

Control

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Abstract: European food law states that official checks on goods exchanged within the community should be performed at the place of origin, trusting in the guarantees provided by the supplier Member State. However, spot checks at the destination are also allowed. The Veterinary Offices for Compliance with EU Requirement (UVAC) are uniquely Italian offices implementing destination controls on EU products of animal origin. In this study, a data analysis on the control activity of the UVAC of Tuscany on seafood products in the period 2014-2016 was performed. Consignments were analysed according to their category (fish, fillets, crustaceans, molluscs, processed products) and country origin and data on seafood market flows were provided. Checks performed on consignments were investigated and cases of non-compliances with the EU standard safety requirements were analysed. Fish category was the most representative (49%), followed by molluscs (24%), fillets (12%), crustaceans (8%) and processed seafood (5%) and consignments were mainly provided by Spain, France and Netherlands. These outcomes were relatively in accordance with national and European data. The percentage of checked consignments was higher than the national one, although decreasing (from 0.73% in 2014 to 0.57% in 2016). 26 consignments (3.4% of the total checked) were found as non-compliant with the standard EU requirements: 12 (46.2%) involved chemical risks (mercury, additives), 9 involved biological risks (*L. monocytogenes*, *Anisakis* spp., Norovirus), and 5 involved physical risks and other minor irregularities. These outcomes proved the actual usefulness of ancillary checks performed at national level in protecting consumers' health and even represents a further data source for evaluating EU citizens risk exposure.

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Dear Editor,

We would like to submit the following manuscript for possible publication: **“Data analysis of official checks on intra-EU seafood trade: a survey on the Italian Veterinary Office for Compliance with EU Requirement (UVAC) of Tuscany in three-year period 2014-2016”**

Veterinary official checks represent a pillar within the EU food legislation. They are planned according to risk assessment processes that require the identification of hazards related to a given food category, mostly based on the historical data gathering. In this respect, the sharing of information between various European entities assumes a central role for this purpose.

The Veterinary Offices for Compliance with EU Requirement (UVAC) are uniquely Italian offices implementing destination controls on EU products of animal origin to especially guarantee national companies and protect the internal market against the entry of commodities that are non-compliant with the EU requirements and that may sometimes represent an actual health risk for consumers.

In this study, a data analysis on the control activity of the UVAC of Tuscany on seafood products in the period 2014-2016 was performed. Data on consignments were firstly analysed according to their category (fish, fillets, crustaceans, molluscs, processed products) and country origin. Then, checks percentage was evaluated and cases of non-compliances with the EU standard safety requirements were analysed.

Although UVAC control activity should be ancillary, as official checks on goods exchanged within the community have to be mandatory performed at the place of the supplier Member State, different types of non-compliances were found among the checked consignments. Major issues involved the presence of chemical risks (high level of mercury and additives) and biological risks (*L. monocytogenes*, *Anisakis spp.*, *Norovirus*).

This study, although related to a strictly local activity, proved the actual usefulness of ancillary checks performed at national level in protecting consumers' health and even represents a further data source for evaluating EU citizens risk exposure.

Best Regards,

Andrea Armani

1 **Data analysis of official checks on intra-EU seafood trade: a survey on the Italian**
2 **Veterinary Office for Compliance with EU Requirement (UVAC) of Tuscany in three-year**
3 **period 2014-2016**

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Abstract

European food law states that official checks on goods exchanged within the community should be performed at the place of origin, trusting in the guarantees provided by the supplier Member State. However, spot checks at the destination are also allowed. The Veterinary Offices for Compliance with EU Requirement (UVAC) are uniquely Italian offices implementing destination controls on EU products of animal origin. In this study, a data analysis on the control activity of the UVAC of Tuscany on seafood products in the period 2014-2016 was performed. Consignments were analysed according to their category (fish, fillets, crustaceans, molluscs, processed products) and country origin and data on seafood market flows were provided. Checks performed on consignments were investigated and cases of non-compliances with the EU standard safety requirements were analysed. Fish category was the most representative (49%), followed by molluscs (24%), fillets (12%), crustaceans (8%) and processed seafood (5%) and consignments were mainly provided by Spain, France and Netherlands. These outcomes were relatively in accordance with national and European data. The percentage of checked consignments was higher than the national one, although decreasing (from 0.73% in 2014 to 0.57% in 2016). 26 consignments (3.4% of the total checked) were found as non-compliant with the standard EU requirements: 12 (46.2%) involved chemical risks (mercury, additives), 9 involved biological risks (*L. monocytogenes*, *Anisakis spp.*, *Norovirus*), and 5 involved physical risks and other minor irregularities. These outcomes proved the actual usefulness of ancillary checks performed at national level in protecting consumers' health and even represents a further data source for evaluating EU citizens risk exposure.

Keywords

53 Official Control, Veterinary Offices for Compliance with EU Requirement (UVAC), seafood,
54 chemical risks, biological risks, consumer protection

55 **1. Introduction**

56 European food law is overall targeted at citizens' health protection and goods' free movement
57 within the Single Market (Alemanno, 2006). EU rules regarding food hygiene, aimed at ensuring
58 food safety from production to consumption, are reported in key acts (known as EU Hygiene
59 Package) related to the principles and requirements provided by the EC General Food Law
60 (Regulation (EC) No 178/2002). Member States (MSs) are responsible for the legislation
61 enforcement and Competent Authorities (CA) are assigned to organise official controls systems on
62 their territory to verify that Food Business Operators (FBOs) activities and goods placed on the
63 internal market (either EU produced or imported from non-EU countries) comply with EU
64 requirements and safety standards. Regulation (EC) No 882/2004 and Regulation (EC) No
65 854/2004 currently define principles and tools of official controls on food and animal feed, although
66 they will be repealed by the new Regulation (EU) No 2017/625 starting from 14th December 2019.

67 Among foodstuff of animal origin, imports of live animals and animal products from extra-EU
68 countries are specifically controlled by veterinaries checks at their point of entry, so called
69 Veterinary Border Inspection Posts (BIPs). Contrariwise, for the intra-Union trade, which solely
70 refers to the movement of live animal or animal products between MSs, the EU system is based on
71 the confidence in the guarantees provided by the supplier country and the official checks should be
72 therefore carried out at the place of origin. However, non-discriminatory spot checks at the final
73 destination are allowed (Council Directive 89/662/EEC).

74 The Veterinary Offices for Compliance with EU Requirement (UVAC) are peripheral offices of
75 the Italian Ministry of Health which maintain the responsibility of destination controls on EU
76 products of animal origin, animal by-products, live animals and their productions at national level.
77 Seventeen UVAC are currently distributed throughout Italian land and each of them has a territorial
78 competence covering one or two region/s. They have been set up with the Legislative Decree No 27

79 of 30 January 1993 implementing the Council Directive 89/608/EEC, in response to the launch of
80 the EU Single Market and the abolition of border controls between MSs. Differently from the BIPs
81 veterinary controls that are mandatory and therefore performed by all the MSs, the UVAC checks
82 are purely Italian activities. Basically, UVAC priority tasks refer to: (i) setting the control
83 percentages depending on the goods type and provenience; (ii) applying restrictive measures issued
84 by Health Ministry, in co-ordination with Regional Veterinary Services (RVS) and Local
85 Veterinary Unit (LVU); (iii) Co-ordinating and verifying the consistency of the control activities
86 performed by LVU, in cooperation with the regions; (iv) Managing the information flows relating
87 to the intra-Union exchanged goods; (v) providing technical and legislative advices in cases of
88 Community's legal disputes (Legislative Decree No 28 of 30 January 1993). Undoubtedly, a proper
89 knowledge of the trade flows from MSs is required for carrying out the above-mentioned tasks.
90 Thus, the recipient FBOs should electronically pre-notify the arrival of the goods consignments to
91 the respective UVAC and LVU through the Trade and Imports Integrated System, with the Italian
92 acronym "S.INTE.S.I.S".

93 Seafood has long been considered an important sustenance source on the Italian scene, supported
94 by current per-capita average consumption that, reaching 28.4 kg in 2014, has overcome the
95 average consumption of European citizens (FAO, 2016a). According to the most updated national
96 data, provided by the Italian Ministry of Health through annual reports, a high amount of pre-
97 notified imported products is represented by seafood, with percentages ranging from 38% to 42% of
98 the total EU imported foodstuff consignments in the three-years period 2014-2016 (Italian Ministry
99 of Health, 2014; Italian Ministry of Health, 2015; Italian Ministry of Health, 2016).

100 In the same reports, cases of non-conformities assessment, related to an actual non-compliance
101 of the products with the standard safety and quality requirements, are reported. The potential public
102 health risks arising from non-compliant seafood have long been known and they are especially
103 related to the presence of biological (e.g. bacteria, virus, parasites, biotoxins, histamine) and
104 chemical (e.g. heavy metals, PCB, dioxins, PAHs, additives, residues of veterinary drugs) hazards

105 (D'Amico et al., 2018). Efficient and consistent checks are therefore particularly required to
106 guarantee consumers' protection and they should be even carried out on goods checked at BIPs
107 located in other MSs but intended to the Italian territory.

108 In this study, a comprehensive data analysis on the control activity performed by the UVAC of
109 Tuscany on imported EU seafood products in the three-year period 2014-2016 was performed. The
110 main outcomes emerging from the study were assessed in the light of the European and national
111 data related to the same period. Cases of non-compliances with the standard safety requirements
112 and the relative adopted measures were analysed to implement the knowledge on EU citizens risk
113 exposure and assess the actual usefulness of ancillary checks performed at national level in
114 protecting consumers' health. Finally, considering that accurate and reliable data gathering is a
115 prerequisite for informed risk assessment and risk management, the study also sought to provide
116 additional data on intra-EU seafood market flows.

117 **2. Materials and methods**

118 *2.1 Data collection and analysis*

119 Data on seafood consignments that have been pre-notified to the S.INTE.S.I.S intended to be
120 dispatched to Tuscany region and that have been the subject of veterinary checks under the UVAC
121 of Tuscany in the three-year period from 1st January 2014 to 31st December 2016 were collected and
122 re-organized in an Excel worksheet. For each consignment, the items reported in the following
123 sections were considered.

124 *2.1.1 Type of product and product's origin.* Seafood consignments were divided in five macro-
125 categories according to the Common Customs Tariff Combined Nomenclature (CN), the Council
126 Regulation (EEC) No 2658/87 and its following amendments: 1) Fish (F): live fish and fresh,
127 chilled, frozen fish (except fish fillets); 2) Fillets (Fi): fresh, chilled, frozen fish fillets/other fish
128 flesh (even minced); 3) Crustaceans (C): live crustaceans, fresh/chilled/frozen/dried/salted/in brine
129 crustaceans (whole or shelled), boiled or steamed whole crustaceans
130 (fresh/chilled/frozen/dried/salted), prepared or preserved crustaceans, crustaceans' meal, powder or

131 pellets; 4) Molluscs (M): live molluscs, fresh/chilled/frozen/dried/salted/in brine molluscs (whole or
132 shelled), molluscs' meal; 5) Processed seafood (P): dried/salted/in brine fish or fish fillets; smoked
133 fish (even cooked), prepared or preserved fish, fish meal, powder or pellets, caviar and other fish
134 roe preparations, packaged mixed seafood (chilled or frozen), fish/crustaceans/molluscs sauces) and
135 counted. M category was further sub-divided into a) "bivalves", b) "cephalopods" c) "gastropods"
136 and d) "mixed".

137 Consignments imported from MSs and EU Free Trade Association (EFTA) States were
138 considered.

139 Outcomes from this section were compared to data on seafood imports provided by both the *EU*
140 *Market Observatory for Fisheries and Aquaculture Products* (EUMOFA) and the *Italian Institute of*
141 *Services for the Agricultural Food Market* (ISMEA) related to the same three-years period.

142 *2.1.2 Type of UVAC veterinary check.* The overall number of veterinary checks and the number
143 for each type of check were calculated. The checks were divided in planned (annually set up by
144 UVAC for LVUs and based on the products' risk assessment) and extra-planned according to
145 Legislative Decree No 28 of 30 January 1993 implementing the Council Directive 89/662/EEC and
146 subsequent amendments. Extra-planned checks further included: a) mandatory checks -
147 implemented as a result of the *Rapid Alert System for Food and Feed* (RASFF) alert notifications or
148 for ascertained non compliances, b) checks for suspicion - implemented if, in absence of specific
149 alerts, doubts existed as the actual consignment's safety or as its notice time's correctness, or as a
150 result of Italian Ministry of Health specific dispositions and c) LVU monitoring checks -
151 implemented by LVU in presence of suspects during the internal surveillance.

152 *2.1.3 Type of controls made on consignments.* The number of each following type of controls,
153 commonly performed by UVAC, was calculated: documentary checks, identity checks, physical
154 checks, all defined by Regulation (CE) n. 882/2004; moreover, also the laboratory checks
155 performed by Italian official laboratories (Experimental Zooprophyllactic Institutes) on samples
156 taken from the consignments were included.

157 ***2.2 Non-compliances evaluation***

158 Final non-compliances (NC) were calculated. For non-compliant consignments, the type of non-
159 compliance and the measures implemented to protect food safety were investigated.

160 **3. Results and Discussion**

161 ***3.1 Data collection and analysis***

162 Seafood consignments (N=119896) represented the 43% in 2014 (N=37162), 44% in 2015
163 (N=39632) and 47% in 2016 (N=43102) of the total consignments composed of products of animal
164 origin, animal by-products and livestock that were pre-notified to the S.INTE.S.I.S for Tuscany
165 region during the investigated period, showing a growth trend of +6.6% and +8.8% in 2015 and
166 2016, respectively. Even at national level seafood consignments were the most represented, with
167 38.2%, 42% and 40.8% of the total pre-notified to the S.INTE.S.I.S in 2014, 2015 and 2016,
168 respectively (Italian Ministry of Health, 2014; Italian Ministry of Health, 2015; Italian Ministry of
169 Health, 2016). This growth was overall in accordance with the global and European trend. Seafood
170 represent in fact one of the most traded commodities worldwide (FAO, 2016a). World per capita
171 consumption increased significantly in the last decades, with over 20 Kg in 2015, as indicated in the
172 most updated report by *Food and Agriculture Organization of the United Nations* (FAO, 2016a). In
173 EU, citizen's expenditure for seafood products increased as well over the last years and peaked in
174 2016, reaching 54.8 billion euro (EUMOFA, 2017). Even Italian expenditure increased by 1.4% in
175 2016 compared with 2015 and, with 10458 billion euro, it was second only to Spain (EUMOFA,
176 2017).

177 Approximately half of the EU seafood market is currently based on internal exchanges, with 6.2
178 million tonnes and a total value of 25.2 billion euro in 2016, increasing +9% respect to the previous
179 year (EUMOFA, 2017). In Italy, of the total 1032489 tonnes of imported products in 2016, 584641
180 tonnes (57%) came from internal flows with other MSs (www.ismea.it).

181 ***3.1.1 Type of product and product's origin.*** Fish category (F), with 59141 consignments, was the
182 most representative in all the three years (49%), followed by molluscs (M) with 29847

183 consignments (24%), fillets (Fi) with 14547 consignments (12%), crustaceans (C) with 9961
184 consignments (8%) and processed seafood (P) with 6400 consignments (5%). Percentages remained
185 relatively stable within each considered year. Cephalopods sub-category was the most
186 representative among M in all the three years (60.3%) followed by bivalves (32.9%), mixed
187 products (4.8%) and gastropods (2%). In comparison with European situation, the total intra-Union
188 exchanges data provided by EUMOFA especially involved fish category (F) (59% of the total
189 volume), followed by molluscs (M) (9%) and crustaceans (C) (5%) (EUMOFA, 2017). However, as
190 both fillets (Fi) and processed (P) categories were probably distributed in the three above mentioned
191 macro-categories, a comparison between European and regional data was not possible. It should be
192 anyway noted that the squid products' flow from Spain to Italy was currently reported as one of the
193 most important intra-EU exchange (EUMOFA, 2017), reason why the percentage of molluscs'
194 category (M) emerged from our data could be higher respect to the EU average. In the same way, it
195 was not possible to compare these outcomes with the national data, as the ISMEA only provided
196 pooled data belonging to both intra-EU and extra-EU trade.

197 As regards the products' origin, the consignments were overall imported from 28 countries (MSs
198 and EFTA States) during the three-years period, although five of them (Cyprus, Czeck Republic,
199 Greenland, Malta and Switzerland) were present in the S.INTE.S.I.S only for one or two years
200 among those considered (Table 1SM). Overall, the major amount of seafood consignments was
201 provided by France, Spain and Netherlands, followed by Greece, Denmark, UK and Portugal (Fig.
202 1). Four other countries less contributed to the overall seafood amount (1% each), while the
203 remaining 17 countries provided only 2% all together (Fig. 1). To compare these outcomes with the
204 national data, it should be noted that, while Spanish and Dutch leadership over the period 2014-
205 2016 was confirmed (38% and 10% of the total amount, respectively), France ranked the fourth
206 place, after Greece, with only 6.8% (www.ismea.it). National data on the other major importers
207 were instead rather like regional ones (www.ismea.it). Regional data on the major providers were
208 reported by each year as illustrated in Fig. 2. As can be observed, the amount of French

209 consignments decreased over the years (-15.8% in 2016 respect to 2014); Contrariwise, imports
210 from Spain substantially raised (+28.7% in 2016 respect to 2014). As a country of age old marine
211 tradition, Spain is in fact the biggest seafood producer in EU by volume (Eurofish, 2017). It enjoys
212 entry points in both the Atlantic Ocean and the Mediterranean Sea and offers good condition for
213 marine and freshwater aquaculture. Spain is even a large exporter, mainly to EU, that adsorbs two-
214 thirds of its exports of which 20% were addressed to Italy (Eurofish, 2017), in accordance with the
215 outcomes of this study. However, as recently highlighted by D'Amico et al. (2018), products of
216 Spanish origin are often made with raw materials coming mainly from South America and Asia.
217 This aspect factually designates Spain not only as great producer, but also as a country having a
218 highly-developed industry processing seafood imported from Third Countries.

219 While regional imports from Netherlands, Greece, Denmark and UK were maintained at stable
220 levels, consignments from Portugal considerably increased, especially in 2016 (+ 56.4% respect to
221 2014) (Fig. 2). Percentages on products' origin even considerably varied among different seafood
222 categories. As illustrated in Fig. 3, Spain was the only that maintained high percentages (from 22%
223 to 32%) for each category; France was the leader of F (33%) and M (49%) categories (Figs. 3a and
224 3d) but contributed in lower proportions to Fi (14%) and P (9%) categories (Figs. 3b and 3e).
225 Netherlands and Denmark significantly contributed to the amount of consignments belonging to Fi
226 and C categories, respectively (Figs. 3b and 3c) but their contribution to the other categories was
227 always lower than 13%. Greece mainly provided consignments from F category (Fig. 3a). A more
228 varied scenario was obtained from P category's data, since different countries that not appeared as
229 significant providers for the other categories were included (Fig. 3e). The export trend of each
230 considered MSs/EFTA State was reported in Fig. 4. Despite the evident limitations, outcomes
231 emerging from this study could even provide an insight on the market situation. Overall, EU market
232 trend was substantially confirmed: Islands, Mediterranean countries or other seaside countries
233 whose economy is known as largely linked to fishery sector (FAO, 2016a; FAO, 2016b) mainly
234 exported consignments belonging to F or Fi categories; the latter was particularly exported by

235 countries bordering the Baltic Sea, as well as Iceland and Greenland, as the national catches are
236 traditionally related to species commonly sold in form of fillets or slices, such as herring, salmon,
237 mackerel or cod (OCEANA, 2012). Dutch filleted herring especially represents an important intra-
238 EU commercial flow (EUMOFA, 2017). Inland countries or other countries located in eastern
239 Europe, whose economy was less influenced by fishery activities, mainly refer to fish processing
240 industry and exported processed products; food processing especially represents for instance the
241 fourth-largest industry in Germany (Global Agricultural Information Network, 2017), which
242 particularly provides the major amount of fishmeal to the intra-Union market (EUMOFA, 2017).
243 MSs export trend was confirmed even within crustacean's category (C) with Belgium and Denmark
244 as good exporters (EUMOFA, 2017). Interestingly, 62% of Irish prawns, mainly caught in the
245 North East Atlantic, the Mediterranean and the North Sea, were exported to Italy in 2016
246 ([https://www.bordbia.ie/industry/buyers/industryinfo/FishSeafoodIndustry/directories/Seafood%20f](https://www.bordbia.ie/industry/buyers/industryinfo/FishSeafoodIndustry/directories/Seafood%20from%20Ireland/Seafood%20from%20Ireland%20-%20Species%20Catalogue.pdf)
247 [rom%20Ireland/Seafood%20from%20Ireland%20-%20Species%20Catalogue.pdf](https://www.bordbia.ie/industry/buyers/industryinfo/FishSeafoodIndustry/directories/Seafood%20from%20Ireland/Seafood%20from%20Ireland%20-%20Species%20Catalogue.pdf)).

248 *3.1.2 Type of UVAC veterinary checks.* Official controls should be organised to verify that the
249 relevant requirements of feed and food law are fulfilled by FBOs at all stages of production,
250 processing and distribution. Food and feed requirements are provided by a number of EU specific
251 dispositions flanking the Hygiene Package, such as Regulation (EC) No. 183/2005, laying down
252 requirements for feed hygiene, Commission Regulation (EC) No 2073/2005, on microbiological
253 criteria for foodstuff, Commission Regulation (EC) No 1881/2006, setting maximum levels for
254 certain contaminants in foodstuff, Regulation (EC) No 1333/2008 on food additives, Commission
255 Regulation (EU) No 37/2010, on pharmacologically active substances and their classification
256 regarding maximum residue limits in foodstuffs of animal origin, and others. Such hygienic
257 provisions define the characteristics of purity and authenticity (chemical and microbiological
258 characteristics) and required productive standards that ensure safety for consumption.

259 Provision should be even made for the organisation of official controls of feed and food that is
260 introduced into the territory of the Community (Regulation (EC) No 882/2004). In the case of

261 UVAC, checks especially aim at guaranteeing national companies and protecting the internal
262 market against the entry of commodities that are non-compliant with the Community requirements
263 and that may sometimes represent an actual health risk for consumers. The checks' percentage is
264 annually planned according to a targeted risk assessment that is mostly based on the history of the
265 previous year's flow, the number of the alerts/non-compliances cases and the hazards associated to
266 the type of commodity.

267 In this study, 774 consignments were subject to UVAC veterinary checks during the considered
268 period, respectively distributed in 272, 256 and 246 within each year. The percentage of checked
269 consignments on the totally pre-notified seafood was overall higher than the national one with
270 0.73% in 2014, 0.65% in 2015 and 0.57% in 2016 (Table 2SM). As can be observed, veterinary
271 checks have decreased over the years, with percentages of -5.9% between 2014 and 2015 and -3.9%
272 between 2015 and 2016. These data were in accordance with the overall national trend, that
273 reported decreases of 4.5% in 2015 respect to 2014 and of 3% in 2016 respect to 2015, with a final
274 check percentage of 0.48% in the last considered year (Italian Ministry of Health, 2014; Italian
275 Ministry of Health, 2015; Italian Ministry of Health, 2016). It can be therefore hypothesized that the
276 level of the risk combined with seafood imported from EU has progressively lowered, allegedly
277 thanks to the implementation of more effective and targeted activities.

278 The checks were performed on the pre-notified consignments from 18 countries, mostly
279 addressed on Spain (N=273), France (N=178) and Netherlands (N=118) (Table 2SM). The higher
280 percentage of checks in 2014 involved French consignments (36%), while Spanish consignments
281 were the most checked in both the subsequent years, with percentages of 34% and 40.7% in 2015
282 and 2016, respectively; the checks percentage of French consignments were instead considerably
283 reduced in 2015 (13.3%) and 2016 (19.9%) respect to the first considered year. The implementation
284 of more intensive controls on Spanish consignments was explained since Spain was among the
285 countries with the higher number of seafood notifications on the RASFF system in the 2011-2015
286 period (D'Amico et al., 2018) and, according to the 2016 annual RASFF report, it ranked at the first

287 place for the number of notification related to the presence of mercury in fish and fish products
288 (RASFF, 2016). In 2017, fish from Spain was even included in the “black list” provided by the
289 National Confederation “Coldiretti” (www.coldiretti.it).

290 As reported in Table 1, planned checks were the most applied (n=575), representing 74.3% of
291 the total checks in the entire considered period. Among the extra-planned checks, 17.4% (n=135)
292 were represented by “mandatory checks”, while “checks for suspicion”, as well as, “LVU
293 monitoring checks”, involved 4.1% (n=32) of the total checks each. It could be note that, while the
294 planned checks’ extent has over the years decreased (-19% in 2016 respect to 2014), the extra-
295 planned has instead increased, especially in the case of the “mandatory checks”.

296 *3.1.3 Type of controls made on consignments.* For the entire considered period, both documental
297 and identity checks were carried out for all the checked consignments, except for one case in which
298 only the documental check was applied. The average percentage of physical and laboratory check
299 was 98% and 40.5%, respectively. The low number of laboratory checks, compared to the physical
300 ones, could be probable due to the cost of the analytical procedure. In fact, official laboratories
301 should possess the expertise, equipment, infrastructure and staff to carry out such tasks to the
302 highest standards and should be accredited for the use of these methods. However, although
303 accreditation is the instrument of choice to ensure high performance by official laboratories, it is
304 also a complex and costly process (Regulation (EU) No 2017/625). Each year’s partial outcomes
305 were reported in Table 2.

306 **3.2 Non-compliances assessment and implemented measures**

307 The free movement of safe and wholesome food is an essential aspect of the EU internal market
308 and significantly contributes to the health and well-being of EU citizens, and to their social and
309 economic interests (Uberth, 2016). Acceptability criteria for food and feed additives or biological
310 and toxic contaminants are reviewed on the basis of risk analysis results and therefore these should
311 be carried out at an international or national level (Trevisani & Rosmini, 2008). An integrated pan-
312 European approach to the identification of risks in the food chain is therefore essential to protect

313 consumer health and also the interests of the food industry which is an important economic and
314 social driver within the EU (Costa et al., 2017). Currently, the RASFF system, by allowing to
315 exchange information rapidly and act co-ordinately in response to serious food and feed safety
316 risks, represent an essential “data mine” for risk assessment process (D’Amico et al., 2018). The
317 collection of precise and update data on non-compliant goods exchanged within the EU territory is
318 in fact an important prerequisite for informed risk assessment and risk management. In this respect,
319 the data gathering achieved by official checks performed at local level factually contributes to the
320 enlargement of the data pool and consequently to the increase of the analysis overall reliability.
321 Such types of official controls may even provide useful prevention on emerging risks involving the
322 food chain (Costa et al., 2017). For instance, we pointed out the case reported by Barontini, Bossù,
323 Campagna, & Lorenzetti (2010), where during an official control carried out by the LVU of Empoli
324 (Italy), one batch of processed fish imported in Italy from Spain and labelled as *Uranoscopus* sp.
325 (stargazer) was molecularly identified as composed by species belonging to the poisonous
326 Tetraodontidae family, that must not be placed on the EU market according to Regulation (EC) No
327 853/2004.

328 In this study, 26 consignments (3.4% of the total checked) were found as non-compliant within
329 the entire considered period. Nine of them (34.6%) occurred in 2014, 5 (19.2%) in 2015 and 12
330 (46.2%) in 2016.

331 Non-compliances involving chemical risks represented 46.2% (n=12) of the total assessed non-
332 compliances, followed by 34.6% (n=9) involving biological risks, 7.7% (n=2) involving physical
333 risks, 7.7% (n=2) involving documental irregularity and 3.8% (n=1) involving misidentification
334 cases (Table 3). Fish (F) was the most non-compliant seafood category, with 13 non-compliant
335 consignments (50%). Most of the non-compliant consignments (N=16; 62%) were provided by
336 Spain, followed by France (N=4; 15.4%), Portugal (N=3; 11.5%), Netherlands, Poland and
337 Romania (1 consignment each) (Table 3). Considering the low volumes of goods imported from
338 these latter two MSs, the NC amount may be considered indicative. Planned checks revealed only

339 one NC, while the most part of NC (N= 21; 80.7%) were found through extra-planned mandatory
340 checks (Table 3). Obviously, mandatory checks, implemented as a result of the RASFF alert
341 notifications or for ascertained NC and targeted to specific samples, have a higher probability to
342 reveal NC compared to planned checks performed on random samples.

343 *3.2.1 Chemical risks.* 38.5% (n=10) of the total non-compliant consignments involved the
344 presence of mercury. One of them was regularised after a second laboratory analysis which had
345 provided outcomes below the mercury legal limit (Table 3). In this respect, the highest number of
346 RASFF notifications from 1980-2016 were reported to be related to mercury, regardless of product
347 types (Pigłowski, 2018). All non-compliant consignments were provided by Spain, except for one
348 case provided by Portugal, confirming the mercury issue of Spanish products, already reported in
349 section 3.1.3 and even highlighted by the *Ocean Conservation group* (OCEANA, 2014). However,
350 it should be noted that the non-compliant consignments were represented by seafood imported in
351 turn, which came from a wide diversity of catching areas besides the Mediterranean Sea (FAO area
352 37), ranging from Atlantic Ocean (FAO areas: 27, 34 and 41), Pacific Ocean (FAO areas: 77 and
353 87) and Indian Ocean (FAO area 57), factually proving the high presence of mercury in marine
354 habitats as a worldwide issue. Mercury is in fact a persistent toxic pollutant that bioaccumulates and
355 biomagnifies through food chains. It is currently considered that seafood products are the main
356 source of human exposure and predatory fish that occupy the higher trophic levels, such as
357 swordfish, shark and tuna, are those having the highest concentrations (EFSA, 2004). In accordance
358 with the Commission Regulation (CE) n. 1881/2006, the maximum levels of mercury in fishery
359 products and muscle meat of fish should be 0.50 mg/kg wet weight and of 1 mg/kg in some species
360 listed in the same regulation. This limit was established in response to the opinion related to
361 mercury and methylmercury in food adopted by the *European Food Safety Authority* (EFSA), that
362 endorsed the provisional tolerable weekly intake of 1.6 µg/kg bw (EFSA, 2004).

363 In this study, 50% (N=5) of consignments having non-compliant concentrations of mercury were
364 associated to the swordfish, while the other 50% involved the blue shark (N=2), whole tuna (N=1),

365 smoked marlin (N=1) and seabream (N=1). Differently from swordfish, blue shark, tuna and marlin,
366 reported among the fish highest in mercury by the FDA ([https://www.verywellfit.com/the-best-](https://www.verywellfit.com/the-best-types-of-fish-for-health-2223830)
367 [types-of-fish-for-health-2223830](https://www.verywellfit.com/the-best-types-of-fish-for-health-2223830)), the seabream is not included in the group of significant bio-
368 accumulators and, together with other lean fish, has been rarely implicated in cases of mercury
369 limits exceedance (Bosch, O'Neill, Sigge, Kerwath, & Hoffman, 2016; Brambilla et al., 2013).
370 However, a recent study proved that a considerable number of the lean fish species most frequently
371 consumed by the Spanish population (such as dusky grouper, common dentex, conger, common
372 sole, hake and angler) exceeded the maximum levels proposed by the European legislation when
373 they originate from the Mediterranean Sea (Llull, Garí, Canals, Rey-Maqueira, & Grimalt, 2017).
374 This aspect was even confirmed by Di Lena, Casini, Caproni, Fusari, & Orban (2017), that reported
375 cases of high limits exceedances in monkfish (*Lophius piscatorius*) inhabiting the Mediterranean. In
376 this respect, a recent thesis work by Telleschi (2017), that evaluated the results of analysis
377 performed on fish samples for the determination of mercury content in the context of UVAC
378 sampling executed by the Local Veterinary Unit (LVU) of Empoli (Italy) from 2012 to the first
379 semester of 2017, highlighted that the mostly sampled species was *L. piscatorius*. Thus, the
380 veterinary checks represent a valuable tool for assessing emerging risks involving the food chain, as
381 well as an encouragement for the scientific community to in-depth investigate on new hazards that
382 could compromise consumer's safety.

383 Other NC involving chemical risks were found in 1 consignment of whole tuna and 1
384 consignment of pan fried fish that not reported on the label the presence of the additives nitrate and
385 albumin, respectively, whose uses and maximum levels are established by Regulation (EC) No
386 1333/2008. Nitrites and nitrates (E249-E250), in particular, which are used as additives as they
387 exert antimicrobial effect in cured meat products, including inhibition of the outgrowth of spores of
388 putrefactive and pathogenic bacteria such as *Clostridium botulinum* (EFSA, 2003), are potentially
389 linked to health risk if their intake exceed defined limits (Waard, 2005). Among seafood, they are
390 only allowed as preservatives in pickled herrings and sprats, with maximum level of 500 mg/kg.

391 3.2.2 *Biological risks*. 15.4% (N=4) of the total non-compliant consignments involved the
392 presence of *Listeria monocytogenes*. This non-compliance was especially found in 3 consignments
393 of ready-to-eat salmon and 1 consignment of mackerel's eggs from Spain, Romania and Poland. In
394 this respect, an outbreak of *L. monocytogenes* linked to salmon processing facility in Poland was
395 recently reported in Denmark (www.seafoodnews.com). Factually, *L. monocytogenes* represents a
396 foodborne pathogen of public health concern that is primarily associated with the consumption of
397 ready-to-eat products and particularly to processed fishery products (smoked fish) (Rožman, Njari,
398 & Kozačinski, 2016). According to Regulation (EC) n. 2073/2005, FBOs manufacturing ready-to-
399 eat foods, which may pose a *L. monocytogenes* risk for public health, shall sample the processing
400 areas and equipment for this pathogen as part of their sampling scheme. Moreover, 11.5% (n=3) of
401 whole fish and fillets consignments was considered as non-compliant for the presence of the
402 parasite *Anisakis spp.* (all provided by France). In this perspective, our data highlighted a control
403 system's actual leak within the exporting companies.

404 Finally, 7.7% (N=2) bivalves consignments (mussel and oyster) were non-compliant for the
405 presence of *Norovirus*. Even in this case the NC were found through mandatory checks, since the
406 current legislation do not provide any obligation to perform official controls for the detection of
407 *Norovirus*. Therefore, it may be assumed that such types of checks had been applied in response to
408 previous or concurrent RASFF alert notifications. Factually, among the 219 alert and border
409 rejection RASFF notifications for *Norovirus* from 1979 until 31 August 2017, 143 (65.3%)
410 involved bivalve molluscs and products thereof (Papapanagiotou, 2017). Interesting to note, the
411 non-compliant mussel consignments was produced in Galicia and, according to the Spanish Agency
412 for Consumer Affairs, Food Safety and Nutrition (AECOSAN) the recent cases of *Norovirus*
413 outbreaks in the Valencian Community are linked to mussels of Galician origin (Smallman, 2018).

414 3.2.3 *Other risks*. Physical risks, documental irregularities and misidentification cases were
415 recorded. Physical risks were linked to the presence of metallic foreign bodies in 2 molluscs
416 consignments. Documental irregularity (2 consignments) was due to the discrepancy between the

417 species' scientific name reported on the label and that declared on the consignments' documents.
418 Overall, the mislabelling rate was rather low if compared to the 22.5% reported by the recent work
419 of Guardone et al. (2017), in a survey conducted at the Border Inspection Post of Livorno-Pisa
420 (Italy) related to official controls of fishery products imported from Third Countries. It could be
421 assumed that the EU law on seafood labelling is better applied by FBOs producing and marketing
422 fishery products within the EU borders. Finally, a single misidentification case was due to an
423 erroneous labelling of the consignment.

424 *3.2.4 Measures implemented on non-compliant consignments.* According to the Article 7 of the
425 Council Directive 89/662/EEC on veterinary checks in intra-EU trade “*if during a check carried out*
426 *at the place of destination [...] the competent authorities of a Member State establish [...] that the*
427 *goods do not meet the conditions laid down by Community directives [...] they may give the*
428 *consignor or his representative the choice of destroying the goods, or using the goods for other*
429 *purposes, including returning them with the authorization of the competent authority of the country*
430 *of the establishment of origin*”. Among consignments presenting NC, 61.5% (n=16), which
431 represented 2.07% of the total 774 checked seafood consignments, were destroyed (Table 3), for a
432 final amount of 1866,98 Kg. This measure especially included consignments involving health risks:
433 7 consignments from Spain with chemical risks (mercury and nitrate) and 9 consignments with
434 biological risks (*L. monocytogenes*, *Anisakis spp.*, *Norovirus*). 23.1% (n=6) of non-compliant
435 consignments were re-dispatched, four of which involving chemical or physical risks (Table 3).
436 Finally, 1 misidentified consignment was regularised, according to the same directive establishing
437 that if the certificate or the documents are found to contain irregularities, the consignor must be
438 granted a period of grace to regularise the goods (Council Directive 89/662/EEC).

439 **Conclusions**

440 Veterinary official checks represent a pillar within the EU food legislation as they provide an
441 essential tool for assessing and containing risks involving the food chain. The checks' percentage is
442 generally planned according to a targeted risk assessment process that primarily requires the

443 identification of hazards related to a given food category and it is mostly based on the historical
444 data gathering. The sharing of information between various European entities especially assumes a
445 central role for this purpose. In this respect, the checks performed by UVAC, although included in a
446 strictly Italian context, may play a role for the enlargement of the EU data pool to draw from.
447 Factually, outcomes from this study highlighted the presence of concrete health chemical and
448 biological risks involving seafood consignments freely circulating within the EU market and,
449 although the few cases, pitfalls in the companies' control systems at pan-European level were
450 revealed. Such evidence pointed out the importance of national ancillary checks in protecting
451 consumers' health.

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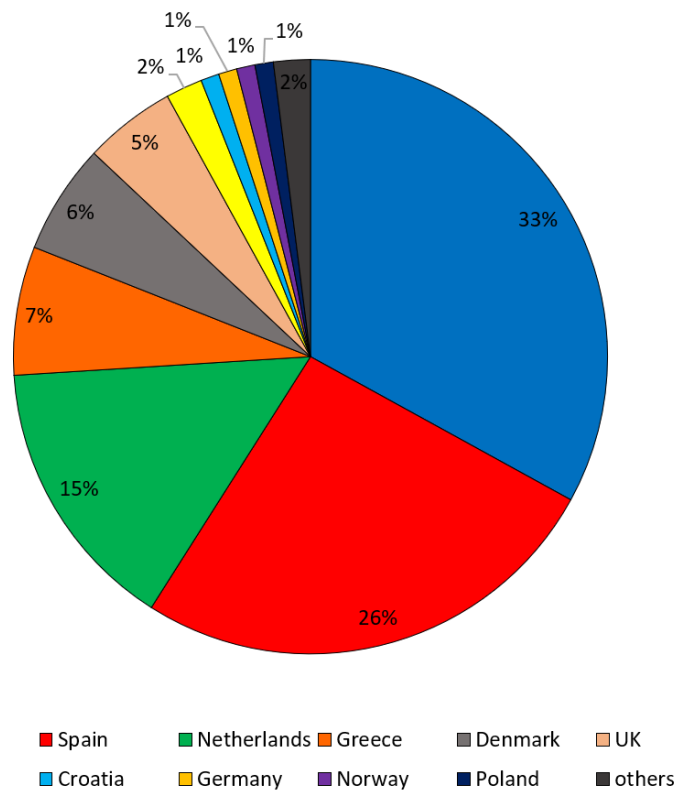
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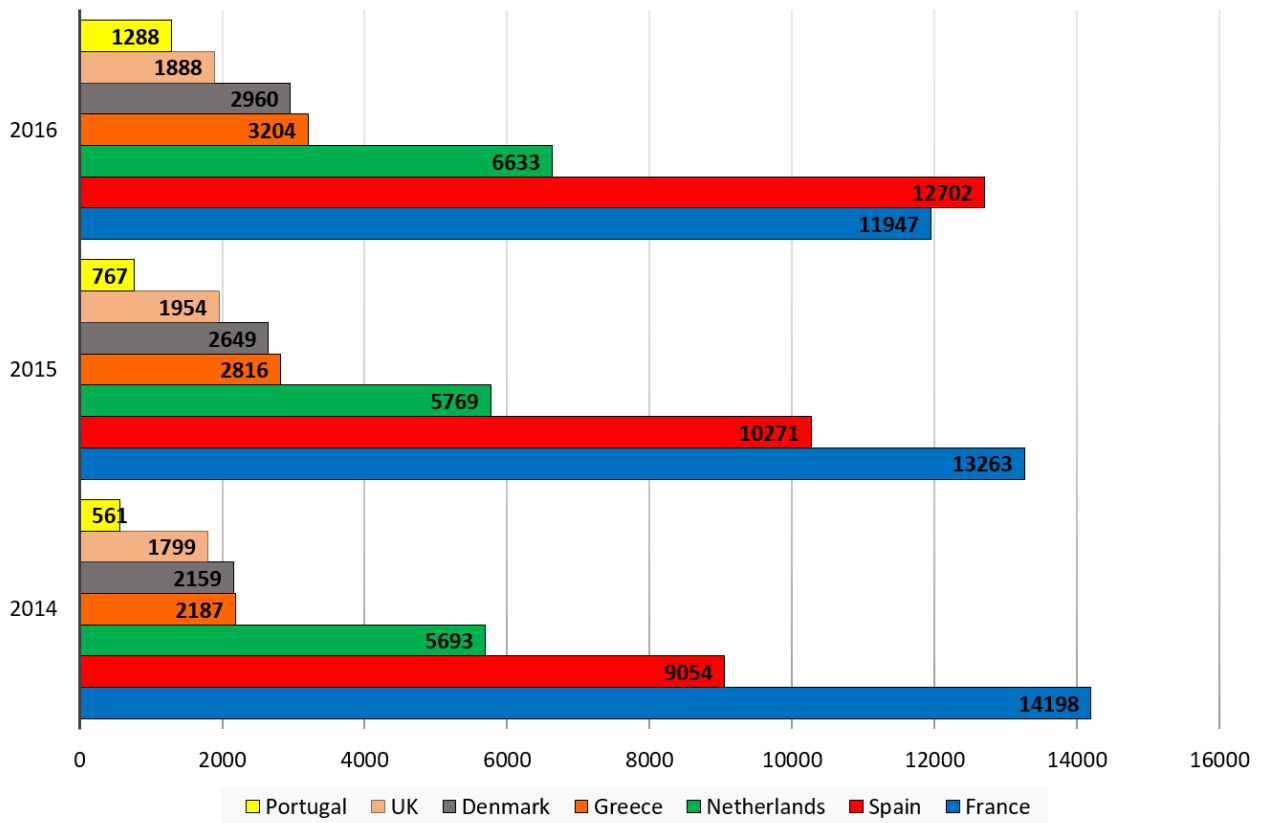
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576 **Figures**



578 **Fig. 1: Percentages of seafood consignments pre-notified to S.INTE.S.I.S by country origin (period 2014-2016).**

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Fig. 2: Number of seafood consignments pre-notified to S.INTE.S.I.S and imported from the major providers.
Each analysed year was considered separately.

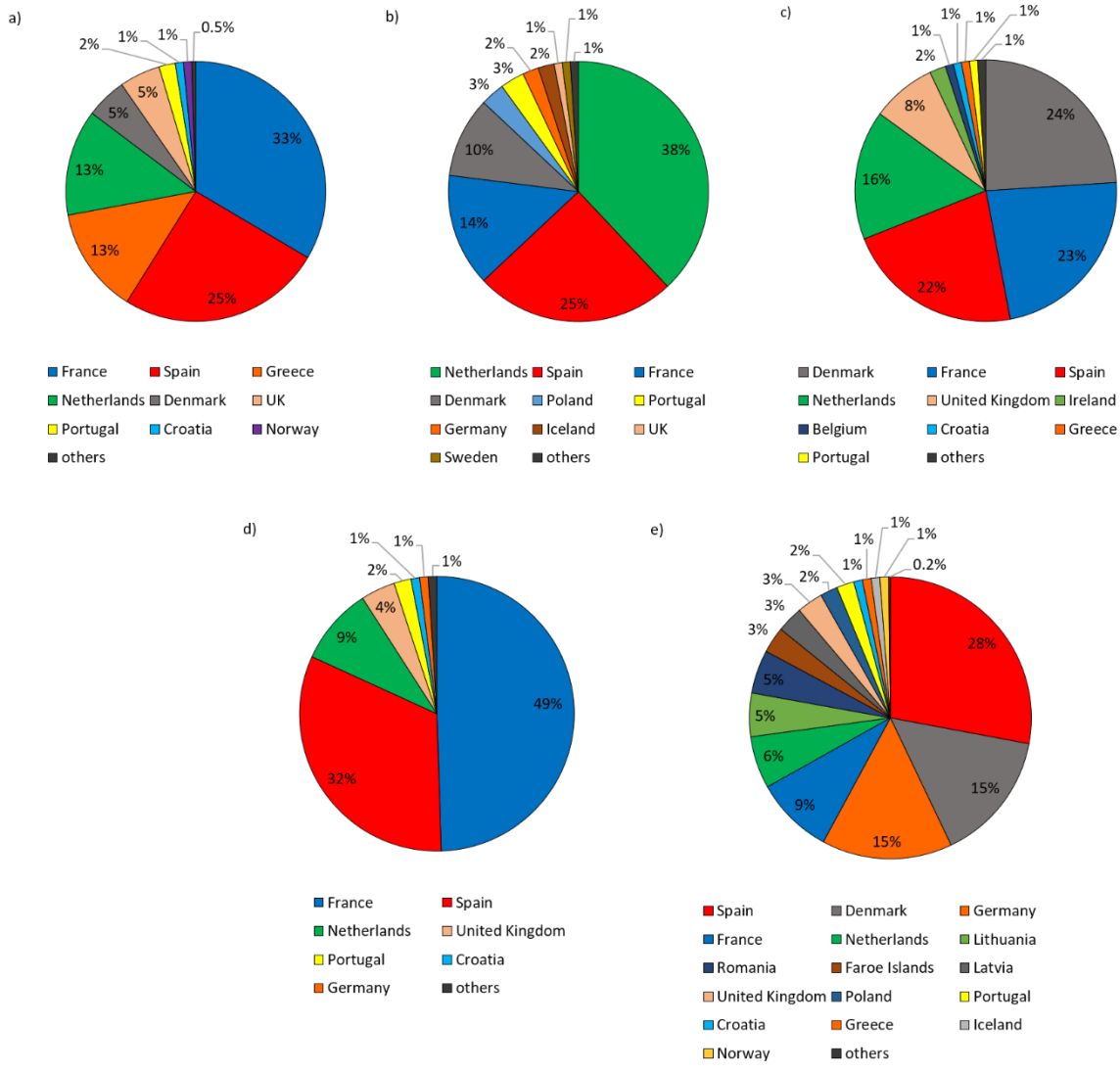
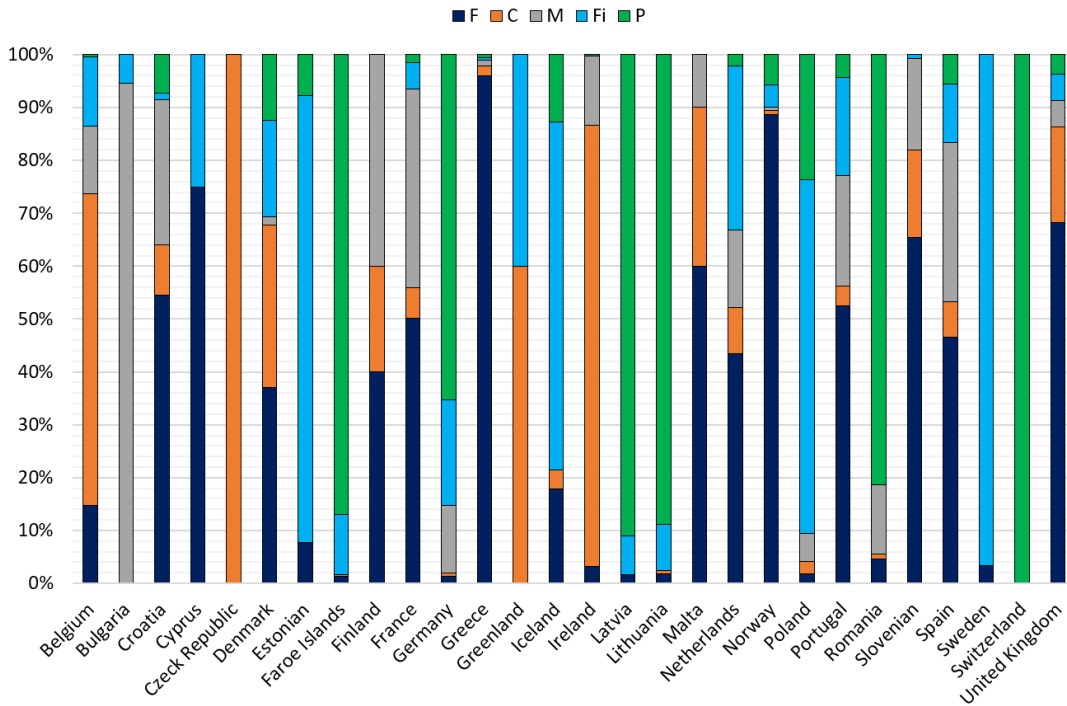


Fig. 3: Percentages on products' origin among different seafood categories. a) Fish (F); b) Fillets (Fi); c) Crustaceans (C); d) Molluscs (M); e) Processed products (P).

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Fig. 4: Seafood export trend (%) of each considered MSs and EFTA State.

Tables

	Type of UVAC veterinary check	Total consignments number in 2014	Total consignments number in 2015	Total consignments number in 2016	Total consignments number in the entire period
Extra-planned	Planned	212	191	172	575
	Mandatory check	40	39	56	135
	Check For suspicion	13	9	10	32
	LVU monitoring check	7	17	8	32
	Total consignments number per-year	272	256	246	774

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Table 1. Number of planned and extra-planned UVAC veterinary checks (per-year and within the entire period)

Type of control	2014		2015		2016	
	N/total checked	%	N/total checked	%	N/total checked	%
Documental	272/272	100%	256/256	100%	246/246	100%
Identity	271/272	99.6%	256/256	100%	246/246	100%
Physical	260/272	95.6%	252/256	98.4%	246/246	100%
Laboratory	109/272	40.1%	92/256	35.9%	112/246	45.5%

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Table 2. Type of control made of consignments (number and percentage) per-year.

	Type of non-compliance	Seafood category	Consignment's labelling	Number of consignments	Check	Origin	Measure
Chemical risk	Heavy metals: mercury	F	swordfish (<i>Xiphias gladius</i>)	4	E(M)	Spain	destroyed
		Fi	swordfish (<i>Xiphias gladius</i>)	1	E(S)	Spain	used
		F	tuna	1	E(M)	Spain	destroyed
			seabream	1	E(L)	Spain	destroyed
			blue shark	1	E(L)	Spain	regularised
			blue shark	1	E(M)	Portugal	re-dispatched
	P	smoked marlin	1	E(M)	Spain	destroyed	
Additives Nitrate	Fi	tuna (<i>Thunnus albacares</i>)	1	E(M)	Spain	destroyed	
Additives: Albumin	P	pan fried fish	1	E(M)	Netherlands	re-dispatched	
Biological risk	Bacteria: <i>L. monocytogenes</i>	Fi	salmon tartare	2	E(M)	Spain	destroyed
		P	smoked Pacific salmon (<i>Oncorhynchus spp.</i>)	1	E(M)	Poland	destroyed
			mackerel's eggs	1	E(M)	Romania	destroyed
	Parasites: <i>Anisakis spp.</i>	F	jon dory (<i>Zeus faber</i>)	1	E(M)	France	destroyed
		F	tub gurnard	1	E(M)	France	destroyed
		Fi	tub gurnard	1	E(S)	France	destroyed
	Virus: <i>Norovirus</i>	M (bivalves)	mussel (<i>Mytilus spp.</i>)	1	E(M)	Spain	destroyed
oyster			1	P	France	destroyed	
Physical risk	metallic foreign bodies	M (cephalopods)	squid	2	E(M)	Spain	re-dispatched
Documental irregularities	label/lot document discrepancy	F	smooth-hound (<i>Mustelus spp.</i>)	2	E(M)	Portugal	re-dispatched
Misidentification	mislabelling	Fi	tuna (<i>Thunnus albacares</i>)	1	E(M)	Spain	regularised

Table 3. Types of non-compliances found on checked consignments with relative number, type of control and implemented measure. P: planned; E(M): extra-planned (mandatory check); E(S): extra-planned (check for suspicion); E(L): extra-planned (LVU monitoring check).

Highlights

1. A data analysis on the 2014-2016 seafood checks of the UVAC of Tuscany was performed
2. Fish was the most representative category, with Spain, France as major suppliers
3. Checks rate was higher than the national one and 26 non-compliant consignments were found
4. Chemical (mercury, additives) and biological (*L. monocytogenes*, *Anisakis*, *Norovirus*) risks were revealed
5. UVAC checks were proved as usefulness for further protecting EU consumers

e-component

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