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MACQUARIE University NEWS

**Speed of climate
change puts trees
at risk**

**Selling lamingtons
to Tokyo**

**The cultural
significance of
Schapelle Corby**

A U S T R A L I A ' S I N N O V A T I V E U N I V E R S I T Y



Tripneustes gratilla
– the Lamington Urchin

Rob Harcourt

Selling lamingtons to Tokyo

A lamington drive could take on a whole new meaning when talking to two Macquarie University marine scientists. They are the brains behind what could become the world's first commercial closed-system aquaculture system for the production of sea urchin roe from *Tripneustes gratilla* – the Lamington Urchin – and a potential major export industry for Australia.

Drs Jane Williamson and Devarajen Vaitilingon from Macquarie University's Marine Ecology Group have just received close to \$800,000 from an AusIndustry Commercial Ready grant with commercial partner VentureAxess to spend the next 12 months developing an echiniculture (sea urchin aquaculture) system at Macquarie's unique seawater facility.

The pair has already spent the past few years conducting practical research into growing sea urchins from eggs in closed farm conditions. Most recently their work has focused on finding the species that produces the tastiest roe.

"While Australia has 42 species of regular sea urchins, there are only a handful that taste really nice," Williamson explains. "We have decided to work with *Tripneustes gratilla* – commonly known as the Lamington Urchin as it has a black body and white spines – because it is a tropical species found all around the world and along the east Australian coast and its roe is very tasty."

This species also has substantial advantages from a farming point of view as it only takes eight to nine

months from fertilisation for the Lamington Urchin to reach marketable size and therefore readiness for roe harvesting.

Sea urchin roe is a delicacy in some Asian markets, particularly Japan which consumes 85 per cent of the world's sea urchin roe production. Sea urchins are known as uni in Japan, and the roe of the Lamington Urchin is called white uni – the best quality roe on the Tokyo market. However, due to over-fishing, Japan now only locally produces 20 per cent of its consumption.

"Uni is a traditional Japanese food item that is often exchanged as a gift during the New Year celebrations," Williamson says. "In Japan, sea urchin roe is regarded, along with tuna, lobster and abalone, as premium seafood, selling in top restaurants for ¥5,000 (around A\$53) per 20 gram serve."

Traditionally urchin roe has been eaten at sushi bars and restaurants, but more recently the distribution of roe has widened to include a new market of Japanese consumers in supermarkets.

So while demand for sea urchin roe is increasing, many of the traditional exporters of sea urchin roe to Japan such as the United States and Russia have overexploited their populations of urchins.

"The number of sea urchins is declining worldwide due to natural harvesting, and many populations of urchins have been over-exploited, resulting in less productive remaining populations," she says.

Sea urchins reproduce by shedding their gametes (sperm and eggs) into the surrounding water in a

process known as external fertilisation. Sea urchins often form aggregations prior to releasing gametes to maximise their chances of successful fertilisation. Removing the density-dependent urchins from their natural environments for roe harvesting can have major reproductive implications for the remaining populations.

Sea urchins also play a pivotal role in regulating the community structure in a diverse range of marine habitats and are important sources of food for many predators including blue groper, octopus, Port Jackson sharks and large starfishes.

Sustainable fishing is not only an important environmental consideration for this project, but is also something that Williamson is passionate about. She is a strong advocate for the development of marine parks and their benefits to both a sustainable fishing industry and to marine biodiversity. As President of the NSW Branch of Australian Marine Sciences Association she has been involved in raising awareness of the scientific benefits of marine parks along the NSW coast.

“If we harvest more sea urchins we’re likely to see a huge cascade of effects on different marine life in the ecosystem. In most of the places worldwide that have been commercially targeted, urchins have been overharvested – in many cases to extinction,” Williamson says.

“Considering the complex ecological role sea urchins have in temperate marine ecosystems it makes sense not to greatly impact on their natural abundance and distribution,” she adds.

The technique Williamson and Vaitilingon plan to use with the Lamington Urchin is closed life cycle echiniculture and it involves reproducing all the stages of the urchin’s life cycle under controlled conditions.

Through this approach, they can control all the important variables during the life cycle to potentially increase roe yield per urchin, expand production rates, harvest all year round and ensure consistency of the process and therefore the quality of supply to the customer.

“We are able to control all the main product quality requirements – colour, texture, size and shape, and (due to our proximity to the major Asian markets) freshness,” Williamson says.

“Harvesting of wild sea urchins can only be done during times of the year when the roe is of a marketable quality. To date, collecting wild sea urchins and then trying to grow them in controlled conditions to improve the quality and quantity of the roe – a process known as partial aquaculture – has had limited success in Australia,” she says. “Our project will enable us to eventually harvest urchins year round as we are able to reproduce all stages of the life cycle under controlled conditions.”

The culture process involves five stages (hatchery, pre-growth, growth, broodstock maintenance, and processing and marketing) and involves purpose-built equipment within Macquarie University’s seawater facility, one of the more technologically advanced seawater systems in Australia at the moment.

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To facilitate the commercialisation of this research, Macquarie University’s commercial arm AccessMQ has created a company – AusUni Pty Ltd – to develop this technology and enhance the commercialisation process.

Providing all goes well with the project during the year, the next step will be to build a pilot farm to produce marketable quantities of Lamington Urchins with commercially viable body weight and consistently high quality roe. The following stage will involve raising capital for a commercial plant and developing an export market to Japan.

The end result – based on Williamson and Vaitilingon’s research and developed by AusUni – could well be a profitable while ecologically sustainable aquaculture industry for the export of sea urchins from Australia.

Drs Devarajen Vaitilingon and Jane Williamson with a Lamington Urchin in Macquarie University’s seawater facility.

Story by Kathy Vozella

