I wish to thank Dr. G. T. Tonapi for helpful suggestions, Prof. (Dr.) L. Mulherkar for facilities and U.G.C. authorities for financial assistance.

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ON THE TRACHEAL ORGANS OF SPIDER *OECOBIUS PUTUS*

In spiders, there is a great diversity in respiratory organs[1]. A survey of these organs by Levi[2] reveals that these animals are provided with book-lungs, tracheae or both. The presence of tracheal organs in some spiders has been completely overlooked. These were first reported in a Japanese liphistiid spider, *Heptathela kimurai* by Yoshikura[3]. Recently we have observed tracheal organs in an Indian spider, *Oecobius putus* collected from Ahmedabad. In this communication we intend to report our observations on tracheal organs of *Oecobius putus* carried out with the help of a Cambridge S4–10 scanning electron microscope as well as a binocular research microscope.

The tracheal organs are the pair of ovoid bodies located between two book lungs on either side of the midventral axis (Fig. 1). The basal portions of these organs form a common stalk called the pedicel. This in turn communicates to exterior through a single opening placed on the hind margin of second abdominal segment.

The scanning electron micrograph of tracheal organs reveals that, their broader fan-shaped free part presents uneven surface giving appearance of folds. But this can never be compared with the lamellar components of a true book-lung. The cross-section passing through the tracheal organs on the other hand, indicates the presence of tubular elements which form the core of the tracheal organs (Fig. 2). Looking to the arrangement of these elements and the radial projection of their bristles towards the lumen of the organs, it is convincing to believe these organs arising from tracheal system. Thus our observations support the histological findings of Yoshikura that, the tracheal organs may be homologous with tracheal trunks of the true spiders and their functions may be tracheal. Moreover, like *Heptathela kimurai* which is a dipneumonous spider, *Oecobius* also possesses two book-lungs. Thus although phylogenetically *Oecobius putus* belongs to different taxonomic group than that of *Heptathela kimurai*, the presence of tracheal organs suggests the primitive status of *Oecobius putus* in its group.

FIG. 1. Stereomicrograph showing the tracheal organs and book-lung, × 2,000.

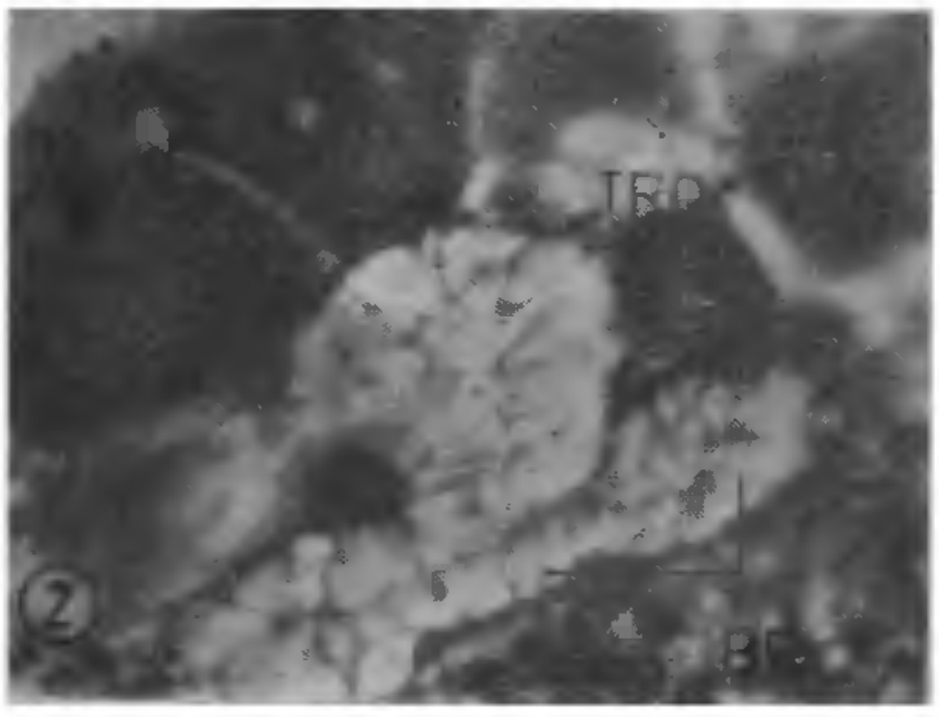

FIG. 2. Transverse section passing through the tracheal organs, × 1,000.

Abbreviations used: B = book-lung; BR = bristles; P = pedicel; TRO = tracheal organ.

We are thankful to Dr. V. C. Shah, Head of the Zoology Department, Gujarat University, Ahmedabad, for providing the facilities. Our thanks are also due to Director of Atira for providing the SEM facilities.

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THE EFFECT OF γ-BHC ON THE OXYGEN CONSUMPTION OF THE EARTHWORM, *MEGASCOLEX MAURITII*—A CHRONO-TOXICOLOGICAL APPROACH

The responsiveness or susceptibility of organisms to various chemical agents has been shown to vary with the time of the day at which they are administered[1–3]. Work on these lines has been restricted mainly to agents like ethanol, ouabain, carcinogens, or endotoxins[2, 4]. Since investigations on the effect of more common pesticides on nontarget organisms in relation to the time of the day are meagre, an attempt is made to study the effect of Lindane (γ-BHC) on the earthworm, *Megascolex mauritii*, in relation to the time of the day.

The earthworm, *M. mauritii* collected from the fields of Annamalainagar, where pesticide application is nil was used in the study. They were acclimated to the laboratory conditions for at least 15 days under natural LD cycles in soil brought from the Boating Canal (Annamalainagar) where pesticide spraying is not in practice. The organochlorine pesticide γ-BHC (99% by M/s. Bharat Pulverising Mills, Bombay) was used as toxicant. The rate of oxygen consumption of earthworms was studied at 29 ± 1° C using Warburg's constant volume respirometer at two different times of the day, 10·00 hr and 17·00 hr. The earthworms were exposed to sub-lethal concentration (25 ppm) of γ-BHC for a period of half an hour. The method of application consists in introducing ten earthworms in suitably-sized polythene bags containing 1 kg of the soil mixed homogeneously with the appropriate quantities of the pesticide (1 mg of Lindane per kg of soil constitutes 1 ppm) and 10 ml of water. The mouth of the polythene bag was then sealed. The volatility of Lindane is very low and since the animals were exposed in a closed system with limited amount of air space, the possibility for an error due to volatility would be remote. The earthworms were washed with water and the oxygen consumption was recorded in two groups of six animals each, for the two periods studied. The animals were treated with the pesticide concentration (25 ppm) an hour before the period of study and in the 30 minutes left between the end of exposure and recording the oxygen consumption, the washing and equilibration procedures were completed.

The results (Table I) show that in untreated animals, the oxygen consumption rate has increased by 49% at 17·00 hr over that at 10·00 hr. This increase is likely to be due to the time of the day, since other factors which influence the oxygen consumption were kept constant. Sub-lethal concentration of Lindane increased the rate of oxygen consumption in the earthworm by 46·8% over the untreated controls at 10·00 hr. The same concentration of Lindane for the same duration of exposure had practically no effect on the rate of oxygen consumption at 17·00 hr.

The existence of a daily rhythm of oxygen consumption in the earthworm, *Lumbricus terrestris*, had been shown as early as 1957 by Ralph[5]. Over 25% increase in oxygen consumption rate in the same species in the evening over that at noon had been reported by Bennet and Guilford[6]. Recently the study of Hanumante[7] also confirmed the existence of such a daily rhythm in oxygen consumption rate in the tropical oligochate, *Perionyx excavatus*, with two maxima falling in the evening at 5 p.m. and 7 p.m. and a minimum around noon. These studies confirmed the existence of a metabolic oscillation in earthworms during the solar day.

Table I

Effect of sub-lethal concentration (25 ppm) of the pesticide, γ-BHC, on the oxygen consumption of M. mauritii

Time	Mean values of oxygen consumption in ml/hr/gm wet weight	
	Untreated	After half an hour exposure to γ-BHC
10·00 hr	0·2442	0·3583 (46·8% increase) SD – 0·04709 Student's '*t*' $p < 0·001$
17·00 hr	0·3617 49·0% increase (over normal at 10·00 hr) SD 0·0438 Student's '*t*' $p < 0·001$	0·3580 (1·02% decrease) SD 0·0356 Student's '*t*' – Not significant