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Review of Hemerobiidae (Insecta:Neuroptera) from Egypt, with a new record

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ABSTRACT

The Egyptian fauna of family Hemerobiidae (Neuroptera) is reviewed. Three species belonging to two genera; *Wesmaelius* (*Kimminsia) navasi* (Andreu, 1911), *Wesmaelius* (*Kimminsia) nervosus* (Fabricius, 1793) and *Sympherobius* (*Sympherobius) fallax* Navas, 1908 are recognized, with the first species is a new record for the Neuroptera fauna of Egypt. Male genetalia of *W. navasi* and *W. nervosus* are dissected and photographed. A key to Egyptian taxa is included together with color images. Synonyms, diagnoses, specimen examined and distributional data are also given.

Key words: Brown lacewing, Hemerobiidae, Neuroptera, predators, distribution, new record.

INTRODUCTION

Family Hemerobiidae or brown lacewing is the third largest family within order Neuroptera; suborder Hemerobiiformia. It is represented by approximately 600 species worldwide (Oswald, 2004; Farahi *et al.*, 2009). Brown lacewings are small to medium-sized insects, easily recognized by their pale brown, frequently cryptic coloration, moniliform antennae, and wings held roof-like over the abdomen when resting (Monserrat, 2002).

Members of this family are similar to green lacewings (Family: Chrysopidae) but usually smaller, brown, membranous wings usually more rounded and covered with small hairs. Most brown lacewings are aphidophagous predators, usually having a narrow host range compared to green lacewings. They play a role in biological control, being more effective at low aphid densities than green lacewings as adults of these insects do not need to feed on honey dew to lay eggs. The low temperature of brown lacewings also gives them a survival advantage during cold spells and frosts in temperate climates (Neuenschwander *et al*. 1975; Kovanci *et al*. 2014).

Females of brown lacewings lay eggs, usually singly or in small groups. There are three larval instars and larval development needs about 15-20 days for completion. Larvae are active predators with broad bodies and curved, impressive mandibles used to catch and suck up body fluids from soft-bodied, phytophagous insects. Pupation occurs in a small silk capsule (Monserrat, 2002).

Currently, Hemerobiidae is divided into nine subfamilies; Drepanepterginae, Megalominae, Microminae, Carobiinae, Zachobiellinae, Drepanacrinae, Notiobiellinae, Hemerobiinae and Sympherobiinae (Orduna *et al*. 2016). Only the last two subfamilies are represented in the Egyptian fauna (El Hamouly & Fadl, 2011).

Navas (1926) recorded only one species, *Hemerobius nervosus* Fabricius from Egypt. Since then, no detailed study has been conducted on the Hemerobiidae fauna in Egypt. So the present work was intended to clarify the taxonomic status of family Hemerobiidae in the Egyptian fauna.

MATERIALS AND METHODS

Hemerobiid specimens for this study are preserved in the following main

Egyptian reference collections: Ain Shams University Collection, Faculty of Science **(ASUC)**; Cairo University Collection, Faculty of Science **(CUC)** and Ministry of Agriculture Collection, Plant Protection Institute, Identification section **(MAC)**. General terminology and the diagnosis of female genitalia follow Makarkin (1995 & 1996). Male genitalia were placed in a solution of 10% KOH at room temperature for about 10-15 minutes to remove soft tissue, then rinsed and dissected in 75% ethanol with drops of glycerin.Colored images were taken by a digital camera (Sony Dsc-W610).

RESULTS AND DISCUSSION

Family Hemerobiidae Latreille, 1802
Hemerobini Latreille, 1802.
Type genus: ***Hemerobius*** Linnaeus, 1758.
Hemerobiidae Westwood, 1838.
Hemerobiidae Latreille: Oswald, 1993.

Diagnostic characters:

Small brown or brownish insects, 6-15mm in length. Compound eyes well developed, ocelli absent. Antennae elongated, moniliform with an enlarged basal segment. Pronotum generally transverse, wider than long, usually with a pair of obvious calli. Wings subequal; forewing length 3-18mm., R1 and RS fused for a long distance, Rs with two or more branches arising from the apparently fused stems of R1 and Rs, Sc and R not fused apically, costal veinlets always numerous and usually forked, most cross veins are in gradate series, M and CU forked near the base of the wing, R1 appears to give off a series of two or more separate radial sectors. Abdomen with10 segments, genitalia of both sexes give good specific characters, ovipositor not exerted.

Key to Egyptian taxa of Hemerobiidae

1- Forewing with 3 to 5 radial sectors (Fig. 1a); male ectoproct ending with ventral or lateroventral pointed process……... ……**Hemerobiinae** (Genus ***Wesmaelius*** Kruger)…….……2

- Forewing with 2 radial sectors (Fig. 1b); male ectoproct with one - three digitiform processes of varying length and curvature (Fig. 1c)……...**Sympherobiinae** (***Sympherobius fallax* Navas**)

2- Longitudinal veins of forewing pale with fine brownish strips (Fig. 1d); female subgenitalia with relatively long lateral lobes and without paired additional plates; male terminalia, gonarcus and parabaculum as in Figs (1e-1h)……....***W. navasi*** (Andreu)

- Longitudinal veins of forewing with dark and yellow strips (Figs. 1a & 2a); female subgenitalia are markably broad with paired minute additional plates; male terminalia, gonarcus and parabaculum as in Figs (2b -2 f) ……. ……..***W. nervosus*** (Fabricius)

Subfamily Hemerobiinae Latreille, 1802
Hemerobini Latreille, 1802.
Type genus: ***Hemerobius*** Linnaeus, 1758.
Hemerobiinae Latreille: Oswald, 1993.

Genus *Wesmaelius* Kruger, 1922
Wesmaelius Kruger, 1922.
Type species: ***Hemerobius concinnus*** Stephens, 1836.
Kimminsia Killington, 1937.
Type species: ***Hemerobius betulinus*** Strom, 1788.
Wesmaelius Kruger: Oswald, 1993.

Diagnosis:

Forewings broad with rounded or slightly pointed apex, recurrent vein long, subcostal area narrow, with one basal or one apical cross vein between Sc and R, Rs normally with 3-4 branches, CuA pectinately branched, CuP forked only at margin, A1 long with several branches, A2 branched at its beginning, A3 simple, inner gradate series of crossveins (Gr1) short, with 3-4 crossveins, intermediate series (Gr2) usually with 4-5 cross veins, outer series (Gr3) usually with 6-8 cross veins.

Male genitalia: Tergit 9 expanded at ventral side. Ectoproct ending with ventral or lateroventral pointed process. Sternite 9 rather narrow. Gonarcus arch like. Parabaculum fused basally with pointed posterior apex and with two dorsal broad lobes.

Female genitalia: Tergite 8 narrow, band-like, rounded ventrally. Tergite 9 expanded ventrally. Subgenitalia well developed, of various size and shape, with mostly separated lateral lobes. Ectoproct more or less rounded, oval or triangular with rounded angles. Gonocoxites 9 semi-oval or semi-rounded. Seminalduct bag-like.

Remark: Aspock *et. al*. (1980) subdivided the genus *Wesmaelius* Kruger, into 2 subgenera *Wesmaelius* Kruger, 1922 and *Kimminsia* Killington, 1937. Klimaszewski and Kevan (1987) diagnosed *Wesmaelius* based on four main characters: forewing broadly oval, with 2ir crossvein present, ectoproct of male triangular in shape, and 9^{th} gonocoxites of female elongate. While the subgenus *Kimminsia* was characterized by forewing narrowly oval with 2ir crossvein absent, ectoproct of male rectangular in shape, and 9^{th}gonocoxites of female short. This subdivision has been widely accepted. Only subgenus *Kimminsia* is presented by two species in Egypt.

Wesmaelius* (*Kimminsia) navasi (Andreu, 1911) **(New species record)** (Figs. 1d-1h)
Boriomyia navasi Andreu, 1911.
Boriomyia persica Morton, 1921.
Kimminsia neimenica Yang, 1980.
Wesmaelius* (*Kimminsia) navasi
(Andreu): Makarkin, 1996.

Diagnostic characters:

Body length 5 mm with pale hairs. Head entirely yellow with no brown spots between antennal base. Antennae yellow. Pronotum yellow with a short indistinct brownish median stripe anteriorly, lateral border pale brown. Mesothorax and metathorax yellow with pale brown bands. Forewing 6.8 mm. long, pale yellowish, Gr1 with 3 crossveins, Gr2 with 5 cross veins, Gr3 with 6 crossveins. An obvious spot occurs around the crossvein m-cua in inner gradient. Longitudinal veins pale yellowish with fine brownish interruptions. Crossveins partly pale. Hindwing 6 mm. long, yellowish, with veins pale, partly brownish. Legs pale yellowish, femora dark outside, fore and middle tibiae with brown spots. Abdomen yellowish with pale yellowish hairs.

Male genitalia: ectoproct rectangular in shape, with heavy long hairs in the inner lateral side,ventral process dark brown, short and pointed apically; gonarcus with arched and stout paramediuncus; mediuncus short; parabaculum arrow-like in dorsal view and comma shape with bulging part at middle in lateral view.

World distribution: Spain, Greece, Malta, Morocco, Tunis, Egypt, Saudi Arabia, Palestine,Turkey, Lebanon, Iraq, Pakistan and Iran.

Specimen examined:
Locality only listed as Egypt, (1 male) **(MAC)**. Cairo 7.12.1918 (2 males) **(ASUC)**.

Wesmaelius* (*Kimminsia) nervosus
(Fabricius, 1793) (Figs. 1a & 2a-2f)
Hemerobius nervosus Fabricius, 1793.
Hemerobius frostinus Navas, 1933.
Kimminisia cinerea Nakahara, 1960.
Kimminsia alexanderi Nakahara, 1965.
Kimminsia acuminate Yang, 1980.
Wesmaelius* (*Kimminsia)nervosus
(Fabricius): Makarkin, 1996

Diagnostic characters:

Body length 5 mm. Face brownish yellow. Vertex pale yellow with four dark spots. Antennae entirely brownish yellow. Pronotum brownish with lateral border dark brown. Mesothorax and metathorax yellowish with lateral dark stripes. Fore

wing 7mm. long, Gr1 with 3 crossveins, Gr2 with 5 crossveins and Gr3 with 6 crossveins. Longitudinal veins with dark and yellow strips. Conspicuous dark brown spots occurring around the crossveins m-cua of Gr2 and crossveins of cubital area. Cross veins dark colored. Hind wing 6.5mm. long with longitudinal and pale crossveins. Legs yellowish with darker apical joints of tarsi. Fore and middle tibiae with two distinct dark spots outside. Abdomen dark brown with heavy elongated yellow hairs.

Male genitalia: ectoproct rectangular in shape, with heavy long hairs in the inner lateral side, ventral process dark brown, extended and pointed apically; gonarcus with arched, elongated and stout paramediuncus; mediuncus prolonged; parabaculum arrow-like in dorsal view and comma shaped in lateral view.

World distribution: Iran, China, Japan, Armenia, Canada, USA and Egypt.

Specimen examined:
Cairo 12.11.1918 (1) **(ASUC)**. Wadi El Ratba S. Sinai 24.4.40 (2), Wadi El Arbeine S. Sinai 24.4.40 (2), Wadi El Lega S. Sinai 20.4.39 (4) **(CUC)**. Meadi 26.3.1913 (1), 5.5.1918 (3), 30.9.1918 (1); Cairo 11.2.1918 (1); Wadi El Natroun 29.2.1923 (2); Sant Kathrin 28.5.1935 (2); Locality only listed as Egypt (5) **(MAC)**.

Subfamily: Sympherobiinae Comstock, 1918
Sympherobiidae Comstock, 1918.
Type genus: ***Sympherobius*** Banks, 1904.
Sympherobiinae Comstock: Oswald, 1993.
Genus *Sympherobius* Banks, 1904
Sympherobius Banks, 1904.

Type species:
Hemerobius amiculus Fitch, 1854.
Spadobius Needham, 1905.
Hemerobius occidentalis Fitch, 1854.
Sympherobius amicus Navas, 1915 a.

Sympherobius Banks: Oswald, 1993.

Diagnosis:
Forewings broad with rounded apex; costal area nearly simple or very narrow, Rs normally with two branches, CuP not forked proximal to crossvein 2cua-cup, inner gradate series of crossveins (Gr1) short, with 3-4 crossveins, intermediate series (Gr2) usually with 5-6 crossveins, outer series (Gr3) usually with 4 or lesscrossveins arranged into two groups, MP and MA connected by a cross vein shortly after the origin of former.

Male genitalia: Ectoproct bearing one - three digit form processes of varying length and curvature, usually pointed or armed apically. Callus cercus with trichobothria. Sternite 9 elongated into a long finger-like process.

Female genitalia: 8th tergite with lateral ends widely separated, adjacent or fused ventrally. 9th tergite expanded ventrally. Subgenitalia small, oval or sub-rectangular, posterior margin sometimes emarginate. Seminal duct long and well sclerotized.

Note: this genus comprises two subgenera: *Sympherobius* Banks, 1904 and *Niremberge* Navas, 1909. Only the first subgenus is represented in the Egyptian fauna.

Sympherobius* (*Sympherobius) fallax
Navas, 1908 (Figs. 1b &1c-2g & 2h)
Sympherobius fallax Navas, 1908.
Sympherobius amicus Navas, 1915a.
Nefasitus amicus Navas, 1915b.
Sympherobius fallax Navas: Monserrat, 2008.
Sympherobius fallax Navas: El Hamouly & Fadl, 2011.

Diagnostic characters:
Body length 3 mm. Vertex pale yellow. Antennae brownish yellow. Pronotum brownish. Legs yellowish. Fore wing length 5 mm, Gr1 with 3 crossveins,

Gr2 with 5 crossveins and Gr3 with 4 crossveins. Longitudinal veins yellowish with short brownish interruptions. Crossveins dark. Hind wing 4 mm. long with longitudinal palecross veins. Abdomen brownish with sparse white long hairs.

Male genitalia: ventrolateral ectoproct process biforked apically, dorsolateral and ventromedial ectoproct processes pointed apically; pseudomediuncus bipartite.

World distribution: Saudi Arabia, Egypt, Palestine, Lebanon, Turkey, Spain, Greece, Sudan, Ethiopia and Morocco.

Specimen examined:
Cairo 8.10.1918 (1), 13.10.1918 (1), 28.10.1918 (2), 9.11.1918 (1), 12.11.1918 (1), 16.11.1918 (2), 19.11.1918 (2), 23.11.1918 (3), 25.11.1918 (2), 26.11.1918 (2), 5.12.1918 (1), 19.12.1918 (1), 24.12.1918 (1), 25.12.1918 (1), 18.2.1922 (1); Embaba 5.11.1920 (3), 8.11.1920 (1), 10.11.1920 (1), 16.11.1920 (2); Gezirah 4.11.1920 (2); Girga 12.11.1920 (1); Meadi 8.9.1918 (1), 24.9.1918 (1), 30.9.1918 (3);Giza 9.2008 (7);Locality only listed as Egypt (35) (**MAC)**. Ain Shams 8.2017 (1) **(ASUC)**.

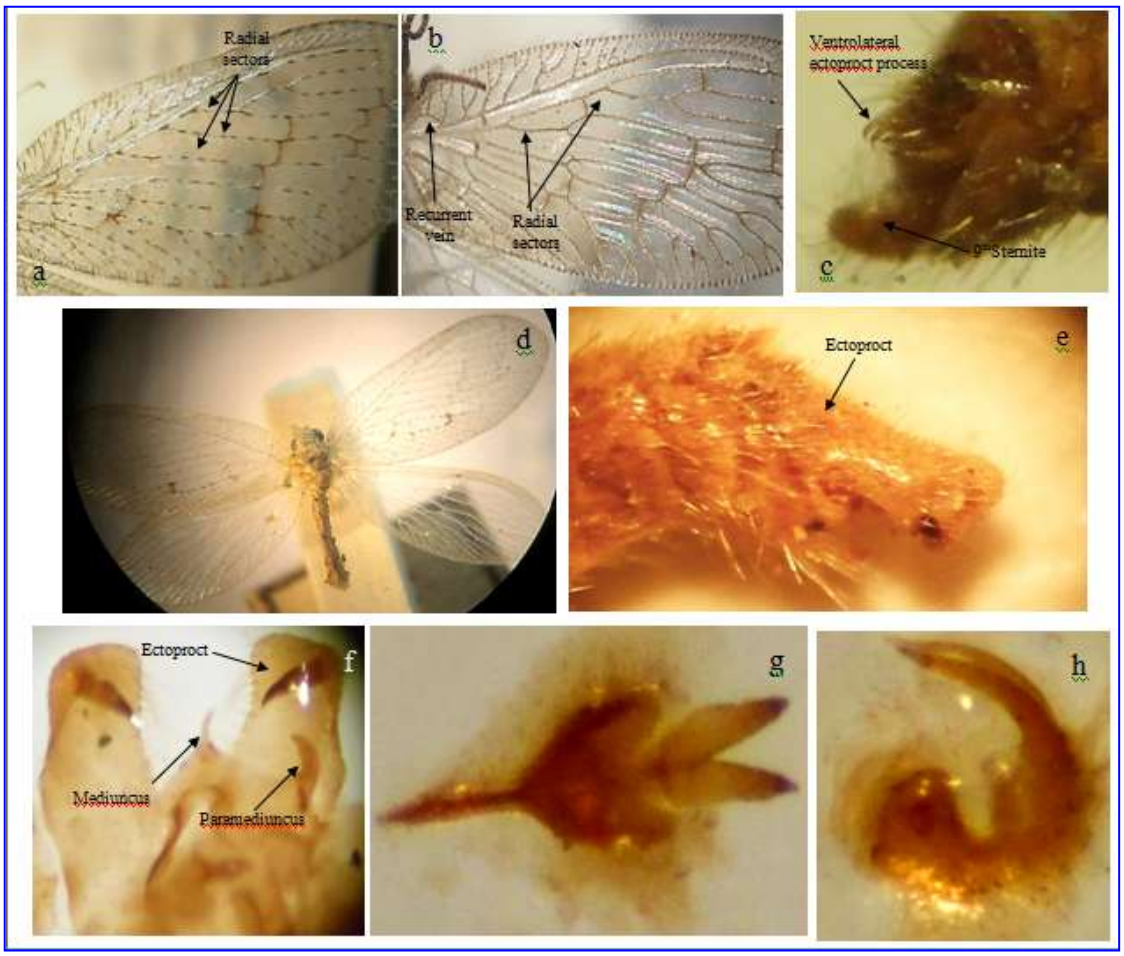

Fig. 1: a. *Wesmaelius nervosus* (Fabricius) forewing; **b. & c.** *Sympherobius fallax* Navas: **b.** Forewing, **c.** Male terminalia, lateral view; **d-h.** *Wesmaelius navasi* (Andreu): **d.** Habitus, **e.** Male terminalia, lateral view, **f.** Gonarcus, dorsal view; **g.** Parabaculum, dorsal view, **h.** Parabaculum, lateral view.

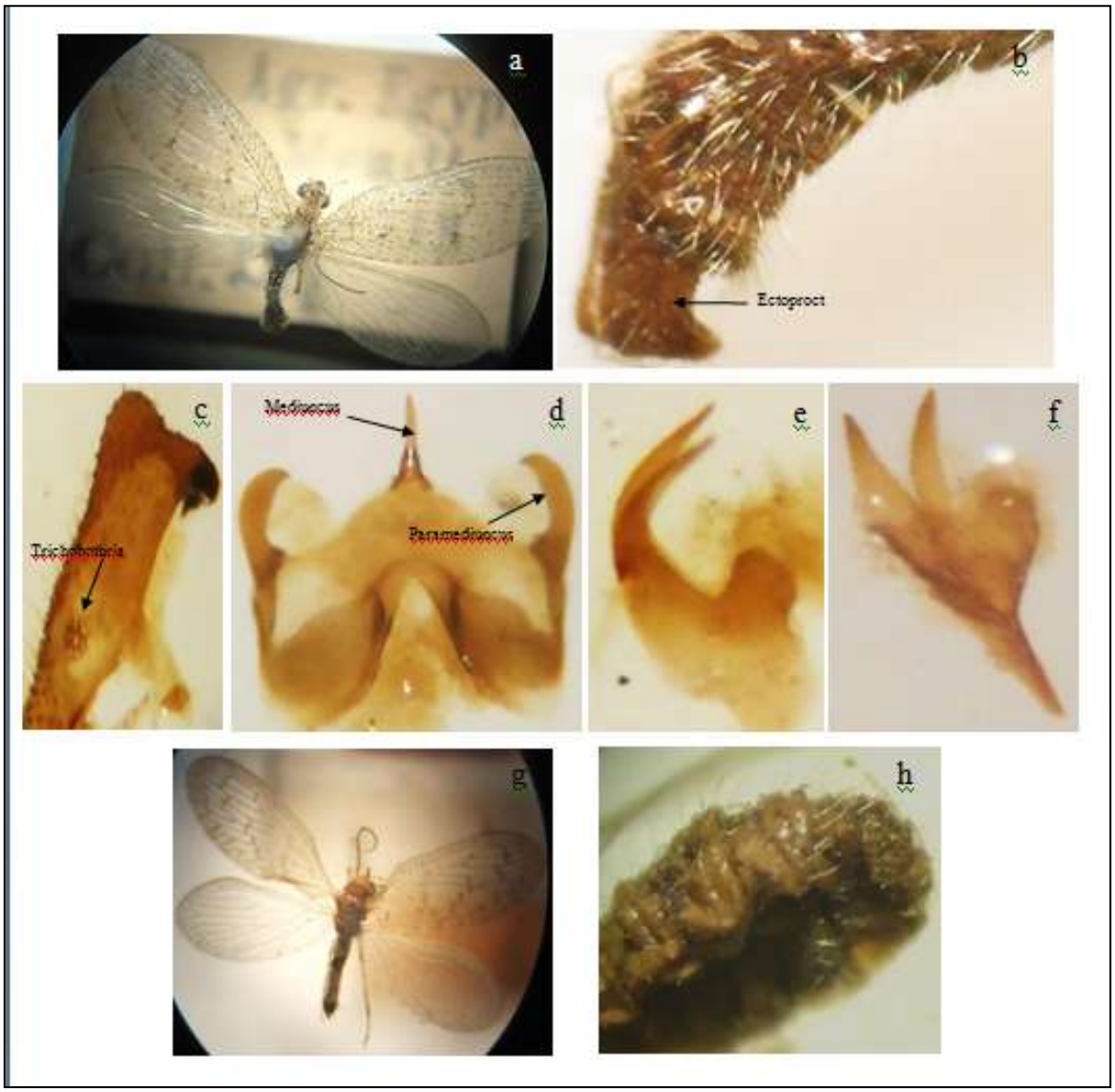

Fig. 2: a-f. *Wesmaelius nervosus* (Fabricius): **a.** Habitus, **b.** Male terminalia, lateral view, **c.** Ectoproct, caudal view, **d.** Gonarcus, dorsal view, **e.** Parabaculum, lateral view, **f.** Parabaculum, dorsal view; **g. & h.** *Sympherobius fallax* Navas: **g.** Habitus, **h.** Abdomen, lateral view.

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Review of Hemerobiidae (Insecta:Neuroptera) from Egypt, with a new record

مراجعة تصنيفية للهيميروبيدي في مصر (شبكية الأجنحة) مع تسجيل نوع جديد

هيام الحامولي – رباب فتحي صوابي
قسم الحشرات – كلية العلوم – جامعة عين شمس – القاهرة – مصر

المستخلص

من خلال الدراسة الحالية تمت المراجعة التصنيفية لفصيلة الهيميروبيدي (شبكية الأجنحة) في مصر. وقد تبين وجود ثلاثة أنواع تنتمي الي جنسين وهم: *ويزميلاس (كيمينسيا) نافازي* (أندريو) - *ويزميلاس (كيمينسيا) نيرفوسيس* (فابريشيس) وأيضا *سيمفروبيس (فالكس) فالكس* نافاز مع العلم أن النوع الأول يسجل لأول مرة في مصر. أيضا تم تشريح وتصوير الأعضاء التناسلية الذكرية للأنواع *ويزميلاس (كيمينسيا) نافازي* (أندريو) - *ويزميلاس (كيمينسيا) نيرفوسيس* (فابريشيس). بالأضافة الي ذلك تم عمل مفاتيح تصنيفية للأنواع المصرية مزودة بالصور الملونة وتم أدراج التوزيع الجغرافي لهذه الأنواع.