Gilthead sea bream (Sparus aurata) skin-on fillets, prepared from 48-hour post-harvest iced fish, were individually quick-frozen in an Armfield FT 34-MKII plate freezer, wrapped in a single layer of polyethylene film and stored at -18 °C. Quality changes of the fillets were assessed by sensory evaluation, lipid profile analyses, rancidity development assays and colour measurements of the raw and cooked flesh, over a period of three months.

Rancidity development, assessed by measurements of thiobarbituric acid-reactive substances (TBA-RS), proceeded slowly during storage and correlated significantly (r = 0.955, P < 0.05) with the observed decline in sensory score for cooked fish flavour. Unlike fillet lightness (L*) which remained practically unchanged (P < 0.05) during storage, changes in a* and b* values were quite pronounced, indicating a shift towards reddish/bluish colorations in the cooked flesh.

Lipids in fresh Sparus aurata skin-on fillets were composed of triglycerides and phospholipids as major constituents. Small amounts of cholesterol, free fatty acids and diglycerides were noticeable. During frozen storage, both triglyceride (TG) and phospholipid (PhL) contents decreased, while the free fatty acid (FFA), diglycerides (DG), monoglycerides (MG) and lyso-phosphatidylcholine (l-PC) (Fig. 2). Frozen storage significantly affected the fatty acid composition of Sparus aurata fillets. Since triglycerides and phospholipids underwent hydrolysis into FFA during storage, free PUFAs and MUFA could have undergone oxidation, which is supported by the increasing TBA values. This result was evidenced by the significant decrease in P/S during storage. As SFA increase and PUFAs decrease synchronously during storage.

Mean scores for cooked flavour declined almost linearly during storage (y = -0.026x + 9.28, r = 0.970). Slight rancid, cold oil-like off-flavours were evident by the end of the trial. Rancidity development proceeded slowly during storage (3.4 mg malondialdehyde at the end of the trial) and correlated significantly (r = 0.955, P < 0.05) with the observed decrease in sensory score for cooked fish flavour. Fillet lightness remained practically unchanged during storage.

On a weight basis, total lipid content of the fish fillets showed a predominance of phosphatidylcholine (PC) followed by phosphatidylethanolamine (PE), phosphatidylserine + phosphatidylinositol (PS/PI), sphingomyelin (Sphm) and lyso-phosphatidylcholine (l-PC) (Fig. 2). Frozen storage appeared to cause significant (P<0.05) degradation in the above PhL into FFA and l-PC, which can be considered a degradation product of PC.

From a nutritional perspective, cholesterol content remained unchanged (P>0.05) at 0.76g per 100g of fish fillets. Sparus aurata skin-on fillets are an excellent source of dietary PC, providing 790mg of PC per 100g of fillet. In spite of the significantly (P<0.05) PC content decrease (from 0.97g/100g of edible portion in initial sample to 0.70g/100g in the 3 months frozen storage sample), its concentration was found to exceed the PC recommended daily intake (RD) in the human diet (550 mg for men and 450 mg for women) (Fig. 3).

Fat content was significantly (P<0.05) reduced during frozen storage (initial, 12.00%; 3 months of storage, 10.47%). The major lipid class in skin-on fillets of sea bream Sparus aurata were neutral lipids (NL) (>91%), mainly triglycerides (TG). Frozen storage caused significant (P<0.05) decomposition in TG that was reflected in more than fifteen fold increase in FFA and appreciable increase in DG and MG (Fig. 1).