



## Why marine Catfish *Plotosus lineatus* is unique amongst all of the teleosts?

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### Abstract:

Unlike other marine teleosts, the Plotosidae catfish reportedly have an extra-branchial salt secreting dendritic organ (DO). Salinity acclimation [brackishwater (BW) 3‰, seawater (SW<sub>control</sub>) 34‰ and hypersaline water (HSW) 60‰] (10 days) was used to investigate the osmoregulatory abilities of *Plotosus lineatus* through measurements of blood chemistry, muscle water content (MWC), Na<sup>+</sup>/K<sup>+</sup>-ATPase (NKA) activity and ion transporter expression in gills, DO, kidney and intestine using immunoblotting (IB), immunohistochemistry. HSW represented a significant osmoregulatory challenge with elevated mortality (36%), plasma osmolality and ions, and hematocrit, and decreased MWC. DO NKA activity and protein were significantly higher than other organs at all salinities; DO mass thus total DO NKA activity was higher, indicating higher overall capacity at HSW although elevated Hsp70 levels indicate a cellular stress and possible pathological condition. BW acclimation resulted in lower NKA activity in gill and DO. Cl<sup>-</sup> levels were better regulated and the resulting strong ion ratio in BW suggests a metabolic acidosis. Strong NKA and NKCC1 co-localization was observed in DO parenchymal cells, which was rare in gills ionocytes. NKCC1 expression was only detected (IB) in DO which was highest at HSW. CFTR localize apically to DO NKA-IR cells. Taken together, the demonstration of high NKA activity in DO coexpressed with NKCC1 and apical CFTR indicates the presence of the conserved secondary active Cl<sup>-</sup> secretion mechanism found in other ion transporting epithelia suggesting a convergent evolution with other vertebrate salt secreting organs.

**Keywords:** osmoregulation, gill, NKCC, Na<sup>+</sup>/K<sup>+</sup>-ATPase, *Plotosus lineatus*, CFTR