# A REVISION AND ILLUSTRATED IDENTIFICATION KEYS TO SOLDIERS AND ADULTS OF TERMITE (ORDER: ISOPTERA) IN EGYPT

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(Manuscript received 28 September 2009 )

***Abstract***

Illustrated identification keys are presented for soldiers and winged adults of seven termite species known from Egypt. These species are: *Anacanthotermes ochraceus* (Burm.), *Psammotermes hybostoma* Desneux, *Reticulitermes lucifugus* (Rossi), *Amitermes desertorum* Desneux, *Microcerotermes eugnathus* Silvestri, *Cryptotermes brevis* (Walker) and *Kalotermes flavicollis* (Fabricius). Synonymies, diagnosis, geographical distribution and habitat for each species are given.

## INTRODUCTION

Termites are group of social insects usually classified at the taxonomic rank of order Isoptera. Termites live in colonies and mostly feed on dead plant material, generally in the form of wood, leaf litter, soil and animal dung. Termites increasingly become important pests of crops and buildings in all zoogeographic regions. Damage may extend to household furniture, paper products, many synthetic materials and food items.

There are more than 2750 recognized species of termites all over the world. More than 1000 species are found in African continent. Termite diversity in North Africa is low, with about 11 species comprised of subterranean and dry wood termites (Report of United Nations, 2000). The important genera of this region are *Anacanthotermes*, *Psammotermes*, *Reticulitermes*, *Amitermes*, *Microcerotermes* and several species of family Kalotermitidae.

Termite fauna of Egypt comprised of 7 species, five of which belonging to subterranean termites and two species under dry wood termite. Several studies including distribution, ecological notes, behavior and habitat were made in Egypt (Nour and Helal 1965, El-Hemaesy,1, 1976, El-Hemaesy *et al.*, 1976, El-Hemaesy *et al.* 1980, Helal and Ali, 1981, El- Sebay, 1993 a & b, Hassan, 1993, and Batt *et al.* 2005). Laila and Kaschef (1973) described the morphological and taxonomic characteristics of *Anacanthotermes ochraceus* (Burm.), *Psammotermes hybostoma* (Desn.) and *Amitermes desertorum* Desn. Moein (1997) recorded the mound building termite *Microcerotermes eugnathus* Silvestri from the Northern Western coast of Egypt.

Termites need detail and update data about their taxonomy and geographical distributions. It is the first step for the management of these pests. The present study provides assistance in the identification of all castes of termite species of Egypt.

## MATERIALS AND METHODS

Samples of all castes of termite species were collected from infested localities in deferent regions of Egypt. Specimens were collected directly by hand from rural buildings, wood and cellulose products, papers and books, dry residues of plants, alive portions of trees and furniture or indirectly by using modified trap (El-Sebay 1991) fixed in different regions.

Desiccated specimens are difficult to identify owing to shrinkage and color change (usually darkening), therefore specimens are kept alive after collection and then killed by freezing just before being keyed. Specimens cannot be kept alive were immersed in 40% aqueous ethanol. For long-term museum storage, 85% ethanol was used (Scheffrahn and Su, 1994). Line drawings of specimens were made at 20 – 80x magnification with the aid of a camera Lucida attached to an Olympus light microscope and all measurements were made with an ocular micrometer. Many specimens of species are preserved in the main collection of the Plant Protection Research Institute, ARC, Dokki, Egypt.

Identification of termites specimens was made by Prof. Dr. M. K. El-Akkad (Classification section, Plant Protection Research Institute), using the available termite keys as follows: Sjostedt (1926), Emerson (1928), Snyder (1949 & 1954), Krishna (1961), laila and Kaschef (1973), Scheffrahn and Su (1994), Myles (1998) and Sands (1998).

## RESULTS

### Classification

Order Isoptera is represented by six families, five families compromise the lower termites (about 400 species) and one the higher termites (about 1600 species). The distinction between lower and higher is based primarily on their evolutionary development and social behavior, but mainly on the composition of the gut microflora. Lower termites have symbiotic bacteria and protozoa in their gut, which assist in the breakdown of cellulose food material. In higher termites (Family: Termitidae), bacteria are absent and only protozoa and enzymes appear to be involved in food digestion. Lower termites include five families: Mastotermitidae, Kaloter-mitidae, Termopsidae, Hodotermitidae and Rhinotermitidae.

Egyptian termite fauna is composed of eight species as follows:

Order: Isoptera

Suborder: Afontanella

Family: Hodotermitidae

[1] *Anacanthotermes ochraceus* (Burmeister)

Family: Kalotermitidae

Subfamily: Kalotermitinae

[2] *Kalotermes flavicollis* (Fabricius)

[3] *Kalotermes sinaicus* Kemner*

Subfamily: Cryptotermitinae

[4] *Cryptotermes brevis* (Walker)

Suborder: Fontanella

Family: Rhinotermitidae

Subfamily: Psammotermitinae

[5] *Psammotermes hybostoma* Desneux

[6] *Reticulitermes lucifugus* (Rossi)

Family: Termitidae

Subfamily: Amitermitinae

[7] *Amitermes desertorum* Desneux

[8] *Microcerotermes eugnathus* Silvestri

* Specimens of this species are not available and not collected or examined in the present work.

## Key to termite soldiers of Egypt

1- Antenna 26-28 segments (Fig. 8), compound eyes present (Fig. 1), fontanelle absent, left mandible with 4 teeth (Fig. 16), pronotum saddle-shaped, with three anterior lobes (Fig. 20), fore, mid and hind tibiae with 3: 4: 4 apical dark brown spurs, respectively.....
..... *Anacanthotermes ochraceus* (Burm.)

- Antenna less than 20 segments (Figs: 9, 11 & 12), compound eyes usually absent, fontanelle present or absent, mandibles variable..... 2

2- Left mandible without teeth or with a single tooth basally or medially as in Figs. 15-17..... 3

- Left mandible at least with three teeth (apical and two marginal teeth as in Figs. 14, 18 and 19)..... 5

3- Left mandible saber- shaped, without teeth, right mandible also without teeth (Figs. 5 & 17), antenna 13 segments, third segment shorter than second or fourth (Fig. 5), pronotum saddle-shaped (Fig. 20).....

*Microcerotermes eugnathus* Silvestri

- Left mandible with one tooth, antenna 14 or 16 segments..... 4

4- Antenna 14 segments, relative length formula 2=3>4<5=6<7 (Fig. 12), labrum broadly rounded at tip (Fig. 4), left and right mandible sickle – shaped, with a single marginal median tooth (Figs. 4 & 19), pronotum saddle-shaped, with anterior lobes (Fig. 20), dark brown matter visible in gut through the translucent wall of body.....
..... *Amitermes desertorum* Desn.

- Antenna 16 segments, relative length formula 2>3<4<5=6<7, labrum triangular (Fig. 3), left mandible with broad basal tooth (Fig. 15), right mandible without teeth, fontanelle indistinct , opening of it on very shallow groove on frons just posterior to antennal sockets (Fig. 3), pronotum trapezoidal, with two brown patches medially as in Fig. 21. .....
*Reticulitermes lucifugus* (Rossi)

5- Fontanelle visible from dorsal view, at the end of apical third of head (Fig. 2), left mandible with 6 - 9 teeth, right one with 5 - 6 teeth (Fig. 14), antenna 14 segments, the third one longer than the second or fourth segment (Fig. 10).....*Psammotermes hybostoma* Desn.

- Fontanelle absent, third segment of antenna shorter than the second or fourth segment, right mandible with three teeth..... 6

6- Head reddish brown to black, plug-like and deeply wrinkled (Fig. 6), frons with a bowl, surrounding by a ridge, mandibles not prominent, each one with apical tooth and two marginal teeth as in Fig. 19, pronotum as wide as head capsule, fore tibia without apical spurs ..... *Cryptotermes brevis* (Walker)

- Head yellowish brown, elongate, nearly1.8 times as long as wide (Fig. 7), frons smooth, not wrinkled, mandibles prominent, right mandible with 3 teeth, left mandible with seven teeth (Fig. 18), antenna 17 segmented, pronotum wider than head capsule, nearly one and half times as wide as head and flat (Fig. 7), fore tibia with 3 dark apical spurs..... *Kalotermes flavicollis* (F.).

## Key to winged adult termites of Egypt

1- Large species, length with wings about 27 – 32 mm, antenna 26 - 28 segments, left mandible with 3 teeth (apical and two marginal teeth as in Fig. 23, wing riches by longitudinal and cross veins (Fig. 30)... ..... *Anacanthotermes ochraceus* (Burm.)

- Smaller species, less than 15 mm. with wings, antenna less than 20 segments, left mandible with 3 - 4 teeth (apical tooth and 2 or 3 marginal teeth as in Figs 24 - 29, wing venation not as above..... 2

2 Left mandible with 4 teeth (apical tooth and 3 marginal teeth (Figs. 24 & 25), antenna 16 segments, fontanelle present ..... 3

- Left mandible with 3 teeth (apical tooth and 2 marginal teeth (Figs. 26 - 29), antenna usually 14 segments, fontanelle present or absent ..... 4

3- Radius and median veins not branched (Fig. 32), cubitus vein with 10 branches, tibiae black, tarsai yellow..... ..... *Reticulitermes lucifugus* (Rossi)

- Radius vein branched to 4 branches, median vein branched to 2 branches, cubitus vein with 3-4 branches (Fig. 31), tibiae and tarsai yellowish..... *Psammotermes hybostoma* Desn.

4- Radius vein not branched as in Figs. 33 - 34, pronotum saddle- shaped, with three anterior lobes (Fig. 20), fontanelle present, antenna 14 segments, distance between 1st and 2nd marginal teeth large (Fig. 26 – 27)..... 5

- Radius vein with 5 – 6 branches towards costal margin (Figs. 35-36), pronotum flat without anterior lobes (Fig. 22), fontanelle absent, antenna variable, distance between 1st and 2nd marginal teeth shorter (Figs. 28 – 29)..... 6

5- Median vein with 4 branches, cubitus vein with 8 branches (Fig. 34)..... *Microcerotermes eugnathus* Silvestri

- Median vein with 2 branches, cubitus vein with 14 branches (Fig. 33)..... *Amitermes desertorum* Desn.

6- Median vein united with radius vein at apical third of wing (Fig. 35), antenna 14 segments..... *Cryptotermes brevis* (Walker)

- Median vein united with radius vein by 4 cross veins and branched to 6 branches apically (Fig. 36), antenna 16-18 segments..... ..... *Kalotermes flavicollis* (F.).

## (A) Subterranean termites

### Family: Hodotermitidae

### [1] *Anacanthotermes ochraceus* (Burmeister)

*Termes ochraceus* Burmeister, 1839, Handbuch der Entomologie Berlin, p. 765.

**Type locality:** Egypt (Imago).

**Common name:** The harvester termite.

**Zoogeographical regions:** Palaearctic region.

**Distribution of the world:** North Africa, Arabian Peninsula, Persian Gulf to the mountains of Northeastern Afghanistan.

**Diagnosis:** This species can be recognized from other termites of Egypt by the following:

**Soldier:** Length 11 – 13 mm. Head yellowish brown, body dirty white, fontanelle absent, mandibles (Fig. 13) left mandible with apical tooth and 3 marginal teeth, right mandible with apical tooth and two marginal teeth, antenna 26-28 segments (Fig. 8), compound eyes kidney- shaped, ocelli absent, pronotum saddle-shaped (Fig. 20), broader than long, narrower than head, fore, mid and hind tibiae with 3:4:4 dark apical spurs, respectively.

**The alate (winged caste):** Length with wings 27 – 32 mm. Head brownish orange, abdominal tergites with pale bands alternating with broad transverse brownish orange, antenna 26-28 segments, length formula 2>3>4=5=6, fontanella and ocelli absent , left mandible (Fig. 23) with apical tooth and 2 marginal teeth (1st and 2nd marginal teeth are united), right mandible with apical tooth and 2 marginal teeth and with subsidiary tooth between apical and 1st marginal tooth as in Fig. 23, pronotum saddle-shaped , wing riches by longitudinal and cross veins, radius , median and cubitus veins with many longitudinal and cross branches (Fig. 30), fore, mid and hind tibiae with 3-4-4 apical dark spurs, respectively.

**The worker:** Length 5 – 13 mm. Mandibles are similar to those of the winged adult (Fig. 23).

**Habitat:** This termite attacks rural buildings, wood (frames of windows and doors), dry root residues of plants, dry palm trees and paper products.

**Specimens:** Samples were collected from the following localities:

1. Fayoum Governorate: 15 colonies, 71 alates, 4 soliers and large number of workers. (Tamiya, Sinnuris, El-Mandarah, Traiza and Atsa).
2. New Valley Governorate: El-Maassarah, El-Rashdah, El-Monirah, El-Kaser and Moot (5 colonies, workers only).

3. South Sinai Governorate: Saint Katherine and wadi Ferran (3 Colonies: workers only).
4. Sharkiah Governorate: Abu Hammad (2 colonies: workers only).
5. Ismailia Governorate:: El- Kassasin (2 colonies: workers only).

## Family: Rhinotermitidae

### (2) *Psammotermes hybostma* Desneux

*Psammotermes hybostma* Desneux, 1902, Ann. Soc. Ent. Belg. 46 (10): 437
*Psammotermes fuscofemoralis* Sjoested, 1904, Akad. Handll. 38 (4): 62.
*Psammotermes assuanensis* Sjoested, 1912, Arkiv for Zoolgi, 7 (27): 3.

**Type locality:** Biskra, Algeria.

**Common name:** The sand termite.

**Zoogeographical regions:** Palaearctic region.

**Distribution of the world:** North Africa.

**Diagnosis:** This species can be recognized from other termites of Egypt by the following:

**Soldier:** Length 4 – 8 mm. Head brownish yellow, with distinct fontanelle at end of apical third of frons (Fig. 2), compound eyes and ocelli absent, mandibles saber-shaped (Fig. 2 & 14), right mandible with 5 - 6 teeth, left one with 6 – 9 teeth , apical tooth of left mandible smaller than apical tooth of right mandible, antenna 14-segmented, relative length formula as follows 2<3>4=5=6<7=8 (Fig. 9 & 10), pronotum trapezoidal in shape, narrower than head, nearly twice as wide as long , fore, mid and hind tibiae with 3:2:2 dark apical spurs, respectively.

**The alate (winged caste):** Length with wings 9 - 12 mm. Head blackish brown, broadly oval, fontanelle visible, yellowish and rounded in shape, left one with apical tooth and 3 marginal teeth, right mandible with apical tooth and 2 marginal teeth and with subsidiary tooth between apical and 1st marginal tooth (Fig. 24), compound eye and ocelli present, antenna 16 segments, wings membranous, smoky white, radius, vein with 4 branches, median vein with two branches and cubitus vein with 4 branches as in Fig. 31, pronotum trapezoidal - shaped.

**The worker:** length 4 – 9 mm. Head yellowish, oval in shape, thorax and abdomen yellowish brown, compound eyes and ocelli absent, mandibles similar to the winged adult.

**Specimens:** Samples were collected from the following localities:

1. Aswan Governorate: Edfo ( El-Hager, El-Ghonaimiah, Tomen and Draw Nag El-Shona), Kom Ombo (Qielit, El-Adwah and El-Dahshanah) and Aswan (Eikab El-

Kibly, Eikab El-Bahary and Nasr El-Noba) (26 colonies: 19 alates, 93 soldiers and large numbers of workers).

2. Qena Governorate: Howah, Luxor, Nag Hamady, Al-Ashraf (big soldiers were collected from this locality from residues of tree), Arment, Esna and Farshout (10 colonies: 2 alates, 28 soldiers and large numbers of workers).
3. Sohag Governorate: Sakolta, Akhmim, Tahta, El-Maraghah and Sohag (12 colonies: 270 soldiers and large numbers of workers).
4. Assiut Governorate: Sahel Selim, El-Ghanaim and El-Fateh (6 colonies: 65 soldiers and large numbers of workers).
5. Fayoum Governorate: Tamiya (2 colonies: 16 alates, 15 soldiers and large numbers of workers).
6. Menia Governorate: Samalot (one colony: 2 soldiers and large numbers of workers).
7. New valley Governorate: El-Monairah and El-Kasr (3 colonies: number of workers).
8. South Sinai Governorate: Wadi Feiran and Dir El-Banat (3 colonies: 13 soldiers and large numbers of workers).
9. Ismailia Governorate: Ismailia (one colony: 11 soldiers and large numbers of workers).
10. Alexandria Governorate: Nobariah (3 colonies: 4 soldiers and large numbers of workers).
11. Beheira Governorate: Wadi El- Natroun (3 colonies: 22 soldiers and few numbers of workers).

## (3) *Reticulitermes lucifugus* (Rossi)

*Termes lucifugus* Rossi, 1792, Mantissa Insectorum. Etr.p. 107.

*Leucotermes lucifugus* Holmgren, 1911, Kungliga Svenska Vetenskap. Handlinger 46 (6): 69.

*Leucotermes (Reticulitermes) lucifugus* Holmgren, 1913, Kungliga Svenska Vetenskap. Handlinger 50 (2): 60.

*Reticulitermes lucifugus* Rossi , Bank And Snyder 1920, p. 20.

**Type locality:** Shores of Mediterranean.

**Zoogeographical Regions:** Palaearctic region.

**Distribution of the world:** France, Italy and Belgium.

**Diagnosis:** Castes of this species can be recognized from other termites of Egypt by the following:

**Soldier:** Length 3.5 – 4.5 mm. Head yellowish brown, fontanelle indistinct , opening of it on very shallow groove on frons just posterior to antennal sockets (Fig. 3),

compound eyes and ocelli absent, mandibles dark brown, scimitar-shaped, right mandible without teeth, left one with basal broad tooth (Figs. 3 & 15), antenna 16 segments, relative length formula as follows 2>3<4<5=6<7=8 (Fig. 11), labrum triangular, with pointed apex (Fig. 3) , pronotum trapezoidal in shape, narrower than head, nearly two times as wide as long , with two brown patches medially(Fig. 21), fore, mid and hind tibiae with 3:2:2 dark apical spurs, respectively.

**The alate (winged caste):** It is not collected during this study, the diagnosis of it from literatures: Length with wings 10 – 12 mm, body dark brown to black, tarsi yellowish, compound eyes and ocelli present, mandibles as in Fig. 25, left mandible with apical tooth and 4 marginal teeth, right mandible with apical tooth and 2 marginal teeth and with subsidiary tooth between apical and 1st marginal tooth, antenna 16 segments, the third one shortest, radius and median veins of wing not branched, cubitus vein with 10 branches as in fig. 32, pronotum flat, without anterior lobes, nearly 2.2 times as wide as long.

**The workers:** mandibles of this caste are similar to those of the winged adult.

**Specimens:** Eighteen soldiers and few numbers of workers were collected from Semouha (Alexandria Governorate) from a single colony. The colony was in the wall of the building and the castes were collected from the wood windows and doors frames in 13th flat. The nest was contact with the ground by tunnels through cracks in the foundations.

**Habitat:** this termite attacks the wood of buildings or other wood structure.

## Family: Termitidae

### Subfamily: Amiterminae

### (4) *Amitermes desertorum* Desneux

*Amitermes desertorum* Desneux, 1902, Ann. Soc. Ent. Belg. 46(10): 346-440.

**Type locality:** Unknown

**Common name:** The desert subterranean termite.

**Zoogeographical Regions:** Palaearctic region.

**Distribution of the world:** Algeria and Egypt.

**Diagnosis:** Soldiers and workers of this termite differ from other termites in Egypt by visible of the dark brown matter in gut through the translucent wall of the body.

**Soldier:** Length 4.5 – 6.0 mm. Head yellowish light brown, fontanelle present and exist at apical median part of frons (Fig. 4), compound eyes and ocelli absent, mandibles dark brown, sub equal, sickle-shaped, each mandible with a single marginal tooth medially (Fig. 4 &16), antenna 14 segments, relative length formula as follows

2=3>4<5=6<7=8 (Fig. 12), labrum triangular, broadly rounded at tip (Fig. 4), pronotum saddle-shaped (Fig. 20), with three lobes anteriorly, broader than long, narrower than head, fore, mid and hind tibiae with 3:2:2 dark apical spurs, respectively.

**The alate (winged caste):** Length with wings 11-13 mm. Head and pronotum brownish black, fontanelle visible and oval in shaped, compound eyes large and prominent, ocelli present but small and white, left mandible with apical tooth and 2 marginal teeth, the distance between 1st and 2nd marginal tooth large (Fig. 26), right mandible with apical tooth and three marginal teeth (Fig. 26), antenna 14 segments, the third one shortest, wings densely covered with minute bristles, costa and radius veins not branched, median vein with two branches, cubitus vein with 10 branches (Fig. 33), pronotum saddle – shaped and narrower than the head.

**The worker:** length 3 - 4.5 mm. The compound eyes and ocelli are absent, mandibles are similar to those of the winged adult.

**Specimens:** Samples were collected from a single colony from Moot, Dakhla Oasis (New Valley Governorate).

**Habitat:** The castes of this termite were collected from alive portions of Hibscus roots and also were collected from dead portions of Morus and Hibscus stumps.

### (5) *Microcerotermes eugnathus* Silvestri

*Microcerotermes eugnathus* Silvestri, 1901, Bollettino die Musei di Zool. E Anatomia comparata della Univ. di Torino XVI(389):1-8.

**Type locality:** Unknown.

**Common name:** The mound building termite.

**Zoogeographical Regions:** Palaearctic region.

**Distribution of the world:** North Africa.

**Diagnosis:** Castes of this species can be recognized from other termites of Egypt by the following:

**Soldier:** Length 3.5 – 4.5 mm. Head elongated, broadly rounded at posterior margin (Fig. 5), head pale brown at apical half, yellowish at posterior half, Fontanelle small, exist at apical median portion of frons (Fig. 5), compound eyes and ocelli absent, mandibles dark brown, sub equal, sabre-shaped, without teeth (Figs. 5 & 17), antenna 13 segments, relative length formula as follows 2>3<4=5<6<7=8 (Fig. 5), labrum triangular, broadly rounded at tip (Fig. 5), pronotum saddle-shaped (Fig. 20), with three lobes anteriorly, broader than long, narrower than head, fore, mid and hind tibiae with 3:2:2 dark apical spurs, respectively.

**The alate (winged caste):** Length with wings 9 - 10 mm. Body blackish dark brown, tibiae blackish, tarsai yellowish, compound eyes and ocelli present, Antenna 14 segments, left mandible with apical tooth and 2 marginal teeth, the distance between them is large (Fig. 27), right mandible with apical tooth and two marginal teeth (Fig. 27), wings pale brown to greyish, costa , subcosta and radius veins sclerotized, without branches, median vein with two branches , cubitus with 8 branches (Fig. 34), pronotum saddle-shaped (Fig. 20), with three lobes anteriorly, broader than long, narrower than head, fore, mid and hind tibiae with 3:2:2 dark apical spurs, respectively.

**The worker:** length 3.5 - 4.5 mm. The compound eyes and ocelli are absent, mandibles are similar to those of the winged adult.

**Specimens:** Samples (18 winged adult, 6 soldiers and large numbers of workers) were collected from six colonies from Al Arish (North Sinai Governorate).

**Habitat:** This species recorded from the Northern Western Coast and Western desert of Egypt, attacking human dwellings and trees (gum Arabic, Olive, Fig, Ethel and Vine).

## B- Non - subterranean termites

### Family: Kalotermitidae

Kalotermitidae is the largest lower termites family with 21 genera and 350 species. They are drywood termites. Three species were recorded from Egypt. These species are: *Kalotermes flavicollis* (Fabricius), *Kalotermes sinaicus* Kemner and *Cryptotermes brevis* (Walker).

## 6- Cryptotermes brevis (Walker)

*Termes brevis* walker, 1853, List of specimens of neuropterous insects in the collection of the British Museum Part III. London: British Museum, 542.

*Calotermes(Cryptotermes) brevis*, Holmgren, 1911, Kungliga Svenska Vetenskap. Handlinger 46 (6): 55.

*Kalotermes (Cryptotermes ) brevis*, Emerson, 1925, Zoologica 6 (4) : 326.

*Cryptotermes piceatus* Snyder, 1922, National Museum 61(20): 14.

*Cryptotermes pseudobrevis* Fuller, 1921, South African J. of natural History 39(1): 30.

This species was recorded from structural timbers introduced to Egypt through Port Said Sea Port prior to 1965 by international trade (El-Hemaesy *et al.* 1976).

**Type locality:** Jamaica.

**Common name:** West Indian termite.

**Zoogeographical Regions:** Australia, Nearctic and Neotropical regions.

**Distribution of the world:** Argentina, Australia, Brazil, Chile, Colombia, Ecuador, Mexico, United States, Spain, Uruguay and the West Indies.

**Diagnosis:** Castes of this species can be recognized from other termites of Egypt by the following:

**Soldier:** Length 4 –5 mm. Head deep reddish brown to black, plug- like and deeply wrinkled (Fig. 6), soldiers use their heads to plug- off galleries from invading ants, fontanelle, compound eyes and ocelli absent, frons rimmed above by a ridge, ridge surrounding frons forming bowl, mandibles not prominent, each mandible with apical tooth and 2 marginal teeth (Fig. 19), antenna 16 segments, pronotum as wide as head capsule, flat, without anterior lobes (Fig. 22), fore tibia without apical spurs.

**The alate (winged caste):** Length with wings 10 - 11 mm. Body dull brown, compound eyes and ocelli present, antenna 16 segments, relative length formula as follows: 2>3>4<5=6=7, mandibles as in Fig. 28: left mandible with apical tooth and 2 marginal teeth ($1^{st}$ +$2^{nd}$ marginal teeth are united and $3^{rd}$ marginal tooth, right mandible with apical tooth and two marginal teeth (Fig. 28), wings membranous, hairless equal in size, costa, subcosta and radius veins darkened and thickened, radias vein with 5 branches towards costal margin, median vein united with radias vein at apical fourth as in Fig. 35, cubitus vein with 12 branches (median, cubitus and its branches veins are very paler.

**The worker:** length 4 - 5 mm. The compound eyes and ocelli are absent, mandibles are similar to those of the winged caste.

**Specimens:** Sixty winged adult and few numbers of workers were collected from ten colonies from Port Said Governorate. One winged adult and three workers were collected from wooden frames in library at Al-Arish (North Sinai Governorate).

**Habitat:** This species attacks timbers, wood-work in buildings, furniture and the other wood materials.

## 7- Kalotermes flavicollis (Fabricius)

*Termes flavicollis* Fabricius, 1793, Entomologica Systematica. Copenhagen: Vol. 2, p. 91.

**Type locality:** UnKnown.

**Common name:** European dry wood termite.

**Zoogeographical Regions:** Palaearctic region.

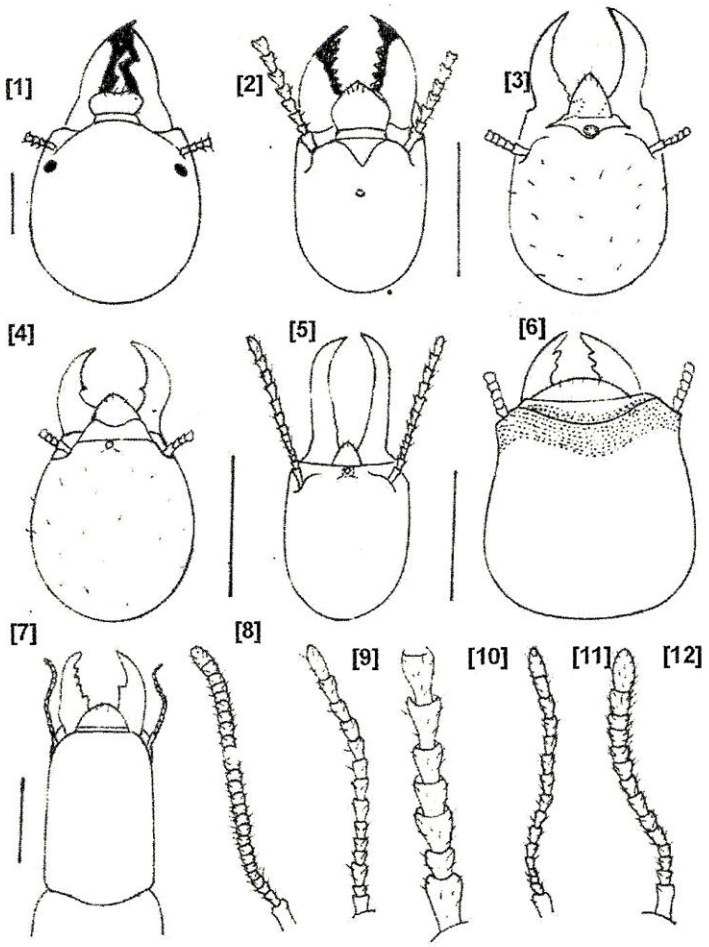
**Distribution of the world:** Algeria, Egypt, France, Italy, Libya, Portugal, Spain, Syria, Tunisia and Yugoslavia.

**Diagnosis:** Castes of this species can be recognized from other termites of Egypt by the following:

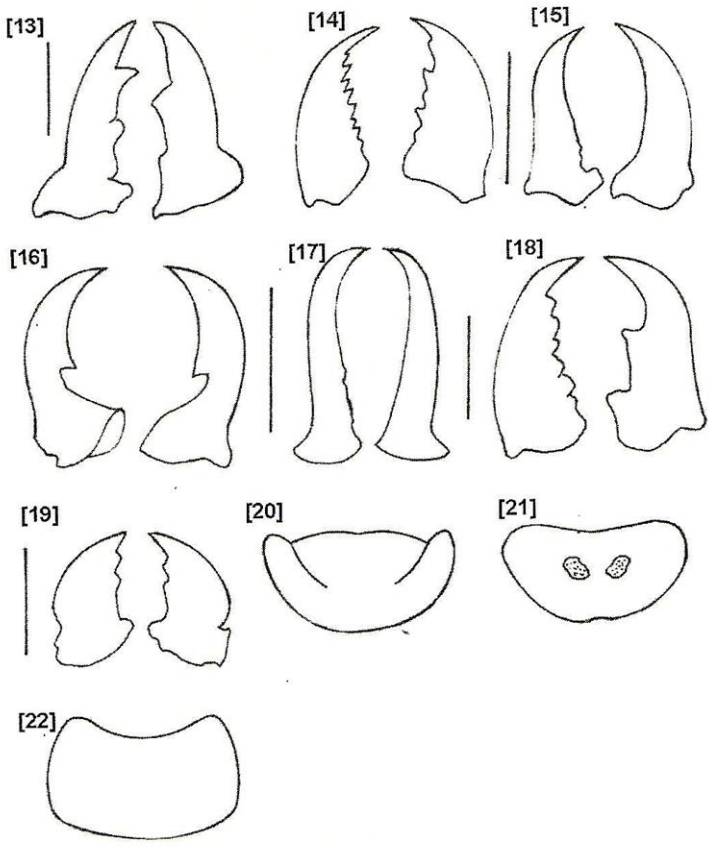
**Soldier:** Length 10 – 12 mm. Head yellowish brown, elongate, nearly 1.8 times as long as wide (Fig. 7), fontanelle, compound eyes and ocelli absent, mandibles (Fig. 18) prominent, right mandible with apical tooth and 2 marginal teeth, left mandible with seven teeth, antenna 17 segments, pronotum wider than head capsule, nearly one and half times as wide as long, flat, without anterior lobes (Fig. 7), fore, mid and hind tiblae with 3:3:2 dark apical spurs, respectively.

**The alate (winged caste):** Length with wings 10 mm. Body yellowish brown, compound eyes and ocelli present, antenna 17 segments, mandibles as in Fig. 29: right mandible with apical tooth and two marginal teeth, left mandible with apical tooth and 2 marginal teeth ($1^{st}$+2nd are united and third tooth), wings membranous, hairless equal in size, costa, subcosta and radius veins darkened and thickened, radius vein with 6 branches reaches to costal margin, radius and median veins reached by four cross veins, cubitus vein with nearly thirteen branches (Fig. 36)

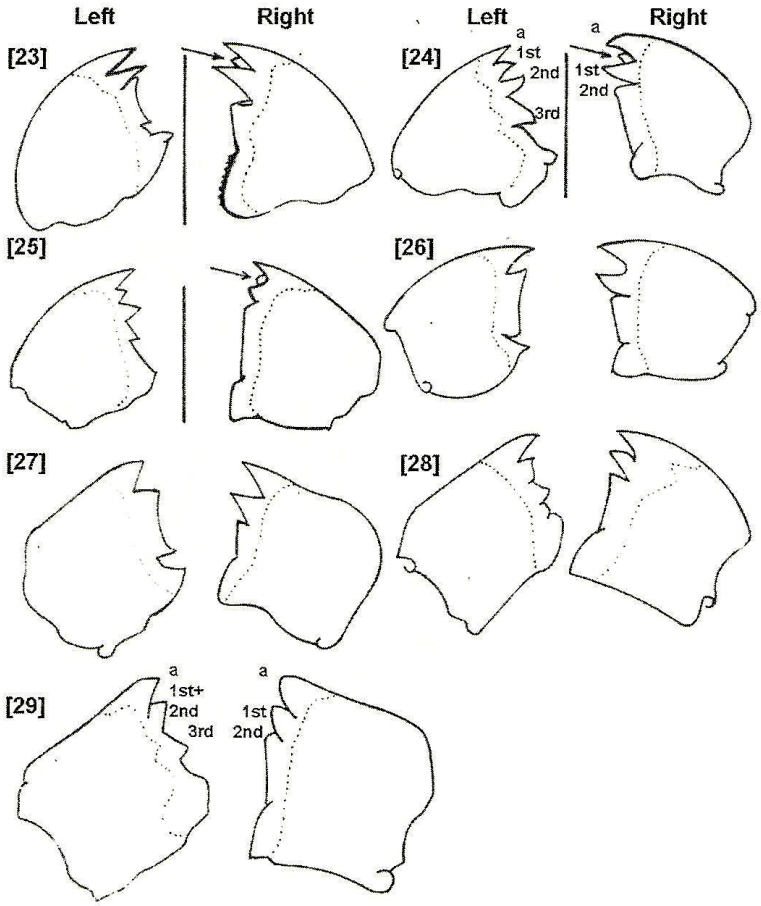
**The worker:** length 4 - 5 mm. The compound eyes and ocelli are absent, mandibles are similar to those of the winged adult.



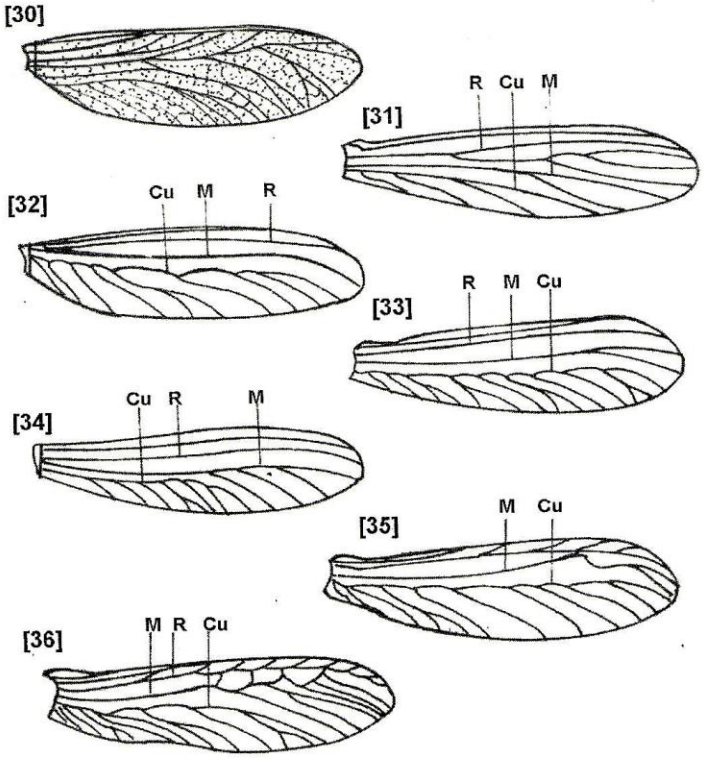

Figs. 1 - 7: Dorsal view of heads of termite soldiers: (1) *Anacanthotermes ochraceus* (Burm.), Bar = 0.5 mm.; (2) *Psammotermes hybostoma* Desn.; (3) *Reticulitermes lucifugus* (Rossi), Bar = 1 mm (4) *Amitermes desertorum* (Desn.); (5) *Microcerotermes eugnathus* Silvestri, Bar = 1 mm.; (6) *Cryptotermes brevis* (Walker), Bar = 0.5 mm.; (7) *Kalotermes flavicollis* (fabricius), Bar = 0.5 mm.; Figs. 8 - 12: Antenna of: (8) *Anacanthotermes ochraceus* (Burm.); (9) *Psammotermes hybostoma* Desn.; (10) Basal segment of *Psammotermes hybostoma* Desn. (inlarged); (11) *Reticulitermes lucifugus* (Rossi); (12) *Amitermes desertorum* (Desn.).




Figs. 13 - 19: Dorsal view of mandibles of termite soldier: (13) *Anacanthotermes ochraceus* (Brum.), Bar = 0.5 mm.; (14) *Psammotermes hybostoma Desn.;* (15) *Reticulitermes lucifugus* (Rossi), Bar= 1mm.; (16) *Amitermes desertorum* (Desn.); (17) *Microcertermes eugnathus* Silvestri, Bar = 0.5 mm.; (18) *Kalotermes flavicollis* (Fabricius), Bar = 1 mm.; (19) *Cryptotermes brevis* (Walker) , Bar = 0.5 mm.: Figs. 20 - 22: Pronotum of: (20) *Anacanthoterme ochraceus* (Brum.),; (21) *Reticulitermes lucifugus* (Rossi) ; (22) *Cryptotermes brevis* (Walker).




Figs. 23 29: Mandibles of winged adult: (23) *Anacanthotermes ochraceus* (Burn.) Bar = 1mm; (24) *Psammotermes hybostoma* Desen. Bar = 0.5 mm; (25)*Reticulitermes lucifugus* (Rossi) Bar = 0.5 mm; (26) *Amitermes desertorum* (desn.); (27) *Microcerotermes eugnathus* Silvestri; (28) *Cryptotermes brevis* (Walker); (29) *Kalotermes flavicollis* (Fabricius). a, apical tooth; 1st. first tooth,;2nd , second tooth and 3rd, third tooth; Arrow = subsidiary tooth.




Figs. 30 - 36: Wings of winged adult: (30) *Anacanthotermes ochraceus* (Burn.); (31) *Psammotermes hybostoma* Desn.; (32) *Reticulitermes lucifugus* (Rossi); *Amitermes desertorum* (Desn.); (34) *Microcerotermes eugnathus* Silvestri; (35) *Cryptotermes brevis* (Walker); (36) *Kalotermes flavicollis* (Fabricius); Cu, Cubital vein; M, medial vein and R, radial vein.

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# مراجعه ومفاتيح تعريف توضيحية للجنود والأطوار البالغة للنمل الأبيض ( رتبة متساوية الأجنحة) في مصر

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*معهد بحوث وقاية النباتات – مركز البحوث الزراعية – الدقي – الجيزة*

تضمن البحث عمل مراجعة تصنيفية لسبعة أنواع من النمل الأبيض جمعت وصنفت من خلال هذا العمل، وهي تنتمي لأربعة فصائل وسبعة أجناس مختلفة. كما تم عمل مفاتيح تصنيفية منفصلة لكل من الجنود والأطوار البالغة المجنحة مصحوبة برسوم توضيحية للصفات التصنيفية التي يمكن إستخدامها لفصل هذه الأنواع بسهولة للعاملين في مجال مكافحة النمل الأبيض. كما تضمن البحث أيضا الأسماء المرادفة والعامة لكل نوع والتشخيص والموطن الأصلى والأماكن التي تم جمع الأنواع منها من مختلف أنحاء جمهورية مصر العربية والتوزيع الجغرافي في العالم والعوائل النباتية التي يهاجمها ويتغذى عليها.