PINE DECLINE IN THE SOUTH-EASTERN UNITED STATES AND THE INVOLVEMENT OF BARK BEETLES AND OPHIOSTOMATOID FUNGI

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Forest decline and mortality syndromes have been increasingly reported in the past twenty years in many areas in the south-eastern USA. Forest tree declines have been described as resulting from complex interactions of biotic and abiotic stressors. Current studies of pine stands in the southern USA. with trees expressing symptoms of decline show strong associations with the presence of root feeding insects and the presence of *Leptographium* and *Ophiostoma* species. Species of *Leptographium* and *Ophiostoma* are most commonly reported as causes of blue-stains in sapwood of pine, spruce and other conifers. These stain fungi rarely kill healthy trees, but they do reduce the value of timber and may be associated with mortality in stressed trees. In addition, a few *Leptographium* species are known to be virulent pathogens under appropriate field conditions. *Leptographium serpens, L. procerum, L. terebrantis* and several undescribed *Ophiostoma* species have been reported from the roots of declining southern yellow pines (loblolly, short-leaf, and long-leaf pines) in the south-eastern USA. The level of pathogenicity and the specific role of these fungi with respect to southern pines are uncertain and research is continuing on this topic. *Leptographium* species are commonly associated with various species of root feeding bark beetles, which attack stressed trees. These insects serve as vectors, introducing these fungi into tree roots or as wounding agents, creating infection courts that permit the infection by these fungi. The predominant root feeding insects associated with an incidence of *Leptographium* species fall in two groups, root weevils and bark beetles. Both groups introduce fungi into feeding and oviposition wounds, and the bark beetles spread fungi during maturation feeding. However, the exact roles and possible interactions among associated insects and stain fungi in the premature decline of southern pine remains unclear, and is still being researched.