

Artificial propagation of eels A GLOBAL PERSPECTIVE

BY MARK LOKMAN AND ARJAN PALSTRA

Eels have important cultural value for Maori in New Zealand and for many peoples in South-East Asia and Europe. Catching methods of eels, and associated traditions and preparations as a food, have been compiled in a beautiful book *Eels and Humans*, edited by Dr Mari Kuroki and the world's leading eel expert, Professor Tsukamoto from Japan. The book nicely illustrates that for people in many nations, eels are among the *most-valued* fish to eat (as a reader, you may be suitably surprised) – no mean feat for a freshwater fish!

There are 16 eel species spread across the globe, two of which are common in New Zealand. With its popularity as a food and with increasing human populations and associated impacts on ecosystems, it may come as less of a surprise that the eel is under threat.

At a larger scale, the complex life cycle of the eel, with its long-distance migration to remote spawning areas, may well be affected (if not already) by climate change and shifts in oceanic currents. Such shifts could have dramatic effects on the ability of eels to make their way back to their



Eggs from eel that were induced to spawn artificially using fertility drugs. The embryos in this photograph are close to hatching, some 2 days after they were fertilized. © Arjan Palstra.

spawning grounds – with tremendous follow-on impacts on spawning success and recruitment.

RELIEVING THE PRESSURE

One of the approaches to conserve these fish is to develop captive breeding programmes to support eel farming and to alleviate fishing pressures on natural stocks.

Worldwide, researchers have tried to complete the eel life cycle in captivity for many years. This research is a little akin to running a fish fertility clinic. Indeed, eels are subjected to prolonged treatment with fertility drugs to bring them into a spawn-ready state. Once this is achieved, fish can mate spontaneously, or IVF approaches can be used to ensure the eggs are being fertilized.

Japanese researchers are well ahead of the pack, and several generations of captive-bred eels have been obtained under lab conditions. But so far there's no respite for the farming industry as apparently, it presently costs about \$300 or so to make a 'seed eel' that can be sold to enterprise.

A group of scientists in The Netherlands opted to get researchers, who run such 'eel fertility clinics', together from all over the world. The goal was ideally for each of them to present their state-of-the-art, and then work towards some sort of consortium, where the scientists could



Presentations on eel reproduction at the Impulse Speakers Corner – a neat, open space whose ambiance is to help generate ideas. Wageningen University & Research. © Mark Lokman.

bring their thinking together and work together.

Spearheaded by Arjan Palstra and William Swinkels, these Dutch scientists managed to get most (not quite all) of the world's eel reproduction geeks together at Wageningen University & Research, located smack in the middle of the Low Countries.

The gathering in October 2016 represented eight countries, together during a workshop just last month.

As an attendee (Mark Lokman) and workshop organiser (Arjan Palstra), we summarize some of the key outcomes below:

1. Research aimed at producing good quality sperm and egg – including brood stock conditioning and use of farmed, rather than wild, adults – is continuing. Understanding what governs gamete quality is deemed highly important.
2. The technology to produce eel larvae, both in Europe and Japan, becomes increasingly widespread – an important bit of progress towards completion of the eel life cycle.
3. Current constraints are very much centred around finding suitable larval feeds – although Japanese research groups have managed to solve this issue at an experimental level, it remains as yet impossible to produce eel juveniles in large enough numbers and at costs that are affordable for industry.
4. The launch, and buy-into by all attendants (including researchers employed by private companies), of the Eel Reproduction Innovation Centre EELRIC (www.eelric.eu) – a platform for collaboration and sharing of ideas between research groups focusing on eel reproduction. A contributor to EELRIC is DUPAN, a recently established foundation that represents eel fishers, farmers and traders in The Netherlands. This foundation aims to link in with the increased recognition by consumers for the need to fish sustainably. It achieves this, in part, by having developed a *sustainability label* on its product and introducing a small mark-up on its prices to support research and conservation effort.

The interest and willingness among researchers from different countries and cultures to work together to solve key issues in captive breeding of eel is a notable step forward – and indeed, it has already resulted in another EELRIC meeting being planned next year.

Ongoing interactions and exchanges will open the door to safeguarding this fish



species with amongst the most exceptional life histories of any on the planet.

At the same time, these efforts will see to ongoing future enjoyment of a culinary delight.

Have you ever thought that eels were just slimy, slippery monsters of no use? Read their life history, try eating them smoked or grilled, and think again....

*About the authors: **Mark Lokman** is a faculty member in Zoology (University of Otago, Dunedin), and focuses on fish (eel!) reproductive biology and induced spawning.*

Arjan Palstra, a key driver of the Symposium 'Towards reproduction of eel in captivity to support sustainable aquaculture', stands beside a flume used to induce long-distance swimming in the eel – a little like the eel spawning migration. Wageningen University & Research. © Mark Lokman.

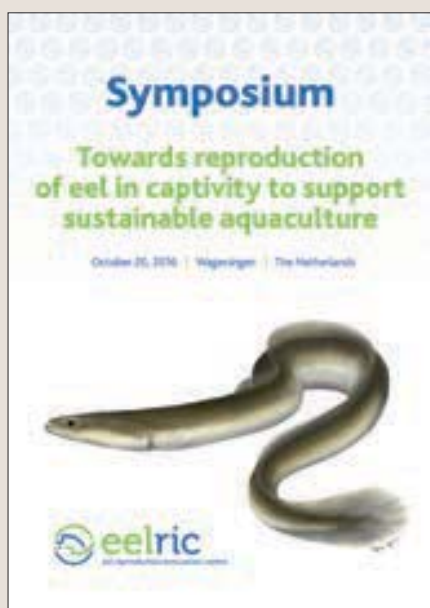
***Arjan Palstra** works at the Animal Breeding & Genomics Centre (Wageningen University & Research, The Netherlands) and has extensive expertise in fish exercise biology and eel reproduction.*



Welcome address

EELRIC SYMPOSIUM

BY MARTIN C. TH. SCHOLTEN



Martin Scholten



Kiwi scientist Mark Lokman presenting at the symposium

A very warm welcome to the Campus of Wageningen University and Research. My name is Martin Scholten, general director Animal and Marine Sciences at Wageningen U&R. It is a great honour for us to host the first EELRIC symposium.

Wageningen U&R is ranked as the #1 University in the domain of AgroFood production; sustainable nutrition security; how to feed a world with about 10 billion people within the carrying capacity of planet earth. Our mission is to explore the potential of nature to improve the quality of life, within the scope of the UN Sustainable Development goals.

For a long time, eels have been an intriguing subject in our studies. This is because eels are at the heart of the Netherlands. Smoked eel is a Dutch icon, comparable to our windmills, our wooden shoes and dikes. Eel is also a high value product, in price, tradition and sentiments. The Netherlands is also #1 in world eel production on the basis of turnover.

But nowadays the sentiments are split – because of the fact that our eel stocks have drastically declined over the last century. Eel numbers suffered from water pollution and the construction of waterworks protecting our land against a rising sea.

The number of glass eels rebuilding our stocks are critical. The ongoing efforts

to work on restoration of eel stocks are enormous. These efforts are aimed both from the perspective of *nature conservation*, as well as from the perspective of *sustainable eel production* by fisheries and aquaculture operators. An example is the DUPAN foundation of eel producers (Duurzame Palingsector Nederland) which includes farmers, fishers, processors, traders and sellers.

Science faces the challenge of fostering the restoration of the eel. Science is challenged to unravel the undiscovered parts of the eel biology and eel reproduction. Exploring the potential of nature (in this case, eel reproduction) to improve the quality of life – a life *with* our beloved eel.

Eel reproduction is one of the most outstanding scientific and social challenges in the world today in which *knowledge* seems to be an unlimited factor. Because we try hard to understand (the exploration phase), but we are not yet there to yield the achievements (the exploitation phase).

This is a journey of discovery that requires a lot of patience and perseverance, and it requires global cooperation between all the eel scientists from a wide range of expertise and disciplines – from all the eel regions in the world.

And that is exactly why we are so glad that you are here to participate



in the Eel Reproduction Innovation Centre symposium – at the occasion of the beginning of the Eel Reproduction Innovation Centre. This is a unique facility to foster global cooperation in eel research at the world famous campus of Wageningen University & Research, the epicentre of life sciences for nutritious food production in a living environment for the well-being of mankind.

I wish you all fruitful discussions and creation of new alliances at today's symposium. We are all looking forward to seeing the results of the global cooperation in this very relevant global issue.

Edited from speech notes published at eelric.eu

