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Morphology of barramundi and its characteristics during processing

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Abstract
Barramundi is a highly opportunistic species that dominate many tropical rivers. Delicious and thrilling to catch, they also live in both freshwater and saltwater, change sex and eat just about anything. Barramundi support substantial commercial, recreational and customary fisheries. By filleting, head and bone of fish account for 33-35%, viscera 11-13%, skin 6-8, flesh 46-50% in edible part. Based on chemical characteristics, barramundi fish has moisture 80.22%, protein 70.40%, and lipid 12.77%. Its firmness is nearly stable at 4 ^{o}C in 1 hour before freezing. If the prefreezing time lasts over 4 hours, its firmness is 91% compared to raw fish.

Keywords: *Barramundi, filleting, firmness, prefreezing.*

1. Introduction
It is a well-known fact that fish represent a high-quality nutritional source (Sidhu, 2003). Fish demand is also increasing as a result of the increasing world population, higher living standards and the good overall image of fish among consumers (Cahu *et al.*, 2004). Fishes are rich source of protein commonly consumed as an alternative source of protein due to the higher cost of meat and other sources of animal protein (Omolara and Omotayo, 2009). Harris (1997) also reported that fish has lower cholesterol content when compared with meat and thus often recommended for consumption especially among the adult population. Since fish is not normally consumed raw, various processing methods are employed in preparing them for consumption and some of these processes include boiling, frying, roasting, smoking, which could have varying effects on their nutrient contents, texture and flavour (Eriksson, 1987). Previous workers had reported the effects of some processing methods on different fish types (Greenfield and Kosulwat, 1991), it was reported that the type of food and cooking procedures influence the fat content and other nutrients. The fat content of raw fishes can also influence fat exchanges and interactions between the culinary fat and that of the fish during processing (Sanchez-Muniz, 1992). Post mortem softening of fish muscle is caused by the combination of two reactions: biochemical-induced by enzymatic degradation of myofibrils and collagen, and physical due to the separation of myotomes called “gaping”.
Sea bass or barramundi (*Dicentrarchus labrax* L.) is found in our waters naturally and consumed well in the World due to flavor of its meat. Besides it is preferred because of its durability of different conditions and culturing successfully in controlled environment. The meat of fish effects from physical and environmental factors rapidly from harvesting point, because of its sensitivity to degradation.
In this situation after harvesting, it must be consumed in a short time or if it is not possible it should be conserved in various ways and be protected. The processing technologies which had developed for this aim show diversity and the aim of these technologies to maintain the existing quality as much as possible and to protect consuming of the fish for a long time.
There are several researches mentioned to fish morphology during processing (Ayeloja *et al.*, 2013; Gülsün *et al.*, 2005; Marroquin *et al.*, 2004; Nikheel Rathod *et al.*, 2013; Romuald *et al.*, 2005; Sona Younus *et al.*, 2013; Yunus *et al.*, 2012). Purpose of our research is to investigate morphology of barramundi and its characteristics during processing.

2. Material & Method
2.1 Material
Barramundi fish is collected in Mekong river delta, Vietnam.

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Fig 1: Barramundi fish

Research method

Experiment #1: Morphology of barramundi raw fish

Experiment is arranged with one factor. Factor A: initial weight of fish (4) with four levels: A1 = 400 ÷550 g/pcs, A2= 550 ÷750 g/pcs, A3 = 750 ÷1000 g/pcs, A4= > 1000 g/pcs. Testing parameters include relationship between fish weight and size; percentage of weight by different compositions.

Experiment #2: Firmness of barramundi fillet during processing

Experiment is arranged with one factor. Factor B: treatment time from filleting to freezing with 7 levels: B1= 15 minutes, B2= 30 minutes, B3= 45 minutes, B4= 1 hour, B5= 2 hours, B6= 3 hours, B7= 4 hours. Testing parameter includes firmness of fillet.

2.3 Statistical analysis

All data are processeed by Excel 2003.

3. Result & Discussion

3.1 Relationship between fish weight and size

Table 1: Relationship between fish weight and size

Group	Length	Width	Thickness
400-500g	341.0^{a}	74.5^{a}	35.4^{a}
550-750g	358,8^{b}	87.2^{b}	36.9^{a}
750-1000g	368.4^{bc}	92.1^{c}	42.5^{b}
>1000g	379.1^{c}	98.8^{d}	47.2^{c}

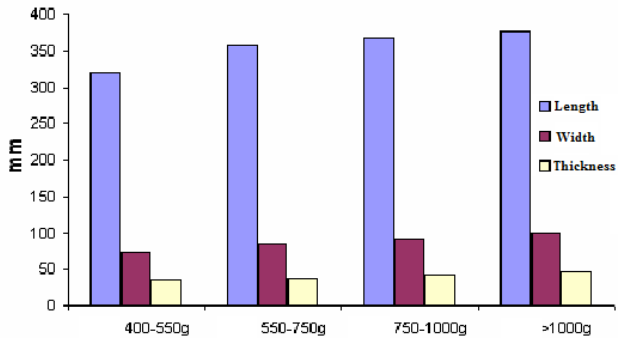

Fig 2. Relationship between fish weight and size from figure 2, we see that barramundi fish has weight > 750 gam in maturity.

3.2 Effect of fish weight to edible percentage

Table 2: Effect of fish weight to edible percentage

Group	Flesh	Viscera	Skin	Bone
400-500g	46.1^{a}	11.3^{a}	7.6^{a}	35.3^{a}
550-750g	46.4^{a}	12.6^{b}	6.9^{b}	35.1^{a}
750-1000g	47.3^{a}	12.9^{b}	6.5^{b}	34.2^{b}
>1000g	49.6^{b}	12.1^{ab}	6.5^{b}	33.1^{b}

From table 3, we see that fish bone accounts for 33-35%, viscera 11-13%, skin 6-8, flesh 46-50%. So it's ideal for fillet processing.

3.3 Effect of fish weight to its firmness

Table 3: Effect of fish weight to its firmness

No	Group	Firmness (g force)
1	400-500g	475.44^{a}
2	550-750g	564.21^{b}
3	750-1000g	647.14^{b}
4	>1000g	830.99^{c}

From table 3, we see that fish in group #1 (400-550g) has the least firmness (475.44 g force); group #2 & 3 has the medium firmness (564.21-647.14 g force); group #4 (> 1000g) has the highest firmness (830.99 g force).

3.4 Effect of fish weight to chemical composition

Table 4: Effect of fish weight to chemical composition

No	Group	Moisture (%)	Lipid (%)	Protein (%)
1	400-500g	79.43^{a}	8.91^{a}	62.54^{a}
2	550-750g	81.45^{a}	8.01^{a}	70.34^{b}
3	750-1000g	80.32a	11.97^{b}	76.89^{c}
4	>1000g	79.67^{a}	22.17^{c}	71.82^{b}
Average		80.22	12.77	70.40

From table 4, we see that barramundi fish has the high protein content (70.40%) so it's appropriate for fillet processing.

3.5 Effect of treatment time to fish firmness

Table 5: Effect of treatment time to fish firmness

Time (minutes)	Firmness (g force)
0	1.01^{c}
15	1.00^{c}
30	0.98^{c}
45	0.98^{c}
60	0.98^{c}
120	0.96^{b}
180	0.95^{ab}
240	0.92^{a}

Fillet firmness is nearly stable during one hour of processing, so processors should pay attention to this parameter to get the high fish quality.

4. Conclusion

After a fish dies, the flesh quickly becomes rigid, in a process known as rigor mortis. This rigidity then dissolves, and the fish flesh decomposes. The decomposition of the fish occurs as its constituent compounds break down (called autolysis). The proteins, nucleotides and sugars break down, bases are released, the pH falls and the fats are oxidised. These make the fish smelly, rancid and tough. So it's very important to pay attention to processing time so that fish quality remains significantly.

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