

SPECIAL ALIMENTARY PROVISION IN AN EDENTULOUS CLUPEID—
GONIALOSA MANMINNA (HAM.)

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ABSTRACT

The pyloric stomach (gizzard) in edentulous *Gonialosa manminna* is a secretory and masticatory organ. It is equipped with a luminal plaque of protein-carbohydrate material.

INTRODUCTION

A THICK pyloric stomach (gizzard) has been reported in several members of Clupeoidei, Chanoidei, Characinoidei and Mugiloidei (see Kapoor *et al.*¹, Castro *et al.*² gave a detailed account on the histology and histochemistry of the special inner coating (the plaque). This report deals with the gizzard, especially the plaque, in an Indian clupeid, *Gonialosa manminna* (Ham.).

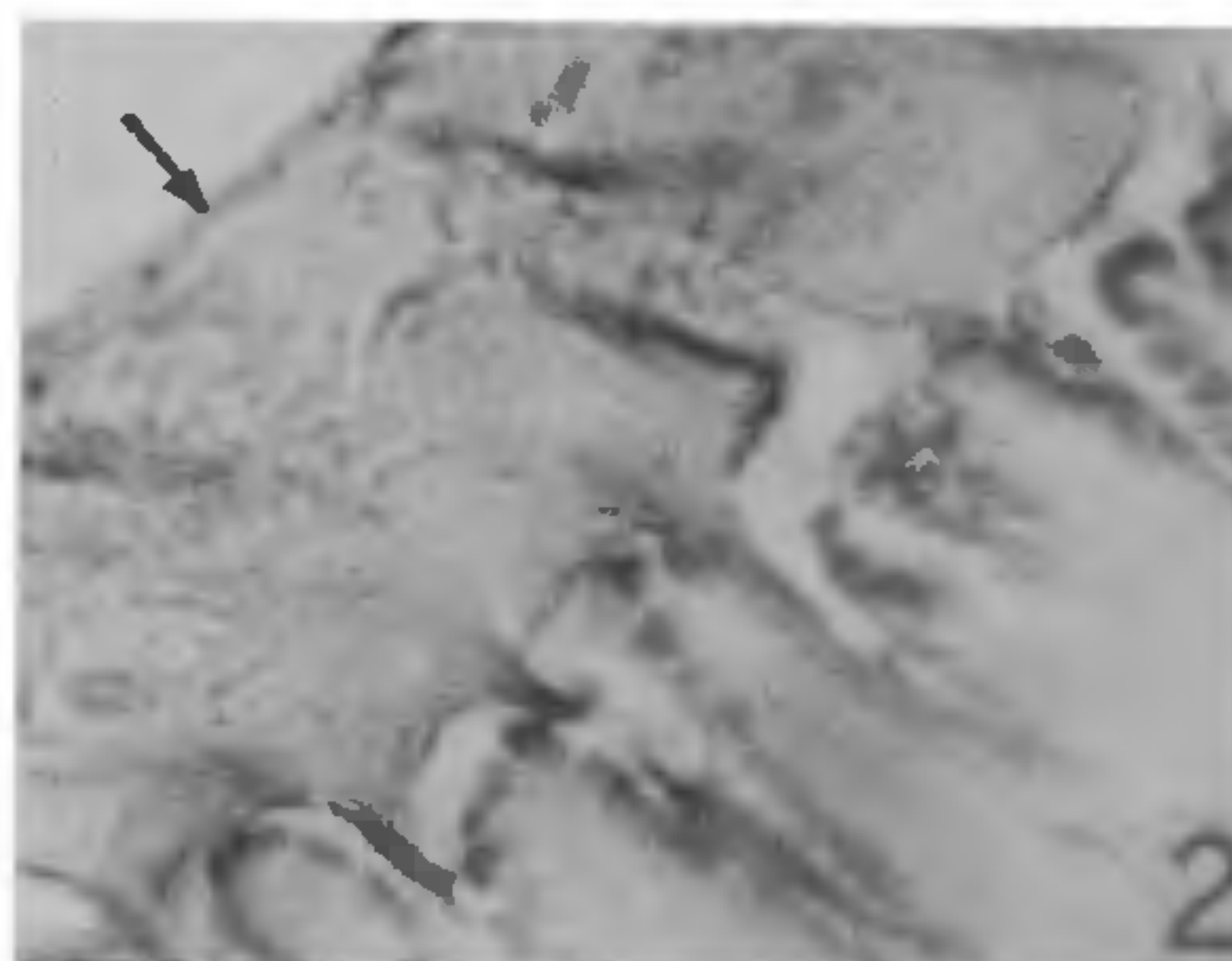
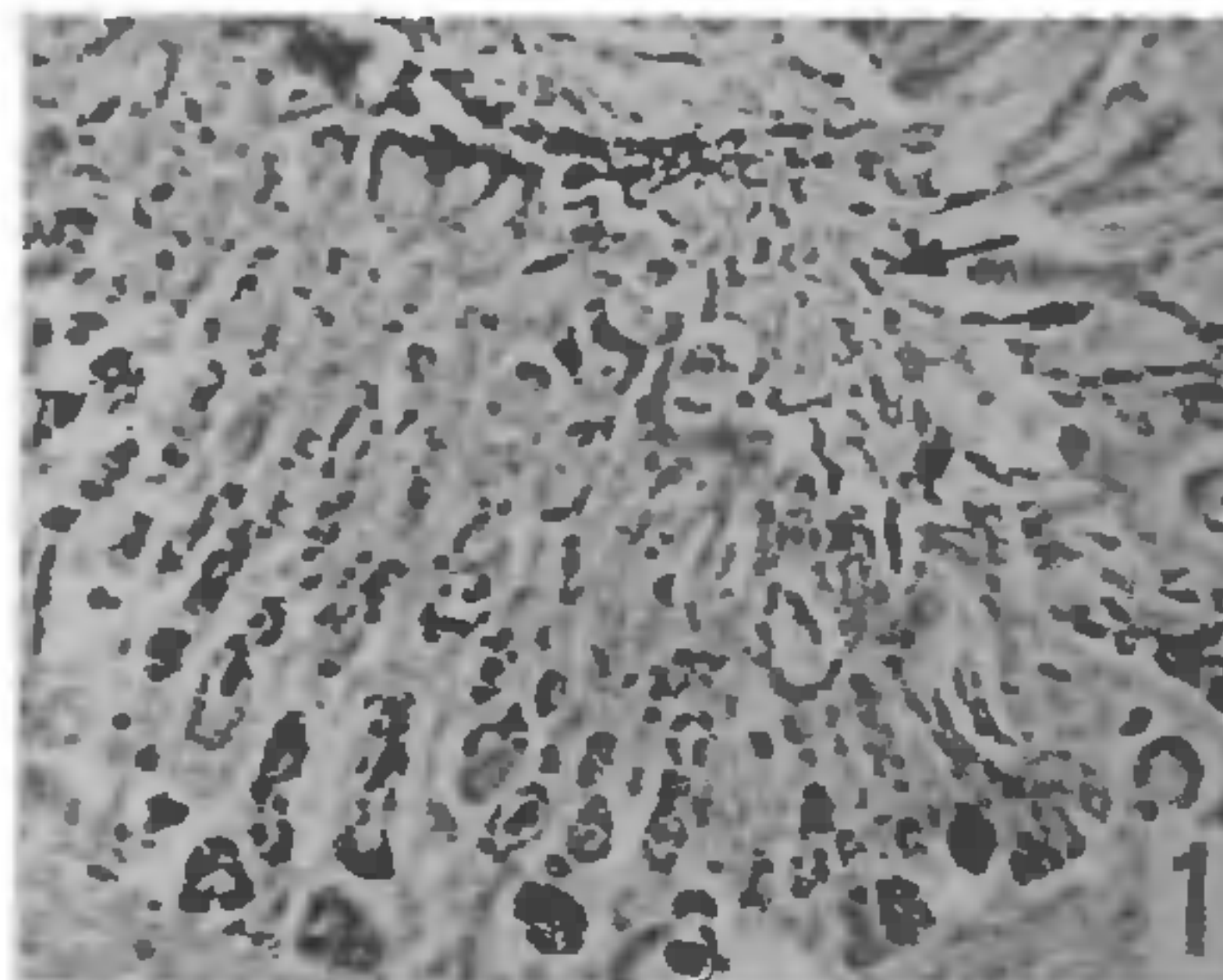
MATERIAL AND METHODS

Live *Gonialosa manminna* were collected from Ganges at Allahabad (U.P.). Small pieces of gizzard were washed in saline water and fixed in Bouin's fluid and 10% saline formalin. Paraffin embedded material was transversely cut at 5-7 microns. Sections were stained with Haematoxylin and Eosin. PAS, mucicarmine and alcian blue (AB) tests were done for polysaccharides and mercury bromphenol blue for proteins.

OBSERVATIONS AND DISCUSSION

The pyloric stomach (gizzard) in *Gonialosa manminna* is composed of four tunics: mucosa submucosa, muscularis and serosa. The characteristics of this gizzard are (i) the innermost plaque and (ii) a strong muscular layer.

The mucosa extends into finger-like folds and has a columnar epithelial lining surmounted by a thick, continuous plaque whose prolongations extend between the gastric folds upto the glandular region (Fig. 1). The plaque is pierced by sinuous canals along its entire thickness and has an irregular, cuticular luminal border (Fig. 2). It gets stained with eosin, PAS, mucicarmine and mercury bromphenol blue. AB test gives a faint reaction. These histochemical reactions indicate the presence of both neutral mucopolysaccharides and proteins in the plaque. It has been reported as: (i) a thick mucus sheet (Ghazzawi³, Al-Hussaini^{1,2}, Mahadevan¹⁰, Thomson¹⁶, Castro *et al.*², Nagar *et al.*¹¹, Schmitz and Baker¹⁸, probably mucoid), (ii) a horny (Ishida⁶) keratinous layer (Zambriborsch¹⁷),



FIGS. 1-2. Photomicrographs of T.S. gizzard of *Gonialosa manminna* showing the presence of luminal plaque (arrow). Fig. 1. Mercury bromphenol blue technique, $\times 125$. Fig. 2. Periodic acid-Schiff technique, $\times 375$.

(iii) a layer of non-cellular material (Wier and Churchill¹⁶, Swarup¹⁹), (iv) a cuticle (Kapoor⁷, López and DeCarlo⁹), and (v) a stratified epithelium with a layer of non-cellular or keratinized tissue possessing scattered groups of isolated cells detached from the underlying epithelium (Chandy and George⁴). Our observations on the structure of plaque are identical with those of Castro *et al.*².

Just underneath the columnar epithelium lies a thick glandular region. The cells of gastric glands are not

differentiated into peptic and oxyntic types. The tunica propria, the support in between the gastric glands, and the connective tissue of submucosa have similar histology.

The muscularis is of unstriated type and made up of a circular layer of muscles. A distinct, outer longitudinal muscle layer is not seen. An outermost serosa with connective tissue fibres and blood capillaries wrap the entire wall.

Various views on the function of gizzard are : partly compensation for poor dentition (Pillay¹², Mahadevan¹⁰), trituration of food (Thomson¹⁵), and secretory as well as masticatory organ (Schmitz and Baker¹³). Our findings that the gizzard serves as a secretory and crushing region in edentulous *Gonialosa man-minna* lend support to the inference drawn by Schmitz and Baker¹³ in *Dorosoma cepedianum*.

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EFFECTS OF POST-NATAL UNDERNUTRITION AND SUBSEQUENT REHABILITATION ON ALDOLASE ACTIVITY IN RAT BRAIN

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ABSTRACT

Effects of post-natal undernutrition and subsequent rehabilitation on aldolase activity in rat brain were investigated. Rat pups were undernourished during the first 21 days of post-natal life by increasing the litter size. A 14% deficit in the enzyme activity was observed at 21 days as a consequence of undernutrition which appeared to be a permanent deficit and could not be reversed by rehabilitation into adult life. The results are discussed with reference to energy metabolism in brain tissue as a function of undernutrition during development.

INTRODUCTION

UDERNUTRITION during 'vulnerable periods' of brain development⁶ in mammals has been shown to affect enzymes of carbohydrate^{1,16-18}, protein¹³, lipid¹⁴ and neurotransmitter metabolism^{1,9,10,12,15}. Adlard and Dobbing¹ have reported lowered activity of the glycolytic enzyme aldolase and oxidative enzyme succinic dehydrogenase in brain as a consequence of

undernutrition. This deficit in succinic dehydrogenase and lowered oxygen consumption which implies an impairment in oxidative metabolism has been shown to persist even in the adult life¹¹. But a similar study for the enzyme aldolase has not been reported to see whether undernutrition during 'critical periods' of brain development results in a lowered metabolic activity in adult brain even after feeding *ad libitum* into adult life, hence the present study.