

# OFFICIAL ABSTRACT and CERTIFICATION

## Inner Ear Synaptic Changes in Porichthys notatus Supporting Seasonally Enhanced Acoustic Communication

Chapin Zerner

Commack High School, Commack, NY, USA

*Porichthys notatus*, commonly known as the plainfin midshipman fish, is a vocal fish found across the west coast of North America. Plainfin midshipman exhibit extreme seasonally dependent environmental alterations. Winter months are spent ~100m beneath the surface of the water; reproductively active summers occur in intertidal zones [1]. The role of dopamine (DA) has been extensively studied in mammalian subjects, namely rodents [2]. However, dopaminergic processes have previously remained understudied in ancient teleost fish. Type I Male *Porichthys notatus* rely on vocal signaling in the form of low frequency hums (100 Hz) to court gravid females during reproductively active summer seasons. Females thusly rely upon response to auditory stimuli and require significant neuroanatomical changes to compensate for vast changes in water depth. Conducted experimentation was hypothesized to show increased levels of dopaminergic processes in summer. Results showed an increase in count, volume, and proximity of DA terminals to regenerative hair cells in winter females, demonstrating a repressive aspect of the neuroreceptor. Moreover, hypothesized results included quantity and contact area of synaptic surfaces to increase in summer females, with a similar increase in darkened hair cell membrane ribbons. Experimentation showed quantity of synaptic contacts was decreased in winter as was area of contact compared to that of summer, both in total area and that adjusted to account for volume per images within electron microscopic stack. A reciprocal trend was observed in ribbons, wherein quantity remained increased in summer, while total and adjusted volume were less than that of winter.

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