

AperTO - Archivio Istituzionale Open Access dell'Università di Torino

Nationwide survey of the Bulgarian market highlights the need to update the official seafood list based on trade inputs

This is the author's manuscript

Original Citation:

Availability:

This version is available <http://hdl.handle.net/2318/1725766> since 2020-01-29T12:31:33Z

Published version:

DOI:10.1016/j.foodcont.2020.107131

Terms of use:

Open Access

Anyone can freely access the full text of works made available as "Open Access". Works made available under a Creative Commons license can be used according to the terms and conditions of said license. Use of all other works requires consent of the right holder (author or publisher) if not exempted from copyright protection by the applicable law.

(Article begins on next page)

Journal Pre-proof

Nationwide survey of the Bulgarian market highlights the need to update the official seafood list based on trade inputs

Lara Tinacci, Deyan Stratev, Georgi Zhelyazkov, Ralitsa Kyuchukova, Mariyana Strateva, Daniele Nucera, Andrea Armani



PII: S0956-7135(20)30047-5

DOI: <https://doi.org/10.1016/j.foodcont.2020.107131>

Reference: JFCO 107131

To appear in: *Food Control*

Received Date: 3 December 2019

Revised Date: 8 January 2020

Accepted Date: 19 January 2020

Please cite this article as: Tinacci L., Stratev D., Zhelyazkov G., Kyuchukova R., Strateva M., Nucera D. & Armani A., Nationwide survey of the Bulgarian market highlights the need to update the official seafood list based on trade inputs, *Food Control* (2020), doi: <https://doi.org/10.1016/j.foodcont.2020.107131>.

This is a PDF file of an article that has undergone enhancements after acceptance, such as the addition of a cover page and metadata, and formatting for readability, but it is not yet the definitive version of record. This version will undergo additional copyediting, typesetting and review before it is published in its final form, but we are providing this version to give early visibility of the article. Please note that, during the production process, errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

© 2020 Published by Elsevier Ltd.

Lara Tinacci: Conceptualization, Methodology, Writing - Original Draft, Writing - Review & Editing

Deyan Stratev: Funding acquisition, Conceptualization, Methodology, Writing - Original Draft

Georgi Zhelyazkov: Resources

Ralitsa Kyuchukova: Resources

Mariyana Strateva: Resources

Daniele Nucera: Formal analysis

Andrea Armani: Conceptualization, Methodology, Writing - Original Draft, Writing - Review & Editing, Supervision

1 **Nationwide survey of the Bulgarian market highlights the need to update the official**
2 **seafood list based on trade inputs**

3
4 Lara Tinacci^{1*#}, Deyan Stratev^{2#}, Georgi Zhelyazkov³, Ralitsa Kyuchukova²; Mariyana
5 Strateva⁴; Daniele Nucera⁵, Andrea Armani¹

6 ¹*FishLab, Department of Veterinary Sciences, University of Pisa, Via delle Piagge 2, 56124,*
7 *Pisa (Italy);*

8 ²*Department of Food Hygiene and Control, Veterinary Legislation Management, Faculty of*
9 *Veterinary Medicine, Trakia University, 6000 Stara Zagora, Bulgaria;*

10 ³*Department of Biology and Aquaculture, Faculty of Agriculture, Trakia University, 6000 Stara*
11 *Zagora, Bulgaria;*

12 ⁴*Department of Veterinary Anatomy, Histology and Embryology, Faculty of Veterinary*
13 *Medicine, Trakia University, 6000 Stara Zagora, Bulgaria*

14 ⁵*Department of Agriculture, Forest and Food Science, University of Turin, Largo Braccini 2,*
15 *10095, Grugliasco - Torino (Italy).*

16
17
18 # These authors equally contributed to this work

19
20
21 **Corresponding author**

22 Lara Tinacci

23 *Department of Veterinary Sciences, University of Pisa, Via delle Piagge 2, 56124, Pisa (Italy).*

24 Email: lara.tinacci@unipi.it

25 **Abstract**

26 An extensive survey of the Bulgarian seafood market was conducted to assess the diversity of

27 fish products available and to compare the provided commercial designations (CDs) and scientific
28 names (SNs) on the products with those on the Bulgarian official seafood designations list, in light
29 of the requirements of Regulation (EU) No. 1379/2013 on seafood labelling. The survey was
30 conducted in 15 different towns belonging to three different geographical macro-areas: North,
31 North-east/South-east and South/South-west. Seventy-one points of sale, including both large and
32 local retailers, were included in the study. In total, 1611 different products were recorded on the
33 market, mostly comprising fresh, frozen and canned fish. Analysis of the product designations
34 showed the presence of 110 different CDs, most of which (n=43, 39.1%) were not associated with
35 any SN. Forty-seven (42.7%) of the 110 CD were compliant with the current EU legislation on
36 seafood labelling, reporting a descriptive common name. A highly significant difference was found
37 in the percentages of non-compliant designations of fresh (57.3%) and frozen (3.9%) product
38 categories (p-value < 0.00001). Overall, the main concerns highlighted regarded the presence on the
39 market of CDs and SNs not included in the official list, thus highlighting the ineffectiveness of the
40 list in supporting fish traceability. CDs already accepted at retail and currently applied throughout
41 the country could represent a starting point to propose an update of the list based on trade inputs, as
42 established by the Regulation (EU) No. 1379/2013.

43 **Keywords**

44 Common Fisheries Policy, Seafood labelling, Bulgaria, Commercial designations, EU seafood
45 market

46 **1. Introduction**

47 Traceability is defined as the ability to trace and follow a food product through all stages of
48 production, processing and distribution, in order to guarantee its forward and backward tracking
49 through the supply chain and control safe and fair trade (Regulation EC No. 178/2002). Preserving
50 the integrity of a traceability system is a complex and challenging endeavour especially in the
51 seafood sector, which is recognized as the third-highest risk food category exposed to illegal
52 practices (Reilly, 2018). Fraudulent incidents within the seafood sector primarily involve species

53 substitution and counterfeit and are generally elicited by inaccurate labelling or utilization of vague
54 or unclear commercial designations. Their occurrence, other than having a general impact on the
55 supply chain, affects the marine environment and possibly consumers' health (Reilly, 2018, Giusti et
56 al., 2018; Stawitz et al., 2017).

57 The Common Fisheries Policy (CFP) of the European Union (EU) was established to create an
58 effective system to monitor fishery and aquaculture sustainability and constitutes a legislative
59 framework to control seafood authenticity and enhance consumer protection and market
60 transparency. In particular, with the enactment of the Regulation (EU) No. 1379/2013, specific
61 attention was paid to the establishment of a harmonized and compulsory seafood labelling model to
62 enable informed consumer choice (D'Amico et al., 2016). More specifically, with respect to the
63 attribution of product trade names, the single Member States are required to draw up, publish and
64 periodically update a list of the commercial designations (CDs), associated with their scientific
65 names (SNs), accepted in their territory. According to the Article 37 of the aforesaid Regulation, the
66 officially accepted CD may be the name of the species in the official language or languages of the
67 Member State concerned or, where applicable, any other name accepted or permitted locally or
68 regionally. SNs are instead assigned in accordance with the FishBase Information System (Froese
69 and Pauly, 2000) or the Food and Agriculture Organization (FAO) Aquatic Sciences and Fisheries
70 Information System (ASFIS) database (Garibaldi & Busilacchi, 2002). On the basis of Regulation
71 (EU) No. 1379/2013, the single Member States are explicitly called upon to update their list on the
72 basis of trade inputs and in response to the expansion of the variety of species, present, in transit or
73 permanently introduced on the national market. The update is essential to guarantee the clear
74 recognition of the products by consumers and the harmonization of commercial designations within
75 national borders. The Regulation also specifies that any change to the list has to be communicated
76 to the Commission, which is responsible for informing the other Member States. However, since the
77 national lists are compiled independently, this delegation system leads to a disparity in information
78 and number of designations between the lists of the different Member States. For this purpose, the

79 Commission has initially provided an information system gathering all the official national lists
80 accepted in the Member States. A multilingual tool has also been created to facilitate the
81 comparison of all the lists (the lists and the multilingual tool are available at the following links
82 https://ec.europa.eu/fisheries/cfp/market/consumer-information/names_en and
83 https://mare.istc.cnr.it/fisheriesv2/home_en).

84 Even though the seafood sector still represents a marginal area of the Bulgarian economy, a
85 gradual and progressive growth has been observed in the last years. In fact, seafood consumption
86 estimates have gradually increased from 3 kg per capita in 1990-2000s to 4.9-5 kg per capita in
87 present days (EUMOFA, 2018; Todorov, 2019). In this respect, the number of species available for
88 purchase has consistently increased together with product imports and aquaculture rates, in spite of
89 a slight decrease in domestic Black Sea catches (Todorov, 2019; Stancheva, 2018). Currently, the
90 Bulgarian consumers' choice is widened by local marine and freshwater products (sprat, red mullet,
91 goby, turbot, carp, perch) and mid- and high-end marine and freshwater products, such as cod, hake,
92 mackerel, salmon, tuna, trout and catfish, mainly deriving from European and international trade,
93 as well as from recently developed Bulgarian aquaculture plants (Todorov, 2019). Despite this, the
94 Official Bulgarian list first published in 2006 (Ministry of Agriculture and Forestry, 2006) and
95 based on the principal commercial species available at that time on the national market, has never
96 been updated. The recent work of Tinacci et al., (2018), aimed at identifying fish species sold on the
97 Bulgarian market by DNA barcoding, highlighted that the Bulgarian list does not fully correspond
98 with the actual variety of fish species sold within the national territory.

99 This considered, in the present study, a nationwide market survey aimed at assessing the current
100 fish products availability on the Bulgarian market and at comparing the CDs and SNs found on the
101 products with those on the Bulgarian official seafood list, was conducted. Data arising from the
102 survey were analysed and used to propose a functional update of the Bulgarian official list of
103 seafood designations based on trade inputs.

104 **2. Materials and Methods**

105 ***2.1 Selection of survey geographical areas and retail channels***

106 In order to perform an extensive market survey throughout the national territory, the country was
107 preliminarily divided into three macro-areas based on the classification proposed by Popescu (2011)
108 and corresponding to: 1) North region (NR) bounded externally by the course of Danube, 2) North-
109 east to South-east region (NE-SER) mainly extending along the Black Sea coastline and partially
110 overlooking the border with Turkey 3) South to South-west region (S-SWR) including the Country
111 capital city and overlooking the border with Greece (Figure 1). Then, 15 provincial capital cities
112 (five per macro-area) were selected for the survey according to their size and to the presence of
113 fishery and/or aquaculture activities. In particular, Vidin, Pleven, Veliko Tarnovo, Ruse, Silistra
114 were selected for the NR, Dobrich, Shumen, Varna, Sliven, Burgas for the NE-SER and Kardjali,
115 Haskovo, Plovdiv, Blagoevgrad, Sofia for the S-SWR.

116 The selection of the retail channels was carried out through a preliminary online search
117 highlighting a variable distribution of large and local fishery retailers according to fishery and
118 aquaculture activities relevance within the three macro-areas (Popescu, 2011). The following retail
119 channels to the final consumers (as defined by the Article 5 of the Regulation (EU) No. 1379/2013)
120 were included in the survey: large-scale retail trade, local grocery stores and local fish markets
121 located in each selected city. Restaurants, caterers, and ready to eat local vendors were not included.
122 Seventy-one points of sales consisting of 49 wholesale markets, hypermarkets and supermarkets
123 belonging to four different large retail chains, 11 local grocery stores and 11 local fish markets were
124 finally selected (Table 1).

125 ***2.2 Data collection and analysis***

126 During the survey, carried out from April to July 2019, all the fish products presented on sale
127 within each point of sale were checked. In particular, the product category (fresh, frozen, canned,
128 marinated, breaded precooked, dried, alive fish, smoked, salted) as well as the CD and the SN were
129 recorded for each product and organized in an excel sheet. The data were subsequently analysed to:
130 1) calculate the total number of products and the number of products for each category for

131 distribution channel and per macro-area; 2) perform a descriptive analysis of the CDs; 3) calculate
132 the total number of designations (commercial and scientific) used for describing the products and
133 the CD frequency rates. In addition, compliance with the requirements of the Regulation (EU) No.
134 1379/2013 was also assessed.

135 ***2.3 Statistical analysis***

136 Statistical analyses were performed using chi-square test (SPSS for Windows, Version 16.0.
137 Chicago, SPSS Inc.) and the significance assessed at $p < 0.05$. The following parameters were
138 compared: 1) proportions of sample typologies across areas and retail channel types; 2) proportions
139 of CD compliances; 3) proportions of CD- and SN- identified samples were compared across areas,
140 retail channel types and sample typologies.

141 **3. Results and discussion**

142 ***3.1 Products by area and retail channel .***

143 In the survey, 1611 different seafood products were recorded, with an overall average number of
144 22.7 different products per vendor with slight differences within the three surveyed macro-areas
145 (24.4 in NE-SER, 22.4 in S-SWR and 20.7 in NR). Highly significant differences ($\chi^2 = 78.9$,
146 $p < 0.001$) were found in the overall number of products within each category sold at different retail
147 channels (large retail, local grocery and local fish market) included in the survey. The highest
148 number of products was observed in large retail channels (n=1281 products, 79.6% of total
149 products) in which all product categories were sold, whereas fewer products were observed in fish
150 markets (n=178, 11%) and grocery stores (n=152, 9.4%). This distribution trend is plausibly related
151 to the significant turmoil that the Bulgarian retail sector has experienced in the latest years, with the
152 domestic supermarkets chains and local grocery distribution downscaling their business in favour of
153 large hypermarkets and supermarket chains belonging to foreign companies (Export Enterprises SA,
154 2019). This is also confirmed by the fact that the large-scale retail trade was widely and
155 homogeneously distributed within the national territory, while local grocery stores and fish markets
156 were mainly concentrated in the NE-SER cities (Table 1), especially along the coast.

157 With regards to products categories, fresh fish made up the largest proportion of the products (n=
158 596, 37%), followed by canned fish (n=473, 29.4%) and frozen products (n=405, 25.1%). The other
159 categories (marinated, breaded precooked, dried, alive fish, smoked, salted) were less or marginally
160 observed (Table 2). These outcomes agree with a recent survey conducted by Stancheva, (2018)
161 which showed that Bulgarian consumers seem primarily orientated towards fresh/frozen and tinned
162 products. Nonetheless significant differences among the product number per categories among the
163 three macro-areas were observed ($\chi^2= 14.8$, $p<0.01$) (Figure 2 and Table 1SM). In fact, in NE-SER,
164 a relevant increase in the mean percentage of fresh products per vendor (42%) and a decrease in
165 canned products percentage (26%), compared to the overall rate, were highlighted. The higher
166 prevalence of fresh products recorded in the five cities included in NE-SER (Dobrich, Shumen,
167 Varna, Sliven, Burgas) could be explained by virtue of their fishing activity and the presence of
168 recently growing marine aquaculture plants. Therefore, this outcome could be plausibly attributed to
169 the local catching activities and to the growing need to diversify the market offer in relation to the
170 rise of Bulgarian restaurant sector and seafood demand on the Black Sea coastline (Todorov, 2019;
171 FAO, 2020). Considering the remaining categories, the average frequency rate appeared stable
172 within the three macro-areas except for salted products, only marginally recorded during the survey
173 and not found in NE-SER (Figure 2; Table1SM).

174 **3.2. CDs recorded on the market and compliance with the Regulation (EU) No. 1379/2013.**

175 *3.2.1 Descriptive analysis of the CDs.*

176 Seventy-one of the 110 CDs (65.4%) consisted only of a common name referring to a group of
177 species (e.g. Сьомга/Salmon; рибаТон/Tuna fish; Треска/cod, Хек/hake). In other 22 of 110 CDs
178 (20%) the name was accompanied by an adjective referring to the geographical origin (e.g.
179 Атлантическа сьомга/Atlantic Salmon; Норвежка сьомга/Norway salmon), in 11 CDs (11%) by
180 an adjective related to a specific morphological character (e.g. Червена сьомга/Red salmon;
181 Розова сьомга/Pink salmon), while the remaining 6 CDs were general terms, terms referring to the

182 product processing, terms not related to any specific products or terms referring to specific
183 traditional specialties.

184 Bulgarian commercial designations were used for 89% (98/110) of the terms collected from the
185 market. In the remaining 11% (12/110), terms of Russian (n=6 CDs), Ukrainian (n=4 CDs), Greek
186 (n=1 CD) and Portuguese (n=1 CD) origin were found. In particular, the Russian terms referred
187 both to freshwater (Сулка/Pike perch) and marine fish (Сельодка/herring; Сайда (Saida)/Saithe;
188 Минтай (Mintai)/pollack; Бротола/Brotola; Сайра (Saira)/Pacific saury); the Ukrainian terms were
189 used to describe four marine fish of local interest (Шпроти/Sprat; Ватус/ Thornback ray;
190 Кольос/chub mackerel; Салака/Herring) three of which are fished along the Black Sea coastline
191 and likely directly imported to Bulgaria (GAIN, 2019); the term Ципура (Tsipura) has been directly
192 transferred from the Greek language to refer to the gilthead seabream (*Sparus aurata*) which
193 represents one of the main fish products imported from Greece to Bulgaria. Finally, the term
194 Бакаляро/bacaliaro, derived from Bacalao, has been directly transferred from Portuguese to
195 Bulgarian language to describe a typical salted-dried fish product mostly imported from Spain to
196 Bulgaria.

197 Only 47 (42.7%) out of the 110 CDs (see section 3.2.2) were compliant with the Regulation
198 requirements. Nevertheless, the 68 remaining CDs records were found compliant with the definition
199 of “food name” provided by the Regulation EU No. 1169/2011 (Art 11) intended as “*the legal name*
200 *or customary name, or, descriptive name*” allowing the product’s characterization by the consumer.
201 Relevant exceptions were represented by the few CDs using vague descriptive terms (Бяла
202 риба/white fish), terms referred to processing (Чироз/dried fish), terms directly belonging to the
203 name of a traditional local or imported dish (Килка/kilka fried buttered sprat; Бакаляро/bacaliaro),
204 or terms not directly associated with any fish product (Капитан/Captain). In all these cases the CDs
205 applied were not informative enough for the recognition of the product by the consumer at the time
206 of purchase. Examples of common names referring to a group of species highlighted through the
207 survey are: Риба Тон (Tuna fish) for three different *Thunnus* species (*T. albacares*, *T. alalunga*, *T.*

208 *obesus*) and Скумрия (Mackerel) for three different *Scomber* sp. species (*S. colias*, *S. japonicus*, *S.*
209 *scombrus*). In this regard, the most complex scenario was highlighted within the Gadiformes order,
210 with respect to the use of Трепка (cod) and Хек (hake) as common names. The term Трепка was
211 indeed recorded to be applied in association with three different species belonging to the family
212 Gadidae, namely *Gadus chalcogrammus*, *Gadus morhua*, *Gadus macrocephalus*, and the
213 taxonomically distant species *Alepocephalus bairdii*, belonging to the Osmeridae family. Similarly,
214 the term Хек (hake) was associated with the genus *Merluccius* sp., and several species belonging to
215 the Merluccidae family (*Merluccius hubbsi*, *Merluccius productus* and *Merluccius gayi gayi*, the
216 latter still indicated with the obsolete SN*Merluccius gayi*). The same term was thus applied in
217 association with the species SN *Gadus chalcogrammus*, *Micromesistius australis* (Gadidae) and
218 *Alepocephalus bairdii* (Osmeridae). The use of vague common names such as cod/Трепка,
219 hake/Хек, should be further clarified in order to provide the market with effective and unambiguous
220 CDs. In fact, the overlapping and ambiguous use of the two general terms Трепка and Хек for the
221 CD of species belonging to separate and distant taxonomical Families and characterized by an
222 heterogeneous commercial value may contribute to consumers' confusion on fish value and to
223 market exposure to deceitful incidents for economic gain (Lowell et al., 2015; Xiong et al., 2016).

224 *3.2.2 CDs and SNs found on the products.* The compulsory association of a CD and a SN is
225 imposed for live fish, fresh and frozen raw products (whole or filleted) and, among processed
226 seafood, for salted, dried and smoked products. Contrariwise, all the other processed seafood falls
227 out of the scope of the regulation. For them, the declaration of the SN is exclusively subject to the
228 will of the Food Business Operator (FBO), although strongly advocated by the European Parliament
229 to elicit an informed consumers' choice (Tinacci et al., 2019; Giusti et al., 2019; D'Amico et al.,
230 2016; European Parliament Resolution No. 2016/2532).

231 A total of 110 different CDs were used for the 1611 products: 43 CDs were not associated with
232 any SN, 28 CDs were associated with SNs attributable to a species or a genus, and the remaining 39
233 were used both alone and in association to a species/genus SNs (Table 1SM). CDs associated with a

234 SN were reported on 1202 products (74% of the total) while in the remaining 409 (26%) only the
235 CD was available (Table 3). The 1202 products presenting both CD and SN mostly belonged to
236 canned fish (n=463, 38.8%) and frozen fish (n=354, 29.4%), followed by fresh fish (n=235, 19.5%),
237 and, to a lesser extent, by marinated fish (n=41, 3.2%), breaded precooked fish based products
238 (n=37, 3.2%), dried fish (n=17, 1.4%), smoked (n=1) and salted (n=1) products. The 1202 products
239 were described by a total of 67 different CDs associated with 66 different SN consisting of 64
240 species SNs (Table 2SM) and 2 genus SNs (*Oncorhynchus* sp. and *Merluccius* sp. recorded in 10
241 and 2 products, respectively). Four-hundred and nine products in which the CD alone was available
242 on the label were described by means of 83 different CDs mainly represented by fresh products (n=
243 340, 83.0%) and marginally by the following categories: marinated (n=17, 4.1%), frozen (n=16,
244 3.9%), alive fish (n=15, 3.7%), canned products (n=10, 2.4%), smoked (n=7, 1.7%) and salted fish
245 (n=4, 1.0%) (Table 3, Table 1SM). As regards fishery products falling into the scope of the
246 Regulation (EU) No. 1379/2013 (Article 35 and Annex I), overall labelling non-compliances were
247 observed for 382 of 1029 product (37.1%). In particular, a high non-compliance percentage was
248 highlighted for fresh products (340 of 596, 57.3%) opposite to a significantly lower non-compliance
249 rate ($\chi^2=296.6574$. The p-value < 0.00001) highlighted for frozen products (3.9%). High non-
250 compliance rates were also highlighted for product categories minimally represented on the market
251 as: live fish (15 of 15, 100%), smoked products (7 of 8, 87.5%), salted products (4 of 5, 80%).
252 Details of labelling non-compliances in all retail channels, within the three macro-areas and product
253 categories are reported in Figure 3. Furthermore, the chi-squared analysis highlighted significant
254 differences in the non-compliances distribution both in terms of retail channels ($\chi^2= 38.9$, p-value
255 <0.01) and geographical macro-areas ($\chi^2=18.4$, p-value <0.001). In this respect, an overall higher
256 non-compliances percentage was recorded at local fish markets (81%) mainly due to the lack of
257 SNs related to fresh products exposed at purchase. In addition, the greater percentage of non-
258 compliance on fresh products was found in the NE-SER macro-area where the fisheries sector has
259 significant importance in the local economy and, particularly, for freshwater products, and marine

260 species of national interest, which plausibly came from local aquaculture or local fishing
261 production. The same products were also found non-compliant when offered for sale as frozen or
262 alive fish. All these evidences contributed to underline a lack of insufficient training of sector
263 operators in terms of correct labelling and presentation of fish products for sale.

264 Contrariwise, an opposite trend was observed for canned, breaded precooked and marinated
265 products. In fact, although falling out of the requirements listed in the Article 35 of the Regulation
266 (EU) No. 1379/2013, the voluntary association of a CD with a SN was highlighted in a high
267 products percentage corresponding to 98%, 100% and 74.5% respectively. According to Todorov,
268 (2019) these product categories, albeit affected by a relevant demand decrease in the latest years,
269 are often imported from neighbour European countries already prepacked and labelled to be directly
270 presented for sale. Therefore, such a high degree of voluntary compliance with Regulation (EU) No.
271 1379/2013 terms on imported products, may reflect the growing level of awareness by European
272 FBOs towards the protection of consumers' rights pursuing the European Parliament Resolution No
273 2016/2532. Similar evidences have been recently highlighted for anchovies and herring products
274 (Giusti et al., 2019; Tinacci et al., 2019).

275 ***3.3 CD frequency rates.***

276 The CD frequency rate (overall, for CDs associated with SNs and for CDs found alone) was
277 calculated to highlight the CDs most frequently applied at retail. Overall, CD frequency rates
278 highlighted values ranging from 0.01 to 2.14 products/vendor;. In general, the present survey
279 confirmed consumption and import data collected in the 5-year period 2013-2017 by Todorov,
280 (2019). Our analysis indeed, in accordance with the author, highlighted the expansion of the
281 Bulgarian seafood market, originally mainly addressed to freshwater fish species, towards marine
282 Mediterranean, Atlantic and Pacific species belonging to Clupeids, Salmonids Scombrids, Gadids
283 and Merluccids, all of them well represented at purchase both as fresh and variously processed
284 products. Moreover, Todorov, (2019) highlighted a relatively large import volume of sardine,
285 herring, hake, salmon and trout and an increasing import rate of fresh and frozen mackerel products

286 to satisfy the national market demand. The products most frequently recorded at retail were also in
287 agreement with the most sought-after species emerged from Stancheva, (2018) and from a report of
288 the European Market Observatory on EU consumer habits regarding fishery and aquaculture
289 products (EUMOFA, 2017).

290 The frequency rate calculated only on CDs associated with SNs records showed frequency rates
291 similar to the overall values highlighting that the products presenting the overall highest frequency
292 rate were generally found on sale with a complete designation and thus generally compliant with the
293 European Regulation (Section 3.2). A relevant exception was represented by the Cyprinidae family,
294 for which the CD+SN frequency rate dramatically fell. In this respect, the majority of Cyprinids
295 products were indeed associated with a high CD frequency rate. Similarly, locally farmed
296 freshwater fish (African catfish/Африкански сом and Бял амур/White amur) together with local
297 marine (Морски език/Sole, Халибут/Halibut, Писия/Plaice and Mullet/Кефал) and fresh water
298 fish (Костур/Perch, Щука/Pike, Сулка/Pike perch, Бяла мряна/white barbel) showed that
299 frequency rates calculated on CDs alone exceeded the overall values. In all the cases, the products,
300 sold both at large and local retails or at fish markets sale counters, belonged to fresh or alive
301 category. Data are available in Table 2SM.

302 Finally, the calculation of partial frequency rates of CDs without a scientific identification led to
303 emphasize, for fresh and alive products, sold in bulk, on the sales counter of all commercial
304 channels, a general non-compliance with the Regulation (EU) No.1379/2013 which imposes for
305 non-packaged products to display all the mandatory information for fish product identification
306 through the use posters, billboard and sales tag. These data, together with those highlighted in
307 section 3.3, confirmed the evidence gathered in the previous study conducted by Tinacci et al.,
308 (2018) on seafood labelling compliance sold on the Bulgarian market and were in agreement with
309 the data collected in a similar study conducted in Sardinia on not pre-packaged products sold within
310 different retail channels (Esposito & Meloni, 2017). In fact, in both studies a high frequency of
311 missing or incomplete indication of SNs had been reported for such products.

312 The comparison of the frequencies of CDs alone and of the CDs found in association with SNs
313 highlighted a different species distribution according to the three macro-areas (NR, NE-SER, S-
314 SWR) (Table 2SM). This could be in relation to the fish resources of the territories and import
315 trends. In particular: in NE-SER, higher CDs frequencies of marine species of national interest
316 (sprat (*Sprattus sprattus*), Mediterranean Horse Mackerel (*Trachurus mediterraneus*), Horse
317 mackerel (*Trachurus trachurus*), Flathead Grey Mullet (*Mugil cephalus*), Bonito (*Sarda sarda*),
318 Bluefish (*Pomatomus saltatrix*), Turbot (*Scophthalmus maximus*) and Gobies (Gobiidae) were
319 highlighted as a result of the local fishing activities (FAO, 2020); in S-SWR, higher CDs record
320 frequencies of fresh water farmed species (sturgeon and rainbow trout), plausibly attributable to the
321 greater presence of dedicated aquaculture facilities in the area (PROJECT BG0713EFF-511-
322 220270) and of imported marine species (seabass, seabream, red porgy,) belonging to the Greek and
323 Turkish fishing and aquaculture activities both reported as the main exporter to Bulgaria for these
324 kind of products (Turkish Statistical Institute, 2017) were verified. Finally, in NR, relatively higher
325 CDs frequencies rate describing freshwater local wild or cultured freshwater species (rainbow trout,
326 carp, catfish, Danube peak and pike) were highlighted, in accordance with fishery national
327 production data (PROJECT BG0713EFF-511-22027). This area is in fact the principal basin of
328 small and medium-sized inland aquaculture plants for the production of common freshwater
329 species.

330 ***3.4 Main deficiencies of the Bulgaria seafood list and proposal for its update***

331 The comparison of the data collected in this study and the current Bulgarian seafood list
332 highlighted the presence of: 1) a total of 50 CDs associated with SNs, in which both the CD and the
333 SN registered on the market were not included in the official list; 2) 22 CDs recorded alone and not
334 listed among the Official CDs reported in the ministerial document. The comparison between the
335 SNs reported on the list and the 66 SNs retrieved on the market highlighted the presence of 34
336 species SNs and 2 genus SNs not included in the document and described by 60 different CD+SN
337 designations (Table 4; Table 3SM). Furthermore, the comparison highlighted minor issues

338 concerning: 1) the association of a SN (valid or obsolete) included in the list with a CD not included
339 in the list (12 CDs); 2) the editing of officially accepted CDs by adding or removing an adjective
340 related to the fish origin or to specific morphological features (5 CDs); 3) the extended use of CDs
341 already existing in the official list in association with a valid SN not included among the official
342 records (6 CDs) (Table 4).

343 The survey results confirmed the current presence of the majority of the species already verified
344 as commercial leading products on the Bulgarian market (EUMOFA, 2017; Tinacci et al., 2018).
345 Moreover, the analysis of the CDs describing alone the fresh products sold at retail contributed to
346 complete the panorama of fish species currently present on the national market for which an update
347 of the list is necessary. CDs and CD+SN combinations reported in Table 4 and Table 2SM might
348 represent an objective starting point for the selection of new designations to be included in the
349 Official Bulgarian list by allowing the identification of a basket of fish species not yet characterized
350 through the use of CDs and SNs already recognized, on the national market, by the final consumer
351 and FBOs.

352 Nevertheless, harmonizing seafood labelling and providing a system of CDs punctual updated in
353 relation to the exponential growth of the number of species available on the market seems
354 impossible. Thus, the choice of a CD for several related species may still represent a sustainable
355 compromise in association with the addition to the generic name of references to the geographical
356 area or morphological peculiarities of the different species (Tinacci et al., 2019). Thus, the selection
357 of specific descriptive terms referring to the geographic origin and or morphological features in
358 association to one or a limited number of species belonging to a common genus would be desirable
359 to elicit a clear and immediate identification of the product by the consumer.

360 **4. Conclusions**

361 This survey confirmed the ineffectiveness of the current official list of Bulgarian seafood
362 designations in describing the products present at retail and the need to provide a substantial
363 revision to meet the offer of an expanding market and harmonize the terms applied for products

364 identification. This work highlighted also high non-compliances rates to the Regulation (EU) No.
365 1379/2013 requirements on the labelling of fresh raw, alive, smoked and salted products due to the
366 absence of the scientific name declaration. Thus, an effective training of FBO (both at large and
367 local retail level) is necessary, especially on how to correctly display raw products on fish counters
368 in order to properly inform the final consumer. Finally, the present survey could represent a starting
369 point for a more oriented sampling aimed at molecularly identify by DNA barcoding techniques
370 products lacking scientific names (Tinacci et al., 2018; Lewis & Boyle, 2017; Martinsohn, 2013).

371 **Acknowledgments and Funding**

372 This study was funded by National Scientific Program "Healthy Foods for a Strong Bio-
373 Economy and Quality of Life" approved by DCM № 577/17.08.2018, funded by Bulgarian Ministry
374 of Education and Science.

375

376 **Figures captures**

377 **Figure 1: Bulgaria Statistical Regions. The three geographical macro-area were obtained**
378 **by merging contiguous statistical regions proposed by Popescu (2011) as follow: North Region**
379 **(NR): North-western + North-central region; North-east/South-east Region, (NE-SER):**
380 **North-eastern + South-eastern Region; South/South-west Region (S-SWR): South central +**
381 **South-Western region. The name of the Provincial cities included in the study are indicated.**
382 **Image modified from Popescu, (2011).**

383 **Figure 2: Percentage of the nine commercial product categories/vendor highlighted on the**
384 **market during the survey within the different pinpointed macro-areas.**

385 **Figure 3: Details of labelling non-compliances in retail channels for the three macro-areas**
386 **and product categories**

387 **References**

388

- 389 Barendse, J., Roel, A., Longo, C., Andriessen, L., Webster, L. M., Ogden, R., & Neat, F. (2019). DNA
390 barcoding validates species labelling of certified seafood. *Current Biology*, 29(6), 198-199.
391 <https://doi.org/10.1016/j.cub.2019.02.014>
- 392 D'Amico, P., Armani, A., Gianfaldoni, D., & Guidi, A. (2016). New provisions for the labelling of fishery
393 and aquaculture products: Difficulties in the implementation of Regulation (EU) n. 1379/2013. *Marine*
394 *Policy*, 71, 147-156. <https://doi.org/10.1016/j.marpol.2016.05.026>
- 395 EUMOFA. (2018). Case study – Fisheries and aquaculture in Bulgaria and Romania, in MONTHLY
396 HIGHLIGHTS | NO.5/2018 [https://www.eumofa.eu/documents/20178/119445/MH+5+2018.pdf/aa0b6293-](https://www.eumofa.eu/documents/20178/119445/MH+5+2018.pdf/aa0b6293-8d1e-4618-ae4a-6ae7b3fffc2f)
397 [8d1e-4618-ae4a-6ae7b3fffc2f](https://www.eumofa.eu/documents/20178/119445/MH+5+2018.pdf/aa0b6293-8d1e-4618-ae4a-6ae7b3fffc2f). Accessed 13 October 2019
- 398 EUMOFA. (2017). EU consumer habits regarding fishery and aquaculture products.
399 [http://agricultura.gencat.cat/web/.content/de_departament/de02_estadistiques_observatoris/27_butlletins/02](http://agricultura.gencat.cat/web/.content/de_departament/de02_estadistiques_observatoris/27_butlletins/02_butlletins_nd/documents_nd/fitxers_estatics_nd/2017/0189_2017_Pesca_UE-consum-peix-aquicultura-2016.pdf)
400 [butlletins_nd/documents_nd/fitxers_estatics_nd/2017/0189_2017_Pesca_UE-consum-peix-aquicultura-](http://agricultura.gencat.cat/web/.content/de_departament/de02_estadistiques_observatoris/27_butlletins/02_butlletins_nd/documents_nd/fitxers_estatics_nd/2017/0189_2017_Pesca_UE-consum-peix-aquicultura-2016.pdf)
401 [2016.pdf](http://agricultura.gencat.cat/web/.content/de_departament/de02_estadistiques_observatoris/27_butlletins/02_butlletins_nd/documents_nd/fitxers_estatics_nd/2017/0189_2017_Pesca_UE-consum-peix-aquicultura-2016.pdf) Accessed 15 October 2019.
- 402 Esposito, G., & Meloni, D. (2017). A case-study on compliance to the EU new requirements for the
403 labelling of fisheries and aquaculture products reveals difficulties in implementing Regulation (EU) n.
404 1379/2013 in some large-scale retail stores in Sardinia (Italy). *Regional Studies in Marine Science*, 9, 56-61.
405 <https://doi.org/10.1016/j.rsma.2016.11.007>
- 406 European Parliament Resolution 2016/2532 European Parliament Resolution No 2016/2532 (RSP) of 12
407 May 2016 on traceability of fishery and aquaculture products in restaurants and retail.
408 [http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+TA+P8-TA-2016-](http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+TA+P8-TA-2016-0222+0+DOC+PDF+V0//EN)
409 [0222+0+DOC+PDF+V0//EN](http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+TA+P8-TA-2016-0222+0+DOC+PDF+V0//EN). Accessed 15 October 2019
- 410 Export Enterprises SA. (2019) Bulgarian market: distribution. [https://import-](https://import-export.societegenerale.fr/en/country/bulgaria/market-distribution)
411 [export.societegenerale.fr/en/country/bulgaria/market-distribution](https://import-export.societegenerale.fr/en/country/bulgaria/market-distribution). Accessed 8 January 2020.
- 412 FAO, (2020) Fishery and Aquaculture Country Profiles, The Republic of Bulgaria.
413 <http://www.fao.org/fishery/facp/BGR/en>. Accessed 8 January 2020
- 414 Froese, R., & Pauly, D. (2000). *FishBase 2000: concepts designs and data sources* (Vol. 1594). Los
415 Banos, Philippines: WorldFish
- 416 Garibaldi, L., & Busilacchi, S. (2002) ASFIS list of species for fishery statistics purposes, ASFIS
417 Reference Series No. 15. Rome, FAO, 258p.
- 418 Giusti, A., Ricci, E., Guarducci, M., Gasperetti, L., Davidovich, N., Guidi, A., Armani, A. (2018).
419 Emerging risks in the European seafood chain: Molecular identification of toxic *Lagocephalus* spp. in fresh
420 and processed products. *Food Control*, 91, 311–320. <https://doi.org/10.1016/j.foodcont.2018.04.013>
- 421 Giusti, A., Tinacci, L., Sotelo, C. G., Acutis, P. L., Ielasi, N., & Armani, A. (2019). Authentication of
422 ready-to-eat anchovy products sold on the Italian market by BLAST analysis of a highly informative
423 cytochrome b gene fragment. *Food control*, 97, 50-57. <https://doi.org/10.1016/j.foodcont.2018.10.018>
424

- 425 Lewis, S. G., & Boyle, M. (2017). The expanding role of traceability in seafood: tools and key initiatives.
426 *Journal of Food science*, 82(1), 13-21. <https://doi.org/10.1111/1750-3841.13743>
- 427 Lowell, B., Mustain, P., Ortenzi, K., & Warner, K. (2015). One name, one fish: Why seafood names
428 matter. <https://usa.oceana.org/OneNameOneFish>. Accessed 30 October 2019
- 429 Martinsohn, J. (2013). Using new analytical approaches to verify the origin of fish. In P. Brereton. *New*
430 *analytical approaches for verifying the origin of food*. 1st Ed. Woodhead Publishing Series in Food Science,
431 Technology and Nutrition, (pp. 189-215). Woodhead Publishing Imprint. Elsevier.
- 432 Ministry of Agriculture and Forestry. (2006). Decree n. 4 of 13.01.2006 on the conditions and order for
433 the first sale of fish and other aquatic organisms. *Official Gazette*, 14, 14.02.2006, 73-80
- 434 Popescu (2011). Fisheries in Bulgaria. European Parliament Note of Directorate General for Internal
435 Policies Policy Department B: Structural and Cohesion Policies Fisheries.
436 [http://www.europarl.europa.eu/RegData/etudes/note/join/2011/460049/IPOL-](http://www.europarl.europa.eu/RegData/etudes/note/join/2011/460049/IPOL-PECH_NT(2011)460049_EN.pdf)
437 [PECH_NT\(2011\)460049_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/note/join/2011/460049/IPOL-PECH_NT(2011)460049_EN.pdf). Accessed 30 October 2019.
- 438 Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying
439 down the general principles and requirements of food law, establishing the European Food Safety Authority
440 and laying down procedures in matters of food safety. *Official Journal*, L 31, 1.2.2002, 1–24
- 441 Regulation (EU) No 1169/2011 of the European Parliament and of the Council of 25 October 2011 on the
442 provision of food information to consumers, amending Regulations (EC) No 1924/2006 and (EC) No
443 1925/2006 of the European Parliament and of the Council, and repealing Commission Directive 87/250/EEC,
444 Council Directive 90/496/EEC, Commission Directive 1999/10/EC, Directive 2000/13/EC of the European
445 Parliament and of the Council, Commission Directives 2002/67/EC and 2008/5/EC and Commission
446 Regulation (EC) No 608/2004. *Official Journal*, L 304, 22.11.2011, 18–63
- 447 Regulation (EU) No 1379/2013 of the European Parliament and of the Council of 11 December 2013 on
448 the common organisation of the markets in fishery and aquaculture products, amending Council Regulations
449 (EC) No 1184/2006 and (EC) No 1224/2009 and repealing Council Regulation (EC) No 104/2000. *Official*
450 *Journal*, L 354, 28.12.2013, 1–21
- 451 Reilly, A. (2018). Overview of Food Fraud in the fisheries sector. FIAM/C1165. FAO, Rome, 2018.
452 <http://www.fao.org/3/i8791en/I8791EN.pdf> Accessed 15 October 2019.
- 453 Stancheva, M. (2018, November). A survey on fish consumption in Bulgaria. International Symposium
454 On Animal Science (ISAS) 2018; 22nd – 23rd November 2018, Faculty of Agriculture, Belgrade-Zemun,
455 Serbia.
456 [https://www.researchgate.net/publication/329210059_A_SURVEY_OF_FISH_CONSUMPTION_IN_BUL-](https://www.researchgate.net/publication/329210059_A_SURVEY_OF_FISH_CONSUMPTION_IN_BULGARIA)
457 [GARIA](https://www.researchgate.net/publication/329210059_A_SURVEY_OF_FISH_CONSUMPTION_IN_BULGARIA). Accessed 15 October 2019.
- 458 Stawitz, C. C., Siple, M. C., Munsch, S. H., Lee, Q., & Derby, S. R. (2017). Financial and ecological
459 implications of global seafood mislabeling. *Conservation Letters*, 10(6), 681–689.
460 <https://doi.org/10.1111/conl.12328>

- 461 Tinacci, L., Guardone, L., Rubio, J. C. P., Riina, M. V., Stratev, D., Guidi, A., & Armani, A. (2019a).
462 Labelling compliance and species identification of herring products sold at large scale retail level within the
463 Italian market. *Food Control*, 106, 106707. <https://doi.org/10.1016/j.foodcont.2019.106707>
- 464 Tinacci, L., Giusti, A., Guardone, L., Luisi, E., & Armani, A. (2019b). The new Italian official list of
465 seafood trade names (annex I of ministerial decree n. 19105 of September the 22nd, 2017): Strengths and
466 weaknesses in the framework of the current complex seafood scenario. *Food Control*, 96, 68-75.
467 <https://doi.org/10.1016/j.foodcont.2018.09.002>
- 468 Tinacci, L., Stratev, D., Vashin, I., Chiavaccini, I., Susini, F., Guidi, A., & Armani, A. (2018a). Seafood
469 labelling compliance with European legislation and species identification by DNA barcoding: A first survey
470 on the Bulgarian market. *Food control*, 90, 180-188. <https://doi.org/10.1016/j.foodcont.2018.03.007>
- 471 Tinacci, L., Guidi, A., Toto, A., Guardone, L., Giusti, A., D'Amico, P., & Armani, A. (2018b). DNA
472 barcoding for the verification of supplier's compliance in the seafood chain: How the lab can support
473 companies in ensuring traceability. *Italian Journal of Food Safety*, 2 (7).
474 <https://doi.org/10.4081/ijfs.2018.6894>
- 475 Todorov, A. (2019). GAIN Report Number: BU1914. Fish and Seafood Market Brief –
476 Bulgaria. Published on 1st April, 2019.
477 [https://apps.fas.usda.gov/newgainapi/api/report/downloadreportbyfilename?filename=Fish%20and%20Seafo
478 od%20Market%20Brief%20-%20Bulgaria Sofia Bulgaria 4-11-2017.pdf](https://apps.fas.usda.gov/newgainapi/api/report/downloadreportbyfilename?filename=Fish%20and%20Seafood%20Market%20Brief%20-%20Bulgaria%20Sofia%20Bulgaria%204-11-2017.pdf). Accessed 15 October 2019.
- 479 Turkish Statistical Institute, (2017). Overview of the Turkish fisheries and aquaculture sector.
480 <https://www.eurofish.dk/turkey>. Accessed 8 January 2020
- 481 Xiong, X., D'Amico, P., Guardone, L., Castigliero, L., Guidi, A., Gianfaldoni, D., & Armani, A. (2016).
482 The uncertainty of seafood labeling in China: A case study on Cod, Salmon and Tuna. *Marine Policy*, 68,
483 123-135. <https://doi.org/10.1016/j.marpol.2016.02.024>
484
485

Macro-Area	City	Retail channel type			Total
		Large retail	Local retail	Local fish market	
NR	Vidin	2	1	2	5
	Pleven	4	2	0	6
	Veliko Tarnovo	4	1	0	5
	Ruse	4	0	0	4
	Silistra	2	0	1	3
	Area Subtotal	16	4	3	23
NE-SER	Dobrich	3	2	0	5
	Shumen	3	1	3	7
	Varna	4	1	1	6
	Sliven	3	3	1	7
	Burgas	4	0	1	5
	Area subtotal	17	7	6	30
S-SWR	Kardjali	2	0	0	2
	Haskovo	2	0	1	3
	Plovdiv	4	0	0	4
	Blagoevgrad	4	0	1	5
	Sofia	4	0	0	4
	Area Subtotal	16	0	2	18

Table 1: Number of different retail channels surveyed in each macro-area. NR: North Region; NE-SER: North-east/South-east Region; S-SWR: South/South-west Region

Product type	Retail channel type			Total
	Largeretail (N=49)	Local retail (N=11)	Local fish market (N=11)	
Fresh	382	49	165	596
Frozen	358	41	6	405
Canned	418	53	2	473
Marinated	44	8	3	55
Smoked	5	1	2	8
Salted	5	0	0	5
Dried	17	0	0	17
Breaded precooked	37	0	0	37
Alive	15	0	0	15
Total	1281	152	178	1611

Table 2. Number, overall and within different retail channels, of products belonging to different categories checked in the survey.

Designation at retail	Product category	Retail channels			Total
		Large retail	Local retail	Local fish market	
CD associated with SN	Fresh	235	16	5	257
	Frozen	354	35	0	389
	Canned	411	52	0	463
	Marinated	35	3	0	41
	Smoked	0	1	0	1
	Salted	1	0	0	1
	Dried	17	0	0	17
	Breaded precooked	37	0	0	37
	Alive	0	0	0	0
Sub-total CD+SN		1090	107	5	1202
CD alone	Fresh	147	33	160	340
	Frozen	4	6	6	16
	Canned	7	1	2	10
	Marinated	9	5	3	17
	Smoked	5	0	2	7
	Salted	4	0	0	4
	Dried	0	0	0	0
	Breaded precooked	0	0	0	0
	Alive	15	0	0	15
Sub-total CD alone		191	45	173	409

Table 3: Overall CDs number in different product categories found within the three retail channels included in the survey.

CD record	English term	SNs associated	Valid SN	Overall Freq. rate	Comparison with Official Bulgarian list
Трициона	Herring	<i>Clupea harengus</i>	<i>Clupea harengus</i>	1.7%	SN associated with a CD not included in the official list
Балтийска херинга	Baltic herring	<i>Clupea harengus membras</i>	<i>Clupea harengus</i>	18.6%	Editing of an existing CD (Херинга)
Салака (Ukranian)	Herring	<i>Clupea harengus</i>	<i>Clupea harengus</i>	1.7%	SN associated with a CD not included in the official list
		<i>Clupea harengus balticus</i>		6.8%	Obsolete SN associated with a CD not included in the official list
		<i>Clupea harengus membras</i>		20.3%	Obsolete SN associated with a CD not included in the official list
Бейби херинга	Baby herring	<i>Clupea harengus</i>	<i>Clupea harengus</i>	8.5%	SN associated with CD edited from an approved CD
Сельодка (Russian)	Herring	<i>Clupea harengus</i>	<i>Clupea harengus</i>	40.7%	SN associated with CD not included in the official list
Капитан	(Captain) Herring	<i>Clupea harengus membras</i>	<i>Clupea harengus</i>	23.7%	Obsolete SN associated with a CD not included in the official list
Чироз	Dried fish	<i>Clupea harengus membras</i>	<i>Clupea harengus</i>	28.8%	Obsolete SN associated with a CD not included in the official list
Балтийска Цаца	Baltic sprat	<i>Sprattus balticus</i>	<i>Sprattus sprattus</i>	3.4%	Obsolete SN associated with CD edited from an approved CD
Килка	Sprat	<i>Sprattus sprattus sulinus</i>	<i>Sprattus sprattus</i>	1.7%	SN associated to CD not included in the official list
Сардина	Sardine	<i>Sardinella logiceps</i>	<i>Sardinella logiceps</i>	3.4%	Extension of use of CD already associated to a valid SN
Аншоа	Anchovy	<i>Sardina pilchardus</i>	<i>Sardina pilchardus</i>	20.3%	SN associated to CD not included in the official list
		<i>Engraulis encrasicolus</i>	<i>Engraulis encrasicolus</i>	16.9%	Both CD and SN absent
		<i>Engraulis ringens</i>	<i>Engraulis ringens</i>	11.9%	Both CD and SN absent
Сафрид	Horse mackerel/scad	<i>Trachurus trachurus</i>	<i>Trachurus trachurus</i>	61%	Extension of use of CD already associated to a valid SN
		<i>Trachurus mediterraneus</i>	<i>Trachurus mediterraneus</i>	1.7%	SN associated with CD edited from an approved CD
Скумрия	Mackerel	<i>Scomber scombrus</i>	<i>Scomber scombrus</i>	88.1%	SN associated with CD edited from an

					approved CD
		<i>Scomber japonicus</i>	<i>Scomber japonicus</i>	67.8%	SN associated with CD edited from an approved CD
		<i>Scomber colias</i>	<i>Scomber colias</i>	64.4%	Both CD and SN absent
Бяла рибаТон	White tuna	<i>Thunnus alalunga</i>	<i>Thunnus alalunga</i>	10.2%	SN associated to a CD not included in the list
Жълтопер тон	Yellowfin tuna	<i>Thunnus albacares</i>	<i>Thunnus albacares</i>	8.5%	Both CD and SN absent
		<i>Katsuwonus pelamis</i>	<i>Katsuwonus pelamis</i>	76.3%	Extension of use of CD already associated to different valid SN (<i>Thunnus thynnus</i> , <i>Thunnus obesus</i>)
Риба Тон	Tuna	<i>Thunnus albacares</i>	<i>Thunnus albacares</i>	81.4%	
		<i>Thunnus alalunga</i>	<i>Thunnus alalunga</i>	6.8%	Extension of use of CD already associated to different valid SN
		<i>Theragra chalcogramma</i>	<i>Gadus chalcogrammus</i>	44.1%	Extension of use of CD already associated to different valid SN
Треска	Cod	<i>Gadus macrocephalus</i>	<i>Gadus macrocephalus</i>	6.8%	
		<i>Alepocephalus bairdii</i>	<i>Alepocephalus bairdii</i>	8.5%	
Морска треска	Sea cod	<i>Theragra chalcogramma</i>	<i>Gadus chalcogrammus</i>		Editing of CD present in the list and already associated to different valid SN
Тихоокеанска треска	Pacific cod	<i>Gadus macrocephalus</i>	<i>Gadus macrocephalus</i>	8.5%	Editing of CD present in the list and already associated to different valid SN
		<i>Micromesistius australis</i>	<i>Micromesistius australis</i>	6.8%	Extension of use of CD already associated to different valid SN
Мерлуза	Hake	<i>Macruronus magellanicus</i>	<i>Macruronus novaezelandiae</i>	15.3%	
		<i>Merluccius hubbsi</i>	<i>Merluccius hubbsi</i>	18.6%	
Сайда	Saithe	<i>Pollachius virens</i>	<i>Pollachius virens</i>	20.3%	SN associated to a CD not included in the list
		<i>Merluccius sp.</i>	<i>Merluccius sp.</i>	3.4%	Both CD and SN absent
		<i>Merluccius australis</i>	<i>Merluccius australis</i>	1.7%	Both CD and SN absent
		<i>Merluccius gayi</i>	<i>Merluccius gayi gayi</i>	5.1%	Both CD and SN absent
Хек	Hake	<i>Merluccius hubbsi</i>	<i>Merluccius hubbsi</i>	20.3%	Both CD and SN absent
		<i>Merluccius productus</i>	<i>Merluccius productus</i>	15.3%	Both CD and SN absent
		<i>Theragra chalcogramma</i>	<i>Gadus chalcogrammus</i>	54.2%	Both CD and SN absent
		<i>Alepocephalus bairdii</i>	<i>Alepocephalus bairdii</i>	11.3%	Both CD and SN absent
Нототения	Nototenia	<i>Merluccius hubbsi</i>	<i>Merluccius hubbsi</i>	1.7%	Both CD and SN

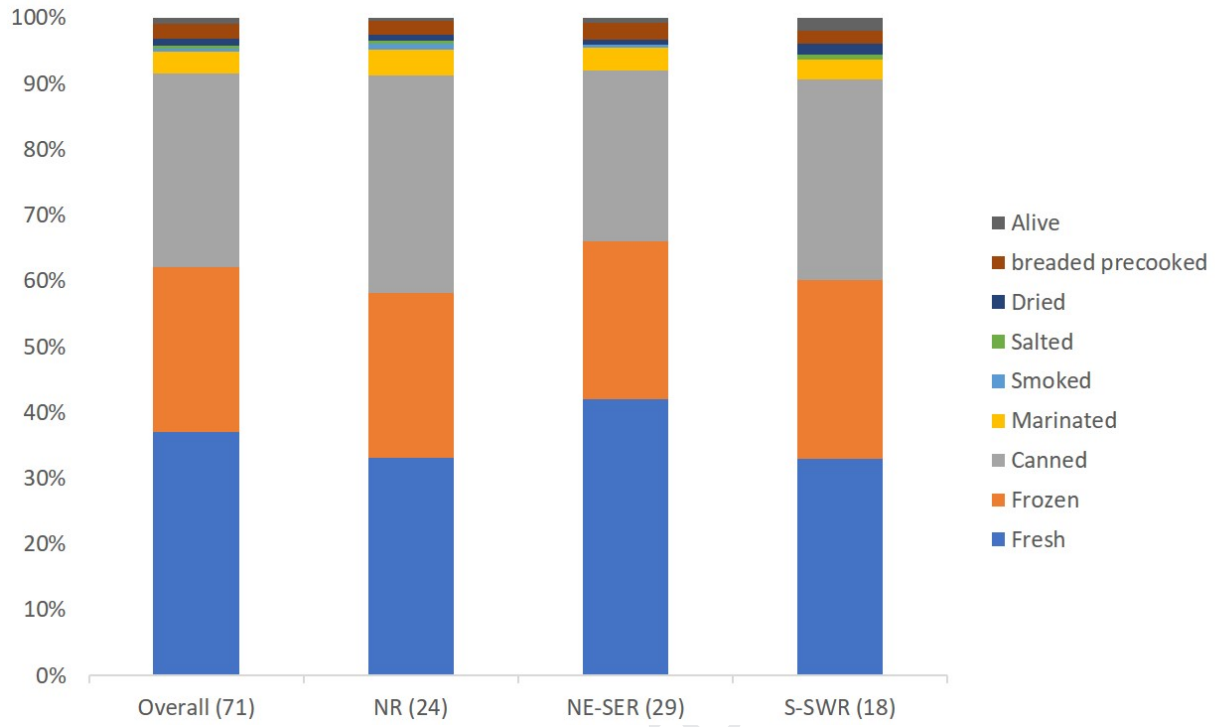
					absent
Бяла риба	White fish	<i>Merluccius hubbsi</i>	<i>Merluccius hubbsi</i>	8.5%	Both CD and SN absent
		<i>Theragra chalcogramma</i>	<i>Gadus chalcogrammus</i>	23.7%	Both CD and SN absent
Бакаляро (Portuguese origin)	“Bacaliaro” Hake	<i>Merluccius hubbsi</i>	<i>Merluccius hubbsi</i>	1.7%	Both CD and SN absent
Минтай (Russian origin)	Cod	<i>Theragra chalcogramma</i>	<i>Gadus chalcogrammus</i>	54.2%	Both CD and SN absent
		<i>Pollachius virens</i>	<i>Pollachius virens</i>	8.5%	Both CD and SN absent
		<i>Macruronus novaezelandiae</i>	<i>Macruronus novaezelandiae</i>	8.5%	Both CD and SN absent
Хоки		<i>Macruronus magellanicus</i>	<i>Macruronus novaezelandiae</i>	13.6%	Both CD and SN absent
Новозеландски макруронус	New Zealand macruronus	<i>Macruronus novaezelandiae</i>	<i>Macruronus novaezelandiae</i>	5.1%	Both CD and SN absent
Хек - Аляска	Alaska Hake	<i>Merluccius productus</i>	<i>Merluccius productus</i>	3.4%	Both CD and SN absent
Аржентински хек	Argentine Hake	<i>Merluccius hubbsi</i>	<i>Merluccius hubbsi</i>	30.5%	Both CD and SN absent
Сьомга	Salmon	<i>Oncorhynchus gorbuscha</i>	<i>Oncorhynchus gorbuscha</i>	8.5%	Both CD and SN absent
		<i>Salmo salar</i>	<i>Salmo salar</i>	13.6%	Both CD and SN absent
Атлантическа сьомга	Atlantic salmon	<i>Salmo salar</i>	<i>Salmo salar</i>	66.1%	Both CD and SN absent
Норвежка сьомга	Norwegian salmon	<i>Salmo salar</i>	<i>Salmo salar</i>	8.5%	Both CD and SN absent
Пъстърва	Trout	<i>Oncorhynchus mykiss</i>	<i>Oncorhynchus mykiss</i>	11.9%	Both CD and SN absent
		<i>Salmo gairdneri irideus</i>	<i>Oncorhynchus mykiss</i>	10.2%	Both CD and SN absent
Дъгова пъстърва	Rainbow trout	<i>Oncorhynchus mykiss</i>	<i>Oncorhynchus mykiss</i>	57.6%	Both CD and SN absent
Сьомгова пъстърва	Salmon trout	<i>Oncorhynchus mykiss</i>	<i>Oncorhynchus mykiss</i>	13.6%	Both CD and SN absent
		<i>Salmo gairdneri irideus</i>	<i>Oncorhynchus mykiss</i>	5.1%	Both CD and SN absent
Сребриста сьомга	Silver salmon	<i>Oncorhynchus kisutch</i>	<i>Oncorhynchus kisutch</i>	1.7%	Both CD and SN absent
Розова сьомга	Pink salmon	<i>Oncorhynchus gorbuscha</i>	<i>Oncorhynchus gorbuscha</i>	5.1%	Both CD and SN absent
Куча сьомга	Chum salmon	<i>Oncorhynchus keta</i>	<i>Oncorhynchus keta</i>	18.6%	Both CD and SN absent
		<i>Oncorhynchus sp</i>	<i>Oncorhynchus sp</i>	16.9%	Both CD and SN absent
		<i>Oncorhynchus keta</i>	<i>Oncorhynchus keta</i>	18.6%	Both CD and SN absent
Тихоокеанска сьомга	Pacific salmon	<i>Oncorhynchus nerka</i>	<i>Oncorhynchus nerka</i>	1.7%	Both CD and SN absent
		<i>Oncorhynchus keta</i>	<i>Oncorhynchus keta</i>	18.6%	Both CD and SN absent
Кета	Keta	<i>Oncorhynchus keta</i>	<i>Oncorhynchus keta</i>	1.7%	Both CD and SN absent
Червена сьомга	Red salmon	<i>Oncorhynchus nerka</i>	<i>Oncorhynchus nerka</i>	3.4%	Both CD and SN absent
Ципура (Greek origin)	Seabream	<i>Sparus aurata</i>	<i>Sparus aurata</i>	64.4%	Both CD and SN absent

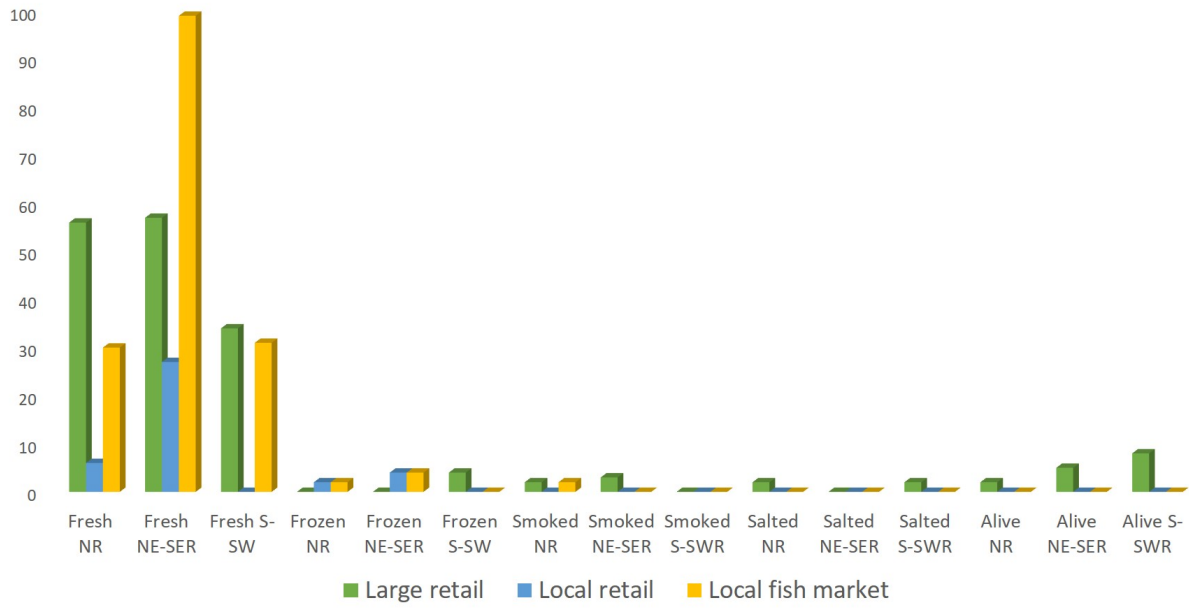
Фагри	Red Porgy	<i>Pagrus coeruleostictus</i>	<i>Pagrus caeruleostictus</i>	1.7%	Both CD and SN absent
Лаврак	European seabass	<i>Dicentrarchus labrax</i>	<i>Dicentrarchus labrax</i>	37.3%	Both CD and SN absent
Чернокоп	Bluefish	<i>Pomatomus saltatrix</i>	<i>Pomatomus saltatrix</i>	1.7%	SN associated to a different CD (Лефер)
Зарган	Garfish	<i>Scomberesox saurus</i>	<i>Scomberesox saurus</i>	16.9%	Both CD and SN absent
Унаги	Unagi /Eel	<i>Anguilla japonica</i>	<i>Anguilla japonica</i>	1.7%	Both CD and SN absent
Лакедра (Greek origin)	Lunar-tailed bigeye	<i>Priacanthus hamrur</i>	<i>Priacanthus hamrur</i>	1.7%	Both CD and SN absent
		<i>Prionace glauca</i>	<i>Prionace glauca</i>	23.7%	Both CD and SN absent
		<i>Isurus oxyrinchus</i>	<i>Isurus oxyrinchus</i>	15.3%	Both CD and SN absent
Акула	Shark	<i>Squalus acanthias</i>	<i>Squalus acanthias</i>	1.7%	SN associated to a specific CD (черноморски региоа Акула)
		<i>Oreochromis niloticus</i>	<i>Oreochromis niloticus</i>	8.5%	Both CD and SN absent
		<i>Lates niloticus</i>	<i>Lates niloticus</i>	8.5%	Both CD and SN absent
Пангасиу	Pangasius	<i>Pangasius hypopthalmus</i>	<i>Pangasianodon hypopthalmus</i>	39.0%	Both CD and SN absent
Морски кефал	Flathead greymullet	ND	-	2.1%	Absent
Илария	Leaping mullet	ND	-	2.1%	Absent
Халибут	Halibut	ND	-	2.1%	Absent
Попче	Goby	ND	-	14.6%	Absent
Попче/Кая	Goby/Kaya	ND	-	4.2%	Absent
Махи махи	Mahi Mahi	ND	-	2.1%	Absent
Риба меч	Swordfish	ND	-	14.6%	Absent
Марлин	Marlin	ND	-	2.1%	Absent
Минокоп	Shidrum	ND	-	4.2%	Absent
Фриса	Black Sea Roach	ND	-	4.2%	Absent
Червена риба	Red Fish	ND	-	2.1%	Absent
Скат	Scat	ND	-	2.1%	Absent
Есетра	Sturgeon	ND	-	12.5%	Absent
Обикновен сом	Common catfish	ND	-	2.1%	Absent
Африкански сом	African catfish	ND	-	22.9%	Absent
Дунавска мряна	Danube Barbel	ND	-	2.1%	Absent
Облец	Danube bleak	ND	-	2.1%	Absent
Ледена риба	Icefish	ND	-	2.1%	Absent
Кликач	Antartic toothfish	ND	-	2.1%	Absent
Мойва	Capelin	ND	-	2.1%	Absent
Полярна пъстърва	Polar Trout	ND	-	2.1%	Absent
Сарпа	Salema	ND	-	2.1%	Absent

Table 4: List of CDs (associated to SN or alone) not included in the Official Bulgarian list.



Journal Pre-proof





- A survey on the Bulgarian seafood market for assessing fish products availability was conducted
- Products availability was then compared with the current seafood official list
- The ineffectiveness of the list in describing products available on the market was highlighted
- Main concerns regarded the presence on the market of CD and SN not included in the list
- CD already applied throughout the country represent a starting point to propose an updating of the list

Journal Pre-proof

Authors declare no conflict of interest

Journal Pre-proof