

All of these phase-out formulas were rejected in favor of the restrictions that were approved. The approved measures allow foreign fishing a "reasonable opportunity" to fish for tuna, while ensuring that the swordfish bycatch does not exceed recent levels (1982).

Charge foreign fishing compensatory damages for their swordfish bycatch. 1983 amendments to the PMP for Atlantic Billfish and Sharks considered charging foreign fishing compensatory damages for killing billfish and swordfish. The amounts considered presumably compensated the U.S. an amount equal to the economic value of the fish killed. This was not implemented. There was controversy over the appropriate economic value for assessing damages.

Now with reduced foreign longlining it is clear that for swordfish, compensation for lost fish did not capture the real cost of lost fishing opportunities. Foreign tuna longliners with a bycatch of swordfish had continually displaced domestic swordfish longliners from the better sword-fishing locations.

12.0 MONITORING

12.1 Data Requirements for the Variable Season Closure

Data will be collected from a sample of commercial fishing boats. Other data may be collected to test the applicability of other stock assessment techniques. Changes in mandatory reporting requirements can be by regulatory amendment.

Landings data will continue to be collected through already established voluntary reporting channels except for mandatory reporting in the Caribbean. If more accurate landings data are required then mandatory reporting of landings in all areas may be required.

12.2 Important Deadlines Specified by the FMP

Data that drive the closures must be evaluated annually and closures determined before they are expected to begin. Enough time must be provided to offer the option of expanding closures backwards as well as forward in the calendar year. It is anticipated that the following timetable will provide sufficient time with closures starting anytime in the last quarter of the year. If closure dates change then this timetable can be adjusted accordingly.

- DATA YEAR: January 1 - December 31 (Calendar Year)
- February 1 - Previous year's landings and size frequency data given to the working panel.
- March 15 - Working panel report provided to each committee chairman and Council including the updated VSC calendar.
- April 15 - Each Council submits the number of days to be closed in conformance with the updated VSC calendar to the Regional Director.
- May 1- Secretary implements closures for the year.

12.3 Research Needs

Research needs are classified as short, intermediate, and long term according to how long it will likely take to produce results that could change the plan.

Short-term research. Most short-term research could result in prompt changes in the plan by regulatory amendment. Examples include minimum size limits, specific gear restrictions, and modification of the data collection program.

The highest priority is to determine if altering fishing practices (gear, time, location) can reduce the catch of small fish or improve the survivability of released fish. The intent of this research is to evaluate a minimum size limit or gear restrictions that could augment or substitute for the VSC. It is anticipated that these investigations can be done in conjunction with the onboard technician data collection program designed to collect biological data.

Another high priority short-term research topic is the analysis of longline and net bycatch data to determine strategies to minimize any undesirable bycatch. Billfish bycatch will be an important future consideration for the swordfish plan (requiring plan amendment) or the billfish plan. It is anticipated that these investigations can also be done in conjunction with the onboard technician data collection program.

An equally important short-term research topic is to find ways to minimize or eliminate the need for onboard technicians and still accomplish the foregoing research as well as collect the necessary

biological data for age and growth analyses that is the basic task of the technician program. The onboard technician program is costly and places a burden on vessels selected to participate. Currently there is no alternative to collecting the basic biological data as well as evaluating fishing selectivity by size, release survival, and bycatch information.

The final short-term research topic is to evaluate the effect of speed of haul-back on number of swordfish retained on a longline versus the number torn off in the foreign fishery.

Intermediate term research. Critically evaluate alternative stock assessment methods. Priority should be given to assessment methods that can produce quantitative estimates of the potential benefits of viable management strategies. The existing yield-per-recruit models on swordfish suggest that there is potentially more to be gained by selectively controlling fishing mortality on small fish than controlling mortality on all sizes. These models also imply that there would be advantages to selectively controlling fishing mortality by sex. There is no current management strategy that can selectively avoid the harvest of small fish or harvest by sex. However, stock assessment methods should be designed to address the potential effects of controlling fishing mortality by size or sex because these are still important management considerations that may become viable with more information. Results of this research could be incorporated into the plan by regulatory or plan amendment.

Long-term research. The most important long-term research is on stock structure which includes migratory patterns. A basic underlying assumption of the plan is that there is only one stock in the management unit (Northwest Atlantic). If there is more than one stock in the management unit, it may not alter the likelihood of the VSC or other measures to produce benefits from delaying the harvest of small fish, but it could alter the distribution of those benefits. If there is substantial migration outside the management unit, then some of the benefits of larger fish may accrue to other countries. Knowledge of stock structure is important for stock assessment. The onboard technician program does provide the opportunity to tag a large number of swordfish (also sharks and billfish) in a relatively short period of time. This would be very useful for determining stock structure.