

Identification key for Some Phoretic Acarididies (Acari: Acaridida) from Upper Egypt with Description of Two New Species

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Abstract

The study herein presents brief characterization and identification key for some Acaridides (Acari: Acaridida), phoretic on termites collected from termite nests of different locations in Upper Egypt. The present work is a continuity of the collecting activity of the first author during 1998 to 2008. Samples were collected from certain nests of termites, *Psammotermes hypostoma* Desneux (New Valley, Assiut and Qena Governorates) and *Amitermes desertorum* (Desneux) (Aswan Governorate). The identification key is simple and easy to understand and the diagnosis is in most cases based on genera and species. The two new acarid mite species, extracted from nests of the sand termite, *Psammotermes hypostoma* Desneux are described and illustrated in this study.

Introduction

The Acaridida mites are among the most successful arthropods to exploit spatial and temporally restricted habitats. Dispersal between habitat patches is affected by phoretic association between the specialized deutonymphs of the Acaridida mites and the host which may be either

another arthropod or a vertebrate (OC'onnor, 1982 and Houch and OC'onnor, 1991). Knowledge of the Acaridida mites is still in a relatively early stage of development. Most of non-parasitic species have been described from either the adults or the dispersing deutonymphs, but not both. With the exception of some groups of mammalian ectoparasites, relatively few species have been described from any group of the Acaridida mites in most area of the world, especially in Egypt. Many species pertaining to this group were recorded in Upper Egypt by Eraky (1993, 1994a&b, 1997, 1998, 1999a,b & c, 2000a&b), Eraky and Shoker (1993a,b and 1994) and Early and Osman (2008a,b&c). The systematic studies of the Acaridida fauna of North America were recorded by OC'onnor (1989, 1990 and 1991) and OC'onnor and Houck (1989).

On the other side, the super cohort Acaridides contains the species of economic importance, utilizes a wide range of food including grain, fishmeal and substances containing sugars (e.g., dried fruits) but the large number of acaridid species associated with these materials and a relatively few can be considered as an important pests (Hughes, 1976). This group includes the

economically important families, of which some cause mange and scabies in domestic animals, a number of families include parasites and commensals of mammals and birds, and those associated with stored products. In addition to infesting food, certain species also live in human habitats where they are found in damp situations favoring the growth of fungi upon which they feed. Members of one family, commonly referred to as house dust mites, are of considerable medical importance in being the causative agents of a topic asthma and rhinitis, the allergy being present in their fecal pellets. The majority of species are living as saprophytic and fungivores in soil litter, debris and organic manure. Others can be found on different economic plants, causing injury to plant directly by feeding, or by transmitting various disease agents (Zakhvatkin, 1941; Baker and Wharton, 1952; Scheucher, 1959; Hughes & Jackson, 1958 and Hughes, 1961 & 1976). The hypopus (heteromorphic deutonymph) in this group is a succeeding stage both in dispersal and behavior, highly resistant to environmental stress. Some are adapted for dispersal by phoresy, in most cases phoretic on insects by having attachment organs in the form of sucker-plate (Griffits, 1977; Houck & OC'onnor, 1991; OC'onnor, 1994; Kettle, 1995; Myles, 2002 and Eraky, 1998, 1999a, b & c and 2008a, b & c).

Study on the Acaridida has received the attention of several authors (viz., Samsinak, 1957, 1960, 1962a&b, 1966 and 1972 in Czeck republic; Griffits, 1960, 1964, 1966 and 1967 in England; Mahunka, 1961a&b, 1962a&b, 1963a&b, 1964, 1967, 1968, 1969a&b, 1972, 1973a,b&c, 1974a&b, 1975a&b, 1976, 1977, 1978a,b,c&d, 1979, 1981, and 1982a&b and Mahunka and Eraky, 1987 in Hungary; Woodring 1963, 1969 & 1973 and OC'onnor, 1982, 1984a&b, 1989, 1990, 1991, 1993 and 1997 in America; Fain, 1967 to 1984 in Belgium; Eraky, 1993 to 2000a,b, Eraky and Shoker, 1993a,b and 1994; Abdel-Sater and Eraky, 2002 and Eraky and Osman, 2008a,b&c).

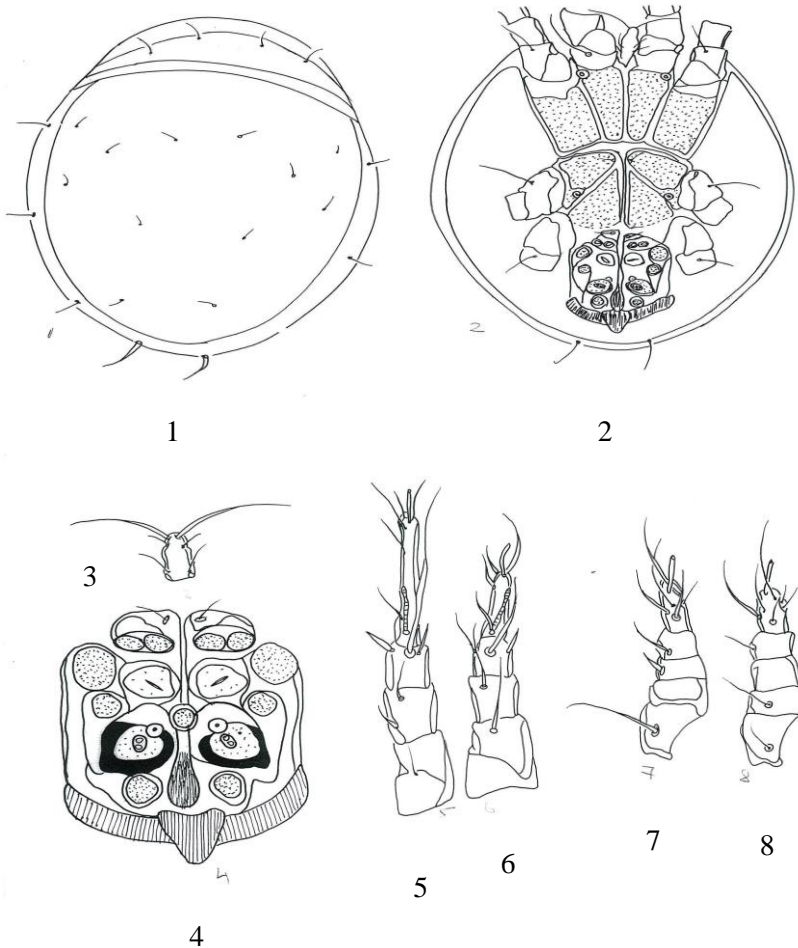
Description of the new species
***Forcellinia assiuti* sp.n. (Hypopus)**

Measurements: Length: 111-117 μ m & Width: 95-98 μ m
Dorsum (Fig. 1). Body approximately ovoid in outline, anteriorly and posteriorly rounded. Propodosoma comparatively triangular in its outline. Both pairs of dorsal setae of propodosoma relatively long and thin, inner one standing anteriorly to the outer pair, yet in the same length. Dorsejugal region present, without any sculpture. Dorsal surface smooth. Notogaster setae short and thin, but well visible, especially the marginal ones.

Ventrum (Fig. 2). Infracapitulum of gnathosoma (Fig. 3) oblong, palpi hardly separated off, solenidia long and thick, infra-

capitular setae well developed. Decurrence of apodemes and the shape of epimeres agree with basic type of genus. Apodemes well-developed, all epimeres closed. Epimeres I and III with suction disks each. A paired suction discs standing at genital opening in addition to a pair of simple setae standing above them.

Adhering plate (Fig. 4). Adhering plate large, entirely filling space between legs IV, but removed from the body end. Disks D and DS of the adhering plate well-developed, D1 and D2 approximately large, the inner rings of D2 removed from each other, most disks ornamented with foveolae.



Figs. (1-8): *Forcellinia assiuti* sp. n.

1- Dorsum, 2- Ventrum, 3- Gnathosoma, 4- Adhering plate,
5- Leg I, 6- Leg II, 7- Leg III, 8- Leg IV.

Legs (Figs. 5-8). All legs with well-developed claws. Adhering setae of all legs simple. Solenidia ϕ_1 of tarsi of legs I and II very long, longer than entire tarsi of both legs, much longer on legs I. Solenidia ω_1 of tarsi of legs I and II, approximately longer and thicker than ω_3 .

Material examined: Holotype and 6 paratypes extracted from the nests of the sand termite, *Psammotermes hypostoma* Desneux: El Ghorieb, Assiut Governorate, Egypt, Leg. M.K. Bohibah. 20/6/2007. Holotype and 4 paratypes deposited in Plant Pro-

tection Department, Faculty of Agriculture, Assiut University, Assiut, Egypt; 2 paratypes deposited in the Arachnoidea collection of the Hungarian Natural History Museum, Budapest.

Remarks: The new species is well relegable to the genus *Forcellinia* Oudemans, 1924 and stands very near to *Forcellinia egyptiaca* Eraky, 1998, collected from the nests of the sand termite, *Psammotermes hypostoma* Desneux El-Kharga Oasis, New Valley, Egypt and may be distinguished from it by the following characters:

Egyptiaca Eraky, 1998	Assiuti sp.n.
• Dorsosejugal region wide, ornamented with punclulae	• Dorsosejugal region narrow, without any sculpture.
• Infracapitulum of gnathosoma rounded, palpi not separated off	• Infracapitulum of gnathosoma oblong, palpi hardly separated off.
• Infracapitular setae thin, scarcely visible	• Infracapitular setae well-developed.
• Epimeres I and IV with suction disks, epimeres III without any sculpture	• Epimeres I and III with suction disks each, a paired suction disks standing on epimeres IV.
• Tarsi of legs I and II approximately short.	• Tarsi of legs I and II long, longer at Leg I.

***Caloglyphus problematica* sp.n. (Hypopus)**

Measurements: Length: 120-130 μm , & Width: 85-94 μm .
Dorsum (Fig.9). Propodosoma nearly triangular in its outline, inner pair of propodosomatic setate (Sci) at the same length of the outer one (Sce), originated in front of them. Surface of propodosoma smooth, without any sculpture. Dorsosejugal region ornamented with transversal

lines. Notogastral surface smooth, setae short and thin. Ventrum (Fig. 10). Infracapitulum of gnathosoma (Fig. 11) long, palpi short, hardly distinct. Solenidia long, infracapitular setae well observable.

Apodemes of anterior sternal plate weakly developed, all terminating free, thus epimeres open. Apodemes III free medially, sejugal ones missing. In pos-

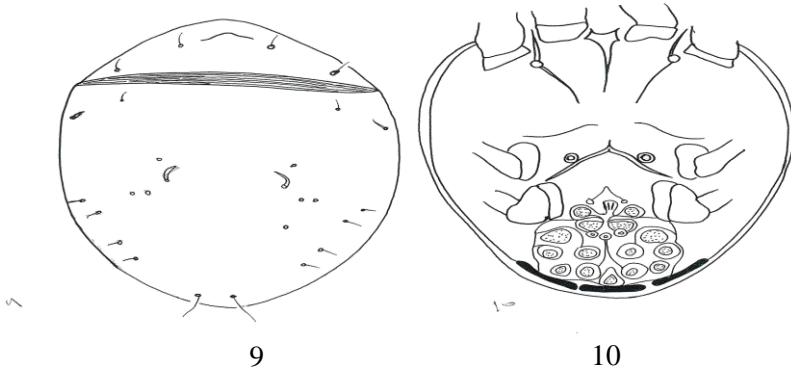
terior sternal plate, intermediate sternal apodeme short, ending free and posterior sternal apodeme missing. Eipmeres I, III and IV with well-developed suc-torial disks each, larger on epi-mere IV.

Adhering plate (Fig. 12) very large, occupied entire body surface behind and partly between legs IV.

Legs (Figs. 13-16). All legs with normal developed claws. Adhering setae of legs I approximately long and robust, legs II-IV with simple setae each. Solenidia ω_1 and ω_3 of tarsi of legs I and II

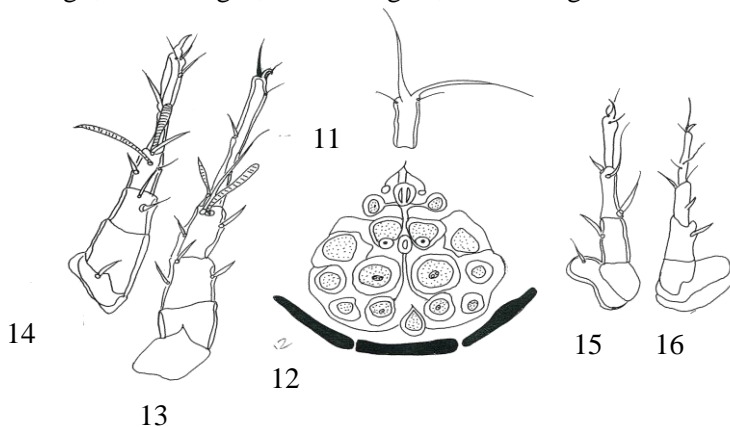
shorter than solenidia ϕ_1 of both legs.

Material examined: Holotype and 4 paratypes, extracted from the nests of the sand termite, *Psammotermes hyposotoma* Des-neux, inside the wood of old and unoccupied apiary. El-Ghorieb, Assiut University, Assiut, Egypt. Leg. M.K. Bohibah, 10-08-2007. Holotype and 2 paratypes depos-ited in Plant Protection Depart-ment, Faculty of Agriculture, Assiut University, Egypt and 2 paratypes deposited in the Arachnidea collection of the Hungarian Natural History Mu-seum, Budapest.



(9-16): *Caloglyphus problematica* sp.n.

9- Dorsum, 10-Ventrum, 11-Gnathosoma, 12- Adhering plate, 13- Leg I, 14- Leg II, 15- Leg III, 16- Leg IV



Remarks: This species appears to be related to certain genera. The final place of the species can be made only after further revisional work, its relegation to the genus *Caloglyphus* Berlese, 1923 is still problematic. The new species differs from its congeners by the course, the shape of apodemes and the shape of adhering plate distinguishes it also from other related taxa.

Key of 18 Acaridides species collected from the nests of termites in Upper Egypt

The present study includes an identification key for 18 Acaridides mite species (Table 1) belonging to 2 families and 10 genera, based on the morphological characters of the hypopial stages. All species are collected from termite nests from three locations of Upper Egypt (Assiut, Qena, Aswan and New Valley).

(Drawings of all species are presented in Eraky, 1998, 1999a,b&c, and 2000b and Eraky and Osman, 2008c).

- 1 (12) All legs long and tapering, the two hind pairs of legs being directed forward **Family: Histiostomatidae**
- 2 (8) Epimeres I and III with well-developed normal suckers or cups, sensory setate of leg I normal developed, shorter than entire tarsus.
- 3 (9) All legs with well-developed claws, dorsosejugal region with sculpture consists of transversal lines, ribs or striations.
- 4 (10) Suctorial plate normal-developed (e.g. two pairs of movable, two pairs of immovable suckers and other five structures: ring or cups), epimeres I and III with normal suckers or discs.
- 5 (6) Apodemes III fused medially, sejugal one missing. Solenidia ω_1 and ϕ_1 of tarsi of legs I and II normal-developed ***Histiostoma mannai* Eraky, 1999a**
- 6 (5) Apodemes III free medially, sejugal apodemes represented, only fragmentally, solenidia ω_1 and ϕ_1 of tarsi I and II large and clavate ***Histosotma camphori* Eraky, 1999c**
- 7 (11) Apodemes III not touching each other medially and have a small lateral arch, both pairs of scapular setae short and thin, originating far from each other, behind the lateral margin of the propodosoma ... ***Histiostoma sammari* Eraky, 1999c**
- 8 (2) Epimeres I without normal suckers or cups, epimeres III with normal suction cups, sensory setae of legs I much longer than entire tarsi
- 9 (3) All legs with normal-developed claws, except legs IV clawless, dorsosejugal region ornamented with transversal lines.

- 10 (4) Suctorial plate with two pairs of conoids, epimeres I and III with alveoli.
- 11 (7) Apodermes III fused medially without lateral arch, both pairs of scapular setae originating along a common line up and parallel the dorsosejugal suture.
- 12 (1) All legs short and stout, the two hind pairs of legs being directed backward **Family: Acaridae**
- 13 (51) All legs with well-developed claws, dorsal surface smooth, without any sculpture.
- 14 (24) Dorsosejugal region approximately wide, suctorial plate small removed from the posterior body margin by a distance exceeding its length.
- 15 (25) Propodosoma narrow, approximately sinuous anteriorly, its surface smooth.
- 16 (22) Tarsi of legs III and IV long and thin, normally forming a right angle with the rest of the legs, infracapitulum of gnathosoma normal-developed, longer than wide, its surface smooth.
- 17 (20) Tarsi of legs I to IV with 2 spoon-shaped setae each, infracapitulum of gnathosoma short, hardly longer than wide
- 18 (27) Dorsal setae very long and thick, except the marginal ones, inner pair of prodorsal setae much longer than the outer one. ***Acotyledon ahmadi* Eraky and Osman, 2008c**
- 19 (21) Epimeres I and III with alveoli, epimeres IV with normal discs, anterior and posterior sternal plates standing not far from each other ***Acotyledon lamiai* Eraky, 1998**
- 20 (17) Tarsi of legs I to IV with 3 large calyciform setae each; infracapitulum of gnathosoma long, much longer than wide
- 21 (19) No any structures on epimere I, setae on epimere III and normal disks on epimere IV; anterior and posterior plates standing far from each other by a long distance.
- 22 (16) Tarsi of legs III and IV short and stout; infracapitulum of gnathosoma piriform, surface ornamented with punctulae.
- 23 (26) Hysterosomatic setae long and thick, each with two lateral branches, the marginal setae very short and spimple; inner pair of scapular setae shorter than the outer one, the latter much longer ***Cosmoglyphus barbisetus* Eraky, 1999c**
- 24 (14) Dorsosejugal region approximately narrow, suctorial plate large, situated not far from the posterior body margin.
- 25 (15) Propodosoma wide, nearly triangular in its outline, its surface with sculpture.
- 26 (23) Hysterosomatic setae approximately short and thin without lateral branches, scapular setae also thin
..... ***Cosmoglyphus manure* Negm, 2007**

- 27 (18) Dorsal setae short and simple, inner scapular setae shorter than the outer one.
- 28 (29) Body very long, nearly equally rounded anteriorly and posteriorly, propodosoma ornamented with foveolae in its anterior part, its posterior part membranous ***Caloglyphus ornatus* Eraky 2000b**
- 29 (28) Body approximately oblong, surface of propodosma smooth
- 30 (31) Adhering plate very large, occupied entire body surface behind and partly between legs IV. All apodemes short ending free, thus epimeres of anterior and posterior plates open ***Caloglyphus problematica* sp. n.**
- 31 (30) Adhering plate normal-developed, standing approximately far from the body end, apodemes long, fused medially, thus all epimeres closed.
- 32 (57) All apodemes long, thus all epimeres closed, entire surface of epimeres ornamented with punctulae.
- 33 (34) Dorsosejugal region ornamented with heavy punctulae, infracapitulum of gnathosoma small and rounded..... ***Forcellinia egyptiaca* Eraky, 1998**
- 34 (33) Dorsosejugal region smooth, without any sculpture, infracapitulum of gnathosoma normal-developed, longer than wide ***Forcellinia assiuti* sp.n.**
- 35 (46) Dorsal setae very short and scarce, epimeres I, III and IV with normal-developed suction disks.
- 36 (41) Dorsosejugal region wide, ornamented with transversal lines, scapular setae short, inner pair much shorter.
- 37 (39) Propodosomal margin convexity rounded, laterally with a denticulate body margin; infracapitulum of gnathosoma wide approximately trapezoid ***Mahunkallinia serratus* Eraky, 1999b**
- 38 (42) Epimere I with a minute, epimere III with a very small suction disks, epimere IV with a pair of setae standing near primordial of genital opening, tarsi I and II with large straight claws, those in legs III and IV falcate-shaped.
- 39 (37) Propodosmal margin rounded, gnathosoma developed as a convexity labular projection, bears only two pairs of setae, inner one very small.
- 40 (43) All apodemes short ending free in a granulate halo in the middle of the entire body surface, legs I and II with large lanceolate setae each, absent on the two hind legs.
- 41 (36) Dorsosejugal region narrow, ornamented with scarce punctulae, outer pair of scapular setae long and thick, much longer than the inner one ***Mahunkaglyphus solimani* Eraky, 1998**

- 42 (38) Epimeres I, III and IV without any sculpture, legs I and II with normal claws each, legs III and IV with very thin ones.
- 43 (40) Apodemes of anterior sternal plate short, ending free, no granular halo present, all apodemes on posterior sternal plate missing, no lanceolate setae on legs I and II.
- 44 (49) Dorsosejugal region present only as a band, prodorsal setae comparatively long, both pairs at the same length.
- 45 (50) Gnathosoma approximately rounded, bears only a pair of thin and short setae, suctorial plate large, standing close to the posterior body margin.
- 46 (35) Dorsal setae approximately long, no any structures on epimeres I, III and IV ***Acarus solimani Eraky, 1999c***
- 47 (52) Leg I with very long setiform and feebly bent claw, leg II with bottle-shaped one, legs III and IV with long and thick claws each, all apodemes long, except posterior sternal apodeme missing, thus epimeres I, II and III close, epimere IV open.
- 48 (53) Epimeres I, III and IV with normal suction disks each, propodosoma narrow encircling hysterosoma like a narrow strip.
- 49 (44) Dorsosejugal region normal, but narrow without any sculpture, propodosomal setae reduced.
- 50 (45) Gnathosoma modified, long with thickened base, suctorial plate normal-developed, originating not far from the body end..... ***Froriepia negmi Eraky, 1999b***
- 51 (13) All legs with normal claws, except legs IV clawless, dorsal surface with heavy sculpture
- 52 (47) Legs I to III with very short claws each, legs IV clawless, apodemes of anterior sternal plate short, ending free, on posterior sternal plate all apodemes long.
- 53 (48) Epimeres I and III with or without alveoli, epimeres IV with small suction disks, propodosoma enlarged anteriorly, nearly triangular, longer than the half length of hysterosoma.
- 54 (56) Dorsal side ornamented with longitudinal, arcuate and irregular lines. Dorsosejugal region smooth, without any sculpture.
- 55 (58) Epimeres I and III without any sculpture, epimeres IV with normal suction disks and a pair of setate, ap. IV standing far from ap. sp., the later not reaching primordial of genital opening ***Calvolia zaheri Eraky, 1998***
- 56 (54) Dorsal surface ornamented with punctulae and longitudinal and arcuate lines; propodosma with punctulae and transverse lines medially, dorsosejugal region ornamented with heavy transversal lines.
- 57 (32) All apodomes short, thus all epimeres open, entire surface

of epimeres smooth.

- 58 (55)** Epimeres I with alveoli, epimeres III without any sculpture, epimeres IV with a pair of long setae adjacent to primordial of genital opening ***Calvolia solimani* Eraky, 1999b**

Table (1): Distribution of some Acaridides (Acari: Acaridida) phoretic on termites in Upper Egypt.

No.	Mite species	Study area
	Family: Acaridae Ewing and Nesbitt, 1942	
1	<i>Acarus solimani</i> Eraky, 1999c	Aswan
2	<i>Acotyledon ahmadi</i> Eraky and Osman, 2008c	Qena
3	<i>Acotyledon lamiai</i> Eraky, 1998	New Valley
4	<i>Acotyledon longsetoses</i> Eraky, 1999b	Aswan
5	<i>Caloglyphus ornatus</i> Eraky, 2000b	Aswan
6	<i>Caloglyphus problematica</i> sp.n.	Assiut
7	<i>Calvolia solimani</i> Eraky, 1999b	Aswan
8	<i>Calvolia zaheri</i> Eraky, 1998	New Valley
9	<i>Cosmoglyphus barbisetus</i> Eraky, 1999c	Aswan
10	<i>Cosmoglyphus manuri</i> Negm, 2007	Assiut
11	<i>Forcellinia assiuti</i> sp.n.	Assiut
12	<i>Forcellinia egyptiaca</i> Eraky, 1998	New Valley
13	<i>Froriepiea negmi</i> Eraky, 1999b	Aswan
14	<i>Mahunkaglyphus solimani</i> Eraky, 1998	New Valley
15	<i>Mahunkallinia serratus</i> Eraky, 1999b	Aswan
	Family: Histiostomatidae (Anoetidae Oudemans, 1904)	
16	<i>Histiostoma camphori</i> Eraky, 1999c	Aswan
17	<i>Histiostoma mannai</i> Eraky, 1999a	Aswan
18	<i>Histiostoma sammari</i> Eraky, 1999c	Aswan

All types established herein are deposited in the Acari collection of the Plant Protection Department, Faculty of Agriculture, Assiut University, Egypt and the Arachnoidea collection of the Hungarian Natural History Museum, Budapest, Hungary.

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مفتاح تقسيمي لبعض أنواع حلم الأكاريديدا المستخرجة من عشوش النمل الأبيض مع وصف نوعان جديان

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لقد تم إجراء العديد من الدراسات على أنواع الحلم التابعة لفصيلتي الأكاريدى والهستوستوماتيدى والمستخرجة من مناطق بيئية مختلفة في صعيد مصر ولقد أهتمت هذه الدراسات بالناحية التقسيمية حيث تم وصف وتصنيف العديد من الأنواع الجديدة والتي لم يتم اكتشافها من قبل ضمن الأنواع المعروفة . وإهتمت الدراسة الحالية بعمل مفتاح تقسيمي للأنواع المصاحبة للنمل الأبيض فقط والمستخرجة من عشوش النمل الأبيض بمحافظات (أسيوط – قنا – أسوان – الوادى الجديد) حيث تم تسجيلها من قبل بواسطة كل من :

Eraky (1998, 1999a,b&c, 2000), Eraky and Osman (2008)

هذا بالإضافة للنوعان الجديان .

ولقد اشتملت الدراسة الحالية على الموضوعات التالية :

- 1- إنشاء مفتاحاً تقسيماً لكل الأجناس والأنواع التابعة لفصيلتي الأكاريدى والهستوستوماتيدى (18 نوع) والمستخرجة فقط من عشوش النمل الأبيض من صعيد مصر خلال الأعوام من 1998 وحتى 2008 .
- 2- وصف ومناقشة العديد من الصفات المورفولوجية الهامة للحوريات الثانية من هذه المجموعة وإجراء المقارنات المختلفة مع الأنواع قريبة الشبه .
- 3- اكتشاف نوعان جديان تابعان لفصيلا الأكاريدى وهما :

Caloglyphus problematica sp.n.

Forcellinia assiuti sp.n.

ولقد أجريت هذه الدراسات من الوجهة التقسيمية ونوقشت الصفات المورفولوجية للأنواع قريبة الشبه لإظهار أهم الاختلافات والتي على أساسها تم فصل الأجناس والأنواع التابعة لكل جنس وكذلك بالنسبة للنوعان الجديان .
وتفيد هذه الدراسات التقسيمية لمعرفة الأنواع الأكاروسية المتواجدة والمصاحبة للنمل الأبيض حيث أن دراسة تلك الأنواع فى مصر لم ينل اهتمام الدارسين بالمقارنة بالمجموعات الأكاروسية الأخرى .