



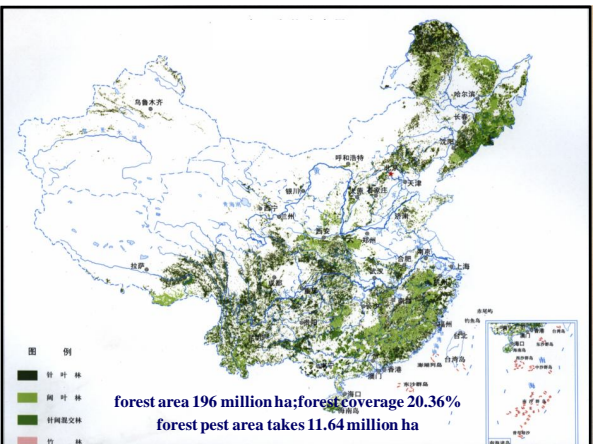
# Forest invasive species early detection and rapid response in China

YAN Jun

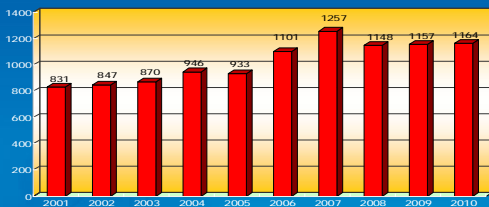
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State Forestry Administration  
Shenyang, Liaoning Province, P.R. China

## Content

- 1. Situation of forest invasive species in China
- 2. Organization of forest pests management in China
- 3. Early detection and rapid response of forest invasive species in China



## 1.1 General summary of forest pests in China



Occurrence area of forest pests in China, 2001-2010

There are more than 8000 species forest pests in China including 300 serious species which causes direct economic loss surpassed 110 billion RMB yuan. 35 invasive species equal to lost 56 billion yuan.

## 1.2 Invasive alien species (IAS 35)

### 16 invasive species before 1980 (1980 investigation)

*Cronartium ribicola* JCFischer ex Rabenhorst-soft pine stem blister rust 松疱锈病菌

*Eichhornia crassipes* (Mart.)Solms. - Common Waterhyacinth水葫芦

*Eriosoma lanigerum* (Hausmann) - Woolly apple aphid苹果绵蚜

*Eupatorium adenophorum* Spreng- Crofton Weed紫茎泽兰

*Eupatorium odoratum* L. Fragrant eupatorium飞机草

*Guignardia loricata* (Sawada) Sydow-larch shoot blight落叶松枯梢病菌

*Heterobostrychus aequalis* (Waterhouse) 双钩异翅长蠹

*Hyphantria cunea* (Drury) -fall webworm 美国白蛾

*Laspeyresia pomonella* Linne.-codling moth 苹果蠹蛾

*Lecanosticta acicola* (Thum.) 松针褐斑病菌

*Matsucoccus matsumurae* (Kuwana) Japanese pine bast scale

*Mikania micrantha* H.B.K.-south american climber 假甘菊

Poplar mosaic Virus (PMV) 杨树花叶病毒

*Solidago canadensis* L.-Common Goldenrod-加拿大一枝黄花

*Spartina anglica* C.E.Hubb.- Rice grass or English cordgrass 大米草

*Trialeurodes vaporariorum* (Westwood)-Greenhouse whitefly 温室白粉虱



### 19 invasive species since 1980 (2003-2005 investigation)

*Brontispa longissima* (Gestro)- coconut leaf beetle 椰树叶甲

*Bursaphelenchus xylophilus* - pine wilt disease-pine wood nematode 松材线虫

*Carpomyia vesuviana* Costa- Ber fruit fly 枣实蝇-2007

*Chilades pandava* (Horsfield) 曲纹紫灰蝶

*Corythucha ciliata* (Horsfield) 悬铃木方翅网蝽

*Dendroctonus valens* LeConte -red turpentine beetle 红脂大小蠹

*Frankliniella occidentalis* (Pergande) - western flower thrips 西花蓟马

*Hemiberlesia pitysophila* Takagi - pine needle hemiber scale 松尖圆蚧

*Leptocybe invasa* Fisher et LaSalle - blue gum chalcid 桉树枝瘿姬小蜂-2007

*Liriomyza sativae* Blanchard- Woolly apple aphid 美洲森潜蝇

*Obolodiplosis robiniae* 刺槐叶瘿蚊

*Octodonta nipae* (Maulik) - Hispidae beetle 水椰八角铁甲

*Opogona sacchari* (Bojer) -banana moth 蔗扁蛾

*Oracella acuta* (Lobdell) 湿地松粉蚧

*Quadrastichus erythrinae* Kim 刺桐姬小蜂-2005

*Rhabdoscelus lineaticollis* (Heller) 褐纹甘蔗象

*Rhynchophorus ferrugineus* (Oliver) - Red palm weevil 红棕象甲

*Solenopsis invicta* Buren-red fire ant 红火蚁

*Synathedon lipuliformis* Clerck 茶藨子透翅蛾



## (1) *Bursaphelenchus xylophilus* 松材线虫病

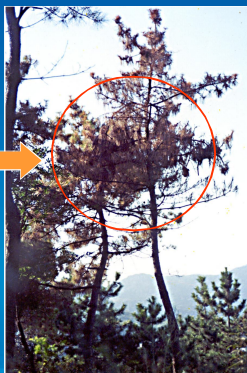


Since the **pine wilt** was found in Zhongshan Tomb in Nanjing in 1982, the disease spread rapidly in the south of China and is badly endangering the ecosystem of some beauty spots, such as Huangshan, Jiuhuashan, Xihu, and so on. More than 80 counties had found Pine wilt.

自1982年在南京市首次发现后，在中国华东和东南地区呈跳跃式传播，对中国南方3000多万hm<sup>2</sup>松林形成包围态势，对黄山、九华山、张家界、西溯等风景名胜名胜区构成了严重威胁。



9th July



7th August

Disaster Symptom  
松材线虫病危害状况

## (2) *Hyphantria cunea* 美国白蛾



Fall webworm is an international quarantine pest species for its extensive host species and serious damage, can harm more than 200 kind of plant including trees, crops and wild plants. It has spread to Shandong, Shanxi, Hebei and Tianjing since its first found in Niao long Province in 1979.

1979年传入我国辽宁丹东一带，后扩散至山东、天津、陕西、辽宁等省，其繁殖力强，扩散快，每年可向外扩散35-50km。可为害果树、林木、农作物及野生植物等200多种植物。

### (3) *Carpomya vesuviana* 枣实蝇

2007年9月在新疆吐鲁番地区发现



Berfruit fly was find in Xinjiang in 2007, it causes a heavy economic losses for Jujube production

枣实蝇的入侵，使新疆吐鲁番地区的枣业遭到沉重打击，销毁虫果0.22万吨，枣果减产20%，并将直接影响到今后2~3年枣果的生产，对枣农造成巨大的经济损失。



### (4) *Leptocybe invasa* 桉树枝瘦姬小蜂



2007年  
在广西发现

*Leptocybe invasa* (blue gum chalcid) was find in 2007 in Guangxi, since then has been found in Hainan and Guangdong in 2008, the pest harm to leaf and cause death of Eucalyptus

2007年，在我国广西与越南交界处首次发现桉树受桉树枝瘦姬小蜂危害，2008年相继在海南、广东发现。主要危害桉树苗木和幼林，在叶片、主脉、叶柄及当年生枝梢上形成虫瘿，导致苗木倒伏、落叶、植株矮化、枝梢枯死，甚至植株死亡，对桉树产业构成重大威胁。



### (5) Invasive harmful plants 外来有害植物

----*Mikania micrantha* / *Ageratina adenophora* / *Salidago Canadensis*

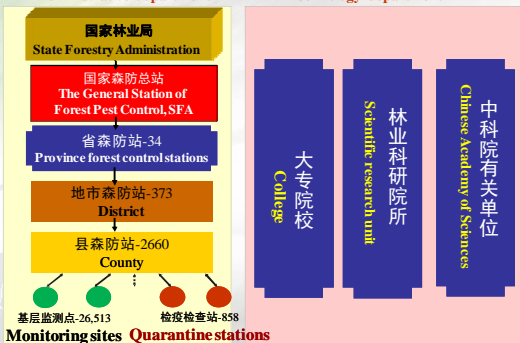


## 2 Organizations of forest pest management in China

中国林业有害生物防治管理机构

Administrative department

Technology department



## 2 Organization of forest pest management in China

中国林业有害生物防治管理机构

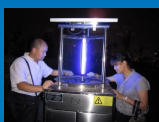
There are 3068 forest pest control stations and 18,964 personnel throughout the country, including 34 province stations, 373 district stations and 2,660 county stations. 858 forest plant quarantine stations and 26,513 forecasting stations had been set up, which included 1,000 state level forecasting stations and 1,593 province level forecasting stations.

目前, 中国已建成各级防治检疫站3,068个, 其中省级站34个, 市级站373个, 县级站2660个。林业植物检疫检查站858个。各级测报站点26,513个, 其中国家级中心测报点1,000个, 省级测报点1,593个。全国林业生物灾害防治从业人员107804, 其中, 专职工作人员19,610, 专职测报人员9871名, 专职检疫员达12738人。基层检疫员30,348人, 基层测报员57,846人。



## 3 Early detection and rapid response

监测预警  
Monitoring



检疫封锁  
Quarantine



应急除治  
Eradication



## 3.1 Monitoring and forecasting

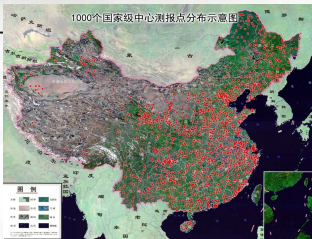
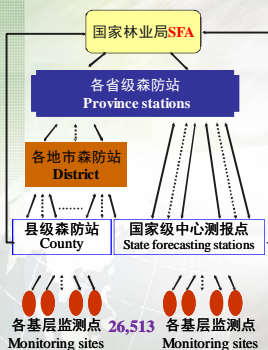
On-the-spot manual investigation is the primary method for forest pest monitoring in China. At the same time, it's greatly pushed to use pheromone or chemical attractant and light captor for pest monitoring. In addition, "3S" and some other advanced monitoring techniques are also introduced or in the process of testing.

目前, 我国林业有害生物的监测主要是以地面人工调查为主, 同时大力推行引诱剂和灯诱监测技术, 努力开展“3S”技术等先进监测技术的开发与应用。



### 3.1.1 Enhancing monitoring and forecasting network system

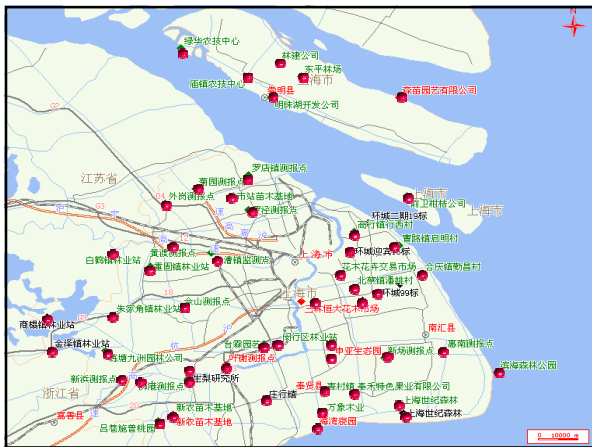
加强监测预警网络建设



Establishing 1000 national forest pest monitoring- & forecasting stations in the whole country.

Consequently, dangerous forest pest species can be monitored all over the year and the unhealthy or dead trees can be found in time.

建立1000个国家级中心测报点, 对中国主要林业有害生物进行监测



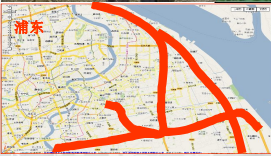
### 3.1.2 Improve Monitoring-&-Forecasting Guides (Technical regulation) of 14 main forest pest species 目前已颁布14种主要林业有害生物测报办法

- ❑ Monitoring-&-Forecasting Regulation of *Bursaphelenchus xylophilus* Nickle
- ❑ Monitoring-&-Forecasting Regulation of *Hyphantria cunea* Drury
- ❑ Monitoring-&-Forecasting Regulation of *Matsucoccus matsumurae* Kuwana
- ❑ Monitoring-&-Forecasting Regulation of *Hemiberlesia pitysohyla* Takagi
- ❑ Monitoring-&-Forecasting Regulation of *Oracella acuta* Loddell
- ❑ Monitoring-&-Forecasting Regulation of *Apocheima cinerarius* Erschoff
- ❑ Monitoring-&-Forecasting Regulation of *Ceracris kiangsu* Tsai
- ❑ Monitoring-&-Forecasting Regulation of *Parocneria orientalis* Chao
- ❑ Monitoring-&-Forecasting Regulation of *Apocheima cinerarius* Erschoff
- ❑ Monitoring-&-Forecasting Regulation of *Dendrolimus*
- ❑ Monitoring-&-Forecasting Regulation of Poplar Longhorned Beetles
- ❑ Monitoring-&-Forecasting Regulation of *Apocheima cinerarius* Erschoff
- ❑ Monitoring-&-Forecasting Regulation of *Closteria anachoreta* Fabricius
- ❑ Monitoring-&-Forecasting Regulation of Forest Rodent

At present time, all of these regulations are still in trial implementation.

### 3.1.3 Manual investigation 地面人工调查

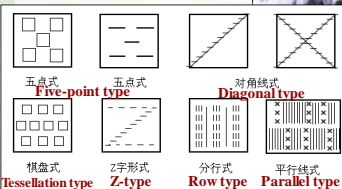
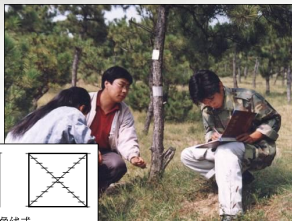
- ❑ 林间踏查 Field inspection



Route map in Shanghai World Expo And forest in Chaoyang of Liaoning province) 踏查路线图

### 3.1.3 Manual investigation 地面人工调查

- ❑ 设定固定标准地调查 Setting fixed pilot area for investigation



几种常用的随机抽样方法  
Random-sample methods

### 3.1.3 Manual investigation 地面人工调查



Shaking for investigation  
采用振落法调查



Cutting branch for inves  
野外剪枝调查



Cage-rearing for investigation  
野外套笼饲养昆虫

### 3.1.3 Manual investigation 地面人工调查

#### 应用诱虫灯调查 Investigating with light captor



### 3.1.3 Manual investigation 地面人工调查

#### 应用性诱剂监测 Investigating with attractant



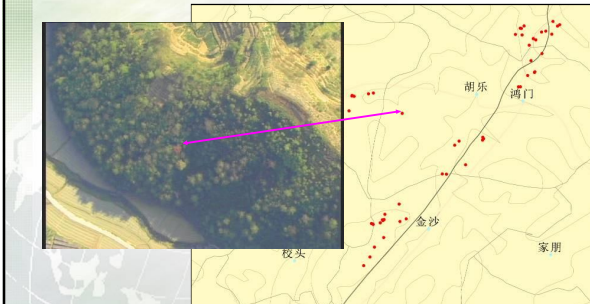
Monitoring *Hyphantria cunea* Drury with pheromone attractant  
用性诱剂监测美国白蛾



### 3.1.4 "3S" monitoring techniques 应用"3S"技术进行监测

#### □ 航拍监测

Aerophotographical monitoring techniques

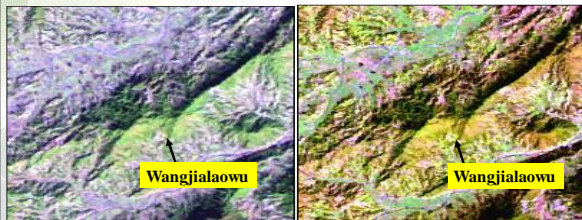


### 3.1.4 "3S" monitoring techniques 应用"3S"技术进行监测

#### □ 遥感监测

Remote sensing monitoring techniques

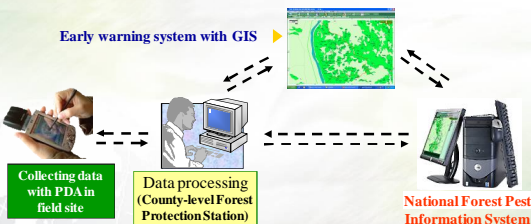
不同时期拍摄的TM图片  
TM photographs taken in different time



安徽 (Anhui province)

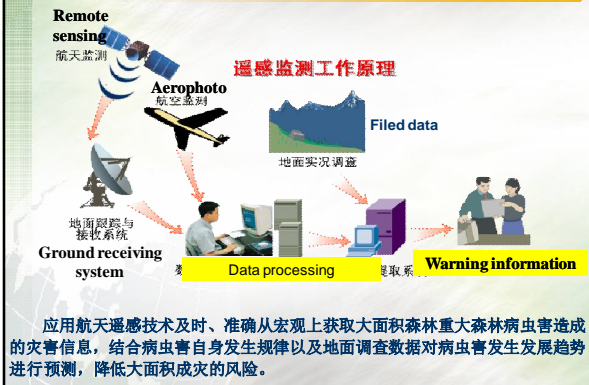
### 3.1.4 "3S" monitoring techniques 应用"3S"技术进行监测

#### □ GIS技术监测 GIS monitoring techniques



重庆市应用GIS 技术实现林业有害生物信息管理及监测  
Monitoring and information management of forest pest  
with GIS (Chongqing)

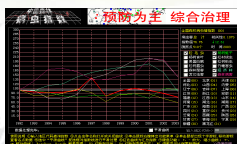
### 3.1.4 "3S" monitoring techniques 应用 "3S" 技术进行监测



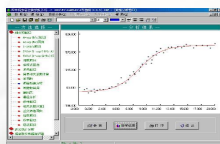
### 3.1.5 Data analysis and transmission 数据分析与传输



the software named *Control & Quarantine Information System of Forest Pest*, and realizing the transmission of monitoring data and quarantine certificate with internet



Occurrence and the trend of forest pest can be reflected visually by *Chinese Forest Pest Index*.



Analyzing the investigation data with monitoring- & forecasting professional software

### 3.1.6 Release of disaster forecasting and early warning

及时发布灾害预报和警报



CCTV/通过电报纸媒体及时发布林业有害生物预警，为决策及生产提供服务



虫快讯及时掌握疫情

病虫害快讯

Internet 建立网络发布平台

When the Ber fruit fly was found in Xinjiang in 2005, Promptly issued a warning bulletin by SFA

建立了病虫害信息快报、电话问询和灾情调度制度，及时发布预警信息，推行以地县两级区域性预报为主体的生产性预报。2005年在新疆发现枣实蝇后国家林业局及时发布警示通报。



## 3.2 Inspection and quarantine

Port quarantine ----AQSIQ-Quarantine

Domestic ----Quarantine in places of origin

---- Quarantine transportation

2



### 3.2.1 Risk assessment

- General investigation—1980-1982/2003-2005
- Risk assessment of potential invasion species
- Risk assessment of invasion species
- List of quarantine forest pests (19)
- Determine the degree of the forest pest by Risk assessment (77 species & types)  
(Ias-35, Qs-19, Ds-37-66667ha)



### ----Grading management 分级管理

#### By risk assessment on 77 species

对77种(类)的有害生物开展危险性评估

★★★★ 极度危险的森林有害生物—3s

The first degree--The most dangerous forest pests

★★★☆☆ 高度危险的森林有害生物—20s

The second degree--The more dangerous forest pests

★★☆☆☆ 中度危险的森林有害生物—23s

The third degree--The mild dangerous forest pests

★☆☆☆☆ 低度危险的森林有害生物—22s

The fourth degree--The low dangerous forest pests

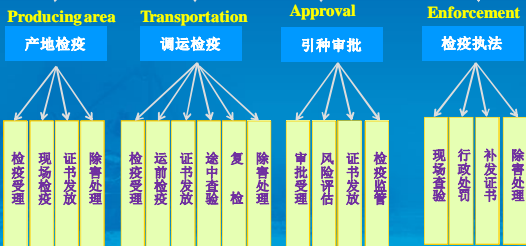


### 3.2.2 legislation---law and regulations

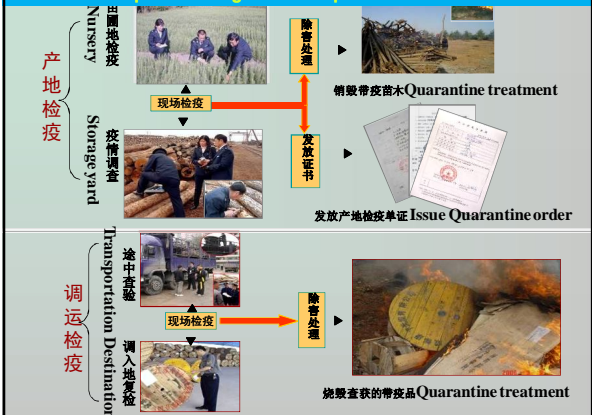


### 3.2.3 Standard the quarantine procedures

#### 林业植物检疫 forest plant quarantine



#### Quarantine in places of origin and transportation



## 3.2.2 law enforcement in inspection and quarantine



----2010 Shanghai World Expo  
 ----Joint law enforcement operations  
 ----by SFA, AQSIQ, Shanghai City,  
 and three provinces of East China

2010年4月，由国家林业局、国家质检总局和上海市人民政府联合举办了  
 “为世博服务 保生态安全 联合执法行动启动” 仪式。

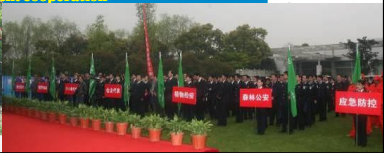
## 3.3 Control and eradication

### Strategy:

Eradication/Elimination new IAS



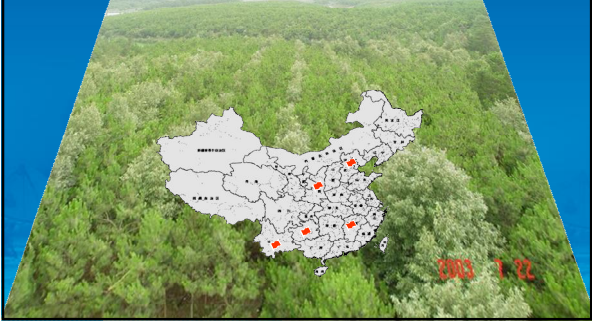
----Leadership—Department cooperation



# Measures of Control and Eradication

## ---Planting health forest

In artificial afforestation, with particular respect to the area of important National Engineering Forestation, it has to be planted with mixed forest to increase the biodiversity and to improve the self-defensive ability against forest pest of forest



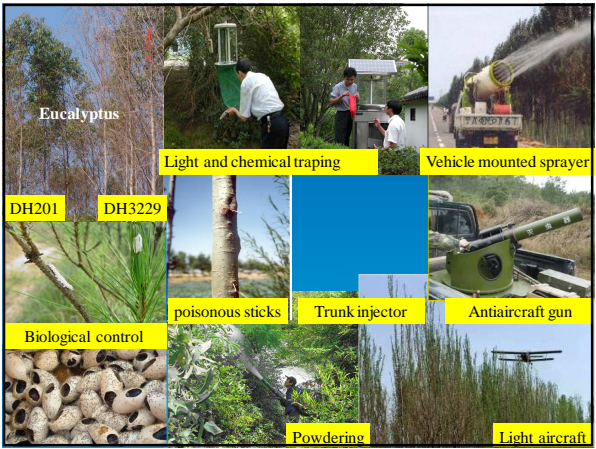
## Fumigation and Burning for rapid response



Red palm weevil



指定疫木除害处理厂  
Authorized place for  
treatment of infested wood



### 3.4 Other Related activities

- Training
- Scientific research
- International co-operation
- Propaganda and Publicity

4

### 3.4.1 开展技术培训 Training

- 业务培训 Professional training
- 管理培训 Management training
- 培训农民 Training for farmers



### 3.4.2 加强科学研究 Scientific research



近年来，陆续开展了重大林业有害生物风险评估技术、松树线虫病快速检疫技术、杨树蛀干害综合治理技术、信息素技术和林业有害生物远程诊断和专家系统的开发等多项课题研究，这些研究在一定程度上促进了中国林业有害生物监测预警工作的开展。

In recent years, several scientific research projects were carried out, including *Pest Risk Assessment against Major Forest Pests*, *Quick Quarantine Technique of Pine Wilt Disease*, *Integrated Control Technique of Poplar Boring Pests*, *Pheromone Attracting Techniques*, *Remote Diagnosis and Expert-auxiliary System* etc. These projects have promoted the development of early warning against forest pest greatly.

### 3.4.3 国际交流与合作 International exchange and co-operation



- 亚太地区林业外来有害生物防范协作网  
Aisa-pacific network against invasive forest pest
- 中美森林健康试点项目  
Sino-America Co-operation project on forest health
- 中德西部地区主要森林病虫害监测技术项目  
Sino-Germany Co-operation project on monitoring technique against main forest pests
- 引进森林鼠害环保型毒饵增效诱捕器技术  
Introduced techniques of efficiency-increased forest rodent attractor with environment-friendly poisonous attractant
- 引进轻型飞机防治与监测技术  
Introduced techniques of forest pest monitoring and control with professional lightplane
- 引进红脂大小蠹引诱剂技术  
Introduced techniques of monitoring and control against *Dengrotonus valens* leConte with attractant
- 引进椰心叶甲天敌——椰甲截脉姬小蜂和椰扁甲啮小蜂繁殖技术  
Introduced artificially rearing techniques of *Asecodes hispinarum* and *Tetrastydchus brontispa*, the natural enemies of *Brontispa longissima* (Gestro)



Asia-Pacific International Conference on Invasive Forest Pest



### 3.4.4 加强宣传 Public awareness



## 4. Cooperation field 需要加强合作的领域

- ❑ **Techniques: pheromone attractant, Remote sensing, Aerophoto ----- On early detection and rapid response techniques**  
适用的林业有害生物监测技术。如引诱剂、航空遥感和航空勾绘等。
- ❑ **Information: Establishing international communion of forest pest information to improve the ability of emergent reaction against invasive pest**  
建立国际间的林业有害生物信息共享机制，增强对外来有害生物的应急处理能力。
- ❑ **Research on some important species: Establishing international co-operating research on invasive forest pest to reduce possible damage**  
对已传入的外来有害生物，建立国际间的合作研究，减少可能造成的危害。
- ❑ **Risk assessment: Research on forest pest risk assessment and establishing effective early warning system to prevent invasive pests.**  
开展国际之间的林业有害生物风险评估研究，建立预防外来有害生物的早期预警系统。

# Thank You!

