



GOZDARSKI INŠTITUT SLOVENIJE
SLOVENIAN FORESTRY INSTITUTE

Izbrana nova spoznanja:

- štorovke
- fitoftore
- jesenov ožig

Barbara Piškur

*Oddelek za varstvo gozdov
Gozdarski inštitut Slovenije*

ARMILLARIA SPP.



Sibirija, Igor Pavlov



ARMILLARIA SPP.



ARMILLARIA SPP.

- 70 vrst
- 965 ha, 600 ton
- koreninska trohnoba; listavci, iglavci
- rizomorfi
- oslabljena drevesa (← klimatske spremembe)
- *A. mellea* (sivorumena mraznica), *A. gallica* (rumenovenčna mraznica), *A. cepistipes* (čebulasta mraznica), *A. ostoyae* ...



PHYTOPHTHORA SPP.

- kraljestvo KROMISTI (Chromista / Stramenipila) → Oomycota (glivolike alge)
- φυτόν (phytón) & φθορά (phthorá) = uničevalec rastlin
- **primarni rastlinski patogeni**, oportunistični patogeni, saprofiti
- gozdarstvo, kmetijstvo
- koreninski sistem, koreničnik / listi, iglice, skorja, poganjki
- **problem detekcije in identifikacije**



PHYTOPHTHORA SPP.

- 50 vrst (1996) → 150 vrst (2018)
 - pan-EU študija (Jung et al., 2016):
 - 90 % drevesnic (730)
 - 67 % nasadov (2500)
 - 68 različnih vrst fitoftor → večina **INVAZIVNIH**
- ~ EU: 1990-2010: 680.000 novih pogozditev (5 mil. ha) s sadikami, okuženih s fitoftorami

!!!INVAZIVNE TUJERODNE VRSTE *Phytophthora*!!!



PHYTOPHTHORA SPP.

Vir: Jung et al., 2018: Canker and decline diseases caused by soil- and airborne *Phytophthora* species in forests and woodlands

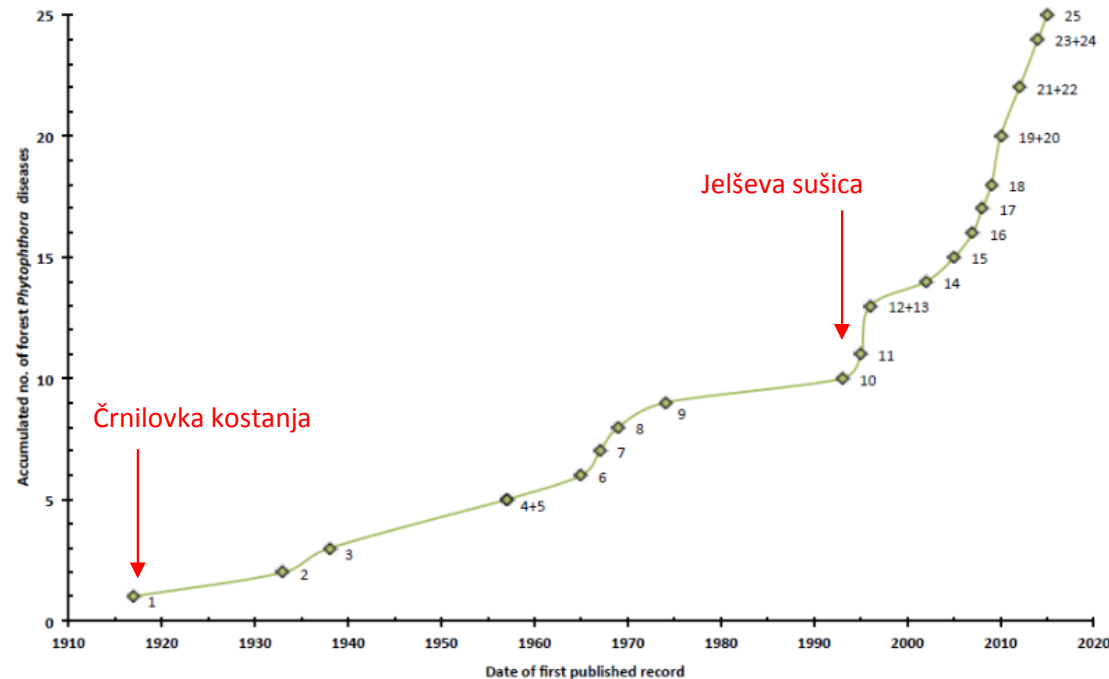


Fig. 1 Accumulated number of important *Phytophthora* declines and diebacks of forests and natural ecosystems over time; 1 = ink disease of *Castanea sativa* in Europe (observation of first typical symptoms in 1838); 2 = ink disease of *Castanea dentata* in the USA (observation of first typical symptoms in 1824); 3 = decline of *Fagus sylvatica* in the UK; 4 = littleleaf disease of pines in the USA; 5 = decline and mortality of *Chamaecyparis lawsoniana* in the Pacific Northwest; 6 = jarrah dieback in Western Australia (WA; observation of first typical symptoms in the 1920s); 7 = ink disease of *C. crenata* and chestnut hybrids in Korea; 8 = eucalypt dieback in Victoria (observation of first typical symptoms in 1935); 9 = kauri dieback in New Zealand; 10 = Mediterranean oak decline; 11 = *Alnus* mortality in Europe; 12 = temperate European oak decline; 13 = decline of *F. sylvatica* in mainland Europe; 14 = Sudden Oak Death in California and Oregon; 15 = mortality of *Austrocedrus chilensis* in Argentina (observation of first typical symptoms in 1948); 16 = oak decline in the Eastern USA; 17 = needle cast and defoliation of *Pinus radiata* in Chile; 18 = dieback of *Eucalyptus gomphocephala* in WA; 19 = dieback of *E. rudis* in WA; 20 = Sudden Larch Death in the UK; 21 = dieback of *Nothofagus* spp. in the UK; 22 = mortality of *Juniperus communis* in the UK; 23 = red needle cast of *P. radiata* in New Zealand; 24 = leaf and twig blight of *Ilex aquifolium* in Corsica and Sardinia; 25 = dieback of Mediterranean maquis vegetation.



PHYTOPHTHORA SPP.

Jelševa sušica (*P. ×alni*, *P. ×multiformis*, *P. uniformis*)

- jelše relativno „neproblematična“ drevesna vrsta do 1993 (UK, *A. glutinosa*)
- *A. incana*, *A. cordata* (Avstrija, Češka, Belgija, Hrvbaška, Estonija, **Slovenija**)
- Manjši listi, rumenjenje, redkeje olistana krošnja, povečan obrod, propad (mlajša drevesa do 1 leta; starejša več let; 100 % mortaliteta v poplavljenih območjih)
- Razširjanje z vodotoki



Vir: Jung et al., 2018: Canker and decline diseases caused by soil- and airborne *Phytophthora* species in forests and woodlands



PHYTOPHTHORA SPP.

Jelševa sušica (*P. ×alni*, *P. ×multiformis*, *P. uniformis*)

- 3 vrste:
 - *P. ×multiformis* & *P. uniformis*: tujerodni vrsti (S. Amerika)
 - Hibridizacija teh dveh vrst v *P. ×alni* (EU)
- Bavarska: okuženi obrečni gozdovi (20.000 km)
- Avstrija: okuženi obrečni gozdovi (26 rečnih sistemov)

→ VZROK: sadnja okuženih sadik

- *P. siskiyouensis* (S. Amerika, Avstralija → 2013, UK)



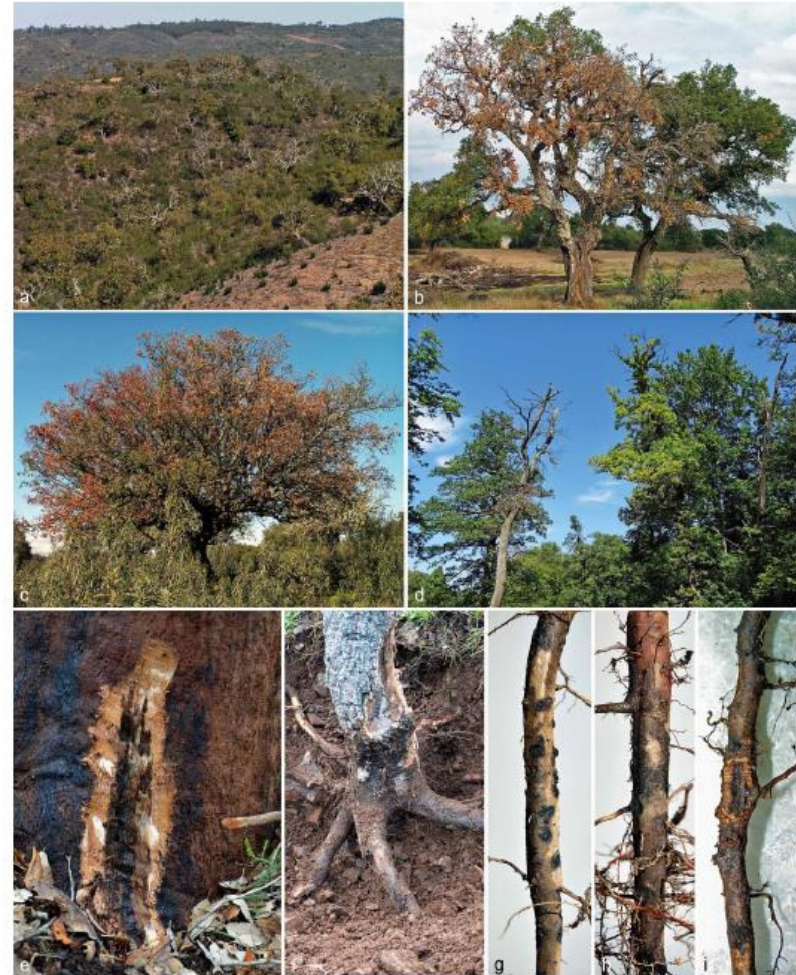
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PHYTOPHTHORA SPP.

Odmiranje hrastov (*oak decline & dieback*)

- Od 1900 posamična poročila v Evropi, USA
- Zadnje obdobje v Evropi od 1980
- Vzroki ???
- Več vrst fitoftor (invazivne, tujerodne)
- **Akutno** propadanje – hiter propad (ekstremna poletna sušna obdobja, *P. cinnamomi*) / **kronično** odmiranje (sušna obdobja, močna deževja, *Phytophthora* spp.)



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Fitoftorna sušica vejic (sudden oak death & sudden larch death)

- 1995, USA (Kalifornija)
- Gozdovi, urbana okolja
- *P. ramorum*
- > 150 gostiteljev
- EU:
 - 1990; *Rhododendron* spp., *Viburnum* spp.
 - 2009; UK; *Larix kaempferi* (2013: 3 milijone dreves, 10.000 ha)
 - maj 2017: *L. kaempferi*, gozd, Francija
- različne linije *P. ramorum*



PHYTOPHTHORA SPP.

Mediterska makija

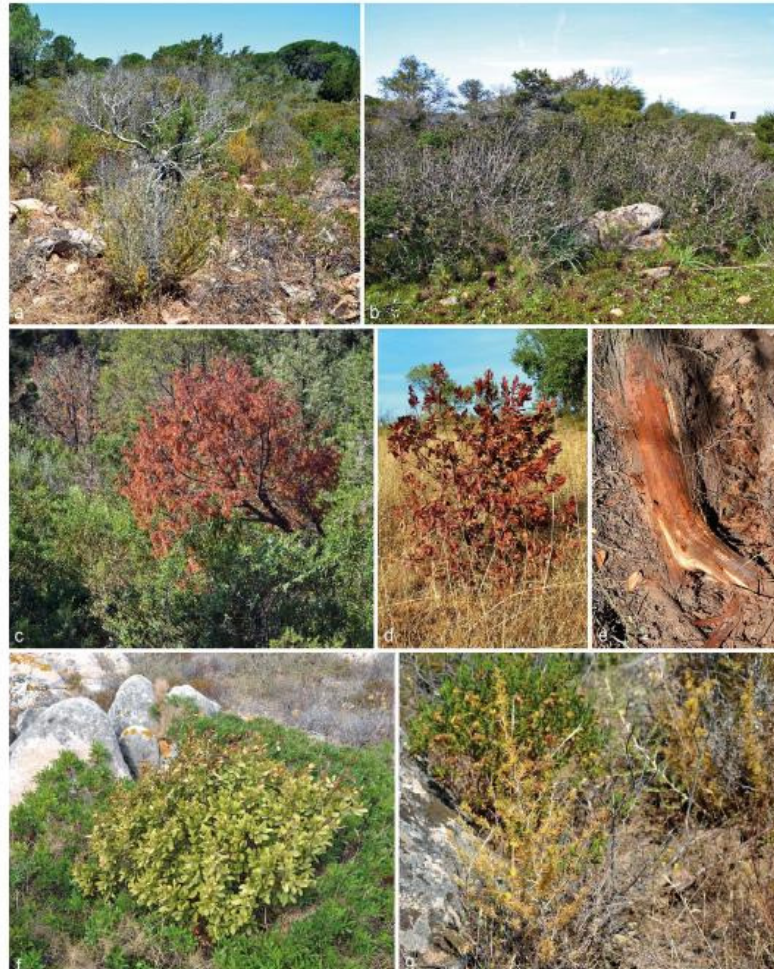
P. cinnamomi ,...

+

Klimatske spremembe

=

????



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Vir: Jung et al., 2018: Canker and decline diseases caused by soil- and airborne *Phytophthora* species in forests and woodlands

9. seminar in delavnica iz varstva gozdov

PHYTOPHTHORA SPP.

P. pinifolia (Dano foliar del pino)

- 2004; *P. radiata*; Čile



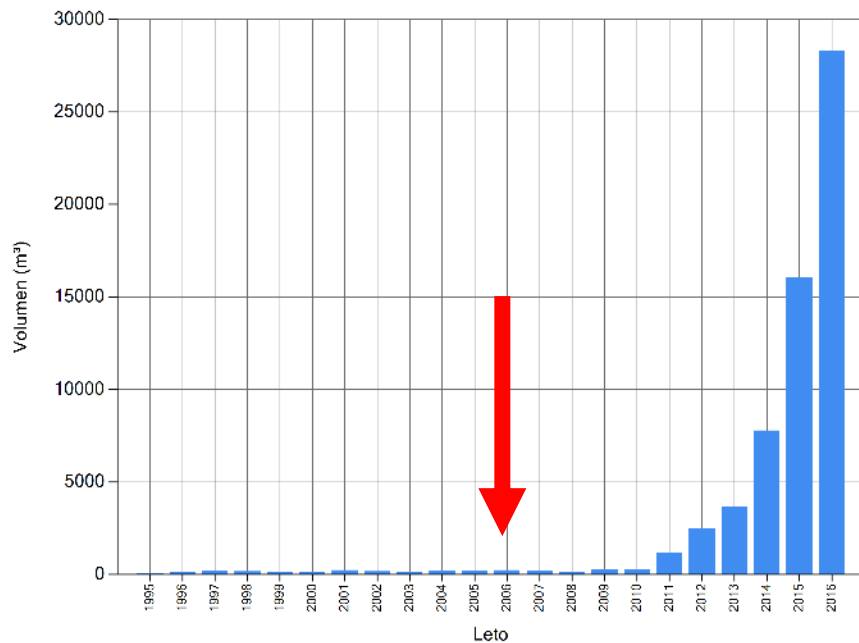
PHYTOPHTHORA SPP.

- eksotične, nove vrste fitoftor
- hibridizacije → novi hibridi
- vnos s sadilnim materialom → prst, vodotoki
- vpliv na ekosisteme

- + višje zimske T
- + daljša sušna poletna obdobja
- + neobičajna močna deževja



JESENOV OŽIG (*HYMENOSCYPHUS FRAXINEUS*)



Sanitarni posek velikega jesena v Sloveniji
(Timber - podatkovna zbirka o poseku
gozdnega drevja. Zavod za gozdove Slovenije,
1995-2016)



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foto: dr. Tine Hauptman

JESENOV OŽIG (*HYMENOSCYPHUS FRAXINEUS*)



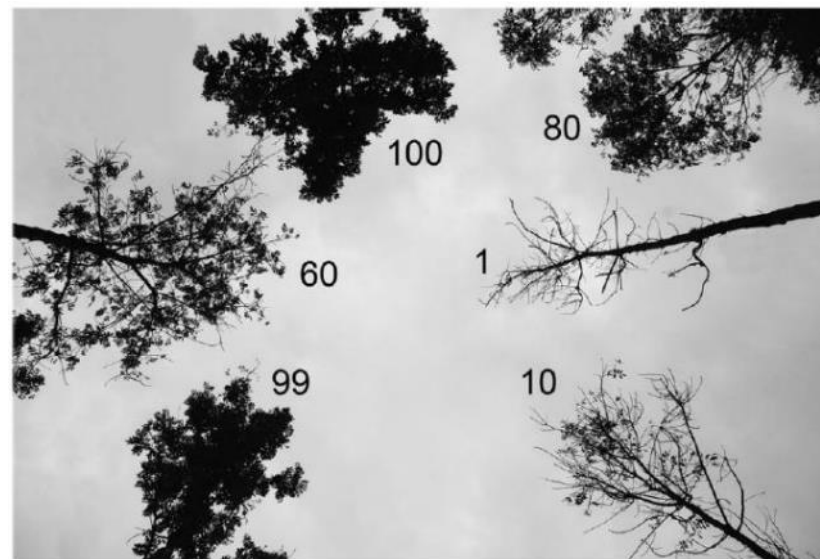
- 95 % velikega jesena v Evropi ogroženega
- genetske raziskave (McMullan et al., 2018):
 - evropski izolati glive MANJ genetsko variabilni od azijske populacije
 - začetek evropske populacije = 2 trosa (na sadilnem materialu, ???)

**NEVAROST VNOSA NOVIH GENETSKIH POPULACIJ
TE GLIVE V EVROPO**



JESENOV OŽIG (*HYMENOSCYPHUS FRAXINEUS*)

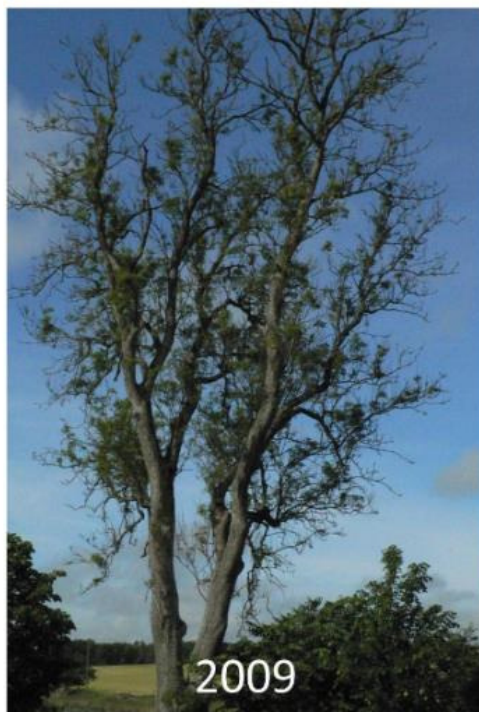
- sekundarne okužbe (*Armillaria* spp.), žuželke (jesenov ličar)
- 1-5% genotipov v populaciji jesena je (delno) odpornih (tolerantnih)
- ohranjanje manj poškodovanih dreves (brez poškodb korenčnika, žuželk) - >75% (>25% → posek)



Vir: Skovsgaard et al., 2017 (Silvicultural strategies for *Fraxinus excelsior* in response to dieback caused by *Hymenoscyphus fraxineus*)



JESENOV OŽIG



Gunnar Isacsson, 2009



Gunnar Isacsson, 2014

Figure 3: A severely affected *F. excelsior* in Norra Sandby, Scania, Sweden. Whilst the tree looks better in 2014, it can't be considered to have recovered, nor can it be considered as having a high level of disease tolerance, due to the secondary 'inner' crown which has developed from epicormic stress growth. What the pictures do show is the variation in tree health which can occur from year to year.

Vir: Joe Alsop, 2014



JESENOV OŽIG

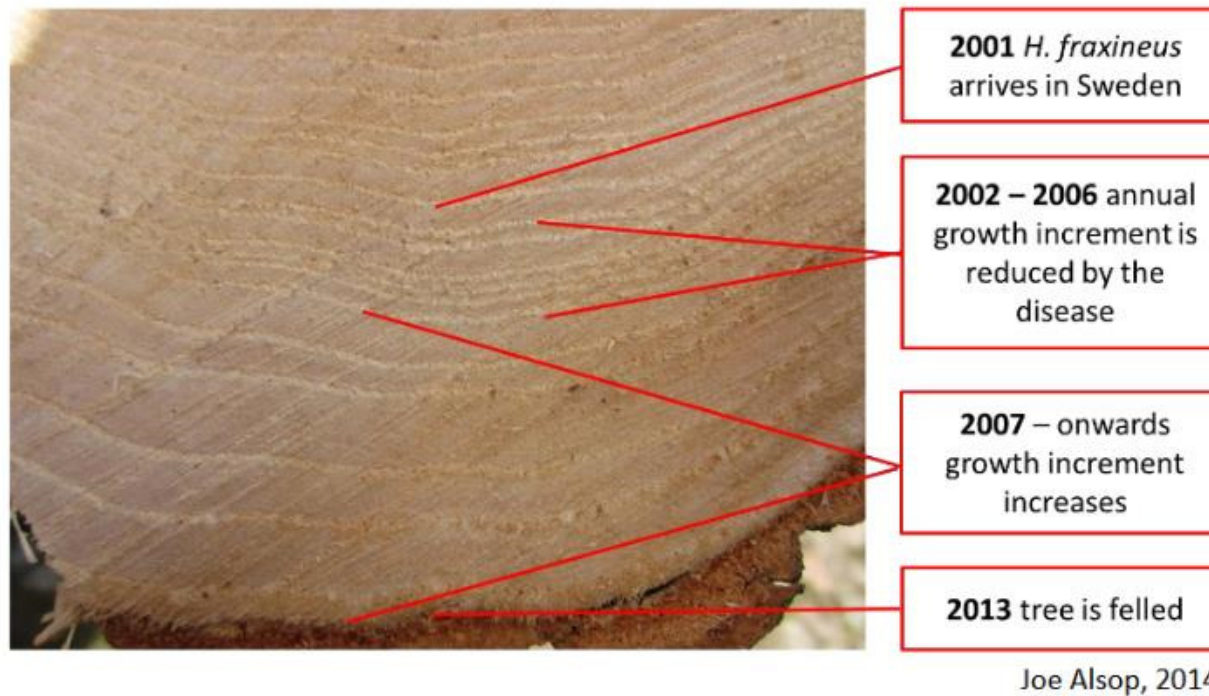


Figure 19: A disc cut from an *F. excelsior* by private forest owner John Nordqvist: south-west Sweden. *H. fraxineus* arrived in 2001 and has reduced the annual increment for a number of years, although since 2007 it has grown well. The appearance of the tree was monitored by the owner and whilst it did defoliate moderately in the first years of infection, subsequent symptoms alleviated matching the story from the annual rings. Of note the tree wasn't felled due to the disease.

Vir: Joe Alsop, 2014



POVZETEK

- Nove vrste & neprilagojeni „domači“ gostitelji
- Nove populacije že prisotnih vrst
- Klimatske spremembe in neobičajni vremenski dogodki
- Vnos in razširjanje ŠO (viri, razkuževanja, ...) – ali smo pripravljeni na pojav karantenske bolezni v gozdovih?
- **Ekonomski in ekološki vplivi**



