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Revision of the Antlions of The Genus *Creoleon* Tillyard, 1918 (Neuroptera: Myrmeleontidae) from Egypt

Hayam El Hamouly, Rabab F. Sawaby & Gawhara M.M. Abu El-Hassan

Department of Entomology, Faculty of Science, Ain Shams University, Abbassia, Cairo, Egypt

E-mail* : drhayamelhamouly@yahoo.com - rababsawaby@sci.asu.edu.eg - gawhara_magdy@sci.asu.edu.eg

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ABSTRACT

The Egyptian fauna of the genus *Creoleon* is revised. Seven species are recognized. A key to the Egyptian species with illustrations of the genitalia of the available species is included. Also, lists of material examined and distribution are provided for each species. The status of *Creoleon africanus* (Rambur); a doubtful species is discussed.

INTRODUCTION

Family Myrmeleontidae comprises the largest and most prevalent family of Neuroptera due to their efficiency in the exploitation of a wide range of habitats including sand (Mansell, 1999). The knowledge of the antlion (Neuroptera: Myrmeleontidae) fauna of Egypt is still very incomplete up to now. This paper is the second contribution dealing with Egyptian antlions. The first work by El Hamouly *et al.* (2019) dealt with the subfamily Palparinae and in the present contribution, we review the genus *Creoleon* Tillyard.

The genus *Creoleon* Tillyard belongs to the tribe Nemoleontini Banks, 1911 within subfamily Myrmeleontinae Latreille, 1802. It comprises 58 valid species worldwide, more than half of which are African (Stange 2004, Ai-Qin *et al.*, 2012, Oswald 2021). Members of this genus are recognized by the following characters: Forewing with veins CuP + 1A parallel to wing margin, CuA1 and CuA2 run parallel for a long distance, the origin of Rs behind fork of CuA, hind wing with one presectoral crossvein; male gonocoxites 9 are fused into a structure resembling a "Y" shape with a ventral projection and two processes curved upward.

In Egypt, the oldest record dates of genus *Creoleon* back to 1926, when Navás recorded seven species from the country: *C. gracilis* Klug 1834 (Currently synonym to *Pseudoformicaleo gracilis*), *C. murinus* Klug 1834, *C. plumbeus* Olivier 1811, *C. africanus* (Rambur, 1842). *C. klugi* nom. Nov. and the two new species: *C. gularis* and *C. indigus*. Later, Aspöck *et al.* (2001) in the catalogue of Neuroptera of the Palearctic stated only five species to be distributed in Egypt: *C. griesus* Klug 1834, *C. aegyptiacus* (Rambur, 1842), *C. parallelus* (Klapálek, 1911), *C. cinerascens* Navas, 1912, *C. antennatus* Navás 1914.

Finally, El-Hamouly & Fadl (2011) in the annotated checklist of order Neuroptera of Egypt recorded six *Creoleon* species: *C. aegyptiacus*, *C. antennatus* Navás 1914, *C. griseus*, *C. gularis*, *C. plumbeus* and *C. surcoufi* Navás 1912.

Taxonomically, *Creoleon* species are in need to revise both in Afrotropic and Palearctic regions, where some widely distributed species were perhaps described more than once (Ábrahám, 2017). Also, there is no comprehensive work on the taxonomy of the species which belonging to genus *Creoleon* in Egypt since the work by Navás (1926). Accordingly, in this paper, we aim to revise the Egyptian species for the genus *Creoleon* and provide a key to species.

MATERIALS AND METHODS

The specimens examined in this study are preserved in the following Egyptian Reference collections: Ain Shams University, Faculty of Science, Entomology Department (ASUC); Cairo University, Faculty of Science, Entomology Department (CUC); Entomological Society of Egypt (ESEC); Ministry of Agriculture, Plant Protection Institute, Section of Identification (PPDD).

The valid species names were mainly derived from Oswald (2020). The terminology of wing venation follows Wang *et al.* (2003). The terminology of male genitalia follows Krivokhatsky (2002) and Aspöck. & Aspöck. (2008). Line drawings were made with a stereomicroscope at magnification (100 – 400x). Genitalia was macerated in 10% KOH to remove soft tissue, later washed in distilled water, preserved in glycerine for further examination and finally kept in a genital vial. Body length was measured from vertex to abdomen tip; wing length was measured longitudinally from base to apex. The distribution map of each species was provided (Fig. 1).

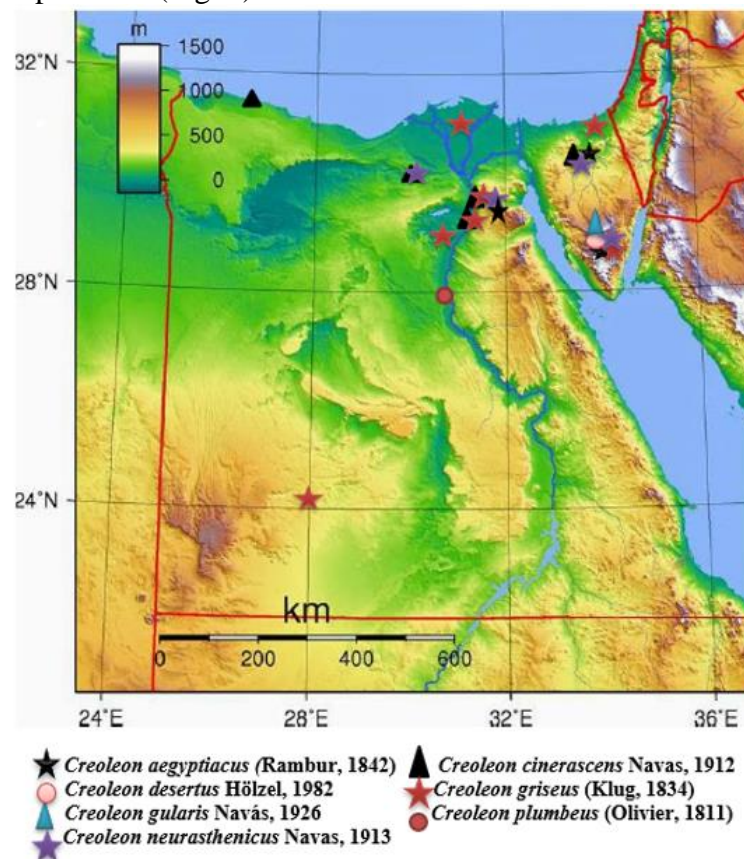


Fig.1: Map of local distribution of *Creoleon* species

RESULTS

Creoleon Tillyard, 1918: 436.

Type species: *Myrmeleon plumbeus* Olivier, 1811, by subsequent designation.

Creagris Hagen, 1860: 364.

Gama Navás, 1912: 57.

Mauroleo Navás, 1920: 286.

Allogama Banks, 1943: 166. Nomen nudum.

Allogama Markl, 1954: 242.

Key to Egyptian Species of Genus *Creoleon* Tillyard, 1918

1. Cross vein between 2A, 3A distinct (Fig. 2a)..... 2
- Cross vein between 2A, 3A absent (Fig. 2b) 4
2. Membrane of fore wings with brown spots in the distal half (Fig. 2c); male abdomen shorter than wing *C. aegyptiacus*
- Membrane of fore wing completely stain-free (Fig. 2d); male abdomen longer than wing 3
3. Pronotum with 2 wide brown F-shaped longitudinal stripes (Fig. 2e); abdomen yellow; head with a large black mark behind, above & between the base of antennae *C. plumbeus*
- Pronotum black except 2 small rounded spots (Fig. 2f); abdomen dark; head with a black mark above antennal base only *C. gularis*
4. Wings hyaline without any spots (Fig. 2g) 5
- Wings with dark stain (Fig. 2h) 6
5. Male genitalia as in (Fig. 3a) , terminal hooks of parameres less divergent, length of paramere base equal to more than one time the length of hooks; pronotum yellow with brown markings as in (Fig. 3b) *C. griesus*
- Male genitalia as in (Fig. 3c) , terminal hooks of parameres strongly divergent; length of paramere base at most equal to the length of hooks; pronotum with two narrow median stripes in caudal half and indistinct brownish shading laterally *C. desertus*
6. Pronotum longer than wide, yellow in color with two median longitudinal wide brown stripes and two thinner laterally (Fig. 3d); wings wide with strongly pointed apex as in (Fig. 3e) *C. cinerascens*
- Pronotum as long as wide (Fig. 3f), black in colour; wings narrow not wide, hardly pointed at apex as in (Fig. 3g) *C. neurasthenicus*

1- *Creoleon aegyptiacus* (Rambur, 1842) (Figs. 2a, c & 3h)

Myrmeleon aegyptiacus Rambur, 1842: 393.

Myrmeleon v-nigrum Rambur, 1842: 394.

Myrmeleon submaculosus Rambur, 1842: 396.

Myrmeleon falcipennis Costa, 1883: 55.

Creoleon v-nigrum collina Navás, 1919: 220.

Diagnosis: Length: body 30-31 mm, fore wing 30-32 mm., hind wing 28-29 mm.

Head dark, antennae dark yellow with dark annulations, vertex black except small area; pronotum black except 2 yellowish small spots and stripes; wings with shadow, veins dark-spotted with yellow and black stripes, pterostigma distinct, a fore wing with 6 crossveins before Rs; spurs of fore and middle legs as long as three basal tarsal segments and equal to two basal tarsal segments in hind legs; abdomen in male slightly longer than fore wing; parameters in the male are much shorter, with broad, strongly divergent apical hooks.

Type Locality: Egypt

Specimen Examined: South Sinai, 28.VII.1992 (1); Egypt, 1.IX.1935 (1) **ASUC**
Wadi Digla, 15. V.1922 (1); Wadi Natroun, II.1923 (1); Sandy plain near Gabal Um Lebas
(N. Sinai), 16.IV.1924 (1) **PPDD**

Local Distribution: Lower Egypt, Sinai.

World Distribution: Northern and eastern Africa (widespread), the Middle East to east China (Xinjiang) and Mongolia, Madagascar, Southern Europe (widespread).

2- *Creoleon cinerascens* Navas, 1912 (Figs. 2b & 3d, e & i)

Creoleon cinerascens Navas, 1912: 59; Abraham, 2017

Creagris cinerascens Navás, 1912

Creagris irrorata (Klug, 1834)

Creagris parallela Klapálek, 1911

Creagris surcoufi Navás, 1912

Creoleon irroratus (Klug, 1834)

Creoleon klugi Navás, 1926

Creoleon parallelus (Klapálek, 1911)

Creoleon surcoufi (Navás, 1912)

Myrmeleon irroratus Klug, 1834

Type Locality: Somalia: Bulbar.

Diagnosis: Length: body 23-25 mm, fore wing 23-25 mm., hind wing 22-24 mm.

Vertex yellow with numerous irregular black spots, dark black mark above the antennal base which adjacent to each other; antennae dark with fine yellow annulation; pronotum with longitudinal black stripes; wings wide with very pointed apex, veins yellow with brown stripes; fore wing with 5-6 cross veins before Rs; tibial spurs of forelegs longer than the length of the 3 basal tarsal segments and shorter than the 3 basal tarsal segments of hind legs; abdomen dark brown with short whitish hairs and shorter than wings in both sexes; male genitalia as in (Fig. 3 i).

Specimen Examined:

Matruh, VII.1951 (1); Matruh, VII.1952 (2); Matruh, 10.VII.1952 (1); Gabel Asfar, 31.VII.1952 (1); Mersa Matruh, VIII.1953 (1); Gabel Asfar, 7. IX. 1953 (1); Wadi Hoff, 8. X.1953; Mansuriah, 23.IV.1954 (1); Mersa Matruh, 20. VIII.1955 (1); Gabel Asfar, 30. V.1956 (2); Pyramids, 12.X.1958(1); Fayoum, 25.V.1993 (2); Cairo, 15.IV.1994 (1); Ain Shams, 19.V.1994 (1); Giza, 6.VI.1994 (1); Fayoum, 24.VIII.1994 (1); Cairo, 19.V.1995 (1); Mersa Matruh, IX.2019 (2).....**ASUC**

Mead, 13.VIII.1917 (1).....**CUC**

Mead, 1.VIII.1912 (1) **ESEC**

Mead, Cairo, 15.V.1913 (1); 20.VIII.1915 (1); 19.X.1916 (1); 18.X.1917 (1); 29.V.1924 (4); 25.VIII.1924 (1); Kantra, Sinai, 1.IX.1924 (1); Helwan, 25.IX.1925 (1)**PPDD**

Local distribution: Lower Egypt, Sinai.

World distribution: Algeria, Egypt, Ethiopia, Iran, Palestine, Saudi Arabia, Sudan, Tunisia.

3- *Creoleon desertus* Hölzel, 1982 (Fig. 3c)

Creoleon desertus Hölzel, 1982: 267.

Type Locality: "Saudi Arabia ... Wadi Al Ammariyah"

Diagnosis after Hölzel (1982): Length: body 32 mm, fore wing 33 mm, hind wing 31 mm. General colour pale brown. Head with a brownish mark behind antennae, vertex with large brown spots; antennae pale brown; pronotum scarcely longer than broad with two narrow median stripes in caudal half and indistinct brownish shadings laterally; meso- and metanotum with interrupted brown stripes laterally and brown spots on prescutum and mesoscutellum; wings membrane hyaline without shadings, venation totally pale,

pterostigma indistinctly brownish; legs pale brown with black (and a few pale) hairs and bristles; spurs of fore and mid legs as long as the tarsal segments 1 +2, in hind legs slightly longer than the basal tarsal segments. Abdomen pale with a median dark line dorsally and indistinct dark areas laterally; gonarcus and parameres.

Note: This species is diagnosed after Holzel (1982) who recorded it from Sinai, Wadi Firan, 27. IX. 1977.

Local distribution: Sinai.

World distribution: Egypt, Saudi Arabia.

4- *Creoleon griseus* (Klug, 1834) (Figs 2g & 3a, b & j)

Myrmeleon griseus Klug, 1834: 31.

Myrmeleon perfidus Walker, 1853: 350.

Alyrmeleon sedulus Walker, 1853: 355.

Myrmeleon adversus Walker, 1853: 358.

Creagis perfidlls MacLachlan, 1868: 277.

Creolen griseus Holzel, 1972: 61.

Creoleon griseus, Ghosh, 1984: 40.

Type locality: not available.

Diagnosis: Length: body: 32-34 mm., fore wing 28-34 mm., hind wing 26-32 mm.

Body colour dark brown; vertex with two transverse brown bands and two small brown spots; antennae yellow, with fine brown rings, dark brown marks between antennal base; pronotum broader than long with four narrow stripes, meso- and metanotum black; legs dark brown; wings narrow; pterostigma yellowish and indistinct; veins yellow and membrane without shade or spot, hindwing shorter and narrower than forewing; abdomen black shorter than wings in males.

Specimen examined: Abu Ghalib (Giza), 10.IV.1951 (1); Wrdan, Giza, 14.I.1951; Warak, 4.VIII.1952 (4); Suez, 7.VIII.1953; Fayioum, 12.V.1993 (9); Qalubiya, 20.V.1993 (20); South Sinai, 13.VI.1993 (2); Ashmun, 15.VI.1993 (10); Giza, 27.VII.1993 (5); Kafer El Sheikh, 9.VIII.1993 (6); Kafer El Sheikh, 15.IX.1993 (4); Dakahlyia, 5.X.1993 (5); Cairo, 24.V.1994 (4) **ASUC**

Wadi El Natroun, 6.VIII.1929 (1); Helwan, 4.XI.1933 (1); Helwan, 11.X.1935 (6); El Arish, 16.VIII.1951 (10); 4.IX.1951 (9); Ain Gedeirat, 27.VIII.1951 (1); Barrage, 2.III.1953 (2); Gabal Asfer, 7.VIII.1953 (3); Giza, 29.V.1953 (6) **CUC**

Meady, 25.V.1913 (1); 14.IV.1914 (1); 15.V.1916 (1); Kharga Oasis, 25.IX.1916 (1); Kerdasa, 18.IV.1924 (1); Meady, 25.IX.1924 (1) **PPDD**

El Rhode (Cairo), 2.IX.1913 (1); Shoubra (Cairo), 15.VIII.1913 (1); Burg, Mariout, 15.VI.1926 (1) **ESEC**

Local distribution: Lower and Upper Egypt, Sinai, Western desert.

World distribution: Northern Africa (widespread), Middle East to India, Southern Europe (Spain).

5- *Creoleon gularis* Navás, 1926 (Figs. 2d, f & 3k)

Creoleon gularis Navás, 1926: 50.

Diagnosis: Length: body: male 28-30 mm., female 23 mm., fore wing 23-26 mm., hind wing 21-24 mm.

Vertex black except certain pale areas, a black mark above the antennal base; antennae with yellow and brown annulations; thorax black pronotum length as long as width, black except two small round pale spots, metanotum dark with two oval black spots; wings with pointed apex, pterostigma distinct brown basally and yellowish distally, veins yellow with brown stripes, a fore wing with seven cross veins before Rs; legs yellow, femora with dark dots, the apex of each tarsal segment with black spot, fore tibial spure longer than the three basal tarsal segments and longer than the two basal tarsal segments in

hind legs; abdomen dark with the length shorter than the length of each wing in female and in male longer than the length of each wing.

Type Locality: Egypt: "Wadi Dabbeh" (aux environs de la 5e Tour de la Route de Suez).

Specimen examined: South Sinai, 13.VI.1993 (9)ASUC

Wadi Dabbaa (Mariout, V. Coast), 2.X.1921 (1) PPDD

Local distribution: Coastal stripe & Sinai.

World distribution: Egypt.

6- *Creoleon plumbeus* (Olivier, 1811) (Fig. 2e)

Myrmeleon plumbeus Olivier, 1811: 126.

Myrmeleon murinus Klug, 1834: 4.

Myrmeleon tabidus Eversmann, 1841: 359.

Creagris plumbeus maculosa Navás, 1927: 80

Diagnosis: Length: body: 24 mm, fore wing 25 mm, hind wing 24 mm.

Head yellow with a large black mark behind, above and between the base of antennae, antennae brown with fine yellow annulations, vertex yellow with dark brown marks; Pronotum length as long as width, with two longitudinal F-shaped brown stripes at middle and two short stripes laterally; wings with pointed apex, fore wing without shadow and with seven cross veins before Rs, veins pale yellow, pterostigma indistinct; tibial spure of forelegs as long as the three tarsal segments, spure of mid and hind tibia longer than the 1st tarsal segment; abdomen yellow, shorter than both wings; male genitalia with apical hooks much less divergent.

Type Locality: Greece.

Specimen examined: Miniya, 12.X.1916 (1) PPDD

Local distribution: Upper Egypt.

World distribution: Northern Africa (widespread), Middle East (widespread) east to western China (Xinjiang), southern Europe (widespread).

7- *Creoleon neurasthenicus* Navas, 1913 (Figs. 2h & 3f, g & l)

Creoleon neurasthenicus (Navas, 1913): 453.

Creoleon antennatus (Navas, 1914): 612.

Creagris antennata (Navas, 1914): 20.

Creoleon indigus (Navas, 1926): 52.

Type Locality: Egypt: Kosseir.

Diagnosis: length male body: 32 mm, fore wing 24 mm, hind wing 22.5 mm.

Antennae with yellow and brown annulations, with a dark mark between and behind antennal base which adjacent to each other, vertex completely dark except two pale transverse bands and two pale spots; pronotum length as long as width, dark brown except longitudinal pale areas, meso and metanotum nearly brown except small pale areas, metanotum brown with two orange oval spots; wing hyaline, pterostigma pale, veins with yellow and brown stripes; fore wing with 5-7 cross veins before Rs; legs yellow, apex with tibial and tarsal segments with dark spots, fore tibial spurs longer than the three basal tarsal segments and longer than two basal tarsal segments in hind legs; abdomen brown with black hairs, male abdomen longer than each wing; male genitalia as in (Fig. 3l).

Specimen examined: South Sinai, 13.VI.1993 (30); North Sinai, 8.IX.1993 (5), Abu Ghalib, 10.IV.1951 (1)ASUC

Bir ISLA (Sinai), 14. IV. 1940 (2)CUC

Wadi Digla, 25. V.1922 (1); Wadi Natroun, 29.II.1923 (1); Sandy Plain, 6. IV. 1924 (1)

..... PPDD

Local distribution: Lower Egypt & Sinai.

World distribution: Algeria, Egypt, Iran, Libya, Oman, Palestine, Saudi Arabia, Sudan, Syria, Yemen.

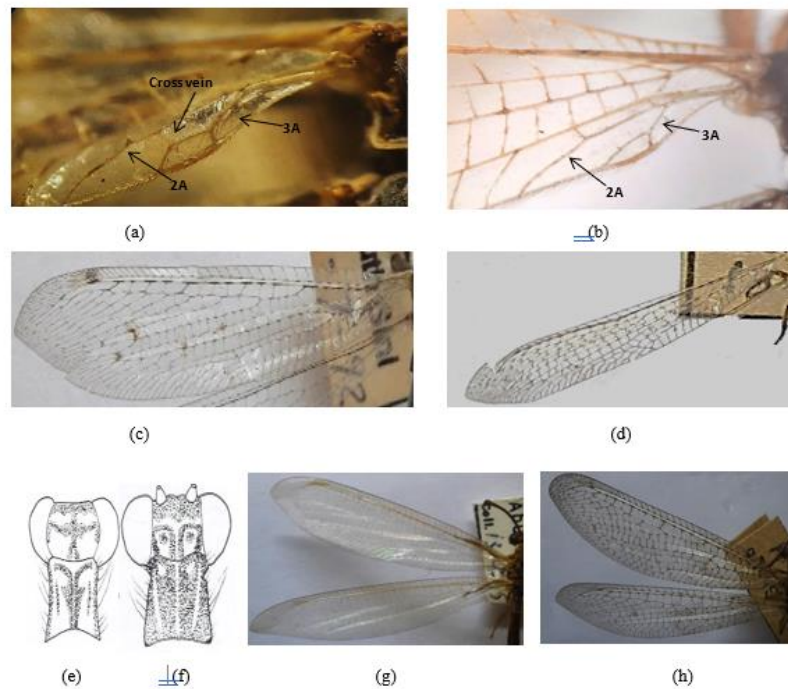


Fig. 2: a. & c. *Creoleon aegyptiacus* (Rambur): a. fore wing with cross vein, c. brown spots in the fore wing; b. *Creoleon cinerascens* Navas, fore wing without cross vein; d. & f. *Creoleon gularis* Navás: d. fore wing without brown spots, f. pronotum; e. *Creoleon plumbeus* (Olivier), pronotum; g. *Creoleon griseus* (Klug), fore and hind wings; h. *Creoleon neurasthenicus* Navas, fore and hind wings.

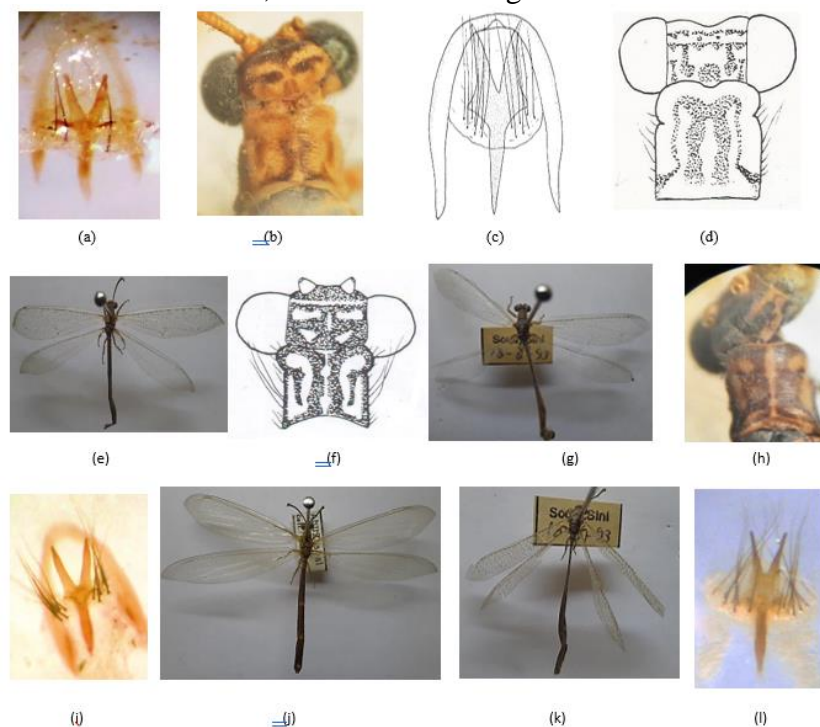


Fig. 3: a., b. & j. *Creoleon griseus* (Klug): a. male genitalia (gonarcus with parameres ventral view), b. pronotum, j. habitus; c. *Creoleon desertus* Hölzel, male genitalia after Hölzel 1982; d., e. & i. *Creoleon cinerascens* Navas: d. pronotum, e. habitus, i. male genitalia (gonarcus with parameres ventral view); f., g. & l. *Creoleon neurasthenicus* Navas: f. pronotum, g. habitus, l. male genitalia (parameres ventral view); h. *Creoleon aegyptiacus* (Rambur), pronotum; k. *Creoleon gularis* Navás, habitus.

DISCUSSION

As a result of this study, we have confirmed seven species of *Creoleon* from Egypt. These are the same species which have been listed by El-Hamouly & Fadl (2011) with *Creoleon antennatus* (Navás, 1914) being synonymized with *Creoleon neurasthenicus* (Navás, 1913) and *Creoleon surcoufi* (Navás, 1912) with *Creoleon cinerascens* (Navás, 1912) according to the work by Ábrahám (2017) this is besides *Creoleon desertus* which added to the Egyptian fauna according to the work by Hölzel (1982).

Navás (1926) recorded *Creoleon africanus* (Rambur, 1842) from Egypt depending on specimens deposited in Alfieri and Ain Shams University collections, some of these are still available. Following our own examination of the specimens which were collected from Meadi, 14.IV.1914 & 15. V.1916; Kerdasa, 18.IV.1924 (PPDD) and Suez, 24.II.1940 (ASUC) it is clear that these specimens were incorrectly identified by Navás and must belong to *C. griseus*. While *C. africanus* was mentioned in the list of synonyms of *griseus* in the work by Hölzel and Ohm (1991), *C. africanus* is currently a valid species and distributed in Madagascar, Spain (Canarias) and South Africa only according to the works by Aspöck & Hölzel (1996), Aspöck *et al.* (2001), Stange (2004) and Neuropterida Species of the World (Oswald, 2021). As we cannot examine all specimens listed by Navás (1926), the occurrence of this species in Egypt is considered doubtful.

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