

Santo

The Natural History of

edited by
Philippe Bouchet, Hervé Le Guyader, Olivier Pascal



PATRIMOINES NATURELS

PUBLICATIONS SCIENTIFIQUES DU MUSÉUM
IRD ÉDITIONS
PRO-NATURA INTERNATIONAL

TERMITES IN SANTO: LESSONS FROM A SURVEY IN THE PENAORU AREA

Yves Roisin, Bruno Corbara, Thibaut Delsinne, Jérôme Orivel & Maurice Leponce

Termites (Isoptera) are social insects. Their societies rely upon a complex system of castes, i.e. categories of morphologically distinct individuals that perform specific tasks. Among the most ubiquitous castes are the reproductives (queen and king), soldiers and workers. The reproductives are the only ones to reproduce. Soldiers are specialized for defence, whereas workers perform most of the colony's chores, such as digging, construction, food gathering and distribution, and care of the young.

The most basal termite families, such as the Kalotermitidae, live within pieces of dead wood on which they feed, but the Termitidae, often called "higher termites", have diversified to exploit a wide variety of food items such as decayed wood, grasses, lichens, leaf litter or humus. In most tropical rain forests, termites are major decomposers. Lowland continental termite assemblages are the most diversified with respect to their nesting ecology and food sources. Hypogeous nesters and soil feeders are usually poor migrants, whose species richness quickly dwindles as soon as overseas dispersal is required. In a recent revision of the Termitinae of New Guinea, Bourguignon, Leponce and Roisin showed that only a few species in this sub-family may qualify as soil or soil-wood interface

feeders, of which only one reaches the Solomons. Further east, island termite faunas comprise exclusively wood feeding species. Although the effect of altitude on termite assemblages has seldom been quantified, it is obvious for field termitologists that termite abundance and diversity decline from lowland to montane forests. Finally, within a single type of forest, termites may display a vertical stratification between ground-level and canopy strata as we have shown in a previous IBISCA programme held in a lowland forest of Panama.

The termite fauna of Vanuatu is mostly known from casual records. In 1915, Holmgren and Holmgren described *Procryptotermes speiseri* and *Nasutitermes novarumhebridarum*, as well as six new species from New Caledonia and the Loyalty Islands. The Royal Society – Percy Sladen expedition collected only six genera and 10 species from Vanuatu in 1971. Of these, two species of *Neotermes* and two *Nasutitermes* were found on Santo, bringing the reported richness of this island to six species in three genera. Subsequent collecting and identification work was carried out by John C. Buckerfield, from CSIRO, whose unpublished records mention 24 species in nine genera from Vanuatu, of which 16 species in seven genera would be present on Santo.

Table 10: Termite species collected near Penaoru during the Santo 2006 expedition. Number of occurrences in systematic ground-level samples (100-900 m) and in canopy samples (C100-C300 m).

Family / Species	100 m	300 m	600 m	900 m	C100 m	C300 m
Kalotermitidae						
<i>Cryptotermes tropicalis</i> Gay & Watson	2					
<i>Cryptotermes albipes</i> (N. & K. Holmgren)		1				1
<i>Procryptotermes speiseri</i> (N. & K. Holmgren)		3			1	5
<i>Incisitermes</i> sp.	3				2	
<i>Neotermes</i> sp.	2		2	5		
<i>Glyptotermes</i> sp.A	1	1				
<i>Glyptotermes</i> sp.B			1	2		
Rhinotermitidae						
<i>Prorhinotermes inopinatus</i> Silvestri		1				
Termitidae						
<i>Nasutitermes novarumhebridarum</i> (N. & K. Holmgren)	14	4	5	1	2	5
<i>Diwaitermes kanehirae</i> (Oshima)	6	9	5	5		
Total occurrences: 89	28	19	13	13	5	11
Total species: 10	6	6	4	4	3	3

••• Santo 2006: study sites and methods

During Santo 2006, termite collecting took place on the Penaoru site, in November 2006 in the context of the IBISCA-Santo programme. Systematic sampling was carried out on four plots, situated at altitudes of 100 m (plot 100B), 300 m (300A), 600 m (600B) and 900 m (900B) asl. On each plot, 5 m²-quadrats were positioned every 10 m along a 60 m x 60 m grid (49 quadrats per plot). Each quadrat was searched for one-half man-hour, according to standard termite sampling protocols proposed by Jones and Eggleton and modified by Roisin and Leponce. At sites 100B and 300A, dead wood taken down from the canopy with the help of professional climbers was also examined for termite presence. Casual collecting at all sites as well as in the degraded vegetation situated downhill from the camp along the path to the coast provided additional material.

••• Termite diversity and distribution

Ten species were collected, representing eight genera and three families (Table 10).

••• Termitidae

Two species of Termitidae are common at all elevations. Both belong to the subfamily Nasutitermitinae, characterized by soldiers possessing a pear-shaped head with a long frontal tube, through which they can squirt a glue on intruders (Fig. 156). *Nasutitermes novarumhebridarum* was found both in the canopy and at ground level. This species builds carton nests made of partly digested wood. One such nest was found at ground level between

the roots of a big tree at the 300 m site, but this species is also able to build nests higher in trees as already observed in Papua New Guinea. The small *Diwaitermes kanehirae* was limited to dead wood on the ground, where workers often formed dense feeding aggregations. Both species are widespread in the southwest Pacific region.

••• Rhinotermitidae

This family was represented by a single record of *Prorhinotermes inopinatus*. This genus is characterized by numerous soldiers with long, falcate mandibles and a defensive frontal gland, which opens through a small pore on the upper side of the head capsule. *Prorhinotermes* species are famous for their ability to colonize islands, presumably through colony fragments in drift wood. Substitute reproductives easily differentiate in isolated colony fragments, while soldiers and immatures are able to explore their environment to search for favourable sites for colony development.

••• Kalotermitidae

Known as drywood termites, the Kalotermitidae form small colonies confined to single pieces of wood on which they feed. Soldiers do not possess a frontal gland, but defend their colony by blocking passages in the wood with their head, which is often heavily thickened and endowed with powerful, crushing mandibles (Fig. 157). When their home piece of wood approaches exhaustion, most of the individuals will proceed to the winged, alate stage and attempt to found a new colony in another site. This is the most species-rich family



Figure 156: Soldiers (with pointed head capsule) and workers of *Nasutitermes novarumhebridarum*. Tunnel made of wood carton was opened to show walking termites.

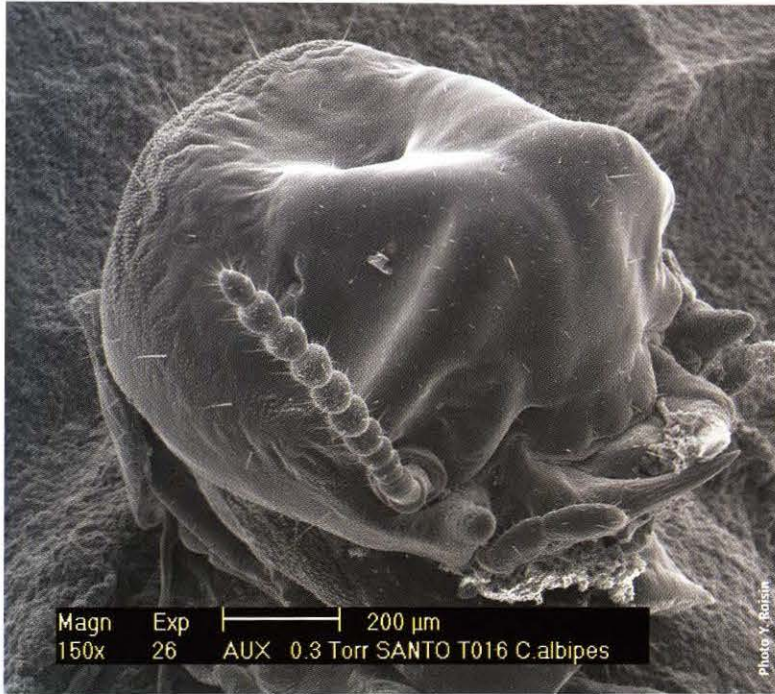


Figure 157: Scanning electron micrograph of head of *Cryptoterme albipes* soldier. Note plug-shaped head capsule and short, powerful mandibles.

on south Pacific Islands. Species identification is however made difficult by intraspecific variability, since soldier size and shape may vary not only according to their genetic constitution, but also with colony age and condition. The same two species, *Neoterme* sp. (Fig. 158) and *Glyptoterme*

sp.B were found at 600 m and 900 m. *Neoterme* sp. was casually collected at 1200 m. At lower altitudes, the fauna appears more diversified. Dead branches or stubs high in trees can be home to whole colonies, allowing this family to be well represented in the forest canopy. *Procryptoterme speiseri* was especially common in the canopy at 300 m.

... **Conclusions**

As is the rule for southwest Pacific islands, the termite fauna of Santo is exclusively composed of wood feeders. Endemism of termites on Santo is probably low. Both Termitidae species and *Procrhinoterme inopinatus* are widespread in the southwest Pacific region. The geographic distribution of the two *Cryptoterme* species is probably extensive as well: *C. tropicalis* was described from Queensland, Australia, and *C. albipes* from the Loyalty Islands. This latter species also occurs in New Guinea (YR, unpublished). However, the identification of the other Kalotermitidae is still in progress. The lack of clear correspondence between our collections and published species descriptions suggests that some species might ultimately prove to be new, and perhaps endemic.



Figure 158: Part of an incipient colony of *Neoterme* sp., showing the royal pair (reddish brown), a soldier (left, with heavily sclerotized head and long mandibles), two larvae (top, white), and large working immatures (right, with pale head and reddish digestive tube).