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Distribution of External Taste Buds in Walking Catfish (*Clarias batrachus*) and Piranha *(Serrasalmus nattereri)*

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Abstract

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To determine the distribution of external taste buds (TB), 3 specimen each of the two species of aquarium fishes: Walking catfish ***(Claris batrachus)*** *and Piranha* ***(Serrasalmus nattereri),*** *were studied. In walking catfish TB were in the highest frequencies in lips, barbels, pelvic and dorsal fins but in the piranha the TB was located only in lip epithelium. The mucous cells were observed together with TB in skin and barbels of both species.*

Keywords: Walking catfish, piranha, taste buds.

Introduction

In fish, the chemical senses, olfaction and taste are highly developed and very important for a wide range of activities like feeding, orientation and social behavior (Boudriot and Reutter, 2001). Taste buds (TB) are comprised of group of 30 to 100 "secondary" receptor cells, which are specialized epithelial cells that form synapses with gustatory nerve fibers.

In fishes, TB enable the animal to identify food by detecting distinct chemical substances at a short distance (Kasumyan, 1997).

In this preliminary study location of external taste buds has been studied in walking catfish and piranha to generate base line data.

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Materials and Methods

Three adults each of walking catfish (L 32 cm, W 240 g) and piranha (L 22 cm, W 190 g) were used for this study. The samples were taken from lips, barbels, lateral (between pectoral and anal fin, anal and caudal fins), dorsal (close to head) and ventral (between pelvic and anal fins) location and dorsal- pelvic- pectoral- anal and caudal fins in both species. All samples were fixed in Bouin's fluid for 24-48 h. After dehydration by passing tissue through a series of alcohol solutions, the samples were embedded in paraffin and sagitally sectioned at 6-7 µm. Hematoxylin and Eosin (H&E), Van Gieson's (VG), Alcian Blue (AB), Periodic Acid Schiff (PAS), Verhoeff's (V) staining methods were performed on the sections. Microphotographs were taken with an Olympus microscopic, CH30 (Olympus, Tokyo, Japan).

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Results and Discussion

In walking catfish the highest frequencies of TB were in lip (Fig. 1), barbells (Fig. 2), pelvic (Fig. 3) and dorsal fin but in piranha these were located only in lip epithelium (Fig. 4). Average height and width of TBs were 43.8 µm and 34.8 µm in walking catfish and 48.1 µm and 37 µm in piranha.

In both species, the TB were detected in lips epithelium in high densities and this finding is in accordance with other findings from flower fish (Cinar and Senol, 2005); gobiid fishes (Fishelson and Delarea, 2004), Garra rufa (Cinar *et al*., 2008) etc.

Spinous and mucous cells were observed together with TBs in skin, barbells and fins of walking catfish and piranha (Fig. 3). They were stained with Alcian blue and PAS, indicating the neutral and acidic (Carboxyl and sulphate groups) glycoproteins (Fig. 5, 6).

In both the examined fishes the TBs were relatively small and were composed of two elongated cells, light (electron-lucent) and dark(electron-dense) cells, whereas the zebrafish has a third fusiform cell type of low electron density (Hansen *et al*., 2002).

Two types (II and III) of TBs have been identified in both species that were different

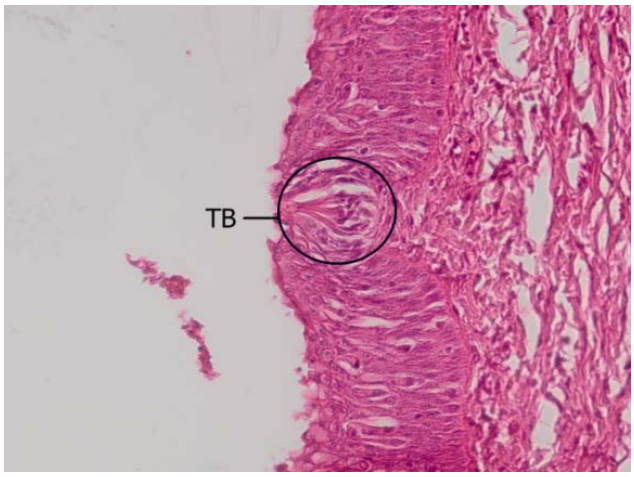

Fig. 1. Taste bud (TB) is placed underneath of epithelium in lip of walking catfish, (H&E, ×640).

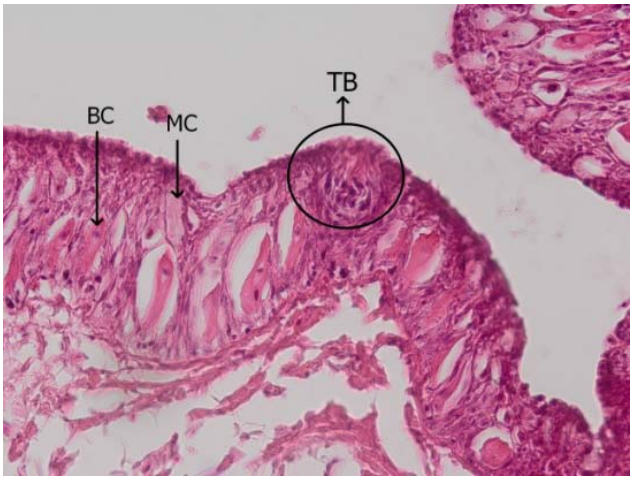

Fig. 3. Taste bud in pelvic fin of walking catfish, taste bud (TB), Mucosal cell (MC), Big cell (BC), (H&E, ×640).

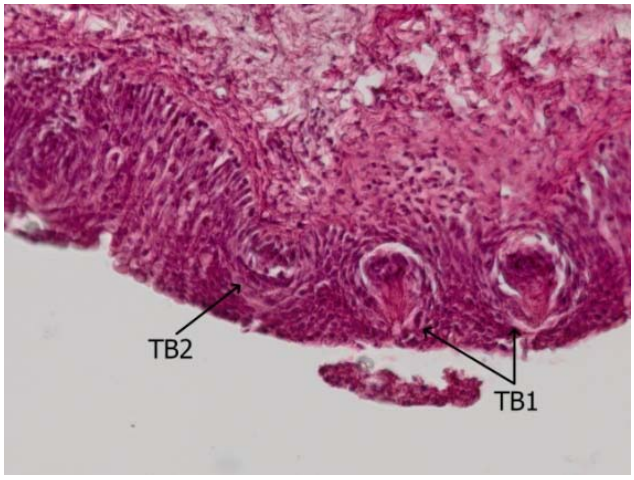

Fig. 2. Taste buds type (I) and type (II) in barbels of walking catfish (H&E, ×640).

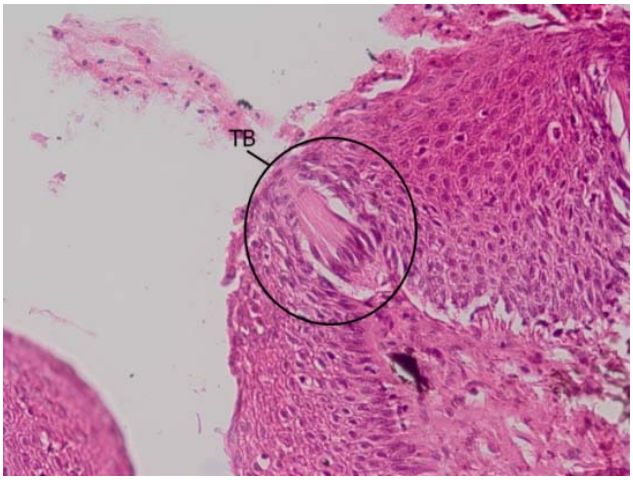

Fig. 4. Taste bud (TB) is placed underneath of epithelium in lip of piranha, (H&E, ×640).

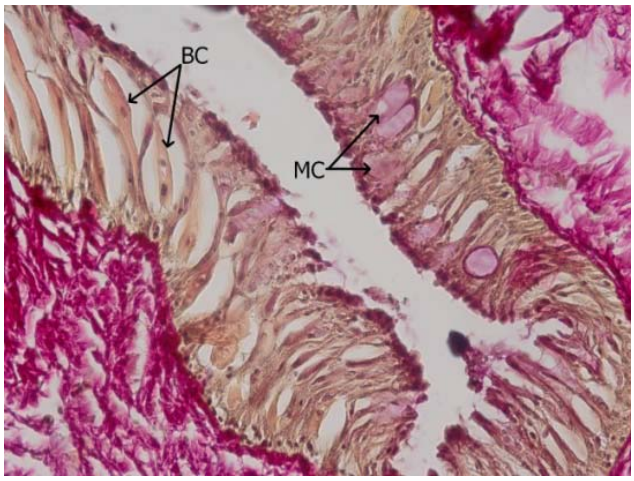

Fig. 5. Mucosal cell in pelvic fin of walking catfish, mucosal cell (MC), big cell (BC), (PAS/VG, ×640).

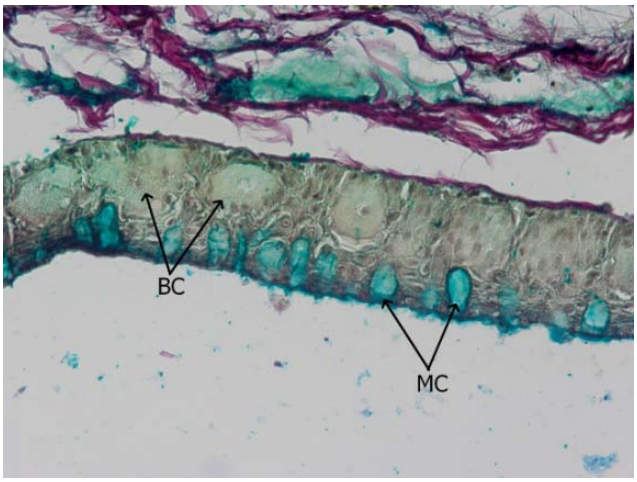

Fig. 6. Mucosal cell (MC) in dorsal fin of walking catfish (AB/VG, ×640).

Table 1
Size of taste buds in various regions of the Walking catfish (WCF) and Piranha (P): LL, lower lip; UL, upper lip; La1, lateral line (cranial); La2, lateral line(caudal); V, between pelvic and anal fin; D, close to head; PF, pelvic fin; AF, anal fin; DF, dorsal fin, PEF, pectoral fin; CF, caudal fin; UB, upper barbel; LB, lower barbel

Region	Basal-apical length (μm) (A)		Maximum width (μm) (B)		WCF	P
	WCF	P	WCF	P	A/B	A/B
LL	41±10.1	48.1±10.3	34±9.7	37±7.7	1/2	1/2
UL	43±12.4	-	31±9.5	-	1/3	1/3
La1	-	-	-	-	-	-
La2	-	-	-	-	-	-
V	-	-	-	-	-	-
D	-	-	-	-	-	-
PF	42.8±9	-	33.9±6.4	-	2/1	-
AF	-	-	-	-	-	-
DF	49.1±14.6	-	37.5±9	-	1/3	-
PEF	-	-	-	-	-	-
CF	-	-	-	-	-	-
UB	43.7±12.5	-	37.3±7.5	-	1/1	-
LB	46.6±10.6	-	35.4±5.8	-	1/3	-

from the results of the studies in Yellow catfish (Fig.2) (Zhang *et al*., 2006).

Many TBs were observed in dorsal and ventral barbels of walking catfish. Earlier study showed that in *Mulus barbatus* and *M. surmuletus* TBs increased from the basal area to the apical area of barbel (Aguirre and Lombart, 2000).

Generally the species living in deep water and nourishing with benthic organisms have higher density of TB than those living in shallow water. It is reported that same species

living in shallow water may pass through benthic area where the density of TB can increase (Gomahr *et al*., 1992).

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