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STRUCTURAL AND FUNCTIONAL ANATOMY OF STOMACH OF A FRESHWATER BIVALVE *PARREYSIA FAVIDENS* (BENSON) OF KOSI RIVER OF NORTH BIHAR

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INTRODUCTION

Different members of the bivalves show considerable variations in structure and function of the stomach Graham, 1949; Owen, 1956; Purchon, 1960a; Bernard, 1973; Judd, 1979). *Parreysia favidens* is one of them found commonly in freshwater system belonging to the family Unionidae. The alimentary canal of *Parreysia favidens* like other bivalves is peculiar due to the presence of many specialized characters which suits their specific mode of feeding. *P. favidens* is a deposit and suspension filter feeder, feeding chiefly on phytoplankton, zooplankton and detritus. Several works have been done on the structure and function on the stomach of molluscs. Morton, 1953; George, 1952; Owen, 1956; Millar, 1955; But no adequate knowledge is available on the Structural and functional anatomy of stomach of *P. favidens.* The present paper deals with the structural and functional anatomy of a freshwater bivalve *Parreysia favidens.*

Key Words : Structural, Functional Anatomy, Stomach, *P. favidens.*

MATERIALS AND METHODS

Live specimens of *P. favidens* were collected from different rivulets and channels of the river Burhi Gandak of North Bihar. The collected specimens were fixed in 5% formalin. Now the alimentary canal of the specimens were taken out and cut into small pieces. The small pieces of stomach were dehydrated in graded alcohol and xylene and specimens transferred for 2 hrs in wax at 60-62°C. Three changes were made and specimens were embedded. The embedded materials were trimmed and section (5-7 μm thick) and were stained with haemotoxylin. For analysis of enzymes, analysis test of lipase, Protease and amylase were made by mixing the extract with an

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emulsion of olive oil and subsequently staining a small sample with Nile blue sulphate (George, 1952). Camera lucida sketches of the specimens were drawn.

RESULT AND DISCUSSION

The alimentary canal of *Parreysia favidens* consists of a mouth, a relatively short and flattened oesophagus, a complex stomach, a midgut and rectum opening outside by the anus. The stomach is surrounded by a deep brownish or greenish digestive gland or diverticula. From the stomach arises a number of openings into the digestive diverticula. (Fig. 1). The stomach receives digestive enzymes (Proteases and lipases, Mansour Bek; 1948. Rose; 1949 and George; 1952) from diverticula through ducts. An outgrowth is found at the junction of stomach and intestine which is called "style sac" Style sac secretes a still gelatinous rod of mucoprotein termed "crystalline style" which contains mucous and powerful amylolytic anzyme (Fig. 1).

The stomach of *P. favidens* is relatively a thin walled sac and extensively ciliated. The ciliated areas are typically formed into a complex pattern of fold and ridges to create sorting areas. There are three main sorting regions out of which first region sorts fine food particles from the mucous string by means of ciliary sorting areas and rejects debris or indigestible matters into the intestine, second region carries part of digestible food which is to be passed into the digestive gland for intracellular digestion and third conveys waste materials returned from the digestive gland to the intestine (Reid, 1965). The grooves and redges of gastric shield really corresponds to those present on the inner wall of the stomach. The food particles remain present towards the ventral side in the lumen of the stomach hence the midgut takes its origin. Gastric shield constitutes an inert structure which is a chitinous, protective lining of the stomach against which the style rotates. It appears to be present upto greater or lesser extent in all the bivalves and hold the head of the styles assisting in the mortar trituration of the stomach contents by a type of mortar and pestle action (own, 1956, shaw and Battle, 1959). The shield overlay a ciliated epithelium. The cilia are infact attached on its free surface. The crystalline style sac is completely filled by a gelatinous crystalline style. It is solid but flexible rod (Fig. 2). Morphologically the style sac separately develops from the midgut. In *P. favidens* the particulate matter forming the bottom deposits includes sand grains, living organisms and organic detritus (Table 1, 2). It is collected by the palp proboscis and injested in considerable quantity, so that in freshly caught animals the stomach is invariably distended. The presence of sphincter muscle at the junction of the style sac with the intestine prevents the scope of material from the stomach except by the intestinal groove. Enzymes are secreted into the lumen by the style sac epithelium and by the digestive diverticula and food and enzymes are thoroughly mixed with food enzyme rotatary action by the action by the specialized cilia of the style sac. The pressure exerted by the distended wall of the stomach, aided by muscular action, serves to evaluate

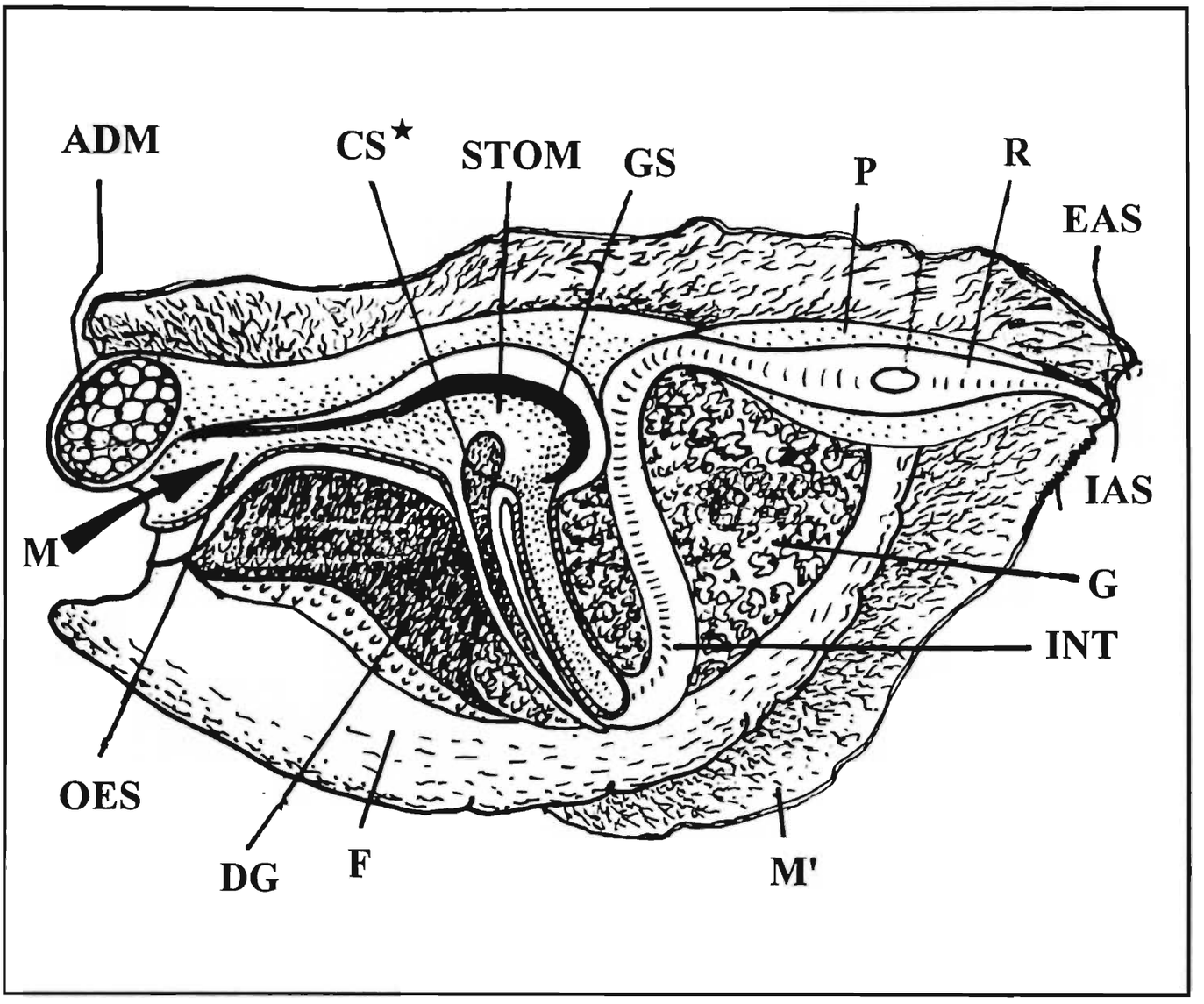

Fig. 1. Diagrammatic representation of internal anatomy of *Parreysia favidens* showing the position of stomach alongwith crystalline style (CS) and gastric shield (GS).

the soluble products of digestion out of the contained mass and these are absorbed by the lining opithelium. Finally, relaxation of the sphincter muscle allows the compacted faecal mass contained in the style sac to enter the intestine (own, 1956). The secretory spheres produced by the fragmentation of the tubule cells may contain proteases and lipases, whose traces could be liberated into the stomach (Morton (1953) suggested for the gastropod, *structhio Laria*) presumably serve to drive fluid out of the ducts, while at the same time preventing material from entering the diverticula.

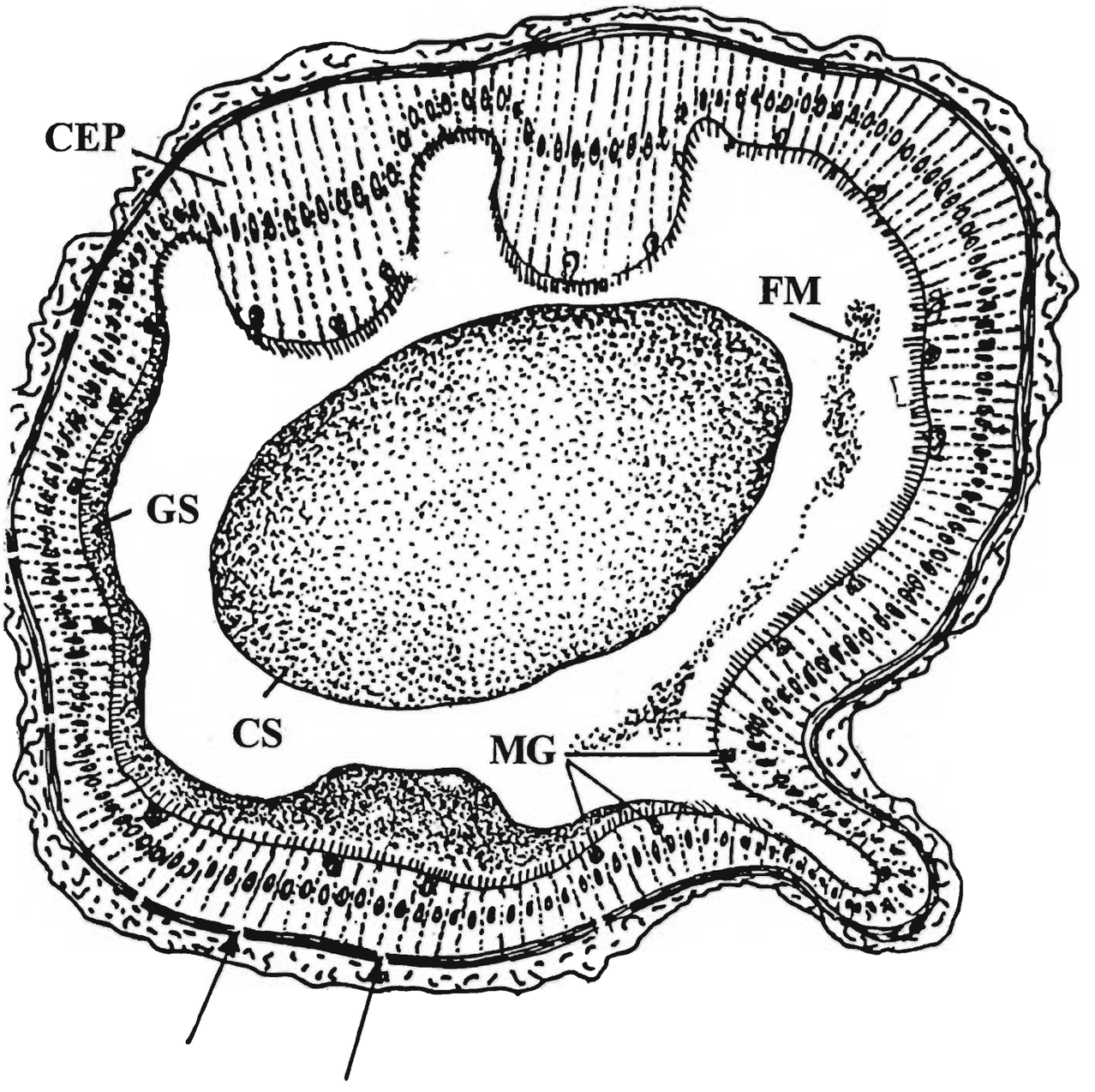

Fig. 2. Showing the camera lucida sketch of T.S. of stomach of *Parreysia favidens*. Note asterix shows the position of crystalline style (CS) and gastric shield (GS) of *P. favidens*.

ABBREVIATIONS

ADM	..	Adductor muscle	M	..	Mouth
CS	..	Crystalline style	MG	..	Mucous gland
DG	..	Digestive gland	R	..	Rectum
EAS	..	Exhalant	OES	..	Oesophagus
FM	..	Faecal matter	STOM	..	Stomach
GS	..	Gastric shield	P	..	Pericardium
G	..	Gonad	M'	..	Mantle
IAS	..	Inhalant siphon	F	..	Foot
INT	..	Intestine			

Table 1. Intensity of feeding in Parreysia favidens in different periods (Values in %).

Months	No. of stomach	Georged	Full	3/4 Full	1/2 Full	1/4 Full	Little	Empty
MAR	20	8.2	26.6	26.4	17.6	9.2	7.8	2.2
APR	23	21.4	30.3	13.7	14.4	8.4	6.5	5.3
MAY	19	15.4	39.6	11.4	13.7	6.3	7.9	5.7
JUN	21	13.4	28.1	20.6	20.6	10.7	4.2	2.4
JUL	17	02.4	06.6	11.7	20.8	32.6	20.8	5.1
AUG	18	01.9	04.3	10.7	20.8	30.7	28.7	2.9
SEP	14	–	–	07.4	16.3	40.3	16.9	19.1
OCT	11	–	–	10.4	18.3	38.6	25.8	5.9
NOV	16	02.0	04.0	27.3	29.3	30.4	07.0	–
DEC	19	08.1	21.4	20.3	21.4	14.8	13.8	0.2
JAN	21	09.9	20.4	22.6	23.7	16.3	08.7	0.4
FEB	13	10.4	23.4	27.6	20.4	10.3	06.2	1.7

Table 2. Plankton community (%) in gut contents of *Parreysia favidens* and water samples of Siurighat (Begusarai) during March 1995 to February 1996.

SEASONS	Gut contents of Parreysia favidens									Plankton in water sample of Siurighat							
	Phytoplankton				Zooplankton				Miscllanous	Phytoplankton				Zooplankton			
	Bac.	Chl.	Myx.	Tot.	Pro.	Rot.	Cla.	Tot.		Bac.	Chl.	Myx.	Tot.	Pro.	Rot.	Cla.	Tot.
Summer	31	23	17	71	14	06	05	25	04	36	31	13	80	12	05	03	20
										(1062)	(625)	(396)	(2000)	(286)	(113)	(71)	(500)
Monson	32	23	18	73	13	04	04	21	06	35	24	21	80	11	06	03	20
										(42)	(28.8)	(25.2)	(96)	(13.2)	(7.2)	(3.6)	(24)
Winter	28	24	18	70	15	09	01	25	05	28	32	19	79	14	06	01	21
										(196)	(224)	(133)	(533)	(98)	(42)	(7)	(147)

(Values in brackets are densities in U/L)

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