

The Effects of Glyphosate Exposure on Oyster Development and Survival

Research Plan/ Project Proposal



Figure 1. Round Up Logo Image

By: Lauren Salitan

Advisor: Mauricio Gonzalez

Marine Biology Research Program

Urban Assembly New York Harbor School

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Introduction:

It has been observed that there is a decline in oyster population in recent times. Oysters have been declining in places such as Chesapeake Bay [1], Galveston Bay [2], and the New York Harbor in multiple areas [3]. Decline in populations occur when survival is not continuing, when young are not being produced, and/or when young are not developing.

The effects of Glyphosate (the active ingredient in Herbicides) consumption, exposure, etc., have been considered quite a bit. Research has proved that glyphosate has negative impacts upon numerous organisms. Some of which include, but are not limited, to humans, rats, and bees. It has rarely been researched as to whether glyphosate has an impact on the very well known, keystone and indicator species, the oyster. In France, a research scientist began to investigate the effects of Glyphosate-Based Herbicide (GBH) exposure of the Pacific Oyster, *Crassostrea gigas*. He could publish his research [4], which stated that (1) France suffered from a major decline of oyster population in 2013, (2) Glyphosate is a well-known stressor to living organisms and French coastal waters are heavily polluted with it, and (3) embryo-larval development was sensitive to the GBH exposure he tested out. Mottier finished his article by saying that further research in regards to the GBH exposure on oysters is necessary. Research is more than necessary since it is not completely understood the limitations and safety hazards of the exposure and use of glyphosate. This planned research is key on the grand scale as well. As mentioned earlier, oysters are both a keystone and indicator species. They are vital to the environments in which they live. This research will further the investigation Mottier started to determine if Glyphosate/GBHs are harmful and impacting the environment.

Project Design:

The scientific problem behind the planned research is, 'Effects of Glyphosate Exposure on Oyster Development.' The first hypothesis developed is, 'If glyphosate interacts with oysters, their development across growth stages may be significantly interrupted due to the known dangerous effects of the chemical.' This will build upon the confirmed fact that glyphosate poses hazardous risks [5] and that oysters are sensitive to glyphosate exposure. Answering the research question will support scientific research in regards to deeper comprehension of chemical exposure onto biological factors, as well as the general environmental issue of specie interaction with pollutants.

Procedures and Methods:

Data must be collected to pursue this project. Experiments shall be taken out under a controlled environment to compare oyster development with and without exposure to GBHs (RoundUp) as well as sampling of waterways around the area in which the research is. The technology to be used to test for presence of glyphosate will be the Elisa Method (enzyme-linked immunosorbent *assay*). This kit detects and quantifies substances tested for. It will reveal that glyphosate is dangerous if oysters are not developing properly under exposure. If this is proven and glyphosate is discovered in the environment, it will reveal that glyphosate is the cause- or one of the causes) behind the recent decline in oyster population and survival.

Ethics:

No ethics under this experiment will need to be addressed... no vertebrate animals- including humans- or life threatening factors will partake within this research.

Major References:

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- [2] Powell, E. N. (1995). Modeling oyster populations. V. Declining phytoplankton stocks and the population dynamics of American oyster (*Crassostrea virginica*) populations. *Fisheries Research*, *24*(3), 199-222. doi: [https://doi.org/10.1016/0165-7836\(95\)00370-P](https://doi.org/10.1016/0165-7836(95)00370-P)
- [3] McCann, M., Dr. (2017, April). [2016 Billion Oyster Project Reefs Report Email PDF from Michael McCann]. Unpublished raw data.
- [4] Mottier, A. (2013). Effects of glyphosate-based herbicides on embryo-larval development and metamorphosis in the Pacific oyster, *Crassostrea gigas*. *Aquatic Toxicology*, *128-129*, 97-78. doi: <https://doi.org/10.1016/j.aquatox.2012.12.002>
- [5] Meyers, J. P. (2016). Concerns over use of glyphosate-based herbicides and risks associated with exposures: a consensus statement. *Environmental Health*, *15*(19). doi:10.1186/s12940-016-0117-0