Global Journal of Environmental Research 3 (1): 42-45, 2009
ISSN 1990-925X

Comparison of Fatty Acid Profile in the Edible Crabs *Scylla serrata* and *Portunus pelagicus*

G. Rameshkumar, S. Ravichandran, Kumar Chandan and T.T. Ajithkumar

Centre of Advanced Study in Marine Biology,
Annamalai University, Parangipettai 608 502, India

Abstract: Fish oils are the major source of Poly Unsaturated Fatty Acids (PUFA). The scope of the study is to give emphasis on the crab meat and open the door for other researchers to perform the scientific work related with the fatty acid profile in different species or the same species in some different aspect. In the present study two species of commercially important food crab *Scylla serrata* and *Portunus pelagicus* were collected from in and around Parangipettai coastal waters. The results clearly indicates that the *Scylla serrata* and *Portunus pelagicus* have potential for substituting the marine fin fisheries resources for the consumptions. In *Scylla serrata* C20: 5 PUFA is 8.07% in the ovary as compared to 4.82% in the chelate. In the *Portunus pelagicus* C20: 2 are more in the chelate leg accounting for the 4.02% and 3.02% in the ovary. In the *S.serrata* the MUFA content specially C16: 2 in chelate is 4% and the ovary it is 7% in the *P. pelagicus* C16: 1 is more common it accounts for 2.39% in chelate and 0.213% in ovary.

Key words: Crab · Fatty acid · MUFA · PUFA · SFA

INTRODUCTION

Crab fishery in is fast developing and there is a vast scope for the crab meat due to its delicacy and nutritional richness. Some species of crabs are edible and a number of others are commercially important for fishmeal industry. Among the various resources, crab is a valuable and easily accessible of food, rich in lipid. As a crab contains lipid of superior nutritional properties, it is placed in important category of seafood. Fatty acids are the most dominant lipids found in shore crabs, possibly constituting up to 90% of the total lipid content in the crab [1]. The fatty acid profiles were significantly different between claw meat, breast meat of the crab [2]. The percentage of total saturated fatty acids was higher in the claw or breast meats.

The fatty acid composition of the ovary at different physiological stages (immature, mature, spawning, egg loss and abortion) of the Chinese mitten crab *Eriocheir sinensis* [3]. Fish and other marine life are rich sources of a special class of polyunsaturated fatty acids known as the omega-3 or n-3 fatty acids. They are so named because the first of the several double bonds occur three carbon atoms away from the terminal end of the carbon chain. Potential side effects should be kept in mind. On the other hand, inclusion of marine sources of the n-3 PUFA in the diet seems reasonable because they are good sources of protein without the accompanying high saturated fat seen in fatty meat products.

Eicosapentaenic acid (EPA, 20:5 ω 3) and disosahexaenonic acid (DHA, 22:6 ω 3) are the important ω 3 PUFA, while arachidonic acid (AA, 20:4 ω 6), is a vital ω6 PUFA. EPA and DHA are important in treatment of arthosclerlsis, cancer, rheumatoid arthritis, psoriasis and diseases of old age such as Alzheimer's and age-related macular degeneration [4] AA and DHA are of special importance in the brain and blood vessels and are considered essential for pre-and post-natal brain and retinal development. In this context, the present investigation provides the fatty acid profile of two economically important crab species *Scylla serrata* and *Portunus pelagicus* from the Parangipettai coastal environment.

MATERIALS AND METHODS

Two species of commercially important food crabs *Scylla serrata* and *Portunus pelagicus* were collected

Corresponding Author: S. Ravichandran, Centre of Advanced Study in Marine Biology, Annamalai University, Parangipettai 608 502, India E-mail: sravicas@gmail.com

from in and around Parangipettai coastal waters. To the 100-200mg. of finally ground tissue sample 2.0 ml of chloroform: methonal (2:1) was added to keep for 30 sec. The residual matter was removed filtering glass filter. This was washed with 1ml of choloroform: methonal (2: 1) volume inorganic substances removed from combined extract by partition with chloroform: methonal; water (8:4:3) and the lower phase evaporated to dryness. The dried matter was subjected to a sealed test tube with 3 ml of 3% methoanolic HCl at 80°C for 18hours. To the 2 ml of hexane was added and extracted fatty acid methyl esterase (FAME) obtained from methanol phase hexane. Top 1ml of hexane phase was collected in a microbial evaporated under nitrogen gas. The residual fraction was dissolved in 10microlitre of Ethyl acetate and injected 1micro liter of aliquot in to a gas chromatography equipped with a flame identification detector and column Hp ULTRA-2 (25 m, 0.2 mm 1D) [5].

RESULTS

In Present study *S. serrata* ovary (8.87%) and chelate leg (4.82%) shows highest percentage in C20: 5 n3 (Eicosapentaenoic Acid) and the lowest percentage of 0.02% was reported in C18: 2 n6c (Linolelaidic acid) in chelate leg followed by the C20: 5 n3 (Eicosapentaenoic Acid) in the ovary. (Table.1).

In case of *P.pelagicus* chelate leg C20: 2 cis-11, 14-(Eicocadienoic Acid) was noticed highest percentage of 4.02% and lowest percentage of 0.01% was recorded in C17: 1 cis-10 (heptadecanoic Acid). But in the ovary shows maximum percentage of 3.08% in C20: 5 n3 (Eicosapentaenoic Acid) and minimum percentage of 0.19% was recorded in C17: 1 cis-10 (heptadecanoic Acid) Table 1.

DISCUSSION

In the past decades, studies on crustacean fatty acids have focused on the nutritional requirements of brooders during ovarian development [6-9] or juvenile growth [10,11]. Large quantities of fatty acids were found to be necessary for the development of ovaries [6]. However, little information is available for fatty acid composition and variation in ovaries and chelate of crabs. Lipids are nutritionally significant in crustaceans. Comparisons of wild and captive crustaceans have demonstrated the influence of dietary lipid composition on fatty acid profiles of tissues and their subsequent eject on reproductive success and spawning quality [12-14].

Lipids play an important role in fish nutrition for provision of both energy and fatty acids (EFA) [15]. The effects of different types of lipids on growth and tissue fatty acid composition have been investigation for a number of cultured species [16-18]. The percentage of total saturated fatty acids was higher in the (25.15-26.24% of total Fas) than in the claw meat (22.58-23.49% of total FAs) [19].

Nutrient composition of green crab (*Carcinus maenus*) Leg meat had higher lipid concentrations (1.16 g/100 g) than either steamed (0.62 g/100 g) or raw (0.54 g/100 g) claw meat [20]. Average n-3 fatty acid concentrations ranged from 115 to 336 mg/100 g and 154 to 344 mg/100 g for DHA and EPA, respectively and were significantly higher in leg meat than in claw meat. Lipid content, fatty acid and mineral composition of mud crabs (*Scylla serrata*) the fatty acids contained between 12.5 and 11.0% of eicosatetraenoic acid (C20:4 n-6), 11%n eicosapentaenoic acid (C20:5 n-3) and between 5.2 and 6.6% of docosahexaenoic acid (DHA; C22:6 n-3). The other major fatty acids were palmitic and oleic acids in both crabs [21].

Table 1: Fatty acid composition of the lipids of crab % by weight of total fatty acid

MUFA	Scylla serrata		Portunus pelagicus	
Name of the fatty acid	Chelate leg	Ovary	Chelate leg	Ovary
C16: 1 Palmitoleic Acid	4%	7%	2.39%	0.213%
C17: 1 cis-10heptadecanoic Acid	0.1%	0.21%	0.01%	0.19%
C20: 0 Arachidic acid	0.1%	1.0%	0.90%	1.23%
PUFA	Scylla serrata		Portunus pelagicus	
C18: 2 n6c Linolelaidic acid	0.02%	2%	0.2%	0.5%
C18: 3 n6 Linolenic acid	0.42%	0.22%	0.25%	0.30%
C20: 2 cis-11,14-Eicocadienoic Acid	2.45%	3.02%	4.02%	3.02%
C20: 4 n6 Arachidonic Acid	1.03%	7.01%	0.22%	0.33%
C20: 5 n3 Eicosapentaenoic Acid	4.82%	8.87%	2.07%	3.08%
Total F.acid	8.74%	21.12%	6.76%	7.23%

The marine animal is richest source of PUFA. Total PUFA may account for 1.5%-10.5% of the total fatty acids where 20.4 and 20.5 accounts for about 90% [22]. This is an agreement with the present study where the total PUFA content ranged from 0.22% to 8.87%. Highly unsaturated fatty acids occur mainly in phospholipids, whereas smaller saturated and mono-unsaturated fatty acids such as myristate, (14:0), palmitate (16:0) and palmitoleic acid (16:1 ω7) primarily occur in triglycerides (TGs), in agreement with lipid composition in higher animals,demonstrating the different biological functions of SFAs, MUFAs and PUFAs. In the heptaopancreas of shore crabs approximately 80% of the FAs occur as triglycerides and only 13% as phospholipids [1].

The saturated fatty acid ranges from 16.8 to 22.5% in *Scylla serrata* and *Scylla tranquebarica.* Among the individual component 18:0 and 20:0 were more Mukova and Zhukova polyunsaturated fatty acid in *S. tranquebarica* and *Portunus sanguinolentus* and the observed that fatty acid content of this during breeding period ranges from 8.2% to 25% [23]. This is an agreement with the present study where the total PUFA content ranged from 8.74% to 21.12% in *S. serrata*. The present study is clear-cut indication of the presence of PUFA in a large quantity mainly C20: 4 n6 (Arachidonic Acid) and C20: 5 n3 (Eicosapentaenoic Acid) *Scylla serrata* and C20: 2 cis-11,14-(Eicocadienoic Acid) and C20: 5 n3 (Eicosapentaenoic Acid) are more in *Portunus pelagicus.*

In *S. serrata* whose breeding season coincides with March-April has the highest PUFA content in the ovary. The suggest that the lipid plays an important role in reproduction as the hormones of lipid origin mostly takes part in controlling the sexual behavior [24]. The 20:5 fatty acids are more in the ovary which suggests that the higher the unsaturation, more is the beneficial for the reproduction [25].

In *P. pelagicus* 20:2 is more which is very useful in the regeneration of the visual pigment rhodopsin [26]. The 20:5 ω 3 are very important in arteriosclerosis, cancer, Rheumatoid, arthistis, Azheimer diseases [27]. 18 carbons ω 3 PUFA is required for health, which human can't synthesis, however human can synthesize other ω 3 fatty acid from ALA, including EPA+DHA [28]. According to VSDA nutrient laboratory amount required to provide approximately 1 gm of EPA+DHA is 8.5 gm, while for the same in fish it requires 12 gm (FDA USA, 1997). So *S. serrata* and *P. pelagicus* provides a good source of fatty acid, which are useful in many aspects of the common people.

ACKNOWLEDGMENT

The authors are grateful to the Director of CAS in Marine Biology and authorities of Annamalai University. The Centre for Marine Living Resources and Ecology (CMLRE), Government of India, Cochin, for the financial support and staff members of ENVIS centre for their keen interest and encouragement.

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Abbreviations

SFA-	Saturated fatty acid
PUFA-	Poly unsaturated fatty acid
MUFA-	Mono unsaturated fatty acid
EPA-	Eicosapentaenic acid
DHA-	Disosahexaenonic acid
FAME-	Fatty acid methyl esterase
Tgs-	Triglycerides