

## SOUND PRODUCING ORGANS OF *ACHETA KHANPURENSIS* KHAN AND AHMAD 2016 WITH ITS VALUE IN CONFIRMATION OF TAXONOMIC IDENTIFICATION OF *ACHETA* SPECIES

Nasreen Khan\*<sup>1</sup> and Imtiaz Ahmad<sup>2</sup>

<sup>1</sup>Department of Zoology, Faculty of Science, Jinnah University for Woman, Karachi, Pakistan.

<sup>2</sup>Room No. 15, Biological Research Centre, University of Karachi, 75270, Karachi, Pakistan.

\*e-mail: nasreen\_khan2007@yahoo.com

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### ABSTRACT

*Acheta khanpurensis* Khan and Ahmad 2016 was described from Khanpur, Punjab Pakistan. Presently its sound producing organs, especially its files and teeth structures are described and compared with other *Acheta* species from Pakistan and adjacent areas. The distinctive nature of stridulating sound producing structure, such as files, teeth etc. provide some of the most important characteristics for the identification of males of *Acheta* species.

**Key Words:** *Acheta khanpurensis*, Stridulatory teeth, Tegmina, Pars stridens, Identification.

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### INTRODUCTION

In Gryllidae the sound producing organs i.e., length of file, number of teeth and density of teeth are important features to separate the male callers but the distribution, body size, colour patterns and morphometric features are considered insufficient for their identification (Weissman *et al.*, 1980)

The fauna of Ensifera have a prominent position in their sounds producing organs and behavioural patterns with reference to their tegminal stridulatory structures (Desutter-Grandcolas, 2003). Tegminal region of male crickets have two large membranous areas in between harp and mirror that work as resonator and produce sounds (Nocke, 1971; Michelsen and Nocke, 1974; Sismondo, 1979; Bennet-Clark, 1989). Rhythmic patterns in Ensiferen fauna are always variable in different taxa and remarkably consistent in conspecific members (Alexander, 1962; Popov, 1972; Bennet-Clark, 1989; Otte, 1992; Desutter-Grandcolas, 1998a, 1998 b). Sound produced by gryllids is to attract females, at high and low range and also interacts between male and male (Alexander, 1960, 1968). The variations in different taxa in the structure of their stridulatory organs, songs and behavioural sound-related ecological features of Gryllidae help to solve the problems of their origin and evolutionary diversity (Desutter-Grandcolas, 2003).

*Acheta khanpurensis* was described from Khanpur, Punjab with special reference to its tegmen and male genitalia (Khan and Ahmad, 2016), but its sound producing organs specially its files and teeth structures are important features used to separate it from the only other *Acheta* species i.e. *A. domesticus* which occur in Pakistan (Ahmad and Khan, 2015), and would also separate it from its counter parts described by Gorochov (1993) from Saudi Arabia.

### MATERIALS AND METHODS

Fifteen specimens were collected from Khanpur, Punjab, Pakistan mostly at night, when these are easily detected by their sounds and were easily handpicked under the grasses, and litters, near the plants. They usually were collected in summer season. After collection the specimens were preserved in the pinned dry form after stretching their wings and legs in the fresh specimens.

The identification of the present taxon was confirmed by the courtesy of Dr. Libin Ma, Northeast Normal University, Changchun, China, as *Acheta* sp.

The preserved specimens were boiled for softening. The right tegmen was then detached with the help of a pair of forceps, then placed on a slide to clean it with brush using 40% formalin, and covered with a cover slip and taking photographs by using Nikon Cool Pix 5400 digital camera after placing it under Nikon SMZ 800 Binocular microscope.

Then the right tegmen of the specimen was mounted on a stub for the study of file structure and placed in a desiccator with Silica gel to dry. The sample was placed to coat with auto coater into JEOL model No. JFC-1500 Japan having gold target, which coated up to 300<sup>0</sup>A. Then it scanned with Scanning Electron Microscope, JEOL Japan model No. JSM 6380A and studied after taking SEM photographs of file from the ventral region at a given

high magnification. The teeth of file, their size, distance, the structure of plectrum and structure of microtrachea were analyzed and studied. SEM photographs were further analyzed and compared by using the software of Coral Draw 13.

## RESULTS

### Tegmina: (Fig. 1)

Tegmina almost reaching to apex of abdomen. Stridulatory file curve. Wings long. Length of tegmina 07.0 -7.4 mm., width 3.2-3.5 mm. Other tegminal characters such as different longitudinal and cross veins, cells, shape and size of mirror etc. were described by Khan and Ahmad (2016).

### Pars stridens: (Figs. 2-5)

Teeth evenly distributed on entire file, starting before basal end of stridulatory file. Distance between teeth variable, terminal regions having minimum distance. Morphology of a single tooth resembling with those of other species of same genus. Teeth of medium size, base narrow, cusp thick, wavy at middle, without any wrinkle, narrow, basal area broad, round, dorso-ventrally flattened, apical area thick. Anterior wing shorter and broader than posterior wing, sub-acute at lateral margin, basal margin broad, flattened. Posterior wing longer and narrower than anterior wing, acute at lateral margin, basal margin straight, flattened. Both wings straight at their apical margin, not curved towards anal region. Costal teeth shorter, with shorter and flattened wings than median teeth, having minimum distance. Anal teeth different from costal and median teeth in size, and shape, with elongate, thin, crescent shape, cusp deeply concave, regular, lateral wings long, lateral margins sub-acute, terminal teeth of variable shape, overlapping at each other.

Plectrum oval at anterior region, pointed at posterior region. Anal margin feebly curved, thick, turned over plectrum, costal margin broad, deeply round. Microtrachea many in number, long, straight, thick, pointed at apex.

Length of file 1.8-2.0 mm, plectrum 0.9 mm, total number of teeth 176-185, including minor and asymmetrical teeth. Density 90-97.2 teeth per millimeter.



Fig. 1. Dorsal view of male Tegmen of *A. khanpurensis*.

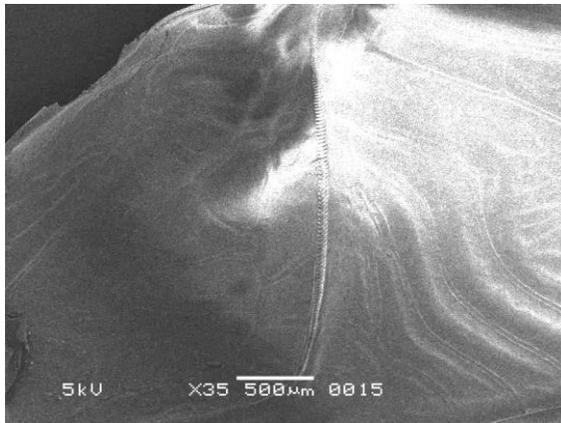


Fig. 2. Ventral view of Stridulatory File.

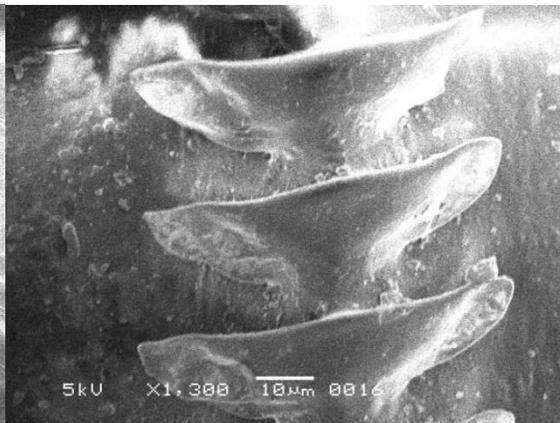


Fig. 3. Stridulatory Teeth.

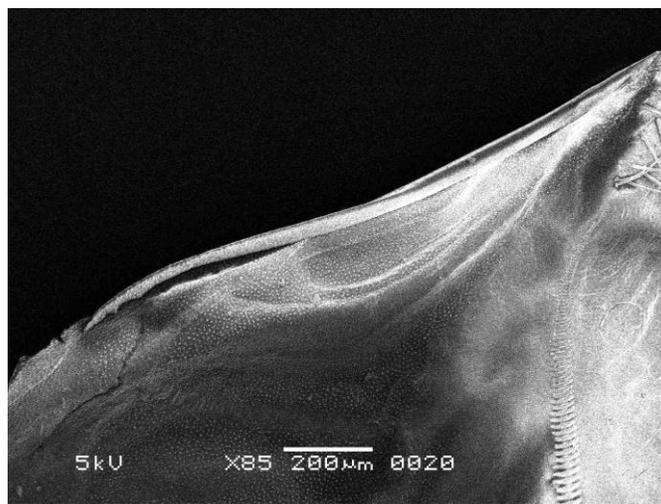


Fig. 4. Ventral view of Plectrum.

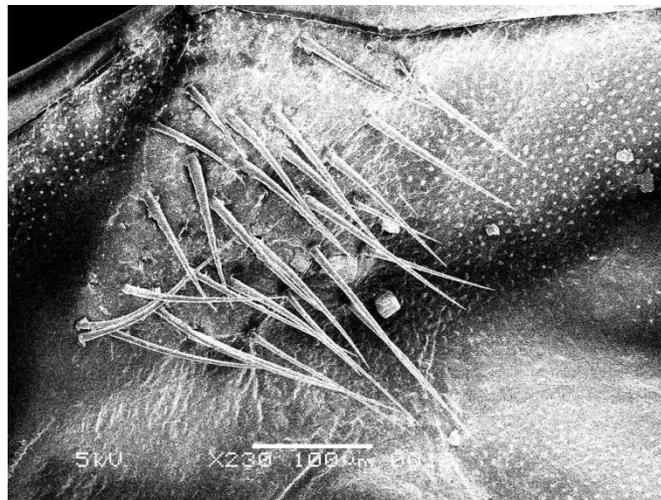


Fig. 5. Microtrachea.

## DISCUSSION

Alexander (1957), Weissman and Rentz (1977), Gray (1997) and Moradian and Walker (2008) described not only the acoustic characters of different species of *Acheta* but also the male sound producing organs i.e. structure of

stridulatory file, number and density of teeth, etc. and analyzed them to identify the different species. These characteristics were thought to be more reliable for the identification and separation of sibling species.

The representatives of *A. domesticus* appear to be clearly separated from *A. khanpurensis* on the basis of their sound producing characteristics, i.e., length of stridulatory file 2.9-3.7 mm, number of teeth 176- 225 and density of teeth 53.2-75.5 per mm (Weissman *et al.* 1980), The representatives of the genus *Gryllus* (L.) appear to be clearly separated from those of the genus *Acheta* of family Gryllidae on the basis of their sound producing characteristics, i.e., number of teeth in stridulatory file is less than 175, with the density also less than 50 teeth per mm. and length of stridulatory file distinctly less than 3 mm. in *Gryllus*.

Whereas in *A. khanpurensis* length of stridulatory file is 1.8- 2.2 mm. number of teeth usually never more than 185 and density of teeth much higher than that in *A. domesticus*. i.e. *A. domesticus* 90- 97.2 teeth per mm.

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