



Work Progress Update

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Sino-France Joint Laboratory for Invasive Forest Pests in Eurasia

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1 Alien insects in Europe and China

1.1 Pests of European trees in China : Literature Records

➤ **2018-2019 : We systematically sorted out European tree species introduced in China and the recorded pests of them.**

85 European tree species (woody plants) in China

13 coniferous species, 72 broadleaf species

32 (of 85) tree species have pest records in China

233 pest insect species

142 (of 233) pest insect species are not distributed in Europe.



➤ 1.1 Results — European tree species

- ✓ **85 European tree species (woody plants)** in China
- **13 coniferous species, 72 broadleaf species**
- Distributed in the botanical gardens and urban gardens.



Oriental plane

三球悬铃木

Platanus orientalis



Sweet cherry

欧洲甜樱桃

Cerasus avium



Oleander

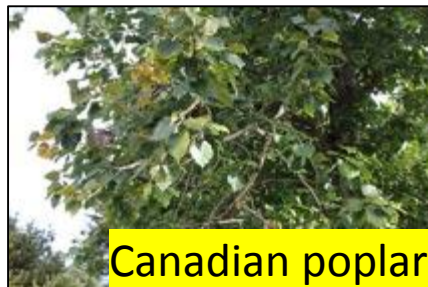
欧洲夹竹桃

Nerium oleander



地中海荚蒾

Viburnum tinus



Canadian poplar

加杨

Populus X canadensis



Olive

木犀榄

Olea europaea



月桂

Laurus nobilis

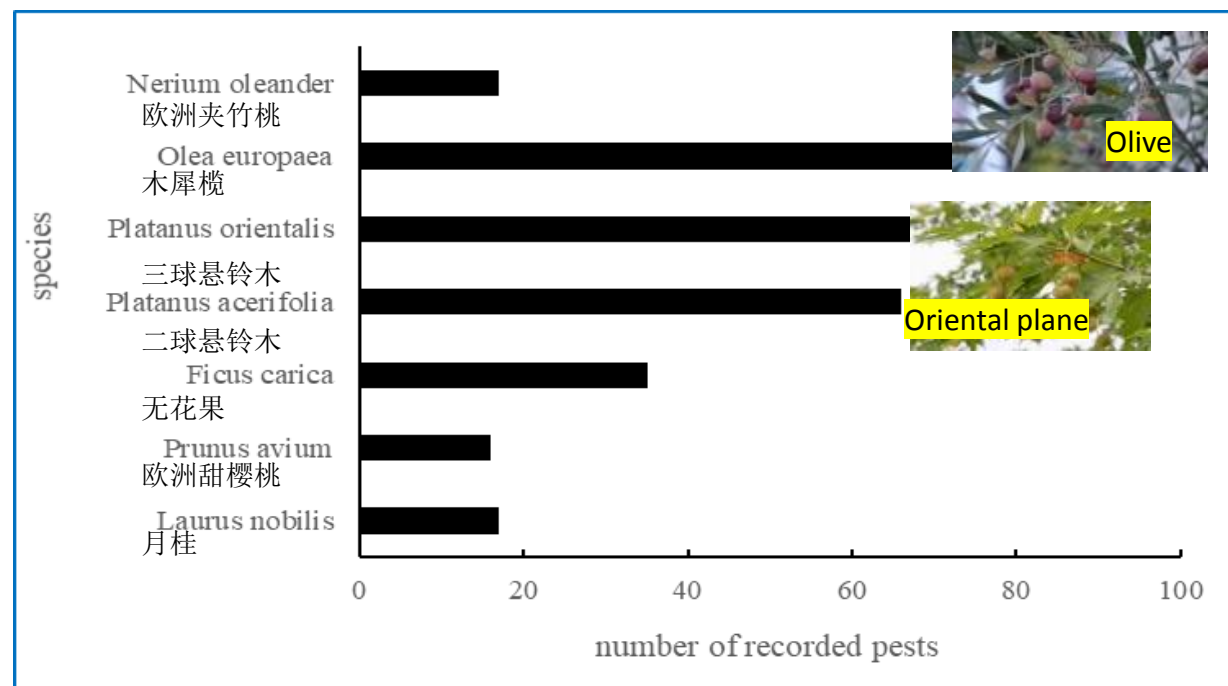
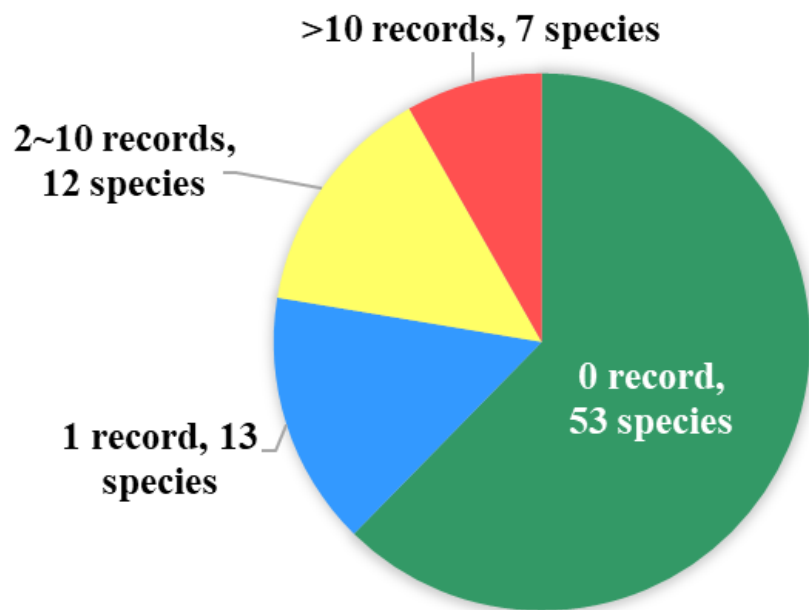


洋常春藤

Hedera helix

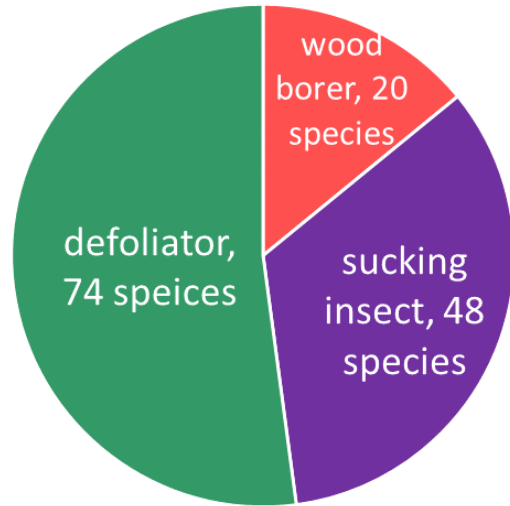
➤ 1.1 Results — Pest species

- ✓ **32 (of 85)** tree species have pest records in China.
- **233 pest insect species** and **60 diseases**
- **7 tree species** with more than **10 pest records**
- The scientific names of many pathogens have **changed greatly**.

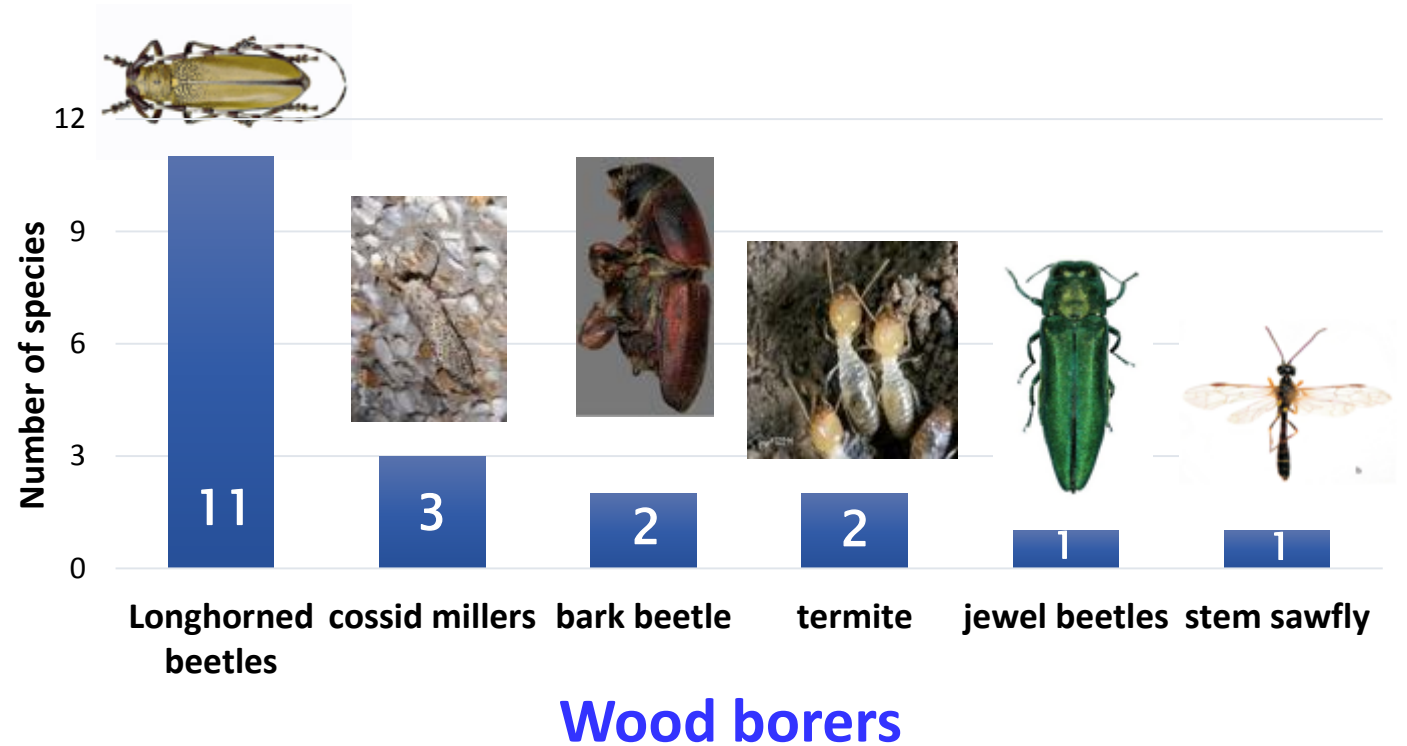


Top 7

➤ 1.1 Results — Insect Pest Species



142 species



- **142 (of 233) pest insect species are not distributed in Europe.**
- ✓ **Defoliator accounts for nearly a half of all the pest species.**
- ✓ **Longhorned beetles accounts for a large proportion of wood borers.**

1 Alien insects in Europe and China

1.2 Pests of European trees in China : Botanical Garden Survey

- **2019-2021** : occurrence of pests in European trees was investigated in several botanical gardens in China.

Few European trees and almost no pests

Damage symptoms but no insect (Chemical control, insect life history)

Noteworthy species: *Erthesina fullo* (Yellow spotted stink bug), found on *Aesculus hippocastanum*, *Ostrya carpinifolia*, *Tilia platyphyllos*, *Quercus robur* trees in Shanghai Chenshan Botanical Garden.



4 botanical gardens with more than 20 European tree species



**Kunming Botanical
Garden, 21 species**



**Beijing botanical garden
(southern and northern),
41 species**



**Shanghai Chenshan Botanical
Garden, 35 species**



**Nanjing Botanical Garden,
21 species**



5 botanical gardens were visited.

2 are suitable for surveys (vast species, similar latitude, climate with Europe)

Beijing botanical garden



- Institute of Botany, CAS.
- ✓ **Founded in 1956 with a display area of 0.7 Ha.**
- ✓ **Nearly 6000 plant species and varieties.**

- ✓ **Search for European tree species and locating them with GPS.**
- ✓ **Surveys were conducted per month (May-September).**

1.2 Result

- ✓ **12** (of 41, Botanical catalogue) European tree species are located.
- Not all trees are labeled which makes it difficult for species recognition.



欧洲黑松
Pinus nigra

欧洲云杉
Picea abies

欧洲白榆
Ulmus laevis

欧洲七叶树
*Aesculus
hippocastanu*

心叶椴
Tilia cordata



西洋接骨木
*Sambucus
nigra*

欧椴
*Fraxinus
excelsior*

欧丁香
*Syringa
vulgaris*

欧洲荚蒾
*Viburnum
opulus*

欧榛
*Corylus
avellana*

欧洲红端木
*Cornus
sanguinea*

洋常春藤
*Hedera
helix*

1.2 Result

Observed pests

Meimuna mongolica (Distant, 1881) 蒙古寒蝉



Viburnum opulus 欧洲荚蒾



Vibidia duodecimguttata 十二斑褐菌瓢虫
spore-feeding ladybug



developing into pupa.
一种螟蛾

➤ Shanghai chenshan botanical garden

- Founded in 2011 with 207 ha areas
- More than 10,000 living taxa have been collected
- A European plant area



- Surveys were conducted in July and August



The checklist of cultivated plants
of Shanghai botanical garden
2014

- the cultivation area of the plants.

1.2 Result

- **24 European tree species are located.**
- **5 coniferous species + 19 broad-leaved tree species**



欧洲赤松
Pinus sylvestris

欧洲黑松
Pinus nigra

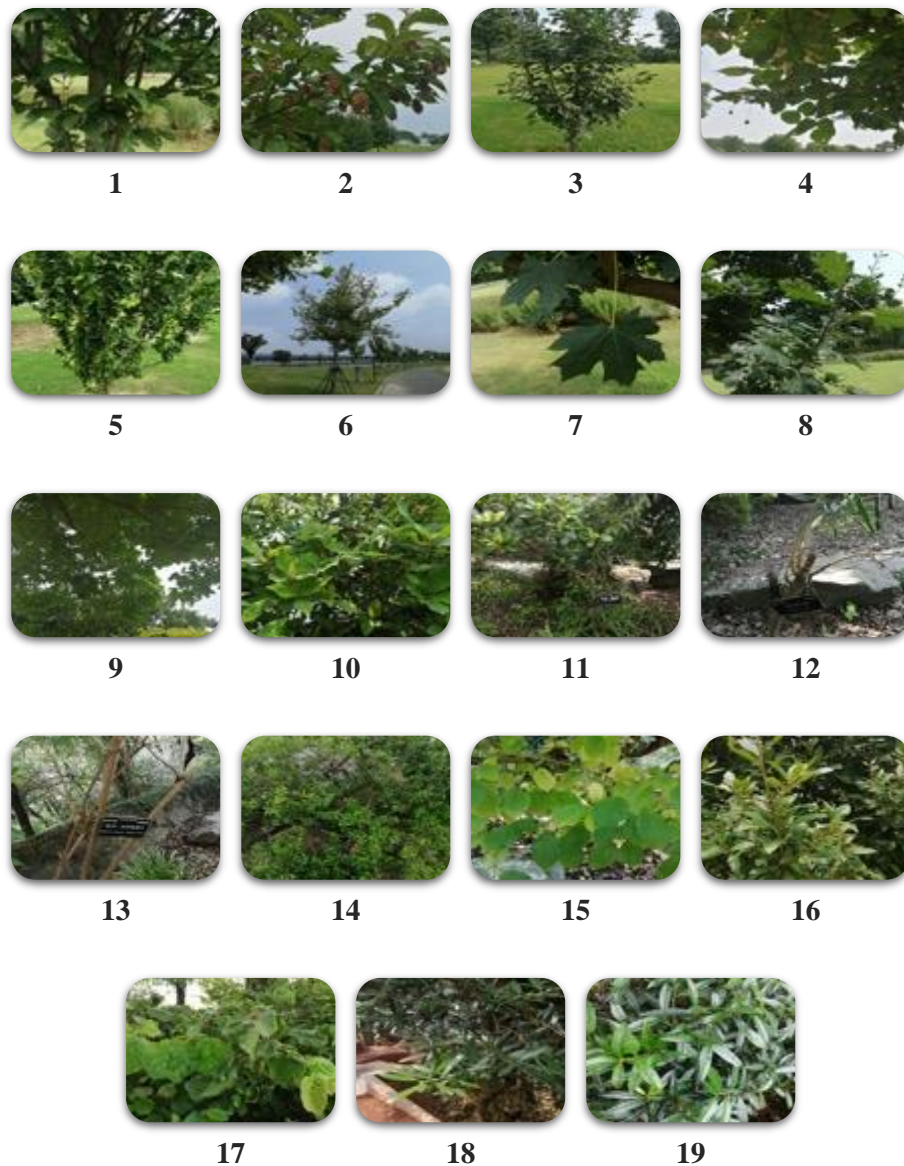
地中海柏木
Cupressus sempervirens

欧洲山松
Pinus mugo

欧洲红豆杉
Taxus baccata

- ❑ **No adult conifers in Shanghai chenshan botanical garden, probably because it was established for a short time.**

1.2 Result



✓ 19 broad-leaved tree species

No	Species	中文
1	<i>Carpinus betulus</i>	欧洲鹅耳枥
2	<i>Ostrya carpinifolia</i>	欧洲铁木
3	<i>Tilia cordata</i>	心叶椴
4	<i>Tilia platyphyllos</i>	阔叶椴
5	<i>Ulmus×hollandica</i>	荷兰榆
6	<i>Platanus orientalis</i>	三球悬铃木
7	<i>Acer campestre</i>	栓皮槭
8	<i>Quercus robur</i>	夏栎
9	<i>Aesculus hippocastanum</i>	欧七叶树
10	<i>Viburnum tinus</i>	地中海荚蒾
11	<i>Arbutus unedo</i>	草莓树
12	<i>Nerium oleander</i>	欧洲夹竹桃
13	<i>Sambucus racemosa</i>	总序接骨木
14	<i>Myrtus communis</i>	香桃木
15	<i>Cornus sanguinea</i>	欧洲红端木
16	<i>Laurus nobilis</i>	月桂
17	<i>Corylus avellana</i>	欧榛
18	<i>Olea europaea</i>	油橄榄
19	<i>Prunus laurocerasus</i>	桂樱

1.2 Result

Observed pests



詹凯翔图



Most of the cases

It's hard to know what the insects are because they have left.

Observed on many trees!

Erthesina fullo (Thunberg, 1783)
Yellow spotted stink bug

Aesculus hippocastanum 欧洲七叶树

Ostrya carpinifolia 欧洲铁木

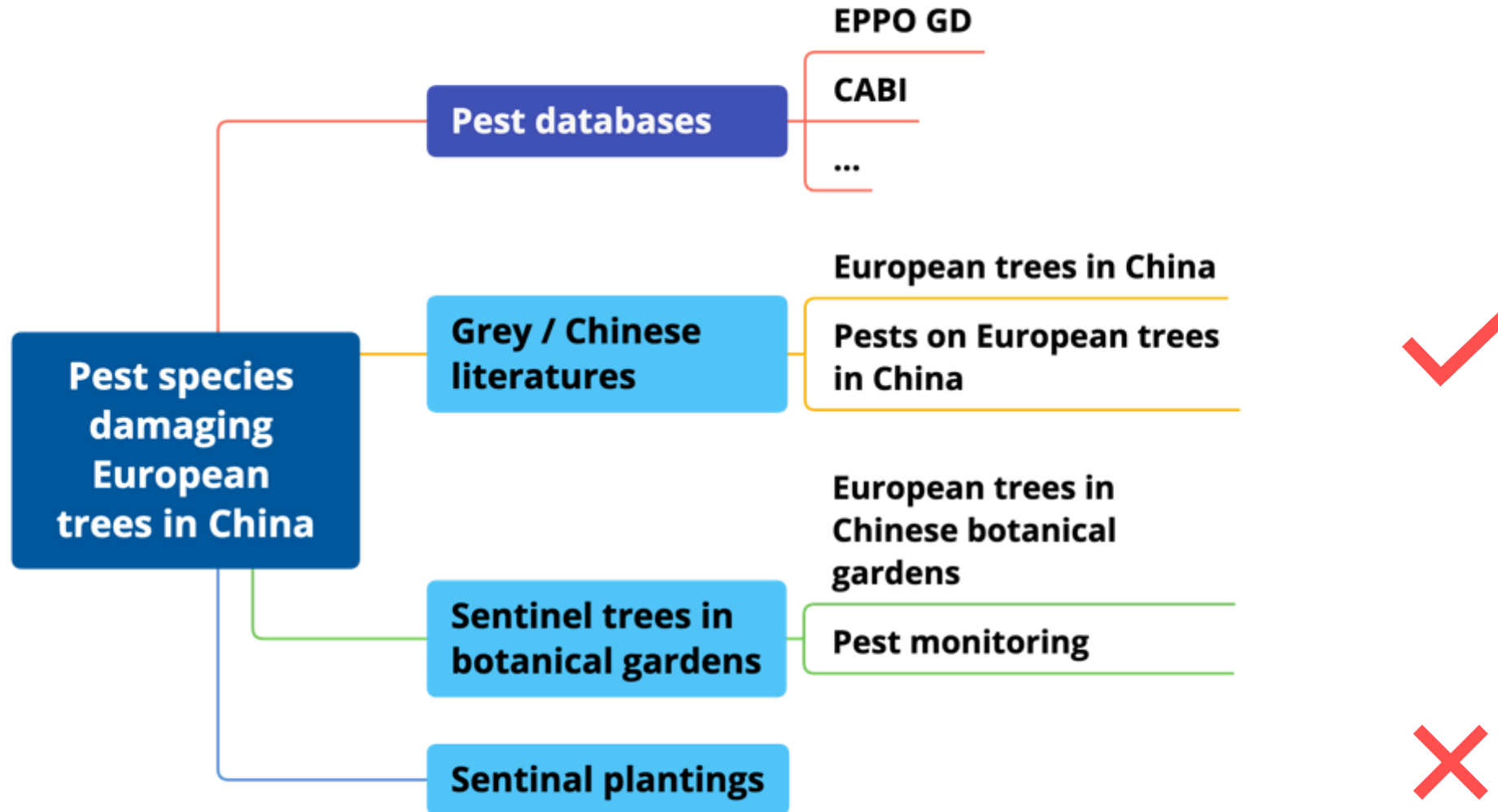
Quercus robur 夏栎

What can we do next for Europe?

- **There are few pests in botanical gardens.** ✗
 - There are few European trees in Chinese botanical gardens. Only Shanghai Chenshan Botanical Garden has a European plant garden.
 - The work of the botanical garden will no longer be carried out.
- **Import of European trees** ✗
 - Biosafety law, import restriction on host plants of *Phytophthora ramorum*, Management organization and personnel changed.
 - Difficult to achieve.
- **Literature records of European trees' pests in China are good resources.** ✓
 - Maybe we can publish a data paper, **evaluating the availability of data, and do some risk assessment work.**

Potential forest insects which invade Europe from China (Alternative plan for Sentinel plantings)

What we have done



How can China use sentinel trees?

- **2022 : Published a Chinese review on sentinel trees**



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World Forestry Research

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- **Survey in imported nurseries abroad.**
- **Sentinel botanical gardens and IPSN (International Plant Sentinel Network).**
- **Information collection on pests of Chinese trees abroad.**

Research Progress on Sentinel Trees Warning Potential Invasive Forest Pests

Xu Qinwang Ren Lili Luo Youqing

(Beijing Key Laboratory for Forest Pest Control, Beijing Forestry University / Sino-French Joint Laboratory for Invasive Forest Pests in Eurasia, Beijing Forestry University - French National Research Institute for Agriculture Food and Environment (INRAE), Beijing 100083, China)

Abstract: Invasive forest pests have severely occurred on a global scale, and it is difficult to carry out early prevention. Many countries have researched sentinel trees with the aim to identify and warn potential pests, having made sure progress in recent years. Sentinel trees refer to a type of trees that investigate and monitor pests' occurrence in high-risk areas to provide early warning information of pests. It mainly researches by using the existing introduced trees in the botanical gardens and by introducing and planting trees. Sentinel tree research can be divided into sentinel plantings, sentinel nurseries, sentinel botanical gardens according to research purposes and methods. Representative studies of sentinel trees include the planting of European and imported trees in global high-risk areas by Europe, the monitoring of New Zealand trees introduced by overseas botanical gardens by New Zealand, and the International Plant Sentinel Network established by the Botanical Garden Conservation International. This paper aims to introduce the concept of sentinel tree, summarize the research status, and look forward to the research prospect, hoping to enlighten the establishment of the early prevention and early warning system for invasive forest pests in China.

Keywords: early warning, invasive forest pest, biological invasion, plant quarantine, botanical garden

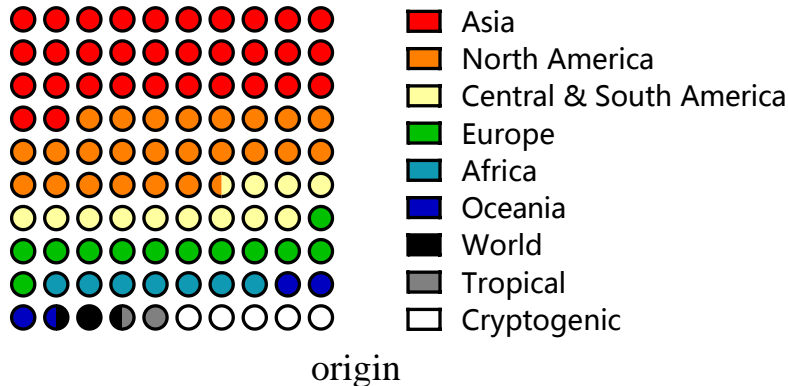
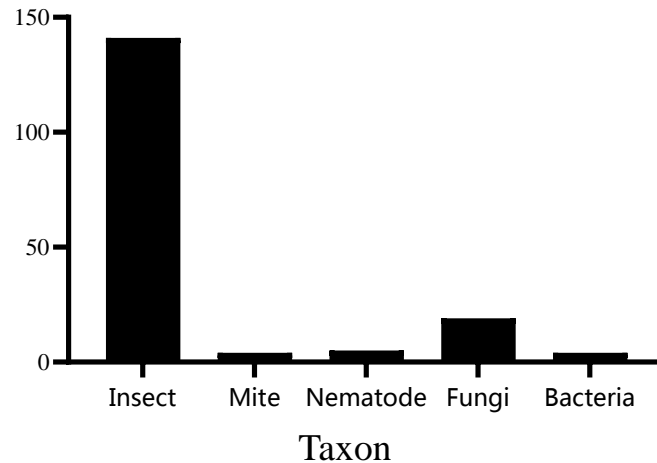
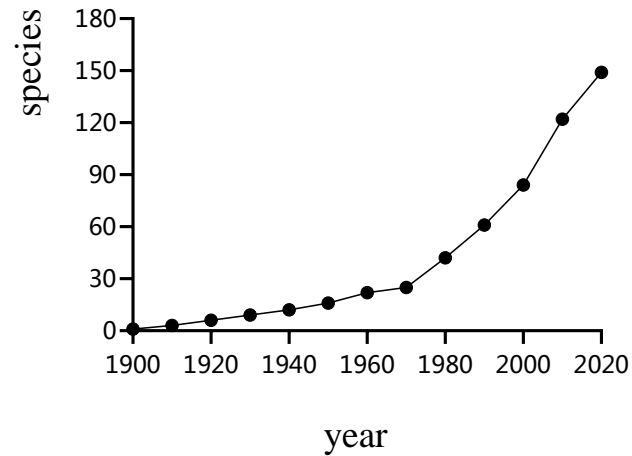
All are difficult to implement.

Alien forestry pests and risk prioritization (Qingwang XU)

Alien forestry pests in China



PRA and risk prioritizing



Multi-index and semi-quantitative Chinese PRA standard

Risk pre-assessment
172 species

5 indicators, meet 3 indicators going on for further evaluation
Distribution, possibility of invade establish and spread, potential damage, hosts importance, management difficulty.

Risk assessment

Score calculation for 15 indicators
14 species

Important species

11 species

Alien forestry pests and risk prioritization (Qingwang XU)

Two manuscripts are working on together.

- **Checklist and introduction characteristics of invasive insect pests in forest and grassland ecosystems of the Chinese mainland.**
- **Screening and assessment of global forest insect pests based on horizon scanning.**

2 Multi-lure Trap progress in China

2.1 Trapping sites information

Which lures expected for a generic attractiveness?

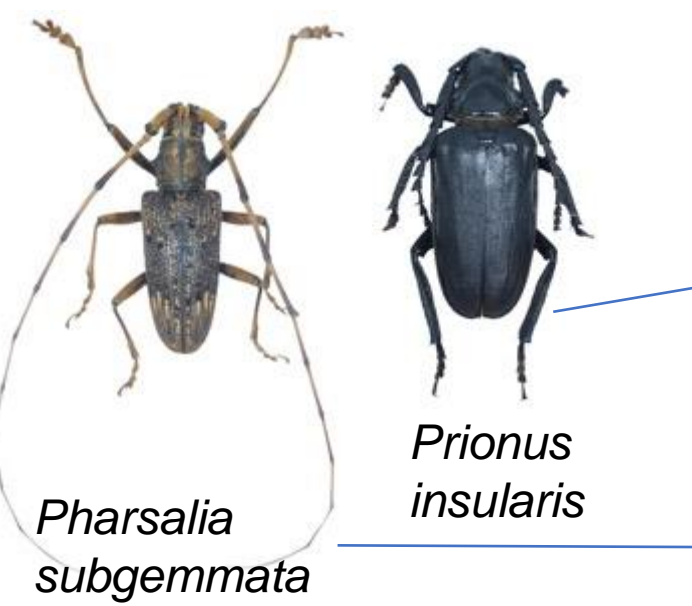
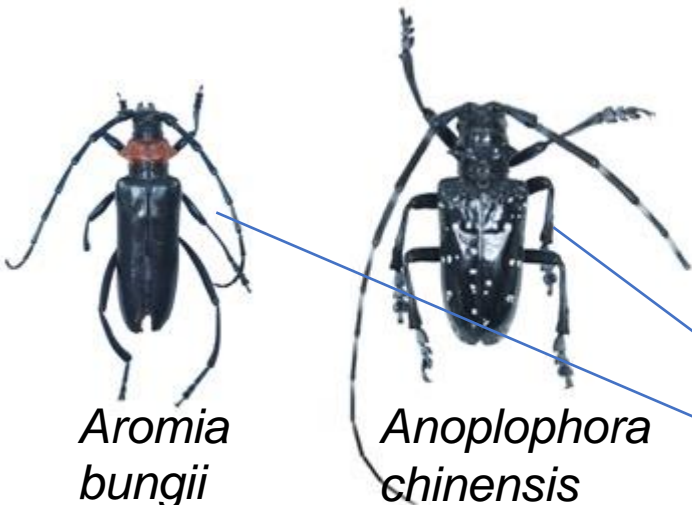
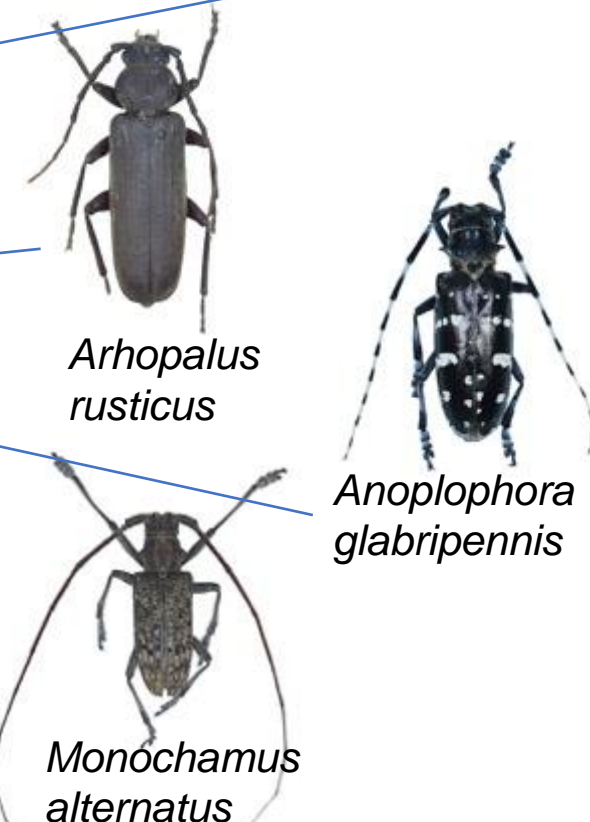
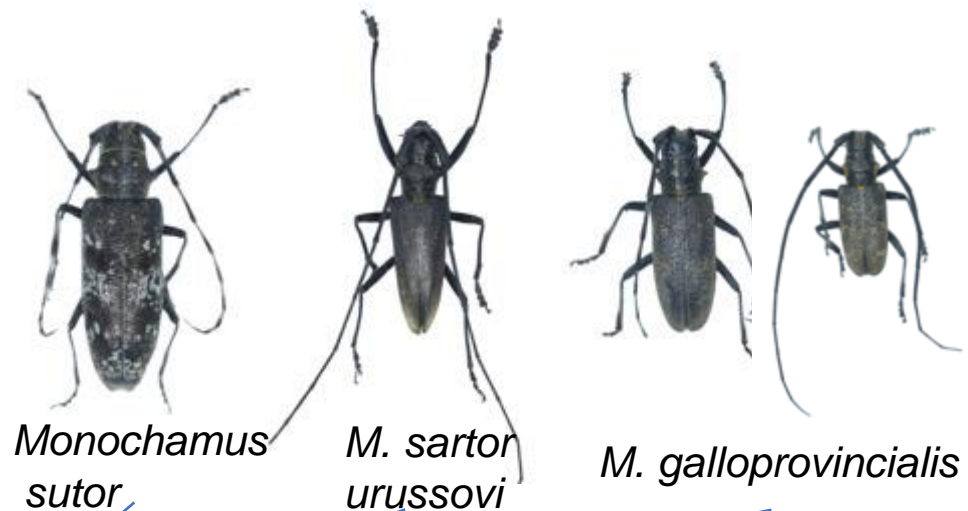
At first, for cerambycids

- *Selet a 8/10- component blend, complemented with α -pinene and Ethanol to do experiments during 2019-2022 in Chinese forests. We have 18 sites in 2022.*

2022 Site	Hebei, Saihanba	Hebei, Mulan Paddock	Liaoning, Fushun	Zhejiang, Fuyang	Yunnan, Kunming	Inner Mongolia, Helihe	Inner Mongolia, Jiagedaqi	Jiangxi, Deixing	Jiangxi, Quannan	Hunan, Changsha	Beijing, Jiufeng	Shandong, Yantai
Traps	3 multifunnels traps	3 multifunnels traps	3 multifunnels traps	3 multifunnels traps	3 multifunnels traps	3 multifunnels traps	3 multifunnels traps	3 multifunnels traps	3 multifunnels traps	3 multifunnels traps	3 multifunnels traps	3 multifunnels traps
Progress	2 packages (2022.7~9)	2 packages (2022.7~9)	5 packages (2022.6~9)	3 packages (2022.7~9)	1 packages (2022.7~9)	1 packages (2022.7~9)	3 packages (2022.7~9)	1 packages (2022.7~9)	2 packages (2022.5~9)	3 packages (2022.6~9)	3 packages (2022.6~2022.10)	1 packages (2022.7~10)(代存)
2022 Site	Gansu, Zhangye	Gansu, Lanzhou	Hainan	Guangxi	Guangdong, Guangzhou	Xinjiang Uygur Autonomous Region						
Traps	3 multifunnels traps	3 multifunnels traps	9 multifunnels traps	3 multifunnels traps	6 multifunnels traps	3 multifunnels traps						
Progress	?	?	?	2 packages (2022.7~9)	1 packages (2022.7~9)	?						

58 species of cerambycids trapped in forests over last 2 years ...

- **PWN vector in all forests (1244 specimens !)**
- ***Arhopalus rusticus*** in 8 forests (464 specimens in total, 247 specimens in Weihai)
- **6 species of Clytini tribe** was trapped in Fushun, Niaoning Province



➤ Site in Zhejiang for example



突尾材小蠹 *Xyleborus amputatus*

削尾材小蠹 *Xyleborus mutilates*

小粒材小蠹 *Xyleborus saxeseni*

Annual Review of Entomology

Early Monitoring of Forest Wood-Boring Pests with Remote Sensing

Youqing Luo, Huaguo Huang, Alain Roques*Annual Review of Entomology*

Early Monitoring of Forest Wood-Boring Pests with Remote Sensing

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Keywords

forest insects, wood-boring pests, remote sensing, early detection, unmanned aerial vehicle, UAV, satellite

Abstract

Wood-boring pests (WBPs) pose an enormous threat to global forest ecosystems because their early stage infestations show no visible symptoms and can result in rapid and widespread infestations at later stages, leading to large-scale tree death. Therefore, early-stage WBP detection is crucial for prompt management response. Early detection of WBPs requires advanced and effective methods like remote sensing. This review summarizes the applications of various remote sensing sensors, platforms, and detection methods for monitoring WBP infestations. The current capabilities, gaps in capabilities, and future potential for the accurate and rapid detection of WBPs are highlighted.



**Seven mitochondrial genomes of Tribe Hylurgini (Coleoptera:
Curculionidae: Scolytinae) in Eurasia and their phylogenetic analysis**

Na An; Yuan Yuan ; Lili Ren; Alain Roques; You-qing Luo

Hylurgini (Coleoptera: Curculionidae: Scolytinae), contains 13 genera:

- *Chaetoptelius*
- ***Dendroctonus* (Invasive and Native species)**
- *Dendrotrupes*
- *Hylurdrectonus*
- *Hylurgonotus*
- *Hylurgopinus*
- ***Hylurgus* (non-Native species in China, and Native species in Europe)**
- *Pachycotes*
- *Pseudohylesinus*
- *Sinophloeus*
- ***Tomicus* (Native species)**
- *Xylechinosomus*
- *Xylechinus*

Those 3 Genus are all of great ecology and economy importance in China.

Sampling Species

Table1

Collection information of Tomicini species in this study

Name	Location	longitude	latitude	Accession number
<i>Dendroctonus valens</i>	Heilihe National Nature Reserve, Inner Mongolia			OP651189
<i>Hylurgus ligniperda</i>	coastal shelterbelt in Moping District, Yantai City, Shandong Province	121.851217	37.457241	OP651193
<i>Hylurgus micklitzii</i>	Le Thoronet, France			OP651194
<i>Tomicus brevipilosus</i>	Ninger Hani and Yi Autonomous County, Pu 'er City, Yunnan Province	101.238255	22.964431	OP651191
<i>Tomicus minor</i>	Pupeng Town, Xiangyun County, Dali Bai Autonomous Prefecture, Yunnan Province	100.915525	25.315671	OP644291
<i>Tomicus piniperda</i>	coastal shelterbelt in Moping District, Yantai City, Shandong Province	121.851217	37.457241	OP651192
<i>Tomicus yunnanensis</i>	Anaconda Pit, Panlong District, Kunming City, Yunnan Province	102.882109	25.202455	OP651190



T. brevipilosus



T. minor



T. piniperda



T. yunnanensis



Hylurgus ligniperda



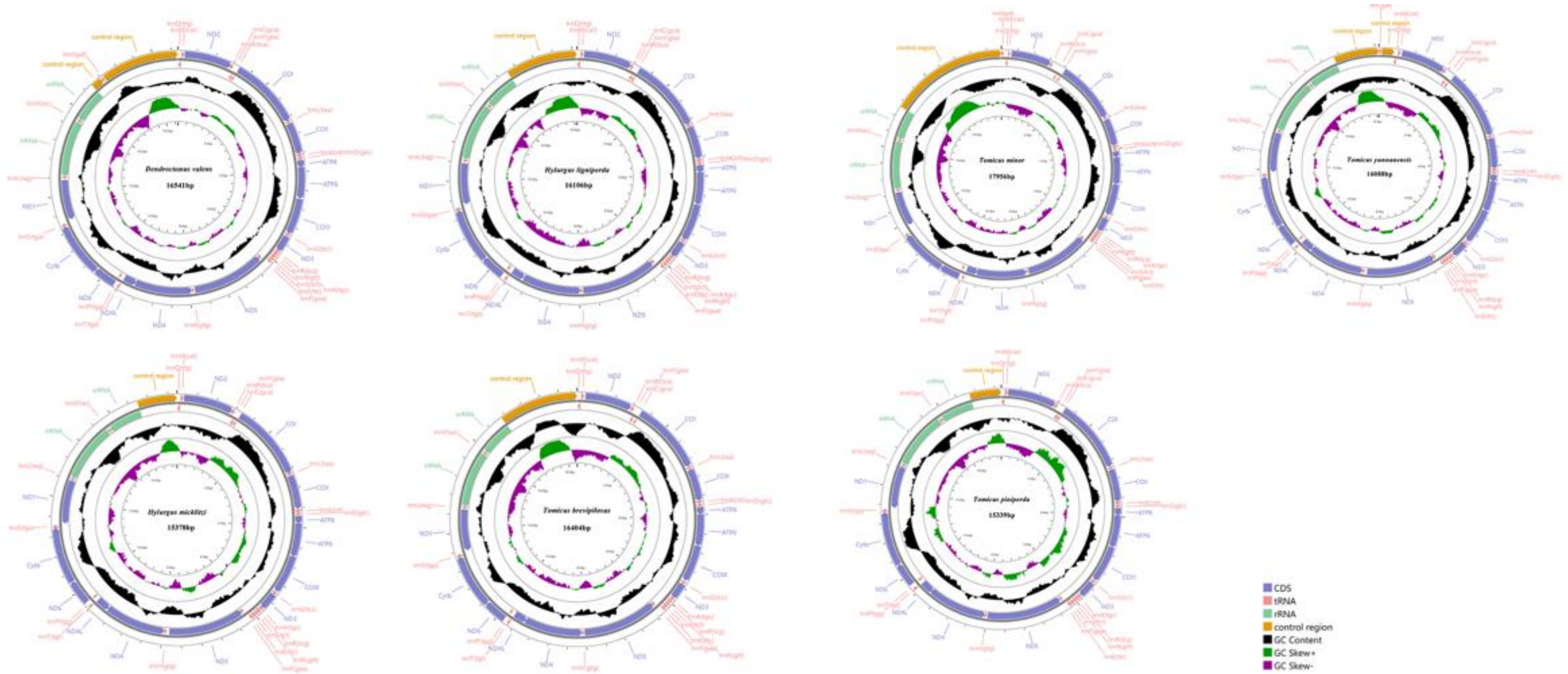
Hylurgus micklitzi



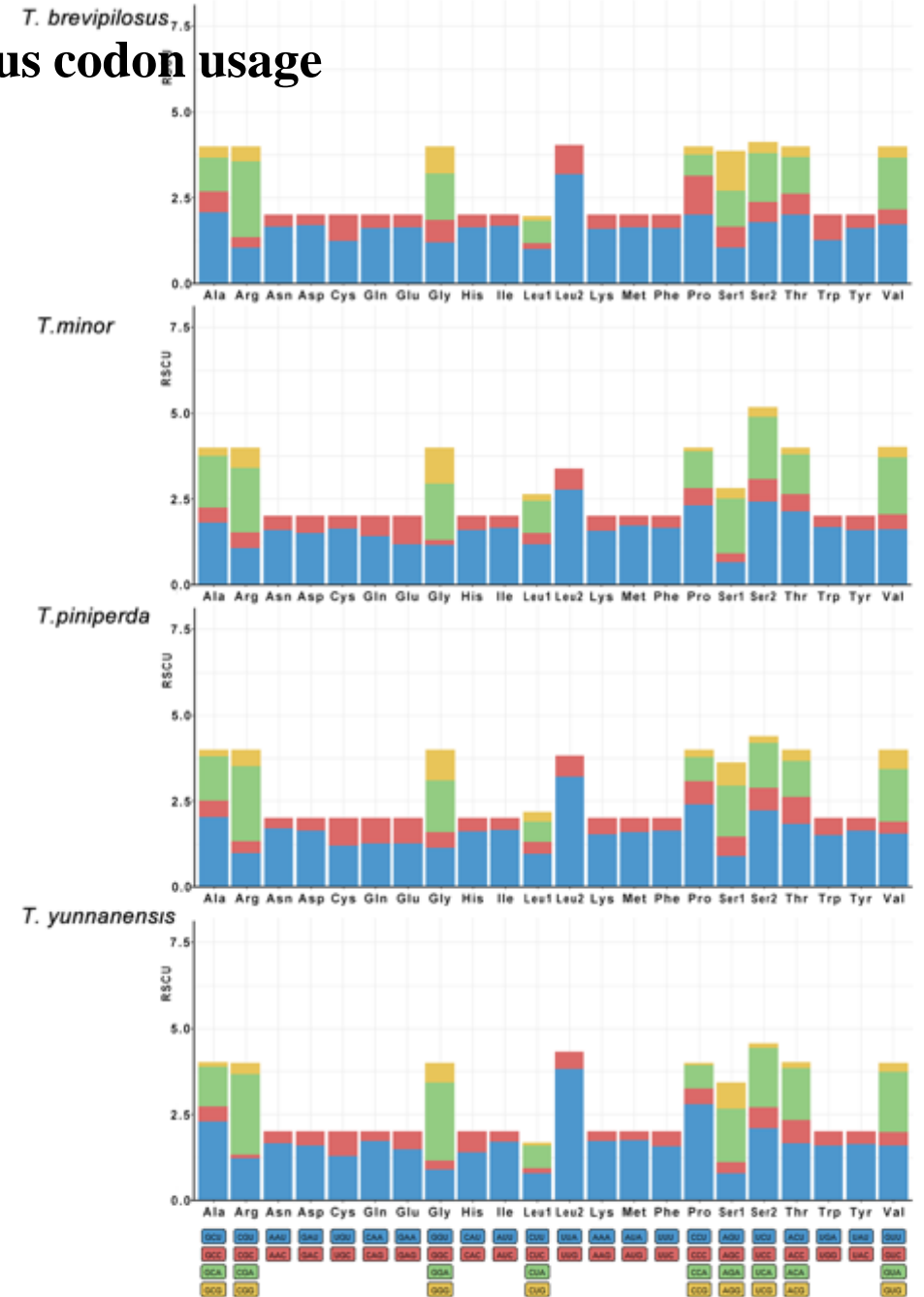
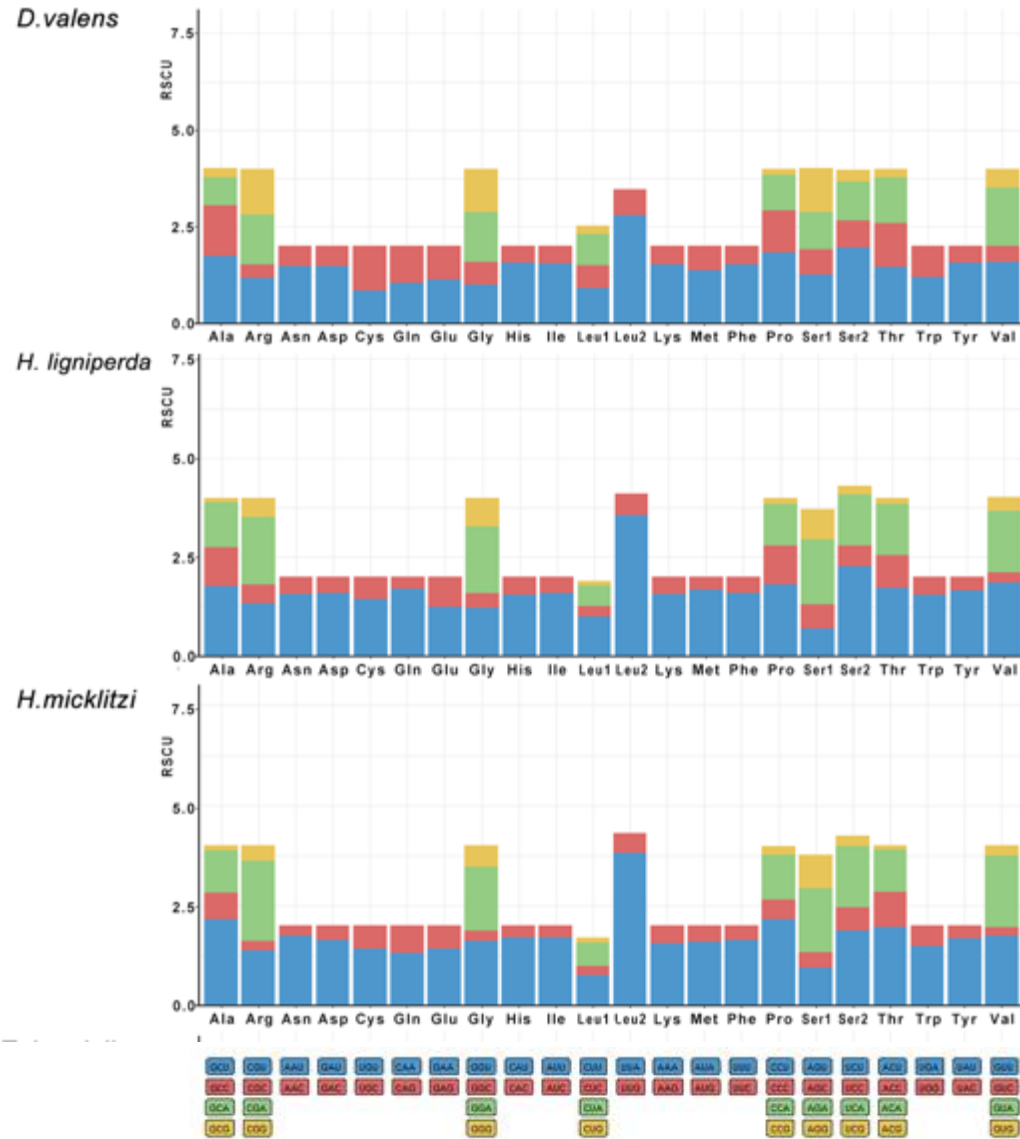
Dendroctonus valens



Mitochondrial genome structure and base composition of seven Hylurgini species

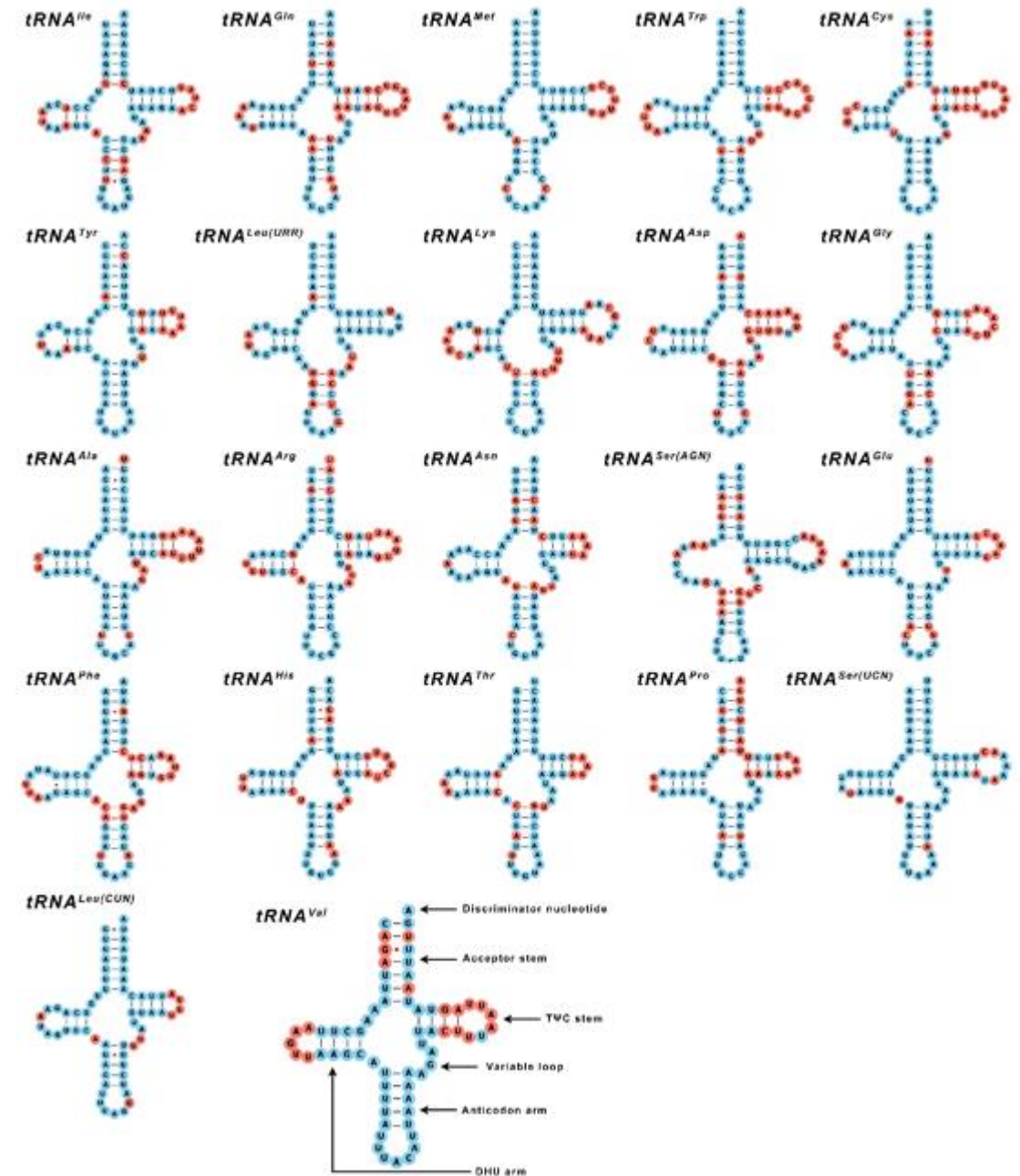


Mitochondrial protein-coding genes and relative synonymous codon usage



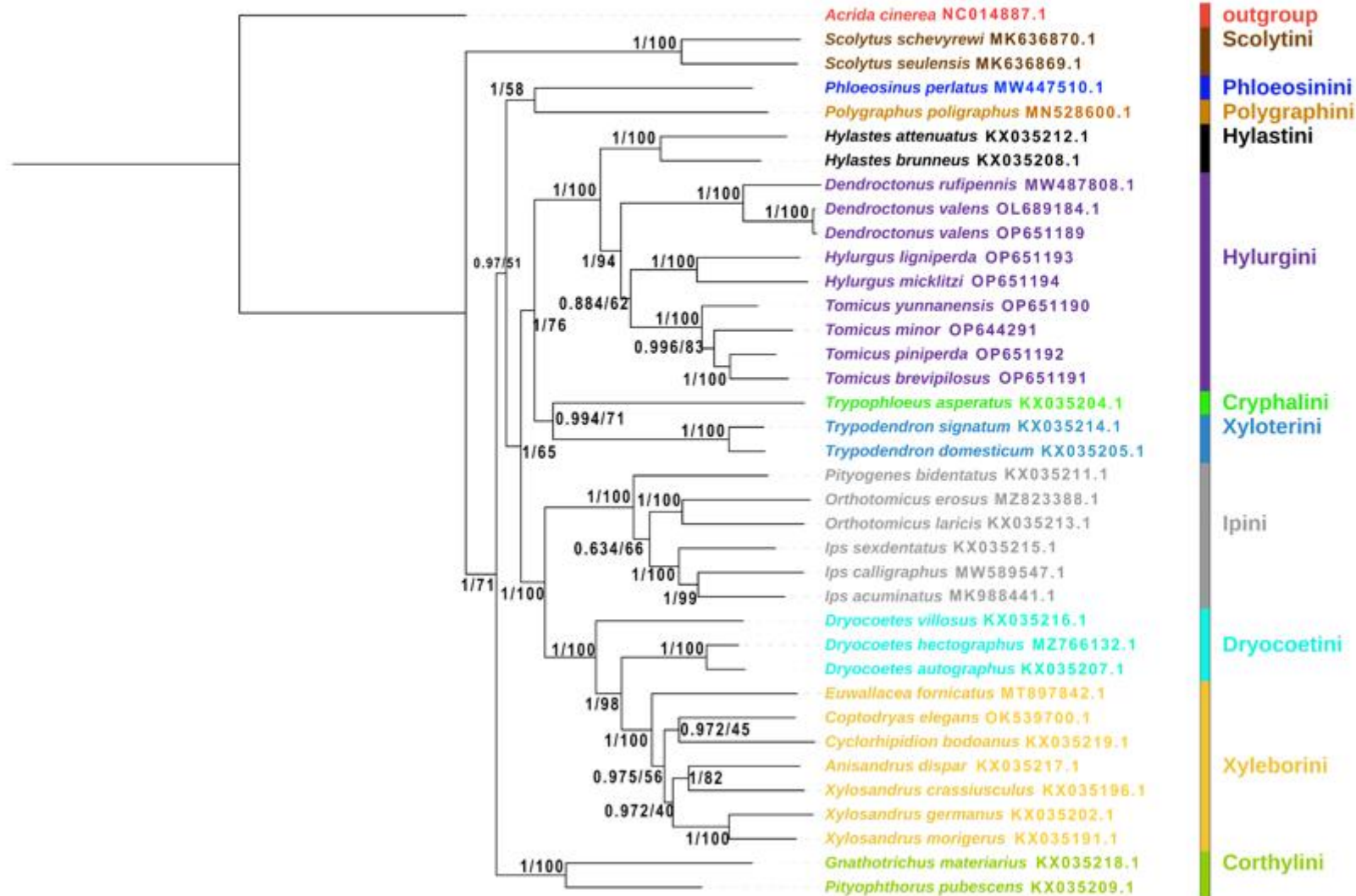
Secondary structure of 22 tRNA genes

- The length of tRNA genes ranged from 60 bp (*tRNA^{Cys}* of *D. valens*) to 71bp (*tRNA^{Lys}* of *D. valens*, *H. micklitzii*, *T. minor*, *T. brevipilosus*, *T. yunnanensis* and *T. piniperda*).
- The secondary structure of 21 tRNA genes was typical of cloverleaf, and only the *tRNA^{SER(AGN)}* was a typical in all of seven Hylurgini: lacking a dihydrouracil (DHU) arm.



Phylogenetic analysis

Tree scale: 1



- Phylogenetic tree constructed based on 13 protein-coding genes of the mitochondrial genomes.
- MrBayes 3.2.6 (Bayesian inference, BI) (Ronquist, 2012) & IQ-TREE (maximum likelihood, ML) (Nguyen, Schmidt, Haeseler, & Minh, 2014)

THANK YOU
for your attention !

Sino-France Joint Laboratory for Invasive Forest Pests in Eurasia

Jan. 18th, 2023, Beijing, China