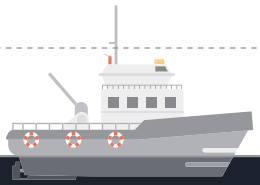


Adapting to life in the deep

Many strange creatures were discovered in the depths of the Indian Ocean by Singapore and Indonesian scientists during a deep sea biodiversity expedition in southern Java in 2018. Their physical attributes, though unconventional, are what help them thrive in hostile environments.



ABOUT THE EXPEDITION:

- A 14-day voyage in 2018.
- Scientists sailed anti-clockwise towards Cilacap in southern Java and back, covering a total distance of 2,200km.



- The expedition team comprised 31 researchers and support staff.
- Samples collected from 63 stations, at depths averaging 800m, with the deepest depth reached at 2,100m.
- More than 12,000 creatures collected.

THE DEEP SEA IS A HOSTILE ENVIRONMENT:

It is dark and cold

- Sunlight does not penetrate beyond 200m. Without any source of heat, the waters are cold, with temperatures at the bottom dipping well below 10 deg C, even in the tropics.

Food is scarce

- With no light, there are no plants or photosynthetic phytoplankton. This means there are no herbivorous marine creatures, which are often prey for other animals. Most are therefore scavengers or predators.

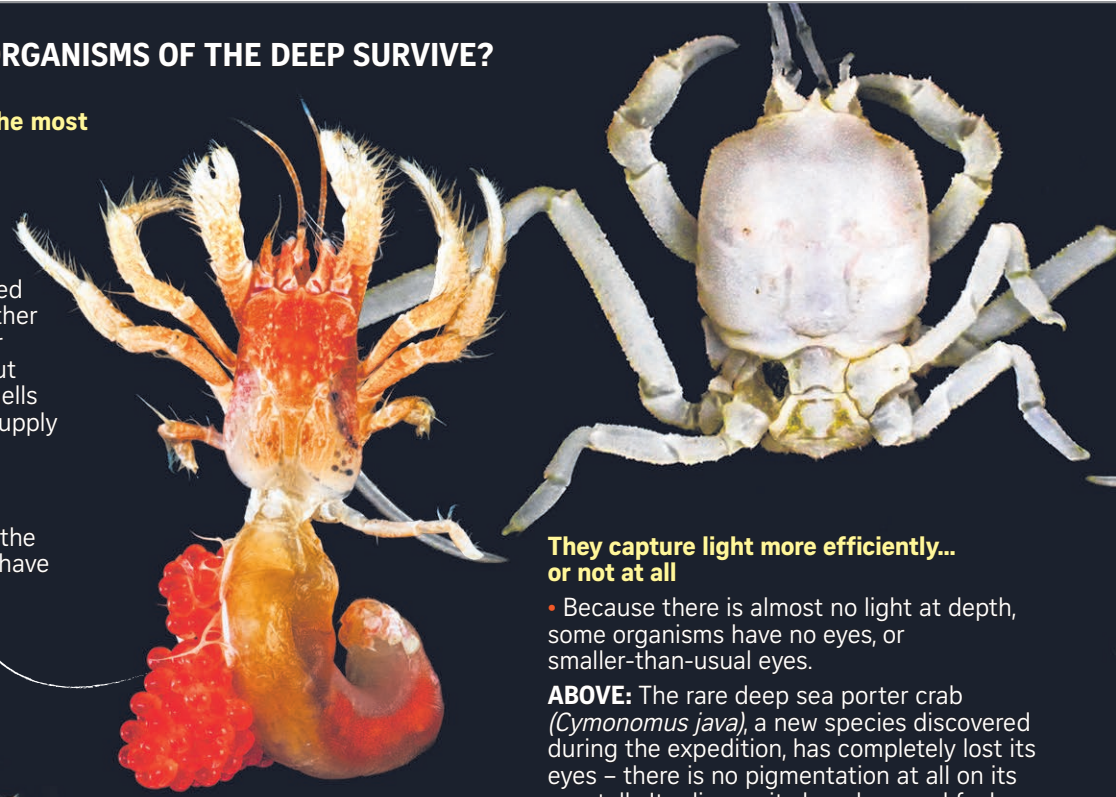
Pressure is high

- The deeper the seabed, the higher the pressure. Every 10m of water exerts a pressure equivalent to the atmospheric pressure experienced by an organism at the surface. This means that at 200m, organisms have to deal with pressure that is 21 times that felt by land-dwelling organisms.

HOW DO ORGANISMS OF THE DEEP SURVIVE?

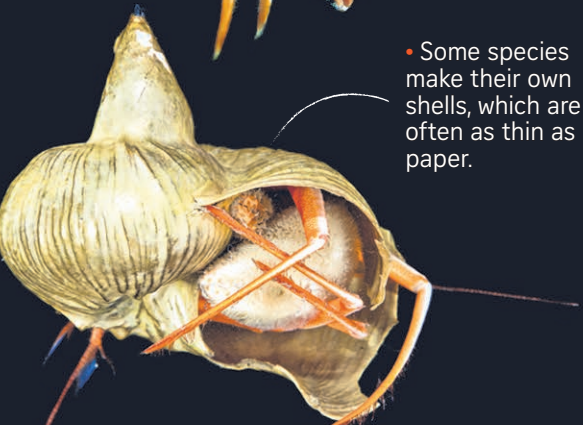
They make the most of things

- On the seashore, hermit crabs are known to use abandoned shells from other organisms for protection. But since such shells are in short supply in the deep oceans, they improvise.
- Sometimes, the hermit crabs have no shell.



- This crab made its home in a sunken piece of wood.

- Some species make their own shells, which are often as thin as paper.



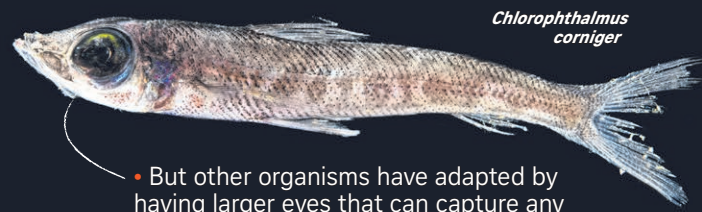
- Others make use of the things around them, such as sea anemones.



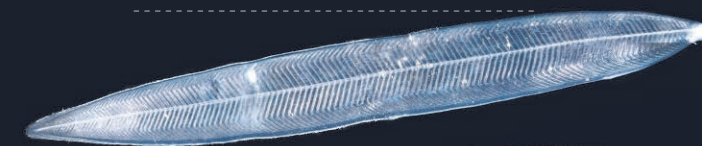
They capture light more efficiently... or not at all

- Because there is almost no light at depth, some organisms have no eyes, or smaller-than-usual eyes.

ABOVE: The rare deep sea porter crab (*Cymonomus java*), a new species discovered during the expedition, has completely lost its eyes – there is no pigmentation at all on its eyestalk. It relies on its long legs and feelers to search the deep for food.



- But other organisms have adapted by having larger eyes that can capture any incoming reflection.

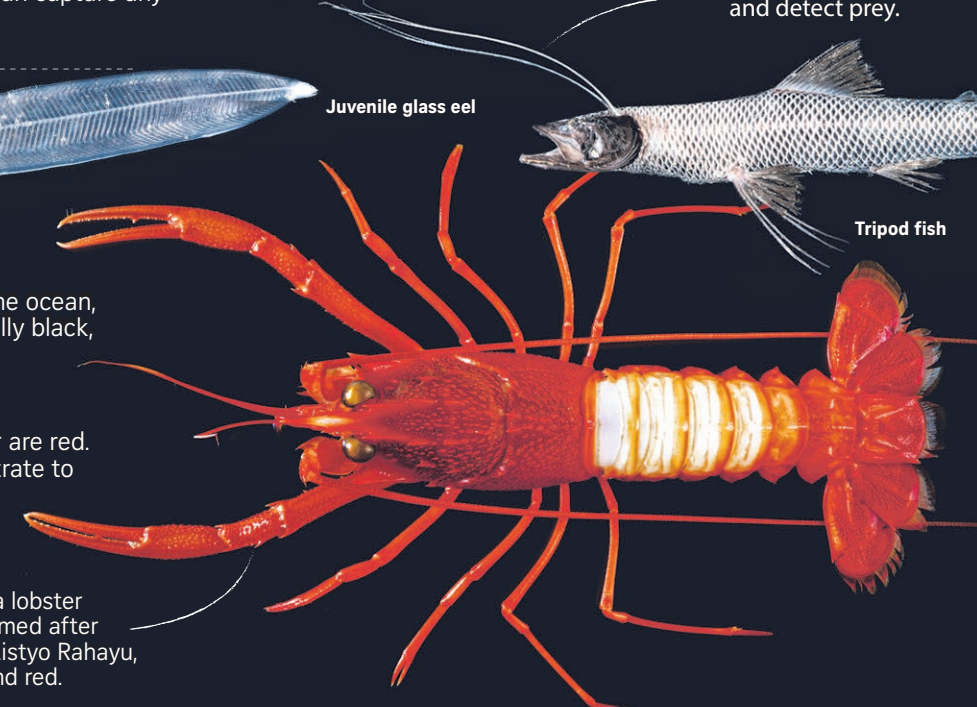


Monochromatic life, with pops of red

- In the dark depths of the ocean, many creatures are usually black, white or translucent.

- The only pops of colour are red. Red light does not penetrate to such depths, which helps the organisms to camouflage themselves.

RIGHT: Rahayu's deep sea lobster (*Nephropsis rahayuae*), named after Indonesian scientist Dwi Listyo Rahayu, is a spectacular orange and red.



They search for food more efficiently

- Larger mouths help organisms catch any prey that may swim by.

Fangtooth

- Good things come to those that wait. The tripod fish is known to lie in wait for prey on the seabed, propped up by its tail and fins.

- Other creatures have developed long feelers that can help them make their way around in the dark and detect prey.

Juvenile glass eel

Tripod fish

Sources: NATIONAL UNIVERSITY OF SINGAPORE, SOUTH JAVA DEEP SEA BIODIVERSITY EXPEDITION (SJADES)

PHOTOS: SJADES STRAITS TIMES GRAPHICS