農業への生態系サービス提供者としての森林生物の保全

Conservation of ecosystem service agents in forest landscape for agro-food productions

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OUTLINE

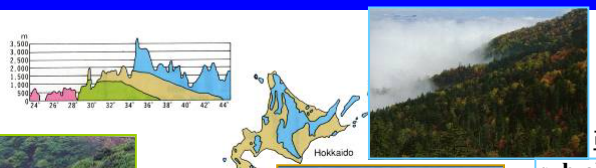
- Japanese forests and forest biodiversity 日本の概況
- Do ecosystem services benefit agro-food productions come from forests?
- What types of forests provide more services?

森林から農業への生態系サービス

- How we should manage forests for ecosystem service flow to agriculture (near forests)

農業生産に有効な森林管理

Japanese Forest Distribution 日本の森林分布



亜高山帯

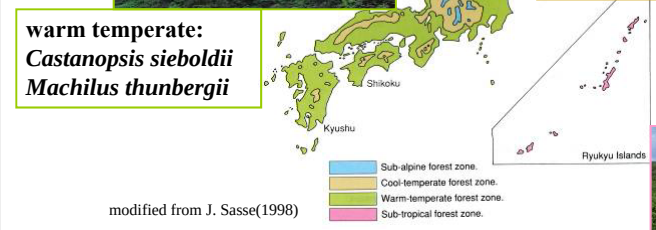
sub-alpine:
Abies veitchii
Picea jezoensis

暖帯林

warm temperate:
Castanopsis sieboldii
Machilus thunbergii

冷温帯林

cool temperate:
Fagus crenata
Quercus crispula
Acer mono

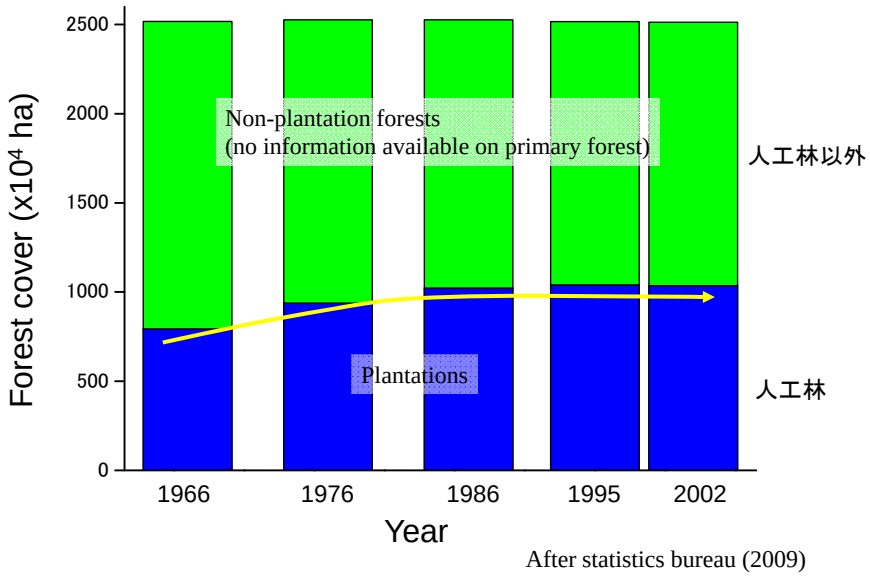


modified from J. Sasse(1998)

sub-tropical:
Bruguiera gymnorrhiza
Ficus superba

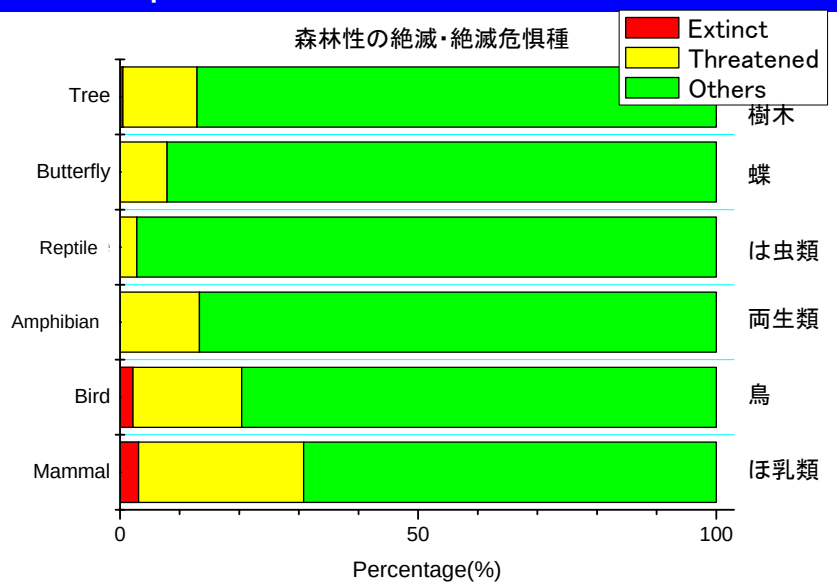
亜熱帯林

Japanese forest cover change 森林面積の変化



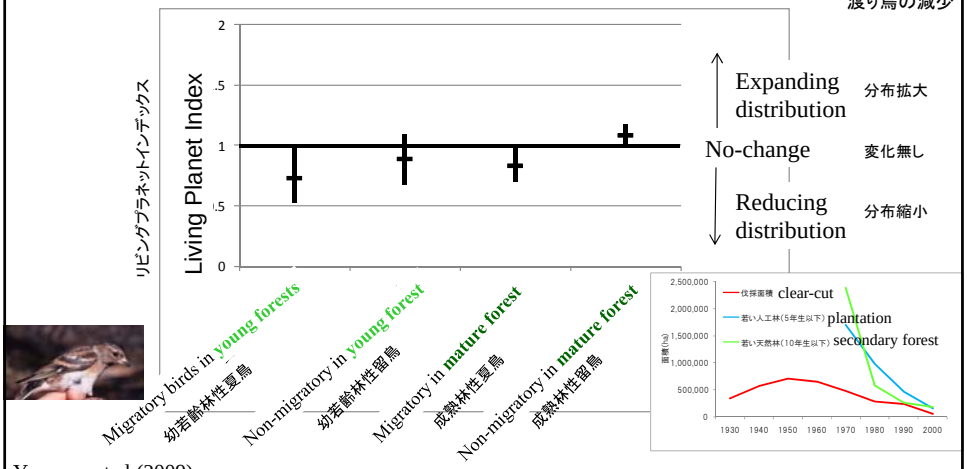
After statistics bureau (2009)

Extinct and threatened forest dependent species in Japan (based on the Red List of MoE 1991 or 2006)



Biodiversity assessment -birds-

- No species declined 種数減少無し
- Mature forest birds increased their distribution area, while birds in early successional forests decreased the area 若齢林種の分布減少
- Decrease of Southeast Asian forests decreased migratory birds 渡り鳥の減少



Yamaura et al (2009)

Biodiversity assessment -results-

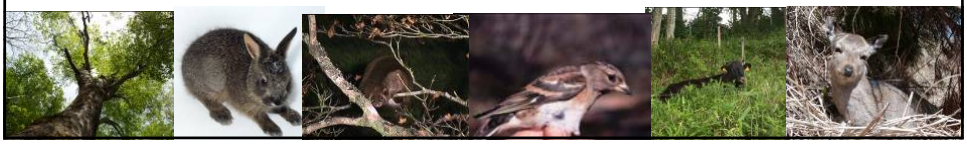
Our results showed that

1) The number of Japanese forest dependent species did not drastically decline for a last few decades although their habitats have been altered. 種数は減っていないが生息地は改変されている

2) Forest dependent species are directly affected by changes of forest states where they inhabit.
森林性種は森林の状態に左右される

How about ecosystem services and goods in forest?

（種数の特徴はわかったが）生態系サービスの変化はどうか？

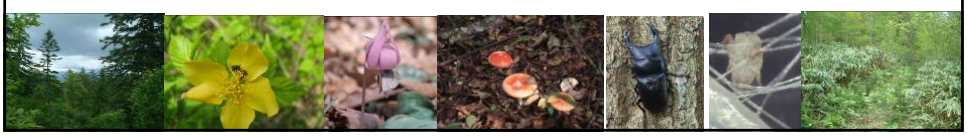


生物多様性と森林の生態系機能

Forest ecosystem functions affected by biodiversity

Ecosystem functions	Strongly to moderately affected 影響大	Less affected 影響小
Supporting 基盤	Pollination, nutrient cycling, decomposition,	O_2 production, soil formation,,
Regulating 調節	Biological control, human diseases,,	Air quality, erosion control,,
Cultural 文化	Diversity and identity, recreation, ecotourism,	
Provisioning 供給	Food, genetic resources, biochem,	Fresh water, fiber, fuel wood

After Dobson et al (2006)



森林の生態系サービス

What ecosystem services we expect from forests?

Organisms living in forests and working for forests
→agents of forest sustainability 森林内で働く生物
Organisms living in forests and working also out of forests
→potential agents of ecosystem services in other ecosystems

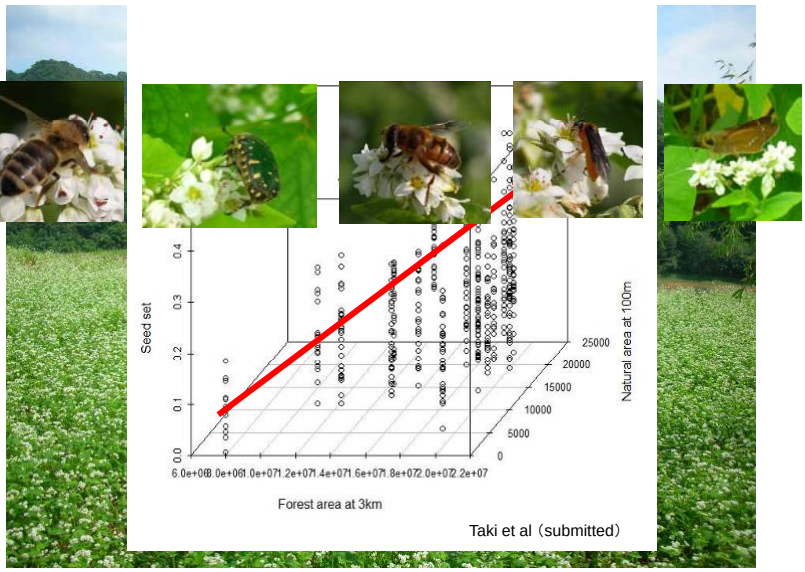
農地で活躍が期待される生物

森林から農業へ　サービスの提供ー送粉昆虫

Forest ecosystem near an agricultural field contributes crop production – an example of native pollinators

Buckwheat field near forest

Forest ecosystem near an agricultural field contributes crop production – an example of native pollinators



Taki et al（submitted）

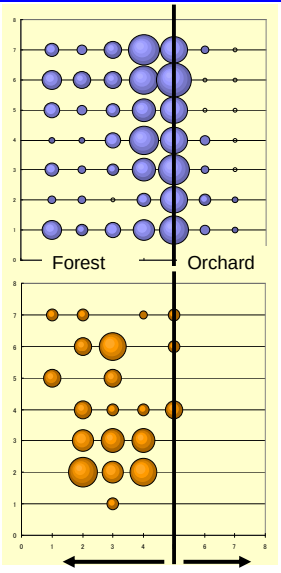
森林から農業へ　サービスの提供ー天敵

Forest ecosystem near agricultural fields contributes crop production – an example of native predators

Carabus yaconinus
ヤコンオサムシ

Adult成虫

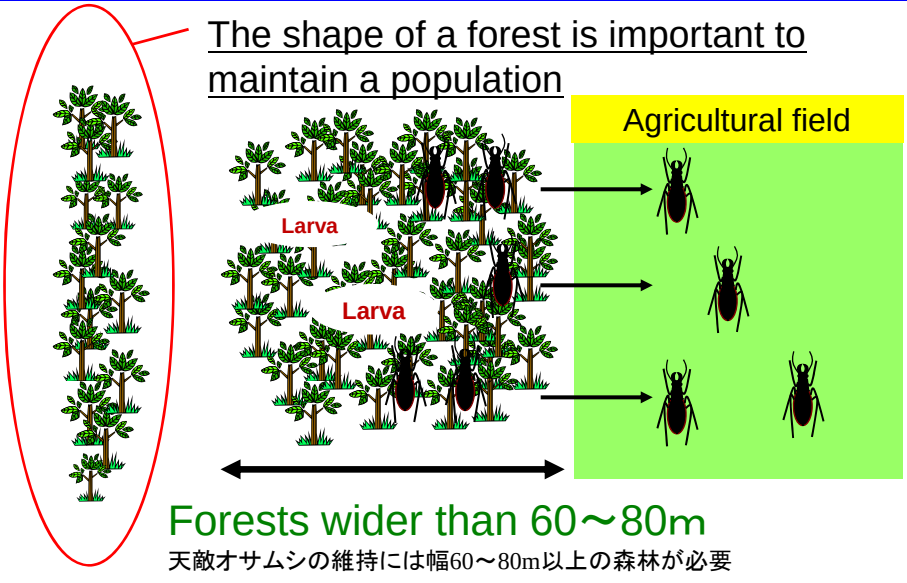
Larva幼虫



Predaceous ground beetles need forests

➢Kagawa & Maeto (2009) *European Journal of Entomology* 106: 385-391

Forest ecosystem near agricultural fields contributes crop production – an example of native predators



Forests wider than 60～80m

天敵オサムシの維持には幅60～80m以上の森林が必要

森林から農業へ　サービスの提供ー有機物堆肥

Forest ecosystem near an agricultural field contributes crop production – an example of decomposers

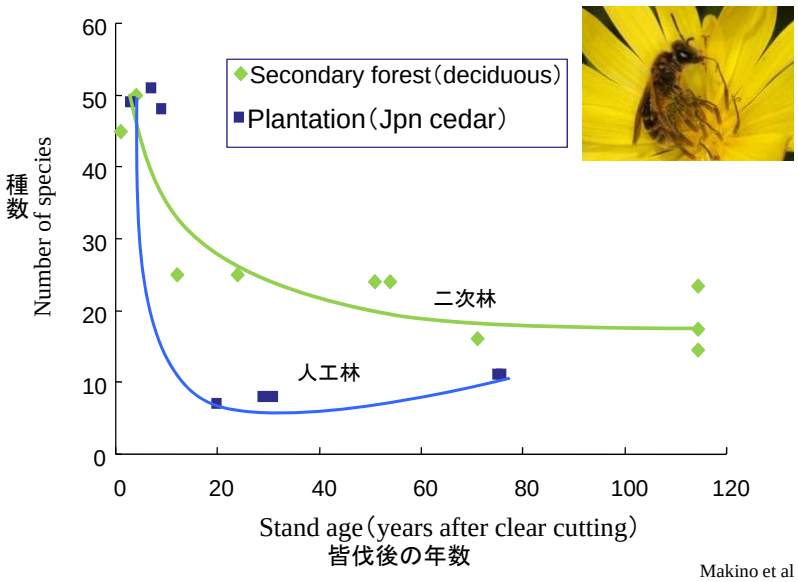
courtesy of T. Tsubuku

Types of forests that can provide more services

In order to utilize forest ecosystem services and goods for agro-food productions, what types of forests and forest management are useful? 農業に貢献が期待できる森林管理とは？

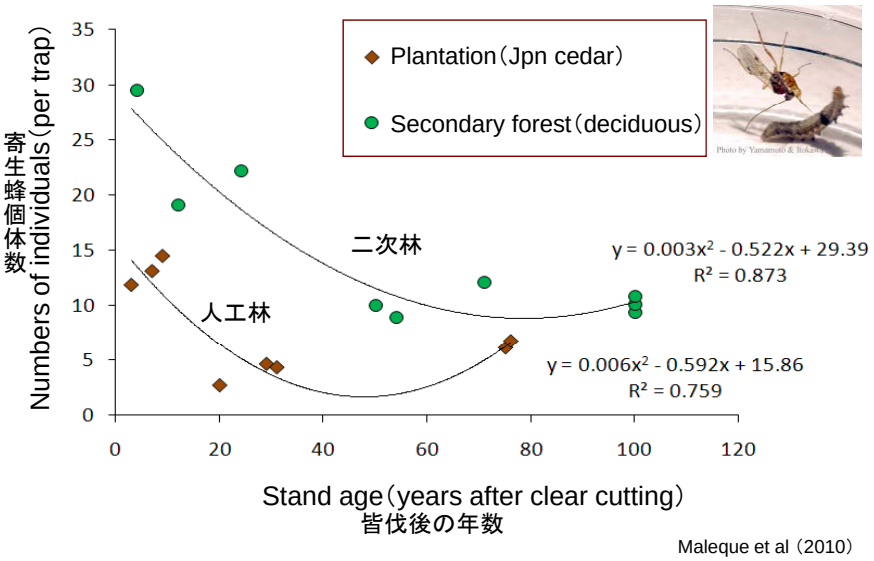
Bees : Pollinators

ハチ：送粉者



Makino et al（unpublished）

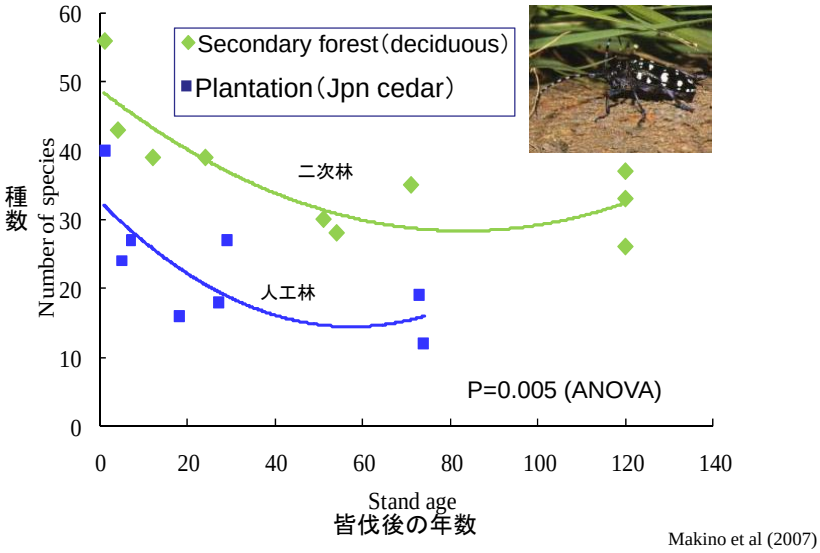
Parasitoids : Biological control 寄生蜂:天敵



Maleque et al（2010）

Cerambycid beetles: wood decomposers

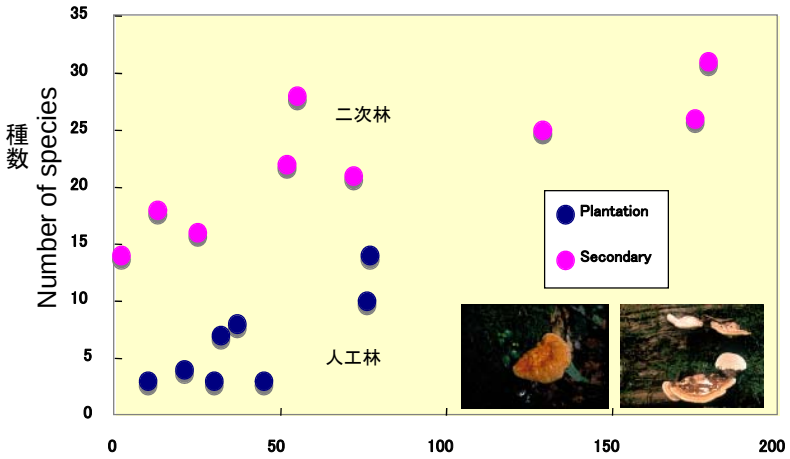
カミキリムシ:樹木分解者



Makino et al (2007)

Wood decaying fungi: wood decomposers

腐朽菌：樹木分解者



Stand age（years after clear cutting）

皆伐後の年数

Hattori et al（unpublished）

森林施業によって多様性が変化する

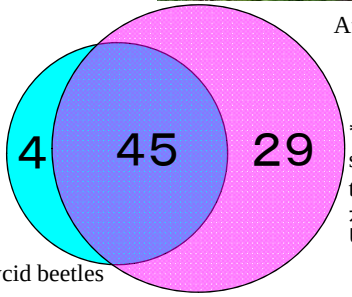
Forestry management at the stand level can increase species richness

Before thinning

間伐前

After thinning

間伐後



Species numbers and compositions of cerambycid beetles

カミキリムシの種組成

*Many beetles are suspected to fly into the thinned forests

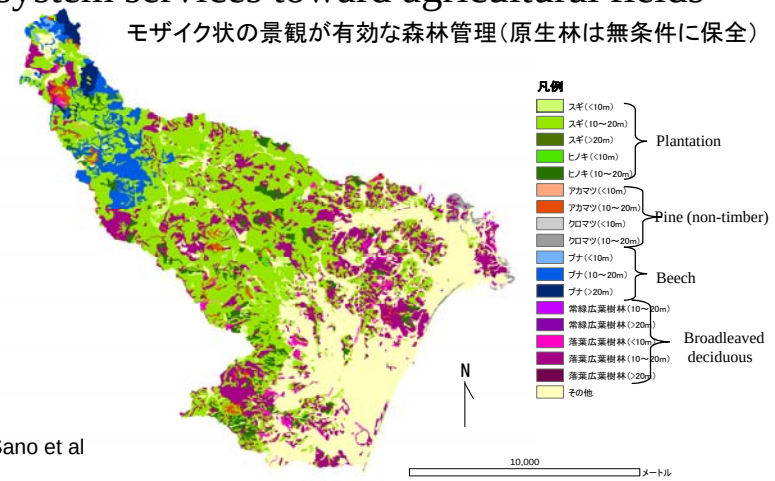
カミキリムシは林外から移動してきたらしい

Taki et al (2009)

Forest management at the landscape level

At the landscape level, maintaining “primary forest” should be prioritized, then “mosaic” can provide better ecosystem services toward agricultural fields

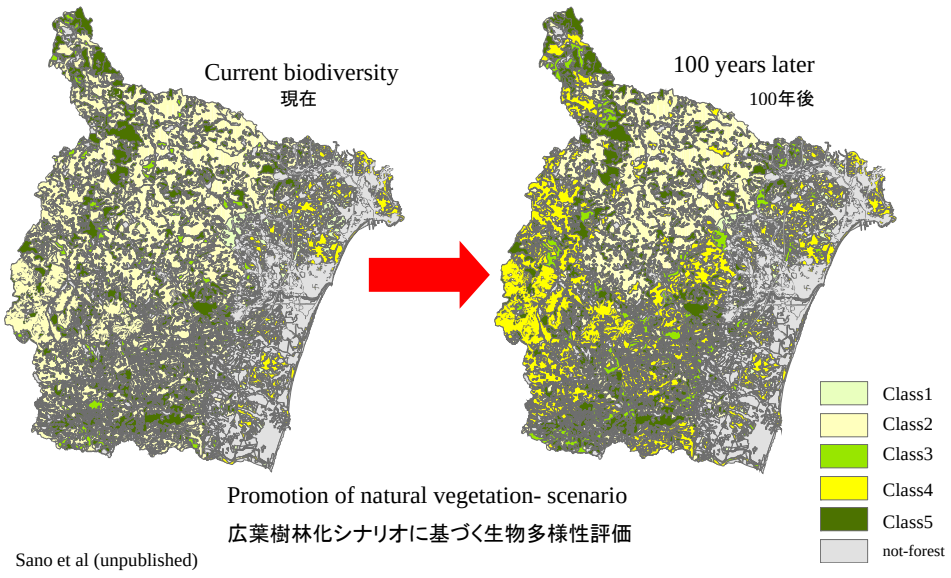
モザイク状の景観が有効な森林管理（原生林は無条件に保全）



by Sano et al

シナリオに基づく施業の事前評価

For forest management at the landscape level, biodiversity and ecosystem service changes are simulated based on scenario(s).



Promotion of natural vegetation- scenario

広葉樹林化シナリオに基づく生物多様性評価

Sano et al (unpublished)

Conclusions & Perspectives

- Japanese forest biodiversity did not remarkably decline for a last few decades at the species level but at the ecosystem and genetic levels, we have little information.
  日本の生物多様性減少は種レベルは小さいが、生態系や遺伝子レベルでは情報がない
- Forest biodiversity is expected to provide ecosystem services and goods to agro-food production.
  森林の生物多様性は農業生産に貢献する
- To develop an appropriate forest management at landscape level is necessary for sustainable use of forest ecosystem services and goods.
  持続的森林生態系サービスの利用のための森林管理手法が必要

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Thank you