



Grey seal mortality in Cornwall - an insight from post mortem data

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Introduction

Grey seals (*Halichoerus grypus*) from around the coast of Cornwall, United Kingdom have been necropsied at the Animal Health and Veterinary Laboratories Agency (AHVLA), Truro since 1985. In 1990 these were incorporated into the UK Defra-funded Marine Mammal Strandings Programme (now the Cetacean Strandings Investigation Programme). Due to funding constraints, the number examined under the official programme was limited but with additional external funding (from the National Seal Sanctuary) and internal funding (from the Defra-funded AHVLA Diseases of Wildlife Scheme) seal necropsies continued until the present. Animals submitted included those that had died or were euthanased during rehabilitation or had died or were euthanased on the shoreline.

As seals were submitted from multiple sources and under different funding streams, necropsy details were not stored on a common database that could be interrogated for trends in causes of death against various parameters, such as is used for cetaceans submitted under the Cetacean Strandings Investigation Programme. Despite this, data from necropsies carried out at AHVLA Truro in the 1990s contributed to a larger data set considered in a publication on causes of wild grey seal mortality in England Wales (Baker and others 1998) and to publications on presenting conditions and survivorship in wild grey seal pups undergoing rehabilitation (Barnett and Westcott 1999, Barnett and others 2000).

The project

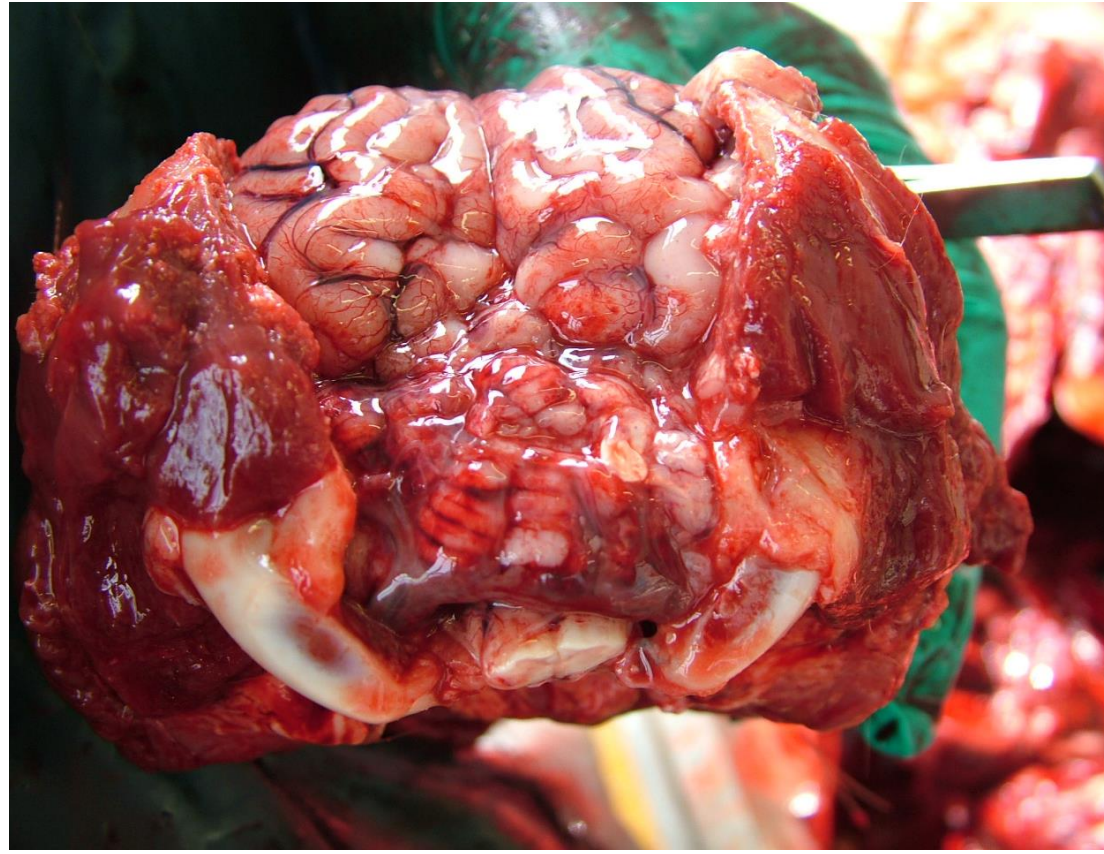
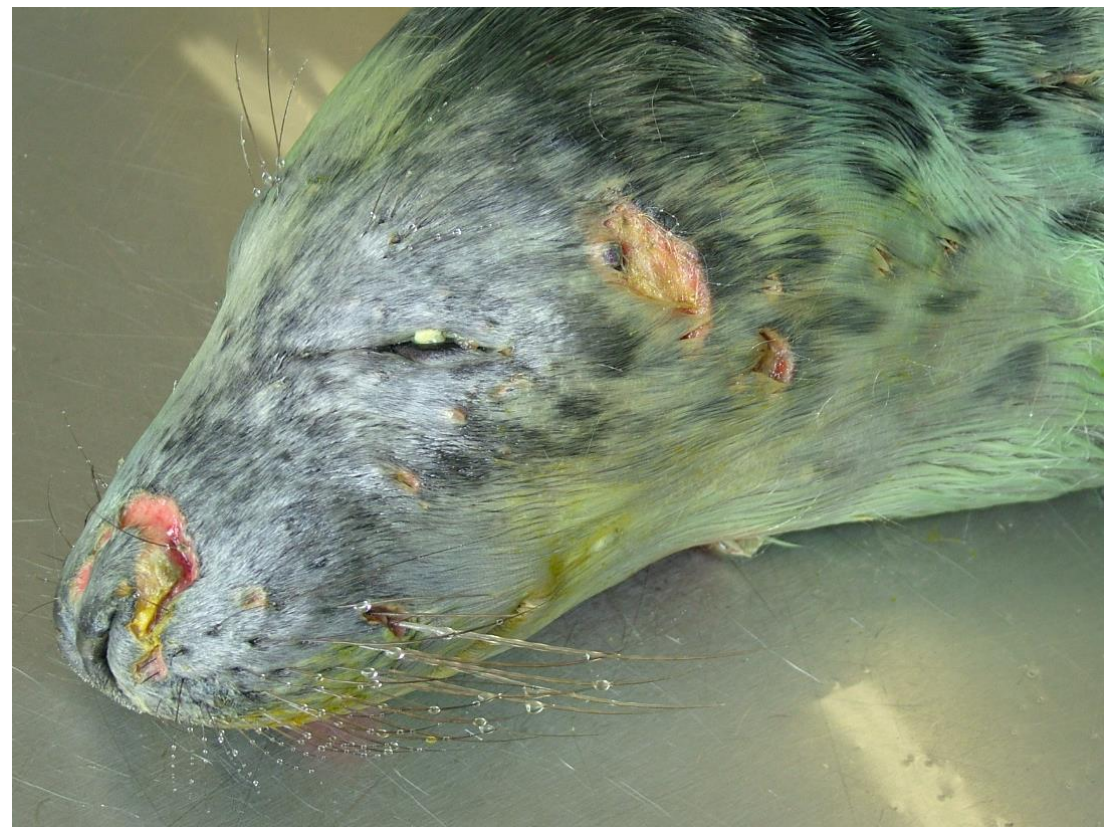
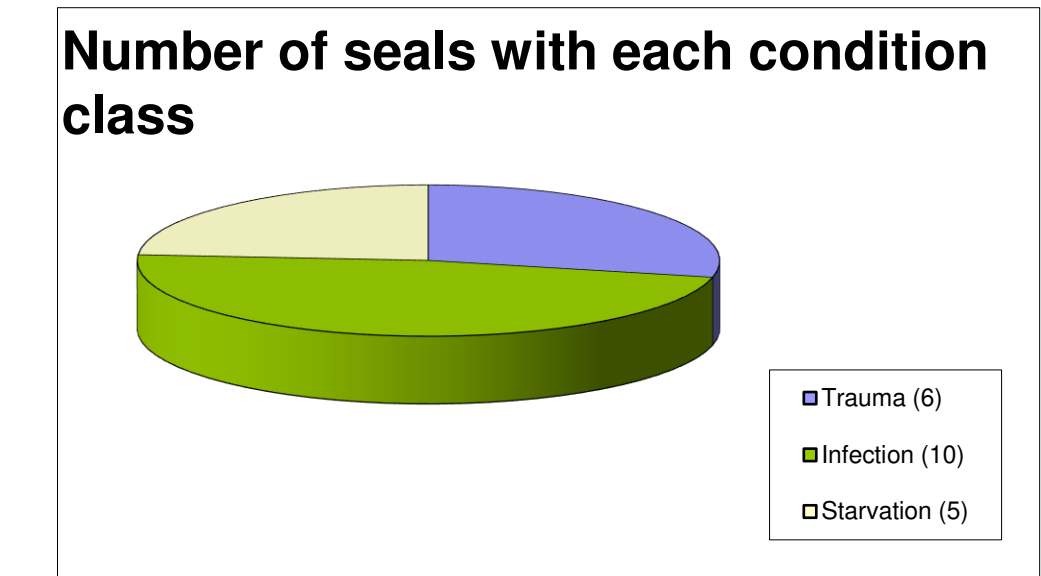
A study of grey seal necropsy reports from 1998 to 2011 was carried out to bring up to date the interrogation of grey seal necropsy data in Cornwall for information on wild grey seal mortality. In order to try and reflect only conditions likely to have led to death or extremis in seals that had been picked up in the wild, the criteria for inclusion of seals in the study was:

- found dead or euthanased in extremis on the coast
- died or euthanased in extremis in the first week of rehabilitation

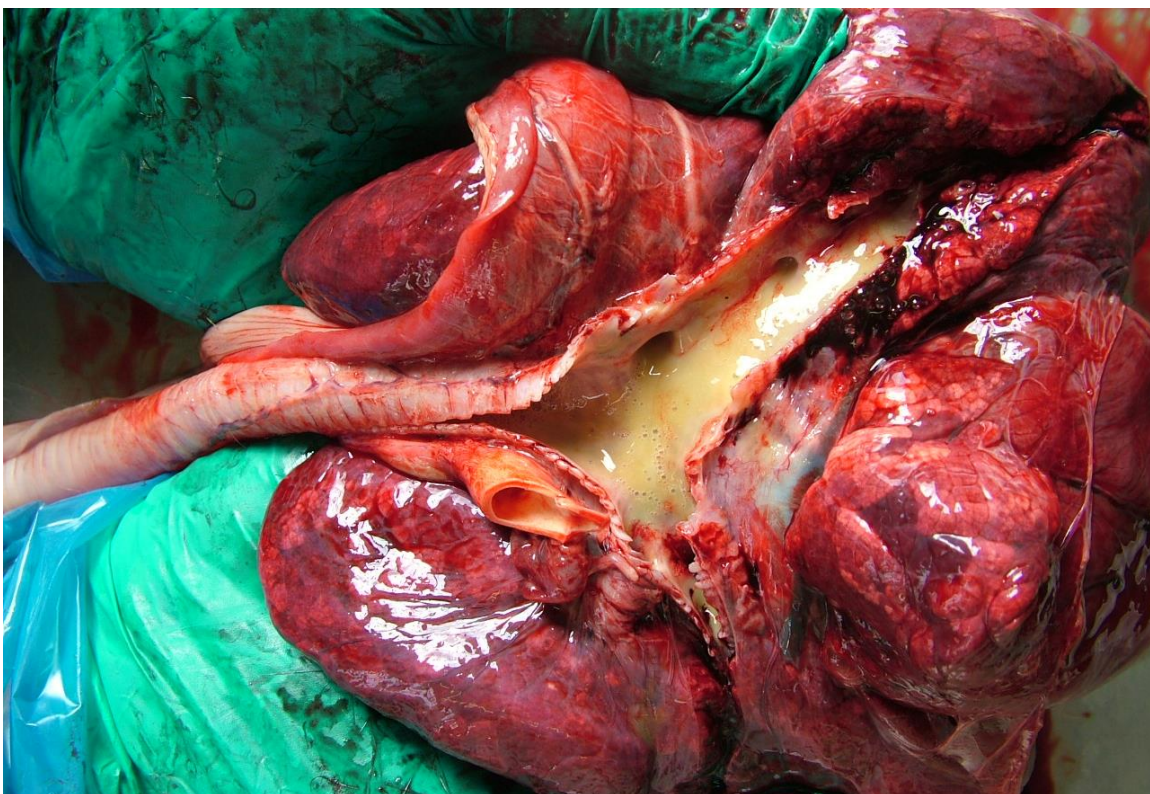
Conditions considered likely to have contributed to death or the need for euthanasia were extracted from reports.

46 seals qualified for inclusion in the study. On the basis of coat (lanugo vs. adult pelage) and length, the animals were split into different age classes: unweaned pups, juveniles and adults. All seal pups were subjected to gross pathological examination and, where considered necessary, further investigation primarily through bacteriology was employed. Due to funding limitations, histopathology was only used in a small number of necropsies (9 seals) and therefore the certainty of the diagnosis was unclear in cases where gross pathological lesions were more subtle.

Probable causes of death / extremis in 15 unweaned / midmoulted pups



Pathology contributing to death	No. of seals
Starvation ^{deh}	5
Septicaemia ^{ae fh}	4
Omphalitis ^{b fj}	3
Peritonitis ^{e j}	3
Encephalitis/meningitis ^{hi}	2
Fractured rib(s) ^{bg}	2
Infected open mandibular fracture ^{aj}	2
Pneumonia ^{ch}	2
Soft tissue infection ^{fi}	2
Septic arthritis	1
Fractured skull ^c	1
Intra-abdominal haemorrhage ^a	1
Extensive wounds ^k	1
Gastropathy ^d	1
Orchitis ^e	1
Panophthalmitis ^l	1



Results and discussion (1)

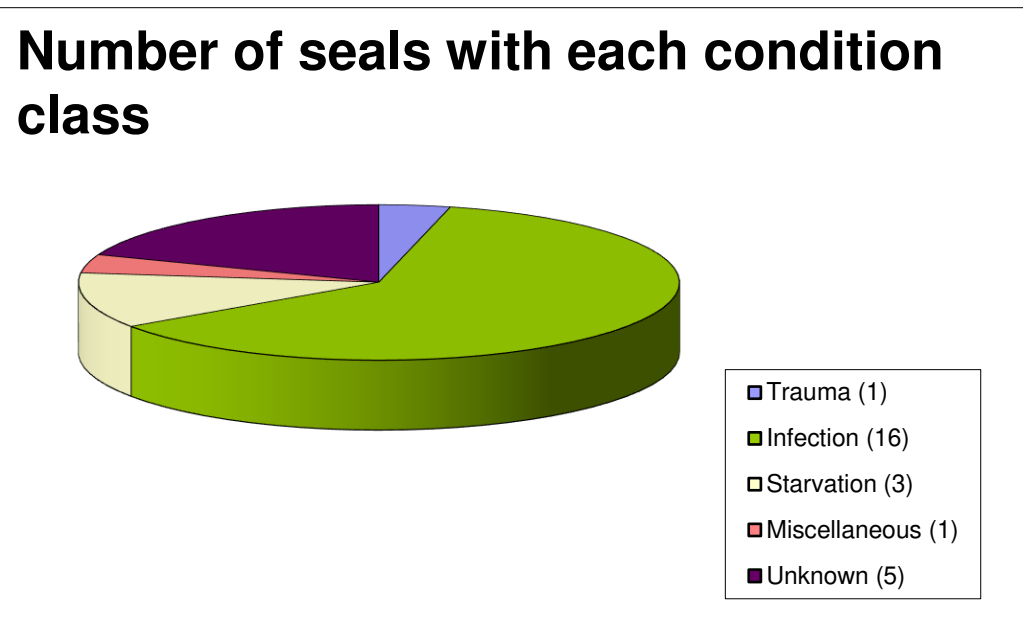
Half of the seals were assessed to have had more than one contributory condition leading to death or extremis.

Severe infectious conditions were reported in over half of the seals in each of the three age classes.

Conditions reported in 5 or more animals included septicaemia, peritonitis, pneumonia, (meningo)encephalitis, omphalitis, urogenital infections, soft tissue infections and arthritis/osteomyelitis. Pneumonia was associated with lungworm infestation (primarily *Otostrongylus circumlitis* but also in one case *Parafilaroides gymnuris*) and/or bacterial infections. Omphalitis, as expected, was observed only in younger seals, but the lack of other conditions in adults may well reflect only the small number received for necropsy, due to the logistics of removing large animals from the shore and the often advanced state of autolysis in which they were found.

Probable causes of death / extremisin 25 juveniles

Pathology contributing to death	No. of seals
Starvation ^{eh}	4
Peritonitis ^{c fg}	3
Septic arthritis/osteomyelitis ^{ah}	3
Septicaemia ^{gh}	3
Meningitis / encephalitis ^b	3
Pneumonia (parasitic/bacterial) ^b	3
Soft tissue infection ^{ah i}	3
Urogenital infection ^{ci}	3
Omphalitis (+/- urachitis) ^{d g}	2
Pyothorax ^d	1
Oesophageal abscess ^e	1
Endocarditis ^f	1
Pyloric impaction ^a	1
Blunt trauma (soft tissue/internal haemorrhages)	1
Head trauma (blubber haemorrhage)	1
Inconclusive	3



Results and discussion (2)

Severe traumatic injuries were encountered in relatively few animals. However, some conditions classified as infectious were highly likely to have been initiated by trauma, e.g. septic arthritis and soft tissue infections (cellulitis, subcutaneous abscessation) and other conditions, e.g. panophthalmitis, septicaemia and peritonitis also may have had a traumatic origin. Many grey seal pups submitted to AHVLA Truro show evidence of recent or partially healed wounds penetrating the skin, blubber and subcutis, suspected mostly to be bite wounds inflicted by other seals. Although often not associated with serious traumatic injury, a range of bacteria have been isolated from such wounds (Barnett and others 2000, Ayling and others 2011) and these are likely to act as a point of entry for musculoskeletal and potentially some systemic infections.

Starvation as a likely primary contributing factor to a seal's death or extremis was seen in a little over a quarter of the seals necropsied. Starvation may have been the direct cause of death or led to the seal succumbing to hypothermia associated with a reduced insulating blubber layer. Starvation was reported in two thirds of adults, although the significance of this in such a small sample size is unclear. One adult had a mass in the tracheal lumen, possibly originating from penetrating trauma or an inhaled foreign body, which may have led to exercise intolerance and dysphagia. Many seals with severe infections also were in poor nutritive state.

Conclusions

The laboratory is planning to provide a more detailed necropsy, reporting and sampling protocol for grey seals in the future and it is hoped that this initial study will provide a baseline against which data gathered from the new protocol can be compared.

Acknowledgements:

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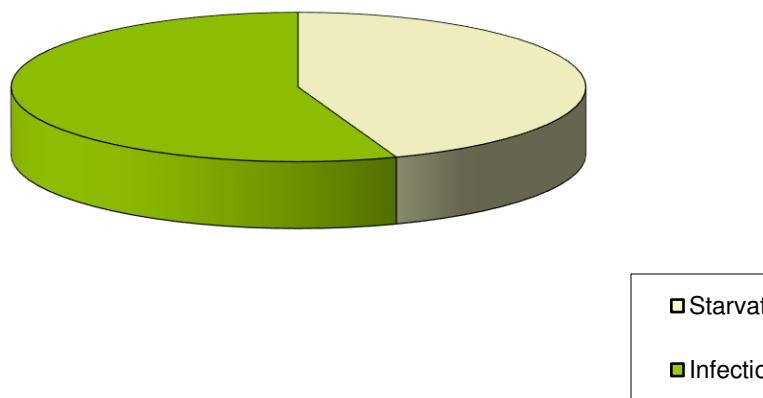
The authors would like to thank staff and volunteers of the National Seal Sanctuary, Cornwall Wildlife Trust Marine Strandings Network, British Divers Marine Life Rescue and Cornwall Seal Group for submission of carcasses. They would also like to thank AHVLA Truro staff for assistance with necropsies and bacteriology. Finally, they would like to thank all those who contributed photographs.



Bacterial isolates from infectious conditions

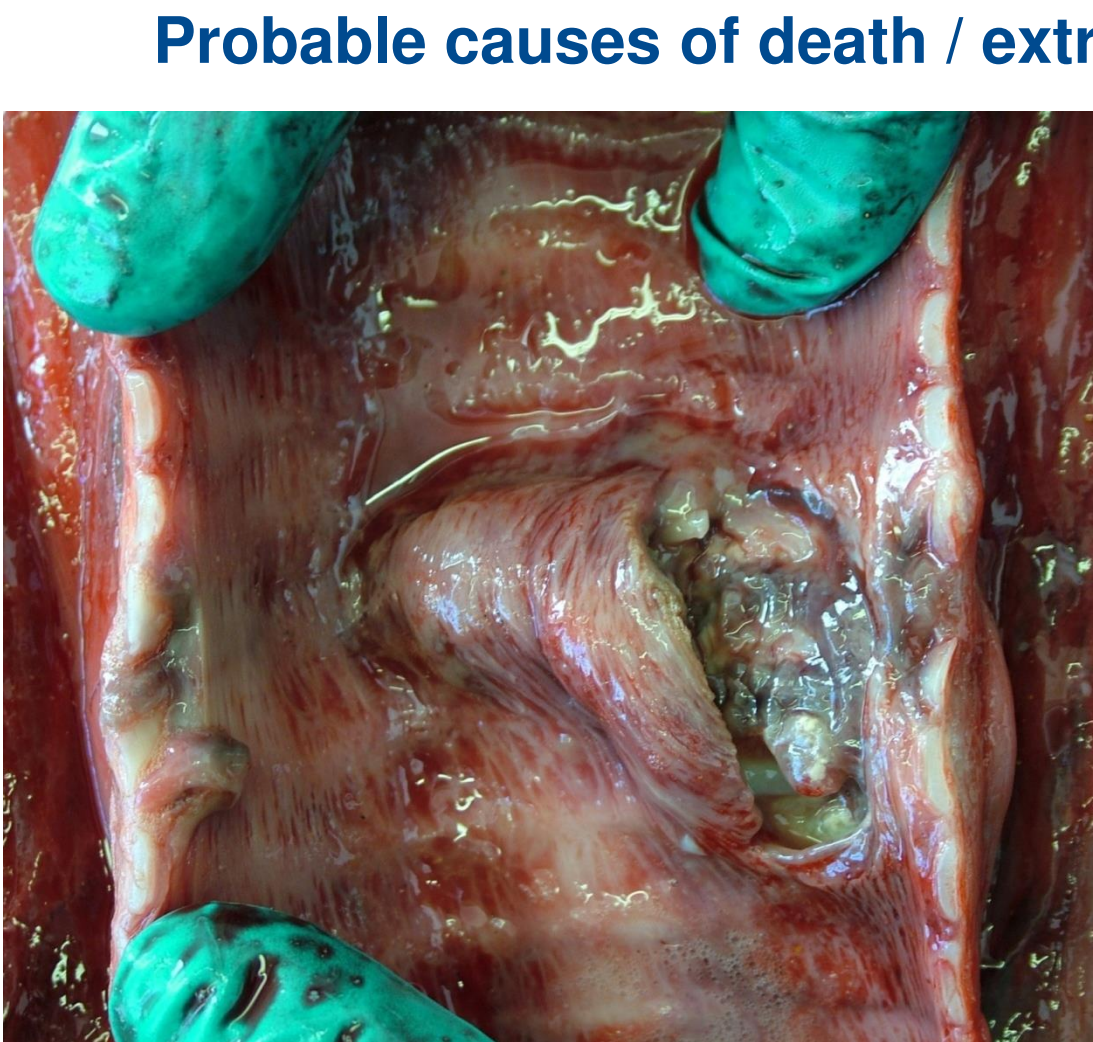
Streptococcus phocae
Arcanobacterium phocae
Edwarsiella hoshinae
Pasteurella multocida
Brucella pinnipedialis
Escherichia coli
Pseudomonas aeruginosa
Klebsiella pneumonia
Ganerella vaginalis
Citrobacter sp.
Bordetella sp.
Mycoplasma sp.
Corynebacterium sp.

Number of seals with each condition class



NOTE:

The same superscripts by conditions in the tables indicate conditions found in the same animal



Pathology contributing to death	No. of seals
Starvation ^{abcd}	4
Urogenital infection ^{bcd}	3
Rhinitis (<i>Halarachne halichoeri</i> mites) ^{ce}	2
Panophthalmitis ^{cd}	2
Pneumonia ^e	1
Tracheal mass ^a	1



References:

- Ayling, R.D, Bashiruddin, S., Davison, N.J., Foster, G., Dagleish, M.P. and Nicholas, R.A.J. (2011). The Occurrence of Mycoplasma phocicerebrale, Mycoplasma phocidae, and Mycoplasma phocirhinis in Grey and Common Seals (*Halichoerus grypus* and *Phoca vitulina*) in the United Kingdom. Journal of Wildlife Diseases, 47, 471-475.
- Baker, J.R., Jepson, P.D., Simpson, V.R. and Kuiken, T. (1998). Causes of mortality and non-fatal conditions among grey seals (*Halichoerus grypus*) found dead on the coasts of England, Wales and the Isle of Man. Veterinary Record 142, 595-601.
- Barnett, J. and Westcott, S. (2001). Distribution, demographics and survivorship of grey seal pups (*Halichoerus grypus*) rehabilitated in southwest England. Mammalia 65, 349-361.
- Barnett, J.E.F., Woodley, A.J., Hill, T.J., Turner, L. (2000). Conditions in grey seal pups (*Halichoerus grypus*) presented for rehabilitation.
- Hewer, H.R. (1964). The determination of age, sexual maturity, longevity and a life table in the grey seal (*Halichoerus grypus*). Proceedings of the Zoological Society of London 142, 593-623.