

KEY TO THE SPECIES OF THE *ORTHETRUM* NEWMAN, 1833
(ODONATA, LIBELLULIDAE)
WITH A NEW RECORD SPECIES IN IRAQ

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ABSTRACT

This paper provides an identification key to the species of *Orthetrum* Newman, 1833 (Odonata, Libellulidae), including six species that were collected from different localities in Iraq.

The species of *O. anceps* (Schneider, 1845) is registered as a new record in Iraq; the most important characters which are used in diagnostic key are included.

Key words: Iraq, Libellulidae, New record, Odonata, *Orthetrum*.

INTRODUCTION

The dragonfly insects belonging to the Odonata, are abundant and of worldwide distribution (Corbet, 1980); the genus of *Orthetrum* Newman, 1833 under the guild of Anisoptera in Libellulidae family, is the biggest one of dragonfly world-wide (Manwar *et al.*, 2012), and this genus is a very large one, spread across the old world (Watson *et al.*, 1991).

The genus of *Orthetrum* contains about sixty of species worldwide (Dijkstra and Kalkman, 2012). This genus is characterized by: sectors of arculus in fore wings with a differentiated merger before encounter arculus; bases of hind wings without blackish-brown markings; ever any accessive cross-veins to the bridge (Fraser, 1936). It is already typified in Iraq by the following fives species: *O. brunneum* (Fonscolombe, 1837), *O. coerulescens* (Fabricius, 1798), *O. sabina* (Drury, 1773), *O. taeniolatum* (Schneider, 1845), *O. trinacria* (Selys, 1841) according to the list (Kalkman, 2006).

There are no detailed studies of this genus in Iraq, but there are found on other genera of the same family, for example: Abd and Al-Asady (2012, 2014), Abd (2013), Ali and Khidhir (2015). From the other hand, Augul *et al.* (2016) were re-description of *O. chrysostigma* (Burmeister, 1839) and referred to it as a new record from Iraq, although previously is none

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specifically mentioned by Askew (1988); therefore, this paper was conducted to design a key to species under the genus of *Orthetrum* in Iraq.

MATERIALS AND METHODS

Specimens collection and identification

A lot of specimens belonging to *Orthetrum* species (Odonata, Libellulidae) were collected from several Provinces of Iraq by using air net during 2017. The specimens were killed by freezing for few hours, and mounting by insect pins. The date and localities of collecting samples were recorded.

The members of genus *Orthetrum* were diagnosed by using different taxonomic keys such as: Fraser (1936), Dumont (1991), Kalkman (2006) and Degabriele (2013). The specimens were capturing photo by the Dino-light microscope used with scale of measurements; in addition, some plates were taken with a Samsung galaxy S4, GT-19500 and used binocular dissecting microscope (MB. MARIOBROMA.SRL, Roma) to magnificent the morphological features.

The collecting materials were compared with spacemen's stored at the Iraq Natural History Research Center and Museum, University of Baghdad. The newly collected species were deposited in the insect collection of the Department of Entomology and Invertebrates at Iraq Natural History Research Center and Museum, University of Baghdad.

Abbreviations

Following the abbreviations of the diagnostic features that used in the present key:

Ab. S	: Abdominal segment	Me	: Membranula
ALo	: Anal loop	Mspl	: Nervulus between Cu &MA
ALa	: Anterior lamina	Nod	: Nodus
ANC	: Transverse antenodal nervulus	PNC	: Transverse postnodal nervulus
Arc	: Arculus	Ppt	: Paraproct
C	: Costal vein	Pt	: Pterostigma
Cn	: Transverse Cubital nervulus	Ri	: 1st Radius vein
Cuii	: Cubital vein	Rii	: 2nd Radius vein
DF	: Discoidal field	Riii	: 3rd Radius vein
em2	: Mesopimerum	Riv	: 4th Radius vein
em3	: Metaepimerum	Rs	: Radius vein
GLO	: Genital lobe	Rspl	: Nervulus between IRiii & Riv
H	: Hook	Sap-Cr	: Superior anal appendage
Ha	: Hamula	Sc	: Subcosta vein
HS	: Humeral suture	Sn	: Subnodus
HT	: Humeral triangle	Sp	: Spine
IA	: Anal vein	St	: Sub triangular cell
Iap- Ept	: Inferior anal appendage	Su1	: Suture 1
IRiii	: 1ST Radius vein branch	Su2	: Suture 2
Lo	: Lobe	T	: Triangular cell
MA	: Median arculus	VS	: Vulvar scale

RESULTS AND DISCUSSION

In the present study, an identification key to species was made depending on the morphological characters, and followed by geographical distribution; these species included: *O. anceps*, *O. brunneum*, *O. sabina*, *O. taeniolatum*, *O. chrysostigma* and *O. trinacria*; the first one is registered as a new record in Iraq.

Key to the species of *Orthetrum* Newman, 1833:

- 1- Membranula pure white (Pl. 1 A, B) 2
- Membranula dark or dark brown (Pl.1 C, D, E, F) 3

- 2- All cells between IRiii and Rspl in fore wing are not doubled (Pl.2 A); Cubital vein (Cuii) in hind wing emerging from the rear angle of discoidal cell (Pl. 2 B); Secondary genitalia as in Plate (4 A); female vulvar scale as in Plate (A5) *O. anceps* (Schneider)
- Four or more cells between IRiii and Rspl are doubled in both wings (Pl. 3 A1); Cubital vein in hind wing emerging from the anterior side of discoidal cell (Pl. 3 A2) *O. brunneum* (B. de Fonscolombe)

- 3- Base of abdomen ($S_2 - S_3$) bulbously swollen and thence abruptly skinny and compacted laterally to the end, S_{7-9} expanded and broader than S_{4-6} ; black marked with greenish-yellow (Pl 6 C); appendages yellow (Pl.7 C); Secondary genitalia as in Plate (4 C) with orange hairs on the anterior lamina; female vulvar scale as in Plate (5 B) *O. sabina* (Drury)
- Base of abdomen ($S_2 - S_3$) expanded but not bulbously swollen, never very skinny nor compacted laterally (Pl.6 D, E, F); mostly with pruinose abdomen and thorax; less than four cells are doubled between IRiii and Rspl (Pl.3 C, D, E); appendage dark (Pl.7 D, E, F) 4

- 4- Small species in plate (10B), with total length less than 4 cm; Cubital vein in hind wing emerging from the rear angle of discoidal cell (Pl.3 C); Membranula very narrow and dark brown bordered with white (Pl.1 D); Side of thorax with two pale stripes one behind the humeral suture in mesoepimerum and one behind the second suture in metaepimerum (Pl.8 D) *O. taeniolatum* (Schneider)
- Moderately large species in plate (10 C), total length not exceeding 5 cm; Cubital vein in hind wing emerging from the anterior side of discoidal cell (Pl.3 D); Side of thorax with one pale stripe behind the humeral suture in mesoepimerum (Pl.8 E); the abdominal is characterized by having waisted between abdominal segments 3 and 4 (Pl.6 E) *O. chrysostigma* (Burmeister)
- Large species in plate (10 D), total length exceeding 5 cm; Cubital vein in hind wing emerging from the anterior side of discoidal cell well afar from its rear angle (Pl.3 E); Side of thorax without any pale stripe (Pl.8 F); the male superior anal appendage twice as long as in inferior (Pl.7 E); female vulvar scale as in Plate (5 C) *O. trinacria* (Selys)

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Orthetrum anceps (Schneider, 1845)

Materials examined: (4 specimens 2♂♂, 2♀♀) Dohuk province, Zawita, 1♂, 2♀♀), 26.IX.2010; Karbala province, Ain Al Tammer, 1♂, 25.IX.2010.

Distribution: Europe to India, northern Africa (ITIS, 2017), newly recorded in Iraq.

Note: The male genitalia of this species compared and agreed with (Klingenberg and Martens, 1996).

Orthetrum sabina (Drury, 1773)

Materials examined: (22 specimens 8♂♂, 14♀♀) Wasit Province, Az Aziziya, 5♂♂, 8♀♀) 2.V.2013; Maysan province, Hawiza Marshes, 1♂, 3♀♀, 14.VI.2015; Baghdad province, Madaen, 2♂♂, 3♀♀, 3.X.2016.

Distribution: Iraq, Egypt, Libya, Kuwait, Saudi Arabia, United Arab Emirates, Jordan, Lebanon, Syria, Qatar, Oman, Yemen, Bahrain, Sudan, Tunisia, Eritrea, Iran, Turkey, Turkmenistan, Afghanistan, Lao, Algeria, Brunei, Armenia, Greece, Australia, Cyprus, Bangladesh, Azerbaijan, Bhutan, Cambodia, Darussalam, Chad, Ethiopia, Georgia, Hong Kong, India, Japan, Kazakhstan, Malaysia, Indonesia, Myanmar, Nepal, New Caledonia, Pakistan, Thailand, Papua New Guinea, Philippines, Russia, Singapore, Solomon Islands, Timor-Leste, Somalia, China, Sri Lanka, Taiwan, Israel, Uzbekistan, Tajikistan and Viet Nam (Mitra, 2013).

Orthetrum brunneum (Fonsclombe, 1837)

Materials examined: (2 specimens 2♂♂) Sulaymaniyah Province, Zalan District, 14.VII.2010

Distribution: Mediterranean region, Central Europe, North Africa, Middle East and Mongolia (Ebrahimi *et al.*, 2013).

Orthetrum taeniolatum (Schneider, 1845)

Materials: (5 specimens 5♂♂) Baghdad province, Baghdad province, Madaen, 3♂♂, 20.IV.2015; Rashidayia, 2♂♂, 3.V.2017.

Distribution: Afghanistan, Middle East, Nepal, Northern Africa southwards to Nigeria and Ethiopia, Northern India, Pakistan (Ebrahimi *et al.*, 2013).

Orthetrum trinacria (Selys, 1841)

Materials examined: (3 specimens 2♂♂, 1♀) Maysan province, Hawiza Marshes, 1♂, 14.VI.2015; Baghdad province, Yossifiya, 1♂, 1♀, 3.X.2016.

Distribution: Iraq, Saudi Arabia, Syria, Egypt, Jordan, Kuwait, Libya, Libya, Tunisia, Morocco, South Sudan, Turkey, Iran, Algeria, Ethiopia, Namibia, Angola, Cameroon, Botswana, Burkina Faso, Cape Verde, Niger, Côte d'Ivoire, Gabon, Malta, Ghana, Israel, Greece, Italy, Kenya, Liberia, Madagascar, Zimbabwe, Malawi, Tanzania, Mauritania, South

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Africa, Mayotte, Nigeria, Portugal, Rwanda, Senegal, Mali, Somalia, Congo, Spain, Mozambique, Gambia, Swaziland, Togo, Zambia and Uganda (Boudot *et al.*, 2016a).

Orthetrum chrysostigma (Burmeister, 1839)

Materials examined: Maysan province, Hawiza Marshes, 1♂, 14.VI.2015; Baghdad province, Karrada, 3♂♂, 4.X.2017.

Distribution: Egypt, Jordan, Lebanon, Libya, Syria, Saudi Arabia, United Arab Emirates, Yemen, Oman, Sudan, Palestine, Tunisia, Mauritania, Morocco, Eritrea, Iran, Turkey, Algeria, Ethiopia, Angola, Benin, Uganda, Botswana, Somalia, Burkina Faso, Cameroon, Zimbabwe, Gambia, Chad, Swaziland, Congo, Côte d'Ivoire, Mali, Guinea, Kenya, Nigeria, Liberia, Ghana, Mozambique, Namibia, Portugal, Rwanda, Senegal, Zambia Sierra Leone, South Africa, Greece, Tanzania, Spain, Togo, and Malawi (Boudot *et al.*, 2016 b).

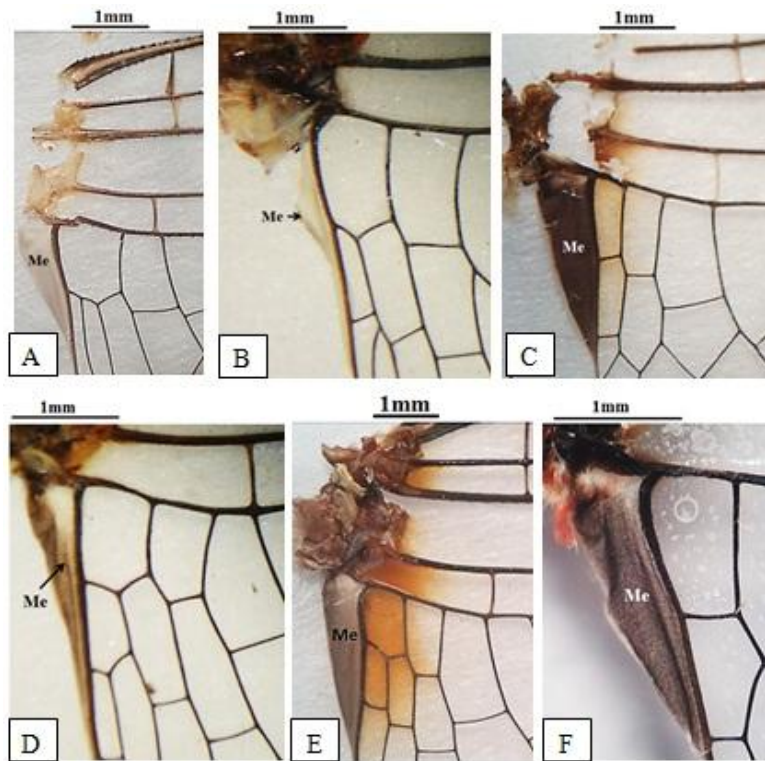


Plate (1): Base of hind wing; (A) *O. anceps*, (B) *O. brunneum*, (C) *O. sabina*, (D) *O. taeniolatum*, (E) *O. chrysostigma*, (F) *O. trinacria*.

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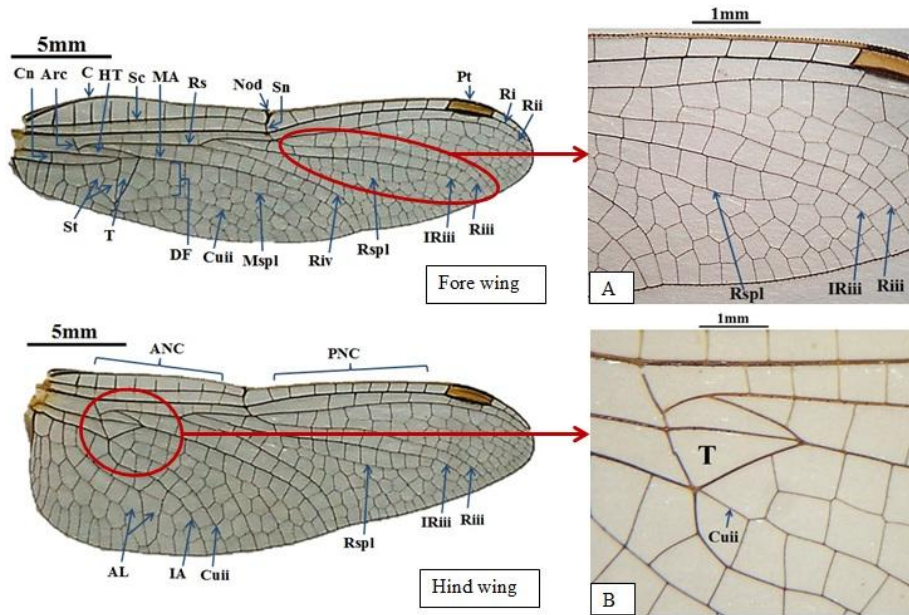


Plate (2): Wings of *Orthetrum anceps*; (A) Fore wing, (B) Hind wing.

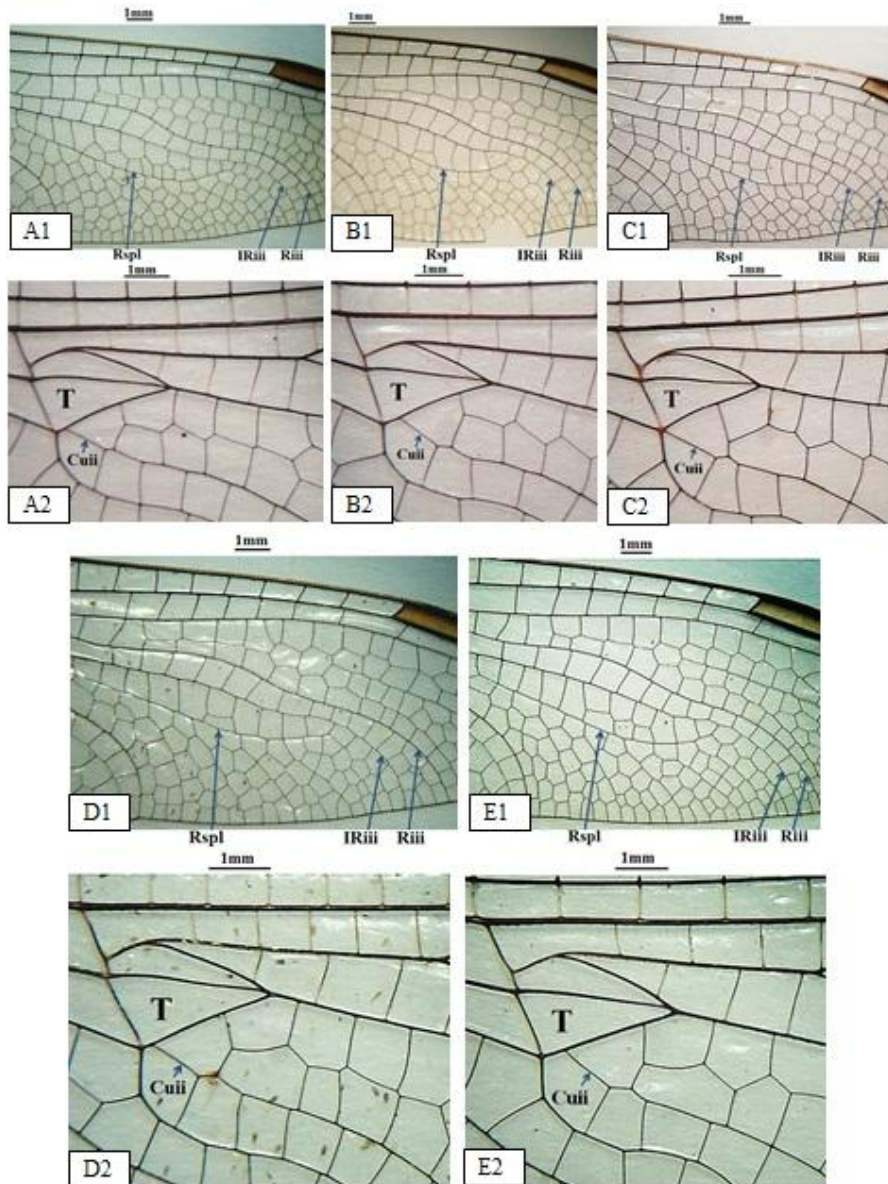


Plate (3): Wings of *Orthetrum*; (1) Fore wing, (2) Hind wing.
(A) *O.brunneum*, (B) *O. sabina*, (C) *O. taeniolatum*,
(D) *O. chrysostigma*, (E) *O. trinacria*

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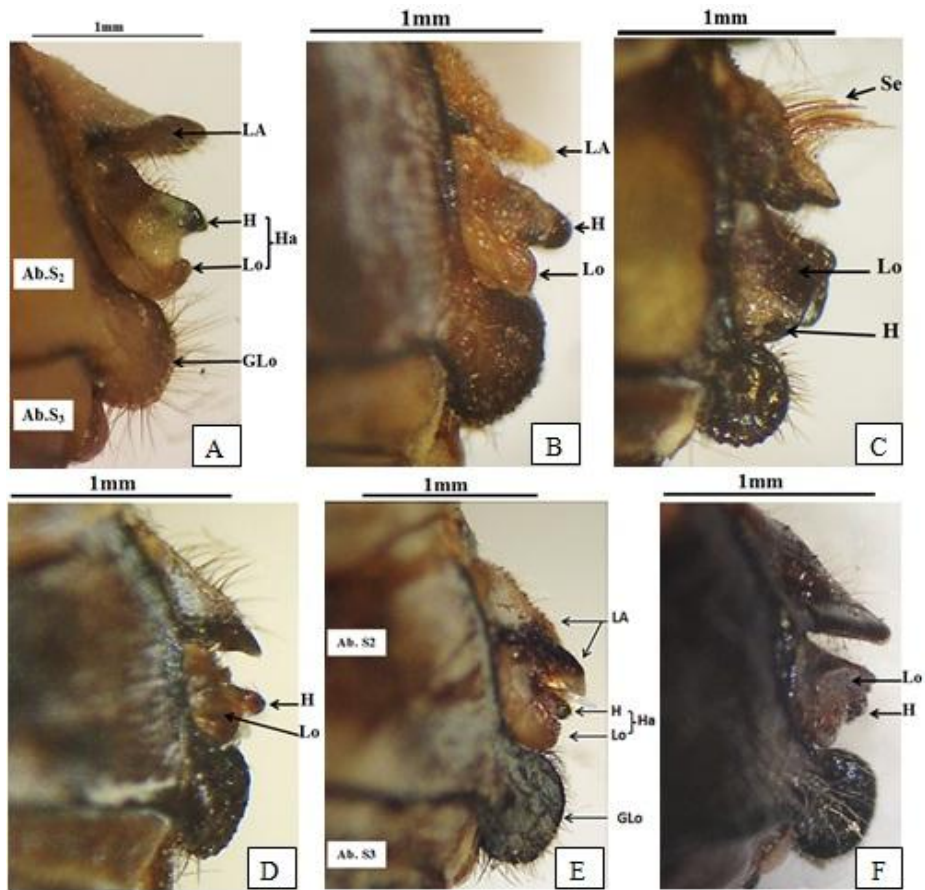


Plate (4): Secondary genitalia of *Orthetrum*; (A) *O. anceps*, (B) *O. brunneum*, (C) *O. sabina*, (D) *O. taeniolatum*, (E) *O. chrysostigma*, (F) *O. trinacria*.

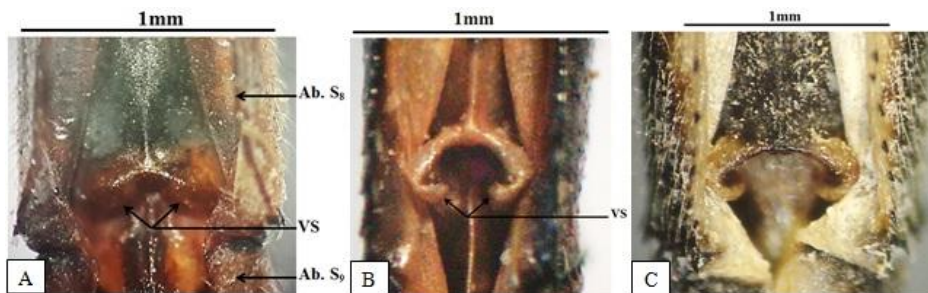


Plate (5): Vulvar of *Orthetrum*; (A) *O. anceps*, (B) *O. sabina*, (C) *O. trinacria*.

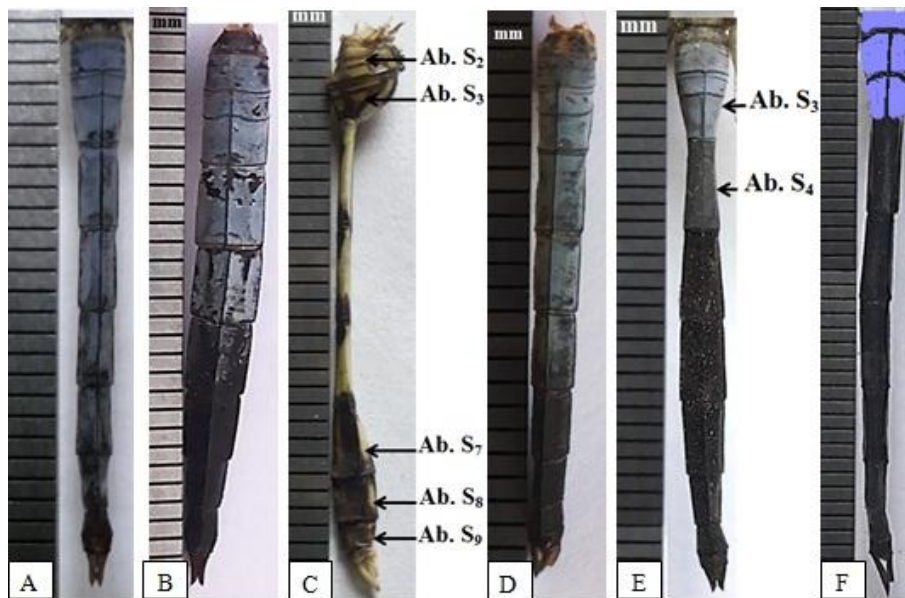


Plate (6): Abdomen of *Orthetrum*; (A) *O. anceps*, (B) *O. brunneum*, (C) *O. sabina*, (D) *O. taeniolatum*, (E) *O. chryso stigma*, (F) *O. trinacria*.

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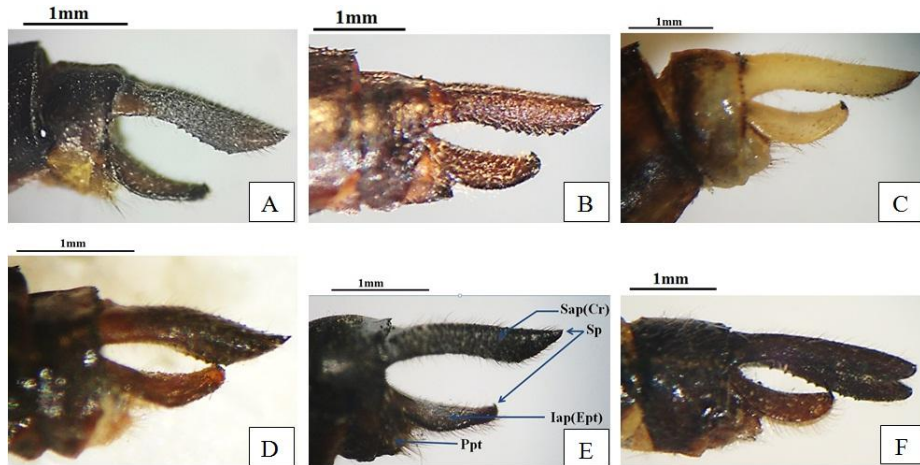


Plate (7): Appendages of *Orthetrum*; (A) *O. anceps*, (B) *O. brunneum*, (C) *O. sabina*, (D) *O. taeniolatum*, (E) *O. chrysostigma*, (F) *O. trinacria*.

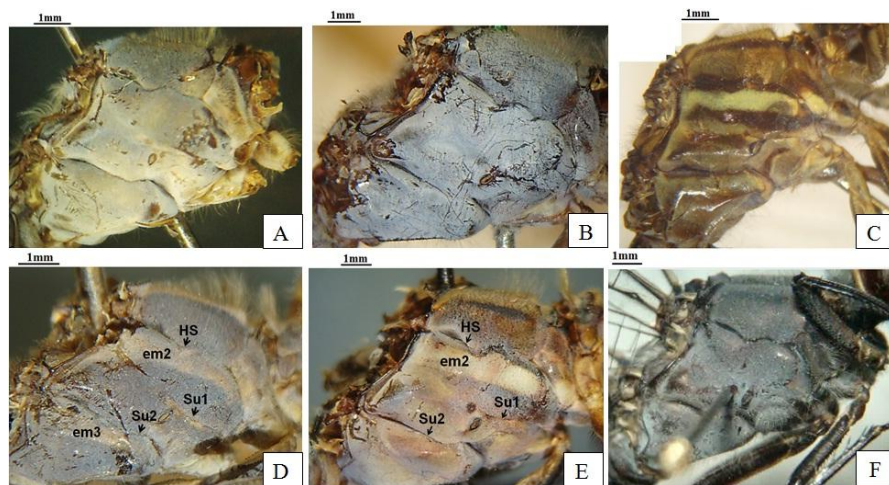


Plate (8): Synthorax of *Orthetrum*; (A) *O. anceps*, (B) *O. brunneum*, (C) *O. sabina*, (D) *O. taeniolatum*, (E) *O. chrysostigma*, (F) *O. trinacria*.

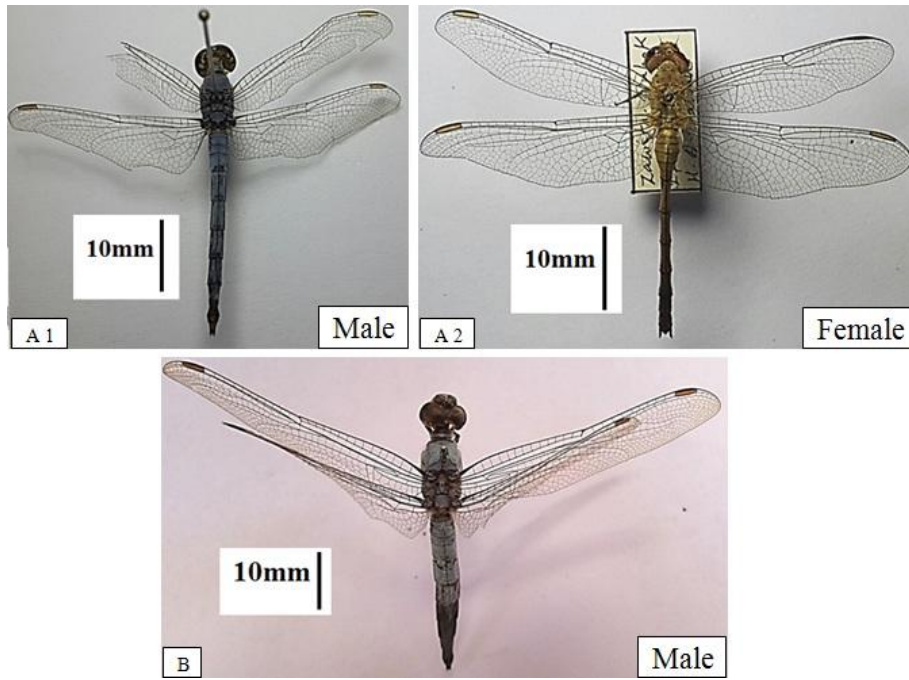


Plate (9): Adults; (A) *O. anceps*, (B) *O. brunneum*.

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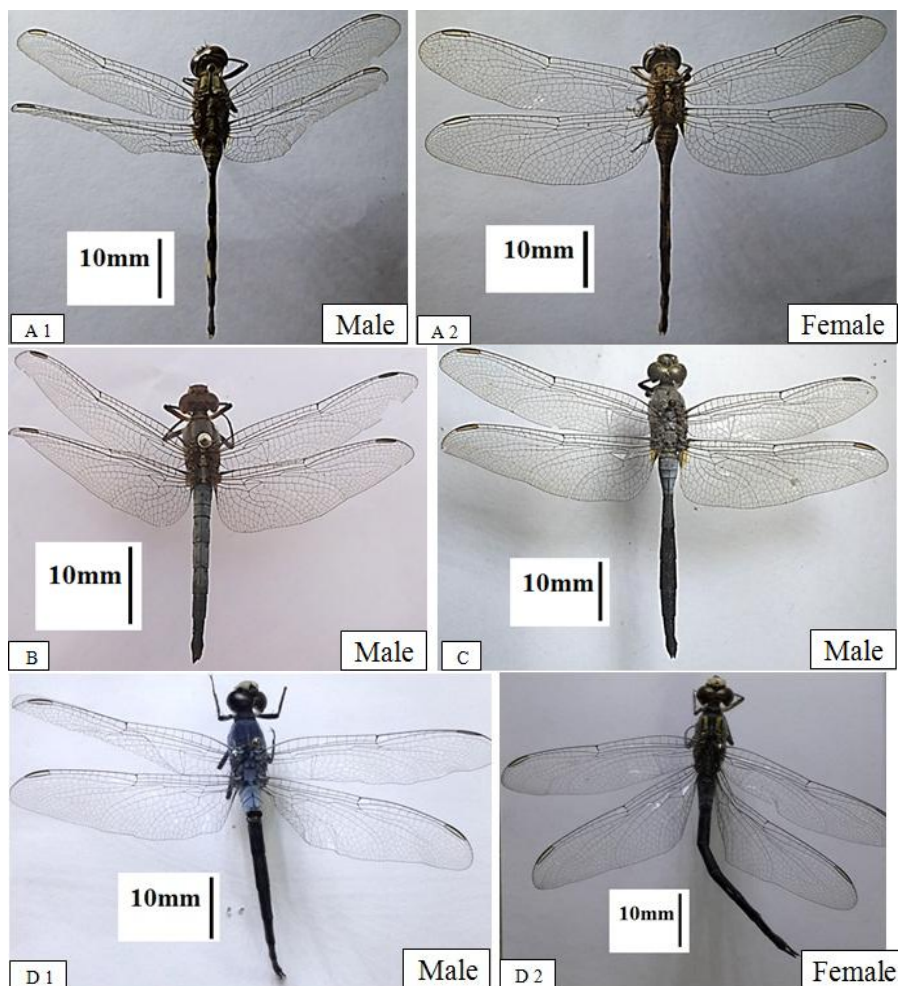


Plate (10): Adults; (A) *O. sabina*, (B) *O. taeniolatum*, (C) *O. chrysostigma*, (D) *O. trinacria*.

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مفتاح لأنواع الجنس
Orthetrum Newman, 1833 (Odonata, Libellulidae)
مع تسجيل نوع جديد للعراق

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الخلاصة

اعد خلال هذه الدراسة مفتاحاً تشخيصياً لأنواع الجنس *Orthetrum* Newman, 1833 رتبة الرعاشات، عائلة Libellulidae، متضمناً ٦ انواع جمعت من مناطق مختلفة في العراق.

أشارت النتائج الى تسجيل النوع (*O. anceps* (Schneider, 1845) لأول مرة في العراق، زود المفتاح بالصور التوضيحية لأهم الصفات المظهرية المعتمدة في التشخيص.