**How good are fish feeds: over-processing of protein.**

The quality of fish feeds determines the growth, health and waste production in aquaculture. Fish feeds are characterised by a high protein and low carbohydrate content. Fish meal scarcity enhances the use of alternative protein ingredients, having lower protein quality and higher carbohydrate fractions. Fish feeds and ingredients are processed in various ways to increase the bio-availability and neutralize anti-nutritional factors. Processing can however lead to irreversible damage of proteins, like crosslinking between amino acids and Maillard reactions products. Maillard reactions products often coincide with colour changes (brown and black colourations). In commercial pet food it has recently been demonstrated that high amounts of Maillard reaction products are present. In fish feeds production similar processing techniques (extrusion) are applied as for pet foods, fish feed have high protein contents and are often darkish brown towards black of colouration. It is hypothesised that also in commercial fish feeds large amounts of Maillard reaction products are present. Work to be done includes 1) a literature search; 2) analysis of a number of blinded commercial fish feed samples of Maillard reaction products; and 3) analyses of experimental diets for Maillard reaction products and relate these values to measured digestibility of protein.

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Number of possible student subjects: 2