Aquatic Mammals 2021, *47*(1), 63-70, DOI 10.1578/AM.47.1.2021.63

Short Note

Resightings of Humpback Whales (*Megaptera novaeangliae*) from Ireland to a Known Breeding Ground: Cabo Verde, West Africa

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Humpback whales (*Megaptera novaeangliae*; Borowski, 1781) occur in all major oceans. They undertake some of the longest known migrations of any animal from feeding grounds at high latitudes (both in the northern and southern hemisphere) to breeding grounds in tropical waters, typically around 20° north and south of the equator (Rizzo & Schulte, 2009). In the North Atlantic, there are approximately six distinct feeding grounds—the Gulf of Maine, Newfoundland/Labrador, the Gulf of St. Lawrence, Greenland, Iceland, and Norway, including Svalbard—with high site fidelity to each site (Wenzel et al., 2020), though movements between these feeding grounds have been documented (Stevick et al., 2006). Most North Atlantic humpback whales migrate annually to breeding grounds in the Caribbean, including the Silver, Navidad, and Mouchoir Banks off the Dominican Republic, and a portion of the population migrate to the southeastern Caribbean (i.e., Guadeloupe) (Stevick et al., 2018). A second breeding ground off Cabo Verde hosts a smaller number of humpback whales, which feed in waters around Iceland and especially Norway (Wenzel et al., 2020).

Since 1999, the Irish Whale and Dolphin Group (IWDG) has been collecting images to be used to identify individual humpback whales in Irish waters. Between 1999 and 2014, a total of 28 individual humpback whales were recorded using photo-identification of tail flukes and dorsal fins, largely through citizen science or from whale-watching platforms, including two resightings—one between Ireland and the Netherlands and one near Iceland—but none in any known breeding grounds (Ryan et al., 2016).

Since 2014, the IWDG (unpub. data) have identified another 74 individual humpback whales. The *Irish Humpback Whale Catalogue* contains 102 individual whales based on fluke/dorsal fin identifications collected over a 20-y period (1999 to April 2020). Over one-half (55.8%) have been recorded in more than 1 y, with 15.6% recorded in 5 y or more, and one individual (HBIRL#3) in 15 of the last 20 y. All fluke images have been shared with the *North Atlantic Humpback Whale Catalogue* (NAHWC; College of the Atlantic, Bar Harbor, ME, USA; https://coa.edu/allied-whale). The NAHWC is the primary curator for humpback whale fluke photographs from throughout the North Atlantic. NAHWC photographs date from 1958 to 2020, with photographs submitted by more than 750 international contributors. The NAHWC contains records of more than 11,000 individual humpback whales from the entire North Atlantic. Most photographs were obtained from the western North Atlantic feeding grounds, but, recently, there has been a significant increase in contributions from the eastern North Atlantic and southeastern Caribbean.

Due to the massive population decrease in humpback whales worldwide from commercial whaling, the full comprehension of the worldwide migratory patterns and gene flow between populations of this species is crucial for conservation and the understanding of the humpback whale's ecology and genetics (Rizzo & Schulte, 2009). There have been six international resightings from Ireland to feeding grounds off Iceland and Norway and rarely used habitats off the Netherlands and Gibraltar (Table 1); however, prior to the records presented

Table 1. Resightings of humpback whales (*Megaptera novaeangliae*) from Ireland to feeding grounds and during migration

Irish Humpback Whale Cat. No.	Ireland		Outside Ireland		
	Location	Date	Location	Date	Ground
HBIRL#07	Cork	Sept 2007	Netherlands	May and Nov 2007	Feeding?
HBIRL#07	Cork	Sept 2007	Norway	Nov 2012, Nov 2014	Feeding
HBIRL#09	Cork and Kerry	2008, 2014, 2017	Iceland	June 2014	Feeding
HBIRL#23	Kerry	2013, 2014, 2015, 2016, 2018	Iceland	April 2012	Feeding
HBIRL#25	Kerry	Sept 2013	Iceland	2011, 2014, and 2018	Feeding
HBIRL#55	Kerry	Aug-Oct 2015	Gibraltar	March 2011	Migration?

Table 2. Details of resightings between Ireland and Cabo Verde

Irish Humpback Whale Cat. No.	*North Atlantic Humpback Whale Cat*. No.	Dates photographed off Ireland	Photographed off Boa Vista, Cabo Verde
HBIRL#55	NA04740	Aug-Oct 2015	23 April 2019
HBIRL#73	NA10441	Aug-Oct 2016	25 February 2020
		May 2017	
		Aug-Sept 2018	
		May-June 2019	
HBIRL#78	NA10446	Jan-Nov 2017	10 March 2020

herein, no humpback whale from Irish waters has been sighted on a known breeding ground.

The IWDG has been collecting images of individual humpback whales photographed in Ireland since 1999 (Ryan et al., 2016). Images of tail flukes and dorsal fins, largely collected through a citizen science network or from whale-watching boats, were submitted with a sighting record to the IWDG and included date and location of sighting, observer details, and group size. Occasionally, additional information such as water depth and behaviour (e.g., actively feeding) were included (Wenzel et al., 2020). Not all individuals in a group, if more than one whale was present, were necessarily photographed/identified.

Marine mammal surveys were conducted in Cabo Verde during the winter and spring months (January to June) between 1990 and 2020. Surveys varied from 30 to 90 d in duration (see Wenzel et al., 2020). Ryan et al. (2013a, 2014) conducted small boat (5 m) research, including biopsy and photo-identification efforts, during the 2011-2012 seasons. Since 2008, most photo-identification data were collected from whale-watching vessels between early March and late May by Bios CV (https://bioscaboverde.com) sailing from Sal Rei, Boa Vista, Cabo Verde.

Humpback whales are uniquely identifiable based primarily on the ventral side of their flukes (Katona & Whitehead, 1981), and these identifications can be augmented by other features such as dorsal fin shape, scars, and genetic data (Smith et al., 1999). Images were matched to the *Irish Humpback Whale Catalogue*, given a unique identifier (HBIRL ###), and submitted to the NAHWC. New photographs were compared to those already in the NAHWC collection to identify resightings using standard methods (Katona & Beard, 1990).

Herein, we report on three matches from feeding grounds off Ireland to the humpback whale breeding grounds off Cabo Verde (Table 2). All matches in Cabo Verde were made during the spring of 2019 and 2020 from images obtained off Ireland between 2015 and 2019.

First Match to Cabo Verde (Humpback Whale HBIRL#55)

HBIRL#55 (also known as Humpback 55) was photographed on five occasions around the Blasket Islands off west County Kerry (c. 52.194° N, -10.496° W) between 7 August and 1 October 2015 by NM (Figure 1A). The same humpback whale was also photographed off Valentia Island 30 km to the south of the Blasket Islands on 30 September 2015 (V. Hyland, pers. comm.). This individual whale was photographed in the same area as 23 other humpback whales during this 3-mo period. Between four and 11 other humpbacks were photographed in the same area, from the same platform, and on the same day as HBIRL#55. On 23 April 2019, a humpback whale was

Figure 1. Photographs of a humpback whale (*Megaptera novaeangliae*), HBIRL#55, off Co. Kerry on 7 August 2015 (A) and the same whale off Santa Monica, Boa Vista, Cabo Verde, on 23 April 2019 (B) (*Photo credits:* © Nick Massett [A] and © Simon Berrow [B])

photographed at Santa Monica as part of a dyad (off the southwest tip of Boa Vista, Cabo Verde; 15.98915° N, -22.91825° W) by SB (Figure 1B). On 24 April 2019, the same individual whale was photographed by BJ at Boa Vista, Cabo Verde (15.95104° N, -22.91031° W), between Boa Vista and Maio. It was recorded singing for 20 min in a water depth of 40 m, confirming that it was a mature male (Clapham, 1996). This humpback whale (HBIRL#55) was previously seen at Gibraltar (CA95 20110303) off the south coast of Spain on 3 March 2011. Gibraltar is around 1,800 km from Ireland, and this was the first documented humpback whale to be photographed off Gibraltar. The timing of this record is consistent with this whale travelling to a breeding ground further south, with Cabo Verde around 2,700 km southwest of Gibraltar. This earlier sighting confirms that this humpback is at least 9 y old.

Second Match to Cabo Verde (Humpback Whale HBIRL#78)

HBIRL#78 (or Humpback 78) was photographed off Ireland on three occasions during 2017—twice off County Wexford in January (52.087° N, -6.928° W) (Figure 2A) and 10 mo later off County Cork (51.582° N, -8.407° W) on 2 November. It was observed alone off Wexford and with only one other whale in the area in November. On 10 March 2020, the same individual whale was photograhed at 16.162° N, -22.943° W off Sal Rei in Boa Vista in Cabo Verde (Figure 2B & C). The whale was observed with a second adult that was photographed as a calf in 2012. They were both diving for 6 to 9 min periods and stayed at the sea surface between 30 and 60 s.

Third Match to Cabo Verde (Humpback Whale HBIRL#73)

HBIRL#73 (or Humpback 73) was first photographed off Ireland on 27 August 2016 west of the Aran Islands, County Galway. It was photographed again further south off Mutton Island, County Clare, on 19 October 2016. It had been recorded each year since: in 2017 off County Kerry and in 2018 off Counties Kerry and Cork; and it was last recorded on 25 June 2019 off County Kerry (52.153° N, -10.599° W) (Figure 3A). It has been observed in the same area as six other humpbacks, including two (HBIRL#61 and 64) on two occasions—one between years and once within the same year. On 25 February 2020, the same humpback whale was photographed from the shore at Santa Monica (15.988° N, -22.904° W), Boa Vista, Cabo Verde, by Adilson Santos (Figure 3B).

There have been six international resightings between Ireland and feeding grounds off Iceland and Norway and off the Netherlands and Gibraltar (Table 2). Humpback whales are not common in the North Sea, and the resighting to the Netherlands was a surprise, especially as it had been recorded 4 mo before it was recorded in Ireland in September and 2 mo after it had been photographed off west County Cork back in the Netherlands (Table 1). The humpback whale was small and thought to be a juvenile. Three individuals have been recorded in both Ireland and Iceland. HBIRL#23 was recorded in April 2012 in Iceland, which is the peak of the breeding season in Cabo Verde, and then subsequently in Ireland during 6 of the last 7 y since 2013. In the 3 y in which we had one or more sightings, its residency period in Irish waters was between 49 and 94 d, with its earliest record on 2 May and the latest on 21 September. One whale (HBIRL#25) was seen

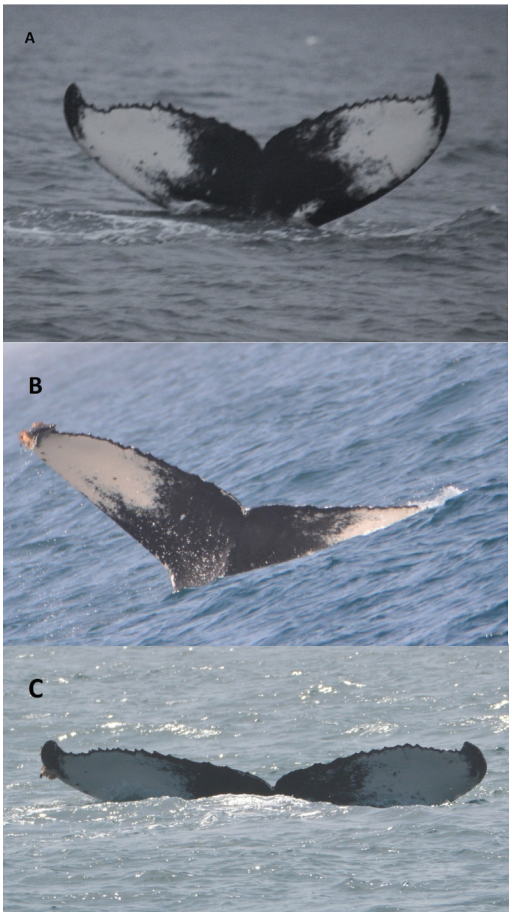

Figure 2. Photographs of HBIRL#78 off Co. Wexford, Ireland, on 8 January 2017 (A) and the same humpback whale off Sal Rei, Boa Vista, Cabo Verde, on 10 March 2020 (B & C) (*Photo credits:* © Andrew Malcolm [A] and © Bios CV [B & C])

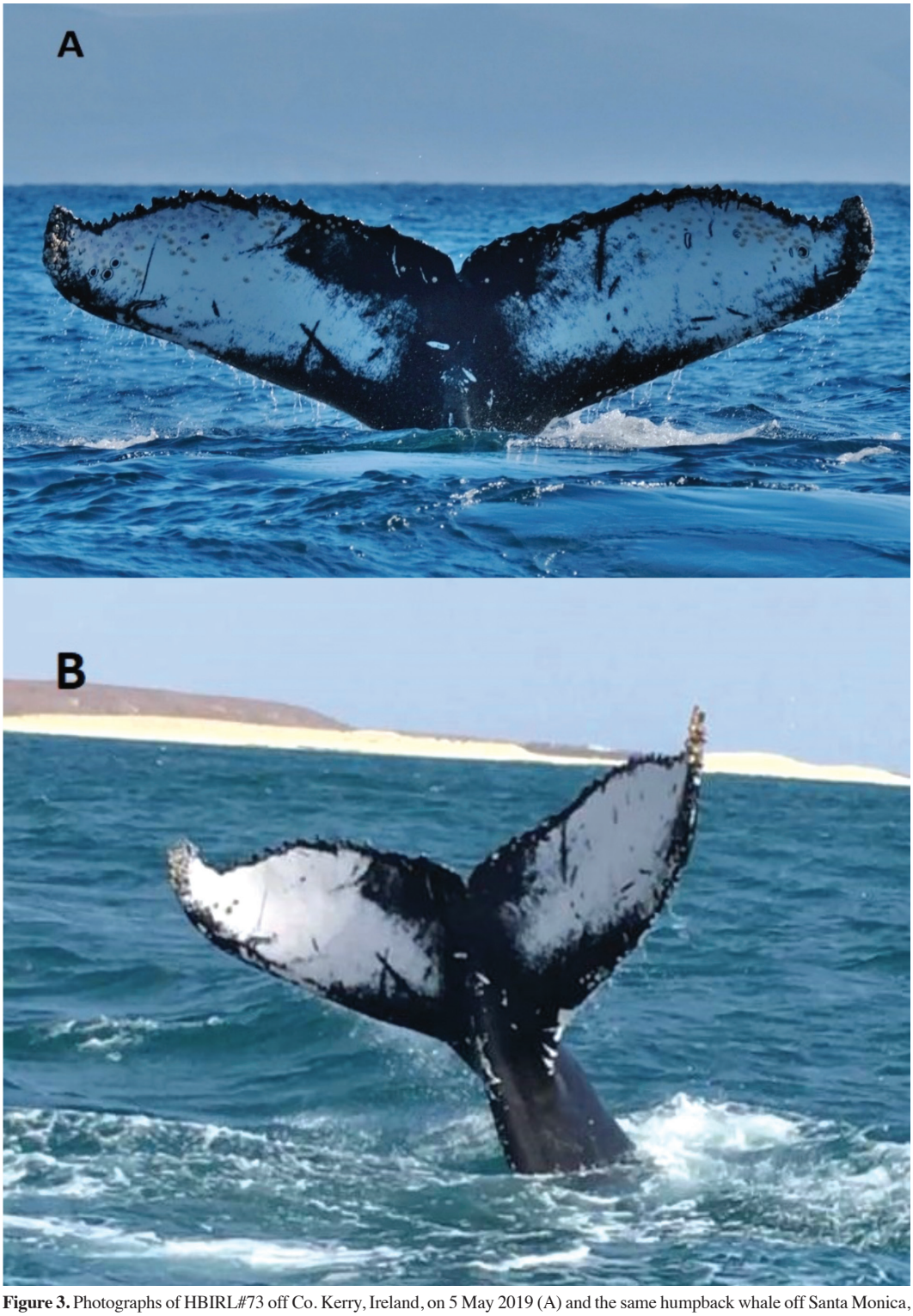

Figure 3. Photographs of HBIRL#73 off Co. Kerry, Ireland, on 5 May 2019 (A) and the same humpback whale off Santa Monica, Boa Vista, Cabo Verde, on 25 February 2020 (B) (*Photo credits:* © Nick Massett [A] and © Adilson Santos [B])

in Iceland on 28 July 2013 and in County Kerry on 14 September in the same year. A distance of 1,800 km could be traveled in 47 d, which is a minimum journey speed of 38 km/d (1.6 km/h^{-1}), if the whale left Iceland immediately after it had been photographed.

Humpback whales are not rare in Ireland, occurring both offshore along the shelf edge and inshore, especially off the south and southwest coasts (Berrow et al., 2010; Wall et al., 2013). They have been recorded in Irish waters during every month, with a previously reported peak between September and December (Berrow et al., 2010). More recently, this peak in sightings occurred in July and August, with a trend towards earlier arrivals each year beginning in late March to mid April (IWDG, unpub. data).

Most sighting records are from west County Cork and west County Kerry, but this is partially due to the presence of two whale-watching boats, which report sightings to the IWDG, and extra observer effort at these sites. Sightings have also increased outside these two core areas in recent years, with more records from Counties Clare and Galway along the west coast and from the Irish Sea and Northern Ireland. Humpback whales occur offshore mainly during winter months (Charif et al., 2001). They are rarely sighted due to the difficulties of surveying offshore waters (Wall et al., 2013; Rogan et al., 2018), but their singing can be detected by acoustic monitors. The western seaboard of Ireland is thought to be a migratory corridor with humpback whales moving between Norway and Iceland to breeding grounds in the Caribbean (Charif et al., 2001) or Cabo Verde (Wenzel et al., 2020).

The breeding grounds of humpback whales feeding in Ireland have long been uncertain. Ingebrigtsen (1929), in his review of whaling records, reported the breeding area of humpback whales killed off Norway could have been just to the south of Ireland. How far south of Ireland or whether he implied south to the tropics is not clear.

Ryan et al. (2013b) used a contaminant profile as an ecological tracer and showed humpback whales genetically sampled in Cabo Verde and Ireland had similar concentrations of persistent pollutants. Samples from four individual whales off Ireland were compared/analysed to 20 samples from Cabo Verde, and this consistency in contaminant profile suggests that whales in Ireland typically breed off West Africa and not in the Caribbean as Caribbean humpback whales sampled had very different, and considerably higher, concentrations of persistent pollutants.

The humpback population breeding in Cabo Verde represents the remnants of a historically much larger population around Cabo Verde and off northwest Africa (Reeves et al., 2002). A recent review of the worldwide status of humpback whales (Bettridge et al., 2015) determined that this Cabo Verde population comprises a Distinct Population Segment (DPS) under the U.S. Endangered Species Act. The DPS designation was based on genetic evidence that suggested a second breeding ground is occupied by humpback whales that feed primarily off Norway and Iceland. Loss of this DPS unit would result in a loss of this unique breeding population as well as a significant number of humpback whales that feed in Iceland and Norway (Bettridge et al., 2015).

In this short note, we have identified Ireland as another feeding area for humpback whales who use the Cabo Verde breeding grounds. Although we only report on three individual whales recorded both in Ireland and Cabo Verde, it is likely that more individuals migrate between these two sites. Currently, there are 102 individual humpback whales in the *Irish Humpback Whale Catalogue* (as of 30 April 2020) and 267 individual humpback whales in the Cabo Verde catalogue (as of 1 January 2019) (Wenzel et al., 2020). High inter-annual resighting rates both in Ireland (55.8%) and Boa Vista, Cabo Verde (49%), suggest the likelihood of obtaining a resighting between the two locations should also be high if Cabo Verde is the breeding ground for more humpback whales feeding in Irish waters.

The distance between County Kerry, Ireland, and Boa Vista, Cabo Verde, is around 4,200 km (2,300 nmi). Kennedy et al. (2014) used satellite tags to record swimming speeds of humpback whales migrating from the Caribbean to feeding grounds of around 4 km/h^{-1}. This would result in a journey time between Ireland and Cabo Verde of around 44 d. Thus, humpback whales recorded in Ireland even in February and March would have enough time to reach Cabo Verde for the breeding season which starts in February and ends in late May to early June (Wenzel et al., 2020). In Cabo Verde, many of the known mature males are recorded towards the "end" of the breeding season in April/May. Pregnant females appear to arrive in late March/early April and stay a month or more. The humpback whale reported herein was a male and, thus, might be expected to arrive in Cabo Verde in April and depart in May. The timing of most whale sightings recorded in Ireland are consistent with humpback whales moving between Ireland and Cabo Verde, while humpback whales occurring in Ireland in March to May are more likely immature non-breeders or those resting between breeding attempts. Humpback whales with calves are very rarely recorded in Ireland (Berrow et al., 2010); and humpback whales in Ireland do seem to be quite small, suggesting most are not fully mature.

The resighting of three humpback whales from the *Irish Humpback Whale Catalogue* of

102 individuals does not imply that all humpback whales feeding in Irish waters breed in Cabo Verde. The proportion of humpback whales from Ireland that are resighted to breeding grounds is an order of magnitude lower than that from the overall North Atlantic feeding ground sample. No humpback whales have been matched to Caribbean breeding sites despite this area having much greater research effort and more extensive photo-identification catalogues. This could indicate that the majority of humpback whales feeding off Ireland migrate to areas that are not well studied or that the Irish cohort are less likely to be sexually mature.

Boa Vista is only one area of the known humpback whale breeding habitat in Cabo Verde, but other areas within the archipelago have been poorly surveyed. It is possible that humpback whales feeding in Ireland tend to use sites in Cabo Verde other than Boa Vista. It is interesting to note that two of the three humpback whale matches reported herein were from Santa Monica to the southeast of Sal Rei. Although only 25 nmi (46 km) from Sal Rei, there has been relatively little photo-identification effort off Santa Monica compared to Sal Rei (Ryan et al., 2013a). This does hint at the probability that humpback whales feeding in Ireland are potentially breeding outside the main study area of Bahia de Sal Rei. There were also historical breeding grounds for humpback whales off mainland West Africa in Senegal and Mauritania (Reeves et al., 2002), though very little is known about current use of these areas. These areas would greatly benefit from more survey effort, and we suspect humpback whales feeding in Ireland are likely to use breeding grounds along the West African coast.

It is possible that humpback whales in Ireland originate from more than one breeding ground. For example, humpback whales from the southeastern Caribbean show a marked tendency to migrate to feeding areas in the eastern North Atlantic (Stevick et al., 2018). Recently, humpback whales photographed in Scotland have been identified in the Caribbean off Guadeloupe (Jones et al., 2017; O'Neill et al., 2019) demonstrating quite different migratory destinations by humpback whales from two relatively close feeding areas such as the United Kingdom and Ireland.

Acknowledgments

We would particularly like to thank skipper José Perez for his fantastic support in Boa Vista, Cabo Verde, and to Rónán Berrow for help in the field in Cabo Verde during April 2019. We would like to thank Colin Barnes, John Burke, the late Martin Colfer, Richard Creagh, Vinny Hyland, Simon Kennedy, Andrew Malcolm, Ronan McLouglin (of the Irish Naval Service), Nigel Moyter, Chris O'Sullivan, Nick Pfeiffer, Mick Sheeran, and Britta Wilkens for sending images of humpback whales off Ireland to the IWDG, and Adilson Santos in Cabo Verde for the image of HBIRL#78 in Cabo Verde. Partner organizations in Cabo Verde were Naturalia and Bios.cv. Research permits in Cabo Verde were issued by the National Directorate of Environment. IWDG would like to extend an especially big thank you to Allied Whale, College of the Atlantic, whose support and generosity of spirit maintains the sense of collaboration and sharing of humpback whale images in the North Atlantic without which discoveries like those reported herein would not be possible.

Fieldwork on humpback whales was funded in part in 2003 (Wildlife Grant 12290) and 2005 (Wildlife Grant 13743) by the Heritage Council of Ireland. Fieldwork in Cabo Verde in 2019 was funded by the Island Foundation in the United States and Loro Parque Fundación in the Canary Islands.

Literature Cited

Berrow, S., Whooley, P., O'Connell, M., & Wall, D. (2010). *Irish cetacean review (2000-2009)*. Irish Whale and Dolphin Group. 60 pp.

Bettridge, S., Baker, C. S., Barlow, J., Clapham, P. J., Ford, M., Gouveia, D., Mattila, D. K., Pace, R. M., Rosel, P. E., Silber, G. K., & Wade, P. R. (2015). *Status review of the humpback whale (*Megaptera novaeangliae*) under the Endangered Species Act* (NOAA Technical Memorandum NOAA-TM-NMFS-SWFSC-540). National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

Charif, R. A., Clapham, P. J., & Clark, C. W. (2001). Acoustic detections of singing humpback whales in deep waters off the British Isles. *Marine Mammal Science*, *17*(4), 751-768. https://doi.org/10.1111/j.1748-7692.2001.tb01297.x

Clapham, P. J. (1996). The social and reproductive biology of humpback whales: An ecological perspective. *Mammal Review*, *26*, 27-49. https://doi.org/10.1111/j.1365-2907.1996.tb00145.x

Ingebrigtsen, A. (1929). Whales caught in the North Atlantic and other seas. *Rapports et Procés-Verbeaux des Réunions, Conseil Permanent Internationa1 pour l'Exploration de la Mer*, *56*(2), 1-26.

Jones, L. S., Bouveret, L., Stevick, P. T., Thomason, B., Wenzel, F. W., & Whooley, P. (2017, March). *First humpback whale resighting from the British Isles to a breeding ground*. Proceedings of the 22nd Biennial Conference on the Biology of Marine Mammals, Halifax, Nova Scotia.

Katona, S. K., & Beard, J. A. (1990). Population size, migrations and feeding aggregations of the humpback whale (*Megaptera novaeangliae*) in the western North Atlantic Ocean. *Reports of the International Whaling Commission*, Special Issue 12, 295-305.

Katona, S. K., & Whitehead, H. (1981). Identifying humpback whales using their natural markings. *Polar Record*, *20*, 439-444. https://doi.org/10.1017/S003224740000365X

Kennedy, A. S., Zerbini, A. N., Vásquez, O. V., Gandilhon, N., Clapham, P. J., & Ada, O. (2014). Local and migratory movements of humpback whales (*Megaptera novaeangliae*) satellite-tracked in the North Atlantic Ocean. *Canadian Journal of Zoology*, *92*, 9-18. https://doi.org/10.1139/cjz-2013-0161

O'Neill, K. E., Cunningham, E. G., & Moore, D. M. (2019). Sudden seasonal occurrence of humpback whales *Megaptera novaeangliae* in the Firth of Forth, Scotland and first confirmed movement between high-latitude feeding grounds and United Kingdom waters. *Marine Biodiversity Records*, *12*, Article 12. https://doi.org/10.1186/s41200-019-0172-7

Reeves, R. R., Clapham, P. C., & Wetmore, S. E. (2002). Humpback whale (*Megaptera novaeangliae*) occurrence near the Cape Verde Islands based on American 19th century whaling records. *Journal of Cetacean Research and Management*, *4*(3), 235-253.

Rizzo, L. Y., & Schulte, D. (2009). A review of humpback whales' migration patterns worldwide and their consequences to gene flow. *Journal of the Marine Biological Association of the United Kingdom*, *89*(5), 995-1002. https://doi.org/10.1017/S0025315409000332

Rogan, E., Breen, P., Mackey, M., Cañadas, A., Scheidat, M., Geelhoed, S., & Jessopp, M. (2018). *Aerial surveys of cetaceans and seabirds in Irish waters: Occurrence, distribution and abundance in 2015-2017*. Department of Communications, Climate Action & Environment and National Parks and Wildlife Service (NPWS), Department of Culture, Heritage and the Gaeltacht, Dublin, Ireland. 297 pp.

Ryan, C., Wenzel, F. W., Suárez, P. L., & Berrow, S. D. (2014). An abundance estimate for humpback whales *Megaptera novaeangliae* breeding around Boa Vista, Cape Verde Islands. *Zoologia Caboverdiana*, *1*(2), 75-99.

Ryan, C., Craig, D., Lopez-Suárez, P., Vázquez Perez, J., O'Connor, I., & Berrow, S. D. (2013a). Breeding habitat of poorly studied humpback whales (*Megaptera novaeangliae*) in Boa Vista, Cape Verde. *Journal of Cetacean Research and Management*, *13*(2), 175-180. https://research.thea.ie/handle/20.500.12065/237

Ryan, C., Whooley, P., Berrow, S. D., Barnes, C., Massett, N., Strietman, W. J., Broms, F., Stevick, P. T., Fernald, T. W., & Schmidt, C. (2016). A longitudinal study of humpback whales in Irish waters. *Journal of the Marine Biological Association of the United Kingdom*, *96*, Special Issue 4, 877-883. https://doi.org/10.1017/S0025315414002033

Ryan, C., McHugh, B., Boyle, B., Bérubé, M., Lopez-Suárez, P., Elfes, C., Boyd, D. T., Ylitalo, G., Van Blaricom, G. R., Clapham, P. J., Robbins, J., Palsbøll, P. J., Berrow, S. D., & O'Connor, I. (2013b). Levels of persistent organic pollutants in Northeast Atlantic humpback whales *Megaptera novaeangliae*. *Endangered Species Research*, *22*, 213-223. https://doi.org/10.3354/esr00545

Smith, T. D., Allen, J., Clapham, P. J., Hammond, P. S., Katona, S. K., Larsen, F., & Øien, N. (1999). An ocean basin-wide mark-recapture study of the North Atlantic humpback whale (*Megaptera novaeangliae*). *Marine Mammal Science*, *15*(1), 1-32. https://doi.org/10.1111/j.1748-7692.1999.tb00779.x

Stevick, P. T., Bouveret, L., Gandilhon, N., Rinaldi, C., Broms, F., Carlson, C., Kennedy, A., Ward, N., & Wenzel, F. W. (2018). Migratory destinations and timing of humpback whales in the southeastern Caribbean differ from those off the Dominican Republic. *Journal of Cetacean Research and Management*, *18*, 127-133.

Stevick, P. T., Allen, J., Clapham, P. J., Katona, S. K., Larsen, F., Lien, J., Mattila, D. K., Palsbøll, P. J., Sears, R., Sigurjónsson, J., Smith, T. D., Vikingsson, G., Øien, N., & Hammond, P. S. (2006). Population spatial structuring on the feeding grounds in North Atlantic humpback whales. *Journal of Zoology*, *270*(2), 244-255.

Wall, D., Murray, C., O'Brien, J., Kavanagh, L., Wilson, C., Glanville, B., Williams, D., Enlander, I., Ryan, C., O'Connor, I., McGrath, D., Whooley, P., & Berrow, S. D. (2013). *Atlas of the distribution and relative abundance of marine mammals in Irish offshore waters: 2005-2011*. Irish Whale and Dolphin Group. 58 pp. ISBN 0-9540552-7-6

Wenzel, F. W., Broms, F., López-Suárez, P., Lopes, K., Veiga, N., Yeoman, K., Rodrigues, M. S. D., Allen, J., Fernald, T. W., Stevick, P. T., Jones, L., Jann, B., Bouveret, L., Ryan, C., Berrow, S., & Corkeron, P. (2020). Humpback whales (*Megaptera novaeangliae*) in the Cape Verde Islands: Migratory patterns, resightings, and abundance. *Aquatic Mammals*, *46*(1), 21-31. https://doi.org/10.1578/AM.46.1.2020.21