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Nutritional evaluation of seafood, with respect to long-chain omega-3 fatty acids, available to UK consumers

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Fish, and seafood in general, are the main dietary source of the omega-3 (n-3) long-chain polyunsaturated fatty acids (LC-PUFA), eicosapentaenoic (EPA) and docosahexaenoic (DHA) acids, that exert a range of health benefits through their molecular, cellular and physiological actions[1]. Indeed, government and health authorities currently recommend consuming at least two portions of fish per week, of which one should be oily, as a means of achieving a daily intake of 250–1000 mg EPA+DHA in order to protect against cardiovascular and inflammatory diseases among others[2]. As the global population, and its demand for seafood, continues to grow more of our fish is coming from aquaculture. However, farmed fish feeds traditionally relied upon the inclusion of the finite marine ingredients, fishmeal and fish oil, sourced from the wild captures fisheries. As the aquaculture sector grows these finite marine ingredients are increasingly being replaced with alternatives of terrestrial origin, typically plant based origin, devoid of any EPA and DHA that has resulted in the decline of these beneficial fatty acids in the flesh of farmed fish[3], thereby decreasing the overall nutritional value to the final consumer. Thus, the present study assessed the nutritional value of seafood (farmed/wild fish, cephalopod and shellfish), particularly n-3 LC-PUFA (EPA and DHA) content, available to consumers on the UK market and relate the results to current health recommendations.

Fish and seafood products were purchased from various retailers and fishmongers. Lipid content was extracted from the raw edible portion before analysed for fatty acid composition (% and g.100g^{-1} wet weight) by gas-liquid chromatography. Data were analysed by ANOVA with multiple comparisons made using Tukey's *post hoc* tests.

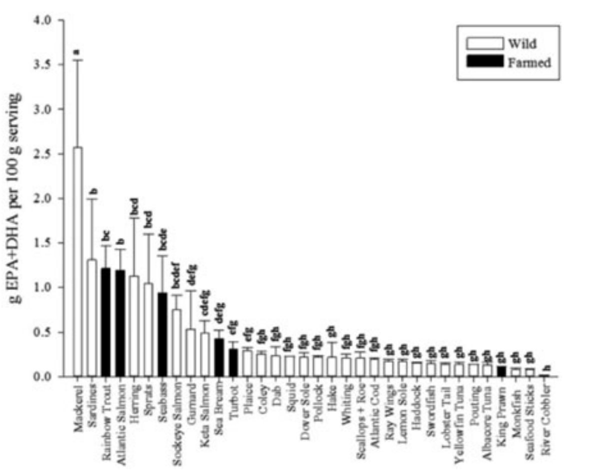

Fig. 1. EPA+DHA content (g.100g^{-1} serving, mean ± SD) in seafood available to UK consumers. Bars bearing different lettering are significantly different ($P < 0.05$).

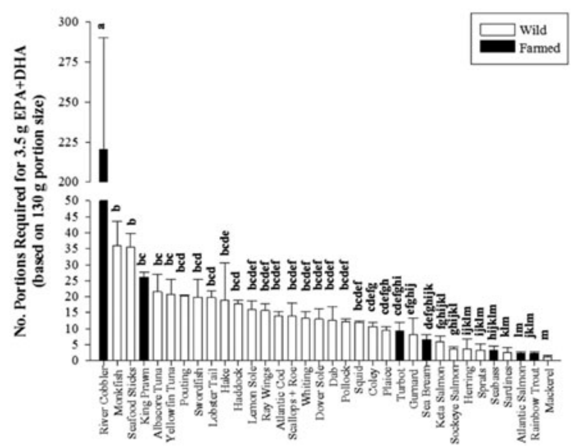

Fig. 2. Number of portions (130 g) required in order satisfy the 3.5 g EPA+DHA recommended weekly intake. Bars bearing different lettering are significantly different ($P < 0.05$).

Levels of EPA+DHA in commercially available seafood ranged from 2·57 g EPA+DHA per 100 g serving in mackerel to 0·01 g in Basa (Fig 1.), largely reflecting the overall lipid content (% oil) of the sample. Farmed species tended to have higher levels of oleic (18:1n-9), linoleic (18:2n-6) and α-linolenic (18:3n-3) fatty acids than wild species (data not shown), indicating the reliance of vegetable oil use in aquafeeds. Nevertheless, farmed Atlantic salmon for instance still contained 2–4 times more EPA+DHA than their wild Pacific counterparts. However, based on a recommended weekly intake of 3·5 EPA+DHA[4], only mackerel would require just one 130 g portion with farmed salmon and trout requiring two portions and Basa a total of 220 portions (Fig 2). These results demonstrate the variation in EPA+DHA levels in seafood available to consumers and the potential need to review current fish intake guidelines with regards human health, while also highlighting the global deficit in EPA and DHA and the need for alternative novel sources (e.g. microalgae, transgenic plants).

1. Calder P (2014) *Eur. J. Lipid Sci. Tech*, **116**, 1280–1300.
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3. Sprague M, Dick JR & Tocher DR (2016) *Sci. Rep.*, **6**, 21892.
4. ISSFAL (2004) *Report of the sub-committee on: Recommendations for intake of polyunsaturated fatty acids in healthy adults.*