

## Short Note

# Short-Beaked Common Dolphins (*Delphinus delphis*) Observed Bow-Riding Basking Sharks (*Cetorhinus maximus*)

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Bow-riding is a behaviour regularly displayed by a variety of dolphin species in which they exploit the pressure wave caused by displaced water at the front of a vessel, wave, or whale to swim faster with greatly reduced physical exertion (Würsig, 2018a). The short-beaked common dolphin (*Delphinus delphis*) regularly displays this behaviour when it encounters vessels or large whales (Bilgmann et al., 2007). We report herein on incidences where bow-riding by common dolphins was observed to occur on a large but slow marine megafauna species, the basking shark (*Cetorhinus maximus*), off the southwest coast of Ireland.

Basking sharks appear annually around Ireland from April through November, with records showing a peak in June (Berrow & Heardman, 1994; Doherty et al., 2017; Lieber et al., 2020). These sightings correlate with increased sea temperatures (between 8 to 16°C) that enable the shark’s planktonic prey to bloom during the spring and summer months (Sims et al., 2003; Sims, 2008). The sharks are often observed alone but may be seen in small groups feeding with their mouths wide open when prey is concentrated or during social encounters that may include courtship (Sims et al., 2000; Berrow & Johnston, 2009). Basking sharks are currently classed as endangered by the International Union for Conservation of Nature (IUCN), and those recorded off the Blasket Islands, Co. Kerry, in the southwest of Ireland are genetically distinct from all other sampled North Atlantic populations (Clarke et al., 2016; Rigby et al., 2019; Lieber et al., 2020). They are one of 35 shark species regularly documented in Irish waters, the second largest fish globally (reaching 12 m and weighting 4,000 kg), and the largest fish species in the North Atlantic Ocean (Sims, 2008; Clarke et al., 2016).

Common dolphins are frequently sighted off Ireland, primarily from the Celtic Sea and along the Atlantic coasts (Wall et al., 2013; Rogan, 2016; National Parks & Wildlife Service [NPWS],

2019). Common dolphins are the most regularly recorded dolphin species in Irish waters with sightings logged year-round but most frequently between May and December, peaking in October (Rogan, 2016; Murphy et al., 2019). Common dolphins use Irish waters for feeding, mating, and calving (Brophy et al., 2009; Rogan, 2016). This species regularly bow-rides fast moving vessels and large baleen whales in Irish waters (SAO’C, unpub. data, March 2020).

Associations between cetacean species (particularly common dolphins) and other genera (seabirds and tuna) have previously been observed in Irish waters but typically occur due to feeding opportunities (Ryan et al., 2014; O’Callaghan et al., 2019), indicating the importance of a mutually beneficial food resource causing the association to occur. These interspecies associations appear to be more beneficial for seabirds and tuna who target the fish corralled near the surface by common dolphins, but herding by tuna may help dolphins to catch extra prey when a bait ball becomes depleted (Evans, 1982; Clua & Grosvalet, 2001; Ryan et al., 2014). These typical, food-related interspecies associations do not explain why common dolphins were interacting with basking sharks in our observations, however.

Interactions were opportunistically documented from a 6-m rigid inflatable boat (RIB) research vessel and commercial marine eco-tour vessels through photographs (Canon EOS 7D, 100-400 mm lens) and video footage (GoPro Hero 2, Sony HDR-CX260VE camcorder, and Samsung A5 2017 mobile phone) from both above and below the water’s surface between 2012 and 2019. The resulting photographs and video footage were reviewed to gauge how both species behaved around one another to define the interactions for analysis. *Bow-riding* was defined as when a dolphin (or dolphins) passed close to the shark’s mouth either heading in the same direction as the shark or cutting across its path when viewed

from above and below the water; these movements resembled typical dolphin behaviour when bow-riding boats and indicated they were not deliberately harassing the shark. Dolphin swim speeds varied depending on the encounter, which may be linked to their interest in the shark. Interactions were also noted when dolphins were away from the shark's mouth but surfaced in close proximity to its flanks or caudal fin which were referred to as *lateral surfaces*. Evidence of disturbance was noted if the shark closed its mouth, increased speed, or changed direction (between 180 and 360°) when the dolphins swam fast and tail slapped within ~2 m of the shark, especially when around the mouth.

Interactions between common dolphins and basking sharks were recorded on six occasions over a 7-year period (2012 to 2019) in three locations along the southwest coast of Ireland (Table 1). One to six dolphins interacted with typically one shark (83.3% of sightings) with interactions lasting between < 5 to 99 min when documented per day (Figure 1). In total, 94 bowrides and 42 lateral surfaces were recorded (Table 1). Two incidents of disturbance were recorded on 19 April 2014 and 20 April 2019 when dolphin groups (with 5 to 6 individuals) surfaced directly in front of their mouths. Most observations were made above the water's surface, but underwater footage from 18 April 2014 clearly showed two dolphins interacting with a shark's mouth by bow-riding it, while three other dolphins passed close by within ~3 m of the shark (see supplemental video of this event in the "Supplemental Material" section of the *Aquatic Mammals* website: [https://www.aquaticmammalsjournal.org/index.php?option=com\\_content&view=article&id=10&Itemid=147](https://www.aquaticmammalsjournal.org/index.php?option=com_content&view=article&id=10&Itemid=147)).

A basking shark's typical feeding swim speed is 0.85 ms<sup>-1</sup>, but cruising speeds can reach 1.08 ms<sup>-1</sup> (Sims, 2000). These speeds are not suitable to produce surface pressure waves appropriate for typical bow-riding by dolphins to take place. Additionally, a basking shark's surface feeding is limited in duration (0.17 to 1.45 h/d; Sims et al., 2003), which would reduce the amount of time for such interactions. While breaching sharks have been estimated to reach 5 ms<sup>-1</sup> in quick bursts (Johnston et al., 2018), these are infrequent events requiring vertical movement in the water column that is not conducive for bow-riding.

The dolphins involved in these bow-riding and lateral surfacing behaviours may have been attracted to the sharks opportunistically—for example, the dolphins might have been approaching the vessels that documented their behaviours but shifted to the sharks because the vessels were largely stationary. However, sandeels (*Ammodytes* sp.) were also documented during each sighting and are more likely to have attracted foraging dolphins into areas with sharks already present (filmed by NM on 28 April 2014). Both of these fish species are planktivorous (Molloy, 1967; O'Connell & Fives, 1995; Sims, 2008) and are active during the spring and summer months when plankton blooms in the region (Raine et al., 1990), which might have facilitated the observed interactions. They also occurred in tidal flows off the Co. Kerry coast around the Great Blasket and An Tiaracht Islands, which may have concentrated phytoplankton and zooplankton at the surface (NM, unpub. data, March 2020). It did not appear that feeding sharks were fragmenting shoals of sandeel and attracting foraging common dolphins given there was a lack of fast surface foraging

**Table 1.** Documented cases of short-beaked common dolphins (*Delphinus delphis*) bow-riding basking sharks (*Cetorhinus maximus*) off the southwest of Ireland between 2012 and 2019

Date	Location	Latitude	Longitude	No. of sharks	No. of dolphins interacting	No. of bowrides	No. lateral surfaces	Interaction duration (min)
3 May 2012	An Tiaracht, Co. Kerry	52° 12' 53" N	-10° 57' 53" W	1	1	1	0	7
18 April 2014	Great Blasket, Co. Kerry	52° 10' 38" N	-10° 50' 45" W	2	5-7	33	11	99
19 April 2014	Great Blasket, Co. Kerry	52° 10' 62" N	-10° 50' 72" W	1	5	27	23	49
28 April 2014	Great Blasket, Co. Kerry	52° 10' 37" N	-10° 50' 15" W	1	1	0	1	6
31 March 2017	Great Blasket, Co. Kerry	52° 06' 53" N	-10° 57' 85" W	1	4	4	0	< 5
20 April 2019	Stags Rocks, Co. Cork	54° 25' 62" N	-9° 13' 83" W	1	6	29	7	> 5



**Figure 1.** Three short-beaked common dolphins (*Delphinus delphis*) bow-riding a basking shark (*Cetorhinus maximus*) (A), while five common dolphins laterally surface with the same shark (centre dorsal fin) (B) at the Great Blasket on 19 April 2014 (Photo: Nick Massett)



behaviours exhibited by the dolphins; the latter mainly milled at the surface while interacting with the sharks. As such, the occurrences of bow-riding appears to be a result of an overlap in the respective prey for the sharks and delphinids as opposed to being a mutually beneficial strategy; these occurrences also represent an opportunity for the dolphins to play.

Most shark–dolphin interactions are predatory (where dolphins are bitten or consumed) or provoke defensive responses from dolphins (Heithaus, 2001; Smith et al., 2017), although killer whale (*Orcinus orca*) predation on various shark species is an exception to this definition (Engelbrecht et al., 2019; Jorgensen et al., 2019). One fatal shark predation event was documented from the Island of Ireland where a presumed porbeagle shark (*Lamna nasus*) inflicted a fatal wound on a harbour porpoise (*Phocoena phocoena*) at Strangford Lough, Northern Ireland, on 23 July 2005 (Hassard, 2005); and an adult common dolphin with a shark bite scar along its flank was observed in offshore Irish waters in 2016 (SAO'C, unpub. data, July 2016), which indicates that this species may occasionally be predated on locally.

Young dolphins accompanying adults that were bow-riding sharks may help the young individuals to practice this potentially high-risk behaviour (in the case of a fast-moving marine vessel) on slow moving and less threatening basking sharks (Würsig, 2018b). While most dolphins moved slowly around the sharks, some surfaced quickly and close to the shark, which may have been an attempt to provoke the shark to surge forward and create a pressure wave for them to ride, similar to how a large whale may react (Würsig, 2018b).

These behavioural interactions between common dolphins and basking sharks appeared to be positive for the dolphins who seemed to be inquisitive while the sharks appeared to be largely unaffected by their close proximity. As expected, no pressure wave was observed to be produced by the sharks while feeding, so the dolphin behaviours support the play aspect of bow-riding discussed by Würsig (2018a), especially since some interactions lasted for extended periods of time. While these bow-riding and lateral surface observations are incidental, they do demonstrate that common dolphins seek out and associate with species of interest when possible, seemingly to engage in playful behaviour.

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