SUSTAINABLE U.S. SEAFOOD:
WHAT'S SCIENCE GOT TO DO WITH IT?

Join NOAA Fisheries Service in this five-part series to learn about the science behind responsibly managed U.S. fisheries.

How many fish are there?

A goal of fishery science is to determine the amount of fish to harvest that does little to no harm to the environment and leaves enough fish in the water for the population to renew itself. The first step is to find out how many fish are in a population. Polly Pollock has offered her species as an example. What do we know about walleye pollock? We know they live in the Bering Sea off Alaska.

What challenges do you think the scientist will face in trying to count pollock?
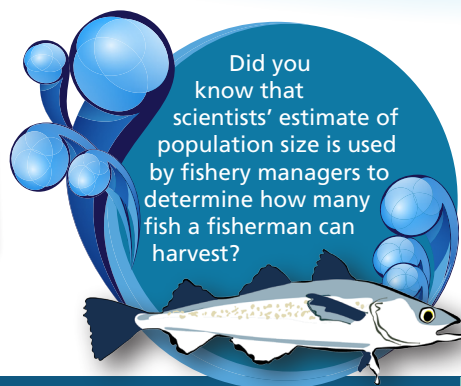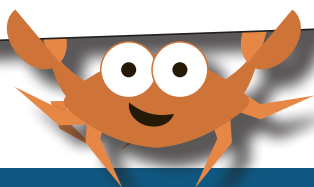
- Pollock live in the ocean.
- The ocean is huge — it covers about 70 percent of the Earth.
- Much of the ocean is dark.
- The parts of the ocean that pollock live in are very cold.
- Pollock are always moving around!

Just knowing these facts, it is clear that a scientist isn't going to be able to count every fish.

How do scientists figure out how many pollock are in the ocean?

Fisheries scientists estimate population size from samples. It would be really expensive and an inefficient use of time to sample the entire ocean, so scientists use different sampling methods — depending on species and geographic location — to estimate population size. For instance, to sample for pollock in the Bering Sea, scientists put an imaginary grid over the entire continental shelf and only sample a few of the grids. How do scientists select which grids to sample? One way is to use a random sampling method. This method ensures that areas with fish and without fish are represented. If scientists sampled only where there were a lot of pollock, their estimate would be biased. Their estimate would be higher than the actual population size. If a harvest level were based on that estimate, we would end up depleting the pollock population.

Data collection: Scientists at the Alaska Fisheries Science Center conduct surveys every year to assess the abundance of crab and groundfish (like pollock) in the Eastern Bering Sea.

Did you know that scientists' estimate of population size is used by fishery managers to determine how many fish a fisherman can harvest?
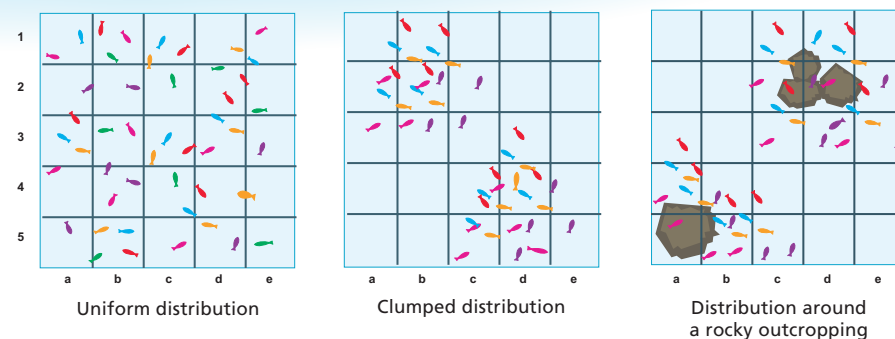
Let's do science!

Today you are a scientist on a research boat on the Bering Sea. You placed your grid over three different areas (see boxes below) and now it is time to sample them. The random number generator says sample grids: 2A, 3D and 5C, from each area. Count all the fish within each grid and add them up for each area. Now get the mean or average of those three numbers for each area. What are they?

There are two types of surveys conducted to estimate pollock population size. One is a bottom-trawl survey, where a large net is dragged along the seafloor to catch fish. A hydroacoustic survey uses sound to count pollock in the water column. Sound? That's right. Sound waves bounce off the air-filled swimbladder (an organ that helps with buoyancy) of pollock and is collected by a receiver located on the bottom of the ship.

Now that we know the mean, we can get an estimate of how many fish are in each area. How do we do that? If we have the mean number of fish per grid (your answer from above), and we know many grids there are (25), then we can do what's called an extrapolation. How? Multiply the mean number of fish per grid and the number of grids in your area.

What is your estimate population size for fish in area 1 _____ area 2 _____ and area 3 _____?

Think about why your estimates may be different from the actual number (50 fish). Would you change your sampling method? How?

Scientists sometimes don't know the distribution pattern of a fish population before doing a survey. Once you know what type of distribution your fish population has, would you change your sampling method? Why?

Uniform distribution

Clumped distribution

Distribution around a rocky outcropping

To register for NIE, email **nie@seattletimes.com**.

ACTIVITIES

- Fish Fetch: **www.afsc.noaa.gov/education/activities/activities.htm**
- More information on how groundfish in Alaska are assessed: **www.afsc.noaa.gov/RACE/groundfish/ebs.htm**
- For more informations contact: **afsc.outreach@noaa.gov**

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