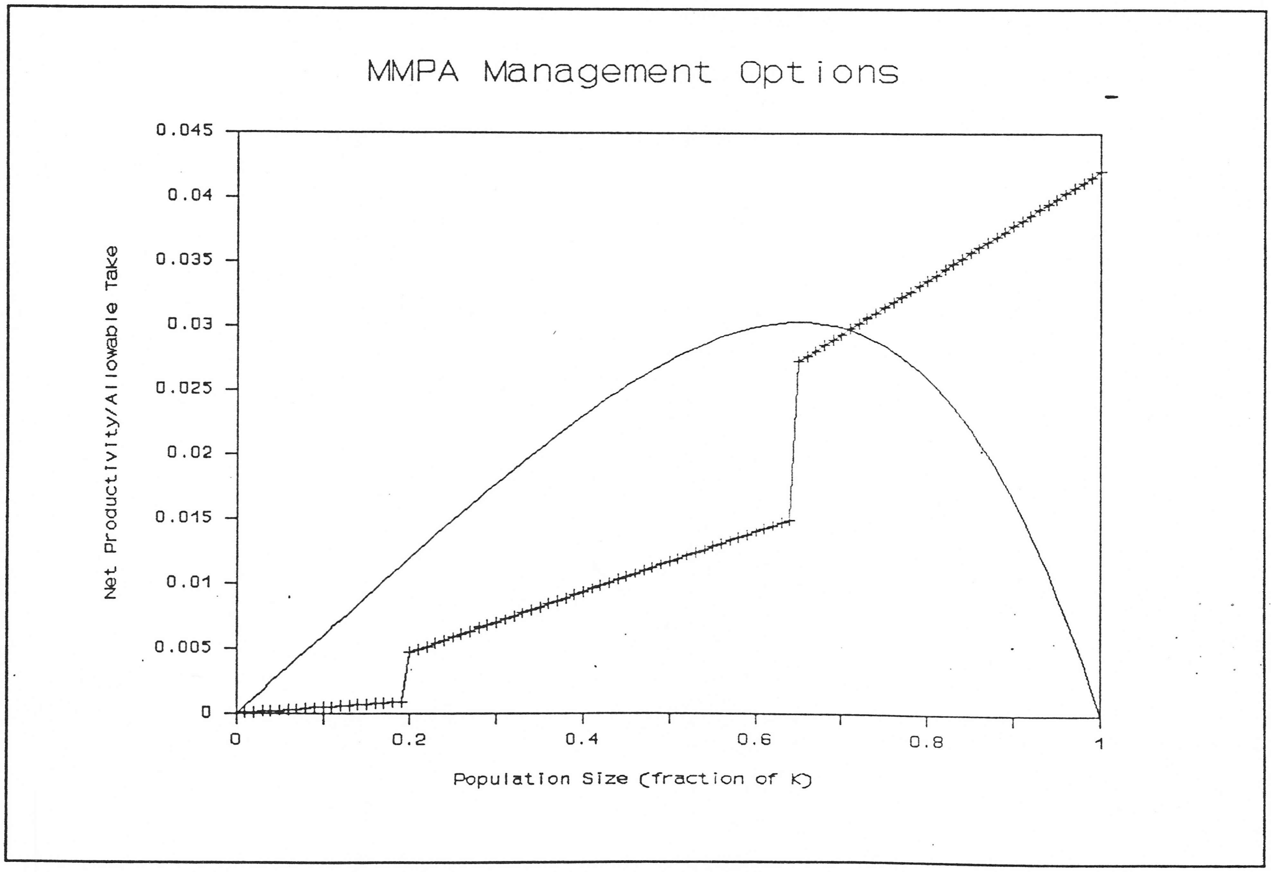
PROPOSED MANAGEMENT FRAMEWORK FOR MARINE MAMMALS

Jay Barlow

Several complex proposals have been made for revisions to the Marine Mammal Protection Act in 1992. I believe that their complexity is likely to be a detriment to their effective use. Below I have tried to derive a single simple equation which sets the allowable take from a marine mammal population. It is illustrated in Figure 1. Because safety factors are built in and because all takes are proportional to the population size, I believe that this approach will be robust to problems in estimating the status of populations.



My proposal incorporates safety factors at three levels. First, there is an explicit allocation factor built into the equation for allowable take. Second, a minimum estimate of population size is used in place of the mean estimate of population size. Finally, animals from two separate areas should be assumed to belong to separate stocks until it is shown that the rate of interchange between those areas is greater than 1% per year or unless morphological differences can be shown.

In my scheme, allowable take depends on the status of the population. Status is classified into one of three categories.

Classification of status will be made based on best available information with no explicit safety factor. First, a population is **severely depleted** if it is below 20% of its mean equilibrium population (K). Second, a population is **depleted** if it is above 20% of K but is below its maximum net productivity level. Finally, a population is **acceptable** if it is above its maximum net productivity level. If population status is unknown, then it is assumed to be severely depleted. If population status is uncertain, but known to be above 20% of K, then the population is assumed to be depleted. Mean equilibrium population is defined as the average population size that would be expected in the absence of any human factors. If the maximum net productivity level cannot be estimated, it will be assumed to be 65% of mean equilibrium population.

Allowable take, **AT**, is defined as being less than the product of a allocation factor times the maximum allowable take rate times the minimum population size:

$$\mathbf{AT} < \mathbf{Allocation} * R_{MAT} * N_{min} .$$

Allowable take includes all sources of human-inflicted mortality, including indirect mortality caused by competition. The definition of the above terms can vary depending on the status of the population and the availability of information.

The **allocation** factor above depends only on the estimated status of the population. If the population is severely depleted, the allocation factor is 0.1. If the population is depleted, the allocation factor is 0.5. If the population is at acceptable levels, the allocation factor is 0.9.

The maximum allowable take rate, R_{MAT}, is defined as the maximum net productivity rate of a population. This is the maximum net growth of a population divided by the population size that gives that growth rate. If the maximum net productivity rate has not been measured, it is defined as the greatest net productivity rate that has been previously measured. If net productivity has never been measured, it is defined as 0.06 for pinnipeds and 0.02 for cetaceans.

The minimum population size, $\mathbf{N_{min}}$, is defined as the lower 95% confidence of the population abundance estimate minus an estimate of the human-inflicted mortality that has occurred since the last census. If statistical estimates of abundance are not available, it is defined as a minimum count of the animals in the population. If a minimum count is not available, the maximum allowable take is zero.

If there is further interest in this model, I would be happy to elaborate on how it would behave given a variety of possible errors in the estimation of status or of population parameters.

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL	# of pages ► 2
To Tom Eagle	From Jay Barlow
Dept./Agency F/PR	Phone #
Fax # 301 713-0376	Fax #