Opportunities and Challenges Associated with VMS Data Use in the Snapper-Grouper Fishery: Preliminary Observations from a Pilot Study

Scott Baker, NC Sea Grant Program, bakers@uncw.edu. February, 2013. *Note - Below are some of my preliminary observations from an ongoing research project. A presentation of work to date will be made to the SAFMC Snapper-Grouper Advisory Panel at their meeting in April.

Background

The SAFMC is considering Vessel Monitoring Systems (VMS) for use in the commercial snapper-grouper fishery. Research in some fisheries has shown that VMS data can be capable of independently tracking fishing effort. Unfortunately, no VMS data exists for the snapper-grouper fishery, which makes it difficult to fully consider its potential utility as a management tool.

Methods

In 2010, a NOAA funded cooperative research study led by Sea Grant personnel in cooperation with fishermen evaluated electronic monitoring (EM) systems on 7 fishing vessels equipped with electric bandit reels. In addition to video, the EM systems collected similar data to that of VMS systems (lat, long, heading, speed, date and time) but at a much higher frequency of 360 "pings" per hour. That study resulted in a small dataset of 5 trips on 4 unique vessels that contained both EM data and detailed accounts of all fishing activity recorded by an at-sea observer. By systematically removing a portion of the EM record and keeping only data for 1 ping per hour, we can simulate a complete series of VMS records for each trip. For this discussion, "fishing" is defined as the period of time in which hooks were either actively being deployed, retrieved or in the water. From a practical standpoint, all other activities (e.g., anchoring, positioning the vessel over bottom fishing locations, etc.) were not considered fishing.

Descriptions of trips with both EM and an observer onboard

An observer and an EM system were onboard 4 different vessels for a total of 5 trips (26 sea days) from June to September 2010. Trips occurred off NC, SC and GA. For this study, it was not logistically possible to sample off of FL. Mean trip length and hours fished was 5.1 days and 50.2 hours. All fishing activity (487 sets) was documented. On average, 15.9 sets, each lasting ~ 0.5 hours, were fished each day. The range of sets fished and hours fished per set was considerable. Most fishing occurred between sunrise and sunset. The observer indicated that approximately 28% and 72% of each trip was spent fishing and not-fishing, respectively. Total catch in this dataset was similar to total catch reported by all vessels fishing in this region in 2010.

My preliminary observations from this dataset:

1. It appears likely that a large number of VMS records can be classified as "fishing" or "not-fishing" based on the use of simple data filters, particularly vessel speed and time of day. In order for VMS data to most useful for management, it would be beneficial to retain all VMS records associated with fishing activity and filter out all VMS records associated with non-fishing activity. Most fishing activity occurred at vessel speeds ≤ 0.4 knots. However, more than half of non-fishing activity also occurred during this speed range. No fishing activity occurred in the late evening or early morning; therefore, all VMS records collected during this time interval were removed. For the fishery, or at least the region of this study (NC – GA), it would be important to determine how prevalent night fishing is among "most" vessels and under what circumstances night fishing occurs as the "time of day" filter appears effective for this fishery. Time and speed filters in combination retained 95% of fishing activity and eliminated 77% of non-fishing activity. Work is ongoing.

2. VMS records *classified as fishing* (see above) appear to have a positive linear relationship with fisherman-reported logbook effort. Effort reported in logbooks is not validated and VMS may serve as a management tool to perform this task. The relationship appears better for the logbook category "days away" than for "total hours fished." Additional trips with EM (VMS) data will be analyzed.

3. It appears that a more frequent ping rate (multiple pings per hour) will be required in this fishery if the objective is to capture 100% of fishing locations in the VMS record on a given trip. On average, it appears that a 1 hour VMS ping rate will capture only ~40% of unique sets documented by the observer. VMS systems can be configured to ping at different intervals, with 1 ping per hour being common. Generally, more frequent ping rates translate to higher VMS operating costs.

4. It appears very likely that VMS data, once filtered to approximate fishing effort, could be used to enhance effort data reported by fishermen in NMFS logbooks. We are currently analyzing the spatial distribution of fishing effort (active "fishing" only) for all 93 trips (500+ days) involved in the aforementioned EM study and will be comparing this to the logbook accounts of primary grids fished. We are currently looking at plotting the fishing effort on the existing NMFS statistical grids (1 degree x 1 degree) as well as onto 1/4 or 1/16 NMFS sub-grids. Any other suggestions?

5. Although the VMS systems can transmit data is real-time, less expensive and more configurable electronic logbooks (ELBs) should be able to provide equivalent data for this fishery. For this fishery, it appears likely that an ELB, like the one developed by LGL Associates and used for the past several years in the Gulf of Mexico penaeid shrimp fishery, can produce equivalent data as that of VMS units. (*see* Gallaway et. al. 2003. Description of a simple electronic logbook designed to measure effort in the Gulf of Mexico Shrimp Fishery. *North American Journal of Fisheries Management*. Vol. 23. Pp 581-589). While the primary advantage of VMS is real-time data transmission, the advantages of the ELB are lower overall costs, the ability to increase the standard ping rate without increasing the cost of data collection and assumed decreased power usage.