

# HUMPBACK WHALES HAVE SUPER FEEDING EVENTS IN AUSTRALIAN WATERS

Madeleine J. Brasier<sup>1\*</sup> and Vanessa Pirota<sup>2</sup>

<sup>1</sup>College of Sciences and Engineering, Institute for Marine and Antarctic Studies, University of Tasmania, Hobart, TAS, Australia

<sup>2</sup>Marine Predator Research Group, School of Natural Sciences, Macquarie University, Sydney, NSW, Australia

## YOUNG REVIEWERS:



DEBASISH

AGE: 15



VINCENT

AGE: 10



WILLIAM

AGE: 13

Each year, the east Australian humpback whale population migrates between their Antarctic feeding grounds, where they spend the summer feeding, to their sub-tropical breeding grounds, where they give birth. Historically, this population was once hunted in both Antarctica and off Australia, however, since whaling ended in the early 1960s, this population has continued to recover. As the population continues to grow, we may now be witnessing “new” behaviors. For the first time, scientists have footage of humpback whales bubble-net feeding and feeding in “super-groups” of 20+ whales in Australian waters. This footage was collected by citizen scientists—regular citizens who help scientists monitor this whale population. These feeding observations are important for understanding how this whale population is changing—not just in numbers but also behaviors—and what we can do to protect whale populations into the future.

### BALEEN WHALES

Large, toothless whales that have baleen plates that filter their prey from seawater. They have streamlined bodies ranging from 6 to 33 m in length.

### BALEEN PLATES

Large bristles hanging from the upper jaws of baleen whales, like a large bristly brush. They help to filter their prey (fish or krill) from water.

### Figure 1

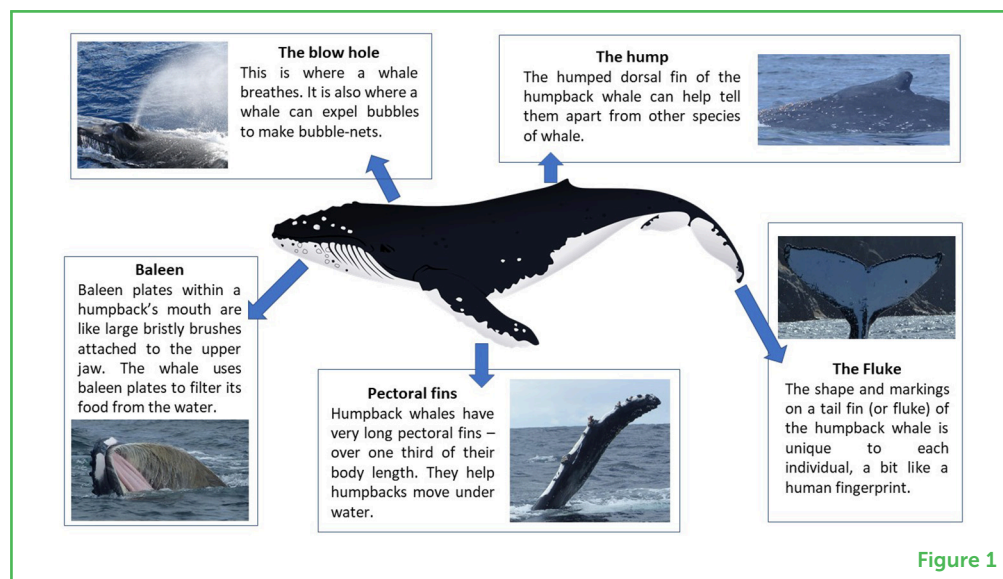
Humpback whales are large baleen whales with a few characteristics that make them stand out from other whales, such as their humped dorsal fin and their large pectoral fins.

### KERATIN

The hard protein that hair, skin, and nails are made of. It also makes the baleen plates of whales.

## HUMPBACKS: A HISTORY

Humpback whales are large **baleen whales**, reaching up to 17 m in length and over 30,000 kg in weight. They are called baleen whales because of the hundreds of **baleen plates** that hang from their upper jaw (Figure 1). These plates are made of **keratin**, which is the same substance as our fingernails. Baleen plates are important because they enable humpbacks to filter their food from seawater after they have taken a huge mouthful of fish or krill.



Compared to other baleen whales, of which there are around 16 species, humpback whales have a few unique physical characteristics. For example, their humped dorsal fin and their large pectoral fins (Figure 1), which can be a third of their body length. Humpback whales use their pectoral fins to perform tight maneuvers, like when feeding.

There are 14 different humpback whale populations around the world, but we focus on the east Australian population in the Southern Hemisphere. Like many whales, east Australian humpback whales were hunted for oil and meat, amongst other things. By 1962, their population was reduced to only a few hundred individuals. Nowadays, the east Australian humpback population appears to be thriving and are considered a conservation success story. Regular monitoring by scientists has recorded an average population increase of 11% per year since the 1960s [1]. The last official survey in 2015 estimated that about 25,000 whales swam past east Australia. Scientists estimate this population could reach over 40,000 whales by 2026, which may well be close to its pre-whaling population size.

As populations increase, it is likely that they will reveal new or re-emerging behaviors. These are behaviors that whales may have done before they were hunted to near extinction. In 2020, scientists in

Australia recorded exciting behaviors never before seen in Australian waters [2]. But first let us understand a bit more about humpback whale migrations and the types of behaviors we might expect to see in different areas of their distribution range.

### THE HUMPBACK HIGHWAY

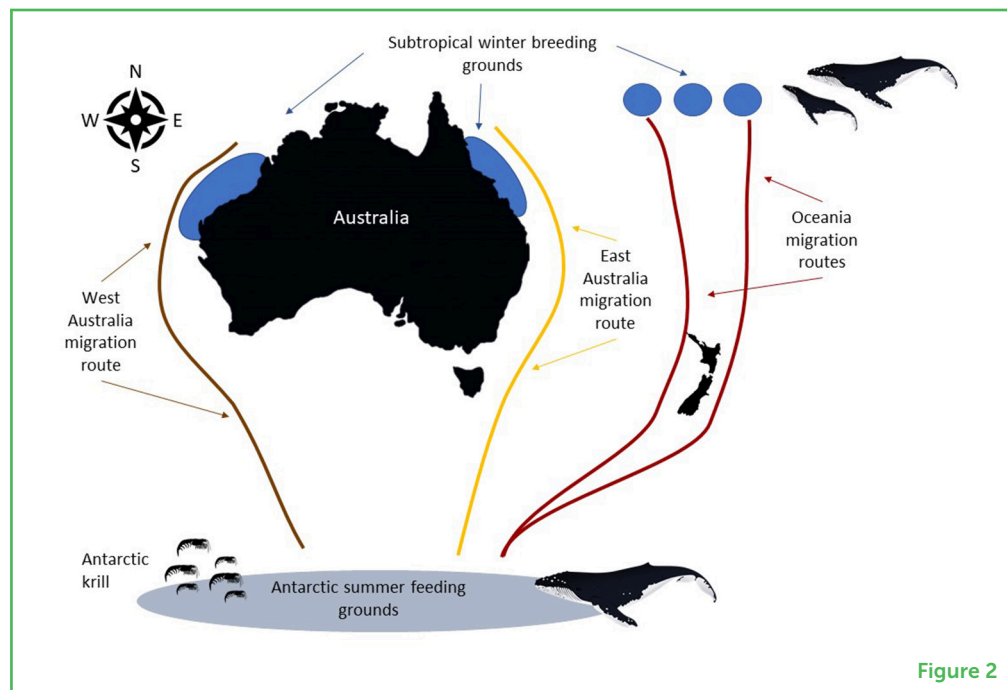
Humpback whales perform some of the longest migrations of any whale species, swimming up to 10,000 km each year. They migrate because they feed and breed in very different places. In the Southern Hemisphere, humpback whales spend the summer in the cold waters of Antarctica, feeding on Antarctic krill, which are small shrimp-like **crustaceans** which live in large groups called swarms. In the wintertime, humpbacks migrate north to mate and give birth in warmer, sub-tropical waters. However, the east Australian population is not the only humpback population migrating to and from Antarctica each year. **Figure 2** shows the migration pathways of the nearby Oceania population and the west Australian population. With so many whales swimming up and down Australia’s coastlines, these migration routes are often referred to as “humpback highways.” These populations may sometimes mix, so it is not always easy to tell the difference between them without collecting skin or tissue samples to identify which population they belong to based on their DNA.

#### CRUSTACEANS

Animals with a hard outer body made up of different sections e.g., crabs, prawns, barnacles.

**Figure 2**

The migration pathways or “humpback highways” of Australian and Oceania humpback whale populations. These whales migrate up to 10,000 km each year, spending the winter in their subtropical breeding grounds off the Australian coast and summer in the cool Antarctic feeding grounds.



**Figure 2**

Historically, scientists believed that humpback whales followed a “feast or famine” lifestyle. This means they are either in “feast” mode, eating as much as they can on their feeding grounds, or in “famine” mode, not eating at all while they migrate and spend time reproducing/calving on their breeding grounds. However, we now know this is not the case

### LUNGE FEEDING

Which is when a whale opens its mouth super wide and lunges at a patch of food to take a mouthful.

### BUBBLE-NET FEEDING

A specialized way of feeding in which whales deliberately blow bubbles from their blowhole (nose) while swimming in a tight circle, to create a bubble-net around their prey.

### SUPER-GROUP

A group of whales containing more than 20 individuals within five body lengths of one another.

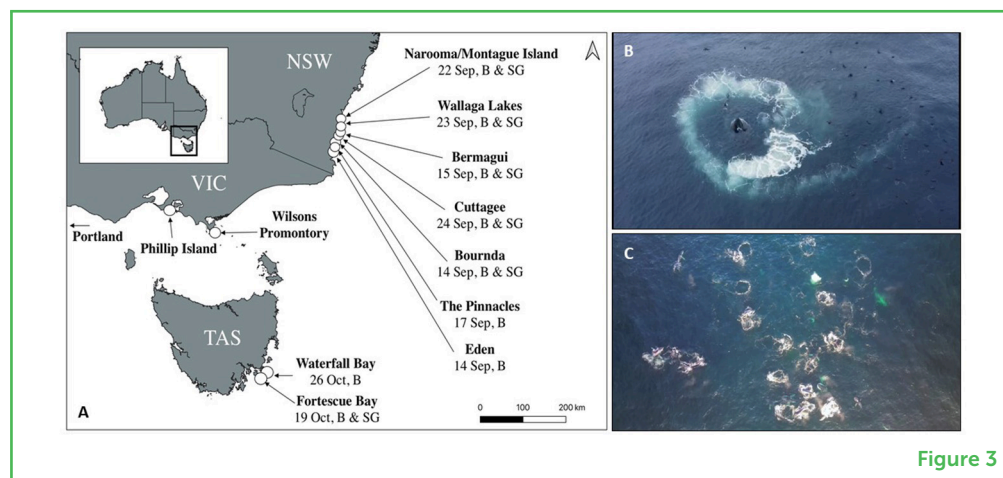
for east Australia humpback whales. There are now multiple records of humpback whales feeding off the coast of Australia during their migration [3]. In these feeding events, the whales were **lunge feeding**, which is when a whale opens its mouth super wide and lunges at a patch of food to take a mouthful. But, in 2020, humpback whales were also documented **bubble-net feeding** in Australian waters for the first time.

## CATCHING DINNER IN A NET MADE OF BUBBLES

Bubble-net feeding is when whales deliberately blow bubbles from their nose (the blowhole, **Figure 1**) while swimming in a tight circle using their pectoral fins. This creates a bubble-net around their food. They then scoop up their tightly packed food by lunging toward it (**Figure 3B**). This is a more specialized feeding behavior than lunge feeding, and in the Southern Hemisphere, it had previously only been recorded in Antarctica. As scientists, we were very excited to have 10 recorded observations of bubble-net feeding off east Australia in 2020 during the humpback whale southward migration (**Figure 3A**). To add to this feeding frenzy, we also saw lots of whales feeding together in a big group. This is known as **super-group**, which had also never been documented before in Australian waters (**Figure 3C**).

**Figure 3**

(A) Locations of humpback whale bubble-net feeding (B) and super-groups (SG) observations off east Australia in 2020 (Figure credit: Pirotta et al. 2021 [2]). (B) Bubble-net feeding, you can see the ring of bubbles created by the whale to trap food and the whale scooping a mouthful of the food in the middle (Image credit: Wild Ocean Tasmania). (C) A humpback whale super-group, you can see from the white water lots of whales in the frame close together (Image credit: Brett Dixon).



**Figure 3**

## SUPER-GROUP FEEDING FRENZIES

These super-groups were particularly exciting because we usually only see whales traveling in smaller groups of two to three as they migrate along the east Australian coast [1]. The observed super-groups contained between 20 and 90 whales within five body lengths of one another [2, 4]. This was larger than any group previously recorded off Australia [3]. This may have been observed due to lots of food in one area and favorable sea conditions, which might have been different in previous years.

## CITIZEN SCIENTIST

A member of the public who is not a scientist but participates in scientific research. In this project, our citizen scientists provided videos and photographs of whales feeding.

While we knew some whales fed in Australian waters, we now know it is not just a few individuals within the population. Their ability to grab a snack or meal during their migration may be one of the factors contributing to the recovery of this population. It also highlights how important observations by **citizen scientists** are. In fact, anyone can be a citizen scientist and work together with scientists to interpret their findings [5].

## CITIZEN SCIENTISTS, CAN I BE ONE?

Citizen scientists can be young people or grandparents, and everyone in between. In whale research, many commercial whale-watching businesses and their visitors collect whale data such as census counts, behavioral observations, and fluke images to identify individual whales. This data can help scientists in a number of ways such as monitoring whale movements and recording interesting behaviors. In this study, commercial whale-watching vessels and recreational drone pilots helped obtain images of bubble-net feeding and super-group feeding events. If you are interested in being a citizen scientist, check out your local nature or conservation groups to see how you might be able to get involved. There are also many online organizations which use citizen scientists to count or identify animals from images. In all cases, be sure to seek parental or guardian approval and abide by all safety procedures or wildlife guidelines.

## HUMPBACKS IN THE FUTURE

We are so happy to see the east Australian humpback whale population increasing! However, all whales, including this population, face a number of threats in the ocean. These threats include human impacts, such as increasing amounts of ocean plastics and discarded fishing gear (like nets and lines). Whales may eat plastic or become stuck in fishing gear, both of which can have life-threatening consequences. Other threats include ship strike, sound pollution and human-driven climate change, which leads to increases in sea temperatures and changes in prey distributions [6].

We can all do our bit to help whales. For example, keeping our beaches clean and eating sustainable seafood are great ways to help. Scientists are investigating how whales may be able to adapt to changing ocean conditions, possibly by increased feeding on their migrations or by the emergence of new feeding grounds and behaviors. If we can understand where and when the whales feed, we might be able to help protect them by changing *our* behavior. This might involve reducing vessel and fishing activity in areas where whales are known to feed or rest. If all of us—scientists, citizen scientists, and the public—do everything we can to help humpback whales, populations

of these amazing animals should hopefully continue to thrive long into the future!

## ACKNOWLEDGMENTS

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## ORIGINAL SOURCE ARTICLE

Pirotta, V., Owen, K., Donnelly, D., Brasier, M. J., and Harcourt, R. 2021. First evidence of bubble-net feeding behaviour and the formation of “super-groups” by the east Australian population of humpback whales during their southward migration. *Aquat. Conserv. Mar. Freshw. Ecosyst.* 31:2412–9. doi: 10.1002/aqc.3621

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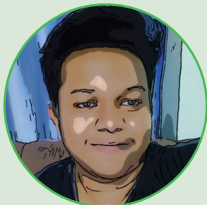
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## YOUNG REVIEWERS

### DEBASISH, AGE: 15

I am a young lad with curiosity to learn and innovate. I am highly interested in reading science fictions. I love to watch sci-fi movies. Cricket is also something I enjoy playing.



### VINCENT, AGE: 10

I love animals, sports, video games, and the outdoors! I play baseball daily. I love science and STEM topics. I am in the Science Olympiad Team for my elementary school. I have built water rockets and I also study animals, plants, and birds as a Backyard Biologist for my team. I want to be a vet when I grow up because I like animals. I like reading about science.



### WILLIAM, AGE: 13

I love science and everything to do with it. My passion for science helped me land a spot in the Science Olympiad for my middle school and I have been to the National tournaments in the U.S. I am more of a hands-on person, wanting to go to medical school when I grow up, every aspect of science is interesting for me. I also play multiple sports such as soccer, swimming, and baseball.

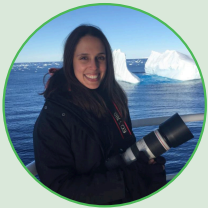


## AUTHORS



### MADELEINE J. BRASIER

I am a marine biologist at the University of Tasmania in Australia. I am really interested in the marine life around lutruwita/Tasmania and Antarctica. I have studied lots of species and habitats, from deep-sea worms, Antarctic krill, seagrass beds, and rocky reefs to humpback whales. Whatever the animal or habitat is, I am interested to know how science can be used to help protect and conserve them for future generations. When I am not in the office or out at sea collecting data, I enjoy running, looking for shells on the beach, and swimming or snorkeling in the sea. \*[madeleine.brasier@utas.edu.au](mailto:madeleine.brasier@utas.edu.au)



### VANESSA PIROTTA

I am a wildlife scientist from Australia. My research is focused on using innovative technologies for animal conservation. I have worked around the world studying humpback whales in places such as Tonga, Antarctica, and Madagascar. My most famous research involves using drones to collect whale snot. I enjoy bringing science to life and sharing my research with the world through science communication. I love being around the sea where I free dive, drive boats, and enjoy seeing marine life.