

Innocent  
mongoose

## Guilty persons who introduce alien species

The Small Indian Mongooses are considered harmful animals which give damages the ecosystem on Amami Oshima, however, the mongooses are important species in the original habitat in India. We have to recognize the ecosystem damages caused by the introduction of invasive alien species, and not repeat again same mistakes in future.

### Three principles in prevention of damages caused by alien species

#### No Introduction

No Introduction of alien species which have a possibility to cause damages to ecosystems

#### No Release

No Release of alien species into the field

#### No Spreading

No Spreading of alien species which already exist in specific areas to other areas

### Existing alien species on Amami-Oshima Island

Many alien species are recognized on the Island, such as feral cats, goats, the Black Rat, and the Lanceleaf Tickseed, in addition to the mongooses. Effective measures are necessary for control of these alien species which give directly and indirectly damages on ecosystems on the Island.



Feral cat



Feral goat



Black Rat



Lanceleaf Tickseed

#### Small Indian Mongoose, an invasive alien species

The mongooses are listed in invasive alien species by the Invasive Alien Species Act, and it is prohibited to keep and transport of live animals. AMB catch the mongooses with special permission.



Alien species acts

### Conservation of the nature on Amami-Oshima Island

Don't abandon  
pets

Once the predatory pets are abandoned in wild, they act like the mongooses and attack the precious animals on Amami Oshima. The stray pets have risks of road kill and infection animal disease. It is important for your pet's well-being to keep the pets inside following animal welfare rules.



the regulation of  
pet cat and its  
management

#### Pet Cat Ordinance of 5 local governments on Amami-Oshima Island

- To insert microtips, and attach neck rigs and register domestic cat kept
- To keep cats inside door
- To castrate cats except cats complete keeping inside
- To keep maximum 4 cats, you need special permission to keep more than 5 cats
- Not to give unnecessarily foods to cats of other people/ stray cats



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Amami Wildlife Conservation Center

☆ we ask for your cooperation inactivity of  
Amami Mongoose Busters



Blog :  
<https://amb.amamin.jp>



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Ministry of the Environment  
Government of Japan

FOR ALL THE LIFE ON EARTH



Biodiversity

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Revised  
2019

# Conservation of a precious ecosystem in Amami-Oshima Island

## Eradicating Small Indian Mongoose on Amami-Oshima Island



Amami Oshima

環境省  
Ministry of the Environment

# Animals and plants in Amami-Oshima Island



Owston's White-backed Woodpecker

Amami Oshima is located in subtropical zone, and the island supports one of the largest laurel forests in Japan. Rich and diverse natural environments remain on the island which is surrounded by a beautiful ocean with coral reefs. The unique biodiversity of the Amami Oshima has developed because the island has been isolated from outside the areas for millions of years. As a reflection of its distinctive natural environmental history, many globally precious and endemic species such as the Amami Rabbit evolved in the island. Many of ancestors of the native species migrated to Amami Oshima long years ago, when the island was connected to the Eurasian Continent. We must preserve the rich and diverse natural environment of Amami Oshima for future generations.



**Amami Rabbit**

*Pentalagus furnessi*

This primitive rabbit is found only on Amami Oshima and Tokunoshima. The Amami Rabbit stays in burrows in daytime, and leaves there at night to eat seedlings and acorns.



**Habu Viper**

*Protobothrops flavoviridis*

The Habu Viper is a large size poisonous snake more than 2 m length. The snakes inhabit on Amami Oshima, Tokunoshima, Okinawa Islands, and other several neighboring small Islands. The Island's people have always a mortal fear of the snake. The snake is the top predator in the food chain of forest ecosystem on the Island, and prey on various animals such as rats, birds, lizards, and frogs.



**Ryukyu Ayu-fish**

*Plecoglossus altivelis ryukyuensis*

An endemic freshwater fish to Amami Oshima and Okinawa Island. The fish became extinct on Okinawa Island, and was reintroduced into the island from Amami Oshima.



**Amami Calanthe**

*Calanthe amamiana*

An orchid group plant, endemic to Amami Oshima. The plants bloom with beautiful pink and white flowers on March and April. The orchid is common on the Island, but population size of the plant has decreased due to overexploitation and deforestation.



**Ryukyu Long-haired Rat**

*Diplothrix legata*

The largest rat in Japan, and endemic to Amami Oshima, Tokunoshima, and the northern part of Okinawa Island. It is arboreal, and mainly eats nuts and others on the trees.



**Amami Spiny Rat**

*Tokudaia osimensis*

Endemic species to Amami Oshima. The Amami Spiny Rats lack the Y chromosome (viz. XO-type sex chromosome) as same as the Tokunoshima Spiny Rats, a closely-related species of the rat. The rats are covered by spine-like hairs, and dodge attacks of the Habu Vipers.



**Amami Jay**

*Garrulus lidtbi*

A beautiful bird with bright blue and brown in color. It is endemic to Amami Oshima, Kakeromajima, and Ukejima. It forages nuts and buries them.

**Amami-Oshima Island**

Area : 712km<sup>2</sup>  
Highest elevation : 694m (Mt. Yuwan-dake)  
Population : About 61,200 people



**Amami Ishikawa's Frog**

*Odorrana splendida*

A frog species of beautiful green color with gold spots. This frog is found only on Amami Oshima. Its call echoes throughout the mountain streams at night in breeding season.



**A species of Longicorn Beetle**

*Rosalia ferriei*

A long-horned beetle, endemic to Amami Oshima. Adults appear short period in summer. The beetle prefers old trees of such as chinquapins (*Castanopsis sieboldii*), and decrease of population size is concerned due to deforestation.



**Nominated to the world heritage site:**  
Amami-Oshima Island, Tokunoshima Island, the northern part of Okinawa Island, and Iriomote Island

The Government of Japan has submitted the nomination documents of Amami-Oshima Island, Tokunoshima Island, the northern part of Okinawa Island, and Iriomote Island for the World Heritage Site to the UNESCO World Heritage Center in 2017 and in February 2019.

Amami Oshima contains rich nature environment in evergreen broadleaf forests under semi tropical climate, and many endemic species which were formed through the geography feature of the island, separation and joint from/ with the Eurasian Continental. The Japanese Government aims to protect the only one biodiversity on the Amami Oshima through listing the Islands to the World Heritage.

The eradication of the Small Indian Mongoose on Amami Oshima is an essential effort for the conservation of the biodiversity on the Island, and an important project for listing the area to the World Heritage.

HELLO I am AMAKURO





# Biology of the Small Indian Mongoose

The Small Indian Mongooses were introduced and released into Amami Oshima in 1979 for control of Habu Vipers and rats. Mongooses have become invasive animal species and give damage to ecosystems throughout the world. In Japan, all mongoose species of Herpestidae family were designated as invasive alien species under the Invasive Alien Species Act in 2005.

### Definition of invasive alien species in Alien Species Act

Individuals and their organs, stipulated under the Invasive Alien Species Act, have been brought to Japan from overseas and cause harm to ecosystems, people's lives, and the farming industry. Breeding, transporting, importing, and releasing of the invasive alien species are prohibited by the Act.

### Why and when did the mongooses introduced to Japan?



A Habu Viper attacks a Black Rat. Despite the introduction of mongooses, no significant decrease of the Habu Viper population has been observed in Amami Oshima.

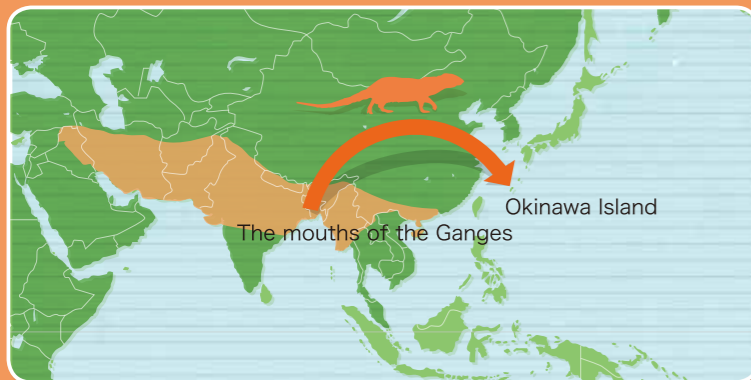
The people of Amami Oshima and Okinawa Island have suffered from bitten damage by the poisonous Habu Viper. In 1910, Dr. Shoza-buro Watase, a zoologist of Tokyo University, released mongooses in Okinawa Island in the hope that they would decrease the population of Habu Vipers and Black Rats (on which Habu Vipers prey). This effort, however, brought very little effect on decrease of the Habu Viper and rat populations. Nevertheless, mongooses were released on Amami Oshima in 1979.

## Ecology of the Small Indian Mongoose

*Herpestes auropunctatus* ※

### Distribution

The Small Indian Mongoose (*Herpestes auropunctatus*) originally ranges from the Middle East to China. They were also released on the Hawaiian and Caribbean islands and have established populations in these islands. In Japan, it has been confirmed that the mongooses inhabit on Amami Oshima, Okinawa Island, and in parts of Kagoshima City.



### Body size

Body length	Males : 60 cm
	Females : 50 cm
Weight	Males : 600 to 1,000 g
	Females : 400 to 600 g



Males 60cm, Females 50cm

※ Although the mongooses introduced to Amami Oshima were considered Javan mongooses (*Herpestes javanicus*), recent studies have shown that they are actually Small Indian Mongooses (*H. auropunctatus*)(*Urva auropunctatus*, as an alternative taxonomy).

### Food

Insects, lizards, and rats are most important prey of mongooses. In addition, birds and small mammals are also predated by the animals.

### Ecology

#### Reproduction :

Mongooses give birth once or twice a year in warm season, from April to September in Amami Oshima. Litter size is 1 to 5 (an average of 2.26). The young reach adult size in about 8 months after birth.

#### Life span :

On Amami Oshima, the average life span of mongooses is 1 to 2 years and the maximum life span is about 3 to 4 years.

#### Home range size :

The home range size of mongooses is 20 ha for adult males and 24 ha for females. They sometimes travel more than 2 km over a short period of time.

## Introduction of the Small Indian Mongooses to Japan.

The mongooses occur now in Japan were caught in the estuarine area of the Ganges River and introduced to Okinawa Island in 1910, and then brought to Amami Oshima from Okinawa Island in 1979.

A number of the Small Indian Mongoose still inhabit on the Okinawa Island. Ministry of the Environment, Japan(MOEJ) and local governments conducts eradication project of the mongoose in Yambaru area, northern part of the Island and habitats of Okinawa rail and other important species, for conservation of the ecosystems on the Island.

## Introduction of the mongooses degraded the forest ecosystem of Amami-Oshima Island

I visited Amami Oshima for the first time in 1987, during my last summer vacation in college. I stayed for about a week, and I visited various places of the mountain and ocean areas in Amami Oshima and Kakeromajima. I was fascinated by Amami Rabbits and Amami Woodcocks that appeared one after another along the forest trails of Kinsakubaru at night trekking. I started living on Amami Oshima in the following spring after I graduated from college. I regularly visited the forest trails in Setouchi Town and Sumiyo Town, Amami City, where I encountered many Amami Spiny Rats as well as Amami Rabbits running along the trails. When I went to Kinsakubaru on a winter day with Mr. Takeichiro Minami, a Habu Viper catch specialist, a marvelous sound like birds chirping echoed through the forest trails at night. Mr. Minami told me that the animal sound is chorus of Amami Ishikawa's Frogs. It was like a large choir, and it sounded like there were hundreds of frogs calling. I never expected that the animals in Kinsakubaru would disappear in a matter of a few years. The establishment and increase in the number of mongooses drastically have affected status of other animals in the forest.



Yukari Handa (Mammalogical Society of Amami) and I investigating mongooses in 1990

Shintaro Abe (Ministry of the Environment, Japan)

# What is caused by the Small Indian Mongoose ?



Amami Woodcock



Green Grass Lizard



Amami Spiny Rat

## Problem 1

1

### Introduction of the mongooses

Mongoose were brought into Amami Oshima to decrease Habu Vipers and Black Rats. However, because mongooses are diurnal and both Habu Vipers and Black Rats are nocturnal, the introduction of mongooses did not lead to a large number of predation on the snakes and the rats, and decreasing their populations. On the other hand, young Amami Rabbits, which spend the daytime in their burrows, and the Amami Woodcocks, which make their nest on the ground, became preferred prey animals of mongooses, and consequently their population sizes have decreased. The release of mongooses into the island with the hope that they would decrease the populations of Habu Vipers and Black Rats led to an unforeseen result: the decrease of the native species on Amami Oshima.

A mongoose invading in a Amami Rabbit burrow



Mother checking her baby in its burrow



A mongoose come into the burrow



A mongoose left the burrow after two minutes later

(photo by Fumio Yamada)

## Problem 3

3

### Vanishing of indigenous species on the Island

From analyses of the stomach contents and fecal samples of mongooses, the remains of animals such as Amami Rabbits and Amami Spiny Rats were presented. It was also confirmed that mongooses ate amphibians such as Amami Ishikawa's Frogs as well as reptiles such as Okinawa Tree Lizards. The populations of such native species on Amami Oshima decreased as the mongoose population increased.

Animals predated by mongooses



A mongoose eating Ryukyu Green Snake



Amami Rabbit fur in a mongoose feces (photo by Fumio Yamada)



Okinawa Tree Lizard

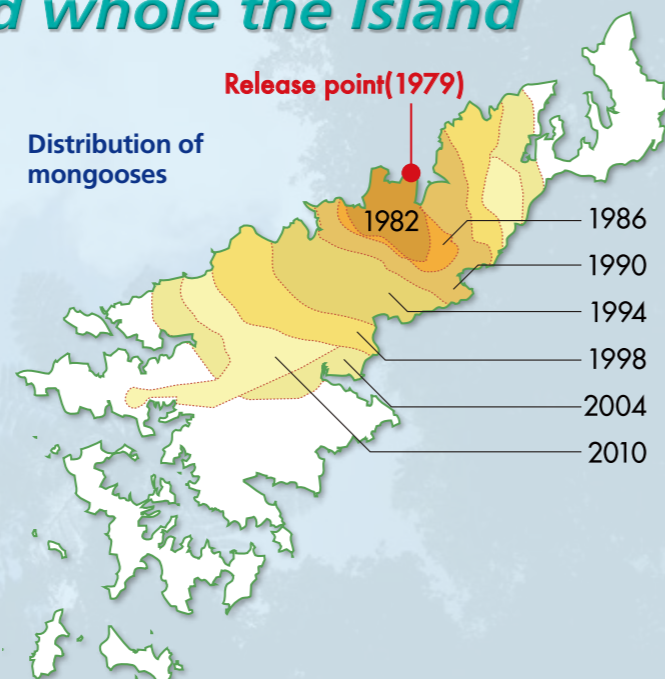
## Problem 2

2

### Population growth and spread whole the Island

The mongooses released in central part of the island in 1979 gradually dispersed across a wide area on the island. By 2010, mongooses could be found in Uken village, which is located in the southwestern part of Amami Oshima. Thirty mongooses are said to have been released on Amami Oshima in 1979. It is estimated that the population of mongooses on the island increased to about 10,000 by the year 2000.

Distribution of mongooses



## Task

### Conservation of endemic species on Amami-Oshima Island

The only way to protect the native species on Amami Oshima was to reduce the population size of mongooses by capturing them. In order to do this, community organizations and local governments began investigating the impact of mongooses to native animals, and also started capturing efforts.

#### Recovering of several species through the eradication programme



Ryukyu Long-haired Rat



Amami Tip-nosed Frog



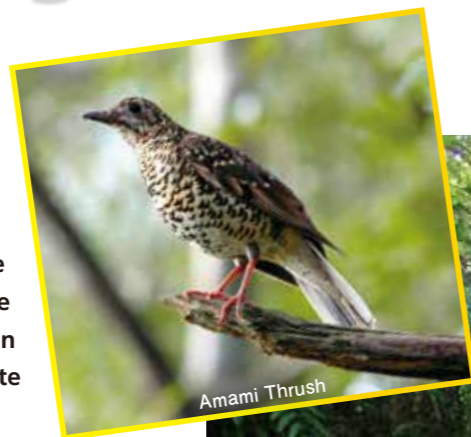
Checking a trap

Monitoring of wild animals indicate gradual recovery of distribution of several native species, such as the Ryukyu Long-haired Rat and the Amami Tip-nosed Frog, in the areas where the mongoose gave the degradation of status of the indigenous species on the Island.

# Mongoose eradication project

## Restoration of original ecosystem without mongoose

If things don't change, the animals on Amami Oshima will be gone. With the support of the people of the island who had such concerns, a full-scale mongoose eradication project was started in the year 2000. The mongoose eradication project based on the Invasive Alien Species Act was commenced on Amami Oshima in 2005. The goal of the project is to completely eradicate mongooses from Amami Oshima.



Amami Thrush

1979 ~

### Prehistory of mongoose eradication project

Kinsakubaru, a protection forest on the Island, was a habitat of many endemic species such as Amami Rabbit, Amami Ishikawa's frog, and Amami Woodcock before the release of the Small Indian Mongooses. After the release of the predatory animals in 1979, the population of the endemic species have decreased in the Kinsakubaru which locates near the mongooses release area.

People on the Island expected decrease of the Habu Viper through the mongoose predation, however, several people noticed biodiversity degradation on the Island by the mongoose release. The Mammalogical Society of Amami was one of the groups which gave warnings to the mongoose release issue. The member of the Mammalogical Society of Amami started study on ecological damage by the mongooses from 1989, when several agricultural damages occurred by the mongooses. The study on food habits of the mongooses showed predation on precious endemic species by the animals, and gave caution against the issues to the people on the Island.



estimated population size  
▼

1,000

1989

• Release of the mongooses introduced from Okinawa Island into Amami Oshima

• Commencement of study on ecosystem damage by the mongooses (Mammalogical Society of Amami)

6,000

1993

• Launch mongoose control programme to prevent agricultural products (Local governments)

10,000

1996

• Launch study on status and a model control programme (MOEJ and Kagoshima Prefectural Gov.), and subsidy as a nuisance animal control (Kagoshima Prefectural Gov.)

5,000

2000

• Start full control program of the mongooses as nuisance animal control (MOEJ)

1,300

2003

• Finish the nuisance animal control program by the local governments

150

2005

• Enforcement of the Invasive Alien Species Act (MOEJ)  
• Start the mongoose eradication project on Amami Oshima (MOEJ)  
• Establishment of the Amami Mongoose Busters (AMB)  
• Formulating mongoose control plan on Amami Oshima (MOEJ)

10

2007

• Introduction of mongoose detection dogs for the control project (AMB)

10

2013

• Formulation second period of mongoose control plan (MOEJ)

10

2017

• Revision the second period of mongoose control plan (MOEJ)  
• Establishment the Amamigunto National Park (MOEJ)

10

2018

• Capture only one mongoose from April 2018 to March 2019 due to decrease of the mongoose population (AMB)

Future 2022

Expecting eradication of the mongoose on Amami-Oshima Island

2005 ~

### Establishment and activities of Amami Mongoose Busters

The mongoose control programme started since 2000. At the beginning stage of the project, voluntary member of hunter association supported the control of animals using traps, and the local governments paid subsidies. Quite a lot of the mongooses were captured by the programme, and regular monitoring showed decrease of density index of the animals. But, eradication of the animals was difficult because trapping in mountain areas was hard task for the voluntary members. Therefore, the Amami Mongoose Busters (AMB) was organized for eradication of the mongoose from whole areas on the Island in 2005. People on the Island expected AMB to contribute recovery of the indigenous species such as Amami thrush and endemic flogs through the mongoose control project. AMB started the activities based on these backgrounds.



A photo of AMB member at a day

2013 ~

### Second period of mongoose control plan in Amami-Oshima Island

The Invasive Alien Species Act was enforced since 2005 and the Invasive Alien Species (IAS) can be controlled by the mitigation plan. The Small Indian Mongoose is also stipulated as the IAS by the Cabinet Ordinance of the Act, and the mongoose control plan on Amami Oshima was authorized by the MOEJ. The control plan was conducted according to the plan, and eradication is shown up through the systematic data on status of the animals gathered by the project and exclusion in spot areas. "The second period of mongoose control plan" was established in 2013 based on the achievement of the first period. The second period plan indicates eradication of the mongoose from Amami Oshima by 2022, and the AMB and other relevant organizations conduct the mongoose eradication project.

Professionals to conserve the ecosystem on Amami Oshima

# Amami Mongoose Busters!

The Amami Mongoose Busters was formed in 2005 with the aim of eradication of mongooses and restoring the native animals on Amami Oshima. It is an organization of professionals that strives to protect the wildlife of Amami Oshima. These professionals have the skills to capture mongooses, the power to climb mountains, the knowledge about wildlife, and are passionate about eradication of mongooses.



## Restoration of the native species to Amami-Oshima Island



### Monitoring of the native species

In order to monitor the restoration of native species as a result of the decline of the mongoose population, monitoring for the native animals are being carried out. The sensor cameras which set in various places on the Island show steady recovery of distribution area of Amami Rabbit, Amami Spiny Rat, and Amami Woodcock. AMB note the locations in where they observe the animals or hear voices of the native species during the routine works of trap sites checking. For the Amami Mongoose Busters, observing the restoration of the populations of the native animals on Amami Oshima through daily activities enables the members to confirm the achievements of their eradication project for mongooses. They are proud of what they have achieved.



Photos of a Ryukyu Long-haired Rat (upper) and a mongoose (lower) taken by sensor cameras.

## The most effective method of reducing the mongoose population



### Catching by the traps

The most effective method of reducing the mongoose population is to catch them by traps. The Amami Mongoose Busters captures mongooses with live traps and weasel traps.

A new long pipe trap was developed for more effective control of the mongooses and they are used mainly in areas where by-catches of Amami Spiny Rat occur frequently. More than 30,000 traps are set systematically to cover whole areas in where the mongoose detected on the Island.



Live Trap

Because the number of mongooses captured has decreased conspicuously and the eradication of the animals is coming realistic target. AMB use sensor camera (take photo using infrared sensor), hair traps (take hairs of mongooses) and mongoose detection dogs for the monitoring and catching the animals in order to confirm the eradication.



Weasel Trap



Hair Trap

## An effective tool for searching the mongooses



### Detection dogs

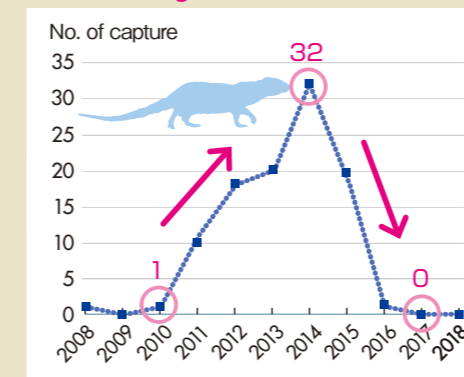
In order to catch mongooses more effectively, AMB introduce detection dogs, which track down mongooses and find their burrows. The mongoose detection dogs have a good sense of smell and special abilities of motion, and are trained to follow the direction of persons of the programme. Handlers of AMB give training the dogs, and they use the dogs passed the examination in field. The mongoose detection dogs go to the forests to detect smell and feces of the

mongooses with the handlers, and if they find hiding holes of the animals, the handlers try to catch them. The number of captured mongooses using the dogs is as many as the number of captured it by traps in 2014. According to the decrease of population size of the mongoose, the number of captured animals is also decreasing, however, the dogs are expected to confirm eradication of the mongoose on the Island. The role of the dogs is still important for eradication.



All members of dog handler and detection dogs in 2019

### Number of captured mongooses by detection dogs



## Trump for successful eradication



### Chemical control

Although population decline of the mongoose, AMB has encountered an issue in 2016. They found a high-density area of the mongooses in roadside slope. The area was covered by rock fall prevention nets, which hampered trapping and work of the mongoose detection dogs. AMB and MOEJ considered use of chemical control for the eradication in the area. They introduced a chemical material which contains "Diphacinone" as principal element and usually use for mouse and rat control. They made poison bates contained the Diphacinone, and put them in the area in April 2017 and March 2018. After spreading the poison bates, the sensor cameras never took photo of the mongoose, and no trapping of the animals in and around the area. The chemical control of the mongoose is the first case in Japan, and it is an important step to the successful eradication.



sausage baits using chemical control



Mongoose eating a sausage bait

# Eradication of mongooses in the near future

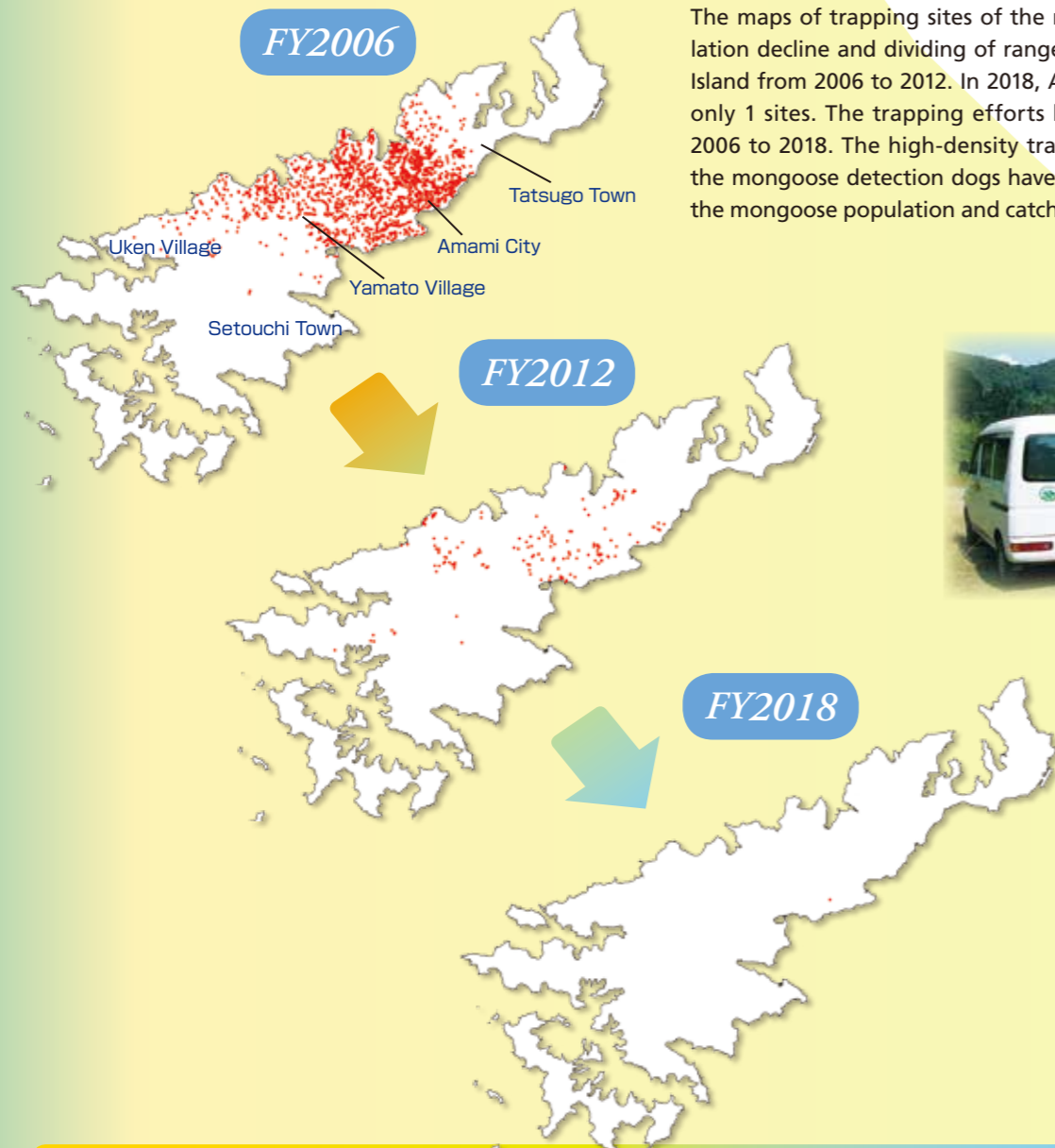
The original habitat of the Small Indian Mongooses introduced to Amami Oshima is South Asia. The mongooses were introduced to many places for controlling rats and other animals, and have become established as an invasive species on many other islands (e.g., islands in the Caribbean and Hawaii). They have caused problems such as predation on native species, damage to farm production in many places introduced.

Only small islands with an area of less than 4 km<sup>2</sup> have been

successful in eradication of the mongooses, and there are no large Islands such as Amami Oshima (712 km<sup>2</sup>) that have been successful in complete removing mongooses in the world. If Amami Oshima is successful in eradication of mongooses, it will give a great deal of hope to people around the world who suffer from damage caused by mongooses. Although many challenges still remain, it appears that we are close to making our ambition come true.

## Changes in capture points

● Points of capture



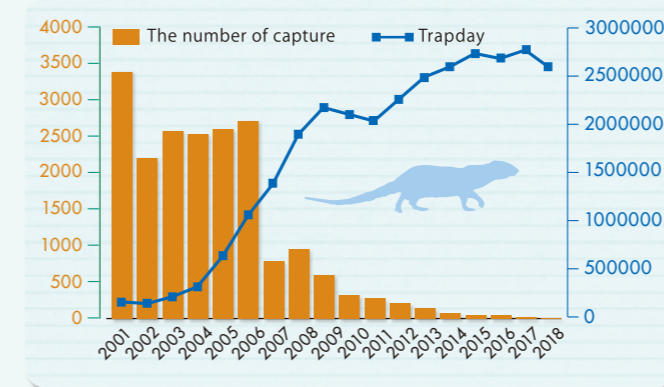
## Scattering and disappear of range of mongoose

The maps of trapping sites of the mongooses indicate population decline and dividing of range in the central area of the Island from 2006 to 2012. In 2018, AMB caught the mongoose only 1 sites. The trapping efforts has steady increased from 2006 to 2018. The high-density trapping and introduction of the mongoose detection dogs have contributed the decline of the mongoose population and catching sites.

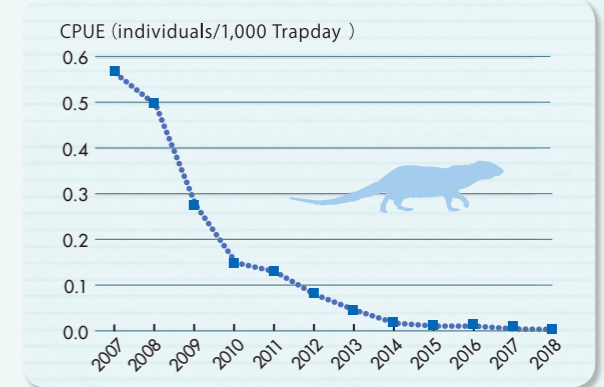
## Decreasing in mongoose population

More than 32,000 mongooses have been captured on Amami Oshima by 2012. The number of traps has increased significantly since 2005, when the Amami Mongoose Busters started its activities. In contrast, the number of mongooses caught by the traps in a year has continued to decrease. CPUE indicates decrease of densities and almost vanishing population of the mongooses in recent years.

### Annual changes in the number of capture and effort



### Annual changes in CPUE



Since the Amami Mongoose Busters started its activities, there has been a drastic increase in the total number of traps (see the line graph). The total number of trap days has kept around 2 million every year since 2009. The number of mongooses caught (see the bar graph) has shown a declining trend since 2007, and been a significant drop in the number in recent years.

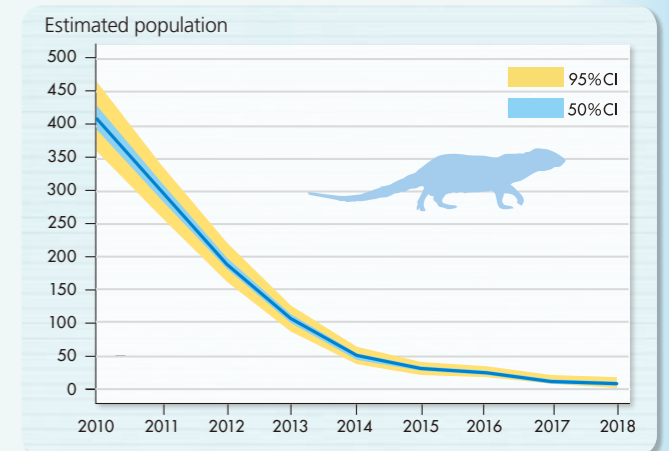
CPUE(Catch per Unit Effort) , an indicator of mongoose population size, has continued to decrease.

**Mongooses have steadily decreased !**

## Can we eradicate mongooses perfectly in Amami-Oshima Island ?

We estimate that the population of the mongooses is maximum 10 individuals in 2018. Based on the results of a computer simulation, it is expected that if mongooses continue to be captured at the current efficiency, the total population will be close to zero by around the year 2020. The smaller the mongoose population, the more difficult it will be to catch them. Therefore, things may not go as expected. However, eradication of mongooses from the Island in the near future, we have to continue trapping efforts and monitoring by the sensor cameras to confirm the eradication of mongoose for long time.

### Estimated population



**Eradication will be accomplished soon!**

**Distribution of mongooses have decreased !**

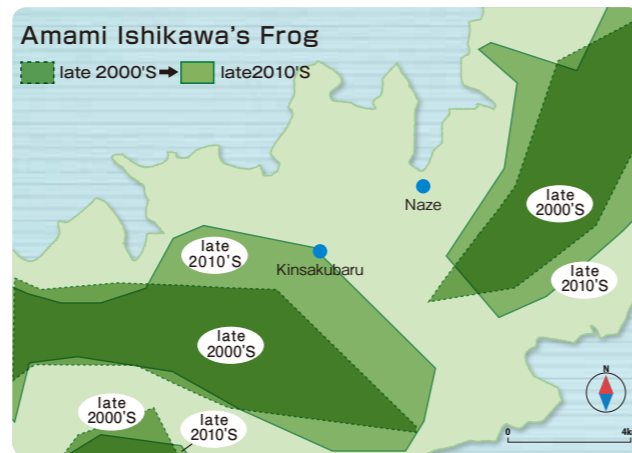
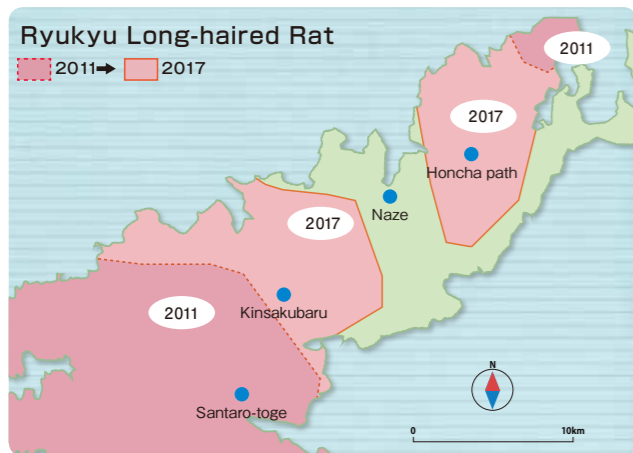
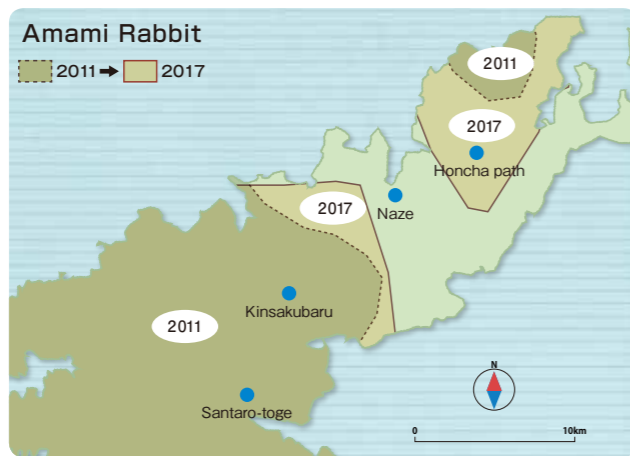
# No more mongooses and healthy forest ecosystem

## Native species recovery as a result of decreasing of the mongooses

The native species of Amami Oshima have recovered in parallel with the decline of the mongooses. Monitoring by AMB and other studies indicates the successful recoveries of the many species.

### Recovery of native species

The decrease of mongooses has brought the recoveries of historic range of the native species. The presences of the Amami Rabbit and the Ryukyu Long-haired Rat show the maximum 8-km expansion of their ranges from 2011 to 2017. The range of Amami Ishikawa's Frog has also recovered and spreaded in late years. The frogs especially expand their ranges in Naze and Tatsugo, high-density areas of the mongooses before, and is confirmed in Kinsakubaru no presence area in late 2000s.



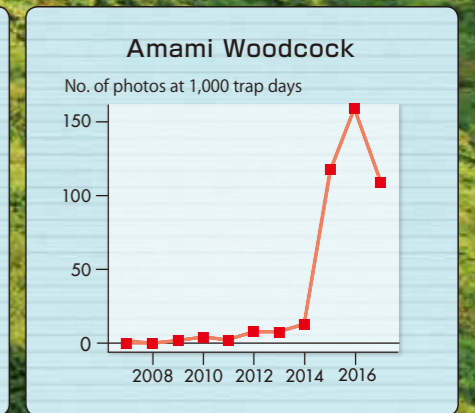
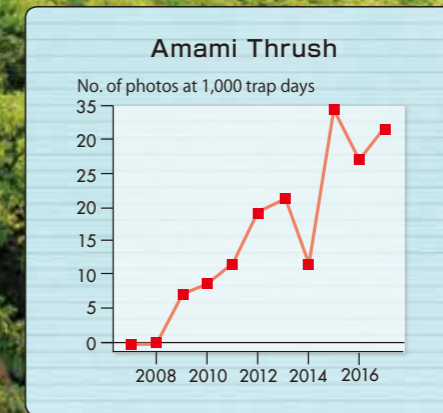
This figures show results of native species monitoring. Lines indicate the edges of observation points. Changes from 2011 to 2017 are shown in Amami Rabbit and Ryukyu Long-haired Rat, late 2000's to late 2010's is shown in Amami Ishikawa's Frog.

### Native species have been recovered

Native species have been recovered, which are shown by sensor camera monitoring and observation data from the Mongoose control project. The number of photos of Amami Thrush and Amami Woodcock taken each day gradually increase by decreasing of mongoose population.

### Results of monitoring using sensor cameras

The figure shows historical changes of photos taken rate of Amami thrush and Amami Woodcock by sensor cameras (number of photos taken per 1,000 trap days). The photo taken rates has increase notably in eastern part of Naze area in where the mongooses have declined remarkably.

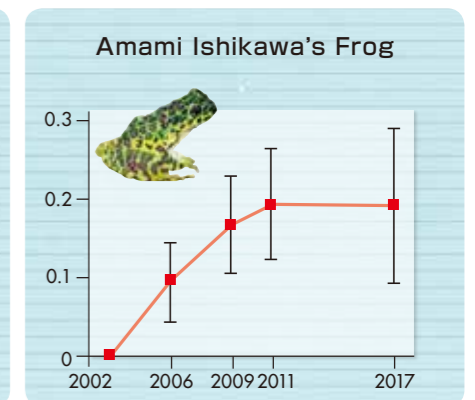
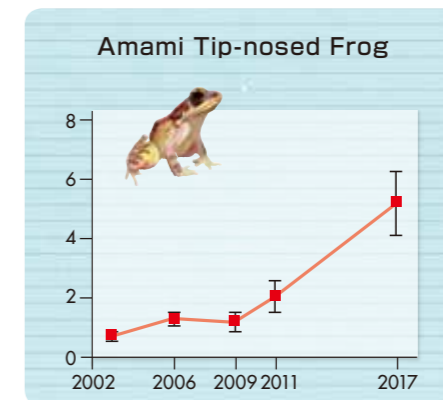
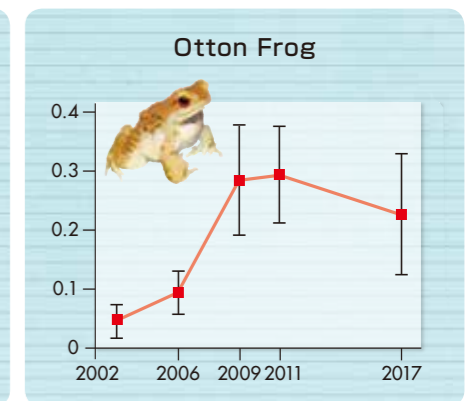
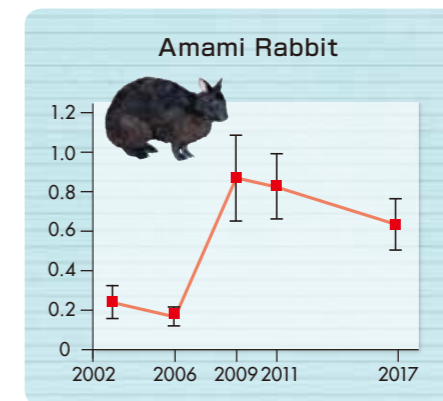


### Results of night road census

These graphs show the number of animals observed while slowly driving along a 41.1 km long forest road at night. The vertical axis indicates the number of animals detected per one survey, and the horizontal axis indicates the year of studies.



Photo of study site



Watari et al. (2013) modified