

consequences to ecosystem processes. Control and eradication of *P. ramorum* is very difficult because of the pathogen's broad host range, survival in the environment, and prolific basal sprouting from disease-killed trees. The long-term consequence of this disease is removal of tanoak from the overstory in many forests, an impact similar to chestnut blight in the Northeastern USA. However, we found thresholds for pathogen persistence in epidemiological models suggesting a conservation strategy that combines identification of host resistance and management to reduce sporulation can retain biodiversity associated with tanoak.

Could climate warming be one of the causes of *Phytophthora alni* emergence in Europe?

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Emerging infectious diseases have become a major threat to the forest ecosystem conservation. Several factors may cause these emergences, among which evolution of silviculture practices, environmental changes, or introduction of alien pathogen by international trade. Those causes often can occur together and precisely assessing their importance is an important scientific question. In France, *Alnus glutinosa* is threatened by the development of the epidemic caused by *Phytophthora alni*. This pathogen is known to have been invasive in part of Europe and is the result of an interspecific hybridation event between *Phytophthora alni* subsp. *uniformis* and *Phytophthora alni* subsp. *multiformis*. The aim of this study was to assess whether the climate warming of the last decades might have participated determine in the disease emergence. For that, *P. alni* soil inoculum and incidence of the crown decline and of canker were monitored on 16 sites located along a altitudinal gradient in NE France used as an proxy for a temperature gradient. The results show that the disease incidence, i.e. the likelihood of new disease case in the sites, was positively correlated with the mean temperature of the winter. Evolution of past temperature in the last 40 years suggests that climate warming could by one of the cause explaining the emergence of *P. alni* alder decline.

Influence of bird faeces in the behaviour of the root rot of *Quercus suber* caused by *Phytophthora cinnamomi* at Doñana Biological Reserve (SW Spain)

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Centennial cork oaks are considered keystone structures in the ecosystem of the stabilised sands of the Doñana Biological Reserve. These remnant big trees are currently threatened by nesting of colonial waterbirds, whose debris induced deep soil chemical changes. Since 2008 *P. cinnamomi* is also being isolated from roots and rhizosphere of declining trees [1]. *Phytophthora cinnamomi* has experienced a large spread in the Park over the last years, taking advantage of the extremely wet 2010 spring and winter. The objective of this work was to analyze the ability of the pathogen for oak root infection at various concentrations of natural and commercial (guano) bird dejections:

- a) *in vitro*, by testing the influence of three concentrations of bird faeces on chytrid sporangial production and zoospore release, and
- b) *in planta*, adding bird faeces to infested soil at different concentrations and analyzing plant response



at the synergy between pathogen and dejections on infection of seedling roots.

The results obtained in the *in vitro* experiments showed that high concentrations of faeces inhibit crucial steps in the life cycle of the pathogen and consequently, could affect its infection ability. Results to be obtained in plant experiments will be show at the congress.

[1] De Vita, P., Serrano, M. S., Callier, P., Ramo, C., García L. V. and Sánchez, M. E. *Phytophthora* root disease: a new threat for cork oaks at Doñana National Park (South-Western Spain). *IOBC/WPRS Bulletin* **76** 93-96 (2012).

Spatial patterns of *Phytophthora cinnamomi* in declining Mediterranean forests: implications for tree species regeneration

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Soil-borne pathogens are a key component of the belowground community due to the significance of their ecological and socio-economic impacts. However, very little is known about the complexity of their distribution patterns in natural systems. Here we explored the patterns, causes and ecological consequences of spatial variability in the abundance of the soil-borne pathogen *Phytophthora cinnamomi* in Mediterranean forests, where this species represents a major driver of oak decline. We used spatially-explicit neighborhood models to predict *Phytophthora* abundance as a function of local abiotic conditions (soil texture) and the characteristics of the tree and shrub neighborhoods (species composition, size and health status). The implications of *Phytophthora* abundance for tree seedling performance were explored by conducting a sowing experiment in the same locations where pathogen abundance was quantified. *Phytophthora* abundance in the forest soil was not randomly distributed, but exhibited spatially predictable patterns influenced by both abiotic and particularly biotic factors (tree and shrub species). Soil texture seemed to affect *Phytophthora* abundance indirectly through its effects on soil water content, whereas woody species affected *Phytophthora* mostly directly by providing living host tissue with different susceptibility to pathogen attack. *Phytophthora* abundance reduced seedling emergence and survival, but not in all sites or tree species. Our findings suggest that heterogeneous spatial patterns of *Phytophthora* abundance at fine spatial scale can have relevant implications for the dynamics and restoration of declining Mediterranean forests.

Roads and streams are not significant pathways for SOD spread in tanoak forests

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We used two approaches to study the importance of roads and streams as pathways of spread of sudden oak death in Oregon. A GIS-based spatial analysis of infected sites relative to the road and stream networks was compared to analysis based on a set of random points. Second, ground surveys of roads and streamside vegetation in the infested area mapped the association between *P. ramorum* in streams or on road surfaces and infection of adjacent vegetation.

The spatial analysis showed no association between roads and SOD sites. The median distance from *P.*

