




**UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric
Administration**

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May 17, 2017

MEMORANDUM TO: Gregg Waugh,
SAFMC Executive Director

FROM: Bonnie J. Ponwith, Ph.D. 
Science Director

SUBJECT: SAFMC Assessment & Related Requests

In response your request for and "evaluation of ageing resources for the South Atlantic," the SEFSC has prepared the following report titled, "Evaluation of Ageing Resources of Fish Species Managed by the SAFMC."

cc:

SAFMC	Monica Smit-Brunello
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**Evaluation of Ageing Resources of Fish Species Managed by the SAFMC
Report to the South Atlantic Fishery Management Council**

By

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May 17, 2017

Executive Summary

An evaluation of the resources needed to clear the backlog of samples and keep up with annual samples by the laboratories engaged in ageing fish managed by the SAFMC was undertaken. Species listed in the SAMFC Research Prioritization Plan were considered. The evaluation was based on the following parameters:

1. fully trained and experienced staff (1 staff equals one year, full time hours);
2. estimates to clear backlog included all samples of a species that may need to be re-aged, following age validation studies;
3. two readings of every sample;
4. annual samples completed within 12 months of receipt;
5. estimates do not fully account for age workshops, exchanges of reference sets, SEDAR participation, and age validation studies.

Four laboratories were identified as primary data providers for SEDAR assessments in the South Atlantic jurisdiction, though other state agencies and universities have occasionally provided data.

1. NMFS-Beaufort Laboratory (BFT) - all species except those covered exclusively by PC and FWC;
2. South Carolina Department of Natural Resources - Marine, Monitoring and Prediction program (MARMAP) - all species except those covered exclusively by PC and FWC;
3. NMFS – Panama City Laboratory (PC) – king mackerel and Spanish mackerel; and
4. Florida Fish and Wildlife Conservation Commission (FWC) - black grouper, mutton snapper and yellowtail snapper.

Laboratory	Current Resources (incl. salaries, supplies, travel, etc.)	Backlog	Resources (salaries and supplies) to clear backlog	Resources to keep up with annual samples	Lab/office space to expand program
BFT	5 staff members	Yes	13 staff for 1 year and funding for equipment	6 staff members	No
MARMAP	3 staff members (do not know funding in 2017)	Yes	10 staff for 1 year and funding for equipment	6 staff members (plus funding for saw, image analysis system)	Limited
PC	1 staff member	Yes	3 staff members for 1 year and funding for equipment	3 staff members (to meet requirements for SA and GOM mackerel samples, plus funding for saws)	Limited
FWC	2 staff members	No	N/A	2 staff members	N/A

Introduction

The South Atlantic Fishery Management Council (SAFMC) submitted a request for an evaluation on ageing resources for priority species in the South Atlantic. The information requested would be used by the SAFMC for scheduling Southeast Data, Assessment and Review (SEDAR) assessments and for research prioritization plans. The request included three parts, as outlined below:

- a) The resources required to clear the current backlog of age evaluations,
- b) The resources required to provide up to date age structure evaluations for SAFMC primary data collection species, and
- c) A comparison of current age structure evaluation resources with the resources required to keep age evaluations up to date.

The species included in the evaluation (Table 1) are from the primary and secondary list, excluding dolphin, wahoo and crustaceans, from the March 6-8, 2017 SAFMC Briefing Book, Tab 02 SEDAR Committee, A03, SAFMC Long-Term Assessment Considerations. Notes on the collections of the “Special” species were made.

Table 1. SAFMC stocks categorization in the Research Prioritization Plan

Category	Primary	Secondary	Special
Stocks	Vermilion Snapper	Tomtate	Warsaw grouper
	Snowy Grouper	Knobbed Porgy	Speckled Hind
	golden Tilefish	Bar Jack	Goliath grouper
	Red Grouper	Almaco Jack	Nassau grouper
	Black Grouper ¹	Lane Snapper	Red Snapper
	Scamp	Banded Rudderfish	Wreckfish
	Black Sea Bass	Rock Hind	Spiny Lobster*
	Gag	Red Hind	Golden Crab*
	Greater Amberjack	Wahoo*	
	White Grunt	Penaeid Shrimp*	
	Yellowtail Snapper ¹		
	Gray Triggerfish		
	Mutton Snapper ¹		
	Red Porgy		
	Dolphin		
	King Mackerel ²		
	Spanish Mackerel ²		
Blueline Tilefish			
Assessment Goal	Age based	Survey methods or production models	Varies due to unique management circumstances

1. Age data from FWC; 2. Age data from PC; * No one identified as ageing these species.

To meet the data input needs for SEDAR, age data are compiled from several sources depending on species. Primary contributors include NMFS-Beaufort Laboratory (BFT), South Carolina Department of Natural Resources - Marine, Monitoring and Prediction program (MARMAP), NMFS – Panama City Laboratory (PC), and Florida Fish and Wildlife Conservation Commission (FWC). Occasionally, other state agencies or universities contribute age data. For example, North Carolina Division of Marine Fisheries (NCDMF) provides black sea bass age data from NC commercial fishery, Georgia Department of Natural Resources has

contributed red snapper age data and Old Dominion University has contributed mid-Atlantic blueline tilefish and cobia age data. Not every data contributor is engaged in ageing all of the species in the Research Prioritization Plan. This report will focus on the primary contributors' resources and will be addressed on a lab by lab basis.

Analyzing the resources needed to clear backlogs, keep up with annual age samples and compare current resources to what would be required to keep up has many caveats. Most of the labs actively ageing fish for SEDAR have had to rely on contract staff for much of the work. There is a high rate of turnover in that staff. When new people are hired, they must be trained in sectioning techniques, database usage and ultimately in age reading methodology. All of these aspects may take six (6) months to one (1) year before a person is qualified to work independently. Another aspect of managing a production ageing lab is the need for a full time manager. That person assigns tasks based on SEDAR schedule, oversees projects, participates in data analysis, attends SEDAR workshops/webinars, and carries out general administrative tasks including seeking funding for the lab and managing budgets. The analyses within this report were based on the following parameters:

1. The number of full time staff refers to personnel who are fully trained and experienced in ageing the suite of species addressed in this report.
2. All estimates of time for age readings were based on two readings of every sample.
3. The number of full time staff to clear the backlog were based on a one year time frame, or two years in the case of MARMAP.
4. The number of staff to process and age annual samples of priority species in based on a 12 month lag, unless stated otherwise.
5. All estimates of annual samples were based on recent 5-year averages or recent trends in sample collection.
6. Estimates to clear the backlog included all samples of a species that may need to be re-aged based on results of age validation studies.
7. Personnel needed to process and age samples represents only the time required for processing and aging the samples in a production framework. It does not fully account for other required tasks associated with providing high quality age data, including time needed for
 - a. Age workshops
 - b. Reference set exchanges and readings
 - c. SEDAR participation
 - d. Age validation studies
 - e. Management of sample databases
 - f. QA/QC of data.

Resources to clear current backlog

The BFT lab is actively engaged in processing and ageing all primary species, except black grouper, mutton snapper, yellowtail snapper, king mackerel and Spanish mackerel, and some of the secondary and special species in the Research Prioritization Plan list. BFT has a backlog of eight of twelve primary species ($n = 33,505$). The collection of white grunt is the most notable because BFT holds ~25,000 samples dating back to the late 1970s that have not been processed.

Eight (8) staff would be needed to clear this backlog in one year's time. One and one half (1.5) people would be needed to re-age all red porgy, gray triggerfish and blueline tilefish already sectioned, dependent on the outcome of the age validation studies already in progress. Of the secondary species, BFT is currently studying knobbed porgy, lane snapper and gray snapper. BFT holds archives of tomtate, almaco jack, rock hind and red hind in limited quantities. Four (4) additional staff would be needed to clear the backlog of the secondary species ($n = 16,881$) in one year's time. The species in the "special" category are much more limited in recent years with the exception of wreckfish. One person dedicated to sectioning and ageing wreckfish samples would take six (6) months to clear the backlog. Thirteen (13) full time, fully trained staff would be needed to clear the backlog of the majority of the species in the BFT collection that are in the Research Prioritization Plan. BFT would require equipment (e.g., saws and image analysis systems) and supplies to clear the backlog. The greatest limitation to clearing the backlogged samples is the need for additional laboratory space. At this time there is no available lab and office space in the BFT facility.

MARMAP holds all the fishery-independent samples collected through the Southeast Reef Fish Survey (SERFS), a joint effort by MARMAP, the Southeast Area Monitoring and Assessment Program, South Atlantic Region's (SEAMAP-SA) Reef Fish Complement, and the Southeast Fishery Independent Survey (SEFIS). In addition, the SEAMAP-SA Coastal Trawl Survey obtains age data for mackerels. Of the species represented in Table 1, MARMAP has a backlog of approximately 115,292 age samples that need to be (re)read, including samples in excess of 300 individual fish for twenty-two different species. Ultimately, the number of age samples to be (re)read for some species (e.g., Gray Triggerfish, Red Porgy, Blueline Tilefish) will depend on the outcome of any validation studies and associated age workshops. Most notable in this backlog are the greater than 9,000 historical samples that need to be (re)read for Black Sea Bass, Gray Triggerfish, Red Porgy (single largest backlog at >50k samples), Vermilion Snapper and White Grunt. To clear the backlog of species in the Research Prioritization Plan within one year, MARMAP estimates it would require 10 full time, fully trained staff experienced with finfish age determination, including necessary equipment (e.g., microscopes and image analysis systems). The greatest limitation to clearing the backlogged samples is the lack of available personnel time. All current staff adequately trained in age determination are also required to assist with other MARMAP program research priorities as part of their official job duties, including assisting with fieldwork, reproductive analyses, database management, diet studies, video reading, etc. Clearance of the backlog would require either significant investment in training new staff and/or the hiring of staff that could relieve the burden of other job duties from current staff.

The PC lab ages all king mackerel and the vast majority of Spanish mackerel for the South Atlantic and Gulf of Mexico. The data presented in this portion of the report will pertain to South Atlantic age samples only. Currently, there is only one person fully trained in sectioning methodology and age reading. Thus, PC needs to invest time in training additional staff in processing and ageing of these species. PC has a backlog of samples for both species that dates back to the terminal year of the last stock assessments - 2011 for Spanish mackerel and 2012 for king mackerel. Based on the backlog of both species, three (3) staff would be needed to process and age all samples in one year's time. Additional funding would be needed for equipment to achieve this level of production, including three (3) saws and supplies. Laboratory

and office space for the additional people and equipment would pose a limitation at the PC facility.

The FWC lab age all black grouper, mutton snapper and yellowtail snapper age samples for stock assessment purposes. Any fishery-dependent samples of those three species received at BFT are sent to FWC for age evaluation. The FWC lab also age all red snapper and gray snapper collected by FWC port agents. To date, FWC staff are able to process and age all annual samples within 12 months of the following calendar year (e.g., collection year = 2015, all samples aged by EOY 2016). Thus, FWC does not have any backlog.

Resources to keep up with annual age samples

The BFT lab currently receives 20,000 samples per year of 23 of the Research Priority Plan species. These samples represent the commercial and recreational fisheries of the South Atlantic. With six (6) full time people, BFT would be able to process and age all samples within 12 months of the previous fishing year. Laboratory and office space may be a limiting factor to any expansion of this research group at the facility.

MARMAP currently collects approximately 21,000 age samples each year from most of the priority species. This estimate includes all relevant samples collected by SERFS, limited fishery-dependent samples collected to prepare life history information for stock assessments, and the occasional additional project (e.g., the recent tilefish projects). With six (6) full time people, MARMAP would be able to process and age all samples by the end of year (EOY) of the following year after collection (e.g., collection year = 2016, all samples aged by EOY 2017). Additional funding for equipment would be required to meet the demand for keeping up with annual samples. Note, staff involved in fish ageing studies is also required to participate in fishery-independent cruises and other research activities contained within the MARMAP and SEAMAP-SA scopes of work. Note, estimated cost and staff requirements do not include the costs (in money or staff time) associated with participation in age workshops, reference set exchanges, SEDAR participation, age validation studies, management of sample databases, QA/QC of data, etc. These costs represent only the direct costs associated with production aging once the sample is housed at the lab and prior to any QA/QC of resultant data.

The PC lab takes the lead on ageing all king mackerel and most Spanish mackerel for the South Atlantic and Gulf of Mexico. It would take one person up to 12 months following the end of the fishing year to age the South Atlantic only samples of both species. The laboratory requires additional funding for equipment dedicated to processing the otoliths. At this time, only one person is experienced in processing and ageing the mackerel species. Thus, that person is also required to age the Gulf of Mexico mackerel samples. Two (2) additional staff would need to be trained in processing and ageing of mackerels to truly keep up with annual samples in both jurisdictions. This consideration is important to remember because the king mackerel assessments are usually done as SA/GOM joint assessments.

As stated in the previous section, FWC takes the lead on aging all black grouper, mutton snapper, and yellowtail snapper. They also are engaged in ageing red snapper and gray snapper

from their own collections. The FWC lab is able to process and age all annual samples within 12 months of the previous fishing year with their current staffing levels.

Conclusion

The demand for age data for SEDAR assessments takes a lot of resources and the close collaboration of several laboratories around the region. The staff of each lab are actively engaged in exchanging reference sets of samples to ensure consistency in age readings. They are also attending age workshops to fine tune processing methodology and discuss potential discrepancies in age readings. Some of the labs have been conducting age validation studies to get more accurate age data. All these activities must be done to have the best product for stock assessments.

The evaluation of current resources compared to what is needed to clear backlogged samples and keep up with annual samples revealed real deficits in fish ageing programs around the region. To clear the backlog of samples within a one year time period would require a large investment in additional staff, equipment and supplies for three of the four labs. It must be stressed that the two NMFS laboratories do not have the lab or office space to expand their programs. MARMAP may be limited on space as well. In addition to clearing the backlogged samples, three of the four laboratories would require additional staff to keep up with annual samples, and three of the four laboratories would require additional equipment. Following is a tabular summary (Table 2) of the current resources, resources to clear backlog and resources needed to keep up with annual samples.

Table 2. Current resources of each laboratory engaged in ageing fish for SAFMC managed fish species; estimates of one year, full-time staff equivalents, supplies and equipment to clear the backlog of samples of priority species; and estimates of resources needed on a yearly basis to keep up with annual samples with additional one time equipment needs. The estimates of the resources to clear backlog and to keep up with annual samples do not include the space requirements to do those tasks.

Laboratory	Current Staff Resources	Backlogged Samples	Annual Samples completed within 12 months
	Current staff levels	Staff required (one year equivalent with significant funding for needed equipment)	Staff required with significant funding for equipment
NMFS Beaufort	2 FTE/3 Contract	13	6
MARMAP	2 FTE/1 Contract	10	6
NMFS Panama City	1 FTE (mackerels only)	3	3 (to meet requirements for SA and GOM mackerel samples)
Florida FWC	2 Contract	N/A	2 Contract

Staff = One year, full time equivalent