



## OY application

Galen Tromble  
NMFS, Office of Sustainable Fisheries

Fisheries Leadership & Sustainability Forum  
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# 1976 Fishery Conservation and Management Act

The term “optimum,” with respect to yield from a fishery means the amount of fish which-

- (A) Will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities; and
- (B) Is prescribed as such on the basis of the maximum sustainable yield from the fishery, **as modified by** any relevant economic, social, or ecological factor.



# 1996 Sustainable Fisheries Act

The term “optimum,” with respect to yield from a fishery means the amount of fish which-

- (A) Will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, **and taking into account the protection of marine ecosystems;**
- (B) Is prescribed as such on the basis of the maximum sustainable yield from the fishery, **as reduced by** any relevant economic, social, or ecological factor; **and**
- (C) In the case of an overfished fishery, provides for rebuilding to a level consistent with producing MSY in such fishery.**



# Benefits to the Nation

- ❖ Food production: providing seafood, maintaining economically viable fishery, etc.
- ❖ Recreational opportunities: long open seasons, opportunity to catch trophy fish, generous bag limits, etc.
- ❖ Marine ecosystems: viable populations, adequate forage, ecological processes, etc.

# OY Considerations

- ❖ Social factors: enjoyment from recreational fishing, avoidance of gear conflicts, dependence of local communities, etc.
- ❖ Economic factors: profitability, adequately supplying markets, other market considerations, etc.
- ❖ Ecological factors: forage fish stocks, predator-prey interactions, protected species, etc.

# OY Requirements in the MSA

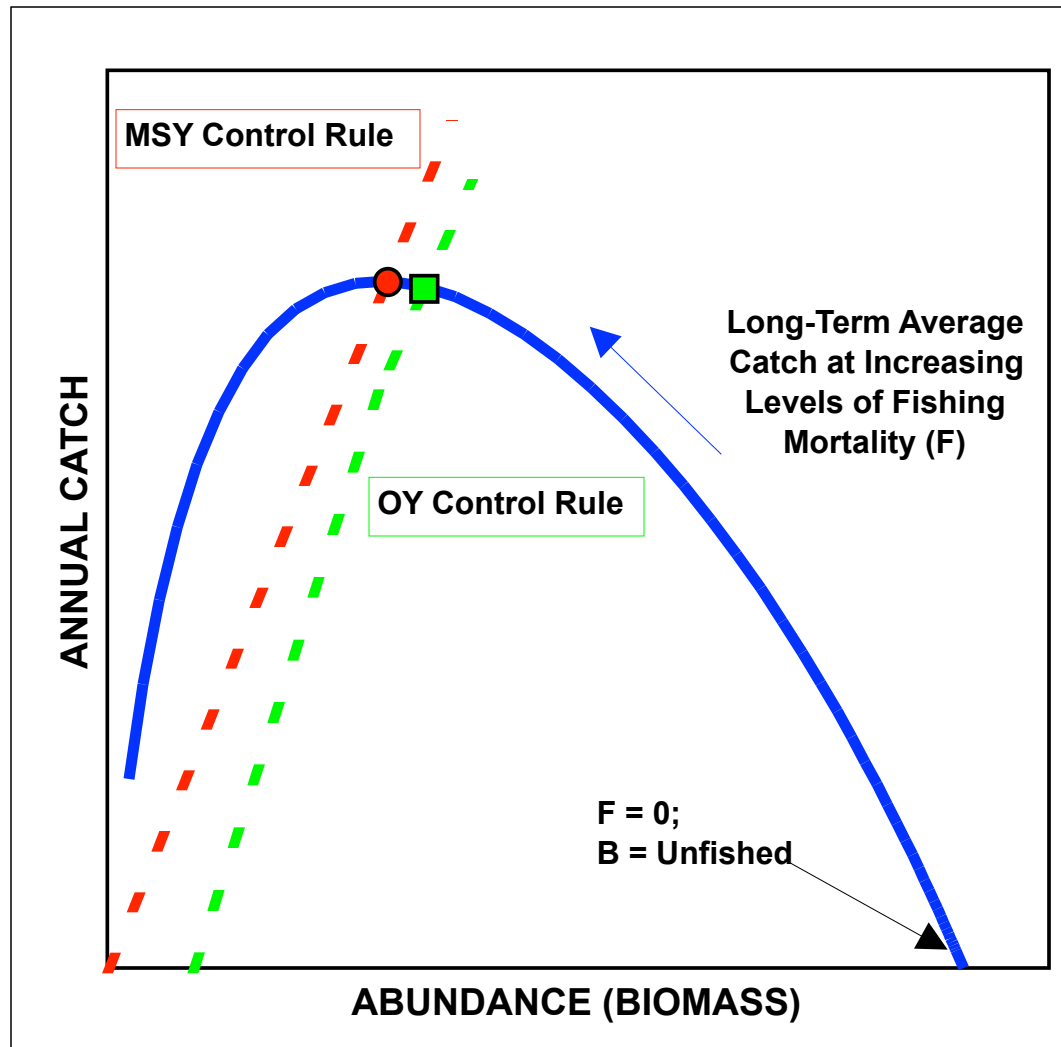
- ❖ FMPs are required to:
  - ❖ assess and specify the OY from the fishery.
  - ❖ include a summary of the information utilized in making OY specifications.
  - ❖ assess and specify the extent to which U.S. fishing vessels will harvest the optimum yield.
- ❖ Councils are required to review on a continuing basis, and revise as appropriate, their OY assessments and specifications.

# Relationship between MSY and OY

- ❖ OY can be reduced from MSY to account for economic, ecological, and social factors.
- ❖ Recommended default target control rule from Restrepo et al. 1998 guidance [ $F_{\text{target}} = 0.75F_{\text{MSY}}$ ] has been used as the basis for many OY definitions.



# MSY and OY Control Rules





# Examples of OY definitions



# Types of OY definitions in FMPs

- ❖ OY is the amount of fish harvested pursuant to FMP, as determined by the overfishing definition and rebuilding schedule.
  - ❖ Spiny dogfish FMP.
- ❖ OY is zero.
  - ❖ Arctic FMP: OY for commercial fisheries for arctic cod, saffron cod, and snow crab is zero.
- ❖ ACL = OY
  - Golden Crab FMP: Prior to ACLs, OY used to be the amount of fish harvest legally under provisions of the FMP. Now: ACL=OY=ABC= 2,000,000 pounds
  - Dolphin-Wahoo FMP: Prior to ACLs, OY for Dolphin was the amount of harvest that can be taken by fishermen while not exceeding  $.75 \times \text{MSY}$  (between 14.1 and 34.9 million lbs). Now: ACL=OY=ABC (estimated to be 14,596,216 lbs ww)



# Types of OY definitions in FMPs

- ❖ Annual OY values
  - ❖ Pacific Coast Groundfish: Prior to ACLs, annual OYs were set based on ABCs. Now: ACLs are set instead of annual OYs.
- ❖ OY is set at MSY or MSY proxy.
  - ❖ West Coast HMS (for species not considered vulnerable). Note in this FMP, the international exception to setting ABCs and ACLs applies to all stocks in the fishery.
- ❖ OY is set at yield associated with  $F_{MSY}$  or MSY proxy
  - ❖ Squid, mackerel, butterfish FMP: Maximum OY is the catch associated with  $F_{MSY}$  or  $F_{max}$ . Now, the Mid-Atlantic Council Omnibus ACL amendment describes OY as being the long term average catch, which is designed not to exceed the ACL and will fall between ACL and ACT.
- ❖ OY is set at a % of MSY or MSY proxy.
  - ❖ West Coast HMS (for vulnerable species):  $OY(proxy) = 0.75 * (MSY \text{ or } MSY \text{ (proxy)})$ .



# Types of OY definitions in FMPs

- ❖ OY is yield associated with % of  $F_{MSY}$  or MSY proxy
  - ❖ Gulf of Mexico Reef Fish (Gag grouper): OY = yield at  $.75 \times F_{MSY}$
- ❖ OY is set for a fishery (and by statute).
  - ❖ The OY for groundfish in the Bering Sea and Aleutian Islands Management Area shall not exceed 2 million metric tons. FMP states that OY for the complex is 85% of MSY (1.4 to 2.0 million mt), plus the incidental harvest of nonspecified species.
- ❖ OY described in rebuilding plan.
  - ❖ Gulf of Mexico Reef Fish FMP (red grouper): Rebuilding plan implemented in 2004. From 2004-recovery, red grouper OY is the yield defined by the F consistent with the rebuilding strategy to  $B_{MSY}$  within the allowable rebuilding period. After achieving the rebuilding target, OY shall be the yield obtained by fishing at  $.75 \times F_{MSY}$ .
  - ❖ Snapper-Grouper FMP (red grouper): ACL = OY = ABC



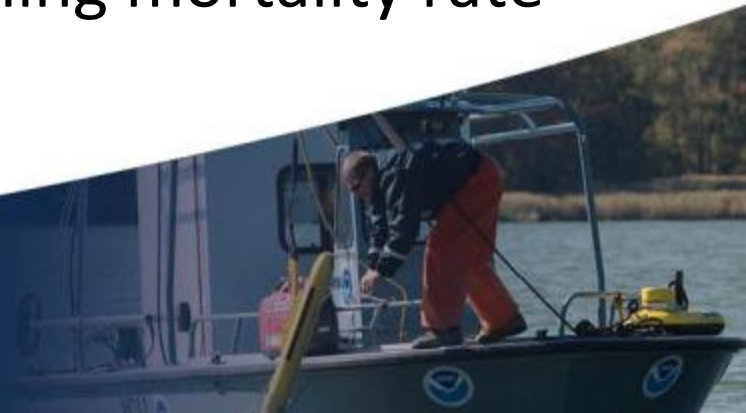
# Determining OY

- ❖ Some OY definitions explicitly mention ecological, economic, and social factors, but many do not.
- ❖ Focus is now on setting ABCs and ACLs.
- ❖ The decisions on how to manage a fishery (ex: in-season closure authority, quotas, trip limits, days-at-sea, etc), are based on ecological, economic, and social reasons.



# Interaction of Biological and Social Aspects – an example

- ❖ Reducing catch (OY) below the maximum **can increase stability and resiliency** in a fishery.
- ❖ By managing for a lower fishing mortality rate on a higher biomass, the fishery can support more stability in annual catches over time. (Alaska groundfish is a good long-term example of this.)
- ❖ In years when the biomass is lower than average, there is room to increase the fishing mortality rate without overfishing.

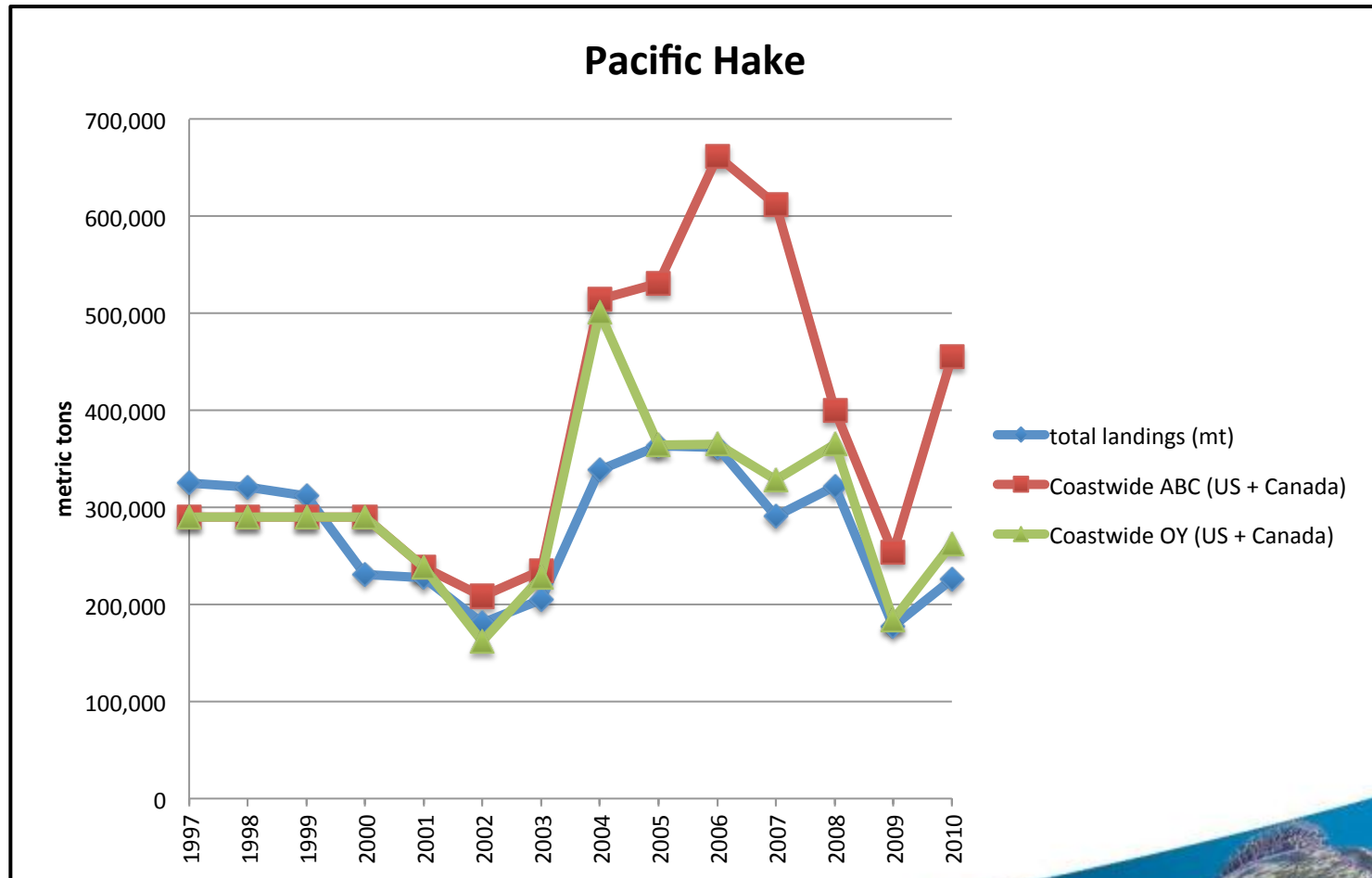


# Ecosystem Considerations -- Examples

- ❖ Coastal Pelagics FMP (Amendment 12) – established a krill harvest ban.
  - ❖ OY = zero
- ❖ Arctic FMP -- prohibits commercial harvests of all fish resources of the Arctic Management Area until sufficient information is available to support the sustainable management of a commercial fishery.
  - ❖ OY = zero for commercial fishery



# Annual OYs, Strong year classes, & Rebuilding Constraints – an example





# How does the OY related to ACT?

## Optimum yield

- ❖ OY is the desired yield from a stock, complex, or fishery.
- ❖ OY specification is supposed to prevent overfishing so should consider scientific and management uncertainty in addition to ecological, economic, and social factors (EES).
- ❖ OY has been used as a long-term average and an annual value.
- ❖ Required.

## ACT

- ❖ ACT is the amount of fish the fishery is trying to catch.
- ❖ ACT accounts for management uncertainty.
- ❖ EES factors are not an explicit part of ACT, however the decision to use certain management measures are based on EES factors.
- ❖ ACT is an annual value.
- ❖ Recommended



# How can OY evolve to take into account EES factors?

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- ❖ How can we more explicitly take into account economic, social, or ecological factors?
- ❖ What tools are necessary?
- ❖ Should OY be set at the stock or fishery level?

# Summary

- ❖ Have a variety of OY definitions in FMPs.
- ❖ OY is sometimes treated as an annual value and sometimes as a long-term value.
- ❖ Setting OY is just one of many requirements in the MSA.
- ❖ Two ways of viewing OY:
  - ❖ First set OY, then figure out how to achieve it consistent with all other requirements.
  - ❖ OY is the end result of complying with all MSA requirements.
- ❖ Full range of conservation and management measures (including ACLs and AMs) should achieve OY for the fishery on a continuing basis.

