



JNCC Report No: 599

**1016S Cruise Report: Monitoring survey of Geikie Slide and the
Hebridean Slope NCMPA
Appendix 8: Fishing activity review**

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Appendix 8: Fishing activity review (Ellen Last, JNCC)

Introduction

VMS data

Under EC Regulation 2244/2003 and the Scottish Statutory Instrument (SI) 392/2004, certain sized EU fishing vessels are obliged to have a Vessel Monitoring System (VMS) onboard.

The VMS is a form of satellite tracking, which transmits the identity, position, heading and speed of the vessel every two hours to the Fisheries Monitoring Centre (FMC) of both their own member state and that of the EU member state waters where they are located. Since 1st January 2012, all vessels 12m or over in length in EU waters have been subject to this regulation. Prior to 2012, in EU waters VMS was only obligatory for vessels greater than or equal to 15m. Speeds of between 0-6 knots are estimated to be indicative of fishing activity, which accounts for a range of gear types.

It is worth noting that in some countries the implementation of VMS was delayed, and some vessels were still not using VMS in 2013. Additionally, some vessels <15m adopted VMS voluntarily prior to 2012; for example all Norwegian fishing vessels >15 m have been required to carry VMS since 1st of January 2010. Due to this EU-wide VMS adoption change, and the slight variance in implementation between countries, data collected prior to and post 2012 that is reviewed below cannot be directly compared. Although there are many vessels under 15m fishing in UK waters (98.4% of the UK fleet in 2010), the majority of activity in offshore waters (waters beyond 12 nautical miles, within British Fishery Limits and the seabed within the UK Continental Shelf Designated Area) is from vessels equal to or exceeding this overall length. Smaller vessels are therefore not represented by the data reviewed below.

Access to VMS data is permitted under the EU Council Regulation Article 18, allowing data to be made available to end users to support scientific analysis and for advice to fisheries management and policy development. Article 20 states the end user obligation, which JNCC are bound to.

VMS data can be displayed in a variety of formats and those which were used in this review are detailed below in section 2.

Fishing activity review

A review of available fishing activity data has been undertaken by JNCC to help inform survey planning for the 1016S monitoring survey to Geikie Slide and the Hebridean Slope NCMPA (hereafter referred to as GSH). The results of this review have been used to inform sampling box and station placement to allow the sampling design to account for the fishing activity patterns observed (see Section 2 Sampling Design above).

Data reviewed

A combination of UK and non-UK VMS data was reviewed, ranging in temporal coverage from 2006 to 2013. Only data which had activity at or near GSH was included in the review.

- VMS ping data was used, which shows the location of vessels estimated to be actively fishing as informed by the speed of the vessel.
- Aggregated VMS data was used in a gridded format at 0.05dd (decimal degrees) resolution, which accounts for vessel positions being recorded every two hours.

- Subsurface and surface abrasion pressure is expressed as the 'swept area' ratio from VMS data. The surface 'swept area' is calculated based on time between fishing pings (aggregated per grid), vessel speed and extent of gear contact.
- Pelagic fishing activity was not considered in this review as this form of fishing is not associated with seabed contact.

Further detail of the specific data used is described in Table 1 below.

Table 1: Table summarising each of the datasets analysed as part of the fisheries activity review at Geikie Slide and Hebridean Slope NCMPS.

Data type	Sampling type	Years	Fleet	Gear type
VMS Pings	-	2011, 2012, 2013	UK	All
			Non-UK	All
VMS Swept Area Ratio	Surface abrasion	2011, 2012, 2013	UK and non-UK	All
	Subsurface abrasion	2011, 2012, 2013	UK and non-UK	All
VMS gridded	Total Hours by Gear	2006-2009	UK	Demersal trawls: beam, otter, otter twin, pair
				Hooks and lines: longlines, set longlines
			Non-UK	Demersal trawls
				Hooks and lines
		2009-2013	UK	Nets
				Demersal trawls
			Non-UK	Hooks and lines
				Demersal trawl
	Hours by Year and Gear	2009-2013	UK	Demersal seines
				Gillnets
			Non-UK	Hooks and lines
				Purse seines
		2009-2013	UK	Demersal trawls
				Otter/pair trawls
			Non-UK	Hooks and lines
				Demersal trawls

Results

VMS ping data

Table 2: Table summarising the results from the review of the coverage of VMS ping data from 2011, 2012 and 2013, for both UK and non-UK vessels, at Geikie Slide and the Hebridean Slope NCMPS.

Year	Fleet	Summary of VMS ping data coverage
2013	UK	Between 200m and 300m depth and 500m-700m. No activity deeper than 1500m or shallower than 200m. South of site, one block of activity, although not that dense, between <u>600-700m</u> , decreasing gradually through to GSH boundary/inside site.

	Non-UK	Gradual increase from 200m to 300m where dense activity band, then down to nearly 1500m. No activity deeper than 1500m or shallower than 200m. South of site, one block of very dense activity between <u>600-700m</u> , decreasing gradually through to GSH boundary/inside site.
2012	UK	200m-300m and 500-700m only. No activity deeper than 1500m or shallower than 200m. South of site, one block of activity (much greater than inside site) between <u>600-700m</u> , decreasing gradually through to GSH boundary/inside site.
	Non-UK	200m to nearly 1500m, densest bands at 300m and 500m. No activity deeper than 1500m or shallower than 200m South of site, one block of very dense activity between <u>600-700m</u> , decreasing gradually through to GSH boundary/inside site.
2011	UK	Activity between 200m and 300m, 500m to 1000m. South of site, one block of activity between <u>600-700m</u> , decreasing gradually through to GSH boundary/inside site.
	Non-UK	Activity between 300m to nearly 1500m. Densest activity between 500m-1000m. South of site, one area of very dense activity between <u>600-700m</u> , decreasing gradually to GSH boundary/inside site.

Surface swept ratio

Table 3: Table summarising the results from the review of surface swept ratio for 2011, 2012 and 2013 for all non-UK vessels, at Geikie Slide and the Hebridean Slope NCMPA.

Year	Summary of surface swept ratio coverage and values observed
2013	200m to 1500m at 0-1. Band of slightly higher activity of >1-2 at 600-900m. South of site: one block of activity at >3-4 between <u>600-700m</u> , decreasing gradually through to >1-2 at GSH boundary/inside site. Non-UK VMS also shows area of very dense activity at this depth range south of site. UK VMS also present at this depth range, but not especially dense.
2012	200m to 1500m at 0-1. Slightly higher dispersed blocks of activity between 200-300m, and also one at both 500m and 700m. South of site: one block of activity at >5-6 between <u>600-700m</u> , decreasing gradually through to >1-2 at GSH boundary/inside site. Non-UK VMS also shows area of very dense activity at this depth range south of site. UK VMS also present at this depth range (much greater than inside site).
2011	200m-300m activity is >1-2 with <u>couple of areas of >2-3</u> . 500m-800m is >1-2 with <u>couple of areas of >2-3 (700-800m)</u> . South of site: one block of activity at >6-7 (highest value) between <u>600-700m</u> , decreasing gradually through to >1-2 at GSH boundary/inside site. Non-UK VMS also shows area of very dense activity at this depth range south of site. UK VMS also present at this depth range.

VMS gridded 2006-2009

Total hours by gear:

Table 4: Table summarising the results from the review of the VMS gridded data for 2006-2009, in total hours per gear, for a range of demersal towed and static gear types for both UK and non-UK vessels, at Geikie Slide and the Hebridean Slope NCMPA.

Fleet	Gear type	Summary of VMS gridded data coverage and
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			values observed
UK	Hooks and lines	Longlines	Low activity between 300-500m (max. 26hrs) and from 700m to nearly 1500m at the southern edge of the site (max. 24hrs).
		Set longlines	<u>High at 300m (max. 318hrs), continuing north-east of site. Decreasing from 300-500m.</u>
	Demersal	Beam	Some very low patches of activity between 200-300m (max. 2hrs).
		Otter trawl bottom	Low from 200-400m (max. 124hrs), and 600-800m (max. 66hrs).
		Otter twin	Low (max. 50hrs) between 200-300m. Some very low activity (max. 13hrs) between 600-700m.
		Pair trawl	Low (max. 33hrs) at south-east of site around 200m.
Non-UK	Demersal		Low from 300-400m (max. 263hrs) and 500-1500m (max. 305hrs).
	Hook and line		Low between 300-700m (max. 410hrs), <u>increasing to medium around 400m north-east of site (max. 552hrs) (inside box F).</u>
	Nets		Couple of low patches between 300-400m (max. 17hrs).

VMS gridded 2009-2013

Total hours by gear:

Table 5: Table summarising the results from the review of VMS gridded data for 2009-2013, in total hours by gear, for a range of demersal towed and static gear types for both UK and non-UK vessels, at Geikie Slide and the Hebridean Slope NCMPA.

Fleet	Gear type	Summary of VMS gridded data coverage and values observed
UK	Hooks and lines	Low at 200m, increasing to <u>medium between 300-400m</u> , then decreasing to low until 600m (max. 541hrs).
	Demersal trawls	Max. 226hrs around 200m (box E); overall low activity occurs from 200-1000m. Gap of negligible (max. 2hrs) activity between 500-600m (box D).
Non-UK	Demersal seines	Some very low (max. 2hrs) between 200-400m.
	Demersal trawls	Low between 200-1500m (max. 300hrs). Increasing activity south of site to 800-1000m (863hrs 24km south).
	Gillnets	Low between 200-300m (max. 78hrs). Increasing to 135hrs just north of site <u>around 200m.</u>
	Hooks and lines	Medium (max. 814hrs) <u>between 300-400m (continues north-east of site along this depth range).</u>
	Purse seines	Some low around 200m (max. 7hrs).

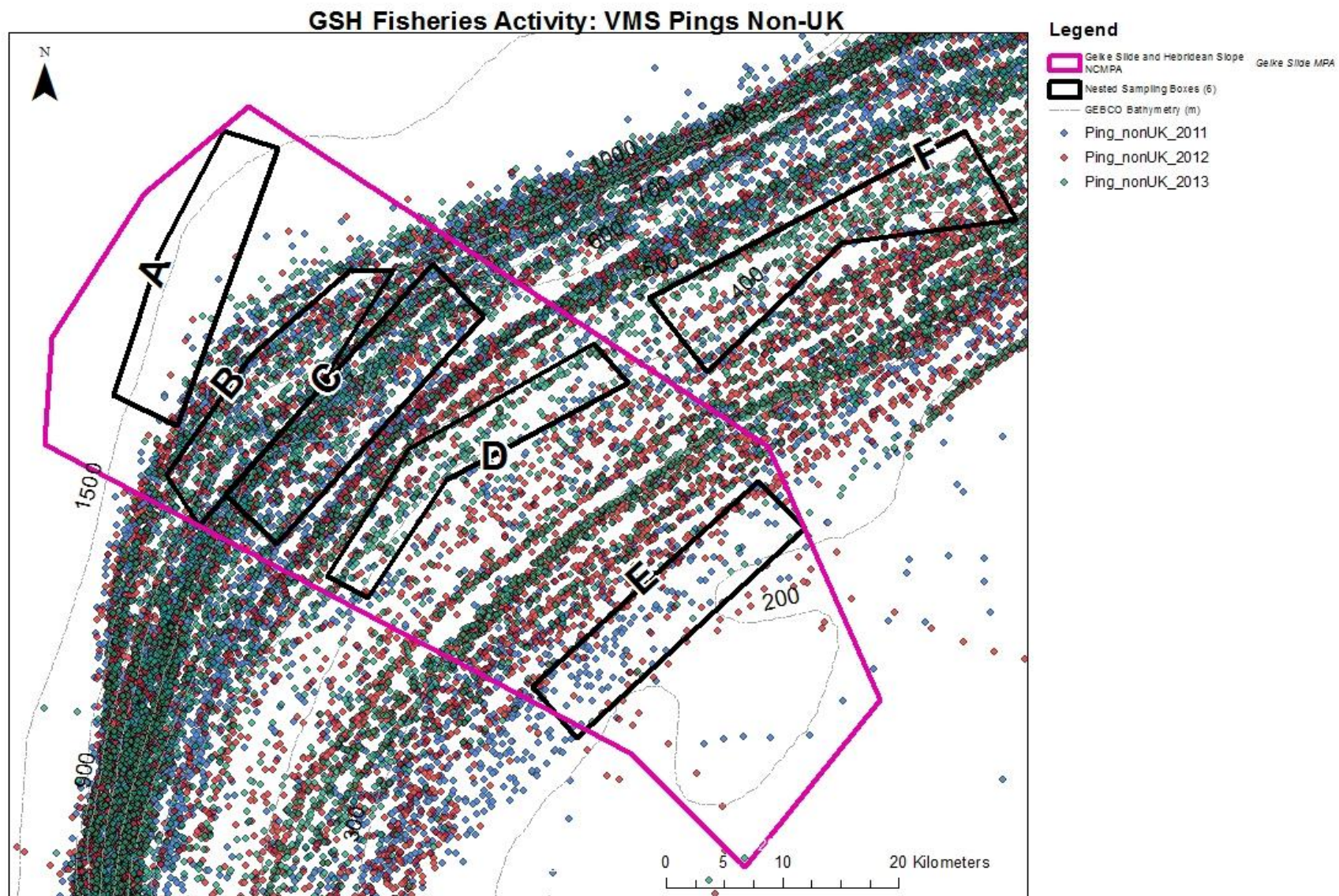
Hours by year and gear:

Table 6: Table summarising the results from the review of VMS gridded data for 2009-2013, in hours by year and gear, for a range of demersal towed and static gear types for both UK and non-UK vessels, at Geikie Slide and the Hebridean Slope NCMPS.

Fleet	Gear type	Year	Summary of VMS gridded data coverage and values observed
UK	Demersal trawls	2009-2013	General decrease in activity from a maximum of 67-69hrs in 2010-2011 to max. of 36-42hrs in 2012-2013. Only 48hrs (max.) in 2009 however.
	Otter/pair trawls (Note: states unknown demersal/pelagic)	2012-2013	Negligible difference in annual activity between 2012 (max. 8hrs) and 2013 (max. 10hrs). Additional section of low activity (max. 4hrs) in 2013 between 600-800m.
	Hooks and lines	2009-2013	Decrease in activity from a peak of 167hrs in both 2009 and 2010, to max. 87hrs in 2012 and max. 113hrs in 2013.
Non-UK	Demersal seines	2010-2012	Similar, max. 2hrs, activity for each year - 2010, 2011 and 2012. Variable depths between years: 2012 only had activity at no deeper than 200m, whereas in 2010 activity was between 200-400m and in 2011 around 300-400m only.
	Demersal trawls	2009-2013	Decrease from max. 114hrs in 2009 to 81hrs in 2010, 100hrs in 2011; down to max. of 48-53hrs in 2012-2013.
	Gillnets	2009-2013	Change in activity distribution along 200-300m depth range, however maximum activity remains focused at northern edge of boundary for each year. 2009 activity only within site but little activity inside site in 2010. In 2011, activity spreading along to southern edge of site boundary. 2012 activity present along full extent of 200m depth contour through site and past southern boundary. Increasing from max. 8-11hrs in 2009-2010 up to max. 37hrs in 2011 and max. 28hrs in 2012. Only 6hrs maximum activity in 2013 just outside the north eastern edge of the site at 200m, decreasing to 2hrs at the site boundary. Additional 1hr blocks of activity occurred in the centre of GSH at 600m in 2013, and in a line parallel to the top corner of the site, spanning all depth ranges.
	Hooks and lines	2009-2013	Decrease from max. 266hrs in 2009 to 149hrs max. in 2013. Additional activity in 2013 between 500-700m.
	Purse seines	2011-2013	Negligible difference between years - max. 3hrs in 2011 and max. 6hrs in 2012. None in 2013 inside site.

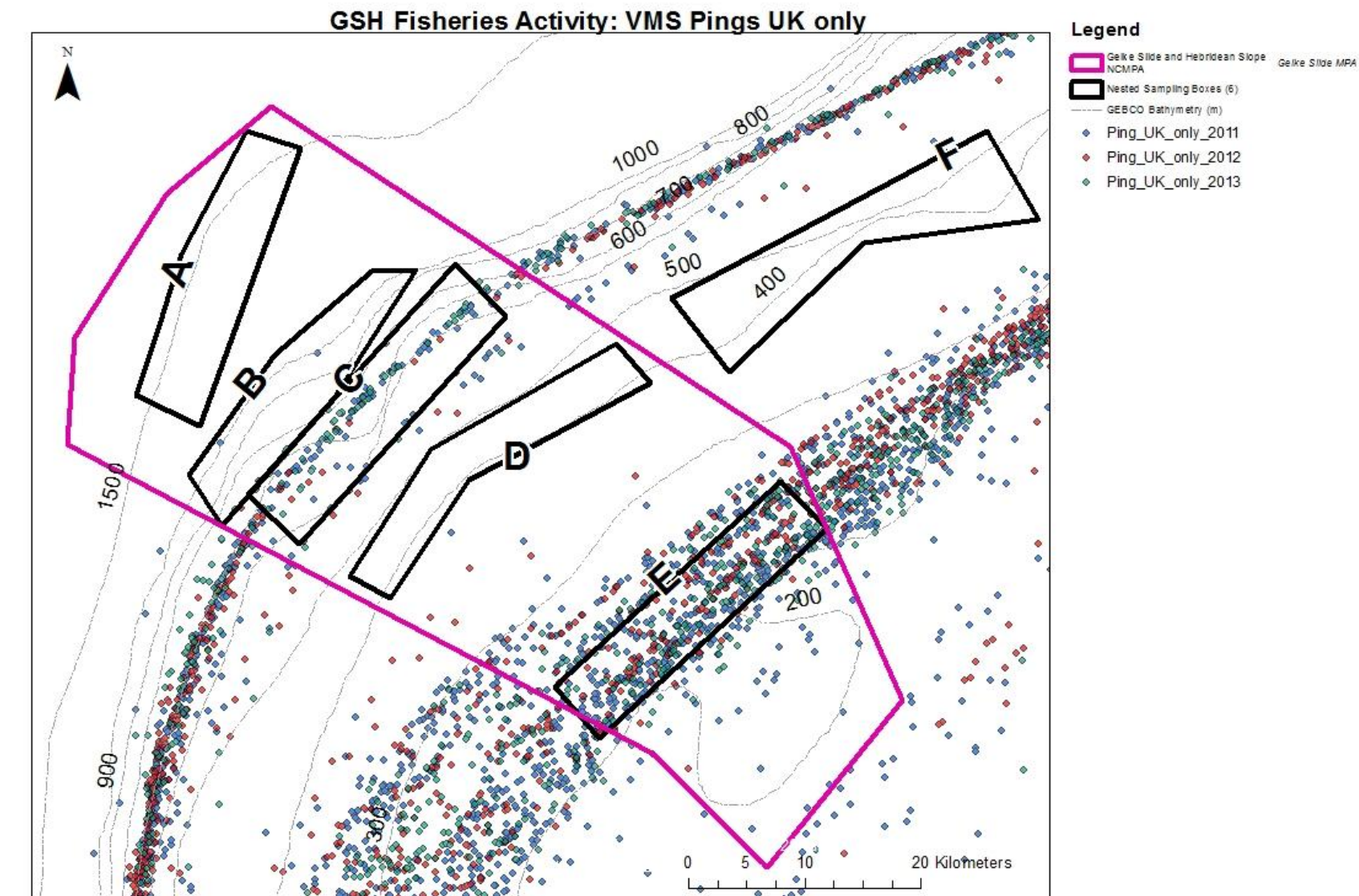
Summary maps

The maps below display the data discussed above. Please note that for the maps representing 'by gear type' data, only the total hours by gear data is used. These values have been derived from 2006-2009 and 2009-2013 datasets, for UK and/or non-UK.



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Figure 1: Map showing the distribution of VMS pings from non-UK vessels within Geikie Slide and Hebridean Slope NCMPA.



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Figure 2: Map showing the distribution of VMS pings from UK vessels within Geikie Slide and Hebridean Slope NCMPA.

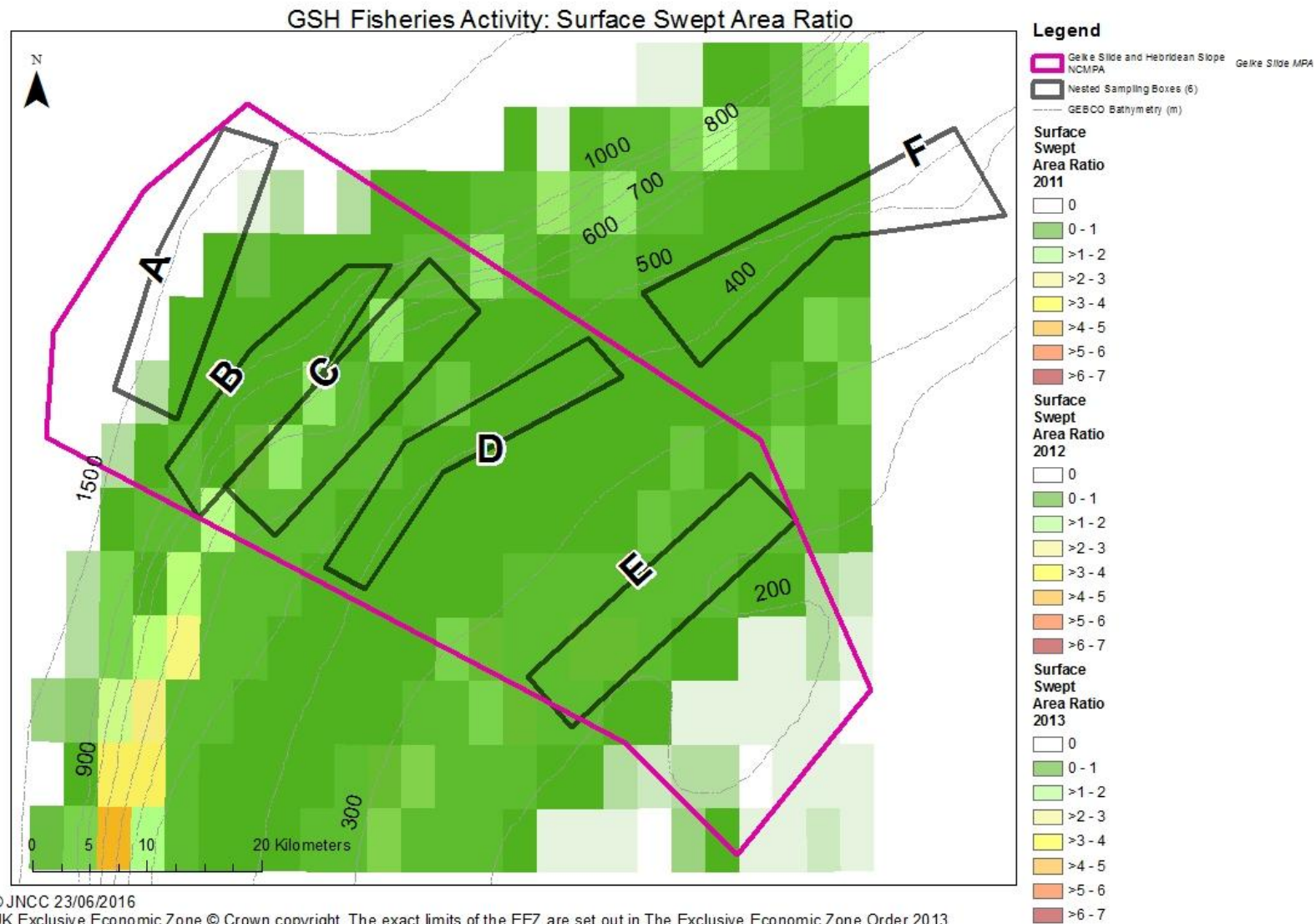
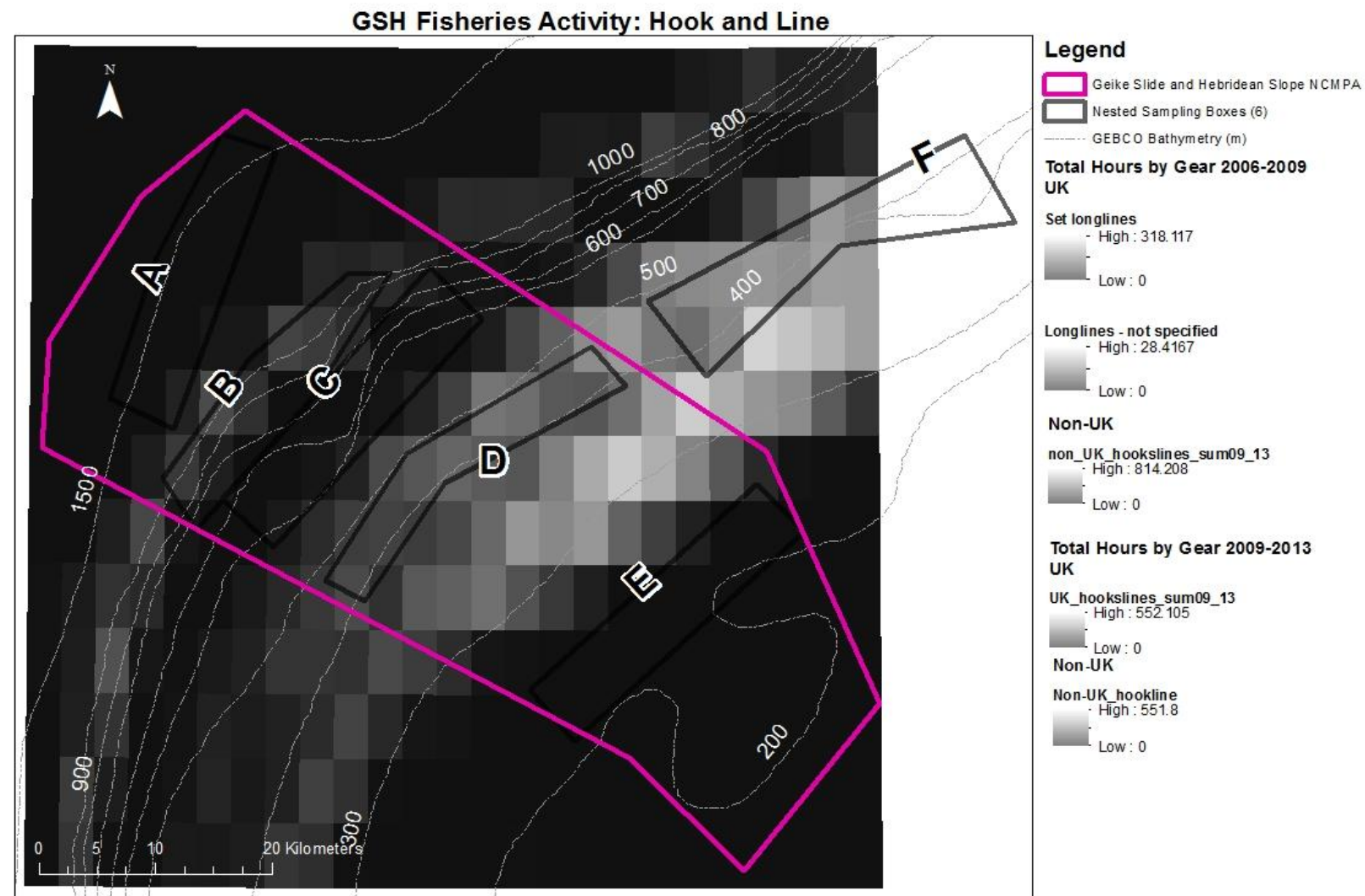
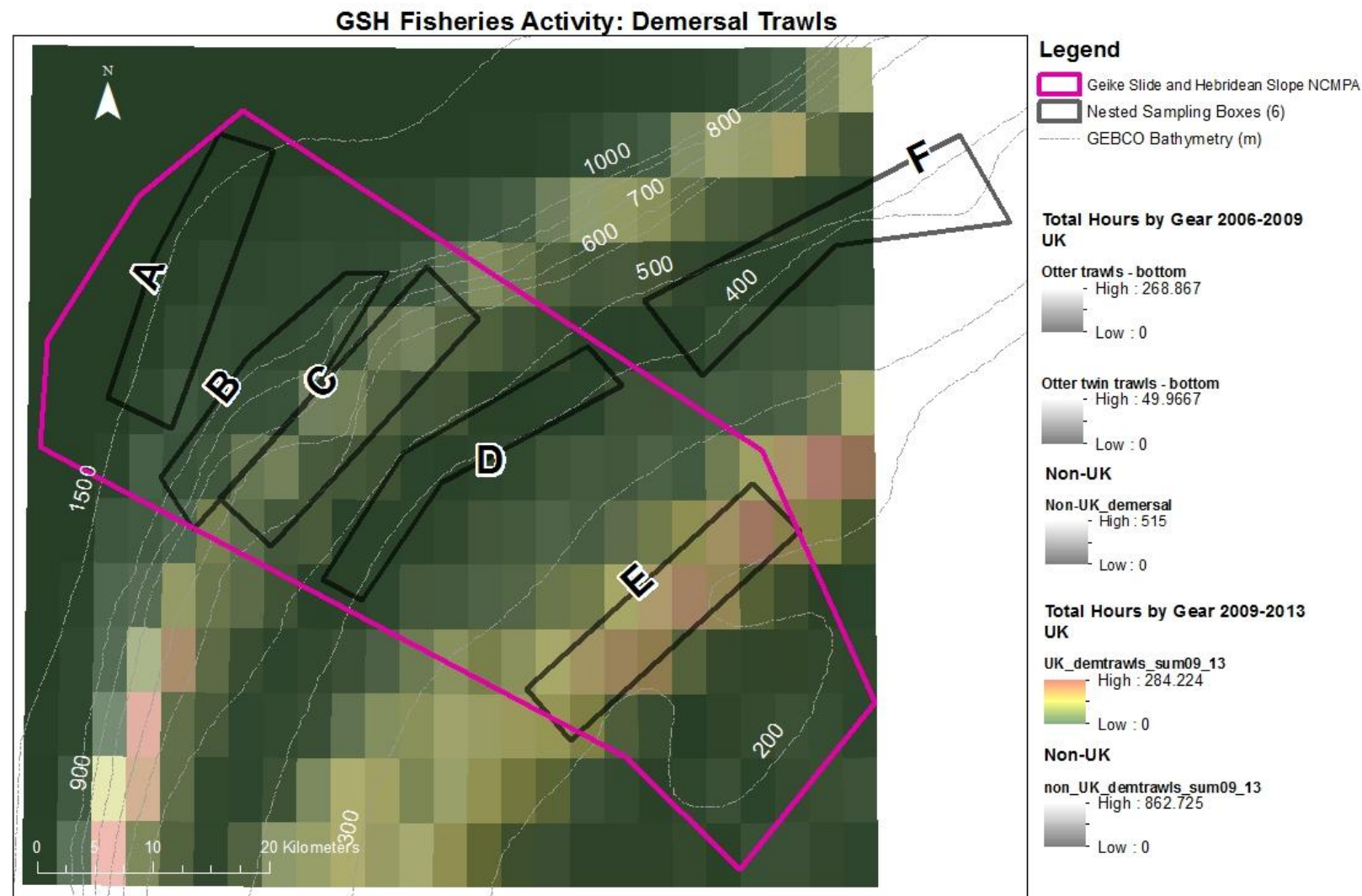


Figure 3: Map showing the surface swept area ratio, which includes both UK and non-UK activity, within Geikie Slide and Hebridean Slope NCMPA.



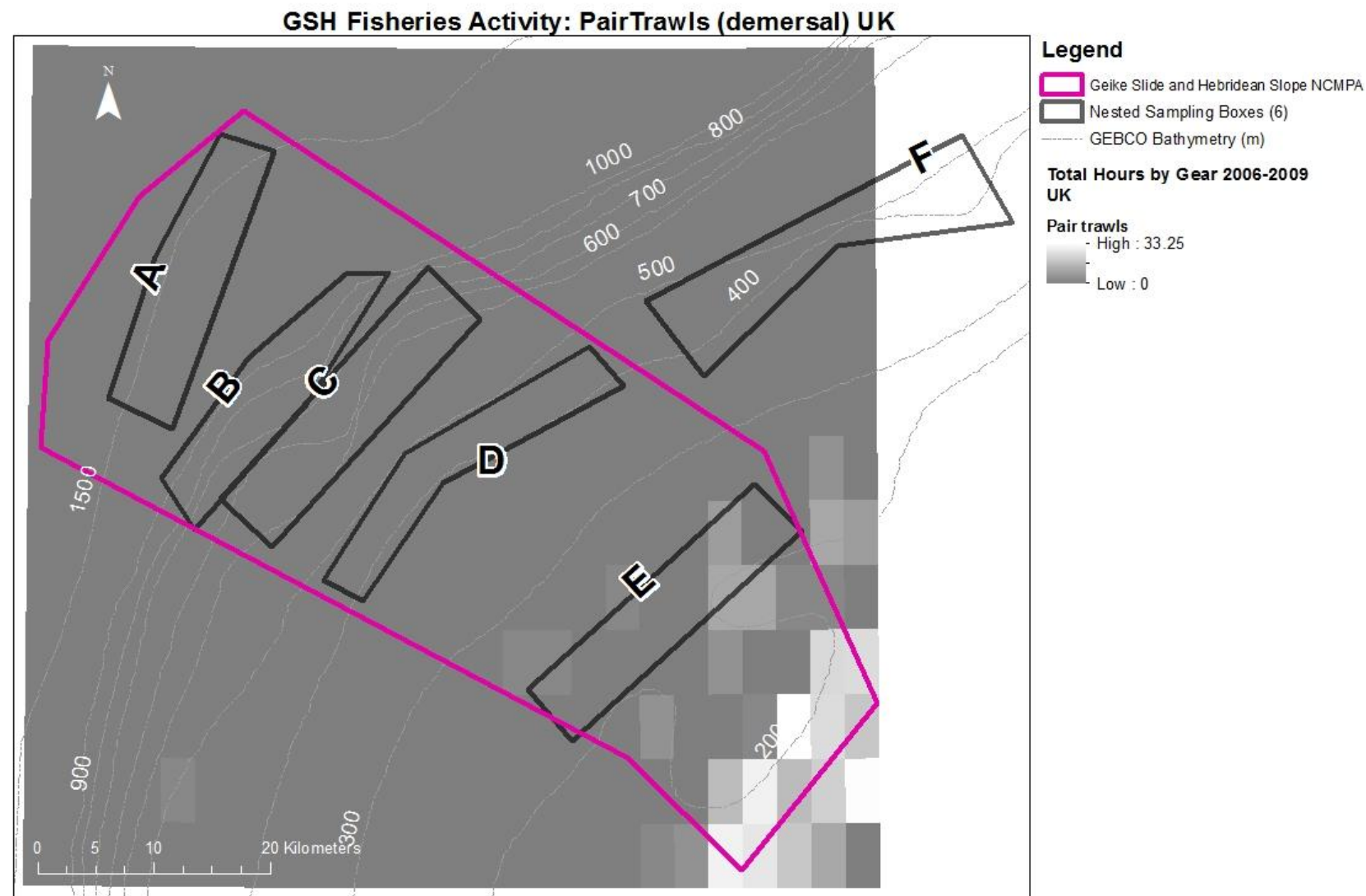
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Figure 4: Map showing the UK and non-UK hook and line activity within Geikie Slide and Hebridean Slope NCMPA. The data shows total hours by gear from 2006-2009 and 2009-2013.



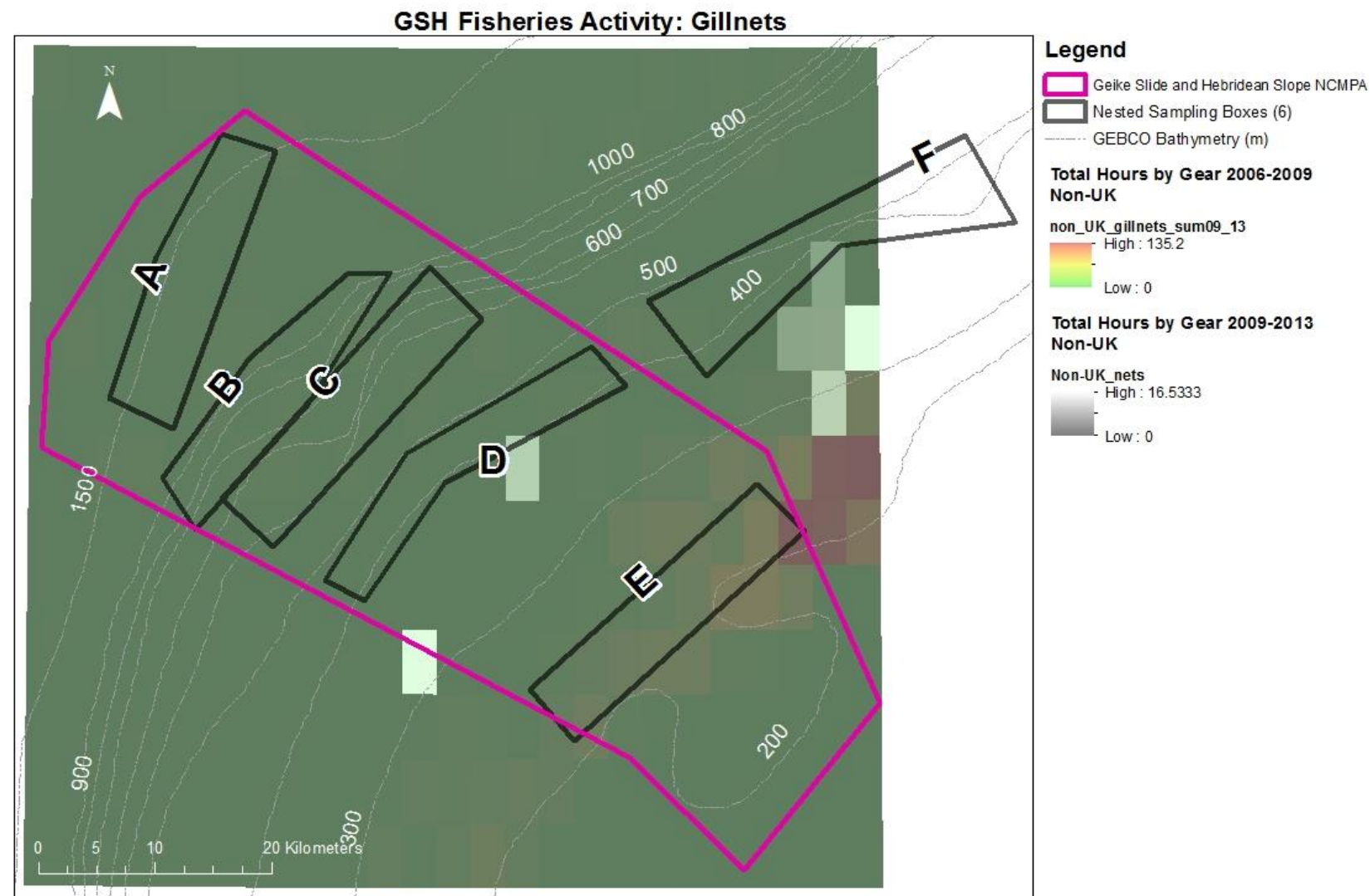
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Figure 5: Map showing the UK and non-UK demersal trawl activity within Geikie Slide and Hebridean Slope NCMPA. The data shows total hours by gear from 2006-2009 and 2009-2013. Note that beam trawl data is excluded as values are considered negligible (pair trawls are shown in Figure 6).



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Figure 6: Map showing the UK pair trawl (demersal) activity within Geikie Slide and Hebridean Slope NCMPA. The data shows total hours by gear from 2006-2009. 2009-2013 data is considered negligible.

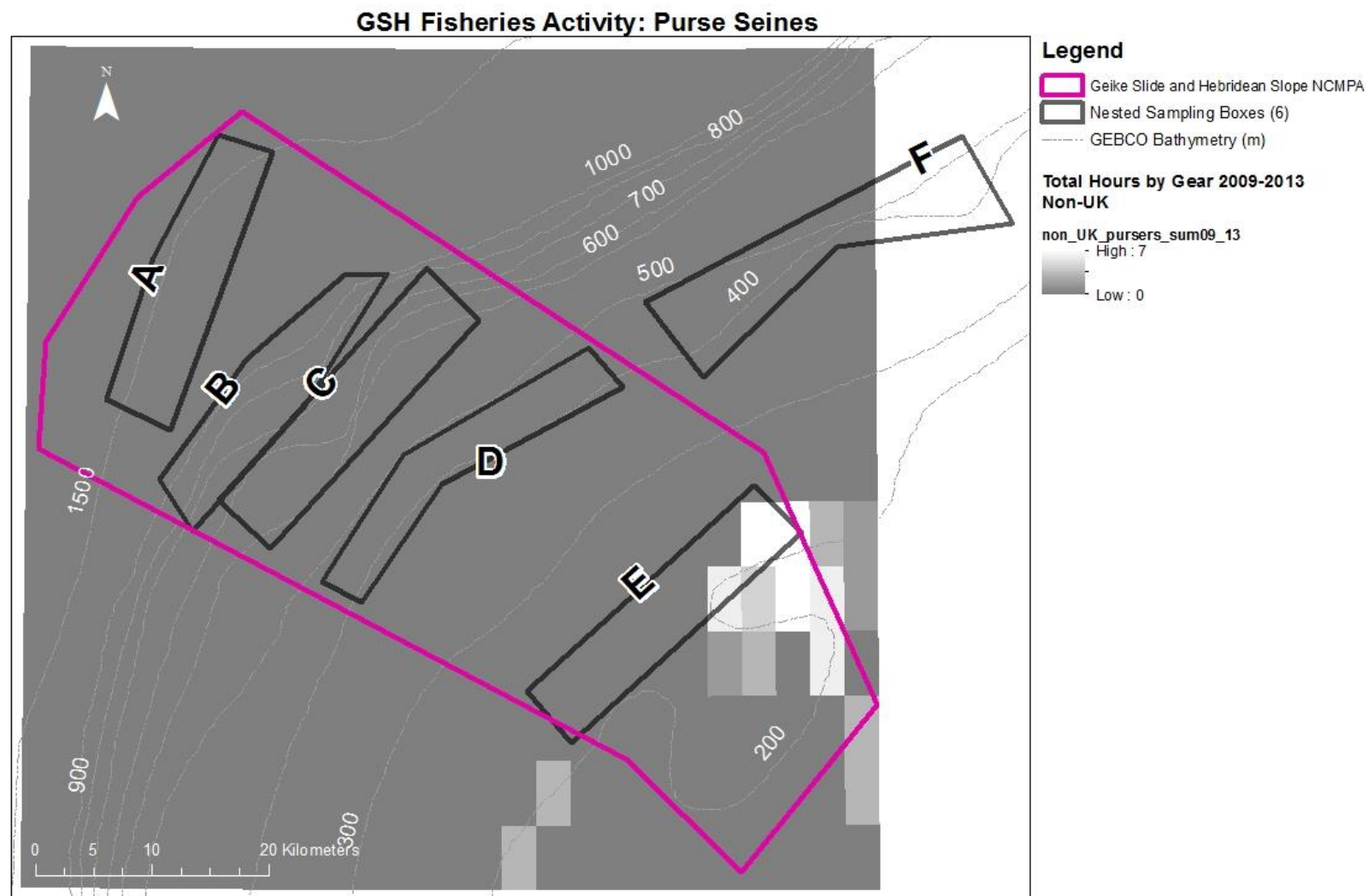


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Figure 7: Map showing the non-UK gillnet activity within Geikie Slide and Hebridean Slope NCMPA. The data shows total hours by gear from 2006-2009 and 2009-2013.



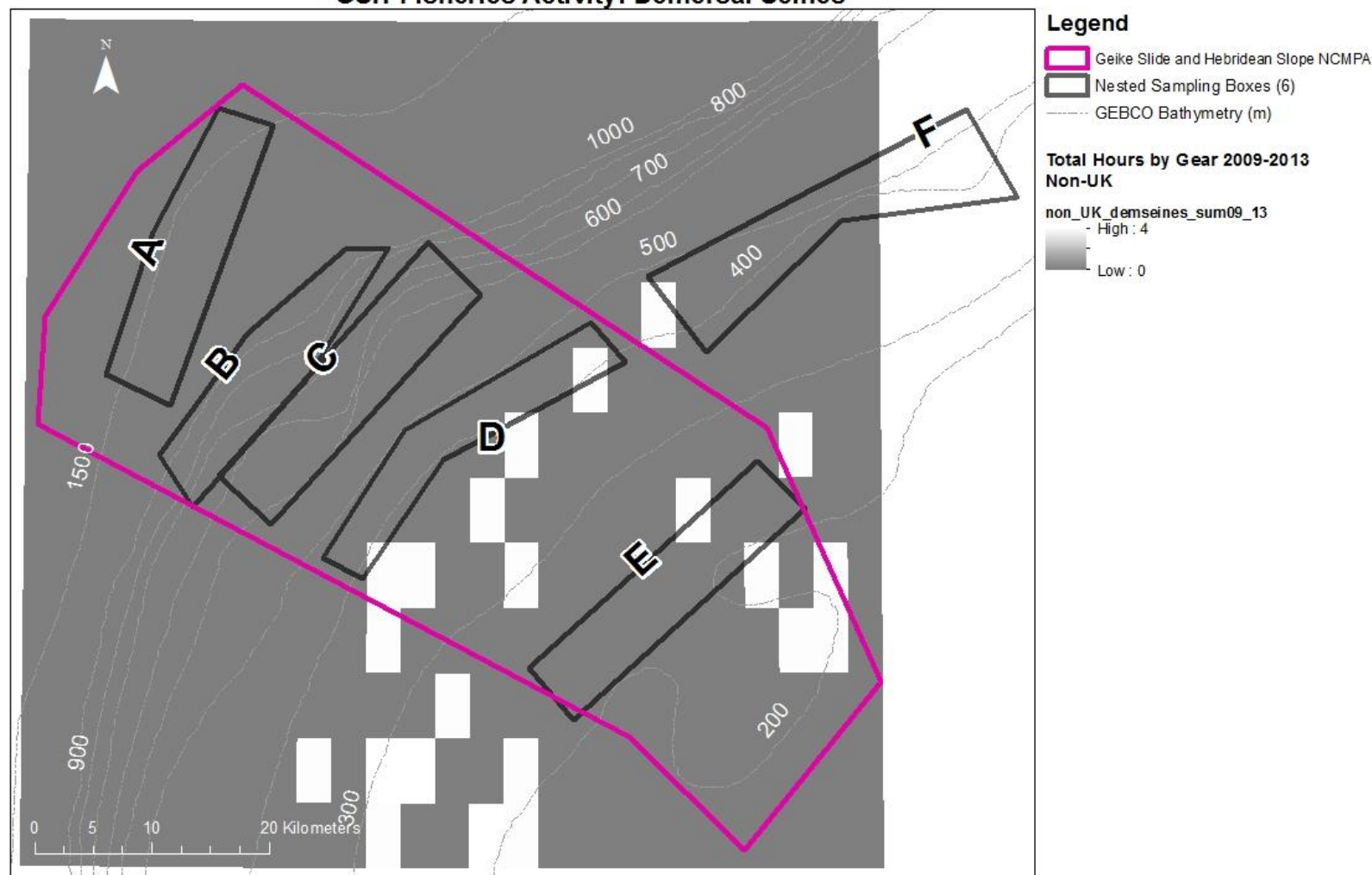
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Figure 8: Map showing the non-UK purse seine activity within Geikie Slide and Hebridean Slope NCMPA. The data shows total hours by gear for 2009-2013 (2006-2009 data was very minimal so is not shown).

GSH Fisheries Activity: Demersal Seines



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Figure 9: Map showing the non-UK demersal seine activity within Geikie Slide and Hebridean Slope NCMPA. The data shows total hours by gear for 2009-2013, (2006-2009 data was very minimal so is not shown).

Summary

The review of VMS ping data suggests that there has been no fishing activity in GSH deeper than 1500m or shallower than 200m in 2012 or 2013. Surface swept ratio values have decreased by half between 2011 and 2013, both inside and south of GSH. Differences in values from 2011 to 2012 and 2013 suggest that activity increased in range into deeper waters from 200-300m to 300-400m. VMS ping data coverage is consistent between these years, although ping data representing UK vessel activity south of the site appears to have declined between 2012 and 2013. For all years, the highest ping coverage was provided by non-UK vessel data along the 300m depth contour. Overall, the data reviewed suggests UK fishing vessel activity at GSH is much lower than that of non-UK fishing vessels.

The review of VMS gridded data from 2006 through to 2013 undertaken suggests consistent hook and line activity in GSH, particularly between 300-400m, for both UK and non-UK vessels. This activity can also be seen further along the 300-400m depth contour to the north-east of the site, within proposed sampling box F, where values of 551 total hours for non-UK vessels 2006-2009, 736 hours for non-UK 2009-2013 and 552 hours for UK vessels 2009-2013 have been observed. Low level (23 total hours 2006-2009) UK longline activity has been observed in the deeper part of the site, at around 1000m depth (within proposed sampling box B). The maximum value observed related to this activity is 814 total hours for non-UK vessels between 2009-2013. The VMS gridded data from 2009 to 2013 suggests an overall decline in hook and line activity for both UK and non-UK vessels. Overall, the data reviewed suggests UK fishing activity is lower than that of the non-UK activity at GSH.

Non-UK demersal trawl activity from 2006 through to 2013 has been observed in two depth ranges within the site at 300m and between 500-1500m (proposed sampling boxes B and C). The UK demersal trawl activity (2006-2013) has similarly been observed to occur in two depth ranges between 200-300m (sampling box E) and 500-800m (sampling box C). These areas of activity continue north and south outwith the site, in parallel with the depth contours. Of particular note is an area of activity which continues south-west of the site along the 800-1000m contours and shows the highest level of activity 24-29km away from the site boundary. The activity is mainly from non-UK vessels, though UK vessels are also present. Additionally, the data suggest a notable level of UK activity has occurred between 2009-2013 to the north east of the site at 200-300m. According to the data reviewed, levels of UK and non-UK demersal trawling activities in the site have approximately halved between 2010/2011 and 2012/2013.

Levels of non-UK gillnet activity are low within GSH, and are focused to the north-east corner of the site at 200m depth. The data reviewed suggest the activity continues past the site boundary, following the 200m depth contour. The data suggest in-site gillnet activity has remained at low levels from 2006 through to 2012. A slight change in distribution of this activity has occurred over the years 2009 to 2012, with an increased occurrence of fishing observed across the site along the 200m contour and past the southern edge of the site boundary. In 2011 and 2012, low levels of activity were observed to occur within proposed sampling box E. 2013 activity appears anomalous, with only very low levels of activity occurring, which focused just outside the north-east corner of GSH. Due to the overall low

levels of gillnet activity in GSH, and the inconsistency between 2013 and previous years, it is suggested that this activity can be considered to be undertaken opportunistically.

A relatively small area of low level non-UK purse seine activity has been observed to have occurred to the east corner of the site at 200m, in 2011 and 2012, falling just within the proposed sampling box E. No purse seine activity was observed in 2013. As with the gillnet activity at the site, it is suggested that levels of purse seine activity can also be considered opportunistic, with some annual variability.

The observed levels of non-UK demersal seine activity within GSH are low, with annual variability in depth and location. This activity is distributed between the 200-400m depth contours.

Due to the low levels of activity and minimal abrasion caused by these static gears, purse seines and gillnets can be considered as causing negligible abrasion impact at GSH. Proposed sampling box E however does cover the area of both gillnet and purse seine activity. Hook and line activity is also likely to cause a minimal abrasion impact, despite the data reviewed suggesting this activity occurs within the site (proposed sampling box F includes part of the hook and line activity area). The demersal trawl activity occurring to the south-west of the site has not been considered in the survey design as this activity is outside of the GSH boundary. The demersal trawl activity within the site boundary and to the immediate north of the site fall overlap proposed sampling box F, box E and box C. All fisheries activities observed have been found to occur in parallel with the depth contours in the site. Therefore the proposed sampling boxes have been located to reflect this apparent distribution of effort.