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PREFACE

Among the most valuable and at the same time replaceable resources of the Philippines are her rich forests. There is probably no other country in the world that has hard-wood forests comparable to those found in the Philippines in terms of quality and per hectare value. In addition to the presence of forest abounding in dipterocarp trees which cover large areas and whose commercial value as timber is unparalleled but concentrated in a few species, the country has considerable reserves of pine soft-wood in the mountainous area of northern Luzon.

This natural wealth is now playing and will continue to play an important role in the Philippine economy as well as a vital role in regulating the supply and flow of water. The forest products have been consistently the biggest dollar earner for the country since 1967.

In the rich tropical forests, animal and plant communities are so diverse that the outbreak of pests scarcely occurs on living trees. Since the introduction of tree-farming in the Philippines, insect pests have frequently become serious problems in some plantations and many trees have been infested with fungi growing on their branches and stems.

This report is composed of two sections, one consists of brief notes on the present status of forest and forest products pest problems together with a list of host trees harbouring harmful insects, and the other is a report on observations and surveys conducted on forest insects from March 1 to April 30, 1976.

I. Present status of forest and forest products pest problems in the Philippines

1. Forest status

As of June 1974, the Bureau of Forest Development figures showed that among the 30 million hectares total land area of the Philippines, the national forests cover about 17 million hectares (roughly 57 percent) of which 9 million hectares have been classified by the government as timber land and the remaining 8 million hectares have yet to be classified as to their final use. Among the commercial forest lands, however, only 7.4 million hectares can be considered as productive forests including dipterocarpus type forests which occupy 7.05 million hectares; mangrove type, 120 thousand hectares; and pine type, 200 thousand hectares.

In the period extending from 1900 to the present time, the rapid population increase (7.6 to 42.8 million or 2–3 percent average annual increase) combined with the encouragement of commercial agriculture sponsored by the government were primarily responsible for the expansion of farm areas and the subsequent decline in forest reserves. Through all these years, the rate of forest destruction has reached the appalling rate of about 172,000 hectares annually. This has resulted in years of massive land deterioration, floods during rainy season, droughts in the dry months, lack of water for agriculture and industries, power failure due to sedimentation and low water levels in the reservoirs of hydroelectric stations. Forests for commercial use which are still exploited today are located far in the center of the country or in uninhabited zones as well as in areas bordering the Pacific Coast where transportation and loading are inconvenient. (4.61 million hectares in Mindanao, 1.12 million hectares in Palawan and 4.83 million hectares in Luzon.)

The indiscriminate cutting of trees and encroachment upon productive forest land have prompted the Bureau of Forest Development to predict that timber production in the Philippines could drop from the present estimate of 26 million cubic meters annual yield to about 3 million cubic meters by the year 2000. These figures also have led to the another estimation by SEARCA that the domestic demand will come up to some 10 million cubic meters by the year 2000, seven million more than the expected production, and the Philippines instead of being, as it is now, a country which exports forest products representing the main foreign exchange earner since 1967, might even have to import such products by the year 2000.

In the face of this alarming situation, the sylvicultural system which has been introduced consists of promoting natural regeneration through selective cutting while massive reforestation projects have been initiated by the Reforestation Administration since 1960. In the selective logging method for the dipterocarp forests, only trees above 70 cm in diameter are cut. About 50 percent of the total volume is usually cut by this method which is effective, provided that the residual trees and soil are not destroyed during the logging operation. It is reported, however, that in practice more than 20 percent of the residual trees are often destroyed and this figure may go up as high as 70 to 80 percent if proper care is not taken during the logging operations. Natural regeneration in such cases is then impossible and many residual stocks may be killed by vines 3 to 5 years after the logging operation, in some places. For the pine forests, the government prescribes the seed tree method. It is deemed sufficient to leave 16–20

seed trees per hectare so as to enable the area to regenerate naturally.

To hasten the slow pace of reforestation, which has been outpaced 8 to 10 times by forest destruction, the planting of fast-growing tree species has been introduced by industries. This procedure is generally called "industrial plantation", which may be defined as economic forest trees planted and grown on open or deteriorated lands for the production of timber, peeler, log, pulpwood, poles, fuelwood and other forest products.

Fast-growing tree species are Moluccan sau (*Albizzia falcataria*), Kaatoan bangkal (*Anthocephalus chinensis*), Bagras (*Eucalyptus deglupta*), Yemane (*Gmelina arborea*), Gubas (*Endospermum peltatum*), Balsa (*Ochroma pyramidale*), Banlag (*Xylopia ferruginea*) and Giant ipil-ipil (*Leucaena pulverulenta*). At present, the area planted with these species amounts to about 8,320 hectares and is located mostly in Mindanao.

Other targets of massive reforestation projects are the critical areas within the primary watershed totalling about 4 million hectares.

2. Forest and forest products pest problems

The species in plant and animal communities are in a state of equilibrium with one another especially in the tropical rain forests. Prior to interference with natural forests, insect and disease problems occurred rarely on living trees, while felled logs are frequently infested by wood-boring beetles and fungi.

Fast-growing tree species have been known to be susceptible to tree diseases and insect attack and the problems have increased in proportion to the expansion of the artificial monocultured areas in many countries in the world, and the Philippines is no exception in that respect. Fast-growing species like *Albizzia falcataria* and *Anthocephalus chinensis* have been frequently attacked by defoliators and are very susceptible to tip borers. These pests have often compelled industries to change tree species in some areas.

Also, the Benguet pine has been widely affected by some unknown agents since 1958.

As mentioned before, insect and disease problems have occurred recently in the Philippines, and the need for basic and applied research is keenly felt at present.

3. Present status of the research organizations on pest problems

While the College of Forestry at the University of the Philippines at Los Banos (UPLBCF), does conduct forest research supervised by two entomologists and a pathologist, the UPLBCF is primarily an educational institution, and both staff and facilities are insufficient at present for this type of research.

The Forest Research Institute (FORI) was established in 1974 to coordinate, formulate and conduct accelerated research in the production, management and protection of the forest resources. The Forest Protection Section, of the Sylviculture and Forest Protection Division, formulates research programs, projects or studies on pests and diseases, regarding their occurrence, epidemiology and effective methods of control as well as on other biotic agents like climbers and parasitic plants, destructive animals and birds, abiotic agents like fire, and attempts to investigate causes and methods of prevention and control. This new institute has been provided with facilities and personnel since its establishment, but the positions of entomologist and pathologist are not yet filled.

The Forest Products Research & Industries Development Commission (FORPRIDECOM) meets still another specific need, namely, research in the utilization of the

forest primary products such as logs. Active research and studies on pests have been conducted at the Forest Products Entomology and Forest Products Pathology Laboratories as seen in the bibliography compiled in this report.

Research projects have been controlled by the Philippine Council for Agriculture and Resources Research (PCARR). The projects on forest and forest products entomology and pathology which were currently undertaken in 1976 are as follows.

UPLBCF: Guzman, E. Study of diseases affecting forest trees in the nurseries.

FORPRIDECOM: Arenas, C. A. A study of soft-rotting fungi in the Philippines.

FORPRIDECOM: Decena, A. Log-defect studies on Philippine commercial species. I. Philippine mahogany and other species.

FORPRIDECOM: Garcia, M. An economic survey and collection of timber borer causing damage to logs and lumber in different regions in the Philippines.

FORPRIDECOM: Garcia, M. Evaluation of the effectiveness of insecticides against subterranean termite infestations in houses and buildings.

FORPRIDECOM: Garcia, M. Studies on irradiation of powder-post and other wood-boring beetles.

FORPRIDECOM: Mata, P. Natural durability of untreated heartwood of Philippine woods against wood destroying organisms by stake tests.

FORPRIDECOM: Arenas, C. Studies on the cultivation of edible species of wood-inhabiting fungi.

4. Insect pests

i) Forest products pests.

Ambrosia or "Pinhole" beetles:

Newly felled timber is always subject to the attack of many beetles belonging to the families Buprestidae, Cerambycidae, Anthribidae, Brentidae, Curculionidae, Scolytidae and Platypodidae. Among them, Ambrosia beetles are the most serious and frequently infest recently felled timber, green logs and lumber. These beetles, which are represented in the Philippines by 228 species of Scolytidae and 63 species of Platypodidae, are responsible for about 10 percent of monetary loss for the timber industries on account of devaluation of affected materials. The export timber species of the Philippine Dipterocarp group which are the most susceptible to ambrosia beetles are as follows.

Shorea kalunti Merr. Kalunti
Shorea almon Foxw. Almon
Parashorea plicata Brandis. Bagtikan
Pentacme contorta (Vid.) Merr. & Rolfe. White lauan
Shorea squamata (Turcz.) Dyer. Mayapis
Shorea polysperma (Blanco) forma *tiaong* Merr. Tiaong
Shorea polysperma (Blanco) Merr. Tanguile
Shorea negrosensis Foxw. Red lauan

For the control of beetle attack, chemical treatment by spraying Lindane emulsion (4 or 5%) is effective for 6–7 weeks.

Powder-post beetles:

Powder-post beetles are very common and are destructive pests of well-seasoned sapwood lumber. The following 15 species belonging to the families Lyctidae and Bostrychidae are listed below and the most common species are marked with an asterisk.

Lyctidae

Lyctus africanus Lesne*

Lyctus brunneus Stephens*
Minthea reticulata Lesne
Minthea rugicollis (Walker)*
Minthea obsita (Wollaston)

Bostrychidae

Dinoderus brevis Horn
Dinoderus minutus Fabricius*
Dinoderus ocellaris Stephens
Synoxylon anale Duftschmid
Trogoxylon aequale Wollaston
Trogoxylon parallelopidedum (Welsh)
Heterobostrychus aequalis Waterhouse*
Bostrychopsis parallela Lesne
Xylothrips flavipes Illiger
Xylopsocus capucinus Fabricius

Sapwood of practically all species of Philippine woods are more or less susceptible to the attack of powder-post beetles. The following trees are particularly susceptible to *Heterobostrychus aequalis* and *Minthea rugicollis*.

Koomposia excelsa (Becc.) Manggis
Endospermum peltatum Merr. Gubas
Pterocymbium tinctorium (Blanco) Merr. Taluto
Pentacme contorta (Vid.) Merr. & Rolfe. White lauan
Mangifera altissima Blanco. Pahutan
Sesbania grandiflora (L.) Pers. Katurai
Shorea negrosensis Foxw. Red lauan
Pterocarpus indicus Willd. Narra
Parashorea plicata Brandis. Bagtikan

Termites:

Termites are among the most abundant and notorious insects, and serious infestations of wood and wooden constructions have frequently been recorded in the tropics. They are represented in the Philippines by 54 species, of which 6 species are most common and economically destructive. The six species are:

Cryptotermes cyanocephalus Light
Cryptotermes dudleyi Banks
Coptotermes vastator Light
Microcerotermes losbanosensis (Oshima)
Macrotermes gilvus (Hagen)
Nasutitermes luzonicus (Oshima)

In the Philippines, control measures against powder-post beetles and termites are similar to those in Japan.

ii) Insect pests of natural forest trees.

In the rich tropical forests, animal and plant communities are so diverse that the outbreak of pests is scarce. The only record was the outbreak of the pine-needle measuring worm, *Millonia coronifera* at Baguio in 1934.

The insect pests so far recorded from the Philippines are enumerated below. This list is based mostly on Mesa (1934, 35), Schedl (1966) and many records of wood-boring insects intercepted at plant quarantine in various countries. Scientific and domestic names of trees follow the terminology adopted by Salvosa's Lexicon of Philippine trees (1963), but some old records are directly quoted in the list in the case of the synonyms unknown to the authors.

Forest host plants of harmful insects in the Philippines

AMYGDALACEAE

Parinari sp.
- *Hypocryphalus striatus* Hopk.
- *Ozopemon parinarii* Hopk.

ANACARDIACEAE

Mangifera indica, Mango
- *Euclea capita* Pasc.
- *Xylopsocus capucinus* F.
- *Arixyleborus rugosipes* Hopk.
- *Xyleborus metacuneolus* Egg.

Anacardium occidentale, Kasui
- *Xyleborus mancus* Blandf.
- *Xyleborus exiguus* Walk.
- *Xyleborus perforans* Woll.

Semecarpus merillana, Inas
- *Xyleborus similis* Ferr.

ARALIACEAE

Polyscias nodosa, Malapapaya
- *Trichalus cyaneiventris* Waterh.
- *Metapocyrtus propanus* Erich.
- *Oberea makilingi* Heller

ARAUCARIASEAE

Agathis philippinensis, Armaciga
- *Acalolepta holotephra* Boisd.
- *Ozodendron papuanus* Egg.

BOMBACACEAE

Ceiba pentandra, Kapok
- *Batocera numitor* Newm.

Ochroma pyramidale, Balsa
- *Batocera numitor* Newm.

BURSERACEAE

Canarium hirsutum f. *multipinnatum,* Dulit
- *Arixyleborus imitator* Egg.
- *Xyleborus diversicolor* Egg.

Canarium warburgianum
- *Poecilips medius* Egg.
- *Xyleborus mascarensis* Eichh.
- *Xyleborus torquatus* Eichh.

Canarium luzonicum, Piling-litan
- *Dactylipalpus transversus* Chap.

CELASTRACEAE

Solenospermum toxicum, Abuab
- *Platypus jansoni* Chap.
- *Platypus lepidus* Chap.

CLETHRACEAE

Clethra lancifolia, Kamong
- *Haplosonyx smaragdipennis* Chevr.
- *Epilachna indica* Muls.
- *Trichalus cyaneiventris* Waterh.

COMBRETACEAE

Terminalia catappa, Talisai
- *Euclea capito* Pasc.

Terminalia citrini, Binggas
- *Chrysodema jucunda* C. & G.
- *Bolioneta sagittaria* Esch.

Terminalia edulis
- *Xyleborus mascarensis* Eichh.
- *Xyleborus procerior* Schedl
- *Xyleborus terminaliae* Hopk.

Terminalia microcarpa, Kalumpit
- *Chrysodema jucunda* C. & G.

CORNACEAE

Alangium longiflorum
- *Platypus excedens* Chap.

CYCADACEAE

Cycas circinalis riuminiana, Pitogo
- *Aulacophora bicolor* Weber
- *Aulacophora coffeae* Hornst
- *Temnaspis cumingi* Westw.

DILLENIACEAE

Dillenia philippinensis, Katmon
- *Xyleborus similis* Ferr.

DIPTEROCARPACEAE

Dipterocarpus grandiflorus, Apitong
- *Aeolesthes holosericea* F.
- *Anancylus socius* Pasc.
- *Chloridolum accensum* Newm.
- *Eoporis elegans* Pasc.
- *Macrotoma absurda* Newm.
- *Mecocerus allectus* Pascoe
- *Mecocerus basalis* Jord.
- *Mecocerus gazella brunnescens* Jord.
- *Cyphagogus planifrons* Kirsch
- *Camptorrhinus doriae* Pasc.
- *Camptorrhinus tibialis* Sparr.
- *Colobodes billbergi* Bohem.
- *Zeugenia figurata* Pasc.
- *Zeugenia rosacea* Heller
- *Mecysolobus* (=*Alcidodes*) *carassus* Pasc.
- *Arixyleborus granulifer* Egg.
- *Arixyleborus imitator* Egg.

Arixyleborus rugosipes Hopk.
Coptodryas confusa Hopk.
Dryocoetiops laevis Strohm.
Hypocryphalus rotundatus Hopk.
Hypocryphalus kalambanganus Schedl
Cyrtogenius elongatus Egg.
Ips bicaudatus Egg.
Ozopemon brownei Schedl
Ozopemon dipterocarpi Hopk.
Poecilips subcribrosus Blandf.
Scolytomimus philippinensis Egg.
Sphaerotrypes palawanus Egg.
Webbia dipterocarpi Hopk.
Xyleborus bidentatus Mots.
Xyleborus dipterocarpi Hopk.
Xyleborus emarginatus Eichh.
Xyleborus macropterus Schedl
Xyleborus obliquesectus Egg.
Xyleborus perforatus Woll.
Xyleborus posticeipilosus Schedl
Xyleborus subcostatus Eichh.
Xyleborus sublongus Egg.
Xyleborus torquatus Eichh.
Crossotarsus laratensis Bees
Crossotarsus shoreanus bifurcatus Schedl
Diapus pendlebruyi Schedl
Diapus pussilimus Chap.
Diapus quinquespinatus Chap.
Platypus curtus Chap.
Platypus shoreanus bifurcatus Schedl
Platypus shoreanus mutilatus Schedl
Platypus spectabilis Schedl
Platypus solidus Walker

Dipterocarpus polosapis
Hypothenemus dipterocarpi Hopk.

Dipterocarpus vernicifluus
Poecilips incognitus Schedl
Poecilips sannio Schauf.

Hopea acuminata, Manggachapui
Mecysolobus crassus Pasc.
Nanophyes v-fuscatus Heller
Nanophyes matusculus Heller

Hopea sp.
Sphaerotrypes philippinensis Strohm.

Parashorea malaanonan
Platypus shoreanus bifurcus Schedl

Parashorea plicata, Bagtikan
Aeolesthes induta Newm.
Pediris sulcigera Boisd.
Hoplocerambyx spinicornis Newm.
Diochares ambigenus Chevr.
Dihammus fistulator Germ.
Sphaerotrypes moseri Egg.
Platypus cavus Strohm.

Pentacme contorta, White lauan
Hoplocerambyx spinicornis Newm.
Sphaerotrypes moseri Egg.
Crossotarsus lecontei Chap.
Crossotarsus palatus Beez.
Platypus turbatus Chap.

Shorea almon, Almon
Batocera albofasciata DeGeer

Shorea guiso, Guijo
Mecysolobus crassus Pasc.

Shorea mindanensis
Platypus shoreanus bifurcus Schedl

Shorea negrosensis, Red lauan
Xyleborus perforatus Woll.
Platypus shoreanus bifurcus Schedl

Shorea pulosapis
Xyleborus torquatus Eichh.

Shorea spp. Lauan
Aeolesthes indica Newm.
Aeolesthes holosericea Fab.
Batocera rubus L.
Dialeges pauper Pasc.
Hoplocerambyx spinicornis Newm.
Macrotoma absurda Newm.
Mecocerus basalis Jordan
Niphades pardalotus Pasc.
Arixyleborus granulifer Egg.
Arixyleborus imitator Egg.
Arixyleborus rugosipes Hopk.
Dactilipalpus transversus Chap.?
Eccoptopterus spinosus Oliv.
Ozopemon brownei Schedl
Poecilips suberibrosus Blandf.
Sphaerotrypes moseri Egg.
Xyleborus amphicranoides Hargend.
Xyleborus bidentatus Mots.
Xyleborus cognatus Blandf.
Xyleborus emarginatus Eichh.
Xyleborus obliquesectus Egg.
Xyleborus perforatus Woll.

Xyleborus posticeipilosus Schedl
Xyleborus subcostatus Eichh.
Xyleborus ursulus Egg.
Crossotarsus bifurcatus Schedl
Diapus quinquespinatus Chap.
Platypus cupulatus Chap.
Platypus curtus Chap.
Platypus shoreanus bifurcatus Schedl
Platypus shoreanus mutilatus Schedl
Platypus solidus Walk.
Platypus turbatus Chap.
Parastasia canaliculata Westw.

Vatica mangachapoi, Narig
Ips bicaudatus Egg.
Xyleborus obtusicollis Schedl

EBENACEAE

Diospyros ahernii
Platypus hybridus Schedl

Diosphyros philippensis, Kamagong
Neopyreops granosus Bch.
Castalia bimaculata C. & G.

Diosphyros pilosanthera
Platypus hybridus Schedl

Diosphyros pyrrhocarpa, Anang
Platypus hybridus Schedl

EHRETIACEAE

Cordia dichotoma, Anonang
Platypus caliculus Chap.

EUPHORBIACEAE

Aleurites moluccana, Lumbang
Desmidophorus cumingi Schoenh.
Sipalinus gigas F.
Pediris sulcigena Boisd.
Xyleborus nepos var. *robustus* Sch.
Crossotarsus lecontei Chap.
Platypus lepidus F.
Platypus turbatus Chap.

Hovea brasiliensis, Rubber
Platypus solidus Walk.

Macranga bicolor, Hamindang
Mecysolobus plagiatus Sch.
Platypus solidus Walk.

Mallotus ricinoides, Hinlauma
Cryphalus malloti Schedl
Scotytoplatypus papuanus Egg.
Scolytoplatypus pusillus Egg.

FAGACEAE

Lithocarpus jordanoe, Katiluk
Xyleborus rufus Schedl

Lithocarpus luzoniensis, Kilog
Moraecamus cosmopolita Thoms.
Praonetha bigibbera Newm.
Proteuclea laterivitta Heller

LECYTHIDACEAE

Petetrsianthus quadrialata, Toog
Erioschidias philippinensis Schedl

LEGUMINOSAE

Abarema scutifera, Anagap
Aulacophora quadrinotata Chap.

Acacia confusa, Ayangili
Crossotarsus lecontei Chap.

Afzelia rhomboidea, Tindalo
Xyleborus perforatus Woll.
Crossotarsus lecontei Chap.

Albizzia procera, Akleng-parang
Chrysochroa fulminans F.
Erythrina variegata var. *orientalis* Merr.
Batocera albofasciata DeGeer

Amherstia nobilis, Amherstia
Xylopsocus capucinus Fr.

Cassia javanica, Antsoan
Cryphalus capucinus Schedl
Platypus geminatus Chap.

Erythrina indica
Margadillius erythrinae Hopk.
Xyleborus schultzei Schedl

Gliricidia sepium, Madre-cacao
Xyleborus perforans Woll.
Xyleborus schultzei Schedl

Leucaena glauca
Xyleborus xanthopus Eichh.

Leucaena leucocephala, Ipil-ipil
Cissites cephalotes Oliv.
Diochares ambigenus Chev.

Parkia roxburghii, Kupang
Xystrocera globosa Oliv.
Crossotarsus lecontei Chap.

Peltophorum inerme,
Platypus sordidus Walk.

Pithecolobium dulce, Kamachile
Xyleborus perforans Woll.

Pongamia pinnata, Bani
Xyleborus schultzei Schedl

Pterocarpus indicus, Narra

Platypus jansoni Chap.
Platypus lepidus Barb.
Samanea samon, Rain tree
Macrotoma luzonum L.
Crossotarsus octocostatus Schedl

MALVACEAE

Bombycidendron campylosiphon, Lanutan-buhukan
Pachyrrhynchus monilifer Germ.

MELIACEAE

Cedrela odorata, Spanish cedar
Xyleborus funereus Lea
Xyleborus hybridus Egg.
Xyleborus muriceus Walk.
Xyleborus perforans Woll.
Xyleborus sexspinosus Mots.
Xyleborus torquatus Eichh.
Platypus excedens Chap.
Dysoxylum decandrum, Igyo
Xyleborus nipus var. *robustus* Sch.
Crossotarsus lecontei Chap.
Platypus lepidus Babr.
Swietenia mahogoni, Mahogany
Xylopsocus capucinus F.
Xyleborus exiguus Walk.
Xyleborus duplicatus Sch.
Xyleborus indicus Eichh.
Crossotarsus lecontei Chap.
Crossotarsus octocostatus Schedl
Crossotarsus squamulatus fractus Samps.
Platypus lepidus Babr.
Toona calantas, Kalantas
Xyleborus dossuarius Egg.
Xyleborus exiguus Walk.
Xyleborus haddeni Schedl
Eccoptopterus spinosus Oliv.

MORACEAE

Allaeanthus luzonicus, Himbaba-o
Xyleborus recidens Samps.
Artocarpus communis, Rimas
Batocera albofasciata DeGeer
Artocarpus odoratissima, Marang-banguhan
Diochares ambigenus Chevr.
Artocarpus ovata, Anubing
Crossotarsus lecontei Chap.
Platypus solidus Walk.
Ficus benguetensis, Tabul
Scolytoplatypus papuanus Egg.
Scolytoplatypus pusillus Egg.
Ficus cumingii, Isis-ibon
Xyleborus perforans Woll.
Ficus hauli
Xyleborus dossuarius Egg.
Xyleborus funereus Lea
Xyleborus minimus Schedl
Xyleborus schultzei Schedl
Xyleborus ursulus Egg.
Scolytoplatypus papuanus Egg.
Ficus nota, Tibig
Sipalinus gigas F.
Hylesinus despectus Walk.
Xyleborus quadraticollis Egg.
Xyleborus hydridus Egg.
Xyleborus diversicolor Egg.
Xyleborus cylindricus Egg..
Xyleborus amphicranoides var. *latecavatus* Egg.
Platypus caliculus Chap.
Platypus geminatus Chap.
Platypus setaceus Chap.
Crossotarsus subdepressus Schedl
Ficus minhassae, Hagimit
Oberea makilingi Heller
Olenecamptus bilobus Fr.
Phylaitis v-album Pasc.
Mecopus bispinosus W.
Sipalinus gigas F.
Arixyleborus rugosipes Hopk.
Cryphalus densepilosus Schedl
Cryphalus indicus Eichh.
Hylesinus javanus Egg.
Dryocoetes luzonicus Schedl
Hypocryphalus perminimus Schedl
Xyleborus amphicranoides var. *latecavatus* Egg.
Xyleborus cylindricus Egg.
Xyleborus dassuerius Egg.
Xyleborus diversicolor Egg.
Xyleborus duplicatus Schedl
Xyeborus hybridus Egg.
Xyleborus mascarensis Eichh.
Xyleborus similis Ferr.
Crossotarsus lecontei Chap.
Crossotarsus subdepressus Schedl

Diapus pusillimus Chap.
Diapus quinquespinatus Chap.
Platypus cupulatus Chap.
Platypus lepidus F.
Platypus jansoni Chap.
Ficus variegata var. *sycomoroides*, Dolalog
Stephanoderes glabripennis Hopk.
Stephanoderes setosus Eichh.
Ficus sp.
Cryphalus indicus Eichh.
Hylesinus porcatus Chap.
Cnestus nitidus Schedl
Xyleborus barbatus Hag.
Scolytoplatypus papuanus Egg.
Scolytpplatypus pusillus Egg.
Crossotarsus subdepressus Schedl
Platypus nocuus Schedl
Platypus tenellus Schedl
Platypus velatus Schedl
Streblus sp.
Xyleborus streblicola Hopk.

MYRISTICACEAE

Myristica philippensis, Duguan
Dactylipalpus transversus Chap.
Phloeosinus asper Samps.
Phloeosinus australis var. *nagaensis* Schedl
Sphaerotrypes philippinensis Strohm.

MYRTACEAE

Eugenia sp.
Stephanoderes psidii Hopk.
Syzygium bordenii
Poecilips philippinensis Egg.

LAURACEAE

Dehasia triandra
Hypocryphalus obesus Hopk.
Margadillius margadilaonis Hopk.

PALMAE

Arenga pinnata, Kaong
Euchlora anoguttata Burm.
Oryctes gnu Mohn
Oryctes rhynoceros L.
Diocalandra frumenti F.
Otidognathus elegans Fairm.
Rhynchophorus ferrugineus Oliv.
Livistona rotundifolia var. *luzonensis*, Anahau
Oryctes gnu Mhon
Rhabdocnemis lineaticolls Heller
Rhynchophorus ferrugineus Oliv.

PINACEAE

Pinus kesiya, Benguet pine
Aesiotes notabilis Pasc.
Aeolesthes indica Newm.
Baralipton sanchezi Schultze
Megopis sanchezi Bay
Cryphalus malloti Schedl
Cyrtogenius nitidus Hag.
Cyrtogenius rugicollis Egg.
Ips caligraphus Germar
Piperius pini Hopk.
Scolytoplatypus pusillus Egg.
Platypus setaceus Chap.
Platypus tenellus Schedl
Miliona coronifera Swinhoe
Pine shoot-moth
Lasiocampid moth

PITTOSPORACEAE

Pittosporum resiniferum, Petroleum nut
Cryphalus resiniferi Schedl

POLYGALACEAE

Xanthophyllum philippinensis, Malatadiang
Xyleborus torquatus Eichh.

RHAMNACEAE

Zizyphus talanai, Balankat
Platypus turbatus Chap.

RHIZOPHORACEAE

Burguiera sexangula, Pototan
Diocalandra frumenti Fr.
Ceriops tagal, Tangal
Diocalandra frumenti Fr.

RUBIACEAE

Cinchona ledgeriana, Yellow-bark quinine
Metapocyrtus ruficollis Waterh.
Pachyrrhynchus gloriosus Faust

SAPINDACEAE

Euphoria didyma, Alupag
Epilachna indica Muls.
Episomus lentus Erichs.
Pachyrrhynchus gloriosus Faust
Harpullia arborea, Uas
Platypus setaceus Chap.
Pometia pinnata, Malugai

Xyleborus philippinensis Eichh.
Xyleborus sordicauda Mots.
Xylothrips flavipes Ill.
Crossotarsus lecontei Chap.
Platypus philippinensis Blandf.

SAPOTACEAE

Madhuca betis, Betis
Parastasia nigriceps White
Crossotarsus lecontei Chap.
Crossotarsus octocostatus Schedl
Crossotarsus squamulatus fractus Samps.
Platypus solidus Walk.
Sideroxylon ahernianum, Ahern nato
Lagria ionoptera Erichs.
Plocia notata Newm.
Plocia sericeicallis Heller
Cyamobolus sturmi var. *dinitus* Heller
Crossotarsus lecontei Chap.
Sideroxylon macranthum
Poecilips myristicae Roepke
Poecilips papuanus Egg.
Poecilips philippinensis Egg.
Scolytomimus philippinensis Egg.
Xyleborus bicolor Blandf.
Xyleborus fornicatus Eichh.
Xyleborus funereus Lea
Xyleborus indicus Eichh.
Xyleborus laevis Egg.
Xyleborus similis Ferr.
Crossotarsus lecontei Chap.
Crossotarsus subdepressus Schdl
Platypus caliculus Chap.
Platypus cupulatus Chap.
Platypus geminatus Chap.
Platypus lepidus Chap.
Platypus pallidus Chap.
Platypus solidus Walk.

STERCULIACEAE

Heritiera littoralis, Dungon-late
Macrotoma luzonum L.
Pterocymbium tinctorium, Taluto
Haplosonyx smaragdipennis Chaem.
Desmidophorus cumingi Schoenh.
Hypocryphalus perminimums Schedl
Xyleborus cylindricus Egg.
Xyleborus emarginatus Eichh.
Xyleborus hybridus Egg.
Xyleborus indicus Eichh.
Xyleborus procerior Schedl
Crossotarsus subdepressus Schedl
Platypus caliculus Chap.
Platypus geminatus Chap.
Platypus jansoni Chap.
Platypus quadrifissilis Schedl
Tarriettia javanica, Lumbayau
Platypus spectabilis Schedl
Theobroma cacao, Cacao
Hypocryphalus obscurus Hopk.
Coccotrypes graniceps Eichh.

TAMARICACEAE

Tamarindus indicus, Sampalok
Stephanoderes tamarindi Hopk.
Xyleborus schultzei Schedl

TILIACEAE

Colona serratifolia, Anilau
Pachyrrhynchus eschscholtzi Waterh.
Diplodiscus paniculatus, Balobo
Adoretus ranunculus Burm.
Adoretus semperi Ohs.
Dicercomorpha fasciata Wat.
Episomus lentus Erichs.
Pachyrrhynchus gloriosus Faust
Eugigas whiteheadi Jord.
Dactylipalpus transversus Chap.
Xyleborus duplicatus Schedl
Xyleborus quadraticollis Egg.
Crossotarsus lecontei Chap.
Platypus calignosus Schedl
Platypus cupulatus Chap.
Platypus lepidus Chap.
Platypus pernanulus Schedl
Platypus quadrifissilis Schedl
Platypus setaceus Chap.

ULMACEAE

Trema orientalis, Anabiong
Aulacophora quadrinotata Chap.
Crossotarsus lecontei Chap.
Celtis luzonica, Magabuyo
Xyleborus sexspinosus Mots.
Xyleborus perforatus Woll.
Xyleborus ursulus Egg.
Platypus solidus Walk.
Celtis philippensis, Malaikmo
Eugigas whiteheadi Jord.
Xyleborus philippinensis Eichh.

Xyleborus torquatus Eichh.
Crossotarsus lecontei Chap.
Platypus solidus Walk.

URTICACEAE

Artocarpus integra, Tsempedak
Xyleborus perforans Woll.
Laportea luzonensis, Lipa
Mecysolobus plagiatus Schoenh.
Leukosyke capitellata, Alagasi
Crossotarsus lecontei Chap.
Crossotarsus terminatus Chap.

VERBENACEAE

Tectona grandis, Teak
Neopyreops granosus Boh.
Duomitus ceramicus Walk.

iii) Insect pests of the fast-growing tree species.

Anthocephalus chinensis, Kaatoan bangkal, has been widely affected by a species of Pyralid larvae, and weevils of the genera *Pachyrrhynchus* and *Metapocyrtus*. A species of Chryscomelid beetles, *Phylosina cynthia ricini*, and a species of scale insects were also found in this tree. Among them, a species of Pyralid moth is most abundant and heavily infested trees become completely defoliated as reported in some forests of PICOP area.

Albizzia falcataria, Moluccan sau, has been known to be susceptible to larval attack of *Eurema hecabe*.

Eucalyptus deglupta, Bagras, which is extensively planted in PICOP area, was reported to have been affected very seriously, in some plantations by "a tip-borer" and "a stem zigzag borer".

5. Diseases

i) Forest products diseases.

Fungi associated with wood are grouped into three categories, molds, stainers and wood-rotters.

Molds:

Newly felled trees or lumber with high moisture content are often attacked by fungi such as *Aspergillus, Fusarium, Rhizopus, Penicillium, Trichoderma*, etc.

The infestation is superficial, but makes the wood dirty and sometimes gives rise to an unpleasant odor.

Wood-stainers:

The wood-stainers generally belong to the class of Ascomycetes and Fungi Imperfecti. They are species of the genera *Alternaria, Ceratocystis, Curvularia, Diploda, Graphium*, etc. These fungi infest newly-felled trees, but unlike molds, they have the capacity to penetrate deeply into sapwood and the invaded wood displays a discoloration ranging from blue to black, blue-grey, and greyish brown which cannot be removed even by bleaching agents.

Staining fungi cause economic loss to some wood industries using light wood species, in which the natural colour tone is important in such products as spoons, matches, popsicle sticks and rattan.

Wood-rotters:

The fungi causing wood rot belong to the Basidiomycetous group of the genera *Fomes, Lentinus, Lenzites, Phaeophlebia, Pleurotus, Polyporus, Poria*, etc. They are more destructive than their temperate counterparts due to the favourable temperature and moisture throughout the year, irregular treatment with preservatives, and the abundance of species and organisms responsible for the lesions of the trees present in the tropics.

ii) Nursery diseases.

Since the plantation of trees was first undertaken in the Philippines about 40 years ago, the following diseases have been recorded from the nurseries.

Pinus kesiya
Damping-off
Swietenia macrophylla
Root-rot, Nursery wilt
Cinchona ledgeriana
Rhizoctonia damping-off
Schizolobium excelsum
Pythium stem-rot, Canker
Casuarina equisetifolia
Rhizoctonia damping-off
Albizzia falcataria
Damping-off
Powdery mildew
Eucalyptus deglupta
Dieback

iii) Heart-rot problem of living trees.

It is said that in the Philippines about 20–30 percent of the commercial size trees in the dipterocarp forests are considered as culls due to the presence of conks in the wood. Also 5 to 10 percent of the trees which are cut as sound timber are later on often found to be affected by heart-rot. The latter cull group may be attributed to "top-rot" caused by fungal attack through the broken branches far above the ground.

6. Nematodes

The seedlings of *Anthocephalus chinensis*, Kaatoan bangkal, are often infested by a *Meloidogyne* root-knot nematode, but the soil of seedflat is easily decontamined with the application of nematicides. Some other nematodes collected from trees are enumerated in the list of Philippine nematodes compiled by Castillo *et al.* (1974), but the extent of the damage is not ascertained.

7. Bibliography of forest and forest products insect pests and diseases in the Philippines

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II. Observations and surveys of some forest insect problems in the Philippines

This is a report on our observations and surveys conducted on forest insects from March 1 to April 30, 1976.

1. Observations on damage to the Benguet pine

Trees of the genus *Pinus* which are distributed mostly in the temperate regions of the northern hemisphere have been introduced into the countries of the south. These trees have frequently been attacked by many pests and diseases, in places, and severe damage has occurred in some countries.

The Benguet pine is found in the high-lands of central and northern Luzon at an altitude of about 500–2500 m forming pure stands with a grassy ground in which the dominant grass is *Themeda triandra*. The pine forests are important not only economically as a source of logging and tapping, but also for the conservation of steep slopes and watershade in the mountainous areas.

The main agents causing the death of this pine can be classified into four categories as follows:

1. Forest fire.
2. Over-tapping.
3. Inadequate treatment of pine stands or trees.
4. Unknown cause of death recorded in some places since 1958, and thought to be associated with *Ips* beetles.

No. 4 group interests us most. This report will discuss the cause of damage from the angle of both Entomology and Nematology.

Materials and methods

Observations were made on the Benguet pine under various conditions, from health to death, on March 10–13 at Santa Fe, Bobok, Baguio and vicinity, and on April 19–21 at Baguio.

Trees are tentatively classified into six categories according to physiological conditions, as follows:

1. Normal.
2. Old leaves coloured, new leaves green. Oleoresin exudation normal.
3. Old leaves coloured, parts or some new leaves coloured. Oleoresin exudation weak.

5. All leaves coloured. Oleoresin exudation scarce to nil.
6. Dead, heavily attacked by beetles.

Tree conditions and the mode of beetle attack were examined on the spot and nematodes were recovered from woods of the trees under the above mentioned conditions and examined in the laboratory by the Baermann's funnel method.

Results

Infesting beetles and nematodes are tabulated in relation to the tree conditions in Tab. 1.

Among the beetles, *Ips* was the most abundant in all the trees which die in the rainy season, but it was not always found in the dying trees at the time of the observations. This beetle was first observed by Caleda and Veracion in 1959 in Baguio and recorded as *Ips interstitialis* Eichhoff, although it was originally described in Jamaica. This name was, however, treated by American taxonomists as a synonym of nearctic *Ips calligraphus* Germar. Caleda and Veracion stated that the infestation by *Ips* was found to occur from February to June, normally during the dry season. In our observations no infectious agents were trapped by bait logs set in March 11 and April 19 at infested stand, nor did they attack felled healthy trees, which seemed to have been cut in Baguio from late February to the middle of March. Adults already emerged from infested trees except for two cases, one in a log at Lumber Mill in Bobok, and the other in a felled tree at Kennon Road Camp 5.

The other beetles seemed to be rare and seldom encountered. A species of Scolytidae was collected from a dead tree at Santa Fe and Baguio and an other species of Scolytidae was found in a bait log at Kennon Road Camp 5, in small numbers. Pupal chambers of *Niphades* were observed in a log at Bobok and two adults were collected once on a bait log at Kennon Road Camp 5. *Stenoscelis*, *Macrorhyncholus* and *Dryophthorus* were collected together in dead trees at Imelda Park, Baguio. A species of Cerambycidae was found in dead trees at Kennon Road Camp 5.

Nematodes were recovered from woods belonging to categories 5 and 6 together with the infestation by *Ips*, but not found in the wood of categories 1–4, neither on dead or weakened trees which were not attacked by beetles. Of the 12 species of nematodes recovered, two, apparently, were nematodes of the genus *Bursaphelenchus*.

Discussion

It is obvious from Table 1 that *Ips* and other beetles did not attack the healthy trees with normal oleoresin exudation (categories 1–3), but that they oviposited into weakened or dead trees. When the beetles of the genus *Ips* attacked the trees belonging to category 4, they were expelled or killed by the oleoresin. In this case a slight exudation of oleoresin was usually observed at the point of attack on the bark. From these observations, *Ips* seemed to be a secondary pest for the pine tree and at most partly responsible for the death by reducing the aptitude for recovery (trees of category 4).

Symptoms of deceased Benguet and Japanese pines and mode of beetle attack are compared in Tab. 2. In the Benguet pine, the reduction in oleoresin flow seemed to bear a correlation with the discoloration of the leaves. But in the Japanese species, trees infected by wood-nematodes appeared healthy at first, in spite of the lack of oleoresin exudation. The difference in the symptomatology suggests the possibility of the presence of a causal agent other than the nematodes in the Benguet pine.

Table 1. Infesting beetles and nematodes in relation to tree conditions.

CATEGORIES	Recovery competence					
	Present				Disappeared	
	1	2	3	4	5	6
Beetles				+*		
Ips calligraphus	−	−	−	−	+	+
Scotytid sp. 1	−	−	−	−	?	+
Scotytid sp. 2	−	−	−	−	?	+
Stenoscelis sp.	−	−	−	−	?	+
Macrorhyncholus sp.	−	−	−	−	?	+
Dryophthorus sp.	−	−	−	−	?	+
Niphades sp.	−	−	−	−	?	+
Cerambycid sp.					?	+
Nematodes	−	−	−	−		
Bursaphelenchus sp. 1	−	−	−	−	?	+
Bursaphelenchus sp. 2	−	−	−	−	+	+
sp. 3	−	−	−	−	+	+
sp. 4	−	−	−	−	+	+
sp. 5	−	−	−	−	?	+
sp. 6	−	−	−	−	+	+
sp. 7	−	−	−	−	?	+
sp. 8	−	−	−	−	?	+
sp. 9	−	−	−	−	?	+
sp. 10	−	−	−	−	?	+
sp. 11	−	−	−	−	?	+
sp. 12	−	−	−	−	?	+

* Attacked, but killed by oleoresin.

Table 2. Symptoms of Benguet and Japanese pines and beetle attack.

BARK BEETLES	BENGUET PINE	JAPANESE PINES
No attack	Healthy ↓ Oleoresin exudation weak, Old leaves coloured. New leaves coloured.	Healthy (Wood-nematode transmitted)
Oviposition	↓ Oleoresin exudation nil. All leaves coloured. ↓ Dead	↓ Oleoresin exudation slight to nil, All leaves green. ↓ Oleoresin exudation nil. All leaves coloured. ↓ Dead

In either case, beetle oviposition always followed a substantial change of certain physiological tree properties, for instance, the marked reduction of oleoresin yield.

Conclusion

As far as the present investigation is concerned the primary causal agent(s) responsible for the death of Benguet pine trees in the Philippines are presently unknown.

Observations by foresters who noticed that infested areas often expand unless otherwise cleared of dead trees suggest the presence of certain infectious causal agents. *Ips* and nematodes seem to be secondary pests.

Recommended methods for future studies

1. Monitoring of infestation and confirmation of the mode of injury.
   - 1–a. Fix the experimental stand adjoining the injured area. Number every tree and plot the location on map.
   - 1–b. Check the coloration of leaves, oleoresin conditions and the existence of beetle attack on every tree at least once a month.
2. Confirmation of the role of *Ips*.
   - 2–a. Cut down from the healthy pine 50 cm long bait logs and attach them to the healthy bole. Beetles are attracted by the odour from the bait logs and usually attack both bait logs and nearby healthy boles.
   - 2–b. Check the conditions of trees as 1–b.
3. Inoculation experiment of wood-nematodes.
   - 3–a. Mass-culture the nematode on fungi.
   - 3–b. Inoculate the nematodes on the different pine trees.
   - 3–c. Check the conditions of trees as 1–b.
4. Observations from the Entomology standpoint.
   - 4–a. Check the existence of Mealybug of the genus *Matsucoccus*.
   - 4–b. Check the existence of wood-wasp.
   - 4–c. Check the other insects always associated with weakened or dead trees.
5. Observations and experiments from a standpoint of Pathology.

2. Survey of insects associated with fast-growing tree species

For the accumulation of basic data, insects affecting fast-growing tree species were collected at the Nursery and Seed-Orchard of UPLBCF at Mt. Makiling, and at the reforestation area of PICOP in Bislig.

Eucalyptus deglupta. Bagras

During our tour of the plantations in Bislig on April 5–7, 1976, we observed the following problems.

The Australian variety of Bagras was heavily infested by Buprestid beetles which were suspected to belong to *Agrilus* sp. This beetle lays eggs into the bark through small fed wounds and the larvae feed and make zigzag channels into the cambium and cortex, almost girdling the tree. This causes the eventual death of the tree. The infestation was of an alarming proportion, as approximately six out of ten trees were affected in the areas we visited.

The "dying-back" of some trees was suspected to be caused by sucking insects and blight. We collected three species of sucking insects of the order Homoptera located on the branches.

Gmelina arborea. Yemane.

A species of *Philicoptus* (Curculionidae) was found on the leaves of seed trees at the seed orchard of PICOP, Bislig. Damage to the trees was caused by adults feeding on the leaves, which became like skeletons while some were dried up. In spite of the heavy infestation, however, no apparent adverse effect on the physiological vigor of the tree was observed.

Anthocephalus chinensis. Kaatoan bangkal.

Two species of Curculionidae, *Metapocyrtus (Trachycyrtus) profanus* and *Philicoptus waltoni* were found feeding on young leaves and branches at the nursery of UPLBCF. We collected a species of Pyralid moth larvae, but failed to get adults.

Swietenia macrophylla. Large leaf mahogany.

Dead off-shoots have been observed at Mt. Makiling following the attack by *Philicoptus waltoni* and *Metapocyrtus profanus.*

3. Survey of the insect fauna of Mt. Makiling

Insects collected at Mt. Makiling will be identified in Japan in cooperation with Japanese taxonomists and a series of specimens will be preserved in the Entomology Museum of UPLBCF.

III. Acknowledgements

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IV. Summary

1. Present status of forest and forest products pest problems

i) Insect pest and disease problems have often become serious problems in some plantations since the introduction of tree-farming in the Philippines. Felled logs and green lumber are frequently infested by wood-boring beetles and fungi, and well-seasoned woods are also attacked by powder-post beetles and termites.

ii) Fast-growing tree species have been known to be particularly susceptible to diseases and insect attack. There is an urgent need for basic and applied research in order to implement measures aimed at controlling the insects.

iii) In spite of the alarming situation regarding forest pest problems in plantations, both staff and facilities are insufficient at present for conducting research on these recent problems.

iv) Forest and forest products, insect and diseases observed in the Philippines are briefly reported.

v) Compilation of a list of trees harbouring harmful insects observed in the Philippines up to now is presented.

vi) Bibliography related to forest and forest products insect pests and disease is presented.

2. Observations and surveys on some forest insects

1) As for the main causal agent(s) responsible for the death of the Benguet pine in the Philippines, it is suggested that *Ips* and nematodes might act as secondary pests while the primary causal agent(s) still remain to be identified.

ii) Observations on some insects of fast-growing tree species are briefly reported.

要　　約

1.　これは1976年３～４月に，フィリピン大学林学部で行なった調査結果の報告である。

2.　フィリピンの森林病虫害問題：天然林では病虫害問題はほとんどなく，伐倒後の穿孔虫によるピンホールや菌による変色，乾材の防腐防虫が主な問題で，造林が行なわれる様になって苗畑の病虫害や線虫害が問題となってきた。最近になって８～10年伐期という生長の早い樹種が企業によって造林されはじめると，これらに病虫害が激発する様になってきた。これとは別に，1958年から小規模な集団枯損が Benguet Pine に発生している。

3.　今回調査した森林害虫問題

a.　Benguet Pine の小集団枯損原因調査

枯損木から検出した８種の穿孔虫と12種の線虫は，マツが生理的に異常となったあとで加害する二次的害虫と推定されたが，マツを異常にさせる原因は解明できなかった。被害木を放置すると周辺へ被害範囲が拡がることから，枯損原因は近距離へ伝染する性質をもっている。

b.　造林樹種の害虫調査

Eucalyptus degluptus, Anthocephalus chinensis, Swietenia macrophylla, Pinus kesyia などの害虫相を調べた。

4.　今後の問題点

フィリピンの林業にとって病虫害は最近になって激発する様になった問題で，しかも材質低下や枯損に直接つながっている。樹種ごとに病害虫の種類と生活史の解明，発生環境の解析を進め，特に造林に伴なう害虫化の問題は，早急に各地林分を比較研究して，樹種や施業方法を検討する必要がある。

Benguet Pine は水源や自然環境保全上極めて重要な樹種であるので，現在発生している小集団枯損原因を解明しなくてはならない。マツモグリカイガラ類やキクイムシの一種 *Ips calligraphus* と枯損の関係をまず明らかにする必要がある。

Explanations of Photographs

A. Benguet pine, tapping.

B. Benguet pine forest, young trees were killed by fire.

C. Massive destruction of trees in a forest of Benguet pines, Santa Fe.

D. Clearance of dead trees in a forest of Benguet pines, Kennon Road Camp 5.

E. Stump of dead Benguet pine, the cut-surface is covered with a thin layer of oleoresin after felling.

F. Gallery of *Ips calligraphus* under the bark of a Benguet pine.

G. A lasiocampid caterpillar on a Benguet pine, Baguio.

H. A lymantriid catepillar on a Benguet pine, Baguio.

I. Flagging-disease of Benguet pines, Baguio.

J. A mealybug of the Margarodidae on a Benguet pine, Baguio.

K. Shoot moth of Benguet Pine, Baguio.

L. Zigzag gallery of *Agrilus* sp. on the living trunk of Bagras, Bislig.

M. A twig-blight of Bagras, Bislig.

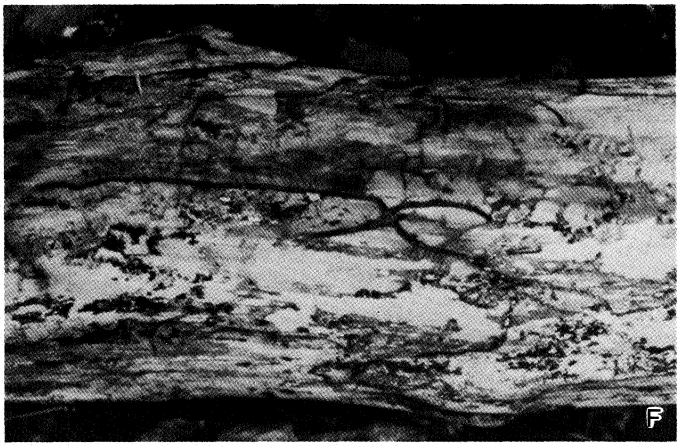
N. Yemane infested by *Philicoptus* sp., Bislig.

O. Kaatoan bangkal infested by pyralid larvae, Nursery of UPLB-CF.


B


C


D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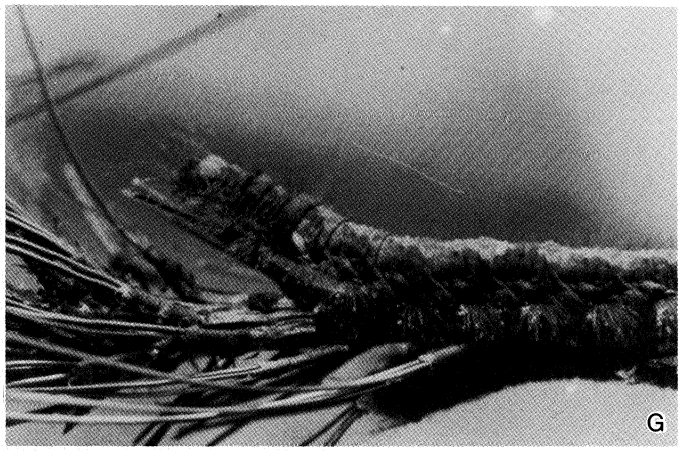
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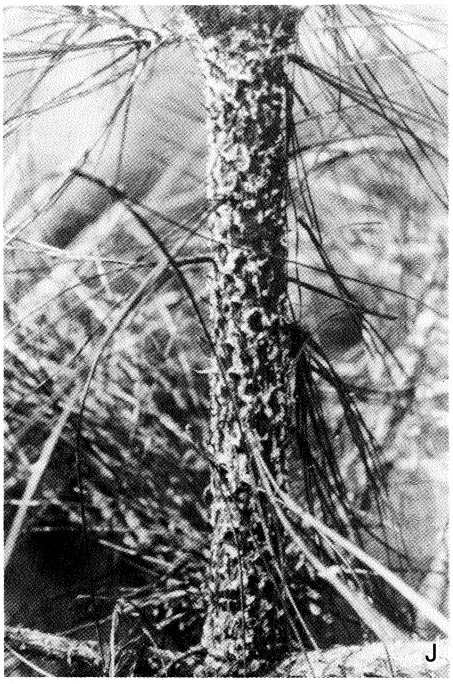
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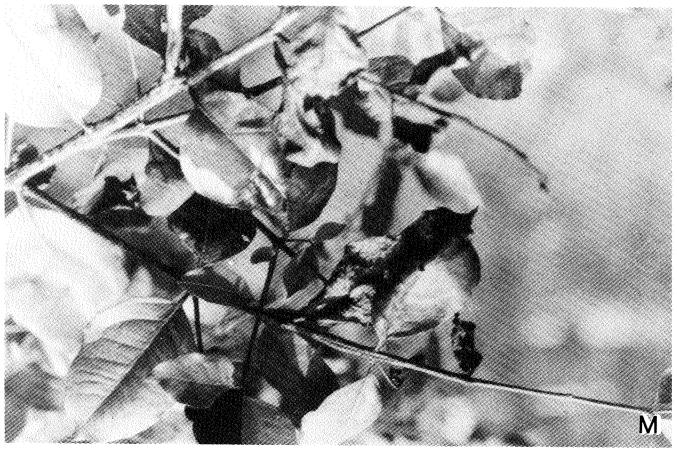
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