Status of forest invasive species in Kenya

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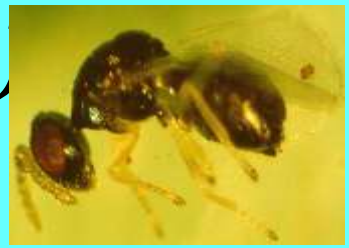
(Background-KEFRI Headquaters)

Introduction

- **Kenya like other countries in Africa has experienced problems of invasive species**
- **In forestry they consist of plants, insects and diseases.**
- **Records show that 34 species have invaded the country (Farrell, Kibata and Sutherland, 1995).**
- **Two (2) more species have recently entered the country (*Leptocybe invasa* and *Thaumastocoris peregrinus*)**



Introduction Cont'd

- **Some have had serious effects on forestry.**
- **Successful management for some have been achieved**
- **Phytosanitary procedures and issues in the past were handled by the ministry of agriculture (KARI).**
- **Now mandated to KEPHIS (Kenya Plant Health Inspectorate Service).**

Plants

Prosopis juliflora

- **Initial introductions around 1973 (Nightingale,1980) -*P. pallida***
- **1980 Prosopis had topped the**
- **list of priority species for drylands due to it's adaptability.**
- **Promoted by NGO's, government departments and aid agencies**

Invasion by Prosopis-Bura-Tana River

Purpose of introduction

- **Ensure self sufficiency in wood and non-wood products:**
- **fuel wood, charcoal**
- **fodder,**
- **poles and other fencing materials, timber and woodcarving**
- **medicinal uses, honey**
- **shade**
- **rehabilitation of degraded areas.**

- **Has become invasive especially *P. juliflora* *since 1990's***
- **Invasion and colonization of habitats**
- **Elimination of other vegetation (biodiversity loss) grass, indigenous species etc**

Invasion of roadside

Lake Baringo

Baringo

Management

Mechanical removal

- Removal by slashing and uprooting stems.
- Burning
- Is labor intensive

Mechanical removal

- Utilization-Main focus

Utilization

❖ carvings

❖Food

❖ Furniture

❖ Fuel wood

❖Fodder

❖Drying pods

❖Pods for livestock feed

❖Charcoal

Biological control

- A beetle *Algarobius prosopis* was imported from South Africa
- Tests on host specificity carried out under quarantine
- Release has been put on hold while other options are being developed.

Algarrobius

Lantana camara

- **A perennial woody shrub native to regions in central and tropical South America**
- **Considered invasive in many countries.**
- **Nominated as among 100 of the world's worst invaders**
- **In Kenya, it is found in highlands, dry environments, natural forests, planted forests, woodlands and grasslands**

- **Hinders regeneration of other species**
- **Decreases biodiversity**
- **Invades pastures and prevent growth of grasses**
- **Invades agricultural land**

Invasion by *L. camara*

Management

- **Has proved difficult to control**
- **Mechanical control possible in small areas especially on farms**
- **Biological control tried in many countries**
- **In Kenya three insects released: *Bohemia lantanae* (Dipteral), *Salvia haemorrhodalis* Guanee (Lepidoptera) and *Teleonemia scrupulosa* (Hemiptera)**
- **No records of impact**

Leucaena leucocephala

- **Introduced as an agroforestry species for alley-cropping.**
- **Used for fuelwood, soil nutrient replenishment etc.**
- **Has become invasive in some sites.**
- **Control-Mechanical removal and burning.**

Invasion of roadsides

Cutting

Cut and burn

Diseases

Botryosphaeria canker

- The most common disease of Eucalyptus in Kenya
- Symptoms: Production of gum and cracking of stems
- Mainly found on *E. grandis, E. camaldulensis,*
- Some GC clones now being affected eg GC540, GC522 and GC14

Infected *Eucalyptus* trees

Botryosphaeria on *Grevillea*

- **Canker and dieback disease affected approximately 36% of *G. robusta* trees on farms in the AEZs with about 18 % mortality occurring in the ASALs**
- ***G. robusta* is highly susceptible to the canker pathogens under stressful conditions.**

Healthy trees

Gummosis

Infected trees

Stem

Dothistroma needle blight

- Arrived in Kenya in early 1960's
- Affected *P. radiata* an exotic tree
- Caused by *Mycosphaerella pini*
- (*Dothistroma pini)*
- 1962 planting of *P.radiata* stopped due to the disease
- Selected materials and those obtained from Newzealand
- Planting restarted
- Still found in some young plantations

Infected trees

Selected material

Diplodia pinea (*Sphaeropsis sapinea*)

- ***Diplodia pinea*** **(Desm.) Kickx is a destructive pathogen of pines**
- **The disease occurs on trees from 5 years or older trees (Roux et al, 2005).**
- **Damage to trees includes shoot blight, branch and stem cankers**
- **The cankers exude copious amount of resin from stems and branches.**
- **The fungus also causes blue stain on timber**

- **Few years ago most of the *P. patula* plantations were clear felled hence the incidence of the disease is low.**
- **Found on remnant plantations**

Trees infected by Diplodia

Insects

Blue gum Chalcid (*Leptocybe invasa*)

L.invasa

- **A new pest of Australian origin**
- **A pest of *Eucalyptus* species**
- **Affects mainly *E. camaldulensis*, *E. grandis*, *E. globulus*, *E saligna*, *E. tereticornis* and hybrid clones**
- **Invaded Kenya in 2002 possibly from Uganda**
- **Has since spread to Western, Nyanza, Central, Coast and Eastern provinces**

L. invasa damage and management status

- **Damage continues in all parts of the country.**
- **Variation in damage on *Eucalyptus* species and clones (Nyeko and Mutitu, 2010)**
- **The tolerance/resistance to attack need further studies whether heritable and sustainable**
- **Biological control using parasitoids – *Quadrastichus mendeli* and *Selitrichodes kryceri* failed in Kenya**
- **A new hymenoptera parasitoid in quarantine in South Africa – FABI/UP might be the panacea**

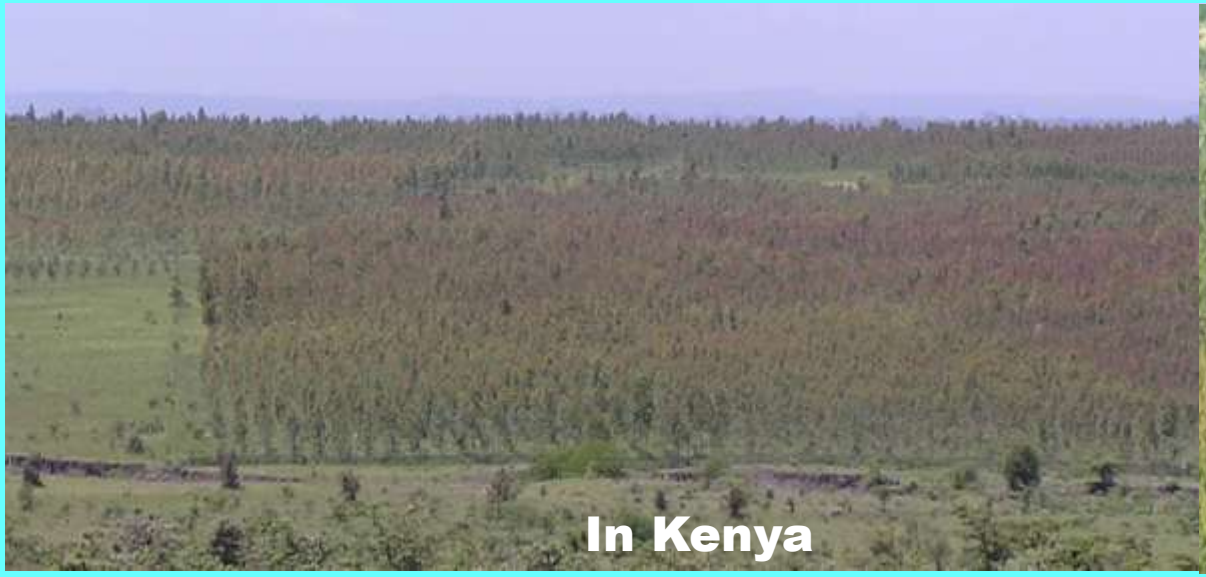
***L. invasa* Damage**

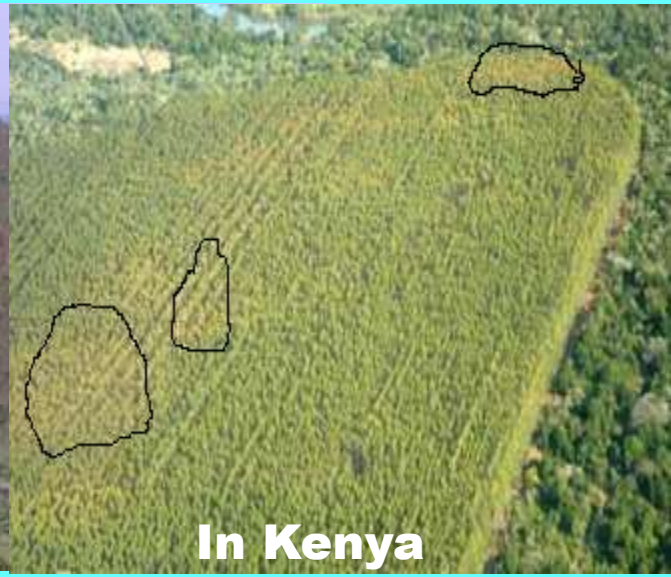
Thaumastocoris peregrinus

- **Winter bronzing bug a sap-sucking heteropteran of Australian origin**
- **Clusters of black eggs and colonies of nymphs and adults are easily visible on infested tree canopy foliage**

T. peregrinus

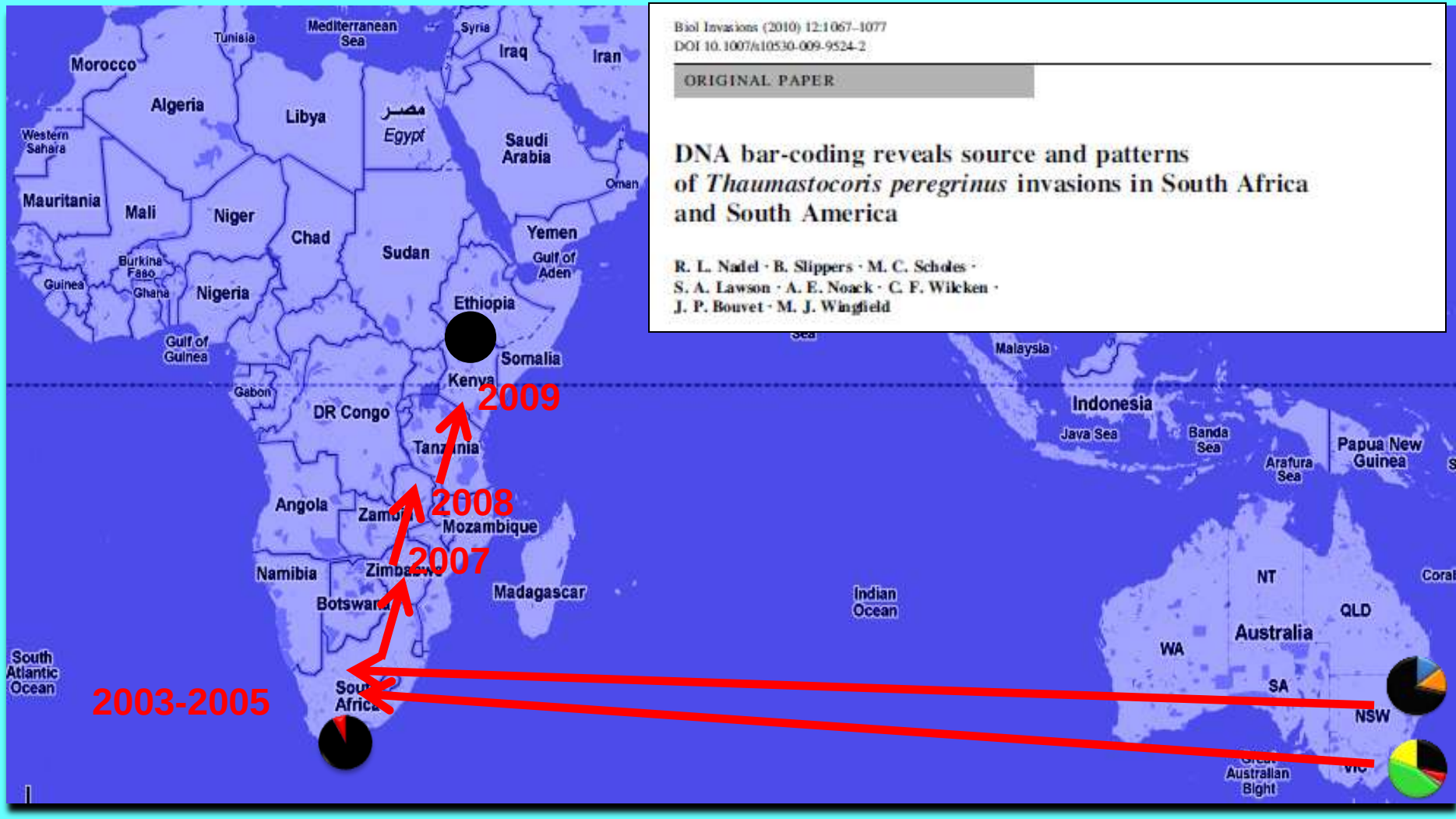
Damage Symptoms on trees





- Causes the tree foliage to turn reddish-brown and as infestation increases, foliage becomes yellow-brown
- Under severe infestations trees loose their leaves

What is the invasion, spread and genetic diversity?



Biol Invasions (2010) 12:1067–1077
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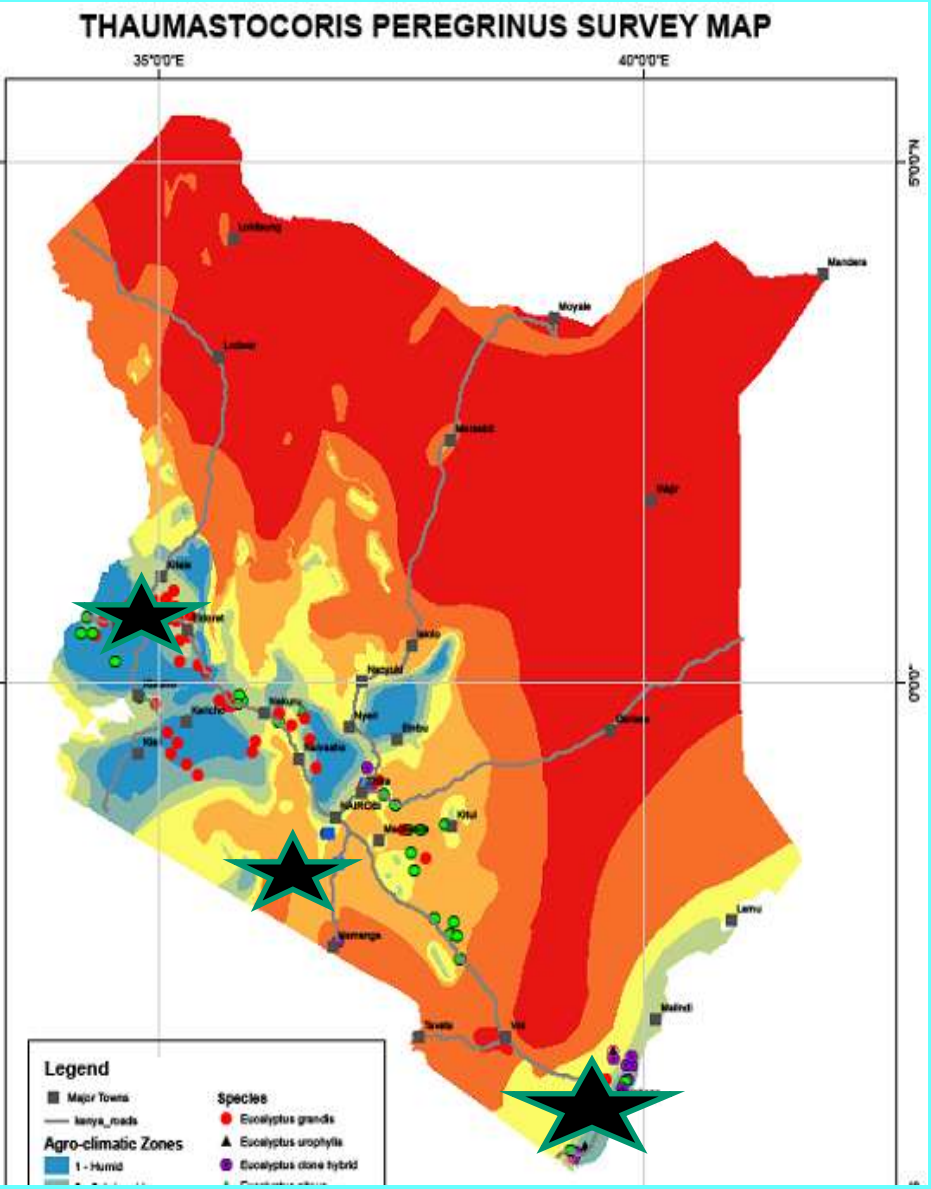
ORIGINAL PAPER

DNA bar-coding reveals source and patterns of *Thaumastocoris peregrinus* invasions in South Africa and South America

R. L. Nadel · B. Slippers · M. C. Scholes · S. A. Lawson · A. E. Noack · C. F. Wilcken · J. P. Bouvet · M. J. Wingfield

❖**Winter bronzing bug has also been recorded in South America (Argentina, Uruguay and Brazil)**

What is the current spread?



- Found in drier parts (ACZ III and IV) of the country
- High populations on the Kenya/Uganda/Tanzania borders and coastal strip
- Extensive monitoring using yellow sticky traps initiated in Jan. 2010

Salient key discussion points

- ***Thaumastocoris peregrinus*** **has spread to most parts in Kenya by Jan. 2012**
- **Its population increase and damage has not been as extensive in the first two yrs. as expected based on its rapid spread in Africa**
- **Similar phase of slow establishment was observed in South Africa between 2003 - 2005, however, the pest later spread, and is now considered a pest of economic importance**

- **Provides an opportunity to study the invasion, establishment, spread and population dynamics of *T. peregrinus* and develop sustainable and environmentally friendly management strategies**
- **Genetic diversity studies ongoing**
- **Biological control agent studies being undertaken in South Africa- FABI/UP**

Eucalyptus Snout Beetle *Gonipterus scutellatus*

- **Reported in Kenya in 1920's**
- **Attacks wide range of *Eucalyptus* species**
- **Biological control method attempted using egg parasitoid *Anaphes nitens***
- **Release in Kenya proved successful.**
- **Only sporadic outbreaks are experienced.**

Gonipterus

Damage on Eucalyptus

Cinara pinivora

- ***Cinara pinivora*-A new pest of pines**
- **A giant conifer aphid**
- **Observed in Kenya since August 2004**
- **Distributed in Central, Rift valley and Eastern Provinces.**
- **Attacks young shoots**
- **Damage serious when in combination with others pine pests**

Aphids on shoots

Cypress aphid (*C. cupressivora*)

- **Invaded Kenya in early 1990**
- **Attacks *Cupressus lusitanica* and *J. procera***
- **Occurs on branches and stems**
- **Causes dieback and death of trees**
- ***P. juniperorum* selected and released in 1994**
- **Control achieved**

Aphids

Damage on Cypress

Pausia

Phytosanitary issues

- Used to be handled by Ministry of agriculture
- In 1996 KEPHIS was formed and mandated to handle it.
- Mainly deals with agricultural and horticultural crops
- All phytosanitary measures are based on IPPC and WTO (SPS)

Vegetables

Flowers

Functions

- Plant health clinics-diagnosis
- Plant quarantine-station
- Grading and inspection-pests and diseases, packaging-Air ports and border points.
- Despite this pests and diseases can spread across borders.
- Biological control agents
- Vetted by Kenya standing technical committee for import and export (KSTCIE)
- National biosafety committee (GMOs).

Algarrobius

- Imported forest plant materials are also put in a quarantine nursery.

Constraints

- KEFRI is not included as a collaborator by KEPHIS in it's website.
- No forest entomologist or pathologist is included for inspection to deal with forest pests and diseases.
- Lack of biological control quarantine facility at KEPHIS
- KEFRI quarantine facility almost complete.

KEFRI Quarantine facility

Conclusions

- Forest invasive species are present in Kenya and a few are recent introductions.
- They include plants, insects and diseases.
- Some especially insects have been managed mainly through biological control.
- Others urgently need control strategies to be developed.
- There is need to streamline phytosanitary measures regarding forestry.


ThankYou