



CARICOM Fisheries Unit



European Union

FISHERIES DATA ANALYSIS TRAINING WORKSHOP

Workshop Report
(March 18-25, 2002; Belize City, Belize)

Project No. 7:ACP:RPR:385

**Integrated Caribbean Regional
Agriculture and Fisheries Development Programme**
- **Fisheries Component**
(EU funded)

CARICOM Fisheries Unit
Belize City, Belize C.A.

March 2002



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Executive Summary

The main objective of the Fisheries Component of the Integrated Caribbean Regional Agriculture and Fisheries Development Programme (ICRAFDP) is optimal utilization and sustainable management of marine resources in the CARIFORUM countries. The participating countries are Antigua and Barbuda, The Bahamas, Barbados, Belize, Dominica, Dominican Republic, Grenada, Guyana, Haiti, Jamaica, Montserrat, St. Lucia, St. Kitts and Nevis, St. Vincent and the Grenadines, Suriname and Trinidad and Tobago.

The Fisheries Data Management Systems subproject of the ICRAFDP focuses on: (1) Improving the Data Collection and Management Systems in the CARIFORUM Countries; (2) Providing fisheries data for resource assessment and management; and (3) Providing quality data to facilitate effective monitoring and regulation of fishing effort.

In an effort to provide information for management and decision-making on a continuous basis, the Project will assist the Belize Fisheries Department to strengthen their data analysis and reporting capability. The purpose of the Fisheries Data Analysis Training Workshop was to train the Belize Fisheries Department staff in data analysis. The training focused on statistical concepts, exploratory data analysis, statistical graphics, data analysis-hypothesis testing, regression analysis, survey and basic concepts and approaches in sample-based fishery survey.

The presenters included Ms. Merline Hemmings (Data Manager/Analyst-CFU); Ms. Jeanette Mateo (Biologist-CFU) and Mr. Jaime Villanueva (Fisheries Technician-Belize Fisheries Department). Sixteen (16) fisheries staff members were trained in the following areas:

- Statistical Concepts
- Exploratory Data Analysis
- Data Analysis-hypothesis testing
- Regression Analysis
- Basic Concepts and Approaches in Sample-Based Fishery Survey
- Practical data analysis using Statistical Software for Social Scientist (SPSS).

During the workshop the participants demonstrated a great deal of interest in all the presentations and practical sessions, asking numerous relevant questions as well as sharing their own field experiences with the group. Most of the participants indicated that they benefited from the theoretical and practical presentations. Over 80% of the participants requested a follow-up workshop, for a period of at least two weeks, to cover topics such as:

- Other statistical techniques
- Research proposal writing
- Technical report writing
- Stock assessments
- Designing research studies (e.g. survey)



- Survey methods and data form development
- Analyzing qualitative surveys
- Data elements required in a socio-economic survey.

The Closing Ceremony was chaired by Mr. Milton Haughton (Scientific Director-CFU). The Project Director, Mr. Hugh Saul, delivered the opening remarks and Ms. Beverly Wade (Fisheries Administrator-Fisheries Department) spoke on behalf of the Ministry of Agriculture, Fisheries and Cooperatives. Mr. Dwight Neal (Head of the Capture Fisheries Unit-Fisheries department) gave the Vote of Thanks. Ms. Beverly Wade presented Certificates of Participation to the participants.



FISHERIES DATA ANALYSIS TRAINING WORKSHOP

SECTION I

SUMMARY OF WORKSHOP ACTIVITIES

MONDAY, 18TH MARCH 2002

The Workshop commenced at 9.00 a.m. The Data Manager/Analyst welcomed the participants on behalf of the CARICOM Fisheries Unit (CFU). Mr. Dwight Neal (Head of the Capture Fisheries Unit-Fisheries Department) addressed the delegates on behalf of the Fisheries Department. The participants then introduced themselves, giving their names, designation and departments.

After the self-introductions the first session commenced with the presentation of Module One: Statistical Concepts by Mr. Jaime Villanueva, Fisheries Technician-Fisheries Department, Belize. During the session the concepts presented were illustrated using length frequencies for two samples of fish caught by a trawler. The topics covered include:

- Measures of central tendency
- Measures of variability
- Populations and samples.

During the second session Ms. Merline Hemmings (Data Manager/Analyst-CFU) presented Module Two: Exploratory Data Analysis. In this session participants were introduced to both graphical and non-graphical exploratory data analysis techniques. Some of these include the bar chart, box-and-whiskers plot, stem-and-leaf plot, histogram, frequency distribution, P-P plot and the Q-Q plot. The various techniques were illustrated using samples of fish lengths, weights and lobster tail lengths.

In the afternoon, participants were introduced to the Statistical Package for Social Scientist (SPSS) and its basic functions. They used various fisheries datasets to conduct analyses based on the theory presented in Module One and Two.

TUESDAY, 19TH MARCH 2002

The Data Manager/Analyst, Ms. Merline Hemmings, continued with the presentation on Exploratory Data Analysis, followed by Module Three: Statistical Graphics during the first session. The statistical graphics presentation focused on creating effective graphs that communicated the correct information using various graphical techniques, such as scatter plots,



bar charts, histograms, three dimensional graphs and pie charts. The examples used to illustrate the various techniques were taken from various disciplines.

During the first afternoon session, the theoretical aspects of Module Four: Data Analysis-Hypothesis Testing was presented. In this session the topics covered included:

- What is hypothesis testing?
- The null and alternate hypothesis
- Type I and Type II Errors
- One-tailed and two-tailed tests.

During the second session of the afternoon participants used fisheries datasets to do practical exercises utilizing the concepts covered in modules two and three.

WEDNESDAY , 20TH MARCH 2002

During the morning sessions, Ms. Merline Hemmings presented the theory of hypothesis testing. The session focused on:

- Parametric and non-parametric tests
- Summarizing hypothesis testing in six steps
- Summary of the three types of t-tests
 - One-sample t-test
 - Independent (Unpaired) t-test
 - Dependent (Paired) t-test
- The statistical assumptions underlying the one sample t-test
- How to determine when to use the one-sample t-test
- Calculating the t-statistics for the one-sample t-test
- Using the critical t-value and the calculated t-value to determine if there is significant difference between the sample mean and a standard value.
- Using the exact p value and alpha to determine if there is significant difference between the sample mean and a standard value.

In the afternoon sessions the Data Manager/Analyst illustrated the various steps involved in analyzing data from a practical point of view, commencing with the exploratory data analysis step to interpreting the resulting outputs. The explore procedure in SPSS was used to demonstrate how to test if the statistical assumption of the one-sample t-test is violated. The one sample procedure was then used to conduct a one-sample t-test and the outputs were explained.

The participants were then asked to analyze a dataset consisting of a sample of yellow tail snapper (*Ocyurus chrysurus*) length frequencies and a standard value. The aim of the analysis was to investigate if the sample mean was significantly different from the standard value. The one-sample t-test procedure in SPSS was used to conduct the analysis. The results were then discussed and errors in concepts and interpretation of results corrected and explained.



THURSDAY, 21ST MARCH 2002

During the morning sessions the Data Manager/Analyst continued with the presentation on hypothesis testing covering the topics related to the Independent (Unpaired) t-test. These topics include:

- The statistical assumptions underlying the Independent two-sample t-test
- How to determine when to use the Independent (Unpaired) t-test
- Calculating the t-statistics for the Independent t-test:
 - when the variances in both samples are equal
 - when the variances in both samples are not equal
- Using the critical t-value and the calculated t-value to determine if there is significant difference between the sample means.
- Using the exact p value and alpha to determine if there is significant difference between the sample means.

In first afternoon session Ms. Jeanette Mateo (Biologist-CFU) presented Module Five: Surveys. This presentation focused on:

- Survey, sample and census
- Types of surveys and Who conducts surveys
- Survey methods and quality
- Planning a survey
- What is done after data collection
- Problems that can occur in conducting a survey.

In the second session the participants were introduced to using SPSS to do an Independent t-test using a dataset containing two samples of fish lengths for the same species caught at different landing sites. In addition to conducting the test, the participants had to determine if any of the statistical assumptions were violated, interpret the results and make inferences based on their results.

The exercise was then discussed and the Data Manager/Analyst indicated that the layout of the data was very important in this particular analysis as incorrect data layout would not result in processing error but would produce erroneous results.

FRIDAY, 22ND MARCH 2002

In the morning sessions the Data Manager/Analyst continued with a presentation on hypothesis testing covering the topics related to the Dependent (Paired) t-test. These topics include:

- The statistical assumptions underlying the Dependent (Paired) two-sample t-test
- How to determine when to use Dependent (Paired) t-test
- Calculating the t-statistics for the Dependent t-test
- Using the critical t-value and the calculated t-value to determine if there is significant difference between the sample means.



- Using the exact p value and alpha to determine if there is significant difference between the sample means.

During the second morning and the first afternoon sessions, the technique for comparing two or more sample means, One-Way Analysis of Variance (ANOVA) was covered. The presentations focused on:

- The statistical assumptions underlying the One-Way Analysis of Variance
- How to determine when to use ANOVA
- Calculating the F-statistic/F-ratio
- Using the critical F-value and the calculated F-value to determine if there is an overall significant difference between the sample means.
- Using the exact p value and alpha to determine if there is an overall significant difference between the sample means.
- Multiple comparisons tests
- Brief summary of Two-Way Analysis of Variance.

In the final session of the afternoon the participants used a dataset containing fish catch for two trawling periods to investigate the effect of trawling period on fish catch using the paired t-test. The second dataset consisted of the number of a certain species of fish landed at a sampling point on various sampling days in February, May and August. ANOVA was used to determine if there was an overall difference in the monthly sample means. The Scheffe Multiple Comparisons test was used to determine which pairs of means were significantly different.

The results were discussed and queries regarding the testing of the various assumptions and the use of Levene's test, the Scheffe test and interpreting the results were clarified.

MONDAY, 25TH MARCH 2002

In the first morning session, the Data Manager reviewed the three types of T-tests and ANOVA. A summary of Simple and Multiple Linear Regression was also done. The latter presentation focused on when to use regression analysis, the nature of the model, how to use the model to predict values and the differences between the Simple and Multiple Linear Regression.

In the second morning session Ms. Jeanette Mateo made a presentation on the "Basic Concepts and Approaches in Sample-based Fishery Survey". The topics covered include:

- Calculating totals and means
- Populations and samples
- Conducting a frame survey
- Calculating total catch, effort and catch per unit effort
- Sample-based catch/effort surveys
- Multi-Gear and Multi-Species Surveys



The students were evaluated by a written quiz, which covered the concepts presented at the workshop. Thirteen (81.25%) scored over 60% on the quiz; the highest score was 86.0%. Most of the participants indicated that they benefited from the theoretical and practical presentations. Over 80% of the participants requested a follow-up workshop, for a period of at least two weeks, to cover topics such as:

- Other statistical techniques
- Research proposal writing
- Technical report writing
- Stock assessments
- Designing research studies (e.g. survey)
- Survey methods and data form development
- Analyzing qualitative surveys
- Data elements required in a socio-economic survey.

A Closing Ceremony was held with senior members of the CFU management and technical staff and the Fisheries Department in attendance. The Closing Ceremony commenced at approximately 4.00 p.m. and was chaired by Mr. Milton Haughton (Scientific Director-CFU). He delivered the Chairman's Introduction, which was followed by the Opening Remarks delivered by Mr. Hugh Saul (Project Director-CFU). Ms. Beverly Wade, (Fisheries Administrator-Fisheries Department) spoke on behalf of the Ministry of Agriculture, Fisheries and Co-operatives. Mr. Dwight Neal (Head of Capture Fisheries Unit-Belize Fisheries Department) gave the Vote of thanks. Ms Beverly Wade presented the certificates to the participants.



APPENDIX I

Closing Ceremony

Agenda

Participants List



Closing Ceremony

FISHERIES DATA ANALYSIS
TRAINING WORKSHOP



Belize Fisheries Department
and
CARICOM Fisheries Unit



PROGRAMME

<i>National Anthem</i>			<i>National Anthem</i>
<i>O, Land of the Free by the Carib Sea, Our manhood we pledge to thy liberty! No tyrants here linger, despots must flee This tranquil haven of democracy. The blood of our sires, which hallows the sod, Brought freedom from slav'ry, oppression's rod, By the might of truth and the grace of God. No longer shall we be hewers of wood.</i>	<i>Cho</i>		
<i>Arise ye sons of the Baymen's clan! Put on your armour, clear the land! Drive back the tyrants, let despots flee! Land of the Free by the Carib Sea!</i>			
<i>Nature has blessed thee with wealth untold, O'er mountains and valleys where prairies roll; Our fathers, the Baymen, valiant and bold Drove back th'invader, this heritage bold From proud Rio Hondo to old Sarstoon, Through coral isle, over blue lagoon, Keep watch with the angels, the stars and moon. For freedom comes tomorrow's noon.</i>			
		4:00pm – 4:05pm	<i>Chairman's Introduction Mr. Milton Haughton Scientific Director-CFU</i>
		4:05pm – 4:15pm	<i>Remarks Mr. Hugh Saul Project Director-CFU</i>
		4:15pm – 4:30pm	<i>Feature Address Hon. Daniel Silva Minister of Agriculture, Fisheries and Co-operatives</i>
		4:30pm – 4:35pm	<i>Closing Remarks Mr. Sergio Garcia CEO, Ministry of Agriculture, Fisheries and Co-operatives</i>
		4:35pm – 4:40pm	<i>Vote of Thanks Ms. Beverly Wade Fisheries Administrator</i>
		4:40pm – 5:10pm	<i>Presentation of Certificates</i>
		5:10pm – 5:30pm	<i>Refreshments</i>





FISHERIES DATA ANALYSIS TRAINING WORKSHOP

March 18-25, 2002
Belize City, Belize.

ANNOTATED AGENDA

MONDAY, MARCH 18

- 9:00 – 10:00 **Module One: Statistical Concepts**
(Presenter: **Mr. Jaime Villanueva-Fisheries Technician, Belize Fisheries Department**)
In the statistical concepts session, topics such as (1) measures of central tendency (2) measures of variability (3) populations and samples and (4) distributions will be covered. These concepts will be illustrated using samples of fish length measurements.
- 10:00 – 10:15 COFFEE BREAK*
- 10:15 – 12:00 **Module Two: Exploratory Data Analysis**
(Presenter: **Ms. Merline Hemmings –Data Manager/Analyst, CFU**)
During this session the participants will be introduced to using graphical and non-graphical techniques to explore their data for errors and deviation from distribution assumptions.
- 12:00 – 1:00 LUNCH*
- 1:00 – 3:00 **Module One: Practical Session using SPSS**
(Presenter: **Ms. Merline Hemmings –Data Manager/Analyst, CFU**)
During this session the participants will be introduced to SPSS and its basic functions. They will use SPSS to conduct analyses based on the theory covered in Module One.
- 3:00 – 4:00 **Module Two: Exploratory Data Analysis**
(Presenter: **Ms. Merline Hemmings –Data Manager/Analyst, CFU**)
During this session the participants will be introduced to using graphical and non-graphical techniques to explore their data for errors and deviation from distribution assumptions.

TUESDAY, MARCH 19

- 9:00 – 10:00 **Module Two: Exploratory Data Analysis/Module Three: Statistical Graphics**
(Presenter: **Ms. Merline Hemmings –Data Manager/Analyst, CFU**)
During this session the participants will be introduced to using graphical and non-graphical techniques to explore their data for errors and deviation from distribution assumptions. In the statistical graphics session the participants will be introduced to using graphs effectively in communicating accurate information.
- 10:00 – 10:15 COFFEE BREAK*



10:15 – 12:00 **Module Three: Statistical Graphics**
(Presenter: **Ms. Merline Hemmings –Data Manager/Analyst, CFU**)
During this session the participants will be introduced to using graphs effectively in presenting data.

Module Four: Data Analysis: Hypothesis Testing
(Presenter: **Ms. Merline Hemmings –Data Manager/Analyst, CFU**)
This session will focus on illustrating the concepts of the null and alternate hypotheses using examples from the marine reserves, aquaculture and lobster, conch and fish fisheries. The concepts of the Type I and Type II Errors and one-tailed and two-tailed tests will also be covered.

12:00 – 1:00 LUNCH

1:00 – 2:00 **Module Four: Data Analysis: Hypothesis Testing**
(Presenter: **Ms. Merline Hemmings –Data Manager/Analyst, CFU**)
This session will focus on illustrating the concepts of the null and alternate hypotheses using examples from the marine reserves, aquaculture, lobster, conch and fish fisheries. The concepts of the Type I and Type II Errors and one-tailed and two-tailed tests will also be covered.

2:00 – 4:00 **Module Two and Three: Practical Sessions using SPSS**
(Presenter: **Ms. Merline Hemmings –Data Manager/Analyst, CFU**)
The participants will use SPSS to do practical exercises utilizing the concepts presented in Modules Two and Three.

WEDNESDAY, MARCH 20

9:00 – 10:00 **Module Four: Data Analysis: Hypothesis Testing**
(Presenter: **Ms. Merline Hemmings –Data Manager/Analyst, CFU**)
This session will focus on parametric and non-parametric tests, summarizing hypothesis testing in six steps, summary of the three type of t-tests and comparing means using the one-sample t-test.

10:00 – 10:15 COFFEE BREAK

10:15 – 12:00 **Module Four: Data Analysis: Hypothesis Testing**
(Presenter: **Ms. Merline Hemmings –Data Manager/Analyst, CFU**)
This session will focus on parametric and non-parametric tests, summarizing hypothesis testing into six steps, summary of the three type of t-tests, comparing means using the one-sample t-test.

12:15 – 1:15 LUNCH

1:00 – 3:00 **Module Four: Practical Sessions using SPSS**
(Presenter: **Ms. Merline Hemmings –Data Manager/Analyst, CFU**)
In this session the participants used the one-sample t-test to compare a sample of yellow tail snapper length measurements with the average value for Belize.



3:00 – 3:15 **COFFEE BREAK**

3:15 – 4:00 **Module Four: Practical Sessions using SPSS**
(Presenter: **Ms. Merline Hemmings –Data Manager/Analyst, CFU**)
In this session the participants used the one-sample t-test to compare a sample of yellow tail snapper length measurements with the average value for Belize

THURSDAY, MARCH 21

9:00 – 10:00 **Module Four: Data Analysis: Hypothesis Testing**
(Presenter: **Ms. Merline Hemmings –Data Manager/Analyst, CFU**)
In this session the concepts of the Independent t-test will be illustrated using samples for the same fish species caught at two different beaches.

10:00 – 10:15 **COFFEE BREAK**

10:15 – 12:00 **Module Four: Data Analysis: Hypothesis Testing**
(Presenter: **Ms. Merline Hemmings –Data Manager/Analyst, CFU**)
In this session the concepts of the Independent t-test will be illustrated using samples for the same fish species caught at two different beaches.

12:00 – 1:00 **LUNCH**

1:00 – 2:30 **Module Five: Surveys**
(Presenter: **Ms. Jeanette Mateo –Biologist, CFU**)
This session will focus on surveys. The topics to be covered include (1) what is a survey? (2) judging the quality of the survey (3) how to collect survey data and (4) how to plan a survey.

2:30 – 2:45 **COFFEE BREAK**

2:45 – 4:30 **Module Four: Practical Sessions using SPSS**
(Presenter: **Ms. Merline Hemmings –Data Manager/Analyst, CFU**)
In this session the participants analyze data sets using the Independent t-test.



FRIDAY, MARCH 22

9:00 – 9:00 **Module Four: Data Analysis: Hypothesis Testing**
(Presenter: **Ms. Merline Hemmings –Data Manager/Analyst, CFU**)
In this session the concepts of the Dependent t-test will be covered. One-Way Analysis of Variance (ANOVA) will be utilized in comparing the mean number of fish samples landed on various sampling days in February, May and August.

10:00 – 10:15 COFFEE BREAK

10:15 – 12:00 **Module Four: Data Analysis: Hypothesis Testing**
(Presenter: **Ms. Merline Hemmings –Data Manager/Analyst, CFU**)
In this session the concepts of the Dependent t-test will be covered. One-Way Analysis of Variance (ANOVA) will be utilized in comparing the mean number of fish samples landed on various sampling days in February, May and August.

12:00 – 1:00 LUNCH

1:00 – 2:30 **Module Four: Practical Sessions using SPSS**
(Presenter: **Ms. Merline Hemmings –Data Manager/Analyst, CFU**)
In this session the participants analyze data sets using the Dependent t-test and ANOVA.

2:30 – 2:45 COFFEE BREAK

2:45 – 4:30 **Module Four: Practical Sessions using SPSS**
(Presenter: **Ms. Merline Hemmings –Data Manager/Analyst, CFU**)
In this session the participants analyze data sets using the Dependent t-test and ANOVA.

MONDAY, MARCH 25

9:00 – 9:30 **Module Six: Data Analysis: Regression**
(Presenter: **Ms. Merline Hemmings –Data Manager/Analyst, CFU**)
This session will focus on giving a brief summary of simple and multiple linear regression and a brief summary of polynomial and non-linear regression and generalise linear models.



- 9:30 – 10:00 **Module Seven: Basic Concepts and Approaches in Sample-Based Fishery Survey**
(Presenter: **Ms. Jeanette Mateo –Biologist, CFU**)
During this session practical aspects of sampling in the field will be covered.
- 10:00 – 11:00 **Module Seven: Basic Concepts and Approaches in Sample-Based Fishery Survey**
(Presenter: **Ms. Jeanette Mateo –Biologist, CFU**)
During this session practical aspects of sampling in the field will be covered.
- 11:00 – 12:00 LUNCH**
- 12.30 - 2.30 **Written Quiz**
The participants will be evaluated using a written quiz that will focus on material covered during the Workshop.
- 4:00 - 5.10 **Closing Ceremony**
Presentation of certificates to participants.
- 5:10 – 5:30 COFFEE BREAK/REFRESHMENTS**



LIST OF PARTICIPANTS

Miguel Alamilla

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FISHERIES DATA ANALYSIS TRAINING WORKSHOP MANUAL



FISHERIES DATA ANALYSIS TRAINING WORKSHOP

Workshop Report *(March 18-25, 2002; Belize City, Belize)*

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CARICOM Fisheries Unit
Belize City, Belize



March 2002