Pakistan J. Sci. Ind. Res., Vol. 23, Nos. 3–4, June–August 1980

STUDIES ON THE MALE AND FEMALE EXTERNAL GENITALIA OF *HYPSAUCHENIA SUBFUSCA* BUCKTON, *LEPTOBELUS DAMA* (GERMAR) AND *L. GAZELLA* (FAIRM.) (MEMBRACIDAE: CENTROTINAE) WITH PHYLOGENETIC CONSIDERATIONS*

Imtiaz Ahmad and Naseer Ahmad Khan

Department of Zoology, University of Karachi, Karachi 32

(Received August 29, 1979; revised May 17, 1980)

External male and female genitalia of *Hypsauchenia subfusca* Buckton of the tribe Hypsaucheniini, *Leptobelus dama* (Germar) and *L. gazella* (Fairm.) of the tribe Micreunini of the subfamily Centrotinae are studied and compared with those of members of other tribes within Centrotinae from the literature and in this light their phylogeny is briefly discussed.

INTRODUCTION

Lawson [1], Caldwell [2], Dennis [3,4], Kopp and Yonke [5,6], Strumple [7–9], Ahmad and Yasmeen [10], Ahmad and Abrar [11] and Kitching [12] regarded the genital characters useful in different membracoid species, while Capener [13], Strumple [14], Ahmad [15] and Ahmad and Yasmeen [16] have shown the validity of genital characters at tribal level. Of a total of ten tribes from Pakistan, Azad Kashmir and Bangladesh [17] of the family Membracidae, Rahman [18] worked on the morphology, taxonomy, phylogeny, distribution and general features leaving only hypsaucheniines and also the members of the present genus *Leptobelus* Stål. Deitz [19] in his classification of the higher categories of the new world treehoppers mainly utilized the characters of male and female genitalia. Morphological studies on the male and female genitalia of *Hypsauchenia subfusca* Buckton or of any member of the tribe Hypsaucheniini, and *Leptobelus dama* (Germ.) and *Leptobelus gazella* (Fairm.) of the tribe Micreunini have not been previously reported. The systematic position of the genus *Leptobelus* is also disputed [20]. To fill this gap presently, the male and female genitalia of the above species were studied and in the light of the present findings and those reported in the literature on other membracids, their systematic positions are also briefly reviewed.

MATERIAL AND METHODS

The members of the tribe Hypsaucheniini or of the present Micreunine genus *Leptobelus* are so rare in their distribution that in several expeditions in different parts of Pakistan, Azad Kashmir and Bangladesh since 1968 through todate not a single specimen was collected by the present authors and their colleagues [17].

These also appear to be remarkably scarce in the world collections for only 8 pinned specimens representing 4 species were presently obtained and were used in this study which included: (1) *Leptobelus gazella* (Fairmaire), 3 ♀ with labels Assam (Shillong), Burma (Maymyo), leg. V.R. Rao, Fletcher and Boy, 26.3, 31.5, 5.6.1918, 4.1926, det. Mr. S. Samouselle 1931; (2) *Hypsauchenia subfusca* Buckton, 1 ♂ and 2 ♀ with labels Sikkim 500 ft, Kurseong, leg Fletcher and H.M.L. 5.10.1908, 7, 20.6.1922, det. W.L. Distant, belonging to old pusa collection of undivided India lodged at National Insect Museum, PARC Malir Halt, Karachi, and borrowed by the courtesy of Dr. Hafeez Ahmed Incharge and other authorities of the Museum. (3) *Leptobelus dama* (Germar) 1 ♂ with labels, Perak, Larut hills, leg H.M. Pendlebury, det. P. Broomfield, 23.2.1932; (4) *Hypsauchenia hardwickii* Kirby, 1 ♂ with labels, Khasia hills, leg Jordan, lodged at British Museum Natural History, London and examined during the visit of first author to that Institution. For dissection and examination of male and female genitalia the conventional procedures especially those used by the present authors [20] has been generally followed.

RESULTS

External Genitalia of Hypsauchenia *Germ*

Male Genitalia (Fig. 1A–D). Process of ninth segment

*Financially supported by PARC–USDA Research Project, FG-Pa-245 (PK-ARS-56).

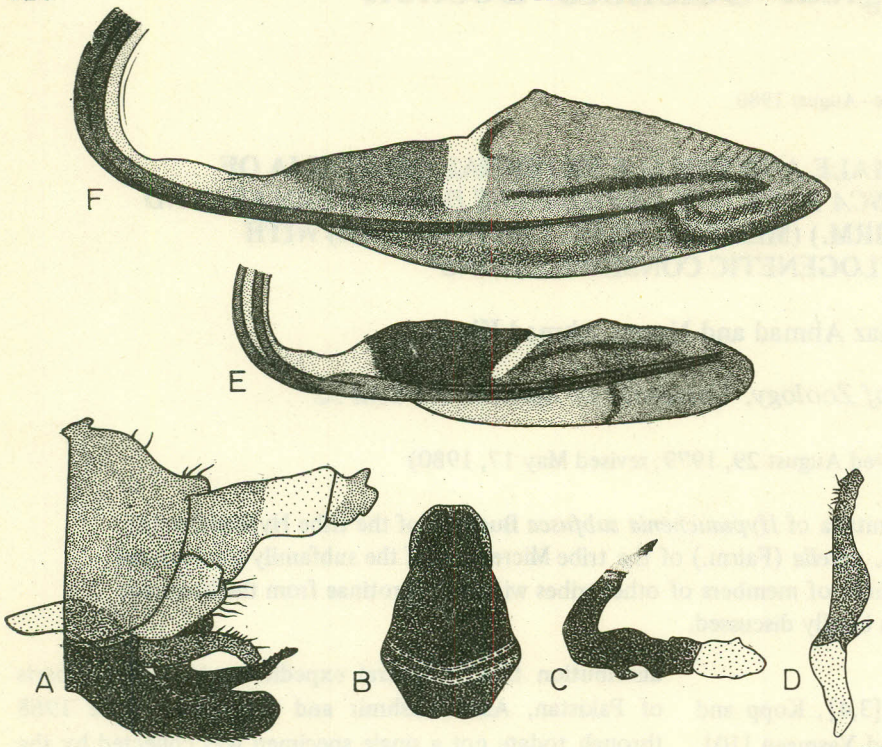

Fig. 1 (A–E) Male and female genitalia of *H. subfusca:* (A) male genitalia, lateral view, (B) subgenital plate, ventral view (C) aedeagus, lateral view (D) paramere, lateral view, (E) second gonapophyses, lateral view, (F) second gonapophyses of *L. gazella,* lateral ivew.

small, prominent and apically truncated; subgenital plate elongately oval broad at base then only slightly tapering, but apical portion distinctly untapering and with only a little marked split, lateral margins medially slightly convex; parameres with somewhat straight stem, relatively medium-sized and with apically acute head, inner margin at subapical portion slightly outwardly curved, outer margin distinctly convex; aedeagus short, with rounded and broad apex, inner margin apically distinctly sinuate and equipped with small denticles.

Female Genitalia (Fig. 1E). Second gonapophyses of more or less uniform width throughout, distinctly sinuate medially proximal to small main tooth and with few minute serrations at apical portion of its inner margin, tip comparatively broadly rounded.

External Genitalia of Leptobelus, *Stål*

Male Genitalia (Fig. 2A–D). Process of ninth segment strongly developed, dagger-like, abruptly becoming narrow at rounded apex; subgenital plate elongated, distinctly broad at base, strongly tapering for about 1/3 of its distance then slightly tapering but apically becoming somewhat broad with a prominent split extending for 1/4 of its distance, lateral margins irregular in shape; parameres with strongly curved stem, relatively very broad and apically acute head with narrow neck and comparatively broad basal portion; aedeagus longer, with rounded apex, inner margin unarmed, slightly tapering apically and distinctly sinuate subapically.

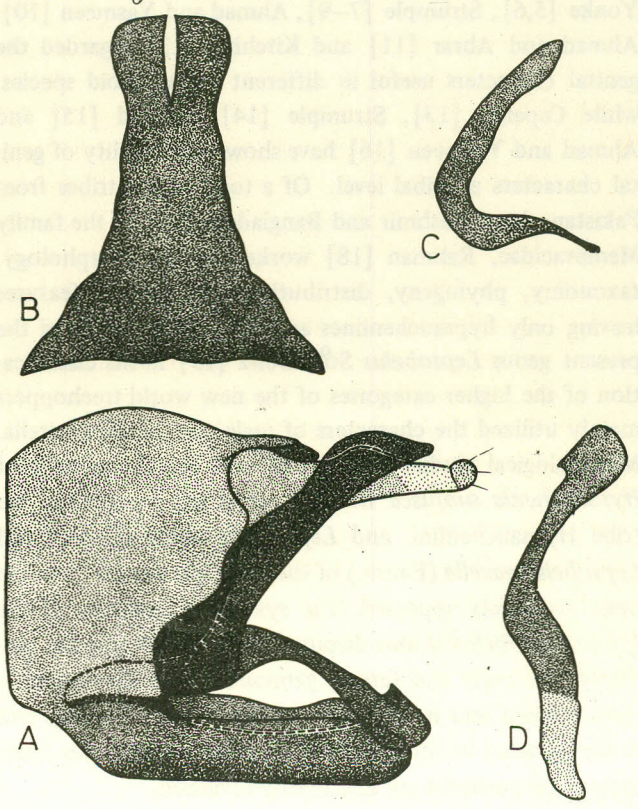

Fig. 2 (A–D) Male genitalia of *L. dama:* (A) male genitalia, lateral view, (B) subgenital plate, ventral view, (C) aedeagus, lateral view, (D) paramere, lateral view.

Female Genitalia (Fig. 1F). Second gonapophyses distinctly broad in the middle with a prominent main tooth, then abruptly tapering proximally for a short distance and

then slightly tapering towards proximal end at its inner margin, distal to main tooth inner margin tapering irregularly with only a few minute serrations and with subrounded apex.

DISCUSSION

The systematic position of *L. gazella* was not only disputed in the literature [21] but the taxonomic position of the genus *Leptobelus* Stål needs revision. The type species *L. dama* (Germar) appeared closely related to species of leptocentrines in the characters of thoracic sclerites and sutures [20]. Further, the genitalia of *Leptobelus* and *Hypsauchenia* were unknown and, therefore, could not throw any light on their systematic positions.

The external genitalia of *H. subfusca* support the conclusion drawn by Ahmad and Khan [20] on the basis of thoracic sclerites and sutures. It appears to be related to the ancestral stock for it possesses following characters: a pair of small processes on the ninth segment in the males; an elongately oval subgenital plate only slightly tapering, but apical portion distinctly untapering and with small split; parameres with somewhat straight stem, and apically acute head; short aedeagus with rounded and broad apex having inner margin equipped with small denticles. Females with second gonapophyses more or less of uniform width throughout, distinctly sinuate medially proximal to the small main tooth and with comparatively broadly rounded tip.

The male genitalia of *L. dama* appear to have diverged from this ancestral stock with processes of ninth segment strongly developed and dagger-like; elongated subgenital plate strongly tapering for a short distance then slightly tapering but apically broad with a prominent split; parameres with strongly curved stem relatively very broad and apically acute head; aedeagus with rounded apex, with inner margin unarmed. In females second gonapophyses in *L. gazella* distinctly broad in the middle with a prominent main tooth and subrounded apex. These features not only show the genus closer to but distinctly more advanced than that of *H. subfusca* and also relate it to other leptocentrines in these character [15].

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