Journey across the ocean (For the teacher)

In this activity you will play “Bingo” to learn about whale migration patterns.

Duration: 90 minutes

Learning outcomes

Scan the QR code

Materials

- Material to write
- “Bingo” cards (Handout 1)
- Scissors
- Coordinate randomiser (or the table in page 4 in this document)

GUARDNA cards

Species Cards

- Blue whale
- Fin whale
- Humpback whale
- Long-finned pilot whale
- Minke whale
- Sei whale

Stakeholder Cards

- Scientists

Background

Scientists study whale and dolphin migration patterns to be able to understand and assess the impact of human activities to protect critical habitats, such as breeding grounds and feeding grounds, monitor ecosystem health, and understand the effects of climate change. Understanding where and when whales migrate is essential for effective management and conservation efforts.

To track these migration patterns, scientists often use satellite tagging, which allows them to learn about whale movements across the globe. One of the current satellite tagging projects is the MINTAG project. MINTAG aims to develop tags that can track large fast-swimming rorquals, and other whale species of interest—the main species being fin, minke, and pilot whales—throughout the year, providing comprehensive datasets on their geographic locations and their possible interactions with human activities.

Preparation

1. Print handouts 1 and cut the cards following the lines. One set of handouts can be used by nine students.
2. Distribute the cards to the students, one card per students.
3. Open the Coordinate Randomiser. If you do not have internet access, you can use the geographical points listed on page 4 of this document and select the coordinates randomly.

Procedure

In this activity, students will play a bingo game with a twist. Instead of crossing off numbers, they will mark geographical points on a map.

Each point is identified by an ordered pair of coordinates, in the form of (X, Y). The first number (X) represents the x-coordinate, or longitude, while the second number (Y) represents the y-coordinate, or latitude. To graph a point, students will place a dot on the map where the coordinates intersect.

1. Give each student a “bingo” card, which is a map showing a whale’s track (the maps in Handout 1).
2. The teacher will then call out coordinates either randomly (page 4) using the Coordinate Randomiser. Read the coordinates by their full name to get the students used to it. For example: read “79°N, 10°E” as “seventy-nine degrees north, ten degrees east”.
3. Students must find the called-out coordinate on their map. If the coordinate is on their map, they should circle it. If it is not, they should place a cross at the correct location.
4. When a student has circled all the coordinates on their map, they call out "BINGO". The teacher then checks the map to confirm the student’s bingo is correct.

Follow-up discussion

- **Compare the cards with each other. Notice that all the migration paths follow a north-south pattern. Why do you think this happens? Can you guess what might occur in the northern and southern regions?**

  Large whales follow a north-south migration pattern mainly due to seasonal changes in temperature and food availability. They move to their breeding grounds, in warmer southern waters, during winter months for breeding and calving, where the conditions are better for raising their offsprings. In the summer months, they migrate north to

feeding grounds to colder regions rich in food, like krill and fish, to feed and build up energy reserves.

- **Some animals in this activity belong to the same species but follow different migration paths, as seen with the fin whale. Why do you think this is the case? What challenges might these animals face along their different migration routes? Consider the concepts of "population" and "stock/subpopulation" in your explanation.**

  In management and conservation, pinnipeds and cetaceans are assessed by populations rather than by species. A population is a group of individuals of the same speciesthat typically live and interbreed in a particular habitat or region and are isolated to some extent from other groups within the species.

  Within a single species, one population might be at risk while another is thriving. Furthermore, within a single whale population, groups are divided into "stocks" or "subpopulations". Some stocks may be healthy, while others are not. A stock is a distinct component of a population, which can be based on geographic, genetic, morphological (shape of the animal), and/or behavioural differences.

  For example, the northeast Atlantic fin whale population includes different stocks with distinct breeding and feeding grounds. Fin whale 1, shown in this activity, feeds in Svalbard (Norway winter stock) and breeds off the west coast of Spain (Spain summer stock). Fin whale 2 feeds in southeast Greenland (East Greenland stock) and breeds near the Azores (Central stock). Identifying these stocks is crucial as they face different threats, such as varying food availability, human activities like shipping and fishing (which increase risks from noise, ship strikes, etc.), and hunting.

  Scientists use satellite tagging to track migration paths and to identify breeding and feeding areas, and therefore define the different stocks within a whale population. Some species, like humpback whales, are easier to tag and thus, study. However, fast-swimming species like fin whales and minke whales are harder to tag, and there has not been any successful long-term tagging yet. Therefore identifying the breeding and feeding grounds of the different stocks of these species is more challenging. The MINTAG project addresses this by developing smaller and lighter tags for long-term deployment, aiming to improve understanding of these species' migration patterns and population structure, and thus support effective management efforts.

- **Whales are thought to rarely feed during their migration and to not eat druing the breeding season. How can they manage this?**

  Whales rarely feed during the migration and do not eat during the breeding season, subsisting on stored fat reserves accumulated at the feeding grounds. Some whales make a feeding stop-over on the way to the breeding/feeding grounds in an area with a lot of food. For example, some humpback whales migrating from Svalbard feeding grounds to the Caribean or Cabo Verde stop in northern Norwegian fjords to eat lots of herring before continuing their journey.

- **Using the GUARDNA cards, each student should pick an interesting fact about the species on their card and explain it concisely to the class.**

Extension

- **Follow the MINTAGged whales.** On the MINTAG page, you can track the real-time movements of whales that have been tagged with MINTAG devices and watch real footage of the tagging process.

References

Lydersen, C., Vacquié-Garcia, J., Heide-Jørgensen, M.P. et al. (2020). Autumn movements of fin whales (Balaenoptera physalus) from Svalbard, Norway, revealed by satellite tracking. *Scientific Reports* 10, 16966. https://doi.org/10.1038/s41598-020-73996-z

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Víkingsson, G.A., and Heide-Jørgensen, M.P. (2015). First indications of autumn migration routes and destination of common minke whales tracked by satellite in the North Atlantic during 2001–2011. *Marine Mammal Science*, 31, 376-385. https://doi.org/10.1111/mms.12144

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List of geographical points marked in the “bingo” cards.

Minke whale 1:
- 70°N, 10°E
- 60°N, 10°W
- 40°N, 20°W
- 30°N, 40°W
- 30°N, 60°W

Minke whale 2:
- 70°N, 20°W
- 70°N, 30°W
- 60°N, 30°W
- 60°N, 20°W
- 50°N, 20°W

Minke whale 3:
- 60°N,10°W
- 60°N, 20°W
- 50°N, 30°W
- 40°N, 30°W
- 30°N, 30°W

Pilot whale:
- 70°N, 10°E
- 60°N, 0
- 60°N, 10°W
- 50°N, 20°W
- 40°N, 30°W

Humpback whale:
- 60°N, 50°W
- 50°N, 50°W
- 40°N, 60°W
- 30°N, 70°W
- 20°N, 70°W

Sei whale:
- 60°N, 50°W
- 50°N, 50°W
- 50°N, 40°W
- 50°N, 30°W
- 40°N, 30°W

Fin whale 1:
- 80°N, 10°E
- 60°N, 10°W
- 50°N, 20°W
- 40°N, 30°W
- 40°N, 10°W

Fin whale 2:
- 80°N,10°E
- 70°N, 0
- 60°N,10°W
- 50°N,10°W
- 40°N,10°W

Fin whale 3:
- 70°N, 20°W
- 60°N, 30°W
- 50°N, 40°W
- 40°N, 40°W
- 40°N, 30°W