A NEW NEOTROPICAL ELEMENT (*ANOPLOTERMES*) IN THE INDIAN TERMITE FAUNA, WITH FULLER DESCRIPTION OF *A. SHILLONGENSIS* FROM ASSAM*

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(With 3 Tables, 2 Text-figures and 1 Plate)

CONTENTS

I—INTRODUCTION

There is a group of termites in the *Anoplotermes*-complex (Isoptera, Family Termitidae, Subfamily Amitermitinae) in which the soldier caste is absent†, and only the worker caste and the reproductives (alates : male and female) are known to occur. The complex consists of two closely allied genera, *Anoplotermes* Müller and *Speculitermes* Wasmann.

The genus *Anoplotermes* was erected by Müller (1873) to accommodate a new Neotropical species, *A. pacificus* Müller, from Peru. Later on, Wasmann (1902) erected the genus *Speculitermes* to accommodate a new species, *S. cyclops* Wasm., from India. Holmgren (1912), however, reduced *Speculitermes* to the status of a subgenus of the parent genus *Anoplotermes* which thus had two subgenera, *Anoplotermes* and *Speculitermes*. Some authorities (*e.g.*, Grassé, 1949, p. 537) have accepted this new status, while others continue to hold the two groups as of generic rank (Snyder, 1949). There is no doubt that the two genera are very closely allied, but as there are marked and clear differences, it is perhaps best to regard them as two full genera which are separable

* For a preliminary account, see Roonwal, M. L. and Chhotani, O.B. (i) *Nature*, London, **184**, pp. 1967-1968, 19th Dec., 1959 ; and (ii) *Sci. & Culture*, Calcutta, **25**(12), p. 701, June, 1960.

† While this paper was in the press, we discovered the soldier caste in the genus *Speculitermes*, from two collections of *S. cyclops sinhalensis* Roonwal & Sen-Sarma, from southern India (*vide* Roonwal & Chhotani, *Sci. & Culture*, Calcutta, **26**(3), pp. 143-144. Sept. 1960.

as in the following key, while a more detailed comparison is given in Table 1.

Key to workers of the genera of the Anoplotermes*-complex.*

1 (2). Body pale. Smaller (head and body *ca.* 2·7-6·3 mm. long ; head-width 0·4-1·2 mm.). Mid-dorsal spot on head either absent or very weak and reduced to a point. Antennae shorter, *ca.* 1·2-1·6 times the head-width ; with 14 segments ; 3rd segment generally smaller than 2nd. Fore-tibia markedly swollen. Tibial spur formula variable, generally either 3 2 : 2 (Ethiopian species) or 2 : 2 : 2 (Neotropical and Oriental species). Left mandible with an apical and either 2 or 3 marginal teeth ; the 3rd marginal, when present, very small.

... *Anoplotermes* Müller

2 (1). Body dark. Larger (head and body *ca.* 4·0-7·0 mm. long ; head-width 1·0-1·4 mm.). Mid-dorsal spot on head ("Stirnocellus" of Wasmann) large and prominent. Antennae longer, *ca.* 1·5-2·0 times the head-width ; with 14 (rarely 15) segments ; 3rd segment longer than 2nd (rarely subequal). Fore-tibia not swollen. Tibial spur formula 2 : 2 : 2. Left mandible with an apical and 2 marginal teeth.

...*Speculitermes* Wasmann.

TABLE 1.—*Comparison of worker characters of the genera* Anoplotermes *and* Speculitermes.

Anoplotermes	*Speculitermes*
1. Generally pale	1. Generally dark coloured.
2. Smaller species :	2. Larger species :
Total length *ca.* 2·7—6·3 mm.	Total length *ca.* 4·0—7·0 mm.
Max. head-width 0·4—1·2 mm.	Max. head-width 1·0—1·4 mm.
3. Head weakly chitinized	3. Head usually strongly chitinized.
4. Mid-dorsal spot on head either absent or very weak and reduced to a point.	4. Mid-dorsal spot on head ("Stirnocellus" of Wasmann) large and prominent and of varying shape — round or triangular.
5. Antennae shorter, length 1·2—1·6 times the head-width ; 14-segmented ; 3rd segment generally shorter than 2nd.	5. Antennae longer, length 1·5—2·0 times the head-width , generally 14-segmented (15-segmented in *S. proratus* Emerson) ; 3rd segment generally longeg than 2nd (subequal in *S. proratus*).
6. Fore-tibia markedly swollen	6. Fore-tibia slender, not swollen.
7. Tibial spur formula variable. In Ethiopian species 3:2:2, and in Neotropical species 2:2:2 (Silvestri, 1914). In *A. shillongensis* Roonwal and Chhotani from Assam, fore-tibial spurs varying within the species from 2-3.	7. Tibial spur formula 2:2:2.
8. Left mandible with an apical and either 2 or 3 marginal teeth ; 3rd marginal, when present, very small and lying a little above the molar plate.	8. Left mandible with an apical and 2 marginal teeth.

TABLE 2.—*Zoogeographical distribution of the species of* Anoplotermes *and* Speculitermes.

Zoogeographical Regions	Continents, etc.	Species	
		Number	Percentage
	I—Anoplotermes		
1. Neotropical	South & Central America; West Indies.	32	72·7
2. Ethiopian	Africa	11	25·0
3. Nearctic	Southern U.S.A.	1 Common with Neotropical	2·3 Common with Neotropical
4. Oriental	India (Assam)	1	2·3
	TOTAL	44 (excluding 1 Nearctic which is common with Neotropical)	100
	II—Speculitermes		
1. Neotropical	South America	4	57·1
2. Oriental	India, Burma, Ceylon	3	42·9
	TOTAL	7	100

II—NEW FIND OF *ANOPLOTERMES* IN INDIA, AND FULLER DESCRIPTION OF *A. SHILLONGENSIS* ROONWAL & CHHOTANI

The genus *Anoplotermes* has hitherto been known to have representatives from the Neotropical (S. America), the southern Nearctic (southern United States) and the Ethiopian (Africa) Regions, and none from the Oriental. Recently (Roonwal & Chhotani, 1959, 1960), we discovered the existence of the genus in India (Assam), where it is represented by a single new species, *Anoplotermes shillongensis* Roonwal & Chhotani,

which was briefly described by us (1960) some time ago, and a fuller, illustrated description is given below :—

Anoplotermes shillongensis Roonwal and Chhotani

(Table 3; and Plate 14)

1960. *Anoplotermes shillongensis* Roonwal & Chhotani, *Sci. & Cult.*, Calcutta, **25**(12), p. 701. (Preliminary description).

(a) *Material*

(i) Several workers, in a vial, in spirit, Shillong (Bishop Falls), Assam (91° 56′ E. long.; 25° 34′ N. lat.), India, coll. *A. P. Kapur*, 22nd December, 1958.

(ii) Four workers, in a vial, in spirit, Rongrengiri, District Tura, Assam (approx, 90° 45′ E. long.; 25° 45′ lat.), coll. *A. N. Fernandez*, 13th January, 1957, *ex* "earth in the forest around Rongrengiri" (Found mixed with a new species of *Speculitermes* to be described elsewhere; now separated and kept in another vial.)

Also, two slides, Nos. 6 and 7, from lots (i) and (ii) above.

(b) *Fuller Description*

1. IMAGO.—

Unknown.

2. SOLDIER.—

Unknown in the genus.

3. WORKER (Table 3; and Pl. 14).—

General.—Head-capsule pale yellow; postclypeus of same colour as head-capsule; anteclypeus whitish hyaline; labrum pale yellow, whitish hyaline anteriorly; antennae, thorax and legs pale yellow, paler than head-capsule; mandibles pale yellow, with dark brown toothed margins; abdomen dirty grey because of food matter in the intestines visible through sclerites. Head and body rather densely hairy. Total-length of head and body (excluding antennae) *ca.* 3·6-4·2 mm.

Head.—Head-capsule subcircular; broader than its length to base of mandibles (width 0·85-0·90 mm.; length 0·70-0·75 mm.); broadest a little behind the level of antennae; sides rounded and narrowing posteriorly; posterior margin round; a faint, circular, tiny, whitish mid-dorsal spot usually present (sometimes absent); Y-suture absent. *Eyes :* Two lateral, rudimentary, brown eye-spots, one on either side, usually present (sometimes absent). *Ocelli :* Absent. *Antennae :* With 14 segments; moderately pilose; pilosity gradually increasing distally; segment 1 longest, cylindrical; 2 about half the length of 1, and cylindrical; 3 somewhat shorter than 2; 4 shorter than 3; 5-8 club-shaped, and gradually increasing in length; 9-13 club-shaped, and gradually decreas-

ing in length ; last (14th) ovate, longer than the penultimate one. *Clypeus* : Divided into an ante- and a postclypeus. Postclypeus weakly swollen, pilose ; a little shorter than half its width ; divided into right and left halves by a median suture ; posterior margin convex, medially incurved, forming a notch. Anteclypeus whitish, hyaline, apilose ; subtrapezoidal ; shorter in length than postclypeus. *Labrum :* Slighty broader than long ; broadest in middle ; in front somewhat narrowing ; anterior margin rounded. *Mandibles :* Somewhat longish; outer margins incurved. Left mandible with an apical and 3 marginal teeth ; apical finger-like ; 1st marginal slightly smaller than apical ; second smaller than 1st and widely separated from it ; 3rd very minute, located just above the molar-plate. Right mandible with an apical and 2 marginal teeth ; apical finger-like ; 1st marginal somewhat shorter than apical and broader ; 2nd shorter than 1st and finger-like.

Thorax.—Pronotum : Saddle-shaped ; narrower than head-capsule ; much broader than long (width 0·53-0·55 mm. ; length 0·25-0·28 mm.) ; anterior lobe rounded and greatly upturned ; anterior margin not notched ; sides strongly narrowing posteriorly ; posterior margin substraight. *Mesonotum :* Narrower than pronotum ; posterior margin substraight. *Metanotum :* Broader than pronotum ; posterior margin straight. *Legs :* Long and thin ; fore-tibia *swollen*, middle-tibia a little less swollen, and hind-tibia slender and not swollen. Tibial spur formula variable, either 3 : 2 : 2 or 2 : 2 : 2, thus : Tibia generally with 2 apical spurs in the forelegs, sometimes (approximately 16 per cent) with a third minute rudimentary spur on outer side ; middle and hind-tibiae with 2 apical spurs each. Tarsi 4-jointed.

TABLE 3.—*Body measurements (in mm.) and indices of* Anoplotermes shillongensis *Roonwal and Chhotani.* (10 specimens measured.)
Caste.—WORKER.

BODY-PART	RANGE	HOLOTYPE
I—MEASUREMENTS		
1 Total body-length (approx.)	3·6—4·2 mm.	3·8 mm.
2. Head-length to lateral base of mandibles	0·70—0·75 mm.	0·70 mm.
3. Max. width of head .	0·85—0·90 mm.	0·90 mm.
4. Max. height of head	0·33—0·38 mm.	0·33 mm.
5. Diameter of mid-dorsal spot (when present).	0·05—0·07 mm.	0·05 mm.
6. Length of antennae	1·33—1·35 mm.	1·35 mm.
7. Max. length of pronotum	0·25—0·28 mm.	0·25 mm.
8. Max. width of pronotum . .	0·53—0·55 mm.	0·55 mm.
9. Length of hind-tibiae	0·75—0·78 mm.	0·78 mm.
II—INDICES		
1. Antennal-length/head-length	1·77—1·93	1·93
2 Antennal-length/head-width	1·50—1·56	1·50

Abdomen.—Elongated, hairy. Cerci 2-jointed, short about 0·05 mm. long. Styli absent.

Measurements.—See Table 3 above.

(c) *Type-specimens*

Holotype.—From "Material" (i) above ; one worker, Z.S.I. Reg. No. 2445/H8, in spirit, in a vial ; Shillong (Bishop Falls) Assam, India, coll. *A. P. Kapur*, 22. xii. 1958. Deposited in the National Zoological Collections in the Zoological Survey of India, Calcutta.

Paratypes.—Deposited as follows : (i) Five workers, Z.S.I. Reg. No. 2446/H8, in Zoological Survey of India, Calcutta. (ii) Two workers in Entomological Collection, Forest Research Institute, Dehra Dun. (iii) Two workers with Professor A.E. Emerson, Department of Zoology, University of Chicago, Chicago (U.S.A.).

(d) *Type-locality*

INDIA : Bishop Falls, Shillong (Assam), 25° 34′ N. lat. and 91° 56′ E. long.

(e) *Geographical Distribution*

INDIA : *Assam :* Rongrengiri (District Tura) ; and Shillong (type-locality).

(f) *Comparison*

The worker of *Anoplotermes shillongensis* Roonwal & Chhotani is close to that of the two Ethiopian species, namely, *A. pacatus* Silvestri and *A. quietus* Silvestri, but differs from them as follows :—

(1) From *A. pacatus :* (i) Head broader (0·85-0·90 *vs.* 0·83 mm.). (ii) Antennae longer both absolutely and comparative to head-length and head-width (length 1·33-1·35 *vs.* 1·20 mm.) ; index antennal length/head-length 1·77-1·93 *vs.* 1.66 ; and index antennal length/head-width 1·50-1·56 *vs.* 1·44. (iii) Hind-tibia longer (0·75-0·80 *vs.* 0·72 mm.).

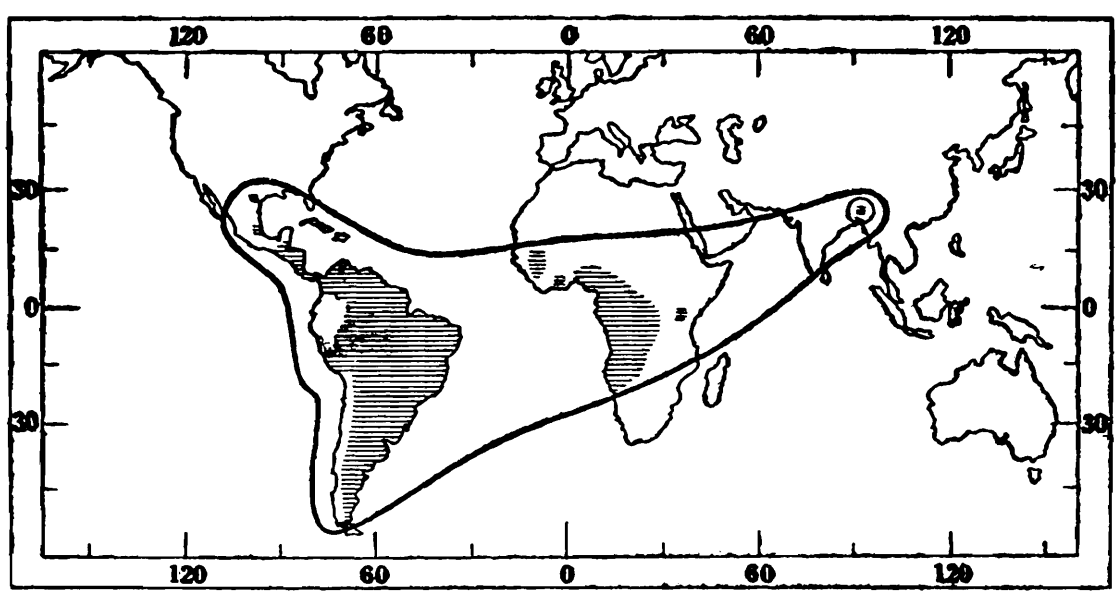
(2) From *A. quietus :* (i) Head broader (0·85-0·90 *vs.* 0·84 mm.). (ii) Antennae longer both absolutely and comparative to head-length and head-width (length 1·33-1·35 *vs.* 1·20 mm.) ; index antennal-length/head-length 1·77-1·93 *vs.* 1.54 ; index antennal-length/head-width 1·50-1·56 *vs.* 1·43. (iii) Hind-tibia shorter (0·75-0·80 *vs.* 0·85 mm.).

III—DISCUSSION

(Table 2 ; and Text-figs. 1 and 2)

Out of about 44 known species of *Anoplotermes* (Silvestri, 1901, 1914 ; Holmgren, 1912 ; Emerson, 1925 ; Sjöstedt, 1925 ; Snyder, 1949) the majority are Neotropical (72·7 per cent, one Nearctic, a few Ethiopian (25 per cent) and one Oriental (present paper), *vide* Table 2 and Text-fig. 1.

The closely allied but smaller genus, *Speculitermes* (regarded by some authorities as a subgenus of *Anoplotermes*), where only 7 species are known (*vide* Snyder, 1949 ; Roonwal & Sen-Sarma, 1959 ; and Roonwal & Chhotani, present paper), is also largely Neotropical (57.1 per cent) but is also well represented in the Oriental Region (42·9 per cent), *vide* Table 2 ; and Text-fig. 2. It has so far not been recorded from the



TEXT-FIG 1.—Map of the world, showing the known geographical distribution areas shaded in horizontal lines) of genus *Anoplotermes* Fr. Müler.

Ethiopian Region. The Oriental forms of *Speculitermes* comprise three species, one of which has two subspecies, as follows :—

1. *S. cyclops* Wasmann.

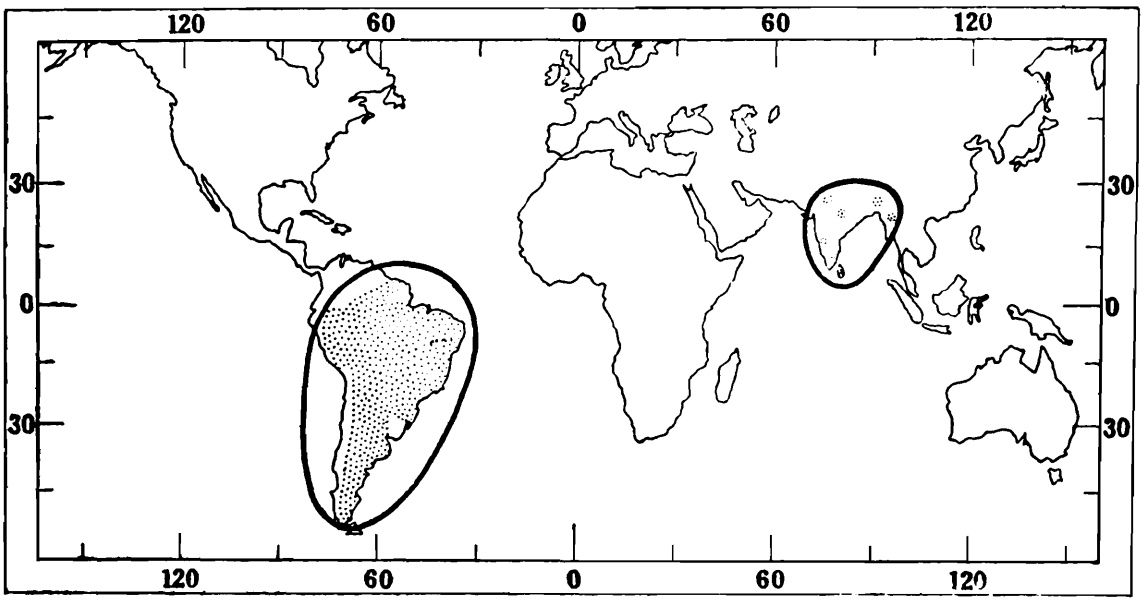
   S. cyclops, cyclops, Wasmann.—All India (except extreme south of the Peninsula, and the eastern region, *e.g.*, Bihar, Bengal and Assam) ; and Burma.

   S. cyclops sinhalensis Roonwal & Sen-Sarma.—Peninsular India ; and Ceylon.

2. *S. triangularis* Roonwal & Sen-Sarma.—India (Uttar Pradesh).

3. A new species of *Speculitermes* to be described elsewhere).—India (Assam).

From the abundance and variety of the species of both the genera of the *Anoplotermes-Speculitermes* complex, which comprises a total of about 51 species, it will be evident that the complex was most probably evolved in the Neotropical Region (South America) and thence spread



TEXT-FIG. 2.—Map of the world, showing the known geographical distribution (areas shaded with smali dots) of genus *Speculitermes* Wasmann.

to Africa and the Indo-Malayan Region while these land-masses were still contiguous and before they had started to drift apart according to Wegener's Hypothesis (Wegener, 1922 ; van der Gracht, 1928). Alternatively, one can regard the group to have evolved independently in S. America, Africa and India, a contingency which appears to be unlikely to have happened. Accepting the former view, we may suppose that the *Anoplotermes*-element, which is the stronger one (44 out of 51 species) spread to Africa, and one species, *A. shillongensis* R. & C., reached as far east as Assam (India).

The *Speculitermes*-element of this complex, which is relatively weak (7 out of 51 species), also appears to have been evolved in South America, but whether it initially occurred and evolved in the Indo-Malayan Region as well, or spread there later, is not clear, and its total absence in the intervening land-mass of Africa is puzzling.

IV—SUMMARY

1. The termite genus *Anoplotermes* Müller (Isoptera, Termitidae, Amitermitinae) is, along with the closely allied genus *Speculitermes* Wasmann, characterised by the absence of the soldier caste*—only workers and the reproductives (male and female alates) being present.

2. *Anoplotermes* was hitherto known mainly from the Neotropical (32 species) and the Ethiopian (11 species) Regions, with one of the Neotropical species extending north to the Nearctic Region (southern U.S.A.).

*Since the above was written, the soldier caste has been found in the genus *Speculitermes* by Roonwal & Chhotani, *viele* foot-note on p. 159.

3. Recently (Roonwal & Chhotani, 1959, 1960*a*), the genus has been found to occur in India (Assam) where it is represented by a single species, *A. shillongensis* Roonwal & Chhotani, which is described in detail ; a brief, preliminary description was given earlier (Roonwal & Chhotani, 1960*a*).

4. The discovery of a mainly Neotropical element in the Oriental Region is of considerable zoogeographical significance.

5. The allied genus *Speculitermes* (with 7 known species), which some authors regard as a subgenus of *Anoplotermes*, has been recorded from the Neotropical Region (S. America) and the Oriental Region (India), but is, curiously enough, totally absent in the intervening landmass of Africa (Ethiopian Region).

6. The *Anoplotermes-Speculitermes*-complex was presumably evolved in the Neotropical Region where it still dominates. The *Anoplotermes*-section thence spread to the Ethiopian Region, and also sent an offshoot to the Indian Region (a single species). The *Speculitermes*-section is well represented in both the Neotropical and the Oriental Regions, and its absence from the intervening Ethiopian Region is quite puzzling.

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