



## Report on 2021 Seal Surveys in the Greater Thames Estuary

### Introduction

There are two species of seal that are resident in the UK, both of which are found in the Greater Thames Estuary – the harbour (or common) seal (*Phoca vitulina*) and the grey seal (*Halichoerus grypus*). The southern North Sea grey seal population has been increasing, and until more recently, harbour seal populations on the east coast of England had also generally been increasing (punctuated by major declines due to phocine distemper virus (PDV) outbreaks in 1988 and 2002) (SCOS, 2020). Consistent with other parts of the east coast of England, the Greater Thames Estuary seal populations have seen an increase in numbers, with both harbour and grey seal populations demonstrating high annual growth rates (8.99% pa, bootstrap 95% CI 6.79-11.19 for harbour seals; and 12.62% pa, bootstrap 95% CI 7.71-17.52 for grey seals) (Cox et al., 2020). More recent counts by the Sea Mammal Research Unit (SMRU) in the south-east England Seal Management Unit (SMU), however, may indicate the start of a decline in the harbour seal population of the Wash, North Norfolk Special Area of Conservation (SAC) (SCOS, 2020). The trajectory of other harbour seal populations around the UK coast is variable; generally, populations on the east coast of Scotland and Northern Isles are declining, and those in western Scotland are stable or increasing. With this national context in mind, there is a clear need to continue monitoring the trends in abundance of the Greater Thames Estuary harbour and grey seals.

Surveys of the area were carried out by SMRU and Bramley Associates between 2004 and 2012 (Bramley and Lewis, 2004; Bramley Associates 2005, 2007 and 2010 survey data, unpublished; Bramley Associates, 2012; SCOS, 2020) and ZSL began annual surveys in 2013 (Cox et al., 2020). Harbour seal pup surveys were also carried out in 2011 (SMRU) and 2018 (ZSL). This report presents the latest counts for the Greater Thames Estuary as well as results from the third pup survey of the area (both the population and harbour seal pup surveys had been postponed in 2020 because of the Covid-19 pandemic). In addition, this report presents the findings from an additional aerial survey which was conducted to better understand seal movement and the impact of the multi-day survey methodology used by ZSL.

### Methodology

Population and pup surveys were carried out from a light fixed-wing aircraft (Rallye model), based at Southend airport.

The harbour seal pup survey is timed to coincide with when the peak number of pups are expected and the population survey takes place over the harbour seal moult period, which follows whelping. Typically, on the east coast of England, pupping takes place at the end of June-start of July and the moult occurs over the first two weeks of August. The surveys take place within two hours either side of low tide. To minimise environmental variability, surveys should also ideally happen between 12:00 and 19:00 (SCOS, 2020). However, where Ministry of Defence (MoD) Danger Areas exist, and airspace

restrictions are in place (as in the Greater Thames Estuary) this rule is relaxed. Surveys of coastline and sandbanks that overlap with MoD Danger Areas take place over the weekend, subject to agreement from MoD Range Control.

The pup surveys were scheduled to take place 1<sup>st</sup> July 2021 – 3<sup>rd</sup> July 2021. Surveys were successfully completed on 1<sup>st</sup> and 2<sup>nd</sup> July, however, weather warnings prevented aircraft flying on 3<sup>rd</sup> July. Despite efforts, it was not possible to reschedule the 3<sup>rd</sup> July survey of the Southend area of the Greater Thames Estuary. A total pup estimate for the Greater Thames Estuary is therefore not provided in the results, however, the number and location where pups were recorded in the remainder of the estuary is included.

The population surveys took place on 7<sup>th</sup>, 8<sup>th</sup>, and 10<sup>th</sup> August 2021. Typically, the survey would happen over three consecutive days, however, storms on 9<sup>th</sup> August prevented this.

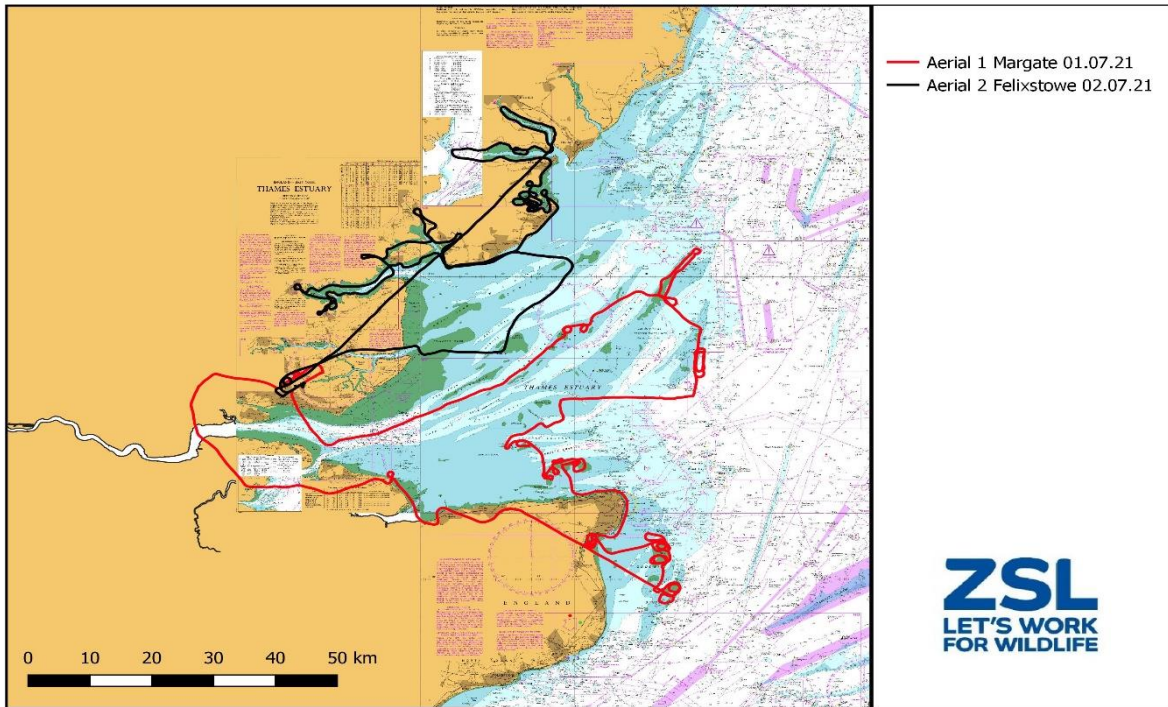
A repeat survey of the coastline and sandbanks covered on the 10<sup>th</sup> was carried out on 11<sup>th</sup> August. ZSL aim to conduct the seal counts over three consecutive days because the survey team have not found it possible to survey all the coastline and sandbanks of the Thames estuary within a single four-hour window, two hours either side of low tide. The estuary is broadly divided into three 'sections' – Margate, Felixstowe, and Southend – and each section covered on a different day. It has been assumed that the movement of seals between these different sections is limited and therefore the risk of double counting or missing seals that move between survey days is low. A repeat survey was carried out for the first time this year to better understand the impact of multi-day surveys on the counts.

The location of seals was recorded using a Garmin eTrex10 handheld GPS unit. The same unit was used to record the path of the aircraft. Hauled out seals were photographed using a Canon EOS 250D body and Canon EF 100-400mm f/4.5-5.6 L IS USM lens. After the survey, the photos are used to count seal numbers and species at each haul-out site. This is done independently by two people, their counts are compared, any disparities discussed, and a final count agreed.

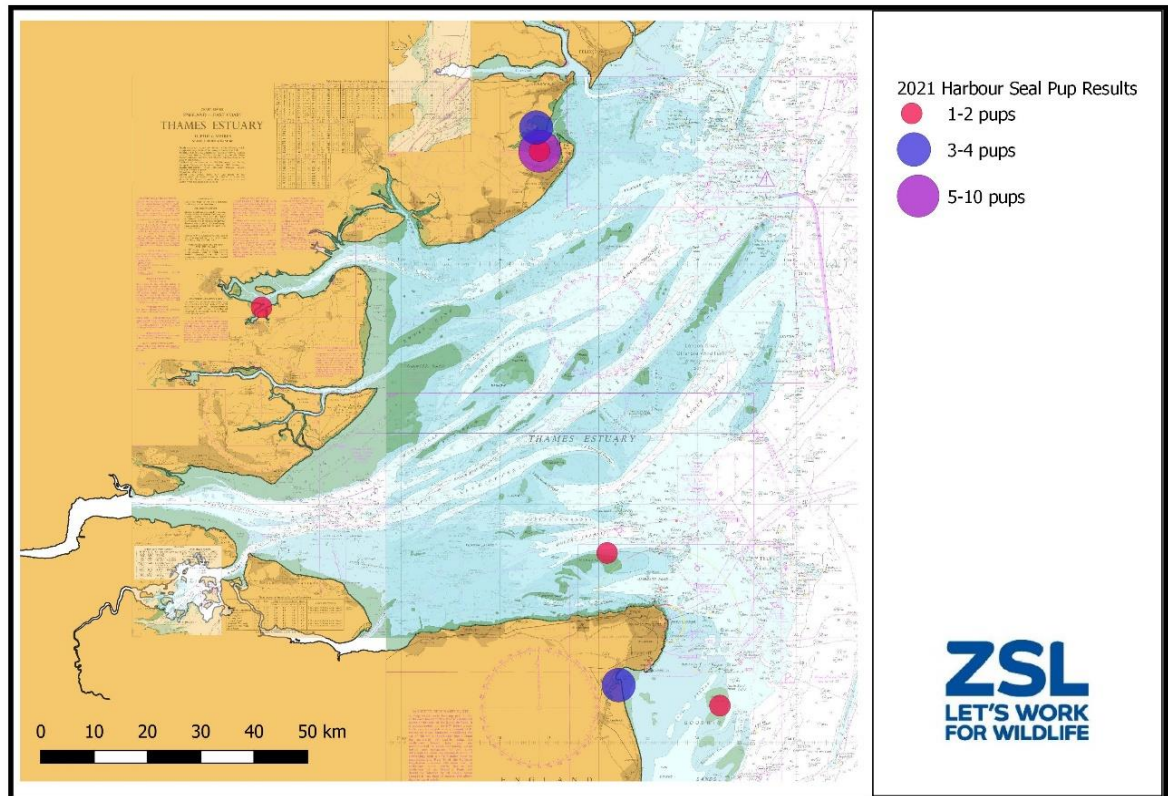
## **Results – Pup Survey**

On 1<sup>st</sup> and 2<sup>nd</sup> July, a total of 1,135 seals were counted, this included 21 harbour seal pups (assumed to be born this year based on size and proximity to an adult harbour seal, presumed to be the mother), 230 harbour seals (all age classes excluding pups) and 99 grey seals (all age classes). There were 785 seals counted that were not identified to species level or age class (pup vs. older). These seals were at two locations in the Estuary – Kentish Knock sandbanks and the Goodwin Sands. A wind farm constructed near the Kentish Knock sandbanks prevented the aircraft flying near enough to the seals to capture photos from which species could be determined with reasonable confidence. Likewise, airspace restrictions over the Goodwin Sands prevented the aircraft flying close enough for the photos needed (except for one location – Goodwin Knoll).

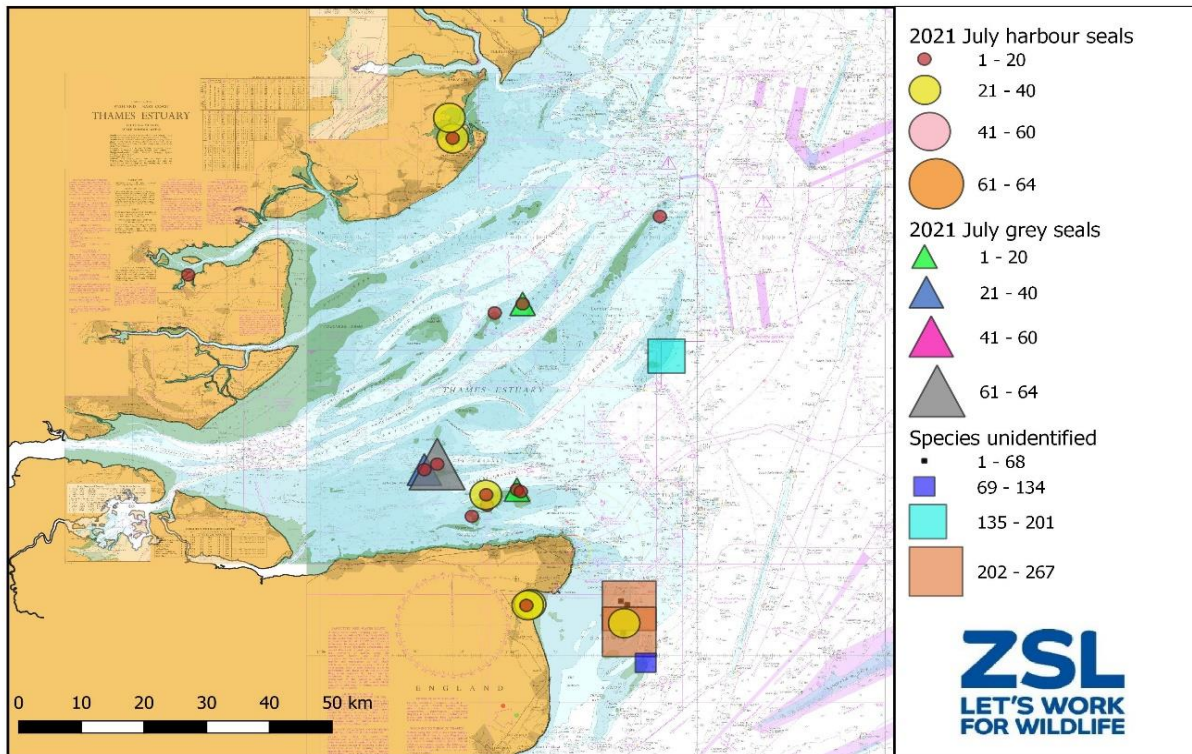
The aerial survey effort that was possible is presented in **Fig. 1**. The distribution and count of harbour seal pups that were seen is presented in **Fig. 2**. Pups were seen across five locations – Margate Sands, Pegwell Bay, Goodwin Knoll, the Blackwater, and Hamford Water. **Fig. 3** shows the distribution and count of harbour and grey seals, for which species identification was possible (all age classes for both species), as well as seals not identified to species level.



**Fig. 1 – Aerial survey effort for pup count, 2021 © Crown Copyright, 2021. All rights reserved. License No. EK00120130801**



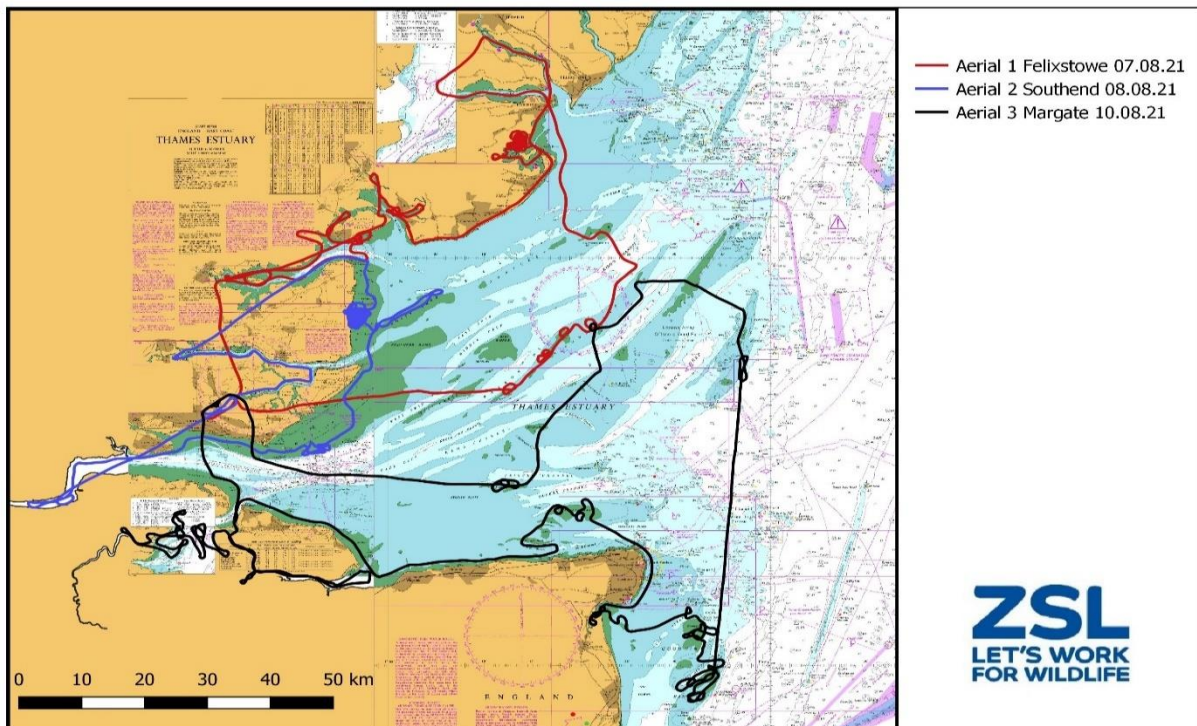
**Fig. 2 – Counts of harbour seal pups, 2021 © Crown Copyright, 2021. All rights reserved. License No. EK00120130801**



**Fig. 3 – Counts of harbour seals, grey seals, and seals (not ID-ed to species) (all age classes), 2021**  
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### Results – Population Survey

A map of the aerial effort for the population survey is presented in **Fig. 4**. No boat surveys or land-based surveys were conducted in 2021 as it was possible to cover the entire estuary by aircraft.



**Fig. 4 – Aerial survey effort for population count, 2021** © Crown Copyright, 2021. All rights reserved. License No. EK00120130801

Counts and estimated harbour and grey seal population size for the Thames is presented in **Table 1** below – the latest counts are shown in bold. Populations are estimated by a scaling up of count numbers. This is based on the estimated proportion hauled out during surveys – for harbour seals, this is 72% (0.72, 95% confidence intervals (CI): 0.54-0.88), and for grey seals, this is 23.9% (0.239, 95% CI: 0.192-0.286) (Loneragan et al., 2013; SCOS-BP-16/03).

**Table 1: Counts and harbour and grey seal population estimates for the Thames**

|  | <b>2013</b>       | <b>2014</b>         | <b>2015</b>         | <b>2016</b>         | <b>2017</b>         | <b>2018*</b>        | <b>2019</b>         | <b>2021**</b>       |
|--|-------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| <b>Harbour seal count</b>                        | 482               | 489                 | 451                 | 694                 | 795                 | 738                 | 671                 | <b>498***</b>       |
| <b>Harbour seal population estimate (95% CI)</b> | 669<br>(548-893)  | 679<br>(556-906)    | 626<br>(513-835)    | 964<br>(789-1285)   | 1104<br>(903-1472)  | 1026<br>(840-1369)  | 932<br>(763-1243)   | 692<br>(566-922)    |
| <b>Grey seal count</b>                           | 203               | 449                 | 454                 | 481                 | 575                 | 596                 | 775                 | <b>749***</b>       |
| <b>Grey seal population estimate (95% CI)</b>    | 849<br>(710-1057) | 1879<br>(1570-2339) | 1900<br>(1587-2365) | 2013<br>(1682-2505) | 2406<br>(2010-2995) | 2490<br>(2080-3099) | 3243<br>(2710-4036) | 3134<br>(2619-3901) |
| <b>Total seal count</b>                          | 685               | 938                 | 905                 | 1175                | 1370                | 1334                | 1446                | 1247                |

\*Count completed by SMRU

\*\*Count not completed in 2020 due to Covid-19 restrictions

\*\*\*Counts updated post press release in September 2021

This year's count excludes seals observed on Kentish Knock sandbanks. As noted above for the pup survey, proximity of the sandbanks to the wind farm meant it was not possible to fly close enough to the seals to take photos from which a total count could be taken, or species identified. Based on observation during the flight, it is estimated that there were ~200 hauled out seals; and based on previous surveys, it is expected to be a mixed species group dominated by grey seals. Airspace restrictions over Goodwin Sands were temporarily lifted to allow those sandbanks to be surveyed for the population count, therefore numbers above include those haul-out sites.

**Fig. 5** below shows the distribution and counts of harbour and grey seals in the Thames in 2021. **Fig. 6** below shows the change in harbour and grey seal counts in the Thames since surveys began in 2003 (Cox et al., 2020).

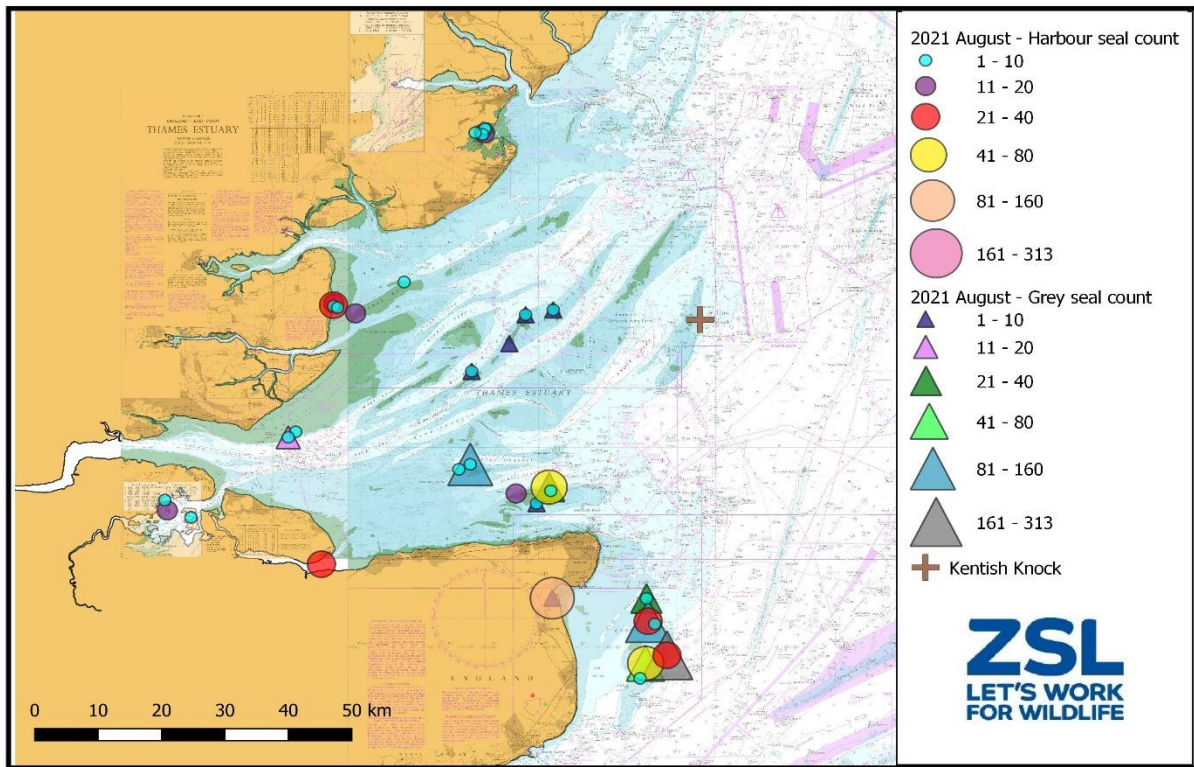


Fig. 5 – Counts of harbour seals and grey seals, 2021 © Crown Copyright, 2021. All rights reserved. License No. EK00120130801

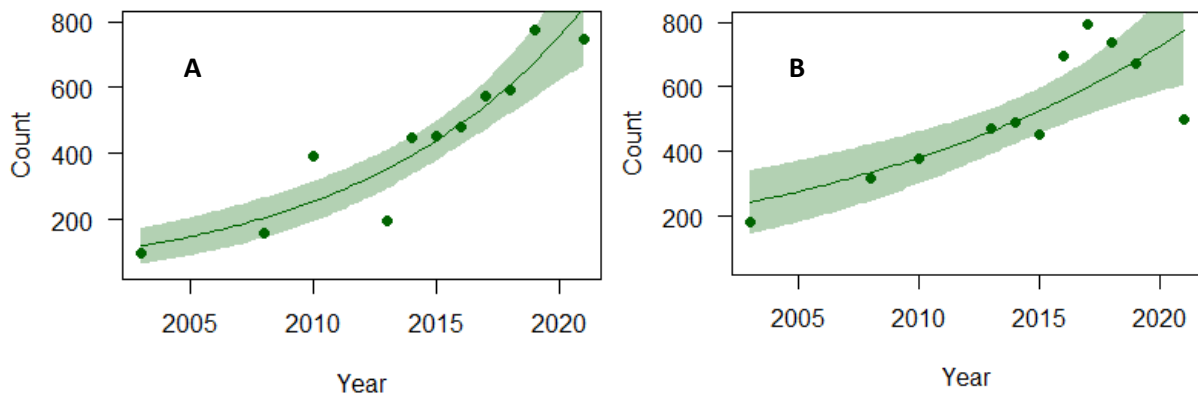


Fig. 6 – Counts and fitted trend for Thames grey seals (A) and harbour seals (B), 2003-2021, 95% CI shown, by SMRU, Bramley Associates and ZSL (see Cox et al., 2020)

### Results – Repeat Survey

On 11<sup>th</sup> August, 398 harbour seals and 635 grey seals were counted (total of 1,033). This count excludes Kentish Knock sandbanks, for the reason explained above. This was a repeat of 10<sup>th</sup> August flight (same areas surveyed in the same order), during which 352 harbour seals and 714 grey seals were counted, totalling 1,066 seals (similarly excluding Kentish Knock sandbanks). See Fig. 7 for survey route (which can be compared to the 'Margate route' in Fig. 4) and Fig. 8 for the distribution and count of seals. Table 2 shows a direct comparison of locations (sometimes combined multiple haul-out sites to represent sandbanks/one location) and seal counts for the two days.

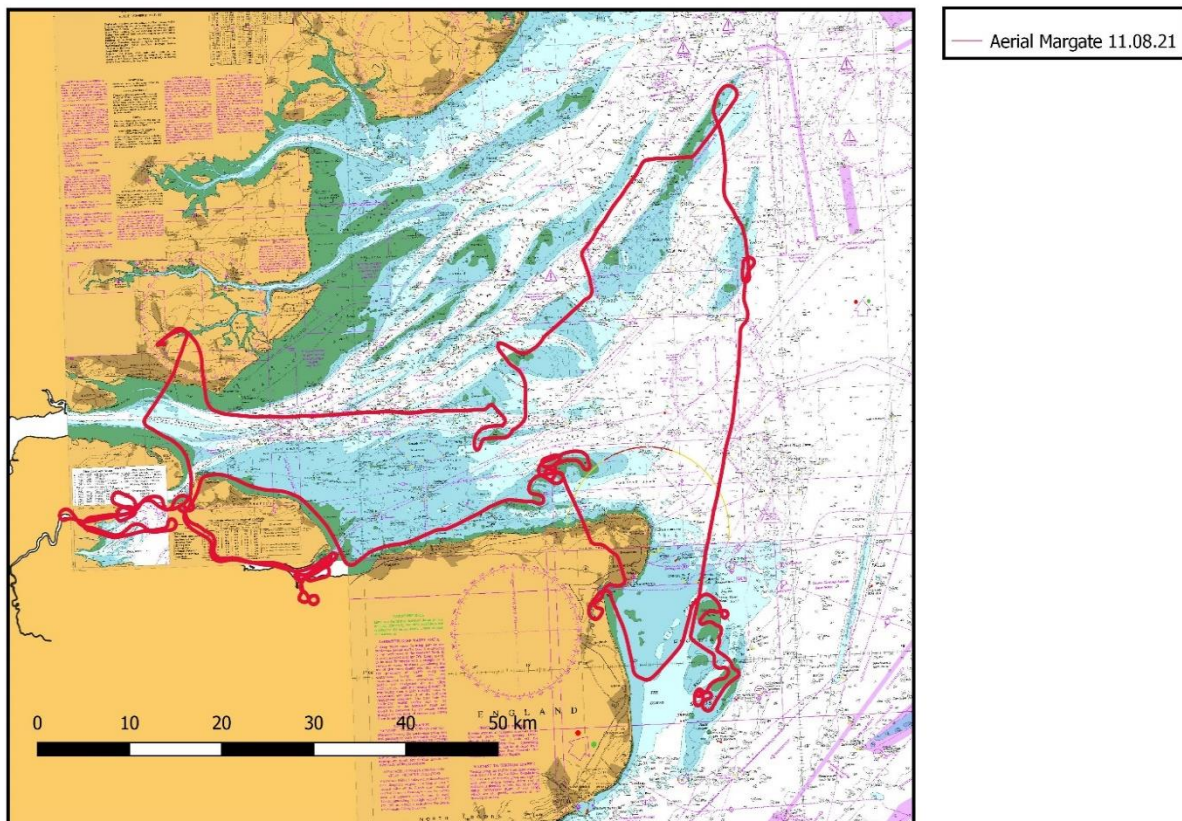


Fig. 7 – Aerial survey effort for repeat count, 11 August 2021 © Crown Copyright, 2021. All rights reserved. License No. EK00120130801

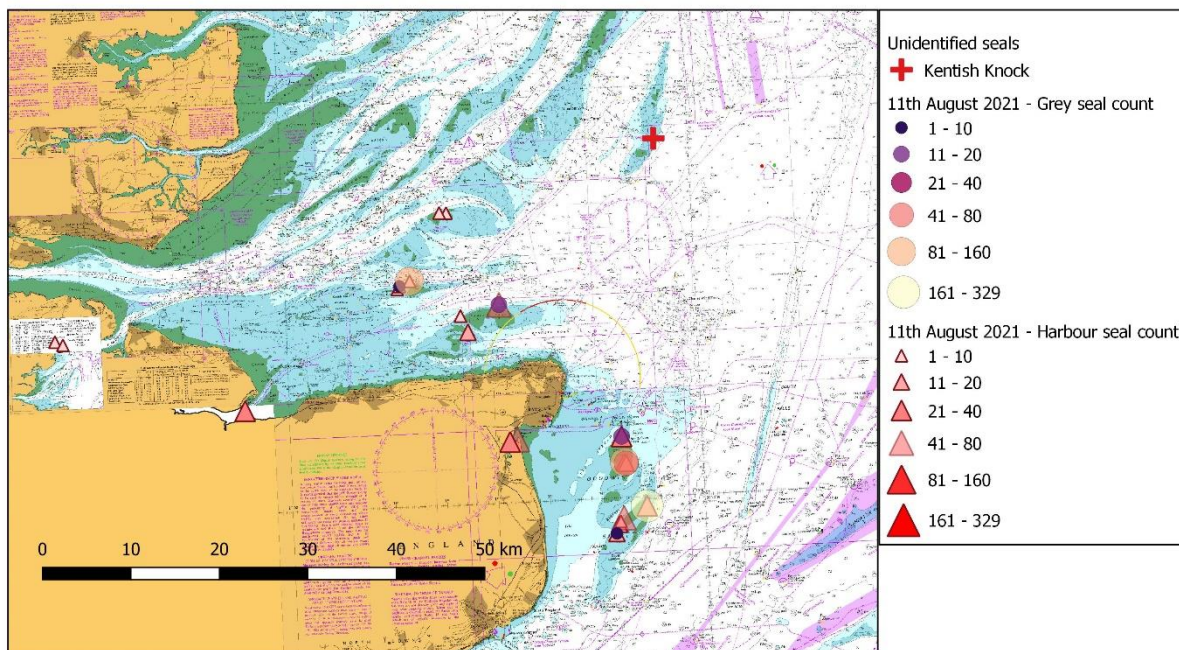


Fig. 8 – Count of harbour seals and grey seals, 11 August 2021 © Crown Copyright, 2021. All rights reserved. License No. EK00120130801

**Table 2 – Comparison of counts on 10<sup>th</sup> and 11<sup>th</sup> August 2021**

| Location       | No. of harbour seals on 10 <sup>th</sup> | No. of harbour seals on 11 <sup>th</sup> | No. of grey seals on 10 <sup>th</sup> | No. of grey seals on 11 <sup>th</sup> |
|----------------|--|--|---------------------------------------|---------------------------------------|
| Medway         | 21                                       | 17                                       | 0                                     | 0                                     |
| Swale          | 26                                       | 31                                       | 0                                     | 0                                     |
| Margate Sands  | 70                                       | 71                                       | 28                                    | 20                                    |
| Pegwell Bay    | 97                                       | 97                                       | 3                                     | 0                                     |
| Goodwin Sands  | 118                                      | 160                                      | 574                                   | 494                                   |
| Shingles Patch | 0  | 2  | 0                                     | 0                                     |
| Pan Sand Ridge | 20                                       | 20                                       | 109                                   | 121                                   |
| <b>Total</b>   | <b>352</b>                               | <b>398</b>                               | <b>714</b>                            | <b>635</b>                            |

## Discussion

In August 2021, a total of 498 harbour seals were counted, compared with an average of 735 for three surveys in 2017-2019, and an average of 545 for three surveys in 2014-2016. There has been an increase in harbour seal counts since surveys began in 2013 to 2017, and since then there appears to have been a gradual decline. Some variability year-to-year is to be expected, associated with the proportion of the population hauled out and available to count. However, the change in counts since 2017 could also reflect a true decline in harbour seal numbers and requires ongoing monitoring. Considering changes observed in the Wash (the 2019 count was ~27.5% lower than the mean of the previous five years, 2014-2018) and declines elsewhere in the UK, this could be of concern.

In August 2021, a total of 749 grey seals were counted. There has been a sustained increase in grey seal counts in the Thames year-on-year, consistent with the rest of the east coast of England, up until this year. It is suspected that the lower count this year reflects the missed Kentish Knock sandbanks rather than a true decline - a large group of seals were observed at Kentish Knock but could not be photographed and which is typically grey seal dominated. The long-term trend will become clearer with continued monitoring.

Whilst a total pup count for the Thames in 2021 cannot be provided, the survey results show that the Thames estuary is important harbour seal pupping habitat. Further surveys of the entire estuary will be important to build on pup surveys in 2011 and 2018 and monitor trends, especially in determining the cause of any change in population size.

### *Repeat survey*

A comparison of **Figs. 5** and **8** and **Table 2** shows that seals, of both species, were largely seen at the same locations on the Margate route over both days, and in similar numbers, suggesting that there is not a large amount of movement of seals in this short period of time. Overall, there is a +13.1% change in harbour seal counts on 10<sup>th</sup> and 11<sup>th</sup>, and -11.1% change in grey seal counts on the same dates. The numbers of each species at each haul-out site do not match exactly though, with the largest difference being at Goodwin Sands (harbour seals +35.6% and grey seals -13.9%), therefore it is possible that there is some level of seal movement within and, most importantly, outside of the Margate 'section'. This therefore means there could be some risk of double counting or missing seals. The difference in numbers between the days could also be due to other reasons though: such as, missed seals/observer bias, errors in photo analysis or environmental factors such as differences in tidal state (although the timing of the surveys is such to minimise this kind of variability). Whilst further, more-resource intensive, research would be needed to fully understand seal movement patterns in the estuary, these results, except for harbour seals at Goodwin Sands, do suggest low level of movement of seals between areas across the 3-day survey period and gives us more confidence that seals are not missed or double counted in large numbers because of multi-day surveys.



## Limitations

The surveys conducted in the Thames follow the recognised methodology for harbour seal moult counts in sandy/muddy estuaries, however, there are uncertainties associated with it and limitations of the 2021 survey specifically. These are outlined below:

- When possible, ZSL surveys are timed to coincide with a spring low tide to maximise the time for which coastline and sandbanks are exposed, and therefore available to be surveyed. However, with other constraints on survey dates, such as airspace restrictions, etc., this is not always possible, as was the case this year. As such, certain sandbanks were covered over at the time of surveying – the Barrows, Gunfleet, Long Sands and Knock John.
- Whilst the surveys only took place in fine weather, the conditions in the days around the surveys were unsettled with heavy rain. The third day of the pup survey had to be cancelled and the third day of the population survey postponed by one day because of this. It is possible that the unsettled weather could have affected haul-out behaviour (SCOS, 2020) and therefore the seals available to count.
- Population estimates made from counts do contain considerable uncertainty (SCOS, 2020). During their annual moult, harbour seals spend longer hauled out and the highest proportion of the population is available to count. Some seals will still be at sea though. There is just one UK study that estimates the proportion of harbours seals hauled out during the moult (0.72, 95% CI 0.54-0.88) (Loneragan et al., 2013) and it is this figure that is used to calculate a population estimate. Furthermore, whilst environmental variability is reduced by consistent timing of surveys, the conversion/scaling up factor only represents adult seals – haul-out behaviour could vary with age and sex and the age structure and sex ratio will change over time. The age-sex composition for the Thames population is not known. As such, counts should be considered the minimum number of harbour seals in each area, and population estimates from scaled up counts should be treated with a certain level of caution.
- Counts and especially species ID depend on the quality of the aerial photography and ideally capturing images of the animal's faces/heads. Every effort is made to ensure this but especially where the group of seals is particularly large it is not possible to get a photograph of every animal's face, therefore some assumptions must be made based on other seals in the photographs, position on the shore, position relative to each other, size, etc.

## Acknowledgments

ZSL would like to thank Banister Charitable Trust for funding the 2021 seal surveys. Our thanks go to Derek Watson, pilot, for his help with this year's surveys, donating his time and plane. ZSL would like to thank Andy Haigh, pilot, and Jon Bramley and colleagues of Bramley Associates for their continued support of the project. ZSL would also like to thank Southend Airport staff; Dave Thompson and his team at the Sea Mammal Research Unit (SMRU) for their invaluable advice and guidance throughout the project; and the QinetiQ team at MOD Shoeburyness for helping with permissions for the surveys.

## Contact

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