

Do we need more strict forest reserves in Slovenia and Europe?



World population to hit 11bn in 2100 - with 70% chance of continuous rise

New study overturns 20 years of consensus on peak projection of 9bn and gradual decline



📷 A crowded Oshodi market in Lagos, Nigeria - the country's population is expected to soar from 200m today to 900m by 2100. Photograph: James Marshall/Corbis

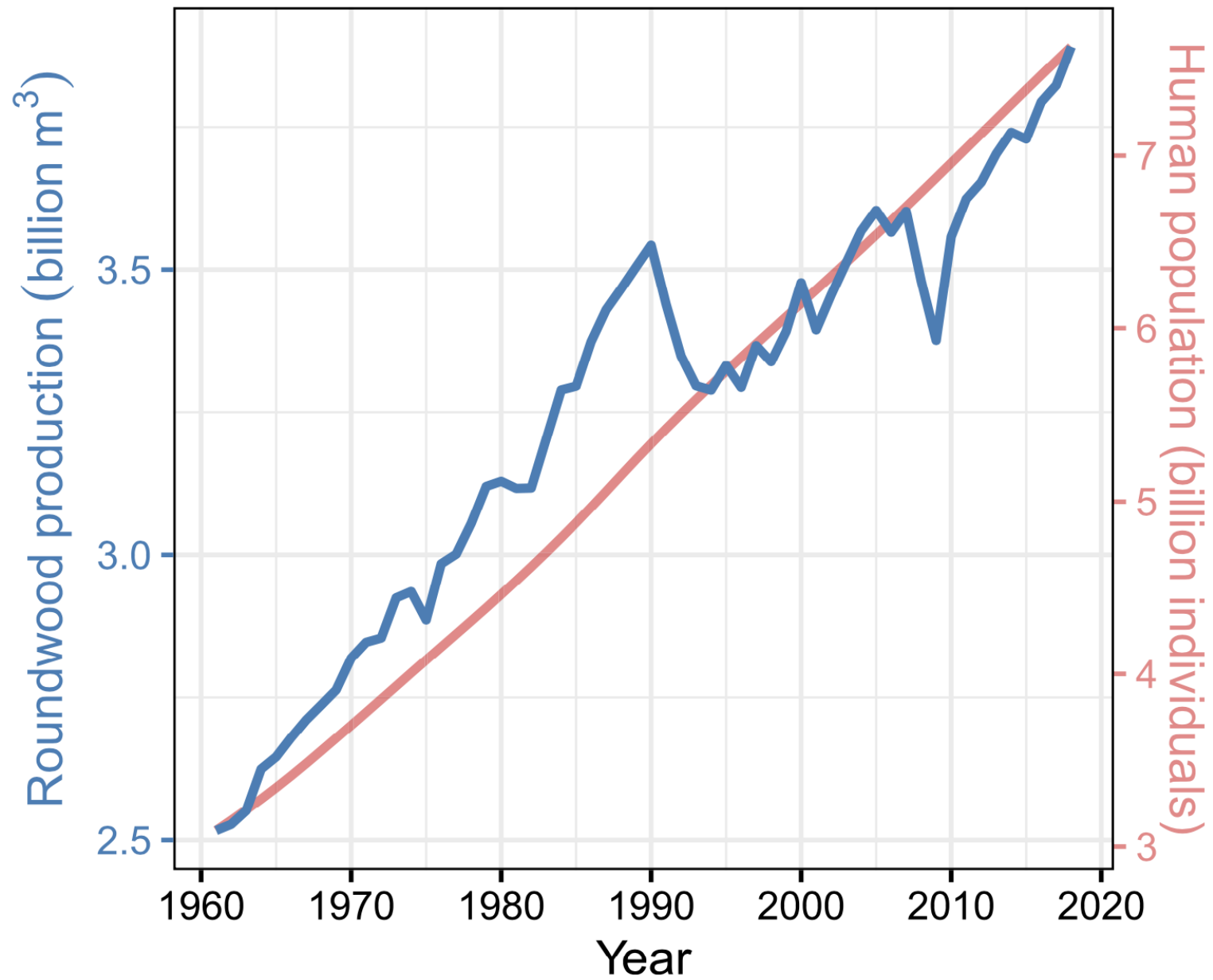
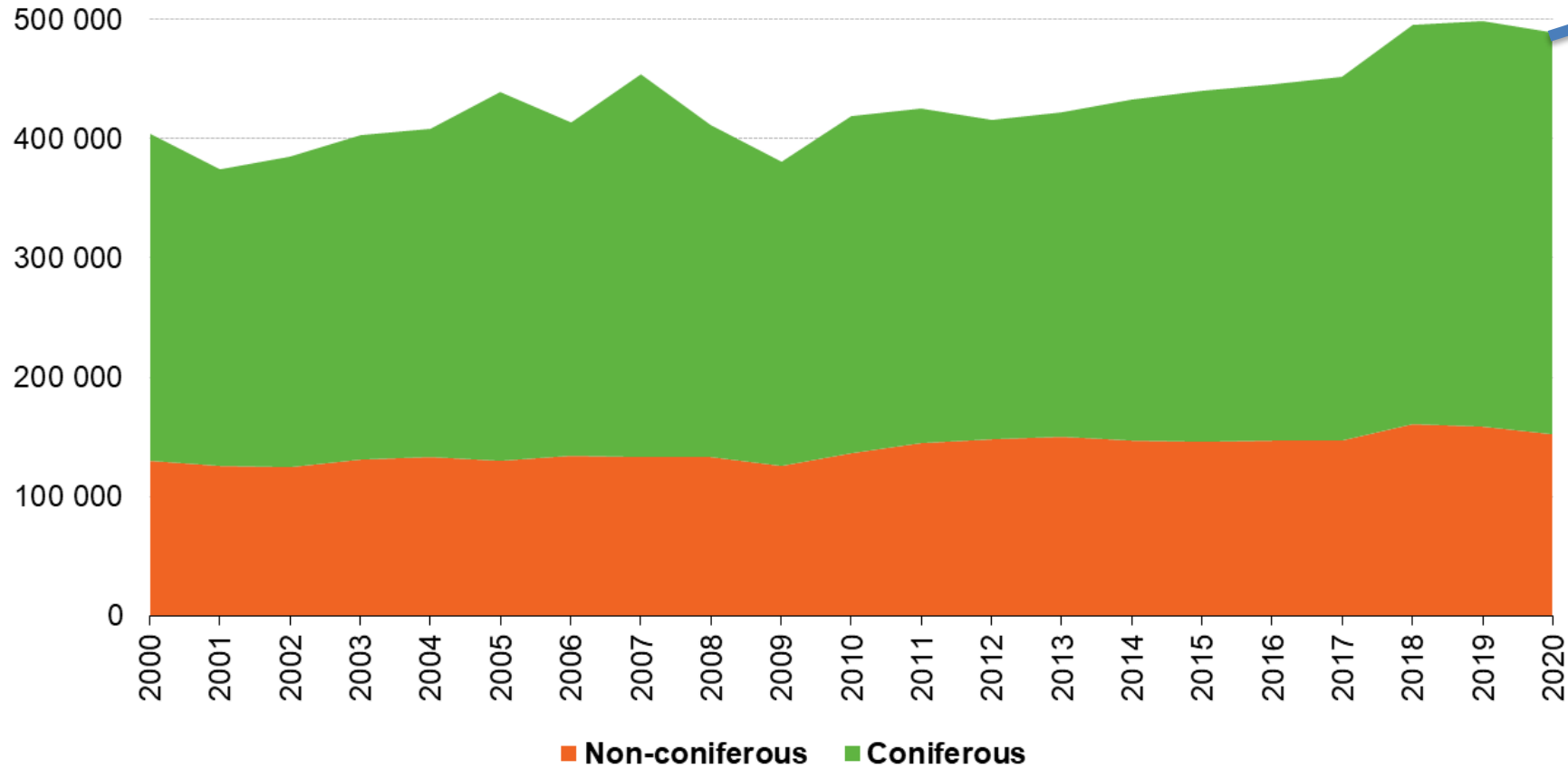


Fig 1. Global roundwood production (blue) and human population size (red). Data sources: FAOSTAT (2019 a,b).

Annual production of roundwood, EU, 2000–2020 (1 000 m³)



Meeting the 55% emission reduction target by 2030 and climate neutrality by 2050 will place additional demands on production of woody biomass from European forests

Note: EU estimate produced using latest available data if a country did not report for 2020

Source: Eurostat (online data code: for_remov)

eurostat 

global roundwood consumption expected to increase by 33% by 2050 (Kok et al. 2018)

Forest products
(economic function)



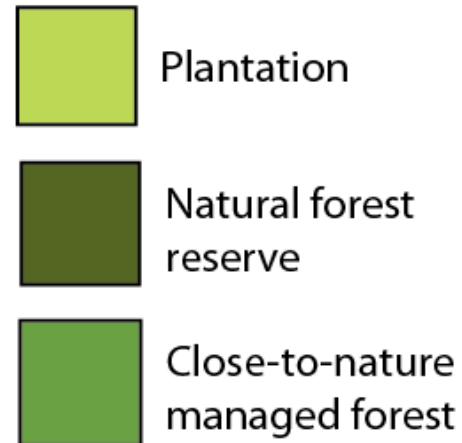
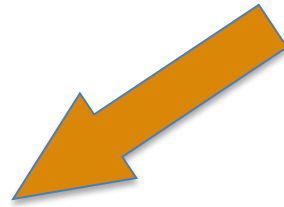
Biodiversity and
Ecosystem services
(ecological function)



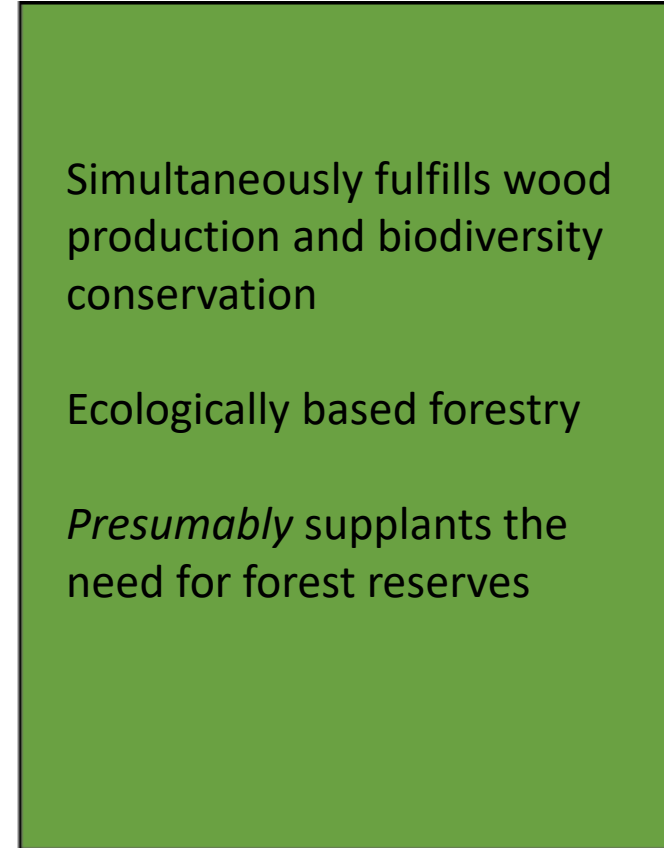
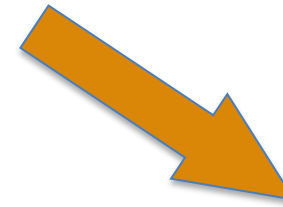
Adaptation to climate change

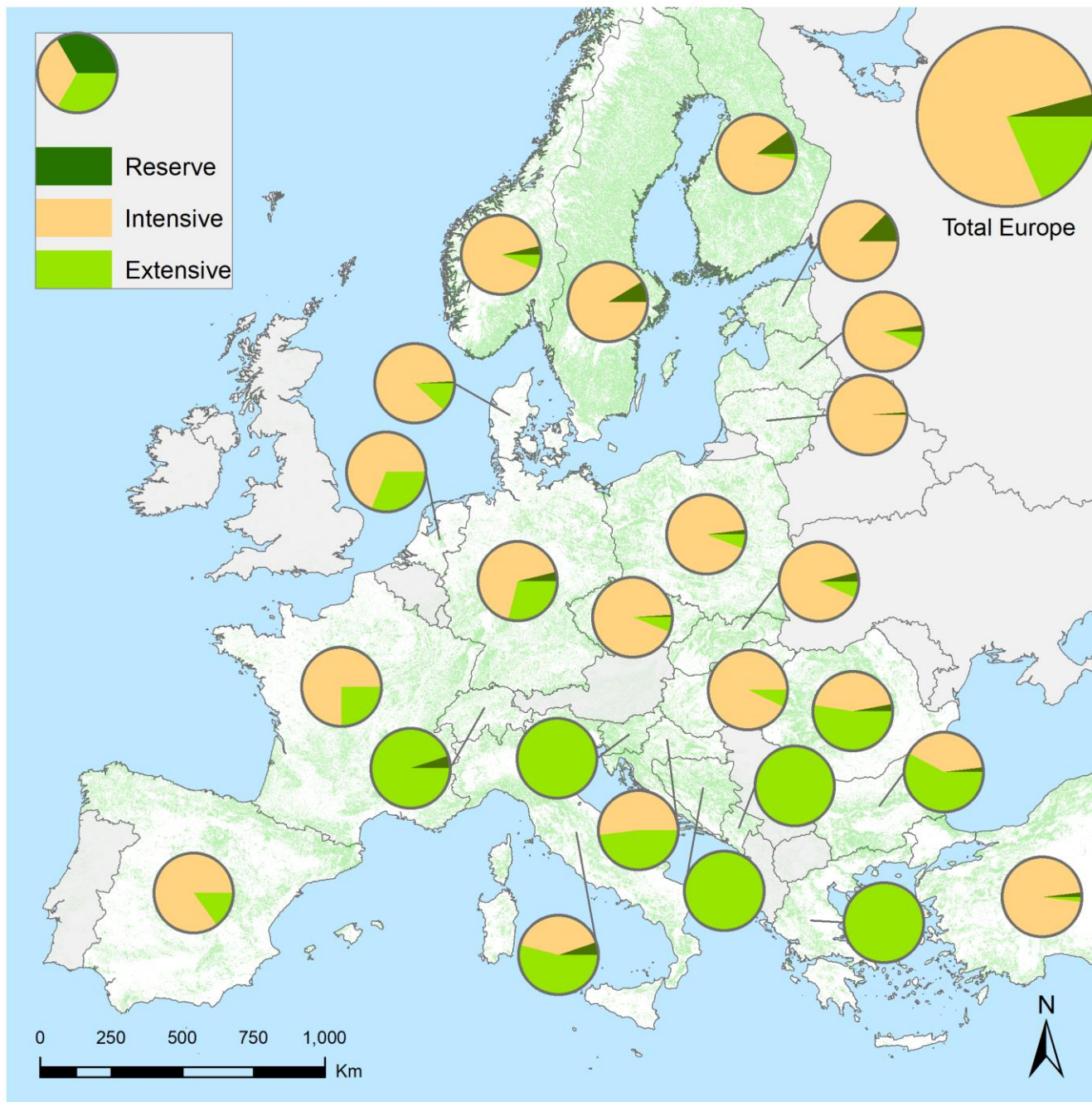
How do we produce timber at least cost to native biodiversity?

Land sparing
(segregation,
intensive)



Land sharing
(integration,
extensive)





- A few countries have > 10% of forest area strictly protected (e.g. Estonia, Finland), some > 5%
- Most less than 2%
- As a whole, 3.8% (7.2 million ha) of the total forest area in the dataset is under strict protection
- Many countries with less than 1% strictly protected forest area





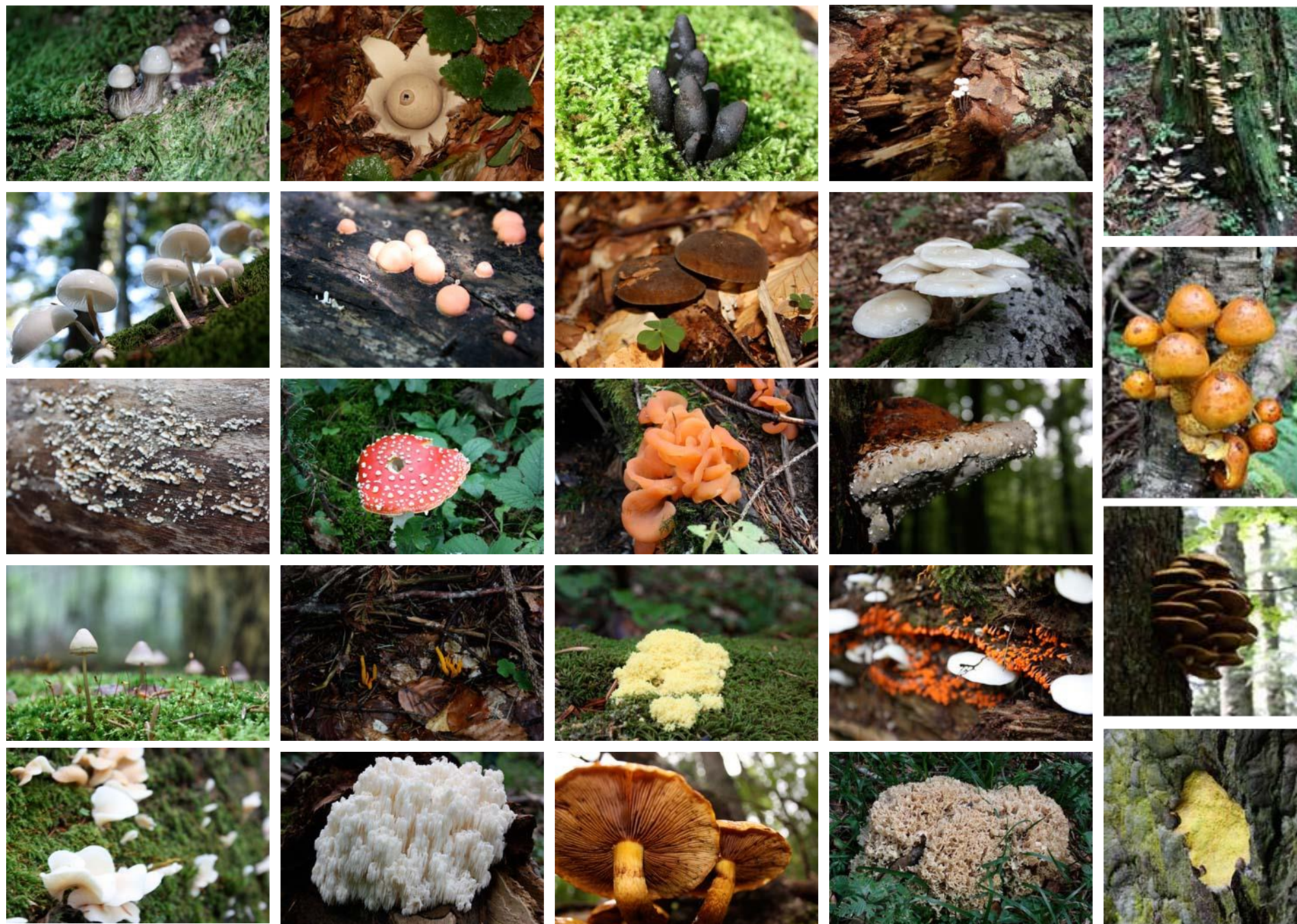




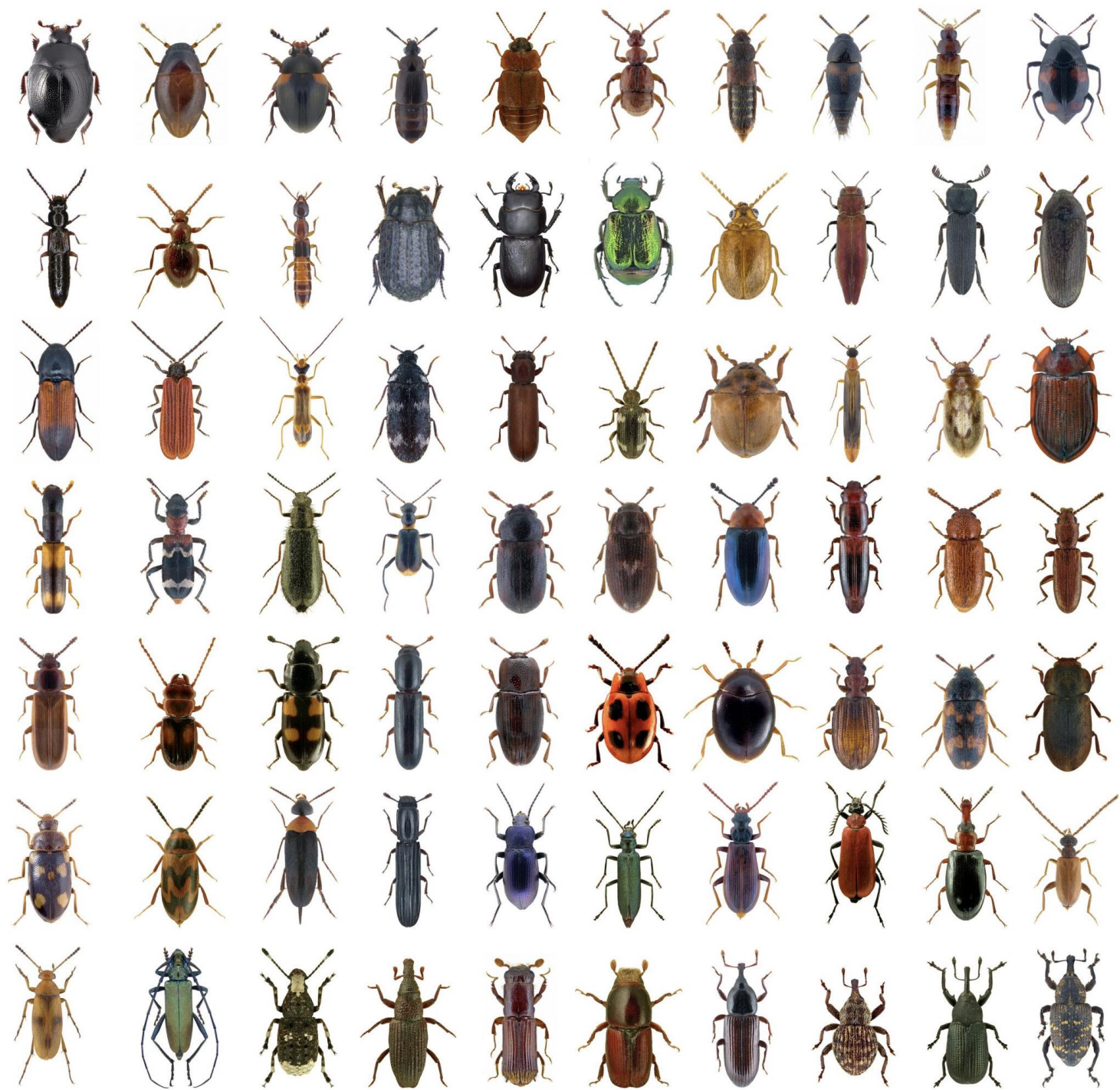


Dead wood and habitat trees = forest biodiversity

- A conservative estimate for the total number of species dependent on dead-wood habitats is 4000-5000 (e.g. all saproxylic species) in European forests (25% of all forest species)
- Many of these on National red lists and threatened with extinction in the EU
- Herbs, Epixylic bryophytes, Lichens, Mycorrhiza fungi, Soil macrofungi, Saproxylic fungi, Snails, Slugs, Ground arthropods, Saproxylic beetles, Saproxylic flies, Birds, Mammals, etc



Forest Biodiversity, e.g. Fungi on dead wood, Peručica, BiH



21.7%
threatened²
in the EU

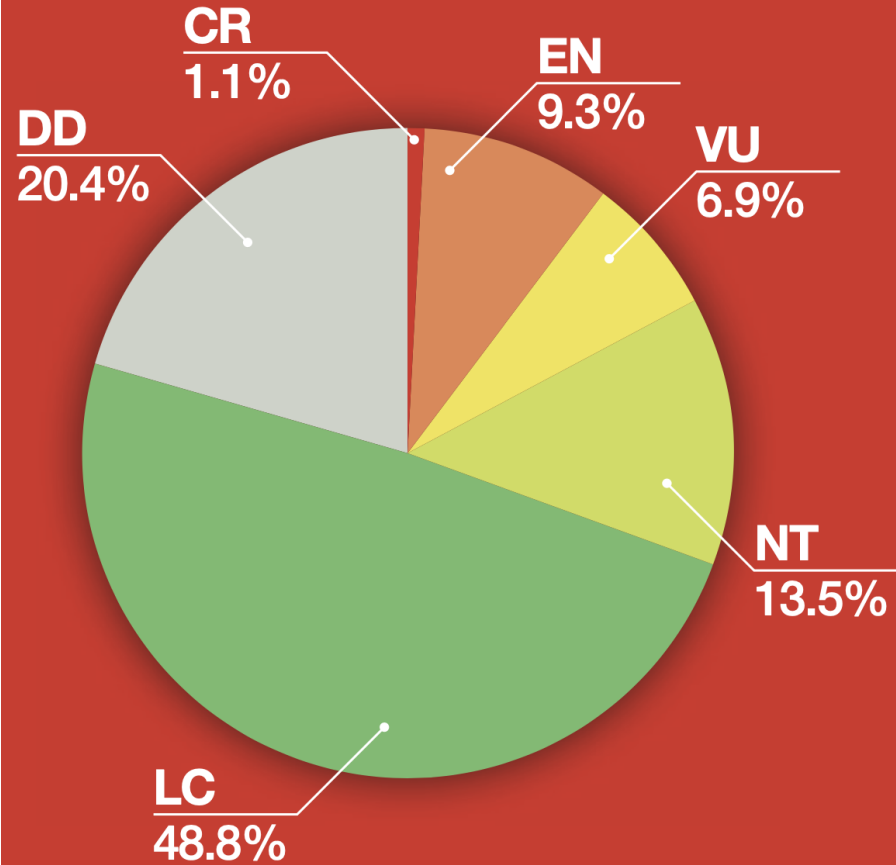
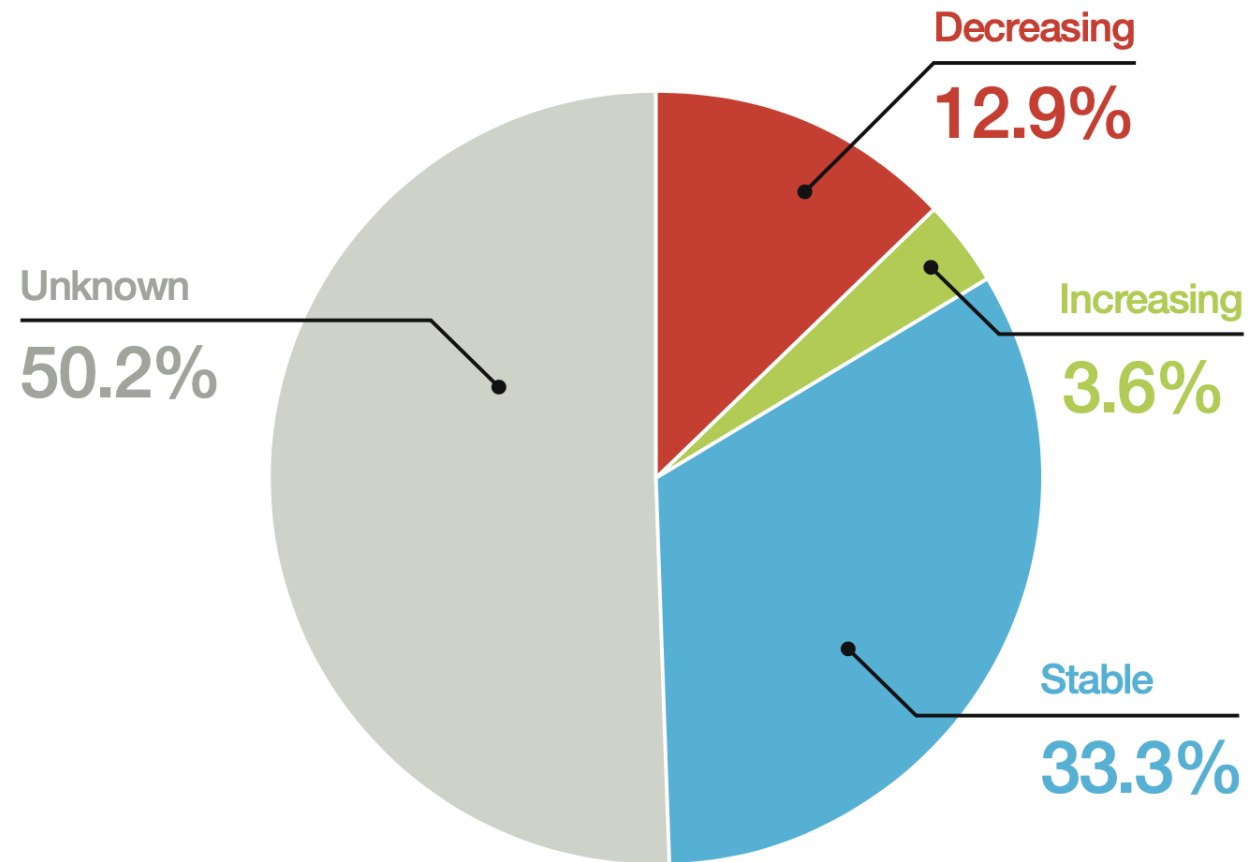
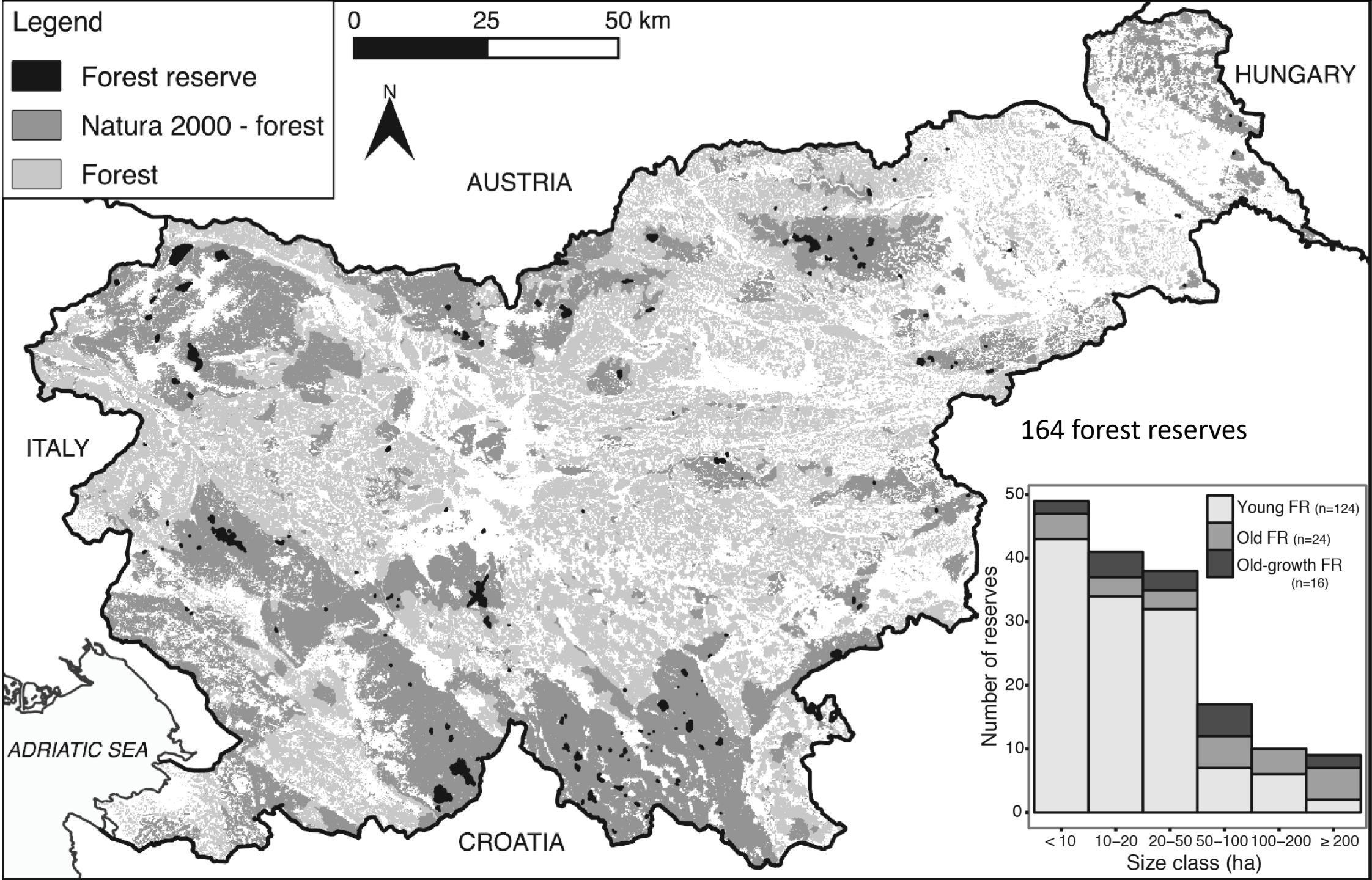


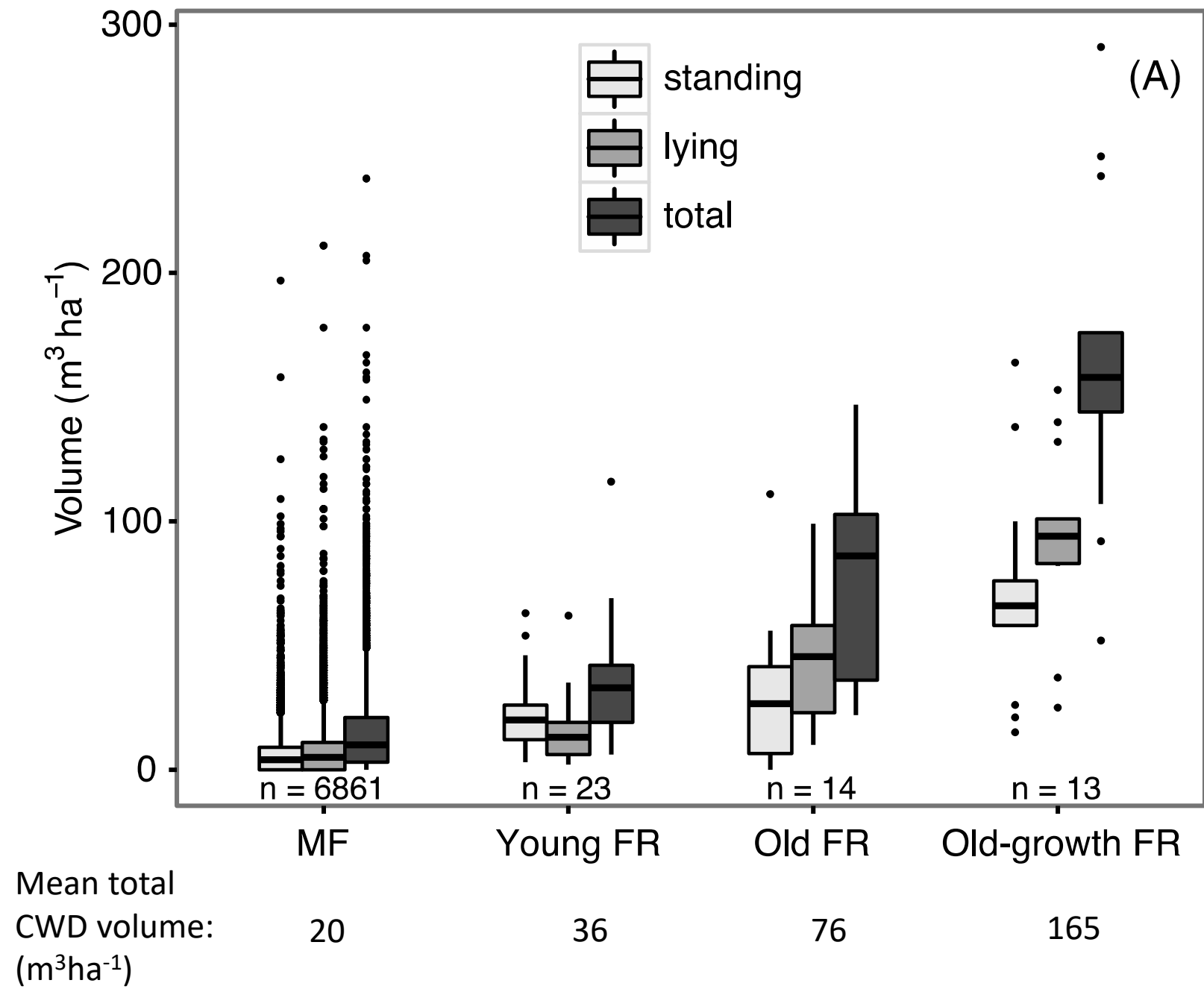
Figure 2. IUCN Red List status of saproxylic beetles in the EU.

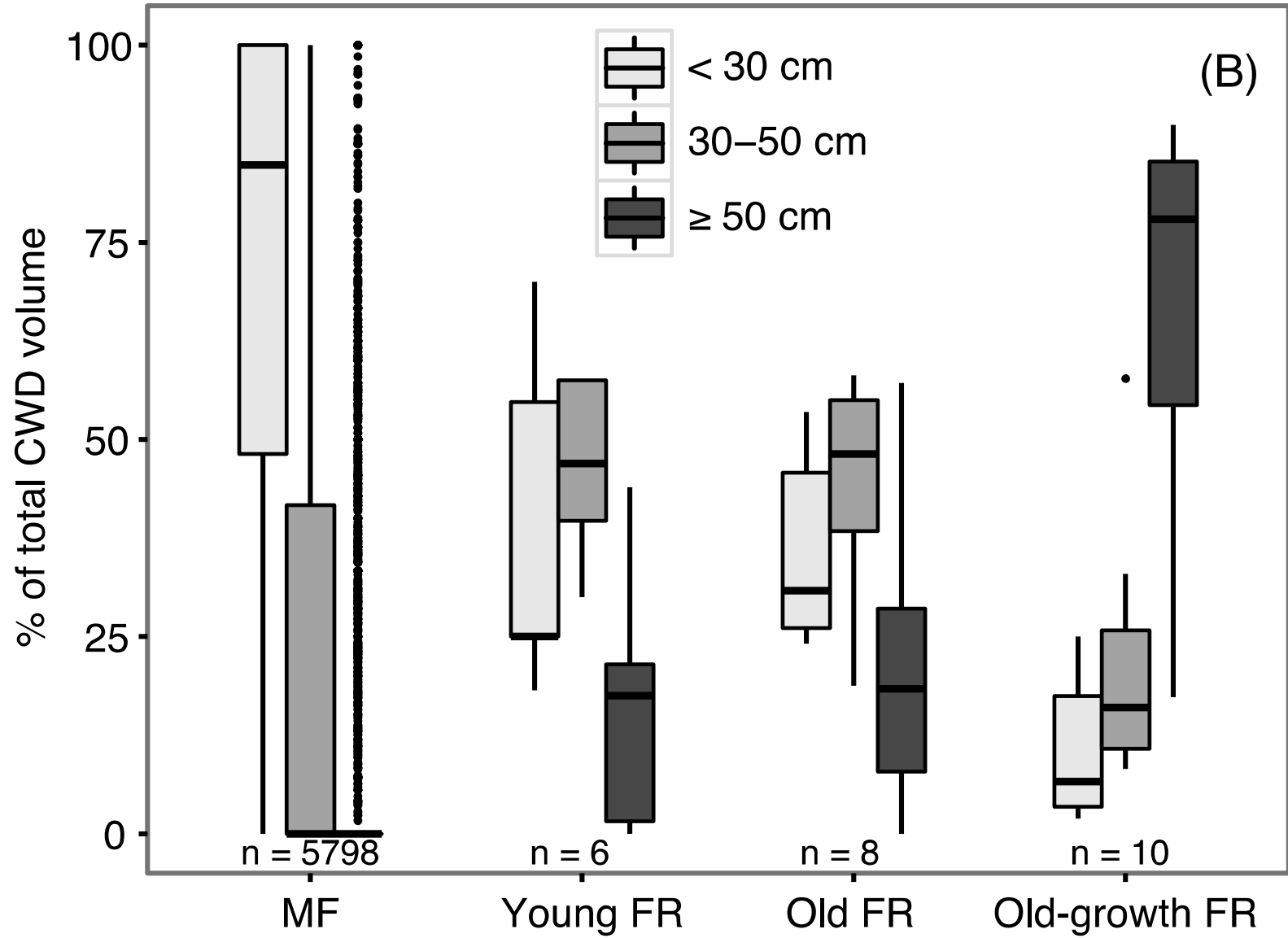
Biodiversity dependent on dead wood is in decline

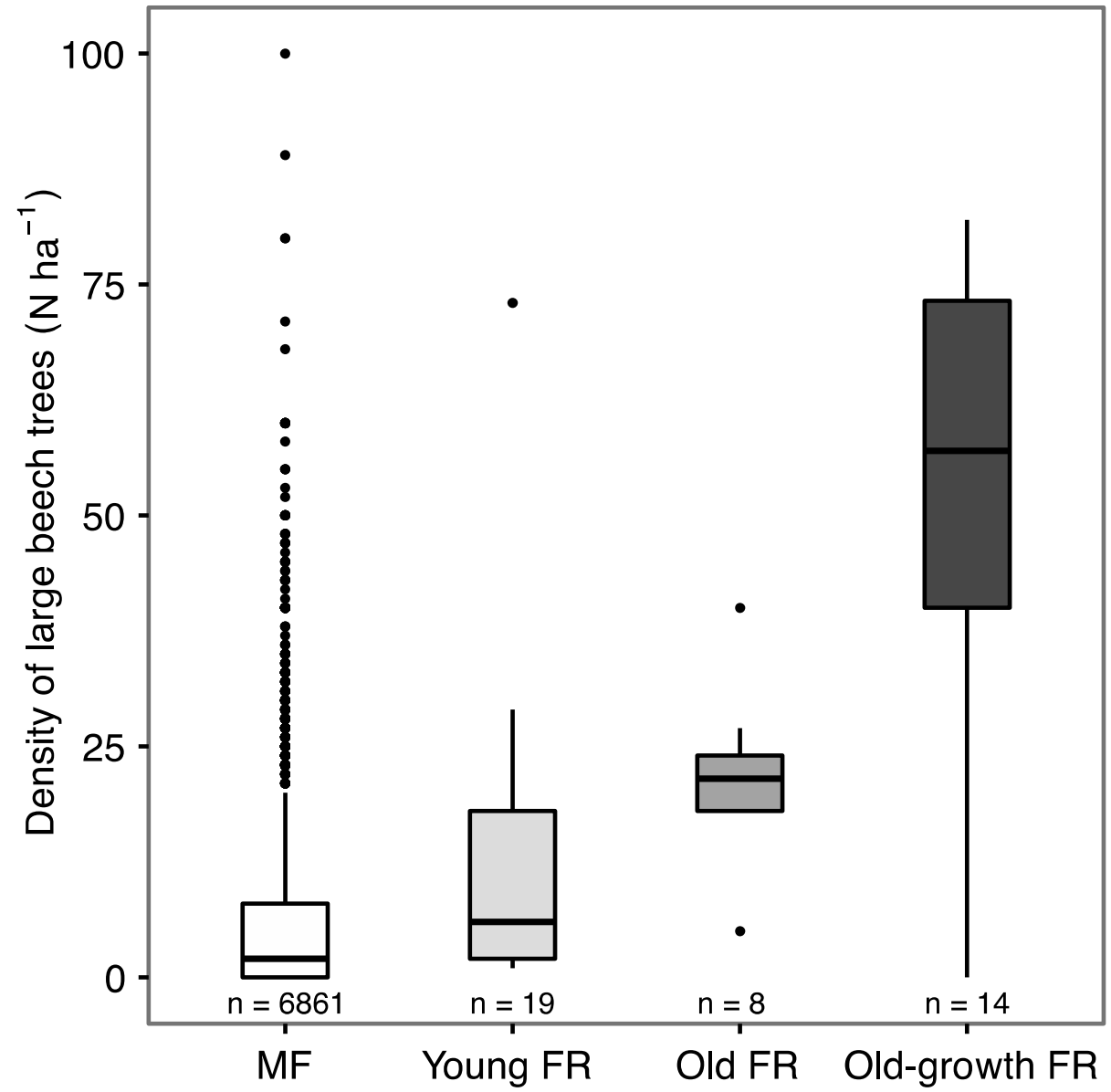
Figure 4. Population trends of European saproxylic beetles.











Mean N ha⁻¹:

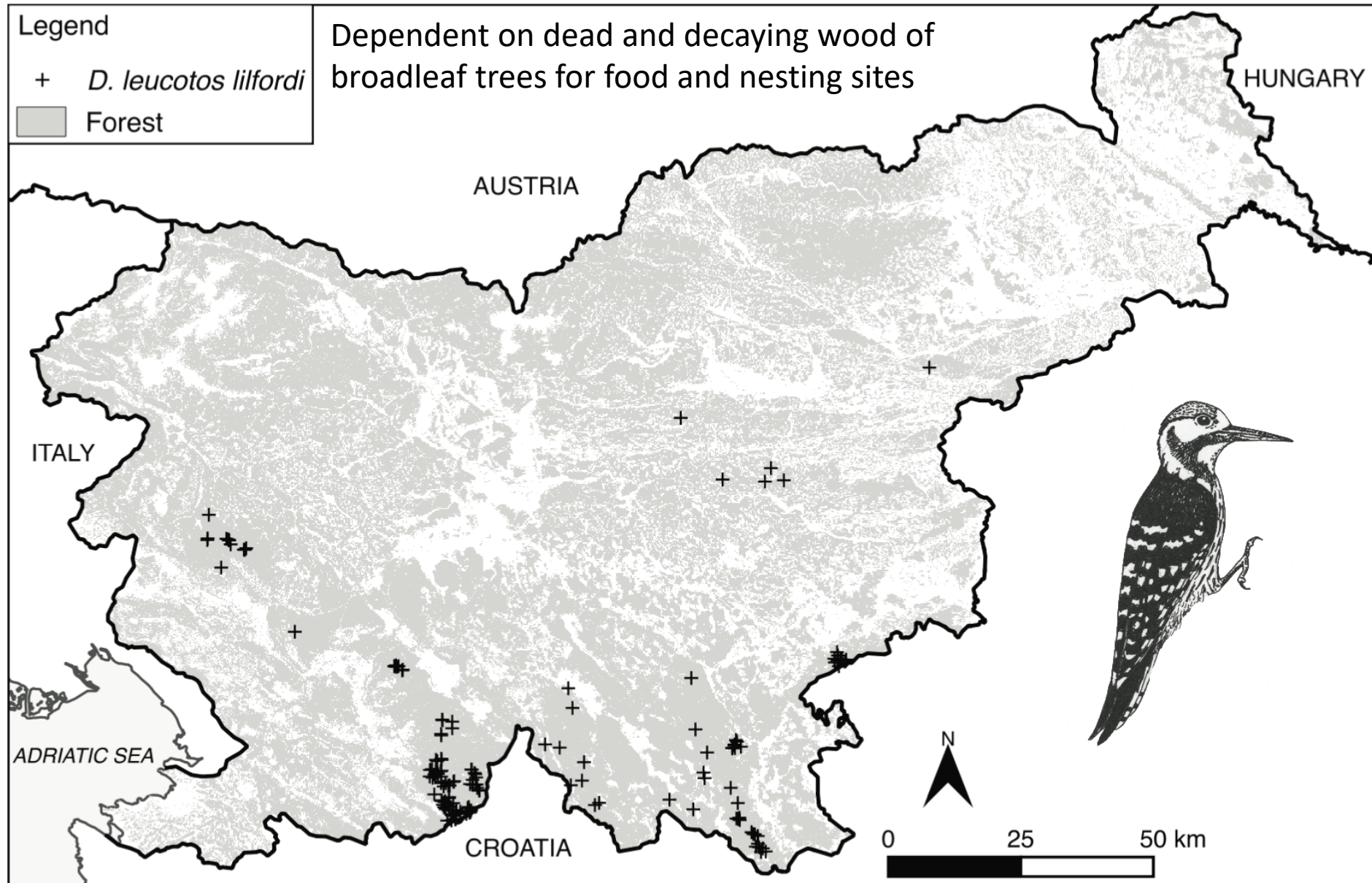
6

13

22

55

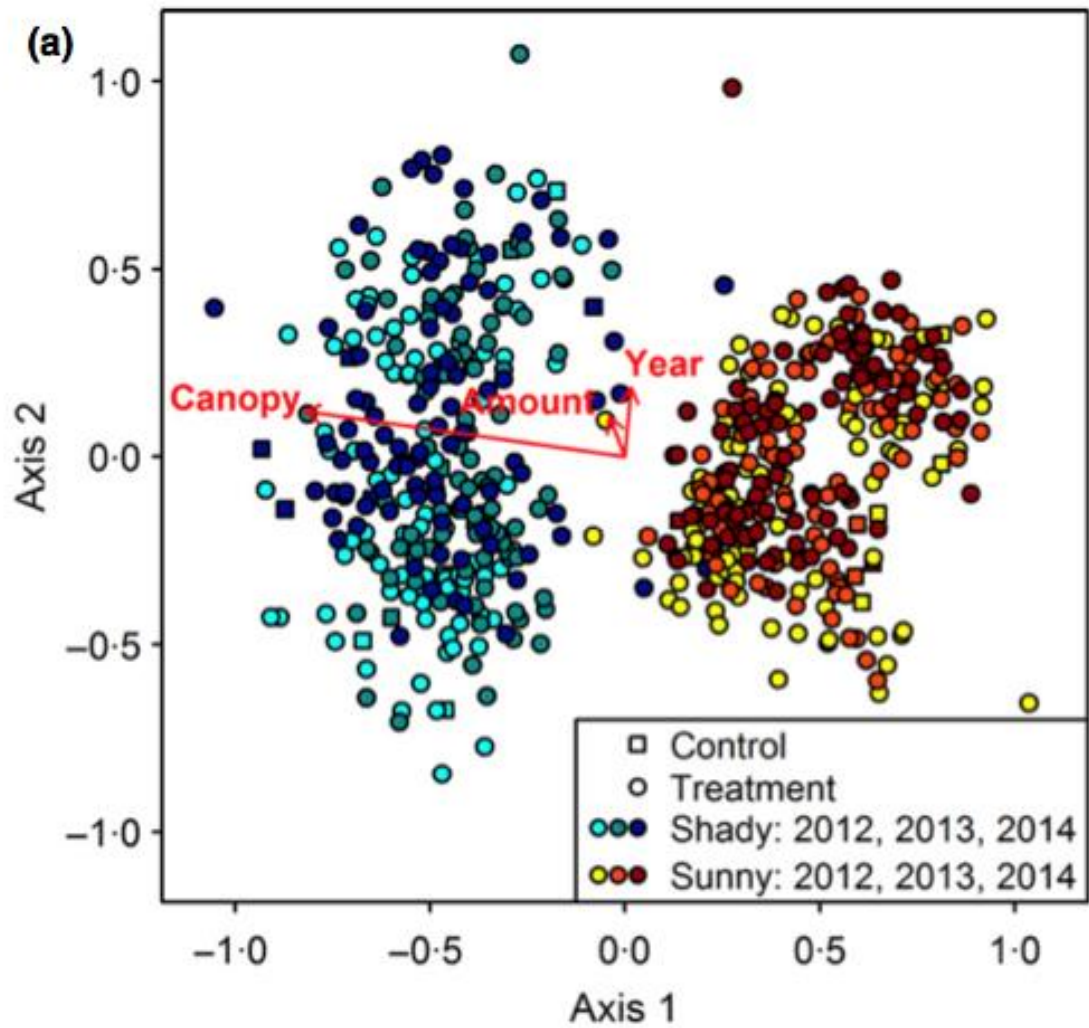
Distribution of the White-backed woodpecker (*Dendrocopos leucotos lilfordi*)



Estimated population size of 100-150 breeding pairs in Slovenia (Denac and Mihelic, 2015)

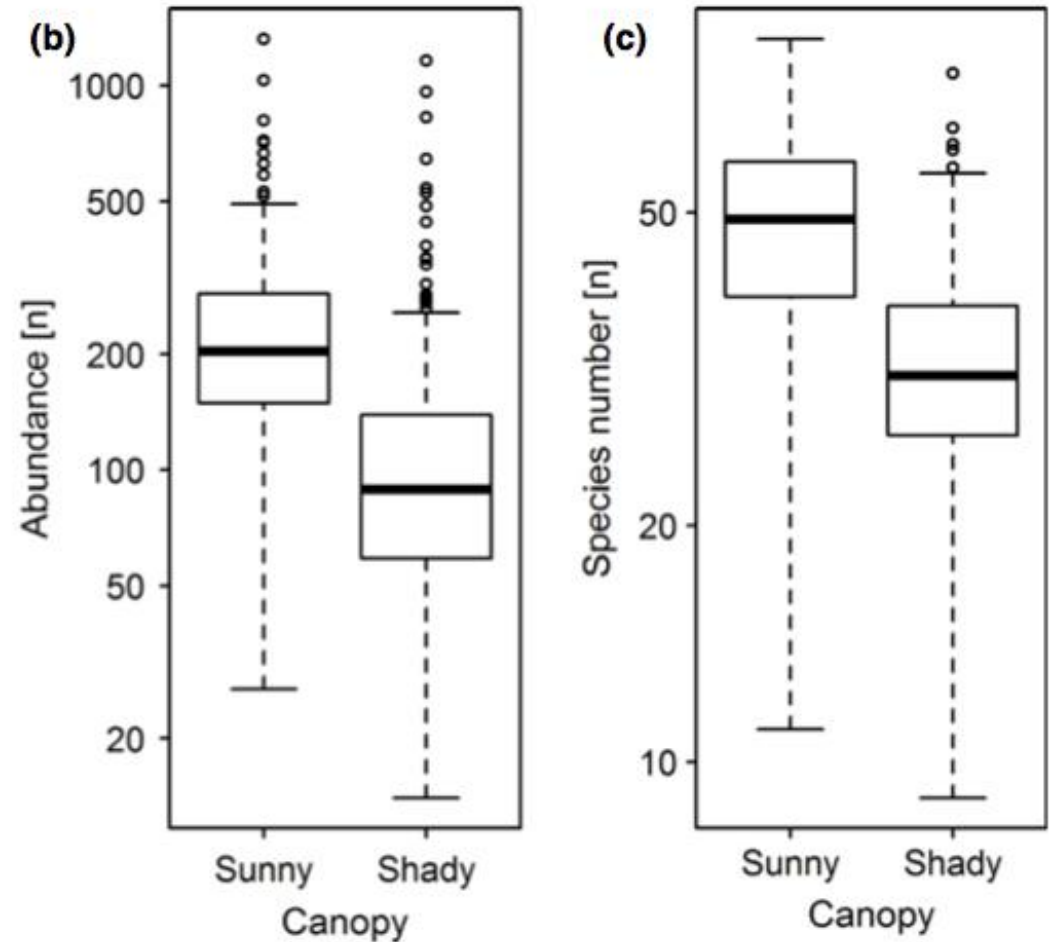




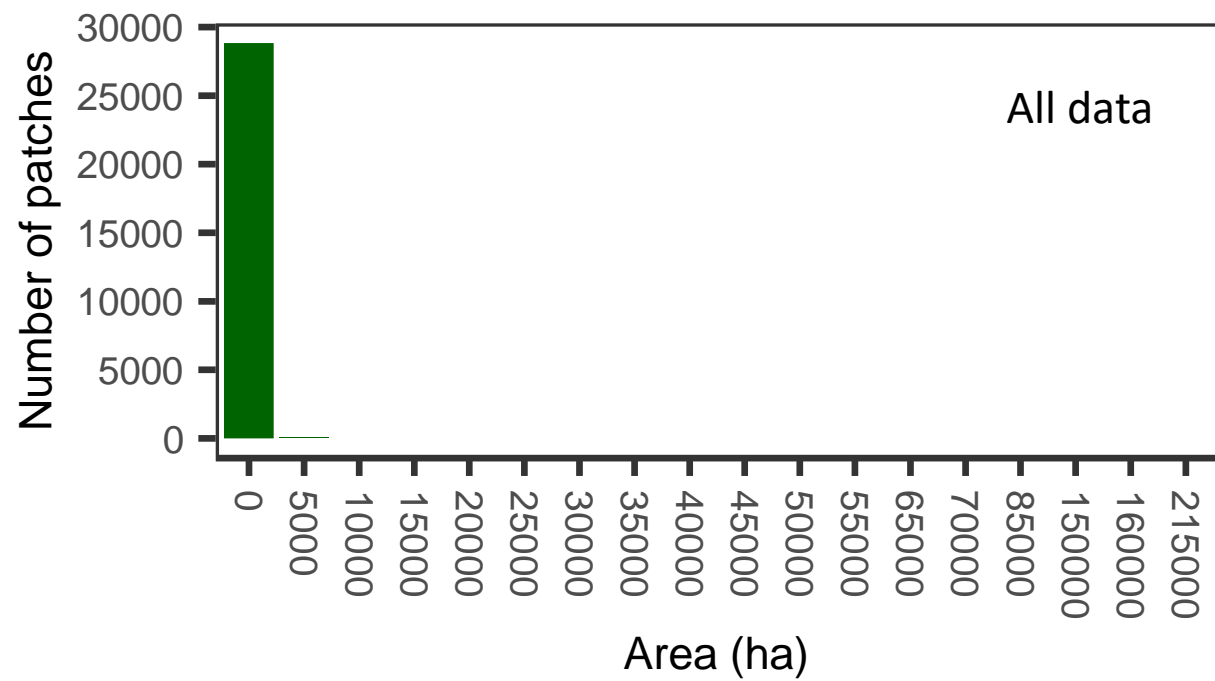


- Clearly distinct difference in saproxylic beetle species between sunny and shady plots
- Higher abundance and richness on sunny plots

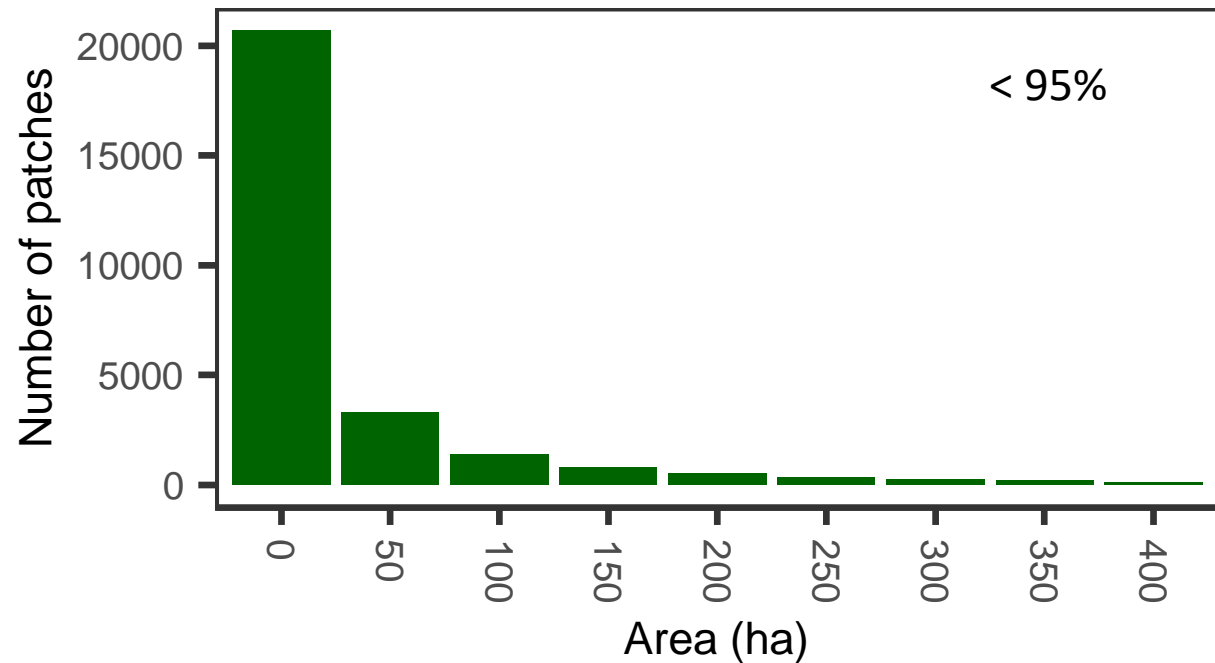
- 190 experimental plots; 283,243 trapped beetles;
- 477 saproxylic beetle species
- 68 red listed species

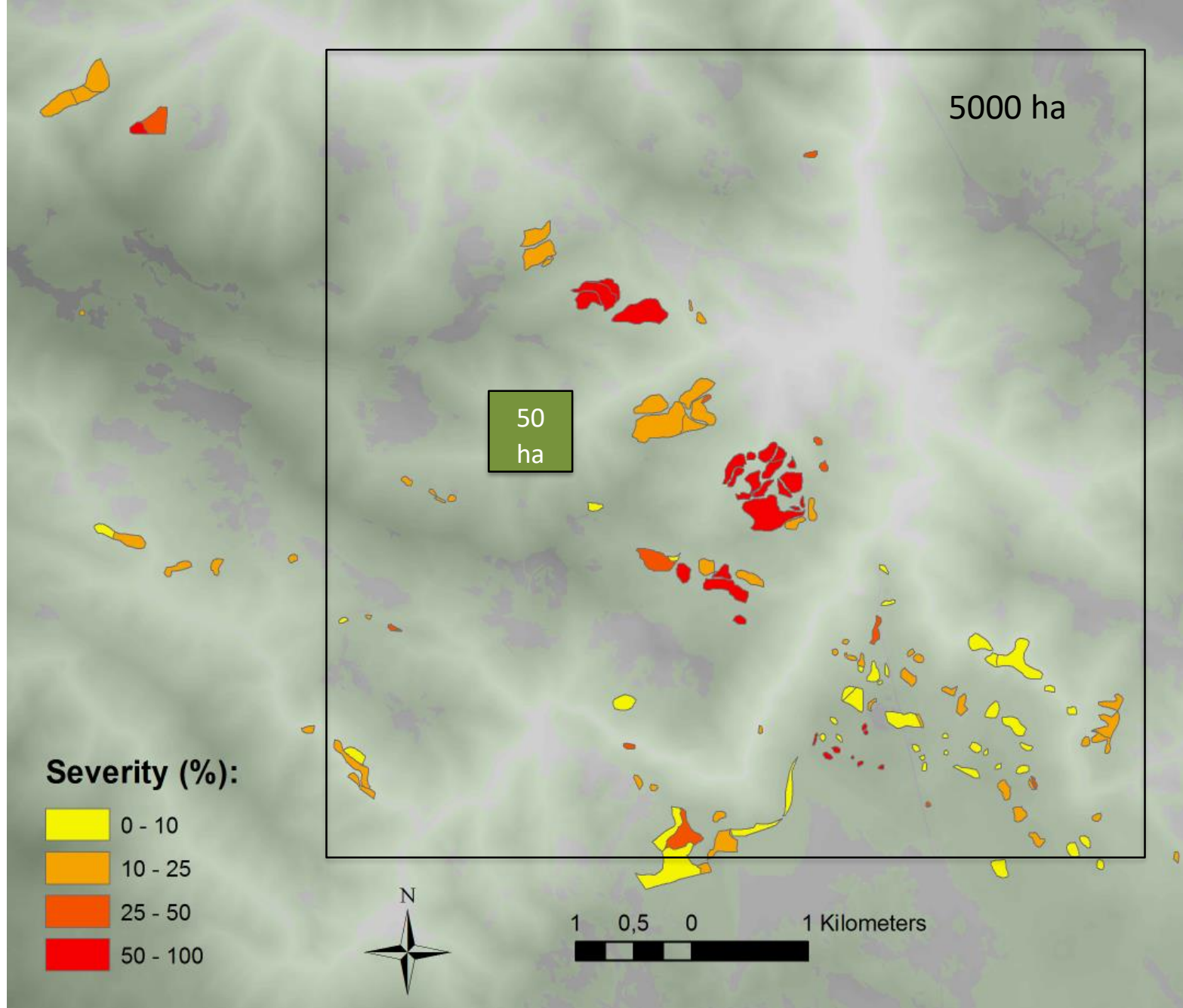






- 71% < 50 ha in size
- 50% < 20 ha
- Only 2% > 1000 ha
- 44 areas > 10,000, mostly in Sweden, Italy, and Turkey
- Too small to capture natural disturbance regimes!



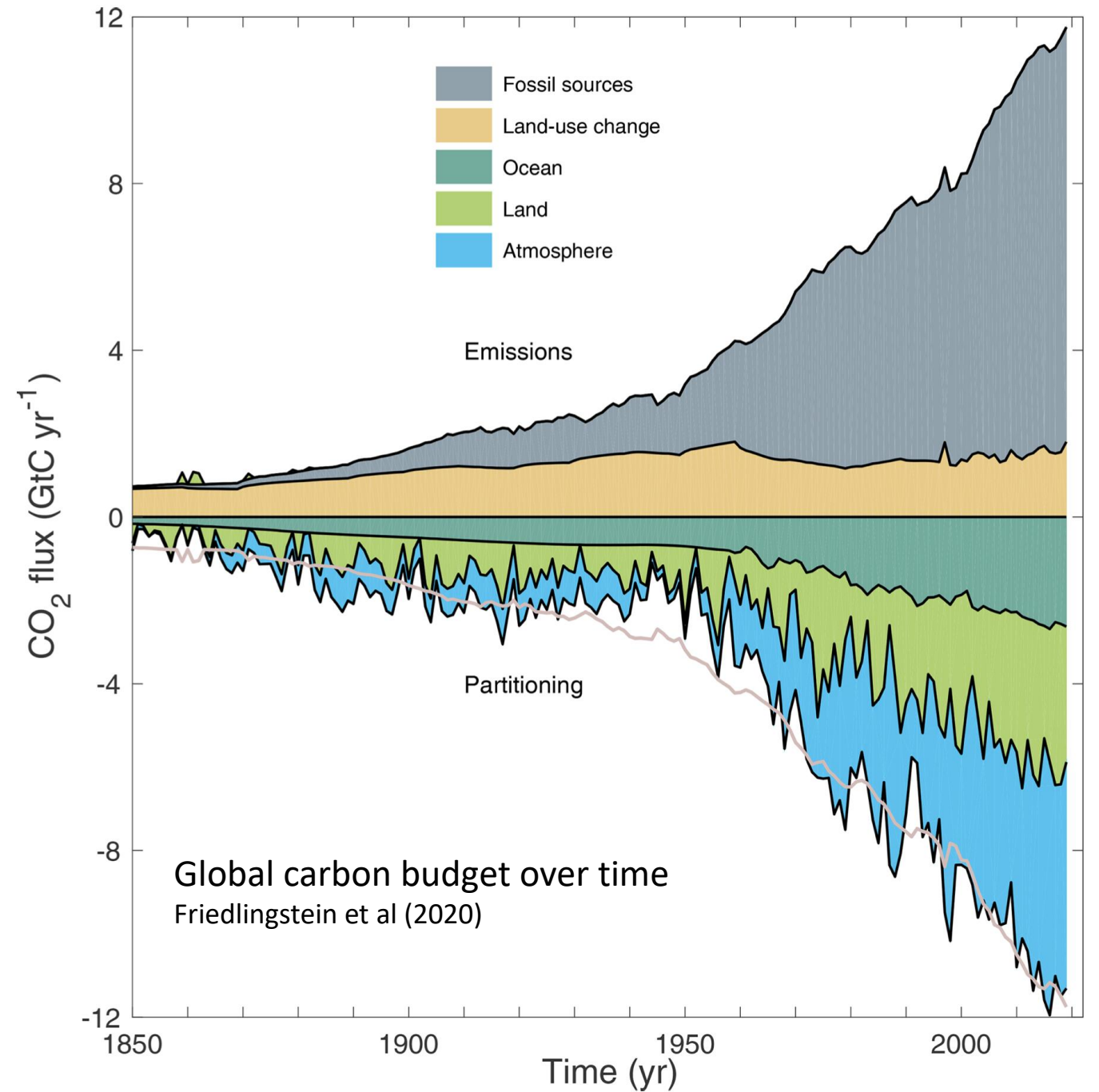


Nagel et al. (2017) Forest Ecology and Management

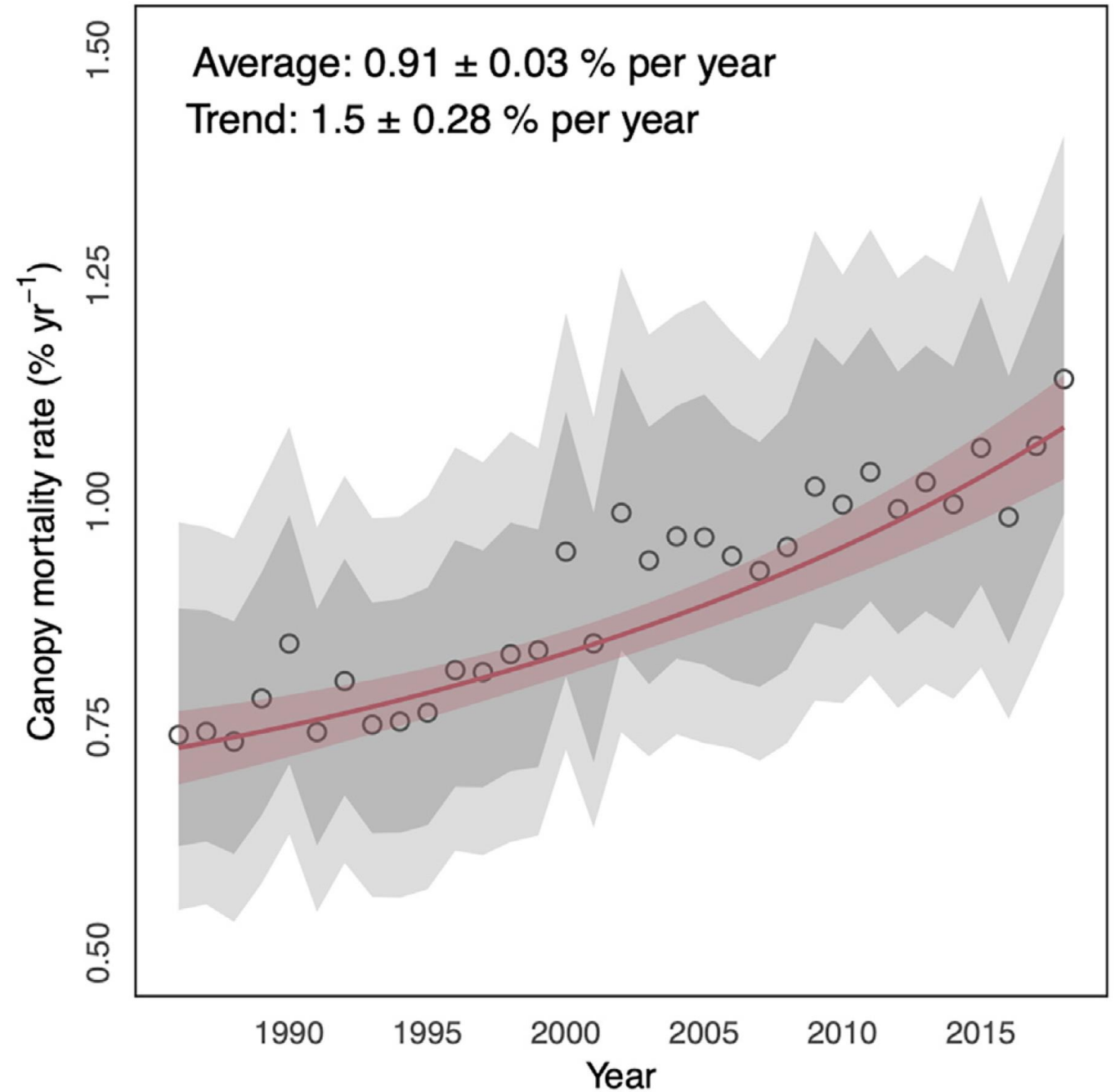
What about carbon and forest reserves?

- Carbon cycle:

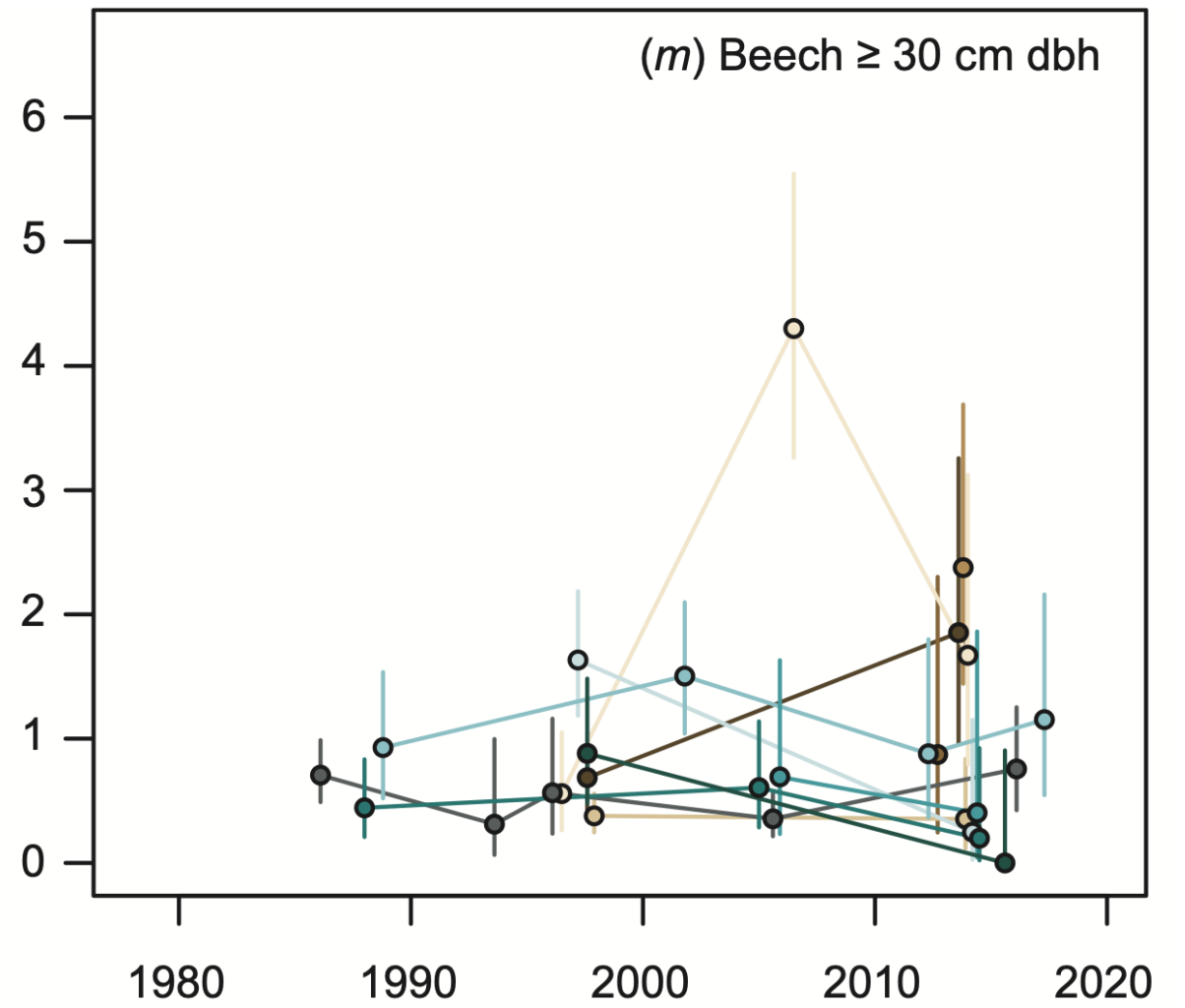
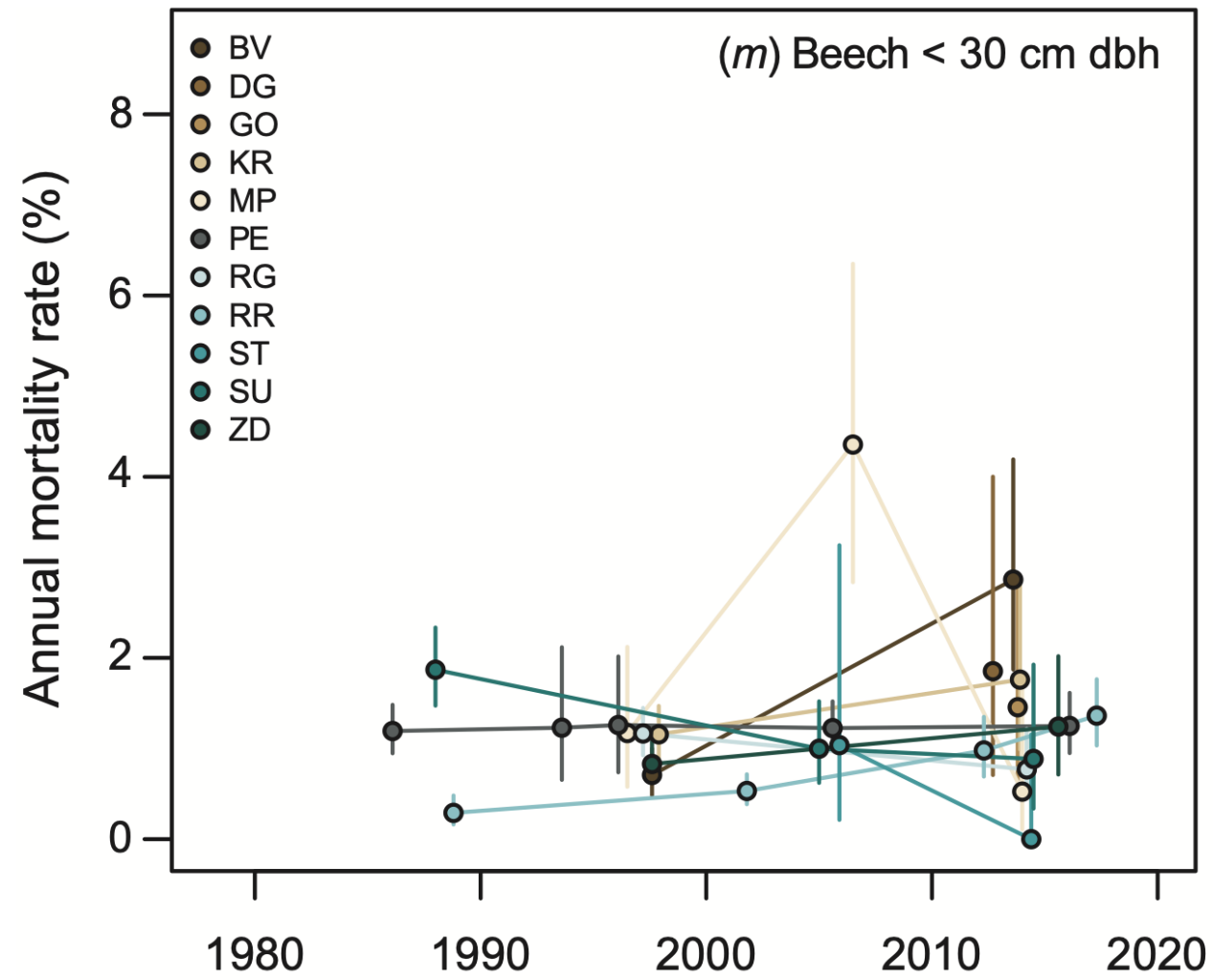
$$C_{\text{storage}} = C_{\text{uptake}} - C_{\text{respiration}} - C_{\text{mortality}}$$



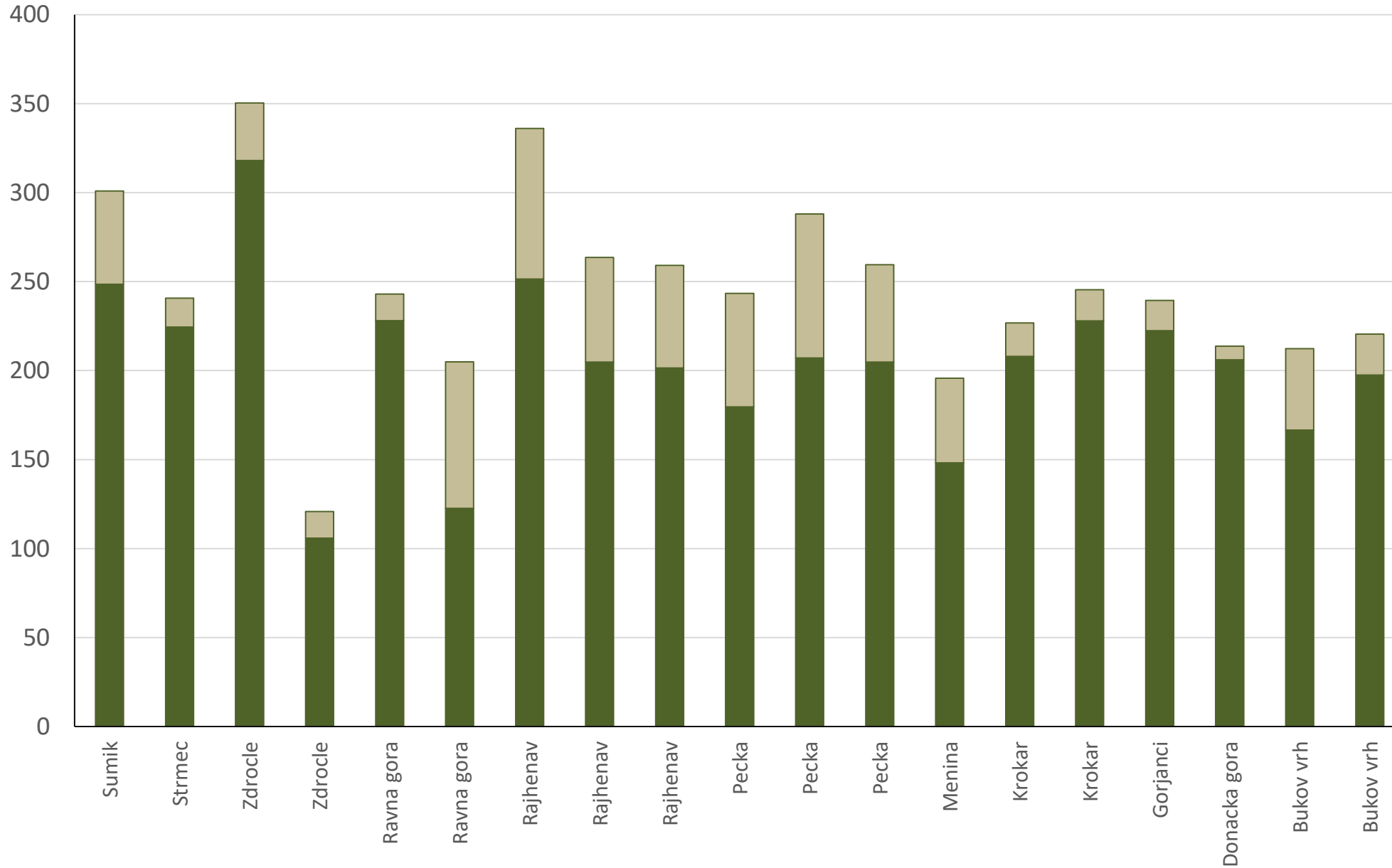
- Increasing rates of canopy mortality in managed forests of Europe



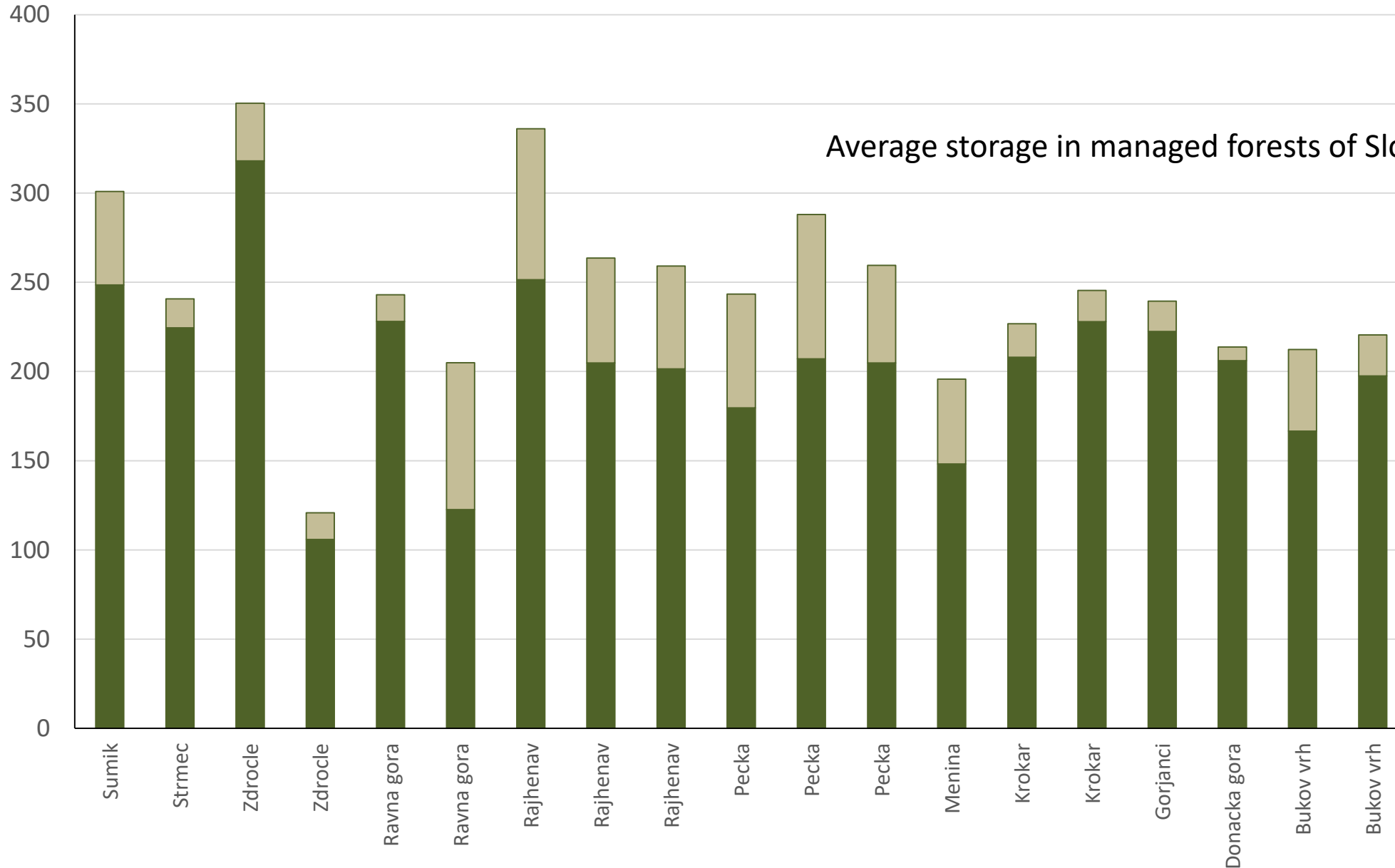




Total above ground C t/ha in old-growth forests of Slovenia

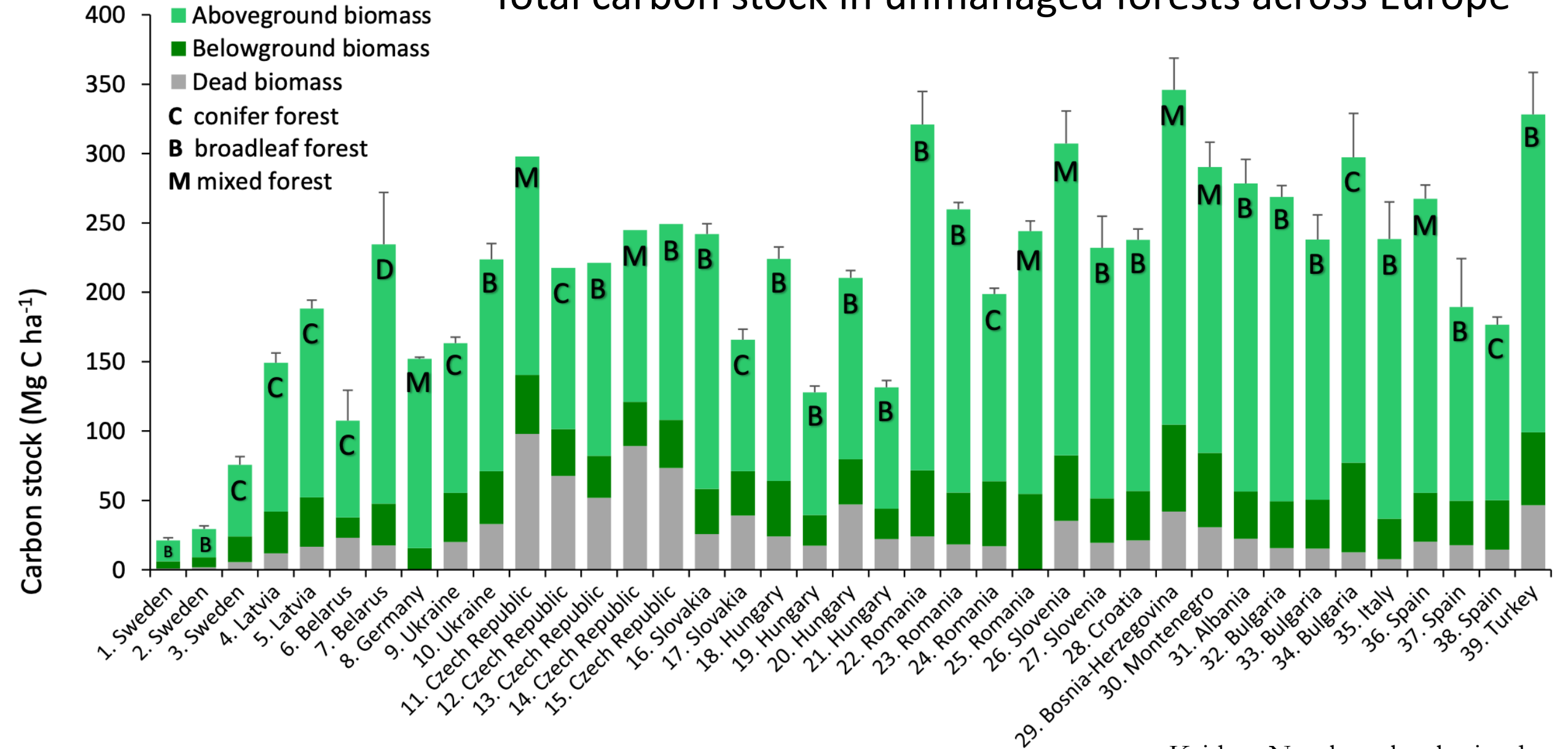


Total above ground C t/ha in old-growth forests of Slovenia

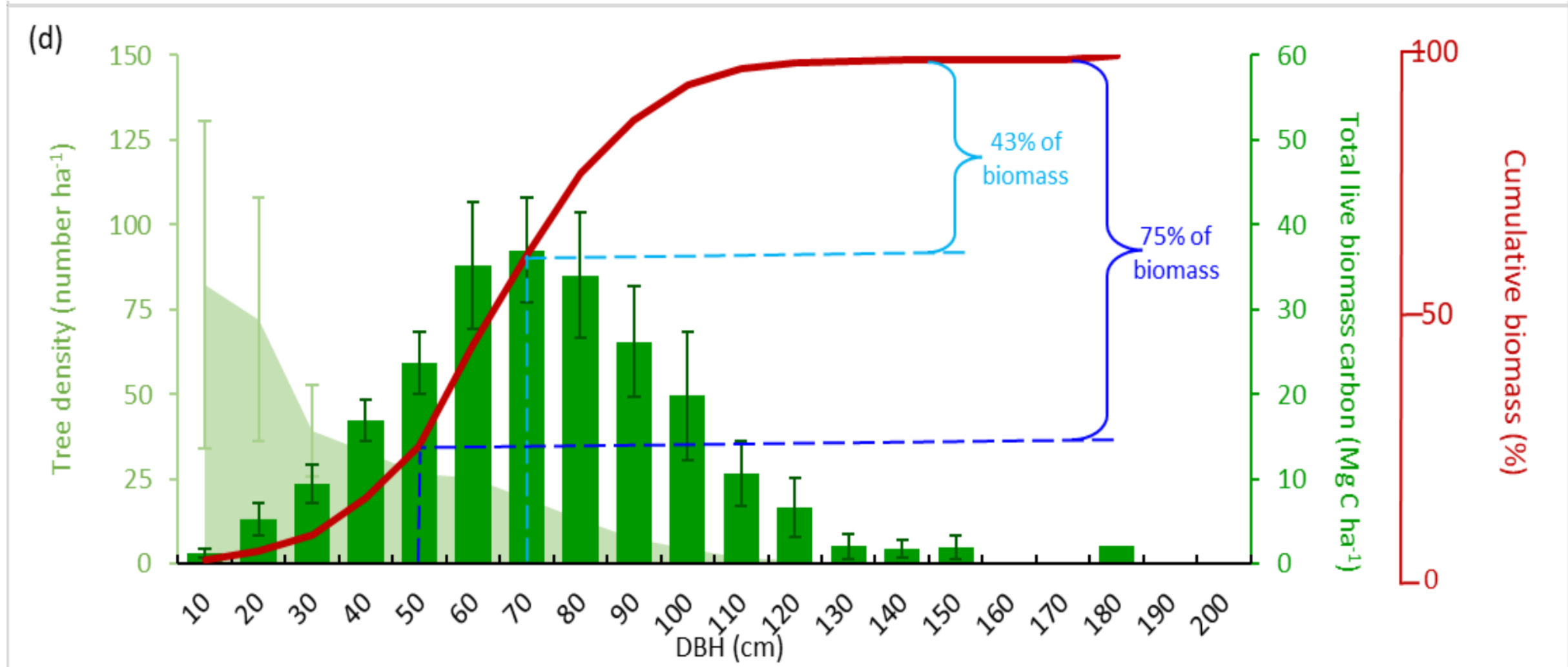


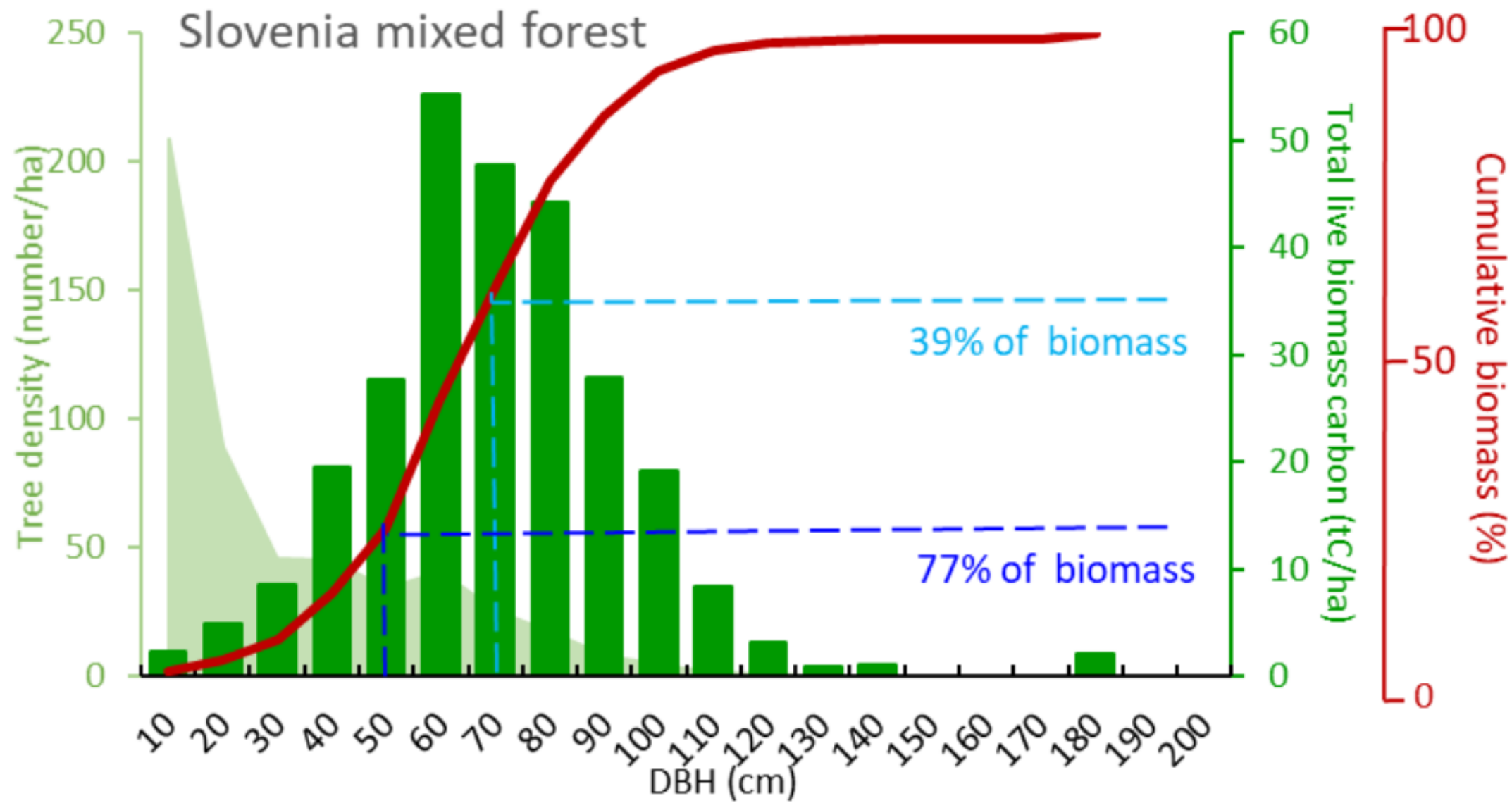
Average storage in managed forests of Slovenia is 88 t C/ha

Total carbon stock in unmanaged forests across Europe



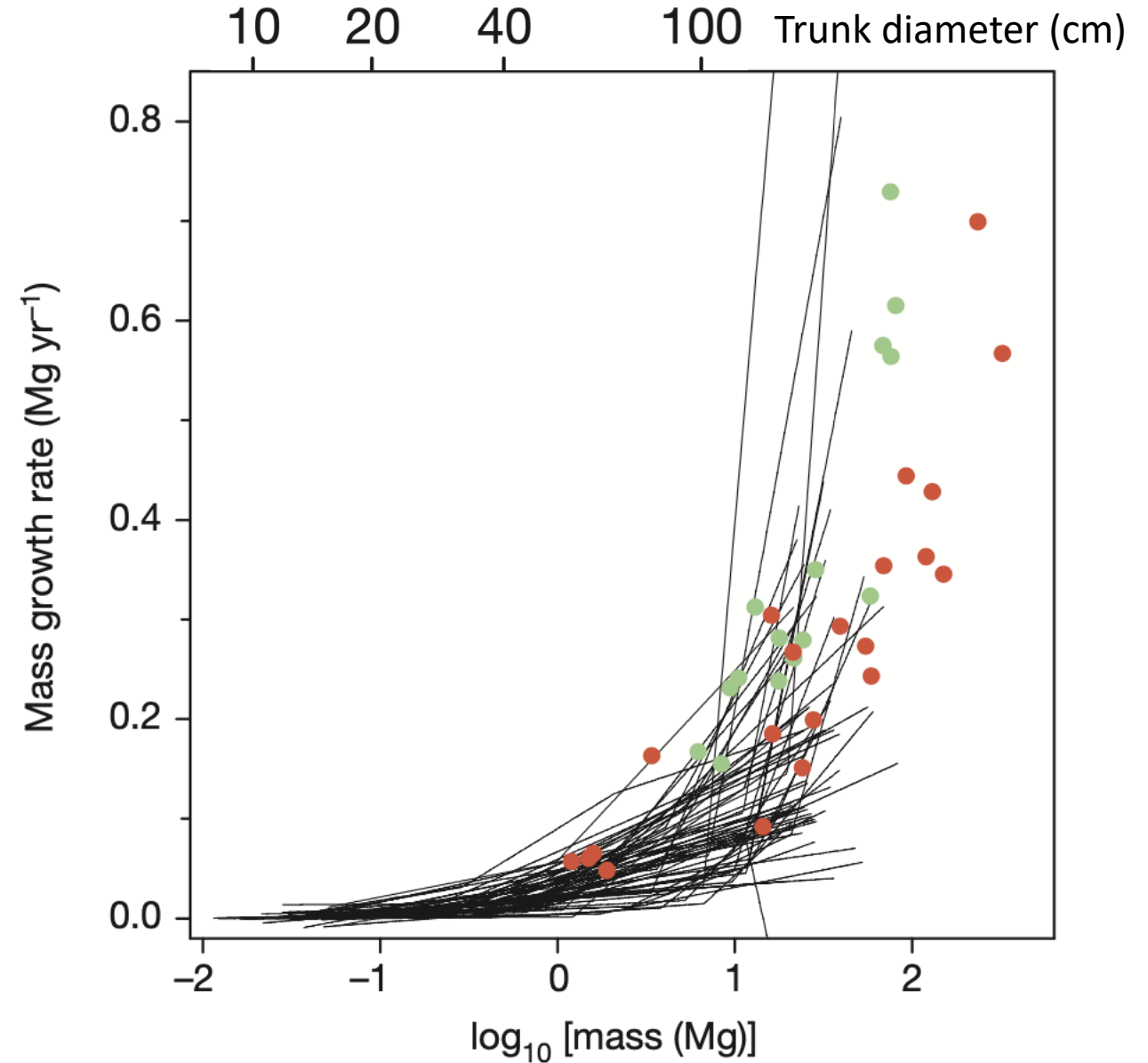
Most of the carbon biomass is stored in large trees!





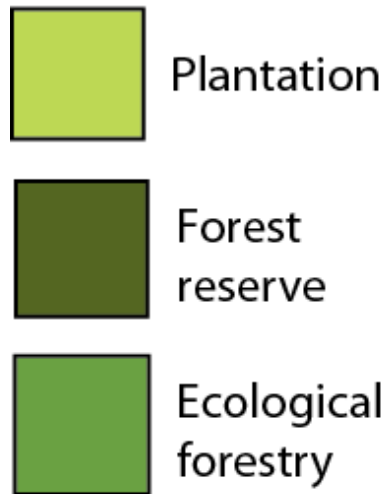
Biomass growth rates of tree species around the world

- Mass growth rate increases continuously with tree size for most species worldwide
- Large, old trees are not just reservoirs, but actively fix large amounts of carbon compared to small trees
- In some cases, a single large tree can add the same amount of carbon to the forest in one year as is contained in an entire mid-sized tree



How can we increase strict forest reserves and wood production?

TRIAD zoning



Take home message

- Currently, Europe does not protect enough unmanaged forests to maintain populations of more demanding old-growth species
- Threats of increasing climate related tree mortality or disturbance in unmanaged forests are unfounded
- In fact, disturbance is desirable in forest reserves, but most reserves are too small to capture natural disturbance regimes and maintain disturbance dependent species.
- Increasing forest reserves has substantial co-benefit with long-term carbon storage
- Land sparing (Triad) may offer a viable solution to reconcile increasing demand for timber with conservation of native forest biodiversity

