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OAK INHABITING APHIDS (HOMOPTERA : APHIDIDAE) OF WESTERN AND NORTH WEST HIMALAYA

By

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(With 19 Figures and 1 Table)

INTRODUCTION

Among the major ecological groups, Oak vegetation (*Quercus* spp. Fam. Fagaceae) attains montane, subtropical and temperate forests (Mani, 1974) ranging between *c* 1700 m and *c* 4200 m in North West Himalaya. They are one of the major component of ever green forests and are found in association with Conifers, Birch, Rhododendron etc. Out of the 59 recorded species of *Quercus* (Hooker, 1885 ; Collet, 1971 ; Rau, 1974), only 8 species viz. *Q. semicarpifolia* Smith, *Q. incana* Roxb., *Q. dilatata* Lindl., *Q. glauca* Thumb, *Q. lamellosa* Smith, *Q. lanuginosa* D. Don, *Q. ilex* Linn. and *Q. floribunda* Lindl. have recorded from Western and North West Himalaya.

The Himalaya maintains its peculiarities by its enormous massiveness, the great elevations of the mountain ranges, their trendlines, their location in the middle of a vast continental mass, their Tertiary orogeny, the Pleistocene glaciation and continued Post-Pleistocene uplift. Humidity, altitudinal zonation, temperature stratification and monsoon rainfall determine the Himalayan flora and fauna. The extra-peninsular zone (Mani, 1974) of Himalayan ranges includes eastern Himalaya, Nepal or Central Himalaya, Western Himalaya and Northwest Himalaya. However, Western Himalaya and North West Himalaya can be subdivided into Kumaon range, Garhwal range, Simla range and Kashmir range.

In this paper an account of aphids infesting *Quercus* spp., their incidence and mode of life cycle have been discussed. A key to such species has also been provided for their identification.

TAXONOMY OF **Quercus** INHABITING APHIDS

Several species of aphids use Oak as their host plant. The foliage provides nourishment while barks as hibernating places to a considerable members of aphid species. During the surveys in the Western

Himalaya as many as 25 aphid species have been recorded to infest these plants in this area. Out of these, 12 species belong to the subfamily Greenideinae, 5 species to Lachninae and 4 species each to Drepanosiphinae and Hormaphidinae. Aphids belonging to subfamilies Aphidinae, Chaitophorinae, Anoeciinae and Pemphiginae have never been found to cherish this plant.

Oak inhabiting aphids may be autoecious or heteroecious as regard their life cycle. Different genera and number of species under each subfamily infesting Oaks and the type of their life cycle has been presented in Table 1.

Abbreviations

Aptera/e : Apterous viviparous female/s ; Alata/e : Alate viviparous female/s ; b. d. III : Basal diameter of antennal segment III ; p. t. : Processus terminalis ; u. r. s. : Ultimate rostral segment ; h. t. 2 : 2nd segment of hind tarsus ; Coll. : Collector ; H. P. : Himachal Pradesh ; U. P. : Uttar Pradesh.

TABLE 1. Subfamily wise distribution and mode of life cycle of *Quercus* inhabiting aphids.

Subfamilies	Genera	No. of species	Types of Life cycle
Greenideinae	*Eutrichosiphum* Essig & Kuwana	9	Autoecious
	Greenidea Schouteden	3	Autoecious
Lachninae	*Lachnus* Burmeister	2	Autoecious
	Nippolachnus Matsumura	3	Autoecious
Drepanosiphinae	*Globulicaudaphis* Hille Ris Lambers	1	Autoecious
	Myzocallis Passerini	2	Autoecious
	Serratocallis Quednau & Chakrabarti	1	Autoecious
Hormaphidinae	*Heminipponaphis* Chakrabarti & Raha	1	Heteroecious
	Neothoracaphis Matsumura	1	Heteroecious
	Pseudothoracaphis Raychaudhuri, Ghosh & Das	1	Heteroecious
	Reticulaphis Takahashi	1	Heteroecious

Following is the systematic account of aphids infesting *Quercus* spp. along with the available morphs recorded, locality and period of collection.

SYSTEMATIC ACCOUNT

A. SUBFAMILY GREENIDEINAE

1. **Eutrichosiphum garhwalense** Maity and Chakrabarti

Eutrichosiphum garhwalense Maity and Chakrabarti, 1980. *Annal. Zool.*, **35** (22) : 307.

Specimens examined : 19 apterae and nymphs, INDIA : U. P. : Mussoorie, 24.v.1978 (Coll. *S. P. Maity*).

Host plant : *Quercus incana.*

Distribution : India : Uttar Pradesh.

2. **Eutrichosiphum pyri** Chakrabarti, Ghosh and Raychaudhuri

Eutrichosiphum pyri. Chakrabarti, Ghosh and Raychaudhuri, 1972. *Oriental Ins.*, **6** (3) : 389.

Specimens examined : 2 apterae and nymphs, INDIA : U. P. : Chaubattia, 13.vi.1970 (Coll. *S. Chakrabarti*) ; Many apterae and nymphs, INDIA : U. P. : Gourikund, 1.vi.1978 ; Rambara, 2.vi.1978 (Coll. *D. K. Bhattacharya*).

Host plant : *Quercus* sp., *Pyrus communis* and an unidentified plant.

Distribution : India : Uttar Pradesh, Meghalaya, Assam.

3. **Eutrichosiphum taoi** Ghosh, Basu and Raychaudhuri

Eutrichosiphum taoi Ghosh, Basu and Raychaudhuri, 1970. *Oriental Ins.*, **4** (1) : 68 ; Chakrabarti, Ghosh and Raychaudhuri, 1972. *Oriental Ins.*, **6** (3) : 390.

Specimens examined : 6 apterae and nymphs, INDIA : U. P. : Bhowali, 5.iv.1970 (Coll. *S. Chakrabarti*).

Host plant : *Quercus* sp.

Distribution : India : Uttar Pradesh.

4. **Eutrichosiphum (Eutrichosiphum) tapatii** Mondal, Chatterjee and Raychaudhuri

Eutrichosiphum (*Eutrichosiphum*) *tapatii* Mondal, Chatterjee and Raychaudhuri, 1979. *Entomon*, **4** (1) : 77 ; Raychaudhuri, Ghosh and Das, 1980. *Ins. Matsumurana*, **20** : 33.

Material reported : 2 apterae and many nymphs, INDIA : U. P. : Kemphy, 4.xi.1978 : (without collector's name).

Host plant : *Querces* sp.

Distribution : India : Himachal Pradesh, Uttar Pradesh and Sikkim.

5. **Eutrichosiphum (Neoparatrichosiphum) khasyanum** (Ghosh and Raychaudhuri)

Paratrichosiphum (*Neoparatrichosiphum*) *khasyanum* (Ghosh and Raychaudhuri, 1962. *J. Asiat. Soc. Cal.*, **4** (3 & 4) : 108.

Eutrichosiphum (*Neoparatrichosiphum*) *khasyanum* (Ghosh and Raychaudhuri) ; Raychaudhuri and Chatterjee, 1980. Aphids of North East India and Bhutan. D. N. Raychaudhuri, Ed., p. 334 ; Raychaudhuri, Ghosh and Das, 1980. *Ins. Matsumurana*, **20** : 34.

Material reported : 2 apterae and 4 nymphs, INDIA : H. P. : Barog, 31.x.1978. (without collector's name)

Host plant : *Quercus dealbata*, *Q. griffithi*, *Quercus* sp. and *Petunia violacea* (Solanaceae).

Distribution : India : Arunachal Pradesh, Himachal Pradesh, Meghalaya and Uttar Pradesh.

6. **Eutrichosiphum (Paratrichosiphum) alnicola** (Basu)

Paratrichosiphum alnicola Basu, 1967. *Bull. Entomology*, 8 (2) : 14 ; Ghosh, Ghosh, and Raychaudhuri, 1971. *Proc. zool. Soc. Cal.*, **24** : 50.

Eutrichosiphum (*Paratrichosiphum*) *alnicola* (Basu) ; Raychaudhuri and Chatterjee, 1980. Aphids of North East India and Bhutan, D. N. Raychaudhuri, Ed., p. 336 ; Raychaudhuri, Ghosh and Das, 1980. *Ins. Matsumurana*, **20** : 34.

Specimens examined : Many apterae and nymphs, INDIA : U. P. : Mussoorie, Laltibba, 1.xi.1977 (Coll. S. P. Maity).

Host Plant : *Quercus* sp., *Alnus nepalensis*.

Distribution : India : Himachal Pradesh, Uttar Pradesh.

7. **Eutrichosiphum (Paratrichosiphum) assamensis** (Ghosh and Raychaudhuri)

Paratrichosiphum tattakanum assamensis Ghosh and Raychaudhuri, 1962. *J. Asiatic Soc.*, **4** (3 & 4) : 112.

Eutrichosiphum (*Paratrichosiphum*) *assamensis* (Ghosh and Raychaudhuri) ; Chakrabarti and Maity, 1980. *Annal. Zool.*, 35 (9) : 100.

Specimen examined : Many apterae, alate oviparous females, alate males and nymphs, INDIA : U. P. : Mussorie, 30.x.1977, 1.xi.1977, 26.v.1978 (Coll. *S. P. Maity*) ; Gourikund, 31.v.1978 (Coll. *D. K. Bhattacharya*) ; Rambara, 2. vi. 1978 (Coll. *D. K. Bhattacharya*) ; Trijuginarayan, 5.vi.1978 (Coll. *D. K. Bhattacharya*) ; Sonprayag, 6.vi.1978 (Coll. *S. P. Maity*).

Host plant : *Quercus* sp.

Distribution : India : Assam, Himachal Pradesh and Uttar Pradesh.

Note : Verma (Per. Comm.) informed *Paratrichosiphum tattakanum* (Takahashi) from Himachal Pradesh. However, re-examination of this material show that these are *Paratrichosiphum* (*Neoparatrichosiphum*) ***khasyanum*** (Ghosh and Raychaudhuri). Raychaudhuri and Chatterjee (1980) considered *Eutric' osiphum* (*Paratrichosiphum*) *assamensis* (Ghosh and Raychaudhuri) as a synonym of *Paratrichosiphum* (*Neoparatrichosiphum*) *khasyanum* (Ghosh and Raychaudhuri). Raychaudhuri and Chatterjee (1977) considered *Paratrichosiphum* Takahashi as a subgenus of *Eutrichosiphum* Essig and Kuwana. However, we are of opinion to consider this as a separate distinct species.

8. **Eutrichosiphum (Paratrichosiphum) neoalnicola** Raychaudhuri, Ghosh and Das

Eutrichosiphum (*Paratrichosiphum*) *neoalnicola* Raychaudhuri Ghosh and Das, 1980. *Ins. Matsumurana*, **20** : 34.

Material reported : 3 apterae and nymphs, INDIA : H. P. : Nagwain, 7.vii.1970 (Coll. *S. K. Sen*) ; 1 aptera, H. P. : Narkanda, 27.ix.1974 ; 2 apterae, H. P. : Solan, 25.x.1978 (without collector's name).

Host plant : *Quercus* sp.

Distribution : India : Himachal Pradesh.

9. **Eutrichosiphum (Paratrichosiphum) querciphaga** Chakrabarti and Maity.

Eutrichosiphum (*Paratrichosiphum*) *querciphaga* Chakrabarti and Maity, 1980. *Annal. Zool.*, **35** (9) : 97.

Specimens examined : 3 apterae, INDIA : U. P. : Mussoorie, 16.x. 1976 (Coll. *S. P. Maity*).

Host Plant : *Quercus* sp.

Distribution : India : Uttar Pradesh.

10. **Greenidea (Trichosiphum) anonae** (Pergande)

Trichosiphum anonae Pergande, 1906. *Ent. News. Philad.*, **17** : 208.

Greenidea anonae (Pergande) Takahashi, 1931. Aphids of Formosa, pt. 6, p. 29 ; ————1941. *Ins. Matsumurana*, **15** (4) : 147. ; ————1950. *Ann. Ent. Soc. Amer.*, **43** (4) : 587.

Greenidea (*Trichosiphum*) *anonae* (Pergande) ; Raychaudhuri, 1956. *Zool. Ver.*, **31** : 47. ; Chakrabarti and Raychaudhuri, 1975. *Oriental Ins.*, **9** (2) : 208.

Specimens examined : 5 apterae and nymphs, INDIA : U. P. : Almora, Bharari, 10.x.1970 (Coll. *S. Chakrabarti*) ; 11 apterae and nymphs, Almora, Loharkhet, 11.x.1970 (Coll. *S. Chakrabarti*).

Host plant : *Quercus* sp.

Distribution : India : Uttar Pradesh : Malaya Peninsula ; Sumatra ; Java ; Japan.

11. **Greenidea (Trichosiphum) haldari** Maity and Chakrabarti

Greenidea (*Trichosiphum*) *haldari* Maity and Chakrabarti, 1980. *Annal. Zool.*, **35** (22) : 310.

Specimens examined : Many apterae and nymphs, INDIA : U. P. : Mussoorie, 1.xi.1977 (Coll. *S. P. Maity*) ; 16 apterae, Mussoorie, 3.xi. 1977 (Coll. *S. P. Maity*).

Host Plant : *Quercus* sp.

Distribntion : India : Uttar Pradesh.

12. **Greenidea (Trichosiphum) kumaoni** Chakrabarti and Raychaudhuri

Greenidea (*Trichosiphum*) *kumaoni* Chakrabarti and Raychaudhuri, 1978. ***Entomon***, **3** (1) : 95.

Specimens examined : 1 aptera and 3 nymphs, INDIA : U. P. : Mussorie, 17.x.1976 (Coll. *S. P. Maity*).

Host plant : *Quercus* sp.

Distribution : India : Uttar Pradesh.

B. Subfamily : Lachninae

13. **Lachnus acutihirsutus** Kumar and Burkhardt

Lachnus acutihirsutus Kumar and Burkhardt, 1970. *J. Kansas Ent. Soc.*, **43** (4) : 461.

Specimens examined : Many apterae, 1 alata and many nymphs, INDIA : U.P. : Mussoorie, 20.vi.1975 (Coll. *S. Chakrabarti*) ; Mussoorie, 20-21.vi.1976 ; 16.x.1976 ; 18.x.1976 (Coll. *S. P. Maity*).

Host plant : *Quercus incana*, *Quercus indica*.

Distribution : India : Uttar Pradesh, Himachal Pradesh.

14. **Lachnus tropicalis** (van der Goot)

Pterochlorus tropicalis van der Goot, 1916. *Rec. Indian Mus.*, **12** : 3.

Lachnus tropicalis (van der Goot) ; Takahashi, 1950. *Annal. Ent. Soc. Am.*, **43** : 592.

Lachnus (*Pterochlorus*) *tropicalis* (van der Goot) ; Tao, 1961 *Sci. Yb. Taiwan Mus.*, **4** : 41.

Lachnus tropicalis, (van der Goot) ; Paik, 1965 Aphids of Korea, Seoul, 13. ; Szelegiewicz, 1968 *Annal. Zool.*, **25** (12) : 468.

Specimens examined : Many apterae, alatae and nymphs, INDIA : U. P. : Sonprayag, 4.vi.1978 (Coll. *D. K. Bhattacharya*) ; Trijuginarayan, 5.vi.1978 (Coll. *D. K. Bhattacharya*).

Host plant : *Quercus* sp.

Distribution : India : Uttar Pradesh, West Bengal, Meghalaya, Manipur, Sikkim ; Malaya ; China ; Japan ; Korea ; Vietnam ; Indoneshia.

15. **Nippolachnus bengalensis** Basu and Hill Ris Lambers

Nippolachnus bengalensis Basu and Hille Ris Lambers, 1968. *Ent. Ber. Amst.*, **28** : 9 : Ghosh, 1974. *Oriental Ins.*, 8 (2) : 171 ; Ghosh, 1982. Fauna of India, Pt. 2, Subfamily Lachninae, 112.

Material reported : 2 apterae and 3 nymphs, INDIA : H. P. : Solan, 25.x.1978 (without collectior's name).

Host plant : *Quercus* sp. but usually on *Eriobotrya dubia*, *Pyrus pashia*. Also recorded on *Photina arguta*.

Distributiou : India : Himachal Pradesh, Meghalaya, West Bengal.

16. **Nippolachnus himalayensis** (van der Goot)

Lachnus himalayensis van der Goot, 1971. *Rec. Indian Mus.*, **13** : 180 ; Tao, 1958. *Agric. Res.*, (Taiwan) 8 : 1.

Nippolachnus eriobotryae Basu and Hille Ris Lambers, 1968. *Ent. Ber., Amst.*, 28 : 11 ; Eastop and Hille Ris Lambers, 1976. Survey World's Aphids : 321 ; Ghosh, 1982. Fauna of India. Pt. 2, Subfamily-Lachninae, 115.

Material reported : 5 apterae, INDIA : H. P. : Solan, 30. x. 1978 (without collector's name).

Host plant : *Quercus* sp. but usually on *Eriobotrya petiolata*.

Distribution : India : Himachal Pradesh, West Bengal.

17. **Nippolachnus piri** Matsumura

Nippolachnus piri Matsumura, 1917. *J. Coll. Agric. Tohoku Univ.*, **7** (6) : 382.

Anoecia piri (Matsumura) ; Essig and Kuwana, 1928. *Proc. Calif. Acad. Sci.*, 8 (3) : 103.

Nippolachnus piri Matsumura ; Ghosh and Raychaudhuri, 1962. *J. Asiat. Soc. Cal.*, **14** (3 & 4) : 107 ; Ghosh, 1982. *Fauna of India*, Pt. 2, Subfamily—Lachninae, 118.

Material reported : 9 apterae, INDIA : H.P. : Barog, 31.x.1978 (without collector's name).

Host plant : *Quercus* sp. but usually on *Pyrus communis*, *P. khasiana*, *Prunus persica*.

Distribution : India : Himachal Pradesh, Meghalaya, West Bengal ; Japan ; Korea, Taiwan and Malaya.

C. Subfamily : DREPANOSIPHINAE

18. **Globulicaudaphis pakistanica** Hille Ris Lambers

Globulicaudaphis pakistanica Hille Ris Lambers, 1966. *Tijdschr. Ent.*, **109** (8) : 209.

Specimens examined : Many apterae, alate and nymphs, INDIA : U. P. : Hanuman Chatti, 13.vi.1980 (coll. *A. K. Mandal*).

Host plant : *Quercus* sp.

Distribution : India : Uttar Pradesh ; Pakistan : Muree.

19. **Myzocallis (Agrioaphis) polychaetus** David

Myzocallis (*Dryomyzus*) *polychaetus* David, 1968. *Oriental Ins.*, **3** (1) : 80.

Myzocallis (*Agrioaphis*) *aptera* Richards and Kumar, 1971. *Can. Ent.*, **103** : 116.

Myzocallis polychaetus David ; Chakrabarti and Raychaudhuri, 1974. *Indian J. Ent.*, **36** : 129.

Specimens examined : Many apterae, 5 alatae and and many nymphs, INDIA : U. P. ; Gourikund, 1-2.vi.1978 (coll. *D. K. Bhattacharya*).

Host plant : *Quercus semicarpifolia*.

Distribution : India : Himachal Pradesh, Uttar Pradesh.

20. **Myzocallis (Hoplocallis) microsetosus** Quednau and Chakrabarti

Myzocallis (*Hoplocallis*) *microsetosus* Quednau and Chakrabarti, 1976. *Can. Ent.*, **108** : 466.

Specimens examined : 1 alata, INDIA : U. P. : Nainital, 7.iv.1970 (Coll. *S. Chakrabarti*).

Host plant : *Quercus incana*.

Distribution : India : Uttar Pradesh.

21. **Serratocallis takahashii** Quednau and Chakrabarti

Serratocallis takahashii Quednau and Chakrabarti, 1976. *Can. Ent.* **108** : 464.

Specimens examined : 10 alatae, 17 apterae and 37 alatoid nymphs, INDIA : U. P. : Loharkhet, Almora, 11.x.1970 (Coll. *S. Chakrabarti*) ; 3 alatae, 2 apterae and 4 alatoid nymphs, U. P. : Almora, Dhakuri, 11.x.1970 (Coll. *S. Chakrabarti*).

Host plant : *Quercus* sp.

Distribution : India : Uttar Pradesh.

D. Subfamily : HORMAPHIDINAE

22. **Heminipponaphis querciphaga** Chakrabarti and Raha

Heminipponaphis querciphaga Chakrabarti and Raha, 1985. *Ann. Zool.*, **39** : 88.

Specimen examined : 5 apterae and nymphs, INDIA : U. P. : Fool Chatti, 19.x.1981 (Coll. *S. Saha*).

Host plant : *Quercus* sp.

Distribution : India : Uttar Pradesh.

23. **Neothoracaphis garhwalensis** Chakrabarti and Raha

Neothoracaphis garhwalensis Chakrabarti and Raha, 1985. *Ann. Zool.*, **39** : 90.

Specimens examined : Many apterae and nymphs, INDIA : U. P. : Janaki Chatti, Jamunotri, 18.x.1981 (Coll. *S. Saha*).

Host plant : *Quercus* sp.

Distribution : India : Uttar Pradesh.

24. **Pseudothoracaphis himachali** Raychaudhuri, Ghosh and Das

Pseudothoracaphis himachali Raychaudhuri, Ghosh and Das, 1980. *Ins. Matsumurana*, **20** : 36.

Material reported : 40 apterae, INDIA : U. P. : Mashobra, 28.x.1978 (without collector's name).

Host plant : *Quercus* sp.

Distribution : India : Himachal Pradesh.

25. **Reticulaphis distylli rotifera** Hille Ris Lambers and Takahashi

Reticulaphis distylli rotifera Hille Ris Lambers and Takahashi, 1959. *Tijdschr. Ent.*, 102 : 12 ; Raychaudhuri, Ghosh and Das, 1980. *Ins. Matsumurana*, **22** : 38.

Material reported : 18 apterae, INDIA : H. P. : Mashobra, 28.x.1978 (without collector's name).

Host plant : *Quercus* sp.

Distribution : India ; Himachal Pradesh.

APHIDS OCCASIONALLY FOUND ON *Quercus* spp. ;

1. *Longicaudus himalayensis* Hille Ris Lambers
2. *Shivaphis celti* Das

APHID LIFE CYCLE ON *Quercus* :

In general, life cycle of the aphids is a very complex one. The life cycle may be of two types, Autoecious life cycle and Heteroecious life cycle. Majority of the aphids that live on *Quercus*, lead an autoecious type of life cycle, while a few of them may lead a heteroecious life. The members of the genera, viz., *Eutrichosiphum* Essig and Kuwana and *Greenidea* Schouteden under the subfamily Greenideinae, *Lachnus* Burmeister under the subfamily Lachninae, *Globulicaudaphis*

Hille Ris Lambers, *Myzocallis* Passerini and *Serratocallis* Quednau and Chakrabarti under the subfamily Drepanosiphinae lead autoecious life cycle. On the contrary, *Nipponaphis* Pergande and its related genera under the subfamily Hormaphidinae living on *Quercus* seem to use the plant as a secondary host.

(i) Greenideinae : These group of aphids attack several plant families including Fagaceae. Quite a few species is restricted to *Quercus* and related genera. In the tropics and subtropics, Greenideinae on the whole reproduce parthenogetically (Raychaudhuri, 1956). However, according to our collection and observation bisexual mode of reproduction is not completely lost in *Eutrichosiphum* (*Paratrichosiphum*) *assamensis* (Ghosh and Raychaudhuri) and *Eutrichosiphum* (*Paratrichosiphum*) *alnicola* (Basu).

(ii) Lachninae : In North West Himalaya two species of *Lachnus* Burmeister infest *Quercus* and are monophagous (Ghosh, 1982). In general, *Lachnus* spp. overwinter as diapause aggs (Bodenheimer and Swirski, 1957). So far, no sexual morphs of *Lachnus* is known from this continent and hence their autoecious holocyclic life as represented elsewhere could not be established in the area of study.

Members of the genus *Nippolachnus* Matsumura are restricted to Rosaceous plants (Ghosh, 1982). Raychaudhuri, Ghosh and Das (1980) reported 3 species of *Nippolachnus* viz. *bengalensis* Basu and Hille Ris Lambers, *himalayensis* (van der Goot) and *piri* Matsumura infesting *Quercus* in some localities of Himachal Pradesh during the month of October. This host association seems to be dubious and reconfirmation is necessary.

(iii) Drepanosiphinae : *Myzocallis* Passerini in general are monophagous and lead holocyclic life cycle (Bodenheimer and Swirski, 1957 ; Richards, 1968). The present findings also support the above work at least in *Myzocallis* (*Agrioaphis*) *polychaetus* David in the present locality. Information on the life cycle of *Globulicaudaphis* Hill Ris Lambers and *Serratocallis* Quednau and Chakrabarti are still meagre.

(iv) Hormaphidinae : *Nipponaphis* Pergande and allied genera are found to produce galls on *Distylium* sp. and alternate with *Quercus*. In India, no hormaphidine aphid has been collected from their primary host. They are presumably restricted to parthenogenetic viviparous life cycle on their secondary host, as in the case of South East Asian species (Takahashi, 1958).

KEY TO THE SPECIES INFESTING *Quercus*

1.	Head, thorax and 1st abdominal segment fused to form prosoma (Fig. 1) ; siphunculi absent ...	...	2
	Head, thorax and abdominal segments not fused to form prosoma ; siphunculi always present but may occasionally be represented by pores only ...	...	5
2.	Antennae 1 segmented (Fig. 8) ...	...	3
	Antennae 2-3 segmented (Fig. 9) ...	...	4
3.	Tarsi normal with claws (Fig. 2) ; dorsum corrugated, without any polygonal reticulation (Fig. 4) ; segment 8 with 2 hairs ...	*Heminipponaphis querciphaga* Chakrabarti and Raha	
	Tarsi rudimentary (Fig. 3) with 5-6 minute conical processi ; dorsum with mid dorsal polygonal reticulations (Fig. 5) ; segment 8 with 4 hairs ...	*Neothoracaphis garhwalensis* Chakrabarti and Raha	
4.	Tarsi atrophied without claws ; spinopleural dorsum of prosoma distinctly reticulated (Figs. 6a, 6b) ...	*Reticulaphis distylli rotifera* Hille Ris Lambers and Takahashi	
	Tarsi normal with claws ; dorsum of prosoma never reticulated but may be wrinkled and corrugated (Fig. 7) and reticulation may be faintly present in the marginal area ...	*Pseudothoracaphis himachali* Raychaudhuri, Ghosh and Das	
5.	First tarsal segment with 9 or more ventral hairs ; head with distinct median longitudinal suture ; siphunculi cone shaped (fig. 10) ; primary rhinaria nonciliated ...	...	6
	First tarsal segment never with more than 7 ventral hairs ; head without a median longitudinal suture ; siphunculi variously shaped but never as above ; primary rhinaria usually ciliated ...	...	10
6.	Eyes with distinct occular tubercles ; cephalic hairs short, utmost 1.5 times the b. d. III ; wings variegated ...	...	7
	Eyes without distinct occular tubercles ; cephalic hairs long, may be as long as 6.5 times the b. d. 1II ; wings thin and pale ...	...	8

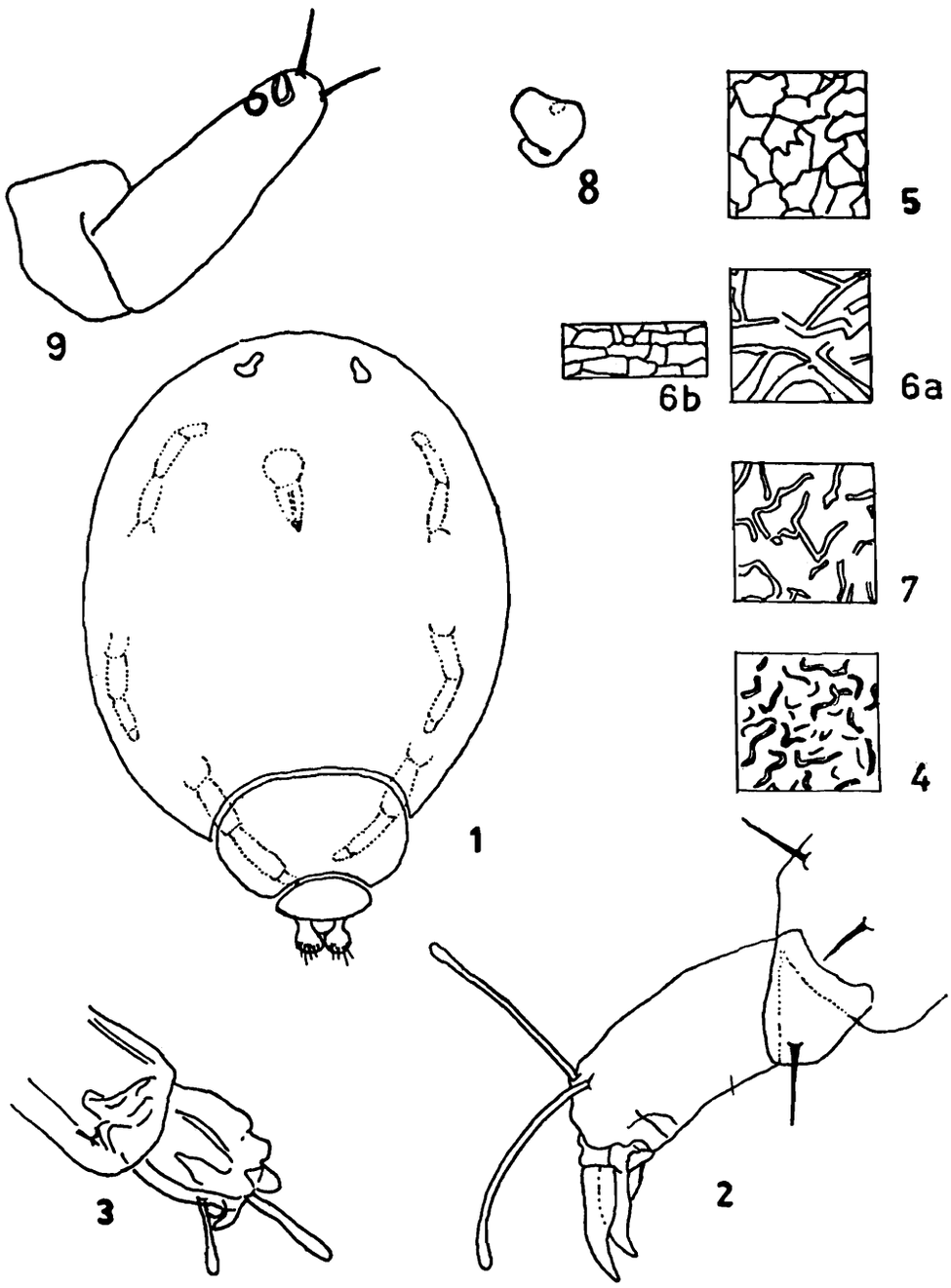


Fig. 1. *Reticulaphis distylii rotifera* Hille Ris Lambers and Takahashi. ... Apterous viviparous famale.

Figs. 2-3. Second joint of hind tarsus.

2. *Heminipponaphis queriphaga* Chakrabarti and Raha ; 3. *Neothoracaphis garhwalensis* Chakrabarti and Raha.

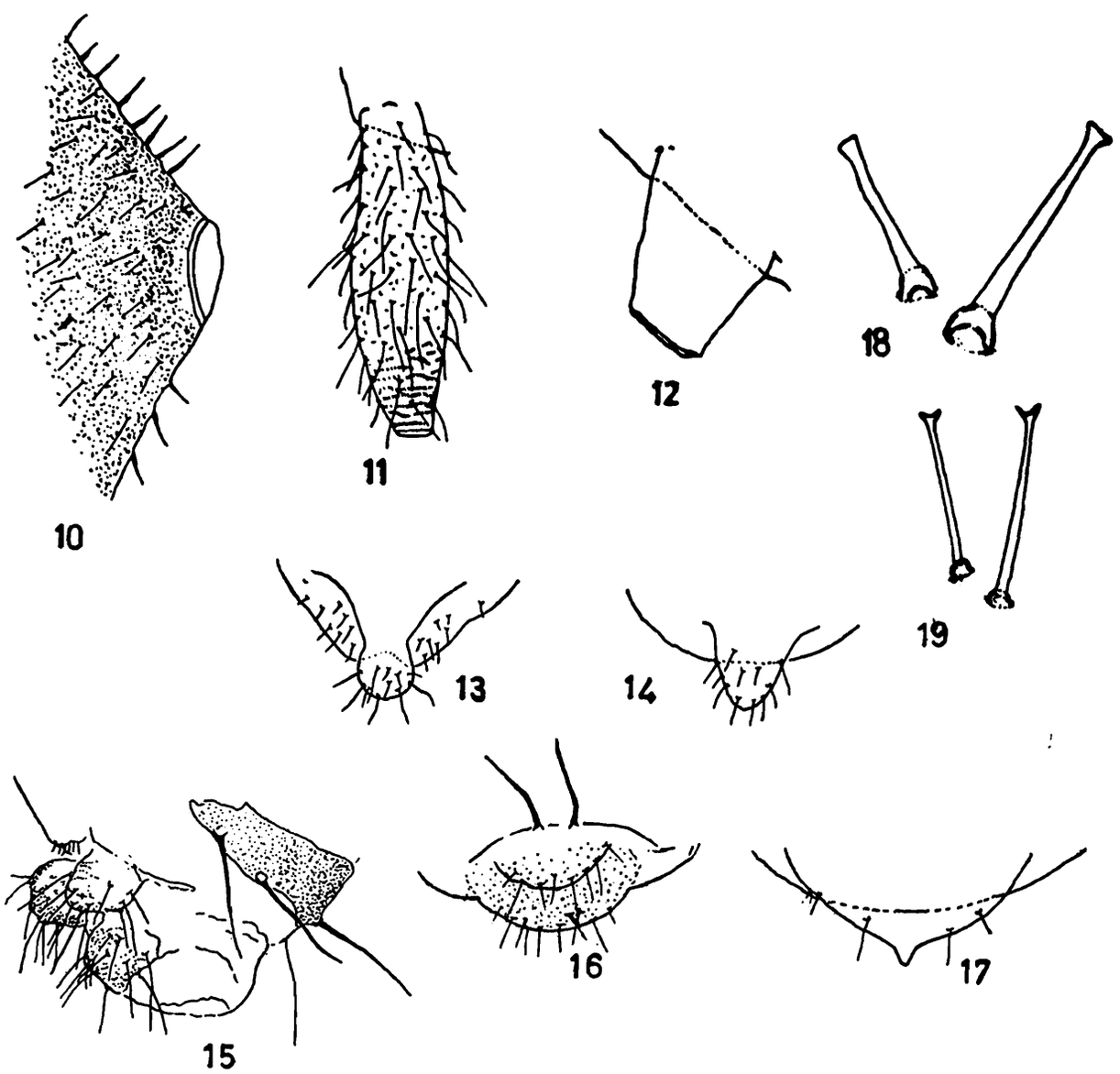
Figs. 4-7. Dorsal sclerotization.

4. *Heminipponaphis* sp., 5. *Neothoracaphis garhwalensis* Chakrabarti and Raha. 6a. *Reticulaphis distylii rotifera* Hille Ris Lambers and Takahashi, 6b. *Reticulaphis distylii rotifera* Hille Ris Lambers and Takahashi (on margin), 7. *Pseudothoracaphis himachali* Raychaudhuri, Ghosh and Das.

Figs. 8-9. Antennae

... 8. *Reticulaphis distylii rotifera* Hille Ris Lambers and Takahashi, 9. *Heminipponaphis* sp.

7.	U.r.s. with 11-14 accessory hairs : longest hair on vertex 1.25-1.50 times the b.d. III ; hairs on anterior abdominal tergites 1.30-1.60 times, on 7th tergite about 1.6-1.9 times, on 8th tergite 1.75-2.1 times the b.d. III respectively ; antennae 0.45 times the body ; segment III in alate with 6-7 secondary rhinaria ...	*Lachnus acutihirsutus* Kumar and Burkhardt
	U.r.s. with 18-22 accessory hairs ; longest hair on vertex as long as b.d. III ; longest hair on anterior abdominal tergite 0.8-0.9 times, on 7th tergite 0.85-1.0 times and on 8th tergite 1.33-1.46 times the b.d. III respectively ; antennae 0.5-0.6 times the body ; sagment III in alate with 12-23 secondary rhinaria ...	*Lachnus tropicalis* (van der Goot)
8.	Legs dark ; dorsal cephalic hairs 2.5-2.8 times the b.d. III ; segment III in alate with 40-60 and IV with 10-11 secondary rhinaria ...	*Nippolachnus himalayensis* (van der Goot)
	Legs pale ; dorsal cephalic hair 5.0-6.5 times the b.d. III ; segment III in alate with 12 and IV with 0-5 secondary rhinaria ...	... 9
9.	U.r.s. with 9-14 secondary hairs, about 0.65-0.71 times the h.t. 2 ; p.t. with 1 pair of terminal spines ; secondary rhinaria may be present on segments III, IV and V ; p.t. in alate about 0.25-0.35 times the base of segment VI ...	*Nippolachnus bengalensis* Basu and Hille Ris Lambers
	U.r.s. with 16-18 secondary hairs, about 0.75-0.80 times the h.t. 2 ; p.t. with 2 or more pairs of terminal spines ; secondary rhinaria always absent on antennal segments ; p.t. in alate about 0.45-0.57 times the base of the segment VI ...	*Nippolachnus piri* Matsumura
10.	Cauda knobbed or elongate but never semioval ; siphunculus usually truncate without any hair ; subanal plate bilobed or indented ...	... 11
	Cauda semioval (Fig. 16) ; siphunculus long, densely covered with hairs (Fig. 11) ; subanal plate entire ...	... 14
11.	Hairs on dorsum spine like and placed on tuberculate bases ; cauda tongue shaped and without constriction (Fig. 14) ...	*Serratocallis takahashii* Quednau and Chakrabarti
	Hairs ou dorsum normal but not spine like as above ; cauda knobbed or membranous bladder like but never as above ...	... 12



Figs. 10-12. Types of siphunculi.

10. *Lachnus acutihirsutus* Kumar and Burkhardt.,

11. *Eutrichosiphum garhwalense* Maity and Chakrabarti.

12. *Myzocallis* (*Hoplocallis*) *microsetosus* Quednau and Chakrabarti.

Figs. 13-17. Types of cauda.

13. *Myzocallis* (*Hoplocallis*) *microsetosus* Quednau and Chakrabarti. 14. *Serratocallis takahashi* Quednau and Chakrabarti. 15. *Globulicaudaphis pakistanica* Hille Ris Lambers. 16. *Eutrichosiphum pyri* Chakrabarti Ghosh and Raychaudhuri. 17. *Greenidea* (*Trichosiphum*) *kumaoni* Chakrabarti and Raychaudhuri.

Figs. 18-19. Types of hairs.

18. *Myzocallis* (*Agrioaphis*) *polychaetus* David.

19. *Eutrichosiphum* (*Neoparatrichosiphum*) *khasyanum* Ghosh and Raychaudhuri.

12. Cauda membranous, smooth, bladder like (Fig. 15) and with ventral sclerotic area ... *Globulicaudaphis pakistanica* Hille Ris Lambers

Cauda elongate, constricted basally to form a knob (Fig. 13) and not as above 13

13. Discal hairs single with broad flal apices (Fig. 18); each lobe of the anal plate bears 10 hairs; siphunculi raised with dark rims; apterous generation present ... *Myzocallis* (*Agrioaphis*) *polychaetus* David

Discal hairs in cluster with pointed or weakly capitate apices; each lobe of the anal plate bears 15 hairs; siphunculus without dark rim (Fig. 12); apterous generation absent ... *Myzocallis* (*Hoplocallis*) *microsetosus* Quednau and Chakrabarti

14. Cauda with a median stylus (Fig. 17) 15

Cauda without a median stylus 17

15. P.t. shorter than antennal segment III; siphunculi about 0.14-0.16 times the body ... *Greenidea* (*Trichosiphum*) *haldari* Maity and Chakrabarti

P.t. longer than antennal segment III; siphunculi about 0.22 times the body 16

16. U.r.s. with 10 secondary hairs; longest hair on 7th tergite about 3.6-4.2 times the b.d. III and those on 8th about 2.6-2.9 times the b.d. III .. *Greenidea* (*Trichosiphum*) *kumaoni* Chakrabarti and Raychaudhuri

U.r.s. with 14 secondary hairs; longest hair on 7th tergite about 1.1-1.5 times the b.d. III and those on 8th about 1.0-1.9 times the b.d. III ... *Greenidea* (*Trichosiphum*) *anonae* Pergande

17. Antennae 5 segmented 18

Antennae 6 segmented 21

18. Cauda with 2 hairs; u.r.s. with 12 secondary hairs ... *Eutrichosiphum garhwalense* Maity and Chakrabarti

Cauda with 6-8 hairs; u.r.s. with 6-11 secondary hairs 19

19. P.t. as long as base of segment V; dorsal abdominal hairs mostly with furcated apices; u.r.s. with 10-11 secondary hairs; body dark ... *Eutrichosiphum taoi* Ghosh, Basu and Raychaudhuri

P.t. 1.2-1.6 times the base of segment V; dorsal abdominal hairs mostly with blunt or acuminate apices; u.r.s. with 6-8 secondary hairs; body pale 20

20. Tergite 7 with 2 hairs, about 3.5-4.4 times the b.d. III and those on tergite 8 about 4.25-4.50 times the b.d. I11 ... *Eutrichosiphum pyri* Chakrabarti, Ghosh and Raychaudhuri

Tergite 7 with 6 hairs, about 2.5-3.2 times the b.d. III and those on teagite 8 about 2.0-2.7 times the b.d. III *Eutrichosiphum* (*Eutrichosiphum*) *tapatii* Mondal, Chatterjee and Raychaudhuri

21. Most of the hairs on basal 0.70 portion and a few apical hairs of siphunculi with furcated apices (Fig. 19) and rest with fine apices .. *Eutrichosiphum* (*Neoparatrichosiphum*) *khasyanum* (Ghosh and Raychaudhuri)

Hairs on siphunculi fine with more or less similar in length but sometimes 2-3 basal short hairs with furcated apices 22

22. Dorsum of abdonen with dark central patch on tergites 3-5 ; longest hair on antennal segment III about 3.0-3.50 times as long as b.d. III ... *Eutrichosiphum* (*Paratrichosiphum*) *querciphaga* Chakrabarti and Maity

Dorsum of abdomen may be sclerotic but never with a dark central patch on tergites 3-5 only ; longest hair on antennal segment III always less than 3 times as long as b.d. III 23

23. Rostral segment IV about 6.0-8.5 times as long as segment V ; p.t. about 1.20-1.60 times as long as the base of segment VI ; longest hair on anterior abdominal tergites 3.50-3.80 times as long as b.d. III ; siphunculi about 0.26-0.33 times the body 24

Rostral segment IV about 4.6-5.2 times as long as segment V ; p.t. about 1.63-2.16 times as long as the base of segment VI ; longest hair on anterior abdominal tergites about 2.22-2.77 times as long as b.d. III ; siphunculi about 0.34-0.45 times the body ... *Eutrichosiphum* (*Paratrichosiphum*) *alnicola* (Basu)

24. Cauda with 10 hairs ; p.t. about 0.65-0.70 times the antennal segment III ; longest hair on vertex about 2.5-3.1 times the b.d. III ... *Eutrichosiphum* (*Paratrichosiphum*) *assamensis* (Ghosh and Raychaudhuri)

Cauda with 6 hairs ; p.t. about 0.5-0.57 times the antennal segment III ; longest hair on vertex about 3.4-3.5 times the b.d. III ... *Eutrichosiphum* (*Paratrichosiphum*) *neoalnicola* Raychaudhuri, Ghosh and Das

SYNOPSIS

This paper embodies a comprehensive account of the Oak (*Quercus* spp.) inhabiting aphids of Western and North West Himalaya where altogether 25 aphid species under 11 genera are known to infest these plants. The life cycle of the aphids under four subfamilies are briefly discussed. A key to the species is provided.

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