

Gut health monitoring during the seawater phase of farmed Atlantic salmon in different production regions of Norway – the GutMatters project

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Optimization of feed resource utilization, production costs, fish growth performance, and environmental impact of Atlantic salmon industrial production is highly dependent on a healthy, optimally functioning gut. Overt clinical signs of gut dysfunction are rare in field conditions, yet subclinical gut health disorders can significantly diminish fish performance and health. Regardless, gut health of farmed fish populations at sea is not routinely monitored for impacts of feed, noxious, infectious or parasitic agents. As part of the ongoing GutMatters project funded by the Norwegian Seafood Research Fund, a national survey to establish the prevalence of gut health disorders and their incidence during a production cycle in sea farmed Atlantic salmon was therefore initiated in the autumn of 2017. Six sea farming sites along the Norwegian coast were monitored starting at about 5 weeks after sea-transfer until about 12 months of the fish at sea. Standardized procedures were developed for comprehensive sampling of up to 20 fish per site, including external and abdominal gross pathology, fish weight, length and blood plasma, content and tissue from intestine, liver, head kidney, spleen, and heart for histology and/or gene expression, microbiota, metabolomics, and digestive enzyme activity analyses. At each of 3 sampling events per farm, site physico-chemical data, fish stock feeding, growth, and health history were collected. Histology was used as the initial screening tool for gut health status of the sampled fish from which subsequent analyses will be based on. This presentation reports results from a semi-quantitative histology scoring for selected inflammatory and degenerative morphological changes in the mucosa of the pyloric caeca, mid-, and distal-intestine and the liver. Main findings from the histological evaluation of the fish sampled after 5 weeks post sea-transfer were mild to moderate inflammatory changes in the distal intestine of most of the fish sampled from one of the participating farms, as well as mild to marked enterocyte steatosis in the pyloric caeca in most of the groups evaluated. The inflammation resembled the well-documented soybean meal induced distal intestinal enteritis observed in salmonids fed diets containing soybean, or other legumes, as a protein source. The steatosis is thought to represent a lipid transport or metabolism disorder in enterocytes that in severe cases manifest as lipid malabsorption, steatorrhea and ‘floating faeces’. Both disorders of inflammation and steatosis may markedly diminish gut function, fish growth and health and are candidate indicators of reduced feed utilization in Atlantic salmon. Details from the histological assessment of the gut and liver from fish sampled during the first and second round of monitoring the participating sea farms will be presented.