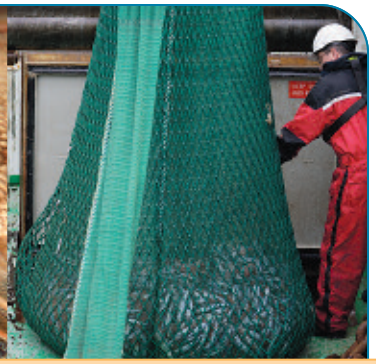




LENFEST OCEAN PROGRAM

RESEARCH SERIES

SEPTEMBER 2006

Better design and implementation of rebuilding plans may help restore depleted fisheries.

STRENGTHENING REBUILDING PLANS: THREE RECOMMENDATIONS FOR ACTION

A SUMMARY OF NEW SCIENTIFIC ANALYSIS:

Wiedenmann, J and Mangel, M. 2006. A Review of Rebuilding Plans for Overfished Stocks in the United States: Identifying Situations of Special Concern.

IN OCTOBER 1996, Congress passed amendments to the Magnuson-Stevens Fishery Conservation and Management Act ("Magnuson-Stevens Act") that required fishery managers to rebuild depleted populations of marine fish. Despite this strong federal mandate, in too many cases the U.S. has failed to rebuild fish populations and overfishing continues to hamper progress.

In a study funded by the Lenfest Ocean Program, John Wiedenmann and Marc Mangel examined fishery rebuilding plans developed since the rebuilding requirement was adopted in 1996. This study identified three situations in which improvements in the development and implementation of rebuilding plans could enhance the chance of restoring overfished populations. This *Lenfest Ocean Program Research Series* report is a snapshot of the study's findings.

WHAT IS THE STATUS OF REBUILDING EFFORTS TO DATE?

A recent study funded by the Lenfest Ocean Program examined the status of rebuilding efforts to date, and found that:

- Rebuilding plans for 67 fish stocks identified as overfished have been adopted, but only three stocks (less than 5%) have been successfully rebuilt.
- 82% of the populations that need rebuilding are still below healthy levels (i.e., overfished) and/or continue to be overexploited (i.e., overfishing is occurring).
- Overfishing is still occurring on nearly half (45%) of the fish stocks under rebuilding plans.
- Despite the legal requirement that fish populations be rebuilt in 10 years (unless the biology of the fish dictates otherwise), over half (54%) of depleted fish stocks have rebuilding plans of more than 10 years (ranging from 11 to 90 years). Only two stocks (3%) have a plan with a timeline of less than 10 years.

Rosenberg AA, Swasey JH, and Bowman M. 2006. Rebuilding US Fisheries: Progress and Problems. Frontiers in Ecology and the Environment 4(6): 303–308.

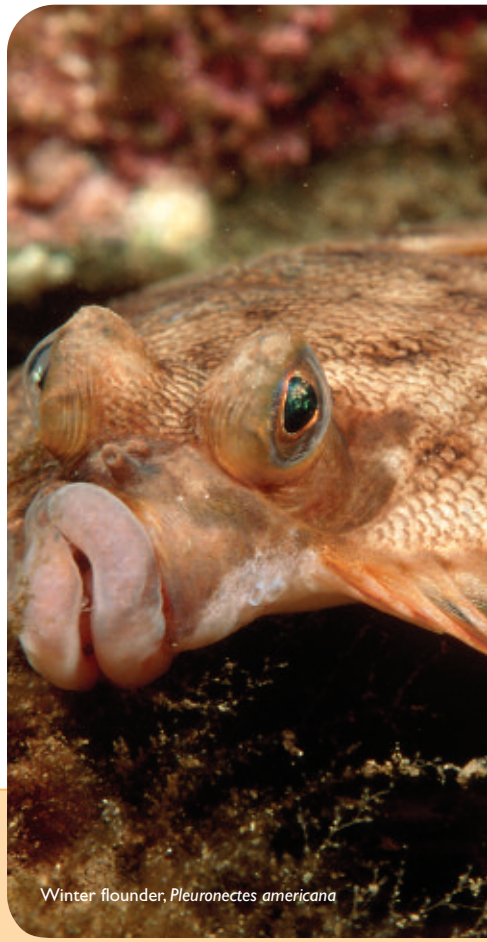
WHAT DOES A CLOSER LOOK AT REBUILDING PLANS REVEAL?

The Magnuson-Stevens Act requires that fishery management plans for overfished species contain conservation and management measures to prevent or end overfishing and rebuild the fishery within 10 years or less, unless the biology of the fish dictates a longer plan. To pass legal muster, a plan must be more likely than not to succeed, which is usually interpreted as having a 50% or better chance of rebuilding the population by the target date.

In their study, Wiedenmann and Mangel found that rebuilding may be delayed or prevented when plans:

1. Fail to account properly for uncertainty when setting rebuilding plans;
2. Allow overfishing during rebuilding; and/or
3. Fail to consider the implications of a skewed age distribution when assessing a population's status.

The authors use a modeling approach to explore the implications of these situations and highlight particular examples that illustrate each of these concerns. They recommend ways to improve the development and implementation of rebuilding plans in order to increase success of fishery rebuilding efforts.



Winter flounder, *Pleuronectes americana*

1. INCORPORATING UNCERTAINTY INTO STOCK ASSESSMENTS: AN OUNCE OF PREVENTION

One of the most difficult aspects of developing a rebuilding plan for a depleted fish population is predicting how the population will behave in the future. Rebuilding plans usually take account of some uncertainty about the future due to the inherent randomness in the ecological system, but plans rarely take into account uncertainty about the fish population (such as limited information or observation error). When uncertainty is not sufficiently accounted for in a stock assessment, the results are less likely to predict the future accurately. This limitation, combined with the tendency of managers to adopt rebuilding plans that embody the bare minimum probability of success permitted under law, may go a great distance toward explaining the lack of broad success in federal rebuilding programs.

For example, recent recruitment events for Cape Cod/Gulf of Maine yellowtail flounder were the lowest in over 20 years (reflecting ecological uncertainty). As a result, stock projections that used past estimates of recruitment were too optimistic. In the case of Georges Bank yellowtail flounder, recent population sizes were overestimated in past assessments (due to uncertainty in the data collection and analysis). As a result the current population is well below rebuilding projections. In both cases, overly optimistic projections allowed for higher levels of catch, which has further slowed rebuilding progress.

2. OVERFISHING DURING REBUILDING: BAD FOR FISH AND FISHERIES

Many rebuilding plans approved by fishery management councils allow for continued overfishing of depleted fish populations in the early years of rebuilding. In examining these plans, Wiedenmann and Mangel identified four ways in which this practice hampers rebuilding efforts.

- **Dramatic quota cuts.** To rebuild a fish population that has experienced overfishing during its rebuilding plan, significant cuts need to be made to fishing quotas. These cuts are often larger than if cuts were made at the beginning of the rebuilding plan. This may result in economic dislocation for fishing interests, and/or political pressure not to reduce fishing quotas (resulting in even longer rebuilding timelines and likely deeper quota cuts later).
- **Stagnant or decreased growth.** For many species, such as snowy grouper, South Atlantic sea bass, and Gulf of Maine yellowtail flounder, overfishing during the rebuilding period results in stagnant or decreased growth of the population. This further delays rebuilding.
- **Even growing populations can't rebuild.** In some circumstances, a depleted population can experience overfishing and still show an increase in total population size. However, the authors demonstrate that such populations will never rebuild to legally mandated targets while subjected to overfishing, and quota reductions will eventually be necessary (see "Fish Populations May Grow" box).
- **No room for error.** Overfishing during rebuilding does not leave much room for error. If the population abundance used for projections is estimated too high, or if fishing quotas are exceeded, overfishing may result in slowed population growth, or even a decline. Such stagnant rebuilding will ultimately lead to a longer rebuilding timeline and more dramatic reductions in quotas.

TROUBLED FISHERIES

In the South Atlantic region, snowy grouper, black sea bass, and golden tilefish have all experienced overfishing during their rebuilding plans. In order to reach rebuilding targets, recently adopted quotas have significantly reduced catch for each of these species (see "Falling Quotas" chart). Many of the New England groundfish have also experienced overfishing during their rebuilding plans, including Gulf of Maine cod, Georges Bank cod, Southern New England/Mid Atlantic yellowtail flounder and Southern New England/Mid Atlantic winter flounder. The authors analyzed recent stock projections and concluded that under current quotas only Georges Bank cod was on track to rebuild by the end of its rebuilding period (see "Rebuilding Prospects" chart).

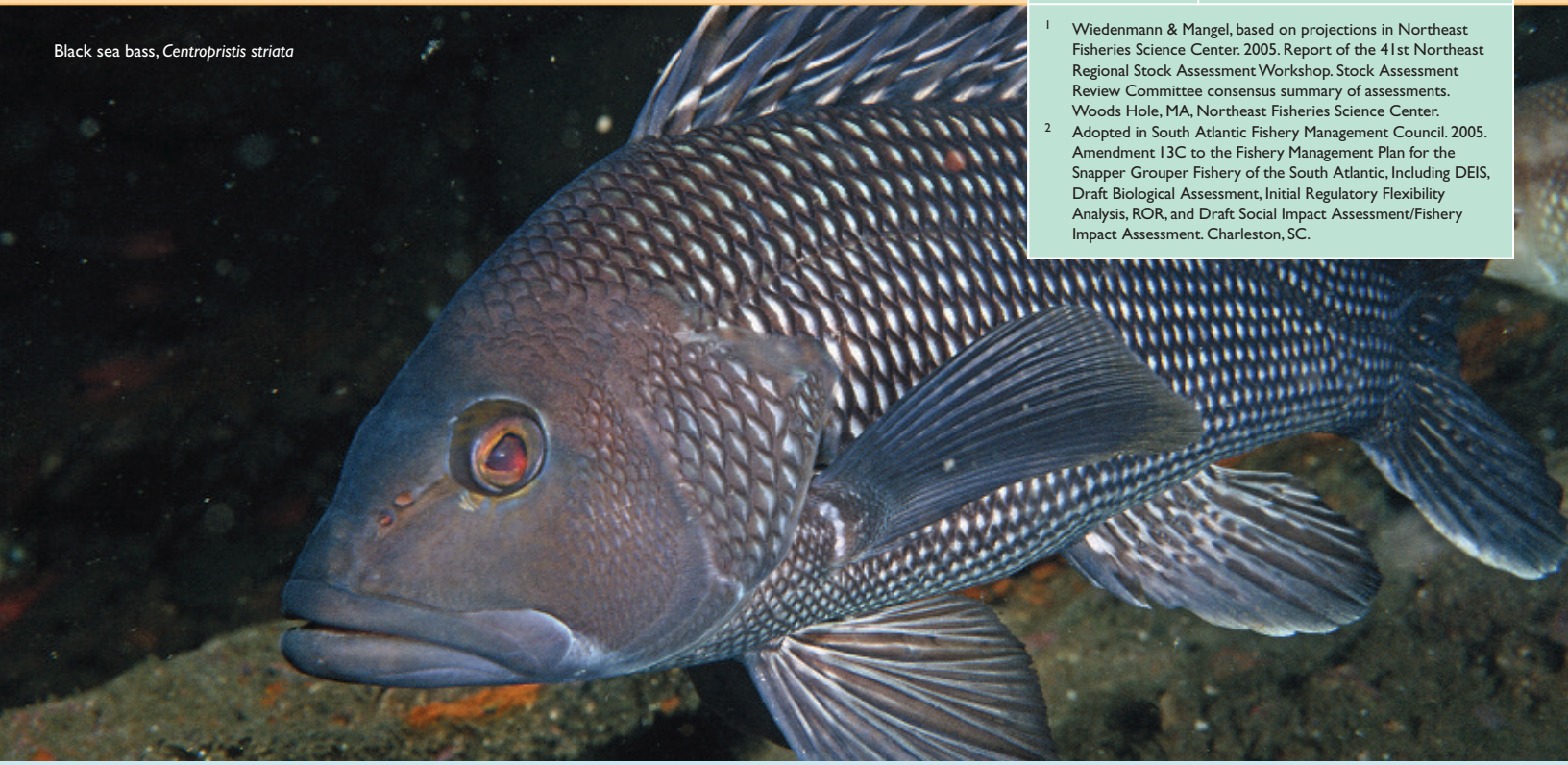
FALLING QUOTAS

Examples of fish populations where allowing overfishing in the early years of a rebuilding plan has meant steep quota reductions in later years.

	Percent Reduction in Landings Needed to Rebuild
Summer flounder	28%[1]
South Atlantic black sea bass	39%[2]
South Atlantic golden tilefish	70.5%[2]
Snowy grouper	76%[2]

[1] Wiedenmann & Mangel, based on projections in Northeast Fisheries Science Center. 2005. Report of the 41st Northeast Regional Stock Assessment Workshop. Stock Assessment Review Committee consensus summary of assessments. Woods Hole, MA, Northeast Fisheries Science Center.

[2] Adopted in South Atlantic Fishery Management Council. 2005. Amendment 13C to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic, Including DEIS, Draft Biological Assessment, Initial Regulatory Flexibility Analysis, ROR, and Draft Social Impact Assessment/Fishery Impact Assessment. Charleston, SC.



Black sea bass, *Centropristis striata*

FISH POPULATIONS MAY GROW, BUT CAN'T CATCH UP

South Atlantic golden tilefish, Georges Bank cod, Gulf of Maine cod, summer flounder, and Southern New England/Mid Atlantic yellowtail and winter flounder are examples of fish populations that have experienced growth despite continued overfishing. For nearly all such stocks, the adverse consequences of overfishing are clear. For example, the most recent South Atlantic golden tilefish quota sets a 70.5% decrease in catch in order to meet rebuilding targets, and summer flounder will need a 28% reduction in fishing mortality in 2007 for the stock to have a 50% chance or greater chance of rebuilding by the flounder plan's 2008 target rebuilding date (see "Falling Quotas" chart).

3. POPULATIONS WITH A SKEWED AGE DISTRIBUTION: CAUTION REQUIRED

Some fish populations experience uneven yearly reproductive success, resulting in a wide range of population sizes in different year classes. For fish populations undergoing rebuilding, a single strong year class can result in dramatic increases in total population size. This can result in a population temporarily achieving its rebuilding target. However, in the absence of another strong year class, such a fish population will likely drop below the recovery threshold again as the large year class naturally dies out. Any recovery of fish populations with variable year class sizes should be viewed with caution, and sources of dramatic increases in population size should be closely scrutinized to avoid overexploitation.

For example, Pacific hake (whiting) experienced a very strong year class in 1999 and as a result the population showed strong growth and achieved its rebuilding target. However, this 1999 year class is now dying out, and the total population is declining, even in the absence of overfishing. Similarly, Georges Bank haddock had strong year classes in 1997, 1999 and 2003, and its total population size is increasing. As these year classes mature, the population may exceed the rebuilding target. However, unless the population experiences additional strong year classes, the total population will likely decrease dramatically as these year classes mature.

REBUILDING PROSPECTS AND REALITIES

Based on the authors' analysis, Georges Bank cod is on track to rebuild by the end of its rebuilding period, but other New England fish populations are not. A comparison of projected vs. actual fishing mortality and biomass shows that Georges Bank Cod is the only population whose actual fishing mortality was close to projected mortality, and whose biomass was higher than predicted.

	Projected chance of rebuilding by plan target date[1]	Were more or less fish caught in 2002–2004 than were specified in the rebuilding plan?[2]	Was the estimated population in 2004 higher or lower than predicted in the rebuilding plan?[2]
Southern New England/ Mid Atlantic yellowtail flounder	0.5%	More	Lower
Southern New England/ Mid Atlantic winter flounder	7.8%	More (except in 2003)	Lower
Gulf of Maine cod	15%	More	Lower
Georges Bank cod	77%	Slightly more	Higher

1 Based on modeling analysis in Widenmann & Mangel using information from (a) Northeast Fisheries Science Center. 2005. Assessment of 19 Northeast groundfish stocks through 2004. 2005 Groundfish Assessment Review Meeting. Woods Hole, MA, Northeast Fisheries Science Center, and (b) Northeast Fishery Management Council. 2005. Amendment 13 to the Northeast Multispecies Fishery Management Plan including a final supplemental environmental impact statement and an initial regulatory flexibility analysis. Newburyport, MA, New England Fishery Management Council and National Marine Fisheries Service.

2 Based on data in Northeast Fisheries Science Center. 2005. Assessment of 19 Northeast groundfish stocks through 2004. 2005 Groundfish Assessment Review Meeting. Woods Hole, MA, Northeast Fisheries Science Center.

HOW COULD REBUILDING PLANNING AND IMPLEMENTATION BE IMPROVED?

Based on their analysis of current rebuilding plans, the authors recommend the following guidelines for fishery managers in developing and implementing rebuilding plans:

- **END OVERFISHING.** For a greater chance of recovery within the rebuilding timeline, overfishing should not occur. In most cases, allowing overfishing does not prevent reductions in fishing quotas, it just delays them.
- **CONSIDER THE POPULATION'S AGE STRUCTURE.** Managers should not rely too heavily on single recruitment events to rebuild a population. When a fish population crosses the rebuilding threshold, the age structure of the population should be considered and quotas should be set with caution if the rebuilding "success" resulted from a few strong year classes.
- **PROPERLY ACCOUNT FOR UNCERTAINTY.** Whenever possible, uncertainty not only about randomness in the ecological system but also about biological unknowns should be incorporated into rebuilding analyses. Projections that show the wide range of possible rebuilding timelines and thus the true uncertainty about a population's rebuilding projections may encourage fishery managers to err on the side of caution when setting rebuilding quotas.

About the Authors

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