On the distribution and taxonomy of *Conocephalus* species (Orthoptera: Tettigonioidae: Conocephalinae) from Pakistan

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**Key words:** Occurrence, taxonomy, *Conocephalus*, wide range, measurement, forest.

**Abstract**

A detail survey for the collection of *Conocephalus* species has been carried out during the year 2011-2013 in various provinces of Pakistan. A single genus with single species i.e, *Conocephalus maculates* (Le Guillo) was recorded in large numbers. Besides this, important taxonomic character along with drawing lines, measurement of various body parts was also provided. At the present its occurrence is confirmed throughout the country. It was also observed that *Conocephalus* species damage the wide range of cultivated plants when these are established in areas from where the forest has been cleared.

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Introduction

The genus *Conocephalus* Thunberg belongs to Conocephalinae has been recognized with nearly 156 species throughout the world (Otte and Naskrecki, 2004). The grasshoppers belonging to this genus are common in the fields and are easily distinguished from the other grasshoppers found in Pakistan by their smaller size, slanting shaped head, long antennae and sword shaped ovipositor. It is the pest of agriculture fields of rice, sugarcane, forests, fruit orchards, grapevine, berry shrubs, hilly, semi desert and desert areas, trees, shrubs, herbs and grasses and cause considerable rapid pace of deforestation.


Moreover, recent few authors (Desutter, 2003, Heller and Lehman, 2003, Heller, 2004, Jost, 2006 Hungel, 2009, Eades and Otte 2010) have provided phylogenetic relationship, distribution, stridulation process from the other countries. In addition to this (Ramme, 1951, Karabag, 1958, Karabag et al., 1971, 1981, Ciplak et al., 1996, Sevgili and Ciplak, 2000) have published an important work on many aspects of bush-crickets alongwith addition of new genera and species in this group from abroad. But the representative of *Conocephalus* is very less studied from Pakistan except Wagan (2008) who gave its brief account from Hyderabad. It was important to learn more about the hidden facts of *Conocephalus* from Pakistan this study is the beginning of a survey of *Conocephalus maculates* in Pakistan, which we hope can be continued in the future by other researchers.

Materials and methods

Study sites

The adults of *Conocephalus maculates* were collected from the agriculture fields of rice, sugarcane, forests, fruit orchards, grapevine, berry shrubs, hilly, semi desert and desert areas, trees, shrubs, herbs and grasses with the help of traditional insect hand-net (8.89 cms in diameter and 50.8 cms in length) as well as by hand pick through large forecep. The collection was made during the year 2011-2013 in the months of March to October from various provinces of Pakistan (Map. 1).

Map. 1. Showing the collection of *Conocephalus maculates* species from various districts of Pakistan.

Killing and preservation of grasshoppers

Field collected specimen’s were brought into the laboratory and were killed and preserved by adopting method of Vickery and Kevan (1983) and Riffat and Wagan (2012).

Depository

All the collected material has been deposited in the Entomological Museum Department of Zoology, University of Sindh, Jamshoro.

Identification and drawing lines

Identification of specimen was carried out under the Stereoscopic Dissecting Binocular Microscope with the help of keys and description available in literature and on the “Web site (http://www.orthoptera.org) Orthoptera Species File Online” The diagrams were all drawn with the help of “Ocular Square Reticule” fitted in one Ocular of Binocular dissecting microscope. All the measurements are given in millimeter and were made with scale, divider, and ocular square graph.

Statistical analysis

Data obtained from experimental groups was subjected to one-way analysis of variance (ANOVA) (SPSS 10.0 Soft Ware) with repeated measures and significant means were determined using Latter Significantly Different Range Test (LSD). These tests
were used to compare the means of the various treatments.

Results and discussion

Genus Conocephalus Thunberg, 1815

Conocephalus Thunberg, 1815: 214;
Anisoptera Bethold, 1827: 409;
Neoxiphidion Karny, 1912: 8;
Palotta Walker, 1869: 249;
Xiphidion Audinet-Serville, 1831: 159;
Xiphidium Burmeister, 1838: 707;
Xiphidium Fieber, 1853: 170.

Type species Gryllus and Tettigonia and conocephalus Linnaeus, 1767.

Genus Diagnosis

Smaller in size, vertex less or more flat laterally, and round at apex, frontal fastigium higher than head from lateral view. Pronotum having oblique and triangular lobes. Tegmina and hind-wings fully developed or shortened. Fore and mid femora without spines on ventral sides. While hind femur having two sharp spines on the knees, fore and mid tibia with short ventral spurs but on dorsally these spurs are not found. Tympanal organ close on fore tibiae. ♂ Cerci having teeth inside. Ovipositor smooth and sword shaped.

Conocephalus (Anisoptera) maculates (Le Guillou, 1841)

Xiphidium maculatum Le Guillou, 1841: 294;
Locusta (Xiphidium) lepida De Haan, 1842: 189;
Locusta (Xiphidium) continua Walker, 1869: 271;
Locusta (Xiphidium) maculatum Walker, 1869: 275;
Xiphidium sinense Walker, 1871: 35;
Anisoptera maculaturn Kirby, 1906: 278;
Xiphidion maculatum Karny, 1907: 93;
Xiphidium maculatum Matsumura et Shiraki, 1908: 51;
Xiphidion neglectum Bruner, 1920: 123;
Conocephalus (Xiphidion) maculatus Karny, 1912: 11;
Conocephalus maculatus Bolivar, 1913: 8;

(Fig:1 A-H)

Diagnostic characters

Smaller in size with dark brown dorsal ventral bands. Antenna with (206) segmented and dark brown in color. Fastigium of vertex moderately wide(Fig 1 A-D). Prosternum bispinose wings fully developed and having large dark spots. No marking in costal and pre-costal areas; cross veins of costal and precostal areas of fore wings irregular to almost regular. Stridulatory file of left male fore wing shaped, hind femora unarmed ventrally; tibiae marked with spot towards base, dark on mid tibiae often faint on other hind tibiae with 6 apical spurs, ♂ cerci with one internal spine(Fig 1 G)female cerci lack spine(Fig 1 H). Ovipositor very short and relatively straight (Fig 1 E-F). Measurement of different body Parameters has been shown in Table 1.

Table 1. Showing measurements of various body parts of Conocephalus maculates.

<table>
<thead>
<tr>
<th>Body Parameters</th>
<th>Male (n=15)</th>
<th>Female (n=15)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean±SD</td>
<td>Min-Max</td>
</tr>
<tr>
<td>Length of pronotum</td>
<td>3.13±0.02</td>
<td>3.1-3.17</td>
</tr>
<tr>
<td>Length of tegmina</td>
<td>18.96±0.18</td>
<td>18.6-19.2</td>
</tr>
<tr>
<td>Length of femur</td>
<td>11.91±0.18</td>
<td>11.6-12.2</td>
</tr>
<tr>
<td>Length of ovipositor</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>Total body length</td>
<td>13.94±0.16</td>
<td>13.7-14.2</td>
</tr>
</tbody>
</table>

Material Examined

Several specimens’ from various localities of Pakistan has been collected see Table.II.

Ecological account

C.maculates is small hygrrophilous insect. It is mostly associated with marshy habitats having tall grasses. Some specimen’s of this species have been observed
during night hours rushing on high branches on tree and foliage while exploring the surrounding with them tremendously long antenna. These grasshoppers usually appear in the beginning of April and remain in the field till late July. Thus insect is associated with wide range of cultivated plants at present it was collected from Poa annua, Poa aegptiaca, Oryza sativa (L), Tritium aestivum, Vinca rosea, Cynodon dactylon, Helianthus annus ,Poa tenella Sesbania bispinosa ,Tamarix aphylla ,Tamarix articulate, Tamarix dioica Echinochloa colonum , and Vitis sp. species in fairly large numbers. Using knowledge of habitat preference of Conocephalus maculates the distribution pattern locally restricted species can be understood.

Table 2. Collection of Conocephalus maculates from various provinces of Pakistan during the year 2011-2013.

<table>
<thead>
<tr>
<th>Provinces</th>
<th>Year</th>
<th>♂ Mean±SD</th>
<th>♀ Mean±SD</th>
<th>♂ Mean±SD</th>
<th>♀ Mean±SD</th>
<th>♂ Mean±SD</th>
<th>♀ Mean±SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sindh</td>
<td>2011</td>
<td>1.5±0.68</td>
<td>1.54±0.68</td>
<td>1.66±0.88</td>
<td>1.5±0.67</td>
<td>2.75±2.22</td>
<td>2.25±1.35</td>
</tr>
<tr>
<td>Punjab</td>
<td>2012</td>
<td>1.45±0.68</td>
<td>1.36±0.50</td>
<td>1.72±1.009</td>
<td>1.27±0.46</td>
<td>3.04±1.0</td>
<td>2.09±1.13</td>
</tr>
<tr>
<td>KPK</td>
<td>2013</td>
<td>1.33±0.5</td>
<td>1.14±0.37</td>
<td>1.66±1.11</td>
<td>1.33±0.5</td>
<td>2.88±0.60</td>
<td>2.0±0.70</td>
</tr>
<tr>
<td>Balochistan</td>
<td>2011</td>
<td>3.0±1.0</td>
<td>2.0±1.0</td>
<td>3.66±1.5</td>
<td>3.0±1.0</td>
<td>6.33±0.57</td>
<td>4.66±1.52</td>
</tr>
</tbody>
</table>

**Distribution**

This species mostly distribute in Pakistan, China, Japan, Philippines, Malaysia, Indonesia, Burma, Thailand, Nepal, Bengal, India, Sri Lanka, New Guinea, Australia, Ethiopia, Madagascar, Africa.

**Fig. 1.** Conocephalus maculates (Le Guillou, 1841)
A-B Female: adult Lateral view; C-D same but Male; E-F Female Ovipositor lateral view; G Male Cerci; H same but Female.

**Remarks**

A large number of this species have been collected from various cultivated fields which confirmed the presence of this insect throughout the country. At the present it was observed that some specimen’s tegmina and wings are white in color and without any spots. On contrary to this majority of specimens came in our collection are dark in color with numerous spots. It might be due to geographical conditions of the region or might be these two distinct species but our latter detailed genetalia study will confirm it’s exact status. Earlier Shishodia and Gupta (2009) reported this species from Chamba, Sirmour and Solan (India). In addition to this Garai (2002) recorded 3 ♂ and 1 ♀ from northern areas of Pakistan without giving any exact locality, similarly Wagan (2008) reported 2 ♂ having white color tegmina and wings from Miani forest Hyderabad Sindh. At the present we have collected large numbers from various districts of Sindh.

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**References**


