

While it is extremely difficult to determine the actual value of catching a billfish to a recreational fisherman, it is clear that their recreational value far exceeds their commercial value. At \$1.00 per pound, the average white marlin is worth less than \$50 commercially. Regardless of how one calculates the recreational value of that same fish, its value will be many times higher than this (based on 1981 dollars and 1979 data, the compensation value cited in the PMP was \$500).

8.0 CAPACITY DESCRIPTORS

8.1 Optimum Yield (OY)

8.1.1 Specification of Optimum Yield

Optimum yield for billfishes is the greatest number of billfish that can be caught by the recreational fishery in the EEZ, consistent with the provisions of this fishery management plan, considering the biological limitations of the stock and the unavoidable incidental catches in other fisheries.

Optimum yield in this fishery cannot be quantified. The optimum yield is the greatest number of billfish that the recreational fishery can catch at the maximum population level that can be established. Even then, the term "yield" is inappropriate because the maximum benefits to society from this fishery are derived from the experience of catching a billfish, not from their harvest. The present population levels are unknown, the present level of catch is not known, the stock size is unknown, the stock structure is not known, and the maximum potential population size is not known. Thus it is impossible to define a numerical OY.

8.1.2 Economic, Social and Ecological Considerations

The billfish fishery is essentially unique among U.S. fisheries in that the recreational experience is the basis of the value, not the food value or a combination of food and recreational value as would be the case in more typical fisheries. In fact a large proportion of the anglers seem to enhance the value of the recreational experience by releasing rather than retaining their catches. Therefore OY actually would be more meaningfully expressed in terms of high population density of fish rather than in the more conventional terms of yield from the stocks. It is the intent of this FMP to encourage the release of the maximum number of billfishes so that the population density is maintained at the highest possible level. It is the intent of the FMP to minimize the harvest, thereby maximizing population density while still allowing traditional, competitive fishing tournaments to be held.

The higher the availability of billfishes within the EEZ, the greater the likelihood that U.S. anglers will catch a billfish. Any increase in the likelihood of success should have a substantial, positive impact on the socio-economic values of the fishery. Thus, the optimum yield will result from reserving to the U.S. recreational fishery the most billfish possible occurring in the EEZ at any given time.

The U.S. fishery for billfish has been historically and is currently almost entirely recreational. There is no directed U.S. commercial fishery for billfish. However, in the Caribbean Islands billfish taken by the recreational fishery and occasionally by the small-scale, handline fishery are often used as food, although many fish are tagged and released as well.

The recreational billfish fishery plays a significant role in the economic and social well being of a great many people. The fishery was estimated in 1978 to provide more than one million days of recreation for approximately 66,000 people and generate direct expenditures of approximately \$100 million, approximately \$1,300 per fish caught or \$22 per pound. It was estimated that in 1983 in the Mid-Atlantic region alone, over \$40 million was spent in the recreational billfish/tuna fishery. By comparison, in 1986 there were 204,215 pounds of marlin worth \$134,716 sold commercially. The commercial (food) value of the fish is clearly minute compared to these values. In Puerto Rico, the ex-vessel value of blue marlin, the billfish most commonly entering commercial markets, presently is approximately \$1.50 per pound. Smoked marlin retails for about \$8.00-10.00 per pound, but the yield is quite small relative to total weight.

From these social and economic considerations, it is concluded that the greatest overall benefit to the nation will result from reserving billfishes for the recreational fishery. A commercial fishery for billfishes in the EEZ would compete with the recreational fishery, a fishery which yields far greater benefits, depends on a high availability of fish, and has the capacity and intent to make use of all billfishes that can be expected to be available in the EEZ.

Catching a billfish is an uncommon or "rare event" in the terminology of survey statisticians. In other words, the time spent actually fishing for a billfish is disproportionately large compared to the number of fish caught. It takes approximately 10-30 boat days to catch a blue marlin, 10-20 boat days to catch a white marlin, and 5-6 boat days to catch a sailfish. The level of stock abundance required to maintain current catch rates is significantly higher than the level of the current catch. In the northern Gulf of Mexico in 1986, only 74 percent of the billfish raised (i.e., attracted to the bait) were hooked and only 46 percent were boated.

The billfish stocks being dealt with occur throughout the North Atlantic and possibly throughout the entire Atlantic. The harvest from these stocks occurs in international waters and within the fishing zones (economic zones, etc.) of several countries by fishermen who are beyond the control of this plan. Indeed, U.S. fishermen account for less than one fourth of the removals from the marlin stocks. MSY is a function of the total range of each stock and thus must take into account all fishing. Therefore, in arriving at optimum yield for the billfish fishery, MSY cannot be viewed in the same light that it would have been if the entire stock had been within the jurisdiction of the plan.

Social and economic factors lead to focusing on high availability to the fishery or high population density, rather than on fish removed from the water. The greatest benefit to the U.S. will result from increasing the availability of fish to recreational anglers to the extent possible in

view of the inadvertent mortality in other fisheries and the harvest extracted by other users of the stocks who fish outside of U.S. jurisdiction.

8.1.3 Alternatives Considered

The following alternative strategies for determining the optimum yield for the U.S. billfish fishery were considered.

- A. OY is that quantity of fish that will provide for a high quality recreational fishery. High quality is related to a reasonably high catch rate (presumably higher than that which currently exists in the fishery) and to a reasonable expectation of catching a trophy size fish.

This alternative has the advantage of stressing the fact that the major value of this fishery lies in the high quality recreation experienced by the participants. However, inability to describe and quantify an appropriate level of quality led to setting aside this concept. Objective criteria could not be established which would allow measurement of degree of quality of the fishery.

- B. OY is that quantity of fish which will provide for a high participation rate in the recreational fishery.

This option focuses on a combination of the esthetic benefits accruing to the participants and the economic benefits accruing to the recreational fishing industry and to the various associated industries. As with the first option, lack of quantitative criteria for determining an appropriate level of participation led to setting aside this option. Additionally, it was recognized that in seeking an appropriate trade-off between participation rate and quality of fishing, managers can only prevent participation from exceeding a certain level. They cannot force participation up to a stipulated level.

- C. OY is equal to 4,945 blue marlin, 14,458 white marlin, and 60,042 sailfish/spearfish. This is the estimated catch in 1977-78 for sailfish/spearfish and 20 percent reductions from recent catches for the marlins in the EEZ. It includes releases by both foreign longlines and U.S. recreational fishermen.

Statement of OY as some target number of fish to be caught is not realistic at this time because the data base is extremely weak. In addition, since the objective of the FMP is to maximize the population available to the recreational fishery, and since we do not know if these are the maximum levels that can be made available, the numerical OY's are inappropriate. Further, these are estimated catches, not yields. Many of these fish are released, at least some of which are recaptured.

In the absence of a numeric OY, foreign bycatch is controlled by maintaining the measures already implemented and/or approved in the PMP and by prohibiting imports. Domestic catch (kill) is controlled by prohibiting commercial possession and sale, and by size limits for recreational possession.

Of additional concern regarding a numeric statement of OY is the unknown relationship between number of fish caught and the overall value to the nation of the fishery. The basis of the value is the recreational experience, not the fish itself. Many anglers seem to enhance the value of their recreation by releasing their catches of billfish.

To the extent that these fish can be caught again, or that they perpetuate the population, the value of the fishery is enhanced. There is, however, no firm basis for quantifying the extent of such "recycling." Thus it is uncertain whether released fish should be included in a numeric OY or excluded from it. Because of these weaknesses in the information base, the Councils decided against a numeric OY at this time but might quantitatively designate it at some future time if the questions can be resolved.

8.1.4 Future MSYs and Optimum Yields

Although MSY values are based on the best available data, they are believed to be uncertain at best. The critical information necessary to refine these estimates is lacking and is not expected to be available in the immediate future. A numerical OY cannot be calculated at least until MSY values are available. Until then, a qualitative OY statement must suffice.

8.2 Expected Domestic Annual Harvest (DAH)

The expected domestic annual harvest cannot be accurately estimated because of uncertainties in the data base. However, one estimate of DAH is the estimated U.S. landings submitted by NMFS to ICCAT for 1985 which was 188 mt of blue marlin, 143 mt of white marlin, and 308 mt of sailfish. In 1983, it was estimated that the recreational fishery caught 2,347 blue marlin of which 834 (35.5 percent) were released, and 7,761 white marlin of which 4,519 (58.2 percent) were released. Catches have probably increased since then.

Following implementation of the measures proposed in this FMP, recreational landings are expected to decrease by 50 percent for blue and white marlin and 30 percent for sailfish (see Section 9.2 for a discussion of the derivation of these values).

8.3 Total Allowable Level of Foreign Fishing (TALFF)

There are no billfishes in the EEZ in excess of the quantity needed to support the domestic fishery. Consequently no TALFF will be declared. As is pointed out in Section 8.1.2, the quality of the domestic fishery is dependent upon the density of the fish population. Therefore, the U.S. will realize the greatest overall benefits by reserving for domestic use the billfishes which occur in the EEZ.

Most billfish are taken for recreational purposes and there is very little processing involved. Thus, processing capacity is not a factor in determining TALFF.