MOLECULAR DIAGNOSIS OF HERPESVIRUS AND *CETACEAN MORBILLIVIRUS* IN BEAKED WHALES STRANDED IN THE CANARY ISLANDS (1999-2017)

Idaira Felipe-Jiménez*[1], Antonio Fernández[1], Marisa Andrada[1], Manuel Arbelo[1], Simone Segura-Göthlin[1], Ana Colom-Rivero[1], Cristian M. Suárez-Santana[1], Jesús De La Fuente[1] and Eva Sierra[1].

[1] Veterinary Histology and Pathology, Atlantic Center for Cetacean Research, University Institute of Animal Health and Food Safety (IUSA), Veterinary School, University of Las Palmas de Gran Canaria (ULPGC), Canary Islands, Spain.
idaira.felipe101@alu.ulpgc.es; antonio.fernandez@ulpgc.es; marisaana.andrada@ulpgc.es manuel.arbelo@ulpgc.es; simone.segura101@alu.ulpgc.es; ana.colom101@alu.ulpgc.es; cristian.suarez@ulpgc.es; jesus.delafuente@ulpgc.es; eva.sierra@ulpgc.es

Abstract: Beaked whales (BWs), *Ziphiidae* family, have oceanic and deep diving habitat patterns[1], with records of six different species in the Canary Islands. The aim of this study was developed a retrospective survey for detecting herpesvirus (HV) and *cetacean morbillivirus* (CeMV) in 55 BWs (35 *Ziphius cavirostris* and 20 animals belonging to the *Mesoplodon* genus) stranded in the Canary Islands between 1999 to 2017. Between 294-319 tissue samples were subjected to molecular analysis. For detection of HV, a conventional nested polymerase chain reaction (PCR) based on the DNA polymerase gene, was performed[2], while CeMV identification was carried out by one or more of three PCRs[3–5] amplifying a fragment of the fusion protein (F) and/or phosphoprotein (P) genes. HV was detected in 14.45% (8/55) of the analyzed BWs. A positive percentage of 8.57% (3/8) was found within the Cuvier's BW group, whereas the positivity rose to 25% (5/8) within the *Mesoplodon* genus group (three *M. densirostris*, one *M. europaeus*, and one *M. bidens*). All the obtained sequences belonged to the *Alphaherpesvirinae* subfamily, from which three are considered novel sequences, all of them within the *Mesoplodon* genus group. In addition, to the best of our knowledge, this is the first description of HV infection in Gervais' and Sowerby's BWs[6]. On the other hand, Dolphin morbillivirus (DMV) was detected in one subadult male Cuvier's BW (1.82%; 1/55), stranded in 2002. This result supposes the earliest confirmed occurrence of DMV in the Cuvier's BW species. The obtained partial P gene sequence showed the closest relationship with other DMV sequence detected in a striped dolphin stranded in the Canary Islands in the same year[7]. Furthermore, the obtained DMV result supports a previous hypothesis of a cross-species infection and the existence of the circulation of endemic DMV strains in the Atlantic Ocean[8].

Key words: Herpesvirus, *cetacean morbillivirus*, Beaked whales, *Mesoplodon*, *Ziphius cavirostris*, PCR.

Acknowledgments: We acknowledge the following funding bodies that have supported this research work: To the Canary Islands Government, which has funded and provided support to the stranding network. The MARCET (MAC/1.1b/149) and MARCET II (MAC2/4.6c/392) projects, and the Research National Project "Embolic Pathology (gas/fat) in cetaceans," which is supported by the Ministerio de Ciencia e Innovación del Gobierno de España (CGL2015-71498-P), Ministerio de Ciencia, Innovación y Universidades (PGC2018-101226-B-100).

References:

(1) Macleod, C.; Perrin, W.; Pitman, R.; Barlow, J.; Ballance, L.; D Amico, A.; Gerrodette, T.; Joyce, G.; Mullin, K.; Palka, D. (2005). Known and Inferred Distributions of Beaked Whale Species (Cetacea: *Ziphiidae*). Journal of Cetacean Research and Management, *7* (3), 271.

(2) Vandevanter, D.R.; Warrener, P.; Bennett, L.; Schultz, E.R.; Coulter, S.; Garber, R.L.; Rose, T.M. Detection and Analysis of Diverse Herpesviral Species by Consensus Primer PCR. (1996). Journal of Clinical Microbiology, *34* (7), 1666–1671.

(3) Barrett, T.; Visser, I.K.G.; Mamaev, L.; Goatley, L.; Van Bressem, M.F.; Osterhaus, A.D.M.E. (1993). Dolphin and Porpoise Morbilliviruses Are Genetically Distinct from Phocine Distemper Virus. Virology, pp 1010–1012.

(4) Reidarson, T.H.; McBain, J.; House, C.; King, D.P.; Stott, J.L.; Krafft, A.; Taubenberger, J.K.; Heyning, J.; Lipscomb, T.P. (1998). Morbillivirus Infection in Stranded Common Dolphins from the Pacific Ocean. Journal of Wildlife Diseases, *34* (4), 771–776.

(5) Bellière, E.N.; Esperón, F.; Fernández, A.; Arbelo, M.; Muñoz, M.J.; Sánchez-Vizcaíno, J.M. (2011). Phylogenetic Analysis of a New Cetacean Morbillivirus from a Short-Finned Pilot Whale Stranded in the Canary Islands. Research in Veterinary Science, *90* (2), 324–328.

(6) Felipe-Jiménez, I.; Fernández, A.; Andrada, M.; Arbelo, M.; Segura-Göthlin, S.; Colom-Rivero, A.; Sierra, E. (2021). Contribution to Herpesvirus Surveillance in Beaked Whales Stranded in the Canary Islands. Animals, 11(7), 1923.

(7) Felipe-Jiménez, I.; Fernández, A.; Arbelo, M.; Segura-Göthlin, S.; Colom-Rivero, A.; Suárez-Santana, C.M.; De La Fuente, J.; Sierra, E. (2022). Molecular Diagnosis of Cetacean Morbillivirus in Beaked Whales Stranded in the Canary Islands (1999–2017). Veterinary Sciences, 9 (3), 121.

(8) Bento, M.C.R. de M.; Eira, C.I.C.S.; Vingada, J.V.; Marçalo, A.L.; Ferreira, M.C.T.; Fernandez, A.L.; Tavares, L.M.M.; Duarte, A.I. (2016). New Insight into Dolphin Morbillivirus Phylogeny and Epidemiology in the Northeast Atlantic: Opportunistic Study in Cetaceans Stranded along the Portuguese and Galician Coasts. BMC Veterinary Research, 12(1), 1-12.