

THE DISTRIBUTION AND LARVAL HABITAT CHARACTERISTICS OF IRANIAN CULICINAE

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ABSTRACT. The distribution of the Iranian Culicinae is updated and reported by province. Larval habitat characteristics of each species, based on the information gathered throughout its range in Iran and at different times during the breeding season, are also presented.

INTRODUCTION

To better understand the Culicinae fauna of Iran and gather information on their distribution and the kinds of breeding sites in which they occur in nature, a comprehensive study was begun in 1980. More than 60,000 larval mosquitoes and several thousand adults from many parts of Iran have been collected. They were mostly collected by the inspectors of antimalaria teams, Ministry of Health and Medical Education, as well as the technicians of Hormozgan and Iranshahr Medical Research Stations, School of Public Health, who monitored mosquito breeding sites in their administrative regions, at least once a month, during the mosquito breeding season. The culicines, along with the description of their breeding sites were sent to the School of Public Health, where the author identified the material. Most of the identified specimens have been deposited in the Insect Museum of the School of Public Health. Further information on the collection and handling of material as well as the Zoogeography of Iran are detailed elsewhere (Zaim and Cranston 1986).

The study has revealed 33 species belonging to four genera of Culicinae. A checklist and keys to the Culicinae of Iran have been published (Zaim and Cranston 1986). In this paper, the distribution of larval species is updated and reported and the characteristics of larval habitats are presented. Tables 1 and 2 show the larval habitat characteristics for 18 of the more common species. These tables are further subdivided to show the percentage of occurrence for each species in each kind of habitat studied. Analysis of mosquito abundance is not presented here, mainly because samples taken have been a function of the collecting efforts of the antimalaria teams and are by no means quantitative. Also the major differences which appear in the zoogeography of the three separate climatic and biotic regions of the country; i.e., Caspian Sea littoral; central plateau; Khuzistan plain and Persian Gulf littoral, make the comparison of temporal patterns very difficult to summarize here.

Culex antennatus (Becker) and *Cx. torrentium* Martini, previously reported from Iran by Lotfi

(1970) and Harbach (1985), were not found in this study. The distribution and habitat characteristics given for these species in this paper are based on the limited data presented by Lotfi (1970).

The species names and the arrangement of subgenera follow Knight and Stone (1977), except in three cases where recent changes have been made. These changes include the elevation of *Culiseta subochrea* (Edwards) to species status (Ribeiro et al. 1977), the placement of *Cx. deserticola* Kirkpatrick in the subgenus *Maillotia* (Harbach 1985) and the correction of the spelling of the name *Aedes pulcritarsis* (Snow 1985). Following the distribution caption for each listed species are the provinces in which the larvae have been collected. The location of each province in the country is shown in Fig. 1. Species marked with an asterisk are those which are relatively uncommon and have only been found on a few occasions. Data on the distribution and/or larval habitat characteristics of these species may be far from complete.

SPECIES OF IRANIAN CULICINAE

Aedes (*Aedimorphus*)

vexans (Meigen)

DISTRIBUTION: Gilan, Mazandaran, West Azerbaijan, Hormozgan.

HABITATS: Larvae mostly occur in temporary, standing bodies of fresh water, such as pools, ditches and puddles, with or without vegetation and in full or partial sunlight.

**vittatus* (Bigot)

DISTRIBUTION: Hormozgan

HABITATS: Collected only on three occasions from small ditches with clear, fresh water in full sunlight.

Aedes (*Finlaya*)

**echinus* (Edwards)

DISTRIBUTION: Mazandaran.

HABITATS: Tree holes.

**geniculatus* (Oliver)

DISTRIBUTION: Gilan, Mazandaran.

Table 1. Larval habitat characteristics of the more common Iranian Culicine species, as shown by percentage of occurrence in each category, A through H.

	Ae. <i>vexans</i>	Ae. <i>caspius</i>	Cx. <i>pusillus</i>	Cx. <i>bitaenio- rhy- chus</i>	Cx. <i>laticinc- tus</i>	Cx. <i>mimeti- cus</i>	Cx. <i>perex- iguus</i>	Cx. <i>pipiens</i>
A) 1—Permanent	28.6	42.5	16.7	43.1	77.8	88.5	38.7	48.2
2—Transient	71.4	57.5	83.3	45.9	22.2	11.5	61.3	51.8
B) 1—Slow-running water	16.7	41	10	51.1	42.9	59	34	22.4
2—Standing water	83.3	59	90	48.9	57.1	41	66	77.6
C) 1—With vegetation	87.5	86.4	93.2	72.6	75	60.8	86.8	71.7
2—Without vegetation	12.5	13.6	6.8	27.4	25	39.2	13.2	28.3
D) 1—Full sunlight	44.5	72	82.9	55.7	55.2	80	61.8	68.8
2—Partial sunlight	55.5	25.2	11.4	41.2	37.6	20	36.2	22.3
3—Shaded	0	2.8	5.7	3.1	17.2	0	2.0	9.9
E) Bottom-type	62.5	68.5	91.2	27.3	33.3	24.2	76.8	60.7
1—Mud	37.5	27	5.9	59.6	33.3	51.6	17.9	20.7
2—Gravel	0	4.5	2.9	13.1	33.4	22	5.3	18.6
3—Cement								
F) 1—Muddy water	28.6	17.6	5.3	3.8	31.3	18.8	15	26.5
2—Clear water	71.4	82.4	94.7	96.2	68.7	81.2	85	73.5
G) 1—Fresh water	100	81.4	86.7	95.8	100	96.8	81.3	80.8
2—Brackish water	0	18.6	13.3	4.2	0	3.2	18.7	19.2
H) Natural	71.4	71.5	34	59.9	63.2	88.7	43.6	63.7
a) Spring fed pools	20	4.9	0	4.6	75	11.6	6.2	2.9
b) Rain pools	20	32.5	17.6	10.1	0	4.7	27.7	25.5
c) Streams	20	2.4	23.5	16.5	0	7.0	20	6.6
d) Stream bed pools	20	26.8	23.5	52.3	25	67.4	21.5	26.3
e) Bogs & meadows	0	15.4	5.9	5.5	0	2.3	10.8	10.2
f) Marshes	0	10.6	5.9	5.5	0	2.3	6.2	10.9
g) Ditches	20	7.3	23.5	5.5	0	4.7	7.7	17.5
2—Man-Made (Artif.)	28.6	28.5	66	40.1	36.8	11.3	56.4	36.3
a) Palm irrig. plots	50	57.1	18.2	13.7	0	0	15.5	2.6
b) Irrig. channels	0	14.3	18.2	23.3	0	0	20.2	6.4
c) Overflow water	0	20.4	27.3	13.7	42.9	45.5	3.6	19.2
d) Seepage water	0	2	0	1.4	0	0	2.4	1.3
e) Pools	50	6.1	6.1	1.4	14.2	0	2.4	23.1
f) Wells	0	0	0	2.7	42.9	0	2.4	11.5
g) Rice fields	0	0	30.2	43.8	0	54.5	53.6	35.9

HABITATS: Tree holes.

Aedes (Ochlerotatus)

**caballus* (Theobald)

DISTRIBUTION: Sistan & Baluchistan, Hormozgan.

HABITATS: Small rain pools in floodplains.

caspius (Pallas)

DISTRIBUTION: Gilan, West Azerbaijan, Zanjan, Luristan, Khorasan, Isfahan, Chahar-Mahall, Yazd, Kerman, Sistan & Baluchistan, Hormozgan, Fars, Bushehr, Khuzistan.

HABITATS: Larvae occur in permanent or temporary, slow running or standing water, such as rain pools, stream bed pools, bogs and meadows, marshes, irrigation ditches, overflow water in full or partial sunlight, with muddy or sandy bottom. About 81% of the habitats had fresh water, and the remainder were brackish water.

**detritus* (Haliday)

DISTRIBUTION: Hormozgan.

HABITATS: Temporary, standing brackish water.

**flavescens* (Mueller)

DISTRIBUTION: West Azerbaijan.

HABITATS: Larvae were collected only once in a large pool in a meadow.

**leucomelas* (Meigan)

DISTRIBUTION: Hormozgan.

HABITATS: Larvae were collected from stream bed pools in full sunlight with vegetation.

**pulcritarsis* (Rondani)

DISTRIBUTION: ? Only adults have been found on a few occasions in Mazandaran province.

HABITATS: ? Tree holes.

Table 2. Larval habitat characteristics of the more common Iranian Culicine species, as shown by percentage of occurrence in each category, A through H.

	Cx. quinquefasciatus	Cx. sinaiticus	Cx. theileri	Cx. tritaeniorhynchus	Cx. arbieeni	Cx. deserticola	Cx. hortensis	Cx. longiareolata	Cs. subochrea	Ur. unguiculata
1—Permanent	32.9	33.3	68.5	9.6	45.8	20	75.9	61.1	62.5	60
2—Transient	67.1	66.7	31.5	90.4	54.2	80	24.1	38.9	37.5	40
1—Slow running water	26.9	37.5	35.2	8.9	55.6	33.3	45.7	44.1	71.4	20
2—Standing water	73.1	62.5	64.8	91.1	44.4	66.7	54.3	55.9	28.6	80
1—With vegetation	53.3	68.7	79.9	75.6	75.8	45.5	63	60.6	88	90
2—Without vegetation	46.7	31.3	20.1	24.4	24.2	54.5	37	39.4	12	10
1—Full sunlight	70.5	51.7	83	58.2	58.1	80	83.3	71.9	64.3	57.1
2—Partial sunlight	24.2	38.0	15.3	39.8	35.4	10	13.9	19	32.1	42.9
3—Shaded	5.3	10.3	1.7	2.0	6.5	10	3.8	9.1	3.6	0
Bottom type										
1—Mud	57.1	54.2	61.5	86.6	13.3	9.1	35.8	41.4	60.9	57.1
2—Gravel	16.5	33.3	33.7	9.0	60	54.5	54.7	34.3	34.8	14.3
3—Cement	26.4	12.5	4.8	4.5	26.7	36.4	9.5	24.3	4.3	28.6
1—Muddy water	31.9	0	24	10.9	4.8	9.1	12	10.7	31.3	40
2—Clear water	68.1	100	76	89.1	95.2	90.9	88	89.3	68.7	60
1—Fresh water	75.9	94.4	90.4	92.8	95.7	72.7	92.7	71.6	68.4	50
2—Brackish water	24.1	5.6	9.6	7.2	4.3	27.3	7.3	28.4	31.6	50
1—Natural	59.1	52.6	82.1	24	84.4	73.3	93.5	78	73.2	71.4
a) Spring fed pools	6.7	6.7	12.2	5.3	7.4	0	11.3	21.6	10	20
b) Rain pools	48	20	10.9	28.9	3.7	9.1	7.3	12.4	3.3	40
c) Streams	4	6.7	3.6	18.4	3.7	0	2.8	2.7	10	0
d) Stream bed pools	17.3	40	45.9	23.7	59.3	72.7	56.5	41.3	43.3	40
e) Bogs & meadows	1.3	13.3	11.2	5.3	7.4	0	8.5	4.6	13.3	0
f) Marshes	1.3	6.7	7.1	1.3	0	0	2.3	2.7	6.7	0
g) Ditches	21.3	6.7	9.1	17.1	18.5	18.2	8.5	14.7	13.3	0
2—Man-Made (Artif.)	40.9	47.4	17.9	76	15.6	26.7	6.5	22	26.8	28.6
a) Palm irrig. plots	23.1	22.2	4.7	17.8	0	0	0	14.7	0	50
b) Irrig. channels	13.5	14.8	11.6	9.1	20	0	16.7	2.9	0	0
c) Overflow water	15.4	11.1	19.8	3.3	60	50	8.3	22.8	27.3	0
d) Seepage water	7.7	0	1.2	0.8	0	0	8.3	0.7	0	0
e) Pools	19.2	3.7	1.2	0.4	20	50	8.3	40.4	9.1	0
f) Wells	9.6	0	0	0	0	0	8.3	11	9.1	0
g) Rice fields	11.5	48.1	61.6	68.5	0	0	50	7.4	54.5	50



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|------------------------------|-------------------------------|
| Bakhtaran (7) | Khuzistan (23) |
| Bushehr (22) | Kohkiluyeh & Bouir Ahmad (21) |
| Chahar-Mahall Bakhtiari (15) | Kurdistan (5) |
| East Azerbaijan (4) | Luristan (9) |
| Fars (20) | Markazi (10) |
| Gilan (1) | Mazandaran (2) |
| Hamadan (8) | Semnan (12) |
| Hormozgan (19) | Sistan & Baluchistan (18) |
| Ilam (24) | Teheran (11) |
| Isfahan (14) | West Azerbaijan (3) |
| Kerman (17) | Yazd (16) |
| Khorasan (13) | Zanjan (6) |

Fig. 1. Location of Iranian provinces.

Culex (Barraudius)

**modestus* Ficalbi

DISTRIBUTION: West & East Azerbaijan, Isfahan, Hormozgan.

HABITATS: Fresh or slightly saline bodies of water in full sunlight with rich vegetation. Larvae of this species were found in spring fed pools, in meadows and in rice fields.

pusillus Macquart

DISTRIBUTION: Kerman, Sistan & Baluchistan, Hormozgan, Bushehr, Khuzistan.

HABITATS: Larvae mostly occur in temporary stagnant bodies of water in full sunlight with vegetation. Habitats with clear water and mud bottoms predominated. Man made breeding sites (e.g., irrigation channels, overflow

water, pools and rice fields) with fresh water were the most common habitats for this species.

Culex (Culex)

**antennatus* (Becker) based on Lotfi (1970)

DISTRIBUTION: Hormozgan, Fars.

HABITATS: Grassy ponds.

bitaeniorhynchus Giles

DISTRIBUTION: Kerman, Sistan & Baluchistan, Hormozgan, Fars, Kohkiluyeh, Bushehr

HABITATS: Permanent or temporary, stagnant or slow moving bodies of water, mostly with fresh and clear water, with vegetation and in full or partial sunlight. Stream bed pools, and man-made habitats, such as rice fields, were the most common sources for this species.

laticinctus Edwards

DISTRIBUTION: Khorasan, Chahar-Mahall, Yazd, Kerman, Hormozgan, Fars, Kohkiluyeh, Bushehr.

HABITATS: Larvae mainly occur in fresh, natural, permanent bodies of water with vegetation and in full or partial sunlight.

mimeticus Noè

DISTRIBUTION: Mazandaran, West & East Azerbaijan, Kurdistan, Zanjan, Bakhtaran, Luristan, Semnan, Khorasan, Isfahan, Chahar-Mahall, Yazd, Kerman, Hormozgan, Fars, Kohkiluyeh, Bushehr, Khuzistan.

HABITATS: Larvae mostly occur in small permanent pools in crevices in rocks and backwaters of rapidly flowing mountain streams with vegetation and in full sunlight.

perexiguus Theobald

DISTRIBUTION: Mazandaran, East Azerbaijan, Kurdistan, Zanjan, Bakhtaran, Luristan, Semnan, Isfahan, Chahar-Mahall, Yazd, Kerman, Sistan & Baluchistan, Hormozgan, Fars, Kohkiluyeh, Bushehr, Khuzistan, Ilam.

HABITATS: Larvae mostly occur in fresh or slightly brackish, temporary, stagnant water overgrown with vegetation and in full or partial sunlight.

pipiens Linnaeus (including *molestus* Forskål)

DISTRIBUTION: Gilan, Mazandaran, West & East Azerbaijan, Kurdistan, Zanjan, Bakhtaran, Hamadan, Luristan, Markazi, Teheran, Semnan, Khorasan, Isfahan, Chahar-Mahall, Yazd, Kerman, Sistan & Baluchistan, Hormozgan, Fars, Bushehr, Khuzistan, Ilam.

HABITATS: Larvae occur in diverse types in natural and artificial standing water such as swamps, shallow parts of large bodies of water, ditches, pools, puddles, rain barrels and reservoirs. Although fresh water is preferred, 19.2% of the positive breeding sites had slightly brackish water. They tolerate a high degree of pollution.

**pseudovishnui* Colless

DISTRIBUTION: Sistan & Baluchistan.

HABITATS: Larvae have only been found in rice fields.

quinquefasciatus Say

DISTRIBUTION: Kerman, Sistan & Baluchistan, Hormozgan, Fars, Kohkiluyeh, Bushehr, Kuzistan.

HABITATS: Larvae occur in a wide variety of sites including rain pools, stream bed pools, ditches, overflow water, seepages, pools, wells and rice fields. They tolerate a high degree of pollution.

sinaiticus Kirkpatrick

DISTRIBUTION: Kerman, Sistan & Baluchistan, Hormozgan, Fars, Bushehr, Khuzistan.

HABITATS: Larvae mostly occur in fresh, clear, natural or man-made bodies of water. Temporary, stagnant waters with vegetation and in full or partial sunlight were preferred.

sitiens Wiedemann

DISTRIBUTION: Coastal areas of Hormozgan province (including Ghesm Island in the Persian Gulf).

HABITATS: Coastal marshes with brackish water.

theileri Theobald

DISTRIBUTION: Gilan, Mazandaran, West & East Azerbaijan, Kurdistan, Zanjan, Bakhtaran, Hamadan, Luristan, Markazi, Teheran, Semnan, Khorasan, Isfahan, Chahar-Mahall, Yazd, Kerman, Sistan & Baluchistan, Hormozgan, Fars, Kohkiluyeh, Bushehr, Khuzistan, Ilam.

HABITATS: Larvae mainly occur in natural, fresh, clear, temporary, stagnant bodies of water overgrown with vegetation in full sunlight.

**torrentium* Martini (based on Lotfi 1970)

DISTRIBUTION: Fars

HABITATS: Ponds in bushy areas.

tritaeniorhynchus Giles

DISTRIBUTION: Gilan, Mazandaran, East Azerbaijan, Bakhtaran, Khorasan, Chahar-Mahall, Kerman, Sistan & Baluchistan, Hormozgan, Fars, Kohkiluyeh, Bushehr, Khuzistan.

HABITATS: Larvae occur mostly in fresh, clear, standing, temporary bodies of water with vegetation in full or partial sunlight. Mud bottom was preferred over gravel and cement. Man-made breeding sites, especially rice fields, were the most common habitats for this species.

*Culex (Maillotia)**arbieeni* Salem

DISTRIBUTION: Khorasan, Luristan, Chahar-Mahall, Yazd, Kerman, Sistan & Baluchistan, Hormozgan, Fars, Bushehr.

HABITATS: Larvae mostly occur in fresh, clear, natural bodies of water (e.g., stream bed pools) with vegetation in full or partial sunlight.

deserticola Kirkpatrick

DISTRIBUTION: Kerman, Sistan & Baluchistan, Hormozgan, Khuzistan.

HABITATS: Mainly in fresh, clear, tempo-

rary, stagnant, natural bodies of water in full sunlight.

hortensis Ficalbi

DISTRIBUTION: Gilan, Mazandaran, West & East Azerbaijan, Kurdistan, Zanjan, Bakhtaran, Hamadan, Luristan, Teheran, Semnan, Khorasan, Isfahan, Chahar-Mahall, Yazd, Kerman, Sistan & Baluchistan, Hormozgan, Fars, Kohkiluyeh, Bushehr, Khuzistan, Ilam.

HABITATS: Larvae mostly occur in fresh, clear, natural bodies of water in full sunlight. Permanent habitats with vegetation and gravel bottom were preferred.

Culex (Neoculex)

**territans* Walker

DISTRIBUTION: Gilan, Kurdistan, Khorasan, Isfahan, Hormozgan

HABITATS: Small, permanent pools in full sunlight with vegetation.

Culiseta (Allotheobaldia)

longiareolata (Macquart)

DISTRIBUTION: Gilan, Mazandaran, West & East Azerbaijan, Kurdistan, Zanjan, Bakhtaran, Hamadan, Luristan, Markazi, Teheran, Semnan, Khorasan, Isfahan, Chahar-Mahall, Yazd, Kerman, Sistan & Baluchistan, Hormozgan, Fars, Kohkiluyeh, Bushehr, Khuzistan, Ilam.

HABITATS: Larvae occur in a wide variety of man-made and natural bodies of permanent or temporary, slow running or stagnant water with or without vegetation mainly in full sunlight. Clear, fresh water was preferred; however, slightly brackish water is tolerated. This species tolerates a high degree of pollution.

Culiseta (Culiseta)

**alaskaensis* (Ludlow)

DISTRIBUTION: East Azerbaijan, Teheran.

HABITATS: Larvae were found only on three occasions in permanent, slow running water with vegetation in partial sunlight.

subochrea (Edwards)

DISTRIBUTION: Gilan, Mazandaran, West & East Azerbaijan, Kurdistan, Hamadan, Teheran, Khorasan, Isfahan, Chahar-Mahall, Yazd, Kerman, Hormozgan, Fars, Kohkiluyeh, Bushehr.

HABITATS: Larvae mainly occur in natural, fresh, clear, permanent, slow-running water, such as stream bed pools, with vegetation in full or partial sunlight.

Uranotaenia (Uranotaenia)

unguiculata unguiculata Edwards

DISTRIBUTION: West Azerbaijan, Bakhtaran, Teheran, Khorasan, Isfahan, Yazd, Sistan & Baluchistan, Hormozgan, Fars, Kohkiluyeh, Bushehr, Khuzistan, Ilam.

HABITATS: Larvae are mainly found in natural, clear, temporary, stagnant water, with vegetation in full or partial sunlight.

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