LWT - Food Science and Technology 77 (2017) 397-405



Contents lists available at ScienceDirect

LWT - Food Science and Technology

journal homepage: www.elsevier.com/locate/lwt



The quality of deep-frozen octopus in the Portuguese retail market: Results from a case study of abusive water addition practices



Rogério Mendes^{*}, Bárbara Teixeira, Susana Gonçalves, Helena Lourenço, Fernanda Martins, Carolina Camacho, Rui Oliveira, Helena Silva

Portuguese Institute for the Sea and Atmosphere - IPMA, I.P., Department for the Sea and Marine Resources, R. Alfredo Magalhães Ramalho, 6, 1495-006, Lisbon, Portugal

A R T I C L E I N F O

Article history: Received 29 September 2016 Received in revised form 10 November 2016 Accepted 20 November 2016 Available online 21 November 2016

Keywords: Mollusk Conformity Safety Water soaking Cooking losses

ABSTRACT

Octopus spp. are among the most important cephalopod traded. However, consumers frequently complain of excessive reduction of weight/volume, after cooking. A case study in the Portuguese market was held with deep-frozen octopus, being added water and cooking losses evaluated, as well as product's biochemical and microbiological quality. Negative deviations (1.3%-7.7%) to the declared weight were detected in 28% of the products. These shown to be good sources of K, Mg, Cu and Zn and contaminants (Cd, Hg and Pb) were lower than limits. Microbiological quality was generally good though coliform, *E. coli*, molds and yeasts detected indicate poor hygienic conditions in a number of production facilities. Cephalopod species determined were in accordance with the label in all samples. Most of the products (92%) presented significantly higher moisture and lower protein contents than unprocessed samples, signaling water soaking. Cooking losses were also higher than in unprocessed samples. Overall unconformities were accounted in 80% of the samples, mostly because water was added and not labelled (68%), or because citrates listed as ingredients were not detected. Consumers were shown to be at high risk of being defrauded. New regulations and reference criteria for water addition control need to be enforced.

© 2016 Elsevier Ltd. All rights reserved.

1. Introduction

Cephalopods of the genus *Octopus* spp. are among the most important commercially octopus species harvested worldwide, being these cephalopods typically marketed fresh, dried salted and frozen (Barbosa & Vaz-Pires, 2004). This species is highly appreciated mainly in Mediterranean, South American and Asian countries and product demand commands high prices throughout all distribution chain thus, sustaining artisanal as well as industrial fisheries. In Europe, the common octopus (*Octopus vulgaris*) is fished in both the northeast Atlantic and the Mediterranean Sea, mainly by small-scale fishing fleets (Pita, Pereira, Lourenço, Sonderblohm, & Pierce, 2015). In Southern European countries, the common octopus is one of the most important fishery resources in terms of economic value.

Despite product demand, consumers often express discontent

because their expectations are not always corresponded by the purchased product, in particular regarding the excessive reduction of weight/volume, after cooking. It is a common result to have cooked octopus reduced to less than half the purchased weight. Media reports concerning food fraud and in particular seafood counterfeit have increased in the last years and a diversity of incidents to defraud the general public, restaurants, retailers and other seafood business have been reported (Lou, 2015; Mariani et al., 2014). Driven by the high prices attained, octopus is now also under the attention of the media (Coelho, 2013) and based on a general public opinion about the low yield of these products after cooking, suspicions regarding excessive water addition that could be deemed adulteration and result in economic fraud for the buyer, have been raised (Coelho, 2013). Though, no scientific information or technical report has been published up to date on the general quality of the retail products or more specifically on the water uptake by octopus or on the effect of these weight gains on the cooking yield.

In Portugal, cephalopods are an important part of the diet, having these a growing demand, as the products are easy to prepare, have a peculiar texture and flavor and can be cooked in different ways. The

^{*} Corresponding author. E-mail address: rogerio@ipma.pt (R. Mendes).

per capita consumption of octopus represents in Portugal an amount estimated between 2 and 3 kg per year, being the third packed frozen seafood product more consumed, after hake and cod (INE, 2015). The supply is achieved at the expense of domestic production and a strong contribution of imported products.

On account of the importance of octopus in the Portuguese diet and its commercial value, this market was selected as a European model for a case study of the quality of deep-frozen octopus. A comparative test was held with 25 commercial samples of prepackaged deep-frozen octopus with the objective of evaluating the legal conformity and safety of the products, namely the added water, cooking losses, additives (phosphates and citrates) and labelling as well as the quality of the products, both in terms of biochemical (TVB-N, additives, essential and contaminant elements) and microbiological quality.

2. Material and methods

2.1. Raw material, processing and sampling

2.1.1. Market study

In order to know the universe of brands of deep-frozen octopus

products pre-packaged or sold in bulk available in the retail market, an inquiry was made on site in 40 food shops covering small traditional food shops (12 minimarkets, traditional markets and frozen fish shops) and large food retail chains (28 hyper/supermarkets). The data collection took place during lune 2015 in five districts of Continental Portugal (Lisbon, Oporto, Faro, Braga and Guarda) and Madeira and the Azores Islands. The inquiry identified 115 products and 35 brands and the results were subjected to statistical analysis, with determination of frequencies of the brands, by district and retail shop. Based on the geographical representation and frequency of the brand on the market (*i.e.*, number of times a brand is repeated in the different retails shops visited) and the representativeness by distribution channel (large food retail chains, traditional food shops) a sample of 25 brands was subsequently selected (Table 1). In fact, and given the growing importance of own brands of large food retail chains, about half of the sample is composed of these brands (44% large food retail chains brands and 56% manufacturer brands). The sample did not include brands with regional distribution or distribution restricted to the Madeira or the Azores Islands. Sampling also followed a criterion of homogeneity in what concerns the type of product: preference to 1-2 kg whole deep-frozen octopus products of the species Octopus vulgaris,

Table 1

Number of packages, net weight, labelled species, capture area, production date and labelled ingredients of 25 deep-frozen octopus products sampled in the Portuguese retail market in October 2015.

Jampa RobotReferenceLabelited <th colspan="2">Sample No. of</th> <th>Net weight</th> <th>Labelled</th> <th></th> <th>Production</th> <th>Labelled ingredients</th>	Sample No. of		Net weight	Labelled		Production	Labelled ingredients
0141.5Octopus vulgarisAtlantic Ocean East-Central17.08.2015Octopus, salt0241.5Octopus spp.Atlantic Ocean East-Central02.09.2015Octopus, water, salt, E3310341.3Octopus vulgarisAtlantic Ocean North-East (FAO 27), Portuguese vulgaris19.08.2015-0460.8Octopus cyanea ulgarisIndic Ocean25.04.2015-05100.5Octopus cyanea ulgarisIndic Ocean01.11.2014Octopus0642.8Octopus vulgarisAtlantic Ocean East-Central20.07.2015-0742.0Octopus vulgarisAtlantic Ocean East-Central20.07.2015Octopus, salt, E330, E331, E5000842.0Octopus vulgarisAtlantic Ocean East-Central20.07.2015Octopus, water, salt0941.0Octopus spp. VulgarisPacific Ocean West-Central09.06.2015Octopus, water, salt, E3311141.0Octopus sppAtlantic Ocean East-Central09.06.2015Octopus, water, salt, E3311241.0Octopus sppPacific Ocean North-East, Portuguese waters20.07.2015Octopus, water, salt, E3311241.0Octopus sppAtlantic Ocean East-Central09.06.2015-1341.4Octopus Atlantic Ocean East-Central03.08.2015Octopus, water, salt, E3311441.0Octopus vulgarisAtlantic Ocean East-Central <td>Samp</td> <td>packages</td> <td>(kg)</td> <td>species</td> <td>Capture area</td> <td>date</td> <td>Labelleu lligreulents</td>	Samp	packages	(kg)	species	Capture area	date	Labelleu lligreulents
0241.50ctopus spn. Atlantic Ocean East-Central0.209.2015 (PAUPS)0ctopus, vater, salt, E3310341.30ctopus (Vugaris)Malantic Ocean North-East (FAO 27), Portuguese waters19.08.2015-0460.80ctopus vinue (Vugaris)Pacific Ocean South-East25.04.2015-0460.80ctopus vinue (Vugaris)Pacific Ocean South-East25.04.2015-05100.5Octopus varue (Vugaris)Pacific Ocean20.07.2015-0642.8Octopus (Vugaris)Atlantic Ocean East-Central (Vugaris)20.07.2015-0742.0Octopus (Vugaris)Atlantic Ocean East-Central (Vugaris)20.07.2015Octopus, vater, salt, E330, E331, E5000842.0Octopus (Vugaris)Natinic Ocean East-Central (Vugaris)20.07.2015Octopus, water, salt, E3311041.0Octopus spp.Pacific Ocean West-Central (Vugaris)05.05.2015Octopus, water, salt, E3311141.0Octopus spp.Pacific Ocean West-Central (Vugaris)19.06.2015-1241.0Octopus spp.Pacific Ocean West-Central (Vugaris)19.06.2015-1341.0Octopus spp.Pacific Ocean West-Central (Vugaris)30.09.2015Octopus, vater, salt, E3311441.0Octopus spp.Pacific Ocean West-Central (Vugaris)30.08.2015Octopus, salt, citric acid, trisodium citr	01	4	1.5	Octopus	Atlantic Ocean East-Central (FAO 34)	17.08.2015	Octopus, salt
Q241.5Octopus spp.Atlantic Ocean East-CentralQ2.09.2015Octopus, water, salt, E331Q341.3OctopusAtlantic Ocean North-East (FAO 27), Portuguese1908.2015-Q460.8Octopus minus Pacific Ocean South-East25.04.2015-Q5100.5Octopus cyaneaIndic Ocean South-East20.07.2015-Q6442.8OctopusAtlantic Ocean East-Central20.07.2015-Q742.0OctopusAtlantic Ocean East-Central20.07.2015Octopus, salt, E330, E331, E500Q842.0OctopusAtlantic Ocean East-Central20.07.2015Octopus, water, saltQ941.0Octopus spp.Pacific Ocean West-Central05.05.2015Octopus, water, salt, E3311041.0Octopus spp.Pacific Ocean North-East, Portuguese waters20.07.2015Octopus, water, salt, E3311141.0Octopus sppAtlantic Ocean East-Central09.06.2015Octopus, water, salt, E3311241.0Octopus sppPacific Ocean West-Central19.06.2015-1341.4Octopus sppPacific Ocean West-Central19.06.2015-1441.0Octopus sppPacific Ocean West-Central19.06.2015-1560.8OctopusAtlantic Ocean East-Central19.06.2015-1641.0OctopusAtlantic Ocean East-Central19.06.2015 <td></td> <td></td> <td></td> <td>vulgaris</td> <td></td> <td></td> <td></td>				vulgaris			
03 4 1.3 Octopus Minus Atlantic Ocean North-East (FAO 27), Portuguese 19.08.2015 - 04 6 0.8 Octopus minus Pacific Ocean South-East 25.04.2015 - 05 10 0.5 Octopus cyaner Indic Ocean South-East 20.07.2015 - 06 4 2.8 Octopus Atlantic Ocean East-Central 20.07.2015 - 07 4 2.0 Octopus Atlantic Ocean East-Central 28.08.2015 Octopus, salt, E330, E331, E500 08 4 2.0 Octopus Atlantic Ocean East-Central 20.07.2015 Octopus, water, salt 09 4 1.0 Octopus Atlantic Ocean East-Central 09.06.2015 Octopus (attract attract attrattract attract attrattract attract attract a	02	4	1.5	Octopus spp.	Atlantic Ocean East-Central	02.09.2015	Octopus, water, salt, E331
vulgariswaters0460.8Octopus minusPacific Ocean South-East25.04.2015-05100.5Octopus cyaneaIndic Ocean Cast - Central20.07.2015-0642.8OctopusAtlantic Ocean East-Central20.07.2015-0742.0OctopusAtlantic Ocean East-Central20.07.2015Octopus, salt, E330, E331, E5000842.0OctopusAtlantic Ocean East-Central20.07.2015Octopus, water, salt0941.0OctopusAtlantic Ocean East-Central20.07.2015Octopus, water, salt1041.0OctopusAtlantic Ocean East-Central20.07.2015Octopus, water, salt1141.0OctopusAtlantic Ocean East-Central20.07.2015Octopus, water, salt, E3311241.0OctopusAtlantic Ocean North-East, Portuguese waters20.07.2015Octopus, water, salt, E3311241.0Octopus sppPacific Ocean West-Central19.06.2015-1341.4OctopusAtlantic Ocean East-Central19.06.2015-1441.0OctopusAtlantic Ocean East-Central03.08.2015Octopus, water, salt, E3311560.8OctopusAtlantic Ocean West-Central21.07.2015Octopus, salt, citric acid, trisodium citrate1741.0OctopusPacific Ocean West-Central21.07.2015Octopus, salt, citric acid, trisodium citrate<	03	4	1.3	Octopus	Atlantic Ocean North-East (FAO 27), Portuguese	19.08.2015	-
0460.8Octopus minus Pacific Ocean South-East25.04.2015-05100.5Octopus cyanea Indic Ocean01.11.2014Octopus0642.8Octopus Atlantic Ocean East-Central20.07.2015-0742.0Octopus Atlantic Ocean East-Central28.08.2015Octopus, salt, E330, E331, E5000842.0Octopus Atlantic Ocean East-Central20.07.2015Octopus, water, salt0941.0Octopus of the constraint05.05.2015Octopus, water, salt1041.0Octopus of the constraint09.06.2015Octopus, water, salt, E3311141.0Octopus sppAtlantic Ocean East-Central09.06.2015Octopus, water, salt, E3311141.0Octopus sppAtlantic Ocean East-Central09.06.2015Octopus, water, salt, E3311241.0Octopus sppAtlantic Ocean North-East, Portuguese waters20.07.2015Octopus, water, salt, E3311241.0Octopus sppAtlantic Ocean East-Central19.06.2015-1341.4Octopus Atlantic Ocean East-Central (FAO 34)03.09.2015Octopus, water, salt, E3311441.0OctopusPacific Ocean West-Central03.08.2015Octopus, water, salt, E3311560.8OctopusPacific Ocean West-Central21.07.2015Octopus, salt, citric acid, trisodium citrate1641.0OctopusPacific Ocean West-Central20.07				vulgaris	waters		
05100.5Octopus cyane Indic Ocean01.11.2014OctopusOctopus0642.8OctopusAtlantic Ocean East-Central20.07.2015–0742.0OctopusAtlantic Ocean East-Central28.08.2015Octopus, salt, E330, E331, E5000842.0OctopusAtlantic Ocean East-Central20.07.2015Octopus, water, salt0941.0Octopus spp.Pacific Ocean West-Central05.05.2015Octopus, water, salt, E3311041.0Octopus spp.Pacific Ocean West-Central09.06.2015Octopus, water, salt, E3311141.0Octopus sppAtlantic Ocean East-Central09.06.2015Octopus, water, salt, E3311141.0Octopus sppAtlantic Ocean North-East, Portuguese waters20.07.2015Octopus, water, salt, E3311241.0Octopus sppPacific Ocean West-Central19.06.2015–1341.4OctopusAtlantic Ocean East-Central03.09.2015Octopus, water, salt, E3311441.0OctopusAtlantic Ocean East-Central03.08.2015Octopus, water, salt, E3311560.8OctopusPacific Ocean West-Central21.07.2015Octopus, salt, citric acid, trisodium citrate1641.0OctopusPacific Ocean West-Central02.07.2015Octopus, salt, citric acid, trisodium citrate1741.8OctopusPacific Ocean West-Central02.07.2015Oc	04	6	0.8	Octopus mimus	Pacific Ocean South-East	25.04.2015	-
0642.8Octopus vulgarisAtlantic Ocean East-Central20.07.2015-0742.0Octopus vulgarisAtlantic Ocean East-Central28.08.2015Octopus, salt, E330, E331, E5000842.0Octopus vulgarisAtlantic Ocean East-Central20.07.2015Octopus, water, salt0941.0Octopus vulgarisAtlantic Ocean East-Central05.05.2015Octopus octopus, water, salt, E3311041.0Octopus vulgarisAtlantic Ocean East-Central09.06.2015Octopus, water, salt, E3311141.0Octopus vulgarisAtlantic Ocean North-East, Portuguese waters vulgaris20.07.2015Octopus, water, salt, E3311141.0Octopus spp vulgarisAtlantic Ocean North-East, Portuguese waters vulgaris20.07.2015Octopus, water, salt, E3311241.0Octopus spp vulgarisPacific Ocean West-Central vulgaris19.06.2015 octopus, citric acid, Na citrates, Na carbonates1441.0Octopus vulgarisAtlantic Ocean East-Central vulgaris03.08.2015Octopus, salt, citric acid, trisodium citrate vulgaris1560.8Octopus vulgarisPacific Ocean West-Central vulgaris02.07.2015Octopus, salt, citric acid, trisodium citrate vulgaris1641.0Octopus vulgarisPacific Ocean West-Central vulgaris02.07.2015Octopus, salt, citric acid, trisodium citrate vulgaris1741.8Octop	05	10	0.5	Octopus cyanea	Indic Ocean	01.11.2014	Octopus
0742.0vulgaris octopusAtlantic Ocean East-Central (vulgaris)28.08.2015Octopus, salt, E330, E331, E5000842.0Octopus vulgarisAtlantic Ocean East-Central vulgaris20.07.2015Octopus, water, salt0941.0Octopus spp. vulgarisPacific Ocean West-Central vulgaris05.05.2015Octopus vulgaris1041.0Octopus spp. vulgarisAtlantic Ocean East-Central vulgaris09.06.2015Octopus, water, salt, E3311141.0Octopus spp. vulgarisAtlantic Ocean North-East, Portuguese waters vulgaris20.07.2015Octopus, water, salt, E3311141.0Octopus spp. vulgarisAtlantic Ocean West-Central vulgaris19.06.2015 octopus, citric acid, Na citrates, Na carbonates1141.0Octopus vulgarisAtlantic Ocean East-Central vulgaris03.09.2015Octopus, water, salt, E3311241.0Octopus vulgarisAtlantic Ocean East-Central vulgaris03.08.2015Octopus, citric acid, Na citrates, Na carbonates1441.0Octopus vulgarisAtlantic Ocean West-Central vulgaris03.08.2015Octopus, salt, citric acid, trisodium citrate vulgaris1560.8Octopus vulgarisPacific Ocean West-Central vulgaris02.07.2015Octopus, salt, citric acid, trisodium citrate vulgaris1641.0Octopus vulgarisPacific Ocean West-Central vulgaris30.07.2015Octopus, salt, citr	06	4	2.8	Octopus	Atlantic Ocean East-Central	20.07.2015	-
0742.0Octopus vulgarisAtlantic Ocean East-Central vulgaris28.08.2015Octopus, salt, E330, E331, E5000842.0Octopus vulgarisAtlantic Ocean East-Central vulgaris20.07.2015Octopus, water, salt0941.0Octopus octopus vulgarisPacific Ocean West-Central vulgaris05.05.2015Octopus octopus, water, salt, E3311041.0Octopus vulgarisAtlantic Ocean East-Central vulgaris09.06.2015Octopus, water, salt, E3311141.0Octopus spp vulgarisAtlantic Ocean North-East, Portuguese waters vulgaris20.07.2015Octopus, water, salt, E3311241.0Octopus spp vulgarisAtlantic Ocean West-Central vulgaris19.06.2015 octopus, water, salt, E331-1341.0Octopus vulgarisAtlantic Ocean East-Central (FAO 34) vulgaris03.09.2015Octopus, water, salt, E3311441.0Octopus vulgarisAtlantic Ocean West-Central vulgaris03.08.2015Octopus, water, salt, E3311560.8Octopus vulgarisPacific Ocean West-Central vulgaris21.07.2015Octopus, salt, citric acid, trisodium citrate vulgaris1641.0Octopus vulgarisPacific Ocean West-Central vulgaris02.07.2015Octopus, salt, citric acid, trisodium citrate vulgaris1741.8Octopus vulgarisPacific Ocean East-Central vulgaris30.07.2015-				vulgaris			
0842.0Octopus Octopus vulgarisAtlantic Ocean East-Central Nulgaris20.07.2015Octopus, water, salt0941.0Octopus spp. Octopus Pacific Ocean West-Central05.05.2015Octopus Octopus, water, salt, E3311041.0Octopus spp. VulgarisAtlantic Ocean North-East, Portuguese waters Vulgaris20.07.2015Octopus, water, salt, E3311141.0Octopus spp. Pacific Ocean North-East, Portuguese waters Vulgaris20.07.2015Octopus, water, salt, E3311241.0Octopus spp. Pacific Ocean West-Central19.06.2015-1341.0Octopus spp. VulgarisPacific Ocean West-Central19.06.2015-1441.0Octopus VulgarisAtlantic Ocean East-Central03.09.2015Octopus, citric acid, Na citrates, Na carbonates1441.0Octopus VulgarisAtlantic Ocean East-Central03.08.2015Octopus, water, salt, E3311560.8Octopus VulgarisPacific Ocean West-Central21.07.2015Octopus, salt, citric acid, trisodium citrate Vulgaris1641.0Octopus VulgarisPacific Ocean West-Central02.07.2015Octopus, salt, citric acid, trisodium citrate Vulgaris1741.8Octopus VulgarisPacific Ocean West-Central02.07.2015Octopus, salt, citric acid, trisodium citrate Vulgaris	07	4	2.0	Octopus	Atlantic Ocean East-Central	28.08.2015	Octopus, salt, E330, E331, E500
0842.0Octopus vulgarisAtlantic Ocean East-Central20.07.2015Octopus, water, salt0941.0Octopus spp.Pacific Ocean West-Central05.05.2015Octopus Octopus, water, salt, E3311041.0Octopus sppAtlantic Ocean East-Central09.06.2015Octopus, water, salt, E3311141.0Octopus sppAtlantic Ocean North-East, Portuguese waters20.07.2015Octopus, water, salt, E3311241.0Octopus sppPacific Ocean West-Central19.06.2015-1341.4Octopus vulgarisAtlantic Ocean East-Central03.09.2015Octopus, citric acid, Na citrates, Na carbonates1440.0Octopus vulgarisAtlantic Ocean West-Central03.08.2015Octopus, water, salt, E3311560.8Octopus vulgarisPacific Ocean West-Central21.07.2015Octopus, salt, citric acid, trisodium citrate vulgaris1641.0Octopus vulgarisPacific Ocean West-Central02.07.2015Octopus, salt, citric acid, trisodium citrate vulgaris1741.8Octopus vulgarisAtlantic Ocean East-Central30.07.2015-				vulgaris			
vulgarisvulgarisvulgarisOctopus spp.Pacific Ocean West-Central05.05.2015OctopusOctopus1041.0OctopusAtlantic Ocean East-Central09.06.2015Octopus, water, salt, E3311141.0Octopus sppAtlantic Ocean North-East, Portuguese waters20.07.2015Octopus, water, salt, E3311241.0Octopus sppPacific Ocean West-Central19.06.2015Octopus, water, salt, E3311241.0Octopus sppPacific Ocean West-Central19.06.2015Octopus, citric acid, Na citrates, Na carbonates1341.4OctopusAtlantic Ocean East-Central (FAO 34)03.09.2015Octopus, water, salt, E3311441.0OctopusAtlantic Ocean East-Central03.08.2015Octopus, water, salt, E3311560.8OctopusPacific Ocean West-Central21.07.2015Octopus, salt, citric acid, trisodium citrate vulgaris1641.0OctopusPacific Ocean West-Central02.07.2015Octopus, salt, citric acid, trisodium citrate vulgaris1741.8OctopusAtlantic Ocean East-Central02.07.2015Octopus, salt, citric acid, trisodium citrate vulgaris	08	4	2.0	Octopus	Atlantic Ocean East-Central	20.07.2015	Octopus, water, salt
0941.0Octopus spp. Atlantic Ocean West-Central05.05.2015Octopus Octopus, water, salt, E3311041.0Octopus vulgarisAtlantic Ocean East-Central09.06.2015Octopus, water, salt, E3311141.0Octopus sppAtlantic Ocean North-East, Portuguese waters vulgaris20.07.2015Octopus, water, salt, E3311241.0Octopus sppPacific Ocean West-Central19.06.2015-1341.4Octopus vulgarisAtlantic Ocean East-Central (FAO 34)03.09.2015Octopus, citric acid, Na citrates, Na carbonates1441.0Octopus vulgarisAtlantic Ocean East-Central03.08.2015Octopus, water, salt, E3311560.8Octopus vulgarisPacific Ocean West-Central21.07.2015Octopus, salt, citric acid, trisodium citrate vulgaris1641.0Octopus vulgarisPacific Ocean West-Central vulgaris02.07.2015Octopus, salt, citric acid, trisodium citrate vulgaris1741.8Octopus vulgarisAtlantic Ocean East-Central vulgaris30.07.2015-				vulgaris			
1041.0Octopus vulgarisAtlantic Ocean East-Central09.06.2015Octopus, water, salt, E3311141.0Octopus sppAtlantic Ocean North-East, Portuguese waters20.07.2015Octopus, water, salt, E3311241.0Octopus sppPacific Ocean West-Central19.06.2015-1341.4Octopus vulgarisAtlantic Ocean East-Central (FAO 34)03.09.2015Octopus, citric acid, Na citrates, Na carbonates1441.0Octopus vulgarisAtlantic Ocean East-Central03.08.2015Octopus, water, salt, E3311560.8Octopus vulgarisPacific Ocean West-Central21.07.2015Octopus, salt, citric acid, trisodium citrate vulgaris1641.0Octopus vulgarisPacific Ocean West-Central vulgaris02.07.2015Octopus, salt, citric acid, trisodium citrate vulgaris1741.8Octopus vulgarisAtlantic Ocean East-Central vulgaris30.07.2015-	09	4	1.0	Octopus spp.	Pacific Ocean West-Central	05.05.2015	Octopus
11 4 1.0 Octopus spp Atlantic Ocean North-East, Portuguese waters 20.07.2015 Octopus, water, salt, E331 12 4 1.0 Octopus spp Pacific Ocean West-Central 19.06.2015 - 13 4 1.4 Octopus Atlantic Ocean East-Central (FAO 34) 03.09.2015 Octopus, citric acid, Na citrates, Na carbonates 14 4 1.0 Octopus Atlantic Ocean East-Central 03.08.2015 Octopus, water, salt, E331 15 6 0.8 Octopus Pacific Ocean West-Central 21.07.2015 Octopus, water, salt, E331 16 4 1.0 Octopus Pacific Ocean West-Central 02.07.2015 Octopus, salt, citric acid, trisodium citrate 17 4 1.8 Octopus Atlantic Ocean East-Central 30.07.2015 -	10	4	1.0	Octopus	Atlantic Ocean East-Central	09.06.2015	Octopus, water, salt, E331
1141.0Octopus sppAtlantic Ocean North-East, Portuguese waters20.07.2015Octopus, water, salt, E3311241.0Octopus sppPacific Ocean West-Central19.06.2015-1341.4Octopus vulgarisAtlantic Ocean East-Central (FAO 34)03.09.2015Octopus, citric acid, Na citrates, Na carbonates1441.0Octopus vulgarisAtlantic Ocean East-Central03.08.2015Octopus, water, salt, E3311560.8Octopus vulgarisPacific Ocean West-Central21.07.2015Octopus, salt, citric acid, trisodium citrate vulgaris1641.0Octopus vulgarisPacific Ocean West-Central vulgaris02.07.2015Octopus, salt, citric acid, trisodium citrate vulgaris1741.8Octopus vulgarisAtlantic Ocean East-Central vulgaris30.07.2015-				vulgaris			
12 4 1.0 Octopus spp Pacific Ocean West-Central 19.06.2015 - 13 4 1.4 Octopus vulgaris Atlantic Ocean East-Central (FAO 34) 03.09.2015 Octopus, citric acid, Na citrates, Na carbonates 14 4 1.0 Octopus vulgaris Atlantic Ocean East-Central 03.08.2015 Octopus, water, salt, E331 15 6 0.8 Octopus vulgaris Pacific Ocean West-Central 21.07.2015 Octopus, salt, citric acid, trisodium citrate vulgaris 16 4 1.0 Octopus vulgaris Pacific Ocean West-Central 02.07.2015 Octopus, salt, citric acid, trisodium citrate vulgaris 17 4 1.8 Octopus vulgaris Atlantic Ocean East-Central 30.07.2015 -	11	4	1.0	Octopus spp	Atlantic Ocean North-East, Portuguese waters	20.07.2015	Octopus, water, salt, E331
13 4 1.4 Octopus vulgaris Atlantic Ocean East-Central (FAO 34) 03.09.2015 Octopus, citric acid, Na citrates, Na carbonates 14 4 1.0 Octopus Atlantic Ocean East-Central 03.08.2015 Octopus, water, salt, E331 15 6 0.8 Octopus Pacific Ocean West-Central vulgaris 21.07.2015 Octopus, salt, citric acid, trisodium citrate vulgaris 16 4 1.0 Octopus Pacific Ocean West-Central vulgaris 02.07.2015 Octopus, salt, citric acid, trisodium citrate vulgaris 17 4 1.8 Octopus Atlantic Ocean East-Central 30.07.2015 –	12	4	1.0	Octopus spp	Pacific Ocean West-Central	19.06.2015	-
14 4 1.0 Octopus vulgaris Atlantic Ocean East-Central 03.08.2015 Octopus, water, salt, E331 15 6 0.8 Octopus vulgaris Pacific Ocean West-Central 21.07.2015 Octopus, salt, citric acid, trisodium citrate 16 4 1.0 Octopus vulgaris Pacific Ocean West-Central 02.07.2015 Octopus, salt, citric acid, trisodium citrate 17 4 1.8 Octopus vulgaris Atlantic Ocean East-Central 30.07.2015 –	13	4	1.4	Octopus	Atlantic Ocean East-Central (FAO 34)	03.09.2015	Octopus, citric acid, Na citrates, Na
14 4 1.0 Octopus vulgaris Atlantic Ocean East-Central 03.08.2015 Octopus, water, salt, E331 15 6 0.8 Octopus vulgaris Pacific Ocean West-Central 21.07.2015 Octopus, salt, citric acid, trisodium citrate 16 4 1.0 Octopus vulgaris Pacific Ocean West-Central 02.07.2015 Octopus, salt, citric acid, trisodium citrate 17 4 1.8 Octopus vulgaris Atlantic Ocean East-Central 30.07.2015 –				vulgaris			carbonates
1560.8Octopus vulgaris vulgarisPacific Ocean West-Central vulgaris21.07.2015Octopus, salt, citric acid, trisodium citrate1641.0Octopus vulgarisPacific Ocean West-Central vulgaris02.07.2015Octopus, salt, citric acid, trisodium citrate1741.8Octopus vulgarisAtlantic Ocean East-Central vulgaris30.07.2015-	14	4	1.0	Octopus	Atlantic Ocean East-Central	03.08.2015	Octopus, water, salt, E331
15 6 0.8 Octopus vulgaris Pacific Ocean West-Central 21.07.2015 Octopus, salt, citric acid, trisodium citrate 16 4 1.0 Octopus vulgaris Pacific Ocean West-Central 02.07.2015 Octopus, salt, citric acid, trisodium citrate 17 4 1.8 Octopus vulgaris Atlantic Ocean East-Central 30.07.2015 -				vulgaris			-
16 4 1.0 Octopus vulgaris Pacific Ocean West-Central 02.07.2015 Octopus, salt, citric acid, trisodium citrate 17 4 1.8 Octopus vulgaris Atlantic Ocean East-Central 30.07.2015 –	15	6	0.8	Octopus	Pacific Ocean West-Central	21.07.2015	Octopus, salt, citric acid, trisodium citrate
16 4 1.0 Octopus vulgaris Pacific Ocean West-Central 02.07.2015 Octopus, salt, citric acid, trisodium citrate 17 4 1.8 Octopus Atlantic Ocean East-Central 30.07.2015 -				vulgaris			
vulgaris 17 4 1.8 Octopus Atlantic Ocean East-Central 30.07.2015 – vulgaris	16	4	1.0	Octopus	Pacific Ocean West-Central	02.07.2015	Octopus, salt, citric acid, trisodium citrate
17 4 1.8 Octopus Atlantic Ocean East-Central 30.07.2015 – vulgaris				vulgaris			
vulgaris	17	4	1.8	Octopus	Atlantic Ocean East-Central	30.07.2015	-
· uburio				vulgaris			
18 4 1.5 Octopus Atlantic Ocean North-East (FAO 27), Portuguese 21.04.2015 –	18	4	1.5	Octopus	Atlantic Ocean North-East (FAO 27), Portuguese	21.04.2015	-
vulgaris waters				vulgaris	waters		
19 4 1.2 Octopus Atlantic Ocean Northeast (FAO 27) 13.04.2015 E331	19	4	1.2	Octopus	Atlantic Ocean Northeast (FAO 27)	13.04.2015	E331
vulgaris				vulgaris			
20 4 1.5 <i>Octopus</i> Atlantic Ocean East-Central (FAO 34) 12.12.2014 -	20	4	1.5	Octopus	Atlantic Ocean East-Central (FAO 34)	12.12.2014	-
vulgaris				vulgaris			
21 4 1.2 Octopus Atlantic Ocean North-East (FAO 27), Portuguese 24.12.2014 –	21	4	1.2	Octopus	Atlantic Ocean North-East (FAO 27), Portuguese	24.12.2014	_
vulgaris waters				vulgaris	waters		
22 4 1.2 Octopus Atlantic Ocean East-Central (FAO 34) 22.08.2015 Octopus, salt, E330, E331, E500	22	4	1.2	Octopus	Atlantic Ocean East-Central (FAO 34)	22.08.2015	Octopus, salt, E330, E331, E500
vulgaris				vulgaris			
23 4 1.0 Octopus Atlantic Ocean East-Central 03.08.2015 Octopus, salt	23	4	1.0	Octopus	Atlantic Ocean East-Central	03.08.2015	Octopus, salt
vulgaris				vulgaris			
24 4 2.0 Octopus Atlantic Ocean North-East (FAO 27), Portuguese 11.09.2015 –	24	4	2.0	Octopus	Atlantic Ocean North-East (FAO 27), Portuguese	11.09.2015	-
vulgaris waters				vulgaris	waters		
25 4 2.4 Octopus Atlantic Ocean East-Central (FAO 34) 17.08.2015 Octopus, water, salt, E 536, E450 e E338	25	4	2.4	Octopus	Atlantic Ocean East-Central (FAO 34)	17.08.2015	Octopus, water, salt, E 536, E450 e E338
vulgaris				vulgaris			

Download English Version:

https://daneshyari.com/en/article/5768879

Download Persian Version:

https://daneshyari.com/article/5768879

Daneshyari.com