Fatty Acid and Mineral Composition of Shellfish *(Gelonia papua)*

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The fatty acid composition of the shellfish lipid and mineral composition of its meat were analysed. Moisture, lipid, protein and ash of shellfish,*Geloina papua* were determined. Dry shellfish meat had 15.2% lipids of which 58.4% was nonpolar and 41.6% phospholipids. The protein (51.2%) and ash (7.44%) contents were appreciable. The level of omega-3 polyunsaturated fatty acids was moderately high. The component minerals and heavy metals determined were Na, K, Ca, Fe, Zn, Cu, Cd, Pb, Hg, As and Se. The concentrations of essential minerals (Na, K, Ca, Mg and Fe) were significant.

People interested in the health benefits of polyunsaturated fatty acids, in particular omega-3 fatty acids (Dyerberg *et al.*, 1978; Kinsella, 1986; Ackman,1988; Kromhout *et al.*, 1985; Phillipson *et al.*, 1985) have generated interest in identifying new potential sources of n-3 oils. Seafood lipids (fish,crabs,lobster,etc.) are a rich source of omega-3 (or n-3) polyunsaturated fatty acids, especially eicosapentaenoic and docosahexaenoic acids (Kinsella, 1987; Ackman,1974). Shellfish is an important seafood consumed in Papua New Guinea. Reliable data on chemical composition of shellfish obtained by standard methods are needed by nutritionists, fisheries biologists and food scientists to aid in dietary formulation, processing, quality stabilization, ecological research and aquaculture.

The aim of the present study was to collect compositional and nutritional data for shellfish (G.*papua*), consisting of the proximate composition, fatty acid composition of lipid and mineral and heavy metal contents.

Materials and Methods

Shellfish (G.*papua*) were collected in fresh condition from the market, within one day of capture. These were transported to the laboratory, separated the flesh, cut into small pieces and pooled to form composite samples and processed immediately.

Standard methods were used to determine moisture, protein and ash contents (AOAC, 1984). The lipids were extracted and purified according to Folch *et al.* (1957). Total lipids were fractionated on silicic acid column (Carroll, 1976) with chloroform eluting non-polar lipids and methanol the phospholipids. The non-polar lipids and phospholipids were quantified by gravimetry. Methyl esters of the fatty acids were prepared from the total lipids by refluxing with methanol using concentrated sulphuric acid as catalyst.

The gas liquid chromatography (GLC) of fatty acid methyl esters were carried out using a Hewlett-Packard 5890A unit fitted with a flame ionization detector (FID) and data processor. Helium was used as carrier gas and the column, injection port, and detector were maintained at 200, 200 and 210°C respectively. A polar (BP- 20) capillary column (25.0m x 0.25mm), SGE Scientific, Melbourne, was used for the analysis. The peak were identified by comparison with standard fatty acid methyl esters. Samples were ashed and analysed for minerals by the AOAC (1984) method using Varian Spectra AA-20 Model Atomic Absorption Spectrophotometer. Total mercury

was determined by cold vapour generation, and arsenic and selenium were determined by hydride generation using a VGA-76 vapor generation accessory coupled to the Varian Spectra AA-20.

Results and Discussion

The moisture, lipids, protein and ash contents are presented in Table 1. Lipids and protein contents are comparable with other variety of fishes.

Table 1 *The percentage of moisture, lipids,protein and ash in shellfish (G.papua) meat*

Moisture, %	81.1 ± 2.5
Lipids, %	15.2
Protein, %	51.2 ± 8.2
Ash, %	7.4 ± 0.2

Table 2 *Fatty acid composition of total lipids, nonpolar lipids and phospholipids of shellfish (G.papua)*

Fatty acids	% of total lipids,	% of nonpolar lipids (58.4%)	% of phospho-lipids (41.6%)
14:0	5.3	8.0	1.3
16:0	24.9	26.7	23.6
16:1	13.8	17.0	8.1
16:1 isomer	3.5	4.0	3.0
16:3	3.4	3.0	4.3
17:1	2.4	1.2	3.1
18:0	6.6	6.2	6.4
18:1 (n-9)	6.5	5.5	6.2
18:1 (n-7)	6.3	8.0	6.0
18:2	2.1	2.6	2.6
19:3	2.0	2.2	1.8
20:1 (n-9)	8.6	5.6	9.5
20:4 (n-6)	2.9	1.9	5.8
20:5 (n-3)	2.1	1.9	2.7
22:3	2.0	0.2	4.5
22:4	1.7	1.1	2.7
22:5 (n-3)	2.3	1.6	3.7
22:6 (n-3)	3.6	3.3	3.9

Table 2 shows the fatty acid distribution in the total lipids, non-polar lipids and phospholipids of the shellfish. The shellfish contained high levels of 16:0, 16:1 and 18:1 fatty acids in all lipid classes. Palmitic and oleic acids are present in appreciable quantities (30% or more) in most marine oils (Stansby, 1982). The shellfish (*G. papua*) had significant amounts (13.8%) of palmitoleic acid in comparison to other shellfish varieties. A significant concentration of 20:1 (n-9) and 20:4 (n-6) were found in the shellfish lipids, with higher proportion in phospholipids compared to non-polar lipids. The shellfish contained 8% of omega-3 fatty acids (20:5 n-3, 22:5 n-3 and 22:6 n-3)in total lipids. The phospholipids contained high proportion of this (10%) compared to non-polar lipids (6.8%). Marine species analysed contain significant

Table 3 *Mineral composition of shellfish (G. papua)*

Mineral	
Cu (μg/g)	20.30 ± 1.97
Zn ((μg/g)	104.00 ± 10.6
Cd ((μg/g)	2.75 ± 0.47
Pb ((μg/g)	0.20 ± 0.00
Fe (mg/g)	1.72 ± 0.16
Na (mg/g)	1.64 ± 0.11
K (mg/g)	1.85 ± 0.21
Ca (mg/g)	5.61 ± 0.50
Mg (mg/g)	1.01 ± 0.13
Hg ((μg/g)	0.23 ± 0.00
As ((μg/g)	0.001 ± 0.00
Se ((μg/g)	0.32 ± 0.021

amounts of eicosapentaenoic acid (EPA or 20:5 n-3) and docosahexaenoic acid (DHA or 22:6 n-3), which are normally characteristic of fish oils, (Stansby, 1982; Ackman, 1988 a). These compounds are believed to have an inhibitory effect on platelet aggregation which is known to prevent the risk of thrombosis (Kinsella, 1986; Ackman, 1988 a).

The minerals and heavy metal composition are given in Table 3. The concentration of potassium, magnesium, and iron were high compared to other minerals, which are considered to be essential for growing bodies.

Sodium and calcium levels are appreciable in shellfish and are considered to be important in food due to their involvement in coronary heart disease, hypertension and osteoporosis (Recker, 1983; Gualdoni *et al.*, 1986; McCarron *et al.*, 1982). Heavy metal concentrations (Cu, Zn, Pb, Cd, Hg, As and Se) were lower than standards internationally accepted for direct or indirect human consumption (Nauen,1983). Mercury levels does not exceed the 0.5 ug/g (wet wt) guide line for food stuffs suggested by WHO (1976).

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