

Regulatory Triage Assessment

Title of Measure	The Canyons Marine Conservation Zone (Specified Area) Prohibited Fishing Gears Byelaw 2021
Lead Department/Agency	Marine Management Organisation (MMO)
Expected Date of Implementation	DRAFT
Origin (Domestic or International)	Domestic
Date of Assessment	01/02/2021 (DRAFT)
Lead Departmental Contact	Marine Conservation Team, Marine Management Organisation, Lancaster House, Hampshire Court, Newcastle, NE4 7YH, conservation@marinemanagement.org.uk
Departmental Triage Assessment	Low-cost regulation (fast track)
Rationale for intervention and intended effects <p>Fishing activity has the potential to hinder the conservation objectives of The Canyons Marine Conservation Zone (MCZ), particularly in regard to the “recover to favourable condition” general management approach (GMA) assigned to the features of conservation importance (FOCI) coral gardens, cold-water coral reef, and the broadscale habitat of deep-sea bed. Additionally, the FOCI sea-pen and burrowing megafauna communities has a “maintain in favourable condition” GMA. This byelaw is proposed to ensure the site’s conservation objectives are furthered by prohibiting certain fishing activities in a specified area.</p>	
Viable policy options (including alternatives to regulation) <p>Option 0: Do nothing</p> <p>Option 1: Whole site prohibition.</p> <p>Option 2: Whole feature prohibition.</p> <p>Option 3: Zoned feature prohibition.</p> <p>Option 4: Voluntary agreement.</p> <p>Option 3 is the preferred option.</p>	
Description of Novel and Contentious Elements (if any) <ul style="list-style-type: none"> Use of new powers introduced by the Fisheries Act 2020. 	
Initial assessment of impacts on business <p>Available evidence suggests 11 UK fishing vessels are likely to be directly affected by the prohibition of demersal trawls, demersal seines and anchored nets and lines across The Canyons MCZ management area.</p> <p>The impacts are likely to be ongoing as opposed to one-off but are expected to be mitigated by use of other available fishing grounds.</p> <p>The estimated monetised total cost to UK businesses over ten years is expected to be £11,101 (2020 present value). The equivalent annual net direct cost to business (EANDCB) of £11,101 (2020 present value).</p>	

Non-monetised costs include the potential impact of displaced fishing activity on habitats/areas outside of the management area, and indirect costs to the fishing industry associated with displacement to other fishing grounds.

None of the expected benefits of the proposed management measure have been monetised, however non-monetised benefits include the protection designated features and the ecosystem services they provide, including indirect benefits to the fishing industry resulting from spillover.

Summary of monetised impacts

- Estimated Net Present Value: -£95,551
- Estimated Business Net Present value: -£95,551
- Estimated Equivalent Annualised Net Costs to Business: £11.101
- Appraisal period: ten years
- The Price Base Year and Present Value Base Year: 2019 and 2020
- **BIT status/score : 0.05**

The proposal is a Regulatory Provision as it relates to business activity (the fishing industry); it has a regulatory effect by prohibiting the use of demersal trawls, demersal seines and anchored nets and lines fishing gears within specified area; and has effect by virtue of the exercise of a function conferred on a Minister of the Crown or a relevant regulator.

The proposal is a Qualifying Regulatory Provision as it does not fall within any of the administrative exclusions set out in the Business Impact Target written ministerial statement - HCWS574¹.

Rationale for producing an RTA (as opposed to an Impact Assessment)

The fast-track appraisal route is appropriate as this regulation falls under the “low cost” criteria - EANDCB is under £5m, as detailed in the initial assessment of impact on business above.

¹ <https://questions-statements.parliament.uk/written-statements/detail/2016-03-03/HCWS574>

Supporting evidence

1. The policy issue and rationale for Government intervention

- 1.1. The MMO has the duty to exercise its functions in a way which best furthers the conservation objectives of MCZs². MMO also has the power to manage fishing in order to conserve marine habitats³.
- 1.2. The MMO has undertaken an assessment⁴ of the impact of fishing in The Canyons MCZ. This assessment determined that demersal trawls, demersal seines and anchored nets and lines fishing may be hindering the conservation objectives of the MCZ. The proposed byelaw will further the conservation objectives of the MCZ by prohibiting the use of bottom towed fishing gears and anchored nets and lines within a specified area within the site.
- 1.3. Fishing activities have the potential to cause negative outcomes in the marine environment as a result of 'market failures'. These failures can be described as:
 - public goods and services: A number of goods and services provided by the marine environment such as biological diversity are 'public goods' (no-one can be excluded from benefiting from them, but use of the goods does not diminish the goods being available to others). The characteristics of public goods, being available to all but belonging to no-one, mean that individuals do not necessarily have an incentive to voluntarily ensure the continued existence of these goods which can lead to under-protection/provision. With regard to bottom towed fishing, this means that fishers can benefit from the biological diversity of marine habitats through sale of sea fisheries resources caught while simultaneously damaging the habitat and reducing its biological diversity. While the habitat continues to provide benefits to fishers through the sales of sea fisheries resources there is no incentive to protect these habitats. A lack of ownership allows the activity to continue unchecked until such time biological diversity falls to the point where catches are no longer profitable and fishers move on to more productive grounds.
 - negative externalities: Negative externalities occur when the cost of damage to the marine environment is not fully borne by the users causing the damage. Bottom towed fishing can cause severe damage to fragile habitats which can reduce biodiversity and productivity and take many years to recover. The only cost borne by bottom towed gear fishers of this damage is the eventual reduction in catches and the potential increase in fuel costs involved in moving to new fishing grounds. The availability of other fishing grounds lessen the cost associated with reduced catches and potentially increased fuel costs are not significant enough to dissuade fishers from causing the damage in the first place.
 - In many cases no monetary value is attached to the goods and services provided by the marine environment and this can lead to more damage occurring than would occur if the users had to pay the price of damage. Even for those marine harvestable goods that are traded (such as wild fish), market prices often do not reflect the full economic cost of the exploitation or of any damage caused to the environment by that exploitation.

² Section 125 of the Marine and Coastal Access Act 2009. Where it is not possible to further the conservation objectives, the MMO has the duty to least hinder them.

³ Section 129B of the Marine and Coastal Access Act 2009.

⁴ https://consult.defra.gov.uk/mmo/call-for-evidence-mmo-mpa-assessments/supporting_documents/Draft%20The%20Canyons%20MCZ%20fisheries%20assessment.pdf

- 1.4. This byelaw aims to redress these sources of market failure in the marine environment through conservation of designated features of the MCZ, which will ensure negative externalities are reduced or suitably mitigated.
- 1.5. The decision to introduce The Canyons Marine Conservation Zone (Specified Area) Prohibited Fishing Gears Byelaw 2021 has been made in accordance with the South West Marine Plan⁵.

In particular the following marine plan policies in the South West Marine Plan are relevant to this decision:

- | | |
|------------|----------------|
| – S-BIO-1 | – S-FISH-4 |
| – S-BIO-2 | – S-FISH-4-HER |
| – S-BIO-3 | – S-MPA-1 |
| – S-CO-1 | – S-MPA-2 |
| – S-EMP-2 | – S-MPA-4 |
| – S-FISH-1 | – S-SOC-1 |
| – S-FISH-2 | – S-TR-1 |
| – S-FISH-3 | – S-TR-2 |

The remaining policies in the South West Marine Plan are not applicable to this decision.

In creating this draft byelaw, MMO have had regard to the UK Marine Strategy, as required by regulation 9 of the Marine Strategy Regulations 2010⁶.

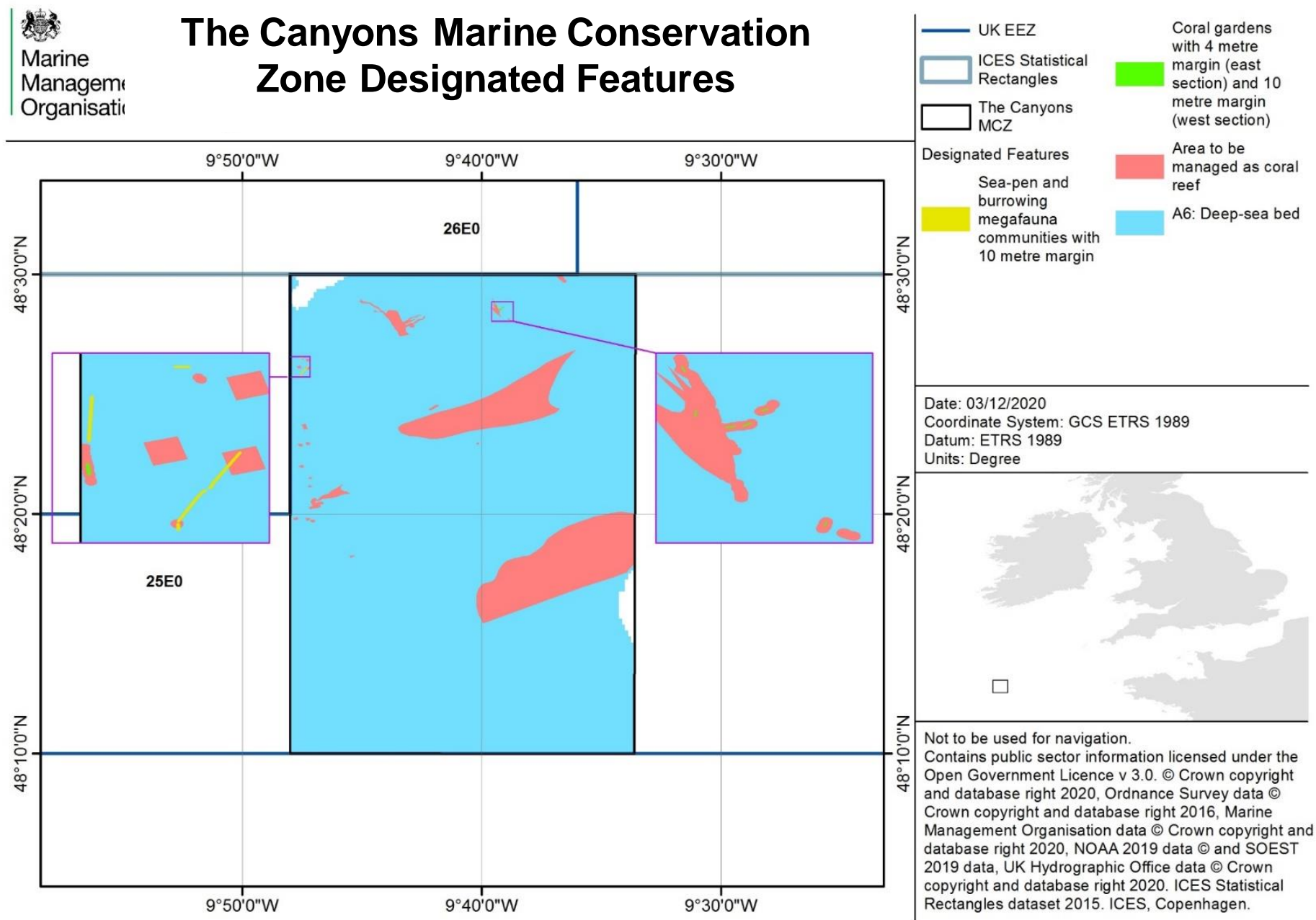
2. Policy objectives and intended effects

- 2.1. The policy objective of the proposed byelaw is to further the conservation objectives of The Canyons MCZ. This will be achieved by prohibiting certain fishing gears within the specified area of the site.
- 2.2. The social and economic impacts of management intervention will be minimised where possible.

⁵ <https://www.gov.uk/government/collections/south-west-marine-plan>

⁶ <https://www.legislation.gov.uk/uksi/2010/1627/contents/made>

Figure 1: The Canyons MCZ Feature map



3. Policy options considered, including alternatives to regulation

3.1. Option 0. Do nothing.

This option is not a viable option to conserve the marine habitats and further the conservation objectives of the MCZ. All other options are compared to option 0.

3.2. Option 1. Remove/avoid pressures (whole site prohibition). Demersal trawls, demersal seines and dredges, traps and anchored nets and lines will be prohibited in all areas of the site.

This option would remove the impact of fishing activities from all areas of the site. This will help to achieve the conservation objectives of the site and give the best possible chance of restoring the features to favourable condition. However, is disproportionate, as it would prohibit fishing activity to occur in areas of the site where the MMO has concluded fishing can continue without undermining the site's conservation objectives.

3.3. Option 2. Remove/avoid pressures (whole feature prohibition). Demersal trawls, demersal seines and dredges, traps and anchored nets and lines will be prohibited over all designated features of the site.

3.4. This option would remove the impact of fishing activities on the features of the site. This will help to achieve the conservation objectives of the site and support the restoration of the features to favourable condition. However, this option is disproportionate, as it would prohibit fishing activity to occur in areas of the site designated for deep-sea bed where the MMO has concluded fishing can continue without undermining the site's conservation objectives.

3.5. Option 3. Reduce/limit pressures. Due to the potential impacts of demersal trawls, demersal seines and anchored nets and lines on the features of the site, management will be introduced to reduce the risk of the conservation objectives not being achieved. This may be through a zoned management approach and/or limiting the activity/intensity of these gear types.

3.6. Prohibiting the use of demersal trawls, demersal seines and anchored nets and lines within a specified area of the site remove any significant risk to the conservation objectives from fishing activities. This option will conserve the site's marine habitats and further the conservation objectives of the MCZ.

3.7. Option 4. No fisheries restrictions. Introduce a voluntary agreement

3.8. This option would involve the development of voluntary codes of practice to protect features. MMO has considered this option in light of Better Regulation⁷, which require that new regulation is introduced only as a last resort. However the government's expectation is that management measures for commercial fishing in marine protected areas (MPAs) should be implemented through statutory regulation to ensure adequate protection is achieved.

3.9. Option 3 is the preferred option as all other options are not considered appropriate in this instance, as such option 3 is considered in the costs and benefits analysis.

3.10. The boundaries of the proposed management area include a buffer zone. This is to prevent direct damaging physical interactions between adjacent fishing activity and the designated features. Where the sensitive site features exist up to boundary of the MCZ, the buffer zone extends beyond

⁷ <https://www.gov.uk/government/publications/better-regulation-framework>

the boundary of the MCZ. The buffer distance is based on generalised warp length to water depth ratios, thereby taking into account the water depth at the site and the possible location of mobile gear on the seabed relative to a vessel at the sea surface. The management boundary has also been simplified to aid compliance. The buffer zone therefore extends between 50 and 100 metres from the edge of the feature.

4. Expected level of business impact

4.1. All costs analysed are compared to option 0. As option 3 is the chosen option the MMO have used this as the basis for comparison.

4.2. The MMO has used the best available evidence to assess the impact of management option 3, however assumptions have been made in the development of this assessment:

- Cost estimates are based on estimates of UK landings values derived from within the management areas. The bottom towed gear landings information are determined as a proportion of landings related to the International Council for the Exploration of the Seas (ICES) rectangle 25E0. They may not therefore represent the true landings derived from each fishing trip.
- Vessel monitoring system (VMS) data assumes fishing activity from speed of travel. Speeds of up to six knots are considered fishing speed. Some vessels can tow gear at speeds greater than six knots which may lead to an underestimate of fishing activity. Some vessels may be travelling at speeds lower than six knots for reasons other than fishing (currents, tides etc.), this may lead to an overestimate of fishing activity.
- Economic performance indicators are estimated using the landings obtained from the MPA and individual vessels average Seafish calculated GVA/profit ratios of fishing in the site. The economic performance indicators calculated per MPA are determined by the share of the value of landings derived by vessels fishing in the MPA versus overall value of their landings. It should be noted however that these estimates work on the assumption that the costs of vessels are distributed the same way as earnings between all individual vessel's fishing grounds. Seafish produces the dataset by combining costs and earnings information from vessel accounts provide by vessel owners to the annual Seafish UK Fleet Survey with official effort, landings and capacity data for all active UK fishing vessels provided by the UK MMO.
- Displacement is difficult to quantify, and it is impossible to predict where exactly activities will be displaced to.
- Estimated costs to the fishing industry are likely to be an overestimate, as vessels are likely to offset some of the lost revenue by fishing in other areas.
- It is possible that the increased environmental status within the management areas could coincide with relatively more abundant fishing grounds beyond the management area (due to spillover), and therefore the analysis may have underestimated the value of reduced fishing ground.

4.3. Information used to assess the impacts of the proposed closure has been taken from:

- VMS data for UK and non-UK vessels from 2014 to 2019 taken from entered log book and sales note data provided by MMO statistics.
- landings data for UK vessels under and over 12m in length.
- non-UK landings data for vessels over 12m in length.
- data from Seafish annual economic performance for the UK fishing fleet from 2014 to 2018⁸.

⁸ <https://public.tableau.com/profile/seafish#!/vizhome/FleetEnquiryTool/1Overview>

- information gathered from stakeholders by the MMO during the pre-consultation call for evidence November-December 2020; and
- local MMO marine officer knowledge.

4.4. Prohibition of the use of bottom towed fishing gears and anchored nets and lines in the proposed management areas may result in the following costs:

- direct costs to the fishing industry from reduced access to fishing grounds;
- indirect costs to the fishing industry associated with displacement to other fishing grounds; and,
- environmental impacts related to possible increased damage to habitats in other areas due to displacement.

4.5. Costs to the fishing industry have been monetised and these estimated values have been collated and presented as part of this RTA (Table 1, Table 3 and Table 5).

4.6. Environmental costs due to possible increased damage of habitats due to displacement of fishing activity from the proposed management areas to other areas are difficult to value and are therefore described here as non-monetised costs.

4.7. Prohibition of the use of bottom towed fishing gears and anchored nets and lines fishing gears in the proposed management areas may result in indirect benefits to the fishing industry resulting from spillover and other environmental benefits related to the restoration of the habitat. These benefits are difficult to value and are therefore described under non-monetised benefits.

Costs to the UK fishing industry

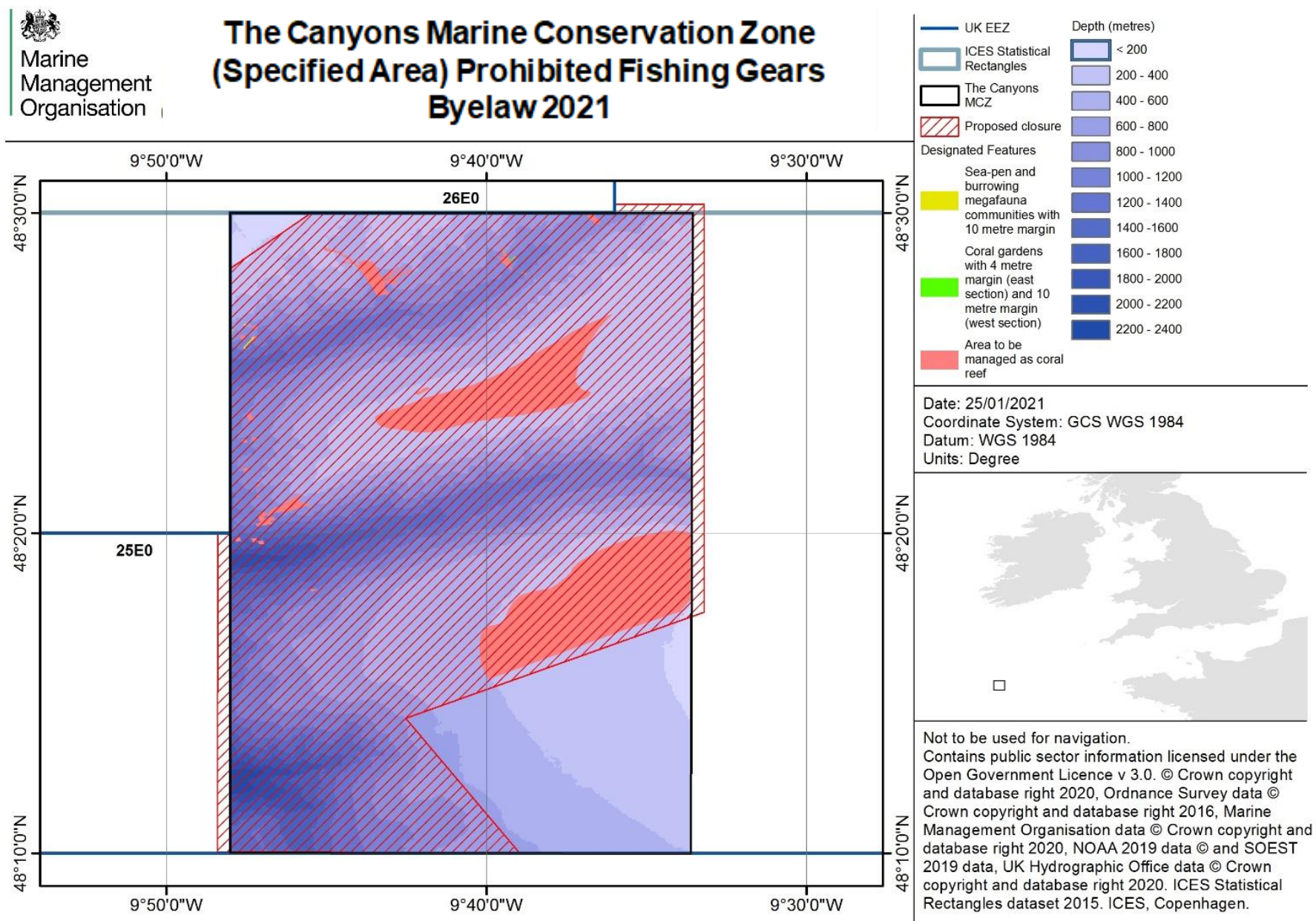
4.8. This RTA considers the economic impact to UK businesses. Economic impacts to non-UK businesses and individuals, including fishing vessels registered outside of the UK, are not in scope for the headline cost figures. However, evidence for non-UK fishing vessels have been provided for context.

4.9. Fisheries landings are reported at ICES statistical rectangle level. ICES standardise the division of sea areas for statistical analysis. Each ICES statistical rectangle is '30 min latitude by one degree longitude' in size which is approximately 30 nautical miles by 30 nautical miles (size varies with latitude due to the spheroid shape of the Earth). The proposed management areas fall within ICES rectangle 25E0 (Figure 1).

4.10. To estimate the economic impacts of the proposed management, fishing patterns of vessels using bottom towed gear and anchored nets and lines within the proposed management area were analysed. The most recent six years of VMS data and landings available (2014-2019) was used for this analysis.

4.11. The VMS data for UK vessels indicates that limited fishing activity has occurred in The Canyons MCZ from 2014 to 2019 (Table 1; Figure 3 to Figure 14). Fishing activity throughout the site is mostly bottom towed gear and long lines with the main gear types being bottom otter trawls, anchored lines and set longlines. The French and Spanish fleets appear to be the only vessels using anchored nets in The Canyons MCZ. The vast majority of these vessels use gillnets opposed to trammel nets (MMO marine officer, *pers. comm.*, high confidence). Demersal trawling in The Canyons MCZ is conducted predominantly by UK, French, Dutch, Danish, Spanish and German vessels respectively. A number of demersal seining fishing activities occur within The Canyons MCZ including 'Danish' or 'anchor' seines, pair seines and Scottish seines. Of the non-UK vessels, Spanish and French vessels fish the most in the MCZ (Table 2; Figure 3 to Figure 14).

Figure 2 : The Canyons MCZ Proposed management



- 4.12. Landings associated with VMS for UK vessels within The Canyons MCZ proposed management area for most recent six years of landings available (2014-2019) are displayed in Table 5. For context, non-UK vessels VMS activity 2014-2018 are displayed in Table 4.
- 4.13. The closure of fishing grounds can lead to significant displacement of fishing effort which can result in a range of costs. Displacement is dependent on the intensity and distribution of fishing activities within the site before the closure and on external factors (such as fish distribution, total allowable catch/quota, fuel prices).

Box 1. Non-UK fishing vessels

Although the focus of this RTA are the impacts on UK businesses and public bodies, vessels registered in other countries ('non-UK vessels') may also have access to fish in The Canyons MCZ

Estimates of fisheries landings values by non-UK vessels were determined using landings data provided by the European Commission Scientific, Technical and Economic Committee for Fisheries (STECF) for the ICES rectangle 25E0 over which The Canyons MCZ overlaps (Figure 1) and the proportion of VMS fishing activity occurring in The Canyons MCZ management area for rectangles 25E0 (Table 6). This provided an estimate of non-UK landings derived from the proposed management area for each rectangle for the years 2014 – 2018 (2019 data is not currently available).

Between 2014 and 2018, an annual average of approximately £114,428 was estimated to be derived from the proposed management area by non-UK vessels. Annual landings derived from the proposed management area by non-UK vessels using bottom towed gear were £182,392 in 2014, £123,988 in 2015, £107,025 in 2016, £74,595 in 2017 and £84,141 in 2018.

Using the worst-case scenario that 100% of these landings are lost, and applying a discounting rate of 3.5%, the net present value cost over the 10-year life of the RTA to non-UK vessels is estimated to be £107,6742.

It is important to note that in contrast to the estimated costs to UK fishing vessels, estimated costs to non-UK vessels are based on the values of fish landed, rather than operating profit. The costs to non-UK vessels are therefore considerably overestimated as the costs are based solely on revenue from landings rather than operating profit. Furthermore, as per UK vessels, non-UK vessels are likely to offset some of their lost revenue by fishing in other areas.

Figure 3: 2014 VMS Fishing Activity by gear type in The Canyons MCZ

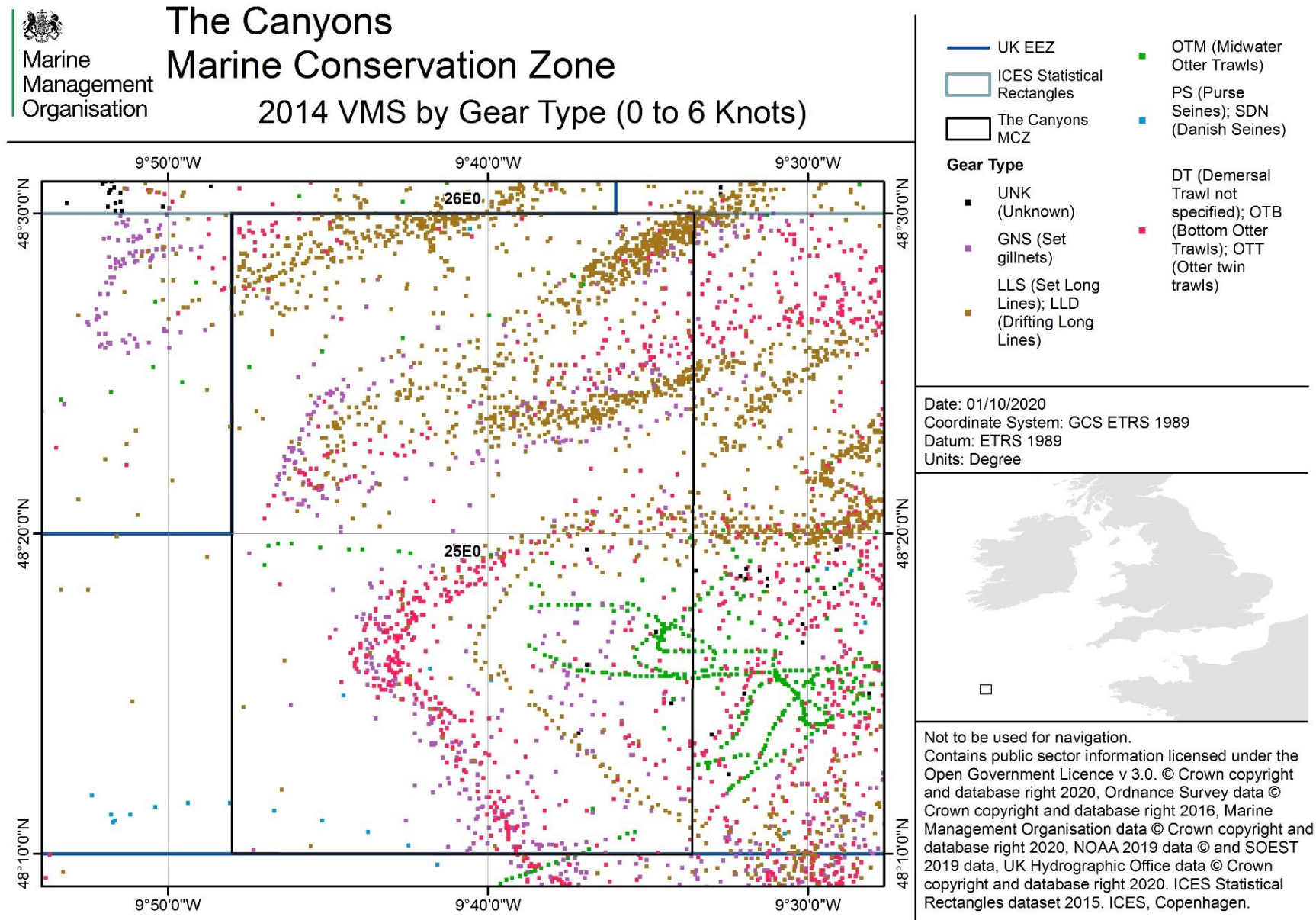


Figure 4: 2015 VMS Fishing Activity by gear type in The Canyons MCZ

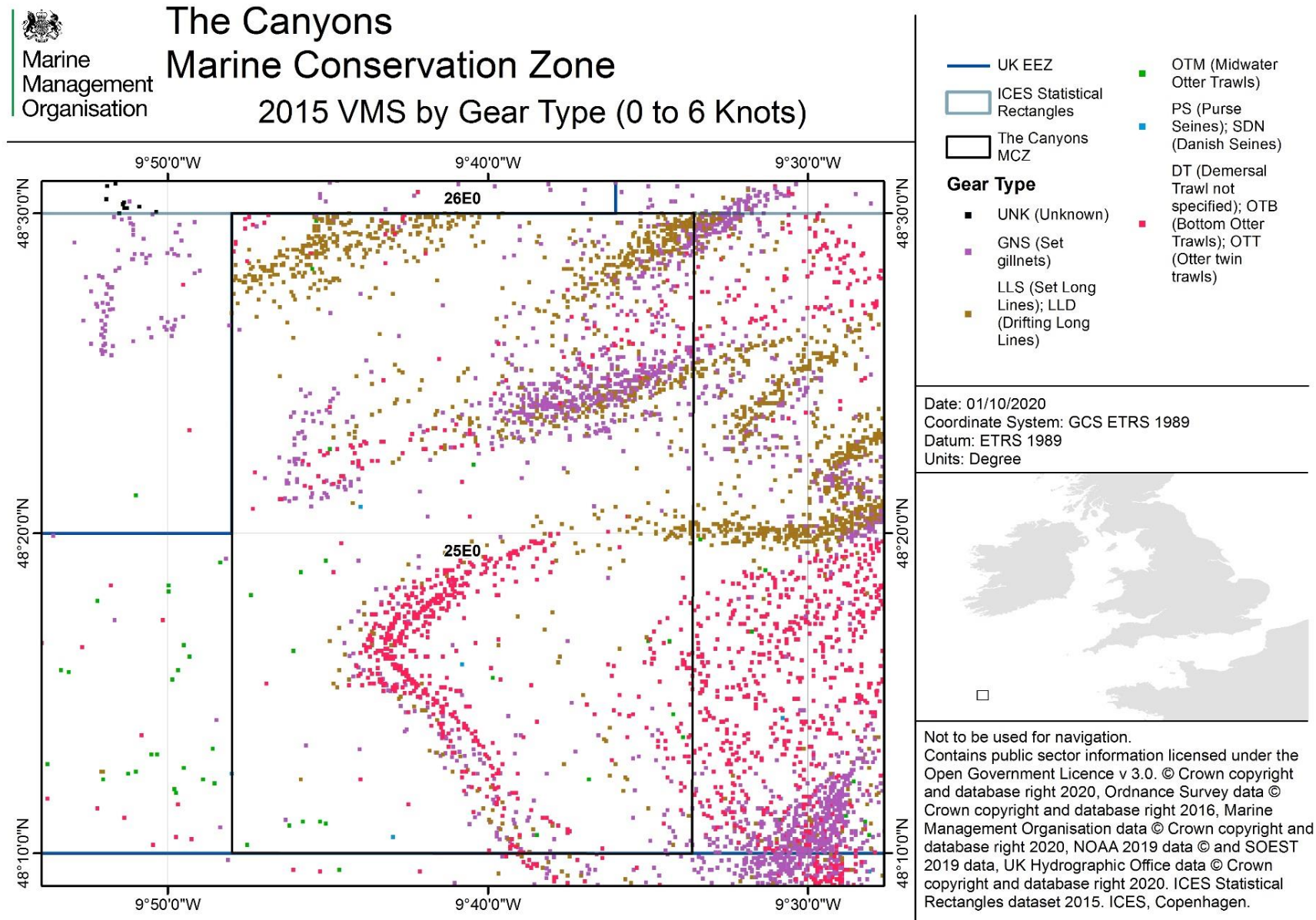


Figure 5: 2016 VMS Fishing Activity by gear type in The Canyons MCZ

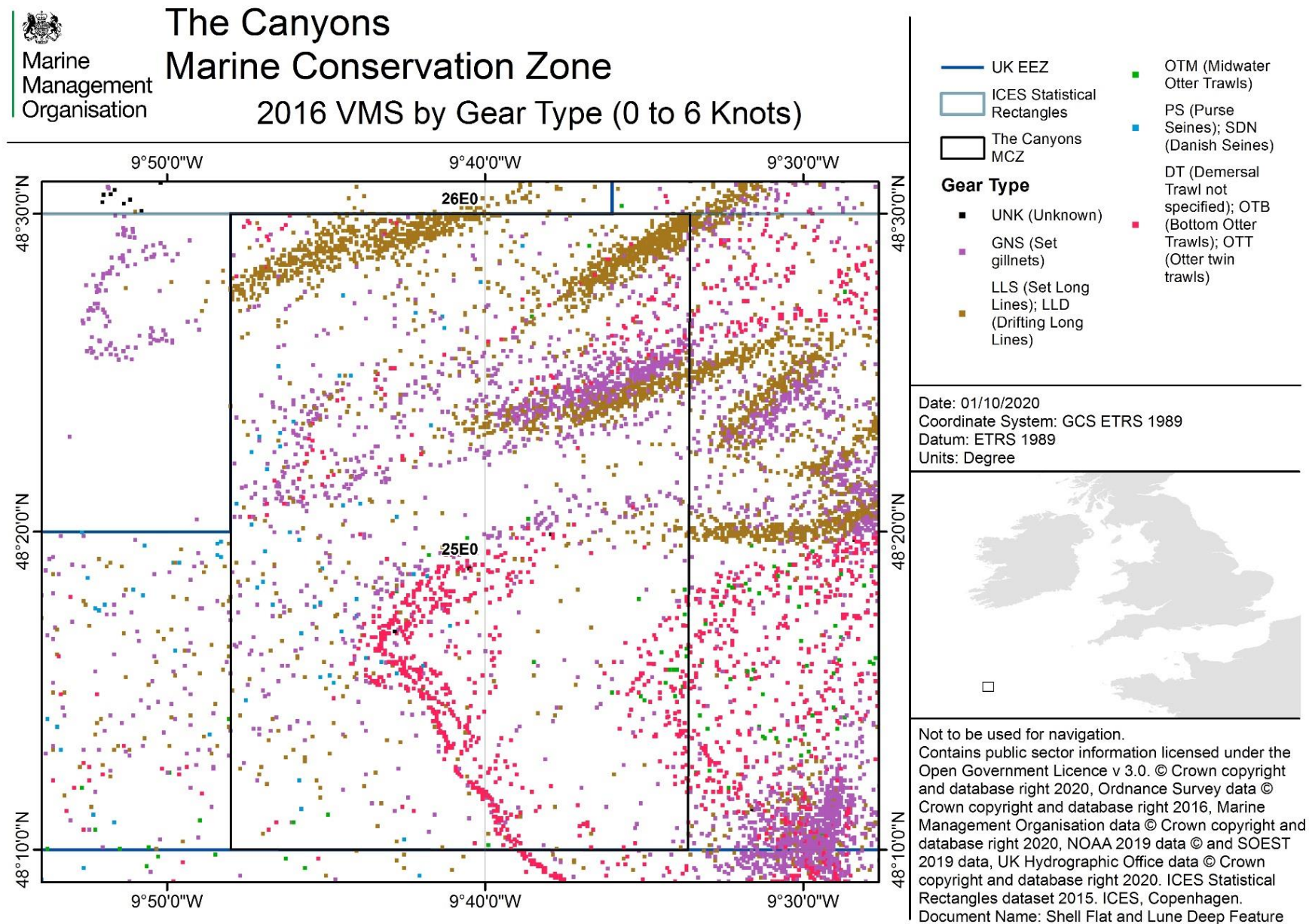


Figure 6: 2017 VMS Fishing Activity by gear type in The Canyons MCZ

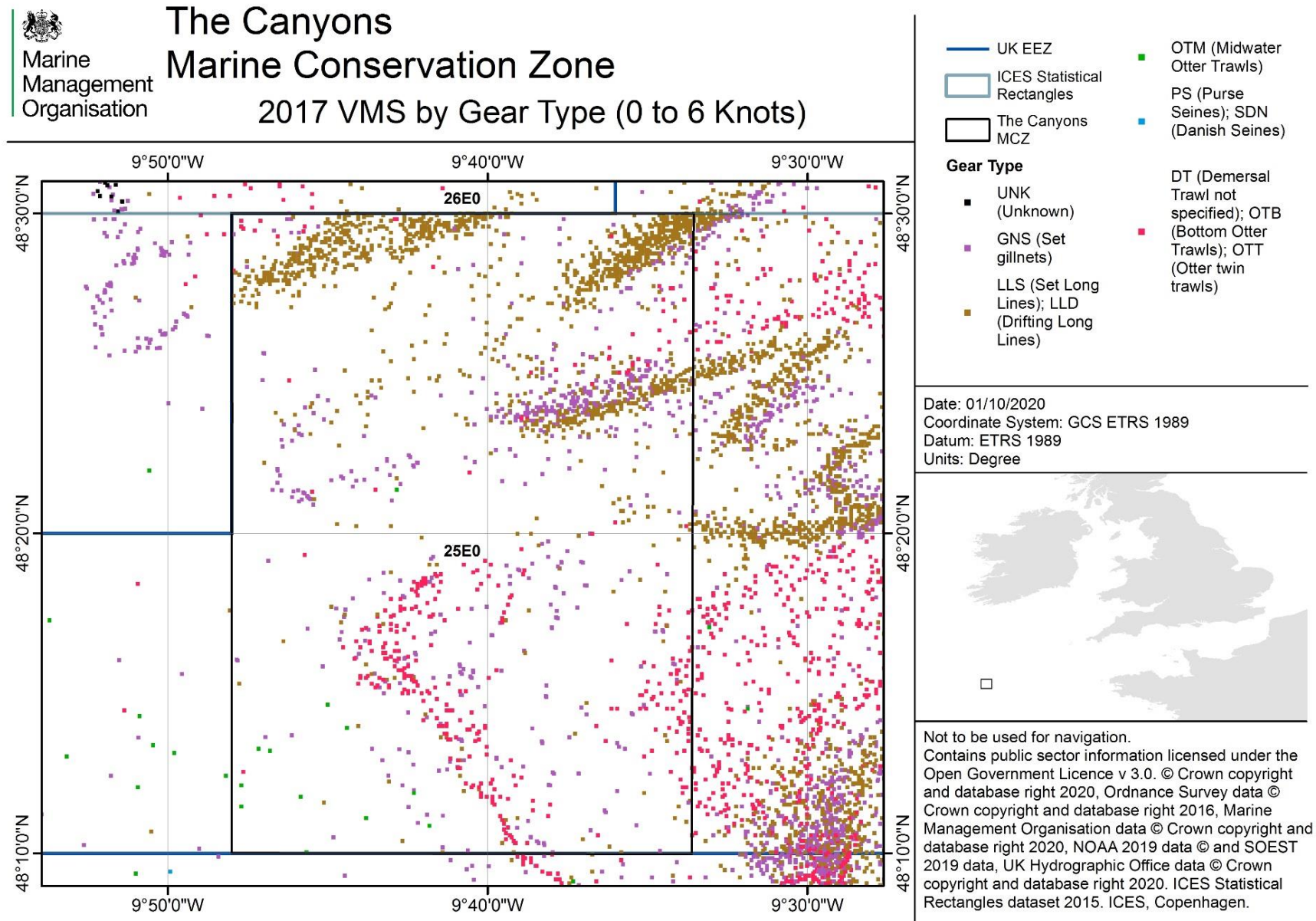


Figure 7: 2018 VMS Fishing Activity by gear type in The Canyons MCZ

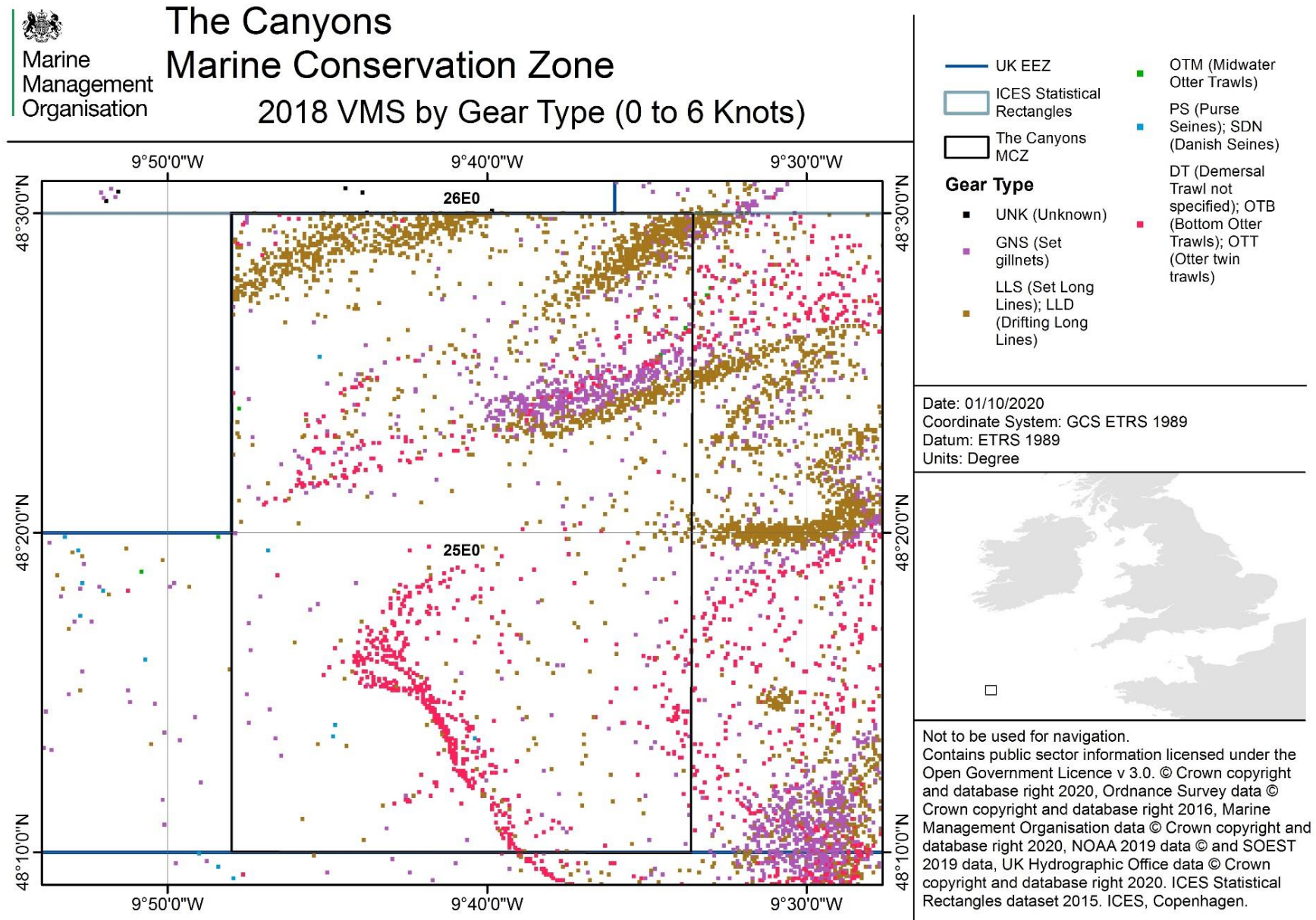


Figure 8: 2019 VMS Fishing Activity by gear type in The Canyons MCZ

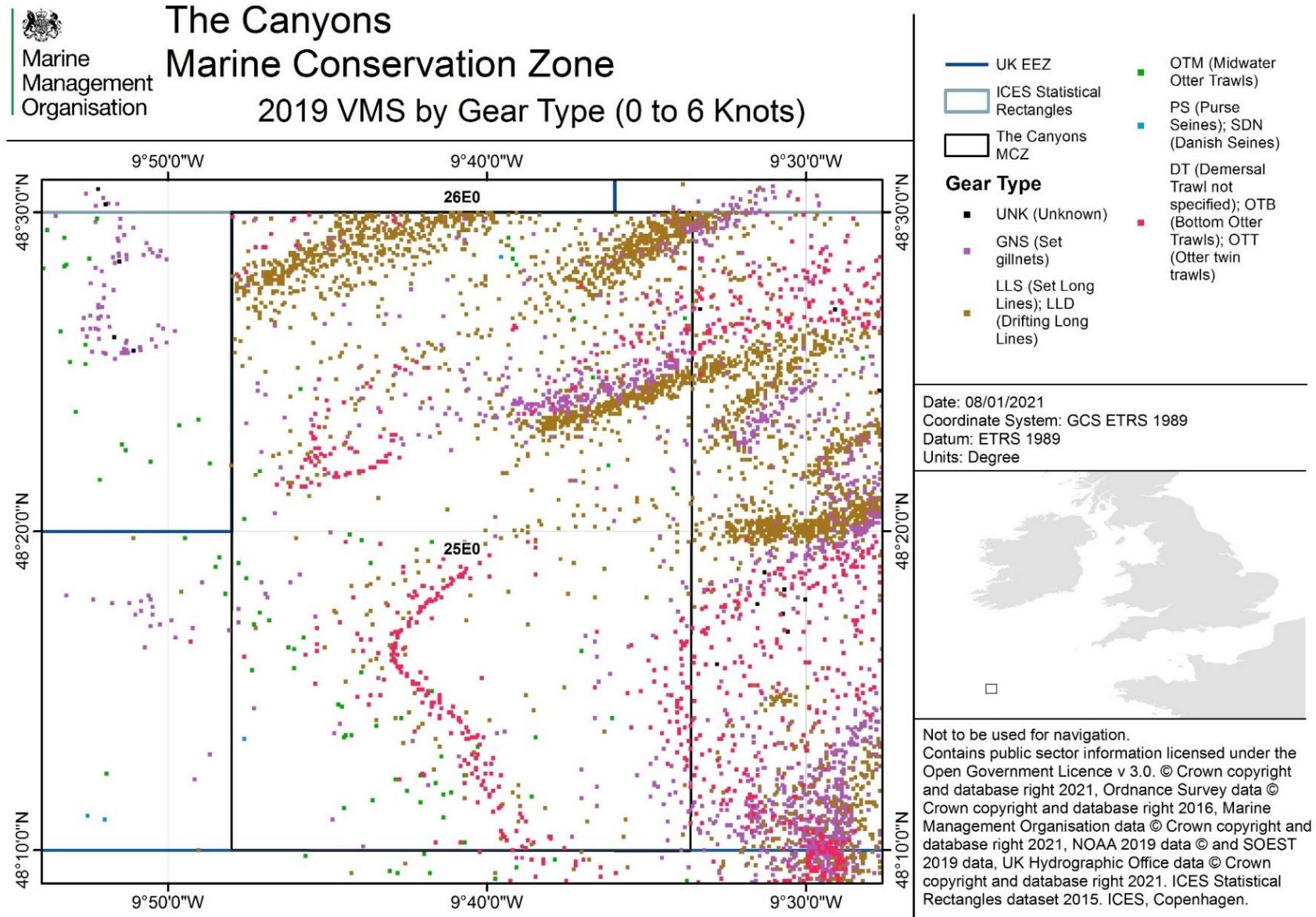


Figure 9: 2014 VMS Fishing Activity by Nationality in The Canyons MCZ

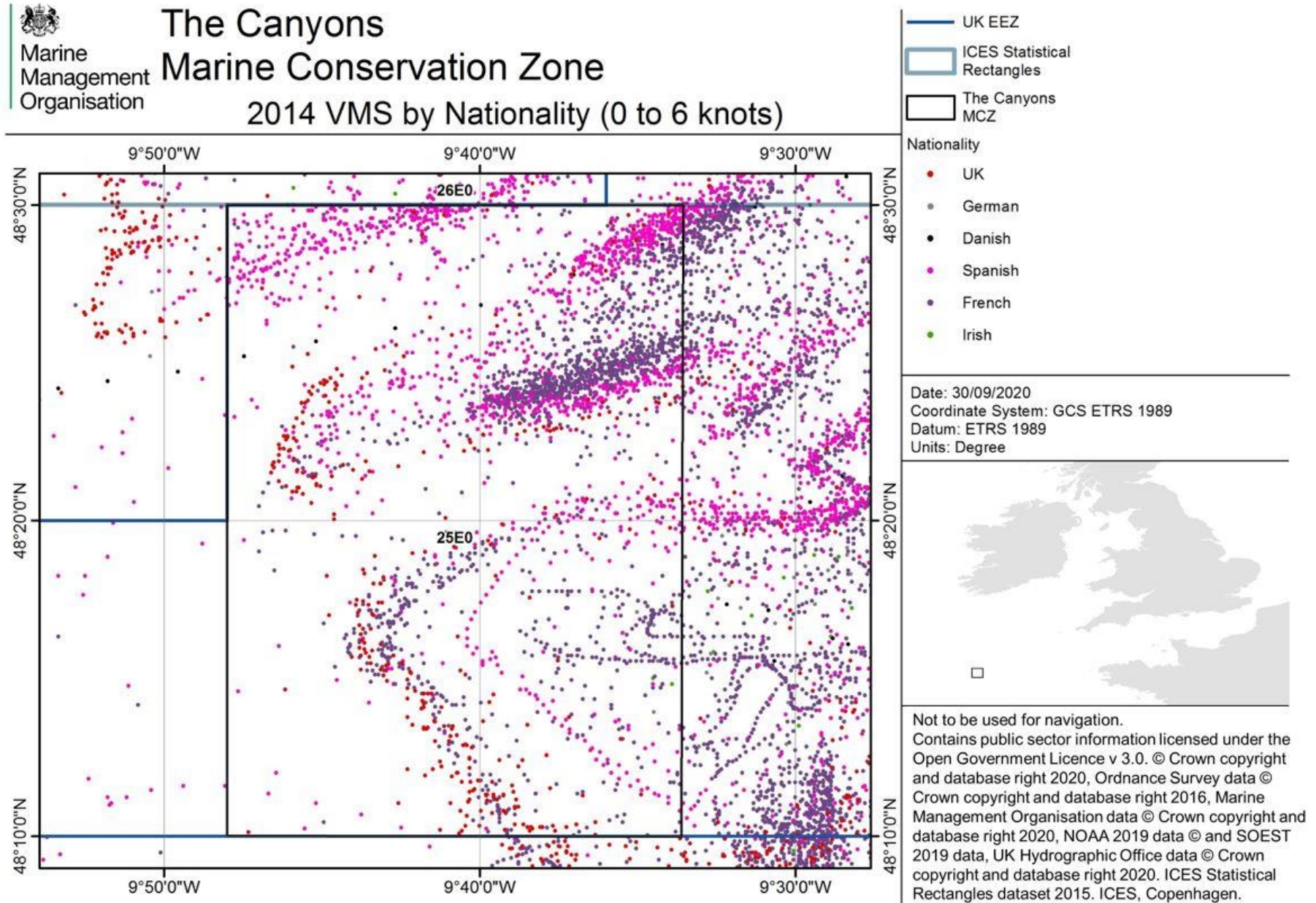


Figure 10: 2015 VMS Fishing Activity by Nationality in The Canyons MCZ

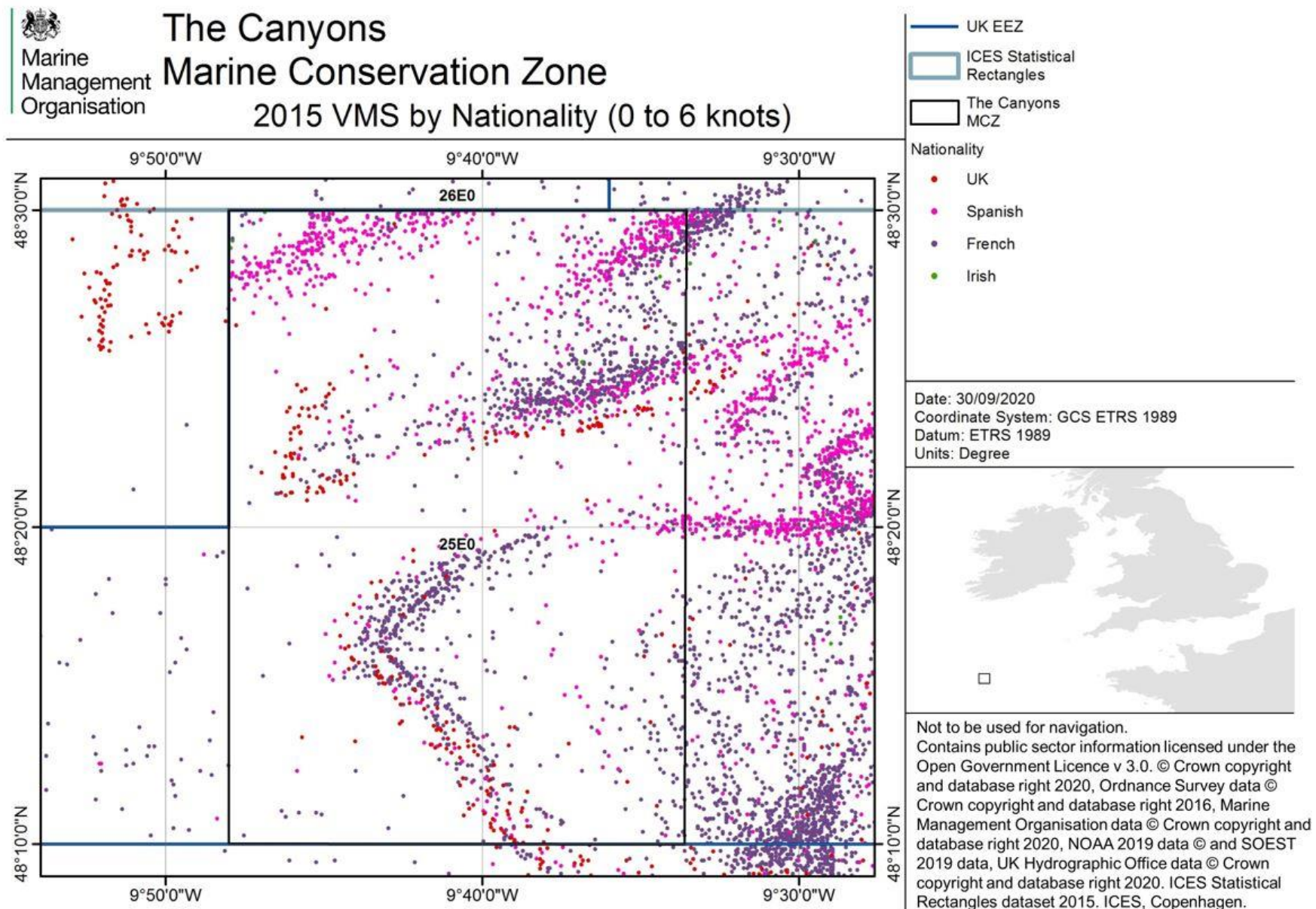


Figure 11: 2016 VMS Fishing Activity by Nationality in The Canyons MCZ

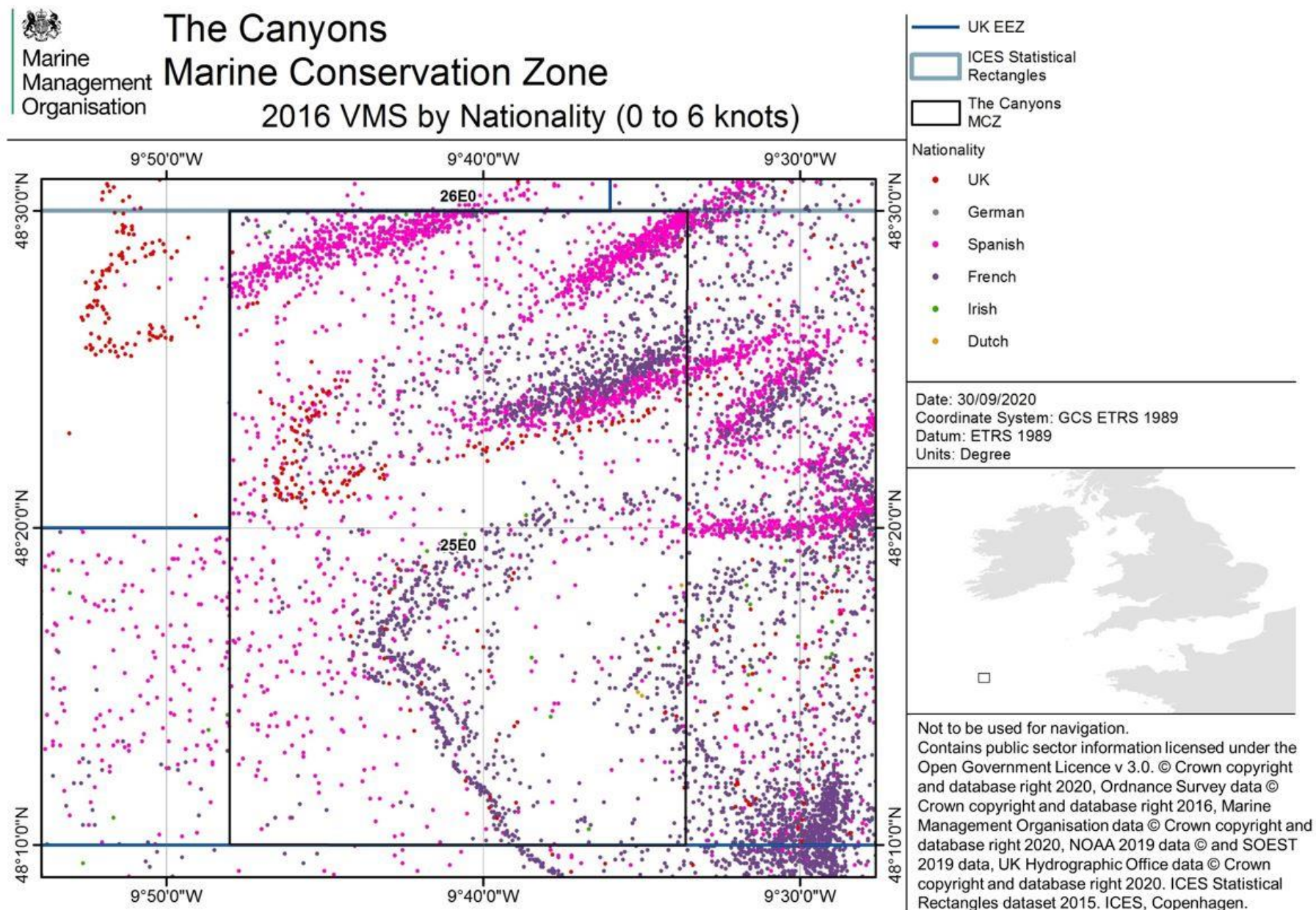


Figure 12: 2017 VMS Fishing Activity by Nationality in The Canyons MCZ

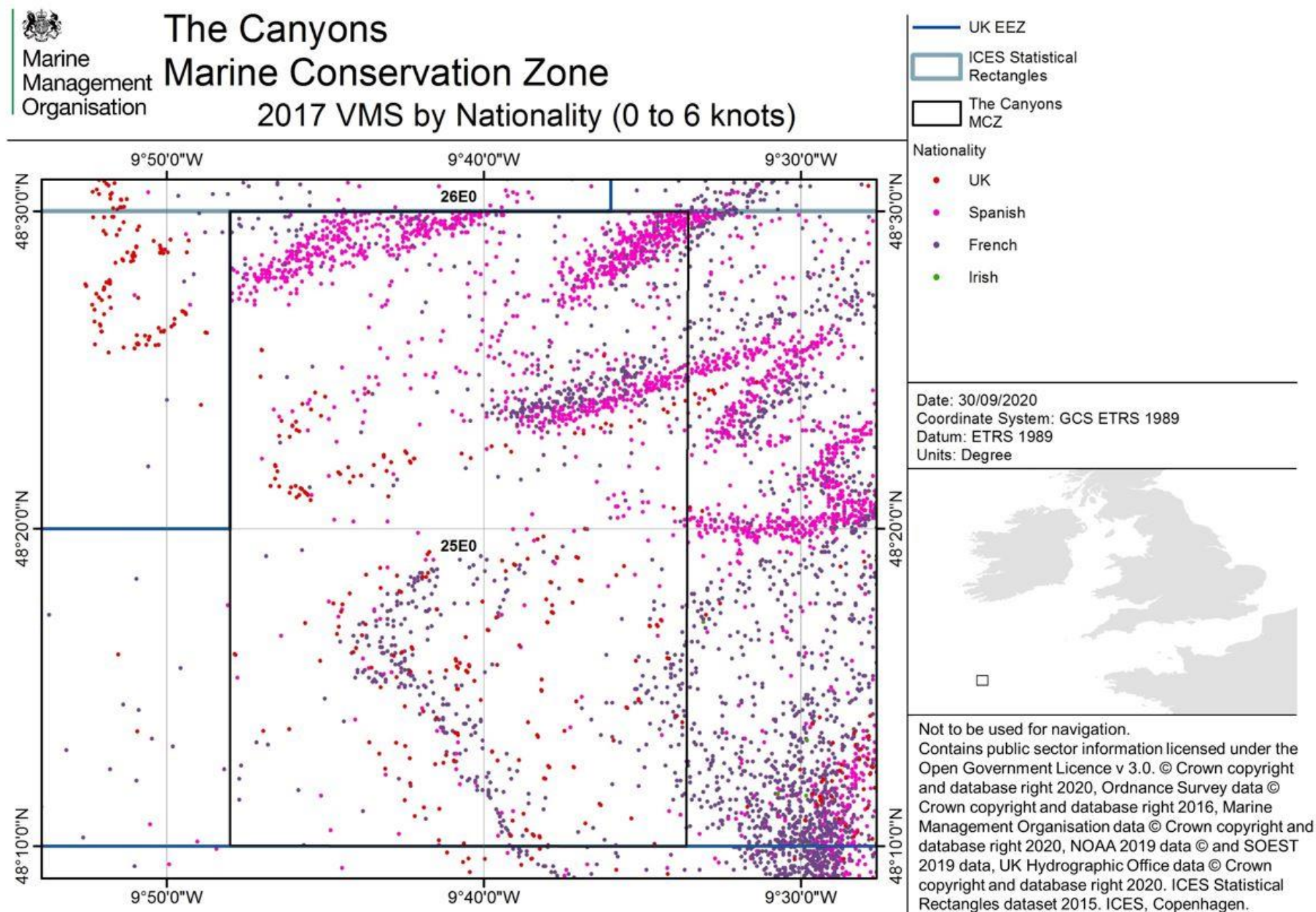


Figure 13: 2018 VMS Fishing Activity by Nationality in The Canyons MCZ

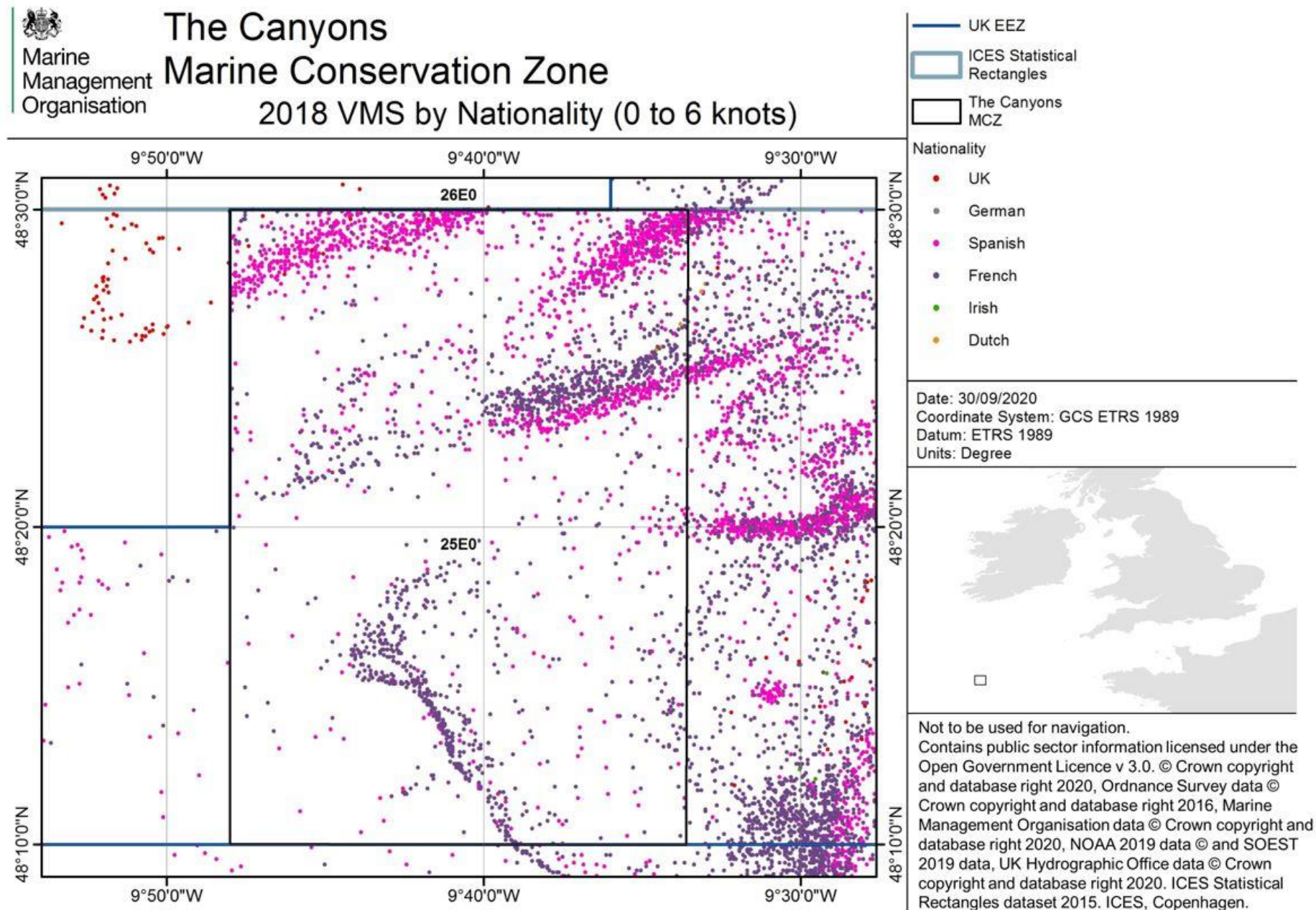
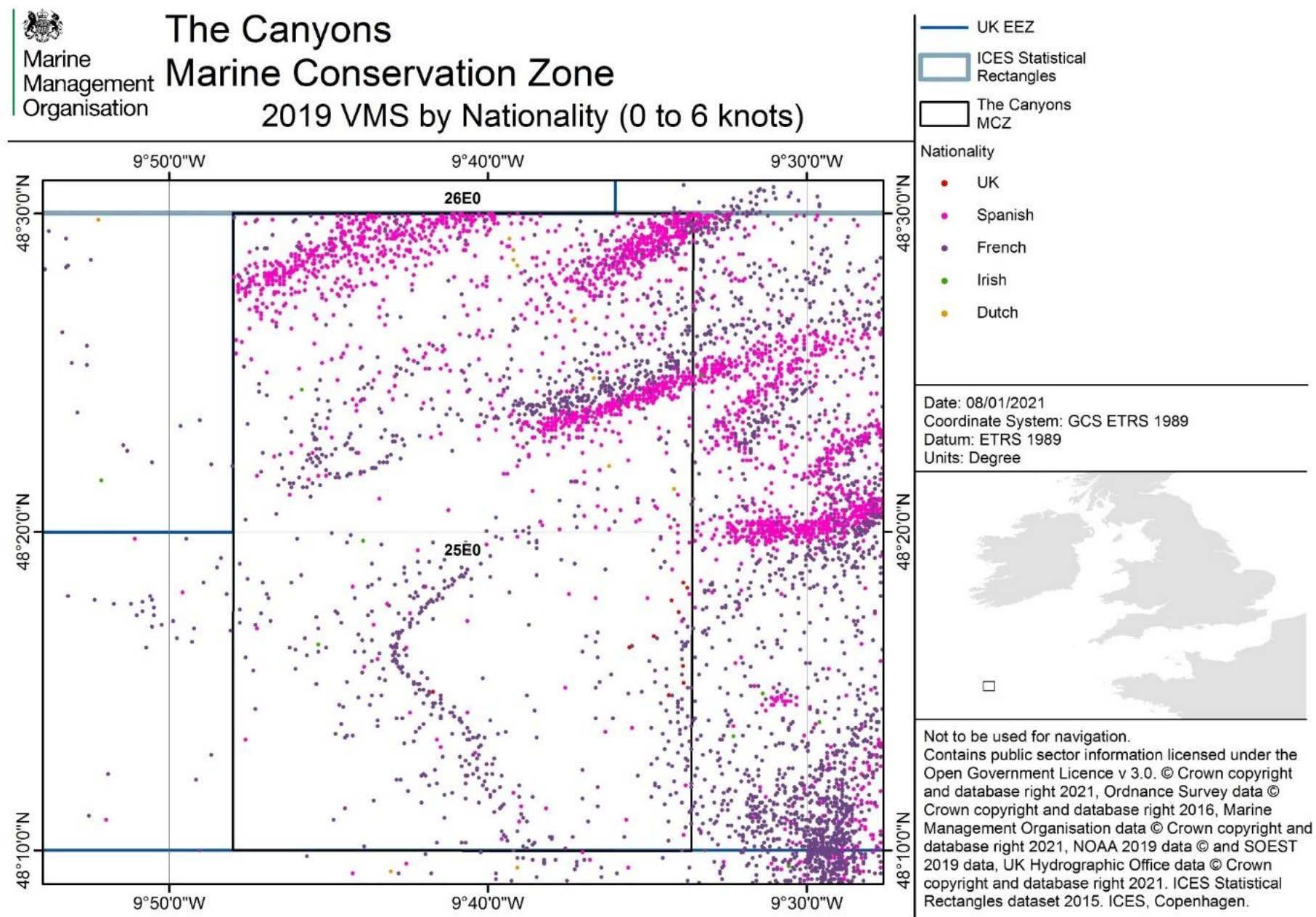


Figure 14: 2019 VMS Fishing Activity by Nationality in The Canyons MCZ



Compliance costs

- 4.14. MMO compliance action is intelligence-led and risk-based in accordance with the National Intelligence Model⁹. Where intelligence suggests non-compliance or a risk of non-compliance with the proposed byelaw, compliance resources will be deployed accordingly. This may include a Royal Navy fisheries patrol vessel presence, MMO fisheries patrol vessel presence or joint operations with other agencies (for example the Border Force or the Environment Agency). Joint operations cannot be monetised here as they are requested on an *ad hoc* basis and costs can vary. The MMO will coordinate any joint operations. The principles by which the MMO will regulate marine protected areas are set out by the Legislative and Regulatory Reform Act 2006¹⁰ and the Regulators' Compliance Code¹¹ and aim to ensure that the MMO is proportionate, accountable, consistent, transparent and targeted in any compliance action it takes.
- 4.15. Compliance costs for the inspection of MPAs and associated byelaws do not represent an additional cost. MPA inspections take place under standard operating procedure of Royal Navy/MMO fisheries patrol vessels. MPA and byelaw inspection costs are therefore absorbed by existing compliance systems and will not be considered here.

Total monetised costs

- 4.16. The economic impacts of the proposed management area are estimated as the loss of profitability of fishing effort at the site. This is informed by data from the MMO on potential activity within the area and from the 2014-17 Seafish data on the profitability of fishing¹². This operating profit combines cost and earning information provided by the vessel owners to the annual Seafish UK Fleet Survey with official landings and capacity data for vessels actively fishing within the management area provided by the MMO.
- 4.17. For 2018 and 2019 Seafish operating profit data was not available because either there were too few vessels operating in the proposed management area (2018) or because data are not yet available (2019). To estimate operating profit for these years, the average of the operating profit ratios used for 2014 to 2017 was applied.
- 4.18. An estimate of £11,489 has been made for the average operating profit for UK landings derived from the proposed management area (Table 5).
- 4.19. A discount rate of 3.5% was applied to calculate the present value and 2019 was used as the price base year. The best estimate of highest net 2020 present value cost over ten years to the UK fishing industry of introducing management is estimated to be £11,101.

⁹ Association of Chief Police Officers (2005) Guidance on the national intelligence model.

¹⁰ <https://www.legislation.gov.uk/ukpga/2006/51/contents>

¹¹ <https://www.gov.uk/government/publications/regulators-code>

¹² <https://public.tableau.com/profile/seafish#!/vizhome/FleetEnquiryTool/1Overview>

Table 1: Number of UK fishing VMS reports within The Canyons MCZ proposed management area from 2015 – 2019 (GNS – Gill nets; LLS – Set longline; OTB – otter bottom trawl).

Year	GNS	LLS	OTB
2015	82	0	0
2016	108	0	0
2017	94	0	1
2018	2	4	0
2019	9	0	1
Total	295	4	2

Table 2: Number of non-UK fishing VMS reports within The Canyons MCZ from 2014 – 2019.

Year	Germany	Denmark	Spain	France	Ireland	Netherlands
2014	6	6	1,302	1,569	2	0
2015	0	0	834	1,316	3	0
2016	2	0	2,055	1,642	10	3
2017	0	0	1,163	695	0	0
2018	1	0	1,508	1,396	0	0
2019	0	0	1,611	909	3	8

Table 3: The Canyons MCZ UK landings by weight (tonnes) based on VMS reports from 2014-2018.

Year	Gear			
	GNS	LLS	OTB	Total landings
2014	41.8	3.9	0	45.7
2015	83.7	0	0	83.7
2016	16.8	0	0.6	17.5
2017	40	0	3.2	43.2
2018	0.1	0.5	0	0.5
2019	1.2	0	0	1.2
Annual Average	30.6	0.7	0.6	31.9

Table 4: EU member state vessel landings by value (£) for ICES rectangle 25E0 based on STECF data.

Year	Gear		
	GNS	LLS	OTB
2014 (all gears)	7,599,661		
2015	3,468,481	219,287	1,478,415
2016	2,732,886	402,387	1,324,096
2017	1,667,469	368,052	1,072,612
2018	2,196,401	248,092	1,061,387
Annual Average (2015-2018)	2,516,309	309,455	1,234,128

Table 5: The Canyons MCZ proposed management area UK landings values (£) and operating profit (£). Operating profit figures are based on Seafish economic data.

Year	Gear			Total landings	Operating profit
	GNS	LLS	OTB		
2015	58,703	0	0	58,703	31,448
2016	15,994	0	0	15,994	23,069
2017	67,833	0	11,892	79,724	3,837
2018	0	807	0	807	9,460
2019	3,113	0	303	3,416	214
Annual Average	29,129	161	2,439	31,729	11,489

Table 6: Areas (km²) of the proposed management area and ICES rectangle 25E0, and the percentage of 25E0 occupied by the proposed managed area.

Proposed management area (km ²)	ICES rectangle 25E0 area (km ²)	% of 25E0 occupied by proposed management area
575.35	4,129	13.93

Non-monetised costs

4.20. The prohibition of bottom towed gears and anchored nets and lines across The Canyons MCZ could lead to the displacement of these fishing activities increasing pressure on habitats outside of the site. However, it is not possible to accurately predict the location (and thus the associated environmental costs) of displaced fishing activity.

Non-monetised benefits

4.21. The site is unique within the context of England's largely shallow seas due to its depth, sea-bed topography and the coral features it contains; the site is the only MCZ designated for coral gardens and cold-water coral reefs. There are two large canyons within the site, which add to its topographic complexity: the Explorer Canyon to the north and the Dangeard (also known as Dangaard) Canyon running east to west along the central part of the site¹³. Cold-water coral reefs (*Lophelia pertusa*), an OSPAR threatened and/or declining habitat, have been found on the northernmost wall of the Explorer Canyon, which is the only known example recorded within English waters¹⁴.

4.22. Prohibition of the use of bottom towed fishing gear and anchored lines and nets within the management area will contribute to the protection of a number of features designated in the site. This in turn will support provision of the ecosystem services provided by those features. The deep-sea bed, sea-pens and burrowing megafauna, cold-water coral reef and coral gardens, contribute towards (Fletcher *et al.*, 2012):

- Biogeochemical cycling - Deep-sea beds have a profound involvement in global biogeochemical processes and nutrient regeneration, which in turn sustain primary and secondary oceanic production. At the deep-sea bed there is considerable sedimentation of organic matter. In addition, chemical energy is released and converted into organic matter around hydrothermal vents and cold-seeps (van de

¹³ <https://jncc.gov.uk/our-work/the-canyons-mpa/#summary>

¹⁴ https://webarchive.nationalarchives.gov.uk/20101014085102/http://www.searchmesh.net/PDF/SWCanyons_FinalReport_v1.4_final.pdf

Velde *et al.*, 2018). Bioturbation is the process of nutrient cycling in deep-sea beds and creates a much more of a productive layer immediately around the beds in comparison with deep-sea pelagic habitats. Waste absorption and detoxification are important processes, as marine organisms store, bury and transform waste materials through assimilation and chemical transformation;

- Food web dynamics – The deep-sea bed has few trophic levels and often relies on primary production that is external to the system. Available energy resources are also increasingly supplemented by fisheries discards, which create carrion for benthic scavengers (Carroll *et al.*, 2017).;
- Species diversification and formation of species habitat – The sea bed itself is not thought to be associated with high species diversity but has errant megafauna dominated by echinoderms and to a lesser extent decapoda, or bottom-dwelling fish. At the top of seamounts, corals, sea pens, sponges, and brachiopods flourish. Pelagic and benthopelagic fish species are found at seamounts as are gorgonian sea fans and there is often significant endemism in seamount fauna. The biological diversity of cold water coral reef communities can be three times as high as the surrounding soft sediment. For example, studies of the biodiversity of cold water coral reefs indicate increased megafaunal diversity occurs “on-reef” compared to “off-reef” (Jensen and Frederiksen 1992 cited in Roberts *et al.*, 2008).;
- Genetic diversification - Novel and uncultured bacterial lineages dominate deep-sea beds. Deep-sea genetic diversity is being exploited by the new blue biotechnology industry (Pfannkuche *et al.*, 2009);
- Climate regulation - The deep-sea bed acts as an unrivalled reservoir (up to 30%) for sequestration of CO₂. Gas and climate regulation provided by the deep sea includes the maintenance of the chemical composition of the atmosphere and the oceans, for example via the “biological pump”, which transports carbon absorbed during photosynthesis into the deep seas. Methanotrophic microbes in the ocean floor and waters control almost all of the oceanic methane emission (Reeburgh 2007);
- Secondary biomass production – the microbial community and the symbiotic macrofauna of hydrothermal vents and cold-seeps are the key components of secondary production, however, the processes that lead to secondary production are poorly understood (Jorgensen and Boetius 2007);
- Formation of species habitat - cold water coral reefs create complex three-dimensional structures providing space and refuge for a diverse community of organisms. Cold water *L. pertusa* reefs are thought to act as both breeding grounds for commercially targeted fish species and provide hunting territory for predatory demersal fish species; and
- Formation of physical barriers - similar to warm water coral reefs, *L. pertusa* reefs create structural habitats that alter local hydrology. For example, on the Mingulay Reef Complex of *Lophelia* reefs, located in the Sea of Hebrides off the west coast of Scotland, current speeds and turbidity are spatially structured (i.e. differ between the top and the base of the reef) due to the interplay between reef topography and local hydrography (Davies *et al.*, 2009 cited in Henry *et al.*, 2009) .

Recommended Management Option

Following the above assessment the recommended management option is Option 3: MMO byelaw to prohibit the use of bottom towed fishing gears and anchored nets and lines in a specified area within the site.

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