PART I

Regional and global analysis

Africa

The total number of pest species reported from the seven countries in the region was 99 (Figure 1; Table 2). Insect pests were the most frequently reported pest type, followed by pathogens. Only one mammalian pest was reported, the indigenous Barbary macaque (*Macaca sylvana*) from Morocco.

Almost 60 percent of the pests reported were indigenous, while the rest were introduced. The majority were reported exclusively in planted forests, about 30 percent in naturally regenerated forests and 11 percent in both types of forest. Malawi was the only country that reported more pests in naturally regenerated forests.

Broadleaf tree species were the most commonly reported host type. Twenty-eight percent of the pests were recorded on conifers while 8 percent of pests were reported as infesting both broadleaves and conifers. Pests recorded in Kenya were evenly split between broadleaf and conifer trees, while Morocco reported conifers as the most common host. On the African continent, conifers are mainly found in North Africa and in planted forests in eastern and southern Africa.

Lepidopteran (butterflies and moths) and coleopteran (beetles and weevils) species were the most common insect pests recorded in almost all countries (Figure 2), although Kenya reported more Hemiptera (true bugs, aphids and hoppers), and Malawi reported more Isoptera (termites) species. The most common pathogens reported from Africa were species from the phylum Ascomycota.

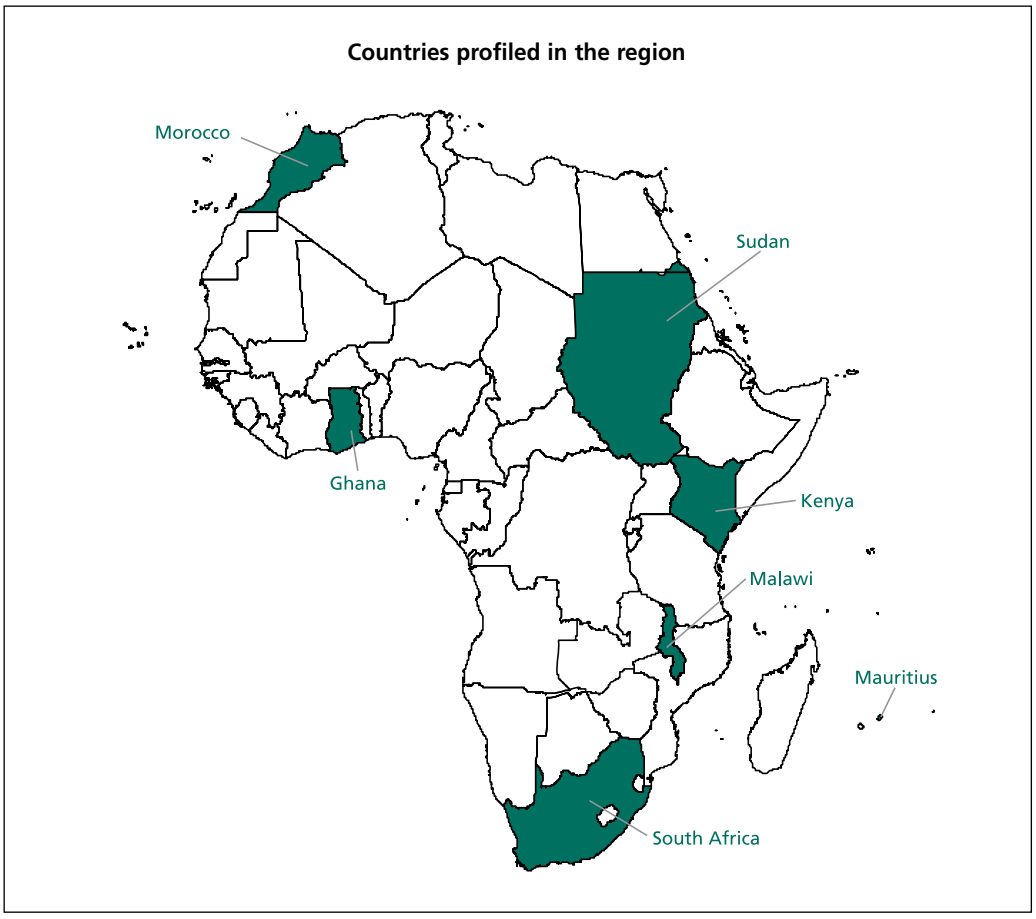


FIGURE 1
Number of forest pest species reported, Africa

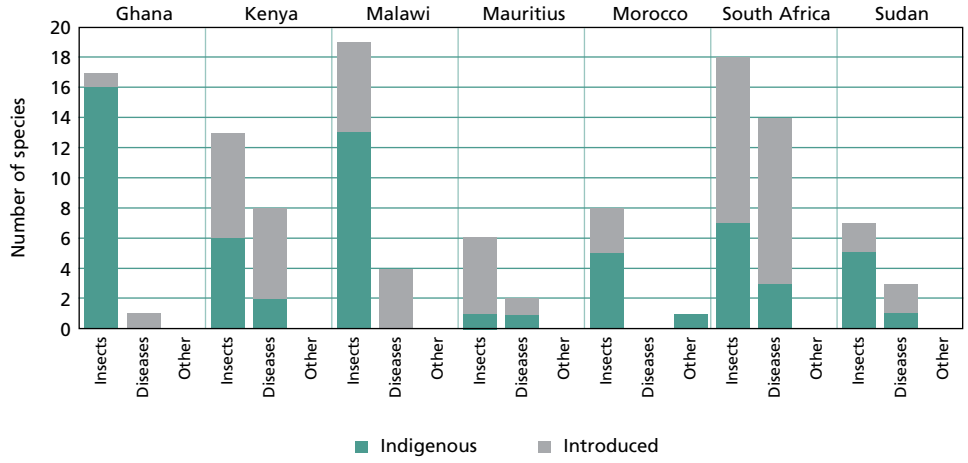
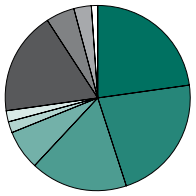


FIGURE 2
Most prevalent pests, Africa



Insects		Diseases	
Coleoptera	23%	Ascomycota	18%
Lepidoptera	22%	Basidiomycota	5%
Hemiptera	17%	Other diseases	3%
Isoptera	7%		
Orthoptera	2%	**Other**	
Hymenoptera	2%	Other pests	1%

SPECIES FOUND IN MORE THAN ONE COUNTRY

A number of forest pests were reported from more than one country in the region (Table 3). All transboundary species reported from Africa are introduced species from other continents.

Nine insect pest species, out of a total of 72, were recorded from more than one country in the region. All of these insect pests were recorded in planted forests. Three species (*Cinara cupressivora**, *Eulachnus rileyi* and *Pineus pini*) were recorded on conifers and the remaining six were recorded on broadleaf trees.

The longicorn borers *Phoracantha recurva** and *P. semipunctata** and the leaf-feeding curculionid *Gonipterus scutellatus** are significant pests of eucalypts. *Heteropsylla cubana** is a pest of the fast-growing Central American tree, *Leucaena leucocephala*, which has been widely planted in the tropics since the 1970s for agroforestry, wood production and fodder. The shoot borer, *Hypsipyla robusta**, is a major pest of several high quality timber species including African mahogany (*Khaya* spp.), mahogany (*Swietenia macrophylla, S. mahagoni*), and teak (*Tectona* spp.). The blue gum chalcid, *Leptocybe invasa**, is a relatively new threat to planted eucalypt forests in Africa, reported first from Kenya in 2002 and from South Africa in July 2007. This pest is also known to occur in Morocco although the date of introduction is unknown.

Three introduced pathogens were recorded from more than one country. *Armillaria mellea** was recorded in both naturally regenerated and planted forests, while *Mycosphaerella pini** and *Sphaeropsis sapinea* were reported exclusively in planted forests. All three were recorded on conifers, although *A. mellea* was also noted to be a pest of broadleaf trees.

TABLE 2
Summary of the data on forest pest species reported, Africa

Pest type	Number of pest species						
	Total	In naturally generated forests	In planted forests	In both types of forest	On broadleaf	On conifer	On both host types
Indigenous species							
Insects	53	26	25	2	39	12	2
Diseases	6	1	1	4	3	1	2
Other	1	0	0	1	0	1	0
Introduced species							
Insects	19	0	19	0	10	9	0
Diseases	20	2	14	4	11	5	4
Other	0	0	0	0	0	0	0
Total	**99**	**29**	**59**	**11**	**63**	**28**	**8**

TABLE 3
Forest pest species found in more than one country, Africa

Pest species	Order/phylum: family	Countries of occurrence	Indigenous/ introduced	Type of forest	Host type
Insects					
*Cinara cupressivora**	Hemiptera: Aphididae	Kenya, Malawi, Mauritius	Introduced	Planted	Conifer
Eulachnus rileyi	Hemiptera: Aphididae	Kenya, Malawi	Introduced	Naturally regenerated, planted	Conifer
*Gonipterus scutellatus**	Coleoptera: Curculionidae	Kenya, Mauritius, South Africa	Introduced	Planted	Broadleaf
*Heteropsylla cubana**	Hemiptera: Psyllidae	Kenya, Malawi, Mauritius, Sudan	Introduced	Planted	Broadleaf
*Hypsipyla robusta**	Lepidoptera: Pyralidae	Ghana, Mauritius	Introduced	Planted	Broadleaf
*Leptocybe invasa**	Hymenoptera: Eulophidae	Kenya, Morocco, South Africa	Introduced	Planted	Broadleaf
*Phoracantha recurva**	Coleoptera: Cerambycidae	Malawi, Morocco, South Africa	Introduced	Planted	Broadleaf
*Phoracantha semipunctata**	Coleoptera: Cerambycidae	Malawi, Morocco, South Africa	Introduced	Planted	Broadleaf
Pineus pini	Hemiptera: Adelgidae	Kenya, Malawi, South Africa	Introduced	Planted	Conifer
Diseases					
*Armillaria mellea**	Basidiomycota: Marasmiaceae	Kenya, Malawi, Sudan	Introduced	Naturally regenerated, planted	Broadleaf, conifer
*Mycosphaerella pini**	Ascomycota: Mycosphaerellaceae	Kenya, South Africa	Introduced	Planted	Conifer
Sphaeropsis sapinea	Ascomycota: Incertae sedis	Kenya, South Africa	Introduced	Planted	Conifer

CAPACITY FOR FOREST HEALTH PROTECTION

Monitoring and detection

Most countries do not carry out routine monitoring and detection. Such activities are often informal in nature involving observations made by foresters and forest workers while carrying out other activities in the field. In some countries, monitoring activities have been carried out for specific pests, such as aerial surveys to detect damage by *Cinara cupressivora** in Kenya and the mapping of winter nests and placement of pheromone traps to detect *Thaumetopoea pityocampa** in Morocco. In South Africa, disease development in planted forests is regularly monitored. A major impediment to effective monitoring and detection activities is the lack of highly trained and skilled people capable of identifying insects and diseases as causal agents of damage to forests. This is compounded by a lack of infrastructure and transport.

Data management

Of the little information available on forest health in the African countries, most is qualitative in nature; very little quantitative data exist for most countries. Some data are available for specific pests, such as *Cinara cupressivora** in Kenya, Malawi and Mauritius and the tree locust (*Anacridum melanorhodon*) in the Sudan. Impediments to forest health data management include lack of trained personnel, inadequate data storage facilities and low capacity for analysing large quantities of data. Considerable data are stored as hard copy, whereas to be of value for predictive forecasting they need to be transferred to electronic databases.

As part of the Global Forest Resources Assessment (FRA) 2005, FAO asked countries to report on the impact of insect pests and diseases on their forests for two reporting periods: 1990 (average from 1988 to 1992); and 2000 (1998 to 2002). Most countries did not provide any solid, quantitative information through the country correspondent and only two provided data on the area of forests impacted. Morocco reported that over 16 000 ha (1990) and 37 000 ha (2000) of forest were damaged by insect pests while other disturbances damaged a further 2 500 ha (2000). South Africa reported that 2 250 ha (1990) and 919 ha (2000) of planted forests were damaged by weather, diseases, insects, animals and rodents.

Pest management

Some pest management activities, such as physical removal of infested trees, the application of chemical and biological pesticides, classical biological control, and the planting of pest tolerant tree species, have been carried out to varying degrees in each country. Most activities are target specific and include classical biological control programmes, e.g. for management of *Cinara cronartii* in South Africa and *Heteropsylla cubana** in Kenya and Mauritius, and *Cinara cupressivora** in Kenya, Malawi and Mauritius. Aerial application of chemical and biopesticides has been carried out in Morocco for management of *Thaumetopoea pityocampa**. Most countries lack comprehensive forest pest management plans or preventative measures.

Ownership

In most of the countries, the majority of the forests are in the public domain. In privately owned and managed forests, pest management activities are often carried out in collaboration with national agencies and departments.

ADDITIONAL INFORMATION

In general, there is a broad trend in the region towards recognizing environmental and biodiversity concerns including forest health and protection. However, information on forest health is scarce and, as part of FRA 2005, only five countries from the entire continent reported quantitative data pertaining to insect pests and diseases. This is insufficient for trend analysis.

African forests are subject to the impact of a number of indigenous mammalian pests such as baboons (*Papio* spp.) and the African elephant (*Loxodonta africana*). Baboons can cause considerable damage to pine plantations in southern Africa, particularly in Malawi, Zambia and Zimbabwe, where they strip bark, which results in tree death. They may also attack *Eucalyptus*, *Acacia* and *Cupressus* plantations. In East Africa the elephant may cause death of young trees by rubbing against saplings and by pulling branches during feeding.

The African continent faces severe challenges from invasive forest species. An example is the blue gum chalcid, *Leptocybe invasa**, which damages young eucalypt trees and seedlings. A recent introduction into Kenya, Morocco and South Africa, it is also found in the forests of Algeria, Uganda and the United Republic of Tanzania. This pest has also been reported in Asia and the Pacific, Europe and the Near East. Other pests introduced into the continent in the last five years include: *Cinara pinivora** in Malawi, *Coniothyrium zuluense* in Ethiopia, *Thaumastocoris peregrinus* and *Coryphodema tristis* in South Africa and *Gonometa podocarpi* in the United Republic of Tanzania. All of these pose threats to bordering countries.

Conifer aphids have been a major problem in the region for several decades particularly in countries where planted conifer forests are common. While Kenya, Malawi and Mauritius reported the cypress aphid, *Cinara cupressivora**, as a pest of cypress and cedar trees, it is also known to be or has been a major problem in other African countries including Burundi, the Democratic Republic of the Congo, Ethiopia, Rwanda, South Africa, Uganda, the United Republic of Tanzania, Zambia and Zimbabwe (Ciesla, 1991; Ciesla, 2003a). Kenya and Malawi also reported the pine needle aphid, *Eulachnus rileyi*, which has become a major pest of planted pines throughout eastern and southern Africa since its initial introduction into the region (South Africa, Zambia, Zimbabwe) in the late 1970s (Murphy, Abraham and Cross, 1991). The pine woolly aphid, *Pineus pini* has attained pest status worldwide. While it has been reported from Kenya, Malawi and South Africa, information on this pest's occurrence in other African countries is lacking, with the exception of the United Republic of Tanzania.

The European woodwasp, *Sirex noctilio**, now established in South Africa, is a significant pest of conifer forests in many other countries outside Africa as well, causing considerable damage and cost to local economies. Efforts are being made to address the severe threat of this pest to the African continent, including a meeting in 2007, hosted by South Africa, to review current knowledge and increase the understanding of *Sirex noctilio* and its worldwide threat to forestry (www.fabinet.up.ac.za/sirex/index).

The leucaena psyllid, *Heteropsylla cubana**, noted as a significant pest of *Leucaena leucocephala* in Kenya, Malawi, Mauritius and the Sudan, is also a well-known pest in leucaena growing areas in Burundi, Ethiopia, Mozambique, Réunion, the United Republic of Tanzania, Uganda and Zambia (FAO, 2001; Nair, 2001).

Native to Australia, *Phoracantha recurva** is a pest of planted forests in Malawi, Morocco, and South Africa and is also known to occur in Tunisia and Zambia as well as in other regions.

Apate spp., indigenous small borer beetles, have been reported as pests of broadleaf planted forests in Kenya (*A. indistincta* and *A. monachus*) and Ghana (*A. terebrans*).

Fungal *Armillaria* spp., which cause Armillaria root disease, are found throughout the temperate and tropical regions of the world. *Armillaria mellea** has been reported from Kenya, Malawi and the Sudan. *A. fuscipes* has been identified as the main cause of Armillaria root disease in South Africa. *A. heimii* is recorded in Kenya. Unidentified *Armillaria* species were reported in Mauritius. *Sphaeropsis sapinea*, reported from Kenya and South Africa, is also a cosmopolitan fungus; it causes shoot blight and canker disease on conifer trees throughout the world. Specific information on the occurrence of these pathogens in other African countries is lacking.

The red band needle blight, *Mycosphaerella pini**, reported from Kenya and South Africa, is also known as a pest in Malawi, the United Republic of Tanzania, Uganda, Zambia and Zimbabwe (EPPO/CABI, 1997). This fungal disease, previously referred to as Dothistroma blight, has contributed to the decline of *Pinus radiata* plantations in Kenya.

*Botryosphaeria dothidea**, *B. eucalypticola* and *B. eucalyptorum* are pests in South African broadleaf planted forests. Kenya and Malawi both reported unidentified *Botryosphaeria* sp. in broadleaf planted forests and broadleaf and conifer naturally regenerated forests.

Dieback and declines of uncertain cause affect junipers and cedars in several countries in the region. Some species affected include *Cedrus atlantica* in Algeria and Morocco, representing the world's genetic base for Atlantic cedars; *Juniperus phoenicea* in the Libyan Arab Jamahiriya; and *Juniperus procera* in Kenya.

REGIONAL PEST MANAGEMENT EFFORTS

The Forest Invasive Species Network for Africa (FISNA), created by a group of African scientists with the support of the FAO and the United States Forest Service, coordinates the collation and dissemination of information relating to forest invasive species in sub-Saharan Africa. The network raises regional awareness on forest invasive species; encourages the publication and sharing of research results, management and monitoring strategies; and acts as a link between and among experts, institutions, networks and other stakeholders concerned with forest invasive species in the region. Up-to-date information on new invasions is disseminated through a Web site (www.fao.org/forestry/26951).

Plant protection and phytosanitary issues are addressed by the Inter-African Phytosanitary Council (IAPSC) which is a Regional Plant Protection Organization (RPPO) of the International Plant Protection Convention (IPPC).