

ABSTRACT

**The Functional Morphology of the gut of the Callichthyid Catfishes
Hoplosternum littorale (Hancock 1828), *Callichthys callichthys* (Linnaeus
1758) and *Corydoras aeneus* (Gill 1858).**

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An unusual and little understood phenomenon is in the use of the posterior intestine as an air-breathing organ by Callichthyid catfishes. Intestinal gas exchange and digestion/absorption are not mutually exclusive. Comparative morphology and histology of the gut of Callichthyid catfishes (*Hoplosternum littorale*, *Callichthys callichthys* and *Corydoras aeneus*) were examined. The digestive regions of the gut are the buccal and pharyngeal regions, oesophagus, stomach, digestive intestine and rectum. The respiratory region is the posterior intestine between the digestive intestine and rectum. Histologically the digestive region is typical of a teleost fish. In the respiratory intestine there is the reduction in thickness of the epithelium, submucosa and muscle blocks resulting in a diffusion barrier of 1.25 - 3 μm . These reductions make the respiratory intestine limited in its digestive functions. Digesta in the respiratory intestine will disrupt gas exchange, so it has to be transported quickly. This can be accomplished by using the unidirectional, ventilatory air currents within the respiratory intestine. This was demonstrated to be the case in *H. littorale* and *C. aeneus* as when air-breathing is prevented the amount of digesta transported to the rectum is dramatically reduced. Studies of the passage of digesta through the gut revealed that the anterior digestive intestine was

important in this transportation mechanism and the passage of air through the digestive intestine. It packages digesta into a string of slightly compressed boluses which creates an air channel in the digestive intestine allowing air to pass unimpeded. The form in which the digesta is packaged aids the transportation mechanism. Only a small bolus of digesta is in the respiratory intestine at any point in time This maximizes the surface area that is in contact with air and hence maximizes gas exchange. The majority of the digesta is confined to the digestive regions of the gut where digestion /absorption occurs.

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