Muscle contribution in royal knifefish (*Chitala blanci)* during high and low power suction feeding strikes.

Royal knifefish (*Chitala blanci*) can generate exceptionally high suction power, with strikes as powerful as 162 W. To achieve such high suction power, royal knifefish produce large magnitudes of subambient intraoral pressure, while expanding its buccal cavity at exceptionally fast speeds. We have found that the unusual body shape of the royal knifefish, specifically its hump-like body shape dorsocaudal to the neurocranium, contributes to its high suction power ability. This hump-like appearance is a product of a curved vertebral column at rest and a dorsoventrally deep body shape, making space for increased epaxial muscle mass. At rest, the curved vertebral column causes the neurocranium to have a depressed resting posture, but during suction expansion, the vertebral column straightens (extends) contributing to a high degree of neurocranial elevation. Additionally, high magnitudes of epaxial muscle shortening are used for generating large neurocranial elevation, large magnitudes of buccal cavity expansion, and subsequently high suction power. Royal knifefish are also capable of shortening their epaxial muscles at high velocities to create faster rates of buccal cavity expansion. However, not all suction feeding strikes that we recorded were high power. In lower power strikes, we found lower epaxial strain and shortening velocity, a decrease in neurocranial elevation, higher variability in hypaxial shortening and cleithral retraction patterns, yet still the same speed and magnitude of sternohyoid strain. We suggest that during lower power strikes, the sternohyoid contributes more to suction power than it would in higher power strikes. While body shape may predict the role of axial muscles and the suction feeding capability of a species, the relative contribution of the axial and cranial muscles may vary across high and low power strikes.

Keywords: XROMM, suction feeding, muscle power, body shape, fish

Topics:
1. Feeding and digestion
2. Muscle and tendon morphology and mechanics
3. Evolution of form and function

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