7. Lund, A. E. and Engelhardt, N. T., *J. Insect Pathol.*, 1962. **4**, 131.
8. Vey, A., *Rev. Elev. Med. Vet. Pays Trop. (N.S.)*, 1971, **24**, 577.
9. Niethammer, A., *Arch. Mikrobiol.*, 1933, **4**, 72.
10. Tandon, R. N., *Mucorales of India*, ICAR, New Delhi, 1968, p. 3.

INNERVATION OF THE PROTHORACIC GLANDS AND ITS POSSIBLE SIGNIFICANCE IN THE LARVA OF THE CASTORMOTH, *TRABELA VISHNU* (LEPIDOPTERA)

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INNERVATION of the prothoracic glands (PTG) is known in many insect orders including Lepidoptera[1]. But the role of innervation has been investigated by direct surgical intervention only in one insect[2]. In this communication, we have studied the innervation and examined its role in the castormoth, *T. vishnu*.

Young V (ultimate) instar larvae were dissected in physiological saline and the nerves innervating the PTG stained intravitally with methylene blue. Insects were narcotized by drowning them in water and all the nerves innervating the PTG of both sides were severed collectively and individually through the intersegmental membranes on the thoracic venter. An antibiotic powder was sprinkled on the incisions to prevent infection and the insects were allowed to revive at low temperature in a refrigerator to minimise movement and the accompanying bleeding.

The PTG of *T. vishnu* are paired, tri-radiate and flattened organs situated on the tracheal trunks close to the first thoracic spiracle (figure 1). Each PTG is innervated by 5 nerves designated as N_1 through N_5 given out by the thoracic segment of the ventral nerve cord (VNC). The N_1, arising from the first interganglionic connective (C_1) joins N_2 given out by the prothoracic ganglion (G_1). The composite (fused) nerve thus formed gives out a small branch to the anterior portion of the PTG and runs over the gland to supply the muscles and body wall of this segment. The N_3 which is the transverse branch of the first median nerve (MN_1) receives a branch from

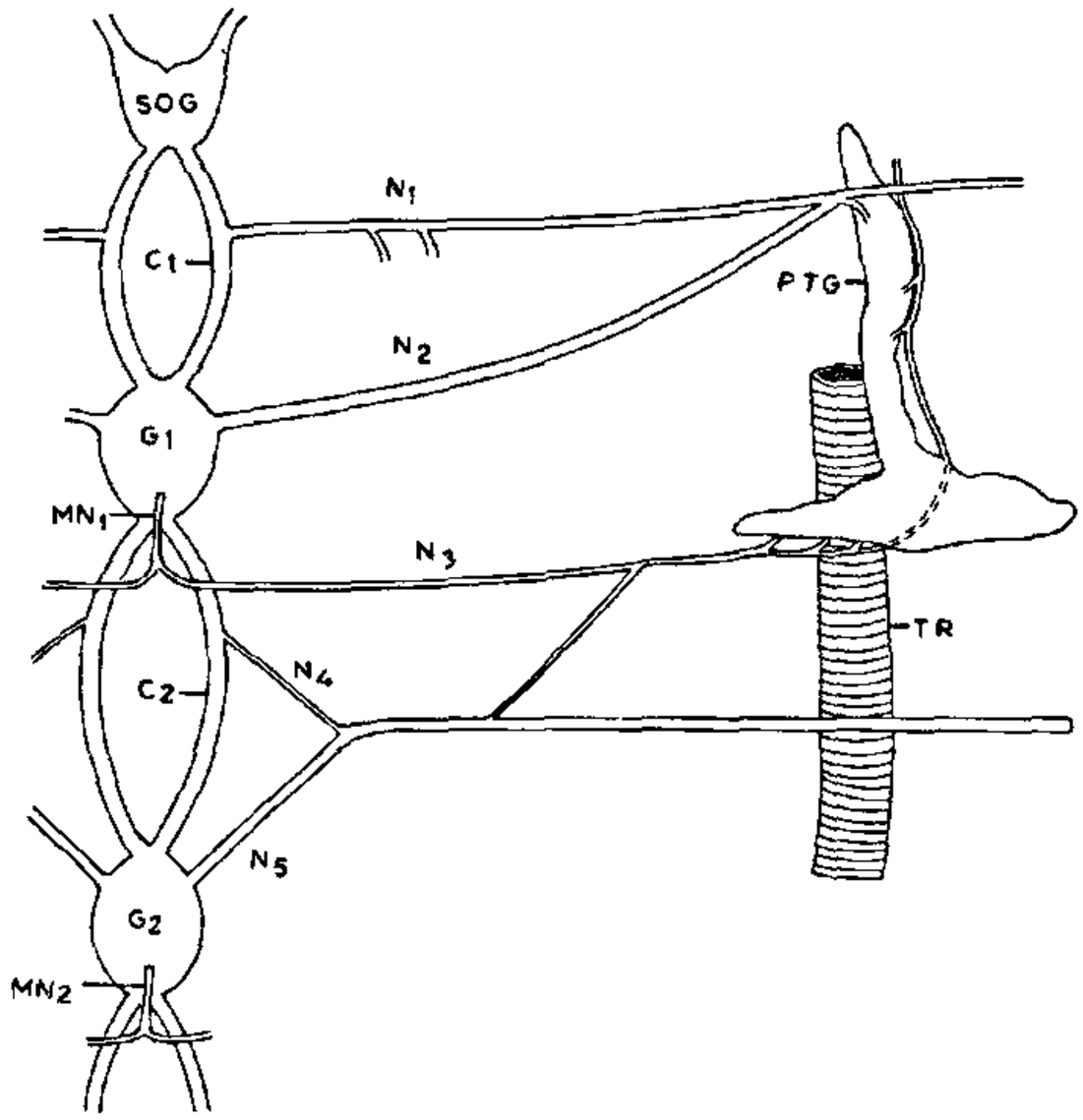

Figure 1. Diagram of the PTG and its nerve supply (for lettering see the text).

the common nerve formed by the fusion of N_4 given out by the second interganglionic connective (C_2) and N_5 given out by the mesothoracic ganglion (G_2). The composite nerve thus formed innervates first, the posterior part of the PTG and then, runs underneath it to innervate the anterior arm and further away, the first thoracic spiracle. The main trunk of the N_5 runs past the PTG supplying the muscles and body wall of this region.

While severance of all the five nerves on the two sides of the VNC produced no effect on the course of development and metamorphosis of the insect, it prevented shortening of C_2 and thus fusion of G_1 and G_2 which normally occurs during metamorphosis. To pinpoint which of the five nerves produced this effect, the nerves were severed individually and it was found that severance of N_4 alone was the cause of the observed phenomenon. The above operation was repeated in 50 larvae and in the 40 larvae that survived, the results were the same.

From the pattern of PTG innervation in this and other Lepidoptera, some generalizations emerge: (i) that there is no ganglion or nerve exclusively devoted to PTG innervation; this is supported by our earlier observation employing cobalt filling technique[3] that the same neurons that supply the PTG also supply other structures of the segment; (ii) that the nerves that innervate the PTG are only the minor branches of major trunks which themselves

supply other structures, and (iii) that the ganglia and interganglionic connectives that send nerves to the PTG are highly variable throughout Lepidoptera[4–8] which is inconsistent with the concept of nerve specificity. These facts reveal that the PTG innervation has no role specific to the activity of the glands. This presumption is supported by the lack of any effect of dennervation of the glands on the growth and metamorphosis of this and another insect[2]. The PTG innervation would thus appear to represent a minor part of the general body innervation meant to integrate the function of different segments. The same conclusion can also be derived, albeit indirectly, from the fact that PTG is not universally innervated and that in all insects investigated the glands are hormonally regulated by the prothoracicotropic factor of the brain hormone[9].

In regard to the failure of shortening of the second interganglionic connective (C_2) following N_4 sectioning, Pipa[10] presented evidence that the connective shortening occurs due to the tractive force exerted by the neuroglial cells which in turn may be dependent on the nervous inputs fed to the central nervous system. The N_4 sectioning in the present case, seems to disrupt such a nervous input and thus prevents the tractive force to come through thereby preventing shortening of the C_2.

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1. Herman, W.S. and Gilbert, L. I., *Gen. Comp. Endocrinol.*, 1966, **7**, 275.
2. Srivastava, K. P., Tiwari, R. K. and Kumar, P., *Experientia*, 1977, **33**, 98.
3. Singh, H. H., Srivastava, K. P. and Katiyar, R. L., *Curr. Sci.*, 1986, **55**, 49.
4. William, C. M., *Biol. Bull.*, 1948, **99**, 62.
5. Singh, U. V. and Awasthi, V. B., *Entomon* , 1981, **6**, 183.
6. Lee, H. T., *Ann. Ent. Soc. Am.*, 1948, **41**, 200.
7. Singh, Y. N., *Experientia*, 1975, **31**, 40.
8. Granger, M. A., *Int. J. Insect. Morphol. Embryol.*, 1978, **7**, 315.
9. Novak, V. J. A., Chapman & Hall, New York, 1974.
10. Pipa, R. L., *J. Exp. Zool.*, 1967, **164**, 47.

A NEW SPECIES OF *THALEROSPHYRUS* FROM SOUTH INDIA (EPHEMEROPTERA: HEPTAGENIIDAE)

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EATON[1] named the genus *Thalerosphyrus* from male and female imagos collected in the Philippines and Borneo. Ulmer[2] described the nymphs. This genus is distributed in the Palearctic, Ethiopian and Oriental Realms. Jensen[3] examined nymphs of this genus from Lebanon and Madagascar. Six species viz *T. ciqulatus*[4], *T. determinatus*[5], *T. melli*[6]; *T. sinuosus*[4], *T. sumatranus*[2] and *T. torridus*[5] of this genus were described from the Oriental Realm and one *T. ethiopicus*[7] from the Ethiopian Realm. This genus is zoogeographically significant in the sense that it could have spread via the drifting Indian plate from Madagascar to Southeast Asia[8]. This is the first record of this genus from South India. *Thalerosphyrus flowersi* sp. nov. is described based on the reared material from Kumbakkarai stream in Palni hills and on nymphs from Courtallam and Thirumurthi Hills of Western Ghats. Terminology and procedures used in the description follow those of Sivaramakrishnan[9].

Thalerosphyrus flowersi sp. nov. (Figures 1–9) (measurements are in mm unless otherwise mentioned).

Male imago (in alcohol).– length: body, 9.5–10.5: forewings, 9.5–10. Head: light brownish-yellow, margin darker. Scape and pedicel of antennae reddish-brown, flagellum pale. Eyes: basal half of ocelli black, apical half white. Thorax: yellowish-brown, carinae darker, sutures lighter; margins of pronotum black. Legs: coxae brown; femora brownish-yellow, apex of all femora blackish-brown; a reddish-brown, narrow, transverse band near middle of femora; tibiae of all legs uniformly washed with yellowish-brown, remainder of legs light yellowish-brown. Wings: base of forewings dark brown; costal, subcostal and radius of forewings yellowish-brown; a dark brown spot near bulla of subcostal vein; other longitudinal and cross veins of fore and hind wings brown; membrane of fore and hind wings hyaline except cells C and Sc of forewings brownish-yellow with two dark brownish-yellow clouds in the pterostigmatic area. Abdomen: tergum 1 dark brown, posterior margin with a narrow, blackish-brown band, lateral edges broader