Natural England Commissioned Report NECR231

Falmouth and St.Austell pSPA bird bycatch analysis report year 1 - 2014

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Foreword

Natural England commission a range of reports from external contractors to provide evidence and advice to assist us in delivering our duties. The views in this report are those of the authors and do not necessarily represent those of Natural England.

Background

The Vulnerability Assessment for the Falmouth Bay to St Austell Bay proposed Special Protection Area (pSPA) identified that mortality as a result of entanglement in fishing gear whilst birds forage within the water column, or potentially when attempting to feed on fish entangled in nets, may present a potential impact to the future conservation of the bird features.

It was agreed by both Natural England and Cornwall IFCA that the implementation of an incidental bycatch monitoring program would be a risk-based approach to better understand the interaction between the bird features and set/fixed net activities occurring in the area.

This report details the analysis from the first year of this ongoing project. It will be used to better inform future monitoring of the feature species, and will provide evidence for impact assessments on proposed activities within the SPA.

Further analysis of this data combined with data collected in subsequent years will contribute to management decisions for the site.

This report should be cited as:
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Further information
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Report

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Falmouth and St Austell pSPA by-catch data analysis

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Summary

This report, commissioned by Natural England, considers by-catch data from checks of fishing boats made by Cornwall Inshore Fisheries and Conservation Authority (CIFCA) staff. Nine boat transects were completed by CIFCA staff within the Falmouth – St. Austell Bay pSPA area to undertake net observations and gather information from skippers. Transects covered the period from late November 2013 to mid-March 2014. Boats recorded hauling nets were visited and the nets checked. The aim of the work was to determine the level of bird by-catch and netting within the pSPA. During the nine boat transects, 20 net observations were recorded and it is these data that are analysed within this report.

Four net observations involved a by-catch of birds, none of the species trapped were interest features of the pSPA. Details relating to each net observation included distance from shore, mesh size, water depth, fleet length and soak time. None of these were significant predictors of the probability of a by-catch being recorded.

The analysis is based on a very small sample size and more meaningful analysis will require a larger data set. Recommendations are made regarding data collection.

Contents

Acknowledgements

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We are grateful to Cornwall Inshore Fisheries and Conservation Authority for providing their report, data and GIS data, and also for comments on an initial draft of this report. .

1. Introduction

1.1 Natural England, in conjunction with JNCC, are progressing work on a new Special Protection Area, in south Cornwall: Falmouth Bay to St Austell Bay (pSPA). The site is recommended for three wintering bird species; Black-throated Diver *Gavia arctica*, Great Northern Diver *G. immer* and Slavonian Grebe *Podiceps auritus*.

1.2 This report has been commissioned by Natural England to further investigate the findings of the Cornwall Inshore Fisheries and Conservation Authority (CIFCA) pSPA incidental by-catch and netting study (Street & Trundle 2014). The by-catch report provides details on the survey methodology and observations recorded. In summary, nine boat transects were completed within the pSPA area to undertake net observations and information gathering from skippers with the aim of finding out the level of bird by-catch and netting within the pSPA. During the nine boat transects, 20 net observations were recorded and included in the study. The transects covered the period from late November 2013 to mid March 2014.

1.3 Given the interest features of the site, the study focussed on by-catch of diver species but records were also made of all bird species reported as by-catch. In the CIFCA Report (Street & Trundle 2014), there were no observations of diver species by-catch but other bird species were observed. In total, 9 birds (7 guillemot and 2 cormorant) were recorded as by-catch in four different nets.

1.4 The aim of this report is to provide further analysis looking at the non-diver by-catch data in terms of factors which may influence the presence of by-catch. Furthermore this report presents the by-catch data geospatially and with respect to the data collected as part of the wintering grebes and divers study 2014 (Liley *et al.* 2014). This report also provides a review of the approach and some discussion on likely levels of effort necessary to generate more data.

2. Methods

2.1 The net observation data was provided by Natural England from the CIFCA study. We used the data to generate a series of covariates which were then tested to see which (if any) were significant predictors of a by-catch occurring. We used binary logistic regression (in Minitab v14) with the presence of a by-catch in a net observation being set as 0 (no by-catch) or 1 (by-catch taken).

2.2 In order to look for any spatial patterns, net observations were plotted using Mapinfo v10.5. Given the small sample size the plots simply allow a visual check of where nets with by-catch were recorded in relation to the SPA and bird observations from the survey work conducted during the same winter (Liley *et al.* 2014).

4. Results

Summary of by-catch data

4.1 From the nine survey transects, 20 net observations were carried out on eight transects. There were four net observations out of 20 where avian by-catch was observed (Table 1). All four net observations were only partially completed such that the net observation commenced after the start of the haul. Therefore 20% of the nets observed had avian by-catch within them. In total 9 birds were observed within the nets: 2 cormorant and 7 guillemot. The highest number of birds observed in one net was 5 guillemots. This particular fleet was using a 266.7mm mesh net to target spider crab and sole. The net had been left out for 2 nights at a depth of 30.8m and according to the skipper the fleet length was 3000m in length. Six out of 7 of the guillemots caught were observed within spider/sole nets. All nets which caught guillemot had been left overnight for at least one night. The two spider/sole nets which caught the 6 guillemots were left out for a 2 nights and 4 nights.

4.2 The two nets which caught the cormorants (one each), were using a smaller net mesh (101-153mm) and were targeting species (bass and pollack). These nets were also left out for shorter periods of time (2 hours and 12 hours) compared to the other two nets which caught the 6 guillemots.

Table 1: Summary information about net observations where by-catch was recorded (* indicates water depth measure not provided in the study but inferred from admiralty data).

Transect ID	Date	By-catch	Distance from shore (km)	Target species	Soak time	Approx soak time (hours)	Fleet length (m)	Fleet length x approx hours	Mesh size (mm)	Water depth (m)
1	26/11/2013	1 cormorant	1.16	Bass	2 hours	2	1000	2,000	101.6	11.3*
6	19/2/2014	1 cormorant, 1 guillemot	2.30	Pollack	Over night	12	600	7,200	152.4	32.8
9	14/3/2014	1 guillemot	5.67	Spider/ sole	4 nights	80	2000	160,000	250	62.1
9	14/3/2014	5 guillemots	2.54	Spider/ sole	2 nights	30	3000	90,000	266.7	30.8

Analysis of by-catch data

4.3 The full data set included 20 net observations where four had by catch present. Binary logistic regression was used to investigate the significance of a number of covariates on the presence/absence of by-catch in the nets. None of the covariates tested were significant (p in all cases>0.05). The covariates and notes about them are listed in Table 2.

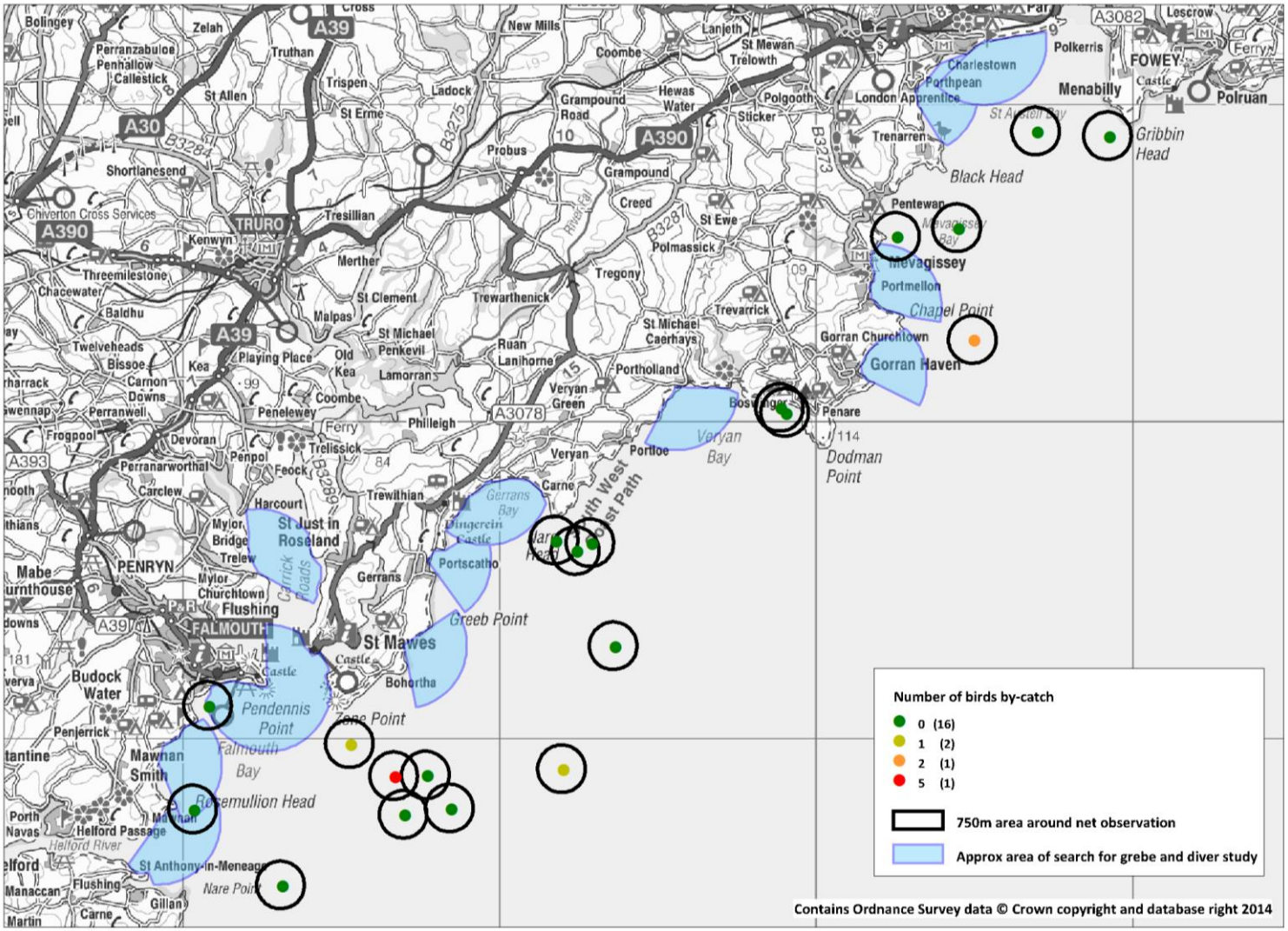
Table 2: Covariates tested using binary logistic regression to investigate presence/absence of by-catch in net observations.

Covariate	Notes	Coefficient ±SE	p
Distance from shore (km)	Shortest distance between observation and coastline	0.42±0.36	0.23
Mesh size (mm)		0.87±0.5	0.08
Fleet length (m)		0.002±0.001	0.06
Approx soak time (hours)	Where hours provided these were used, where number of nights was provided an estimate was made based on less than 'number of nights x24hours'	0.06±0.04	0.17
Fleet length x approx soak time	Created as an index of fishing effort	0.00004±0.00002	0.11
Water depth (m)	Data for two points were inferred from admiralty data as not provided as part of the study	0.025±0.03	0.46

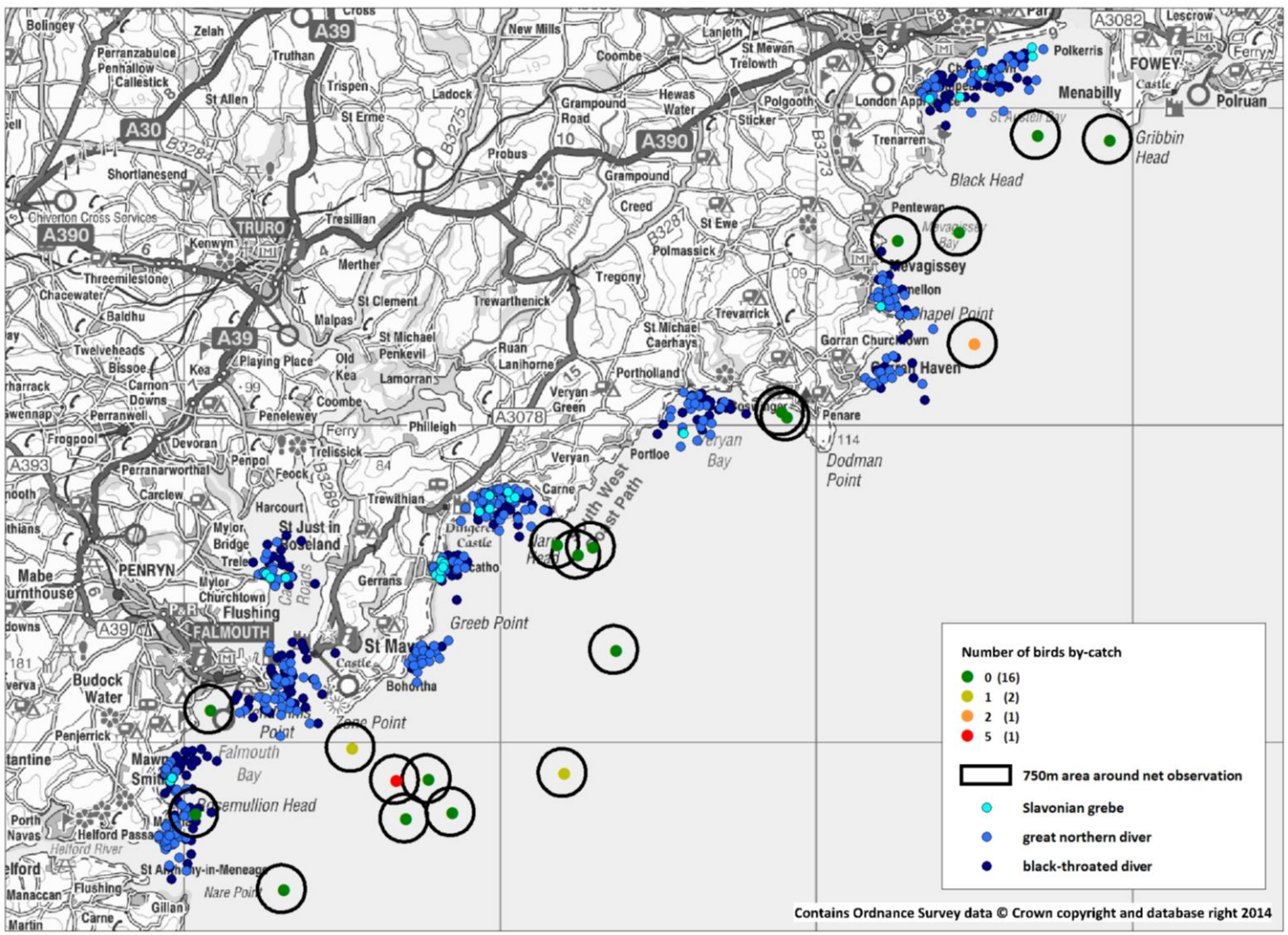
Geospatial features of by-catch and interest features

4.4 We have presented the net observation locations and the number of bird by-catch recorded in Map 1. In addition to indicating the level of by-catch, we have presented the search arcs used in the diver and grebe study (Liley *et al.* 2014) and we have also placed buffers around each of the net observations of 750m radius to demonstrate the potential area covered by the net. The radius of 750m was chosen to reflect the average fleet length reported by skippers (718.4m). In Map 2, the observations of the interest features of the pSPA are shown with the net observations and 750m buffers.

4.5 There are three net observations from the by-catch study (Street & Trundle 2014) which occurred within the search arcs included in the diver and grebe study (Liley *et al.* 2014). Avian by-catch was not observed in any of the net observations occurring within search arcs for which interest feature bird data are available. Seven of the 20 net haul observations were in water of a depth of 20m or less – i.e. the water depths most likely to be used by the pSPA interest features (see Liley *et al.* 2014).



Map 1: Net observation locations with 750m buffer (average fleet length) and the number of birds recorded as by-catch in the nets shown alongside search arcs for diver and grebe study (Liley *et al.* 2014).



Map 2: Net observation locations with 750m buffer (average fleet length) and the number of birds recorded as by-catch in the nets shown alongside records of interest feature bird species for pSPA from the diver and grebe study (Liley *et al.* 2014).

5. Discussion and recommendations

5.1 The analysis conducted found no significant predictors of by-catch. The small sample size (i.e. 4 out of 20 observations) means that a pattern would have to be very clear to be significant. The small sample size also limits the analyses that can be conducted – for example we could not look for interactions between the covariates. It can be seen from Table 1 that the by-catch observations covered a range of different months, the soak time ranged from two hours to four nights, mesh size and target species varied. Water depths were all deeper than 10m, and ranged from 11m to 62m. From Table 1 it is clear that there is no consistent pattern in which nets resulted in by-catch. The by-catch observations also included two different species.

5.2 The second part of the winter, from January through March was characterised by a series of very severe winter storms, these are likely to have limited fishing activity and affected how and where fishing took place. Furthermore the storms may well have affected the distribution and behaviour of the birds.

5.3 Survey effort was patchy. The aim had been to cover the five survey blocks evenly, however due to weather (the weather for the winter 2013-2014 was exceptionally stormy) and time restrictions this was not achievable. Falmouth Bay was covered on four of the transects, Gerrans Bay was also covered on four (different) dates. Veryan Bay (two transects), Megavissey Bay (three transects) and St. Austell Bay (two transects) received less coverage.

5.4 With a bigger data set the following data summaries and analyses should be possible:

- Plots of all fishing activity observed – with boats plotted within the GIS by type. Some spatial analysis would then be possible of where different types of vessels occur within the pSPA.
- More detailed logistic regression to consider probability of by-catch in relation to month, year, type of boat, characteristics of net, length of time net in water, fleet length, distance from shore, water depth etc. With larger sample, analysis could test for interactions between variables. Depending on the by-catch it may be possible to compare catches by bird species.

5.5 It is difficult to be specific about how large a dataset would be adequate. If the focus of the analysis was only the pSPA interest then 20 net observations have generated no observations of by-catch for these species and it is impossible to estimate how many observations may be required to record any, let alone data that may allow any analysis. If we assume analysis of any by-catch is useful, then one in five observations from the current data held by-catch. Extrapolating from this, 100 observations might generate 20 observations of by-catch. This is perhaps a minimum level at which any useful patterns might emerge. Using power analysis, a sample size of around 172 for a two-sample t test would be necessary to detect a difference of 5m at a power of 0.80 and assuming a standard deviation of 16.5m (this is the standard deviation of the 20 water

depths recorded for the net observations analysed here). This is a rough guide based on a single variable (water depth) and simple statistical test based on the means of the two samples.

5.6 In order to facilitate future analysis the following suggestions are made regarding data collection:

- Details on the number of hours the net was out for and the number of these that were in darkness
- Complete data (as far as is possible), such that water depth etc are recorded consistently for all net observations
- Tide details: i.e. neaps or springs (these data can be added retrospectively, but it is more efficient to record systematically at the time)
- More consistent coverage of the survey area such that all areas receive a relatively similar level of cover

5.7 Finally, it would be useful to quantify the total fixed-net effort in the area in order to understand how representative the recorded net hauls are to the entire pSPA. This could be achieved in part through the analysis of data described in para 5.4 (depending on the amount of survey effort) or alternatively warrants a dedicated study.

6. References

Liley, D., Fearnley, H., Waldon, J. & Jackson, D. (2014) *Distribution and Ecology of Wintering Grebes and Divers in the Falmouth-St. Austell pSPA*. Footprint Ecology Unpublished Report, Natural England.

Street, K. & Trundle, C. (2014) *Survey Report Winter 2013/14: pSPA Incidental by-Catch and Netting Intensity Study*. Cornwall Inshore Fisheries and Conservation Authority.