Effort of eradication of invasive mongoose for conservation of biodiversity in the Ryukyu Islands, Japan

Fumio Yamada[a], Shigeki Sasaki[b], Nobuhiko Kotaka[a], Takamichi Jogahara[c], Makoto Asano[d], Go Ogura[e], Takuma Hashimoto[f] and Shintaro Abe[g]

[a] Forestry and Forest Products Research Institute (FFPRI), JAPAN
[b] Yokohama National University, JAPAN
[c] Okayama University of Science, JAPAN
[d] University of the Ryukyus, JAPAN
[e] Gifu University, JAPAN
[f] Japan Wildlife Research Center, JAPAN
[g] Ministry of the Environment, JAPAN

In Japan, we have 2 populations of the IAS mongoose, and one population in Kagoshima in mainland.
I talk about the invasive mongoose in Island and our initiatives.

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The mongoose introduced 65 islands and areas in the world to control rats and native poisonous snakes

100 of the World's Worst invasive alien species

(Hays & Conant, 2007)

世界で65以上の島嶼や大陸に導入されたジャワマングース

Successful eradication on 6 small islands in the world

1. **Several small islands off Antigua**
(0.5 – 43ha) By toxin（brodifacoum）

2. **Praslin Island** (1.1ha)
By traps（Dickinson et al. 2001）

3. **Leduck Island** (5.7ha)
By tomahawk traps in 1970s（Nellis 1982）

4. **Dodge Island** By traps in 1976 (Nellis 1978)

5. **Buck Island** (72.68ha)
By box traps In 1980s（McNair 2003）

6. **Fajou Island** (115ha)
By traps and Toxin in 2001 (50ppm bromadilone paraffin baits)（Lorvelec et al. 2004）

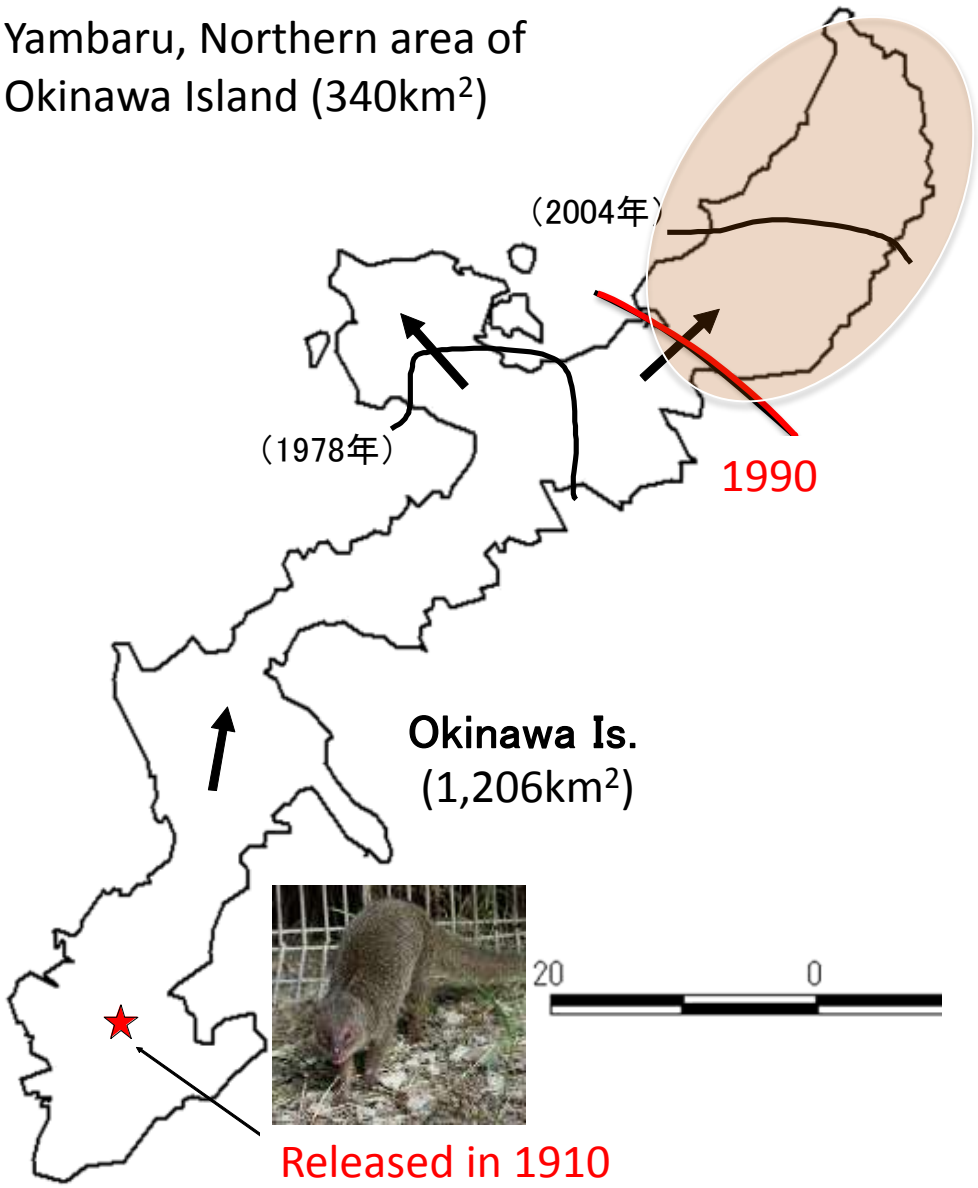
Amami Island 71,200ha !
Northern area on Okinawa Island 34,000ha! **300-600 times bigger**

Baruia A. et al. (2011)

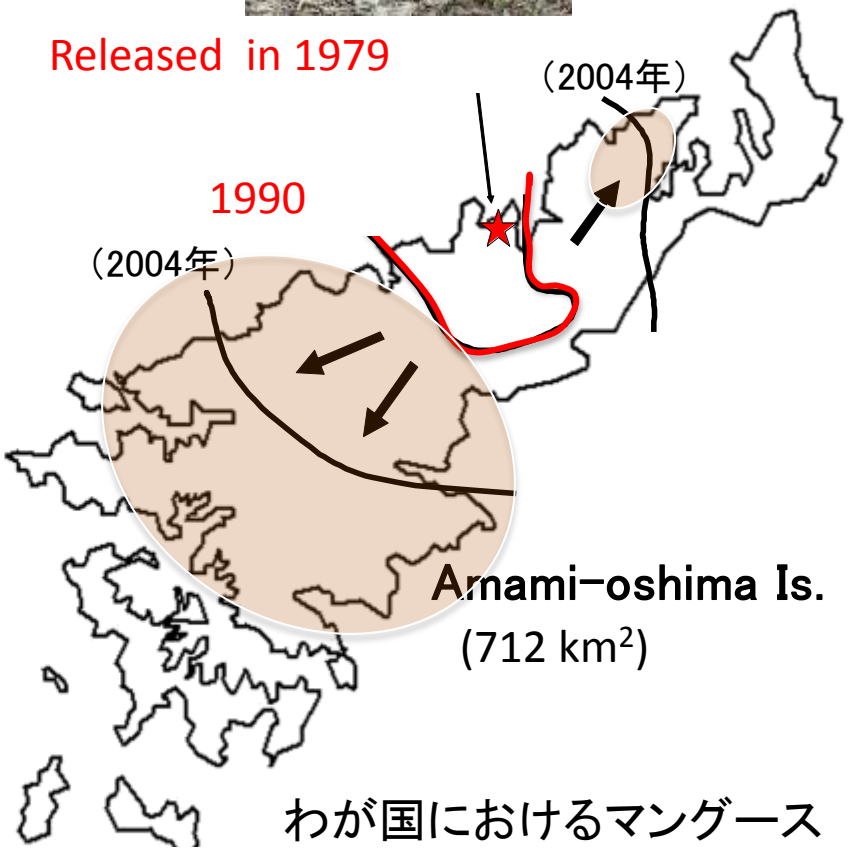
First challenges to eradicate mongoose against big islands

Released points and expansions of mongoose towards important biodiversity areas

Yambaru, Northern area of Okinawa Island (340km^2)



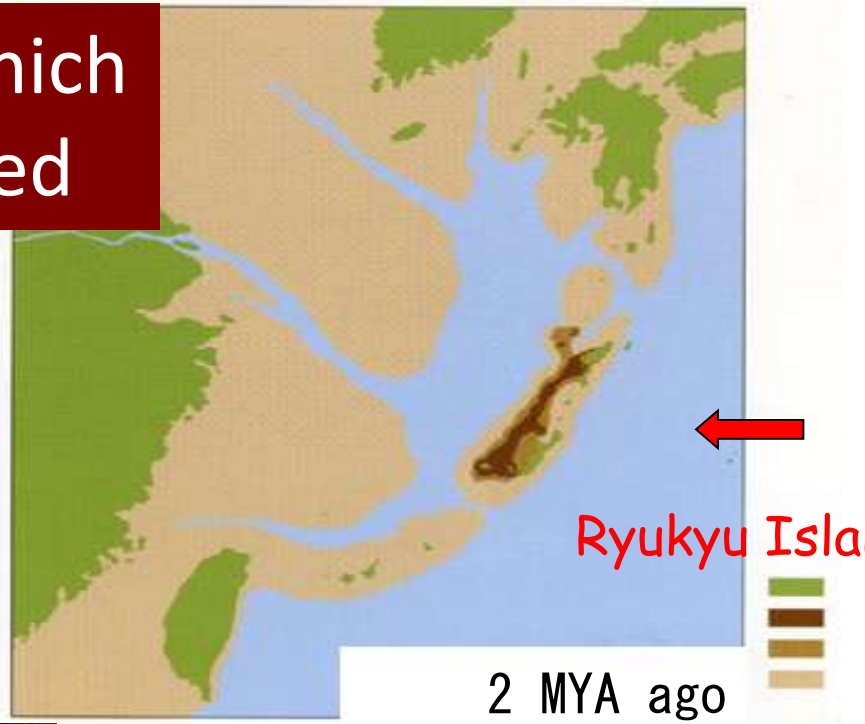
Released in 1979

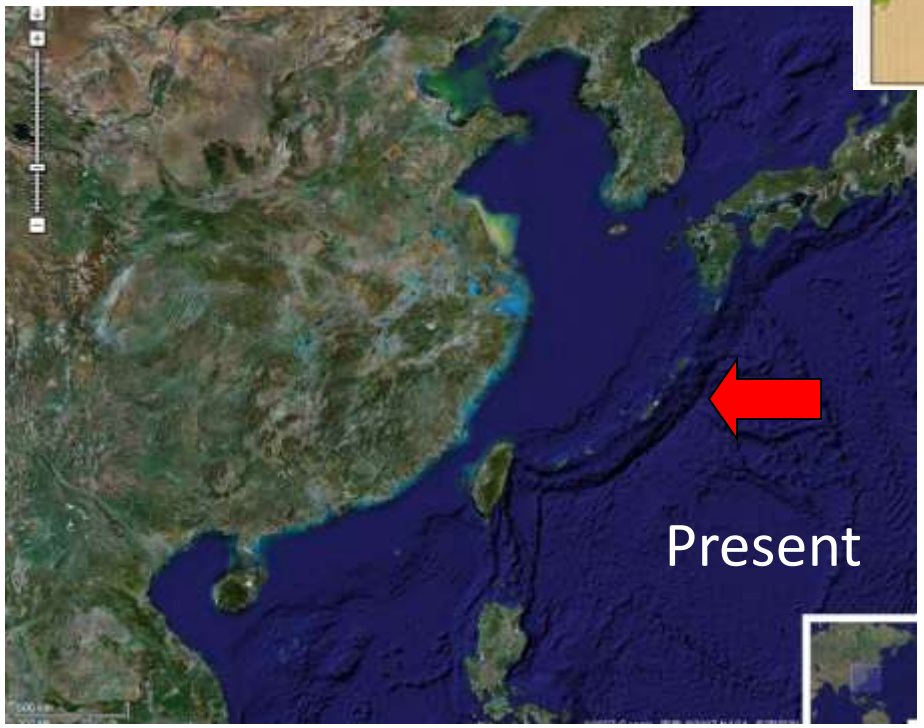


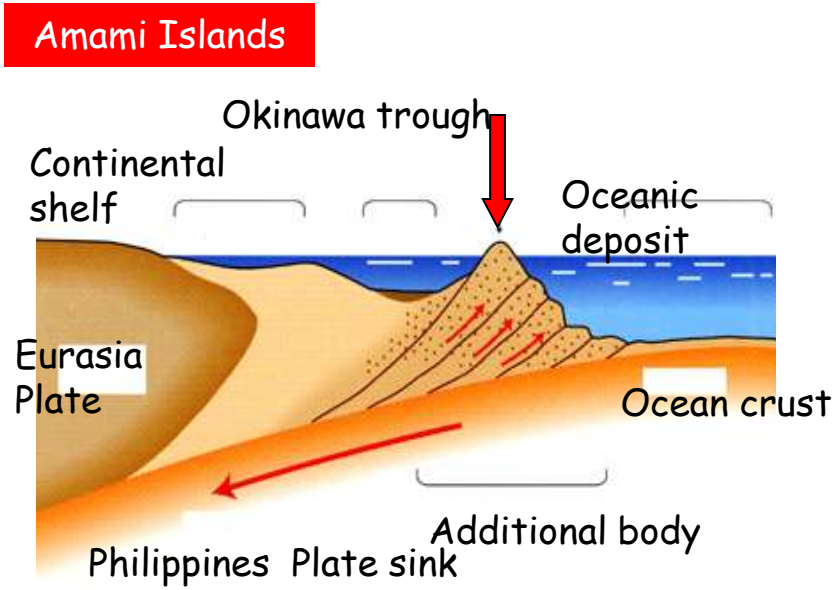
わが国におけるマングースの導入と分布拡大

Continental islands in which endemic species evolved

Ryukyu Islands has been connected and separated by the Eurasian continental in geological time.







Amami and Okinawa, a most important biodiversity hotspot in Japan

Taxon	Island	CR	EN	VU	Not threatened	Total
Mammals	Amami		4	1	5	10
	Okinawa	1		1	7	9
Birds	Amami	1		3	11	15
	Okinawa	1	2	1	12	16
Reptiles	Amami			1	10	11
	Okinawa		1	2	12	15
Amphibians	Amami		6		2	8
	Okinawa		5		2	7
Total		3	18	9	61	91

Important endemic animals evolved in the islands without predatorial mammals










Eradication campaigns of mongoose in Amami and Okinawa based on the IAS Law (2005)

Goal：Eradication of mongoose for conservation of the important native species and biodiversity

Period：2005-2014（for 10 years）, Budget 200-250 million US$ / year

Steps：Reduction of distribution, extinction of high density area, reduction of impacts on ecosystem, eradication, and recovery of native species

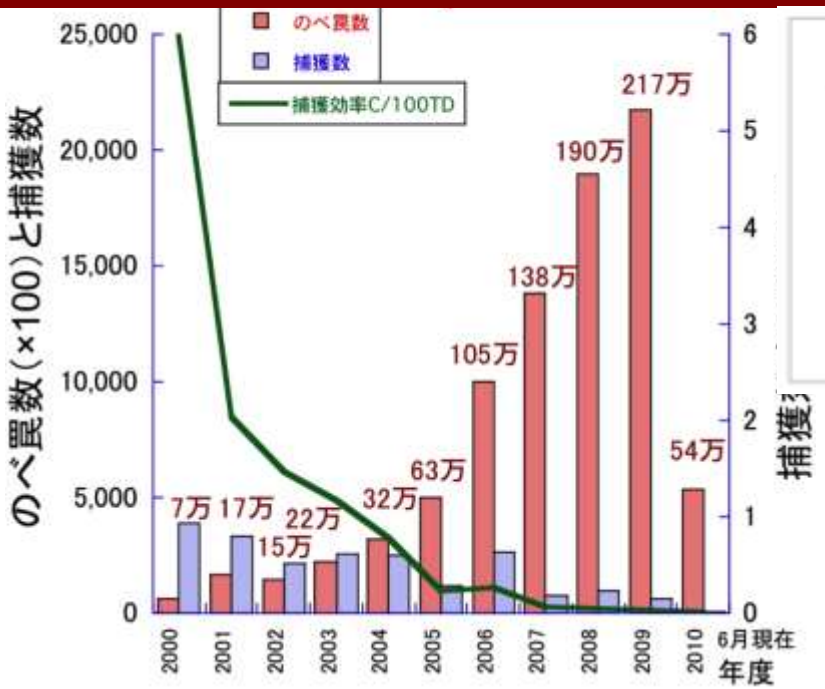
Methods：Trapping, mongoose-detection dog, fence, bait station, 30-40 mongoose busters, etc.

Monitoring：confirmation by hair trap, camera. Recovery of native species

Public relations

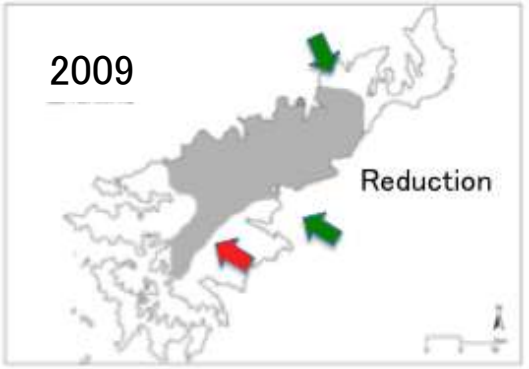
Yambaru Mongoose Busters

Numbers of mongoose captured and traps, and decrease of distribution in Amami



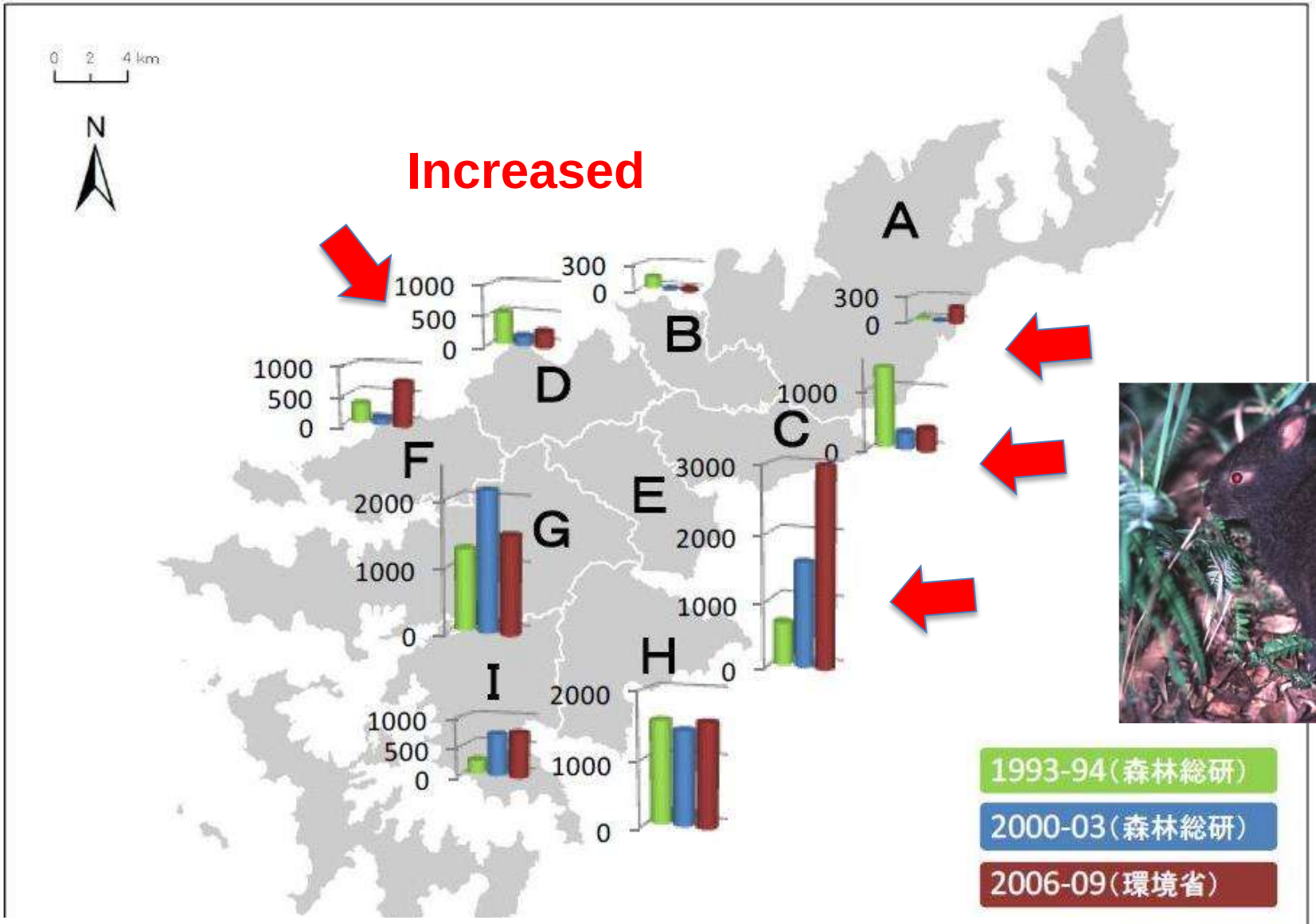
live traps

a kill trap



環境省資料から

Recovery of endangered Amami rabbit since the mongoose eradication campaign in Amami



Rabbit population index was indicated by fecal dropping census

Next step to achieve eradication of low-density of mongoose after intensive trappings

Needs to develop techniques and control strategy

For detection techniques,

1. Evaluation of censor cameras, dogs, hair traps
2. DNA techniques for identify individuals and sex of mongoose

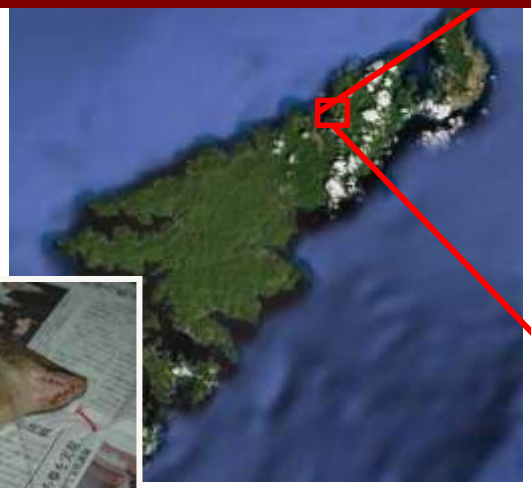
…

For elimination techniques,

1. New poisons and attractants
2. Avoidance of bi-catch between mongooses and non-target animals (endangered rodents)
3. Soft fencing
4. Immune infertility

…

How many remained mongoose after intensive trappings ?



記号	使用期	地点数
●	1～3期	130
●	2, 3期	47
●	3期	8
●	1期	10
	合計	195

No	Days	Detected by radio-tracking	Detected by censor cameras	MCP(ha)	Carnel95 % (ha)	Carnel95 % Number of cameras
2	32	16	1	25.7	121.0	71
3	13	12	1	7.2	73.8	73
4	21	13	0	22.9	89.7	95
5	2	3	0	0.8	0.0	-
6	13	14	2	18.2	95.9	68
Non-marked			9			

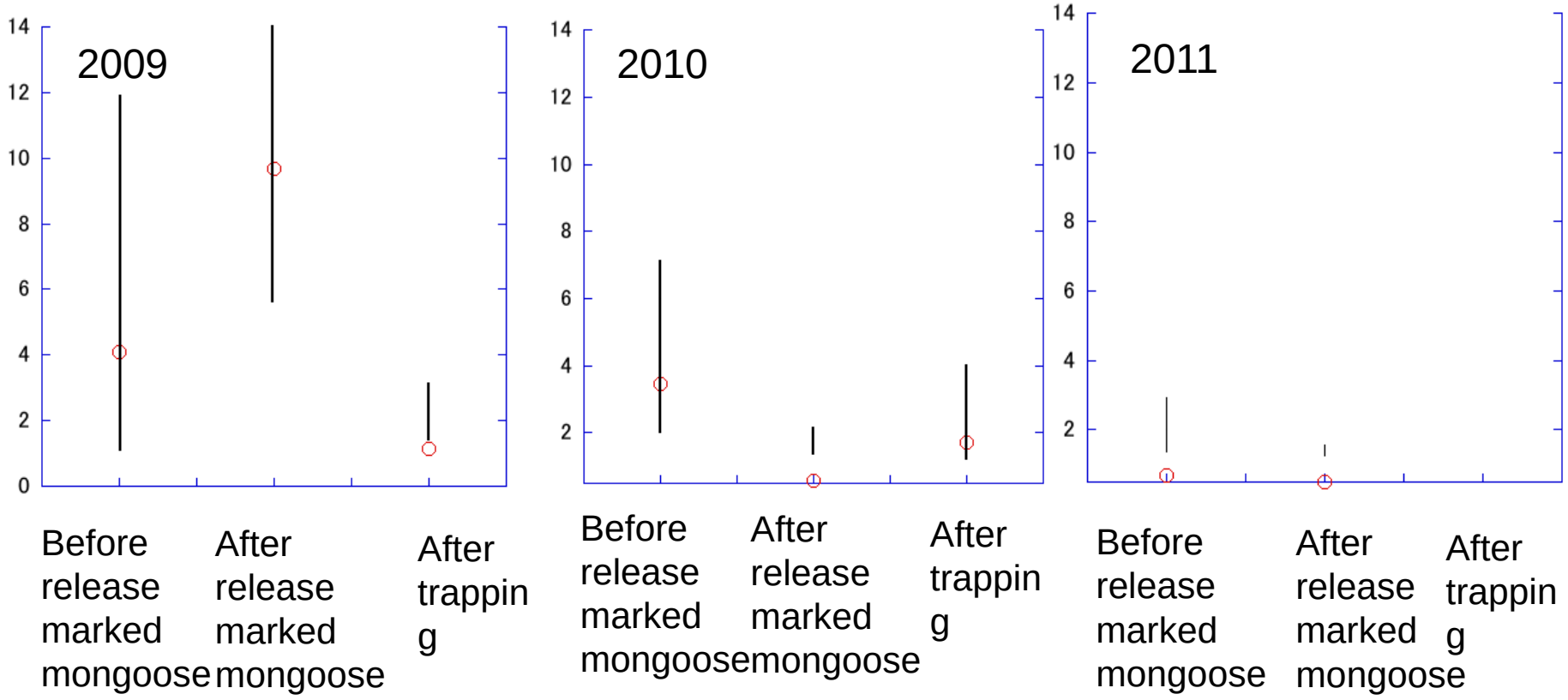
Detection ratio of marked mongoose by censor cameras in low-density area

Year	Days	Number of photos	Number of Camera-days	Detection ratio
2009	101	19	4,480	0.000042
2010	76	7	4,088	0.000023
2011	174	26	11,655	0.000013

Detection ratio was very low (0.042–0.013photos/1,000 camera-days)

5-7 marked mongooses/2 km^2

Number of remained mongoose (non-marked) estimated by marked individulals using censor cameras



10 mongoose was in 2009, 1-2 mongoose in 2010 and 2011

Evaluation of censor cameras, dogs, hair traps and trap

Tools	Effort	mongoose	CPUE (95%)
Censor camera	5,541 camera-days	3	0.24 (0.09-0.53)
Trap	1,768 trap-days	1	0.10 (0.02-0.41)

Tools	Effort	mongoose	CPUE (95%)
Censor camera	4,180 camera-days	3	0.32 (0.12-0.64)
Trap	3,529 trap-days	0	0.00 (0.00-0.13)
Hair trap	11,456 trap-days	0	0.00 (0.00-0.12)
Dog	96.2 km2	15	0.83 (0.60-0.94)

Censor camera was 2-3 times higher than trap.
Dog was 3 times higher than censor camera.

→Poster Session P2-334J

Significance of our results

For detection techniques, we made

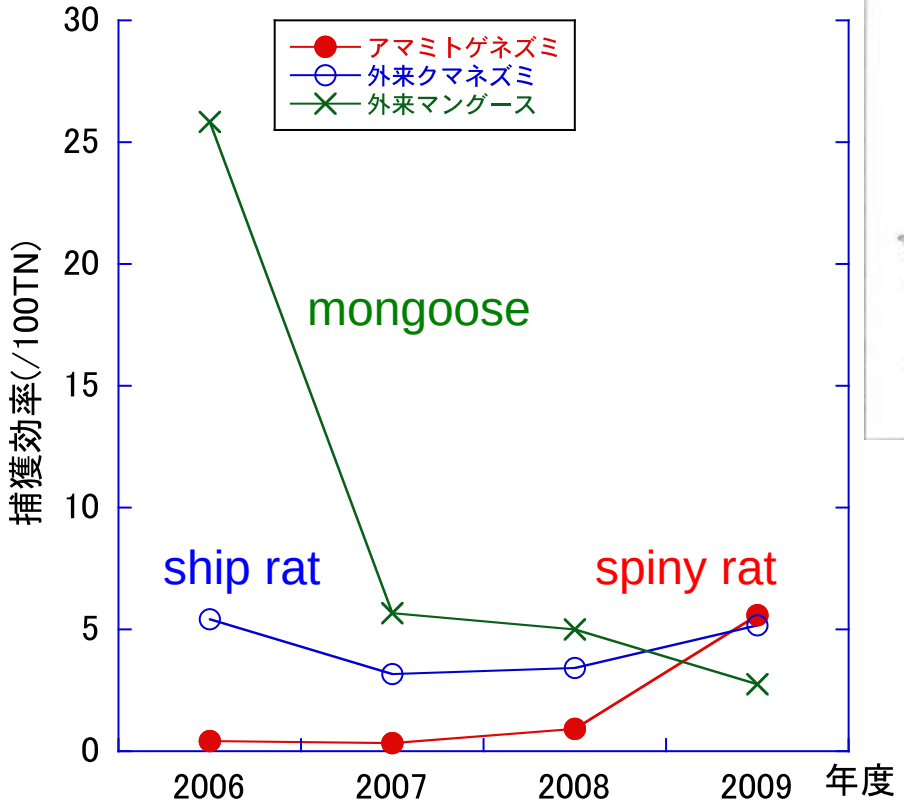
1. A estimation method of evaluation of censor cameras, dogs, hair traps

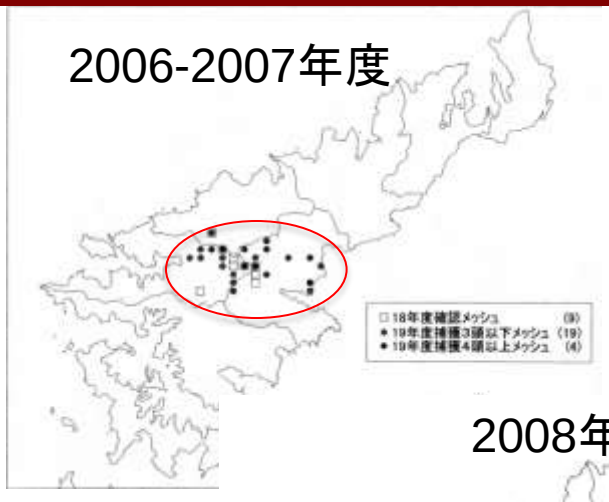
2. A qantification of remained animals

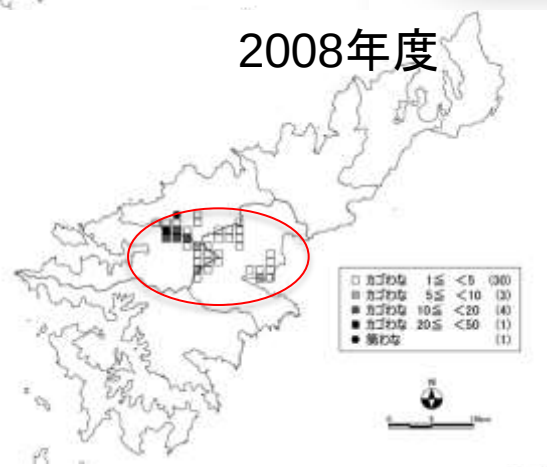
3. A evaluation of tools

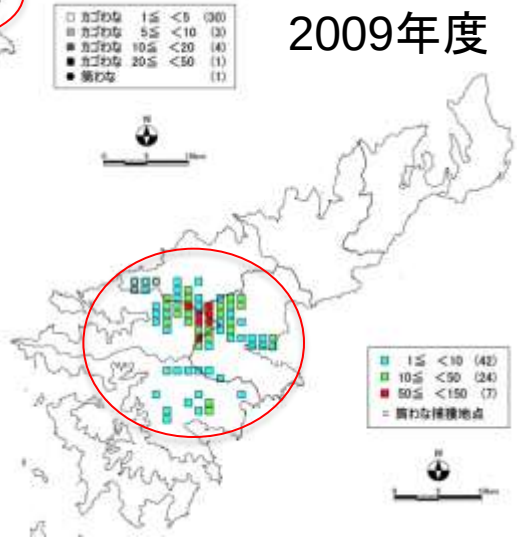
Detection and elimination is important in low-density

Recover of endangered Amami spiny rat
After the campaign in Amami









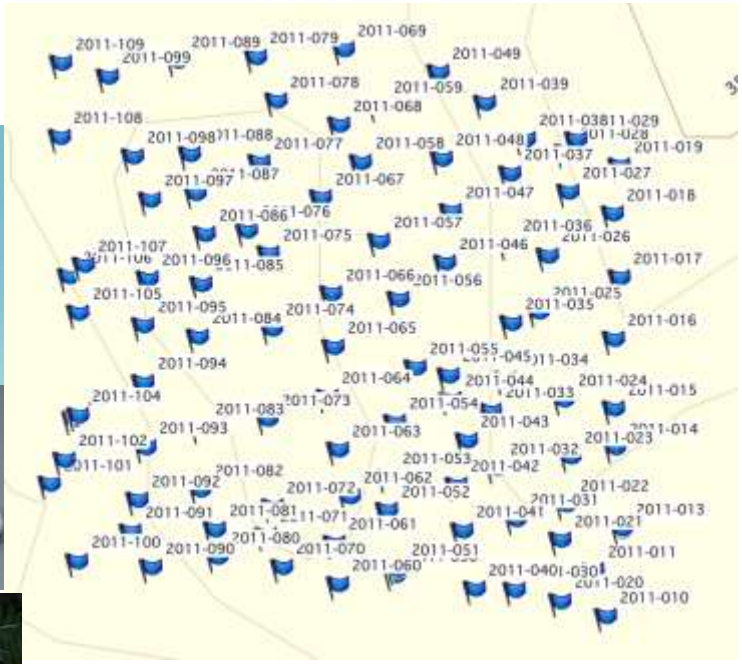
Number of capture spiny rats
500 spiny rats in 2007
1,800 spiny rats in 2010

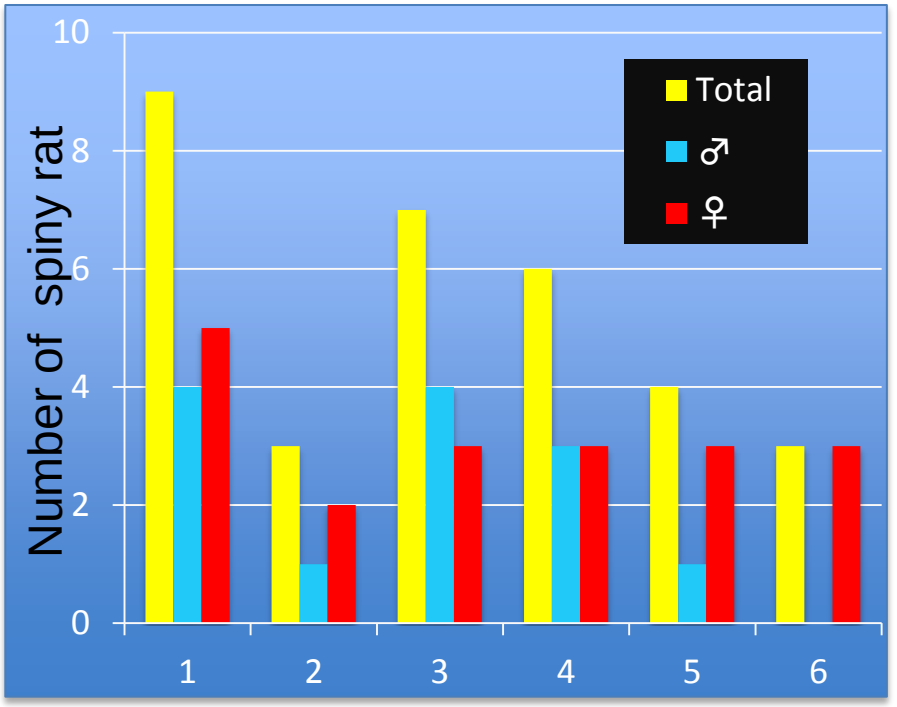
環境省資料から

Marked and released spiny rat survey

Survey：November 20-26, 2011（6 nights）
Site：Amami (a most high density area)
Method：100 rat traps in 10m grid in 100m × 100m grid

Total individulals：33（♂14, ♀19）
Total times：99（♂36, ♀63）





% of re-caputure was 67%

Density was 35.31±6.28 / ha (Lincoln-Peterson method)

Number of captured Amami spiny rat in campaign： 1,788 spiny rats in 2010

Real number: 500 spiny rats

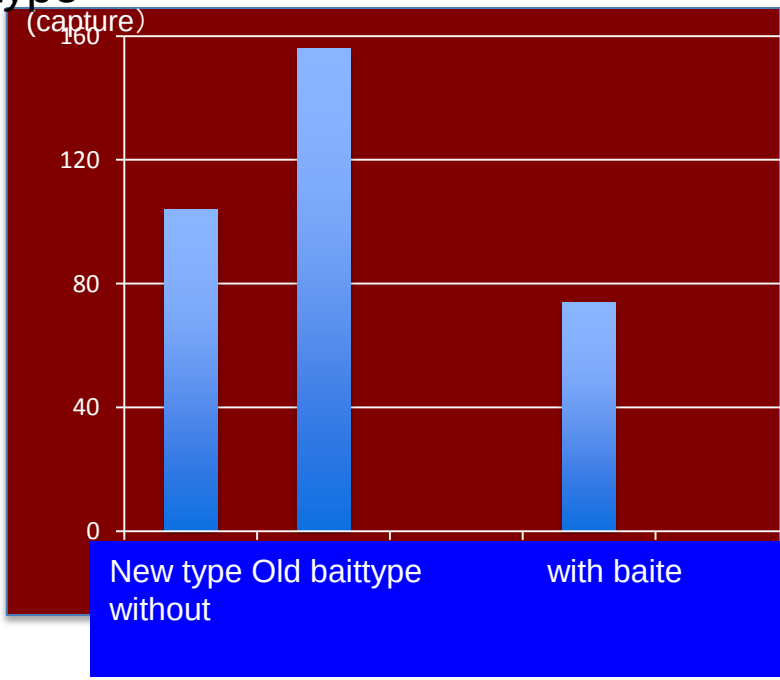
Improvement of kill trap to avoid bi-catch native endangered rodent

Number of capture by new type decreased than old type
No killed and injured to spiny rats by new trap

Old type

New type

Guide bar



Crisis of secure financial resources

Evaluation by the Government Revitalization Council against the the campaigns of the IASs in 2012 was fundamentally reconsideration and may be large scale budget cut.

Budget for mongoose: 253 million JPY in 2012 → half ? in 2013, and 2014…

So, for reduction of negative impacts, we need

1. To appeal to the government by scientific societies and NPOs
2. To strength understandings
3. To propose measures to improve

Review of administration business by the Government

Conclusions

1. The current eradication campaigns are giving some good results of reduction of mongoose and recovery of native species.
2. It needs to use new technique and elimination strategy to achieve the next step.
3. Our research results, detection tools and avoidance of bi-catch trap, are applied practically by the mongoose campaigns.









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