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FIRST PERSON

First person – Natalí Delorme and Leonardo Zamora

First Person is a series of interviews with the first authors of a selection of papers published in Biology Open, helping early-career researchers promote themselves alongside their papers. Natalí Delorme and Leonardo Zamora are co-first authors on 'A new method to localise and quantify oxidative stress in live juvenile mussels', published in BiO. They are both researchers in the laboratory of Serean Adams at the Cawthron Institute, Nelson, New Zealand. Natalí's research interests centre around ecophysiology of marine invertebrates, particularly on the organisms' stress response. Leonardo is investigating the biology of commercially, ecologically and culturally relevant marine invertebrates throughout their life cycle.

Natalí Delorme and Leonardo Zamora

What is your scientific background and the general focus of your lab?

Our backgrounds are in marine biology, especially in the physiology of marine invertebrates. We both work in the Aquaculture Group at the Cawthron Institute. Here, we investigate shellfish stress, behaviour, health and nutrition of current and emerging aquaculture species to improve husbandry, hatchery production, breeding and farming practices. Our research is aimed toward enabling the growth, diversification and future proofing of the aquaculture sector in New Zealand.

How would you explain the main findings of your paper to non-scientific family and friends?

As in humans, all living organisms have a stress-response mechanism, even shellfish! When an organism is exposed to stress, there is an increased production of reactive oxygen species (ROS), which are molecules that can be very damaging to different parts of the cells (proteins, lipids, and DNA). ROS are usually quantified using specific stains. Stains are added to cells, and when ROS is present, the stain becomes fluorescent within the cell, and we can see this fluorescence using a fluorescent microscope. In our study, we showed for the first time a new method to stain whole live juvenile mussels (~1.5 mm shell length) – instead of free cells, and we could see where the stain was localised and could quantify the ROS signal using microscopy and image analysis. With this method, we can determine stress levels in live mussels that have been subjected to unfavourable conditions, such as air exposure.

What are the potential implications of these results for your field of research?

A new method for determining stress levels *in vivo* for juvenile shellfish is ground-breaking for us. It will allow us to further investigate the kinetics of the stress response in mussels exposed to several stressors with ecological and commercial relevance (for example, ocean warming and acidification, diseases, and aquaculture farming practices). All this information will improve our general understanding of how mussels respond to stress and how/if they can recover from it. Knowing how climate change stressors such as warming temperature may affect juvenile mussels and helping improve aquaculture farming practices to mitigate mussel stress is of particular interest to us to support the aquaculture industry. This new ROS staining protocol includes a final, optional fixation step that enables mussels to be stained *in situ* in the field, fixed, and then transported back to the laboratory for imaging and analysis so we can get an understanding of what is happening in real-world conditions.

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What has surprised you the most while conducting your research?

We found that the ROS signal was strongest in the mantle of the mussels, which possibly reflects the high metabolic activity of the mantle cells that are involved in shell production, especially in actively growing juvenile mussels.

What, in your opinion, are some of the greatest achievements in your field and how has this influenced your research?

The application and integration of tools developed and applied in other fields has opened a world of opportunities to help us address aquaculture research questions, provide practical ways to improve hatchery and farming practices, and address some of the challenges faced in aquaculture. Taking the opportunity to apply new technologies to solve common problems in our field has been a game changer for our research. We are now able to apply these tools to help us think further outside the box and provide enhanced understanding, and to optimize these new techniques and technologies for aquaculture and aquaculture research.

> **"Taking the opportunity to apply new technologies to solve common problems in our field has been a game changer for our research."**

What changes do you think could improve the professional lives of early-career scientists?

We think that one aspect that could be improved is around the funding schemes for early-career researchers, to increase the overall science capability across multiple fields. Depending on the

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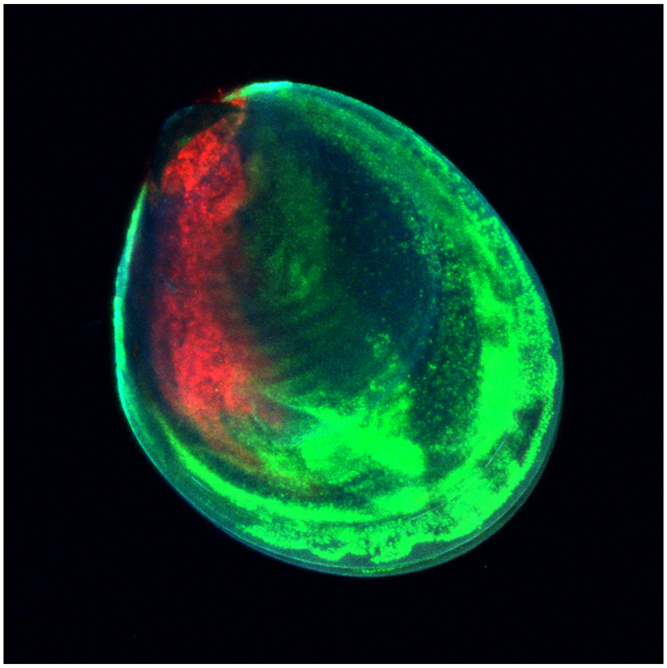

Live mussel juvenile incubated with specific dye to show fluorogenic ROS signal (green).

country, funding opportunities for early-career researchers looking for support either in academia or the private sector are very limited and scarce. Therefore, we think more investment is needed to support and enable the integration of emerging scientists to position them in roles that can make a difference to the future.

What's next for you?

We are both currently working as researchers at the Cawthron Institute, New Zealand's oldest and largest independent science organisation. We plan to continue developing our scientific careers and continue our research that supports the growth, resilience and success of New Zealand's shellfish aquaculture industry. We want to continue collaborating with researchers from other leading national and international institutes to deliver high-impact science that advances the field.

"Collaborations are the soul of science."

How do you think collaborations can help advance your research and yourself as an early-career researcher?

Collaborations are the soul of science. We need to be able to collaborate with researchers from different national and international institutions to bring together complementary disciplines and capabilities with a best-team approach. For early-career researchers, building a strong network of collaborations is essential for our career development and future research prospects. In this study, we were fortunate to collaborate with Alfonso Schmidt, who is a senior scientist and bioimaging specialist at the Malaghan Institute of Medical Research, and with Associate Professor David Burritt, who is an expert on oxidative stress and redox biology at the University of Otago. Without these collaborations, we would not have accomplished what we did, integrating our different backgrounds in marine science, medical science and redox biology to develop a new technique with great potential.

Reference

Delorme, N. J., Schmidt, A. J., Zamora, L. N., Burritt, D. J. and Ragg, N. L. C. (2021). A new method to localise and quantify oxidative stress in live juvenile mussels. *Biology Open* **10** bio.059030.