

Bubble Bursts, a Potential Foraging Strategy for Bottlenose Dolphins (*Tursiops truncatus*) in Cardigan Bay

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Bubble netting in humpback whales (*Megaptera novaeangliae*) is probably the best known and most studied cetacean foraging strategy relying on the emission of bubbles to secure prey (Jurasz & Jurasz, 1979; Wiley et al., 2011; Pirota et al., 2021). However, some delphinid species, such as bottlenose dolphins (*Tursiops truncatus*; Fertl & Wilson, 1997), Atlantic spotted dolphins (*Stenella frontalis*; Fertl & Würsig, 1995), killer whales (*Orcinus orca*; Similä & Ugarte, 1993; Visser et al., 2008), dusky dolphins (*Lagenorhynchus obscurus*; Trudelle, 2010), and false killer whales (*Pseudorca crassidens*; Zaeschmar et al., 2013), have also been recorded utilising bubbles for communication to facilitate prey capture.

Bottlenose dolphins are known to engage in complex foraging strategies such as sponge feeding (Smolker et al., 1997), kerplunking (Connor et al., 2000; Weiss, 2006), barrier feeding (Weiss, 2006), mud plume feeding (Lewis & Schroeder, 2003), and systematic depredation of recreational fishing lines (Powell & Wells, 2011). These distinct foraging strategies are thought to be driven by both ecological factors and social learning (Wells, 2019), with mother-to-calf transmission the most significant pathway of information transfer (Sargeant & Mann, 2009).

Bottlenose dolphins using bubble bursts during foraging events are relatively poorly documented, with few examples in published literature (Fertl & Wilson, 1997; Zaeschmar et al., 2013) and none in British waters. There are only two semi-resident coastal populations of bottlenose dolphins in the United Kingdom: one in East Scotland, particularly around the Moray Firth (Cheney et al., 2013, 2014, 2018); and one in Cardigan Bay, Wales (Lohrengel et al., 2018). Both populations have been the subject of extensive monitoring efforts; however, unlike other populations, such as in Sarasota Bay (Wells, 2019) and Shark Bay (Smolker et al., 1997; Sargeant & Mann, 2009), there have been no observations of specialised

foraging strategies in the UK. As part of long-term monitoring efforts, the Sea Watch Foundation has worked closely with platforms of opportunity such as wildlife tour boats and fishing vessels, incorporating data collected by volunteers or members of the public and via the Sea Watcher app into the main Sea Watch Foundation sightings database. Herein, we describe the occurrence of repeated bubble bursts during attempted prey capture by two bottlenose dolphins as observed from such a platform of opportunity. The video footage was opportunistically taken using a mobile phone camera and reviewed using Quicktime media player (the video footage for this paper is available in the “Supplemental Material” section of the *Aquatic Mammals* website: https://www.aquatic-mammalsjournal.org/index.php?option=com_content&view=article&id=10&Itemid=147).

During a fishing charter run by Epic Fishing on 28 July 2021 at 1208 h (BST), their boat, *M/V Legend*, was approached by two bottlenose dolphins, a mother and a juvenile, ~300 m off the main pier (Figure 1). Concurrently, Sea Watch observers aboard a visitor passenger boat recorded a sighting of three dolphins (two adults and one juvenile) in the area, describing their behaviour as suspected feeding or foraging. Photographs taken by observers during this sighting were matched with the Sea Watch Foundation bottlenose dolphin catalogue, and the adult with the juvenile was identified as 003-07R or “Berry.” The timing of this sighting and colouration of the adult fin suggest the two dolphins in the video may be Berry and her juvenile (nicknamed “Luna”). Berry was first recorded in 2007, and Luna is her third known calf, thought to be born in 2019.

One of the fishing boat passengers noticed a salmon (*Salmo salar*) at the side of the boat, beneath the boat’s fender adjacent to the hull. The adult dolphin, suspected to be Berry, approached the boat, repeatedly circling close to the fenders, and blew eight bubble bursts within the 1 min of

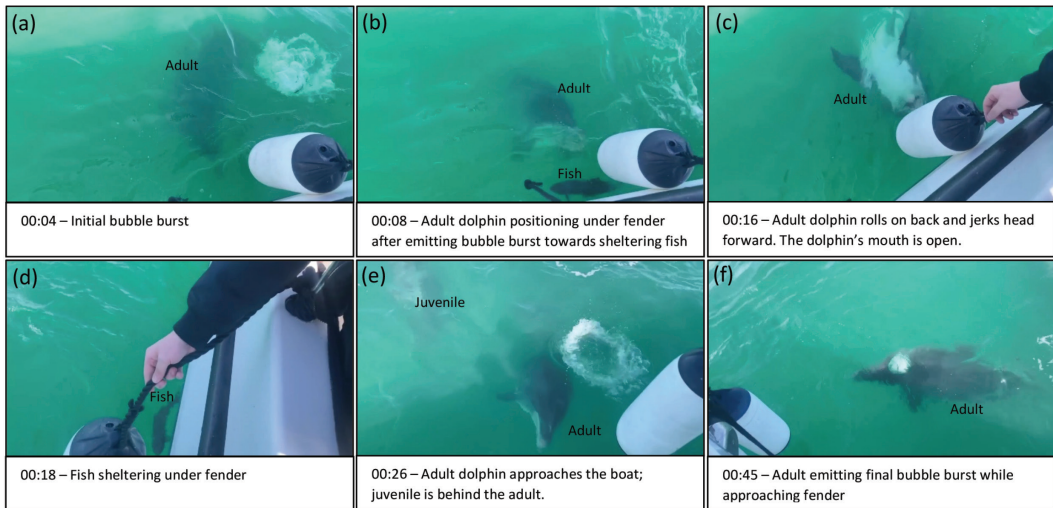


Figure 1. Bottlenose dolphin (*Tursiops truncatus*) approaches the boat emitting bubbles

video footage. The bursts were short (~1 to 2 s duration) and forceful, taking the shape of bubble rings before dispersing at the surface:

- 00:00-00:05 – First observed were two bubble bursts emitted within 3 s of each other from the adult dolphin positioning itself underneath the fender and jerking its head several times (Figure 1a).
- 00:08-00:17 – The adult dolphin, suspected to be Berry, turned away from the boat to surface, and then immediately returned to the boat, emitted a bubble burst (00:12) on approach, rolled on her back, and jerked her head underneath the fender (00:15). Berry then left the boat to surface while emitting a whistle (Figure 1b & c).
- 00:18-00:21 – The dolphins were no longer in view, but the video revealed the salmon sheltering under the fender at the side of the boat (Figure 1d).
- ~00:21 – The juvenile dolphin surfaced and seemed to turn towards the side of the boat where the salmon was located.
- 00:23-00:26 – The adult dolphin thought to be Berry surfaced facing the side of the boat, then submerged blowing a bubble burst while approaching the boat (00:24), and again directly next to the fender (00:26) (Figure 1e).
- 00:27-00:35 – The adult dolphin thought to be Berry faced away from the boat and surfaced

(00:31) about 1 m from the side of the boat; the juvenile dolphin could be seen coming up close to it and surfacing, also facing away from the side of the boat (00:32) at ~2 m away.

- 00:36-00:49 – The adult dolphin suspected to be Berry surfaced facing the side of the boat, emitted two bubble bursts while approaching the boat (00:38, 00:42), and again once next to the fender (00:45). The juvenile surfaced in the background (0:39, 00:47) about 4 m away and then approached the boat (00:49), appearing underneath the adult briefly (Figure 1f).
- 00:49-01:00 – The adult dolphin continued to approach the fender, positioning on her side while moving her head, before swimming out of frame where the prey item was eventually captured.

Although there were two bottlenose dolphins present in this video, only the adult emitted bubble bursts. The third dolphin that was observed in the vicinity of the boat by observers was not involved in this observation. The bursts were not emitted in the direction of the juvenile but always on approach to the boat and the prey item. Following the boat approach and bubble bursts, the adult was seen positioning itself underneath the fender, rolling on its side and upside down, and forcefully jerking its head several times.

Several hypotheses have been proposed for the bottlenose dolphins' use of bubble bursts during foraging events: keeping schooling prey together, displacing prey, or as a social cue to conspecifics (Fertl & Wilson, 1997). In other contexts, bubble

bursts have been associated with social interactions (particularly aggression), responses to objects, or as an expression of interest or excitement (Moreno & Macgregor, 2019). Given the context of this encounter, the bubble bursts are likely to have served to displace the prey from an inaccessible location; to display excitement, agitation, or interest; or to attract the attention of the juvenile.

From the video, it is clear that the dolphins were unable to access the fish in its location directly under the fender. Emission of bubble bursts in the direction of inaccessible prey has been reported in killer whales (Visser, 1999, 2005; Visser et al., 2008), while Weddell seals (*Leptonychotes weddellii*) have been documented to use bubbles to flush fish out from underneath the sea ice (Stone, 1998). It is possible that the adult dolphin was attempting to use bubble bursts to displace the fish from its protective position beside the boat's hull. However, although all bubble bursts were emitted during the approach to the fender, they were not always aimed directly at the fish. A similar behavior employing bubble formation has been observed by one of the authors (PGHE); these were utilised by a minke whale (*Balaenoptera acutorostrata*) in the presence of shoaling herring next to the vessel.

Alternatively, the bubble bursts may be an indication of excitement or interest. In two cases, bubble bursts were followed by head jerks that are often associated with aggressive displays in bottlenose dolphins (Mann & Smuts, 1999; Scott et al., 2005), and it is possible that the visible but inaccessible prey was eliciting an excitement response. It is also possible that these movements were attempts to “head scan” for the fish using echolocation (Diercks et al., 1971; Wei et al., 2021), although no clicks were heard at the time. While the purpose of the bubble bursts in this video is not entirely conclusive, it provides a rare insight into foraging behaviour in Cardigan Bay bottlenose dolphins, recording a previously unknown behaviour in this well-studied population.

It is also possible that the adult bottlenose dolphin was attempting to draw the juvenile's attention to the prey with its positioning and bubble emissions. Bottlenose dolphins have been shown to cooperatively hunt—in some cases, with each dolphin taking on distinctive roles such as the “driver” and the “barrier” dolphin (Gazda et al., 2005). The bubbles may have served as a combination of these two factors, attracting the juvenile's attention and serving as the first part of a “flush and ambush,” a cooperative hunting approach employed by species such as Harris hawks (*Parabuteo unicinctus*; Bednarz, 1988).

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