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Proximate Composition of the Deep-Sea Crab, *Chaceon affinis*, from an Exploratory Fishery off Madeira Island (Portugal - Eastern Central Atlantic)

by

P. Vasconcelos [1] and N. R. Braz [2]

[1] Instituto de Investigação das Pescas e do Mar (IPIMAR), Centro Regional de Investigação Pesqueira do Sul (CRIPSul), Avenida 5 de Outubro s/n, 8700-305 Olhão - PORTUGAL
Phone: +351 289 700518; Fax: +351 289 700535; E-mail: pvasconcelos@ipimar.ualg.pt

[2] Universidade do Algarve (UAlg), Escola Superior de Tecnologia (EST), Campus da Penha; 8000-117 Faro - PORTUGAL
Phone: +351 289 800900; Fax: +351 289 823539; E-mail: nbraz@ualg.pt

Abstract

In the context of a deep-sea crabs exploratory fishery carried out in Madeira Island (Portugal - Eastern Central Atlantic), which results suggest an hypothetical implementation of a local small-scale targeted fishery, the main objective of this study was the proximate composition analysis of the deep-sea crab *Chaceon affinis*. A total of 40 crabs were separated into three different parts: legs, chelae and whole carapace (cephalothorax). The proximate composition analysis was performed separately for the meat yield (edible portion) of legs and chelae and for the whole carapaces. The methodologies adopted were dehydration in an air oven at ±105ºC (moisture), incineration in a muffle furnace at ±550ºC (ash), Kjeldhal method (protein) and Soxhlet method (fat). The proximate composition of total meat (edible content from legs and chelae) was of approximately 80.6% ± 1.6% moisture, 17.8% ± 0.1% protein, 2.3% ± 0.1% ash and 0.7% ± 0.2% fat (fresh weight). No significant differences were found between the proximate compositions of legs and chelae meat. In comparison terms, the proximate composition of *Chaceon affinis* showed to be very similar to the vast majority of the commercially exploited crab species (including some geryonid crab species). The proximate composition of the whole carapace (cephalothorax) was composed of approximately 73.0% ± 0.3% moisture, 10.9% ± 0.3% protein, 6.6% ± 0.1% fat and 5.5% ± 0.9% ash (fresh weight). Mostly due to its weight and proximate composition, particularly in the protein and fat contents, the whole carapaces seem to be an interesting raw material for the seafood by-product industry.

Key Words: Proximate composition analysis, Deep-sea crab, *Chaceon affinis*, Geryonidae, Madeira Island, Portugal.

Introduction

The growing demand of crustaceans for human consumption encouraged an increasing interest in the exploitation of deep-sea crabs by commercial fisheries.

Some deep-sea crab species support targeted fisheries of high economical value. In some cases crabs are marketed alive, but generally they are send to seafood processing industries, where they are used as raw material for the production of several diversified seafood products.

The deep-sea crab *Chaceon affinis* was subjected to an exploratory fishery off Madeira Island (Portugal - Eastern Central Atlantic). The apparent abundance of this alternative fishing resource and the short distance to the

fishing grounds suggested the possibility of implementing a local small-scale fishery targeted to this important geryonid crab species.

This study reports the proximate composition analysis of *Chaceon affinis* specimens caught in this exploratory fishery.

Materials and Methods

A total of 40 crabs were separated into three different parts: whole carapace, legs and chelae. The proximate composition analysis was performed separately for the whole carapaces (C) and for the meat from legs (L) and chelae (CH) (Fig. 1).

The methodologies adopted in the proximate composition analysis were dehydration in an air oven at ±105ºC (moisture), incineration in a muffle furnace at ±550ºC (ash), Kjeldhal method (protein) and Soxhlet method (fat).

Results

The results obtained in the proximate composition analysis of the whole carapaces and of the meat from legs and chelae of *Chaceon affinis* are represented in Fig. 2 a, b, c and d.

Discussion

The comparisons between the proximate compositions of legs, chelae and total meat (legs+chelae) of *Chaceon affinis* and the proximate compositions of other commercially exploited crab species are presented in Tables 1a), b) and c).

No significant differences were found between the proximate compositions of legs and chelae edible content (Fig. 2a, b). The proximate composition of total meat (edible content from legs + chelae) was of approximately 80.6% ± 1.6% moisture, 17.8% ± 0.1% protein, 2.3% ± 0.1% ash and 0.7% ± 0.2% fat (fresh weight) (Fig. 2c). In comparison terms, the proximate composition of *Chaceon affinis* showed to be very similar to the vast majority of the commercially exploited crab species (including some geryonid crab species) (Tables 1a,b,c).

The proximate composition of the whole carapace was composed of approximately 73.0% ± 0.3% moisture, 10.9% ± 0.3% protein, 6.6% ± 0.1% fat and 5.5% ± 0.9% ash (fresh weight) (Fig. 2d). Mostly due to its weight and proximate composition, particularly in the protein and fat contents, the whole carapaces seem to be an interesting raw material for the seafood by-product industry.

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Table 1a). Comparison of legs meat proximate composition between *Chaceon affinis* and other commercially exploited crab species.

	Legs Meat Proximate Composition (wet weight - %)				
Family / Species	**Moisture**	**Protein**	**Ash**	**Fat**	**References**
Family Geryonidae:					
Chaceon affinis	**79.4%**	**17.8%**	**2.4%**	**0.6%**	**Present Study**
Chaceon fenneri	84.2%	15.5%	-	1.3%	22
Other Commercial Crabs:					
Callinectes sapidus	-	-	1.81%	-	24
Callinectes sapidus	-	-	1.57%	-	10
Chionoecetes bairdi	80.0%	18.3%	1.2%	1.5%	16
Chionoecetes opilio	80.1%	17.55%	1%	0.95%	15
Erimacrus isenbeckii	76.7%	20.5%	1.9%	0.7%	15
Paralithodes brevipes	78.4%	18.6%	1.6%	0.9%	15
Paralithodes camtschatica	78.9%	17.1%	1.9%	1.6%	17
Paralithodes camtschatica	76.8%	20.1%	-	-	24
Paralithodes camtschatica	81.0%	15.8%	1.9%	0.6%	15
Portunus trituberculatus	80.4%	16.4%	2.2%	0.8%	15

Table 1b). Comparison of chelae meat proximate composition between *Chaceon affinis* and other commercially exploited crab species.

	Chelae Meat Proximate Composition (wet weight - %)				
Family / Species	**Moisture**	**Protein**	**Ash**	**Fat**	**References**
Family Geryonidae:					
Chaceon affinis	**81.7%**	**17.9%**	**2.2%**	**0.8%**	**Present Study**
Chaceon fenneri	84.2%	13.7%	-	1.0%	22
Other Commercial Crabs:					
Callinectes sapidus	81.6%	16.02%	1.61%	-	8
Callinectes sapidus	78.18%	13.98%	-	-	20
Cancer magister	80.7%	16.98%	1.56%	1.0%	9
Chionoecetes bairdi	80.0%	18.0%	1.3%	1.0%	16
Paralithodes camtschatica	76.5%	20.7%	1.9%	1.6%	17
Scylla serrata	82.94%	16.28%	5.11%	1.0%	12

Table 1c). Comparison of total meat proximate composition between *Chaceon affinis* and other commercially exploited crab species.

	Total Meat Proximate Composition (wet weight - %)				
Family / Species	**Moisture**	**Protein**	**Ash**	**Fat**	**References**
Family Geryonidae:					
Chaceon affinis	**80.6%**	**17.8%**	**2.3%**	**0.7%**	**Present Study ***
Chaceon quinquedens	80.8%	15.0%	1.44%	0.99%	19 *
Chaceon quinquedens	80.8%	-	1.6%	1.0%	22
Chaceon quinquedens	-	-	-	0.9%	18
Geryon longipes	83%	13%	3%	1%	3
Other Commercial Crabs:					
Callinectes sapidus	-	-	-	0.4%	8
Callinectes sapidus	77.08%	18.42%	2.48%	2.48%	14
Callinectes sapidus	77.4%	19.8%	2.06%	1.02%	24
Callinectes sapidus	81.2%	16.1%	1.6%	1.0%	25
Callinectes sapidus	78.23%	18.96%	2.18%	2.12%	27
Callinectes sapidus	78.47%	-	-	-	21
Callinectes sapidus	79.0%-80.3%	17.9%	2.0%	1.3%	22
Callinectes sapidus	78.8%	16.4%	2.1%	0.8%	22
Callinectes sapidus	82.0%-82.6%	-	-	-	26
Cancer borealis	78.23%	16.2%	1.47%	1.9%	19
Cancer borealis	80.0%	17.3%	1.5%	1.3%	22
Cancer borealis	78.0%	-	-	1.1%	18
Cancer borealis	-	-	-	1.1%	1
Cancer irroratus	79.1%	-	-	1.2%	18
Cancer magister	-	15.10%	-	1.0%	4
Cancer magister	80.5%	17.2%	1.4%	1.4%	25
Cancer magister	80.0%	17.3%	1.5%	1.3%	22
Cancer magister	78.8%-79.1%	-	-	-	6
Cancer pagurus	-	22.4%	-	-	5
Cancer pagurus	71%-74%	19%-24%	1%-2%	0.6%	7
Chionoecetes bairdi	-	18.8%	1.0%	1.5%	16
Chionoecetes bairdi	79.7%	18.4%	1.2%	1.3%	22
Chionoecetes opilio	-	-	-	0.75%	2
Chionoecetes opilio	80.6%	15.3%	2.1%	1.14%	19 *
Chionoecetes opilio	81.5%	15.6%	1.9%	1.0%	22
Chionoecetes opilio	-	-	-	0.75%	1
Chionoecetes phalangium	-	19.4%	-	-	5
Neptunnis spp.	78.4%	16.5%	1.45%	0.5%	25
Paralithodes camtschatica	-	18.0%	1.8%	2.0%	17
Paralithodes camtschatica	-	18.3%	1.6%	-	24
Paralithodes camtschatica	80.7%	17.2%	1.6%	0.7%	25
Paralithodes camtschatica	77.7%	17.5%	1.5%	2.6%	22
Paralithodes camtschatica	81.9%	15.2%	1.5%	0.8%	22
Podophthalmus vigil	69.5%-74.5%	18.5%	-	-	23
Scylla serrata	79.86%	-	-	-	11
Scylla serrata	80.3%	14.9%	1.8%	2.9%	25
Scylla serrata	77.2%-78.0%	20.9%	-	-	12
Scylla serrata	79.80%	-	-	-	13

Note: * Legs + Chelae

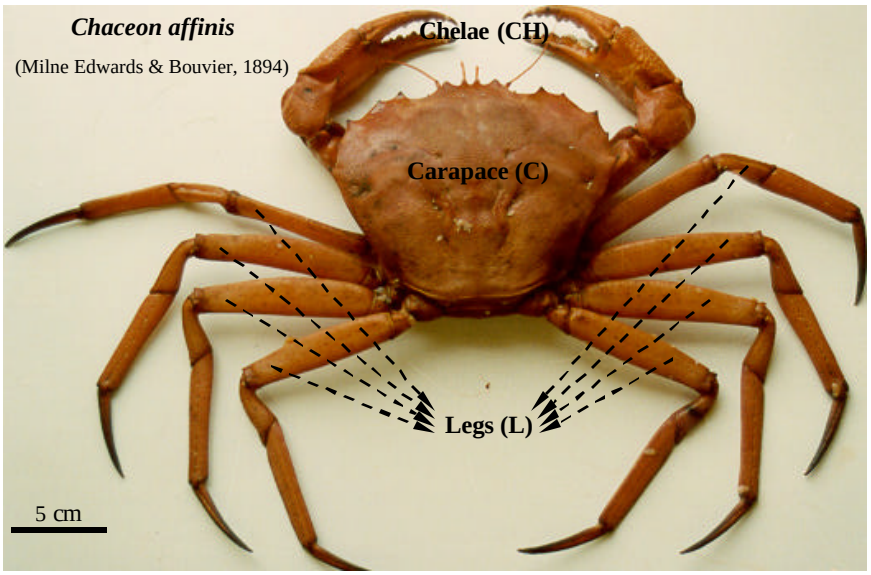

Fig. 1. Schematic representation of body parts separation made on *Chaceon affinis* specimens for the proximate composition analysis.

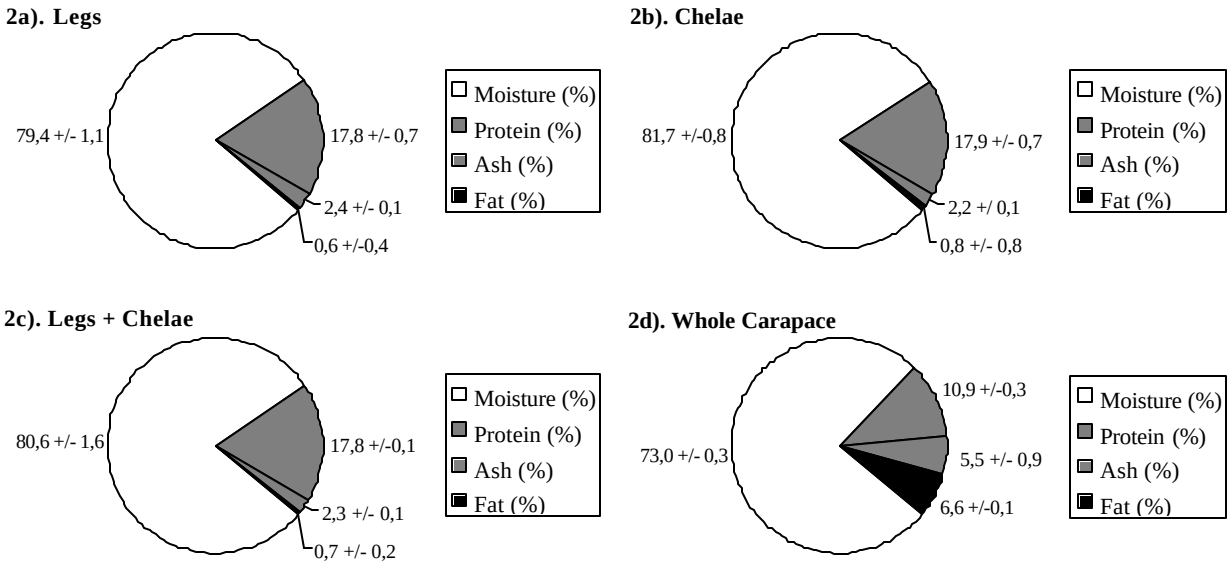

Fig. 2. Proximate composition analysis of (**a**) legs, (**b**) chelae, (**c**) total meat (legs + chelae) and (**d**) whole carapace of *Chaceon affinis*.