Canoe Association established (35 businesses). (They set limits on the number of users on the Hinai River per day per business.)
2004	Nakama River Conservation and Utilization Agreement signed by tour boat and canoe business operators that use the Nakama River (five businesses). (It contains motor-driven tour boat driving speed limits, limits on the number of canoe users, etc.)

4.b. (v) Number of inhabitants within the property and buffer zone

Table 4-12 shows the number of residents within the property and buffer zones. There are no residents within the property boundaries. There are 10 households with 15 residents within the buffer zones.

Table 4-12: Residents within the nominated property and buffer zones

	Nominated property		Buffer zones	
	Number of residents	Number of households	Number of residents	Number of households
Amami-Oshima Island	0	0	1	1
Tokunoshima Island	0	0	6	3
Northen part of Okinawa Island	0	0	7	5
Iriomote Island	0	0	1	1
Total	0	0	15	10

5

Protection and Management of the Property

5.a. Ownership

5.b. Protective Designation

5.c. Means of Implementing Protective Measures

5.d. Existing Plans Related to Municipality and Region in Which the Nominated Property is Located

5.e. Property Management Plan or Other Management System

5.f. Sources and Levels of Finance

5.g. Sources of Expertise and Training in Conservation and Management Techniques

5.h. Visitor Facilities and Infrastructure

5.i. Policies and Programmes Related to the Presentation and Promotion of the Property

5.j. Staffing Levels and Expertise

Amami rabbit (*Pentalagus furnessi*), Amami-Oshima Island

5. Protection and Management of the Property

5.a. Ownership

Table 5-1 shows the percentages of land ownership in the four component clusters in the nominated property.

Table 5-1: Land ownership of four regions containing the nominated property

	Area of the nominated property by island (with area of the buffer zone in the lower cell)	National land	Prefectural land, municipal land	Private land, etc. (including land with unknown ownership)
Amami-Oshima Island	11,544ha	27% (3,080 ha)	24% (2,766ha)	49% (5,698ha)
	14,468ha	5% (699ha)	32% (4,581ha)	64% (9,188ha)
Tokunoshima Island	2,434ha	95.4% (2,322ha)	0.4% (10ha)	4.2% (102ha)
	2,852ha	29% (820ha)	9% (252ha)	62% (1,780ha)
Northern part of Okinawa Island	5,133ha	20% (1,010ha)	73% (3,753ha)	7% (370ha)
	3,268ha	12% (402ha)	52% (1,697ha)	36% (1,169ha)
Iriomote Island	18,835ha	95.3% (17,946ha)	0.1% (23ha)	4.6% (866ha)
	5,542ha	87% (4,824ha)	4% (204ha)	9% (514ha)
Total	37,946ha	64% (24,359ha)	17% (6,552ha)	19% (7,036ha)
	26,130ha	26% (6,745ha)	26% (6,734ha)	48% (12,651ha)

(Some total figures do not match the sum totals due to the rounding off of fractions.)

In terms of the entirety of the nominated property, the percentage of national land is 64% for the nominated property and 24% for the buffer zones. All types of public land put together account for 81% of the nominated property and 50% of the buffer zones. The contact information of the main landowners—the Ministry of the Environment, the Forestry Agency, Kagoshima Prefecture, Okinawa Prefecture, and local municipalities—is shown in Chapter 8.

5.b. Protective Designation

The nominated property is strictly protected pursuant to domestic laws and systems with designations that include: National Park Special Protection Zone; National Park Class I Special Zone; Forest Ecosystem Reserve Preservation Zone; National Wildlife Protection Area and; National Natural Monument.

The buffer zones are adjacent to the nominated property and use and development is regulated within National Park Class II Special Zone, Forest Ecosystem Reserve Conservation and Utilization Zone, or other protected areas. Tables 5-2-1 to 5-2-4 show details of the protected areas, such as the names of the respective protected areas, designation years, and legal foundations (see Appendices 3 and 4 for more detailed information).

Figures 5-1-1 to 5-1-13 show maps depicting the boundaries of each protected area.

Table 5-2-1: Designation details for protected areas in the nominated property (Amami-Oshima Island)

Name of protected area (Date of designation)	Legal foundation (Date of promulgation)	Objectives of system
Amami Gunto National Park (provisional name) (scheduled in 2017) Total National Park / Area in Amami-Oshima Island Total terrestrial area: 42,181 ha / 34,330 ha Special Protection Zone: 5,248 ha / 3,806 ha Special Zone: 35,363 ha / 29,896 ha*1 Ordinary Zone: 1,570ha / 628 ha Total marine area: 33,082 ha*2 Marine Special Zone: 1,124 ha*2 Ordinary Zone: 31,958 ha*2	Natural Parks Act (June 1, 1957)	Outstanding natural scenic areas representing the sceneries of the State as designated by the Minister of the Environment for the purpose of serving to health, recreation and culture of the people as well as contributing to conservation of biological diversity, through protection of the excellent natural scenic areas and promoted utilization.
Amami Gunto Forest Ecosystem Reserve (March 15, 2013) Total Forest Ecosytem Reserve / Area in Amami-Oshima Island Total area: 4,820 ha / 2,045 ha Preservation Zone: 2,253 ha / 731 ha Conservation and Utilization Zone: 2,567 ha / 1,314 ha	Act on the Administration and Management of National Forest (June 23, 1951) National Forest Administration and Management Bylaw (January 21, 1999)	Areas to preserve natural forests in virgin condition in order to maintain a natural environment of the forest ecosystem, protect plants and animals, preserve genetic resources, develop forest operation and management technique, and promote scientific research etc.
Mt. Yuwandake National Wildlife Protection Area (November 1, 1965) Total area: 320 ha (renewed October 28, 2005) Special Protection Zone: 103 ha	Wildlife Protection, Control and Hunting Management Act (July 12, 2002)	Areas designated to protect and recover wildlife through prohibiting capture of wildlife, securing stable maintenance, conserving and managing diverse wildlife habitats and thereby securing local biodiversity conservation.
National Natural Monuments Kamiya/Yuwandake (November 8, 1968)	Act on Protection of Cultural Properties (May 30, 1950)	Animals, plants, and geological features of high academic value for the State.

*1 : Areas of Special Protection Zone includes Class II Special Zone in Kakeroma, Ukejima, and Yoro Islands.
*2 : Marine areas are public water surfaces owned by the State and are not clarified for each island. Therefore the figures show the area of the entire Amami Gunto National Park.

Forest near the summit of Mt. Yuwandake, Amami-Oshima Island (Photo: MOEJ)

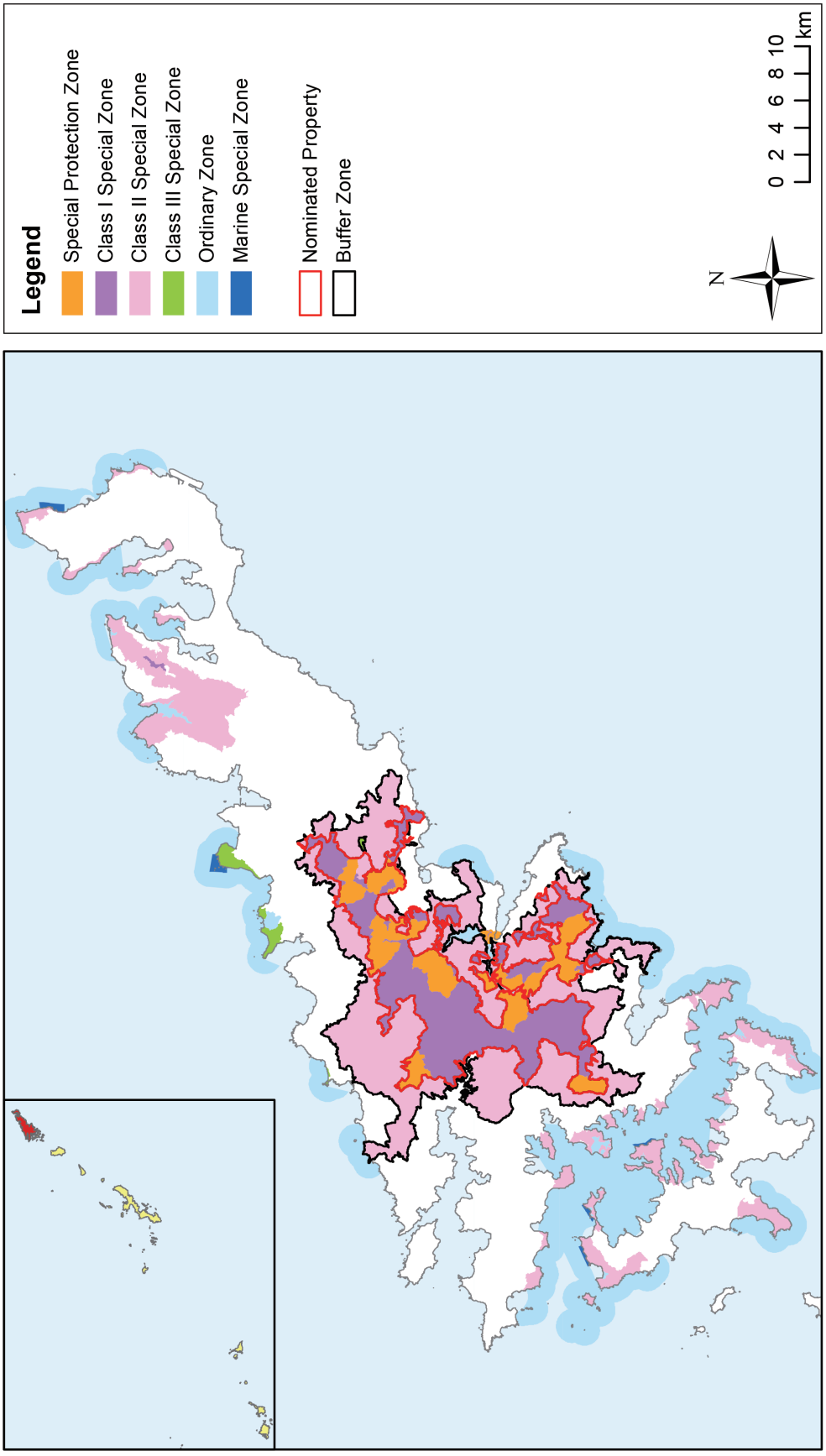


Figure 5-1-1: Amami Gunto National Park (Amami-Oshima Island)

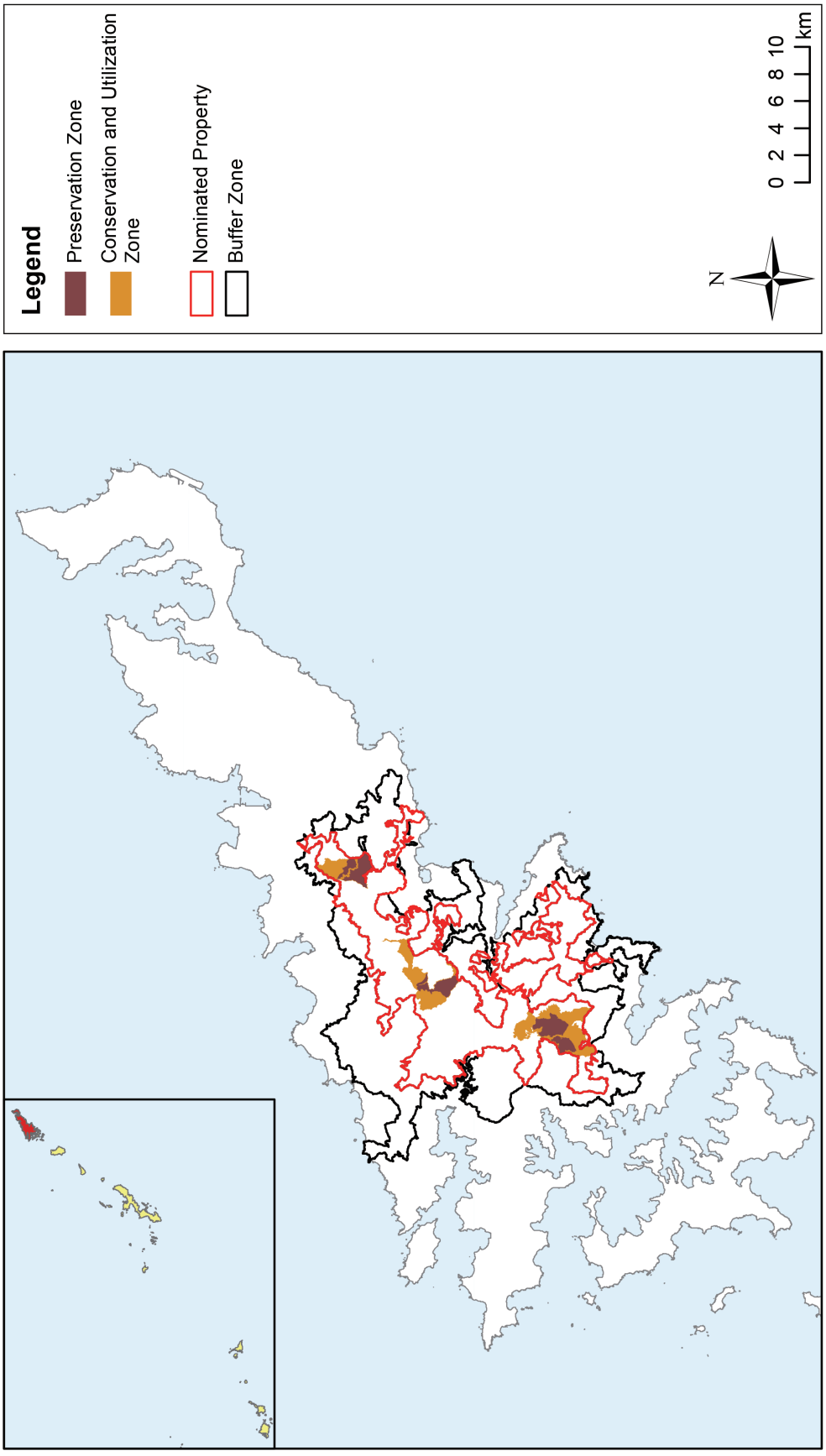


Figure 5-1-2: Amami Gunto Forest Ecosystem Reserve (Amami-Oshima Island)

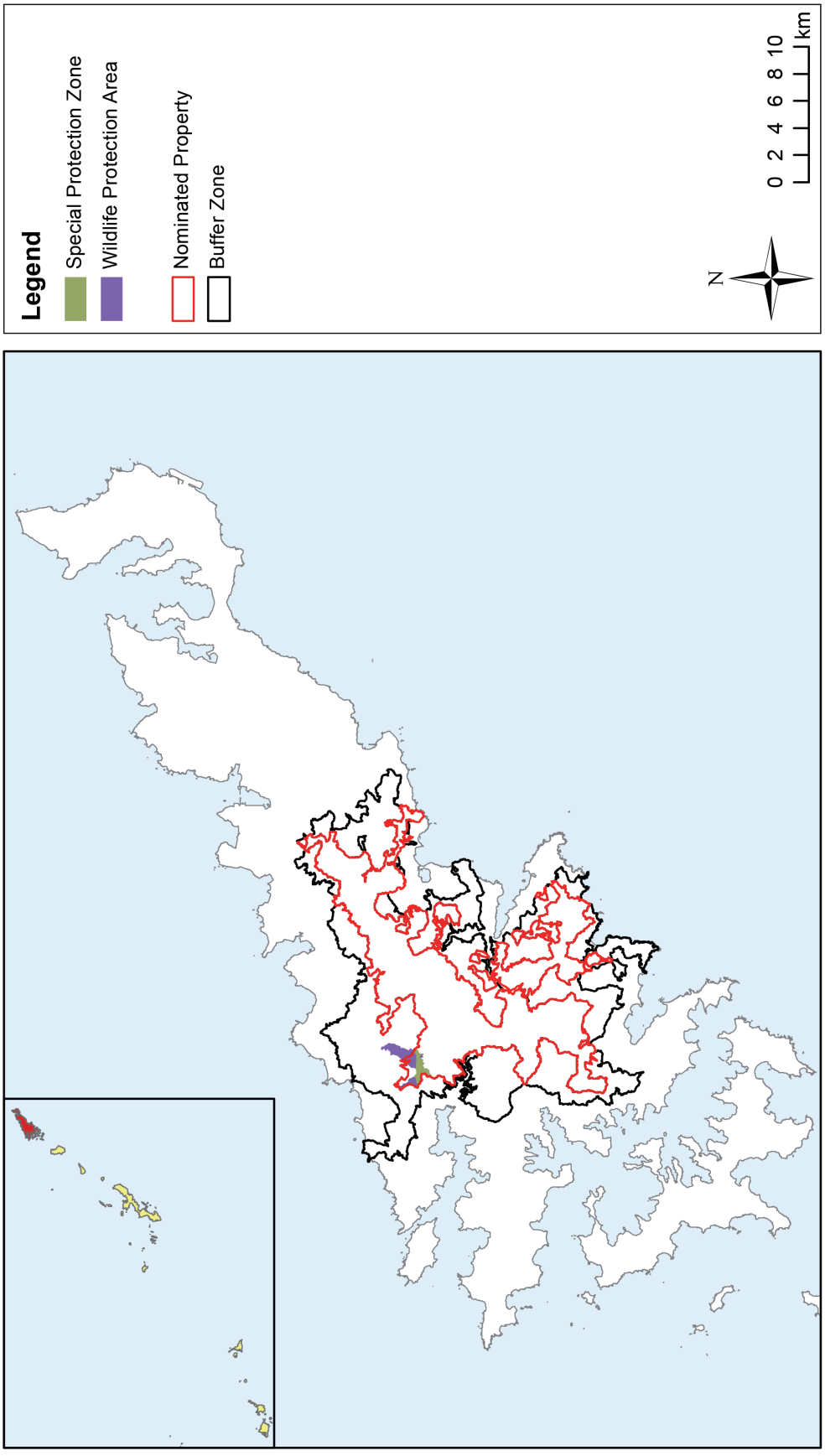


Figure 5-1-3: Mt. Yuwandake National Wildlife Protection Area (Amami-Oshima Island)

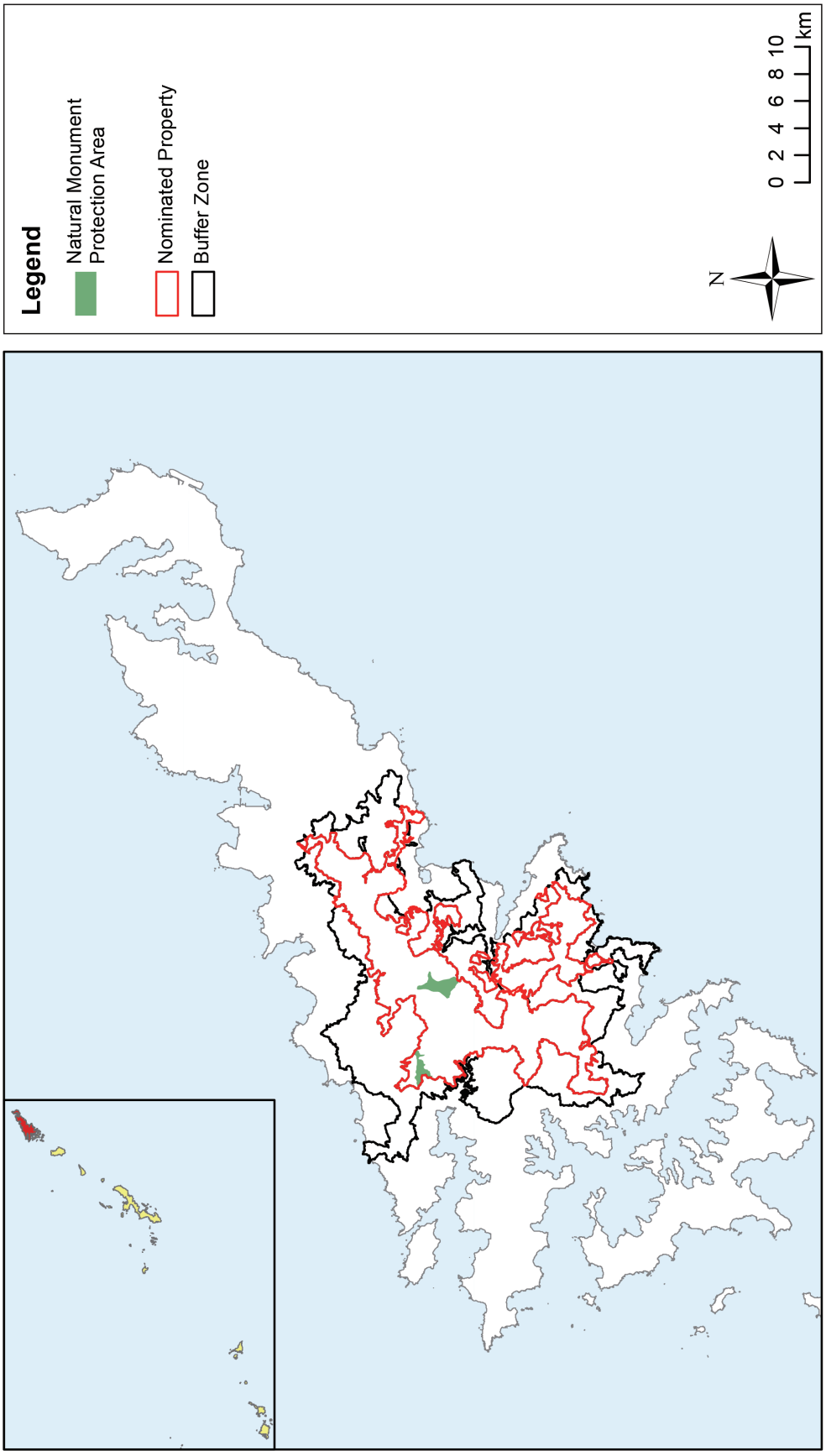


Figure 5-1-4: National Natural Monument, Kamiya-Yuwandake (Amami-Oshima Island)

Table 5-2-2: Designation details for protected areas in the nominated property (Tokunoshima Island)

Name of protected area (Date of designation)	Legal foundation (Date of promulgation)	Objectives of system
Amami Gunto National Park (provisional name) (scheduled in 2017) Total National Park /Area in Tokunoshima Island Total terrestrial area: 42,181 ha / 6,122 ha Special Protection Zone: 5,248 ha / 1,442 ha Special Zone: 35,363 ha / 4,362 ha Ordinary Zone: 1,570 ha / 318 ha Total marine area: 33,082 ha* Marine Special Zone: 1,124 ha* Ordinary Zone: 31,958 ha*	Natural Parks Act (June 1, 1957)	See Table 5-2-1
Amami Gunto Forest Ecosystem Reserve (March 15, 2013) Total Forest Ecosytem Reserve / Area in Tokunoshima Island Total area: 4,820 ha / 2,775ha Preservation Zone: 2,253 ha / 1,521ha Conservation and Utilization Zone: 2,567 ha / 1,254 ha	Act on the Administration and Management of National Forest (June 23, 1951) National Forest Administration and Management Bylaw (January 21, 1999)	See Table 5-2-1

* : Marine areas are public water surfaces owned by the State and are not clarified for each island. Therefore the figures show the whole marine area of Amami Gunto National Park.

Mt. Inokawadake, Tokunoshima Island (Photo: JWRC)

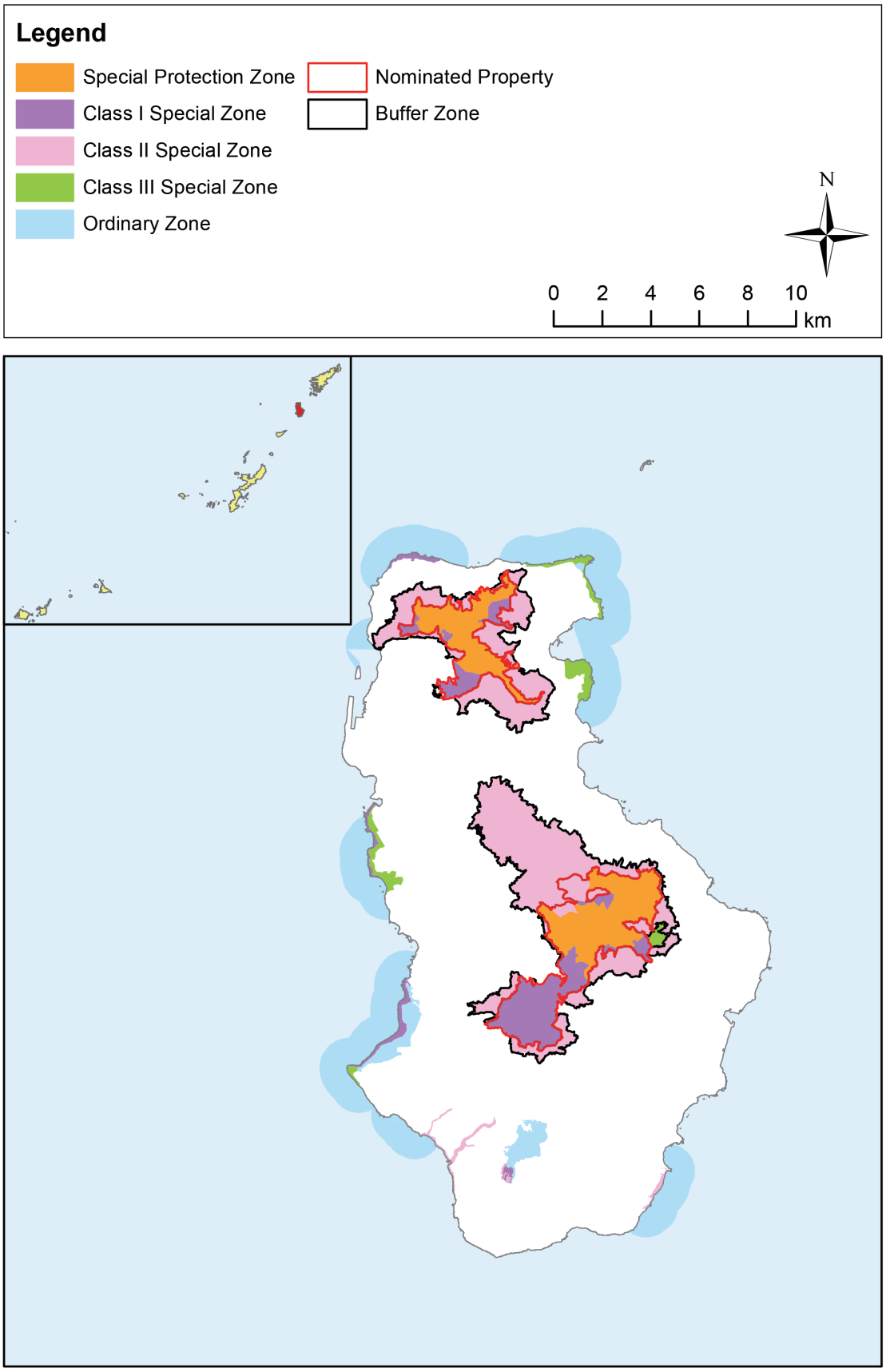


Figure 5-1-5: Amami Gunto National Park (Tokunoshima Island)

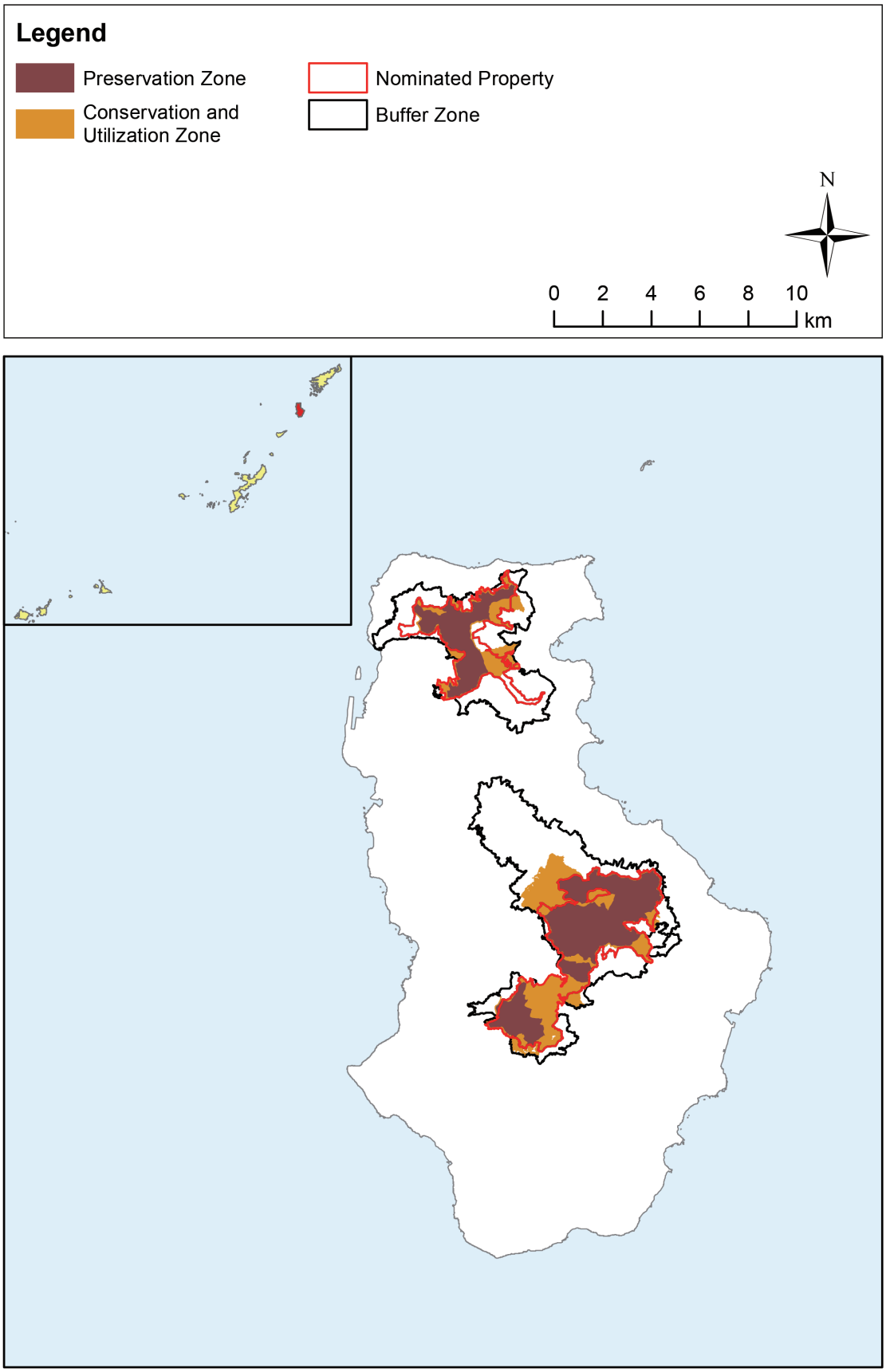


Figure 5-1-6: Amami Gunto Forest Ecosystem Reserve (Tokunoshima Island)

Table 5-2-3: Designation details for protected areas in the nominated property (Northern part of Okinawa Island)

Name of protected area (Date of designation)	Legal foundation (Date of promulgation)	Objectives of system
Yambaru National Park (September 15, 2016) Total terrestrial area: 13,622 ha Special Protection Zone: 789 ha Special Zone: 11,827 ha Ordinary Zone: 1,006 ha Total marine area: 3,670 ha Ordinary Zone: 3,670 ha	Natural Parks Act (June 1, 1957)	See Table 5-2-1
Yambaru (Ada) National Wildlife Protection Area (November 1, 2009) Total area: 1,279 ha Special Protection Zone: 220 ha	Wildlife Protection, Control and Hunting Management Act (July 12, 2002)	See Table 5-2-1
Yambaru (Aha) National Wildlife Protection Area (November 1, 2009) Total area: 465 ha	Same as above	See Table 5-2-1
National Natural Monuments Mt. Yonahadake Natural Monument Protection Area (May 15, 1972)	Act on Protection of Cultural Properties (May 30, 1950)	See Table 5-2-1

Mt. Yonahadake Trail, Yambaru National Park (Photo: MOEJ)

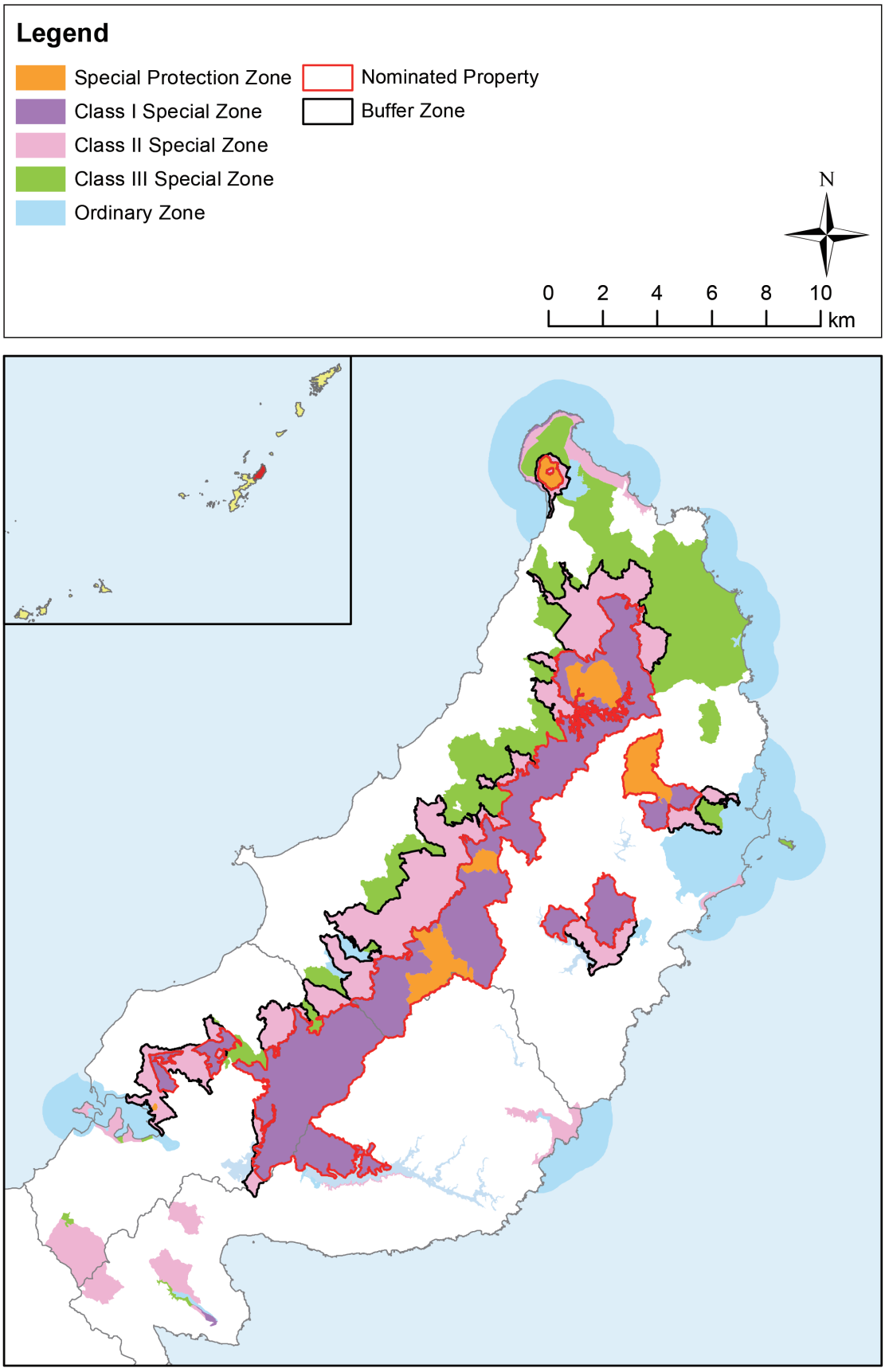


Figure 5-1-7: Yambaru National Park (Northern part of Okinawa Island)

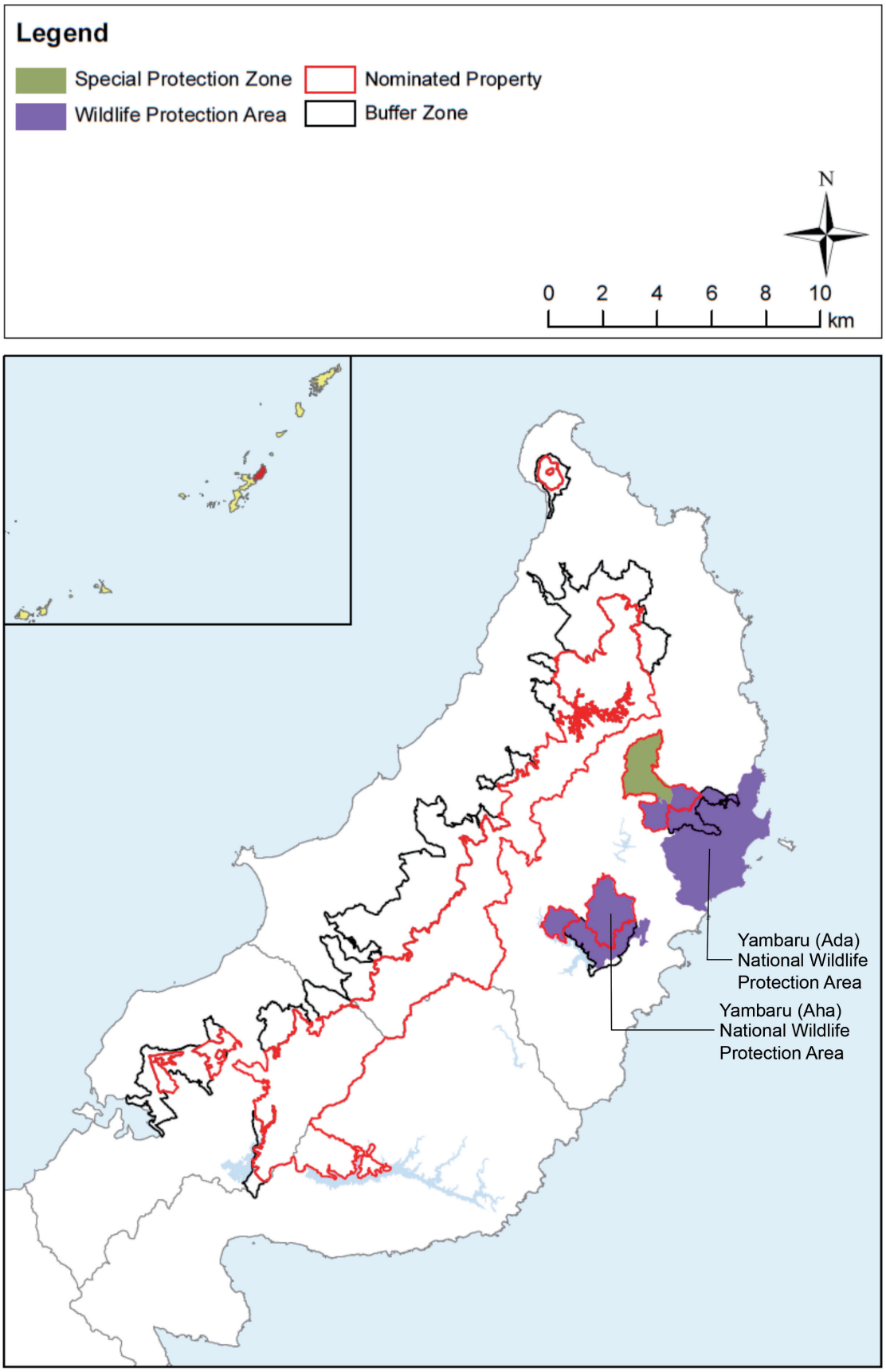


Figure 5-1-8: Yambaru (Ada) and Yambaru (Aha) National Wildlife Protection Area (Northern part of Okinawa Island)

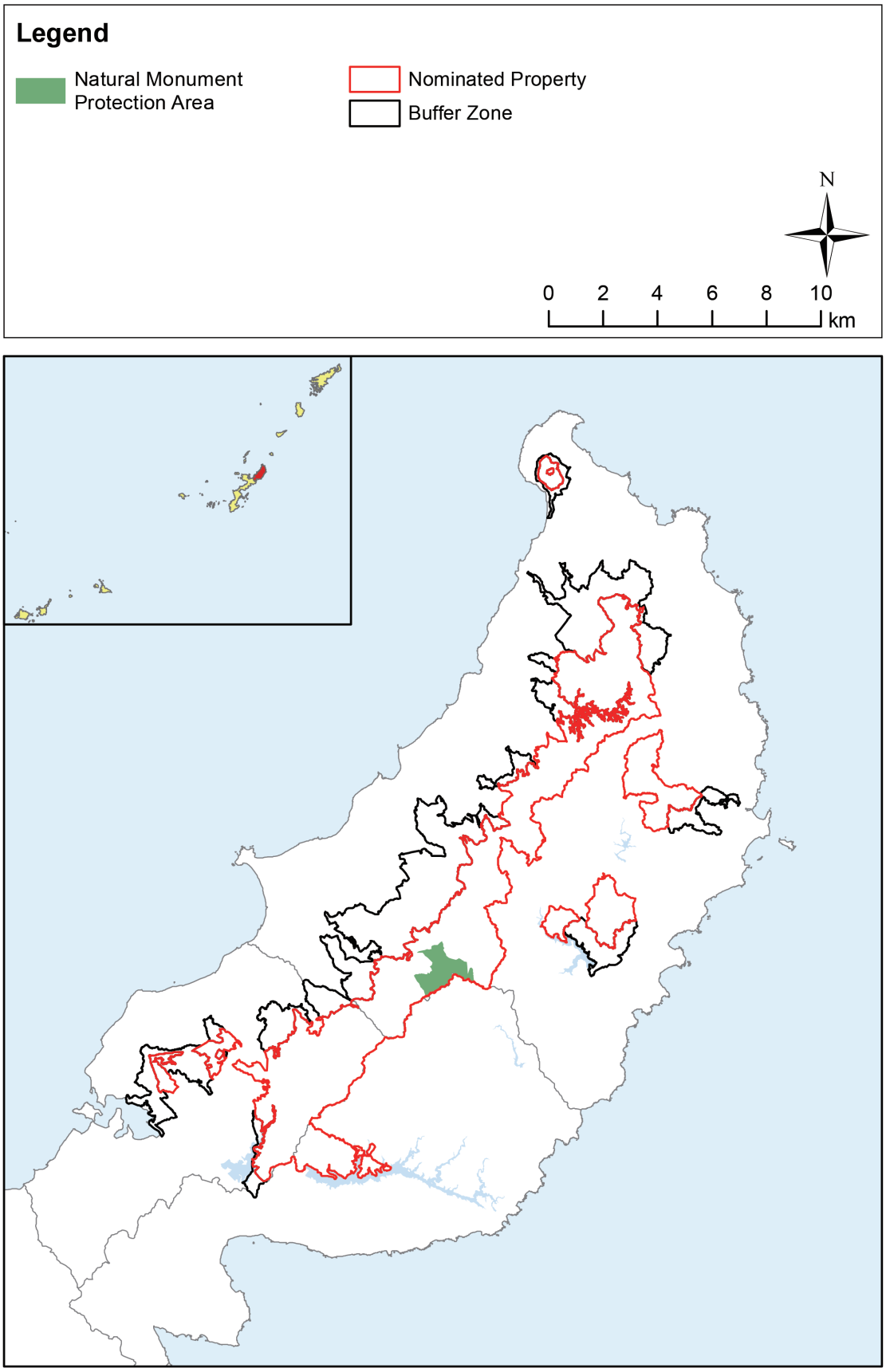


Figure 5-1-9: Mt. Yonahadake Natural Monument Protection Area (Northern part of Okinawa Island)

Table 5-2-4: Designation details for protected areas in the nominated property (Iriomote Island)

Name of protected area (Date of designation)	Legal foundation (Date of promulgation)	Objectives of system
Iriomote-Ishigaki National Park (May 15, 1972) Total National Park /Area in Iriomote Island Total terrestrial area: 40,653 ha / 29,446 ha (renewed April 15, 2016) Special Protection Zone: 5,181 ha / 4,624 ha Special Zone: 28,814 ha / 22,226 ha Ordinary Zone: 6,658 ha / 2,596 ha Total marine area: 81,497 ha (renewed April 15, 2016)* Marine Special Zone:15,923 ha Ordinary Zone: 65,574 ha	Natural Parks Act (June 1, 1957)	See Table 5-2-1
Iriomote Forest Ecosystem Reserve (March 28, 1991) Total area: 22,367 ha (expanded by amendment of Regional Administration and Management Plan April 1,2015) Preservation Zone: 9,999 ha Conservation and Utilization Zone: 12,368 ha	Act on the Administration and Management of National Forest (June 23, 1951) National Forest Administration and Management Bylaw (January 21, 1999)	See Table 5-2-1
Iriomote National Wildlife Protection Area (March 1, 1992) Total area: 10,218 ha (renewed October 24, 2011) Special Protection Zone: 9,999 ha	Wildlife Protection, Control and Hunting Management Act (July 12, 2002)	See Table 5-2-1
National Natural Monuments Nakama River Natural Monument Protection Area (May 15, 1972) Ubundul *Satakentia liukiuensis* communities (May 15, 1972)	Act on Protection of Cultural Properties (May 30, 1950)	See Table 5-2-1

* : Marine areas are public water surfaces owned by the State and are not clarified for each island. Therefore the figures show the entire marine area of Amami Gunto National Park.

Mariyudo Waterfalls,
Iriomote National Park
(Photo: MOEJ)

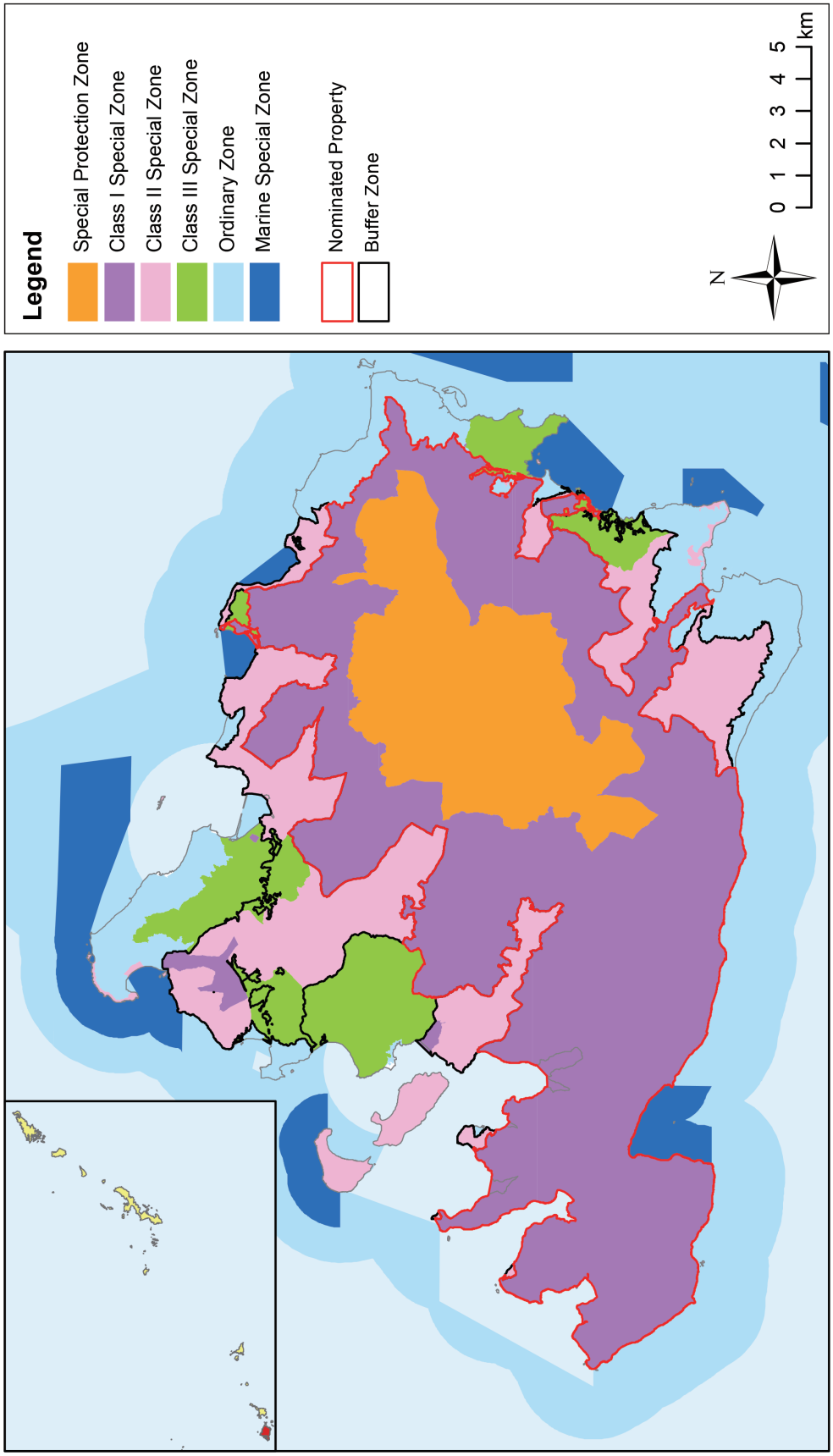


Figure 5-1-10: Iriomote-Ishigaki National Park (Iriomote Island)

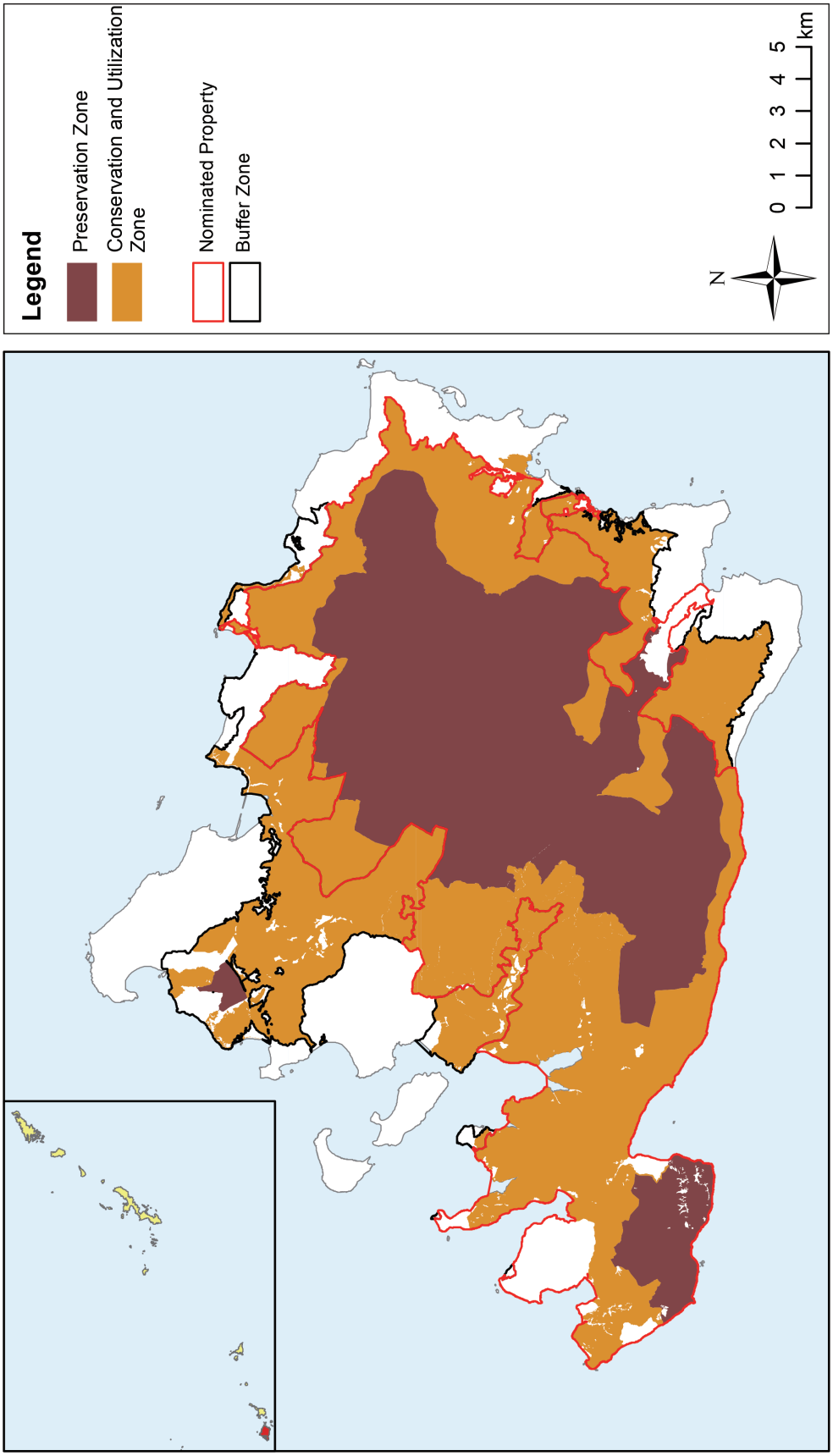


Figure 5-1-11: Iriomote Forest Ecosystem Reserve (Iriomote Island)

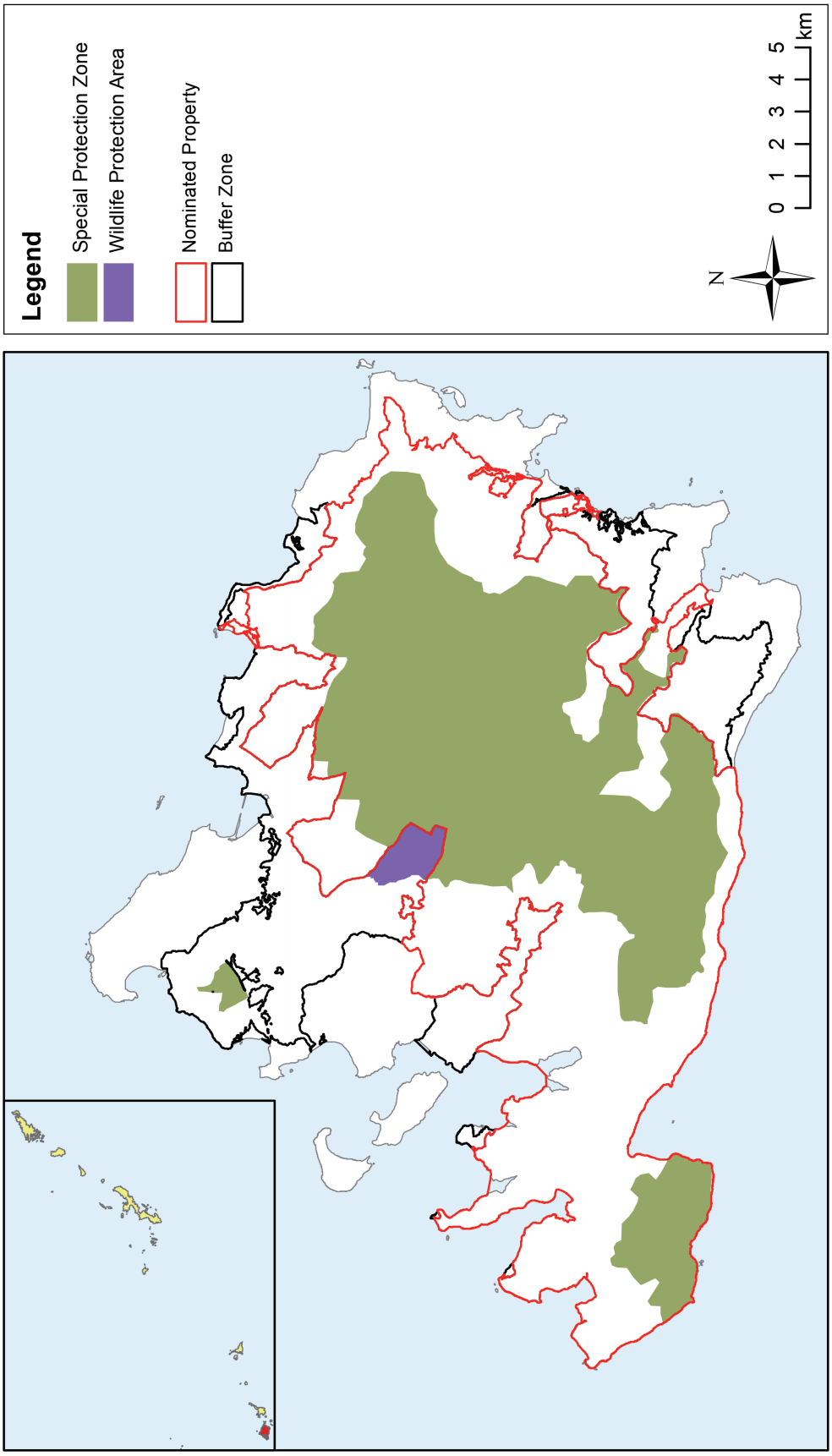


Figure 5-1-12: Iriomote National Wildlife Protection Area (Iriomote Island)

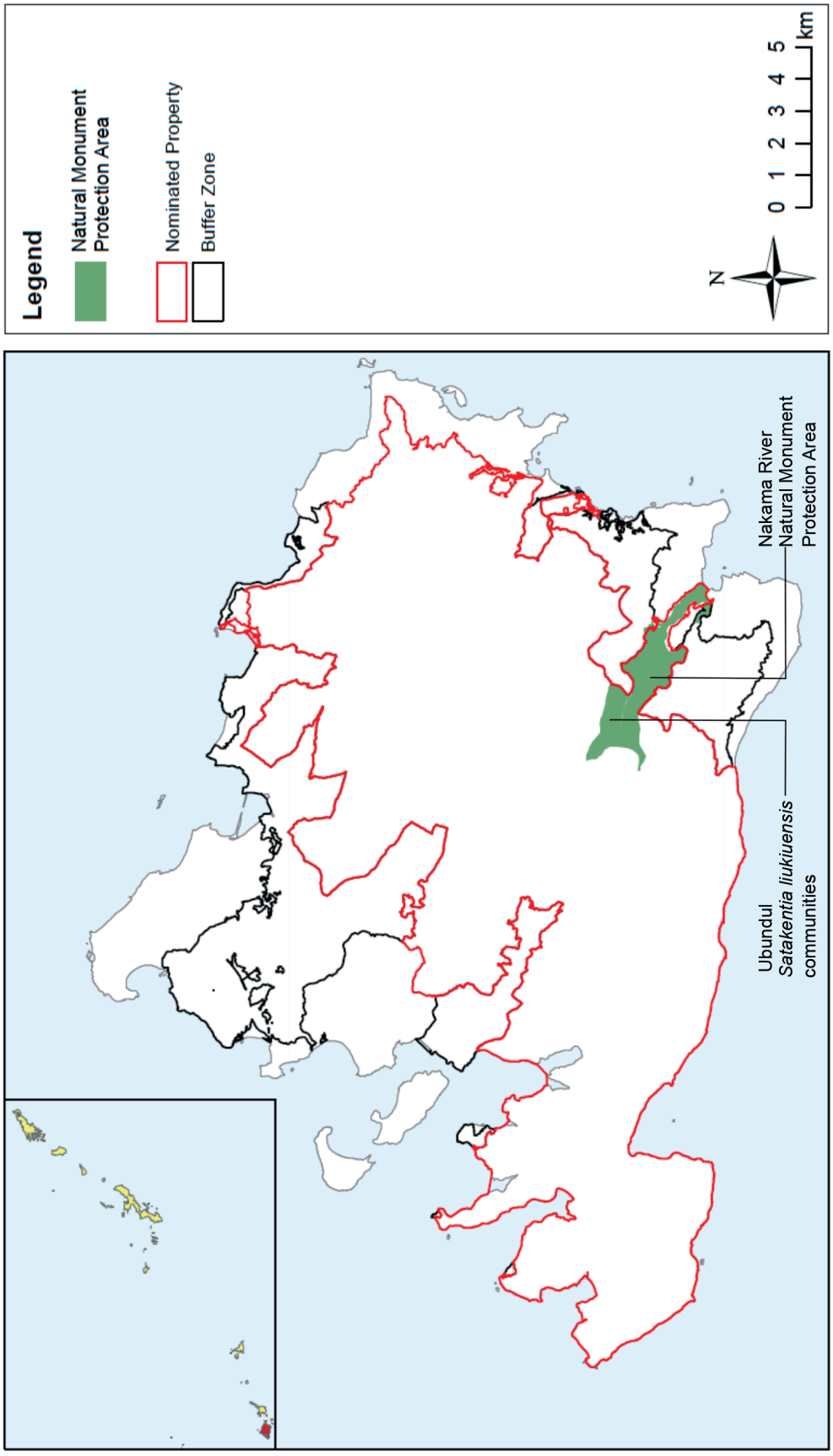


Figure 5-1-13: National Natural Monuments (Iriomote Island)

5.c. Means of Implementing Protective Measures

The nominated property is designated as protected areas listed in Tables 5-2-1 to 5-2-4, pursuant to domestic laws. Many of these protected areas overlap, thereby enhancing their function of protecting the nominated property as they complement one another.

In addition, within the boundaries of the nominated property are the habitats of endemic species and rare species, some of which are designated and protected as National Endangered Species under the Act on Conservation of Endangered Species of Wild Fauna and Flora, or as Natural Monument under the Act on Protection of Cultural Properties.

Overviews of the respective protection measures are given below.

5.c.1. Amami Gunto National Park, Yambaru National Park, and Iriomote-Ishigaki National Park

A National Park is an area designated and managed by the Minister of the Environment under the National Parks Act to protect the excellent natural scenic areas and promote utilization for the purpose of contributing to citizens' health, recreation and culture, and conserve biodiversity.

National Parks are divided into different categories and regulated according to those categories based on a Park Plan: Special Zone, an area where superb natural state must be maintained; Special Protection Zone, an area that conserves pristine state of nature, which must be protected in a particularly strict manner; and Ordinary Zone, an area where sceneries should be protected in an integrated manner along with aforementioned zones (Table 5-3).

Pursuant to the National Parks Act, a new National Park was designated in Amami-Oshima Island and Tokunoshima Island in 2017, and one in the northern part of Okinawa Island in 2016—Amami Gunto National Park and Yambaru National Park, respectively. In addition, almost entire area of Iriomote Island was designated as a National Park in 2016 due to a major expansion of Iriomote-Ishigaki National Park (Iriomote Island had part of its territory designated as Iriomote National Park in 1972). The nominated property is designated as either a Special Protection Zone, or a Class I Special Zone and acts potentially affecting the maintenance of evergreen broadleaved forests, which offer vital habitats for wild living organisms that characterize the nature of the region, are subject to regulation.

For the purpose of promoting appropriate utilization of the natural environment with its conservation being ensured, work has also been done to establish trails, recreation sites, etc. in accordance with a National Park visitor facility plan.

Table 5-3: Regulations applicable within the respective zones

Acts in a Special Zone that require permission from the Minister of the Environment	Acts in a Special Protection Zone that require permission from the Minister of the Environment	Acts in an Ordinary Zone that require notification to the Minister of the Environment
1. Constructing, reconstructing or extending structures 2. Felling trees or bamboos 3. Mining minerals or extracting soil and stones 4. Causing increase or decrease of the water-level or quantity of water of rivers and lakes, etc. 5. Discharging sewage or waste water into a designated lakes, and wetlands 6. Setting or otherwise showing advertisements, etc 7. Accumulating or storing in the open air soil and stones or designated materials 8. Reclaiming the surface of water or reclaiming by drainage 9. Changing the feature of land 10. Collecting or damaging designated plants 11. Capturing or killing or wounding designated animals 12. Altering the colors of roofs, wall surface, etc. 13. Entering into designated wetlands, etc. 14. Using vehicles , horses or power -driven vessels, etc in designated areas	In addition to 1 through to 6, 8, 9, 12 and 13 on the left: 1. Damaging trees or bamboos 2. Planting or sowing seeds of plants 3. Pasturing livestock 4. Accumulating or storing things in the open air 5. Setting fire or making fire 6. Collecting or damaging plants, or collecting fallen leaves or branches 7. Capturing, killing or wounding animals, or collecting or damaging their eggs 8. Using vehicles, horses or power-driven vessels, or landing an airplanes, other than roads or plazas 9. Releasing animals	1. Constructing, reconstructing or extending major structures 2. Causing increase or decrease of the water-levels or quanty of rivers and lakes, etc. within a Special Zone 3. Setting or otherwise showing advertisements, etc 4. Reclaiming the surface of water or reclaiming by drainage 5. Mining minerals or extracting soil and stones 6. Changing the feature of land 7. Changing the feature of seabed

*1: Special Zones are classified into three categories with each subject to a different degree of restrictions. In Class I Special Zones, the existing landscape must be protected as much as possible, for instance, with the felling of trees and bamboos permitted only in the case of single-tree selection cutting. Class II Special Zones are defined as areas where efforts must be made to achieve good balance with agriculture, forestry, and fisheries, with the felling of trees and bamboos permitted so far as the relevant statutory criteria, such as a limit on the total clear-cut area, are satisfied. As for Class III Special Zones, there are no restrictions on the felling of trees and bamboos.

*2: Even if an application is filed for permission for conducting any the above-listed acts in a Special Protection Zone, approval is given only when such an act is deemed necessary for academic research or other forms of public interest.

5.c.2. Amami Gunto Forest Ecosystem Reserve and Iriomote Forest Ecosystem Reserve

The purposes of a Forest Ecosystem Reserve are to contribute to the preservation of the natural environment composed by forest ecosystems, protection of wildlife and genetic resources, development of forest operation and administration techniques as well as academic research, etc. by administering primeval natural forests that represent Japan's climate zones and forest zones. A Forest Ecosystem Reserve is an area designated and administered by the Forestry Agency under a Regional Administration and Management Plan prescribed in the Act on the Administration and Management of National Forest.

Under this system, Iriomote Island had the Iriomote Forestry Ecosystem Reserve designated in 1991 and expanded its boundaries in 2012 and 2015; consequently, most of Iriomote Island has been designated as a Forest Ecosystem Reserve. For Amami-Oshima Island and Tokunoshima Island, the Amami Gunto Forest Ecosystem Reserve was designated in 2013, primarily in the mountainous regions of both islands.

A Preservation Zone within a Forest Ecosystem Reserve is a zone mainly consists of pristine natural forests including endemic species and rare species habitats. A general rule applied to a Preservation Zone is to have natural transitions take care of it with no human intervention, so as not to affect the forest ecosystems.

A Conservation and Utilization Zone is a zone which has area large enough to serve as a buffer keeping Preservation Zone free from direct influence from the external environment. As a general rule, a Conservation and Utilization Zone which is consisted mainly of the same type of natural forest as those in Presercation Zone must be treated in a way equivalent to a Preservation Zone (Table 5-4).

Within the Forest Ecosystem Reserve, based on scientific grounds, acts are taken if deemed necessary to conserve and rehabilitate its endemic biodiversity and forest ecosystem. In addition, scientific researches, nature observation and education, utilization of genetic resources, and other acts of public interests are implemented if deemed necessary.

Table 5-4: Main policies concerning the Forest Ecosystem Reserve

Preservation Zone	In principle, this zone is left to natural transition, without human act.
Conservation and Utilization Zone	Natural forests are dealt with in the same manner as those in the Preservation Zone. Artificial forests may undergo operations of multi-storied forests to transform into natural forests.

5.c.3. National Wildlife Protection Area

A National Wildlife Protection Area is an area designated by the Minister of the Environment pursuant to the Wildlife Protection, Control and Hunting Management Act. Its purpose is to conserve the area for protection of wildlife if deemed necessary from the viewpoint of international or national wildlife protection. Based on this act, capture of wildlife requires permission from the Minister of the Environment or other. Hunting does not require permission but needs other procedures such as obtaining a license and registration. Hunting is prohibited within the boundaries of a Wildlife Protection Area (Table 5-5). A zone that poses a particular need for the protection of wildlife or its habitat is designated as a Special Protection Zone, an area where certain development activities are regulated.

Mt. Yuwandake National Wildlife Protection Area

Mt. Yuwandake National Wildlife Protection Area is a forested area dominated by such broadleaved evergreen trees as Castanopsis (*Castanopsis sieboldii*), *Quercus miyagii*, *Machilus thunbergii* and *Distylium racemosum*, and gained this designation in 1965 as it serves as habitats for the Amami rabbit (*Pentalagus furnessi*), Amami woodcock (*Scolopax mira*), Amami thrush (*Zoothera dauma major*), white-backed woodpecker (*Dendrocopos leucotos owstoni*), Ryukyu robin (*Luscinia komadori komadori*), and other rare wildlife species. The entire area is included in either the nominated property or the buffer zone.

Yambaru (Ada) National Wildlife Protection Area

Containing the vast expanse of an evergreen broadleaved forest, most notably Castanopsis, the area was designated as a National Wildlife Protection Area in 2009 as it provides habitats for the Okinawa woodpecker (*Sapheopipo noguchii*), Okinawa rail (*Gallirallus okinawae*), subspecies of Ryukyu robin (*Luscinia komadori namiyei*), Ryukyu long-haired rat (*Diplothrix legata*), and other rare wildlife species. It is included in either the nominated property or the buffer zone, except for the vicinity of settlements and other such areas.

Yambaru (Aha) National Wildlife Protection Area

Containing the vast expanse of an evergreen broadleaved forest, most notably Castanopsis, the area gained its designation in 2009 as it provides habitats for the Okinawa woodpecker, Okinawa rail, subspecies of Ryukyu robin (*Luscinia komadori namiyei*), and other rare wildlife species. Most of its land area is included in either the nominated property or the buffer zone.

Iriomote National Wildlife Protection Area

Containing the vast expanse of a pristine evergreen broadleaved forest, most notably Castanopsis and *Quercus miyagii*, the area gained its designation in 1992 as it provides habitats for the Iriomote cat (*Prionailurus bengalensis iriomotensis*), crested serpent eagle (*Spilornis cheela perplexus*), emerald dove (*Chalcophaps indica yamashinai*), and other rare wildlife species. The entire area is included in either the nominated property or the buffer zone.

Table 5-5: Description of regulations applicable to the respective areas

Acts prohibited in a Wildlife Protection Area	Acts in a Special Protection Zone that require permission from the Minister of the Environment
Hunting of wildlife	1. Constructing a new building or other structure, or remodeling or adding to an existing building or structure 2. Undertaking landfill or reclaiming a water surface 3. Felling trees or bamboos 4. Any act specified by a Cabinet Order that might affect the protection of wildlife within the boundaries of a zone designated within a Special Protection Zone

5.c.4. National Endangered Species

A National Endangered Species means endangered wildlife species that live or grow in Japan, and which is designated by a Cabinet Order pursuant to the Act on Conservation of Endangered Species of Wild Fauna and Flora.

Among the animals and plants that live or grow in the nominated property, the designation of National Endangered Species has been given to six mammals, including the Iriomote cat, Amami rabbit, Ryukyu long-haired rat, Okinawa spiny rat (*Tokudaia muenninki*), Amami spiny rat (*T. osimensis*) and Tokunoshima spiny rat (*T. tokunoshimensis*); 13 birds, including the Amami woodcock, Okinawa rail, white-backed woodpecker and Okinawa woodpecker; two reptiles, including Kuroiwa's ground gecko (*Goniurosaurus kuroiwae*) and the banded ground gecko (*G. splendens*); six amphibians, including Holst's frog (*Babina holsti*), the Otton frog (*B. subaspera*), Namie's frog (*Limnonectes namiyei*), Okinawa Ishikawa's frog (*Odorrana ishikawae*), Amami Ishikawa's frog (*O. splendida*) and Anderson's crocodile newt (*Echinotriton andersoni*); three insects, including a stag beetle (*Neolucanus okinawanus*) and Yanbaru long-armed scarab beetle (*Cheirotonus jambar*); one inland water decapod crustacean; and 23 plants, including *Polystichum obae* and *Dendrobium okinawense*. It is prohibited to capture, kill, injure, wound, collect, damage, transfer or perform any similar act on these National Endangered Species.

Of those National Endangered Species, plans for the protection and recovery program have been established for seven species, including the Amami rabbit, Okinawa rail, and Iriomote cat based on Act on Conservation of Endangered Species of Wild Fauna and Flora. The plan aims to promote the species reproduction and maintain their habitats. A variety of work is underway, such as clarifying and monitoring their current status, maintaining and improving their habitats, and engaging in captive breeding, for the purpose of their stable survival under natural state (see Appendix2-2).

5.c.5. Natural Monuments

A Natural Monument means an animal (including its habitat, breeding, and migrating site), a plant (including its native growing sites) or a geological feature or mineral (including land where any unique natural phenomenon is in progress) that is designated by the Minister of Education, Culture, Sports, Science and Technology, pursuant to the Act on Protection of Cultural Properties for the purpose of preserving the important monuments that have high academic value for Japan. Those that are particulary important among them are designated as Special Natural Monumnet.

The animals designated as Special Natural Monumnets in the nominated property include the Amami rabbit, Iriomote cat, Okinawa woodpecker and crested serpent eagle. The designated Natural Monuments are: two mammals, including Ryukyu long-haired rat and spiny rat; seven birds, including Okinawa rail, white-backed woodpecker and Amami jay (*Garrulus lidthi*); three reptiles, including yellow-margined box turtle (*Cuora flavomarginata*), Ryukyu black-breasted leaf turtle (*Geoemyda japonica*) and Kishinoue's giant skink (*Plestiodon kishinouyei*); one insect, i.e. Yanbaru long-armed scarab beetle; and one group of inland water decapod crustaceans, i.e. terrestrial helmet crabs (seven species belonging to the same genus *Coenobita*). In the plants category, one site is designated as Natural Monuments, i.e. the Ubundul *Satakentia liukiuensis* communities. In addition, three sites are designated as Natural Monument Protection Areas: Kamiya-Yuwandake, the Nakama River Natural Monument Protection Area, and Mt. Yonahadake Natural Monument Protection Area.

Anyone who intends to perform any act that would involve changing the current status or affecting the preservation of a Natural Monument requires permission from the Commissioner for Cultural Affairs.

5.c.6. Programs concerning alien species countermeasures

Pursuant to the Act on the Prevention of Adverse Ecological Impacts Caused by Specified Invasive Alien Species, certain alien species that live or grow in the nominated property, such as the small Indian mongoose (*Herpestes auropunctatus*), cane toad (*Rhinella marina*), white-lipped treefrog (*Polypedates leucomystax*), *Coreopsis lanceolata* are designated as Specified Invasive Alien Species; consequently, various acts that include importing, raising, growing, storing and carrying, as well as releasing, planting and sowing them are regulated.

5.d. Existing Plans Related to Municipality And Regions In Which The Proposed Property Is Located

Tables 5-6-1 to 5-6-4 list the plans concerning the conservation and use of the nominated property and the buffer zones, including National Park Plans, which provide protective regulations and visitor facility plans, and Regional Administration and Management Plans, which prescribe policies for the management of Forest Ecosystem Reserves and other national forests.

Table 5-6-1: Plans concerning the nominated property and the buffer zones (Amami-Oshima Island)

Plan name	Legal foundation	Responsible agency	Purpose	Summary
Amami Gunto National Park Plan	Article 7 of the National Parks Act	Ministry of the Environment	To serve as basic guidelines for appropriate operation of a National Park by clarifying policies to maintain the scenic beauty and landscapes, and to promote suitable use as a park.	The plan presents the regulation and utilization plan required for appropriately protecting the unique ecosystem, fauna and flora, landscapes, etc. that Amami Gunto National Park contains, and actively promoting park utilization based on such protective actions.
Regional Administration and Management Plan (Amami-Oshima Island Forest Planning Zone)	Article 6, paragraph 1 of the Act Concerning Utilization of National Forest Land	Forestry Agency	A five-year plan that provides basic matters regarding the administration and management of national forest in the Amami-Oshima Island Forest Planning Zone, in light of the National Forest Management Basic Plan. National forest administration and management should be performed appropriately pursuant to this plan.	Basic matters regading the maintenance and conservation of national forest including Forest Ecosystem Reserve; matters regarding supplies of forest products; and matters regarding utilization of the national park are described.
Amami Gunto Forest Ecosystem Reserve Regional Conservation Management Plan		Forestry Agency	A plan that clarifies how national forest conservation management should be designed in consideration of the features of the Amami Island Group, with the aim of handing down the unique nature of the Amami Island Group to posterity without letting it further deteriorate, and also gradually restoring it to a pristine state, in the Amami Gunto Forest Ecosystem Reserve.	- Systematic promotion of countermeasures against alien species in order to protect the endemic ecosystem of the Amami Island Group. - Coordination of use and protection for the purpose of mitigating impacts on the endemic ecosystem as a result of its use.
Mt. Yuwandake National Wildlife Protection Area Designation Plan; Mt. Yuwandake National Wildlife Protection Area Yuwandake Special Protection Zone Designation Plan	Article 28 and 29 of the Wildlife Protection, Control and Hunting Management Act	Ministry of the Environment	To protect Wildlife found significant from both international and national viewpoints, and their habitats	The plan states the zone being designated, its area, the wildlife living there, guidelines on protection, etc.

Plan name	Legal foundation	Responsible agency	Purpose	Summary
Plan for Protection and Recovery Program (Amami woodcock, Amami thrush, Amami rabbit)	Article 45 of the Act on Conservation of Endangered Species of Wild Fauna and Flora	Ministry of the Environment, Ministry of Agriculture, Forestry and Fisheries (Forestry Agency), etc.	Established for contributing to the appropriate and effective implementation of the protection and recovery program.	The goals, areas, contents, and other necessary matters to ensure appropriate and effective implementation of the protection and recovery program.
Amami Island Group Promotion and Development Plan	Article 5 of the Act on Special Measures Concerning Promotion and Development of the Amami Island Group	Kagoshima Prefecture	A plan that presents the directions of promotion and development of the Amami Island Group pursuant to the Basic Policy on Promotion and Development of the Amami Island Group, set by the national government.	With the basic principle set on taking advantage of the geographical and natural features of the Amami Island Group and enhancing its appeal, the plan promotes local initiatives to encourage relocation and enhance communication exchange.
Amami-Oshima Island Regional Forestry Plan	Article 5 of the Forest Act	Kagoshima Prefecture	A 10-year plan, developed every five years, on prefectural, municipal, and private forests in the Amami-Oshima Island Forest Planning Zone for formulating and promoting the directions and objectives of forestry operations.	The plan defines the boundaries of forest areas to be covered, goals of forest development and conservation by the function of each forest, scheduled volumes of logging, afforestation, etc., and also describes guidelines and criteria for municipal forest development plans.
Phase 2 Mongoose Control Plan for Amami-Oshima Island	Act on the Prevention of Adverse Ecological Impacts Caused by Specified Invasive Alien Species	Ministry of the Environment	A plan focused on the complete elimination of the small Indian mongoose, a Specified Invasive Alien Species, from Amami-Oshima Island for the purpose of recovering the native species on Amami-Oshima Island.	The plan states the region in which control action is to be taken, control goals, control structure, a description of actions to be implemented, etc.

Table 5-6-2: Plans concerning the nominated property and the buffer zones (Tokunoshima Island)

Plan name	Legal foundation	Responsible agency	Purpose	Summary
Amami Gunto National Park Park Plan	Same as Amami-Oshima Island			
Regional Administration and Management Plan (Amami-Oshima Island Forest Planning Zone)	Same as Amami-Oshima Island			
Amami Gunto Forest Ecosystem Reserve Regional Preservation Management Plan	Same as Amami-Oshima Island			
Plan for Protection and Recovery Program (Amami woodcock, Amami rabbit)	Same as Amami-Oshima Island			
Amami Island Group Promotion and Development Plan	Same as Amami-Oshima Island			
Amami-Oshima Island Regional Forestry Plan	Same as Amami-Oshima Island			

Headwater forest, Tokunoshima Island (Photo: MOEJ)

Table 5-6-3: Plans concerning the nominated property and the buffer zones (northern part of Okinawa Island)

Plan name	Legal foundation.	Responsible agency	Purpose	Summary
Yambaru National Park Plan	Article 7 of the National Parks Act	Ministry of the Environment	To serve as basic guidelines for appropriate operation of a National Park by clarifying policies to maintain the scenic beauty and landscapes, and to promote suitable use as a park.	The plan presents the regulation and utilization plan required for appropriately protecting the unique ecosystem, fauna and flora, landscapes, etc. that Yambaru National Park contains, and actively promoting park utilization based on such protective actions.
Regional Administration and Management Plan (Northern Okinawa Forest Planning Zone)	Article 6, paragraph 1 of the Act Concerning Utilization of National Forest Land	Forestry Agency	A five-year plan that provides basic matters regarding the administration and management of national forest in the northern part of Okinawa Island Forest Planning Zone, in light of the National Forest Management Basic Plan. National forest administration and management should be performed appropriately pursuant to this plan.	Basic matters regading the maintenance and conservation of national forest including Forest Ecosystem Reserve; matters regarding supplies of forest products; and matters regarding utilization of the national park are described.
Yambaru (Ada) National Wildlife Protection Area Designation Plan; Yambaru (Ada) National Wildlife Protection Area Yambaru (Ada) Special Protection Zone Designation Plan; Yambaru (Aha) National Wildlife Protection Area Designation Plan	Article 28 and 29 of the Wildlife Protection, Control and Hunting Management Act	Ministry of the Environment	To protect wildlife found significant from both international and national viewpoints, and their habitats.	The plan states the zone being designated, its area, thewildlife living there, guidelines on protection, etc.
Plan for Protection and Recovery Program (Okinawa rail, Okinawa woodpecker, Yanbaru long-armed scarab beetle)	Article 45 of the Act on Conservation of Endangered Species of Wild Fauna and Flora	Ministry of the Environment, Ministry of Agriculture, Forestry and Fisheries (Forestry Agency), etc.	Established for contributing to the appropriate and effective implementation of the protection and recovery program.	The goals, areas, contents, and other necessary matters to ensure appropriate and effective implementation of the protection and recovery program.

Plan name	Legal foundation.	Responsible agency	Purpose	Summary
Okinawa Promotion and Development Plan	Act on Special Measures Concerning Promotion and Development of Okinawa	Okinawa Prefecture	A plan about the directions that promotion of Okinawa should take and basic measures to be taken, as set pursuant to the Basic Policy on Promotion and Development of Okinawa, set by the national government.	With the aim set for shaping fundamental conditions for Okinawa's self-reliant development and building a prosperous community, the plan states the directions and approaches to promotion.
Northern Okinawa Regional Forestry Plan	Article 5 of the Forest Act	Okinawa Prefecture	A 10-year plan, developed every five years, on private forests in the northen part of Okinawa Island Forest Planning Zone that states the goals of forest development and conservation of private forests, scheduled volumes of logging, afforestation, etc.	The plan defines the boundaries of forest areas to be covered, goals of forest development and conservation by the function of each forest, policies on measures to control forest disease and pest damage, etc.
Phase 2 Mongoose Control Plan for the Northern Part of Okinawa Island	Act on the Prevention of Adverse Ecological Impacts Caused by Specified Invasive Alien Species	Ministry of the Environment, Okinawa Prefecture	A plan focused on the complete elimination of the small Indian mongoose north of the first northward movement prevention fences, and on the prevention of re-invasion for the purpose of restoring and conserving the ecosystem of the Yambaru region in a stable condition.	The plan states the region in which control action is to be taken, control goals, control structure, a description of actions to be implemented, etc.

Prevention fence against mongooses' northward invasion, northern part of Okinawa Island (Photo: MOEJ)

Table 5-6-4: Plans concerning the nominated property and the buffer zones (Iriomote Island)

Plan name	Underlying law or regulation, etc.	Responsible agency	Purpose	Summary
Iriomote-Ishigaki National Park Park Plan	Article 7 of the National Parks Act	Ministry of the Environment	To serve as basic guidelines for appropriate operation of a National Park by clarifying policies to maintain the scenic beauty and landscapes, and to promote suitable use as a park.	The plan presents the regulation and utilization plan required for appropriately protecting the unique ecosystem, fauna and flora, landscapes, etc. that Iriomote-Ishigaki National Park contains, and actively promoting park utilization based on such protective actions.
Regional Administration and Management Plan (Miyako-Yaeyama Forest Planning Zone)	Article 6, paragraph 1 of the Act Concerning Utilization of National Forest Land	Forestry Agency	A five-year plan that provides basic matters regarding the administration and management of national forest in Miyako-Yaeyama Forest Planning Zone, in light of the National Forest Management Basic Plan. National forest administration and management should be performed appropriately pursuant to this plan.	Basic matters regading the maintenance and conservation of national forest including Forest Ecosystem Reserve; matters regarding supplies of forest products; and matters regarding utilization of the national park are described.To conserve the unique ecosystem of the Miyako-Yaeyama region in an integrated manner, the existing protected forest is to be reorganized and appropriate protection will be ensured by designating it as the Iriomote Forest Ecosystem Reserve.
Iriomote Forest Ecosystem Reserve Regional Preservation Management Plan		Forestry Agency	A plan that clarifies how national forest conservation management should be designed in consideration of the features of Iriomote Island, with the aim of handing down the unique nature of Iriomote Island to posterity without letting it further deteriorate, and also gradually restoring it to a pristine state, in the Iriomote Forest Ecosystem Reserve.	- Systematic promotion of countermeasures against alien species in order to protect the endemic ecosystem of Iriomote Island. - Coordination of use and protection for the purpose of mitigating impacts on the endemic ecosystem as a result of its use.

Plan name	Underlying law or regulation, etc.	Responsible agency	Purpose	Summary
Iriomote National Wildlife Protection Area Designation Plan; Iriomote Wildlife Protection Area Iriomote Special Protection Zone Designation Plan	Article 28 and 29 of the Wildlife Protection, Control and Hunting Management Act	Ministry of the Environment	To protect wildlife found significant from both international and national viewpoints, and their habitats.	The plan states the zone being designated, its area, the wildlife living there, guidelines on protection, etc.
Plan for Protection and Recovery Program (Iriomote cat)	Article 45 of the Act on Conservation of Endangered Species of Wild Fauna and Flora	Ministry of the Environment, Ministry of Agriculture, Forestry and Fisheries (Forestry Agency), etc.	Established for contributing to the appropriate and effective implementation of the protection and recovery program.	The goals, areas, contents, and other necessary matters to ensure appropriate and effective implementation of the protection and recovery program
Okinawa Promotion and Development Plan	Act on Special Measures Concerning Promotion and Development of Okinawa	Okinawa Prefecture	A plan about the directions that promotion of Okinawa should take and basic measures to be taken, as set pursuant to the Basic Policy on Promotion and Development of Okinawa, set by the national government.	With the aim set for shaping fundamental conditions for Okinawa's self-reliant development and building a prosperous community, the plan states the directions and approaches to promotion.
Miyako-Yaeyama Regional Forestry Plan	Article 5 of the Forest Act	Okinawa Prefecture	A 10-year plan, developed every five years, on private forests in the Miyako-Yaeyama Forest Planning Zone that states the goals of forest development and conservation of private forests, scheduled volumes of logging, afforestation, etc.	The plan defines the boundaries of forest areas to be covered, goals of forest development and conervation by the function of each forest, policies on measures to control forest disease and pest damage, etc.

5.e. Property Management Plan or Other Management System

5.e.1. Management plan for the nominated property

The Natural World Heritage Nominated Property Comprehensive Management Plan (hereinafter referred to as the "Management Plan") will be developed for conserving and managing the natural environment of the nominated property, which boasts extremely diverse and unique value, both in the present and the future.

The Management Plan is intended to clarify the basic policies for the operation of systems and the promotion of various projects so that the administrative organs charged with systems concerning conservation of the nominated property can manage the nominated property in a proper and smooth way, while ensuring close mutual collaboration and cooperation with the relevant agencies, local residents, related businesses from the tourism,

agricultural, forestry and other industrial sectors, researchers, NPOs, etc. (hereinafter referred to as "stakeholders"). An outline of the Management Plan is provided below. The entire text of the Management Plan is also attached to Appendix 1.

a. Scope of application of the management plan

For conserving the natural environment of the nominated property, it is necessary to take such actions as securing continuity of endemic or threatened species habitats and enhancing buffer functions. For that reason, the Management Plan will set the "surrounding area" around the nominated property and buffer zones. The scope of the Management Plan will cover the nominated property, buffer zones, and surrounding areas.

b. Management framework and structure

The Management Plan will set an overall objective, management policies, and other comprehensive matters common in four regions containing the nominated property. Further, in light of characterestic features and challenges of respective regions, the Management Plan will draw up regional action plans that lay out goals and concret contents of measures to be taken. In addition to properly implementing the protective measures described in 5.c and conserving the outstanding value of the nominated property, the administrative organs and stakeholders will collectively carry out a series of conservation and management efforts, the main examples being measures to control alien species and measures concerning rare species, in accordance with the Management Plan. Sections 5.e.2 to 5.e.4 describe the structure designed for that purpose (see also 3.1.e. ; Figure 3-2).

c. Basic management approaches and measures

• Conservation of the natural environment

The administrative organs charged with the various protection systemes listed in 5.c will protect values relevant to Criteria (ix) and (x) through appropriate operation of the systems. The administrative organs and local stakeholders will present, in an active collaboration and cooperation, basic policies and directions of concrete measures of each effort, including rare species protection and recovery; elimination and mitigation of alien species impacts; balanced coordination with industry; appropriate use and ecotourism; participation and collaboration of local communities; and effective monitoring, so as to promote conservation and management.

• Implementation of adaptive conservation and management

The implementing bodies of adaptive conservation and management will conduct monitoring in order to appropriately understand changes in the natural environment resulting from the implementation of coservation and management measures, scientifically assessing the findings in accordance with the advice from experts, and reflecting the outcomes in measures to be taken thereafter.

5.e.2. Scientific Committee on Amami-Oshima Island, Tokunoshima Island, the northern part of Okinawa Island, and Iriomote Island natural World Heritage nominated property

In the process of managing the nominated property, it is necessary to monitor activities, assess the findings, and ensure that feedback is appropriately applied, based on the latest scientific knowledge. To that end, a Scientific Committee on Amami-Oshima Island, Tokunoshima Island, the northern part of Okinawa Island, and Iriomote Island: Natural World Heritage Nominated Property and Local Working Groups composed of experts and other persons well versed in the region's nature, are established as a body from which to seek expert advice in the course of formulating and revising the Management Plan, and implementing a range of projects.

5.e.3. Regional Liaison Committee and sub-local meetings on Amami-Oshima Island, Tokunoshima Island, the northern part of Okinawa Island, and Iriomote Island natural World Heritage nominated property

Amami-Oshima Island, Tokunoshima Island, the northern part of Okinawa Island, and Iriomote Island extend across many administrative areas containing 12 municipalities within two prefectures. All the islands are inhabited, and many people reside and live around the nominated property. As the environment in which the threatened and endemic species representing heritage value occur is situated adjacent to, or in some cases overlaps the locations where the residents live and industrial activities take place, coordination with the lives of residents and industry is imperative; in other words, the nominated property cannot be properly managed without understanding and cooperation from the residents.

Accordingly, a Regional Liaison Committee on Natural World Heritage Nominated Property (Regional Liaison Committee), composed of administrative organs, as well as four sub-local meetings, under the Regional Liaison Committee, composed of administrative organs, local governments, concerned bodies and NPOs, are established so that the nominated property can be conserved and managed with mutual role-sharing and cooperation in place.

5.e.4. Actions by respective agencies

The Ministry of the Environment, the Forestry Agency, the Agency for Cultural Affairs, Kagoshima Prefecture, Okinawa Prefecture and local municipalitie, and the organizations composing island-specific sub-local meetings established under the Regional Liaison Committee will, on the basis of decisions made by the aforementioned plans and committees, pursue their respective actions according to an appropriate division of roles.

5.f. Sources and Levels of Finance

The nominated property is managed by each of the managing authorities charged with the respective systems, facilities, etc. The sources and amounts of their funding, as well as the actions to be taken in FY2018 are summarized below.

5.f.1. Ministry of the Environment

National Parks and National Wildlife Protection Areas are managed by the Ministry of the Environment, with an annual budget of approximately 543,223,000 yen (approx. 5.43 million dollars). National Parks are managed jointly with respective prefectures.

The budget covers the following items:

- Establishment of adaptive conservation management framework
- Protection and recovery of the National Endangered Species, such as Amami rabbit, Okinawa rail, and Iriomote cat.
- Patrol operation and awareness-raising program to prevent illegal poaching/picking of the National Endangered Species.
- Control of alien species, such as the small Indian mongoose and cane toad, and awareness-raising program.
- Review conservation methods of the spiny rats.
- Research on the status of the ground geckoes.
- Feral cat control measures in the rare species habitats (in forests) and promotion of appropriate pet cat care.
- Management and operation of Wildlife Conservation Centers and Ranger Offices for Nature Conservation.
- Facility maintenance, management, and awarness-raising related to protection and use of National Parks.

The budget is entirely funded by the national treasury and will be secured into the future to continue supporting necessary projects.

5.f.2. Forestry Agency

National forests in the Forest Ecosystem Reserves, which account for about 60% of the nominated property, and in the vicinity of the nominated property is managed by the Forestry Agency, with an annual budget amounting to approximately 12,079,000 yen (approx. 120,000 dollars).

The budget covers the following items:

- Nature restoration and vegetation recovery surveys, such as for mangrove forests.
- Rare species protection and management surveys and patrols.
- Removal and monitoring alien plant species, such as Leucaena and Casuarina, for the purpose of forest ecosystem restoration.

Other measures include creating vegetation distribution maps to serve as the basis for ensuring appropriate forest conservation and management in the nominated property, and examining forest management methods designed with attention paid to forest ecosystem conservation, at an annual cost of approximately 22,877,000 yen (approx. 229,000 dollars).

The budget is entirely funded by the national treasury and will be secured into the future to continue supporting necessary projects.

5.f.3. Agency for Cultural Affairs

The Agency for Cultural Affairs provides subsidy to support projects implemented by municipalities for the conservation and utilization of Natural Monuments, with an annual budget amounting to approximately 3,444,000 yen (approx. 34,440 dollars).

The following project related to the nominated property is being subsidized under this budget.

- Research carried out by Okinawa Prefecture on Ryukyu long-haired rat (*Diplothrix legata*).

The subsidy budget is entirely funded by the national treasury and will be secured into the future to continue supporting necessary projects.

5.f.4. Kagoshima Prefecture

Kagoshima Prefecture engages in a range of actions, including those intended to maintain natural heritage value in the nominated property, strike a good balance between environment conservation and sustainable use for tourism, etc. and foster momentum among local residents, for which approximately 55 million yen (approx. 550,000 dollars) is budgeted annually (on the basis of FY2016 budget).

The budget covers the following items:

- Strengthening the heritage area's buffer function through biodiversity-friendly forest management and other actions
- Actions towards the implementation of public works with attention paid to the natural environment
- Developing rules and structures so as to make the use appropriate
- Protective measures for rare wild animals and plants
- Alien species control measures
- Promotion and awareness-raising about the inscription as a natural World Heritage site

The budget is funded by Amami Island Group promotion and development subsidies (e.g., 1/2 from national government funds, 1/2 from prefectural government funds) or solely by prefectural government funds; and will be secured into the future to continue supporting necessary projects.

Mongoose control program and captured mongoose (Photo: JWRC, MOEJ)

5.f.5. Okinawa Prefecture

Okinawa Prefecture shares responsibility for development and conservation management of the nominated property with the Ministry of the Environment, with an annual budget amounting to approximately 266,882,000 yen (approx. 2.68 million dollars) on the basis of the FY2016 budget.

The budget covers the following items:

- Administering natural park facilities
- Building natural park facilities
- Developing and operating area-specific action plans
- Validating measures to prevent traffic accidents involving Iriomote cats
- Surveying the status of damage to rare species from feral cats, etc. and examining measures to address it
- Formulating frameworks for establishing center facilities intended to ensure appropriate use and utilization of the nominated property
- Promotion and awareness-raising about the inscription as a natural World Heritage site
- Alien species control measures (against mongooses, etc.)

The budget is funded by Okinawa promotion and development subsidies (e.g., 8/10 from national government funds, 2/10 from prefectural government funds) or solely by prefectural government funds; and will be secured into the future to continue supporting necessary projects.

5.f.6. Municipalities

Amami-Oshima Island (Amami City, Tatsugo Town, Setouchi Town, Yamato Village, and Uken Village)

The five municipalities with local government functions on Amami-Oshima Island are engaged in patrol operation to prevent illegal digging and picking, alien species eradication, and measures to control cats as an alien species, with public organizations working hand-in-hand with local residents. The municipalities also undertake promotion and awareness-raising efforts to further understanding the importance and preciousness of the natural environment of Amami-Oshima Island, and foster a mindset conducive to acting on one's own accord to conserve precious nature while ensuring symbiosis with nature. Approximately 34,962,000 yen (approx. 350,000 dollars) is budgeted annually.

The budget covers the following item:

- Amami-Oshima Nature Protection Council (patrolling, alien plant control, promotion and awareness-raising (creating brochures, placing signs))

The budget is funded by Amami Island Group growth strategy promotion subsidies (e.g., 5/10 from national government funds, 1/10 from prefectural government funds, 4/10 from municipal government funds); and will be secured into the future to continue supporting necessary projects.

The Amami Island Group, which includes Amami-Oshima Island, also has a special local public entity pursuant to Article 1-3 of the Local Autonomy Act—the Wide Area Administration Association of Amami Islands—that

was established to address common region-wide issues. As an effort to popularize and promote eco-tourism, the Wide Area Administration Association of Amami Islands works on formulating the overall concept for promoting Ecotourism of Amami Island Group, which sets policies for desirable eco-tourism, as well as on other actions, including developing eco-tour guides who are conscious about the region's nature and culture, and also capable of conveying their appeal, for all of which approximately 17,400,000 yen (approx. 170,000 dollars) is budgeted annually.

Tokunoshima Island (Tokunoshima Town, Isen Town, and Amagi Town)

The three municipalities with local government functions on Tokunoshima Island engage in rare species protection activities, including patrol operation to prevent illegal digging and picking, and measures to control cats and other alien species, with the initiative being taken by local residents. The municipalities also undertake promotion and awareness-raising efforts to further understanding the importance and preciousness of the natural environment of Tokunoshima Island, and foster a mindset conducive to acting on one's own accord to conserve the precious nature while ensuring symbiosis with nature. Approximately 33 million yen (approx. 330,000 dollars) is budgeted annually.

The budget covers the following items:

- Tokunoshima District Nature Protection Council (patrolling, alien plant control, promotion and awareness-raising (creating brochures, placing signs))
- Tokunoshima Three Towns Cat Control Council (Operation of shelter for feral cat captured or removed in rare species habitats (in forests), stray cat TNR (Trap, Neuter, and Return) activities, awareness-raising about how to properly take care of pet cats)

The budget is financed by town government funds, etc.; and will be secured into the future to continue supporting necessary projects.

In addition, actions being taken by the Wide Area Administration Association of Amami Islands described above also include activities on Tokunoshima Island.

Damselfly (*Rhipidolestes amamiensis*) (Photo: MOEJ)

Northern part of Okinawa Island (Kunigami Village, Ogimi Village, and Higashi Village)

The three villages in the northern part of Okinawa Island undertake promotion and awareness-raising efforts so that local residents may better understand the importance and preciousness of the natural environment of Yambaru, and foster a mindset conducive to acting on one's own accord to conserve the precious nature while ensuring symbiosis with nature. Approximately 19,929,000 yen (approx. 200,000 dollars) is budgeted annually.

The budget covers the following items:

- Projects for promotion of environmental conservation and beautification (cat control, etc.)
- Project for promotion and awareness-raising about the inscription as a natural World Heritage site
- Project for Okinawa rail ecology conservtion
- Okinawa Rail Wild Forest management and administration costs
- Operation of the Yambaru Hands-On Nature Activity Committee

The budgetis entirely financed by village government funds; and will be secured into the future to continue supporting necessary projects.

Iriomote Island (Taketomi Town)

Taketomi Town engages in the protection of Iriomote cats and other rare species, takes measures to control alien species, and also undertakes promotion and awareness-raising efforts so that residents may better understand the importance and preciousness of the natural environment of Iriomote Island, and foster a mindset conducive to acting on one's own accord to conserve the precious nature while ensuring symbiosis with nature. Approximately 26,997,000 yen (approx.270,000 dollars) is budgeted annually.

The budget covers the following items:

- Taketomi Town Appropriate Pet Care Promotion Project (stray cat control measures)
- Iriomote Cat Traffic Accident Occurrence Prevention Liaison Conference (joint secretariat with the Ministry of the Environment)
- Beach cleanup activities, natural recreation forest cleanup activities (island resident volunteer activity cost)
- Biodiversity conservation and promotion project (measures to control alien species, including the Indian peafowl (*Pavo cristatus*), boar, and alien frogs)
- Environmental conservation awareness-raising project (promotion and awareness-raising), etc.

The budget will be secured into the future to continue supporting necessary projects.

5.g. Sources of Expertise and Training in Conservation and Management Techniques

5.g.1. Ministry of the Environment

The Ministry of the Environment's Naha Nature Conservation Office and the respective Ranger Offices for Nature Conservation in Amami, Tokunoshima, Yambaru and Iriomote are staffed with personnel versed in nature protection systems and protection and management techniques required for the purpose of conservation management of the nominated property. They provide expert advice to construction businesses and program operators in the process of performing permit and authorization services under the National Parks Act and other applicable acts and regulations, etc., and services associated with protection and recovery program for National Endangered Species.

They also engage in other activities, including promotion and awareness-raising activities in the form of planning and operating nature viewing tours.

As needed in the course of their services, they ensure a higher level of expertise by seeking advice from experts in universities and other external sources (Table 5-7).

Okinawa Ishikawa's frog (*Odorrana ishikawae*) (Photo: MOEJ)

Table 5-7: Review conferences for implementation purposes

Name of the review conference, etc.	Description
Amami Rare Species Protection and Recovery Review Conference	Conducts reviews on the protection and recovery of the Amami woodcock, Amami thrush and Amami rabbit
Yambaru Rare Species Protection and Recovery Review Conference	Conducts reviews on the protection and recovery of the Okinawa rail, Okinawa woodpecker and Yanbaru long-armed scarab beetle
Iriomote Cat Protection and Recovery Review Conference	Conducts reviews on the protection and recovery of the Iriomote cat
Liaison Committee on Prevention of Traffic Accident Occurrences Involving Iriomote Cats	Conducts reviews, communication and coordination on protective measures taken by the organizations concerned and local residents for the purpose of preventing occurrences of traffic accidents involving Iriomote cats (held jointly with Taketomi Town)
Yaeyama Region Liaison Committee on Measures to Protect Crested Serpent Eagles	Conducts reviews, communication and coordination on crested serpent eagle surveys and protective measures in the Yaeyama region
Conference on Measures to Control Cane Toads, etc. in the Yaeyama Region	Conducts reviews on projects for controlling cane toads, white-lipped treefrogs and other animals in the Yaeyama region
Amami-Oshima Island Mongoose Control Project Review Conference	Conducts reviews on the mongoose control project on Amami-Oshima Island
Northern Okinawa Region Mongoose Control Project Review Conference	Conducts reviews on the mongoose control project in the northern Okinawa region (held jointly with Okinawa Prefecture)

5.g.2. Forestry Agency

The Kyushu Regional Forest Office is staffed with personnel versed in programs, techniques and other matters required for the purpose of conservation management of forests and wild animals and plants, as well as the appropriate management of national forests pursuant to the Forest Act, the Act Concerning Utilization of National Forest Land and other applicable laws and regulations. They provide expert advice required in the process of implementing related services.

In the course of performing the protection and management of Forest Ecosystem Reserves, and implementing protective measures for the Iriomote cat and other endangered species of wild fauna and flora, projects for controlling alien plant species, etc., they exercise a higher level of expertise by, for instance, seeking advice from experts in universities and other external sources (Table 5-8).

Table 5-8: Review conferences for implementation purposes

Name of the review conference, etc.	Description
Amami Gunto Forest Ecosystem Reserve Conservation Management Committee	Conducts reviews (conservation management plans, administration and utilization) for the purpose of appropriately conserving and managing the valuable forest ecosystem of the Amami Island Group into the future
Iriomote Forest Ecosystem Reserve Conservation Management Committee	Conducts reviews (conservation management plans, administration and utilization) for the purpose of appropriately conserving and managing the valuable forest ecosystem of Iriomote Island into the future

5.g.3. Agency for Cultural Affairs

The Agency for Cultural Affairs is principal national agency in charge of protection of cultural properties in Japan. As it does not have its own local offices unlike the Ministry of the Environment and the Forestry Agency, the conservation and management of the nominated property has been implemented by the Board of Education of Okinawa Prefecture and Kagoshima Prefecture. Based on the Act on Protection and Cultural Properties, the Agency for Cultural Affairs manages services associated with permit and authorization related to Natural Monument and provides professional advice on project for the conservation and utilization of Natural Monuments implemented by municipalities. It also ensures a high level of expertise by obtaining advice from external experts as necessary.

5.g.4. Kagoshima Prefecture

The Nature Conservation Division, Environment and Forestry Affairs Department, Kagoshima Prefecture, and the Hygiene and Environment Office, Oshima Branch Office are staffed with personnel versed in nature protection programs as well as protection and management techniques required for the purpose of conservation management of the nominated property, and engage in rare wild fauna and flora protection and recovery projects, alien species control projects, and services associated with permit and authorization under the National Parks Act. As needed in the course of their services, it also ensures a high level of expertise by obtaining advice from external experts as necessary. (Table 5-9).

Table 5-9: Review conferences for implementation purposes

Name of the review conference, etc.	Description
Amami Island Group Natural World Heritage Nominated Property Conservation and Utilization Review Conference	Conducts reviews on environmental conservation, sustainable use and other actions required for inscription, such as public works with attention paid to the natural environment and steps to make the use for tourism appropriate.
Kagoshima Prefecture Review Committee on Rare Wild Fauna and Flora Protection Measures	Established for the purpose of engaging in the selection and other actions for the designation of rare wild fauna and flora as prescribed in the Kagoshima Prefectural Ordinance to Protect Endangered Wild Fauna and Flora.
Kagoshima Prefecture Alien Species Control Measures Review Committee	Examines measures required for the purpose of preventing damage caused by alien species on ecosystems, people's lives and health, or agriculture, forestry and fisheries, in the prefecture.
Council on Amami Island Group Rare Wild Fauna and Flora Protection Measures	Organizations concerned are engaged in discussing necessary measures with respect to the protection of rare species so as to ensure the maintenance and improvement of value held by the Amami Island Group as a Natural World Heritage nominated property.
Feral Dog and Feral Cat Control Measures Review Conference (Amami district, Tokunoshima district)	Organizations concerned are engaged in examining measures against feral cats that prey on rare species, and against supply sources of feral cats.

5.g.5. Okinawa Prefecture

The Nature Conservation Division, Department of Environmental Affairs is staffed with personnel versed in nature protection programs as well as protection and management techniques required for the purpose of conservation management of the nominated property, and engages in services related to the building and management of natural park facilities, endangered species of wild fauna and flora protection and recovery programs, and alien species control projects. As needed in the course of their services, it also ensures a high level of expertise by obtaining advice from external experts as necessary (Table 5-10).

Table 5-10: Review conferences for implementation purposes

Name of the review conference, etc.	Description
Iriomote Cat Traffic Accident Prevention Measures Review Committee	Conducts reviews concerning the basic plan formulation aimed at taking steps to prevent traffic accidents involving Iriomote cats, such as examining validation testing methods and effects validation methods, in order to enhance measures to address traffic accidents involving Iriomote cats.
Feral Dog and Feral Cat Control Measures Review Committee	Conducts reviews concerning methods of estimating feral dog and feral cat populations in forests that pose concerns about predation damage on rare wild animals, and concerning the actual state of predation damage and effective measures to address it, in order to conserve heritage value in the Yambaru region.
Northern Okinawa Region Mongoose Control Project Review Conference	Conducts reviews on the mongoose control project in the northern Okinawa region (held jointly with the Ministry of the Environment).
Alien Species Control Review Committee	Conduct reviews concerning alien species control guidelines, establishement of alien species control action plans, effective capture methods of green anoles, etc.

5.g.6. Municipalities

For the continuous conservation of the World Heritage property, obtaining cooperation from local communities is essential. In particular, administrative districts (municipalities) are expected to play a central role. Examples of pioneering initiatives by municipalities include the biodiversity conservation strategy (Amami-Oshima Regional Biodiversity Strategy) developed by Amami-Oshima Island's five municipalities, and the regional biodiversity conservation plan (Ogimi Village Regional Collaboration-Based Conservation Action Plan) worked out by Ogimi Village, an administrative district located in the northern part of Okinawa Island. Other conservation measures are also underway by Amami-Oshima Island's five municipalities and Tokunoshima Island's three municipalities, including the enforcement of an Ordinance for the Protection of Endangered Species of Wild Fauna and Flora and the designation of species to be protected under the Ordinance. Furthermore, all administrative districts in the nominated property have designated Natural Monuments and enacted an Ordinance for the Protection of Cultural Properties as well as an Ordinance for the Proper Keeping of Domestic Cats. In the future, a variety of other initiatives including the removal of alien species and public relations activities will be launched with the aim of conserving the region's nature and raising environmental conservation awareness.

Amami-Oshima Island

The offices of the five municipalities on Amami-Oshima Island are engaged in protective activities that only locals can deliver, with dedicated personnel placed so as to ensure the supply of accurate information to local residents about conservation management of the nominated property, and cooperation with other public organizations. The Wide Area Administration Association of Amami Islands is also active in offering entry-level instruction and training for people who wish to become eco-tour guides.

Table 5-11: Review conferences for implementation purposes

Name of the review conference, etc.	Description
Amami-Oshima Nature Protection Council	Mainly engages in protective measures for species designated under the Ordinance to Protect Endangered Wild Fauna and Flora (2013) (patrolling for prevention of illegal digging and picking), alien plant control measures, and promotion and awareness-raising activities.
Amami-Oshima Island Cat Control Council	Conducts reviews on feral cat TNR activities near settlements, and appropriate pet cat care for the purpose of protecting Amami rabbits, etc.
Amami Island Group Ecotourism Promotion Council	Engages in preparation of the overall concept for promoting Ecotourism of the Amami Island Group and an eco-tour guide accreditation program.

Tokunoshima Island

The offices of the three municipalities on Tokunoshima Island are engaged in protective activities that only locals can deliver, with dedicated personnel placed so as to ensure the supply of accurate information to local residents about conservation management of the nominated property, and cooperation with other public organizations. The Wide Area Administration Association of Amami Islands is also active in offering entry-level instruction and training for people who wish to become eco-tour guides.

Sword-tailed newt (*Cynops ensicauda*)
(Photo: MOEJ)

Table 5-12: Review conferences for implementation purposes

Name of the review conference, etc.	Description
Tokunoshima District Nature Protection Council	Mainly reviews protective measures for species designated under the Ordinance to Protect Endangered Wild Fauna and Flora (2012) (patrolling for prevention of illegal digging and picking, alien plant control measures and promotion and awareness-raising activities).
Three Tokunoshima Villages Cat Control Council	Conducts reviews on feral cat TNR activities near settle ments, shelter operation of feral cats captured and removed in the rare species habitats (in forests) and appropriate pet cat care for the purpose of protecting Amami rabbits, etc.
Amami Island Group Ecotourism Promotion Council [second mention]	Engages in preparation of the overall concept for promoting Ecotourism of the Amami Island Group, guide training, etc.

Northern part of Okinawa Island

The offices of the three municipalities in the northern part of Okinawa Island encourage protective activities that only locals can deliver, with dedicated personnel placed so as to ensure the supply of accurate information to local residents about conservation management of the nominated property, and cooperation with other public organizations.

Table 5-13: Review conferences for implementation purposes

Name of the review conference, etc.	Description
Okinawa Rail Wild Forest Management and Operation Conference	Conducts reviews and discussions about the management and operation of Okinawa Rail Forest, a protective shelter for the Okinawa rail.
Yambaru District Cat Control Measures Liaison Conference	Engages in reviews, communication and coordination with respect to feral cat control measures taken by the organizations concerned.
Four-Party Conference on the Okinawa Rail Ecology Exhibition and Learning Facilities	Conducts reviews and discussions about promotion and awareness-raising about Okinawa rail protection, individual bird care, facilities management and operation.

Iriomote Island

The office of Taketomi Town engages in protective activities that only locals can deliver, with personnel placed so as to ensure the implementation of nature protection programs required for conservation management of the nominated property, conservation management in general, the supply of accurate information to local residents, and cooperation with other public organizations.

Freshwater crab (*Ryukyum yaeyamense*)
(Photo: MOEJ)

Table 5-14: Review conferences for implementation purposes

Name of the review conference, etc.	Description
Iriomote Appropriate Pet Keeping Promotion Conference	Conducts reviews on proper pet keeping on Iriomote Island, in order to prevent impacts caused by domestic cats on Iriomote cats.
Iriomote Cat Traffic Accident Occurrence Prevention Liaison Conference	Engages in reviews, communication and coordination with respect to protective measures taken by the organizations concerned and local residents, in order to prevent occurrences of traffic accidents involving Iriomote cats (held jointly with the Ministry of the Environment).
Taketomi Town Nature Protection Council	Holds deliberations about revisions of the Taketomi Town Natural Environment Protection Ordinance, a protection system designed to contribute to the protection and management of the ecosystem and biodiversity of Taketomi Town.

5.g.7. Universities, etc.

Amami-Oshima Island is home to the Amami Branch of the Research Center for the Pacific Islands of Kagoshima University; the northern part of Okinawa Island is home to Yona Field of the Subtropical Field Science Center of the University of the Ryukyus and; Iriomote Island is home to the Iriomote Station of the Tropical Biosphere Research Center of the University of the Ryukyus and the Okinawa Regional Research Center of Tokai University. All being research center facilities available for use by researchers and students, these facilities contribute to driving research activities for which this region serves as a field study site and to accumulating information on the natural environment.

5.h. Visitor Facilities and Infrastructure

The numbers of visitors to the four islands containing the nominated property are as shown in 4.b (iv).

5.h.1. Local museums and visitor centers

Tourism facilities include the following establishments, which are open and available for tourist visitors.

5.h.1.1. Wildlife Conservation Centers

Wildlife Conservation Centers have been established by the Ministry of the Environment on Amami-Oshima Island, in the northern part of Okinawa Island, and on Iriomote Island. These facilities are built as centers designed to offer explanations to, and engage in promotion and awareness-raising activities for, visitors through exhibitions, videos, etc. about National Endangered Species and other wild living organisms unique to the region, as well as to push forward protection and breeding projects, survey research and other such activities for National Endangered Species of in a comprehensive way. These centers organize a wide variety of activities, including themed exhibits, talks, craft activities and nature viewing tours, so that everyone, adults and children alike, can gain an understanding and knowledge of the nature of the respective regions in a fun way. Their exhibition facilities are made open to the public free of charge.

Table 5-15-1: Amami Wildlife Conservation Center

Location	551 Koshinohata, Ongachi, Yamato-son, Oshima-gun, Kagoshima
Year opened	2000 (*Heisei* 12)
Size	・Exhibition building 508.47㎡ (total floor area) ・Research building 297.75㎡ (total floor area)
Exhibition details	Wall picture; exhibition rooms (insect section, plant section, survey research section); themed exhibition room; library, etc.
Staff size	8 persons

Table 5-15-2: Yambaru Wildlife Conservation Center: Ufugi Nature Museum

Location	Hiji 263-1, Kunigami-son, Kunigami-gun, Okinawa
Year opened	1999 (*Heisei* 11)
Size	・Exhibition building 605.88㎡ (total floor area) ・Research building 264.20㎡ (total floor area)
Exhibition details	Exhibition room (nature and living creatures in Yambaru); audiovisual and lecture room; library, etc.
Staff size	7 persons

Table 5-15-3: Iriomote Wildlife Conservation Center

Location	Komi, Taketomi-cho, Yaeyama-gun, Okinawa
Year opened	1995 (*Heisei* 7)
Size	・Main building 704.22㎡ (total floor area) ・Quarantine building 67.00㎡ (total floor area)
Exhibition details	Exhibition room (natural environment and wild living organisms on Iriomote Island; explanations on the Iriomote cat); videos; library, etc.
Staff size	6 persons

Amami thrush (*Zoothera dauma major*)
(Photo: MOEJ)

5.h.1.2. Other related facilities

Table 5-16: Other related facilities (The entity in brackets is the operator)

Amami-Oshima Island	Amami Park (Kagoshima Prefecture) Amami Museum of History and Folklore (Amami City) Amami Nature Observation Forest (Tatsugo Town) Amami Museum (Amami City) "Kuroshio no Mori" Mangrove Park (Amami City) Uken Village Museum of History and Folklore (Uken Village) Amami Seaside Museum (Amami City) Amami Forestpolis (Yamato Village) Setouchi Town Folk Museum (Setouchi Town)
Tokunoshima Island	Tokunoshima Town Folk Museum (Tokunoshima Town) Amagi Town History, Culture, Industry and Science Center Yui-no-Yakata (Amagi Town) Isen Town Museum of History and Folklore (Isen Town)
Northern part of Okinawa Island	Okinawa Rail Ecology Center (Kunigami Village) Yambaru Discovery Forest (Kunigami Village) Yanbaru Forest Toy Museum (Kunigami Village) Ogimi Village Basho-fu Hall (Ogimi Village) Higashi Museum (Higashi Village) Oku Yanbaru no Sato Museum (Kunigami Village) Fukuji Dam Museum (Okinawa General Bureau Northern Dam Administration Office of the Cabinet Office) Taiho Dam Museum Bunagaya House (Okinawa General Bureau Northern Dam Administration Office of the Cabinet Office)
Iriomote Island	Iriomote Tropical Tree Breeding Technical Garden (Forest Tree Breeding Center, Forestry and Forest Products Research Institute) Iriomote Island Eco-Tourism Center (Iriomote Island Ecotourism Association) Taketomi Town Remote Island Development Center (Taketomi Town) Iriomote Handicraft Center (Taketomi Textiles Cooperative Association)

5.h.2. Trails, guided tourism, signage, printed information

Pursuant to National Park Plans, the nominated property has trails, roads, etc. planned and built appropriately.

5.h.2.1. Trails, etc.

The nominated property is equipped with the following major trails and recreation site, which are subject to appropriate management.

Yambaru Wildlife Conservation Center and its exhibitions (Photo: JWRC)

Table 5-17-1: Amami-Oshima Island

Major trails	
Yuwandake Climbing Trail	There is a boardwalk built that takes one from the northern side of Mt. Yuwandake all the way to its summit. Wind-beaten shrubs typically found in the alpine belt of Amami-Oshima Island dominate the forest here, in which plants endemic to Mt. Yuwandake can also be seen.
Recreation sites	
Fukumoto Recreation Site	A recreation site that can be a useful base for visitors coming to experience nature in the forests and streams, etc. surrounding it, including Mt. Yuwandake, and that provides easy opportunities to have a hands-on encounter with nature in a forest environment setting. A camp site and an athletic field are also adjacent to the park.
Yuwandake Recreation Site	Located at the entrance to the climb to Mt. Yuwandake, it has a lookout where visitors can enjoy a view of the subtropical evergreen broadleaved forest in the core region.

Table 5-17-2: Northern part of Okinawa Island

Major trails	
Mt. Ibudake Trail	A trail that offers a scenic walk through natural surroundings of the subtropical evergreen broadleaved forest and ruins of bygone lives. The Okinawa rail and other endemic or rare animals and plants make a habitat here.
Mt. Yonahadake Trail	A trail that connects to the summit of Mt. Yonahadake, the highest mountain on Okinawa Island, situated in the core of the Yambaru region. The Okinawa rail and other endemic or rare animals and plants make a habitat here.
・Mt. Nekumachijidake/Mt. Shioya-fuji Trail	A trail for climbing Mt. Nekumachijidake and Mt. Shioya-fuji, which are limestone mountains. Rare plants that are unique to limestone terrains grow here.

Table 5-17-3: Iriomote Island

Major trails	
Iriomote Trans-Island Trail	A climbing trail that runs across Iriomote Island, starting from Gunkan-iwa Rock upstream of the Urauchi River and leading to Otomi. The magnificent nature of Iriomote Island can be savored in the thick of its subtropical evergreen broadleaved forest formed by trees like Castanopsis and *Quercus miyagii*. It offers views of mighty waterfalls, including Mariudu Falls, Kampire Falls, and Mayagusuku Falls.
Recreation sites	
Nishi-Funatsuki Recreation Site	It has a lookout built on Otomi Forestry Road (Iriomote Trans-Island Trail), which commands a sweeping view overlooking a mangrove forest, among the largest in Japan, alongside the Nakama River.
Omija Recreation Site	Located at the mouth of the Omija River, it has a boardwalk built for scenic views of a mangrove forest that is home to an abundance of benthic organisms, as well as a lookout with a sweeping tideland view.
Komi Recreation Site	It has a boardwalk built for scenic views of the Komi *Heritiera littoralis* communities and mangrove forests. Looking from the ocean to the inland, the transition of the forests from the grey mangrove (*Avicennia marina*) to Asiatic mangrove (*Rhizophora stylosa*), *Kandelia obovata* and the oriental mangrove (*Bruguiera gymnorhiza*) can be observed.

5.h.2.2. Guided tourism, Signage, and Printed information

The state of guided tourism on the respective islands is described below.

Amami-Oshima Island

About 420,000 inbound visitors and travelers come to Amami-Oshima Island per year. In terms of the pattern of tourism, there are group sightseeing tours using a large bus on one hand, while the number of individual tourists renting a car to go sightseeing is growing. Major guided tours include canoeing trips in mangrove forests and night wildlife watching tours. There are a total of 61 guides, inland and marine put together, registered with the Amami-Oshima Island Eco-Tour Guide Liaison Council, most of whom are individual business operators and there are accordingly few major businesses hiring multiple guides, except for diving business operators.

Tokunoshima Island

About 130,000 inbound visitors and travelers come to Tokunoshima Island per year. Only 14 guides are registered with the Tokunoshima Island Eco-Tour Guide Liaison Council. Other than diving businesses, there is no business operator that makes profits whose main line of business is guiding.

Northern part of Okinawa Island

While the number of tourists entering Okinawa Island has been rising each year, the percentage of those tourists who visit this region remains relatively small, given the long distance from Naha Airport: it is estimated that in FY2014, approximately 520,000 Japanese tourists from other prefectures visited the northern part of Okinawa Island. In the three villages in the northern part of Okinawa Island, there are 20 ecotourism business operators and 85 guides, few of whom are full-time guides. Major guided tours include forest walks and casual canoe trip tours. Non-local operators also offer eco-tours in the three villages of the northern part of Okinawa in the form of a day trip.

Iriomote Island

The annual number of visitors to Iriomote Island totaled 387,952 (in FY2015) and has been on the rise since New Ishigaki Airport opened in 2013. In the eastern district of Iriomote Island, many people take a bus tour and there are more wintertime visitors. In the western district, on the other hand, the number of visitors rises in summertime and many of them take an eco-tour or go snorkeling, diving, etc. There are 67 tourism business operators and 136 guides (in 2014) that offer tours designed to experience nature, and the number of such businesses and guides has doubled in the past 10 years (FY2013 Report on Appropriate Mountain Climb Trail Use Promotion in Iriomote-Ishigaki National Park).

5.h.3. Accommodations

Amami-Oshima Island

As of August 2015, there are 106 accommodation establishments on Amami-Oshima Island (Amami Oshima Tourism and Product Association). The total capacity of those accommodations is 5,800 per day. While the number of inbound visitors and travelers on Amami-Oshima Island has been on the increase recently due to a low-cost carrier (LCC) now serving the island, its accommodation capacity remains sufficient, with the largest number of monthly inbound visitors and travelers thus far being 46,669 (in August 2015). There is one camp site in the buffer zone (Yamato Village), along with two camp sites in the coastal area.

Tokunoshima Island

There are 33 accommodation establishments on Tokunoshima Island as of August 2015 (Amami Oshima Tourism and Product Association). The total capacity of those accommodations is 1,059 per day. While the number of inbound visitors and travelers on Tokunoshima Island has been on the increase recently due to lower airfares and sea fares through the use of Amami Islands promotion subsidies, its accommodation capacity remains sufficient, with the largest number of monthly inbound visitors and travelers thus far being 13,638 (in August 2015).

There are four camp sites in the coastal area outside the buffer zone. Northern part of Okinawa Island. There are 41 accommodation establishments in the northern part of Okinawa Island (surveys by the respective village offices). The total capacity of those accommodations is 1,476 per day. Of all visitors to the Yambaru region, 70% are day-trippers from accommodations located outside of the Yambaru region (FY2013 Tourism Statistics and Actual Status Survey Report (Okinawa Prefecture)). There is a large resort hotel (capacity: 550 per day) in Kunigami Village, in which roughly two-thirds of people staying overnight in Kunigami Village take up lodgings. Apart from that hotel, most of the accommodations are relatively small, with the capacity ranging from 5 to 30 per day. In addition to the accommodation establishments, camp sites are also used (one within the buffer zone and one outside the buffer zone).

Iriomote Island

As camping is prohibited on Iriomote Island, except in a designated camp site, most tourists stay in the accommodations on the island. There are 30 accommodation establishments on Iriomote Island, but are located outside of the nominated property and outside the buffer zone (December 2012 Chamber of Commerce and Industry Directory).

5.h.4. Restaurants, eating and drinking establishments, etc.

There are 1,102 wholesale/retail stores and eating/drinking establishments on Amami-Oshima Island, 390 on Tokunoshima Island, 58 in the northern part of Okinawa Island, and 32 on Iriomote Island, all of which are located outside of the nominated property.

5.i. Policies and Programmes Related to the Presentation and Promotion of the Property

In order to maintain human activities in the social, production and economic spheres in a sustainable manner in future years, while appropriately managing the heritage value of the nominated property, actions will be taken proactively with a view toward promoting the region in harmony with nature through ecotourism, etc. To that end, the promotional and awareness-raising activities now being carried out to make ecotourism approaches and rules known to island visitors and business operators will be continued in the years to come as well, along with efforts to train nature guides as supporters of such activities.

In the nominated property, information on the value of nature and other related subjects is offered to users in the forms of exhibitions at visitor facilities, explanations given by guides, and signs placed in major spots along trails or in recreation sitesand other utilization facilities, as described in 5.h.

5.j. Staffing Levels and Expertise

The number of professionals and the technical and maintenance staff sizes in the nominated property are as stated below.

Ministry of the Environment

Naha Nature Conservation Office: Natural Environment Development Department: 2 persons
National Park Department: 3 persons
Wildlife Department: 4 persons

Amami Ranger Office for Nature Conservation: 5 persons
Tokunoshima Ranger Office for Nature Conservation: 2 persons
Yambaru Ranger Office for Nature Conservation: 5 persons
Iriomote Ranger Office for Nature Conservation: 5 persons

Forestry Agency

Kyushu Regional Forest Office: Planning and Conservation Department: 5 persons
Kagoshima District Forest Office: 4 persons
Naze Forest Office: 1 person
Tokunoshima Forest Office : 1 person
Okinawa District Forest Office: 3 persons
Takae Forest Office : 1 person
Ohara Forest Office : 1 person
Sonai Forest Office : 1 person
Iriomote Forest Ecosystem Conservation Center: 3 persons

Kagoshima Prefecture

Environment and Forestry Affairs Department: 1 person

Nature Conservation Division: 7 persons

Hygiene and Environment Office, Oshima Branch Office: 2 persons

Cultural Assets Division: 3 persons

Okinawa Prefecture

Nature Conservation Division, Department of Environmental Affairs: 17 persons

Cultural Assets Division, Board of Education: 1 person

Municipalities

Amami-Oshima Island

- Amami City: World Natural Heritage Promotion Office, Environmental Measure Section: 3 persons
  Sumiyo General Branch Office: 1 person
  Kasari General Branch Office: 1 person
- Yamato Village: General Affairs and Planning Division: 1 person Taxation Division: 1 person (responsible for cats)
- Uken Village: General Affairs and Planning Division: 1 person Fisheries Division: 1 person Taxation Division: 1 person (responsible for cats)
- Setouchi Town: Setouchi Board of Education Department of Social Education World Natural Heritage Setouchi Promotion Office: 2 persons Setouchi Towns Man Affairs Division: 1 person (responsible for cats)
- Tatsugo Town: General Affairs and Planning Division: 1 person Consumer & Environment Protection Division: 1 person

- Amami Promotion Division, Wide Area Administration Association of Amami Islands: 3 persons

Tokunoshima Island

- Tokunoshima Town: Planning Division: 1 person Resident Life Department: 1 person (responsible for cats)
- Amagi Town: Planning Division: 1 person Resident Life Department: 1 person (responsible for cats)
- Isen Town: Kyura-Machi Tourism Division: 1 person Kyura-Machi Tourism Department: 1 person (responsible for cats)
- Amami Promotion Division, Wide Area Administration Association of Amami Islands [second mention]

Northern part of Okinawa Island

- Kunigami Village World Natural Heritage Promotion Division: 3 persons
- Kunigami Village Board of Education, Education Division: 1 person
- Ogimi Village Planning and Tourism Division: 2 persons
- Higashi Village Planning and Tourism Division: 2 persons

Iriomote Island

- Taketomi Town: Natural Environment Division: 2 persons
  Commerce, Industry and Tourism Division: 2 persons
  Cultural Properties Section, Board of Education: 3 persons

*: As the Agency for Cultural Affairs does not have local offices, no staff is stationed in the local areas of the nominated property (There are three officers in charge of Natural Monuments designated as cultural properties under the Act on Protection of Cultural Properties).

Red bayberry (*Myrica rubra*) (Photo: MOEJ)

6

Monitoring

6.a. Key Indicators for Measuring State of Conservation

6.b. Administrative Arrangements for Monitoring Property

6.c. Results of Previous Reporting Exercises

Banded ground gecko (*Goniurosaurus splendens*), Tokunoshima Island (Photo: MOEJ)

6. Monitoring

6.a. Key Indicators for Measuring State of Conservation

Table 6-1 shows a list of key indicators that are thought to serve as measures of the nominated property's conservation status.

The three species used to indicate heritage values and integrity are endemic species and threatened species that serve a flagship role for the purpose of ecosystems and biodiversity conservation on the respective islands. As these species are designated as National Endangered Species under the Act on Conservation of Endangered Species of Wild Fauna and Flora, actions are underway as per protection and recovery program, in cooperation with a broad range of organizations concerned, to monitor their status and to combat traffic accidents, alien species, and other threats. While on another front, tourism offers opportunities to deepen understanding about the values of the property, as any disorderly business expansion or over-exploitation might eventually impair their heritage values.

These species will be monitored as key indicators in order to track the conservation status of the nominated property's values and the effects of protection management measures, and reflect the findings obtained in the work to administer proper management. Since the endemic species and threatened species, as well as alien species and tourism activities selected as the key indicators, also interact the peripheral areas outside of the nominated property and the buffer zones, the work of monitoring will be performed with those areas covered as well.

Table 6-1: List of key indicators for the nominated property's conservation status

Monitoring viewpoints	Specifics	Key indicator	Locations covered				Survey period	Organization to maintain information (Implementing organization)
			Amami-Oshima Island	Tokunoshima Island	Northern part of Okinawa Island	Iriomote Island		
A. State of heritage values Whether the endemic species and threatened species indicating OUV are maintained	・Distribution status	Amami rabbit	●	●	–	–	Every year/ every 5 years	・Naha Nature Conservation Office ・Kyushu Regional Forest Office
		Okinawa rail	–	–	●	–		
		Iriomote cat	–	–	–	●		
B. Status of integrity Whether anthropogenic impacts on the endemic species and threatened species are reduced, or past impacts improved	・Number of traffic accidents ・Number of roadkills	Amami rabbit	●	●	–	–	Every year/ every 5 years	・Naha Nature Conservation Office ・Kagoshima Prefecture
		Okinawa rail	–	–	●	–		
		Iriomote cat	–	–	–	●		

Monitoring viewpoints	Specifics	Key indicator	Locations covered				Survey period	Organization to maintain information (Implementing organization)
			Amami-Oshima Island	Tokunoshima Island	Northern part of Okinawa Island	Iriomote Island		
C. Status of protection management Whether the number of alien species posing a threat is reduced *** The status of the endemic species and threatened species as its effect is addressed in A above**	・CPUE (relative habitat density) ・Distribution status	Mongoose	●	–	●	–	Every year	・Naha Nature Conservation Office ・Okinawa Prefecture
	・Distribution status ・Number and percentage of microchipped pet cats	Cats	●	●	●	●	Every year	・Naha Nature Conservation Office ・Kagoshima Prefecture ・Okinawa Prefecture ・Municipalities concerned ・Veterinary Medical Association
D. Sustainable tourism use Whether tourism use of the nominated property and areas surrounding it is done in a sustainable way	・Number of inbound visitors and travelers per island ・Number of users of leading establishments ・Number of ecotour participants within national forests	Tourism users	●	●	●	●	Every year	・Naha Nature Conservation Office ・Kyushu Regional Forest Office ・Kagoshima Prefecture ・Okinawa Prefecture ・Municipalities concerned
	・Number of accredited guides ・Number of businesses that have signed a conservation and utilization agreement	Eco-tour guides and businesses	●	●	●	●	Every year	・Amami Island Group Regional Administration Association ・Okinawa Prefecture

In addition to the monitoring on three species above, the following indicators represent information that can be obtained from studies, action projects, and other measures conducted periodically, and therefore can serve as additional indicators to complement the key indicators listed above, for the purpose of tracking the status of heritage value conservation and the effects of protection management measures (Table 6-2).

Iriomote cat (Photo: MOEJ)

Table 6-2: Indicators for complementary use in addition to key indicators for determining the nominated property's conservation status

Monitoring viewpoints	Specifics	Key indicator	Locations covered				Survey period	Organization maintaining information (Implementing organization)
			Amami-Oshima Island	Tokunoshima Island	Northern part of Okinawa Island	Iriomote Island		
A. Status of heritage values Whether the endemic species and threatened species indicating OUV are maintained	Distribution status of endemic species and rare species	[Mammals] Spiny rats, long-haired rats, etc.	●	●	●	–	Every year/ every 5 years	•Naha Nature Conservation Office •Kyushu Regional Forest Office
		[Birds] Amami jay *(Garrulus lidthi),* Amami thrush (*Zoothera dauma major*), Okinawa woodpecker (*Sapheopipo noguchii*), Amami woodcock (*Scolopax mira*), etc.	●	●	●	–	Every year/ every 5 years	•Naha Nature Conservation Office •Kyushu Regional Forest Office •Private organizations
		[Reptiles] Ground geckoes, Ryukyu black-breasted leaf turtle, etc.	–	●	●	–	Every year/ every 5 years	•Naha Nature Conservation Office •Kyushu Regional Forest Office
		[Amphibians] Ishikawa's frogs, tip-nosed frogs, Otton frog (*Babina subaspera*), Namie's frog (*Limnonectes namiyei*), etc.	●	●	●	–	Every year/ every 5 years	•Naha Nature Conservation Office •Kyushu Regional Forest Office
		[Insects] Yanbaru long-armed scarab beetle, etc.	–	–	●	–	Every year/ every 5 years	•Naha Nature Conservation Office •Kyushu Regional Forest Office •Yanbaru Long-Armed Scarab Beetle Poaching Prevention Council •Private organizations

Monitoring viewpoints	Specifics	Key indicator	Locations covered				Survey period	Organization maintaining information (Implementing organization)
			Amami-Oshima Island	Tokunoshima Island	Northern part of Okinawa Island	Iriomote Island		
B. Status of integrity Whether any impact or any sign of impact of climate change or disasters is detected early	Meteorological data, including temperatures, precipitation, number of typhoons developed and landing	Meteorological changes in the nominated property	●	●	●	●	Every day	•Japan Meteorological Agency
	Composition of species that occurred, numbers and populations of those species, etc.	Changes in the vegetation and in the fauna of mammals and birds (e.g., alien species of a southern origin)	●	●	●	●	Every year/ every 5 years	•Ministry of the Environment Biodiversity Center of Japan •Kyushu Regional Forest Office
C. Status of protection management 1) Whether the number of alien species posing a threat is reduced	Number of alien species confirmed to have encroached or become established	Status of invasion/ establishment of alien species in general	●	●	●	●	As needed	•Naha Nature Conservation Office •Kyushu Regional Forest Office
	Number of days no cane toad was spotted Target number of white-lipped treefrog captures, area covered for survey	Cane toad White-lipped treefrog	–	–	–	●	Every year	•Naha Nature Conservation Office
2) Whether poacher encroachment is prevented	Number of patrols per year, number of engaged staff members, etc.	Status of implementation of steps to prevent illegal collecting and capturing of endemic species and rare species	●	●	●	●	As needed	•Naha Nature Conservation Office •Kyushu Regional Forest Office •Amami Island Group Rare Wildlife Protection Program Council •Yanbaru Long-Armed Scarab Beetle Poaching Prevention Council •Private organizations

6.b. Administrative Arrangements for Monitoring Property

Coordination and cooperation system is established among relevant government agencies, relevant organizations and researchers. The information obtained during the monitoring or research is shared on the website as appropriate and used effectively.

6.c. Results of Previous Reporting Exercises

Many studies, research and conservation projects have been conducted in the nominated property up until now. The papers and reports from those endeavors that have relevance to the key indicators listed in Table 6-1 relative to the nominated property's conservation status are listed below, together with summary descriptions (Table 6-3).

Table 6-3: Previous studies on key indicators for the nominated property's conservation status

Editor/author, year of publication	Paper or report title	Issuer	Summary description
Relevant to the Amami rabbit			
Kagoshima Prefecture Board of Education (1977)	Study on the Actual Condition of the Special Natural Monument Amami Rabbit	Kagoshima Prefecture Board of Education	For the purpose of obtaining basic data on protection management measures for the Amami rabbit as a special natural monument, the ecology of the Amami rabbit was grasped on the basis of resident questionnaires and field surveys, along with a report being issued on the results of estimating their habitat distribution range and population.
Nature Conservation Bureau, Environment Agency (1994)	Study on the Actual Condition of Rare Wildlife Habitats in the Amami Island Group	Nature Conservation Bureau, Environment Agency	A survey was conducted on the status and habitat environments of rare species in the Amami Island Group that are particularly important for conservation purposes (e.g., Amami rabbit, Ryukyu long-haired rat, spiny rats), as well as of alien species causing impacts on them, along with a report being issued on the results of deliberations about conservation measures.
Nature Conservation Bureau, Environment Agency (1995)	Report on the Survey in Areas with Biodiversity (Amami Island Group Region)	Environment Agency	From the standpoint of biodiversity conservation, a survey was conducted on Amami-Oshima Island and Tokunoshima Island of the Amami Island Group to investigate the status and habitat environments of rare mammals for which there were particular concerns over population declines (five species including the Amami rabbit), along with a report being issued on the results of deliberations about conservation measures.

Editor/author, year of publication	Paper or report title	Issuer	Summary description
Nature Conservation Bureau, Environment Agency (1999)	Survey on the Actual Condition for Designation as a Nationally Endangered Species and for Other Purposes: the Amami Rabbit	Environment Agency	With the aim of developing basic data for selection as a National Endangered Species under the Act on the Conservation of Endangered Species of Wild Fauna and Flora, a report is issued on the findings from a survey conducted on Amami-Oshima Island and Tokunoshima Island to comprehend the status of the Amami rabbit, the current condition of their habitats, and impacting factors.
Relevant to the Okinawa rail			
Agency for Cultural Affairs (1983)	Special Study Report on the Natural Monument: Okinawa Rail (*Rallus okinawae*)	Agency for Cultural Affairs	A report on the findings from studies conducted after discovery of the species in 1981 for natural monument designation purposes, to investigate its taxonomic position, developments leading to the discovery, the distribution of locations where it was spotted and its carcass collected, its habitat environment, issues for conservation purposes, etc.
Nature Conservation Division, Department of the Environment and Public Health, Okinawa Prefecture (1989- 1994)	Habitat Environment Survey I to VII on Special Birds, etc. and Other Species	Nature Conservation Division, Department of the Environment and Public Health, Okinawa Prefecture	For the purpose of expanding the Wildlife Protection Area designated by Okinawa Prefecture in the northern part of Okinawa Island, a report is issued on the findings from a survey of the distribution of animals, including mainly special birds under the (now-repealed) "Act on Regulation of Transfers, etc. of Special Birds, etc." (Okinawa rail, Okinawa woodpecker, Amami woodcock and others), and some amphibians.
Environment Agency (1982, 84, 85, 86, 88, 89, 91, 92, 93)	Survey Report on Special Birds, etc.	Environment Agency	A report on the findings from a survey conducted to investigate the status of special birds, etc. under the (now-repealed) "Act on Regulation of Transfers, etc. of Special Birds, etc." (Okinawa rail, Okinawa woodpecker, Amami jay, Amami thrush, Ryukyu robin and white-backed woodpecker (*Dendrocopos leucotos owstoni*)).
Naha Nature Conservation Office, Ministry of the Environment (2008～2016?)	Okinawa Rail Status Survey Report	Naha Nature Conservation Office, Ministry of the Environment	To understand the distribution of the species, play-back study is conducted in three Yambaru villages.

Editor/author, year of publication	Paper or report title	Issuer	Summary description
Relevant to the Iriomote cat			
Environment Agency (1975 - 1977)	Research on the Ecology and Protection of the Iriomote Cat: First to Third Reports (1975 - 1977)	Environment Agency	The first set of findings from the comprehensive survey conducted by the Ministry of the Environment at approximately ten-year intervals starting in 1973 in order to reveal the ecology of the Iriomote cat and comprehend its status.
Environment Agency (1983 - 1985)	Survey for the Purpose of Measures to Conserve the Habitat Environments, etc. of the Iriomote Cat (1983 – 1985)	Environment Agency	The second set of findings from the comprehensive survey conducted by the Ministry of the Environment at approximately ten-year intervals starting in 1973 in order to reveal the ecology of the Iriomote cat and comprehend its status.
Environment Agency (1993 - 1994)	Special Survey Project Report on Iriomote Cat Habitats (1993 – 1994)	Environment Agency	The third set of findings from the comprehensive survey conducted by the Ministry of the Environment at approximately ten-year intervals starting in 1973 in order to reveal the ecology of the Iriomote cat and comprehend its status.
University of the Ryukyus (2008)	(Fourth) Comprehensive Survey Report on the Status, etc. of the Iriomote Cat	Ministry of the Environment	The fourth set of findings from the comprehensive survey conducted by the Ministry of the Environment at approximately ten-year intervals starting in 1973 in order to reveal the ecology of the Iriomote cat and comprehend its status.
Okinawa Forestry Station, Kumamoto Regional Forestry Office, Forestry Agency (1994 - 1998)	Endangered Species of Wild Fauna and Flora Protection Management Measure Study Report on the Iriomote Cat: First to Fourth Reports	Okinawa Forestry Station, Kumamoto Regional Forestry Office, Forestry Agency	As a protection management project for National Endangered Species under the Act on the Conservation of Endangered Species of Wild Fauna and Flora, a survey was conducted to develop a general outline of the status and habitat environments of the Iriomote cat and its prey animals, along with a report being issued on impacting factors for conservation purposes and on the results of deliberations about protection management measures.

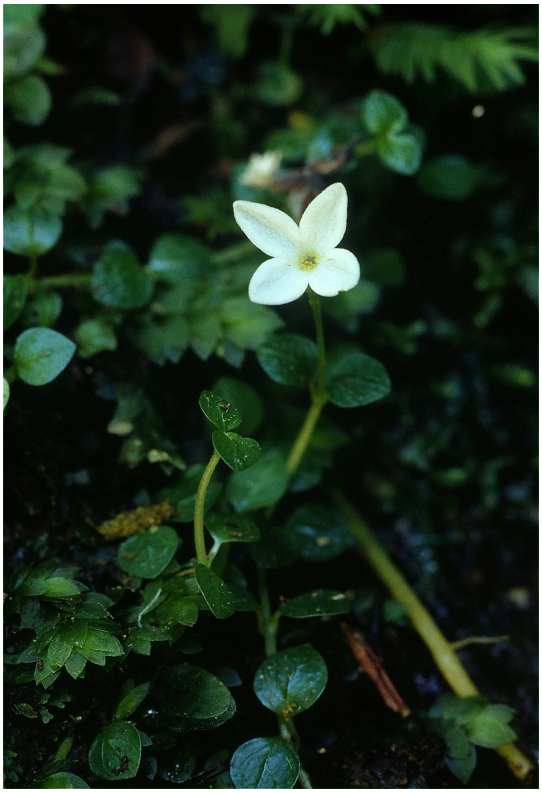
Editor/author, year of publication	Paper or report title	Issuer	Summary description
Naha Nature Conservation Office, Ministry of the Environment/ Okinawa District Forest Office, Kyushu Regional Forest Office, Forestry Agency (1996～ 2016?)	Iriomote Cat Protection and Recovery Project Implementation Report	Naha Nature Conservation Office, Ministry of the Environment Office/ Okinawa District Forest Office, Kyushu Regional Forest Office, Forestry Agency	A detailed summary of the project implemented by the Ministry of the Environment and the Forestry Agency pursuant to the protection and recovery project plan. A report on the findings from a monitoring survey based on automated photography and spotting information, and surveys on traffic accident prevention steps and domestic cat situations.
Relevant to mongooses and feral cats			
Sadao Ikehara (editor and author) (1991)	Influence upon wildlife by introduced animals in the Nansei-Shoto Islands	World Wide Fund for Nature Japan (WWF Japan)	A report on the findings from studies conducted to obtain basic data for wildlife species conservation on the major islands of the Nansei-Shoto Islands - Amami-Oshima Island, Okinawa Island and Iriomote Island - with respect to the types and distribution ranges of alien animals, and their impacts on biota.
Kagoshima Prefecture (1996 - 2000)	Study Report for the Introduced Species (Mongoose) Elimination and Control Model Project in the Insular Region	Environment Agency / Kagoshima Prefecture	For the purpose of conserving the biota unique to Amami-Oshima Island, the status and biological characteristics of mongooses were grasped, along with a report being issued on the results of deliberations about their impacts on native species and about countermeasures, capture methods, and elimination and control structure developments, etc.
Ministry of the Environment (2001 - 2004)	Introduced Species (Mongoose) Elimination Project Report	Ministry of the Environment	As a result of the above model project, a shift to a full-scale elimination project followed as prompt action was required. Based on the outcomes of elimination efforts over three years, a report is issued on the results of deliberations about population reduction, the possibility of eradication, and elimination policy and planning.
Ministry of the Environment (2005 - 2016)	Report on the Javan Mongoose Control Project on Amami-Oshima Island (2005 - 2014) Report on the Small Indian Mongoose Control Project on Amami-Oshima Island (2015 - 2016)	Ministry of the Environment	A report on the results of the mongoose control project implemented on Amami-Oshima Island by the Ministry of the Environment (e.g., capturing mongooses and tracking their status, examining effective control methods, monitoring the recovery of native species) pursuant to a control implementation plan under the Specified Invasive Alien Species Act.

Editor/author, year of publication	Paper or report title	Issuer	Summary description
Northern Dam Administration Office, Okinawa General Bureau (1994 - 1997)	Biological Environment Study Data in the Northern Region of Okinawa's Main Island (Mongoose)	Northern Dam Administration Office, Okinawa General Bureau	Results of surveys conducted on the capture and feeding habits of alien mammals (mongooses and domestic cats), which are considered among the factors inhibiting the distribution of native species in the northern part of Okinawa Island.
Nature Conservation Division Department of Cultural and Environmental Affairs, Okinawa Prefecture (2001- 2016?)	Mongoose Elimination Contract Work Report	Nature Conservation Division, Department of Cultural and Environmental Affairs, Okinawa Prefecture	Results of a survey on mongoose control implemented by Okinawa Prefecture in order to recover the habitat range of rare wildlife in the northern part of Okinawa Island, and on the progress of rare species recovery.
Naha Nature Conservation Office, Ministry of the Environment (2010 - 2016)	Report on the Project for Controlling Javan Mongooses, etc. in the Northern Region of Okinawa Island (2010 - 2014) Report on the Project for Controlling Small Indian Mongooses, etc. in the Northern Region of Okinawa Island (2015- 2016)	Naha Nature Conservation Office, Ministry of the Environment	Results of the mongoose control project implemented in the northern part of Okinawa Island by the Ministry of the Environment (e.g., capturing mongooses and tracking their status, examining effective control methods, monitoring the recovery of rare native species) in accordance with a control implementation plan developed pursuant to the Specified Invasive Alien Species Act.
Naha Nature Conservation Office, Ministry of the Environment (2015 - 2016)	Report on the Alien Mammal Status Survey Aimed at Recovering Ecosystems of Tokunoshima Island (2015) Report on the Feral Cat Control Implementation Aimed at Recovering the Ecosystems of Tokunoshima Island (2016)	Naha Nature Conservation Office, Ministry of the Environment	Results of a survey on the status of domestic cats that are affecting the Amami rabbit and other rare species on Tokunoshima Island, the estimation of cats population, distribution range, distribution density, etc., and deliberations about future measures.
Watari *et a*l. (2013)	Evaluating the "recovery level" of endangered species without prior information before alien invasion. Ecology and Evolution. 3(14): 4711–4721.	John Wiley & Sons Ltd.	A method of calculating numerical targets to evaluate the level of recovery of indigenous species was developed. In reference to the mongoose control project on Amami-Oshima Island, it was demonstrated that the populations of the Amami rabbit and three indigenous frog species had made a remarkable recovery.

Editor/author, year of publication	Paper or report title	Issuer	Summary description
Fukasawa et al. (2013)	Differential population responses of native and alien rodents to an invasive predator, habitat alteration, and plant masting. Proceedings of Royal Society B: Biological Sciences. 280: 2013 - 2075.	The Royal Society	A method of calculating numerical targets to evaluate the level of recovery of indigenous species was developed. In reference to the mongoose control project on Amami-Oshima Island, it was demonstrated that the populations of the Ryukyu long-haired rat and the Amami spiny rat, both indigenous species, had made a remarkable recovery and that there had been no sign of increases of black rats, an alien species.
General research, etc. on the natural environment and wildlife			
WWF Japan Scientific Committee (ed) (1984 - 1985)	The Nansei-Shoto Islands and Their Nature Protection: I - II	World Wildlife Fund Japan	Results of a basic survey on the fauna of the Nansei-Shoto Islands, which were expected to see various problems between nature protection and development arise in the future (species list, distribution data, literature list), and a biological and sociological survey on the islands inhabited by major internationally rare species (the Amami rabbit for Amami-Oshima Island and the Iriomote cat for Iriomote Island).
Nature Conservation Bureau, Environment Agency (1989 - 1991)	Research on the Conditions Essential for the Preservation of Wildlife Species in the Nansei-Shoto Islands Survey Report on the Northern Part of Okinawa Island (1989) Survey Report on the Sakiyama Peninsula District of Iriomote Island (1990) Survey Report on Amami-Oshima Island (1990) Summary Report (1991)	Nature Conservation Bureau, Environment Agency	Results of surveys with the aim of summarizing the conservation measures in the important regions of the Nansei-Shoto Islands (Amami-Oshima Island, northern part of Okinawa Island, Iriomote Island). Overviews of the weather and geographical and geological formations of each region, the findings from survey data on the distribution of vegetation, flora and fauna (vertebrate animals, insects, and invertebrate animals), and a summary thereof.
Nature Conservation Bureau, Environment Agency (1994)	Study on the Actual Condition of Rare Wildlife in the Amami Island Group	Nature Conservation Bureau, Environment Agency	A survey was conducted on the status and habitat environments of rare species in the Amami Island Group that are particularly important for conservation purposes (e.g., Amami rabbit, Ryukyu long-haired rat, spiny rats), as well as of alien species causing impacts on those rare species, along with a report being issued on the results of deliberations about conservation measures.

Editor/author, year of publication	Paper or report title	Issuer	Summary description
Kagoshima Prefectural Museum (1996)	Kagoshima Nature Study Project Report III: Nature in Amami	Kagoshima Prefectural Museum	Overviews of the weather, geographical and geological formations of the Amami Island Group, and a report on the island-specific data on the vegetation, flora and fauna (e.g., vertebrates, insects, land snails, crustaceans), and on the findings from a field survey on Tokunoshima Island.
Environment Agency (2000)	Amami-Oshima Island Rare Wildlife Survey Report	Environment Agency	A report on the findings from survey data on the distribution of rare species (e.g., vertebrates, insects, land snails, myriapods, higher plants) on Amami-Oshima Island and Tokunoshima Island.
Okinawa District Nature Conservation Office, Nature Conservation Bureau, Ministry of the Environment, (2001)	Iriomote National Wildlife Protection Area Survey Report	Okinawa District Nature Conservation Office, Nature Conservation Bureau, Ministry of the Environment	For the purpose of shedding light on the status of the Iriomote cat and the status within the inland wildlife protection area, for which surveys had been scarce, a report is issued on a survey using automated photography, census, etc. and on the results of deliberations about impacting factors and conservation measures.
Naha Nature Conservation Office, Ministry of the Environment (2005)	Mt. Yuwandake National Wildlife Protection Area Survey Report	Okinawa District Nature Conservation Office, Nature Conservation Bureau, Ministry of the Environment	A report on the findings from a survey on the status of birds and animals, including rare species, conducted as basic data for the purpose of designating a national wildlife protection area in Mt. Yuwandake on Amami-Oshima Island.
Shigeki Yasumura, WWF Japan (ed.) (2009)	A Collection of Reports on Biodiversity Evaluation Projects in the Nansei-Shoto Islands	World Wide Fund for Nature Japan	A report on the selection and mapping of areas of priority for biodiversity conservation purposes on the Nansei-Shoto Islands, and on the findings from a field survey, including the distribution range of Okinawa spiny rats.

Editor/author, year of publication	Paper or report title	Issuer	Summary description
Relevant to sustainable use in tourism			
Amami Island Group Tourism Association / Oshima Branch Office, Kagoshima Prefecture (- 2016)	Trends of Tourism in the Amami Island Group	Amami Island Group Tourism Association / Oshima Branch Office, Kagoshima Prefecture	A report on various statistical surveys conducted every year to grasp the trends of tourism in the Amami Island Group, including the number of inbound visitors, total number of travelers, number of inbound visitors by island, by month and by point of departure, number of users of establishments, etc.
Okinawa Prefecture (- 2016)	Tourism Directory	Okinawa Prefecture	A report on various statistical surveys conducted every year to grasp the trends of tourism in Okinawa Prefecture, including the number of inbound visitors, tourist trends, tourism revenues, accommodations, etc.
Okinawa Prefecture (- 2016)	Yaeyama Tourism Statistics	Okinawa Prefecture	A report on the statistical survey conducted every year about tourism trends in the Yaeyama region of Okinawa Prefecture, including the number of inbound visitors by island.



Nertera yamashitae
(Photo: Hiroshi Yamashita)

Quercus miyagii (Photo: MOEJ)

7

Documentation

7.a. Photographs and Audiovisual Image Inventory and Autorization Form

7.b. Texts Relating to Protective Designation, Copies of Property Managemant Plans or Documented Management System and Extracts of Other Plans Relevant to the Property

7.c. Form and Date of Most Recent Records or Inventory of Property

7.d. Address Where Inventory, Records and Archives Are Held

7.e. Bibliography

Okinawa rail (*Gallirallus okinawae*), the northern part of Okinawa Island (Photo: MOEJ)

7. Documentation

7.a. Photographs and Audiovisual Image Inventory and Autorization Form

No.	Format	Caption	Date	Photographer	Copyright owner	Contact detail of copyright owner	Nonexclusive cession of rights
1	jpg	Evergreen broadleaved forest (Amami-Oshima Is.)	2011		MOEJ*1	MOEJ	Yes
2	jpg	Mt. Inokawadake (Tokunohsima Is.)	2008		JWRC*2	JWRC	yes
3	jpg	Evergreen broadleaved forest (Northern part of Okinawa Island)	2016		MOEJ	MOEJ	yes
4	jpg	Mt. Komidake (Iriomote Is.)	2010		MOEJ	same as above	yes
5	jpg	View from the Funaura Bay (Iriomote Is.)	2010		MOEJ	same as above	yes
6	jpg	Cloud forest (Northern part of Okinawa Is.)	2003		MOEJ	same as above	yes
7	jpg	Mountain stream (Amami-Oshima Is.)	2012		MOEJ	same as above	yes
8	jpg	Mangrove forest (Nakama River, Iriomote Is.)	2009		MOEJ	same as above	yes
9	jpg	*Cardiandra amamiohsimensis*	2012		MOEJ	same as above	yes
10	jpg	*Arisaema heterocephalum*	2012		MOEJ	same as above	yes
11	jpg	*Viola amamiana*	2010		MOEJ	same as above	yes
12	jpg	*Asarum simile*	2013		MOEJ	same as above	yes
13	jpg	*Platanthera sonoharae*	2010		MOEJ	same as above	yes
14	jpg	*Solenogyne mikadoi*	2013		MOEJ	same as above	yes
15	jpg	*Dendrobium okinawense*	2007		MOEJ	same as above	yes
16	jpg	Amami rabbit (*Pentalagus furnessi*)	2012		MOEJ	same as above	yes
17	jpg	Iriomote cat (*Prionailurus bengalensis iriomotensis*)	2006		MOEJ	same as above	yes
18	jpg	Amami spyny rat (*Tokudaia osimensis*)	2014		MOEJ	same as above	yes
19	jpg	Tokunoshima spiny rat (*Tokudaia tokunoshimensis*)	2015		MOEJ	same as above	yes
20	jpg	Okinawa spiny rat (*Tokudaia muenninki*)	2009		MOEJ	same as above	yes
21	jpg	Ryukyu long-haired rat (*Diplothrix legata*)	2008		MOEJ	same as above	yes
22	jpg	Amami jay (*Garrulus lidthi*)	2015		MOEJ	same as above	yes
23	jpg	Okinawa rail (*Gallirallus okinawae*)	2007		MOEJ	same as above	yes
24	jpg	Okinawa woodpecker (*Sapheopipo noguchii*)	2012		MOEJ	same as above	yes
25	jpg	Amami woodcock (*Scolopax mira*)	2014		MOEJ	same as above	yes
26	jpg	Amami thrush (*Zoothera dauma major*)	2007		MOEJ	same as above	yes
27	jpg	White-backed woodpecker (*Dendrocopos leucotos owstoni*)	2013		MOEJ	same as above	yes
28	jpg	Ryukyu black-breasted leaf turtle (*Geoemyda japonica*)	2008		MOEJ	same as above	yes
29	jpg	Yellow-margined box turtle (*Cuora flavomarginata*)	2011		MOEJ	same as above	yes
30	jpg	Banded ground gecko (*Goniurosaurus splendens*)	2014		MOEJ	same as above	yes
31	jpg	Kuroiwa's ground gecko (*Goniurosaurus kuroiwae*)	2009		MOEJ	same as above	yes
32	jpg	Kishinoue's giant skink (*Plestiodon kishinouyei*)	2008		MOEJ	same as above	yes
33	jpg	Anderson's crocodile newt (*Echinotriton andersoni*)	2015		MOEJ	same as above	yes
34	jpg	Amami tip-nosed frog (*Odorrana amamiensis*)	2014		MOEJ	same as above	yes
35	jpg	Okinawa tip-nosed frog (*Odorrana narina*)	2009		MOEJ	same as above	yes
36	jpg	Greater tip-nosed frog (*Odorrana supranarina*)	2006		MOEJ	same as above	yes
37	jpg	Utsunomiya's tip-nosed frog (*Odorrana utsunomiyaorum*)	2007		MOEJ	same as above	yes
38	jpg	Amami Ishikawa's frog (*Odorrana splendida*)	2012		MOEJ	same as above	yes
39	jpg	Okinawa Ishikawa's frog (*Odorrana ishikawae*)	2009		MOEJ	same as above	yes
40	jpg	Namie's frog (*Limnonectes namiyei*)	2008		MOEJ	same as above	yes
41	jpg	Otton frog (*Babina subaspera*)	2008		MOEJ	same as above	yes
42	jpg	Holst's frog (*Babina holsti*)	2008		MOEJ	same as above	yes
43	jpg	Yanbaru long-armed scarab beetle (*Cheirotonus jambar*)	2005		MOEJ	same as above	yes
44	jpg	Damsel fly (*Rhinocypha uenoi*)	2016		MOEJ	same as above	yes
45	jpg	Asahina's skipper (*Ochlodes asahinai*)	2009		MOEJ	same as above	yes

*1: Ministry of the Environment
*2: Japan Wildlife Research Center

7.b. Texts Relating to Protective Designation, Copies of Property Managemant Plans or Documented Management System and Extracts of Other Plans Relevant to the Property

Appendix 3: Legal instruments of protection applying to the nominated property

Appendix 1 and 4: Management Plan and other plans applying to the nominated property

7.c. Form and Date of Most Recent Records or Inventory of Property

Article	Content	Implementing organization	Form	Date
Geology	Seamless Digital Geological Map of Japan (1:200,000)	Geological survey of Japan, AIST	https://gbank.gsj.jp/seamless/index_en.html?	2015
Climate	Automated Meteorological Data Acquisition System (AMeDAS) In order to observe weather conditions such as rain, wind, snow, observations at manned stations cover amonut of precipitation, wind direction/speed, air temperature, sunshine duration. All of these elements are observed automatically.	Japan Meteorological Agency	http://www.data.jma.go.jp/obd/stats/data/mdrr/index.html	every 10 minutes - hours
	Past Weather Data Search	Japan Meteorological Agency	http://www.data.jma.go.jp/obd/stats/etrn/index.php	2016
	Radar-AMeDAS rainfall	Japan Meteorological Agency	DVD	2016
Plant	National Survey on the Nature Environment - vegetation survey, etc.	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/kiso/fnd_f.html	2016
	National Survey on the Nature Environment - vegetation survey. Browse Vegetation Map · Download GIS data	Biodiversity Center of Japan, Ministry of the Environment	http://gis.biodic.go.jp/webgis/index.html	2016
	Threatened Wildlife of Japan -Red list - Plant I (vascular plant)	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/rdb/rdb_f.html	2015
	Threatened Wildlife of Japan -Red list - Plant II (nonvascular plant)	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/rdb/rdb_f.html	2015
Mammal	Distribution Map The National Survey on the Natural Environment Report of the distributional survey of Japanese animals (mammal)	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/kiso/fnd_f.html	2002
	Threatened Wildlife of Japan - Red list revision. - mammalia	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/rdb/rdb_f.html	2015
Aves	Threatened Wildlife of Japan - Red list - Aves	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/rdb/rdb_f.html	2015
	Distribution Map The National Survey on the Natural Environment Report of the distributional survey of Japanese animals (Aves)	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/kiso/fnd_f.html	2004

Article	Content	Implementing organization	Form	Date
Amphibia / Reptile	Distribution Map The National Survey on the Natural Environment Report of the distributional survey of Japanese animals (Amphibia / Reptile)	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/kiso/fnd_f.html	2001
	Threatened Wildlife of Japan - Red list - Amphibia / Reptile	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/rdb/rdb_f.html	2015
Insect	Distribution Map The National Survey on the Natural Environment Report of the distributional survey of Japanese animals (beetles)	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/kiso/fnd_f.html	2002
	Distribution Map The National Survey on the Natural Environment Report of the distributional survey of Japanese animals (Cicadas & Aquatic Hemiptera)	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/kiso/fnd_f.html	2002
	Distribution Map The National Survey on the Natural Environment Report of the distributional survey of Japanese animals (Butterflies)	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/kiso/fnd_f.html	2002
	Distribution Map The National Survey on the Natural Environment Report of the distributional survey of Japanese animals (Dragonflies)	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/kiso/fnd_f.html	2002
	Threatened Wildlife of Japan - Red list - Insect	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/rdb/rdb_f.html	2015
Arachnida / Myriapoda	Threatened Wildlife of Japan - Red list - Arachnida / Myriapoda	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/rdb/rdb_f.html	2015
Land & Fresh Water Mollusks	Distribution Map The National Survey on the Natural Environment Report of the distributional survey of Japanese animals (Land & Fresh Water Mollusks)	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/kiso/fnd_f.html	2002
	Threatened Wildlife of Japan - Red list - Land & Fresh Water Mollusks	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/rdb/rdb_f.html	2015
Fish	Distribution Map The National Survey on the Natural Environment Report of the distributional survey of Japanese animals (Fresh water fish)	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/kiso/fnd_f.html	2002
	Threatened Wildlife of Japan - Red list - Brackish /Fresh water Fish	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/rdb/rdb_f.html	2015
Crustacean	Threatened Wildlife of Japan - Red list revision. - Crustacean, etc.	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/rdb/rdb_f.html	2015

7.d. Address Where Inventory, Records and Archives Are Held

Biodiversity Center of Japan, Nature Conservation Bureau, Minstry of the Environment
5597-1 Kenmarubi, Kamiyoshida, Fujiyosida City, Yamanashi Prefecture 403-0005
TEL: +81-555-72-6031 FAX: +81-555-72-6035

Geological Survey of Japan, National Institute of Advanced Industrial Science and Technology
1-1-1 Higashi, Tsukuba City, Ibaraki Prefecture 305-8567
TEL: +81-29-861-3540 FAX: +81-29-861-3746

Japan Meteorological Agency
1-3-4 Otemachi, Chiyoda-Ku, Tokyo 100-8122
TEL: +81-3-3212-8341

Polystichum obae (Photo: MOEJ)

7.e. Bibliography

(Note: English translations of titles in Japanese are tentative, unauthorized, and only for information purposes)

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2. Description

2.a. Description of Property

2.a.1. Overview of the natural environment of the nominated property

2.a.1.1. Geology and geography

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Amami Rabbit (*Pentalagus furnessi*) (Photo: MOEJ)

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Ryukyu leopard plant
(*Farfugium japonicum* var. *luchuense*)
(Photo: MOEJ)

4. State of Conservation and Factors Affecting the Property
4.a. Present State of Conservation
4.a.1. Present conservation state of species subject to monitoring

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Sphenomeris minutula (Photo: JWRC)

4.a.2. Major current threats and countermeasures

4.a.2.1. Invasion of alien animals

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4.b. Impacting Factors

4.b.(i). Development pressures

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4.b.(ii). Environmental pressures

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4.b.(iv). Responsible visitation at World Heritage sites

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Kanpiree waterfalls, Iriomote Island (Photo: MOEJ)

8

Contact Information of Responsible Authorities

8.a. Preparer

8.b. Official Local Institution / Agency

8.c. Other Local Institutions

8.d. Official Web Address

Iriomote cat (*Prionailurus bengalensis iriomotensis*), Iriomote Island (Photo: MOEJ)

8. Contact Information of Responsible Authorites

8.a. Preparer

8.a.1. The Ministry of the Environment

Nature Conservation Bureau

Adress: Godochosha No. 5, 1-2-2 Kasumigaseki, Chiyoda-ku, Tokyo 100-8975

TEL: +81-3-3581-3351 FAX: +81-3-3591-3228

Naha Regional Office for Nature Conservation

Address: Naha Daiichi Chihou Godochosha, 1-15-15 Higawa, Naha City, Okinawa Prefecture 900-0022

TEL: +81-98-836-6400 FAX: +81-98-836-6401

8.a.2. The Forestry Agency

Forestry Agency

Address: 1-2-1 Kasumigaseki, Chiyoda-ku, Tokyo 100-0022

TEL: +81-3-3502-8111 FAX: +81-3-3502-2887

Kyushu Regional Forest Office

Address: 2-7 Kyomachi-honcho, Nishi-ku, Kumamoto City, Kumamoto Prefecture 860-0081

TEL: +81-96-328-3500 FAX: +81-96-355-3891

8.a.3. Kagoshima Prefecture

Nature Conservation Division, Environment and Forestry Affairs Department

Address: 10-1, Kamoike-Shinmachi, Kagoshima City, Kagoshima Prefecture 890-8577

TEL: +81-99-286-2613 FAX: +81-99-286-5546

Oshima Branch Office

Address: 17-3 Naze Nagata-cho, Amami City, Kagoshima Prefecture 894-8501

TEL: +81-997-52-5411 FAX: +81-997-53-7874

8.a.4. Okinawa prefecture

Nature Conservation Division, Department of Environmental Affairs

Address: 1-2-2 Izumizaki, Naha City, Okinawa Prefecture 900-8570

TEL: +81-98-866-2333 FAX: +81-98-866-2855

Yaeyama Regional Public Works Office

Address: Yaeyama Godochosha, 438-1 Maezato, Ishigaki City, Okinawa Prefecture 100-0002

TEL: +81-980-82-2217 FAX: +81-980-82-1954

8.b. Official Local Institution / Agency

Amami Ranger Office for Nature Conservation, Ministry of the Environment
Address: 551 Koshinohata, Ongachi, Yamato Village, Oshima County, Kagoshima Prefecture 894-3104
TEL: +81-997-55-8620 FAX: +81-997-55-8621

Tokunoshima Ranger Office for Nature Conservation, Ministry of the Environment
Address: Amagi Town Office, 2691-1 Hetono, Amagi Town, Oshima County, Kagoshima Prefecture 891-7612
TEL: +81-997-85-2919 FAX: +81-997-85-2045

Yambaru Ranger Office for Nature Conservation, Ministry of the Environment
Address: 263-1 Hiji, Kunigami Village, Kunigami County, Okinawa Prefecture 905-1413
TEL: +81-980-50-1025 FAX: +81-980-50-1026

Iriomote Ranger Office for Nature Conservation, Ministry of the Environment
Address: Komi, Taketomi Town, Yaeyama County, Okinawa Prefecture 907-1432
TEL: +81-980-84-7130 FAX: +81-980-85-5582

Kagoshima District Forest Office, Kyushu Regional Forest Office, Forestry Agency
Address: 12-1 Hama-machi, Kagoshima City, Kagoshima Prefecture 892-0812
TEL: +81-99-247-7111 FAX: +81-99-247-6571

Okinawa District Forest Office, Kyushu Regional Forest Office, Forestry Agency
Tsubogawa Building, 3-2-6 Tsubogawa, Naha City, Okinawa Prefecture 900-0025
TEL: +81-98-918-0210 FAX: +81-98-918-0211

Naze Forest Office, Kagoshima District Forest Office, Kyushu Regional Forest Office, Forestry Agency
Address: 1-17 Naze Manatsu-machi, Amami City, Kagoshima Prefecture 894-0015
TEL: +81-997-52-4531 FAX: +81-997-52-4531

Tokunoshima Forest Office, Kagoshima District Forest Office, Kyushu Regional Forest Office, Forestry Agency
Address: 7111-2 Kametsu, Tokunoshima Town, Oshima County, Kagoshima Prefecture 891-7101
TEL: +81-997-82-0027 FAX: +81-997-82-0027

Takae Forest Office, Okinawa District Forest Office, Kyushu Regional Forest Office, Forestry Agency
Address: 466-1 Takae, Higashi Village, Kunigami County, Okinawa Prefecture 905-1201
TEL: +81-980-43-2123 FAX: +81-980-43-2123

Sonai Forest Office, Okinawa District Forest Office, Kyushu Regional Forest Office, Forestry Agency
Address: 689 Iriomote, Taketmomi Town, Yaeyama County, Okinawa Prefecture 907-1542
TEL: +81-980-85-6201 FAX: +81-980-85-6201

Ohara Forest Office, Okinawa District Forest Office, Kyushu Regional Forest Office, Forestry Agency
Address: 201 Haemi, Taketmomi Town, Yaeyama County, Okinawa Prefecture 907-1434
TEL: +81-980-85-5308 FAX: +81-980-85-5308

Oshima Branch Office, Kagoshima Prefecture
Address: 17-3 Naze Nagata-cho, Amami City, Kagoshima Prefecture 894-8501
TEL: +81-997-52-5411 FAX: +81-997-53-7874

Yaeyama Regional Public Works Office, Okinawa Prefecture
Address: Yaeyama Godochosha, 438-1 Maezato, Ishigaki City, Okinawa Prefecture 100-2101
TEL: +81-980-82-2217 FAX: +81-980-82-1954

Amami City
Address: 25-8 Naze Saiwai-cho, Amami City, Kagoshima Prefecture 894-8555
TEL: +81-997-52-1111 FAX: +81-997-52-1354

Yamato Village
Address: 100 Yamatohama, Yamato Village, Oshima County, Kagoshima Prefecture 894-3192
TEL: +81-997-57-2111 FAX: +81-997-57-2161

Uken Village
Address: 915 Yuwan, Uken Village, Oshima County, Kagoshima Prefecture 894-3392
TEL: +81-997-67-2211 FAX: +81-997-67-2262

Setouchi Town
Address: 23 Koniya-Funatsu, Setouchi Town, Oshima County, Kagoshima Prefecture 894-1592
TEL: +81-997-72-1111 FAX: +81-997-72-1120

Tasugou Town
Address: 110 Ura, Tatsugo Town, Oshima County, Kagoshima Prefecture 894-0192
TEL: +81-997-62-3111 FAX: +81-997-62-2535

Tokunoshima Town
Address: 7203 Kametsu, Tokunoshima Town, Oshima County, Kagoshima Prefecture 891-7101
TEL: +81-997-82-1111 FAX: +81-997-82-1101

Amagi Town
Address: 2691-1 Hetono, Amagi Town, Oshima County, Kagoshima Prefecture 891-7612
TEL: +81-997-85-3111 FAX: +81-997-85-3110

Isen Town

Address: 1842 Isen, Isen Town, Oshima County, Kagoshima Prefecture 891-8201

TEL: +81-997-86-3111 FAX: +81-997-86-2301

Kunigami Village

Address: 121 Hentona, Kunigami Village, Kunigami County, Okinawa Prefecture 905-1495

TEL: +81-980-41-2101 FAX: +81-980-41-5910

Ogimi Village

Address: 157 Oganeku, Ogimi Village, Kunigami County, Okinawa Prefecture 905-1392

TEL: +81-980-44-3001 FAX: +81-980-44-3139

Higashi Village

Address: 804 Taira, Higashi Village, Kunigami County, Okinawa Prefecture 905-1292

TEL: +81-980-43-2201 FAX: +81-980-43-2457

Taketomi Town

Address: 11-1 Misaki-cho, Isigaki City, Okinawa Prefecture 907-8503

TEL: +81-980-82-6191 FAX: +81-980-82-6199

8.c. Other Local Institutions

Amami Wildlife Conservation Center

Address: 551 Koshinohata, Ongachi, Yamato Village, Oshima County, Kagoshima Prefecture 894-3104

TEL: +81-997-55-8620 FAX: +81-997-55-8621

Amami Park

Address: 1834 Kasari-cho Setsuta, Amami City, Kagoshima Prefecture 894-0027

TEL: +81-997-55-2333 FAX: +81-997-55-2612

Kagoshima Prefectural Amami Library

Address: 1-1 Naze Furuta-cho, Amami City, Kagoshima Prefecture 894-0016

TEL: +81-997-52-0244 FAX: +81-997-52-9634

Amami Museum

Address: 517 Naze Nagahama-cho, Amami City, Kagoshima Prefecture 894-0036

TEL: +81-997-54-1210 FAX: +81-997-53-6206

Amami Seaside Museum

Address: 701-1 Naze Koshuku-ohama, Amami City, Kagoshima Prefecture 894-0046

TEL: +81-997-55-6000

"Kuroshio-no Mori" Mangrove Park

Address: 478 Sumiyo-cho Ishihara, Amami City, Kagoshima Prefecture 894-1201

TEL: +81-997-56-3355 FAX: +81-997-56-3377

Setouchi Municipal Museum and Library

Address: 1283-17 Koniya, Setouchi Town, Kagoshima Prefecture 894-1508

TEL: +81- 997-72-3799 FAX: +81-997-72-3999

Amami Oshima Tourism and Product Association

Address: AiAi Hiroba, 14-40 Naze Suehiro-cho, Amami City, Kagoshima Prefecture 894-0027

TEL: +81-997-53-3240 FAX: +81-997-52-1364

Amami-Oshima Tourism Association

Address: 19-15 Naze Saiwai-cho, Amami City, Kagoshima Prefecture 894-0025

TEL: +81-997-54-4991 FAX: +81-997-55-1181

Uken Tourism and Product Association

Address: Uken Village Activation Cneter, 2937-83 Yuwan, Uken Village, Kagoshima Prefecture 894-3301

TEL: +81-997-67-2071

Setouchi-cho Tourist Information Office

Address: Setouchi Seaside Station, 26-14 Koniya Ominato, Setouchi Town, Kagoshima Prefecture 894-1503

TEL: +81-997-72-4567

Tokunoshima Tourism Federation

Address: 1-1 Asama, Amagi Town, Kagoshima Prefecture 891-7605

TEL: +81-997-81-2010

Yambaru Wildlife Conservation Center "Ufugi Nature Museum"

Address: 263-1 Hiji, Kunigami Village, Kunigami County, Okinawa Prefecture 905-1413

TEL: +81-980-50-1025 FAX: +81-980-50-1026

Okinawa Rail Ecology Exhibition Learning Facility "Kuina-no Mori"

Address: 1477-35 Ada, Kunigami Village, Kunigami County, Okinawa Prefecture 905-1503

TEL: +81- 980-41-7788

Kunigami Environmental Education Center "Yambaru Discovery Forest"

Address: 1301-7 Aha, Kunigami Village, Kunigami County, Okinawa Prefecture 905-1504

TEL: +81-980-41-7979

Higashi Museum

Address: 61-1 Kawada, Higashi Village, Kunigami County, Okinawa Prefecture 905-1203

TEL: +81-980-51-2828

Roadside Station “Yui Yui Kunigami”

Address: 1569-1 Okuma, Kunigami Village, Kunigami County, Okinawa Prefecture 905-1412

TEL: +81-980-41-2420

Oginomi Tourism Association

Address: 1357-18 Taminato, Ogimi Village, Kunigami County, Okinawa Prefecture 905-1314

TEL: +81-980-44-1960

Higashi Village Tourism Promotion Council

Address: 471-24 Taira, Higashi Village, Kunigami County, Okinawa Prefecture 905-1205

TEL: +81- 980-51-2655

Iriomote Wildlife Conservation Center

Address: Komi, Taketomi Town, Yaeyama County, Okinawa Prefecture 907-1432

TEL: +81-980-85-5581

Taketomi Town Tourist Assosiation

Address: 1-5 Misaki-cho, Ishigaki City, Okinawa Prefecture 907-0012

TEL: +81-980-82-5445 FAX: +81-980-82-5472

Iriomote Island Ecotourism Association

Address: 870-277 Uehara, Taketomi Town, Yaeyama County, Okinawa Prefecture 907-1541

TEL: +81-980-85-6331 FAX: +81-980-85-6442

8.d. Official Web Address

About property management plan

URL: http://kyushu.env.go.jp/naha/nature/index.html

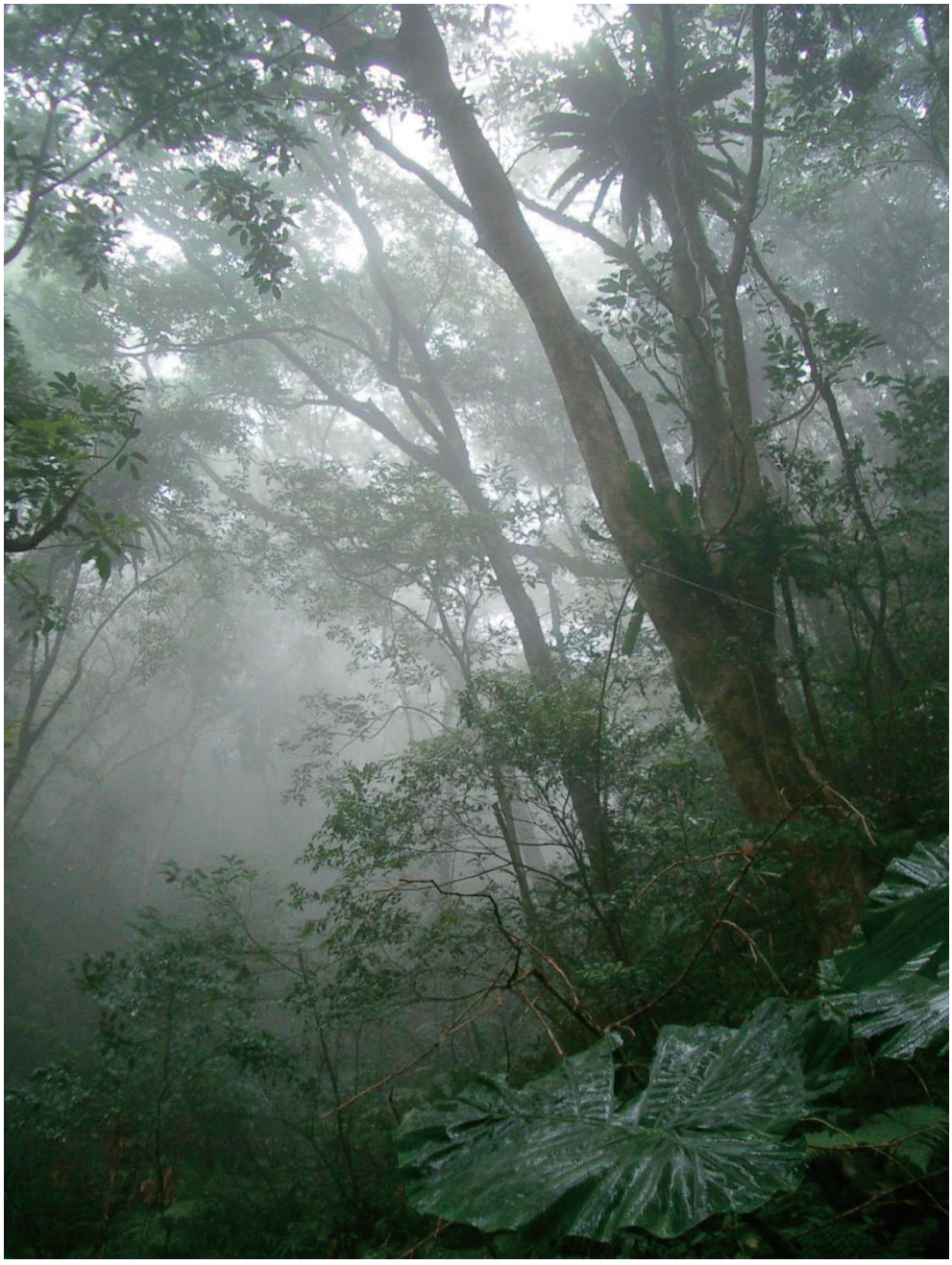
About regional information

URL: http://www.kagoshima-kankou.com/amamiryukyu/amami.html

Riparian forest in Tokunoshima Island (Photo: MOEJ)

9

Signature on behalf of the State Party



Humid subtropical rainforest (Photo: MOEJ)

KAMEZAWA Reiji

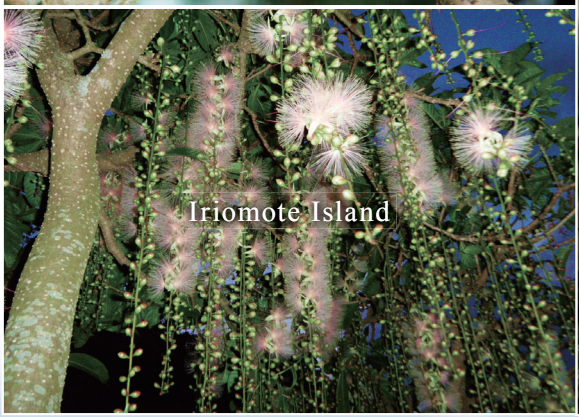
Director-General
Nature Conservation Bureau
Ministry of the Environment
Government of Japan

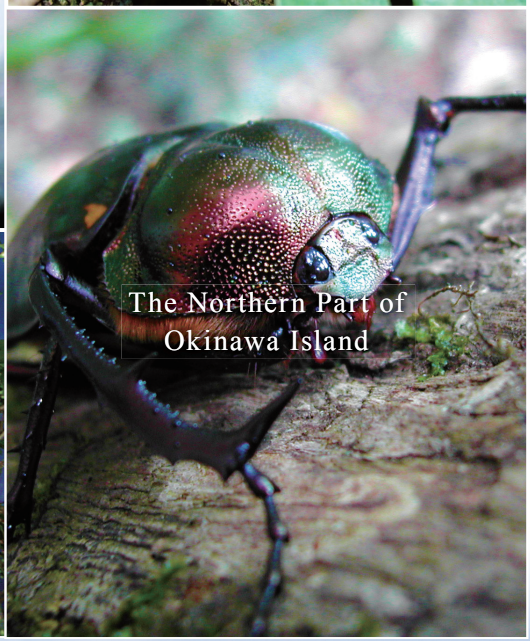
IMAI Satoshi

Director-General
Forestry Agency
Government of Japan


Amami-Oshima Island


Tokunoshima Island


Iriomote Island


The Northern Part of
Okinawa Island