GSI Talking Points, Including 2010 Study Results
16 December 2010

General Genetic Stock Identification (GSI) Information

What is the GSI salmon study?

- The National Marine Fisheries Service (NMFS) has been collaborating with partners in California, Oregon, and Washington to conduct a long-term West Coast salmon Genetic Stock Identification (WCGSI) study to improve our understanding of the ocean distribution and migration patterns of Chinook salmon and to use in, and potentially improve, management of ocean salmon fisheries.
    - Partners include the commercial salmon fishing industry, university, federal, state and tribal agency scientists and managers.
- Because salmon stocks co-mingle in the ocean and cannot be visually distinguished, mixed stock ocean salmon fisheries require management to be tailored to the weakest stock(s).
- With better spatial and temporal information about the individual stocks in the ocean resulting from GSI data, salmon fishery management may be improved by allowing greater harvest of more abundant stocks while minimizing impacts to stocks of concern, such as Endangered Species Act (ESA)-listed stocks.
- For the 2010 project, tissue and scale samples were collected by commercial fishermen who also noted the exact location of the catch in the ocean and recorded fishing effort using Global Positioning System (GPS) units. Tissue and scale samples were sent to labs for genetic identification and aging.

What can GSI data tell us?

- GSI data can contribute to our knowledge of stock distributions, migration patterns, and expected stock contributions in salmon fisheries.
- Using GSI data we can identify distribution of individual stocks in relation to oceanographic conditions.
- GSI data provide a more detailed picture of stock composition than traditional coded-wire-tag (CWT) data.
    - GSI data are capable of showing short-term, local variability in stock compositions.
    - Given adequate resources, GSI samples can be analyzed and stock compositions estimated on a time scale useful for in-season management.
- GSI can be used to identify stocks that are not coded-wire tagged. This includes most natural stocks.

What are limitations of GSI data?

- GSI stock compositions alone are not informative about stock abundances. Observed stock compositions depend on the abundance and distribution (and other factors) of all stocks in the mixture.
- GSI does not give us the age of the fish. Scale analysis can be used to fill this data gap.
- GSI stock categories do not always match management categories. For instance, some Chinook stocks are genetically indistinguishable, yet separate management objectives may exist for these indistinguishable stocks. Conversely, GSI can divide some stocks into units smaller than the management categories. GSI technologies are continually improving.

How will GSI data be used for management?

- Tissue sampling of West Coast commercial and recreational Chinook salmon fisheries has occurred sporadically for many years. However, 2010 was the first year of comprehensive sampling in the commercial fishery from May through September in Oregon and California.

- At this time, because there has only been one year of comprehensive GSI sampling, it is unclear specifically how GSI data will be incorporated into the future ocean salmon fishery management process. Possible applications include:
    - Refining fishery management area boundaries.
    - Verifying distribution estimates derived from CWT data.
    - Improving the baseline information used in harvest models.
    - Monitoring in-season distribution and migration of stocks.
    - Monitoring in-season fishery impacts on specific stocks
    - Identifying distribution of stocks not marked with CWTs.
    - Verifying the appropriateness of using hatchery indicator stocks for natural stock components.
    - Assistance with monitoring consistency with ESA consultation standards or developing new standards or measures to protect ESA-listed stocks.
- In order to incorporate GSI data into management, it is anticipated that several years of data (perhaps 3 to 5 at least) is necessary in order to compare GSI results with current CWT-based data and refine or revise current fishery management models.
- In the short term, scientists and mangers will be examining the data for patterns that warrant further investigation.
- The extent to which future GSI sampling will occur is unknown due to uncertainty with funding.

2010 GSI Sampling Study and Results

Overview

- Sampling occurred from May to September 2010 in ocean areas that were both open and closed to commercial fishing off California, Oregon, and Washington.
    - Over 9000 tissue and scale samples were collected.
- This year marked the first time that samples were collected along the entire U.S. West Coast south of the Columbia River (California and Oregon).
- In closed areas, a federal scientific research permit was obtained authorizing the sampling. Off California, except for a few weeks off Fort Bragg, most of the sampling involved catch-and-release sampling conducted in closed times and areas (from the Oregon border to Santa Barbara). Some mortality with catch-and-release sampling is expected, although special handling methods were incorporated to minimize this impact.

What are the findings of the 2010 GSI data?

- Genotypic analysis is ongoing and Project partners are in the process of determining the best approaches to analyzing the data.
- Data collection/entry systems are under development.
- Although data are still preliminary, some points to note include:
    - Preliminary analysis generally/broadly agrees with previous understanding from CWT recoveries.
    - Fishery independent survey methods were tried in California and Oregon – catch rates were low compared to normal fishing. More experimentation is needed, but such surveys could be used prior to fishing openers.

- Preliminary analysis indicates consistent differences in stock composition to the north and south of Point Reyes in the San Francisco Fishery Management area.
- Some ESA-listed stocks were sampled, which was expected given the mixed stock nature of ocean salmon fisheries, and was accounted for in pre-season management decisions.
- More years of similar data are needed before these results can be interpreted in relation to the current fishery management system or used to modify biological opinions.

Notes on the November 2010 Information Report:

- The report is available at: http://www.pacificfishtrax.org/media/WCGSI_Update_101510.pdf.
- Figure 1 is an example analysis using preliminary data collected in June 2010. It shows results from sampling off Oregon and California with stock compositions for 10 areas on the coast.
- In summary - Columbia River stocks contributed at the highest rate off the Oregon coast; Central Valley stocks off the California coast; and Klamath stocks near the Klamath River coastal area. Another 20 or 30 stocks are represented, but cannot be read off of this figure.
- Stock composition represented here does not equate to either abundance or exploitation rate.

How will NMFS use the 2010 GSI data?

- We must be cautious interpreting/mis-interpreting only one year of data.
- With regards to ESA stocks, NMFS will review the data to look at consistency with current ESA consultation standards for salmon ocean fisheries. However, several years of GSI data, as well as additional information on abundance/escapement of many ESA-listed stocks, will be needed before we can confidently interpret how they relate to current standards or any assumptions made in developing those standards.
- The Southwest and Northwest Science Centers will advise the Northwest and Southwest Regional Offices on appropriate interpretation.

Next Steps

- Project partners meet to discuss various aspects of the West Coast GSI Collaboration two times a year, usually in December and March, to review results and coordinate sampling programs.
- Project partners are going to host a workshop for fishermen, managers, and the public to communicate the 2010 study results and solicit feedback. The meeting is currently scheduled for 17 March 2011 in Santa Rosa, California.
- A full report of the 2010 study findings is anticipated for presentation early next year at the March 2011 PFMC meeting.
- The use of these data for fishery management and conservation is an area of active research at the NMFS Southwest and Northwest Fisheries Science Centers.

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Figure 1. Preliminary stock contributions from Santa Cruz, CA to Newport, OR from June, 2010 GSI sampling, superimposed on a map of proposed juvenile salmon sampling. * indicates that Washington samples are not displayed.