Project information

Project title

Microplastics from artificial sports pitches: composition, degradation and biological interactions (MARS)

Year

2018

Project leader

Dorte Herzke & Claudia Halsband

Geographical localization of the research project in decimal degrees (max 5 per project, ex. 70,662°N and 23,707°E)

Tromsø: 69.67°N 18.79°E/Svalbard: 78.24°N, 15.62°E

Participants

Dorte Herzke, NILU; Claudia Halsband, APN	Andy Booth, SINTEF; Jan Sundet, IMR

Flagship

Hazardous Substances

Funding Source

Flagskip Hazardous Substances

Summary of Results

- Finalisation of the Citizen Science project "Sjekk kunsgressbanen" which invovled more than 12500 pupils and almost 600 football games at almost 350 pitches

- Hitchhiking rubbercrumbs are removed in considerable amounts by players from the fields

- Established protocols for leachate analysis and extraction of leached compounds from seawater.

- Identified and established analytical methods for relative additive chemicals.

- Conducted leachate studies looking at the leaching of organic compounds (PAHs and additive chemicals) and metals from rubber granulates into seawater.

- Looked at variations in leachate concentration with size fraction (including cryomilled particles, 250-1500 µm and up to pristine soccer pitch particles) and rubber concentration (0.001-0.1 g/mL water).

- Examined the leachate profile variations between pristine rubber particles and rubber particles collected from soccer fields in Tromsø and Trondheim.

- Conducted a time-series leachate (0-30 days) to look at effect of leachate time on concentrations.

- Analysed leachate used in copepod exposure experiments.

- Contaminats and additives were determined in both the rubber and seawater leachate with phenolic compounds dominating in the rubber leachate and metals in the ruber itsself

- Leaching is not affected by particle size

- Analysed the body burden of copepods exposed to rubber leachates.

- production of rubber leachates from 3 rubber types (Tromsø field, Trondheim field, Ragnsell medium pristine/new)

    - concentration gradients of leachates in filtered seawater: stocks (100%), 10%, 1% and 0.1%

    - preparation of leachates in all concentrations for chemical analyses and use in exposure experiments

    - exposure experiments with two species of planktonic marine copepods (*Acartia longiremis*, *Calanus finmarchicus*) in the low concentrations (10, 1 and 0.1%), to complement previous experiments (2017) with higher concentrations (5-100%)

    - determination of mortality rates in a long-term exposure over 2 weeks

- preliminary data analysis of mortality data
- exposure experiment with brown crabs (*Cancer pagurus*) in december 2018

- Organisation of a two day Science Session on MArine Plastic in the RActic at Arctic Frontiers 2019 and at NEST conference at Svlbard in February 2018

- One proposal to NFR MILJØFORSK call "Environmental behaviour of tire wear particles and their impacts on ecosystems

exposed to multi-stressors (ENTIRE)"

Master and PhD-students involved in the project

none

For the Management

Rubber crumb is a source of a number of pollutants which easily leach out into seawater. High mortality rates were observed for different plankton species, typical in Arctic waters (*Calanus finmarchicus and Acartia longiremis).* The prevention of rubber crumbs leaving artificial soccerfields uncontrolled, is a prerequisite for an efficient regulation of rubber crumb emissions and limitations of harmful effects to the marine environment.

Published Results/Planned Publications

Planned publication:

'Rubber granulate from car tires: leachate composition and toxicity in marine environments'

Communicated Results

Feb 2019	NordMar network Plastic. Plastic in the Arctic. Nordic Council kick off meeting, Reykjavik, Iceland
Jan 2019	Organisation of a 2 day science session on "Plastic in the Arctic" including 1 oral presenation of the project results
Jan 2019	Op-Ed Aftenposten "Gummigranulat på fotballbaner - en ustudert kilde til miljøgifter"
Dec 2018	AMAP report on emerging contaminants 2017: chapter 2.17: Marine Plastics and Microplastics was published
Oct 2018	Interview for Arctic Today. https://www.arctictoday.com/week-ahead-plenty-fishing-sea/?wallit_nosession=1
Sep 2018	Innlegg Nordlys "Er Tromsø Idrettslag på banen for miljøet? Alternativt "Er Tromsø Idrettslag TIL for miljøet?"
May 2018	Forskning.no: Fotballspillere drar med seg 65 tonn gummi fra banen hvert år
May 2018	Bergens Tidene: Så mange gummikuler drar barnet ditt med seg hjem etter fotballtrening
May 2018	Report Forksningskampanjen 2017 published
May 2018	Presented one poster on the leaching of harmful chemicals from rubber crumbs at SETAC Europe in Rome, May 2018 , which was selected for Poster Corner
March 2018	Marine plastic pollution in the Arctic: an emerging research field. Fram Forum 2018
Feb 2018	Popular science articles in online magazine Gizmodo.com on trophic transfer of microplastics and microplastics concentrations in the oceans
Feb 2018:	One Poster at the 6th Marine Debris Conference in San Diego in Ferbuary 2018
Feb 2018	Participated in the organisation of a plastic session plus oral presentation: Is crumb rubber a source of pollutants and harmful effects in the marine environment? at the NETS, March 2018, Svalbard
Jan 2018	Arctic Frontiers Pecha Kucha Night: Arctic marine litter

Jan 2018 Arctic Frontiers Side Event: Microplastics in the marine Arctic environment – what do we need to know and do? Panel debate with the minister for Climate and the Environment (Ola Elvestuen), the Research Council of Norway (Fridtjof Unander), The Norwegian Fishermen Association (Marit H. Haugseth) and WWF Norway (Karoline Andaur).

Budget in accordance to results

yes

Could results from the project be subject for any commercial utilization

No

Conclusions

Rubber crumb is a source of a number of pollutants which easily leach out into seawater. High mortality rates were observed for different plankton species, typical in Arctic waters (*Calanus finmarchicus and Acartia longiremis)*. The prevention of rubber crumbs leaving artificial soccerfields uncontrolled, is a prerequisite for an efficient regulation of rubber crumb emissions and limitations of harmful effects to the marine environment. The impact on species higher in the food chain, as fex the brown crab, will be investigated in 2019 together with publishing and proposal writing.