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## DISSOLVED OXYGEN REQUIREMENTS OF MAYFLY NYMPHS

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If oxygen requirements of different species of aquatic insects were better known, it should be possible to estimate, in retrospect and with considerable accuracy, what oxygen levels have existed in a given aquatic environment during the life history of the organism<sup>1</sup>. Closely adjacent areas may harbour individuals of different respiratory capacity<sup>2</sup>. Critical oxygen demand of two heptageniid species, namely *Epeorus* sp. nov.<sup>†</sup>, which inhabits exclusively the torrential areas of rock-bottomed streams, and *Cinygmia* sp. nov.<sup>†</sup>, which inhabits side pools of the same stream, was determined to assess the scope for the use of mayfly nymphs as bioindicators of dissolved oxygen levels.

Mature nymphs of *Epeorus* sp. nov. ( $6 \pm 0.5$  mm) and *Cinygmia* sp. nov. ( $2 \pm 0.5$  mm) were collected from Kumbakkarai stream of Palni hills in South India. This stream is subjected to organic pollution because of its tourist attraction. A series of micro-Winkler bottles filled with stream water was set up. Five nymphs of selected species were introduced in

<sup>†</sup>The taxonomy of these new species will be published elsewhere.

each bottle. The bottles were closed and kept immersed up to neck level in the shallow region of the stream to maintain a constant temperature ( $25 \pm 0.5^\circ\text{C}$ ). Two control bottles were maintained simultaneously. Preliminary experiments were conducted to find out the time to death of nymphs of *Epeorus* sp. nov. and *Cinygmia* sp. nov. in a closed Winkler bottle filled with stream water and it was found that the time to death was about an hour for the former and about 5 h for the latter. Hence one experimental bottle was taken out every 15 min in the case of *Epeorus* sp. nov. and every 1 h in the case of *Cinygmia* sp. nov. The rate of oxygen consumption was determined by the micro-Winkler technique developed by Job<sup>3</sup>. The experiments were continued till dissolved oxygen reached asphyxial level, the level at which 50% of the animals fell flat and died. The experiments lasted 1–5 h. From the amount of dissolved oxygen in each bottle, partial pressure of oxygen ( $\text{PO}_2$ ) was calculated by referring to the table of Whipple<sup>4</sup>.

In *Cinygmia* sp. nov., the oxygen consumption was more or less uniform (0.62 mg/mg dry wt/h) at oxygen tension between 80 mm Hg and 20 mm Hg and dropped considerably (0.38 mg/mg dry wt/h) at 20 mm Hg. In *Epeorus* sp. nov., oxygen consumption decreased with falling oxygen tension (table 1).

The critical oxygen level (pc) for *Epeorus* sp. nov. (40 mm Hg or 2 mg/l) was found to be higher than for *Cinygmia* sp. nov. (16 mm Hg or 0.8 mg/l). In general, animals from high-oxygen environment have higher pc than animals from low-oxygen environment<sup>5</sup>.

Of the two heptageniids investigated, *Epeorus* sp. nov. appears to be more sensitive to reduced oxygen content and it can be used as bioindicator of minimum oxygen level, particularly in waters with relatively small ranges of temperature fluctuations (e.g. mountain streams or tropical waters). The presence of nymphs of *Epeorus* sp. nov. in a stream (water temperature  $25^\circ\text{C}$ ) is an indication that the minimum oxygen level of that area is approximately 2 mg/l (40 mm Hg) and the presence of nymphs of

Table 1 Oxygen uptake in mg/mg dry wt/h at different  $\text{PO}_2$  levels in two different Heptageniidae

Species	$\text{PO}_2$ (mm Hg)						
	20	30	40	50	60	70	80
<i>Epeorus</i> sp. nov.	—	—	0.12 $\pm 0.01$	0.18 $\pm 0.01$	0.36 $\pm 0.01$	0.41 $\pm 0.01$	0.61 $\pm 0.01$
<i>Cinygmia</i> sp. nov.	0.38 $\pm 0.02$	0.57 $\pm 0.01$	0.58 $\pm 0.01$	0.61 $\pm 0.01$	0.62 $\pm 0.01$	0.62 $\pm 0.01$	0.72 $\pm 0.04$

*Cinygmula* sp. nov. indicates minimum oxygen level of 0.8 mg l (16 mm Hg).

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## A NEW SPECIES OF THE SPIDER, GENUS *POECILOCHROA* (GNAPHOSIDAE) FROM INDIA

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SPIDERS of the family Gnaphosidae have received scant attention in the oriental region and even representative works like *Fauna of British India, Arachnida* by Pocock (1900), *Spiders of Burma* by Thorell (1895), and *Malaysian spiders* by Workman (1896) contain no references to this family. The spiders of Gnaphosidae are little known from India. Practically there was no work in the past on gnaphosid spiders from India, although they are abundant throughout the country. Recently Tikader, Gajbe and Patel have published some papers on this group of spiders.

While examining the spiders of Gujarat, an interesting member of the genus *Poecilochroa* Westring (Family, Gnaphosidae)<sup>1-2</sup> was noticed. It showed marked differences from known species<sup>3,4</sup> and therefore designated as a new species and named as *Poecilochroa tikaderi* sp. nov. after Dr B. K. Tikader, a well-known arachnologist of India.

The type specimen will be deposited in the National Zoological Collections, Zoological Survey of India, Calcutta.

## *Poecilochroa tikaderi* sp. nov.

### General

Cephalothorax and legs dark-brown, abdomen grey; total length 6.50 mm. Carapace 2.50 mm long, 2 mm wide; abdomen 4 mm long, 2 mm wide.

### Cephalothorax

Longer than wide, narrowing in front, clothed with hairs, cephalic region slightly elevated and dark, thoracic region provided with distinct fovea. Ocular quad longer than wide, wider behind than in front; anterior medians smallest, laterals bigger in size than medians; posterior row slightly procurved. Sternum heart-shaped, pointed behind, dark and clothed with hairs; labium longer than wide and

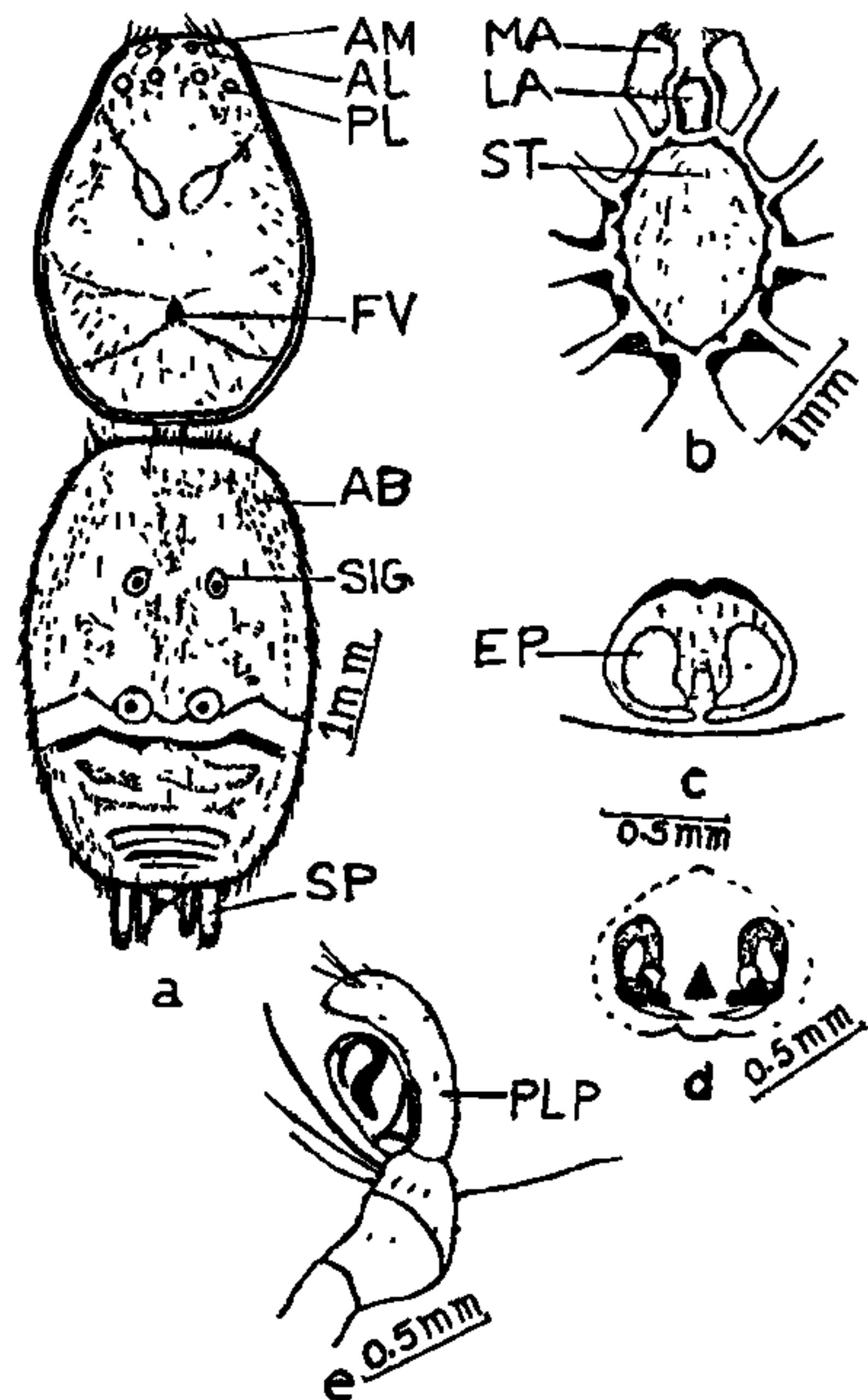


Figure 1a-e. *Poecilochroa tikaderi* sp. nov. a. Dorsal view of female, legs omitted [AB, Abdomen; AL, Anterior lateral eyes; AM, Anterior median eyes; FV, Fovea; PL, Posterior median eyes; SIG, Sigillae; SP, Spinnerets]. b. Sternum, labium and maxillae [LA, Labium; MA, Maxillae; ST, Sternum]. c. Epigyne (ventral view) [EP, Epigyne]. d. Internal genitalia, and e. Male palp [PLP, Palp].