SUMMARY

1. Various ecotypes of hydrias, collected from 15 different locations in India had been studied at behavioural, morphological, physiological, cellular and biochemical levels, under constant laboratory conditions to see taxonomic affinities among them.

2. Hydra size, based on the estimations of the length, the total protein content and the total number of cells per hydra, emerged as a reliable diagnostic feature which could be used for taxonomic purposes.

3. The shape of the column was generally inconsistent within an ecotype, except in Green Hyderabad and Delhi hydrias, and cannot be used as a parameter for classification.

4. The tentacle number varied widely within an ecotype. It was also found to be influenced by high temperature. After 96 h at 34°C, a large number of tentacles were observed to develop within the oral ring in Pune, Delhi, Trivandrum, Chandan Nagar and Imphal hydrias. Therefore, the number of tentacles in a polyp might not be a
reliable characteristic for identification of the species.

5. The density and the arrangement of nematocysts in the tentacles showed significant differences in the various ecotypes. The low nematocyst density in Calcutta, Bolpur and Madurai hydras shows correlation with the low density of the nematocyst precursors and interstitial cells. In Green Hyderabad and Srinagar hydras a high density of nematocysts and a correspondingly high density of nematocyte precursors and interstitial cells was found.

6. Significant differences in the shape of the holothrichous isorhiza was found in the different hydra types.

7. The position of the budding region was found to be specific for each ecotype. The order of emergence of tentacle rudiment on the buds was uneven in all hydra ecotypes except the Green Hyderabad hydra where the tentacle rudiments appeared simultaneously on the buds.

8. The shape and size of the basal disc was characteristic for hydras within each ecotype and thus provided some criterion for taxonomic purposes.
9. The Green Hyderabad hydras showed reduced planktonic behaviour after 72 h of starvation and enhanced response to mechanical and photic stimuli, as compared to all other hydra types.

10. Sexual reproduction was predominantly hermaphroditic in Green Hyderabad hydras, unstably dioecious in the Santiniketan hydras and stably dioecious in all other ecotypes except the Srinagar, Delhi and White Hyderabad. In the Srinagar, Delhi and White Hyderabad hydras, no gonads were observed.

11. All ecotypes showing gonad production exhibited spontaneous occurrence of gonads at different times of the year. However, the occurrence of endogenous cyclic phase was most clearly evident in the Santiniketan polyps.

12. Low temperature (15°C) was found to act as a stimulus for gonad induction in Bolpur hydras.

13. The time taken for bud development and its detachment was found to vary inversely with temperature in all ecotypes except the Green Hyderabad. In the latter bud development and
detachment took longer time at $29^\circ C$ and $15^\circ C$ as compared to $23^\circ C$.

14. The bud maturation time was found to increase with temperature in all cases but the degree of increase varied significantly in the different ecotypes.

15. At $29^\circ C$, the population doubling time increased significantly from that at $23^\circ C$ in Pune, Delhi, Trivandrum, Chandan Nagar, Calcutta and Green Hyderabad hydras. In Shillong, Jammu, Tirupati, Madurai and Lucknow hydras the time taken for the population to double remained either the same at $29^\circ C$ or showed a slight decrease. In Bolpur, Srinagar, Santiniketan and White Hyderabad hydras population doubling time decreased at $29^\circ C$.

16. At $15^\circ C$, the Green Hyderabad, White Hyderabad, Lucknow and Jammu hydras showed favourable growth response, as compared to Calcutta and Delhi ecotypes in which less growth was recorded.

17. At all the three temperatures studied ($23^\circ C$, $29^\circ C$ and $15^\circ C$), the growth was found to be high in the
Green Hyderabad, Bolpur, Srinagar, Santiniketan, Lucknow, Madurai, Chandan Nagar, Shillong, Calcutta, Pune, Madurai and Tirupati hydras. In the Trivandrum, Delhi, Jammu, White Hyderabad and Imphal growth rate remained low at all temperatures.

18. Differences in the number of epithelial cells and the density of interstitial cells and nerve cells indicated significant differences in Green Hyderabad, Bolpur, Srinagar and Madurai hydras at cellular level.

19. The similarity in the density of gland cells in all these ecotypes (except Calcutta hydras, where the density was low in the hypostome) indicated that it might not be significant for diagnostic purposes.

20. During the regeneration of the midgastric annulus, basal disc determination was found to occur much before hypostome regeneration in case of Green Hyderabad hydras. In all other 15 hydra types hypostome determination either preceded basal disc regeneration or both occurred simultaneously.

21. The pattern of RNA synthesis during growth did not differ significantly in the Green Hyderabad,
Bolpur, Srinagar, Madurai and Calcutta hydras.

22. During hypostome and basal disc regeneration in situ hydra, the RNA synthesis showed an accelerated pattern in the Green Hyderabad hydras as compared to the Bolpur, Srinagar, Madurai and Calcutta hydras.

23. Since the Green Hyderabad hydras had been found to resemble Chlorohydra viridissima in possessing characters such as endosymbiotic algal cells, short tentacles, sensitivity to high temperature, hermaphroditic nature and presence of slipper shaped holotrichous isorhiza, it is concluded that it belonged to the genus Chlorohydra. All other ecotypes appear to fall under the genus Hydra.

24. A comparison of major characteristics of 16 ecotypes has been done, and the magnitude of inter-ecotypic affinities has been demonstrated.