

TERMITES OF SOUTHEASTERN POLYNESIA

By

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BERNICE P. BISHOP MUSEUM

OCCASIONAL PAPERS

VOLUME XII, NUMBER 12

HONOLULU, HAWAII
PUBLISHED BY THE MUSEUM
September 15, 1936

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INTRODUCTION

The termites here reported were collected by the Mangarevan Expedition to southeastern Polynesia in 1934, chiefly by Elwood C. Zimmerman. Included are collections from the Society Islands, Mangareva, the Austral Islands, the Pacific Equatorial Islands, Oeno, and Pitcairn. Combined with the results of the Pacific Entomological Survey² and the accounts of the termites of Hawaii³ ⁴ and of Fanning and Washington Islands² ⁵, these collections give a fairly complete record of the distribution of termites in eastern and southeastern Polynesia. Notes on distribution and biology are by Mr. Zimmerman and, unless otherwise stated, the collections were made by him.

Several species among the known termites of the eastern Polynesian islands have an extraordinarily wide distribution. This seems to indicate that the slow, natural spread of the termite fauna before the advent of man has since been accelerated by the migrations of the indigenous peoples and especially by the visits of ships. It would be interesting to determine the relative importance of these methods of distribution. But for this we would need much more information than we now have of the distribution, affinities, and ecological incidence of each species, as well as such first-hand knowledge as is available among the inhabitants. Some clues might be found in the languages, but these would be meager at best. At present the known affinities are with the faunas to the west, with the exception of *Kaloterms* (*Rugiterms*) *athertoni* (Light) which is clearly neotropical, the subgenus *Rugiterms* being confined to the tropics of the new world. A knowledge of the termite faunas of the islands extending

¹ Mangarevan Expedition Publication 8.

² Light, S. F., Termites of the Marquesas Islands: B. P. Bishop Mus., Bull. 98, pp. 73-86, figs. 21-25, pls. 1-3, 1932.

³ Snyder, T. B., New termites from Hawaii, Central and South America, and the Antilles: U. S. Nat. Mus., Proc., vol. 61, art. 20, pp. 1-32, figs. 1-6, pls. 1-5, 1922.

⁴ Kofoid, C. A., Light, S. F., and others, Termites and termite control, Univ. California Press, Berkeley, 1934.

⁵ Kirby, Harold, Jr., *Cryptotermes hermsi* sp. nov., a termite from Fanning Island: Univ. California Pub. Zool. 26, pp. 437-441, 1945.

from Pitcairn to the coast of Chile might throw some light on the problem.

SPECIES COLLECTED

1. **Kalotermes (Neoterme) connexus** Snyder.

Neoterme connexus Snyder: U. S. Nat. Mus., Proc., vol. 61, art. 20, pp. 9-11, figs. 3-4, pl. 4, fig. 16, 1922.

Kaloterme (Neoterme) connexus; Light: B. P. Bishop Mus., Bull. 98, pp. 76-77, fig. 22, pl. 1, *D*, 1932.

Society Islands. Moorea, September 1934: Tepatu Valley, altitudes 300, 600, and 800 feet, from *Hibiscus tiliaceus*. Huahine, October 1934: valley southeast of Tahateao, altitude 300-500 feet, from *Hibiscus tiliaceus*. Raiatea, October 1934: south slope of Toahiva Valley, altitude 400-600 feet, from *Hibiscus tiliaceus*; valley east of Mt. Orotaio, altitude 300 feet, from *Hibiscus tiliaceus*, Y. Kondo and Zimmerman; northwest ridge, Paaroa Bay, altitude 400 feet, on *Fragraea*; all collections contain numerous well-pigmented alates. Tahaa, October 1934: valley southeast of Mt. Purauti, altitude 800 feet, from *Hibiscus tiliaceus*.

This species, originally described from Hawaii, was also taken by the Pacific Entomological Survey in the Marquesas and in Moorea, Society Islands. Although not yet taken in Tahiti or Borabora, the species almost certainly is to be found there; further collecting needs to be done in the lowlands. The preferred host is *purau* (*Hibiscus tiliaceus*), a tree much used by the Polynesians. The distribution of this termite among the islands was probably aided materially by native and commercial intercourse.

Mr. Light has compared this species with a single topotype soldier of *K. (N.) samoanus* Holmgren from Samoa, identified by Hill, and with a paratype soldier and alate of *K. (N.) rainbowi* Hall from the Ellice Islands. There are marked differences between the soldier from Samoa and those from the Society and Marquesas Islands. The soldier from the Ellice Islands, however, is very similar to those from the Society and Marquesas Islands. The Ellice Islands alates show distinct differences from those of the Society Islands. Therefore the validity of these species must await a study of the range of variation among the individuals and colonies of the three regions. In view of the wide range of variation, not yet carefully studied, in *K. (N.) connexus* Snyder and the facts stated above, it seems

probable that these termites will ultimately be found to represent a single species, which would then be designated by the oldest name, *K. (N.) samoanus* Holmgren.

2. *Kalotermes (Rugitermes) athertoni* (Light).

Kalotermes (Metaneoterмес) athertoni Light: B. P. Bishop Mus., Bull. 98, pp. 78-80, fig. 23, pl. 1, *A-B*, pl. 2, *A-C*, 1932.

Society Islands, Tahiti, Mt. Aorai Trail, September 1934: altitude 5800 feet, two collections from dead *Metrosideros* (one from a dead limb); altitude 5500 feet, from dead *Metrosideros*; altitude 4500 and 5500 feet, from a *Weinmannia* stump.

This species occurs from sea level to 3500 feet in the Marquesas, where *Hibiscus tiliaceus* is its most common host.⁶ Although little time was spent searching for termites in the lowlands of Tahiti and although this species was not taken below 4,000 feet where collections of other species were made, it may occur, as it does in the Marquesas, from the lowlands to the heights of the interior. It is not common even on Mt. Aorai, for only four collections were made there in five days of rather careful searching.

K. (R.) athertoni, formerly thought by Light⁷ to represent a new subgenus, was previously known only from the Marquesas. A similar species taken by von Hagen in Ecuador was provisionally considered by Light⁸ to be the same. More careful study has shown that the Ecuador species is distinct. A comparison with authentic type material (Emerson, in lit.) shows that *K. athertoni*, although seemingly distinct, should be placed in the subgenus *Rugitermes*, confined to the neotropics where it has a wide distribution.

3. *Kalotermes* (?) *rapae*, new species (fig. 1).

Dealate female (young queen).—Generally castaneus; intersegmental membranes, sternites, legs beyond coxae, and an area in front of the eye distinctly lighter. Head (fig. 1, *f*) parallel-sided, longer than broad; transverse sutures faint; frons with two minute but conspicuous muscle marks near center, and behind them a fainter V-shaped figure and two large, inconspicuous muscle marks, one above each antenna. Eye (fig. 1, *e*) separated from dorsal margin of head by approximately its short diameter, and from ventral margin by approximately its long diameter, sharply truncated on antero-dorsal margin and less distinctly so on its ventral margin. Ocellus yellowish, not projecting, elongated, its long diameter approximately twice its short diameter; directed obliquely dorsad and antiad; about half as long as long diameter of eye;

⁶ Light, S. F., Termites of the Marquesas Islands: B. P. Bishop Mus., Bull. 98, pp. 78-80, fig. 23, 1932.

⁷ Idem.

⁸ Light, S. F., The termites: California Acad. Sci., Proc., vol. 21, no. 20, p. 237, 1935.

separated from eye by about half the short diameter of ocellus. Antenna with 11-| segments (incomplete in all individuals available), first segment light brown, second pale, others dark brown; second and third subequal, fourth smallest. Maxillary palpi (fig. 1, *e*) with unusually thick distal segments; labial palpi (fig. 1, *e*) also with thick distal segments. Pronotum (fig. 1, *g*) with broadly and shallowly concave anterior margin; posterior margin with broad, shallow, somewhat angular median emargination; postero-lateral corners receding into biconvex posterior margin; Y-marking very broad and shallow. Meso- and metanota with faintly concave posterior margins. Anterior wing scale reaching to about middle of metanotum. All tibiae with three apical spines.

Measurements (in millimeters) of morphotype female:

Length	7.5
Length of head capsule.....	1.3
Length of head over all.....	1.6
Width of head with eyes.....	1.4
Width of head capsule.....	1.3
Maximum diameter of eye.....	0.3
Minimum diameter of eye.....	0.2
Length of pronotum.....	0.8
Maximum length of pronotum.....	0.9
Width of pronotum (in position).....	1.25

Soldier.—Frons brown, rest of head, antennae, and palpi yellow-brown; rest of body whitish except anterior margin of pronotum, the claws and apical spines of tibiae, which are reddish. Head (fig. 1, *a*) subrectangular, sides slightly concave near middle, somewhat bulging posteriorly; more than half as wide as long; about as high as wide; dorsal surface sloping forward slightly to frons, which makes an angle of about 45° with the vertical axis of the head (fig. 1, *c*); dorsal margin of frons somewhat bilobed, owing to a shallow groove arising at about junction of Y-suture and running onto frons; two low, shield-shaped bosses, one on each side dorsal to the antenna, each somewhat darker than rest of frons and succeeded posteriorly by a somewhat crescentic pale area. Antero-lateral region of head capsule provided with two prominent tubercles (fig. 1, *a*); one tubercle sharp, almost spinelike, at the extreme antero-lateral angle and directed laterad, anteriad, and slightly dorsad; the other, thicker and broader-based, situated on the antennal ridge between the antenna and the dorsal mandibular condyle. Postclypeus (fig. 1, *a*) narrow, dark, the free margin with a broad, low, median, angular convexity. Labrum (fig. 1, *a*) parallel-sided, wider than long, its anterior margin with a median triangular convexity. Gula (fig. 1, *h*) more than twice as wide anteriorly as at narrowest point. Antennae (fig. 1, *a*) of 14-15 segments; fourth shortest; third chitinized, shorter than second but longer than fourth or fifth; sixth about as long as wide; distal segments increasing in length; ninth to fifteenth subequal. Mandibles (fig. 1, *a*) nearly as long as width of head, basally thick and wrinkled, narrowed distally, strongly incurved in distal fourth; teeth reduced, two on right, one distinct tooth and two vestiges on left. Pronotum (fig. 1, *b*) weakly sclerotized, about as wide as head, less than half as long as wide; anterior margin shallowly, broadly, and angularly concave; antero-lateral corners shortly rounded, sides parallel, postero-lateral corners rounding into weakly biconvex posterior margin.

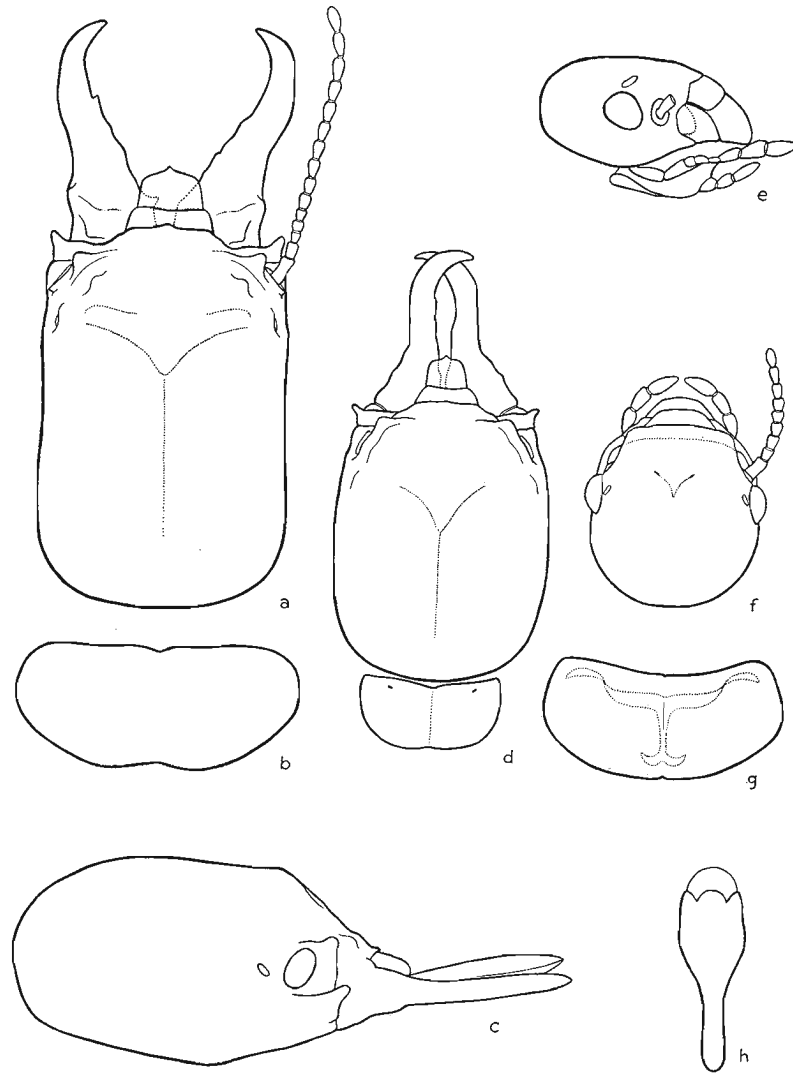


FIGURE 1.—*Kalotermes* (?) *rapae*: a, head of large soldier, dorsal view; b, pronotum of same; c, head of same, lateral view; d, head and pronotum of soldier of incipient colony, dorsal view; e, head of female, side view; f, head of same, dorsal view; g, pronotum of same; h, gula of large soldier. (Camera lucida drawings).

Measurements (in millimeters) of soldier:

	From Old Colony	From Incipient Colony
Length	9.0	6.4
Length of head.....	2.5	1.85
Width of head.....	1.7	1.5
Height of head.....	1.5	1.1
Maximum width of gula.....	0.5	0.4
Minimum width of gula.....	0.2	0.2
Length of left mandible.....	1.45	1.15
Length of pronotum.....	0.7	0.4
Width of pronotum.....	1.7	1.0
Head index	0.68	0.79
Head-width-mandible index	0.86	0.77
Head-width-height index	0.87	0.73
Gular contraction index.....	0.375	0.44
Head-pronotum index	1.0	0.69

The following seven collections, including 25 soldiers and 10 dealates, were made on Rapa, the most southerly of the habitable Polynesian islands, in July 1934: southeast ridge, Mangaoa Peak, altitude 1000-1100 feet; Maitua, altitude 700-800 feet; north slope, Mt. Tautautu, altitude 700-800 feet, in *puru* (unidentified endemic tree); Mt. Tanga, altitude 700-800 feet, in a dead *Lautea* limb, and from a dead *puru* limb; east ridge, Mt. Perahu, altitude 1200-1500 feet, from a dead stump; Karapo Rahi Islet, altitude 200-300 feet, from a dead stump. Holotype soldier, morphotype female, and paratypes in Bernice P. Bishop Museum; other paratypes in collections of S. F. Light, A. B. Emerson, and the California Academy of Sciences.

No significant variation has been observed among the dealates. Soldiers of older colonies show only minor variations, but those of very young (incipient?) colonies show, as usual, significant differences. They are much smaller and lighter, the heads (fig. 1, *d*) are relatively much shorter and have convex sides. The antennae have only 12 or 13 segments, the teeth are vestigial, and the pronotum weak and much narrower than the head. Such differences are known to be characteristic of the nanitic early instar soldiers of incipient colonies of several other species of Kalotermitidae and probably of all. The various indices of proportion show that these are not merely differences in size but in proportion.

No termites have heretofore been known from Rapa. This new species is not at all common; it was taken but rarely and only in the

native forests. Although an effort was made to find termites in the introduced trees known to support several species of termites on other islands, no termites or evidence of their work could be found anywhere on the island except in the highlands.

The peculiar angularities on the front of the head of the soldier of this species suggest its affinity with the species of the subgenus *Procryptotermes* of which there are three species in Africa and one—*Kalotermes (Procryptotermes) speiseri* K. and N. Holmgren—in the New Hebrides. However, the soldier of *K. rapae* lacks the elongation of the third antennal segment characteristic of the subgenus. In the absence of the alate, therefore, it seems unwise to attempt a subgeneric designation, particularly since H. Kirby, Jr.⁹ reports that the Protozoa give no clue.

Whether or not *K. rapae* proves to be a species of *Procryptotermes*, its occurrence in Rapa alone, so far as at present known, is difficult to understand unless it has been introduced by man.

4. *Kalotermes (Glyptotermes) xantholabrum* Hill.

Kalotermes (Glyptotermes) xantholabrum Hill: Nat. Mus. Melbourne, Mem. 7, pp. 14-15, pl. 5, fig. 153, pl. 8, fig. 154; Insects of Samoa, pt. 7, fasc. 1, pp. 13-15, 1927.—Light: B. P. Bishop Mus., Bull. 113, p. 4, pl. 1, fig. 1, 1935.

Kalotermes (Glyptotermes) juddi Light: B. P. Bishop Mus., Bull. 98, pp. 169-170, 1932.

Society Islands, late September and early October, 1934. Tahiti: Taohiri, Mt. Aorai trail, altitude 3500 feet, from a *Tecomaria* (?) log. Moorea: Tepatu Valley, altitudes 200, 800, and 900 feet, three collections from *Hibiscus tiliaceus*; Maramu Valley, altitude 50 feet, two collections from *Hibiscus tiliaceus* and one from *Inocarpus edulis*. Huahine: north slope of Mt. Taiahi, altitude 700-800 feet, from breadfruit (*Artocarpus incisa*), Kondo and Zimmerman; southeast end Haapuu Bay, altitude 100 feet, from *Artocarpus incisa*; valley southeast of Tahateao, altitude 300-500 feet, three collections from *Hibiscus tiliaceus* and one from *Inocarpus edulis*. Raiatea: Paaioia Valley, altitude 300 feet, from *Hibiscus tiliaceus*, Kondo and Zimmerman; northwest ridge, Faaroa Bay, altitude 500 feet, from *Pagraea*; Paaioia Valley, altitude 500 feet, from *Inocarpus edulis*. Tahaa: valley southeast of Mt. Purauti, altitudes 600 and

⁹ Personal communication.

1,000 feet, from *Hibiscus tiliaceus*; east ridge of Mt. Purauti, altitude 100 feet, from a species of Rubiaceae. Borabora: west slope of mountain north of Mt. Pahio, altitude 900 feet, two collections from *Hibiscus tiliaceus*, one by Kondo.

The more extensive collections here studied show that the differences in size, upon which *K. (G.) juddi* Light was chiefly based, fall within the variational range of *K. (G.) xantholabrum* Hill. Hence *K. (G.) juddi* is reduced to synonymy.

This species was originally described from New Britain, reported by Hill¹⁰ from Samoa, and by Light¹¹ from Tahiti. The small collection from the Marquesas, described as *K. (G.) juddi* by Light, completes a range of over 7,000 miles from New Britain to the Marquesas. Like *K. (N.) connexus* Snyder this species has *Hibiscus tiliaceus* as its preferred host, so that its wide distribution has probably been facilitated by man.

5. *Kalotermes (Cryptoterme)s dolei* Light.

Kaloterme)s (Cryptoterme)s dolei Light: B. P. Bishop Mus., Bull. 98, pp. 81-83, pl. 3, *A-B*, fig. 24, *a, d*, 1932.

Pitcairn Island, June 1934: altitude 1,000 feet, from a wound in *Metrosideros*; south side of island, altitude 700 feet, from a branch of *te pau* (unidentified tree); north side of island, altitude 600 and 700 feet, from mango; St. Pauls Point, altitude 600 feet, from dead *Celtis*, F. R. Fosberg and Zimmerman; St. Pauls Point, altitude 800 feet, from mango. Mountain apple was also attacked.

Mangareva, May 1934. Akamaru: north side of island, altitude 250 feet, one collection from a candlenut stump (*Aleurites moluccana*) and two from orange trees; northwest side of island, altitude 100 feet, from *Hibiscus tiliaceus*. Aukena: northwest side of island, two collections from *Barringtonia* and *Hibiscus tiliaceus*. Mangareva Island: northwest slope of Mt. Duff, altitude 200-400 feet, two collections in *Hibiscus tiliaceus* and orange wood; northeast slope of Mt. Duff, near the convent, altitude 300 feet, two collections from mango log and a wound in *Inocarpus edulis*.

Austral Islands. Raivavae, August 5, 1934: south slope of Pic Rouge, altitude 200-300 feet, in a stem of *Elaeocarpus*. This colony

¹⁰ Hill, G. F., Isoptera: family Termitidae: Insects of Samoa, pt. VII, fasc. 1, pp. 1-18, figs. 1-14, pl. 1, 1927.

¹¹ Light, S. P., Termites from the Society Islands: B. P. Bishop Mus., Bull. 113, p. 4, pl. 1, fig. 1, 1935.

was the only evidence of termites found on Raivavae in ten days' collecting and is the first record of a termite from the island.

Society Islands. Moorea, September 22, 1934: Urufara Valley, altitude 300 feet, from *Hibiscus tiliaceus*. Huahine, October 1934: northwest ridge of Mt. Turi, altitude 700 feet, October 1, 1934, in orange wood; valley southeast of Tahatea, altitude 300-500 feet, October 2, 1934. Borabora, October 13, 1934: west slope of mountain north of Mt. Pahio, altitude 1100 feet, from *Hibiscus tiliaceus*.

6. ***Kalotermes (Cryptoterme)s hermsi*** Kirby.

Kaloterme)s (Cryptoterme)s hermsi Kirby: Univ. California Pub.

Zool., vol. 26, pp. 437-441, figs. 1-12, 1925.

Oeno Island, June 23, 1934: from *Tournefortia* log; the first record of a termite from Oeno.

Austral Islands. Rurutu, August 21, 1934: altitude 50 feet, from dead coffee tree; the only record of a termite from Rurutu and the second collection of termites from the Austral Islands.

Society Islands. Meetia, May 12, 1934: Fatia-pa, altitude 800 feet, from a *Barringtonia* trunk; the first record of a termite from Meetia. Tahiti, March-April 1934: Tiupi Bay, Papeari, March 30 and April 23, 1934, two collections of alates at light; Arihiri, Pare, March 8, 1934, from fence posts. Huahine, September 1934: north slope of Mt. Taiahi, altitude 700-800 feet, from *Hibiscus tiliaceus*, Kondo and Zimmerman. Raiatea, October 1934: south ridge of Paaioia Valley, altitude 800 feet, from wound in *Alphitonia*; Horeu Islet, altitude 3 feet, from *Barringtonia*; Tetaro Islet, altitude 3 feet, from *Barringtonia*.

Flint Island: October 16, 1934, from a dead coconut log, Kondo; same date, from *Tournefortia*.

This species was found damaging fence posts and buildings in Tahiti. Heretofore it has been known only from Fanning Island and the Marquesas¹².

¹² Light, S. F., Termites of the Marquesas Islands: B. P. Bishop Mus., Bull. 98, pp. 83-84, 1932.

CHECK LIST OF THE TERMITES OF EASTERN POLYNESIA
WITH THEIR KNOWN DISTRIBUTIONS

1. **Kaloterme** (**Kaloterme**) **immigrans** Snyder, 1922.
Hawaii. Washington Island. Fanning Island. Jarvis Island. Marquesas Islands: Hivaoa. Galapagos Islands. Ecuador.
2. **Kaloterme** (**Neoterme**) **connexus** Snyder, 1922.
Hawaii. Society Islands: Tahaa, Raiatea, and Moorea. Marquesas Islands: Eiao, Nukuhiva, Uahuka, Uapou, Hivaoa, Tahuata, and Fatuhiva. Possibly the same as *K. (N.) samoanus* Holmgren from Samoa and *K. (N.) rainbowi* from Ellice Islands.
3. **Kaloterme** (**Rugiterme**) **athertoni** (Light, 1932).
Society Islands: Tahiti. Marquesas Islands: Nukuhiva, Uahuka, Uapou, Tahuata, and Fatuhiva.
4. **Kaloterme** (?) **rapae**, new species.
Rapa Island.
5. **Kaloterme** (**Glyptoterme**) **xantholabrum** Hill, 1927.
New Britain. Samoa. Society Islands: Borabora, Tahaa, Raiatea, Huahine, Moorea, and Tahiti. Marquesas Islands: Uahuka.
6. **Kaloterme** (**Cryptoterme**) **dolei** Light, 1932.
Society Islands: Borabora, Huahine, and Moorea. Austral Islands: Raivavae. Marquesas Islands: Eiao, Nukuhiva, Uahuka, Uapou, Hivaoa, Mohotani, and Fatuhiva. Mangareva: Mangareva Island, Akamaru, and Aukena. Pitcairn Island.
7. **Kaloterme** (**Cryptoterme**) **hermsi** Kirby, 1925.
Fanning Island. Flint Island. Society Islands: Raiatea, Huahine, Tahiti, and Meetia. Austral Islands: Rurutu. Marquesas Islands: Hivaoa and Tahuata. Oeno Island.
8. **Kaloterme** (**Cryptoterme**) **piceatus** Snyder, 1922.
Hongkong, China (?). Hawaii. Marquesas Islands: Hivaoa.
9. **Coptoterme** **pacificus** Light, 1932.
Marquesas Islands: Hivaoa.
10. **Coptoterme** **formosanus** Shiraki, 1909.
China. Formosa. Japan. Hawaii.