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THE INVASIVE POTENTIAL OF *PINUS CARIBAEA* MORELET IN WET AND INTERMEDIATE AGRO-ECOLOGICAL ZONES IN THE KNUCKLES RANGE, SRI LANKA

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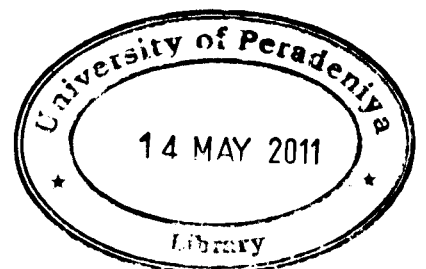*for the award of the degree of*

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THE INVASIVE POTENTIAL OF *PINUS CARIBAEA* MORELET IN WET AND INTERMEDIATE AGRO-ECOLOGICAL ZONES IN THE KNUCKLES RANGE, SRI LANKA

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After 1967, more than 25,000 ha of abandoned, highly eroded, unproductive tea lands were converted to *Pinus caribaea* plantations by the Forest Department of Sri Lanka. Since the introduction of *P. caribaea*, now a globally listed invasive species, the possibility of its natural spread has not been scientifically investigated. This study investigated the natural spread of *P. caribaea* into surrounding habitats of plantations in the Knuckles Range (KR) in relation to its seed production, ground cover, agro-ecological zones (AEZ) and anthropogenic fire.

Eight *P. caribaea* plantations in two AEZs were selected for the investigation by using stratified random sampling method. Habitats next to each *P. caribaea* plantation was stratified into three belt transects (width 50 m) parallel to the plantation perimeter and mapped using Arc GIS software. *Pinus caribaea* that has spread into these transects were recorded. Their growth stage, whether sapling, juvenile or adult (1-2, 2-4, >4 m height respectively) and density per ha were quantified and analyzed. Cone production gradient, seed and cone production, seed germination potential, wind effect on tree crowns and fire history of randomly selected *P. caribaea* plantations were investigated.

Grasslands adjoining the plantations appear to be highly vulnerable to *P. caribaea* invasion compared to tea plantations, home gardens, scrublands and forests. Grasslands in the intermediate zone mid-country 1b AEZ (IM1b) are most vulnerable to *P. caribaea* invasion ($p < 0.05$). *Pinus caribaea* density in the wet zone mid-country 3b AEZ (WM3b) grasslands showed a significant negative correlation with increasing distance away from the perimeter of the original plantation ($p < 0.05$). However, grasslands in the IM1b zone did not show such a correlation ($p > 0.05$). *Pinus caribaea* trees grown on the perimeter of the respective plantations carried a significantly higher number of cones responsible for the bulk of the seed production in each of the plantations ($p < 0.05$). However, there was no

significant difference (p >0.05) in the dispersible seed quantity per cone (~180 seeds per cone) and germination potential between the *P. caribaea* plantations in the two different AEZs. Even though the cone production of *P. caribaea* in the perimeter of the IM1b zone was significantly less compared to that in the WM3b zone, grasslands in this particular zone were recorded to be the most affected by *P. caribaea*. Local wind pattern has an important role to play in regard to the tree growth and seed dispersal of *P. caribaea* in the IM1b zone compared to these features in the WM3b zone. *Pinus caribaea* trees in the IM1b zone are relatively short with asymmetrical (flagged) tree crowns compared to those in the WM3b zone (p <0.05) indicating the presence of strong wind, which mostly affects migrating seed density and long distance seed dispersal. Furthermore, factors such as variations of ground cover, soil erosion and fire regime in these grasslands may also affect the *P. caribaea* spread. An understanding of the invasive potential of *P. caribaea* into different vegetation types in the KR and further research into the management of invaded *P. caribaea* are called for to contain *P. caribaea* spread at this very early stage.

In this respect, the pilot studies carried out in *P. caribaea* plantations, (near the NW boundary of the Sinharaja World Heritage Site and in Lower Hantana in the Peradeniya campus), provide insights in to (i) the manipulation of the stand structure of established *P. caribaea* plantations to create suitable above ground environments favorable for establishment of native species, and (ii) to match suites of plant species to appropriate sites in different agro-ecological regions. These models could also be extended into the naturally regenerating *P. caribaea* populations in the KR.