The Rock-skipping Fishes of the Blenniid Genus *Andamia* from the Andamans

ON the rock-bound and coral boulder-strewn coasts of the Andamans are little-known fishes called the Blennies and Rock-skippers living in shallow rock-pools or on the rocks between tide-marks subject to the action of breakers. The family Blenniidæ to which the Rock-skippers and Blennies belong has a wide distribution in tropical and temperate seas. Their small size and unattractive sombre colours, and their being of no economic importance have attracted very little attention to the members of this family in spite of their wide distribution. The Blennies and Rock-skippers are easily recognised by their slender elongate body, strongly developed fan-shaped pectoral fins near the neck-region, the much-reduced more or less fleshy ventral fins, the long and continuous dorsal fin, and the smooth scaleless body. The males of certain species have fleshy crests on the head. In an excellent paper on the Ecology and Bionomics of the Blenniid Fishes of the genus *Andamia* of the Andamans, published in the *Records of the Indian Museum*, XL, pp. 377–93, pls. viii–x (1938), Dr. H. Srinivasa Rao has made a valuable contribution to our knowledge of the little-known habitats and habits of two species of *Andamia*, one of which is described as new to science by Dr. S. L. Hora (*loc. cit.*, pp. 393–400). The two species of *Andamia* live in the same localities in situations which are only a few feet apart, the older species, *Andamia heteroptera*, in crevices and fissures of rocks or on exposed surfaces of isolated rocks swept by waves or kept constantly moist by the spray from the waves, and the new species, *Andamia raoi*, on the face of rocks exposed to the full force of the breakers from the open sea. The latter species is less well-adapted to a terrestrial existence than the former which is capable of living out of water during the low-water period with only a trace of moisture retained in its minutely corrugated skin. Both the species live in groups of not less than four or five often in larger groups of ten or more. In open bays studded with rocks or coral boulders constantly bathed by waves, *A. heteroptera* keep moving with the tides jumping on to rocks not completely submerged by the sea. The dislodgement of the fish from their positions on the rocks by the powerful currents and waves is prevented by the action of a curious fleshy cup-shaped sucker on the lower side of the chin and by the fan-shaped pectoral fin. Besides the active movements of the fish such as skipping, skimming and swimming, the author describes its progression on rock-surfaces by the flexure of its tail, and various other curious voluntary movements.

The Rock-skippers feed mainly on minute algæ growing on rocks which they scrape with the help of their fine golden yellow teeth. The great length of the intestine shows that they are vegetable feeders.

The study of the behaviour of the ever-active Rock-skippers in their natural environment having presented considerable difficulties, the author succeeded in keeping them in aquaria for periods up to a month and observing them under various experimental conditions to which he subjected them in the Laboratory. These fish, it was observed, could not survive desiccation for more than three hours as when the moisture on the skin dried up they began to collapse. The author has pointed out that the minute ridges and grooves on the head, operculum and parts of the body may serve to retain moisture for a much longer period than if the skin were smooth. Although the fish bask in the sun in their natural haunts for short periods, it would appear that the moisture content of the skin determines the period up to which they can suffer desiccation. Nor can the fish survive prolonged immersion in the sea-water as atmospheric air, not air dissolved in water, is essential for their life under the conditions prevailing in the intertidal region. The Rock-skippers although terrestrial in their habits are fully

adapted for aerial respiration in the presence of moisture, but under adverse conditions can remain alive for short periods through aquatic respiration in which the organs of aerial respiration seem to subserve aquatic function as well. The spacious opercular chamber and the well-developed gill-lamellæ and pseudobranch appear to be the important factors concerned in this increased capacity for aerial respiration. The gradual dilution of sea-water in which the fish live has little effect on them, but in fresh water they show considerable distress and die in about two hours.

The breeding season of *Andamia*, judging from the occurrence of young ones in nature throughout the year and of eggs under laboratory conditions from September to March, seems to be fairly extended and almost continuous. Some of the stages of embryonic development observed in the Laboratory have been described.

The most interesting point in the observations recorded is that, of the several species of Blenniid fishes which inhabit the intertidal region in the Andamans, two have reached a higher stage in the evolution of the air-breathing habit by leaving the relatively stable environment of the rock-pools and acclimatising themselves to the unstable but better aerated conditions of the spray and surf which bathe the rocks on which they live. Of these two species, *Andamia raoi* occupies a lower rung in the ladder of evolution as it is unable to live far away from the open sea while *Andamia heteroptera* has advanced further in its adaptation to a relatively more terrestrial habitat.

OBITUARY

Dr. T. S. Narayana, M.Sc., Ph.D.

DR. T. S. NARAYANA comes of a family of reputed scholars.—His father is Mahamahopadhyaya Kalaprapurna Dr. Tata Subbaraya Sastri of Vizianagaram. Educated at the Maharajah's College, Vizianagaram, and the Hindu University, Benares, he worked for three years at the Indian Institute of Science, Bangalore, as a Madras Government Research Scholar under the direction of Prof. H. E. Watson. Thereafter he did research in the laboratories of the Andhra University and was serving as a Lecturer in Chemistry in the P. R. College, Cocanada, at the time of his death.

Dr. T. S. Narayana

His published work relates to the Budde Effect in Halogens and is very widely appreciated—extensive references to it are to be found in recent books on Photochemistry like Plotnikov's "Allgemaine Photochemie". He was a very gifted experimenter, and a man of wide learning, not a narrow specialist. His death at the premature age of 32 has removed from our midst a physical chemist of great promise, a skilful experimenter, a popular teacher and above all a very genial friend.