ENTOMOLOGY BULLETIN NO.47
FOREST INSECT PESTS OF PAPUA NEW GUINEA

3. White ants (termites) attacks on plantation trees

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INTRODUCTION

Healthy trees can normally resist insect attack, but where trees are unhealthy successful invasion by insects will follow. Such poor health does not have to be obvious to the human eye for attack to occur. Chemical changes inside the 'sick' trees cause them to 'smell' differently. Insects quickly become aware of these 'smells'. Termites (white ants) are one group of insects which can take advantage of such unhealthy trees. In plantations forest/timber operations are usually the reason why trees lose their healthy condition.

DESCRIPTION

Termites belong to the insect group Isoptera and there are many kinds in Papua New Guinea. Most of them feed usually on dead wood; some however can attack living trees as well.

Termites are called social insects because they live in colonies. Each colony has several different forms of individuals, each with a particular job to do: queen and king produce the next generation; soldiers defend the colony; workers gather food and build the nest.

The size of the worker termites ranges from 0.3-0.7 cm, while that of soldier termites ranges from 0.5-0.9 cm. The queen termite's size is between 0.7-1.2 cm. The length of the termite life history is still unknown in Papua New Guinea.

Three kinds of termites are now important in forest plantations: *Coptotermes elisae; Nasutitermes novarumhebridarum; Microcerotermes biroi.* These different termites can be identified by their soldiers. Both *Coptotermes* and *Nasutitermes* have soldiers which eject (put out) a white sticky gum from their heads to defend their colonies. In *Coptotermes* this comes from an easily visible round hole on the head. In *Nasutitermes* the gum comes from beneath a pointed projection of the head. *Microcerotermes* have soldiers with very large jaws. They will readily grab human skin, leaving both jaws and head behind if attempts are made to brush them off.

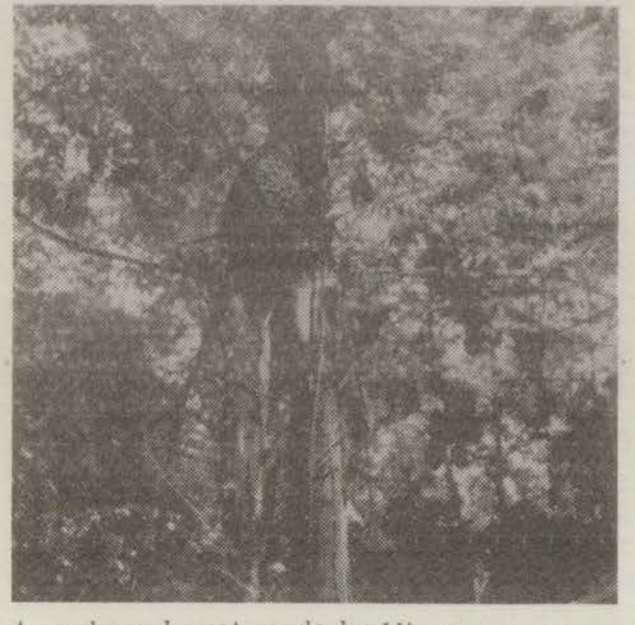
BIOLOGY

All three kinds of termites usually make their nests in dead stumps and logs left from previous logging. *Nasutitermes* and *Microcerotermes* also however make nests on the trunks of trees. These nests are then called arboreal nests. The trees carrying the nests are not attacked. Such nests are a common feature in the Trans-Gogol area of Madang Province.

From the termite nests galleries (passages) are put out in all directions by workers, supported by soldiers. These galleries run through the ground and up the trunks of neighbouring living trees.

The termites will readily feed on any suitable dead wood on or in the ground, or in dead branches still attached in the crowns of live trees.

An arboreal nest made by Nasutitermes *on a living Kamarere tree. This is a common feature in the Trans-Gogol area of Madang Province.*



An arboreal nest made by Microcerotermes *on a living Kamarere tree. A common feature in the Trans-Gogol area of Madang Province*

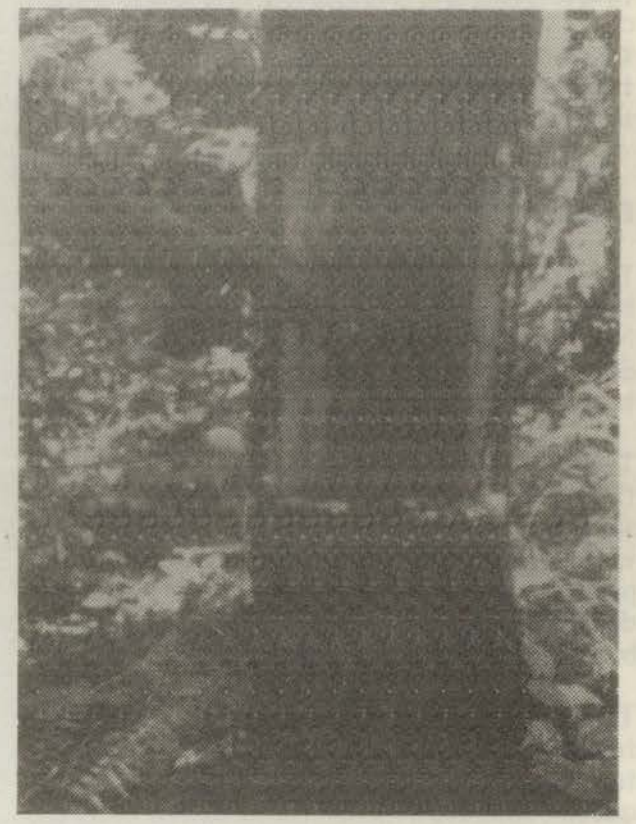
ECONOMIC IMPORTANCE

Coptotermes elisae and *Nasutitermes novarumhebridarum* (possibly also *N. princeps)* are the only termites proved to cause direct damage and death to plantation trees in Papua New Guinea. *Coptotermes* kills living hoop pine in the Bulolo/Wau Plantations, Morobe Province, and it is a major problem.

Klinkii pine is closely related to hoop pine, and makes up a significant part of the plantations. Surprisingly, it does not suffer from attack by these termites.

Pinus species, which are much younger, and not native to this country, are also attacked, though as yet not so badly.

Nasutitermes kills kamarere, swamp talis, and wattle (Acacia), both on the mainland and the islands and is a real threat to all hardwood plantations in the lowlands of Papua New Guinea.



The hollow tunnel in the base of this tree was caused by Coptotermes *attack.*

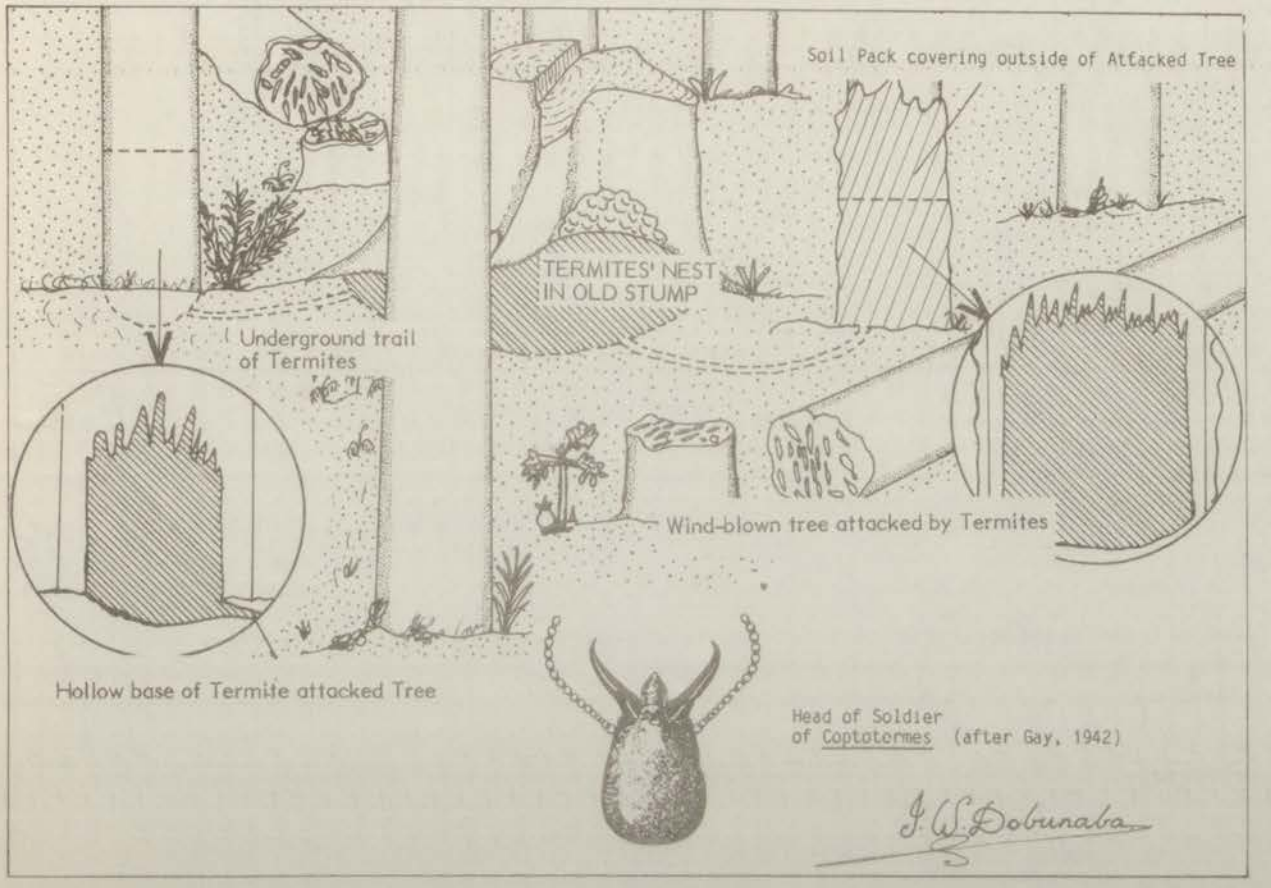


Fig 1: Death of Hoop Pine (BULOLO/WAU) because of Coptotermes *attack.*

DESCRIPTION OF ATTACK

By *Coptotermes*

Attack by *Coptotermes* on live hoop pine occurs in patches. A number of adjacent trees will be attacked from a nest in an old stump. The termites enter through the roots then tunnel into the heart of the tree making a hollow at the base of the stem, and at the top of large roots. At the same time there is often a 'mud-pack' cover of up to one metre on the outside of the bark. Usually this mud dries, then falls off.

A wind blown hoop pine as a result of termite attack.

Attacked trees may show clear changes in leaf colour, from yellow to brown. This change occurs from the top of the tree downwards. Often, however, damage to the base of the stem, takes place only at the heart of the tree. The outer few centimetres of wood which conduct the water and foodstuffs are unaffected. In this case there will be no change in leaf colour even though the tree is being attacked by termites.

One test that does reveal attack by termites is to hammer the stem with a stout stick. A hollow sound quickly shows which trees are attacked. Trees that are attacked are most likely to be wind-thrown before they are killed, otherwise they die from the

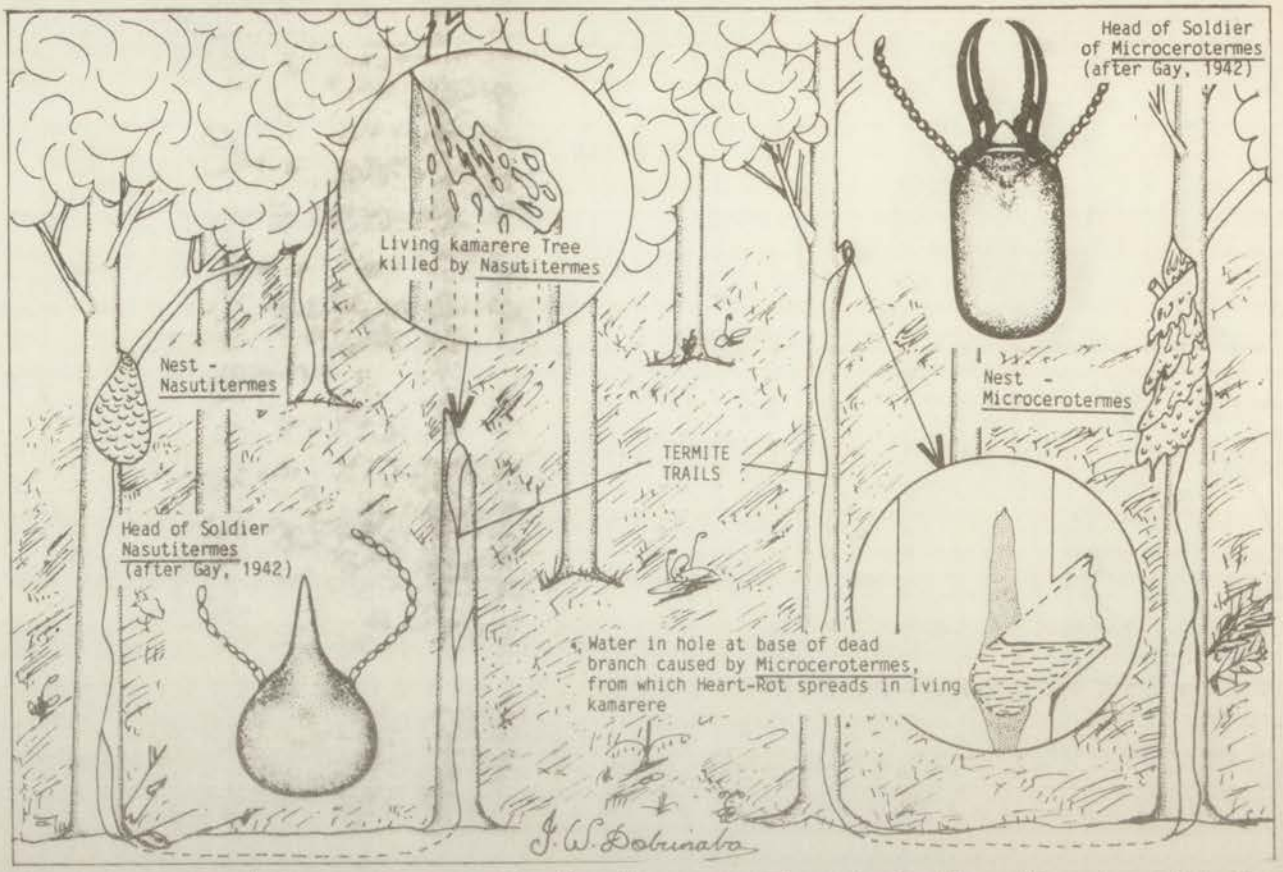


Fig 2: Death of Kamarere caused by Nasutitermes. *The introduction of heart-rot into live Kamarere is caused by* Microcerotermes.

top downwards.

Death can take place quite quickly, in a matter of months. Trees are attacked at any age, at least up to 25 years. No assessments have been made in recent years on the extent of the losses. Past studies have suggested that up to 10% of a stand may suffer. Today this figure is certainly higher. In hoop pine, *Coptotermes* attack is associated with thinning, the termites appearing after the first thinning.

By *Nasutitermes*

Attack on kamarere by *Nasutitermes* is more obvious than attack by *Coptotermes*. The tree takes a much shorter time to die. Again the outside of the trunk is covered by a mud-pack, but to a height of a few metres. The wood is riddled (filled up with holes), and within a month the stem falls down, and breaks into pieces. Trees of 5-10 years appear most vulnerable (exposed to damage), particularly if they are on a wet site. Young trees are not usually attacked. The reason for this is not known.

At any one time the number of trees attacked by *Nasutitermes* in the Trans-Gogol is small, but there are many trees completely missing in wet sites. Termites very probably have caused many of these gaps.

Nasutitermes, since it attacks dead branches on live trees, will also indirectly encourage the entrance of rots.

By *Microcerotermes*

Microcerotermes as yet has not been found attacking live trees, even damaged ones. However when these insects feed on dead branches in the crowns of living kamarere and swamp talis they make large holes, vertically downwards where the branches leave the stem. Water gathers in these holes. The standing water allows rots to develop, and some, particularly heart-rot *(Phellinus)*, can reach the living wood of the tree from these sites. From there the rots spread up and down the stem discolouring the wood, and reducing its strength. Heart-rot may also enter the root systems if

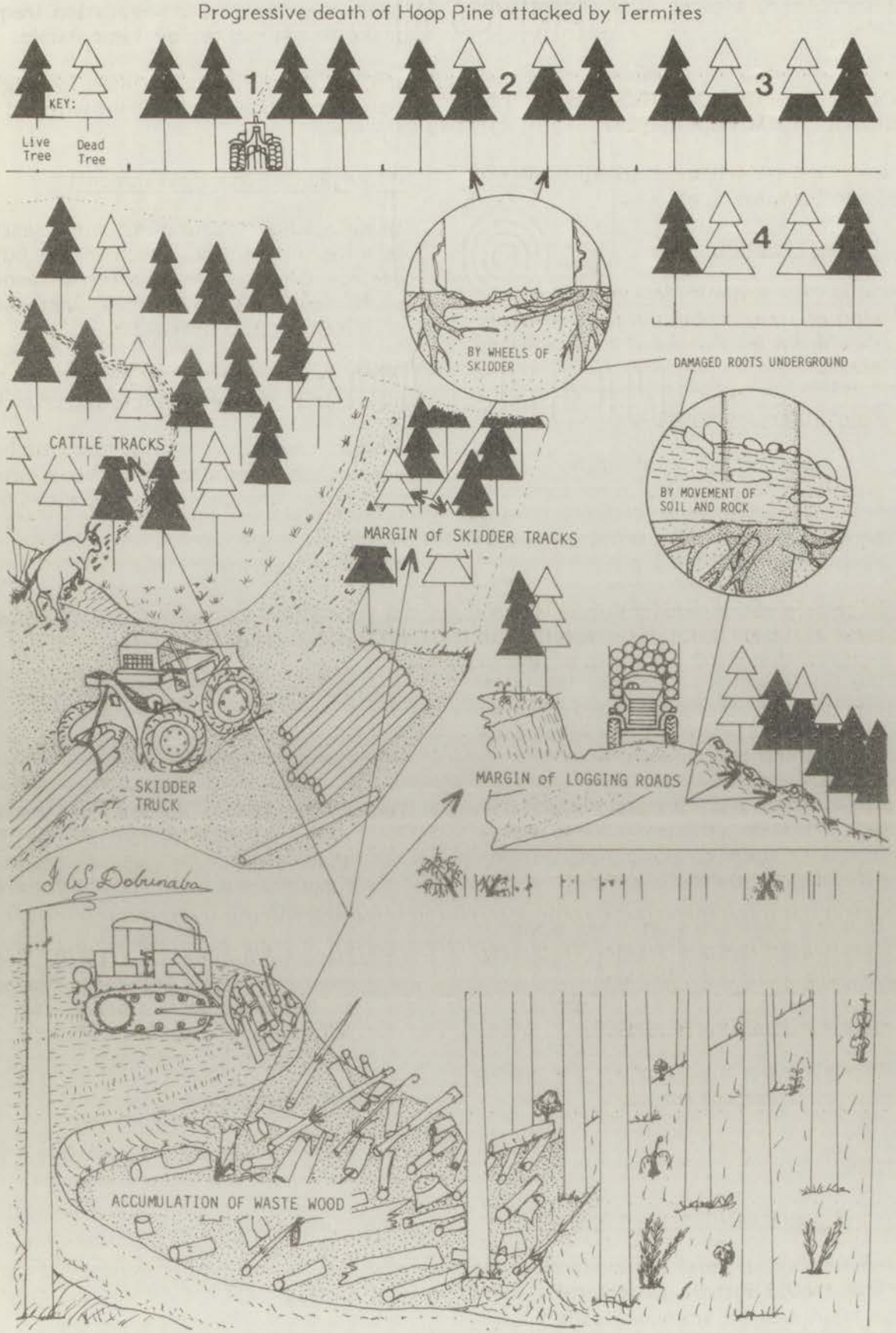


Fig 3: Activities going on within the plantation area that can result in Termite attack on hoop pine.

Microcerotermes attacks dead underground rootlets.

PLANTATION CONDITIONS THAT ENCOURAGE TERMITE ATTACK

The following conditions on plantations will encourage termites to attack:

(a) Natural features

- Soils not suitable for growth of the kind of trees to be planted; kamarere should not be planted in badly drained areas.

(b) Plantation operations

- Accumulation of wood waste - large quantities of stumps, tree tops and branches offer extra food, allowing big increases in the termite population.
- Excessive use of skidder tracks (tracks used by small mechanical vehicles to extract thinnings) - on these tracks the fine rootlets of trees at the track margins are easily damaged because they are just below the ground surface (particularly hoop pine).
- Log-ramps, and logging roads for heavy timber vehicles - these interfere with drainage along their margins affecting the trees planted there.
- Thinning operations on steep slopes - this causes surface erosion, exposing the fine rootlets to damage.

(c) Cattle with tree plantations

- Where cattle follow often the same path, root damage results.

CONTROL

Before and during plantation establishment:

Find and remove all nests in old stumps and logs. This should destroy all termites. The only problem will be reinvasion from outside the area by winged adults. Unfortunately the terrain and vegetation frequently make this stump removal impossible.

Decide on the sites of main logging roads before planting, and allow plenty of space for them.

After plantation establishment:

Using a labour squad of six men, search for termite infestation, then seek out and destroy the queen. An offer of money for each nest destroyed may increase the efficiency of this operation.

When forest operations commence ensure all waste is stacked, then removed or burnt.

Where trees are grown for timber or veneer, and termites may be a problem, prune dead branches and coat with Colgraft or Ag/Seal.

For local control:

Apply 0.2% Chlordane 80 in diesolene directly to the opened nests.

Burn the stump or log with nest if possible.

FURTHER READING

Daur, P. P. (1980). Insect Pest survey of Hoop and Klinki in the Bulolo Plantations. 14 pp. (cylostyled) (unpublished Forestry Department Report).

Gray, B. and Butcher, J. (1969). Termite eradication in *Araucaria* Plantations in New Guinea. *Comm. For. Rev.*, 48(3), No. 137, pp 201-207.

FURTHER INFORMATION

For further information about forest insect pests in Papua New Guinea, contact:

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