**NOAA
FISHERIES
SERVICE**

Fisheries Statistics Office
Publications

How is the Potential Sector
Contribution Calculated?

Table of Contents

Introduction

The New England Fishery Management Council (NEFMC) develops Fisheries Management Plans (FMPs) that meet the requirements of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) and other legislative mandates. The Northeast Multispecies FMP specifies management measures for northeast multispecies (groundfish) and their associated stocks off the New England and Mid-Atlantic coasts. Amendment 16 to the Northeast Multispecies FMP specifies, in part, revisions to management measures, including significant revisions to the sector management measures.

For a complete description of how Potential Sector Contributions (PSCs) are used in sector management measures, see the Final Rule for Amendment 16 published in the Federal Register: http://www.nero.noaa.gov/nero/regs/frdoc/10/10MultiAmend16FR.pdf

Note: A list of these regulated Northeast multispecies groundfish stocks may be found in the appendix at the end of the current document.

Before you learn about how the National Oceanic and Atmospheric Administration's (NOAA's) National Marine Fisheries Service (NMFS) determines the PSC, you should be familiar with a few other definitions of terms you'll see in this discussion.

Definitions You Need to Know

This section provides definitions of terms for this document.

Moratorium Right Identifier (MRI)

A unique identifying number, used for tracking purposes, for each limited access permit's landings history, qualifications, attributes, and specifications. The MRI travels with the permit, regardless of what happens to the vessel or its owner. When NMFS calculates the PSC, it uses the MRI history because this is the way to determine how much multispecies groundfish has been associated with that permit over time.

PSC

The proportion of the total landings of a particular groundfish stock (in live pounds) associated with an individual MRI over a particular period:

> Sum of landings for an individual MRI (as reported by dealer)

divided by

> Sum of fleet-wide landings (as reported by dealer)

For most stocks managed by the Northeast Multispecies FMP the PSC is based on a MRI's landings history during fishing years (FYs) 1996-2006, divided by the landings history of the entire fleet for each stock.

For example, suppose the entire fleet landed 1,000,000 pounds of Georges Bank (GB) winter flounder and a particular MRI associated with a vessel landed 1,000 pounds of GB winter flounder. In this case, the MRI is assigned 0.1% of the GB winter flounder catch, or a proportion of 0.001. This is the PSC of this MRI for GB winter flounder.

Annual Catch Limit (ACL)

The limit of each groundfish stock that can be harvested by all vessels during each fishing year. Refer to the Federal Register language for more information about ACLs: http://www.nero.noaa.gov/nero/regs/frdoc/10/10MultiAmend16FR.pdf

Annual Catch Entitlement (ACE)

The sum of the PSCs for each MRI participating in a sector, multiplied by the commercial groundfish fishery ACL each stock for that year. The product of that multiplication is the ACE for that sector for each stock — the amount of stock in pounds that the sector is allowed to catch for that fishing year. The ACE of each stock equals the sum of PSCs times the ACL, or

$$\sum(PSCi * ACL)$$

Statistical Area

A delineated area of ocean used to track where fish were caught. NMFS overlays a grid of statistical areas onto nautical charts in order to accurately identify specific areas of the ocean. Statistical areas are approximately one degree square although in many cases they do not correspond exactly to specific latitudes and longitudes.

Stock Area

A group of connected statistical areas that defines the geographic distribution of a particular population of an individual species. For example, the Gulf of Maine (GOM) cod stock area comprises statistical areas 464, 465, 467, 510, 511, 512, 513, 514, and 515. All catch of cod in any of these stock areas is attributed to the GOM cod stock.

Understanding the PSC

PSCs, as you've seen, are used to help determine the sector ACE based on the history of individual MRIs. To generate the PSC, NMFS needs as much historical fishing information as possible.

The two sources of information for the PSC are:

- Vessel trip reports (VTRs)
- Dealer reports

These two reports have much of the same information in common, but each of them also has information the other does not.

For example, the VTR captures estimated landings and discards by statistical areas, which are necessary to determine stock areas. The dealer report, on the other hand, captures landings information using official weigh-outs. But dealer reports have no stock area information

available, and stock information is necessary to calculate the PSC. PSCs are calculated based on landings data existing in the dealer database.

This means that NMFS has to match VTR stock information and dealer landings information in order to get landings-by-stock information. This is the first part of what the PSC calculation process does.

Once that matching happens, the PSC calculation process can determine each PSC, which is the proportion of each stock's historical landings that each MRI has relative to the whole fleet.

The next section examines the PSC calculation process in more detail.

Calculating the PSC

Following is a description of how NMFS determines the PSC. This description walks through the calculation process step-by-step. Also, the description contains additional information in each step that provides the "Why?" behind the "What?"

Preparing the MRI Vessel Data

The PSC calculation process first prepares the raw VTR data so that they can be used to produce stock proportions. To do this, NMFS:

Step 1   Prepares the vessel MRI tracking sheet table.

This step prepares a table that lists the vessel permit history associated with each MRI. The history comes from database records checked against the physical vessel permit files in the permits office.

Step 2   Creates a table of VTR landings for MRIs eligible to participate in sectors.

This step creates a table listing of all VTR landings for all eligible sector MRIs in the fleet within the correct date range (FYs 1996-2006, inclusive). This allows NMFS to:

- o   Create a raw VTR data table for multispecies landings in FYs 1996-2006 for all MRIs.
- o   Reassign outdated or inshore statistical areas to current statistical areas.
- o   Create stock areas from species and statistical areas. (Assign the geographic distribution of a particular subset of an individual species in connected statistical areas to one stock area based on Amendment 16 stock area definitions.)
- o   Create fishing years from calendar years. (A fishing year is defined as May 1st of the current year to April 30th of the following year.)

Step 3   Removes yellowtail landings that were by-catch in the scallop fishery from multispecies combination vessels.

This step removes groundfish landings by combination vessels (vessels that are issued both a limited access multispecies and a limited access scallop permit) on scallop trips. Yellowtail landings on scallop trips do not contribute toward the calculation of the PSC based upon regulations implementing Amendment 16, so these records must be removed.

To remove the yellowtail data, NMFS:

- o Creates a table of multispecies MRIs with combination permits that allowed them to land both scallops and multispecies on a single trip. The fisheries to which the landings are attributed depend upon the pounds landed on a specific trip, as determined by regulations.
- o Creates a table of all VTR landings attributed to multispecies MRIs with combination permits.
- o Based on management regulations for each fishing year from 1996 to 2006, determines whether yellowtail landed by combination vessels are attributed to scallop trips or multispecies trips.
- o Removes yellowtail by-catch landings associated with scallop trips as determined by regulatory language.

Now that the exempted yellowtail landings have been removed, NMFS:

Step 4   Creates a table that selects VTR landings by permit, MRI, and date range using the vessel MRI tracking sheet from **Step 1**.

This step breaks out VTR landings by the date range that a permit was associated with a specific MRI.

Getting Stock-to-Species Proportions

Now NMFS has the following data correctly associated:

- VTR landings
- MRI
- Date range

This makes it possible to calculate the proportion of stock-to-species for the VTR landings for each MRI. NMFS will calculate these proportions for each fishing year within the qualifying period. Why is this important? Because the proportion will be used later in **Step 11** to convert the species numbers in the dealer report landings into stock numbers.

To calculate the stock proportions for VTR landings, NMFS does the following:

Step 5   Sums the individual VTR landings by MRI, owner, year, and species.

This step summarizes all vessel trips in a year for one species by owner and MRI. The species number will be used as the denominator in **Step 7**.

Step 6   Summarizes all individual VTR landings and records annually by owner, MRI, year, and stock.

This step summarizes all vessel trips in a year for one stock into one record by owner and MRI. This stock number will be used as the numerator in **Step 7**.

Step 7   Divides the stock total in **Step 6** by the species total in **Step 5** to get a stock-to-species proportion for landings by that MRI for each fishing year.

For example, suppose a vessel associated with a particular MRI caught 1,000 pounds of cod. Of this amount, 400 pounds were caught in the GB stock area and 600 pounds were caught in the GOM stock area. Divide 400 by 1,000, and divide 600 by 1,000.

The result is that the MRI has stock proportions of 40% (0.4) GB cod and 60% (0.6) GOM cod. This proportion calculation is done for each stock landed by each active MRI. These stock proportions will be used later in the calculation process.

Preparing the MRI Dealer Data

The dealer data is prepared in a similar way to the VTR data preparation that you saw earlier in the section Preparing the MRI Vessel Data. To prepare the dealer data, NMFS:

Step 8   Creates a table with all dealer report landings (live weight converted from dealer reported landed weights) for the appropriate groundfish species from May 1, 1996, to April 30, 2007, for all fleet-wide limited access multispecies permit vessels.

This is the same method for preparing data that was done for VTR landings in **Step 2** and **Step 3**. This includes steps to assign species and fishing year information, and to remove yellowtail by-catch landings associated with scallop trips taken by multispecies vessels.

Step 9   Creates a table that selects dealer landings by vessel permit number, MRI, date range, and species using the vessel history tracking sheet that was created in **Step 1**.

This step combines dealer landings with vessel tracking sheet MRI histories. This is the same methodology that was done for VTR landings in **Step 4**. This associates the dealer landings by MRI and by time range.

Processing the MRI Dealer Data

At this point, NMFS can create stock information for dealer landings. To do this, NMFS:

Step 10   Sums the vessel dealer landings by owner, MRI, year, and species.

This step summarizes all dealer-reported landings in a year for one species by owner and MRI into one record.

Step 11   Converts the individual dealer-reported landings using the proportional multiplier created in **Step 7**.

This step does the actual conversion from species landings to stock landings.

In the example in **Step 7**, the VTR landings records showed that 1,000 pounds of cod were landed by a particular MRI during the fishing year, and that this MRI had 40% (0.4) of its cod catch as GB cod and 60% (0.6) as GOM cod. NMFS multiplies the 1,000 lb. dealer cod catch by 0.4 and by 0.6 to get the stock numbers for cod for this MRI.

Question: What if the VTR landings are missing?

If VTR landings data are missing but the dealer-reported landings exist for a trip, at this point NMFS pro-rates the missing information from the dealer data.

NMFS does this by using the principal port and principal state information from dealer landings records in order to create stock zones, which stand in for stock areas. (Principal port is the port that the vessel uses to land fish, which may or may not be the home port. Similarly, principal state is the state that the vessel uses to land fish, which may or may not be the home state.) NMFS determines stock zones by fishing year based on permit renewal.

There are three stock zones in the Northeast Region:

- North of Portland to Canadian waters
- Portland to Cape Cod
- Cape Cod to southern point of the Northeast Region

NMFS produces proportions of each stock landed by stock zone each year based on landings from all groundfish VTRs. For example, a proportion might be GOM cod vs. GB cod landed by Zone 1 vessels for FY 2002. These fleet proportions are used to pro-rate any individual dealer landings that are missing VTRs.

For some zones and stocks, there might not be proportions for a year. In this case, NMFS finds the average of the other years' proportions in order to determine the proportions for the missing years.

To perform the apportionment, the script:

- Selects the permit number and year.
- Identifies the stock zone of the permit number for that year.
- Uses the zone proportions of stocks for that fishing year in order to apportion the dealer landings to a trip for which the VTR data are missing.

Processing the Fleet-Wide Dealer Data

There is one more task to do before NMFS can find the stock proportion of MRI-to-fleet that determines the PSC. The calculation process:

Step 12   Sums the dealer landings by species, stock, and year to get the fleet-wide landings.

This step creates the fleet-wide dealer landings number that will be the denominator in the MRI-to-fleet proportion used to determine the PSC.

Producing the PSCs

At this point, NMFS has determined the stock information for dealer landings for both individual MRIs and for the entire fleet. Therefore, NMFS:

Step 13   Divides the individual MRI dealer landings in **Step 11** by the fleet-wide dealer landings in **Step 12**.

Look at one particular MRI and one stock as an example. Suppose the entire fleet landed 1,000,000 pounds of GB yellowtail flounder and a particular MRI associated with a vessel landed 1,000 pounds of GB yellowtail flounder. In this case, the MRI is assigned 0.1% of the GB yellowtail flounder catch, or a proportion of 0.001. This is the PSC of this MRI for GB yellowtail flounder.

NMFS adds this PSC to all the other GB yellowtail flounder PSCs in the sector. NMFS then multiplies the sum of sector PSCs by the ACL for GB yellowtail flounder. The result is the sector ACE for GB yellowtail flounder. All the ACEs for the sectors are produced in this same way.

The following sections describe adjustments to the final numbers based on regulatory requirements.

Implementing the GB Cod Exception for Existing Sectors

There are two groundfish sectors that existed before FY 2010: the GB Cod Hook Sector and the GB Cod Fixed Gear Sector. Any MRI that was signed on to the preliminary FY 2009 roster (submitted March 1, 2008) for either of these two existing sectors has its GB cod PSC based on FYs 1996-2001, rather than FYs 1996-2006. To implement the GB cod exception, NMFS:

Step 14   Separates dealer MRI landings histories into year blocks based on the Amendment 16 cod exception.

This step finds the data of the vessels that meet the proper criteria (GB Cod Hook Sector or the GB Cod Fixed Gear Sector roster on March 1, 2008, MRI, owner, year, species = cod, stock = GB, live pounds).

Step 15   Creates fleet-wide dealer totals by stock for FY1996-2006 and for FY1996-FY2001 GB Cod.

This step follows the same methodology that was used earlier in **Step 12** to determine the fleet-wide dealer landings denominator. The only difference is that there are two ranges:

- o   FY1996 – FY2006. This range is for the whole fleet and constitutes the total range of fishing years covered by the sectors program.
- o   FY1996 – FY2001. This range is for the whole fleet and constitutes the cod exception years.

Both of these fleet-wide numbers will be used later in the cod exception process.

Step 16   Sums the landings records in **Step 14** into single rows showing allocation for the MRI's current owner.

This step summarizes all dealer-reported landings for the MRI into one record per year.

Step 17   Determines GB Cod PSCs for every MRI on the two existing sectors' (Cape Cod Hook and Cape Cod Fixed Gear) March 1, 2008, rosters based on FY1996-FY2001 landings.

NMFS divides the individual MRI dealer landings for FYs 1996-2001 in **Step 16** by the fleet-wide dealer landings for FYs 1996-2001 in **Step 15**.

Now the MRIs in the two existing sectors have their final PSCs for GB cod.

Equalizing the PSCs

There is a final step to do: Equalize the PSCs. The fleet-wide PSCs calculated in **Step 13** add up to 100%. Now NMFS takes the GB cod PSCs for the two existing sectors that were determined in **Steps 14** through **17** and uses these PSCs in the ACE equation (sum of PSCs $*$ ACL = sector ACE). This puts the sector ACE final result for GB cod over 100% for the two existing sectors. This is because the PSCs for GB cod of the two existing sectors, based on FYs 1996-2001, are larger than they would have been for FYs 1996-2006.

Therefore, NMFS must bring the GB cod PSCs of the rest of the fleet down to a percentage that, when added to the percentage in the two existing sectors, totals 100% for all MRIs.

At this point, NMFS:

Step 18 Implements an equation to proportionally decrease the GB cod PSCs of the MRIs in the rest of the fleet.

NMFS runs the following equation for every MRI not in the Georges Bank Cod Hook Sector or in the Georges Bank Cod Fixed Gear Sector:

$$\left[1 - \frac{New\ Total - Old\ Total}{Other\ Total}\right] \times Original\ PSC$$

as in:

$$\left[1 - \frac{1.04 - 1.00}{0.77}\right] \times 0.459318627 = 0.435457919$$

See Table 1 for term meanings.

NMFS adds the adjusted GB cod PSCs of the two existing sectors to the adjusted GB cod PSCs of the other nonexcepted sectors to get the total of all GB cod PSCs back to 100%.

Table 1 GB Cod Equation Term Meanings

Term	Meaning
New Total	Sum of the following (total is greater than 100%): o GB cod PSCs for MRIs in Cape Cod Hook sector for FYs 1996 – 2001 o GB cod PSCs for MRIs in Cape Cod Fixed Gear sector for FYs 1996 – 2001 o GB cod PSCs for MRIs in all other sectors for FYs 1996 – 2006
Old Total	Sum of the following (total is 100%): o GB cod PSCs for all MRIs in all sectors for FYs 1996 – 2006
Other Total	Sum of the following (total is less than 100%): o GB cod PSCs for MRIs in all sectors except Cape Cod Hook and Cape Cod Fixed Gear for FYs 1996 – 2006
Original PSC	o GB cod PSC for an MRI in any sector except Cape Cod Hook and Cape Cod Fixed Gear for FYs 1996 – 2006

Appendix: Northeast Multispecies Groundfish Stocks

Table 2 provides a list of the Northeast multispecies groundfish stocks covered in this document.

Table 2: Northeast Multispecies Groundfish Stocks

Species	Stocks
American plaice	American plaice
Cod	GB
	GOM
Haddock	GB
	GOM
Pollock	Pollock
Redfish	Redfish
White hake	White hake
Winter flounder	GB
	GOM
Witch flounder	Witch flounder
Yellowtail flounder	Cape Cod (CC)/GOM
	GB
	Southern New England (SNE)/Mid-Atlantic (MA)