# Observations of *Castanea sativa* as a Host of *Phytophthora ramorum* in England over a Decade

Mick Biddle[1], Barnaby Wylder[1], Anna Harris[2] and Joan Webber[2]
[1]Forestry Commission, Bristol Business Park, Bristol, BS16 1EJ, UK
[2]Forest Research, Alice Holt Lodge, Farnham, Surrey, GU10 4LH, UK

**e-mail mick.biddle@forestrycommission.gov.uk**

## Introduction

Forestry Commission England aerial surveillance operations to detect *Phytophthora ramorum* between 2009 and 2014 were primarily focused on identifying infected larch (*Larix* spp.), although sweet chestnut (*Castanea sativa*) has been recognized as a sporulating host of *P. ramorum* since the mid-2000s (Denman *et al*., 2006). During follow-up ground investigations, infected sweet chestnut was confirmed and considered an incidental host on 23 sites (54 laboratory positives), with individual trees or small discrete stands of sweet chestnut affected but always in close proximity to other infected sporulating hosts (usually *Rhododendron ponticum* and larch). Observed symptoms of sweet chestnut comprised foliar wilting, leaves with blackened petioles, discolored mid-ribs, and/or 'water-soaked' or discolored leaf margins. These symptoms were most common on abundant epicormic growth low on the stems of mature trees.

## Observations

In 2014 an area of sweet chestnut showing general symptoms of decline and crown dieback was noted. The site was in south-west England in a woodland with known historic *P. ramorum* infection. To determine if crown dieback was apparent on other similar sites, in 2015, woodlands where sweet chestnut samples had yielded a positive lab result for *P. ramorum* were added to the larch aerial surveillance program. In subsequent years, sweet chestnut stands without a documented history of *P. ramorum* were also included for aerial surveillance.

**Fig. 1** Sweet chestnut showing crown dieback and mortality observed from the air in 2016.

Between 2015 and 2017, 182 sweet chestnut stands (predominantly in south-west England) were identified with crown dieback and mortality. Disease severity in stands ranged from single trees through to approximately ≥30% trees affected (Fig.1). Follow-up ground investigations inspected trees for symptoms consistent with *P. ramorum* infection. Many sites were found to contain sweet chestnut trees with symptoms which yielded positive lateral flow test results, and laboratory testing of samples from 82 of the sites yielded 148 positive *P. ramorum* results, either based on isolation of *P. ramorum* (EU1) cultures and/or rtPCR confirmation.

In addition to foliar symptoms, further symptoms were observed which also yielded positive results from laboratory testing. These included; premature abscission of symptomatic leaves from the crown, cankers on small branches and epicormic shoots with and without association to a leaf or leaf node (Fig. 2), and in some cases extensive aerial cankers affecting branches and stems of mature trees (Fig. 3). There was also co-occurrence of symptoms with rapid or chronic crown dieback (Fig. 3).

**Fig. 3** Crown dieback symptoms in mature sweet chestnut (left) observed in association with confirmed *P. ramorum* infection in shoots, foliage and epicormic growth. Right: Aerial stem canker.

In 64 cases, confirmed sweet chestnut infection was in a location with a current or historic presence of *P. ramorum* in larch or rhododendron, although the dieback on the sweet chestnut had progressed despite the removal of other sporulating hosts on these sites. In a further 18 cases however, infected sweet chestnut trees with crown decline were confirmed in locations geographically isolated from infected larch and rhododendron (up to 7.5 kilometers distant in one instance) (Fig 4).

**Fig. 2** Symptoms of *P. ramorum* observed include: cankers on small branches and epicormic growth with or without association to leaf nodes (top left & centre); aerial cankers on fine branches in upper crown (top right) and premature abscission of symptomatic leaves from the canopy, often found at the base of affected trees (left).

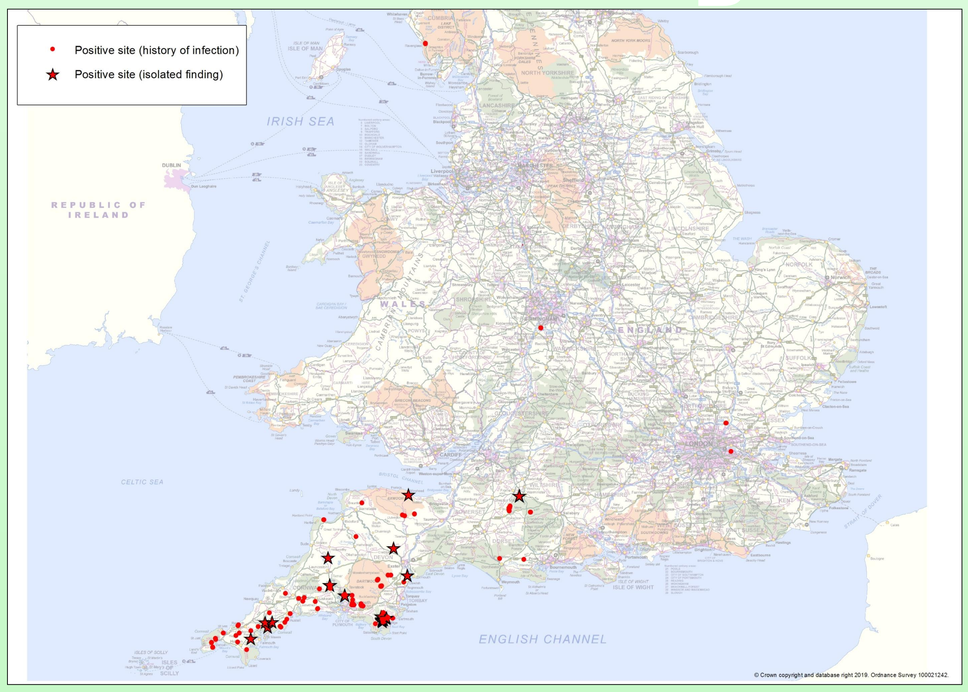


**Fig. 4** Distribution of *P. ramorum* infections in sweet chestnut observed in England 2009-2017, differentiating sites with a history of infection from isolated findings where long distance aerial transmission is most likely.

## Conclusions

Our observations suggest long distance aerial transmission of *P. ramorum* to sweet chestnut, and that the disease can also cycle on sweet chestnut in the absence of any other sporulating hosts.

This represents a change in the understanding of the behaviour of *P. ramorum* in sweet chestnut, and the role this host species plays in the epidemiology of the disease. These observations also have implications for regions and other countries which place a high value on sweet chestnut populations. This is especially important in light of confirmed infections in sweet chestnut in the Greater London area (close to significant coppice woodland in Kent) and recent infection of larch in mainland Europe (Schenck *et al*., 2018).

## References

Denman, S., Kirk, S., Whybrow, A., Orton, E. and Webber, J. 2006. *Phytophthora kernoviae and P. ramorum*: host susceptibility and sporulation potential on foliage of susceptible trees. EPPO Bulletin. 36(2): 373-376.

Schenck, N., Saurat, C., Guinet, C., Fourrier-Jeandel, C., Roche, L., Bouvet, A., Husson, C., Saintonge, F.X., Contal, C. and Ioos, R. 2018. First report of *Phytophthora ramorum* causing Japanese larch dieback in France. Plant disease, 102(10): 2045-2045.