

1.7% fewer than in 2011. However, these vessels had 285 (3.6%) more days absent on non-groundfish trips than they did in 2011, and from 2011 to 2012, the average length of a non-groundfish trip for these vessels increased from 3.66 to 3.91 days per trip (Table 15).

4. AVERAGE VESSEL PERFORMANCE

A complete assessment of fishery economic performance requires information from all vessels on all fishing-related costs and on all fishing-related revenues to determine profits. Actual annual financial profit is the sum of the owner's share of net revenue for all trips made over a year less annual fixed costs.¹⁹ This information would include the cost of purchasing additional ACE or DAS and the revenues from the sales of fish and ACE. Although progress is being made to address critical data gaps, at this time the Social Sciences Branch (SSB) does not have sufficient information to estimate profitability for various segments of the groundfish fleet, or at a finer level (e.g., on the vessel affiliation or the individual vessel level). The primary obstacles to this estimation are (1) a lack of data on fixed costs and crew payments²⁰ and (2) incomplete data on ACE trading and DAS leasing.

This report uses three metrics to evaluate financial performance: (1) nominal revenue per vessel and day; (2) total factor productivity, and (3) net revenue. None of these measures alone provides a complete assessment, but taken together they allow insights into important aspects of economic performance and provide some indication of trends in the economic efficiency of the active groundfish fleet.

In contrast to the FY2010 and FY2011 Groundfish Performance Reports, the net revenue estimations in this report account for the impacts of leasing activity.²¹ Because an overview of ACE leasing activity in FY2012 is necessary to understand these net revenue estimates, the discussion of net revenue has been deferred to Section 8 of this report.

¹⁹ Fixed costs are typically costs that do not vary with the amount of fishing effort such as insurance.

²⁰ Fixed cost and crew payment data was collected through a voluntary survey in 2006-2008. However, vessel owner response to that fixed cost survey was poor and the resulting data quality was insufficient. In 2012, SSB implemented a redesigned cost survey to collect information about fixed costs and crew payments incurred in 2011 from approximately 50% of the commercial fishing vessel owners in the Northeast, according to vessel size and primary gear type. The survey was repeated in 2013, surveying the remaining half of vessel owners in the Northeast for fixed costs and crew payments incurred in 2012. These more recent surveys have resulted in higher response rates than the 2006-2008 efforts, with response rates of 30% and 21% respectively, and the SSB now has fixed cost and crew payment data for over 800 commercial fishing vessels in the Northeast. This data is being analyzed now as the SSB strives towards a more complete understanding of profitability for various segments of the fleet. At this time, both the Northeast Fishery Observer Program (NEFOP) and the At-Sea Monitors (ASM) Program collect some of fishing-related costs and these data can be used to evaluate financial performance. Information contained in VTR and dealer data can also be used to derive additional performance measures.

²¹ Although the Social Science Branch (SSB) cannot yet fully analyze profitability of the active groundfish fleet, it continues to move forward in its understanding of economic performance. The FY2010 and FY2011 Final Reports both provided net revenue estimation (see Kitts et al. 2011 and Murphy et al. 2012). Net revenue is defined as gross revenue less trip costs. Prior to 2013, net revenue analysis did not account for the impact of costs incurred to purchase quota (leasing costs), due to incomplete leasing activity data. At the fishery level, leasing costs incurred by vessel owners that "lease in" fish are offset by leasing revenues earned by vessel owners that "lease out" fish. However, leasing activity does change net revenues received by specific segments of the fleet. Since the release of the FY2011 Final Report, analysis of the net revenues earned by the groundfish fleet has been expanded by examining the impacts of leasing activity. In 2013, the net revenue analysis presented in the FY2011 Final Report was updated to reflect how leasing activity impacts net revenues received by different segments of the fleet (see Kitts and Demarest, 2013).

4.1. Nominal Revenue per Vessel and Day

Landings revenue per unit of effort was used as a proxy measure for profitability. Profitability is often measured as the ratio of total revenue divided by total cost, with a ratio greater than one indicating positive profits. Because a complete accounting of costs is not available, effort is used as a proxy for cost. If the costs of inputs used to generate effort are constant, comparing the ratio of revenue per unit of effort in two time periods serves as a proxy for profitability change. With constant input prices and revenue, an increase in effort would increase costs, reducing the revenue per unit effort ratio, and imply reduced profitability between the two time periods. Conversely, increased revenue with constant (or lower) effort would imply increased profitability. However, even with constant effort, the costs of inputs used to generate effort could be increasing.

The nominal revenue per effort metrics used in this report characterize the performance of an average vessel within each vessel size category. However, individual vessel performance can vary substantially, in either direction, from the average. As stated above, changes in nominal revenue per unit effort can also be accompanied by changes in the use (and therefore the cost) of inputs.²² These caveats should be considered when evaluating the results that follow.

Average all species nominal revenue per vessel on groundfish trips decreased in 2012 for all vessel size categories except for the less than 30' group (Table 16). The less than 30' group saw a 50% increase in average all species nominal revenue per vessel on groundfish trips. It is important to note, however, that the less than 30' group accounts for only a very small percentage of the total number of groundfish trips taken in 2012 (1.3%) (Table 15). Average all species revenue per groundfish trip decreased from 2011 to 2012 by a range of 19% to 20% for all other vessel size categories (Table 16).

Average all species revenue per vessel on non-groundfish trips increased by 5% for both the less than 30' and the 75' and above categories in 2012. For the two middle size categories, average all species revenue per vessel on non-groundfish trips increased by less than 1% during the same time period (Table 16). The minimal increase in average revenue per vessel on non-groundfish trips furthers the notion that groundfish fishermen were unable to offset a reduction in groundfish landings with increased non-groundfish landings (Table 16).

Average nominal revenue per day on groundfish trips increased by greater than 28% in 2012 for all vessel size categories, with the exception of the greater than 75' category, which decreased by 20.4% (Table 17). Average nominal revenue per day on non-groundfish trips decreased in 2012 for all vessel size categories, except for the 30' to <50' category, which saw a small gain of 7.3%. The largest percent decrease in average nominal revenue per day on non-groundfish trips in 2012 occurred in the greater than 75' category (17%) (Table 17)²³.

4.2. Vessel Productivity

Productivity is a key economic indicator and a critical factor in economic growth. With a single output and single input, productivity is typically measured as the ratio of output produced

²² For example, the amount of fuel used could increase because of a change in fishing behavior that may generate an increase in revenue per day absent.

²³ The standard deviation associated with average nominal revenue per day on a non-groundfish trip in 2011 is relatively high, suggesting the 2011 average may have been influenced by a few extreme values.

to the input used. With a more complicated production process, productivity is measured as aggregate output divided by aggregate input, and is called Total Factor Productivity (TFP). TFP is the most general measure of productivity, and changes in TFP can be measured at the firm level or at the aggregate industry level.

Fishing vessels typically catch multiple species on a trip using multiple inputs. For example, vessels use labor (crew), capital stock (vessel length and horsepower), and energy (fuel) on fishing trips to harvest a variety of fish and shellfish species. Because of this multiple output, multiple-input fishing technology, index numbers which combine outputs and inputs into a single number are necessary to measure TFP.

A Malmquist Index (MI) was therefore constructed to examine changes since 2007 in TFP for groundfish vessels.²⁴ A value greater than one for the MI indicates an improvement in productivity, while a value less than one signifies a decline in productivity. Yearly MI values were then used to construct a Malmquist Chained Index (MCI) with 2007 as the base year.²⁵ Productivity, as measured by the MCI, decreased by 10% in 2012 to a five-year low (Table 18). This decrease can be attributed in large part to the substantial reduction in groundfish landings in 2012.

5. ACE LEASING

Every limited access groundfish permit has a potential sector contribution (PSC) based on its fishing history. The PSC is a percentage share of the total allocation for each allocated groundfish stock. Every limited access groundfish permit also has a tracking identification number called a Moratorium Right Identifier (MRI). PSC is technically allocated to MRIs, which are subsequently linked to vessels through Northeast Multispecies limited access fishing permits. When fishermen join a sector, their PSC is pooled and becomes the sector's annual catch entitlement (ACE). Each sector determines how to distribute its ACE among its members. All groundfish catch on sector fishing trips counts towards that sector's ACE. ACE is transferable between sectors via approved annual leases, while PSC is transferable within sectors using lease arrangements. ACE and PSC are generally leased because one fisherman or sector wishes to catch more than their initial allocation for a particular stock. Importantly, some sectors or

²⁴ The Malmquist Index (MI), which was introduced by Caves, Christensen and Diewert (1982), is an index well suited for measuring TFP change. Because only outputs and inputs are needed to construct the MI, this index is particularly advantageous for estimating changes in productivity of fishing vessels. Other productivity metrics require data on output and input prices. Although price data for landed species are extensive, data on input prices are only available for a subset of vessels. Since both input and output quantities are readily available for all vessels, the Malmquist index approach was chosen to estimate TFP change.

Landings for each vessel were aggregated into three broad output groups: roundfish, flatfish, and all other species. Inputs included vessel length, gross tonnage, horsepower, days absent, and average crew size. The MI was calculated for three gear groups: trawl, hook, and gillnet. Lack of sufficient observations precluded calculation of the MI for other gear groups. Next, the average productivity change per vessel in each fishing group was calculated. Individual vessel index numbers were then aggregated to derive an overall index value. The contribution of each vessel's productivity to the overall value was weighted by its nominal revenue.

²⁵ A chain index uses successive years of data. For example, the MCI for 2010 is calculated as $MCI_{2010} = MI_{2010} \times MI_{2009} \times MI_{2008} \times MI_{2007}$. The interpretation of this allows one to compare productivity in 2010 against a given base year, such as 2007 in our case.