



Structure And Biodiversity In Managed And Unmanaged Mixed Beech Forests: A Comparison Based On The Strict Forest Reserves Network In France

Réserves
Naturelles
DE FRANCE



Office National des Forêts



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Primeval Beech Forests: 2-9th June 2013, Lviv, UKR



Unmanaged forests in Europe

Primeval forests < 1% of the European forest area
13% - US west coast
40-52% - Canada

Reference state for forest management and biodiversity

Global effect of management on forest dwelling species?



Review

Biodiversity Differences between Managed and Unmanaged Forests: Meta-Analysis of Species Richness in Europe

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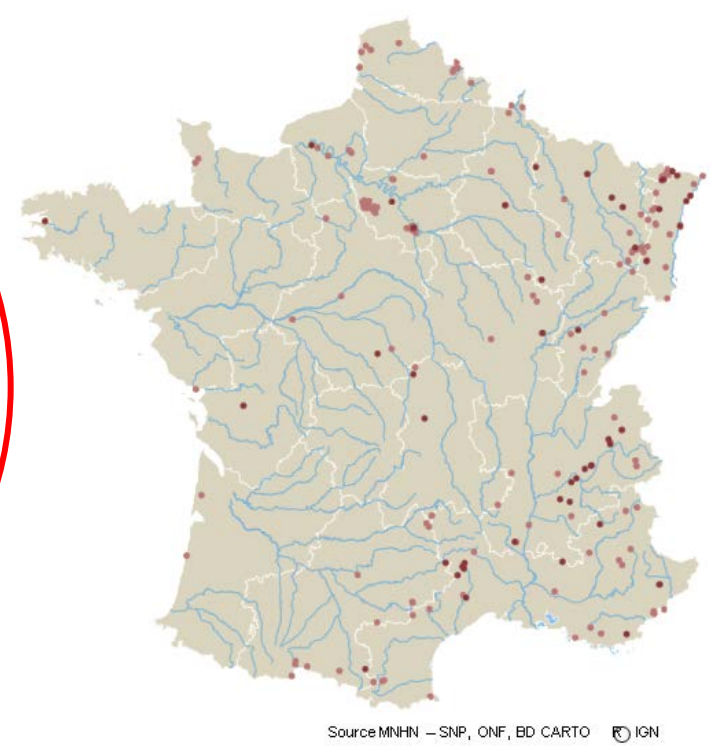
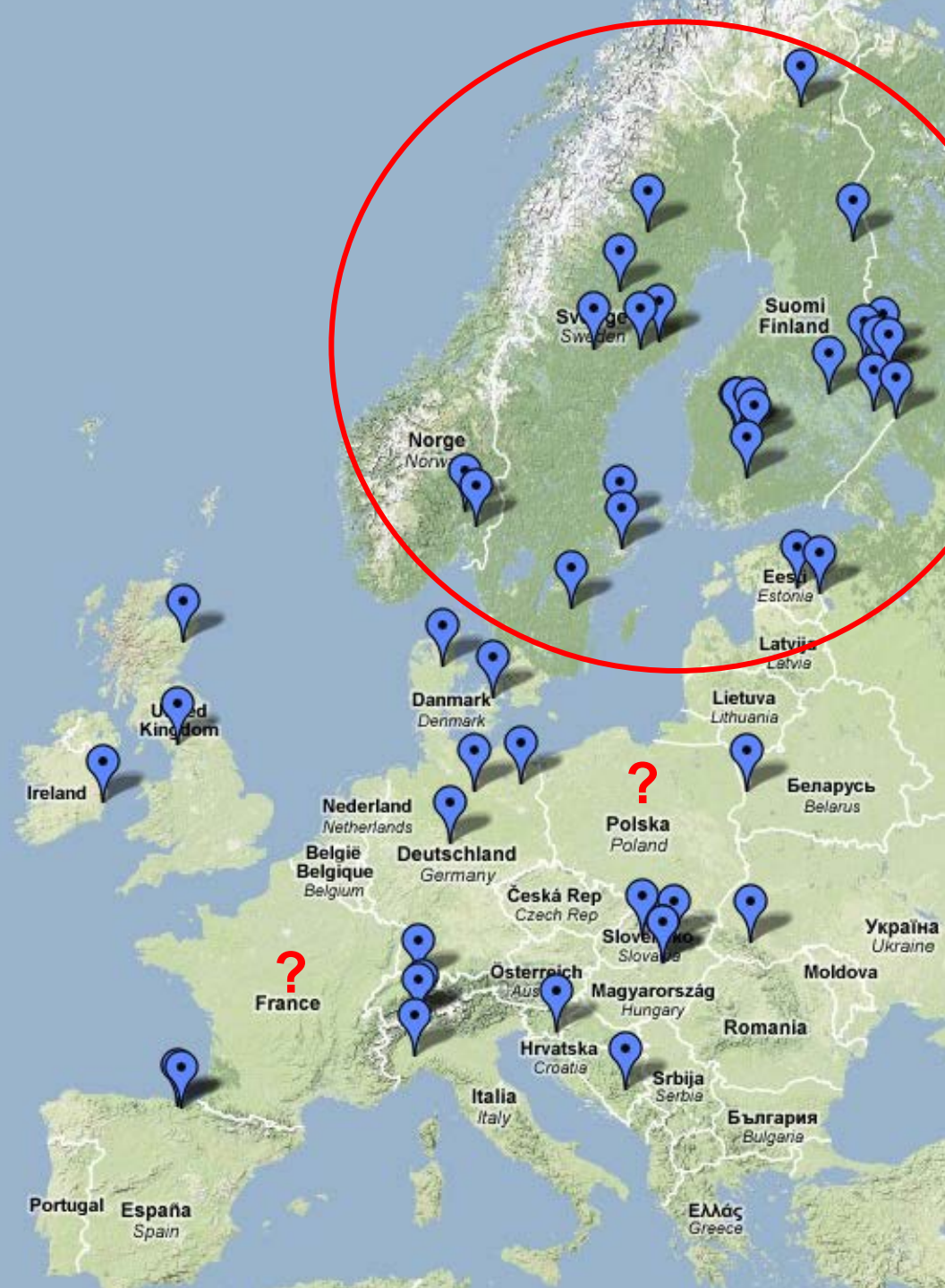
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Source MNHN – SNP, ONF, BD CARTO © IGN

No real “primeval” forests

SFR: 0.3% of the forest area

Most of the French strict forest reserves are recent

No structure / biodiversity comparisons between reserves and managed forests



Aims and scopes



Hypotheses:

- higher levels of old-growth structural attributes and biodiversity in unmanaged forests
- Increasing “old-growthness” and biodiversity with time since last harvesting



Materials and methods

Study sites:

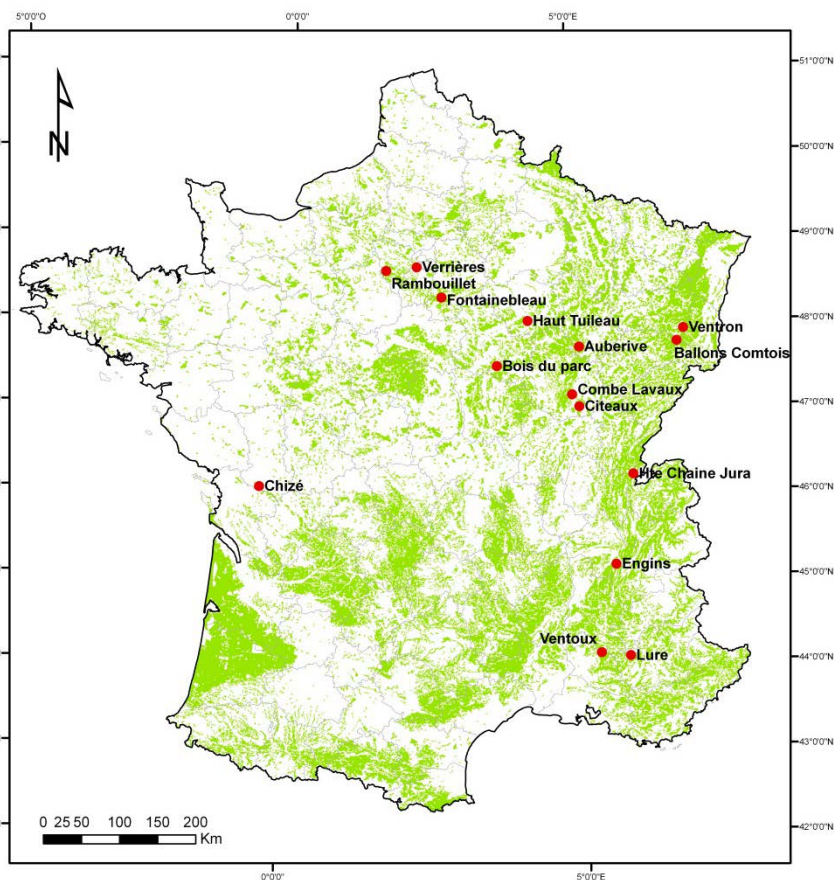
15 lowland and mountains beech dominated forests, 213 plots

Plots chosen at random in and around forest reserves, controlled forest site

Time since last harvesting

- MAN: 9 ± 12 years

- UNM: 46 ± 38 years

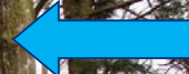


Stand structure characterization: combined fixed angle and surface techniques

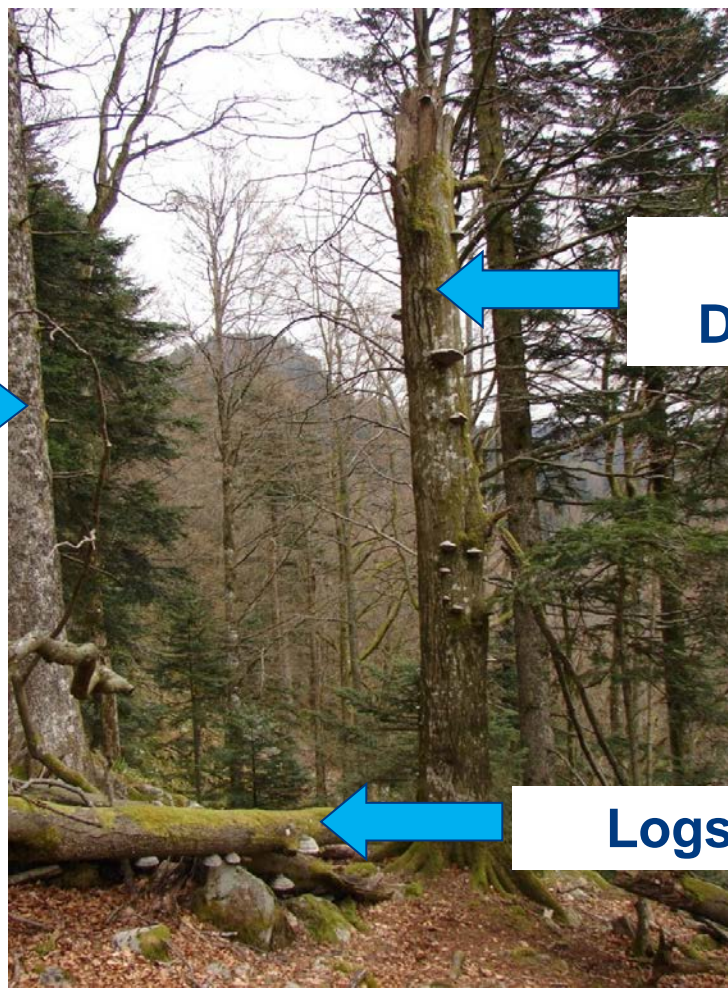
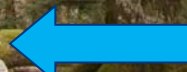
Living wood
DBH>7.5cm



Snags
DBH>7.5cm



Logs D>5cm



Biodiversity sampling: 6 taxa

Vascular plants: 1000m², 2 observers, 35min

Perennial fungi: all living and dead trees

Bryophytes: 3 random living / dead trees

Birds and bats: 5 and 40 min point counts

Insects: saproxylic and carabid beetles



Analyses

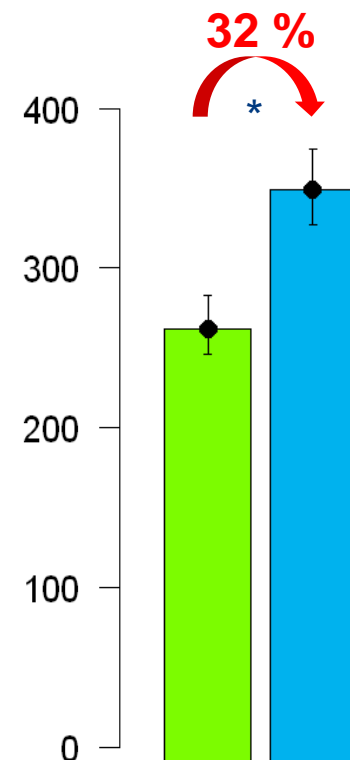
Stand structure: non-linear generalized model, confidence intervals re-estimated by bootstrapping

In practice: multiplication coefficient assessed against a null hypothesis

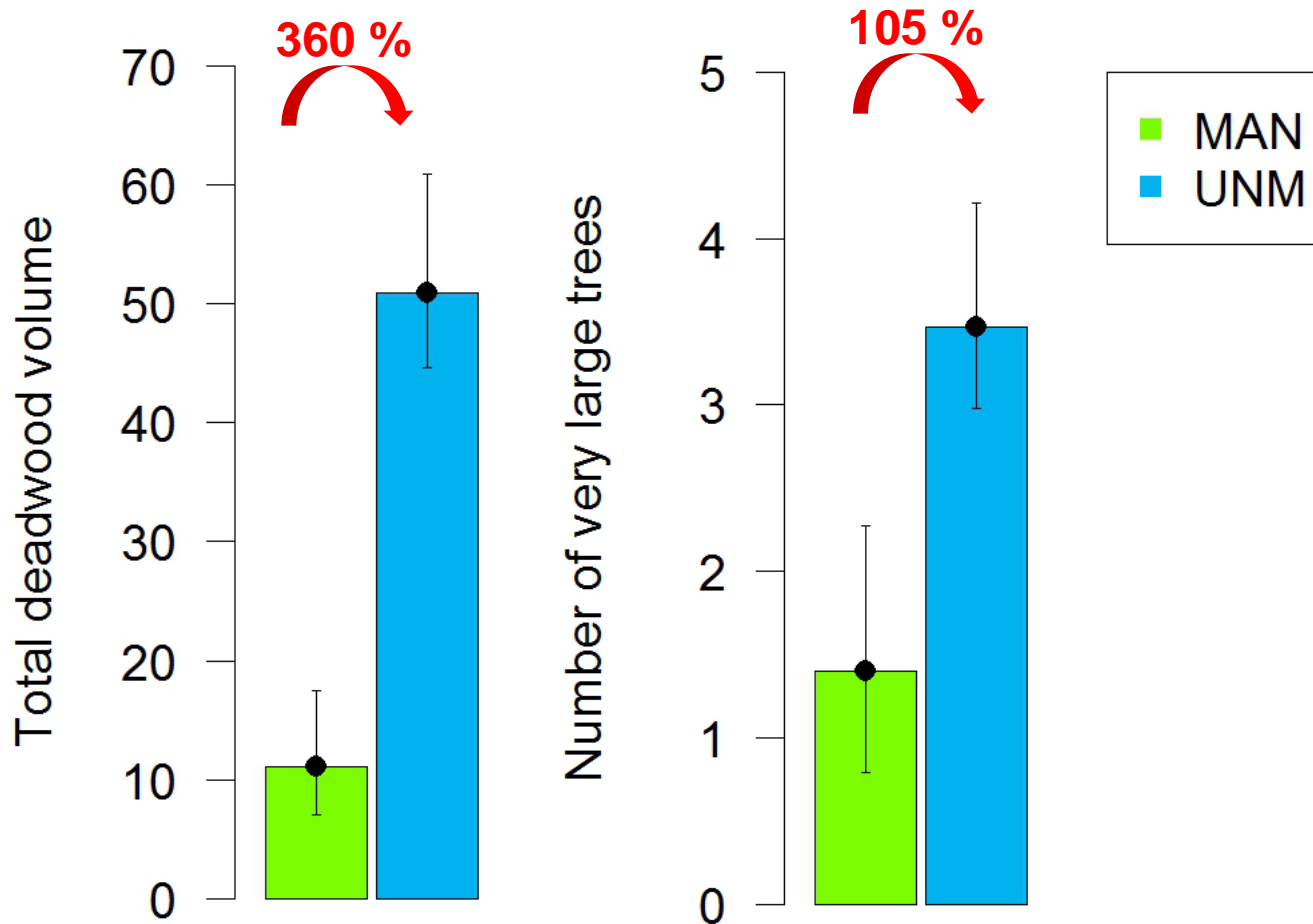
Biodiversity (total species richness): generalised linear models with Poisson error distribution

Explanatory variables:

- management: MAN vs. UNM
- elevation: LWL vs. MON
- Time since last harvesting



Results: stand structure





Results: stand structure

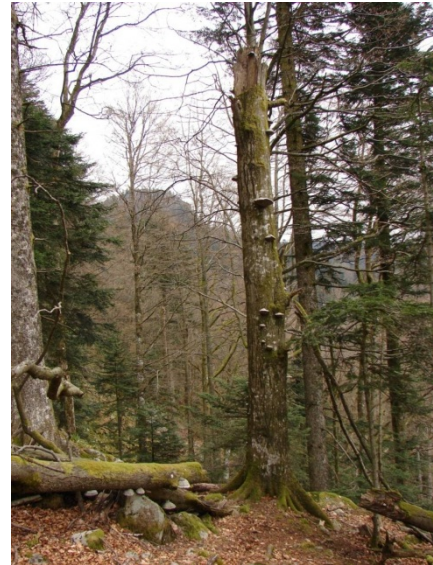
Most of the results significant in lowland forests

- Number and basal area of large trees
- Deadwood volumes

Far less in mountain forests

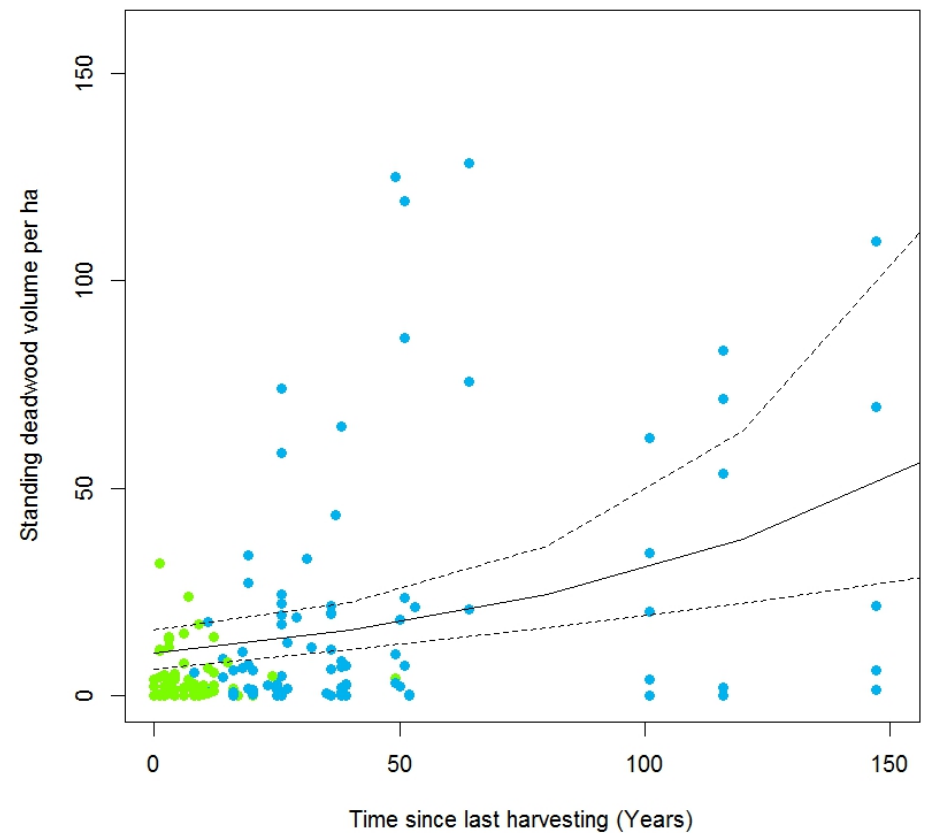
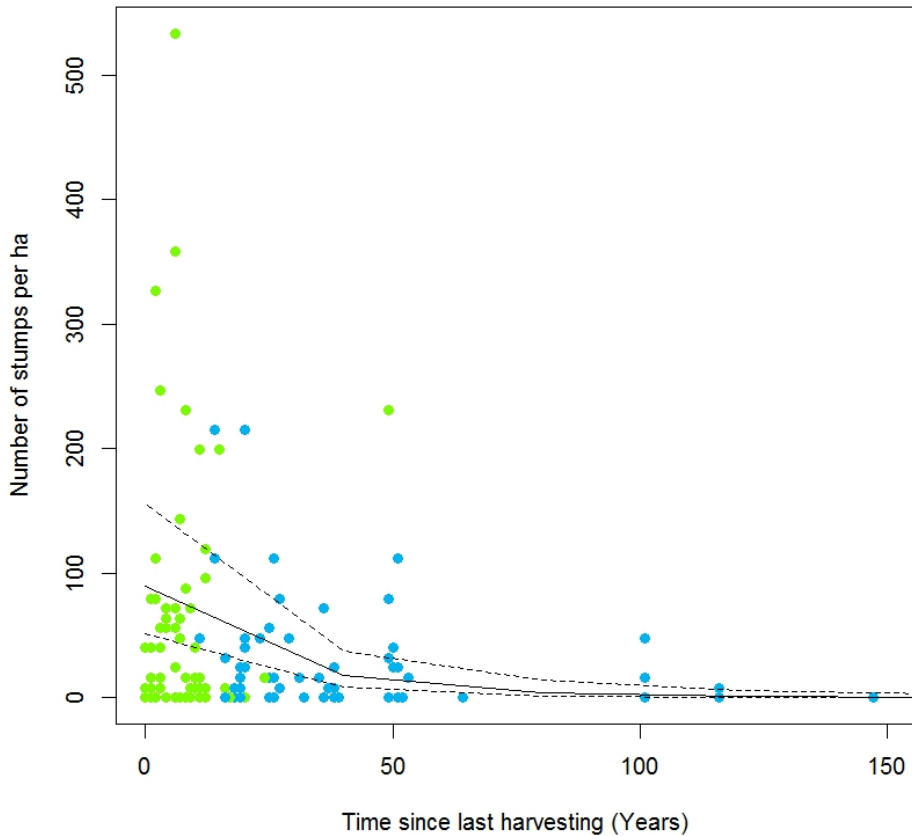
- Number and basal area of Very Large Trees
- Total deadwood volume

Higher levels in mountains both in MAN and UNM forests



Results: stand structure

Effects of the time since last harvesting





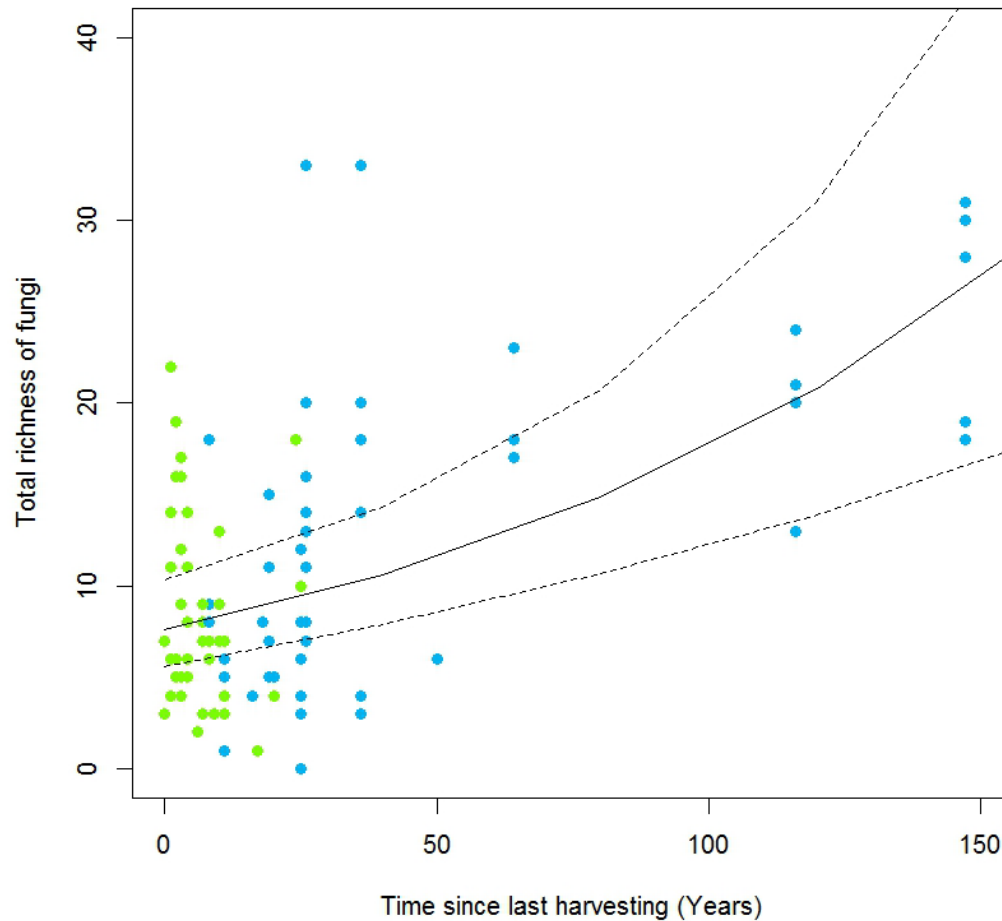
Results: biodiversity

Managed forests vs. strict reserves

		Managed forests		Unmanaged reserves		
Taxa	n	Estimated Mean	SE	Estimated Mean	SE	p
Fungi	99	8.6	1.192	12.3	1.190	***
Vascular plants	197	32.5	1.100	32.7	1.100	ns
Bryophytes	86	19.6	1.111	23.9	1.110	***
Carabids	121	3.3	1.293	3.1	1.294	ns
Saproxylic beetles	169	26.0	2.032	24.2	2.032	ns
Birds	185	11.1	1.075	11.9	1.075	(*)
Bats	101	4.8	1.352	5.7	1.351	ns

Results: biodiversity

Total richness vs. Time since last harvesting





Discussion: strong effects of forest management on forest structure

Most of the structural attributes are higher in unmanaged forests and increase with time since last harvesting:

- Forest harvesting tends to shorten forests silvigenetic cycle**
- Aged and senescent phases eliminated**
- However : reserves probably in aggradation phase**
- Slow recovery of old-growth characteristics**

- Higher differences in lowlands than in mountains**



Discussion: small differences in terms of biodiversity

Only total richness Fungi, Bryophytes and Birds showed differences:

-Species that depend on deadwood and large trees during their life cycle

- Surprisingly no response of saproxylic beetles
- Deadwood volume = main driver?



Discussion: small differences in terms of biodiversity

Lack of response for some groups despite structural differences:

-French strict reserves very recent: no colonisation of typical species

-An extinction debt that has already been paid due to centuries of forest harvesting

-Sustainable management in the surrounding managed forests



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-Other spatial and time scales have a greater role on biodiversity than management per se



Thanks for your attention