

Ngahuru/Autumn 2023 | ISSUE **158**



SHELLS For Forest & Bird's young conservationists

Inside:

 Extraordinary shells
Speak up for the Hauraki Gulf

What people commonly call anga | shells are the exoskeletons (hard outsides) of molluscs...

Other animals have things we call shells, but they are different.

10 Maarten Heerlien

Clam. 🖸 Udo M. Savalli

How are mollusc shells made?

Molluscs are invertebrate animals - like snails, clams, and mussels - who need a hard shell to protect their soft, squishy bodies from being eaten, drying out, and getting hurt.



The mantle is the part of the soft squishy body that connects to the shell. It lets out proteins and minerals to form and build the shell and repair it.

Kaikaikaroro | Triangle shell. 🖸 Martin Hoj Hanson

The shells grow over time from the bottom up or inside out.

are made almost entirely of the mineral calcium carbonate. One form of it makes the chalky outside layer and another makes the inner pearly layer of the shell. Egg shells and limestone are also made from this material.

Mollusc shells have three layers and

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COVER: Etched chiton | *Onithochiton neglectus* subantarcticus 🖸 Rod Morris



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Powelliphanta. I Ratephenson



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Tiotio mawhero | Pink barnacle. © Shona Treanor

How are some other shells made?

Crabs and barnacles are crustaceans. They shed their exoskeleton completely to grow a bigger one.

Pāpaka | Paddle crab. 🖸 Splish

Turtle shells are made from their rib bones and covered in a protein called keratin - that's what our fingernails are made from. Their shells are an endoskeleton, not an exoskeleton. They are part of their hard insides. kina shells are called a "test". They are round and made up of many small interlocking plates. When a kina is living, it has a thin skin on top of its test, with spikes attached. This means their shell is also an endoskeleton. @ Rileyrose

What about lamp shells?

Lamp shells or brachiopods are very ancient shelled animals. They got the name "lamp shell" because they look like Roman oil lamps. Six hundred million years ago, they were one of the most common animals on earth!

They look an awful lot like clams, so people think they are molluscs, but the shells aren't quite right.

One side of a brachiopod shell is the mirror image of the other side. Mollusc shells aren't symmetrical like this.



Not everything that looks like a shell is actually a shell though...

This is a paper nautilus shell. It is really the egg case of an octopus!

Pūpū tarakihi | Paper nautilus. 🖸 Ginnical

And while most molluscs have a hard shell to protect their soft squishy bodies, molluscs are incredibly diverse.

Some molluscs, like octopus and sea slugs, don't have a shell at all! Others may seem like have no shell, but it's actually hidden inside their bodies. An example from NZ is the ram's horn squid.

> What you see when it is living

> > The shell that remains after it has died

d niwa

COOL HUH?

ioi niwa



Aotearoa has shelled molluscs living in our oceans, in fresh water, and on the land.

Use the clues to work out what type of mollusc shells are below and write in your answers.

- Bivalve shells have two parts, connected by a hinge
- Gastropod shells are one piece and usually have a spiral at the end
- **Tusk shells** look like they belong on an elephant
- Chiton shells look like armour
- **Cephalopod** shells have little chambers to help with buoyancy.



101 Te Papa

Kōmore | Antalis nana are a type of

O Chris Paulin

Papatai | turret shells, kākara | knobbed whelks, and ngākihi | star limpets are types of This is the inside of a **kotakota ngū | ram's horn squid shell**. They are a type of

🖸 Jacqui Geux

Kākahi | NZ freshwater mussels are a type of **Papatua** have a snake skin pattern. They are a type of

EXTRAORDINARY SHELLS

Aotearoa's molluscs have some pretty unusual shells and can be rather unusual animals too. Here are some examples:

Carrier snails

glue other shells and stones to their shells, so they can be camouflaged (disguised or hidden).



Shipworms look like worms but are really clams. They have two small shells at the end of their bodies. They use these to drill holes in driftwood and wooden piers; indeed, almost any wood they can find!

> 🖸 Smithsonian Environmental Research Center

This corkscrew shell belongs to a sea snail called **Tenagodus** weldii.

D Andrew Spurgeon

🖸 Te Papa



Most NZ mollusc shells are dark coloured. It helps them blend into our seaweed and rocks. **Violet shells** are an exception. They eat animals called blue bottles (who have blue colouring), and this turns their shell purple. It's like how flamingos are pink because they eat brine shrimp. Wild Things Issue 158, Feb 2023. Published by Forest & Birc

Calf Cowrie.

Our special *Latia* limpet is the world's only bioluminescent freshwater species. "Bioluminescent" means that its mucus/slime glows in the dark!

🖸 Shaun Lee

Cowries are marine snails who have soft bits that go all over the top of their shell. The shell gets polished (smooth and shiny) from this happening.

> Slugs don't have shells, right? Not always... This is the **pāua slug**, which is a type of NZ semi-slug. It has a partial shell.

Chitons have shells made up of eight valves or plates and have a fleshy "girdle" around the outside holding them all together. Some species of chitons have 100s of teeny weeny eyes in the back of their shells and can respond to changes in light intensity.

Violet chiton. © Lloyd Esler

The fleshy outside of the butterfly chiton is so thick you can't even really see the plates! @ Jon Sullivan

D Jussiep

This is the shell of a *Suteria ide*, one of our "hairy" land snails! Scientists think that the tiny golden hairs either protect the snail from other invertebrates who want to eat them or lessen the amount of dirt and water that can cling onto the shell.

@ Adzebill

TE KOHA Ā TANGAROA TANGAROA'S GIFT

Our **pāua** have one of the most beautiful shells in the world! Why are they so beautiful? Why is each unique? One explanation comes from Māori tradition...

n the days of old, Pāua did not have a shell, and this caused him much difficulty. Tangaroa, the atua of the sea, saw this and decided to help. He mixed the **blues from the ocean**, the **greens from the forest**, **violet from the dawn**, and **pink from the sunset** with the shimmer of mother of pearl and made Pāua a special patterned shell.

The shell sparkled and dazzled, but it was also very thin and fragile. It was soon broken by the other sea creatures who were both curious and jealous of Pāua. So Tangaroa remade the shell, but this time he made it hard and strong by adding many layers of the blues, greens, violet, and pink. He added too a camouflage coat, drawing greys and brown from the rocks. The beauty of the new shell was now hidden away, for Pāua to enjoy alone.

With such a gift comes much responsibility, and so Tangaroa left Pāua with a task... to add layer upon layer of colour, practising his own artistry, throughout his lifetime.







Practice your pūkenga toi | artistry by colouring in this pāua. Make your own multicoloured masterpiece!

Name:

Age:

Show us your mahi by emailing us at kccinbox@forestandbird.org.nz



CHITON PUZZLE

Cut out the pieces, then arrange this nine-piece puzzle into *Sypharochiton sinclairi.*

Find a picture of the finished puzzle to help you on **kcc.org.nz**

Illustration: Studio C

Scavenger HUDDE See what you can notice about

See what you can notice about **BIVALVE SHELLS** next time you're at the beach.

CHALLENGE **1** SHAPES

These are all common shapes of NZ bivalves. Once you've found a shell that matches each shape, lay them on top and take a photo.



Looking for a list of common shells to find that match these shapes? Go to kcc.org.nz

USE YOUR

use your hands



CHALLENGE **2** SHAPES

If you rub your finger over the outside of the shell, what does it feel like? Sculpture is the texture on the outside of a shell. Once you have found a shell that matches each sculpture, lay them on top and take a photo.

TOP TIP: Start with circular shells, which vary a lot in sculpture!



EXTRA FOR EXPERTS



Find a shell that still has its two parts connected.



Find a shell that has a bumpy margin (outside edge).



This activity was created by **Tobia Dale**

STORY OF MY LIFE

Did you know that shells have growth rings like trees? The scientific name for these is "increments". On most shells, you can't see them easily without a microscope, but they are pretty clear here on this tuangi/tuaki | NZ cockle.

Growth rings are made annually (every year). Over time, the lines create the pattern of the shell and record information. They tell us how old the mollusc is and also about the environment that it grew in. If shells had a diary – this would be it!

🖸 Graham Bould

Use our instructions to make your own shell that tells the story of your life so far...

You can watch a video at **kcc.org.nz** too.

You'll need:

- A piece of paper
- A crayon

Send a photo of your mahi to **kcc@forestandbird.org.nz**

This person felt that 2019 and 2021 were a bit wobbly, and 2020 was really important, so they showed it in the way they drew their growth rings.







SETTING IT UP: Make sure your paper is square, then fold it in half lengthwise. Fold the bottom corners into the middle to make a point, then fold each flap back on itself to make the shell have a square-shaped hinge. Fold up the point like in the last picture.



RECORDING YOUR STORY: Turn

your shell over. Draw in your growth rings (e.g. if you are eight years old, draw eight lines). Then start filling in the detail of your story through your patterning. For years that were really important for you, you might like to make the lines thicker or darker. If the time between two birthdays was really eventful (i.e. lots of cool stuff, or hard stuff, happened), you might want to show this with shading.







FOLDING YOUR SHELL: Turn your shell over again. You are going to fold in the ridges and grooves now. Fold one side in like in the first photo, then fold it in again like the second photo. Turn your shell over. Fold the side back on itself from the middle, like in the last photo. Repeat for the other side (photos 4, 5, 6).









FINISHING IT OFF: Once you have done your folding, your shell should look like this first photo. Turn your shell over and fold down the points sticking up.









Found in Northland O Thomas Hvid

I'm a pupu harakeke | flax snail. My shell is really long, up to around 8cm - thats almost as long as a eftpos card.

Found in Kahurangi National F near Nelson. 10 GGCraig

I'm a type of Powelliphanta superba. We've got the largest shells. They're up to 9-10cm across - about the size of an adult fist!

Found in Northland. o Paul Bell-Butler

Giant She vs tiny she

GET YOUR RULER

Found in the North Island from Wellington up to Ruahine Ranges. 🖸 Jacob Littlejohn

I'm Wainuia urnula. I still have a pretty large shell, even if it seems small compared to the others. It is 2-3cm across - that's about the size of a strawberry.

l'm zebra snail or Flammulina zebra. My shell only grows up to 7.5mm across. Isn't my shell ātaahua | beautiful?

Found in the North, south, stewart, Auckland, and Campbell Islands. O Aman Hunt



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I'm the bigger **pūpūranga | kauri snail**. My shell can be up to 7.9cm across - that's about as big as a peach.

> I'm **Charopa coma**, one of NZ's commonest native land snails. My shell grows up to Gmm across.

There are probably 2000 different native land ngata | slugs and snails in Aotearoa. That's huge for a small country like us. Yet another reason why our biodiversity is so special. Found in the North, South, and Chatham Islands. © Uwe Schneehagen

I'm **Liarea hochstetteri carinella.** My shell grows up to 8mm long. Look how small I am compared to the photographer's finger...

OUT AND COMPARE -

l'm a type of *Cavelliropa* snail. My shell is a miniscule Imm across!

Found in the North and South Island. © Christopher Stephens

FACT:

Most NZ land snails are micro snails. A large micro shell is just 4-5mm across, and many shells are even less than 1mm across! Found in the North Island from Auckland to Taranaki and on Kawau Island in the Hauraki Gulf. @ Dave Holland

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Ways we can help our native snails

1 Trapping

Introduced predators like rats, possums, pigs, and hedgehogs feast on our native snails. Get involved in backyard trapping or a Predator Free group where you live to help.





2 Stormwater

USE YOUR EVES

use your hands

Snails don't swim, so we don't want lots of extra water going into our bush areas, where most of our native species live. Check where your stormwater is going, and make sure your stormwater drains are clear.

Rod Morris

3 Fencing

Stock animals, like sheep and cattle, don't look where they step, and trample and crush native snails. Fence off areas of bush where native snails are living.







COULD SNAIL SHELLS HELP WITH TREES WITH KAURI DIEBACK?



Scientist Karin Mahlfeld is looking into it!

When African farmers find their cocoa trees sick with a similar disease to the one that causes kauri dieback here in Aotearoa, they use snail shell dust to make their trees better. Could we do the same to help our kauri trees?



For a moment, let's imagine what a healthy thriving kauri forest would have looked like before a lot of the big trees were cut down for timber and the soil turned over for kauri gum and farms. There would have been a lot more giant carnivorous kauri snails roaming around. Rats, hedgehogs, and pigs have drastically lowered the numbers of large forest snails and other invertebrates, which are important to plant and forest health.

Healthy cocoa beans vs those with black pod disease.



ls my shell the answer? © Grzegorz Polak

Snails are decomposers. They help to break down and recycle nutrients on the forest floor for the trees and other plants. When their shells break down on the forest floor, they also give back riches to the soil and the plants.

Shells have a little of a material called chitin in them for extra strength and support. When chitin breaks down, it turns into something called chitosan. African farmers have found that chitosan helps control black pod disease, which is a sickness that destroys cocoa beans. Without cocoa powder from cocoa beans, we cannot make hot chocolate or chocolate!

To help their trees, African farmers gather the empty shells of the giant African snail *Achatina* fulica, which are sold at markets. The farmers grind the shells in a mortar and pestle to a fine powder, dissolve it in water, and spray the cocoa plants with it or add it to the soil. It helps the trees a lot.

I'm looking forward to trying out this shell dust here with our kauri soon and learning more about chitin and forest health. A young freshwater mussel that still has its beautiful gold-green colour. As they get older, they tend to darken in colour. Freshwater mussels can live up to 50-60 years old.

Kakahi help clean water

Dr Deborah Hofstra, NIWA Freshwater Scientist, shares about her research.

Freshwater mussels live in many of the lakes and streams in Aotearoa. They are bivalves, which means they have two shells that are hinged together. The most common species in Aotearoa have the scientific name *Echyridella menziesii*, but across the country they are also known by different names, including torewai, kāeo, and kākahi. They are a taonga (treasured) species and native to Aotearoa. Did you know that kākahi feed by filtering the water they live in and removing their food from it? As the water enters the kākahi, small particles (algae, microorganisms) are sorted on the gill and delivered to the mouth to be eaten while the water flows out.

What the kākahi doesn't want to eat gets "spat" out of the mouth end (inhalant siphon) and is called pseudofaeces – we call it goop.

Waste from the bottom end (exhalant siphon) of the kākahi is called faeces - we call it poop.



A mussel buried in lake sediment with only its siphons in the water. The inhalant siphon has the fringed edge (left) and the exhalant siphon is smooth looking (right).



Mussels in this tray have been pooping and gooping as they feed. The goop is directly beside the mussel, and the poop is the small pellets that are pushed out and are further away.





Because kākahi naturally filter the water, we wanted to study if they could be used in large numbers (on rafts) to help clean up water in lakes or waterways where the water is no longer as clean as it used to be. Our enquiry question was *Could freshwater mussels be part of the solution to cleaning up our lakes (a process called lake restoration)?*

Our research team tested how well kākahi could filter water, how many particles they could remove, how long it took, how much goop and poop they produced.

We used maths to calculate how many kākahi would be needed to filter very dirty water (with lots of nutrients and algae). We found that more than 40 mussels (per m²) could do a good job of cleaning water (removing nutrients and algae).



One of our floating mussel rafts.

Kākahi usually live on the bed of lakes and streams, using their foot to move around on the sand or mud. But if the mud becomes too soft (as happens in some unhealthy lakes), it can be hard for the kākahi to move around and keep their siphons out of the mud. When kākahi sit upright on firm mud or sand, their siphons stick out, and they can filter the water.

This project was funded by MBIE, project C01X1815.

FACT:

Kākahi shells had many uses in traditional Māori culture. They were used to cut hair, to cut umbricial cords of newborn babies, to scrape vegetables, and as rattles on kites.



Me doing a kākahi health check. This was one of the monitoring days at the lake where the team took the crates off the rafts and brought them to shore so that we could check the health of the kākahi.



Mussels in the crates on the rafts had blankets of hessian.

We put mussels on floating rafts in a lake to see if they would be able to live out of the sand and mud.

In some of the raft crates, we also put blankets made from felted hessian (sacks) to see if this would protect the kākahi shells from being damaged. Just like human skin can get scratched against a hard surface, we didn't want our kākahi to be scratched or bumped on the hard surfaces of the raft crates. We discovered that the kākahi were able to live and grow on the rafts just as well as on sand and that the blankets worked well to protect the kākahi shells.

Hundreds of square kilometres of mussels used to cover the bottom of much of the Firth of Thames and Tāmaki Strait. What would it mean if they were still there?

Cleaner water – the water of the Gulf would be less murky. A single mussel can filter up to 350 litres of water a day! **More marine life** – kūtai/kuku are community builders. Animals use reefs as places to shelter and to grow. Where there are mussel reefs, there can be 10 times more ika | fish!

Help protect Tīkapa Moana/ Te Moananui ā-Toi | the Hauraki Gulf

On land, we protect our most treasured wilderness areas. Our precious ocean deserves the same protection too.

Did you know that tāonga like kūtai/kuku | green-lipped mussels, along with scallops and pāua, are "functionally extinct" in the Hauraki Gulf? Their numbers are so low that they are not able to play their important role in the Gulf's ecosystem anymore.

Lots of things happening on land and at sea are making it hard for these shelled creatures. For example, trawling and dredging (where fishing gear is towed near or along the bottom of the ocean) are destroying the seafloor. Think about it like a bulldozer pushing through the forest over and over, destroying the ngahere, all just to collect mushrooms! That's what dredging does, just to collect scallops. Thriving mauri (life force) means looking after the whole ecosystem.



See what

happens when

the mussel

reefs are

restored!



Only 0.3% of the Gulf is currently properly protected. We want it to be at least **30%**.



Help bring what is happening under the water to the surface!

Use your voice to support the Government creating 19 new areas to protect and restore the Hauraki Gulf Marine Park. This would create a network of small protection areas that can work together, allowing the mauri of the moana to thrive!

Get behind ending bottom trawling in the Gulf too!



Use the QR code to sign the petitions on Forest & Bird's website, find out more, and get involved in other actions for the Gulf.

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If we care about our shellfish, we need to care about the rules put in place to protect them.

They tell us where we can collect shellfish from and when, how many we can take, and how big they need to be. It's toitū | being sustainable.

Where do I find the up-to-date fishing rules?

There's an app! It's called **NZ Fishing Rules**. It works even if you're somewhere without reception – sweet as!





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How do I measure the shells?



Some shellfish have minimum size limits. That means they have to be at least that big to be taken.

- For **pāua**, you measure them flat rather than over the curve of the shell.
- With **tipa/tupa/pure** | scallops, you measure the greatest diameter (width) of their shell.

Why not make your own gauge?

It's another helpful tool!

If the shell-fish fits inside your gauge, you know straight away it's too small.

Illustrations: Ministry of Primary Industries (MPI)

Paua

10 a dau Auckla

REMEMBER:

If you're not sure, you can always ask a Fisheries Officer. They care about nature like you and are there to help!

> We upcycled a lid from a takeaway container to make ours.

TOP TIPS:

- Measure and count shellfish as you collect them. Then you know everything you bring back to the beach is good to go.
- Don't take heaps, only what you actually need.
- Make sure you count what you eat while collecting too.
- Small shellfish need more time to grow. Leave them be.

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In the LBOX 0

SHELL ART

Juliette (6)

made some observational drawings of her favourite shells from her collection.









Hazel's (8) artwork shows how excited she gets when she finds a pāuā shell. She used oil pastels to get the effect she was after.





 Image: Constrained state stat

tree was made by **Amber** and her auntie when she was 11. They collected the shells from Ōtarawairere Bay near Whakatāne.



Eve -11yrs Pencil on vintage Japanese scallop shell.

> Ka mau te pai **Eve**! Fantastic work.

LEGO STORY

Save our sharks

Maia (age 11) from KCC Tauranga sent in this LEGO story to bring awareness of what is happening in our oceans to sharks.

Send in your LEGO stories about issues important to you to **kccinbox@forestandbird.org.nz.**



Panga | Puzzles

Maze

Check your whakautu | answers at kcc.org.nz/puzzle-answers.

Tongue twister

How fast can you say this and still get all the words correct?

She sells seashells by the seashore, The shells she sells are seashells, I'm sure. So if she sells seashells on the seashore, Then I'm sure she sells seashore shells.

Rebus brainteasers

Look at the way these words and letters are arranged to work out the names of these two seashells.

LL LL AA CC SS

1 Nice Naughty Nice Naughty

Hihi, hihi!

- 2 Naughty Nice Naughty Nice
- **3** Nice Nice Nice Nice

Anagrams

MOLLUSC SHELLS

You can make the name of a type of NZ mollusc from these letters – what is it?

What do snails do on their birthday? They shellabrate.

Funnies

Why is the snail the strongest animal? Because he carries a house on his back!

I used to search for seashells on the beach until one day I pulled a mussel...

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MAKE A 100TH BIRTHDAY NZ NATURE CAKE

Forest & Bird is having a BIG birthday this year - we're turning 100 years old!

To help us celebrate this milestone, we want you to make a special NZ nature-themed birthday cake. It can be edible (to eat) or ornamental (just to look at).

Any design will do, but to give you some ideas...



Cake made from nature







Cake showing an environment/habitat



Cake shaped like a NZ animal

Cake showing something used in conservation work

Send in a photo of your mahi to **kccinbox@forestandbird.org.nz**, and be in the draw to win one of 10 mystery birthday prizes! Closes 22 March 2023.



KCC ADVENTURES

Fun in Foxton **1**

KCC Manawatu headed down to Foxton Estuary to welcome the godwit back to New Zealand shores. Foxton Estuary has been a RAMSAR site of international importance since 2005, which recognises its importance for wading and shorebird species.

They spotted a flock of godwits, four royal spoonbills, a white-faced heron, and a tern from the viewing platform. Afterwards, they headed down to see what the birds had been feeding on, and with great delight they found rather a lot of mud crabs.









Glow worms down south **2**

After a warm hot chocolate on the side of the road, **KCC Dunedin** slowly walked up the Nicols Creek track to the glow worm colony. It took a few minutes for their eyes to adjust, but when they did the kids (and adults!) were amazed. Glow worms everywhere! It was like looking at stars, except they were not in the sky but along the rocks hidden among the vegetation. Thanks to Luca, who managed to take this amazing photo despite the complete darkness.



Wellington workshop 3

KCC Wellington took part in a toy testing workshop with Massey University.

"We went into the bush and met creatures. Tanya said that they were real, but we played with the toy ones. I made a hotel for these creatures, where the water could not come in. I made a dam. The mushrooms get dirt from the ground. They mush it up and eat it and then spit it out to make nice soil for the plants, but they only come up after the rain." **Frida** (age 6)

"The toy workshop was fun. It wasn't really structured. You got to make your own design, and it was very free. You got to explore and do what you wanted to do in that area. We got to take home little prototypes, which were very cute. The toys were characters based on native creature and fungi. I liked the one that could be used to create potions. At the moment, I've got some leaves in their decomposing, and I can watch them filter through the sieves." **Kezia** (age 10)



Where is that adventure?

Had a KCC adventure? Let us know at kcc@ forestandbird.org.nz.

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Thanks Professor **Hamish Spencer** for helping us with this magazine. Hamish is a shell scientist and science communicator from Otago University.



WHAT I DO IN NATURE.

"My favourite thing to do is investigate the bush and streams near my house, especially the eels! While I was investigating behind my house one day, I saw a small skink. When I took a closer look. I was surprised to see that, instead of regrowing one tail. this skink regrew TWO tails! I remember from one other KCC magazine a tuatara with two growing tails. This was a mini version!" - Odin (age 7)











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You'll receive Wild Things magazine and get to explore the outdoors with a local KCC group. It's easy to join or give a gift membership.

Just go to www.kcc.org.nz or phone 0800 200 064 for more information.

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