

## Key to the Families of scale insects in Egypt (Hemiptera: Sternorrhyncha: Coccoidea)

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### ABSTRACT

A key to the families of super family Coccoidea in Egypt, based on the morphological characters of the adult female, is presented.

**Keywords:** Hemiptera, Coccoidea, Egypt, Key.

### INTRODUCTION

Since very long time, scale insects and mealybugs have been highly attractive to taxonomist. This trend might have been due to their economic importance, the result had to be the accumulation of about 7900 described species and 48 families with great amount of diversity (Ben-Dov *et al.* (2010)).

The Egyptian scale insects fauna includes thirteen families (Mohammad & Ghabbour, 2008); Aclerdidae (2 spp), Asterolecaniidae (3 spp), Coccidae (28 spp), Dactylopiidae (2 spp), Diaspididae (94 spp), Eriococcidae (2 spp), Halimococcidae (1sp), Lecanodiaspididae (1sp), Margarodidae (1sp), Monophlebidae (5 spp), Ortheziidae (1sp), Phoenicococcidae (1sp), and Pseudococcidae (49 spp).

The main purpose of the present work is to construct usable key leading to the identification and throw some light upon the highest level of coccoid categories in Egypt as recently handled.

An illustration of each known Egyptian family is given to represent every particular family.

### MATERIAL AND METHOD

Information for the character was compiled from the literature , i.e. Morrisson (1925,1928, 1952), Stickney (1934); Russell (1941); McConnell (1954); Miller, & González, (1975); Howell & Williams (1976); Gill (1993); Ben-Dov (1993, 1994, and 2006); Ben-Dov, *et al* (1997); Ben-Dov & German (2003); Ben-Dov, *et al* (2010).

As for literature by scientists who locally worked on species in Egypt, Hall (1926); Habib (1957); Ezzat (1958, 1962, 1969); Mohammad & Nada (1991); Mohammad & Nada (1995); Mohammad *et al.* (1995); Ghabbour & Mohammad (1996); Mohammad (1998); Nada & Mohammad (1993); Saleh *et al* (1995); Mohammad & Ghabbour (2008).

Illustrations to identify each family were included from the above mentioned literature.

### RESULT

#### Key to the families of Scale insect in Egypt (Based on Adult Female)

1. Abdominal spiracles present.....2

- Abdominal spiracles absent.....4
- 2(1)** Anal ring distinct, with numerous pores and 6 long setae; antennae with a single stout terminal seta; eyes usually stalked; legs relatively large and long as compared to the size of the body; predominant pore type quadrilocular.....**Ortheziidae (ensign scales or ortheziids)** .....(Fig.1)
- Anal ring reduce, with no pores or setae; antennae without a single stout terminal setae; eyes rarely stalked. legs relatively large, but definitely shorter than the body; pore type quadrilocular not predominant.....3
- 3(2)** Without mouthparts; cicatrices absent; Thoracic spiracles usually with pores in atrium; front legs greatly enlarged for digging; anal opening generally not obvious; forming a cyst.....**Margarodidae (ground pearls or margarodids)** (Fig.2)
- With mouthparts; cicatrices present; Thoracic spiracles without pores in atrium; front legs not greatly enlarged for digging; anal opening generally obvious; not forming a cyst.....**Monophlebidae (Giant scales or monophlebids)** (Fig.3)
- 4(1)** Abdomen terminating in fused segments forming a pygidium.....5
- Abdomen without posterior segments fused to form a pygidium.....6
- 5(4)** With pygidial lobes and plates; tubular ducts not divided longitudinally, 8-shaped.....**Diaspididae (armored scales or diaspidis)** (Fig.4)
- Without pygidial lobes or plates; tubular ducts divided longitudinally, 8shaped.....**Halimococcidae (palm scales or halimococcids)** (Fig.5)
- 6 (4)** 8- shaped pores or duct present .....
- 8- shaped pores or duct absent .....
- 7(6)** Antennae normally with multiple segments; cribriform plates present; small anal cleft present.....**Lecanodiaspididae (false pit scales or lecanodiaspidis)** (Fig.6)
- Antennae normally 1 segment; cribriform plates and small anal cleft absent.....8
- 8 (7)** Body margin with series of dermal papillae, spiracles with bar; 8-shaped duct scattered on abdomen; duct without invagination and truncate filaments.....**Phoenicococcidae (palm scales or phoenicococcid)** (Fig.7)
- Body margin without series of dermal papillae; spiracles without bar; 8-shaped pores form a band around the body margin; duct with small invagination and a much enlarged truncate filaments.....**Asterolecaniidae (pit scales or asterolecaniids)** (Fig.8)
- 9 (6)** With anal plate.....10
- Without anal plate.....11
- 10(9)** Antennae 1- segmented; spiracular atrium not connected to body margin by furrow containing wax pores; legs absent or represented by small sclerotized areas; anal opening covered with single plate; posterior apex of body with short anal cleft; margin of posterior abdomen crenulate.....**Aclerdidae (flat grass scales or aclerdids)** (Fig.9)
- Antennae normally with multiple segments; spiracular atrium connected to body margin by furrow containing wax pores; legs present; anal opening covered with two anal plate, posterior apex of body with a well developed anal cleft; margin of posterior abdomen not crenulate .....
- Coccidae (soft scales or coccids)** (Fig.10)
- 11(9)** Numerous, thick truncate seta present; clusters of quinquelocular pores surrounding orifice of some tubular ducts; anal ring without pores and setae.....**Dactylopiidae (chochineal scales or dactylopiids)** (Fig.11)
- Thick truncate seta absent; clusters of quinquelocular pores surrounding orifice of some tubular ducts absent; anal ring with pores and setae.....12
- 12.(11)** With ostioles; cerarii at least on anal lobe; one or more circuli; tubular duct without invagination; cruciform pores absent; anal lobes not strongly protruding .....
- Pseudococcidae (mealybugs or pseudococcids)** (Fig.12)
- |Ostioles, cerarii and circuli absent; strongly protruding anal lobes; cruciform pores present.....**Eriococcidae (felt scales or eriococcids)** (Fig.13)

Illustrations of the species and the subspecies presented in the Key of Coccoidea of Egypt

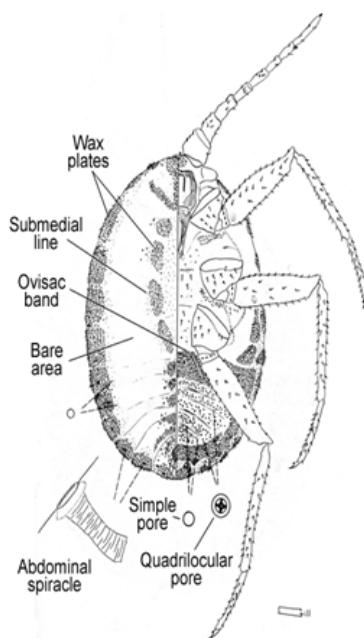


Fig. 1: *Insignorthezia insignis* (Browne) Illustration by Hollyoak from Ben-Dov *et al.* (2010)

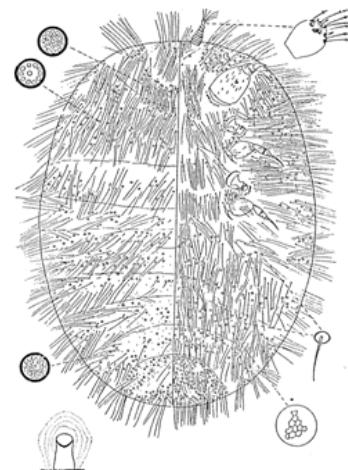


Fig. 2: *Porphyrophora hirsutissima* (Hall) Illustration by Mohammad *et al.* (1995)

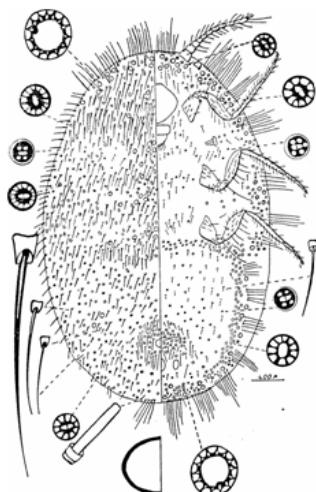


Fig. 3: *Icerya seychellarum seychellarum* (Westwood) Illustration by Mohammad (1998)

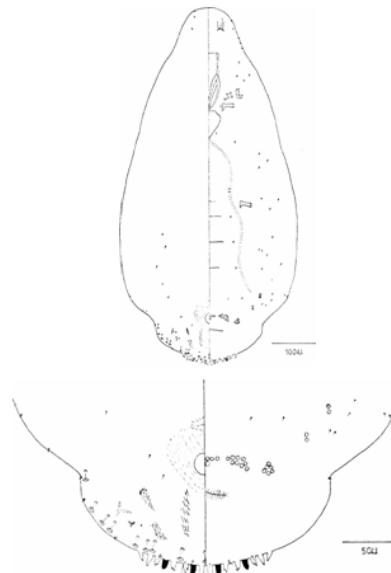


Fig. 4: *Leucaspis riccae* Targioni Tozzetti, 1881 Illustration by Saleh *et al.* (1995)

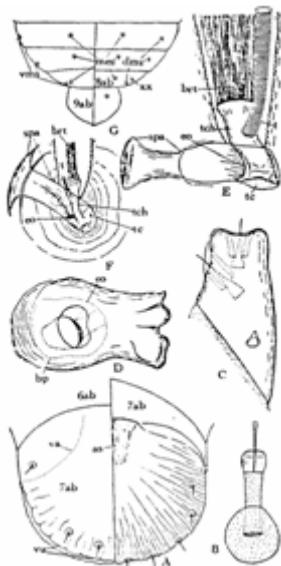


Fig. 5: *Halimococcus thebaicae* Hall Illustration by Stickney (1934)

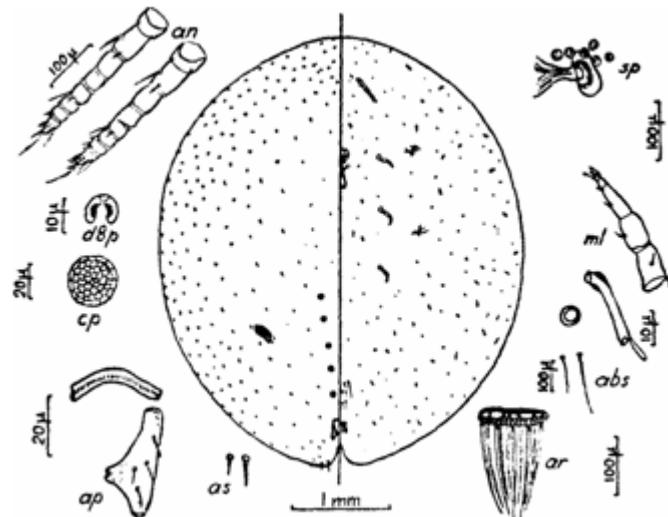


Fig. 6: *Lecanodiaspis africana* (Newstead)  
Illustration by Habib (1957)

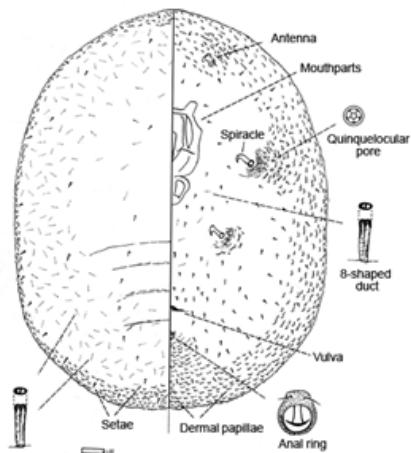


Fig. 7: *Phoenicococcus marlatti* Cockerell  
Illustration by Ray Gill (1993)

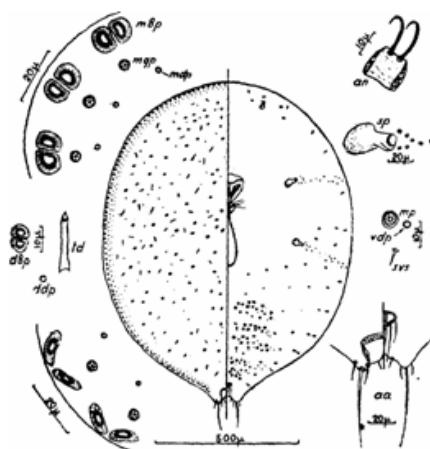


Fig. 8: *Bambusaspis bambusae* (Boisduval)  
Illustration by Habib (1957)

## DISCUSSION

The classification of the superfamily Coccoidea is based almost on the characters of the adult females and particularly on those which can be noticed on the slide-mounted preparations made of cuticle. Examples of characters used in the key: abdominal spiracles present or absent; anal ring distinct or reduced; abdomen terminating in fused segments forming a pygidium or not; with or without mouthparts; cicatrices present or absent; cribiform plates present or absent; body margin with series of dermal

papillae or absent; thick truncate seta present or not; with or without ostioles and cerarii at least on anal lobe.

## REFERENCES

- Ben-Dov, Y. (1993): A systematic catalogue of the soft scale insects of the world (Homoptera : Coccoidea: Coccidae). Flora & Fauna Handbooks No. 9: 536.
- Ben-Dov, Y. (1994): A systematic catalogue of the mealybugs of the world (Insecta, Homoptera : Coccoidea: Pseudococcidae & Putoidae) with data on geographical distribution, host plants, biology and economic importance. Intercept limited, Andover, UK 686pp.
- Ben-Dov, Y. (2006): A systematic catalogue of eight scale insects families (Hemiptera: Coccoidea) of the world. Aclerdidae, Asterolecaniidae, Beesoniidae, Carayonemidae, Conchaspidae, Dactylopiidae, Kerriidae and Lecanodiapsididae. Elsevier, Amsterdam 368 pp.
- Ben-Dov, Y. & German, V. (2003): A systematic catalogue of the Diaspididae (armoured scale insects) of the world. Andover, Hants, UK 1112pp.
- Ben-Dov, Y., HODSON, C. J. & Miller, D. R. (1997): Changes and comments on the taxonomy and nomenclature of some taxa in the families Coccidae, Eriococcidae and Pseudococcidae (Homoptera: Coccoidea). *Phytoparasitica* 25(3): 199-206.
- Ben-Dov, Y., Miller, D. R. & Gibson, G. A. P. (2010): A systematic catalogue of the scale insects of the world. // [HYPERLINK  
"http://www.sel.barc.usda.gov/scalenet/scalenet.htm"](http://www.sel.barc.usda.gov/scalenet/scalenet.htm)  
[//http://www.sel.barc.usda.gov/scalenet/scalenet.htm](http://www.sel.barc.usda.gov/scalenet/scalenet.htm)<sup>1</sup>.
- Ezzat, Y. M. (1958): Classification of the scale insects, family Diaspididae, as known to occur in Egypt [Homoptera: Coccoidea]. *Bull. Soc. Ent. Egypte* 42: 233-251.
- Ezzat, Y. M. (1962): A synopsis of the family Pseudococcidae as known in Egypt, U.A.R. [Homoptera: Coccoidea]. *Bull. Soc. Ent. Egypte* 46: 155-170.
- Ezzat, Y. M. & Hussein, N. A. (1969): Redescription and classification of the family Coccidae in U.A.R. (Homoptera: Coccoidea). *Bull. Soc. Ent. Egypte*, 51: 359-426.
- Ghabbour, M. W. and Mohammad, Z. K. (1996): The Diaspididae of Egypt (Coccoidea: Homoptera). *J. Egyptian Ger. Soc. Zoology* 21(E): 337-369.
- Gill, R.J. (1993): The Scale Insects of California: Part 2. The Minor Families (Homoptera: Coccoidea). California Depart. Food & Agric. Sacramento, CA. 241 pp.
- Habib, A. (1957): The Asterolecaniinae of Egypt. *Bull. Soc. Ent. d'Egypte*, 41: 371-379.
- Hall, W. J. (1926): Contribution of the knowledge of the Coccidae of Egypt. (Min. Agr. Tech. and Sci. Serv. Bull., 72.
- Howell, J. O. & Williams, M. L. (1976): An annotated key to the families of scale insects (Homoptera: Coccoidea) of America, North of Mexico, based on characteristics of the adult female. *Annals of the Ent.Soc. America*, 69:181-189.
- McConnell, H. S. 1954 (1953): A classification of the coccid family Aclerdidae (Coccoidea, Homoptera). *Bull. Maryland Agric. Experiment Station*, A75: 1-121.
- Miller, D. R. & González, R. H. (1975): A taxonomic analysis of the Eriococcidae of Chile. *Revista Chilena de Ent.*, 9: 131-163.

- Mohammad, Z. K. (1998): A taxonomic study of Seychelles fluted scale *Icerya seychellorum* (Westwood, 1855) (Homoptera : Coccoidea: Margarodidae). J. Union Arab Biol, Cairo Vol. 9(A) Zoology, 73-84.
- Mohammad, Z. K., Ezzat, Y. M. & Aly, A. G. (1995): Recent review of Egyptian little known species of Coccoidea (Homoptera). J. Egypt Ger. Soc. Zool. Vol.16 (E) Entomology, 477-533
- Mohammad, Z. K. and Ghabbour, M. W. (2008): Updating list of superfamily Coccoidea (Hemiptera) as known to exist in Egypt. J. Egypt Ger. Soc. Zool. Vol. 56E Entomology, 147-162
- Mohammad, Z. K. & Nada, S. M. A.(1991): Observation on the Coccidae of Egypt (Homoptera- Coccoidea- Coccidae). Fourth Arab Congress of Plant protection Cairo.
- Mohammad, Z. K. & Nada, S. M. A. (1995): The Pseudococcidae of Egypt (Coccoidea: Homoptera). Egyptian J. of Agr. Res. 73(3): 607-637.
- Morrison, H. (1925): Classification of scale insects of the subfamily Ortheziinae. J. Agric. Res., 30: 97-154
- Morrison, H. (1928): A classification of the higher groups and genera of the coccid family Margarodidae. U.S. Dept. Agr. Tech. Bull., 52: 239.
- Morrison, H. (1952): Classification of the Ortheziidae. Supplement to Classification of scale insects of the subfamily Ortheziinae. United States Dep. Agric. Tech. Bull., 1052: 1-80.
- Nada, S. M. A. & Mohammad, Z. K. (1993): The family Dactylopiidae in Egypt (Homoptera- Coccoidea). Egyptian J. Agri. Res., 71: 951-959.
- Russell, L. M. (1941): A classification of the scale insect genus *Asterolecanium*. United States Department of Agric., Miscellaneous Pub., 424: 1-319.
- Saleh, M. R. A. Aly, A.G. & Mohammad, Z. K. (1995): Morphological studies on the olive scale insect, *Leucaspis riccae* Targioni (Homoptera: Diaspididae). Egypt. J. Appl. Sci.,10 (3).
- Stickney, F. S. (1934): The external anatomy of the red date scale *Phoenicococcus marlatti* Cockerell, and its allies. United States Dep. Agric. Tech. Bull., 404: 1-162.

### ARABIC SUMMARY

#### مفتاح لتمييز فصائل فوق فصيلة Coccoidea في مصر ( Hemiptera-Coccoidea )

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تم تصميم مفتاح تصنيفي للتمييز بين الفصائل الممثلة لفوق فصيلة Coccoidea في مصر بناء على الصفات المميزة للحشرة الكاملة (إناث). كما تم الإستعانة برسم توضيحي يبين صفات كل فصيلة.