NOTICE OF PUBLICATION

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Sustainable Aquaculture for a Secure Future

Title: **Endocrine Regulation of Compensatory Growth in Fish**

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Compensatory growth (CG) is a period of accelerated growth that occurs following the alleviation of growth-stunting conditions during which an organism can make up for lost growth opportunity and potentially catch up in size with non-stunted cohorts. Fish show a particularly robust capacity for the response and have been the focus of numerous studies that demonstrate their ability to compensate for periods of fasting once food is made available again. CG is characterized by an elevated growth rate resulting from enhanced feed intake, mitogen production, and feed conversion efficiency. Because little is known about the underlying mechanisms that drive the response, this review describes the sequential endocrine adaptations that lead to CG; namely during the precedent catabolic phase (fasting) that taps endogenous energy reserves, and the following hyperanabolic phase (refeeding) when accelerated growth occurs. In order to elicit a CG response, endogenous energy reserves must first be moderately depleted, which alters endocrine profiles that enhance appetite and growth potential. During this catabolic phase, elevated ghrelin and growth hormone (GH) production increase appetite and protein-sparing lipolysis, while insulin-like growth factors (IGFs) are suppressed, primarily due to hepatic GH resistance. During refeeding, temporal hyperphagia provides an influx of energy and metabolic substrates that are then allocated to somatic growth by resumed IGF signaling. Under the right conditions, refeeding results in hyperanabolism and a steepened growth trajectory relative to constantly fed controls. The response wanes as energy reserves are re-accumulated and homeostasis is restored. We ascribe possible roles for select appetite and growth-regulatory hormones in the context of the prerequisite of these catabolic and hyperanabolic phases of the CG response in teleosts, with emphasis on GH, IGFs, cortisol, somatostatin, neuropeptide Y, ghrelin, and leptin.

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