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SURVEY WITH CHECKLIST OF THE INVASIVE INSECTS TO IRAQ

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ABSTRACT

The survey and checklist of invasive species of the insects in some different localities of Iraq are revised; 24 invasive species were documented until December 2018 during the current investigations. The species distributions, common names and synonyms are given.

The current investigation included all of exotic species in Iraq, which are not collected during this study.

Keyword: Insects, Invasive, Iraq, Species, Survey.

INTRODUCTION

The climate modification is expected to change the geographical distribution and abundance of many species; increase the invasion of new areas by exotic species and in some cases lead to the extinction of some species and whole ecosystems (Gutierrez and Ponti, 2014). According to Pimentel *et al*. (2000), the invasive species collectively cause, in excess of 140 $ billion, in losses annually in the USA, and a trillion globally (Oerke and Dehne, 2004); on the other hand, the invasive of species insects may cause damage to the biodiversity of a region, which is made up of three aspects: compositional, functional and structural diversity (Noss, 1990).

The compositional diversity which means the number of different species in a system is most frequently accepted as a measure for this term; however, the functional and structural diversities are an integral part of the system dynamics, and are frequently severely altered by biological invasions. These species impacts are frequently recorded to affect more than one facet, or where one facet has been affected, the others feel ripple effects; these impacts include replacement of diverse systems with single or mixed species stands of aliens, alteration of geomorphological processes, soil chemistry and hydrology; also invasions may lead to the extinction of compositional diversity and the direct threat to native fauna (Cronk and Fuller, 1995).

For the reasons above, this paper is done because of the absence of any checklist related to invasive insects in the ecosystems of Iraq.

MATERIALS AND METHODS

The specimens of this study were collected from different localities of Iraq from January 2013 to December 2018; the sweeping and aerial net, light traps, tephry traps, yellow-sticky traps, lures, baits, and forceps were used to collect the specimens. Some of the collected specimens were put in alcohol (ethanol 75%) mixed with few drops of glycerin to avoid the change to dark color, such as the larvae of Diptera, but the others were pinned directly such as Coleoptera, adult of flies or indirectly by insect cards; the information concerning the date of collection, locality of the specimens are given.

Many keys Many keys were used to identify the specimens that including: Curran (1965), Zumput (1965), Usinger (1966), Endrodi (1985), Spradbery (1992), White and Elson-Harris (1994), Povolny (1994), Yassin and David (2010), Gasca-Álvarez and Amat-García (2010) and Irish *et al.* (2014); for precise identification, they were compared with previously identified specimens stored at Iraq Natural History Research Center and Museum, University of Baghdad.

RESULTS AND DISCUSSION

The current survey from different regions of Iraq for the period 2013-2018 and previous studies showed 24 species belonging to 21 genera, 18 families and 6 orders that have invaded Iraq till the end of December 2018: these species are:

(A) Order: Diptera

1- Family: Calliphoridae

Chrysomya bezziana (Villeneuve, 1914)

Common name: Old world screwworm fly (OWS).

Hosts: Cattles and human.

Materials examined: (31 specimens): Karbala province, Al-Hindiya District, 11 larvae from sheep, specimens, 31.III.2018. Diyala province (20 specimens), Kifri district, 13 larvae from sheep, 13.IV.2017; Al Khalis district, 7 larvae from dogs, 13.XI.2016.

Distribution: Iraq (Abdul-Rassoul *et al*., 1996); most tropical and subtropical areas of Africa, Indian Subcontinent, New Guinea and South East Asia (Norris and Murray, 1964; Zumpt, 1965; Sutherst *et al*., 1989; Rohela *et al*., 2006). Kuwait, Qatar and Bahrain (Rajapaksa and Spradbery, 1989), Iran (Djalayer *et al*., 1978; Navidpour *et al*., 1996); Saudi Arabia (Alahmed, 2002).

2-Family: Drosophilidae

Zaprionus indianus (Gupta, 1970)

Synonyms: *Zaprionus collarti* Tsacas, 1980
Zaprionus inermis Seguy, 1938
Zaprionus paravittiger Godbole & Vaidya, 1972

Common name: The African fig fly.

Hosts: Fermented fruits.

Materials examined: (20 specimens): Baghdad, Bab Al Muadham, 10 specimens, 10.III.2018; Al-Kadhimiya, 10 specimens, 22.IV.2018.

Distribution: Semi-cosmopolitan, Florida and Panama (van der Linde *et al*., 2006); Mexico (Castrezana, 2007); Canada (Renkema *et al*., 2013); Indian subcontinent (Yassin *et al*., 2008); Iraq (Al T'oma and van der Linde, 2010) France (Kremmer *et al.*, 2017).

3-Family: Tephritidae

Ceratitis capitata (Wiedemann, 1824)

Synonyms: *Ceratitis citripeda* Efflatoun, 1924
Ceratitis citriperda Macleay, 1829
Ceratitis hispanica Breme, 1842
Pardalaspis asparagi Bezzi, 1924
Tephritis capitata Wiedemann, 1824
Trypeta capitata (Wiedemann, 1824)
Common name: Mediterranean fruit fly.
Hosts: Citrus plants, pear, grape, tomato, pepper and pomegranate and more than 260 host plants (Steck, 2006).
Materials examined (124 specimens): Wasit province, Numaniyah, 36 specimens, 21.XI.2018; Baghdad province, Bab Al Muadham, 17 specimens, 11.X.2018, Abu Ghraib, 11 specimens, 3. XI.2018 ; Karbala province, Imam Aun district, 27 specimens, 15.V.2018; Diyala province, Baquba city, 21 specimens, 30.XI.2018, Abu Saida district, 12, 20.XI.2018.
Distribution: Invasive to Iraq (Al-Haidary, 1947). It irradiated and appeared again as outbreak in Abu Saida district, Diyala province at 2006 in citrus orchids (AL-Jiboory, 2007). Also distributed in: Mauritius, Reunion, Seychelles, North Africa, Southern Europe, Middle East, Western Australia, South and North America (EPPO, 2011a); Ghana, Togo, Benin, Nigeria (De Meyer *et al*., 2013).

Dacus ciliates Loew, 1862
Synonyms: *Dacus brevistylus* Bezzi, 1908
Dacus insistens Curran, 1927
Tridacus mallyi Munro, 1925
Common names: Ethiopian fruit fly and cucurbit fly.
Hosts: The larvae of this species grow in the fruits of a wide range of cucurbit crops, such as cucumbers and melons; and wild Cucurbitaceae.
Materials examined: (100 specimens): Baghdad province, 20 specimens, Al-Jadryia, 22.VII. 2018 Abu-Gharaib, 25 specimens, 28.VII.2018; Karbala province 30 specimens, Al-Hussainya, 10.XI.2018; Wasit province, Numaniyah, 25 specimens, 22.X.2018.
Distribution: Iraq (Moanas and Abdul-Rassoul, 1989); Bangladesh, India, Iran, Myanmar, Pakistan, Saudi Arabia, Yemen, Angola, Egypt, Benin, Botswana, Cameroon, Chad, Eritrea, Ethiopia, Kenya, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Rwanda, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Tanzania, Uganda, Zaire, Zambia, Zimbabwe (IIE, 1995); Benin, Ghana, Guinea Nigeria, Togo (De Meyer *et al*., 2013).

Dacus frontalis Beecker, 1922
Synonyms: *Dacus scopatus* Munro, 1948
Dacus ciliates var. *duplex* 1932
Dacus duplex Munro, 1932
Common name: Lesser pumpkin fly, melon fly.
Hosts: Cucumbers and pumpkins.
Materials examined: (150 specimens): Baghdad province, 20 specimens, Al-Taji 22.X.2018; Karbala province, Imam Aun, 30 specimens, 11.XI.2018; Diyala, Balad Ruz, 50 specimens, 22.XII.2018; Al Madaen, Al Tuwatha, 50 specimens, 15. I.2019.
Distribution: Iraq (Al-Saffar, 2011); Angola, Botswana, Cape Verde Is., Congo, Eritrea, Kenya, Lesotho, Namibia, Saudi Arabia, South Africa,, Tanzania, Yemen, Zimbabwe (White, 2006); Sudan (White and Goodger, 2009); Benin, Guinea, (De Meyer *et al*., 2013); Tunisia (Hafsi *et al.*,2015); Algeria, Egypt, Libya, Morocco (El Harym and Belqat, 2017).

Bactrocera zonata (Saunders, 1841)
Synonyms: *Bactrocera maculigera* Doleshall, 1858 (misidentification)

Dacus mangiferae Cotes, 1893
Dacus persicus (Biggott, 1890)
Dasyneura zonatus Saunders, 1942
Rivellia persicae Bigot, 1889

Common name: Peach fruit fly.
Hosts: It has a wide range of host plants, which include: berries, fruit, nuts and vegetables; this species can strike many fruits, including guavas, mangoes, peach, apricots, figs and citrus (EPPO, 2002).
Materials examined (20 specimens): Baghdad, AL-Jadryia, 22.V.2018.
Distribution: In Iraq as *Dacus zonata* registered by E l- Haidari *et al.* (1972) and Al-Ali (1977), *Bactrocera zonata* by Abdulrazak *et al.* (2016); also, this species distributes in Saudi Arabia, Yemen, Oman, Mauritius, Iran (White, 2002); Egypt (El-Gendy, 2002).

(B)Order: Hemiptera

1- Family: Aleyrodidae

Aleuroclava jasmine (Takahashi, 1932)
Synonyms: *Aleurotuberculatus jasmine* Takahashi, 1932
Iceria purchasi Kaussari, 1957
Iceria purchasi Kiritchenko, 1932
Icerya pulchasi Chou, 1947

Common name: Jasmine whitefly.
Hosts: Polyphagous plant, it's reached about 20 species; a minor pest of citrus and some ornamentals.
Distribution: Egypt (Amin *et al*., 1997); Australia (Martin, 1999); India (Sundararaj, 1999); China (Luo and Zhou, 2001); Iraq (Al-Shamary, 2004).

2- Family: Cimicidae

Cimex hemipterus (Fabricius, 1803)
Common name: Tropical bed bugs.
Hosts: Humans.
Materials examined (5 specimens): Baghdad, Al- Hurriyah district, 24.II.2018
Distribution: Tropical and subtropical regions (Ibrahim *et al*., 2017); Iraq (Hussain, 1963; Abul –Hab, 1979).

Cimex lectularius Linnaeus, 1758
Common name: Bed bugs.
Hosts: Humans other mammals (like bats).
Material Examined (10 specimens): Baghdad, Al- Chikuk, 5 specimens, 20.I.2018; Al-Taji, 3 specimens, 22.II.2018, Al-Hurriya, 2 specimens, 4.IV.2018.
Distribution: Cosmopolitan distributed (Usinger, 1966); in Iraq this species was registered by Abul-Hab (1980); Malaysia (Ab Majed and Zahran, 2015).

3- Family: Coccidae

Parasaissetia nigra (Niether, 1861)
Synonyms: *Coccus nigrum* Kirkaldy, 1902
Lecanium caudatum Green, 1896

Common names: Pomegranate scale, nigra scale, black coffee scale, hibiscus shield scale.
Hosts: Fig, coffee, and many crops.
Distribution: Iraq (Abdul-Rassoul and Al-Mallo, 2016); Asia: Bangladesh, India, Saudi Arabia, Indonesia and Yemen; Africa: Egypt, Eretria, Ghana and Uganda; Europe: France, Portugal and Spine (Cheraghian, 2014).

4- Family: Diaspididae
Duplachionaspis graminella (Borchsenius, 1949)
Synonyms: *Chionaspis graminis* Archangelskaya, 1937
Chionaspis phragmitidis Borchsenius, 1949
Chionaspis graminella Borchsenius, 1949
Duplachionaspis phragmitidis Balachowsky, 1954
Chionaspis graminellus Alimdzhanov and Bronshtein, 1956
Common name: Armord scale insect**.**
Hosts: Poceae, *Phragmites australis* (Cav.)
Distribution: Iraq (Jabbar *et al*., 2016); Uzbekistan (Borchsenius, 1949); Taiwan (Alimdzhanov, and Bronshtein,1956); Afghanistan (Danzig, 1972); Turkmenistan (Myartseva, 1982); Saudi Arabia (Matile-Ferrero, 1988); Iran (Moghaddam, 2013).

5- Family: Margarodidae
Icerya purchasi Maskell, 1878
Common name: Cottony cushion scale.
Hosts: This scale insect feeds on more than 65 families of woody plants, most notably on the species the belonging to the genera *Citrus* and *Pittosporum*.
Distribution: Iraq (Bodenheimer, 1951); this insect widespread throughout the world wherever citrus is grown (Ebeling, 1959); Slovakia (Kollár *et al*., 2016).

6- Family, Pseudococcidae
Nipaecoccus viridis (Newstead, 1894)
Synonyms: *Dactylopius viridis* Newstead, 1894
Dactylopius vastator Maskell, 1895
Nipaecoccus vastator Ferris, 1950
Common names: Spherical and Lebbeck mealybug.
Hosts: In Iraq this species registered on *Citrus* species; but this species is a widespread and greatly polyphagous pest, which attacks more than 100 species of herbaceous and woody plants (Sharaf and Meyerdirk, 1987).
Distribution: Iraq (Abdul-Rassoul, 1971); widespread throughout Africa and Asia (CABI, 2007). Native to Asia and widespread throughout the tropics and subtropics (Ben-Dov *et al*., 2010; Florida (Stocks, 2010); Rajasthan (Babu, 2016).

Phenacoccus solenopsis Tinsley, 1898
Synonym: *Phenacoccus cevalliae* Cockerell, 1902
Common name: Cotton mealybug.
Hosts: Polyphagous pest on different hosts like field crops, horticultural, fruit, vegetable and ornamental plants.
Materials examined (57 specimens): Baghdad province, 22 specimens from cape jasmine (Family, Rubiaceae), Al- Karrada Al-Sharqiya, 10.VII. 2015; 35 specimens from *Pilea* Lindley (1821) (Urticaceae), Al-Rubaie district, 13 specimens, 29.VI.2015 and 22 specimens collected at 2.VII.2016.
Distribution: New Mexico (Tinsley, 1898), and it spread to Caribbean and Ecuador (Ben – Dov, 1994), Chile (Larrain,2002), Argentina (Granara de Willink, 2003), Brazil (Culik and Guallan, 2005), Pakistan (Abbas *et al*., 2005), India (Yousuf *et al*., 2007), Nigeria (Akintola and Ande, 2008), Sri Lanka (Prishanthini and Laxmi, 2009), Australia (Admin, 2010), Egypt (Abd-Rabou *et al*., 2010), Indonesia (Muniappan *et al*., 2011), Iran (Moghaddam and Bagheri, 2011), Cyprus (EPPO, 2011 b), Turkey (Kaydan *et al*., 2013), Japan (Tanaka and Tabata, 2014); Iraq (Abdul-Rassoul *et al*., 2015).

(C) Order: Lepidoptera

1-Family: Gelechiidae

Tuta bsoluta (Meyrick, 1917)

Synonyms: *Gnorimoschema absoluta* (Meyrick, 1917)
Phthorimaea absoluta (Meyrick, 1917)
Scrobipalpula absoluta (Meyrick, 1917)
Scrobipalpuloides absoluta (Meyrick, 1917)

Common names: Tomato leafminer and tomato pinworm.

Hosts: The larvae of *T. absoluta* attacks tomato leaves, buds, stems and fruits, and this plant is the main host, but this pest also attacks other crops such as Solanaceous including: potato, eggplant, pepper, and pepino; tree tobacco, lambs-quarters and bindweed are also hosts (Desneux *et al*., 2010); recently there are many registered as a new host plants, including: common beans and broad bean, cowpea, wild radish, tobacco, cape gooseberry and goji berry (EPPO, 2009), also the alfalfa plant is reported as a new host to this pest by Abdul-Rassoul (2014).

Materials examined (45 specimens): Wasit province (33 specimens from tomato in plastic houses), 10 specimens, Al-Aziziyah district, 2.V.2016; Dibuni district, 23 specimens, 11.VI.2016. Baghdad province, Al-Mada'in district, 12 specimens, 20.IV.2017.

Distribution: Native to South America and has been recorded from Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay and Venezuela (Cabello *et al*., 2012); Spain (Urbaneja *et al*., 2007), and has subsequently spread throughout the Mediterranean Basin and Europe (Potting, 2009); it is currently an agricultural threat to European and North African tomato production (Desneux *et al*., 2010). In Iraq this species reported by Abdul-Razzak *et al*. (2010).

2- Family: Gracillariidae

Phyllocnistis citrella Stainton, 1856

Common name: Citrus leaf miner.

Hosts: Citrus plants that including: orange, lime, lemon, and tangerine; other Rutaceae recorded as hosts in different regions such as: *Aegle marmelos* (L.) Corr. Serv. (Fletcher, 1920), *Murraya paniculata* (L.) Jack. (Pruthi and Mani, 1945) and *Poncirus trifoliata* (L.) Raf. (Clausen, 1933) in India; *Atalantia* sp. in the Philippines (Sasscer, 1915).

Distribution: This species is described from India (Stainton, 1856); Iraq (Bodenheimer, 1951); it distributed from East Africa: Sudan to Yemen (Badawy, 1967), and through southern Asia: Saudi Arabia to India (Fletcher, 1920), Hong Kong and China and Philippines (Sasscer, 1915); Taiwan (Chiu, 1985); Japan (Clausen, 1927). It is also found in New Guinea and nearby Pacific Islands (CAB, 1970). Mexico and several Caribbean islands (Jones, 2001); USA and Hawaii (Nagamine and Heu, 2003); Australia (Beattie and Hardy, 2004).

(D) Order: Coleoptera

1-Family: Chrysomelidae

Leptinotarsa decemlineata (Say, 1824)

Synonym: *Doryphora decemlineata* Say, 1824

Common name: Colorado potato beetle.

Host: Potato.

Materials examined (15 specimens): Dohuk province, Sumail district, 4 specimens, 22.VIII.2013; Sersink district, 11 specimens, 11.VIII.2013.

Distribution: It occurs in Mexico, United States, Canada; this species has been introduced into Europe and parts of Asia (Capinera, 2001). Iraq (El-Jboory, 2004).

2-Family: Curculionidae
Rhynchophorus ferrugineus (Olivier, 1790)
Synonyms: *Curculio ferrugineus* Olivier, 1790
Cordylesex maculatus Thunberg, 1797
Calandra ferruginea Fabricius, 1801
Rhynchophorus signaticollis Chevrolat, 1882
Common names: Red palm weevil, Red stripe weevil and Asian palm weevil.
Hosts: Date palm, coconut palm and oil palm.
Distribution: Burma, China, Egypt, India, Indonesia, Iran, Malaysia, Pakistan, Papua New Guinea, Philippines, Saudi Arabia, Sri Lanka, Taiwan, Thailand, Tanzania, UAE, Jordan, Palestine and Vietnam (Zaid, 1999); Iraq (Aletby, 2016); Malta (Mizzi *et al*., 2009).

3-Family: Dynastidae
Oryctes sahariensis De Mire, 1960
Common name: Rhinoceros beetles.
Host: Palm.
Distribution: Iraq (Al-Saeedi, 2015); Egypt (Carpenter, 1975); Chad and Sudan (Carpenter and Elmer, 1978); Qatar (Mokhtar, 2009).

4- Family: Scarabaeidae
Maladera castanea (Arrow, 1913)
Synonym: *Autoserica korgei* Petrovitz, 1967
Common name: Asiatic garden beetle.
Hostes: Crops, ornamentals, turfgrass, sweet potatoes, soy beans, corn.
Distribution: Japan (Fujiyama, 1983); Korea, China Russian Far East (Ahrens, 2007); Atlantic Canada (Culter and Rogers, 2009); Florida (Skelley, 2012); India (Bhwane *et al.*, 2012); Iraq (Al-Jamali *et al.*, 2017).

Maladera insanbilis (Brenske**,** 1894)
Synonyms: *Maladera matrida* Argaman, 1986
Autoserica adiuncta Brensk, 1897
Autoserica esfandiiarii Petrovitz, 1970
Serica immutabilis Burmeister, 1855
Common names: White grub beetle.
Hosts plant: It is a polyphagous pest on ornamental and fruit plants**.**
Distribution: Iraq (Al-Jassany *et al.*, 2016), Mediterranean region and Libya (Ahrens *et al.*, 2006); Egypt (Karam and El-Minshawy, 2016); Saudi Arabia (Abdel-Dayem *et al.*, 2017).

(E) Order: Hymenoptera
1- Family: Eulophidae
Leptocybe invasa Fisher & LaSalle, 2004
Common names: Australian gall wasp, blue gum chalcid.
Host: *Eucalyptus* sp.
Distribution: Iraq (Hassan, 2012); Middle east and Africa (Mendel *et al.*, 2004); Wylie and Speight (2012) stated that species of *L. invasa* is native to Queensland, Australia, and presently distributed through Africa, Asia and the Pacific, Europe, Latin America and the Caribbean, Near East and North America.

2- Family: Ichneumonidae
Cryptus inculcator (Linnaeus, 1758)
Synonyms: *Cryptus albopictus* Seyrig, 1928

Cryptus lippensis Rudow, 1883
Cryptus filicornis Ratzeburg, 1844
Cryptus quadrilineatus Gravenhorts, 1829
Cryptus sponsor (Fabricius, 1794)
Itamoplex inculcator (Linnaeus, 1758)
Itamoplex sponsor (Fabricius, 1793)

Host: Greater wax moth.

Distribution: Iraq (Al-Jassany *et al.*, 2012); Ireland (O' Connor *et al.*, 2007); Iran (Barahoei *et al.*, 2015, Mohebban *et al.*, 2015); England (Broad, 2016).

(F) Order: Thysanoptera

Family: Thripidae

Thrips palmi Karny, 1925

Synonyms: *Thrips clarus* Moulton, 1928
Thrips leucadophilus Priesner, 1936
Thrips gossypicola Ramakrishna & Margabandhu, 1939
Chloethrips aureus Ananthakrishnan & Jagadish, 1967
Thrips gracilis Ananthakrishnan & Jagadish, 1968

Common name: Melon thrips.

Hosts: It is a polyphagous pest on vegetables, especially in the Solanaceae and Cucurbitaceae.

Distribution: Iraq (Hamodi and Abdul-Rassoul, 2012*)*; (Bhatti, 1980); India (Rajulu and Gowri, 1988); Malaysia **(**Mound and Azidah, 2009).

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مسح مع قائمة مرجعية للحشرات الدخيلة للعراق

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الخلاصة

اجري مسحا مع مراجعة لقائمة بأنواع الحشرات الدخيلة للعراق؛ اذ وثق 24 نوعا حتى عام ٢٠١٨ خلال التحريات الحالية. ذكر التوزيع الجغرافي، والاسماء الشائعة و مرادفاتها لجميع الانواع.

شملت التحريات الحالية جميع الأنواع الدخيلة في العراق ، بما فيها تلك التي لم تجمع خلال هذه الدراسة.