



Original Article

Ecological Status of Treehopper *Caresa tuarina* in District Hyderabad, Sindh Pakistan

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ABSTRACT

The treehopper, also known as *Caresa tuarina*, is an intriguing creature with more than a hundred recorded species. Treehoppers are a very diverse group of insects, that play a crucial role in the ecosystem, yet many species remain uncovered in terms of their ecological status.

Objectives: To investigate the ecological status of *C. taurina* and propose conservation strategies to ensure its preservation in the district Hyderabad, Sindh, Pakistan. **Methods:** Field survey was carried out in different areas of Hyderabad to investigate the habitat and population of *C. taurina*. For preservation of *C. taurina* specie, naphthalene balls and 70% alcohol were used. Environmental factors including temperature, humidity, plant cover, air pressure, soil type, and UV index and habitat structure were noted at each sample location. **Results:** The collected treehoppers were small size insects, measuring around 8 mm in length. Agricultural areas and riparian zones were shown to be important habitats for *C. taurina* populations. Different physical characteristics included soil type was lay and whose terrain was plane land; there was a full moon, 34°C in the mean temperature; 27% Mean humidity; 21.22 psig of air pressure; and a moderate UV index. Urbanization, intensified agriculture, pesticide usage, and changes in habitat appropriateness brought on by climate change are the main causes of habitat degradation for populations of *C. taurina*. **Conclusions:** It is concluded that population of treehoppers (*C. taurina*) mostly found in agriculture and riparian zones. They are facing habitat degradation as a result of urbanization, intensive agriculture, pesticide use, and changes in habitat appropriateness brought on by climate change.

INTRODUCTION

Treehoppers (*Caresa tuarina*) are any of the roughly 3,200 identified species belonging to the family of insects known as Membracidae, which are part of the order Hemiptera. They are easily identifiable by their distinctive vertical faces and enlarged thoraxes. The treehoppers vary in color and often have speckles or stripes. These insects can be found mostly in tropical regions and feed on sap. Honeydew, a sweet byproduct of digestion, is secreted by several treehoppers [1]. The elaborate structures on the treehoppers resemble thorns, leaves, and ants but are not wings [2]. The Membracidae family of insects includes leafhoppers, cicadas, thorn bugs, and treehoppers, with approximately 400 genera [3]. The leafhopper, a distinct

insect, possesses a unique mouthpart similar to that of the cicada, that allows it to feed on tree sap by penetrating the bark. It secretes saliva that prevents the tree from healing the bitten area [4]. The Membracidae family, which includes the treehopper family, is a member of the Homoptera order, also known as the true bug. They are grouped with cicadas and leafhoppers in the Cicadoidea superfamily, found in the northern regions of Mexico. These insects share similarities in their legs and wing venation, as well as short, bristle-like antennae and three-segmented feet (tarsi). The treehopper family is distinguished from closely related families by their large pronotum, the shield-like first segment of the thorax that resembles a neck or

shoulders. In many species, the pronotum extends forward to cover the head and backward to cover the abdomen. [5]. Treehopper pronota commonly displays spikes, humps, odd shapes, or pointed thorns [6]. The process of sympatric speciation has led some treehopper species, like the *Enchenopa binotata* complex, to develop unique traits. In contrast, others, such as *Paragus apicalis*, form a mutualistic bond with wasps [7]. Geckos also share a symbiotic relationship with treehoppers, as they exchange information via small vibrations in their abdomen [8]. Mutualism extends beyond protection from predators. In the presence of ants, *Publilia concave* treehopper pupae have a greater likelihood of survival, even without predators. This is due to ants collecting honeydew, which prevents mold growth and aids in treehopper excretion and host plant photosynthesis. Collecting honeydew may also facilitate foraging, allowing leafhoppers to consume more [9]. Females lay eggs in holes cut into living tissue or cambium of the stem, using a saw-shaped ovipositor. Some species rhythmically lay eggs during takeoff or on the stem. Females of acid-hybrid species protect their eggs from predators and parasites by sitting on them and can use their wings to fight off intruders. [10]. Although most species are harmless to humans, a few are considered minor pests, such as the spiny beetle *Umbonia crassicornis*, the alfalfa leafhopper *Spissistilus festinus*, and the buffalo leafhopper *Stictocephala bisonia*, which have been introduced to Europe. The *Oxyrachis tarandus* beetle is also recorded as a pest of *Withania somnifera* in India [11, 12]. The complex family of insects known as treehoppers (Membracidae) is distinguished by its distinct form and wide range of ecological functions. A species of special interest among them is *C. taurina* because of its unique traits and its ecological relevance.

Numerous treehopper species are still little known despite their significance, particularly in regards to their ecological state and need for conservation. By systematically examining the ecological state of *C. taurina* in Hyderabad District, Sindh, Pakistan, and putting forward to inform conservation methods to guarantee its preservation, this study sought to close this gap.

METHODS

The ecological status of Treehopper *C. taurina* was determined in the district of Hyderabad, Sindh, Pakistan because of its diverse range of ecosystems and abundance of possible habitats shown in figure 1



Figure 1: Map of Sindh Pakistan, District Hyderabad, from where the Collection of Treehopper (*Caresa tuarina*) was Done

To determine the distribution and abundance of Treehopper *C. taurina*, field surveys were carried out in the different areas of research regions in a variety of habitats. The selection of sampling locations was based on accessibility and ecological variety. To determine *C. taurina*'s preferred habitat, environmental factors including temperature, humidity, plant cover, and habitat structure were noted at each sample location in Hyderabad shown in figure 2.



Figure 2: Habitat Shrub (*Prosopis juliflora*) where Treehoppers (*C. taurina*) Live and Feed

To estimate population density and identify taxonomy, 1000 specimens of *C. taurina* were collected. In order to evaluate the reproductive strategies and changes in abundance of the species, population dynamics, including seasonal variations, were examined. The eco-biological parameters were measured in the terrestrial environment while the physical parameters were measured using an Android app called "Weather Forecast," a thermometer, and a hydro thermograph (HTC -1). These 1000 specimens of the *C. taurina* were preserved in a container containing 70% alcohol for two hours. After that, the specimens were placed in a petri dish to dry. Finally, the specimens were

pinned into a wooden box, and a Naphthalene ball was added to preserve and protect the specimens of treehopper species permanently as shown in figure 3.



Figure 3: Preservation of treehoppers

RESULTS

The present research indicates that treehopper *C. taurina* is widely distributed across the District Hyderabad's diverse habitats. Diverse ecosystems had varying population densities, nevertheless, with some areas exhibiting more abundance than others. During the current studies, the biological characteristics of the treehopper species known as *C. taurina* were observed. The studies reflect the various biological entities that surround the treehopper, including the house sparrows (*Passer domesticus*), and hens (*Gallus domesticus*). The treehopper was observed during sunlight. The collected treehoppers in small size insects, measuring around 8 mm in length had three pairs of legs, one pair of wings, circular eyes, and horns. Its outer covering is tough as shown in figure 4.



Figure 4: Treehopper (*C. taurina*) collected from district Hyderabad, Sindh, Pakistan

C. taurina showed a preference for environments with a moderate amount of plant cover and a microclimate that is generally stable. Agricultural areas and riparian zones were shown to be important habitats for *C. taurina* populations.

The *Prosopis juliflora* shrub plants serve as the home and food source for treehoppers (*C. taurina*). Different physical characters were measured during several day times from August 24 to September 24, 2023 as shown in table 1.

Table 1: Physical Characteristics

Date	Time	Sunlight	Temperature (°C)	Topography	Humidity	Air Pressure	Type of Soil	UV Index
24/9/2023	4:13 pm	Sunny	34°C	Plane land	27%	21.22 in Hg	Clay	Moderate
26/9/2023	6:20 pm	Sunny	36°C	Plane land	24%	20.71 in Hg	Clay	Moderate
29/9/2023	12:56 pm	Sunny	41°C	Plane land	29%	29.71 in Hg	Clay	Very High
29/9/2023	2:29 pm	Sunny	43°C	Plane land	17%	29.73 in Hg	Clay	Moderate
29/9/2023	3:35 pm	Sunny	44°C	Plane land	23%	29.73 in Hg	Clay	Moderate

DISCUSSION

The *Prosopis juliflora* shrub plants serve as the home and food source for treehoppers. Current study reflected the characteristics of treehoppers being observed and measured to understand the ecology of these insects. Different physical characteristics were measured during month of August and September 2023 Biological parameters which consist of different biological entities were studied which include; Butterflies (*suborder Rhopalocera*) [13], Snakes (*Serpentes suborder*) [14] and Dogs (*Canis lupus familiaris*) [15]. 70 % alcohol and naphthalene bolls were used in the preservation of treehoppers to preserve and protect the specimens of treehoppers. For the first time, Pakistan has recorded the presence of the tiny sucking insect pests known as treehoppers on sunflower. Treehopper attacks typically begin in the third week of May and continue until the third week of June. In the fall, they are first seen in the second week of September and continue until the crop is harvested. In our study, treehopper infestations were noted near the base of the leaf stem and at the point where the plant's leaf and stem met, where they fed on both. Treehoppers are easily identified by their long pronotum, which often resembles horns. After eating, they release a sticky, delicious substance called honeydew, which often attracts ants. The current results are consistent with previous research [16], which found that the treehopper is a frequent insect pest on numerous species of Helianthus in southern latitudes as well as farmed sunflower. Due to the release of honey dew, the treehoppers are often attended by a large number of ants and inhabit the stems of sunflower leaves and plant [17]. In the current study, the

biological characteristics of the *C. taurina* were observed. The previous studies reflected that that human activities, environment pressures and other biotic and abiotic factors exert ecological processes [18]. The environment directly selects desirable characteristics and excludes organisms with characteristics unprepared to that particular habitat [19]. The present study of functional characteristics provided information on the direct physiological adaptations of plants to certain settings. Eighteen families and forty-three species have been discovered in the present inquiry. The species found in this study are comparable to those found in several locations of District Hyderabad areas as described by previous researchers [20]. The various biological entities that surround the *C. taurina*, include the house sparrows (*Passer domesticus*) [21] and hens (*Gallus domesticus*) [22]. Observations were made of the physical characteristics of the *C. taurina* about sunlight, temperature, topography, humidity, air pressure, soil types, and ultraviolet index.

CONCLUSIONS

It is concluded that population of treehoppers (*C. taurina*) was mostly found in agriculture and riparian zones. They confronted habitat degradation as a result of urbanization, intensive agriculture, pesticide use, and changes in habitat appropriateness brought on by climate change.

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Authors Contribution

Conceptualization: IB, BS, SAM, AS

Methodology: IB, BS, SAM, AS

Formal analysis: IB, BS, SAM, AS

Writing-review and editing: IB, BS, SAM, AS

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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