SG384: Nutritional evaluation of seafood available to consumers

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Background

Fish, and seafood in general, are a rich source of protein, vitamins and minerals as well as being the main source of the health beneficial omega-3 (n-3) long-chain polyunsaturated fatty acids (LC-PUFA), eicosapentaenoic (EPA; 20:5n-3) and docosahexaenoic (DHA; 22:6n-3) acids, in the human diet. Oily fish such as mackerel, salmon, herring and sardines are renowned for their high levels of EPA and DHA which have key roles in neural development, immune and inflammatory responses as well as being linked to reducing the risk of cardiovascular and neurological diseases (1). Most health organisations, including the UK's Food Standards Agency, currently recommend consuming at least two portions of fish per week, of which at least one should be an oily species. However, there is no global consensus on the recommended daily intake levels of EPA and DHA which generally vary in the region of 250-1000 mg EPA+DHA per day (2). With the world's population increasing, together with its demand for seafood, a greater proportion of seafood is being farmed. However, farmed fish have traditionally been fed a diet consisting largely of the finite marine ingredients, fish meal and especially fish oil, sourced from wild-caught fish stocks. As the aquaculture industry has grown over the years the demand on these marine ingredients has resulted in them being replaced with sustainable alternatives of terrestrial origin, typically plant-based. Consequently, as these terrestrial ingredients are devoid of any EPA and DHA their use in aquafeeds have resulted in the decline of these beneficial fatty acids in the flesh of farmed fish, particularly farmed salmon, thereby decreasing the nutritional value to the final human consumer (3).

Thus, the objective of the proposed work is to assess the nutritional value of seafood (farmed/wild, fish, cephalopods and shellfish), particularly in the first instance with respect to n-3 LC-PUFA, available on the UK market for the human consumer and relate back to current dietary guidelines.

Progress to date

Previously, an undergraduate Honours Degree project was undertaken to look at the fatty acid composition with particular focus on the EPA+DHA content in seafood available from various UK retailers (supermarkets, fishmongers, online etc.). This looked at 34 different species/products and found EPA+DHA contents to range from around 2.5 g per 100g for Atlantic mackerel (*Scomber scombrus*) to 0.02 g per 100 g for Basa (*Pangasius*), requiring the consumption of approximately one 130 g portion of mackerel or 220 portions of Basa (equivalent to ~ 28 kg) for consumers to obtain the recommended 3.5 g EPA+DHA weekly intake as advised by the Global Organisation for EPA and DHA omega-3's.

MASTS funding (£500) was used to purchase various seafood species (whole or portions) to extend the project sample base. This included wild species of Atlantic salmon (*Salmo salar*), Turbot

(*Scophthalmus maximus*), Halibut (*Hippoglossus* spp.), Black bream (*Spondyliosoma cantharus*), Ling (*Molva molva*), Redfish (*Sebastes mentella*), Grey mullet (*Mugil cephalus*), Red mullet (*Mullus* spp.), Brill (*Scophthalmus rhombus*), Witch sole (*Glyptocephalus cynoglossus*), Eel (*Conger conger*, *Muraenesx*), Megrim (*Lepidorhombus whiffiagonis*), Silver pomfret (*Pampus argenteus*), Horse mackerel (*Trachurus trachurus*), Cockles (*Cerastoderma*), John dory (*Zeus faber*), Kingfish (*Scomberomorus cavalla*), Oreo dory (*Pseudocyttus maculatus*), Marlin (*Makaira indica*), Dogfish (*Squalus acanthias*), Razor clams (*Ensis* spp.), Wolffish (*Anarhichas lupus*), White trevally (*Pseudocaranx dentex*) and Cuttlefish (*Sepia pharaonis*); as well as cultured species of Meagre (Argyrosomus regius), Green-lipped mussels (*Perna canaliculus*), Tilapia (*Oreochromis niloticus*), Arctic char (*Salvelinus alpinus*) Barramundi (*Lates calcarifer*), Milkfish (*Chanos chanos*) and Sturgeon (*Acipenser baerii*).

In total, over 90 different species/seafood products totalling over 450 individual samples have been collected. The lipid and moisture contents of the various species have been analysed with the remaining fatty acid profiles currently being completed and the results compiled. It is expected that a manuscript on the lipid and fatty acid compositions (focussing on EPA+DHA) will be prepared for publication by mid 2018. Furthermore, two current undergraduate honours projects are looking at 1.) the protein and energy content and 2.) the mineral (i.e. selenium, iodine etc.) and heavy metal contents from the same samples, thereby maximising the data generated from individual samples. This work will is expected to be completed by mid 2018 with a manuscript likely by the end of 2018.

Expenditure Summary

Expense	Cost
Various Fish Species	£500
TOTAL	**£500**

References

1. Calder, P.C. 2014. Very long chain omega-3 (n-3) fatty acids and human health. *European Journal of Lipid Science and Technology*, 116, 1280-1300.

2. GOED. 2014. Global Organisation for EPA and DHA (GOED), Global recommendations for EPA and DHA intake (Rev. 19 November 2014). Available at: http://issfal.org/GlobalRecommendationsSummary19Nov2014Landscape_-3-.pdf Accessed November 2016.

3. Sprague, M., Dick, J.R., Tocher, D.R. 2016. Impact of sustainable feeds on omega-3 long-chain fatty acid levels in farmed Atlantic salmon, 2006-2015. *Scientific Reports*, 6:21892.