

# Biomagnification Activity:

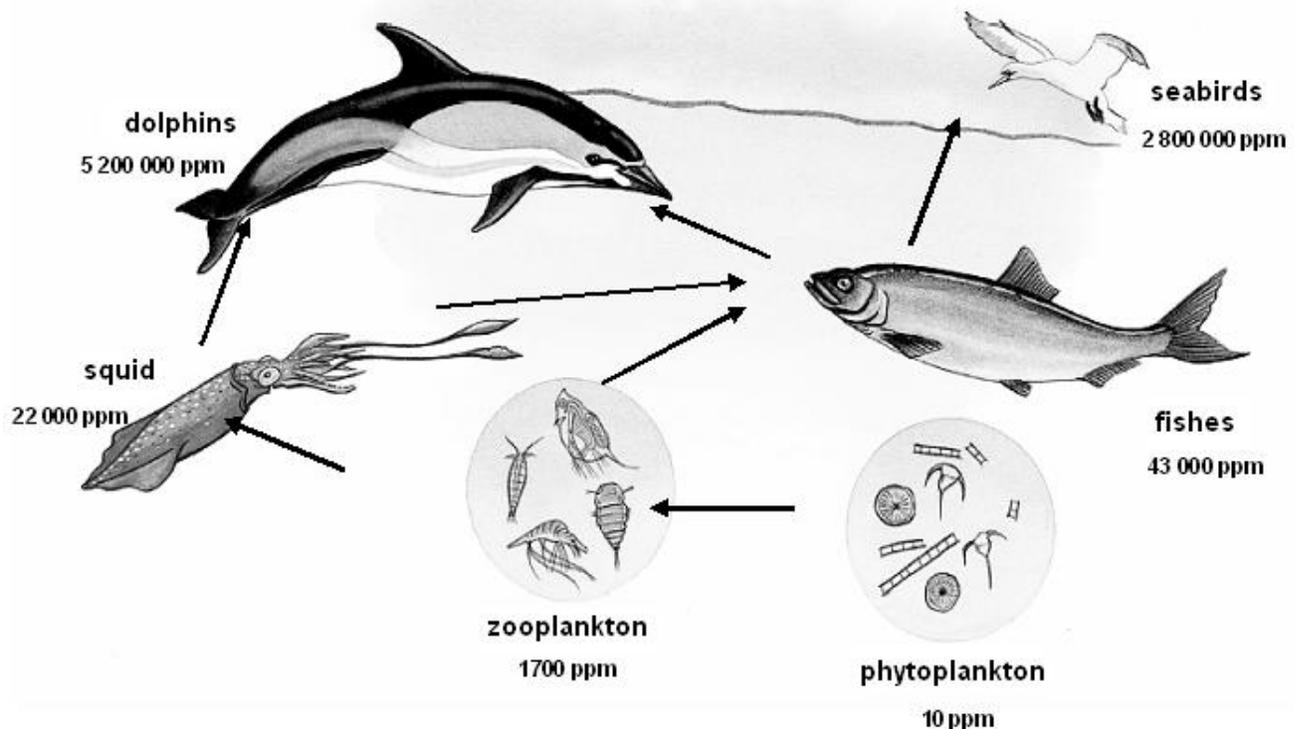
## DDT in the Ecosystem

*Use the following information to answer the questions below.*

DDT (dichlorodiphenyltrichloroethane) is a man-made chemical that persists in the environment. Because it is non-degradable, it accumulates in the fat cells of organisms over time. The Swiss chemist Paul Hermann Müller first discovered its use as an extremely effective pesticide in 1939. He won the Nobel Prize for his work on DDT in 1948. This powerful pesticide has been instrumental in the control of malaria and dengue and yellow fevers, as well as other deadly diseases transmitted by insects. It was widely used until the 1960s.

In 1962, American biologist Rachel Carson was the first to expose the hazards this non-degradable chemical posed to the environment. In her book *Silent Spring*, Carson presented data that supported the idea that DDT was being biomagnified through food chains, causing harmful effects in natural ecosystems. In particular, Carson showed that this pesticide was affecting reproduction in bird species by interfering with eggshell formation. The public outcry spawned by *Silent Spring* led to a ban of the pesticide, first in the United States, and then worldwide. However, DDT continues to be used in some regions of the world today where its effectiveness as a disease-control agent remains unparalleled.

### DDT accumulation in a marine food web, in parts per million (ppm)



The arrows show the flow of energy from one trophic level to another. The concentration of DDT increases with each successive energy transfer in the food web. 1 ppm = 1 mg/kg.

<b>CHAPTER 1</b>	<b>Biomagnification Activity: DDT in the Ecosystem</b>	<b>BLM 1.2.17</b>
HANDOUT		

1. The diagram on the previous page shows the biomagnification of DDT as it passes through a marine food web. Explain what is meant by the term biomagnification. How many times greater is the concentration of DDT at the highest trophic level than at the lowest trophic level?

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2. a) Calculate how much DDT you would consume if you ate 3 kg of squid (calamari).

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- b) Calculate how much DDT you would consume if you ate 3 kg of fish.

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- c) DDT has also been identified as a cancer-causing chemical. In light of these findings, which is the healthier food choice in this case, fish or squid? Explain your answer with reference to the food web above.

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3. The table on the next page gives the DDT levels, in parts per million (ppm), found in the eggs of three species of seabirds. Species include Leach's storm petrel, which feed on small organisms near the surface of the water; the Atlantic puffin, which feed on small fish; and the double-crested cormorant, which feed on larger fish. The eggs were sampled from two different locations along Canada's east coast. Pesticide levels found in birds' eggs are a good indicator of overall pesticide levels in the environment. Study the data in the table and answer the questions that follow.

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### DDT Levels in Atlantic Seabird Eggs

Species	DDT level in eggs (ppm)		
	Year	Bay of Fundy	Atlantic Ocean
Leach's storm petrel	1968	No data	1.46
	1972	6.81	2.48
	1976	1.75	0.75
	1980	1.13	0.46
	1984	1.05	0.40
Atlantic puffin	1968	No data	0.89
	1972	2.57	0.76
	1976	1.27	0.59
	1980	1.03	0.55
	1984	0.74	0.30
Double-crested cormorant	1968	No data	No data
	1972	6.51	2.85
	1976	1.49	2.18
	1980	1.91	1.34
	1984	1.07	1.88

- a) Use graphics software to construct a graph of the data shown above. Identify the manipulated and responding variable.

The manipulated variable is: \_\_\_\_\_

The responding variable is: \_\_\_\_\_

- b) Describe the general difference between pesticide levels in birds' eggs from nesting sites around the Bay of Fundy with those from nesting sites along the Atlantic coast.

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- c) Describe the trend in pesticide levels from 1972 to 1984. What might account for this trend?

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- d) Describe any differences in pesticide levels found in the eggs of the different species of seabirds. What might account for these differences? What other information might be helpful in answering this question?

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4. DDT and other persistent environmental contaminants, such as PCBs (polychlorinated biphenyls), have recently been found in high concentrations in the breast milk of Inuit mothers and in polar bears. These toxin levels are often higher than those found in organisms at higher trophic levels in other regions.

- a) Suggest a reason why the levels of these pollutants might be found in higher concentrations in Inuit people and polar bears.

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- b) If DDT was banned in the 1960s, why is it still an environmental concern today?

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