

RECORDS OF MOSQUITOES COLLECTED FROM JAMMU AND KASHMIR WITH ECOLOGICAL NOTES

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INTRODUCTION

Very little information has been added to the mosquito fauna of Jammu and Kashmir, particularly of higher altitudes, since the publication of monographs on Indian Anophelines (Christophers, 1933) and Culicines (Barraud, 1934) except a few subsequent communications (Jacob, 1950 ; Puri, 1948 ; Tariq, 1967, and Rao, 1981).

The present communication deals with the mosquito collections made during the survey of haematophagous arthropods in this region. Three short surveys were conducted between August 10 and 31, 1967 ; July 20 and September 1, 1968 ; and October 15 and December 10, 1969 ; under the auspices of Indian Council of Medical Research (Rao *et al.*, 1973).

The classification and nomenclature used here are mainly based on the synoptic catalogs of the mosquitoes of the world (Stone *et al.*, 1959 ; Stone and Delfinado, 1973 and Knight and Stone, 1977). Identification was done mainly on adult characters. Genital characters of males and the characters of immature stages were also taken into consideration whenever these forms were available. Additional ecological notes on the species collected are also given.

The altitudes of the collection localities are approximate.

COLLECTION RECORDS

TRIBE-ANOPHELINI

1. *Anopheles gigas simlensis* (James)

Anopheles gigas var *simlensis* (James, 1911)

In James and Liston, *Monogr. anoph. Mosq. India.*, ed. 2 : 66 ; Christophers, 1933 : 36-37 ; Knight and Stone, 1977 : 19 ; Rao, 1981 : 270-272.

This subspecies has been recorded from western Himalayas including the foothills, north west frontier region of Pakistan and Ceylon.

Present record : Baramulla dist. : 13 larvae and 1 ♀ reared from larva, collected from a seepage pool, Rampore (1450 m.), 5 Nov. '69.

2. *Anopheles lindesayi* Giles

Anopheles lindesayi Giles, 1900, Hand book, ed. 1 : 166 ; Christophers, 1933 : 123-129 ; Knight and Stone, 1977 : 22 ; Rao, 1981 : 267-268.

A montane species recorded from India, Pakistan, Nepal, U.S.S.R., Burma. In India it is found all along the Himalayas upto an attitude of about 3000 meters.

Present records : Doda dist. : 9 ♀ ♀ collected while biting human at dusk, at the edge of a forest-clad ravine, Khilani (1300 m.), 20 Nov. '69. Udhampur dist. : 5 ♀ ♀ collected from vegetation along a stream, Phalata (800 m.) one on 24 and four on 27 Nov. '69.

3. *Anopheles annularis* Van der Wulp

Anopheles annularis Van der Wulp, 1884, *Notes Leyden Mus.* 6 : 249 ; Christophers, 1933 : 300-307 ; Knight and Stone, 1977 : 34 ; Rao, 1981 : 448-452.

This species has a wide distribution in the Oriental region.

Present records : Baramulla dist. : 5 larvae and 1 ♂ reared from larva collected from a roadside seepage pool, Mitrang near Sopore (1630 m.), 24 Oct. '69. Udhampur dist. : 5 ♀ ♀ collected from vegetation along a stream, Phalata, 27 Nov. '69. Associated breeder was *An. maculatus willimorei*.

4. *Anopheles culicifacies* Giles

Anopheles culicifacies Giles, 1901, *Entomologist's mon. Mag.* 37 : 197 ; Christophers, 1933 : 197-202 ; Knight and Stone 1977 : 37 ; Rao, 1981 : 365-409.

The species has been recorded from India, Ceylon, Burma, Nepal, Thailand, Indochina, China, Pakistan, Afghanistan, Iran and around Persian Gulf. In India it is the primary vector of malaria in plains and is widely distributed. It has been recorded from many localities in Jammu province.

Present records : Udhampur dist. : 5 ♀ ♀ resting indoors, cattle shed ; 2 ♀ ♀ from vegetation along a stream, Phalata, respectively on 23 and 27 Nov. '69.

5. *Anopheles fluviatilis* James

Anopheles fluviatilis James, 1902, *Scient. Mem. Offrs. med. Sanit. Deps. India.* 2 : 31 ; Christophers, 1933 : 203-208 ; Knight and Stone, 1977 : 39-40 ; Rao, 1981 : 322-343.

The species has a wide distribution range, which includes India, Pakistan, Afghanistan, Nepal, Ceylon, Burma and other Southeast Asian countries, China, Kazakh S. S. R., Iraq, Arabia, Oman and Bahrein.

It is prevalent throughout India, particularly in hilly region and is an important malaria vector.

Present records : Udhampur dist. : 1 ♀ indoor resting, cattle shed, and 1 ♀ resting outdoor on vegetation near a stream, Phalata, respectively on 23 and 27 Nov. '69.

6. *Anopheles maculatus willmorei* (James)

Anopheles maculatus var. *willmorei* (James, 1903) in Theobald *Monogr. cul.* 3 : 100 ; Christophers, 1933 : 285-287 ; Knight and Stone, 1977 : 45 ; Rao, 1981 : 455-461.

Recorded from Pakistan, India, Nepal and Burma. In India, it has been recorded along the Himalayan foothills.

Present records : Baramulla dist. : 5 larvae, and 1 ♀ reared from larva collected from a roadside pool, Mitrang, 24 Oct. '69. Doda dist. : 1 ♂ and 2 ♀ ♀ reared from larvae collected from pools along paddy fields, Bhadarwah (1750 m.), 14 Nov. '69 ; 11 larvae, 3 ♂ ♂ and 4 ♀ ♀ reared from larvae collected from seepage pools along a irrigation canal, and 1 ♀ while biting human at dusk near a forest-clad ravine, Khilani, respectively on 19 and 20 Nov. '69. Udhampur dist : 1 ♂ and 2 ♀ ♀ reared from larvae ; 2 ♀ ♀ indoor resting and 1 ♀ outdoor resting, Phalata, respectively on 22, 25 and 27 Nov. '69 ; 1 ♀ reared from larva collected from a seepage pool near paddy fields, Dehari (800 m.), 29 Nov. '69. The species was found breeding in association with *An. annularis*, *C. bitaeniorhynchus* and *C. p. quinquefasciatus*.

7. *Anopheles subpictus* Grassi

Anopheles subpictus Grassi, 1899, *R. C. Accad. Lineei.* 8 : 101 ; Christophers, 1933 : 231-241 ; Knight and Stone, 1977 : 54 ; Rao, 1981 : 415-425.

The species has a wide geographic range including entire Oriental region Afghanistan, Iran, Southern China and New Guinea.

Present records : Udhampur dist. : Numerous larvae, 3 ♂ ♂ and 7 ♀ ♀ reared from larvae collected from a roadside pool with muddy water, Satani (600 m.), 6 Nov. '69. Associated breeders were *C. fuscocephalus* and *C. p. quinquefasciatus*.

TRIBE : CULICINI

8. *Aedes elsiae* (Barraud)

Aedes elsiae (Barraud, 1923), *Bull. Ent. Res.* 13 : 406 ; Barraud, 1934 : 180-183 ; Knight and Stone, 1977 : 94.

This has been recorded from India, Thailand, Indochina, and China.

Present record : Rajouri dist. : 2 ♂♂ and 2 ♀♀ reared from larvae collected from rock holes on a stream bed, Naushera (800m.), 7 Dec. '69. Associated breeders were *C. barraudi* and *C. p. quinquefasciatus*.

9. *Aedes oreophilus* (Edwards)

Aedes oreophilus (Edwards, 1916), *Bull. Ent. Res.* 6 : 357 ; Barraud, 1934 : 192-194 ; Knight and Stone, 1977 : 101.

This is one of the commonest tree hole breeding species in western Himalayas ; also found in eastern Himalayas and Nilgiris.

Present record : Ladakh. : 1 ♂ collected while hovering around a collector, Phiang (3,500 m.), 7 Aug. '68.

10. *Aedes sintoni* (Barraud)

Aedes sintoni Barraud, 1924, *Indian J. Med. Res.* 2 : 967 ; Barraud, 1934 : 200-202 ; Knight and Stone, 1977 : 104.

The species was originally described from Tangmarg in Kashmir and subsequently recorded from Murree. Apparently this species is restricted to the temperate zone of western Himalayas.

Present record : Ladakh : Numerous larvae and pupae, 16 ♂♂ and 14 ♀♀ reared from immature stages, collected from a seepage pool on Indus river bank clad with scrub vegetation, Dumgal near Batalik (3000 m.), 27 Aug. '67.

This is the first record of this species from trans-Himalayan region of India.

11. *Aedes albopictus* (Skuse)

Aedes albopictus (Skuse, 1894), *Ind. Mus. Notes.* 3 : 20 ; Barraud, 1934 : 233-235 ; Knight and Stone, 1977 : 156.

This species has a wide geographical range which includes Oriental, Australian and parts of Palaearctic and African regions. In India this is the commonest species of *Aedes* found in the peridomestic environment.

Present record : 1 ♂ collected hovering outdoors in the evening, Udhampur (800 m.), 15 Oct. '69.

12. *Aedes vittatus* (Bigot)

Aedes vittatus (Bigot, 1861), *Ann. Soc. Ent. France* (4) 1 : 227 ; Barraud, 1934 : 245-246 ; Knight and Stone, 1977 : 166.

The species is widely distributed in Ethiopian, Mediterranean and Oriental regions.

Present record : Rajouri dist. : 3 ♀ ♀ reared from eggs collected from a dry rock hole on a stream bed, Naushera, 7 Dec. '69.

13. *Aedes w-albus* (Theobald)

Aedes w-albus (Theobald, 1905), *Ann. Mus. Nat. Hung.* 3 : 74 ; Barraud, 1934 : 232-233 ; Knight and Stone, 1977 : 166.

Recorded from the Oriental region only.

Present record : Udhampur dist. : 1 ♀ collected hovering over human in the evening near inspection bungalow, Udhampur, 15 Oct. '69.

14. *Aedes vexans* (Meigen)

Aedes vexans (Meigen, 1830), *Syst. Bechr. europ. Zmeift. Insekt.* 6 : 241 ; Barraud, 1934 : 253-255 ; Knight and Stone, 1977 : 83.

The species is widely distributed in Holarctic and Oriental regions, Pacific islands and Transvaal.

Present records : Ladakh : 7 ♀ ♀ collected indoors from cattle shed, numerous larvae, 1 ♂ and 1 ♀ reared from larvae, collected from river-side pools, Kargil (2800 m.) respectively on 12 and 17 Aug. '67 ; 12 ♀ ♀ collected from vegetation on Shingo river bank, Baroo-sokh (2700 m.), 19 Aug. '67. Associated breeders were *Culiseta longiareolata*, *C. hortensis* and *C. vagans*.

15. *Culiseta longiareolata* (Macquart)

Culiseta longiareolata (Macquart, 1838), *Dipt. Exot.* 1 : 34 ; and *Mem. Soc. Sci. Lille.* 2 : 38 ; Barraud, 1934 : 88-91 ; Knight and Stone, 1977 : 277.

This species is known to be distributed in the southern Palaearctic region from Azores to Central Asia, Ethiopian region, India and Pakistan. In India, it is commonly found in the North-west and west Himalayas.

Present records : 27 larvae collected from a riverside pool, 3 ♂ ♂ reared from larvae, and 6 larvae collected from a cement tank, Kargil, respectively on 11, 12 and 17 Aug. '67. Associated breeders were *Ae. vexans*, *C. hortensis*, *C. theileri* and *C. vagans*.

16. *Culex hortensis* Ficalbi

Culex hortensis Ficalbi, 1889, *Boll. Soc. ent. ital.* 21 : 27 ; Bhat and Kulkarni, 1971 : *Oriental Insect* 5 : 583-584 ; Knight and Stone, 1977 : 250.

This species was known to be distributed in the Mediterranean region of Europe and Africa, Central Europe, Southern U. S. S. R., extending eastwards up to Iran and Tadzhik S. S. R. and westwards upto Canary Island. It was also recorded from Ladakh.

Present records : Ladakh : 1 ♂ and 2 ♀ ♀, collected from river side, vegetation ; 13 larvae, 1 pupa, 12 ♂ ♂ and 7 ♀ ♀ reared from larvae, collected from river-side pools ; 22 larvae, 1 pupa and 1 ♂ reared from pupa collected from a cement tank, Kargil, respectively on 11, 12 and 17 Aug. '69. 7 larvae and 3 pupae from a seepage pool, Horje (3500 m.) at Leh, 4 Aug. '68. 1 ♂ from vegetation, Phiang, 7 Aug. '68. Associated breeders were *C. theileri*, *C. vagans*, *Culiseta longiareolata* and *Ae. vexans*.

17. *Culex pallidothorax* Theobald

Culex pallidothorax Theobald, 1905, *Journ. Econ. Biol.* 1 : 32 ; Barraud, 1934 ; 381-382 ; Knight and Stone, 1977 : 232.

A widely distributed species. The range includes India, Ceylon, Nepal, Burma, Thailand, Indochina, Malaya and through Japan to New Guinea.

Present record : 4 ♂ ♂ and 4 ♀ ♀ collected from vegetation in a ravine, Khilani, 11 Nov. '69.

18. *Culex viridiventer* Giles

Culex viridiventer Giles, 1901, *J. Bomb. Nat. Hist. Soc.* 8 : 609 ; Barraud, 1934 : 378-380 ; Knight and Stone, 1977 : 233.

A common species found in the western Himalayas from western boundary of Nepal to Kashmir.

Present records : Anantnag dist. : 27 larvae and 1 ♂ reared from larvae collected from river-side pool, Pehalgam (2250 m.), 12 Nov. '69. Udhampur dist. : 5 ♂ ♂ and 1 ♀ collected from vegetation along a stream, Dehari, 30 Nov. '69 ; 19 ♂ ♂ and 20 ♀ ♀ reared from a seepage pond, Kulwanda (1750 m.), 2 Dec. '69 ; and 1 ♂ from vegetation, Phalata, 26 Nov. '69. Associated breeders were *C. mimeticus* and *C. p. quinquefasciatus*.

19. *Culex barraudi* Edwards

Culex barraudi Edwards, 1922, *Indian J. Med. Res.* 10 : 284 ; Barraud, 1934 : 403 ; Knight and Stone, 1977 : 202.

The species has been known to be distributed in India, Nepal, Ceylon, China and Southeast Asia.

Present records : Udhampur dist. : 2 ♀ ♀ collected from vegetation along a stream, Phalata (800 m.), 26 Nov. '69. Rajouri dist. : 1 ♀ reared from larva collected from a rock pool, Naushera, 7 Dec. '69. Associated breeders were *Ae. elsiae* and *C. p. quinquefasciatus*.

20. *Culex bitaeniorhynchus* Giles

Culex bitaeniorhynchus Giles, 1901, *J. Bomb. Nat. Hist. Soc.* 13 : 607 ; Barraud, 1934 : 391-394 ; Knight and Stone, 1977 : 203.

Widely distributed species known from several countries in Oriental, Palaearctic, Ethiopian and Australian regions.

Present records : Udhampur dist. : 1 ♂ and 1 ♀ reared from larvae collected from stream-bed pools near paddy fields ; and 1 ♀ collected from nearby vegetation ; Phalata, respectively on 22 and 26 Nov. '69. Associated breeders were *An. maculatus* and *C. p. quinquefasciatus*.

21. *Culex fuscocephalus* Theobald

Culex fuscocephalus Theobald, 1907, *Monogr. Cul.* 4 : 420 ; Barraud, 1934 : 424-426 ; Knight and Stone, 1977 : 208.

Widely distributed in Oriental and eastern parts of Palaearctic regions.

Present records : Udhampur dist. : 3 ♂♂ and 8 ♀♀ collected from forest vegetation, Udhampur, 15 Oct. '69 ; 17 ♂♂ and 23 ♀♀ reared from larvae collected from a roadside seepage pool with muddy water, Satani, 6 Nov. '69. Associated breeders were *An. subpictus* and *C. p. quinquefasciatus*.

22. *Culex mimeticus* Noe

Culex mimeticus Noe, 1899, *Boll. Soc. ent. ital.* 31 : 240 ; Barraud, 1934 : 451 ; Knight and Stone, 1977 : 240.

Known from southern Palaearctic and Oriental regions.

Present records : Doda dist. : 3 ♂♂ and 1 ♀, and 2 ♂♂ and 3 ♀♀ reared from larvae collected from seepage pools, Bhadarwah, respectively on 14 and 16 Nov. '69. Udhampur dist. : 10 ♂♂ and 9 ♀♀ collected from vegetation along a stream, Phalata, between 24 and 27 Nov. '69 ; 1 ♀ reared from larva collected from a seepage pool, Kulwanda, 2 Dec. '69. Associated breeders were *An. maculatus*, *C. viridiventer* and *C. p. quinquefasciatus*.

23. *Culex pipiens quinquefasciatus* Say

Culex pipiens var. *quinquefasciatus* Say, 1823, *J. Acad. nat. Sci. philad.* 3 : 10 ; Knight and Stone, 1977 : 216-219.

A well known cosmopolitan species and is widely distributed all over India.

Present records : Baramulla dist. : 23 ♂♂ and 25 ♀♀ reared from larvae collected from roadside pools, Bandipore (1850 m.), 30 Oct. '69.

1 ♀ collected from vegetation, Marder (1850 m.), 2 Nov. '69. Doda dist. : 31 ♂ ♂ and 38 ♀ ♀ emerged from pupae in a cement tank, Gund near Banihal (1500 m.), 13 Nov. '69 ; 1 larva, 9 ♂ ♂ and 10 ♀ ♀ reared from larvae collected from a pool, Khilani, 19 Nov. '69. Udhampur dist. : 2 ♂ ♂ from vegetation, 3 ♂ ♂ and 5 ♀ ♀ resting indoor, Udhampur, respectively on 15 Oct. and 4 Dec. '69 ; 3 ♂ ♂ and 8 ♀ ♀ resting indoor, and 3 ♂ ♂ and 6 ♀ ♀ reared from larvae collected from a drain, Satani, 6 Nov. '69 ; 2 ♀ ♀ reared from larvae collected from a seepage pool on stream bed, Phalata, 22 Nov. '69 ; 2 ♀ ♀ reared from larvae collected from a pool in a peridomestic area, 4 ♂ ♂ and 8 ♀ ♀ collected from vegetation, Dehari, 30 Nov. '69 ; 3 ♂ ♂ reared from larvae collected from seepage pool, Kulwanda, 2 Dec. '69 ; and 7 ♂ ♂ and 4 ♀ ♀ reared from larvae and pupae collected from a drain, Ramnagar (950 m.), 4 Dec. '69. Rajouri dist. : 4 ♀ ♀ resting indoor, 7 ♂ ♂ and 9 ♀ ♀ reared from immature stages collected from a rock pool, Naushera, respectively on 6, 7 and 8 Dec. '69.

Associated breeders were *An. maculatus*, *An. subpictus*, *Ae. elsiae*, *C. viridiventer*, *C. barraudi*, *C. bitaeniorhynchus*, *C. fuscocephalus*, *C. mimeticus* and *C. vagans*.

24. *Culex* sp.

The species closely resembles *C. gelidus* Theobald, 1901 but differs by the extent of the white ring on the proboscis. The identity needs confirmation by collecting more specimens.

Present Records : Ladakh : 2 ♀ ♀ from vegetation, Pratapgunj at Kargil ; 2 ♀ ♀ indoor resting, Longmithang at Kargil, 14 Aug. '67, 2 ♀ ♀ from vegetation, Poyen (2900 m.), 25 Jul. '68 ; and 1 ♂ from vegetation, Phiang, 7 Aug. '68.

25. *Culex theileri* Theobald

Culex theileri Theobald, 1903, *Monogr. Cul.*, 3 : 187 ; Barraud, 1934 ; 414-416 ; Knight and Stone, 1977 : 225.

The species is known from southern and eastern Ethiopian, southern Palaearctic, and northern Oriental Regions.

Present records : Ladakh : 8 ♀ ♀ from vegetation on Shingo river bank, Kargil, 11 Aug. '67 ; 2 larvae and 2 ♀ ♀ reared from larvae collected from a seepage pool, Drass (3500 m.), 31 Aug. '67 ; 4 ♀ ♀ reared from larvae collected from a seepage pool, Poyen near Kargil, 25 Jul. '68 ; 1 ♂ and 1 ♀ from vegetation, Phiang near Leh, 7 Aug. '68 ; and 1 ♂ and 4 ♀ ♀ from vegetation, Leh (3600 m.), 8 Aug. '68. Associated breeders were *Culiseta longiareolata*, *C. hortensis* and *C. vagans*.

26. *Culex vagans* Wiedemann

Culex vagans Wiedemann, 1828, *Aussereurop Zweifl. Ins.* 1 : 545 ; Barraud, 1934 : 416-418 ; Knight and Stone, 1977 : 227.

The species is known to be distributed in China, Japan, Korea, Far Eastern U. S. S. R., Manchuria, Iran and Pakistan. In India, it has been recorded from the western Himalayas, Kashmir and Punjab.

Present records : 1 ♀ reared from larva collected from a pool adjacent to an irrigation channel, Pratapgunj at Kargil, 11 Aug. '67 ; 15 ♂♂ and 13 ♀♀ from vegetation, 21 ♂♂ and 26 ♀♀ reared from larvae collected from seepage pools on Shingo river bank, Kargil, 12 Aug. '67 ; 1 ♀ resting indoor in cattle shed, Longmithang at Kargil, 14 Aug. '67 ; 2 ♂♂ reared from larvae collected from seepage pools, Drass. 31 Aug. '67 ; 4 ♂♂ and 2 ♀♀ from vegetation, Poyen (3000 m.), 25 Jul. '68. Baramulla dist. : 15 ♂♂ and 21 ♀♀ reared from larvae collected from seepage pools adjacent to wheat field, Sopore, 22 Oct. '69 ; 2 ♀♀ reared from larvae from seepage pools, Bandipore (1900 m.), 30 Oct. '69.

Associated breeders were *Ae. vexans.*, *Culiseta longiareolata*, *C. hortensis* *C.p. quinquefasciatus* and *C. theileri*.

27. *Culex vishnui* Theobald

Culex vishnui Theobald, 1901, *Monogr. Cul.* 1 : 355 ; Barraud, 1934 : 400-402 ; Knight and Stone, 1977 : 228.

The species is widely distributed in Oriental region, Iraq, Iran, Pakistan, China, Korea, Japan and New Guinea, Thailand, Hong Kong, Java, Malaysia and Philippines.

Present records : Udhampur dist. : 4 ♂♂ and 9 ♀♀ from forest vegetation, Udhampur, 15 Oct. '69 ; 5 ♂♂ and 48 ♀♀, from vegetation along the streams, Phalata, between 24 and 27 Nov. '69 ; 9 ♀♀ from vegetation along streams, Dehari, 30 Nov. '69.

DISCUSSION

During the present survey in three distinct ecogeographical areas of the state, viz., Jammu, Kashmir and Ladakh, three genera comprising of 18 species of mosquitoes—six species of *Anopheles*, four species of *Aedes* and eight species of *Culex* were collected in Jammu. These include two important vector species of malaria, viz., *An. culicifacies* and *An. fluviatilis*. Only eight species of mosquitoes were collected in Ladakh. *Culex hortensis*, a member of the subgenus *Neoculex* Dyar, 1905 was recorded for the first time in Ladakh (Bhat and Kulkarni,

1971). The species was found breeding in association with *C. theileri*, *C. vagans*, *Culiseta longiareolata* and *Ae. vexans*. The mosquito fauna of Ladakh is interesting, because all the species were collected in the subalpine and alpine zones which remain snow bound during winter and is represented by palaeartic species such as *C. vagans*, *C. theileri*, and *C. hortensis*, by holarctic species such as *Ae. vexans* and by montane species such as *Culiseta longiareolata* and *Ae. sintoni*. Only five species were collected from Kashmir valley and all the species are also found elsewhere in the western Himalayas.

SUMMARY

During the survey of haematophagous arthropods in the State of Jammu and Kashmir, between August 1967 and December 1969, four genera and 27 species of mosquitoes were collected. They are *Anopheles gigas simlensis*, *An. lindesayi*, *An. annularis*, *An. culicifacies*, *An. fluviatilis*, *An. maculatus willimorei*, *An. subpictus*, *Aedes elsiae*, *Ae. oreophilus*, *Ae. sintoni*, *Ae. albopictus*, *Ae. vittatus*, *Ae. w-albus*, *Ae. vexans*, *Culiseta longiareolata*, *Culex hortensis*, *C. pallidothorax*, *C. viridiventer*, *C. barraudi*, *C. bitaeniorhynchus*, *C. fuscocephalus*, *C. mimeticus*, *C. pipiens quinquefasciatus*, *C. sp.*, *C. theileri*, *C. vagans* and *C. vishnui*. The collection records of these species with ecological notes are presented in this communication.

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REFERENCES

- BARRAUD, P. J. 1934. *The fauna of British India*, Diptera, Vol. V, Family Culicidae, Tribes Megarhinini and Culicini, xxviii+pp. 1-463, Taylor and Francis, London.
- BHAT, H. R. AND KULKARNI, S. M. 1971. A report on the occurrence of *Culex (Neoculex) hortensis* Ficalbi, 1889, in Ladakh, India. *Oriental Insects* 5 : 583-584.