

INSIDE STORIES:

Scientists use Genetic Techniques to Identify Chinook Salmon in Fisheries
p. 1

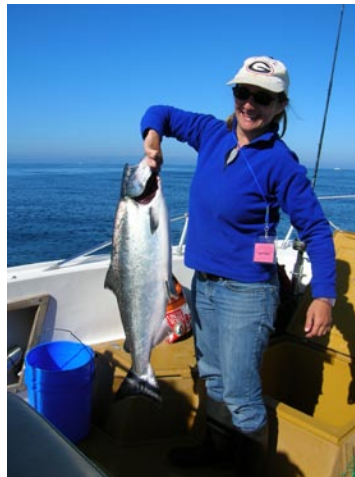
Scientists Need Fishers to Return Tags on Thresher Sharks
p. 2

Vessel Fouling and Invasive Species
p. 3

Scientists use Genetic Techniques to Identify Chinook Salmon in Fisheries

By Carlos Garza, NOAA Fisheries

Local harvest of Chinook salmon provides an important source of fresh, healthy seafood for Californians, and is a multi-million dollar industry. However, recent conditions in the



Woman with Chinook. Photo Credit: Devon Pearse.

Klamath basin have dramatically reduced the size of Klamath River salmon populations. Since they are not distinguishable from the much more abundant Central Valley Fall Run salmon, and since fish from the two rivers intermingle in the ocean, Chinook salmon fisheries in California have been dramatically curtailed in the last several years to protect the dwindling Klamath salmon stocks.

The use of molecular genetic techniques to identify individuals has a long history in fish biology. For example, variants of a specific protein were used more than 20 years ago to distinguish brown trout produced in hatcheries from wild fish. Genetic techniques, however, have rarely been used directly in ocean fishery management. That is changing rapidly, as modern genetic techniques allow the rapid, cost-efficient identification of fish to population of origin. This is particularly important for salmon, as fish from different rivers, and from different populations within rivers, are not visually distinguishable, but are generally quite genetically distinct and may

have very different management concerns and objectives. The current situation with Chinook salmon from the Klamath River has brought this issue to the forefront of fishery management.

Scientists Carlos Garza and Eric Anderson (from NOAA's South West Fisheries Science Center, Ecology Branch in Santa Cruz) have begun testing genetic methods that may allow continuing operation of Chinook salmon fisheries, even when some Klamath salmon are present. These methods rapidly identify the river of origin of fish sampled from fisheries and can then be used to adjust subsequent fishery regulations to minimize harvest of Klamath populations. Application of these genetic methods involve microsatellite DNA genotyping and comparison with a database containing genetic profiles for more than 100 Chinook salmon populations from California to Alaska that was assembled through a collaborative effort funded by the Pacific Salmon Commission. Samples collected from fisheries yield catch population composition in several days.

Results of the first month's sampling (Figure 1) indicate that a very small proportion of fish caught in Monterey Bay are from the Klamath Basin, while about 92% are from the abundant Central Valley Fall Chinook population. This type of rapid analysis can

Origin of Salmon Caught in Monterey Bay

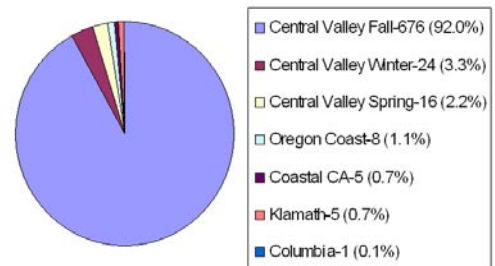


Figure 1: Chinook Salmon Genetic Identification-Monterey Bay Recreational Fishery. April 2006-Cumulative total: N=735 fish

(Continued on page 2)

(Continued from page 1)

potentially transform the way that salmon fisheries are managed in California, by allowing adjustment of regulations during the fishing season, so as not to exceed specific harvest impacts on populations of conservation concern, while maximizing fishing

effort on abundant populations. The data collected using such methods will also provide information about population-specific patterns of ocean distribution and migration at unprecedented levels of detail.

Scientists Need Fishers to Return Tags on Thresher Sharks

By Christina Johnson

To gather the information they need, scientists are relying on anglers and commercial fishermen to return tags on thresher sharks.

The tags look like a small piece from the inside of a computer and are put on a shark's fin. They allow researchers to track shark movements over long periods of time and to correlate their movements with environmental conditions such as ocean water temperature. The only way to retrieve the data they collect, however, is to recapture the tag and download information to a computer.

About 70 thresher sharks have been tagged off La Jolla so far, as part of a California Sea Grant-funded study to understand more about the factors controlling these animals' movement patterns.

Mike Garret is an angler fisherman in Dana Point who recently returned a tag and received the \$100 reward for his efforts. "We are as interested as the scientists in learning about sharks but for a different reason," Garrett said, explaining why he returned the tag. "We want to target the fish more efficiently."

Garret believes better science can help fishermen and the resource. Personally, he would like to know more about what sharks eat and how this changes seasonally, to better lure sharks with appropriate bait. "We already know threshers feed on bait fish, but I've also caught them on squid," he said.

Thresher sharks are believed to migrate seasonally, but only part of their migration route is known. Nobody is sure where adults breed either and the habitat requirements of juveniles are a mystery, too. In short, there are a lot of gaps in what is known about them.

Scripps Institution of Oceanography professor Jeffrey Graham, the lead investigator of the project, and his graduate student Dan Cartamil, are filling some of these gaps. They have learned, for instance, that thresher sharks spend about 95% of their nocturnal life in waters shallower than 36 feet. By day, they make dives to depths of 1000 feet.

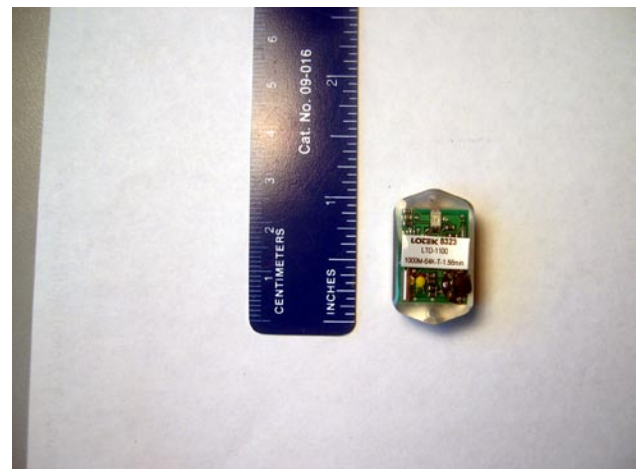
The 36-foot mark is significant because it is also the minimum-depth requirement for drift gill nets. The regulation, designed to create a safe corridor for marine mammals and sea turtles, also offers some protection for thresher sharks, the scientists say. Drift gill netting is only permitted at night, which also reduces shark takes.

If you find a tag, please call Dan Cartamil at the Scripps Shark Lab in La Jolla at (858) 534 8044. More information about the project can be found at <http://elasmoworld.org/thresher/>



Tags are placed on the shark's fin.

Photo credit: Scripps Shark Lab.



Tag put on thresher sharks. Photo credit: Scripps Shark Lab.

(Continued on page 3)

Vessel Fouling and Invasive Species

By Lynn Takata, California State Lands Commission

Mariners have long been aware of fouling as a nuisance to vessel operations. Fouling on the hull can create drag, increasing fuel consumption and potentially causing engine strain. In pipes, fouling can block inflowing seawater meant to cool machinery. To prevent such problems, vessel operators periodically clean underwater vessel parts and utilize antifouling paints and antifouling systems.

Despite these efforts, recent studies indicate that fouling is an important vehicle by which nonindigenous species (NIS) can be transported to new regions. Vessels that move at slow speeds, spend long periods in port, or are repainted infrequently, tend to accumulate more fouling. Unlike the harsh exposed areas of the hull that experience strong water motion, sheltered recesses of vessels appear to be more hospitable for fouling organisms. In Hawaii, fouling is believed to be responsible for more successful marine introductions than any other mechanism. For North America, one study estimated that at least 36% of invertebrates and algae introduced through shipping activities arrived via fouling.

The impending movement of the vessels in the Suisun Bay National Defense Reserve Fleet highlights the potential for NIS spread via fouling, as well as the need for a management infrastructure to address the risk. The so-called "Mothball Fleet" vessels are under the custody of the Maritime Administration and have been stored in the bay in case of emergency or war. Most have been moored for years, if not decades, and have undergone little if any hull maintenance. The Floyd D. Spence National Defense Authorization Act for Fiscal Year 2001 requires the disposal of nonpurposed members of the reserve fleet by the end of September 2006, and several are slated to be scrapped, sunk or donated for public display. Consequently, invasive species experts agree that the likelihood of heavy fouling and the potential for NIS transport on these vessels would be very high if any were relocated.

While the "Mothball Fleet" represents, perhaps, a worst case scenario with regards to the movement of fouling organisms, the regular movement of commercial and recreational fishing vessels remains a constant and currently uncharacterized risk factor for the introduction of NIS. Without a preventative NIS strategy, the native and non-native fouling organisms attached

to these vessels will be transferred with them as they move among California and West Coast ports and harbors

The California State Lands Commission has begun working with the U.S. Coast Guard, other West Coast States, and the research community to discuss the status of scientific knowledge on a number of fronts. These are fouling and introductions; the lack of public awareness of the issue; management frameworks adopted by other regions and nations;

the pros, cons and applicability of potential recommendations for California; and the development of management and outreach strategies to curtail the risk for NIS translocation via the Mothball Fleet vessels and others like them. It is hoped that these first steps will be a springboard for coordinated action that will prevent the movement of non-native fouling organisms to California, as well as their export from California to other regions.



Harbor at sunset. Photo credit: Rick Starr.

For more information about fouling and nonindigenous species contact:

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As well, check out the webpage links below:

West Coast Ballast Outreach Project
<http://ballast-outreach-ucsgep.ucdavis.edu>

Sea Grant Nonindigenous Species Site
<http://www.sgnis.org>

Aquatic Nuisance Species Task Force
<http://www.anstaskforce.gov>

(SGML)

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Sea Grant Fisheries

This quarterly newsletter was supported by the National Sea Grant College Program of the U.S. Department of Commerce's National Oceanic and Atmospheric Administration under NOAA Grant #NA04OAR4170038, project number A/P-1, through the California Sea Grant College Program. The views expressed herein do not necessarily reflect the views of any of those organizations.

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