Tanana Conservation Outreach
2004 - 2005

Student Data Collection Project




Kathleen Peters Zuray

January 2006

Tanana Conservation Outreach, 2004 - 2005

Fishery Information Services Division Project FIS 04 – 256
Final Report

Final Report to the U.S. Fish and Wildlife Service
Federal Office of Subsistence Management

Federal Subsistence Fishery Monitoring Program Report

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Cover (clockwise): 1. Sometimes the project's four students a week gets expanded a little. 2. Using the dissecting microscope connected to computer. 3. Rapids tagging project hired two past TCO students in 2005 and here two present TCO volunteers work a shift. 4. Students collecting whitefish genetics samples for DFO Canada.

Title: Tanana Conservation Outreach, 2005

Study Number: FIS 04-256

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Management Regions: Yukon River Geographic Area

Information Type: Harvest Monitoring/Traditional Ecological Knowledge

Issue(s) Addressed: A need to involve and make more adults and young people aware of fisheries work and issues relating to their subsistence lifestyles. Also the sex, length, weight and disease data this project collects has been identified as priority data at past and present Regional Advisory Council and Yukon River Drainage Fisheries Association meetings.

Study Cost: 2005 $25,942

Study Duration: June 1- August 20, 2004 - 2005

Key Words: communication, data collection, education, elders, fisheries research projects, fishwheels, management, traditional ecological knowledge, students, subsistence.

Project Data: *Description-* Data for this study consists of: 1. Data worksheets and graphs on Chinook sex, length, weight and disease condition (Ichthyophonus and trematode flukes) for the complete season. 2. Fall chum arrival data worksheets and graphs related to visible fat content (flesh color). 3. Disease and/or parasite condition worksheets from work with some whitefish species. 4. Genetic samples of all whitefish species taken for Canadian DFO research.
Custodian(s) - Reports and student work data are maintained by Kathleen Peters Zuray with the Tanana Tribal Council and Stan Zuray of Tanana.
Availability – All the above is available upon request.

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Author

Kathleen Peters Zuray is a lifelong resident of the village of Tanana. She has worked for the Tanana Tribal Council the past 16 years and currently is project manager for the environmental office.

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Joseph Zuray (Tanana student) for donating his boat and outboard, and his time transporting students to other camps to collect data (2004).

Geoff Johnson (project teacher/technician) for loaning the project his laptop, digital camera, GPS equipment and boat.

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The Huslia School for loaning the project the dissecting microscope used to produce all our digital Ichthyophonus records

The local fisherpersons and our fish processor who went out of their way to make sure the students had the samples they needed.

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Introduction

Residents of the rural interior village of Tanana share a rich history of subsistence fishing. Most elders and many adults living in the village at present were raised at summer fish camps. Historically, large portions of the year's food was put up and small amounts of cash needed for other foods and supplies was made by putting up fish strips or drying fish for dog food for the dog teams that delivered mail. Tanana still has some fish camps that operate in a non-recreational manner. The people running these camps and those they provide fish to are very dependent on the fish that come up the river for their subsistence way of life.

A stated goal common to the Office of Subsistence Management (OSM) and the Yukon River Panel is that of capacity building. In the Tanana area Federal fisheries projects such as the Rampart Rapids fall chum salmon tagging project have had a difficult time finding rural residents interested in working on subsistence-focused research projects. Currently the USFWS and other agencies and organizations mostly bring qualified technicians and biologists into rural areas to run needed fisheries projects. A healthier balance of local and non-local workers would benefit the projects and build local capacity.

The Tanana Conservation Outreach (TCO) fisheries/subsistence/science camps funded though OSM since 2001 have generated interest amongst local school age students to work on these projects and the Rampart Rapids tagging project reaped the benefits of its first hires from Tanana from 2003 to 2005. In 2005 8 students worked shifts with the tagging project through TCO. Presently there is more local job interest than the tagging project can support in a single year, mostly coming from past TCO students. The TCO project also teaches cultural and practical values of the subsistence life choice by putting students in direct daily contact with full time subsistence fish camp persons (see figure 1).

The 2004 - 2005 projects take past efforts one step further by giving many students a taste of being part of important biological studies through participating in data collection. Our hope is to help develop interest in future fisheries work. Approximately one quarter of the project's budget goes towards a USFWS selected teacher/technician helping to oversee and show students how to analyze the data collected. That data is comprised of Chinook salmon sex, lengths, and weights during the Chinook season and similar data plus visual inspection of changing flesh color and fat content in chum salmon (see figure 2). Salmon and whitefish species were also inspected for possible disease conditions. The data from these two studies could provide valuable information for subsistence management of Chinook, chum and migratory whitefish in all of the federal conservation units on the Yukon River.

The two studies were chosen because of their expressed importance to subsistence fishermen at multiple Regional Advisory Council meetings, the last four annual YRDFA board meetings and the fall 2004 YRDFA sponsored *Ichthyophonus* meeting. Concerns were expressed over the perceived lack of larger and female Chinook salmon making it into the upper Yukon. The need for accurate sex, length and weight data can help address this issue. Second, on an annual basis there is a controversy between management and fishermen over the appropriateness of counting fall chums using a fixed date (July 15th) to determine the arrival or start of the fall chum salmon run. The inability of management to identify when fall chum start entering the river (by even a few days) could mean closing subsistence fishing on some low run years. Large amounts of chum can enter the river in a matter of days and if management is off by a week or more, serious under-counting or over-counting can occur. This blending and testing of western science and local knowledge has produced a working method of determining fall chum run arrival that is inexpensive and more accurate than the current method used by management.

In 2004 the Yukon River Drainage Fisheries Association (YRDFA) funded a position called “Team Leader” to work with this project. Each week one student who demonstrated a good work ethic and interest was selected from all the students to come back and work with all the students the following week. This provided continuity and example to the new students and was a great addition to the project.

If we are to expect our youth to be able to obtain jobs in the fisheries research and management fields and work in an effective and knowledgeable way, they must learn at an early age that it is an option, what it is about, and that it is important. This is a priority issue for this project. As opposed to providing a seasons work for a couple of individuals the project aims to give a taste of working on a fisheries project, while providing needed and scientifically sound data, to a large number of students from grade 6 through 12. Although limited, this opportunity was also available to and used by a few students from outside of the local area in 2004 and 2005. In 2005, four students were specifically sent from the Huslia School.

Background:

In the summer of 2000, members of the Tanana Tribal Council, superintendent and board members of the Tanana City School District and two classes of students made trips to the Rampart Rapids. There they viewed a Chinook video CPUE project (Zuray, S., 2000) and the USFWS Rapids fall chum tagging projects, (Underwood et al. 2000). As the saying goes, "a picture is worth a thousand words". It became quite clear that the amount that people got out of the visit was so much more than you could ever get from attending a meeting or lecture on fisheries research. Students were excited and wanted to ask relevant questions. For some students who had less opportunity to be on the river it was a unique experience. They were able to handle equipment and some actually helped in the operations of the projects. After discussions amongst fisheries biologist Tevis Underwood (USFWS Fairbanks Field Office) who ran the tagging project at that time, Stan Zuray of Tanana who runs the present video project (Zuray, S., 2004) and Kathleen Peters Zuray of the Tanana Tribal Council’s Environmental Services Office it was felt that some organized effort to provide a forum for elders, management, children and fisheries biologist at the Rapids project site could be very positive. Tevis Underwood, Kathleen Zuray, and Stan Zuray offered to work with the children. Stan and Kathleen offered the use of their subsistence fish camp for lodging and the Tanana Conservation Outreach project was then proposed and approved.

In 2001 to 2003 the Tanana Conservation Outreach project (Peters Zuray, K., 2003) was able to work with a large number of students and smaller numbers of adults, counselors, and elders. During the course of the 2001-2003 projects it was possible to accomplish the original objectives and go further, giving students’ opportunities to work with researchers such as Dr. Kocan and Paul Hershberger (*Ichthyophonus* study) and get a feel for scientific sampling and even receive small stipends for their efforts. Also because of donated personnel time and transportation by the Tanana Tribal Council and others in Tanana, costs were kept to a minimum and some students were paid for clearing brush for two tent frames and a campsite for the 2004 to 2005 project. In all years the project has operated without any administrative costs or costs associated with most of the equipment needed to run camp.

Study Area

The project was conducted on the Yukon River 40 miles upriver from the village of Tanana at an area locally known as "The Rapids", a narrow canyon 1176 km (730 miles) from the mouth of the Yukon River. Both traditionally and today it is an area known for its abundance of a wide variety of fish species and one of the major fish camp areas for local residents.

Objectives

1. To provide a learning experience for students in grades 6 to 12 by having them work on real fisheries projects with a USFWS technician in the hopes of opening up their eyes to how important fish and wildlife careers can be to the traditional subsistence lifestyles they are familiar with.
2. With the combined input of the hired technician, Kathleen Zuray with the Tribal Council Environmental Office and the Education Coordinator from the Fairbanks Fish and Wildlife Field Office (FFWFO) a curriculum will be developed and used as a source for the students' daily activities
3. To use the Chinook and chum salmon data collection studies as a central part of the curriculum and to have the students provide that data in the form of worksheets and graphs to federal and state managers

Methods

The 2004 - 2005 fisheries data collection project was conducted at the Rampart Rapids, the same location as the previous 2001-2003 OSM project. Students were mostly drawn from the Tanana area, and as in other years a few students from outside of the local area attended. In 2005 the Huslia school arranged to have some of their students attend. Students and parents were notified about the program through a poster on the community bulletin board. A campsite with two 12'x14' tent frame units was available to house 4 different students per week plus the YRDFA team leader and provided heating and propane stoves for light cooking, etc.

Kathleen Zuray, the project leader, provided student selection and travel logistics to and from the Rapids camp, ordered food and supplies, taught a range of subsistence activities on plants and fish cutting, and was the official chaperone and cook for the students. She traveled back and forth to Tanana some weekends to take care of these duties and to attend to her other projects at the Tribal Council.

Geoff Johnson, the camp teacher/technician (presently teaching in Huslia, Alaska) helped to oversee the students' fisheries data collection from June 15, at the start of the Chinook run, to August 15, when the fall chum run was firmly established. His main job was to insure proper data collection and he spent very few hours away from the students during the week. Additionally he spent most of his weekends going over the week's data collection.

Faith Peters, a councilor for the Tanana Tribal Council, provided virtually all the transportation to and from Rapids camp using her family's boat. It was a 20' wide bottom, high sided, heavy-duty boat (safe). She was reimbursed for her boat costs through the project budget but the Tanana Tribal Council often donated her time. She always required all students to wear life vests, which were also provided by the Tribal Council.

Stan Zuray, the project manager, was in charge of operations at the Rapids to insure that student and project needs were being met. Most of the fish samples came from his fish wheel. All of his time was donated as were the costs related to the project's use of all the generators and equipment he provided.

Joseph Zuray was in charge of boat transportation between the fish camps in the Rapids area in 2004. Geoff Johnson provided his boat for this in 2005. In season they provided the bulk of the driving among the camps for fish samples. Boats were donated and Joseph's time was donated.

Sampling took place 5 days a week with the students, and occasionally during the weekend on a smaller scale using Geoff Johnson and Stan Zuray only. Because of commercial fish schedules, subsistence closures, and unsafe travel days this schedule occasionally was adjusted. New students came every week until all students had an opportunity to work.

Below are the names of the students who attended in 2004 and the YRDFA team leaders who assisted the project in 2004:

2004

1st Group
Shawn Erhart
Tsood Peters
Tyler Hyslop
Raymond Hyslop
Team Leader: none 1st week

2nd Group
Eric Adams
Jo Beth Roberts
Mary Scannell
Randy Starr
Team Leader: Raymond Hyslop

3rd Group
Don Sanders
Rhi Anna Sommers
Cassandra Joseph
Ruby Campbell
Team Leader: Tsood Peters

4th Group
Ralph Luke
Corey Stickman
Barbara George
Leah David
Team Leader: Tyler Hyslop

5th Group
Doug Folger
Esra Conrad
Ria Conrad
Cy Conrad
Team Leader: Tobin Hugny-Farr

6th Group
Linda Folger
Joey Zuray
Dawn Starr
Selina Sam
Team Leader: Leah David

7th Group
Travis Johnson
Colin Campbell
Pete Luke

Robert Folger
Team Leader: Joey Zuray

8th Group
Tobin Hugny-Farr
Cy Conrad
Travis Albert
Esra Conrad
Team Leader: Colin Campbell
*Team Leader: Ruby Campbell

*Team Leader Ruby Campbell was the 8th team leader and was responsible for hundreds of chum and whitefish hearts being collected for sampling in the weeks following the last group.

Tanana Conservation Outreach Camp
June 13- August 6, 2005
Student List

1. Corey Stickmen
2. Randy Starr
3. Lawrence Purdue, Huslia
4. Katie Vent, Huslia
5. Alex Vent, Huslia
6. Colin Campbell
7. Tobin Hugny-Farr, Nenana
8. Raymond Hyslop
9. Donny Sanders
10. Travis Johnson
11. Robert Wright Jr.
12. Tsoodenalneech Peters
13. Derrick Murray, Beaver
14. Mary Scannell
15. Angela Folger
16. Brittinee Erhart
17. Peter James
18. Joseph Zuray
19. Peter Luke
20. Carl Adams
21. Donovan Albert
22. Cy Conrad
23. Ezra Conrad
24. Ralph Luke
25. Travis Albert
26. Barbara George
27. Katlyn Zuray
28. Ria Conrad
29. Ruby Cambell
30. Selena sam
31. Linda Folger
32. Danielle Sanders

Note: Students not living in Tanana listed with address

Student selection was based mainly on time of submission with considerations to workable grouping by age and sex. Students were paid a $30 a day stipend for each day of data collection out of the OSM budget. The 2004 YRDFA “Team Leaders” were paid $50 a day out of the YRDFA funds. While a goal was to make the students experience pleasant anyone not wishing to participate was told they would have their stipends reduced accordingly. As stated the objective was to provide students with a real world experience of fisheries research at an early age.

Below is a general description of an average week. It should be stressed however that with having to work around subsistence schedules, commercial openings, variable weather, increased or decreased sampling opportunities, etc., that no two days were the same. We felt this ability to adapt was an important aspect of real technician data collection and explained that to students, on those occasions such as commercial openings, when they were asked to get up at 5 am and work long hours.

1st day*:* The students would show up mid day. They were shown their living situation and asked to set up their tents and meet at the main camp which is the Zuray's subsistence camp. Here Kathleen and Stan Zuray, and Geoff Johnson went over basic activities and general camp rules, including:

- Trash disposal
- Respect others belongings
- Time to get up (required for a full days pay) and curfew
- What was expected in terms of data collection
- Other activities and curriculum that would take place

At this point students were assembled on the beach and stored fish were worked up and possibly a quick trip made to another camp for additional samples. Supper was served in the Zuray's fish camp shack and the day ended for the students with a chore or two such as feeding dogs and wash dishes before they relaxed for the evening

2nd day through 4th day: Breakfast served before 10 am with no exceptions. Data collection started at 10 am on the beach, and would often extend to getting data at other camps unless enough samples were available at the Zuray's camp. This depended on the amount of subsistence fish activity going on there. A large extended family and many friends use the camp, so often during prime Chinook season a lot of samples are available. No fish are taken unless they go into the subsistence fishery or will be sold during commercial openings.

The students are related to or friends of all the area fishermen and fish buyers and these persons go out of their way to help the students get their samples by coming by camp to coordinate sampling times or putting up flags etc. to signal sampling opportunities. Fishermen have also expressed that the help the students provide in handling the fish actually makes their job easier and they are more than happy to have them work with them. This support is a key to getting the large amount of samples we were able to obtain. No one camp could normally provide consistent sampling of the run throughout the full season.

After sampling periods students swam or relaxed. Data entry, which was often a combination of that and a computer techniques class, took place each day. Here students learned how to graph and interpret data. Each group used a dissecting microscope connected to a computer to view *Ichthyophonus hoferi* spores and produce digital pictures (see figure 3). The YRDFA team leaders were put in charge of much of the file management.

Geoff Johnson was experienced in GPS navigation and GPS computer programs. Each group using the 3 units provided to us by the USFWS Fairbanks Office took hikes using these. Aquatic insect collection trips were taken by each group and results collected digitally with the microscope back at camp. River discharge readings using velocity meters and student generated transects were attempted by two of the groups.

Some groups did a lengthy medicinal plant collection and class during their time in the program. Most students were shown how to cut subsistence fish for drying by either an elder or Kathleen Zuray although some were knowledgeable in that area already. All students were given the opportunity to put up some fish for taking home at the end of their stay.

5th day: As this was the day to travel back to Tanana, getting data collection done came first. Tents needed to be cleaned up and bags packed. Fish that the students had put up were packaged. Hard-earned stipend checks were given to each student (the highlight of their week). As with day one it was short and to the point.

Work Times:

Students were expected to be available for work or activities about 5 hour's minimum a day. This sometimes got turned into 10 hours during a commercial opening with us going easy the next day.

2004 YRDFA team leaders were expected to put in 35 solid hours to complete their week. Each of these students was given a time card and pencil at the beginning of each week. Each break and work period had to be signed in and out by one of the adults at the camp. This proved to be very workable with the team leaders being conscious of completing their hours, which provided a good example to the new students.

Specific Chinook Sex and Length Data Collection Methods:

Chinook length and sex data were collected during the entire run in 2004. In 2005, weights were added to the data collection effort. Fish were taken from a variety of subsistence fishermen in the Rapids area. Net-caught fish were not used because of their inability to catch jack and very large Chinook at rates similar to the Chinook population in the river. Sampling only took place out of well-known Chinook fish wheel sites as opposed to chum sites, which traditionally catch a high number of jacks.

As opposed to the *Ichthyophonus* sampling, no samples were allowed from catches if some fish were missing from a day's catch as in some were given away or already processed.

Chinook salmon were measured and the gender of each determined either by full dissection or a slit made in the belly into which a finger was inserted to feel for eggs or sperm sac. This second method was necessary because many of the Chinook are not advanced enough in spawning characteristics to determine sex with accuracy, yet it was necessary to keep the fish whole for freezing or transporting out of the area. Informal testing and talking to fishermen about this issue suggest that the data are very poor if taken with external viewing only, especially early in the run. Based on our measures, 1 out of every 5 adults cannot be sexed accurately by external characteristics even among long time fishermen (chum salmon however, can be accurately sexed externally).

Days when the harvest was below a minimum of 20 fish per day, fish from some of the other fish camps in the area were sampled to supplement the collection. There were 5 subsistence camps within view of the students' camp and the fishermen running these camps had offered to allow the students to sample their subsistence catches prior to the season. An 18' riverboat and 35 hp motor were donated for this purpose. This method of sampling had already been done in the prior 2001 to 2003 OSM project with students helping Dr. Kocan get samples for his *Ichthyophonus* study at the Rapids. It was anticipated the project could expect a total sample of around 700 fish for the season prior to its start. In 2005 Geoff Johnson had his own boat which was then the main means of local travel.

Working in groups of two, the students would lay each fish on a table. The first student would measure the fish's length from the middle of the eye to the notch in the fork to the nearest .5 cm. with the second looking on to watch and validate. Both external characteristics and internal organs through dissection determined the sex of the fish. Data was audibly spoken to the data recorder group which was usually made up of one student and an adult supervisor. Data entry was by the student with the adult watching for entry mistakes. At the end of the daily sampling time, the students entered their data into an Excel spreadsheet and every few days graphed the cumulative results with varying amount of help depending on age and experience (see figures 4 through 10 and table 1).

Ichthyophonus Sampling:

Fish were taken from a variety of subsistence fishermen in the Rapids area and fish that were harvested with both net and fish wheel were sampled. As opposed to the male/female/size sampling, *Ichthyophonus* sampling was allowed even if some fish were missing from a days catch (in the event that some were given away or already processed). The heart, liver, and spleen, were looked at after being washing in water and afterwards the eggs and flesh were evaluated. All data collection was overseen by Geoff Johnson or Stan Zuray who looked at all positive hearts found by students. A positive heart was defined as having 3 or more cysts. Other organs having cysts were recorded but alone could not make a positive assessment of *Ichthyophonus*. While the dissecting microscope was used to view examples of the disease tissue no program of sub sample culturing or microscopic procedure was undertaken in 2004 (see figures 11 - 13).

In 2005 Simon Jones (DFO Canada) and Joe Sullivan (YRDFA) came by the camp to give a presentation to local fish camp residents on *Ichthyophonus* and other diseases. They viewed our methods and stated that from what they could see the identification of fish positive for *Ichthyophonus* was proper. Also the occurrence of what this camp had been calling "surface white spots" since 2003 was finally identified by Joe and Simon as meta cercarial trematode, which is a fluke and harmless to humans and the fish but often mistaken as *Ichthyophonus* by many fishermen.

Specific Chum Data Collection Methods:

The chum salmon study started up as the Chinook sampling was nearing its end. We set an early date to insure that some of the sampling would take place before the fall run arrived even if it came early. Also this provided an opportunity to establish a good baseline of summer chum flesh samples before the fall chum arrive. Chum salmon were examined for quality of flesh and traditional ecological knowledge was used to determine if the fish was a summer or fall chum salmon. As stated all this started before the fall chum run had established itself in order to document the change of the summer to fall chum run with the object being to establish a more accurate fall chum arrival date than management currently can provide in this section of the river.

Samples of chum, from catches being used for subsistence, were examined using the traditional methods of determining fall chums. While other factors entered into this traditional determination such as condition of the fishes' exterior color, tooth and jaw development and overall body robustness; the most important was the flesh color and its corresponding fat content.

Each year while the summer chums are running significant color (red) in the flesh is only found in about 10% of the chums. While this is a subjective measurement, the increase in this percentage to 70 – 90% with significant color each year is dramatic and is seen by all fishermen. During this project the use of standard color charts by the students and other consistent sampling practices helped strengthen this traditional method. A digital camera was used to record these changes of flesh color and the pictures were stored on CD storage discs.

With the numerous camps in the area starting to put chum up for dog food any needs for samples not met through the Zuray's subsistence activities was able to be taken care of. A minimum of 20 traditional samples per day was set as a goal. This minimum was only used when the chum were few in numbers as they can be prior to the start of the fall run. At times when the students were able to work with subsistence fisherman as they put up dog food the sample numbers were considerably larger. Stan Zuray and other area fishermen coordinated their subsistence fishing to aid in the needs of the students' sampling.

As with the Chinook data, students all experienced entering the chum data into the computer worksheets from the paper originals at the end of each day (see figures 14 and 15).

Results and Discussion

Thirty students attended the camp for five-day periods with 8 students coming back for an additional week as YRDFA team leaders in 2004. In 2005, thirty two students attended. This took place over an 8-week period with some sampling-taking place by student and adult volunteers before and after this 8-week period. Over 1000 subsistence and commercial Chinook salmon were sampled for sex and length (weights in 2005) and over 500 subsistence Chinook were sampled for *Ichthyophonus* disease in both years. Approximately 1200 individual Chinook were handled in all by the students each year, as some of the sex/length/weight samples were not used for *Ichthyophonus* work. For the chum flesh study we sampled approximately 1000 each year.

Some preliminary data for the two studies were released in season at each weekly YRDFA teleconference (depending on importance and time). More complete preliminary data and graphs were distributed in-season to state, federal and Canadian agency personnel by email on multiple occasions. Post season preliminary data were released during the YRDFA sponsored *Ichthyophonus* meeting in Anchorage. At this meeting pre season mortality and monitoring programs were labeled as the two highest priority projects needed to be run, by the assembled committee. In 2005 as part of the daily email updates put out by the Rapids video project, TCO data would be included if relevant to the time of the season.

The *Ichthyophonus* sampling work by the students shows the feasibility of advanced disease sample collection in this section of the river. Water temperatures taken at the Rapids are used to compare to the annual disease rates (Figure 16). Students work also shows the ability to obtain a large sample size without any added lethal sampling having to take place. By having capable students collecting the samples it reduces the overall cost of mid-river samples while benefiting the students in many ways. The TCO project has chosen the above data collection projects because of the expressed need over the years for these types of baseline data projects. At numerous Federal Regional Advisory Council meetings, the last three annual YRDFA board meetings and the fall 2004 YRDFA sponsored *Ichthyophonus* meeting data needs related to the above were voiced often.

Flesh Study Discussion:

Accurate fall chum arrival dates are critical for management decisions about opening and closing the fishery. It is important that projects from the mouth of the river all the way into Canada have the best available fall chum arrival information. For a number of years the fall chum run has arrived at the Rapids at a date that did not correspond at all with the predetermined fall chum management arrival date at Pilot Station of July 19th (given the normal 18 - 20 day travel time between Pilot sonar and Rapids).

Each year management uses a date that was chosen many years ago as the date when they stop counting every chum entering the Yukon as a summer chum and start counting every chum as a fall chum. This is simple, archaic and lends itself to constant error as the fall run can actually enter the river anytime over the course of a three-week period. In the 5 years of the video project using a combination of traditional and modern data collection methods of determining arrival of the first large numbers of fall chum, they have arrived as early as July 25th and as late as August 3RD with arrival dates as late as August 8TH and August 15TH being remembered by area fishermen in past history.

In this part of the Yukon as long as anyone can remember people have always had a simple way of recognizing this event: the fall chum arrived when they arrived. To explain: the summer chum run in this section of the river is relatively small in numbers and is made up of chum whose fat reserves are low (most are close to their spawning areas) and therefore their flesh color is very pale. All during the summer run people catch chum with pale flesh color in roughly 90% of their catch (see figures 9 and 10). These fish provide much less value for people and dogs as they dry up into something resembling stiff cardboard.

As anyone knows who has spent time right on summer chum spawning grounds a small percent of fish will have nice red flesh, especially in the early part of the run. Each year you hear people on the main river calling these few nice fish fall chums. *This is not at all the event that we are talking about in this section of the river however, when we say the fall chums have arrived*.

What happens here is in a matter of 3-5 days (occasionally longer) after the summer run has been providing people with say consistent 10% (approximately) red flesh fish, the percent of red fleshed fish will rise progressively to a minimum 50% (as in 2004 and 2005) or more normally 75%, to as high as 90% on some years (depending on the amount of summer chum still running and mixed in). After this time summer chum continues to be mixed in, however before this time there are fall chum also in the population. For the purposes of an exact date the video project started calling the day the chum flesh passes the 50% point as the official fall chum start date for counting.

As a way of reducing subjective observation the video project and now this student data project have been using standard color charts at the cutting table since 2000. Observations and even percentages are also compared amongst fishermen in the area as have been long before this project. While this method is not perfect, as pointed out each year by management, it is currently the most accurate method used to determine the passage of the first significant numbers of fall chum heading into the upper Yukon and Canada. This changeover of summer to fall chum is clearly visible to all observers, trained or untrained, when the fall chums first arrive in this part of the river. This method would probably not work in areas closer to the river mouth as all upper Yukon summer chum probably have color there. For the purposes of helping to manage fishing in all sections of the river a date determined at the time the fall run arrives in this section of the river is not at all too late. In

2004 the date for arrival of fall chum was July 27th; and in 2003 it was July 30th. In 2002 the date was July 26th. These dates are only 8 days, 11 days, and 7 days respectively after Pilot Sonar started counting what they considered the first fall chum.

During the past year we have been able to meet all program objectives. The participating students are much more educated about how fisheries research projects work. Awareness of fisheries research and management and young people seeking related work has increased dramatically in the Tanana area since 2001 and this project is largely responsible for that. The 2004-2005 Office of Subsistence Management project has a much more structured work and educational plan, increased technical oversight, and an increased operational time frame compared to the past project. This is of course due to the increase in budget support by OSM.

The project leaders and some of the older students have always been aware that this project can go away at any time. While support sometimes runs high for educating youth, and providing fisheries training, etc. these issues often get neglected when funding is tight. For these reasons we committed ourselves to using this camp as a means to provide as much meaningful and needed data as possible and being open and flexible to the future needs of researchers and managers. Funding has been denied for 2006 however and efforts to obtain alternate funding have failed so this project sadly now ends.

We hear the expressed need for basic disease and sex, length and weight data over and over at all the meetings we attend. Presently the issue of Chinook size being reduced is a story being read in newspapers all over this country. It is an issue that management and fishers will be dealing with and it's a shame to see projects specifically designed to monitor this change be cut short at this time. This project has also been the only published source of *Ichthyophonus* disease rate information on the Yukon River in 2004 an 2005. It will be a loss to not have it in the future especially with the river warming trends anticipated for the future.

We are trying to get funded a reduced disease and sex, length and weight data collection project that will not include multiple students but use a couple of the past TCO students who are now older, have their own boats and are quite familiar with the procedures. This would be very inexpensive but not allow a break in the data from previous years if we could find funding.

Partnership and Capacity Development

As has always been the case during the past 2001 to 2005 projects any assistance that the students could give to other projects or needs requests by federal or state management for other data than that which they are collecting was considered. Often these needs are not known far in advance but this project fully expects to be help in that way. As with getting samples from the area fishermen this can help both students and researchers.

Last summer a Bioelectrical Impedance Analysis project designed to investigate bio-energetic features (body fat, water retention, etc) in migrating salmon (Chinook and Chum) was conducted at the Rapids working in conjunction with biologists from the Fairbanks Fish and Wildlife Field Office. Samples were taken and worked up at the Rapids video test fish wheel. Keith Cox (Doctoral student who designed this technique) from West Virginia University, Kyle Hartman (Professor) from West Virginia University, and Joe Margraff (Professor, Co-op leader) from the University of Alaska, Fairbanks graciously took students with them on each of their sampling trips. This type of experience was invaluable to the students and hopefully this project will continue next year with the students being even more involved.

The USFWS Fall Chum Tagging Project (Underwood, T. J., and J.F. Bromaghin. 2003) starts midway through the students' project with the tagging site and USFWS camp being in the Rapids. During this time all students attending were required to work at least one shift out on the tagging boat to see first hand the technicians tagging fall chum. Many students participated multiple times though and one student went on to donate 12 shifts on his own time in hopes of a future job, which he obtained in 2005. Some days the tagging project had a student volunteer each shift of the day. Each fall time group has an initial and somewhat organized meeting with the tagging crew where technicians and biologists relate their background and schooling, where they found out about the job, and future career desires. This was all in an attempt to show these students some possibilities that exist and the means to them.

In 2005 Don Toews (DFO Canada) requested whitefish genetic samples spread throughout the entire season and this job was given to the students and the samples are now in his hands (Figure 2)

The acknowledgements and other sections of this report are testimony to the amount of partnership and capacity development being built through this project. Almost all area fishermen, the Tanana and Huslia schools, Tanana Tribal Council members, a number of Fish and Wildlife Service personnel, almost all local and a few non local students, and the Yukon River Drainage Fisheries Association, have all had some part in making the project work.

Conclusions

The conclusions for this project are best broken down into two general categories: the importance and value of mentoring and biological implications. In terms of the former, based on our experience with this camp, it is clear that when presented with the right opportunity and people who care and provide supervision and training, young people can show a lot of enthusiasm and capacity for fisheries research work. This project did just that- we provided the opportunity and a supportive learning environment, and the youth excelled.

Another point along these lines is that local Tanana students have already formed relationships with area fishermen. They have knowledge of the areas traditional ways, and are developing and honing their river and outdoor skills. Because of this they are able to avoid many of the pitfalls and obstacles that outside researchers often experience. With proper supervision and support, this can translates into important, quality information collected with significant cost savings.

In terms of biological, findings, we collected information on the fisheries as well as on some environmental factors, such as water temperature. Post season analysis of the water temperature data collected at Rapids each year indicates that the 2005 Chinook salmon traveled through slightly lower water temperature before arriving at Rapids as compared to 2003 and 2004. Originally the water temperature was reported by some fishermen, during YRDFA teleconferences, as warmer than normal they thought. That, combined with the lower disease rate for *Ichthyophonus* in 2005, gave fishermen a false sense of the disease possibly going away. In reality the lower temperatures may be the actual reason and continued monitoring of water temperature should occur. Towards this end, we will read and record daily in-season water/air temperatures in future projects.

While biologists are still speculating on why Chinook salmon are (appear to be?) getting smaller on average, and fishermen and managers are arguing whether they are or not, one thing stands out in the Chinook portion of this report. The data in Table 1 on page 31 illustrate, of the approximately 1,000 Chinook salmon sampled in 2005, the largest one was 35 pounds and only 6 were over 30 pounds. Twenty years ago, it was not uncommon for individual fishers to catch 50 pound Chinook salmon each year, and a 30-35 pound fish was not considered large. It is important to note that all of these salmon were harvested with the same size gear that fishermen in this area have been using for years, thus there is no change in the methods. Also the sample size of approximately 1000 is equal to the total catch of numbers of fishers over the whole season. Therefore, using the same methods as fishermen in this area have been using for many years, the sampling data indicates that the Chinook salmon being caught in this fishery are declining in size.

The data collected as part of this project also point to a correlation between an increased incidence in *Ichthyophonus* and larger Chinook size. That is, the data seem to support the idea that the larger Chinook are the ones that develop the most disease (in 2004 and 2005, figures 12 and 13). The question of larger, older Chinook dying from Ichthyophonus before making it to the spawning grounds is one that needs further research, especially since it is a distinct possibility (in addition to gear selectivity) for explaining the loss of the older age classes of Chinook salmon.

Recommendations

1. Future Tanana Conservation Outreach projects at this site need to continue the collection of accurate and needed data with the teaching of fisheries research methods to the youth. This is both efficient from a dollar value point of view and beneficial to students if they are to become future biologists and managers and /or informed community members.
2. Efforts to find mentors from organizations (USFWS, ADF&G, TCC, YRDFA, etc.) to work with the students need to continue.

Budget Summary

Total Cost: 49,244 (2 year project)   Project Dates: June 1 – August 20, 2004 - 2005

	FY 2004	***FY 2005***
a. Total Annual Budget	23,302	25,942
b. Expenditures thru December	23,302	25,942
c. Balance thru December	0	0
d. Anticipated Remaining Expenditures	0	0
e. Anticipated Final Balance	0	0

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Underwood, T. J., and J.F. Bromaghin. 2003.Estimated abundance of adult fall chum salmon in the middle Yukon River, Alaska, 2000-2001. U. S. Service, Fairbanks Fish and Wildlife Office, Alaska Fisheries Technical Report Number 62, Fairbanks, Alaska.

Figure 1 Page 21

Young ladies entering a day’s data in worksheets at one of the two tent cabins.

Kathleen Peters Zuray (project leader) helping students put up a few fish to later take home.

During the 2004 commercial openings students set up on fishers’ boats to collect sex and length data. 5 am wakeups were the order on these days.

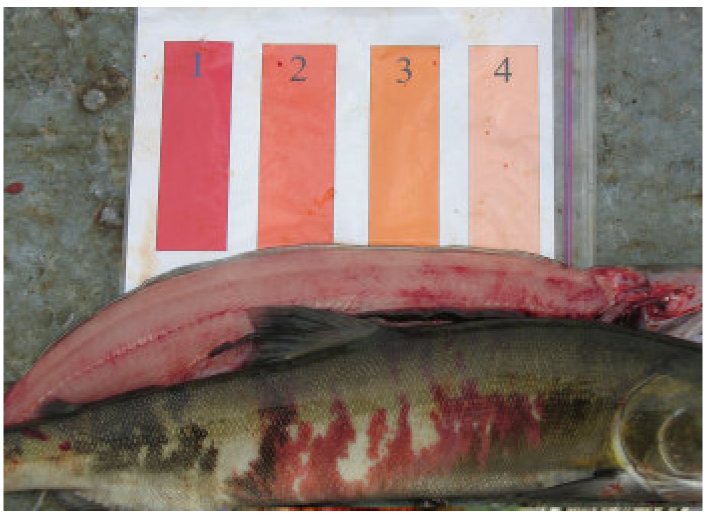
Huslia School loaned dissecting microscope that was used almost daily to view ICH and fluke cysts.

Water sampling at local creeks was taught to every group using equipment loaned to project.

On each end are two past TCO graduates working full time for USFWS Tagging project.

2 chums, 1 month dry, illustrate difference in oil content of the pale and red flesh chum used to determine fall chum arrival at Rapids.

The data assembly line. Geoff Johnson.(student teacher) overseeing the student's progress.

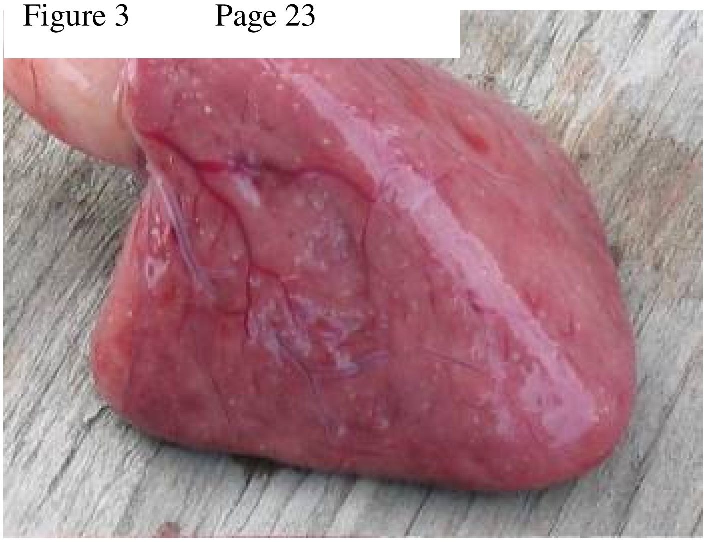


Flesh and exterior color common to Rapids summer chum. 90% are 3's and 4's on color chart before fall chum arrival time. This is # 4 pale

2005 commercial openings students collected hundreds of sex, length, and weights. Assisted by Stan Zuray (project manager)

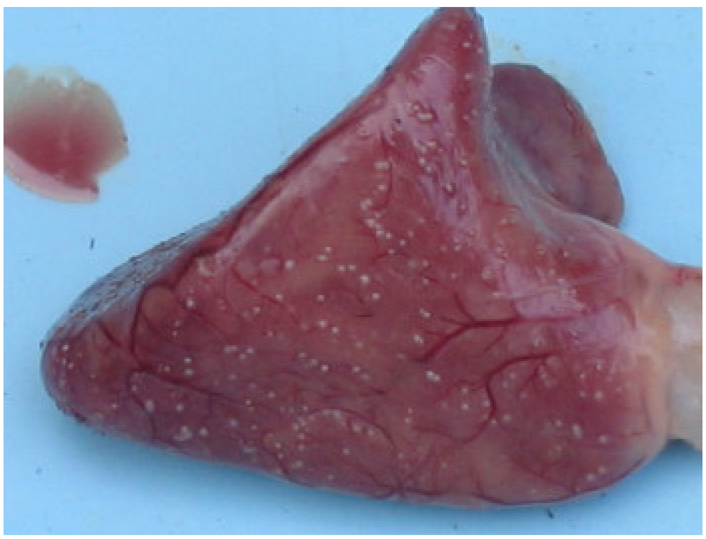
1 red: Flesh type found in high % only in the first bright chum section of fall run

Whitefish genetic samples taken for DFO Canada. All season and each group participated.



Ichthyophonus (ICH) spores in a Chinook heart. Note how they are imbedded in the meat (typical).

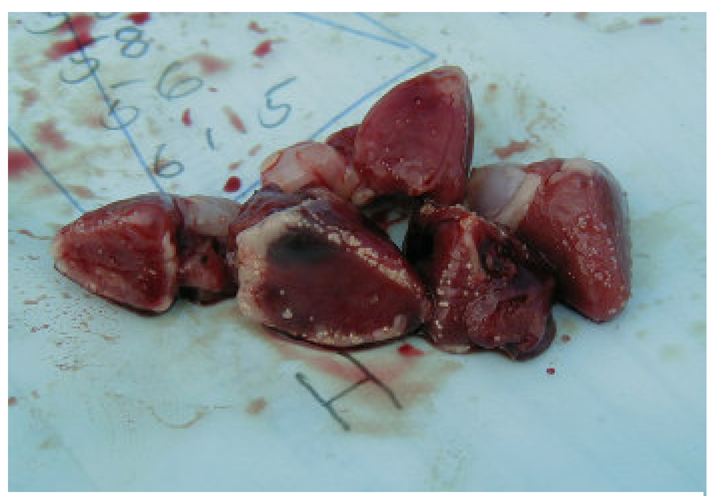
Example of a blood vessel being restricted by ICH spores in a Chinook heart.



Chum heart showing both imbedded ICH and "surface white spots" (in 2005 identified as meta cercarial trematode which is a fluke)

Close up of an ICH spore multiplying into many. Taken with the dissecting microscope.

Sheefish heart with imbedded ICH. This fish had its intestines full of cysts also. Note orange eggs (?) on surface in middle of heart.



Humpback whitefish hearts positive for surface white spots. About 90% of humpback had these spots each year (meta cercarial trematode).

Figure 4

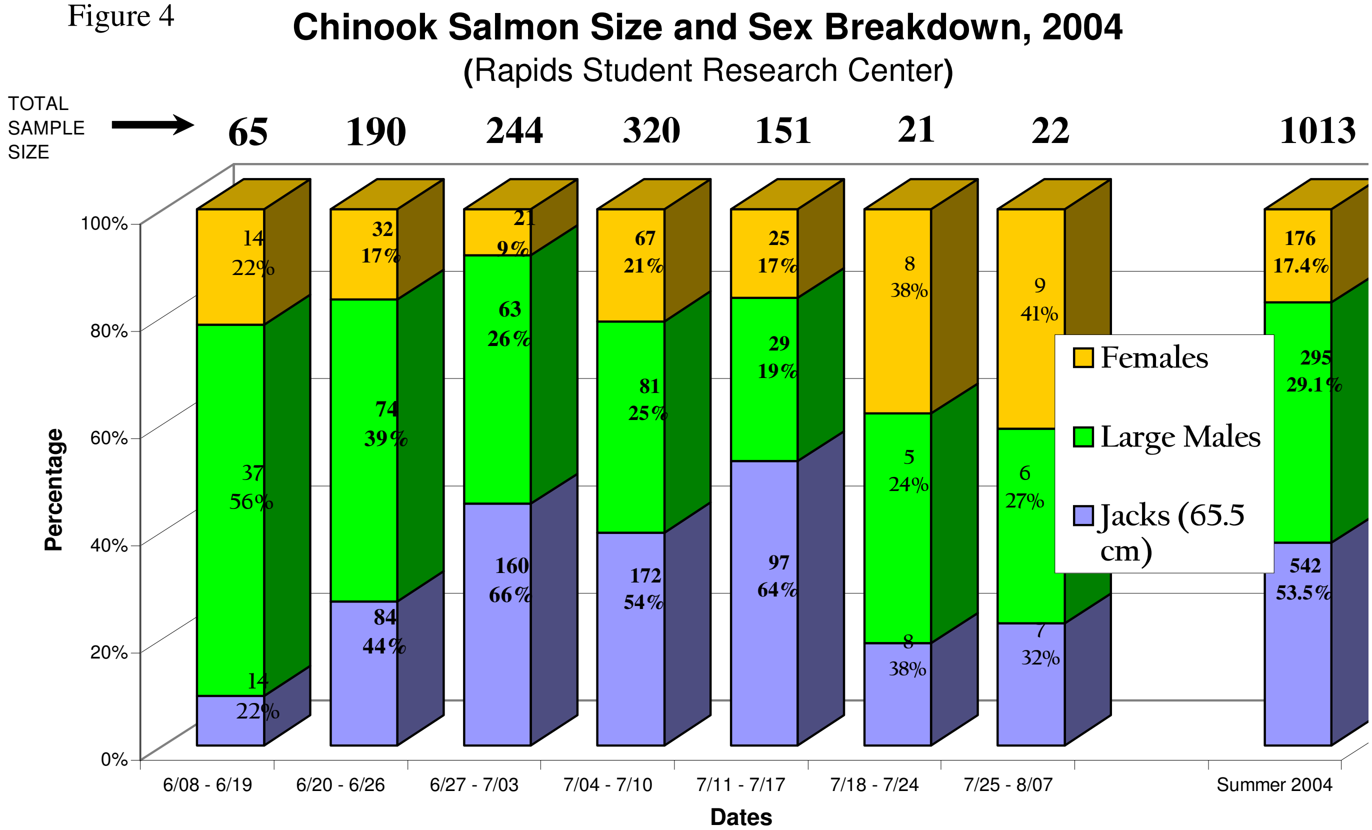


Figure 5

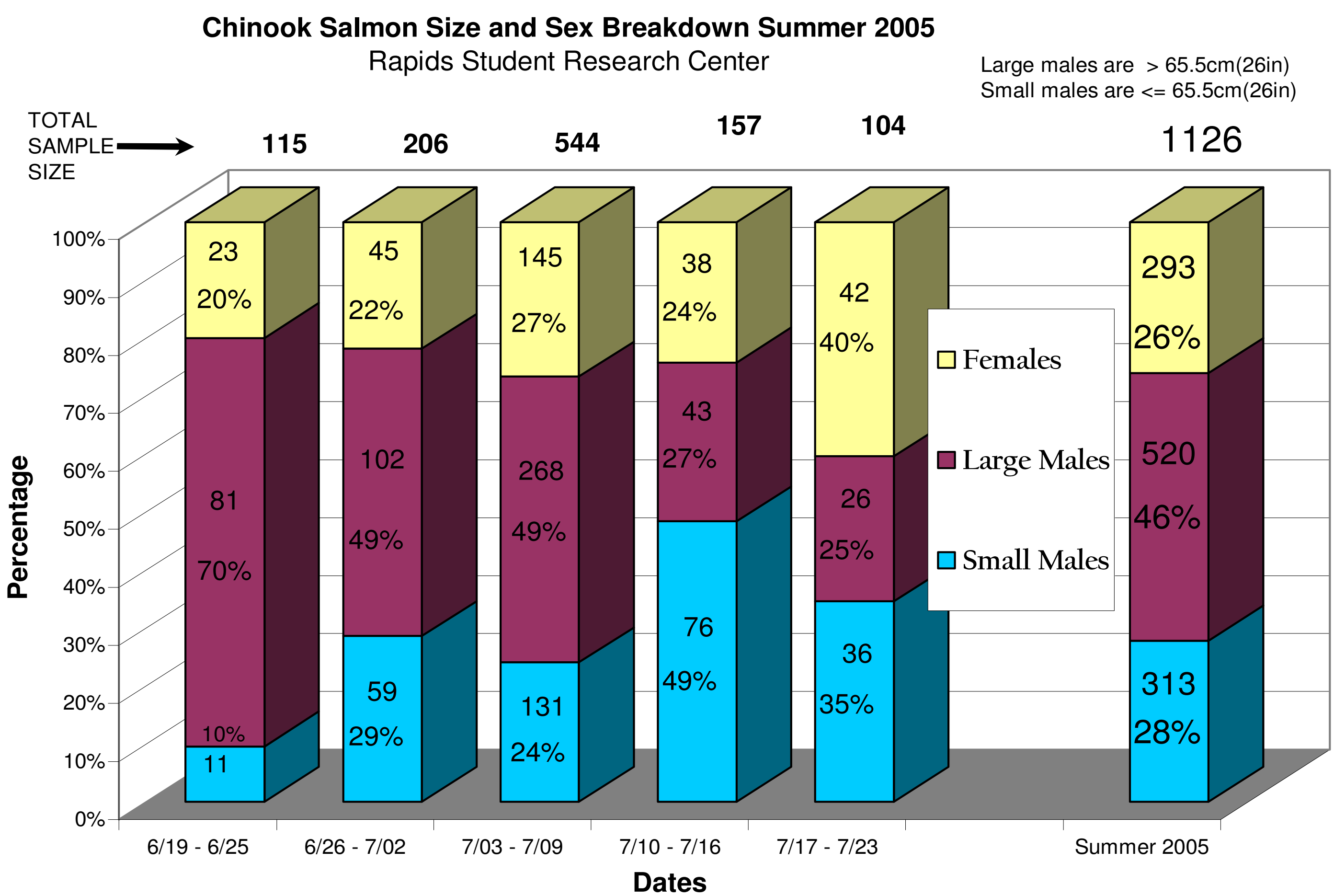


Figure 6

Average Length of Chinook Salmon Breakdown, 2004

(Rapids Student Research Center)

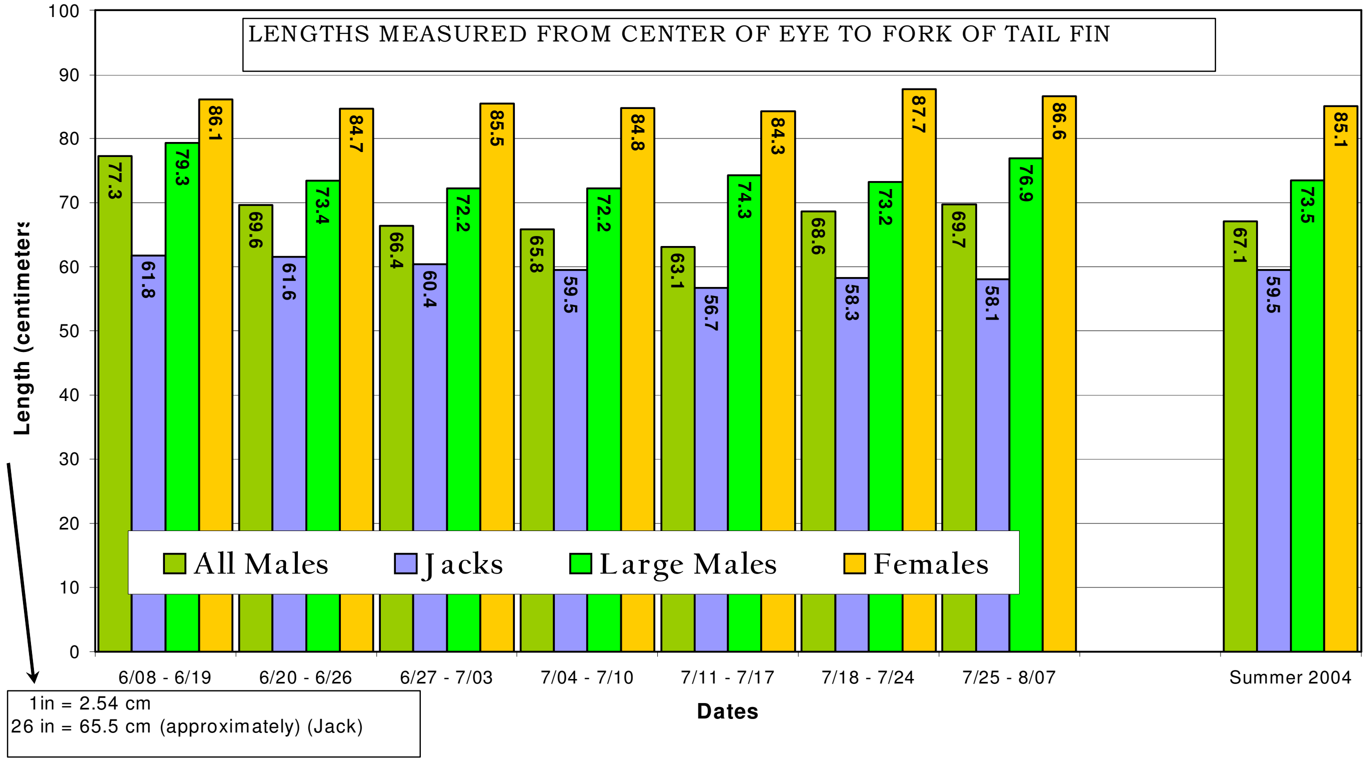
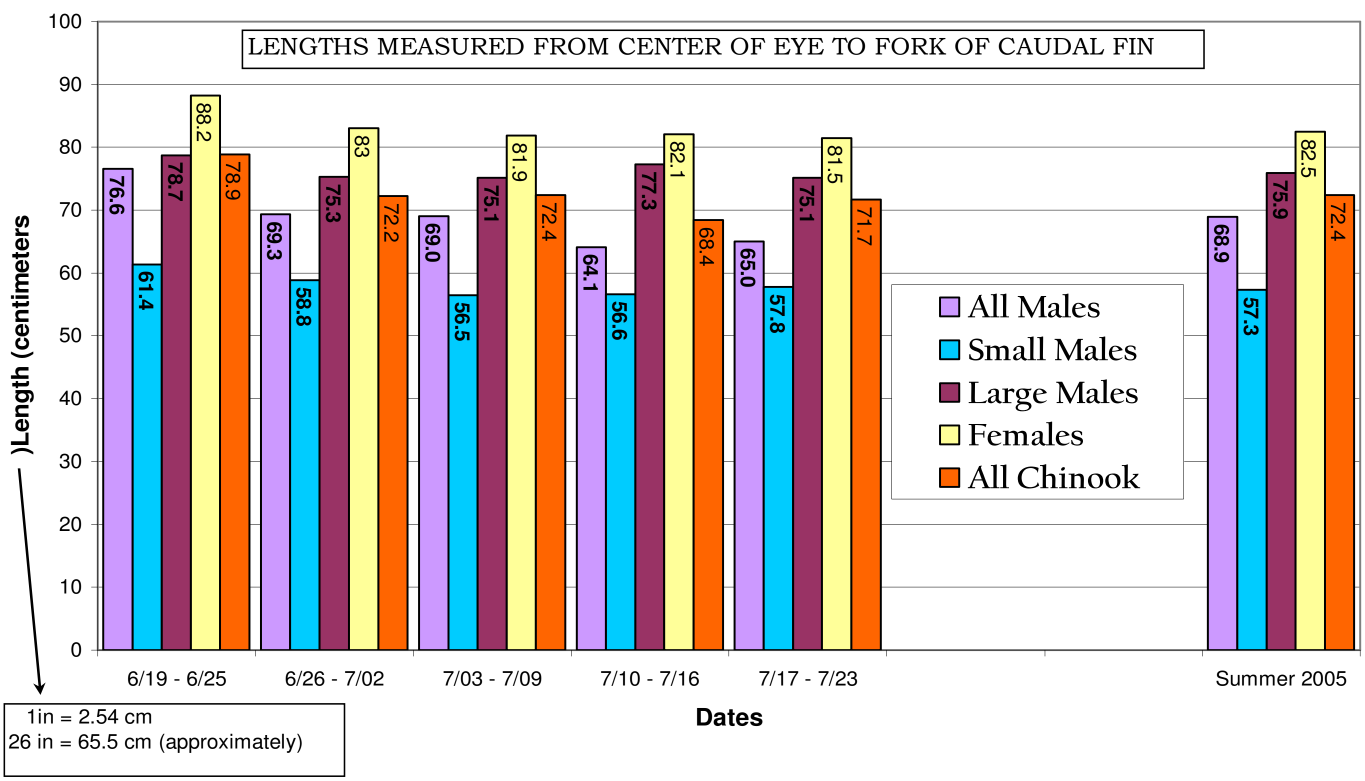


Figure 7

Average Length of Different Size/Sex Chinook Salmon Summer 2005

(Rapids Student Research Center)



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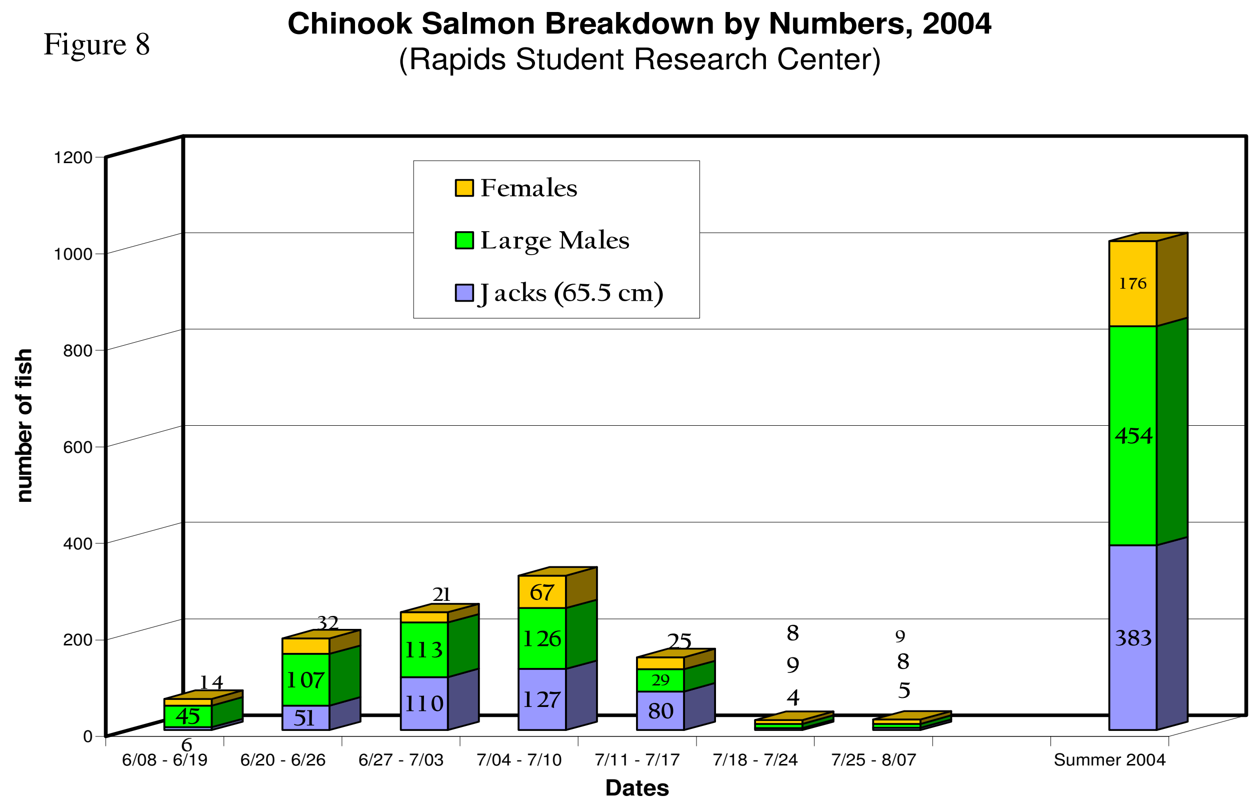

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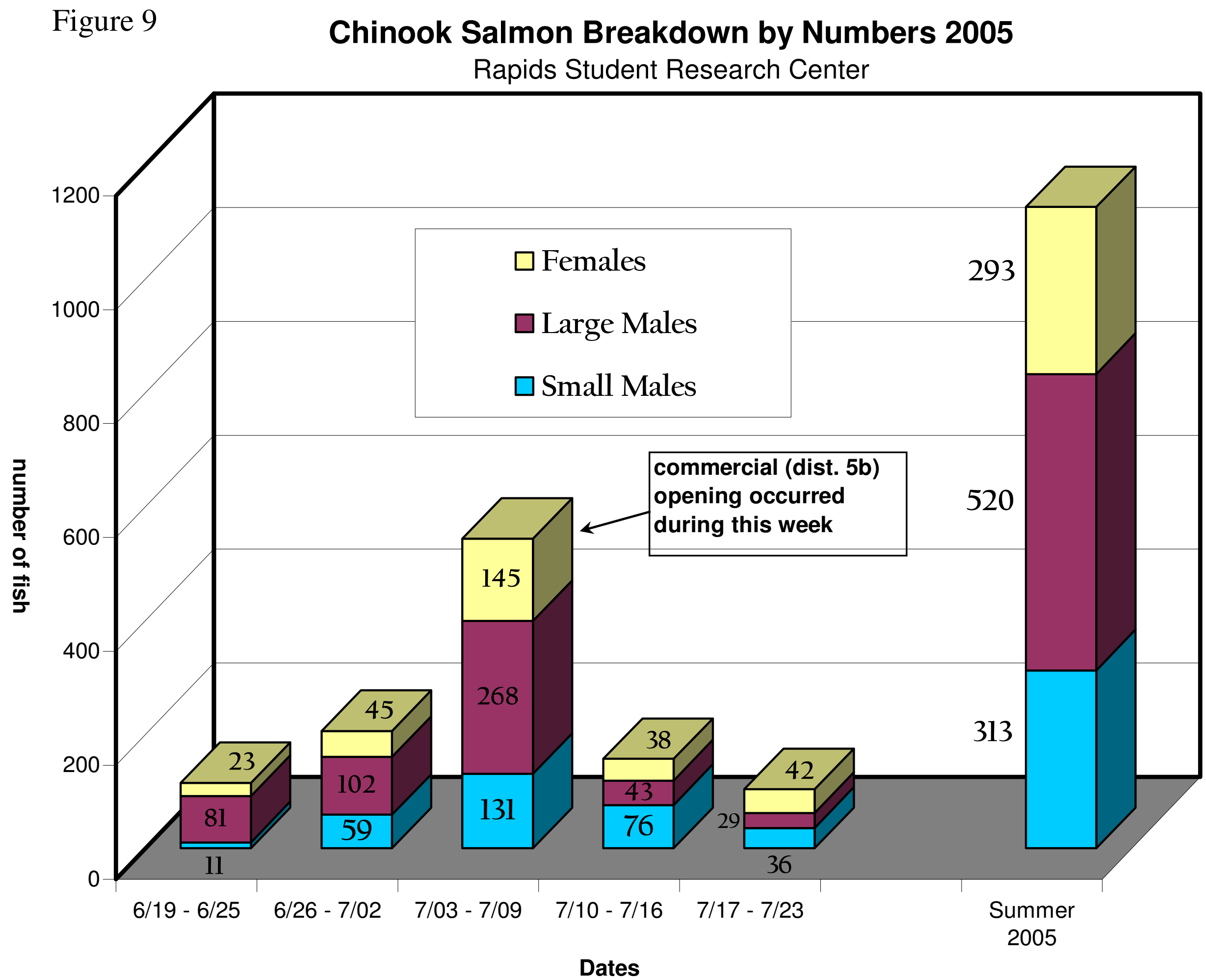


Figure 10

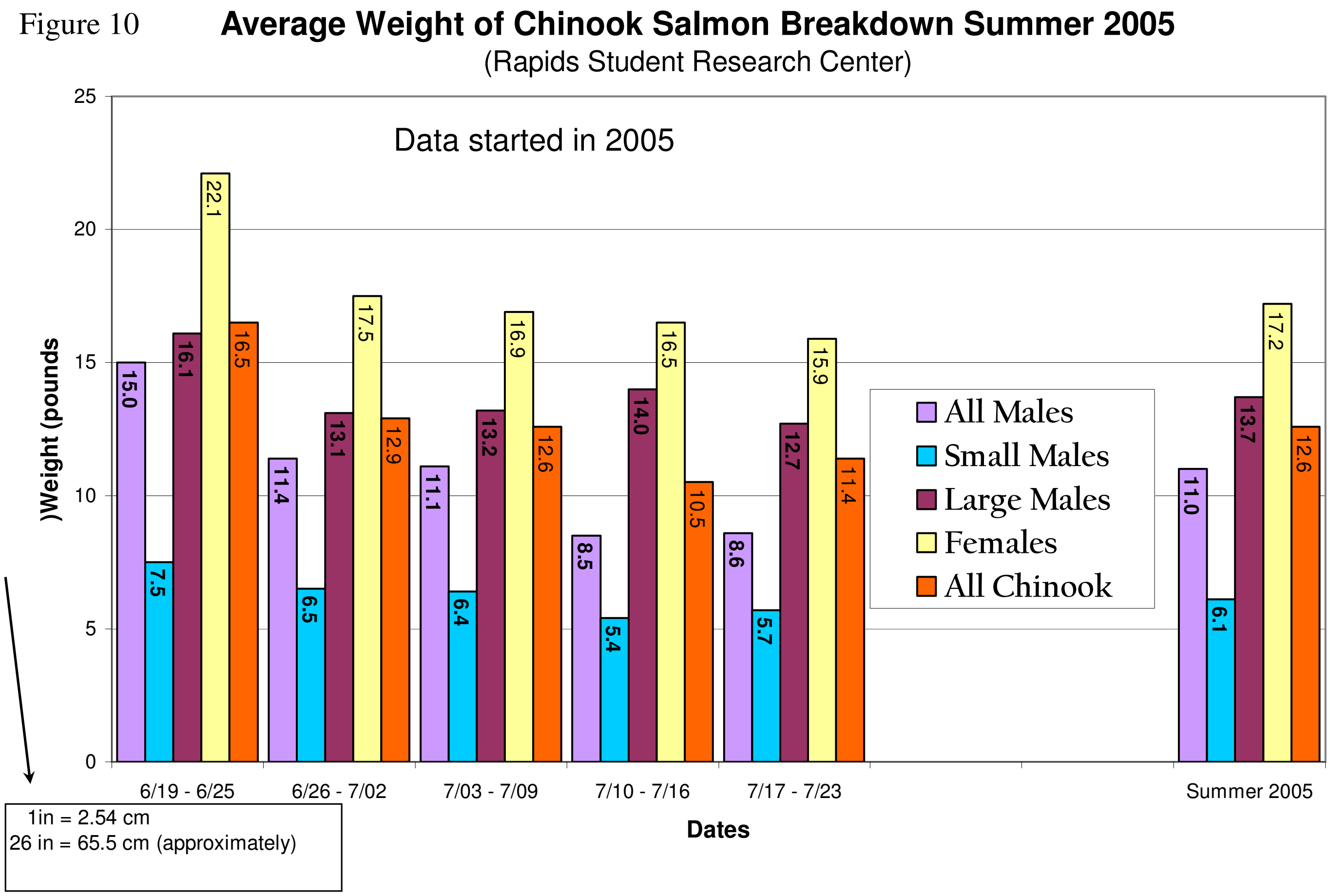


Figure 11

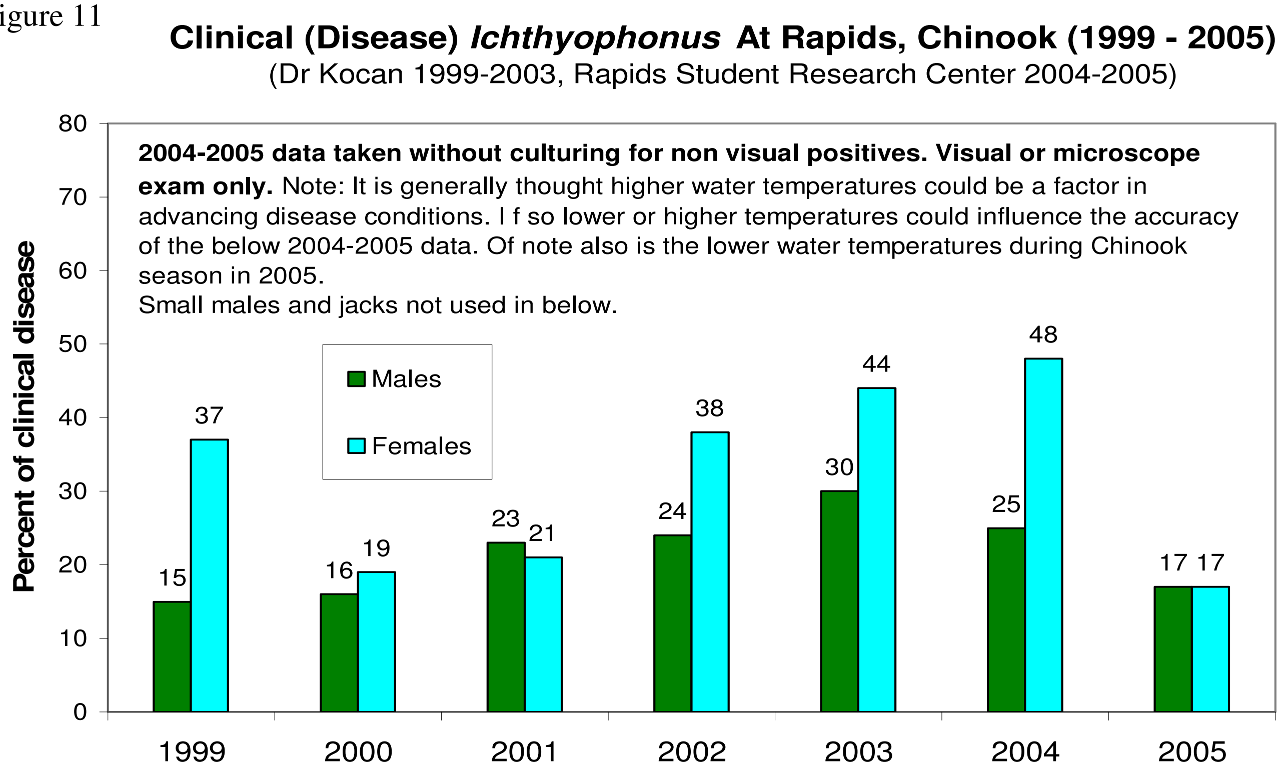


Figure 12

Percentage of Ichthyophonus in Chinook Salmon, 2004
(Rapids Student Research Center)

SAMPLE SIZE (# removed)

	6/20-6/26	6/27-7/03	7/04-7/10	7/11-7/17	7/18-7/24	7/25-7/31	All Season Total
females	11 (0)	13 (1)	24 (0)	29 (0)	32 (0)	8 (2)	117 (3)
lg males	20 (0)	34 (0)	32 (0)	37 (2)	24 (2)	6 (0)	153 (4)
jacks	30 (0)	49 (6)	66 (3)	64 (2)	8 (0)	5 (0)	222 (11)
total	61 (0)	96 (7)	122 (3)	130 (4)	64 (2)	19 (2)	492 (18)

* visual examination only, not cultured for confirmation of positives

Used and removed samples = 528 Chinook

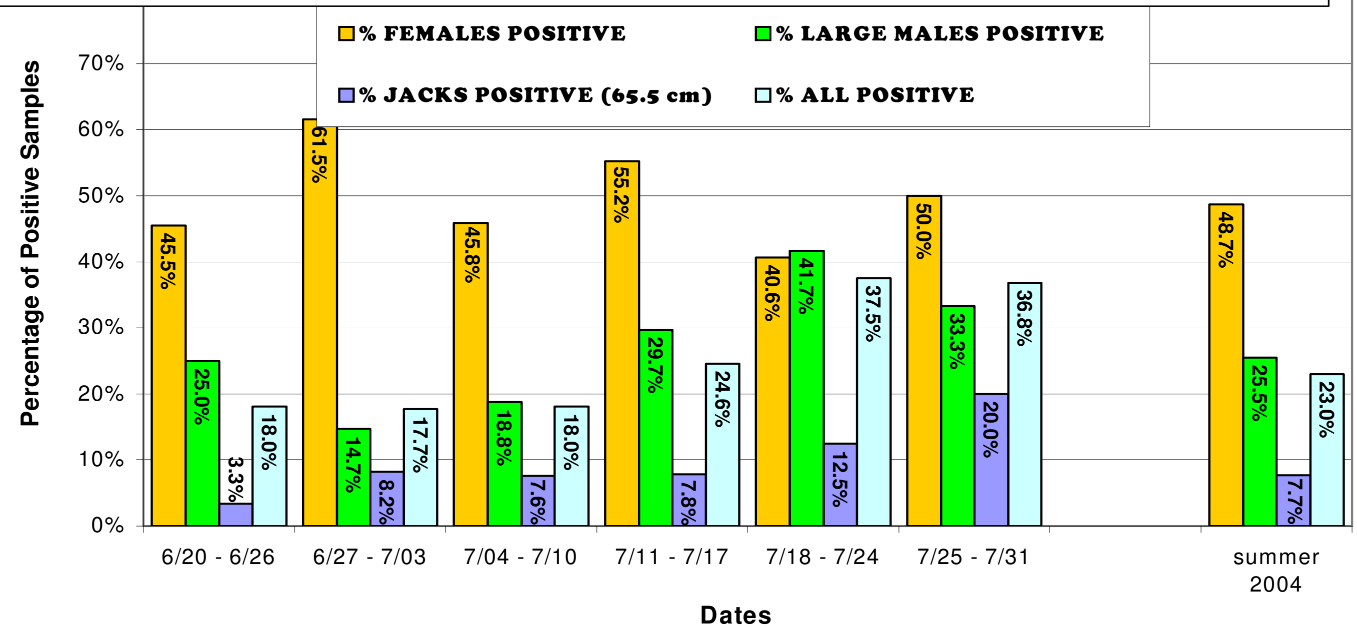


Figure 13

Percentage of Ichthyophonus Disease in Chinook (King) Salmon
Summer 2005 (Rapids Student Research Center)

SAMPLE SIZE (# removed)

	6/19-6/25	6/26-7/02	7/03-7/09	7/10-7/16	7/17-7/23	summer total
females	22 (0)	43 (0)	11 (0)	37 (1)	37 (1)	150 (2)
lg males	66 (0)	94 (4)	29 (0)	38 (1)	25 (2)	252 (7)
sm males	10 (0)	28 (0)	31 (0)	60 (1)	36 (0)	165 (1)
total	98 (0)	165 (4)	71 (0)	135 (3)	98 (3)	567 (10)

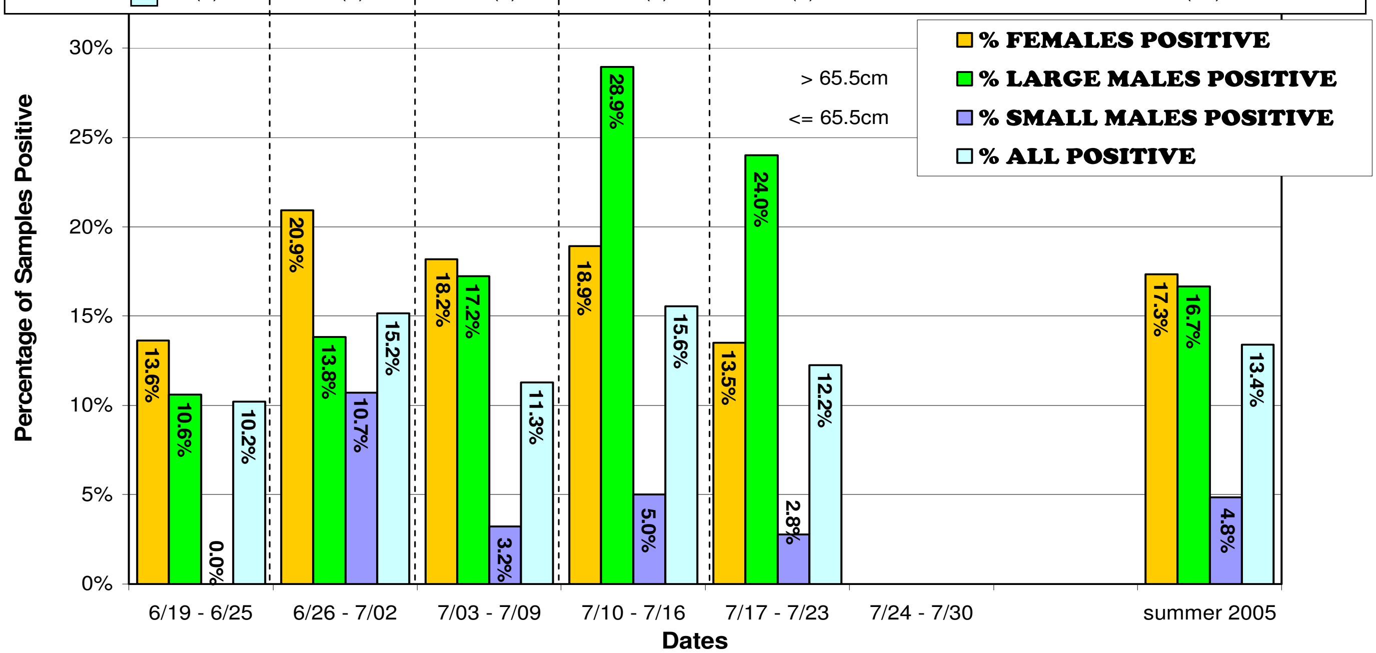


Figure 14

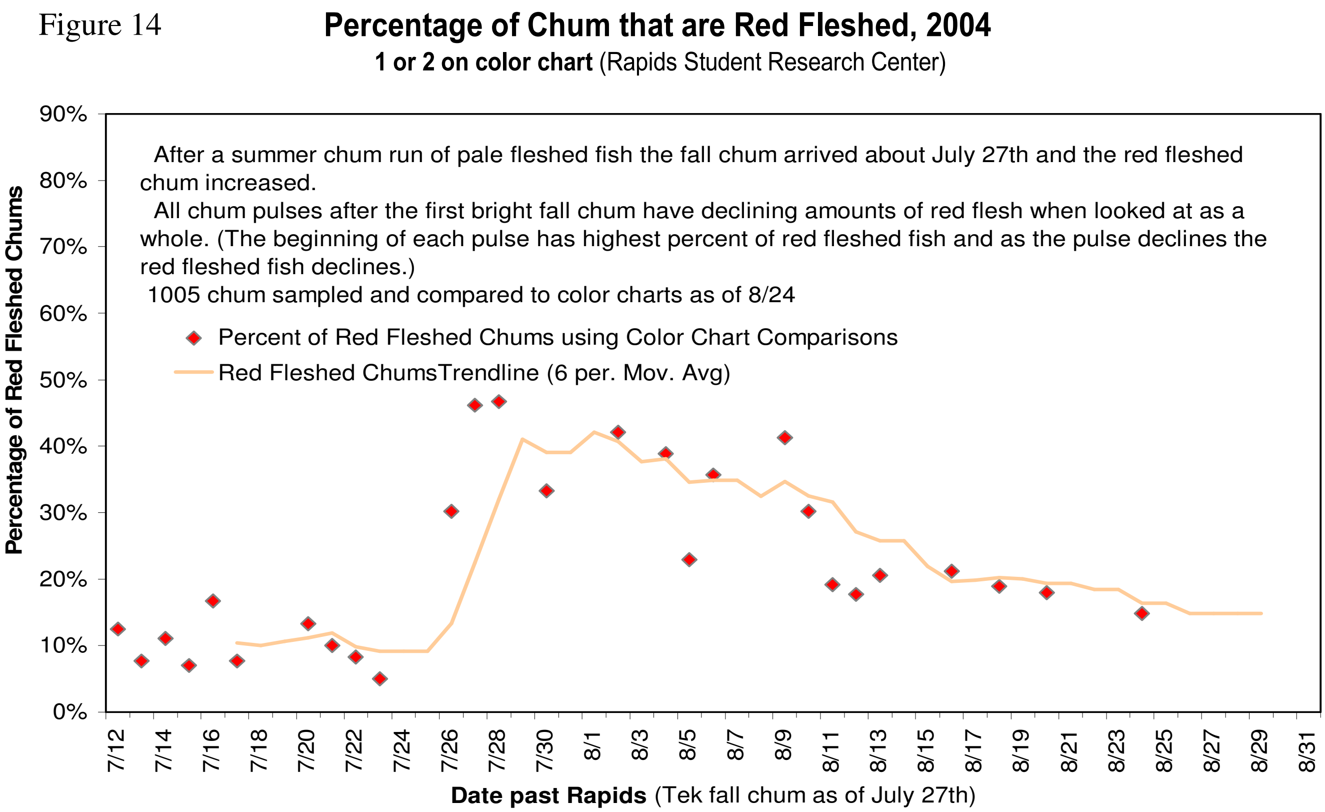


Figure 15

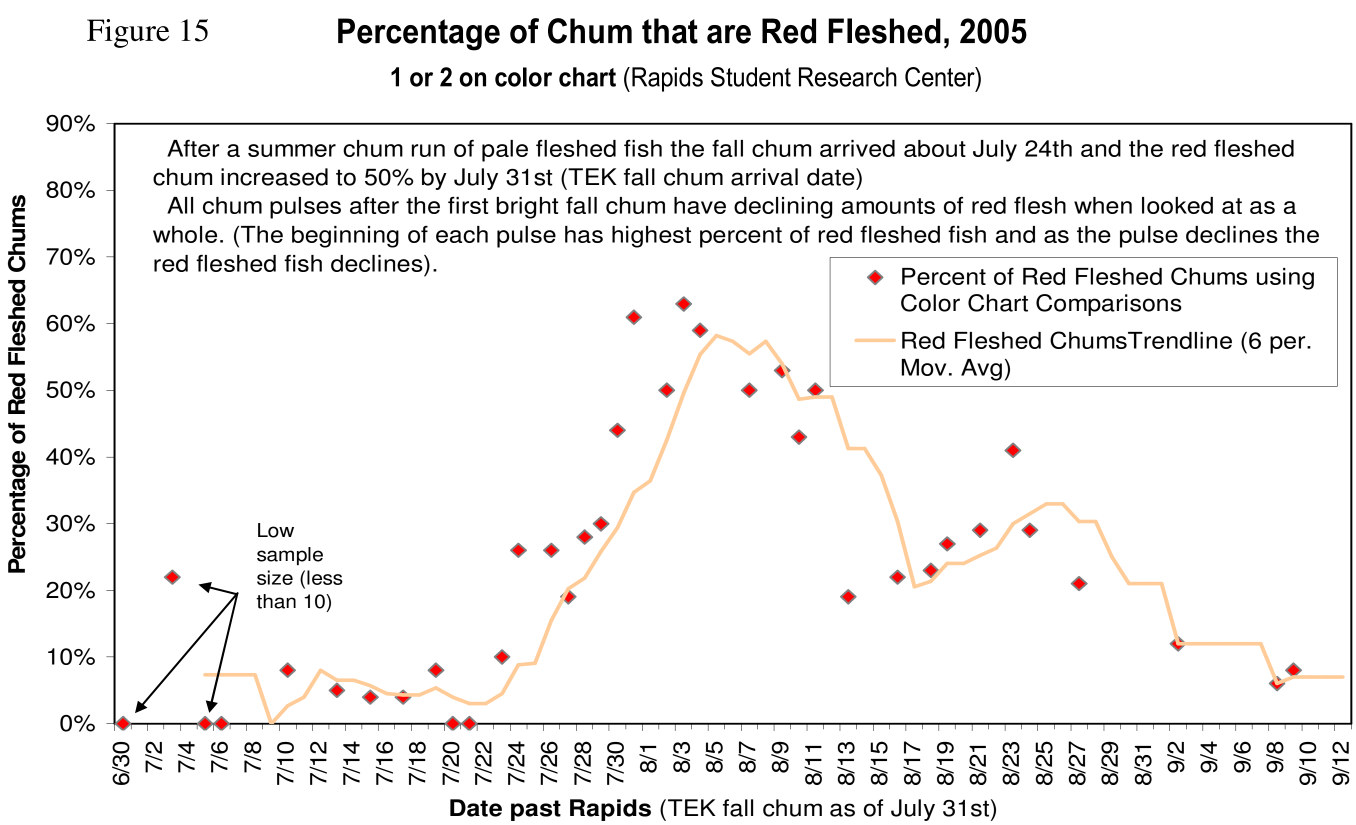
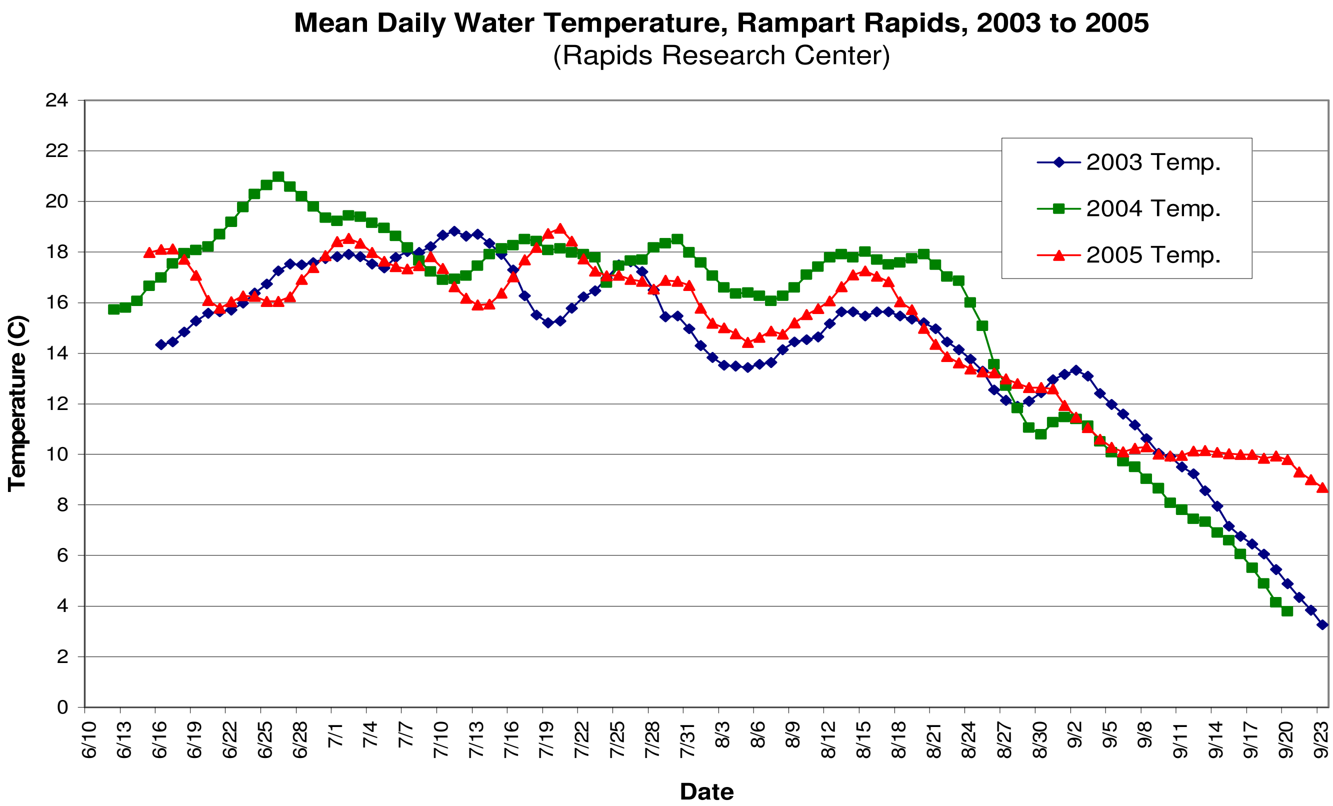


Figure 16



Mean Daily Water Temperature, Rampart Rapids, 2003 to 2005
(Rapids Research Center)
2003 Temp.
2004 Temp.
2005 Temp.
Temperature (C)
24
22
20
18
16
14
12
10
8
6
4
2
0
6/10
6/13
6/16
6/19
6/22
6/25
6/28
7/1
7/4
7/7
7/10
7/13
7/16
7/19
7/22
7/25
7/28
7/31
8/3
8/6
8/9
8/12
8/15
8/18
8/21
8/24
8/27
8/30
9/2
9/5
9/8
9/11
9/14
9/17
9/20
9/23
Date

Table 1

Table of all Chinook Weights Taken in 2005. Chinook Fish Wheel Sites Only																			
Includes Interior AK Prosessors Commercial Catch at Rapids																			
Weights only for : Large Males										Females					"Jacks"				
5	9.5	10.5	11	12	12.8	13.8	14.5	16	19	10	14	16	18.5	21.7	1.9	4.5	5.7	6.2	7.4
6.1	9.5	10.5	11.2	12	12.8	13.8	14.5	16	19	10	14	16	18.5	21.8	2	4.5	5.8	6.3	7.5
6.5	9.5	10.5	11.3	12	12.8	13.9	14.5	16	19.2	10.4	14	16.1	18.5	21.8	2	4.5	5.8	6.3	7.5
7.3	9.5	10.5	11.3	12	12.8	13.9	14.6	16	19.2	10.8	14	16.1	18.5	22	2	5	5.8	6.3	7.5
7.7	9.5	10.5	11.3	12	12.9	14	14.6	16.1	19.5	10.8	14	16.1	18.5	22	2	5	5.8	6.4	7.5
7.8	9.5	10.5	11.3	12	12.9	14	14.6	16.1	19.5	10.8	14.1	16.2	18.5	22.2	2	5	5.8	6.5	7.5
8	9.6	10.5	11.3	12	12.9	14	14.7	16.2	19.6	10.9	14.1	16.2	18.5	22.5	2	5	5.9	6.5	7.5
8	9.6	10.5	11.4	12	13	14	14.7	16.5	19.6	11	14.3	16.3	18.5	22.5	2	5	6	6.5	7.5
8	9.6	10.5	11.4	12	13	14	14.8	16.5	19.9	11	14.3	16.3	18.6	22.7	2	5	6	6.5	7.5
8	9.6	10.5	11.4	12.1	13	14	14.9	16.5	20	11.3	14.3	16.3	18.6	22.8	2	5	6	6.5	7.5
8	9.6	10.5	11.4	12.1	13	14	15	16.5	20	11.3	14.4	16.5	19	22.9	2	5	6	6.5	7.5
8.3	9.7	10.5	11.4	12.2	13	14	15	16.5	20.1	11.3	14.5	16.5	19	23.1	2	5	6	6.5	7.6
8.4	9.8	10.5	11.4	12.2	13	14	15	16.5	20.7	11.5	14.5	16.5	19	23.5	2	5	6	6.5	7.6
8.5	9.8	10.5	11.5	12.2	13	14	15	16.8	21	11.5	14.5	16.5	19	24.3	2	5	6	6.5	7.6
8.5	9.9	10.5	11.5	12.2	13	14	15	16.9	21.5	11.8	14.5	16.5	19.2	24.5	2.5	5	6	6.5	7.9
8.5	10	10.6	11.5	12.3	13	14	15	16.9	21.5	11.8	14.5	16.6	19.2	24.5	3	5	6	6.5	7.9
8.6	10	10.6	11.5	12.3	13	14	15	17	22	12	14.5	16.7	19.4	25.2	3	5	6	6.5	8
8.6	10	10.6	11.5	12.3	13	14	15	17	22	12	14.5	16.9	19.4	25.4	3	5	6	6.5	8
8.8	10	10.6	11.5	12.3	13	14	15	17	22.3	12.2	14.6	17	19.5	25.5	3	5	6	6.5	8
8.8	10	10.6	11.5	12.4	13	14	15	17	23	12.2	14.6	17	19.5	27.5	3	5	6	6.5	8
8.9	10	10.7	11.5	12.4	13.1	14	15	17	23	12.2	14.7	17	19.6	28.4	3	5	6	6.5	8
9	10	10.8	11.5	12.4	13.1	14	15	17	23	12.5	14.7	17	19.7	29.5	3.5	5	6	6.6	8
9	10	10.8	11.5	12.4	13.2	14	15	17	23	12.5	14.8	17	19.7	29.8	3.5	5	6	6.7	8
9	10	10.9	11.5	12.5	13.2	14	15	17	23	12.5	14.8	17	19.8	34	3.8	5	6	6.7	8
9	10	10.9	11.5	12.5	13.2	14	15	17.2	23.5	12.5	14.9	17	20		4	5	6	6.7	8
9	10	11	11.6	12.5	13.2	14	15.1	17.2	24	12.5	14.9	17	20		4	5	6	6.9	8
9	10	11	11.7	12.5	13.3	14	15.2	17.2	24	12.5	15	17	20		4	5.3	6	7	8
9	10	11	11.7	12.5	13.3	14.1	15.3	17.2	24	12.7	15	17.1	20		4	5.4	6	7	8
9	10	11	11.7	12.5	13.3	14.1	15.3	17.4	24.5	12.7	15	17.1	20		4	5.5	6	7	8
9	10	11	11.7	12.5	13.4	14.2	15.3	17.5	24.5	13	15	17.2	20		4	5.5	6	7	8
9.1	10	11	11.7	12.5	13.5	14.2	15.5	17.5	25	13	15.3	17.2	20		4	5.5	6	7	8
9.1	10	11	11.7	12.5	13.5	14.3	15.5	17.5	25	13	15.4	17.3	20.5		4	5.5	6	7	8.1
9.1	10	11	11.8	12.5	13.5	14.4	15.5	17.5	26.1	13	15.5	17.3	20.5		4	5.5	6	7	8.3
9.1	10	11	11.8	12.5	13.5	14.4	15.5	17.5	26.2	13.1	15.5	17.4	20.5		4	5.5	6	7	8.4
9.2	10.1	11	11.8	12.5	13.5	14.4	15.5	17.5	26.5	13.3	15.5	17.5	20.5		4	5.5	6	7	8.5
9.2	10.1	11	11.8	12.5	13.5	14.4	15.5	17.5	26.5	13.4	15.5	17.5	20.8		4	5.5	6	7	8.5
9.2	10.1	11	11.8	12.5	13.5	14.5	15.6	17.5	28.4	13.5	15.5	17.6	20.8		4.4	5.5	6	7	8.5
9.2	10.1	11	11.9	12.5	13.5	14.5	15.7	17.9	30	13.5	15.5	17.6	20.9		4.4	5.5	6	7	8.6
9.3	10.3	11	11.9	12.5	13.5	14.5	15.7	18	30.5	13.6	15.5	17.7	21		4.5	5.5	6	7	8.8
9.3	10.3	11	11.9	12.5	13.5	14.5	15.8	18	33	13.6	15.6	17.8	21		4.5	5.5	6	7.1	8.8
9.3	10.4	11	11.9	12.5	13.5	14.5	15.9	18	34	13.7	15.8	17.9	21		4.5	5.5	6	7.1	9
9.3	10.4	11	12	12.6	13.5	14.5	15.9	18	34.2	13.7	15.8	18	21		4.5	5.5	6	7.2	9
9.3	10.4	11	12	12.6	13.5	14.5	15.9	18.3	35	13.8	16	18	21		4.5	5.5	6	7.2	9
9.4	10.4	11	12	12.6	13.5	14.5	16	18.4		13.9	16	18	21		4.5	5.5	6	7.2	11
9.5	10.4	11	12	12.7	13.6	14.5	16	18.5		13.9	16	18	21.3		4.5	5.6	6	7.3	
9.5	10.4	11	12	12.7	13.6	14.5	16	18.5		14	16	18	21.5		4.5	5.7	6.1	7.3	
9.5	10.4	11	12	12.7	13.7	14.5	16	18.8		14	16	18.3	21.5		4.5	5.7	6.1	7.4	
9.5	10.5	11	12	12.7	13.7	14.5	16	18.8		14	16	18.3	21.5		4.5	5.7	6.2	7.4	

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2. Print pages 2 – 20 in regular quality and double sided.
3. Print pages 24 – 32 in regular quality and double sided.