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Improving feed formulations for juvenile red drum, *Sciaenops ocellatus*, through nuclear magnetic resonance-based metabolomics

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The number of people relying on seafood for their daily protein requirements is increasing along with the global population. Coupled with the majority of wild fisheries being fully exploited or over exploited, and the result has been an ever increasing reliance on aquaculture to meet increasing demands. Limited natural resources are driving a concerted effort to reduce the quantities of fishmeal and fish oil in feeds, and instead utilize sustainable, more cost effective solutions. Advancements in ingredient evaluation, feed quality and production capabilities have allowed global aquaculture operations to expand, however traditional ingredient and feed evaluation techniques cannot provide the data required to fully optimize feed formulations. Different nutrient requirements among the myriad of species raised for aquaculture and their various life stages has introduced problems that require cutting-edge technologies and expertise. The South Carolina Department of Natural Resources (SCDNR) and the National Institute of Standards and Technology (NIST) have been utilizing Nuclear Magnetic Resonance (NMR) based metabolomics to better understand feed effects on juvenile red drum, *Sciaenops ocellatus*. Specifically, how high levels of soy protein products as fishmeal replacements affect overall metabolism in comparison to the metabolic state observed when fish are fed a natural diet. NMR based observations are being utilized to develop novel, targeted supplementation schemes for feed development.