

**Female Humpback Whale (*Megaptera novaeangliae*)
Positions Genital-Mammary Area to Intercept Bubbles Emitted
by Males on the Hawaiian Breeding Grounds
Supplementary Video Descriptions**

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Supplementary Video Descriptions

Included here is a 14-minute edited version of the original video with a time coded description of the activity. Although this version has been edited to remove scenes that were not useful (e.g., distant or poor images, water with no whales present, etc.), the video was taken on the same day, during the same encounter, with the same humpback whales, over an estimated 90-minute period.

An abbreviated version of the video (3:44 in length) showing five examples of the male–female bubble behaviors and interactions can be found on the Whale Trust website (www.whaletrust.org).

There are four whales in the video, one female and three males. Three of the four are easily identified by natural markings and are described below:

- The female is easily identifiable with a white scar on the left of the rostrum. She is also the largest of the four whales, a somewhat lighter color, and the center of the activity.
- We refer to the males as M1, M2, and M3:
 - M1 is the whale usually closest to the female which produced most, if not all, of the bubble streams and clouds. His flippers are dark on the upper side and mostly white on the inside with a black circle on one side. M1's fluke has a mostly black underside with a small notch in its trailing edge just to the left of the center.
 - M2 is the male mostly on the periphery, usually in front of the female, throughout the video. M2 has white flippers (i.e., upper side) and is easily spotted throughout the video.
 - M3 is the male least obvious in the video although likely present throughout as there are four occasions with all males in the same frame with the female. This male was more difficult to identify by markings and at times we cannot discern between M1 and M3.

Time Coded Description of 14-Minute Video

00:00 – The tape begins with two stationary adult humpback whales. The female is in the foreground (well-marked with the white scar on the left side of the rostrum), and M1 is just below and to the side of the female. The male is initially difficult to see but becomes more obvious between 00:32 and 1:09 s. There are some faint bubbles to the side in the beginning, but it is unclear who is making them, and they do not appear to be directed at the female. (**Note:** This is a common posture, spacing, and interaction of adult female–male pairs on the breeding ground; these groups are coined “breath-holders” as they often remain stationary, submerged for 15 to 30 min between breaths.)

1:09 – Male is clearly visible underneath and behind/beyond the female's head.

1:13 – Female turns to begin to move to the sea surface.

1:18-1:40 – Another male (M2) with white flippers appears in the frame in front of the female (and already near the surface) as she rises.

1:44 – The tail (underside) of another whale appears at the lower right edge of the frame (based on identification markings and location of M2, it is presumed to be M3).

1:56 – Cut

1:57 – Bubbles produced by M1 appear below the female from its blowholes.

2:13 – M1 rises in the foreground alongside the female. By 2:17, he surfaces with a blast of air (bubble cloud) from his mouth.

2:22 – M1 dives down below the female. During this dive, the identifying markings associated with M1 are noticeable for the first time. M1 has a mostly black fluke with a white marking on the right side as well as a black circle on the underside of the left pectoral fin. M2, with the white pectoral fins (upper side), can be seen in front of the female in the upper right of the frame.

2:32-2:52 – The female is near the surface, and the swollen genital area is somewhat visible. M2 can be seen to the front left of the female.

2:41 – M1 appears from the lower left blowing a bubble stream beneath the female; M2 still in front periphery of the female.

2:51 – M1 surfaces again beside the female with a burst of bubbles from his mouth.

2:55 – M3 dives down further away in front of the female, visible beyond the female's head (it is obviously M2 due to lack of white pigmentation on the upper side of pectoral fins).

3:03 – M3 turns and appears to interact very briefly with M2, who is identifiable by his white flippers.

3:05 – All four whales are in the frame with the female in the foreground; M1 is to her left, with M3 immediately in front of her, and beyond him is M2 with the white flippers.

3:05-3:09 – The female turns as M3 dives in front of her; M1 is by her side.

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3:12 – M3 passes in front of the female. M2 is in the background (in front of the female) and could be following (or chasing) M3.

3:22 – The female is rising, surfacing, with M1 blowing bubbles beneath her.

3:27 – Female's swollen genital area is visible.

3:33-3:50 – The female turns and positions her body so that the rising bubbles strike the genital-mammary area. At 3:36, the bubbles can be seen rising around either side of the tail stock. At 3:48, the female is completely ensconced in bubbles and briefly out of view.

3:53-4:00 – Examples of bubbles

4:01 – Cut

4:04 – Female above (with white scar) with a male below her, bubbling.

4:16 – Cut

4:17 – Female above and M1 below blowing bubbles; M2 is just in front of the female, at the periphery.

Break

4:42 – M1 surfacing with a bubble stream behind him.

4:50 – M1 diving down again; M2 is noticeable in the background.

4:57 – M1 diving down to the motionless female in the lower left of the frame.

5:02 – Cut

5:18 – There is a male (not sure if M1 or M3) below and behind the female, while M2 with white flippers is off to the right side of the frame and circles back around the location where the female is submerged and stationary.

5:28-5:52 – Bubbles appear around both sides of the female. Appears to be two sources of bubbles: one in foreground (source not seen) and bubbles from M1 or M3 under the female. M2 (white flipper) is seen moving through the left of frame.

5:54 – M1 appears close from the bottom of the frame (perhaps the foreground source of bubbles), surfaces, and dives (6:13). M1 can be identified from his ID (notch on right side of fluke and underside of flipper white with black spot pattern).

6:16 – Camera turns to the stationary female that is still at depth with bubbles rising from both sides of her back. Here, bubbling directed at the female occurs both near the surface and when she is stationary at depth.

6:43 – M2 passes behind the stationary female.

6:45 – M2 flipper can be seen in the upper right corner of the frame.

6:49 – The female is still stationary at depth. M1 passes to the left of the frame, M2 passes through the frame and behind the female, and another whale can be seen stationary under (crisscrossing with) the female. Presumably, this male is the source of bubbles at 6:16.

7:03 – Cut

7:20 – Female rises to the surface, and M1 can be seen beneath her (also rising). Although unclear in this frame, it becomes clear at 8:06 to 8:09 that this whale is indeed M1 (pectoral fins, fluke).

7:35 – M3 can be seen on the left side of the female as she surfaces.

7:50 – Female rises to the surface in between M2 and M3. M2 begins releasing bubbles from his mouth as he surfaces very close to the camera. At 8:03 to 8:06, it becomes clear that this whale is M1.

8:09-8:48 – On diving, M1 blows bubbles that stream up toward the female as she surfaces. At 8:23, bubbles surround the female, and for a brief period, it is hard to see the female through the bubbles.

8:50 – Cut

8:52 – Big bubble cloud appears under the tail of the female (a little hard to see due to framing). M2 can be seen in front of the bubble clouds and female.

9:10 – Good shot of the female in bubbles near the tail stock.

9:15 – Another bubble blast rises right under her tailstock and rises on both sides of the female.

- 9:21 – Another bubble blast can be seen rising underneath her tail stock. It is unclear who is making the bubble clouds and blasts. Female is at or near the surface.
- 9:30 – The whale that had been beneath her producing the bubbles rises to the surface at 9:34. It appears to be M1 based on previous behavior (i.e., bubble clouds on surfacing).
- 9:35 – Cut
- 9:36-9:44 – Brief scene with the female near the surface and M2 passing in front of her. It appears M1 is on the left side of the female during this surfacing (based on bubble cloud release at the surface).
- 9:44 – Cut
- 9:45 – The female is motionless on the right side of the frame, with a male (M1 or M3) approaching the camera on the left.
- 9:57-10:12 – The female lies on her side, arched, head down, and tail higher with half fluke above sea surface hanging motionless. A male can be seen on the other side of her diving down, which is a different male than the one at 9:45. M2 can be seen further in the distance.
- 10:13 – Female rolls over, ventral side up at the sea surface. One male dives beneath her and cannot be seen. M2 with white flippers is in the background.
- 10:20 – A brief surface shot of the female’s pectoral fin/flipper out of the water.
- 10:24 – Female rolls dorsal side up again and in doing so provides first clear evidence of the hemispherical lobe and the swollen genital/mammary area.
- 10:25 – A male approaches quickly toward the female, and M2 can be seen at depth.
- 10:26-10:32 – The approaching male dives under the female, she swoops and slides her tail (providing a good shot of the underside of her fluke), and the male starts bubbling underneath her.
- 10:36 – Bubbles rise toward her genital-mammary area.
- 10:44 – Good scene of bubbles striking lower portion of the female’s body. M1 appears to be blowing bubbles (based on later location of surfacing) with M2 out in front. The female moves her tail so that the bubbles strike her genital-mammary area.
- 10:52 – Female is to the left, and M1 (identified by notch in tail) surfaces beside her; M3 is closer to M2 further to the right.
- 11:07 – Cut
- 11:08 – Female is lying in the center frame with head facing away; M2 is in the background and in front of her.
- 11:34 – Cut
- 11:35 – Three whales can be seen in the frame. M1 (based on underside of pectoral fins) cuts across in front of the female heading toward the camera and then turns to parallel the female; M2 can be seen in the background.
- 11:41 – Continuing shot with M3 now visible in the frame on the other side of the female. All three males with the female can be seen.
- 11:50 – Male can be seen on the far side of the female and dives under her.
- 11:54 – The male starts blowing bubbles while the female is near stationary (but in this case, we don’t see the bubbles strike her underside).
- 12:23 – The female, now near stationary, turns to the right so we see more of her broadside. M2 is in front of her again. Bubbles are seen slowly rising from below.
- 12:39 – M1, moving in from the left (based on behavior during surfacing), moves underneath the female with a bubble stream.
- 12:59 – The female moves forward, and the bubbling male (M1) rises and surfaces beside her.
- 13:03 – Cut
- 13:03 – Female is ventral side up at the sea surface. Male can be seen bubbling beneath her.
- 13:12 – Female remains belly-up, providing a good shot of fluke and genital-mammary region. Hemispherical lobe and swollen genitals are obvious. Bubbles are seen rising from below toward her tail stock.
- 13:16-13:21 – Female rolls onto her side as bubbles break on and around her tail stock; genital-mammary area still clearly visible.
- 13:34 – Female rolls further on her side with male bubbling beneath her.

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13:40 – Cut

13:41-13:53 – Female rolls on her side as a bubble stream clearly strikes the genital-mammary area.

13:54-14:01 – Female slides her tail and genital-mammary area toward and above the bubbles rising from the male below.

End of Videotape