Monitoring the effects of a hovercraft survey

in

Langstone and Chichester Harbours

Report compiled by Louise MacCallum

LANGSTONE HARBOUR BOARD

March 2014

Executive Summary

- The reaction of wildlife, particularly wintering waders and wildfowl to a hovercraft engaged in a benthic intertidal survey were monitored within the Chichester and Langstone Harbours Special Protection Area (SPA).
- A significant disturbance effect upon SPA species was observed, with birds taking flight as a result of the presence of the craft at distances between 75—500m.
- Hovercraft use within Chichester and Langstone Harbours should be restricted to important scientific surveys. Controls and conditions should be placed upon these scientific surveys and should include advice from wildlife experts.
- Hovercraft crew engaged in scientific survey work should be highly trained and experienced. They should have a clear understanding of the habitats and species for which the site has been designated. Every attempt to avoid disturbing wildlife should be made.
- Hovercraft activity of a recreational nature within Chichester and Langstone Harbours should not be permitted to avoid superfluous disturbance to SPA bird species.

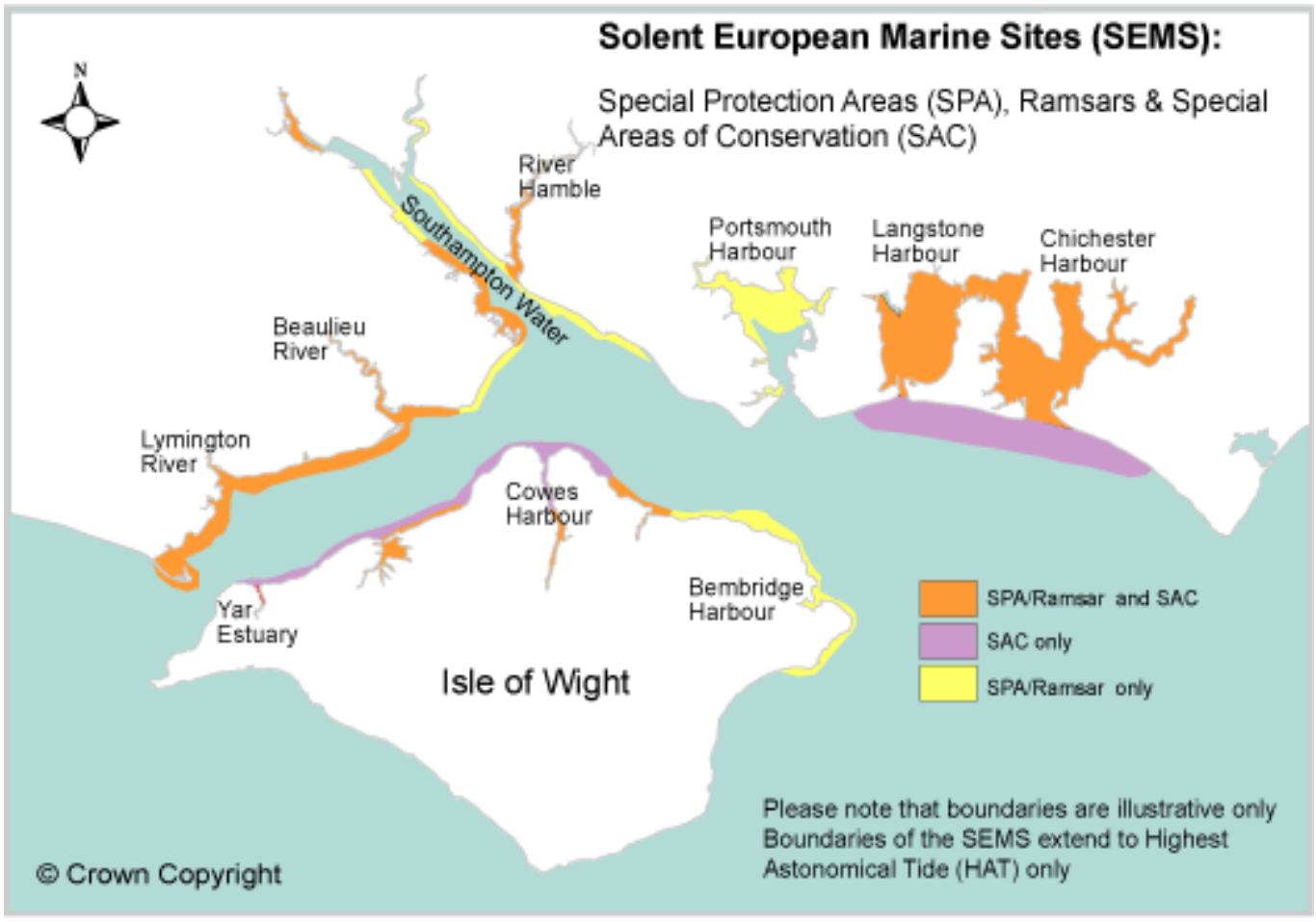
Introduction

Chichester and Langstone Harbours are both highly designated Marine Protected Areas. Both harbours are Sites of Special Scientific Interest (SSSI) and Ramsar Wetlands of International Importance. Together the harbours form the Chichester and Langstone Special Protection Area and are in addition both important components of the Solent Maritime Special Area of Conservation.

During 2013, the Solent European Marine Site (SEMS) Annual Monitoring form highlighted recreational hovercraft as having the potential to have a detrimental impact on the SEMS. While recreational hovercraft activity has not, to date, been commonplace in the Solent, Relevant Authorities within the SEMS are receiving an increasing number of permission requests from recreational hovercraft clubs to operate within their jurisdiction.

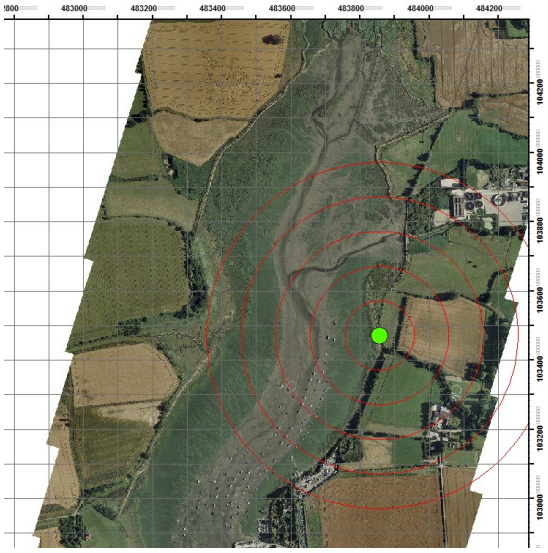
In early 2014 the Environment Agency (EA) requested permission to undertake a scientific benthic intertidal survey in both Chichester and Langstone Harbours utilising a small hovercraft. The object of this survey was to measure benthic invertebrate diversity and quantities to aid in the classification of the harbours under the Water Framework Directive (WFD).

Both the Chichester Harbour Conservancy (CHC) and the Langstone Harbour Board (LHB) granted permission for the survey to occur and the opportunity was taken to use this survey to monitor the reaction of wildlife to the presence of a hovercraft. Utilising methodology adapted from the Solent Disturbance and Mitigation Project fieldwork, and working with the EA survey crew and a team of skilled bird observers, the reaction of wildlife to the presence of a hovercraft was monitored and recorded.

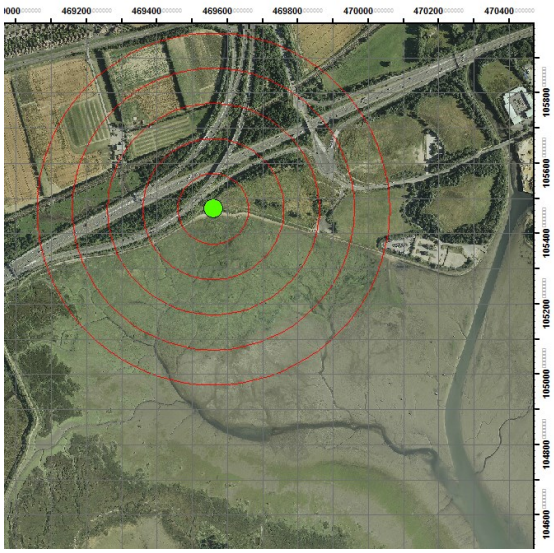


Aims

The study aimed to collect data relating to the reaction of wildlife to the operation of a small hovercraft within the Chichester and Langstone SPA. The results of the study may be used to inform future management decisions relating to the use of hovercraft for survey work, as well as the compatibility of recreational hovercraft use with the conservation objectives of the site.



Dell Quay, Chichester Harbour



Broadmarsh West, Langstone Harbour.

Methodology

Information including sample point maps and proposed hovercraft routes provided by the EA and the hovercraft pilot allowed two observation points in both Langstone and Chichester Harbour to be selected, from which on-shore observers could monitor the hovercraft at close quarters as well as the reaction of wildlife in the vicinity.

All observers (listed below) taking part in the monitoring work were experienced in wildlife survey work and familiar with the harbours.

Louise MacCallum – Environment Officer – Langstone Harbour Board
Ed Rowsell – Conservation Officer – Chichester Harbour Conservancy
Wez Smith – Site Manager – RSPB Langstone and Chichester Reserves
Pete Potts – Senior Countryside Ranger – Hampshire County Council Countryside Service
Paul Sadler – Conservation Professional

In Addition, Aniko Gaal – a student at the University of Southampton undertaking a thesis entitled “The effects of Hovercraft and Paramotor Activity on Waterfowl” accompanied observers at both Langstone and Chichester Harbours.

Observers were equipped with maps of the areas to be observed showing 500m radius from the observation point (see examples above), as well as binoculars, spotting telescopes, a stopwatch and data recording forms based on those used by Footprint Ecology during their bird disturbance surveys for the Solent Disturbance and Mitigation Project.

Upon arrival at each observation point (observers arrived approximately 1 hour before the predicted arrival of the hovercraft in that area), observers examined the map of the area and relevant points on the ground were identified to assist in estimating distances at which wildlife reacted to the presence of the hovercraft.

A count of all birds within a 500m count radius was undertaken prior to the arrival of the hovercraft. Metadata including weather conditions and tidal state were also recorded. Observers made notes of activities aside from the hovercraft which might cause disturbance to birds for the duration of the time at the observation point.

The operational actions of the hovercraft were categorised as follows:

1. First sight of craft
2. Transit over water
3. Transit over intertidal
4. Stopped with engine off
5. Engine restart
6. Final sight of craft

Upon the arrival of the craft in the vicinity of the observation radius, observers recorded the response of wildlife to the different operational actions of the craft, including estimating flushing distances (distance from the hovercraft at which birds took flight) for different species and the distance of displacement.

Following the final sight of the hovercraft, wildlife was monitored to determine the length of time before return to site. A post hovercraft bird count within the 500m radius of each count site was also undertaken.

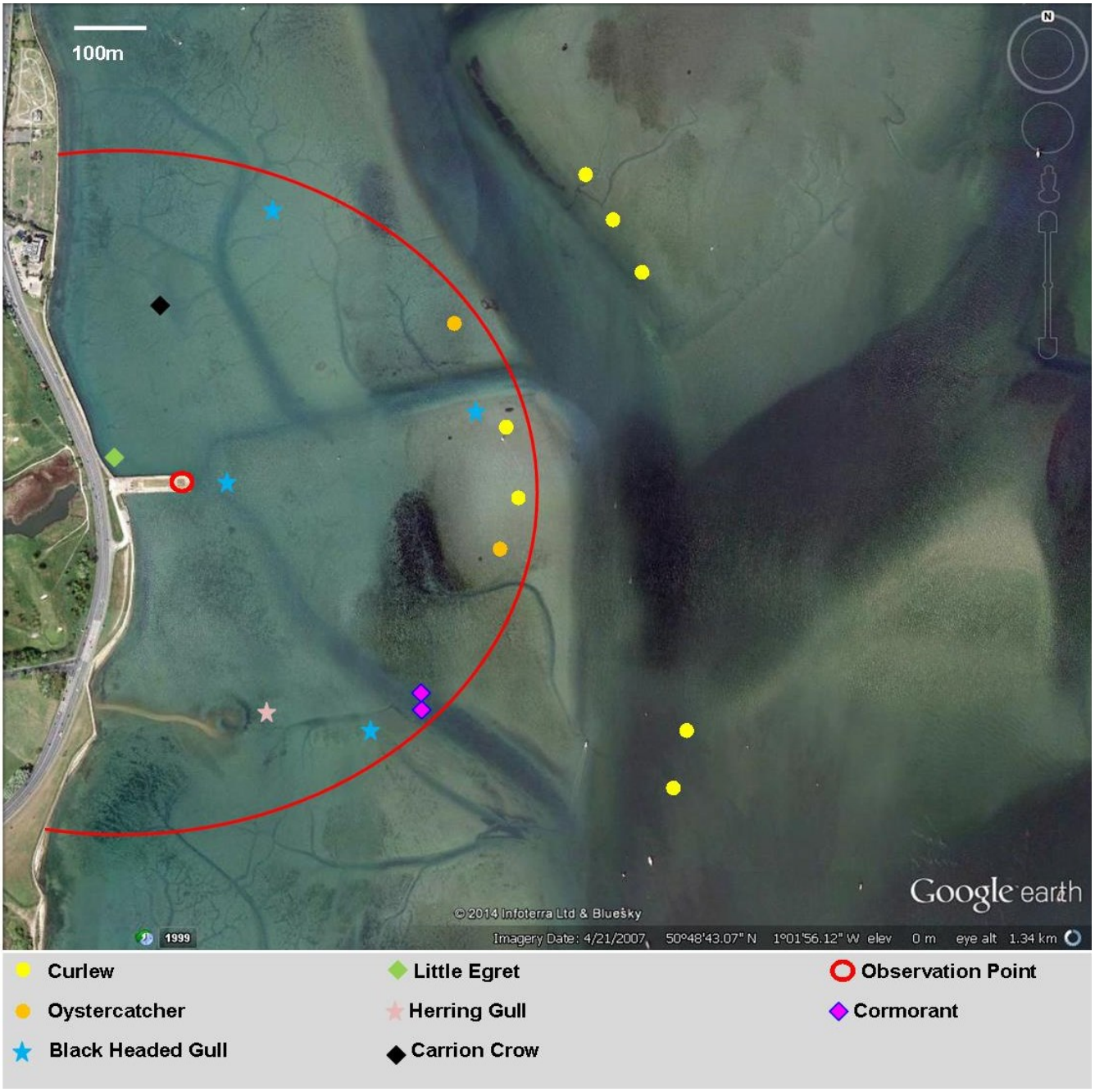
The hovercraft pilot carried a handheld Garmin eTrex GPS aboard the hovercraft, which recorded accurate location and speed data for the hovercraft throughout the survey.

The Hovercraft

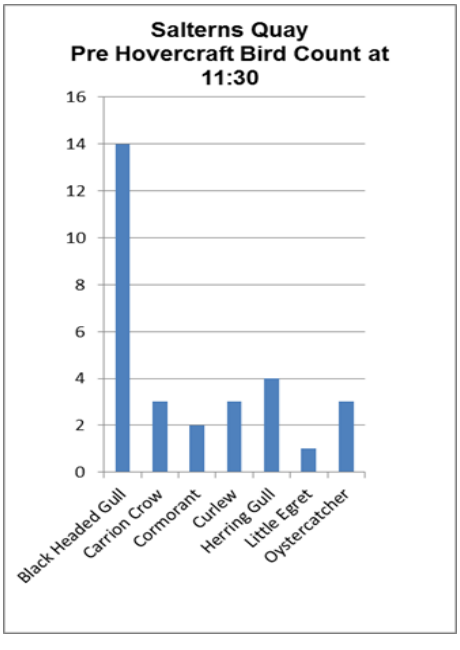
The craft used during the survey was a BBV4 fitted with two petrol engines, total installed power being 80bhp. The craft was 4.8m long with a beam of 2.05m. Unladen, the craft weighed approximately 380kg with a maximum payload of 400kg.

* For scientific names of birds species included in this report refer to page 24

Observation Site 1: Salterns Quay, Langstone Harbour—pre hovercraft



Map A: Approximate location of birds during pre hovercraft count at 11:30 at Salterns Quay. Coloured icons represent individuals or groups of birds.



With the exception of Black Headed Gulls, around half of which were loafing or roosting on the mudflats during the pre hovercraft count, almost all of the other birds observed (79%) were feeding.

Prior to the commencement of the count a yacht was observed sailing along Broom Channel closely passing the 500m count radius. No disturbance to birds was recorded as a result of the presence of this vessel.

Observation Site 1: Salterns Quay, Langstone Harbour—craft transit

Map B: Track taken by hovercraft at Salterns Quay including sample points as measured using Garmin eTrex GPS

Site	**Salterns Quay 50°48.712'N 1°2.370'W**
Observers	Louise MacCallum, Wez Smith (Aniko Gaal also present)
Date & Time	26/03/2014 11:30
Weather	Overcast
Wind	Northerly 12 knots
Air temperature	7.6˚C
Time and height of nearest low water	Low water at 12:58 at 1.5m above chart datum Tide falling for duration of observation
Distance at which craft was audible to observers	Craft clearly audible at EA survey point 860m away from observation point
Other recorded disturbances	A yacht sailed along Broom Channel prior to craft arrival (approx. 40mins prior to craft arrival), although no bird disturbance was noted from this vessel

Observation Site 1: Salterns Quay, Langstone Harbour

Hovercraft Activity	Time	Bird Species	Number of individuals	Flushing distance	Displacement distance	Notes
Transit on water	11:56	-	-	-	-	Craft audible (more than 850m away)
Transit on intertidal	12:09	Curlew	No record	150m	No record	Birds from within count radius
Transit on intertidal	12:09	Curlew	No record	200m	No record	Birds from outside count radius (likely Mallard Sands)
Transit on intertidal	12:18	Curlew	No record	200m	No record	-
Transit on intertidal	12:18	Black Headed Gulls	10	50-100m	Short flight	-
Transit on intertidal	12:19	Cormorant	3	100m	Long flight	-
Transit on intertidal	12:19	Curlew	40	250m	No record	Birds from outside count radius (likely Mallard Sands)
Transit on intertidal	12:19	Black Headed Gulls (juvenile)	3	200m	Short flight	-
Stopped with engine off	11:57	-	-	-	-	No birds within 200m of craft. No response by birds further away.
Stopped with engine off	12:22	Herring Gulls	5	400m	No record	Reason for flight unclear.
Engine restart	12:08	-	-	-	-	Clearly audible by observers. No birds within 200m of craft, no response from birds further away
Engine restart	12:32	-	-	-	-	Clearly audible by observers. No birds within 200m of craft, no response from birds further away

Observers at Salterns Quay recorded birds taking flight (flushing) as a result of the presence of the hovercraft when the birds were between 50m and 400m away from the craft.

Wading birds took flight when the craft reached a distance of 150—200m, while gulls and Cormorants did not fly until the craft reached a distance of 50-150m.

While the craft was stopped at sampling sites with its engine off no birds were recorded within a radius of 200m of the craft. A group of Herring Gulls at a were recorded flying at a distance of 400m from the craft while it was stationary—the longest disturbance distance recorded at this site. The reason for this flight was not clear.

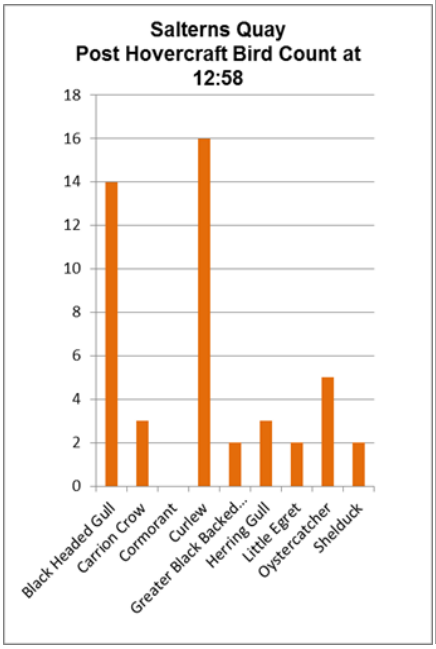
The restarting of the hovercraft engines was clearly audible to observers, however no response was recorded in the birds present in the observation area. The hovercraft engines remained clearly audible to observers throughout its transit.

Harbour Seals (*Phoca vitulina*)

In addition to seabirds, 6 Harbour Seals were hauled out close to Salterns Quay (see Map B). The seals watched the craft intently while it was in the vicinity, and when the craft moved directly past the haul out several individuals became agitated and began readying themselves to leave the haul out and enter the water. Despite the craft passing within 115m of the animals they did not flee the haul out, and resumed normal loafing behaviour immediately after the craft departed.

Observation Site 1: Salterns Quay, Langstone Harbour—post hovercraft

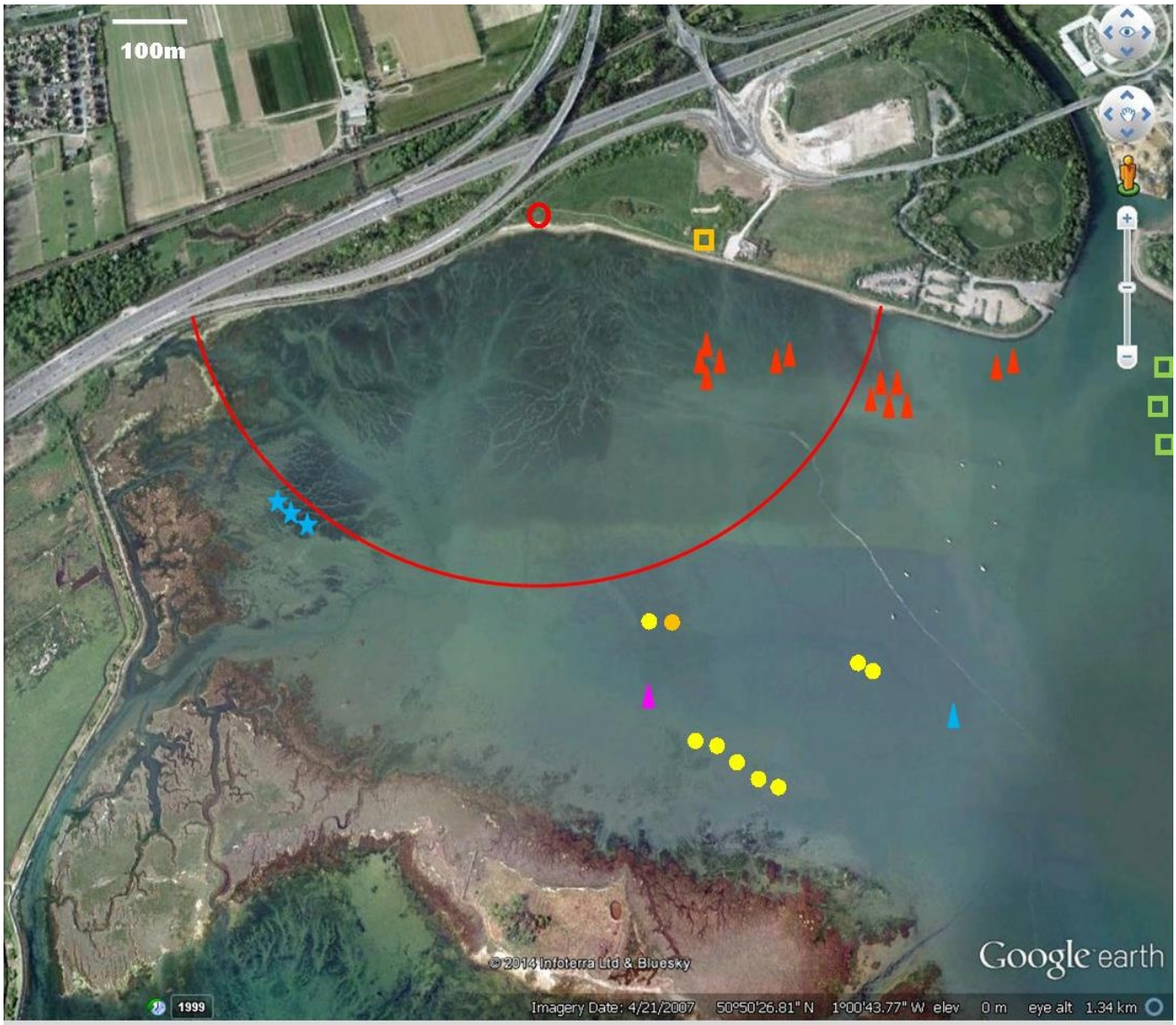
Map C: Approximate location of birds during post hovercraft count at 12:58 at Salterns Quay. Coloured icons represent individuals or groups of birds.



The post count bird count commenced 25 minutes following the final sight of the craft. At 13:04, 6 minutes into this count, the hovercraft re-appeared from the north passing within 200m of the count radius before heading east across the harbour. During this second pass 2 Herring Gulls and 5 Curlews were observed entering the count radius from closer to the craft. The count was completed at 13:10.

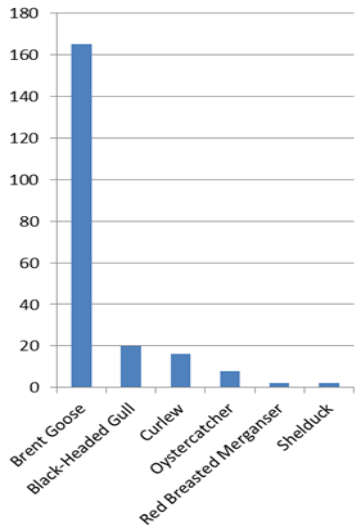
A larger number of birds were present in the count radius post count, as a likely result of their displacement from other parts of the harbour by the hovercraft. Following the departure of the craft from the area most birds began to return immediately — many within just a few minutes. 91% of all birds were feeding in the count radius during the post craft count.

Observation Site 2: Broadmarsh West, Langstone Harbour—pre hovercraft



Curlew
Oystercatcher
Brent Goose
Black Headed Gull
Shelduck
Red Breasted Merganser
Observation Point
Excavator
Bait Digger

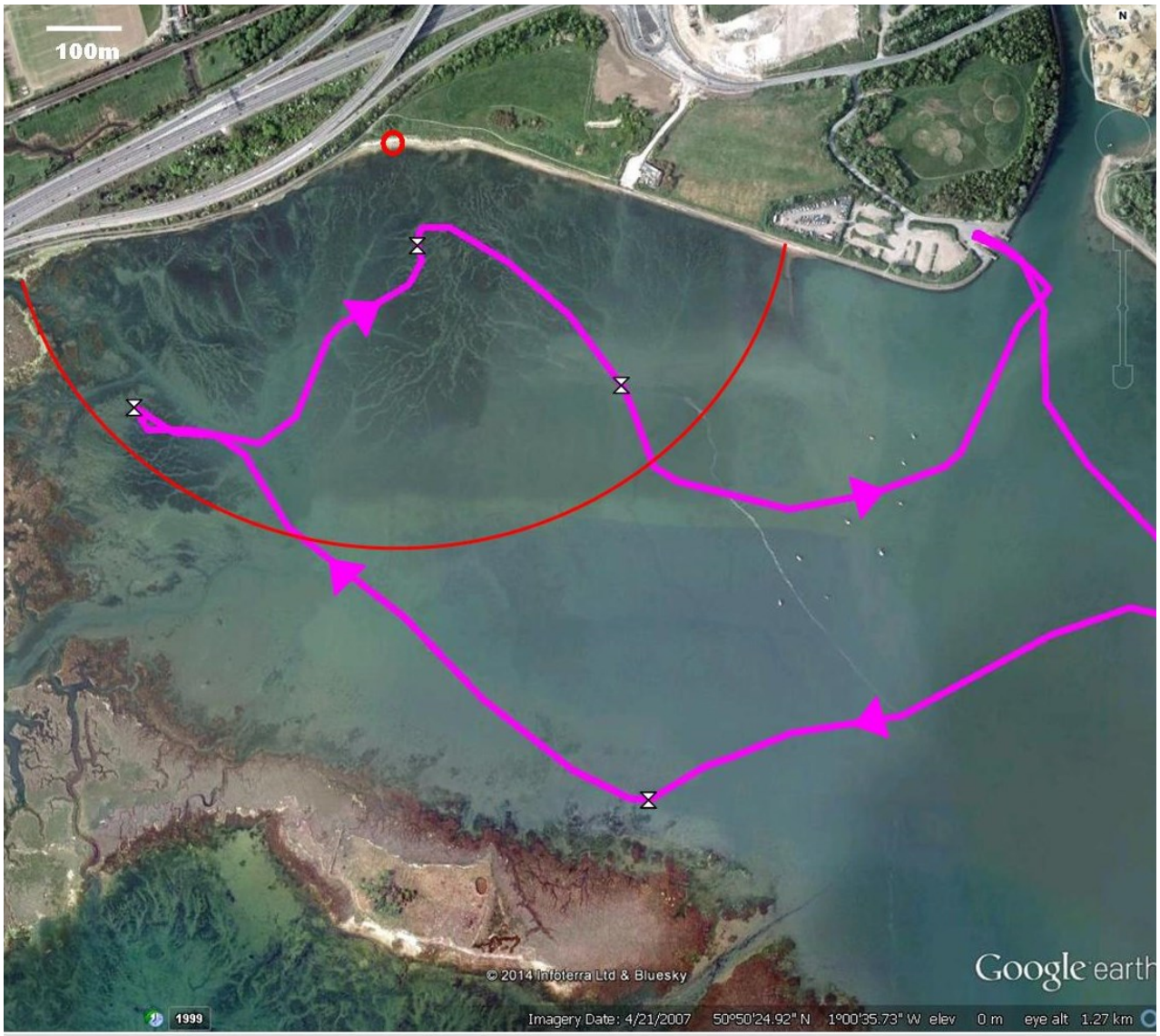
Map D: Approximate location of birds during pre hovercraft count at 12:15 at Broadmarsh West. Coloured icons represent individuals or groups of birds.



With the exception of Black-Headed Gulls, all of which were loafing or roosting on the mudflats during the pre hovercraft count, almost all of the other birds observed (98%) were feeding. Observers included birds outside the count radius but clearly visible from their viewpoint (see Map D).

For the duration of observations at Broadmarsh West an excavator was operating on the sea wall close to the observation point. This machine had been operating at the site for more than a week prior to the hovercraft survey which would have allowed wildlife to become accustomed to its presence. Additionally, numerous bait diggers were present on the intertidal approximately 850m from observers for the duration of observations. Bait digging occurs on a daily basis in this vicinity.

Observation Site 2: Broadmarsh West, Langstone Harbour—craft transit



Map E: Track taken by hovercraft at Broadmarsh West including sample points as measured using Garmin eTrex GPS

Site	**Broadmarsh West 50°50.666'N 1°0.807'W**
Observers	Ed Rowsell, Pete Potts
Date & Time	26/03/2014 12:15
Weather	Overcast, some rain showers
Wind	Northerly 12 knots
Air temperature	7.8˚C
Time and height of nearest low water	Low water 12:58 at 1.5m above chart datum Tide approaching low then rising during observations
Distance at which craft was audible to observers	Not recorded
Other recorded disturbances	Excavator operating on sea defence for duration of observation. 13 x bait diggers located appx.870m from observers (outside count radius). 1 x bait digger located appx.670m from observers (outside count radius).

Observation Site 2: Broadmarsh West, Langstone Harbour

Hovercraft Activity	Time	Bird Species	Number of individuals	Flushing distance	Displacement distance	Notes
Transit on water (first sight)	13:00	Red Breasted Merganser, Brent Goose, Oystercatcher	100	200-300m	400-500m	Red Breasted Merganser seemed particularly sensitive to presence of craft.
Transit on water	13:05	Brent Goose, Oystercatcher, Curlew, Shelduck	20	100-200m	400-500m	Birds returned to site and began feeding 5 minutes after craft departure
Transit on intertidal	13:40	Teal, Oystercatcher, Curlew	20	100-200m	400-500m	-
Transit on intertidal	14:35	Brent Goose, Oystercatcher, Curlew, Redshank	300	100-200m	400-500m	-
Stopped with engine off	13:45	-	-	-	-	No birds within 200m of craft. No reaction by birds further away.
Engine restart	14:00	-	-	-	-	No birds within 200m of craft. No reaction by birds further away.

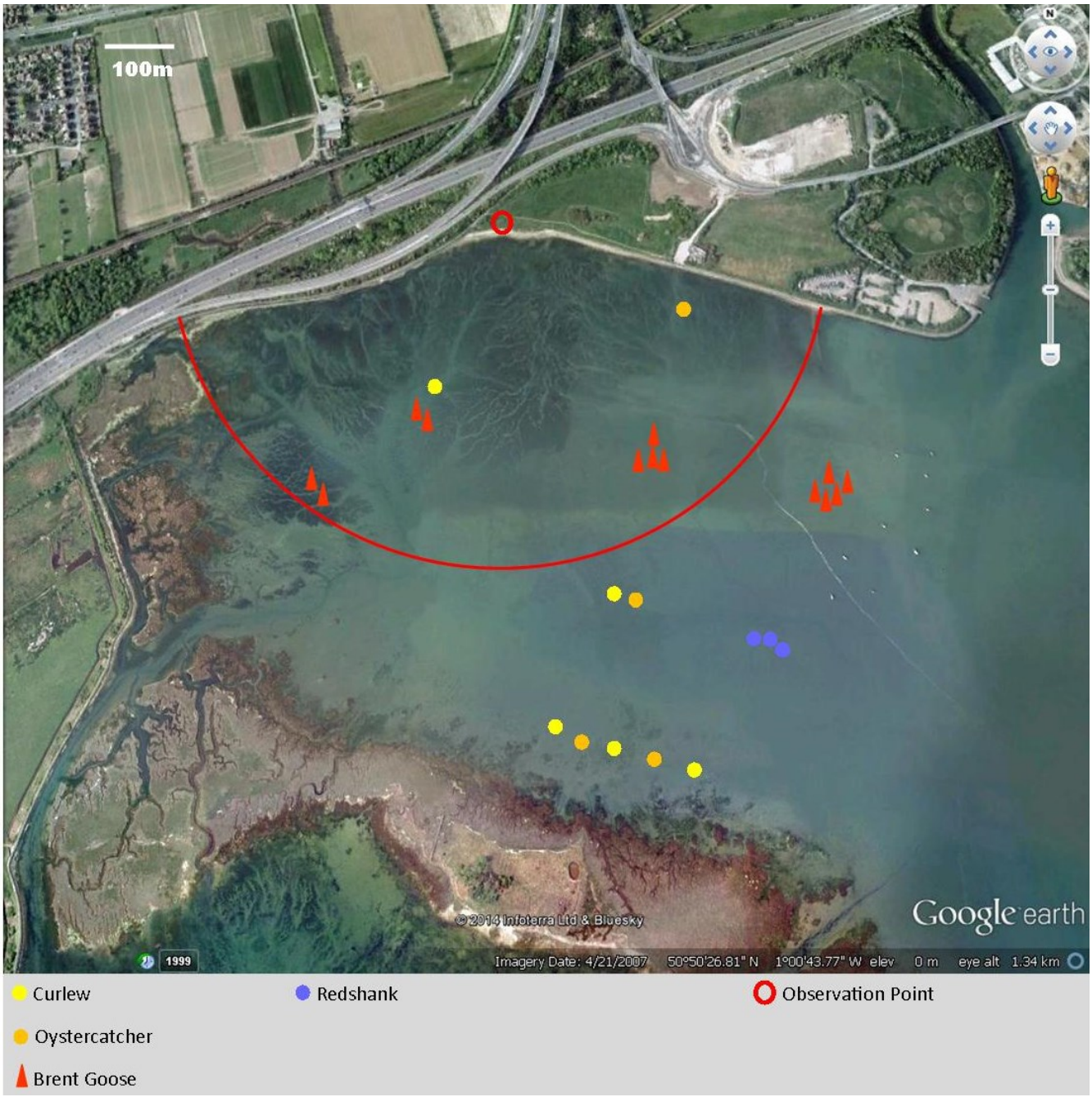
Observers at Broadmarsh West recorded birds taking flight (flushing) as a result of the presence of the hovercraft when the birds were between 100m and 300m away from the craft.

Wading birds took flight when the craft reached a distance of 100—200m, while some duck species were recorded as being particularly sensitive to the presence of the craft taking flight at 300m.

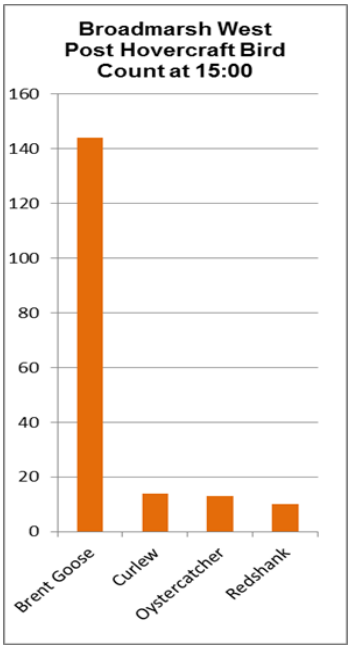
While the craft was stopped at sampling sites with its engine off no birds were recorded within a radius of 200m of the craft. Movement of hovercraft crew around the craft during sampling was not observed to cause disturbance to birds beyond this distance.

Restarting of the hovercraft engine was clearly audible by observers, but no reaction was observed by birds in the observation radius.

Observation Site 2: Broadmarsh West, Langstone Harbour—post hovercraft



Map F: Approximate location of birds during post hovercraft count at 15:00 at Broadmarsh West. Coloured icons represent individuals or groups of birds.

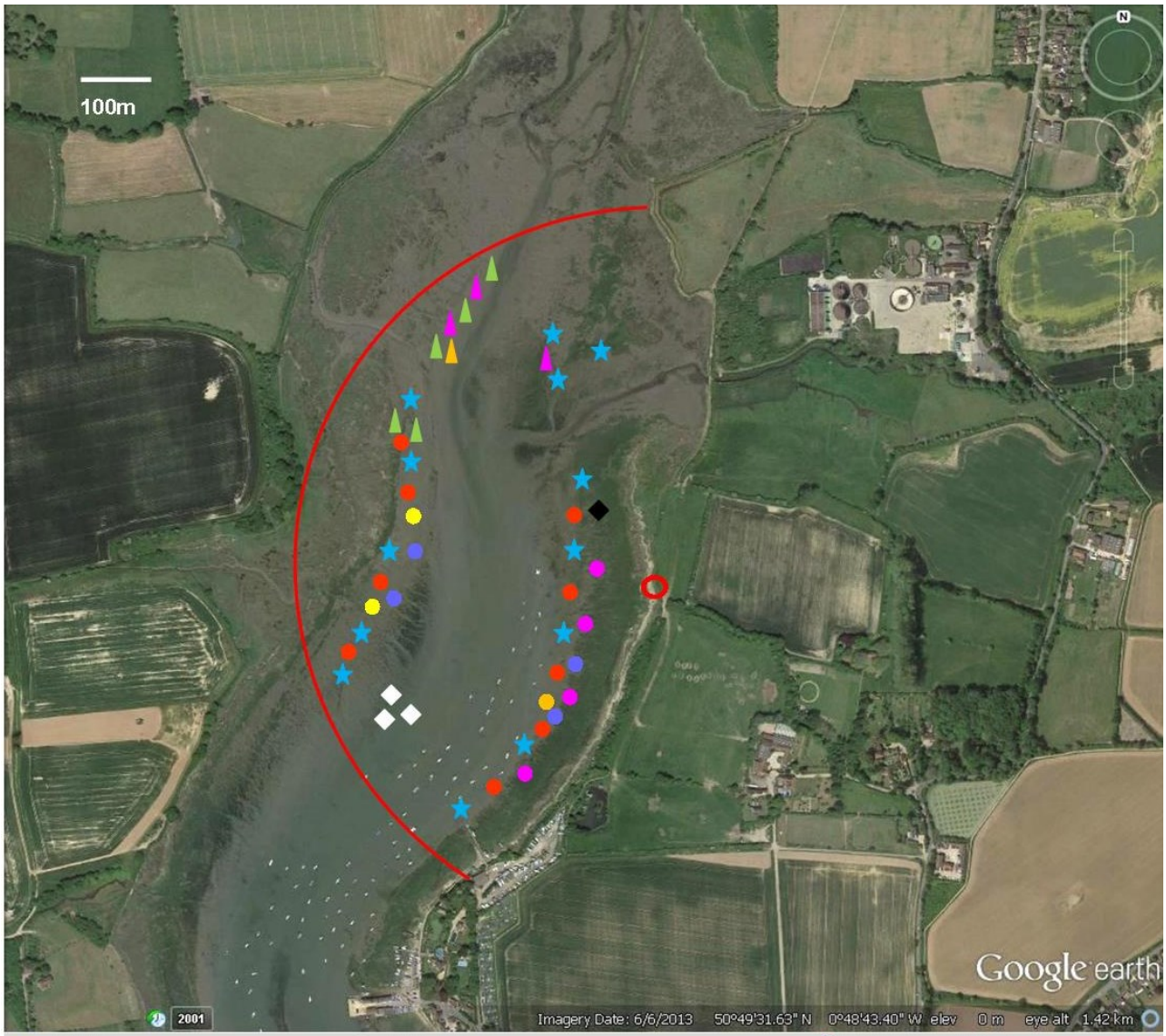


Slightly fewer individual birds were counted during the post craft count which took place 25 minutes after the departure of the hovercraft. Neither Shelduck or Merganser were present during this count.

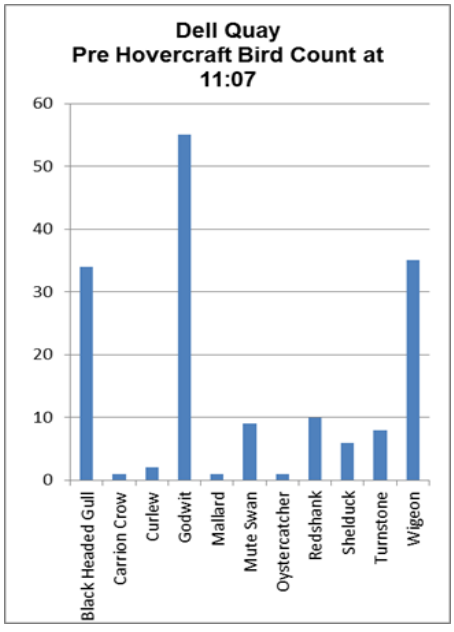
The majority of the birds which took flight when the hovercraft was present returned to the site and began feeding very quickly—in many cases within 5 minutes.

During the post craft count 100% of birds were observed feeding.

Observation Site 3: Dell Quay, Chichester Harbour—pre hovercraft



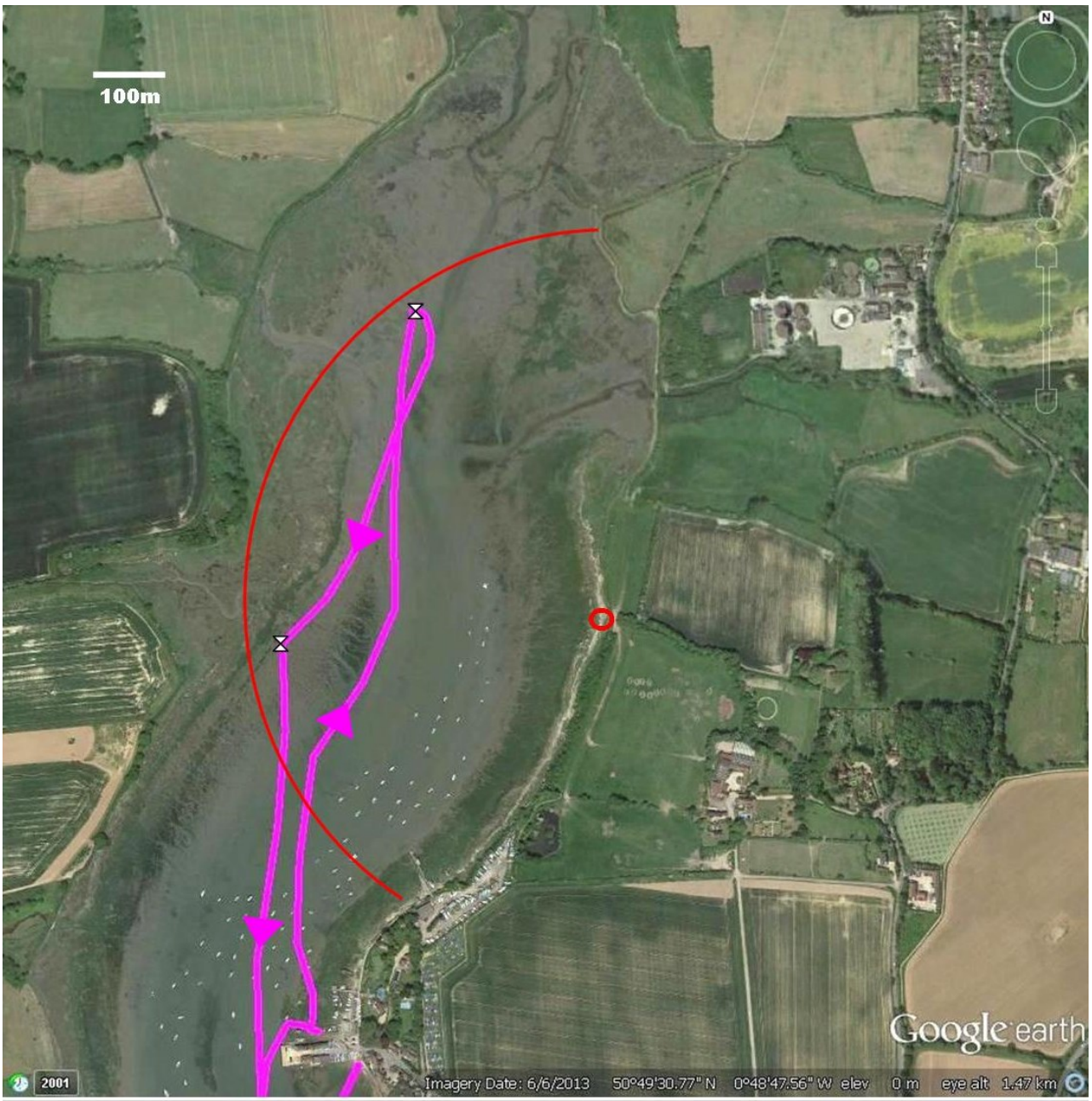
Map G: Approximate location of birds during pre hovercraft count at 11:07 at Dell Quay. Coloured icons represent individuals or groups of birds.



During the pre hovercraft bird count 94% of birds observed in the count radius were feeding.

A "bird scarer" device (which emits a loud bang at variable intervals) was operational on the farmland adjacent to the observation point prior to and during the observation period. The bird scarer went off at 10:59, 11:43 and 11:56. Observers were not set up at 10:59, but at each of the other times the bird scarer caused birds to take flight—30 Black-Headed Gulls flying up and circling, not returning to the intertidal for more than 10 minutes.

Observation Site 3: Dell Quay, Chichester Harbour—craft transit



Map H: Track taken by hovercraft at Dell Quay including sample points as measured using Garmin eTrex GPS

Site	**Dell Quay 50°49.463'N 0°48.638'W**
Observers	Louise MacCallum, Wez Smith
Date & Time	27/03/2014 11:07
Weather	Overcast, some rain showers
Wind	North Easterly 10 knots
Air temperature	8.0˚C
Time and height of nearest low water	Low water 13:57 at 1.2m above chart datum Tide falling for duration of observation
Distance at which craft was audible to observers	Craft clearly audible from launch point at Dell Quay 670m
Other recorded disturbances	Bird scarers (loud bangs) on adjacent farm land went off at 10:59, 11:43 and 11:56. Approx. 30 Black Headed Gulls were flushed by the second bang, and remained overhead circling during the second bang.

Observation Site 3: Dell Quay, Chichester Harbour

Hovercraft Activity	Time	Bird Species	Number of individuals	Flushing distance	Displacement distance	Notes
Transit on water (first sight)	11:30	Shelduck	6	500m	No record	-
Transit on water	11:30	Wigeon	10	500m	No record	-
Transit on water	11:30	Black Headed Gulls	50	200m	No record	-
Transit on intertidal	11:34	Mixed Waders	40	250m	No record	-
Transit on intertidal	11:49	Mixed Waders	20	200m	No record	-
Transit on intertidal	11:49	Mute Swan	6	-	-	Craft passed within 25m of birds
Transit on intertidal	11:58	Mixed Waders	20	200m	No record	-
Stopped with engine off	11:36	Godwit	40	400m	No record	Movement of crew on/ around craft likely caused disturbance
Stopped with engine off	11:52	-	-	-	-	No birds within 200m of craft. No response by birds further away.
Engine restart	11:48	-	-	-	-	Clearly audible by observers. No birds within 200m of craft. No response by birds further away.
Engine restart	11:58	-	-	-	-	Clearly audible by observers. No birds within 200m of craft. No response by birds further away.

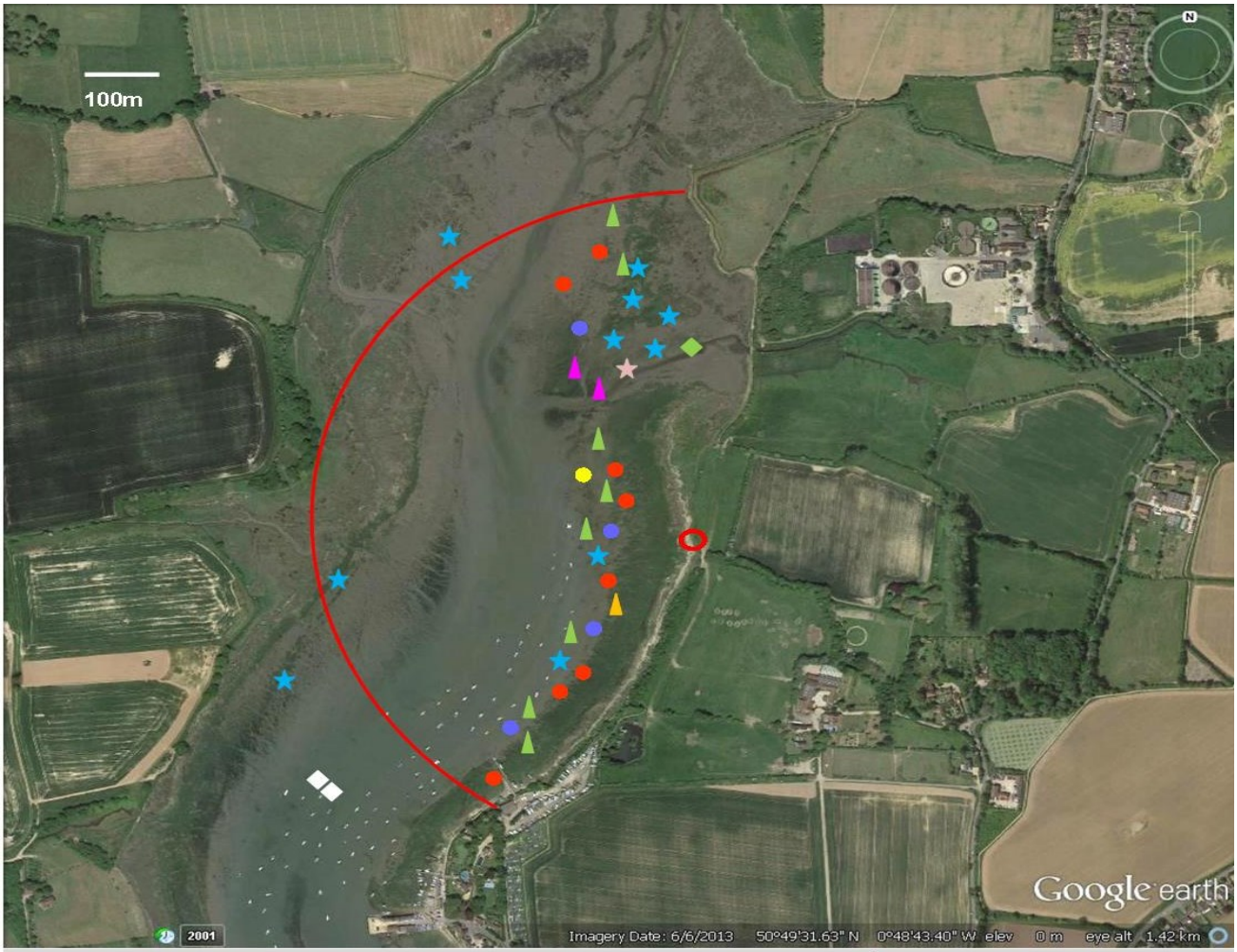
Observers at Dell Quay recorded birds taking flight (flushing) as a result of the presence of the hovercraft when the birds were between 200m and 500m away from the craft. By contrast, the craft passed within 25m of a group of Mute Swans without causing these birds to take flight.

Wading birds took flight when the craft reached a distance of 200-400m, while some ducks were again recorded as being particularly sensitive to the presence of the craft taking flight at 500m.

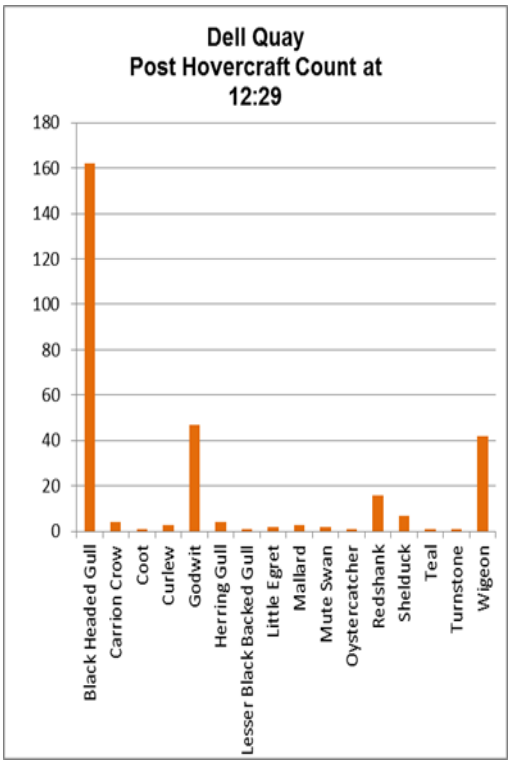
While the craft was stopped at sampling sites with its engine off no birds were recorded within a radius of 200m of the craft. The movement of the hovercraft crew in and around the craft during sampling was observed to disturb a group of Black-Tailed Godwits at a distance of 400m from the craft.

Again, engine restart was clearly audible to observers but no reaction was observed in bird species present. The hovercraft engine was audible to observers from the slipway at Dell Quay and throughout its transit.

Observation Site 3: Dell Quay, Chichester Harbour—post hovercraft



Map I: Approximate location of birds during post hovercraft count at 12:29 at Dell Quay. Coloured icons represent individuals or groups of birds.

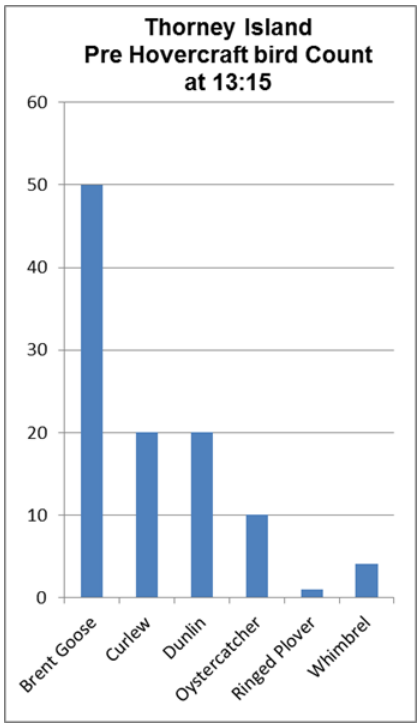


The post craft count took place 30 minutes after the hovercraft disappeared from sight, and recorded almost double the number of birds in the count area as those observed before the hovercraft arrived. These additional birds may have been displaced by the hovercraft from other areas of Chichester Harbour and had flown to Dell Quay to feed on the increasingly exposed mudflat as the tide fell. Notably, although the birds returned to the site and began feeding shortly after the craft's departure, they avoided the western side of the channel along which the craft had transited, instead opting to feed on the opposite side. This behaviour was not seen elsewhere during the study and further study is required to determine if prey items are equally distributed on both sides of the channel.

99% of bird observed during the post craft count were feeding.

Observation Site 4: Thorney Island—pre hovercraft

Map J: Approximate location of birds during pre hovercraft count at 13:15 at Thorney Island. Coloured icons represent individuals or groups of birds.



The pre hovercraft count occurred 45 minutes prior to the arrival of the craft. Observers included birds from outside the count radius (see Map J) and 100% of the birds were observed to be feeding.

Aside from the hovercraft, observers recorded no other potentially disturbing events or activities taking place at this location for the duration of the observations.

Observation Site 4: Thorney Island—craft transit

Map K: Track taken by hovercraft at Thorney Island including sample points as measured using Garmin eTrex GPS

Site	**Thorney Island 50°48.260'N 0°54.949'W**
Observers	Ed Rowsell, Paul Sadler (Aniko Gaal also present)
Date & Time	27/03/2014 13:15
Weather	Overcast, some rain showers
Wind	North Easterly 10 knots
Air temperature	7.7˚C
Time and height of nearest low water	Low water 13:57 at 1.2m above chart datum Tide approaching low, then rising during observations
Distance at which craft was audible to observers	Craft clearly audible from 990m
Other recorded disturbances	None noted

Observation Site 4: Thorney Island

Hovercraft Activity	Time	Bird Species	Number of individuals	Flushing distance	Displacement distance	Notes
Transit on water (first sight)	14:00	Curlew, Dunlin, Brent Goose	80	100-200m	400-500m	Birds flew in panicky flight, but returned soon (60 seconds) after craft had departed
Transit on water	14:00	Brent Goose, Curlew	80	100-200m	400-500m	-
Transit on water	14:00	Oystercatcher	10	-	-	Craft passed within 150m
Transit on intertidal	14:50	Oystercatcher	10	100-200m	400-500m	-
Transit on intertidal	14:50	Brent Goose	50	75m	400-500m	Geese highly alarmed by craft but returned to feeding on site very soon (60 seconds) after craft departed.
Transit on intertidal	14:50	Curlew, Dunlin	110	200-300m	400-500m	-
Transit on intertidal	15:00	Curlew, Oystercatcher, Brent Goose	110	100-200m	400-500m	-
Stopped with engine off	14:20	-	-	-	-	No birds within 200m of craft. No reaction by birds further away.
Engine restart	14:40	-	-	-	-	No birds within 200m of craft. No reaction by birds further away.

Observers at Thorney Island recorded birds taking flight (flushing) as a result of the presence of the hovercraft when the birds were between 75 and 300m away from the craft.

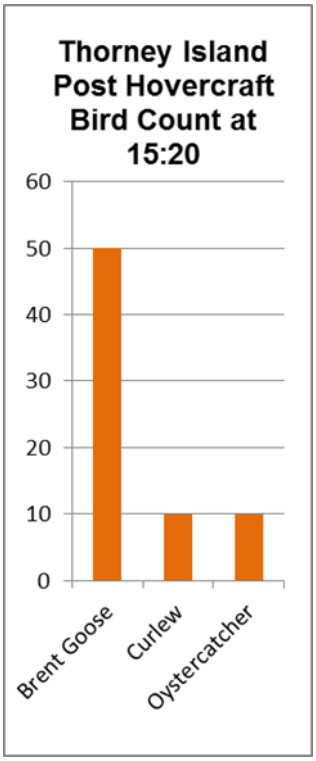
Wading birds were recorded taking flight when the craft reached a distance of 100-300m. A particular group of 50 Brent Geese did not fly until the craft reached approximately 75m. Observers noted that birds made “panicky” flights when approached by the craft, however returned to the site very quickly once the craft had passed, and resumed feeding sometimes within 60 seconds.

While the craft was stopped at sampling sites with its engine off no birds were recorded within a radius of 200m of the craft.

Once again, engine restart was clearly audible to observers but no reaction was observed in bird species present. The hovercraft engine was audible to observers throughout its transit.

Observation Site 4: Thorney Island—post hovercraft

Map L: Approximate location of birds during post hovercraft count at 15:20 at Thorney Island. Coloured icons represent individuals or groups of birds.



A post craft count took place 20 minutes following the departure of the hovercraft. Birds from outside the count radius were included (see Map L).

During this count 100% of the Brent Geese observed were loafing, while all other birds observed were feeding.

Conclusions

Wildlife Response

- The hovercraft was observed causing disturbance to wild birds (in the form of fleeing from the craft) within the Chichester and Langstone Harbour at distances between 75m and 500m.

  • Duck species including Red Breasted Merganser, Shelduck and Wigeon appeared particularly sensitive to the craft, taking flight when the craft was transiting on the water up to 500m away.

  • Wading bird species including Curlew, Oystercatcher and Dunlin were consistently observed to take flight when the craft reached a distance of 200m from the birds, with some observations noting wading birds taking flight at 250—300m from the craft.

  • Other bird species, including Mute Swans and Black Headed Gulls appeared less sensitive to the presence of the hovercraft, remaining within 100m of the craft in transit.

- Once the hovercraft had departed an area, birds returned to that area quickly—bird numbers in each count radius had returned to pre craft levels within 20 minutes of the craft's departure, and in some cases birds were observed to return to the site and begin feeding within 60 seconds of the craft departing.
- The timing of this survey, which fell as the majority of waders and wildfowl that had spent the winter in Langstone and Chichester Harbour had departed on migration, may have affected bird behaviour. The birds observed on the 26th and 27th March were about to join the migration exodus and were thus likely to be hyperphagic. This may have resulted in the short return to site times, as they attempted to feed as much as possible prior to migration.
- The Harbour Seals hauled out close to the Salterns Quay observation point appeared agitated by the presence of the hovercraft, but despite the craft passing within 115m all 6 individuals remained hauled out on the mud and did not flee into the channel.
- Throughout the survey in both harbours the craft was expertly piloted by a pilot with excellent knowledge of the environmental sensitivities of the area, who attempted to minimise disturbance to wildlife. The craft travelled at speeds of up to 34kph over water, and more slowly (15—26kph) over the intertidal. These speeds allowed a compromise between noise, fuel consumption, manoeuvrability and being able to reach all sites within a single low tide period.
- When the craft was stationary on the intertidal no birds were seen within 200m of the craft at any observation site. The noise created by the restart of the engines was not observed to cause disturbance to birds more than 200m away from the craft.
- Further study is required to determine which elements of hovercraft operation result in the large disturbance effects observed. It seems likely that these effects arise as a combination of the engine noise and the presence of a large moving object which may be perceived by wildlife as a predator or similar threat. The clear view of the human crew aboard the craft and the colour of the craft itself (safety orange during these observations) may also contribute to the disturbance effect.

Hovercraft as Survey Tools

- Hovercraft survey permission requests within Chichester and Langstone Harbours should continue to be examined on a case by case basis. Environmental experts including representatives of the RSPB should be consulted on each application and their advice heeded. Permissions should only be granted with conditions including:

    1. The hovercraft crew should be highly trained and experienced, and have a clear under standing of the habitats and species for which the site is internationally designated. Every attempt to avoid disturbing wildlife should be made.

    2. Where possible, hovercraft survey work should be planned for times when fewest birds are present in the harbours, and when food supplies are plentiful. Local ornithological experts should be consulted in regard to this. Hovercraft survey work should be avoided during extremely cold periods of weather or during seabird nesting periods.

    3. The number of scientific surveys taking place aboard hovercraft in any given year in the Chichester and Langstone SPA should be strictly limited in order to minimise disturbance to bird assemblages. The size of hovercraft used for such surveys should be kept to a minimum.

- Sampling of all 15 sites in Langstone Harbour took 4 hours 15 minutes from launching the hovercraft until recovery, and in Chichester Harbour took 5 hours 10 minutes. Without the use of the hovercraft it seems inevitable that this sampling work would have to take place using a conventional shallow draught vessel to get as close as possible to a site, before walking across the intertidal area. The presence of sampling personnel on the intertidal for an inevitably extended period of time seems likely to cause greater and lengthier incidences of disturbance to bird populations than when a hovercraft is utilised for such surveys.
- Conditions placed upon professional scientific hovercraft survey work will mean substrate sampling and assessment is undertaken in the most efficient and least disturbing way.

Recommendations

- Scientific surveys aboard hovercraft should continue to be permitted taking into account the above recommendations.
- To avoid superfluous disturbance to wild birds, hovercraft activity of a recreational nature should not be permitted. Permitting recreational hovercraft activity within Langstone and Chichester Harbours would result in disturbance to wild birds, but would not generate data that may add to scientific understanding, nor improve conservation management decision making.
- The precautionary principal should be applied to the likely reaction to small hovercraft by breeding seabirds and birds at high tide roosts, as in both these cases the birds are more vulnerable and sensitive to disturbing activities.
- Natural England advised in a letter dated 13 July 2012 that *"in principal the use of recreational hovercraft is not compatible with the conservation objectives of Langstone Harbour".* Disturbance to wild birds caused by the small hovercraft observed during this study support this advice.

Bird species recorded during hovercraft monitoring survey, including scientific names

Black Headed Gull	*Larus ridibundus*
Black Tailed Godwit	*Limosa limosa*
Brent Goose	*Branta bernicla*
Carrion Crow	*Corvus corone corone*
Cormorant	*Phalacrocorax carbo*
Curlew	*Numenius arquata*
Dunlin	*Calidris alpina*
Greater Black Backed Gull	*Larus marinus*
Herring Gull	*Larus argentatus*
Little Egret	*Egretta garzetta*
Mallard	*Anas platyrhynchos*
Mute Swan	*Cygnus olor*
Oystercatcher	*Haematopus ostralegus*
Red Breasted Merganser	*Mergus serrator*
Redshank	*Tringa totanus*
Ringed Plover	*Charadrius hiaticula*
Shelduck	*Tadorna tadorna*
Turnstone	*Arenaria interpres*
Whimbrel	*Numenius phaeopus*
Wigeon	*Anas penelope*

Acknowledgements

Thanks to the following individuals and organisations that make the collection of data and compilation of this report possible:

Chris Cockburn, Richard Craven (Chichester Harbour Conservancy), Mark Davison (Environment Agency), Aniko Gaal (University of Southampton), Chris Maclaurin (Environment Agency), Pete Potts (Hampshire County Council), Ed Rowsell (Chichester Harbour Conservancy), Paul Sadler, Wez Smith (RSPB) and James Thurlow (hovercraft pilot—Intertidal Ltd).