

Bio Mag Tag

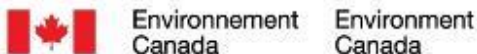


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Activity Name: Bio Mag Tag

Ages: 6-14

Activity Energy: High

Length of time: 30 minutes

Number of Participants: 10 - 30

Concept: This tag-based running game demonstrates the concept of bio magnification using POPs (Persistent Organic Pollutants) in marine ecosystems as an example.

Materials Required: Approximately 100 beans or other small items that can be used to represent POPs. Three different coloured arm bands. Paper, cloth, or plastic bags for putting beans in.

Introduction: Bio magnification is a significant problem for top level predators, which are already at great risk from habitat loss and other factors. Understanding the concept of bio magnification will help students to grasp the sometimes hidden results of environmental pollution. POPs are considered one of the main threats to large marine mammals. Marine pollution and bio magnification have a direct impact on human health because we use many of these species as food.

Methods: Assign participants the role of herring, salmon, or orca. There should be approximately three salmon for every orca and three herring for every salmon, for example; 1 orca, 3 salmon, and 9 herring. Provide arm bands to each participant to mark them as their marine animal (one colour for herring, etc.). Provide bags to the orca(s) and salmon. Each herring starts with one bean (POP). The herring can only be tagged by the salmon, and the salmon can only be tagged by the orca. When a herring is tagged they give their bean to the salmon who tagged them, and then they go to an area designated as the eelgrass to be re-born. At the eelgrass area there is a person who provides re-born herring with a new bean. When a salmon is tagged by an orca they provide all their beans to the orca, and then resume their hunt for herring. It helps to define an area with boundaries where the game will be played.

At the end of the game ask each salmon how many beans they have, and ask the orca how many beans they have. If the game has been played correctly the orca should end up with the most beans. You can then talk about how POPs can become concentrated within the top level predators of a food chain.

Tips for Teachers:

- It's best to choose a fast runner to be the orca otherwise they may not end up with very many pollutants.
- You can say "re-born in the eelgrass" to each herring as they receive their new bean, this can help reiterate the message that herring lay eggs in eelgrass beds.

Background facts and information:

- Southern Resident Orcas (*Orcinus orca*) are considered an endangered species under the USA Endangered Species Act (National Marine Fisheries Service, 2008), as well as by the Province of British Columbia and Canada (Fisheries and Oceans Canada, 2011).
- An adult orca eats approximately 30 salmon per day. The largest of the salmon species (Chinook) are their favorite (National Marine Fisheries Service, 2008).
- Orcas are among the most contaminated mammals in the world due to accumulations of POP's (persistent organic pollutants), including PCBs, DDT, and more recently PBTs (Ross et al., 2002).
- The negative impacts of high POP concentrations can include birth defects, skeletal abnormalities, tumour growth, immunosuppression, and others (Fisheries and Oceans Canada, 2011).

Literature Cited:

Fisheries and Oceans Canada. 2011. Recovery Strategy for the Northern and Southern Resident Killer Whales (*Orcinus orca*) in Canada. Species at Risk Act Recovery Strategy Series, Fisheries & Oceans Canada, Ottawa, ix + 80 pp.

National Marine Fisheries Service. 2008. Recovery Plan for Southern Resident Killer Whales (*Orcinus orca*). National Marine Fisheries Service, Northwest Region, Seattle, Washington.

Ross, P.S. 2002. The role of immunotoxic environmental contaminants in facilitating the emergence of infectious diseases in marine mammals. *Humans and Ecological Risk Assessment* 8: 277-292.