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It's been a great year, coming out of the COVID fog, with full steam ahead for projects. With field work occurring from the Goulburn River to Kyneton and interstate. Deploying passive samplers in challenging environments, bringing Litter Trackers to the Greater Geelong & Surf Coast, investigating point source and diffuse pollution. We have improved process efficiencies in our labs and have successfully supervised both Honours and PhD projects.

Our A3P research partnership with Melbourne Water has been reviewed positively this year, with our projects showing research impact for the business.

Newly Funded Project: Port Phillip Bay Fund 2021-22

RMIT- AQUEST in collaboration with Deakin Uni are a successful grant recipient in the 2021-22 Port Phillip Bay Fund (PPBF) - Establishing a baseline of Bay condition: pollutants and ecological indicators.

For more details see:

<https://www.marineandcoasts.vic.gov.au/grants/port-phillip-bay-fund> or our website.

Sourcing urban pesticide pollution using constructed wetlands in Melbourne, Australia.

A major piece of pesticide sourcing work for Melbourne is available online. Click below for a free version available 'til 5 Feb 2023

<https://authors.elsevier.com/a/1qGBjB8ccuvss>

So What? *These findings inform monitoring programs (ensuring the pollutants present are being sampled for) and direct further research towards relevant pesticides that pose a potential threat to our receiving waters, while identifying major sources which can become the target of management actions.*

A survey of 111 constructed urban wetlands in Melbourne was conducted to identify major pesticides present and their sources (residential, industrial, commercial, roads, recreational ovals) and their association with catchment imperviousness. Three passive samplers (POCIS, Chemcatcher® SDB-XC and Chemcatcher® C18) and fine sediments were deployed/collected and screened for 231 pesticides.

Twenty-two pesticides were detected in >5% of wetlands: 6 pesticides were associated with non-urban land uses (agriculture and forests) and 19 were associated with urban areas. These urban

pesticides were the herbicides simazine, diuron, metolachlor, bromacil propyzamide and paclobutrazol, the fungicides tebuconazole, propiconazole, metalaxyl, azoxystrobin, trifloxystrobin, iprodione and carbendazim and the insecticides fipronil, imidacloprid, bifenthrin, chlorantraniliprole, thiamethoxam and permethrin.

Visiting Academic from Southwest University (SWU), Chongqing, China

Visiting Academic, Associate Professor, Yuanqin Zeng is working on methods to measure tyre and road wear particles and is with us until June 2023.

Honours Projects – Filling knowledge gaps

Congratulations to our two Honours students David Buckles and Hannah Faraone who recently handed in their thesis' and gave their talks.



L-R: Dr Sara Long, Dr Kath Hassell, David Buckles, Hannah Faraone and Dr Jackie Myers. Sara, Dr Hung Vu &, Prof. Vin Pettigrove supervised David, while Kath, Jackie and Dr Claudette Kellar supervised Hannah.

David's project "Assessing the toxicity of **aluminium** to aquatic plants and invertebrates" was based on elevated detection levels (exceeding guideline values) for aluminium **in waterways** across Melbourne Water's Long Term Water Quality Monitoring network. The question was posed: Does this mean that the guidelines are too restrictive or that the current concentrations are causing environmental damage? Tests on two invertebrate and one aquatic plant showed that negative **effects** were detected at significantly higher concentrations than the current guidelines, suggesting that a re-evaluation of the current guideline value is warranted.

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Hannah's thesis "The impact of pollution on biofilms, zooplankton, and macroinvertebrate communities in **constructed stormwater wetlands (CSW)**" addressed the gap in available information on **impacts of pollution to biological communities**, investigating the relationships between these communities and pollutants and confirms that these communities all show potential to be effective bioindicators of pollution in CSWs.

PhD Project Updates

While Pulasthi Serasinghe and Tanya Paige spend solid hours at NMI on their projects, Congratulations goes to Pulasthi who has published his first PhD paper (listed below). Both Tanya on PFAS and Madara on Bifenthrin have papers imminent.



Pulasthi Serasinghe and Tanya Paige at the NMI Research Day, Nov 2022.

Madara Ranatunga has also been busy in the AQUEST lab assessing the impacts of bifenthrin on Growing Grass Frogs.



Dr Claudette Kellar and Dr Sara Long with Madara Ranatunga discussing experiments in the lab.

Our PhD starters from last year are all completing literature reviews and moving into the experimental phase of their projects, these include:

- Ayman Abuameen looking at the efficiency of wetlands in reducing micro and macro plastic pollution,
- Viharika Gudavalli, impacts of anthropogenic activities on *Paratya australiensis*,
- Emily Nguyen focusing on the impacts of an emerging pesticide of concern on the ecological health of instream invertebrates, Plus
- Tehmina Yaqoob developing toxicity tests for early life stage fish,
- Anna Flynn investigating eDNA approaches to study pollution in microbial communities in freshwater system, and
- Caterina Cacciatori who will research pesticide contamination in surface waters and linkages with context related factors, while base primarily at the Joint Research Centre of the European Commission, in Ispra, Italy.

Recent Publications

- Pettigrove, V., Hassell, K., Kellar, C., Long, S., MacMahon, D., Myers, J. Nguyen, H. and M. Walpitagama. Catchment sourcing urban pesticide pollution using constructed wetlands in Melbourne, Australia, *Science of the Total Environment* (2023), <https://doi.org/10.1016/j.scitotenv.2022.160556>
- Beale, D.J, Sinclair, G.M, Shah, R., Paten, A.M., Kumar, A., Long, S.M., Vardy, S, and O. Jones. A review of omics-based PFAS exposure studies reveals common biochemical response pathways (2022) <https://doi.org/10.1016/j.scitotenv.2022.157255>
- Myers, JH., Gavin, R., Odell, E., Zhang, P., Bui A. & V Pettigrove. Household herbicide use as a source of contamination in urban surface waters. *Environmental Pollution* (2022) <https://doi.org/10.1016/j.envpol.2022.118868>
- Nitti, F., Almeida, M. Inˆes G.S., Morrison, R., Catrall, RW., Pettigrove VJ., Coleman RA. & Spas D. Kolev. Flow-through passive sampler for zinc in freshwaters free from flow pattern, water cationic composition and temperature effects, *Microchemical Journal* (2022) <https://doi.org/10.1016/j.microc.2022.107294>
- Serasinghe, P., Nguyen, H.T.K., De Silva, T., Nugegoda, D and V. Pettigrove. A novel approach for tailoring pesticide screens for monitoring regional aquatic ecosystems. *Environmental Advances* (2022) <http://doi.org/10.1016/j.envadv.2022.100277>
- Shen, H. & Nugegoda, D. (2022) Real-time automated behavioural monitoring of mussels during contaminant exposures using an improved microcontroller-based device. *Science of the Total Environment* 806 (2022) 150567 <https://doi.org/10.1016/j.scitotenv.2021.150567>

See our website for more publications, technical reports and project information: <http://rmit.edu.au/aquest>

The Aquatic Environmental Stress Research Group identifies and addresses the ecological impacts of pollution in aquatic environments.