

Butler³ suggested that false smut infection of paddy might be occurring at the flowering stage. Galloway⁴ produced evidence to show that the infection was neither soil-borne nor seed-borne. During our field survey it was found that before the maturity of ear-bearing tillers of paddy, *D. marginata* around the field was infected with false smut. It is possible that when paddy flowers open, the smut spores from infected *D. marginata* become air-borne and infect paddy.

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OOCYTE DIFFERENTIATION AND VITELLOGENESIS IN THE CARIDEAN PRAWN *CARIDINA RAJADHARI* (BOUVIER)

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THE development and eventual fusion of the male and female gametes are of crucial importance to all animals, ensuring both the continuation of the species and its adaptability to changing conditions¹. Studies on the oocyte differentiation are basic in the broader context of establishing the timing of breeding seasons. Published findings concerning the oogenesis of freshwater crustaceans are only a few. Details of oocyte development in the crayfish, *Cambarus clarkii*² and freshwater prawns *Palaemon lamarrei*³, *Palaemon paucidens*⁴ and *Macrobrachium lanchesteri*⁵ were reported. The following study was therefore undertaken on the oocyte differentiation and vitellogenesis of the caridean prawn, *Caridina rajadhari* (Bouvier).

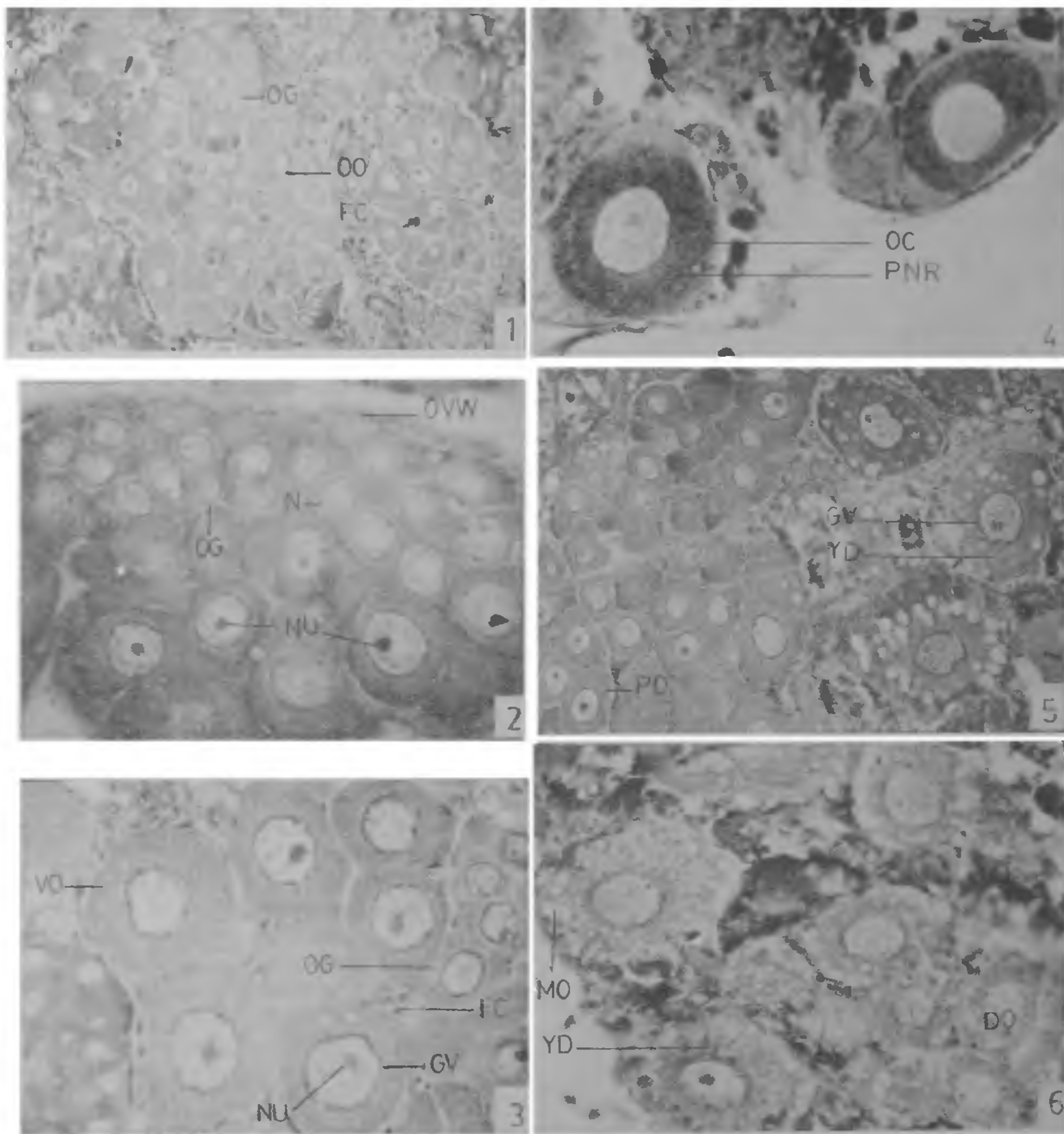
Caridina rajadhari (Decapoda: Atyidae) was collected from Kham river, near Aurangabad, Maharashtra and they were immediately brought to the

laboratory. Thereafter healthy, mature, non-ovigerous, intermoult (stage-C) animals of identical size (mean total length 2.5 cm) and ovarian stage (green-coloured ovary) were selected. The different regions of the ovaries were fixed in Bouin's or Helly's fluid. Paraffin sections of 7 μ m thickness were cut and stained with Harris' haematoxylin using eosin as counterstain. The average oocyte diameter was calculated by measuring rounded oocytes with complete nuclei.

Histological examination of the ovaries of *C. rajadhari* indicated the presence of oocytes in different stages of development (figure 1). During differentiation, four stages could be identified as oogonial cells, early vitellogenic, vitellogenic and late vitellogenic oocytes with the following measurements (table 1). The distinction of these stages depended upon their cytoplasmic content and size of the oocytes. The germinal zone was found to be situated on the ventrolateral region of the ovary (figure 2). The ventrolateral position would be advantageous for the growth of the oocytes in the opposite direction due to the tubular nature of the body cavity and the availability of more space in the dorsolateral regions⁶. The oogonial cells were found in the clusters near the germinal zone. These cells were basophilic with large round nuclei surrounded by a thin rim of oocortex, which lacked stainable yolk materials⁷. By rapid succession of mitotic divisions, the oogonial cells increased in number and size (5 to 38 μ m). At the end of the early vitellogenic phase, the nucleus of the primary oocyte swelled into germinal vesicle. The primary oocyte possessed large germinal vesicle and granular cytoplasm (figure 3). During vitellogenic phase, the yolk granules started accumulating in the oocortex. Eosinophilic granules were observed in the perinuclear ooplasm (figure 4). The prinnuclear ring disappeared with the advancement of vitellogenesis. Generally yolk was formed from both extraoocyte sources

Table 1 Oocyte size classes, measurements and characteristics of the developing oocytes of *C. rajadhari*

| Oocyte size classes | Oocyte diameter range (μ m) | Stage of the Oocytes |
|---------------------|----------------------------------|----------------------|
| I | 10-14 | Oogonial cells |
| II | 15-38 | Primary oocytes |
| III | 39-42 | Early vitellogenic |
| IV | 43-53 | Vitellogenic |
| V | 53-74 | |
| VI | 75-93 | Late vitellogenic |



Figures 1–6. Sectional views of the ovary of *C. rajadhari*. **1.** Oocytes in different stages of development, ($\times 150$). **2.** Germinal zone showing clusters of oogonial cells, ($\times 400$). **3.** Early vitellogenic oocytes with centric nuclei and granular oocortex, ($\times 400$). **4.** Vitellogenic oocytes showing perinuclear eosinophilic granules, ($\times 400$). **5.** Oocytes showing yolk droplets, ($\times 400$). **6.** Matured oocytes showing eosinophilic yolk droplets, ($\times 400$). (DO—degenerating oocyte, FC—follicular cell, GV—germinal vesicle, MO—matured oocyte, N—nucleus, OC—oocortex, OG—oogonial cell, OO—oocyte, OVW—ovarian wall, PNR—perinuclear ring, VO—vitellogenic oocytes and YD—yolk droplets)

(haemolymph) by diffusion through follicular cell layer in collaboration with nucleolar extrusions⁸⁻¹⁰. In *C. rajadhari* nucleolar extrusion granules, which passed into oocyte cortex were believed to take part in yolk formation (Endogenous yolk)¹¹. The oval, non-germinative, accessory, follicular cells were also helpful in the uptake of extraoocytic yolk protein because they were always found attached themselves around the early vitellogenic oocytes (figure 3)¹². The late vitellogenic oocytes of *C. rajadhari* also showed the presence of numerous yolk droplets in the oocortex as in the shrimp, *Chirocephalus bundyi*⁸, prawns *Palaemon paucidens*⁴ and *Macrobrachium lanchesteri*⁵ (figure 5). As the oocytes grow in size, the yolk droplets became strongly eosinophilic and increased in size and number (figure 6). In large oocytes, oocortex showed a well defined thick membrane resembling an egg envelope. After maturation, the ova were ovulated and oviposited in the brood pouch of the female. In *C. rajadhari*, the process of resorption (oosorption) may be simultaneous with oocyte growth. The crowding and competition among the oocytes rendered some of them in such resorbing states. Oocyte resorption was also a normal phenomenon in the females of *P. paucidens*⁴ and *M. lanchesteri*⁵. The presence of more than one size range of oocytes in the ovaries of *C. rajadhari* provided evidence for the continuous breeding pattern of these prawns.

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EFFECTS OF METHYL PARATHION ON THE RATE OF OXYGEN CONSUMPTION OF TADPOLES OF FROG, *RANA CYANOPHLECTIS*

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PESTICIDES, the economically useful poisons are known to spread through all segments of the environment, causing untold hazards to non-target organisms. Pesticides are generally responsible for a number of biochemical and physiological disturbances^{1,2}. Pesticides have been shown to cause a sharp and substantial increase in the rate of oxygen consumption in insects³ and fishes⁴.

However the paucity of data on the toxic effects of methyl parathion on the rate of oxygen consumption during brain development, prompted us to carry out the present investigation. Oxygen consumption of the developing tadpoles of frog, *Rana cyanophlectis* has been studied on exposure to sublethal concentration of methyl parathion. Brain glucose levels were also determined to study the changes in the energy demands of the methyl parathion exposed animals, since it is known that the nervous tissue is the first to respond to any type of stress.

Approximately three-week-old tadpoles of frog, *Rana cyanophlectis* in the weight range of 0.5–2 g were obtained from local ponds and acclimated to laboratory conditions for a week, prior to experimentation. They were fed on Hydrilla. Sublethal concentrations of methyl parathion (0, 0-dimethyl-O-nitrophenyl-thiophosphate, EC 50%, solution, Bayer Ltd., India), in tap water were prepared and the animals were exposed to this for 24 hr. The lethal concentration was experimentally determined. The LD₅₀ value at 24 hr was estimated (LD₅₀ = 8 ppm)⁵. The test animals were then kept in three different concentrations below LD₅₀ (2.5 ppm (sublethal), 5 ppm and 7.5 ppm) for 24 hr. The rate of oxygen consumption was studied by Winkler's 'iodometry' method⁶. The brain glucose levels were determined by the colorimetric procedure of Nelson-Somogyi⁷.