

Review of Driftnet Fisheries in Bulgarian Marine and Inland Waters

Abstract

Driftnets in the Bulgarian marine zone and inland waters are discussed in the present case report. Consultations and questionnaires with relevant bodies, fishery responsible authorities, and research institutes took place during 2013.

The first driftnet fishery identified is the Bulgarian fishery for Atlantic bonito (*Sardasarda*). There are a total of 135 vessels, the majority of which are less than 12m in length, using drifting gillnets and are operating for around 25% of the year (around 90 days). Vessels tend to predominantly use driftnets but will also use drifting long lines to fish. As Atlantic bonito is a primary target of the fishery, it is evident that Council Regulation (EC) 1239/98 banning the use of driftnets to target Annex VIII species has not been effective.

In addition, about 250 fishing vessels (from the total of 650 vessels) operated in the Danube River in 2012 targeting Pontic shad (*Alosa immaculata*) using a local driftnet called "Difana". Most of them are small (5-6 m LOA) open boats powered by the outboard motors (10-20hp). Overall, about 30% of the shad is caught with driftnets and 70% with set gillnets (GNS). In the Bulgarian Danube River, 50% of the shad landed is caught using driftnets. In Bulgaria, 24 other species are also caught in driftnets but in much smaller percentages (i.e. less than 5% of the total catches are caught in driftnets). However, the existence of a fishery taking Atlantic bonito in the Black Sea suggests that control systems and tools in place within Bulgaria are currently not relevant to implementing Regulation (EC) 1239/98 in relation to Annex VIII species.

There was also no evidence of derivative gears. There are no data available for detecting the aspects of the fishery that influence the probability of catching unauthorized/protected species.

Keywords: Driftnets, Atlantic Bonito; *Sardasarda*; Bulgarian Maritime Zone; EU Regulations and National Legislation; Black Sea

Case Report

Volume 2 Issue 2 - 2015

Violin St Raykov^{1*} and George V Triantaphyllidis²

¹IO-BAS Bulgarian Academy of Sciences, Bulgaria
² 9 Davaki str, 162 32 Vyronas, Greece

***Corresponding author:** Violin St. Raykov, IO-BAS 40 Parvi Mai str., P O Box 152, Varna 9000, Bulgaria, Tel:+359 52 370 433; Fax:+359 52 370 484; E-mail: vraykov@io-bas.bg; vio_raykov@abv.bg

Received: November 24, 2014 | **Published:** April 06, 2015

Abbreviations: EC: European Commission; EU: European Union; DG MARE: The Directorate-General for Maritime Affairs and Fisheries. It is the European Commission Department Responsible for the Implementation of the Common Fisheries Policy and of the Integrated Maritime Policy; FPO: Pots and Traps; FVR: Fishing Vessel Register; GFCM: General Fisheries Commission for the Mediterranean; GND: Driftnets; GNS: Set Gillnets (Anchored); GPA: Gobies Nei (Acronym used by the Bulgarian NAFA); GSA: Geographical Sub-Area; IO-BAS: Institute of Oceanology "Fridtjof Nansen", Bulgarian Academy of Sciences, Varna; LEVA: National Currency of Bulgaria; LHM: Handlines and Pole-Lines (Mechanized); LLS: Set Longlines; LOA: Length Overall; MCS: Monitoring, Control and Surveillance; MS: Member State; NAFA: National Agency for Fisheries and Aquaculture; NM: Nautical Mile (By International Agreement it has been Set at 1,852 Metres Exactly (About 6,076 Feet)); OTM: Midwater Otter Trawls; PA: Polyamide; PE: Polyethylene; PES: Polyester; PP: Polypropylene; PVA: Polyvinyl Alcohol

Introduction

Driftnet fishing has traditionally been carried out with nets of limited lengths and relatively small mesh size to catch different small/medium size pelagic species mostly living in or migrating through coastal areas. This small-scale use has never been a

cause for major environmental concerns in the past. Problems began in the late 1970s-1980s when the use of driftnets with much larger mesh sizes and much longer in length (up to 50 km in extreme cases) expanded rapidly in the absence of meaningful control provisions. The use of these nets resulted in significant environmental impacts, in terms of increased fishing effort on target species and, more important, numerous and large incidences of unwanted catch of protected species, in particular, cetaceans, sea turtles and seabirds [1].

The uncontrolled use of these large-scale driftnets had devastating effects on many vulnerable marine species and consequently led to attempts by the EU to apply stricter legislation on these gears. Despite the historical use of small-scale driftnets, (i.e. those using both small mesh sizes and nets up to ~2km in length) in EU coastal zones, the knowledge and information available on these fisheries remains scarce and scattered. Limited information is available on fishing gears, fishing capacity and fleet activity, composition of catches, and eventual impacts on vulnerable species and the environment in general.

A preliminary internal analysis by the European Commission (EC) has highlighted some weaknesses in the current EU legal framework on driftnets that may facilitate circumvention of the

law. An updated knowledge of driftnet fisheries was required, to assist in the evaluation of the current regime and in the alternative policy options as a basis for an impact assessment to support a new Commission proposal improving the EU regime of driftnet fishing. Therefore, the EC (DG MARE) requested a study in support of the review of the EU regime on the small-scale driftnet fisheries within the framework of a retrospective and prospective evaluation on the common fisheries policy [2].

Prior the implementation of the study of Mitchell et al. [2], there was scarce information on the actual description of the driftnet fisheries carried out in the EU waters of the Black Sea. According to the information available from the EC fleet register vessels potentially using driftnets were including Bulgaria and Romania. The retrospective evaluation on driftnet fishing of Mitchell et al. [2], together with the result of a web-based public consultation and dialogue with Member States and stakeholders, provided an updated overview of the actual dimension of active driftnet fishing fleets, of their likely environmental impact and sustainability as well as of possible technical solutions to improve conservation and control in line with EU requirements. This case report is based on inputs from Bulgaria to clarify, document and record the current and previous driftnet fleets in Bulgaria and aims to provide information for the local fishing gears that are used as driftnets, both in marine and inland waters.

Case Presentation

This case report is presenting the fishing activities in Bulgaria with emphasis in the fleets that are using driftnets. Fisheries in Bulgaria are carried out in marine waters as well as inland

waters (rivers, lakes and dams) as follows:

Marine fishery

Bulgaria has a coastline of 378 km in length on the Black Sea and has land frontiers with Turkey, Greece, FYR of Macedonia, Serbia and Romania. Its territorial sea extends out to 12 nm and has an area of 6 506 km², the area of the continental shelf extending from the coastline of Bulgaria is 10,886 km² and the country's Exclusive Economic Zone in the Black Sea is about 25,699 km². Most of the fishing activities are carried out in territorial waters. The main ports used by fishermen for landing catches are in Baltchik, Burgas, Varna, Sozopol and Nessebar. The Bulgarian fishing fleet consists of 1,994 vessels [1] with a total of 6,476 GT and 57,544 kW. The fleet decreased compared to previous years 2,547 in 2008 and 2,546 in 2007. The Bulgarian fleet operates exclusively in the Black Sea and 95.28 % of the Bulgarian vessels are <12 m in length, and most of the vessels use set gillnets (anchored) as their preferred gear type. The species composition of landing during the period 2001 - 2011 includes 36 species of fish, mollusks and crustaceans.

The most important target pelagic fish species are European sprat (*Sprattus sprattus*), Mediterranean horse mackerel (*Trachurus mediterraneus*) and Anchovy (*Engraulis encrasicolus*). Demersal fish species with commercial importance are – Turbot (*Psetta maxima*), Gobies (Gobiidae) and Picked dogfish (*Squalus acanthias*). In the last decade the mollusks with increasing commercial value has been the Rapa whelk (*Rapanavenosa*). The landed catches of the main species during the last decade are presented in Table 1.

Table 1: Landings of the target fish species during the period 2001-2011 (NAFA, 2012 [8]).

Species	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Sprat (t)	695.4	11595	9154.5	2889.06	2574.67	2654.75	2984.59	4303.45	4550.68	4039.9	3950.23
Rapa whelk (t)	3353.4	698	324.6	2427.89	510.87	2773.18	4309.99	28171.3	2214.09	4830	3118.87
Gobies (t)	142	141.5	125.2	78.76	48.98	31.34	73.89	24.97	36.77	44.2	85.06
Mediterranean horse mackerel (t)	130	141.5	141.6	73.92	29.37	62.83	115.88	179.61	177.11	165	393.21
Anchovy (t)	101.8	237	131	87.9	14.32	6.46	60.44	27.67	42.19	57	18
Picked dogfish (t)	126	100	51.3	47.21	14.52	6.23	23.98	22.75	9.5	77	81.01
Turbot (t)	56.5	135.5	40.8	16.2	12.69	14.81	66.85	54.62	52.27	46.2	37.77

The Bulgarian marine fishery takes place in the Black Sea (GFCM Fishing Sub-area 37.4 (Division 37.4.2), and Geographical Sub-area (GSA 29). The fishing opportunities are limited by the specific characteristics of the Black Sea and the exploitation of the fish resources is concentrated in the shelf area (depths under 100 -110 m are anoxic). The main fishing grounds are coastal (to 30 - 40 m depth) and offshore (to 100 m depths). Most of the fishing activities are carried out in territorial waters (12 miles), but a significant part of fishing occurs up to 100 m depth. Open

(coastal) sea fishing practices are either demersal (by bottom-set gillnets) or pelagic (by pelagic trawls), whereas in shallow waters close to the coastline small scale fisheries are based on stationary trap nets, gillnets and hook-and-line methods.

Recreational fishing is also well developed.

The information about the fleet, operating in Bulgarian Black Sea area, is recorded in the Fishing Vessel Register (FVR),

maintained by National Agency of Fisheries and Aquaculture (NAFA). Fisheries Authorizations are granted each year and every eligible gear is sealed by NAFA inspectors. The FVR contains data on registered fishing vessels including their length, gross tonnage, maximum main engine power, registration number, age of the vessel and owner, which is updated in real-time.

Inland fishery

Rivers

The total length of rivers in Bulgaria for inland fishing is 20,231 km, with a water surface of 15,000 ha and about 65 different fish species. A characteristic feature for most Bulgarian rivers is the great fluctuations of the water level and the flood characteristics in spring in their upper streams. Conditionally, the rivers can be divided into "trout", "trout-barbell", "barbell" and "carp" areas as the boundaries between them are not fixed. They are inhabited by more than 50 species and subspecies fish. The rivers have essential importance for angling as well [3,4]. The length of the Danube River in Bulgaria is 471 km. The Danube River is distinguished as a river with the richest ichthyofauna in Europe (about 85 species of which in the Bulgarian part is inhabited by about 65 fish species). In the waters of the Danube River, angling takes place as well as commercial fishing activities, including driftnet fishing¹.

Lakes

The highly mountainous lakes in Bulgaria are predominantly small in area and they do not distinguish with rich total biomass including ichthyofauna. They are inhabited by characteristic highly mountainous hydrobionts. Most of the Bulgarian highly mountainous lakes fall into protected territories as only in some of them angling is permitted. The other natural lakes are situated in the plains: most of them are beside the Black sea - the Burgas Lake, the Varna Lake, the Shabla Lake, the Durankulak Lake, etc.; besides the Danube River - Srebarna; there are also several small lakes inside the country. In case of heavy dry weather the by sea lakes got salted. The lakes have warm waters, with rich nutritional basis and ichthyofauna. Part of them fall into protected territories and they have importance mainly for the angling.

Dams

The total water surface of Bulgarian dams is 63,664 ha. Depending from the water surface, dams can be grouped as follows:

- i. big dams with water surface >200 ha
- ii. mid-size dams with water surface 20 - 200 ha
- iii. small dams with water surface <20 ha

The biggest state-owned dams (about 250, with a total water surface area of 29,452 ha) are used in a complex way with zonal separation. The defined zones are for irrigation, production of electricity, aquaculture, commercial fishing and angling. There are 51 big dams of economic importance (following the

¹Due to the high price of the nets and material (for a net of 400-500m the cost is 4-5 thousand Euros) the number of registered nets is not so high. In Vidin area - 20 vessels (4-5m LOA) operate with Difana (GND). In Rouse - Silistra area around 100 vessels operate with Difana nets, Pleven area 30-40 vessels; Around 250 vessels operated with inland Difana nets in 2012.

definition in the Waters Act) which are being used especially for angling and aquaculture in earthen ponds. The small and mid-size dams are being used for angling or only for aquaculture, or only for commercial fishing. The maximum fish production from dams during the 1980's reached 7,000 tons per year (about 40% of the total production). The dams and areas around dams are appropriate for organizing fishing tourism.

For the implementation of the evaluation process, consultations and questionnaires were done with relevant bodies and fishery responsible authorities and research institutes. Also, expert judgments of experts from the National Agency for Fisheries and Aquaculture (NAFA) of the Ministry of Agriculture and Food, private associations, research institutes, managers etc. were taken into account in doing the assessment for the present case report.

Legal framework

The overall development of the rules and measures introduced within the legal framework for driftnet fisheries can be summarized at the substantive level as follows [2]:

- i. Council Regulation No. 345/92 - introduced a ban on driftnets of individual or total length greater than 2.5 kilometres thereby giving effect to UNGAR 44/225 and the requirement for driftnets >1km in length to remain attached to fishing vessels if deploy offshore (i.e. > 12nautical miles from the coast) or to be monitored if deployed inshore.
- ii. Council Regulation No. 894/97 - re-stated the ban on driftnets of individual or total length greater than 2.5 kilometres and requirements for driftnets >1km in length.
- iii. Council Regulation No. 850/98 - no substantive impact as the provisions on driftnets were not amended.
- iv. Council Regulation No. 1239/98 - prohibited the use of driftnets to catch the tuna and other species listed in Annex VIII and removed the requirement for driftnets >1km in length to remain attached to fishing vessels or to be monitored.
- v. Council Regulation No. 812/2004 - introduced a limited monitoring scheme for cetacean by catch.
- vi. Council Regulation No. 809/2007 - introduced for the first time a definition of driftnets.

Therefore, the current situation is that except in the Baltic Sea, the Belts and the Sound EU-flagged vessels may keep on board and use driftnets provided:

- The individual or total length of such nets is less than 2.5 kilometres; and
- Driftnets are not used to catch and/or land the tuna and other species listed in Annex VIII of Regulation No. 894/97 (as amended).
- A scheme for monitoring cetacean by-catch has been introduced for driftnets only for driftnet fisheries in a limited number of areas in the North Sea and the Atlantic.

Previous driftnet Fleets- fleet trends

The fishery with driftnets (GND) in the Bulgarian waters of the Black Sea was practiced by a locally made driftnet, the so-

called “Fustanella” nets, targeting Atlantic bonito (*Sardasarda*) in the time of its migration (autumn period) along the coastal area of the Bulgarian Black Sea (Collette, 1986). The number of reported fishing vessels (in the EC fishery register) with primary gear GND in 2007 was 26; 2008-26; 2009 - 25; 2010 - 21; 2011 - 15; 2012-11; 2013 - 6 (Figure 1). From this figure the decreasing trend is obvious towards 2013.

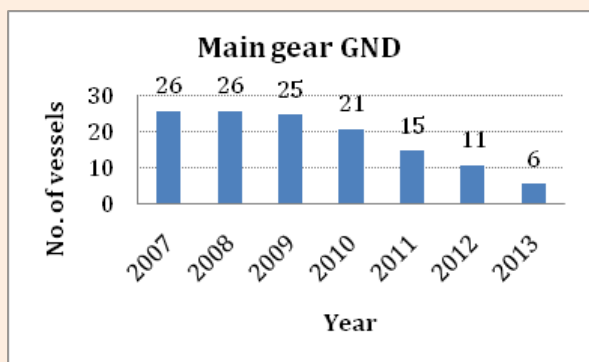


Figure 1: Fishing vessels in Bulgarian fleet with GND as a primary gear. *Source: EC fleet register (EC 2013)

The fishing vessels with registered GND as secondary gear varied from, 233 in 2007 to 129 in 2013 (Figure 2). The decrease from 2007 toward 2013 is due to the fact that 124 fishing vessels declared no usage of GND. Currently, a total of 135 vessels declare GND as primer or secondary gear.

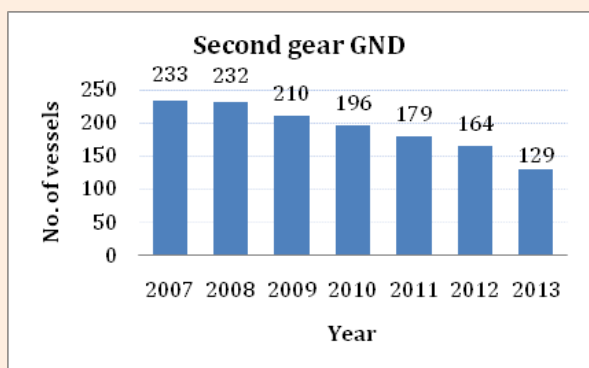


Figure 2: Fishing vessels in Bulgarian fleet with GND as a secondary gear. *Source: EC fleet register

The majority of the vessels declaring driftnets in 2007 were registered in the NUTS 3 areas Varna (247), followed by Burgas (9) and 3 in Dobrich (Table 2).

Table 2: Evolution of driftnet vessels registered in Bulgaria according to NUTS 3 area.

Row Labels	2007	2008	2009	2010	2011	2012
Burgas (Bg341)	9	9	8	10	6	6
Dobrich (Bg332)	3	3	3	2	1	1
Varna (Bg331)	247	246	224	205	187	168
Total	259	258	235	217	194	175

*Source: EC fleet register

The majority of the vessels operated in 2007 using the combination GNS-GND (218 vessels) and 19 as GND-GNS (Figure 2). Other gears used include OTM, LHM, LLS and FPO (Figure 3).

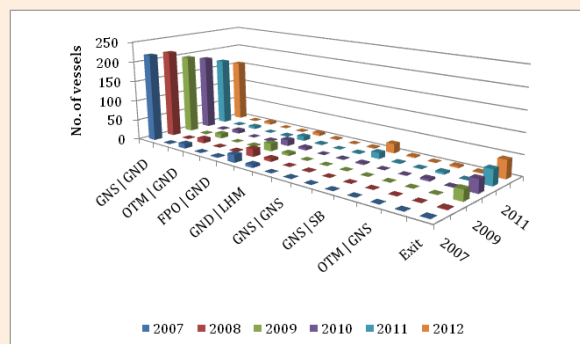


Figure 3: Gear combination evolution of Bulgarian driftnet vessels - all size of vessels. *Source: EC fleet register

Marine fishery characteristics of driftnets

The number of fishing vessels declaring GND as a primary gear in 2007 - 2012 was very low compared to the total number of all registered fishing vessels, and they belonged to the segments under 6m LOA and 6-12m LOA. Vessels declaring GND as secondary fishing gear in 2007 were 233 and towards 2012 their number decreased to 164. The vessels with LOA under 6m and 6-12m were the main ones which operated with GND in the coastal area of Bulgarian marine zone. The majority of them have license to operate up to 2 mile zone and 5 mile zone offshore. The target species of this fishery is the Atlantic bonito (*Sardasarda*). The catch of this species is carried out in a very restricted time interval (autumn) when the active migration of the species occurs in the near shore area of the Bulgarian marine zone.

The main fishing area with GNDs targeting Atlantic bonito is situated in southern direction from Cape Emine - Sozopol, Nessebar, Pomorie, Burgas, Primorsko, Tzarevo, Ahtopol, Kiten, Sinemoretz etc. The main (and only) fishing season for Atlantic bonito is during the autumn (September-November, rarely December) and is dependent on migration patterns of bonito.

The species is highly migratory [5] and occurred in the near shore zone (up to 12 nautical miles-NM- offshore) with different intensity in the years. Most of the fishing vessel operate with GND (“Fustanella”) near shore (2 NM offshore; > 6m LOA and 6 -12m LOA) almost the whole month (30 days) in the September-November period (around 90 days) when the hydro-meteorological conditions are suitable and depending on the fish availability. The GND (target species Atlantic bonito) use the so-called “Fustanella” single net, or fishing net “Uzukma” consisted by “Fustanellas” (mesh size 36/36 mm (in the beginning of the fishing season, e.g. September for the 300-400g individuals) up to 48/48mm (for 800-1kg individuals) at the end of the fishing season (November-December).

On the head rope, where the buoys are compulsory, a 30cm width small mesh (“sardon”) net is attached in order to prevent buoys entanglement into the “Fustanella”. The “Fustanella” is 500m long and the width ranges from 150 to 400 meshes. On the

ground rope, over each 3-4 m are placed lead rings with diameter 10-12cm in order not to entangle into the "Fustanella" net. On each 5-6m head rope and ground rope are connected by the rope ("Pinche") with exact length of the Fustanella (according to the number of the "eyes") aiming not to squash the "eyes" when the "Fustanella" net is full with fish. The "Uzukma" then, is slowly hauled, at dawn. The soaking time varies (3-4 hours) and the fishery takes place throughout the night when there is no moon. Simultaneously, artificial light (by search-light) is pointed out from the water surface and pull it out, on board. The operation using "Uzukma" is compulsory in the night time in order the net to remain "invisible" for the fish.

In the southern part of Bulgaria, (south direction from Cape Emine) the most effective fishing of bonito, (especially 30-40 years ago) was done by the so called "Molarene". The "Molarene" is a type of "Uzukma" but longer, up to 1-1.5km. In principal, 4-5 people crew are needed. The "Molarene" is the name of the process of surrounding the fish shoals using "Uzukma". This process of fishing gave the best results at a distance of 26km from the shore (in southern part) at the place called "Pangus". This area is 50m in depth. Once the fish shoal is detected, an additional "Zodiak" type vessel is released in the water in order the fish shoal to be surrounded, as the vessel with the aid of the "Zodiak" make a round movement to complete the fishing operation.

Inland fishing and inland fishing gears

The total water area in Bulgaria covered by freshwater is 65,000 ha, including natural lakes, fish-farms (earthen ponds, raceways and dams), running waters and the Danube River. The total length of rivers for inland fishing is 20,231 km, with a water surface of 15,000 ha. There are about 80 species that inhabit inland dams, lakes, ponds and other rivers. Inland waters fish catches account for about 10.3 % of the total catch, which consist of catches in the Danube River² (about 1.8 % of whole inland fish catch) and catches in other rivers and basins (about 8.5 % of whole inland fish catch). Most of the catches in the artificial reservoirs are of the same type as the aquaculture breeding species. Mainly small-scale fishing boats, operating in the dams and in some natural lakes, carry out commercial fishing in inland waters.

The main types of gear used in inland fisheries and in the Danube River are the following:

- Drifted gill net – The local name is "Difana". It is a 3 wall net composed by 2 external and one internal (between the 2 externals); the effective catching occurs in the middle net.

The mesh size of the internal (catching) Difananet varies from 18mm (small sized fish – e.g. *Alburnus salburnus*, *Chalcaburnus chalcoides* etc.), 55 - 65mm for larger species – e.g. *Carassius auratus*, *Barbus barbus*, *Cyprinus carpio*, *Carassius carssius*, *Lota lota*, *Sander lucioperca*, *Perca fluviatilis* etc) and 110-120mm for the larger specimens (*Esox lucinus*, *Ctenopharingodon idela*,

²In the Danube River the current is 7.4 kph (4 knots) at least. So, it is suitable to use "Difana" driftnets (GND) and we can assume that about 2% of the whole inland fish catch is done by GNDs. Compared to the whole catch (including marine fishery – this is very small share to the "Difana" nets (personal communications). In other rivers the GND is not so common, instead angling and GNS have been used, as the quantities caught by GNDs are small.

Hippophthalmichthys molitrix, *Silurus glanis* etc., Table 3). The 2 external nets usually have two times bigger mesh size of the net than the internal working net. Thus, the net with 55mm (internal one) would have 2 externals with 110mm mesh size. Each single net is 80-100m long.

Table 3: Important species for fishing in inland water basins and driftnets used.

Species	Mesh size of driftnet "Difana" used
Common carp (<i>Cyprinus carpio</i>)	Difana with mesh size 55-60mm (internal), for smaller specimen smaller mesh 18-32-44mm
Crucian carp (<i>Carassius sp.</i>)	Difana with mesh size 55-60mm (internal), for smaller specimen smaller mesh 18-32-44mm
Silver carp (<i>Aristichthys nobilis</i>)	Difana with mesh more than 60mm-110-120mm
Bighead carp (<i>Hypophthalmichthys molitrix</i>)	
Grass carp (<i>Ctenopharingodon idella</i>)	Difana with mesh more than 60mm-110-120mm
Black carp (<i>Mylopharingodon piceus</i>)	Difana with mesh more than 60mm-110-120mm
Bream (<i>Abramis brama</i>)	
European catfish (<i>Silurus glanis</i>)	
Pikeperch (<i>Sander lucioperca</i>)	50-60mm (for larger fish 110-120mm mesh size of internal net)

"Difana" is composed by 4-5 nets equal to 400-500m length. "Difana" net has no anchors, using only lead weights which enhance the net to "sweep" the bottom. This is a typical drift net fishery. The by catch of *Acipencerruthenus* (river species that do not migrate into the Black Sea) occurred as the *Huso huso* and *A. guldensaedtii* is unlikely to be by caught using this kind (small mesh) of nets. In case of use the big mesh size nets targeting larger species, the by-caught sturgeons must be released in the water. No data about the by catch of sturgeons exist, since no research has been initiated. The use of this kind of nets nowadays is limited because they are expensive nets - for 200-500 meters Difana net the price could be 4-6 thousand leva (2,500 – 3,000 Euro); In the Vidin area around 20 fishermen use "Difana" net; In all Danube River around 100 people use such driftnets.

- Up to 2007 the so called "Karmak" fishing gear was used widely for catching large fishes as *Silurus glanis*, Sturgeons etc. This is a Long line with hooks - very large size. Here, no bait is needed. The "naked" hooks use the natural drift in order to catch the fish. Now it is banned and not used currently;
- Beach seines – widely used – both from the coast and from the vessels.
- "Trepan" for *Silurus glanis* – represents the long rope with big hooks at one end which goes in the bottom and the other end is tied to the trees on the coast.
- GNS – gill nets which are effective in the oxbows and arms of the river, where the current is low or almost absent;

- “Serkme” net – kind of beach seine – could be used from coast or from the board of fishing vessel. Use lead weights attached to the end of the round net – forms the so called “pockets”;
- Fyke nets – widely used for different fish;
- The more important species for fishing in inland water basins are: Common carp, Crucian carp, Silver carp and Bighead carp, Grass carp, Bream, European catfish, Pike - perch, etc. The average annual catches vary between 1,500 and 2,000 tons. The average catches in 2005 were 1,663.86 tons, representing approximately 7.3 % of the total fish production.

The most susceptible species to driftnet fishery in Danube River are given in Table 4.

Table 4: Important species for fishing in Danube River and driftnets used.

Species	Comments
Black Sea shad (<i>Alosa immaculata</i>)	In Danube River – one of the most effective gear for this target species is “Difana” – around 50% of the catch is by “Difana” nets.
Sturgeon species including beluga (<i>Huso huso</i>)	There is a ban of sturgeon fishery in Bulgaria since 1st January 2012 for 4 years period in the Black Sea and inland basins (Danube River). If sturgeon is accidentally caught it must be returned into the river after the ban.
Russian sturgeon (<i>Acipenser gueldenstaedti</i>),	If sturgeon is accidentally caught it must be returned into the river after the ban.
Starry sturgeon (<i>Acipenser stellatus</i>),	If sturgeon is accidentally caught it must be returned into the river after the ban.
Danube sterlet (<i>Acipenser ruthenus</i>) non-migratory	The highest percent of the by-catch is this species is about 20%

*Source: NAFA, 2012 [8]

Some commercial fishing still takes place in some big dams. However, this activity is disappearing and the dams are used for angling, aquaculture or for other activities such as fishing tourism and eco-tourism. The most important species for the population engaged with fishing activity in the Danube River are: European catfish, Danube bream, Barbel, common carp and migratory species such as the Danube herring and sturgeon species. Inland fishing also make a significant contribution to the employment at regional level as 1,620 people are employed in inland fishing but most of the activities are seasonal or performed as fishing for personal consumption, which gives explanation for the low added value of the inland fishing.

Table 5: Catch of Bonito by fishing vessel segments in Bulgarian waters for 2012.

FAO code	< 6 m	6 - 12 m	12 - 18 m	18 - 24 m	24 - 40 m	Total 2012
<i>Atlantic bonito</i> (BON)	14 461.8	76 177.8	4 120.0	0.0	1 340.0	96 099.6

*Source: NAFA, 2013 [7]

Social and economic characteristics

The bonito fishery using GND was restricted for short time period of the year – autumn (September-November). Moreover, this fishery was not regular and depended on the migrations of the species in front of the Bulgarian coast. In different years these migrations were with varying intensity. This is evident when the migrations occur close to the shore (in the frame of the 12 NM territorial sea zone); thus the landings of bonito with small scale (>6m and 6-12m LOA) fishing vessels were relatively high. The majority of vessels with GND on board registered belong to segment 6-12m LOA, followed by those below 6m LOA. The rest of the fishing segments have no registered (or only few GNDs), hence they are not involved in this fishery.

The number of crew on fishing vessels operating with GND on board varied from 2 to 4 people (especially those using nets longer than 500m). Annual turnover from Bonito fishery is hard to be estimated due to the low percent of declared catch.

According to the consultations held with NAFA, in Bulgaria it is difficult to estimate costs associated with MCS on driftnets. The total estimated annual costs for MCS are as follows:

There are 65 fisheries inspectors throughout the Country.

- Personnel costs: 780,000 LEVA (398,808 Euros)
- Fuel costs: If 210 productive days will be estimated per year X 50 LEVS/day = 10,500 LEVA (5,369 Euros)
- Other costs (telephones, consumables etc.): 31,500 LEVA (16,106 Euros)
- Annual costs: 822 000 LEVA (420,282 Euros)

During consultations with fishermen in the area of Varna, the following information was collected: The cost of the nets and their support (replacement) is evaluated as low, since the fishery occur in restricted time interval (not every year) depending on the migration patterns of bonito which are unclear in the Black Sea. Fishermen reported that they change gear every 4-5 years. The cost is about 15 Euros/Kg and the material is brought from Turkey. The material is from Nylon (Polyamide/PA). With reference to the ratio of volume caught with driftnets to volume caught with all gears, the volume caught by driftnets (GND) is almost negligible and cannot be estimated in numbers because of the low reported catches per year. In the years when the catch of Bonito is high, it could reach about 1/10 of the total catch from the Black Sea.

The ratio of value caught with driftnets to volume caught with all gears, NAFA's statistical data reported catch by GND of Bonito in 2012 is 48kg; the ratio according to the total Atlantic bonito catches to GND is only 0.000005. The catch of Atlantic bonito by length segments of the fishing fleet is given for 2012 (Table 5). Catches of main species for 2007-2012 in kg are shown on Table 6.

Table 6: Catches of main species in the Black Sea for the period 2007 - 2012. Values in Kgs.

Main target species	FAO code	Catch in 2007	Catch in 2011	Catch in 2012
<i>European sprat</i>	SPR	2 984 585.0	3 957 895.0	2 836 201.9
<i>Mediterranean horse mackerel</i>	HMM	115 885.7	394 836.0	380 662.2
<i>Atlantic bonito</i>	BON	895	8 257.0	96 099.6
<i>Bluefish</i>	BLU	8 218.9	29 387.0	550 782.7
<i>Flathead grey mullet</i>	MUF	5 844.9	14 687.0	24 702.2
<i>Red mullet</i>	MUT	12 595.0	176 199.0	131 488.3
<i>Picked dogfish</i>	DGS	23 978.0	81 014.0	28 692.7
<i>Turbot</i>	TUR	66 885.0	38 060.0	36 361.6
<i>Rapana snail</i>	RPN	4 309 989.0	3 118 868.0	3 793 386.0
<i>Gobies nei</i>	GPA	73 894.7	85 184.0	89 481.0
<i>Thornback ray</i>	RJC	3 562.0	93 434.0	68 587.7
<i>Silversides nei</i>	SIL	9 437.0	16 515.0	28 108.5

*Source: NAFA, 2013 [7]

Table 7: Data from landings using GND in Bulgaria compared to landings reported from all gears.

Species	Bonito		Gobies		Black Sea Shad (<i>Alosaimmaculata</i>)		Black Sea Shad (<i>Caspialosapontica</i> ³)	
	GND	ALL	GND	ALL	GND	ALL	GND	ALL
2007		16.069t		73.89t		25.814t		
2008		170.279t	653kg	24.97t		14.71t		
2009		4.808 t	172kg	36.77t		38.655t		
2010		16.313t	15kg	44.2 t		63.182t		
2011		8.257 t		85.184t		57.668t		
2012	48kg	96.099,6t		89.98t	36kg	22.10 t	843kg ^{*4}	

From consultations held with NAFA, the official statistics revealed capture of 4 species using GND: bonito, gobies, shad and Black

Sea shad [6]⁵. However, the reported catches of shad and gobies with driftnets might be a misreporting of catches using GNS and therefore these data should be treated with caution. The scientific institutions consulted are not aware of any driftnet fisheries targeting gobies and shad in the Black Sea. Given uncertainty and lack of information, it is difficult to draw firm conclusions on whether there is a marine driftnet fishery for shads and gobies in Bulgaria. The catch of bonito with all gears represented 1.2% from the total catch of all fish species in the Bulgarian marine zone (Table 7).

Market information for major target species: Consultations with the IO-BAS and NAFA revealed that the fish usually were sold directly from the fishermen to the traders and producers at local level. The fish were sold in the internal market. The price depends on the quantities caught. The prize of the fish caught in the beginning of the season (September) is around 5-6 Euro per

Kg. The fish with individual weight around 700-800g could reach 5 Euro per piece in case the amount of the catch is relatively low.

The reason that the fishery is no longer active is that fishermen could not rely on the Atlantic bonito fishery with or without GNDs, because of the limited time of occurrence and unknown migration patterns year by year.

Landings in inland waters

The total landings of Bulgaria for 2012 were 9,595.2 tons. This is 0.4% less than the catch in 2011 because of the Danube River and inland fish catch decreased since the Black Sea landings slightly increased (Figure 4). The catch in the Black Sea for 2011 was as follows: 8,147.6 t (84.6%) – Black Sea; 1,350.6 (14%) - inland waters and 136.3 tons (1.4%) in Danube River (Table 8).

Catch in danube river

During the last few years the landings in the Danube River are relatively low, due to the decrease in main species populations. Order RD 09-43/20.01.2013 of the Minister of Agriculture and Food stipulates the total ban of the sturgeons catch in the Black Sea and Danube River for a 4 year period, starting from 1st of January 2012. Point 3 of Order RD 09-43/20.01.2013 states that:

³For period 2007-2012 there is not separation between *Alosapontica* (*immaculata*) and *Caspialosapontica* landings. In official statistics they have been reported usually as *A.pontica/Caspialosapontica*

⁴REMARK* - 843 kg *Caspialosapontica* (pontic Shad) reported as bycatch (2012) of GND for Bonito. Most probably the data are not correct as it is very unlikely the species to be retained in the mesh size 38-44mm nets.

⁵Chief Expert, Directory FCNAFA, S. Urumov, pers. comm., 2 July 2013

In case of capture of sturgeons they should be released in the water no matter of their condition. In 2012 significant decrease of the total catch in Danube River was detected with 18.5% (in comparison with 2011) at 111.1 tons, including 102.7 tons freshwater species; 2.9 t – *Alosa* sp. and 5.5 tons – other species (Table 9).

About 650 fishing vessels operated in the Danube River in 2012. Most of them are small (5-6 m LOA) open boats powered by the outboard motors (10-20hp). The mandatory minimum crew is 2 people. The main fishing method is small scale driftnet fishing. Around 30 to 60 % of the whole catch in Danube River is made using the driftnet “Difana”. The rest belong to GNS, angling and other gears mentioned above. Speed of the current (minimum 4 knots) excludes the use of fixed gill nets. About 10 % of the licenses are issued for hooks and longlines (NAFA, 2013 [7]).

In the rest of inland water basins, fishery using driftnets has been estimated at around 30% (GND) and 70% belong to the set gill nets (GNS) share (Table 10).

Discussion

The Bulgarian driftnet fishery, currently active in the Black Sea, targets Atlantic bonito (*Sardasarda*) and is comprised of 135 vessels under 12m in length. Large-scale driftnets have not been used in this fishery. Consultations with IO-BAS and NAFA suggested that reported landings data for the bonito fishery may be inaccurate. As Atlantic bonito is a primary target of the fishery, it is evident that Council Regulation (EC) 1239/98 banning the use of driftnets to target Annex VIII species has not been effective. In addition, about 250 fishing vessels (from the total of 650 vessels) operated in the Danube River in 2012 targeted Pontic shad (*Alosa immaculata*) using driftnets. Most of them are small (5-6 m LOA) open boats powered by the outboard motors (10-20hp). Overall, about 30% of the shad is caught with driftnets and 70% with set gillnets (GNS). In the Bulgarian Danube River, 50% of the shad landed is caught using driftnets⁶. In Bulgaria, 24 other species are also caught in driftnets but in much smaller percentages (i.e., less than 5% of the total catches are caught in driftnets).

In Bulgaria for Danube fisheries, there is a 30 to 60 days closure for shad spp. (*Alosa immaculata* and *Alosamaeotica*). There is no evidence to suggest stocks targeted by river and estuary driftnets in the Black Sea are at risk of overexploitation from these fisheries, but detailed assessments have not been carried out.

The use of driftnets in the EU waters of the Mediterranean Sea, the North East Atlantic and the North Sea (including the Skagerrak and Kattegat), as well as the Black Sea following the accession of Bulgaria and Romania in 2007, is currently regulated by Council Regulation (EC) No. 894/97 of 29 April 1997 laying down certain technical measures for the conservation of fishery resources [2]⁷ (“Council Regulation No 894/97”).

The Bulgarian fishery for Atlantic bonito (*Sardasarda*) which

⁶Data provided by NAFA, 2013 and - IO-BAS.

⁷Council Regulation (EC) No 894/97 of 29 April 1997 laying down certain technical measures for the conservation of fishery resources (OJ L 132, 23.5.1997, p. 1).

is not a species under a quota in the Black Sea, is an unauthorized species as Council Regulation No. 1239/98 prohibits the use of driftnets to catch the tuna and other species listed in Annex VIII (and includes *Sardasarda*).

The main landing ports and ports of registration for vessels in this fishery are Sozopol, Nessebar, Pomorie, Burgas, Primorsko, Tzarevo, Ahtopol, Kiten, and Sinemoretz. This fishery normally operates from September to November and sometimes into December. There are a total of 135 vessels, the majority of which are less than 12m in length, using drifting gillnets and are operating for around 25% of the year (around 90 days). Vessels tend to predominantly use driftnets but will also use drifting longlines to fish. Mesh sizes used by vessels vary from 36-48mm, depending on the season and the size of the species targeted. Nets tend to be 500m in length but 2-3 nets are often used together. This is referred to as a “Fustanella” and vessels regularly carry on board and set multiple nets. The width of these nets ranges from 150-400 meshes, with the depth of the nets extending from the surface to the seafloor (normally between 20-50m depth). Most fishing vessels operate within 2 miles offshore. Nets are usually soaked for 2-3 hours but are often used overnight in which case they will soak for 8-9 hours. Pingers are not used on nets to deter cetaceans. In this fishery, around 324 fishers are involved with 2-4 fishers per vessel. 48kg of Atlantic bonito were reported landed in 2012 with a total value of €240; however, these values are not considered to be accurate.

No other species have been reported as being caught as by catch or discarded, and no interactions with protected species have been reported. Vessels operating in this fishery have total landings using all gear types of more than 500 tonnes per year on average. Vessels will fish all year round with gears other than driftnets. EU regulations on driftnets have been included in the national legislation – the Fisheries and Aquaculture Act in 2001.

The only fishery that has been identified in the Black Sea interacting with an Annex VIII species is the Bulgarian marine driftnet fishery targets Atlantic bonito. However, contemporary catch rates are reported as an extremely low proportion of total national catch (NAFA registered just 48kg versus 96,099.66kg of total bonito catches in 2012); based on these reported catches it is unlikely that this fishery is having severe negative impacts on the sustainability of the stock. Comprehensive assessments of the stock status of Atlantic bonito have not been conducted and it is therefore difficult to draw conclusions about the impact of drift netting on this species. However, the existence of a fishery taking Atlantic bonito in the Black Sea suggests that control systems and tools in place within Bulgaria are currently not relevant to implementing Regulation (EC) 1239/98 in relation to Annex VIII species.

The second fishery is the Bulgarian inland river fishery, which mainly occurs in the Danube River and targets various species with a local driftnet called “Difana”. The target species is dependent on the mesh size used: a 18mm mesh size is used for small sized fish e.g. *Alburnus alburnus*, *Chalcaburnus chalcoides*; 55-65mm is used for larger species e.g. *Carassius auratus*, *Barbus barbus*, *Cyprinus carpio*, *Carassius carssius*, *Lota lota*, *Sander lucioperca*, *Perca fluviatilis* etc; and 110-120mm is used for the larger species (*Esox lucinus*, *Ctenopharingodon*

idela, *Hippophthalmatrix molitrix*, *Silurus glanis* etc). Limited information is available for this fishery. Approximately 650 fishing vessels operated in the Danube River during 2012, of which only 250 actively used driftnets. Most of them are small (5-6 m LOA), open boats powered by the outboard motors (10-20hp). The number of vessels using driftnets in inland waters is estimated to be 250. The whole inland fishing provides employment at national level to 1,620 people, of which approximately 500 people use "Difana" driftnets throughout the Danube River and other inland water bodies. Most of the activities are seasonal or performed as fishing for personal consumption, which gives explanation for the low added value of the inland fishing.

No species are currently reported as bycatch in the Bulgarian driftnet fishery targeting Atlantic bonito currently operating in the Black Sea. However, reported data for this fishery are considered to be inaccurate for target species. Driftnets are also used for fishing in the Danube River. Bycatch of Sterlet (*Acipenser ruthenus*) (a river species that does not migrate into the Black Sea) occurs but in unknown numbers. European sturgeon or beluga (*Huso huso*) and Russian sturgeon (*Acipenser guldensaedtii*) are unlikely to be caught in this fishery due to the mesh size of the nets used (60-120mm). In case of use of the bigger mesh size nets targeting larger species, the by-caught sturgeons must be released in the water. No data about the bycatch of sturgeons was available, since no research has been initiated.

The relevant obligations in the Black Sea are:

- 2007 onwards (i.e. post - accession of Bulgaria and Romania) – prohibition of driftnets longer than 2.5km (Regulation (EC) 1239/98);
- 2007 onwards – prohibition of landing Annex VIII species that were caught by driftnets (Regulation (EC) 1239/98).

There are no Romanian marine driftnet fisheries operating in the Black Sea. It is not clear to what extent driftnet fisheries in Bulgaria are prioritized for MCS activities by control authorities. No infringements data were provided for the study. There was no evidence to suggest that Bulgarian and Romanian fleets have used driftnets of length greater than 2.5km either before or after their accession to the EU in 2007. However there are reported landings of one Annex VIII species Bulgarian driftnet fisheries, i.e. Atlantic bonito - *Sardasarda*, and consultations indicate that the driftnet fishery targeting *Sardasarda* is ongoing though dependent on the presence of the species in Bulgarian waters due to its migratory nature.

There was also no evidence of derivative gears for Bulgaria or Romania, and there are no cases of national legislation facilitating the avoidance of EU regulations in Romania or Bulgaria with respect to driftnet fisheries. However the national legislation related to fisheries in Bulgaria is very general and so the key points of the EC regulations may not be clearly expressed, a fact that could explain the continuation of the *Sardasarda* fishery.

In summary, the evidence provided suggests that the objective of Monitoring and Control of driftnets in relation to the objectives of UNGA resolution has not been achieved in the Black Sea, at least for Bulgaria where Annex VIII species are still

targeted by driftnet fisheries.

Sustainability of fisheries

The status of the bonito stocks is unknown, since it is a highly migratory species and should be evaluated for the whole area of the species occurrence. In Black Sea there are no quotas for the species targeted by driftnets and there are no studies on by catch or selectivity of the fishing gear. In Bulgaria there is no specific research for incidental catches and the interactions with protected species. There are no data available for detecting the aspects of the fishery that influence the probability of catching unauthorized/protected species.

The main (and only one) retained species in driftnet fisheries ("Fustanella") is Atlantic bonito. A not very realistic assessment could be done for the present trend of the catches taken by driftnet fleet compared to other fleets. The present level of catches by driftnets is 48kg reported catch of bonito (NAFA, 2012 [8]). In Bulgaria the level of interaction/incidental catches with protected species cannot be estimated and is assumed not to exist. There is no available data for the aspects of the fishery influence the probability of catching unauthorized/protected species.

There is no available data for any national or regional initiatives in existence to mitigate impacts of driftnets on by catch species, in particular protected species. Also there is no available data for the risks associated with the impact of the fisheries: on the species and on protected and/or unauthorized species in relation to population size, reproductive capacity, age/sex/size structure, geographical range. Financial assistance (EU or National) has not been provided to achieve adaptation to the current driftnet regime.

In the national Operational Programmes for Fisheries (2000-2006 and 2007-2013) weren't included specific provisions for financing GND gear replacement for selectivity reasons. Any modification of vessels participating in driftnet fisheries made without any Community Aid and there was no increase of the available funds for financing the permanent cessation of vessels participating in driftnet fisheries [9,10].

Conclusions

The driftnet fishery in the marine area of Bulgaria concern only Atlantic bonito (*Sardasarda*). The real catch and the state of bonito populations are unknown. The inland use of driftnets and more particularly in the Danube River fishery is more dependant and economically viable than the marine one. Taking into consideration all the existent EU regulations and national legislation in force regarding the driftnet fishery, the final impacts of all measures would be sustainable exploitation of living aquatic resources, taking account of the environmental, economic and social aspects in a balanced manner.

The European Commission wants to prohibit the use of any kind of driftnets for fishing in all EU waters as of 1 January 2015 (COM/2014/0265 final - 2014/0138 (COD)). Although rules are already in place to banusing driftnets to catch certain migratory fishes, the practice continues to be a cause of concern due to the incidental catching of marine mammals, sea turtles and sea birds which are mostly protected under EU legislation. To fight

circumvention, the Commission proposal includes a full ban of driftnets fishing in the EU as well as the prohibition of keeping driftnets on board of fishing vessels.

Acknowledgements

This case report is based on a Case Study for Bulgaria, under the Specific Contract No 5 “Study in support of the review of the EU regime on the small-scale driftnets fisheries” of the Framework Service Contract No. MARE/2011/01 “Evaluation and impact assessment activities for the Directorate-General for Maritime Affairs and Fisheries” Lot 2: Retrospective and prospective evaluations on the common fisheries policy, excluding its international dimension which has been implemented by the consortium led by MRAG Ltd. Inputs and discussions from MRAG colleagues and especially Dr. Rebecca Mitchell are gratefully acknowledged.

References

1. EC (2013) - fleet register, July 2013.
2. Mitchell R, Triantaphyllidis G, Metz S, Peatman T, Nelson L, William Mitchell S (2014) Study in support of the review of the EU regime on the small-scale driftnet fisheries. Lot 2: Retrospective and prospective evaluation on the common fisheries policy, excluding its international dimension. Ref. No MARE/2011/01, Specific Contract No. 5. May 2014. 297pp + Annexes.
3. NAFA (2007) NAFA (National Agency for Fisheries and Aquaculture) (2007) National Strategic Plan for Fisheries and Aquaculture 2007-2013. Ministry of Agriculture and Forestry. Sofia, Bulgaria.
4. Zlatanova S (2004) Freshwater fisheries: principles, mechanisms and elements of fishery management, which contribute to decrease of biodiversity of freshwater ecosystems and the unsustainable use of inland fishery resources. Country: Bulgaria. Freshwater Fisheries in Central & Eastern Europe: the Challenge of Sustainability. Questionnaire. IUCN ESUSG. Fisheries WG.
5. Frimodt C (1995) Multilingual illustrated guide to the world's commercial warm water fish. Fishing News Books, Osney Mead, Oxford, England. pp. 215.
6. COM/2014/0265 final - 2014/0138 (COD). Proposal for a Regulation of the European Parliament and of the Council, laying down a prohibition on driftnet fisheries, amending Council Regulations (EC) No 850/98, (EC) No 812/2004, (EC) No 2187/2005 and (EC) No 1967/2006 and repealing Council Regulation (EC) No 894/97.
7. NAFA (2013) NAFA (National Agency for Fisheries and Aquaculture). 2007. National Strategic Plan for Fisheries and Aquaculture 2007-2013. Ministry of Agriculture and Forestry. Sofia, Bulgaria.
8. NAFA (2012) NAFA (National Agency for Fisheries and Aquaculture). 2007. National Strategic Plan for Fisheries and Aquaculture 2007-2013. Ministry of Agriculture and Forestry. Sofia, Bulgaria.
9. http://ec.europa.eu/fisheries/documentation/studies/small-scale-driftnet/index_en.htm
10. Collette BB (1986) Scombridae (including Thunnidae, Scomberomoridae, Gasterochismatidae and Sardidae). pp. 981-997. In: PJP Whitehead, et al. (Eds.), Fishes of the north-eastern Atlantic and the Mediterranean, Vol 2. Unesco, Paris.