

tention the epizootic at Hackberry. We also thank Frank Glenn, Jr., who found the first natural NPV infection in *Psorophora confinnis* and Donald B. Woodard for his assistance in field collections.

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CULICOIDES FROM SOUTHERN PART OF LUT DESERT, IRAN WITH TWO NEW SPECIES (DIPTERA: CERATOPOGONIDAE)¹

SHAHIN NAVAÏ²

In November, 1968, in order to study the insect fauna of the Lut desert, particularly its southern part (Lut-e-Zangi Ahmad), the author accompanied the team of the Geographical Institute of the University of Teheran.

The study area lies between Sistan mountains in the east, Kerman mountains in the west, the range of Jabel-e-Barez, Shahsavaran and Bazman mountains in the south and the desert itself in the north. See Figure 15.

The area is 500 km. long and 200 km. wide. It is criss-crossed by the deep (3-4 m.) usually dry ditches made by the surface waters.

The features of the study localities are as follows:

Baluch-Ab (alt. 418 m.): A spring opening in one of the ditches with water not overflowing. The water is slightly brackish, but more or less potable. The study group raised their tents in this region and stayed there for two weeks.

Shahrokh-Abad (alt. 444 m.): A little (seven household) village about 40 km. south of Baluch-Ab.

Keshit (alt. 480 m.): Located on the western edge of the Lut desert where Keshit river enters the desert. The river is perennial with palm groves on both banks.

MATERIALS AND METHODS. The insects were collected both day and night by hand catch, sweeping with insect nets, in light traps, and with castor oil coated paper. In one instance, a good number were collected around the camping lamp in the tent.

RESULTS. The present paper deals with 583 *Culicoides* collected during this survey. They included two new species as well as five other species. The types of the new species were deposited in the collection of the Institute of Public Health Research, Teheran, Iran.

Culicoides fajghihi n.sp.

Brownish species of moderate size. With clear wings. Thorax without any distinct spot.

Female:

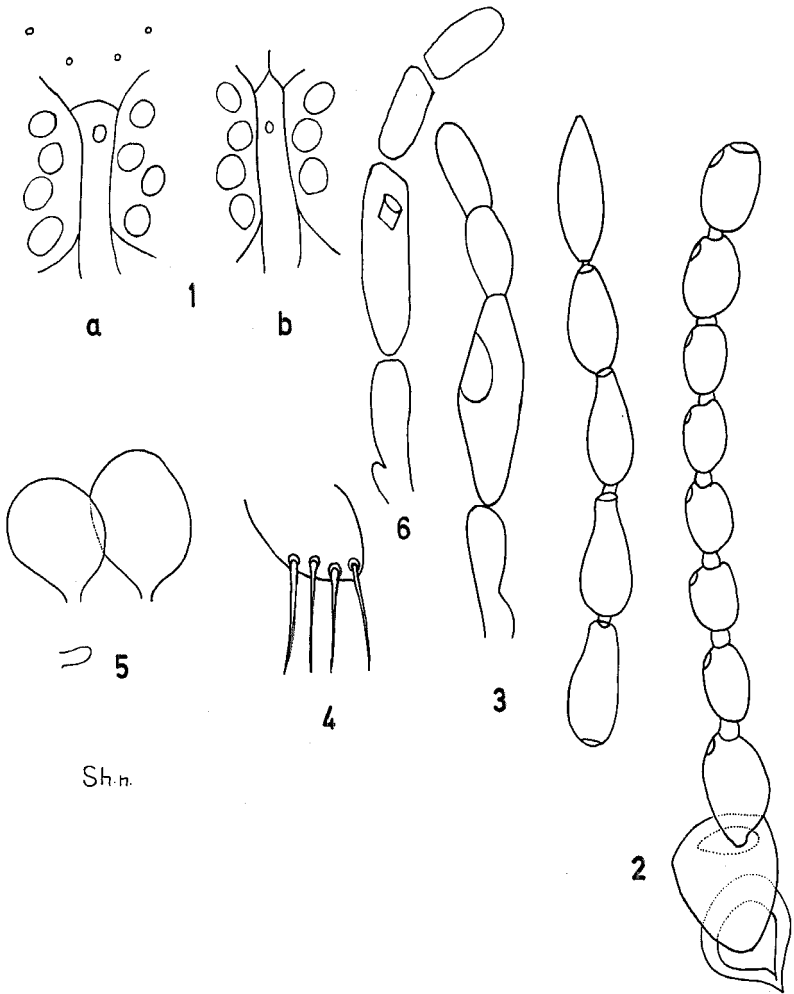
Eyes separate and bare. The diameter of fronto vertex (fig. 1 a, b) usually less than one facet. Antennae (fig. 2): Last five segments of the antennal flagellum well elongated, sensilla present on segments III-X and absent on XI-XV.

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Culicoides faghhi n.sp.

| Measurements (in microns): | No. counted | Min. | Max. | Mean | Limits of confidence (x=0.05) | No. counted | Min. | Max. | Mean | Limits of confidence (x=0.05) |
|-----------------------------------|-------------|------|------|-------|-------------------------------|-------------|------|------|-------|-------------------------------|
| Fronto vertex width | 37 | 9 | 16 | 11.3 | | | | | | |
| Antennal length | 38 | 480 | 780 | 615 | ±18.6 | | | | | |
| Antennal ratio | 38 | 0.85 | 1.11 | 1.01 | ±0.019 | | | | | |
| Number of mandibular teeth | 33 | 12 | 16 | 14 | | | | | | |
| Number of maxillary teeth | 34 | 15 | 22 | 17 | | | | | | |
| Maxillary palpus: | | | | | | | | | | |
| Length of segment II | 37 | 39 | 71 | 54.7 | | 5 | 32 | 35 | 33 | |
| Length of segment III | 37 | 75 | 110 | 92 | | 5 | 48 | 65 | 58 | |
| Length of segment IV | 35 | 29 | 42 | 35 | | 5 | 32 | 39 | 34 | |
| Length of segment V | 32 | 29 | 46 | 36 | | 4 | 39 | 45 | 42 | |
| Third segment ratio | 35 | 1.9 | 2.8 | 2.4 | | 5 | 2.1 | 3.1 | 2.7 | |
| Total length of palp | 32 | 174 | 245 | 218.5 | ±4.46 | 4 | 161 | 180 | 173.8 | |
| Wing length | 35 | 1120 | 1700 | 1372 | ±38.6 | 5 | 1040 | 1290 | 1160 | ±52 |
| Wing width | 25 | 450 | 750 | 602 | | 5 | 320 | 480 | 420 | |
| Spermathecae length | 36 | 45 | 58 | 50.9 | | | | | | |
| Spermathecae width | 34 | 32 | 42 | 37.1 | | | | | | |
| Length of rudimentary spermatheca | 35 | 9 | 19 | 14 | | | | | | |
| Abdomen length | 34 | 1120 | 1830 | 1455 | | | | | | |
| Cercus length | 27 | 52 | 65 | 52.4 | | | | | | |
| Aedeagus: arch length | | | | | | 5 | 58 | 68 | 65 | |
| arch width | | | | | | 5 | 55 | 97 | 68 | |
| body length | | | | | | 5 | 13 | 13 | 13 | |
| ♀ | | | | | | | | | | |
| | Min. | Max. | Mean | No. | Min. | Max. | Mean | No. | ♂ | |
| IX tergite: length | | | | | | | | | | |
| width | | | | | 160 | 190 | 170 | | | 5 |
| Coxite: length | | | | | 130 | 160 | 130 | | | 5 |
| width | | | | | 90 | 100 | 100 | | | 5 |
| Style length | | | | | 58 | 94 | 70 | | | 5 |
| | | | | | 81 | 100 | 95 | | | 5 |



FIGS. 1-6.—*Culicoides faghihi* n.sp. 1a,b) Fronto-vertex of female. 2) Antennae. 3) Female palpus. 4) Female hind tibial comb. 5) Spermathecae. 6) Male palpus.

Maxillary palpus (fig. 3): third segment swollen with a shallow sensory pit and longer than the others. Segments IV and V approximately equal. Mesonotum and scutellum dark brown without spots.

Legs: brown and lighter than thorax; tibial comb usually with 4 spines (fig. 4), first and second being equal and longer than the others.

Wings: unspotted; macrotrichia is mostly present in apex but absent in basal cell.

Spermathecae (fig. 5): two in number oval shape; equal in size and well pigmented; the neck sclerotized; a rudimentary spermatheca present. In some specimens ring is present.

Male:

Antennal sensilla present on segments III and VII-XII. Maxillary palpus (fig. 6): third segment slightly swollen.

Male hypopygium (fig. 7 a, b): tergite IX narrowed proximally, both apico lateral processes and each of terminal hairs of a moderate length, distal margin between processes convex without median emargination. Ninth sternite emarginate, the dorsal and ventral processes of coxites well developed with the ventral process being foot shape (fig. 7 b).

Aedeagus with deep arch and slender arms, terminal portion truncate and short. Membrane not spinose.

Parameres gradually narrowed and bent approximately in middle.

Holotype, male, Baluch-Ab, around camping lamp, 16.II.68.

Allotype, female, Baluch-Ab, around camping lamp, 16.II.68.

Paratype, 4 males, 15 females, Baluch-Ab, around camping lamp, 16.II.68; Keshit, riverside, light trap, 47 females, 1 male, 19-20.II.68; sticky paper, 1 male, 19-20.II.68.

This species is dedicated to Dr. M. A. Faghih, the Dean of the School of Public Health and Institute of Public Health Research in recognition of all the encourage-

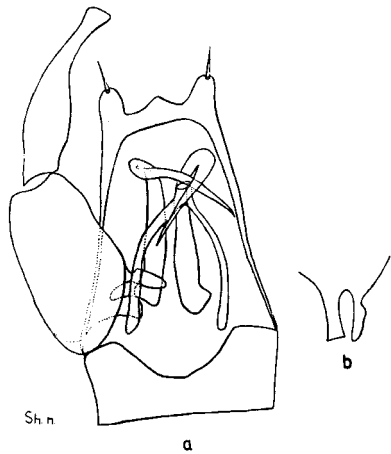


FIG. 7.—Male hypopygium of *Culicoides faghihi* n.sp.

ment and support given the author during her research and field surveys.

DISCUSSION. *Culicoides faghihi* belongs to *segnis* group. Taxonomic characters of this species indicate that it is distinct from any of the known species of this group. The aedeagus and lateral processes of IXth tergite are characteristic.

Culicoides iranica n.sp.

A dark midge of moderate size. Second radial cell slightly dark. No spots on thorax.

Female:

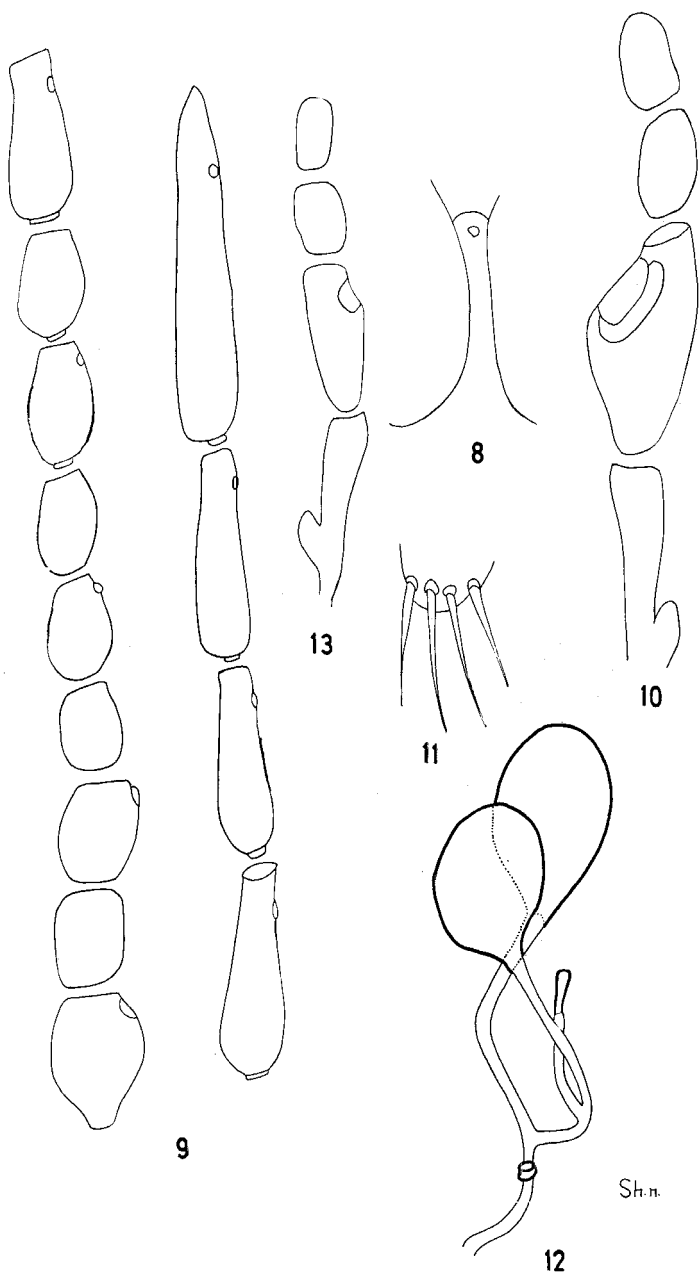
Eyes bare, not connected (fig. 8).

Antennae (fig. 9): last five segments well elongated and longer than preceding eight. Sensilla usually present on segments III, V, VII, IX and X-XV, but rather variable in proximal segments, even in a specimen in right and left flagellums.

Maxillary palpus (fig. 10): third segment moderately swollen with a shallow pit and longer than the others.

Mesonotum dark brown without distinct pattern, scutellum brown with a red brown margin.

Legs: light brown, not banded; hind



FIGS. 8-13.—*Culicoides iranica* n.sp. 8) Fronto-vertex of female. 9) Antenna. 10) Female palpus. 11) Female hind tibia comb. 12) Spermathecae. 13) Male palpus.

tibial comb with four spines, the second and third being equal (fig. 11).

Wings: with two fading pale spots; one covers the cross vein *r-m* and base of first radial cell. Second radial cell slightly darker, with a much paler spot in front of it. Macrotrichia distributed all over the wing surface, with the exception of basal cell area. Halteres rather yellowish in color.

Abdomen: pale brown, with the last two segments pigmented and brown. Two spermathecae (fig. 12) well pigmented and equal in size; a rudimentary spermatheca and ring are present. Ducts poorly pigmented.

Male:

Antennal sensilla present on segments III and XIII-XV. Maxillary palpus (fig. 13): third segment with a shallow sensory pit. Length of segments: II (35 microns), III (45 microns), IV (22 microns) and V (26 microns). Third segment ratio: 2.3.

Wings as in female. Wing length 960 microns and width 390 microns.

Male hypopygium (fig. 14): gradually narrowing toward the distal end, apicolateral processes elongated. No emargination in distal margin. Ninth sternite

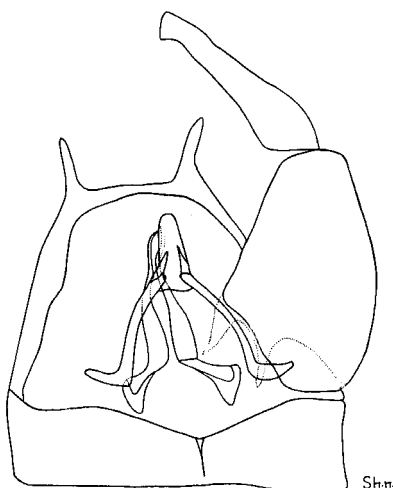


FIG. 14.—Male hypopygium of *Culicoides iranica* n.sp.

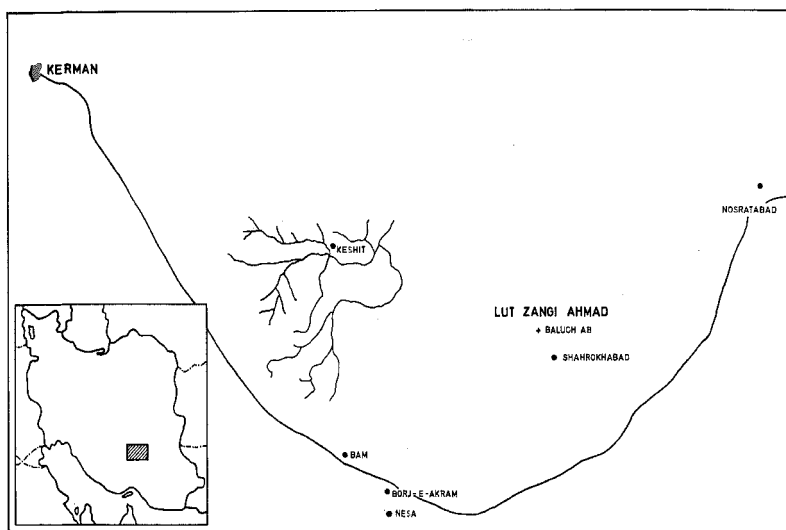
emarginate. The roots of basistyles developed and tapering toward the end.

Aedeagus, arch semi-circular in shape with two slender well-pigmented limbs. Arms sharply bent at the base. The terminal portion moderately pigmented. Membrane not spinose.

Parameres with foot-shaped base and

Culicoides iranica n.sp.

| Measurements (in microns): | No. counted | Min. | Max. | Mean | Limits of confidence $x = .05$ |
|-----------------------------------|-------------|------|------|------|-----------------------------------|
| Fronto vertex width | 5 | 6.5 | 13 | 8.7 | |
| Antennal length | 5 | 500 | 590 | 530 | ± 45.6 |
| Antennal ratio | 5 | 1.1 | 1.3 | 1.2 | $\pm .10$ |
| Number of mandibular teeth | 5 | 12 | 13 | 12.8 | |
| Number of maxillary teeth | 5 | 14 | 15 | 15 | |
| Maxillary palpus: | | | | | |
| Length of segment II | 5 | 39 | 65 | 46 | |
| Length of segment III | 5 | 65 | 91 | 75 | |
| Length of segment IV | 5 | 22 | 35 | 28 | |
| Length of segment V | 5 | 22 | 35 | 23 | |
| Third segment ratio | 5 | 2 | 3.1 | 2.5 | |
| Total length of palp | 5 | 151 | 219 | 156 | ± 44.3 |
| Wing length | 5 | 940 | 1150 | 1012 | |
| Wing width | 5 | 390 | 520 | 410 | |
| Spermathecae length | 5 | 35 | 48 | 40 | |
| Spermathecae width | 5 | 32 | 32 | 32 | |
| Length of rudimentary spermatheca | 5 | 13 | 22 | 14 | |
| Length of abdomen | 5 | 830 | 1120 | 980 | |
| Length of cercus | 5 | 26 | 39 | 28 | |



MAP NO. 1

FIG. 15.—Map showing location of study area and collecting sites.

swollen stem. Stem with fine, slightly bent tip.

DISCUSSION. *Culicoides iranica* appears not to be closely related to other *Culicoides* except in the number and distribution of antennal sensilla which belongs to *vexans* group.

Holotype: Male, Keshit, riverside, light trap, 19–20.II.68.

Allotype: Female, same as Holotype.

Paratype: 9 females, same as type.

Culicoides lailae Khalaf, 1961

Keshit: riverside, light trap, 30 females, 14 males, 19–20.II.68.

Culicoides longipennis Khalaf, 1957

Baluch-Ab: in tent, around camping lamp, 1 female, 16.II.68.

Shahrokh-Abad: stable, light trap, 1 female, 16–17.II.68.

Culicoides pulicaris Linnaeus, 1758

Baluch-Ab: in tent, around camping lamp, 2 females, 16.II.68.

Keshit: riverside, light trap, 14 females, 1 male, 19–20.II.68.

Culicoides schultzei Enderlein, 1908

Keshit: riverside, light trap, 3 females, 19–20.II.68.

Shahrokh-Abad: stable, light trap, 2 females; sticky paper, 5 females, 16–17.II.68.

Culicoides seifadinei Dzhafarov, 1958

Baluch-Ab: in tent, around camping lamp, 28 females, 16.II.68.

Keshit: riverside, light trap, 364 females, 31 males.

Shahrokh-Abad: stable, light trap, 4 females; sticky paper, 3 females, 16–17.II.68.

ACKNOWLEDGMENT. The author is greatly indebted to Prof. A. V. Gutzevich of the Zoological Institute in Leningrad who was so kind as to examine all the specimens which I sent him for confirmation. His very constructive and useful suggestions and advice are greatly appreciated. Also my sincere thanks to Prof. A. Mostoufi, the Director of the Geographical Institute of the University of Teheran, for very valuable cooperation and for all the facilities he gave me during this trip.

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EVALUATION OF VARIOUS INSECTICIDES AS RESIDUAL SPRAYS IN BUILDINGS NATURALLY INFESTED WITH *ANOPHELES QUADRIMACULATUS*

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Since 1957, a continuing evaluation of chemicals as residual sprays against *Anopheles quadrimaculatus* Say has been conducted at the USDA, Insects Affecting Man Investigations Laboratory at Gainesville, Florida (LaBrecque *et al.* 1958, Gahan *et al.* 1967, Wilson *et al.* 1970). The laboratory phase of the evaluation involves, basically, the exposure of adult female mosquitoes to residual insecticides, (1 gram per square meter or 100 milligrams per square foot) for one hour and recording the mortality produced one day later. Then mosquitoes are exposed to the residues once a month over a period of 6 months. The effectiveness of the insecticide is measured by the number of weeks that the residues produce 70 percent or better kill. Whenever possible, promising compounds (effective kill for 24 weeks) are later evaluated in the vicinity

of Stuttgart, Arkansas, in wooden buildings that are naturally infested with *Anopheles quadrimaculatus* (Gahan *et al.* 1968).

The 12 insecticides tested against natural infestations over the past two years, with the common names or company designation, chemical name, and acute oral toxicity (LD-50 in milligrams per kilogram) to white rats, are given in the accompanying tabulation.

Of these, Akton, Chevron RE-11775, Chlorphoxim, Ciba C-10015, phoxim, and Bayer 91273 were obtained from commercial sources and along with malathion were tested at the target dose of 2 g/m² in barns and poultry houses. Four less promising chemicals—Abate, methoxychlor, Dowco 214, and S. B. Penick 1382—were also included in the field study because of their low mammalian toxicity; these 4 insecticides plus malathion and Bayer 91273 were also evaluated at 4 g/m². Propoxur applied at the rate of 2 g/m² was used as the standard.

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