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Opinion Article

Tilapia Skin Microbiomes in Malawi's Aquaculture Interact with Pond Water

Michael Griese*

Department of Aquaculture and Fisheries Science, University of Stuttgart, Stuttgart, Germany

DESCRIPTION

Need for increasing food production to support a fast expanding worldwide population, particularly in lower-middle income nations, is what is driving the intensification of fish farming practices. But as production is increased, the danger of disease outbreaks and subsequent crop losses rises. Although little is known about the microbial communities that live on fish's skin mucosal surface, they are crucial for maintaining fish health and disease resistance. The disruption of this skin's microbial ecology by stressors related to handling, shipping, and environments of intensive procedures puts pathogens that cause disease at risk. We described the microbial assemblages present on the skin and in the water of seven earthen aquaculture ponds from two pond systems located in different geographic regions of Malawi. Prokaryotic and microeukaryotic populations were sequenced using metabarcoding techniques. In both skin and water samples, we discovered that 92% of bacterial amplicon sequence variations were shared. However, the core taxa and differentially enriched taxa varied between the water and skin samples. The cyanobacteria Cyanobium, Microcystis, however, were not concentrated in the tilapia skin were mainly found in pond water. Strong environmental influences on prokaryotic and microeukaryotic community structures can be seen in ponds that grouped together based on the water prokaryotic communities they contained. The grouping of tilapia skin prokaryotes by pond site was less apparent while there was considerable site-specific clustering in the pond water, suggesting fish microbiota had a stronger ability to buffer environmental impacts. Studies on how future intensification tactics may cause microbial dysbiosis and the emergence of disease will start with an analysis of the characterized diversity, structure, and variance of microbial communities linked with tilapia culture in Malawi.

The demand for seafood products from an expanding human population with growing living standards and plateauing, and occasionally declining, wild fish stocks as a result of overfishing and ecosystem degradation will be impossible for capture fisheries to meet. Many aquaculture farming practises are being intensified in an effort to supply growing demand for aquatic products. However, the occurrence of infectious diseases is frequently linked to the transition in aquaculture from extensive to intensive and semi-intensive techniques. Intensification can result in chronic stress, which has a negative influence on fish physiology and reduces growth and disease resistance. Increased pond stocking rates and levels frequently occur with insufficient supplies of clean water, resulting in a decline in water quality, including dissolved oxygen, pH, and ammonia. This has a negative impact on fish growth and health and makes the fish more susceptible to diseases. In turn, the chance of subclinical diseases being repeatedly introduced rises as a result of the routine restocking of ponds with fish whose health is questionable to make up for mortalities.

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With production in more than 170 nations, tilapia is the most frequently farmed finfish in aquaculture worldwide. The Nile tilapia is the most widely farmed tilapia species, and it is grown in Lower-Middle Income (LMIC) nations throughout Southeast Asia, Africa, and South America. Tilapia are currently a production staple for many LMICs and are frequently referred to

Correspondence to: Michael Griese, Department of Aquaculture and Fisheries Science, University of Stuttgart, Stuttgart, Germany, Email: griesemichael@gmail.com

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as the aquatic chicken due to their quick growth, tolerance to a variety of environmental culture conditions, and resilience against illness and poor water quality. While some aquaculture species, like shrimp, are high-value export items, the majority of tilapia is produced for domestic markets. As a result, tilapia production is subject to fewer regulations, and less scientific study has been done to optimize sustainable production than for some other high-value teleost species, such Atlantic salmon.