

Checklist of Iranian mosquitoes (Diptera: Culicidae)

Author(s): Shahyad Azari-Hamidian

Source: Journal of Vector Ecology, 32(2):235-242.

Published By: Society for Vector Ecology

DOI: [http://dx.doi.org/10.3376/1081-1710\(2007\)32\[235:COIMDC\]2.0.CO;2](http://dx.doi.org/10.3376/1081-1710(2007)32[235:COIMDC]2.0.CO;2)

URL: <http://www.bioone.org/doi/full/10.3376/1081-1710%282007%2932%5B235%3ACOIMDC%5D2.0.CO%3B2>

BioOne (www.bioone.org) is a nonprofit, online aggregation of core research in the biological, ecological, and environmental sciences. BioOne provides a sustainable online platform for over 170 journals and books published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Web site, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/page/terms_of_use.

Usage of BioOne content is strictly limited to personal, educational, and non-commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

Checklist of Iranian mosquitoes (Diptera: Culicidae)

Shahyad Azari-Hamidian

School of Public Health, Guilan University of Medical Sciences, P.O.Box: 3391, Rasht, Iran

Received 16 February 2007; Accepted 16 July 2007

ABSTRACT: The mosquito fauna of Iran includes seven genera, 64 species, and three subspecies. The records of 12 other species should be verified. There are 24 species in the most recent checklist of Iranian *Anopheles*. Two species, *An. peditaeniatus* and *An. fluviatilis* species V, have been reported since. *An. atroparvus*, *An. labranchiae*, and *An. martinius* of the Maculipennis Group, and *An. cinereus*, *An. nigerrimus*, and *An. rhodesiensis rupicola* were recorded previously but are not included in the checklist. The checklist of Iranian Culicinae includes ten species of the tribe Aedini, but there are some records of four other species: *Aedes aegypti*, *Ochlerotatus berlandi*, *Oc. chelli*, and *Oc. dorsalis*. The genus *Culex* includes 19 species, excluding *Cx. impudicus*, which has not been collected recently, and some doubtful records of *Cx. univittatus*, *Cx. vishnui*, and *Cx. vagans*. The genus *Culiseta* includes five species and the genera *Coquillettidia* and *Uranotaenia* each include one species in Iran. No information is available for the *An. subpictus*, *Oc. caspius*, *Oc. detritus*, and *Oc. pulcristaris* species complexes in Iran. The *An. claviger* and *Cx. pipiens* complexes and the *An. hyrcanus* group require review. **Journal of Vector Ecology 32 (2): 235-242. 2007.**

Keyword Index: Species checklist, Culicidae, Iran, Middle East, southwestern Asia.

INTRODUCTION

West Nile and Sindbis viruses, as well as *Dirofilaria immitis* (dog heart worm) and *D. repens* (dirofilariasis), which are transmitted by mosquitoes, have been reported in Iran (Naficy and Saidi 1970, Saidi et al. 1976, Azari-Hamidian et al. 2007). Also, the mosquito-borne nematode *Setaria* (setariasis) has been reported in the country (Eslami 1997). There is no information about their vectors in Iran. The possibility of some mosquito-borne arboviral outbreaks like Japanese encephalitis (JE) and Rift Valley fever in the WHO Eastern Mediterranean Region, including Iran, is noteworthy (WHO 2004). Travis and Labadan (1967) mentioned *Culex tritaeniorhynchus* as a vector of JE in Iran and Iraq. There are some doubtful old records of dengue fever in Iran (Foote and Cook 1959), but there is no formal recent record of this virus in the country. Seven species of the genus *Anopheles* (*An. maculipennis s. l.*, *An. sacharovi*, *An. culicifacies s. l.*, *An. dthali*, *An. fluviatilis s. l.*, *An. stephensi*, and *An. superpictus*) are known as malaria vectors in Iran (Edrissian 2006). Zaim et al. (1993) mentioned *An. pulcherrimus* as a potential vector of malaria in southeastern Iran. Eshghy (1977) observed *Plasmodium* oocysts in *An. multicolor*, but sporozoites have not been found in this species and it is not considered a vector in Iran.

Shahgudian (1960) and Lotfi (1976) provided keys to Iranian *Anopheles* and *Culex*, respectively. Zaim (1984) presented a comprehensive study on the Iranian mosquito fauna, including six genera and 55 species, mostly from the Palaearctic Region, and also from the Afrotropical and Oriental Regions. Zaim and Cranston (1986) provided a checklist and keys to the Culicinae of Iran. After that, *Culiseta morsitans* was recorded as new to the Iranian mosquito fauna and the presence of *Coquillettidia richiardii*

was verified (Azari-Hamidian et al. 2004, Azari-Hamidian 2005), but the most important taxonomic change was the elevation of *Ochlerotatus* to the generic rank (Reinert 2001). The most recent checklist of Iranian *Anopheles* includes 24 species (Sedaghat and Harbach 2005). Two species, *An. peditaeniatus* and *An. fluviatilis* species V have been reported since (Azari-Hamidian et al. 2006, Chen et al. 2006). The present paper reviews all species of mosquitoes that have been reported in Iran to facilitate comprehensive research in relation to their systematics, ecology, and medical and veterinary importance. The validity of species and subspecies follows "A Catalog of the Mosquitoes of the World (Diptera: Culicidae)" and its supplements (Knight and Stone 1977, Knight 1978, Ward 1984, Gaffigan and Ward 1985, Ward 1992), and the "Systematic Catalog of Culicidae" in the website of the Walter Reed Biosystematics Unit (WRBU). The citation of Knight and Stone 1977 refers to the catalog, its supplements, and the WRBU website, otherwise a more recent reference is cited.

The internal classifications of the genus *Anopheles* and the subgenus *Culex* of genus *Culex* follow Harbach (2004) and Harbach (1988), respectively, and that of *Ochlerotatus* (*Ochlerotatus*) follows Edwards (1932) and Gutsevich et al. (1974).

Reinert et al. (2004) reclassified the tribe Aedini based on a cladistic analysis of morphological characters of all life stages. Based on this classification, the Iranian aedine mosquitoes include species of four genera: *Aedes* (*Ae. vexans*), *Fredwardsius* (*Fr. vittatus*, formerly *Ae. (Fredwardsius) vittatus*), *Stegomyia* (*St. aegypti*, formerly *Ae. (Stegomyia) aegypti*), and *Ochlerotatus* (other species).

In this article, formally recognized genera and subgenera and their abbreviations follow Reinert (2001), because Iranian entomologists are more familiar with this

system. Based on this classification, the mosquito fauna of Iran includes seven genera, 64 species, and three subspecies. The records of 12 other species or subspecies (names in square brackets in the list below) need to be verified.

It is noteworthy that there are some unconfirmed records of other mosquito species in Iran in the unpublished data of the Institute of Public Health Research (IPHR) (formerly the Institute of Malariology and Parasitology) of Tehran University of Medical Sciences [mostly in Persian (Farsi)], including *Ochlerotatus mariae* (Sergent and Sergent) (Ghaffary 1954, Abdel-Malek, 1960). Other species in this regard are *Aedes cinereus* Meigen, *Ae. cretinus* Edwards, *Ae. unilineatus* (Theobald), *Ochlerotatus lepidonotus* (Edwards), *Oc. refiki* (Medschid), *Oc. rusticus* (Rossi), *Culiseta glaphyoptera* (Schiner), and *Cs. fumipennis* (Stephens). These species are excluded from this review.

CHECKLIST OF IRANIAN MOSQUITOES

Family Culicidae Subfamily Anophelinae

- I) Genus *Anopheles* Meigen
Subgenus *Anopheles* Meigen
Angusticorn Section
Anopheles Series
- 1- *An. (Ano.) algeriensis* Theobald
 - 2- *An. (Ano.) marteri* Senevet and Prunelle (see Note 1)
[*An. marteri sogdianus* Keshishian]
 - Claviger Complex (see Note 2)
 - 3- *An. (Ano.) claviger* (Meigen)
Maculipennis Group
Maculipennis Subgroup (see Note 3)
 - 4- *An. (Ano.) atroparvus* van Thiel
 - 5- *An. (Ano.) labranchiae* Falleroni
 - 6- *An. (Ano.) maculipennis* Meigen
[*An. (Ano.) martinius* (Shingarev)]
 - 7- *An. (Ano.) melanoon* Hackett
 - 8- *An. (Ano.) messeae* Falleroni
 - 9- *An. (Ano.) persiensis* Linton, Sedaghat and Harbach
 - 10- *An. (Ano.) sacharovi* Favre
Plumbeus Group
 - 11- *An. (Ano.) plumbeus* Stephens
Laticorn Section
Myzorhynchus Series
Hyrceanus Group (see Note 4)
 - 12- *An. (Ano.) hyrcanus* (Pallas)
 - 13- *An. (Ano.) pseudopictus* Grassi
Nigerrimus Subgroup
[*An. (Ano.) nigerrimus* Giles]
 - Lesteri Subgroup
 - 14- *An. (Ano.) peditaeniatus* (Leicester)
Subgenus *Cellia* Theobald
Myzomyia Series
 - 15- *An. (Cel.) apoci* Marsh (see Note 5)
 - 16- *An. (Cel.) dthali* Patton
Demeilloni Group
 - 17- *An. (Cel.) sergentii* (Theobald) (see Note 6)

Funestus Group

Culicifacies Subgroup (see Note 7)

- 18- *An. (Cel.) culicifacies* Giles, species A
- 19- *An. (Cel.) culicifacies* Giles, species B (or a new species)

Minimus Subgroup

Fluviatilis Complex (see Note 8)

- 20- *An. (Cel.) fluviatilis* James, species T
- 21- *An. (Cel.) fluviatilis* James, species V

Neocellia Series

- 22- *An. (Cel.) moghulensis* Christophers
- 23- *An. (Cel.) pulcherrimus* Theobald
- 24- *An. (Cel.) stephensi* Liston (see Note 9)
- 25- *An. (Cel.) superpictus* Grassi (see Note 10)

Neomyzomyia Series

Rhodesiensis Group

- [*An. (Cel.) rhodesiensis* Theobald] (see Note 11)
[*An. rhodesiensis rupicola* Lewis]

Paramyzomyia Series

Cinereus Group

- [*An. (Cel.) cinereus* Theobald] (see Note 12)
26- *An. (Cel.) turkhudi* Liston (see Note 13)

Listeri Group

- 27- *An. (Cel.) multicolor* Combouliu

Pyrethophorus Series

Subpictus Complex (see Note 14)

- 28- *An. (Cel.) subpictus* Grassi s.l.

Subfamily Culicinae

Tribe Aedini

II) Genus *Aedes* Meigen

Subgenus *Aedimorphus* Theobald

- 29- *Ae. (Adm.) vexans* (Meigen) (see Note 15)

Subgenus *Fredwardsius* Reinert

- 30- *Ae. (Fre.) vittatus* (Bigot)

Subgenus *Stegomyia* Theobald

- [*Ae. (Stg.) aegypti* (Linnaeus)] (see Note 16)

III) Genus *Ochlerotatus* Lynch Arribalzaga

Subgenus *Finlaya* Theobald

- 31- *Oc. (Fin.) echinus* (Edwards)
- 32- *Oc. (Fin.) geniculatus* (Olivier) (see Note 17)
[*Oc. (Fin.) versicolor* (Barraud)] (see Note 18)

Subgenus *Ochlerotatus* Lynch Arribalzaga

Albofasciatus Group

- 33- *Oc. (Och.) caballus* (Theobald)
[*Oc. (Och.) chelli* (Edwards)] (see Note 19)

Cantans Group

- 34- *Oc. (Och.) flavescens* (Mueller)

Dorsalis Group [Caspian Group sensu Gutsevich et al. (1974)]

- 35- *Oc. (Och.) caspius* (Pallas) (see Note 20)
[*Oc. (Och.) dorsalis* (Meigen)] (see Note 21)

Pulcritarsis Complex (see Note 22)

- [*Oc. (Och.) berlandi* (Seguy)]
36- *Oc. (Och.) pulcritarsis* (Rondani)
[*Oc. pulcritarsis asiaticus* (Edwards)]

Communis Group

- 37- *Oc. (Och.) detritus* (Holiday) (see Note 23)
 38- *Oc. (Och.) leucomelas* (Meigen)

Tribe CuliciniIV) Genus *Culex* Linnaeus**Subgenus *Barraudius* Edwards**

- 39- *Cx. (Bar.) modestus* Ficalbi (see Note 24)
 40- *Cx. (Bar.) pusillus* Macquart

Subgenus *Culex* Linnaeus**Pipiens Group****Pipiens Subgroup (see Note 25)**

- 41- *Cx. (Cux.) pipiens* Linnaeus
 42- *Cx. (Cux.) quinquefasciatus* Say
Trifilatus Subgroup (see Note 25)

- 43- *Cx. (Cux.) torrentium* Martini
 [*Cx. (Cux.) vagans* Wiedemann]

Decens Subgroup

- 44- *Cx. (Cux.) antennatus* (Becker)
Univittatus Subgroup (see Note 26)

- 45- *Cx. (Cux.) perexiguus* Theobald
 [*Cx. (Cux.) univittatus* Theobald]

Theileri Subgroup

- 46- *Cx. (Cux.) theileri* Theobald
 47- *Cx. (Cux.) laticinctus* Edwards

Simpsoni Subgroup

- 48- *Cx. (Cux.) sinaiticus* Kirkpatrick

Sitiens Group**Sitiens Subgroup**

- 49- *Cx. (Cux.) sitiens* Wiedemann

Mimeticus Subgroup

- 50- *Cx. (Cux.) mimeticus* Noe

Vishnui Subgroup (see Note 27)

- 51- *Cx. (Cux.) pseudovishnui* Colless
 52- *Cx. (Cux.) tritaeniorhynchus* Giles
 [*Cx. (Cux.) vishnui* Theobald]

Subgenus *Maillotia* Theobald

- 53- *Cx. (Mai.) arbieeni* Salem
 54- *Cx. (Mai.) deserticola* Kirkpatrick
 55- *Cx. (Mai.) hortensis* Ficalbi (see Note 28)

Subgenus *Neoculex* Dyar

- [*Cx. (Ncx.) apicalis* Adams] (see Note 29)
 [*Cx. (Ncx.) impudicus* Ficalbi] (see Note 30)
 56- *Cx. (Ncx.) territans* Walker

Subgenus *Oculeomyia* Theobald

- 57- *Cx. bitaeniorhynchus* Giles (see Note 31)

Tribe CulisetiniV) Genus *Culiseta* Felt**Subgenus *Allotheobaldia* Broelemann**

- 58- *Cs. (All.) longiareolata* (Macquart)

Subgenus *Culicella* Felt

- 59- *Cs. (Cuc.) morsitans* (Theobald)

Subgenus *Culiseta* Felt

- 60- *Cs. (Cus.) alaskaensis* Ludlow (see Note 32)
 [*Cs. alaskaensis indica* (Edwards)]
 61- *Cs. (Cus.) annulata* (Schrank) (see Note 33)
 62- *Cs. (Cus.) subochrea* (Edwards) (see Note 33)

Tribe MansoniiniVI) Genus *Coquillettidia* DyarSubgenus *Coquillettidia* Dyar

- 63- *Cq. (Coq.) richiardii* (Ficalbi) (see Note 34)

Tribe UranotaeniiniVII) Genus *Uranotaenia* Lynch Arribalzaga**Subgenus *Pseudopictus* Theobald**

- 64- *Ur. (Pfc.) unguiculata* Edwards (see Note 35)

NOTES

1. *An. marteri* has two subspecies: *An. marteri marteri* and *An. marteri sogdianus* Keshishian [Tajikistan (type locality)]. Only *An. marteri sogdianus* has been recorded in Iran (Shahgudian 1956, 1960). It seems that the validity of this subspecies is doubtful. Ribeiro et al. (1987) considered it as a synonym of *An. marteri*, but Glick (1992) treated it as a valid taxon.

2. The Claviger Complex has two species: *An. claviger* and *An. petragrani* Del Vecchio (Coluzzi 1962). The adult females of these species cannot be distinguished. It is not known whether the second species occurs in Iran.

3. The Maculipennis Group includes 12 species in the Palaearctic Region (Trari et al. 2004, Gordieev et al. 2005) in which eight of them have been reported in Iran. *An. maculipennis*, *An. messeae*, and *An. sacharovi* have been recorded based on both DNA sequence data and morphological characters, *An. atroparvus* and *An. labranchiae* based on DNA sequence data and *An. melanoon* based on egg pattern. There is only one reference to *An. martinius* in Iran, i.e. Glick (1992), but there is no formal record of this species in Iran and it is consequently not included in the checklist in this article. *An. persiensis* was described from this country based on DNA sequence data (Sedaghat et al. 2003). The specific name 'persiensis' is derived from Persia, the old name of Iran before 1933. Doosti et al. (2006) provided most of the literature on members of the Maculipennis Group in Iran. Sedaghat and Harbach (2005) did not mention *An. atroparvus*, *An. labranchiae*, and *An. martinius* in their checklist of Iranian *Anopheles*.

4. There are three species of the Hyrcanus Group in Iran. The old records of *An. nigerrimus* need to be verified. The taxon "mesopotamiae" was described as a variety of *An. sinensis* Wiedemann from Khorramshahr of Khuzistan Province in southwestern Iran. It is currently considered to be a synonym of *An. hyrcanus* (Knight and Stone 1977, Azari-Hamidian et al. 2006). *An. hyrcanus* was described from the southern shores of the Caspian Sea (Ramsdale 2001). The specific name 'hyrcanus' is derived from Hyrcania, the old name of the region in the southeast of the Caspian Sea littoral that includes Golestan and Mazandaran Provinces (Kitzmilller 1982).

5. *An. apoci* was described from specimens collected in Masjid-i-Solaiman, Khuzistan Province of southwestern Iran. The specific name 'apoci' is derived from the acronym for the Anglo Persian Oil Company (Marsh 1933). This

species is recorded only in Iran and Iraq (Knight and Stone 1977). The adult females of *An. apoci* and *An. paltrinerii* Shidrawi and Gillies cannot be distinguished morphologically except by features of the cibarial armature (Shidrawi and Gillies 1987).

6. *An. sergentii* has two subspecies: *An. sergentii sergentii* and *An. sergentii macmahoni* Evans [Kenya (type locality)] (Knight and Stone 1977).

7. The Culicifacies Complex has five sibling species designated A, B, C, D, and E in the Oriental Region (Kar et al. 1999). *An. culicifacies* A was recorded in Iran based on cytotaxonomy (Zaim and Javaherian 1991). Dinparast-Djadid et al. (2000a) introduced a new species in this complex from Iran. Oshaghi et al. (2004c) verified the occurrence of *An. culicifacies* A and recognized species B based on PCR-RFLP analysis of the mitochondrial cytochrome c oxidase I gene (COI). However, presence of species B is doubtful, since later sequence analysis of the COI and ITS2 loci of the species B specimens were significantly different than those of the other species of the complex and may represent a new species (Oshaghi et al. 2006a, Oshaghi, personal communication).

8. Oshaghi et al. (2000) mentioned the possible occurrence of *An. fluviatilis* species S and T in Iran based on RAPD-PCR. Dinparast-Djadid et al. (2000b) reported two distinct species in this taxon in Iran using ITS2-PCR. Naddaf-Dezfouli et al. (2003) verified the presence of the species T in Iran based on ITS2 sequence. The *An. fluviatilis* complex probably includes four species (S, T, U, and V) in southern Asia. The former species Y is one of the ITS2 haplotypes of species T (with T1 and T2) and the former species X is synonym with species S. Also, species U may hybridize with T in some regions (Chen et al. 2006, Singh et al. 2006). Therefore, there are at least two sibling species (T and V) in Iran (Chen et al. 2006).

9. *An. stephensi* has three egg phenotypes: mysorensis, typical, and intermediate. They are natural variations and systematically considered infrasubspecific forms of *An. stephensi*. All of them are recorded in Iran (Sahabi et al. 1973 mysorensis, Oshaghi et al. 2006b all three forms).

10. Oshaghi et al. (2004b, 2006a, personal communication), based on sequence analysis of the mtDNA COI and rDNA ITS2, suggested that *An. superpictus* is a complex of species in Iran.

11. Shahgudian (1960) mentioned that the old records of *An. rhodesiensis rupicola* Lewis [Sudan (type locality)] in Iran might be based on misidentifications. Some records include Edwards (1921, Baluchistan), Christophers (1924), and Foote and Cook (1959). This subspecies is recorded in some other countries in southwestern Asia (Glick 1992).

12. There is only one record of *An. cinereus* in Iran by Foote and Cook (1959). Shahgudian (1960) and Sedaghat and Harbach (2005) did not mention it in their checklists of Iranian anophelines. This species is recorded from some other countries in southwestern Asia (Glick 1992).

13. *An. turkhudi* has two subspecies: *An. turkhudi turkhudi* and *An. turkhudi telamali* Saliternik and Theodor [Israel (type locality)] (Knight and Stone 1977). Validity of the

second subspecies is in doubt (Glick 1992). Edwards (1921) described *persicus* as a variety of *An. turkhudi* in Iran. It is considered to be a synonym of *An. turkhudi* (Knight and Stone 1977).

14. The Subpictus Complex has four sibling species, A, B, C, and D, in India (Suguna et al. 1994). There were no recent reports of *An. subpictus s.l.* in Iran, but after about forty years, few specimens of *An. subpictus s.l.* were found in southeastern Iran (Oshaghi et al. 2004a). There is no information about the *An. subpictus* complex in the country.

15. *Ae. vexans* has three subspecies *Ae. vexans vexans*, *Ae. vexans arabiensis* (Patton) [Yemen (type locality)], and *Ae. vexans nipponii* (Theobald) [Japan (type locality)] (Knight and Stone, 1977, Reinert et al. 2004). There is no information about the subspecies of *Ae. vexans* in Iran. The occurrence of the second subspecies in southern Iran seems possible.

16. *Ae. aegypti* was reported by Barraud (1920) (as *Stegomyia fasciata*) in Khorramshahr (former Mohammerah) of Khuzistan Province, by Edwards (1921) (as *Ae. argenteus*), by Monchadskii (1951) (as *Ae. aegypti*), and Dow (1953) (as *Ae. aegypti*) in Bushehr, Bushehr Province of southern Iran. Also, there is an informal record of *Ae. aegypti* by Mofidi in Bushehr in the early 1950s (Zaim et al. 1984). This species has not been reported in Iran for more than 50 years, but it may possibly occur in southern Iran, especially in view of its recent record in Saudi Arabia (Miller et al. 2002). Zaim and Cranston (1986) did not mention it in their checklist. There are two subspecies in this species: *Ae. aegypti aegypti* and *Ae. aegypti formosus* (Walker) [Sierra Leone (type locality)] (Knight and Stone 1977, Reinert et al. 2004).

17. Gutsevich et al. (1974) described a form or subspecies of *Oc. geniculatus* (as *Ae. geniculatus*), without a specific name, from northern Iran. Minar believes that *Oc. geniculatus* found in Guilan Province, northern Iran, belongs to this form or subspecies (Azari-Hamidian et al. 2002, personal communication).

18. Danilov (1978) transferred *Oc. versicolor* (as *Ae. versicolor*) from the previous subgenus *Ochlerotatus* to the previous subgenus *Finlaya* of genus *Aedes* and recorded it in the Azerbaijan Republic (former Azerbaijan SSR) near the Iranian border and noted its possible occurrence in Iran.

19. McIntosh (1973) reported *Oc. chelli* Edwards (as *Ae. chelli*) in Jask, Hormozgan Province of southern Iran and illustrated its male genitalia based on Iranian specimens. There are no other references about this species in Iran. Zaim and Cranston (1986) did not mention it in their checklist.

20. *Oc. caspius* has two subspecies: *Oc. caspius caspius* and *Oc. caspius meirai* Ribeiro, Ramos, Capela and Pires [Portugal (type locality)] and a variety: *Oc. caspius* var. *hargreavesi* (Edwards) [Italy (type locality)] (Knight and Stone 1977, Reinert et al. 2004). Also, two sibling species A and B are recorded in the *Oc. caspius* complex (Cianchi et al. 1980). Minar (1981) noted that the specimens that he studied from Iran showed typical characters. There is no more information about different forms of this species in Iran.

21. *Oc. dorsalis* had been reported by Barraud (1920) in Ashar, Khuzistan Province of southwestern Iran and by Kalandadze and Kaviladze (1947) (as *Ae. caspius dorsalis*) in different locations of East and West Azerbaijan Provinces, northwestern Iran. There are no other records of this species in Iran. Zaim and Cranston (1986) did not mention it in their checklist.
22. *Oc. pulcritarsis* has two subspecies: *Oc. pulcritarsis pulcritarsis* and *Oc. pulcritarsis asiaticus* (Edwards) [Pakistan (type locality)] (Knight and Stone 1977, Reinert et al. 2004). Monchadskii (1951) noted the occurrence of both subspecies (as subspecies of *Ae. pulcritarsis*) in Iran. Minar (1974) reported *Oc. pulcritarsis pulcritarsis* (as *Ae. pulcritarsis pulcritarsis*) in Mazandaran Province, northern Iran. Also, *Oc. pulcritarsis* is mentioned as a species complex that includes: *Oc. pulcritarsis* and *Oc. berlandi*. Only Gutsevich et al. (1974) noted the occurrence of the second species (as a variety of *Oc. pulcritarsis*) in Iran. There is no other information about this species and Zaim and Cranston (1986) did not mention it in their checklist.
23. The *Oc. detritus* complex includes two species: *Oc. detritus* and *Oc. coluzzi* (Rioux, Guilvard and Pasteur) (Rioux et al. 1998). There is no information about the second species in Iran.
24. *Cx. modestus* has two subspecies: *Cx. modestus modestus* and *Cx. modestus inatomii* Kamimura and Wada [Japan (type locality)] (Knight and Stone 1977).
25. Lotfi (1970, 1976) recorded *Cx. torrentium* and *Cx. vegans* in Iran based on unreliable characters in the larval stage. These two species cannot be distinguished from members of the *Cx. pipiens* complex with certainty based on these characters. Zaim and Cranston (1986) listed only *Cx. torrentium* in their checklist and Harbach (1988) mentioned that the records of these species in Iran are doubtful. Danilov (1975) reported *Cx. torrentium* from Rasht in northern Iran. Both physiological and behavioral forms of *Cx. pipiens*, the nominotypical and *molestus* forms, are recorded in Iran (Lotfi 1970, 1973, 1976, Amirkhaniyan 1974, Zaim and Cranston 1986).
26. The old records of *Cx. univittatus* in southwestern Asia, and in Iran by Gutsevich (1943), Monchadskii (1951), Lotfi (1970, 1973, 1976), and Zaim et al. (1985), are considered to refer to *Cx. perexiguus*. The former species is an Afrotropical one that occurs only in Yemen Republic in southwestern Asia (Harbach 1988). Recently, Mahmoud-Asl (1989) mentioned some specimens from Hormozgan Province, southern Iran, that show morphological characters of *Cx. univittatus*.
27. The old records of *Cx. vishnui* in southwestern Asia and in Iran by Gutsevich (1943), Monchadskii (1951), and Lotfi (1970, 1973, 1976) are considered to refer to *Cx. pseudovishnui* (Zaim and Cranston 1984, Harbach 1988). However, based on the record of the first species in Pakistan, it seems that *Cx. vishnui* may occur in southeastern Iran.
28. *Cx. hortensis* has two subspecies: *Cx. hortensis hortensis* and *Cx. hortensis maderensis* Mattingly [Portugal (type locality)] (Knight and Stone 1977).
29. The old records of *Cx. apicalis* in the Old World, including Iran, by Gutsevich (1943) were misidentifications that refer to the Holarctic *Cx. territans*.
30. *Cx. impudicus* was recorded in Iran only by Lotfi (1970, 1973, 1976). Zaim and Cranston (1986) did not mention it in their checklist of Iranian Culicinae.
31. *Oculeomyia* was reinstated as a subgenus of *Culex* for the species belonging to the Bitaniorhynchus Subgroup (Tanaka 2004).
32. *Cs. alaskaensis* has two subspecies: *Cs. alaskaensis alaskaensis* and *Cs. alaskaensis indica* (Edwards) [India (type locality)] (Knight and Stone 1977). Maslov (1967) recorded *Cs. alaskaensis indica* in Iran. Zaim et al. (1986) and Zaim and Cranston (1986) mentioned *Cs. alaskaensis* as a new record for Iran without any information at the subspecies level. There is little information about this species in Iran (Azari-Hamidian 2005).
33. Maslov (1967) and Zaim et al. (1986) reported *Cs. subochrea* (as subspecies of *Cs. annulata*) in Iran. Zaim and Cranston (1986) mentioned *Cs. annulata* in their checklist and *Cs. subochrea* in their keys. Minar (1981) and Azari-Hamidian (2005) found *Cs. annulata* in northern Iran and Gilan Province, respectively. The taxonomy and distribution of these two species need more investigation in Iran (Azari-Hamidian 2005).
34. Zaim et al. (1986) and Zaim and Cranston (1986) did not find *Cq. richiardii*, which was previously recorded in Iran by Gutsevich (1943), but noted a possible new species of *Coquillettidia* from Marivan, Kurdistan Province of western Iran. There is one female of *Coquillettidia* in the Medical Arthropod Museum in the School of Public Health and Institute of Public Health Research, Tehran University of Medical Sciences from Marivan without any other information on its label. Examination of this specimen revealed that it resembles specimens of *Cq. richiardii* from northern Iran (Azari-Hamidian et al. 2004).
35. *Ur. unguiculata* has two subspecies: *Ur. unguiculata unguiculata* and *Ur. unguiculata pefflyi* Stone [Saudi Arabia (type locality)] (Knight and Stone 1977). Zaim and Cranston (1986) noted the presence of *Ur. unguiculata unguiculata* in Iran. The occurrence of the second subspecies seems to be possible in southern Iran.

Acknowledgments

The author is very grateful to R.E. Harbach, Department of Entomology, the Natural History Museum, Cromwell Road, London, SW7 5BD, UK and M.A. Oshaghi, Department of Medical Entomology and Vector Control, School of Public Health and Institute of Public Health Research, Tehran University of Medical Sciences, Tehran, Iran, for reviewing the manuscript and their valuable comments.

REFERENCES CITED

- Abdel-Malek, A. 1960. The culicine mosquitoes of the northern region of the United Arab Republic (Diptera: Culicidae). Bull. Soc. Entomol. Egypte 44: 111-128.

- Amirkhanian, J.D. 1974. The salivary gland chromosomes of *Culex pipiens molestus*. Iranian J. Publ. Hlth. 3: 40-54.
- Azari-Hamidian, S., M.A. Joeafshani, A.R. Rassaei, and M. Mosslem. 2002. Mosquitoes of the genus *Aedes* (Diptera: Culicidae) in Guilan. J. Med. Fac. Guilan Univ. Med. Sci. 11: 29-39 [In Persian with English abstract].
- Azari-Hamidian, S., M.A. Joeafshani, M. Mosslem, and A.R. Rassaei. 2004. Notes on *Coquillettidia richiardii* and *Uranotaenia unguiculata* (Diptera: Culicidae) in Guilan province. J. Med. Fac. Guilan Univ. Med. Sci. 13: 1-9 [In Persian with English abstract].
- Azari-Hamidian, S. 2005. Larval habitat characteristics of mosquitoes of the genus *Culiseta* Felt, 1904 (Diptera: Culicidae) in the Caspian Sea littoral, Iran. Zool. Middle East 36: 59-66.
- Azari-Hamidian, S., M.R. Abai, H. Ladonni, H. Vatandoost, and K. Akbarzadeh. 2006. *Anopheles peditaeniatus* (Leicester) new to the Iranian mosquito fauna with notes on *Anopheles hyrcanus* group in Iran. J. Am. Mosq. Contr. Assoc. 22: 144-146.
- Azari-Hamidian, S., M.R. Yaghoobi-Ershadi, E. Javadian, I. Mobedi, and M.R. Abai. 2007. Review of dirofilariasis in Iran. J. Med. Fac. Guilan Univ. Med. Sci. (In press) [In Persian with English abstract].
- Barraud, P. J. 1920. Notes on some Culicidae collected in lower Mesopotamia. Bull. Entomol. Res. 10: 323-325.
- Chen, B., R.K. Butlin, P.M. Pedro, X.Z. Wang, and R.E. Harbach. 2006. Molecular variation, systematics and distribution of the *Anopheles fluviatilis* complex in southern Asia. Med. Vet. Entomol. 20: 33-43.
- Christophers, S.R. 1924. Provisional List and Reference Catalogue of the Anophelini. Indian J. Med. Res., Supp. Ser., 105 pp.
- Cianchi, R., A. Sabatini, D. Boccolini, L. Bullini, and M. Coluzzi. 1980. Due entità riproduttivamente isolate sotto il nome di *Aedes caspius* (Diptera, Culicidae). Atti XII Congresso Nazionale Italiano Entomologia, Roma, 2, pp. 269-272 [In Italian].
- Coluzzi, M. 1962. Le forme di *Anopheles claviger* Meigen indicate con i nomi *missirolii* e *petragnanii*, sono due specie riproduttivamente isolate. R. C. Accad. Lincei 32: 1025-1030 [In Italian].
- Danilov, V.N. 1975. Mosquito fauna of northwestern Iran. Med. Parasit. and Parasitic Dis. 44: 732 [In Russian with English abstract].
- Danilov V.N. 1978. The first finding of the mosquito *Aedes (Finlaya) versicolor* Barraud (Diptera: Culicidae) in the USSR, description of its female and larva of instar IV. Vest. Zool. 3: 82-85 [In Russian with English abstract].
- Dinparast-Djadid, N., M. Zaim, and H. Townson. 2000a. Molecular identification of a new species related to *An. culicifacies* species complex from Iran. 2nd Iranian Congress on Malaria, Tehran, p. 20 [In Persian with English abstract].
- Dinparast-Djadid, N., M. Zaim, and H. Townson. 2000b. Population genetics and molecular systematics of *Anopheles fluviatilis* in Iran. 2nd Iranian Congress on Malaria, Tehran, p. 61 [In Persian with English abstract].
- Doosti, S., S. Azari-Hamidian, H. Vatandoost, M.A. Oshaghi, and M. Hosseini. 2006. Taxonomic differentiation of *Anopheles sacharovi* and *An. maculipennis s.l.* (Diptera: Culicidae) larvae by seta 2 (antepalpmate hair). Acta Med. Iran. 44: 21-27.
- Dow, R.P. 1953. Notes on Iranian mosquitoes. Am. J. Trop. Med. Hyg. 2: 683-695.
- Edrissian, G.H. 2006. Malaria in Iran: Past and present situation. Iranian J. Parasitol. 1: 1-14.
- Edwards, F.W. 1921. A revision of the mosquitoes of the Palaearctic region. Bull. Entomol. Res. 12: 263-351.
- Edwards, F.W. 1932. Genera Insectorum. Diptera, Fam. Culicidae. Fascicle 194, Bruxelles.
- Eshghy, N. 1977. *Anopheles multicolor* Cambouliu and its role in the transmission of malaria in Iran. J. Entomol. Soc. Iran 4: 87-88 [In Persian with English abstract].
- Eslami, A. 1997. Veterinary Helminthology. Vol. 3. Nematoda and Acanthocephala. Tehran, Tehran University Publications [In Persian].
- Foote, R. H. and D.R. Cook. 1959. *Mosquitoes of Medical Importance*. Washington, D.C., Agriculture Handbook No. 152, Agricultural Research Service, U.S. Department of Agriculture.
- Gaffigan T.V. and R.A. Ward. 1985. Index to the second supplement to *A Catalog of the Mosquitoes of the World*, with corrections and additions (Diptera: Culicidae). Mosq. Syst. 17: 51-63.
- Ghaffary, E.N. 1954. Preliminary keys to the fourth instar larvae of culicine species present in Iran. Tehran, Institute of Malariology.
- Glick, J.I. 1992. Illustrated key to the female *Anopheles* of southwestern Asia and Egypt (Diptera: Culicidae). Mosq. Syst. 24: 125-153.
- Gordeev, M.I., A.B. Zvantov, I.I. Goriacheva, E.V. Shaikevich, and M.N. Ezhov. 2005. Description of the new species *Anopheles artemievi* sp.n. (Diptera, Culicidae). Med. Parazito. 74: 4-5 [In Russian with English abstract].
- Gutsevich, A.V. 1943. On the mosquitoes of north Iran. Compt. Rend. Acad. Sci. USSR 40: 123-125 [In Russian].
- Gutsevich, A.V., A.S. Monchadskii, and A.A. Shtakelberg. 1974. Fauna of the USSR Diptera Volume III No4 Mosquitoes Family Culicidae. Leningrad. Akad Nauk SSSR Zool Inst NS No 100 [In Russian, English translation by R. Lavoott, ed. by O. Theodor. Jerusalem. Israel Program for Scientific Translations].
- Harbach, R.E. 1988. The mosquitoes of the subgenus *Culex* in southwestern Asia and Egypt (Diptera: Culicidae). Contrib. Am. Entomol. Inst. 24: 1-240.
- Harbach, R.E. 2004. The classification of genus *Anopheles* (Diptera: Culicidae): a working hypothesis of phylogenetic relationships. Bull. Entomol. Res. 94: 537-553.
- Kalandadze, L. P. and O.P. Kaviladze. 1947. On the blood-sucking mosquitoes of the western part of the Iran Azerbaijan. Med. Parasitol. Parasit. Dis. 16: 57-65 [In

- Russian with English abstract].
- Kar, I., S.K. Subbarao, A. Eapen, J. Ravindran, T.S. Satyanarayana, K. Raghavendra, N. Nanda, and V.P. Sharma. 1999. Evidence for a new malaria vector species, species E, within the *Anopheles culicifacies* complex (Diptera: Culicidae). *J. Med. Entomol.* 36: 595-600.
- Kitzmiller, J.B. 1982. *Anopheline Names: Their Derivation and Histories*. Thomas Say Foundation and Entomological Society of America. College Park, MD.
- Knight, K.L. and A. Stone. 1977. *A Catalog of the Mosquitoes of the World (Diptera: Culicidae)*. 2nd ed. Thomas Say Foundation and Entomological Society of America. College Park, MD.
- Knight, K.L. 1978. *Supplement to a Catalog of the Mosquitoes of the World (Diptera: Culicidae)*. College Park, MD. Thomas Say Foundation and Entomological Society of America.
- Lotfi, M.D. 1970. Iranian species of genus *Culex* (Culicinae: Diptera). *Bull. Soc. Path. Exot.* 63: 399-403.
- Lotfi, M.D. 1973. Iranian species of genus *Culex* (Culicinae: Diptera) II. Report of four species of larvae (including three new records) and 14 adult species. *Bull. Soc. Path. Exot.* 66: 204-207.
- Lotfi, M.D. 1976. Key to Culicinae of Iran, genus *Culex* and their biology (Diptera: Culicidae). *Iranian J. Publ. Hlth.* 5: 71-84.
- Mahmoud-Asl, F. 1989. The Spatial Distribution of the Culicine Mosquitoes in Hormozgan Province (Southern Iran) with Notes on Certain Aspects of their Behavior (Diptera: Culicidae). M.S.P.H. Thesis, Department of Medical Entomology and Vector Control, School of Public Health, Tehran University of Medical Sciences [In Persian].
- Marsh, F. 1933. A new species of *Anopheles* (*Myzomyia* group) from south-west Persia. *Stylops* 2: 193-197.
- Maslov, A.V. 1967. *Blood-Sucking Mosquitoes of Subtribe Culisetina (Diptera: Culicidae) in the World Fauna*. Moscow. Opredeliteli po Faune SSSR, No. 93 [In Russian, English translation by P.M. Rao, with a forward by R.A. Ward (1989) Washington D.C. Smithsonian Institution Libraries and the National Science Foundation].
- McIntosh, B.M. 1973. A taxonomic re-assessment of *Aedes* (*Ochlerotatus*) *caballus* (Theobald) (Diptera: Culicidae) including a description of a new species of *Ochlerotatus*. *J. Entomol. Soc. Sth. Afr.* 36: 261-269.
- Miller, B.R., M.S. Godsey, M.B. Crabtree, H.M. Savage, Y. Al-Mazrao, M.H. Al-Jeffri, A.M.M. Abdoon, S.M. Al-Seghayer, A.M. Al-Shahrani, and T.G. Ksiazek. 2002. Isolation and genetic characterization of Rift Valley fever virus from *Aedes vexans arabiensis*, Kingdom of Saudi Arabia. *Emerg. Infect. Dis.* 8: 1492-1494.
- Minar, J. 1974. Result of the Czechoslovak-Iranian entomological expedition to Iran 1970 No 6: Diptera: Culicidae. *Acta Entomol. Mus. Nat. Pragae* 6 (Suppl.): 87-89.
- Minar, J. 1981. Result of Czechoslovak-Iranian entomological expeditions to Iran (Diptera: Culicidae, Oestridae). *Acta Entomol. Mus. Nat. Pragae* 40: 83-84.
- Monchadskii, A.S. 1951. The Larvae of Blood-Sucking Mosquitoes of the USSR and Adjoining Countries (Subfam-Culicinae). Moscow. Opre Faune SSR, Zool. Inst. Akad. Nauk. SSR 37: 1-290 [In Russian].
- Naddaf-Dezfouli, S.R., M.A. Oshaghi, H. Vatandoost, and M. Assmar. 2003. rDNA-ITS based species-diagnostic polymerase chain reaction assay for identification of sibling species of *Anopheles fluviatilis* in Iran. *Southeast Asian J. Trop. Med. Publ. Hlth.* 34 (Suppl. 2): 56-60.
- Naficy, K. and S. Saidi. 1970. Serological survey on viral antibodies in Iran. *Trop. Geogr. Med.* 2: 183-188.
- Oshaghi, M.A., H. Townson, and H. Vatandoost. 2000. Genetic variation of the *Anopheles fluviatilis* complex in Iran. 2nd Iranian Congress on Malaria, Tehran, p. 17 [In Persian with English abstract].
- Oshaghi, M.A., M.T. Moradi, and B. Taghilo. 2004a. Specific detection of malaria parasites using nested-PCR in individual mosquitoes and infected bloods in Chabahar and Iranshahr, Iran. *Hakim* 7: 24-31 [In Persian with English abstract].
- Oshaghi, M.A., M.R. Yaghoobi-Ershadi, K. Shemshad, M.R. Abaei, and K. Akbarzadeh. 2004b. Mitochondrial and ribosomal DNA sequence variation between *Anopheles superpictus* populations in Iran. IX European Multicolloquium of Parasitology, Valencia, Spain, pp. 103-104.
- Oshaghi, M.A., B. Taghilo, M.T. Moradi, and H. Vatandoost. 2004c. Detection of the *Anopheles culicifacies* complex species A and B in Baluchistan using mtDNA PCR-RFLP assay; the first report of species B from Iran. *Hakim* 7: 35-42 [In Persian with English abstract].
- Oshaghi, M.A., H. Vatandoost, M.M. Sedaghat, S.R. Nadaf, F. Yaaghobi, K. Shemshad, M.R. Abaie, and K. Akbarzadeh. 2006a. Review of the cryptic taxa within the genus *Anopheles* in Iran, with particular reference to the main malaria vectors. 6th International Congress of Dipterology, Fukuoka, Japan, p. 188.
- Oshaghi, M.A., F. Yaaghobi, and M.R. Abaie. 2006b. Pattern of mitochondrial DNA variation between and within *Anopheles stephensi* (Diptera: Culicidae) biological forms suggests extensive gene flow. *Acta Trop.* 99: 226-233.
- Ramsdale, C.D. 2001. Internal taxonomy of the Hyrcanus Group of *Anopheles* (Diptera: Culicidae) and its bearing on the incrimination of vectors of malaria in the west of the Palaearctic Region. *Eur. Mosq. Bull.* 10: 1-7.
- Reinert, J.F. 2001. Revised list of abbreviation for genera and subgenera of Culicidae (Diptera) and the notes on generic and subgeneric changes. *J. Am. Mosq. Contr. Assoc.* 17: 51-55.
- Reinert, J.F., R.E. Harbach, and I.J. Kitching. 2004. Phylogeny and classification of Aedini (Diptera: Culicidae), based on morphological characters of all life stages. *Zool. J. Linn. Soc.* 142: 289-368.
- Ribeiro, H., H. da Cunha Ramos, C.A. Peres, and R.A. Capela. 1987. Research of the mosquitoes of Portugal (Diptera, Culicidae) IX-A new anopheline record.

- Garcia de Orta Ser. Zool. 12: 105-112.
- Rioux, J.A., E. Guivard, and N. Pasteur. 1998. Description d'*Aedes (Ochlerotatus) coluzzii* n. sp. (Diptera, Culicidae), espèce jumelle A du complexe *detritus*. *Parassitologia* 40: 353-360.
- Sahabi, Z., J.D. Amirkhani, and E.R. Shahgudian. 1973. The polytene chromosomal pattern of *Anopheles stephensi mysorensis* of Kazeroon, Iran. *Iranian J. Publ. Hlth.* 2: 194-199.
- Saidi, S., R. Tesh, E. Javadian, and A. Nadim. 1976. The prevalence of human infection of West Nile in Iran. *Iranian J. Publ. Hlth.* 5: 8-14.
- Sedaghat, M.M., Y.-M. Linton, M.M. Oshaghi, H. Vatandoost, and R.E. Harbach. 2003. The *Anopheles maculipennis* complex (Diptera: Culicidae) in Iran: molecular characterization and recognition of a new species. *Bull. Entomol. Res.* 93: 527-535.
- Sedaghat, M.M. and R.E. Harbach. 2005. An annotated checklist of the *Anopheles* mosquitoes (Diptera: Culicidae) in Iran. *J. Vect. Ecol.* 30: 272-276.
- Shahgudian, E.R. 1956. Notes on *Anopheles marteri* Senevet and Prunelle, 1927. *Proc. R. Entomol. Soc. Lond.* A 31: 71-75.
- Shahgudian, E.R. 1960. A key to the anophelines of Iran. *Acta Med. Iran.* 3: 38-48.
- Shidrawi, G. R. and M.T. Gillies. 1987. *Anopheles paltrinierii*, n. sp., (Culicidae: Diptera) from the Sultanate of Oman. *Mosq. Syst.* 19: 201-211.
- Singh, O.P., D. Chandra, N. Nanda, S.K. Sharma, P.T. Htun, T. Adak, S.K. Subbarao, and A.P. Dash. 2006. On the conspecificity of *Anopheles fluviatilis* species S with *Anopheles minimus* species C. *J. Biosci.* 31: 671-677.
- Suguna, S.G., K. Gopala Rathinam, A.R. Rajaval, and V. Dhanda. 1994. Morphological and chromosomal descriptions of new species in the *Anopheles subpictus* complex. *Med. Vet. Entomol.* 18: 88-94.
- Tanaka, K. 2004. Studies on the pupal mosquitoes of Japan (11) subgenera *Oculeomyia* (stat. nov.) and *Sirivanakarnius* (nov.) of the genus *Culex*, with a key of pupal mosquitoes from Ogasawara-gunto (Diptera: Culicidae). *Med. Entomol. Zool.* 55: 217-231.
- Trari, B., R.E. Harbach, O. Himmi, M.A. Dakki, and A. Agoumi. 2004. An inventory of the mosquitoes of Morocco. I. Genus *Anopheles* (Diptera: Culicidae). *Eur. Mosq. Bull.* 18: 1-19.
- Travis, B.V. and R.M. Labadan. 1967. Arthropods of Medical Importance in Asia and the European USSR. Part I. U.S. Army Natick Lab. Tech. Rep. 67-65-ES. Walter Reed Biosystematics Unit. 2001. Systematic Catalog of Culicidae. Washington D.C. Walter Reed Biosystematics Unit, Smithsonian Institution, available from <http://www.mosquitocatalog.org/> (accessed 12 Feb. 2007).
- Ward, R.A. 1984. Second supplement to *A Catalog of the Mosquitoes of the World (Diptera: Culicidae)*. *Mosq. Syst.* 16: 227-270.
- Ward, R.A. 1992. Third supplement to *A Catalog of the Mosquitoes of the World (Diptera: Culicidae)*. *Mosq. Syst.* 24: 177-230.
- WHO. 2004. Integrated Vector Management. Cairo. WHO Regional Office for Eastern Mediterranean.
- Zaim, M. 1984. Mosquito fauna of Iran. XVII International Congress of Entomology, Hamburg, p. 29.
- Zaim, M. and P.S. Cranston. 1984. The occurrence of *Culex pseudovishnui* in Iran. *Ann. Trop. Med. Parasit.* 78: 179-180.
- Zaim, M., A.V. Manouchehri, and M.R. Yaghoobi-Ershadi. 1984. Mosquito fauna of Iran 1-*Aedes*. *Iranian J. Publ. Hlth.* 13: 3-10 [In Persian with English abstract].
- Zaim, M., A.V. Manouchehri, and M.R. Yaghoobi-Ershadi. 1985. Mosquito fauna of Iran 2-*Culex*. *Iranian J. Publ. Hlth.* 14: 1-12 [In Persian with English abstract].
- Zaim, M., A.V. Manouchehri, and M.R. Yaghoobi-Ershadi. 1986. Mosquito fauna of Iran 3-*Culiseta*, *Coquillettidia* and *Uranotaenia*. *Iranian J. Publ. Hlth.* 15: 1-9 [In Persian with English abstract].
- Zaim, M. and P.S. Cranston. 1986. Checklist and keys to the Culicinae of Iran. *Mosq. Syst.* 18: 233-245.
- Zaim, M. and Z. Javaherian. 1991. Occurrence of *Anopheles culicifacies* species A in Iran. *J. Am. Mosq. Contr. Assoc.* 7: 324-326.
- Zaim, M., S.K. Subbarao, A.V. Manouchehri, and A.H. Cochrane. 1993. Role of *Anopheles culicifacies* s.l. and *An. pulcherrimus* in malaria transmission in Ghassreghand (Baluchistan), Iran. *J. Am. Mosq. Contr. Assoc.* 9: 23-26.