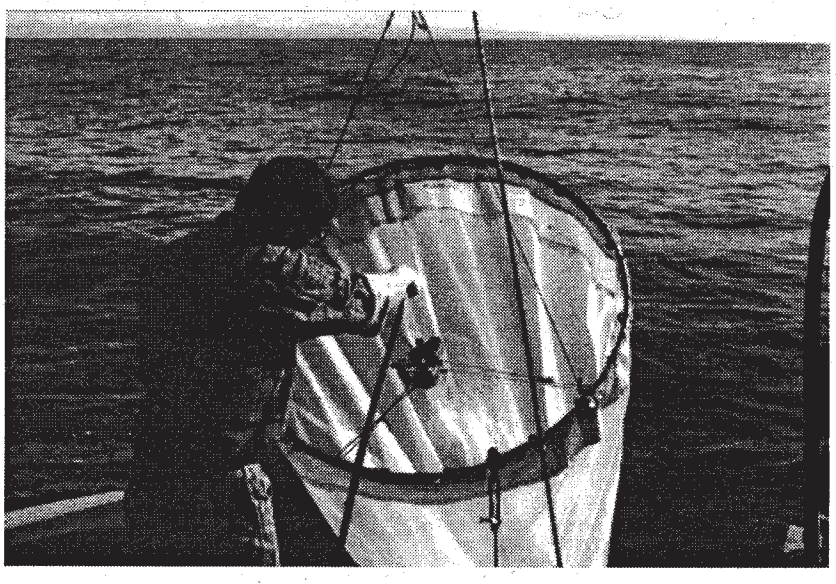
Northwest Fisheries Science Center

Fish Matters



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El Niño continues to bring exotic visitors to Northwest coast

Tropical game fish and voracious predators are appearing along the Northwest Pacific coast while gill-netters and seiners are coming up with empty nets. Unseasonably severe rainstorms continue to deluge the normally dry California coast while high waves are washing tropical sea turtles onto Oregon beaches.

Fishermen and scientists blame the unusual weather and shift in fish populations on a powerful El Niño, a disruption of the ocean-atmosphere system that reshapes climatic conditions around the world. One of the biggest El Niños of the century continues to brew in the equatorial Pacific.

Researchers at the Northwest Marine Fisheries Science Center are studying this phenomenon, which has already attracted aggressive tropical predators to Northwest waters and drastically reduced the recent harvest of sockeye salmon from Alaska's Bristol Bay. Northwest fishermen have been among the first to notice a drastic shift in fish

migration routes, especially among temperature-sensitive salmon.

El Niño, named by Peruvian fishermen for the Christ child because of its traditional yuletide arrival, is a disruption of the ocean-atmosphere system in the tropical Pacific, which causes a current of warm water to flow eastward along the equator from the Western Pacific toward the South American coast. During normal years, off the South American coast, strong northerly winds push water toward the equator and offshore and replace that water with cooler and nutrient-rich waters moving up to the surface; a condition called "upwelling". Fish rely on that upwelling to fuel the food chain. Nutrients support prolific growth of phytoplankton (plant plankton). Zooplankton (copepods and krill) feed on the phytoplankton and fish feed on the zooplankton. During El Niño the winds weaken and stall the upwelling, which normally brings nutrients up from the deeper ocean. The food supply is cut off and the fish have to either dive deeper for food or migrate out of the region. El Niño also causes equatorial waters to form a thick layer of warm nutrient-deficient water that moves into the coast and collapses the normal marine food chain. These drastic changes cause some fish to die and generate strange fish migrations and weather patterns. Scientists do not fully understand what causes the El Niño phenomenon, other than it repeats itself every five to ten years.

"I've never seen anything like this! The ocean has been extraordinarily warm (during this El Nino)" says Northwest Fisheries Science Center oceanographer Bill Peterson. "There has been a complete replacement of upwelled water by offshore water and from the south. Plankton production has ceased and the food chain shut down. The warm water has completely replaced the plankton and changed the currents" adds Peterson, who has been surveying plankton abundance near Newport, Oregon for several years. A few weeks ago he found the first species of copepods to migrate north from California and is currently looking for evidence of krill from Baja California. "This month tropical green turtles and loggerhead turtles have washed up on Newport area beaches." Peterson says that one weekend this past September, fishermen spotted ten marlin and landed several yellowfin tuna near Newport. He adds that while that prompted one enterprising resident to rent a boat to lead marlin and tuna fishing expeditions off the Oregon coast, this past year has been a very bad season for all fish native to the Northwest, especially the little coho who live off the coast.

"Not only is there nothing for them to eat and El Niño is bringing in aggressive predators. What most people don't realize is that the water is so clear that predators can see prey at a far greater distance than usual. Thus, there is no place for the coho to escape. Mackerel and hake are eating up the coho, smelt, and anchovy."

Peterson says that while El Niño is increasing coastal erosion by generating stormy seas, high waves and a rising sea level; marine life is getting hit the hardest. "If the northward flows persist into spring and if the normal weather patterns do not set up, the living marine resources are in for trouble. Many species depend on upwelling beginning on a normal schedule, April or May. If upwelling does not begin on time, we can expect another year of die-offs of the common murre (a sea bird) and another year of poor survival of coho salmon." Peterson adds that "my concern is that we have had two summers in a row of poor production. If 1998 is another poor year then we should begin to see effects among growth and reproduction of longer-lived species." Peterson worries about the health of marine life under continued chronically poor conditions and suspects a large negative impact on this year's salmon runs.

The drastic decline in the Pacific salmon population over the past two decades has resulted in sharp reductions in harvest levels and listings of fish populations under the Endangered Species Act. Salmon have disappeared from more than 40% of their historical breeding range in Washington, Oregon, Idaho, and California and for the first time in almost 12 years, Alaska salmon returns are seriously declining. While experts don't always agree on what is causing this decline in fish populations, they are unified in their concern that the current powerful El Niño is only making matters worse. Another complicating factor is the increasing frequencies of El Niños. Some scientists suspect another climatic regime, such as global warming, may be playing a role in drastic global changes.

New West Coast groundfish research projects funded

NOAA Fisheries has given its Northwest Region an additional $750,000 for West Coast groundfish research and management. The permanent funding was made available amid recommended reductions in allowable catch of several economically important groundfish species.

The Northwest Region's Northwest Fisheries Science Center does research that provides the scientific basis for Pacific Fishery Management Council recommendations on harvest levels for West Coast groundfish species. The Council works in partnership with NOAA Fisheries' Northwest Regional Office to provide sustainable management of West Coast fishery resources.

A recent National Research Council report said that NOAA Fisheries' methods used to assess the health of fish stocks are the best available, but could benefit from improved data on species abundance and reproduction potential.

"We're grateful to have the additional funds," said Usha Varanasi, Northwest Fisheries Science Center Director. "It will allow us to hire more scientists to shoulder some of the tasks at hand, particularly in the area of stock assessments and communication. It will also provide an opportunity to develop some cooperative resource surveys and other projects with industry."

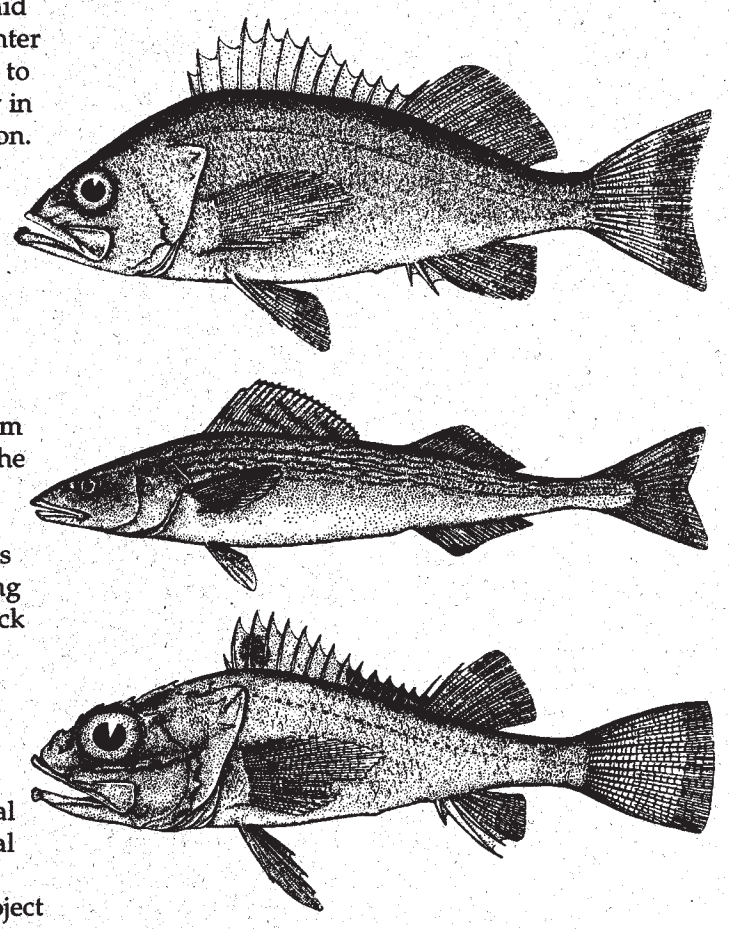
These funds will be used to conduct four new cooperative research projects.

1) 1998 Groundfish Survey.
This survey will allow trends in stock status from year to year and area to area to be identified. The biological information will provide additional insights into stock status, life history strategies, ecological relationships, and habitat usage. This data, which will be collected on chartered fishing vessels, is needed to produce more accurate stock assessments for sablefish, Dover sole, and thornyheads.

2) The Biology of Groundfish from Selected Depths.
This one year pilot program will use commercial fishers to collect critical depth-specific biological information on groundfish species as a part of their routine fishing efforts. The goal of this project is to understand seasonal patterns in depth distribution of fish. This, in turn, will assist the interpretation of other fishery data and will help design improved surveys.

3) Commercial Fisher Interview Program.
The goals of this project are to improve the dialog between commercial fishers and scientists and improve the groundfish logbook system. This project will use enhanced logbooks and periodic interviews between commercial fishers and scientists to improve understanding of scientific information needs and fishing operations.

4) Enhancement of Groundfish Stock Assessments.
Using recently collected groundfish data scientists will update the sablefish and shortspine thornyhead stock assessments. Scientists will also develop a new generation of assessment models and improve communication of assessment results.



Scientisits identify Pacific salmonids threatened by extinction

Scientists at the Northwest Fisheries Science Center (NWFSC) have just completed assessing the extinction risk for three species of Pacific salmonids in Washington, Oregon, California, and Idaho. Their findings will serve as a guide for the National Marine Fisheries Service (NMFS) in determining whether or not populations of sockeye, chum, and chinook salmon should be listed as threatened or endangered under the Endangered Species Act (ESA). NMFS, which is mandated to protect all marine (salt-water) and anadromous (fish that ascend rivers from the sea to spawn) species, announced the listing status of these species in February.

NMFS initiated status reviews for all species of anadromous Pacific salmonids after receiving petitions to list individual populations of several species as threatened or endangered. The Biological Review Teams (BRTs), created to conduct the status reviews, were staffed by NWFSC scientists and their colleagues from the Alaskan and Southwest regions of NMFS and the U.S. Geological Survey's Biological Resource Division. Their status reviews addressed two primary issues: 1) what are the units that can be considered "species" as defined in the ESA; and 2) are the "species" threatened or endangered? The ESA permits the listing of "distinct population segments" of a species or subspecies, and according to NMFS policy a population of Pacific salmon is considered distinct if it represents an evolutionary significant unit (ESU) of the species.

NWFSC biologist, Dr. Jim Myers, said "defining each ESU was one of the toughest challenges for the BRTs." An ESU is a population, or group of populations, which is reproductively isolated and represents an important component of the evolutionary legacy of the species. It took more than a year of extensive research by NMFS scientists, in conjuction with biologists from federal, state, and tribal agencies, to identify the genetic and life-history characteristics unique to each ESU. Myers said that sometimes a unique genetic trait, such as "straying", can hold the key to future survival of a species. Most of today's Northwest salmon, for example, are descendants of one or more southern "pioneering stocks" that strayed into Puget Sound waters after glacial ice receded almost 12,000 years ago. Myers added that "a common public misconception is that all salmon are the same. People don't understand how chum can be so plentiful in Alaska while considered threatened in Oregon. We don't know what the future holds, so to ensure continued survival of a species we need to maintain as much genetic diversity as possible. Once we lose a genetically based characteristic in an ESU we can't recreate it from breeding with fish in other ESUs. That is why it is so important to conserve each ESU."

The researchers' second major challenge was to determine which species was in danger of extinction. A species is classified as "threatened" if it is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. When NMFS determines that a listing or listings are needed, the NMFS Regional office prepares a "Factors for Decline" document to identify one or more causal factors: destruction or modification of habitat, overutilization by humans, disease or predation, inadequacy of existing regulatory mechanisms, or other natural or human factors. Once the listing proposal is announced, a public comment period is provided in order to gather any additional information. NMFS has one year following a listing proposal to make a final listing decision.

These NWFSC status reviews of Pacific salmonids; the product of years of extensive research of scientific journals, state, tribal and environmental reports, and countless field studies; provide new and invaluable information for fisheries management. Dr. Jeff Hard, who heads the population-biology group that coordinates the NWFSC status review process, says these studies have "given NMFS scientists an unique opportunity to evaluate biological information on each species over such a broad geographic scale and in such detail that it now enables us to recognize the importance of previously unappreciated life-history strategies. The understanding that this information provides will be central to developing sustainable strategies to manage and conserve all salmonids."