Summary Report for Red-throated divers (*Gavia stellata*) and netting bycatch in the Outer Thames Estuary SPA. Winter 2012-2013.

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Preface

Static and drift net fisheries have been shown to be a hazard to diving seabirds globally, with some studies reporting Red-throated divers (*Gavia stellata*) amongst the casualties. In regions of Europe, netting and entanglement in fishing gear has been shown to represent a high risk to Red-throated divers (RTD's). In the light of this best available evidence, entanglement in netting was identified in the draft Conservation Objectives of the Outer Thames Estuary Special Protection Area (SPA) as posing a moderate risk to the designated RTD wintering populations (Annex 1). There was however insufficient scientific data available from the Outer Thames Estuary itself to be certain that this level of risk was appropriate in the case of the Outer Thames Estuary SPA.

Summary

Within the scientific literature, there are many studies in which static and drift net fisheries of various types have been found to be a particular hazard to diving seabirds and have been implicated in the decline of seabird populations in some parts of the world (reviewed in Gubbay and Knapman (1999) and Zydelis et al. (2009)). Within that body of literature there are some studies in which RTD's (and other species of diver) have been recorded amongst the casualties. Much of this information comes from studies in The Netherlands and the Baltic as detailed below.

Dutch studies
On the Dutch North Sea coast there has been a long-running programme of recovering all species of beached birds and recording their cause of death (Camphuysen 1990, 2008). Since 1970, nearly a quarter of a million bird corpses of many species have been recorded of which 0.2% were entangled in marine litter or fishing gear. After gannet and cormorant, RTD was the species most frequently recorded as being entangled (9 of 1011 corpses (0.9%)). Unfortunately, in these studies the material entangling each corpse was not recorded in detail, but Camphuysen (2008) concludes that "it is certain that nylon fish lines, pieces of fishing nets and all other kinds of ropes and lines, often from fisheries activities, were mostly to blame". As such, the results of this study do not provide any direct evidence on the risks posed to RTD's by set or drift nets in particular. As in the UK studies, as the majority of causes of death of divers in these Dutch studies were unknown, deaths from netting may be far more common than the data suggest.

German studies

In another long-term study on the Baltic coast of Germany, Schirmeister (2003) recorded a total of 370 RTD's drowned in set nets over a 12 year period. This was the 4th highest species total after long-tailed duck, cormorant and common scoter. Based on these figures Zydelis (2009) estimated that the extensive inshore set net fishery within the western Baltic killed approximately 210 RTD's per year. Based on the density of birds within this general area (Guse et al., 2009) it can be calculated that this approximately represents mortality of 3% of the population per year due to set nets.

Considering these studies together**, there is evidence that set nets and marine debris pose a significant risk of mortality to RTD's**. There is however, little direct evidence of the risk posed by drift netting.

UK studies

Within the UK, the evidence regarding the relative importance of various causes of death of RTD's is based on long-term ringing studies. Up to 1998, a total of 2664 red-throated divers have been ringed with individually coded rings (Okill, 2002). Most birds have been ringed since 1977 in the north of Scotland and northern isles. Of the 174 birds recovered dead over the years, only 62 could be said to have died for a particular reason. Of these, 33 (53%) died as a result of becoming entangled in fishing nets. Amongst those recorded as having died in particular types of nets, Okill (1994) reported salmon netting (either those around salmon fish-farm cages or nets set to catch wild salmon) to be the most frequent cause of death (n=7). However, many other types of netting have been found to entrap divers including: discarded pieces of netting (n=5), monofilament nets (n=1), herring nets (n=2), gill, ring, trammel and skate nets (n=1 each) (Okill 1994). An up-to-date data request to the British Trust for Ornithology (BTO, 2010) showed that there have to date been 265 recovered dead RTD's. Of the 74 birds which died from an identifiable cause, 34 (46%) were recorded as killed due to 'trap set for other species' and assumed to be net types listed in Okill (1994) and Okill (2002) since these studies are based on the same BTO ringing data. Deaths where the cause was unknown (i.e. recorded as 'found', 'ring only', 'leg and ring' and 'unknown') represented 72% of recoveries**.**

Although these numbers are undoubtedly small, it must be borne in mind that they relate **only** to ringed birds and only a tiny fraction of the UK breeding population over that time period has been ringed. Also, even these recovery records do not reveal the whole picture as an unknown proportion of those ringed birds reported as having been "found dead" will have been ringed birds removed from nets but not reported as such (Okill 1994). On the other hand, ringed birds that die without getting entangled in nets are probably less likely to be found and reported than those that do (Okill 1994), so the proportion dying in netting may be overestimated. Nevertheless, as two thirds of the reported recoveries come from nets, this would indicate that the species is vulnerable to being killed by netting (Okill 1994). In fact, netting is now used as the most effective means of entrapping birds on their lochans for the purposes of ringing (Dave Okill, pers. comm.).

In the studies of Okill (1994 and 2002) it should be noted that there are only 5 (out of 174) recoveries of UK ringed birds on the east coast of England. In contrast, of the 10 foreign ringed birds recovered, 8 have been recovered in the south east of England. This suggests that the lack of recoveries of British ringed birds in the south east of England should not lead to a conclusion that divers do not die in this area, but rather that this area may not be the most important wintering area for British breeding birds. Rather the south east of England would seem to be an important wintering area for birds originating in Greenland and Scandinavia (Okill, 2002).

East of England information

The beached bird winter survey carried out by the RSPB since 1971 reveals a total of 76 un-oiled RTD's washed ashore in the south east of England. Of these, only 1 had obviously been killed due to entanglement with fishing gear. This survey is focused on the recovery and quantification of birds killed due to oil spill events so unfortunately does not accurately enable risk from netting to be determined. Moreover, as noted by Okill (1994), any birds that drowned in nets but then removed from them and discarded, would not have been reported as having died in netting.

A fishing survey in the East of England resulted in the commercial fishing community stating that RTD's are never caught in nets despite 40% of those responded using nets in winter (Weston, 2010). This low bycatch rate may be explained by netting in winter in the East of England being dominated by drift netting with only limited set netting (Weston, 2010). By its manner, drift netting should pose a lower risk of entanglement to RTD's than unattended set nets since the inshore fishing boat stays within 10-15m of the nets. Divers are well known for being highly sensitive to disturbance from human activity at sea (Garthe and Huppop, 2004), and are therefore disturbed and flushed at a distance of several hundred meters by approaching vessels. Accordingly, any nets attended by fishing vessels are probably less likely to pose a risk of entanglement to these birds than nets left unattended for long periods.

Set netting in the Outer Thames Estuary SPA may also represent a lower risk than in the Baltic since fishing practices differ between these regions. In the Baltic, set nets are left for many days and checked every 2-4 days (Guse et al 2009; Schirmeister, 2009). Along the English east coast, set nets are deployed for shorter time periods, i.e. for hours not days (A. Garnham, ESFJC/KEIFCA, pers. comm.). In waters under KEIFCA management, fixed nets are not permitted to be left un-cleared for a period of more than 30 hours. It is then possible that divers which have been scared from an area while nets have been set or checked will not return to that area before the nets are again checked. The frequency of fishing vessel activity may effectively exclude the birds from the area of risk. Clearly, detailed information on fishing practices along the UK east coast would be helpful in assessing the true risk posed to divers from entanglement in set and drift nets in this area.

These differences in set netting practice between the Baltic and the Thames estuary, and the likely lower risk from drift netting, may explain the low reported RTD bycatch in netting in the Outer Thames Estuary SPA by the commercial fishing community. It is also worth noting that both KEIFCA and EIFCA strongly supported the fishermen's assertions that netting and bird bycatch was not a problem in the Outer Thames Estuary SPA.

In summary, the evidence indicates that set nets and entanglement due to discarded commercial and recreational fishing gear pose a significant risk to RTD populations. However, the magnitude of the risk posed by netting to a population of birds depends upon many factors; the type, location, frequency, seasonality and intensity of the fishing activity, the particulars of the netting/lines (e.g. colour of the material, mesh size etc), and the behaviour and distribution of the birds themselves. Accordingly, there is a need for a site-specific study of this issue in order to improve understanding of the scale of the netting bycatch of RTD's in the Outer Thames Estuary SPA.

In order to understand the impact of netting practices on RTD's within the Outer Thames Estuary SPA, a survey of commercial fishermen was conducted to get a better understanding of fishing methods and the locations visited. These surveys identified, for example, seasonality of different fisheries, deployment of net periods, net colour, mesh sizes, set versus fixed nets etc. and also to develop further understanding of the disturbance impact of fishing vessels on RTD's within the SPA. A previous study was carried out for the winter season 2011-2012.

Objectives of the study

1. **To collate a database documenting the current netting activity within the Outer Thames estuary SPA**
2. **To derive an overall estimate of the number of red throated diver caught as bycatch by set and drift netting over the birds' key wintering period**
3. **To assess the population level consequences of any level of bycatch found.**
4. **To record the reaction of red throated divers to the approach and presence of fishing vessels and the presence of set nets.**

Methodology

A pro-forma was drawn up and circulated to members of the fishing community as a way of recording a log of their fishing activities throughout the key period of the presence of RTD's (between October and March), and the overlap of netting activity.

The log enabled recording the following information; date and location of fishing activity, fleet size, type of fishing gear deployed, target fish species, length and breadth of net, soak time, mesh size, depth of deployment, characteristics of location (e.g. known sediment type etc.), and the number and species of any bird bycatch.

Completed logs will be collated and entered into a computer database with the option of producing GIS map-layers showing the spatial distribution of various fishing activities.

Sampling was carried out by Kent and Essex IFCA through a program of vessel boarding's and catch haul observations. IFCA officers were then able to accompany fishing vessels during net hauls and record any bycatch in the nets.

Results

Appendix 1 shows a table detailing the results of the vessel boardings and catch haul observations. Fourteen vessel boardings took place between the 13th October 2012 and 14th March 2013. Of the 14 boardings, it was observed that two different types of net gear were set; Drift Nets and Drift Trammel Nets (see Appendix 2 for further description of these net types). Of the 13 vessel boardings where Drift Nets were set no RTD's were observed as bycatch (n=0). Furthermore no other bird species were observed as bycatch in the Drift Nets (n=0).

Of the 1 vessel boarding where a Drift Trammel Net was set no RTD's were observed as bycatch (n=0). Furthermore, no other bird species were observed as bycatch in the Drift Trammel Nets (n=0).

Discussion

No RTD bycatch was observed during the 14 vessel boardings. It is worth noting that although the 14 boardings yielded no direct observations of bird bycatch, that the fishermen on the 27/11/2012 boarding had not recorded sight of a RTD for 2 years and suggests that the Offshore Windfarm London Array keeps them at bay. The fishermen also note that none

have been caught in nets for over 10 years. The findings to date are consistent with the view that alterations in RTD population levels either within the SPA through species mortality from bycatch within the SPA are very unlikely.

It is important to note, however, that the sample size and duration of this study, is much smaller in comparison with that of other studies carried out in areas such as the Baltic. Therefore, the evidence to date suggests that by-catch of RTD does not appear to be of a significant issue within the Outer Thames Estuary SPA, and as this is the second year of monitoring in 2012-2013 with similar results, there is a degree of confidence in this preliminary conclusion.

There are a number of reasons why the scale of the problem may be far less within the Outer Thames Estuary SPA than elsewhere. First, the number of fishermen operating set nets within the SPA is less than in other areas such as the Baltic. Additionally, fishing practices within the Outer Thames SPA differ from those identified in other studies such as the Baltic. In the Outer Thames the majority of fishing is drift net where nets are set for a period of 3-6 hours (min 0.75hrs, mean 5.7hrs max 24hrs (n=24)). In contrast in the Baltic fixed trammel nets are more widely used and can be set for a number of days at a time. For fixed netting in the Outer Thames, the boats tend to remain in the area once the nets are set. Divers are well known for being highly sensitive to disturbance from human activity at sea (Garthe and Huppop, 2004), and are therefore disturbed and flushed at a distance of several hundred meters by approaching vessels. The divers are unlikely to return to the drift net area whilst the boats remain present, therefore reducing the likelihood of entanglement in the nets.

It is important to note that the reaction of the RTD's to the approach and presence of fishing vessels and presence of set nets were considered to be recorded during this survey season. This meets the 4th objective of the study. However, as none were caught nor seen, this provides an insight into the theories behind the RTD behavior and the presence of offshore structures such as windfarms. Further work is currently underway in regards to the potential issue of disturbance of these birds in relation to the London Array Offshore Windfarm.

Conclusions

There are many studies in the UK and abroad that show how RTD's are susceptible to entanglement in netting, fishing lines and other marine debris. This evidence indicates that these birds are highly sensitive to mortality from such sources. No scientific evidence currently exists in the Outer Thames Estuary SPA and therefore, the purpose of this study was to provide evidence to indicate if there was also a similar problem of RTD's bycatch in the Outer Thames Estuary SPA.

From this study, it is evident that no RTD's were observed as bycatch from the 14 vessel boardings and catch haul observations during the 2012-2013 winter season which reflects the results of the 2011-2012 winter season also. There are several theories as to why by-catch of RTD may (appear to) be less of an issue within the Outer Thames Estuary SPA than data from elsewhere might indicate. These include: a smaller study sample size (to date); smaller numbers of fishermen operating in the Outer Thames SPA; shorter permitted soak times; boats remaining with the drift nets causing a greater possible disturbance and deterrent for RTD return. The minimum target of 40 boardings has been achieved throughout the two winter seasons 2011-2012 and 2012-2013 and it can be concluded that the response of the divers to the small fishing boat sized vessels and the concern over bycatch is negligible in the Outer Thames Estuary SPA. However the issue of disturbance to RTD from offshore structures now presents itself, which is currently being studied. The results of this further study should be read in conjunction with this report.

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Appendix 1 Vessel boarding's and catch haul observations

Sample number	Date	Longitude	Latitude	Time on board	Time off	Gear type	How set	Mesh size (mm)	Water depth (m)	Soak time (hrs)	Fleet length (yrds)	No. fleet	No. byc
T012	30/10/2012	51 45.72	01 03.59	12:20	12:30	herring drift netting	Bottom set	54mm	6	0.50	50	1	0
T013	30/10/2012	51 45.93	01 04.72	12:40	13:00	herring drift netting	bottom set	57-58mm	6	1.00	100	1	0
T014	06/11/2012	51 50.08	001 18.14	08:57	10:00	Bass drift netting	surface	90mm			460	4	0
T015	06/11/2012	51 46.78	01 12.82	10:28	10.:55	herring drift netting	set at 2 feet	54mm		2.00	91	1	0
T016	06/11/2012	51 46.46	01 11.91	11:25	12:20	Cod Drift tramm el netting	set at 10 feet	100mm		3.00	1370	1	0
KG14	27/11/2012	51 26.90	01 26.08	10:50	11:00	Drift netting	top set	100 mm	12.4	1.50	915	4	0
T017	27/11/2012	51 45.59	01 04.39	11:20	11:30	Drift netting	top set	57-58mm	6	1.00	100	4	0
T018	27/11/2012	51 45.24	01 04.47	11:36	11:45	Drift netting	3 ft from surface	58mm	10	1.50	550	2	0
T019	06/03/2013	51 50.03	01 19.27	11:50	12:15	Drift netting	Bottom set	120mm	8.5	4.5	460	4	0
T020	070/03/2013	51 45.11	00 53.93	14:15	14:30	Drift netting	top set	54mm	10	1	100	1	0
T21	14/03/2013	51 45.03	01 05.70	10:10	10:30	Drift netting	Bottom set	100mm	27	2	400	2	0
T22	14/03/2013	51 46.22	01 14.01	11:42	12:36	Drift netting	3/4 set	100	16.5	4.5	1000	3	0
T23	14/03/2013	51 46.56	01 10.89	12:45	13:15	Drift netting	top set	125	11	5	500	1	0
T24	14/03/2013	51 46.10	01 02.51	13:30	13:40	Drift netting	top set	56 mm	6	0.75	100	1	

Appendix 2 Net type Descriptions (Seafish, 2011)

Net Type	**Description**
Drift Nets	Sheets of thin netting which are allowed to drift with the tide or current to catch fish by enmeshing or entangling them.
Trammel Net	Type of gill net using several layers of netting. Gill nets are sheets of thin netting which are anchored (if **fixed** trammel nets) in the water to catch fish by enmeshing or entangling them. Trammel nets can be used to catch a wide variety of species ranging from cod and monk to sole and plaice. They generally consist of three walls of netting which hang vertically in the water.