**ACTIVITY: Utilising *Navigating our freshwater environment***

**Activity idea**

In this activity, students use a browser-based storymap to follow the journey a tuna makes during its life cycle and learn about the challenges it faces. This journey reflects the state of the freshwater environment in Aotearoa.

By the end of this activity, students should be able to:

* progress through the *Tuna navigating our freshwater environment* storymap
* interact with the data used in [Our freshwater 2023](https://www.sciencelearn.org.nz/resources/3232-our-freshwater-2023) via interactive maps
* use media and text to explore the stages of the tuna life cycle
* use media and text to consider the challenges tuna face at each stage of their life cycle
* consider how these same challenges affect other living things – including humans
* discuss how this information can be used to protect, restore or care for freshwater systems.

**For teachers**

***Introduction/background***

[Navigating our freshwater environment](https://storymaps.arcgis.com/stories/155527d42155408c8b08649ca971dad0?play=true&speed=medium) is an interactive storymap that explores the state of freshwater environments from the perspective of a tuna (eel). Tuna is both a taonga species and an indicator species – their presence, size and condition can provide an indication of the health of the environment and the life-supporting capacity of our wai (water).

The storymap was created by the Ministry for the Environment as an interactive product that allows users to explore data and findings from the environmental report [Our freshwater 2023](https://www.sciencelearn.org.nz/resources/3232-our-freshwater-2023). It features both challenges that humans have created for tuna migration and efforts to mitigate these challenges.

This activity helps users navigate and deepen engagement with the health of the environment through the lens of the tuna. It includes questions to promote understanding of the key science and te ao Māori concepts and provides links to resources that can help to extend this learning. It also provides opportunities for students to use multiple science capabilities.

***Key science and te ao Māori concepts***

* Ki uta ki tai (from the mountains to the sea) – interconnectedness of freshwater systems, catchments and the life they support.
* Wai ora – water is the basis for all life. It is taonga, something to be cherished and looked after. For Māori, wai holds mauri – a spiritual life force. To keep the mauri intact, we need to look after the water.
* Life cycles – the tuna life cycle includes multiple stages: eggs, larva, glass eel, elver, adult.
* Heke/migration – adult eels leave their freshwater habitats and journey to spawning ground near Tonga. After hatching, larvae make their way back to Aotearoa and find a suitable place to live.
* Maramataka – the rising of the constellation Tunanui marks the beginning of the tuna heke.
* Habitat – once in freshwater, larvae change into glass eels, then elvers and finally adults. They swim upstream, climb vertical surfaces and move overland to find suitable streams, wetlands or lakes.
* Mahinga kai – tuna are one of the most important mahinga kai species. They are known by over 100 different names depending on their location and appearance.
* Nature of science – not everything about tuna heke is known – there’s still much we have to learn about spawning.
* Communicating in science – science communication can take many forms. The information in the storymap reflects the information in the more conventional Ministry for the Environment and Stats NZ environmental report.

The handout [Glossary terms and kupu Māori](#Glossary) lists some of the content vocabulary used within these concepts.

***What you need***

* Access to the article [Our freshwater 2023](https://www.sciencelearn.org.nz/resources/3232-our-freshwater-2023)
* Access to the storymap [Navigating our freshwater environment](https://storymaps.arcgis.com/stories/155527d42155408c8b08649ca971dad0)
* The handout [Glossary terms and kupu Māori](#Glossary)
* Access to supporting online content

***Teaching suggestions***

There are numerous ways to make use of *Navigating our freshwater environment*. Rather than offer a prescriptive pathway, the following notes offer suggestions. It will be helpful for educators to read the Hub article [Our freshwater 2023](https://www.sciencelearn.org.nz/resources/3232-our-freshwater-2023) to gain some insights regarding the pressures that cause changes to the state of the environment and the impacts they create.

***What to do***

1. Introduce the activity by gathering students’ prior knowledge and experiences with tuna/longfin eels.
2. Watch the video [The life cycle of eels](https://www.sciencelearn.org.nz/videos/211-the-life-cycle-of-eels).
3. Use the handout [Glossary terms and kupu Māori](#Glossary)to identify content vocabulary students encounter in the video and in the storymap.
4. Introduce students to the virtual experience [Navigating our freshwater environment](https://storymaps.arcgis.com/stories/155527d42155408c8b08649ca971dad0).
5. Use the prompting questions below to analyse the text and media and the data they provide.

Gather and interpret data

* What signals the start of the tuna heke?
* How does the tuna change when it is ready to migrate?
* Why does the tuna only get one chance to reproduce?
* What are some of the challenges the tuna faces at each of its life stages?
* How/why do the challenges/pressure tuna face also affect our quality of life and things that are important to us as humans?
* What are some of the ways people are helping to restore the environment and reduce the impacts for native species like tuna?

Interpret representations

* How are the challenges tuna face presented in the storymap?
* How do the interactive maps get this information across?
* Do the maps have legends to help interpret and understand the information?
* How is colour used to present information in the interactive maps?
* Are there sources to say where the information has come from?
* What local information can you gather from the various interactive maps?
* What other types of representations are used in the storymap?
* How do they convey information about the pressures humans place on freshwater systems and the impacts this has?

Use evidence

* The storymap makes it clear that tuna face challenges with each life stage. How does it use evidence to support these claims?
* How does the storymap use evidence to demonstrate the pressures and impacts on water as it journeys ki uta ki tai (from the mountains to the sea)?
* What observations inform maramataka about tuna heke?

Engage with science

* How important is this information? For tuna? For us as humans?
* How can this information influence people’s decisions or actions?
* How can we find out if tuna live in our local freshwater systems?
* How can we find out if they are well and healthy?

***Extension ideas***

The following resources support further learning of key science and te ao Māori concepts. Several of the suggested resources are curations that contain links to articles, activities and media.

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| **Concept** | **Resources** |
| Ki uta ki tai and freshwater interconnections with people and te taiao (nature) and wai ora | * [Waitī – freshwater environments](https://www.sciencelearn.org.nz/resources/3124-waiti-freshwater-environments) – article * [Wai Māori](https://www.sciencelearn.org.nz/image_maps/88-wai-maori) – interactive * [Water catchments](https://www.sciencelearn.org.nz/resources/2873-water-catchments) – article and interactive * [Tōku awa koiora](https://www.sciencelearn.org.nz/resources/420-toku-awa-koiora-introduction) – curation |
| Tuna life cycle and migration | * [Longfin eels](https://www.sciencelearn.org.nz/resources/441-longfin-eels) – article * [Tuna – working with glass eels](https://www.sciencelearn.org.nz/resources/423-tuna-working-with-glass-eels) – article * [The life cycle of eels](https://www.sciencelearn.org.nz/videos/211-the-life-cycle-of-eels) – video * [The fish highway](https://www.sciencelearn.org.nz/resources/3075-the-fish-highway) – *Connected* journal |
| Freshwater habitats | * [The lakes of Aotearoa New Zealand](https://www.sciencelearn.org.nz/resources/3211-the-lakes-of-aotearoa-new-zealand) – article * [Exploring my local lake](https://www.sciencelearn.org.nz/resources/3213-exploring-my-local-lake) – activity * [Repo (wetlands) – a context for learning](https://www.sciencelearn.org.nz/resources/3001-repo-wetlands-a-context-for-learning) – curation * [Te whakamahi i ngā rauemi o Tuihonoa Te Reo o Te Repo hei whakarite ara whakaako](https://www.sciencelearn.org.nz/image_maps/96-te-whakamahi-i-nga-rauemi-o-tuihonoa-te-reo-o-te-repo-hei-whakarite-ara-whakaako) – curation * [Tōku awa koiora](https://www.sciencelearn.org.nz/resources/420-toku-awa-koiora-introduction) – curation |
| Maramataka and tohu | * [Maramataka – the Māori calendar](https://www.sciencelearn.org.nz/images/4397-maramataka-the-maori-calendar) – image * [SMART – Māori astronomy](https://www.sciencelearn.org.nz/resources/3153-smart-maori-astronomy) – article * [Māori ways of knowing – weather and climate](https://www.sciencelearn.org.nz/resources/2961-maori-ways-of-knowing-weather-and-climate) – article * [Cultural indicators for repo](https://www.sciencelearn.org.nz/resources/2992-cultural-indicators-for-repo) – article |
| Mahinga kai | * [Mahinga kai](https://www.sciencelearn.org.nz/resources/3174-mahinga-kai) – article * [Mahinga kai – natural resources that sustain life](https://www.sciencelearn.org.nz/image_maps/124-mahinga-kai-natural-resources-that-sustain-life) – interactive |
| Action taking to support freshwater systems | * [Rivers and Us – introduction](https://www.sciencelearn.org.nz/resources/2882-rivers-and-us-introduction) – curation * [Inquiry and action learning process](https://www.sciencelearn.org.nz/image_maps/92-inquiry-and-action-learning-process) – interactive * [Monitoring stream health](https://www.sciencelearn.org.nz/resources/2889-monitoring-stream-health) – activity * [Smart Water – a context for learning](https://www.sciencelearn.org.nz/resources/3088-smart-water-a-context-for-learning) – interactive |

**Glossary terms and kupu Māori**

|  |  |
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| elvers | Darker-coloured juvenile eels. Glass eels darken and become elvers. |
| glass eels | Transparent juvenile eels. Eel larvae – leptocephali – change into glass eels. |
| heke/migration | When a number of animals pass from one region to another. |
| indicator species | A particular species or organism whose presence or absence in an environment can provide an indication of the status of the environment. |
| ki uta ki tai | The journey of water from the atmosphere to the mountains and across the land to the sea. |
| larva | An immature form that some animals pass through before metamorphosing into an adult form. |
| macroinvertebrate | An invertebrate (animal without a backbone) that can be seen with the naked eye (it is macroscopic). |
| macroinvertebrate community index (MCI) | A measure of the abundance and diversity of macroinvertebrates. |
| mahinga kai | Indigenous freshwater species that have traditionally been used as food, tools or other resources. |
| Puna-kauariki | A constellation near Rehua (Antares) that marks the celestial origin of tuna. Puna-kauariki was a spring in the highest heavens. When it dried up, tuna and other species made their way from the heavens to Papatūānuku (the Earth). |
| spawn | The act of reproduction of aquatic creatures. The mixing of the sperm of a male and the eggs of a female of the species. |
| trophic level index (TLI) | An indicator of the overall condition of freshwater. It is based on the concentrations of total nitrogen, total phosphorus and chlorophyll-a (algae). |
| tohu | A sign, marker or post. In this context, an indicator species. |
| tuna | Longfin eel. |
| Tunanui | Within maramataka, a constellation that signals tuna heke (eel migration). |
| weir | A low dam built across a river to raise the level of water upstream or regulate its flow. |