

**TAXONOMIC KEY FOR THE IDENTIFICATION  
OF INDIAN DELPHACIDAE\***

K. V. MAMMEN<sup>1</sup> and M. G. R. MENON<sup>2</sup>

The family delphacidae comprises a number of important crop pests which include the paddy brown hopper, *Nilaparvatha lugens* Stal, white backed hopper, *Sogatella furcifera* Horv., maize lantern fly, *Perrierinus maidis* Ashm., sugarcane leaf hoppers, *Perkiensiella saccharicida* Kirk. and *P. sinensis* Dist. and a majority of them are vectors of virus diseases of plants. Correct identification of the members of this family was in a state of confusion till recently. Zimmerman (1948), Ishihara (1949), Fennah (1956, 1964 & 1965) and Dantis *et* (1964) made faunistic studies of delphacids from Hawaii, Japan, China, Madagascar, Australia, New Zealand and Russia respectively and prepared keys for separating the family into sub-families, genera and species. Taxonomic studies of Indian delphacidae are very meagre, the main contributions being those of Distant and Muir.

Distant (1906 & 1916) worked on the taxonomy of the Indian delphacidae and described fifteen genera including thirtyfour species. Muir (1921) made several nomenclatural changes and synonymised many of the genera and species erected by Distant. The use of only superficial characters by most of the earlier workers has resulted in multiplication of genera and species beyond reason and so the generic and specific limitations have not yet been fully established. Mammen and Menon (1972) reported twenty-nine new species of delphacids recorded for the first time from India.

In view of their importance as crop pests and their role as vectors of viruses, the present investigations were undertaken to make a comprehensive study of the taxonomy of Indian delphacidae for settling the correct identity of the members of the family upto species level. A dichotomous key for the segregation of the various genera of Indian delphacids studied by the authors is presented in this paper.

\* Part of the thesis of the Senior Author approved for the award of Ph. D. degree in 1971 of the Post-graduate School, Indian Agricultural Research Institute, New Delhi.

1 Lecturer in Entomology, College of Agriculture, Vellayani, Trivandrum, Kerala.

2 Senior Systematic Entomologist (Retd.), I. A. R. I., New Delhi,

### Materials and Methods

Insects studied were obtained from light trap collections and by sweeping on grasses and crop plants. Light trap collections were made at Trivandrum, Thiruvalla, Pathanamthitta and Trichur (Kerala); Coimbatore (Tamil Nadu); Coorg (Mysore); Kalimpong (West Bengal); Gauhati and Shillong (Assam) and new Delhi. A few specimens were sorted out from the unidentified collection in the national Pusa Collection (NPC) collected from Pusa and Ranchi (Bihar); Chapra and Darjeeling (West Bengal); Sholapur and Basin Fort (Maharashtra); Mt. Abu (Rajasthan); Raipur and Gwalior (Madhya Pradesh); Simla (Himachal Pradesh); Delhi; Port Blair (Andamans) and Afghanistan.

Tag mounts of the specimens were used for studying the morphological features. Slides of the various parts of the insects and dry mounts of wings were prepared as described by Mammen and Menon (1971), for the detailed investigations of the taxonomic characters.

### Results and Discussion

During the course of the investigation fortyfour species were studied out of which only fifteen were old records from our country and ten are reported for the first time. Nineteen species have been found to be new to science and out of these eight could not be assigned to any of the so far recorded genera. For accommodating these, five new genera viz, *Upacharella*, *Liburniellana*, *Thiruvella*, *Paraperkinsiella* and *Paratropidocephala* were erected.

Based on the taxonomic characters studied by the authors, the following dichotomous key was prepared for separating the genera of the Indian delphacidae.

#### Key to the Indian Genera of Delphacidae

1. Hind tibial spur thick, flattened or concave on inner face, hind margin without teeth. Forewings with  $R_1$  separate, not forming a common stalk with  $R_s$  and hindwings with  $M_1$  and  $Cu_1$  fused together after a short distance from base, second anal vein divided into two branches. Anal segment devoid of spines (Tribe: TROPIDOCEPHALINI) ..... 2
- Hind tibial spur thin, laminate or foliaceous, usually deeply concave on inner face, hind margin with a row of distinct teeth. Forewings with  $R_1$ ,  $R_s$  and  $M_1$  usually arising from a common stalk; hindwings with  $M$  and  $Cu$ , not fused together, second anal vein divided into three branches. Anal segment with spines (Tribe: DELPHACINI).

- Lateral carinae of frons and vertex deeply foliate.  
 First segment of antennae much longer than second, flattened and foliaceous. . . . . *Purohita*
- Lateral carinae of frons and vertex moderately developed; antennae short and terete. . . . . 3
- Antennae much shorter than face, first segment annular, second about twice the first. . . . . *Tropidocephala*
- Antennae about length of face; first segment long about two-third the length of second. . . . . *Paratropidocephala*
- Both segments of antennae flattened. . . . . 5
- Both segments of antennae terete. . . . . 6
- Head distinctly narrower than pronotum. First antennal segment long, only slightly broadened distally. Forking of median frontal carina far below level of eyes. . . . . *Paraperkinsiella*
- Head as wide as pronotum. First antennal segment short, triangular broadening towards apex. Forking of median frontal carina near lower margin of eyes. . . . . *Perkinsiella*
- Anterior and intermediate femora and tibiae compressed and foliaceous. . . . . *Phyllodinus*
- All leg segments simple, cylindrical. . . . . 7
- Carinations on head and thorax very faint; median longitudinal carina on face almost completely obliterated. . . . . *Upacharella*
- Carinations of head and thorax quite distinct. . . . . 8
- Submedian carinae of vertex meeting far behind the apical margin and forming a small areolet at the middle. . . . . *Liburniellana*
- Submedian carinae of vertex meeting at the apical margin or beyond, on the face. . . . . 9
- Submedian carinae of vertex meeting at the apical margin and continued on the face as a single median carina (in *Steuocranus ajmerensis*, these do not really meet but run down as far as clypeus as two very closely opposed carinae). . . . . 10
- Submedian carinae of vertex converging apically but meeting only on the face (i. e. median longitudinal carinae of face furcate). . . . . 21

10. Lateral pronotal carinae reaching upto hind margin.....11  
 Lateral pronotal carinae not reaching the hind margin, usually distinctly curved laterad before fading off on the pronotum.....12
11. Lateral pronotal carinae more divergent. Pygofer without a medio-ventral process. .... *Meemelodes*  
 Lateral pronotal carinae less divergent. Pygofer with a long medio-ventral process bifid apically. .... *Phrictopyza*
12. Vertex in profile angulately rounding into frons. not parallel to anterior margin of eyes. .... *Matutinus*  
 Vertex usually subrectangularly or obtusely rounding into frons, parallel to margin of eyes.....13
13. Hind basitarsus with one or more small lateral spines. First antennal segment longer than wide. .... *Nilaparvatha*  
 Hind basitarsus without any lateral spines. ....14
14. Basal segment of antennae short, as long as broad or only very slightly longer.....15  
 Basal segment of antennae distinctly longer than broad .....17
15. Vertex only slightly longer than broad, basal width more than twice the width of each eye in the same line.....*Eoewrysa*  
 Vertex very narrow, distinctly longer than broad .....16
16. Second antennal segment not more than twice as long as basal segment; submedian carinae of vertex meeting together before apex; the basal compartment of vertex rectangularly very elongate. .... *Sardia*  
 Second antennal segment about three times as long as basal segment. (Male aedeagus passing through an accessory appendage; third valvulae of females very much broadened).....*Stenocranus*
17. Antennae distinctly long and slender; basal segment more than half as long as second; vertex distinctly longer projecting in front of eyes; calcar as long as basitarsus; anal spines long.....*Thiruvella*  
 Antennae short; basal segment less than half as long as second; anal spines short .....18
18. Head broad, nearly as broad as pronotum; pronotal carinae strongly elevated. ....*Coronacella*

Head narrower than pronotum.....19

19. Basal compartment of vertex distinctly long; Y-carina distinct; basal segment of antennae more than twice as long as broad at apex.....*Unkanodes*

Basal compartment of vertex relatively short; Y-carinae obsolete; basal segment of antennae relatively shorter.....20

20. Elongate forms. Aedeagus cylindrical, sinuate and acute at apex.....*Sogatella* (Part)

Short forms. Aedeagus cylindrical, straight and truncately rounded at apex.....*Chloriona*

21. Median frontal carinae furcate at extreme base of face.....22

Median frontal carina forked about one third from base of face.....23

22. Vertex longer than wide at base, projecting in front of eyes. Aedeagus cylindrical, sinuate and acute at apex.....*Sogatella* (Part)

Vertex almost square. Aedeagus cylindrical, straight and truncately rounded at apex.....*Delphacodes*

23. Vertex square. Hind tibial spur with numerous minute teeth. Aedeagus long, very narrow and whip-like.....*Perigrinus*

Vertex slightly longer than wide.....24

24. Hind basitarsus much longer than the other two segments together; legs fairly long and slender; fore femora considerably longer than coxae.....*Euidella*

Hind basitarsus not longer than the other two together or only very slightly so. Fore femora only slightly longer than coxae.....*Dicranotropis*

#### Acknowledgement

The authors are grateful to the Director and Head of Division of Entomology, Indian Agricultural Research Institute, New Delhi for providing facilities for undertaking this work.

സംഗ്രഹം

ചാഴിവാർഗ്ഗത്തിൽ പെട്ട 'ഡെൽഫാസിഡേ' കുടുംബത്തിലുള്ള അനേകം പ്രാണികൾ നെല്ല്, കരിമ്പ്, ഗോതമ്പ്, ബാർലി മുതലായ കാർഷികവിളകളുടെ പ്രധാനപ്പെട്ട കീടങ്ങളാണ്. കൂടാതെ ഇവയിൽ മിക്കവയും സസ്യങ്ങൾക്കുണ്ടാകുന്ന മാതൃകയായ ഡെൽഫാസിഡേ കുടുംബത്തിൽ പെടുന്നു. ഡെൽഫാസിഡേ കുടുംബത്തിലുള്ള കീടങ്ങളുടെ പ്രാധാന്യത്തെ മുൻ നിർത്തി നടത്തിയ പഠനത്തിന്റെ ഫലമായി ഇൻഡ്യയിൽ പല ഭാഗങ്ങളിലും കാണപ്പെടുന്ന വിവിധതരം പ്രാണികളുടെ താരതമ്യനിർണ്ണയം സാദ്ധ്യമാക്കത്തക്കവിധമുള്ള ഒരു കൃത്യമായ നിർണ്ണയം ഈ കൃതികളുടെ സഹായത്താൽ ഇൻഡ്യൻ ഡെൽഫാസിഡുകൾക്ക് അനായാസകരമായി താരതമ്യനിർണ്ണയം ചെയ്യാവുന്നതാണ്. ഡെൽഫാസിഡുകൾക്ക് പറ്റിയുള്ള വർഗീകരണ നിയമപഠനം നടത്തിയത് ഇൻഡ്യയിൽ ആദ്യമായിട്ടാണ്.

REFERENCES

Dantis, E. M., Emel' yanov, A. F., Loginova, M. H. and Shaposhinkov, G. K., 1964, Key to the Insects of the European U. S. S. R., I (18) Homoptera: 419-850.

Distant, W. L., 1906, *Fauna British India*, 3, 465-491

—, 1916, *Ibid*, 6, 134-145

Fennah, A. G., 1956, Fulgoroidea from Southern China. *Proc. Calif. Acad. Sci.*, (4) **28**, 441-527

—, 1964, Delphacidae from Madagascar and the Mascarene Islands. *Trans. R. ent. Soc. London*, 133: 131-150

1965 Delphacidae from Australia and New Zealand. *Bull. Br. Mus. (nat. Hist.) London* (Ent.) I 7, 1-59

Ishihara, T, 1949, Revision of Arseopidae of Japan, Ryuku Island and Formosa. *Sci. Rep. Motsumura agric. Coll.*, no. 2, 1-102.

Mammen, K. V., and Menon, M G. R., 1971, Taxonomic observations on the family Delphacidae with special reference to wing venation and male genitalia, *Agri. Res. J. Kerala* 9, 72-75

—, 1972, New Records of Delphacids from India, *Entomologist's News letter*, 2, 7-9

Muir, F., 1921, On some Delphacidae from South India *Proc. Hawaiian Ent. Soc.*, 4, 480-486,

Zimmerman, E., 1948, Insects of Hawaii. Homoptera: *Auchenorhycha*, 4, 134-248.

(M. S. received: 4-4-1974)