

OBSERVATION ON APHIDS (HOMOPTERA : APHIDIDAE)
INFESTING BAMBOO PLANTS IN SIKKIM,
NORTH EAST INDIA

By

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(With 6 Text-figures and 1 Table)

INTRODUCTION

Bamboo plants constitute an important part of forest wealth in eastern India. In Sikkim, a state of north east India, warm temperate zone i. e. from about sea level to localities having altitude of c 2000 m bamboo plants occur either as dense forest or in scattered clusters. Livelyhood of people in the state depends mostly on the forest wealth, bamboo constituting a substantial share in it. Over 16 species of bamboos occur in Sikkim, including *Bambusa tulda*, *B. vulgaris*, *Dendrocalamus hamiltoni*, *D. hookeri*, *Pseudostachyum polymorphum*, *Melocanna baceifera*, *Arundinaria* sp. Rich belts of *Bambusa* spp. and *Dendrocalamus* spp. occur in well-drained parts of hills, slopes and valleys.

Ghosh A. K. (1974) published informations on aphids of economic importance in india, wherein 15 species have been reported from Bamboos, from all over Indian region. In Sikkim region, 10 of the 15 species have been noted, besides *Neoceratovacuna panivicola* (Takshashi), which is known from *Andropogon*, *Oplismenus* and *Panicium* elsewhere. As such aphids infesting bamboo plants in the state comprise of 11 species under 9 genera and 3 subfamilies. Of these, at least 3 species were found to be important from economic point of view as was revealed by the extent and intensity of other infestation. Frequent observations on these aphids in the field resulted in the collection of interesting information on their biology. This paper embodies these observations and provide a running key to the identification of aphids infesting bamboo-plant along with necessary diagrams.

MATERIALS AND METHODS

Survey for aphids was conducted in a systematic way by selecting localities at different altitudinal strata by random sampling method

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during the period 1969-1977. All species of bamboos were scrupulously and meticulously searched for presence of aphids at regular monthly intervals in each of the selected localities. A part of the colony was collected when encountered and records on the intensity of infestation, host plant species, effects on the host plant and other associated insects were maintained carefully. The aphids obtained were processed and mounted by the method of Eastop and van Emden (1972) and identified for the purpose of this study.

RESULTS AND DISCUSSIONS

The survey revealed the occurrence of as many as 11 species of aphids on different species of bamboos found in Sikkim. The names of the species arranged systematically is given in the following :

Subfamily APHIDINAE

1. *Melanaphis bambusae* (Fullaway)

Subfamily DREPANOSIPHINAE

2. *Takecallis arundinariae* (Essig)

Subfamily HORMAPHIDINAE

3. *Astegopteryx minuta* (van der Goot)
4. *Ceratoglyphina bambusae bengalensis* L. K. Ghosh
5. *Ceratovacuna indica* Ghosh, Pal and Raychaudhuri
6. *Ceratovacuna lanigera* Zehntner
7. *Ceratovacuna silvestrii* (Takahashi)
8. *Glyphinaphis bambusae* van der Goot
9. *Neoceratovacuna panicicola* (Takahashi)
10. *Paraoregma alexanderi* (Takahashi)
11. *Pseudoregma bucktoni* Ghosh, Pal and Raychaudhuri

KEY TO THE SPECIES

1. Empodial hair strap-like ; clypeus with nose-like process (Fig. 1) ; spinal hairs arranged in longitudinal rows excepting on tergite 7 where these apart ; only alate known. ... *Takecallis arundinariae* (Essig)
- Empodial hair never as above ; clypeus without any process 2

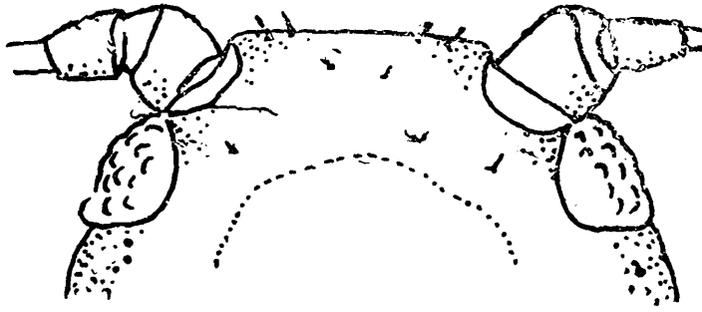


FIG. 2

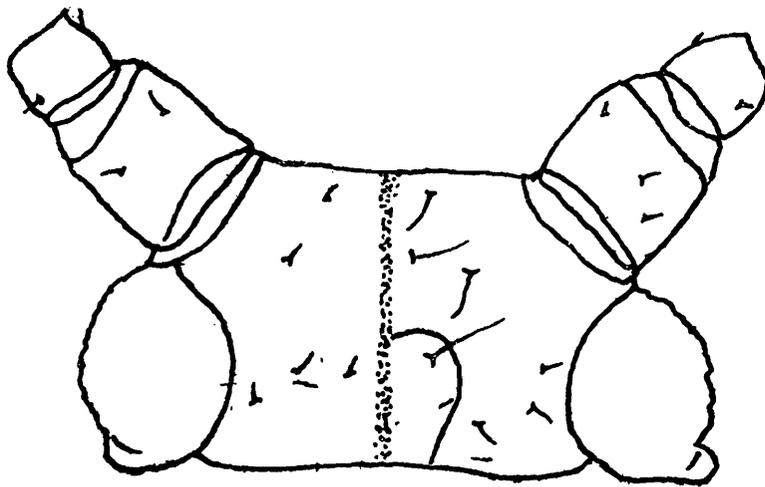


FIG. 1

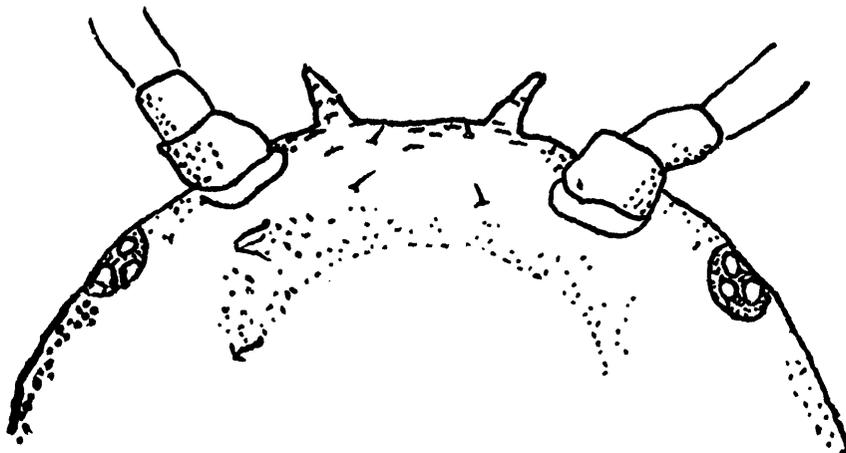


FIG. 3

- Text-figs. 1-3. 1. Head of *Takecallis arundinariae* (Essig) showing nose-like clypeus.
2. Head of *Melanaphis bambusae* (Fullaway) showing multifaceted eyes.
3. Head of *Ceratoglyphina bambusae bengalensis* Ghosh, showing frontal horns placed far apart.

2. Eyes in apterae multi-faceted (Fig. 2) ; siphunculi $0.06-0.08 \times$ length of body and $0.85-0.88 \times$ length of elongated cauda ; processus terminalis about $3.30-4.50 \times$ base of last antennal segment ; cauda with 4-5 hairs. ... *Melanaphis bambusae* (Fullaway)
- Eyes in apterae 3-faceted siphunculi poriform or cone-shaped ; cauda rounded or knobbed. ... 3
3. Head in apterae without any frontal horn ; subanal plate bilobed ; Siphunculi cone-shaped and without hair ; cauda knobbed and knobbed portion nearly pentagonal ; secondary rhinaria in alatae transversely elliptical or oval ... *Glyphinaphis bambusae* van der Goot
- Head in apterae with well-developed frontal horns ; subanal plate rounded or bilobed. ... 4
4. Cauda and subanal plate rounded ; frontal horns placed far apart (Fig. 3) ... *Ceratoglyphina bambusae bengalensis* Ghosh
- Cauda knobbed ; subanal plate indented or bilobed. ... 5
5. Wax-gland cells in apterae laterally compressed and arranged in a row on the margin of the body but those on abdominal segment 8 placed spinopleurally in two groups leaving the median area free in apterae ; both dorsoapical hairs on 2nd tarsal segments with funnel-shaped apices, in alata one of these hairs with acuminate to blunt apices. ... *Astegopteryx minuta* (van der Goot)
- Apterae with either rounded wax-gland cells or with cribriform wax pores ; in apterae either both dorsoapical hairs on 2nd tarsal segments with swollen apices or at least one with such apex and the other with blunt apex. ... 6
6. Cribriform wax-pores present over almost entire body ; one of the dorsoapical hair on 2nd tarsal segments with swollen apices, the other with blunt apices. ... 7
- Abdomen with rounded wax-gland cells ; both dorsoapical hairs on 2nd tarsal segments with swollen apices. ... 8
7. Abdomen in apterae with marginal sclerites on all segments ; wax-gland cells absent but cribriform wax-pores scattered all over the body ; cubitus and anal veins in forewing arising from a common stem. ... *Pseudoregma bucktoni* Ghosh, Pal and Raychaudhuri

- Abdomen in apterae with marginal sclerites only on antesiphuncular tergites which also with cribriform wax-pores, postsiphuncular tergites with wax-gland cells; cubitus and anal veins in forewing just touching each other near subcosta. ... *Paraoregma alexanderi* (Takahashi)
8. Cephalothorax mostly dark, bearing distinct cribriform sclerotic wax-pores; frontal horns of nymph short and blunt. ... *Neoceratovacuna panicicola* (Takahashi)
- Cephalothorax pale, with or without distinct wax-gland cells but never with wax-pores as above; frontal horns of nymphs pointed. ... 9
9. Dorsum of abdomen with spinal wax-gland cell groups at least on anterior segments and with hairs of normal and swollen apices occur intermingled. ... *Ceratovacuna silvestrii* (Takahashi)
- Dorsum of abdomen lacking spinal and pleural wax-gland cell groups. ... 10
10. Wax-gland cells on 8th abdominal tergite arranged in a transverse row. ... *Ceratovacuna indica* Ghosh and Raychaudhuri
- Wax-gland cells on 8th tergite arranged irregularly. ... *Ceratovacuna lanigera* Zehntner

BRIEF NOTES ON THE MORPHOLOGY AND BIOLOGY OF THE APHIDS

1. ***Astegopteryx minuta*** (van der Goot)
(Text-fig. 4)

Yellow insects of this species infest the undersurface of the leaves and form gregarious colonies. The species is always found in association of ants. Heavily infested leaves appeared pale and such bamboo plants sometimes appear to have retarded growth. November-January period has been found to be favourable for the species to colonise the bamboo plants in Sikkim.

Raychaudhuri (1980) reported the genus and the species for the first time from Sikkim.

Host plants : *Bambusa arundinacea*, *Bambusa* sp.,
Dendrocalamus sp.

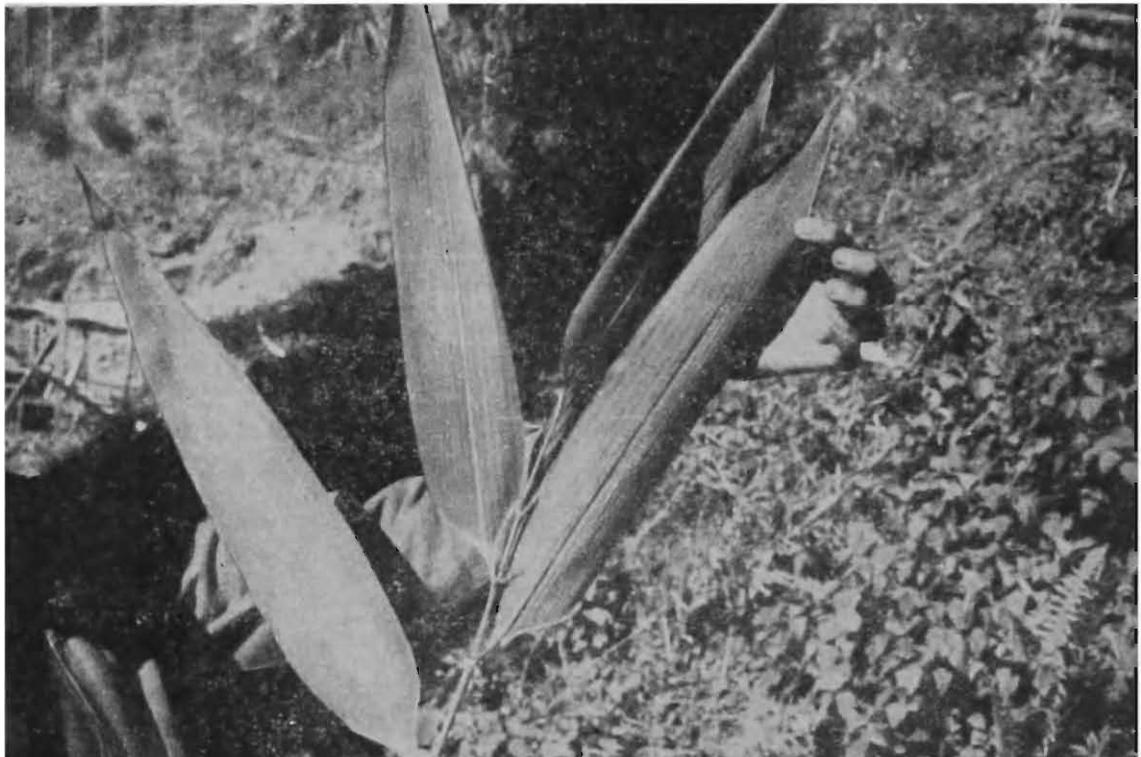
2. ***Ceratoglyphina bambusae bengalensis*** Ghosh
(Text-fig. 5)

Yellow to brown insects with faint waxy secretion infest mainly the nodal region of the host plant within the leaf sheath and are occasionally attended by ants. The species form gregarious colonies and

reproduces parthenogenetically in the climate of Sikkim. The species has been found to dwell on their hosts in between October-January.

Raychaudhuri (1980) reported the species from Sikkim for the first time.

Host plants : *Bambusa arundinacea*, *Fambusa* sp.



Text-fig. 4. Infestation of *Astegopteryx minuta* (v. d. Goot) on the leaves of *Bambusa* sp.

3. *Ceratovacuna indica* Ghosh, Pal and Raychaudhuri

Greenish yellow insects infest undersurface of the older leaves of the host plant and were found covered with faint waxy secretion. Black ants were noticed in association of the species. Summer months have been found to be favourable for the species to make gregarious colonies on their hosts.

The species is reported here for the first time on bamboos from Sikkim.

Host plants : *Bambusa* spp.

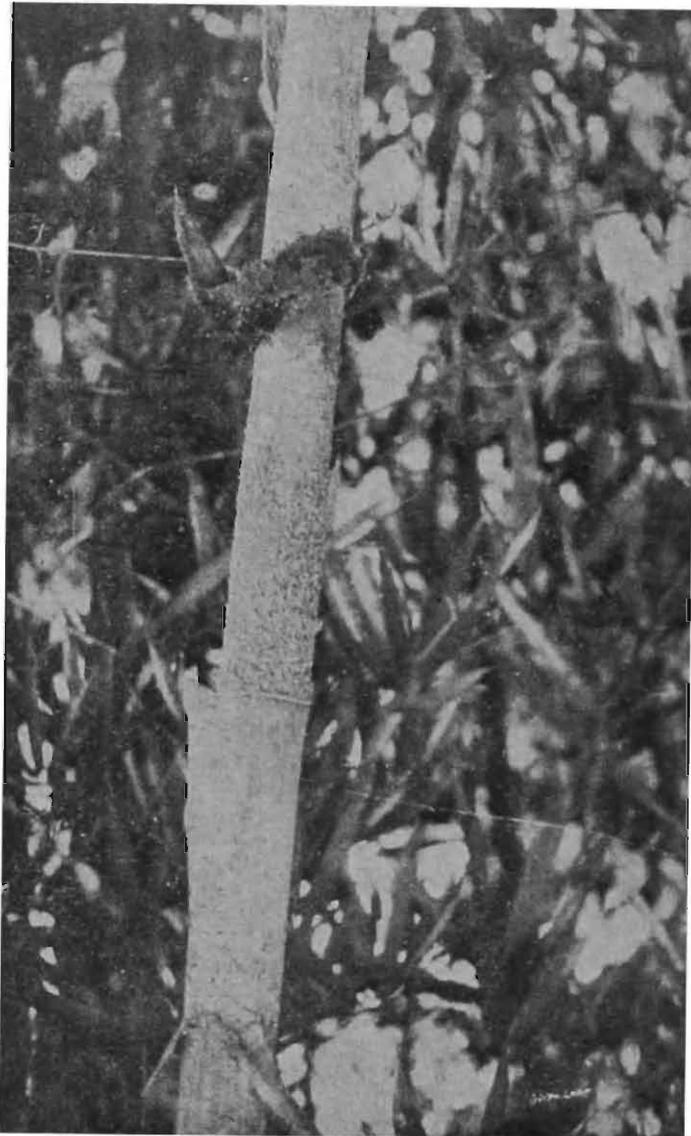
4. *Ceratovacuna lanigera* Zehntner

This species infest both the leaf surfaces of the host plants heavily during the months of September and October. Profuse wax secretion covered the body of pale green insects. The aphid also secretes profuse honeydew which causes the growth of sooty mold on their hosts bearing heavy infestation. The species is attended by black ants.

Ghosh A. K. and Raychaudhuri (1980) reported the species for the

first time from Sikkim. Besides bamboo plants, the species also infest sugarcane and some grasses.

Host plants : *Bambusa arundinacea*, *Bambusa* sp. *Saccharum officinarum* and grasses.

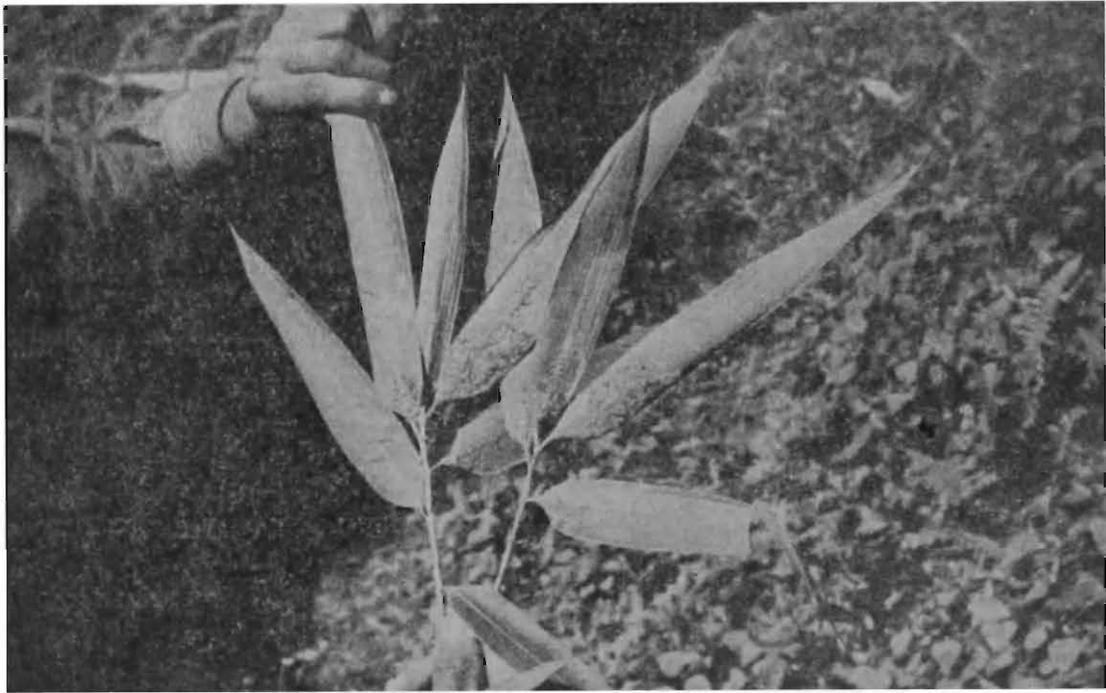


Text-fig. 5. Gregarious colony of *C. bambusae bengalensis* Ghosh on nodal and internodal regions of a bamboo plant.

5. ***Ceratovacuna silvestrii*** (Takahashi)
(Text-fig. 6)

Blackish insects mainly infest the undersurfaces of older leaves and produce wax and copiously secrete honeydew. Big colonies were always noticed in association of ants. The heavily infested areas of the leaves were found to become yellow. In Sikkim, the species is monophagous on bamboo plants and reproduced parthenogenetically. May-June in summer and November-December in cooler periods, this species form gregarious colonies on their hosts.

Raychaudhuri (1980) reported the species for the first time from Sikkim. Host plants : *Bambusa* spp. and indet. bamboo plants.



Text-fig. 6. Wax-covered *Paraoregma alexanderi* (Takahashi) on the leaves of *Bambusa* sp.

6. *Glyphinaphis bambusae* van der Goot

This species has light brown colour and infest the tender shoots of the host plants. These aphids secrete profuse waxy secretion and are always attended by red ants. The preferred host of the aphid is *Thysanolaena* spp. but occasional infestation on *Dendrocalamus* spp. has also been noted. May-June and October-November months have been found to offer favourable conditions for the aphids to colonise their hosts in sikkim.

Host plants : *Dendrocalamus* spp., *Thysanolaena* spp.

7. *Melanaphis bambusae* (Fullaway)

Brown to dark brown insects infest lower surfaces of the leaves and buds with faint powdery secretion all over the body. The species form small colony and is occasionally attended by ants. The species could be collected in the months of November, December and January. In summer months only a few nymphs and winged forms could be noticed.

8. *Neoceratovacuna panicicola* (Takahashi)

Brown insects mainly infest the undersurfaces of leaves and panicles. Aphids were found covered with white waxy deposition on dorsum and sometimes attended by ants. David (1959) reported that this

species is not attended by ants in south India. In Sikkim, the species chiefly infest bamboo plants and long grasses of *Oplismenus* spp. Occasional infestation were also noticed on *Andropogon* spp. and *Granolia* spp. The species could be encountered between November-January months only.

Ghosh, M. R. *et. al.* (1974) reported the species from Sikkim as *Pseudorema panicicola* (Takahashi).

Host plants : *Andropogon* spp., *Granolia* sp., *Oplismenus compositus*, *Oplismenus* spp., indet bamboo plants.

9. *Paraoregma alexanderi* (Takahashi)

Black insects infest almost all the aerial parts of a young bamboo plant and are covered with faint waxy secretions throughout the body. The species form gregarious colonies and on stem such colony run continuously. October-February months have been found to be most favourable for the species to colonise their hosts.

Host plants : *Bambusa arundinacea*, *Bambusa* spp.

10. *Pseudoregma bucktoni* Ghosh, Pal and Raychaudhuri

Dark green to black insects infest the stem at nodal and internodal regions and undersurface of leaves. The species make very dense colonies. The insects were found to be covered with powdery secretion and ants were noticed in association. In Sikkim the species is monophagous on bamboo plants and colonise their hosts mostly during the months of October-January.

Ghosh, M. R. *et. al.* (1974) reported the species from Sikkim as *Pseudoregma bambusicola* (Takahashi).

Host plants : *Bambusa* spp.

11. *Takecallis arundinariae* (Essig)

Light greenish insects of the species infest the undersurface of young and old leaves of bamboo plants. The infestation comprises of individual alata accompanied by a few nymphs. On a single leaf as many as 15-20 adult alatae could be observed. Usually the insect prefer to feed along the mid-rib or stout veins of the leaf. In Sikkim the species infested the bamboo plants in the months of March-May and November-January.

Ghosh, M. R. *et. al.* (1974) reported the species for the first time from Sikkim.

Host plants : *Bambusa arundinacea*, *Bambusa* spp.

DISCUSSION

Of the 11 species of aphid *A. minuta*, *Ceratovacuna silvestrii* and *Paraoregma alexanderi* were found to be important. These species frequently occurred in large numbers on their host plants and such plants revealed apparent symptoms of injury. *A. minuta* and *C. silvestrii* infested only the leaves and in severe cases of infestation, both the species cause yellowing and subsequent premature shedding of the heavily colonised leaves. In addition, *C. silvestrii* habitually secrete profuse honeydew which accumulate on the plant on which sooty mold grow. This phenomenon of honeydew accumulation and growth of sooty mold on leaves of plants deterred the normal physiological function of photosynthesis and respiration. This is reflected on the growth of the plant. *P. alexanderi* primarily infest the newly emerging bamboo stalks where it frequently cover the haulm, hardly leaving any free space. Such new canes, though may exhibit linear growth, the rate of growth is often much less as compared with un-infested ones and canes appear much thinner. It was apparent that *P. alexanderi* was of significant importance for production of normal bamboo.

TABLE 1. Occurrence of aphid species in different altitudinal strata (+ indicates occurrence, —not occurring)

Aphid species	Range of altitude		
	up to 1000 m	up to 1500 m	up to 2000 m
1. <i>Astegopteryx minuta</i>	—	+	+
2. <i>Caratoglyphina bambusae</i>	—	—	+
<i>bengalensis</i>			
3. <i>Ceratovacuna indica</i>	+	+	+
4. <i>Ceratovacuna lanigera</i>	+	+	+
5. <i>Ceratovacuna silvestrii</i>	+	+	+
6. <i>Glyphinaphis bambusae</i>	+	+	+
7. <i>Melanaphis bambusae</i>	+	—	—
8. <i>Neoceratovacuna panicicola</i>	+	+	+
9. <i>Paraoregma alexanderi</i>	—	+	+
10. <i>Pseudoregma bucktoni</i>	+	+	+
11. <i>Takecallis arundinariae</i>	—	+	+
No. of aphid species	7	9	10

Occurrence of aphid species exhibited some pattern with respect to the altitude of the locality. This becomes obvious when it is compared with the localities that are away from the direct influence of the Great Himalayas which Sikkim is subjected to. Bamboos grown in the plains of southern part of West Bengal do not harbour any aphid species at all. Considering Sikkim as an unit area having diverse ecological conditions, low-altitude areas show lesser number of aphid species as compared to high altitude areas. The distribution pattern further reveals that *M. bambusae* occur in localities only upto *c.* 1000 m while *A. minuta*, *P. alexanderi* and *T. arundinacea* are restricted to localities above *c.* 1500 m. The remaining species though could be found all through the altitudinal ranges of the present study, were more frequently met within rather higher part of lowest stratum (i. e. between 700 m and 1000 m). This indicates, in general, the preference of lower temperature by the aphid species. (Table 1).

SUMMARY

Eleven species of aphids infest bamboo plants in Sikkim, a mountainous state of north-east India. Three of the 11 species has been found to cause injury on their bamboo hosts. A key to the identity of these aphid species has been provided along with the biological observations made during the period 1968-1977. It has been found that low altitude areas harbour lesser number of aphid species as compared to high altitude areas. This indicated, in general, the preference of the aphid species to lower temperature.

ACKNOWLEDGEMENTS

Thanks are due to United States Department of Agriculture for providing financial assistance through a PL 480 project (1968-'72) to Late Prof. D. N. Raychaudhuri, University of Calcutta, under whose guidance this work was carried out. The first author acknowledges with gratitude the financial assistance provided by Indian Council of Agricultural Research, New Delhi during the period 1975-'78. Department of Agriculture and Department of Forest, Government of Sikkim deserves thanks for providing transport facilities in many difficult areas of the state for collection of the study material.

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