jamesbarnettvet@gmail.com

Analysis of causes of death in necropsied common dolphins in Cornwall, UK (2018-2022) illustrates the continued threat of bycatch for this species

James Barnett[a], Kelly Astley[ab], Rob Deaville[c], Padraig Queally[a], Felicity Whitehouse[a] and Mark Wessels[d]

[a] Cornwall Marine Pathology Team, Fishers Well, Higher Brill, Constantine, Falmouth, Cornwall TR11 5QG, United Kingdom
[b]Institute of Zoology, Zoological Society of London, Regents Park, London NW1 4RY, United Kingdom
[c]Cetacean Strandings Investigation Programme, Institute of Zoology, Zoological Society of London, Regents Park, London NW1 4RY, United Kingdom
[d]Finn Pathologists, One Eyed Lane, Weybread, Norfolk, IP22 5TT, United Kingdom

Introduction

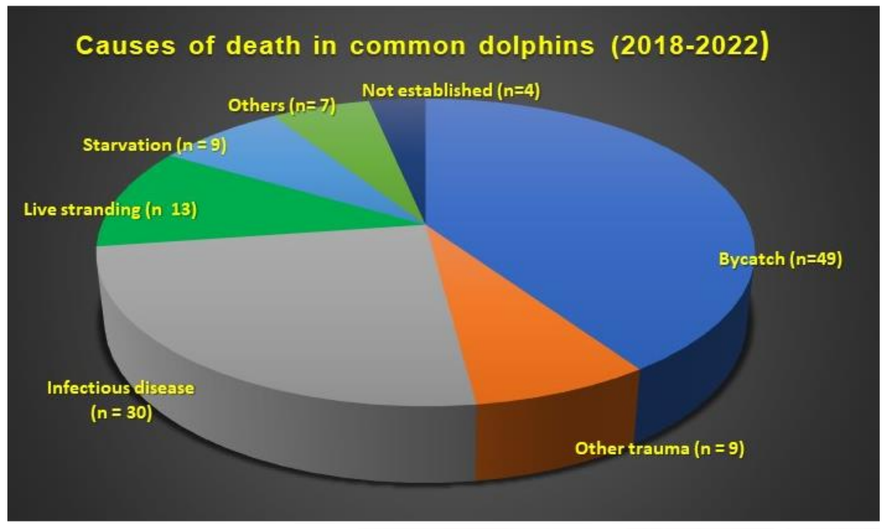
Between January 2018 and December 2022, 522 common dolphins (*Delphinus delphis*) were found stranded in Cornwall and reported to the Cornwall Wildlife Trust Marine Strandings Network. Of these, 121 individuals, consisting of 64 adults/subadults, 53 juveniles and four neonates, were necropsied using standard protocols (https://randd.defra.gov.uk/ProjectDetails?ProjectId=17835) as part of the Defra funded Cetacean Strandings Investigation Programme (CSIP).

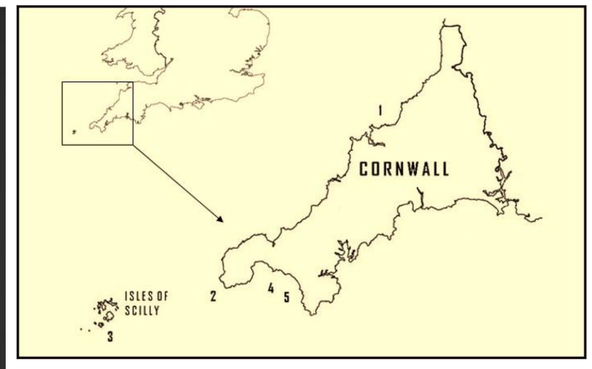
Bycatch

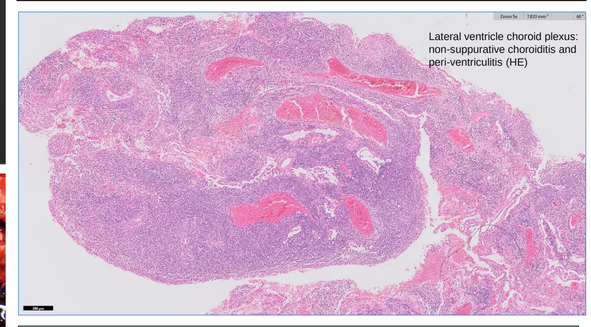
49 cases of bycatch were necropsied, of which 41 (84%) stranded on the south coast of the county. External lesions consistent with bycatch (Kuiken at al, 1994, Jepson et al, 2013) were seen particularly on the rostrum, melon, fins, tail stock and flukes. Lesion appearance was consistent with bycatch in monofilament netting associated with static nets (gillnets, tangle nets), multifilament netting associated with trawls and ring nets were also suspected to be implicated in some cases. In some cases, net was still attached to the animal. In one known live stranded animal, histopathological examination of monofilament net associated wounds indicated that they had occurred at least 6 to 8 hours prior to the animal's death, consistent with the animal live stranding within hours of being freed/coming free from a net.

Encircling monofilament net marks

Monofilament net fragment still attached



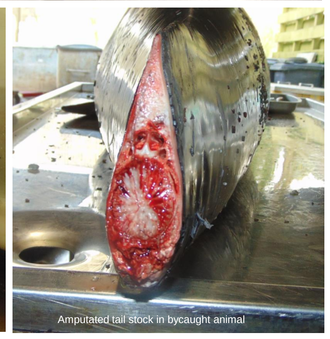




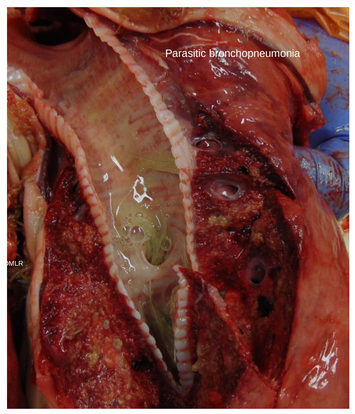
Lateral ventricle choroid plexus: non-suppurative choroiditis and peri-ventriculitis (HE)

Crossing multifilament net marks

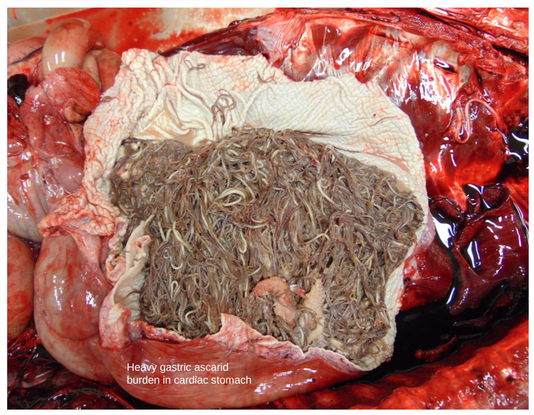
Encircling monofilament net marks



Amputated tail stock in bycaught animal



Parasitic bronchopneumonia



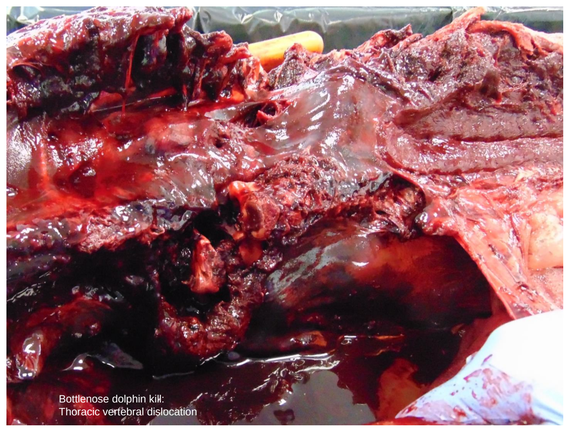
Heavy gastric ascarid burden in cardiac stomach

Infectious disease

Of the 30 cases of infectious disease, 12 were of parasitic and/or bacterial pneumonia. Lungworm seen were consistent with *Halocercus* species and bacteria isolated included *Actinobacillus delphinicola* and *Edwardsiella tarda*. The primary finding in five animals was heavy gastric ascarid (*Anisakis simplex*) parasitism and associated ulceration, and several other animals had significant burdens of gastric ascarids. One juvenile male had meningitis, choroiditis and periventriculitis strongly suspicious of *Brucella ceti* infection but this was not isolated (see photomicrograph above). Another juvenile male had died due to severe trauma but was clearly already debilitated and had a disseminated fungal infection which included the meninges and may have increased its susceptibility to e.g. boat strike. 17 (57%) of the cases of infectious disease were known to have live stranded or had pathology consistent with live stranding.

Other trauma

Of the nine cases of non bycatch related trauma, two had lesions consistent with bottlenose dolphin attack (Ross and Wilson, 1996). Bottlenose dolphin and common dolphin interactions have been previously reported (Barnett et al 2009) and one of the cases, an adult male weighing 107kg, was one of the largest animals killed by bottlenose dolphins to date in the UK, having suffered thoracic vertebral dislocation and multiple rib fractures. Two animals had lesions consistent with boat/ship strike (Costiditis et al, 2013). One juvenile male had propellor wounds over the thorax and abdomen, histopathology indicating that these occurred ante-mortem, and multiple net wounds that histopathology indicated had occurred post mortem. This suggested that the animal was killed by a propellor and was subsequently hauled in a net.



Bottlenose dolphin kill: Thoracic vertebral dislocation

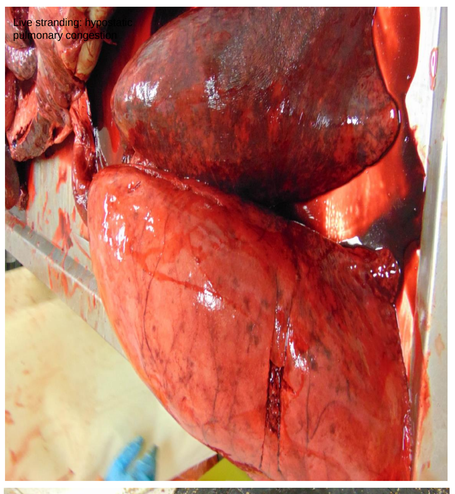
Bottlenose dolphin kill: rake marks on pectoral fin

Boat strike: propellor wounds

Live stranding

13 animals were judge to have died as a result of live stranding in good health and nutritional status (Jepson, 2005. Typical findings in such animals included fresh abrasions to the rostrum, head, fins and flukes, bruising along the ventral surfaces, hypostatic pulmonary congestion and beach material in the stomachs. In one mass stranding on the north coast of Cornwall in 2018, two adult females and a dependent calf stranded and died, with up to 12 other animals reported to have been refloated.

Live stranding: beach material in fundic stomach



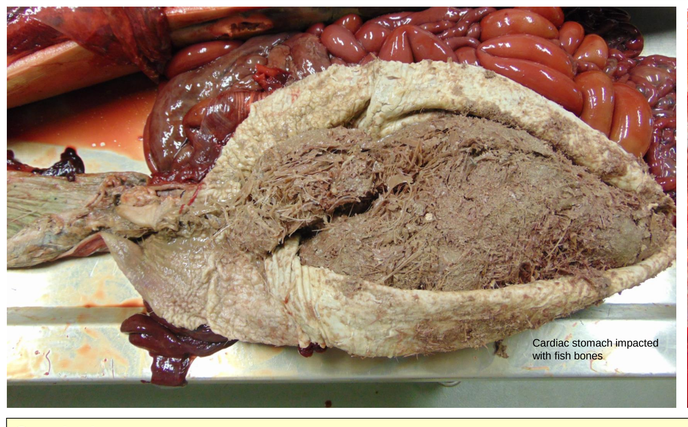
Live stranding: hypostatic pulmonary congestion

Starvation

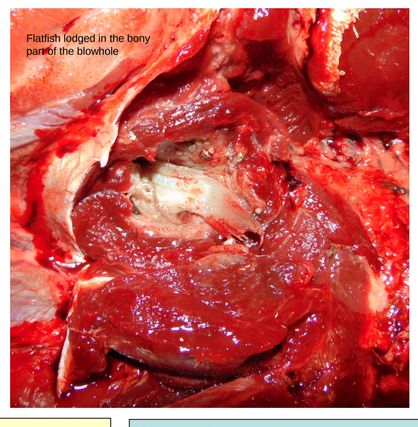
Nine animals were judged to have died as a result of starvation with no other significant disease processes that could explain their poor nutritional state (Jepson et al, 2005). Three were neonates and one of these had evidence of recent, potentially aggressive interaction with con specifics, with extensive fresh, rake marks with haemorrhage over the carcass. The calf had a vacuolar hepatopathy consistent with negative energy balance, showed no evidence of having suckled and had terminally live stranded.

Other causes of death

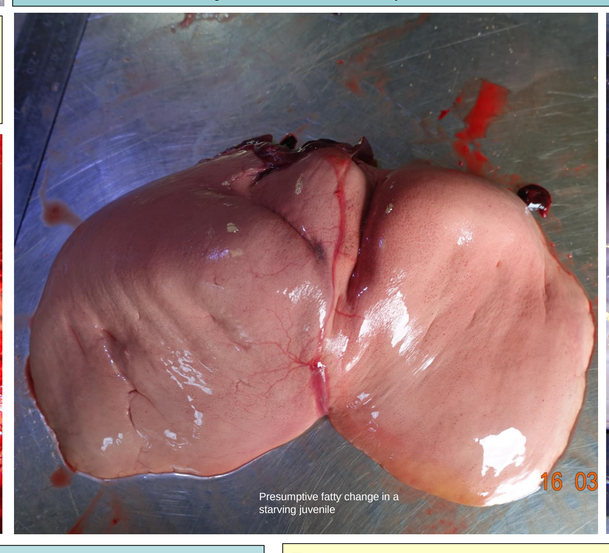
Seven animals could not be classified into a specific cause of death category. One of these, an adult female in poor body condition, had impaction of the cardiac stomach with 3.7kg of dry fish bones. Two other animals showed lesser degrees of gastric impaction and one of these, an adult male common dolphin, also had hepatic lesions consistent with gas bubble disease (Jepson et al, 2005). One subadult male asphyxiated after a small flatfish lodged in the bony part of the blowhole after dislocation of the larynx.



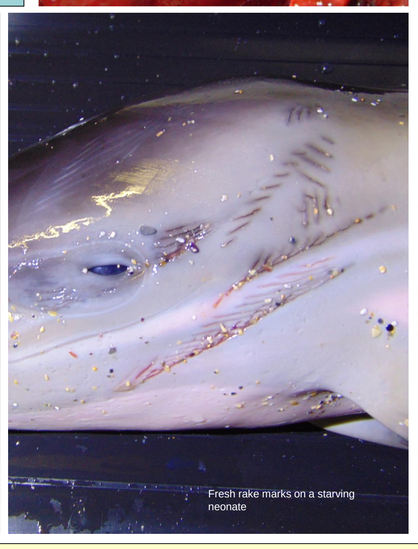
Cardiac stomach impacted with fish bones



Flatfish lodged in the bony part of the blowhole



Presumptive fatty change in a starving juvenile



Fresh rake marks on a starving neonate

Live stranding: fresh abrasions to tail fluke

Conclusions

Bycatch was the most common cause of death in common dolphins necropsied in Cornwall between 2018 and 2022, accounting for just over 40% of all animals examined. There has been little change in this percentage over the last 20 years, with 41% (127 of 311) of common dolphin necropsies between 2003 and 2022 being bycaught animals. This is consistent with Cornwall being the hotspot for bycatch in this species in the UK, with 64% of all cases of bycatch diagnosed in UK stranded and necropsied common dolphins between 1990 and 2019 being recorded in the county (CSIP UK strandings database (1990-2020)). Despite the biases inherent in using necropsy data to make statements about cetacean morbidity and mortality, this nonetheless illustrates the continued threat that bycatch poses for common dolphin populations in the region. In summary, necropsies of common dolphins carried out in Cornwall make a substantial contribution to our knowledge of the threats faced by this species in UK waters and the wider region.

Acknowledgements

Necropsies were carried out under the Cetacean Strandings Investigation Programme, which is funded by Defra and the Devolved Government of Wales. The authors would like to thank the University of Exeter, Paul Hancock and Defra for providing PM facilities, staff and volunteers of the Cornwall Wildlife Trust Marine Strandings Network and British Divers Marine Life Rescue for assistance with carcass retrieval, volunteers of the Cornwall Marine Pathology Team for assistance with necropsies, Shaheed MacGregor and Shinto Kunjamma John of the Zoological Society of London for assistance with microbiology and staff of Finn Pathologists for assistance with histopathological processing.

References

Barnett et al (2009) Postmortem evidence of interactions of bottlenose dolphins (*Tursiops truncatus*) with other dolphin species in south-west England. Veterinary Record 165, 441-444.

Costidis et al (2013). Sharp trauma induced by vessel collisions with pinnipeds and cetaceans. In: Moore et al (eds) Criteria and case definitions for serious injury and death of pinnipeds and cetaceans caused by anthropogenic trauma. Diseases of Aquatic Organisms 103: 251-256.

Jepson (editor (2005) Cetacean Strandings Investigation and Co-ordination in the UK 2000-2004. Final report to the Department for Environment, Food and Rural Affairs. 79pp.

Jepson et al (2005). Acute and chronic gas bubble lesions in cetaceans stranded in the United Kingdom. Veterinary Pathology 42: 291-305.

Jepson et al (2013) Peracute underwater entrapment of pinnipeds and cetaceans. In: Moore et al (eds) Criteria and case definitions for serious injury and death of pinnipeds and cetaceans caused by anthropogenic trauma. Diseases of Aquatic Organisms 103: 235–239.

Ross and Wilson (1996) Violent interactions between bottlenose dolphins and harbour porpoises. Proceedings of the Royal Zoological Society of London, Series B 263, 283-286.