BIOLOGICAL DATA COLLECTION AND AGEING PROCEDURES UNDER THE FISHERIES INFORMATION NETWORK (FIN)

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INTRODUCTION

The Fisheries Information Network (FIN) is a state-federal cooperative program to collect, manage, and disseminate statistical data and information on the marine commercial and recreational fisheries of the Southeast Region.[1] The FIN consists of two components: Commercial Fisheries Information Network (ComFIN) and the Southeast Recreational Fisheries Information Network [RecFIN(SE)].

The scope of the FIN includes the Region's commercial and recreational fisheries for marine, estuarine, and anadromous species, including shellfish. Constituencies served by the program are state and federal agencies responsible for management of fisheries in the Region. Direct benefits will also accrue to federal fishery management councils, the interstate marine fisheries commissions, the National Park Service, the U.S. Fish and Wildlife Service, and the NOAA National Marine Sanctuaries Program. Benefits which accrue to management of fisheries will benefit not only commercial and recreational fishermen and the associated fishing industries, but the resources, the states, and the nation.

The mission of the FIN is to cooperatively collect, manage, and disseminate marine commercial, anadromous and recreational fishery data and information for the conservation and management of fishery resources in the Region and to support the development of a national program. The four goals of the FIN include to plan, manage, and evaluate commercial and recreational fishery data collection activities; to implement a marine commercial and recreational fishery data collection program; to establish and maintain a commercial and recreational fishery data management system; and to support the establishment of a national program.

The FIN utilized and expanded existing systems to collect biological data from commercial and recreational fisheries, while utilizing regional panels to determine assessment needs of both state and federal partners. The FIN established a formalized process for the development of species priorities and target sampling levels. The objective of the process is to determine the species that will be targeted for size frequency and bioprofile sampling. This process addresses the needs of stock assessment and enables personnel to conduct assessment with the necessary data.

There are many difficulties inherent in dockside sampling; nevertheless, the FIN strives to ensure that the data collected are representative of the fisheries which are surveyed. To that end, the procedures used by FIN are guidelines which promote the collection of data in a consistent and well-

[1]The Southeast Region (the Region) includes Alabama, Florida, Georgia, Louisiana, Mississippi, North Carolina, Puerto Rico, South Carolina, Texas, and the U.S. Virgin Islands.

documented manner. Although the FIN seeks to avoid bias in the collection of data, it provides for recording of bias, real or potential, where it may occur. Such documentation is extremely important to fisheries managers.

COLLECTION OF DATA

Base level biological data for recreational species are collected through a separate survey to ensure the statistic validity of the MRFSS. Base level biological data for commercial species are collected through the port sampling program. Sampling is designed to statistically collect random length-frequency measurements, age, sex and reproductive information to aid in stock assessments. An initial step in the data collection procedures was to identify fisheries which regularly land species that are the subject of current assessments or for which assessments are planned. Of course, it is desirable to obtain data on all fisheries, but fisheries for assessment species must be prioritized until sampling targets are met. Table 1 lists the primary and secondary species that were identified by the FIN Committee and their work groups.

Table 1. Primary and secondary FIN species:

Primary species	**Secondary species**
Black Drum	Spanish Mackerel
Gag	Scamp
Golden Tilefish	Yellowtail Snapper
Gray Snapper	Cobia
Gray Triggerfish	Black Grouper
Greater Amberjack	Black Sea Bass
Gulf Flounder	Red Porgy
King Mackerel	Snowy Grouper
Red Drum	Speckled Hind
Red Grouper	Warsaw Grouper
Red Snapper	
Sheepshead	
Southern Flounder	
Spotted Seatrout	
Striped Mullet	
Vermilion Snapper	
Yellowedge Grouper	

Fisheries which land species in this list on a regular basis should be considered priority targets for trip selection and sampling. In sampling landings from such trips, sample the species on the list first, then the rest of the catch as the situation permits.

Sampling Targets (Age, Length-Frequency)

Species of primary or secondary concern can be sampled at a site with emphasis placed on primary species. It is essential that the samplers identify the fish to species level. Individuals should be sampled in a manner that would spread collection throughout the wave and year. No more than 30

fish per species should be sampled from each mode (or gear) from a trip. It is best to follow some simple process like selecting every third or fifth fish to measure in order to avoid non-representative selection. For commercial fisheries, every effort should be made to associate a sample with a trip ticket number, but the ticket number is not required. Port samplers should work closely with dealers to enhance the productivity of their sampling effort. Table 2 provides a list of minimum data elements.

Table 2. Standard data elements of biological sampling.

DATA ELEMENT	DESCRIPTION	FORMAT
Unique Identifier	Some Combination of Data Elements That Allows for the Unique Identification of this Action. Use Trip Ticket Number If Available. For the recreational component, it will be site #, date, interviewer id.	30 digit alphanumeric
Record Type	Type of data collection activity that data was captured under: 01=MRFSS; 02=Texas survey; 03=Biological sampling add-on; 04=TIP sampling; 05=At-sea observer; 06=Head boat survey	2 digit numeric
Interview Number	Sequential number of total amount of interviews conducted per day	3 digit numeric
Sample Date	Month / Day / Year	MM/DD/YYYY
Sampler	Port Agent Code/Recreational interviewer ID	4 digit numeric
State (Landing)	State Code (FIPS)	2 digit numeric
County (Landing)	County Code (FIPS)	3 digit numeric
Sampling Location	Dealer Number/MRFSS site number	2 digit numeric
Gear Code	Gear Code	3 digit numeric
Area Fished	Area Code	4 digit numeric
Depth	Depth of water (in feet) where fishing occurred	4 digit numeric
Landing Condition	Condition Landed (Whole, Gutted, Headed, Etc.). For recreational, this would be a disposition code	2 digit numeric
Market Size Range	Actual Size Range	4 digit numeric
Market Category	Code that will specify any market or grade categories that affect price, usually size related.	2 digit numeric
State (Sampled)	State Code (FIPS)	2 digit numeric
County (Sampled)	County Code (FIPS)	3 digit numeric
Total sample weight	Weight of sample	4 digit numeric
Species	ITIS species code	11 digit character
Mode	Mode of fish: charter boat, head boat, private/rental, shore, commercial	2 digit character
Specimen Method	Method used to collect the specimen (random vs. non-random)	2 digit character
Length1	First length of individual fish (in millimeters)	4 digit numeric
Length2	Second length of individual fish (in millimeters)	4 digit numeric

DATA ELEMENT	DESCRIPTION	FORMAT
Length3	Third length of individual fish (in millimeters)	4 digit numeric
Weight	Weight of individual fish	4 digit numeric
Weight Units	Units weight was collected in (pounds, kilograms, etc.)	2 digit alphanumeric
Sex	Sex Code	2 digit alphanumeric
Age Tag Number1	First Age Structure Identifier, sequential # by port sampler/rec interview	4 digit numeric
Age Tag Number2	Second Age Structure Identifier, sequential # by port sampler/rec interview	4 digit numeric
Gonad Tag Number	Gonad Identifier, sequential # by port sampler/rec interviewer	4 digit numeric
Stomach Tag Number	Stomach identifier, sequential # by port sampler/rec interviewer	4 digit numeric
Tissue Tag Number	Tissue Identifier, sequential # by port sampler/rec interviewer	4 digit numeric
Tissue Type	Type of Tissue collected - muscle, eye parts, etc	2 digit numeric

For primary and secondary species, sampling target levels for otoliths and lengths were developed by the Data Collection Plan Work Group. These otolith/spine targets were developed based on age proportions (multinomial distribution). The literature cites that 500 samples per key strata are adequate to determine the status and size of the stock. The number of lengths was determined by doubling the number of needed otoliths/spines. The key strata are defined as areas where one would expect to have differences in age of fish between strata. The key strata are year, gear and region. The Work Group identified the key strata for both primary and secondary species. The list of primary and secondary species with their associated key strata is in included in Table 3. The totals from Table 3 were then distributed by administrative strata (waves, modes, states, etc.) throughout the Gulf of Mexico region.

Table 3. Primary and secondary species, by gears and regions.

SPECIES	#GEAR	#REGIONS	#OTOLITHS	GEARS	REGIONS
Primary species					
Black Drum	3	2	3,000	rec HL, com HL, com TRAWLS	N GOMEX, FL
Gag	3	1	1,500	rec HL, com HL, com LL	GOMEX
Golden Tilefish	2	1	1,000	com HL, com LL	GOMEX
Gray Snapper	2	2	2,000	rec HL, com HL	E/W GOMEX
Gray Triggerfish	3	2	3,000	rec HL (PR) rec HL (CH), com HL	E/W GOMEX
Greater Amberjack	2	2	2,000	rec HL, com HL	E/W GOMEX
Gulf Flounder	1	1	500	com HL	GOMEX
King Mackerel	2	3	3,000	rec HL, com HL	E/W GOMEX, S. ATL
Red Drum	1	3	1,500	rec HL	TX, LA, MS/AL/FL
Red Grouper	3	1	1,500	rec HL, com HL, com LL	GOMEX
Red Snapper	3	2	3,000	rec HL, com HL, com LL	E/W GOMEX
Sheepshead	3	2	3,000	rec HL, com HL, com TRAWL	E/W GOMEX

SPECIES	#GEAR	#REGIONS	#OTOLITHS	GEARS	REGIONS
Spotted Seatrout	2	3	3,000	rec HL (PR) rec HL (CH)	TX, LA, MS/AL/FL
Striped Mullet	2	3	3,000	rec CAST, com CAST, com STRIKE	LA, MS/AL, FL
Vermilion Snapper	2	2	2,000	rec HL, com HL	E/W GOMEX
Yellowedge Grouper	2	1	1,000	com HL, com LL	GOMEX
Secondary species					
Spanish Mackerel	3	2	3,000	rec HL, com CAST, com GILL	GOMEX, ATL
Scamp	3	1	1,500	rec HL, com HL, com LL	GOMEX
Yellowtail Snapper	2	1	1,000	rec HL, com HL	E GOMEX
Cobia	1	2	1,000	rec HL	E/W GOMEX
Black Grouper	1	1	500	rec/com	GOMEX
Black Sea Bass	3	1	1,500	rec HL, com HL, com POTS	E GOMEX
Red Porgy	3	1	1,500	rec HL, com HL, com LL	GOMEX
Snowy Grouper	1	1	500	rec/com	GOMEX
Speckled Hind	1	1	500	rec/com	GOMEX
Warsaw Grouper	1	1	500	rec/com	GOMEX
TOTAL			47,500		

Length Measurements

It is necessary to obtain length measurements on fish where age structures have been collected. These length measurements are taken during the course of sampling and are recorded on the data sheets. All lengths are collected as fork (center-line), taken in centimeters with the exception of Texas where lengths are collected as total length. Fish lengths can be measured on a board with a built in measuring scale or with a meter stick. The length of the fish is read from the board and either written on paper or recorded on tape. The punch board is a modification of the conventional measuring board and is more versatile in that it can be used to record lengths either by the conventional manner or by punching holes into the data sheet that overlays the board.

Sex Determination

Sex may be determined if samplers are allowed to open the body cavity or if the fish have been gutted and still retain a portion of the gonads. Sex should be recorded using only one of three codes (M=male, F=female, U= unknown). Length and weight must be recorded along with the sex. Sex can usually be determined by macroscopic inspection of the viscera. Correct sex determination is crucial in developing age-length keys for stock assessment. Incorrect sex determinations can lead to erroneous conclusions regarding the status of a fisheries stock. If samplers are not sure of the sex, either send a portion of the gonad on ice for verification or identify the sex as unknown.

Ageing Structure Collection (otolith, head, dorsal spine)

Ageing structures include scales, otolith, spines, and/or vertebrae. For each species, samplers are told which structure (otolith, scale etc.) and quantity (quota) (number/size increment/gear type/location) to be taken. No more than 30 fish per species (for unsorted catches) and 10 fish per species (for sorted catches) should be sampled from each mode (or gear) from a trip. An otolith

sample is defined as one or more pairs of otolith from a single species taken from a single location by one gear type for a given date. The standard for otolith collection is to obtain both otoliths from a fish; however, if only one otolith is available, it is still considered a viable sample and should be collected.

QUALITY CONTROL AND ASSURANCE

Sampler Training

New field samplers are initially trained in fish identification and sampling techniques. Samplers are tested on a minimum of 20 fish that are predominant in the fisheries in their state. Fish should be identified to species level and correct ITIS codes associated with each species. Samplers will be re-tested every year to ensure proper identification of fish. Each new sampler is accompanied on their first assignment by a supervisor to insure that proper procedures are utilized for sampling and identification of fish. If the supervisor deems it necessary, he/she accompanies the sampler on subsequent assignments until the supervisor is sure the sampler is performing efficiently. Supervisors review 100% of data collected from the first three solo assignments of a new sampler for accuracy, completeness and compliance with standard operating procedures. After the first three solo assignments, supervisors review data from one assignment every three months for accuracy.

For every year of active sampling, a sampler has a quality assurance/quality control (QA/QC) visit from a supervisor. The supervisor checks that the sampler has all standard equipment, forms and procedures manual. The supervisor administers a written questionnaire on standard sampling procedures to the sampler. The supervisor also observes the sampler conducting an assignment. The supervisor fills out a rating form grading the sampler on his/her ability to properly identify and subset a sample, record weight and length information, record trip information and properly code all information obtained during the assignment. If the sampler is found to be deficient in one or more areas, the supervisor may recommend partial or complete re-training of the sampler. Periodic meetings of samplers are also part of QA/QC for FIN. The meetings allow for interaction among the samplers and provide a forum to discuss data collection methods, problems encountered in the field and potential solutions, and other related issues.

Otolith Processing Training

On an annual basis, an otolith processors training workshop is conducted in the Gulf of Mexico region. Processors from the various state and federal processing laboratories attend this meeting to discuss issues related to age structure processing. The main purpose of the meeting is to ensure that the processors from the various labs are consistent in their processing and ageing techniques. This consistency ensures that all the processors are determining the ages (for the identified species) in a similar manner. One way to ensure consistency is the development of reference sets for the various species. These sets are used to test reader precision among all the personnel reading the identified species in the Gulf of Mexico. For each set, the distribution group (who will be utilizing the set) as well as the direction of distribution (e.g. east to west) is determined. In addition, a primary point of contact and a reading time frame for each agency is established. The reading of the reference sets is conducted on an annual basis. For established readers, they read a subset of the otoliths just to refresh their memory but for new readers, they should conduct the reading of all the otoliths in the reference set every year for the first couple of years. Once all of the agencies have read the set, the primary contact compiles the ages and calculates an APE among the agencies and this information is presented at the annual otolith processors training workshop. Under the FIN program, there are two

(2) readers for each otolith. This ensures that several people look at the otolith to determine the age and there is some comparability among the readers. When there are discrepancies between the two readers, they need to get together and come to agreement about the ring count and edge code. If agreement cannot be reach, the otolith is discarded and not included in the data set. The agreed upon number of rings and edge code is entered into the reader1 variable. When states send their data to the FIN Data Management System (DMS), the information from reader2 is not sent. However, the states continue to utilize the reader2 information as a reference to identify potential discrepancies between the readers.

RESULTS/DISCUSSION

Collection of king mackerel otoliths

The FIN began coordinated biological sampling in 2002 and will continue to collect ageing structures into the future. From the beginning, king mackerel has been identified as a primary species and FIN has collected biological data on this species since the inception of biological sampling under FIN. Table 4 shows the number of otoliths collected and processed by each of the Gulf state fisheries agencies. It should be noted that the majority of king mackerel otoliths collected by the state of Florida are sent to the NMFS Panama City Laboratory for processing. Also, Mississippi lost all otoliths collected in 2005 due to Hurricane Katrina. Please note that FWRI = Florida Fish and Wildlife Research Institute; AMRD = Alabama Marine Resources Division; MDMR = Mississippi Department of Marine Resources; LDWF = Louisiana Department of Wildlife and Fisheries; and TPWD = Texas Parks and Wildlife Department.

Table 4. Number of king mackerel otoliths collected, by year, by state agency

	2002	2003	2004	2005	2006	Total
FWRI	n/a	116	9	n/a	n/a	125
AMRD	114	84	72	29	63	362
MDMR	33	45	52	n/a	35	165
LDWF	222	243	221	191	121	998
TPWD	57	36	151	238	193	675
Total	426	524	505	458	412	2325

Table 5 provides the distribution and percentages of otoliths collected from the commercial and recreational fisheries in the Gulf of Mexico. Overall, about 40% of the otoliths were obtained from the commercial fishery however; almost all of the commercial otoliths were collected in Louisiana. The distribution of recreational samples are most equally dispersed with about 50% of the otoliths obtained from west of the Mississippi River and the other half from east of the River.

Table 5. Percentage of otoliths obtained from commercial and recreational fisheries, by year, by agency.

	2002		2003		2004	
	Commercial	Recreational	Commercial	Recreational	Commercial	Recreational
FWRI	n/a	n/a	0.0	100.0	0.0	100.0
AMRD	0.0	100.0	0.0	100.0	0.0	100.0
MDMR	0.0	100.0	0.0	100.0	0.0	100.0
LDWF	96.4	3.6	97.1	2.9	97.3	2.7
TPWD	0.0	100.0	0.0	100.0	0.0	100.0

	2005		2006		Overall	
	Commercial	Recreational	Commercial	Recreational	Commercial	Recreational
FWRI	n/a	n/a	n/a	n/a	0.0	100.0
AMRD	13.8	86.2	4.8	95.2	1.9	98.1
MDMR	n/a	n/a	0.0	100.0	0.0	100.0
LDWF	96.9	3.1	92.6	7.4	96.4	3.6
TPWD	0.0	100.0	0.0	100.0	0.0	100.0

Tables 6 and 7 provide a summary of the distribution of king mackerel sexes and length measurement statistics by state agency and year. This information appears to vary greatly between years and states.

Table 6. Distribution of king mackerel sexes, by year, by state agency

	2002			2003		
	Male	Female	Unk	Male	Female	Unk
FWRI	n/a	n/a	n/a	63.8	36.2	0.0
AMRD	39.5	60.5	0.0	35.7	61.9	2.4
MDMR	0.0	0.0	100.0	0.0	0.0	100.0
LDWF	44.6	44.1	11.3	49.0	41.6	9.5
TPWD	0.0	0.0	100.0	0.0	5.6	94.4

	2004			2006		
	Male	Female	Unk	Male	Female	Unk
FWRI	66.7	33.3	0.0	n/a	n/a	n/a
AMRD	22.2	76.4	1.4	41.4	41.4	17.2
MDMR	0.0	0.0	100.0	0.0	0.0	100.0
LDWF	42.1	57.5	0.4	32.5	60.7	6.8
TPWD	39.1	57.6	3.3	50.0	49.6	0.4

	2006		
	Male	Female	Unk
FWRI	n/a	n/a	n/a
AMRD	25.4	71.4	3.2
MDMR	0.0	0.0	100.0
LDWF	47.1	52.9	0.0
TPWD	45.1	54.9	0.0

Table 7. Average, minimum and maximum length measurements, by year, by state agency

	2002			2003		
	Avg	Min	Max	Avg	Min	Max
FWRI	n/a	n/a	n/a	861	585	1158
AMRD	781	520	1320	829	640	1191
MDMR	812	676	1012	1151	825	1448
LDWF	838	570	1529	829	606	1338
TPWD	860	700	1120	821	662	980

	2004			2005		
	Avg	Min	Max	Avg	Min	Max
FWRI	794	724	871	n/a	n/a	n/a
AMRD	801	571	1194	818	581	1250
MDMR	1066	620	1471	n/a	n/a	n/a
LDWF	839	600	1172	886	616	1405
TPWD	930	647	1260	n/a	n/a	n/a

	2006		
	Avg	Min	Max
FWRI	n/a	n/a	n/a
AMRD	824	521	1220
MDMR	n/a	n/a	n/a
LDWF	817	602	1094
TPWD	n/a	n/a	n/a

Ageing of king mackerel otoliths

As mentioned above, the various state and federal otolith processors meet on an annual basis to attend a processors training workshop to ensure that the processors from the various labs are consistent in their processing and ageing techniques. One of the activities at this workshop is a reading exercise where processors break up into groups and read a number of otoliths from various species. After each group determines the age of the various fishes, the information is used to calculate APEs. For king mackerel, the APEs have varied through the years, ranging from 2.4% to 14.7%. The historical APE continues to be high although some of the differences may be attributed to the quality of the images due to the equipment used during the workshop. The equipment used in Panama City provides a clearer image and that could explain some of the discrepancies.

In addition, a king mackerel reference set is distributed throughout the Gulf of Mexico to test reader precision among all the personnel reading king mackerel otoliths. Table 8 provides the APE results of the most recent reading of the reference set. Tables 9 and 10 summarize the percent agreement among readers within an agency for both sectioned and whole king mackerel otoliths. The percent agreement refers to the percent of agreement between the reference set ages and state agency ages as measured by ± 0, 1, 2, or 3 annuli. For the sectioned otoliths, the majority of ages were misidentified by ± 1 year while the whole otoliths have a larger discrepancy (majority of ±2 years) between the reference set and state agency ages.

Table 8. APEs from the king mackerel reference set reading, by agency.

	APE		APE
	Whole	Sectioned	Overall
FWRI	5.03%	0.48%	2.75%
AMRD	5.82%	2.30%	4.06%
MDMR	11.31%	4.84%	8.76%
LDWF	14.35%	5.93%	7.75%
TPWD	n/a	n/a	n/a

Table 9. Reader percent agreement results of **sectioned** samples from the king mackerel reference collection, by agency.

	± 0yr	± 1yr	± 2yr	± 3yr
FWRI	95%	100%	100%	100%
AMRD	72%	97%	100%	100%
MDMR	68%	95%	100%	100%
LDWF	60%	92%	99%	100%
TPWD	n/a	n/a	n/a	n/a
Overall	74%	96%	100%	100%

Table 10. Reader percent agreement results of **whole** samples from the king mackerel reference collection.

	± 0yr	± 1yr	± 2yr	± 3yr
FWRI	72%	97%	100%	100%
AMRD	69%	96%	100%	100%
MDMR	44%	81%	94%	100%
LDWF	51%	82%	85%	98%
TPWD	n/a	n/a	n/a	n/a
Overall	59%	89%	95%	100%

Please note that TPWD personnel are still in the process of reading the otoliths from the reference set. Hopefully, the results from TPWD will be available by the SEDAR data workshop in February.