

Plant quarantine system in Japan: Protecting Japanese agriculture and forests



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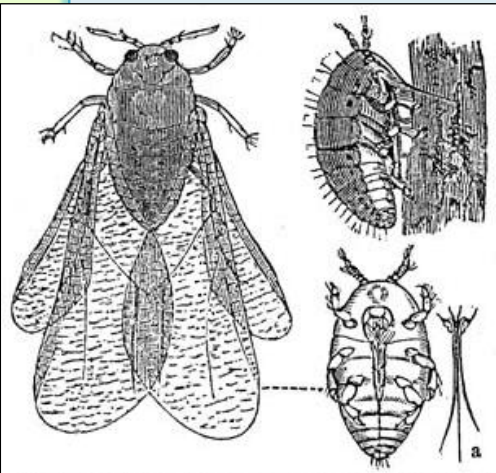
2012 June 10
Research Division, Yokohama Plant Protection Station
(PPS, MAFF)

Masaru Satoh

The history of disastrous losses of crops by alien pests (1)

Great French Wine Blight (the late 1850's -)

Phylloxera, *Daktulosphaira vitifoliae* (= *Viteus vitifoliae*)
(Hemiptera: Phylloxeridae)



Phylloxera in *Meyers Lexikon* (1888)



Phylloxera (left) and their galls (right)

© EPPO Gallery

- Feed on the roots and leaves of grapevines, and produce galls on them.
- **Introduced to Europe from North America in the 1850s.**

The history of disastrous losses of crops by alien pests (1)

European wine grape is very susceptible to phylloxera.



Devastated vineyards and grape growing industry in Europe .



France is considered to have been worst affected; Total wine production 8.45 million kl (1875) → 2.34 million kl (1889)

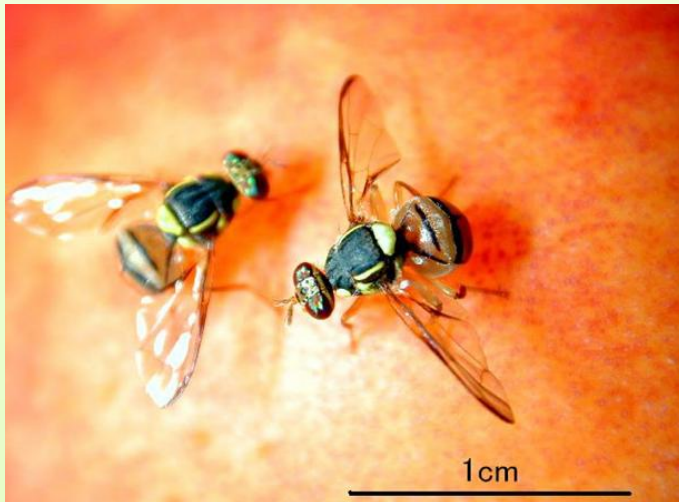


Convention Concerning the Measures to be Taken Against *Phylloxera vastatrix* (1878)
*** The world's first international treaty of plant quarantine**



The phylloxera, a true gourmet, finds out the best vineyards and attaches itself to the best wines.
Cartoon from "Punch", 6 Sep. 1890.

The history of disastrous losses of crops by alien pests (2)



Oriental fruit fly, shortened to OFF (*Bactrocera dorsalis*)



Melon fly, shortened to MF (*Bactrocera cucurbitae*)

Diptera: Tephritidae

© PPS

A very serious pest of a wide variety of fruits and vegetables (citrus, apple, avocado, coffee, guava, mango, melon, peach and plum, etc.)

A very serious pest of cucurbit and other fruit crops (papaya, tomato and common bean, etc.)

Damage levels can be anything up to 100% of unprotected fruit

The history of disastrous losses of crops by alien pests (2)

Both fruit flies entered into Nansei Islands around 100 years ago. OFF also entered into Ogasawara (bonin) Islands.

Nansei Islands

Ogasawara (bonin) Islands



Melon fly

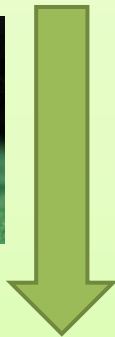


Oriental fruit fly

The history of disastrous losses of crops by alien pests (2)

Both fruit flies bring devastating economic impacts;

- Direct yield losses from infested fruits;
163 million yen in Okinawa prefecture (1981, OFF)
- Quarantine restriction of movement of host plants to mainland;
3, billion yen / year (for eggplant and bell pepper)



Eradication program was initiated in 1968

- OFF : male annihilation method using methyl eugenol sterile insect technique in Ogasawara Islands
- MF: sterile insect technique

Eradication of both flies took total 25 years with the total expenditure of 25.4 billion yen (excluding personnel expenses)



Other well-known alien pests in Japan

Mulberry moth, Fall webworm

Hyphantria cunea (Lepidoptera: Arctiidae)



Male



Female



Web on willow (larvae)

Lopez-Vaamonde et al. (2010)

- Native to North America and introduced into Europe and Asia
- Attacks a wide range of forest and fruit trees (but not conifers)
- In Japan, known as urban-type pest, and roadside trees, garden trees or trees in parks are often attacked.

Other well-known alien pests in Japan

Melon thrips *Thrips palmi* (Thysanoptera: Thripidae)



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© Osaka Plant Protection Association



© Saga Prefecture

- Native to Indonesia and introduced into tropical area, East Asia, USA, etc.
- A major pest of cucurbits, solanaceous and leguminous plants, etc.
- In 1978 this thrips suddenly became a major threat to vegetable growers in Japan. By 1990 it had become the most serious pest of cucumber, aubergine and *Capsicum annum* in the western part of Japan.

Other well-known alien pests in Japan

Citrus greening disease or Citrus Huanglongbing
caused by *Candidatus Liberibacter asiaticus*



© PPS



- Regarded as one of the most important threats to global commercial and sustainable citrus production.
- In Japan, presenting at part of the Nansei Islands.
- Eradicated at Kikaijima Is. by emergency action this year.

Other well-known alien pests in Japan

▪ **Pine wilt nematode** *Bursaphelenchus xylophilus*

▪ **Ceratocystis blight** *Ceratocystis fimbriata*

▪ **Arrowhead scale** *Unaspis yanonensis*

▪ **Potato ring rot** *Clavibacter michiganensis*
subsp. **sepedonicus**

▪ **Rice water weevil** *Lissorhoptrus oryzophilus*

▪ **American serpentine leafminer** *Liriomyza trifolii*

▪ **Tobacco whitefly** *Bemisia tabaci*
and **Tomato yellow leaf curl virus** (TYLCV)

etc.



Functions of Plant Protection Stations

Aims

Protecting Japanese agriculture and plants;

- Prevent the infiltration of overseas pests that damage Japanese crops
- Prevent the proliferation of specially designated pests within Japan

Methods

- Inspection of imported plants
- Prevent the movement of specially designated pests and their host plants within Japan

➤ A legal basis . . . **‘Plant Protection Law’**

Plant protection stations in Japan

Nationwide network of seaports and airports

There are 68 offices across the country

Placed in the major seaports and airports

- : Head office 5
- : Sub-station 16
- : Branch 47

Number of Quarantine officials: 875

(As of April, 2012)



Plant quarantine system in Japan

International plant quarantine

Domestic plant quarantine

- Prohibition on the movement of designated pests and their host plants
- Monitoring survey for newly invasive pests
- Emergency action
- Quarantine of domestic seeds and seedlings

Import quarantine

- imported plant inspection (including “import ban”)
- Post-entry quarantine
- Pre-shipment quarantine in originating country

Export quarantine

- Export plant inspection
- Field inspection of export plants

Import quarantine procedure

Import-banned items

- Host plants of the pests that could be expected to cause serious damage if they were to enter Japan and for which inspection is difficult at time of importation.
- Live pests
- Soil etc.

Items subject to quarantine

Import plant inspection

Quarantine pests detected

Entry refused

Destruction

Disinfestation

No quarantine pests detected

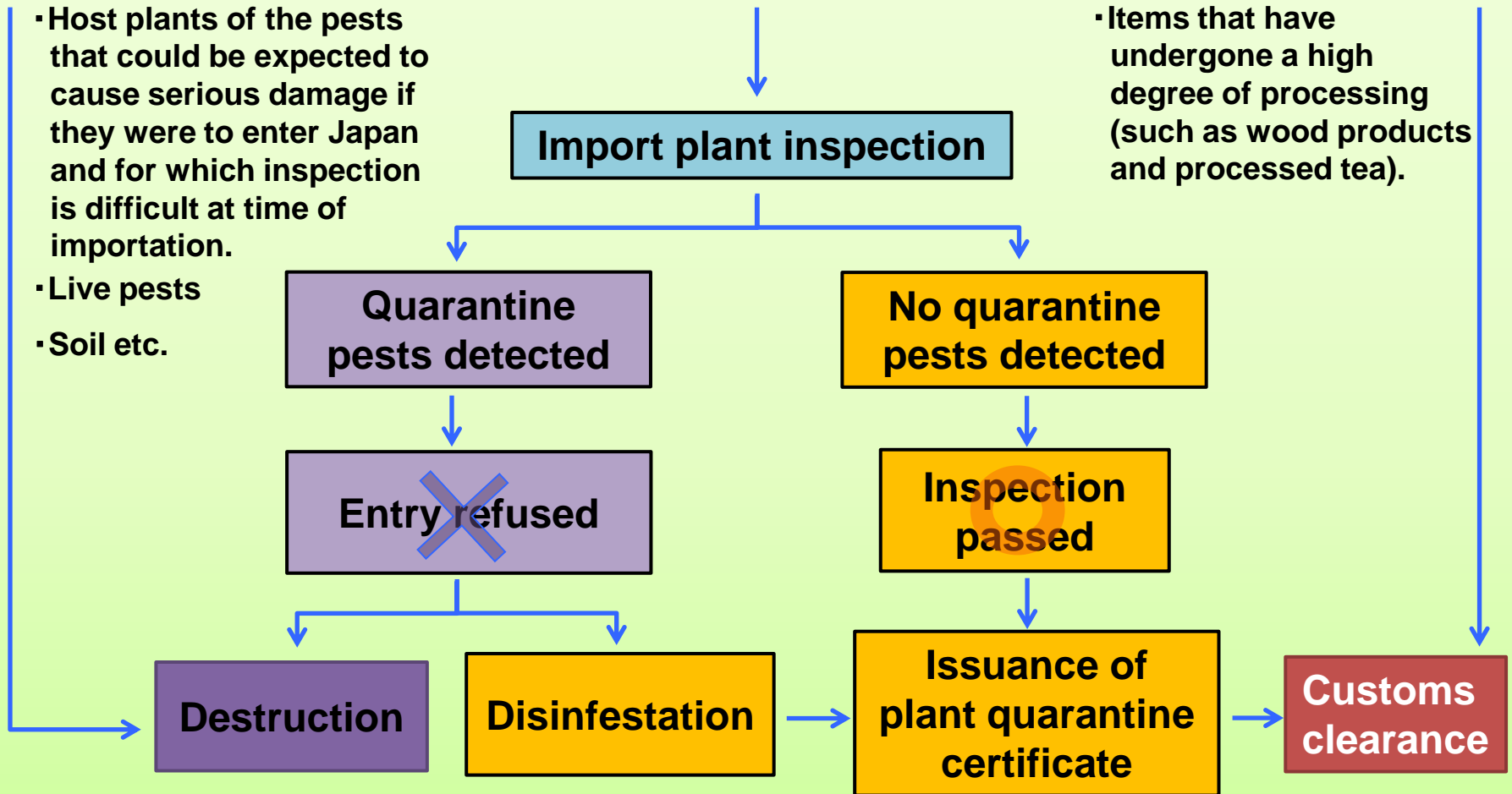
Inspection passed

Issuance of plant quarantine certificate

Items not subject to quarantine

- Items that have undergone a high degree of processing (such as wood products and processed tea).

Customs clearance



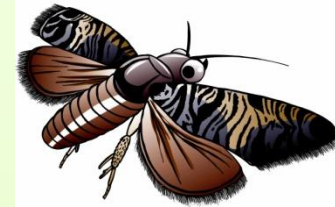
Pests subject of import ban

Insects

Medfly



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Codling
moth

Mediterranean fruit fly (*Ceratitis capitata*), Melon fly, Codling moth (*Cydia pomonella*), Sweet potato weevil (*Cylas formicarius*), etc.

Diseases

Fire Blight (*Erwinia amylovora*), Citrus greening disease (Citrus Huanglongbing), etc.



Fire Blight

©PPS

Nematoedas

Potato cyst nematode (*Globodera rostochiensis*),
White potato cyst nematode (*G. pallida*), etc.



Potato cyst nematode ©PPS

Various import plant inspection

Import inspection at seaports or airports



Import inspection of grains
on a bulk-cargo ship



Import inspection of cut flowers
at an airport

Various import plant inspection

Import inspection at seaports or airports



Import inspection of avocados
at a seaport



Import inspection of woods
at a log pond

Various import plant inspection

Import inspection at seaports or airports



Import inspection of seedlings at a seaport

Various import plant inspection

1. Import inspection at seaports or airports
2. Seeds for planting are subjected to **laboratory thorough inspection** following 1.
3. For bulbs, fruit tree seedlings and scions, potatoes, sweet potatoes, etc., thorough inspections are conducted through **post-entry quarantine at national farms** following 1.



Import inspection of seedlings at a seaport

General description of domestic plant quarantine

The prohibition of movement

The prohibition against movement of some designated locally distributed important pests and their host plants.

Monitoring survey for newly invasive pests

To detect newly invasive serious pests at early stage, conducted at sea / air port or farmland.

Emergency action

The urgent control action to prevent the spread of newly introduced serious pests and eradicate them finally.

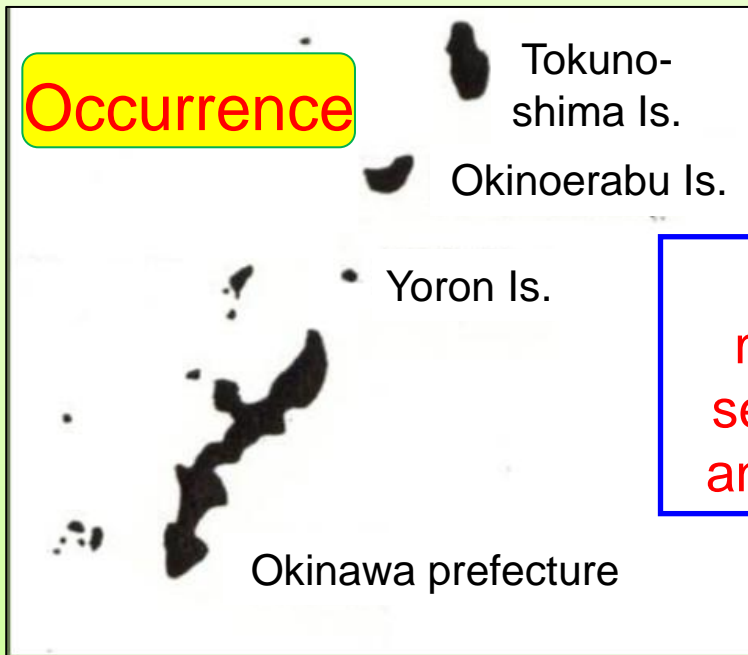
Quarantine of domestic seeds and seedlings

Plant quarantine officials inspect nationally-designated seeds and seedlings for pests during their growth.

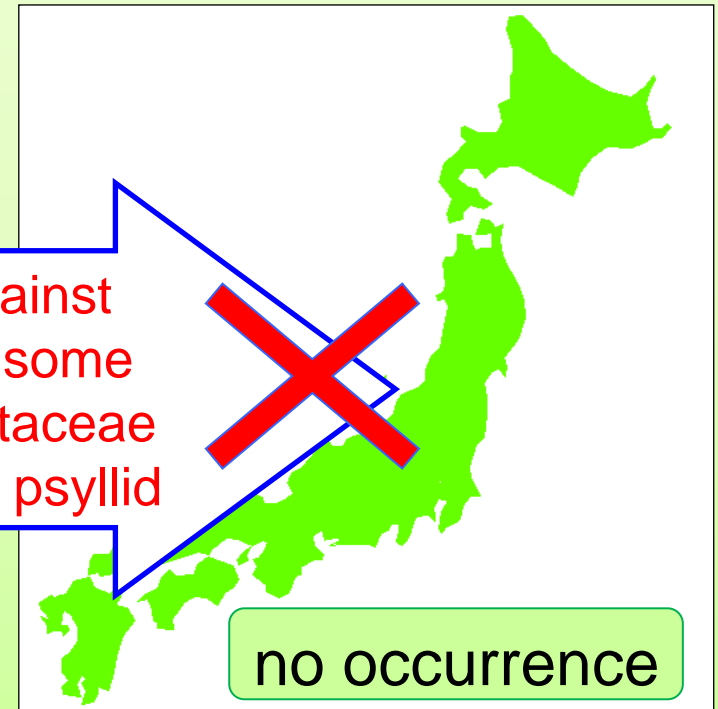
An example of the prohibition of movement

Citrus greening disease (or Citrus Huanglongbing)

- In Japan, presenting at part of the Nansei Islands.
- Transmitted by vector (Asian citrus psyllid *Diaphorina citri*) and also by graft transmission.



Prohibition against movement of some seedlings of Rutaceae and Asian citrus psyllid



Monitoring survey for newly invasive pests

Conducted by prefectures and Plant Protection Stations

Trapping survey



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Field survey

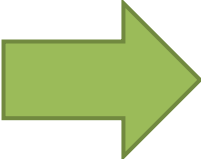


Surveyed pests

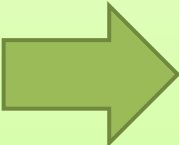
- Mediterranean fruit fly
 - Oriental fruit fly
 - Sweet potato weevil
 - West Indian sweet potato weevil (*Euscepes postfasciatus*)
 - Melon fly
 - Codling moth
 - Fire blight
 - Citrus greening disease (or Citrus Huanglongbing)
 - Bacterial fruit blotch (*Acidovorax avenae* subsp. *citrulli*)
- etc.**

Emergency action

When the entry of new serious pests to an area are detected, emergency action may be exercised;

- 
- Prohibition of the movement of host plants
 - Regulation of the growth of host plants
(Require establishment of new regulation)

- Removing host plants
- Chemical control of the pests

- 
- Prevention of the proliferation of the pest
 - Rapid eradication of the pest

Conducted by prefectures and Plant Protection Stations

Emergency action

The examples of the exercise of Emergency actions

1965-1969, **Sweet potato weevil** (Satsuma Peninsula, Kagoshima prefecture)

1967-1969, **Burrowing nematode *Radopholus similis***
(Hachijoujima is., Tokyo Metropolis)

1991-1998, **Sweet potato weevil** (Tanegashima is., Kagoshima prefecture)

1995, **Sweet potato weevil** (Satsuma Peninsula, Kagoshima prefecture)

1996-1998, **Sweet potato weevil** (Muroto city, Kochi prefecture)

1998-2000, **Sweet potato weevil** (Yakushima is., Kagoshima prefecture)

1998-2004, **West Indian sweet potato weevil**
(Yakushima is., Kagoshima prefecture)

2007-2012, **Citrus greening disease** (Kikaijima is., Kagoshima prefecture)

2009-2012, **Sweet potato weevil and West Indian sweet potato weevil**
(Satsuma Peninsula, Kagoshima prefecture)

2010-, **Plum Pox Virus** (Ome city, Tokyo Metropolis, and others)

Emergency action against sweet potato weevils



Sweet potato weevil

Cylas formicarius Shortened to “Cf”



West Indian sweet potato weevil

Euscepes postfasciatus Shortened to “Ep”

© PPS

Serious pests of sweet potato:
Subject for import ban and
the prohibition of movement



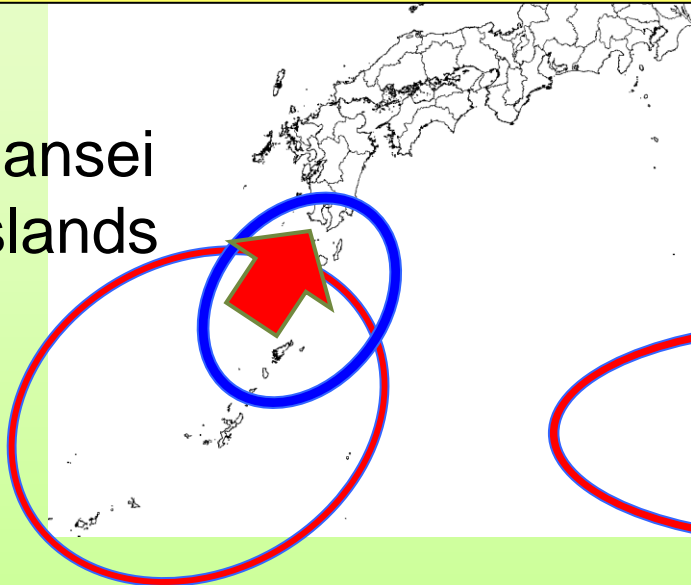
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Distribution of sweet potato weevils in Japan

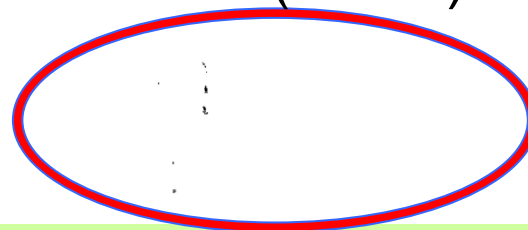


**Distribution in Nansei Islands and Ogasawara (bonin) Islands;
(alien pests)**

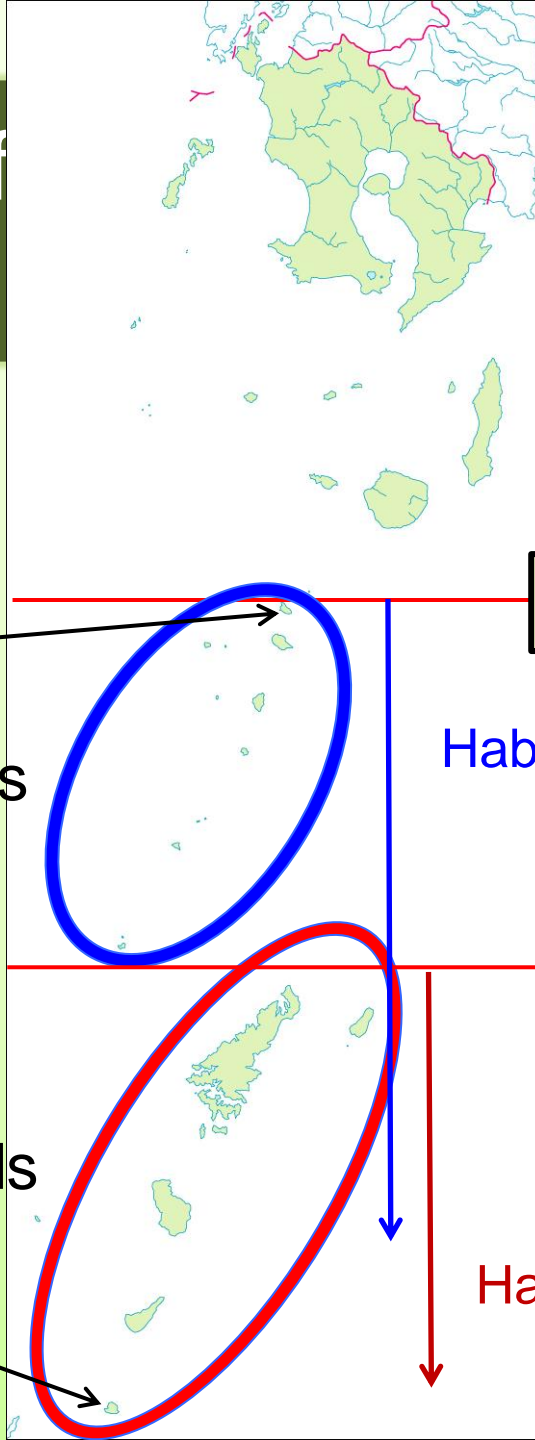
Nansei
Islands



Ogasawara
(bonin) Islands



Distribution of *Cf* and *Ep* weevils in



Kuchinoshima Is.
Cf (1942)

30° N

Tokara Islands

Habitat region of *Cf*

Amami Islands

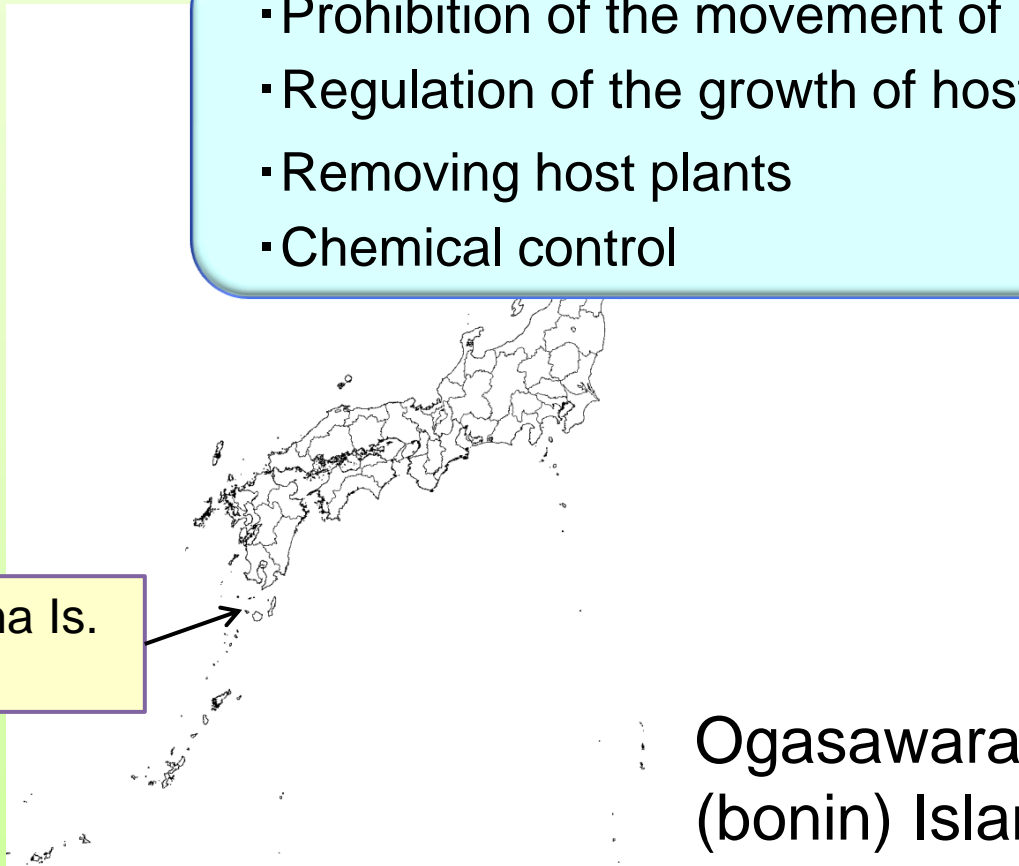
Habitat region of *Ep*

Yoronjima Is. *Cf* (1915)
Ep (1968)

Emergency action against sweet potato weevils

Conducted by prefectures and Plant Protection Stations

- Prohibition of the movement of host plants
 - Regulation of the growth of host plants
 - Removing host plants
 - Chemical control
- etc.



Kuchinoerabujima Is.
Cf (1951-1978)

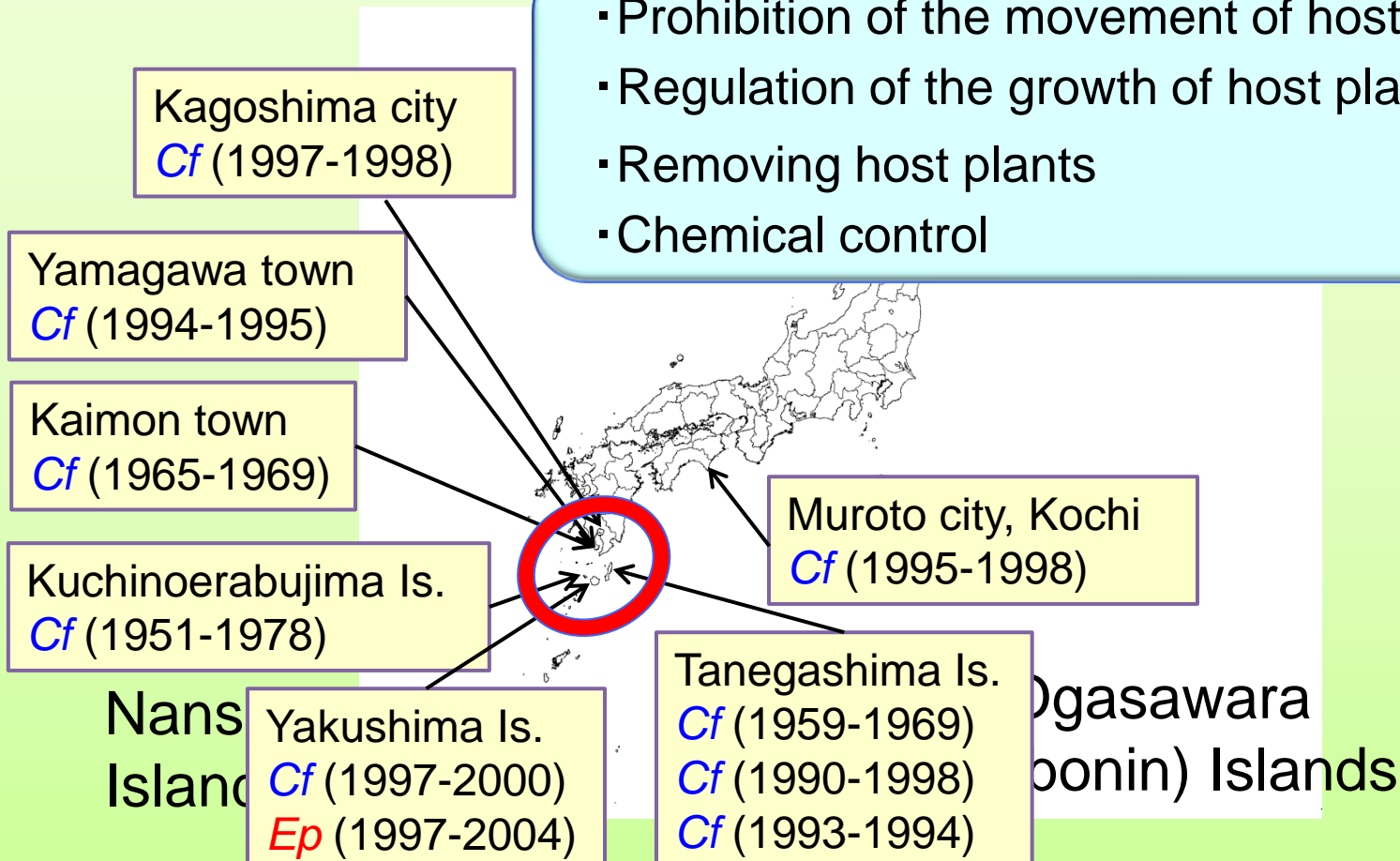
Nansei
Islands

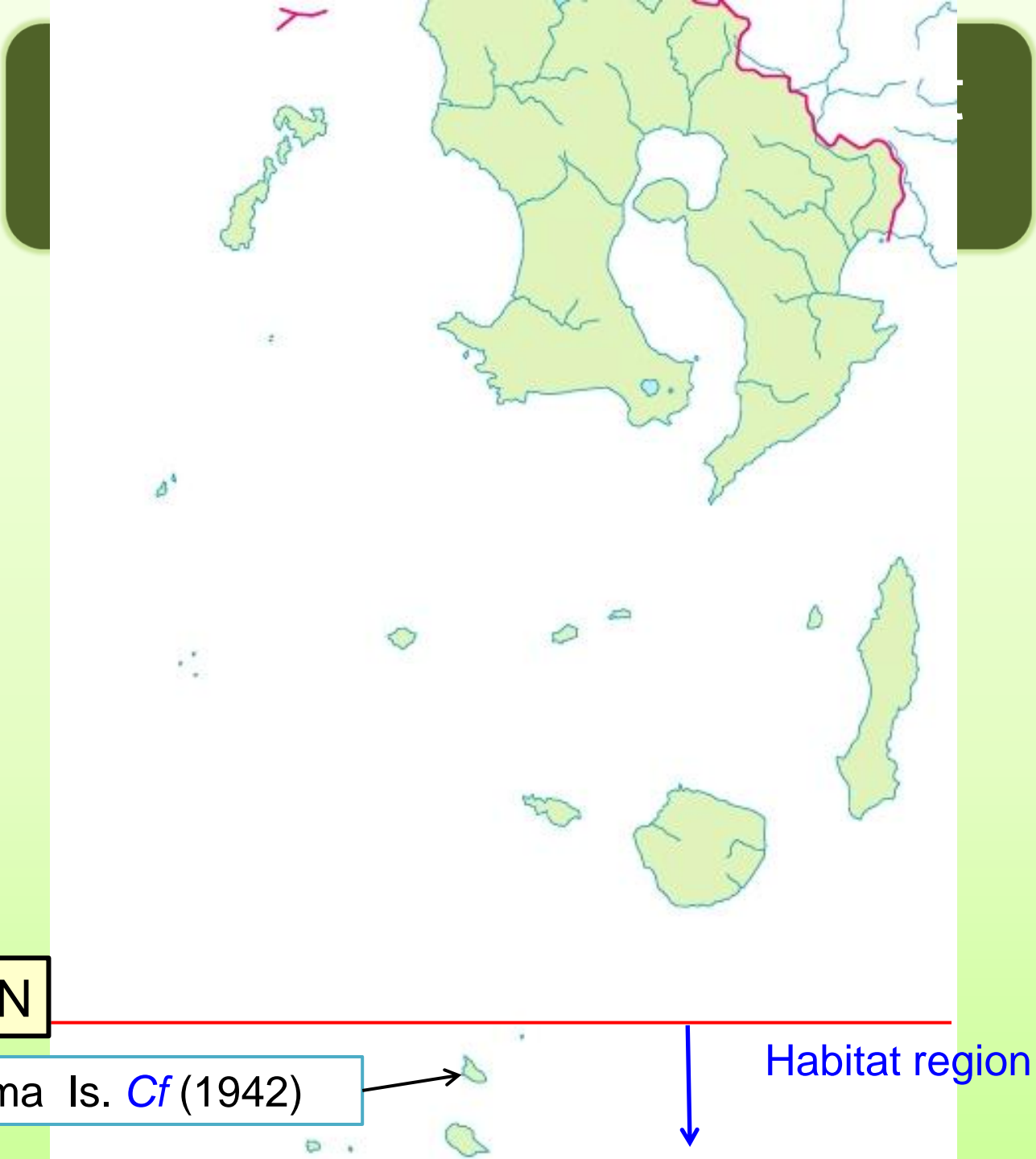
Ogasawara
(bonin) Islands

Emergency action against sweet potato weevils

Conducted by prefectures and Plant Protection Stations

- Prohibition of the movement of host plants
 - Regulation of the growth of host plants
 - Removing host plants
 - Chemical control
- etc.





30° N

Kuchinoshima Is. *Cf* (1942)

Habitat region of *Cf*

Kagoshima city
Cf, 320ha (1997-1998)

Shimokoshiki village
Cf, 30ha (1998-2000)

Yamagawa town
Cf; 90ha (1994-1995)
Cf; 19ha (1998-1999)
(Incorporated into new Ibusuki city)
Cf; 3ha (2006-2007)

Kaimon town
Cf (1965-1969)

Kuchinoerabujima Is.
Cf (1951-1978)

Yaku town,
Yakushima Is.
Cf, 1,207ha (1997-2000)
Ep; 4,252ha (1997-2004)

Kuchinoshima Is. *Cf*

Muroto city, Kochi
Cf; 780ha (1995-1998)
Cf; ? (<300ha?)
(2000-2001)

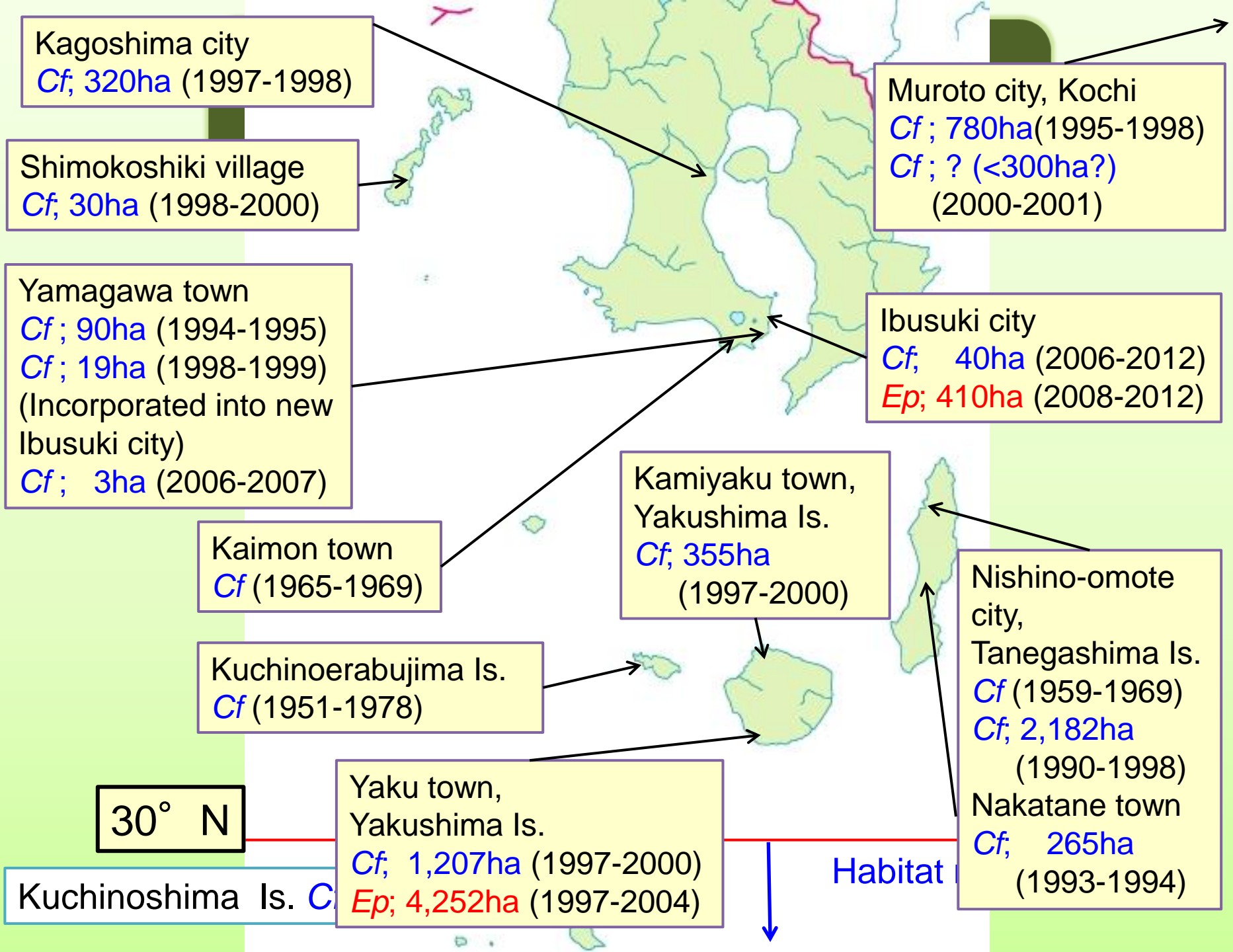
Ibusuki city
Cf, 40ha (2006-2012)
Ep; 410ha (2008-2012)

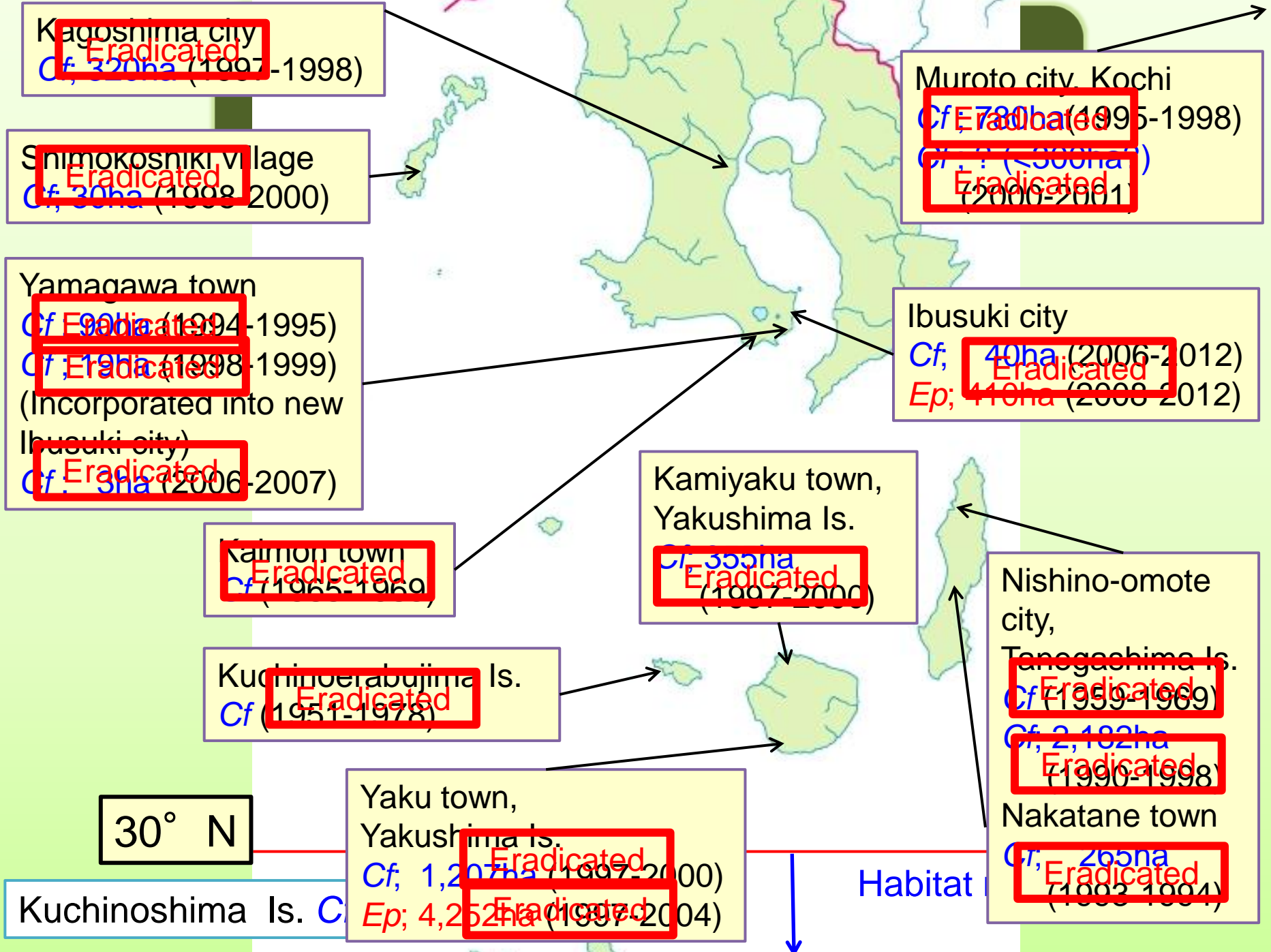
Kamiyaku town,
Yakushima Is.
Cf, 355ha
(1997-2000)

Nishino-omote
city,
Tanegashima Is.
Cf (1959-1969)
Cf, 2,182ha
(1990-1998)
Nakatane town
Cf, 265ha
(1993-1994)

30° N

Habitat

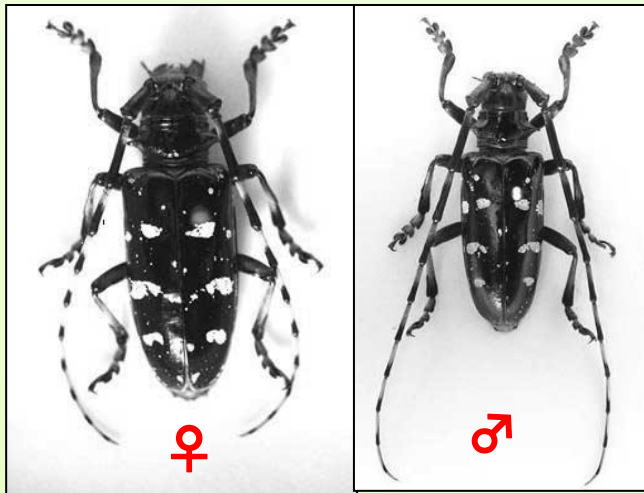




Japanese plant quarantine system is succeeding in preventing the spread of sweet potato weevils

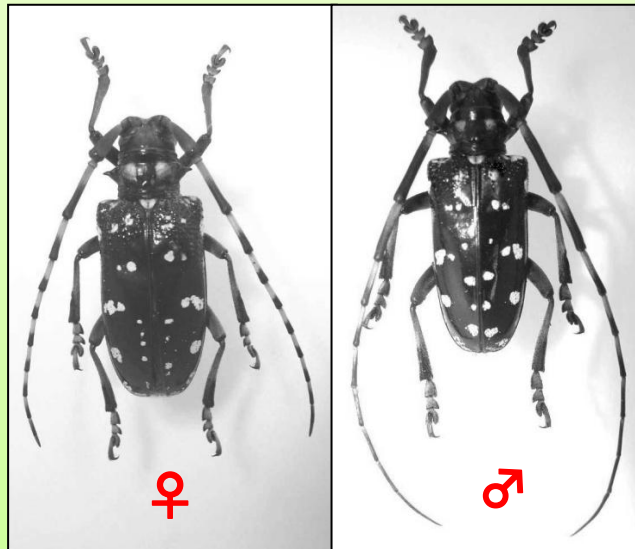


Detection and Eradication of the Asian Longhorned Beetle in Yokohama



Asian Longhorned Beetle
Anoplophora glabripennis
(Coleoptera: Cerambycidae)

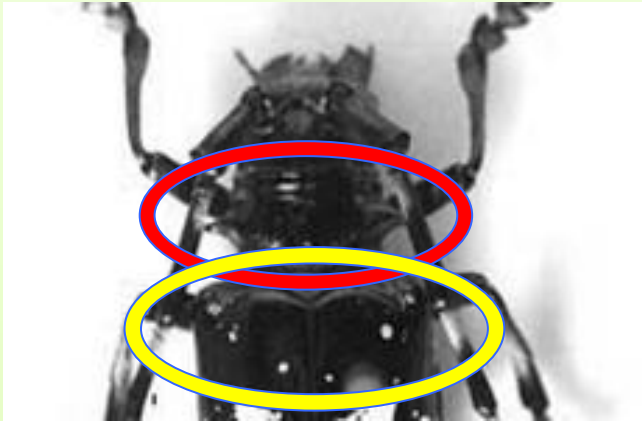
- Native to China and Korea, introduced into USA, Canada and Europe



White-spotted longicorn beetle
A. malasiaca

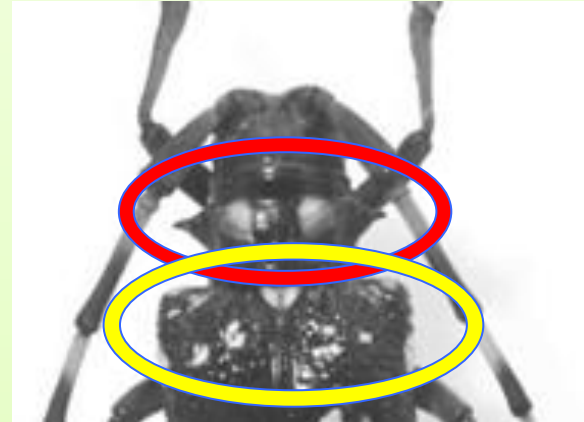
- Native to Japan

Detection and Eradication of the Asian Longhorned Beetle in Yokohama



A. glabripennis

© PPS



A. malasiaca

Do not distributed in Japan

Most well-known
cerambycid beetle
in Japan

Both beetles are destructive pests of various trees:
Cause heavy damage in USA and Europe

Detection and Eradication of the Asian Longhorned Beetle in Yokohama

Asian Longhorned Beetle was first found on Chinese elm (*Ulmus parvifolia*) street trees in Yokohama in July 2002



Adult



Exit holes of adults

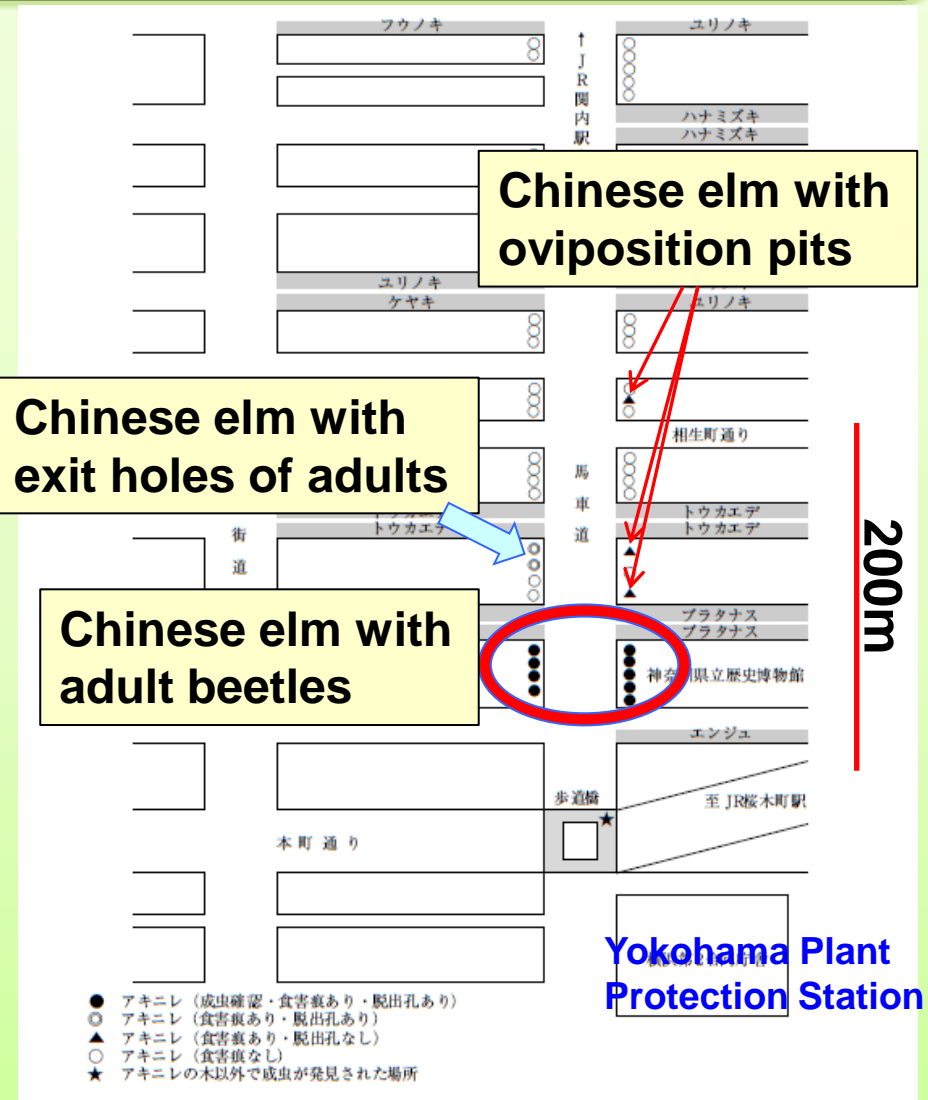
Detection and Eradication of the Asian Longhorned Beetle in Yokohama

All street trees were investigated and delimiting survey was conducted in neighboring area.



The range of occurrence was very limited. (14 Chinese elms)

Takahashi and Ito (2005) *Res. Bull. Pl. Prot. Japan* (in Japanese with English abstract)





Chemical treatment against lightly damaged tree (September 2002)

Cut down of heavily damaged tree (February 2003)

Detection and Eradication of the Asian Longhorned Beetle in Yokohama

Any further beetles, exit holes or oviposition pits were not found since march 2003



Asian Longhorned Beetle was eradicated

Because the occurrence was very limited, exercise of emergency action had been unnecessary

*** The cause of occurrence of Asian Longhorned Beetle remains unknown**

Eradication programs

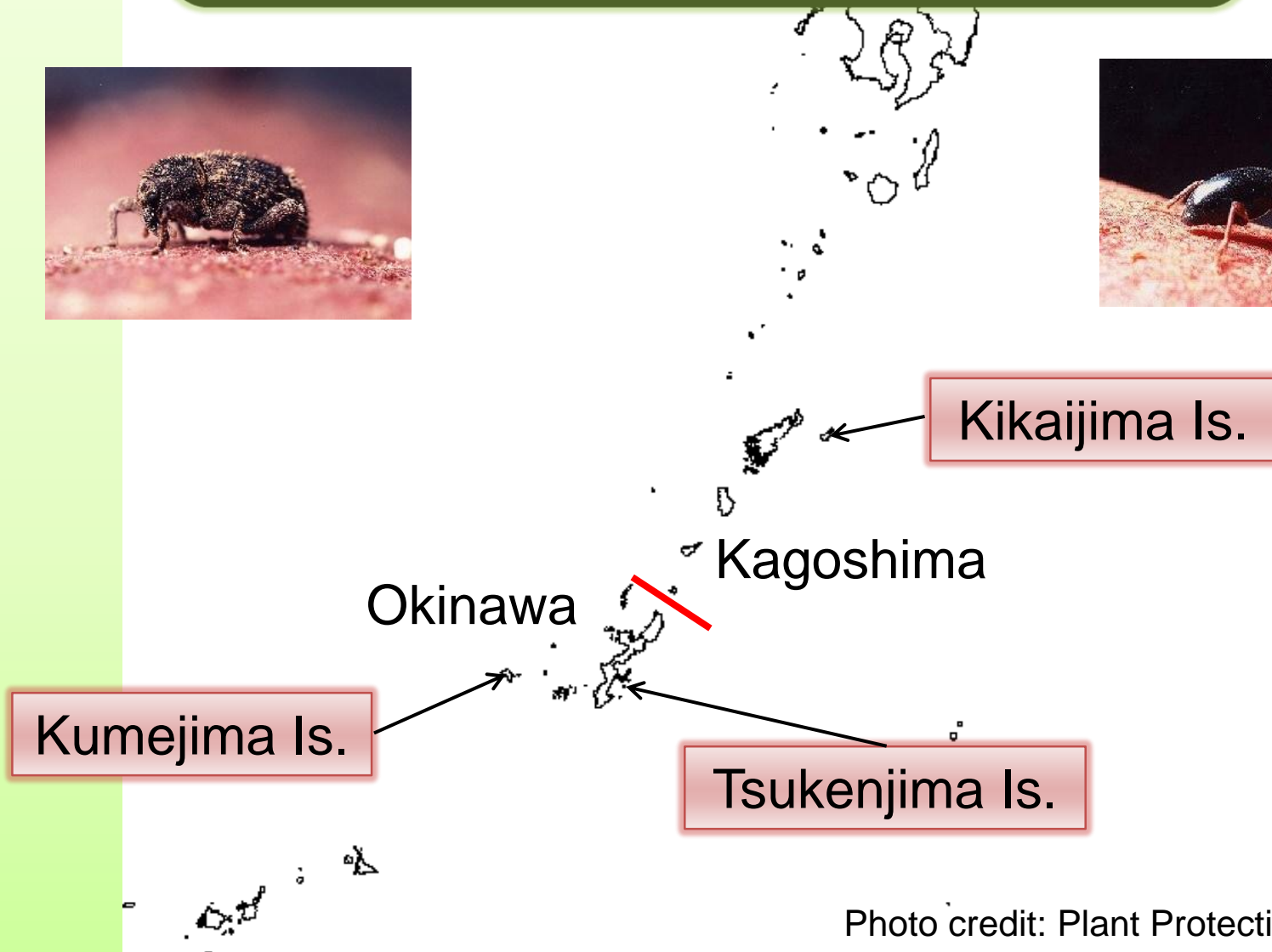
Prefectures have been conducting eradication programs against established alien pests, with subsidies from the national government.



	Region	Methods for eradication	Period and expenditure
Oriental fruit fly	Amami Islands, Ryukyu Islands and Ogasawara (Bonin) Islands	Male annihilation method and sterile insect technique	1968-1986 5 billion yen*
Melon fly	Amami Islands and Ryukyu Islands	sterile insect technique (Suppression control)	1972-1993 20.4 billion yen*
<i>Cf</i> and <i>Ep</i>	Kikaijima Is., Kumejima Is. and Tsukenjima Is.	sterile insect technique, Removing host plants (Suppression control)	1994-

* Excluding personnel expenses

Eradication programs of sweet potato weevils



Problems to be solved



1. Harmonization with the international rules

- * International Plant Protection Convention
- * Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement; An international treaty of WTO)

- Use of harmonized sanitary and phytosanitary measures between members, on the basis of international standards, guidelines and recommendations developed by the relevant international organization
- To minimize negative effects of sanitary and phytosanitary measures on international trade

(From SPS Agreement)

Problems to be solved



2. Further enhancement of import quarantine

	1995		2005
The number of inspection	570, 000	➔	800, 000
The number of items	7, 000	➔	8, 400
The number of exporting countries or regions	122	➔	179

- Increase and diversification of plants and plant products imported from overseas.
- Improvement of technique for freshness retention

Creating greater risk that pests may enter Japan

Further enhancement of import quarantine is necessary

**Thank you for your kind
attention.**

**Plant Protection Station HP:
<http://www.maff.go.jp/pps/>**

**MAFF HP:
<http://www.maff.go.jp/>**

