FIRST RECORD OF *TROPIDOCEPHALA SACCHARIVORELLA* MATS. FROM INDIA

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DAMMERMAN (1929) mentions the Delphacid, *Tropidocephala sacchearivorella* Mats., as a rather serious pest of sugarcane in South China and Formosa and that it has also been recorded from Mindanao, in the Philippines. Copeland (1917) and Schumacher (1920) earlier referred to its occurrence on sugarcane in the Philippines and Formosa respectively, the former considering it to be of pest status. Box (1953) recorded it as occurring only in China (Southern), Formosa and the Philippines (Mindanao). However, Johnston (1961) mentioned its occurrence on sugarcane only in the Philippines.

During the course of work on sugarcane pests and their natural enemies, the present author has recorded this species for the first time on sugarcane at Bangalore and Mandya in Mysore State, India. According to information received from the Commonwealth Institute of Entomology, London, to whom material was sent for identification, this is the first record from India. Additional material of the same species had also recently been received from Kantalai, Ceylon. Usman, Sivashankara Sastry and Puttarudriah (1957) have listed a *Tropidocephala* sp., under "casual insects (incidental insects)" collected on sugarcane in the Visvesvaraya Canal tract of Mandya District. It is quite possible that the species referred to by them is the same as the one now under consideration. Although it may, at present, be an unimportant insect in India, in view of the fact that it is said to be a serious pest of sugarcane in South China and Formosa (Taiwan), it would appear to be worth-while making a careful survey of all the sugarcane growing areas in India to (1) find out its exact present distribution and (2) keep a watch on it so that immediate and effective measures for its control can be undertaken should its population increase in any area, possibly as a result of any changes that might occur in methods of sugarcane cultivation, irrigation, etc.

To enable those connected with sugarcane cultivation in the country to recognize the pest, an illustration of it is included in this note. It is a pale greenish insect 3 to 4 mm. in length, the forewings being hyaline with brown lines and spots, the apical portion with four longitudinal blackish stripes.

Although one may surmise that certain ecological conditions have not permitted this insect to attain a pest status so far in India, a case for comparison is that of *Numicia viridis* Muir which was unknown as a pest of sugarcane in South Africa until 1962 when symptoms of its attack became acute over a considerable part of the sugarcane plantations in Swaziland and parts of Natal and today it is one of the most destructive of pests of sugarcane in that country.

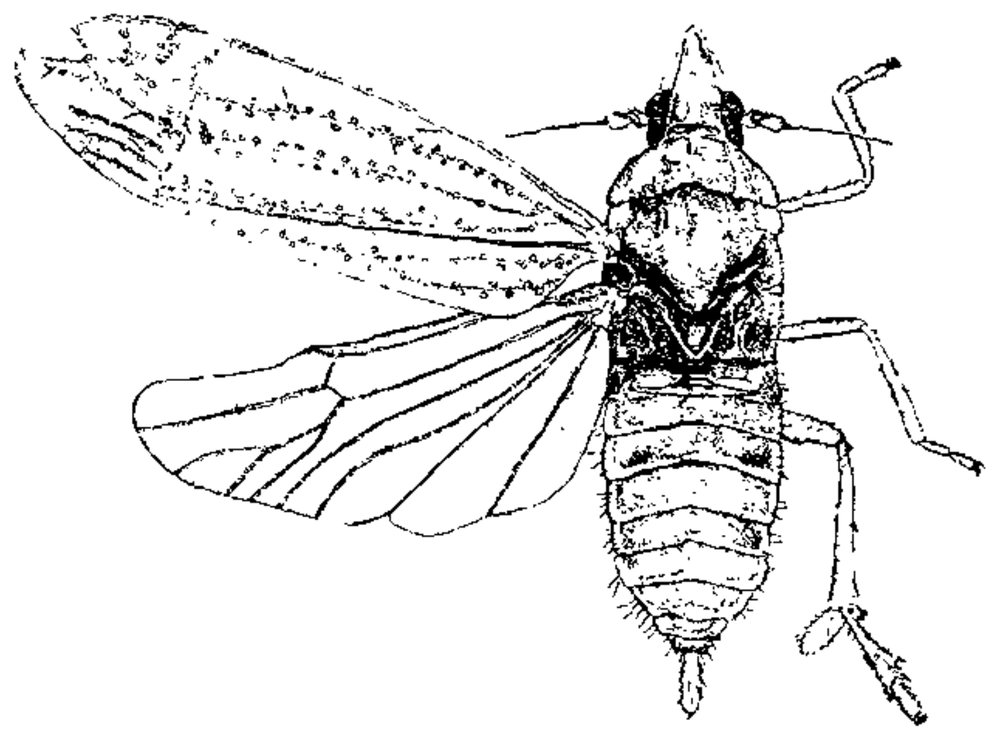

FIG. 1. Dorsal view of *Tropidocephala saccharivorella* Mats, × 35.

It is quite possible that the native home of *T. saccharivorella* is South China and it has gradually spread to Taiwan, the Philippines and Indonesia. There is also a possibility that the insect has been introduced into India along with Java varieties of sugarcane in earlier years when plant quarantine stations did not exist at ports of entry. The record of this possibly exotic insect again stresses the importance of plant quarantines to prevent the spread of insect pests from one country into another.

Although *T. saccharivorella* is an important pest, no information is available as regards its natural enemies in South China, Taiwan, the Philippines or Indonesia. Box (1953) does not mention any of them. It may, therefore, be worthwhile for all countries where the insect occurs to make a survey and find out what its natural enemies are and arrange for their exchange, if any of them do not occur in a country with a view to trying the same for biological control of the pest.

The author is very grateful to Mr. E. O. Pearson, Director, Commonwealth Institute of Entomology, for arranging to identify specimens of this species collected by him.

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3. Dammerman, K. W., *The Agricultural Zoology of the Malay Archipelago*, J. H. De Bussy Ltd., Amsterdam, 1929, pp. 473.
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5. Schumacher, F., "Der gegenwartige stand unserer kenntnis von der Homopteran—Fauna der Insel Formosa," *Mitt. Zool. Mus. Berlin*, 1920, **8** (1), 73.
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MIXING AND CIRCULATION IN GAUTAMI-GODAVARI ESTUARY

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THE nature of circulation in the river estuaries has been discussed in considerable detail by Rochford,[9] Redfield,[7] Ketchum,[3,4] Pritchard,[5,6] and Stommel.[10] The circulation in Fjord type of estuaries has been discussed by Tully,[13] Redfield[8] and Cameron.[1] An extensive review of the nature of circulation in different estuaries has been made by Stommel and Farmer.[11] The need for a critical study of Indian estuaries was pointed out by Seshaiya.[12] Jacob and Rangarajan[2] observed that in mixing and circulation the Vellar estuary resembles the atidal south-west Australian estuaries in general and the Swan river system in particular.

The distribution of salinity in relation to the depth and distance has been studied during the years 1958-62 in the Gautami branch of the Godavari estuary, the second largest in the country.

With the onset of the south-west monsoon heavy drainage of freshwater into the estuarine limits of the river occurs commencing from early July so that a freshwater isostatic head develops rather abruptly. This naturally results in a gravity-impelled flow of water in the direction of the confluence from the head, effecting to begin with, a rapid seaward displacement of the surface waters. With the seaward flow of fresh or brackish water at the surface level and high saline water moving in along the bottom, a steep halocline ensues. Because of the suppression of the tidal pressure from the sea, the halocline formed effectively prevents vertical mixing. When the inflows gain greater momentum resulting in high floods, a total disruption of the prevailing salinity structure takes place culminating in a complete freshwater scouring of the whole system. During this prolonged period of high floods, the river waters reach the sea unimpeded and the incoming tides are completely blocked. This state of complete freshwater scouring of the estuary continues from about the end of July upto September (Fig. 1, 4). This is due to (1) heavy freshwater drainage in the form of a series of intermittent spates when the sea-water intruding along the bottom from the confluence gets pushed back and (2) the shape of the estuary with a narrow mouth compared to the great width higher up.

The recovery cycle leading to the establishment of estuarine conditions is rather slow compared to the rapidity with which the entire system has been disrupted and freshwater scouring occurred. Consequent on the diminution of freshwater inflow beginning usually from October, neritic penetration gains prominence as evidenced by the establishment of brackish water conditions in the fore-estuary because of the gradual fall in the level of the freshwater isostatic head and a simultaneous progressive manifestation of the marine isostatic head. During this recovery phase the establishment of vertical salinity gradient occurs first at the confluence (Fig. 1, 3). A progressive shift in the establishment of the zone of vertical salinity