

Tomas Makaras

CONTACT INFORMATION

Adress Verkių Str. 98, Vilnius LT-12201, Lithuania
Nature Research Centre
Tel. No.: +370 678 31656
E-mail: tomas.makaras@gamtc.lt
<https://orcid.org/0000-0001-6665-008X>
<https://www.researchgate.net/profile/Tomas-Makaras>

EDUCATION AND ACADEMIC DEGREE

- 2015 – 2019 Phd in ecology and environmental science (N 012) (Environmental sciences) (Vilnius university and Nature Research Centre).
Doctoral thesis: “ The effects of multicomponent mixtures on behavioural, physiological and biochemical parameters of different fish species ”, Supervisor – dr. G. Svecevičius (2015-2016), dr. N. Kazlauskienė (2016-2019).
Scientific interests: ecotoxicology, behavioural toxicology, nano- and micromaterials toxicity, stress ecology and risk assessment, fish physiology, exploration and application of non-invasive biomarkers
- 2013 – 2015 Master in environmental sciences and management, Vilnius university, Faculty of Natural Sciences.
Master thesis: “ The sublethal effects of landfill leachate on the behaviour of juvenile Rainbow Trout (*Oncorhynchus mykiss*) ”.
The research was conducted at the laboratory of hydrobiont ecology and physiology, Nature Research Center.
Scientific interests: ecotoxicology, fish physiology and behaviour; evaluation of toxic effects of pollutants on fish behaviour and physiological parameters employing standardised (ISO, OECD) and non-standardized biological toxicity assays.
- 2009 – 2013 Bachelor degree in Ecology, Vilnius university, Faculty of Natural Sciences.
Bachelor thesis: “Water toxicity assessment by use of behavioral responses of medicinal leech (*Hirudo verbena*) ”.
The research was conducted at the laboratory of hydrobiont ecology and physiology, Nature Research Center.
Scientific interests: ecology and behavioural toxicology of medicinal leeches, research of behavioural characteristics of medicinal leeches in assessing the toxicity of the aquatic environment

PROFESSIONAL EXPERIENCE

- 2022 – until now **Senior Researcher**
Laboratory of ecotoxicology
- 2020 – 2022 **Researcher**
(since 2021 07 01 – Laboratory of ecotoxicology)
- 2017 – 2018 **Junior researcher**
Laboratory of hydrobiont ecology and physiology

2015 – 2019 **PhD student**
 (since 2019-01-15 – Laboratory of fish ecology)
 2014 - 2017 **Biologist**
 Laboratory of hydrobiont ecology and physiology

RESEARCH INTERESTS

Studies on the impact of micro- and nanomaterials, metals, various types of waste water, and other pollutants on different trophic levels (crustaceans, fish) in the context of environmental change; analysis of these effects on organisms at different stages of development at the molecular, biochemical, physiological, and behavioural (whole-organismal) levels; searching for and employing non-invasive and in vivo biomarkers in fish to study psychological stress; practical evaluation of test organisms, their sensitivity, and the suitability of their biological responses in the toxicity assessment of contaminated water.

Methodology: application of acute and chronic toxicity tests, as well as behavioural testing in accordance with ISO (ISO 7346-1: 1996; ISO 7346-2: 1996; ISO 7346-3: 1996; ISO 10229:1994; ISO 12890:1999), OECD (OECD 202, 211), EPA (EPA 2002a, 2002b), ASTM (ASTM E1604-12, 2012; ASTM E1711-12, 2012; ASTM E1768-95, 2013) ISO's standardised and non-standardized guidelines and recommendations; application of specialized softwares and systems for detection, registration, and analysis of test animal behaviour (Ethovision XT 17, DanioVision, Danioscope, etc., Noldus Inf. Tech., The Netherlands).

PUBLICATIONS

Scientific articles published in conference proceedings, indexed in „Clarivate Analytics Web of Science“ database:

1. **Makaras T**, Razumienė J, Gurevičienė V, Sauliutė G, Stankevičiūtė M. 2022. Technical suitability and reliability of an in vivo and non-invasive biosensor-type glucose assessment as a potential biomarker for multiple stressors in fishes: An evaluation on Salmonids. *Environmental Science and Pollution Research* 29: 41187–41206.
2. **Makaras T**, Stankevičiūtė M. 2022. Swimming behaviour in two ecologically similar three-spined (*Gasterosteus aculeatus* L.) and nine-spined sticklebacks (*Pungitius pungitius* L.): a comparative approach for modelling the toxicity of metal mixtures. *Environmental Science and Pollution Research*, 29(10): 14479–14496.
3. Stankevičiūtė M, Sauliutė G, **Makaras T**, Čepukoitienė B, Vansevičiūtė G, Markovskaja S. 2022. Biomarker responses in perch (*Perca fluviatilis*) under multiple stress: Parasite co-infection and multicomponent metal mixture exposure. *Environmental Research* 207, 112170.
4. **Makaras T**, Stankevičiūtė M, Šidagyte-Copilas E, Virbickas T, Razumienė J. 2021. Acclimation effect on fishbehavioural characteristics: determination of appropriate acclimation period for different species. *Journal of Fish Biology*, 99 (2):502–512.
5. Stankevičiūtė M, **Makaras T**, Pažusienė J, Čapukoitienė B, Sauliutė G, Jurgelėnė Ž, Raudonytė-Svirbutavičienė E, Jokšas K. 2021. Biological effects of multimetal (Ni, Cd, Pb, Cu, Cr, Zn) mixture in rainbow trout *Oncorhynchus mykiss*: Laboratory exposure and recovery study. *Ecotoxicology and Environmental Safety*, 216: 112202.
6. Montvydienė, D., Šulčius, S., Jurgelėnė, Ž., **Makaras T.**, Kalčienė V., Taraškevičius R., Kazlauskas M., Kazlauskienė N. 2020. Contrasting Ecotoxic Effects of Landfill Leachate and Cyanobacterial Biomass on Aquatic Organisms. *Water Air and Soil Pollution* 231, 323.
7. **Makaras T**, Montvydienė D, Kazlauskienė N, Stankevičiūtė M, Raudonytė-Svirbutavičienė E. 2020. Juvenile fish responses to sublethal leachate concentrations: comparison of sensitivity of different behavioral endpoints. *Environmental Science and Pollution Research* 27, 4876-4890. <https://doi.org/10.1007/s11356-019-07211-6>

8. **Makar** T, Razumienė J, Gurevičienė V, Šakinytė I, Stankevičiūtė M, Kazlauskienė N. 2020. A new approach to stress evaluation in fish using β -D-Glucose measurement in fish holding water. *Ecological Indicators* 109, 105829.
9. Stankevičiūtė M, Jakubowska M, Pažusienė J, **Makar** T, Otremba Z, Urban-Malinga B, Fey DP, Greszkiewicz M, Sauliūtė G, Baršienė J, Andruliewicz E. 2019. Genotoxic and cytotoxic effects of 50 Hz 1 mT electromagnetic field on larval rainbow trout (*Oncorhynchus mykiss*), Baltic clam (*Limecola balthica*) and common ragworm (*Hediste diversicolor*). *Aquatic toxicology* 208: 109–117.
10. **Makar** T, Montvydienė D, Kazlauskienė N, Stankevičiūtė M. 2019. Rapidness- and sensitivity-based comparison of behavioral and respiratory responses of European perch and rainbow trout to metal mixture exposure. *Bulletin of Environmental Contamination and Toxicology*. 103(3): 391–399.
11. Stankevičiūtė M, Sauliūtė G, **Makar** T, Markuckas A, Virbickas T, Baršienė J. 2018. Responses of biomarkers in Atlantic salmon (*Salmo salar*) following exposure to environmentally relevant concentrations of complex metal mixture (Zn, Cu, Ni, Cr, Pb, Cd). Part II. *Ecotoxicology* 27(8): 1069–1086.
12. **Makar** T, Svecevičius G, Kazlauskienė N, Montvydienė D. 2018. Rapid detection of sublethal toxicity using locomotor activity of rainbow trout juveniles. *Bulletin of Environmental Contamination and Toxicology* 100: 221–227.

Other reviewed scientific publications (books, books' chapters, collections of articles, articles, textbooks and etc.):

1. **Makar** T, Razumienė J, Gurevičienė V, Sauliūtė G, Stankevičiūtė M. 2021. Glucose measurement in response to environmental and physiological challenges: towards a non-invasive approach to study stress in fishes. World Academy of Science, *Engineering and Technology International Journal of Animal and Veterinary Sciences* Vol:15, No:11, 2021
2. **Makar** T, Montvydienė D, Kazlauskienė N. 2019. Behavioural responses of European perch (*Perca fluviatilis*) and rainbow trout (*Oncorhynchus mykiss*) to exposure of complex (Pb, Zn, Cu, Cd, Ni and Cr). *Proceedings of the 14th International Conference on Environmental Management, Engineering, Planning and Economics*. Mykonos Island, Greece, 460-470. ISBN: 978-618-5271-73-2.

PARTICIPATION IN INTERNATIONAL AND NATIONAL SCIENTIFIC PROGRAMMES AND PROJECTS

- | | |
|-------------|--|
| 2020 – 2022 | Member of the Lithuanian scientific group. SMART-WaterDomain project „Framework for Organisational Decision-Making Process in Water Reuse for Smart Cities“. Joint Call on Smart water management for sustainable society, Eig Concern-Japan. Project participants: Japan, Germany, France, Turkey, Slovakia, Czech Republic, Poland, Lithuania. https://www.jst.go.jp/pr/info/info1410/Attachment1.html |
| 2022 – 2025 | Project supervisor Assessment of risk from tire fire accidents and micro-/nano-particle-related pollution in the aquatic environment. Supported by Research Council of Lithuania, Project No P-MIP-22-51. |
| 2021 – 2024 | Principal investigator Multiple stressors on threshold levels: interactive effects of parasites infestation and pollution in aquatic organisms (MULTIS). Supported by Research Council of Lithuania, Project No S-MIP-21-10. |

- 2020 – 2023 **Secondary investigator** Fish as a model of trophic ontogenesis in the study of nanoparticles transport through aquatic food chain in the context of climate change (FISH). Supported by Research Council of Lithuania, Project No MIP-S-20-22.
- 2017 – 2020 **Principal investigator** Assessment of Cumulative Toxicity Impact in the aquatic organisms induced by different types of Stressors (ACTIS). Project was funded by the Research Council of Lithuania, Project No. S-MIP-17-10.
- 2015 – 2018 **Principal investigator** Nanoparticles and heavy metal toxicity mechanisms in fish during ontogenesis (NanoTox). Project was funded by the Research Council of Lithuania, Project No. S-MIP-108/2015

INTERNSHIP AND TRAINING

- 2020 – 2022 Post-doc fellowship at Life Science Center of Vilnius university: Development of a non-invasive glucose measurement method for assessing physiological stress in fish (project no. 09.3.3-LMT-K-712-19-0110)
- 2021 06 Internship at National Marine Fisheries Research Institute in Gdynia, Poland. Experimental studies on the influence of microplastics and nanocarbon materials on the behaviour of the early development stages of fish; stereoscopic analysis of water and organism samples from the environment for the presence of microplastics; biological and morphometric analyzes of the fish larvae from the experiments; field trip (coastal zone) to collect and analyze biological samples (algae, crustaceans, etc.)
- 2016 – 2017 Course in "Laboratory animal science" Sertificate No. 377. Vilnius University, Life Science Center (2016-09 - 2017-01).

PARTICIPATION IN SCIENTIFIC CONFERENCES

International scientific conferences:

1. Vansevičiūtė G, Stankevičiūtė M, Sauliūtė G, **Makaras T.** 2021. The genotoxic impact to peripheral blood cells in *Perca fluviatilis* induced by multiple stressors. 17th international conference of young scientists on energy and natural sciences issues, CYSENI 2021. May 24-28, 2021, Vilnius, Lithuania.
2. **Makaras T.**, Stankevičiūtė M. 2021. Acclimation effect on salmonids (*Oncorhynchus mykiss* and *Salmo salar*) swimming behaviour: determination of appropriate acclimation period. 64th International Conference on Natural Sciences. Open readings. 16-19th March, Vilnius. Lithuania.
3. **Makaras T.**, Razumienė J, Gurevičienė V, Sauliūtė G, Stankevičiūtė M. 2021. Glucose Measurement in Response to Environmental and Physiological Challenges: Towards a Non-Invasive Approach to Study Stress in Fishes. World Academy of Science, Engineering and Technology International Journal of Animal and Veterinary Sciences Vol:15, No:11, 2021
4. Stasiūnaitė E, Čapukoitienė B, Eglinskaitė R, Stankevičiūtė M, **Makaras T.**, Butrimavičienė L. 2019. Haematological and biochemical indices in rainbow trout (*Oncorhynchus mykiss*) after 4, 7 and 14 days exposure with metal mixtures. 62th International Conference for Students of Physics and Natural Sciences "Open Readings 2019", 19-22th March, Vilnius, Lithuania.
5. Sauliūtė G, Stankevičiūtė M, **Makaras T.** 2019. Biomarkers responses in *Salmo salar* exposed to multicomponent metal mixtures. 16th International Conference on Environmental Science and Technology, 4-7 September, Rhodes Island, Greece.
6. **Makaras T.**, Montvydienė D, Kazlauskienė N. 2019. Behavioral responses of European perch (*Perca fluviatilis*) and rainbow trout (*Oncorhynchus mykiss*) to exposure of complex (Pb, Zn,

- Cu, Cd, Ni and Cr). Proceedings of the 7th International Conference on Environmental Management, Engineering, Planning and Economics, 19th- 24th May, 2019, Mykonos Island, Greece.
7. **Makar** T, Montvydienė D, Razumienė J, Gurevičienė V, Šakinytė I, Stankevičiūtė M, Kazlauskienė N. 2019. Behavioural and biochemical responses of rainbow trout (*Oncorhynchus mykiss*) and European perch (*Perca fluviatilis*) to exposure of complex (Pb, Cu, Cd, Ni, Zn, Cr) metal mixture. 8th SETAC Young Environmental Scientist Meeting” 5-10, February 2019, Ghent, Belgium.
 8. Montvydienė D, **Makar** T, Kazlauskienė N, Cibulskaitė Ž, Šulčius S. 2017. Ecotoxicity assessment of multicomponent mixtures of different origin (landfill leachate and biomass of harmful algae bloom) using three aquatic organisms. 6th International Conference on Environmental Management, Engineering and Economics (CEMEPE 2017) and SECOTOX Conference, June 25-30, 2017, Thessaloniki, Greece.
 9. **Makar** T, Svecevičius G. 2017. Rapid detection of sublethal toxicity using fish locomotor behavior. 12th International Conference of Natural and Life Sciences, The Coins, 28th February – 2nd March, 2017, Vilnius, Lithuania.
 10. Cibulskaitė Ž, Kazlauskienė N, Jokšas K, Kulvietis V, **Makar** T, Stankevičius M, Rotomskis R, Montvydienė D. 2017. Accumulation of Cd in the early stages of the development of rainbow trout *Oncorhynchus mykiss* exposed to cd-based quantum dots and Cd salt. enviro.2017.014 <https://doi.org/10.3846/enviro.2017.014>

PARTICIPATION IN THE STUDY PROCESS

Supervision and consultation of bachelor and master students

| | |
|------------------|---|
| Paulina Stankutė | Scientific supervisor Master thesis: „The impact of complex metal mixture on mortality and behaviour of three-spined stickleback (<i>Gasterosteus aculeatus</i>) and nine-spined stickleback (<i>Pungitius pungitius</i>)“ (Vilnius university, Life Science Center, Ecology study program). 2019 – 2021 |
| | Scientific consultant. Bachelor thesis: „The impact of complex metal mixture on mortality and behaviour of rainbow trout (<i>Oncorhynchus mykiss</i>) and european perch (<i>Perca fluviatilis</i>) (Vilnius university, Life Science Center, Ecology study program) 2015 – 2019 |

OTHERS

| | |
|-------------------------------|--|
| Science popularisation | Participation in the "Spaceship Earth" 2022 science festival" read a report to the conference attendees on "Water pollution and its Effect on Fish" September 16th, 2022, Vilnius, Lithuania. https://www.mokslofestivalis.eu/renginys/2022/vandens-tarsa-ir-jos-poveikis-zuvims/ 2020 09 16 |
| | Participation in the "BŪTENT" forum festival, practical sessions on the topic "Fish behavioural aspects in assessing the toxicity of the aquatic environment." September 7th, 2019, Birštonas, Lithuania. 2019 09 07 |

| | | |
|-------------------|---|------------------|
| Awards | A letter of commendation for scientific work „Daugianarių cheminių mišinių poveikis skirtingų žuvų rūšių elgsenos, fiziologiniams ir biocheminiams rodikliams”, in the competition of young scientists and doctoral students of the Lithuanian Academy of Sciences, Vilnius, Lithuania. | 2021 |
| | Lithuanian academy of Sciences. Scholarship of the young scientists Physical, Biomedical, Agricultural and Technology, Lithuanian Academy of Sciences, Vilnius, Lithuania. | 2020 |
| | Research Council of Lithuania. Scholarship for academic achievement. Lithuanian Academy of Sciences, Vilnius, Lithuania. | 2019 |
| Membership | Member of a labour union at Nature Research Centre | 2018 – until now |
| | Member of Society of Environmental Toxicology and Chemistry (SETAC Europe). | 2018 – 2019 |