

A STUDY OF THE SOUND PRODUCING ORGANS OF *SCIOBIA* SP. (ORTHOPTERA: GRYLLIDAE)

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ABSTRACT

This paper describes the species of genus *Sciobia* of family Gryllidae on the basis of their sound producing organs, including stridulating file, structure of teeth, number of teeth, length of stridulatory file, structure of tegmina and plectrum and these characters were identified with the help of Scanning Electron Microscopy by following the technique of David *et al.* (2003). These specimens were collected from Khyber pakhtoonkhaw, Parachanar and first time reported from these areas.

Key-words: Sound producing organs, *Sciobia* sp., Tegmina, Pars stridens

INTRODUCTION

Previously, the researchers used the external morphological characters and genital components for the identification of the species of crickets of the family Gryllidae but they had doubt on their authenticity. At the beginning of the 20th century the systematists of this group concentrated on the calling songs of the males to their conspecific female partners. The acoustic character was found most reliable when Fulton (1932) discovered for the first time that populations of *Gryllus* sp., in North Carolina, USA produced four different types of calling signals which actually were then considered as four different species.

Stridulum is a complex organ in concerning its structure and its functioning mode. (Michelsen and Nocke, 1974; Sismondo, 1979; Koch *et al.*, 1988; Bennet-Clark, 1989; Desutter –Grandcolas, 1995). The length of the stridulatory file and the number of file teeth are generally inversely correlated with pulse rate, within a genus or a sub genus, (Walker, 1963). The structures of the tegmina of different species that produce and radiate the acoustic signals, having different structures (Walker and Carlysle, 1975), and later may be used as taxonomic character. Stridulation is a significant character for deciding species level.

MATERIALS AND METHODS

To remove the tegmen the specimen was boiled with KOH for a few minutes, and then right tegmen was removed from the body. Mounted tegmen on a stub was placed in a desiccator to dry with Silica gel. For coating, the sample was placed with auto coater, JEOL model No. JFC-1500 Japan, having gold target, which coated up to 300^oA then it was placed to scan with Scanning Electron Microscopy, JEOL Japan model No. JSM 6380A, then as different regions were studied for stridulatory file from its ventral region, at Centralized Science Laboratory, University of Karachi, Karachi.

RESULTS

Tegmina: (Fig. 1)

Apical field small, with six rows of cells, apical margin round with two diagonal veins present, 1st long, feebly curved, 2nd small, straight, both veins joining to mirror without cross veins. Chords four, 1st and 2nd strongly convex, originating from a single vein, 3rd faintly curved, 4th straight. Three oblique veins present, long, complete, strongly curved at middle, starting at middle of stridulatory file. Lateral field short with five sub-cubital veins, smooth, straight with equal distance. Mirror large, broader than long, forming a large square cell, with broad, round apex, two median veins, close to each other, two cubital veins present joining each other at basal region, having equal distance, unbranched. Stridulatory file oblique, pointed at basal end. Hind wings absent. Length of tegmina 5.8-6.4 mm. width 3.3-3.7 mm.

Pars stridens: (Figs. 2-7)

Teeth evenly distributed on entire file, starting at basal end of stridulatory file. Distance between teeth variable, terminal regions having minimum distance. Morphology of a single tooth in *Sciobia* sp. resembling with those of

other species of the same genus. Teeth large, base narrow, cusp thick, curved at middle, broad, with wrinkles, gradually acutely pointed, broad, basal margin broad, round, dorso-ventrally flattened, apical margin thick. Anterior wing shorter than posterior wing, narrow, pointed at lateral margin, basal margin broad, rounded, flattened. Posterior wing longer than anterior wing, broad, pointed at lateral margin, basal margin broad, thick. Both wings feebly curved towards anal region. Costal teeth smaller than median teeth, with short and flattened wings, having maximum distance. Anal teeth similar to median teeth in shape, but smaller in size, with minimum distance, terminal teeth of variable shape, not overlapping at each other.

Plectrum straight at anterior margin, pointed at posterior margin. Anal margin slightly curved, thin, costal margin round. Microtrachea dense, long, curved, pointed at apex.

Length of file 1.6-1.8 mm, plectrum 1.0-1.2 mm, total number of teeth 95-100, including minor and asymmetrical teeth. Density 53.3-55.0 teeth per millimeter.

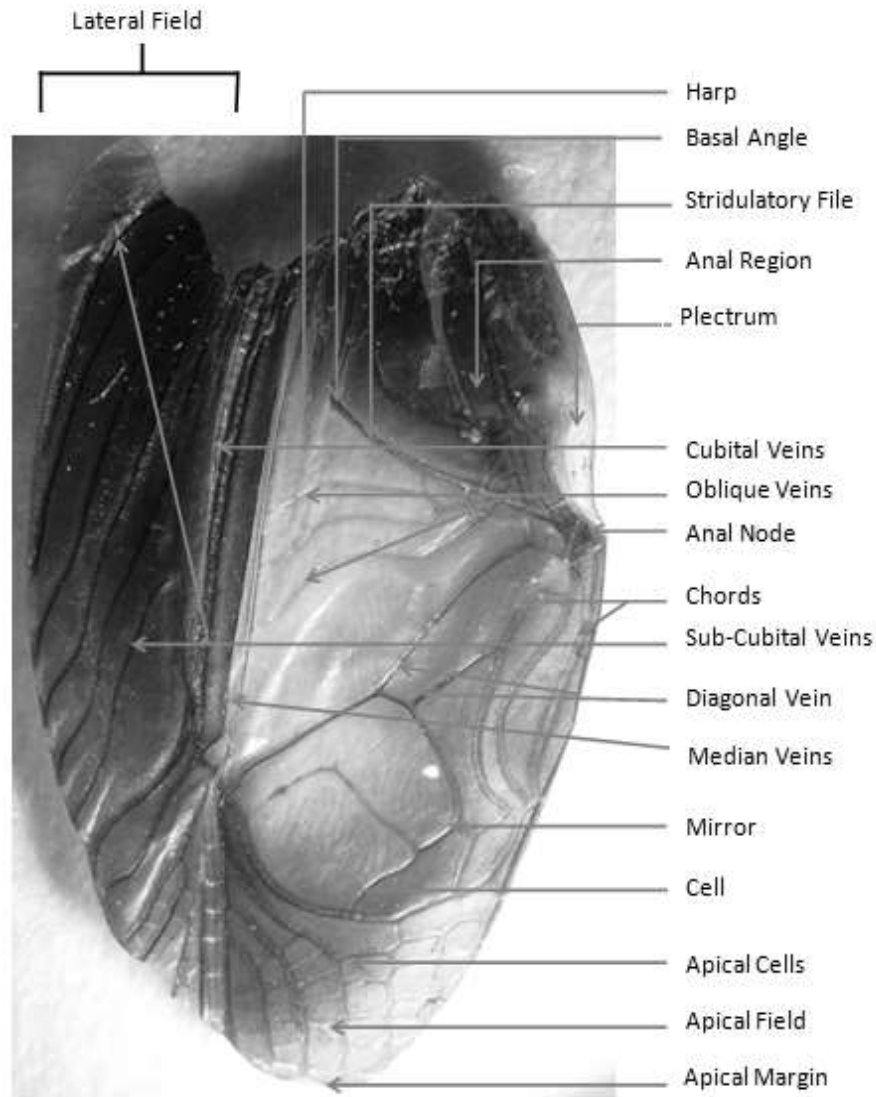


Fig. 1. *Sciobia* sp.- Tegmen

DISCUSSION

In the present work *Sciobia* sp. in the family Gryllidae was described on the basis of their sound producing organs, i.e., stridulatory file, Stridulatory teeth, structure of Tegmen, plectrum, where as previously this group was

classified with the help of their external morphology and male and female genital components by the author and her colleague (Khan and Kamaluddin, 2006 and 2009).

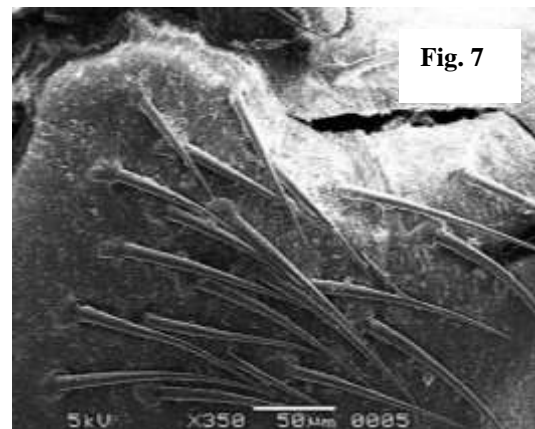
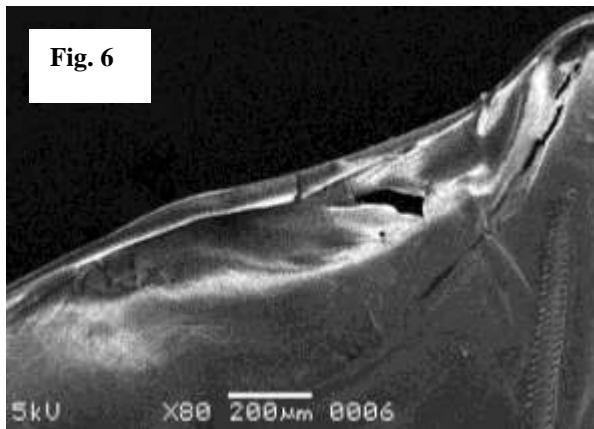
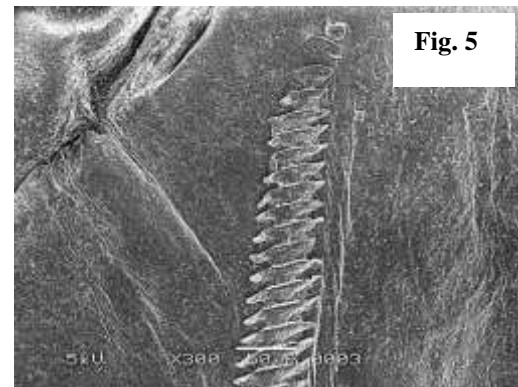
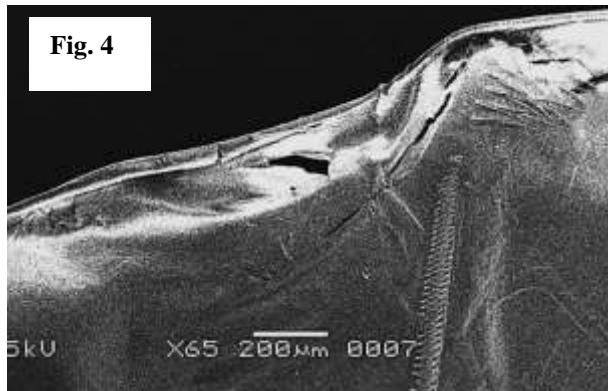
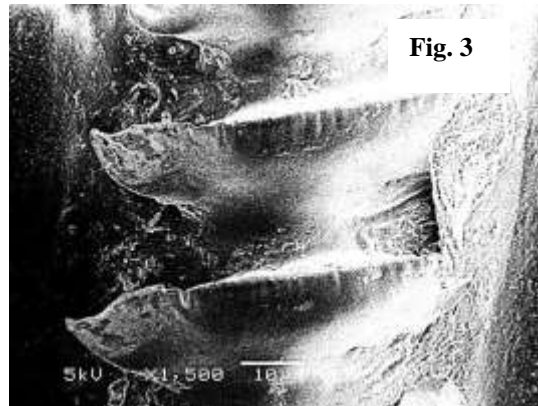
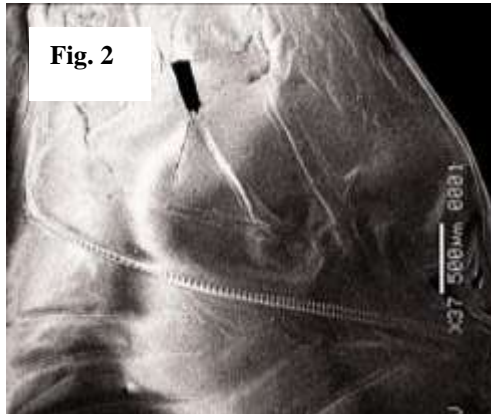


Fig. 2. Stridulatory File; Fig. 3. Stridulatory Teeth; Fig. 4. Anal Region; Fig. 5. Anal Teeth; Fig. 6. Plectrum; Fig. 7. Microtrachea.

In Pakistan only a few researchers worked on the family Gryllidae i.e., Saeed *et al.* (2000) revised different genera of the family Gryllidae and also presented some new species by describing their morphological and genital characters.

Chopard (1969) described the genus from Oriental region on the basis of their external morphological characters and genital structure, but no one described their acoustic characters.

Presently the representative of the sub-family Gryllinae was identified for the first time from Pakistan on the basis of their stridulatory file and teeth profile.

Otte and Cade (1984), and Otte (1987) identified the sub-family Gryllinae with reference to their external morphology, genital characters and correlated with their sound pattern. Presently a representative of the sub-family Gryllinae was identified for the first time from Pakistan on the basis of their stridulatory file and teeth profile. Walker and Carlisle (1975) described the structure of the stridulatory file teeth in crickets with reference to acoustic implications for ascertaining their taxa.

REFERENCES

- Bennet-Clark, H. C. (1989). *Cricket behaviour and neurobiology*, 227-261.
- Chopard, L. (1969). The fauna of India and adjacent countries (Orthoptera: Gryllidae). *Fauna India*, 2: 1-421.
- Desutter-Grandcolas, L. (1995). Toward the knowledge of evolutionary biology of phalangopsid crickets (Orthoptera: Gryllidae: Phalangopsidae): data, questions and scenarios. *Journal of Orthoptera Research*, 4: 163-175.
- David, J.A.O., E. Zefa and C.S. Fontanetti (2003). Cryptic species of *Gryllus* in the light of biacoustic (Orthoptera, Gryllidae). *Neotropical Entomology*, 32: 75-80.
- Fulton, B. B. (1932). North Carolina's singing orthoptera. *Journal of the Mitchell Society*, 55-69.
- Khan, N. and S. Kamaluddin (2006). Aspects of morphology of head, thorax and abdomen and their appendages of *Pteronemobius indicus* (Walker) (Orthoptera: Gryllidae: Nemobiinae) and their relationship. *Pakistan J. Entomol. Karachi*, 21(1 and 2): 11-14.
- Khan, N. and S. Kamaluddin (2009). Two new species of the Genus *Scottiola* Uvarov (Orthoptera: Gryllidae: Nemobiinae) from Pakistan with Cladistic Relationship. *Int. J. Bio. Biotech.* 6 (3): 103-108.
- Koch, U. T., C. J. H. Elliott, K.-H. Schaffner and H.-U. Kleindienst (1988). The mechanics of stridulation of the cricket *Gryllus campestris*. *J. comp. Physiol.*, A 162: 213-223.
- Michelsen, A. and H. Nocke (1974). Biophysical aspects of sound communication in insects. *Advances in Insect Physiology*, 10: 247-296.
- Otte, D. (1987). African crickets (Gryllidae). 9. New genera and species of Brachytrupinae and Gryllinae. *Proceeding of the Academy of Natural Sciences of Philadelphia*, 139: 315-374.
- Otte, D. and W. Cade (1984). African crickets (Gryllidae). 6. The genus *Gryllus* and some related genera (Gryllinae: Gryllini). *Proceeding of the Academy of Natural Sciences of Philadelphia*, 136 (1): 98-122.
- 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.
- Sismondo, E. (1979). Stridulation and tegminal resonance in the tree cricket *Oecanthus nigricornis* (Orthoptera: Gryllida: Oecanthinae). *Journal of Comparative Physiology*, A, 129: 269-279.
- Walker, T. J. (1963). The taxonomy and calling songs of United States tree crickets (Orthoptera: Gryllidae: Oecanthinae). 11. The *nigricornis* group of the genus *Oecanthus*. *Ann. Ent. Soc. Amer.*, 56(6): 772-789.
- Walker, T.J. and T.C. Carlisle (1975). Stridulatory file teeth in crickets: taxonomic and acoustic implications (Orthoptera: Gryllidae). *Int. J. Insect Morphol. and Embriol.*, 4: 151-158.

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