A tree girdling beetle in Korogwe District: its potential risk to Eucalyptus plantations and woodlots in Tanzania

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ABSTRACT

A study was conducted to identify and assess damage of an insect pest girdling young Eucalypts in Korogwe Forest Plantation, Tanga. Purposive sampling was employed to establish 10 plots of 10m by 10m. A total of 90 trees were sampled. Insect pest specimens were collected and girdled trees counted in each plot. The insect pest specimens were identified using reference resources at the Department of Ecosystems and Conservation, SUA. The mean number of girdled stems was computed. Results showed that the girdling insect pest was *Paranaleptes reticulata*. The pest was girdling *Eucalyptus camaldulensis* and *E. terecticornis*. It was found girdling up to 150 stems/ha of *Eucalyptus* stems. Removal and burning of girdled branches material especially dry ones keeps in check the population density of *P. reticulata* below economic injury level. The pest is a potential risk to Eucalyptus plantations and woodlots in Tanzania. Therefore, there is a need of immediate interventions to control *P. reticulata*.

Key words: Insect pest, Girdling, Eucalyptus, Forest, Plantation, *Paranaleptes reticulata*

INTRODUCTION

Establishment of forest plantations in Tanzania started in the 1950s. During the time, the planted tree species were totally free of insect pests and disease attack until in the last two decades when attack by several insect pests and diseases started (Madoffe and Petro 2011; Ndomba *et al*. 2011). The outbreak of insect pests and diseases was due to introduced host plants, which later caused major damage in forest plantation and in some cases, their impacts have been worldwide (Speight and Wainhouse 1989).

The spread of exotic forest pests to foreign countries is mostly accidental. Many of the insect pests now established in different parts of the world originated from Europe (Campbell and Schlarbaum 2014). Some of the early introductions into the new world, in the late nineteenth and early twentieth centuries were due to importation of European trees by the large immigrant population to USA, Canada and Africa. Some of these insect pests became serious pests of the forest plantations in Tanzania (Madoffe and Petro 2011; Lyimo 2016). The main source of insect pests was exotic species being used first as ornamental and/or trial plots in Eastern and Southern Africa, particularly in Tanzania (Madoffe and Petro 2011).

Extensive exotic tree planting in Tanzania started in 1960s. The exotic species widely planted are *Pinus patula, P. elliottii, P. caribaea, P. kesiya, Cupressus lusitanica, Eucalyptus* species, *Acacia mearnsii* (wattle trees), *Cedrela mexicana*, *Tectona grandis,* and *Terminalia* species. The planting of these exotic species in Tanzania led to outbreak of Cypress aphid *(Cinara cupressivora),* Leucaena psyllid *(Heteropsylla cubana),* Pine woolly aphid

(Pineus boerneri) and Blue gum chalicid *(Leptocybe invasa)* which attack Cypress, Leucaena, Pines and Eucalyptus respectively (Madoffe and Petro 2011; Lyimo 2016).

The introduced exotic insect pests caused considerable damage to large areas of forests in different parts of the Tanzania. Over 15000 hectares (ha) in Tanzania were infested by *C. cuppressivora* to variable damage levels ranging from slight to severe (Mwangi 2002). It was estimated that *C. cuppressivora* caused an annual loss of growth increment worth USD 13.5 million and killed USD 41 million worth of trees in Africa (Murphy 1996). The average household economy loss due to *H. cubana* attack were estimated at 54 125 Tanzania shillings (TZS) per year (Johansson 1994). On other hand, *P. boerneri* caused growth loss and even death of *Pinus* species particularly the one growing in inferior sites of Sao Hill Forest Plantation in Iringa, Tanzania (Petro 2009). Similarly, *L. invasa* was recorded to cause growth reduction of infested Eucalypts due to the fact that it inflicts severe damage by inducing galls mainly on rapidly growing parts like shoots, young stems, petioles or midribs of leaves which form an ideal breeding site for the wasp (Petro 2016).

Recently, a new insect pest named red gum lerp psyllid, *Glycaspis brimblecombei* was reported to attack *Eucalyptus* clones in Mbizi Forest Plantation, Tanzania (Petro *et al*. 2017). In June 2017, a beetle girdling young Eucalyptus in Korogwe Forest Plantation was observed, which led to the present study. This study was undertaken to identify and describe diagnostic features of the pest and assess its damage on young Eucalypts in Korogwe Forest Plantation, Handeni, Tanzania.

MATERIALS AND METHODS

Study area

Korogwe Forest plantation (KFP) is located in Handeni district in Tanga region at between latitude 5°15'0" to 5°13'0" and longitude: 38°16'0.01" to 38°14'0.00" (Figure 1). The altitude lies between 300 and 600 metres above sea level. Before establishment of KFP, there area was known as Korogwe Fuelwood Forest Reserve covering 10,805 ha. At the time this survey conducted, KFP covered about 307 ha of 3-year trees divided into 102 ha of mixed *Eucalyptus camaldulensis* and *Eucalyptus terecticornis*, 105 ha of *Cedrela odorata*, 92 ha of *Acacia mangium*, and 8 ha of *Terminalia superba*.

The plantation is accessible through Korogwe-Handeni tarmac road. The forest is surrounded by 4 villages namely Kwengoma, Kwamatuku, Sindeni located in Handeni District and Mswaha located in Korogwe District.

Handeni District has a bi-modal rainfall pattern with a main rainy season in April to May and a short rains season from October to December. The mean annual rainfall is about 1000 to 1200 mm per year and mean temperature 26ºC with considerable variation from year to year.

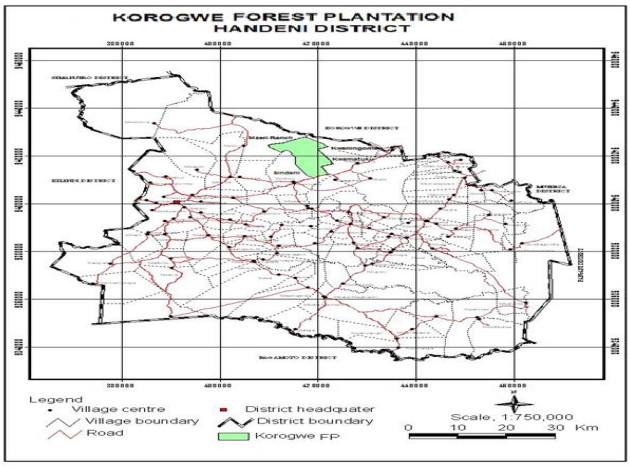

Figure 1. Map showing Korogwe Forest Plantation, Handeni

Sampling Design

Purposive sampling was employed to select Eucalyptus compartment. A total of 10 plots of 10m by 10m was established and 9 trees form each plot were selected systematically as shown on Figure 2. The dark dots represent selected trees for observation and white dots are none selected trees in a plot. Plots were randomly distributed in a 102 ha of a Eucalyptus compartment.

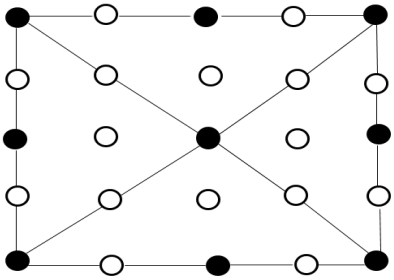

Figure 2. Sampling design used for selecting trees in a plot.

Data collection

Field surveys were conducted from 23rd June to 1st July 2017. Data were collected three times a day, from 06:30-10:00am in the morning, 12:00-02:30pm in the afternoon and 05:00-06:30pm in the evening.

In each plot, insect pest samples of the girdling beetle were collected for identification and the girdled Eucalyptus stems were counted. The biology of the insect pest was carefully studied during field and laboratory to determine its diagnostic features. The girdled *Eucalyptus* stems were observed in order to characterize the nature of girdling. Photographs of girdled trees were also taken.

Data analysis

Insect samples were identified using reference resources at the Department of Ecosystems and Conservation, College of Forestry, Wildlife and Tourism, Sokoine University of Agriculture. The diagnostic features of the observed insect pest and characteristics of girdled Eucalyptus stems were described. Mean number of girdled Eucalyptus stems were computed to determine damage caused by the insect pest.

RESULTS

Identification of the beetle

The girdling beetle species was found to be *Paranaleptes reticulate* Thoms (Coleoptera: Cerambycidae)**.** The life cycle of the *P. reticulata* has four stages of development called complete metamorphosis. Complete metamorphosis takes four stages of development: egg, larva, pupa and adult. The egg is laid by the female *P. reticulata* in some girdled dead branches of host plant species.

Diagnostic features

The head and the thorax of beetle is dark brown; the wing cases are orange with large black blotches giving them a reticulate appearance while the abdomen has leopard pattern colours (Plate 1). Larvae are yellow in colour and reach a length of 46 mm and the adult is brown in colour with length of 40-50 mm. The female is slightly larger than the male.

The beetle utilizes the deadwood of girdled tree stem as breeding ground. An adult *P. reticulata* damages *Eucalyptus* stems leaving 2-9 mm thick central pillar round the pith, leading to falling of the tree. Then, the distal part of the tree stems dries out allowing the female to oviposit eggs on dry wood and feed subcortically and eventually pupate in the fallen stem.

Damage

Paranaleptes reticulata was girdling exotic species *Eucalyptus camaldulensis* and *E. terecticornis* (Plates 2, 3 and 4). Also, the beetle was spotted on *Terminalia superba* but girdling of the species is not yet confirmed (Plate 5). The beetle was causing damage normally to *E. camaldulensis* and *E. terecticornis* with a diameter of 3-8 cm. *Paranaleptes reticulata* was observed to girdle up to 150 stems/ha of *Eucalyptus* species, which is a considerably serious economic damage (Plate 6).

Plate 1: ***Paranaleptes reticulate***

Plate 2: Girdled *Eucalyptus camaldulensis*, Korogwe, Tanzania.

Plate 3: Remain Eucalyptus stem after falls of top girded part

Plate 4: A healing Eucalyptus stem after girdling, Korogwe, Tanzania

Plate 5: *P. reticulata* on *Terminalia superba*, Korogwe, Tanzania

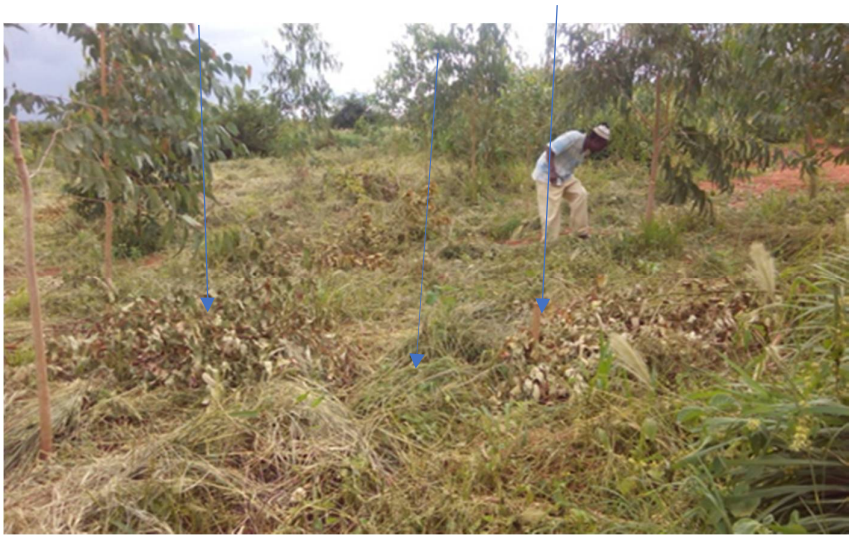

Plate 6: Loss of Eucalyptus trees due to girdling by *P. reticulata*, Korogwe, Tanzania.

The beetle girdling Eucalypts in Korogwe Plantation, *P. reticulata* is found in Ethiopia, Somalia, Kenya and Uganda (Jones 1961; FAO 2007). This insect pest was known as a tree pest as long as 1911 in Africa (Jones 1961). In Tanzania, it was observed for the firsttime girdling kapok (*Ceiba pentandra*) near Dar es Salaam in the 1960s (Jones 1961). Thereafter, the pest was observed damaging other plants such as *Bougainvillea* species, *Hibiscus* species, *Citrus* species and *Plumeria acutifolia* in Korogwe, Tanzania (Jones 1961). *Paranaleptes reticulata* is also reported to girdle other plants such as cotton and *Acacia* in Kenya (Jones 1961; Dwomoh *et al.* 2008; FAO 2007).

Paranaleptes reticulata girdling is similar to damage caused by *Analeptes trifasciata* Fabr. of the same family. *Analeptes trifasciata* is known as a serious pest on cashew trees and several others, like *Bombax costatum*, *Adansonia digitata*, *Ceiba pentandra* and *Eucalyptus* species in Nigeria (FAO 2007; Asongwa *et al*. 2011). *A. trifasciata* is reported to damage up to 554 cashew trees/ha in plantations during high temperature season in Nigeria (Asongwa *et al*. 2011). *Paranaleptes reticulata* was reported on high population density in October, November, April, May, and July in East Africa (Jones 1961). The present study was conducted in June when there was low temperature which disfavor *P. reticulata* reproduction. As a result of low population density of the pest, the found girdled stems were considered to be few. Therefore, there is high possibility of the girdled stems being beyond 150stems/ha in high temperature period if all factors are kept constant.

Further, *P. reticulata* have been observed girdling *Eucalyptus* in Bagamoyo District, however, this need confirmation. Local farmers managing Eucalyptus woodlots reported this problem to Kibaha Lowland Afforestation Research Centre for further investigation.

CONCLUSION AND RECOMMENDATION

This study confirmed that the insect pest causing girdling in Korogwe Forest Plantation was *Paranaleptes reticulate* beetle. The adult pest is a typical longhorn beetle causing damage normally to trees with a diameter range of 3-8 cm. The beetle was found girdling *E. camaldulensis*, *E. tereticornis* and *Sclerocarya birrea*. *Paranaleptes reticulata* girdled about 150 stems/ha of *E. camaldulensis* and *E. terecticornis*.

Paranaleptes reticulata is potential risk to Eucalyptus plantations and woodlots in Tanzania. Currently, there is meager information regarding this pest. Therefore, there is a need of immediate interventions such as detailed studies on *P. reticulata* to understand its interaction with the environment, economic loss it may cause, and its sustainable control measures.

Removal and burning of girdled branches material especially dried, keep in check its population density below economic injury level. This is because the female *P. reticulata* lays eggs in the girdled dead branches. Also, there is a need to apply phytosanitary measure to prevent spread of the pest to other forest plantation and woodlots with similar hosts. So far, no any insecticide has been tested to control *P. reticulata*

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