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Public subsidies have supported the development of electric trawling in Europe

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ABSTRACT

In the 2000s, the Dutch beam trawl fleet was in chronic deficit and under pressure to reduce its environmental impact. Instead of converting to selective fishing gears, it successfully lobbied the European Commission with the support of public authorities and scientists to obtain derogations against formal scientific advice to practice a prohibited technique: electric trawling. Since then, electric trawling has expanded beyond regulatory threshold: 84 large trawlers now catch the vast majority of the Dutch flatfish quota, causing detrimental socio-environmental impacts. To assess whether the European Union's fisheries policies fulfilled legal objectives and implemented the 2030 Agenda, it appeared crucial to quantify how much public financial aid had been provided to the Dutch fishing sector for its conversion to electric trawling. The financial information enabling this evaluation was first concealed but was eventually obtained. We show that the institutional opacity surrounding electric trawling was not serendipitous and has served to dissimulate allocations of public monies to a prohibited fishing method (otter trawl), illegal licenses, and falsely 'scientific' fishing. In breach of EU laws, 20.8 million EUR of structural funds have so far been granted to this sector in the form of direct subsidies, i.e. over 30 times the amount acknowledged by the fishing industry. The findings presented here lift part of the veil surrounding electric trawling, but the complete reconstruction of the impacts of this fishing method can only be done when decision-makers and scientists disclose all data in full transparency and become the warrants of the public interest.

1. Introduction

In the waters of the European Union (EU), electric trawling consists in equipping regular beam trawls with electrodes emitting bipolar currents (hence the 'pulse fishing' name used by its proponents). The electrodes are meant to replace the usual metallic tickler chains of beam trawlers. This technique was first tested by the Netherlands in the 1970s [1], but was widely adopted by the Dutch fishing industry in the late 2000s, at a time when its beam trawl fleet was chronically loss-making [2] and under the threat of a full ban on beam trawling due to its destructiveness [3,4].

Although fishing with electric current was prohibited in EU waters as of 1998 for the "conservation of fishery resources through […] the protection of juveniles" [5], Dutch lobbying proved efficient and "with some power play [they] got it in the regulation" [3] and mainstreamed in the North Sea in just a few year. In late 2006, the European Commission (referred to as 'the Commission' throughout) proposed that derogations be granted to use electricity in marine fisheries in the southern part of the North Sea. The Commission alleged to scientific guidance to justify its proposal but it later turned out that the Commission's decision went against the explicit advice of its own Scientific Technical and Economic Committee for Fisheries (STECF) [6,7]. This proposal by the Commission was swiftly adopted by the Council of the EU (referred to as 'Council' throughout) in December 2006 [8]. Through sleight of hand, this authorization to practice a prohibited fishing method came as a legislative rider through the 'Total Allowable Catches (TACs) & quotas' regulation, i.e. the text that allocates fishing opportunities to each Member State on a yearly basis. This covert trick to grant derogations to a prohibited fishing method was renewed in 2007 [9] and again in 2008 [10], for the years 2008 and 2009 respectively. As a result, the Netherlands used an exemption regime, which was tailor-made for them, to grant 22 licences to their national trawlers [7], but from the get-go, these derogations surpassed by three vessels the legal limit arbitrarily proposed by the Commission (Table 1).

An analysis by a former Commission's jurist has shown that EU institutions have then facilitated the expansion of electric trawling to full commercial scale by a series of unjustifiable and opaque decisions [7] when this technique should have been, at most, trialed under a strict scientific protocol. In 2008, the Commission released a legislative proposal to "simplify the Technical Measures Regulation" [11], which was adopted by Council in 2009 just days before the Lisbon Treaty came into force and imposed co-decision with the European Parliament (referred to as 'the Parliament' throughout) thereafter: Regulation (EC) No 1288/2009 allowed electric trawling to continue until 20 June 2011

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Table 1
Number of Dutch derogations over time compared to the legal limit set by Council Regulation (EC) No 41/2007 and then Regulation (EU) No 227/2013.

Year	Number of derogations granted	Legal limit (i.e. 5% of the beam trawl fleet)[a]	Comment
2007	22	19 (i.e. 3 illegal)	According to the online EU Fleet Register (http://ec.europa.eu/fisheries/fleet/), there were 386 Dutch-flagged beam trawlers active as of 1 January 2007.
2011	20 (total of 42)	17 (i.e. 25 illegal)	According to the online EU Fleet Register (http://ec.europa.eu/fisheries/fleet/), there were 351 Dutch-flagged beam trawlers active as of 1 January 2011.
2014	42 (total of 84)	16 (i.e. 68 illegal)	According to the online EU Fleet Register (http://ec.europa.eu/fisheries/fleet/), there were 326 Dutch-flagged beam trawlers active as of 1 January 2014.
2018	None (total of 84)	14 (i.e. 70 illegal)	According to the EU Fleet Register (http://ec.europa.eu/fisheries/fleet), there were 322 Dutch-flagged beam trawlers as of 1 January 2018. However, Dutch researchers reported an overall fleet of 280 vessels eligible to exemptions [11], hence the legal limit set to 14 derogations.

[a] The number of illegal derogations (i.e. total number of derogations minus legal limit) is provided in parentheses.

under the name of 'transitional technical measures'. These were prolonged until the end of 2012 thanks to Regulation (EU) No 579/2011, which was adopted by the Parliament.

It was only in 2013 that the 1998 Regulation was amended to include the principle of derogations in the law, thus allowing Member States to equip up to 5% of their beam trawl fleets with electrodes without requiring yearly exemptions [12]. However, the 5% exemption threshold set forth in 2007 and incorporated in the Regulation in 2013 was insufficient to convert the Dutch commercial fleet of trawlers to electricity. The Dutch government succeeded to obtain from Council — outside the normal legislative process — that more exemptions be granted in parallel: as a result, 20 additional licences were delivered for 'scientific research' in December 2010 [3], surpassing the 5% regulatory limit and bringing the total amount of licences to 42 (the justification of the Council's decision and the legislative act are nowhere to be found). Yet again, 42 licences were still not sufficient to satisfy all Dutch fishers, so the Government sought other justifications to obtain licences despite the Dutch beam trawl fleet having already converted 12% of its vessels, i.e. over twice the legal threshold (Table 1).

In 2014, lobbying by the Netherlands to the Commission proved efficient: the European Maritime and Fisheries Fund's (EMFF) legislative proposal included the possibility to increase the legal threshold of electric trawlers through the modernization of fleets, but this measure was removed by the Parliament's EMFF rapporteur [3]. Defeated by this Parliament's decision, the Netherlands negotiated directly with the Commission and Council a way to circumvent this decision and obtained 42 additional derogations, under the guise of a 'pilot project' on bycatch mitigation [13]. This last tactic brought the total number of licences to 84, i.e. over five times the legal limit of 5% at that time (Table 1).

If the Netherlands were to comply with the legal limit set by the 2013 Technical Measures Regulation, there would have been 'only' 14 Dutch electric trawl licences granted for 2018 (Table 1). Instead, 84 large Dutch electric trawlers are now catching the overwhelming majority of the Dutch flatfish quota (see Supplementary material, Appendix A). Around ten UK- and Germany-flagged vessels under Dutch ownership are also equipped with electric trawlers [14]. On 1 February 2019, the services of the Commission acknowledged the illegal number of derogations granted by the Netherlands and asked the College of Commissioners to open a formal infringement procedure against that country [15].

1.1. A controversial fishing method

As early as 2015, representatives from the small-scale fishing sector — accounting for 82% of the EU fishing units [16] — raised their concerns about the impacts of electric trawling on their livelihoods and marine ecosystems, but the political reach of the Dutch industry proved again so strong that in 2016, the Commission proposed to lift the ban and thus deem electric trawling as a 'conventional' method [17]. Despite ecological evidence that electric trawling has negative impacts on marine ecosystems, the extent of the socio-economic impacts have however yet to be assessed properly [18]. While many 'unknowns' remain, there are ample worrisome 'knowns'. Among others:

- Electric trawls remain bottom contact gear that are dragged along the seabed and impact marine habitats. According to the latest report published by the International Council for the Exploration of the Sea (ICES), the average penetration depth of electric trawls was estimated at 1.8 cm [18]. ICES further reported that "the electric field can penetrate over 30 cm in the sediment which is potentially an additional risk compared to the traditional beam trawl which penetrate on average 4 cm". ICES further stated that "the effects of pulse exposure are not yet fully understood and the combined effects have not been studied yet";
- Electric trawls are not selective. According to data compiled by consultants and academics, electric trawlers discard 50–70 kg — including plaice (*Pleuronectes platessa*), dab (*Limanda limanda*) and sole (*Solea solea*) — for 100 kg of fish caught [19,20]. Importantly, it appears that IMARES — the Dutch research institute that conducts the vast majority of research on electric trawling — has actively supported the electric trawling industry by promoting cherry-picked data or setting aside inconvenient results. This phenomenon clearly appears in a video produced by the laboratory on fish survival in relation to the EU 'landing obligation', in which it is stated that "around 95% of the undersized fish are alive immediately after being caught". By doing so, they failed to provide the final results of the study, which indicate that the survival rates of undersized fish are very low for the main species: 13% for brill, 14% for plaice, and 19% for sole [18]. Furthermore, electric trawlers appear to catch more juvenile sole than regular beam trawlers, with 73–81% more discards of this species [18];
- The Dutch fishing industry has emphasized that electric trawling allows fuel consumption to be reduced by half [21]. However, this is only true in terms of overall consumption, not energy efficiency with regards to total catch. According to Dutch scientists, an electric trawler still consumes 2.21 L of fuel per kilo of fish caught, barely less than a regular beam trawler (2.36 L/kg) [22]. Electric trawlers have a reduced overall consumption of fuel because they reach their quota faster for their most valuable target species, sole. This means that they spend less time at sea and have improved their economic returns [2.17 EUR/L for electric trawlers vs. 1.23 EUR/L for regular trawlers; 22];
- The electric current used by electric trawlers, a 'pulsed bipolar current', is identical in nature to that used by Tasers© (electroshock weapons) [23]. This type of current causes such violent, uncontrolled convulsions that 39–70% of large Atlantic cod (*Gadus morhua*) are left with a fractured spine and internal bleeding after the shock [24,25]. Recently, "preliminary results of 362 Atlantic cod sampled on nine fishing trips made by six different electric trawlers using sole pulse indicated that in total 42.5% of the Atlantic cod showed a spinal abnormality" [18];

- Since electric trawls are lighter than conventional beam trawls, they can also operate in coastal areas that were previously inaccessible to them. However, these areas are often reproduction zones or nurseries for numerous marine species [18], where mostly low-impact, small-scale fisheries were previously operating. In the southern part of the North Sea — particularly along the Belgian coast and off the Thames Estuary — landings of sole have increased by around 50%, from 4000 tons landed in 2009 to more than 6000 tons in 2017 [18];
- There is currently little knowledge on the impact of electric current on the development of early life stages. In 2018, ICES acknowledged that "there is no information available on the survival of early life history stages after exposure to the sole pulse" [18]. One study looked at the impacts of electric current on eggs, larvae and young juveniles of cod, but the experiment only tested 'unipolar' current, which is used for shrimp trawling and is relatively less damaging than the 'bipolar' current used for flatfish [26]. Even with these unorthodox parameters, researchers found that the hatching rate was reduced and that the survival rate had declined for two of the four larval stages [27];
- Electric trawling involves introducing energy in the ecosystem, which, in the EU, is defined as 'pollution' according to the Directive 2006/11 [28]. Additionally, the electrolysis of saltwater may also result in the formation of harmful chemical compounds such as chlorine and caustic soda, as well as metallic compounds [29]. In 2018, ICES noted that "possible chemical changes due to electrolysis is also a subject of concern due to the potentially harmful substances which may be released into marine habitats" [18].

Besides these serious problems, ICES also stated in 2015 that the Dutch government issuing 84 derogations with the support of the Commission was "essentially permitting a commercial fishery under the guise of scientific research" [30]. Using science as a pretext, a destructive fishing method was thus authorized against the recurrent advice of scientists. EU institutions have therefore been supporting a fishing practice that is as questionable as 'scientific whaling'. Even Dutch scientists have publicly questioned the logic of the Dutch fleet, which clearly pursued profitability over sustainability [31]. As a result, quality research is lacking since the first exemptions were granted at the end of 2006, as evidenced by the work of a Dutch investigative journalist [32]. When subsequently summoned by media to provide explanations about the high number of derogations, Dutch Fisheries Minister Carola Schouten recognized that there had been no research plan. She blamed the Commission for that: "when it became clear [in 2014] that our scientific research on pulse fishing had not yet begun, the Commission approved a third round of exemptions" [33].

1.2. Current state of play

In January 2018, the Parliament voted for a full ban on electric fishing. In February 2019, the ensuing 'Trilogue' negotiations (between the Parliament, the Commission, and Council) agreed on i) a drastic reduction of the number of derogations — from currently 84 to a number corresponding to 5% of the Dutch beam trawl fleet (i.e. 14 as of 1 January 2018) — and ii) on a full ban on 30 June 2021. While new light was cast on the influence of a sectorial lobbying on public policies as well as on the instrumentalization of science [7], the financial implications of the development of electric trawling remained unquantified. Transparency is necessary to assess whether policies that are implemented by governments fulfill legal obligations and objectives such as those set forth by the EU's Common Fisheries Policy (CFP) and the United Nations' Sustainable Development Goals. It thus appeared crucial to assess whether public financial aid was provided to the Dutch fishing sector for the conversion of its nearly bankrupt beam trawl fleet to electric trawling. In this paper, we analyze the fisheries subsidies that were allocated to the electric trawling sector in the Netherlands since 2007.

2. Material and methods

The analysis presented in this paper covers both the European Fisheries Fund (EFF) and the European Maritime and Fisheries Fund (EMFF) periods, i.e. from 2007 to 2020. We did not analyze the subsidies allocated under the previous period (2000–2006) as the file corresponding to the second iteration of the Financial Instrument for Fisheries Guidance (FIFG) was not available. Although not as critical as the EFF and EMFF files, the FIFG file could however include a few subsidies allocated to electric trawling. Our analysis does also not include State or regional subsidies (except those acknowledged by the industry) nor indirect subsidies such as fuel tax breaks.

2.1. Data sources

The subsidies data analyzed in this paper were collected from the Ministry of Economic Affairs:

- For the EFF, which was supposed to cover the 2007–2013 period but which eventually ran until 2016, data were initially not available online but were obtained in June 2018 through the process described in the Supplementary material (Appendix B). They are now available at: www.rvo.nl/onderwerpen/agrarisch-ondernemen/visserij/openbaarmaking-evf-subsidies.
- For the EMFF, which followed the EFF, data were readily available on the website of the Dutch Ministry of Economic Affairs at: www.rvo.nl/onderwerpen/agrarisch-ondernemen/visserij/eu-fonds-voor-maritieme-zaken-en-visserij/openbaarmaking-efmzv-subsidies.

To analyze these data, we also had to identify the Dutch trawlers equipped with electric gears. However, there is no such list on any of the official governmental portals or documents. The only list that exists is the one put together by the *Cooperatieve Visserij Organisatie* (CVO; an association of Producers Organization), which needed to be produced for the assessment procedure of the 'Marine Stewardship Council' (MSC) seafood label (withdrawn from assessment in December 2016). As part of this assessment, a list of 84 Dutch vessels was provided, along with three UK-flagged and three German-flagged vessels [34]. We have updated and complemented this list, which can be found in the online repository available at: https://doi.org/10.17632/vv238m6wjh.1.

It is important to note that there has not been any official list of electric trawlers since this MSC assessment. Furthermore, there is no official indication of the dates at which each electric trawler was equipped with electricity, despite numerous requests to the electric trawling's principal scientist (IMARES' Dr. Adriaan Rijnsdoorp), the main representative of the electric trawling sector (VisNed's Chief Executive Willem 'Pim' Visser), and ICES. At the date of publication, a correspondence with the Dutch Ministry of Economic Affairs had also been initiated but no response had been obtained. The full correspondence is available at: www.bloomassociation.org/en/requests-electric-fishing.

As a result of this opaque context and in the absence of an official list, it is possible that our list may contain some inaccuracies, and a few vessels may no longer be equipped with electrodes.[1] However, we assumed *by default* that our list was exhaustive and accurate. The burden of proof should be on the fishing industry given that electric trawling is supposed to be a scientific trial, therefore full accountability should be mandatory.

[1] For example, TX-65 (BONA FIDE) was fitted with an electric trawl (it took part in the MSC assessment), but changed hands in 2017 (rebranded WL-39 MONTE SR.). Without any further information, we assumed that it is still fitted with an electric trawl.

2.2. Identification of electric trawling subsidies

Once the EFF and EMFF subsidies data were obtained, those having contributed to the electric trawling sector were identified in two ways:

- For the EFF, a first round of identification was done using keywords contained in project names, i.e. 'puls', 'pulsvisserij', and 'elektrisch vissen'. Subsidies identified with these keywords were automatically considered as having contributed to the development of electric trawling. All other projects were assessed on a one-by-one basis to determine whether they also contributed to the development of electric trawling. A literature review of the reports and articles produced by IMARES was conducted, and several other sources such as governmental (e.g. www.europaomdehoek.nl) and industrial portals (e.g. www.blueportal.nl) were used. Based on this review and on the list of Dutch electric trawlers described in Section 2.1. subsidies allocated to the development of electric trawling were identified. Note that one project can be linked to one or more fishing vessels. Justifications for all identified subsidies are provided in the Supplementary material (Appendix C).
- For the EMFF, the vessels' matriculation numbers contained in the file (i.e. the Community Fleet Register numbers; CFRs) were cross-referenced with the list of electric trawlers described in Section 2.1. By doing so, we were able to identify which subsidies were granted to the development or support of electric trawling. Certain project names also contained the keyword 'puls' and were automatically considered as having contributed to the development of electric trawling.

Finally, each of the beneficiaries of subsidies considered as having benefited to the electric trawling sector was classified as either 'Fishing company' (e.g. *Zeevisserijbedrijf P.A. Baaij En Zn.*), 'Industry representative' (e.g. *De Coöperatieve Visserij Organisatie U.A.*), 'Ministry' (e.g. *Ministerie van EZ*), or 'Others' (e.g. *Delmeco Projecten B.V.*)

Raw data as well as processing scripts are available in the online repository available at: https://doi.org/10.17632/vv238m6wjh.1.

3. Results

Overall, we estimated that 20.8 million EUR (nominal value) of combined EFF and EMFF European structural funds have been allocated to the development, support, and legitimation of the Dutch electric trawling fleet since 2007 (Fig. 1). Most of the EMFF subsidies are committed but have yet to be paid.

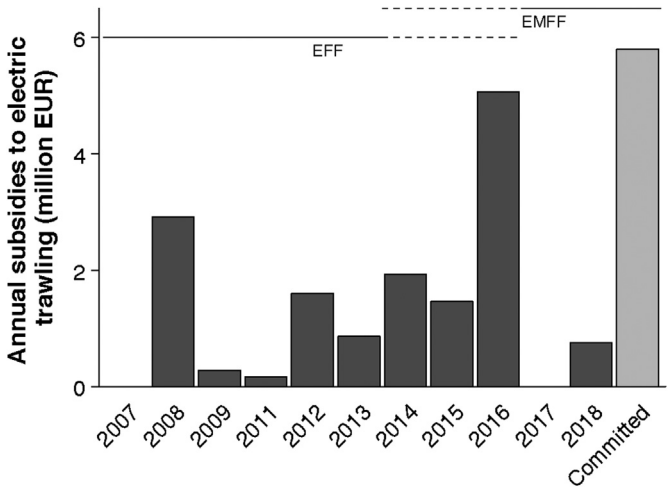

Fig. 1. Annual subsidies allocated to the development of the Dutch electric trawling fleet, 2007–2020. The EFF was extended to the end of 2016, while the EMFF only started to cover electric trawling in 2018 (dash lines). Committed amounts that remain to be paid are shown in lighter grey.

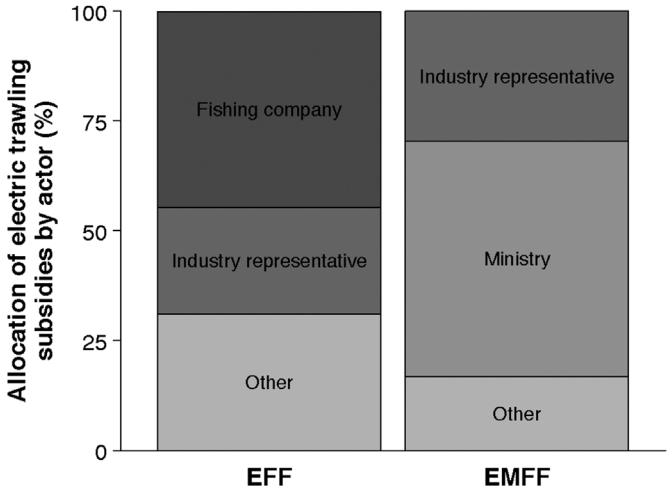

Fig. 2. Allocation by actor of EFF and EMFF funds used for the development of electric trawling. The 'Other' category includes anonymous beneficiaries as well as non-fishing companies such as *Delmeco projecten BV* and *Technisch Bureau Verburg-Holland BV* (electric trawl manufacturers).

Out of these 20.8 million EUR, 32.1% (i.e. 6.7 million EUR) correspond to project names that contain 'elektrisch vissen' or 'puls'. The remaining 67.9% correspond to projects for which documentation proving the link with electric trawling exists, or to projects that implicated electric trawlers (see Supplementary Material for in-depth details; Appendix C).

During the period covered by the EFF, 44.6% of the funds transited through fishing companies, 24.2% through industry representatives such as VisNed, CVO and Nederlandse Vissersbond, and 31.1% through other structures (e.g. anonymous beneficiaries and non-fishing companies). With regards to the EMFF, the flow of money is different, and fishing companies appear to no longer receive any direct subsidies: the Ministry of Economic Affairs manages 53.5% of the funds, while industry representatives handle 29.6% and other structures (such as electric trawl manufacturers) the remaining 16.9% (Fig. 2).

Noteworthy, this allocation of EFF and EMFF funds by actor highlights that the official marine research institute in charge of studying electric trawling — the IMARES/Wageningen University & Research center — has never directly received any public money to conduct research. Public subsidies dedicated to research (e.g. projects 'Innovatieve discardvermindering vanuit de praktijk', 'Netinnovatie kottervisserij', 'Verbeteren overleving tong en schol Nederlandse kottervloot', 'Best practices selectiviteit en overleving bijvangst kottervisseri' etc.) have always first transited through industry representatives alone (for the EFF), or along with the Ministry (for the EMFF).

Finally, our analysis also reveals that the largest single beneficiary of EFF and EMFF structural funds (besides the Ministry) is the Urk-based foundation *Stichting Masterplan duurzame visserij*, which promotes a 'Masterplan for sustainable fisheries'. It has claimed 2.7 million EUR since 2016 for the project development and subsequent construction of the pilot vessel 'MDV-1 IMMANUEL'.

4. Discussion

In January 2018, VisNed's Chief Executive Pim Visser publicly claimed that "apart from [680 000€ of national funds invested in 2009 in the development phase], no national or European public funds have been used to subsidize investment in pulse fishing for the private sector" [35]. In stark contrast with this statement, we estimated that — besides these 680 000 EUR of State aids — 20.8 million EUR of both EFF and EMFF EU structural funds have so far been allocated to the Dutch electric trawling sector. This is over 30 times more than the

amount acknowledged by the Dutch fishing industry. In addition to this significant gap between the Dutch industry's claim and what our analysis show, we highlight several failures in the administration and use of public money in the EU.

4.1. An illegal fishing gear was subsidized

The Urk-based foundation *Stichting Masterplan duurzame visserij*, which promotes a 'Masterplan for sustainable fisheries', has claimed 2.7 million EUR since 2016 for the project development and subsequent construction of the pilot vessel 'MDV-1 IMMANUEL' in breach of several EU regulations:

- 1) Construction subsidies have been prohibited in the EU since 2004 under Council regulation (EC) No 2369/2002 [36];
- 2) The pilot fishing vessel supported by the project is an *otter* trawler equipped with electrodes, but the EU legal framework only allows *beam* trawlers to switch to electricity [12], not otter trawlers.

In fact, the fishing industry was quite straightforward with regards to the development of illegal fishing gears, as it stated in a document published in 2014 that "technology progresses beyond the current [legal] status. Pulse trawling will be developed for other gears than beam trawls, e.g. twin trawls, dredges etc." [37]. The 2016 proposal by the Commission suggests that this illegal situation may have been known, given that the wording of its Annex V Part B proposed to no longer restrict electric trawling to beam trawls only [7,17].

4.2. Subsidies in breach of EU obligations and global commitments

As part of the Sustainable Development Goals adopted by the United Nations General Assembly in 2015, the EU committed to "end overfishing" and "destructive fishing practices" by 2020 (SDG 14.4), as well as to "prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing" (SDG 14.6) [38]. Given the impacts of electric trawling listed in Section 1.2. we argue that subsidizing electric trawling does the exact opposite of what the EU committed to implement. From a United Nations' perspective, the electric trawling file should alarm citizens and authorities as not only are the needed changes identified by the United Nations' General Assembly not being carried out in the field, but worse, the practices that harm the environment and employment are being encouraged, supported, and financed by institutions.

From the EU's perspective, the Basic Regulation of the Common Fisheries Policy adopted in 2013 set an objective for the EU to restore fish stocks and to end overfishing by 2020 at the latest. In particular, Article 17 stipulates that fishing opportunities must be allocated via "transparent and objective criteria including those of an environmental, social and economic nature", and that "Member States shall endeavour to provide incentives to fishing vessels deploying selective fishing gear or using fishing techniques with reduced environmental impact, such as reduced energy consumption or habitat damage" [39]. Here again, we argue that electric trawling contradicts these objectives.

Furthermore, the subsidies identified above are also in breach of financial EU regulations, such as Article 6 of Regulation (EC) No 1198/2006, which stipulates that "operations financed by the EFF shall not increase fishing effort", and Article 11 of Regulation (EU) No 508/2014, which states that "operations increasing the fishing capacity of a vessel or equipment increasing the ability of a vessel to find fish" are not eligible to the EMFF. However, the use of electric trawls clearly does increase the ability to catch fish, as shown by scholars on several occasions [18,40,41]. The efficacy of electric trawling was also acknowledged by the Commission as early as 2007 [42].

Finally, we also argue that the subsidies identified in this paper have also largely been granted to vessels equipped beyond the legal framework (see Section 1.1.) and are, as such, undue. As a reminder, if the regulatory framework were respected by the Netherlands, there would only be 14 electric beam trawlers operating in the North Sea, not 84. Therefore, any subsidies granted to the other 70 illegal electric beam trawlers are also illegal.

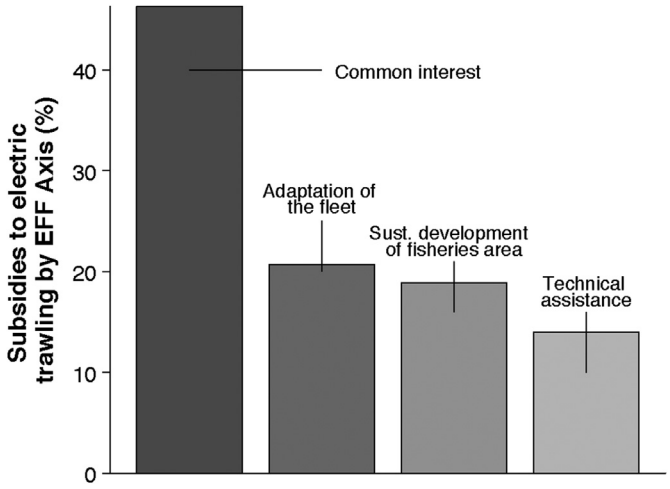

Fig. 3. Distribution of EFF subsidies allocated to the development of electric trawling according to the EU official nomenclature.

4.3. Harmful subsidies disguised as beneficial ones

Our analysis also reveals that harmful fisheries subsidies were presented as beneficial ones via a semantic shift that has allowed electric trawling — a prohibited fishing method — to be branded 'innovative' and therefore to be in a position to claim millions of euros in public money. On first glance, most subsidies, as presented by the Dutch government, could be deemed 'beneficial', as they are allocated under specific 'axes' of the EU fisheries financial instruments. For example, with regards to the EFF, 46.1% of the subsidies allocated to electric trawling fitted under the category 'Measures of common interest', and 18.4% fitted under the category 'Measures for the sustainable development of fishing areas' (Fig. 3). Given the radical efficacy of electric trawlers, their impacts on other fishers in the North Sea and the environmental problems highlighted above (see Section 1.2.), we argue that the development of electric trawling serves everything but 'common interest' and, on the contrary, contributes to the *unsustainable* development of fishing grounds.

4.4. Industry-funded research

Lastly, although the industry claims that besides the 680 000 EUR of State aids they have acknowledged, "further subsidies have only been granted for scientific research" [43], we have shown that public subsidies dedicated to research have always first transited through industry representatives or the Ministry. This raises questions on the independence of science and on the allocation and use of this money. We were indeed unable to assess how much of this money was used for fitting vessels with electric trawls, or to compensate 'pilot vessels', or to conduct actual research in a laboratory. To understand the rationale that justified allocating research funding through industry representatives or ministries (when the research institute could have directly applied for such grants), we requested additional information from IMARES but were dismissed. We feel that such an opaque administration of public funds is questionable and could explain why no proper research has so far been conducted — as evidenced by the Dutch media 'NOS' investigation quoted in the introduction [32] — and why IMARES seems to disregard some inconvenient findings (see section 1.2.).

5. Conclusions

Electric fishing is forbidden in many fishing nations in the world (e.g., in Brazil [44], China [45], Federated States of Micronesia [46], Ghana [47], Hong Kong [48], Iran [49], Kenya [50], Liberia [51], Madagascar [52], Malaysia [44], the Philippines [53], the Russian Federation [54], Samoa [55], Sierra-Leone [56], Solomon Islands [57], Tanzania [58], Thailand [59], the United States [44], Uruguay [44], and Vietnam [60]), and explicitly authorized in none. It was also banned in the EU until the Commission and Council, at the end of 2006, decided to authorize the use of electric current to catch fish through an exemption regime granted to beam trawlers. This initial decision, which is now causing widespread concerns, went against scientific advice, but it satisfied the private interests of the Dutch industrial beam trawl fleet.

In this paper, we demonstrate that beyond the social, environmental, political, and juridical issues identified in the introduction, the electric trawling case is also controversial from a financial point of view. Millions of euros have been allocated to a supposedly scientific endeavor that was pinpointed by ICES as a commercial venture, i) for the development of an illegal fishing fleet (i.e., illegal derogations), ii) for a prohibited fishing method (otter trawling), and iii) against the EU's own regulations and commitments.

In this paper, we have shown that despite a first vote at the Parliament in 2014 and several negative scientific advice, EU citizens have unknowingly financed the development of a destructive and potentially illegal practice. Unfortunately, this undermined a real transition towards sustainable fishing practices, as required by the EU's Common Fisheries Policy, the United Nations' Sustainable Development Goals, and the Paris Accord's objectives. In order to achieve these goals, we will need full transparency to obtain a thorough and accurate picture of the use of public funds, including State aids and indirect subsidies such as fuel tax breaks.

Declarations of interest

None.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.marpol.2019.03.003.

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