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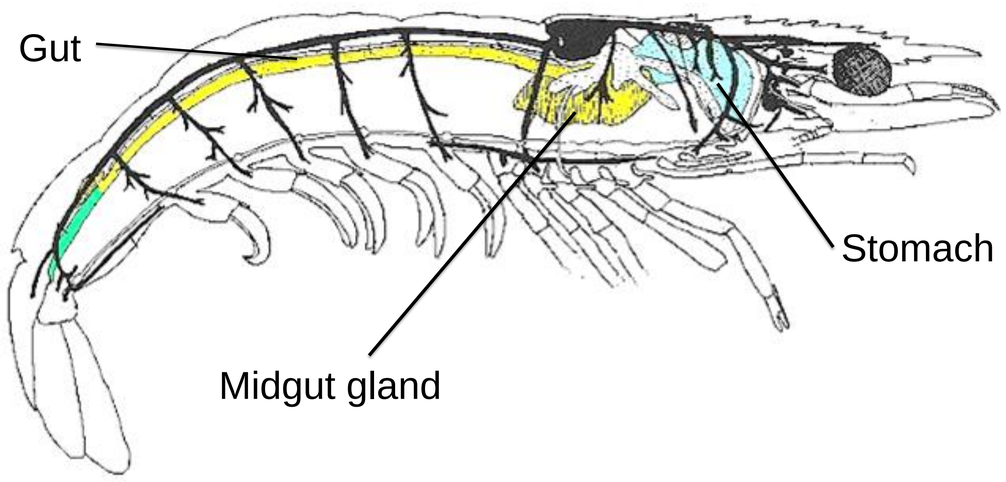
Do microplastics induce oxidative stress in marine invertebrates?

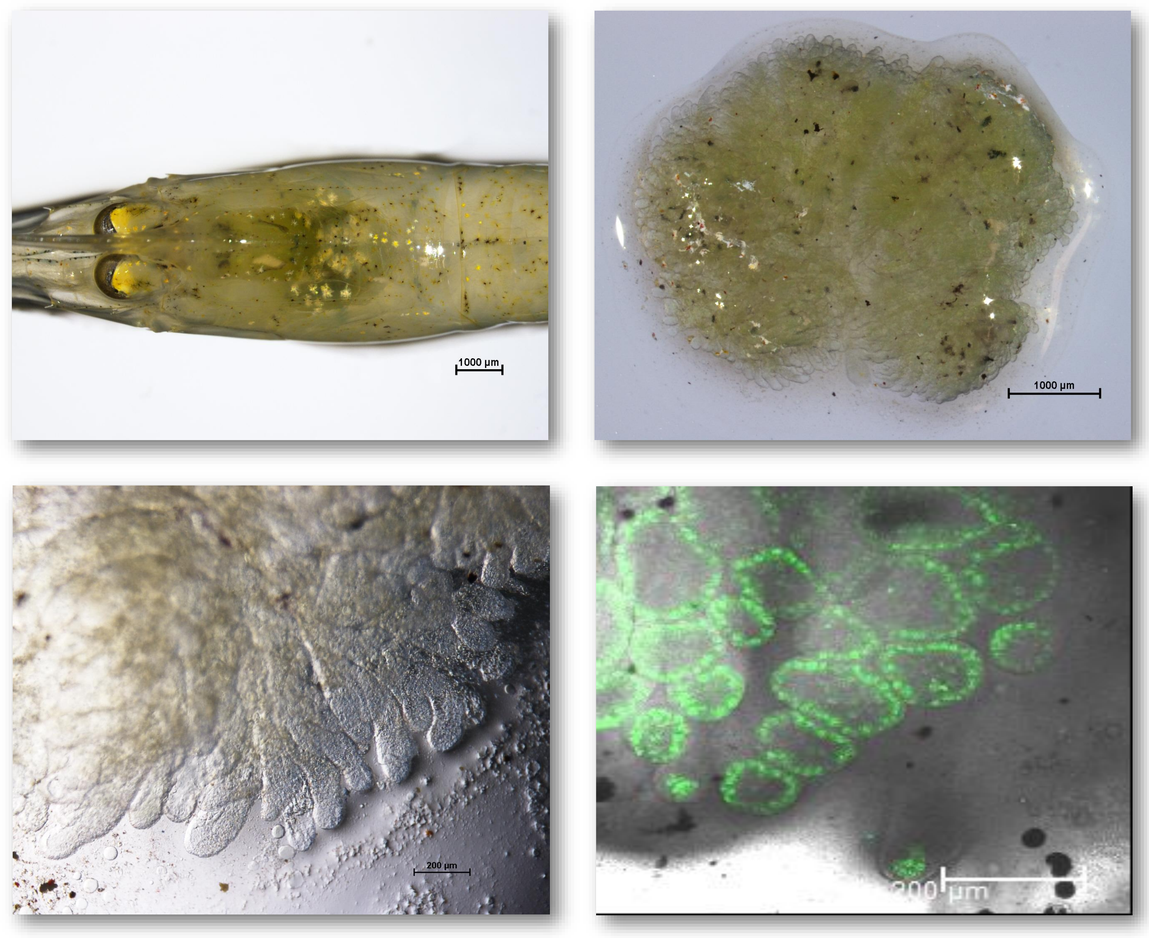
An approach to determine toxicity of microplastics in shrimps

In the last decades environmental pollution by plastic became a rising issue. Marine plastic litter can have adverse effects on animals. Some species may get trapped in lost fishing nets. Others may starve to death upon ingestion of plastic which may clog their stomachs. Degradation of plastic items generates µm-sized particles. These microplastics can have adverse effects on marine invertebrates upon ingestion. Whether they penetrate into tissues and cells and cause cellular stress responses will be matter of this study.

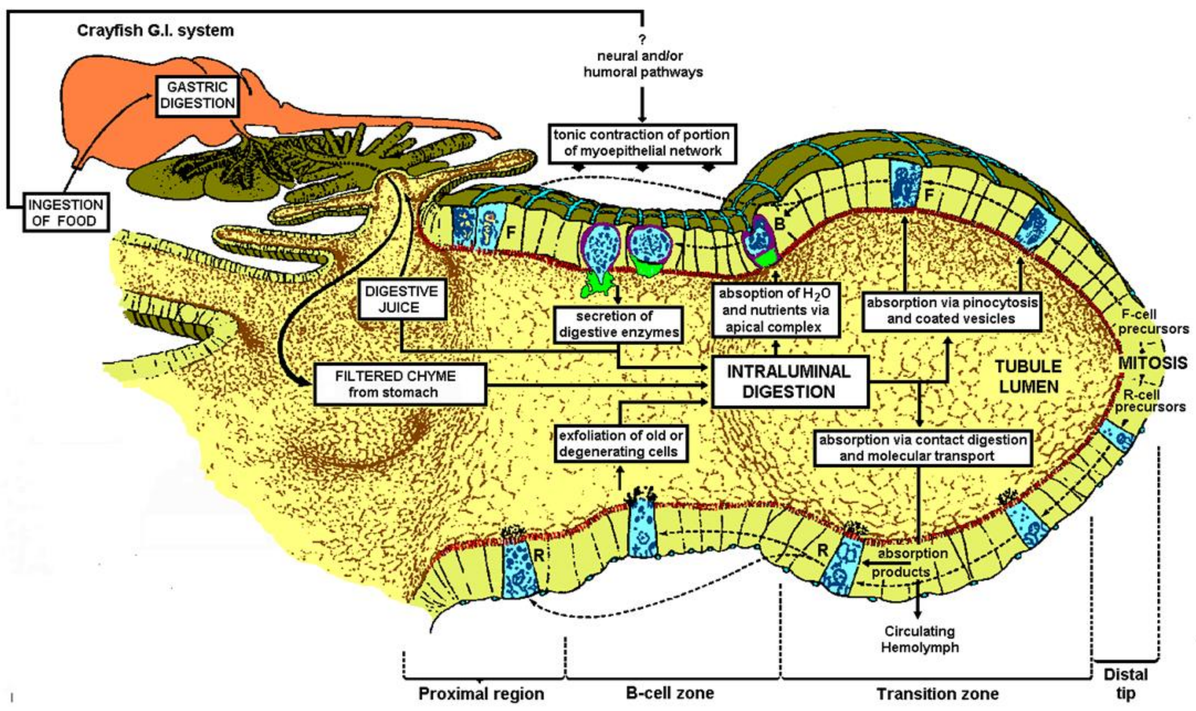
The digestive tract of shrimps



The Atlantic ditch shrimp (*Palaemon varians*) inhabits coastal regions, estuaries, and brackish water systems, which are most effected by anthropogenic pollution. Ingested particles may enter and affect the stomach, the midgut gland (hepatopancreas) and the gut.

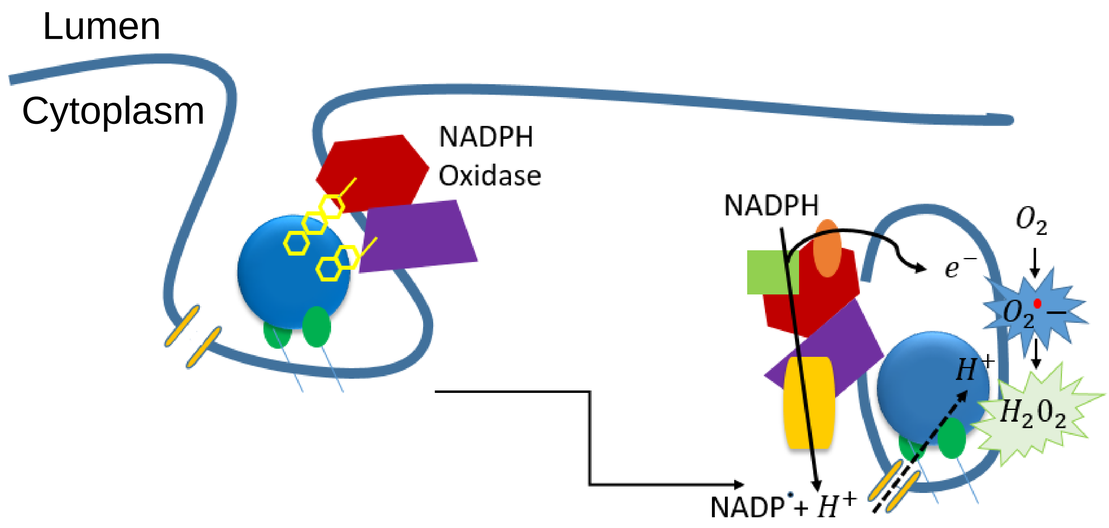


Top view of the midgut gland of *P. varians*; blind ending tubuli of the midgut gland, Syto-13 Green dye to visualize the cell nuclei



Oxidative stress in cells

We hypothesize that particles which enter the cells will cause oxidative stress due to cellular defense mechanisms.



The midgut gland is the site of enzyme secretion and nutrient resorption. Florogenic microbeads will serve as tracer to visualize passage through the gut, retention in the stomach, or translocation of microparticles into the cells of the midgut gland.

Quantification of ROS-formation will be done by confocal laser scanning microscopy and the aid of the fluorogenic substrates Dihydroethidium (DHE) and 2', 7' - Dichlorodihydrofluorescin diacetate (DCFDA).

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