



Northwest Pacific Action Plan

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Northwest Pacific Action Plan
Pollution Monitoring Regional Activity Center

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Proposal for the activity
“Invertebrates as potential indicators of contamination by microplastic and nanoplastic of marine and coastal areas within NOWPAP region”

1. Background.

The activity 'Microplastics abundance in river runoff of the NOWPAP region' was approved by the 21 IGM in 2017 as part of the activities on WG2 – River and Direct inputs of contaminants into the marine environment of the NOWPAP region. Since 2016-2017 biennium, NOWPAP POMRAC collected data related to an urgent topic of microplastic contamination via rivers after publishing a case study of microplastic contamination in the coastal marine water area in the Russian part of NOWPAP region under the RAP MALI activity (UNEP/NOWPAP/POMRAC/FPM 15/Inf.4: "Microplastic Pollution in the coastal water of the Peter the Great Gulf: content and distribution. The first stage of survey"). During the biennium of 2018-2019, it was decided to carry out a case study in the Russian part of NOWPAP region due to absence of related available data. The activity also suggested collection of primary information from all member countries of NOWPAP describing current data availability on microplastic contamination in rivers, methodologies for microplastic contamination assessment in freshwater environment and importance of these assessment measures.

During the biennium 2020-2021 activity on the assessment of contamination of rivers within NOWPAP region by microplastics was continued. New data for the rivers with different level of anthropogenic press for the Russian part of NOWPAP region were observed, including the important transboundary rivers. The data on the contamination by microplastics of the rivers from other NOWPAP countries were collected and analyzed as well. The compilation and generalization of this data will allow to assess the current level of contamination of rivers within region by microplastics and to evaluate the inputs of microplastics to the coastal waters. Together with previous assessment of microplastic abundance in marine and coastal areas it gives some background for the evaluation of the quantity of microplastics in environmental media (water and sediments) on the regional level.

Assessment of microplastics contamination of the environment means inter alia assessment of harmful influence on the organisms. Problems of the hydrobionts response on the appearance of microplastics in the environment are very diverse, and depend on many internal and external factors. Internal factors are connected with properties of the hydrobionts studied (taxonomy, feeding types, resistance to the outer impacts). Invertebrates are suggested for the study in this proposal due to their ubiquitous in water ecosystems, different feeding types, and convenience for experiments. External factors are much more various due to diverse types of possible harmful effects (physical influence on the functioning of different organs, toxicity of absorbed chemical and microbiological substances), and different concentration and characteristics of plastic particles in the environment. Special feature of microplastic in water systems is gradual physical destruction with transfer of microplastic (0.001-5 mm) to nanoplastic (0.001 - 1µm) size fractions. Numerous experiments have shown much more notable negative effects of nanoplastics on the hydrobionts compare with

microplastics, but methods of the determination of nanoplastics in the environment media are practically absent.

The obvious growth of plastic generation in the World and release of notable part of this xenobiotic substances to the environment along with perception of highly likely negative influence of micro/nanoplastic on hydrobionts led to the explosive progress in the experimental exposure ecotoxicological studies. Indeed various negative impacts were registered but at the concentration of micro/nanoplastic several orders higher than have been found in the real environment media. Therefore the assessment of the influence of micro/nanoplastic contamination should begin from the detection of quantity of plastics in the real environmental compartments including organisms. Only after determination of realistic environmental conditions, standardized ecotoxicological studies will allow to assess risk of micro/nanoplastic pollution.

2. Objective

Major goal of this activity is to outline approaches and progress in the assessment of microplastics and nanoplastics influence on the hydrobionts invertebrates in the marine and coastal areas of NOWPAP region. Specific objectives are the follows:

- To collect published results from the NOWPAP countries on the abundance of microplastic in the environmental media (water and sediments) relevant to the field and experimental studies of microplastic contamination influence on the water invertebrates.
- To analyze published results on the quantity and distribution of microplastic/nanoplastic particles in the water invertebrates of marine and coastal areas in different NOWPAP countries.
- To highlight existing gaps and possible way forwards in the assessment of microplastic/nanoplastic contamination influence on water invertebrates.

3. Main tasks

- To compare level of measured concentration of microplastic in the environmental media with quantity of plastic particles used in the ecotoxicological experiments. This task should be done based on the published data.
- To analyze regional case studies relevant to the determination, counting and distribution of micro/nanoplastic particles in the invertebrates tissue. The emphasize should be done on the habitats with probably maximum concentration of micro/nanoplastic due to anthropogenic factors (aquaculture farms, sewage outputs) and natural reasons (bottom surface, beach concentration zones). The uneven distribution of micro/nanoplastic within hydrobionts will be taken into account with stress on the organs where natural concentration

is observed (e.g. gills and mantle). Published data will be a major source of information for this task, but some field and laboratory research to check the methods are planned as well.

- To outline possible approaches and methods for the determination and quantification of nanoparticles (< 1 µm) in the environmental media (water and sediments). This data could be done based on the published data mainly.

4. Expected outcomes and future direction

National inputs from all NOWPAP countries and Regional Overview reflected existing data on the microplastic/nanoplastic abundance in the major environmental compartments will be major outcome of this activity. The stress on the determination of quantity and distribution of micro/nanoplastic particles in the hydrobionts from the marine and coastal habitats with environmental conditions most close to those used in the ecotoxicological experiments will help to make later more environmentally realistic. The implementation of this activity will be a step forward at the outlining the realistic conditions for the future assessment of damage from the micro/nanoplastic contamination of marine and coastal waters. Study of the possible approaches for the determination of nanoparticles (< 1µm) in the environmental media will be useful preliminary step for the resolving of this challenging issue.

5. Schedule for the activity

Time		Actions	Main Body
2022	Q1-Q2	Nomination of experts	POMRAC and FPs
	Q2	Discussion by correspondence of the content of National Inputs on the activity	POMRAC FPs, experts, POMRAC
	Q2-Q4	Preparation of the National Inputs	POMRAC experts
	Q2-Q4	Study of some species of invertebrates on the micro/nanoplastic content and distribution	POMRAC experts
2023	Q1-Q2	Finalization of National Inputs. Study of microplastic content in the invertebrates from the areas with most probable plastic contamination.	POMRAC experts
	Q2-Q3	Compilation of National Inputs, review by RACs, experts, NFPs	Experts, POMRAC
	Q4	Finalization, Printing, Presentation of Regional overview at the POMRAC FPM	POMRAC

6. Budget

Contract	Timing	Output	To be completed	Counterpart	Budget
Preparation of the National Inputs	2022 Q2-Q4	National Inputs	2022 Q4	POMRAC experts from China, Japan, Korea	15,000*
Study of the influence of microplastic on the key species	2022 Q3-Q4	National report	2022 Q4	POMRAC	8,000
Study of microplastic in hydrobionts from the areas with most notable plastic pollution	2023 Q1-Q2	National report	2023 Q2	POMRAC	4,000
Workshop	2023 Q4	Report of WS	2023Q4	POMRAC	10,000
Compilation and finalization of Regional overview	2023 Q3-Q4	Printed Regional Overview	2023 Q4	POMRAC, FPs, experts,	8,000
Total					45,000

*- through the special contracts through RCU or Nairobi HQ