



The Scottish Entanglement Alliance: A collaborative search for solutions

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Alistair Philp¹, Ellie MacLennan², Andrew Brownlow², Fiona Read³, Lauren Hartny-Mills⁴, Sarah J. Dolman³, Kirstie Dearing⁵ and Dan Jarvis⁶

1. Scottish Creel Fishermen's Federation, Kyle of Lochalsh, Rosshire, IV40 8EQ, 2. Scottish Marine Animal Stranding Scheme, School of Biodiversity, One Health and Veterinary Medicine, University of Glasgow, Scotland, G61 1QH, 3. Whale and Dolphin Conservation, Brookfield House, 38 St. Paul Street, Chippenham, Wiltshire SN15 1LJ, 4. Hebridean Whale and Dolphin Trust, 28 Main St, Tobermory, Isle of Mull, Scotland PA75 6NQ, 5. NatureScot, Battleby House, Redgorton, Perth PH1 3EW, 6. British Divers Marine Life Rescue, Lime House, Regency Close, Uckfield TN22 1DS

Contact: e.maclennan.1@research.gla.ac.uk



Background and aims

Entanglement of marine wildlife is a global issue that has conservation, welfare, economic and human safety implications. We define entanglement as 'wraps of line, netting or other materials around body areas (which may include cases in which animals are towing gear or anchored by gear) from which the animal cannot escape and which subsequently causes harm'. Around Scotland a diverse array of marine wildlife including cetaceans, basking sharks and turtles inhabit inshore waters, which also provide valuable fishing grounds for static and mobile fishers. However with thousands of miles of rope and netting associated with these fisheries deployed in the water at any given time, the incidence, rate and range of species impacted by entanglement has been increasing in recent years. In a bid to address this the Scottish Entanglement Alliance (SEA) was established in 2018 following an industry led request for help in understanding the extent, scale and impact of marine animal entanglements in Scotland's creel fisheries. The aims of SEA are to (1) assess the socio-economic, welfare and conservation impacts of entanglements; (2) raise awareness of entanglements amongst fishers and other marine users; (3) improve reporting rates of marine animal entanglements; and (4) encourage fishers to become involved in entanglement research and in developing and trialling best practise protocols and mitigation efforts.

Project methods and findings

Distribution, trends, & welfare impacts of entanglement

(Led by the SMASS)

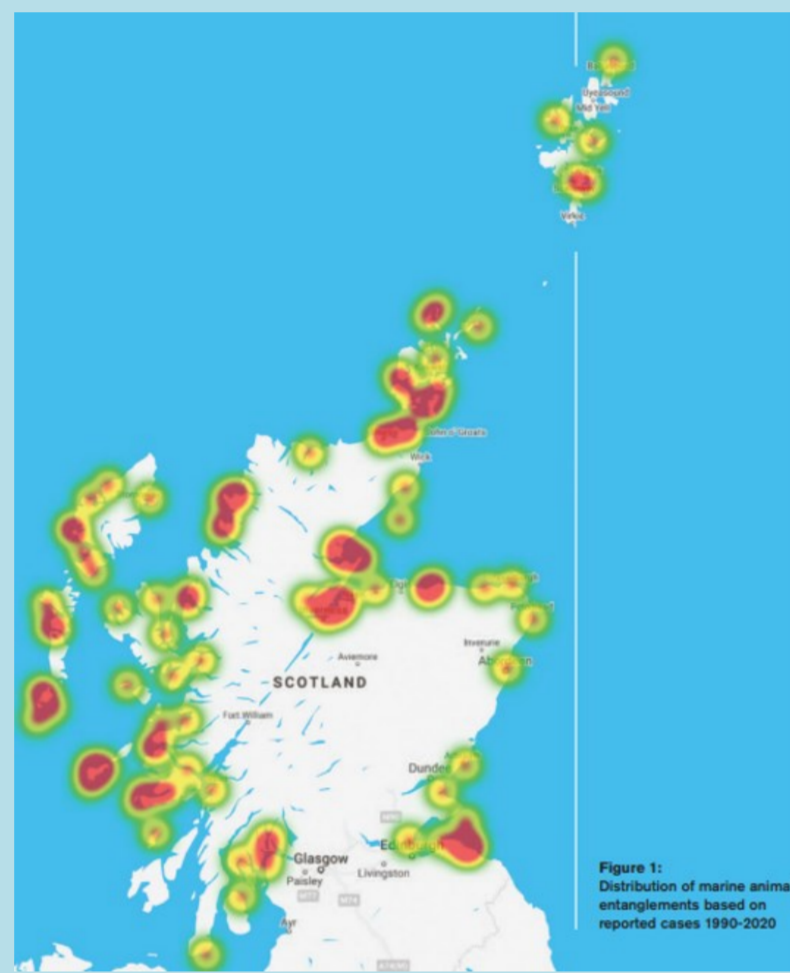
Entanglement reports around the Scottish coast remain rare (c.100) but have increased in recent years. Entanglements occur in all regions (Figure 1) and show some seasonality by species.

An analysis of assumed welfare harm caused by entanglement based on lesion severity, extent and duration conducted on 39 cetacean entanglement cases recorded between 2015-2019 showed:

- 29 (74%) animals were acutely entangled, including 88% of minke whales.
- 5 (13%) animals were chronically entangled, including 75% of humpback whales.
- 5 (13%) animals endured a two-stage entanglement.

Where animals become entangled, both in the gear and on their bodies varied by species:

- Minke whales were more commonly entangled by the tail (64%) whereas humpback whales were more often entangled around the body and/or pectoral fins (75%).



Top photo: A Sowerby's beaked whale chronically entangled in fishing twine.
Bottom photo: Linear abrasions on the tail of an acutely entangled minke whale.

Entanglement survivors

(Led by HWDT)

The prevalence of entanglement related scars in live minke whales off the west coast of Scotland was assessed using photo-ID records of 256 individuals collected between 1990 and 2017.

Photographs were analysed for evidence of scarring from interaction with ropes, strapping and other gear associated with fishing.

In total, 22.3% (n = 57) of the individuals assessed had entanglement related marks.

The types of marks varied from those that had extensive tissue damage or deformation associated with entanglement, to less severe linear scars or wounds that wrapped around parts of the body, indicating they may have previously been entangled.



Photo: Minke whale (BW30 taken on 10/07/2010) with fish packing strap embedded round the upper rostrum. © HWDT.org.

Spatial distribution of entanglement risk

(Led by HWDT)

The distribution and density of minke whale sightings (Figure 2) and the density of vertical creel lines (Figure 3) recorded off the west coast of Scotland during 110,847 km of dedicated surveys conducted by the Hebridean Whale and Dolphin Trust (HWDT) were combined and analysed to identify the areas of greatest overlap.

691 minke whale sightings and 42,313 creel fleets were recorded. Areas of greatest co-occurrence of creels and whales, and therefore where interactions between the two that may result in an entanglement were considered most likely, included to the east of the Outer Isles, coastal waters around Skye and Raasay, and around the Small Isles. Some of these high-risk areas overlap with the recently-designated Sea of the Hebrides Nature Conservation Marine Protected Area for minke whales.

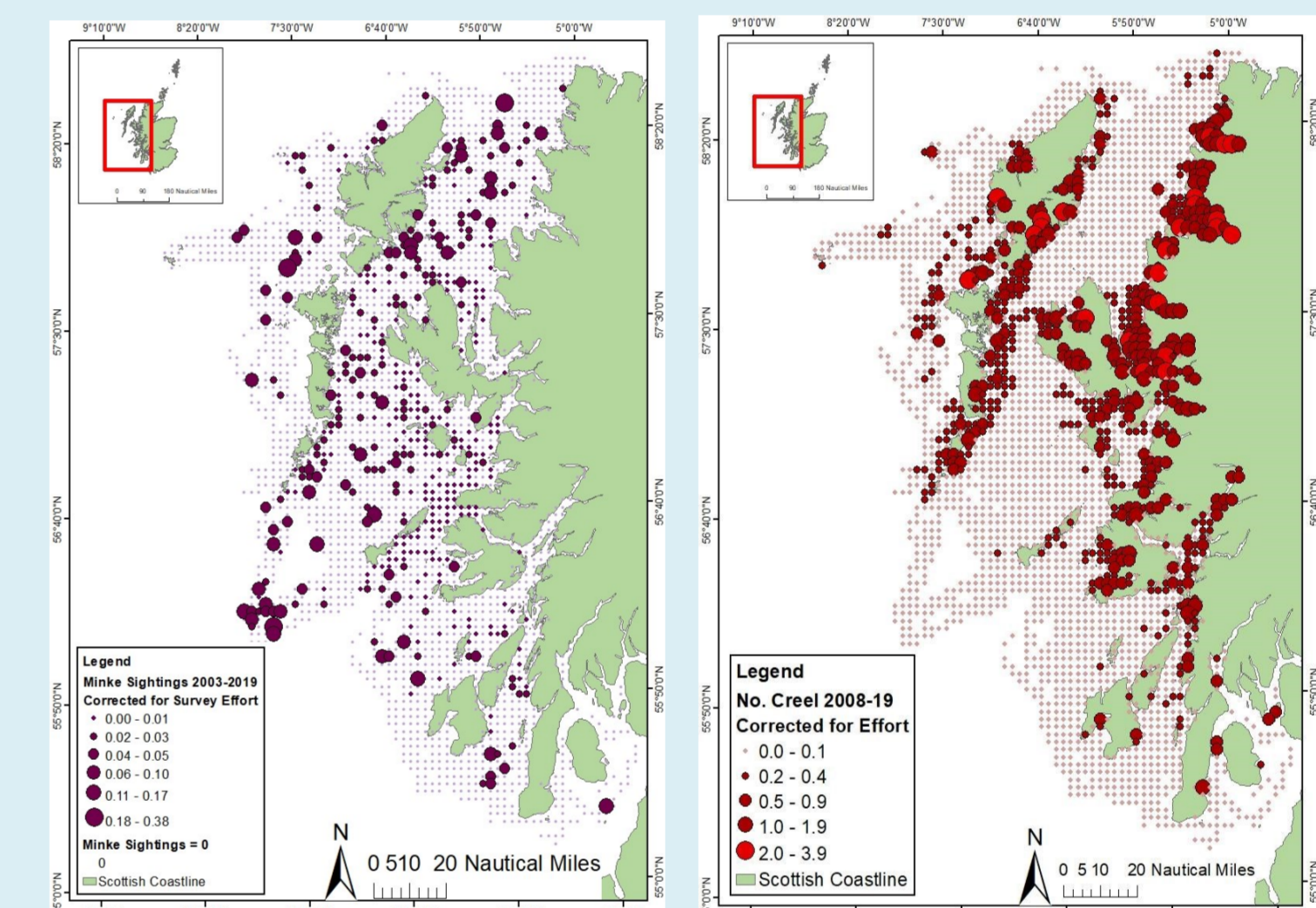


Figure 2: Minke whale sighting rates 2003 to 2019; and Figure 3: Creel sighting rates 2008-2019. Only cells where total visual survey effort conducted in sea state ≤ 3 was greater than 10 km were included.

Fisher knowledge and an industry perspective

(Led by SCFF and WDC)

159 commercial creel fishers were interviewed around Scotland between 2018 and 2019. Findings showed:

- Almost half (49%) reported experiencing at least one entanglement in the previous 10 years.
- In total 146 entanglements were recorded, involving at least 12 species of cetacean, shark and turtle (Table 1).
- Only three of these incidents were previously known about, suggesting significant under-reporting.
- Fishing depth, gear length, hauling frequency and target species appeared to influence entanglement risk.
- 27% of fishers experienced gear loss and/or damage as a result of entanglement incidents. The average loss of income per event was £240, with the highest reported as £2000.

Minke whale (<i>Balaenoptera acutorostrata</i>)	8/43	Fin whale (<i>Balaenoptera physalus</i>)	0/1
Basking shark (<i>Cetorhinus maximus</i>)	10/39	Killer whale (<i>Orcinus orca</i>)	2/0
Humpback whale (<i>Megaptera novaeangliae</i>)	8/3	Sei whale (<i>Balaenoptera borealis</i>)	1/0
Leatherback turtle (<i>Dermochelys coriacea</i>)	6/4	Porbeagle shark (<i>Lamna nasus</i>)	0/3
Pilot whale (<i>Globicephala melas</i>)	3/1	Harbour porpoise (<i>Phocoena phocoena</i>)	0/6
Risso's dolphin (<i>Grampus griseus</i>)	2/1	White-sided dolphin (<i>Lagenorhynchus acutus</i>)	0/1
Unidentified dolphin spp	3/1		

Table 1: Species and number reported entangled during fisher interviews (released live/found dead).

Over 80% of fishers interviewed suggested measures they felt might reduce the risk of entanglement, 20 fishers took part in a two-day disentanglement workshop, and 75% expressed willingness to test various mitigation measures. These included:

- Assessing the behaviour of floating groundline near the seabed and the feasibility, costs and other implications associated with a move toward negatively buoyant ropes where safe and practical;
- Trialling and refining technological advances in alternative fishing methods, e.g. on-call systems;
- Developing clear and enforceable creel density limits at regional and local levels;
- Continuing a programme of disentanglement training events specifically for fishers; and
- Inviting other fishing sectors that may also pose a bycatch and/or entanglement risk to participate in future work.



Photos (L - R): Risso's dolphin entangled in creel gear, successfully released alive; set-up of a typical creel fleet; Fishers undertaking disentanglement training; killer whales foraging near creel gear, Shetland.

What next?

- Recent publication in *Endangered Species Research* – 'Estimates of humpback and minke whale entanglement in the Scottish static pot (creel) fishery' (Leaper *et al.* 2022).
- 15 SCFF vessels on the west coast of Scotland are currently trialling the use of negatively buoyant rope to assess the efficacy of this within their fishery, funded by NatureScot's Nature Restoration Fund.
- SCFF are also working with students at Heriot Watt University to develop a prototype acoustic release device and accompanying digital gear marking app, as a possible mitigation for entanglement in vertical lines.
- PhD research – 'Understanding the scale, impact and potential mitigation of marine animal entanglement in the Scottish static gear fishery'. This research includes chapters on entanglement risk, fisher behaviours, and the use of post-mortem pathology to assess chronic entanglements (Ellie MacLennan, University of Glasgow 2020 – 2025).
- A Defra-funded welfare project to develop a working standard for the welfare assessment of by-caught and entangled cetaceans is also currently underway (2022 – 2024).

For more information please visit www.scottishentanglement.org

