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SURVEY OF THE TERMITES (ISOPTERA: KALOTERMITIDAE, RHINOTERMITIDAE, TERMITIDAE) OF LANYU ISLAND, TAIWAN

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Lanyu Island (= Botel Tobago Island; Orchid Island) is a 48-km^2 volcanic island, ≈90 km southeast of Taiwan Island. Oshima (1912) and Tu (1955) conducted a termite survey on Lanyu Island, and recorded 6 species (3 families, 6 genera) in total, but the voucher specimens were neither mentioned nor available. During 10-12 Jun 2007, we collected 24 termite colony samples from 11 localities along roadsides, in structures, and on boats on the island (Fig. 1). Our survey also yielded 6 species in 6 genera and 3 families (Table 1). Identifications were made by Li based on original descriptions and references listed in Table 1. The voucher specimens are deposited in the University of Florida Termite Collection, Fort Lauderdale Research and Education Center, and National Taiwan University, Department of Entomology, Taipei, Taiwan. The 6 species with brief description are the following.

Cryptotermes domesticus (Haviland): Alates were taken from a sport-fishing yacht, and 4 other colonies were found in the dead branches of living trees. This distribution pattern indicates that *Cr. domesticus* is a structural pest and also a woodland species of Lanyu Island. In Taiwan *Cr. domesticus* was only found in structural wood (Li, unpublished data). Miller & Paton (1983) reported that *Cr. domesticus* is indigenous and only found in mangroves in northern Australia near Darwin, but is a domestic pest in northern Queensland. We assume that Lanyu Island and North Australia are the northern and southern limits of the indigenous range of *Cr. domesticus*. *Cryptotermes kotoensis* (Oshima) collected in Lanyu Island by Oshima (1912) is a junior synonym of *Cr. domesticus* (Chung & Chen 1994; Huang 2000).

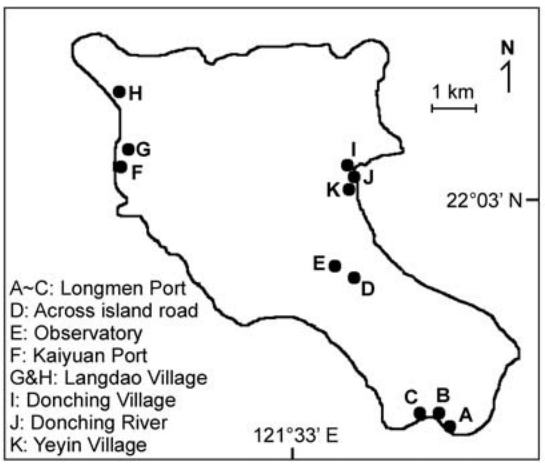

Fig. 1. Collection sites (dark circles) represented in the current survey.

Neotermes koshunensis (Shiraki): *Neotermes koshunensis*, a common species in Lanyu Island, is usually found in dead trees or dead branches of living trees with high moisture and is not known to be a structural pest.

Coptotermes formosanus Shiraki: *Coptotermes formosanus* is the major structural pest on Lanyu Island and found in houses, discarded wood material, wood retaining walls, fence posts, and boats. The yacht infested by *Cr. domesticus* also was infested by *Co. formosanus*, and the latter obtained fresh water by building shelter tubes to the bilge tank. We speculate that *Co. formosanus* is an anthropogenically dispersed species from Taiwan Island due to frequent shipping.

Prorhinotermes japonicus (Holmgren): *Prorhinotermes japonicus* was collected by Hozawa in 1911 and is known only from Lanyu Island. Holmgren (1912) described and named this species as *japonicus* due to the fact that Taiwan and its surrounding islands belonged to Japan between 1895 and 1945. In this survey, we collected only 1 sample in a central dead part of a living *Casuarina* sp. tree, along with 2 other termite species, *Co. formosanus* and *Nasutitermes takasagoensis* (Shiraki).

Reticulitermes flaviceps (Oshima): Oshima (1912) collected a *Reticulitermes* species on Lanyu Island and identified it as *Reticulitermes flaviceps* from specimens collected in Taipei, Taiwan (Oshima 1911). In the termite list of Taiwan and Lanyu Islands, *Reticulitermes speratus* (Kolbe) is listed instead of *R. flaviceps* (Tu 1955). Morimoto (1968) suggested that the *Reticulitermes* sp. collected at Lanyu Island is closer morphologically to *R. fukienensis* Light or *R. speratus* rather than *R. flaviceps* collected in Taipei. Recently, *R. speratus* from Japan, *R. flavipes* from U.S.A., and *R. flaviceps* from Taiwan Island have been supported as 3 valid species based on DNA sequences (Yashiro & Matsuura 2007). However, the taxonomic status of *Reticulitermes* sp. on Lanyu Island has not been validated. Chung & Chen (1994) also pointed out the uncertain identification of *Reticulitermes* sp. on Lanyu Island. In this survey, samples of *Reticulitermes* sp. from 2 colonies were collected at the interface between wet soil and fallen dead trees, and identified as *R. flaviceps* based upon soldier morphology. This result was confirmed by the nucleotide sequences of 3 mitochondrial genes, cytochrome oxidase subunit

TABLE 1. TERMITE SPECIES RECORDS FROM LANYU ISLAND LISTED ALPHABETICALLY BY FAMILY.

Taxon	Collected location[a]	Original species description	Previous locality reference
Kalotermitidae			
Cryptotermes domesticus (Haviland)	A, B, F, J	Haviland (1898)	Oshima (1912), Tu (1955)
Neotermes koshunensis (Shiraki)	B, D, I	Shiraki (1909)	Oshima (1912), Tu (1955)
Rhinotermitidae			
Coptotermes formosanus Shiraki	C, E, F, H, K	Shiraki (1909)	Oshima (1912), Tu (1955)
Prorhinotermes japonicus (Holmgren)	K	Holmgren (1912)	Lo et al. (2004), Oshima (1912), Tu (1955)
Reticulitermes flaviceps (Oshima)	A, B	Oshima (1911)	Oshima (1912), Tu (1955)
Termitidae			
Nasutitermes takasagoensis (Shiraki)	B, D, E, G, K	Nawa (1911)	Oshima (1912), Tsai (2003), Tu (1955)

[a]Location codes are indicated in Fig. 1.

II (COII), ribosomal RNA small subunit 12S and ribosomal RNA large subunit 16S, and a nuclear gene, Internal Transcribed Spacer (ITS) region. The sequences determined in the present study were deposited in the GenBank database with accession numbers EU627778-EU627785.

Nasutitermes takasagoensis (Shiraki): *Nasutitermes takasagoensis* was the most dominant termite species on Lanyu Island. This species builds narrow foraging tubes and sheeting on wood poles, fence posts, discarded construction material, and trees. *Odontotermes formosanus* (Shiraki) common on Taiwan Island builds similar shelters, but is not found in Lanyu Island.

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SUMMARY

A field survey of the termites of Lanyu Island resulted in confirmation of the island's fauna to 6 species in 6 genera and 3 families. The voucher specimens are maintained at the University of Florida, Fort Lauderdale Research and Education Center, Ft. Lauderdale, FL, U.S.A., and National Taiwan University, Department of Entomology, Taipei, Taiwan.

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