COMPARATIVE ELECTROPHORETIC STUDIES ON THE SERA OF FIVE SPECIES OF MARINE MOLLUSCS

By

Dr. H. K. BADAWI and A. K. HASAN

Institute of Oceanography and Fisheries, Alexandria, A.R.E.

ABSTRACT

The proteins in the sera of the bivalves, *Venerupis (Amygdala) decussata decussata* (LINNAEUS) , *Modiolus barbatus barbatus* (LINNAEUS) and *Lopha (Ostreola) stentina stentina* (PAYRAUDEAU), and the gastropods, *Truncolariopsis trunculus* (LINNAEUS), and *Natica josephina* RISSO were concentrated and studied electrophoretically. Among the bivalves, the serum of V. *decussata* exhibited three fractions, that of *M. barbatus* four, and *L. stentina* five. The serum of the gastropods included three fractions. Species-specific patterns among the molluscs studied were evident.

INTRODUCTION

Although comparative electrophoretic studies of sera have been employed as a taxonomic tool among many groups of vertebrates and invertebrates, few studies of this nature have been performed on the *Mollusca* (DEUTSCH and McSHAN, 1949; WOODS et al., 1958; CHENG and SANDERS, 1962; and CHENG, 1964).

This paper presents a comparative description of the electrophoretic components of sera of five species of marine molluscs. These mollusc species are related to different families, each family may have a specific value of the serum protein content, however, this paper was done to prove this fact and to throw some light on the importance of the electrophoretic studies as a useful tool from the taxonomical point of view.

MATERIAL AND METHOD

The molluscs under consideration were the bivalves, *Venerupis (Amygdala) decussata decussata* (LINNAEUS), *Modiolus barbatus barbatus* (LINNAEUS), and *Lopha (Ostreola) stentina stentina* (PAYRAUDEAU), and the gastropods, *Truncolariopsis trunculus* (LINNAEUS), and *Natica josephina* RISSO. The specimen were collected from sandy and muddy grounds from shallow areas off the eulittoral regions surrounding Alexandria.

The techniques for collecting blood and drying and rehydration of sera were those described by CHENG, 1963, 1964.

Total protein concentrations of all the sera samples were determined with a GOLDBERG refractometer before and after drying and rehdration. Data obtained with the refractometer were checked by using the biuret test for proteins. WOLF et al., 1962 have shown that the refractometeric data are comparable to those obtained by the KJELDAHL and biuret methods of analyses.

The electrophoretic equipment employed was a BECKMAN DURRUM-type electrophoresis migration chamber supplied with current from a Spinco Duostat; 0.01 ml serum samples were used in all instances. Sepraphore strips run in ARONSSON'-S buffer for three hours at a constant 300 volts, and stained with bromophenol blue as described by CHENG, (1964) was the technique employed in the studies reported herein.

RESULTS

The total protein concentrations in the sera were increased after drying and rehydration. In table 1. the concentrations of the various sera before and after treatment are compared.

Among bivalves, the serum of *V. decussata* (Fig. 1.) had three fractions, one of which migrated toward the cathode, that of *M. barbatus* exhibited four fractions, one of which migrated toward the cathode, and that of *L. stentina* included the most protein fractions of the species studied, it showed five fractions one of which migrated toward the cathode.

The sera of the gastropods *T. trunculus*, and *N. fosephina* included three fractions each, one of which migrated toward the cathode.

The migration distances of the various serum protein fractions of the species examined are tabulated in table. 2. The sera of the 5 species differed as to the final mobility obtained. *V. decussata* sera migrated 39 mm, *M. barbatus* 45 mm, *L. stentina* 52 mm, *T. trunculus* 45 mm, and *N. josephina* sera 55 mm.

Table 1. Comparison of the total protein concentration, specific gravity, and water concentration of molluscan sera before (pre-) and after (post-) drying and rehydrating as determined refractometrically.

Serum	Refractive index		Protein conc.		Specific gravity		Water conc.g/100ml	
	Pre-	post-	pre-	post-	pre-	post-	pre-	post-
V. decussata	1.3402	1.3460	2.5	5.5	1.0142	1.0215	96.7	94.6
M. barbatus	1.3415	1.3455	3.10	5.15	1.0155	1.0215	96.5	94.9
L. stentina	1.3390	1.3456	1.95	5.30	1.0120	1.0206	97.5	95.2
T. trunculus	1.3396	1.3480	2.15	6.45	1.0125	1.0250	97.35	94.0
N. josephina	1.3334	1.3400	0.008	2.35	1.0032	1.0148	99.7	96.9

Table.2. Comparison of the migration distances of the various serum protein fractions of the molluscs studied.

Species	Serum protein fractions (migration distance, in mm, from line of application)				
	1*	2	3	4	5
V. decussata	6	5	39		
M. barbatus	10	18	30	45	
L. stentina	31	28	35	45	52
T. trunculus	10	8	45		
N. josephina	24	30	55		

* Fraction no 1. migrates toward the cathode.

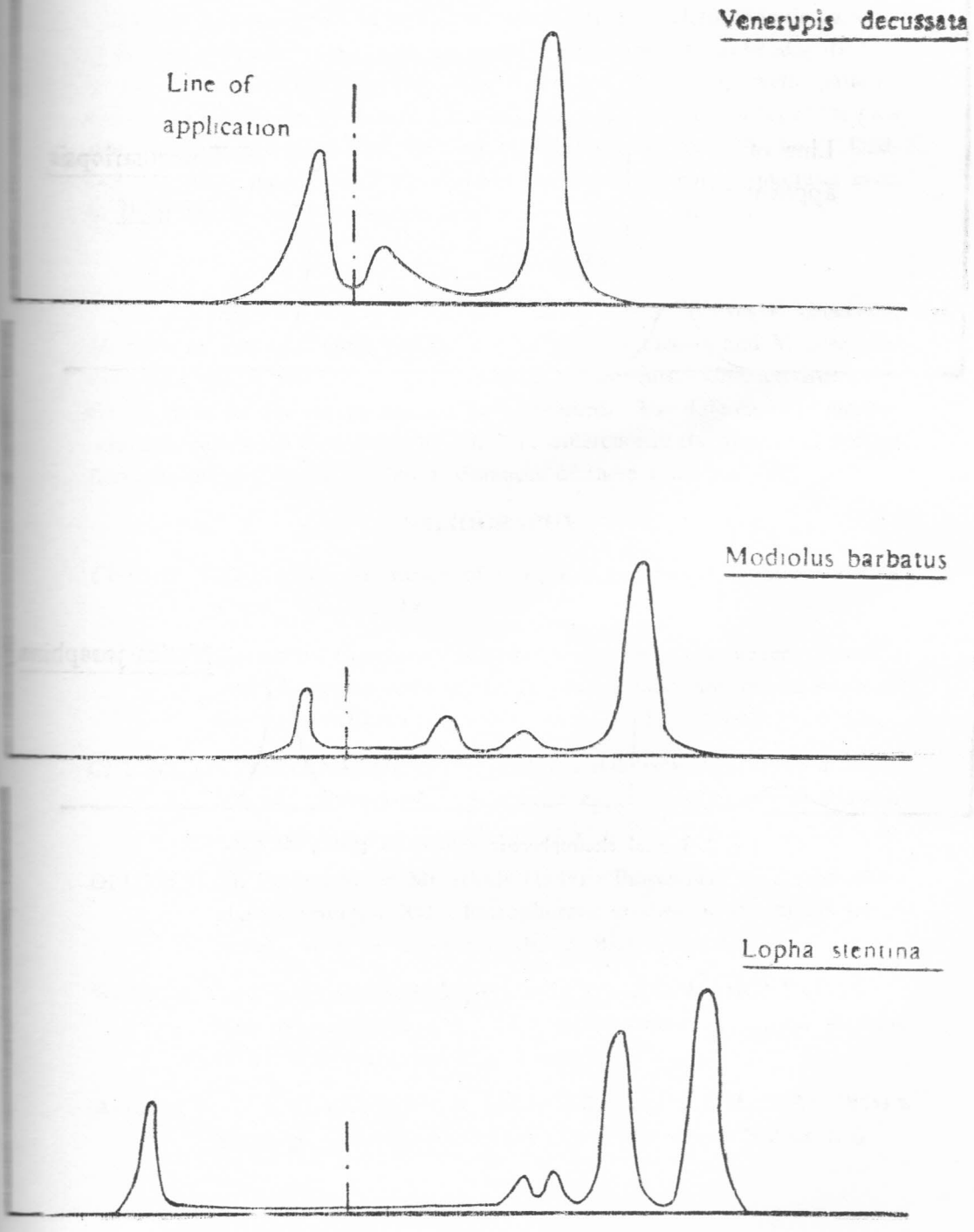

Fig. 1. Typical electrophoretic patterns of bivalves sera.

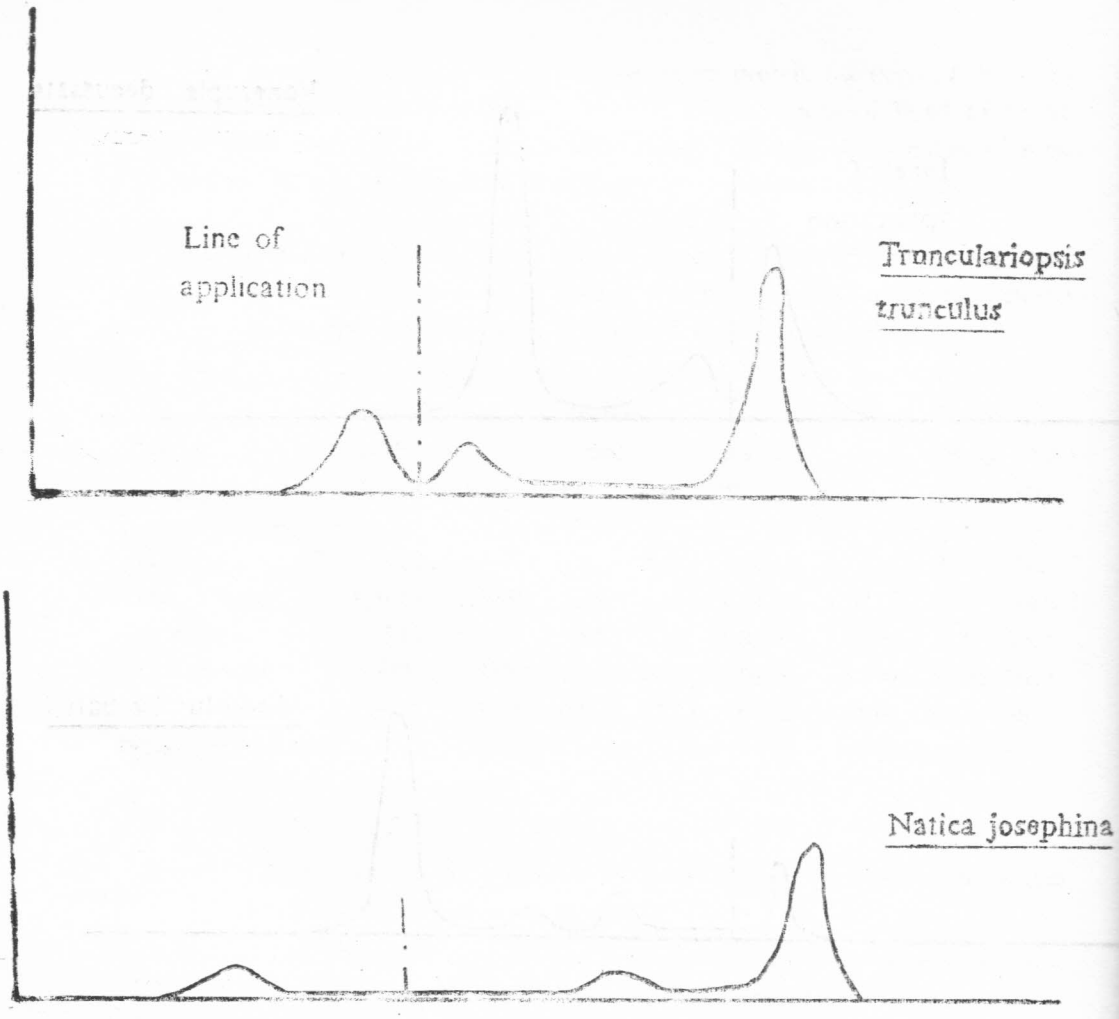

Fig. 2. Typical electrophoretic patterns of gastropods sera.

DISCUSSION

From the data presented herein, it is evident that the electrophoretic patterns of all the five species of molluscs are distinct. Each species can be identified by its serum electrophoretic pattern. The differences in electrophoretic patterns among the species can be classified into two categories (a) the number of the protein fractions present, and (b) the migration distances of these fractions. Undoubtedly much more extensive surveys of the serum proteins of molluses must be made before useful taxonomic informations will be obtained.

SUMMARY

A comparative study of the serum proteins of the bivalves *V. decussata*, *M. barbatus*, and *L. stentina*, and the gastropods, *T trunculus*, and *N. josephina* were analyzed electrophoretically for protein components. Characteristic protein fractions for the species studied were obtained. The differences in electrophoretic patterns is mainly due to either the difference in the number of protein fractions present or the migration distances of these fractions.

BIBLIOGRAPHY

CHENG, T.C. (1963) : Activation of *Gorgodera cercariae* by molluscan sera. Exptl. Parasitol. 13.

CHENG, T. C. (1964) : Comparative electrophoretic studies on the sera of marine and fresh-water molluscs. In Taxonomic biochemistry and serology. Ed. by CHARLES A. LEONE. New York. : Ronald Press Co.

CHENG, T. C. and G. SANDERS (1962) : Internal defense mechanisms in molluses and an electrophoretic analysis of a naturally occuring hemagglutinin in *Viviparus maleatus* (REEVE). Proc Penna. Acad. Sci. 36.

DEUTSCH, H. F., and W. H MCSHAN (1949) : Biophysical studies of blood plasma proteins. XII Electrophoretic studies of the blood serum proteins of some lower animals. J. Biol. Chem 180 .

WOLF, A. V. , J. B. FULLER, F. J. GOLDMAN, and D. MAHONY (1962) : New refractometric methods for the determination of total proteins in serum and in urine. Clin. Chem 8.

WOODS, K. R., E. C. PAULSEN, R. L. ENGLE, JR., and J. H. PERT (1958) : Starch gel electrophoresis of some invertebrate sera. Science 127.