

Comparison of Protein Content in the Haemolymph of Brachyuran Crabs

G. Rameshkumar, S. Ravichandran, G. Kaliyavarathan and T.T. Ajithkumar

Centre of Advanced Study in Marine Biology, Annamalai University, Parangipettai 608 502, India

Abstract: Crustacean haemolymph proteins vary with nutritional state. Blood proteins considerably changed during imposed fasting, qualitative studies of blood protein were mainly based on electrophoretic mobility of proteins. For a long time it was thought that the hemocyanin was the only protein found in crustaceans. The protein content of the haemolymph of brachyuran crabs was studied. Crabs were collected from the Vellar estuarine environment. Protein concentration of the haemolymph was measured using a spectrophotometer. The concentration of protein in the haemolymph shows wide interspecific among brachyuran crabs. The haemolymph proteins from 15 species of brachyuran crab was studied among the species maximum protein content of 10.97% in *Scylla serrata* and the minimum protein content of 2.30% in *Thalamita chaptali* was noticed.

Key words: Estuary • Crab • Haemolymph • Protein

INTRODUCTION

Crabs are good sources of food including protein source for marine lives as well as for human. The nutritional quality of the crab proteins were compared vary favorable than that of muscle meat of mutton, chicken, duck and fish. The literature contains conflicting reports of the effects of nutritional status upon blood protein concentrations in haemocyanin-containing species. The haemolymph proteins of marine invertebrates are unique in composition, as they do not contain immunoglobulin or albumin like proteins and the protein composition vary in relation to physiological and functional state of the animal. The effect of salinity on hemolymph osmotic pressure, sodium concentration and Na⁺-K⁺-ATPase activity of gill of Chinese crab [1]. The proteomic approach for acute-phase proteins of hemolymph and muscles in *Scylla serrata* challenged by a pathogenic bacterium [2]. The relative contributions of hemocyte phenoloxidase and hemocyanin in the physiological ratio at which they occur in hemolymph have been investigated in the crab *Cancer magister* [3].

The concentration of protein in the haemolymph shows wide interspecific among brachyuran crabs like *Carcinus maenas* and *Uca minax* [4] of this haemolymph protein, 70-95% consists of the respiratory pigment haemocyanin [5]. The concentration of total protein was found to increase in the haemolymph with increase in

oocyte size, staying at a stable level at later stages oocyte development [6]. The profile of haemolymph enrofloxacin concentration of *Scylla serrata* [7]. But comparative study on the haemolymph protein of bracyuran crabs was not studied in detail. In the present study, therefore, we described the haemolymph protein concentration of 15 dominant brachyuran crabs from the Vellar estuarine environment.

MATERIALS AND METHODS

Collection of Animal: Crabs were collected from the Vellar estuarine (Fig. 1) environment Lat 11 ° 29 'N; 79° 46' E. Healthy male and female animals at different stages of development were used throughout for experimental purposes and each animal was subjected to a single bleed collections were being done at the time of use.

Collection and Estimation of Protein: Haemolymph were collected by cutting each walking legs of the animal with a fine sterile scissor. The amount of protein was measured by spectrometry according to the method of Biuret [8] using a calibration curve prepared with different concentrations (0.1- 0.5 mg/ml⁻¹) of Bovine Serum Albumin (BSA) as standard. Biuret reagent was used as a colour reactant and concentration was calculated in response to absorbance at 540nm in spectrophotometer (Spectro UK- VIS RS).

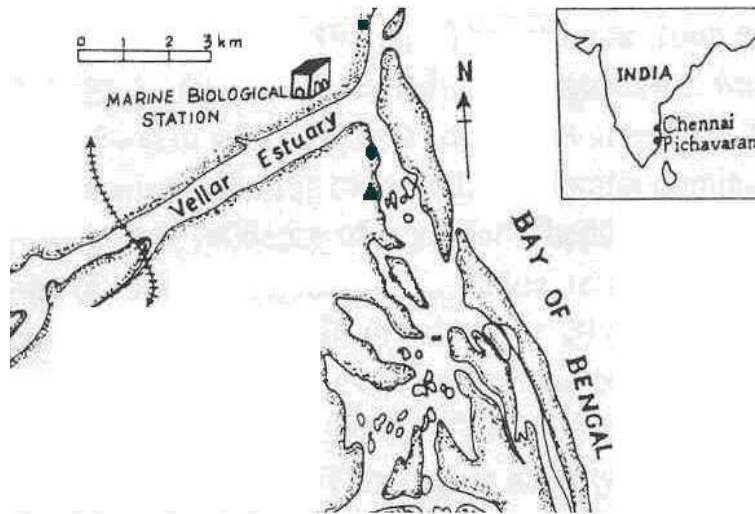


Fig. 1: Showing the study area

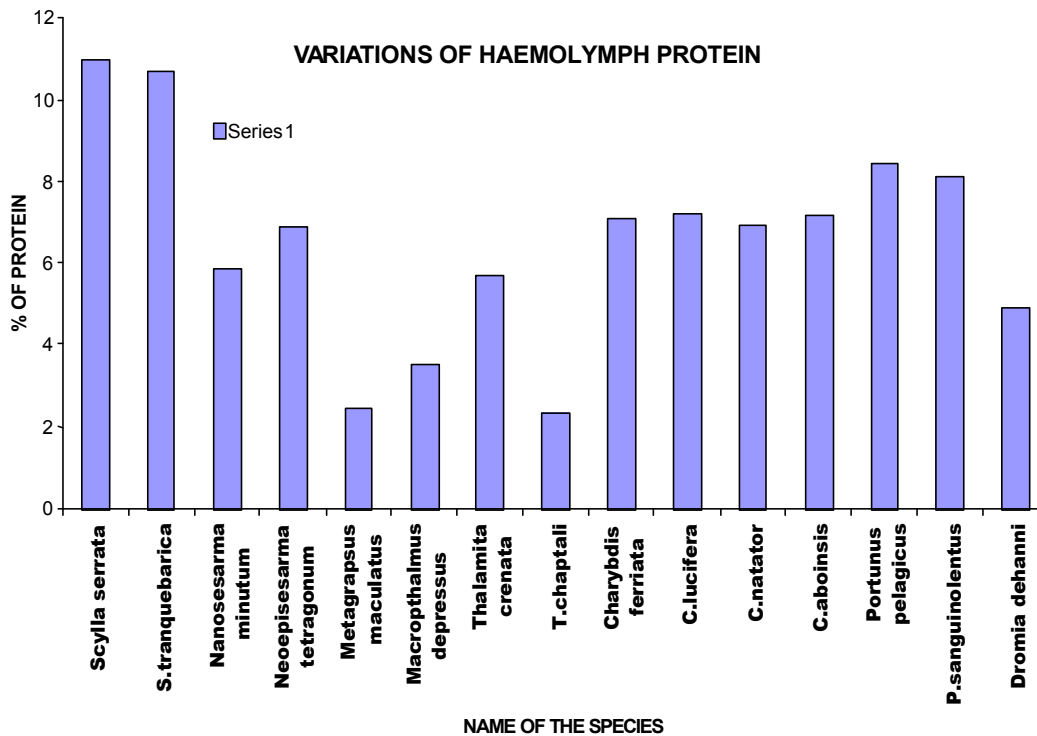


Fig. 2: Comparison of protein content in the brachyuran crabs

RESULTS

Comparison in protein content of the haemolymph of some dominant brachyuran crabs is shown in (Fig. 2). Among the haemolymph proteins from 15 species of brachyuran crabs with a maximum protein content of 10.97% was recorded in *S. serrata* and the minimum protein content of 2.30% in *T. chaptali* crabs.

DISCUSSION

The decapod haemolymph comprises mainly haemocyanin and others have demonstrated the heterogeneity of the haemocyanin [9-13]. Although previous observations of higher blood protein levels in sacculinid specimens of *Carcinus maenas* [14] were not accompanied by satisfactory statistical treatments of the data. The serious general effects of the bacterial

infection in *Carcinus maenas* are not reflected in the total haemolymph concentration, which approximates the reported level of about 30 mg ml⁻¹ in the early premoult stage [15, 16]. In the fiddler crab *Uca pugilator* also found no difference in the haemolymph protein content in infected and healthy crabs [17].

The concentration of protein in the haemolymph shows wide interspecific variation among the brachyuran crabs [18,19]. Similar result was observed in the present study maximum percentage of protein in the haemolymph of mud crabs *S.serrata* (10.97%) and *S.tranquebarica* (10.72%) followed by *Nanoepisesarma minutum* 5.83%, *Neoepisesarma tetragonum* 6.87%, *Metagrapsus maculatus* 2.24%, *Macrothalamus depressus* 3.52%, *T. crenata* 5.7%, *Charybdis ferriata* 7.12%, *C. lucifera* 7.23%, *C. aboensis* 7.18%, *C. natator* 6.94%, *Portunus pelagicus* 8.45%, *P. sanguinolentus* 8.15% and *Dromia dehanni* 4.89% and the lowest percentage of 2.30% was reported in *T. chaptali*. Serum protein levels in *C. maenas* [20] and *Homarus americanus* [21] have also been shown to decrease in response to starvation. The analysis of 41 individual serum protein concentrations in *Maia squinado* by [22] showed three to four-fold differences. The same individuals after molt, despite an abrupt drop in protein concentration, showed the same range of individual variation.

The hemolymph proteins share a surprising degree of sequence similarity and are members of the hemocyanin gene family. Copper-containing prophenoloxidases of crustaceans and insects are directly involved in cross-linking and hardening of the exoskeleton during molting and repair. Crustacean cryptocyanin and insect hexamerins lack copper and have probably evolved from a copper-free product of an early hemocyanin gene duplication. These proteins have been implicated in transport of hormones and phenols and may be used directly as structural components of the new exoskeleton [23, 24, 3]. They are synthesized elsewhere in the body, transported in the hemolymph and probably taken up by the hypodermis via specific receptors. The results of the present study indicate that the concentration of protein in the haemolymph shows wide interspecific variation among the brachyuran crabs.

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