Food security and the archaeology of minor crops

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Crops, Pollinators and People ('Buckbee')

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https://www.arch.cam.ac.uk/research/projects/buckbee-1

What was the crop-honeybee-human dynamic in the past?

- How was the spread of buckwheat constrained by abiotic and biotic factors?
- How did humans interrelate with honeybees across Eurasia in the prehistoric and historic period?
- How did climate and vegetational change affect bee and buckwheat populations?

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Buck Bee

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Insect pollination in the global economy

- Insect-pollinated crops – c. 35% of global food production
- 70% of tropical crops and 84% of European crops rely on animals (insects) for pollination
- Global economic value of pollination - €153 billion (2005)
- In the absence of honeybees, the yields of some crops reduce by up to 90%

\-
Overexploitation of colonies for honey/wax;
Habitat destruction

\+
Colony management;
Alteration of vegetation

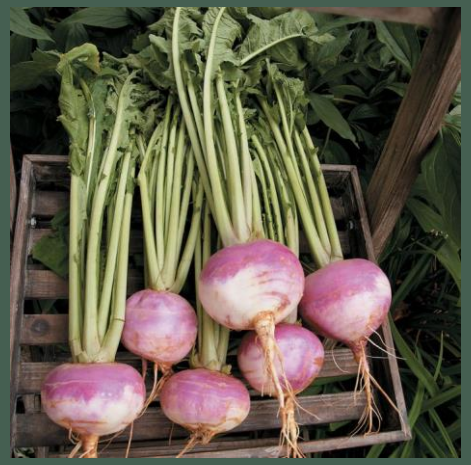
\+
Cultivation of domesticated plants

\+
Nectar availability limits honeybee populations

\+
Pollination -> enhanced seed set

Insect-pollinated crops were domesticated from the 4th millennium BC








Buckwheat (*Fagopyrum*)

Common buckwheat
(*Fagopyrum esculentum*)

Tartary buckwheat
(*Fagopyrum tataricum*)

Jinsha jiang, Yunnan, China

Common buckwheat: modern cultivation range

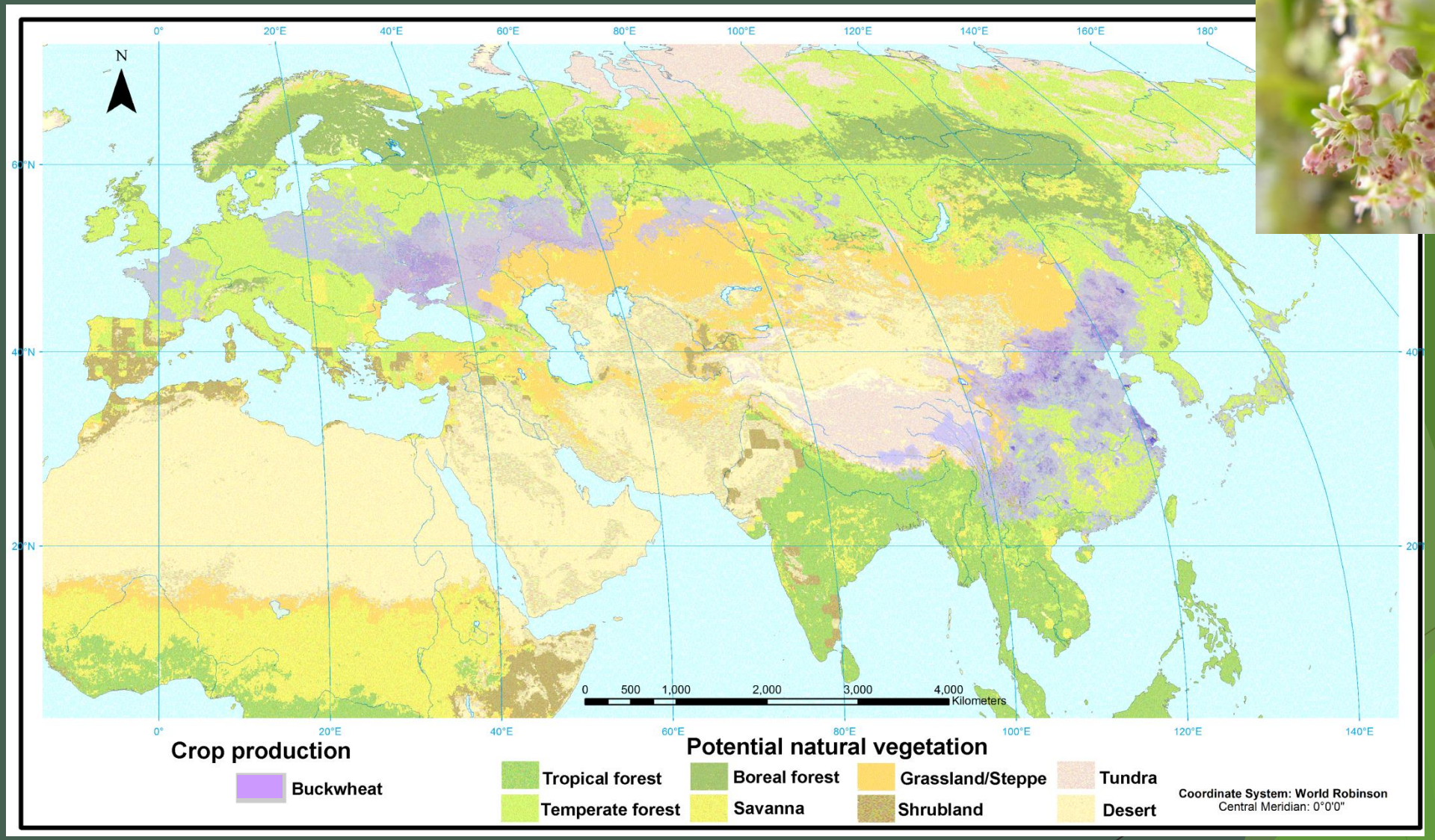
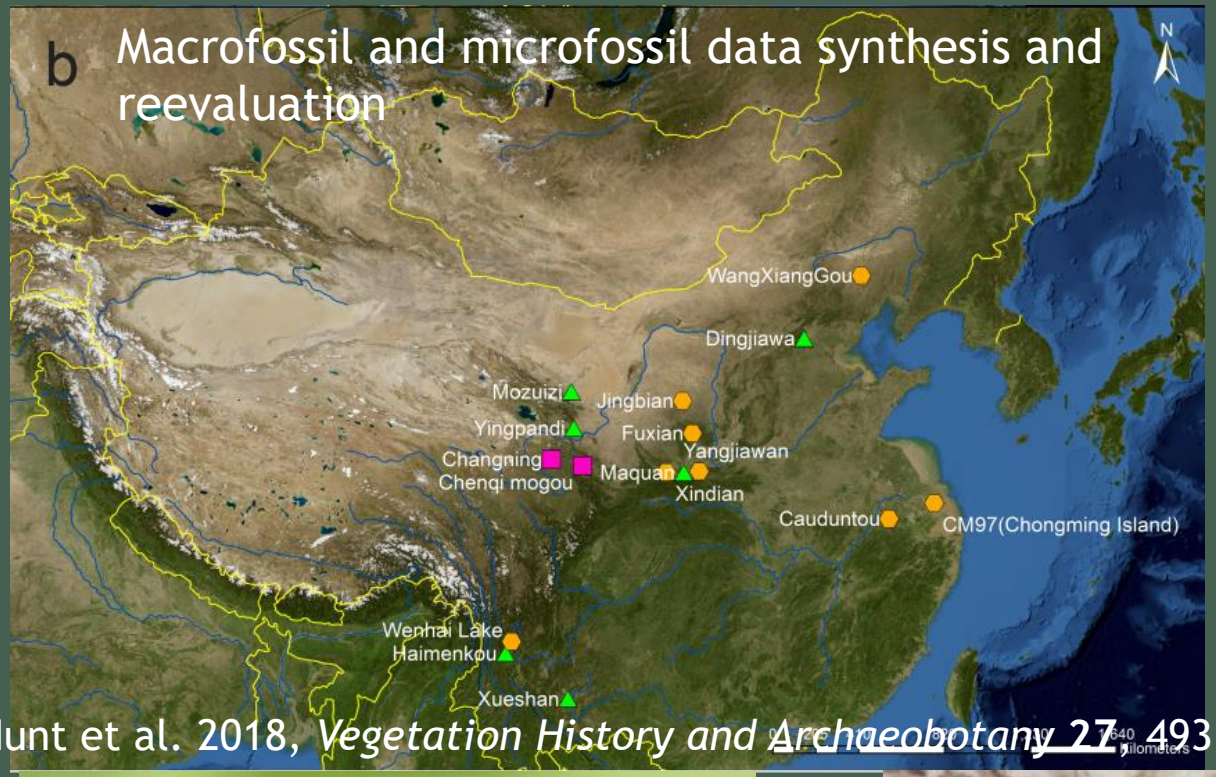
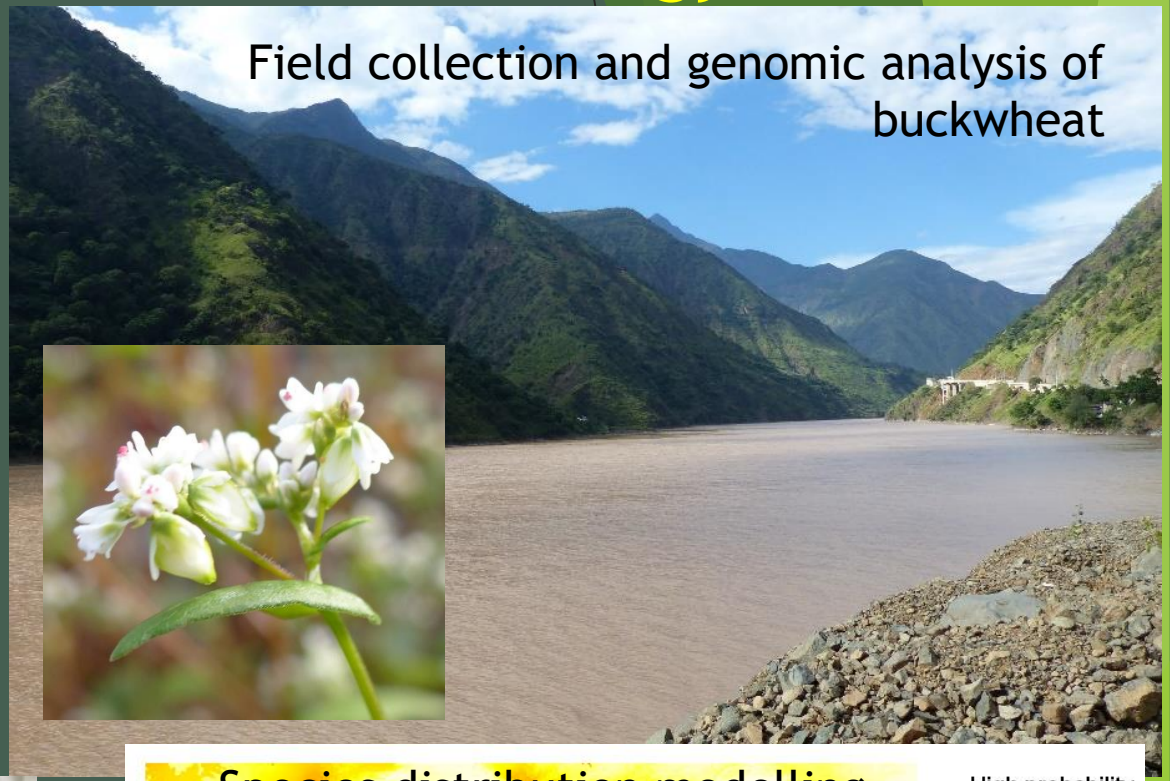


Fig. 4. Hunt et al. 2018 *Vegetation History and Archaeobotany* **27**, 493-506

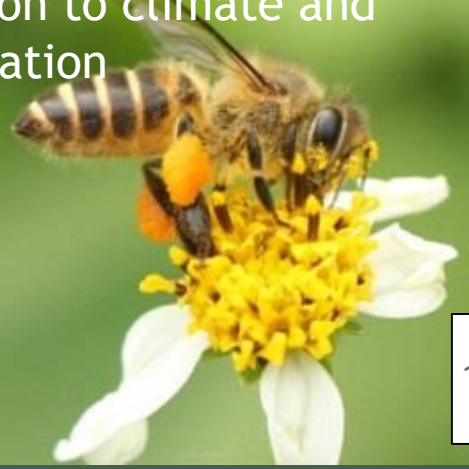
Buckbee: Biomolecular/environmental archaeology strands



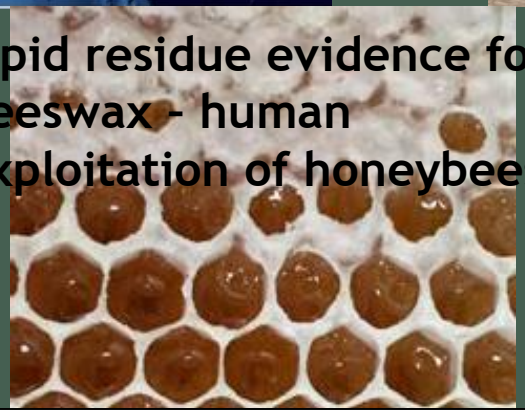
Hunt et al. 2018, *Vegetation History and Archaeobotany* **27**, 493-506

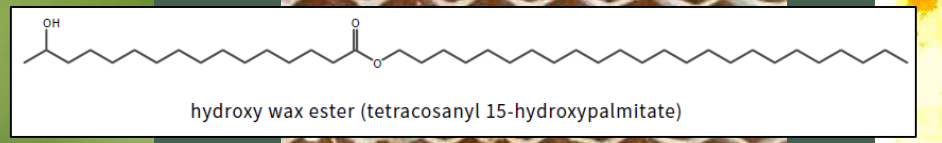


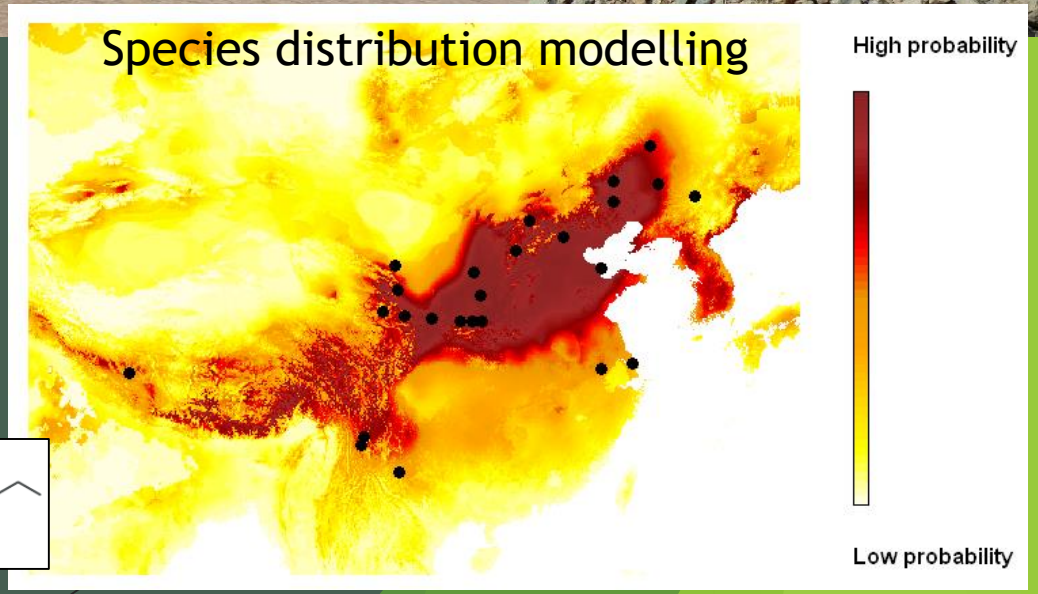
Honeybee population history in relation to climate and vegetation



Lipid residue evidence for beeswax – human exploitation of honeybees

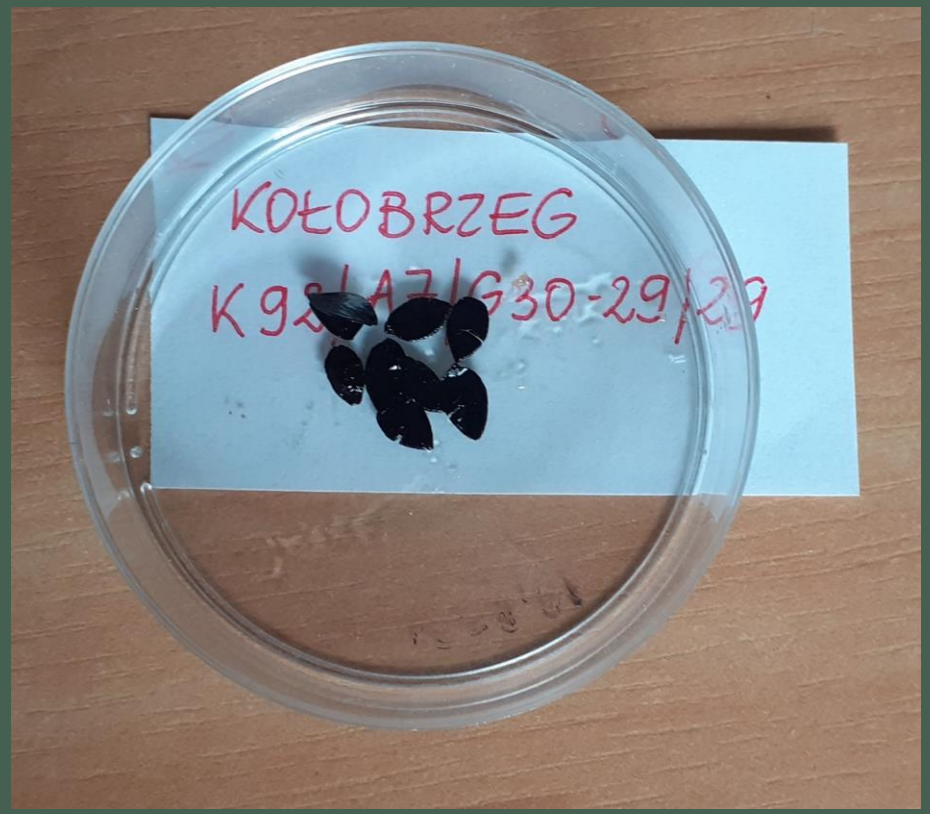


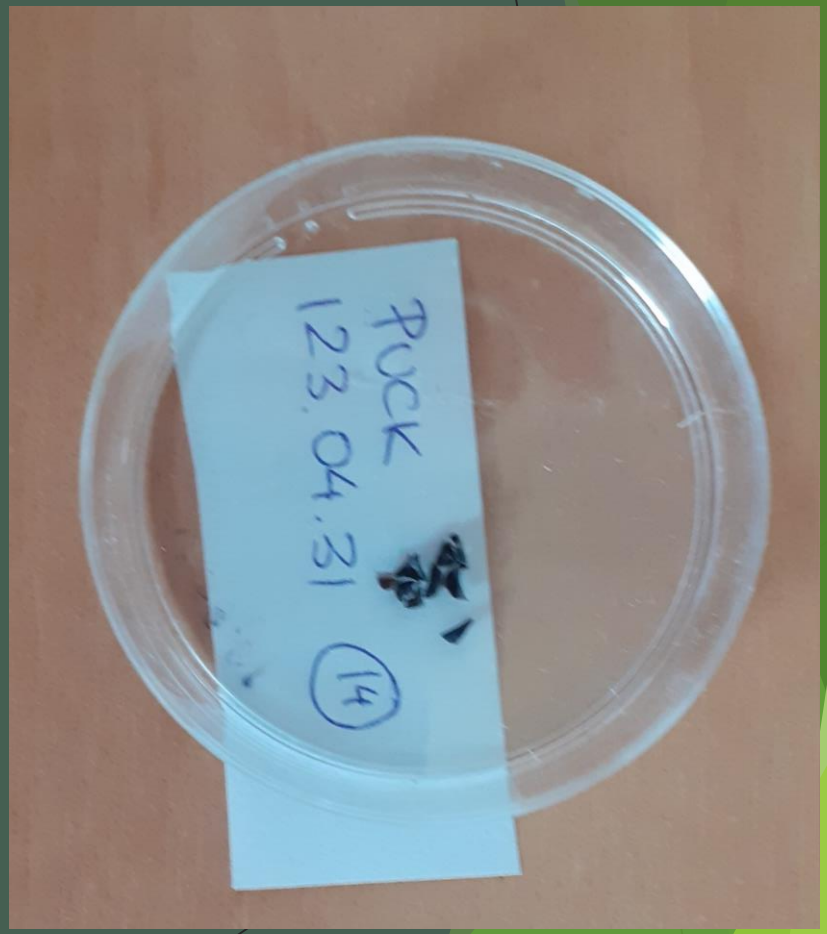





Mediaeval (or pre-mediaeval??) arrival of buckwheat
Changing forest-steppe boundary
A. mellifera management attested from historical record
Neolithic work gives a baseline
Neolithic expansion of buckwheat
Changing forest-steppe boundary
A. cerana population history
Early exploitation of A. cerana in relation to early pottery?
Finland
Russia
Estonia
Latvia
Belarus
Ukraine
Moldova
Romania
Kazakhstan
Mongolia
Black Sea
Bulgaria
Georgia
Caspian Sea
Uzbekistan
Kyrgyzstan
Azerbaijan
Turkey
Turkmenistan
Tajikistan
North Korea
South Korea
Yellow Sea
Syria
Lebanon
Iraq
Israel
Jordan
Iran
Afghanistan
China
Pakistan
Nepal
Bhutan
East China Sea
Egypt
United Arab Emirates
Saudi Arabia
Bangladesh
India
Taiwan

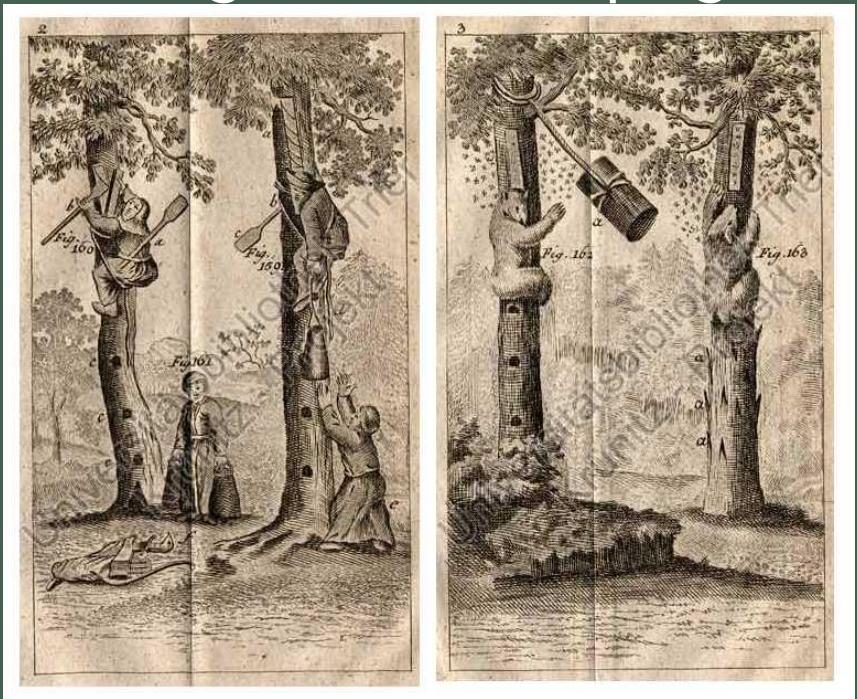
Archaeobotany: evaluation of chronology of spread by AMS dating





Was buckwheat cultivation in Europe synchronous with bee management?

- Russia - Trade of beeswax important from at least AD 900
- Tree beekeeping by AD 1000 – looked after by special class of peasant (‘*bortnik*’)
- Log hive beekeeping from AD 1100-1200



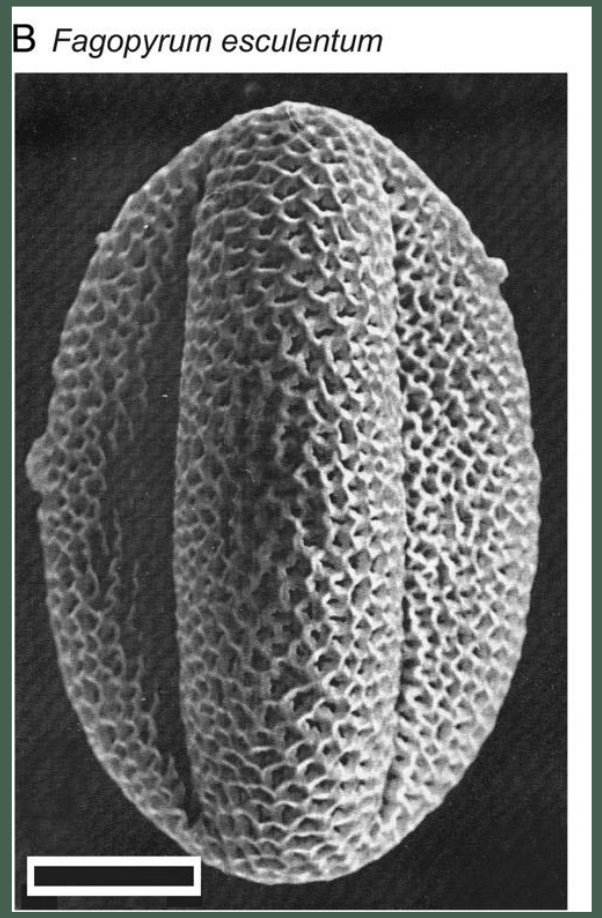
Krunitz 1774, Tree beekeeping in Bashkir, Russia

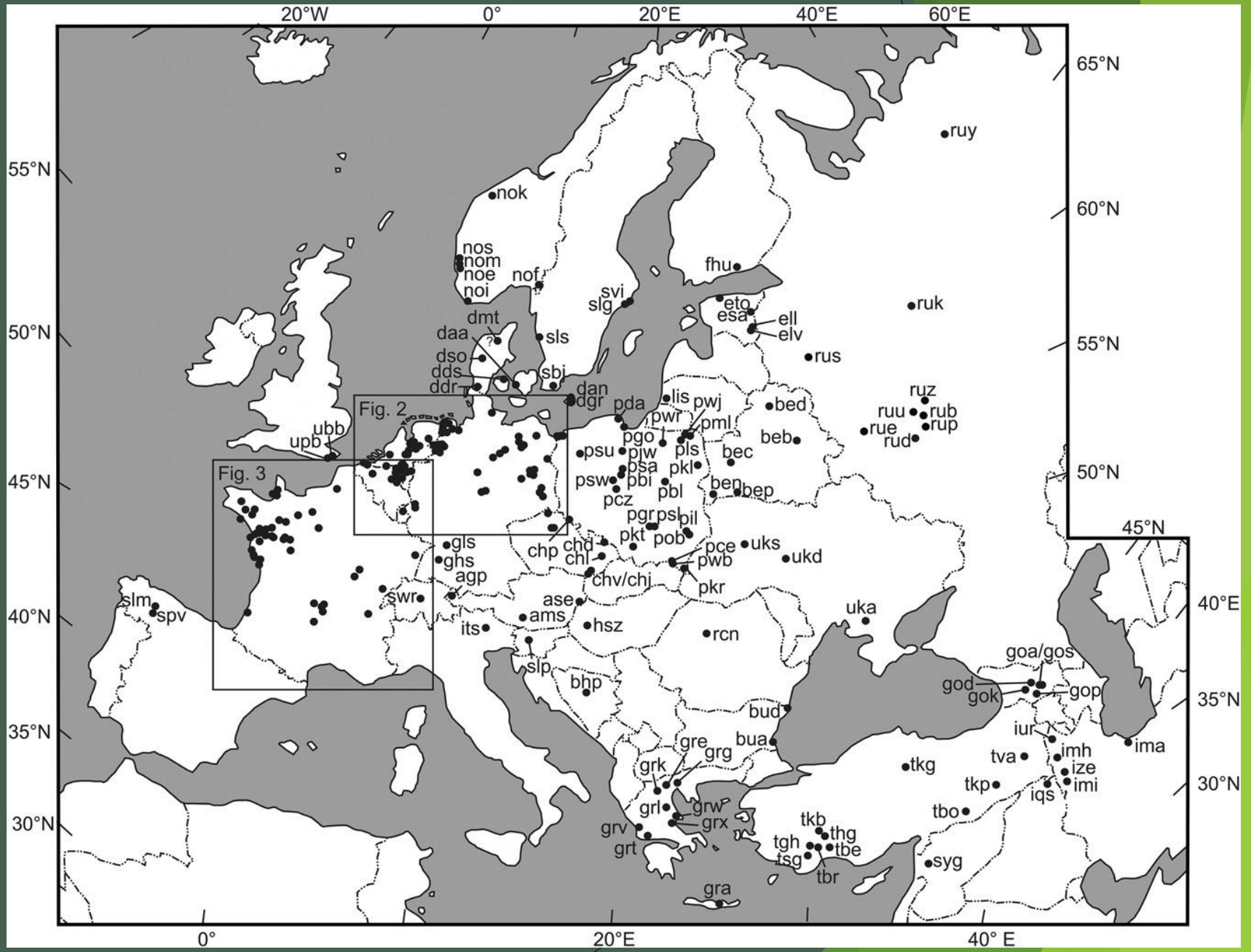
Savrasov 1867, ‘Rural Scene’, showing log beehives

Honeybee management in ancient China (*A. cerana*/ *A. dorsata*)

- Shang (Yin) dynasty, c. 1523-1028 BC – earliest pictographs for bee and honey
- Zhou dynasty (1027-265 BC) – beeswax used in lost wax casting by 500 BC, also in Vietnam
- Han dynasty (303 BC – AD 220) – beekeeping first mentioned in book dated AD 25-150
- Greater honey yield from *A. dorsata* (open nests) than *A. cerana* (cavity nests)

Pre- Late Mediaeval *Fagopyrum* records in Europe

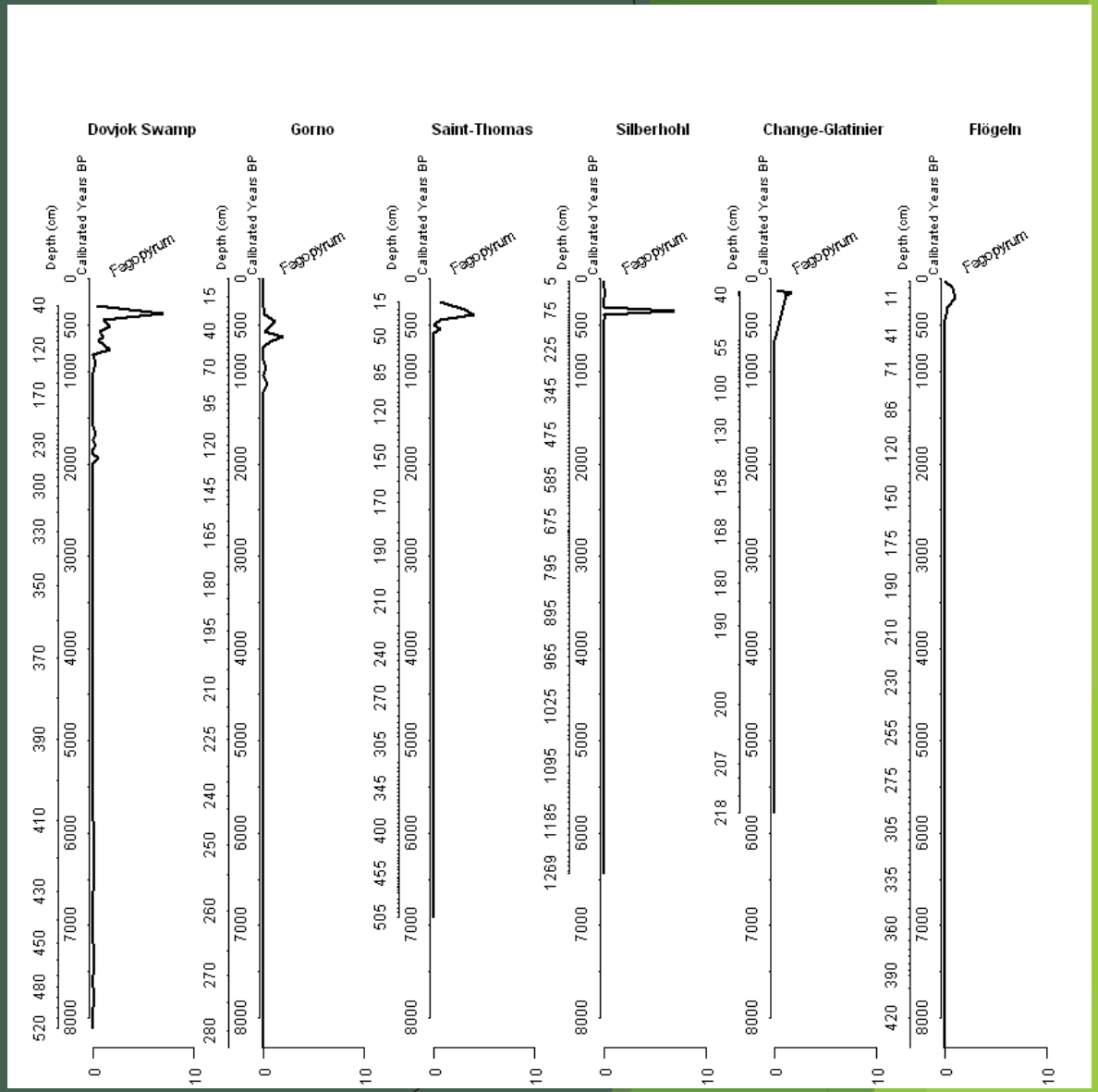




de Klerk et al. 2015, *Palaeoecol, Palynol, Palaeoclimatol*

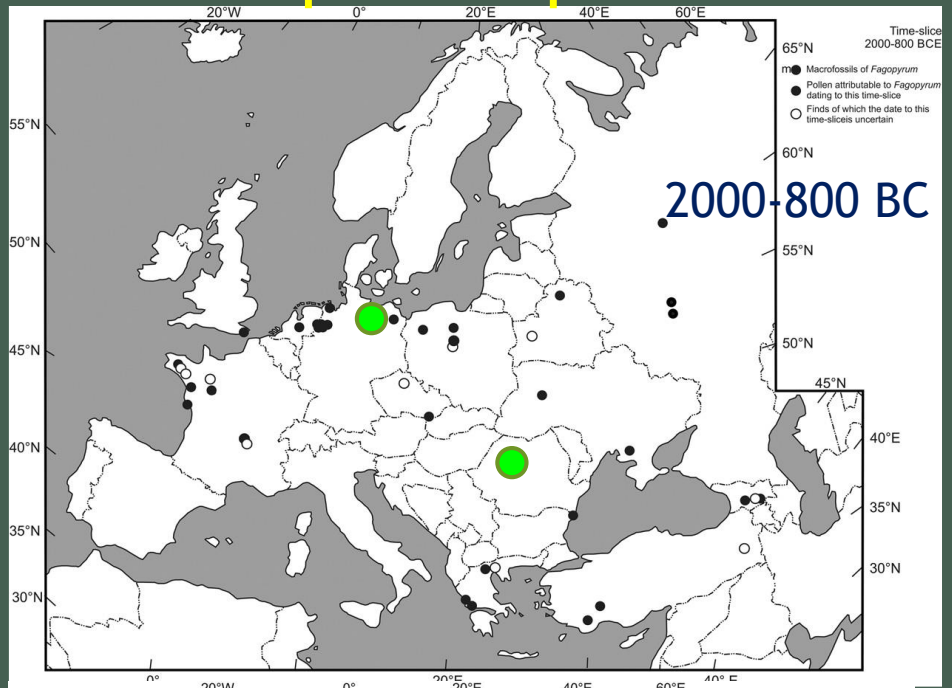
Inferring cultivation from the pollen record

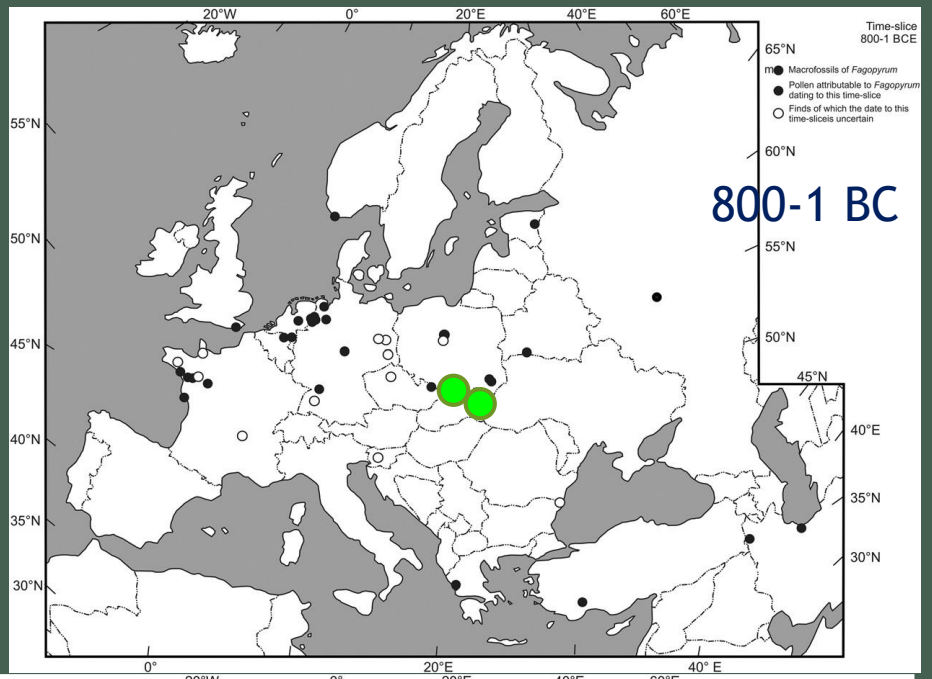
Fagopyrum pollen > 1%

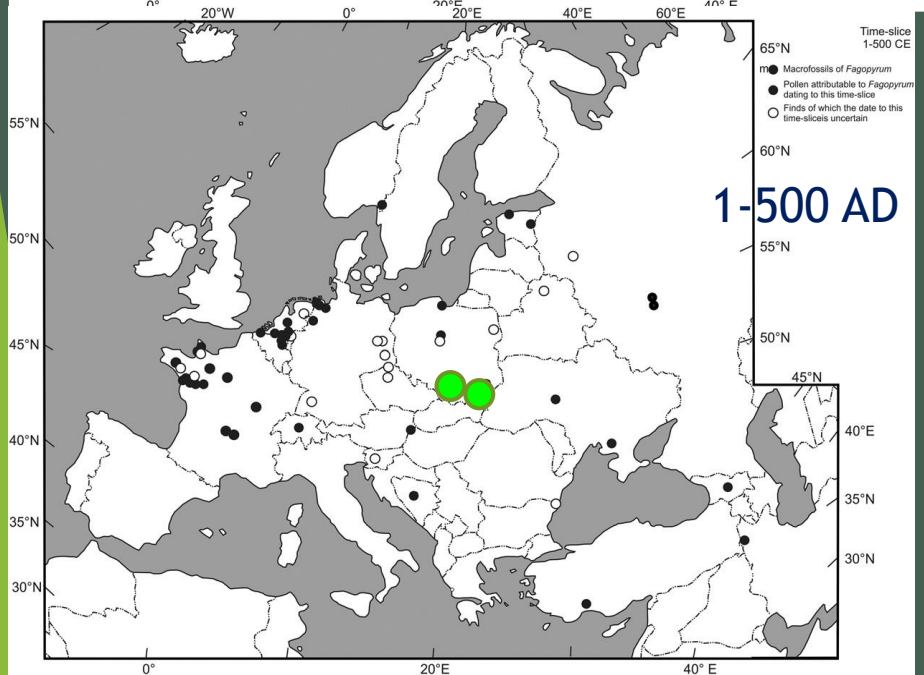


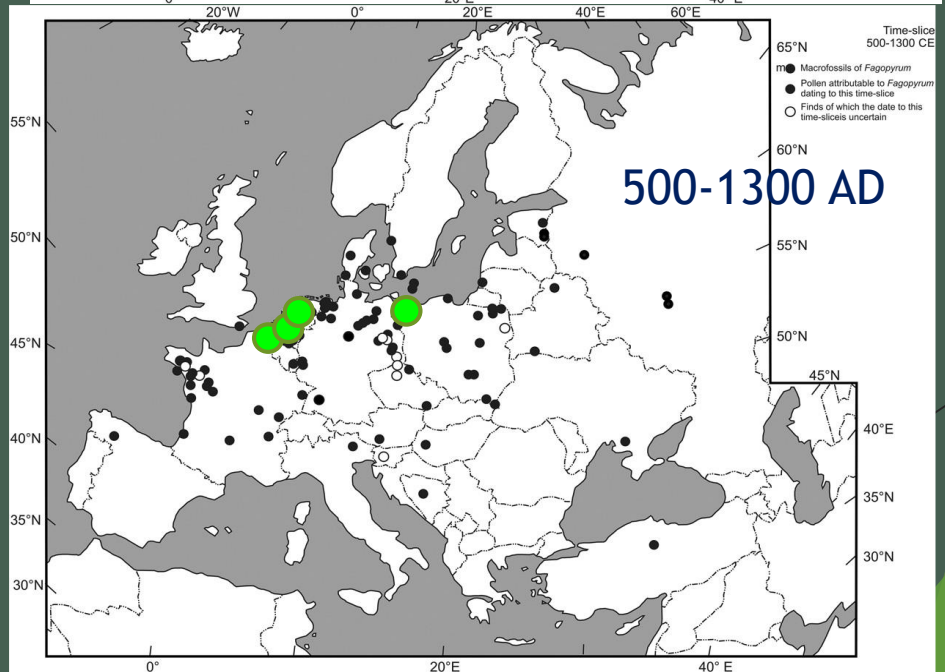
6 sites all Late/Post-Mediaeval show an abrupt increase of *Fagopyrum* (comparable to those in China)

Reported pre Late Medieval *Fagopyrum* macrofossils in Europe









Contacting archaeologists and archaeobotanists to check

- a) if material is conserved
- b) how identification was made
- c) if grains are available for direct AMS dating

Results to date suggest several records unreliable!

de Klerk et al. 2015

Genetic identity of European buckwheat: landraces from germplasm collections

Field sampling of wild buckwheat, Yunnan, China

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