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SOUND PRODUCING ORGANS OF *BRACHYTRYPES PORTENTOSUS* (LICHTEINTEN) (ORTHOPTERA:GRYLLIDAE) AND THEIR IMPACT ON CLASSIFICATION

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ABSTRACT

The specimens of *Brachytrypes portentosus* (Lichteinten) described on the basis of their sound producing structures i.e. tegmina, plectrum, stridulatory file and teeth for the first time in Pakistan. Specimens were collected from Quetta in Baluchistan was subjected to Scanning technique of Electron Microscopy following the techniques of David *et al.* (2003) to study these structures The pars stridulum pattern, the stridulatory file and the number of teeth on file appear as important characters to identify males of *B. portentosus* (Lichteinten) from other related taxa found in Pakistan.

Key-words: *Brachytrypes portentosus*, sound producing organs, tegmina, plectrum, stridulatory file and teeth.

INTRODUCTION

Previously the Family Gryllidae was identified worldwide by their external morphological characters including those of their external male and female genitalia. Pars stridens is a complex sound producing apparatus in different species of Gryllidae. The morphology of teeth present there in also appear differentiating species. The structures of the tegmina of different species that produce and radiate the acoustic signals, have different structures (Walker and Carlysle, 1975), and later may be used as taxonomic character. Stridulation is a significant character for differentiating different species. Number of stridulatory pegs, length of file, size and distance between teeth of file appeared to be associated with stridulation. (Alexander and Thomas, 1959; Alexander and Bigelow, 1960; Walker, 1962; 1963). Diversity of stridulatory organs, signals and behavior solve the problems of origin and evolution of signals in Ensifera (Desutter-Grandcolas, 1997).it could be stated that most subfamilies of crickets could be identified on the basis of file teeth structure. (Walker and Carlysle, 1975).

MATERIALS AND METHODS

The specimen was placed in water, boiled for a few minutes, and then the right tegmina was detached from the specimen, on a slide and covered with a clean cover slip for photograph by using Nikon Cool Pix 5400 digital camera after placing it under Nikon SMZ 800 Binocular. Then the tegmen was mounted on a stub, placed to coat with auto coater into JEOL model No. JFC-1500 Japan having gold target, which coated up to 300^0A then scanned with Scanning Electron Microscopy, JEOL Japan model No. JSM 6380A and studied from the ventral region as SEM pictures of the file, from Centralized Science Laboratory, University of Karachi, Karachi.

RESULT

Tegmen: (Fig. 1)

Apical margin of tegmina circular. One diagonal vein, small, straight, joining to chord by three small cross veins. Chords four, 1^{st} -3^{rd} strongly convex, forming semicircular structure, 4^{th} straight. Five oblique veins present, three long, complete, convex at middle, two short, incomplete, starting from basal end of stridulatory file. Lateral field broad having eight sub-cubital veins, smooth, straight, with equal distance. Mirror, broader than long, divided by a curved vein, forming one large, rectangular cell, with rounded apex. Three median veins, feebly curved anteriorly, close to each other, two cubital veins present having variable distance, unbranched. Stridulatory file short, curved. Wings long.Length of tegmina 22-24 mm, width 11.5-12 mm.

Pars stridens: (Figs. 2-6)

Teeth not evenly distributed on entire file, starting from 2/3 region of stridulatory file. Distance between teeth variable, terminal regions having maximum distance. Morphology of a single tooth in *B. portentosus* resembling with those of other species of same genus. Teeth small, base narrow, cusp thick, straight at middle, wrinkled, broad.

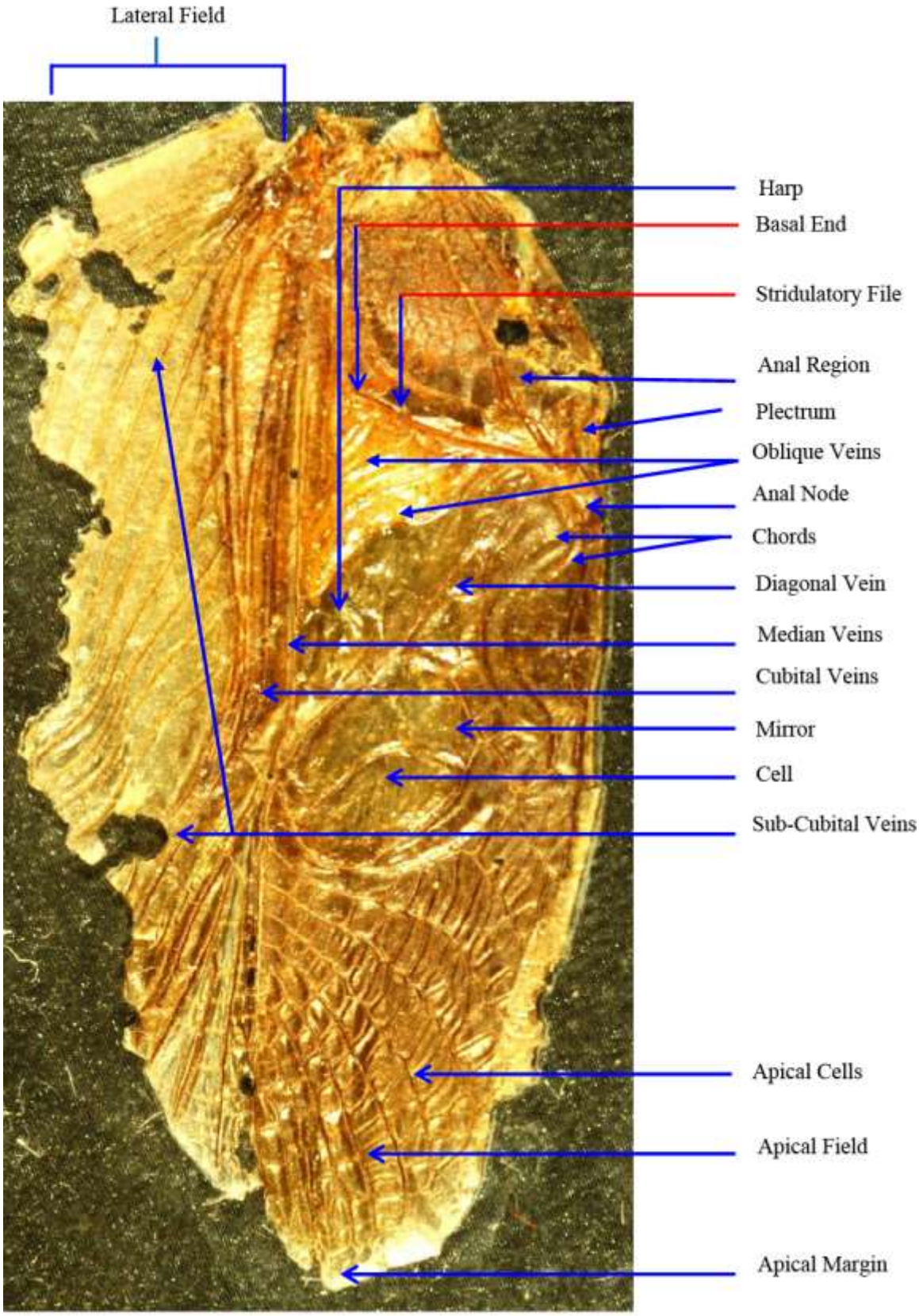
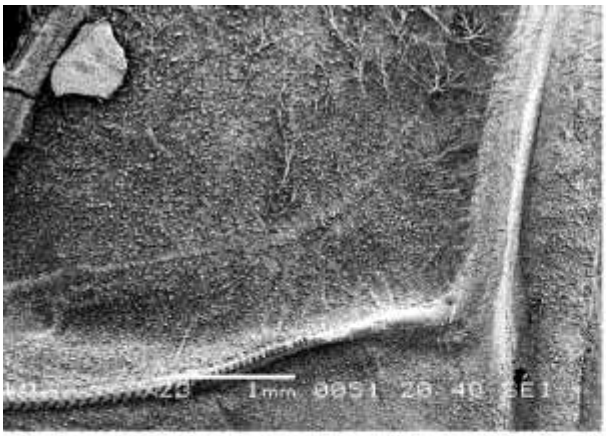
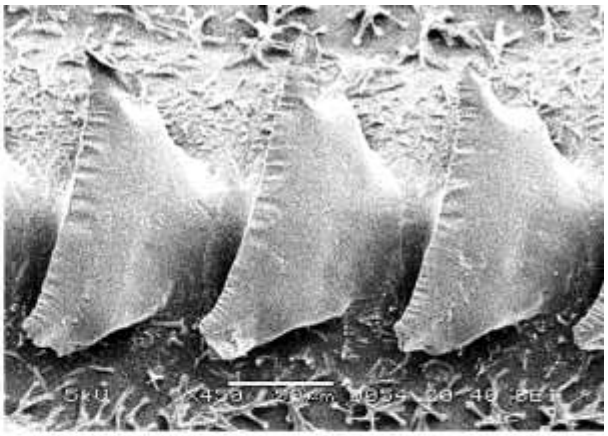


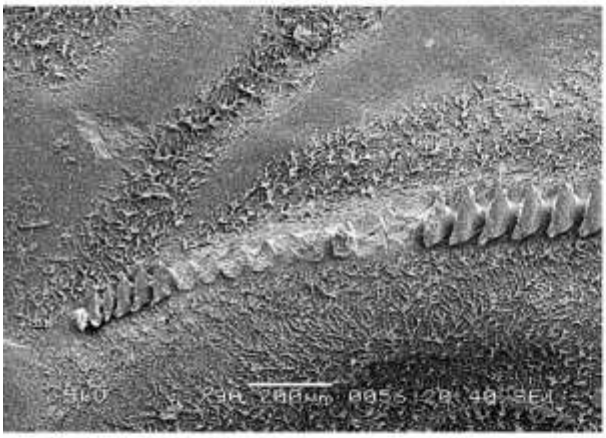
Fig. 1. *Brachytrypes portentosus;* Tegmen.



2: Stridulatory File



3: Stridulatory



4: Anal Teeth

5: Plectrum

6: Microtrachea

Fig. 2-6. *Brachytrypes portentosus;*
2: Stridulatory File;
3: Stridulatory Teeth;
4: Anal Teeth;
5: Plectrum;
6: Microtrachea.

Anterior wing feebly longer than posterior wing, wrinkled, thick broad, pointed at lateral margin, basal margin straight, swollen. Posterior wing feebly smaller than anterior wing, narrow, pointed at lateral margin, basal margin thick. Both wings feebly curved toward anal region. Costal teeth smaller than median teeth, having short, thick cusp with long, wings having minimum distance. Anal teeth similar to median teeth in structure and size, lateral wings large, lateral margins pointed, terminal teeth of variable shape, overlapping to each other.

Plectrum round at costal margin, anal margin straight, turned over plectrum, anterior margin round, broad, posterior margin pointed. Microtrachea thick, long, straight, strongly pointed at apex.

Length of file 4.0-4.3 mm, plectrum1.2-1.3 mm, total number of teeth 81-85, including minor and asymmetrical teeth. Density 19.7-20.2 teeth per millimeter.

DISCUSSION

Earlier, family Gryllidae was revised on the basis of their external morphology and genital component (Khan and Kamaluddin, 2006).But the International literature shows that the stridulatory organs are important taxonomic characters for the identification and classification of cricket species especially when electron microscope giving high powered resolution is being used. Majority of recent researchers, who worked on the family Gryllidae, used instead the acoustic characters with sound producing organs.

When the literature from Pakistan was searched only a few workers i.e. Ashraf *et al*. (1978) and Saeed *et al.* (2000) worked on different genera of the family Gryllidae and they used only the external morphology and genital characters, but not a single worker used the acoustic characters or sound producing structure. Caltabiano *et al.* (1980) and Desutter-Grandcolas (1997) investigated the *Brachytrupes* species and discovered behavioral characters, and pattern of sound. Earlier Chopard (1969) and Randell (1964) described and identified the species on the basis of their external morphology and genital structure, but not a single researcher described their stridulatory file, structure of teeth, and other acoustic characters especially from Indo-Pakistan sub-continent. The representatives of the genus *Brachytrypes* Serville in the present studies appeared to be clearly recognized and were isolated among all other genera of Gryllidae by the sound producing characters, i.e., length of stridulatory file 4.0-4.5 mm, number of teeth 81-85 and density 19.7-20.2 teeth per mm.

The representatives of the genus *Brachytrupes* in the present studies appear to be clearly noticeable and were isolated among all other genera of Gryllidae with the help of sound producing characters.

REFERENCES

Alexander, R. D. and R.S. Bigelow (1960). Allochronic speciation in field crickets and a new species *Acheta veletis. Evolution,* 14: 334-46.

Alexander, R. D. and E.S. Thomas (1959). Systematic and behavioral studies on the crickets of the *Nemobius fasciatus* group (Orthoptera: Gryllidae: Nemobiinae). *Ann. Entomol. Soc. Amer.*, 52: 591-605.

Ashraf, M., M.A. Asghar and M. Yousuf (1978). Comparative external cephalic morphology of *Gryllus bimaculatus* and *Acheta domesticus*. *Pak. J. Zool.,* 10 (2): 209-216.

Caltabiano. A.M., G. Costa and A. Petralia (1980). Ricercheeto-ecologiche sulla fauna delle dune costiere di Portopalo (Siracusa) IV. Biologia comportamentale di *Brachytrupes megacephalus* (lef.) (Orthoptera: Gryllidae). *Animalia*, *Catania*.

Chopard, L. (1969). The fauna of India and adjacent countries (Orthoptera: Gryllidae). *Fauna India*, 2: 1-421.

David, J.A.O., E. Zefa, and C.S. Fontanetti (2003). Cryptic species of *Gryllus* in the light of biocoustic (Orthoptera, Gryllidae*). Neotropical Entomology*, 32: 75-80.

Desutter-Grandcolas, L. (1997). Le peuplement de grillons (Orthoptères Grylloidea) des sous-bois forestiers du Col d'Amieu (Nouvelle-Calédonie).2ème partie.*Analyse systématique.* 137-163, *in* Najt, J. & Matile,

Khan, N. and S. Kamaluddin (2006). Aspects of morphology of head, thorax and abdomen and their appendages of *Pteronemobius indicus* (Waker) (Orthoptera: Gryllidae: Nemobiinae) and their relationship. *Pakistan J. Entomol. Karachi*, 21(1 and 2): 11-14.

Randell, R. L. (1964). The male genitalia in Gryllinae (Orthoptera: Gryllidae) and a tribal revision. *Can. Ent.,* 96: 1565-1607.

Saeed, A., M. Saeed and M. Yousuf (2000). New species and records of some crickets (Orthoptera: Gryllidae) from Pakistan. *Int. J. Agri. Biol*., 2(3): 175-182.

Walker, T.J. (1962). Factors responsible for intra-specific variation in the calling song of cricket. *Evolution,* 16: 407-428.

Walker, T. J. (1963). The taxonomy and calling songs of United States tree crickets (Orthoptera: Gryllidae: Oecanthinae). 11. The *nigrieornis* group of the genus *Oecanthus. Ann. Ent. Soc. Amer.*, 56(6): 772-789.

Walker, T.J. and T.C. Carlysle (1975) Stridulatory file teeth in crickets: taxonomic and acoustic implications (Orth.: Gryllidae). *Int. J. Insect Morphol. and Embriol*., 4: 151-158.

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