

## Diversity of *Phytophthora* species in forests, forest nurseries and riparian ecosystems of Portugal.

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From 2014 to 2016, in the frame of the European BiodivERsA Project RESIPATH, a survey of *Phytophthora* diversity and diseases was performed in 68 forest stands, 12 forest nurseries, 38 river systems and 4 lagoon ecosystems across Portugal. In forests of *Quercus suber*, *Q. ilex*, *Q. robur*, *Q. faginea*, *Q. pyrenaica*, *Castanea sativa*, *Fagus sylvatica*, *Betula celtiberica* and other tree species *Phytophthora*-type decline and dieback symptoms were common. Bleeding stem cankers were frequently observed in *Q. suber* and *C. sativa*. Severe collar rot and dieback of *Alnus glutinosa* was observed along multiple rivers. In all nurseries typical *Phytophthora* symptoms and scattered or patchy mortality were common. A total of 2131 isolates were obtained from 61 forest sites, 37 rivers and all 12 nurseries using baiting assays and direct plating of necrotic tissues. Isolates were identified using both classical identification and sequence analysis of ITS and *cox1* and belonged to 24 known species, 1 informally designated taxon and 9 previously unknown taxa of *Phytophthora*. In addition an array of *Phytophthora* hybrids from Clades 6 and 9, *Nothophytophthora amphigynosa* nom. prov., *Halophytophthora avicenniae* and a new *Halophytophthora* species, 7 known species and one new taxon of *Phytophythium* and multiple *Pythium* species were isolated. The detection of 9 new *Phytophthora* taxa, the first records of *P. amnicola*, *P. boodjera*, *P. hydropathica*, *P. meadii*, *P. quercetorum* and *P. thermophila* in Europe and the finding of *P. ramorum* in a forest stream are of particular concern. Extensive host range testing of new species is needed to clarify their potential threat to European forests. Multigene phylogenetic analyses and morphological and physiological studies are underway for the official description of all new *Phytophthora* taxa. The ubiquitous *Phytophthora* infestations of forest nurseries pose a serious threat to reforestations and afforestations in Portugal.