

Atka Mackerel (F0417)

Reproductive ecology of Atka mackerel, *Pleurogrammus monopterygius*, in Alaska

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The problem: Atka mackerel, located in the Aleutian Islands, support a multimillion-dollar a year commercial trawl fishery. Larval, juvenile, and adult Atka mackerel play a key role in the marine ecosystem as an essential food source for marine birds, predatory fish and marine mammals, including the endangered Steller sea lion. To develop prudent harvest management strategies more research is needed on the reproductive ecology of Atka mackerel, but the remoteness of this species makes it particularly difficult to study.

What is an Atka mackerel nest? The spawning season begins in late June when males establish nesting territories and females choose an individual male's territory for depositing a batch of adhesive eggs. Females will spawn multiple times during the summer and can choose a different male for each spawning event. Males fertilize the eggs and remain to guard the incubating fist-sized egg clutches until they hatch. A "nest" consists of single or multiple clutches of eggs. Nest guarding is important to protect incubating eggs from being eaten by other animals.

A major goal of this study is to locate and describe Atka mackerel spawning and nesting habitat. Reproductive habitat is vital to long term-survival of this commercial species; characteristics of nesting habitat need study for the protection and conservation of Atka mackerel stocks.

Where are nests found? Researchers only recently located spawning and nesting sites in Alaska. To find deep water nesting areas, the Alaska Fisheries Science Center (AFSC) developed a portable winch and camera system for making direct visual observations of Atka mackerel in their nesting grounds. Depth and water temperature were monitored using a small computer recorder system, called a data logger, which was attached to the camera frame. In shallow waters, scuba divers were able to make direct visual observations of nesting behavior.

During nesting, males have unique color and behavior patterns that are easily identified. Nesting sites are identified by groups of males each guarding a nesting territory and are found in rocky areas with moderate to strong tidal currents. Individual territories are adjacent to one another and large groups of nesting males can cover large areas exceeding 1 km². The camera was used on offshore rocky reefs, in and around island passes, and along the nearshore regions. These exploratory underwater camera surveys located nesting sites in Alaska over a broader range and at deeper depths than previously thought.



Male Atka mackerel fertilize the eggs and remain to guard the incubating egg clutch.

What is a suitable nesting environment for Atka mackerel?

Scientists are still trying to determine what makes a good nest site for the mackerel. Using the recorded video images with its corresponding oceanographic data, biologists will identify marine plants and animals in addition to the physical characteristics of the habitats being used by the mackerel for nesting.

How long does it take their eggs to hatch?

To better understand the duration of the Atka mackerel spawning season biologists must learn the rate fertilized eggs develop and hatch at different temperatures. Researchers from the Alaska SeaLife Center, the University of Alaska Fairbanks, and the Alaska Fisheries Science Center are working to document a complete embryonic developmental series by incubating fertilized eggs from a captive population of Atka mackerel at the Alaska Sealife Center.

What can be learned by studying clutches of eggs from their nests?

Egg clutches were collected from different nesting sites using scuba diving and bottom trawls. These field samples of egg clutches will be staged in the laboratory using a dissecting microscope and the developmental series produced at the Alaska Sealife Center. If the prevailing temperature at the nesting site where the eggs were collected is known, researchers will be able to determine spawn and hatch dates, and how often spawning may occur at each nesting site. This information can be used to establish how late in the year females continue to deposit new egg batches and how long it is necessary for males to remain at nesting sites to protect incubating embryos. In addition, the age of egg clutches will be compared within and between nesting sites for investigating the spawning periods of females and geographical differences in the times of nesting and spawning.

What can be learned by studying Atka mackerel caught using a bottom trawl?

Atka mackerel were routinely captured during tagging and tag-recapture surveys between 1999 and 2003 using a bottom trawl. Samples of these fish were measured for length, and their reproductive organs were saved for determining sex and if they were able to spawn. Using histological techniques on the reproductive organs of the fish, biologists will determine how big an Atka mackerel needs to be in order to spawn, how the reproductive condition of spawning adults changes over time, and how spawning males and females are distributed during different times of year at diverse locations. This information will be valuable for looking at the distribution of adult fish in trawl areas during the spawning and nesting season.

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