



World Animal Protection  
Commissioned Report



# Ghost gear in Cornwall, UK

## 2014 to 2015

## Appendices

Sue Sayer and Kate Williams



Juvenile grey seal entangled in ghost fishing gear on 25/04/15 (rescued by BDMLR) *Photo: S Sayer*

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## Appendix A

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### Boat based survey protocol

#### In the field

During each boat survey transect all personnel acted as spotters. Once ghost gear was thought to be present the lead surveyor (Sue Sayer) was alerted and the items were described mostly by locational position relative to horizon or shoreline landmarks and colour. They were then identified, quantified and photographed, whilst the ghost gear recorder (Mike Taylor or Sarah Millward) confirmed these assessments and recorded the items as agreed.

Overlapping photographs were taken of all beaches and cliff back foreshores, inlets and zawns using a Nikon D810 SLR with a Nikkor 300mm f2.8 lens with a 2 times convertor. F8 aperture settings and a focus midpoint up a stretch of shoreline resulted in the best focused images, which were taken using a minimum shutter speed of 1/1000 (and variable automatic ISO) to combat the issue of taking the images from a moving platform. For coastal stretches, all photos were taken systematically from left to right. For very long sections of beach, panoramas were taken in sections (usually between two and four). Each section was photographed with left to right overlapping images once the boat had arrived at a central position relative to identified reference end points for that section. This ensured that all photos were taken from the optimum distance and position to enable ghost gear to be identified. For offshore islands it was necessary to take images systematically from top left to top right, drop down to an overlapping section and repeat this process taking left to right overlapping images until the entire island had been covered. For shady north facing slopes, photos were underexposed by 0.3 or 0.7 of a stop to ensure that detail wasn't lost and could be lightened using digital enhancements.

#### In the office

Once back in the office, images were down loaded for examination. For each survey up to around 3000 photographs were taken and as each photo was between 20 to 25MB a high powered computer with considerable image processing power was required.

As soon as practically possible after the survey, all the photos were examined by the photographer to maximize the benefit of personal survey memory. Photos were viewed in MS Windows Photo Viewer as this straightforward package was found to be the most appropriate for the exact needs of analyzing thousands of photos for ghost gear. The software allowed each photo to be viewed zoomed out when the 'next' arrow was clicked, which made zooming into the relevant parts for ghost gear much quicker and easier using a mouse roller button. Once zoomed in, photographs were scanned from side to side before being moved up/down and repeating the side to side scan until all of the image had been viewed using a zig zag motion.

Once ghost gear had been identified in a photo, the image was saved to a new 'ghost gear' folder and subfolders named according to location. Once all relevant photos had been saved in this way the recording of ghost gear data began. The photos from each location were analysed together, sometimes using MS Image Composite Editor to stitch numerous overlapping photos into one high resolution image avoiding duplicate recording. Even without photo stitching, having all the photos from one location stored within a single folder allowed for relatively easy comparison (for example of a shag's nest with chafe gear) thereby avoiding duplication. Each different item was added to the form shown on page 9 and cross referenced to the records made in the field (for which the criteria of colour and size proved critical). Considerably more items of ghost gear were recorded using photographs than had been seen and identified in the field.

All ghost gear records were verified from photos by the central data manager on entry into the spreadsheet to ascertain if the ghost gear items were new or if they have been recorded on previous surveys.

## Appendix B

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Office based data recording methodology.

### Boat survey records

Boat survey records arrived with completed scanned survey forms but these were still reviewed by the data manager to check: the photo was present, the estimate of size was reasonable and the type was correct. Again a search was done across existing records for matches and repeat records were flagged. This was particularly difficult for records of ghost gear in bird's nests as the look of the nests changed from month to month but all the nests in any one location were assessed together to see if there appeared to be more or less ghost gear than on the previous survey. Once the nesting season was over, the nests were assumed to have been abandoned and no more gear had been added to them.

### Land based records

Land based records were mostly received by the data manager from volunteer recorders by email and usually arrived with photographs of the ghost gear. The photographs were examined and a recording form (page 9) was completed on behalf of the volunteer. The recording form was returned to the volunteer for checking with questions about location, size and removal as required. If any additional information was received, the record was updated.

As records arrived, a search was done across existing records for matches and repeat records were flagged so that they would only be included once in the year total. Repeat records were kept for reference.

### New records

New records were then added to a monthly spreadsheet: sizes were converted to volumes in litres; an area code, latitude and longitude were added for each location; the interaction and entanglement codes were added if this had not been done at the recording form stage.

Photos together with a copy of the email message received and any further correspondence were filed by date (yyyymmdd), location, recorder's name/boat survey name.

### Volume

It was very important that the size of reported ghost gear was reviewed by one person (the data manager) to give a consistency to the reporting as people's perception of size was quite variable. It was also important that recorders were contacted if there was any doubt about the size. Photographing ghost gear, whilst being helpful on assessing size, was by no means foolproof as the size was easily distorted by foreshortening. However, having this task done by one person did mean that the volumes stated would be evenly understated or overstated based on the data manager's perception of size.

The data manager also reviewed the size to volume conversion table during the year; the details of this are contained in appendix C.

### Data grouping for reporting

Although the data includes a detailed description of the location the ghost gear was found, for reporting purposes sites that were close to one another were grouped into standardised sites as this enabled the production of clearer maps.

The data was stored in monthly tables but combined into seasonal quarters and full year sheets for reporting purposes.

## Appendix C

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### Review of volume conversion table

Reporting the size of an object was always going to be difficult, volunteers had no means of measuring weight and were not going to be able to remove much of the reported ghost gear because either it was on an inaccessible beach being monitored for seal activity or it was being recorded from a boat survey. It was decided to use a size comparison method, comparing objects to body size with a review by a single data manager for consistency. A volume table was prepared.

During the recording period the volume table was reviewed twice. It was originally created by reference to various discussion topics on the internet and some trial and error comparing body parts to known measuring utensils (e.g. jugs, buckets, bath).

For the first review, Kath Wherry (a volunteer) arrived with a selection of ghost gear collected during a beach clean. The items available for measuring were not bulky but it gave a good opportunity to test the volume table. All the items were spread out and separated into gear of the same type. The size of these items was assessed by eye and recorded by comparison to body parts. The items were then placed into measuring jugs and buckets for comparison. In total, the assessed volume was approximately 27% overstated compared to the actual measurements. The volume table and all previously recorded ghost gear items were revised accordingly for the smaller volumes.

For the second review all body parts used were measured on two people of different sizes (man and woman) and an average taken. The average measurements were converted to volume by reference to standard shapes: sphere; cylinder; box; for which mathematical formulae for volume were known. The new calculations indicated that the volumes in the original table were probably overstated for the smaller items but understated for the larger items.

A final volume conversion table in litres was created on the experience gained from the two reviews and all records amended accordingly.

Litres	Original Table	First Revision	Second Revision	Final Selection
Fist	0.5	0.3	0.3	0.3
Head	4	3.2	3.5	3.5
Arm	6	4	5	5
Leg	12	10	15	12
Torso	35	35	40	37
Person	80	80	85	80

Volunteers were also encouraged to visualise the items found in a litre jug or a 10 litre bucket and report the size in litres where possible.

It was not unusual to use a multiple of one size, e.g. 2 x Head, or half sizes, e.g. half x torso for maximum accuracy.

For larger items that had been described by the recorder as car or van sized, the data manager would review the photo and record the size as multiples of person, e.g. 8 x Person. These larger items were usually trawl nets which could easily be overstated for size depending on whether the net is spread out or in a roll, please see two examples on the next page.

Large trawl net at Strangles Beach, near Crackington Haven, north coast of Cornwall. August 2015.

	
<p>As seen from the POLPIP boat survey on 12/8/15 originally described as van sized.</p>	<p>A closer look, photo Widemouth Task Force 19/8/15</p>
	<p>Bundled up for removal, photo Widemouth Task Force 29/8/15 – records were amended to 2 x person</p>
	<p>The actual net was : 20m x 8m. It weighed 20kg. Mesh was 9cm. Photos by Bev Sowerby 29/8/15</p>

Large trawl net at Widemouth Bay 21/6/15 – reported and photographed by Lynda Bolding.

	
<p>A large heavy net (recorded as 6 x person)</p>	<p>The same net unrolled by the lifeguards before removal – it looked HUGE.</p>

Figure 40: Examples of the issues involved in quantifying the volume of ghost gear in the field

## Appendix D

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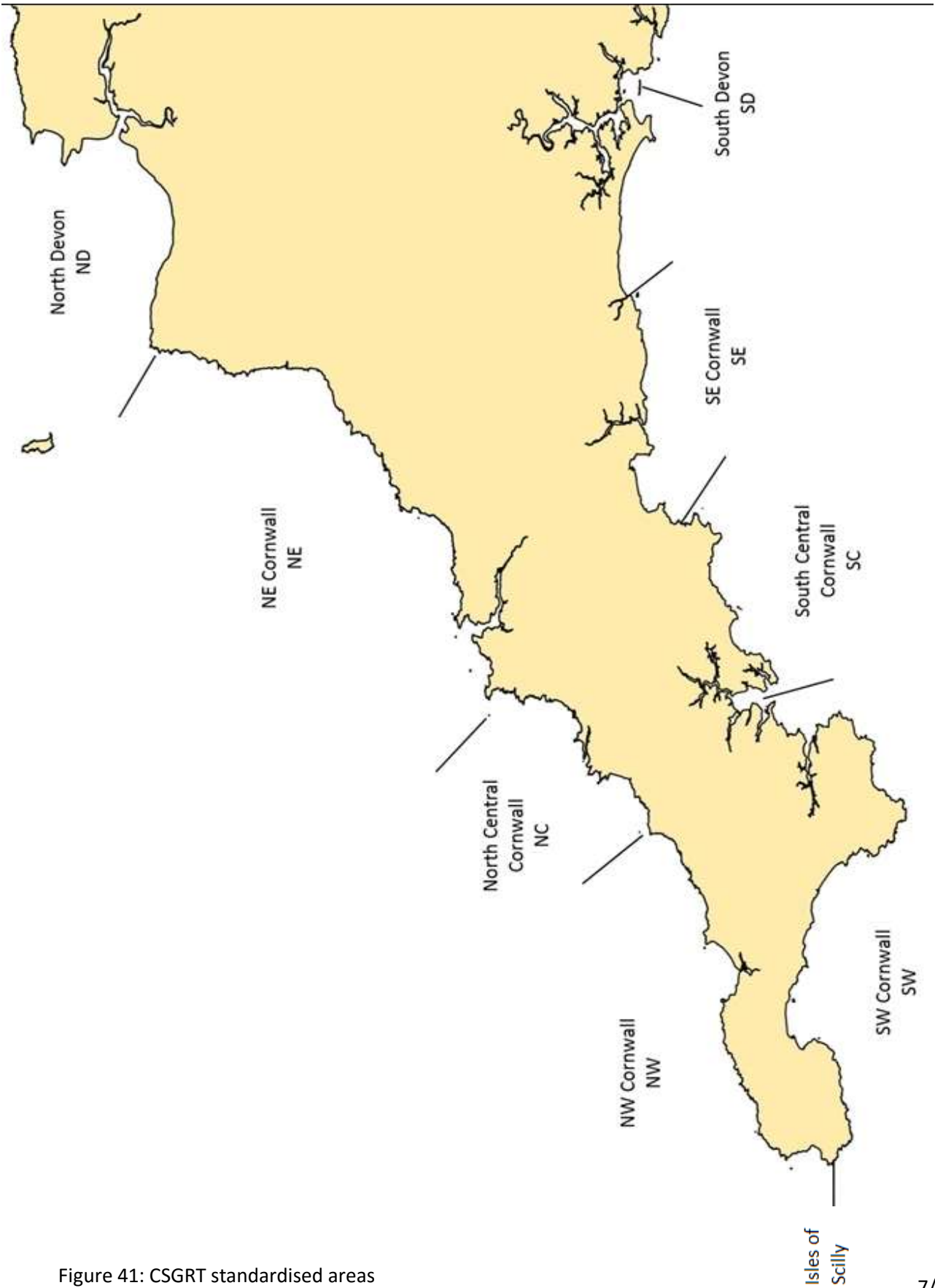


Figure 41: CSGRT standardised areas

## Appendix E

Seasonal land based spatial distribution of ghost gear reported by number of items per visit (green) and volume per visit (blue) quarter 1 winter, quarter 2 spring, quarter 3 summer and quarter 4 is autumn.

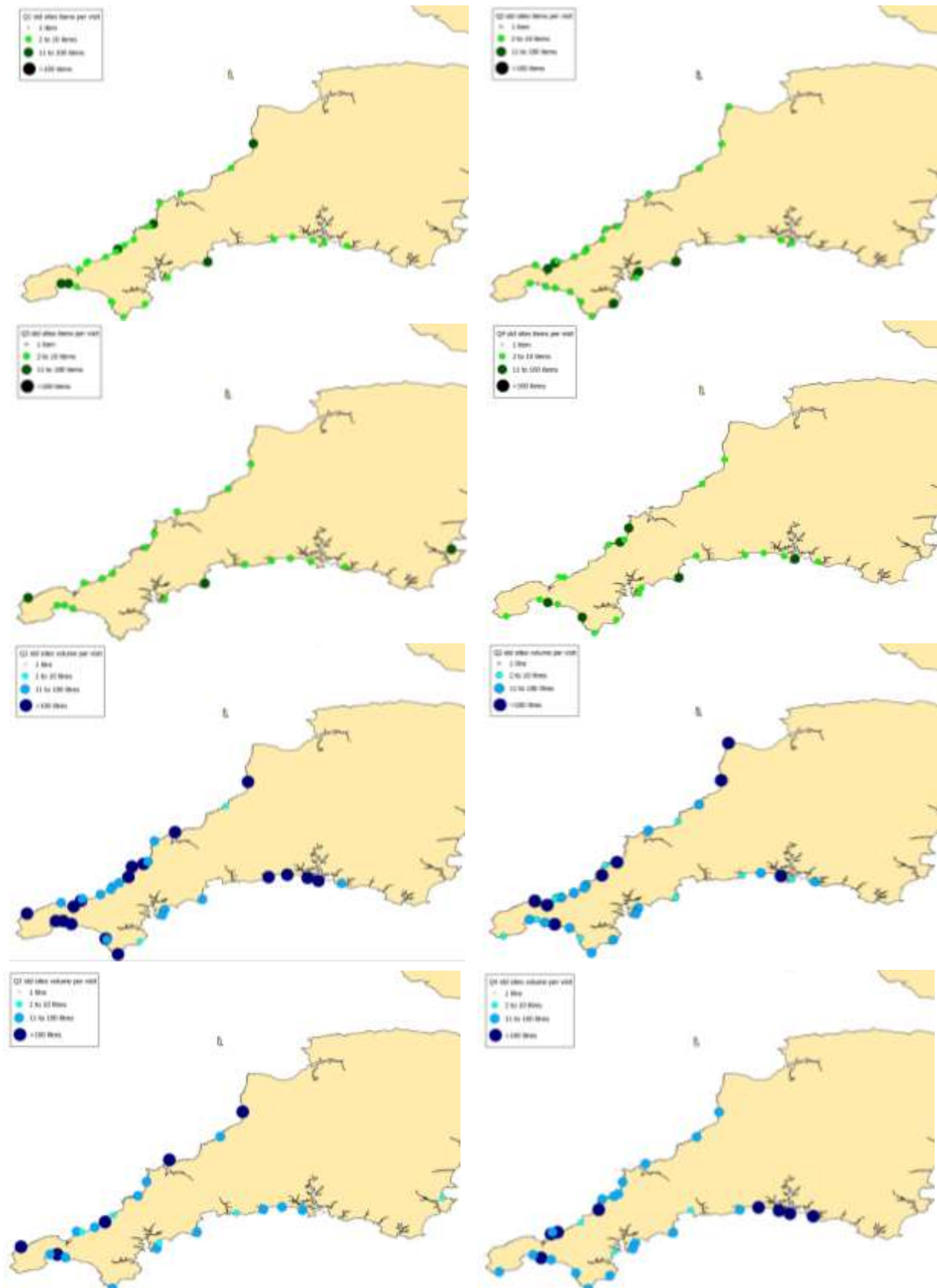


Figure 42: Distribution of land based ghost gear by season



## Appendix F

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### The role of ghost gear in the entanglement of seals

A 'witnessed' dead and decomposing entangled grey seal was photographed by Liz Clark at Booby's Bay on the north coast of Cornwall on 11/01/15 (figure 43). This adult female seal had been entangled in trawl net for an unknown amount of time and CSGRT has not been able to identify her from ID catalogues. These photos provide a 'missing link' between a live entangled seal and a headless corpse with a clean cut wound. It has been thought for some time that headless seal corpses with clean cut neck wounds were likely to have been previously entangled seals and this case study appeared to support that theory. Monofilament net, which formed the majority (72%) of visible material entangling seals (Sayer, 2015) would likely make an even cleaner cut wound.

A similar dead entangled adult male seal was reported in 2013 (figure 43) with a comparable pattern of neck decomposition and a clean cut wound – this animal was found dead in less than 128 days of becoming entangled (Sayer, 2015). From these two case studies it seems that decomposition occurred most around the site of the entanglement and that the neck then became stretched and extended. Presumably this formed a weak point. With a heavy skull the head would sink and be moved backwards and forwards with wave action. Ultimately it is thought that the head would fall off leaving a headless corpse. This is another cause of apparently clean cut wounds in seals.



Figure 43 Ghost gear - witnessed interaction and entanglement for grey seals (left 2015; right 2013)

## Appendix G

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Sandy's story – a female grey seal live stranded in Cornwall

Sandy and CSGRT

Sandy was first identified from a photograph taken by Vic Hall at the North Cornwall haul outs on 04/11/13 when she appeared to be at least two years old (from her size compared to other seals on the beach.) She was already severely entangled, possibly from a very young age, but it could not be determined if she had any entangling material still present due to the distances involved for taking photos at this site.



Figure 44: Live sub adult female grey seal on Hayle

Sandy and BDMLR

Sandy survived her severe entanglement injury for another 16 months before she travelled to West Cornwall. By this time she had lost her entanglement and was in moderate body condition at the age at least 3 and a half years old. Sandy was found by members of the public on 23/02/15 barely alive lying on Hayle Beach in an unresponsive and hypothermic state. They called the Cornish Seal Sanctuary (CSS) who alerted British Divers Marine Life Rescue. Dave Jarvis attended and found a young sub adult female grey seal buried in wind blown sand. He called for back up medics and the CSS team with a large rescue cage. Whilst waiting for everyone to arrive, five medics stood as a windbreak for over an hour in the freezing cold, force 6 north westerly, to keep the blasting sand from piling up against Sandy and going into her eyes, nose and mouth. Sandy was removed from the beach by a team of eight to St Ives Bay holiday park.

Sandy and CSS

Sandy was moved to the Cornish Sea Sanctuary at Gweek where she was assessed by vet Paul Riley. It was decided to give Sandy a chance of recovery. With the considerable care of the animal care team led by Jenny Lewis, Sandy survived her first night at Gweek and appeared to be making some progress. She was found dead on her second morning there (26-27/02/15). She had died within 48 hours of rescue.

Sandy and the Environment and Sustainability Institute at Exeter University

James Barnett (veterinary pathologist for the Cetacean Strandings Investigation Programme at Exeter University, Penryn Campus) post mortemed Sandy on 27/02/15 assisted by Kelly Astley, Dan Jarvis and Sue Sayer. At this time, Sandy had

- A moderate body condition
- A 100% linear encircling scar around her neck that was thickened skin under her neck, and a constriction from shoulder to shoulder about 1cm deep at the sides and 3cm deep at the back of her neck. The scar tissue at the back of her neck extended a further 2cm into her healed blubber
- Probably previously been entangled in monofilament fishing gear
- Extensive emphysema over her right thoracic wall, around her heart and around and inside her lungs
- An apparently enlarged and thin right side to her heart
- Congested lungs, lymph nodes and adrenal glands
- At least three types of parasites – 2 types of worm and nasal mites

The precise cause of the gross changes seen on post mortem was inconclusive.

Sandy was one of over 260 entangled grey seals suffering as a result of entanglement in lost fishing gear in Cornwall. She was one of the many unlucky ones for whom entanglement contributed to a premature death.

## Appendix H

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Dissemination the ghost gear research findings:

Presentations about the interim results of this research have been presented at:

- The South West Marine Ecosystems Conference at Plymouth Marine Laboratory, Plymouth (April 2015)
- The Marine Ecology Conservation Network at the Centre for Ecology and Conservation of the University of Exeter, Penryn (23/06/15)
- Cornwall Wildlife Trust's Marine Stranding Network Forum at Truro College, Truro (17/10/15)
- Cornwall Seal Group's monthly meetings at the Inn for All Seasons in Redruth (first Wednesday of every month).

Information about this research has been shared in discussions at the following events:

- Marine Ecology Conservation Network's Plastics working group at the Maritime Museum, Falmouth (23/06/15)
- Global Ghost Gear Initiative launch at Goodenough College, London 10 and 11/09/15.

This project has successfully engaged people of all age groups.



*Photo by Mark Nason*



Authors Sue Sayer (inset) and Kate Williams removing ghost gear. *Photos R Allen (inset) and D Williams*