



# New official Bulgarian list of seafood trade names: coping with EU labelling requirements and market trends to enhance consumers' informed choice

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## Abstract

The present study aimed at assessing the validity and accuracy of the new official Bulgarian list of seafood trade names in compliance with EU requirements, and the list evolution and adherence to the Bulgarian market trends. The new list consists of 88 commercial designations (CD) associated with 81 scientific names (SN) provided as 72 species, 8 genera and 1 family mostly belonging to the fish category (86.4%, SN = 70). The list analysis highlighted the presence of 14 invalid SN (17.3%), with an obsolete classification. In terms of adherence to the Bulgarian market's trend the inclusion of 51 new SN reflecting fishing data in total, both from inland waters and along the Black Sea coast was pointed out. However, 44 SN relating to commercially relevant species and currently available at purchase were deleted. In terms of accuracy, the introduction of SN as family, the significant reduction of CDs and the use of vague CDs lead the list to distance itself from the one name-one fish conception, proposed at international level, as ideal approach for unambiguous product identification by the consumer. To conclude, the analysis shows a clear will of the national Bulgarian Legislator to enhance local fisheries and aquaculture trade. Nevertheless, major issues related to the SN validity and the non-adherence to seafood market trends are highlighting the ineffectiveness of the current list in describing retail seafood products. This emphasizes the urgency to provide a further substantial list revision.

**Keywords** Seafood trade · Labelling market · EU regulation · Fisheries · Commercial designations · Official Bulgarian list

## 1 Introduction

Seafood traceability, sustainability and frauds countering represent major inspiring principles of the EU common organisation of the markets in fishery and aquaculture products (CMO), as defined by the Council Regulation EU No.

1379/2013. This regulation integrates with the common marketing standards for unprocessed fishery (Council Regulation EC No. 2406/1996) and the control system of the European Common Fisheries Policy (CFP) as defined in the Council Regulation EC No. 1224/2009 and its Implementing Regulation EU No. 404/2011. All the above-mentioned regulations require fishery and aquaculture products to be identified with a valid scientific name throughout the entire supply chain. Pursuant to the Regulation EC No. 1224/2009, each catch or production batch has also to be associated with mandatory information on:

- a. fishing or harvesting area;
- b. the type of gear and mesh size and dimension used during the catching;
- c. a weight estimation of the lot; and
- d. the FAO alpha-3 code of each species.

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The FAO 3-letter code, imposed to monitor and trace the species catches, is directly accessible by the FAO database.<sup>1</sup> Its presence constitutes an additional informative element in support of both the Food Business Operators (FBOs) and the Competent Authorities (Cas) for monitoring the traceability of the products.

The Regulation EU No. 1379/2013 defines mandatory information for labelling of seafood intended for sale to the final consumer (Article 35). In addition to the indications included in the Regulation EC No. 1224/2009, it requires mandatory information such as:

- product trade name composed by the commercial designation,
- scientific name,
- the date of minimum durability (where appropriate), and
- the mention of a previous freezing-thawing process.

Furthermore, each Member State is delegated to draw up and update an official list, reporting the commercial designation accepted throughout the country in association with a valid scientific name in accordance with FAO reference databases (Article 37).

In Bulgaria, the first official list was published by the Ministry of Agriculture, Food and Forestry within the Ordinance No. 4 of 13.01.2006 (2006). However, based on two recent surveys on the Bulgarian market, the list was found to be ineffective in describing the seafood products marketed at national level in the various retail channels (Tinacci et al. 2018, 2020). Major deficiencies concerned the absence of official commercial designations for:

- a. several commercially relevant fish species from the Black Sea and the Bulgarian aquaculture sector,
- b. several highly imported species,
- c. crustacean and mollusc species, despite the increased consumers' demand and imports.

Moreover, the use of obsolete scientific names and commercial designation, were highlighted (Tinacci et al. 2018, 2020). In this respect, the Ministry of Agriculture, Food and Forestry recently issued the Ordinance No. 13 30.11.2021 (2021) on “*Terms and conditions for making the first sale of fishing products*” which includes the applicative guidelines for Regulation EC No. 1224/2009 and Regulation EC No. 2406/1996, and the new Bulgarian list of seafood commercial designations. Upon the Ordinance publication, the previous list has been abrogated and entirely repealed.

Based on this, the present study aimed at verifying the validity, correctness, and accuracy of the new official list of commercial designations according to the Regulation EU No. 1379/2013 and evaluating its evolution and adherence to the Bulgarian market's trend.

## 2 Materials and methods

### 2.1 Descriptive analysis: correctness and validity of the updated list

The structure and correctness of the new Bulgarian official list of seafood commercial designation was analysed according to the model proposed by Tinacci et al. (2019). The listed SN, consisting of one species or genus names, were firstly grouped in 4 taxonomical categories:

1. Fresh water, anadromous and marine fish (Chondrichthyes; Osteichthyes) (F);
2. Crustaceans (C);
3. Mollusc bivalves, cephalopods and gastropods (M);
4. Other organisms (O) (Echinoderms, tunicates animals, Cnidaria, Amphibians).

The SN were checked according to FAO's official information systems<sup>2</sup> and as well as the World Register of Marine Species<sup>3</sup> (WorMS) that were used as taxonomic authorities. All SN with the associated commercial designations (CD) were counted. The correctness of the FAO alpha-3 codes was assessed by comparing them to those reported on the Aquatic Sciences and Fisheries Information System (ASFIS) (FAO 2022a).

### 2.2 Adherence to bulgarian market trends

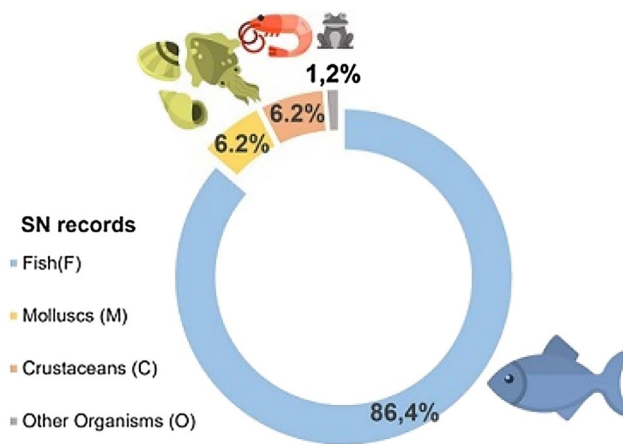
This aspect was evaluated by comparing the SN and commercial denominations (CD) from the list with data from:

- a. the outcomes of two previous studies (Tinacci et al. 2018, 2020);
- b. the Bulgarian seafood market (Todorov 2020), and
- c. market products available at purchase, collected within a three-year monitoring plan (2019–2021) as part of the National Scientific Program funded by Bulgarian Ministry of Education and Science.

<sup>1</sup> <https://www.fao.org/fishery/en/collection/asfis/en>. Accessed 25 July 2022.

<sup>2</sup> <https://www.fishbase.de/home.htm>; <https://www.sealifebase.se/search.php>. Accessed 25 July 2022.

<sup>3</sup> <https://www.marinespecies.org/>. Accessed 25 July 2022.



**Fig. 1** Graphic representation of the Scientific names (SN) distribution within the taxonomical categories

### 2.3 List accuracy

The current list was compared to the previous one (Ordinance No. 4 30.01.2006, Ministry of Agriculture, Food and Forestry 2006) to assess both the overall and the categories' evolution trend in terms of included number of records. The list accuracy was assessed by calculating a species index (SI) corresponding to the ratio of the total number of CD and the number of SN as proposed by Xiong et al. (2016). A second index, the "cumulative species index" (c-SI), was also calculated by dividing the total number of CD with the total number of listed species-specific SN, and then added

with the total number of species from the FAO databases for each included genus or family name.

## 3 Results and discussion

### 3.1 Descriptive analysis: correctness and validity of the updated list

The new Bulgarian list of official seafood designations contains 4 subsections (freshwater fish, anadromous fish, marine fish, other organisms) in which 88 CD are associated with 81 SN (72 species, 8 genera and 1 family). Considering the taxonomical categories assigned in this study, F contributes for 86.4% ( $n=70$ ), followed by C (6.2%,  $n=5$ ), M (6.2%,  $n=5$ ) and O (1.2%;  $n=1$ ) (Fig. 1). Overall, this results show that the main attention of the legislator was primarily focused on fish. This could be due to market demands that are less oriented towards other seafood categories (see Sect. 3.2 for more details).

Regarding the correctness and the validity of the SN as referred in the FAO and WorMS databases, 14 SN (17.3%) were misclassified because of obsolete classifications (Table 1). The periodic verification of SN validity is required due to the constant updating in seafood phylogeny research, and is also recommended by the Regulation EU No. 1379/2013 (Tinacci et al. 2019). A regularly revision of the taxonomic classification is even more needed given the evidence collected on the newly published list.

**Table 1** Seafood list included in the Ministerial Decree where invalid SN were provided

Commercial designation	English name (FAO data)	Scientific name listed in the ordinance	Valid name (FAO, WorMS databases <sup>a</sup> )
Распер	Asp	<i>Aspius aspius</i>	<i>Leuciscus aspius</i>
Брияна (облез, уклея)	Danube bleak	<i>Chalcalburnus chalcoides</i>	<i>Alburnus chalcoides</i>
Немски косат	White-eye bream	<i>Abramis sapa</i>	<i>Ballerus sapa</i>
Чил косат	Zope	<i>Abramis ballerus</i>	<i>Ballerus ballerus</i>
Черна (балканска) мряна	Romanian barbel	<i>Barbus meridionalis petenyi</i>	<i>Barbus petenyi</i>
Сребриста каракуда	Prussian carp	<i>Carassius auratus gibelio</i>	<i>Carassius gibelio</i>
Кефал пелингас	So-iuy mullet	<i>Mugil soiyu</i>	<i>Planiliza haematocheilus</i>
Платерина	Golden grey mullet	<i>Liza aurata</i>	<i>Chelon auratus</i>
Илария	Leaping mullet	<i>Liza saliens</i>	<i>Chelon saliens</i>
Карагъоз, дунавска скумрия	Ponti shad	<i>Caspialosa pontica</i> <i>Alosa pontica</i>	<i>Alosa immaculata</i>
Лаврак	European seabass	<i>Dicentrarchus labrax</i> <i>Morone labrax</i>	<i>Dicentrarchus labrax</i>
Писия	European flounder	<i>Platichthys flesus luscus</i>	<i>Platichthys flesus</i>
Миди речни, седефки	–	<i>Unio</i> sp.	<i>Vulsella</i> sp.
	Marsh frog	<i>Rana ridibunda</i>	<i>Pelophylax ridibundus</i>

<sup>a</sup><http://www.fishbase.de>; <http://www.sealifebase.org>; <http://www.marinespecies.org>

**Table 2** New SN included in the current list (Ordinance No. 13, 30.11.2021) with incorrect ASFIS codes

Listed SN	ASFIS code listed in the Ordinance	Correct ASFIS code <sup>a</sup>	Note
<i>Coregonus peled</i>	WHF	CIJ	Alpha-3 code listed associated with <i>Coregonus</i> sp
<i>Abramis ballerus</i>	FBR	NR	Alpha-3 code listed associated with <i>Abramis</i> sp.
<i>Carassius auratus gibelio</i> (valid name <i>C. gibelio</i> )	CGO	CWG	Alpha-3 code listed associated with <i>Carassius auratus</i>
<i>Atherina</i> sp.	SIL	AVX	Alpha-3 code listed associated with Atherinidae
<i>Lophius piscatorius</i>	ANF	MON	Alpha-3 code listed associated with Lophiidae
<i>Crangon</i> sp.	CSH	CNZ	Alpha-3 code listed associated with <i>Crangon crangon</i>
<i>Astacus leptodactylus</i>	AYS	CRD	Alpha-3 code listed associated with Astacidae/Cambaridae

<sup>a</sup><https://www.fao.org/fishery/en/collection/asfis/en>

A new element compared to the previous ordinance is the presence of alpha 3-codes listed alongside the individual SNs. Pursuant to Regulation EC No. 1224/2009, FBOs are required to associate the alpha-3 code immediately after sorting each species at catch registration on the vessel. Therefore, the code is on all enclosed documents of the individual lots and available during the first sale of the products. Thus, this information may be included in order to offer FBO an alternative consultation tool to the ASFIS database, which may not be readily consulted by the operators even though it is freely accessible (Tinacci et al. 2019). Nevertheless, the analysis of the alpha-3 codes highlighted a wrong association with 4 species and 3 genera (Table 2).

### 3.2 Adherence to the bulgarian market trends

An increase of 51 SN in the current list compared to the previous one was observed, including 42 species, 8 genera, and 1 family (Table 3). In general, the species present in the current list reflect fishing data from both inland waters (Danube and inland watersheds) and the Black Sea. In addition, species from aquaculture and restocking activities for recreational fisheries are included (Todorov 2020; FAO 2022b, c). The newly introduced SN mainly refer to freshwater species leading the aquaculture sector. These species are well represented in local catches, and are still playing a significant role in less developed areas bordering the Danube River (Raykov and Triantapylidis 2015; FAO 2022b, c). There is a massive presence of fish species belonging to the Cyprinidae and Salmonidae family, and some highly valuable species of the Acipenseridae family, widely reported in inland waters at national level (Shivarov 2021). Additionally, marine species of commercial interest at national and local level such as *Rapana* sp., *Atherina* sp. or *Belone belone* and *Dicentrarchus labrax* have been added on the list. This is significantly different to the previous list, as already highlighted by Tinacci et al. (2018, 2020). In general, SN refer to species that are relevant and represented in local

fisheries along the Black Sea coast such as: European sprat (*Sprattus sprattus*), sardine (*Sardina pilchardus*), Mediterranean horse mackerel (*Trachurus mediterraneus*), mullet (*Mugil* sp.), bonito (*Sarda sarda*), bluefish (*Pomatomus saltatrix*), whiting (*Merlangius merlangus*) red mullet (*Mullus barbatus*), turbot (*Scophthalmus maxims*), gobies (Gobiidae family), piked dogfish (*Squalus acanthias*), thornback ray (*Raja clavata*) (Shivarov 2021). This policy update shows the will of the national legislator to include and valorise local fisheries and aquaculture productions. Considering the significant drop in national production in the last 4 years, mainly due to lower production of the main cultured species, makes this even more relevant. Therefore, the policy update is probably an attempt to relaunch the sector by ensuring that the product labelling in compliance with European legislation (Todorov 2020). Nevertheless, despite the introduction of 51 new SN, the overall increase of the total number of SN (n=81) is just slightly higher than in the previous list (n=74), which is due to the removal of 44 SN (33 species and 11 genera) from the list (Table 3). Also, the total number of SN is still notably below the number of records listed by other EU Member States (Tinacci et al. 2018). Therefore, the revision of the list is not adhering to the principles of consumer information enunciated by the Regulation EU No. 1379/2017. This is in contrast with the increasing number of species included in the official lists both of other European countries and at international level, as a result of periodic updates.<sup>4</sup> An example is described for the Italian official list in Tinacci et al. (2019). The gradual expansion of the official list in relation to the increasing variability of supply is crucial to guarantee consumer rights on informed choice, and to encourage informed consumption of fish products.

<sup>4</sup> [https://ec.europa.eu/oceans-and-fisheries/fisheries/markets-and-trade/seafood-markets/commercial-and-scientific-name-species\\_en](https://ec.europa.eu/oceans-and-fisheries/fisheries/markets-and-trade/seafood-markets/commercial-and-scientific-name-species_en); <https://www.fda.gov/food/seafood-guidance-documents-regulatory-information/fda-seafood-list-updates-2021>. Accessed 25 July 2022.

**Table 3** Results of the comparative analysis of the current (Ordinance No. 13 30.11.2021) and repealed (Ordinance No. 4, 30.01.2006) official lists. Both the newly included and the deleted records are shown

Taxonomical order/family	New records			Deleted records		
	Commercial designation (CD)	English name (FAO data)	Scientific name (SN) [valid name]	Commercial designation (CD)	English name (FAO data)	Scientific name (SN)
<i>Fresh water and marine fish</i>						
Acipenseriformes Acipenseridae	Чига	Sterlet sturgeon	<i>Acipenser ruthenus</i>	–	–	–
	Моруна	Beluga	<i>Huso huso</i>			
	Пъструга	Starry sturgeon	<i>Acipenser stellatus</i>			
	Руска есетр	Danube sturgeon	<i>Acipenser gueldenstaedtii</i>			
Anguilliformes Anguillidae	Европейска речна змиорка	European eel	<i>Anguilla anguilla</i>	–	–	–
Anguilliformes Congridae	–	–	–	Морска змиорка	European Conger	<i>Conger conger</i>
Beloniformes Belonidae	Зарган	Garfish	<i>Belone belone</i>	–	–	–
Carangiformes Carangidae	–	–	–	Сафрид	“horse mackerel/ jack mackerel/ scad”	<i>Trachurus</i> sp
Carcharhiniformes Scyliorhinidae	–	–	–	Черноморска акула	“catshark”	<i>Scyliorhinus</i> sp.
Clupeiformes Clupeidae	–	–	–	Херинга Хамсия	herring “anchovy”	<i>Clupea harengus</i> <i>Engraulis</i> sp
Cypriniformes Cyprinidae	Мъздруга	Ide	<i>Leuciscus idus</i>	Бабушка	Roach	<i>Rutilus rutilus</i>
	Распер	Asp	<i>Aspius aspius</i> [ <i>leuciscus aspius</i> ]	Червеноперка	Rudd	<i>Scardinius erythrophthalmus</i>
	Лин	Tench	<i>Tinca tinca</i>	Каракуда	“carp”	<i>Carassius</i> sp.
	Брияна (облез, уклея)	Danub bleak	<i>Chalcalburnus chalcoides</i>			
	Немски косат	White-eye bream	<i>Abramis sapa</i> [ <i>Ballerus sapa</i> ]			
	Чил косат	Zope	<i>Abramis ballerus</i> [ <i>Ballerus ballerus</i> ]			
	Морунаш	“Vimba”	<i>Vimba</i> sp.			
	Маришки морунаш (карабальк)	Macedonian vimba	<i>Vimba melanops</i>			
	Сабица	Sichel	<i>Pelecus cultratus</i>			
	Черна (балканска) мряна	Romanian barbel	<i>B. meridionalis petenyi</i> [ <i>Barbus petenyi</i> ]			
	Маришка мряна	Round-scaled barbel	<i>Barbus cyclolepis</i>			
	Златиста каракуда	Crucian carp	<i>Carassius carassius</i>			
	Сребриста каракуда	Prussian carp	<i>Carassius auratus gibelio</i> [ <i>Carassius gibelio</i> ]			
	Черен амур	Black carp	<i>Mylopharyngodon piceus</i>			
Cypriniformes Catostomidae	Буфало	“buffalo”	<i>Ictiobus</i> sp	–	–	–

Table 3 (continued)

Taxonomical order/family	New records			Deleted records		
	Commercial designation (CD)	English name (FAO data)	Scientific name (SN) [valid name]	Commercial designation (CD)	English name (FAO data)	Scientific name (SN)
Gadiformes Gadidae	–	–	–	Треска	Atlantic cod	<i>Gadus morhua</i>
				Пикша	Haddock	<i>Melanogrammus aeglefinus</i>
				Путасу	Blue whiting	<i>Micromesistius poutassou</i>
				Треска от вида	Saithe	<i>Pollachius virens</i>
				Треска от вида	Pollack	<i>Pollachius pollachius</i>
				Треска от вида	Pouting	<i>Trisopterus luscus</i>
				Треска от вида	Poor cod	<i>Trisopterus minutus</i>
Gadiformes Lotidae	Михалца	Burbot	<i>Lota lota</i>	Морска щука	“ling”	<i>Molva</i> sp
Lophiiformes Lophiidae	Морски дявол	Angler	<i>Lophius piscatorius</i>	Морски дявол	“Angler/monkfish”	<i>Lophius</i> sp
Myliobatiformes Dasyatidae	Морска котка	Common stingray	<i>Dasyatis pastinaca</i>	–	–	–
Mugiliformes Mugilidae	Морски кефал	Flathead grey mullet	<i>Mugil cephalus</i>	Кефал	“mullet”	<i>Mugil</i> sp
	Кефал пелингас	So-iuy mullet	<i>Mugil soiuy</i> [ <i>Planiliza haematocheilus</i> ]	–	–	–
	Платерина	Golden grey mullet	<i>Liza aurata</i> [ <i>Chelon auratus</i> ]			
	Илария	Leaping mullet	<i>Liza saliens</i> [ <i>Chelon saliens</i> ]			
Perciformes Atherinidae	Атерина	“smelt”	<i>Atherina spp.</i>	–	–	–
Perciformes Gobiidae	Попчета	“Goby”	<i>Gobiidae</i>	–	–	–
Perciformes Moronidae	Лаврак	European seabass	<i>Morone labrax</i> [ <i>Dicentrarchus labrax</i> ]	–	–	–
Perciformes Sparidae	–	–	–	Гопа	Bogue	<i>Boops boops</i>
				Смарид	Picarel	<i>Maena smaris</i> [ <i>Spicara smaris</i> ]
				Кантар	Black seabream	<i>Spondylisoma cantharus</i>
Perciformes Triglidae	–	–	–	Морска лястовица	Piper gurnard	<i>Trigla sp</i> [ <i>Trigla lyra</i> ]
Pleuronectiformes Pleuronectidae	–	–	–	Писия от вида	European place	<i>Pleuronectes platessa</i>
				Писия от вида	Common dab	<i>Limanda limanda</i>
				Писия от вида	Lemon sole	<i>Microstomus kitt</i>
Pleuronectiformes Scophthalmidae	Калкан	Turbot	<i>Scophthalmus maximus</i>	Калкан CD wrongly assigned <sup>a</sup>	Turbot “megrim”	<i>Psetta maxima</i> <i>Lepidorhombus</i> sp
Pleuronectiformes Soleidae	Морски език	Common sole	<i>Solea solea</i>	Морски език	“sole”	<i>Solea</i> sp.
Rajiformes Rajidae	Морска лисица	Thornback ray	<i>Raja clavata</i>	Морска лисица	“ray/skate”	<i>Raja</i> sp.

Table 3 (continued)

Taxonomical order/family	New records			Deleted records		
	Commercial designation (CD)	English name (FAO data)	Scientific name (SN) [valid name]	Commercial designation (CD)	English name (FAO data)	Scientific name (SN)
Salmoniformes Salmonidae	Речна(балканска) пъстърва	Sea trout	<i>Salmo trutta fario</i>	–	–	–
	Дъгова пъстърва	Rainbow trout	<i>Oncorhynchus mykiss</i>			
	Сивен	Brook trout	<i>Salvelinus fontinalis</i>			
	Дунавска пъстърва	Huchen	<i>Hucho hucho</i>			
	Чудски сиг	European whitefish	<i>Coregonus lavaretus</i>			
	Пелед	Peled	<i>Coregonus peled</i>			
	Липан	Grayling	<i>Thymallus thymallus</i>			
Scombriformes Bramidae	–	–	–	CD wrongly assigned <sup>a</sup>	“pomfret”	<i>Brama sp.</i>
Scombriformes Scombridae	Черноморска скумрия	Atlantic mackerel	<i>Scomber scombrus</i>	Атлантическа скумрия	–	–
				Японска скумрия	Chub mackerel	<i>Scomber japonicus</i>
				Дългопер тон	Albacore	<i>Thunnus alalunga</i>
				Тон от вида	Atlantic bluefin tuna	<i>Thunnus thynnus</i>
Scombriformes Trichiuridae	–	–	–	Тон от вида	Bigeye tuna	<i>Thunnus obesus</i>
				CD wrongly assigned <sup>a</sup>	Silver scaddarfish	<i>Lepidopus caudatus</i>
Scorpaeniformes Sebastidae	–	–	–	Морски костур	“rockfish”	<i>Sebastes sp.</i>
Siluriformes Siluridae	Канален (американски) сом	Channel catfish	<i>Ictalurus punctatus</i>	–	–	–
<i>Crustaceans</i>						
Decapoda Carcinidae	Обикновен (зелен) крив рак	Green crab	<i>Carcinus maenas</i>	–	–	–
Decapoda Canceridae	–	–	–	Рак пустинник		<i>Cancer pagurus</i>
Decapoda Crangonidae	Пясъчна скарида	–	<i>Crangon sp.</i>	Сиви скариди		<i>Crangon crangon</i>
Decapoda Pandalidae	–	–	–	Северни скариди	Northern shrimp	<i>Pandalus borealis</i>
Decapoda Palaemonidae	Обикновени скариди	–	<i>Leander sp</i>	–	–	–
<i>Mollusk bivalves, cephalopods and gastropods</i>						
Myida Myidae	Бяла пясъчна мида	Softshell clam	<i>Mya arenaria</i>	–	–	–
Pectinida Pectinidae	–	–	–	Миди от вида	Great Atlantic scallop	<i>Pecten maximus</i>
Sepiida Sepiidae	–	–	–	Сепия	Common cuttlefish	<i>Sepia officinalis</i>
Sepiida Sepiolidae	–	–	–	Сепия	Stout bobtail	<i>Rossia macrosoma</i>

**Table 3** (continued)

Taxonomical order/family	New records			Deleted records		
	Commercial designation (CD)	English name (FAO data)	Scientific name (SN) [valid name]	Commercial designation (CD)	English name (FAO data)	Scientific name (SN)
Ostreida Malleidae	Миди речни, седефки	–	<i>Unio</i> sp. [ <i>Vulsella</i> sp.]	–	–	–
Unionida Unionidae	Миди речни, беззъбки	Woebegone floater	<i>Anodonta</i> sp.	–	–	–
Muricidae <i>Other organisms</i>	Рапан.	“rapa”	<i>Rapana</i> sp.	Охлюви от вида	Waved whelk	<i>Buccinum undatum</i>
Anura/Ranidae	Голяма водна жаба	Marsh frog	<i>Rana ridibunda</i> [ <i>Pelophylax ridibundus</i> ]	–	–	–

The square brackets [] specify the valid scientific names according to the official reference databases (FAO, WoRMS)

<sup>a</sup>Evidence from Tinacci et al. (2018)

This aspect was also stressed in a recent study by Paolacci et al. (2021) on the compliance of labels of seafood products to EU legislation. In the study, low attention to traceability and correct labelling was observed in those European countries where consumers are unfamiliar with the appearance of seafood species and are not adequately informed about the variability of seafood. In this sense, a product label showing SN combined with well-known CD is a way to educate consumers regarding conscious purchase.

In fact, with the new Bulgarian list that came into force, FBO are lacking relevant seafood CD. Specifically, the updated list is contradictory to the expansion of the Bulgarian seafood market towards Mediterranean, Atlantic and Pacific species like Clupeids, Scombrids, Gadids and Merluccids (Tinacci et al. 2020). The official deletion of those SN poses a contingent deficiency for marketing imported products such as Atlantic cod (*Gadus morhua*), pollack (*Pollachius pollachius*), saithe (*Pollachius virens*) haddock (*Melanogrammus aeglefinus*), herring (*Clupea harengus*), bluefin tuna (*Thunnus thynnus*), big eye tuna (*Thunnus obesus*) and chub mackerel (*Scomber japonicus*). The latter is a widely used alternative to mackerel (*Scomber scombrus*) in the production of processed and canned products (Tinacci et al. 2018, 2020; Todorov 2020). A summary of relevant species currently available on the Bulgarian market but still not included in both the new and the repealed list shows Table 4.

Overall, the results show a contradiction between the list and the market needs; and the persistent absence of several species with overall high frequency market rates (*Salmo salar*, *Thunnus albacares*, *Sparus aurata*, *Gadus chalcogrammus*, *Merluccius hubbsi* (Tinacci et al. 2020). Similar shortcomings were noted in crustaceans and molluscs categories, where the new list includes a paltry number of species with no relevant changes to the previous list and in contrast with current market trends (Tinacci et al. 2018;

EUMOFA 2019). In particular, the new list lacks crustaceans mainly imported from India, Vietnam, Bangladesh and Indonesia such as *Litopenaeus vannamei*, *Penaeus monodon*, *Metapenaeus* sp., *Penaeus* sp. which are of major interest for the local fishery (Gogaladze et al. 2021; Shivarov 2021; FAO 2022b). Also, brown crab (*Cancer pagurus*) and Norway lobster (*Nephrops norvegicus*), both widely available on the market, especially at large retail, was deleted from the list. They are imported within the EU and originating from the North Atlantic.

Regarding molluscs, the list does not consider caught and cultured bivalve species such as *Chamelea gallina*, *Donax trunculus*, *Dreissena* sp. as local interest (Klisarova et al. 2020). Few imported species of major market interest from the North Atlantic, Southwest Atlantic and Southeast Pacific such as *Mytilus edulis*, *Mytilus chilensis* and *Perna canaliculus* are mostly available at large retail (authors' data). The total disappearance of cephalopods is also evident, they were included in the previous list with at least 2 species of local interest (*Rossia macrosoma* and *Sepia officinalis*). Thus, the list should be amended by re-entering records of species belonging to the Sepiidae family, and by including new species like Loliginidae, Ommastrephiidae and Octopodidae currently available at retail as fresh, frozen and processed products (authors' data). Furthermore, *Rapana* sp., the only gastropod on the new list and previously not mentioned, should be listed as rapa whelk (*R. venosa*), and one of the most exploited species along the Black Sea coasts (Raykov 2020).

### 3.3 List accuracy

The approach to be used in the association of CD and SN for providing a clear consumer information has been debated internationally. Ideally, the association of a single CD for each SN would allow the univocal identification of each

**Table 4** Summary of relevant species available on the Bulgarian market which are not included the current Ordinance No. 13, 30.11.2021 (in force) and Ordinance No. 4, 30.01.2006 (repealed) of the Ministry of Agriculture, Food and Forestry

Taxonomical order/family (WorMS, FAO data)	Scientific name (SN)	English name (FAO data)	Commercial name found at retail (Tinacci et al. 2018, 2020)
<i>Freshwater and marine Fish</i>			
Anguilliformes/Anguillidae	<i>Anguilla japonica</i>	Japanese eel	Унаги
Beloniformes/Scomberesocidae	<i>Scomberesox saurus</i>	Atlantic saury	Зарган
Carangaria incertae sedis/Latidae	<i>Lates niloticus</i>	Nile perch	Нилски костур
Carangiformes/Coryphaenidae	<i>Coryphaena hippurus</i>	Common dolphinfish (mahi mahi)	Махи махи
Carangiformes/Istiophoridae	<i>Istiompax indica</i>	Black marlin	Марлин
	<i>Makaira nigricans</i>	Blue marlin	Марлин
Carangiformes/Xiphiidae	<i>Xiphias gladius</i>	Swordfish	Риба меч
Carcharhiniformes/Carcharhinidae	<i>Prionace glauca</i>	Blue shark	Акула
Carcharhiniformes/Triakidae	<i>Mustelus mustelus</i>	Smooth-hound	Акула
Cichliformes/Cichlidae	<i>Oreochromis niloticus</i>	Nile tilapia	Тилапия
Clupeiformes/Clupeidae	<i>Sardinella aurita</i>	Round sardinella	Аншоа
	<i>Sardinella longiceps</i>	Indian oil sardine	Сардина
Clupeiformes/Leuciscidae	<i>Rutilus frisii</i>	Kutum	Фриса
Eupercaria incertae sedis/Lutjanidae	<i>Lutjanus sp</i>	–	Червена риба
Eupercaria incertae sedis/Priacanthidae	<i>Priacanthus hamrur</i>	Moontail bullseye	Лакедра
Eupercaria incertae sedis/Sciaenidae	<i>Umbrina cirrosa</i>	Shidrum	Минокоп
Gadiformes/Gadidae	<i>Gadus chalcogrammus</i>	Alaska Pollock	Морска треска, Тихоокеанска треска, Треска
	<i>Gadus macrocephalus</i>	Pacific cod	Тихоокеанска треска, Треска
Gadiformes/Merlucciidae	<i>Alepocephalus bairdii</i>	Baird's slickhead	Треска, Хек
	<i>Micromesistius australis</i>	Southern blue whiting	Хек
	<i>Merluccius hubbsi</i>	Argentine hake	Хек
	<i>Merluccius australis</i>	Southern hake	Хек
	<i>Merluccius gayi</i>	South Pacific hake	Хек
	<i>Merluccius productus</i>	North Pacific hake	Хек- Аляска Хек
	<i>Macruronus magellanicus</i>	Patagonian grenadier	Хоки
	<i>Macruronus novaezelandiae</i>	Blue grenadier	Новозеландски макруронус
Lamniformes/Lamnidae	<i>Isurus Oxyrinchus</i>	Shortfin mako	Акула
Osmeriformes/Osmeridae	<i>Mallotus villosus</i>	Capelin	Мойва
Perciformes/Sparidae	<i>Pagrus caeruleostictus</i>	Red Porgy	Фагри
	<i>Sarpa salpa</i>	Salema	Сарпа
	<i>Sparus aurata</i>	Gilthead Seabream	Ципура
Pleuronectiformes/Pleuronectidae	<i>Hippoglossus hippoglossus</i>	Atlantic halibut	Халибу
	<i>Hippoglossus stenolepis</i>	Pacific Halibut	Халибу
Salmoniformes/salmonidae	<i>Oncorhynchus gorbuscha</i>	Pink salmon	Розова съомга, Съомга
	<i>Oncorhynchus kisutch</i>	Coho salmon	Сребриста съомга
	<i>Oncorhynchus nerka</i>	Sockeye salmon	Тихоокеанска съомга
	<i>Oncorhynchus keta</i>	Chum salmon	Тихоокеанска съомга
	<i>Salmo salar</i>	Atlantic salmon	Атлантическа съомга, Норвежка съомга, Съомга
Scombriformes/Scombridae	<i>Scomber colias</i>	Atlantic chub mackerel	Скумрия
	<i>Thunnus albacares</i>	Yellowfin tuna	Жълтопер тон
	<i>Katsuwonus pelamis</i>	Skipjack tuna	Риба Тон
Siluriformes/Clariidae	<i>Clarias gariepinus</i>	North African catfish	Африкански сом
Siluriformes/Pangasiidae	<i>Pangasianodon hypophthalmus</i>	Striped catfish (Pangasius)	Пангасиу

**Table 4** (continued)

Taxonomical order/family (WorMS, FAO data)	Scientific name (SN)	English name (FAO data)	Commercial name found at retail (Tinacci et al. 2018, 2020)
<i>Crustaceans</i>			
Decapoda/Penaeidae	<i>Litopenaeus vannamei</i>	Whiteleg shrimp	Скариди, Скариди – бланширани, Скариди “Ванамей”
	<i>Metapenaeus affinis</i>	Jinga shrimp	Белени скариди
	<i>Metapenaeus ensis</i>	Greasy back shrimp	Белени скариди
	<i>Penaeus monodon</i>	Giant tiger prawn	Скариди – цели
	<i>Fenneropenaeus</i> sp.	–	Скариди
Decapoda/Solenoceridae	<i>Solenocera melantho</i>	Razor mud shrimp	Скариди коктейлни
<i>Mollusk bivalves and cephalopods</i>			
Bivalvia/Mytilidae	<i>Mytilus edulis</i>	Blue mussel	Миди
	<i>Mytilus chilensis</i>	Chilean mussel	Миди
	<i>Perna canaliculus</i>	New Zealand green mussel	Зеленоуста мида
Myopsida/Loliginidae	<i>Doryteuthis gahi</i>	Patagonian squid	Калмари
	<i>Loligo vulgaris</i>	European squid	Калмари
Octopodida/Octopodidae	<i>Octopus vulgaris</i>	Common octopus	Октопод
Oegopsida/Ommastrephidae	<i>Dosidicus gigas</i>	Jumbo flying squid	Калмари
	<i>Illex argentinus</i>	Argentine shortfin squid	Калмари
	<i>Illex illecebrosus</i>	Northern shortfin squid	Калмари
	<i>Nototodarus sloanii</i>	Wellington flying squid	Калмари
	<i>Ommastrephes bartramii</i>	Neon flying squid	Калмари
	<i>Todarodes sagittatus</i>	European flying squid	Калмари
	<i>Todaropsis eblanae</i>	Lesser flying squid	Калмари
	Sepiida/Sepiidae	<i>Sepia esculenta</i>	Golden cuttlefish
<i>Sepia recurvirostra</i>		Curvespine cuttlefish	Сепия

The data are extracted from Tinacci et al. (2018, 2020) and Todorov (2020), and integrated with data from the three-year monitoring plan (2019–2021) under the National Scientific Program funded by Bulgarian Ministry of Education and Science

product (Lowell et al. 2015). According to Xiong et al. (2016), SI = 1 is the most accurate scenario in which a single CD is associated to only one SN, which agrees with “the one species one name” approach proposed by Lowell et al. (2015). As also reported by Tinacci et al. (2019), SI > 1 is suggestive of the association of multiple accepted CD for each SN. On the contrary, SI < 1 indicates the presence of identical CD for different species, even potentially distant. Based on this index of accuracy, the analysis of the previous list (Tinacci et al. 2018) showed an overall high level of accuracy (SI = 1.04) scaled down by the correction applied to calculate the cumulative index (c-SI = 0.22). This is far away from the previously mentioned “one species - one name” approach. The SI and c-SI calculated for the current list shows a notable drop of the c-SI (0.04) and consequently of the list accuracy. This further drop, despite the disappearance of 11 genera that were included in the previous list, is directly linked to the introduction of SN related to Gobiidae, including 1986 accepted species in total, in addition to the species contribution (n = 44) from the above mentioned 8 genus (*Vimba* sp., *Ictiobus* sp.; *Atherina* sp., *Leander* sp., *Crangon* sp., *Unio* sp. - valid name *Vulsella* sp.; *Anodonta*

sp., *Rapana* sp.). This suggests that the introduction of an entire Family as SN is not advisable and strongly opposes to the principles of EU regulation of a clear product identification for the final consumer. In this perspective, particular attention should be paid to the attribution of CD in association with individual SN. By analysing the CD of the current list together with market data from Tinacci et al. (2020), and the data collected within a 3-year monitoring of the National Scientific Program, a frequent use of generic and vague names was observed (Tables 3, 4). Several authors defined them as “umbrella” terms, and linked their use to the potential enhancement of substitutions and intentional frauds (Xiong et al. 2016; Cawthorn et al. 2018, 2021; Tinacci et al. 2019).

In this study, the use of umbrella terms was mostly found as associated with species belonging to Gadiformes (Gadidae and Merlucciidae), Scombridae (*Thunnus* sp.), Carcharhiniformes, Ommastrephidae and Loliginidae, all products for which substitution phenomena are very common (Pardo and Jiménez 2020; Marchetti et al. 2020; Silva et al. 2021). To favour the selection and application based on informative CD, it is necessary to associate the species name with the geographical

origin, or with adjectives that evoke morphological characteristics known to the final consumer (Tinacci et al. 2019). Thus as a reference and as required by Regulation EU No. 1379/2013, trade names from the FAO catalogues could be used as a guide for the allocation of new CD after translation in Bulgarian language. Also, it would be useful to maintain local or regional names by making them official, in accordance with the provisions of European legislation (Regulation EU No. 1379/2013, Article 37).

## 4 Conclusion

This analysis shows that there is a clear will of the national Bulgarian legislator to cope with the EU requirements. The updated list specifically enhances local productions. Nevertheless, this newly enacted list only partially meets the requirements of the European legislator in terms of correct identification and labelling of seafood products on the national market.

Major issues related to the SN validity and the non-adherence to market demands also highlight the ineffectiveness of the current list for retail seafood products and the need to provide a substantially revised version. A rapid attempt might be done to merge the new and the old list as seen in other list updates of Member States, and by including additional species.

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## Declarations

**Conflict of interest** The authors declare that they have no conflict of interest.

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