From Rivers to the Sea – The Plight of the Īnanga

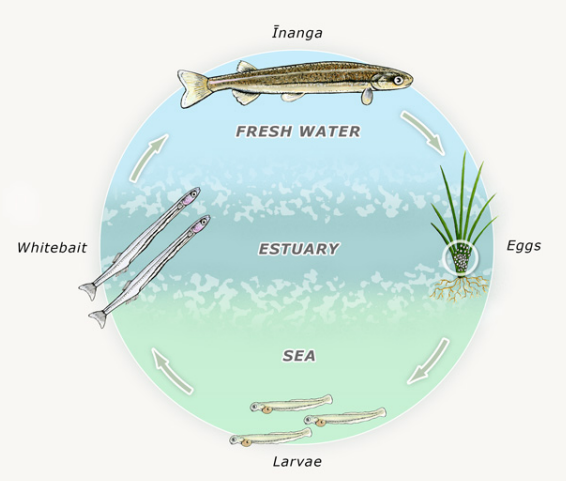
Theme: Animals are affected by human activities.

Objective: To learn about the lifecycle and migration of the īnanga and understand how human activities are affecting them and what we can do to reduce our impact.

Focus Question: Īnanga are an "at risk" species so do we need to manage them? If they stop breeding in our estuaries as a result of human disturbance, do we need to worry – or will they just move somewhere else?

Background Information:
Īnanga (whitebait or *Galaxias maculatus*) are really tasty. Is that why there are less of them now? Whitebait fritters have been a kiwi delicacy for years. In older times our Māori people dried the fish to preserve them and savour the taste for up to a couple of months. They were a highly prized food source due to their oil content - Māori even named a type of light green Pounamu (greenstone) after them!

Īnanga live for about one year and move between fresh water and the sea at different times in their lifecycle.



Te Ara (The Encyclopaedia of NZ) - artwork by Bruce Mahalski

Īnanga eggs - Laid on grasses and plants around the high water mark on a very high spring tide. Males fertilise these by releasing sperm into the water, giving it a milky appearance. Most adults die after spawning. The eggs remain above the water for a number of weeks but remain moist among the vegetation on the estuary banks.

Baby īnanga (larvae) - When another spring tide reaches the eggs, the larvae hatch. Then the falling tide carries them out to sea, where the hatchlings spend the winter, feeding on small crustaceans.

Juvenile īnanga (Whitebait) - In the springtime, the young fish return to the estuary and then make their way upriver to live in freshwater habitats.

Adult īnanga - By autumn the mature fish are ready to swim back down river to spawn in the estuaries.

The estuary is very important for īnanga as the adults spawn in the salt wedge. The 'salt wedge' is the tidal zone where 100% saltwater (ie water with salinity of 35 parts per thousand, known as 35 ppt) changes to 100% freshwater (0 ppt).

Īnanga lay their eggs on the riverbanks at the base of grass stems on very high spring tides, so when the tide drops back to normal the eggs are sticking out of the water. It is the loss of this spawning habitat that has decreased īnanga population.

Along many rivers and estuaries today it is harder for the eggs to survive. In some areas there is not enough suitable vegetation for the īnanga to lay their eggs with farm animals trampling and grazing on the grasses.

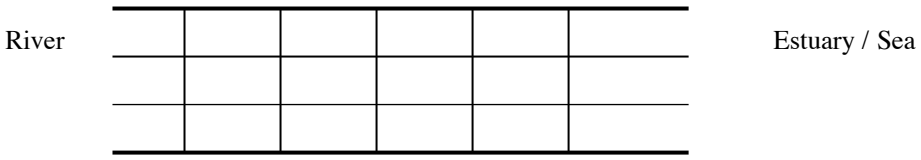
Other threats to īnanga include contamination that can lead to a lack of oxygen in the water. Scientists have found that this causes the fish to jump out of the water in order to obtain oxygen by absorbing it through their skin.

Īnanga Activity

Materials for the game:
Chalk (if working on pavement), masking tape (if working on carpet), children (any number will do), Īnanga game cards (to block off the squares during the activity).

Rules:
Children need to cross from shoreline to the sea and back without stepping on gridlines. If a square on the grid is crossed off, the children need to use other squares to go around or jump that square. If a child steps on a line or crossed off square, he/she is out and watches the rest of the game. The game is stopped when no one can cross without touching the gridlines. A discussion follows.

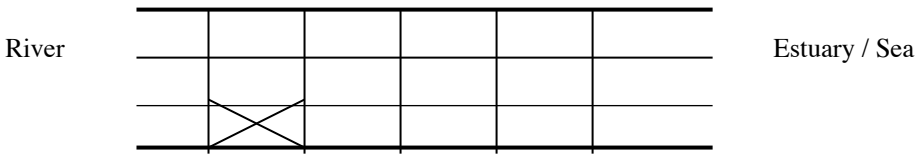
Methods:
1. Mark three lanes on the floor (size and distance will depend on the number of children and the area available).



2. Students become īnanga. After the eggs hatch, the larvae spend the winter at sea, feeding on small crustaceans. Have the children practice swimming like a tiny fish and a bigger fish.

3. The game begins with the children as newly hatched juveniles. After spending the winter at sea, they return to the estuary and make their way upriver to live in live in freshwater habitats. Children (juvenile īnanga) need to move from the sea up the river (spring), without stepping on the lines or jumping squares. They return as adults to the estuary (autumn) to lay their eggs in the estuary (on grasses at the high water mark). Most adults die after spawning. Repeat this yearly life cycle from sea to river and back 1-2 times.

4. The edge of the river is a favourite place for stock to wander. However, these animals can easily trample the grasses where the inanga lay their eggs. Cross off one square in grid. Children are not allowed to step in that square.



5. New houses are built on the side of the estuary. Plants are removed to make way for pulling up the dingy– so the area available for egg laying is reduced. Cross off one square in grid. The children (īnanga) need to avoid these squares in their migration from the sea to the river and back to the estuary go to sea.

6. A slight warming of sea temperatures in the past 50 years is thought to have forced vital food species, such as krill, further south making it harder for juvenile īnanga to find. Cross off one square.

7. Recreational fishers have put up whitebait nets in the river. Juvenile īnanga get caught in nets. Cross off one square.

8. Larger freshwater fish feed on the īnanga juveniles in the rivers. Cross off one square.

9. Larger marine fish have been known to feed on the īnanga larvae at sea. Cross off one square.

10. Pollutants can lead to a lack of oxygen in the water. Scientists have found that this causes the fish to jump out of the water in order to obtain oxygen by absorbing it through their skin. Cross off one square.

11. Too many whitebaiters results in overfishing of the juveniles as they travel up stream. Cross off one square.

12. Microplastics in the water, can be ingested by the īnanga. Cross off one square.

13. Commercial fishing takes large numbers of īnanga. Cross off one square.

14. Clearing of trees in the catchment leads to an increase in the amount of sediment entering the river and estuary. Cross off one square.

15. Add your own obstacles an īnanga might encounter.

Discussion:

1. How many of the threats were natural? How many were man-made?

2. Why is it important that we do not prevent īnanga from moving freely between the sea and the river habitats?

3. Is there any action that we could take that would decrease the number of obstacles that īnanga face during their life cycle and migration from the sea to river and back to the estuary?

Additional Resources:

Īnanga Game Cards (see Resources at www.marine.ac.nz)

This resource was produced by the New Zealand Marine Studies Centre and supported by funding from the Institute of Environmental Science and Research (ESR) Te Whare Manaaki Tangata, Taiao hoki.

