Overview of calibration analyses of traditional MRFSS charterboat landings and effort estimates with For Hire Survey estimates for the Atlantic and Gulf of Mexico

by

Vivian M. Matter[1], Stephen C. Turner[1], Guillermo A. Diaz[2], and Tom Sminkey[3]

National Marine Fisheries Service

[1]Southeast Fisheries Science Center
Fisheries Statistics Division
75 Virginia Beach Dr.
Miami, FL 33135

[2] Southeast Fisheries Science Center
Fisheries Statistics Division
1315 East-West Highway
Silver Spring, MD 20910

[3]Office of Science and Technology
1315 East-West Highway
Silver Spring, MD 20910

March 2012

INTRODUCTION

The Office of Science and Technology of the National Marine Fisheries Service (NMFS) has conducted surveys of recreational fishing along the U.S. Atlantic coast since the 1970s. Starting in 1981, the Marine Recreational Fisheries Statistics Survey (MRFSS) estimated angler catch and effort for all recreational fishing modes. The traditional MRFSS design was based on an intercept survey of anglers to estimate catch rates and a telephone survey of coastal households to estimate angler effort. It was recognized that the telephone survey provided low sample sizes for estimation of effort (number of angler trips) in the for-hire (charter and headboat vessel) sector. To address this problem, an alternative effort estimation survey design (the For Hire Survey, FHS), was tested starting in the mid 1990s. After pilot programs were implemented in different years in different areas, the For Hire Survey was officially

implemented in a staggered manner from Louisiana to Maine. The estimates of effort differed between the MRFSS and the For Hire Survey.

To develop a consistent time series of catch and effort estimates for use in stock assessments and for management purposes, the NMFS Southeast Fisheries Science Center and the Office of Science and Technology developed statistical techniques for calibrating the MRFSS estimates of charter boat catch and effort to levels consistent with those estimated by the For Hire Survey.

In 1986, the Southeast Regional Headboat Survey (SRHS) assumed responsibility for the estimation of headboat catch and effort throughout the southeast. Prior to 1986, the MRFSS was used to estimate charter and headboat catch and effort. From 1981-1985, MRFSS treated charter and headboats as a combined mode which added additional complexity to calibrating the change in the charter boat effort for the South Atlantic and Gulf of Mexico during that period.

METHODS AND RESULTS

GLM approaches were used to determine whether there were significant differences in the ratios of estimated effort from the MRFSS and For Hire Survey. Factors considered in the analyses were wave, state, and in most cases area fished (state waters, federal waters). Wave was found to be a significant factor in all regions and in some cases state and area were also significant. Marginal mean ratios of MRFSS to FHS effort as estimated from the general linear models were then used as calibration factors. Since these factors were based on effort, they can be applied to all species' landings.

Calibration of MRFSS charter estimates to FHS (1986+)
Diaz and Phares (2004) estimated calibration factors for the Gulf of Mexico. In the Gulf of Mexico, the FHS was implemented as the official charterboat mode estimation method in 2000. Two years of pilot data were also available for 1998 and 1999. Calibration factors between the traditional MRFSS charter estimates and the FHS estimates (and their associated standard errors) were estimated using 1998-2003 data and applied to the 1986-1997 traditional MRFSS charter estimates. Data from West Florida were analyzed separately from the other Gulf states (AL, LA, and MS) because area fished was defined differently. Texas is not included in the MRFSS and a separate survey is used for this state. In the Gulf of Mexico, effort ratios showed significant differences among waves and areas fished (Tables 1 and 2).

Sminkey (2008) estimated calibration factors for the South Atlantic. In East Florida, the FHS was implemented as the official charterboat mode estimation method in 2003. For the rest of the South Atlantic states (GA-NC), the FHS was implemented in 2005. One year of pilot data exists for Georgia and north in 2004. Calibration factors between the traditional MRFSS charter estimates and the FHS estimates (and their associated standard errors) were estimated using 2004-2007 data and applied to the 1986-2003 traditional MRFSS charter estimates. For East Florida, the calibration factors were only applied in 1986 to 2002, since the FHS estimates began there in 2003. In the South Atlantic, effort ratios were found to be significantly different among waves and areas fished.. State was also found to be significant; however, South Carolina and Georgia were not found to be significantly different and therefore were pooled. South Atlantic calibration factors were updated in 2011 (Anonymous 2011) to

include additional years of traditional MRFSS and FHS estimates, 2004-2010 (Tales 3, 4, and 5). The resulting calibration factors generally had similar levels and directions as the previous factors.

Calibration of 1981-1985 combined charter-headboat estimates
As previously indicated, effort estimated for the period of 1981-1985 could not be calibrated with the same ratios developed for years 1986+ because during that time period MRFSS treated charterboat and headboat as a single combined mode in both regions. Thus, headboat data from the Southeast Region Headboat Survey (SRHS) was included in the calibration of the estimates from 1981-1985. For the Gulf of Mexico, the calibration analysis for 1981-1985 was based on effort estimates from both surveys (SRHS and MRFSS) under the assumption that angler trips and angler days were equivalent (Diaz and Phares 2004). For the South Atlantic, a species-specific approach using landings estimates from both surveys (SRHS and MRFSS) was developed (Anonymous 2008).

Subsequently, Matter et al. (2012) re-estimated calibration factors for 1981-1985 for the South Atlantic and the Gulf of Mexico. To calibrate the MRFSS combined charterboat and headboat mode effort estimates in 1981-1985, calibration factors were estimated using 1986-1990 effort estimates from both modes in equivalent effort units. The two sets of effort estimates used were: 1) SRHS headboat effort estimates plus the traditional MRFSS charterboat effort estimates, and 2) SRHS headboat effort estimates plus the calibrated (FHS) charterboat estimates. As stated above GLM analyses were used to identify significant effects on effort ratios and to estimate calibration factors. Area fished was not included in the analysis because the SRHS data did not have this variable defined. Some states had to be combined (Georgia and East Florida; Alabama and West Florida) due to the geographic areas defined in the headboat data set. In the Gulf of Mexico, there were significant differences in the effort ratios among states. Summer waves (3 and 4) were not found to be significantly different and therefore were combined. Also the winter waves (1, 2, 5, and 6) were not found to be significantly different from each other either and were combined. In the South Atlantic, wave and state had significant effects on the ratios (Tables 6 and 7).

Calibration of 1981-2003 combined charter-headboat estimates in the Mid-Atlantic
Sminkey estimated calibration factors for the Mid-Atlantic for the SEDAR17 ,(Anonymous 2008). In the Mid-Atlantic, the FHS was implemented as the official charterboat mode estimation method in 2005. One year of pilot data exists for 2004. Prior to this, the traditional MRFSS combined charter and headboat modes into one single mode. Therefore, in order to calibrate the traditional MRFSS charter/headboat estimates back to 1981, FHS estimates of charter and headboat modes needed to be included in the analysis. Calibration factors between the traditional MRFSS charter/headboat estimates and the FHS estimates (and their associated standard errors) were estimated using 2004-2007 data and the GLM approach described above and applied to the 1981-2003 traditional MRFSS charter/headboat estimates. In the Mid-Atlantic, wave and state had significant effects on the ratios (Table 8).

CONSIDERATIONS FOR MRIP-MRFSS CALIBRATION

In addition to the need to calibrate the historical estimates for the changes in intercept survey design and estimation methodology there is a need to calibrate the historical estimates for changes in methods of estimating charter boat effort. If possible it would be desirable to estimate the effects of multiple design and methodological changes simultaneously. If feasible such an approach could provide a model for

future efforts to develop calibration approaches when additional design and/or methodology changes are made.

CITATIONS

Anonymous. 2008. SEDAR 17 Stock Assessment Report. South Atlantic Spanish Mackerel. 95p.

Anonymous. 2011. SEDAR 25 Stock Assessment Report. South Atlantic Black Sea Bass. 163p.

Diaz, Guillermo A. and Patty Phares. 2004. *Estimated conversion factors for calibrating MRFSS charterboat landings and effort estimates for the Gulf of Mexico in 1981-1997 with For Hire Survey estimates with application to red snapper landings.* SEDAR 7-AW-03 11p.

Matter, Vivian M., Nancie Cummings, John Jeffrey Isely, Kenneth Brennan, and Kelly Fitzpatrick. 2012. *Estimated conversion factors for calibrating MRFSS charterboat landings and effort estimates for the South Atlantic and Gulf of Mexico in 1981-1985 with For Hire Survey estimates with application to Spanish mackerel and cobia landings.* SEDAR 28-DW-12.

Sminkey, Tom. 2008. *Estimated conversion factors for calibrating MRFSS charterboat landings and effort estimates from the Southeastern US (North Carolina to Florida-east coast) in 1981-2003 with For-Hire Survey estimates with application to King Mackerel landings.* SEDAR 16-DW-15.

TABLES

Table 1. MRFSS charterboat conversion factors and standard errors (in parentheses).
Apply to 1986 – 1997 charterboat mode in LA, MS, and AL (Diaz and Phares, 2004)

	WAVE					
Area	1	2	3	4	5	6
Inshore	1.26 (1.31)	1.54 (1.27)	3.82 (1.26)	4.67 (1.26)	3.28 (1.27)	1.48 (1.28)
< 3 miles	0.74 (1.37)	0.75 (1.26)	1.49 (1.25)	2.28 (1.24)	0.64 (1.28)	0.52 (1.40)
> 3 miles	0.44 (1.28)	0.63 (1.24)	2.23 (1.23)	1.87 (1.24)	1.26 (1.23)	0.53 (1.28)

Table 2. MRFSS charterboat conversion factors and standard errors (in parentheses).
Apply to 1986- 1997 charterboat mode in west FL (Diaz and Phares, 2004)

	WAVE					
Area	1	2	3	4	5	6
Inshore	3.17 (0.16)	5.31 (0.16)	5.71 (0.16)	5.33 (0.16)	3.49 (0.16)	3.70 (0.16)
< 10 miles	0.95 (0.16)	1.10 (0.16)	1.78 (0.16)	0.70 (0.16)	0.48 (0.16)	0.98 (0.16)
> 10 miles	0.38 (0.16)	0.58 (0.16)	0.77 (0.16)	0.73 (0.16)	0.59 (0.16)	0.55 (0.16)

Table 3. MRFSS charterboat conversion factors and standard errors (in parentheses).
Apply to 1986- 2002 charterboat mode in east FL (Sminkey, 2008)

	Wave					
Area	1	2	3	4	5	6
INSHORE	1.600 (0.65)	2.786 (0.65)	2.201 (0.65)	2.894 (0.65)	1.630 (0.65)	2.386 (0.65)
OCEAN	0.664 (0.10)	0.852 (0.10)	0.828 (0.10)	1.006 (0.10)	0.478 (0.10)	0.549 (0.10)

Table 4. MRFSS charterboat conversion factors and standard errors (in parentheses). Apply to 1986- 2003 charterboat mode in GA and SC (Sminkey, 2008)

	Wave				
Area	2	3	4	5	6
INSHORE	1.635 (0.90)	3.100 (0.90)	2.092 (0.90)	0.931 (0.90)	0.757 (0.90)
OCEAN	0.939 (0.36)	1.272 (0.33)	2.161 (0.32)	0.835 (0.33)	0.638 (0.36)

Table 5. MRFSS charterboat conversion factors and standard errors (in parentheses). Apply to 1986- 2003 charterboat mode in NC (Sminkey, 2008)

	Wave				
Area	2	3	4	5	6
INSHORE	11.850 (3.48)	10.026 (2.63)	6.616(2.84)	3.766 (2.84)	9.415 (3.11)
OCEAN	2.188 (0.58)	2.504 (0.58)	1.565 (0.60)	2.102 (0.60)	0.661 (0.60)

Table 6. MRFSS charterboat conversion factors and standard errors (in parentheses). Apply to 1981- 1985 charterboat/headboat mode in the South Atlantic (Matter et al., 2012)

	WAVE					
STATE	1	2	3	4	5	6
NC	-	2.151 (0.12)	2.294 (0.12)	1.444 (0.12)	1.763 (0.12)	0.857 (0.12)
SC	-	1.035 (0.04)	1.085 (0.04)	1.437 (0.04)	0.891 (0.04)	0.750 (0.04)
GFE	0.845 (0.02)	0.951 (0.02)	0.985 (0.02)	1.016 (0.02)	0.811 (0.02)	0.696 (0.02)

Table 7. MRFSS charterboat conversion factors and standard errors (in parentheses).

Apply to 1981- 1985 charterboat/headboat mode in the Gulf of Mexico (Matter et al., 2012). FW is west FL.

	WAVE					
STATE	1	2	3	4	5	6
AL / FW	0.883 (0.03)	0.883 (0.03)	1.104 (0.05)	1.104 (0.05)	0.883 (0.03)	0.883 (0.03)
MS	1.155 (0.11)	1.155 (0.11)	2.245 (0.11)	2.245 (0.11)	1.155 (0.11)	1.155 (0.11)
LA	0.962 (0.09)	0.962 (0.09)	2.260 (0.13)	2.260 (0.13)	0.962 (0.09)	0.962 (0.09)

Table 8. MRFSS charterboat conversion factors and standard errors (in parentheses).

Apply to 1981-2003 charterboat mode in the Mid-Atlantic (Anonymous, 2008).
*originally only said to apply to 1986-2003 data, but the cbt/hbt combined mode in the Mid-Atlantic was consistent from 1981-2003 and there is no SRHS data providing headboat estimates in this sub-region.

	Wave				
State	2	3	4	5	6
DE / MD	1.294 (0.52)	1.599 (0.54)	1.930 (0.54)	0.861 (0.52)	1.171 (0.56)
NJ	1.289 (0.36)	1.179 (0.34)	1.644 (0.34)	0.809 (0.34)	1.115 (0.36)
NY	1.187 (0.48)	2.048 (0.54)	2.665 (0.48)	1.210 (0.51)	0.617 (0.48)
VA	0.770 (0.25)	0.680 (0.21)	0.761 (0.21)	0.324 (0.22)	0.313 (0.22)