

RECORDS OF MOSQUITOES COLLECTED FROM THE
STATE OF HIMACHAL PRADESH, INDIA WITH
ECOLOGICAL NOTES

By

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INTRODUCTION

Not much information has been added on the mosquito fauna of Himachal Pradesh, particularly of the higher altitudes, since the publication of monographs of Indian Anophelines (Christophers, 1933) and Culicines (Barraud, 1934) except for two subsequent publications on Anophelines (Puri, 1948 and Rao, 1981).

The present communication deals with the mosquitoes collected during a survey of haematophagous arthropods in the Himachal Pradesh, between April 1967 and September 1970 under the auspices of Indian Council of Medical Research (Rao *et al.*, 1973).

The classification and nomenclature followed in the present study 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 is mainly done on adult characters : genitalia of males and the characters of immature stages were also taken into consideration. Ecological notes on the species collected are given. The altitudes of the localities, given in parenthesis, are only approximate.

COLLECTION RECORDS

Family CULICIDAE

Subfamily : ANOPHELINAE

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 Himalaya including the foot-hills, north-west frontier region of Pakistan and Sri Lanka.

Present records : Kulu dist. : 2 pupae and 1 ♀ reared from larva collected from river-side pool, Bibhali (1220 m), 11 May 1967. Mandi

dist. : 1 ♀ collected from outdoor vegetation along a garden fence, Galu (1000 m), 28 March 1968. Mahasu dist. : 1 ♀ collected from a tree-hole, Pity Rampur (1300 m), 4 June 1970. Kinnaur dist. : 1 ♀ from forest vegetation and 1 ♀ from indoor resting, Sangla (2700 m), 7 and 16 June 1970.

The present records extend its distribution from temperate to sub-alpine zone upto an elevation of 2700 m.

2. *Anopheles lindesayi* (Giles)

Anopheles lindesayi Giles, 1900, Handbook, ed. 1 : 166 ; Christophers, 1933 : 128-129 ; Knight and Stone, 1977 : 22 ; Rao, 1981 : 267-268.

A montane species recorded from India, Pakistan, Nepal, U. S. S. R. and Burma. In India, it is found in the Himalaya upto an altitude of about 3000 m.

Present records : Chamba dist. : 9 ♂♂ and 3 ♀♀ collected from forest vegetation and tree-holes, Banikhet (1680 m.), 9 and 11 June 1967 ; 2 ♀♀ from forest vegetation, one on 12 June 1967 and the other on 30 May 1967 at Kalatop (2450 m.) and Khalel (2120 m.) respectively. Kangra dist. : 1 ♂ along the river side vegetation, Drung (1120 m.), 2 June 1967. Kulu dist. : 1 ♀ collected from vegetation, Manali (1860 m.), 2 Aug. 1970. Mahasu dist. : 1 ♀ forest vegetation, Dhanguyi (1850 m.), 13 May 1969 ; 1 ♀ resting inside house, Ratanadi (2700 m.) 11 July 1970. Simla dist. : Many larvae and 1 ♂ reared from larva, collected from a water pool in a quarry, Kandaghat (1500 m.) 2 June 1970.

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 : Bilaspur dist. : 1 ♀ resting inside cattle shed, Ballu (580 m.), 27 Mar. 1969. Kangra dist. : 1 ♀ outdoor resting, Dugadda (900 m.), 19 March 1969. Kulu dist. : 1 ♀ resting inside cattle shed, Chyala-Manali (1850 m.), 3 Aug. 1970. Simla dist. : 1 ♀ indoor resting, Nalagarh (600 m.) 9 Apr. 1969.

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.

This species has been recorded from India, Sri Lanka, Burma, Nepal, Thailand, Indochina, China, Pakistan, Afghanistan, Iran and around Persian Gulf. In India, it is widely distributed.

Present records : Sirmour dist. : 1 ♀ collected from outdoor resting, Moginand (500 m.) 28 Apr. 1969.

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 which includes India, Pakistan, Afghanistan, Nepal, Sri Lanka, 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.

Present records : Kangra dist. : 1 ♂ and 1 ♀ collected inside cattle shed, one from Lad (900 m.) and other from Dugadda (900 m.) on 17 and 19 Mar. 1969 respectively. Simla dist. : 6 ♀ ♀ inside house, Manpura (500 m.) 7 Mar. 1969 ; 4 ♀ ♀ inside human dwelling, Malkumajara (500 m.) 8 Mar. 1969 ; 1 ♀ inside house, Pud-Nalagarh (600 m.) 9 Mar. 1969. Sirmour dist. : 1 ♀ resting outdoor on vegetation near hill stream, Moginand (500 m.), 28 Apr. 1969.

6. *Anopheles maculatus willimori* (James)

Anopheles maculatus var. *willimori* (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 : Bilaspur dist. : 8 ♀ ♀ collected from vegetation, Ballu (750 m.) ; 2 ♀ ♀ indoor resting, Bakrol (760 m.) both on 27 Mar. 1969. Kangra dist. : 2 ♂ ♂ and 2 ♀ ♀ from shaded vegetation along a stream, Menjha (1200 m.) 3 June 1967 ; 1 ♂ river valley vegetation, Kalapur (1500 m.) 5 June 1967 ; 1 ♂, 1 ♀ from river side vegetation, Sukoh (850 m.) 6 June 1967 ; 1 ♀ outdoor vegetation, Dugadda (900 m.) 19 Mar. 1969. Kulu dist. : 1 pupa from a stream bed pool and 1 ♂ resting on the stream vegetation, Bharie (1400 m.) 9 May 1967 ; 3 ♀ ♀ inside cattle sheds, Manali (1850 m.) and Jhakadi (1600 m.) on 3 and 4 Aug. 1970. Mahasu dist. : 1 ♂, 5 ♀ ♀ collected from inside cattle shed and human dwelling at Dharampur (1300 m.), Pipty-Rampur (1300 m.), Gaura (2000 m.) on 2 and 4 June 1970 and 5 July 1970. Mandi dist. : 1 ♂, 1 ♀ from vegetation near Govt. rest house, Mandi (920 m.), 24 May 1967. Simla dist. : 1 ♂, 2 ♀ ♀ indoor resting, cattle shed, at Manpura (500 m.) and Malkumajara (500 m.) on 7 and 8 Apr. 1969.

7. *Anopheles splendidus* Koidzumi

Anopheles splendidus Koidzumi, 1920, Taiwan Kenkyujo Hokoku (Rep. Formosa Govt.) 8 : 23 ; Christophers, 1933 : 296-300 ; Knight and Stone, 1977 : 53 ; Rao 1981 : 476-477.

The species has been recorded from India, Formosa, China, French, Indo-china, Thailand, Burma, Nepal, Pakistan and Afghanistan. In India, it has been recorded from many places.

Present records : Mahasu dist. : 2 ♀ ♀ collected inside cattle shed Jeori (1400 m.), 2 July 1970. Simla dist. : 1 ♂ and 29 ♀ ♀ collected inside cattle sheds, Manpura (500 m.), Malkumajara (500 m.) and Pud (600 m.) on 7-9 Apr., 1969.

8. *Anopheles turkhudi* Liston

Anopheles turkhudi Liston, 1901, *Ind. Med. Gaz.*, 36 : 441 ; Christophers, 1933 : 252-257 ; Knight and Stone 1977 : 56 ; Rao, 1981 : 441-443.

The species has been recorded from India, Pakistan, Afghanistan, Israel, Iran, Saudi Arabia, Aden, Yemen, Sudan, Egypt, French Moraco, Ethiopia and Iraq. In India, It has been recorded from many places.

Present records : Simla dist. : 1 ♀ collected inside cattle shed, Manpura (500 m.) 7 Apr. 1969.

Subfamily : CULICINAE

9. *Uranotaenia* sp.

No species of this genus have so far been recorded from this region.

Present records : Chamba dist. : 2 ♂ ♂ collected from forest vegetation, Banikhet (1680 m.), 11 June 1969. Mahasu dist. : 1 ♀ collected from forest vegetation, Kundli (2150 m.), 16 May 1969.

10. *Aedes albolateralis* (Theobald)

Aedes (Finlaya) albolateralis (Theobald, 1908), *Rec. Ind. Mus.*, 2 : 289 ; Barraud, 1934 : 205-208 ; Stone *et al.*, 1959 : 158 ; Knight and Stone 1977 : 90.

The species has been recorded from India, SriLanka, Nepal, Malaya, Sumatra, China, Korea and Japan. Recorded for the first time from western himalayans.

Present record : Mahasu dist. : 3 ♀ ♀ reared from 5 larvae collected from a tree-hole, Pipty-Rampur (1300 m.), 4 June 1970.

11. *Aedes christophersi* Edwards

Aedes (Finlaya) christophersi Edwards, 1922, *Indian J. Med. Res.* 10 : 267 ; Barraud, 1934 : 195-196 ; Stone, *et al.*, 1959 : 167 ; Stone and Delfinado, 1973 : 298 ; Knight and Stone, 1977 : 100.

The species has been recorded from India, Pakistan and Japan. In India, it is known from Simla hills.

Present record : Kinnaur dist. : 1 ♀ collected from forest vegetation, Karcham (1700 m.), 19 Oct. 1967.

12. *Aedes niveus* (Ludlow)

Aedes (Finlaya) niveus (Ludlow, 1903), *In* : Theobald, *Monogr. Cul.* 3 : 193 ; Barraud, 1934 : 208-210 ; Knight and Stone, 1977 : 100.

The species has been recorded from Sumatra, Bali, Singapore Philippines and Japan. In India, it is known from Andaman Islands, West Bengal and Sunderbans.

Present records : Chamba dist. : 1 ♀ collected while biting on man, Surkhi-galli (1600 m.), 12 Sept. 1967. Mahasu dist. : 1 ♂, 1 ♀ collected from vegetation, Mashnu (2100 m.), 3 July 1970.

13. *Aedes oreophilus* (Edwards)

Aedes (Finlaya) 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 breeder, recorded from Himalayas and Nilgiri hills.

Present records : Simla dist. : 1 ♂ collected from vegetation, Dassumajara (500 m.) 3 Apr. 1969.

14. *Aedes pseudotaeniatus* (Giles)

Aedes (Finlaya) pseudotaeniatus (Giles, 1901), *J. Bom. Nat. Hist. Soc.* 13 : 607 ; Barraud, 1934 : 178-180 ; Knight and Stone, 1977 : 102.

The species has been recorded from India, Sri Lanka and Burma. It is a common species in India.

Present records : Mahasu dist. : 1 ♀ from vegetation, Rampur (1300 m.), 29 Apr. 1967 ; 10 ♂♂, 13 ♀♀ inside cattle shed, Pipty-Rampur (1300 m.) and Jeori (1400 m.), 4 and 6 June 1970 and 2 July 1970. Mandi dist. : 1 ♀ inside human-dwelling, Mandi (920 m.), 21 May 1967.

15. *Aedes pulchriventer* (Giles)

Aedes (Finlaya) pulchriventer (Giles, 1901), *J. Bom. Nat. Hist. Soc.* **13** : 608 ; Barraud, 1934 : 190-200 ; Knight and Stone, 1977 : 102.

The species was originally recorded from Himalaya and subsequently from Tibet. A common tree-hole and rock-hole breeder.

Present records : Kinnaur dist. : 100 larvae, 50 pupae collected from rock-holes along the river side, 2 ♂♂, 1 ♀ reared from them, Wangtu (1750 m.), 30 Apr. 1967. Kulu dist. : 1 ♀ collected from river side vegetation, Bharie (1450 m.), 9 May 1967.

16. *Aedes shortti* Barraud

Aedes (Finlaya) shortti Barraud, 1923, *Bull. Ent. Res.* **13** : 405 ; Barraud, 1934 : 183-184 ; Knight and Stone 1977 : 104.

The species has been recorded from India, Pakistan, and Sumatra.

Present record : Chamba dist. : 2 ♀♀ collected from forest vegetation ; Kalatop (2450 m.) 9 Sept. 1967.

17. *Aedes thomsoni* (Theobald)

Aedes (Christophersomyia) thomsoni (Theobald 1905); *Genera Insectorum Dipt. Fam : Culicidae*, **26** : 19 ; Barraud 1934 : 213-215 ; Stone *et al.*, 1959 : 177 ; Knight and Stone, 1977 : 87.

The species has been recorded from western himalayas and Sri Lanka.

Present record : Kangra dist. : 1 ♀ collected from vegetation.

18. *Aedes albopictus* (Skuse)

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

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

Present records : Bilaspur dist. : 1 ♂ and 1 ♀ collected around a house, Deoli (760 m.) 19 July 1970. Kangra dist. : 1 ♀ along a stream vegetation, Sukoh (920 m.), 6 July 1967 ; 2 ♂♂ and 4 ♀♀ collected while biting and hovering around a man, Dadh (1100 m.), 15 Sept. 1967 ; 1 ♀ in peridomestic area, Dharmsala (1200 m.) 17 Sept. 1967 ; 2 ♂♂ collected on vegetation, Baijnath (1000 m.) 13 Aug. 1970. Mandi dist. : 1 ♀ inside a house, Mandi (920 m.) 21 May, 1967 ; 2 ♂♂ and 15 ♀♀ collected on forest vegetation, Mandi (920 m.) 22 July 1970 ; 3 ♀♀ collected while biting on man, Mandi (920 m.) 24 May 1967.

19. *Aedes pseudalbopictus* Borel

Aedes (Stegomyia) pseudalbopictus Borel, 1928, *Arch des Inst. Pasteur d'Indochine*, 7 : 85 ; Barraud, 1934 : 235-237 ; Knight and Stone, 1977 : 163.

The species has been recorded from India, Vietnam, Malaysia, Java, Sumatra, Thailand and Burma.

Present record : Kulu dist. : 1 ♂ and 7 ♀ ♀ collected from roadside forest vegetation, Manali (1860 m.) 2 Aug. 1970.

20. *Aedes subalbopictus* Barraud

Aedes (Stegomyia) subalbopictus Barraud, 1931. *Indian J. Med. Res.* 19 : 225 ; Barraud, 1934 : 238-239 ; Knight and Stone, 1977 : 165.

The species has been recorded from India and Hainan Island.

Present records : Kulu dist. : 4 ♂ ♂ and 3 ♀ ♀ collected while hovering around and biting man, Manali (1820 m.), 6 and 8 Aug. 1970.

21. *Aedes unilineatus* (Theobald)

Aedes (Stegomyia) unilineatus (Theobald 1906), *Wellcom. trop. Res. Lab.* 2 : 70 ; Barraud, 1934 : 242-243 ; Stone *et al.*, 1959 : 188 ; Knight and Stone, 1977 : 166.

The species has been recorded from tropical Africa, Pakistan, India, Sudan, Gold Coast, Nigeria, Uganda, Kenya and Natal.

Present records : Mahasu dist. : 1 ♀ collected while biting man, Rampur (1200 m.), 28 Apr. 1969 ; 1 ♀ resting inside tree-hole, Pipty-Rampur (1300 m.), 4 June 1970.

22. *Aedes vittatus* (Bigot)

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

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

Present records : Mahasu dist. : 1 ♂ and 5 ♀ ♀ collected from outdoor and indoor resting places, Pipty-Rampur (1200 m.), Archoli (1300 m.) 27-28 June 1970 and 8 July 1970.

23. *Aedes vexans* (Meigen)

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

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

Present records : Kulu dist. : 26 ♂ ♂ and 16 ♀ ♀ collected from vegetation, Manali (1860 m.), 2 and 6 Aug. 1970. 2 ♀ ♀ inside cattle shed, Shyal (1850 m.) 8 Aug. 1970.

24. *Armigeres subalbatus* (Coquillett)

Armigeres (Armigeres) subalbatus (Coquillett, 1898), *Proc. U. S. natn. Mus.* **21** : 502 ; Barraud, 1934 : 314-317 ; Stone *et al.*, 1959 : 213-214 ; Knight and Stone, 1977 : 172.

This species is found all over the Oriental region including India and Japan.

Present records : Kangra dist. : 7 ♂♂ and 1 ♀ collected outdoor and while biting on man, Baijnath (1000 m.), 13 Aug. 1970. Kulu dist. : 2 ♂♂ inside cattle shed, Shyal (1850 m.), 8 Aug. 1970. Mahasu dist. : 11 ♂♂ and 12 ♀♀ collected on vegetation and while biting on man, Jugatkhana-Rampur (1200 m.), 30 June 1970.

25. *Culiseta niveitaeniata* (Theobald)

Culiseta (Culiseta) niveitaeniata (Theobald, 1907), *Monogr. Cul.* **4** : 272 ; Barraud, 1934 : 91-93 ; Knight and Stone, 1977 : 281.

The species has been recorded from India, Pakistan, Tibet, China and Taiwan.

Present record : Simla dist. : 1 ♂ collected from vegetation over a forest slope, Narkhanda (2400 m.), 3 June 1970.

26. *Culex halifaxii* Theobald

Culex (Lutzia) halifaxii Theobald, 1903. *Monogr. Cul.* **3** : 231, Stone and Delfinado, 1973 : 327 ; Knight and Stone, 1977 : 249. The species was earlier referred to as *Culex (Lutzia) raptor* Edwards, 1922, *Indian J. Med. Res.* **10** : 275 ; Barraud, 1934 : 343.

The species has been recorded from Malaysia, India, Burma, Sri Lanka, Thailand, China, Indonesia, Phillipines, New Guinea, Australia, Nepal, U. S. S. R. and Japan.

Present record : Kangra dist. : 1 ♂, 1 ♀ collected from forest vegetation, Kalapur (1520 m.) 5 June 1967.

27. *Culex minutissimus* (Theobald)

Culex (Lophoceratomyia) minutissimus (Theobald, 1907), *Monogr. Cul.* **4** : 235 Barraud, 1934 : 263-655 ; Knight and Stone, 1977 : 245.

The species has been recorded from Sri Lanka, India, Maldive Islands, Java, Borneo and China. In India, it is known from Punjab to Orissa. It has been recorded for the first time from western himalayas.

Present record : Kangra dist. : 1 ♂ and 1 ♀ collected from vegetation along a river stream, Drung (1100 m.), 2 June 1967.

28. *Culex (Mochthogenes) sp.*

The species of this subgenus have been earlier recorded from South India. This is the first record from North India. It's identity could not be confirmed.

Present record : Kangra dist. : 1 ♂ from crevices of river stream, Drung (1100 m.) 2 June 1967.

29. *Culex viridiventer* Giles

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

It is a common species found in the western himalayas extends upto western boundary of Nepal.

Present records : Bilaspur dist. : 4 ♂♂, 1 ♀ collected from outdoor vegetation, Ballu (750 m.) and Loharni (750 m.), 27 and 30 Mar. 1969. Chamba dist. : 13 ♂♂, 4 ♀♀ from forest vegetation, Banikhet (1680 m.) 9 and 11 June 1967 ; 3 ♀♀ forest vegetation, Kalatop (2450 m.), 10 and 12 June 1967 ; 19 larvae, 22 pupae from a rain water pond in forest, 2 ♀♀ reared from them, Kalatop (2450 m.), 9 Sept. 1967 ; 1 ♂ forest vegetation, Surkhigali (1620 m.), 11 June 1967 ; 1 ♀ resting on forest vegetation, Tindi (2500 m.), 17 Sept. 1968 ; 3 ♀♀ collected from vegetation, Khalel (2140 m.), 30 May 1969. Kangra dist. : 7 ♂♂, 6 ♀♀ collected from outdoor vegetation, Dadh (1080 m.), Kalapur (1520 m.) and Sukoh (920 m.), 4-6 June 1967 ; 1 ♂, 7 ♀♀ from vegetation, Tal (1000 m.), 18 Mar. 1969. Kulu dist. : 2 ♂♂, 2 ♀♀ river valley vegetation at Bharie (1450 m.), Hurla (1100 m.), 9 and 14 May, 1967 ; 2 ♂♂ from road side vegetation, Bandhrol (1350 m.), 22 Sept. 1967 ; 1 ♂, 2 ♀♀ from outdoor vegetation, Larji (900 m.) 21 Apr. 1969 ; 1 ♀ collected indoor resting cattle shed, Kothi (2580 m.), 23 July 1970. Mahasu dist. : 1 ♀ while biting on man, Rampur (1230 m.) 28 Apr. 1967 ; 2 ♀♀ collected from forest vegetation, Nogli (1000 m.), 17 Oct. 1967 ; 2 ♂♂ 2 ♀♀ collected from forest vegetation, Rohru (1500 m.), Seema (1700 m.) and Chhol (1700 m.) 7, 9 and 12 May 1969 ; 1 ♂, 2 ♀♀ from road side vegetation, Dhanguyi (1750 m.), Kundli (1800 m.), 13 and 16 May 1969 ; 5 ♀♀ outdoor, Mashnu (2100 m.) 3 July 1970. 8 ♀♀ indoor resting and 10 ♀♀ outdoor resting, Baghi (2740 m.), 7, 10-12 and 14 July 1970 ; 2 ♂♂, 4 ♀♀ collected from road side forest vegetation, Ratannadi (2700m.), 12 July 1970. Mandi dist. : 1 ♀ from vegetation in a vegetable garden, Gutkar (1100 m.), 22 May 1967. 1 ♂ on road side vegetation, Galu (940 m.), 28 Mar. 1968. Simla dist. : 12 ♂♂, 3 ♀♀ resting along hill stream, Simla (1800 m.), 20 and 22, Apr. and 4 May 1967.

30. *Culex* (*Culiciomyia*) sp.

Identity of this species could not be determined for want of male specimens.

Present records : Chamba dist. : 2 ♀♀ collected from vegetation, 1 ♀ Rakh (1080 m.), 13 Apr. 1968 and 1 ♀ Dikrund (1680 m.), 5 July 1969. Kulu dist. : 1 ♀ on vegetation, Jibi (1900 m.) 13 Apr. 1969.

31. *Culex barraudi* Edwards

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

The species has been recorded from India, Nepal, Sri Lanka, China and South east Asia.

Present records : Chamba dist. : 1 ♂ from stream bed vegetation, Banikhet (1600 m.) 11 July 1967 ; 1 ♀ from vegetation, Dikrund (1680 m.), 5 July 1969. Kangra dist. : 3 ♂♂, 3 ♀♀, from forest vegetation, stream side vegetation, Sidhwadi (1100 m.), Paraur (1100 m.), Sukho (500 m.), 1, 3 and 6 July 1967. Mandi dist. : 1 ♂, 3 ♀♀ from forest vegetation, Mandi (920 m.), 24 and 27 May 1967. Mahasu dist. : 1 ♂ 1 ♀ indoor resting cattle shed, Pipty-Rampur (1300 m.) 27 June 1970 ; Jeori (1300 m.), 2 July 1970, 2 ♀♀ outdoor resting, Archoli (1300 m.) and Jugatkhana (1200 m.) 28 and 30 June 1970. Simla dist. : 38 ♂♂, 3 ♀♀ from vegetation, Kandaghat (1500 m.), 2 June 1970.

32. *Culex bitaeniorhynchus* Giles

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

The species is widely distributed and known from several countries in Oriental, Palaearctic, Ethiopian and Australian regions.

Present records : Bilaspur dist. : 3 ♂♂, 7 ♀♀ from forest vegetation, Kanjota (760 m.), 20 July 1970. Kangra dist. : 3 ♂♂, 5 ♀♀ river side vegetation, Sidhwadi (1100 m.), Drung (1100 m.), Menjha (1200 m.), Bagsunag (1500 m.), 1 to 5 July 1967. Kulu dist. : 3 ♀♀ road side vegetation, Bandhrol (1380 m.), 22 Sept. 1967. Mandi dist. : 3 ♂♂ from garden vegetation, Gutkar (950 m.), 22 May 1967. Simla dist. : 1 ♂ outdoor vegetation, Dassumajara (580 m.), 3 Apr. 1969.

33. *Culex mimeticus* Noe

Culex (*Culex*) *mimeticus* Noe, 1899, *Bull. Soc. ent. Ital.* **31** : 240 ; Barraud, 1934 : 451 ; Knight and Stone, 1977 : 240.

The species is known from southern Palaearctic and Oriental regions.

Present records : Bilaspur dist. : 5 ♂♂, 1 ♀ from outdoor vegetation, Ballu (580 m.), 25 and 27 Mar. 1969. Chamba dist. : 15 ♂♂, 7 ♀♀ from outdoor forest vegetation, Banikhet (1600 m.), 9 and 11 July 1967 ; 2 ♂♂, 3 ♀♀ indoor resting cattle shed, Darada (1160 m.), 13 July 1967 ; 1 ♀ outdoor vegetation, Krain (920 m.) 5 Apr. 1968 ; 1 ♀ outdoor resting, Tindi (2500 m.), 17 Sept. 1968. Kangra dist. : 9 ♂♂, 10 ♀♀ from outdoor vegetation, Nagari (1100 m.), Sidhwadi (1100 m.), Drung (1100 m.), Patiar (1080 m.), Kalapur (1500 m.), Sukoh (950 m.), 31 May to 6 July 1967 ; 3 ♂♂, 2 ♀♀ from outdoor resting, Lad (900 m.), Tal (1000 m.), Dugadda (900 m.), 17 to 19 Mar. 1969. Kulu dist. : 5 ♂♂, 1 ♀ outdoor vegetation, Bharie (1450 m.), Hurla (1100 m.), Reri (1100 m.), 9, 14 and 15 May 1967 ; 4 ♂♂, 3 ♀♀ road side vegetation, Bandhrol (1350 m.), 22 Sept. 1967, Gadsa (1200 m.), 9 Oct. 1967 ; 2 ♀♀ forest vegetation, Naggar (1380 m.), 20 and 22 Apr. 1968 ; 1 ♂, 3 ♀♀ road side vegetation, Larji (1600 m.), 21 Apr. 1969 ; 5 ♂♂, 7 ♀♀ peridomestic vegetation, Shyalh-Manali (1850 m.), 6 and 8 Aug. 1970. Kinnaur dist. : 1 ♂, 5 ♀♀ from vegetation, Sangla (2700 m.), 9 June 1970. Mahasu dist. : 1 ♀ outdoor resting vegetation, Rampur (1300 m.), 2 May 1967 ; 5 ♂♂, 7 ♀♀ outdoor resting vegetation, Rohru (1600 m.), Seema (1700 m.), Chhol (1680 m), Dhanguyi (1820 m.), 5 to 13 May 1970. 1 ♂ from vegetation, Dharmpur (1500 m.), 13 May 1970. Mandi dist. : 1 ♂, 1 ♀ outdoor forest vegetation, Mandi (920 m.), 27 May 1967. Simla dist. : 1 ♂ forest vegetation, Simla (1800 m.), 20 Apr. 1967.

34. *Culex pipiens quinquefasciatus* Say

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

A well known cosmopolitan species, widely distributed all over India upto alpine zone.

Present records : Bilaspur dist. : 20 ♂♂, 1 ♀ indoor resting cattle shed, Bakrol (800 m.), 28 Mar. 1969 ; 1 ♂, 1 ♀ outdoor vegetation, Kanjota (760 m.), 20 July 1970. Kangra dist. : 17 ♂♂, 12 ♀♀ all from outdoor vegetation, Nagari (1100 m.), Malan (1080 m.), Drung (1100 m.), Menjha (1200 m.), Paraur (1100 m.), Dadh (1080 m.), Kalapur (1500 m.), Sukoh (950 m.), 31 May to 6 July 1967 ; 1 ♂ from vegetation, Baijnath (1000 m.), 14 Aug. 1970. Mahasu dist. : 8 ♂♂, 6 ♀♀, outdoor resting, Nogli (1000 m.), 17 Oct. 1967 ; 6 ♂♂, 1 ♀ from outdoor and indoor resting, Dharmpur (1300 m.), 2 June 1970 ; 15 ♂♂, 17 ♀♀ inside cattle shed, Pipty-Rampur (1300 m.), Brow (1200 m.), 4, 27 to 29 June 1970 and 8 July 1970 ; 1 ♂ outdoor vegetation, Jugatkhana, 30 June 1970. Mandi dist. : 1 ♂, 1 ♀ inside rest house, Mandi (780 m.), 21 May 1967 ;

2 ♂♂, 4 ♀♀ from outdoor vegetation, Gutkar (780 m.), Mandi (780 m.), 22 and 24 May 1967. Simla dist. : 54 ♂♂, 76 ♀♀ all reared from larvae collected from stagnant water pond, Quarry-Kandaghat (1500 m.), 2 June 1970. Sirmaur dist. : 46 ♂♂, 32 ♀♀ inside cattle sheds, Beradwala (580 m.), Moginand (580 m.), 24 and 28 Apr. 1969.

35. *Culex* sp.

The species closely resemble *C. (C.) gelidus* Theobald, 1901 but differs by the extent of the white ring on the proboscis. The identity needs confirmation.

Present records : Chamba dist. : 105 larvae from rock-pools, Banikhet (1600 m.), Kalatop (2450 m.), 9 and 10 July 1967. Kulu dist. : 2 ♂♂ from forest vegetation, Bibhali (1220 m.), Hurla (1100 m.), 11 and 14 May 1967 ; 1 ♀ from vegetation, Manali (1860 m.) 2 Aug. 1970. Mandi dist. : 1 ♀ from forest vegetation, Mandi (920 m.), 27 May 1967.

36. *Culex theileri* Theobald

Culex (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 : Lahul and Spiti dist. : 1 ♂ from road side vegetation, Chhetru (3300 m.), 31 July 1970. Mahasu dist. : 1 ♀ from vegetation, Rampur (1300 m.), 25 Apr. 1967. Mandi dist. : 1 ♂ from forest vegetation, Mandi (920 m.), 27 May 1967.

37. *Culex vagans* Wiedemann

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

The species has been recorded from China, Japan, Korea, Far Eastern U. S. S. R., Manchuria, Iran and Pakistan. In India, it has been recorded from western Himalayas, Kashmir and Punjab.

Present records : Bilaspur dist. : 5 ♂♂, 6 ♀♀ from vegetation, Ballu (580 m.), Bakrol (580 m.), Loharni (750 m.), 25, 28 and 30 Mar. 1969 ; 7 ♀♀ inside house, Ballu (580 m.), 27 Mar. 1969. Chamba dist. : 4 ♂♂, 9 ♀♀ from forest vegetation, Banikhet (1600 m.), 9 and 11 July 1967 ; 3 ♂♂, 2 ♀♀ forest vegetation, Kalatop (2440 m.) 10 and 12 July 1967 ; 3 ♂♂, 4 ♀♀ from vegetation, Krain (590 m.), Pukhri (1150 m.), 5 Apr. 1968 ; 1 ♀ from vegetation, Tindi (2500 m.),

17 Sept. 1968 ; 4 ♀ ♀ from vegetation, Schuin (2280 m.), Khaled (2040 m.), 29 and 30 May 1969 ; 1 ♂, 1 ♀ from forest vegetation, Dikrund (2000 m.), 5 July 1969. Kangra dist. : 2 ♂ ♂, 1 ♀ from vegetation, Drung (1100 m.), Bagsunag (1500 m.), 2 and 3 July 1967 ; 10 ♂ ♂, 4 ♀ ♀ from forest vegetation, Lad (900 m.), Tal (1000 m.), 17 and 18 Mar. 1969. Kulu dist. : 4 ♂ ♂, 5 ♀ ♀ from forest vegetation, Hurla (1100 m.), Reri (1100 m.), 14 and 15 May 1967 ; 1 ♂, 1 ♀ from vegetation, Bandhrol (1350 m.), 22 Sept. 1967 ; 9 ♀ ♀ from forest vegetation, Naggar (1350 m.), 20 and 22 Apr. 1968 ; 2 ♀ ♀ from river side vegetation, Jibi (1922 m.), 13 Apr. 1969. 17 ♀ ♀ from vegetation, Larji (1600 m.), 21 Apr. 1969. Kinnaur dist. : 21 ♂ ♂, 46 ♀ ♀ from peridomestic vegetation, Sangla (2700 m.) 3 to 11 June, 1970. Lahul and Spiti dist. : 3 ♂ ♂, 6 ♀ ♀ road side vegetation, Chhetru (3300 m.) 31 July 1970. Mahasu dist. : 1 ♀ from vegetation, Nogli (1000 m.), 17 Oct. 1967 ; 7 ♂ ♂, 36 ♀ ♀ from peridomestic vegetation, Rohru (1600 m.), 5, 7 and 9 May 1969 ; 3 ♂ ♂, 2 ♀ ♀ from vegetation, Dhanguyi (1820 m.), Jeltahar (1820 m.), 13 and 17 May 1969 ; 6 ♂ ♂, 30 ♀ ♀ from forest vegetation, Mashnu (2100 m.), Gaura (2000 m.), Ratan-nadi (2700 m.), Baghi (2740 m.), on 3, 5, 12 and 14 July 1970. Mandi dist. : 1 ♀ from forest vegetation, Mandi (920 m.), 27 May 1967. Simla dist. : 2 ♀ ♀ from vegetation along a rocky stream, Simla (1800 m.), 20 Apr. 1967 ; 2 ♂ ♂ from forest vegetation, Shoghi (2000 m.), 21 Apr. 1967 ; 2 ♂ ♂, 1 ♀ from vegetation, Dassumajara (500 m.), 3 Apr. 1969 ; 4 ♂ ♂, 5 ♀ ♀ from vegetation along a forest stream, Narkhanda (2400 m.), 3 June 1970.

38. *Culex univittatus* Theobald

Culex (Culex) univittatus Theobald, 1901, *Monogr. Cul.* 2 : 29 ; Barraud, 1934 : 418-420 ; Stone, *et al.*, 1959 : 263 ; Stone and Delfinado, 1973 : 321.

The species is known from Mediterranean region, Africa, Madagascar and north west frontier provinces of India and Pakistan.

Present record : Mandi dist. : 1 ♂ from road side vegetation, Gutkar (780 m.), 22 May 1967.

39. *Culex vishnui* Theobald

Culex (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, New Guinea, Thailand, Hong Kong, Java, Malaysia and Philippines.

Present records : Kangra dist. : 2 ♂ ♂, 4 ♀ ♀ from vegetation, Menjha (1220 m.), Dadh (1100 m.), 3 and 4 July 1967 ; 5 ♂ ♂, 5 ♀ ♀ from

vegetation, Tal (1000 m.), 18 March 1969 ; 1 ♂, 6 ♀ ♀ from inside cattle shed, Baijnath (1000 m.), 16 Aug. 1970. Kulu dist. : 1 ♂ from vegetation, Bandhrol (1350 m.), 22 Sept. 1967. Mandi dist. : 7 ♂ ♂, 11 ♀ ♀ from vegetation, Gutkar (780 m.), Mandi (920 m.), 22 and 27 May 1967. Simla dist. : 3 ♂ ♂, from vegetation, 3 ♀ ♀ from indoor resting cattle shed, Dassumajara (500 m.), 3 Apr. 1969, Manpura (500 m.) 7 Apr. 1969, Malkumajara (500 m.), 8 Apr. 1969. Sirmour dist : 4 ♀ ♀ from vegetation, Beradwala (500 m.), Moginand (500 m.) 24 and 28 April 1969.

40. *Culex* (*Culex*) Sp. nov.

The species belongs to *C. (C.) vishnui* group. Its identity could not be determined for want of males.

Present record : Lahul and Spiti dist. : 6 ♀ ♀ from small alpine vegetation, Chhetru (3300 m.), 31 July 1970.

41. *Culex pseudovishnui* Colless

Culex (Culex) pseudovishnui Colless, 1957 ; *Ann. trop. Med. Parasit.* 51 : 88 ; Stone, et al., 1959 : 258 ; Reuben, 1969 : 643 ; Stone and Delfinado, 1973 : 320.

The species has now been recorded throughout the Oriental region especially from India and Malaysia.

Present records : Kulu dist. : 2 ♂ ♂, 5 ♀ ♀ from vegetation along the river streams, Gaura (2000 m.), Manali (1820 m.), 5 and 6 Aug. 1970.

DISCUSSION

This is for the first time an independent list of 41 species of mosquitoes collected from Himachal Pradesh has been made available since its inception as a separate state of India in 1971. It includes 8 species of *Anopheles*, 14 species of *Aedes*, 16 species of *Culex* and 3 species belonging to remaining 3 genera. Most of the species were collected from dawn to dusk from their outdoor and indoor resting habitats. Records of *An. culicifacies* and *An. fluviatilis* the chief Malaria vectors are of significance. *An. annularis* has also been recorded as a vector of local importance (vectors of Malaria in India, 1961). Though *Aedes aegypti* was not recorded during this survey, it has been reported earlier from a locality in Chamba district (Barraud, 1934). The distribution of *An. simlensis*, *An. lindesayi*, *Culex viridiventer*, *C. mimeticus*, *C. theileri*, *C. vagans* and *Culex* sp. nov. in the sub-alpine and alpine zones of this State is of considerable importance as these areas lie adjacent to Tibet and China.

ACKNOWLEDGEMENTS

The authors are grateful to Dr. T. Ramachandra Rao, former Director, National Institute of Virology, Pune, under whose supervision and guidance the Survey was carried out. We thank the Indian Council of Medical Research (ICMR) New Delhi for making this survey possible by a generous grant specially extended for the purpose. The assistance rendered by the staff of State Government during the survey is gratefully acknowledged. Suggestions given by our colleague Dr. H. N. Kaul, Assistant Director are also gratefully appreciated.

SUMMARY

During a survey of haematophagous arthropods in the state of Himachal Pradesh, India, between April 1967 and September 1970, 41 species of mosquitoes belonging 6 genera were collected. They are : *Anopheles gigas simlensis*, *An. lindesayi*, *An. annularis*, *An. culicifacies*, *An. fluviatilis*, *An. maculatus willimori*, *An. splendidus*, *An. turkhudi*, *Uranotaenia* sp., *Aedes albolateralis*, *Ae. christophersi*, *Ae. nivues*, *Ae. oreophilus*, *Ae. pseudotaeniatus*, *Ae. pulchriventer*, *Ae. shortti*, *Ae. thomsoni*, *Ae. albopictus*, *Ae. pseudalbopictus*, *Ae. subalbopictus*, *Ae. unilineatus*, *Ae. vittatus*, *Ae. vexans*, *Armigeres subalbatus*, *Culiseta niveitaeniata*, *Culex halifaxii*, *C. minutissimus*, *C. (Mochthogenes) sp.* *C. viridiventer*, *C. (Culiciomyia) sp.*, *C. barraudi*, *C. bitaeniorhynchus*, *C. mimeticus*, *C. pipiens quinquefasciatus*, *C. sp.*, *C. theileri*, *C. vagans*, *C. univittatus*, *C. vishnui*, *C. (Culex) sp. nov.* and *C. pseudovishnui*. The collection records of these species with ecological notes are presented.

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