COMMUNICATION

Evolution of European sea bass 
(*Dicentrarchus labrax*) 
freshness during storage

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ABSTRACT - The study aimed to assess freshness evolution in 90 European sea bass (*Dicentrarchus labrax*) analyzed 2h after catch (day 0) and after 1, 2, 4, 6, and 8 days of storage at 2°C. Sea bass weighted 308±37g with average carcass yield of 89.8% and fillet yield of 48.8% slaughter weight. During storage skin colour indexes linearly changed (L*<0.01) showing higher L* and lower a* and b* values. The eye liquor pH increased with storage, with both significant linear and quadratic components of variance. Fillet hardness increased from day 0 to day 4 and then decreased on day 8 (quadratic component of variance <0.01). Sensory freshness assessed by Quality Index Method showed a quadratic evolution and high correlation (R²=0.95) with days of storage.

Key words: European sea bass, Freshness, Quality Index Method.

Introduction – Freshness is the most important trait that contributes to raw fish quality. Post-mortem processes modify progressively the initial fish quality to a rate which depends on ante-mortem factors (species, fish physiological condition, slaughter procedure) as well as on handling and storage procedures after death. Several types of measurements (sensorial, physical, chemical and microbiological) may assess fish freshness. Among sensorial analyses, the EC freshness grades scheme (EU council decision no. 103/76, January 1976) is currently used to evaluate fish freshness, but research and industry are more and more focusing on the use of the Quality Index Method (QIM), which is species-specific and may also be used to predict storage life (Alasalvar et al., 2002; Álvarez et al., 2008). The present paper measured quality evolution in raw sea bass (*Dicentrarchus labrax*) during 8 days of storage by means of physical and sensory traits.

Material and methods – Ninety European sea bass (308±37g) were caught in a commercial farm, slaughtered by immersion in ice-slurry and immediately transported to the laboratory in thermally insulated boxes. The fish were divided into six groups (each of 15 specimens, homogeneous in terms of weight and variability) to be analyzed immediately
(day 0, within 2h after catch), and after 1, 2, 4, 6, and 8 days of storage. The fish were closed into polystyrene boxes and stored without ice in a refrigerated room at 2°C. At each storage time, sensory analysis was performed on intact fish by five trained panelists according to the Quality Index Method (QIM) scheme (Alasalvar et al., 2002). The panelists scored 15 traits (fish appearance for brightness, skin, slime, stiffness; eye for clarity, shape, iris, blood presence; gills for colour, mucus and odour; belly for discolouration and firmness; vent for condition and smell) on a continuous scale of 0 to 2 or 3 demerit points. The sum of the scores given for each of the 15 parameter was the final Quality Index increasing from 0 (fresh fish) to higher values (maximum 40) as the fish deteriorate. The pH of eye liquor and right fillets was measured. Colour was recorded on skin of raw fish and right fillets (dorsal side) according to CIELAB color space (CIE, 1976). Texture profile analysis was performed on the dorsal fillet by TA.HDI dynamometer (Stabel Micro System Ltd., UK) using two consecutive cycles of 25% compression and a 20mm-diameter cylindrical probe moving at a constant speed of 2mm/sec. Data were submitted to analysis of variance using the GLM procedure of SAS and the storage time as the variability factor and estimating linear (L) and quadratic (Q) component of variance.

**Results and conclusions** – Sea bass carcass yield averaged 89.8% and fillet yield 48.8% slaughter weight (Table 1). During storage skin colour indexes linearly changed (L<0.01) showing higher L* and lower a* and b* values, going towards blue and green colours. Similar colour evolution was observed on the fillet. Moreover, colour indexes were higher during days 1 to 4 of storage than at day 0 and days 6-8 (Q<0.05). The pH of eye liquor increased with storage life (L and Q<0.001), while fillet pH did not change (Table 1). Fillet texture significantly varied: hardness increased from slaughter (4.86N on day 0) to the day 4 of

| Table 1. Effect of storage on physical traits and QIM score of sea bass. |
|---------------------------------|------|------|------|------|------|------|------|------|
|                                |     | 0    | 1    | 2    | 4    | 6    | 8    | Prob. | RSD  |
| Carcass yield, % SW2           |     | 88.8 | 89.5 | 91.1 | 89.8 | 89.8 | 89.9 | 0.10  | <0.01| 1.49 |
| Fillet yield, % SW2            |     | 48.5 | 49.6 | 47.9 | 48.1 | 49.2 | 49.8 | 0.27  | 0.11 | 2.31 |
| Skin L*                        |     | 44.8 | 49.5 | 54.4 | 50.7 | 51.7 | 52.3 | <0.001| 0.01 | 3.31 |
| Skin a*                        |     | 0.28 | 0.50 | 0.37 | -0.73| -0.48| -1.22| <0.001| 0.01 | 0.52 |
| Skin b*                        |     | 5.63 | 5.83 | 6.34 | 3.68 | 4.82 | 2.42 | <0.001| 0.02 | 1.81 |
| Fillet L*                      |     | 37.8 | 34.6 | 36.8 | 37.7 | 39.2 | 39.4 | <0.001| <0.01| 2.01 |
| Fillet a*                      |     | 2.46 | -2.92| -2.68| -2.95| -2.75| -2.71| 0.24  | 0.01 | 0.40 |
| Fillet b*                      |     | -0.17| -0.98| -1.88| -2.48| -2.73| -3.01| <0.001| 0.03 | 1.02 |
| Eye pH                         |     | 7.25 | 7.05 | 7.14 | 7.05 | 7.30 | 7.48 | <0.001| <0.001|0.16 |
| Fillet pH                      |     | 6.44 | 6.42 | 6.41 | 6.41 | 6.47 | 6.45 | 6.39  | 0.58 | 0.22 | 0.09 |
| Fillet hardness, N             |     | 4.86 | 5.98 | 6.38 | 7.20 | 6.77 | 6.89 | <0.001| 0.02 | 1.43 |
| QIM score                      |     | 0.0  | 5.1  | 8.6  | 13.8 | 17.0 | 18.4 | <0.001| <0.001|1.53 |

L: linear component of variance; Q: quadratic component of variance. SW, slaughter weight.
storage (7.20N) following rigor mortis onset and then started to decrease with rigor resolution at days 6 and 8) (L<0.001; Q=0.02). Previous studies in red skinned fish also reported increasing skin lightness and decreasing red and yellow colour components with increasing storage (Pavlidis et al., 2006). In sea bass and sea bream, decreasing L* and discolouration were measured on longer storage periods (until 21d) (Cakli et al., 2006; Álvarez et al., 2008). In a recent review, Abbas et al. (2008) confirmed muscle pH to be clearly correlated with fish freshness and to increase after 10-12d of storage. Flesh softening with storage time was instrumentally measured on sea bream and sea bass also by other authors (Alasalvar et al., 2002; Álvarez et al., 2008). Sensory analysis of specific traits (data not reported) and QIM score (Table 1) were always significantly affected by storage time. Eight days after slaughter sea bass still showed an acceptable degree of freshness (QIM=18.4), even if some traits (appearance for brightness, slime, stiffness; gill odour and mucus) degraded more rapidly than others. QIM scores showed high correlation (R²=0.95) and both linear and quadratic evolution from 0 to 8 days of storage. This confirms previous findings that recommend the use of QIM to predict storage life of sea bass and other species (Alasalvar et al., 2002; Álvarez et al., 2008).

In conclusion, physical and chemical traits of sea bass significantly changed during a 8-day storage period. Sensory evaluation of fish freshness using QIM resulted to be highly correlated with storage time and appeared a promising technique to assess sea bass freshness and predict shelf life.

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