



Harbours, bays and estuaries – at the edges of land and sea



Our prized snapper



SCIENTIST
MARK MORRISON
ALWAYS WANTED
TO BE A
SCIENTIST - EVEN
WHEN HE WAS A
LITTLE BOY.

To learn more about snapper, we talked to National Institute of Water & Atmospheric Research Fisheries Ecologist Mark Morrison. Mark has been working with snapper for over 10 years. Even when Mark was a young boy he liked being near the sea and watching fish.

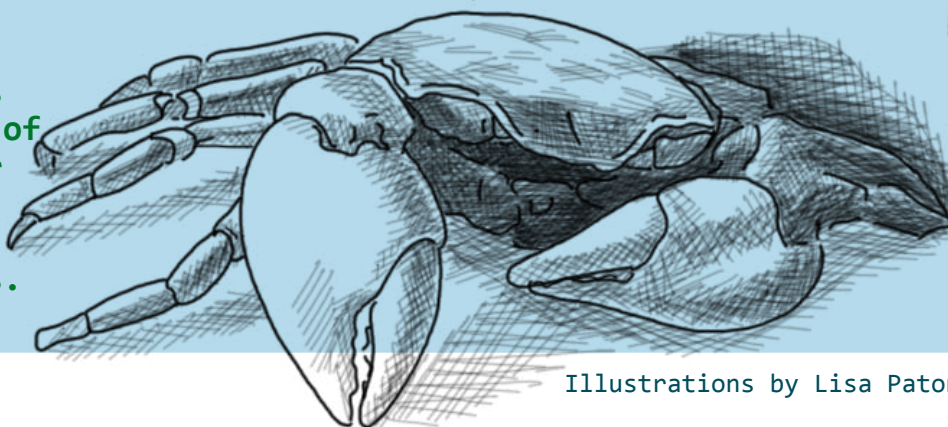
Snapper are fish that live not too far offshore mainly around the coasts of the North Island. They are one of New Zealand's **most important fish species**. In fact, they are often called New Zealand's "most prized" sea fish!

Because lots of people like to fish for snapper, we need to be careful that they **do not become overfished**. Not only that, but because snapper spend most of their life close to our coasts they are also **affected** by what we do on land. Late last century, some fishers and scientists began to notice that in certain areas snapper numbers were dropping.

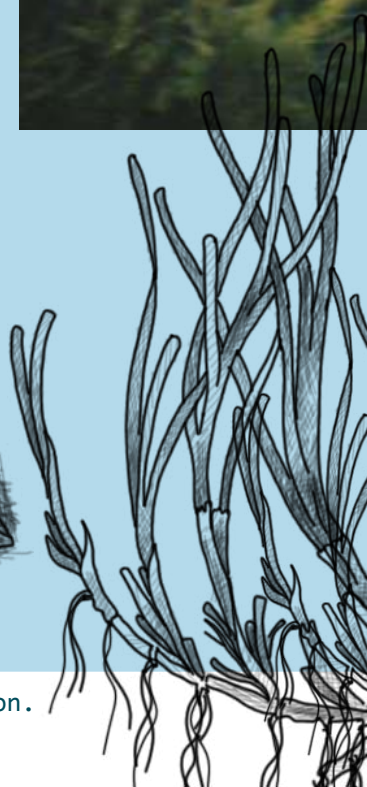
To **protect snapper populations**, the government came up with a system to manage the number of snapper and other fish that could be caught to make sure that snapper and other fish stocks won't be wiped out. The system, which is called the quota management system, appears to be working and in some areas **snapper numbers are increasing**.

Now, some local communities are working to protect snapper habitat to make sure we will always be able to catch these fish.

Mud crabs are some of the other animals found in estuaries.



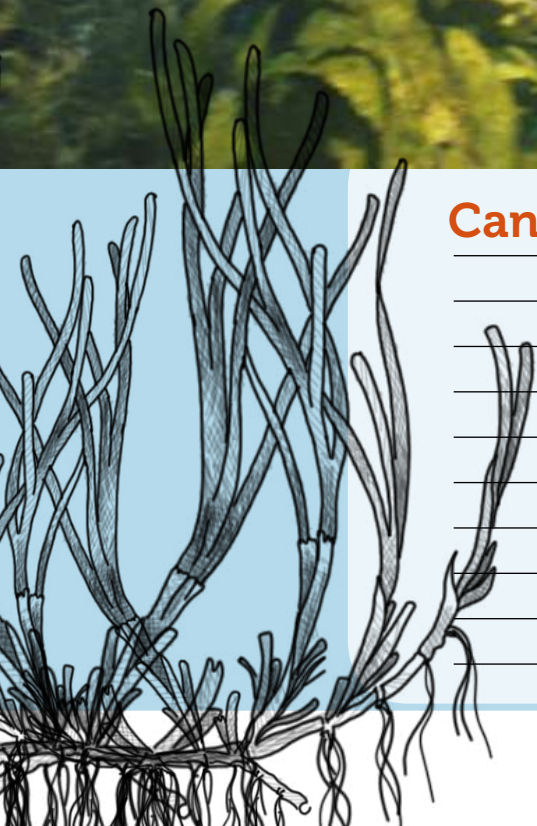
Illustrations by Lisa Paton.





● Snapper amongst kelp.

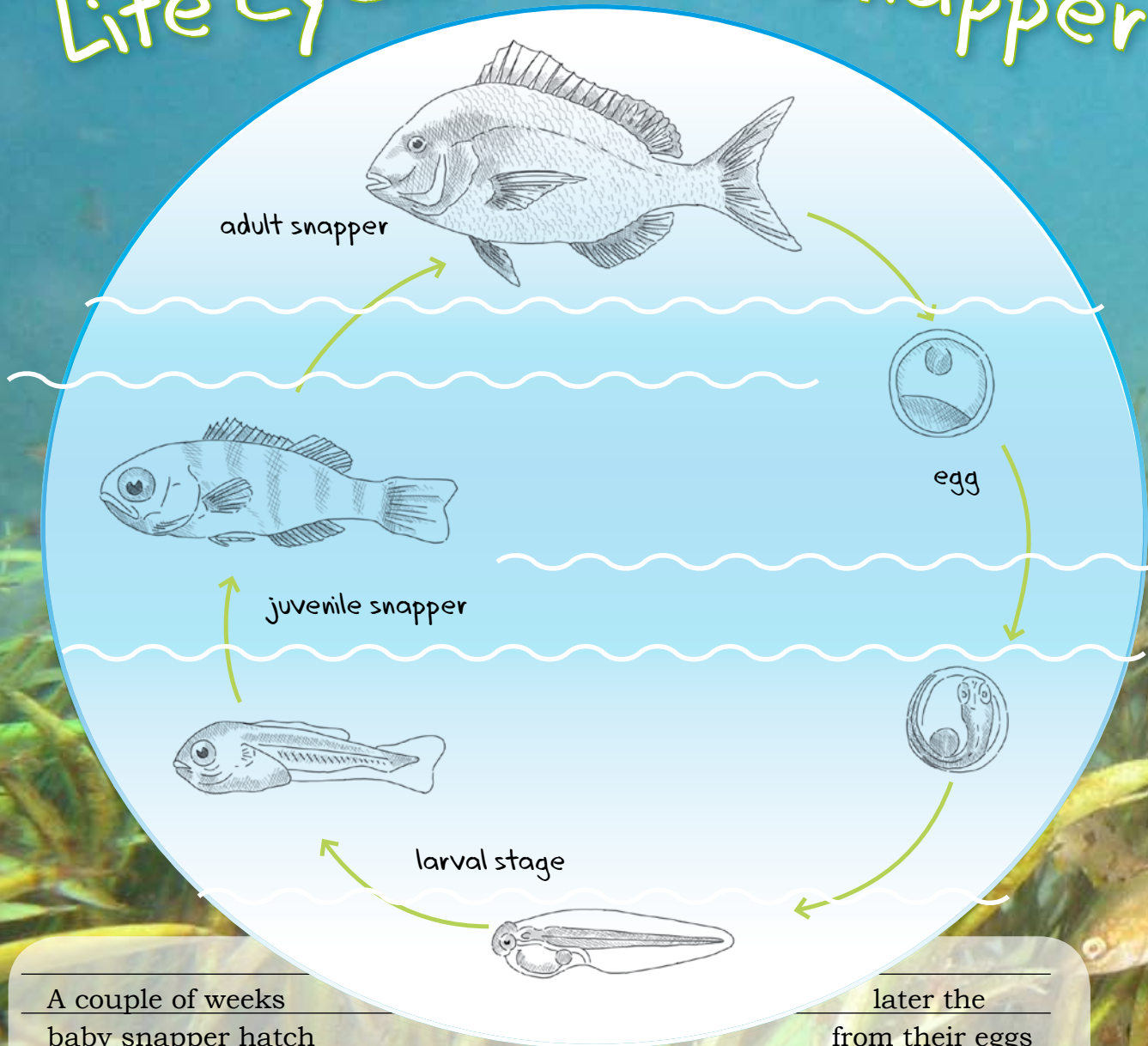
Photo by Kim Westerskov.



Can you tell us how snapper are born?

There is still a lot we don't know about snapper, but we suspect that they gather in large adult groups just outside of the harbours and coastal bays where they grew up to spawn. There the females release their eggs into the water column. Each female spawns many thousands of eggs, over a number of days, which the males fertilise by releasing sperm into the water at the same time – kind of like how an aerial top-dresser works.

Life cycle of the snapper



Illustrations by Lisa Paton.

A couple of weeks later the baby snapper hatch from their eggs – at this point they're called **larvae**. They look very different from their parents. They are thin, semi-transparent spindly little creatures.

The larvae then make their way to harbours and bays where they grow into juvenile snapper. We're not sure if they catch water currents that bring them into the nearby harbours and bays or if they actually swim there.

What we do know is that as juveniles **they thrive in harbours and bays** that have many different plants and animals living there. Snapper seem to particularly thrive in coastal environments where there are seagrass meadows, horse mussel beds, kelp forests and sponge gardens.

When they grow up, snapper have few predators except for humans.

During the juvenile stage, however, they are **prey** for many other animals including shorebirds, sharks and fish like John Dory, kahawai and even adult snapper.

Seagrass provides important habitat for young snapper and other fish like spotties (pictured). Photo courtesy Ministry of Fisheries.



Can you give an example of an important snapper nursery?

We know that today Kaipara Harbour on the north-western side of the North Island is an **incredibly important place** for baby snapper. The harbour is a very complex and productive marine ecosystem. Besides its importance to snapper, it is also a **breeding place** for mullet, flounder, kahawai, rays, sharks and other species.

We know the harbour's importance for snapper because of a recent science experiment.

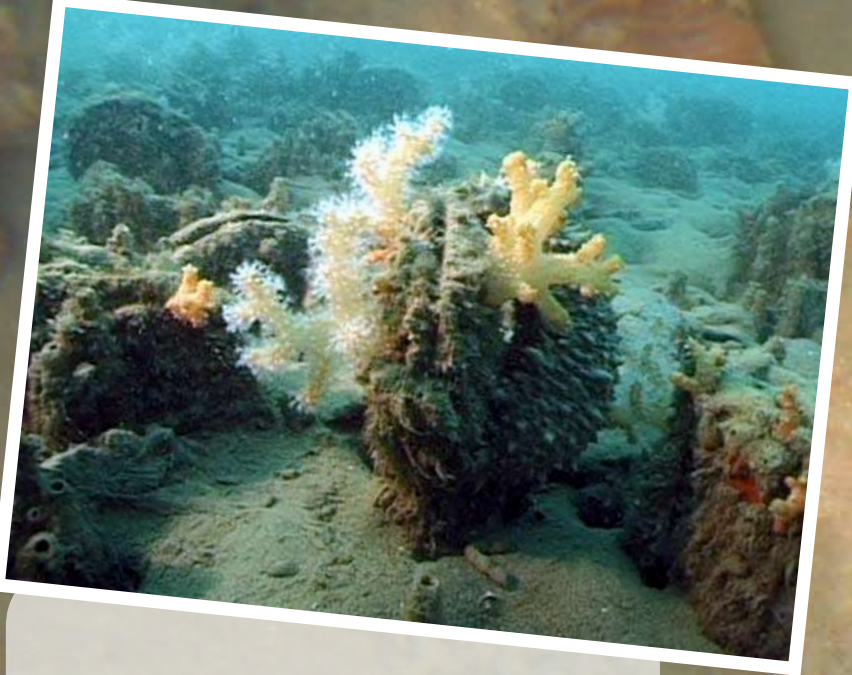
In 2003, we went out and collected juvenile snapper from seven estuaries along the west coast of the North Island. By **testing their ear bones (otoliths)** for eight different chemical elements, we were able to create a 'chemical signature' to identify which harbour each of the young snapper came from.

We then waited for four years before collecting a sample of 140 adult snapper from commercial catches, from Ninety Mile Beach at the top of the North Island to Mana Island which is near Wellington.



NIWA scientists get a little muddy during their field research.

Photo courtesy NIWA.



Young snapper like to live in places where there is lots of food and lots of protection from predators. Horse mussels and soft corals provide great habitat for young snapper and other fish.

Photo courtesy NIWA.

The analysis of the adult snapper using the 'chemical signatures' we'd already established showed that the majority of the adult snapper collected were originally juveniles in the Kaipara Harbour. That percentage is much higher than we expected. It means that our **snapper population is very dependent** on what happens in the Kaipara Harbour.


We think that in the past many other harbours on the west side of the North Island played a bigger role in snapper production, but some of these have changed over time. Some of this is due to **natural processes**, but much of it is also due to **pollution** and **sediment run-off** from land-based activities. These things can turn healthy harbours into underwater deserts for some fish species.

Juvenile snapper.

Photo courtesy NIWA.

Seagrass meadows are important nursery habitat for a number of species including snapper.





Are there ways to restore some of the estuaries that might have been good snapper nurseries in the past?

The short answer is **yes**. In fact, NIWA is working with the Northland Regional Council and the local community right now on a **seagrass restoration project** in Whangarei Harbour. We know that **seagrass meadows play a critical role** in coastal ecosystems and provide habitat for many species, including baby snapper.

In New Zealand there is only one genus of seagrass, *Zostera*. It grows in soft sediments in estuaries all around the country. Here in New Zealand, as in many other parts of the world, seagrass populations are declining.

For example, in the 1940s Whangarei Harbour was home to thriving seagrass meadows – an estimated 1400 hectares in 1942 – but since that time there has been a **big decrease in seagrass** in the harbour. There are a variety of factors that have contributed to the decline including an increased rate of sedimentation, erosion, and even changes in the seabed shape (caused by activities like dredging).

We recently studied parts of the Whangarei Harbour to see if seagrass could be re-introduced there. What we learned is that because of community efforts and changes in land-based activities, in some areas of the harbour the **water and sediment quality has improved** enough for seagrass to be able to survive.

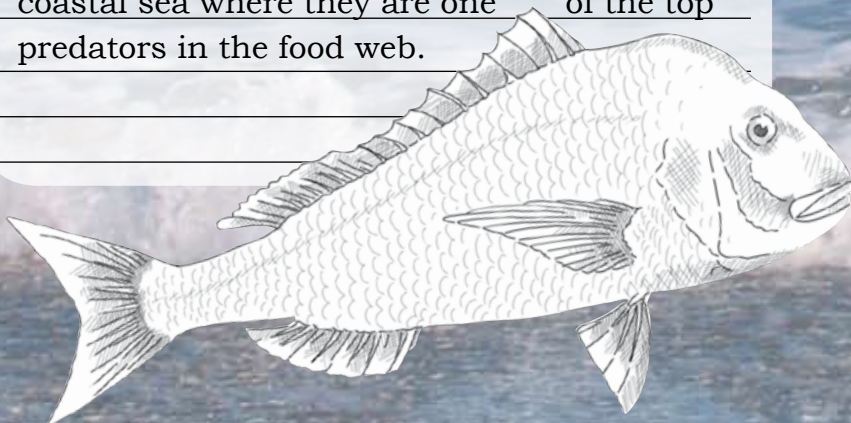
We're now working with the local community to carry out **restoration trials**.

Field research is an important part of NIWA scientist Mark Morrison's work. Photo courtesy NIWA.

What other snapper research are you involved with right now?

We plan to carry out studies similar to what we did on the west coast of the North Island on the east coast of the North Island. We started with the west coast because there are fewer estuaries where snapper larvae are known to congregate. We think the east coast might be a different story, but we'll have to wait and see what we discover.

We're also involved in researching **how far snapper travel** over the course of their lives. It seems that most snapper are **territorial**, but some individuals appear to travel hundreds of kilometres. We recently tagged 10,000 snapper in the Hauraki Gulf and so far have had 800 returns from both commercial and recreational fishers. Some of the tagged snapper were caught as far away as Great Barrier Island and the Bay of Plenty and one was even caught off the coast of Gisborne. There's still a lot we need to learn about snapper. **By knowing** more we'll be better able to **manage the various habitats** that they depend on over the entire course of their lives – from the harbours and bays where they begin their lives as larvae, to the open coastal sea where they are one of the top predators in the food web.





Acknowledgements

The Ministry of Fisheries and the Department of Conservation have developed this web-based educational resource to help students learn more about the effects of land-based activities on our coastal environment.

The student activities in this resource have been developed for Years 7&8, but many of the activities may easily be adapted for older students.

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