Bee Diversity & Pollination Service in China

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China-U.S. Scientific Engagement on Sustainability: A Workshop Series Workshop I: Sustainability and

Outlines

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- Bees
- Pollination Services
- Challenges
- Bee Diversity Gap

2 Innovative Approaches

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- Provide More Services by Bees

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- Training Courses on Pollinators
- East China Program on Pollinators

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- Better Pollination Services
- Mapping Bee Diversity in China/SE Asia

Questions

1. How many wild bees are there in China?

2. What and how much pollination services can wild bees provide?

3. How can we protect wild bees and provide enough pollination services to secure food safety?

Major Challenges - Bees

Bees are the primary pollinators in different ecosystems.

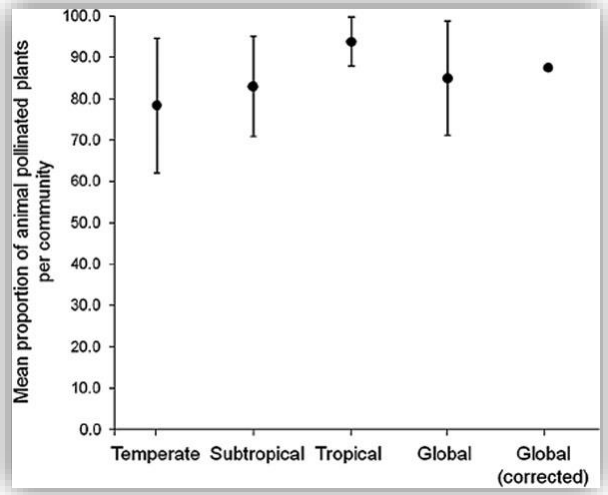
Major Challenges - Pollination Services

Source: https://www.mountaineers.org

Source: https://archive.shine.cn

natural ecosystems **cultivated ecosystems**

the most important pollinators



Source: https://www.nwf.org

- **They pollinate ~90% of all flowering plants that depend on pollination.**

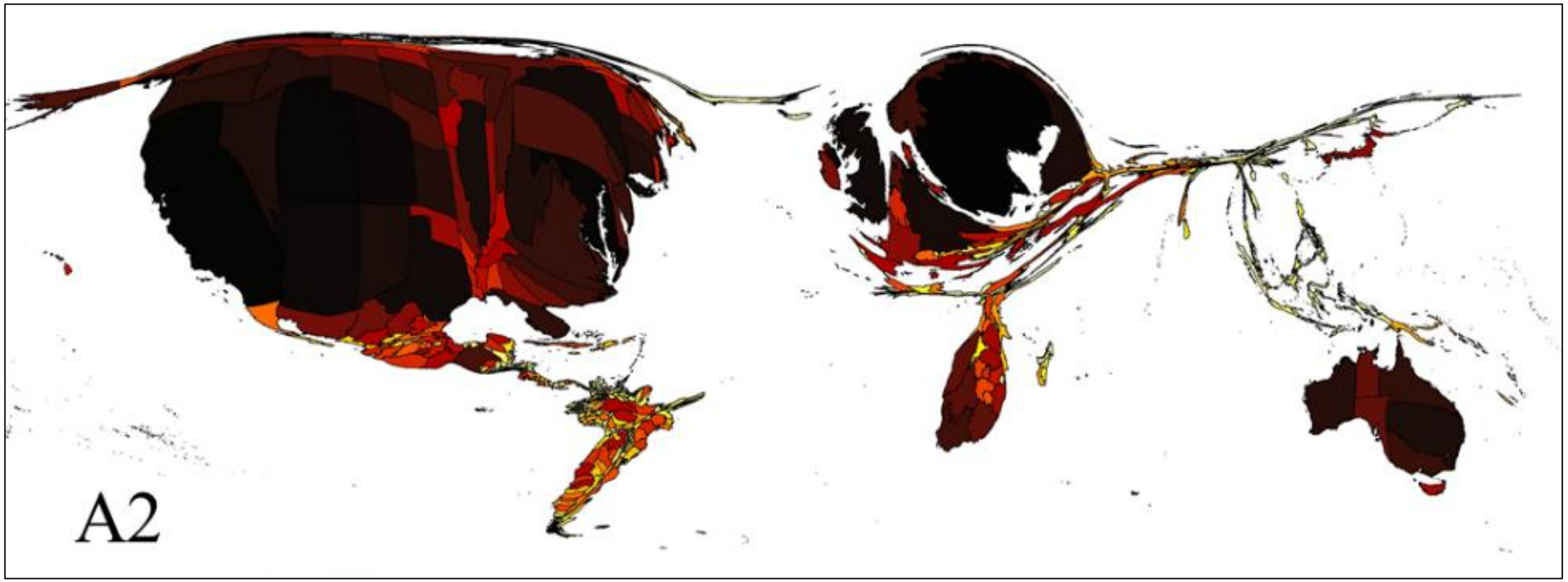
(Klein *et al*. 2007; Willmer *et al*. 2017; Ollerton *et al.* 2011)

Major Challenges

- Hand pollination is needed in some areas
- Too many pesticide/fertilizer inputs
- Land degradation/desertification threaten areas in Northern China
- Apple and other fruits will become less economically profitable
- Bees are in decline, while there are less taxonomists to provide basic information on bees

Major Challenges - Bee Diversity Data Gap

Bees are important, **however ?**

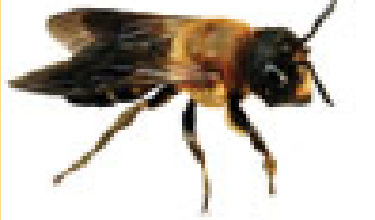


Huge bee diversity data gap exists between China and developed countries, before we can evaluate their status and services.

(Orr, *et al.*, 2021)

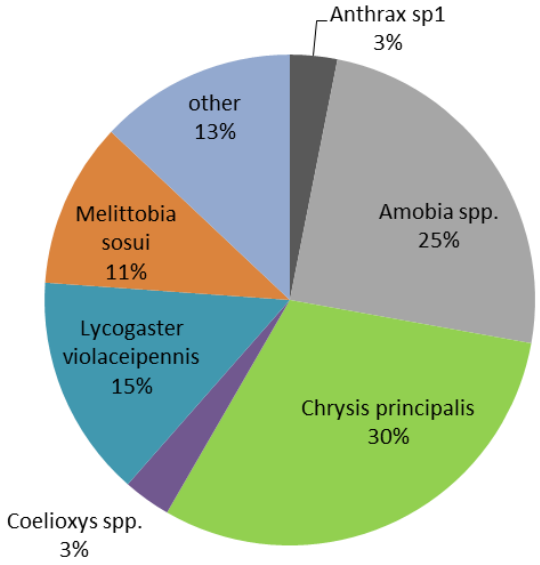
Innovative Approaches - Bee Diversity and Services

粗切叶蜂(传粉者)

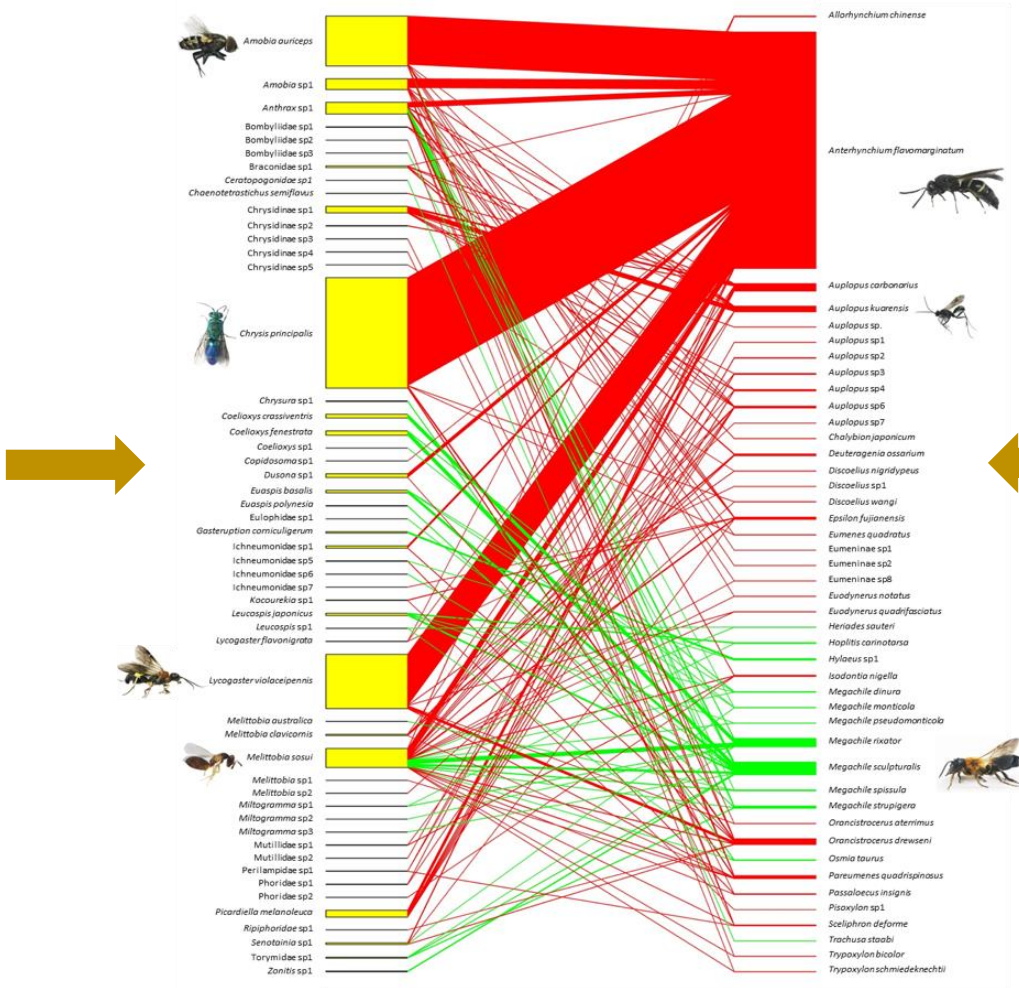


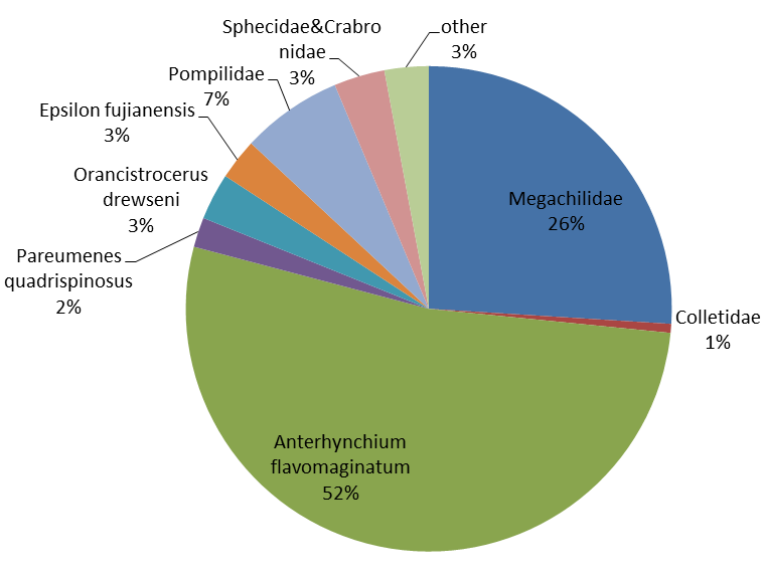
长尾小蜂(寄生蜂)

Innovative Approaches - Bee Diversity and Services



Parasitoids





Hosts

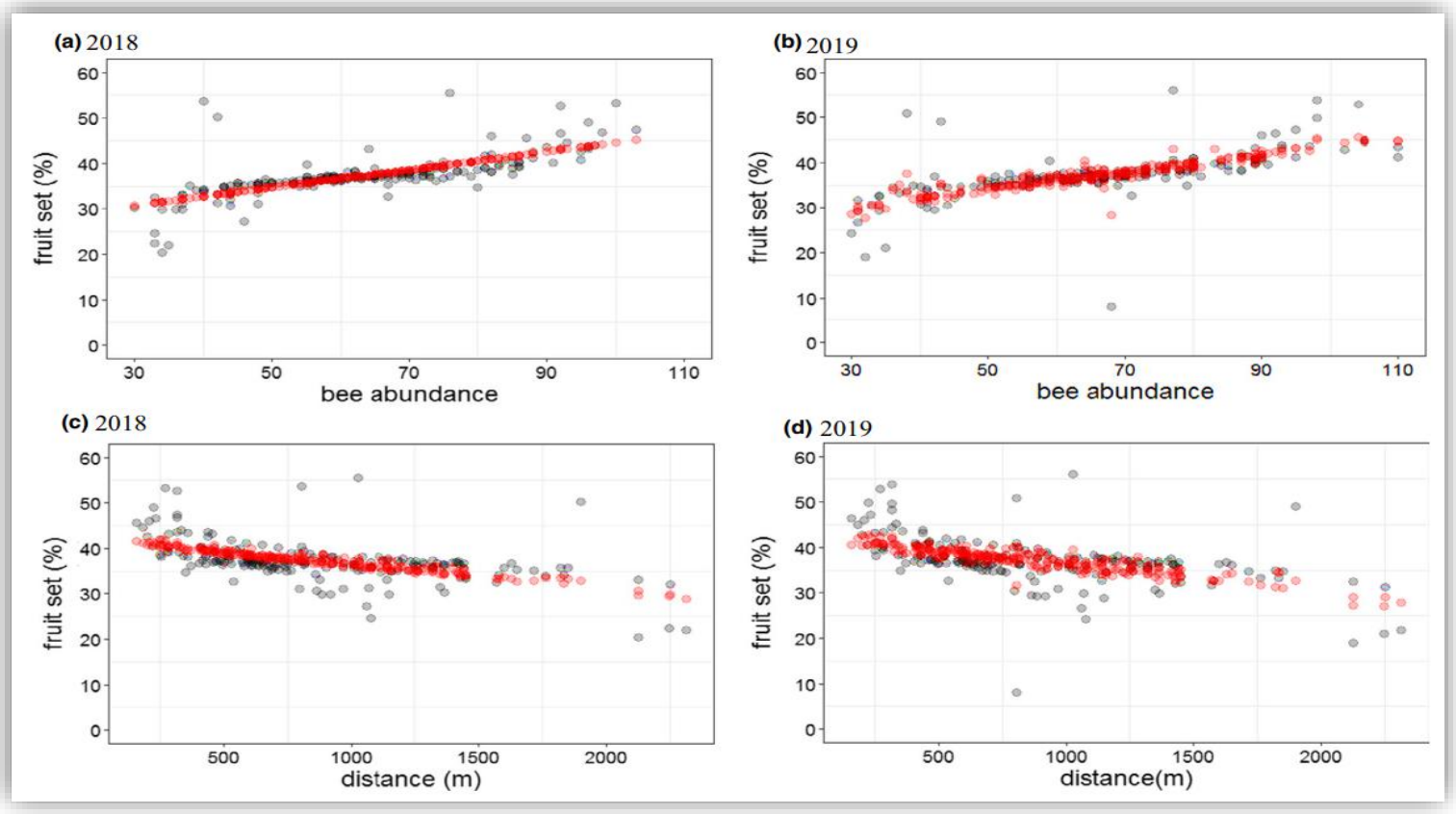
The network between hosts and parasitoids

Innovative Approaches - Protect Habitats for Native Bees

1. Native bees visiting *Camellia oleifera*

Innovative Approaches - Protect Habitats for Native Bees

1. Pollinator bees visiting *Camellia oleifera*



The positive relationships between wild bee abundance and fruit-setting of *Camellia*

FIGURE 3 Relationship between distance and bee abundance with fruit set, estimated as the number of fruit divided by the number of flowers at each tree. We marked 205 sample trees in the final analysis. Each dot represents several trees. The red points were the predicted values, and the black points were the measured values.

Innovative Approaches - Provide More Services by Bees

2. Pollination experiments on *Paeonia* spp.

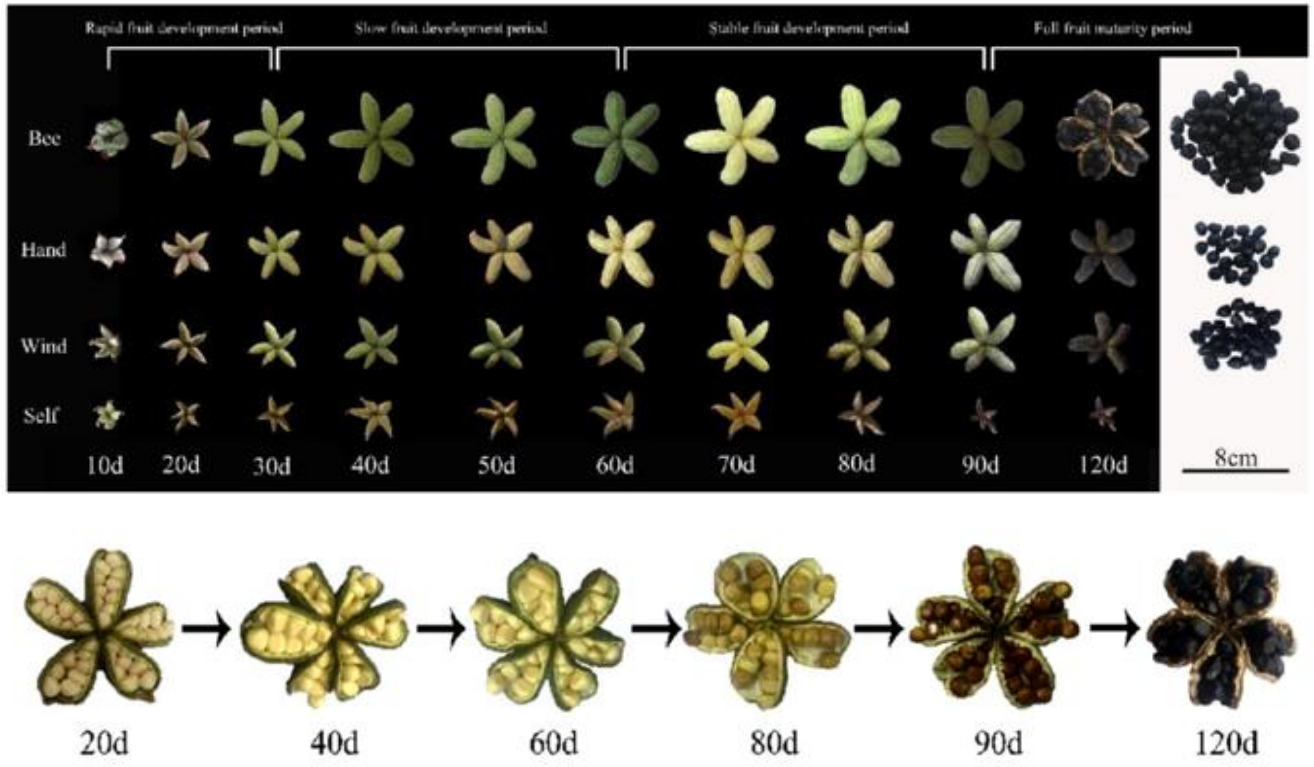
Oil peony (*Paeonia* spp.) is a new type of woody oil crop in China with a large cultivation area.

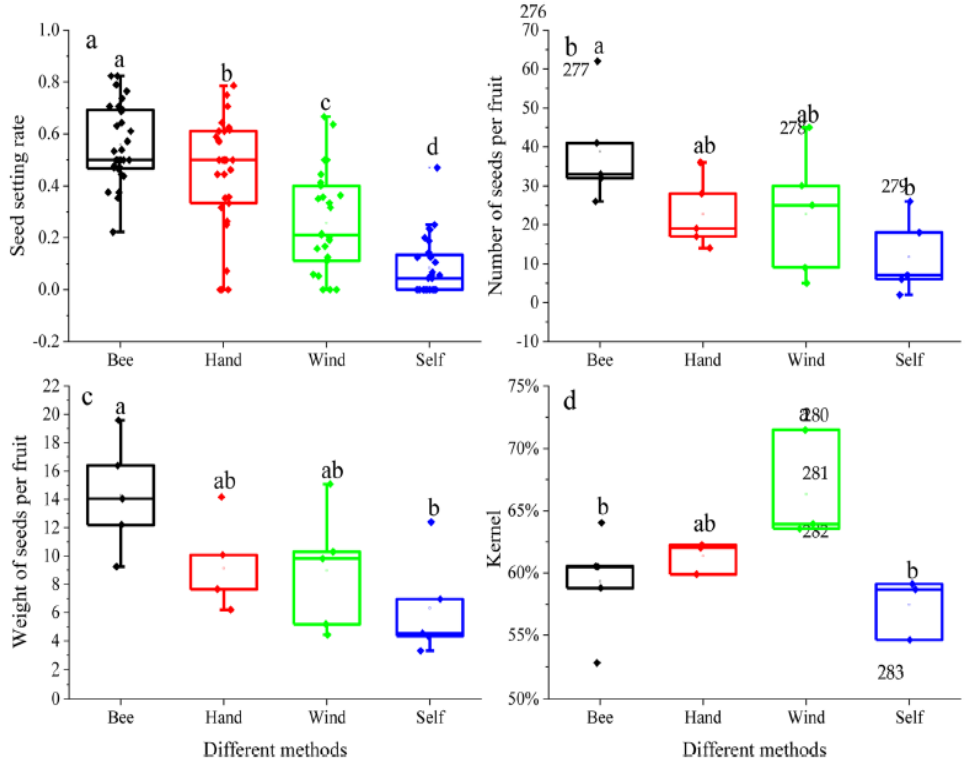
Insufficient pollination → **Low and unstable production of oil tree peony**

Honeybee —promote→ **Seed setting of oil peony**

Innovative Approaches - Protect Habitats for Bees

2. Pollination experiment on *Paeonia spp.*

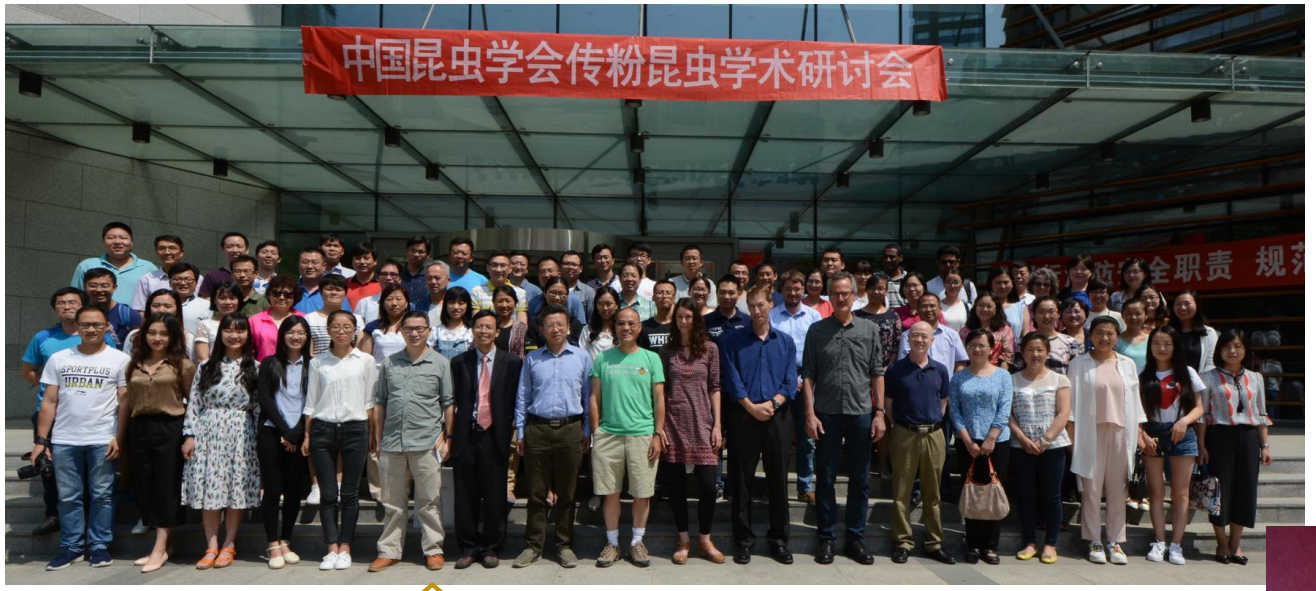




Pollination by honeybees increased yield per fruit by 56.28%, 59.42% and 126.27% compared to the hand, wind and self-pollination, respectively.

（Zhang et al.,2022 Scientia Horticulturae）

New Efforts - Special Committee & Forum



Special Committee on Pollinator Insects, the Entomological Society of China

Pollinator Insects Forum
(Annual meeting from 2016~2019)

New Efforts - Training Courses on Pollinators

➢On-Line Training courses

New Efforts - East China Program of Pollinators

Aims - Survey and evaluate pollinator insects in East China

Work areas:

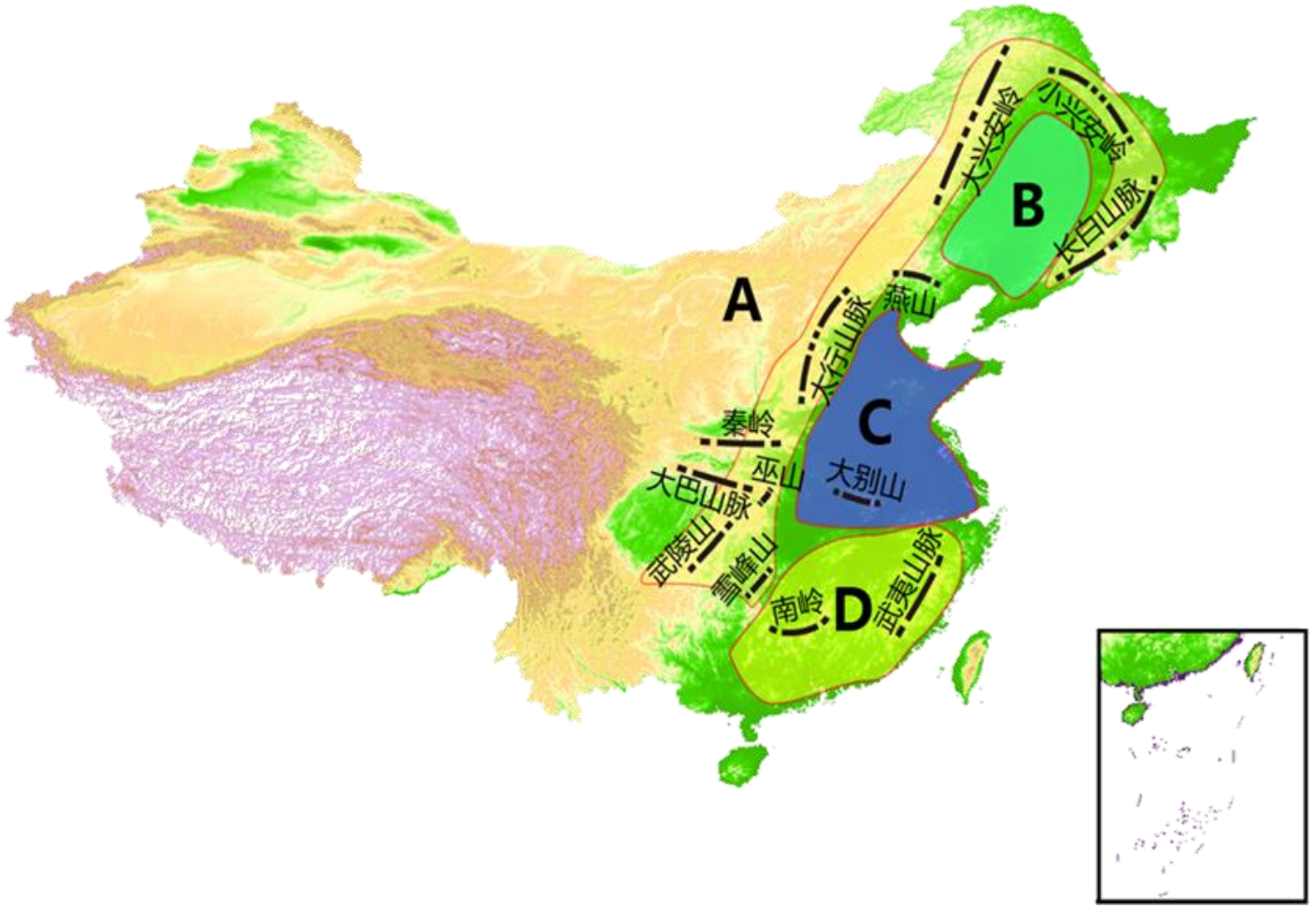
A. The Third Steps of China's Terrain
B. Northeast China Plain
C. Central China Plain
D. Southeast China Hills

Funding:

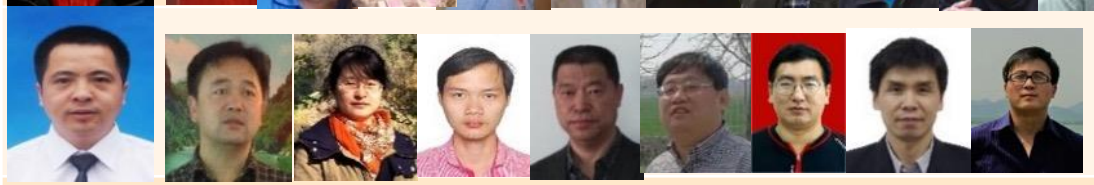
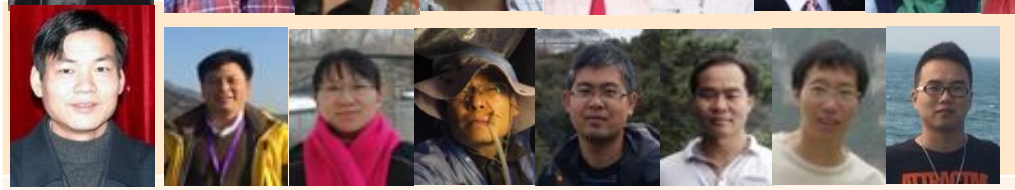
15 million RMB from National Science & Technology Fundamental Resources Investigation Program of China

Organization:

6 projects,
29 institutions/universities



New Efforts - East China Program of Pollinators

Sub-Projects	Team members
Integration, platform sharing and evaluation of pollinator insects resources in Eastern China	
Monitoring network Construction of pollinator insects	
New technologies development for pollinator insects diversity	
Crop pollinator insects diversity and pollination services evaluation	
Investigation and evaluation of pollinator insects resources in Eastern temperate agroforstry ecotone regions	
Investigation and evaluation of pollinator insects resources in typical Eastern tropical and subtropical agroforstry ecotone area	

Questions again

1. How many wild bees are there in China?

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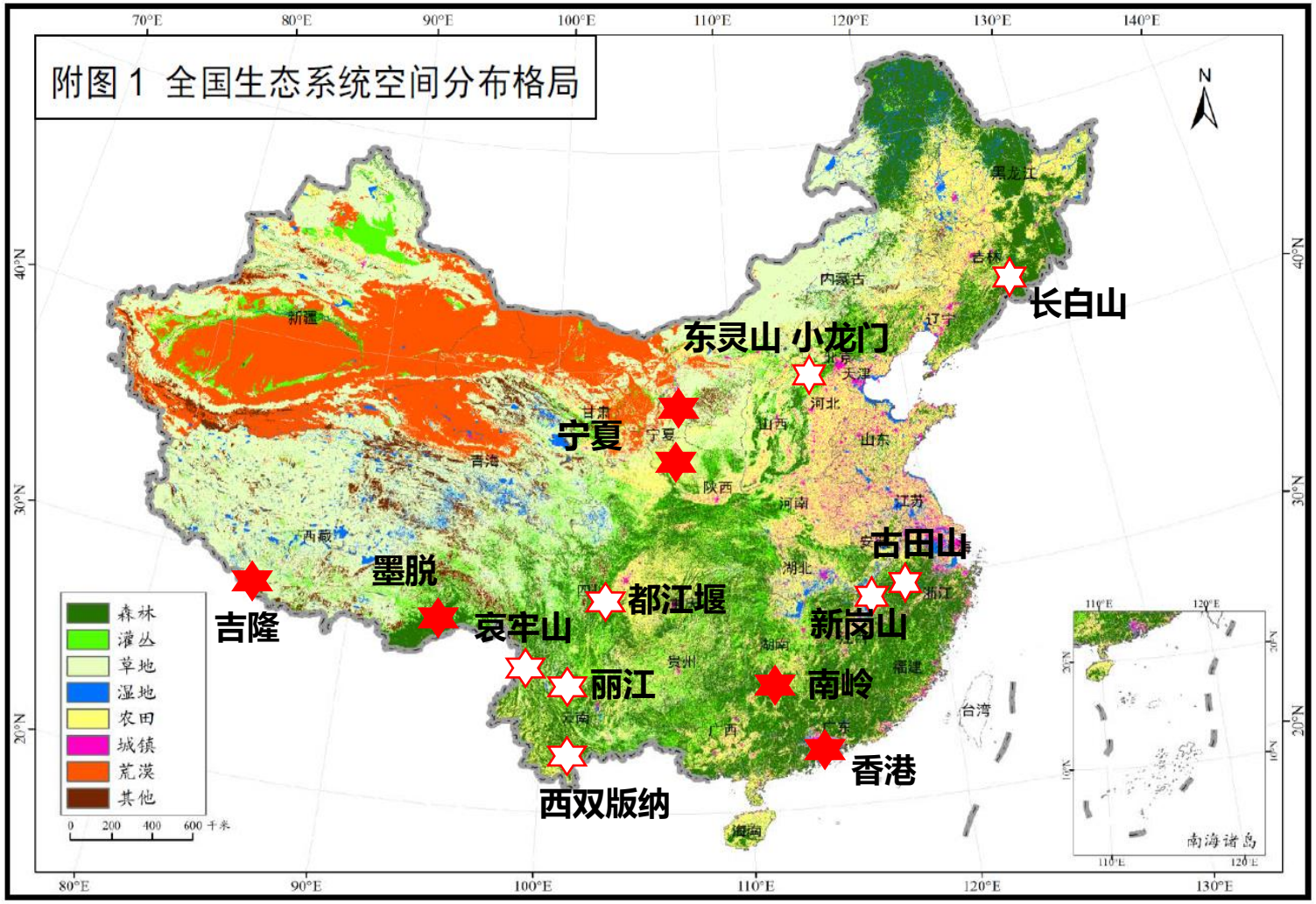
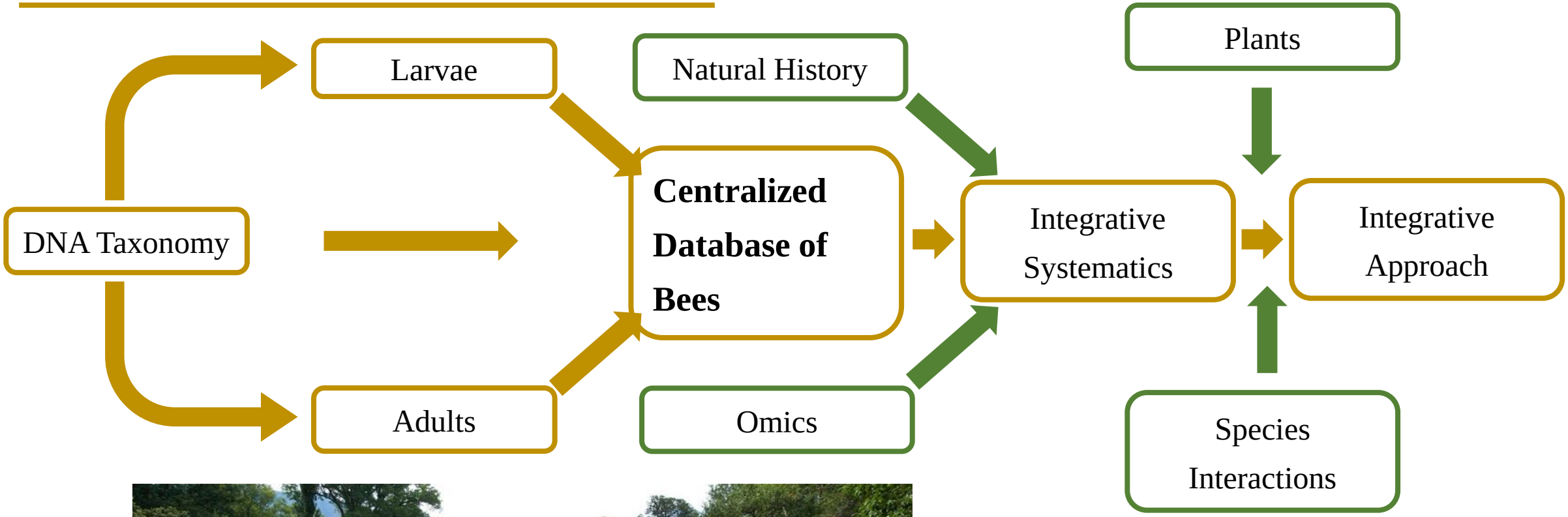
Future Collaborations – Sino-BON - Insects

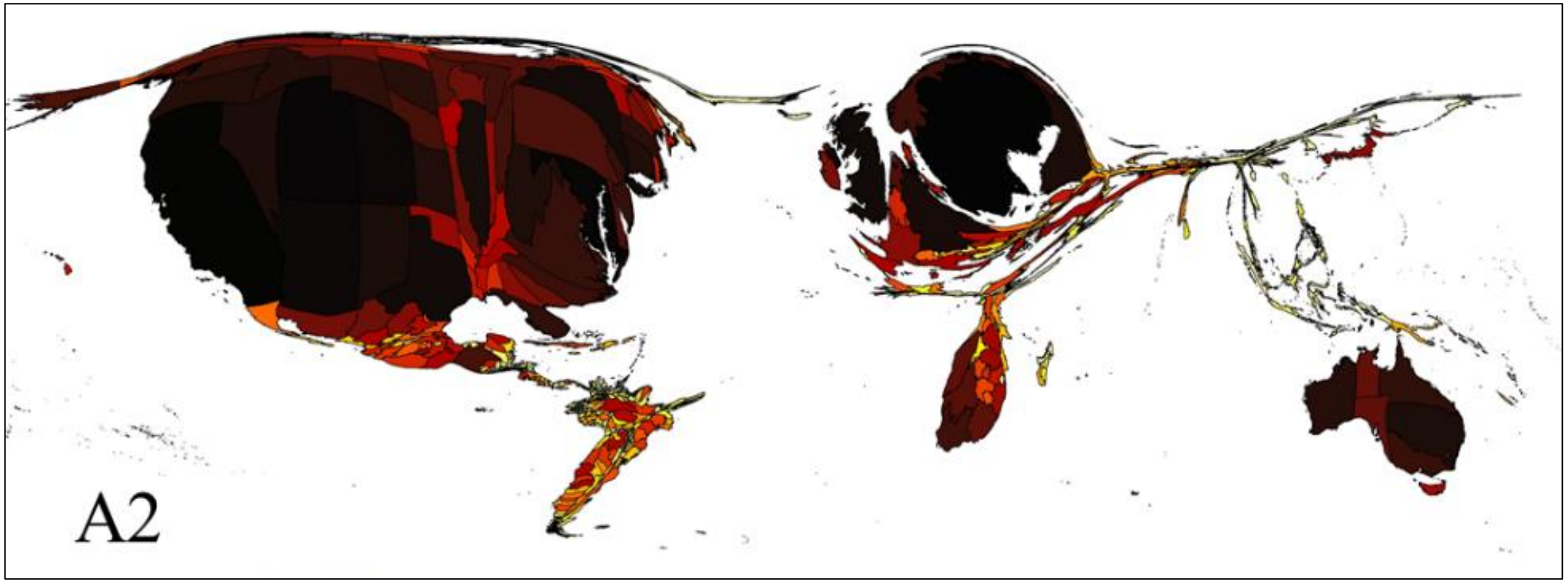
14 monitoring sites to cover –
Forests
Agriculture
Marginal areas between



Future Collaborations - Next Generation Bee Biologists



Future Collaborations – Mapping Bee Diversity in China/SE Asia

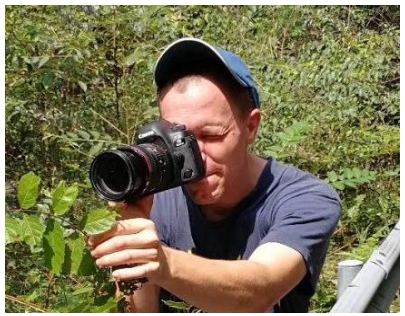
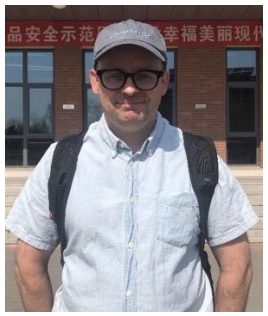


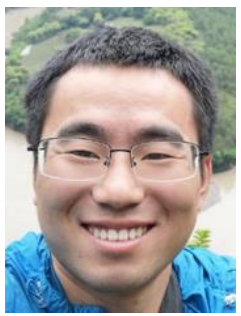
Capacity building of wild bee diversity monitoring;
Centralized databasing of wild bee diversity
Quantifying pollination services by wild bees

Future Collaborations - Better Pollination Services

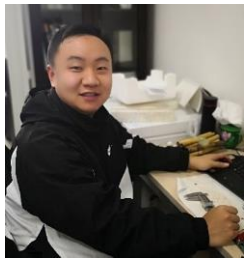
Acknowledgements

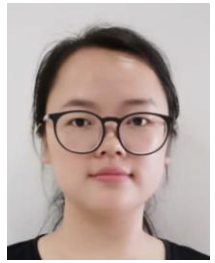







Protect Flowering Plants,
Protect Pollinator Bees
Thanks !