Marine Fisheries Initiative (MARFIN)

Proceedings: Fifth Annual MARFIN Conference

October 28-29, 1992
Radisson Marina Inn
Corpus Christi, Texas

PREFACE

The MARFIN Steering Committee consists of members representing the National Marine Fisheries Service, Sea Grant, the Gulf of Mexico Fishery Management Council, the Gulf States Marine Fisheries Commission, the Atlantic States Marine Fisheries Commission, the South Atlantic Fishery Management Council, Gulf States' marine agencies, Atlantic States' marine agencies, the recreational industry, and the commercial industry. These members assist the Regional Director of the Southeast Region NOAA Fisheries in developing gulf and Atlantic fishery priorities, evaluating proposals for financial assistance, and monitoring existing projects. The NOAA Fisheries (NMFS) provides a program manager to administer all of the MARFIN activities, and individual technical monitors for each of the projects. A grants officer in the NOAA Grants Management Division in Silver Spring, Maryland, is responsible for the overall administration of MARFIN awards.

The MARFIN Conference is held annually and is designed to allow a free interchange of ideas among all the MARFIN cooperators, to disseminate information to fishery managers, researchers, and other interested gulf fishery parties, and to assist the MARFIN Steering Committee and the NMFS in identifying priorities for future MARFIN projects:

The MARFIN research units include:

- Shrimp
- Menhaden
- Coastal Pelagics
- Reef Fish
- Coastal Herrings
- Ocean Pelagics
- Marine Mollusks
- Crabs and Lobsters
- Bottomfish
- Estuarine Fish
- Anadromous & Catadromous Fish
- Mariculture
- Marine Mammals & Endangered Species
- Corals & Sponges

The conference sessions are organized to address most of the research units with MARFIN Steering Committee members acting as chairpersons for each of the sessions.

The MARFIN Program was developed around the concept that fishery data concerning the Gulf of Mexico required coordination. Many state, university, federal and private groups were not working in concert. Enhancing cooperation among these groups was a key aspect in the initiation of MARFIN. If those of you who read this document are considering a proposal to MARFIN, think in terms of cooperation. We would like to see proposals that bring together talent from a number of areas. We would like to receive proposals that could help develop a fishery resource, maintain an existing resource, or aid in the recovery of a resource that had been diminished. The economic aspects of fishery development, maintenance and recovery are also key areas of interest.

For further information call or write the MARFIN Program Office:

David Pritchard, Chief
Cooperative Programs Division
Southeast Regional Office
9450 Koger Boulevard
St. Petersburg, Florida 33702
(813) 893-3720

CONFERENCE PARTICIPANTS

Steering Committee

Jane Black
Commercial Industry - Gulf

Terrance R. Leary (proxy - W. Swingle)
Gulf of Mexico Fisheries Management Council

Jack Van Lopik
Sea Grant - Gulf

Scott Nichols
National Marine Fisheries Service

William S. "Corky" Perret (proxy - W. Tatum)
Gulf States' Marine Agencies

Larry B. Simpson
Gulf States Marine Fisheries Commission

Jean B. West (ex-officio)
NOAA Grants Management

Staff

David L. Pritchard
National Marine Fisheries Service

Ellie F. Roche
National Marine Fisheries Service

Lucia B. Hourihan
Gulf States Marine Fisheries Commission

Cheryl R. Noble
Gulf States Marine Fisheries Commission

CONFERENCE PARTICIPANTS

Presenters

Karen Burns, Mote Marine Laboratory
Nelson Ehrhardt, University of Miami
Henry "Skip" Lazauski, Alabama Department of Conservation and Natural Resources
Christopher Koenig, Florida State University
Carole L. Neidig, Mote Marine Laboratory
Jeffrey Render, Louisiana State University
Sandra Russell, Louisiana State University
Kathy Lang, Louisiana State University
Bruce Thompson, Louisiana State University
John Thompson, Continental Shelf Associates, Inc.
Charles M. Adams, University of Florida
Eugene Nakamura, National Marine Fisheries Service
Joanne L. Shultz, National Marine Fisheries Service
Kenneth Roberts, Louisiana State University
Frederick "Buck" Sutter, Florida Department of Natural Resources
Christopher Gledhill, National Marine Fisheries Service
Ron Schmied, National Marine Fisheries Service
Donald Baltz, Louisiana State University
Claude Boudreaux, Louisiana Department of Wildlife and Fisheries
Dave Burrage, Mississippi State University
Gary L. Graham, Texas A&M Research Foundation
John Ward, National Marine Fisheries Service
Kenneth Heck, Marine Environmental Science Consortium
Loren Coen, Marine Environmental Science Consortium
Charles Wilson, Louisiana State University
Gary Rodrick, University of Florida
Judy Jamison, Gulf & South Atlantic Fisheries Development Foundation, Inc.
Jim Nance, National Marine Fisheries Service
John Watson, National Marine Fisheries Service
Wilma Anderson, Texas Shrimp Association
Donna Rogers, Louisiana State University

Others

Jim Sagnes, Texas Shrimp Association
Wil Seidel, National Marine Fisheries Service
Lee Fuiman, University of Texas
Felicia C. Coleman, Florida State University
David L. Allison, Center for Marine Conservation
Suzie Fowle, Center for Marine Conservation
Bonnie Ponwith, Texas A&M Sea Grant
Gary Saul, FTN Associates
Dianne Stephan, Atlantic States Marine Fisheries Commission
Bob Dorazio, U.S. Fish and Wildlife Service

CONFERENCE PARTICIPANTS

Others

Terry Cody, Texas Parks and Wildlife Department
Paige Campbell, Texas Parks and Wildlife Department
Gene McCarty, Texas Parks and Wildlife Department
Rudy Rosen, Texas Parks and Wildlife Department
Paul Hammerschmidt, Texas Parks and Wildlife Department
Ed Klima, National Marine Fisheries Service
Barton Rogers, Louisiana State University
Harris Lasseigne, Texas Shrimp Association
David L. Nieland, Louisiana State University - CFI
Andy Kemmerer, NMFS Southeast Region Director

TABLE OF CONTENTS

Wednesday, October 28, 1992

WELCOMING REMARKS - Larry B. Simpson, MARFIN Steering Committee

May I have your attention. We'll go ahead and get started. I'd like to open the conference; my name is Larry Simpson. I work for the Gulf States Marine Fisheries Commission and am on the MARFIN Steering Committee. All of you have a copy of the abstracts with the one addition, and you have an agenda before you. Concerning the two Co-chairs which we had initially planned to be the overall Chairmen of the meeting, one had a university problem--Dr. Shipp, who is the Chairman of the Gulf Steering Committee, and Bob Mahood, who is the Executive Director of the South Atlantic Fisheries Management Council, had a meeting which was inadvertently scheduled at this time slot. I'm filling in, and this is your official welcome to the Fifth Annual MARFIN Conference. For those of you who are new in the audience and have not participated in this forum, we have had conferences in Tampa, San Antonio, New Orleans, Orlando and now we're here in Corpus Christi. Our aim is to try to get as much outside participation as possible. The reasoning for our scheduling the meeting in this location was that Southeastern Association of Fish and Wildlife Agencies and AFS were meeting in a similar time slot here in Corpus, and we hoped to get some additional participation. All of the MARFIN symposiums are held about this timeframe, October-November. Besides being a requirement for funding your project, we on the steering committee feel that this forum gives a mechanism of broad distribution of new work and results among your peers and to some degree to the outside lay public. It also helps researchers know what our thinking is from the interchange of questions and answers. Further, it helps the Steering Committee to set their future priorities for requests of new work and, present company excluded, it gives the scientists a deadline for publishing your extremely helpful information which as managers and agency personnel is so desperately needed. We need to use this information; we need to get the information out, thus the reason for a coordinated symposium. The proceedings of this conference which will include a write up of your abstract and questions and answers will be published. You will have an opportunity to review that before publication to make corrections and additions. I would like to introduce the Steering Committee members who are here today. This is the first year of the South Atlantic MARFIN program. As yet, they have not seen this activity, and unfortunately, it doesn't look like they're going to learn much this year because of their scheduling conflicts. The Gulf group is represented here with Scott Nichols from Pascagoula representing NMFS, Terry Leary from the Gulf Council, Jack Van Lopik representing Sea Grant from Louisiana, Corky Perret from Louisiana representing the Gulf States, myself representing the Commission and Jean Martin-West who is the ex-officio member of the Committee from NOAA Grants. There are a lot of presenters here. We are going to do this in two days and to accomplish this we will adhere strictly to the time schedule. At the end of each presentation we will entertain questions from the audience and from the Steering Committee. In the event that a presenter takes his entire 20-minute time slot then we'll move on to the next presenter and take questions of the whole panel at the end of the session. Each session chairman is the ultimate dictator over that session, and we have one minor correction in your program. On Session I, Coastal Pelagics, instead of Jane Black who will be touching down in approximately 15 minutes, Corky Perret will take that session. Instead of Corky Perret in the Session V beginning tomorrow, Jane Black will take that session. Otherwise, Terry is here for his next session; Jack, myself and Scott will take the

bycatch activities. You have all the equipment that you need--we have video, we have overheads, we have slides, and I have a laser pointer here that I'm very proud of that I bought just for the conference. We will dim the lights for presentations, these two lights only, the rest of the lights will stay on for writing notes. With that, thank you for being in Corpus Christi for the MARFIN Fifth Annual Principal Investigators Conference. Now it is my pleasure to give it to Dave Pritchard who handles the MARFIN program for NMFS at St. Petersburg.

CONFERENCE OBJECTIVES - David L. Pritchard, MARFIN Program Officer

Thank you, Larry. On behalf of the National Marine Fisheries Service Southeast Regional Offices, I would like to welcome you to the Fifth Annual MARFIN Conference. Dr. Andrew Kemmerer, The NMFS Southeast Regional Director, asked me to express his regrets at not being able to be with you today for this conference. MARFIN is an unique federal competitive financial assistance program. It was created to bring together the best scientific, technical, industrial and resource conservation and management talents and experience of the region to design and conduct cooperative programs that will facilitate the maintenance and restoration of the marine fishery resources of the region. To be successful, a program such as MARFIN requires great planning and cooperation, and the timely dissemination of the results of both successful and unsuccessful efforts. This is why each recipient of funding under this program has an obligation to attend a MARFIN conference and to report on the project's results. MARFIN Conferences are held annually. Each conference is designed to accomplish four things: 1) to stimulate the free interchange of ideas among participants; 2) to provide for the rapid distribution of the results of MARFIN projects to managers, researchers, industry, and other interested groups and individuals; 3) to encourage other investigators to become involved in the MARFIN Program; and 4) to assist the MARFIN Steering Committee, which is composed of representatives of the states, the fishing industries, the fishery management councils, Sea Grant universities, the marine fisheries commissions, and the National Marine Fisheries Service, to evaluate the benefits of ongoing programs and to identify priorities for future MARFIN programs. This year we have perhaps the greatest number of presenters of any MARFIN Conference. A special seminar on bycatch has been added so that emphasis can be given to this very important topic. The next two days will be filled with presentations and discussions of state-of-the-art fishery research and management. I am sure that all of you are looking forward to learning more about techniques for improving the stewardship of our nation's marine fisheries as much as I am. I'd like to thank you for your participation in this very important program and look forward to continuing to work with you in the administration and the financial assistance elements of the program. Before I go on there are two people that I want to introduce to many of you since we have principal investigators here and they're giving presentations. You don't see them very often but they're very important in the administration of the, I guess you would call it, bureaucratic end, first is Jean West. Jean is the NOAA Grants Officer; she's in charge of all of your administrative aspects and all the financial assistance programs at NOAA. Jean is, as Larry already mentioned, an ex-officio member of the MARFIN Steering Committee and we've enjoyed the opportunity to work with her down through the years and we've relied on her very heavily for assistance and guidance in this cooperative program. Another person that works in the cooperative program division office in St. Petersburg, Florida, is Ellie Roche and many of you have talked to Ellie, and she's talked with you. She's responsible for pulling together all of the elements of your applications and your

reports and a lot of other things that are necessary to take care of all of the agency requirements. Ellie does an excellent job, and this is her first MARFIN conference and her plans along with Jean will be to become more involved in the administration of this program. With that I'll turn it back over to you Larry.

LARRY SIMPSON - Thank you, I appreciate those comments, and we look forward to hearing and seeing Andy as we continue. David has taken over this program and is doing a great job as far as the Commission is concerned with the NMFS portion of the administration, and we're thankful for his work. Before I give it to the ultimate authority for this session, which means I can go get coffee, I'd like to introduce two ladies on my staff lest you get the idea that I did all this stuff. I didn't have a thing to do with it; I just showed up. Ms. Lucia Hourihan, the publications specialist at Gulf States, who does a lot of work with MARFIN and Cheryl Noble, who supports various activities for the Commission. Incidentally, probably all of you have talked to Ginny Herring who does a lot of the travel and logistics from the office. One other comment, we are interested, I think I can say that very forcefully, we are interested in the results of your work. We appreciate the mechanism and how you designed it, but we are interested again in the results of your work. So please keep that in mind when you develop your future presentations. With that I give it over to our first chair for Coastal Pelagics, Mr. Corky Perret.

SESSION I
COASTAL PELAGICS

SESSION I - COASTAL PELAGICS - William S. Perret, Chairman

Thank you Larry. Fortunately, all three of our speakers are present and I'm sure ready to present their findings. I can say from a manager's standpoint the coastal pelagics are certainly a very important species to both the recreational and commercial users and on a percentage of time basis relative to management agencies, states and/or council, both generally take an inordinate amount of time to address their problems. We spend a lot of time on trying to arrive at the best decisions we can on managing these species and, of course, input from the scientists like the three that are getting ready to present their information to us are what we depend on to a very large extent when we make these decisions so with that, Karen you're first up. Karen Burns with Mote Marine Lab will talk to us about "King and Spanish Mackerel, Red Grouper, Red Snapper Stock Assessment in the Southern Gulf of Mexico." Karen, I think you've got twenty minutes according to this schedule. Thank you.

KING AND SPANISH MACKEREL, RED GROUPER AND RED SNAPPER STOCK ASSESSMENT STUDY IN THE SOUTHERN GULF OF MEXICO

Karen M. Burns
Mote Marine Laboratory
1600 Thompson Parkway
Sarasota, Florida 34236

Abstract

Statement of Purpose

Goals and Objectives:

1. To determine the movement and migration of king and Spanish mackerel in the southern Gulf of Mexico.
2. To obtain length/frequency and CPUE data for king and Spanish mackerel, red grouper and red snapper captured in Mexican waters.
3. To procure king and Spanish mackerel, red grouper and red snapper specimens for stock assessment studies.

Schedule:

This project is of 1-year duration. However, 1992 is the seventh consecutive year Mote Marine Laboratory (MML) has conducted this research in cooperation with the National Marine Fisheries Service (NMFS-Panama City Laboratory) and the Mexican Instituto Nacional de la Pesca (INP) under the auspices of the MEXUS-Gulf Agreement. Since the winter collection effort will take place in November and December, data for this project are not complete.

Results

To determine movement and migration patterns of king (KM) (Scomberomorus cavalla) and Spanish (SM) (Scomberomorus maculatus) mackerel in the southern Gulf of Mexico, a total of 3,092 (1,855 KM and 1,237 SM) mackerel has been tagged during the last seven years. From November 1, 1991-September 23, 1992, 7 Spanish mackerel tags have been recovered. During the past 6-1/2 years, 278 mackerel (189 KM, 89 SM) have been recovered under MML's Rapid Reward System for an 8.9% tag return rate. Data from returns have been analyzed and are included in "King Mackerel, Scomberomorus cavalla, Movements and Migrations in the Gulf of Mexico" by W. Fable, Jr., J. Vasconcelos, K. Burns, K.R. Osburn, L. Schultz R., and S. Sanchez G, submitted to Fisheries Bulletin. Length/frequency measurements for king (4,761), Spanish (3,174), cero (580) and Serra Spanish (167) mackerel were recorded during 1992, making a total of 23,725 king, 12,815 Spanish, 954 cero, and 199 Serra Spanish mackerel measurements during the past 6-1/2 years. During length/frequency data collection, the presence of a previously unreported mackerel species in the Gulf of Mexico, S. brasiliensis, was discovered. A paper reporting the range extension for this species, "The Occurrence of Serra Spanish Mackerel (Scomberomorus brasiliensis) in the Southern Gulf of Mexico" by K.M. Burns and B.J. Palko is currently being reviewed by B. Collette, NMFS Systematics Lab, U.S. National Museum, who originally described the species. In addition, 2,964 red

grouper and 117 red snapper were measured. In 1992, 3,570 CPUE measurements were obtained, providing a 6-1/2 total of 8,921 measurements. All data are being compiled according to NMFS-Miami format for use in the next western Gulf mackerel stock assessment. In 1992, 206 adult mackerel, 100 red grouper and 44 red snapper samples were sent to NMFS-Panama City for electrophoretic studies. A 7-year total of 2,901 mackerel samples (1,345 king, 975 Spanish, 155 cero, 23 Serra Spanish, 403 juvenile king) has been sent to NMFS-Panama City for electrophoresis. Otoliths from adult king (198), and Spanish (202) mackerel were collected during 1992. Combined with the collections from previous years, the total number of mackerel otoliths obtained is 1,854. Right otoliths were sent to NMFS-Panama City, the left to INP-Mexico City. The 1992 values and 7-year totals are not final as work will continue in Mexico through December 1992.

L/F Summary for King and Spanish Mackerel from Mexican Gulf States

1986–1992

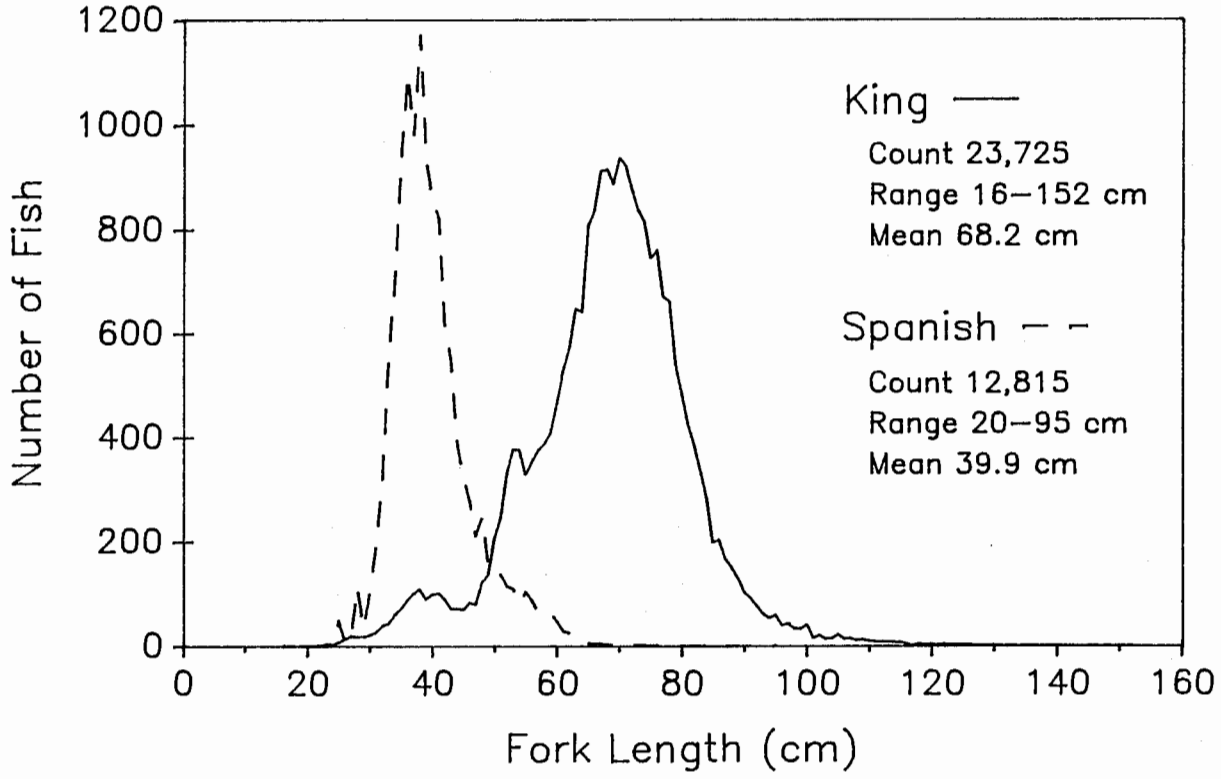


Figure 1. Number of mackerel tagged off Mexican Gulf coast states (1986-1992).
Figure 2. Important tag returns from Texas to Mexico (1986-1992).
Figure 3. Significant long distance tag returns from Louisiana to Mexico (1986-1992).
Figure 4. Significant tag returns from Florida to Mexico (1986-1992).

Fig. 1

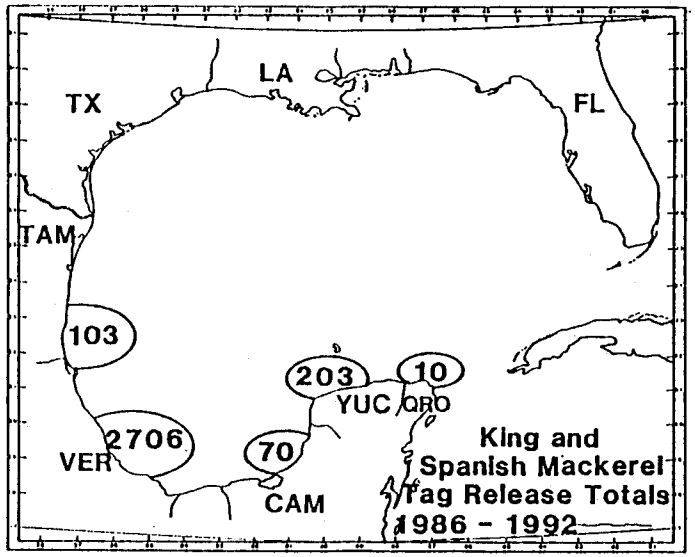


Fig. 2

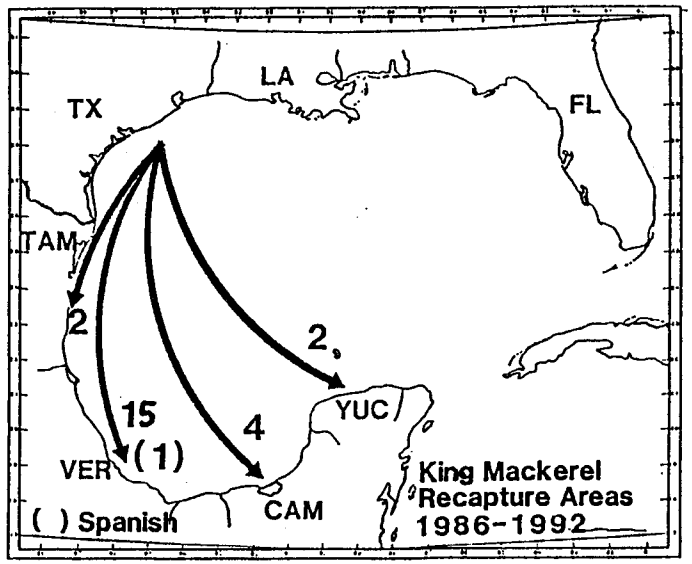


Fig. 3

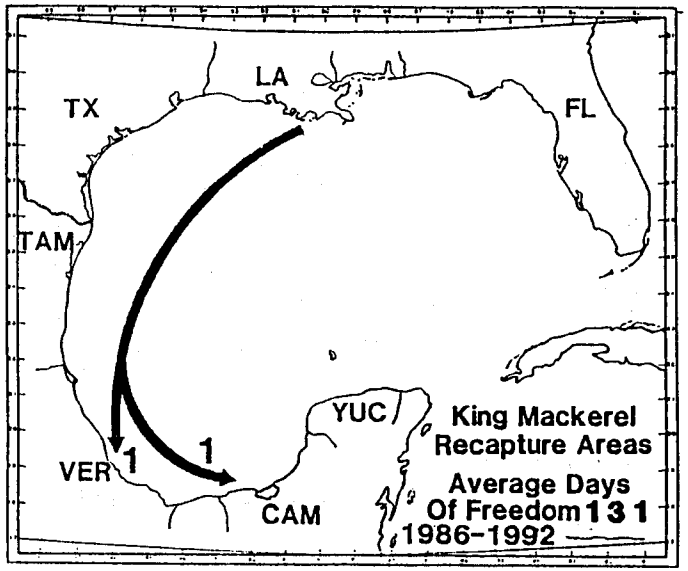


Fig. 4

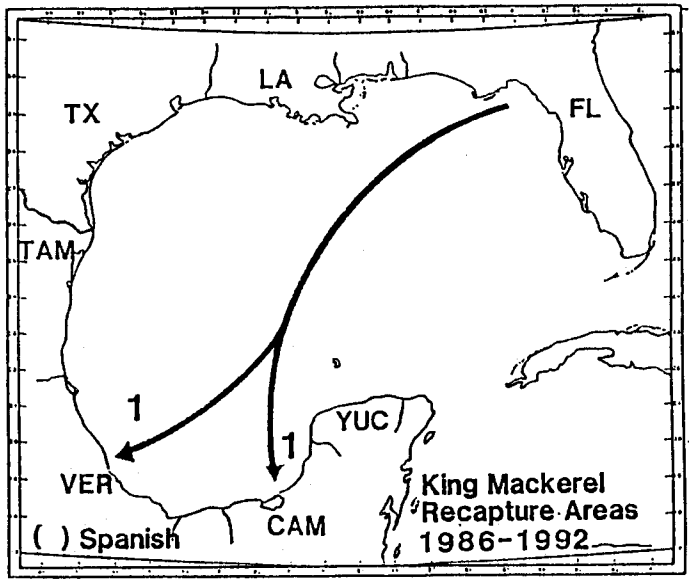


Figure 5. Significant tag returns within Mexico and from Veracruz, Mexico to the U.S. (1986-1992).
Figure 6. Important long distance tag returns from Tamaulipas to other Mexican states (1986-1992).
Figure 7. Significant long distance tag returns from Campeche to other Mexican states (1986-1992).
Figure 8. Important tag returns from Yucatán to Veracruz (1986-1992).

Fig. 5

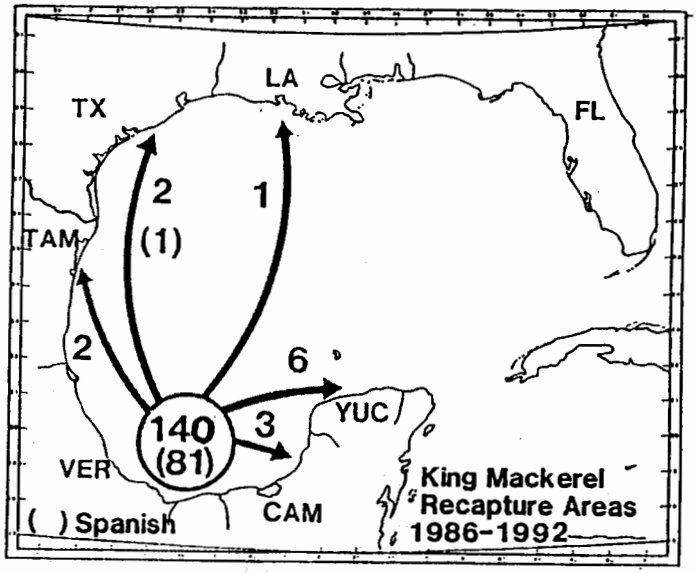


Fig. 6

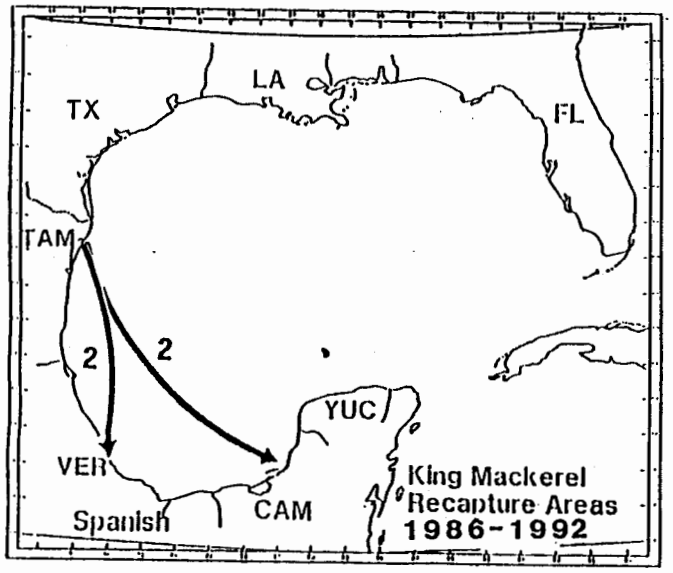


Fig. 7

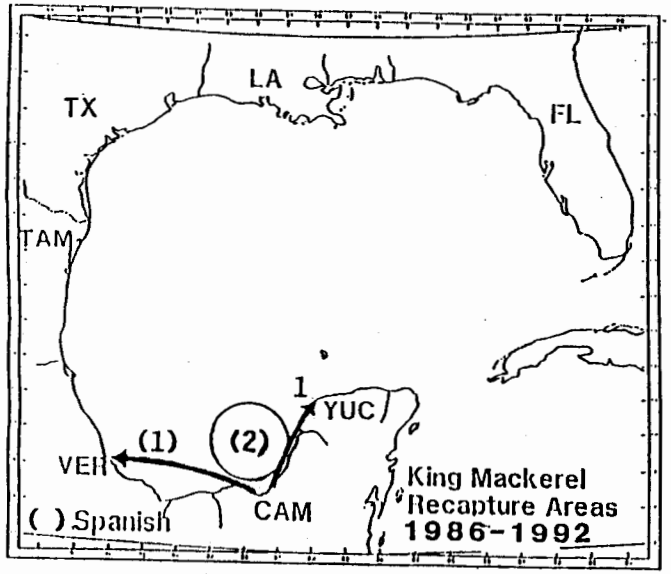
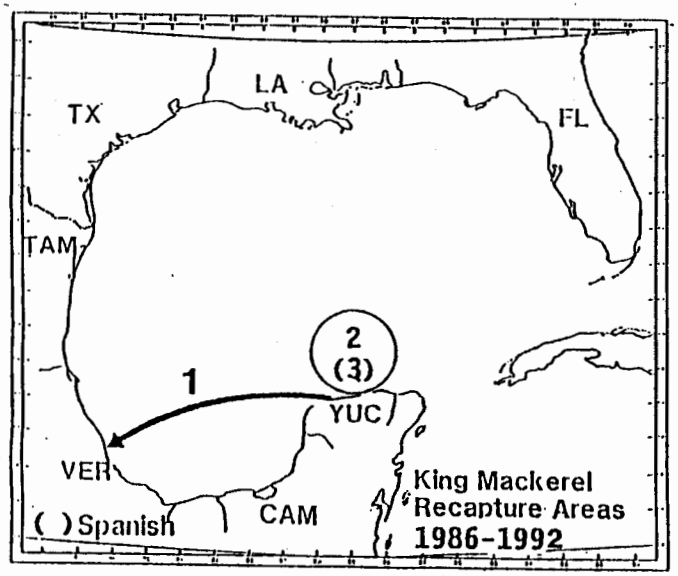


Fig. 8



CORKY PERRET - Thank you very much. What we're going to do is have the three presentations and, none of you speakers have to leave right away do you, then we'll entertain questions after this okay good. Thank you, Karen. Nelson Ehrhardt from the University of Miami is next, and his presentation will be on "Implementation of a Log Book System for Spotter Pilots and Fleet Captains to Record Observations on Mackerel Schools in South Florida."

Implementation of a Log Book System for Spotter Pilots and Fleet Captains to Record Observations on Mackerel Schools in South Florida

Nelson M. Ehrhardt
Rosenstiel School of Marine and Atmospheric Science
University of Miami
4600 Rickenbacker Causeway
Miami, Florida 33149

Abstract

Introduction

Migratory pelagic species in the eastern Gulf of Mexico represent an important resource to the sport and commercial fishery sectors. Among those species, king and Spanish mackerel are the two most intensively exploited species, and therefore, the subjects of considerable management actions.

An important commercial run-around gillnet fishery operates on the winter schooling mackerels in south Florida. Over 80% of the annual commercial quotas allocated to these species in the Gulf of Mexico are realized during the winter fishery. Very little information is available on the spatial-temporal winter distribution of the schooling mackerels and of the commercial activities carried out upon those schools. One way to investigate the impact of fishing upon schooling mackerels in south Florida is by documenting the activities of spotter planes and of the resulting catch of their associated fishing fleets. In order to plan an initiative to gather information on fishing schooling mackerels, the National Marine Fisheries Service sponsored a small scale pilot project in the winter of 1988 to design and test a log book system for spotter pilots and associated captains. Based on preliminary information generated by the pilot project, a two-year MARFIN project was developed and implemented in 1990.

The goal of the project was to determine the temporal-spatial distribution of schooling mackerels and the character of the directed fishery acting upon them. To accomplish this goal the objectives of the project were: (1) to obtain data on the winter distribution and abundance of mackerel schools from log books implemented in the spotter planes and associated fleets, (2) to estimate the level of school utilization by the fleets, (3) to describe the operational characteristics of the fishing fleets associated with spotter planes and (4) to describe environmental and other factors affecting fishing operations and school distributions.

Summary of Results

Results from this project have permitted a better description of the spatial distribution of fishing operations and definition of the relationship between schooling biomass estimated by spotter pilots and the amount of biomass actually caught by the fleet. In general, the area of operation is limited between the 8 and 30-feet isobaths and in an area immediately to the north of the Florida Keys, between Rebecca Shoal and Smith Shoal. Distribution of fishing operations within this general area are well correlated with spatial availability of the schooling biomass detected by the spotter

pilots. On average, 16% to 25% of the estimates schooling biomass is caught per set, and a linear relationship exists between landings and observed biomass. This relationship holds for the range between 0 and 800 thousand pounds of schooling Spanish and king mackerel estimated by the spotter pilots.

Fishing fleets have significantly changed their operational activities associated with spotter pilots during the last two years. This is as a consequence of spotter pilots dropping out of the fishery and new arrangements made between the fleets and the remaining pilots. Consequently, at the end of the project, many of the original boats selected for this project were no longer operating under the guidance of spotter pilots and several boats were contracting spotting services on an ad hoc manner. This situation greatly complicated the implementation of the log book system during the last year of the project due to the substantial amount of research that had to be done to find out which vessels will be associated with which plane. In many occasions captains new to the project were reluctant to participate, therefore, creating a mismatch between landings and the information reported by spotter pilots.

It was concluded that the information generated by the project can be very important to the stock assessment-fishery management process, however, the added complexity of spotter plane arrangements with the fleets will require a substantially larger investment if a similar future project is implemented.

CORKY PERRET - Thank you very much. Our third presenter this morning is Nancy Thompson with National Marine Fisheries Service. She will talk to us on the "Migratory Group Composition of King Mackerel in the Florida Keys."

Migratory Group Composition of King Mackerel off the Florida East Coast

Nancy Thompson
National Marine Fisheries Service
Southeast Fisheries Center
75 Virginia Beach Drive
Miami, Florida 33149

Abstract

King mackerel is an important commercial and recreational resource. Currently, king mackerel are managed as two separate migratory groups, the Gulf of Mexico group and the Atlantic group. The gulf group is considered overfished; the Atlantic group is not overfished. Based on results of mark-recapture work conducted by the Florida Department of Natural Resources from 1975-1979, it was estimated that from 29% to almost 42% of the fish captured in the winter along the Florida east coast belonged to the gulf migratory group. This species is managed such that when the gulf group commercial and recreational quotas are met, fishing is no longer allowed, even within federal waters of this transition zone. Tagging of king mackerel within the winter Florida east coast area was re-initiated in 1988 with the objective of duplicating the 1975-1979 FDNR study. The purpose of this new study is to re-examine the proportional representation of gulf and Atlantic migratory group fish. The current stock assessment analyses can incorporate shifts in the proportional representation of groups. In 1988-1990, 1,500 fish per year were tagged. To reach the duplicate sample size of 11,000 fish would require at the 1,500 per year rate, over 7 years. With MARFIN funding, the Miami Laboratory tagged 3,000 king mackerel in 1992. Tagging was accomplished with commercial fisherman off Ft. Pierce and Key West, Florida, and recreational charterboats off Islamorada. Preliminary examination of recaptures from 1985 to February 1992 indicated that over this period no more than 25% of the fish in this area were from the gulf migratory group. Final analyses of these data will be completed after one final year of tagging and results will be incorporated into the assessments for these stocks.

CORKY PERRET - Before we go any further, Jane will you come up here? I would like to also introduce Jane Black; Jane represents the commercial industry on the steering committee.

JANE BLACK - I apologize for my late arrival.

CORKY PERRET - That's no problem. Among other things, Jane is a voting member of the Gulf of Mexico Fishery Management Council. She is from Louisiana and a real pleasure to work with. We've all heard Karen, Nelson and Nancy's presentations, thanks for three excellent presentations. The subject matter is certainly of interest to, I guess, all of us that are in this room. I'll entertain questions from the steering committee members first, and then if we have any questions from the audience, we'll go to them.

SCOTT NICHOLS - Karen, you mentioned the Islamorada in the gulf and Atlantic fish. Is it because of lack of mackerel in particular or is it something else?

KAREN BURNS - A lack of all the different coastal pelagics species that they normally catch in there. King mackerel, spanish mackerel, bonita, all the different types of fish, the number of fish that they would be catching is going down yearly - the total catch.

CORKY PERRET - I've got a couple of questions. Karen, did I understand you to say that you could only, they would only allow you to tag Spanish mackerel this year?

KAREN BURNS - Yes.

CORKY PERRET - Any reason?

KAREN BURNS - It's their country.

CORKY PERRET - Okay, I can understand that. I just wanted to know why. Nelson, I also have a question for you. I think I read in your abstract between 0 and 7, 8, 900 thousand pound schools, they could expect to catch sixteen.

NELSON EHRHARDT - Twenty percent of that biomass.

CORKY PERRET - And you're comfortable that those figures are pretty accurate.

NELSON EHRHARDT - That is what the figure is trying really.

CORKY PERRET - Yeah.

NELSON EHRHARDT - We have to be careful in the addition of the figure. The X axis is the guess estimate by the spotter pilots. The only thing that we can conclude of the figure is that the guess estimates are very consistent. That is what we can conclude of the figure. It is consistent in terms of the landings and the guess estimate. Hopefully, the guess estimate is not that biased. That is the reason why we implemented a hydroacoustics survey, just to correlate the accuracy of these guess estimates. And indeed the guess estimates are very approximate. And I will

like to add just one comment on the mackerels not being close to shore in Mexico probably, we have observed that phenomenon employed to this past season of the fleet operating off Merida could not find any fish, and the fleet was idle and the fish went all off shore which is a very peculiar behavior we don't understand why.

CORKY PERRET - Thank you. Nancy, I think you said your target was to tag 3,000 fish - you tagged 3,100. Is that because the abundance of fish was much greater or that you worked a little harder?

NANCY THOMPSON - Yeah, I think that we basically had more people out there; we had more boats that were operating. Yes, the fleets were not very large in the past. One boat has been used out of Ft. Pierce and one boat out of Key West. We were able to meet our target with one boat in Key West, but we increased the numbers of boats that we used, we doubled it in some instances. For a certain period of time, I think we actually had three boats operating out of the Ft. Pierce area. So that does make a difference.

TERRY LEARY - Yes, I had a question for Nelson, did I see in a news release or something that the Florida Marine Fish Commission is imposing some sort of restrictions on the use of spotter pilots in the mackerel fisheries, have you heard anything?

NELSON EHRHARDT - I haven't heard anything. That would be detrimental to the people obviously.

LARRY SIMPSON - I had a question of Karen. Do you anticipate any political problems with obtaining data from Mexico in the future years?

KAREN BURNS - It's really hard to say. It all depends on the administration, and also I suppose what happens with the Cuban embargo and TED's and things of that nature.

LARRY SIMPSON - I just understood that there was a law passed that said the analysis of all the data had to be done before it could be taken out, and I was wondering if that will affect future work?

KAREN BURNS - That's true, however, the interpretation of the analyses by the director of the Instituto Nacional de la Pesca could be anything from a published paper to a table made by biologists at the Instituto. So it's up to the discretion of the director of PESCA.

EUGENE NAKAMURA - Nelson, in the regression you showed the estimate of the biomass by the spotter pilots. The estimate that was encircled by the net, was it higher or...

NELSON EHRHARDT - No, not at all. This entire school, and he would set a boat in one corner so he doesn't destroy the school and...

EUGENE NAKAMURA - But then your regression implies that these boats are affecting the entire school.

NELSON EHRHARDT - No. It's the direction of that figure shows is that a fraction of the school that was actually landed. That is what it is. For example, there are several boats that may land from a given school. Those are added in the figure that's landed. Okay, let us assume, for example, that you have a 400 thousand pound school estimated by the spotter pilot and probably 3 boats caught some fish from that school and let us assume that it's 40 thousand pounds.

EUGENE NAKAMURA - One more question, these nets are gill nets and they surround a school and the nets reach the bottom, do they not?

NELSON EHRHARDT - Yes.

EUGENE NAKAMURA - Does that have anything to do with the schools always being found in the same area year after year, or are the fish actually occurring in the same area year after year?

NELSON EHRHARDT - Well there is a limitation in terms of depth. Basically, they don't fish beyond thirty feet basically because of NMFS. Later on in the season the schools will move to deeper water and they are not reachable by the plane. There's a lot of steering inside the net. There are very many things going on with the fishing power of the system in such a way that the fish are truly gilled, and it depends on the ability of the fishermen actually on how they do this.

DAVE BURRAGE - Is the correlation between the spotter pilot estimates and actual school size based on hydroacoustics?

NELSON EHRHARDT - No, no, no.

DAVE BURRAGE - If the correlations are pretty accurate (in other words that sixteen percent that we see that the fishermen actually catch), is that just due to fishing efficiency and not from any differences in an overestimation from the pilot of what's actually there?

NELSON EHRHARDT - Well, the overestimation probably is the scattering you see in the figure and, once again I think that the value of that figure is the consistency. The trend and the slope means consistency, it's a consistent procedure. They are able to, for example, a spotter pilot guess estimates 800 thousand pounds of fish. Sometimes the schools are lost in the horizon. They are very widespread, and they have to fly around in such a way that the line penetrating gives him the idea of what is under there. But basically this is just a guess estimate. His guess estimate and he's taking note of this. He doesn't have an idea of what will be landed later on. So the two log book systems are totally independent, basically. My only concern was to correlate things in such a way that if three vessels were setting nets on a given school I have the records of those three sets. Relative to the guess estimate.

CORKY PERRET - Okay, with only one spotter pilot left do you think you're qualified now to spot the fish?

NELSON EHRHARDT - I can be a good pilot.

CORKY PERRET - Ha, Okay - with that I think we just ended. It's the next chairman's time by just a few minutes so I'll turn it over to Terry Leary who is going to chair this next session. I want to thank you three speakers for fine presentations and staying within your time frame.

NELSON EHRHARDT, KAREN BURNS, NANCY THOMPSON - Thank you.

SESSION II
REEF FISH AND OCEAN PELAGICS

SESSION II - REEF FISH AND OCEAN PELAGICS - Terrance R. Leary, Chairman

If the next group of presenters will move up to the table, I see we're getting some name plates out. Bring your coffee, our time is moving, and we've got a lot of real interesting work to hear before we break for lunch. I'm sitting in for Wayne Swingle who is the primary member of the steering committee, and I'm his alternate. The reason I'm sitting in for him is because he's out holding public hearings on reef fish this week. So we do have a viable interest in the management of the various reef fishes, and this week red snapper in particular. Our first speaker is Dr. Skip Lazauski from the Alabama Department of Conservation. He works with Walter Tatum as you all know, and he's going to tell us about their work on the "Analysis of Red Snapper from the Alabama Charter Boat Fleet."

Analysis of Red Snapper Catches from the Alabama Charter Boat Fleet

Walter M. Tatum and Henry G. Lazauski
Alabama Department of Conservation
and Natural Resources
Drawer 458
Gulf Shores, Alabama 36547

Abstract

Introduction

The recording of daily catch records by logbooks from charter boat fishermen was initiated by the National Marine Fisheries Service on a pay for basis in 1982-1985. In 1986 reporting by logbooks was made mandatory. Mandatory reporting began in 1986-1987, and the logbooks coming in dropped to near zero. From 1988 the present system has been in use which lets those captains who wish to volunteer do so, though reporting is still on the books as mandatory. Catch records from the volunteering captains are used as a sample from the Gulf of Mexico charter fleet universe, and the sample catch expanded to represent the universe catch.

By agreement with the NMFS, Alabama Marine Resources (MRD) has temporarily taken over the field data collection portion of the NMFS charter boat logbook survey. MRD started this in January 1991 which was prior to the start of this MARFIN project in October 1991.

While analyzing catch records from fisheries can be used to develop trends regarding the general health of the fisheries, the appropriateness of using the logbook sample and expanded catch is questionable without some degree of data validation. If the data is to be used in quota monitoring from intensively managed fisheries, data validation is even more important.

The purpose of this project is to validate, or invalidate, the use of log books from the Alabama charter boat fleet.

Method

Individual charter boat fishermen were canvassed at the time they signed up for participation in the logbook survey to determine the intensity of their charter fishing effort. Contact with the captains in the survey was made monthly at the Orange Beach Charter Boat Association meeting and when they were intercepted for ground truthing interviews. The number of MRD intercepts of the charter boat fishery was determined from the number of estimated seasonal trips provided by the charter captains. We estimated that an intercept rate of 5% to 10% of all charter trips should suffice to authenticate log book reports from the fishery.

Randomly selected trips were intercepted by the MRD personnel from which catch data (all species), angler hours fished, fishing method, number of hooks and number of fish thrown back were recorded. Weekends were weighted more than weekdays in selecting the number of days to be sampled. While the days for the MRD

intercepts were randomly selected, some individual captains who fished more frequently than others, could under the random day selection, have been intercepted on an inordinate number of trips. All data collected were coded in accordance with the National Marine Fisheries Service format and forwarded to the Southeast Fisheries Center Panama City Laboratory and the Southeast Fisheries Center in Miami for inclusion in Gulf of Mexico fishery management plans.

On sampling days, MRD personnel called several marinas to determine the number of charter boats fishing. Personnel would then proceed to vantage points along Perdido Pass in Orange Beach and Government Cut in Dauphin Island Bay where the incoming charter boats could be visually sighted. MRD personnel then proceeded to the marina where a particular boat docked, requested permission from the captain to weight and measure the catch and in all instances were granted permission to proceed. Marine Resources Division data were kept separate from the log book data turned into MRD by the captains in data files with the following results.

Results

As the title of this paper suggests, major emphasis of the research is the validation of log book information received to that ground truthed related to red snapper catches. There were 9,249 red snapper reported to MRD from 10 charter boats during the period from October 1, 1991 to June 30, 1992, while MRD random intercepts produced a total of 1,848 individual red snapper. The 10 captains turned in a total of 289 trip sheets while MRD intercepted 61 vessels for a total ground truth percentage of 21%. The percent length/frequencies of reported catches of red snapper and intercepted red snapper catches were essentially mirror images.

The estimated weight of red snapper kept as reported by the captains averaged 1.58 pounds, while those actual weights by MRD from its samples averaged 2.21 pounds. Similarly, captains logs reflected a throw back of 34% of red snapper catches while interviews at the dock by MRD personnel showed a 32% red snapper throw back.

The other species examined in this paper are amberjack, vermillion snapper, and grey triggerfish. The length frequencies of the reported and validated amberjacks and grey triggerfish were not significantly different. A difference, however, did exist between reported and validated vermillion snapper length frequencies. The following table shows parameters for the four species.

	Average Size (lbs)		Percent Released	
Species	Reported	Observed	Reported	Observed
Amberjack	9.59	13.78	55	53
Red Snapper	1.58	2.21	34	32
Gray Triggerfish	1.65	2.54	6	12
Vermilion Snapper	0.83	0.93	3	2

We are still analyzing the reported and observed length frequencies for vermilion snapper and have yet to determine why this species is either misreported or misvalidated.

TERRY LEARY - Skip left us plenty of time; are there any questions on his presentation?

TERRY CODY - Skip, for those of us who have a lot of different ports around on our coast line, do you have any suggestions if we were to try to do something like this?

SKIP LAZAUSKI - That's a good question, and again the nature of the success was that structurally it was focused in the area of the two passes. We could get them on glasses and know where they were going and right away there was no wasted effort; you are searching for them. A way to handle your question would be call in's. If you had captains who were willing to cooperate they'd call you on cellular phones or VHF radios (e.g., the MARY JANE is coming in; I'll be docking in two hours and blah, blah come on and meet me and do your ground truthing). Something like that. That would have a good chance to work, but again feedback to your people, making sure that they know you're on their side and what the data is being used for, they'll come running, I feel.

EUGENE NAKAMURA - Skip, most of these boats are fishing in federal waters, right?

SKIP LAZAUSKI - That's correct, primarily fishing in federal waters, the trolling boats did fish in the inshore waters inside Alabama's jurisdiction but that was in the minor case.

EUGENE NAKAMURA - The fishery management plan says that if you fish in federal waters then you're asked to report this, it's a requirement, isn't it?

SKIP LAZAUSKI - Yes.

EUGENE NAKAMURA - Does that work?

SKIP LAZAUSKI - No. It just does not work. Now, it's like, getting a kid to clean up his room - clean it up or I'll break your arm, it doesn't work. It's a - clean it because, you know I love you and you're hurting me not doing it and things like this that is a little better to work with children. I think it's the same as with the charter boat captains, but the concept being that you want to convince them that it's for their betterment.

EUGENE NAKAMURA - So we can't get enforcement to act and that's not a problem?

SKIP LAZAUSKI - Enforcement's always a problem, it is, agreed. But, you know, I mean remember how the survey went when the National Marine Fisheries Service said it's mandatory, then the survey just went to hell in a handbasket. Then we came back and said okay we want you to do it, and we're probably not going to put the screws to you if you don't do it. They came back.

EUGENE NAKAMURA - Another aspect of this is the quality of the data you get when you require them to turn it in versus those who are volunteering to provide the data.

SKIP LAZAUSKI - It works well, I really like the volunteer aspect because it just goes hand in hand with what's happening around the nation. It's getting people more involved with the natural resources. If they feel they can make a difference by what they're doing they'll help out.

LARRY SIMPSON - I want to philosophize about this. You're collecting data, you've got to decide up front if it's for information or enforcement. I strongly believe that. And I say it over and over again, the lawyers in Washington say well, let them subpoena you, you can get it with that. But if you use it routinely for enforcement or permit sanctions, you're not going to get anything. Skip and the Alabama personnel did that right the way they did it.

SKIP LAZAUSKI - Now in Alabama we had this rule for a long time under various directors...I don't come to enforcement and tell them what this dealer's doing. If I see speckled trout, which is a game fish, in his cooler, in his dealership, I'm not going to get him busted because I will lose a whole vast range of data from that person and he trusts me to know that I'm not going to do that and so we have separation of Church and State of gun and measuring board and in Alabama they don't cross.

EUGENE NAKAMURA - I might add that in our charter boat surveys we also rely on volunteers, people who volunteer. But, like in Alabama the number of participants is falling off considerably and it might very well be due to the same reasons as your charter boat captains.

SKIP LAZAUSKI - They were very irritated about the Council's decision and they thought it was - they said here's the rules, we're going to obey them and they did. The commercial guys used up their quota and were shut down. Then the commercials go running to the Council complaining; in turn, the Council gave them an increase in their quota. That's breaking their own rules and that really, really ticked them, the charter boat captains, off.

TERRY LEARY - Our next speaker is Christopher Koenig, and he is from the Caribbean Marine Research Center and he is going to talk about the "Spawning Biology of Shallow Water Gulf of Mexico Groupers," a very important recreational and commercial fishery in the Florida area.

Spawning Biology of Shallow-Water Gulf of Mexico Groupers

Christopher C. Koenig
Department of Biological Sciences
Florida State University
Tallahassee, Florida 32306

Abstract

The objectives of this research were to define the spawning behavior, location and timing (seasonal, lunar and daily) of gag, Mycteroperca microlepis, and red grouper, Epinephelus morio, in the eastern Gulf of Mexico. Because scamp, M. phenax, were commonly caught with gag, we included them in our analyses. Characteristics of spawning were determined from offshore cruises on commercial fishing vessels and the analysis of gonads obtained from commercial and recreational fishermen. Underwater observations were made through the use of SCUBA and ROV. Spawning periodicity was evaluated through the analysis of daily incremental growth of juvenile otoliths. Additionally, we reared and described the early larval stages (at least to flexure) of the above three species as well as those of the tiger grouper, M. tigris. Field caught ripe females were injected with gonadotropin (1 IU/g) to accelerate egg hydration then stripped and fertilized, using minced testes, in the laboratory.

Areas of intense gag spawning were located with the help of commercial fishermen. Scamp and red grouper also spawn in the same area but gag dominate the commercial catch. Gag spawn in a depth range of about 40 to 120 m. Patchy aggregations are concentrated around the 80 m (40 fathom) isobath from southwest of Apalachicola to west of Tampa. Scamp and red grouper spawning occurs in the same depth range as that of gag; however, red grouper may spawn at depths as shallow as 20 m. Although mature gag (i.e., >50 cm FL) were caught at depths less than 40 m during the peak spawning months, their gonads were inactive.

Gag spawn from February through April with the most intense spawning late February through mid-March. Spawning dates back-calculated from juvenile daily-increment otolith analyses corroborate these spawning times for gag. Scamp and red grouper begin spawning at about the same time as gag, but their season extends into the summer at least to June. There is some evidence that gag spawning intensity increases on the new and full moons, and the most likely time of day for spawning is dusk.

Gag sex differs markedly from that of the other two species. Of 534 gag that were examined for sex only 2% were male (9 male and 2 transitionals). In comparison, 20% of the scamp and 16.3% of the red grouper examined were male. The significance of the low numbers of male gag in the catches in unknown. Male gag were always large (typically between 18 and 23 kg), had a distinctive color pattern and were rarely caught in water shallower than 40 m.

Although we have not observed spawning directly, certain characteristics suggest that gag, scamp and red grouper are haremic spawners; that is, a single male maintains a territory which includes a number of females with which he spawns. We assume this spawning pattern because: (1) aggregations are small and patchily

distributed, unlike the relatively large concentrated spawning aggregations of Nassau grouper, E. striatus, and tiger grouper, M. tigris and (2) ripe testes in these species are small and contain small amounts of milt, suggesting that sperm is parcelled out to many females over the spawning season.

According to fishermen, catches of gag and other shallow water groupers have steadily declined over the last 15 years. Such a decline may be due, at least in some part, to fishermen concentrating on spawning aggregations. Reef fish spawning aggregations are notoriously vulnerable to fishing pressure. Beyond a direct reduction of the reproductive potential by removal of gravid individuals, there may be less obvious effects such as disruption of reproductive behavior or the removal of key males in haremic groups. Such removal of males may constitute a significant problem in gag spawning groups if the proportion of males is as low as catch records suggest. It appears that the area along the 40 fathom isobath from southwest of Apalachicola to west of Tampa is presently a major, if not the major, spawning area of gag grouper. We do not know to what extent the spawning area exceeds this range. Historical accounts of commercial fishermen indicate that the 40 fathom bottom between Apalachicola and Pensacola and the Middle Grounds were also important grouper spawning areas. However, these areas have been extensively over-fished, forcing fishermen to fish less accessible areas.

In an effort to protect spawning stocks, we recommend an areal closure to include the depth zone between 40 and 120 m from southwest of Tampa to southeast of Pensacola. Closure should at least include the peak gag spawning time (February and March) but ideally should also include peak spawning in red grouper (April). As large non-spawning gag are present year round in shallow (<40 m) water, grouper fishing need not be closed altogether.

Extensive seagrass beds of west Florida are the ideal nursery habitat for the estuarine-dependent juveniles stages of gag. The relatively short spawning period is timed such that juvenile settlement is well synchronized with the spring burst of productivity in the seagrass habitat providing ample food and protection for the young fish. The potential for replenishment of this species is great considering that 80% of the 10,000 km^2 of seagrass in the Gulf of Mexico is located on the west coast of Florida and, according to our estimates, average densities in certain areas may exceed 50,000 juveniles per km^2.

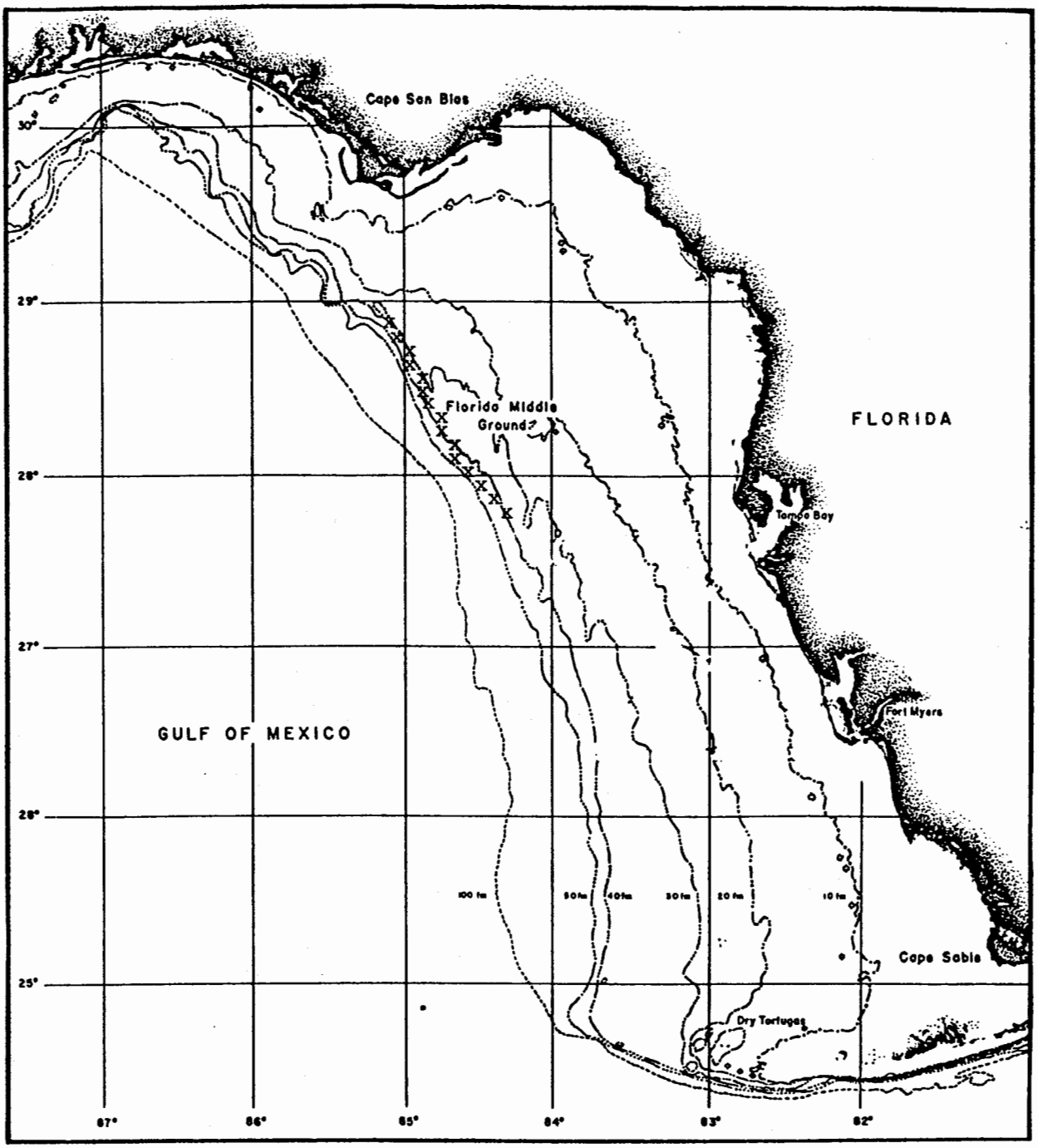


Figure 1. General locations of gag grouper spawning (x's) in the Gulf of Mexico. Isobaths are labeled in fathoms.

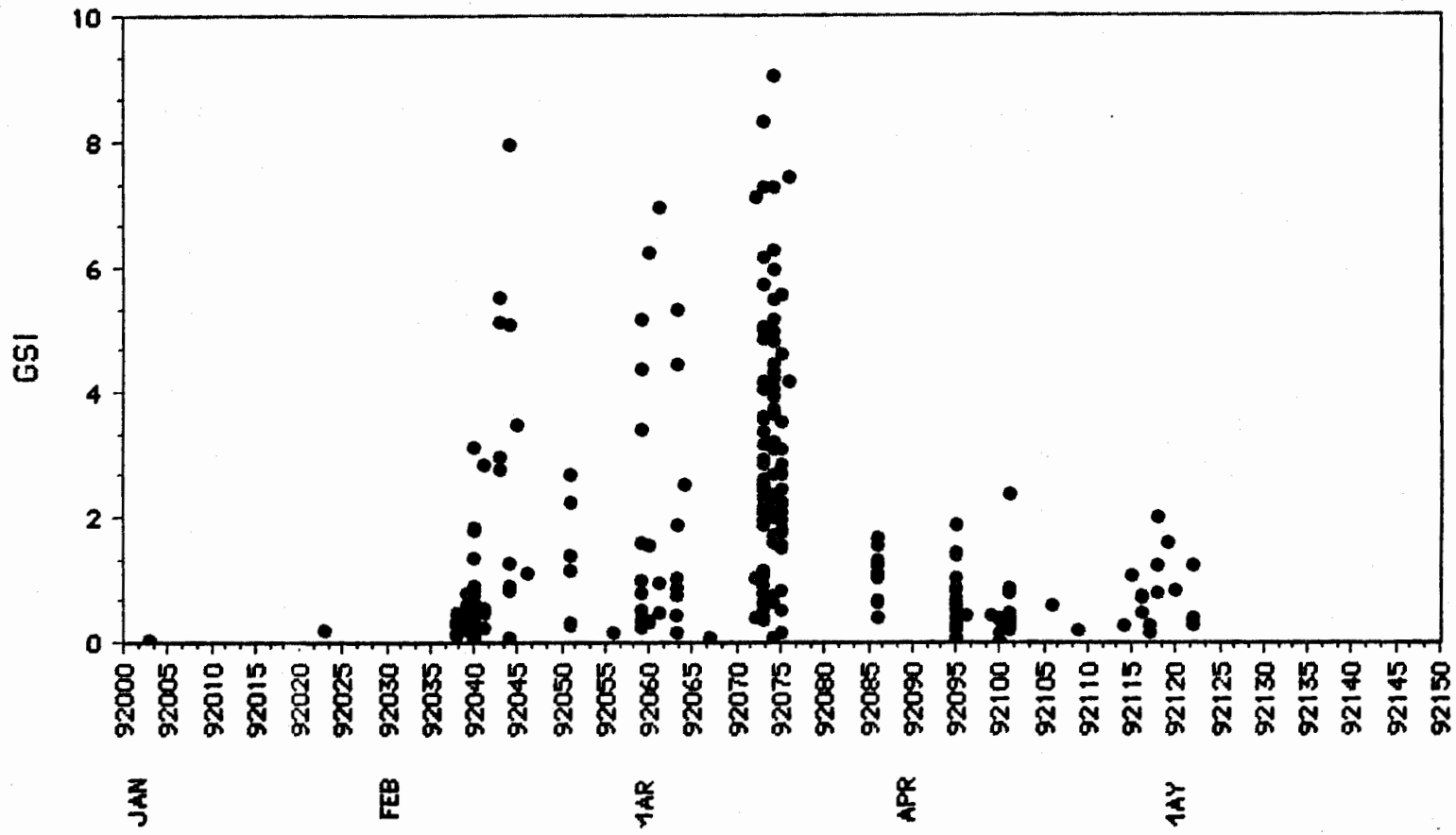


FIGURE 2. Spawning season of gag grouper in the northeastern Gulf of Mexico. The gonadosomatic index, GSI = 100(gonad weight/total body weight), for fish caught at depths greater than 50 m is displayed over the 1992 spawning season.

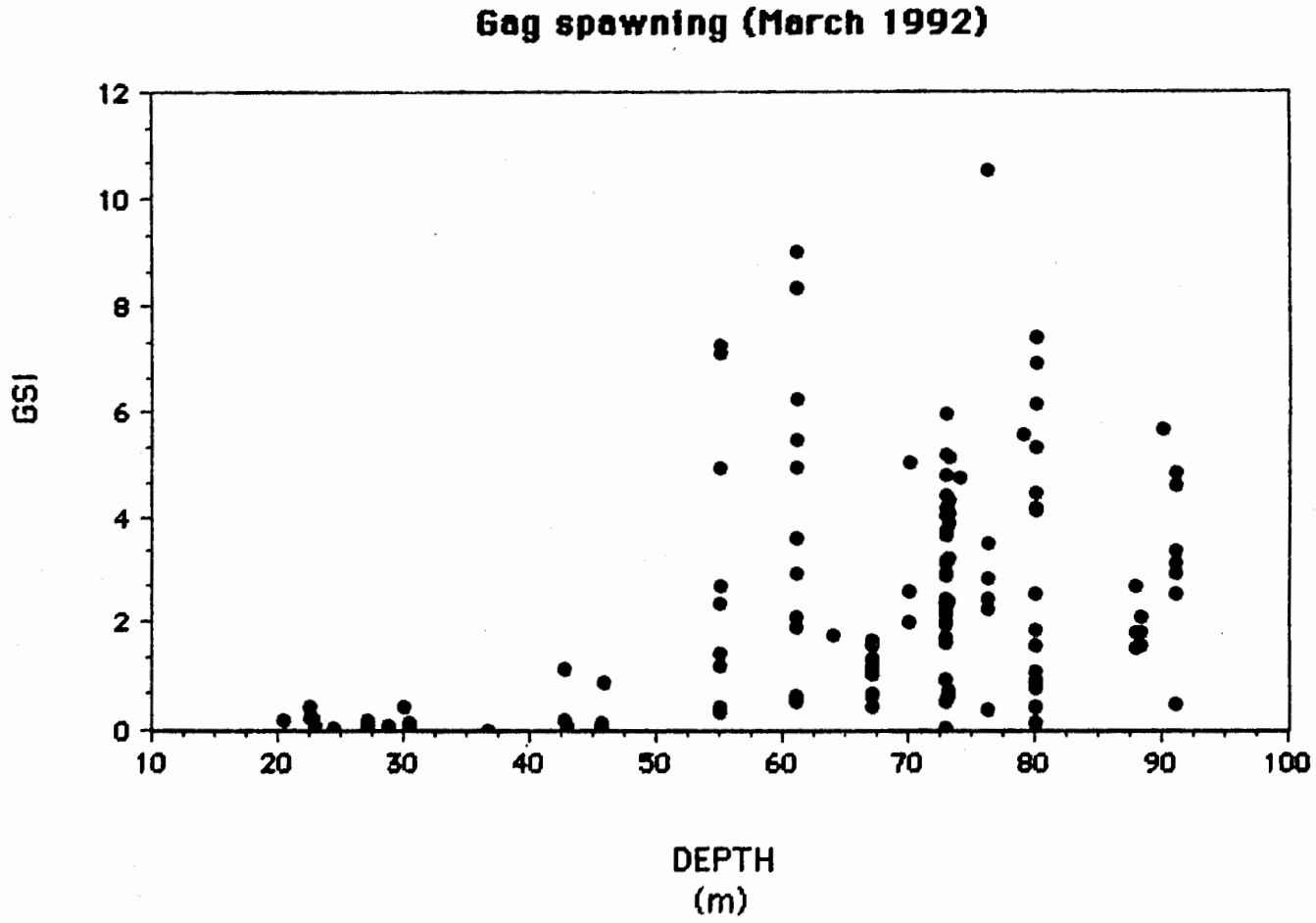


FIGURE 3. Gag grouper gonadosomatic index, GSI = 100(gonad weight/total body weight), relative to depth of capture during March 1992, the time of peak spawning. Mature fish in depths shallower than 40 m had inactive gonads.

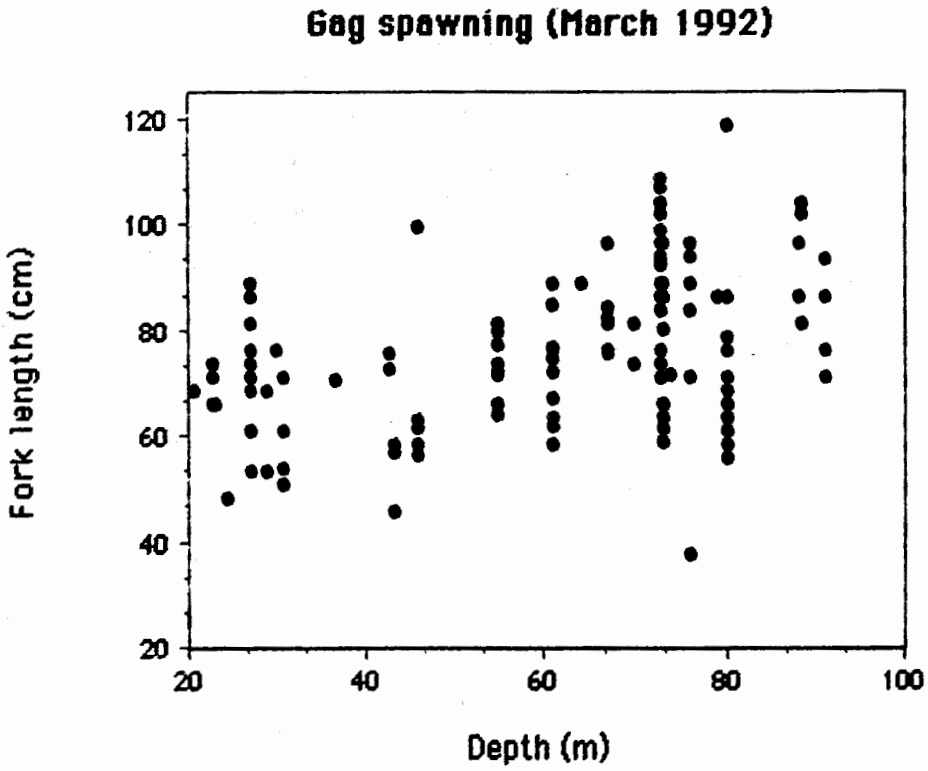


FIGURE 4. Gag grouper sizes relative to depth of capture. Fish were caught during March 1992, the time of peak spawning. This figure, when combined with Figure 3, shows that those fish with inactive gonads were of mature sizes (> 50 cm FL).

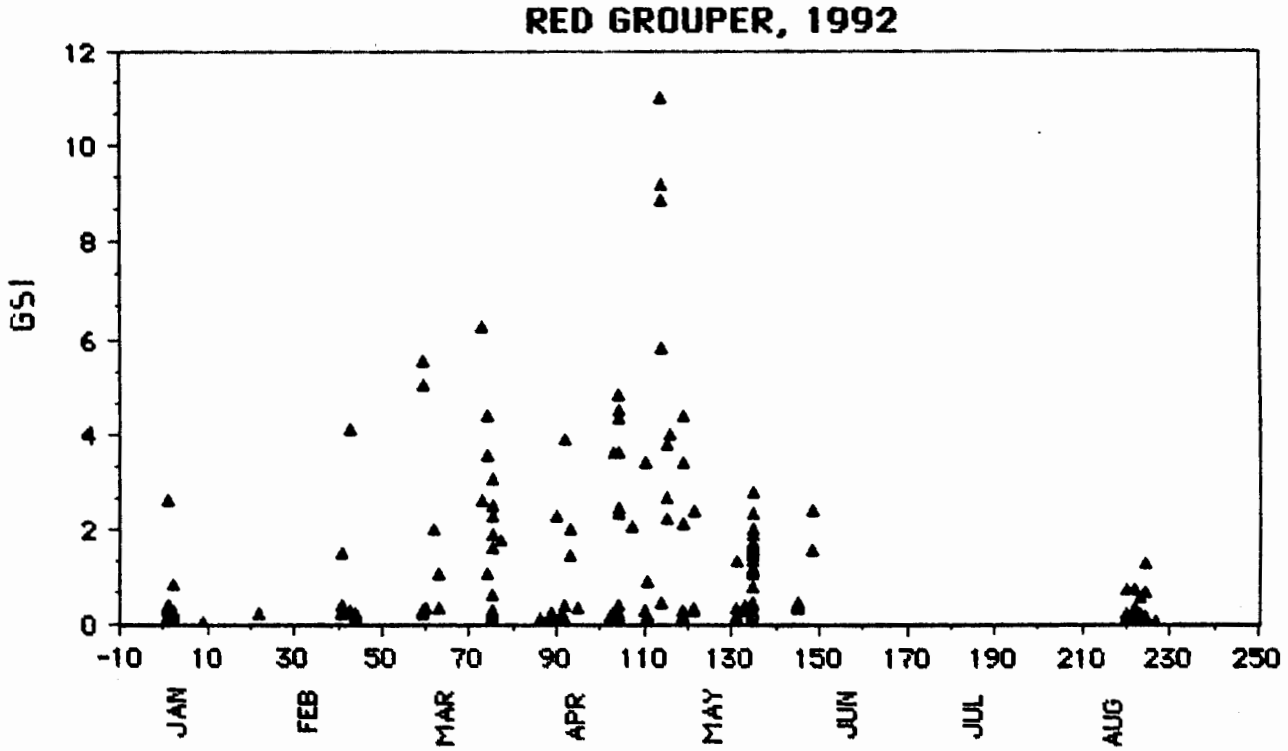


FIGURE 5. Spawning season of red grouper in the northeastern Gulf of Mexico. The gonadosomatic index, GSI = 100(gonad weight/total body weight), for fish caught is displayed over the 1992 spawning season.

TERRY LEARY - Thank you. We'll take questions at the end of the presentations of this group. Our next presenter is Carole Neidig from Mote Marine Laboratory. "Cobia, Amberjack and Dolphin Migration and Life History Study off the Southwest Coast of Florida."

COBIA, AMBERJACK AND DOLPHIN MIGRATION AND LIFE HISTORY STUDY OFF THE SOUTHWEST COAST OF FLORIDA

Carole L. Neidig and Karen M. Burns
Mote Marine Laboratory
1600 Thompson Parkway
Sarasota, Florida 34236

Abstract

Statement of Purpose

This study was an attempt to further understanding of the migration and life history of cobia, Rachycentron canadum, amberjack, Seriola dumerili, and dolphin, Coryphaena hippurus, off the southwest coast of Florida. Project duration was from November 1, 1990 through April 30, 1992. Objectives were: (1) to determine movement and migration through tagging efforts in the Gulf of Mexico and off the southeast coast of Florida, (2) to provide length/frequency data from fish captured off the Florida southwest coast and (3) to analyze hard parts (otoliths, spines, scales) along with sex, size and capture location for age and growth determination.

Results

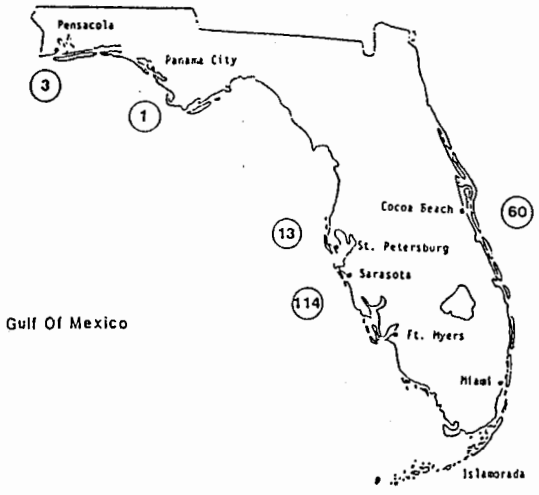
From November 1990 to July 1992, 1,023 fish were tagged. An additional 84 fish were tagged from May-July 1992 by volunteers with tags bought with donations made by sport fishing clubs. Using dart tags (1.5 cm head) from Hallprint of Australia, 1,107 fish were tagged (191 cobia, 848 amberjack, 68 dolphin). While prejudice exists concerning dart tags, because of past failures of dart tags by other companies, we found these tags to be user friendly and very persistent.

Seventy-three fish were recaptured (13 cobia, 55 amberjack, 5 dolphin) resulting in an overall tag return rate of 6.6% (6.8% for cobia, 6.4% for amberjack, 7.3% for dolphin). Considering the short duration of this study, we consider the tagging portion a success. This is, in spite of the fact that most of the fish were tagged by volunteers, and there was no publicized reward for tag returns. Taggers were kept motivated by persistent contact with MML biologists. Twenty-two tag returns were significant either by days of freedom (131-252) or by distance traveled (50-913 mi). These included an amberjack tagged off Anna Maria, Florida, and recaptured 252 days later off Galveston, Texas, a distance of 850 mi; a cobia tagged off Pt. Canaveral, Florida, recaptured 48 days later off Panama City, Florida, a distance of 913 mi; a dolphin which travelled from Islamorada, Florida, to Cape Hatteras, North Carolina, a distance of 800 mi over 10 days; and a dolphin which travelled more than 300 mi, from Cocoa Beach, Florida, to Hilton Head, South Carolina. Winter cobia returns showed a southern/offshore migration, spring and summer recaptures demonstrated a northward/inshore movement. Winter amberjack recaptures showed a southern migration, spring and fall recoveries were divided between north/south movements, and a summer recapture was headed north. Of 46 amberjack recaptures, 12 showed net movement. Dolphin were recovered during the spring and summer and were heading north.

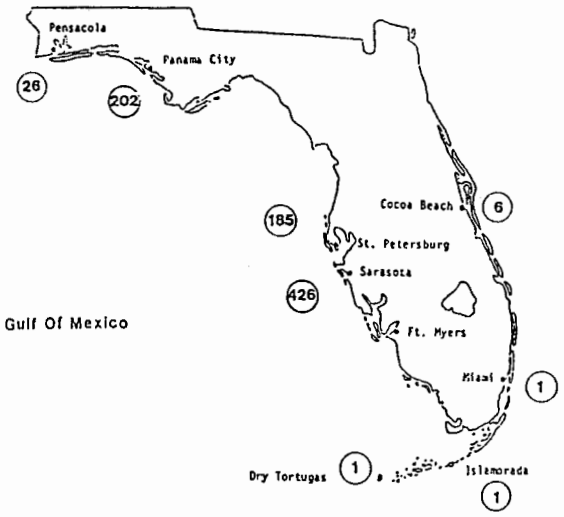
A total number of 1,781 lengths (311 cobia, 1,221 amberjack, 249 dolphin) was compiled from tagging data and measurements collected from commercial fish houses and at a tournament. Data revealed trends related to season, sex and location. Several biases included: a tournament collected larger fish; seasonal efforts were not equal; gear types were not used equally and a full size range of fish was not available for sex analysis. Mean monthly length ranges were as follows: cobia (67.0-117.8 cm), amberjack (48.5-94.2 cm) and dolphin (46.2-86.1 cm). Lengths were generally similar between the sexes. Female dolphins collected in June were smaller than males (54.9-69.3 cm). With months combined, the difference in mean lengths between the sexes of each species was always exceeded by the standard deviations for each sex. Comparing mean lengths to area of collection, amberjack were greater on the east coast; dolphin lengths were similar for each coast, but tended to be smaller from the Florida Keys.

Hard parts (268 otoliths, 368 spines, 3,800 scales) were collected for age and growth calculations. Fork length, weight and sex, date and location of capture, water depth and gear type were obtained. No usable information came from the analysis of amberjack and dolphin spines and/or scales due to degeneration and regeneration of the centers. Otoliths proved to be the best hard part for age/growth evaluation. It was determined that amberjack otolith rings were not annual. Sufficient time in the study was not available to calculate the intervals for ring formation. Year classes of cobia ranged from 1-7 years. The oldest female was 5, oldest male was 6 and one of unknown sex was 7.

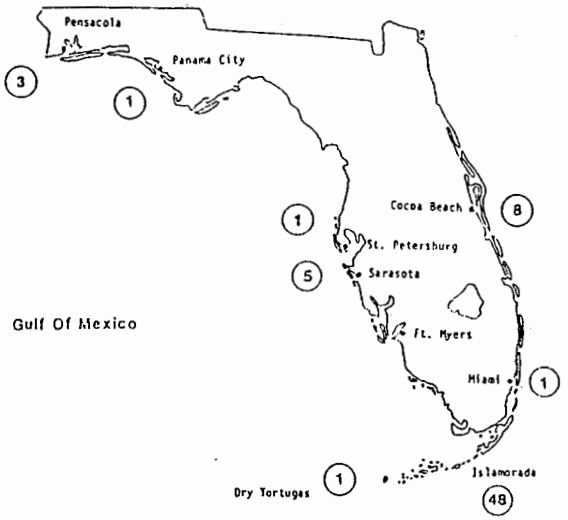
Of 22 cobia examined, 72% were females and 27% males. Of 42 amberjack, 33% were females and 66% males. Of 37 dolphin gonads, 35% were females and 29% males.



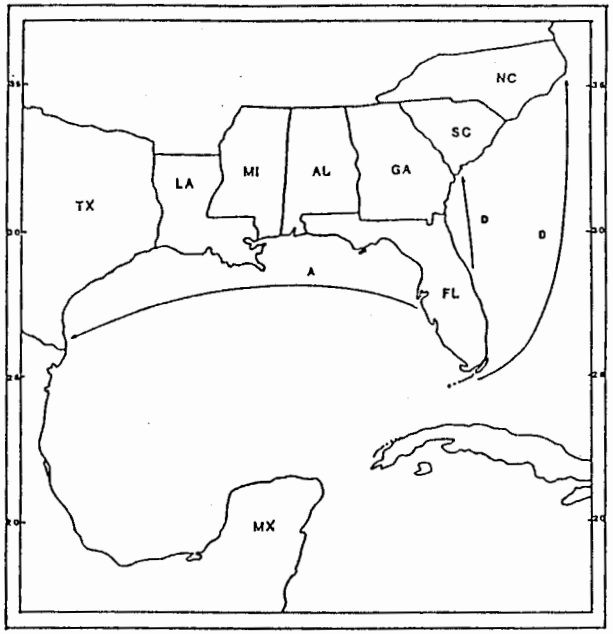
Number of cobia tagged
off the coast of florida



Number of amberjack tagged
off the coast of Florida



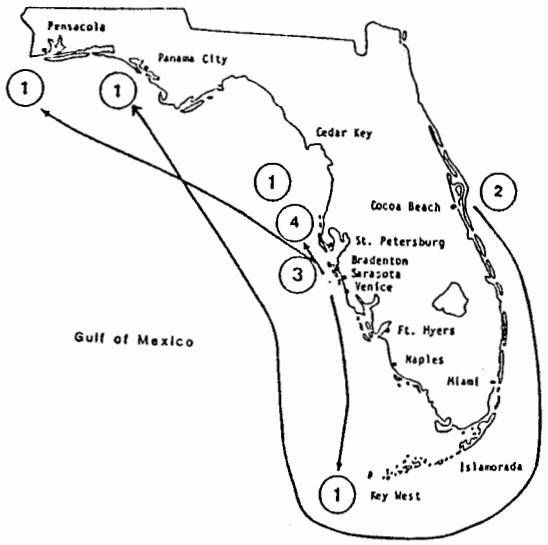
Number of dolphin tagged
off the coast of Florida



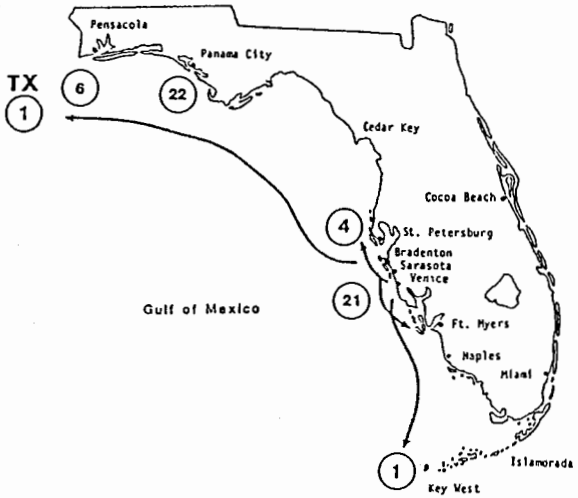
Significant tag returns from
Florida to other states

A = amberjack
D = dolphin

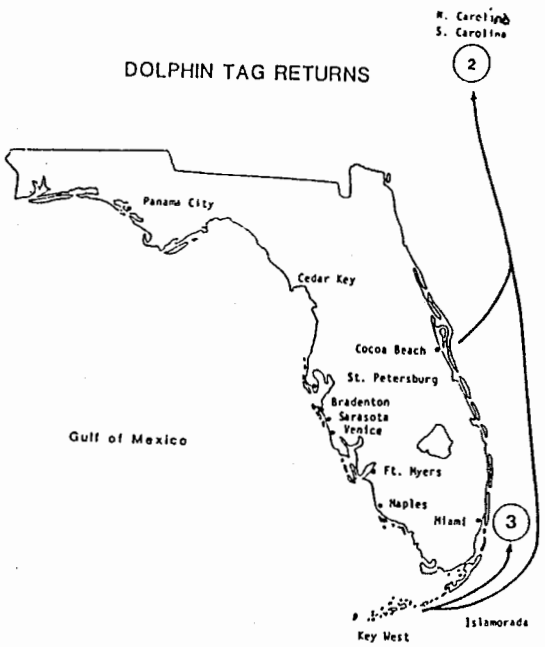
COBIA TAG RETURNS



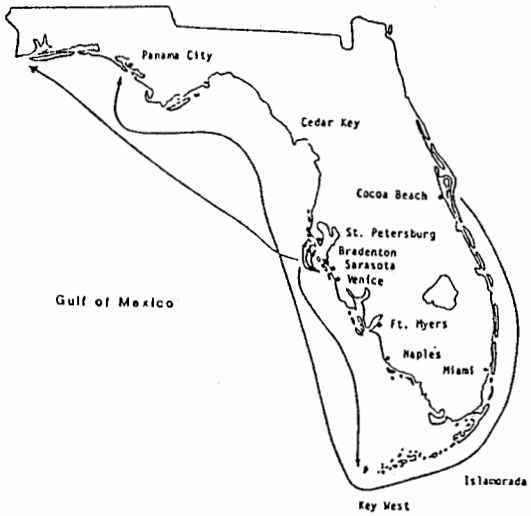
AMBERJACK TAG RETURNS



DOLPHIN TAG RETURNS

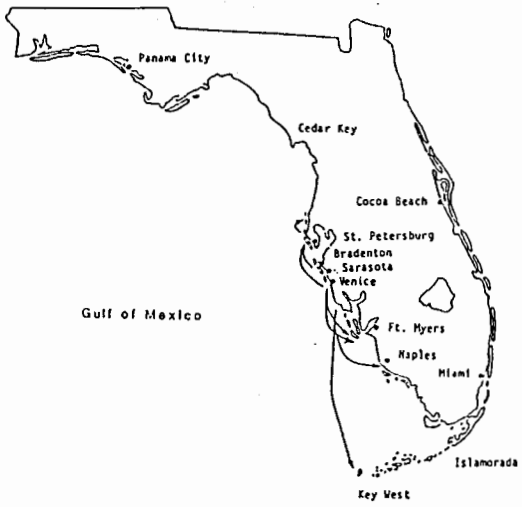


SIGNIFICANT COBIA RETURNS



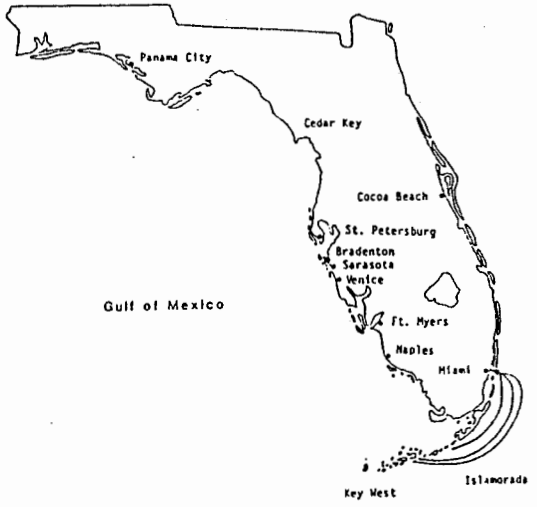
Significant cobia returns within the state of Florida

SIGNIFICANT AMBERJACK RETURNS



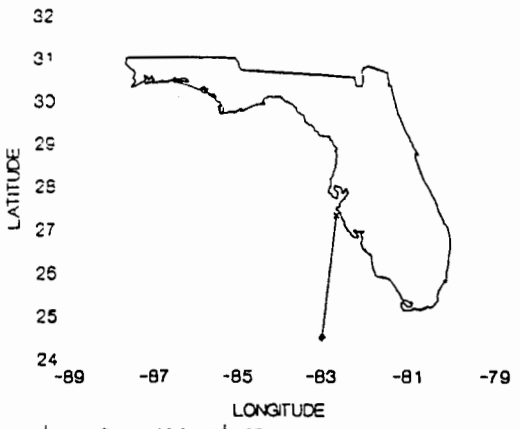
Significant amberjack returns within the state of Florida

SIGNIFICANT DOLPHIN RETURNS



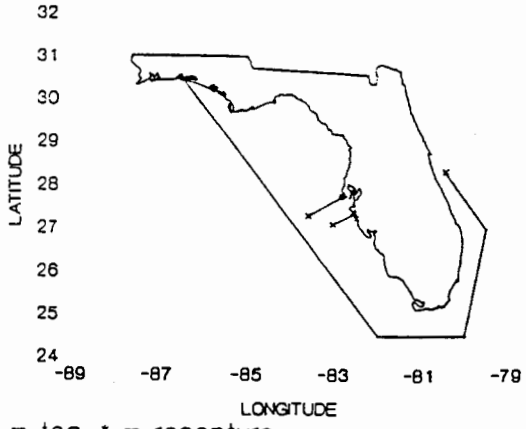
Significant dolphin returns within the state of Florida

WINTER COBIA RECAPTURES



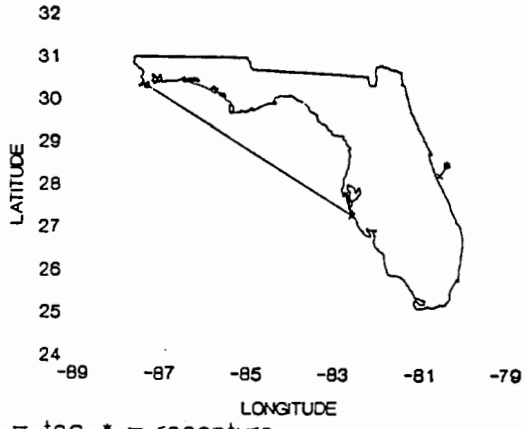
x = tag. * = recapture

SPRING COBIA RECAPTURES



x = tag. * = recapture

SUMMER COBIA RECAPTURES



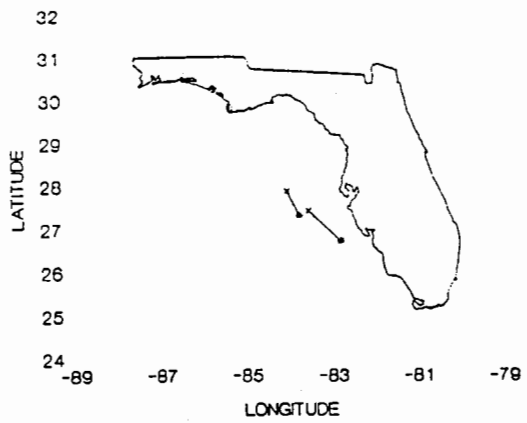
x = tag. * = recapture

COBIA

	SOUTH	NORTH	TOTAL
WINTER	1	0	1
SPRING	0	6	6
SUMMER	0	3	3
TOTAL	1	9	10

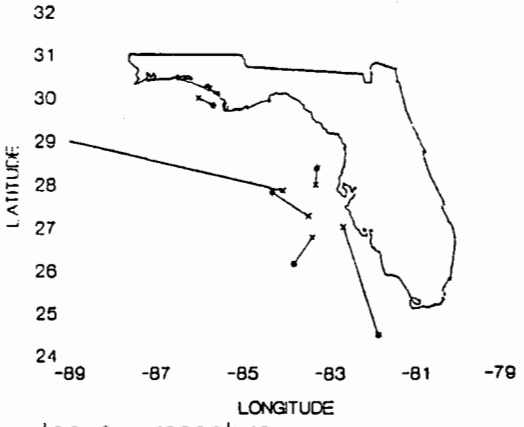
Seasonal movements of cobia based on tag return data.

WINTER AMBERJACK RECAPTURES



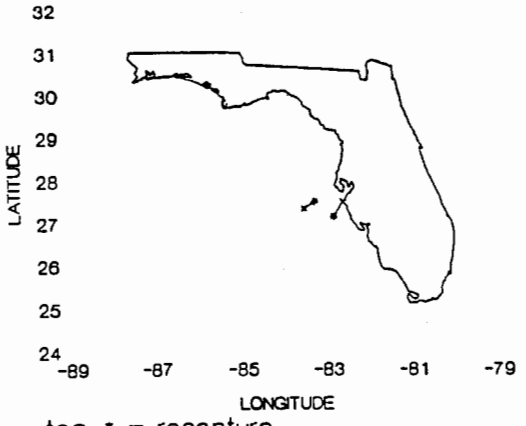
x = tag. * = recapture

SPRING AMBERJACK RECAPTURES



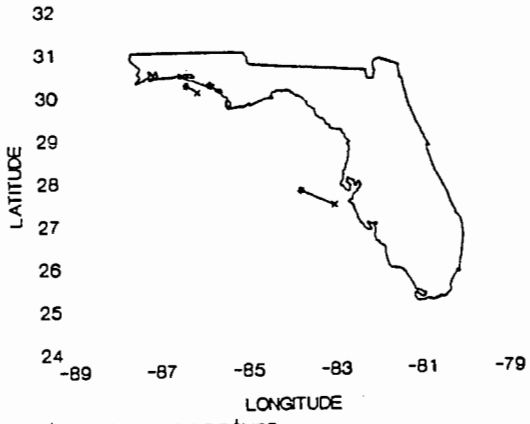
x = tag. * = recapture

FALL AMBERJACK RECAPTURES



x = tag. * = recapture

SUMMER AMBERJACK RECAPTURES



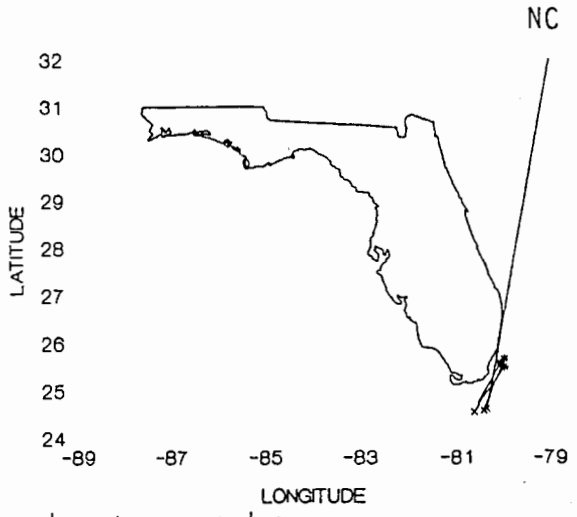
x = tag. * = recapture

AMBERJACK

	SOUTH	NORTH	TOTAL
WINTER	2	0	2
SPRING	4	3	7
SUMMER	2	4	6
FALL	1	1	2
TOTAL	9	8	17

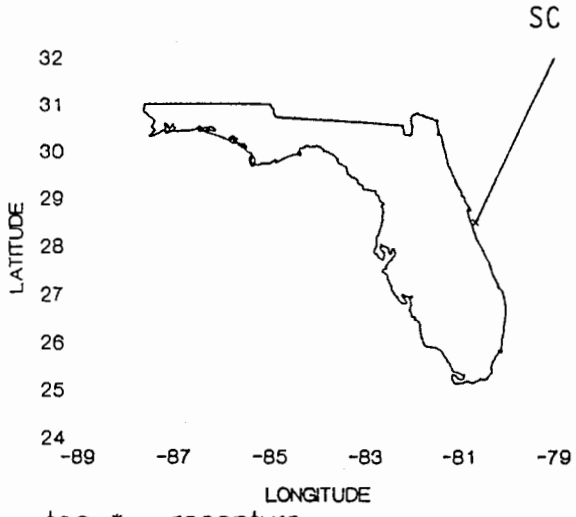
Seasonal movements of amberjack based on tag return data.

SPRING DOLPHIN RECAPTURES



x = tag. * = recapture

SUMMER DOLPHIN RECAPTURES

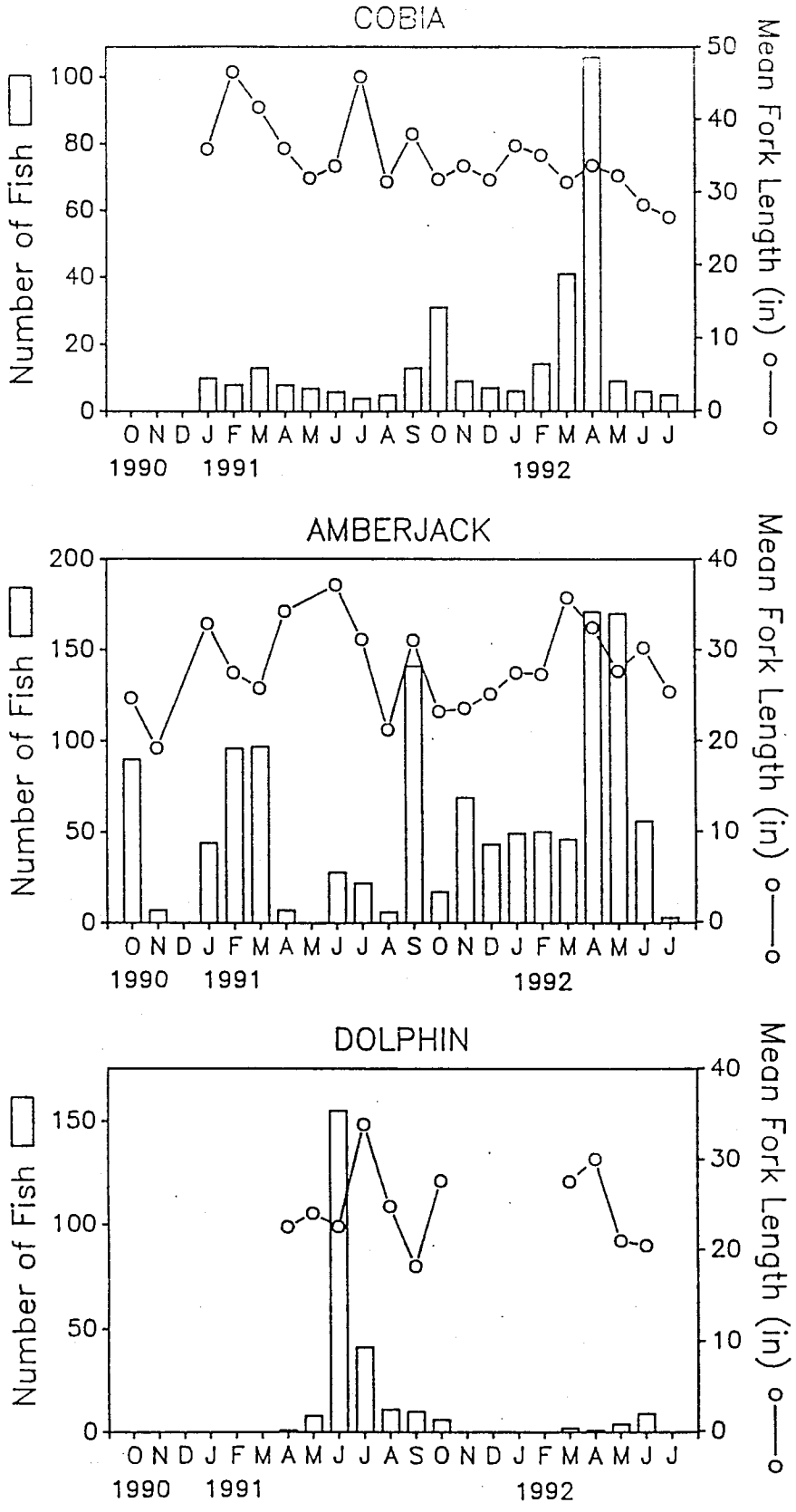


x = tag. * = recapture

DOLPHIN

	NORTH	TOTAL
SPRING	4	4
SUMMER	1	1
TOTAL	5	5

Seasonal movements of dolphin based on tag return data.



Mean monthly fork lengths of cobia, amberjack and dolphin, collected off southwest Florida from October 1990-July 1992.

TERRY LEARY - I'm sure that our audience will have some questions for you later at the summation of the panel. Well now, we're pretty much on schedule. We move for the rest of the morning it looks like to Louisiana State University, and the first of the speakers is Jeffrey Render, and he'll be speaking on "Mortality Rates and Movement of Hook-and-Line-Caught and Released Red Snapper."

Mortality Rates and Movement of Hook-and-Line Caught and Released Red Snapper

Jeffrey H. Render and Charles A. Wilson
Coastal Fisheries Institute
Louisiana State University
Baton Rouge, Louisiana 70803

Due to concerns over the status of red snapper (Lutjanus Campechanus) in the Gulf of Mexico, size and bag limits were enacted for the recreational fishery. As a result of these restrictions, undersized red snapper (<13 in total length) are released, and red snapper of any size are released after a bag limit of 7/person/day is reached. Since red snappers are physoclistus (i.e., closed air bladder system) understanding mortality rates of released red snapper is critical to insure proper management. The goal of this study was to determine: (1) mortality rates of hook-and-line caught and released red snapper and (2) whether red snapper showed affinity for certain structure. The first part of the study was conducted on a Mobil platform approximately 90 km south of Cameron, Louisiana, in 20 m water depth. Red snapper were caught by hook-and-line, treated (control, air bladder deflation, tagged, and tagged and deflated) and released into vertical holding nets (8 meters deep) for varying lengths of time (24, 30, 36 and 48 hrs). Mortality rate by treatment was recorded at the conclusion of each experiment. Some specimens were transferred to the Aquarium of the America's in New Orleans so that long term effects of air bladder deflation could be evaluated. In a separate experiment, 118 red snapper were caught, tagged with Hallprint dart tags and released back under the platform. Results indicate an overall mortality rate of 20% at 70 feet depth, with no significant differences between treatments or time in net (short term mortality). There was a significant difference in mortality between seasons (summer and fall) with higher mortality occurring in all treatments during fall (Figure 1). Results from the Aquarium work indicate that there was no significant difference in mortality between fish that had air bladders deflated and those that did not; therefore, air bladder deflation techniques could be used if a critical depth is identified where air bladder deflation does significantly enhance survival. Of the 136 released tagged fish, we recaptured 8 with the longest number of days at large being 248. On the basis of tag return data and visual observation of additional tagged snapper by divers at the release site, there is evidence to suggest affinity for specific structure by red snapper, at least for the size range of fish that we released (>400 mm). In the second part of the study (ongoing) the effect of depth on mortality is being investigated. Red snapper are caught at various depths between 22 and 54 m, treated (deflated vs. non-deflated) and released into a vertical net that extends 10 m into the water column. The net is open at the tail to allow fish to continue to descend back to depth. Mortality is calculated by counting the number of fish that do not successfully submerge by treatment group. Selected fish from each treatment group will be tagged with ultrasonic transmitters and released so that longterm survival can be monitored at 2 to 4 week intervals for several depth intervals.

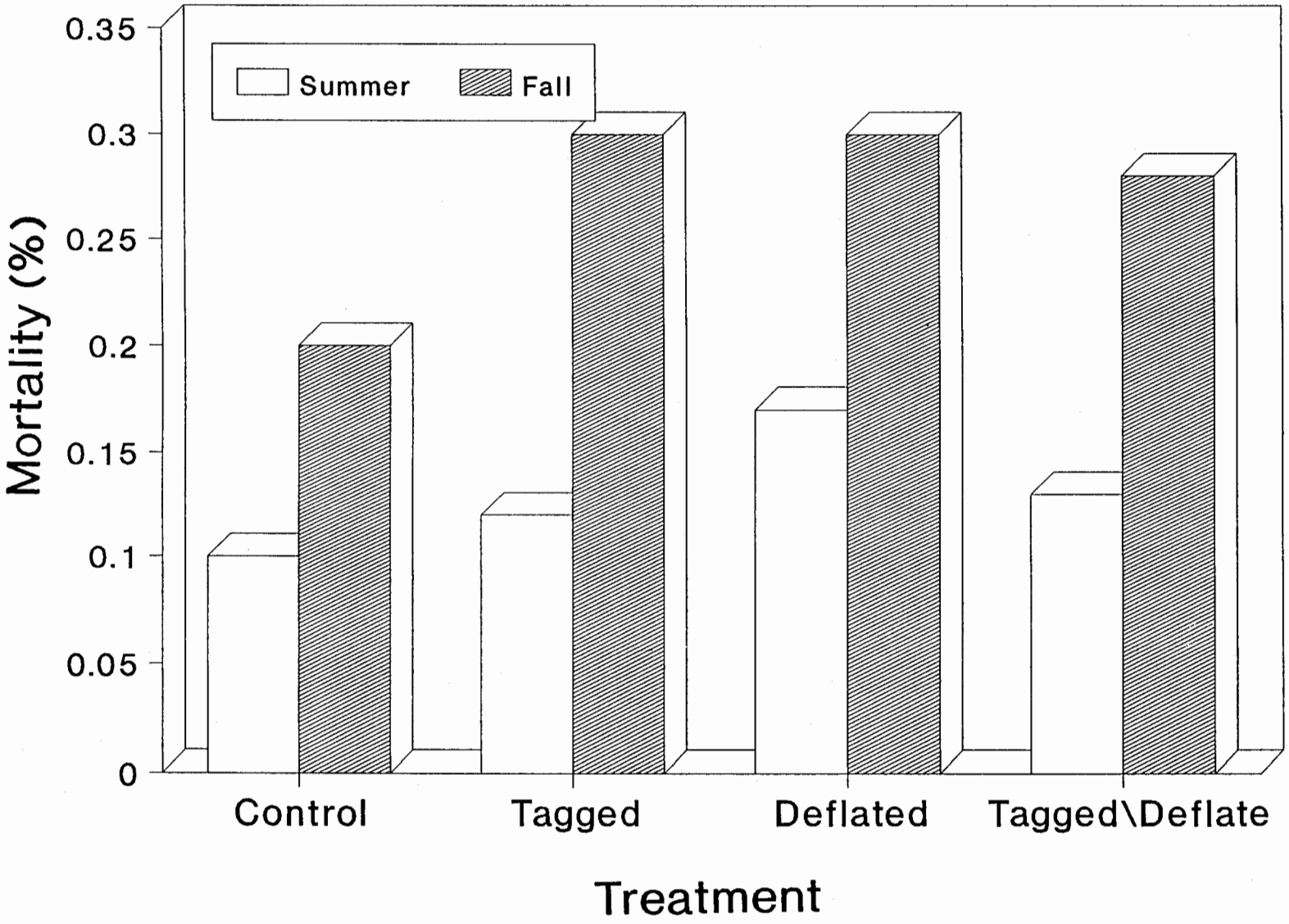


Figure 1. Percent mortality of red snapper by treatment and season.

TERRY LEARY - Any questions? Nelson.

NELSON EHRHARDT - ...predation

JEFFREY RENDER - To the extent, that's correct. What I typically notice on these releases is that I do see predation, even when you release the fish, if he doesn't make it down fairly rapidly, he's not going to make it down. If he flounders, the fish that we've released outside the net, if they flounder for any extent of time anything that's around is going to nail him very rapidly. But it seems fairly consistent. Most of the fish will make it when we release them if they go right back down. But you're right. There is a bias in that regard. We don't know, we can't see obviously what happens on the fish's trip back down to the bottom.

SCOTT HOLT - When you have the fish protected, did you find that they managed to get back down under a few hours?

JEFFREY RENDER - Well, that's the same thing I'm talking about. The fish that made it down to the bottom in the net were rarely seen coming back up, it was the fish that when we first released them, they'd struggle along the surface and then they'd try to get down five feet and pop right back up, they never made it. But if they made it down, it seemed to be sufficient enough to recompress enough to stay down and optimally adjust to that.

TERRY LEARY - Okay, thank you very much. That's all the time we have for questions at the present, and we'll move on to the next presentation. Please save your questions for Jeffrey until later. Our next presenter is Sandy Russell, and she'll be talking on "Mackerel and Reef Fish Bioprofile and Catch/Effort Data Collection from the Northern Gulf of Mexico."

Mackerel and Reef Fish Bioprofile and Catch/Effort Data Collection from the Northern Gulf of Mexico

Sandra J. Russell
Coastal Fisheries Institute
Center for Coastal, Energy and
Environmental Resources
Louisiana State University
Wetlands Resources Building
Baton Rouge, Louisiana 70803

Abstract

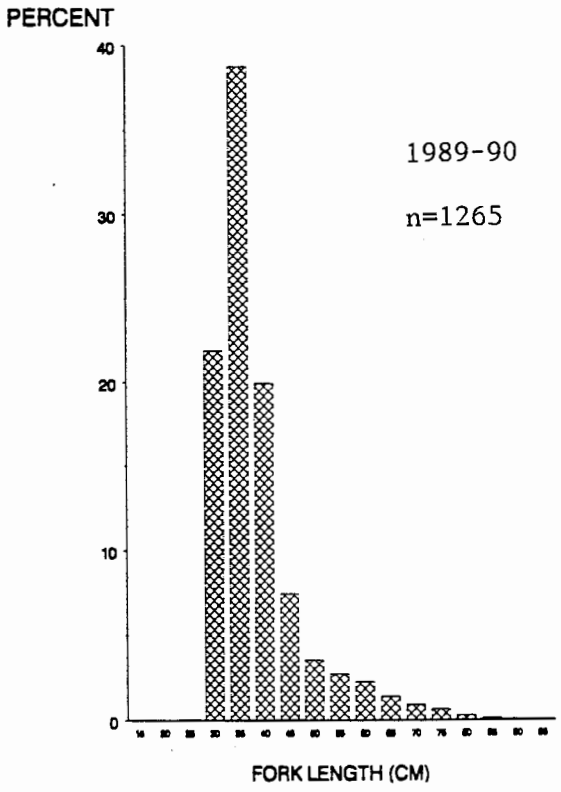
Since 1983, the Coastal Fisheries Institute at Louisiana State University (LSU) has been working cooperatively with the Louisiana Department of Wildlife and Fisheries and the National Marine Fisheries Service (NMFS) under the State/Federal Cooperative Fishery Statistics Program in gathering biological and catch/effort data from both commercial and recreational fishermen targeting reef fish and coastal migratory pelagic fishes in the northern Gulf of Mexico. The three-year MARFIN project, begun October 1, 1989, complemented and expanded on the goals of this state/federal program by providing an additional port sampler in a major commercial port area. The objectives included obtaining interviews from captains of recreational and commercial mackerel and reef fish fishing boats landing their catches in the northern Gulf States, measuring and sexing king mackerel, red snapper and other coastal pelagics and reef fish from these catches and collecting otoliths, muscle tissue or other organ samples for LSU and NMFS age and growth studies.

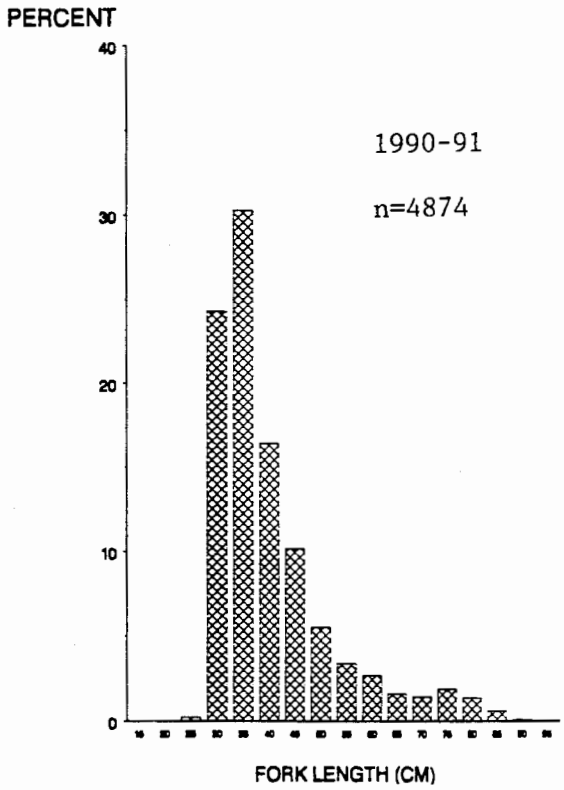
A port sampler surveyed marinas and commercial docks in Leeville, Grand Isle and Fourchon on a regular basis to meet returning private recreational boats and commercial fishing vessels. He interviewed the captains to determine gear type and number, crew size, duration of fishing effort and fishing location. From the dealer tickets, he recorded the catch weight by species. A subsample of each catch was randomly selected for the determination of fork lengths, weights and sexes with at least 25 individuals of the targeted species being chosen first. Protocol for the collection of biological samples varied from year to year depending on NMFS requirements, but a concerted effort was made to collect red snapper gonads and otoliths at all times of the year for an LSU age, growth and reproductive study. The port sampler also attended major fishing tournaments in his area during the summer to collect additional lengths and samples. All data was computerized and transmitted to NMFS-Miami for use by stock assessment panels.

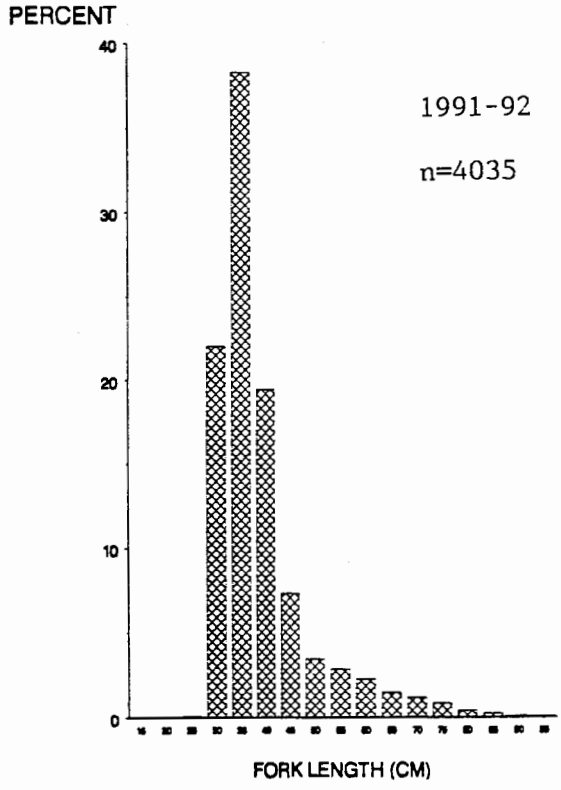
Because of a shortfall in this project's funding due to cost-of-living increases and state mileage rate increases, the port sampler did not work a full 12 months/year for this project beyond the first year. The shortfall was picked up by the state/federal program during the last two years. Therefore, the project results do not reflect a full three years worth of full-time effort. Nevertheless, a total of 452 interviews (320 from bandit reel boats, 38 from bottom longliners, 62 from mackerel trollers, 15 from handliners, 14 from rod and reel fishermen and 3 from tuna/shark longliners) were obtained between October 7, 1989 and July 31, 1992, and 33,540 individuals from 177 species were measured. The port sampler and a couple of

temporary helpers covered 18 offshore fishing tournaments during the three project summers.

Over 3,000 otoliths from various species were shipped to the NMFS-Panama City Laboratory, and over 1,000 otoliths and 200 gonads from red snapper have changed little from 1989 to the present. King mackerel profiles have shown a definite increase in the numbers of size classes contributing to the catches. Red snapper and king mackerel sex ratios have both evened out considerably from around 3 females per male in 1989-1990, to a nearly 1:1 ratio in 1991-1992. The size limits and quotas instituted over the past few years for both species have apparently favorably affected their population structures.







Red snapper length frequencies from fish landed in Louisiana, 10/89-7/92, by project year.

Mean fork lengths (in mm) by gear of some commercially important reef and pelagic species landed in Louisiana, 10/89-7/92.

Species	Bandit reel (n)	Bottom longline (n)	Handline (n)	Trolling (n)	Rod and reel (n)
Greater amberjack	1011 (400)	1067 (23)			
Almaco jack	550 (960)	620 (25)			
Lesser amberjack	395 (94)				
Bigeye	325 (110)				
Black driftfish	661 (108)	693 (114)			
Cobia	946 (157)				
Atlantic croaker	324 (170)				
Rock hind	355 (184)				
Snowy grouper	540 (269)	663 (200)			
Yellowedge grouper	551 (837)	682 (949)			
Gag grouper	775 (269)				
Scamp	507 (1221)	549 (64)			
Yellowmouth grouper	585 (138)				
Creolefish	266 (214)				
Longtail bass	375 (208)	422 (35)			
Red porgy	336 (788)	375 (80)			
Longspine porgy	240 (108)				
Whitebone porgy	299 (324)				
White trout	383 (840)				
King mackerel	890 (130)		1037 (122)	849 (1719)	1027 (150)
Spanish mackerel	499 (11)		537 (192)	540 (70)	
Queen snapper	553 (484)	724 (100)			
Gray snapper	549 (265)				
Lane snapper	327 (1135)				
Red snapper	395 (8968)	482 (294)	389 (427)		439 (344)
Vermilion snapper	320 (4252)	296 (60)	363 (211)		315 (61)
Tilefish	501 (46)	595 (706)			
Goldface tilefish	415 (244)	487 (16)			
Gray triggerfish	361 (1613)	590 (8)	370 (8)		349 (27)
Blackfin tuna	765 (214)	725 (14)			728 (17)
Warsaw grouper	825 (199)	952 (40)			

TERRY LEARY - We have a couple of more minutes if someone has a question.

CORKY PERRET - Sandy, what did you base that statement on about enforcement of snapper size limits was not very good until about mid 1990?

SANDRA RUSSEL - There wasn't any at the docks, any enforcement and they handled a lot of little fish.

CORKY PERRET - Are you speaking for Louisiana alone or the entire gulf?

SANDRA RUSSEL - Yes, that's what I'm familiar with - Louisiana.

CORKY PERRET - But that gives you, that's your opinion.

SANDRA RUSSEL - Yes. Based on our enforcement agents mostly, Corky.

CORKY PERRET - Well they issue a lot of citations that's all I can tell you.

SANDRA RUSSEL - Apparently, it seems that when you talk to the fishermen it wasn't until 1992.

NELSON EHRHARDT - I would like to know about your experimental design. Did you have a stratified random or something, something by statistics say? In such a way that you secured for example, the item of any given minute, range.

SANDRA RUSSEL - No, we just tried to make sure we got fish from during the middle and the unloading process so that we were, you know hopefully randomly sampling whatever they caught. As far as selecting the vessels, no, it was just whatever vessel came in we tried to interview and measure their catches. There was really no way to stratify anything as far as vessel collection because we would just end up missing a lot of boats. And the fish came in so fast by conveyor belt that that was the best way to randomly select fish rather than waiting until they were sorted by size.

NELSON EHRHARDT - Some of your samples then may reflect some of the dynamics of the fishery rather than the fish.

SANDRA RUSSELL - What do you mean?

NELSON EHRHARDT - The rate of change and the preparation of the fishery. Then you may reflect those into a statistic.

SANDRA RUSSELL - Right, I guess. I'm not sure what you mean.

JANE BLACK - Going back to something that Mr. Perret asked you, are you saying that you found substantial numbers of under thirteen inch snapper in your samples during 1989?

SANDRA RUSSELL - Right.

JANE BLACK - Of under thirteen inches.

SANDRA RUSSELL - Yes.

JANE BLACK - Perhaps maybe you could look at that in a later date. Another thing I would like to ask you is relative first to something that Dr. Ehrhardt just said, you made a comment of concern about the drop in percentages of catch of yellow edge groupers, did you take into account when you made that comment the fact that the bandit boats prior to 1990, April, were geared with longlines also in addition to bandits and they targeted yellow edge grouper longline fishing and when they were forced outside fifty fathoms then they no longer care to target that fish and that most of that year actually physically end up in the red grouper fishery in Florida. Even if the vessels didn't to go there, the reels went there.

SANDRA RUSSELL - Yes, we were aware that they carried - double oriented kinds of gear, and we were pretty careful to allocate the correct fish to the correct gear.

JANE BLACK - Because they never did land yellowedge grouper in any amount and with strictly bandit gear within the fishery. A little history, you can ask the fishermen, go back and see what they did in the seventies and early eighties, how of what percentage of their catch, when they just owned bandit gear, the yellowedge grouper was. There wasn't any until the longline fishermen came around.

SANDRA RUSSELL - Yes, we were aware that they carried different kinds of gear and were careful to make sure during the interview that we allocated the correct fish to the correct gear. I feel pretty confident that's what occurred.

TERRY LEARY - Next we have Kathy Lang also from LSU; she's going to address "Age, Growth, Diet and Spawning Dates of Yellowfin Tuna about the Mississippi River Plume."

Age, Growth, Diet and Spawning Dates of Yellowfin Tuna, Thunnus albacares, about the Mississippi River Plume

Dr. Richard F. Shaw
Ms. Kathy L. Lang
Coastal Fisheries Institute
Center for Wetland Resources
Louisiana State University
Baton Rouge, Louisiana 70803

Abstract

This project was undertaken to provide information on the age, growth, diet and spawning dates of larval yellowfin tuna in order to evaluate the importance of the Mississippi River plume as a spawning area and source of recruits to the Gulf of Mexico fisheries. We used 768 larval yellowfin tuna collected from shelf and frontal waters about the Mississippi River discharge plume during July and September 1987. We were able to describe the distribution and abundance of these larvae about the Mississippi River plume and found that they were most frequently collected at surface salinities around 31°/$_{oo}$ (which corresponded to locations around the frontal zone), and within a narrow range of temperatures (28.5° to 30.4°C). Gut content analysis indicated that larvae were feeding on small zooplankters such as ostracods and cladocerans, but no quantitative results were obtained as most larvae had empty guts. We removed sagittal otoliths from each larva, and then counted and measured daily growth increments using an image analysis system. Daily ages were used to back-calculate spawning dates, calculate growth rates, and estimate mortality rates. Larvae ranged in age from 3 to 14 days over a size range of 2.57 to 7.48 mm SL and were spawned from mid-July through September. Absolute growth rate (length/age) and empirical growth rate (from SL on age regression) were estimated to be 0.47 mm/day. We were also able to make spatial and temporal comparisons of larval growth rates and found that larvae collected in July grew slower than those from September (0.37 vs. 0.48 mm/day absolute growth, respectively). Overall, however, larval growth was found to be highest at intermediate salinities (near 31°/$_{oo}$). There also appears to be a significant temperature effect on the growth of larval yellowfin tuna. We fit a negative quadratic function to the relationship between growth and temperature and the results suggest an optimum temperature near 29.4°C. A stepwise multiple regression model indicated that larval growth is most affected by temperature and food availability (R^2 = 0.75, Pr>F = 0.0001). Instantaneous daily mortality rates also showed significant temporal variation. Larvae collected in July had lower mortality rates (Z = 0.16) than those collected in September (Z = 0.41). Because larval growth was found to be highest at intermediate salinities typical of mixed frontal waters, and instantaneous daily mortality was found to be lower in frontal waters, our results suggest that the Mississippi River plume enhances the growth and survival of larval yellowfin tuna.

TERRY LEARY - We come back to Sandy Russell again. And after Sandy we break for lunch, but I'm going to allow for a few questions because we're going to have a change in panel members during the lunch hour. So, following Sandy then we'll have an opportunity for the audience and the Steering Committee to bounce questions off this group. Sandy's title is "Biological and Catch/Effort Sampling of the Domestic Tuna and Shark Longline Fisheries in the Northern Gulf of Mexico."

Biological and Catch/Effort Sampling of the Domestic Tuna and Shark Longline Fisheries in the Northern Gulf of Mexico

Sandra J. Russell
Coastal Fisheries Institute
Center for Coastal, Energy and
Environmental Resources
Louisiana State University
Wetlands Resources Building
Baton Rouge, Louisiana 70803

Abstract

The goals of this project were to collect biological, bycatch and catch/effort data from the domestic tuna and shark longline fisheries in the northern Gulf of Mexico through the use of onboard observers. This three-year project, begun in October 1989, was to build upon the database established by two years' of previously funded MARFIN observer projects at LSU. Vessel selection was necessarily opportunistic, with the two observers responsible for making their own trip arrangements. No more than two consecutive trips aboard the same vessel were allowed in any two-month period. Most trips originated in Venice, Louisiana, but the observers occasionally caught trips out of Panama City and Destin, Florida, and Galveston, Sabine Pass and Port Aransas, Texas. Onboard data collection activities included detailing vessel, gear and set configuration, identifying, measuring and sexing (where practical) each species caught, recording release condition of discarded bycatch, obtaining dock weights of landed catch and collecting gonads and hard parts of swordfish for NMFS. Currently ongoing statistical analyses (log-linear and GLM models) are examining the differential effects of temperature and bait on the catch rates of yellowfin tuna and billfish.

LSU observers took a total of 76 trips (68 targeting tunas, 5 targeting sharks, 3 targeting swordfish) aboard 48 different vessels and recorded data from 319 sets (87 using live bait, 232 using dead bait). They logged 736 days at sea and recorded data on all 7,365 fish caught by the 209,388 hooks. They were present to document important events in these relatively new domestic fisheries such as the switch from dead bait to live bait, the reduction in fleet size and subsequent vessel dispersal to other oceans or countries, the incidence of "hotlining," and the various conflicts among and within user groups in the gulf.

From the sets which targeted tunas, various tuna species comprised only 50%, by number, of the entire catches (including discards), common dolphin comprised 12%, swordfish 11%, miscellaneous species 9%, sharks 7%, other billfish excluding swordfish 6% and escolar 5%. Six sea turtles and one bottlenose dolphin were hooked during the study, but all were released alive. Overall mortality rate of the discarded bycatch was 69%. The shark mortality rate was about 53% due to the practice of shooting sharks, finning them and discarding the carcasses at sea. The mortality rate of discarded swordfish was 72% and that of discarded billfish (excluding swordfish) averaged 66%.

There were significant interactions between bait and sea surface temperatures for white and blue marlin and swordfish. The use of live bait at high sea surface temperatures resulted in the highest proportion of sets capturing at least one specimen of each marlin species. On the other hand, more swordfish were caught at low sea surface temperatures using dead bait. Yellowfin tuna were less dramatically affected by these two factors, although live baited sets at high sea surface temperatures tended to catch more fish.

Silky sharks were the most abundant shark species caught by tuna longlines, followed by spinner, blacktip, dusky and sandbar sharks (coastal species) in order of overall abundance. The coastal species were most often encountered over deep water in the vicinity of the Mississippi River Delta. Blacktip sharks dominated the nearshore shark-directed fishery followed by bull sharks and smooth dogfish. Mean lengths of 11 species from both the tuna and shark sets were smaller than their reported sizes at maturity.

Summary of 68 trips (197,498 hooks; 291 sets) targeting tunas by the U.S. Gulf of Mexico fleet, October 1989 - August 1992.

Species	Retained	Discarded		Total
		Alive	Dead	
Yellowfin tuna	2,529	143	238	2,910
Bluefin tuna	10	11	10	31
Blackfin tuna	91	18	60	169
Bigeye tuna	51	0	4	55
Skipjack tuna	20	3	86	109
Albacore	18	0	1	19
Little tunny	16	55	313	384
Sharks	126	184	208	518
Swordfish	551	71	186	808
Blue marlin	0	29	41	70
White marlin	0	54	132	186
Sailfish	0	28	91	119
Other billfish	0	15	22	37
Common dolphin	833	17	26	876
Escolar	350	14	28	392
Wahoo	203	0	8	211
Lancetfish	0	10	204	214
Stingrays	0	79	18	97
Other fish	44	53	56	153
Marine mammals	0	1	0	1
Sea turtles	0	6	0	6
Total	4,842	791	1,732	7,365

TERRY LEARY - Thank you very much. Are there any questions of Sandy?

LARRY SIMPSON - Sandy, did you say the practice of finning is still going on?

SANDRA RUSSELL - Yes. Especially with fin prices as high as $20 per pound, you better believe it is.

LARRY SIMPSON - Is it significantly less than it used to be?

SANDRA RUSSELL - No.

LARRY SIMPSON - It's relatively the same magnitude as it was before the measures went in?

SANDRA RUSSELL - Nothing really has gone into effect.

LARRY SIMPSON - Well there was an emergency action implemented.

SANDRA RUSSELL - Oh, they were supposed to be bringing in the number of fins in relation to the harvest. It doesn't matter, as long as there is a count.

NELSON EHRHARDT - I have two questions, one for Christopher Koenig and the other for Kathy Lang. Christopher, do you see a real size significance based on the weight? However, you also showed a trend with depth and temperature sizes, and we all know that the weight/depth relationship is not weight but whether the size is very idea. Could you tell me are there any analysis that come from the effect of each one of the...?

CHRISTOPHER KOENIG - These are just to demonstrate the spawning period, I wasn't trying to show anything else besides that. Undoubtedly, in all fish there's elementary growth between the size and the gonads in the size of the fish and there are other better measures to describe that, but I didn't think it was important to show the spawning season. That's all I was interested in.

NELSON EHRHARDT - It is important on the sequence on spawning cycles they have different size?

CHRISTOPHER KOENIG - Well, I had cooperative evidence from the juvenile otolith so it showed pretty carefully. At that point what I was trying to show wasn't related to what you're questioning about.

NELSON EHRHARDT - The second question to Kathy Lang. Your data on the July cruise shows a very significant difference in the... Did you test for the buoyancy of the larvae that may have created a difference in changes of quadric changes...

KATHY LANG - We attempted to do some buoyancy testing on the September cruise, but we were unable to accurately simulate the density of larval fish. It seemed to matter which side of the front we tested, as the water density is different on either side of these fronts. We did determine that in September the water movement was approximately a meter per second, so I think that most of the

movement of the larvae is because they are being transported horizontally when the fronts form and relax.

NELSON EHRHARDT - So you didn't.

KATHY LANG - We really didn't get to look at buoyancy though.

NELSON EHRHARDT - Because of those very significant differences in age distributions may be due to the absence of the larvae in the more dense waters.

EUGENE NAKAMURA - There used to be some controversy, maybe controversy isn't the right word, in the identification of particularly the early stages of tuna tuna larvae. Is that pretty well cleared up now so that we can have pretty good confidence in the identification of the larvae?

KATHY LANG - Well, on these particular larvae I have as much confidence as anybody could have. I've had many larval specialists look at them, and I've tried everything that's feasibly possible to confirm the identifications. The identifications of all the tuna larvae are pretty well set down to maybe a centimeter or a few centimeters, but these larvae are millimeters long so I don't think we'll ever be able to say a hundred percent, but I'm ninety-some percent sure of the identifications.

TERRY LEARY - Any other questions? Yes sir.

BRUCE THOMPSON - Kathy, correct me if I'm wrong but looking at gonads of the adults from some of our work, I only see yellowfin with huge gonads in the summer without the other species having really, really enlarged gonads, so you don't really have a whole lot of other characters with you know to mess up your identification problems, is there?

KATHY LANG - The largest problem with the larval identifications is between yellowfin and blackfin tuna.

BRUCE THOMPSON - But I don't see blackfin with nearly the enlarged gonads. This is looking at it from the rodeo samples.

KATHY LANG - Yes, that's good to know. Can I quote you on that?

BRUCE THOMPSON - We've never really done anything more with them. Our target fish aren't coming in so there's a fish laying around, and I can't keep my hands off it so we cut some open and find yellowfin with immense late stage vitellogenic gonads that don't appear to be, at least in my casual observation, from the recreational caught blackfin. Now the other ones, we just don't ever see as many albacores and the other stuff, but yellowfin do have these immense gonads with very, very, late stage vitellogenic oocytes. Yellowfins are probably the dominant spawners up there.

KATHY LANG - Yes, that's very good to know actually. I didn't find much in the literature and particularly in the Gulf of Mexico about spawning of the adult yellowfin tuna. Thank you.

FELICIA COLEMAN - I have a question for Jeffrey Render. Did you have any significant temperature differences between time involved particularly in the fall?

JEFFREY RENDER - I guess maximum about 7°C. So it wasn't a great deal but in the fall period maybe 7° difference. It's fairly small and apparently might be significant. I'm doing some further testing this winter though in trying to define that a little more closely.

FELICIA COLEMAN - Has there been any temperature differences in and the ability to...

JEFFREY RENDER - Not that I'm aware.

JOHN WALSH - Are you looking at the difference in the water temperature and areas in which they...

JEFFREY RENDER - Just water temperature.

TERRY LEARY - We're ready to begin the afternoon session. The first presentation is Bruce Thompson, again from LSU on "Age, Growth, and Reproductive Biology of the Greater Amberjack and Cobia from Louisiana Waters."

Age, Growth, and Reproductive Biology of Greater Amberjack and Cobia from Louisiana Waters

Bruce A. Thompson, Charles A. Wilson and
Jeffrey H. Render
Coastal Fisheries Institute
Center for Coastal, Energy
and Environmental Resources
Louisiana State University
Baton Rouge, Louisiana 70803

Abstract

Introduction

This was a two-year project, completed April, 1992. The goal of this study was to collect biological data from cobia and greater amberjack in coastal Louisiana waters to determine selected aspects of their life history and population dynamics. Specific objectives were: (1) to validate aging periodicity of sagittal otolith increments via marginal increment analysis; (2) to determine age and growth patterns; (3) to obtain reproductive information, including age and size at maturity, sex ratios, timing and location of spawning and fecundity and (4) to compare data from our various fishery sources. A task that was incorporated during the project was the development of identification criteria for the other three species of Seriola for comparison with greater amberjack.

Methods and Materials

During this project, 756 cobia and 865 greater amberjack were obtained from (1) commercial seafood buyers, (2) charterboats, (3) recreational fishermen and divers at Louisiana saltwater fishing rodeos and (4) research trips to Mobil Rig, West Cameron 352. Comparative material of other Seriola species were examined as well as several species of Caranx.

Sagittal otoliths were sectioned for age estimations. For greater amberjack, some comparisons were made between otoliths, dorsal spines and vertebrae for age estimations. Gonads were removed, preserved in 10% formalin and processed in conjunction with LSU Veterinary School. Most were analyzed from Gill's hematoxylin with eosin counterstaining (H&E), but other preparations were also used for disease determinations.

Results

Cobia

Size information obtained for cobia was:

	FL Range (mm)	x FL (mm)	TotWt Range (kg)	x TW (kg)	N
1987					
M	574-1225	914.8	1.8-23.7	9.0	30
F	358-1355	979.8	4.0-30.1	12.9	
65					
1988					
M	680-1175	942.1	3.0-20.3	9.9	
68					
F	681-1270	1049.8	3.2-29.3	15.3	
25					
1989					
M	675-1432	956.8	4.7-30.8	12.1	12
F	633-1352	1042.3	2.6-33.6	14.0	
60					
1990					
M	528-1250	1002.6	1.5-22.6	12.2	
96					
F	830-1445	1114.4	7.1-45.6	17.6	
36					
1991					
M	562-1184	926.4	2.0-22.1	9.8	
76					
F	478-1430	1053.1	1.0-36.9	15.2	
32					

Six ratios were skewed in favor of males for each of the five years of data (2.13M:1F). In addition, size information was taken from 68 commercial cobia. Growth equations calculated for cobia were:

A) otolith vs. FL, TW, and Age (by sex)

male $FL_{(cm)} = 31.62(Sagwt)^{0.31}$ ($r^2 = 0.81$)

female $FL_{(cm)} = 28.84(Sagwt)^{0.36}$ ($r^2 = 0.84$)

male $TW_{(kg)} = 0.26(Sagwt)^{1.02}$ ($r^2 = 0.81$)

female $TW_{(kg)} = 0.20(Sagwt)^{1.02}$ ($r^2 = 0.84$)

male Age (yrs) = 0.09 (Sagwt) + 0.34 ($r^2 = 0.82$)

female Age (yrs) = 0.08 (Sagwt) + 0.54 ($r^2 = 0.81$)

B) FL and TW (by sex)

male $TW_{(kg)} = 4.01 \times 10^{-6} (FL_{(cm)})^{3.23}$ ($r^2 = 0.98$)

female $TW_{(kg)} = 3.89 \times 10^{-6} (FL_{(cm)})^{3.23}$ ($r^2 = 0.98$)

both sexes $TW_{(kg)} = 3.80 \times 10^{-6} (FL_{(cm)})^{3.24}$ ($r^2 = 0.97$)

C) Von Bertalanffy, FL, TW (by sex)

male $FL_{t(cm)} = (1132 (1-e^{0.49(t+0.49)}))/10)$

female $FL_{t(cm)} = (1294 (1-e^{0.56(t-0.56)}))/10)$

male $TW_{t(kg)} = ((37493 (1-e^{-0.31(t+1.35)})^{3.23})/1000)$

female $TW_{t(kg)} = ((21538 (1-e^{-0.31(t+0.79)})^{3.23})/1000)$

All one year old cobia were immature. Male cobia were ripe by age two, with some females ripening oocytes by this age. All cobia three years old and older were mature. There was a wide range of size at maturity for both sexes, being between 700 and 950 mm FL. Gonad size and maturation stage were obtained from all cobia samples, but hydrated oocytes were rare in our samples, so reproductive information, although strongly suggesting spawning between April and June is more incomplete than planned.

Greater Amberjack

Similar to cobia, greater amberjack females averaged larger than males ($\bar{x}$ 879 mm vs. 854 mm FL), ranging from 374 to 1,441 mm FL. Males did not reach as large a size, ranging from 387 to 1,203 mm FL. The smaller size of males was shown in that 72% of greater amberjack over 1,000 mm FL and 78% over 25 kg were female. We recently sampled a 67.7 kg (149 lb) female, perhaps the largest greater amberjack taken from the Gulf of Mexico.

Unlike cobia, there was strong sexual dimorphism in age structure for greater amberjack. Our samples ranged from 0 to 15 years of age, with males attaining a maximum age of 7, and females living over twice as long to 15 years. One and two year olds made up 57% of our samples.

Growth equations calculated for greater amberjack were:

1) Otolith vs. FL, TW (by sex)

male FL (cm) = $12.49 (Sagwt)^{0.60}$ ($r^2 = 0.96$)

female FL (cm) = $12.27 (Sagwt)^{0.61}$ ($r^2 = 0.96$)

male TW (kg) = $0.04 (Sagwt)^{1.71}$ ($r^2 = 0.96$)

female TW (kg) = $0.04 (Sagwt)^{1.74}$ ($r^2 = 0.96$)

2) FL vs. TW

$$TW\ (kg) = 3.02 \times 10^{-5}\ (FL_{(cm)})^{2.84}\ (r^2 = 0.99)$$

Maturity estimations and spawning information were difficult to delineate by suspected disease conditions interfering with oocyte maturation. We suspect that our estimation of age and size of maturity were overestimated as a consequence of the diseased ovaries resembling immature ovaries.

TERRY LEARY - Next we have John Thompson from Continental Shelf Associates, and his presentation is on "Compilation of Existing Data on the Location and Areal Extent of Reef Fish Habitat on the Mississippi/Alabama/Florida Continental Shelf-Eastern Gulf of Mexico."

Compilation of Existing Data on the Location and Areal Extent of Reef Fish Habitat on the Mississippi/Alabama/Florida Continental Shelf-Eastern Gulf of Mexico

M. John Thompson
Continental Shelf Associates, Inc.
759 Parkway Street
Jupiter, Florida 33477

Abstract

The objectives of the project were as follows:

1) To synthesize previous habitat mapping studies from the eastern Gulf of Mexico into a common format;
2) To classify reef, hard-bottom, and seagrass habitats;
3) To present these habitats on uniform scale base maps; and
4) To calculate the area of these habitats.

Two types of mapping and survey studies were reviewed:

1) Large scale habitat mapping and research projects from the eastern Gulf of Mexico funded by the Minerals Management Service (seven studies); and
2) Outer Continental Shelf Lease Block specific studies conducted by individual oil companies as part of the geohazards and live-bottom clearance surveys required under lease restrictions (38 reports).

Five reef fish habitat classification were mapped:

1) Coral or rock reef showing a vertical relief of greater than 1 m (3.28 ft);
2) Low relief hard ground areas characterized by solitary corals, coral heads, gorgonids, and sponges;
3) Coralline algal and coralline algal nodule habitat;
4) Seagrass beds; and
5) Solitary rock pinnacles.

All mapped habitats were transferred to mylar overlays for the 1:250,000 scale NOS Topo-Bathymetric charts covering the eastern Gulf of Mexico (there are 18 of these charts).

Only 9% of the eastern Gulf of Mexico continental shelf has been surveyed in a manner allowing true habitat mapping. Additional areas have been scouted using long underwater television and side-scan sonar transects, but this type of data does not allow mapping of a habitat or calculation of its area.

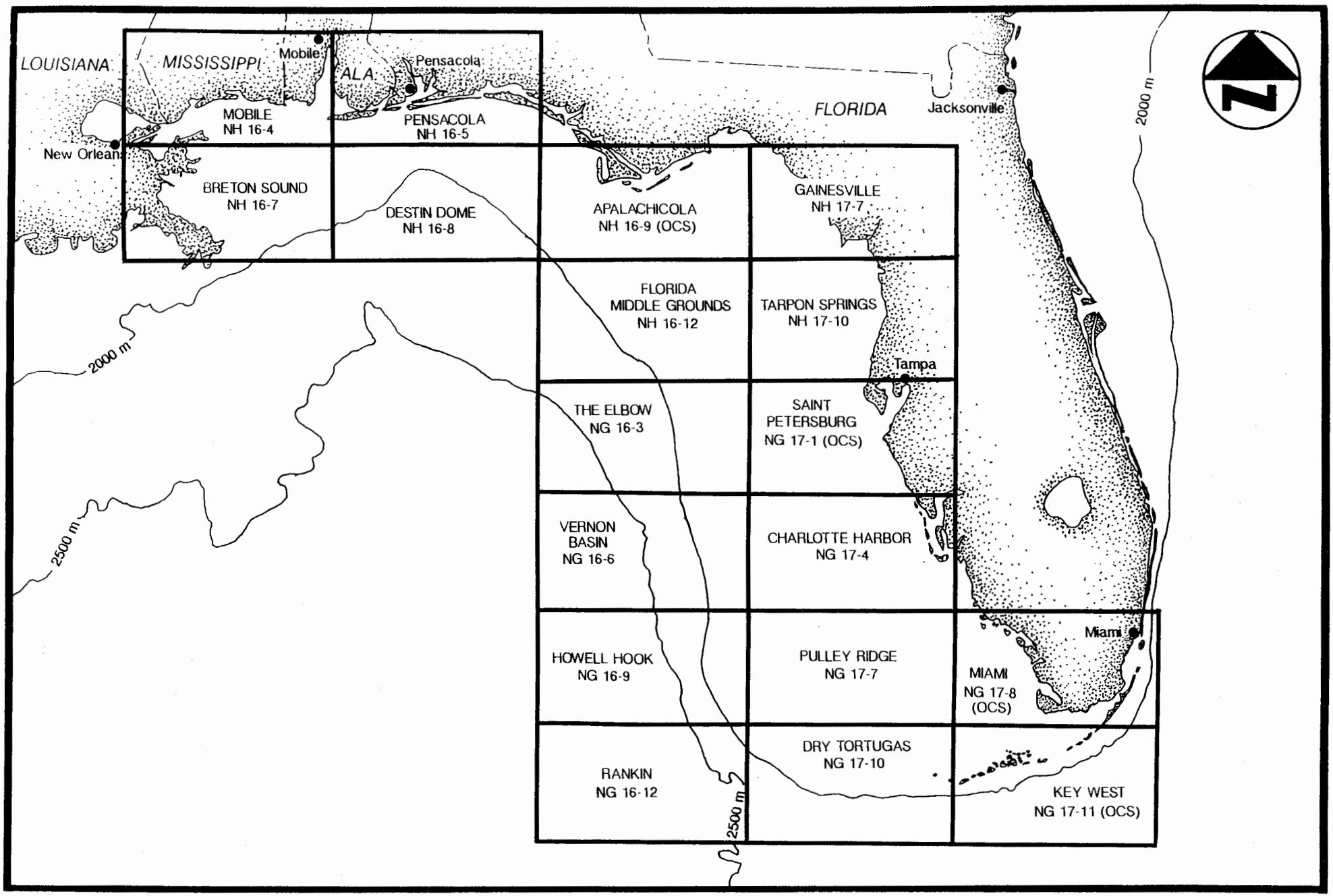
Of the total area mapped, 2,458,737 hectares (6,075,539 acres) high relief hard-bottom or reef covered 1%, low relief hard-bottom covered 5% and seagrass beds covered 28%. If the seagrasses (most of which were mapped aerially) are excluded and only the 687,880 hectares (1,699,751 acres) of seafloor mapped using underwater

television and geophysical instrumentation are considered, reef covered 3% of the mapped area and low relief hard-bottom covered 17%.

Extrapolating from the Parker et al. (1983) reef and hard-bottom estimate of 38.2 %, a total hard-bottom habitat of 939,238 hectares (2,320,856 acres) would be expected. This estimate is several times higher than the reef and hard-bottom habitat actually seen in areas mapped.

Based on the mapped habitat data reviewed and plotted in this study, an estimate of approximately 20% combined reef and hard-bottom cover on the Mississippi/Alabama/Florida continental shelf appears to be reasonable.

Eastern Gulf of Mexico topo-bathymetric 1:250,000 scale charts.


LOUISIANA
MISSISSIPPI
Mobile
ALA.
Pensacola
FLORIDA
Jacksonville
2000 m
MOBILE
NH 16-4
PENSACOLA
NH 16-5
New Orleans
BRETON SOUND
NH 16-7
DESTIN DOME
NH 16-8
APALACHICOLA
NH 16-9 (OCS)
GAINESVILLE
NH 17-7
FLORIDA
MIDDLE GROUNDS
NH 16-12
TARPON SPRINGS
NH 17-10
Tampa
2000 m
THE ELBOW
NG 16-3
SAINT
PETERSBURG
NG 17-1 (OCS)
2500 m
VERNON
BASIN
NG 16-6
CHARLOTTE HARBOR
NG 17-4
Miami
HOWELL HOOK
NG 16-9
PULLEY RIDGE
NG 17-7
MIAMI
NG 17-8
(OCS)
DRY TORTUGAS
NG 17-10
RANKIN
NG 16-12
2500 m
KEY WEST
NG 17-11 (OCS)

Summary of mapped reef fish habitat in the eastern Gulf of Mexico.

OCS Map	Total OCS Area Shown hectares (acres)	OCS Area Surveyed hectares (acres)	% of OCS Surveyed	High Relief Hard Bottom* hectares (acres)	Low Relief Hard Bottom* hectares (acres)	Rock Pinnacle Habitat* hectares (acres)	Coralline Algal Habitat* hectares (acres)	Seagrass Habitat* hectares (acres)
Mobile NH 16-4	156,106 (385,733)	7,924 (19,579)	5%	---	---	---	---	---
Breton Sound NH 16-7 (East of Birds Foot Delta)	1,178,274 (2,911,476)	144,588 (357,272)	12%	3,520 (8,697)	---	2,240 (5,534)	---	---
Pensacola NH 16-5	413,097 (1,020,749)	58,244 (143,918)	14%	---	286 (706)	---	---	---
Destin Dome NH 16-8	2,469,525 (6,102,112)	227,175 (561,341)	9%	6,270 (15,494)	9,614 (23,755)	---	---	---
Apalachicola NH 16-9	1,480,762 (3,658,913)	2,331 (5,760)	0.15%	---	245 (606)	---	---	3,758 (9,285)
Florida Middle Grounds NH 16-12	2,469,525 (6,102,112)	123,148 (304,294)	5%	12,580 (31,085)	187 (463)	---	---	---
The Elbow NG 16-3	2,469,525 (6,102,112)	1,634 (4,037)	0.07%	---	388 (959)	---	---	---
Vernon Basin NG 16-6	2,469,525 (6,102,112)	---	---	---	---	---	---	---
	---	118 km (73 mi)	---	---	---	---	---	---

OCS Map	Total OCS Area Shown hectares (acres)	OCS Area Surveyed hectares (acres)	% of OCS Surveyed	High Relief Hard Bottom* hectares (acres)	Low Relief Hard Bottom* hectares (acres)	Rock Pinnacle Habitat* hectares (acres)	Coralline Algal Habitat* hectares (acres)	Seagrass Habitat* hectares (acres)
Howell Hook NG 16-9	2,469,525 (6,102,112)	---	---	---	---	---	---	---
	---	161 km (100 mi)	---	---	51 km (31 mi)	61 km (38 mi)	---	---
Rankin NG 16-12	2,469,525 (6,102,112)	---	---	---	---	---	---	---
	---	16 km (10 mi)	---	---	13 km (8 mi)	---	---	---
Gainesville NH 17-7	443,322 (1,095,433)	443,322 (1,095,433)	100% (Aerially)	---	654 (1,615)	---	---	76,818 (189,637)
Tarpon Springs NH 17-10	1,136,447 (2,808,121)	430,534 (1,063,881)	38% (Aerial and Geophysical)	---	4,472 (11,051)	---	---	181,593 (448,710)
Saint Petersburg NG 17-1	1,247,461 (3,082,433)	18,310 (45,243)	2%	---	2,532 (6,257)	---	---	---
Charlotte Harbor NC 17-4	2,135,011 (5,275,541)	142,234 (351,457)	7%	471 (1,623)	12,501 (30,889)	---	---	---
	---	386 km (240 mi)	---	---	8 km (5 mi)	---	---	---
Pulley Ridge NG 17-7	2,469,525 (6,102,112)	44,780 (110,651)	2%	---	8,328 (20,578)	---	---	---
	---	512 km (318 mi)	---	---	11 km (7 mi)	2 km (1 mi)	19 km (12 mi)	---

OCS Map	Total OCS Area Shown hectares (acres)	OCS Area Surveyed hectares (acres)	% of OCS Surveyed	High Relief Hard Bottom* hectares (acres)	Low Relief Hard Bottom* hectares (acres)	Rock Pinnacle Habitat* hectares (acres)	Coralline Algal Habitat* hectares (acres)	Seagrass Habitat* hectares (acres)
Dry Tortugas NG 17-10	2,291,771 (5,662,889) ---	309,598 (765,007) 253 km (157 mi)	13% (Aerial and Geophysical)	4,411 (10,900) ---	31,205 (77,107) 22 km (14 mi)	--- ---	--- 60 km (37 mi)	39,292 (97,089) ---
Miami 25080-A1-TB-250 (Gulf only)	532,199 (1,315,045) ---	505,405 (1,248,839) 121 km (75 mi)	95% (Aerially) ---	--- ---	--- 2 km (1 mi)	--- ---	--- ---	120,082 (296,717) ---
Key West NG 17-11	97,454 (240,806)	97,454 (280,806)	100% (Aerially)	---	46,664 (115,306)	---	---	277,981 (688,254)
Totals Eastern Gulf of Mexico	**28,398,579 (70,171,923) ---**	**2,556,681 (6,357,518) 1,567 km (973 mi)**	**9% ---**	**27,252 (67,799) ---**	**117,076 (289,292) 107 km (66 mi)**	**2,240 (5,534) 63 km (39 mi)**	**--- --- 79 km (49 mi)**	**699,524 (1,729,692) ---**

* Percent of total OCS area unknown.

JOANNE SHULTZ - You are aware of our program I think?

JOHN THOMPSON - Which is you work with Mike Russell?

JOANNE SHULTZ - Right.

JOHN THOMPSON - Oh yes, great. I don't have a clear picture of exactly how the program works, but I hope that this information is as it was designed to be, useful to your program.

JOANNE SHULTZ - Yes, it will be.

JOHN THOMPSON - Right. How far do you intend to go with that?

JOANNE SHULTZ - We will continue our observations over time, but I will explain those particulars in my talk.

LARRY SIMPSON - Are you aware of the work by South Atlantic SEAMAP on the east coast that concerned mapping specific areas of reef fish habitat, hard bottom and that's published.

JOHN THOMPSON - That is published?

LARRY SIMPSON - If you contact the office we'd be glad to get that to you.

JOHN THOMPSON - Was that from National Marine Fisheries Service?

LARRY SIMPSON - No, it was the east coast I think South Carolina was the lead on that.

LARRY SIMPSON - Dianne Stephan was involved in that, and I'm sure she can give you that information.

TERRY LEARY - We have Dr. Charles Adams from the University of Florida, and he's going to address "Economic Analysis of U.S. Demand for Swordfish and Economic Analysis of Effort Reduction Measures on the Gulf of Mexico Swordfish Fishery."

Economic Analysis of United States Demand and Economic Analysis of Effort Reduction Measures in the Gulf of Mexico Swordfish Fishery

Eric M. Thunberg, James L. Seale, and
Charles M. Adams
Food and Resource Economics Department
University of Florida
Gainesville, Florida 32611

Abstract

The North Atlantic swordfish (Xiphius gladius) has recently been the subject of an increasing number of domestic and international regulatory measures. As of 1991, swordfish harvested in the management unit which includes the Atlantic, Gulf of Mexico and Caribbean regions, have been subject to harvest quota and size restrictions of fish less than 31 inches dressed carcass length. Such management measures may have an effect upon consumers and producers of swordfish. Therefore, the objective of this research was to develop and estimate an empirical model of United States swordfish supply and demand markets. With this model domestic losses in consumer and producer surplus were to be estimated. Also, stock effects on swordfish stocks not within the management unit and on alternative target species (primarily tunas) were to be evaluated.

To address the project objectives, two econometric models were developed and estimated. In the first model a simultaneous equation system incorporating swordfish and tuna supply and demand functions was developed. The parameter estimates from this model were then used to estimate the parameters of a general equilibrium demand function for swordfish from which consumer surplus changes under with and without quota restrictions could be computed. The results of this analysis showed that consumer surplus losses amounted to $4.6 million per year. This estimate is likely to represent short run losses in consumer surplus. Producer surplus could not be measured using the general equilibrium approach because estimation of the simultaneous equation system required the assumption that swordfish supplies were exogenously determined.

The general equilibrium model considered only aggregate demand and aggregate supplies of swordfish. To analyze the effects of North Atlantic swordfish management on other swordfish stocks a second model was estimated. This model was a simultaneous equation system having a single swordfish demand function and four different swordfish supply functions. The swordfish supply analysis incorporated supply functions for North Atlantic domestic, North Atlantic imported, domestic Pacific and imports from Pacific and Mediterranean stocks. The model results showed that both domestic Pacific and Non-North Atlantic imports of swordfish are responsive to changes in swordfish prices. The implication of this finding is that the price increases brought about by management of the North Atlantic swordfish stocks will lead to increases in effort directed toward other swordfish stocks. In effect, this phenomenon has already been observed with large increases in landings in the Pacific region. These increased Pacific landings could more than offset the price effect of reductions in North Atlantic swordfish supplies leading to lowered swordfish prices, hence an increase in consumer surplus. However, this management of the North Atlantic swordfish may indeed have deleterious effects on

other swordfish stocks, thereby expanding the scope of the task before swordfish fishery managers.

In addition to the potential intra-species effects, swordfish management may also affect alternative target species, tuna in particular. The general equilibrium demand model incorporated tuna and swordfish cross-price effects. The empirical results showed a strong cross-price effect of swordfish price changes on the demand for tuna. This means that a price increase due to harvest restrictions on North Atlantic swordfish would increase the demand for tuna, hence fishing effort directed toward tuna would also be likely to increase. Thus, in addition to the intra-species management effects there are also important inter-species effects that must be considered in swordfish management design.

TERRY LEARY - Thank you. Next we have Eugene Nakamura from the Panama City Lab of National Marine Fisheries Service, and he will be reporting on "Reef Fish Spawning Periodicity and Fecundity Estimates."

Reef Fish Spawning Periodicity and Fecundity Estimates

Eugene L. Nakamura and L. Alan Collins
National Marine Fisheries Service
Southeast Fisheries Science Center
Panama City Laboratory
Panama City, Florida 32408

Abstract

Spawning periodicity and fecundity are important parameters of reproductive biology for determining spawning potential ratios and for developing indices of abundance of a spawning stock from ichthyoplankton data. These aspects of reproduction in reef fishes are being studied by examining gonads collected from catches made by commercial and recreational fishermen in the Gulf of Mexico.

To date, 3,085 gonads from thirteen species of reef fishes (6 species of groupers and 7 species of snappers) have been collected. Because hydrated oocytes were most frequently observed in the gag (Mycteroperca microlepis), research efforts were concentrated on this species during 1992. Established procedures, including histology, for studying reproductive biology were followed.

All gonad samples of gag were collected in the northeastern Gulf of Mexico, 470 from February to December in 1991, and 216 from March to August in 1992. Sampling in January and February of 1992 was not accomplished owing to lack of consent from commercial fishermen and lack of fishing activity by recreational fishermen during these two months. Most 1991 samples were from the commercial fishery and all 1992 samples were from the recreational fishery.

Spawning during the months of February, March, April, and May was inferred from mean gonadosomatic indices (GSIs) and occurrence of ovaries with hydrated oocytes. Mean GSIs indicated spawning during February, March, and April, as the indices for these months ranged from 1.10 to 2.60 (versus 0.13 to 0.40 from May through December). Ovaries with hydrated oocytes were found in February, March, and April. Of 40 ovaries in May 1991, one had hydrated oocytes, thus, the inclusion of May for the spawning season. Frequencies of ovaries with hydrated oocytes ranged from 2.5% to 39.8% during these months in 1991 and 1992.

Batch fecundity was estimated for nine gag that had hydrated oocytes. These fish ranged from 710 to 970 mm total length, 4.5 to 11.0 kg total weight, 4 to 6 years of age, and had ovary weights of 75.2 to 464.1 g. Fecundity ranged from 93,105 to 504,181 ova.

Spawning periodicity was estimated from frequencies of ovaries containing hydrated oocytes. The smallest female gag with hydrated oocytes was 710 mm total length, so only gag this length and greater were considered. From February 11 to May 14 of 1991, the frequency of ovaries with hydrated oocytes was 29.1% (95 out of 327). Thus, the spawning periodicity by a female gag during this period was 3.4 days (reciprocal of 0.291). From March 8 to April 4, 1992, the frequency of hydrated oocytes was 38.6% (17 out of 44); thus, mature females spawned once every 2.6 days in 1992.

Our results thus far lead us to assume that the spawning period extends from February to May, or about three months, and that the spawning periodicity is about three days (every 3.4 days in 1991 and 2.6 days in 1992). Therefore, the average female gag spawns about 30 times per year. Thus, the annual fecundity per female is estimated to range from 2.8 million (93,105 x 30) to 15.1 million (504,181 x 30) ova.

TERRY LEARY - Well being you're also the next presenter, as you know, and this is "Age and Growth of Gag, Red Grouper, and Vermilion Snapper."

Age and Growth of Gag, Red Grouper, and Vermilion Snapper

Eugene L. Nakamura and Allyn G. Johnson
National Marine Fisheries Service
Southeast Fisheries Science Center
Panama City Laboratory
Panama City, Florida 32408

Abstract

Age and growth data are essential elements in understanding the dynamics of our fishery resources. Age and growth may be variable properties that are dependent upon the density of the population. Age-length keys may produce serious biases when applied to populations from which they were not derived, or to years during which they were not derived, if population density is significantly altered by fishing mortality. For many reef fishes in the Gulf of Mexico, age and growth have not been characterized or were done years ago.

This MARFIN project was designed to determine age and growth parameters of gag (Mycteroperca microlepis), red grouper (Epinephelus morio), and vermilion snapper (Rhomboplites aurorubens) collected from commercial and recreational fisheries mainly in the northern and eastern Gulf of Mexico. A few gag were collected on Florida's east coast, and a few red grouper were collected in Yucatan, Mexico. All vermilion snappers were collected in the northeastern Gulf of Mexico. Otoliths were used in determining ages of gag and red grouper, while otoliths and scales were used for vermilion snapper. Otoliths were collected in 1991-1992 from 539 gag, 346 red grouper, and 426 vermilion snapper. Scales were collected from 103 vermilion snapper.

For gag, counts of annuli on the surface and on the cross-sections of the otoliths coincided in 91% of the cases. Agreement between two readers was 97.5%. Ages of the 850 gag ranged form 1 to 27; total lengths ranged from 300 to 1,280 mm. Because 1992 samples are still being collected and processed, comparisons were made between the 1979-80 and the 1991 data. The mean length of 1991 gag (78.9 TL, n = 207) was significantly larger than the mean length of 1979-1980 gag (72.5 cm TL, n = 313). The 1991 gag were significantly larger at capture and also at age than the 1979-1980 gag (i.e., at ages 3-7 and ages 2-6, respectively; other ages were insufficiently represented). The age distribution in the 1979-1980 fishery was relatively even from 3 to 7 year olds, whereas in 1991, 5-year olds predominated in the catches (62.8% of the catch). In 1979-1980, 45.3% of the catch consisted of fish older than 5 years, while in 1991, 12.0% of the catch consisted of fish older than 5 years. The von Bertalanffy growth equation for the 1979-1980 gag was $L_t = 119.9 (1-e^{-0.01354(t+0.9060)})$, where L = total length in cm and t = years. The equation for the 1991 gag was $L_t = 128.3\ 1-e^{-0.1246(t+1.7207)})$. The growth rate in 1991 was significantly greater than the rate in 1979-80. These results indicate a drastic change in the age and size composition of the gag population in the northeastern Gulf of Mexico in the last decade, and may indicate a response to change either in environmental factors or in population density.

For red grouper, counts of annuli on the surface and on the cross-section of about two-thirds of the 600 fish coincided in 77.0% of the samples. Some otoliths did

not have clearly distinguishable marks. If these were eliminated, 90.6% agreement in counts was obtained. Ages of the 600 red grouper as determined from surface readings only of the otoliths ranged from 1 to 25 years, while total lengths ranged from 308.8 mm to 954.0 mm. Age-length keys and back-calculated lengths at age were determined for fish sampled in 1979-81 and in 1991. The 1979-81 fish were measured in fork lengths, while the 1991 fish were measured in total length. Both lengths on the same fish are presently being measured to develop conversion formulae for temporal comparisons.

Aging of vermilion snapper has proven to be less certain than with groupers. Because only 19% of 78 otoliths collected in 1991 had agreement of counts of marks on both surface and sections of otoliths, both otoliths and scales were collected in 1992 from 103 vermilion snapper for comparison of mark enumerations. The agreement was only 20%. The agreement between two readers was 97% for otoliths and 94% for scales. Age-length keys and back-calculated lengths at age were determined for vermilion snapper with data from 1991 sampling. Owing to the low level of confidence in otoliths readings, two sets of computations were made. One was based on marks that were present; the other was based on marks believed to be annuli as judged on the basis of the experience of the investigator. The latter computation yielded larger fish at age.

TERRY LEARY - Our final presentation under the Reef Fish and Ocean Pelagic section is the "Fishery Independent Techniques for Reeffish" presented by Joanne Shultz of NMFS.

Fishery Independent Techniques for Reef Fishes

Joanne Lyczkowski-Shultz, Mike Russell
and Chris Gledhill
National Marine Fisheries Service
Mississippi Laboratories
P.O. Drawer 1207
Pascagoula, MS 39568

Abstract

Reef habitats pose unique problems for resource managers due chiefly to their physical characteristics, biological diversity and ecological complexity making the populations of fishes they support difficult to examine, assess and, therefore, manage. The vulnerability of reef fishes to overfishing and reef habitats to physical destruction are also major concerns. With increasing restrictions on reef fish fisheries, and thus on the availability of fishery data, the life history information and population data required for stock assessments will have to be provided by resource (fishery-independent) surveys.

Investigations of sampling methodologies to survey the fishes that aggregate on or over live and/or hardbottom habitats, and oil platforms have been conducted by the NMFS, university and state scientists for some time now (Huntsman, Nicholson and Fox, editors, 1982). Collection (fishing) gears used have included bottom longlines, gill nets, traps, power assisted handlines, several types of cameras and video equipment operated from fixed locations while drifting or from remotely operated vehicles and submersibles (Haynes 1988). A trap/video (TV) system for assessing species on natural and artificial hardbottoms (exclusive of oil rigs) has emerged that provides a solution to some of the most important data collection problems, observing enough fish at a station for statistical reliability, making individual stations brief enough for meaningful broad-scale surveys, non-destructive sampling of reef habitats and relatively non-selective "collection" (observation) of reef fish species.

Major objectives for FY1992 MARFIN/NMFS reef fish investigations included complete and test modifications to TV system and sample site selection; incorporate new information on hardbottom location into computerized system for probability-based sample site selection; develop data management system for reef fish data; improve methods for estimating abundances from videotape records, including development of taxonomic keys and training tape readers; evaluate acoustic techniques for detecting and quantifying populations not detected by TV and complete gulf-wide survey incorporating new modifications.

During the past year a manual was written outlining reef fish sampling protocols using video cameras ("Reef Fish Assessment Methodology for SEAMAP Surveys of Hardbottom Areas") which represents the state-of-the-art synthesis of efforts to sample reefs with video technology at NMFS Mississippi Laboratories prior to 1992 and covers topics from sample site selection to videotape analysis. A computerized taxonomic tool for the identification of groupers from video tapes, "Pictoral Guide to the Groupers (Epinephelus and Mycteroperca) in the Western North Atlantic (Pisces: Serranidae)" (M. Grace, K. Rademacher, and M. Russell,

manuscript in review), was also developed to facilitate transfer of video techniques for assessment purposes, as well as, general investigations of reef fish ecology and behavior.

The first SEAMAP Gulfwide Reef Fish Survey was conducted during the 1992 season by the NMFS and states of Mississippi and Alabama. Survey participants employed a fish trap/video system consisting of a Yashica KD-HI7OU Hi 8 video camera in an Amphibico V801 Universal housing mounted outside a single funnel fish trap to record fish abundance and habitat type at randomly, preselected sites. The probability-based, sample site selection process used was designed to facilitate not only site selection but also updates sampling sites from data gathered during surveys on the presence and absence of reef habitat. This computerized system of hardbottom locations is based on natural reef habitat from Brownsville, Texas, to the southern tip of Florida at 81°00' W. longitude and 24°39' N. latitude between 5 and 60 fathoms that was inscribed on navigation charts and subdivided into 10 x 10 nautical mile blocks. The reef habitat within each block was digitized, divided into 100 meter square sample sites and numbered by the computer. Blocks to be surveyed were randomly selected with probabilities proportional to size (size being the number of sample sites in a block).

During the 1992 season, 146 sites were sampled during the period 19 May to 1 July from the NOAA ship CHAPMAN with the TV system. At 35 of these sites (eastern gulf only), reef fish were also surveyed, five transects over each TV location, with a fisheries acoustics system or FAS (Thorne 1988) providing an acoustical picture 0.4 nm around each site. Previews of the 1992 video tapes indicate the correspondence between the ship's color echo sounder and video recordings of bottom habitat was good, and the video recordings were of a quality to permit species identification. Species composition of trap catches in the eastern gulf were dominated by tomtate (Haemulon aurolineatum), red porgy (Pagrus pagrus) in the northeast gulf and by red snapper (Lutjanus campechanus) in the western gulf.

Preliminary data from the synoptic TV and FAS survey were analyzed to examine the feasibility of combined deployment of trap/video and acoustic "gear" and the potential relationship between these diverse types of data. These results indicate routine use of video and acoustic techniques to survey reef fishes is feasible, and together video and acoustical techniques may eventually provide the best estimates of reef fish abundance.

TERRY LEARY - As I said, we'd give you an opportunity to question the panelists. We'll take a couple of short questions before we switch over to the next moderator.

SKIP LAZAUSKI - Joanne, did you sample in Alabama on artificial reefs or is most of it natural bottoms?

JOANNE SHULTZ - Just natural bottoms, yes, right. We haven't gone to artificial reefs, you have been doing that.

JOAN HOLT - ...something like March through August, I wonder if there might be different populations dynamics going on down in this area.

BRUCE THOMPSON - Well, considering what we know about the different dynamics of water temperature, salinity patterns, rain fall, just to name a couple of them, it wouldn't surprise me. I suspect that they are, because for example, when I compare my stuff say sex ratios and stuff like that with Jim Franks from east of the river, you almost swear we were in different oceans. For five years, there have been almost a two to one male to female ratio every year. His data is almost the reverse of that in females so there is movement in and more and more tagging is suggesting that there's cross Gulf of Mexico movement and stuff like that. There's a possibility that the males are moving further west or etc., etc., so if you got a longer warmer summer season you might be seeing it much, much longer than we are. I'm basing reproduction strictly on oocytes. By July and on into August, all the vitellogenic oocytes that we identify are in atresea and are incapable of being fertilized so I would have to turn around and ask you how old are these things [refers to small cobia noted in her question] so you can get some idea of how far they could have drifted and so forth. We're basing our stuff strictly on methodology, on a oocyte that we feel could be capable of being fertile.

SESSION III
COASTAL HERRINGS, GROUNDFISH AND GENERAL

SESSION III - COASTAL HERRINGS, GROUNDFISH AND GENERAL - Jack Van Lopik, Chairman

Thank you, Terry. With a title like that for this session we can talk about anything we want to apparently, as long as we do it within fifteen minutes, so if we can get the speakers, four speakers for the session up to the table we can get the session underway. I see we already have one up there so we can get started. And the first speaker is Ken Roberts of Louisiana State University and Louisiana Cooperative Extension Service, and he will discuss "Finfish Processing Sector Changes in the Gulf of Mexico Fisheries Under Management/Regulation."

Finfish Processing Sector Changes in the Gulf of Mexico Fisheries Under Management/Regulation

Kenneth J. Roberts and Walter R. Keithly, Jr.
Louisiana State University
Room 252, Knapp Hall
Baton Rouge, Louisiana 70803

Abstract

Goal and Objectives

The investigators were to identify changes in the structure of the gulf finfish processing sector from 1970-1990. The pre-1985 period was one relatively free of management/regulatory (M/R) procedures in federal waters. This is in contrast to the 1986-1990 period.

- Identify industry structure changes for establishments identified as processors or handlers of key M/R species such as mackerels, reef fish and red drum.
- Handler codes will be tracked to determine if handlers react to M/R by becoming processors.
- Estimate the relationship between target gulf supplies and live weight equivalent volume used by processors.
- To identify the extent to which finfish processors became associated with the region's shellfish processing sector.
- To determine if the processed product mix of gulf finfish has evolved toward products with higher value.
- To specify processing establishment characteristics for evolving issues.

Methods to Accomplish the Project's Purpose

The investigators propose to use a confidential processing database maintained by the National Marine Fisheries Service. It includes a code number for each establishment whether or not still operating. Thus, various files could be created for the structure analysis from: (1) annual processed poundage and value of each species and product form processed, (2) for handlers it lists species but not value, (3) employment information for each establishment and (4) location of facility. Deletion in a year of code numbers associated with specific forms/species indicates the establishment ceased processing that product. Exit and entry of establishments can also be traced.

Tentative Findings (6 months extension to original 9/30/92 completion)

- The 1970-72 was deleted from the data base.

- Edible landings increased at an average annual rate of 2 percent from 1973-1990. Value increased 13.3% annually (5.6% in real terms).
- Finfish processing establishments increased 117%, quantity of product increased 182% (8.3% per year) and real value increased 262% (10.4% per year).
- Quantity per facility increased 29% and real value increased 67%.
- Most growth occurred after 1985; entering firms exceeded exits.
- Florida's west coast had 60% of plants and 50% of production. However, larger plants were in Alabama and Louisiana.
- The concentration of sales among the top 5, 10 and 20 finfish processors decreased.
- Prior to 1985 firms processing finfish only comprised 25 percent of the industry. After 1985 more than 60% of the firms processed finfish only.
- More than half of the firms processed only one species. Eighty-five percent produced three or fewer products.
- Eighty-four percent produced three or fewer products.
- Employee productivity increased throughout the period. Productivity was highest in the finfish only firms.
- Conversions of processing tape data to round weight has been a problem.

JACK VAN LOPIK - Let's take questions now because we have a few minutes.

DAVE BURRAGE - Ken, you mentioned that there was a real sharp break in the data around 1985. What do you think caused that? Was that the institution of the management regulations, or what?

KENNETH ROBERTS - If there is more management/regulation, it could add a depressing effect on the ability of firms to survive. We saw no net exit, in other words, after 1985 there was net entry into the business. What do I attribute it to? I would say an expanding grouper fishery. Some amberjack, black drum, we picked up some firms that were processing black drum and obviously imports. The contributions of each of those I do not know. Now that says something about management. If in fact that statement has some validity, it tells you that maybe you need a comprehensive approach to finfish management because people will go out and start chasing other things to make up their sales. We didn't get any real increase in the number of firms until about 1985, and they went from that base of about forty to fifty-five and then shot up to the high nineties for the last three years of the database. It's a highly specialized type firm that tells me the reason why is within the finfish processing sector and not shellfish processing.

JANE BLACK - Dr. Roberts, when you go back home and you start looking, examine the fact that in 1986 we had common carrier fresh ice fish service directly from west of Louisiana for the first time. And it opened the door so that a company could go in the fresh fish business and sell literally to all over the eastern United States without the incumbermant of running their own eighteen wheeler to market to Chicago or Miami.

KENNETH ROBERTS - If they were cutting those fish we will pick that up, but if they are not cutting those fish we will not.

JANE BLACK - Everybody started putting everything that was fresh on those trucks that previous to that they couldn't get anywhere for years. You might get a few fish on Miller, or Martin's Oysters in New Orleans if he wasn't full, and up until 1986 that was it. Then Trip Seafood came in and now there's a multitude of trucking firms that will haul fresh.

KENNETH ROBERTS - Well if we looked at the handler aspect which is grading, icing and then shipping via common carrier, we might pick that up. On that account we would simply work with the processing data where they are actually cutting and filleting them.

JANE BLACK - Well that allowed more handlers to supply more processors. Before you wouldn't have any handlers because what would they do with it.

KENNETH ROBERTS - It could be a transshipment problem. A lot of that fish may have been directly going to a market elsewhere. Now it's going through processing plants. That's one of the possibilities.

JANE BLACK - Well that man could go in business before that he was, I mean it was literally a Houdini trick to be in the fish business west of Mississippi to figure out what you were going to do with it.

KENNETH ROBERTS - The work that was done with the handlers, we would not see much of a tendency for a handler to move to become a processor in the database.

JANE BLACK - At the same time we worked out problems with the airlines. During that same early late 1985 previous to that, I believe it was United went into the fresh fish business and they ruined three planes with...

KENNETH ROBERTS - Delta did a neat job in New orleans.

JANE BLACK - Yes, remember the disaster and when they got that fixed then they could get processed product out. But it took a couple of years for the fresh fish business to convince the airline that they weren't going to ruin any more planes.

KENNETH ROBERTS - Those are good points and ones that I'm glad I came to hear because those are the kinds of things we need to find out about that are not in our database.

CORKY PERRET - Dr. Roberts, I heard you mention groupers, black drum and some of the others, what about tuna, the impact of their tuna fishery?

KENNETH ROBERTS - Well the tuna on the data tape is not showing up as processed products to any large extent because it's all fresh shipped, it's port sample graded and ice trucked out and that would not show up in the processing database. It's a reason that edible landings in the gulf went up, but it's probably not a reason that the edible processed product went up. That's my guess, Corky.

JACK VAN LOPIK - The next presentation is entitled "Investigations of Inshore and Offshore Population Dynamics of Spanish Sardines Along the Central West Coast of Florida." The speaker is Fred Sutter from Florida Department of Natural Resources.

Investigations of Inshore and Offshore Population Dynamics of Spanish Sardines Along the West Central Coast of Florida

Frederick C. Sutter, Roanne Trapini, and
Behzad Mahmoudi
Florida Marine Research Institute
100 Eighth Avenue, SE
St. Petersburg, Florida 33301

Abstract

Spanish sardines, Sardinella aurita, are an important commercial baitfish species in the Tampa Bay and Panhandle regions of Florida. It is important to obtain a description of age, growth and reproductive patterns for areas where Spanish sardine are exploited and for locations where potential exploitation may occur. The goal of this project was to provide estimates of age, growth and reproduction for inshore and offshore populations of Spanish sardines along the central west coast of Florida. The concomitant objectives were to provide: (1) spatial and temporal descriptions of size/age composition of Spanish sardines based on fishery dependent and independent sampling; (2) spatial and temporal characteristics of reproductive condition, sex composition and maturity schedules and (3) estimate growth rates.

Spanish sardines were collected from inshore and offshore waters of Tampa Bay. For comparison purposes, samples were also taken from the Florida Panhandle and southeastern coast of Florida. Inshore samples were taken from commercial purse seine landings and from cast netting efforts; Spanish sardines from offshore waters were collected using lights to attract fish at night, capturing fish with gill nets and cast nets. A minimum of 300 fish were processed from each sample with otoliths, gonads and weights obtained from an appropriate subsample. Otoliths were processed with a variety of techniques in an attempt to describe the age structure of various populations. Length frequency data were used to derive estimates of L_{inf} and K using a maximum likelihood technique (MULTIFAN). Reproductive studies were based on histological preparations.

The conclusions of this research program, relative to age and growth include: (1) an exhaustive search for adequate means to age Spanish sardines with otoliths yielded less than 3% agreement; (2) comparison of the estimates of the growth coefficient, L_{inf}, and length-weight relationships indicate that female Spanish sardines grow slower than males, but achieve a larger size; fish from the Tampa Bay area grow faster, but not as large as Spanish sardines from the Panhandle; and sardines from the east coast of Florida grow faster and larger than those from either Gulf of Mexico location; and (3) mean lengths at age class from the length frequency analysis were similar for Tampa Bay and northwest Florida. Reproductive parameters described by this study include: (1) males reach 50% maturity at the same size (120 mm FL) for all Gulf of Mexico locations; (2) females were maturing at smaller size for inshore Tampa Bay waters; (3) microscopic staging of female gonadal tissue in the Tampa Bay area indicated that earlier reproductive stages are found inshore while later stages were found from fish taken in deeper water; (4) larger oocytes occurred more frequently in females collected from offshore relative to inshore Tampa Bay waters; (5) mature females were collected from February to August from inshore Tampa Bay waters and during April to September in offshore

locations; similar spawning seasons were found in the Florida Panhandle (June to September) and southeast Florida coast (March to August) and (6) sex ratios favored females in all areas except for the southeast Florida coast. A coccidian parasite (Eimeria sardinae) was found in histological preparations of female and male gonadal tissue occurring more frequently in Spanish sardines from Gulf of Mexico waters than Atlantic Ocean samples. This is the first report of this parasite in female gonadal tissue and also extended the range of occurrence to Gulf of Mexico waters along the west coast of Florida.

Summary of von Bertalanffy Growth Parameters for Spanish Sardines
Using Length Frequency Analysis (MULTIFAN)

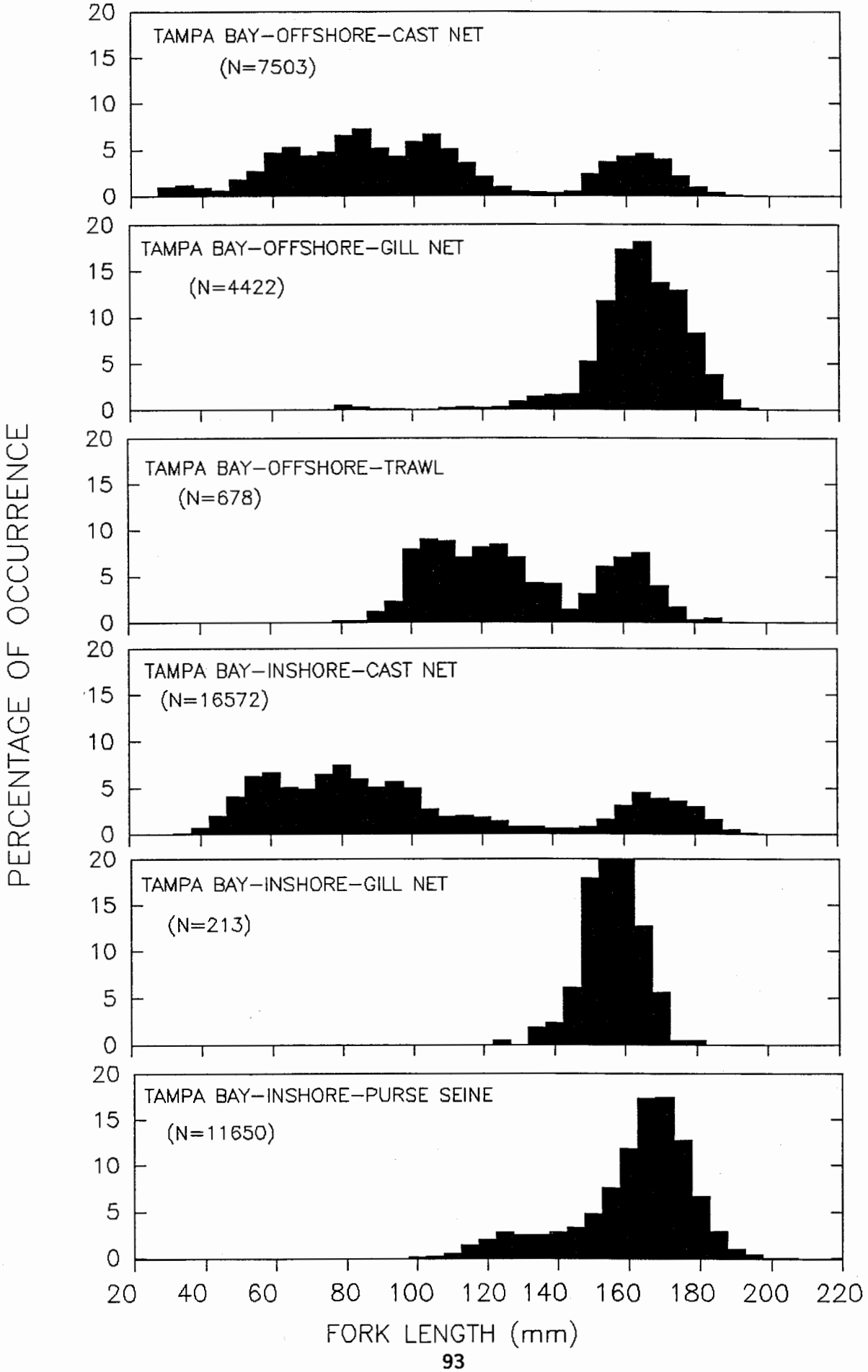
MULTIFAN SUMMARY

MULTIFAN PARAMETERS	*TAMPA BAY AREA*				*OUTLIERS*	
	ALL GEAR COMBINED	MALE	FEMALE	CAST NET	PANHANDLE	EAST COAST
OBJECTIVE FUNCTION VALUE	8321.32	8470.18	8959.51	6157.93	5827.68	6491.25
TOTAL PENALTY	2.318	2.465	2.625	4.318	0.209	0.817
MAXIMUM GRADIENT COMPONENT	0.0006	0.0004	0.0006	0.0005	0.0001	0.0003
NUMBER OF PARAMETERS	58	61	64	46	36	28
K	0.721	0.783	0.733	0.699	0.674	0.825
Linf	189	174.4	181.8	190.7	195.2	199
MEAN LENGTH OF AGE CLASS						
1	62.49	63.06	62.98	60.04	130.58	80.94
2	127.49	123.54	124.73	125.81	162.32	147.5
3	159.11	151.19	154.4	158.49	178.49	176.67
4	174.48	163.82	168.66	174.72		
STANDARD DEVIATION	9.2	9.47	9.45	10.41	9.5	9.87

NOTE: ALL ESTIMATES BASED ON USING AGES 2, 3 AND 4 YEARS
AND K VALUES OF 0.4, 0.6 AND 0.8

SPANISH SARDINE COLLECTIONS BY GEAR TYPE

APRIL 1988 TO JANUARY 1992



JACK VAN LOPIK - The next project concerns "Small Pelagics in the Gulf of Mexico." It will be discussed by Chris Gledhill of the NMFS, Pascagoula Lab.

Small Pelagics Research in the Gulf of Mexico

Scott Nichols
National Marine Fisheries Service
P.O. Drawer 1207
Pascagoula, MS 39568-1207

Abstract

Introduction

Small pelagics (coastal herrings, small jacks and small scombrids) form a large and potentially valuable latent resource in the Gulf of Mexico. Biological and ecological data for most of these species are lacking so consequences of a significant commercial fishery are unknown. Without precise estimates of their biomass, rate of replacement and importance to other living marine resources in the gulf, efficient fisheries development is difficult and effective management is unlikely.

In response to the recognize potential of the small pelagic resource, NMFS initiated a research program in 1983 to collect information on the distribution and abundance of small pelagics, determine environmental and predator-prey relationships, and investigate the handling and processing techniques required to maintain a high quality commercial product. Research has included development of fishing gears to capture small pelagics and technology transfer to the fishing industry. Activities conducted during the past year centered on coastal herrings and have focused on improving assessment methodology, development of a fisheries acoustic survey, development of a geographic information system (GIS) and an evaluation of onboard handling techniques on the quality of selected coastal herring species conducted by the experimental seafood processing plant.

Project Objectives

- Conduct seasonal surveys for coastal herrings in the eastern gulf, and conduct a prototype gulf-wide survey on the small pelagic complex.
- Continue evaluation of a fisheries acoustic system and implement a fisheries acoustic survey.
- Continue gear research to optimize sampling trawl technology for gulf-wide and acoustic surveys.
- Continue sampling the harvest of small pelagic resources by port sampling and by monitoring landings harvested for petfood production.
- Investigate relationships between satellite derived environmental parameters and the distribution and abundance of fish stocks.
- Support implementation of research at the experimental seafood processing plant in Pascagoula.

- Support research studies on selected species to develop these into value-added products for human food use.

- Continue technology transfer of research results.

Summary of Results

Research under the Small Pelagics Program included work to implement a fisheries acoustic survey. The finalization of a survey design, however, was delayed due to the cancellation of a fall 1991 pilot survey as a result of mechanical problems on the NOAA ship CHAPMAN. An experiment to measure the acoustic size (target strength) of small pelagic and other species held in a cage was completed during a summer cruise of the CHAPMAN. The target strengths (TS) of gulf butterfish, rough scad, round scad, chub mackerel, Spanish sardine, scaled sardine and other species were measured. These data are needed to estimate fish density during a fisheries acoustic survey. The average TS of fish targets is used to convert relative abundance estimates made by echo integration and measured as mean volts^2 to estimates of fish/m^3. Target strength estimates can be obtained in situ during a survey. However, these data must be obtained on single fish targets. Few single targets were observed near the sea bottom during two pilot fisheries acoustic surveys conducted in 1990. The estimates of TS obtained during the cage experiments can be used with trawl catch data to fill in gaps in TS estimates made during a survey.

A bottom trawl survey for small pelagics was conducted in March-April, 1992, in the eastern and central gulf. A total of 88 trawl stations were completed during this survey, which was designed to provide the first data point in a time series. Catches were dominated by Spanish sardine, round herring, rough scad, gulf butterfish and round scad.

Port sampling was conducted to determine the catch of small pelagic and other species made by the industrial bottomfish fishery and by vessels that target gulf butterfish. A total of 74 trips were sampled during the period from October 1, 1991, through September 23, 1992. These data are available for stock assessments but are confidential.

The effort to study the relationships between the distribution and abundance of species of small pelagics and environmental variables was enhanced by the acquisition of computer equipment, software and data bases for development and evaluation of a geographic information system (GIS). GIS is a tool for managing living marine resources, and will be used in support of research program funded by the Marine Fisheries Initiative (MARFIN) and the Minerals Management Service. All equipment and software were acquired with funds from the Minerals Management Service.

An evaluation of onboard handling techniques on the quality of selected coastal herring species in conjunction with market evaluations and economic analyses to identify appropriate product forms for domestic and foreign markets was conducted by the experimental seafood processing laboratory. The small pelagics complex is one of the major latent fishery resources of the U.S. Many of the finfish species in this complex have not been readily accessible to traditional fish locating and harvesting methods, and consequently, very little information has been available

concerning proper methods to handle, hold and process these fish. Information is also lacking on proximate and fatty acid compositions of these fish. During the past several months, proximate and fatty acid composition studies have been conducted for several species in the coastal herring complex. Additional analyses will continue throughout the year. Marketing and economic studies have also been conducted for five selected coastal herring species. These analyses are currently being completed. Onboard handling studies have also been conducted with chub mackerel and rough scad. Chemical (i.e., salt, FFA and TBA) and sensory analyses have been initiated. Rough scad were either immediately frozen (control) using the plate freezer, held 3 days in a 3% salt-ice mixture, or held for 1, 3 or 5 days on ice or in refrigerated seawater (RSW) before being frozen in the plate freezer. Sensory results indicated relatively good initial quality for all rough scad samples except for the 3 and 5 day RSW treatments. After 3 months of frozen storage, the control and 1 day ice samples still maintained relatively good quality. Samples of chub mackerel which were either immediately plate frozen (control) or held for 3 days in RSW were also evaluated. The results indicated that few sensory differences existed between chub mackerel control samples and chub mackerel held for 3 days in RSW.

JACK VAN LOPIK - We are pleased to have Ron Schmied discuss "Educational Tools for Marine Recreational Fishermen to Promote Wise Use and Conservation of Gulf Fishery Resources." Ron is associated with NMFS in the Southeast Regional Office.

Educational Tools for Marine Recreational Fishermen to Promote Wise Use and Conservation of Gulf Fishery Resources

Ronald L. Schmied
National Marine Fisheries Service
Southeast Regional Office
9450 Koger Boulevard
St. Petersburg, Florida 33702

Abstract

Purpose

The purpose of this project was to develop a coordinated regional program to secure effective angler involvement in the conservation and management of marine fishery resources in the Gulf of Mexico. Specifically, this program promotes personal stewardship of fisheries resources by identifying and addressing informational and attitudinal constraints to responsible angler behavior. Notably, this project was a continuation of the original MARFIN-funded project initiated in October 1990.

Methods

A task force was assembled representing state and federal fisheries management agencies, the saltwater sport fishing and conservation communities, academia and the media to develop an Angler Conservation Education (ACE) Plan. While task force members were initially drawn from the Gulf of Mexico area, geographical coverage was expanded somewhat to include the South Atlantic to parallel the expanded MARFIN Program. Three full task force meetings were held at the NMFS Regional Office in St. Petersburg, Florida, to develop the content of the ACE Plan and a smaller, three-person team was convened twice to draft the plan.

Findings

All planned project activities were completed on schedule resulting in the preparation of a draft ACE Plan. Key tasks completed by the task force in writing this plan included:

- A review of past and ongoing aquatic and angler education efforts by federal, state and private organizations, and the preparation of a summary of those efforts which is to be included as an Appendix to the ACE Plan.

- A review of recent trends in the Southeast regarding demographic changes, the status of fisheries resources and significant trends in commercial and recreational fisheries.

- A review of research findings regarding the identity and characteristics of marine angler sub-populations in the Southeast and the implications thereof for the development and implementation of this program.

- An assessment of angler involvement in and support for marine fisheries conservation and management programs.

- An identification of informational and attitudinal constraints to more effective angler involvement in fisheries conservation and management.

- The formulation of seven guiding principles for use in program development and implementation.

- The formulation of eight education program objectives and specific strategies, activities and products needed to address each objective.

- The development of a program implementation strategy including the identification of potential funding sources and a recommended organizational structure to support, coordinate and oversee implementation actions.

Now that the ACE Plan is drafted, it will be distributed to a much larger and diverse group of organizations during the winter of 1992 to solicit their comments and suggestions and eventually, their endorsements. On completion of this task, a regional Angler Conservation Education Conference will be planned, organized and held to launch this education initiative.

JACK VAN LOPIK - Are there any questions?

BRUCE THOMPSON - Ron, I do quite a bit of work with fish identification and part of my problem on all of these, a lot of these programs, it seems that somehow there's an inference that we should be teaching recreational fishermen differently or the programs always seem to be different than commercial fishermen. I do recreational and commercial fish identifications because in many cases they're fishing the same animal. So personally and professionally I'd like to see some of these programs not be completely dicotomized between the two portions in the industry. I want to go to the coast and teach people how to identify fish, and I do this all the time. I don't care who's in the audience as long as they're not throwing bricks or rocks at each other (and that may be a problem), but if that is the problem then we've got a bigger problem than the identification of the animal. So I'd like to see some of this not be necessarily restricted to one group of the harvesters or the other.

RON SCHMIED - I agree with you totally Bruce, but this particular effort was targeted initially to the sport fishing community. While they both need to be able to identify fish, you need to produce and distribute a document somewhat differently to get it in their hands. There are indeed some people in the commercial sector that I discussed this with and who we need to do many of the same things on the commercial side. That wasn't my particular goal in this project, but I hope someone will pick it up and run with it.

JEAN MARTIN-WEST - Ron, I know that Bruce just mentioned educating the group of recreational fishermen, and I think you were talking about going to groups that meet in the afternoon or the evening or whatever. What kind of plan do you have for the fishing piers? I fish on the Outer Banks alot, and these are people that come from up north and they are just there for either that weekend or the week and haven't had or haven't taken advantage of any kind of education that is available in the community. You should see what they do. They come down and catch little things and put them right in the ice chest or either they throw them out on the pier and the kids play with them, they stomp on them or cut them up. There's no way that they would do that for that day or that week if you're educated. They don't even know what ID is, they don't know what size/bag limits are. I'm sure that they probably have the regulations posted somewhere as they're going in, but these are people on vacation. These are people who just came in, got their hand stamped, and they're out there throwing one or two lines overboard.

RON SCHMIED - These people are part of the angling public we're calling occasional anglers. These people fish very infrequently, and they are in the case of all of the issues I've presented, they're the most difficult segment to get to. I spent five days up at Nagshead this summer on vacation and most of the tourists have zero information as far as fish ID, regulations, etc. The guy that's running the pier, if it's manned, might have information, but it's usually very little. And that's the point, we need to use those outlets to get information in the hands of anglers, especially those that specialize in pier fishing. Through peer pressure, that sounds like a pun, they can begin to educate the guy standing next to them. They could say, "Hey, friend, I don't know if you realize it, but there is a size limit on that fish and you're going to have to let that one go because he doesn't meet it."

JEAN WEST - But I've done that, and they tell me mind your own business. Well, what I'm talking about is, for instance, when you get your hand stamped, it could be that the person who stamps your hand has to provide some kind of brochure? Now whether you read it or not, you know then that it is your responsibility. But at least if they are able to have this booklet then they might read it and find out the policies. However, if it's long and involved, they're not going to take time to read it.

RON SCHMIED - In many of the states when you go get a license, in Florida, for example, you're not provided any information on regulations. At the minimum, when you get a license, they ought to hand you a copy of the regulations.

ED KLIMA - I would like to make a comment. I, like you, have fished in many areas in this country. Something that really has made an impression on me was when I fished on the west coast in Washington and Oregon. They would no more break a game rule than they would jump off the Empire State Building. The public ethics are so strong; they absolutely will not commit any minor infractions. For example, you're not allowed to use treble hooks -no one would dream of using a treble hook as far as fishing is concerned. And if they did, they would be reported. The public ethic is so strong. Now what I'm saying here is somehow the educational process is working on the west coast, and the people value those resources. Somehow it's been forgotten along the Atlantic and the Gulf coasts. Your program is the type of thing that would make it work through an educational process to a distinct process and a whole bunch of processes so the people are truly aware that this is a resource for them, and they need to protect it and use it wisely.

RON SCHMIED - It is a public resource; they need to take some responsibility towards its future. We need to help them deal with these information constraints and these inaccurate beliefs. There is a model that you can follow on the west coast, and we just need to look into that more closely. In the next two weeks, we're going to be sending this draft plan out to all the states in the southeast to a large list of recreational and conservation groups to get their comments. The plan includes a lot of ideas, well thought out ideas I think, on how we can attack some of these issues. It's not an end all list; it will evolve over time. We're calling for an association of partners to continue planning, monitoring and, very importantly, the evaluation. A main reason why these programs don't get funded is no one ever thinks about how they're going to be evaluated to demonstrate a return on the investment. This program proposes a very strong evaluation section.

JACK VAN LOPIK - Thank you Ron. I would like to take the opportunity again to thank each of the speakers and turn it back over to Larry for final comments.

LARRY SIMPSON - It's been a long day for this session. The next session tomorrow won't be quite as long, but let's get started around 8:00 a.m. Anything anybody else needs to say? We're adjourned.

SESSION IV
SHRIMP, TURTLES AND TEDS

Thursday, October 29, 1992

SESSION IV - SHRIMP, TURTLES & TEDS - Larry B. Simpson, Chairman

Good morning. I would like to call the second day of the MARFIN Principal Investigator Conference to order. All of you had a good night last night. It's good to be here in Texas, and Andy is with us today. Andy got here late last night, and he'll be making some remarks a little bit later. The second day begins with a session which I am chairing on Shrimp, Turtles and TEDS. We've assembled an excellent panel of people who are sharing their work with us. Our first presenter is Dr. Baltz from Louisiana State University, and he'll be talking about "Patterns in the Distribution and Abundance of Fishes and Macroinvertebrates in a Louisiana Marsh: Shrimp Bycatch in Inshore, Fishery-Independent Trawl Samples."

Patterns in the Distribution and Abundance of Fishes and Macroinvertebrates in a Louisiana Marsh: Shrimp Bycatch in Inshore, Fishery-Independent Trawl Samples

Donald M. Baltz[1] and Paul Meier[2]
[1]Coastal Fisheries Institute
& Department of Oceanography and Coastal Science
Louisiana State University
Baton Rouge, Louisiana 70803
and
[2]Louisiana Department of Wildlife and Fisheries
Bourg, Louisiana 70343

Abstract

Our ultimate goal was to explore the links between environmental variation and recruitment into the demersal assemblage. Management strategies for reducing the bycatch in shrimp fisheries in the northern Gulf of Mexico are hampered by a lack of knowledge of how biological, climatological and environmental factors influence the composition and recruitment of non-target species in demersal assemblages. Our objectives are (1) to describe seasonal patterns for common species after characterizing inter-annual variation, (2) to identify relationships between the distribution and abundance of brown and white shrimp and other common bycatch species and (3) to identify correlations between climatological forcing variables and anomalies in the abundance patterns of selected species.

The structure of a demersal assemblage of fishes and macroinvertebrates in open-water habitats in a Louisiana estuary varied considerably over space and time; however, the causative factors responsible for changes in the distribution and abundance of common species have not been previously identified. We have identified seasonal patterns of common species and related them to annual variation of climatological variables. A 4.9 meter shrimp trawl has been used to sample the demersal assemblage at three stations in a central Louisiana estuary on a monthly basis over a 20-year period. Environmental conditions and sampling effort were measured for each sample, and a concurrent climatological database -- including precipitation, air temperature, and river discharge -- exists for the study area. When we used Kendall's W, a coefficient of concordance, to examine correlations between species ranks, estimated from catch-per-unit-effort (CPUE) data, at three stations over the twenty year sampling period, we were able to reject the null hypothesis of no concordance among stations ($W = 0.92$, $N = 20$, $K = 3$, $X^2 = 52.4$, d.f. = 19, $P < 0.005$). We then examined among year variation in assemblage structure by combining data from all three stations and were able to reject the null hypothesis of no concordance among years ($W = 0.77$, $N = 20$, $K = 20$, $X^2 = 291$, d.f. = 19, $P < 0.005$). These results imply a stable or recurrent assemblage structure in this fluctuating environment over the 20-year period. Although the demersal assemblage structure appeared to be predictable over space and time in rank order analyses, CPUE was strongly correlated with environmental variables for several species, and there were long-term trends in CPUE for several species. These results suggest that there are trends in the community that may be the result of fishing pressure, climatic variation or habitat changes. For some of the most abundant species, the pair-wise correlations between CPUE and lagged

environmental variables were stronger than for unlagged variables. For the bay anchovy, which appears to have a prolonged recruitment period, CPUE is significantly correlated with precipitation on a two-month lag. For Atlantic croaker, which recruits in the spring months, only river discharge was correlated in the unlagged analyses; however, precipitation, air temperature and river discharge all showed significant correlations at various lag intervals. Most notably, precipitation was negatively correlated ($\underline{r} = -0.27$) at a lag of four months and air temperature was strongly correlated, $\underline{r} = -0.78$ and 0.79, at lag intervals of 3 and 9 months, respectively. For gulf menhaden, which appears to recruit in February and March, many of the lagged correlations were also stronger than the unlagged correlations, particularly for precipitation and air temperature. For brown shrimp, which appeared to recruit in April, only the unlagged correlation between CPUE and air temperature was significant; however, all three environmental variables were significantly correlated at one or more lag intervals.

CORKY PERRET - Why are you using air temperature instead of water temperature?

DONALD BALTZ - Because the record for air temperature is long, concurrent and available. I couldn't find good data for water temperature over the same study period, but they are highly correlated.

LARRY SIMPSON - The next presenter also works for Louisiana Department of Wildlife and Fisheries; Claude Boudreaux will be reporting on the "Benefits Derived from Shrimp in the Gulf of Mexico by Optimizing the Management in Louisiana."

Enhancing the Benefits Derived from Shrimp Management in the Gulf of Mexico by Optimizing Shrimp Management in Louisiana

Claude Boudreaux
Louisiana Department of Wildlife and Fisheries
P. O. Box 98000
Baton Rouge, Louisiana 70898

Abstract

The goal of this project is to provide a sound program, based on the best scientific data, for the management of shrimp in Louisiana waters. This is the final year of the project; it should be completed by January 1, 1993. The Louisiana Department of Wildlife and Fisheries and Louisiana State University's Coastal Fisheries Institute are cooperating to: (1) assess and model the shrimp stocks in Louisiana and adjacent waters; (2) describe the fishery and related fishing industry; (3) assess and predict future conditions of shrimp habitat and socio-economic circumstances and (4) develop conservation and management options for the future conduct of the fishery. The options will be consistent with the seven National Standards of the Magnuson Fishery and Conservation Management Act and will not conflict with applicable federal laws.

Preparation of the draft plan is complete. A review of the relevant scientific and technical information pertaining to Louisiana's shrimp resources has lead to the following findings:

- Current levels of harvesting have not impacted the capacity of the resource to perpetuate itself.
- The primary cause of variation in shrimp resource abundance is variation in habitat available to juvenile shrimp in Louisiana's coastal marshes.
- Future deterioration and loss of coastal marshes may reduce the abundance of the shrimp resource; at such time current levels of harvest may adversely affect the resource's ability to sustain itself.
- There are some areas of Louisiana's coastal marshes where shrimp typically do not attain useable market size. Current statutory law and management practices allows for, if not encourages, the catch and discarding of such small, unmarketable shrimp. Elimination of the opportunity for destruction of this shrimp may increase total value of the resource.
- The effect of shrimp harvesting operations on the environment and other marine resources is unclear; a major effort by state and federal agencies and the industry is underway to investigate these effects.
- The major source of economic distress to shrimp harvesters is the increasing amounts of shrimp imported from other countries.

- Considerable economic loss to the Louisiana shrimp industry occurs because much of the processing of Louisiana shrimp occurs out-of-state.

- Current worldwide developments in shrimp mariculture prevents implementation of a management strategy assuring maximum economic return from Louisiana's shrimp harvest.

- Current legislative mandates encourage open access to the resource and harvest of a wide range in shrimp sizes.

- Theoretical yield per recruit models indicate that yield in terms of weight may be increased by 10%-20% if minimum harvest size were increased to an 80 count shrimp. However, major changes in current management practices would be required to test this hypothesis.

These findings have resulted in recommended policy, goal, objectives, management standards and other management actions. Currently the Louisiana Wildlife and Fisheries Commission, Louisiana's marine fisheries policy board, is reviewing the preliminary recommendations. Before the end of 1992, hearings will be held to present the findings to the public and the Commission will ratify policy and goals by which Louisiana's shrimp fishery will be managed.

LARRY SIMPSON - I know early on, the shrimp task force was hot on the idea of limited entry. Is that kind of waxed a little bit now or not?

CLAUDE BOUDREAUX - Yes, two years ago a couple of task forces got together and set up a limited entry task force. They went through public hearings; it got to the legislature and didn't go very far. The problem is, of course, that full-time fishermen are interested in that, but as I said, seventy-five percent of the people in the fishery are part-time.

LARRY SIMPSON - If it were to surface again, what kind of legislative action would it take to get something like that in the state?

CLAUDE BOUDREAUX - We probably wouldn't want to do very much unless the feds were doing the same.

LARRY SIMPSON - Oh yes, realizing that, wouldn't it take some legislative action?

CLAUDE BOUDREAUX - Oh, definitely.

LARRY SIMPSON - And they're not doing anything?

CLAUDE BOUDREAUX - No, not at all.

JACK VAN LOPIK - Is there anything in the Department of Economic Development that sort of focuses on the problems of processing the value added in the seafood area, are there any state programs or efforts that do this?

CLAUDE BOUDREAUX - There may be economic incentives; you know we have tax incentives to try to get industry into Louisiana.

JACK VAN LOPIK - But there's nothing that is spoken specifically on this that you're aware of?

CLAUDE BOUDREAUX - No.

DAVID ALLISON - Center for Marine Conservation, in looking at the last problem you were talking about in the privatization and the habitat degradation, has there been any investigation by your group or anyone in looking at land trusts or development of in some way to convert that privatization to the industries by securing those coastal margins for the long term use by the industry basically by leaving it open?

CLAUDE BOUDREAUX - Yes, the shrimp task force is looking into sanctuaries. So they're starting intensive looks at the development of sanctuaries along the Louisiana coast. There is a lot of area which is actually defacto shrimp sanctuary, where for various reasons the shrimpers cannot fish. And one of things we have looked at is marsh management plans if the purpose is not to harvest shrimp and they don't really care about shrimp, maybe we can convince them to make the managed area a shrimp sanctuary, because they don't really care about shrimp resources.

DAVID ALLISON - If the development rights might be valuable there and in purchasing development rights on the margins, that's not going to be part of the development proposal for the marsh management.

CLAUDE BOUDREAUX - right.

LARRY SIMPSON - Correct me if I'm wrong, Claude, there's an unusual situation in Louisiana, I think eighty-five percent of the marsh area is privately owned and the problem is ingress and egress in those five zoned areas. I don't know if you were aware in your question.

DAVID ALLISON - That's why I was thinking that the actually having land trusts purchasing some of that rather than trying to do it through government control might be more effective.

LARRY SIMPSON - In other words buying up the land?

DAVID ALLISON - actually buying up the land.

LARRY SIMPSON - Next is Dave Burrage from Mississippi State and working with the Sea Grant Program in Mississippi. His report will be on "TED Demonstration and Technology Transfer" that they did a while back in that area.

TED Demonstration and Technology Transfer

David D. Burrage
Mississippi State University
Coastal Research and Extension Center
2710 Beach Boulevard, Suite 1-E
Biloxi, Mississippi 39531

Abstract

The objective was to train a group of fishermen to assist others in choosing, installing and using TEDs correctly. A second objective was the creation of a local "clearinghouse" for TED information and assistance. A major project goal was to help minimize shrimp loss while reducing turtle capture in the shrimp fishery.

Forty-seven fishermen from various ports were trained through this project and were then able to assist others in their respective geographic areas with TED-related problems. Small "town hall" type meetings were held to present information regarding optimum TED choice, installation and utilization.

Captain Thomas Schultz was hired as a gear specialist and devoted four man-months to the project. A survey form was designed to interview vessel captains and find out what types of TED-related problems they were experiencing. Similarities were noted and project efforts were directed towards solving the most prevalent problems. A notable finding was the number of vessels and captains which had never used TEDs. In some cases, these boats were able to comply by using tow time restrictions, but other boats were simply "taking their chances" by operating offshore of the COLREGS line without TEDs. When these captains were informed of pending TED regulations which would expand the requirements to include all waters, some requested and received printed matter as well as anecdotal information as to what would be the best TED type for them to use in light of their customary harvest practices and fishing grounds. Other fishermen required more intensive assistance, usually in the form of gear modifications, to help solve their TED-related problems. The most often encountered problems were "bogging" (digging into the bottom), twisting and clogging with debris. Many of these problems were attributable to incorrect installation and rigging.

Visits aboard Vietnamese vessels indicated that the three most widely used TEDs by Vietnamese fishermen were Georgia- or Matagorda-type grids and Morrison soft TEDs. A Vietnamese language fact sheet outlining the legal dimensions for these devices in the gulf was created for distribution among the Vietnamese fleet.

Mississippi Sea Grant Advisory Service continues to be an effective mechanism for providing information and assistance to the seafood industry. This is particularly true for the production sector (fishermen) because project personnel are not hampered by the perception of representing a regulatory agency. Although this project was successful in solving problems and providing information related to TEDs for a number of fishermen, much work remains to be done. Very little work has been done with installing and using TEDs in the smaller nets typically used in the inshore fishery. Funding should be provided to enable the type of work undertaken in this project to continue.

LARRY SIMPSON - The next presenter will be talking about his work in "TED Technology Transfer in the Texas Shrimp Industry." Mr. Gary Graham with Texas A&M.

TED Technology Transfer in the Texas Shrimp Fishery

Gary Graham
Texas A&M Marine Advisory Program
Sea Grant College Program
P.O. Box 1675
Galveston, Texas 77553

Abstract

Goals and Objectives

- To provide assistance to the Texas Shrimp Fishery in the selection, adjustment and solving of problems associated with TEDs.
- Provide technical expertise to the shrimp industry with the development and certification of new TED designs.

Methods and Materials

The primary thrust of this project has been to involve the utilization of a skilled industry member, competent with TED usage and adjustment, to assist other fishermen with problems encountered with TEDs. Various certified TEDs have been made available to industry to perform result demonstrations and comparisons of exclude devices being employed aboard vessels. Both the TED expert and principal investigator have been available to "trouble-shoot" difficulties encountered with TEDs and provide technical assistance regarding transfer of TED technology for a more effective transition to turtle excluder devices.

Conclusions and Recommendations

Commonly encountered problems associated with TEDs were identified through close contact with the Texas shrimping industry and other regional programs. Through a significant amount of one-on-one contact, information was disseminated to fishermen utilizing TEDs. A publication was also developed which explained procedures which could be employed to solve TED-related problems.

A major thrust of this program has been to provide certain certified TEDs on a loan basis so that fishermen could compare the performance of these TEDs to those which they were utilizing. This effort resulted in many fishermen identifying deficiencies of "homemade" TEDs.

An important function of the project's gear expert has been that of demonstration of TED construction and installation. Numerous dockside demonstrations were performed regarding installation of the Morrison TED. Other technical assistance provided by this project related to such areas as flap construction and modification, accelerator funnel design and related TED adjustments.

An example of savings encountered by providing assistance to industry relates to lazy line adjustment. In the initial stages of TED adaptation, considerable shrimp

losses were being experienced aboard vessels utilizing rigid excluder devices in the twin trawl array. Though problem identification and assistance from this project, shrimp losses often equalling 45% to 50% were eliminated by re-rigging the Y-bridle lazy lines commonly used in Texas quad-rig trawls.

Mudding into the soft substrate of the seabed off Texas has presented a substantial damage to many TEDs. Viable solutions have not as yet prevailed for addressing this problem.

JANE BLACK - Gary, can I ask you a question? I heard you mention this spectra webbing, my knowledge is limited on webbing types for shrimp trawls, but what is the controversy? Why is it that I keep hearing some people say nylon and other people say poly - you mentioned that - and other people say spectra. Is there a resistance to putting a piece of spectra in there? Instead of losing their nets and they will never get them back?

GARY GRAHAM - I guess the thing you have with spectra webbing, and that's another project we're involved with is we're funded through our Texas governor's energy office, is it's price tag. You're dealing with $36 a pound stuff versus $3 or $4 a pound stuff. But now, you know you're also looking at a lot lighter material it doesn't interpret, you know. It's almost double the price of a net to go spectra, the heavy duty spectra. But, we've had extensive studies relative to production and fuel economy, and we feel like we can get the money back in a hurry. Obviously if you happen to lose the net the first week, you're not going to be in a very good position to get your money back but looking at a $1,000 a night average. We're figuring around twenty nights you can pay for the nets.

JANE BLACK - Well, do you think then from things that you said that the TED might work better with spectra?

GARY GRAHAM - Well, the only thing is that we have two problems with spectra. Spectra's slick and that webbing can spread if it's not set right and manufactured properly. I think there's a potential for that webbing not to break. Right in here there's a hole in a TED, the escape hole, and there's a very small amount of enforcement right here, you see there's no webbing around here. Well if that gets a tremendous strain in there it will go to ripping right in here. Well if we have some material - spectra is much, much stronger material - we've got some spectra out right now in the, we're using for bags that's probably three times stronger than nylon. Well, you know if we can keep that from breaking right in there it might be worth consideration.

JANE BLACK - I, think I quite don't understand the difference in webbing.

GARY GRAHAM - Our problem with spectra is you don't just run out and buy three pounds of spectra. You know, cause this stuff is just on the developmental stage. To go get spectra, you go buy a bale of spectra - about $5,000 worth and that's kind of tough to just run out and do a little quick experiment.

LARRY SIMPSON - Gary, have you had any problems communicating with the Vietnamese fishermen and if so what have you done to?

GARY GRAHAM - Very frustrating experience with Vietnamese, and I've had some problems. I've been in a learning curve with them. Three or four years ago, I put on TED workshops and scheduled them during the Chinese New Year. I had a party and nobody came. You know, I didn't know about the Chinese New Year, and it was just a mistake that I had made. I have a Vietnamese net man that was going to come here today; he's a very close friend of mine - he does a fine job. He's one of our success stories. In fact, we've got guys from Galveston that are sending him nets to install Morrison TEDs in Port Lavaca. I haven't always been successful, and my biggest thing was, the Department of Justice has a Community Resettlement Program which called us in a lot of times to work with them and/or we've worked

hand-in-hand with a Catholic church. In Port Arthur there were ninety something Vietnamese in that room, and they were complaining of net losses. I said if you guys are having a problem let me get on the boat. I'll go out there; let me make a trip. You know they just wanted to complain; they didn't trust me to get on the boat. Those were some of my experiences. As times have gone on, we have been more successful one-on-one. You get a few guys to come to us now, and we'll get on the boat and straighten it out. I have been more or less disappointed. I'm not where I want to be with that group.

ANDY KEMMERER - Gary and Dave, thank you for your presentations and primarily for the work you've done in the last few years with Sea Grant; it's been an essential part of the overall TED Technology Transfer Program. It's critical for the success, but what's the general attitude of people in the inshore fishery. Are they anticipating those requirements coming down? Are they assuming they're not going to be affected? What's the reaction; are they doing any experimentation at all? Are they paying any attention to this?

GARY GRAHAM - In the Port Lavaca sector, Judy funded the project and then the Parks and Wildlife. It's just a big problem there with getting a project going. One of the things that they're really saying that and I'd love to have some data on. You understand in the bay a lot of times the cabbage heads are smaller, and in particular in the Matagorda Bay system they're a lot smaller, and they're going to a smaller mesh webbing in the Morrison TED. A six inch. And they claim that that's really getting rid of a lot of fish. I have a cousin that's a bait shrimper that pulls, only making fifteen/twenty minute drags, and he's pulling six inch webbing in a Morrison TED just to clean up catch. But as a whole, there's a lot of concern that these are a few guys that are looking positive but as a whole there's a lot of concern because they're not just looking at TEDs right now but also Bycatch Reduction Devices. They're getting a double hit at one time and there's a lot of them that are getting pretty concerned about that and more are expressing some concern. As I said when I started I think the technology of the excluder devices was around longer in the bay than it was in the gulf because of problems that were encountered.

ANDY KEMMERER - What are they? Were they experimenting with devices, were they looking at those?

GARY GRAHAM - Yes, there are a few individuals that are - Charlie Tipps for example, was looking at expanded mesh. There are a few guys, a lot of fish eyes are being used in Galveston.

ANDY KEMMERER - I think Morrison TEDs, right?

GARY GRAHAM - Yes, fish eyes too. It seems like in the Galveston area its fish eyes, down and around the east Matagorda Bay system they're putting in some expanded mesh, a few of them are, but as a whole most of them are just shrimping.

DAVE BURRAGE - In Mississippi, now that the inshore fishermen know that these regulations are impending, I've seen actual shifts to different types of gear. We're kind of fortunate that in the sound, the average depth is fourteen feet, so we can use skimmer rigs there. I've seen fishermen opt for that in lieu of going to use TEDs so far.

CORKY PERRET - You getting any complaints about use of skimmers relative to impact on other fisheries?

DAVE BURRAGE - No.

CORKY PERRET - Tearing up oyster reefs?

DAVE BURRAGE - No. It's funny that you should mention that now because we had that same concern at the same time you outlawed chopsticks.

CORKY PERRET - That's a whole different issue. That's history, that's history.

DAVE BURRAGE - There are the same arguments. The fishermen said that they were tearing up the oyster beds and all that stuff. I submit to you that nothing does more damage to an oyster bed than a heavy trawl door dragging sideways across the reef.

CORKY PERRET - That's why it's illegal to trawl on oyster reefs in Louisiana. There's 365,000 acres in fish and shrimp sanctuaries because it's illegal to trawl over an oyster reef.

DAVE BURRAGE - The short answer to your question is, "no."

LARRY SIMPSON - Our last presenter in this panel is John Ward. He is the last of our economic speakers. He will be speaking on "Economic Analysis of Finfish Bycatch in the Gulf of Mexico Shrimp Fishery." John is with the National Marine Fisheries Service.

The Economic Implications of Bycatch and Dischards in the Gulf of Mexico Shrimp Fishery

John M. Ward
Southeast Regional Office
National Marine Fisheries Service
9450 Koger Boulevard
St. Petersburg, Florida 34620

Abstract

The proposed regulation to reduce bycatch and discarding of finfish in the southeastern region is a gear modification that excludes finfish from shrimp trawls. This regulation is analyzed using a simple theoretical model of a multispecies fishery whose bycatch is harvested in a directed fishery consisting of commercial and recreational fishermen. The costless reduction in bycatch fishing mortality imposed on the multispecies fishery does not result in increased stock size of the bycatch fish species or substantial increases in its level of harvest. Instead, the fish stock is reallocated from the multispecies fishery to the fishery for the bycatch species causing fishing effort to expand in the bycatch species fishery that drives the stock size down to the previously existing equilibrium level. Recreational harvest and effort levels remain unchanged since the model is linear in effort and the commercial fishery is given access to the fishery first.

LARRY SIMPSON - Any questions for John?

CORKY PERRET - John, did I understand you to say something to the effect that the commercial fishery gets the first shot at the fish?

JOHN WARD - According to the way this model is set up.

CORKY PERRET - Oh, okay. I've got another question, but I'm not sure I know how to even ask it. Let me try. For a species that's heavily pursued by recreational and commercial fishermen and the species also enters in and is a substantial part of a bycatch fishery, can your model measure, the impacts of all three?

JOHN WARD - We're working on a model now that extends this; we're trying to lay a more realistic representation of the shrimp fleet. We're attempting to incorporate a recreational/commercial directed fishery for the bycatch species to allow those kinds of allocations to occur.

CORKY PERRET - Right. In other words, the bycatch may be as great or greater discarded bycatch than taken by one or the other components by either recreational or commercial?

JOHN WARD - We're going to look into that to see if we can measure that or not.

LARRY SIMPSON - Other questions from the steering committee? Okay, Ron.

RON SCHMIED - John, when your model says that if the bycatch is reduced in commercial fisheries, these species would then be available to and captured by other directed fisheries. It sounds like you're assuming that all the additional fish that are made available would be harvested and landed to drive the stock back down to where it was in the bycatch fishery. It seems to me from what I've seen in the sports fishery, that may not be the case. For example, it may not be that all those fish will be harvested, landed and removed from the fishery. A substantial catch and release ethic might lead anglers to not keep all of the fish that they catch. In 1991, only about twenty-six percent of those fish landed were indeed reported being caught, partly because of the regulations and partly because of a conservation ethic.

JOHN WARD - When we deal with simple conceptual models, we simplify the real world. There are a lot of things going on out there that are a lot more complex than what we're trying to capture here. Here we're trying to demonstrate that there are some additional problems that need to be addressed. One of which is the expansion of effort in a fishery directed at the bycatch species. If we actually want to capture some benefits for the nation for fishermen by reducing bycatch we need to take that into consideration. That fishermen will move into this fishery, then the effort will expand, and it will drive those stocks back down. In a real world situation, stocks may not go all the way back to the initial equilibrium that exists before regulations were imposed. This model has the capability of capturing this effect. If the demand curve had a steeper slope, called relatively inelastic, stock size will increase. Stock size will go up because the increase in abundance will shift the supply curve outward, drive market prices down and effort will decline as a result. Not as many fishermen will be in the fishery because prices are lower so it will appear that stock sizes have improved and when it's actually a market effect. Catch and release for

recreational fishermen is a way of controlling for this increase in effort in the recreational fishery. If you make a species solely a catch and release recreational fishery, then the increase in effort is not going to have the same impact on the fishing mortality of the recreational species. That's one method for controlling the expansion of effort. You can also put in a bag limit on the number of fish that can be taken on a particular trip or you can even have a quota on recreational landings like we do now on the mackerel industry.

UNKNOWN - We're looking at features of the recreational fishery; I think we need to look at maintaining CPUE of various size classes of the fish as opposed to just looking at total fish at the dock as the way we're managing fish.

JOHN WARD - There are a number of ways of controlling effort. The salmon fishery out in the northwest drives the effort levels down by a lottery for the right to fish for salmon, and then the salmon stamps themselves are marketed. There are numerous ways to control recreational fishing effort.

SESSION V
ESTUARINE FISH, MENHADEN AND OYSTERS

SESSION V - ESTUARINE FISH, MENHADEN AND OYSTERS - Jane Black, Chairman

Ladies and Gentlemen--if you will, we'll begin again. We are going to begin the next session which is session five, and our first presenter is Donald Baltz, LSU and his presentation, "Larval Food, Growth and Microhabitat Selection: Factors Affecting Recruitment of Estuarine-Dependent Fishes in the Northern Gulf of Mexico."

Larval Food, Growth and Microhabitat Selection: Factors Affecting Recruitment of Estuarine-Dependent Fishes in the Northern Gulf of Mexico

Donald M. Baltz[1] and John W. Fleeger[2]
Louisiana State University
[1]Coastal Fisheries Institute
Oceanography & Coastal Sciences
Baton Rouge, Louisiana 70803
[2]Louisiana State University
Zoology and Physiology
Baton Rouge, Louisiana 70803

Abstract

Our primary goal was to identify and characterize critical nursery microhabitat requirements related to the recruitment of three important recreational and commercial species throughout the northern Gulf of Mexico. Our objectives were: (1) to identify and characterize the nursery microhabitats by systematically sampling larval fishes in a variety of microhabitats along environmental gradients in a coastal estuary, Barataria and Caminada bays, (2) to identify important food items in their diets, (3) to characterize recent growth by examining daily growth increments in otoliths and (4) to estimate the recruitment potential of various microhabitats by evaluating the influence of diet and microhabitat use on daily growth rates.

Larval fish distributions in salt-marsh microhabitats were studied using a drop sampler to identify primary nursery microhabitats for estuarine-dependent species. Nurseries were characterized using microhabitat variables (e.g., depth, salinity, temperature, dissolved oxygen, turbidity, substrate type, etc.). Analysis of larval and post-larval specimens yielded information on daily growth rates and diets of young-of-year fishes, which together with microhabitat data, were used in multiple regression models to evaluate the recruitment potential of various microhabitats in an estuarine nursery ground.

We have shown that the marsh edge is utilized by economically important postlarval sciaenids. Moreover, frequency-of-use, densities and growth rates varied directly with diet and with certain microhabitat characteristics. For example, postlarval spotted seatrout frequently occurred among emergent stems. Spotted seatrout density increased with salinity, but their growth rates decreased with increasing salinity. Thus, natural or anthropogenic changes in salinity regimes and shoreline area may profoundly affect recruitment success by these important fishes. All postlarval sciaenids we studied depended heavily on the zooplanktonic copepod Acartia tonsa as food until the fishes reached about 15 mm in length. Acartia is numerous and widespread in Louisiana estuaries with no specific habitat selection. Red drum and spotted seatrout switched to alternative prey when they reached 12-25 mm. Spotted seatrout made this transition slightly earlier and at a smaller size than red drum. Red drum's greater dependency on planktonic prey (copepods) for a longer time may decrease dependency on the marsh-edge ecotone for feeding because of the wide-spread distribution of its prey. Spotted seatrout may utilize microhabitats rich in mysids (those with emergent grass) more intensely as they grow, explaining distributional differences between the two fishes.

In a summary analysis of spotted seatrout data on food, growth and microhabitat, we examined the influence of microhabitat and prey variables on recent daily growth increments of post larvae. We first removed the influence of individual length by calculating the residuals from a regression of daily otolith growth on fish length. A Stepwise Regression Model that included nine microhabitat variables (and their squares to account for nonlinearity) and nine prey variables was used to predict growth residuals. More than twenty variables were made available to the model to predict the residuals of growth for the mean daily growth of the individual's last three full days of growth. A five variable model was selected. This initial model explained 50 percent ($R^2 = 0.497$) of the variation in daily growth. The five variables which made significant ($P < 0.05$) contributions to the model included salinity, distance, distance^2, stem density and zoea weight. The inclusion of two variables for distance suggests a nonlinear relationship (i.e., growth is optimum at intermediate values but diminishes at high and low values). In a preliminary red drum model with most of the same variables, only salinity contributed to the prediction of daily growth; however, a thorough examination of the red drum data set is required before conclusions can be reached.

JANE BLACK - I think that because the time is so close to the allotted time we'll go ahead to the next presenter and ask questions at the summary time. The next presenter is Kenneth Heck from the Marine Environmental Science Consortium, and he's going to present the "Relative Value of Vegetated and Unvegetated Habitats to Juvenile Spotted Seatrout and Red Drum: Comparisons of Nursery Habitats and Field-Growth Rate Measurement Techniques."

Relative Value of Vegetated and Unvegetated Habitats to Juvenile Spotted Seatrout and Red Drum: Comparisons of Nursery Habitats and Field Growth Rate Measurement Techniques

Kenneth L. Heck, Jr.[1], and David A. Nadeau2
[1]Marine Environmental Sciences Consortium
Dauphin Island Sea Laboratory
Dauphin Island, Alabama 36528
[2]Department of Zoology
North Carolina State University
Raleigh, North Carolina 27695

Abstract

Introduction

The objectives of our project are (1) to further understand the habitat requirements of early juvenile spotted seatrout and red drum by determining the relative importance of food availability and refuge from predation and (2) to develop a simple, cost-effective method of comparing in situ individual growth rates of juvenile fishes among potential "nursery" habitats.

We used field experiments to assess the relative value of seagrass (Halodule wrightii and/or Ruppia maritima) and nearby unvegetated habitats by comparing growth of juvenile spotted seatrout and red drum in each. We used large (1.5 m^2) enclosures to restrict fishes to target habitats and measured growth of enclosed fish after approximately 60 days using two techniques. Fish were first graded to similar initial size, and otoliths were marked with calcein (250 mg l^{-1} for 12 hrs) to establish a fluorescent time-reference mark. This allowed us to (1) estimate growth in length and/or weight (final fish size minus mean initial size) and (2) track growth of individual fish by measuring otolith growth distal to the calcein mark.

Summary of Results

Field Growth Experiment #1 -- Juvenile Red Drum

Initial results indicate no significant difference in growth of red drum in vegetated and unvegetated habitats (ANOVA; SL: $F_{1,24}=2.20$, $p=0.151$; TL: $F_{1,24}=0.04$, $p=0.837$; otolith growth: $F_{1,18}=0.01$, $p=0.943$), corroborating the results of four previous red drum growth comparisons that also indicated no significant difference in growth of red drum in seagrass and unvegetated habitats (Nadeau, MS thesis, 1991). Red drum growth in both habitats was roughly 30 mm SL, 35 mm TL, and 147 µm otolith growth and was comparable to growth of wild red drum in December (D. Nadeau, K. Heck, & R. Shipp, unpublished data). The results of these experiments indicate that the role of food may be less important than other factors, such as protection from predators or general habitat preference, in explaining the association of juvenile red drum with seagrass habitats.

Red drum otolith growth and growth in SL and TL were never correlated with aboveground seagrass biomass, the number of fish recovered from enclosures (i.e.,

density) or sediment characteristics (percent sand, percent mud, percent organics) in enclosures. In addition, aperiodic measurements of water temperature, salinity and dissolved oxygen never differed significantly between habitats.

Qualitative examination of gut contents of red drum recovered from enclosures revealed little difference in diet between habitats. Epibenthic crustaceans were the most common prey (88%-100% occurrence) in both habitats with amphipods, isopods and caridean shrimps occurring most frequently. Other common prey items included polychaetes and small fish (approximately 12%-19% occurrence).

Field Growth Experiment #2 -- Juvenile Spotted Seatrout

In contrast to red drum, juvenile seatrout growth was significantly higher in seagrass than over adjacent unvegetated substrate (growth in SL: $F_{1,13}=65.81$, $p<0.0001$; growth in TL: $F_{1,13}=51.76$, $p<0.0001$; growth in weight: $F_{1,13}=54.42$, $p<0.0001$; otolith growth: $F_{1,10}=85.63$, $p<0.0001$). Therefore, the results of this experiment indicate that seagrass habitats provide juvenile seatrout both a rich foraging habitat and protection from predators.

Field Growth Experiment #3 -- Juvenile Spotted Seatrout

Seatrout growth (in SL, TL and weight) in this experiment was not significantly different between seagrass and sand habitats (ANOVA; SL: $F_{1,28}=2.49$, $p=0.1257$, TL: $F_{1,28}=1.51$, $p=0.2293$; weight: $F_{1,28}=1.62$, $p=0.2133$). This result was surprising since our first seatrout growth comparison indicated enhanced growth in seagrass. However, seagrass biomass was much lower during this experiment than in the previous seatrout study.

Qualitative examination of gut contents of seatrout recovered from enclosures at the conclusion of Experiments #2 and #3 revealed little difference in diet between habitats at the level of broad taxonomic prey groups. Epibenthic crustaceans were the most common prey (approximately 96%-100% occurrence) in both habitats in both experiments. Of the crustaceans, mysids, amphipods, crabs and caridean shrimps occurred most frequently. Small fish occurred infrequently (<10%) in gut contents of all seatrout except those enclosed in seagrass in Experiment #2 (37.0% occurrence).

In summary, because conclusions drawn from growth data are identical regardless of technique used to measure growth, it appears that measuring growth based on mean initial length and weight is the most cost-effective means of tracking growth. Because these experiments indicate that habitat-related growth was dependent on fish species, species-specific characteristics such as fish morphology may be important in evaluating habitat suitability. We also propose that habitat-related growth may vary with plant morphology and density and conclude that the role of food in the seagrass nursery paradigm is often less important than the provision of shelter.

JANE BLACK - Again, because our time is spent, we will go to the next presenter which is Mr. Loren Coen; he is going to present "Evaluation of Quahog Abundance and Growth in Inshore Alabama and Northwestern Florida Waters: An Assessment of Favorability for Clam Culture."

Evaluation of Quahog (Mercenaria mercenaria) Abundance and Growth in Inshore Alabama and Northwest Florida: Assessment of Clam Culture

Kenneth L. Heck, Jr. and Loren D. Coen
Marine Environmental Sciences Consortium
Dauphin Island Sea Lab
Dauphin Island, Alabama 36528

Abstract

Statement of Objectives

The objectives of this two year project were to document hard clam (Mercenaria mercenaria) survival and growth rates in Alabama and northwest Florida using experiments in the field. In addition, we are evaluating the suitability of nearshore vegetated habitats as sites for commercially harvested clam populations. For the past two years, we conducted field surveys and carried out experiments to examine the effects of habitat (vegetated and unvegetated), seasonality and sublethal predation (siphon nipping) on hard clam abundance and growth. This information can provide a more general and complete understanding of the environmental factors influencing hard clam survival and growth rates in the northern Gulf of Mexico. Of special importance is our assessment of the relative value of various seagrass species as "critical" habitats for hard clam production in the Gulf of Mexico.

Methods

Field Collections

Seasonal field surveys were made at three sites in 1990 and 1991. In each habitat, five $10m^2$ plots were censused for clams by "treading" and the number, size and location of each clam recorded. To ensure that small clams were not missed, three $0.25m^2$ samples were collected by suction sampling within each plot with a gasoline powered pump. All material collected was passed through a collecting bag with 0.5 mm stretch mesh and examined for hard clams to check the accuracy of the "treading" collections.

Experimental Studies

Experimental field sites were conducted (1) northeast of the Perdido Pass Bridge and southeast of Robinson Island near Gulf Shores, Alabama, and (2) in Big Lagoon along the northern shore of the Gulf Islands National Seashore at Perdido Key, Florida. Both are shallow water (<1 m) sites dominated by dense stands of Halodule wrightii, Thalassia testudinum or a mixture of the two seagrasses with surrounding sandy patches.

Mercenaria were obtained from a Florida hatchery. Clams were measured to the nearest 0.1 mm using axis of maximum growth (umbo to growing shell edge), clam length (anterior to posterior distance) and width (maximum breadth between valves). Our growth experiments incorporated location (for grass distance within the bed versus sand) and siphon treatment (nipped and unnipped) as main effects. In order to simulate sublethal siphon predation, we first anesthetized clams. Upon

relaxation, siphons of the required number of clams were excised ("nipped") proximal to the pigmented siphon tip and associated tentacles. Clams were individually numbered and measured.

Exclusion cages made of Vexar^{tm} polyethylene mesh and borders were employed in all experiments. A total of six clams was placed in each cage yielding an equivalent density of 24 clams m^2. Clams in each cage consisted of 3 nipped and 3 unnipped individuals. Seven experiments were run seasonally for 2 months beginning in 1990. At the conclusion of each experiment, all clams were remeasured and the soft tissue removed for weighing. Siphon condition (i.e., regeneration size) was also scored. Replicate sediment cores were taken from inside and outside each cage at the conclusion of experiments.

Summary of Results

Field surveys of hard clam populations in seagrass and adjacent sand habitats in Alabama and northwest Florida have documented existing population sizes and habitat specific growth rates. As anticipated from prior studies, field clam densities were too low to sustain commercial harvesting (0-0.35 inds. m^{-2}). Using annual growth bands of field-collected clams, we found that clam growth rates in seagrass beds varied substantially declining with distance from the leading edge of the grass bed.

We assessed experimentally relative survival and growth rates of juvenile (2-3 cm length) clams placed in different seagrass (Thalassia and Halodule) habitats. In addition, we experimental simulated the effects of sublethal predation on clam growth by excising siphon tissue from anesthetized individuals, a total of seven. A total of seven two-month experiments were initiated in May and October 1990, and in May and October 1991, using replicated caged and uncaged treatments each of which had nipped and unnipped clams. Initial experiments were conducted in Perdido Pass, Alabama, Halodule beds, but later experiments were also don in Thalassia meadows at Big Lagoon, Florida.

Results of the experiments showed that growth ranged from 1.5-5.5 mm/month in sand and from 2.5-4.35 mm/month in seagrass which highest growth rates in both habitats during fall/winter. Growth was greater in sand than seagrass in fall/winter. In addition, growth rates varied seasonally among locations in the seagrass bed (edge, quarter way or half way into the bed). As anticipated, growth rates were much higher in the Gulf of Mexico than those previously reported from cool temperature Atlantic coast locations. The effects of siphon nipping significantly decreased growth while there were no noticeable artifacts detected from the use of cages.

We conclude that: (1) habitat (sand or seagrass) and season significantly influences growth rates with clams in sand growing fastest in cooler months and clams in seagrass growing at relatively greater rates in summer months; (2) location **within** the grass bed significantly influences growth rates with different locations in the bed changing ranks by season but with overall annual growth rates higher near the edge and lower in the interior of the bed and (3) simulated siphon nipping can significantly reduce growth rates of clams.

This project gathered information on several basic biological parameters of critical importance in establishing a new hard clam fishery. Based on high observed growth rates in Alabama and northern Florida habitats, we suggest that mariculture practices including seeding hatchery-raised clams could support a hard clam industry. Pilot hatchery programs and the transplanting of laboratory-reared seed clams to appropriate areas in Alabama and Florida (based primarily on salinity tolerances) appear to be the next logical step in establishing a commercially-viable clam industry.

JANE BLACK - We do have a few minutes for questions with this topic. Are there any questions from the Steering Committee? From the audience?

FELICIA COLEMAN - Did you anesthisize the unnipped?

LOREN COEN - Yes, we essentially anesthetized the entire group and then used a subset of those for nipping and then the control for potential effects of anesthesia.

DAVE BURRAGE - You mentioned that you recorded slower growing rates during the spring/summer as opposed to fall/winter.

LOREN COEN - Correct.

DAVE BURRAGE - I'm not a biologist, I'm just wondering if clams mimic oysters and during that time of year they lose alot of their energy, go to gamete production instead of building up fatty tissues.

LOREN COEN - That's potentially a problem although most of the clams that we used are juveniles, they're thirty millimeters or less so that probably wouldn't be a problem but that certainly is something, especially if you're interested in larger clams that might be a confounding problem.

DAVE BURRAGE - So the clams were not sexually mature then?

LOREN COEN - No, I don't. Actually, smaller clams have a much higher value than larger clams, so little necks, you can often get five times more than you can for the big chowders that you may have seen.

JANE BLACK - Our next presenter is David Nieland who is here for Charles Wilson from Louisiana State University, and he is going to speak on "The Variation of Year-Class Strength and Annual Reproduction Output of Red Drum and Black Drum from the Northern Gulf of Mexico."

The Variation of Year Class Strength and Annual Reproductive Output of Red Drum, Sciaenops ocellatus, and Black Drum, Pogonias cromis, from the Northern Gulf of Mexico

Charles A. Wilson, David L. Nieland
and A. Louise Stanley
Coastal Fisheries Institute
Louisiana State University
Baton Rouge, Louisiana 70803

Abstract

This project was an extension of a previously funded MARFIN project to monitor the reaction of two sciaenid stocks to federal and state management programs. Our objectives were to determine age composition and reproductive biology of red drum and black drum in the northern Gulf of Mexico.

Red drum (n=775) were collected with the help of Clark Seafood Company of Pascagoula, Mississippi, and black drum (n=371) at a commercial seafood house in New Orleans, Louisiana (P&L Seafood). Whole body weight, gutted body weight and fork length were recorded, sagittal otoliths removed, ovaries or testes excised and preserved. Otoliths were weighed, embedded, sectioned and aged. Ovaries and testes were weighed, oocytes staged and atretic states and postovulatory follicles noted. Spawning frequency and fecundity were estimated. The relationship between batch fecundity, spawning frequency and age was examined.

The similarities in red drum year-class distributions for five successive years provides evidence that we have been sampling the same population. However, it is unclear if we are sampling the entire "post estuarine" population. The presence of younger red drum in schooling populations and in habitats separate from large red drum schools is evidence of offshore movement at earlier ages than previously believed. Schools encountered in offshore waters are not homogeneous in age structure.

The population structure for adult schooling black drum is apparently homogenous inshore/offshore and across all commercial fishing gears. The data collected this year provides further evidence that the strength of annual recruitment of black drum into the adult population is cyclical. Dominant year-classes appear to be recruited every four or five years. We have not found any obvious cyclical patterns in environmental data bases that can account for these strong year classes.

Red drum are group synchronous batch spawners during an approximate ten week spawning season beginning in mid August and lasting until early October. Red drum spawning frequency for the 1991 season was estimated to be once every 8.0 days. The mean estimate of spawning frequency over the 1987-1991 seasons was every 5 days. Batch fecundity estimates indicate that a red drum female releases an average of 1.94 million eggs per spawning event. Extrapolating a five day spawning frequency over a ten week period (14 spawns per season), the year fecundity of the mature as early as age 3 or may mature as late as age 5-6. Factors other than age, length or weight may be important in triggering maturation. Spawning occurs during the nighttime hours in offshore waters.

Black drum are also group synchronous batch spawners during an approximate 14 week spawning season in January-April. Black drum spawning frequency for the 1991 season was once every 1.8 days. The mean estimate of spawning frequency over the 1988-1991 seasons was 3 days. We estimate that black drum have a mean batch fecundity of 1.45 million eggs per spawning event. This estimate varies with the age, length and weight of the individual. Based on a 3 day spawning frequency over a 14 week spawning period (about 30 spawns per season), the yearly fecundity of an average black drum female is 43 million eggs. Female black drum become sexually mature at age 5.

Our research over the last 5 years has provided a data base from which much information can be inferred. However, some estimates, particularly those of batch fecundity and spawning frequency, have shown large variations among years, among cohorts and among individuals. Additional sampling of the populations is necessary to investigate sources of variations and to provide biologically meaningful estimates of these parameters to fishery managers. Fishery managers should be concerned with sustained harvest of long-lived species such as red drum and black drum. Such long-lived species with a relatively late age at maturity are vulnerable to overfishing and recovery time for overfished populations is slow.

JANE BLACK - Yes we have a couple of minutes. Are there any questions from the steering committee?

CORKY PERRET - I have a question. When you say these younger fish, what size fish are you talking about?

DAVID L. NIELAND - I'm talking about probably less than legal size. Fifteen inches.

CORKY PERRET - Oh, that's legal there (pointing to slide). I'm talking about eighteen to me.

DAVID L. NIELAND - Whatever. I'm talking down to fifteen inches.

CORKY PERRET - Well, I should call my office in Louisiana; we're getting an inordinate amount of pressure. It's now the sportsmen complaining that they can get five fish in fifteen minutes, and they want a bigger bag. The commercials want a quota, where, the scientists now you know, and the term we use is red fish everywhere. Yet I sense an extremely conservative approach by the people involved, and I'm wondering if and when you guys are ever going to tell the managers, "hey, we think we should take X number of additional fish." Are you reaching that point? Do you think we need five more years of study? Three years of study? Ten years of study?

DAVID L. NIELAND - It's hard to say.

CORKY PERRET - Yes, I know.

DAVID L. NIELAND - Chuck and I have been talking about this for a long time. There seems to be a relationship between age and size of the fish and the size of the school that they're in. When they're young we may have ten small schools of small fish out here, and for some reason or the other as they're wandering around they'll bump into another and form a larger school. Of course, that might be two or three years down the way and by then they're larger fish. We have to figure out somehow to sort out our data, we have to look at the differences between tagging cruise data and the stuff we've gotten over the last few years to see if there are consistent differences there. Those small fish might have been out there five, six years ago, except we weren't, we were just ignoring them or not seeing them, I don't know. If this trend continues over the next five/ten years, then it's obviously something we're going to have to look at.

CORKY PERRET - Yes but Gene, some of them are saying that we have done the fishing community harm because of being overly conservative.

DAVID L. NIELAND - Oh yes. Well I haven't, you probably heard this too.

CORKY PERRET - The shrimp fishermen are asking why are they thrown to heck when there are too many darn fish out there.

DAVID NIELAND - Oh yes. I've heard it from the crab fishermen too. They say we're ruining three fisheries at the same time. We've got no red fish fishery, they're eating all the crabs and the shrimp and pretty soon there's not going to be anything out there.

CORKY PERRET - Well, will you scientists provide us with the answer so we can address this.

DAVID NIELAND - The answer is that I guess we're seeing more young fish in our samples, should we do something about that right now? Probably not.

SCOTT HALL - The 90-year class this is from, I'm taking it from the Parks and Wildlife data, looks like it is a really boom year class as well. So the same thing happened here.

DAVID NIELAND - Yes, the same thing happened in Mississippi too.

SCOTT HALL - So you may want to find what year class our fishermen are able to catch tons of. That's not the question. You showed an annual fecundity, batch fecundity numbers of one, those were daily numbers right?

DAVID NIELAND - Yes, but say in the case of the black drum they'll spawn 1.21 million fish every two to four days. Over a hundred day period. So their fecundities are eighty, ninety million eggs a year, a spawning season.

JANE BLACK - If I may, can I ask you a question? When you're comparing the purse seine caught red drum from earlier samples when it was a directed set for red drum and when it was bycatch later, did you compare the depth at which the seines were sampling?

DAVID NIELAND - The purse seiners always work in fairly shallow water unless they're sure there's no red fish underneath them. Even in comparing the shallow water if you pull a school of red fish up from sixty, seventy, eighty feet of water, by the time you get them up to the top you're going to kill half of them. So when they are purse seining and looking for blue runners and they think there might be red fish underneath they've got to be in fairly shallow water - forty, forty-five foot maximum. And that's been pretty much the rule ever since the tagging cruises were started.

JANE BLACK - So, then were both samples taken from the same depth of water?

DAVID NIELAND - Yes, within a decent range, yes.

JANE BLACK - In other words they're fishing the blue runners in the same depth of water that they were when they did fish.

DAVID NIELAND - Yes, in the same geographic areas that they've always found there.

JANE BLACK - I was asking that question because fishermen have told me that they're convinced when you were getting the samples from the purse seiners some years ago that the small fish were offshore and that they couldn't go in that depth of water because their nets were to shallow.

DAVID NIELAND - Yes, you probably know Ted Lupe, don't you?

JANE BLACK - Yes.

DAVID NIELAND - He's provided us with about forty or so fish, red fish, that were caught out in a hundred, hundred and twenty-five feet of water while he was snapper fishing out there and those things are among the smallest red fish that we've seen in the offshore waters and consistently small. The snapper fishermen are all up in the air too because they're catching so many red fish they can't keep any bait on their hooks to catch snapper. I don't know. It's crazy out there right now but to answer your question, the fish we're getting now, the ones in the tagging cruises are essentially the same populations, from the same depth and not the same population, from the same depth and the same geographic areas.

JANE BLACK - Our next presenter is Gary Rodrick from the University of Florida, and he's going to speak on "Laboratory and Field Evaluations of Commercial Oyster Depuration in the Gulf of Mexico."

Evaluation of Commercial Oyster Depuration in Florida and Louisiana

Gary E. Rodrick
University of Florida
Department of Food Science and
Human Nutrition
Gainesville, Florida 32611

Abstract

The project objectives were to: (1) design and construct an experimental pilot scale oyster depuration system at Leavins Seafood, Inc., Apalachicola, Florida, and Motivatit Seafoods, Inc., Houma, Louisiana; (2) evaluate the efficiency of these systems in the removal of sewage indicator bacteria in laboratory and naturally inoculated Vibrio species (V. vulnificus and V. cholerae) from Florida and Louisiana oysters and from depuration effluent; (3) evaluate and compare the physiological and microbiological efficiency of ozone and ultraviolet light in the depuration of oysters of Vibrios in a commercial scale system; (4) determine whether the state of Florida and Louisiana regulations for controlled depuration of clams are optimum for the depuration of oysters; (5) evaluate the economic cost effectiveness of commercial depuration of Florida and Louisiana oysters using ultraviolet light and/or ozone; (6) design and construct a oyster depuration facility under the direction of, and in a coordinated fashion with, both Mr. Grady Leavins (Florida) and Mr. Ernie Voisin (Louisiana) and both Florida's and Louisiana's Division of Marine Resources and (7) conduct water chemical tests on the depuration and effluent water during the fall, winter, spring and summer depuration experiments.

An oyster wet storage/depuration facility was designed and constructed at both Leavins Seafood, Inc. in Apalachicola, Florida, and Motivatit Seafoods, Inc. in Houma, Louisiana. Both systems were recirculating and equipped with ultraviolet light. Existing guidelines for clam wet storage and depuration were found to be adequate for the removal and/or lowering of both fecal coliforms and total aerobic bacteria but not V. vulnificus and V. cholerae. In addition, refrigeration of the recirculating seawater was found to be beneficial in lowering bacterial counts especially in the summer months when bacterial counts were extremely high. Moreover, the shelflife of the wet stored and/or depurated oysters were extended when compared to non-wet stored/depurated oysters. The economic assessment of oyster wet storage and depuration was determined for Leavins Seafood, Inc. using oysters from Florida and Louisiana. Cost per bushel was determined to be $1.50 to $2.00 per bushel. The realized potential for this value added process depends on owner and management familiarity with key economic considerations and marketing strategies. Water effluent examinations during the fall, winter, spring and summer were conducted. Specifically, the pH, turbidity, dissolved oxygen, salinity, total suspended solids, total bacteria and Vibrio-like bacteria were determined. Little differences were found in the effluent characteristics except for the Vibrio content during the fall, winter, spring and summer. High numbers of Vibrio bacteria were found in the summer and fall effluent waters. Chlorination of the effluent water reduced all bacteria to undetectable levels.

In summary, both wet storage and depuration are value added processing aids that will allow for a cleaner product with the potential of a longer shelflife. In addition, the process allows for stricter handling of the oysters with better physical and bacteriological data on the product before it is sold.

JANE BLACK - We do have some time before our summary and conclusion if anyone has any questions of Mr. Rodrick.

TERRY LEARY - Gary, was the system over in Louisiana configured the same way as in Florida or was it different?

GARY RODRICK - The one in Houma is a little different. A run through Andy was saying that the motivator thing they're a little bit out of sync with us theoretically we were supposed to go together on this and we got out of sync because of various delays and some problems at the Louisiana end and our end. Their decision is a little different, unfortunately, I didn't get a slide to show you their design. It's basically recirculating the seawater that's artificially made, and I forgot to mention that we had three options on that, a well, filter approved water or make your own and in this case we think making our own and it works very, very good. So really I can't comment a lot on their's except they're making progress.

JACK VAN LOPIK - I have a question for Mr. Heck. I missed the source of the animals that you put in those cages.

KENNETH HECK - Yes, that's because I didn't say what the source was, you didn't miss it. The red drum came from the Claude Peteet Mariculture Center, part of the Conservation Department in Alabama. And the speckled trout came from wild captures. We went out and seined them ourselves, we really didn't have any commercial source that we could use. So we actually went out and got them.

JACK VAN LOPIK - Did you find any naturally occurring right there in the habitat where you put the cages?

KENNETH HECK - That's where we got them from. That's exactly where we got them from.

SCOTT HOLT - I have a question for Ken. In your trout experiments did you see much evidence of cannibalism? They're kind of notorious for that.

KENNETH HECK - Well, we had fairly poor recovery in the first experiment, pretty good in the second and whether they were consuming one another, they just simply weren't there so it's really hard for us to know. We did stock the fish at a density that approximated sciaenid densities in the Gulf of Mexico. Our stocking density was approximately four to five fishes per square meter. So we removed everything but those speckled trout, so to answer, I don't know whether they disappeared because of that, they just simply were gone.

FELICIA COLEMAN - I have a question for Donald Baltz. When you were looking at diet in larval fishes, was there any indication that they were specifically choosing prey items other than by size or did the relative proportions of different prey selected limit to relative proportions in their microhabitats.

DONALD BALTZ - The prey that they selected generally came from typical prey assemblages that were associated with Spartina grass stems for those spotted seatrout sizes that we looked at. We also did a diel sampling experiment that we haven't analyzed as yet in which we looked at prey availability. That should be coming out later; it's not ready at this time.

SPECIAL SEMINAR ON BYCATCH

SPECIAL SEMINAR ON BYCATCH - Scott Nichols, Seminar Chairman

I'd like to invite some comments from our regional director who is presenting the next data meeting for his scheduled time so I offer at this time Dr. Kemmerer.

ANDY KEMMERER - Welcome to our Annual MARFIN Conference and particularly this session on bycatch. I think I know just about everybody, everyone of you out here, and I really do sincerely thank you for coming. This is an important part of the overall MARFIN Program, the annual conference. The intent is to try to get the investigators to come where we have a chance to see the results of those studies but also to provide opportunities for other people to see the results. But most importantly to try to get other people involved in the program. This is a competitive program where annually we provide funds for competitive projects in areas of fishery maintenance, development, recovery and those general areas, general conservation but specifically fisheries type of work with a very, very strong orientation to management concerns. I'm sure you've heard that already so I won't go into that but I guess, I'll give you some good news and some bad news. It's probably always a good idea to give you the bad news first. It looks like MARFIN's been cut somewhat in the' 93 budget. I believe that cut's around two hundred thousand but I'm not sure exactly at this point, we don't have the final numbers yet it hasn't finally been worked out. The good news though, is that we expect to have our requests for proposals on the street much, much sooner this year. And I believe we submitted it back in July or August, something like that and we expect that to come out shortly. We hope that there will be a brand new RFP on the street. We will provide more time this time. Where before we've been, because of the constraints in trying to get the RFP out and going through the entire process, we've had to limit the amount of time people have to develop proposals, this year we expect to have more time for that. More time for technical review. That should work a lot better. So expect within the next few weeks, hopefully within the next few weeks, fingers crossed, that the RFP will be on the street and you can begin developing or tell your colleagues or others that it's going to be available for funding. But again, I just wanted to thank everyone who came, particular the MARFIN Committee members and Jean Martin-West obviously with NOAA grants, she's the one that makes it all happen. So if you have a problem with your grant, see Jean.

JEAN WEST - Thank you.

ANDY KEMMERER - But talk to Dave and Ellie first. But anyway thank you very much.

SCOTT NICHOLS - Thank you, Andy. Our first speaker was allowed a full half hour, but she tells me she needs five minutes. Based on the title alone, she better have a longer time. "Strategic Planning for the Management of Bycatch and the Organization Management of the Gulf and the South Atlantic Fishery Bycatch Management Program." Ms. Judy Jamison.

Strategic Planning, Data Collection and Gear Evaluation for the Management of Bycatch in the Directed Commercial Fisheries of the Gulf of Mexico

Judy L. Jamison
Gulf and South Atlantic Fisheries
Development Foundation, Inc.
5401 West Kennedy Boulevard
Suite 669
Tampa, Florida 33609

Abstract

One of the goals of this project was to plan for data collection, gear testing and evaluation and future NMFS/industry cooperation in improving the efficiency and selectivity of fishing gear (or strategy) through reductions in the harvest and/or mortality of non-target species (bycatch) in the gulf shrimp trawl fisheries. Field testing of bycatch reduction gear designs and data collection would also be carried out under this award.

This project provided for the establishment of a planning mechanism involving diverse fishery representation for determining data needs and a data collection system adequate to manage the growing bycatch issues in the shrimp trawl fisheries of the Gulf of Mexico. To accomplish this, a steering committee was formed consisting of 34 participants with representatives from every major organization concerned about shrimp fishery finfish bycatch. The primary responsibility of the steering committee was to develop a shrimp fishery bycatch problem, develop a gear modification research and evaluation program, evaluate non-gear management options and determine sociological and economic impacts of bycatch reduction approaches. During the establishment of the plan, the steering committee was advised by a ten-member technical review panel made up of objective experts in fisheries biology, fisheries management, gear technology, sociology and economics.

During the past year, the steering committee, technical review panel and statistical panel met several times to write, review, revise and finalize the plan. This comprehensive plan entitled, "A Research Plan Addressing Finfish Bycatch in the Gulf of Mexico and South Atlantic Shrimp Fisheries" has been finalized and is available for distribution. Included in this plan are eight research objectives outlining approximately 44 projects to address these objectives over a four year period at a cost of over $16 million.

Due to the delay in finalizing the research plan, a no-cost extension was requested so that the gear and field testing under this project could be carried out. This is currently underway.

GULF & SOUTH ATLANTIC FISHERIES DEVELOPMENT FOUNDATION, INC.
Shrimp Fishery Finfish Bycatch Program
Steering Committee

Steering Committee Chairman	—	Walter L. Shaffer (Gulf & South Atlantic Fisheries Development Foundation, Inc.)
Gulf & South Atlantic Fisheries Development Foundation, Inc.	—	Peter Hoar/Bycatch Program Coordinator
		Judy L. Jamison/Executive Director
Industry Representatives	—	Wilma Anderson (Texas Shrimp Association)
		Jane Black (Organization of Louisiana Fishermen)
		Bill Chauvin (American Shrimp Processors Association)
		Jack D'Antignac (Georgia Fishermens Association)
		David Hardee (Standard Marine Supply)
		Jan Harper (B&H Shrimp Company)
		John Hoey (National Fisheries Institute)
		Bob Jones (Southeastern Fisheries Association)
		Tee John Mialjevich (Concerned Shrimpers of America)
		Chris Nelson (Bon Secour Fisheries)
		Jerry Schill (North Carolina Fisheries Association, Board Chairman, Gulf & South Atlantic Fisheries Development Foundation, Inc.)
		Jeff Scott (Louisiana Shrimp Association)
Conservation	—	Harry Upton (Center for Marine Conservation)
Recreational	—	Joe Detyens (Atlantic Coast Conservation Association)
		Bob Shipp (Gulf Coast Conservation Association)
Sea Grant Representatives	—	Mike Hightower (Texas A&M University)
		Mac Rawson (University of Georgia)

National Marine Fisheries Service	—	Brad Brown (Southeast Fisheries Science Center)
		Jim Nance (Galveston Laboratory)
		Scott Nichols (Southeast Fisheries Center)
		Andrew Kemmerer (Southeast Regional Office)
		Ron Schmied (Southeast Regional Office)
		Wil Seidel - NMFS Bycatch Technical Monitor (Southeast Fisheries Center)
Fishery Management Councils	—	Bob Mahood (South Atlantic Fishery Management Council)
		Wayne Swingle/H. Gilmer Nix (Gulf of Mexico Fishery Management Council)
Atlantic States Marine Fisheries Commission	—	Paul Perra
Gulf States Marine Fisheries Commission	—	Larry Simpson
State Resource Agencies	—	Bill Hogarth (NC) William (Corky) Perret (LA) Ralph Rayburn (TX) David Whitaker (SC)

GULF & SOUTH ATLANTIC FISHERIES DEVELOPMENT FOUNDATION, INC.
Shrimp Fishery Finfish Bycatch Program
Technical Review Panel

Gulf & South Atlantic Fisheries Development Foundation, Inc.	—	Peter Hoar
Steering Committee Working Group Leaders	—	Jane Black (Organization of Louisiana Fishermen)
	—	Bill Chauvin (American Shrimp Processors Association)
	—	Ron Schmied (National Marine Fisheries Service)
	—	Larry Simpson (Gulf States Marine Fisheries Commission)
Biological Research	—	Richard Condrey (Louisiana State University)
	—	Nelson Ehrhardt (University of Miami)
	—	Robert Muller/Joseph O'Hop (Florida Department of Natural Resources)
	—	Jim Nance (National Marine Fisheries Service)
	—	Arvind Shaw (University of South Alabama)
	—	Charles Wenner (South Carolina Wildlife & Marine Resources Division)
Gear Technology	—	Gary Graham (Texas A&M University)
	—	Dave Harrington (University of Georgia)
	—	Jim Murray (University of North Carolina Sea Grant)
	—	Wil Seidel (National Marine Fisheries Service)
Sociology and Economics	—	Robert Ditton (Texas A&M University)
	—	Michael Orbach (East Carolina University)
	—	Ken Roberts (Louisiana State University)

Organization and Management of a Gulf of Mexico and South Atlantic Ocean Fishery Bycatch Management Program

Judy L. Jamison
Gulf and South Atlantic Fisheries
Development Foundation, Inc.
5401 West Kennedy Boulevard
Suite 669
Tampa, Florida 33609

Abstract

Since South Atlantic activity cannot be funded under MARFIN awards, this project was approved for funding to the Gulf and South Atlantic Fisheries Development Foundation, Inc. through Saltonstall-Kennedy (S-K) funds to facilitate participation by South Atlantic interests in the development of an integrated plan to provide the necessary data collection for addressing current bycatch problems, development of recommendations for funding, assigning responsibility and securing industry cooperation for the data collection system and preparation of an agreed upon protocol and schedule for securing funding and implementation.

This project provided organizational and travel support to the fishery organizations of the South Atlantic coastal states to participate in the planning process through the Steering Committee and Technical Review Panel established in the MARFIN project. This project was integrated with and is identical in most respects to the same activity in the MARFIN project entitled "Strategic Planning, Data Collection and Gear Evaluation for the Management of Bycatch in the Directed Commercial Fisheries of the Gulf of Mexico."

Also under this project, the Foundation will identify commercial vessels from Virginia to Florida engaged in the offshore shrimp fishery interested in testing new or modified bycatch reduction gear under the conditions found on each major shrimp ground as well as provide commercial vessels for bycatch characterization being integrated with the current NMFS observer program and other related programs utilizing both NMFS and non-NMFS observers.

To accomplish these goals and objectives, a steering committee was formed consisting of 34 participants with representatives from every major organization concerned about shrimp fishery finfish bycatch. The primary responsibility of the steering committee was to develop a shrimp fishery finfish bycatch research plan to characterize the shrimp fishery bycatch problem, develop a gear modification research and evaluation program, evaluate non-gear management options and determine sociological and economic impacts of bycatch reduction approaches. During the establishment of this comprehensive plan, the steering committee was advised by a ten-member technical review panel as well as statistical panel, made up of objective experts in fisheries biology, fisheries management, gear technology, sociology and economics.

During the past year, the steering committee, technical review panel and statistical panel met several times to write, review, revise and finalize the plan. This comprehensive plan entitled, "A Research Plan Addressing Finfish Bycatch in

the Gulf of Mexico and South Atlantic Shrimp Fisheries" has been finalized and is available for distribution. Included in this plan are eight research objectives over a four year period at a cost of over $16 million.

Performance on the observer program is currently ongoing. During June, July and August, 1992, the Foundation contracted four observers to work cooperatively to collect data on this program, two in the gulf and two in the South Atlantic. Working cooperatively with the Gulf Shrimp Research and Development Foundation and the National Marine Fisheries Service, over 500 sea days have been logged to date. The Foundation continues to coordinate cooperating commercial vessels for participation in this program.

Due to the delay in finalizing the research plan, a no-cost extension has been approved to complete performance on this project.

GULF & SOUTH ATLANTIC FISHERIES DEVELOPMENT FOUNDATION, INC.
Shrimp Fishery Finfish Bycatch Program
Steering Committee

Steering Committee Chairman	—	Walter L. Shaffer (Gulf & South Atlantic Fisheries Development Foundation, Inc.)
Gulf & South Atlantic Fisheries Development Foundation, Inc.	—	Peter Hoar/Bycatch Program Coordinator
		Judy L. Jamison/Executive Director
Industry Representatives	—	Wilma Anderson (Texas Shrimp Association)
		Jane Black (Organization of Louisiana Fishermen)
		Bill Chauvin (American Shrimp Processors Association)
		Jack D'Antignac (Georgia Fishermens Association)
		David Hardee (Standard Marine Supply)
		Jan Harper (B&H Shrimp Company)
		John Hoey (National Fisheries Institute)
		Bob Jones (Southeastern Fisheries Association)
		Tee John Mialjevich (Concerned Shrimpers of America)
		Chris Nelson (Bon Secour Fisheries)
		Jerry Schill (North Carolina Fisheries Association, Board Chairman, Gulf & South Atlantic Fisheries Development Foundation, Inc.)
		Jeff Scott (Louisiana Shrimp Association)
Conservation	—	Harry Upton (Center for Marine Conservation)
Recreational	—	Joe Detyens (Atlantic Coast Conservation Association)
		Bob Shipp (Gulf Coast Conservation Association)
Sea Grant Representatives	—	Mike Hightower (Texas A&M University)
		Mac Rawson (University of Georgia)

National Marine Fisheries Service	—	Brad Brown (Southeast Fisheries Science Center)
		Jim Nance (Galveston Laboratory)
		Scott Nichols (Southeast Fisheries Center)
		Andrew Kemmerer (Southeast Regional Office)
		Ron Schmied (Southeast Regional Office)
		Wil Seidel - NMFS Bycatch Technical Monitor (Southeast Fisheries Center)
Fishery Management Councils	—	Bob Mahood (South Atlantic Fishery Management Council)
		Wayne Swingle/H. Gilmer Nix (Gulf of Mexico Fishery Management Council)
Atlantic States Marine Fisheries Commission	—	Paul Perra
Gulf States Marine Fisheries Commission	—	Larry Simpson
State Resource Agencies	—	Bill Hogarth (NC) William (Corky) Perret (LA) Ralph Rayburn (TX) David Whitaker (SC)

GULF & SOUTH ATLANTIC FISHERIES DEVELOPMENT FOUNDATION, INC.
Shrimp Fishery Finfish Bycatch Program
Technical Review Panel

Gulf & South Atlantic Fisheries Development Foundation, Inc.	—	Peter Hoar
Steering Committee Working Group Leaders	—	Jane Black (Organization of Louisiana Fishermen)
	—	Bill Chauvin (American Shrimp Processors Association)
	—	Ron Schmied (National Marine Fisheries Service)
	—	Larry Simpson (Gulf States Marine Fisheries Commission)
Biological Research	—	Richard Condrey (Louisiana State University)
	—	Nelson Ehrhardt (University of Miami)
	—	Robert Muller/Joseph O'Hop (Florida Department of Natural Resources)
	—	Jim Nance (National Marine Fisheries Service)
	—	Arvind Shaw (University of South Alabama)
	—	Charles Wenner (South Carolina Wildlife & Marine Resources Division)
Gear Technology	—	Gary Graham (Texas A&M University)
	—	Dave Harrington (University of Georgia)
	—	Jim Murray (University of North Carolina Sea Grant)
	—	Wil Seidel (National Marine Fisheries Service)
Sociology and Economics	—	Robert Ditton (Texas A&M University)
	—	Michael Orbach (East Carolina University)
	—	Ken Roberts (Louisiana State University)

ANDY KEMMERER - I just want to make it clear that the research plan Judy is talking about is basically the direction that we're going to be going in over the next one, two, three years. So if anyone is interested in getting involved in that research, get a copy of this document, cover it, go through all aspects of the kinds of things that need to be done in a bycatch mode. It's a very excellent, very thorough document, reviews all the literature, it identifies the areas that industry, governments (both state and federal), universities, environmental organizations, the Council all feel need to be emphasized. It really gives a very good idea of where the priorities are. That should be the document you look at if you're interested in getting involved. This is such a high priority area, I would encourage everyone to think about being interested so if you don't have a copy of the document, it's not all that thick, I'd strongly encourage you to get a copy.

SCOTT NICHOLS - Next up, we have Jim Nance from the Galveston Lab talking about the "NMFS Bycatch Characterization Project" which is part of this overall research effort.

Shrimp Trawl Fishery Bycatch Characterization Study

Jim M. Nance, Ph.D.
National Marine Fisheries Service
Southeast Fisheries Center
Galveston Laboratory
4700 Avenue U
Galveston, Texas 77551

Abstract

Project Goals and Objectives

Update and expand bycatch estimated temporally and spatially including offshore, nearshore and inshore waters (In the Gulf of Mexico: offshore - waters with a depth >10 fm, nearshore - waters from the COLREG line seaward to a depth of 10 fm and inshore - waters coastward of the COLREG line; In the southeastern U.S. Atlantic: offshore - waters with a distance from the COLREG line >3 miles, nearshore - waters from the COLREG line to a distance of 3 miles and inshore - waters coastward of the COLREG line).

Project Methods and Materials

This research project follows the guidelines found in the Research Plan Addressing Finfish Bycatch in the Gulf of Mexico and South Atlantic Shrimp Fisheries which was prepared by the Gulf and South Atlantic Fishery Development Foundation, under the direction of a Steering Committee composed of individuals representing industry, environmental, state and federal interests. The intent of the sampling design is to survey the commercial shrimp fishery in operation and not to simply establish a research survey study of the bycatch or the finfish populations. The sampling universe in this case consists of all tows from all vessels shrimping in the Gulf of Mexico and along the Atlantic coast of the southeastern United States. Parameters of interest are the catch totals and size distributions of species of finfish and invertebrates incidentally taken by the shrimp fleet.

The quantity and type of bycatch will change with fishing location, season, depth. Stratification of these variables minimized the variances of catch estimates. Sixty strata were identified using season (spring - March, April and May; summer - June, July and August; fall - September, October and November; winter - December, January and February), location (Statistical Zones 1-9, 10-12, 13-17, 18-21 and the U.S. Atlantic coast), and depth (inshore, nearshore and offshore). The sample unit consists of a single subsample from a trawl haul.

NMFS trained observers collect the trawl haul subsamples and record the data following the established NMFS Bycatch Characterization Protocol published with the Bycatch Research Plan. A 26 pound per tow hour subsample is obtained from one randomly selected net after each two. The data collected consists of total tow weight, subsample weight, species composition, abundance, weight and data for life history information.

A maximum of 1,600 observer days at sea is proposed under this project. The actual number of observer days at the end of the project year in April will greatly depend on shrimp vessels cooperating in the characterization research. Since the purpose of the research effort is to characterize total bycatch by the shrimp fleet, allocation of samples is based only on intensity of shrimp effort and not on abundance levels of selected finfish species.

Project Findings to Date

As of September 30, 1992, there has been a total of 319 observer days on shrimp vessels in the Gulf of Mexico and along the east coast of the United States. Although data from several hundred tows have been collected, only the data from 73 tows have received final edited clearance on the computer. A total of 152 different species have been identified in these 73 tows with 64 species being found in at least 10 tows. The 10 numerical dominant species from these initial tows include Atlantic croaker, gulf butterfish, brown shrimp, seatrouts, cutlassfish, white shrimp, star drum, Atlantic brief squid, mantis shrimp and hardhead catfish. The 10 most dominant species by weight from these initial tows include Atlantic croaker, gulf butterfish, cutlassfish, seatrouts, white shrimp, smalltail shark, brown shrimp, star drum, spot and Atlantic bumper. Only very limited analysis has been performed on this initial data set.

SCOTT NICHOLS - Any questions?

JANE BLACK - When will this project be completed, and is it going to be ongoing?

JIM NANCE - We got funding in April and that's when we started putting observers out on vessels. What we've been doing is collecting data and entering that into the computer. I'm not sure if there's an end date or not but we'll analyze it as we get it in. As soon as I get in a complete unit for a given time period, we'll be able to take a look at that on a seasonal basis for the different areas.

JANE BLACK - So, even though you may have an end to this project, you won't have a time where you will say this project is finished.

JIM NANCE - I don't know. I think we will know that as we look at what's being gathered. One year, as we know, is probably only going to represent that one year. It would probably be wise to have several years so we can get an average of what's happening. There's another project that we're doing right now in Galveston Bay, looking at the bycatch within the inshore fishery. We've met with much success there. We have established an industry panel. They've given us a lot of guidance on the sampling protocol and then they helped us get vessels to participate in the study. We have approximately thirty inshore vessels we have utilized through the last year. Every month we've been able to get the number of samples that we've allocated. I think as more of the offshore vessels learn about the project the more willing they are to participate. As that happens we are going to be able to get data that we need.

BRUCE THOMPSON - What kind of post-catch quality control do you have? Protocol for identification?

JIM NANCE - If the observer has a problem identifying a species they bring it back to the lab where we can positively identify it.

BRUCE THOMPSON - But you don't have any protocol where X number of collections are subsequently checked to see what percent somebody might have as a misidentification. There are lot of different species out there.

JIM NANCE - We actually haven't done that.

LARRY SIMPSON - Following up on what Bruce is saying, what kind of training do the observers have?

JIM NANCE - They get training at Texas A&M University, through Dr. Landry and his group on species identification.

ED KILMA - A couple of points, following up on what Jim said. The important part is to get samples for all the cells and that depends on being able to get out on the vessels. The second thing on post-identification, the observers are well trained; they've been trained to identify eighty species offshore. They're all graduates of universities, and we had a special training course at Texas A&M. The training has been done well, and the critical species are reviewed at the course.

One other point is that when snapper do come up the observers point out these to the Captain to make sure they see all snappers onboard during the collection.

SCOTT NICHOLS - It would be interesting to know what any particular components that we need to work harder on are?

JIM NANCE - I think outward reach. When we first started doing this in April, very, very few people knew that we were even going to start this project. I think by word of mouth, as well as by us going out on vessels in each of the different states, people are learning about the project. One of the things that we can have this steering committee do is talk about this program so the industry is a little more aware of what's actually done or trying to happen.

UNKNOWN - Are there different subsampling schemes for large species versus small species or even larger individuals? Because there seems to be a tendency to pick out all the large ones when you get a sample to sort.

JIM NANCE - Well, we select all the large ones out of that trawl, count those up and weigh them. We randomly pick around the pile to obtain the smaller ones.

SCOTT NICHOLS - Thank you Jim. John Watson will give the next talk on NMFS "Shrimp Bycatch Reduction Project."

Shrimp Trawl Bycatch Reduction

Wilber R. Seidel
John W. Watson
U.S. Department of Commerce
National Marine Fisheries Service
Southeast Fisheries Science Center
Mississippi Laboratories
Pascagoula Facility
P.O. Drawer 1207
Pascagoula, Mississippi 39568

Abstract

The goal of this project was to complete development and testing of modifications to increase finfish separation rates of certified commercial TED designs and to develop and evaluate new separator trawl designs based on fish and shrimp behavior information. Objectives were to continue testing of modified TED designs on commercial vessels, to develop new separator trawl designs based on fish and shrimp behavior in shrimp trawls, and to evaluate BRD ideas developed by the shrimping industry. Whenever possible, work has been accomplished cooperatively with the commercial shrimp industry and commercial developers to develop, evaluate and demonstrate, in a variety of shrimping conditions, the efficiency of prototype designs in reducing finfish bycatch without significant loss of shrimp production.

Divers and video cameras were used during actual fishing conditions to investigate the behavior of fish and shrimp when encountering shrimp trawls and to evaluate their reactions to trawl modifications. Behavioral information has been provided to trawl manufacturers and the shrimping industry to stimulate new design concepts. Water flow patterns in commercial shrimp trawls were measured and recorded by scuba divers. Fish and shrimp reactions to variations in the water flow velocities and patterns were documented. Seven BRD prototypes were developed based on studies of fish and shrimp reactions to water flow patterns and velocity, and these designs were evaluated by scuba divers. Two designs developed by shrimpers were also evaluated by scuba divers. Comparative trawling tests of eight new prototype designs were conducted on chartered commercial shrimp vessels and on board the NOAA Ship OREGON II. One hour tows were made with a prototype finfish separator design installed in a trawl with an approved TED on one side and an identical TED equipped trawl on the other side of the vessel. An equal number of tows were made with the experimental net on each side of the vessel to negate bias, and all trawls were tuned prior to testing. Trawl catches were sampled to determine total weights, shrimp catch rates and finfish catch weights, and the catches were separated by species, counted, weighed and measured according to the Southeast Regional Bycatch Project Sampling Protocol. Proof of concept testing on chartered and cooperative shrimp vessels has been completed for five modified TED designs with promising results from initial evaluations in 1990 and 1991. These designs have been made available for commercial testing under the MARFIN cooperative project.

Investigations of fish and shrimp behavior and water flow measurements have resulted in new design approaches for finfish separator trawl designs. Results of

initial investigations were presented at the International Conference on Shrimp Bycatch sponsored by the Southeastern Fisheries Association held in Orlando, Florida, in May 1992. Results of the latest investigations completed in September 1992 will be presented at the Marine Technology Society annual conference in October 1992. Current investigations using new instrumentation provided quantification of water flow velocities which elicit specific reactions in fish. These are being used to develop separator designs which optimize behavioral and swimming ability differences between shrimp and fish with particular emphasis on red snapper. This work has demonstrated that juvenile red snapper and other species respond to turbulent flow patterns in a trawl and accumulate in areas of reduced flow.

Juvenile fish of several species (not red snapper) between 60 and 90 mm in length were observed to exit through escape openings during the tow if the flow rate through an opening was between .2 and .5 meters per second. Juvenile fish did not actively exit through the openings if flow rates were slower than .2 meters per second or faster than .5 meters per second. Shrimp were observed to exit through escape openings if the flow rate was slower than .2 meters per second but could not escape if flow rates were faster than .3 meters per second. This new, quantified flow rate data has been used to design new separator trawl prototypes which produce the desired water flow characteristics. Behavioral observations indicated these designs are successful in reducing juvenile fish bycatch. Preliminary comparative testing indicates that finfish reduction rates are improved and shrimp loss rates were reduced over previous designs. Shrimp loss rates with the new designs averaged 9% as compared with 17% in previous designs, and it was determined that blocking of BRD designs by jellyfish, grass, etc. reduced water flow below design flow rates which caused shrimp loss.

Additional development of designs which maintain desired water flow rates under various operational conditions will be required to effectively reduce catches of juvenile snapper and optimize shrimp retention rates. Five modified TED designs are now available for commercial testing. Proof of concept testing indicates 50% or greater overall fish reduction with no significant shrimp loss. These designs, however, have not shown significant reduction in juvenile red snapper less than 100 mm in length.

SCOTT NICHOLS - Thank you John. We have time for a few questions.

DAVE ALLISON - Have you had any opportunity to use trawl tanks for proportional models or full size trawl tanks to work on modifications of any of these designs or variations, rather than having to go sea with all of them?

JOHN WATSON - We haven't, we've done very little but there's opportunity to do that. Some of the Sea Grant groups are doing that with the clean tank, and it's up to David Taylor. The one area that is certainly useful for this kind of work is the water flow characteristics. What we're concentrating on right now is the behavior and that can't be done in a tank. We have to do that full scale but that's certainly an area that I think is right for someone to address. Certainly design gear and then measuring these water flow rates and maintaining them would be useful. The problem we've got is that we can design something but then you put it in the fishery and your bycatch changes or what you catch changes and then all of a sudden the flow rates in the trawl change. So that's going to be tough too. It would be tough to simulate anything like that in a tank. You have to go full scale at some point, but it would answer some questions in the early designs of these things in terms of flow rates and turbulent area.

SCOTT NICHOLS - Next up is Wilma Anderson from the Texas Shrimp Association, and she will be speaking on "Feasibility Study: Finfish Excluding Gear in Shrimp Trawls in the Western Gulf."

Feasibility Study: Finfish Excluder Gear in Shrimp Trawls in the Western Gulf of Mexico

Wilma Anderson
Gulf Shrimp Research & Development Foundation
Box 1020
Aransas Pass, Texas 78336

Abstract

Goals and Objectives

To conduct field trials and testing of prototype excluder gear under normal commercial fishing conditions to analyze capture of non-targeted species, particularly finfish in shrimp trawls and shrimp retention. Prototype gear testing will be conducted under the guidelines of protocol and criteria that has been established by the Southeast Regional Bycatch Technical Review Panel. Data will be collected in accordance with standard sampling design and recording procedures and results will be entered into a data analysis system established by the panel.

The objectives were to test Turtle Excluder Devices (TEDs) modified to improve their ability to reduce finfish bycatch and to test the modifications with industry to identify and/or develop new ideas or approaches for prototype development and testing.

Methods and Devices Used in Evaluation

The shrimp industry participated by volunteering vessels for observers to be carried onboard to record data of species characterization and finfish reduction in the various reduction designs placed onboard the vessels. Comparisons were completed between the different Turtle Excluder Devices (TEDs) and Bycatch Reduction Devices (BRDs).

Conclusions and Recommendations

This project is not complete, but data to date is beginning to provide the overall in species characterization, design comparison in shrimp retention loss/gain and observers are now fully trained and oriented in the sampling protocol.

Due to the delay in the implementation of this project for the established protocol for Shrimp Trawl Bycatch Research Requirements to be published and observer insurance coverage acceptable to the shrimp industry, at which time, the program could move forward Texas experienced severe flooding and Texas waters were closed to shrimping activities. This project should continue in its present form in order to obtain the full intent of the data collection and device comparisons.

SCOTT NICHOLS - Next up, Donna Rogers from Louisiana State, "Evaluation of Shrimp Trawls Designed to Reduce Bycatch in Inshore Waters of Louisiana."

Evaluation of Shrimp Trawls Designed to Reduce Bycatch in Inshore Waters of Louisiana

Barton D. Rogers and Donna R. Rogers
School of Forestry, Wildlife and Fisheries
Louisiana State University
Agricultural Center
Baton Rouge, Louisiana 70803

Abstract

The purpose of this study is to evaluate shrimp catch and bycatch of trawls equipped with devices to reduce bycatch by shrimp trawlers in inshore waters. This two year study will evaluate four bycatch reduction devices (BRD) each year. An Industry Advisory Committee of Louisiana shrimpers, netmakers and fishery extension agents was organized to make detailed recommendations about the net design, bycatch reduction device design and trawling procedures. The committee met twice and decided that we would use a 4-seam semi-balloon trawl as our base trawl, detailed the net construction and decided on some of the trawling procedures. The committee also selected four BRD's, designed in Louisiana, to be tested: Authement-Ledet Excluder, Cameron Shooter, Eymard Accelerator and Lake Arthur Excluder. Three areas, in each of Louisiana's shrimping zones, were selected: Lake Borgne, Lake Barre/Lake Felicity/Old Lady Lake complex, and Calcasieu Lake. In order to determine that our gear was fishing correctly, personnel from the National Marine Fisheries Service, Pascagoula Laboratory, dove on the nets in Panama City, Florida. As a result, modifications were made to the trawl doors and bycatch reduction devices. The nets and BRDs were videotaped during operation.

Sampling is being done with a twin trawl, two trawls connected by a common sled. A trawl equipped with a BRD is towed alongside a control trawl. Twenty-minute trawls are taken during a trip (two-day period); each of the four devices are towed once on the port and starboard sides of the twin trawl each day. The order of the trawl combinations are randomly selected for each day of trawling. A total of 576 (288 with BRDs and 288 control) trawl samples will be taken. Each of the three zones will have three trips per season (spring and fall seasons). Each BRD will be towed 4 times per trip (twice on the port side and twice on the starboard side). Thus, each BRD will be towed 72 times. Sampling for the spring shrimp season began in May and ended in July 1992. Sampling for the fall shrimp season began in August and will finish in early November. As of 30 September 1992, 14 of the scheduled 18 trips have been completed. Environmental variables such as water depth, conductivity, salinity, water temperature and the level of light near the bottom are measured at each tow site along with the time of day and the location and speed of the boat midway through the tow. Efforts are made to tow in the vicinity of operating shrimp boats; when no shrimp boats are present, tows are made in areas where shrimp were previously caught. Fishes and macrocrustaceans in each sample are identified, counted, measured and the weight of each species in a sample was recorded. The reduction in bycatch and shrimp will be determined. The amount of debris and crab pots caught are also recorded. Results will be available in early 1993.

LARRY SIMPSON - What area is that?

DONNA ROGERS - This is in Florida. Actually, we took the rig to Florida. Hopefully to get a little clearer water.

LARRY SIMPSON - That's what I thought. There's no water in Louisiana that clear.

DONNA ROGERS - We didn't have much luck, actually, with the clearer water. This is off Panama City.

UNKNOWN - That's going out the bottom, and I thought you said it was on top.

DONNA ROGERS - The Authement-Ledet device is on the bottom. That was the first one that I showed you.

BARTON ROGERS - The video's really better than this, but this is too close. Actually, several of the nets we dove on ourselves. In alot of the devices, the fish can easily get out of, but they don't choose to get out. Sometimes we pull in the Cameron Shooter and there will be a flounder sitting in there and he has perfect capability of shooting out but, he just sits there and cruises with the net.

UNKNOWN - Are there certain fishes, like say, flounders that are retained at a higher percentage than more pelagic types? Is it harder for a flounder to get out of one of those than a mackerel?

BARTON ROGERS - No. I guess to answer your question we haven't fully analyzed the data. That's one of the problems. The sampling we've been doing takes five to six days for a trip, two days for the trip and two or three days to work the samples up. It's hard to make any mental observations when you have a lot of species to consider but we should be able to determine whether or not flounder are getting out of any one of the devices more or less than any of the others.

DONNA ROGERS - And when we work these samples up, we work them up individually, so we don't really compare them to the mackerel in the control samples. We've got one more trip left and that's next weekend. Hopefully, after that, we can begin analyzing the data.

SCOTT NICHOLS - What about the debris? Does the reduction device cause any more problems than the trawl alone?

DONNA ROGERS - I don't really think so. It seems like if it's there, regardless of whether there's a device in the trawl or if it's a control net, we're going to catch it. Like crab pots, it doesn't seem like there's a difference. If it goes in, it will either go in one net or the other.

LARRY SIMPSON - In that area, Area Two, Donna, I fish down there a lot, and over in Oyster Bayou, from the Atchafalaya there are times when you get flooding, you get a lot of water hyacinths. Have you had any problem with the clogging of water hyacinths? I've encountered water hyacinths ten miles offshore.

DONNA ROGERS - We haven't seen any water hyacinths at all. That was the area that we found the most debris after Hurricane Andrew though.

LARRY SIMPSON - In Zone Two.

DONNA ROGERS - In Zone Two, yes.

BARTON ROGERS - One thing I mentioned too, is that the Authement-Ledet device was designed in Houma, and it also has a metal grid much like the TEDs that can be put in there. It's mainly designed to eject crabs. And I think that also helps some with the vegetation problems that you're talking about. I think the area that we're in, we just haven't had a big enough flood yet to bring the hyacinths out. It will come certain times of the year.

SCOTT NICHOLS - Now our last talk, Wilma Anderson back on "Evaluation of Trawl Bycatch Impact on High Level Carnivores in the Pelagic Environment of the Western Gulf of Mexico."

Evaluation of Trawl Bycatch Impact on High Level Carnivores in the Pelagic Environment of the Western Gulf of Mexico

Wilma Anderson
Gulf Shrimp Research & Development Foundation
P.O. Box 1020
Aransas Pass, Texas 78336

Abstract

Goals and Objectives

To reduce the expressed concerns over trawl fishery bycatch in the offshore shrimp harvesting industry of the Western Gulf of Mexico. This objective will be accomplished by a joint activity between Texas Shrimp Association, Texas Marine Advisory Service and the Recreational Marine fishery. The commercial and recreational fisheries will evaluate the contribution that shrimp harvesting bycatch makes to the available food supply of targeted recreational fisheries in the pelagic zone.

Method of Evaluation

Formalization of field survey teams of cooperators from the recreational fisheries, commercial shrimp fishery and Texas Marine Advisory Service designated Port Isabel, Port Aransas, Port O'Connor, Freeport and Galveston as the sampling ports for the testing evaluation.

Project Incomplete and Extended

An attempt was made to conduct a field survey out of Port Aransas on May 23rd. A rendezvous was to be established with a shrimp trawler participating in the survey; however, weather conditions required cancellation of the voyage. During the time spawn of this project there was a change in the principal investigator, and the project was delayed and extended.

DAVE BURRAGE - I would hope that there could be a mechanism that would allow us some broader latitude in where and under what conditions we can work with naked nets. And the rationale for that is that, first of all, the amount of effort going into this research is very, very small. And second of all, some of us are working with net designs. Now, we have to go where those fish are in order to get any data and that doesn't necessarily mean that they're to the west of the fifty-ninth parallel of longitude outside fifteen fathoms. If we have to operate with reduced tow times in order to ensure that if we capture a turtle that we won't have a mortality, that's fine. But we ought to be able to go where we need to go in order to do this work.

ANDY KEMMERER - To respond, Dave, already you've used reduced tow times. It's been a problem and we've talked about that before, but as long as there is a NMFS-recruited observer aboard the boat, the policy is to adhere to a fifty-five/seventy-five minute tow time. A three hour total travel time is a problem.

GARY GRAHAM - That's tough for us out here to fill in with small budgets. I don't want to be critical with my statement, but we're confronted with a tremendous enigma right here. It's a problem in industry and you are aware of that; I'm not telling you something you haven't already heard a thousand times but it's becoming more and more a concern.

DAVE BURRAGE - The problem I had was that the permit I had was only going to be good for the west side of the eighty-ninth parallel. I wanted to work the eighty-eighth parallel, and we can't do that. The answer I got was 'you can't do that, but if we propose an amendment to the TED regulations in the Federal Register this could solve it.'

ANDY KEMMERER - It was not a problem to reduce the tow time, that we can do. It's the law because that's where we get the turtle mortality and that's where the problem is. And I understand Gary's problem. We've done a section seven on that, we've gone through the whole area of taking a hard look at that and the position is that there's going to be testing with netted tow times beyond those recommended by... It's got to be in that area west of the river... There's not much else we can do but observe. We still have an awful lot of good information on what these bycatch reduction devices do. If we don't know, with these analysis we certainly will know. The standard net becomes a standard flat trawl, and that's certainly the way it's outlined in the research plan.

SUMMARY AND CONCLUSION - Larry B. Simpson

My only comments in closing are for the presenters. What is your input about trying to follow the Southeastern Association Meeting and AFS in this time-frame? They'll rotate around the region, do you find that helpful? Hopefully in the future if we decide to stay with this group we can run concurrent sessions with them and actually become part of their activities. It will be even better publicized. Any comments about that? The next one happens to be in Atlanta, Georgia. Something we will be considering. Are there any comments or suggestions about how to improve the conference? We also appreciate the people who did supply recommendations for future MARFIN areas of priority. When you get a request in the future hopefully you will spend a little time and give us some of your recommendations. Many of you did, and they are included in this package. We certainly appreciate those suggestions about what priorities this steering committee might consider in the future.

BRUCE THOMPSON - Larry, I have a question about that. Spending a fair amount of time down on the docks with recreational and commercial fishermen, a lot of the recommendations that we send in or that I've sent in have come straight from the fishermen's mouth (so to speak) through the commercial fishermen, something like that. Is there a mechanism that if you get an idea from them let's say next month or sometime, should we go ahead and send that in or will that sit for the next X number of months or something like that.

LARRY SIMPSON - I personally would say yes, send them in, but the Federal Register notice with the specific priorities is already in. What we're doing is looking for out years, but my personal opinion and I think probably other steering committee members will say yes please send them in. It helps us in the future. With that then I think the conference stands adjourned.

RECOMMENDATIONS FOR MARFIN FUNDING

MARFIN RESEARCH RECOMMENDATIONS

Charles A. Wilson
Coastal Fisheries Institute
Louisiana State University

Red Drum - MARFIN has invested a great deal of money into red drum, and we now know more about this species than most in the gulf region. We continue to have the opportunity to monitor effects of the current federal moratorium and reduced state harvest regulations on red drum. The Steering Committee should consider another tag-recapture effort during the next few funding cycles. This would provide a snap shot of age composition and standing stock of the previously sampled population.

Reef Fish - This should be a very high priority area. However, it is confounded by the some 55 species in the management unit. Therefore research effort should be focused on those projects that have realistic goals (e.g., sample acquisition is likely).

Red Snapper - Continue life history studies in lieu of changing management approaches (early life history, age structure and reproductive biology of the commercial harvest, mortality, etc.).

Vermilion Snapper - Is one of the more common species in commercial and recreational harvest and warrants complete life history research.

Several species are beginning to appear in the commercial harvest that were not encountered previously. **Triggerfish, spadefish** and **sheepshead** are a very abundant reef dwelling species and might be susceptible to overharvest. Life history data for these species should be a high priority. Here is our opportunity to work on a species (spadefish) which has not been subjected to intense fishing and another species (triggerfish) that has been subjected to some harvesting.

The **groupers** have life history characteristics that should make them more susceptible to overharvest than others. Most are long lived, reproduce late in life and are sexually dimorphic. The MARFIN Steering Committee should not only focus on those species under the most intense pressure, but also invest in those species that the fishery appears to be moving into. There are regional differences in catch composition that may effect funding priorities.

The fidelity of most reef species is not understood; what is the affinity of these species for a particular habitat and do they migrate? Our work with **Amberjack** indicates they are very rig specific and may remain in the area year-round. Previous red snapper research provides evidence that they make periodic excursions away from a reef, but remain in the area. The MARFIN Steering Committee should set a high priority to the habitat selection of important reef species, particularly **Amberjack, red snapper, vermilion snapper** and **grouper(s)**. This information should be in the management equations, as habitat affinity effects the potential for harvest impact.

Pelagics - The potential for development of **coastal pelagics** remains an important research area. As samples are collected by NMFS, the MARFIN Steering Committee should encourage life history studies of these species.

Yellowfin Tuna - Longline monitoring is not only important, but it also provides biologists with otherwise difficult-to-acquire specimens of **sharks, swordfish** and **billfish**. So the Steering Committee should continue to support observers on a cross section of longliners to collect these data. The Steering Committee should fund the analysis of these samples; targeting life history data, particularly age composition and reproductive biology.

MARFIN RESEARCH RECOMMENDATIONS

Bruce Thompson
Coastal Fisheries Institute
Louisiana State University

Reef Fish - In Louisiana, the family Serranidae (seabass and groupers) is receiving more attention by both sport and commercial fishermen. They are probably very susceptible to overfishing, but our data base on life history and population dynamics from the northcentral Gulf of Mexico is poor, particularly in reference to age structure and reproductive patterns. A data base on eight to ten of the most important species should be assembled. Considerable attention is focused on red snapper, but with restrictions in place on this species, other snapper are being targeted and landed with increasing regularity. Blackfin, silk, queen, gray snapper (called mangrove in Louisiana) and wenchman are rapidly supplementing the catches of red and vermilion snapper. Biological profiles of these species should also be done.

Amberjack - Work should continue on this group because the other species of the genus Seriola are rapidly becoming important components of Louisiana's commercial catch. Lesser amberjack and Almaco jack (called "bars" in Louisiana) can be seen regularly in the commercial catch, taking the place of the smaller, now illegal, greater amberjack that used to be important in their catch.

Shark - Considerable monitoring has been done on commercial shark harvest in the northcentral Gulf of Mexico, but little information is available concerning the recreational shark catch. Due to confusing past species identifications (six different species are called "black-tip") several species probably have much greater sport harvest than previously recorded. Both catch information and life history data should be obtained.

Tilefish - This species, supplemented by several other tilefish species, have become important components of some commercial catches. Although fairly well studied elsewhere, they have received little attention in the Gulf of Mexico.

Black Drift Fish - Called "barrel grouper" by commercial fishermen, this poorly known species has been taken in greater numbers to supplement restricted catches of other species. Virtually nothing is known about its life history or population dynamics. Basic fishery information should be gathered.

MARFIN RESEARCH RECOMMENDATIONS

Donald Baltz
Coastal Fisheries Institute
Louisiana State University

The nursery function of estuarine habitats has received considerable funding, but the questions are not yet answered. Much of the work has been descriptive, and descriptive work is necessary, but it should be used to generate testable hypotheses that can be rejected or corroborated by experimentation. When researchers focus on developing and testing hypotheses, they will be able to provide reliable science for resource managers. I am concerned that an increasing reliance on correlation analyses and modelling may be short circuiting the scientific method. Resource managers should not be forced to use untested hypotheses to manage fisheries, but they do not often have a choice. Accepting paradigms and conventional wisdoms (i.e., untested hypotheses) does not make for rapid progress in science and does not give resource managers the best possible tools.

My primary recommendation is that MARFIN encourage hypothesis testing after initial descriptive research has been accomplished. Of course, my follow-up recommendation is that experimental research is necessary to understand the nursery functions of estuarine habitats for important fishes and macroinvertebrates. We need to understand why particular microhabitats (e.g., flooded Spartina) are important to one species but not to another. And we need to understand how and why marsh habitat loses will influence cohort survival and growth for key species.

MARFIN RESEARCH RECOMMENDATIONS

Richard F. Shaw
Coastal Fisheries Institute
Louisiana State University

The effect of offshore oil and gas platforms on fisheries production and recruitment (i.e., the yet unanswered question of rigs as simply a fishery attractant versus fishery enhancer = increased spawning or nursery habitat).

Reproduction biology and larval ecology of flatfishes in the northern gulf. This issue is especially important given the impacts of by-catch and the increasing recreational pressure on these resources as more and more primary target species have season closures, creel and size limits put on them.

Continued emphasis on reef fish early life history, ecology and taxonomy.

Multistate/university research programs on blue crab recruitment dynamics, especially in light of recent Hurricane Andrew developments where many fishermen (e.g., oystermen) might be being displaced into other low capital outlay fisheries.

Socioeconomic and fishery management impacts of Hurricane Andrew and what can we learn from this that would have implications for other Gulf States.

RESEARCH RECOMMENDATIONS

Volume 57 of the Federal Register, page 21,775 (Friday, 22 May 1992) states one of the research objectives of MARFIN to be the following:

"Mapping and quantification of reef-fish habitats, primarily from existing biological and physical data to determine the effects of habitat alteration or degradation on fish stocks."

The recently completed "Compilation of Existing Data on the Location and Areal Extent of Reef Fish Habitat on the Mississippi/Alabama/Florida Continental Shelf - Eastern Gulf of Mexico," Contract No. NA17FF0380-01, was just such a project.

This project was proposed and conducted using only the hard-bottom habitat data base that Continental Shelf Associates, Inc. (CSA) has in-house. Personally, I am aware of several other federal geophysical data bases from the Gulf of Mexico continental shelf and slope. Most of this data is already available in electronic format, including some on CD-ROM. In addition, I suspect that there are numerous lease block and area specific seafloor mapping and geophysical studies that could be ferreted out of the MMS files and historical records.

The MMS is currently entering the data from the 18 marine habitat overlays developed under the "Compilation of Existing Data on the Location and Areal Extent of Reef Fish Habitat on the Mississippi/Alabama/Florida Continental Shelf - Eastern Gulf of Mexico," contract into and ARCH/INFO Geographic Information System (GIS) data base. With this data base as a starting point, I recommend the Steering Committee give serious consideration to the following:

- Continuing and expanding the reef fish habitat mapping from existing data base programs.
- Expanding the area of coverage to the continental shelf break and slope.
- Requiring that all future submitted map products be in an electronic media format compatible with the existing ARCH/INFO data base.

RESEARCH RECOMMENDATIONS

Research to develop bycatch reduction devices that will reduce the bycatch but maintain the shrimp catch by shrimp trawlers.

Fishery-independent data is not necessarily a good indicator of bycatch ratios because samples may be taken when no shrimping is occurring and may not be indicative of what is actually being caught by the shrimpers. Even our study, which is scheduled around the shrimping seasons in Louisiana, may not be a good measure of bycatch. We are locked into a sampling schedule and may not sample at the peak shrimping times. Conversely, scheduled trips to areas where shrimping is nil due to poor season would yield upwardly biased bycatch estimates. Thus, we recommend research that will accurately assess bycatch. This will probably have to be done with fishery-independent data. Stratified sampling would have to be conducted for the various areas and times within seasons.