

CONTRIBUTIONS FROM THE RUBBER
RESEARCH SCHEME, CEYLON

TERMITES ATTACKING *HEVEA*
BRASILIENSIS IN CEYLON

F. P. JEPSON, M.A.,
ACTING ENTOMOLOGIST,
DEPARTMENT OF AGRICULTURE, CEYLON

THE somewhat formidable number of serious diseases of *Hevea brasiliensis* in Ceylon has been compensated for, to some extent, by an almost entire absence of insect pests of this tree. The few local insects which have been associated with *Hevea* in the past are of minor importance and their occurrence is so occasional, and so rarely reported, that they cannot be regarded as pests of any significance.

It has always been considered a matter for congratulation that Ceylon rubber estates enjoyed immunity from the attacks of termites, especially in view of the important status of these pests on rubber estates in Malaya and the Dutch East Indies.

In the past, records of these insects being associated with *Hevea* in Ceylon appeared to be confined to dead or diseased trees and it was assumed that the termites were not pests of primary importance. ⁽¹⁾ Unfortunately, this view can no longer be entertained and there is reason to believe that the concern with which these pests have been regarded by the tea planter for many years must, in future, be shared by the rubber planter also.

WHAT TERMITES ARE

It might be advisable, at this stage, to explain briefly what termites are. They are better known as "white-ants," but belong to the insect order Isoptera and are in no way related to the true ants (Hymenoptera). The term "white-ants" is an unfortunate one and has led to much confusion. Their more correct name, termites, is preferable. Termites may, for all practical purposes, be grouped into two classes, depending upon whether they nest in the soil, or above it in trees and timber.

Those which nest in the soil usually exist in large societies and several forms of the same insect may be present in the same community. In a typical colony of this type the activity of the

nest centres around the royal pair, which, in the early stages of the society, are the original founders of the colony having been derived from a pair of the winged stage. When the colonising flight takes place, the males and females pair off, shed their wings and enter the soil at a suitable spot to commence the establishment of a new colony. Often the royal pair are enclosed in an earthen cell which is designated the "royal chamber," or "queen cell," and within this abode the queen undergoes a very considerable distention in size often attaining a length of $2\frac{1}{2}$ inches or more. The royal pair are cared for by the "worker" caste, considered to be neuters incapable of further development. The workers feed the king and queen and remove the eggs, as soon as they are laid, to sites which have been prepared for their reception. "Soldiers," which possess formidable jaws which they use to advantage in defending the society against other insect enemies, are also present and there may occur nymphs, about to develop to the winged stage, or the winged insects themselves awaiting a suitable opportunity of embarking on their colonizing flight. This type of soil-nesting termite is represented, locally, by several genera among which may be mentioned the mound-builders *Hypoterme*s and *Cyclosterme*s, and *Termes*, *Leucoterme*s and *Coptoterme*s which erect no superstructure above their nests. More will be said of *Coptoterme*s later.

The termites which nest above the soil in trees, building woodwork and other situations also commence their colonies from winged stages but the queen undergoes little increase in size. There is no worker caste, all individuals, with the exception of the soldiers, being destined to develop to reproductive adults either with, or without, wings. Usually the latter type of adult is produced only in the absence of one, or both, of the true royalties. The colonies produced by this class of termite are small when compared with those formed by the ground-nesting types. The local representatives of this group are species which belong to the sub-genera *Caloterme*s, *Neoterme*s, *Glyptoterme*s, *Cryptoterme*s and *Planocryptoterme*s of the genus *Caloterme*s, and many species are very serious pests of economic crops in the Island.

Figures of larvae, a soldier and a winged adult of *C. (Glyptoterme)* *dilatatus*, which may be considered typical of this group of termites, are shown in Plate I.

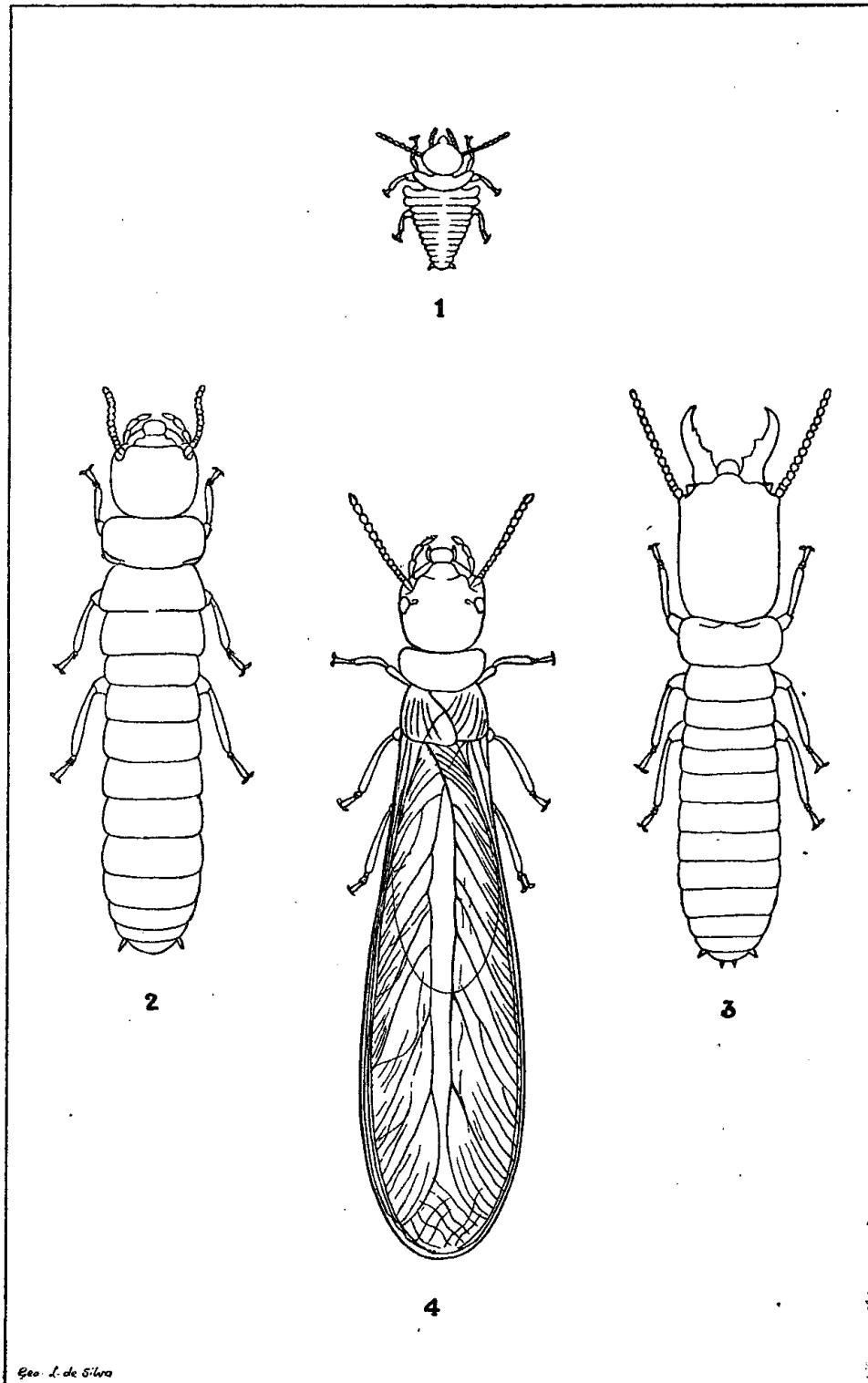


Plate I. *Calotermes (Glyptotermes) dilatatus*

Fig. 1. First stage larva X 10.

Fig. 3. Soldier X 10.

Fig. 2. Full-grown larva X 10.

Fig. 4. Winged adult X 10.

The determination of different species of termites is usually made by an examination of the "soldier" caste. The heads of the soldiers are hard and chitinous, pale, or dark, brown in colour and furnished with prominent mandibles. The arrangement of the processes, or "teeth," on the inner margins of the mandibles is an important specific character. The heads of the soldiers of

the species discussed in this article are illustrated in Plate II. A character which at once distinguishes the genus *Coptotermes* is the possession of a pore situated, anteriorly, on the upper surface of the head and from which a drop of milky-white fluid is ejected if the insect is on the defensive. The gland may be seen in the specimen illustrated in Plate II, fig. 1.

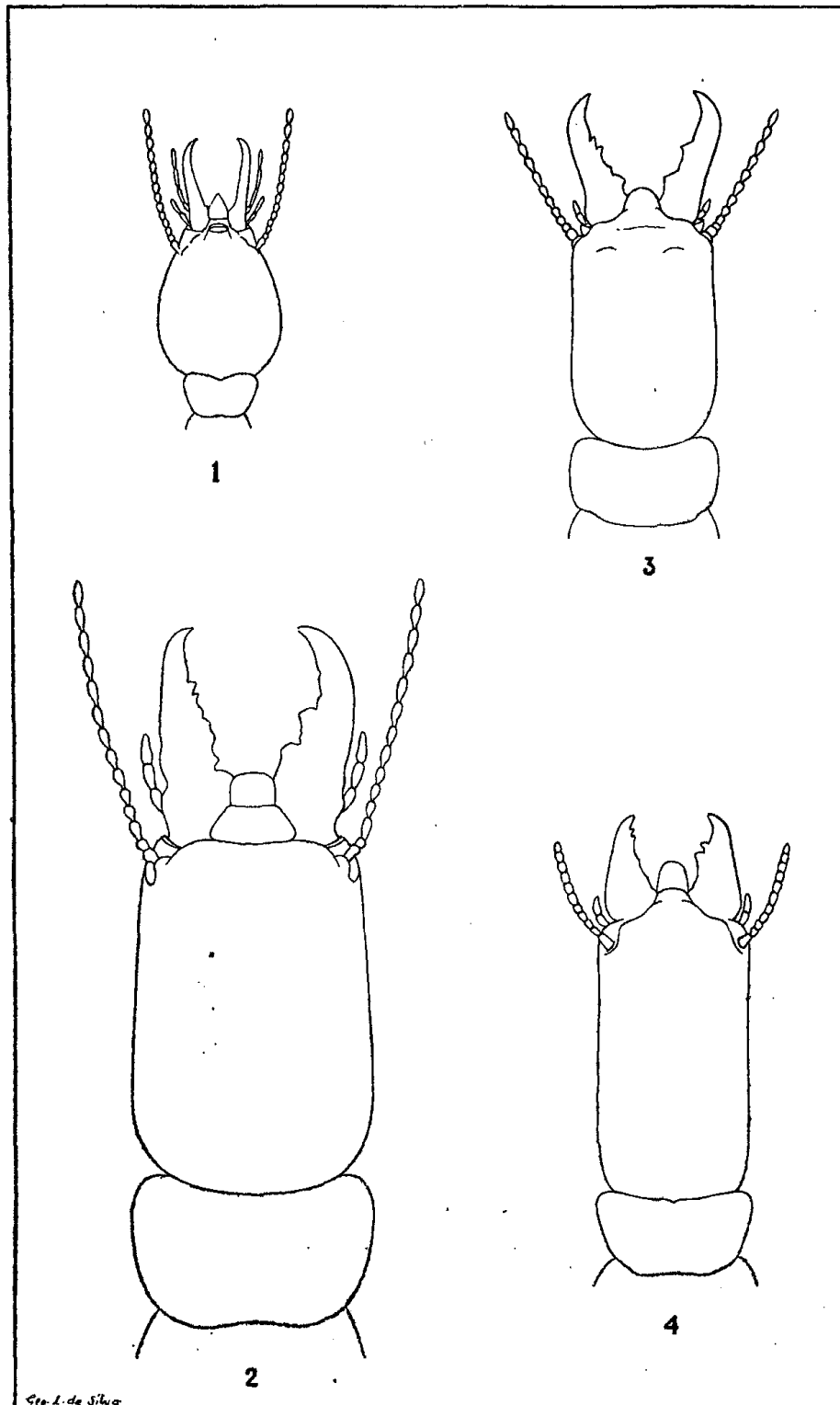


Plate II. Heads of soldiers of termites which attack *Hevea*

Fig. 1. *Coptotermes ceylonicus* X 15.
Fig. 2. *Calotermes* (*Neotermes*) *greeni*
X 15.

Fig. 3. *Calotermes* (*Glyptotermes*) *dilatatus*
X 15.

Fig. 4. *Calotermes* (*Glyptotermes*) *cey-
lonicus* X 15.

If living termites are found to attack a rubber tree under circumstances in which no external, or internal, communication with the soil is maintained, the insects are, almost certainly, a species of *Calotermes*. If, on the other hand, there is definite communication with the soil, such as by runways up the stem, the species will probably be found to belong to the genus *Coptotermes*.

It should not be assumed, however, that any termites which travel up the main stems of the trees beneath the protection of earth-like coverings are injurious as many soil-nesting species behave in this manner and feed only on loose flakes of bark without actually penetrating the cortex to the wood. At the same time these coverings of earth, sometimes enveloping the entire stem some way up the tree, are not desirable and should be removed by the tappers. The only permanent method of preventing their recurrence is to locate the nests and destroy them by injecting petrol or carbon-bisulphide, or by fumigating the central nests with arsenic and sulphur fumes, calcium cyanide or other preparation.

CALOTERMES

In August 1929, a termite which is a very prominent pest of tea on many low-country estates, *Calotermes* (*Glyptotermes*) *dilatatus*, was found invading the sound wood of a *Hevea* tree on an estate at Ingiriya in the Kalutara district under such circumstances as to suggest that, given a suitable point of entry, termites of this genus were capable of causing extensive injury leading to the ultimate death of attacked trees. In this case the original invasion of the tree appeared to have been made at a spot affected by *Ustulina* and there was no doubt that the young colony had originated from a winged pair of adults which had alighted on this spot and effected an entry through the diseased tissue which would present little obstruction to their passage, the young eventually penetrating from this centre to the heartwood of the tree.

Four months later another record was received from an estate in the Ratnapura district, only in this case the species was *Calotermes* (*Neotermes*) *greeni*, also a pest of tea and of many trees, particularly *Grevillea robusta* in many parts of the Island. This species has been collected at various centres from sea level to about 5,000 feet elevation and as wide apart as the Southern and Northern Provinces. The facts of this invasion, which was extensive, left no doubt as to the potentiality of *Calotermes* as a major pest of *Hevea*, under certain circumstances. The entry to this tree had been effected through the decayed end of a branch which had probably been snapped by wind or other agency. The galleries extended down this dead limb to, and into, the main

trunk of the tree. Typical galleries formed in *Hevea* by this species are illustrated in Plate III.

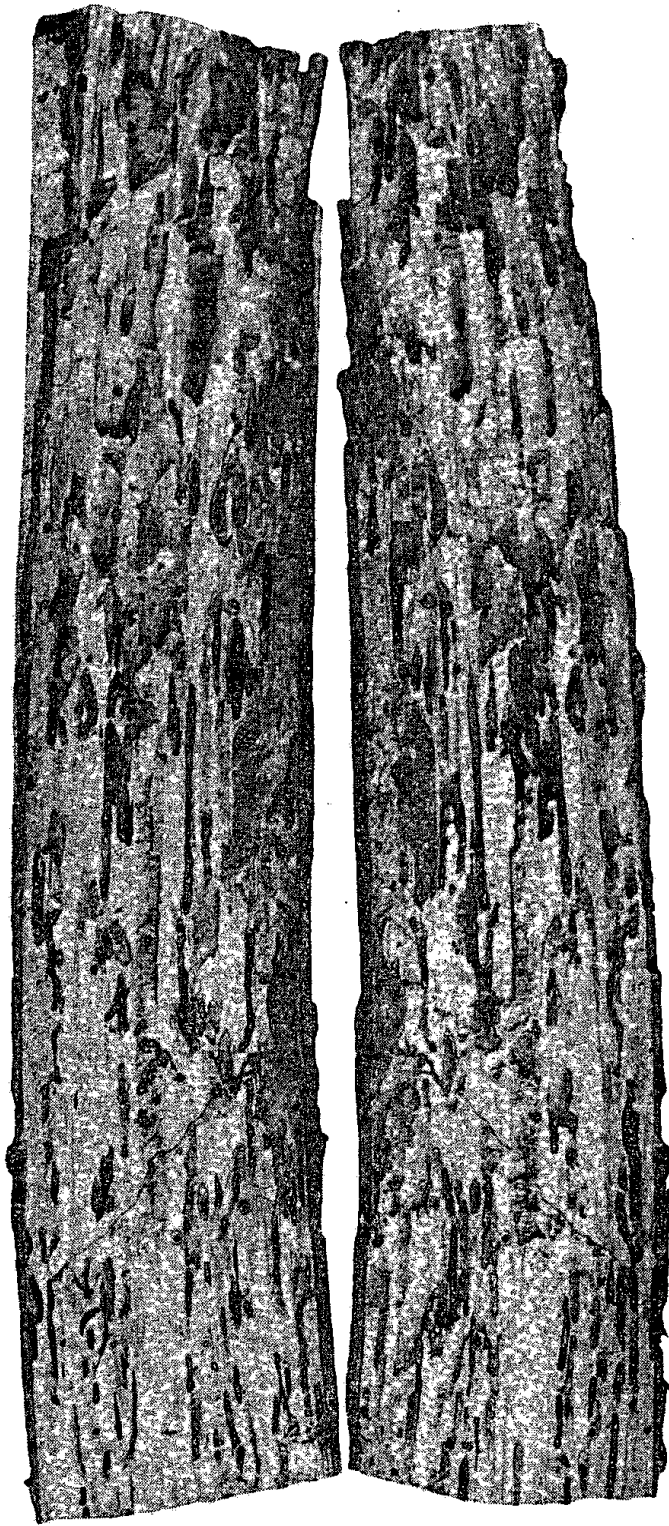


(Photo. by F. P. Jepson).

Plate III. Branch of *Hevea* split open to show galleries formed by *Calotermes* (*Neotermes*) *greeni*.

The circumstances under which earlier records of termite association with *Hevea* had been made were then investigated. Only one case of *Calotermes* invasion was forthcoming, from the Elpitiya district, but in this case the tree was dead and only a stump about 9 feet high remained. This was riddled from the top to the roots by two species of *Calotermes*, viz. *C. (Glyptotermes) dilatatus* and *C. (Glyptotermes) ceylonicus*. It was impossible to decide at the time of this record whether these termites had caused the death of the tree or had invaded it subsequent to its decay, but in view of more recent records it is very probable that the death of the tree was directly due to the attacks of these insects.

In January 1930 a further case was reported from the same estate in the Ratnapura district referred to above, only in this case the species was *C. (Glyptotermes) dilatatus* and there was evidence that entry had been effected through a broken branch attacked by *Ustulina*. The galleries formed in this branch by this species are shown in Plate IV. In March of the same year two *Hevea* trees in the Heneratgoda Gardens, Nos. 108 and 142 planted in Plantation No. 2 in 1887, were found to be attacked by *C. (Neotermes) greeni* and here, also, entry was made through decayed limbs.



(Photo. by F. P. Jepson).

Plate IV. Branch of *Hevea* split open to
show galleries formed by
Calotermes (Glyptotermes) dilatatus.

During April of the present year, in the Peradeniya district, the stump of a dead *Hevea* tree was found to harbour a colony of *C. (Glyptotermes) ceylonicus* the species which had been found previously in the Elpitiya district in 1925. The stump in question was affected by *Ustulina* but the previous history of the tree is unknown. In this case the colony was confined to the base of the stump and it is possible that termite entry occurred subsequent to the death of the tree.

It will be noted that in three of the above records the attacked trees were also affected by *Ustulina* and it is very probable that the decayed wood beneath the rotten bark where the disease occurred provided the winged termites with the opportunity they sought, and required, of gaining access to the heartwood of the trees. In the other cases the decay of fractured branches served the same purpose. In the absence of such essential points of entry it is considered that no species of *Calotermes*, in the winged adult state, could become established in *Hevea* trees and the prevention of attack is, consequently, dependent upon attention being directed to these points, *Ustulina* patches being treated and the factors which favour the development of this disease being eliminated so far as is possible. Branches which have been broken by wind or other agencies should be pruned back to the stem from which they arise and the cut surfaces treated with a suitable wound dressing.

Where *Calotermes* colonies are located in the wood of growing trees they may be destroyed by injecting Paris Green into the active termite workings. The simplest method of giving effect to this operation is to bore a 5/16 in. hole into the occupied galleries with a gimlet or auger and pump in the Paris Green powder by means of a rubber blower. An enema syringe of ball pattern and adult size is a very convenient article for this purpose and is cheap and procurable at any druggist's store. The bored hole should allow of the tapering nozzle of the syringe fitting tightly when introduced, to avoid a blow-back of the powder. The hole should be finally plugged with cement, asphaltum, tar and sand or other efficient seal and the surface neatly smoothed over with the finger. A little grease or oil applied to the finger will prevent the tar or asphaltum adhering.

COPTOTERMES

In 1927 a young *Hevea* stump was found to be attacked on an estate in the Ratnapura district by a ground-nesting termite which proved to be *Coptotermes ceylonicus*. It was the only case reported and it was thought at the time that the termites might have followed a fungus disease.

In March 1930, in connection with the treatment, at the Heneratgoda Botanic Gardens, of two old rubber trees for *Ustilina*, it was found that they had been completely hollowed out by *Coptotermes ceylonicus*. The trees in question are No. 24, in Plantation No. 1, planted in 1877 and No. 124, in Plantation No. 2, planted in 1886. The former tree has grown from one of the original *Hevea* seeds brought from the Amazon Valley by Sir Henry Wickham in 1876 and germinated at the Royal Botanic Gardens, Kew; before being sent to Ceylon. The tree is, consequently, of considerable historical interest. The tree is a large one being 8 feet in circumference one foot above ground level and $6\frac{1}{2}$ feet at a height of 3 feet from the ground. The tree has been completely hollowed to a height of 15 feet or more above soil level and the thickness of the remaining wood, surrounding the cavity, is not more than from $1\frac{1}{2}$ to 2 inches. The tree is apparently sound externally except for a hole at the base which penetrates to the central cavity, and the foliage is normal. It is reported that there has been no appreciable diminution in yield of latex. Tree No. 124 is similarly attacked.

On looking up old records it was learnt that workers, soldiers, nymphs and adults of *Coptotermes ceylonicus* were collected from a *Hevea* tree in the Heneratgoda Gardens in 1909 but other details are lacking. No mention is made of this record by Petch⁽²⁾ who was the collector of the specimens and it may be concluded that there was no reason, at the time, for regarding the insects as being responsible for direct injury to the tree from which they were taken.

In the section of the work referred to Petch states that termites are not pests of rubber in Ceylon as they are in Malaya, Java and Sumatra and explains this fact by the absence from Ceylon of *Coptotermes gestroi*, the notorious rubber termite of the latter countries. While this is true, the same genus is represented in Ceylon by two known species *C. ceylonicus* and *C. exiguus* and they are capable of behaving in precisely the same manner as their better known relative. They are both serious pests of living tea bushes in the low-country districts of Ceylon and the former has also been known to excavate the base of coconut palms in addition to other trees. The instances mentioned above also indicate that *C. ceylonicus* is capable of hollowing-out large *Hevea* trees and thus may threaten to earn for itself the same reputation as a major pest of rubber in Ceylon as its near relative has already done further East. Stages of this species are illustrated in Plate V.

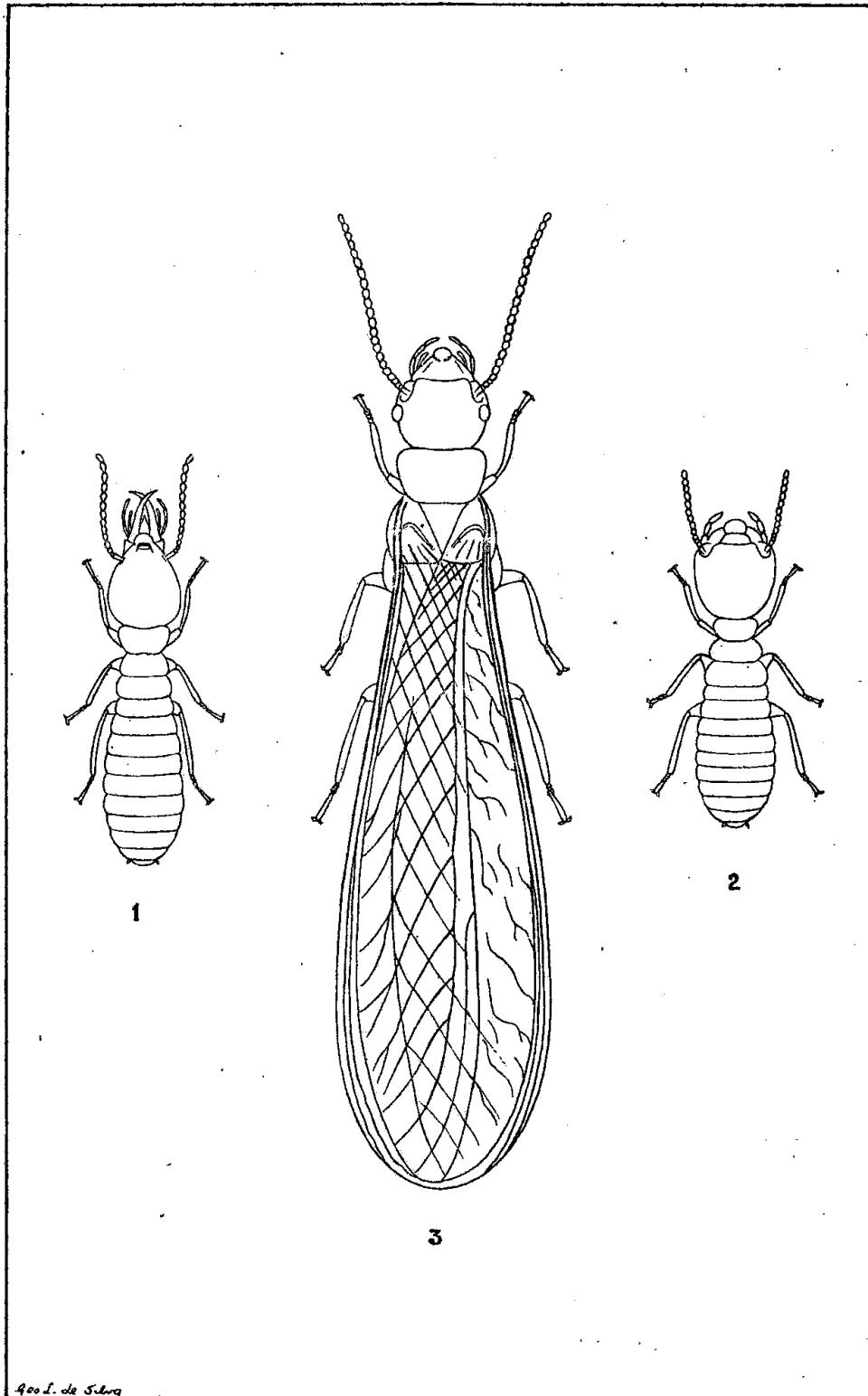


Plate V. *Coptotermes ceylonicus*

Fig. 1. Soldier X 10.

Fig. 2. Full-grown worker X 10

Fig. 3. Winged adult X 10.

The habits of the genus *Coptotermes* are, by no means, fully understood. It is believed that they usually enter their host-plants underground, through the roots, but their presence is rarely detected until very extensive excavation of the wood has taken place. The first indication of infestation may be the collapse of the attacked trees in wet weather and during high winds. One recent instance has been observed by the writer which indicated that *Coptotermes ceylonicus* was commencing to excavate a large *Albizzia* tree from above and not from below the soil. The infestation had apparently commenced at the base of a decayed branch about 15-20 feet from the ground and communication was being maintained with the soil beneath the protection of covered runways. The tree was sawn across 18 inches above soil level and there was no sign of any internal communication with a ground nest. Similar runways were observed on the outside of the trunk of a neighbouring tree of the same species, the objective again being a decayed branch. If extensive downward excavation of the type noted was allowed to continue undisturbed, the soil would eventually be reached and thus communication with the main soil nest would be established, when the previous external means of communication could be dispensed with. It should be mentioned that, so far as is at present known, *Coptotermes* is incapable of founding colonies in situations which are not immediately connected with the soil, and if such communication is interrupted the insects which are cut off from their bases must perish. *Coptotermes* is however, capable of surviving, if conditions are sufficiently moist, for a very much longer period when cut off in this manner than certain soil-nesting species of other genera, viz. *Termes*, *Cyclotermes* and *Hypotermes*.

It would appear, therefore, that *Coptotermes* may enter living trees in two ways. Entry through the roots cannot be prevented, but the absence of rotting snags will certainly reduce the danger of entry by the second method. All broken branches should be taken back to the point from which they arise on the larger branches, or even main stem when necessary, and the pruned surfaces suitably treated.

The species of *Coptotermes* are known to nest below the soil and the stumps of trees and buried logs form favourite centres for the headquarters of colonies. As in the case of other soil-nesting species the queen is a considerably distended individual, the enlargement being mainly in the abdominal region. Journeys of considerable extent are undertaken from the central nests and are said to have been traced for as great a distance as 100 yards. Under these circumstances attempts to destroy the insects underground are valueless unless the central nests can be located and

this appears to be an extremely difficult undertaking. Further investigation regarding the most practical and economic methods of destroying the central nests is required. The removal of tree stumps from cultivated areas will certainly assist in reducing the points at which the formation of new colonies may commence and the operation is desirable for other reasons also as they are frequently the source of root diseases.

LOCAL DISTRIBUTION OF TERMITES KNOWN TO ATTACK HEVEA

The purpose of this article being to acquaint rubber planters with the present position in regard to this subject and to stimulate interest which might lead to further records of termite injury to *Hevea* being received, the known distribution in the Island of the termites referred to in the foregoing pages may be included with advantage. It is not suggested that these species do not occur in districts excluded from the following lists. The lists have been compiled from authentic records only and the distribution as given here is complete so far as it is known at the present time, but it is certain to be extended very considerably in the future.

Calotermes (Glyptotermes) ceylonicus.—Elpitiya, Hewaheta and Peradeniya.

Calotermes (Glyptotermes) dilatatus.—Ambalangoda, Avissawella, Balangoda, Chilaw, Deniyaya, Elpitiya, Galaha, Galle, Gampola, Horana, Ingiriya, Kadugannawa, Katugastota, Kegalle, Kiriella, Matugama, Opanake, Pelmadulla, Peradeniya, Ratnapura, Udugama and Yatiyantota.

Calotermes (Neotermes) greeni.—Ambalangoda, Avissawella, Badulla, Balangoda, Bandarawela, Bogawantalawa, Galaha, Gampola, Gampaha, Jaffna, Kadugannawa, Maskeliya, Peradeniya, Ratnapura, Rattota, Wattegama and Yatiyantota.

Coptotermes ceylonicus.—Ambalangoda, Avissawella, Balangoda, Chilaw, Colombo, Elpitiya, Gampaha, Gampola, Jaffna, Lindula, Maha-iluppalama, Matale, Matugama, Nawalapitiya, Pelmadulla, Peradeniya, Polgahawela, Puttalam and Rattota.

Although the other known local species of *Coptotermes*, *C. exiguus*, has not been found in *Hevea* it behaves in a manner precisely the same as that of *C. ceylonicus* from which it is not easily distinguished. This species has been found at Avissawella, Galaha, Kiriella, Peradeniya and Ratnapura. Similarly, the serious up-country tea termite *Calotermes (Neotermes) militaris* has not been found in rubber, but it has been collected from both tea and dadap on certain estates, or in districts, where rubber is grown. These districts are Deniyaya, Kadugannawa, Madulkelle, Rattota and Ratnapura. The distribution for other localities in which rubber is not grown is not included.

Further records of termites attacking *Hevea* will be welcomed. Specimens for identification, preserved in alcohol, or actually inhabiting the wood in which they are found, should be sent to the Entomological Division, Department of Agriculture, Peradeniya. Particular care should be taken, in all cases, to include specimens of the soldiers which, although not numerous, are present in most termite communities of any size and their conspicuous appearance cannot fail to reveal their presence if a little exploration of the infested wood is undertaken. Brief notes regarding type of attack, situation in which the specimens were found and other points of interest would also be very acceptable. The quest for specimens should be particularly directed to decayed branches and it is anticipated that if such branches are cut off and split open they will, in many cases, be found to harbour species of *Calotermes*. Narrow earthen runways up the main stem to rotting branches suggest *Coptotermes* and if these runs are broken the insects can be intercepted, on their return journey to their soil nests, and specimens collected as they cross the open spaces of the broken passages.

REFERENCES TO LITERATURE CITED

- (1). Green, E. E. (1908). Animals associated with the Hevea Rubber plant in Ceylon.—*Circ. and Agric. Journ. R. B. G., Ceylon*. Vol. IV. No. 12. p. 94.
- (2). Petch, T. (1921).—*The Diseases and Pests of the Rubber Tree*, pp. 225-226. Macmillan & Co., Ltd., London.