Assessing the suitability of using a drone for the non-invasive collection of humpback whale blow samples in the breeding grounds of Cape Verde

A modified drone can be used to collect and sample exhaled respiratory vapour, known as ‘blow’, of humpback whales (*Megaptera novaeangliae*) non-invasively in the breeding grounds of Cape Verde and has potential to improve safety, efficacy and financial cost of blow collection without forfeiting sample quantity and quality. This study was part of a field study examining viral prevalence in humpback whales throughout migration, comparing Iceland, northern Norway, and Cape Verde. A modified DJI Mavic 2 drone apparatus, fitted with floaters and petri dishes, was launched from a boat and flown remotely to non-invasively collect blows of humpback whales upon surfacing. Four petri dishes were attached with velcro and swabbed upon return. Video recording of sampling allows for behaviour analysis and individual identification. Unpreventable methodology-specific limitations include drone battery charge capacity and challenging drone recovery from a boat platform, but overall this method was less restrictive and technically easier than other blow collection methods. Over twelve days, 16 total drone flights collected 10 blow samples from 27 groups of whales, distinguished by tail flukes and dorsal fin patterns. This study indicated the use of a drone for blow collection as a useful and reliable method, beneficial for conditions requiring minimal cetacean stress and distanced collection.

Knowledge on cetacean disease predominantly comes from studies conducted on captive or stranded (live or dead) animals, causing a bias in viral prevalence due to the increased likelihood of diseased cetaceans to strand, and increased stocking density of captive animals. There is a need for increased diagnostic accuracy and a real-time sampling method of wild cetaceans to eliminate this sampling bias.

The method of utilising a drone has risen in popularity in recent years as a non-invasive collection method which, in comparison to the traditional sampling pole method, allows a greater vessel distance from whale and a more rapid collection of blow, and is thus less stressful to both whale and researcher. This method allowed for video recording of the blow collection with the drone camera allowing behaviour analysis, analysis of appearance and body condition score and identification by dorsal fin or tail fluke from a bird's-eye view. Blow sampling using the same method had been successfully attempted in the north Atlantic humpback population in feeding grounds, but not in the Cape Verde breeding grounds; differences in climate, sea conditions, and behaviour may lead to methodology failure.

Cetacean exhaled breath can be analysed for information regarding hormones involved in reproductive status and function, metabolic stress hormones, viral and bacterial infection, genetics, metabolite content, microbiome, and theoretically parasitic infection, proving to be a valuable source to sample.

Figure 1: Drone in position for capture of blow

Figure 2: Modified drone apparatus used for capture of blow