Comparison of One-Step Methyl Ester and Microwave Assisted Fatty Acid Extraction using *Synodus foetens*

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Introduction

Fatty acid (FA) composition plays a vital role in ecological, nutritional, and physiological assessments of marine organisms. Reliable FA profiling is especially critical in Gulf of America fisheries and aquaculture research, where biomarker-based studies inform feed formulation, growth efficiency, and animal health, as well as food web dynamics and environmental pressures. Two methods for FA extraction, One-Step Methyl Ester (OSME) and Microwave-Assisted Extraction (MAE), differ in their susceptibility to degradation, cost, and workflow complexity. This study seeks to compare the efficacy of both methods using *Synodus foetens* (inshore lizardfish) sampled from the Gulf of America as the model species. The results aim to identify a cost-effective analytical approach applicable to fisheries and aquaculture laboratories.

Specimen

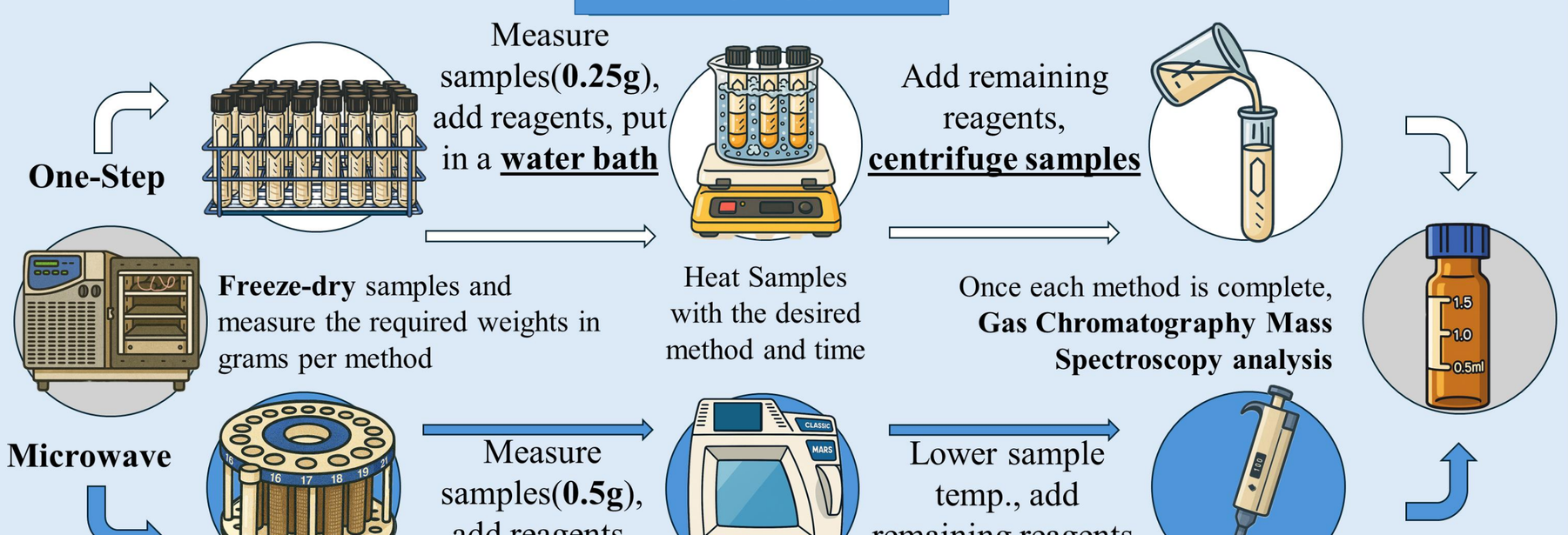
Synodus Foeten (Inshore Lizardfish)

This species was selected based on its relatively low lipid content, broad distribution along the U.S. East Coast, and its role as a predatory and prey fish, making it well suited for evaluating FA extraction performance in low-fat tissues.

Conclusion

- OSME extracted a greater number of fatty acids and produced higher overall concentration yields, making it well suited for high-throughput, large-scale fatty acid analysis in fisheries laboratories.
- MAE detected three fatty acids not identified by OSME (eicosanoic acid, heptadecanoic acid, and methyl stearate), but these were present at low concentrations.
- OSME offers a more cost-effective and efficient approach for routine fatty acid profiling of low-lipid fish species commonly used in fisheries and aquaculture research.
- MAE may provide added sensitivity for select minor fatty acids, but its higher complexity and potential cost make it less practical for mass sample processing.

Methods



Results and Discussion

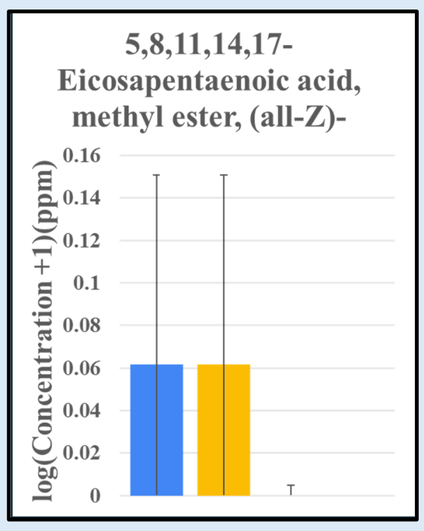
Legend

Fatty Acid Trials and Methods

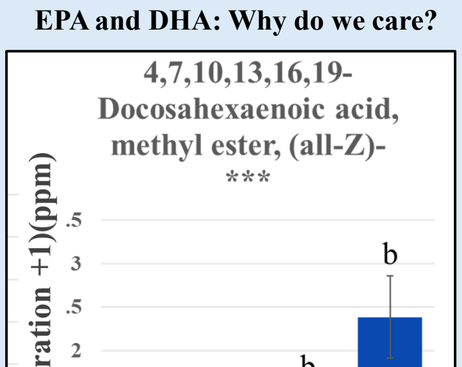
- **Microwave Assisted Trial A**
- **Microwave Assisted Trial B**
- **One-Step Trial A**
- **One-Step Trial B**

Method	Cost	Time	Quality
One Step Methyl Ester **OSME**	Materials: **$1,193** Equipment: **$3,120** Total: **$4,313**	**7 hours**	• More procedural steps • Higher potential for user error. • Consistently produces higher-quality and statistically reliable fatty acid data.
Microwave Assisted Extraction **MAE**	Materials: **$1,336** Equipment: **$75,000** Total: $76,336	**5 hours**	• Offers greater ease and speed. • The convenience does not compensate for the loss of valuable data.

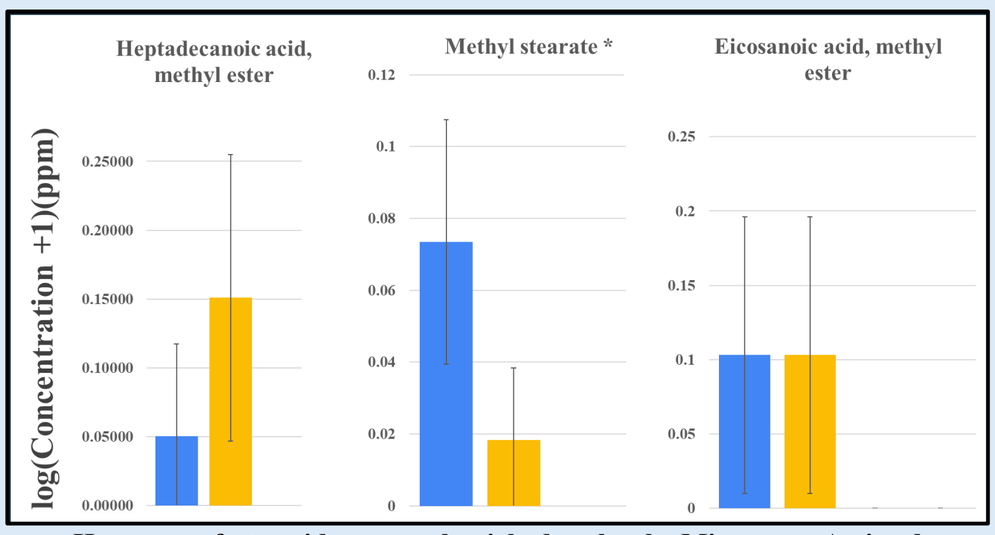
This chart compares each fatty acid extraction method across three critical factors:
Cost, Processing time, and Data quality



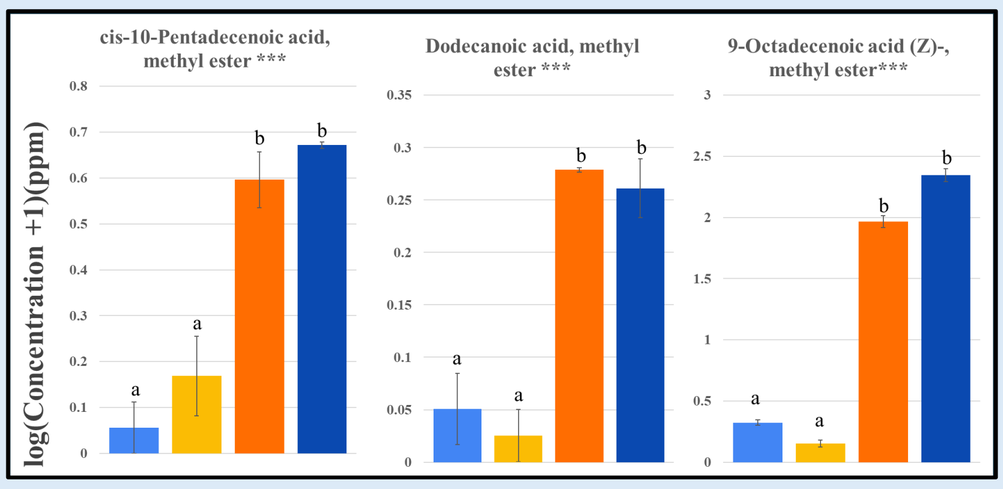
EPA and DHA: Why do we care?



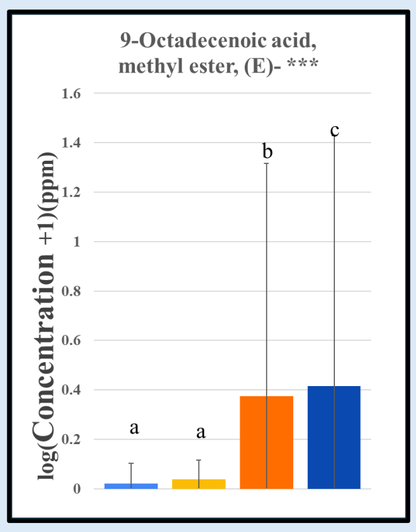
If a method consistently underreports or misses them, it suggests incomplete extraction or poor methylation, lowering data quality.



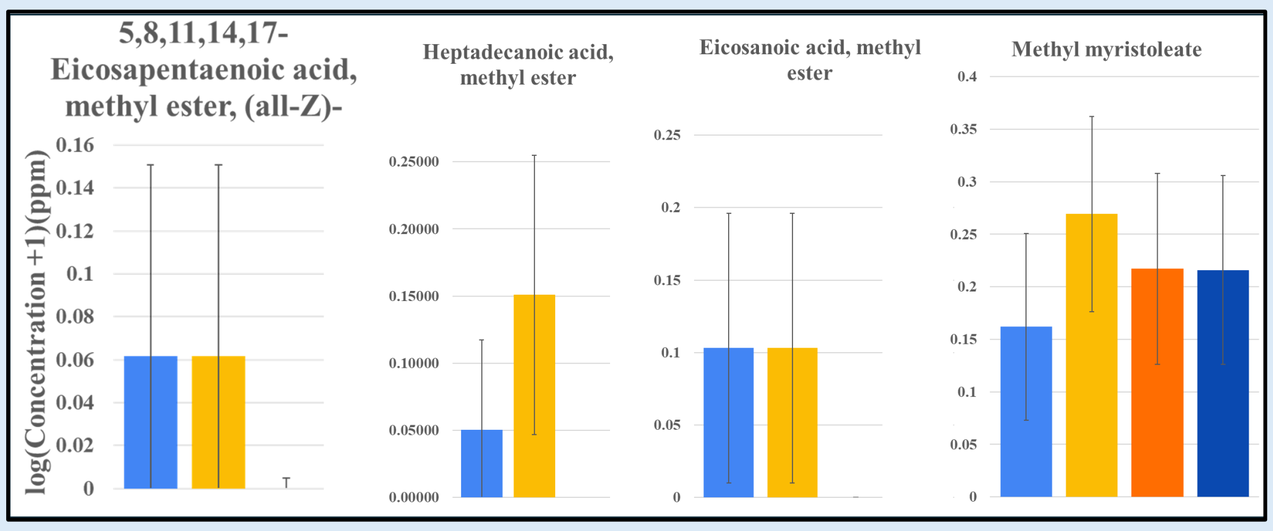
How many fatty acids were only picked up by the Microwave Assisted Extraction method?
Three acids were **ONLY** identified using the MAE method



How many fatty acids were only picked up by the One Step Methyl Ester method?
OSME was able to identify **30** Fatty Acids.
OSME produced the highest concentration levels of every fatty acid it could identify.



How many had differences between trials?
Only **ONE** had a difference between trials



How many fatty acids had a statistical difference between methods?
Out of 33, **29** had significant differences
These did **NOT**

Acknowledgements

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References