Sablefish Management and Trawl Allocation Attainment Committee (SaMTAAC)

11 October 2018

Agenda B. Biological Implications of Geographic Redistribution of Harvest

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This analysis addresses requests made by the SaMTAAC during June 2018. Regional Regions specified for all regional analyses were:

- 42º N. lat. to US/Canada
- 40º 10’ N. lat. to 42º N. lat.
- 36º N. lat. to 40º 10’ N. lat.
- US/Mex to 36º N. lat.

Specific requests and results are detailed below.

1. To investigate the regional distribution of total fishery landings compared to the regional distribution of survey biomass for sablefish.

   Results are provided in Figure 1, which shows the proportion of total annual fishery landings compared to the proportion to total survey biomass by region. For regions south of the 40º 10’ N management line, the proportion of total fishery landings are less than the estimated proportion of total survey biomass in these southerly regions. In the most northerly area, 42º N to the US/Canada border, the proportion of the total annual fishery landings are larger than the estimated proportion of the total survey biomass in this northerly area by an average of 30% during 2003 through 2017. Conversely, during the same period the southerly regions have, on average, taken fishery landings that are less than the estimated total survey biomass by 7%, 10%, and 14% for the 40º 10’ N. to 42º N., 36º N. to 40º 10’ N., and the US/Mexico border to 36º N., respectively.

   A miss-alignment in fishing effort and estimated survey biomass between regions within the California Current may result in either under- or over-harvesting in a given region. For a species that does not move much, ideally the fishery would take the catch at approximately the same proportion of estimated total survey biomass in each region. The estimated survey biomass in each area can be used to apportion catches between the areas. These data suggest that the sablefish fishery has been fishing harder in the most northerly region than would be preferred given the NWFSC survey swept area biomass estimates, with the potential for localized depletion in the northern area. Sablefish are capable of being highly mobile so a miss-alignment between the spatial distribution of the stock and fisheries catch maybe of lesser concern as fish could move into areas that have been more heavily fished. However, the current understanding of movement rates for sablefish within the California Current is limited, with little data available.

2. To investigate the regional distribution fishery landings by gear.

   Figure 2 shows time series of the proportion of landings by area and gear type. In the most northerly area, 42º N to the US/Canada border, landings are dominated by trawl and hook and line gear, with pot gear increasing from about 5% to 10% of the total regional landings during early years to about 15% during more recent years. A majority of sablefish are landed in this most northerly region. Trawl gears dominate the landings in the region between 40º 10' N. to 42º N., while hook and line gears dominate the landings in the region between 36º N. to 40º 10' N. In the 40º 10' N. to 42º N. region a small fraction of the catch is landed with fixed gears, while sablefish landed with pot and trawl gears take a small fraction in the catch in the region between 36 and 40.10. In recent years trawl landings have declined and pot gears have increased in the 36º N. to 40º 10' N. region. In the most southerly region between the US/Mexico border and 36 º N. trawl caught sablefish dominated the landings during the mid-1990s through the late 2000s, followed by a switch to sablefish landed with fixed gears. A majority of these fixed gear landings use hook and line gear.

3. To investigate the regional and coast-wide trends in the NWFSC West Coast Groundfish Bottom Trawl Survey (WCGBTS) index for sablefish.

   Figure 3 shows the biomass index for each area as well as coast-wide. In the regions between 40º 10' N. to 42º N. and 36º N. to 40º 10' the indices are largely flat. In the region between the US/Mexico border and 36 º N. the index is flat between 2003-2005 followed by declines or largely flat trends through 2017. The index for the region between 42º N to the US/Canada border declines from the start of the time series, remains largely flat between 2008 and 2013, and then increases from 2014 through 2017. The coast-wide index largely follows the trend in the region with the greatest proportion of the biomass, 42º N to the US/Canada border. The increase at the end of the survey time series is due to a strong 2013 cohort that has been observed in the survey data for four years.

4. To investigate the regional and coast-wide trends in the NWFSC West Coast Groundfish Bottom Trawl Survey (WCGBTS) length and age composition data for sablefish.

   Length bins from <18 to 90+ cm were used to summarize the sex-specific length frequencies of the survey catches in each year; the first bin includes all observations less than 18 cm and the last bin includes all fish 90 cm or larger. Unsexed fish were assigned to males and females using a 50:50 sex ratio. The length compositions show modes for age-0 fish (18-30 cm), age-1 fish (30-40 cm) and adults to ~80 cm (Figures 4-8).

   Large cohorts are visible as modes in the coast-wide length compositions, suggesting larger recruitment events during 2008, 2010, 2013, and 2016 (Figure 4). Dimorphic growth is evident, with nearly all sablefish above 70 cm being female.

   The length compositions for the region between 42º N to the US/Canada border show similar patterns to the coast-wide data, except that the 2010 recruitment event does not appear in the data (Figure 5). In the 40º N. to 42º N region only the 2008 cohort clearly appears in the data (Figure 6), while the 36º N. to 40º N. region shows modes for 2006, 2008, and 2013 cohorts but not the 2010 recruitment (Figure 7). The 2010 recruitment only appears in the most southerly region between the US/Mexico border and 36 º N, along with

the recruitment during 2008 (Figure 8). However, the 2013 and 2016 recruitments are not apparent in the region between the US/Mexico border and 36 º N. These data show that recruitment can vary regionally. Generally, fish size tends to decrease moving from north to south (Figures 5-8).

Age distributions from age 0 to age 60 were used to summarize the sex-specific age frequencies of the survey catches in each year; the last bin includes all fish 60 years and older. Approximately one-quarter as many fish were aged as were measured for length.

Coast-wide WCGBTS age distributions show the large numbers of young fish in 2009, 2010, and 2014, as well as more older fish in the population after 2006 (Figure 4). The data for the smaller spatial strata appear noisier (Figures 5-8). However large numbers of young fish appear during 2009, 2010, 2011, and 2014 in the region between 42º N to the US/Canada border, during 2009, 2010, and 2011 in the 40º N. to 42º N region, during 2008, 2009, 2010, 2011, and 2014 in the 36º N. to 40º N. region, and 2009, 2011, 2012, 2013, and 2014 in the region between the US/Mexico border and 36 º N (Figures 5-8). Moving from north to south fish there appear to be fewer of the oldest fish in the population in the south (Figures 5-8).

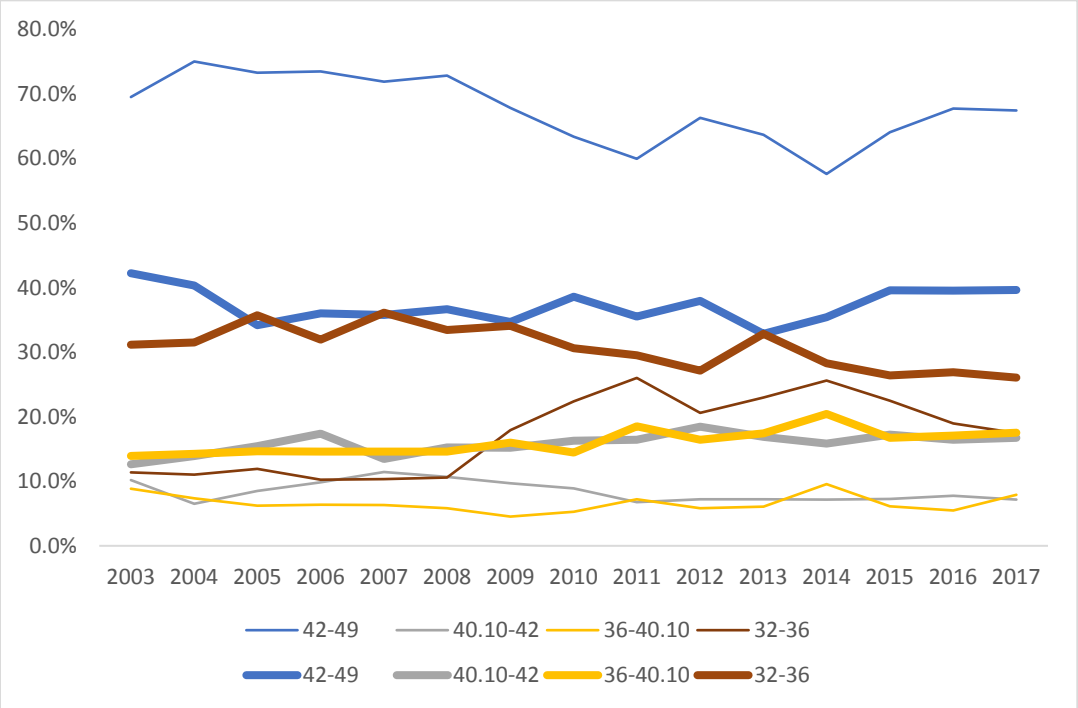

Figure 1. The proportion of total annual landings (light lines) compared to the proportion to total estimated survey biomass (bold lines) for each of the regions specified by the SaMTAAC (colored lines).

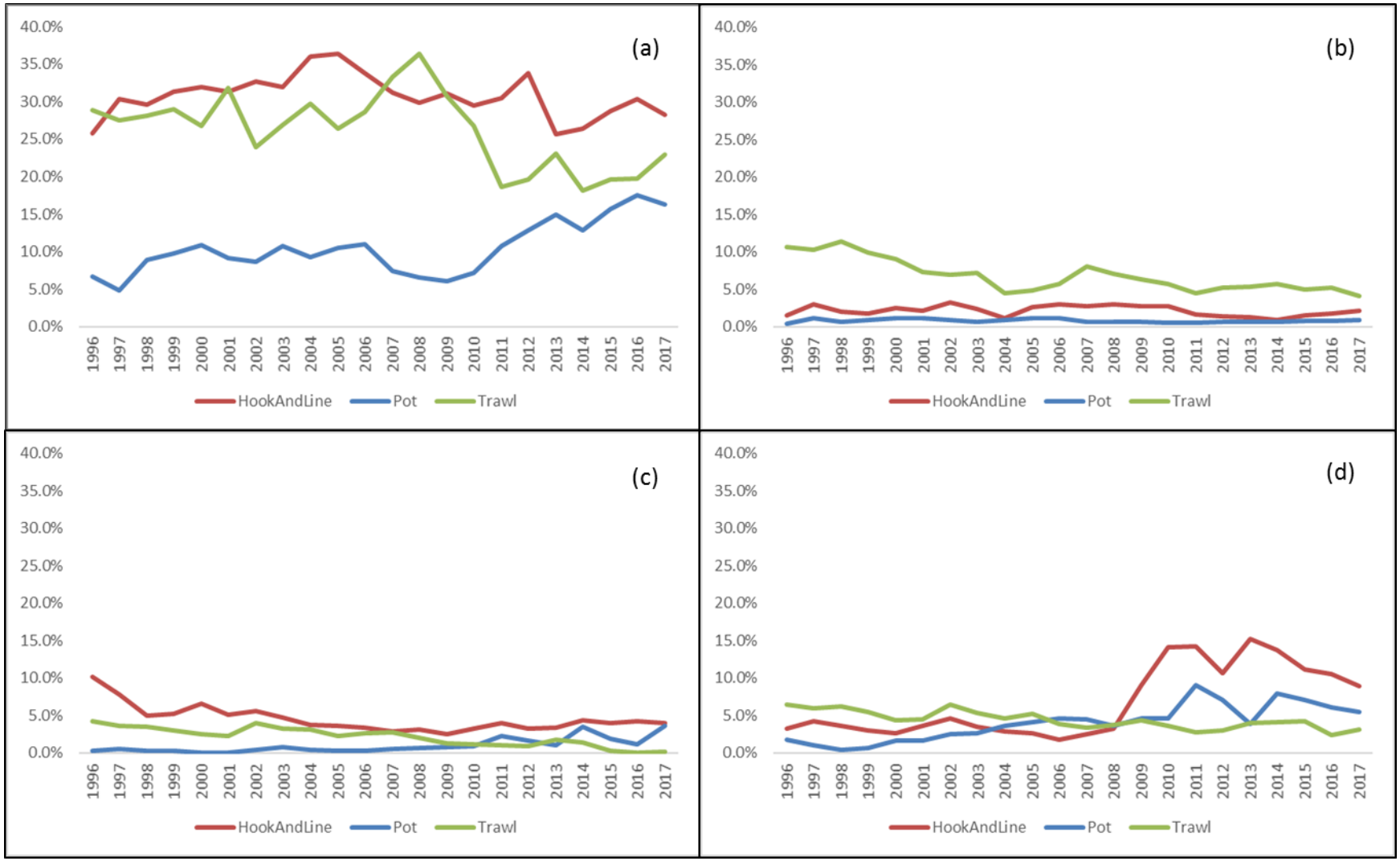

Figure 2. The proportion of total coast-wide fishery landings by area and gear type for the regions 49-42 (a), 40.10 – 42 (b), 36-40.10 (c), 32-36 (d).

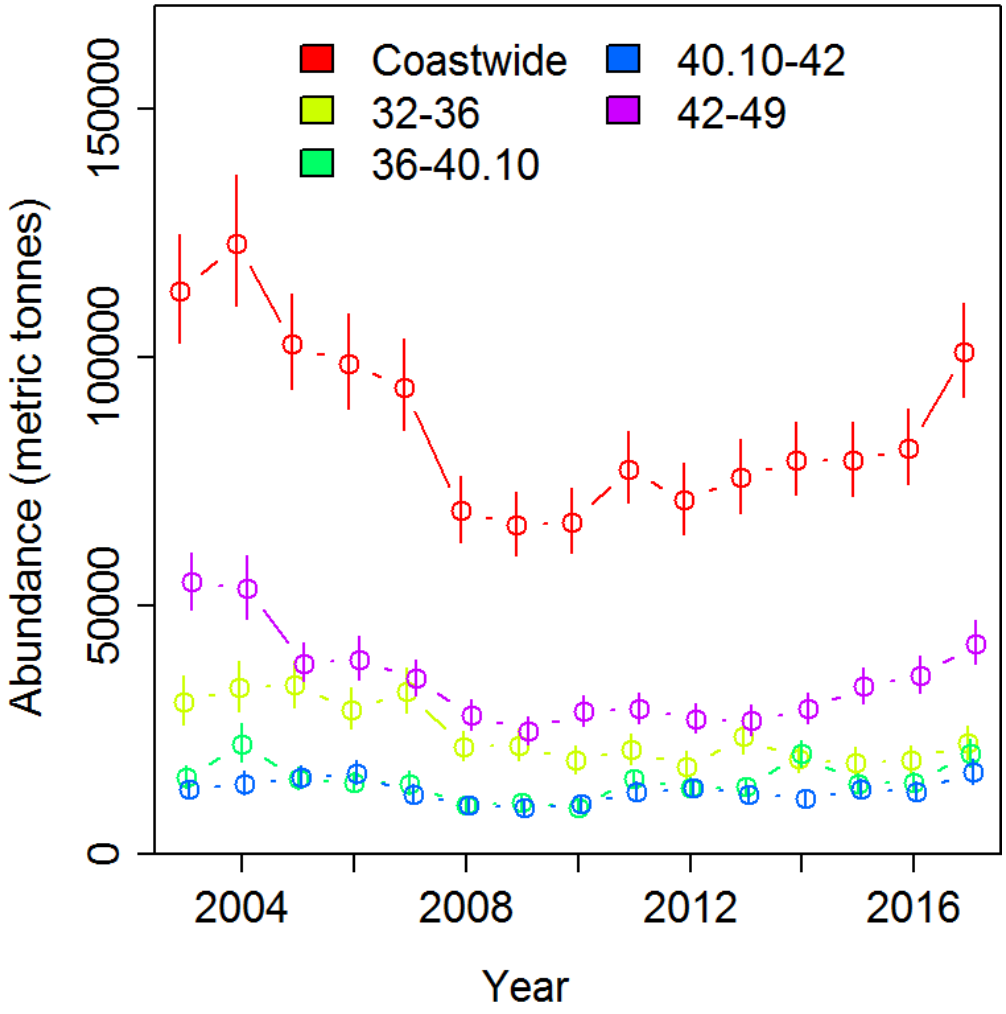

Figure 3. Standardized NWFSC groundfish bottom trawl survey indices.

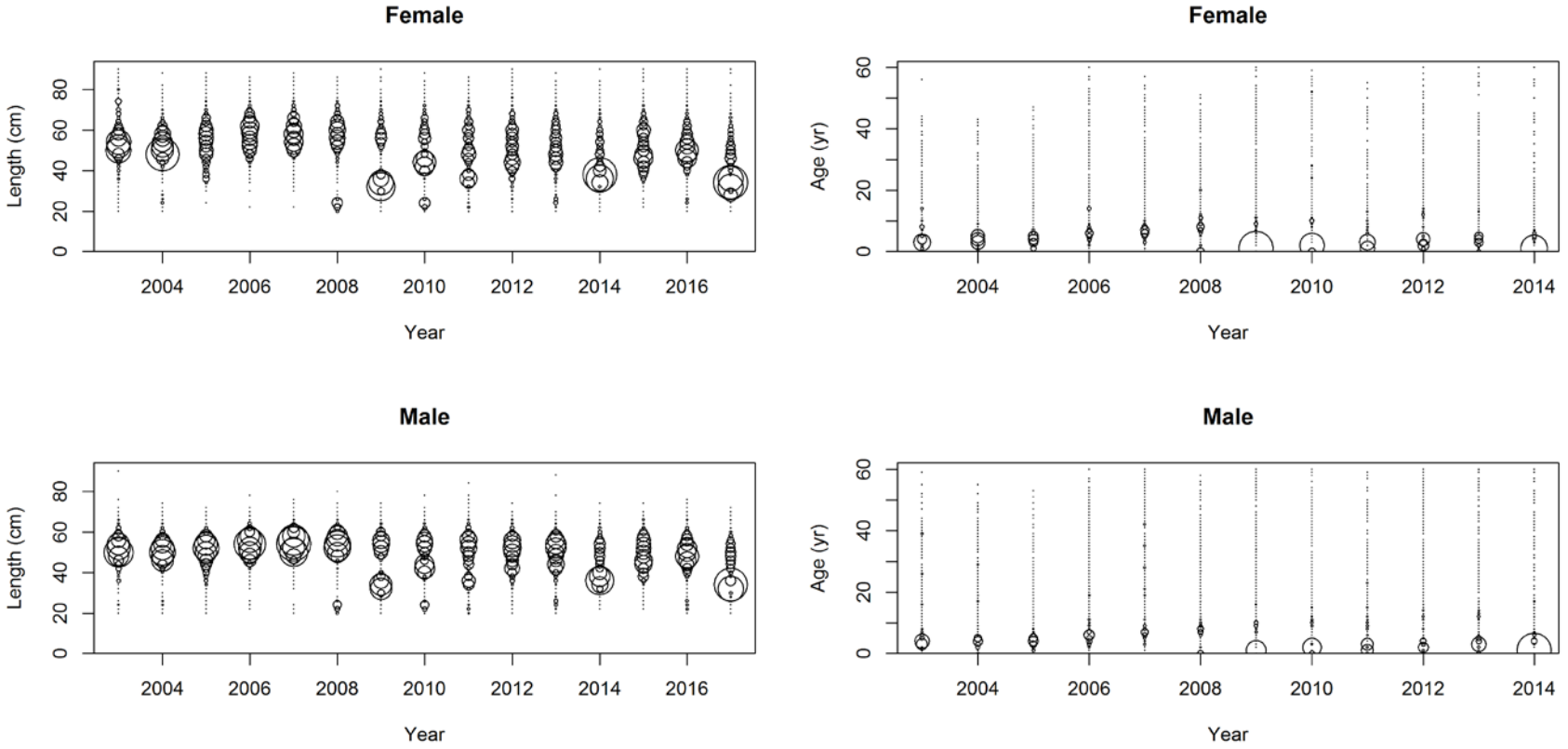

Figure 4. Coast-wide length (left column) and age (right column) compositions.

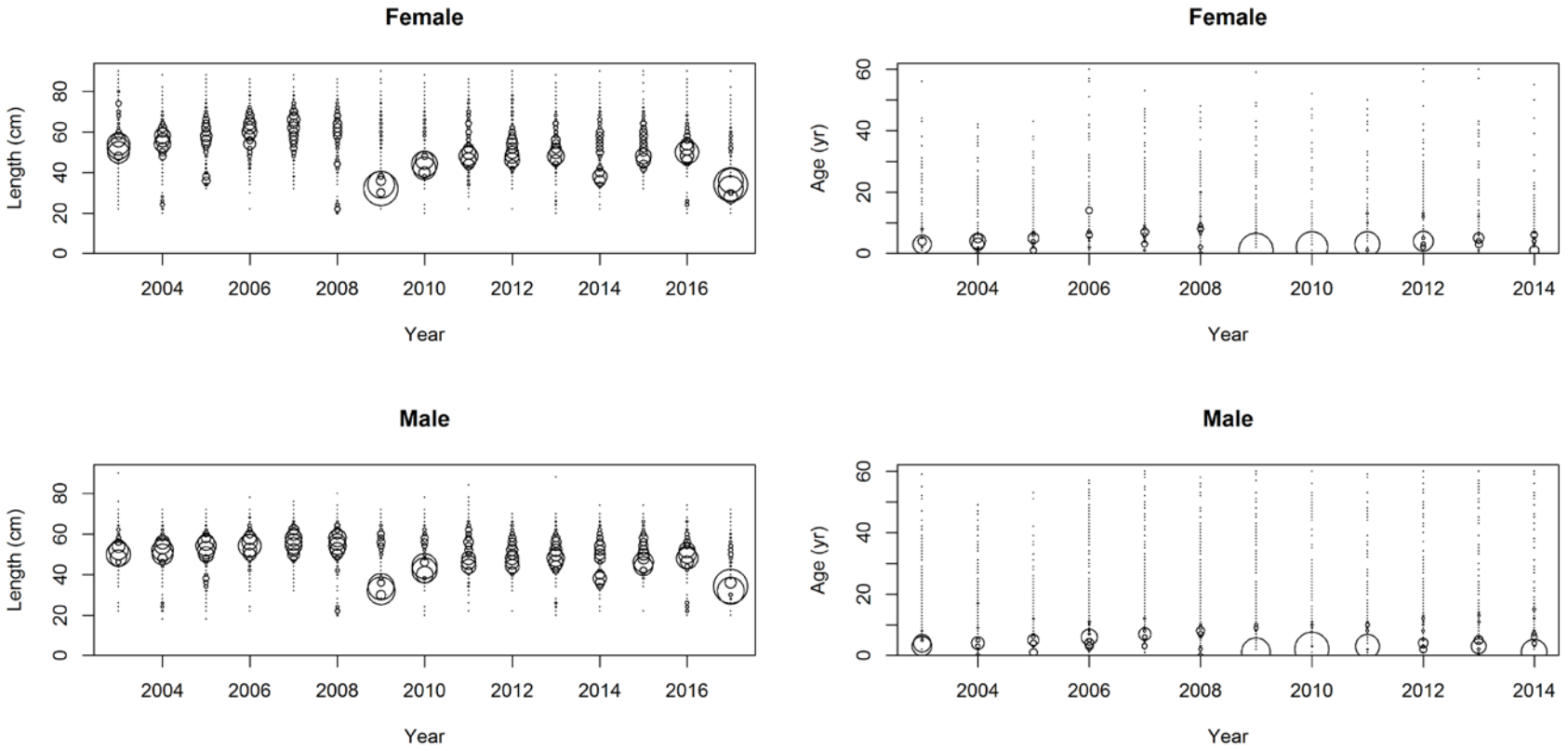

Figure 5. 42º N. to US/Canada length (left column) and age (right column) compositions.

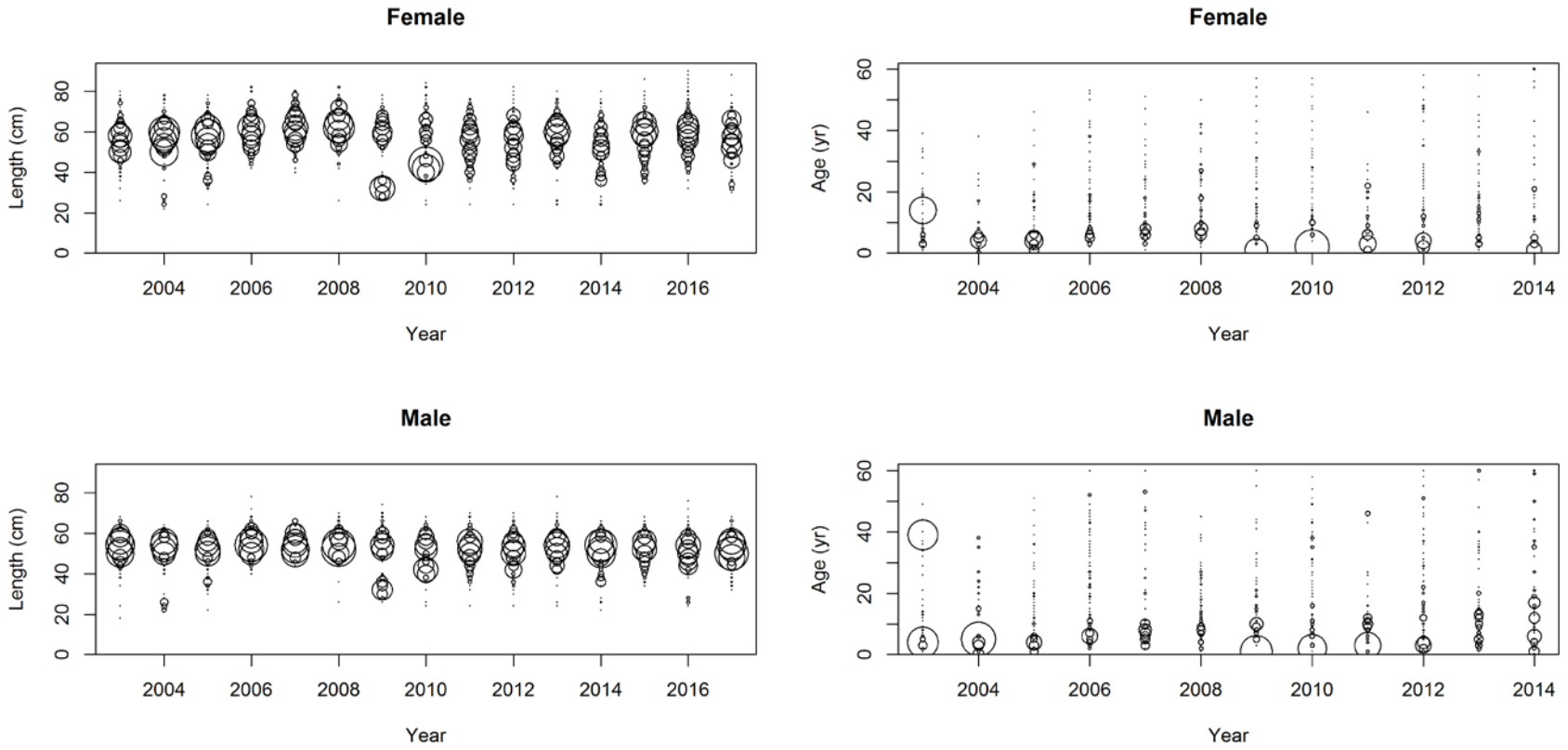

Figure 6. 40º N. lat. to 42º N. length (left column) and age (right column) compositions.

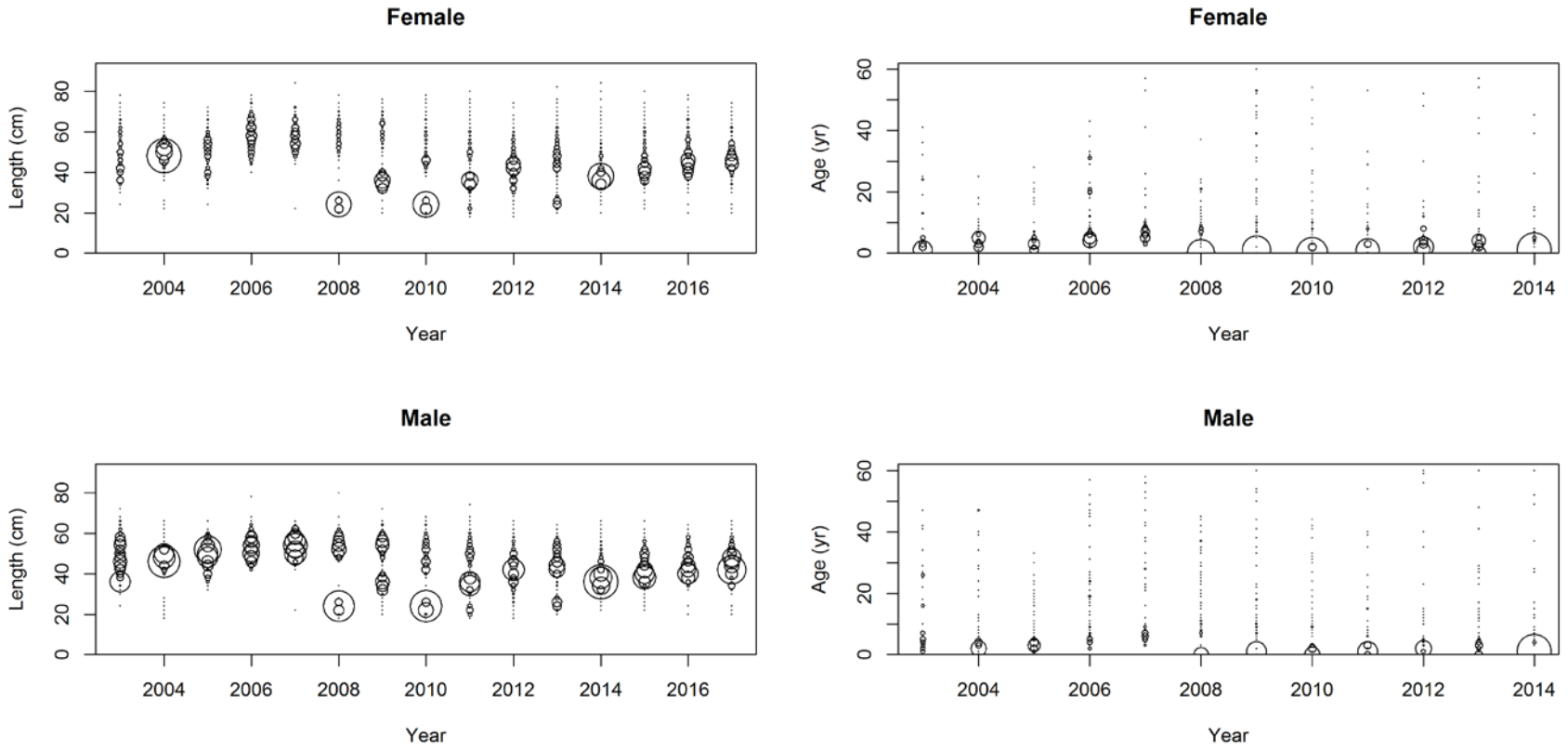

Figure 7. 36º N. to 40º N. length (right column) and age (left column) compositions.

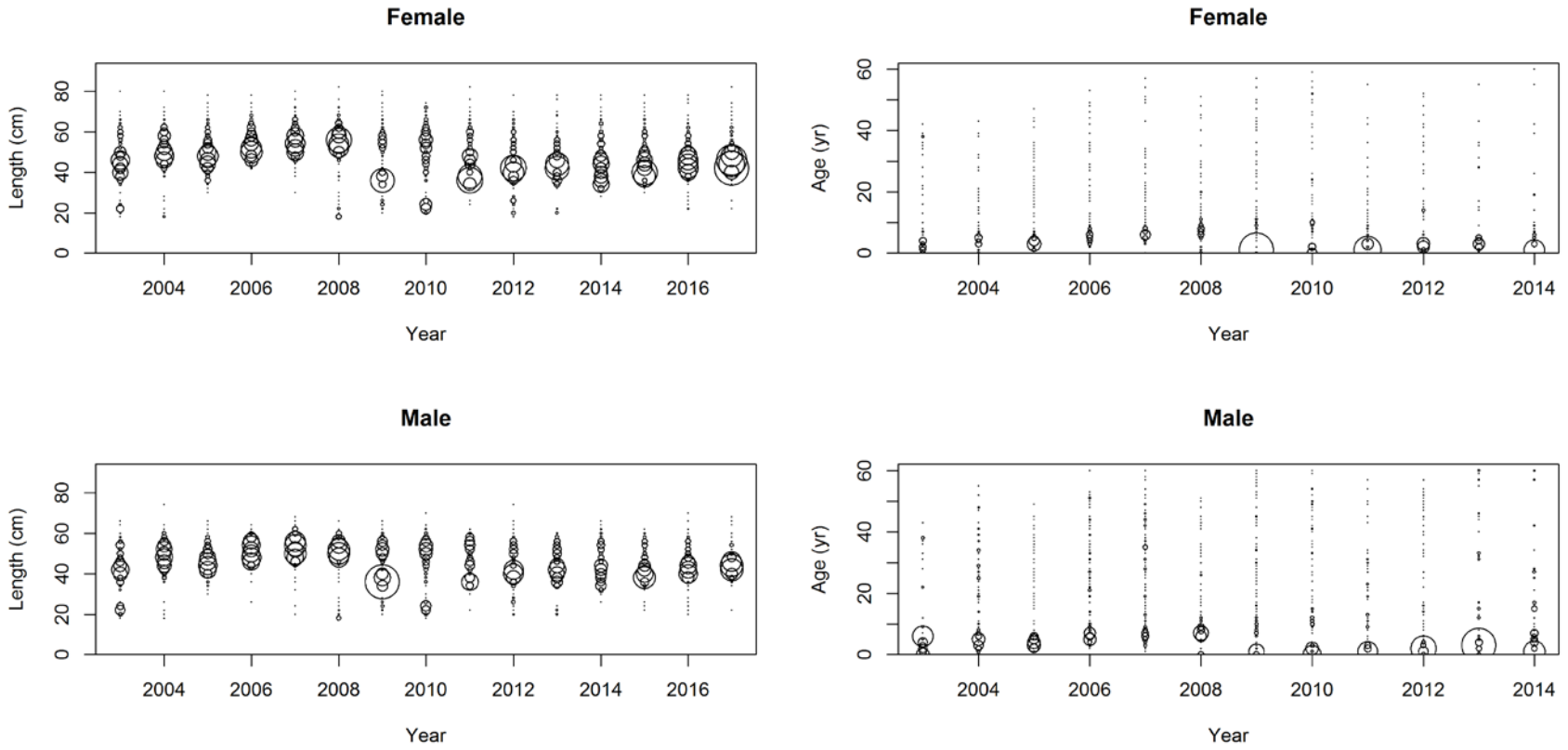

Figure 8. US/Mexico to 36º N. length (right column) and age (left column) compositions.