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Entanglement Alliance (SEA) on previously  
undocumented fatal entanglements of  
minke whales (*Balaenoptera acutorostrata*)  
in Scottish inshore waters

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INTERNATIONAL  
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# Interim report from the Scottish Entanglement Alliance (SEA) on previously undocumented fatal entanglements of minke whales (*Balaenoptera acutorostrata*) in Scottish inshore waters

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## ABSTRACT

Mortality due to entanglement in static fishing gear is a growing concern for minke whales (*Balaenoptera acutorostrata*) in Scottish waters, however a thorough understanding of these incidents is lacking. In a bid to address this six organisations have partnered to form the Scottish Entanglement Alliance (SEA), to better understand the scale and impacts of marine animal entanglement. To achieve this, Scottish inshore creel fishermen have been participating in short, semi-structured interviews to gather data on the frequency of entanglements within the last 10 years, and the consequences of these events. 109 interviews have been completed to date, and 68% of those questioned have reported experiencing at least one marine animal entanglement in the specified timeframe. Of the 105 separate entanglement incidents involving a range of cetacean and other species reported, 37 have involved minke whales. 30 of these have been fatal and none have previously been formally recorded, revealing a much higher rate of entanglement for this species than previously reported. These reports have also come from interviews representing less than 10% of the creel fishing effort, suggesting that the true entanglement rate is much higher.

## INTRODUCTION

Marine animal entanglement in both active and derelict fishing gear is a growing problem worldwide, and is considered by many to be the single most significant marine mammal welfare issue of our time (IWC, 2016). In Scottish waters the reported prevalence of entanglements over the last 20 years has remained low, but based on data collected by the Scottish Marine Animal Stranding Scheme (SMASS) and through media reports, the incidence and range of affected species appears to be increasing. Entanglement in static gear has now been identified as the largest cause of non-natural mortality in baleen whales stranded around Scotland (Northridge *et al.*, 2010), however a thorough scientific understanding of the impacts of these incidents remains incomplete. This is due to limited reporting of entanglement events by fishers, limitations of post-mortem examinations, and the low likelihood of retrieving carcasses (Northridge *et al.*, 2010; Cassoff *et al.*, 2011). In a bid to address this, the Scottish Entanglement Alliance (SEA) was established in April 2018. SEA is a two-year European Maritime and Fisheries Fund (EMFF)-funded partnership between six marine research, industry and conservation and welfare bodies. By working closely with small-scale fisheries using static gear, SEA partners aim to provide a co-ordinated, comprehensive monitoring and engagement programme to better understand the scale and impact of marine animal entanglements in Scottish waters, not only from a conservation and welfare perspective, but also taking into consideration related economic and human safety implications.

## Project aims

The aims of SEA include to raise awareness of marine animal entanglements amongst fishermen and other marine users; to improve reporting rates of marine animal entanglements; to provide a platform for fishermen to suggest solutions to this problem and opportunities for them to become involved in entanglement research and disentanglement efforts; to assess the risk and impact of entanglements to marine animals at an individual and population level; and to better understand the socio-economic impact of marine animal entanglements on the Scottish fishing fleet.

## METHODS

To achieve these objectives, inshore creel fishermen operating around the Scottish coastline have been participating in short, semi-structured interviews. These interviews are based on a questionnaire that has undergone ethical review, and are conducted face-to-face. Questions focus on fisher's practises including the type, amount and length of gear used; soak times; frequency, causes and amounts of gear loss; and their experiences and knowledge of marine animal entanglements within the last 10 year period. There are an estimated 1200 creel boats currently operating in Scottish waters on a full- or part-time basis (Marine Scotland Science, 2017). This project aims to interview fishermen from at least 120 of these vessels (i.e. 10% of the fleet). To engage fishermen, ports and harbours with creel boats operating from them were mapped around the Scottish coast including the islands. An introductory email was then sent to the relevant local fishing associations, harbour trusts and regional inshore fisheries groups with a request for them to share this information with their members. The email outlined the project and invited fishermen to participate, highlighting that it was equally important to interview fishers who both had and had not experienced an entanglement to ensure the data collected was as representative of the industry as possible. Ports and harbours were visited based on responses from these emails. Where no responses were received, these areas were still visited and fishermen approached at random and asked to participate. Snowball sampling methods were then used to gain contact details of other fishers who may be willing to take part in the study, who were subsequently contacted directly.

## RESULTS

To date 109 interviews with inshore creel fishermen around the Scottish coast have been completed, including on the islands of Mull and Skye, the Outer Hebrides and the Orkney and Shetland isles. Of those interviewed, 68% have experienced at least one marine animal entanglement since June 2008. 105 separate entanglement incidents involving a range of cetacean and other species have been reported. Only three of these incidents (all humpback whales, two live and one dead) were previously known of by SMASS or British Divers Marine Life Rescue (BDMLR), a UK-based marine animal rescue charity which operates Europe's only large whale disentangling team. This highlights the low level of reporting of entanglement events. In each case species identification was confirmed through examination of photographs captured by fishers, or in the absence of these through the use of identification keys and targeted questions. A breakdown of these reports is detailed (Table 1).

Species	Released from entanglement alive	Discovered dead in entangling gear
Minke whale ( <i>Balaenoptera acutorostrata</i> )	7	30
Basking shark ( <i>Cetorhinus maximus</i> )	6	24
Humpback whale ( <i>Megaptera novaeangliae</i> )	8	1
Leatherback turtle ( <i>Dermochelys coriacea</i> )	5	3
Pilot whale ( <i>Globicephala melas</i> )	4	1
Harbour porpoise ( <i>Phocoena phocoena</i> )	0	5
Risso's dolphin ( <i>Grampus griseus</i> )	1	3
Atlantic white-sided dolphin ( <i>Lagenorhynchus acutus</i> )	0	2
Unidentified dolphin species	2	0
Orca ( <i>Orcinus orca</i> )	1	0
Sei whale ( <i>Balaenoptera borealis</i> )	1	0
Porbeagle shark ( <i>Lamna nasus</i> )	0	1

Table 1: Species reported entangled in the last 10 years through SEA interviews with Scottish inshore creel fishermen (interviews conducted June 2018 – April 2019). Releases of live animals have all been conducted by fishermen.

Minke whales are the most common species accounting for 35.2% of all reports received. 30 minke whales have been reported deceased and a further seven released from entangling gear alive, although the consequences of these interactions and fate of individuals is unknown. These reports of entangled minke whales have all been

received from fishers operating within 12 nautical miles of the Scottish coastline in creel gear targeting shellfish, and none have previously been formally recorded (Table 2). Interviews will continue until August 2019 after which all available data will be analysed.

Species	Date found	Stranding type	Cause of death
<i>Balaenoptera acutorostrata</i>	05/05/1993	Dead stranded	Physical Trauma: Entanglement
<i>Balaenoptera acutorostrata</i>	21/07/1993	Dead stranded	Physical Trauma: Entanglement
<i>Balaenoptera acutorostrata</i>	08/06/1994	Dead stranded	Physical Trauma: Entanglement
<i>Balaenoptera acutorostrata</i>	31/08/1995	Dead stranded	Physical Trauma: Entanglement
<i>Balaenoptera acutorostrata</i>	20/09/1997	Dead stranded	Physical Trauma: Entanglement
<i>Balaenoptera acutorostrata</i>	20/03/2000	Dead stranded	Entanglement
<i>Balaenoptera acutorostrata</i>	30/04/2000	Dead stranded	Physical Trauma: Entanglement
<i>Balaenoptera acutorostrata</i>	05/10/2000	Dead stranded	Entanglement
<i>Balaenoptera acutorostrata</i>	09/01/2002	Dead stranded	Entanglement
<i>Balaenoptera acutorostrata</i>	19/06/2002	Dead stranded	Physical Trauma: Entanglement
<i>Balaenoptera acutorostrata</i>	11/12/2005	Dead stranded	Physical Trauma: Entanglement
<i>Balaenoptera acutorostrata</i>	16/01/2008	Dead stranded	Physical Trauma: Entanglement
<i>Balaenoptera acutorostrata</i>	10/06/2010	Live stranded	Entanglement And Malnutrition
<i>Balaenoptera acutorostrata</i>	01/04/2011	Dead stranded	Physical Trauma: Entanglement
<i>Balaenoptera acutorostrata</i>	06/11/2011	At sea	Physical Trauma: Entanglement
<i>Balaenoptera acutorostrata</i>	26/08/2015	Dead stranded	Physical Trauma: Entanglement
<i>Balaenoptera acutorostrata</i>	27/11/2015	At sea	Entanglement
<i>Balaenoptera acutorostrata</i>	01/06/2016	Dead stranded	Entanglement (acute)
<i>Balaenoptera acutorostrata</i>	25/09/2018	Dead stranded	Entanglement in trawler gear
<i>Balaenoptera acutorostrata</i>	08/12/2018	Dead stranded	Physical Trauma: Entanglement

Table 2: Records currently held by SMASS of minke whale deaths in Scottish waters due to entanglement.

Reports received by SMASS are often opportunistic cases that have washed ashore and diagnosis of entanglement has been made without any gear attached (SMASS, 2018). None of these reports have so far been detailed though interviews with fishers and therefore are in addition to those listed in Table 1.

## DISCUSSION

Feedback from fishers is highlighting the technical, policy and social challenges surrounding entanglement in small-scale fisheries, but also the willingness to address these issues. For example 88% and 84% of fishers interviewed through SEA have expressed an interest in participating in workshops and training events, and testing mitigation measures that may reduce the risks of future marine animal entanglements in their gear respectively. This demonstrates the potential to develop practical, industry led solutions to the problem of entanglements in Scottish waters.

Although the conservation implications of entanglement for cetacean species here have yet to be fully assessed, consideration of entanglements is required for fisheries management and also for cumulative management considerations for other pressures in the region, within the range of each species. Once data collection is completed, these data will be analysed to assess the extent of the pressure from entanglement to inform next steps of this work. Entanglement is just one cause of human induced mortality for the minke whale population. Other lethal impacts include ship strikes and commercial whaling and all of these need to be taken into consideration when considering population level impacts. The interviews conducted in this study have revealed a much higher rate of minke whale entanglement than previously reported. These reports have also come from interviews representing less than 10% of the creel fishing effort, suggesting that the true entanglement rate is much higher.

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