Review of:

"Monitoring the effect of a hovercraft survey in Langstone and Chichester harbour"

Summary

The Cruising Hoverclub UK (CHCUK) represents recreational light hovercraft operators in the UK.

The report "Monitoring the effect of a hovercraft survey in Langstone and Chichester harbour" by Louise MacCallum of Langstone Harbour Board concludes that a 500m set-back distance is required to avoid disturbance to wild birds, and that in consequence of this recreational hovercraft operation should not be permitted in Langstone Harbour. As these conclusions have an obvious impact on CHCUK members, a review of the methodology, analysis and conclusions of the report has been conducted. The review determined that:

- The measurement techniques employed by MacCallum were inaccurate and were not consistent with best practice in the field
- Analysis of the data demonstrates that it is not self consistent, that it contains gross error and cannot be relied upon.
- The flight initiation distances reported by MacCallum are not consistent with FID's reported by other investigators, being substantially (>5 times) higher.
- The hovercraft chosen by MacCallum for this survey was a specialised survey craft producing 15-20dBa more noise and therefore being perceived as 4 times 'louder' by an observer than a typical recreational hovercraft.
- The routes followed by the hovercraft through the count areas appeared to be designed to maximise bird disturbance by driving directly through the densest bird populations.

For these reasons the results reported by MacCallum cannot be considered to be accurate and cannot be considered typical of recreational hovercraft use.

A survey could be designed to determine the impact of typical recreational light hovercraft on birds in the harbour. This should use a modern craft, which should be operated in accordance with the training and code of conduct of the Cruising Hovercraft Club. In addition, improved observational and measurement techniques must be adopted.

Author: I.L. Brooks & J.A. Robertson
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1 Introduction

The Cruising Hoverclub UK (CHCUK) represents recreational light hovercraft operators in the UK.

The report "Monitoring the effect of a hovercraft survey in Langstone and Chichester harbour" by Louise MacCallum of Langstone Harbour Board concludes that a 500m set-back distance is required to avoid disturbance to wild birds, and that due to this requirement recreational hovercraft operation should not be permitted in Langstone Harbour. As these conclusions have an obvious impact on CHCUK members, a review of the methodology, and an analysis of the data and conclusions of the report has been conducted, and the findings are recorded in this review.

2 Methodology

The MacCallum report conclusions are based on measurements of flushing distance and displacement distance (terms as defined in the report). These measurements were made by stationary observers, who waited for the hovercraft to pass and recorded the response of birds in the vicinity together with the distance from the craft to the bird at the time of the observation.

The observers were required to make visual estimates of exocentric distance (i.e. distance from one remote object to another) in an environment with relatively few distance cues. An already difficult task is rendered more complex by the relative movement of the subjects, and by the movement of the tide. Many of these estimates were made at a distance of 1km or more. No estimate of the likely error in such measurements was presented.

Whilst the observers were provided with maps on which a 500m line had been drawn, the aerial photographs show that the terrain has few distinct features or visual cues to assist with distance estimation, thus the maps would be of little assistance.

A simpler task is to make verbal estimates of egocentric distance (i.e. distance from the observer to a remote object expressed in meters). Studies have been conducted to determine the likely error in egocentric distance estimates which is found to be significant (Johnson, 1982). In a study to determine the magnitude of such errors for subjects who had received basic range estimation training, 90 individuals were asked to estimate the distance to markers under field conditions. Average errors were: at 100m, 38.1m average error (SD 44.6m); at 200m, 69.9m average error (SD 69.2m); at 300m 77.7m (SD 116.9m). (Caviness, 1972). These relatively simple estimates have average errors up to 40%, with the error from some observers being very much greater.

In the case of exocentric distance estimates, where the observer is required to estimate not only the position of the hovercraft and the bird, but also to estimate the relative bearing between the two in order to arrive at the relative distance, it can be expected that the magnitude of the resulting error is greater. This is especially so for the cases where the craft is arriving or departing on a bearing very close to that of the bird, i.e. the craft is directly in front of or behind the bird, and for all these reasons it is suggested that the distance measurements presented cannot be relied upon.

When attempting to estimate the location of distant subjects in similar surveys, experienced wildlife observers normally arrange for multiple observers to be placed in several different locations. Triangulation is then used to derive the actual location from the data collected. This method is normally selected as the method used by MacCallum is grossly inaccurate.

From a review of the literature, it is clear that the method used to estimate the response distances was inadequate for the purpose intended. It is suggested that an egocentric technique could have been used with the observer on the craft, although this would also have involved significant error. A better method would have been to use multiple observers with the results being triangulated.

3 Detailed examination of data

Since the data collection methodology is likely to have introduced error into the results, an analysis of the resulting data was conducted to determine the likely level of error incurred. This was done by determining how consistent the hovercraft track data is when compared to the bird location and flushing distance data. It is postulated that the birds flushed as a result of the hovercraft stimulus. It follows then that plotting the flushing distance around a displaced bird provide a circular locus of possible hovercraft positions for that event. Where there is at least a second simultaneous event, plotting this second circular locus should yield an intersection that determines the hovercraft location. Comparing this location to the actual known hovercraft track will then provide an estimate of the error in the observation data.

Figure1 shows observation site 1 (Salterns Quay) with the count radii, hovercraft track and bird locations taken from MacCallum, superimposed on a single figure. To this have been added the reported flushing events, in three groups representing the reported flushing time and denoted by the different colour circles for the three sets of simultaneous observations. An attempt was made to reconcile the data, and it was expected that each simultaneous group would intersect on the hovercraft track within an error margin which may then be estimated.

The craft was first observed from this location at a prior sampling site reported as 860m distant, where it was located from 11:56 until 12:08. This is marked as point A. On leaving point A at a speed assumed to be 10 knts (the harbour limit), the craft would arrive at point B at 12:09, when the first bird encounters are reported which are are shown as blue circles. It can be seen that these do not intersect at all, suggesting that the data contains gross error.

The next bird encounters are reported at 12:18 and are shown as green circles. Whilst these do intersect and this would place the hovercraft at position C, this position would be difficult to explain unless the craft had slowed down to less than 2 knts, and had not flushed the group of Curlew until it had actually passed them, which seems unlikely. The data related to this encounter is also not reconcilable and confirms that gross error exists in the data.

The final bird encounter is reported at 12:19, this time shown in purple. Again, it does not seem possible to reconcile the flushing data, bird location and hovercraft position data, further confirming that the data contains gross errors.

In summary, an examination of the data shows that the observations of bird position, flushing distance and time cannot be reconciled, indicating that the data contains substantial error. It is not possible to determine the magnitude of the error, and the data is therefore not credible.

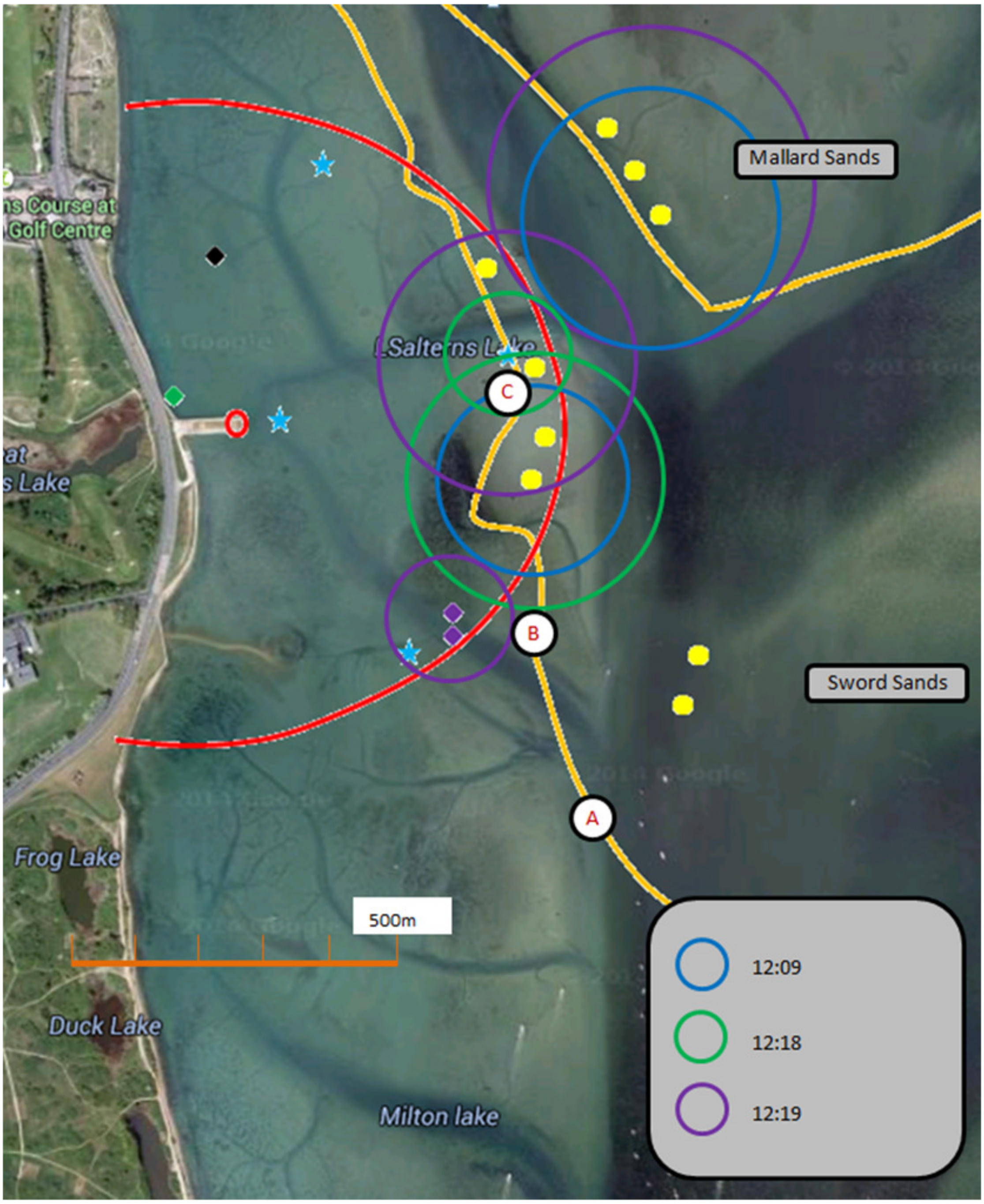

Figure 1: Site 1, Craft track and flushing observations

4 The hovercraft

It is noted that the author chose to make conclusions that are generalised to the UK recreational hovercraft fleet, which presumably is based on an assumption that the subject hovercraft is typical of the recreational fleet. It is therefore useful to examine the hovercraft used in the trial to determine whether is indeed typical.

As stated, the subject hovercraft is a BBV4 fitted with two petrol engines of total power 80hp. However, no noise measurements were taken and no attempt was made to determine whether the craft was indeed typical of he recreational fleet.

This craft is owned and operated by Intertidal Ltd. It is fitted with a Rotax 65hp water cooled thrust engine revving to a maximum speed of 6500 rpm, but retains the standard 4 MW 5z thrust fan blades. The Intertidal craft has been extensively modified for its specialised role, in particular the standard BBV4 is fitted with a low-revving Briggs and Stratton 35hp 4 stroke engine. The author made no attempt to measure the noise levels of this craft, nor to record the ambient noise levels at each site, data which is critical to the interpretation of the survey results.

Two stroke engines employed in the survey craft are considerably noisier than four stroke engines, and are very difficult to silence effectively. For this reason, there are no two stroke engines in the UK recreation hovercraft fleet, which exclusively utilise four stroke engines.

The standard 4 blade thrust fan can only absorb the additional 30hp available from the Rotax engine by spinning faster. The standard BBV4 thrust fan has a tip speed estimated at 113 m/s, whilst the modified Rotax-BBV4 has a tip speed estimated at 145 m/s. Fan noise increases rapidly with fan speed, so the Rotax installation can be expected to be considerably noisier than the standard Briggs and Stratton installation. The Rotax-BBV will produce noise levels in excess of 90dBa at 25m.

Observers report that they could clearly hear the hovercraft above background noise levels of approximately 62dBA (Parsons, private communication) in the quiet areas (NB one observation point is 80 metres from motorway/trunk road interchange and has considerably higher background noise) at a range of 860 metres (MacCallum P6) and 1000 metres (MacCallum P7) downwind of a 14mph breeze. From this data we can calculate that that the Rotax-BBV craft was producing noise levels in excess of 92dBA at 25 metres.

The modern recreational hovercraft fleet are optimised for low noise. Four stroke engines are exclusively used with low speed fans, with the typical installed power being 35-50 hp. A typical example is shown in Figure 2, Figure 3 showing a noise test on this craft at an engine speed consistent with a 20mph cruising speed. The noise level is shown at 72.7 dBa, is below the recreational craft directive noise level (75-78dBa), and is typical of many conventional powered vessels.

In summary, the Rotax-BBV4 used in this trial is a specialised machine that has been modified for survey purposes, where it is expected to manoeuvre into difficult locations such as mudflats. As a consequence of these modifications, the noise levels of this craft are 15 to 20 dBa higher than modern recreational craft.

The dBa scale is logarithmic. A 10dB change in sound level is perceived as a doubling of volume, therefore the BBV-Rotax craft will be perceived to be 3 to 4 times 'louder' than the typical recreational craft. For this reason it is not possible to generalise the results of this survey.

Figure 3: Noise test (typical of 20mph)

5 Flight Initiation Distances

Flushing, or flight initiation distances (FID) are reported by MacCallum to be 500m for duck species, 300m for wading birds and 100m for other bird species. These FID's appear surprising when compared to the literature, which report FID of 30m for duck species (AMEC 2010) and 37m for wading species (Oystercatcher, Blumstein 2003). Additional evidence collected from operators of light hovercraft are consistent with the literature (Appendix A) and not consistent with MacCallum.

A study of the literature has been completed to determine what is known about the relative disturbance caused by hovercraft, boats and people. It is known that people on foot disturb birds at greater distances than people in boats (Rodgers and Smith 1995), and that people in hovercraft disturb birds at similar distances than people in boats (AMEC 2010, Taha 2013) and this conclusion is supported by Natural England who confirmed that hovercraft appear less disturbing than people on foot (NE private communication 2010).

In summary. reported flight initiation distances in MacCallum are grossly overestimated when compared to previously published figures.

6 Hovercraft Routes

In the study the hovercraft pilot was operating on previously determined routes agreed with the Harbour Office. The actual routes were recorded and a sample of these is shown in Figure 4 and Figure 5 for Site 3 & 4 respectively.

Light hovercraft pilots are trained according the to Hovercraft Cruising Club training scheme in the choice of route for any particular situation, in order to ensure safety and to reduce disturbance of wildlife and people. Mudflats usually contain gulleys and tide scoured drops which can be hazardous to the craft, therefore pilots are trained to avoid them. In addition, they are trained to avoid wildlife including feed loafing and rafting birds. Instead, pilots are trained to use main channels exactly as other vessels do.

The detailed routes for the hovercraft were analysed, and they appear to have been chosen to maximise disturbance. As shown in Site 3 (Figure 4), the route chosen to the sampling points was the worst possible, making a direct approach to large groups of birds. This apparent choice of the most disturbing route is again seen in Site 4 (Figure 5), with similarly poor choice of routes in sites 1 and 2.

It is known that boats are more disturbing to birds when they deviate from the established channel (Burger 1998). It is also known that birds recognise a direct approach as more threatening than an oblique approach and that this is more likely to ellicit an early response

The preferred route at, for example site 3 (Figure 4), would have passed up the central channel at a distance of 100-200m from any birds. Recommended set-back distances in the literature are typically in the range of 100 to 150m (Stillman et al 2007, Rodgers 2000, Rodgers et al 1995, Burger 1998).

In summary, the routes chosen in this study are not typical of the routes navigated by recreational hovercraft pilots, and appear to have been chosen specifically to maximise bird disturbance.

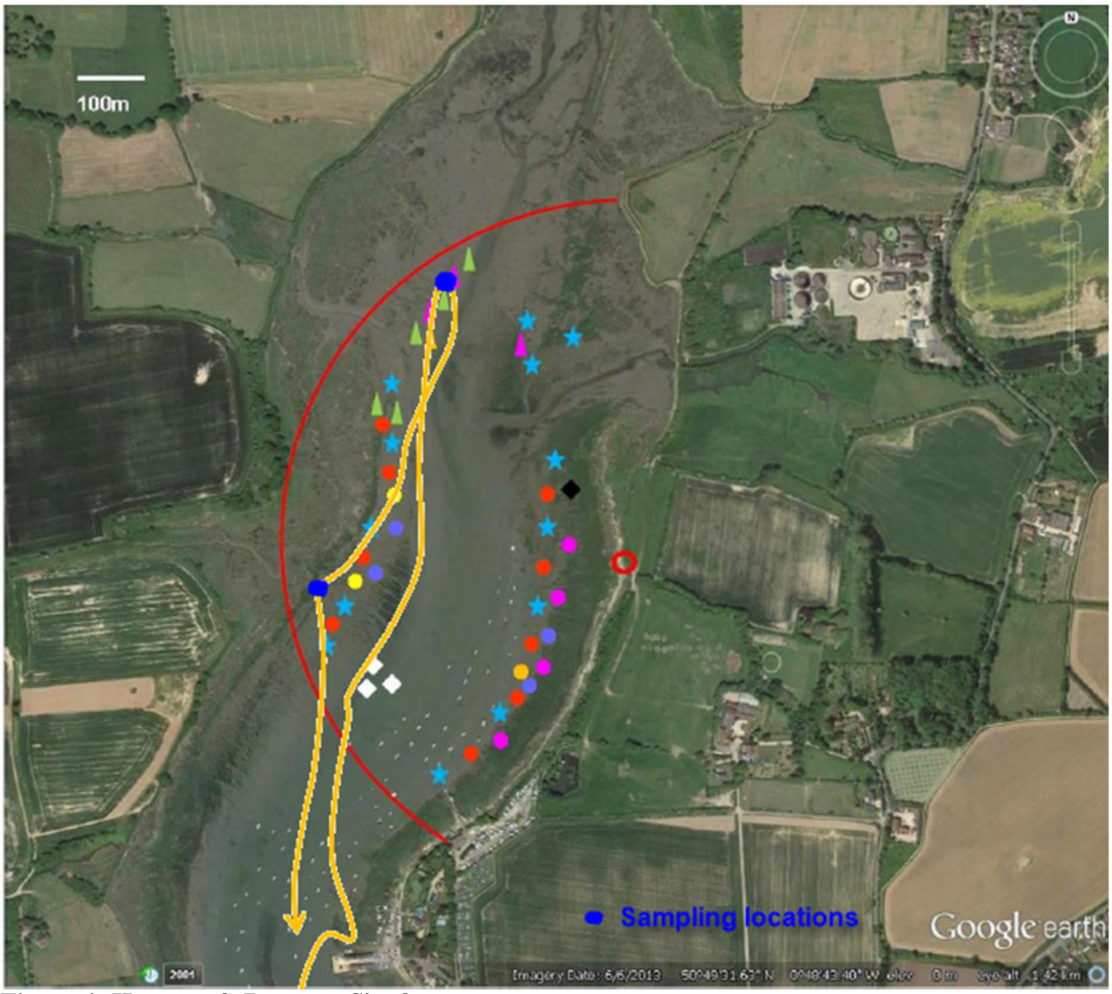

Figure 4: Hovercraft Route at Site 3

Figure 5: Hovercraft Route at Site 4

7 Noise levels

Since MacCallum seeks to generalise the report conclusions to recreational hovercraft it is necessary to quantify the noise levels present.

No noise data has been presented and no attempt has been made to quantify or compare hovercraft noise with other sources. No noise measurements were taken (either ambient or from the hovercraft). No attempt has been made to compare hovercraft noise levels with other vessels that operate in these areas. In addition, no attempt to introduce other non-familiar vessels or noises to use as a control.

The lack of quantified noise data seriously weakens any later conclusion in which these results are extrapolated beyond the particular circumstances of this experiment.

8 Conclusions

MacCallum has sought to determine the effect of recreational light hovercraft on wild birds in Langstone Harbour, and has presented data suggesting that set-back distances of up to 500m would be required, and since this is impracticable, that light hovercraft should not be permitted in the Harbour.

However, in considering this conclusion the following points should be considered:

- The measurement techniques employed by MacCallum were inaccurate and were not consistent with best practise in the field
- Analysis of the data demonstrates that it is not self consistent, that it contains gross error and cannot be relied upon.
- The flight initiation distances reported by MacCallum are substantially (>5 times) higher than are reported in the literature.
- The hovercraft chosen by MacCallum for this survey was a specialised survey craft producing 15-20dBa more noise and therefore being perceived as 4 times 'louder' by an observer than a typical recreational hovercraft.
- The routes followed by the hovercraft through the count areas appeared to be designed to maximise bird disturbance by driving directly through the densest bird populations.

For these reasons the results reported by MacCallum cannot be considered to be typical of recreational hovercraft use. These results may be applicable to the particular specialised hovercraft which was used in the survey, although even this seems in doubt due to the gross errors discovered in the data.

A survey could be designed to determine the impact of typical recreational light hovercraft on birds in the harbour. This should use a modern craft, which should be operated in accordance with the training and code of conduct of the Cruising Hovercraft Club. In addition, improved observational and measurement techniques should be adopted.

It should benoted that light hovercraft are vessels under law and there exists an absolute right to navigate in tidal waters which cannot be extinguished except where specific primary legislation exists. Given this difficulty, it is recommended that Authorities with environmental responsibilities should positively engage with the organisations representing light hovercraft operators to develop a proper understanding of impacts on wildlife and reasonable local arrangements for the protection of wildlife.

9

10 References

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11 Appendix A : Additional Bird Data

The images below were captured from moving hovercraft at speeds between 8 and 19knts.

Black headed and Common Gulls feeding @ <50metres (note gull flying alongside hovercraft – top right)

Roosting and nesting Gulls and Cormorants

Nesting Colony on Sea Stack and Cliffs @ 110metres

… sea stack colony @ 55metres (spray on left is from hovercraft during a turn)

Cormorants @ 28metres

Nesting Cormorants @ 23metres

Loafing Gulls @ 13metres