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# Fatty acid profile of fish scale of *Catla catla*

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**Fish scales are useful to ichthyologists for the purposes of classification, identification, age determination and history study. The fatty acid profile of the hexane extracts of the fresh water fish scale of *Catla catla* were analyzed by gas chromatography. Fish scales were collected from a local fish market, Chidambaram. The fatty acid profile was detected in the scales, with the following fatty acids dominating: 16:0, 18:0, 18:1, 18:2, 18:3 and 18:4. The use of fatty acid profiling in fish scales has the potential for stock identification in addition to the identification of fish farm escapees.**

**Key words:** Fish scales, fatty acid, gas chromatography, *Catla catla.*

## INTRODUCTION

Fatty acids (FAs) have been extensively studied in a range of tissues of aquatic organisms for a variety of purposes. For example, FAs have been used as trophic markers in marine animals (Dalsgaard et al., 2003). Within fish, stock identification through FA analyses has been successfully conducted (Grahl-Nielsen, 2005), showing that FA profiling has the potential to supplement genetic methods for identification purposes.Fish scales have been used to reconstruct diet from stomach contents due to their permanence and hard digestibility (Montana and Winemiller, 2009; Mauchline and Gordon, 1984) and to test for pollutants such as heavy metals in order to assess concentrations in the water (Lake et al., 2006; Basu et al., 2006). They have also been used to study evolution: in paleontological studies to interpret the past biodiversity of an area, to help in understanding the allocation patterns of fish (McDowall and Lee, 2005; Shackleton, 1987) and in comparative studies with phylogenetic aims (Lippitsch, 1992; Roberts, 1993). Species identification is a basic procedure in the conservation of biodiversity and natural resources management, including fisheries. Fish scales have been used for species identification since the early 1900s (Goodrich, 1909) and descriptions of their shape have been used in as discriminating features in several keys (Maitland, 2004; Daniels, 1996; Chervinski, 1984, 1986). The aim of this study was to investigate the fatty acid composition of fresh water fish scale of *Catla catla*.

## MATERIALS AND METHODS

### Sample collection

Fresh water fish scales (*C. catla*) used in this study were collected from a local fish market, Chidambaram.

### Preparation of fish scale

The tissues covering the scales were first scraped off. Washing of the scales in distilled water was then carried out using an ultrasonic

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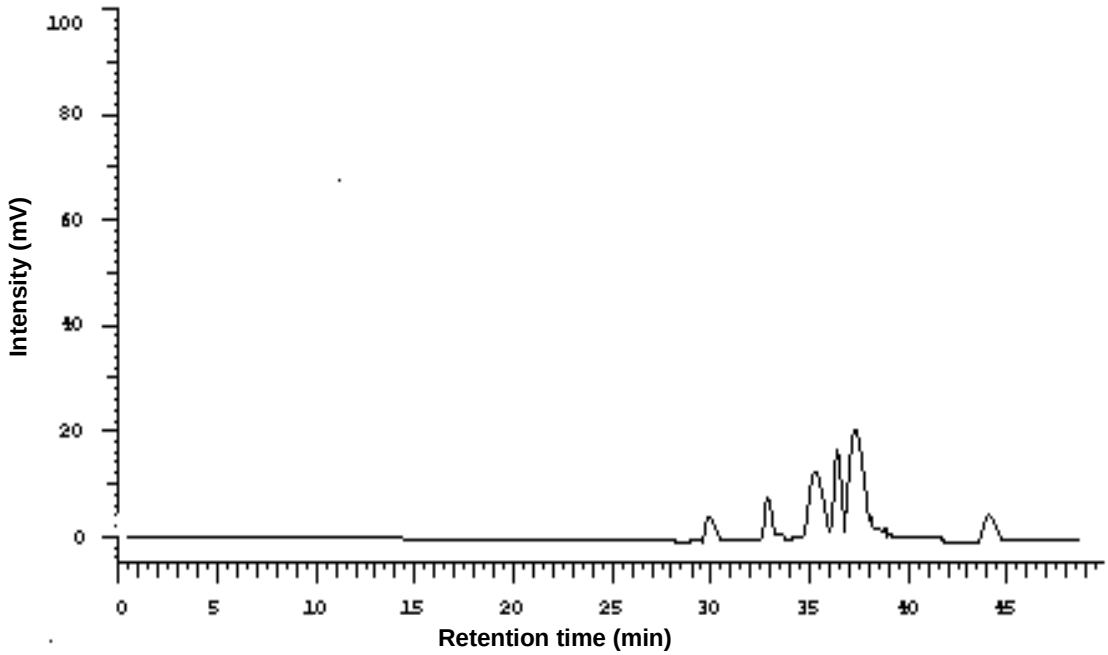


**Figure 1.** Fish scale chromatogram.

**Table 1.** Fish scale chromatogram data.

| Component name | Carbon | Retention time (min) | Area | Area (%) |
|---|---|---|---|---|
| Palmitic acid | C 16 | 30.2 | 12.67 | 0.42 |
| Stearic acid | C 18 | 33.2 | 125.600 | 5.62 |
| Oleic acid | C 18: 1 | 33.5 | 511.600 | 12.4 |
| Linoleic acid | C 18: 2 | 38.2 | 895.100 | 26.5 |
| Alpha linolenic acid | C 18: 3 | 40.1 | 1456.800 | 53.64 |
| Moroctic acid | C 18: 4 | 46.2 | 30.93 | 1.42 |
| Total | | | 3032.70 | 100 |

cleaner. Scales were then air dried on filter paper for 2 h where approximately 10 scales were transferred to 15-ml thick-walled glass tubes containing an accurately determined amount of internal standard. After addition of 0.5 ml of anhydrous methanol containing 2 M HCl and exchange of the atmosphere in the tubes with nitrogen gas, the tubes were securely capped with Texon-lined screw caps and placed in an oven for 2 h at 90°C for complete methanolysis. After cooling to room temperature, the tubes were opened and the methanol evaporated down to about half by a stream of nitrogen gas and 0.5 ml of distilled water was added to reduce the solubility of the formed FA methyl esters (FAMEs) which were extracted with 2 x 1 ml hexane.

Twenty microliter of the combined hexane extracts were injected manually on a 25 m x 0.25 mm (i.d.) fused silica column with polyethylene-glycol (PEG) as stationary phase, with a thickness of 0.2 µm and helium at 20 psi as mobile phase. The column was mounted in Hewlett-Packard 5890A gas chromatograph equipped with a Flame-ionization detector (FID). The injector temperature was set at 260°C and the detector temperature at 330°C. The oven was programmed as follows: 90°C for 4 min, 30°C/min to 165°C, then 3°C/min to 225°C, where it was left isothermally for 10.5 min before cooling for the next run. The chromatographic peaks were identified by comparison with a chromatogram of a standard fatty acid mixture.

## RESULTS AND DISCUSSION

The fatty acid profiles of fish scale are shown in Figure 1 and Table 1. When compared with standard fatty acid mixture (Figure 2 and Table 2), the following was detected in the scales, with the following fatty acids dominating: 16:0, 18:0, 18:1, 18:2, 18:3 and 18:4, and the fatty acid 18:0 is dominated.

Fatty acid profile in fish scales may display greater stability than other tissues such as muscle, which may be linked with their biological function, and the results presented within demonstrate that the fatty acid profile is dependent on both genetic and environmental factors, and may change over relatively short periods. The use of fatty acid profiling in fish scales has the potential for stock

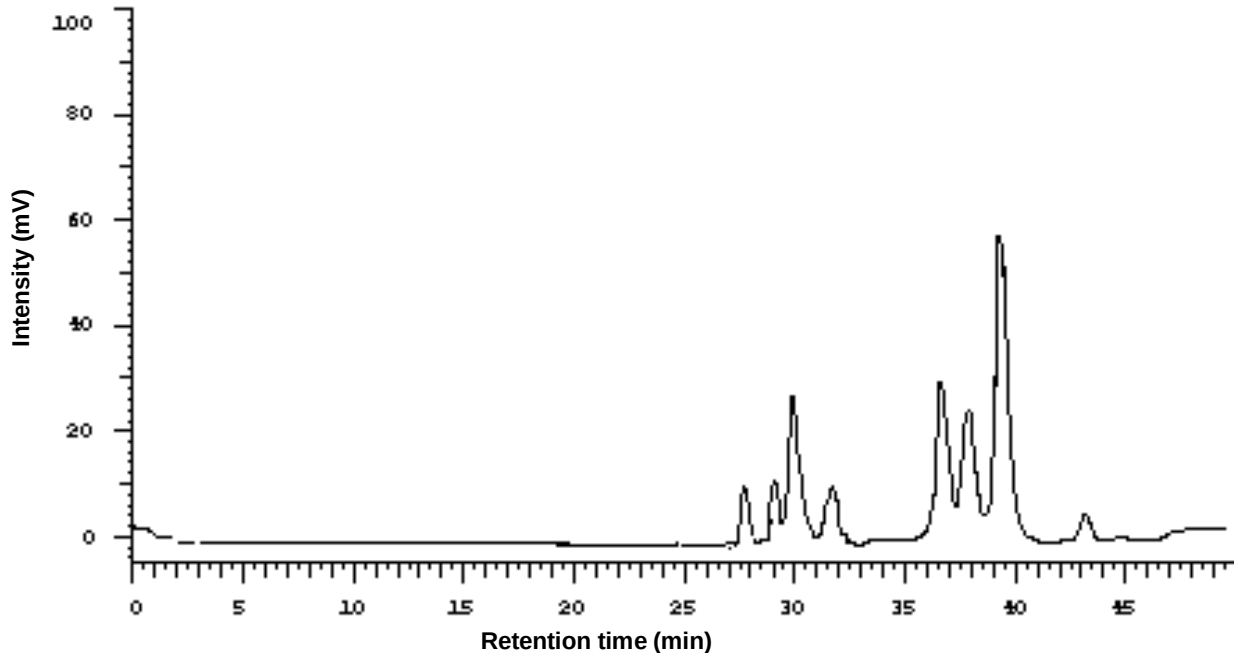


**Figure 2.** Standard fatty acid mixture chromatogram.

**Table 2.** Standard fatty acid mixture chromatogram data.

| Component name | Carbon | Retention time (min) | Area | Area (%) |
|---|---|---|---|---|
| Myristic acid | C 14 | 26.5 | 3452.6 | 6.88 |
| Pentadecanoic | C 15 | 28.1 | 2364.7 | 4.794 |
| Palmitic acid | C 16 | 30.7 | 3125.3 | 6.01 |
| Moroctic acid | C 17 | 30.3 | 2159.746 | 4.08 |
| Stearic acid | C 18 | 33.7 | 1059.531 | 2.03 |
| Oleic acid | C 18: 1 | 35.2 | 8145.561 | 14.269 |
| Linolenic acid | C 18: 2 | 37.8 | 7649.265 | 14.72 |
| Alpha linolenic acide | C 18: 3 | 39.9 | 23745.642 | 44.32 |
| Moroctic acid | C 18: 4 | 44.9 | 426.345 | 0.89 |
| Burucic acid | C 22: 1 | 45.4 | 123.9 | 0.237 |
| Arachidonic acid | C 22: 1 | 46.1 | 89.264 | 1.77 |
| Total | | | 52341.850 | 100 |

identification in addition to the identification of fish farm escapees.

## Conclusion

The aim of this study is to investigate the fatty acid composition of fresh water fish scale of C. catla. FAs have been extensively studied in a range of tissues of aquatic organisms for a variety of purposes. For example, FAs have been used as trophic markers in marine animals (Dalsgaard et al., 2003), though with the stability of the fatty acid composition during changing environmental conditions and changes in diet, and also during growth.

### Conflict of interests

The authors did not declare any conflict of interest.

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