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Aquaculture and Comparative Physiology

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Introduction

Aquatic habitats are under growing anthropogenic strain to offer services to humans as the global population grows (e.g. food production, recreation, cultural values). Ecosystem health and resilience must also be considered while providing these services. According to recent World Health Organization reports, the global population is expected to reach over 9 billion by 2050, and challenges for the global food and water supply, which are already under stress due to climate change and overfishing, are expected to grow and diversify over the next century. Concerns include food security, human health and pathogens, as well as food and water restrictions for humankind. Aquaculture has arisen as a potential possibility to address these concerns and, in part, to tackle many of the problems that arise as a result of population growth. Sustainable aquaculture, for example, is predicted to help fulfill the growing worldwide need for protein, assisting in the achievement of UN Sustainable Development Goals such as eradicating hunger, achieving food security, and improving nutrition. While capture fisheries production has plateaued since the late 1980s, aquaculture production has continued to grow rapidly to meet consumer demand (FAO, 2018). In 2016, global fish production was ~171 million tonnes (USD 362 billion total first sale value) with aquaculture contributing ~47% of production and ~64% of first sale.

Value increased fish and shellfish in future human diets will save millions of hectares of cropland, according to Froehlich and colleagues, who examined country-level terrestrial and aquatic data. Some of this reduced agricultural load would be in countries with significant biodiversity, such as Brazil. However, new conceptual and technical applications are required to keep up with an increasing population in order to improve stock. Development and finding of novel variations for MAS for phenotypic traits, genome annotation for important aquaculture species, and new technologies to synthesis genomic information for genome-wide markers have all enhanced aquaculture over the last several decades. Updates on genetic and genomic resources have been provided in other recent assessments. Omics technologies, like as transcriptomics, proteomics, and metabolomics, have improved the applications of genomics-based aquaculture techniques. These methods have been used to characterise ideal species rearing circumstances and to optimize aquaculture feeding, for example. Because physiological homeostasis is linked to animal health, it is also linked to the viability and longevity of aquaculture projects. A Special Aquaculture Issue (in conjunction with CBP Part A, CBP Part B, and CBP Part C) was published in Comparative Biochemistry and Physiology Part D: Genomics and Proteomics to highlight the state of the science for Omics technology in aquaculture. The goal of aquaculture genomics research is to gain a comprehensive understanding of the molecular basis of production relevant traits like growth rate, stress and disease resistance, and resilience in high temperature and low oxygen environments, as well as economically important traits like shell colour and skin tone. Omics technologies, such as comparative genomics MAS or genomic selection for disease resistance, and transcriptome biomarkers for monitoring physiological responses to diverse stimuli such as food or immunological activation, have enhanced aquaculture techniques at various scales. Salmonid Omics research has lately been broken down into important categories