

## An Analysis of Fishing Effort in Statistical Area 514

With the implementation of Amendment 16 in 2010, management of the commercial groundfish fleet transitioned to sectors. A sector's annual catch entitlement (ACE) for a stock is the sum of the potential sector contribution of all the permits in a sector multiplied by the commercial groundfish annual catch limit (ACL) for each stock for that year. Sectors have the ability to decide how to distribute ACE and discards to its member vessels. One key feature of sector management is the elimination of trip limits. Prior to sectors vessels were limited to set trip limits; the most recent trip limit restricted GOM cod catch to 800 lbs/day (4,000 lbs/trip). Recreational vessels were subject to bag limits (10 cod/person) and seasonal closures (possession prohibited November to April 15). Haddock were subjected to trip limits beginning in 1977; cod trip limits were implemented in 1997. Total commercial landings appear to have increased in SA 514 after 2010 while other areas have not (Figure 1).

VTR data for commercial groundfish landings, within statistical area 514, were examined for fishing years from two time periods: 1996 – 1997 and 2008 – 2012. These time periods were selected in order to compare an initial period under effort controls but before GOM cod trip limits to the last two years of effort controls with trip limits and the first two years under sectors. Data were examined graphically to determine trends in total groundfish landings and landings for cod, haddock and pollock that may indicate any change in fishing behavior after the implementation of sectors. Data were binned into four vessel size classes: less than 30 ft, 30 to less than 50 ft, 50 to less than 75 ft and 75 ft and over. VTR data were used in order to include data for FY2012; data for FY2012 is incomplete as the FY is not yet complete.

### *Total Groundfish Landings in SA 514*

The total groundfish landings within SA 514 appear to have increased since 2010, the year of sector implementation (Figure 2). The apparent decline in all landings in FY2012 may be more an effect of the incomplete fishing year as opposed to a reduction in landings; comparisons with May and June of previous fishing years shows FY 2012 is not anomalously low for those months. Vessel size classes varied in response to the removal of trip limits. Vessels less than 30 have negligible landings on this scale but peaked in 2009; the implementation of sectors does not appear to have affected the fishing behavior of this size class. Vessels in the 30 to less than 50 size range, had higher total groundfish landings in the late 1990s compared to 2008 to 2012 landings. Landings for this size class have decreased since the implementation of sectors. The 50 to less than 75 size range had a comparable level of landings in the two time periods. There does appear to be an increase in landings post sectors but this is still lower than landings in the 1990s. Landings from vessels 75 and over have shown an increase since the implementation of sectors, above that seen in the late 1990s.

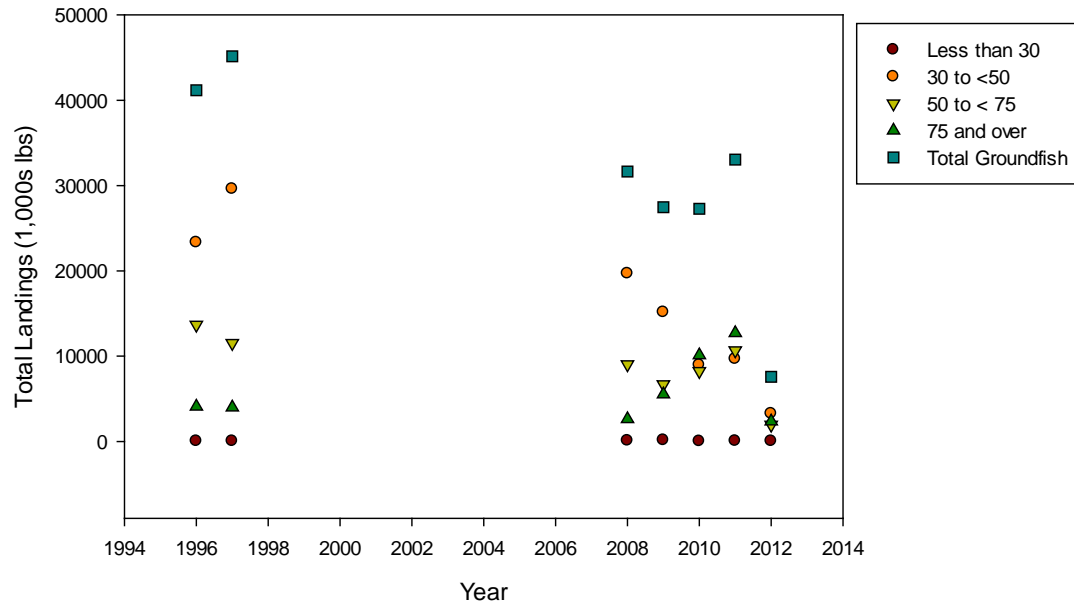


Figure 2: Total groundfish landings shown by vessel size class.

#### *Cod landings in SA 514*

In recent years, cod landings from SA 514 have become an increasing percentage of total cod landings (Figure 1). Cod landings declined between 2008 and 2009 and increased after sector implementation, however, these were lower than landings observed in the 1990s (Figure 3). The impact of sectors on overall cod landings may be difficult to distinguish from underlying population dynamics. Cod landings by vessels less than 30, are relatively low in comparison to the other size classes and it is hard to detect changes in landings; however, there was a peak in 2009. Cod landings by vessels between 30 and less than 50, were higher in 2008 and 2009 than after 2010 and in the late 1990s. Cod landings by vessels between 50 and less than 75 shows a slight increase after 2010 but is still below that observed in 1996. The same can be said for vessels 75 and over; cod landings show a slight increase after 2010 but is still similar to those in 1996. Cod landings haven't changed much over time (Figure 4). The percent of cod landed by size class have increased for vessels over 50 ft after sector implementation; the smaller vessels show a decrease (Table 1). The three smaller size classes show a decrease in landings between April and May (Figures 5, 7 & 9); the largest size class doesn't. The two smallest size classes show higher monthly landings than the larger sizes in 2008 and 2009 but this trend is reversed for the larger sizes where landings between 2010 and 2011 are higher. This is more easily seen in the stacked line graphs where 2010 and 2011 have higher monthly landings for the larger vessels (Figures 6, 8, 10 & 12).

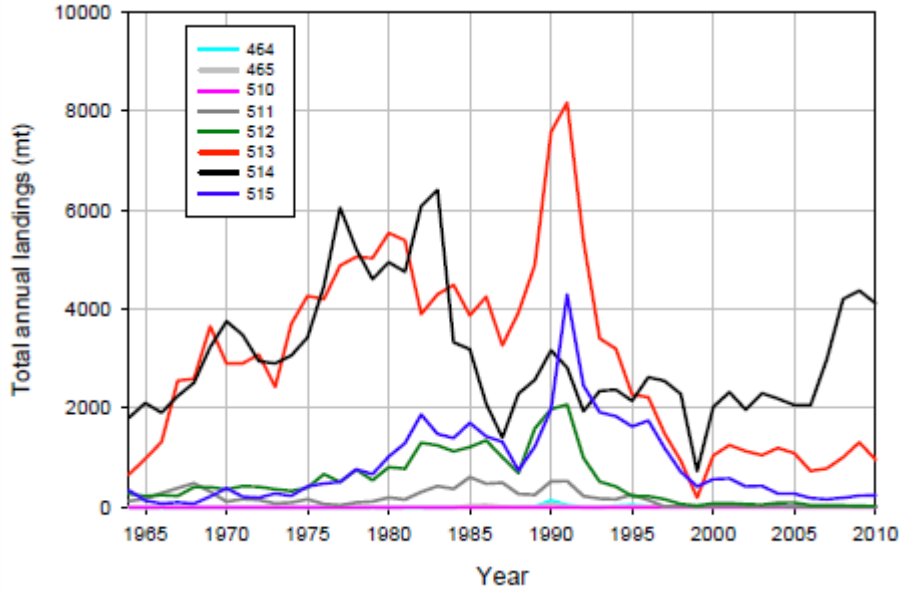


Figure 1: Total commercial landings of Gulf of Maine Atlantic cod by statistical area from 1964 to 2010 (from SARC 53).

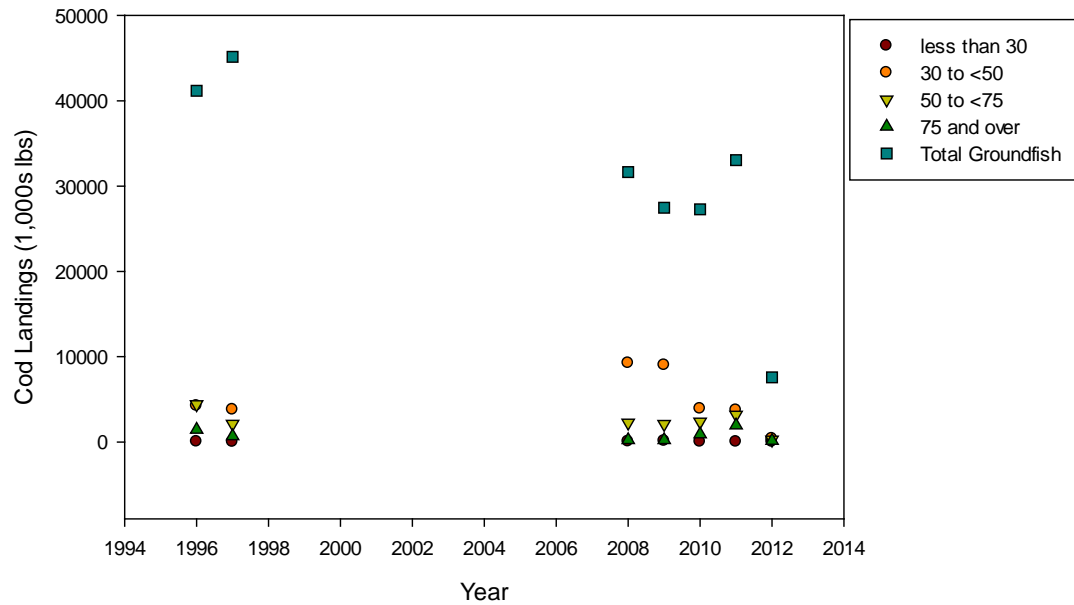


Figure 3: Cod landings shown by vessel size class. Total groundfish landings included for comparison.

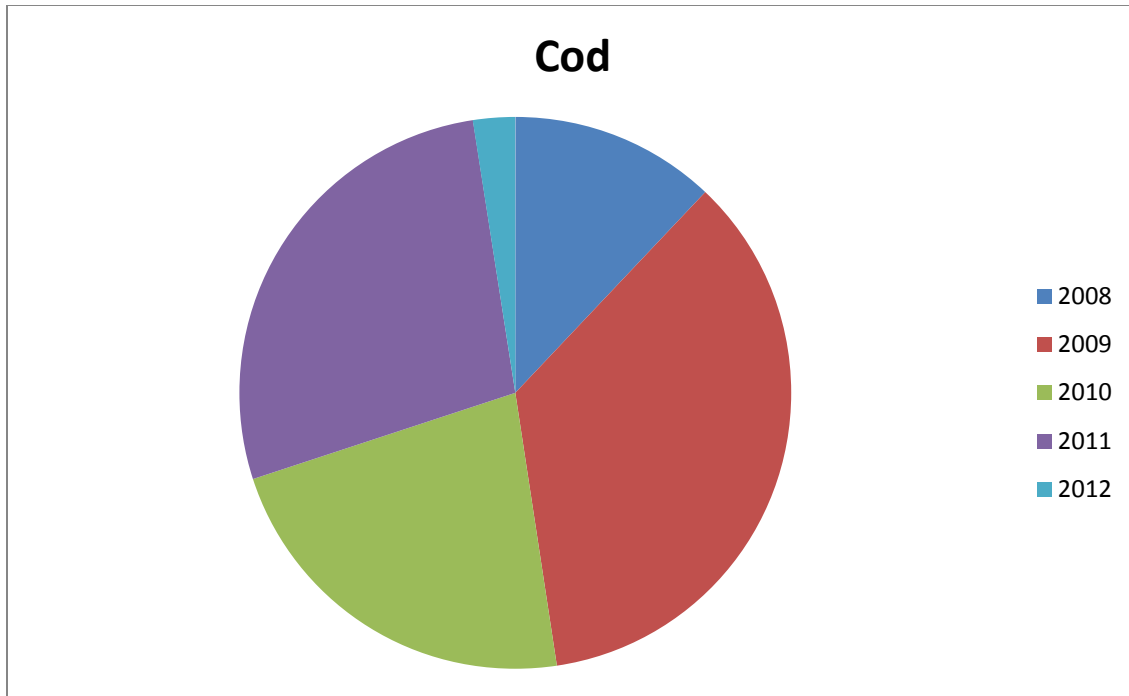


Figure 4. Total cod landings by year.

Vessel Length	1996	1997	2008	2009	2010	2011	2012
Less than 30	0.6%	0.6%	0.4%	1%	0.1%	0.1%	0.5%
30 to less than 50	41.7%	57.3%	77.9%	78.7%	54.2%	41.9%	48.5%
50 to less than 70	43.4%	31.9%	19.8%	18.4%	33.1%	35.9%	33.7%
75 and over	14.3%	10.3%	2%	2%	12.7%	22%	17.3%

Table 1: Percentage of cod landings by vessel size in SA 514.

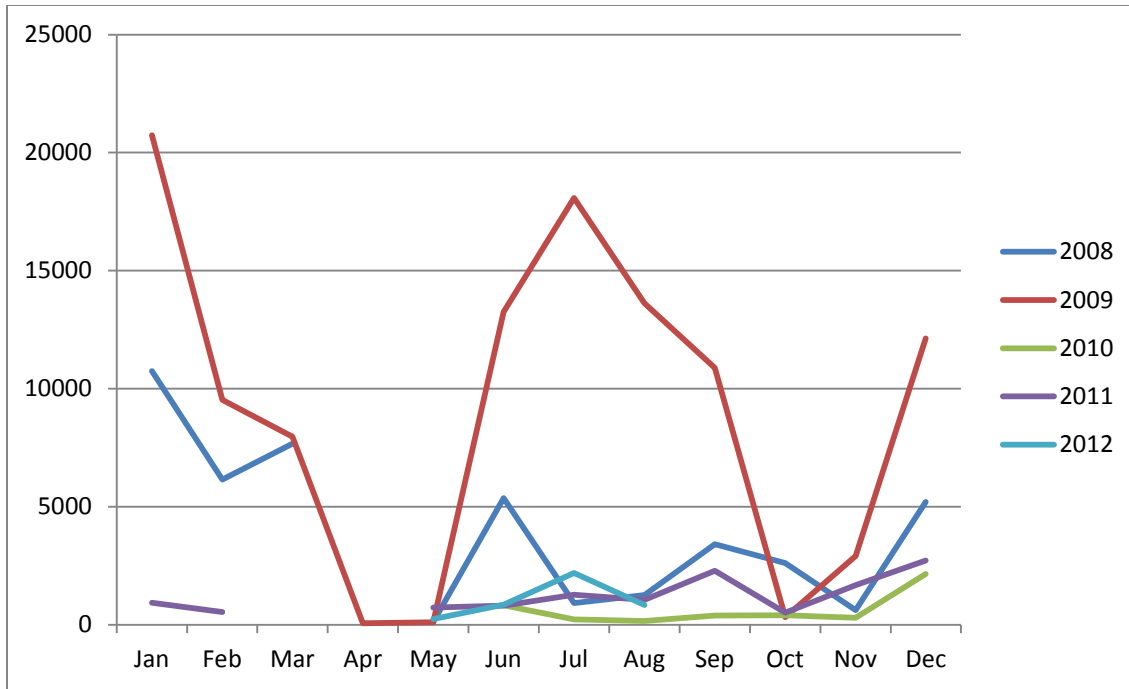


Figure 5. Monthly cod landings for vessels less than 30 ft.

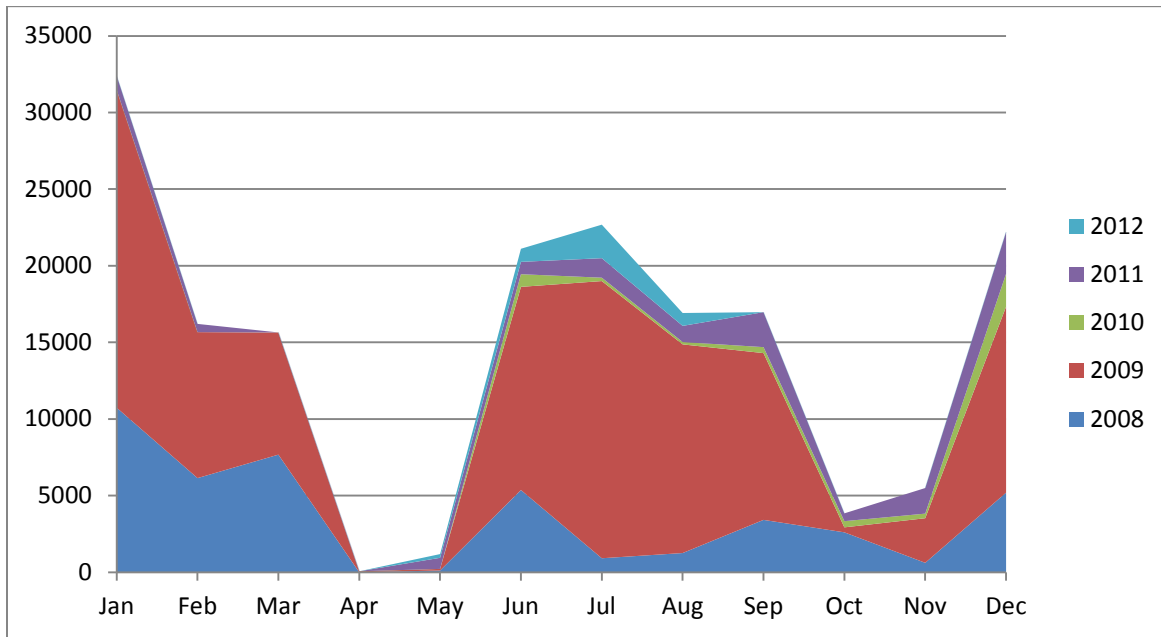


Figure 6: Cod stacked monthly landings for vessels less than 30 ft.

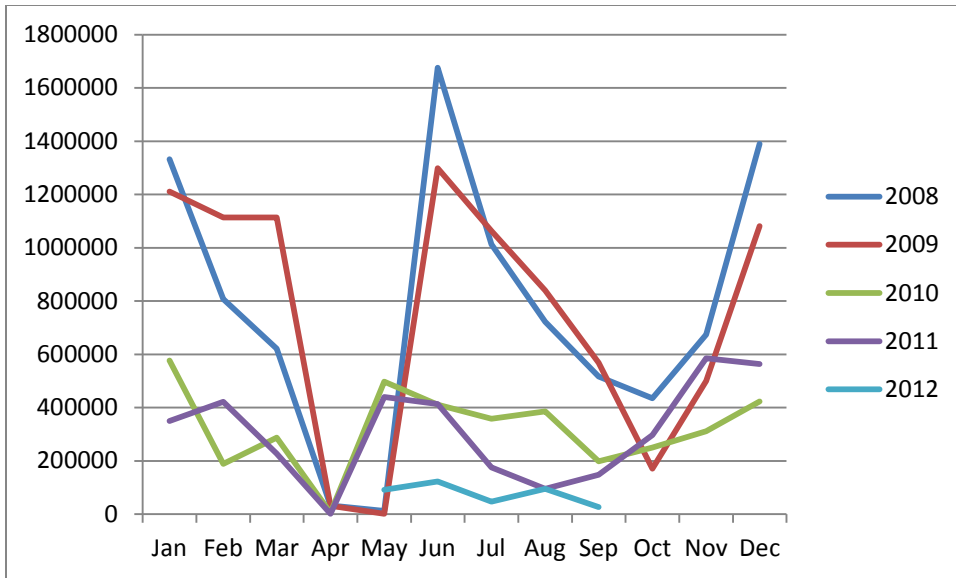


Figure 7: Monthly cod landings for vessels from 30 to less than 50 ft.

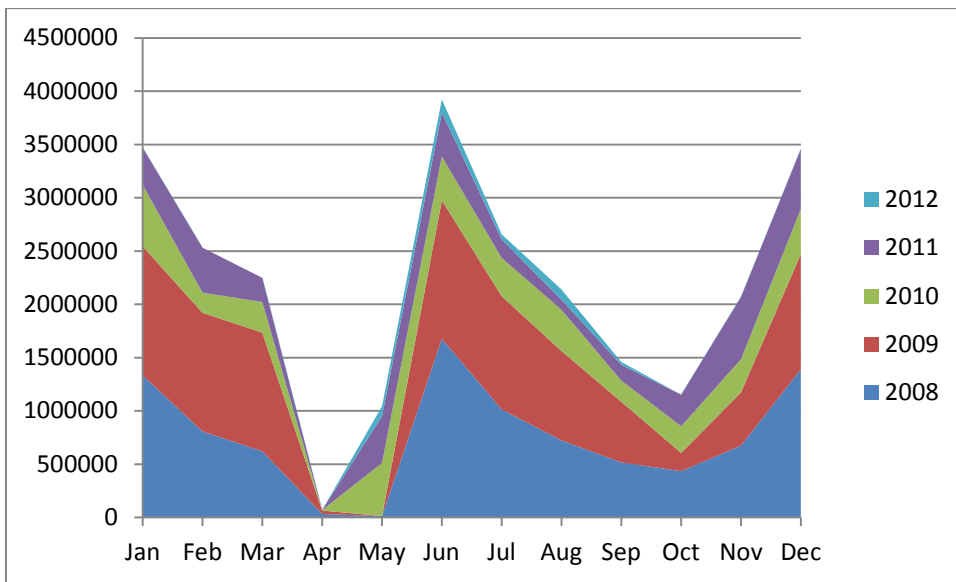


Figure 8: Cod stacked monthly landings for vessels from 30 to less than 50 ft.

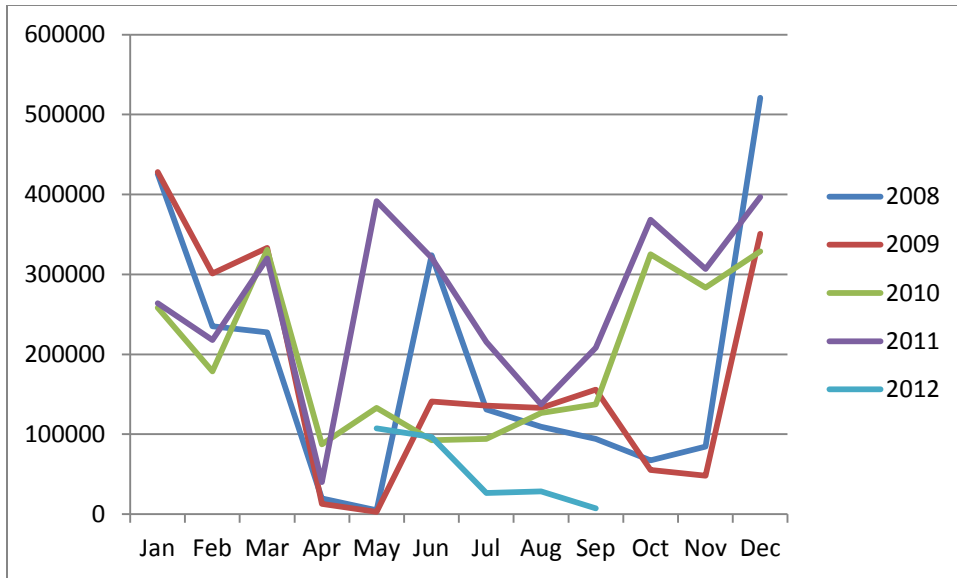


Figure 9. Monthly cod landings for vessels from 50 to less than 75 ft.

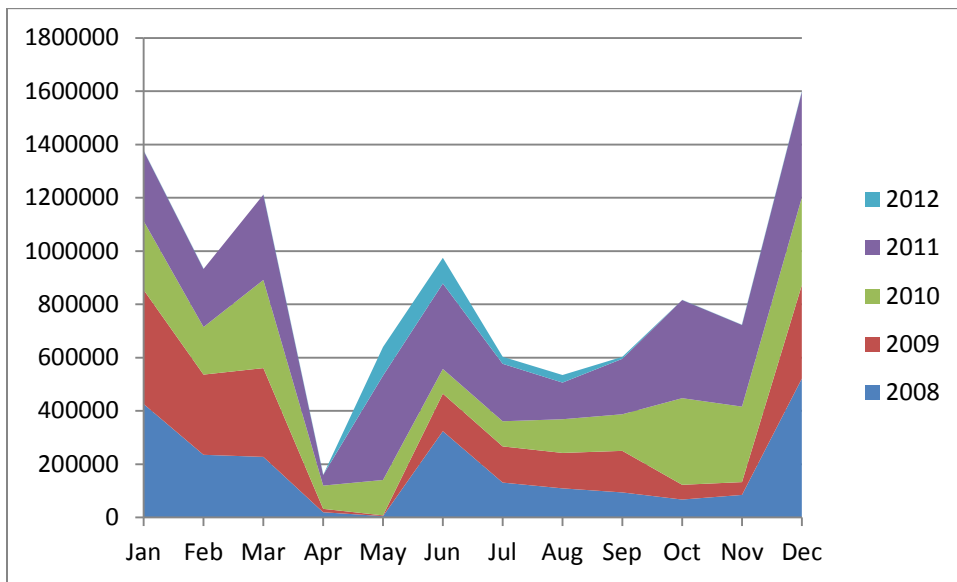


Figure 10: Cod stacked monthly landings for vessels from 50 to less than 75 ft.

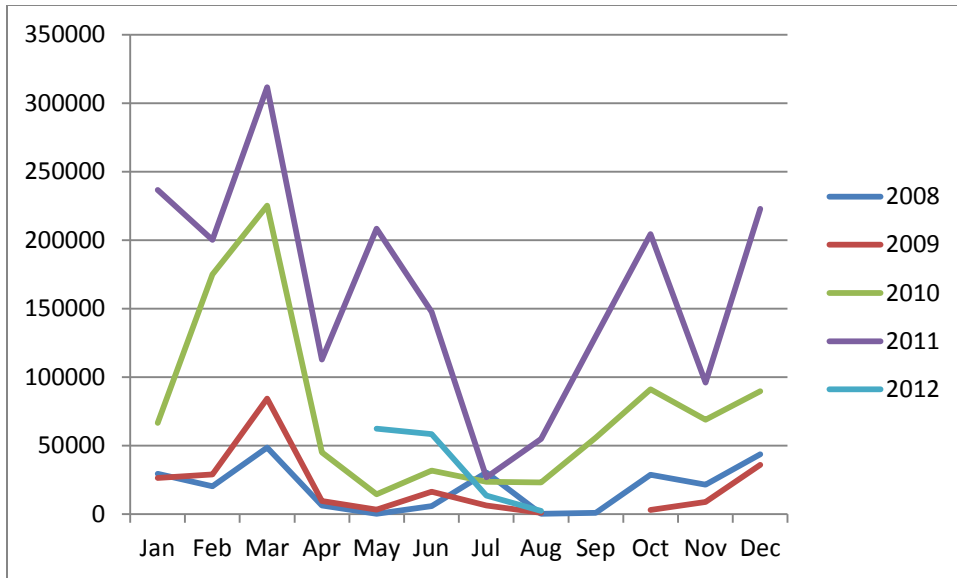


Figure 11: Monthly cod landings for vessels from 75 and over.

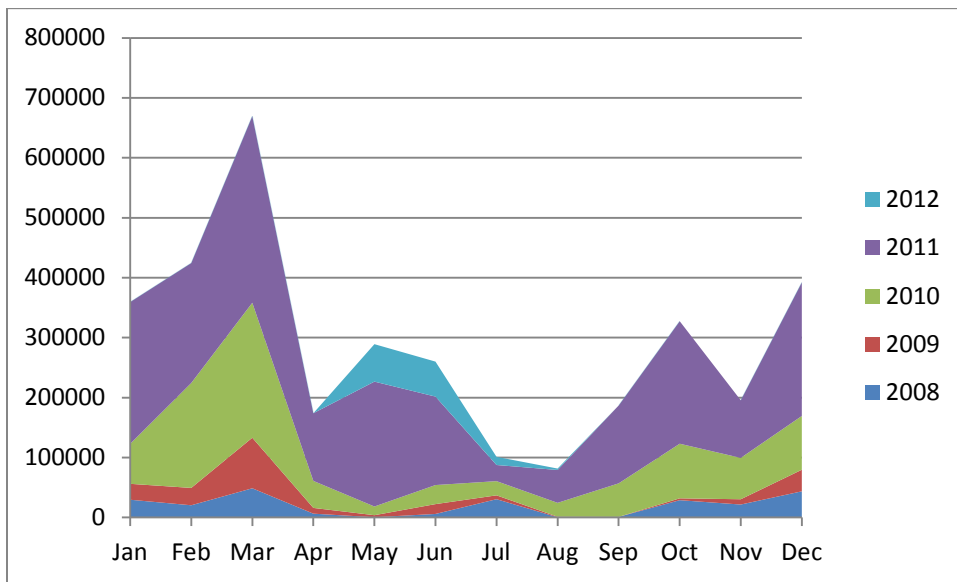


Figure 12: Cod stacked monthly landings for vessels from 75 ft and over.

*Haddock landings in SA 514*

Haddock landings declined between 2008 and 2009 and increased after sector implementation; the post-sector landings were higher than those observed in the 1990s (Figure 13). Haddock landings by vessels less than 30 ft, are relatively low in comparison to the other size classes and it is hard to detect changes in landings; however, there was a peak in 2008. Haddock landings by vessels between 30 and less than 50 ft, also peaked in 2008; all other years had similar landings



Draft  
October 1, 2012

with a slight increase observed in 2011. Haddock landings by vessels between 50 and less than 75 ft increase after 2010 and are higher than landings in the 1990s. The same can be said for vessels 75 ft and over. Haddock landings have increased over time (Figure 14). The percent of landings by size class increased only for vessels 75 ft and over; the other vessel sizes have either decreased or remained around the same level (Table 2). Haddock landings show a peak around February to March (Figures 15, 17, 19 & 21). Monthly landings for larger vessels appear to increase after 2010 (Figures 16, 18, 20 & 22).

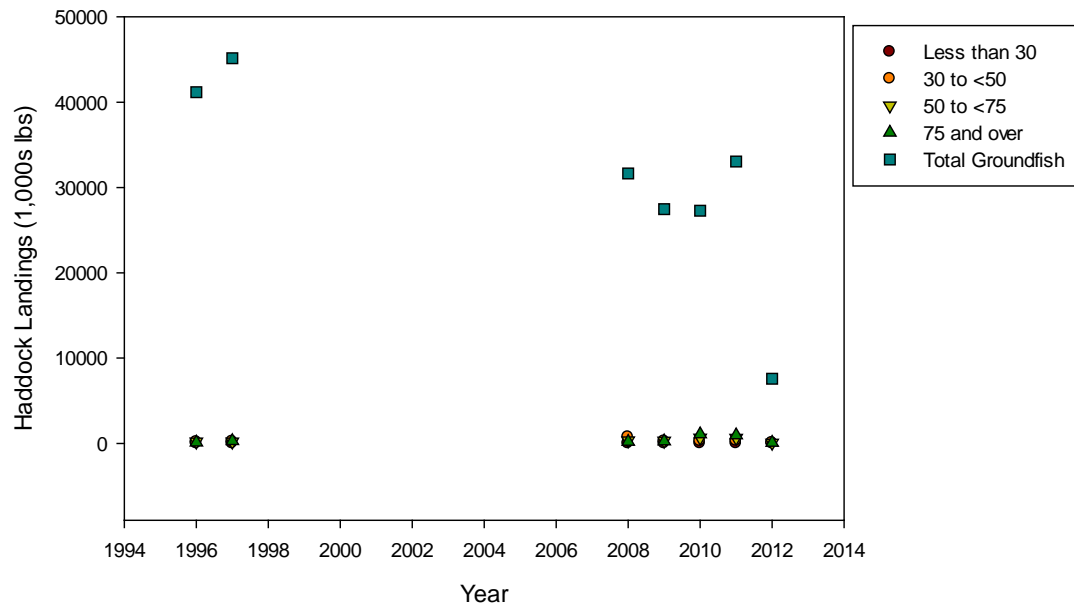


Figure 13. Haddock landings shown by vessel size class. Total groundfish landings included for comparison.

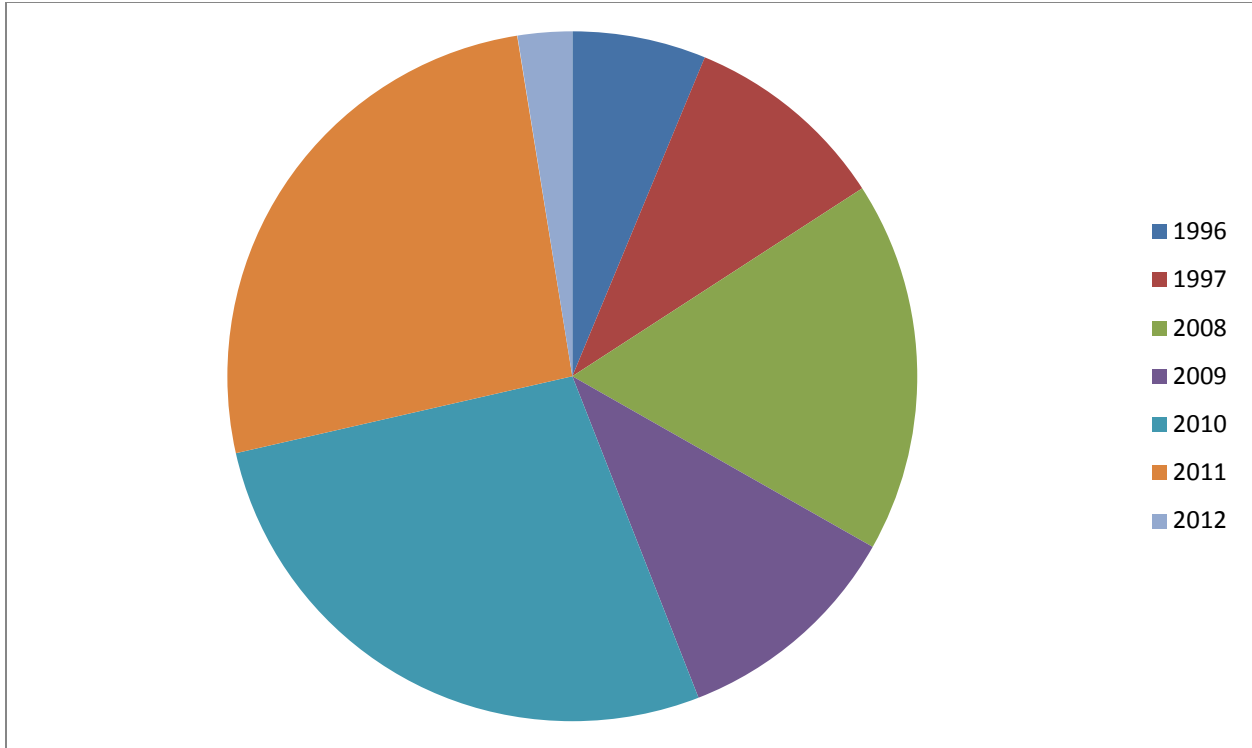


Figure 14: Total haddock landings by year

Vessel Size Class	1996	1997	2008	2009	2010	2011	2012
less than 30	0.2%	0.4%	0.03%	0.03%	0.01%	0.00%	0.1%
30 to less than 50	34.4%	31.2%	58.6%	31.5%	13.3%	16.1%	31.5%
50 to less than 75	41.4%	27.9%	26.2%	38.1%	32.8%	33.7%	30.5%
75 and over	23.9%	40.5%	15.1%	30.4%	54%	50.3%	37.9%

Table 2. Total haddock landings as a percentage of total groundfish landings.

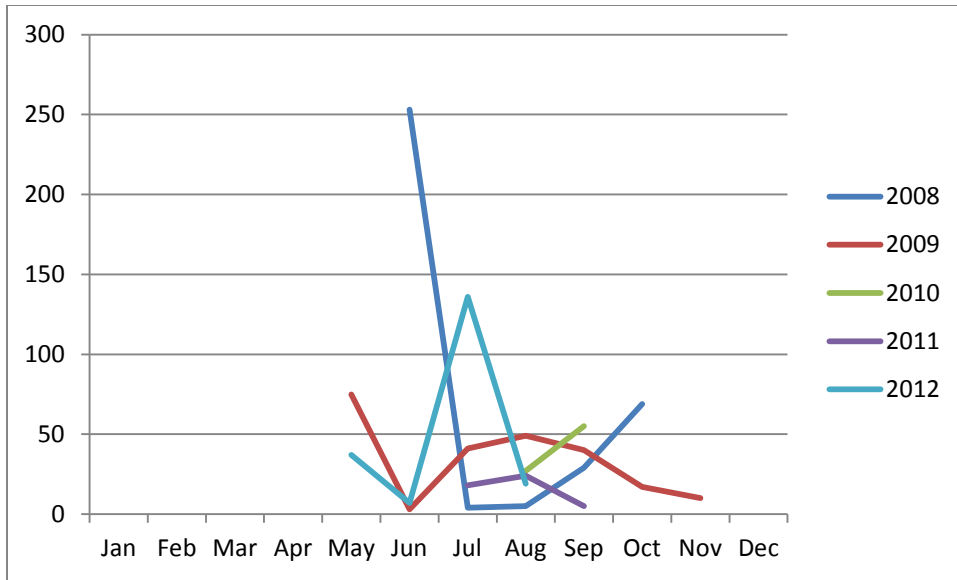


Figure 15. Monthly haddock landings for vessels less than 30 ft.

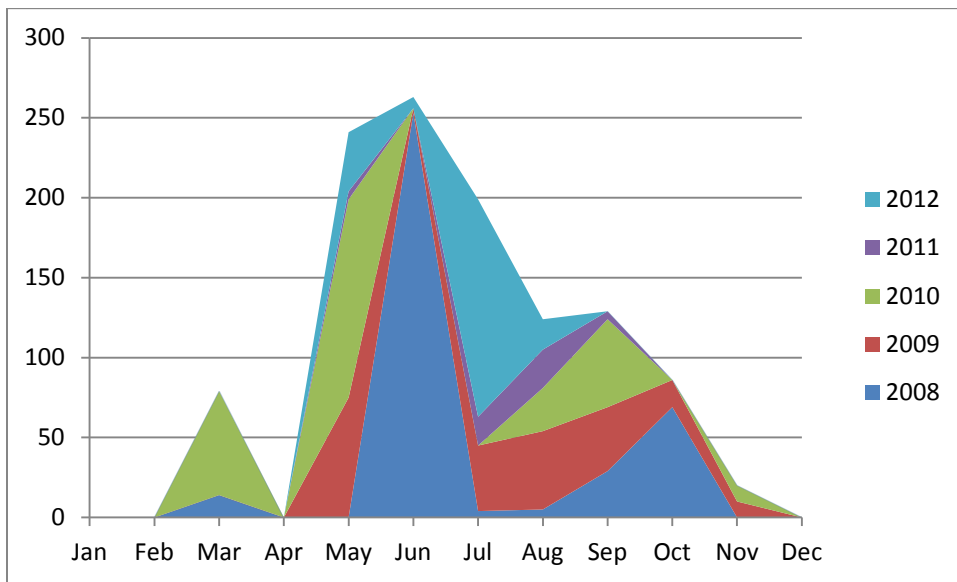


Figure 16: Haddock stacked monthly landings for vessels less than 30 ft.

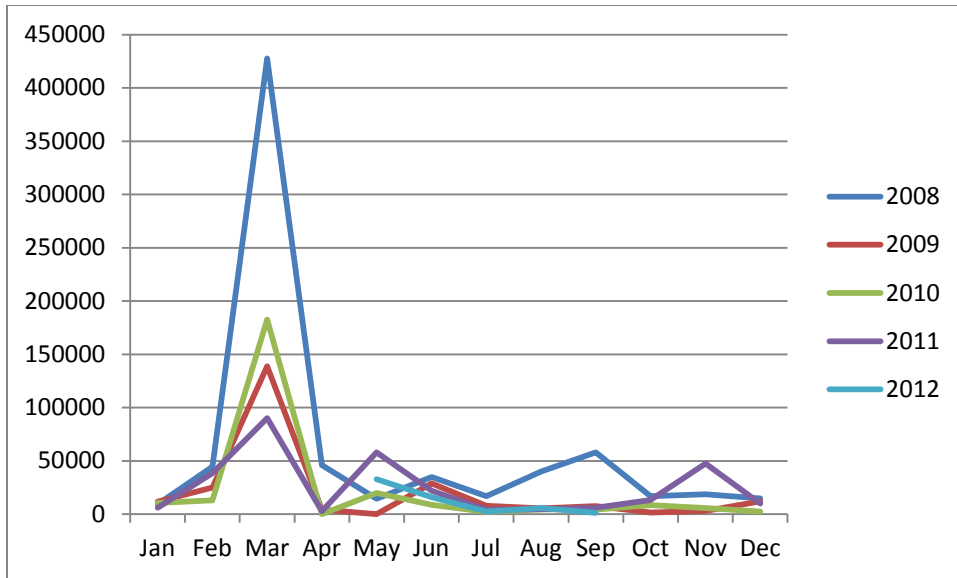


Figure 17. Monthly haddock landings for vessels 30 to less than 50 ft.

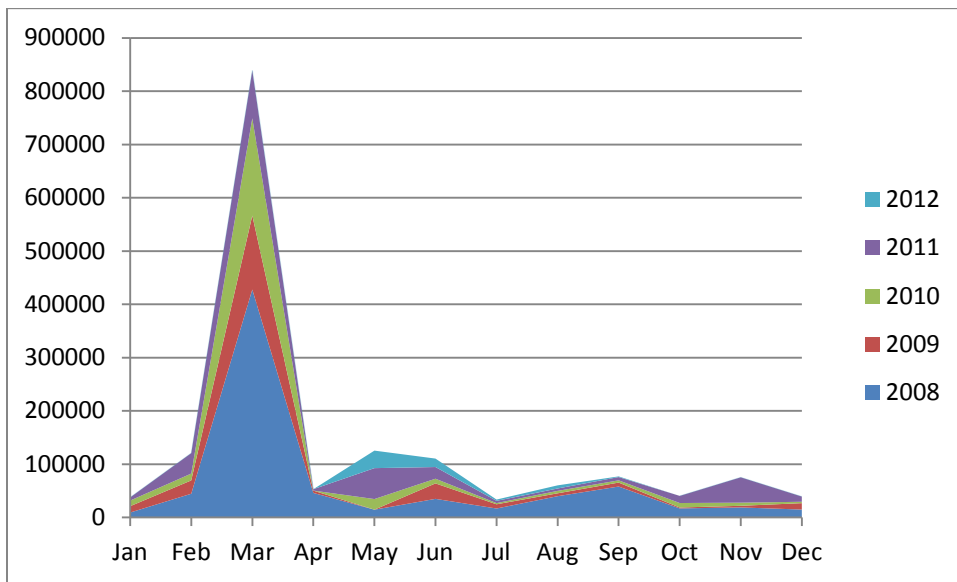


Figure 18: Haddock stacked monthly landings for vessels from 30 to less than 50 ft.

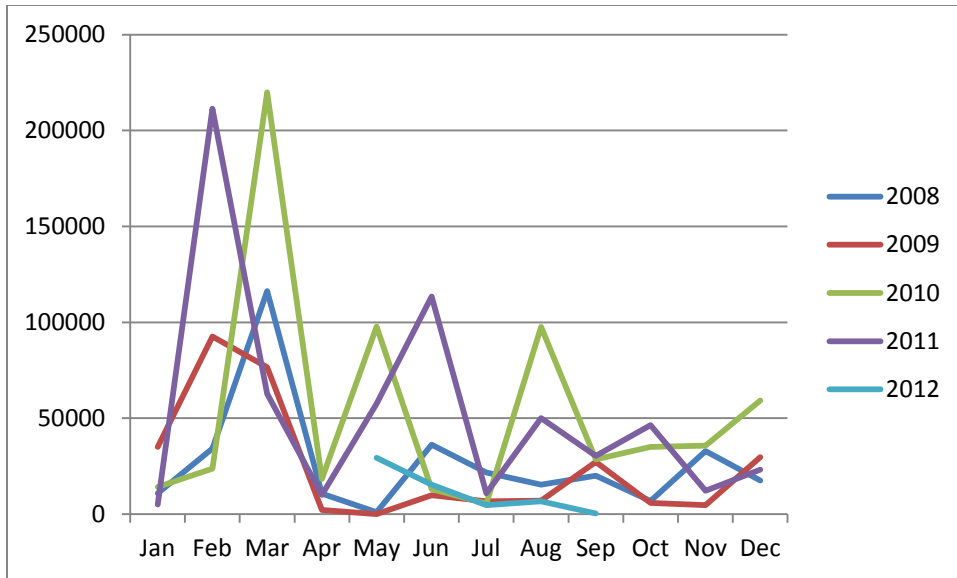


Figure 19. Monthly haddock landings for vessels 50 to less than 75 ft.

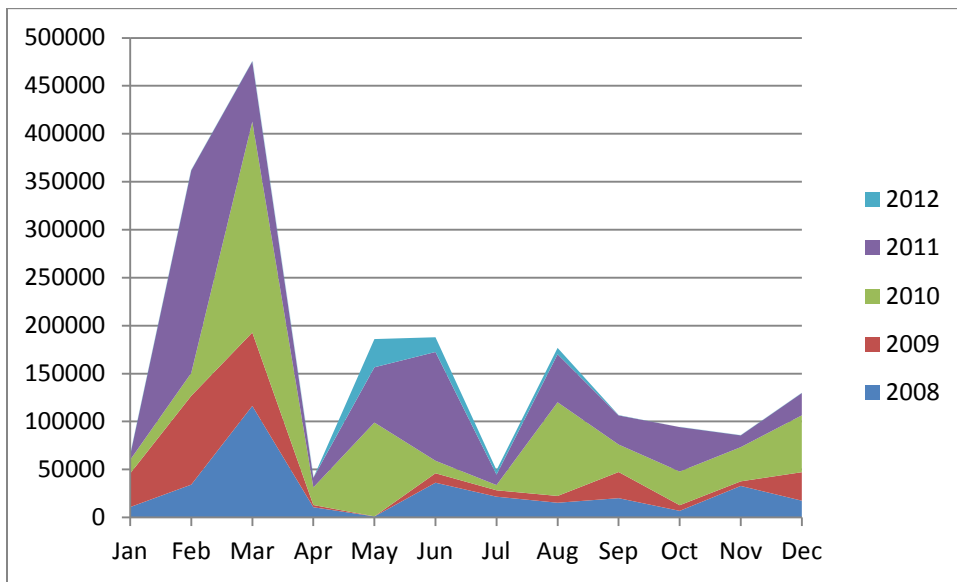


Figure 20: Haddock stacked monthly landings for vessels from 50 to less than 75 ft.

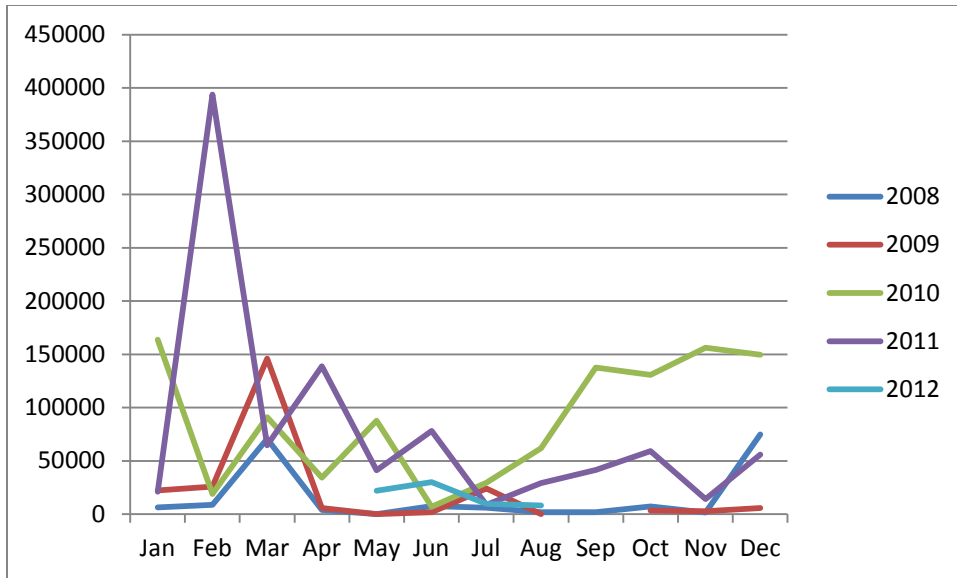


Figure 21. Monthly haddock landings for vessels 75 ft and over.

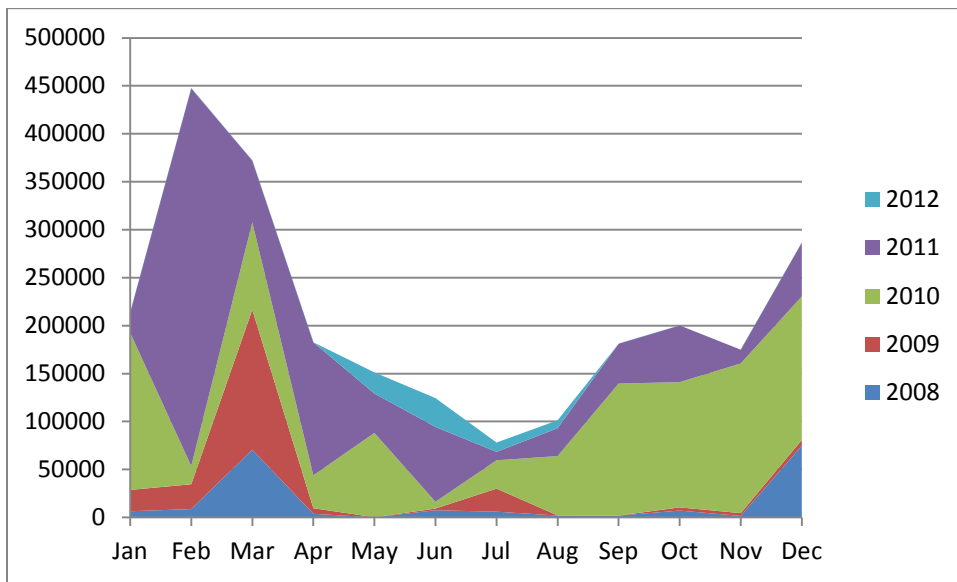


Figure 22: Haddock stacked monthly landings for vessels from 75 ft and over.

*Pollock landings in SA 514*

Pollock landings declined between 2008 and 2009 and increased after sector implementation; the post-sector landings were higher than those observed in the 1990s (Figure 23). Pollock landings by vessels less than 30 ft, are relatively low in comparison to the other size classes but FY2012 has the highest landings followed closely by 2008. Pollock landings by vessels between 30 and less than 50 ft, peaked in 2008; all other years had similar landings with a slight increase

observed in 2011. Pollock landings by vessels between 50 and less than 75 peaked in 2008 and showed a slight increase after sectors but recent years were higher than landings in the 1990s. The peak in landings for vessels 75 and over was in 2011; all recent catches were higher than those observed in the 1990s. Pollock landings have varied over time with two peaks evident in 2008 and 2011 (Figure 24). Vessels 75 ft and over show an increase in the percent of landings after 2010; smaller vessels show a decrease except for those between 50 ft to less than 75 ft, which increased in 2010 but returned to typical level in following years (Table 3). Vessels less than 30 ft appear to only catch pollock in the first half of the fishing year (Figure 25). Pollock landings for vessels between 30 and less than 50 ft peak between November and December; 2008 landings were the highest in the time series examined (Figure 27). Vessels between 50 and less than 75 ft did not show huge differences between years (apart from large amount of landings in 2008 in November) but after sector implementation, landings may be marginally higher between May and December (Figure 29). Post sector years land more pollock each month, on vessels 75 ft and over, than pre-sectors apart from in 2008 when landings in November to December were much higher (Figure 31). Monthly landings were typically higher pre-sectors for smaller vessels, however, FY 2012 appears to be the exception for vessels less than 30 ft (Figure 26 & 28). A shift to higher monthly landings begins to occur for the majority of months for vessels over 50 ft but FY2008 dominates winter landings (Figures 30 & 32).

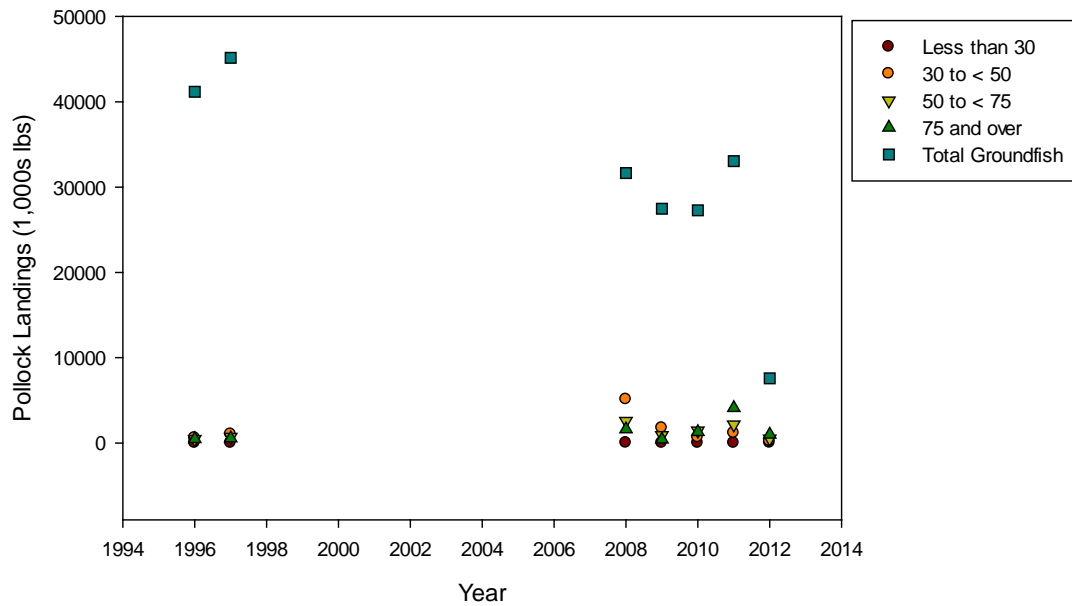


Figure 23. Total Pollock landings by vessel size class. Total groundfish landings included for comparison.

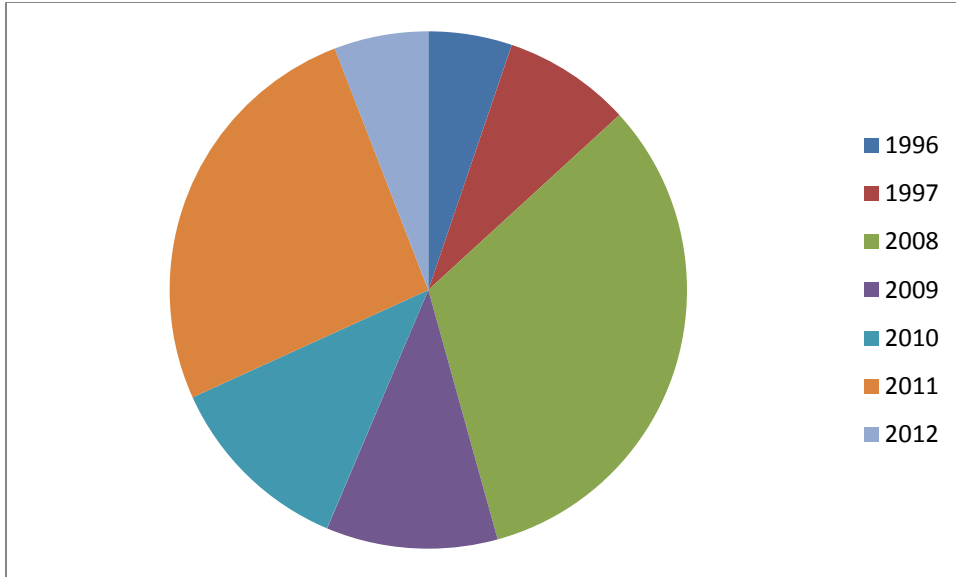


Figure 24. Pollock landings by year.

Year	1996	1997	2008	2009	2010	2011	2012
less than 30	0.03%	0.02%	0.02%	0.1%	0.02%	0.01%	0.1%
30 to less than 50	39.0%	45.1%	54.9%	57.2%	19.3%	15.5%	12.2%
50 to less than 75	30%	30.8%	27.7%	29.5%	42.6%	29.0%	29.5%
75 and over	31%	24.1%	17.4%	13.3%	38.0%	55.5%	58.2%

Table 3. Percent of pollock landings by size class.

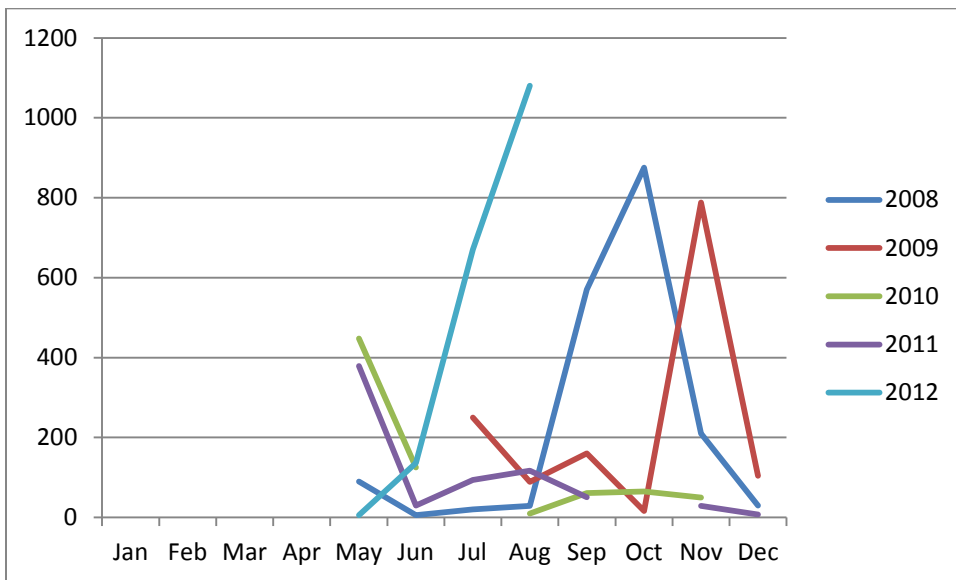


Figure 25. Monthly Pollock landings for vessels less than 30 ft.



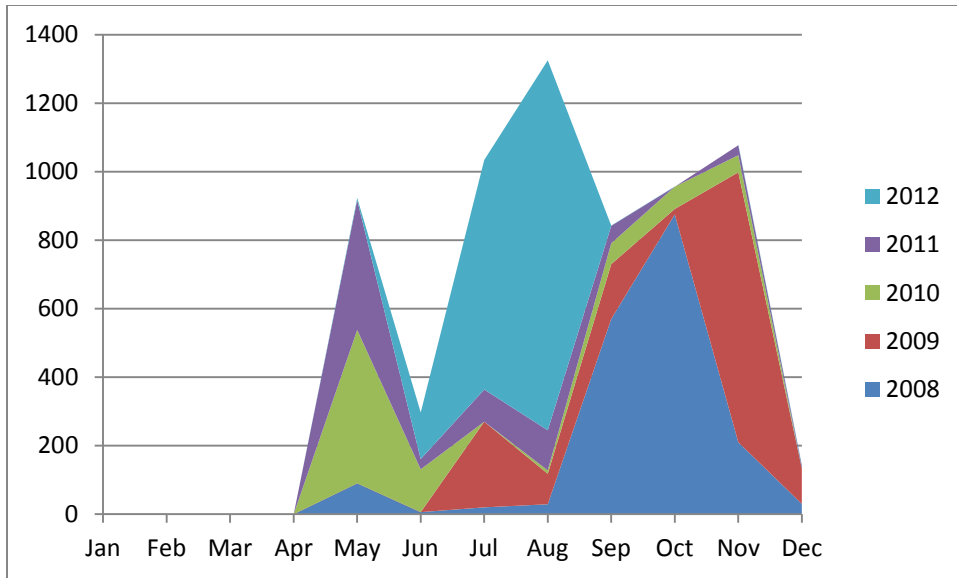


Figure 26: Pollock stacked monthly landings for vessels less than 30 ft.

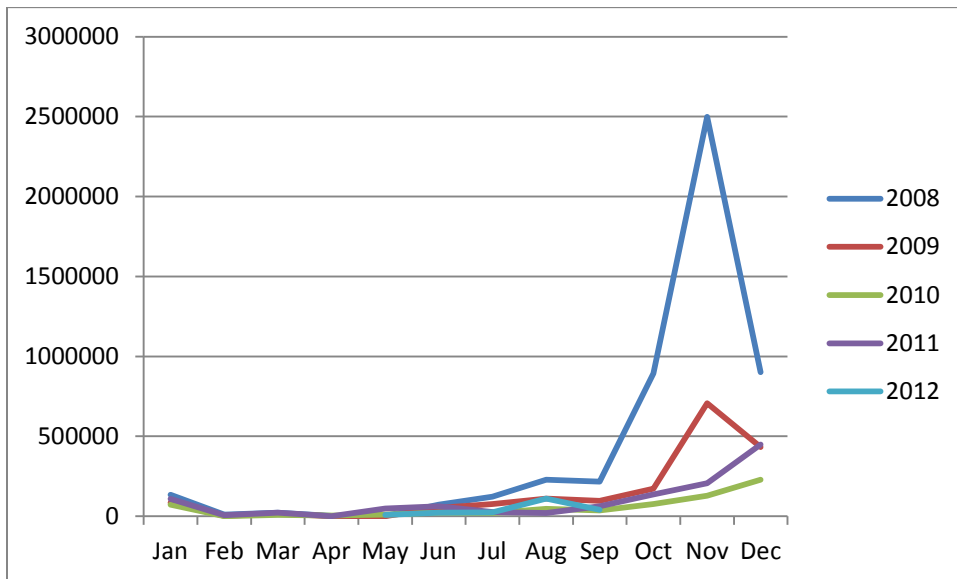


Figure 27. Monthly Pollock landings for vessels 30 to less than 50 ft.

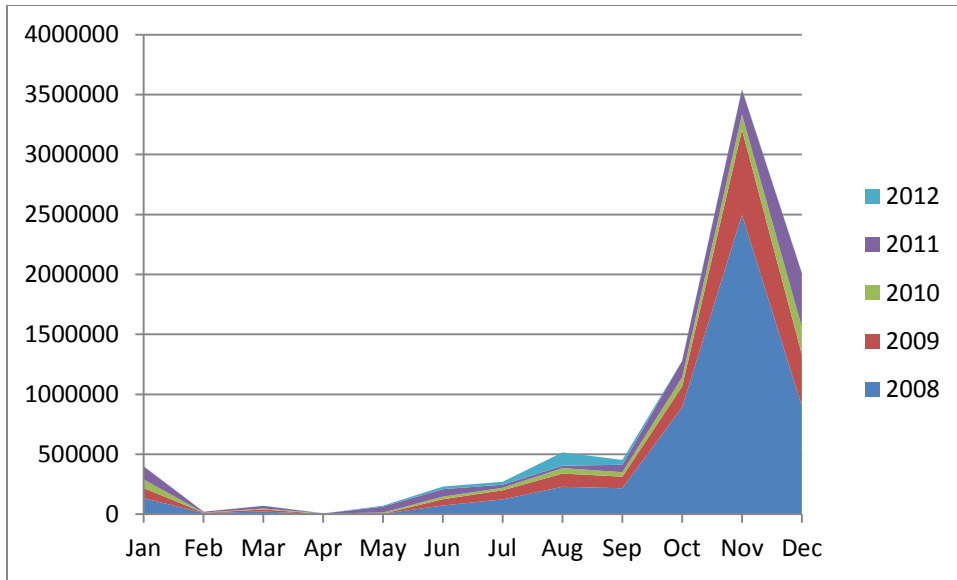


Figure 28: Cod stacked monthly landings for vessels from 30 to less than 50 ft.

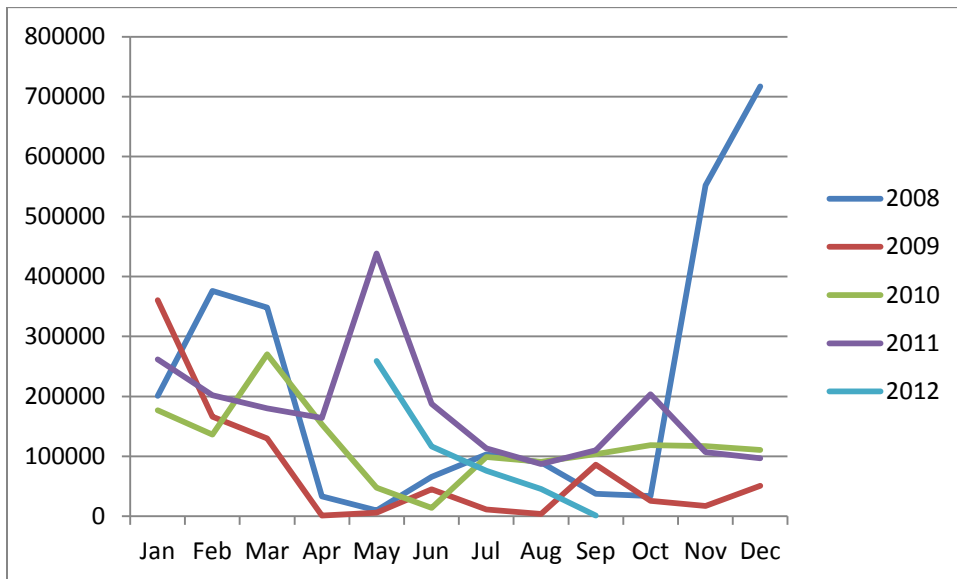


Figure 29. Monthly Pollock landings for vessels 50 to less than 75ft.

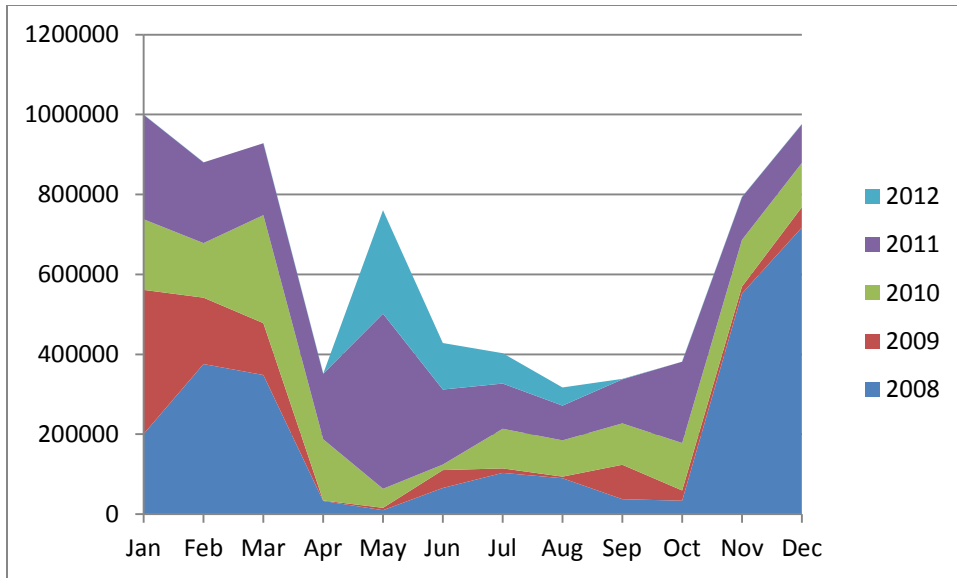


Figure 30: Pollock stacked monthly landings for vessels from 50 to less than 75 ft.

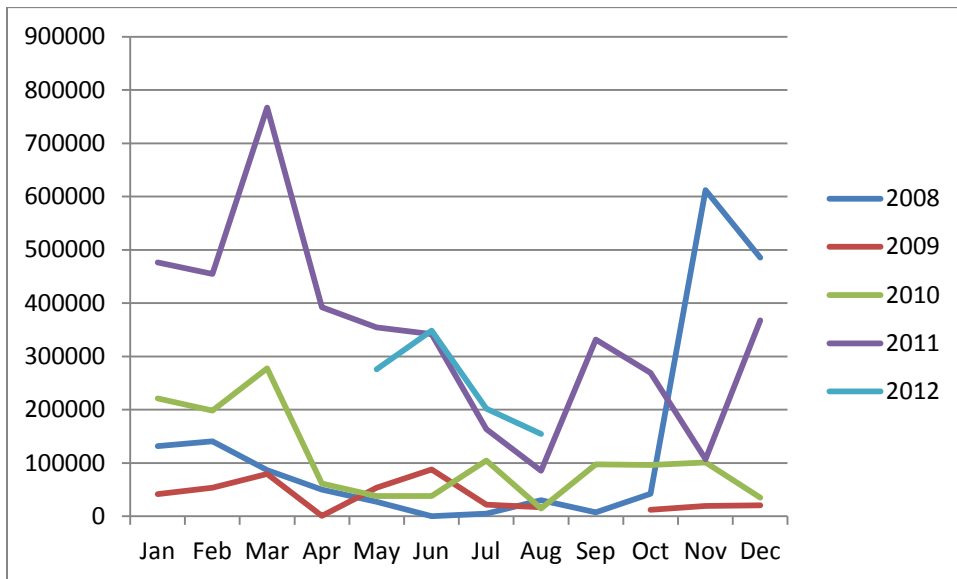


Figure 31. Monthly Pollock landings for vessels 75 ft and over.

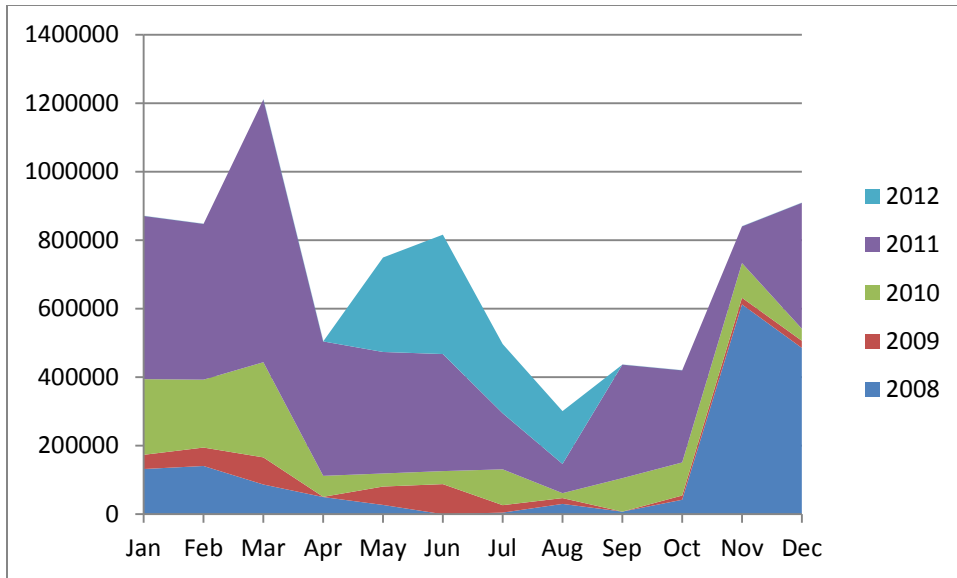


Figure 32: Pollock stacked monthly landings for vessels 75 ft and over.

#### *Trip Numbers and Primary ports*

The number of trips that landed cod, across all size vessels, within SA 514, appears to have decreased after sector implementation but this lower level of trips was also observed in 1997 (Figure 33). The number of trips per pound of landed cod was examined in groups; a number of landings groups showed an increase in the number of trips landing cod post sectors (Table 4). For example, trips landing over 3200 lbs of cod showed a large increase. Haddock and pollock trips were higher in the later time period but have not shown the same level of decrease as those for cod within the same time period (Figure 33). Primary port was examined, by fishing year, to detect any regional shift in landings from SA 514. Gloucester has remained the dominant port for groundfish landings from SA 514, averaging 42% (Figures 33 – 40). Other ports have varied over time. For example, New Bedford has been a relatively minor port for this SA, averaging 7% of groundfish landings. Its lowest year was in 2008 and it peaked in 2010 but has remained around its average in both time periods.

Cod Landings classes (lbs)	1996	1997	2008	2009	2010	2011	2012
0 to less than 400	7294	3784	2594	2360	1919	2769	1709
400 to less than 800	1493	886	2272	2776	862	1344	300
800 to less than 1200	804	521	2888	6352	763	818	84
1200 to less than 1600	433	341	934	274	367	431	35
1600 to less than 2000	296	273	1532	952	278	280	16
2000 to less than 2400	218	132	185	74	185	207	11
2400 to less than 2800	162	115	596	407	162	150	5
2800 to less than 3200	125	134	118	21	100	98	9
3200 and over	614	369	438	227	620	653	42

Table 4: Number of trips landing cod, classified by pounds landed.

*Conclusions*

There appears to be a change in landings for some vessel size classes after 2010, however, it is very difficult to isolate the sole cause for this as it is confounded by population dynamics and fish behavior. The comparison with landings from the late 1990s indicates that the observed differences over a short time period (2008 – 2012) are not abnormal when put into a longer time frame; total groundfish landings are lower than in the late 1990s. For individual species, pre and post-sectors overlap for some of the metrics examined here and are typically on par with or below those in the late 1990s. The increase in the number of trips landing cod could reflect more of a response to fish behavior, e.g. aggregation, than to removal of trip limits. Cod landings don't show a dramatic increase after 2010; 2009 was the biggest year examined. Sectors may have influenced short term fishing behavior but when examined across a longer time frame, they do not appear to have had a significant effect on fishing in SA 514.

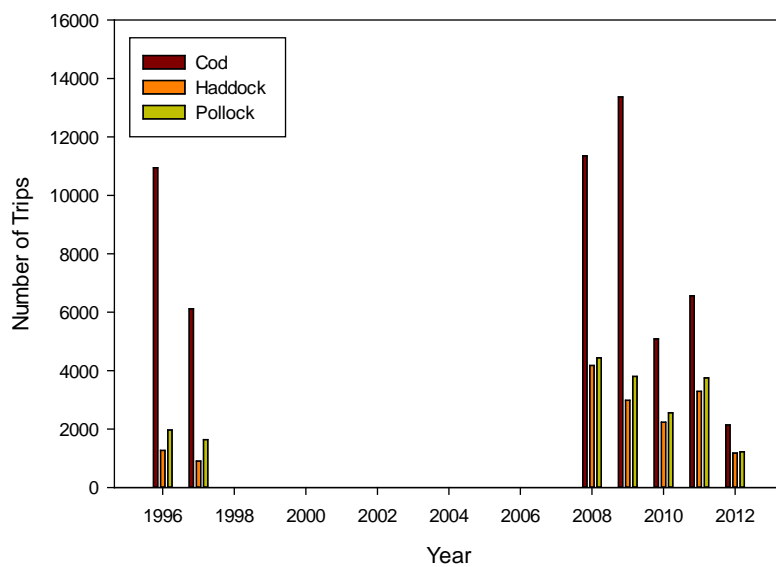


Figure 33. Annual trips landing cod, haddock or Pollock for all vessel sizes.

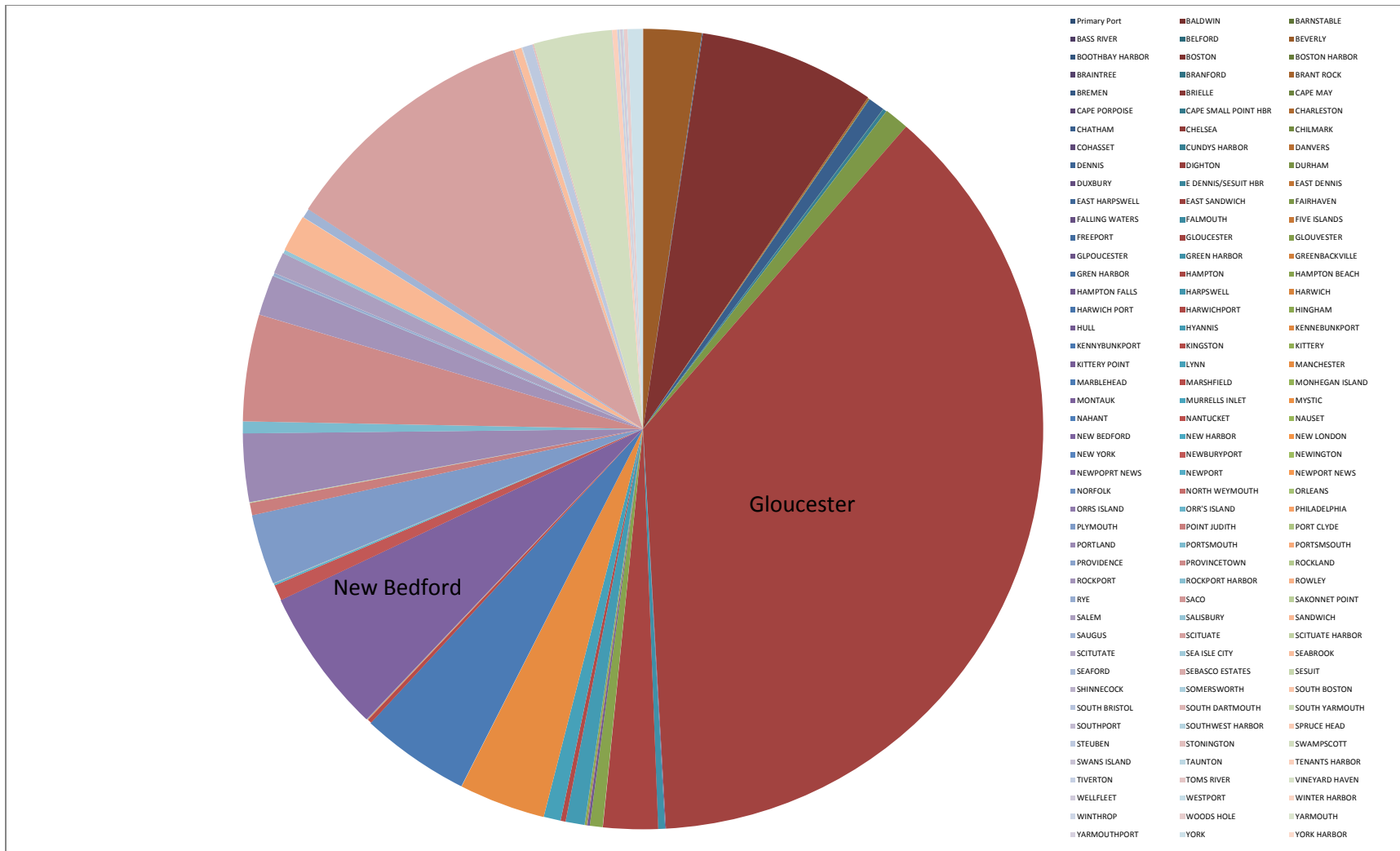


Figure 34. Landings by primary port for FY 1996 for all vessel sizes.

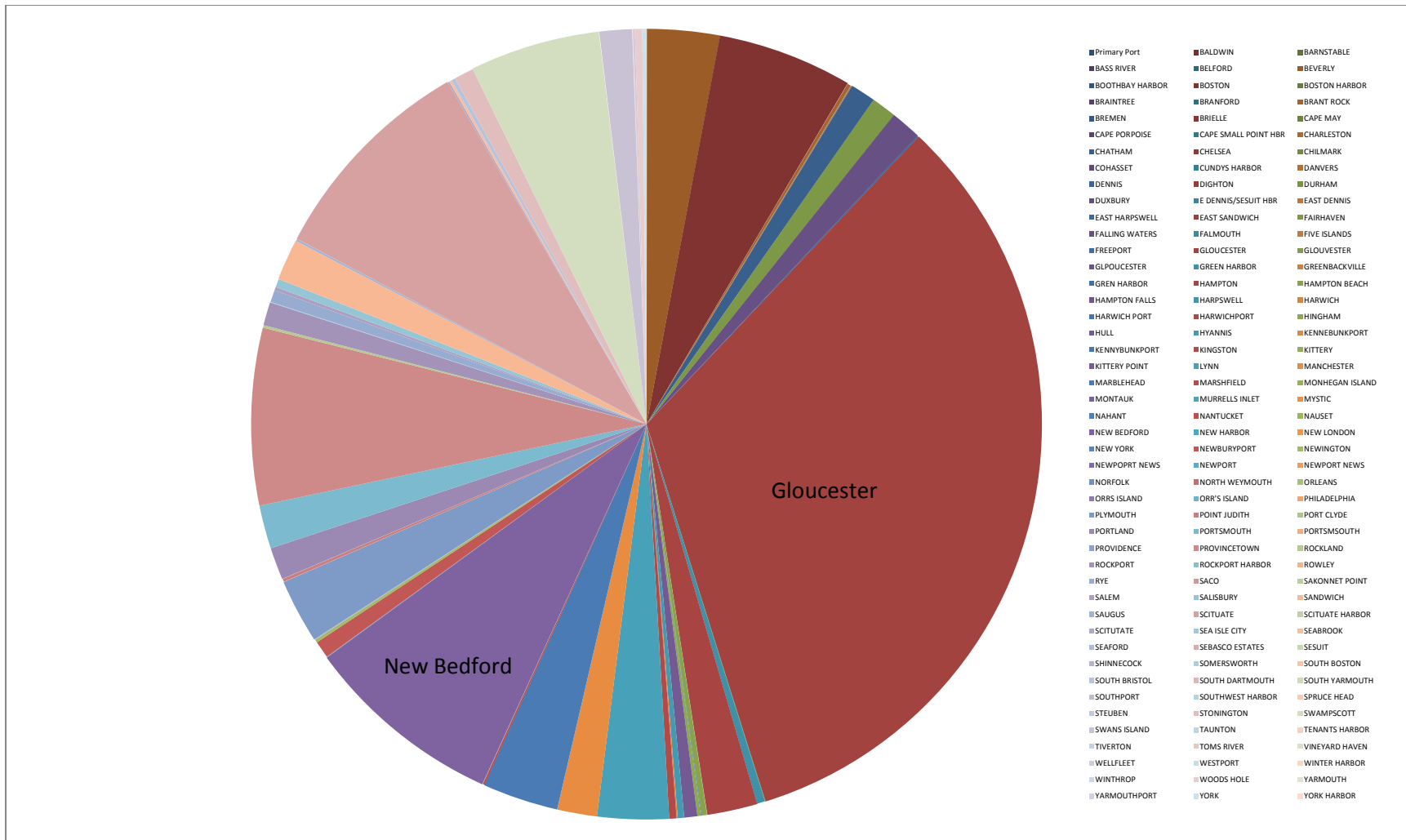


Figure 35. Landings by primary port for FY 1997 for all vessel sizes.

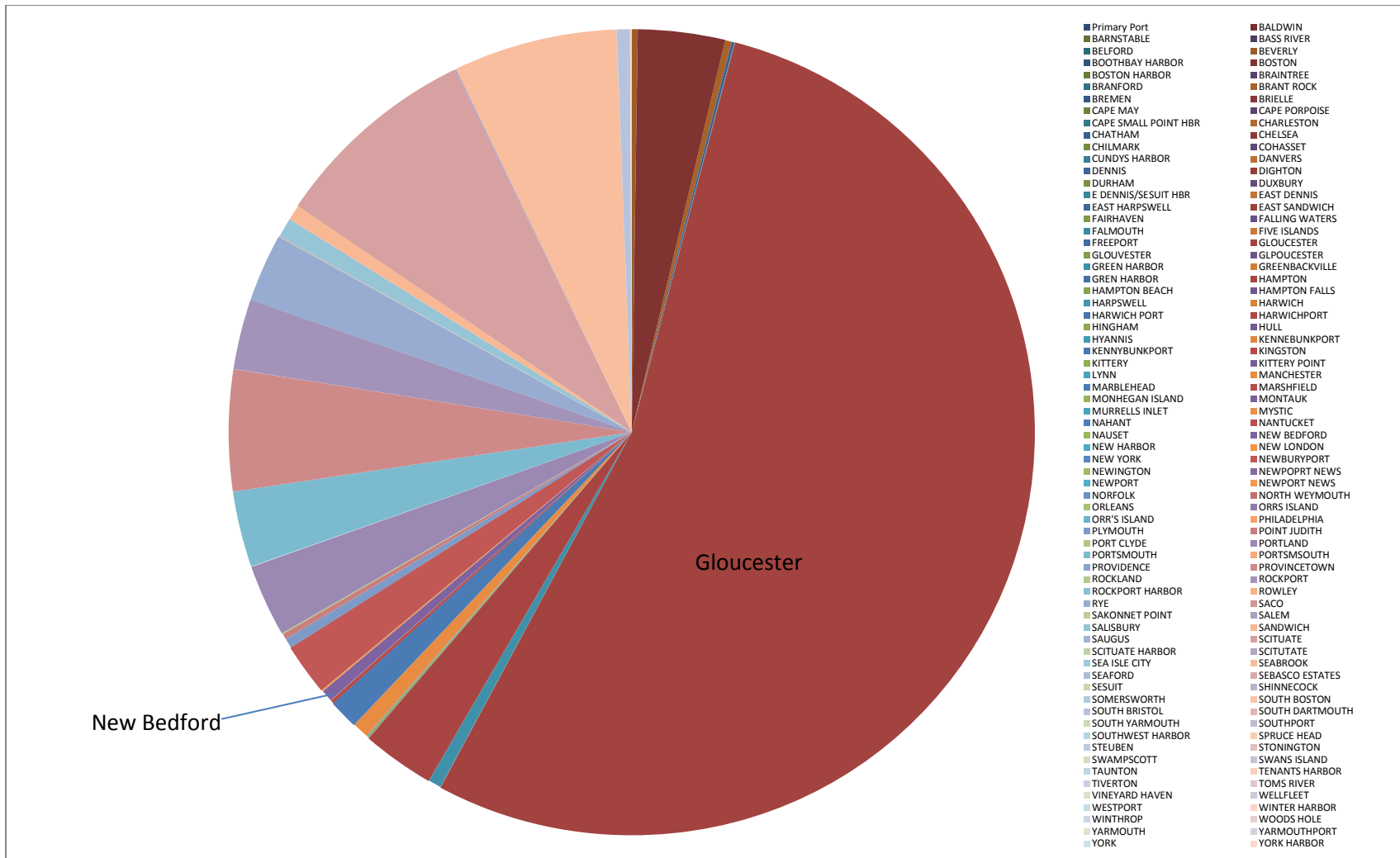


Figure 36. Landings by primary port for FY 2008 for all vessel sizes.



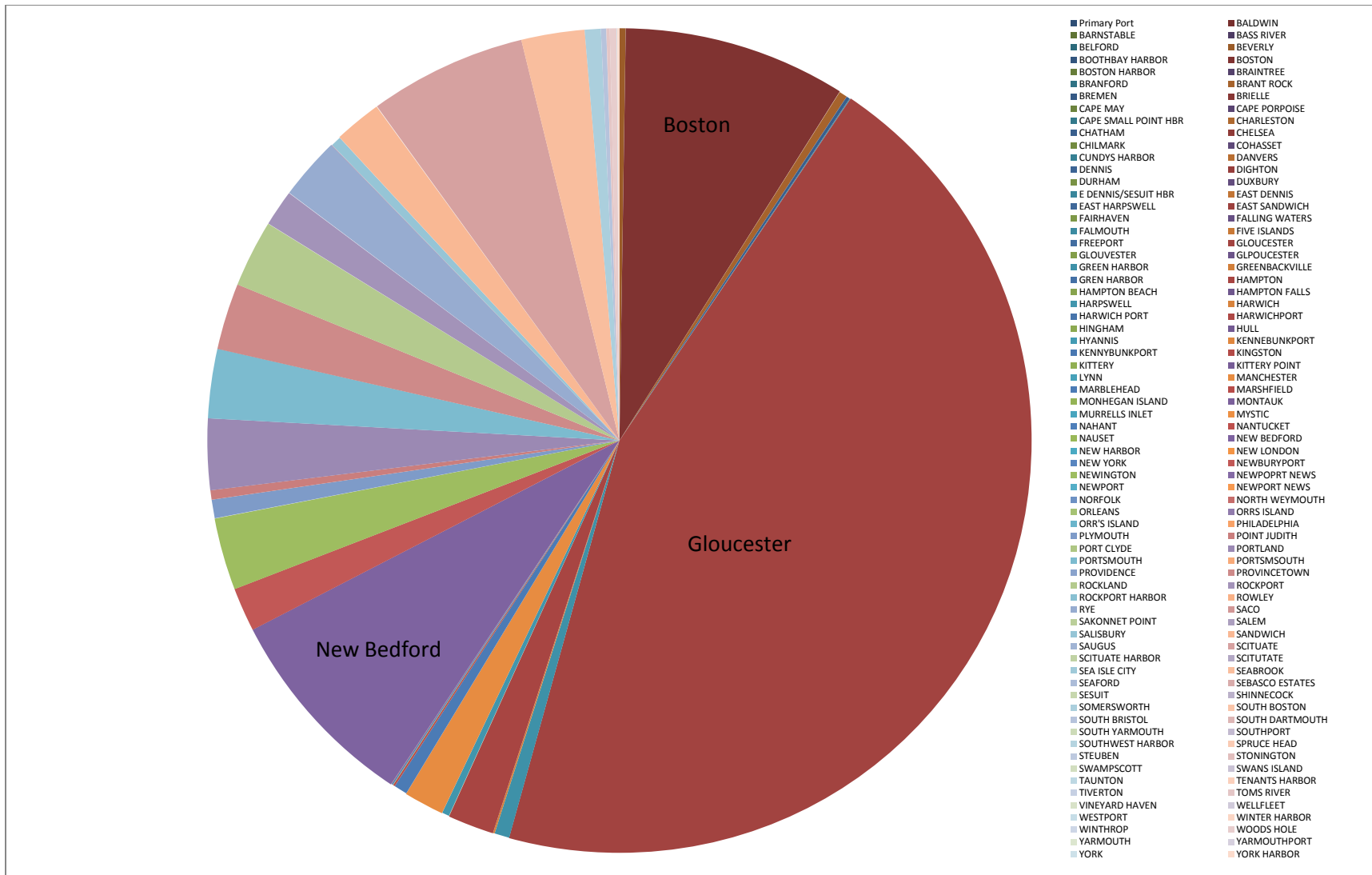


Figure 37. Landings by primary port for FY 2009 for all vessel sizes.

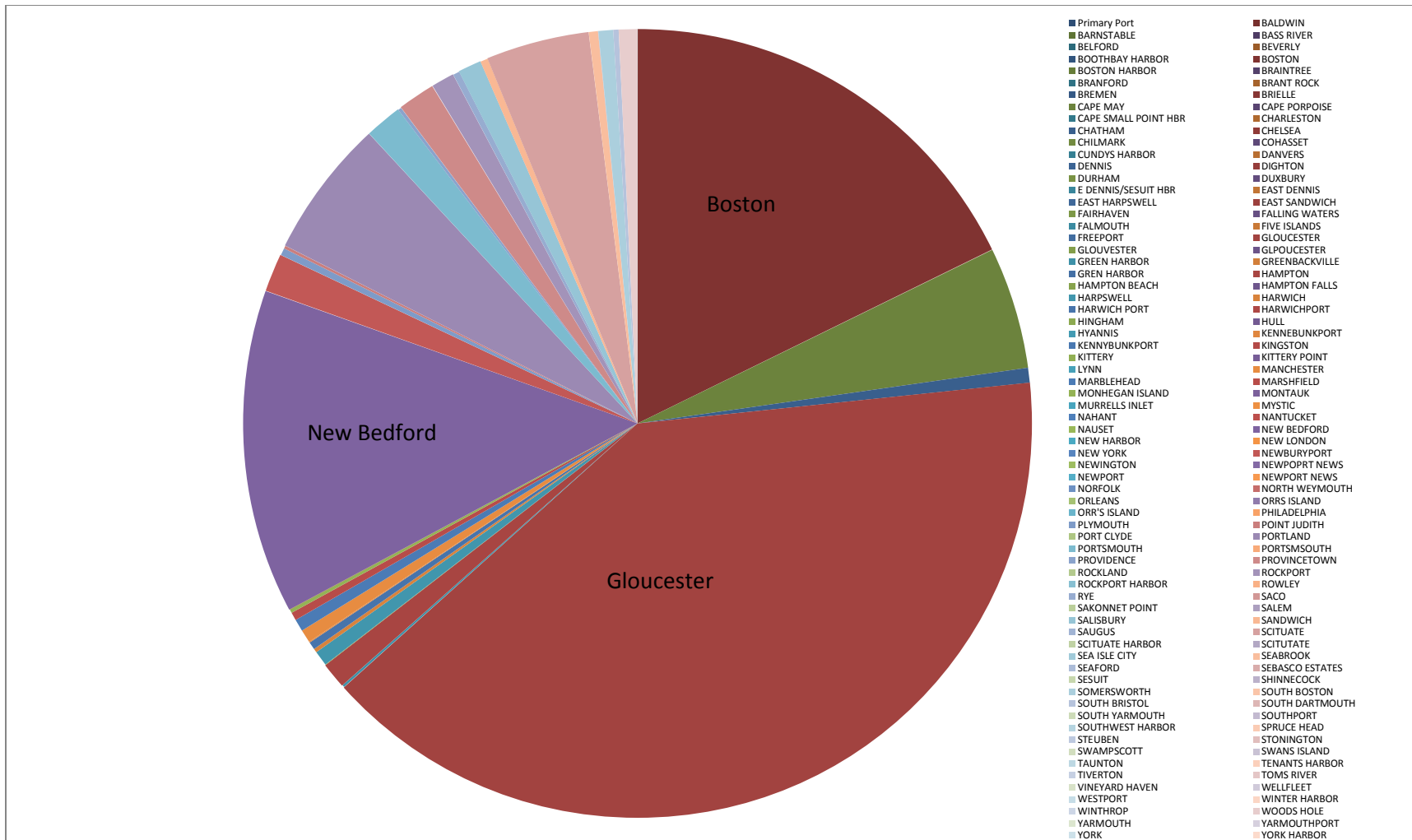


Figure 38. Landings by primary port for FY 2010 for all vessel sizes.

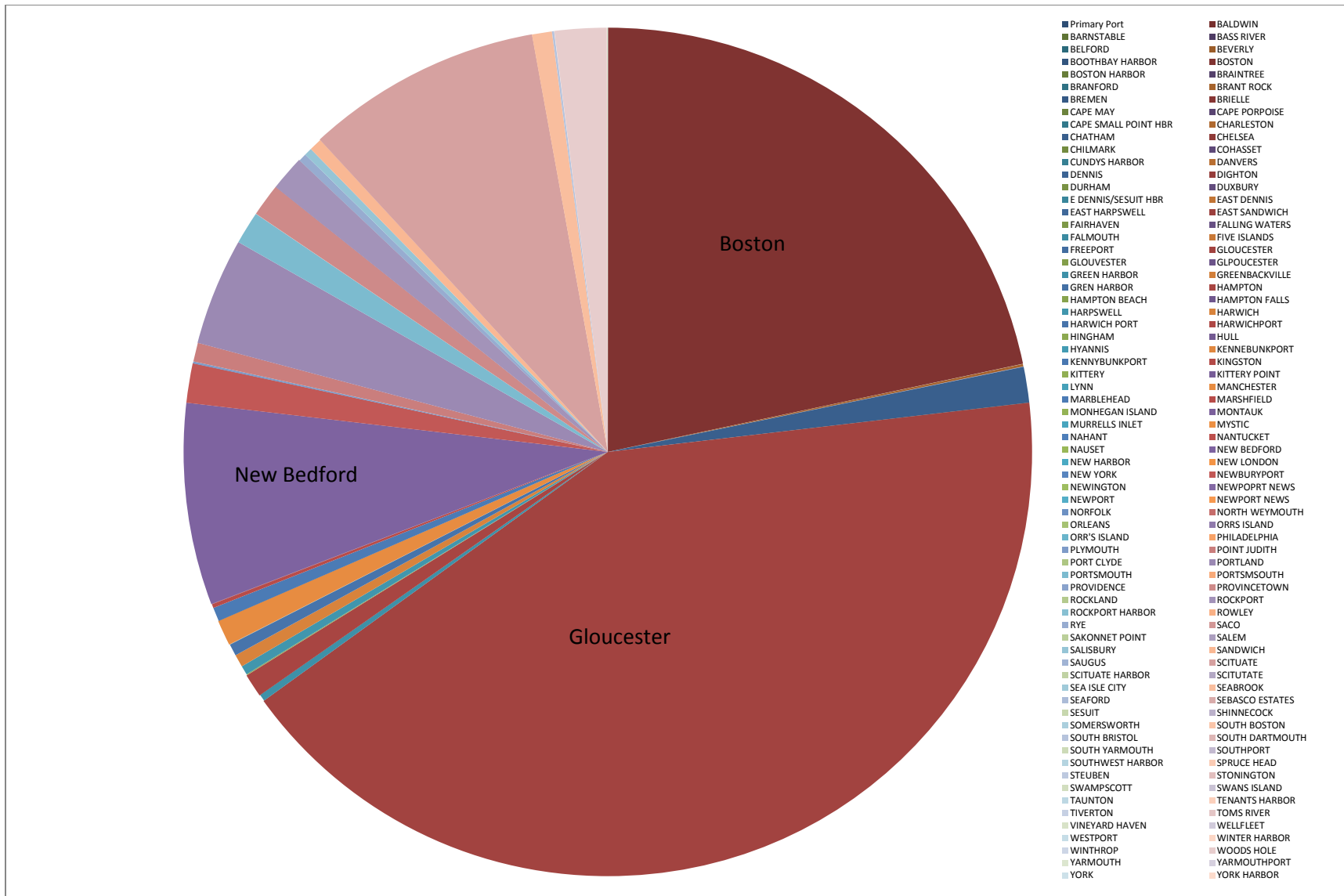


Figure 39. Landings by primary port for FY 2011 for all vessel sizes.

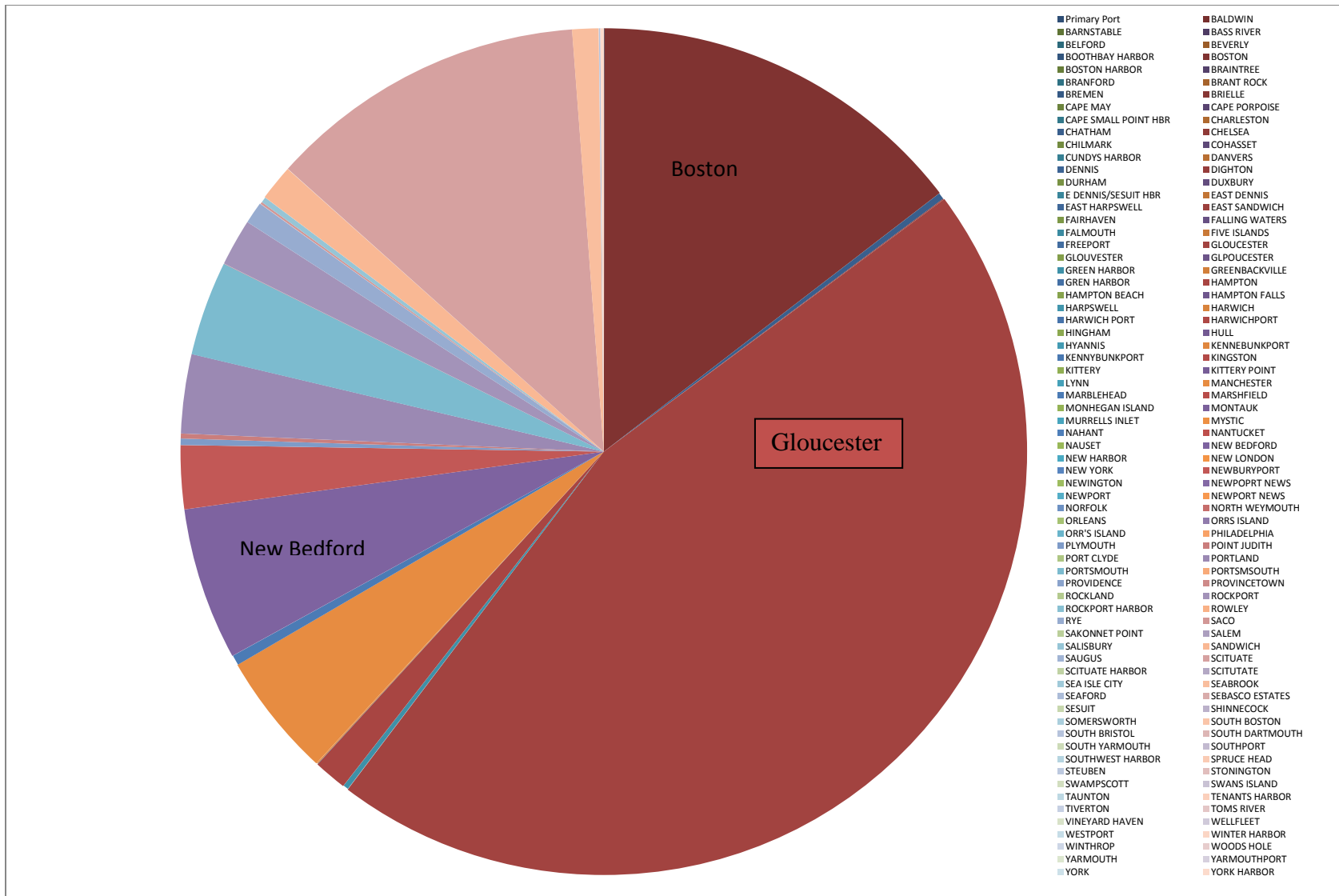


Figure 40. Landings by primary port for FY 2012 for all vessel sizes.