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SENSITIVITIES OF THE CRAB *SCYLLA SERRATA* (FORSKAL) TO NAPHTHALENE IN DIFFERENT MOULTING STAGES

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OVER the past few years, considerable amount of experimental information has been generated regarding the effect of petroleum hydrocarbons in sea-water on marine organisms. From these studies it is evident that naphthalenes (naphthalene and alkyl naphthalene) are highly toxic to marine animals. It is well known that decapod crustaceans are sensitive to natural environmental stresses during moulting. Factors contributing to a high natural mortality in moulting crustaceans include mechanical, physiological and biological factors[1]. Man made stresses such as pollution from off shore oil production and trans-oceanic transport of crude and refined oil could impose an additional burden on the marine ecosystem. The present work is a study of the responses of premoult, intermoult and postmoult stages of the crab *Scylla serrata* to water borne naphthalenes. *S. serrata* is an intertidal crab forming an important part of the crustacean fishery along the Bombay coast.

From a stock of juvenile crabs of more or less uniform size, crabs of different stages namely, intermoult, premoult and postmoult, were seggregated and kept separately in different aquaria for acclimation. The classification proposed by Drach[2] was followed for identification of the different moulting stages of this crab.

The stages identified and tested in the present work were as follows:

Postmoult stage:	Stage A – immediately after moulting.
	Stage B – paper shell stage.
Intermoult stage:	Shell hard and calcification complete.
Premoult stage:	Advanced stage for subsequent moult with a few cracks in the old cuticle.

After acclimation the crabs were exposed to naphthalene concentrations of 11 mg/l, 5 mg/l and 2.5 mg/l in glass aquaria each containing 3 litre of sea water and 10 crabs of each stage. These three concentrations were selected with reference to 96 hr LC_{50} value of naphthalene (17 mg/l) for intermoult crabs. Acetone was used as the solvent for preparing stock solution of naphthalene. Aliquots of this solution were added in each experimental tank to give the desired concentration of the toxicant. In the case of the control, acetone alone was added to the water. Water was changed after every 24 hr with fresh addtion of the toxicant. The crabs were fed on bivalve flesh on alternate days. The sea water used during the tests had a temperature of 27°C to 29°C, PH 7.6 to 8.00, dissolved oxygen 6.3 to 8.5 mg/l and the salinity 30 to 32‰. The crabs were examined after every 24 hr up to a period of 15 days. After recording the mortality the dead animals were removed from the tanks. To see the sensitivity of postmoult crabs (Stage A), premoult crabs moulted under laboratory conditions were used for experimental purposes. Survival rate of crabs in all the four stages was, however, not studied at the same time.

From figure 1 it is evident that amongst the stages studied the postmoult crabs (Stages A and B) are more sensitive to all the three concentrations of naphthalene tested. Higher concentrations of naphthalene *i.e.* 11 mg/l was found most toxic at all the stages. In this case, more than 50% of the postmoult crabs died within 12 hr while the remaining showed autotomy. Crabs in stage A showed cent per cent mortality by the end of 48 hr and those in stage B by the end of 96 hr. Low concentration of naphthalene is comparatively less toxic to postmoult crabs.

Intermoult and premoult crabs showed more or less

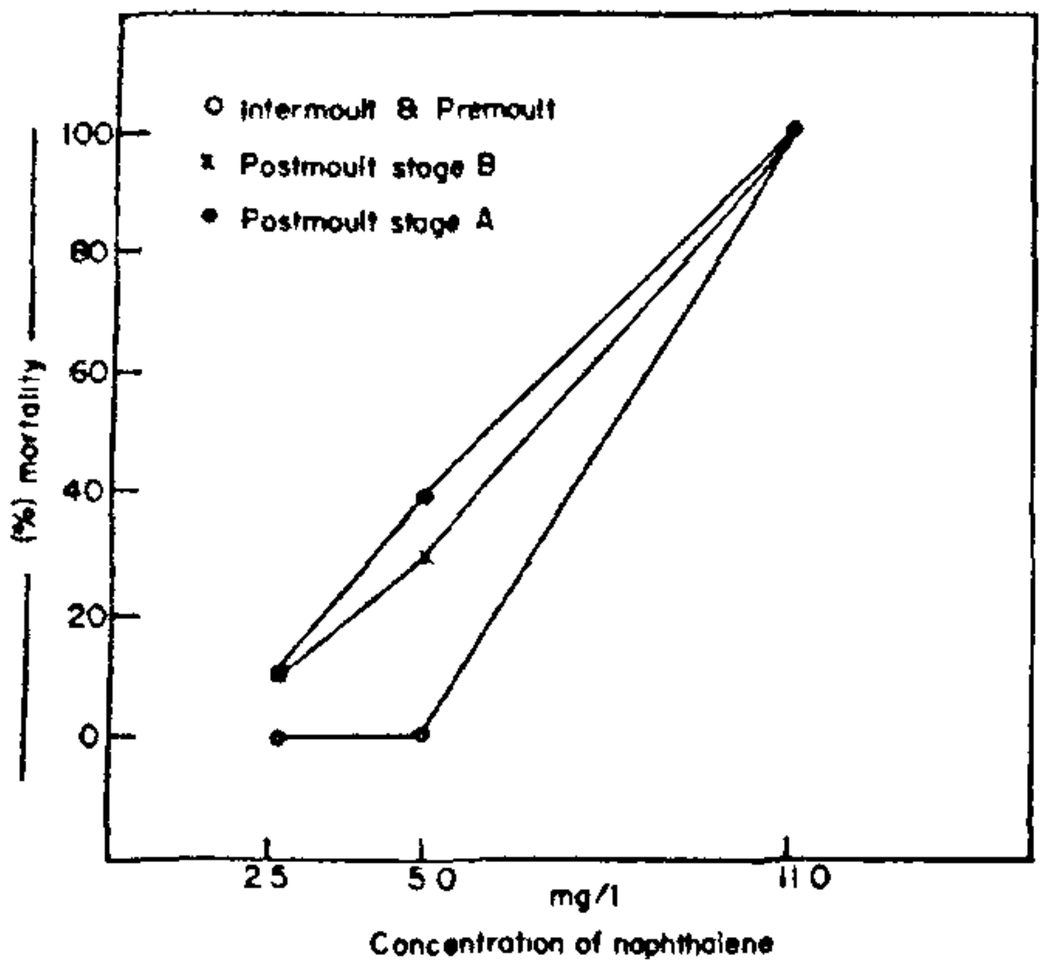

Figure 1. Sensitivities of crab *S. serrata* to naphthalene in different molting stages.

similar sensitivity to all the three concentrations of naphthalene. At the higher concentration of 11 mg/l, the mortality at these two stages began at the end of about 96 hr and all the animals gradually died by the end of the experimental period of 15 days. Both intermoult and premoult crabs could tolerate low concentration of naphthalene over a period of 15 days of the experimental period. Some of the premoult crabs even moulted in water containing low concentration of naphthalene.

Similar high sensitivity of moulting crustacean larvae to the stress of crude oil has been mentioned by few workers[3–5].

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DIURNAL RHYTHM OF BIMODAL OXYGEN UPTAKE IN AN AIRBREATHING LOACH, *LEPIDOCEPHALUS THERMALIS* (VAL.).

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DESPITE many attempts[1,2] to relate respiration to ecology in Indian airbreathing fish, virtually nothing is known on the respiratory patterns in relation to the oxygen content of their natural habitats. Though *Lepidocephalus thermalis* is known[3] to inhabit water of low oxygen content, measurements of O_2 tension are not available to assess the tolerance of the fish to hypoxia and the importance of airbreathing organs under natural conditions. The present investigation attempts to study the diurnal variations in the O_2 consumption of the fish in the absence of fluctuations in the O_2 tension. The pattern of diurnal fluctuations in the O_2 obtained through the airbreathing organs is discussed in relation to the O_2 content and its diurnal variations in the waters inhabited by *L. thermalis*.

Collection, maintenance and weight range of fish used have been described earlier[4]. Fish of either sex were starved for 24 hr before experimentation. The diurnal rhythm of O_2 consumption was studied at 29 $\pm$1°C using respiratory chambers as designed by Reddy and Natarajan[5]. The oxygen consumed under water and in air was separately determined for a day at 3 hr intervals. Total O_2 consumption at each time was obtained by summing up the values for aquatic and aerial respiration obtained at the corresponding time. Throughout the present study the O_2 content of the water was kept constant (6 ± 0.2 mg/1). The aquatic respiration of the fish without access to air was studied by the method of Job[6]. Winkler's method was used for estimating the O_2 content of water samples. The O_2 consumption of the fish in air was measured using a respirometre involving the principles of manometric technique. At each time of the day the experiment was run for only 30 min to avoid the influence of hypoxia.

The O_2 content of the water of a pool inhabited by these fish was estimated at regular intervals of 3 hr for over 4 days. Winkler's iodimetric method was used for estimating the O_2 content of water samples. The average values were noted against the times of the day at which the dissolved O_2 content was estimated.

The O_2 content of the water of a pool inhabited by *L. thermalis* fluctuated between 1.2 cc and 4.2 cc per litre with the maximum being reached at 18 hr and the