SEDAR 17-DW09

Development of Conversion Factors for Different Trap Types used by MARMAP since 1978.

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II. Abstract

A brief (one paragraph) description of the Final Report.

III. Executive Summary

A brief and succinct summary of Final Report.

IV. Purpose

A. Description of Problem:

The Marine Resource Monitoring, Prediction and Assessment program (MARMAP) is a fishery-independent sampling program based at the South Carolina Department of Natural Resources, and funded by NOAA Fisheries. Although MARMAP has sampled the reef fish habitat off the southeastern US since 1978, sampling strategies have changed over time. From 1978 to 1987, twelve study sites, including eight large areas of live bottom from Onslow Bay, NC, to Fernandina Beach, FL, in approximately 20 fathoms were identified using underwater television and sampled each year. Four

additional shelf break areas (approximately 30 fathoms) located off South Carolina were sampled each year using only Florida traps. Other areas were sampled as time and weather conditions allowed (see Collins and Sedberry 1991). Traps were baited, buoyed and deployed from the research vessel. Soak times varied from one to four hours, when the traps were retrieved. In 1988 and 1989, a chevron trap was added to the gear used to sample reef fishes. During this period, the research vessel was anchored over a known live bottom area that was verified using underwater television. One of each of the three trap types was deployed either from the bow, stern or midships of the research vessel (see Collins 1990). Based on the data collected in 1988 and 1989, the use of blackfish and Florida traps was discontinued in 1990, as the chevron traps sampled a greater species diversity and a greater size range of each species (Collins 1990). Since 1990, chevron traps have been the only trap type utilized by MARMAP for generating an index of abundance.

Conversion factors were developed using the data collected during 1988 and 1989 to allow the catch per unit effort (CPUE) of the chevron traps to be compared directly to the CPUE of blackfish and Florida traps. However, during the recent stock assessments of red porgy, vermilion snapper and black sea bass, the SEDAR workgroup decided these conversion factors were not valid due to the different protocol used during 1988/89 when all gears were fished synoptically (SEDAR 2002). This meant the fishery-independent indices of abundance had to separated temporally and by gear for incorporation into the stock assessments. As a result, instead of a single index covering almost the entire period of the southeastern US hook and line fishery, three indices were used –blackfish traps from 1978-87, Florida traps from 1983-87, and Chevron traps from 1990-present.

Currently, the only index usable for stock assessments that covers the entire period is the headboat index, a fishery-dependent index.

The purpose of the proposed research is to synoptically fish the three trap types used by MARMAP since 1978 in the manner they were fished during standard research cruises, and in the same locations. We will therefore be able to directly correlate the catches of the three trap types, and develop conversion factors that will allow the conversion of historic blackfish and Florida trap catches to 'predicted chevron' trap catches. The fishery independent index of abundance will then be a single index from 1978-present with a two-year break for 1988-89, greatly facilitating stock assessment procedures, and providing an easier to interpret comparison between the headboat index and the fishery-independent index.

B. Objectives of the project:

The goal of the proposed research is to develop conversion factors that will allow a single fishery-independent abundance index to be used for all trap types employed by MARMAP since 1978 off the southeastern US coast. To achieve this goal we will meet the following objectives:

1. Synoptically deploy the three trap types (Florida, blackfish, and chevron) from the R/V Palmetto.

2. Collect data for all species landed by each gear type (total weight by species and individual lengths).

3. Develop conversion factors for blackfish and Florida traps based on their catches and catch per unit effort relative to the chevron traps, and compare predicted catches to observed catches.

4. Provide these conversion factors, and converted catch per unit effort in a timely fashion to NOAA Fisheries, and the South Atlantic Fishery Management Council

V. Approach

A.

Field Sampling:

Eight inshore (inner shelf) and four shelf edge study areas sampled as index stations by MARMAP during 1981 through 1989 were identified from previous cruise reports for sampling during this study. Two 5-day research cruises were scheduled on the *R/V Palmetto* during the normal MARMAP summer sampling season (May – September) for each of the three years of the study period. Traps could be set as many times as four trap sets per day, with each trap set comprising six traps. As one day is typically used to steam to and from port, sampling was anticipated to occur for four days each cruise, allowing up to 16 trap sets to be made each cruise, for a maximum of 526 traps set.

At the eight inshore sites, each trap set consisted of two chevron traps, four blackfish traps (two traps per flag, tethered by a 100 ft line) and two Florida traps. Traps were deployed in a random order. At the shelf break stations, each trap set consisted of three chevron and three Florida traps set randomly. All traps were baited with cut clupeids in a manner consistent with that used historically and deployed at randomly selected reef stations within the sample sites (Figure XX). Traps were brommeled to an appropriate length of poly warp and buoyed to the surface with a polyball buoy and a trailing Hi-Flyer and soaked for approximately 90 minutes. After each trap set, depth, salinity, and temperature were measured with a CTD. On retrieval, all fish captured were

sorted to species, total weight for each species was recorded, and individual lengths measured for all specimens sampled from all gear types.

Conversion factor development

Conversion factors were developed on a species-specific basis by:

1. Dividing the mean CPUE of Florida and blackfish traps by the mean CPUE for the chevron traps fished for that particular trap set. CPUE was expressed as the number of fish sampled per trap per hour.

2. Dividing the total number of specimens captured by each trap type by the total number captured by chevron traps.

3. Stratifying the areas sampled into shelf and shelf break zones, calculating conversion factors as for 1 and 2 for each zone, and calculating the mean conversion factor from the zone specific conversion factors.

Mean CPUE was calculated for each year by species as:

$$Mean\ CPUE\ (no.\ fish\ per\ trap\text{-}hr.) = \frac{\sum \frac{no.\ fish\ caught}{soak\ time\ (hr.)}}{no.\ valid\ samples}$$

Differences in CPUE and mean length among years were tested using the SAS General Linear Model Procedure (SAS 1990). Differences were considered significant when $p < 0.05$. The calculated conversion factors were used to predict an estimated chevron trap CPUE for Florida and blackfish traps, which were then be compared to the actual chevron trap CPUE. Newly calculated conversion factors were also compared to those developed by Collins (1990). The conversion factor most closely correlated to the actual chevron trap catches will be identified.

B. Project management:

The project was managed by the Principal Investigator, Patrick J. Harris, who was responsible for the project design, cruise scheduling, and data management and analyses.

VI. Findings

A. Results

A total of XX research cruises were conducted aboard the *R/V Palmetto* during the normal MARMAP summer sampling season (May – September). Owing to conflicting schedules and vessel breakdowns, three cruises were conducted in late April or early October. Up to four trap sets were made per day. Over the four years of the study, 323 traps were set, which was only achieved 56% of the estimated maximum number of traps that could have theoretically been set (Table XX). This was primarily due to the use of the first and last day of each cruise for steaming, instead of the one day (two half days) as estimated in the proposal. Nonetheless, we feel the data collected provide a viable conversion factor for several species.

Over the four years of the study, blackfish traps were set 109 times, Florida traps 103 times, and chevron traps 111 times (Table XX). There were no significant differences in soak time by gear type within each year or over the duration of the study ($p>0.05$). Chevron traps caught the greatest species diversity (28 species) followed by Florida traps (26 species) and blackfish traps (19 species) (Table XX). Fourteen species were captured in all three gear types, seven species were captured only in chevron traps, four in Florida traps, and four in blackfish traps (Table XX). Most economically

important species were captured in all gear types, except for snowy grouper which was only captured in one blackfish trap.

The number of specimens of each species captured in each gear type and the conversion factors based solely on numbers of fish of each species captured are shown in Table XX. Conversion factors were only developed for eleven economically and/or ecologically important species for which sufficient specimens were captured in chevron traps and at least one of the other gear types, or those species routinely captured during MARMAP sampling. Similarly, the mean CPUE s and conversion factors based thereon are shown in Table XX. Chevron traps caught numerically more of all these important species than either of the other two gear types, although the CPUEs for vermilion snapper and tomtate were higher for Florida traps (Table XX). This resulted in conversion factors that 'changed direction' for these two species.

Conversion factors were then used to calculate an estimated chevron trap catch for all years combined, and each year separately. For the conversion of the number of fish caught, the number of specimens captured by each gear type was multiplied by the conversion factor prior to the calculation of CPUE. For the conversion of the CPUE, the CPUE was simply multiplied by the conversion factor for the CPUE for that species and gear. Estimated chevron trap catches for the two different methods were simply compared by considering the sums of squares of the difference of the predicted chevron trap catch and the observed chevron trap catch. Chevron trap catches were estimated from blackfish and Florida trap catches for the eleven economically and ecologically relevant species for all years combined, and for each year separately. These results are presented in Table xx, however, based on the intended usage of these conversion factors

to generate annual estimated chevron trap catches for incorporation into stock assessments, only the results of the annual calculations are discussed in detail.

Blackfish traps:

Florida traps:

The Florida trap CPUE conversion factor tended to provide a better estimate of the chevron trap catch, although the difference was slight for several species (Table XX). The chevron trap catch of tomtate was best estimated by the number conversion factor, where it better estimated the chevron trap catch for three of the four study years. For several other species, there was a 50/50 split as to which conversion factor generated the best estimate of the chevron trap catch (sand perch, pinfish, red porgy and scup), while the remaining were best estimated by the CPUE conversion factor (Table XX). These results were confounded somewhat by the relatively high occurrence of zero catches for some species such as vermilion snapper and bank sea bass (Table XX).

The difference in the estimated chevron CPUE derived from either conversion factor is relatively low, suggesting either conversion factor could be used to estimate chevron trap catches.

B. If significant problems development which resulted in less than satisfactory or negative results, they should be discussed.

C. Description of need, if any, for additional work.

VII. Evaluation

A. Describe the extent to which the project goals and objectives were attained. This description should address the following:

1. Were the goals and objectives attained? How? If not, why?

2. Were modifications made to the goals and objectives? If so, explain.

B. Dissemination of Project results:

Explain, in detail, how the projects results have been, and will be, disseminated.