Southeast Region Headboat Survey (SRHS) Data Evaluation

NOAA FISHERIES SEFSC

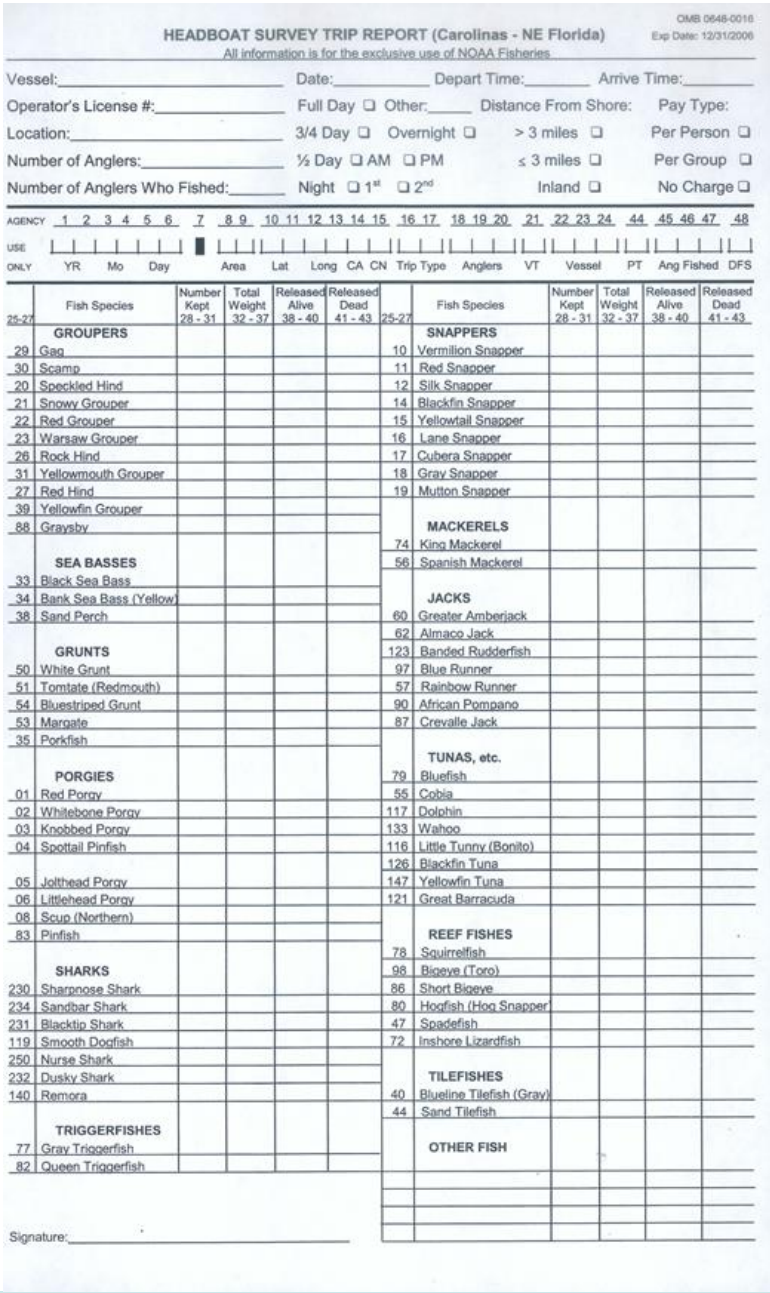
Beaufort, NC Laboratory

SEDAR41-DW46

SEDAR 41 Data Workshop II, 8/4/15, Charleston, SC

Outline

- Impetus
- Study Design
- Results
- Discussion
- Recommendations
- Review



OMB 0648-0016
Exp Date: 12/31/2006

HEADBOAT SURVEY TRIP REPORT (Carolinas - NE Florida)

All information is for the exclusive use of NOAA Fisheries

Vessel:_____ Date:_____ Depart Time:_____ Arrive Time:_____

Operator's License #:_____ Full Day ❑ Other:_____ Distance From Shore: Pay Type:

Location:_____ 3/4 Day ❑ Overnight ❑ > 3 miles ❑ Per Person ❑

Number of Anglers:_____ ½ Day ❑ AM ❑ PM ≤ 3 miles ❑ Per Group ❑

Number of Anglers Who Fished:_____ Night ❑ 1st ❑ 2nd Inland ❑ No Charge ❑

AGENCY 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 44 45 46 47 48

USE ONLY YR Mo Day Area Lat Long CA CN Trip Type Anglers VT Vessel PT Ang Fished DFS

25-27	Fish Species	Number Kept 28 - 31	Total Weight 32 - 37	Released Alive 38 - 40	Released Dead 41 - 43
	GROUPERS				
29	Gag				
30	Scamp				
20	Speckled Hind				
21	Snowy Grouper				
22	Red Grouper				
23	Warsaw Grouper				
26	Rock Hind				
31	Yellowmouth Grouper				
27	Red Hind				
39	Yellowfin Grouper				
88	Graysby				
	SEA BASSES				
33	Black Sea Bass				
34	Bank Sea Bass (Yellow)				
38	Sand Perch				
	GRUNTS				
50	White Grunt				
51	Tomtate (Redmouth)				
54	Bluestriped Grunt				
53	Margate				
35	Porkfish				
	PORGIES				
01	Red Porgy				
02	Whitebone Porgy				
03	Knobbed Porgy				
04	Spottail Pinfish				
05	Jolthead Porgy				
06	Littlehead Porgy				
08	Scup (Northern)				
83	Pinfish				
	SHARKS				
230	Sharpnose Shark				
234	Sandbar Shark				
231	Blacktip Shark				
119	Smooth Dogfish				
250	Nurse Shark				
232	Dusky Shark				
140	Remora				
	TRIGGERFISHES				
77	Gray Triggerfish				
82	Queen Triggerfish				

25-27	Fish Species	Number Kept 28 - 31	Total Weight 32 - 37	Released Alive 38 - 40	Released Dead 41 - 43
	SNAPPERS				
10	Vermilion Snapper				
11	Red Snapper				
12	Silk Snapper				
14	Blackfin Snapper				
15	Yellowtail Snapper				
16	Lane Snapper				
17	Cubera Snapper				
18	Gray Snapper				
19	Mutton Snapper				
	MACKERELS				
74	King Mackerel				
56	Spanish Mackerel				
	JACKS				
60	Greater Amberjack				
62	Almaco Jack				
123	Banded Rudderfish				
97	Blue Runner				
57	Rainbow Runner				
90	African Pompano				
87	Crevalle Jack				
	TUNAS, etc.				
79	Bluefish				
55	Cobia				
117	Dolphin				
133	Wahoo				
116	Little Tunny (Bonito)				
126	Blackfin Tuna				
147	Yellowfin Tuna				
121	Great Barracuda				
	REEF FISHES				
78	Squirrelfish				
98	Bigeye (Toro)				
86	Short Bigeye				
80	Hogfish (Hog Snapper)				
47	Spadefish				
72	Inshore Lizardfish				
	TILEFISHES				
40	Blueline Tilefish (Gray)				
44	Sand Tilefish				
	OTHER FISH				

Signature:_____

Problems with Headboat Index of Abundance Confounds Use in SEDAR 41 Red Snapper

David Nelson, Jimmy Hull, and Peter Barile

SEDAR41-DW40

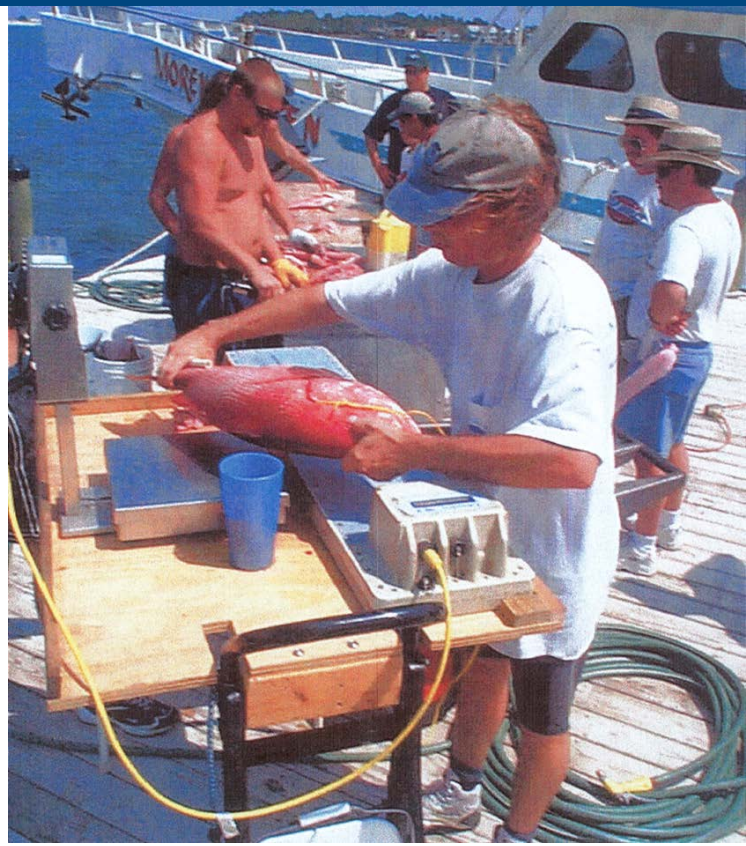
Submitted: 27 August 2014

Impetus

- SEDAR41-DW40 working paper
  - Called into question the data pre-1992
    - Suggested mis-reporting, both by fabrication and by non-reporting
    - Recommended the pre-1992 index be removed
- We were concerned that if the data were wrong, they would affect all the assessments using those data. Decided to conduct a full data evaluation.

Study Design

- Methods
  - Programmatic Component
  - Analytical Component
    - Define strata
    - Catch Records (CR) Analyses
    - Bioprofile (BP) Analyses
  - Social Science Component
  - Review of the methods



Study Design – Programmatic Component

- Programmatic Description and review:
  - Provide a full description and assessment of current and historic SRHS protocols and policies with regard to data quality control and the ability to detect misreported data.
    - QA/QC procedures (e.g., error checks in database, SAS checks for outliers, and “highlighted” entries)
  - Compile a history of motivating factors for participant responses (e.g. payments for forms, regulatory requirements for filling out form, regulations on species, any law enforcement actions based on logbooks, etc.).

Study Design – Analytic Component

Define Strata

- Based on multivariate analysis, grouped inlets by area using species compositions :
  - Carolinas
  - Georgia and North Florida
  - South Florida
- Five time blocks based on regulation changes
  - 1973-1983, 1984-1991, 1992-2000, 2001-2009, and 2010-2013.

Study Design – Analytic Component

Strata

	Carolinas		Georgia-north Florida		south Florida	
Time-block	n.vessels	n.trips	n.vessels	n.trips	n.vessels	n.trips
1972-1983	60	23,509	34	11,547	64	35,487
1984-1991	42	18,539	27	15,092	55	61,000
1992-2000	57	23,159	28	19,827	62	50,756
2001-2009	52	22,077	28	16,519	40	24,170
2010-2013	34	12,282	20	8,131	34	27,166

Study Design – Analytic Component

Catch Records (CR) Analyses

- We used a set of measures to flag vessels that deviated from the norm in their time area block. The assumption being that the central tendency of the time area blocks is unbiased.
  - Examples:
    - If Vessel A always reported catch 30 Black Sea Bass on a trip, it would be flagged.
    - If Vessel B always reported 25 anglers, and that wasn't the capacity of their vessel, it would be flagged.

Study Design – Analytic Component

Catch Records (CR) Analyses

- Rounding/Heaping Metric
  - Not necessarily a sign of misreporting, but was treated as a possible identifying metric for a vessel.
- Species Composition Metric
  - We compared the species compositions of a vessel to the vessels around it and to its own history
- Reported Landings by Species Metric
  - The emergence of common patterns would suggest that misreporting was insubstantial (or else was done collaboratively). The comparisons could also provide insight into vessels that showed deviation from the common patterns (i.e., outlier vessels), which might be consistent with misreporting.

Study Design – Analytic Component

Bioprofile (BP) Analysis

- The BPs are a subsample of the catch, so if the CRs do not contain at least as many species some degree of misreporting has occurred.
  - The frequency and magnitude of discrepancies of BPs and CRs over time will determine whether there has been chronic misreporting, and if that has occurred further investigation would be required.
- Compare the BPs with the landings to determine whether the sampling has changed through time.

Study Design - Social Science Component

- A scientific survey of SRHS headboat captains was considered to assess the extent and potential directionality of misreporting, and whether it has changed over time or space.

- Feedback from two NOAA social scientists strongly indicated that such a survey would not be productive due to multiple factors:
  - Recall bias (which becomes problematic at a scale of weeks to months, and this survey would require recollections over a scale of decades)
  - The inability to form a statistically valid sampling universe (many of the captains from the 1970s and 1980s may be deceased)
  - Competing incentives to respond honestly and dishonestly to survey questions about misreporting.

Study Design - Reviews

- Three reviewers provided feedback on the study design: a NOAA senior scientist, a branch chief in the SWFSC, and a fisheries sampling scientist from the AKFSC
- All reviews were positive and endorsed the use of the proposed methods to achieve our objectives.
  - Some reviewers expressed concern that there may not be a method that would detect average mis-reporting.

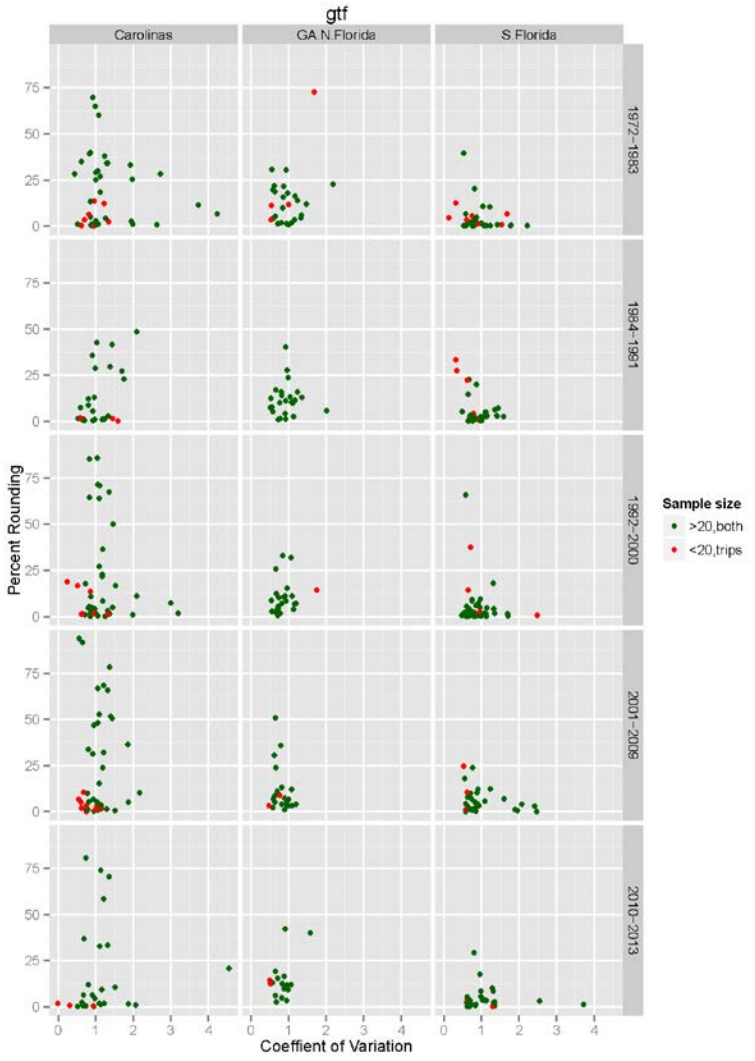
Results – Catch Record (CR) Analyses

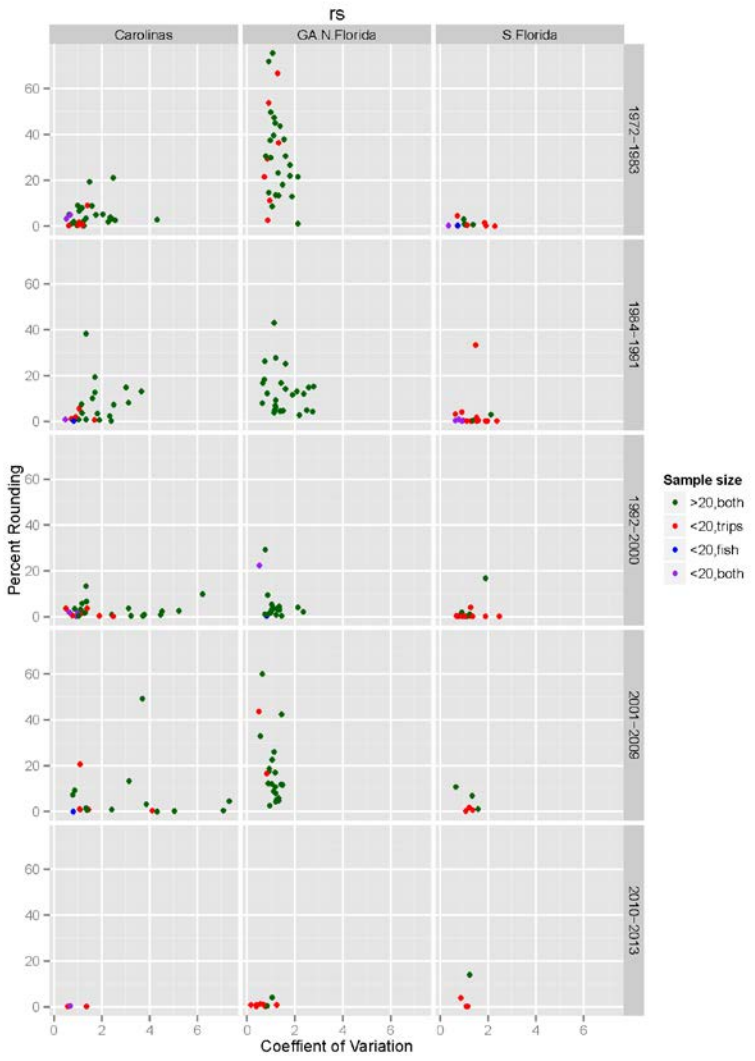
Extreme Outliers

- 161 (only 0.04% of the 369,260 trips) extreme outliers were identified in the SRHS data set.
  - About 15% of those outliers occurred in the Georgia-north Florida region and prior to 1992
  - These outliers could be due to data entry or other types of errors in addition to misreporting.
  - Development of abundance indices routinely applies filters to remove extreme outliers from the data set, and thus previously computed indices are unlikely to have been affected by these values.

Results – CR Analyses

Rounding/Heaping

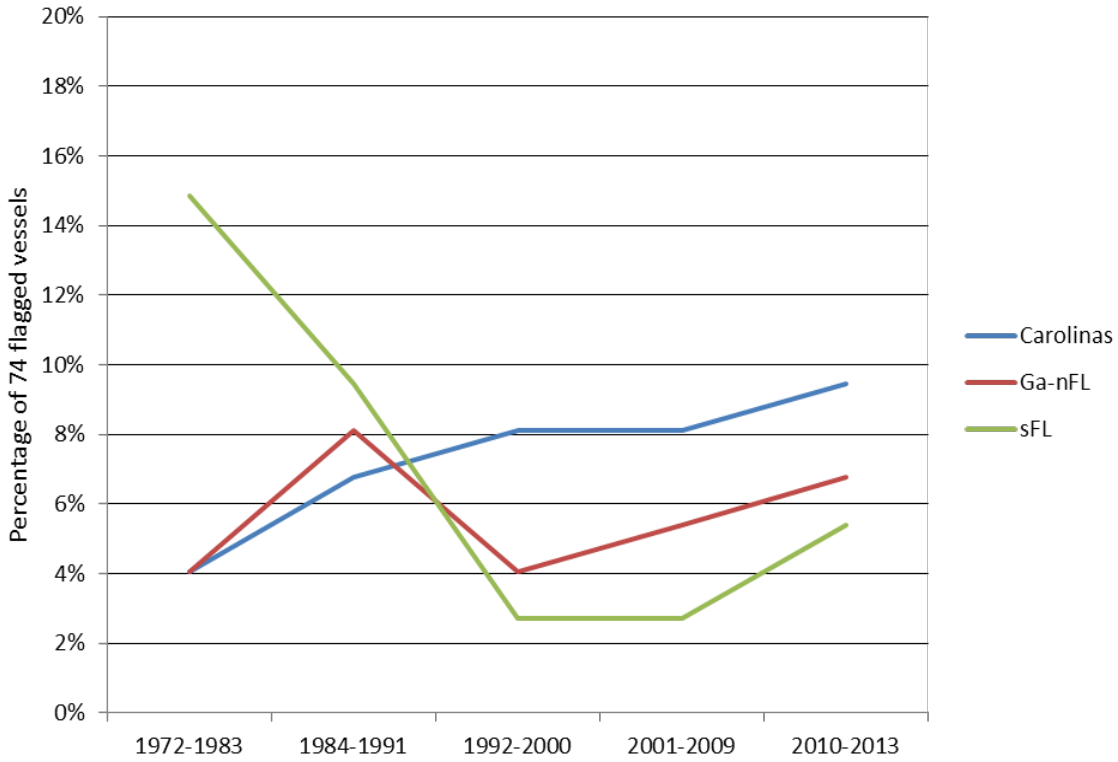




Results – CR Analyses

Flagged metrics

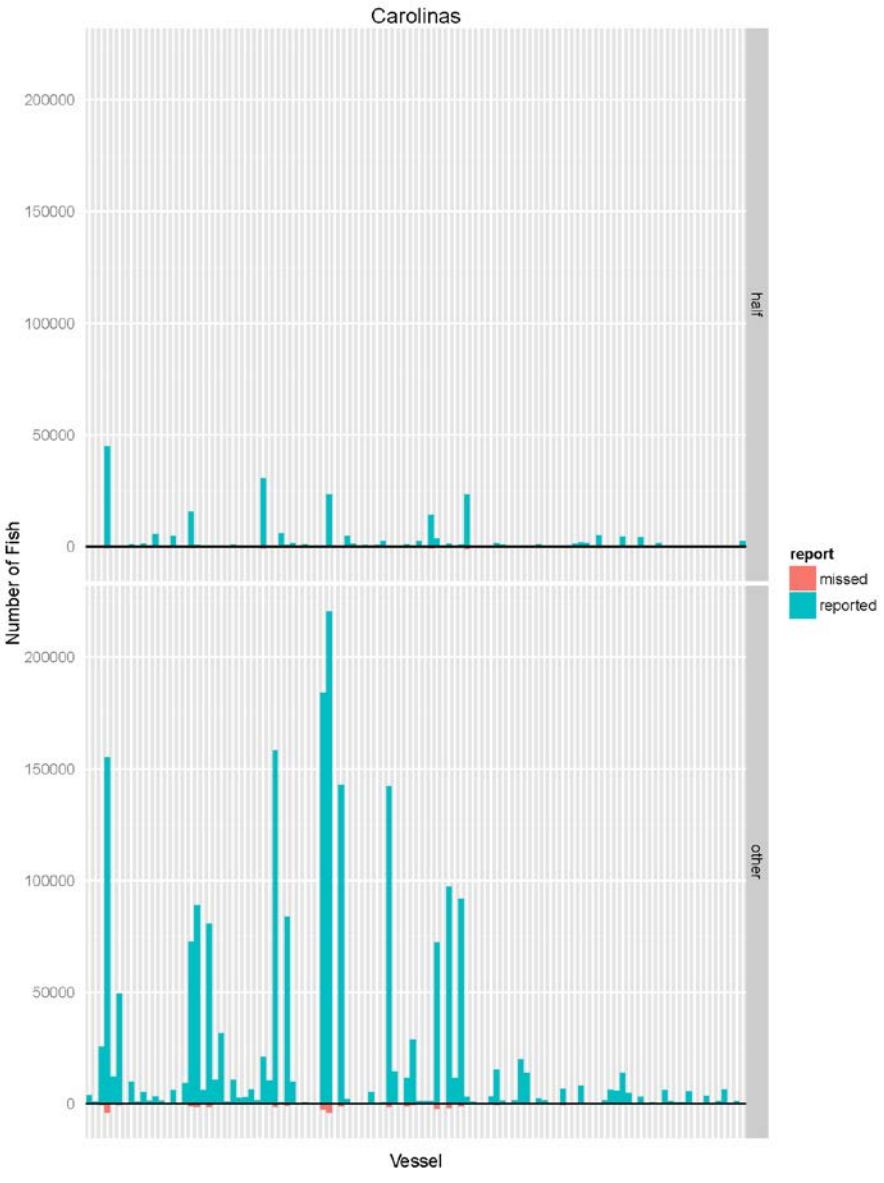
- 74 Vessel/time/area block combinations were flagged (11.6% of the 637 vessel-area-time block combinations in the SRHS database).



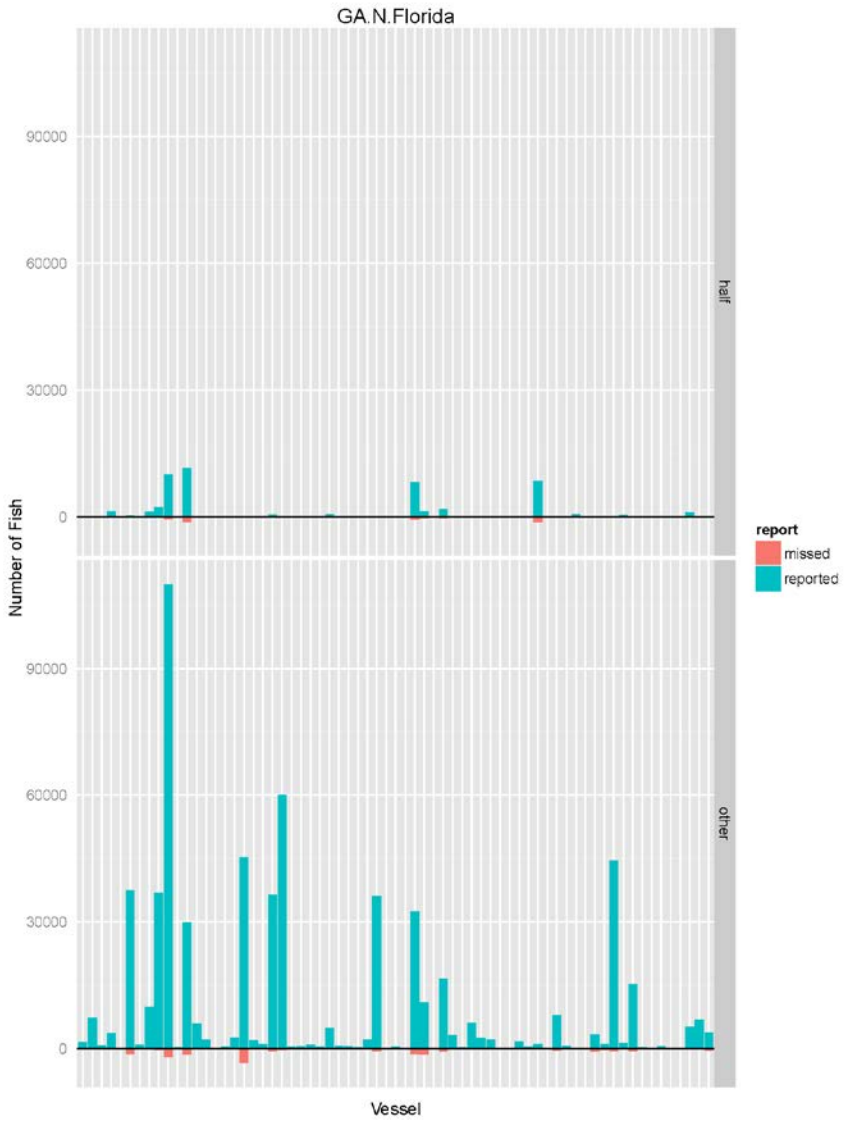
Results – BP Analyses

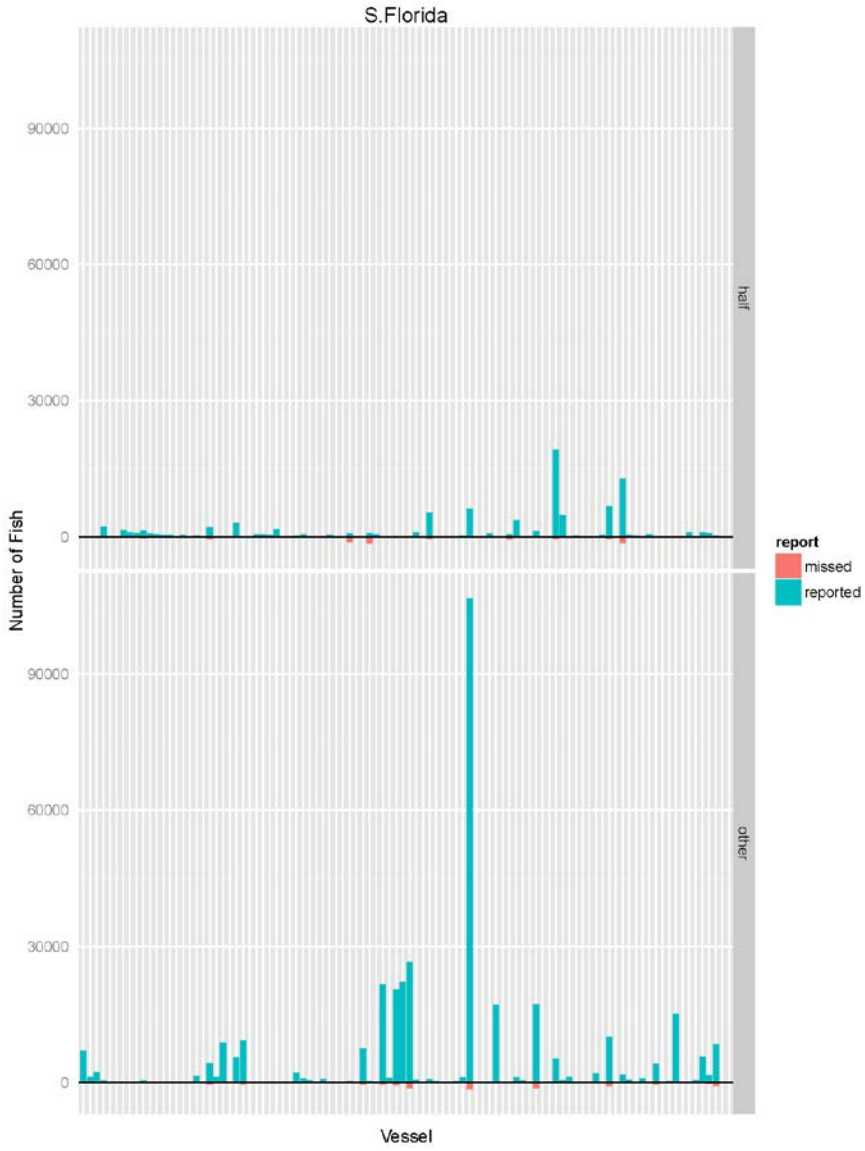
BP/CR Comparison

- The BPs were compared to the CRs, and if the BPs contained more fish measured than the CR, the vessel underreported.
- Only slight underreporting detected, and it was proportional to catch, except in South Florida.



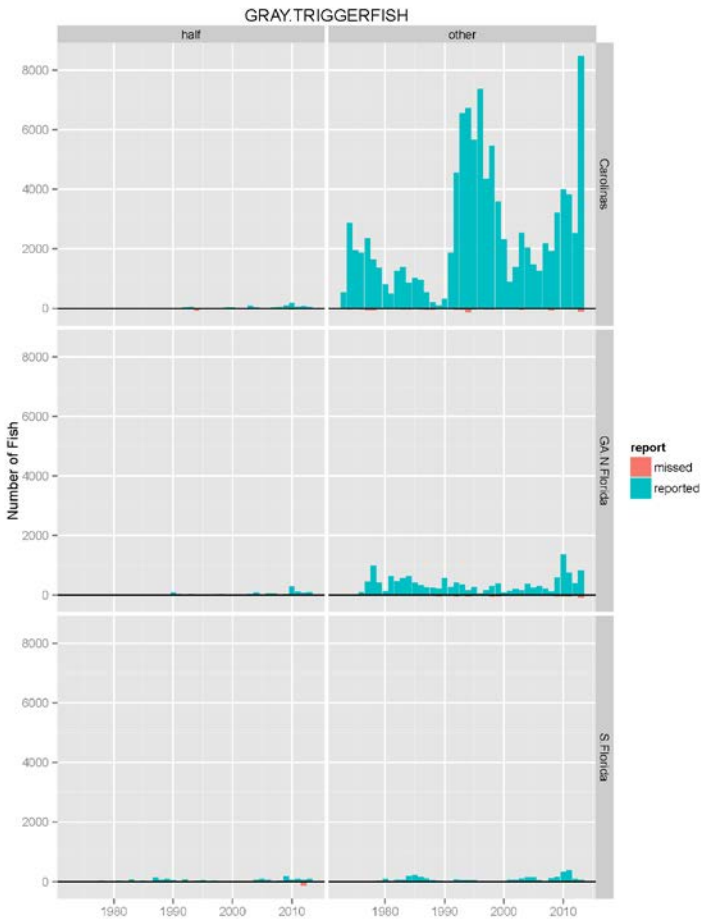
BP/CR Comparison cont'd.

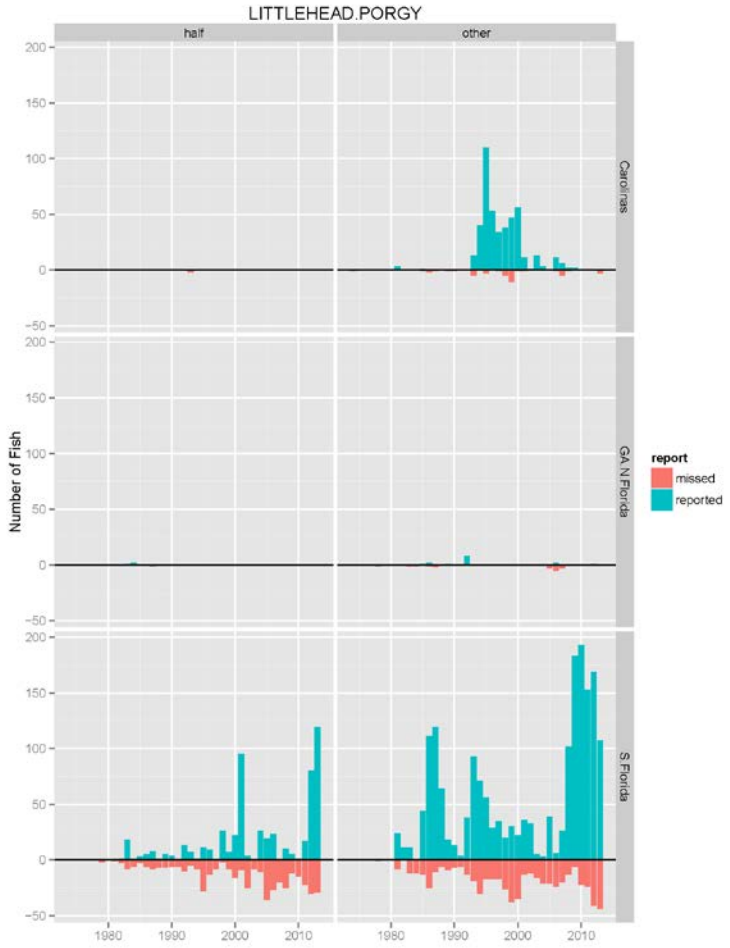




BP/CR Comparison by species

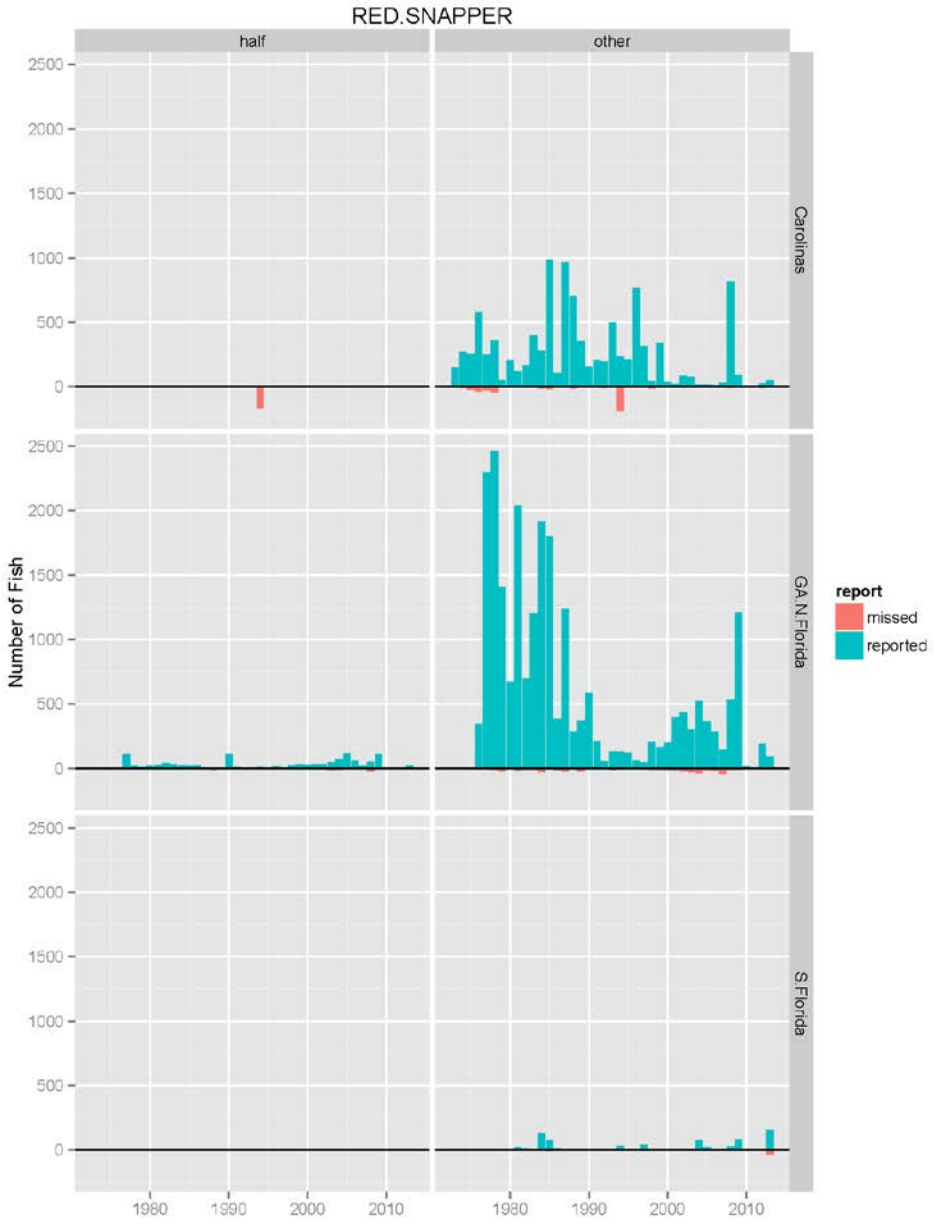
- Species that are difficult to identify make up the underreporting in most cases.





BP/CR Comparison by species

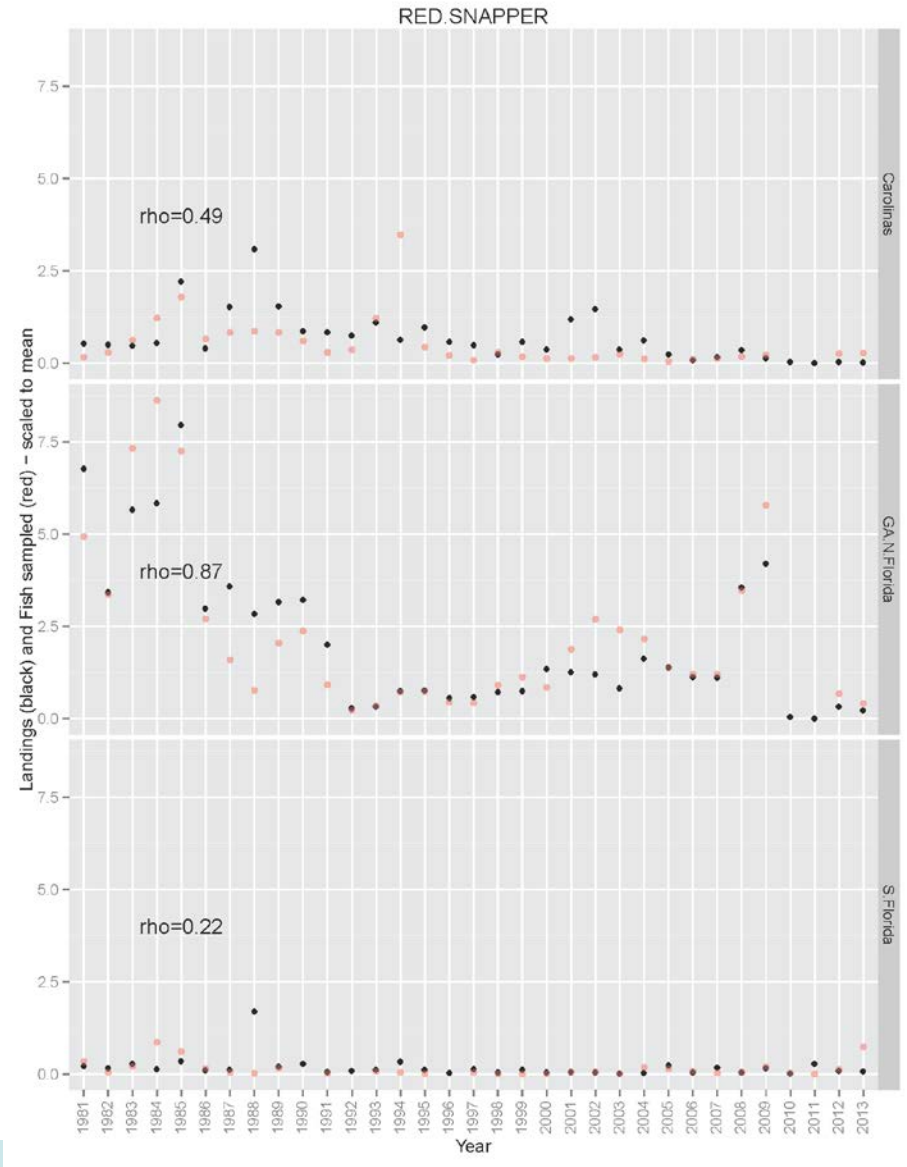
- Very minimal under-reporting of Red Snapper in GA/N. FL region.

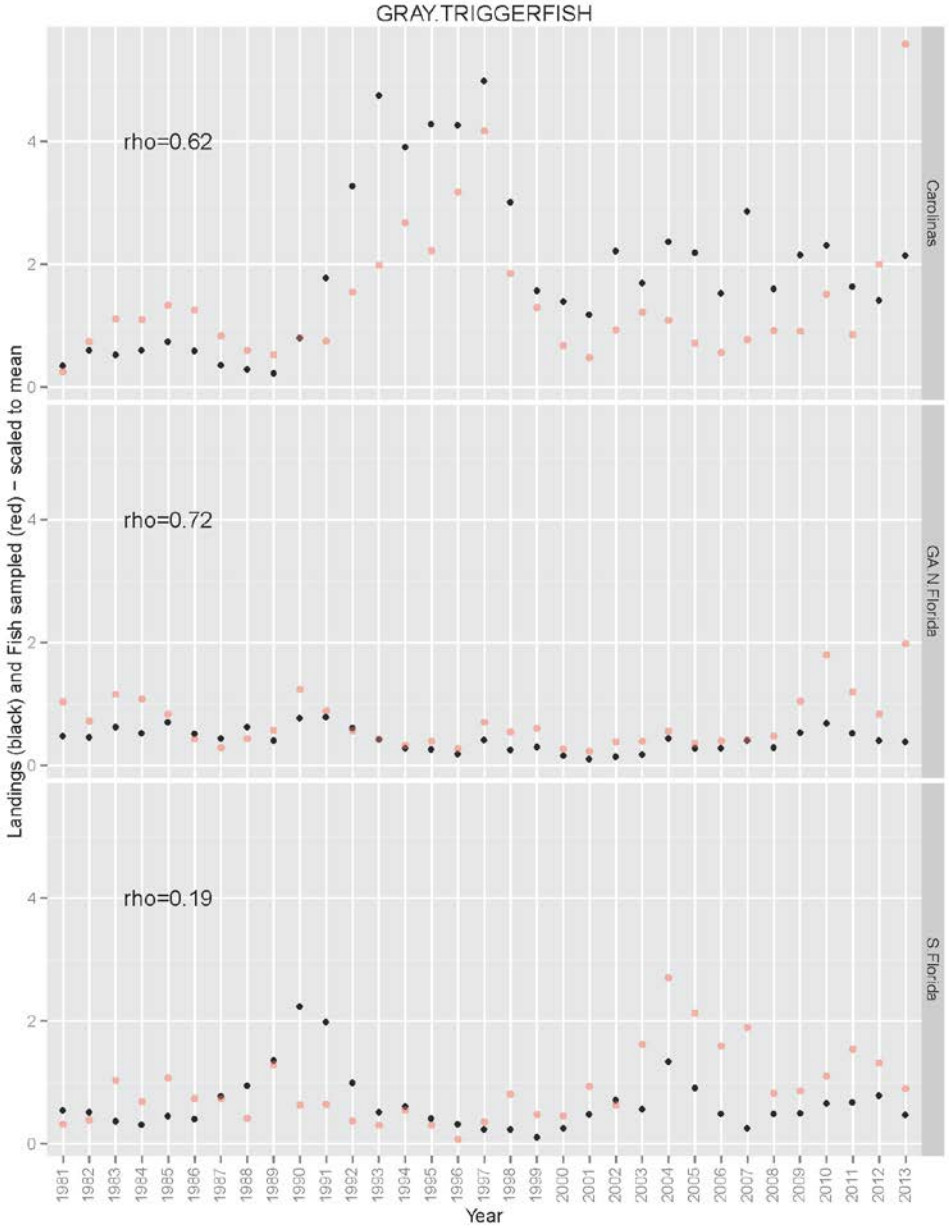


Results – BP Analyses

BP/Landings Comparison

- Species-specific trends in landings and numbers sampled in BPs were generally consistent through time, area, and by species.
- Correlations between reported landings and numbers sampled in BPs tended to be weaker in the south Florida region than in the Carolinas and Georgia-north Florida.




GRAY.TRIGGERFISH
rho=0.62
rho=0.72
rho=0.19
Carolinas
GA N Florida
S Florida
Landings (black) and Fish sampled (red) – scaled to mean
Year
0
2
4
1981
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2012
2013

Discussion – Programmatic component

- These analyses are a second-tier investigation. The first tier of detecting outliers or otherwise misreported data is conducted routinely as part of the SRHS QA/QC protocol.
- Port samplers have inspected all catch records visually. If gross misreporting were detected, those records would be corrected or omitted before being keyed into the database.
- Database managers would make obvious corrections themselves, but if clarification were needed, port agents would ask the headboat captain who submitted the record in question.
- Although the QA/QC protocol could not catch all instances of misreporting, it is highly unlikely that consistent or intentional misreporting would have gone unnoticed by program personnel.

Discussion – CR Analyses

- Only 0.25% (N = 97) of the 39,494 vessel-area-time block values considered were flagged as outliers (potentially erroneous data targeted for subsequent investigation).
- Those flagged outliers were associated with 74 vessel-area-time blocks, representing a relatively small percentage (11.6%) of the total 637 vessel-area-time block combinations in the SRHS database.
- This suggests there is little evidence to support widespread and chronic misreporting in the SRHS database.
- No spatial or temporal trends in the occurrence of outliers were observed, with the exception of the south Florida region during the 1972-1983 time block.

Discussion – CR Analyses cont'd.

- Nearly all of the outliers could be explained by the following factors:
  - Different vessel fishing behavior (e.g., some vessels consistently fish in nearshore waters targeting nearshore species such as Spot and Croaker)
  - Different number of anglers (e.g., some vessels consistently carried relatively small numbers of fishers resulting in lower total landings per trip)
  - Likely misidentification of species by either the captain or the port sampler. Thus, results from the outlier analyses provided no evidence for systematic misreporting by vessel for any area-time block combination.

Discussion – BP Analyses

- The BPs are a subsample of the total catch of a particular trip, therefore, they can be used to detect under-reporting but not over-reporting.

- No temporal patterns in either under-reporting or correlations between CR-reported landings and number of fish sampled in BPs were observed.

- Under-reporting and relatively low correlations between landings and the number of fish sampled were most frequent in the south Florida region, and appear to be driven by species identification issues (e.g., the suite of multiple porgy species).

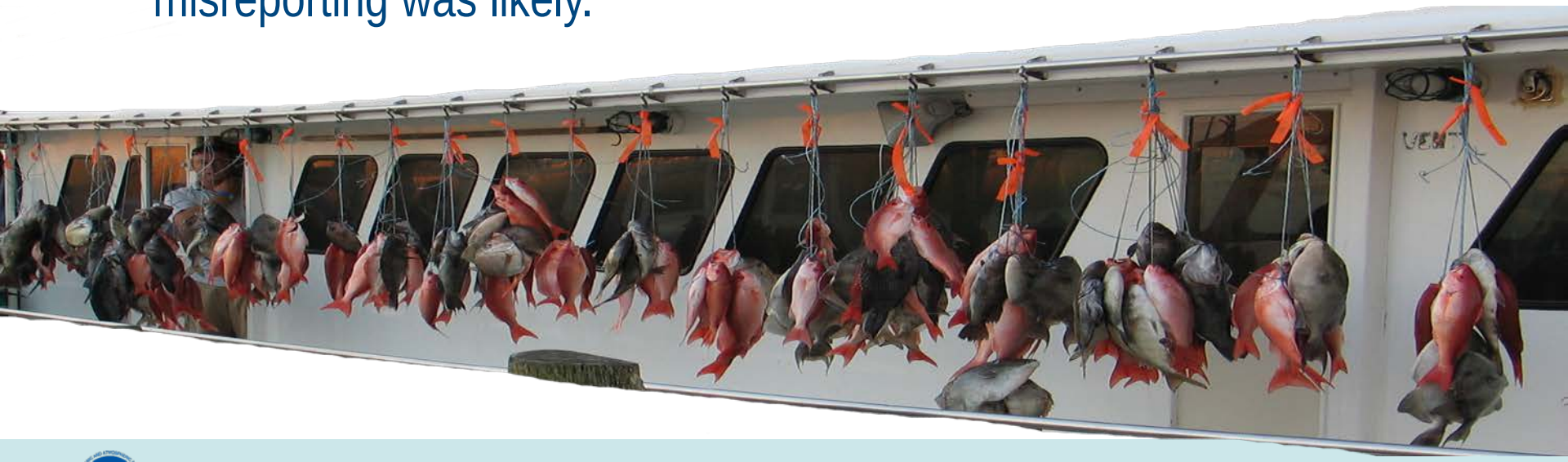
Discussion – BP Analyses cont'd.

- Species identification issues may be due to:
  - a lack of agreement in species identification by the vessel crew
  - a discrepancy between the common and colloquial name of particular species, or
  - failure to observe the catch of all rare species.
- The port samplers are directed to sample stringers with rare species first, thus, the BP data may be more accurate for the rarer species than the catch records, particularly on vessels with many anglers.
- No changes in the response variables were apparent near years when major changes in regulations were implemented (e.g., 1992).

Discussion - Overview

- In the absence of some independent source of validation, it is generally not possible to determine whether self-reported data that are consistent with others in the dataset are accurate.

- Our approach relied on outlier analysis to identify instances of potential misreporting, followed by detailed investigation of identified records to determine whether a plausible explanation existed or misreporting was likely.



Discussion - Overview

- A primary assumption of this approach is that, if misreporting were prevalent, it was not done in collusion with others to misreport all in the same fashion.

- Similarly, it is unlikely that gross misreporting (collusion by many involved) could have gone undetected by port samplers and SRHS personnel.

- Even though some misreporting could remain undetected by outlier analysis, it is likely to have negligible effects on resulting data products (e.g., abundance indices), because misreported data would be similar to average self-reported data.

Recommendations

Programmatic :

- Continue to evaluate and improve QA/QC procedures for SRHS data. Current QA/QC procedures (particularly those implemented with electronic reporting) are extensive but should be regularly evaluated and strengthened where possible.
- Consider re-estimating landings when dictated by the extent and magnitude of error corrections.
- Employ a systematic, consistent method to link catch records (CRs) to bioprofiles (BPs). Implementing a time stamp from the electronic measuring boards to the BPs is already underway.
- Digitize Headboat Activity Records (HARs, historical documents that contain information about trip type and effort) and make them available for analysis. (Already underway)
- Use HARs to create a single unique identifier that identifies individual headboat trips throughout the historical years of the database in a way that is consistent with modern trip identifiers.

Recommendations cont'd.

- Consider species identification issues, particularly in south Florida, when creating correction factors (k factors) for landings estimation.
- The SRHS program should maintain a living document describing all details of the program procedures and changes in those procedures over time. (Already underway as a result of this evaluation)
- Provide a categorical grouping of the vessels by type (# of anglers, location of fishing, etc.) to facilitate evaluation of whether the vessels are representative of the headboat fishery. In the analyses described in this report, some vessels were flagged that seemed to operate more like a charterboat (e.g., carried a small number of anglers.
- Increase (or continue) efforts to verify data through observer programs and/or whole-haul sampling dockside.

Recommendations – utilizing CRs

- Examine the cause of the 161 extreme outliers and correct if possible or remove from the database.
- Consider using a minimum cutoff of number of trips made by a vessel for inclusion in a species-specific index of abundance.
- Identify and filter vessels or trips that fall outside the range of those relevant for analyses of interest.

SRHS Data Evaluation - Review TORs

1. *Evaluate the appropriateness of the methods used to achieve the objectives in the report. If you have suggestions for other methods that might be useful for future analyses of this type, please include them in your evaluation.*

2. *Evaluate the completeness, accuracy, and presentation of the results from the analyses in the report.*

3. *Determine if the conclusions are scientifically supported by the methods and results in the report. Does the report achieve its stated objectives?*

SRHS Data Evaluation - Reviewers

List of outside (non-Beaufort Lab) reviewers

- 2 from Woods Hole, MA, NEFSC, Population Dynamics Division
- 2 from Silver Spring, MD, Marine Recreational Information Program (MRIP)
- 1 from Miami, FL, SEFSC, Fisheries Statistics Division

SRHS Data Evaluation - Review Comments

1. Evaluate the appropriateness of the methods used to achieve the objectives in the report.

Comments:

- The analytical methods appear to be (very) appropriate.
- The methods and statistical approaches appear to be sound.
- The analyses are better suited for identifying erroneous observation rather than systematic bias.
- The outlier detection criterion seems quite conservative.
- Potential issues with effort data are not considered.

Suggestions:

- Consider a transformation of the catch data.
- Consider less conservative approaches to identifying outliers.
- Consider time series analysis techniques to detect changes.

SRHS Data Evaluation - Review Comments

2. Evaluate the completeness, accuracy, and presentation of the results from the analyses in the report.

Comments:

- The results from the analyses described appear to be complete, and they are presented clearly with appropriate measures.
- The review of the SRHS program and procedures was a sensible approach.
- Potential errors need to be considered for their effects on both bias and precision. The potential for widespread falsification (bias) may be greater in recent years.
- Potential outliers (beyond the 161 identified) need to be further explored.

Suggestions:

- Use robust statistics, such as trimmed means, to eliminate extreme data before calculating the means for outlier detection.
- Did the interval time between fishing trips and report submission change over time?

SRHS Data Evaluation - Review Comments

3. Determine if the conclusions are scientifically supported by the methods and results in the report.

Comments:

- The conclusions stated in the report are strongly supported by the results.
- The report has succeeded in achieving its stated objectives.
- The conclusions of the report are supported by the results of the analyses.

Suggestions:

- The available tools are suitable for identifying outliers, they are less suitable for identifying false reports when the reporter patterns the false report around current average conditions.

Questions?