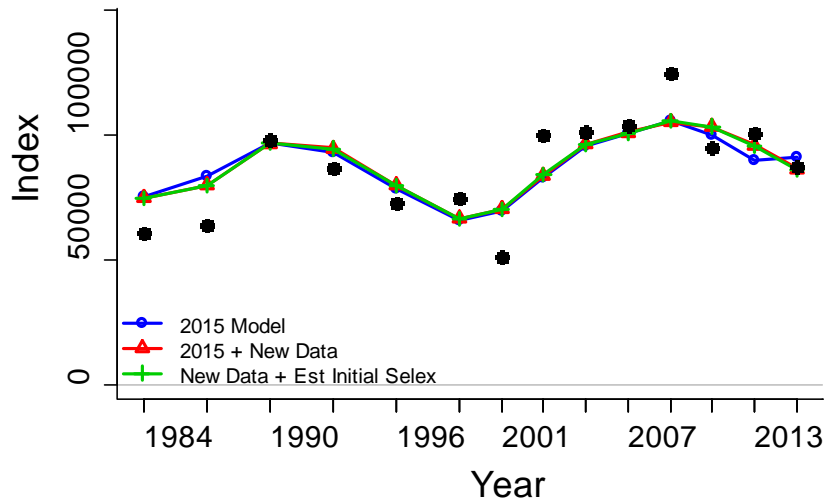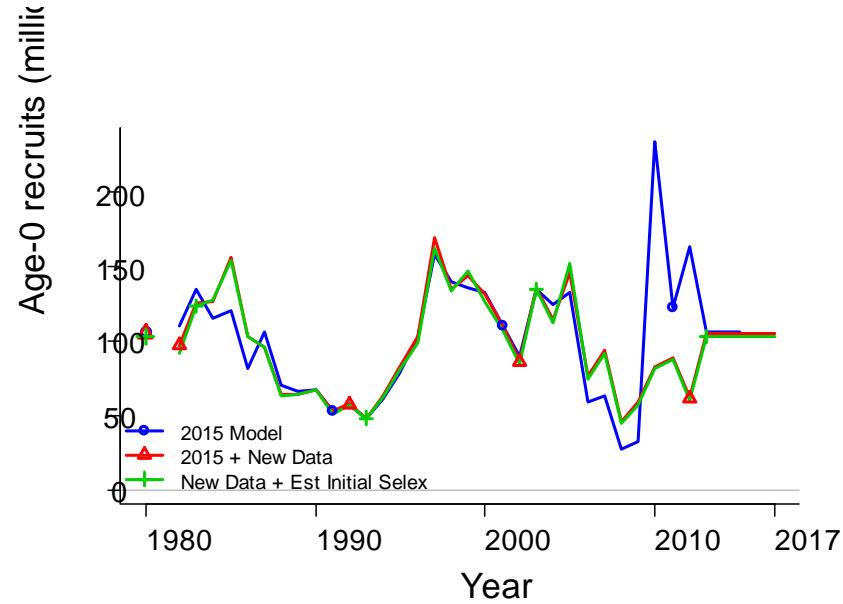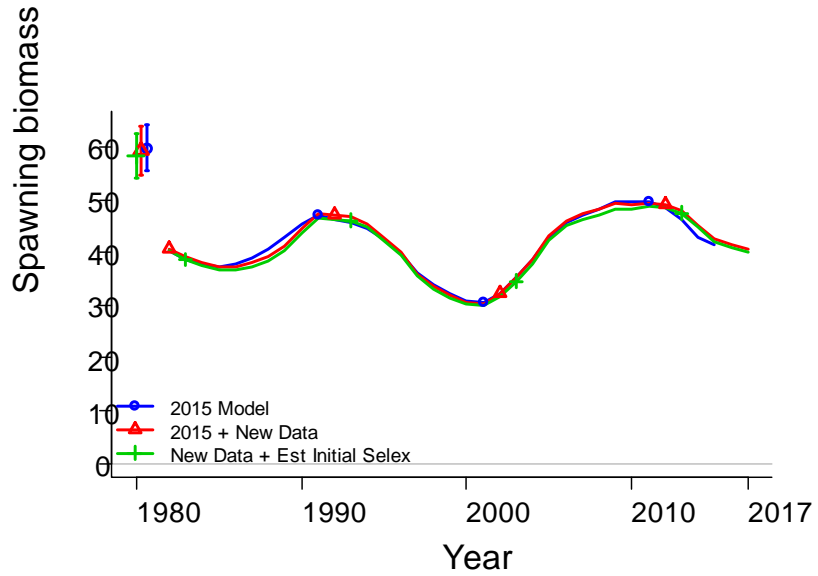# GOA Rex Sole

Carey McGilliard

September 2017

Added new data available since 2015 assessment, estimated initial selectivity
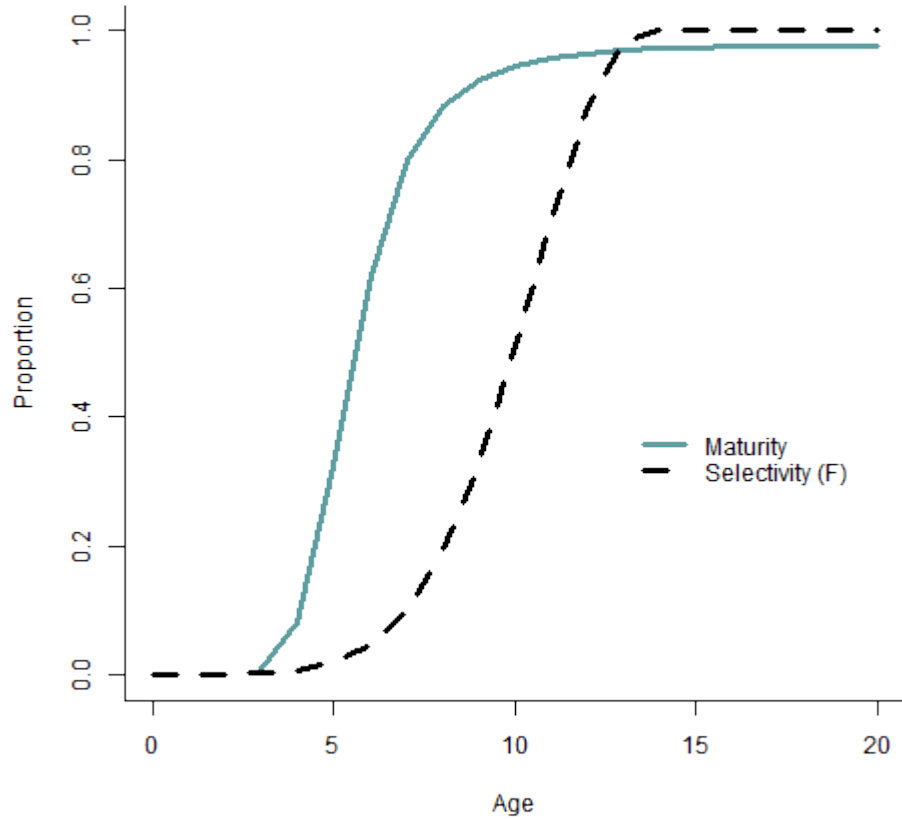## (was fixed at 0 below age 3 to match old non-SS model)
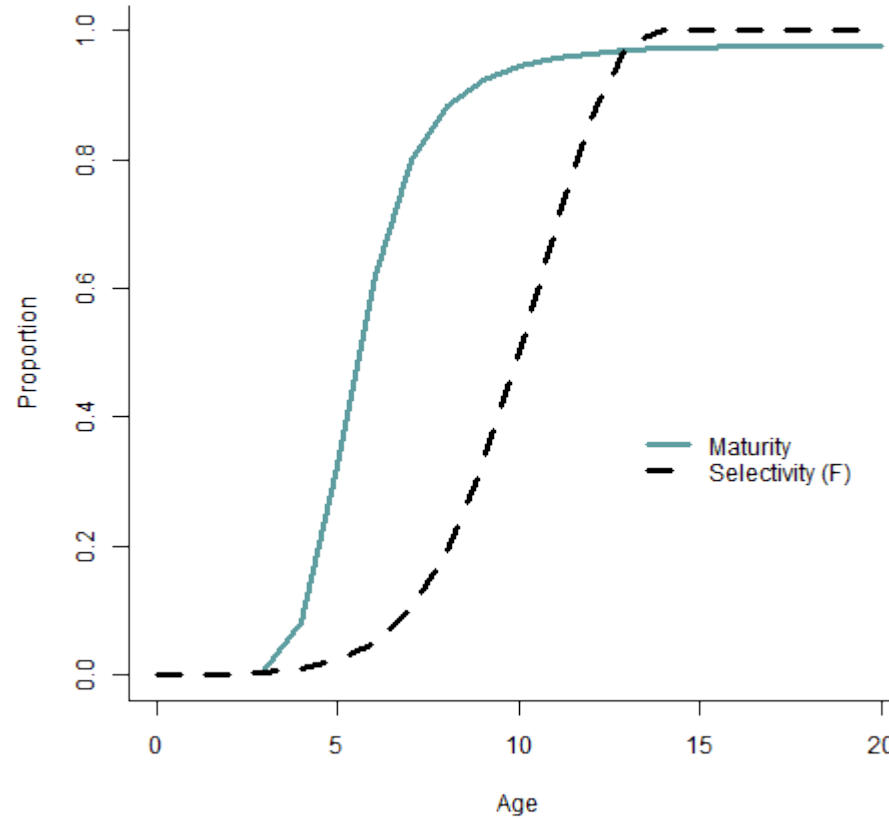

No substantial change, except for updated info on more recent recruitment; will use "New Data + Est Initial Selex as the base model for comparisons on the next few slides

Rex sole is Tier 5 because of this:

2015 Model

New Data + Estimate initial selectivity

= Allows for very high F's and catch limits under Tier 3; risky, especially with no fishery age data to verify this

Are there differences in length-at-age by area, season, gear, or from haul vs port data?

We can incorporate quite a bit more age data if we use data from port sampling + data at the time of the haul;

BUT we don't have extrapolated number for standardizing length comps if using port data

Do raw length samples originate from the same FMP areas as for the catch of rex sole?

Yes, Most of the time

	Proportion of total catch by FMP Subarea					Proportion of length samples by FMP Subarea			
YEAR	WG	CG	SE	WY	YEAR	WG	CG	SE	WY
					1990	0.01	0.93	0.06	0
					1991	0.03	0.97	0	0
					1992	0	1	0	0
					1993	0.01	0.99	0	0
1994	0.01	0.96	0	0.02	1994	0	0.93	0.02	0.05
1995	0.05	0.9	0	0.04	1995	0	0.93	0	0.07
1996	0.09	0.88	0	0.03	1996	0.09	0.88	0	0.03
1997	0.21	0.74	0.01	0.04	1997	0.17	0.57	0.18	0.08
1998	0.16	0.82	0	0.01	1998	0.12	0.86	0	0.02
1999	0.2	0.78	0.01	0.01	1999	0.15	0.85	0	0
2000	0.25	0.75	0	0	2000	0.37	0.63	0	0
2001	0.15	0.85	0	0	2001	0.1	0.9	0	0
2002	0.13	0.87	0	0	2002	0.14	0.86	0	0
2003	0.22	0.78	0	0	2003	0.16	0.84	0	0
2004	0.36	0.64	0	0	2004	0.63	0.37	0	0
2005	0.26	0.74	0	0	2005	0.21	0.79	0	0
2006	0.11	0.89	0	0	2006	0.38	0.62	0	0
2007	0.14	0.86	0	0	2007	0.29	0.71	0	0
2008	0.07	0.93	0	0	2008	0.14	0.86	0	0
2009	0.07	0.93	0	0	2009	0.19	0.81	0	0
2010	0.04	0.96	0	0	2010	0.02	0.98	0	0
2011	0.05	0.95	0	0	2011	0.12	0.88	0	0.01
2012	0.09	0.91	0	0	2012	0.16	0.84	0	0
2013	0.03	0.97	0	0	2013	0.07	0.93	0	0
2014	0.04	0.96	0	0	2014	0.08	0.92	0	0
2015	0.04	0.96	0	0	2015	0.07	0.93	0	0
2016	0.1	0.9	0	0	2016	0.17	0.81	0	0.02
2017	0.04	0.96	0	0	2017	0.11	0.89	0	0

Do raw length samples originate from the same NMFS areas as for the catch of rex sole?

Most data from areas 620 and 630, some mismatches

Proportion of total catch by NMFS area

YEAR	610	620	630	640	650
1994	0.01	0.37	0.6	0.02	0
1995	0.05	0.34	0.56	0.04	0
1996	0.09	0.52	0.35	0.03	0
1997	0.21	0.52	0.22	0.04	0.01
1998	0.16	0.3	0.52	0.01	0
1999	0.2	0.45	0.33	0.01	0.01
2000	0.25	0.33	0.42	0	0
2001	0.15	0.37	0.49	0	0
2002	0.13	0.49	0.38	0	0
2003	0.22	0.49	0.29	0	0
2004	0.36	0.17	0.47	0	0
2005	0.26	0.37	0.36	0	0
2006	0.11	0.45	0.44	0	0
2007	0.14	0.27	0.59	0	0
2008	0.07	0.26	0.67	0	0
2009	0.07	0.5	0.43	0	0
2010	0.04	0.42	0.54	0	0
2011	0.05	0.39	0.56	0	0
2012	0.09	0.36	0.55	0	0
2013	0.03	0.35	0.62	0	0
2014	0.04	0.28	0.69	0	0
2015	0.04	0.44	0.52	0	0
2016	0.1	0.32	0.58	0	0
2017	0.04	0.6	0.36	0	0

Proportion of length samples by NMFS area

| YEAR	610	620	630	631	640	650
1990	0.01	0.66	0.27	0	0	0.06
1991	0.03	0.45	0.53	0	0	0
1992	0	0.19	0.81	0	0	0
1993	0.01	0.19	0.8	0	0	0
1994	0	0.39	0.52	0	0.05	0.02
1995	0	0.26	0.67	0	0.07	0
1996	0.09	0.38	0.5	0	0.03	0
1997	0.17	0.49	0.08	0	0.08	0.18
1998	0.12	0.36	0.51	0	0.02	0
1999	0.15	0.66	0.19	0	0	0
2000	0.37	0.4	0.24	0	0	0
2001	0.1	0.58	0.33	0	0	0
2002	0.14	0.75	0.12	0	0	0
2003	0.16	0.66	0.18	0	0	0
2004	0.63	0.25	0.12	0	0	0
2005	0.21	0.69	0.1	0	0	0
2006	0.38	0.1	0.52	0	0	0
2007	0.29	0.43	0.29	0	0	0
2008	0.14	0.51	0.35	0	0	0
2009	0.19	0.67	0.14	0	0	0
2010	0.02	0.66	0.32	0	0	0
2011	0.12	0.61	0.27	0	0.01	0
2012	0.16	0.66	0.18	0	0	0
2013	0.07	0.59	0.35	0	0	0
2014	0.08	0.57	0.35	0	0	0
2015	0.07	0.67	0.27	0	0	0
2016	0.17	0.45	0.36	0	0.02	0
2017	0.11	0.83	0.06	0	0	0

Do raw length samples originate from the same seasons as for the catch of rex sole?

Yes, Most of the time

	Proportion of total catch by season					Proportion of length samples by season			
YEAR	Q1	Q2	Q3	Q4	YEAR	Q1	Q2	Q3	Q4
					1990	0.25	0.71	0.02	0.02
					1991	0.08	0.44	0.27	0.21
					1992	0.07	0.7	0.07	0.16
					1993	0.48	0.38	0.15	0
1994	0.14	0.38	0.35	0.12	1994	0.22	0.23	0.4	0.14
1995	0.24	0.47	0.19	0.1	1995	0.03	0.59	0.31	0.06
1996	0.33	0.33	0.22	0.12	1996	0.3	0.43	0.26	0.01
1997	0.44	0.25	0.1	0.21	1997	0.28	0.37	0.09	0.26
1998	0.31	0.48	0.17	0.04	1998	0.24	0.67	0.07	0.02
1999	0.25	0.48	0.18	0.08	1999	0.2	0.67	0.06	0.07
2000	0.2	0.58	0.15	0.07	2000	0.17	0.65	0.08	0.1
2001	0.19	0.62	0.13	0.05	2001	0.05	0.92	0.02	0.01
2002	0.14	0.67	0.16	0.04	2002	0.06	0.9	0.03	0.01
2003	0.13	0.59	0.22	0.07	2003	0.09	0.78	0.12	0.02
2004	0.17	0.51	0.31	0.01	2004	0.02	0.93	0.05	0
2005	0.34	0.4	0.25	0.01	2005	0.19	0.59	0.22	0
2006	0.24	0.29	0.37	0.09	2006	0.14	0.49	0.25	0.11
2007	0.31	0.38	0.25	0.07	2007	0.2	0.64	0.09	0.07
2008	0.23	0.43	0.27	0.07	2008	0.18	0.54	0.25	0.04
2009	0.22	0.37	0.3	0.11	2009	0.08	0.37	0.46	0.09
2010	0.17	0.53	0.13	0.17	2010	0.19	0.63	0.09	0.09
2011	0.2	0.49	0.22	0.1	2011	0.15	0.48	0.31	0.05
2012	0.2	0.45	0.2	0.15	2012	0.05	0.48	0.43	0.04
2013	0.23	0.61	0.07	0.1	2013	0.1	0.76	0.09	0.05
2014	0.2	0.66	0.1	0.04	2014	0.06	0.91	0.03	0
2015	0.1	0.58	0.11	0.21	2015	0	0.76	0.06	0.17
2016	0.22	0.48	0.14	0.15	2016	0.01	0.79	0.11	0.09

Fishery Age Data: Does length-at-age change among areas?
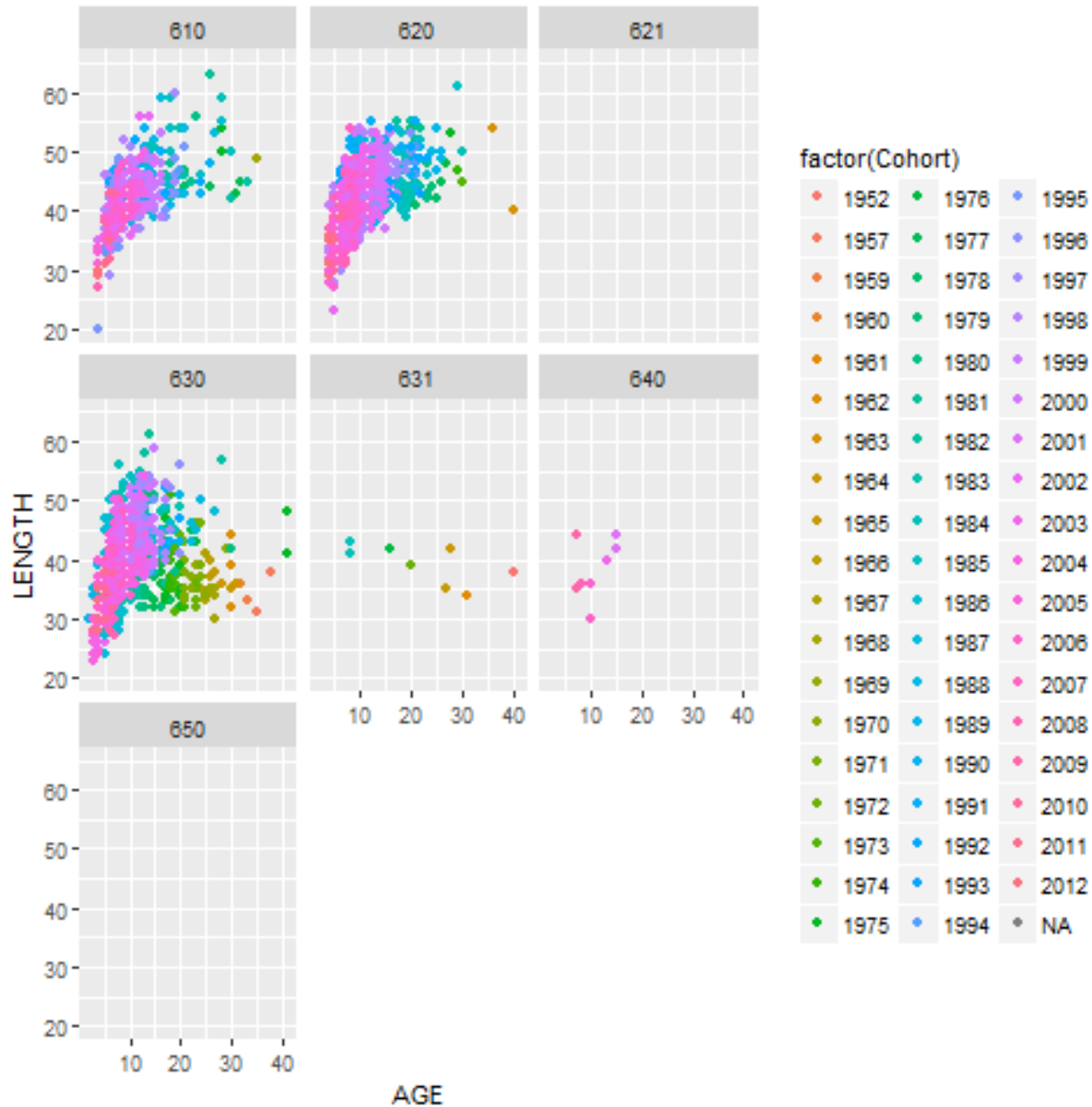
Does length-at-age change by season?
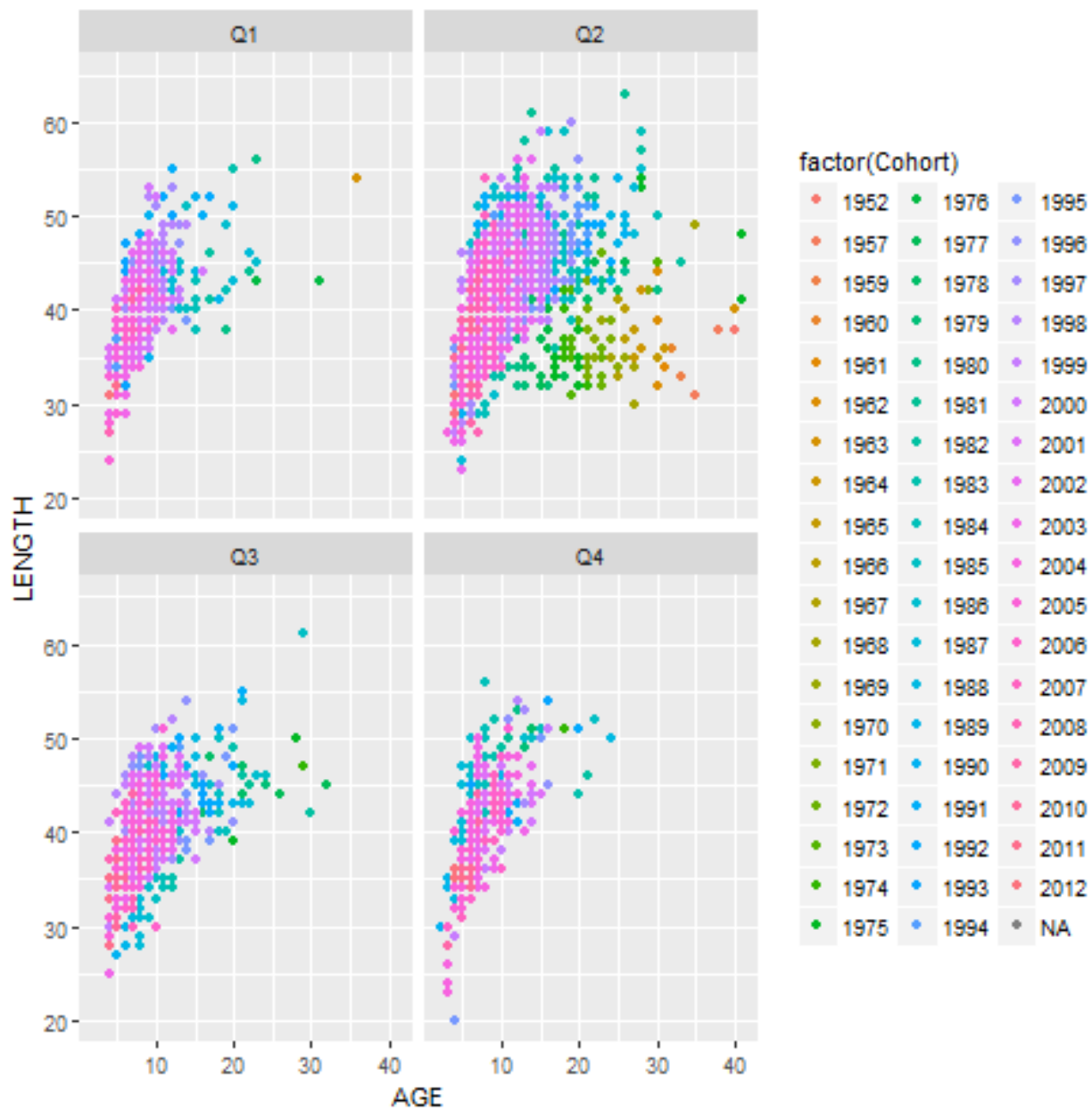
Is length-at-age different for port samples?
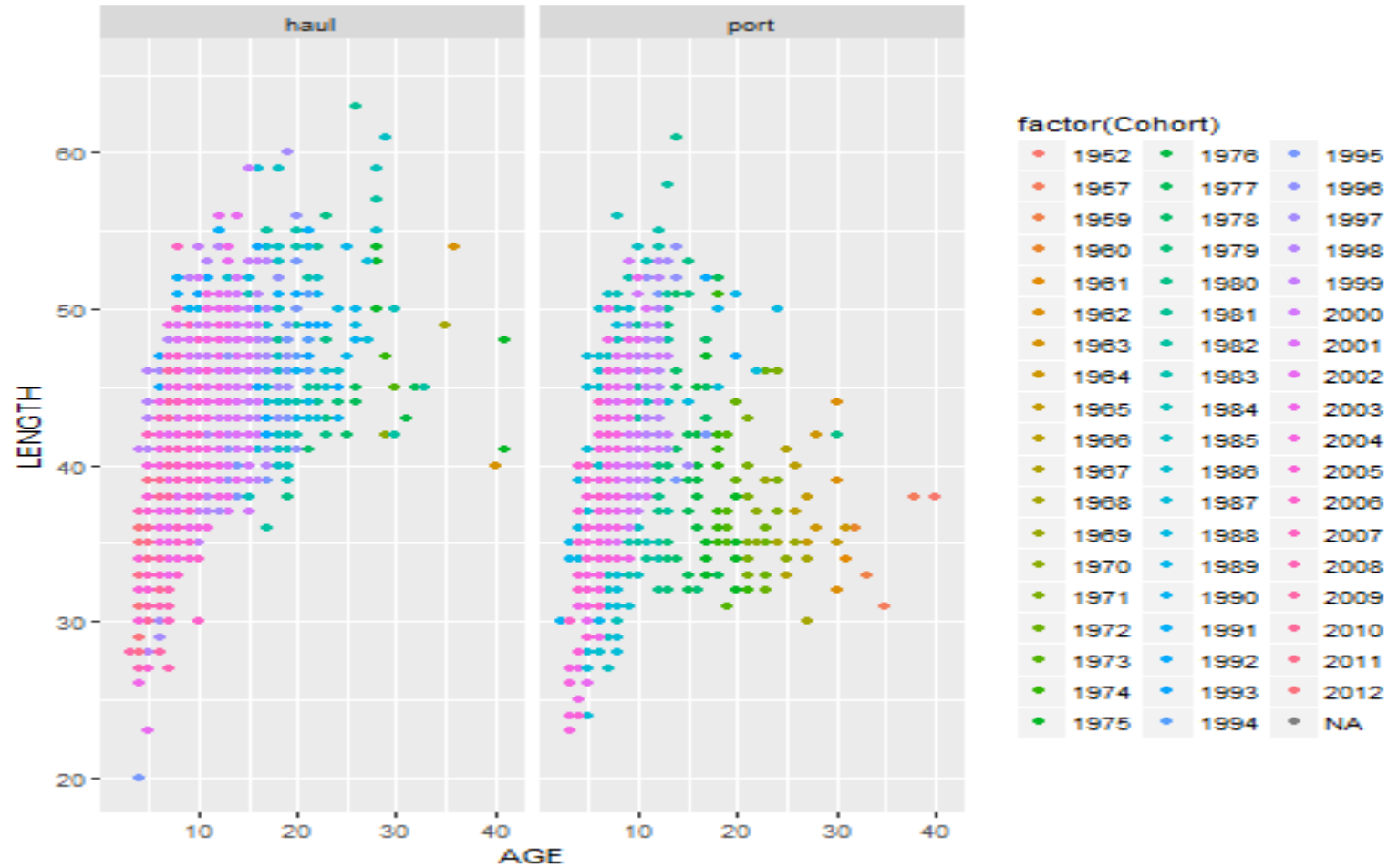
# Does length-at-age change by year sample was collected?
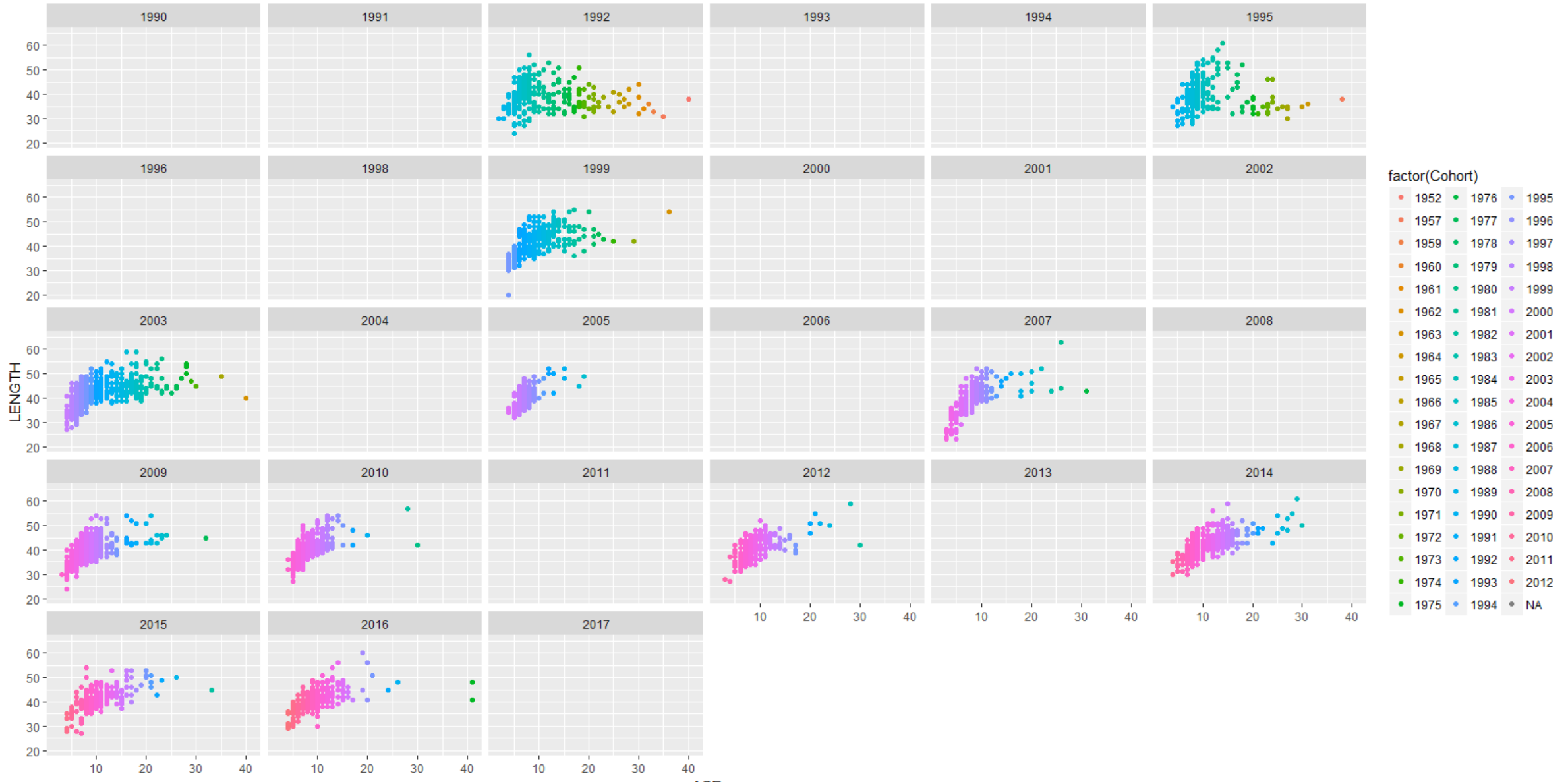
Previous assessments have not included any fishery age data, which could verify or change our perception of fishery selectivity relative to maturity

- Worked with ageing group to age historical GOA rex sole otoliths
- Conducted the following runs:
    1. **Haul data only**: Calculated fishery age comps using year-specific age-length keys and multiplying raw proportions at age within length by length sample each year; length sample was standardized by extrapolated number for each haul to account for size of haul. Effective sample size = number of hauls by year
    2. **Haul + Port data**: As for 1, but adds age and length data collected at ports; used raw length sample (because no extrapolated number for each haul exists for port data). Effective sample size = number of hauls from haul data + number of hauls contributing to port data (norpaq.port_join.number_of_tows provides this info for each port_join)
    3. **Age-length keys specific to year, gear, season, NMFS area, and port vs haul data**: As for 2 (raw length data used), but age-length keys by the above groupings were applied to account for small-scale differences in age-length relationships, if they exist.

Comparing age-length key and length comp methods:
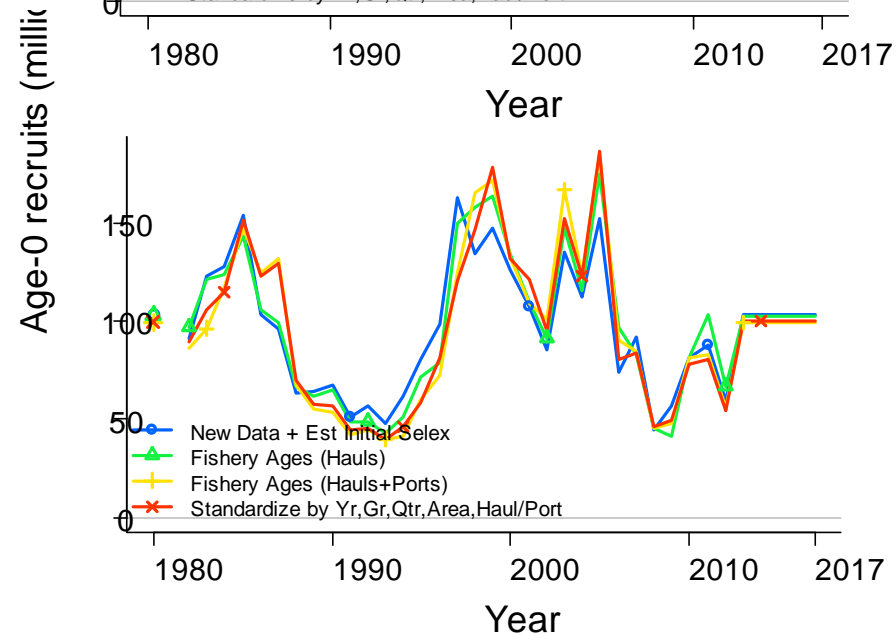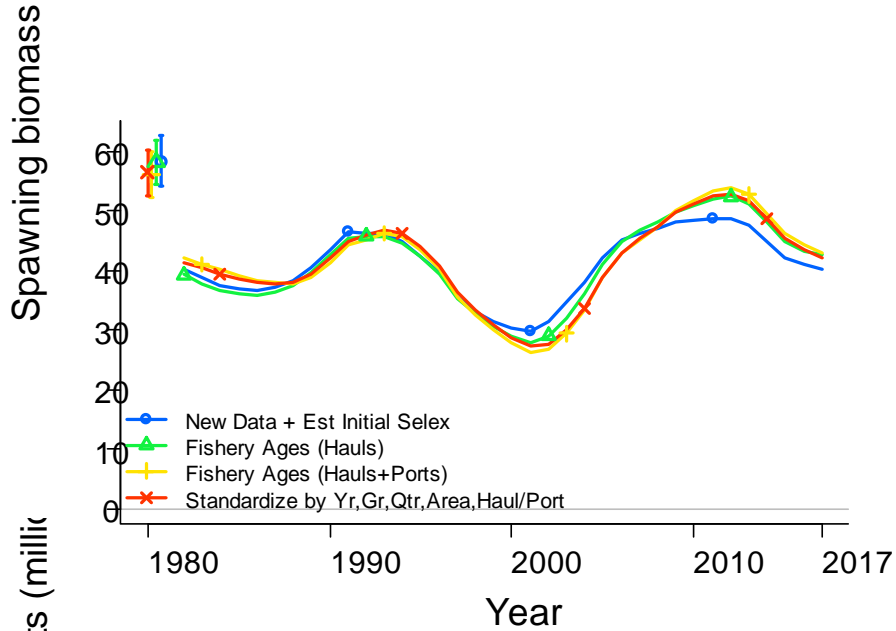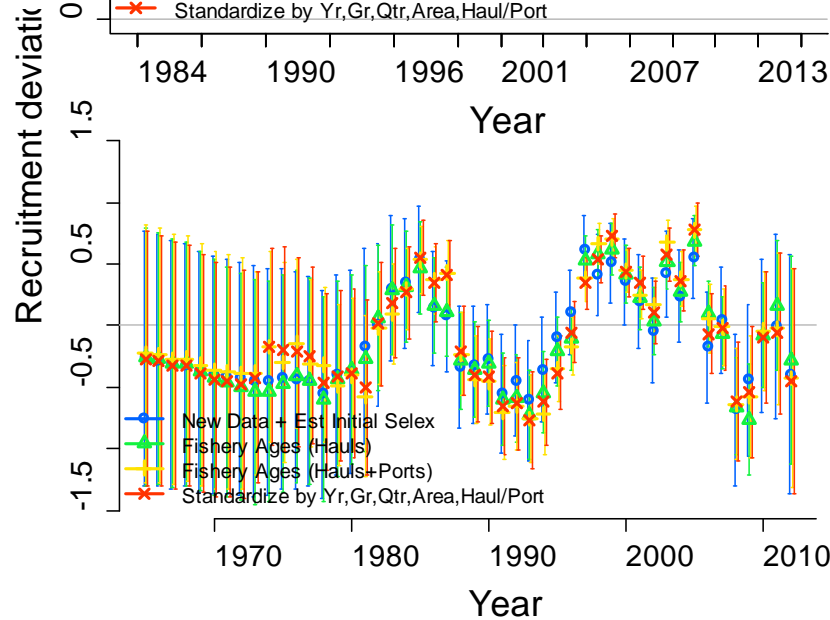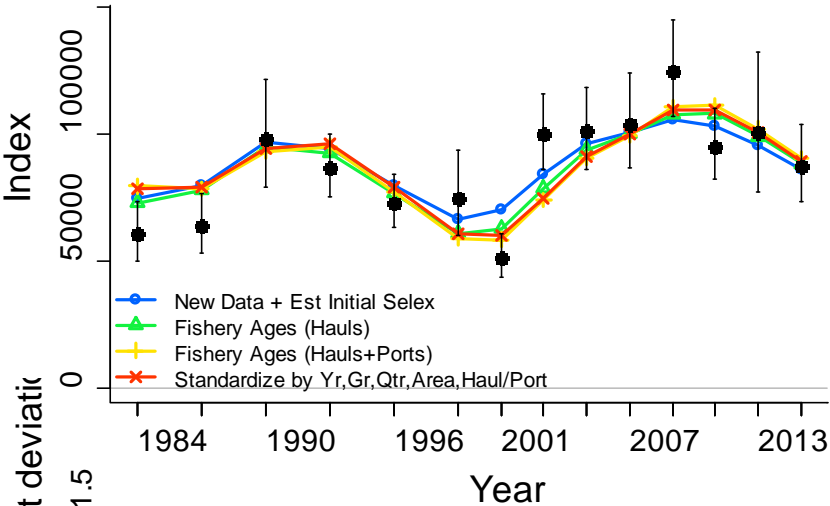
Comparing age-length key and length comp methods:
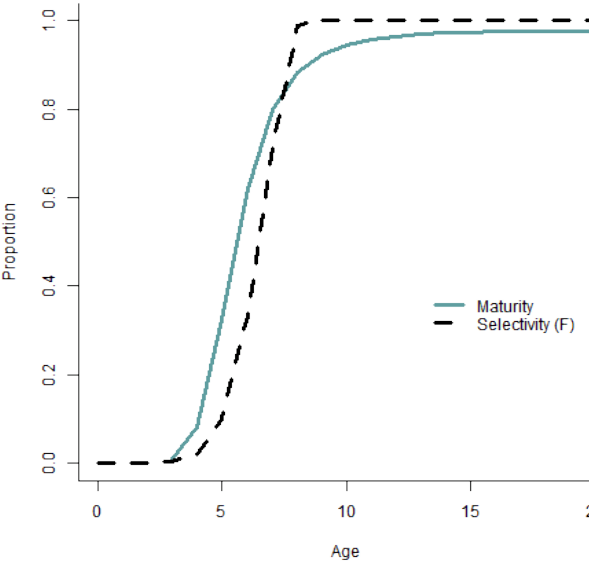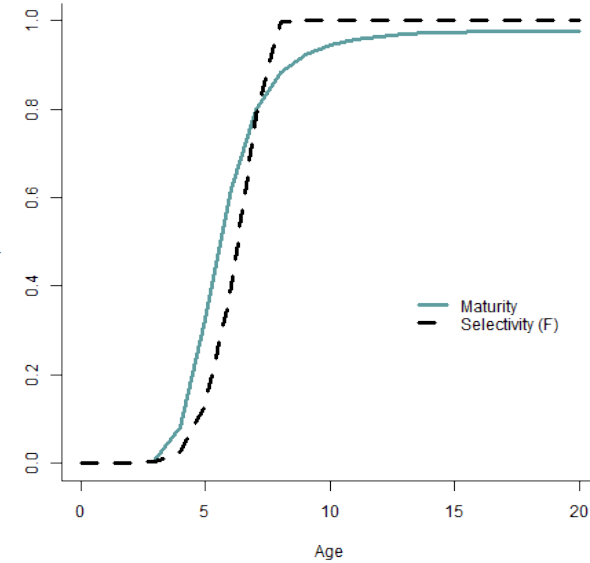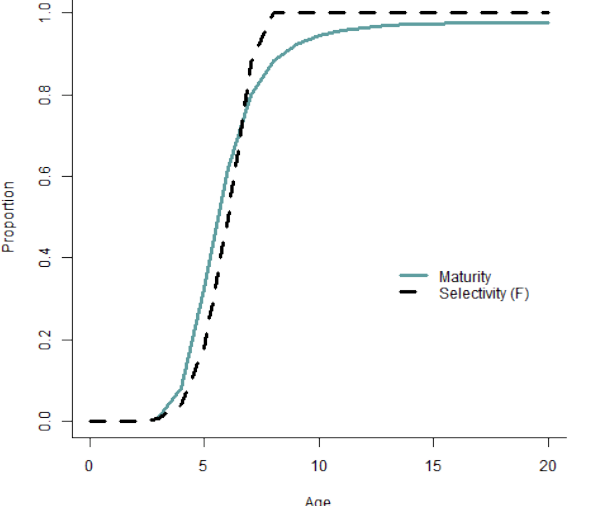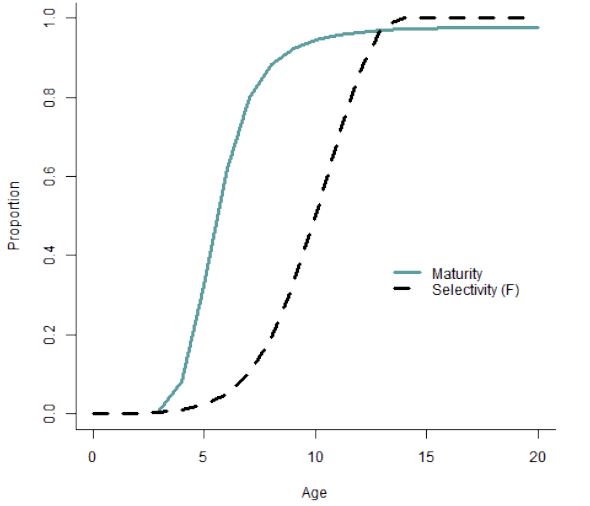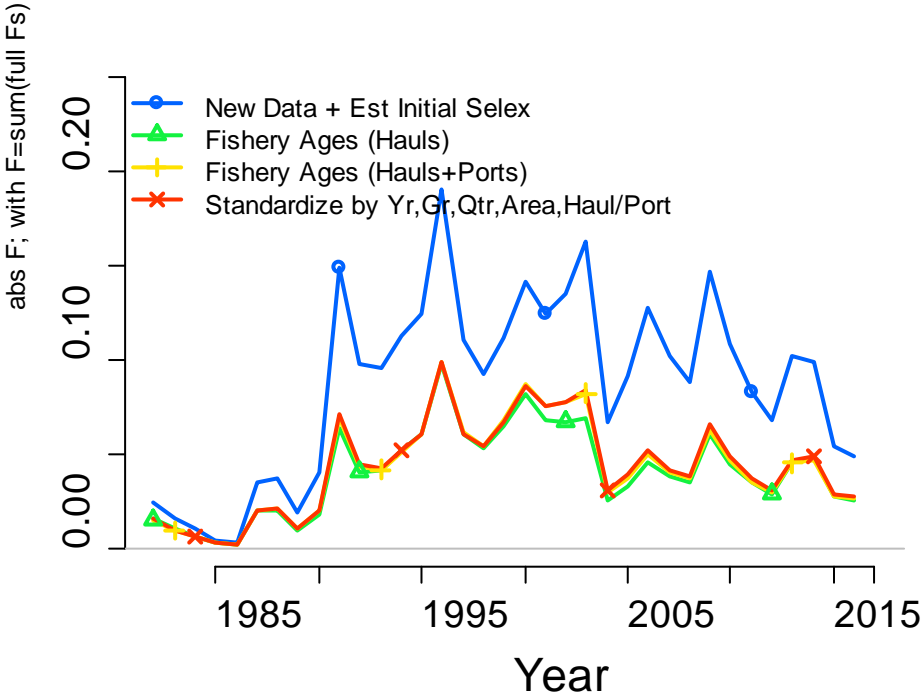
Fits to data looked similar among methods for incorporating fishery age data

Standardizing by Yr, Quarter, Gear, Port vs Haul

Standardizing by Yr, Quarter, Gear, Port vs Haul

Pearson residuals, whole catch, Survey (max=3.99)
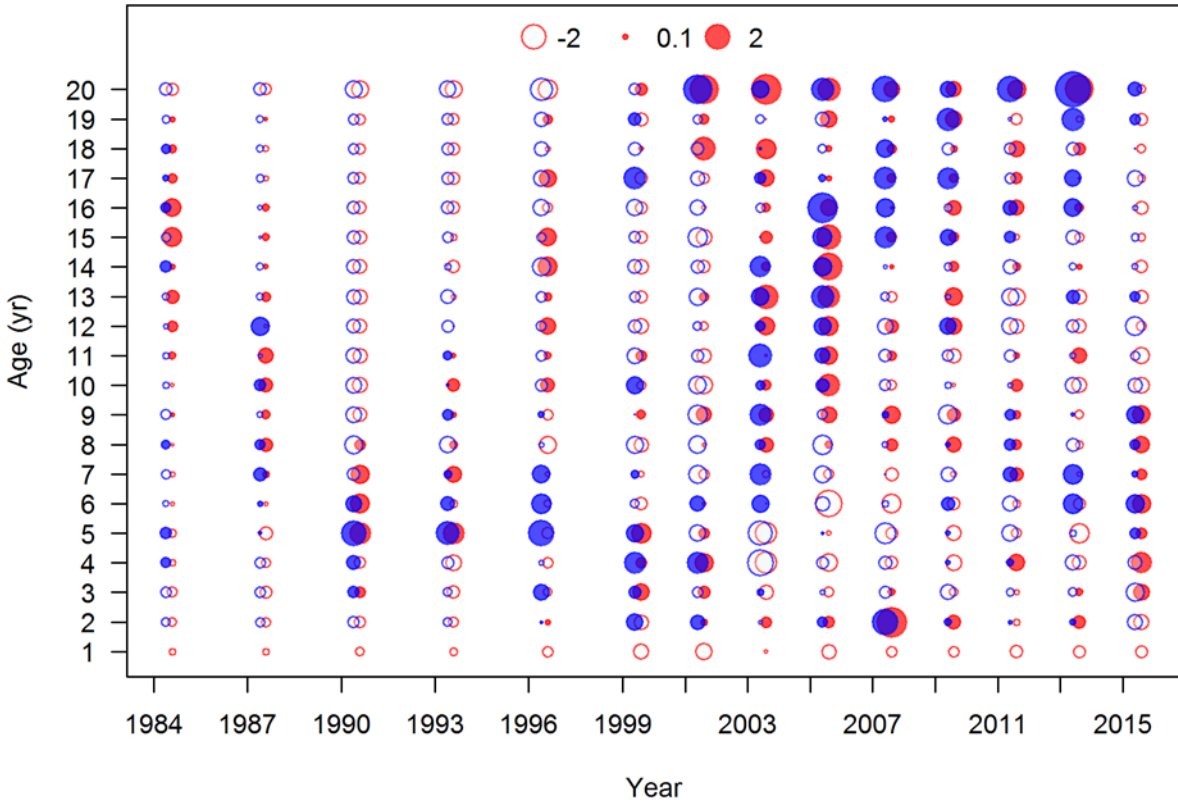
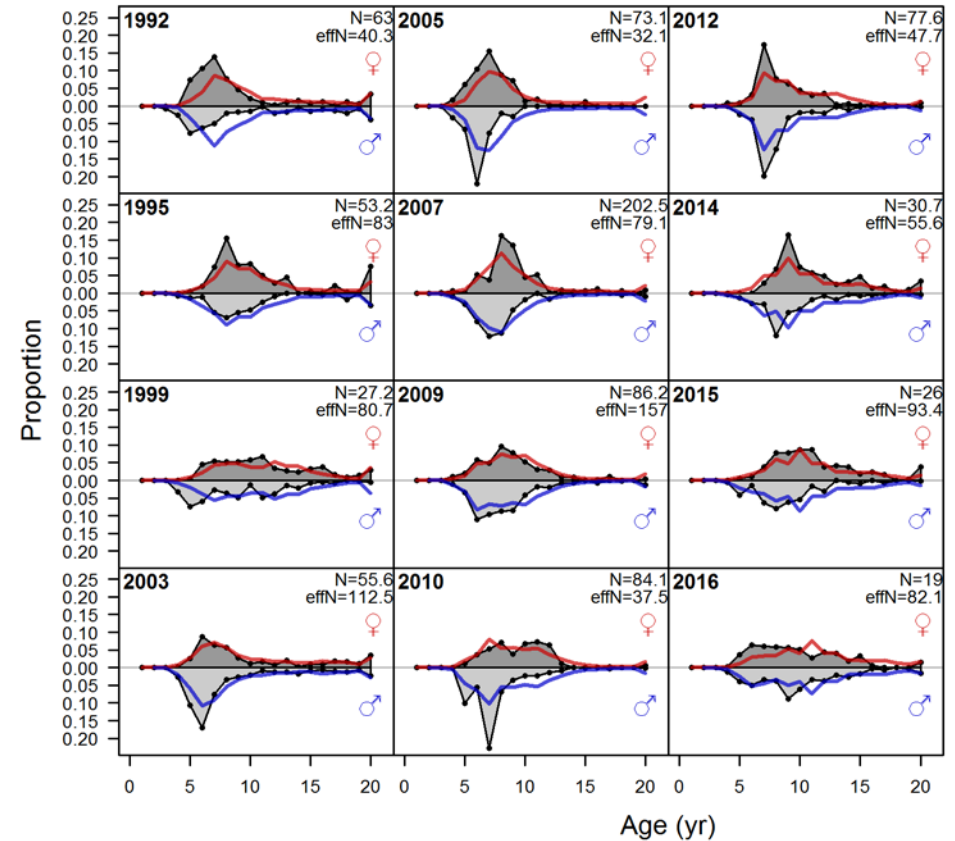Pearson residuals, whole catch, Fishery (max=3.8)
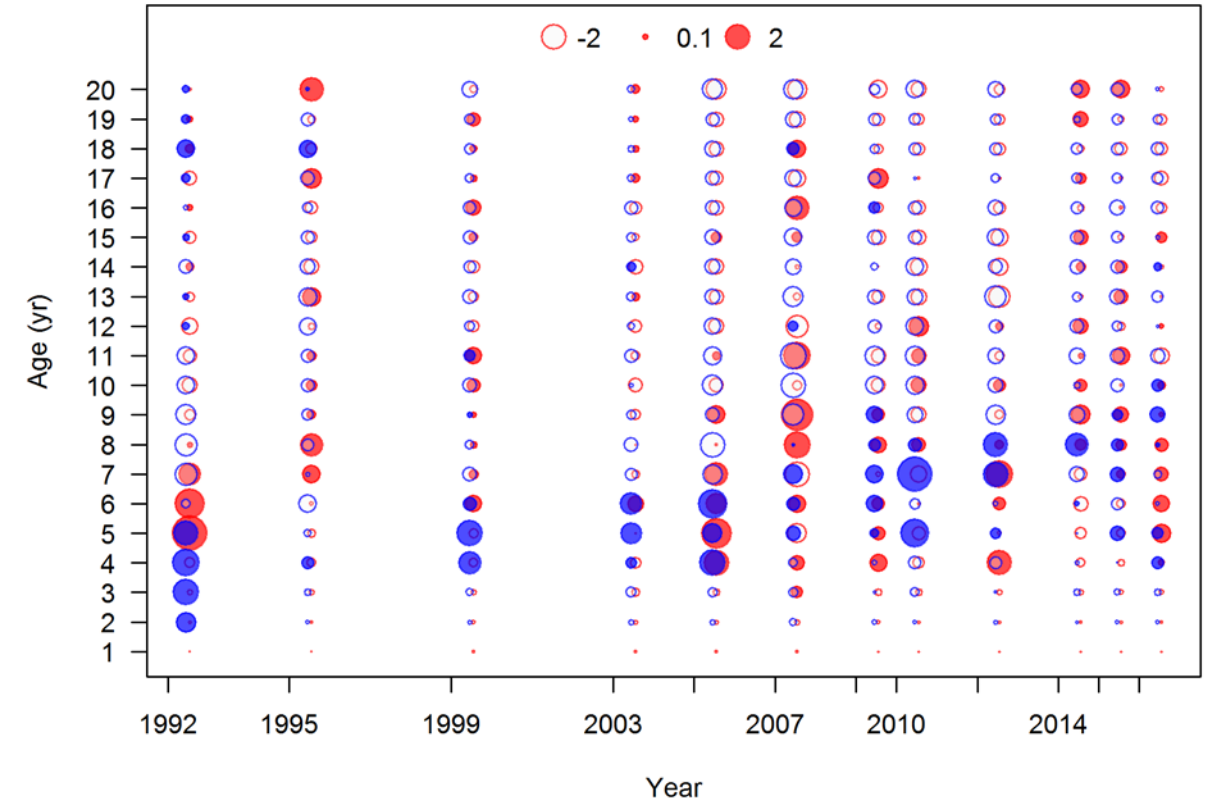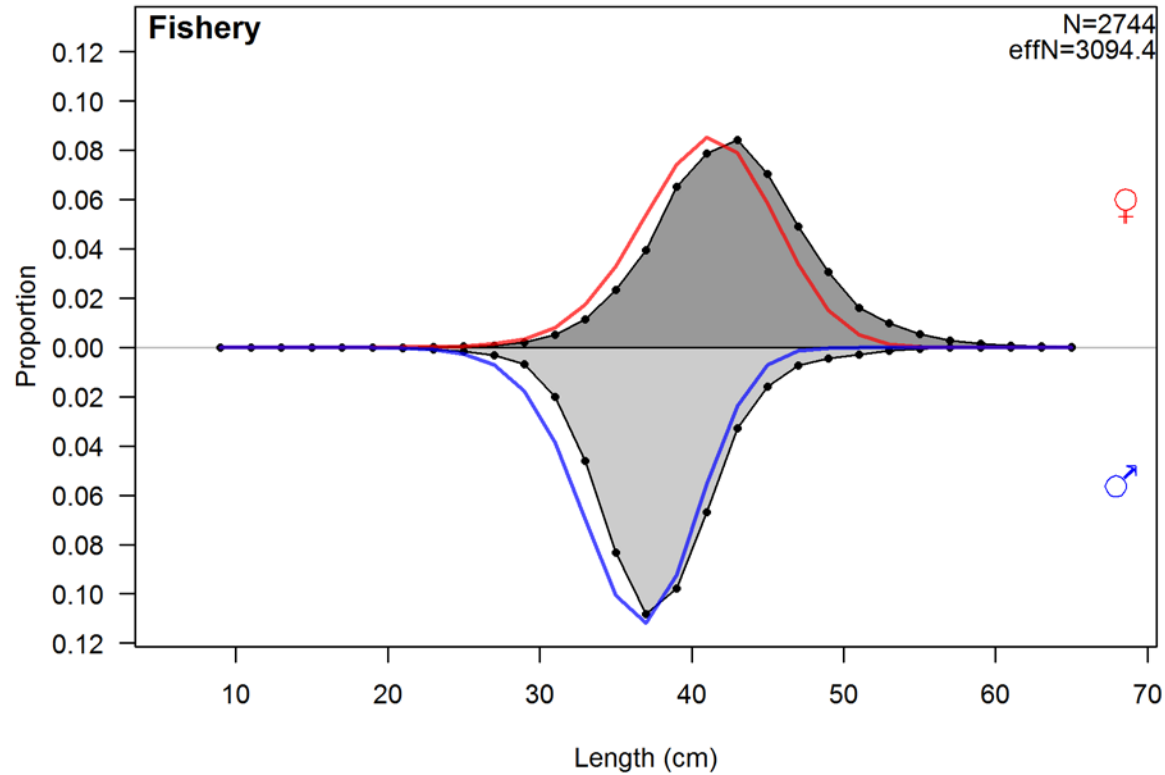
Standardizing by Yr, Quarter, Gear, Port vs Haul

Standardizing by Yr, Quarter, Gear, Port vs Haul

Standardizing by Yr, Quarter, Gear, Port vs Haul

Length comps, whole catch, Fishery
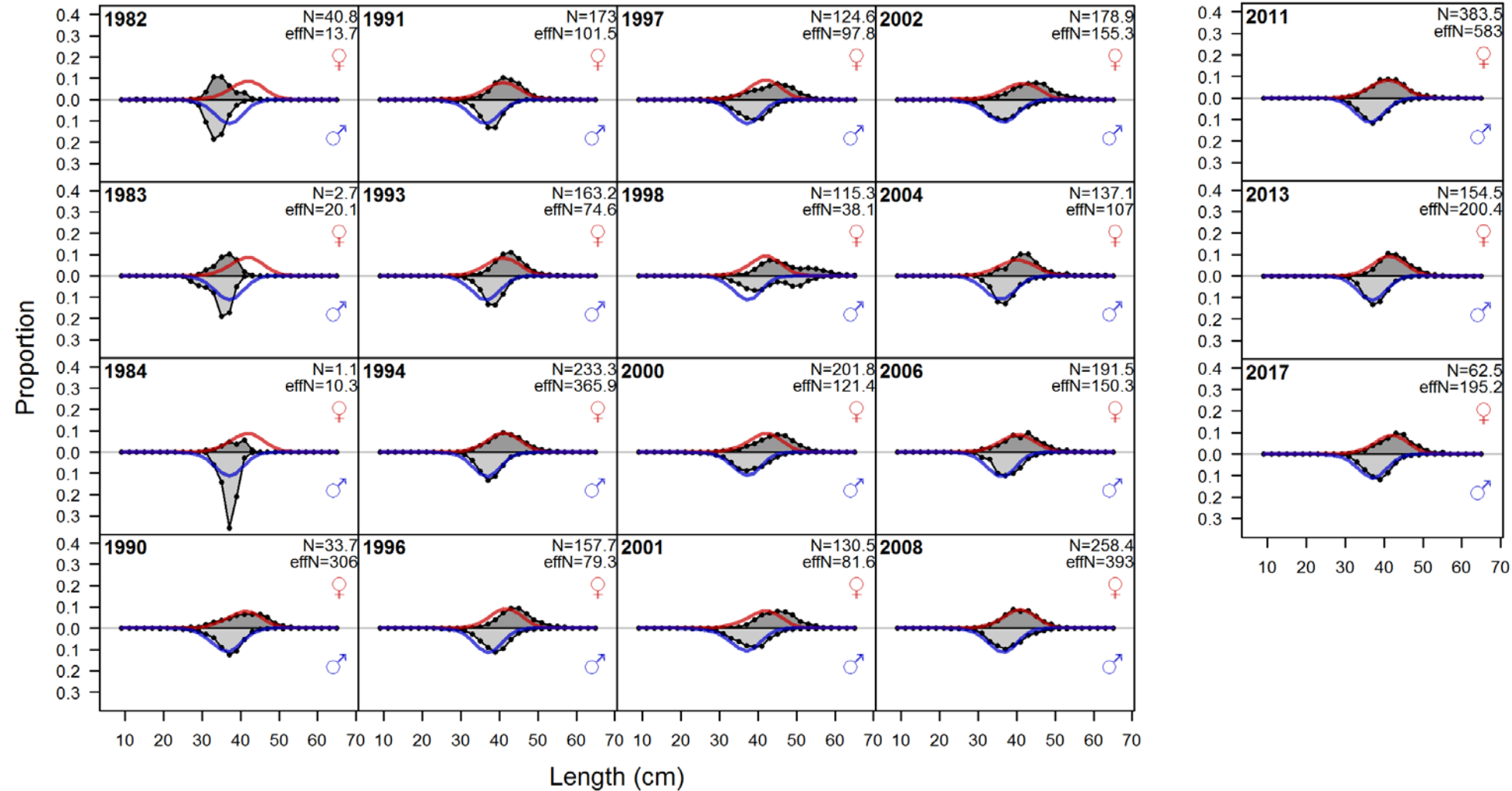
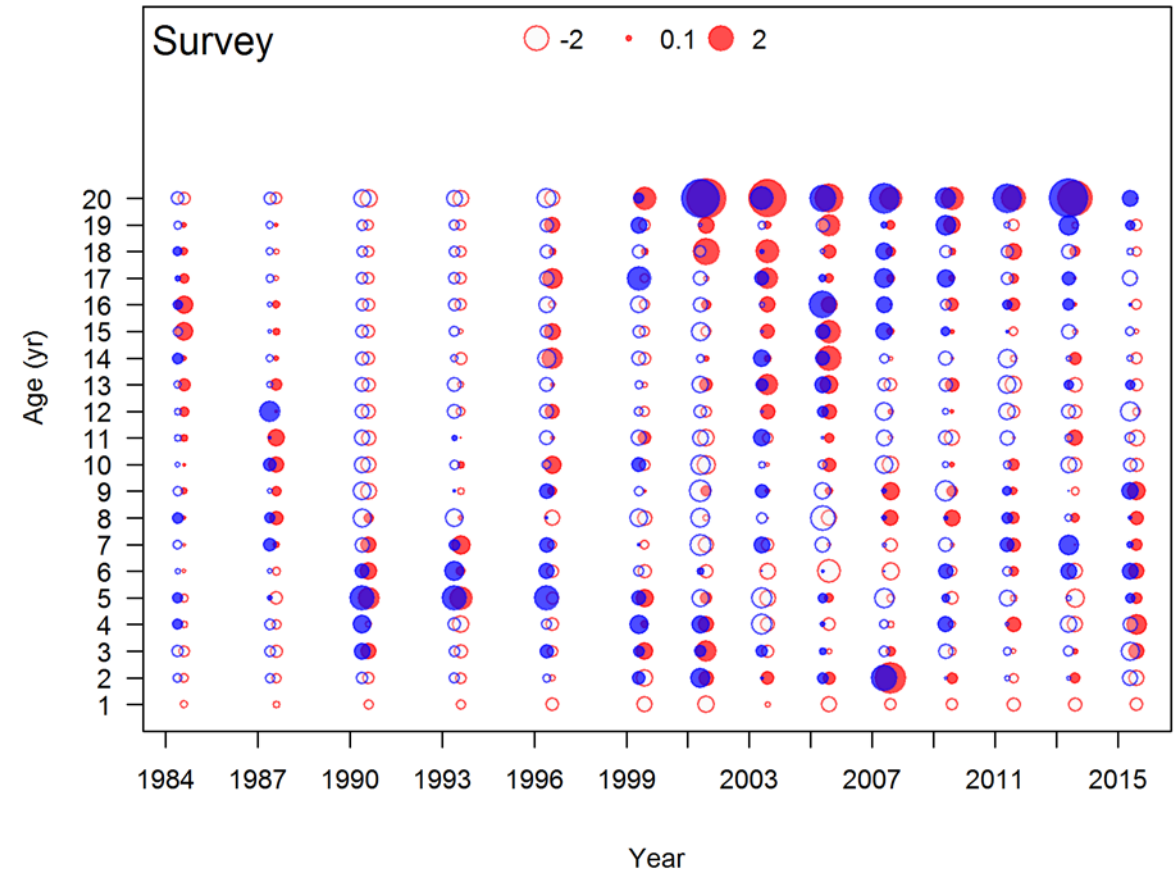# Standardizing by Yr, Quarter, Gear, Port vs Haul

Ghost length comps, whole catch, Survey
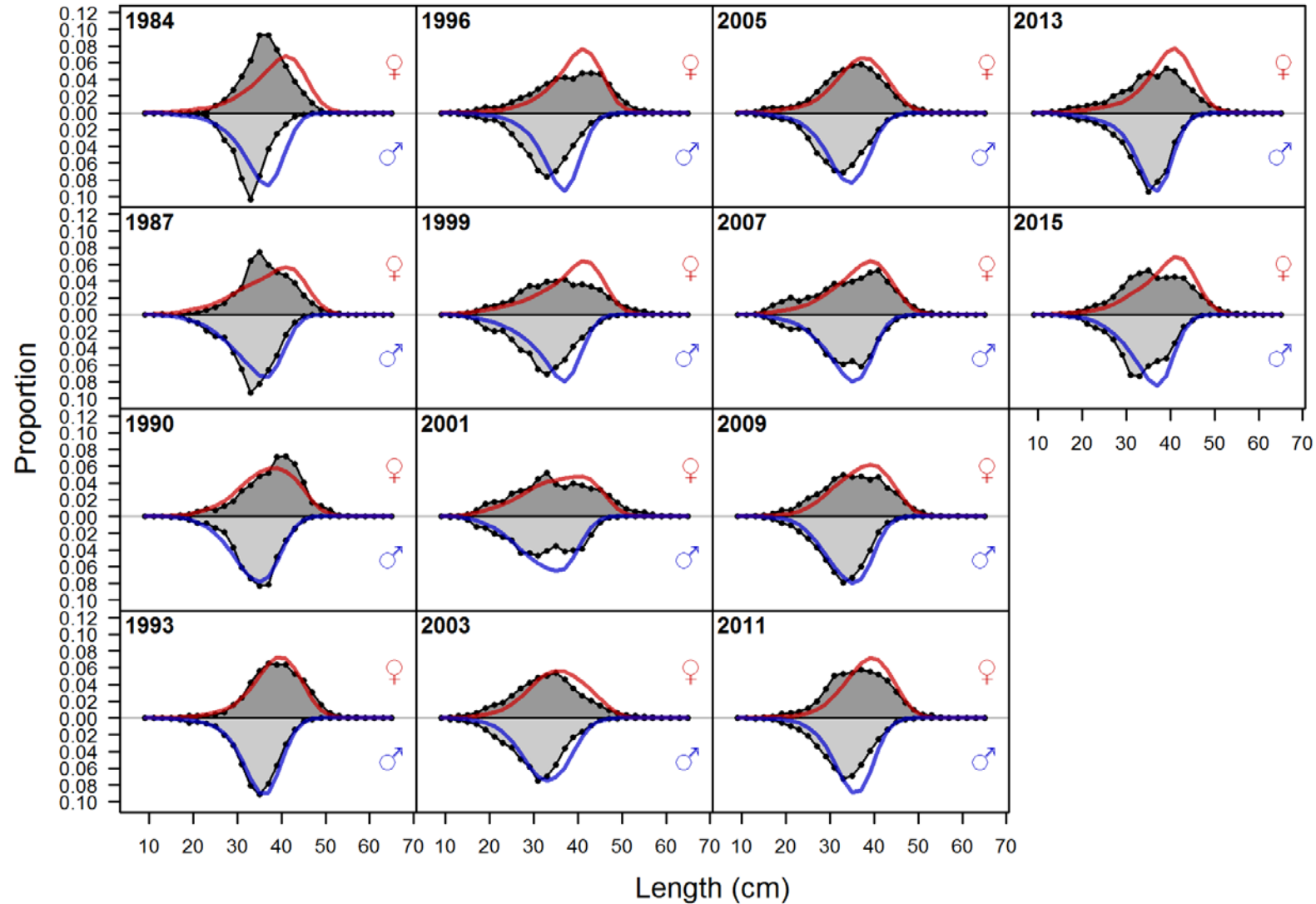
Without fishery age data (new data added, no restriction on initial selectivities)

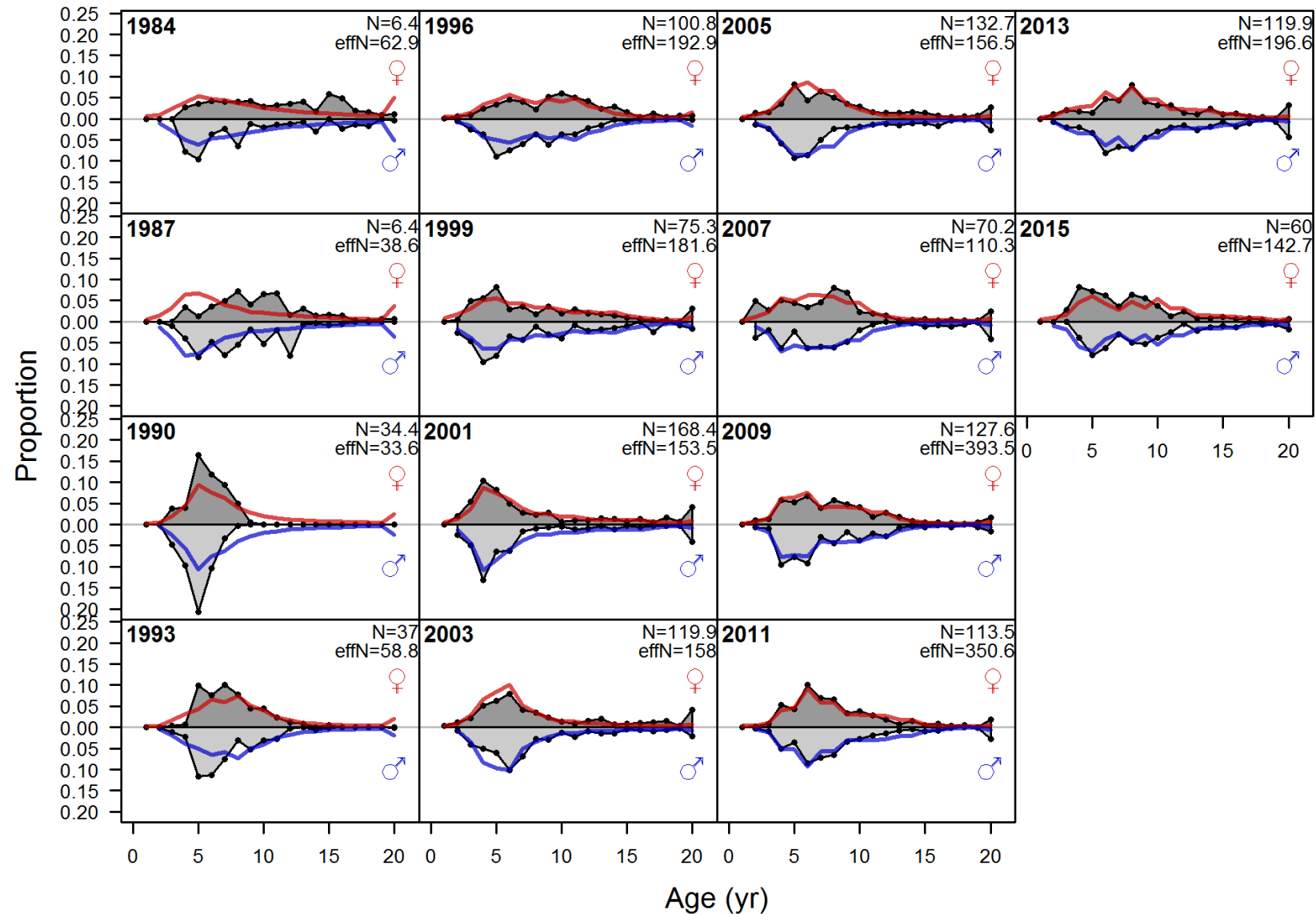Age comps, aggregated across time by fleet
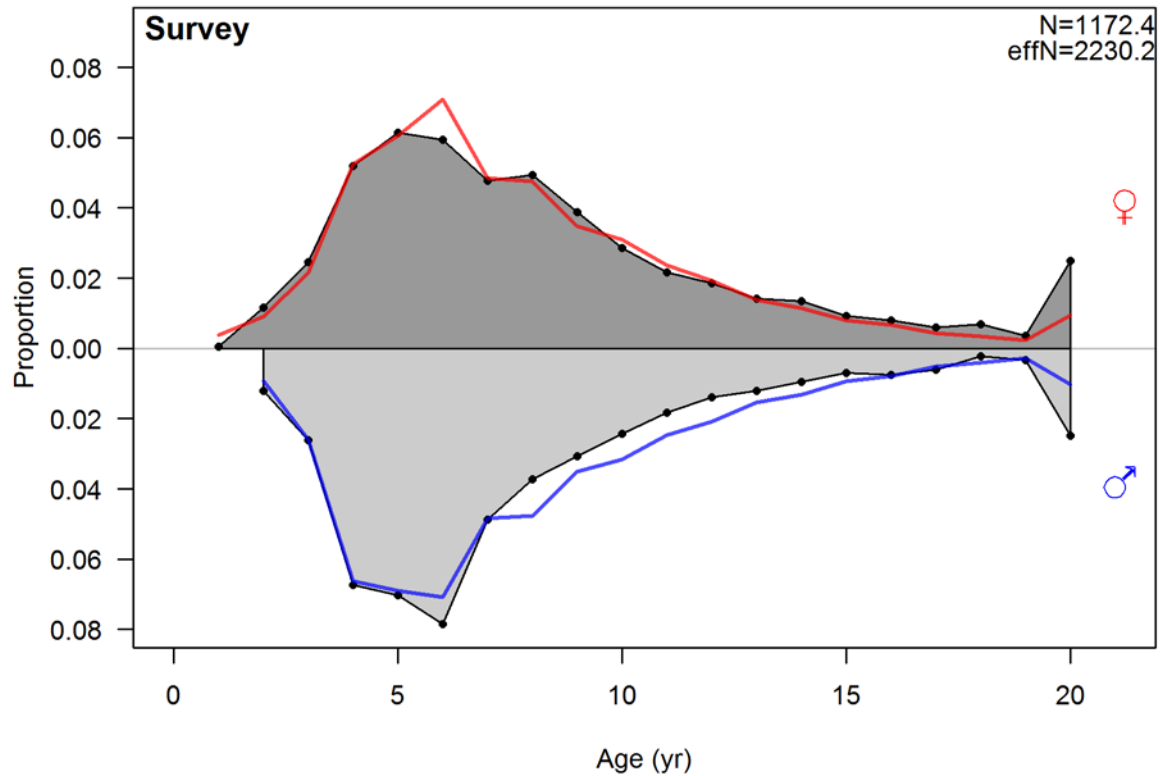
Pearson residuals, comparing across fleets
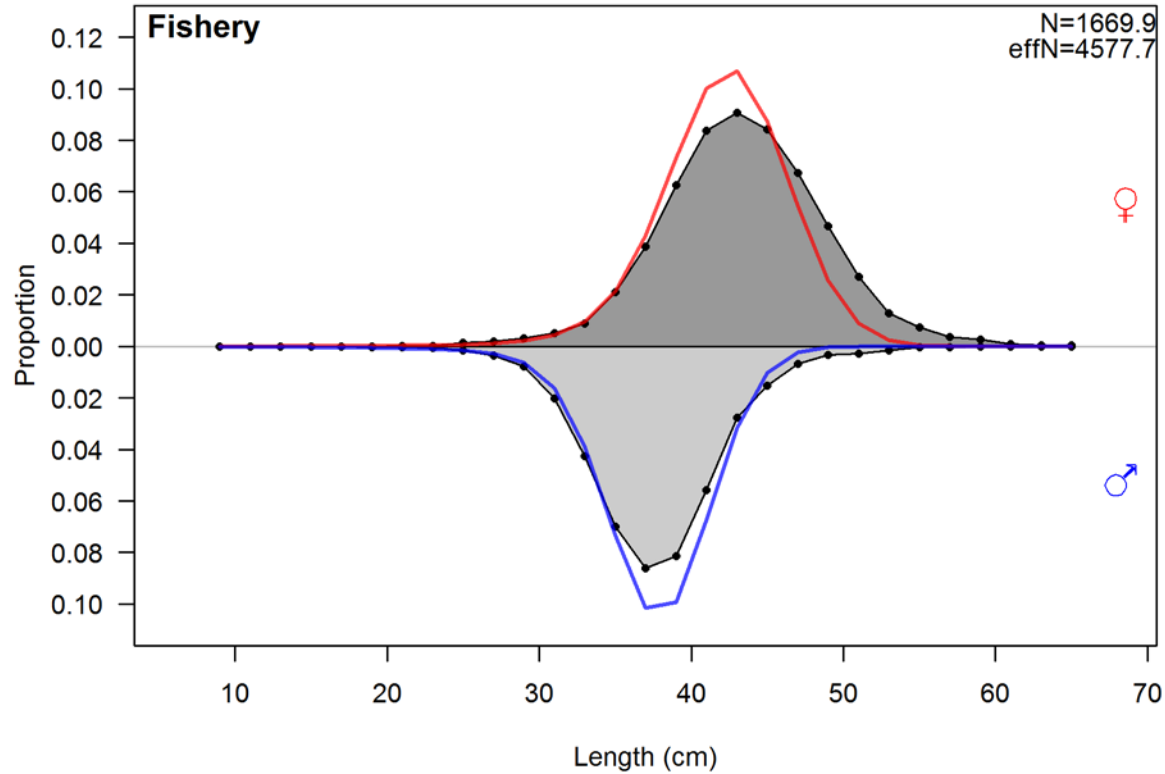
Without fishery age data
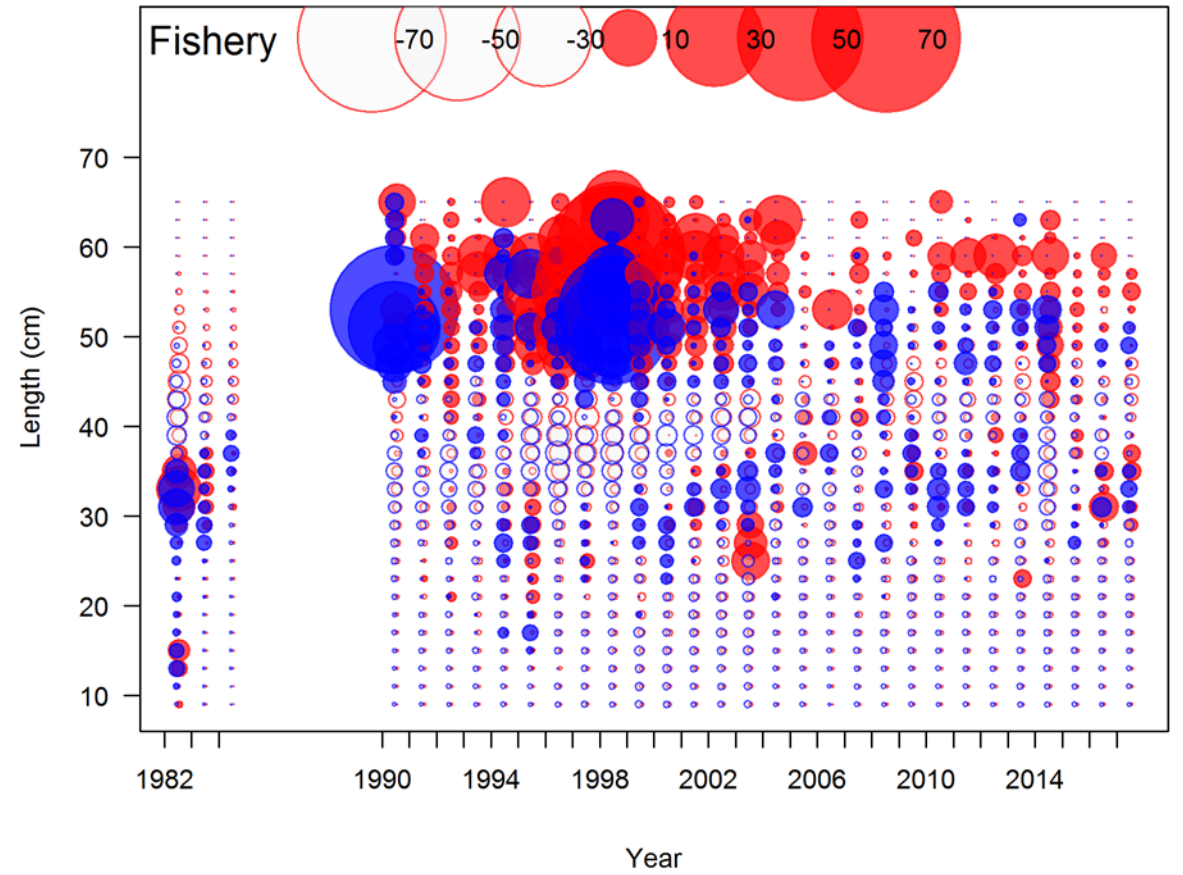

Age comps, whole catch, Survey

Without fishery age data
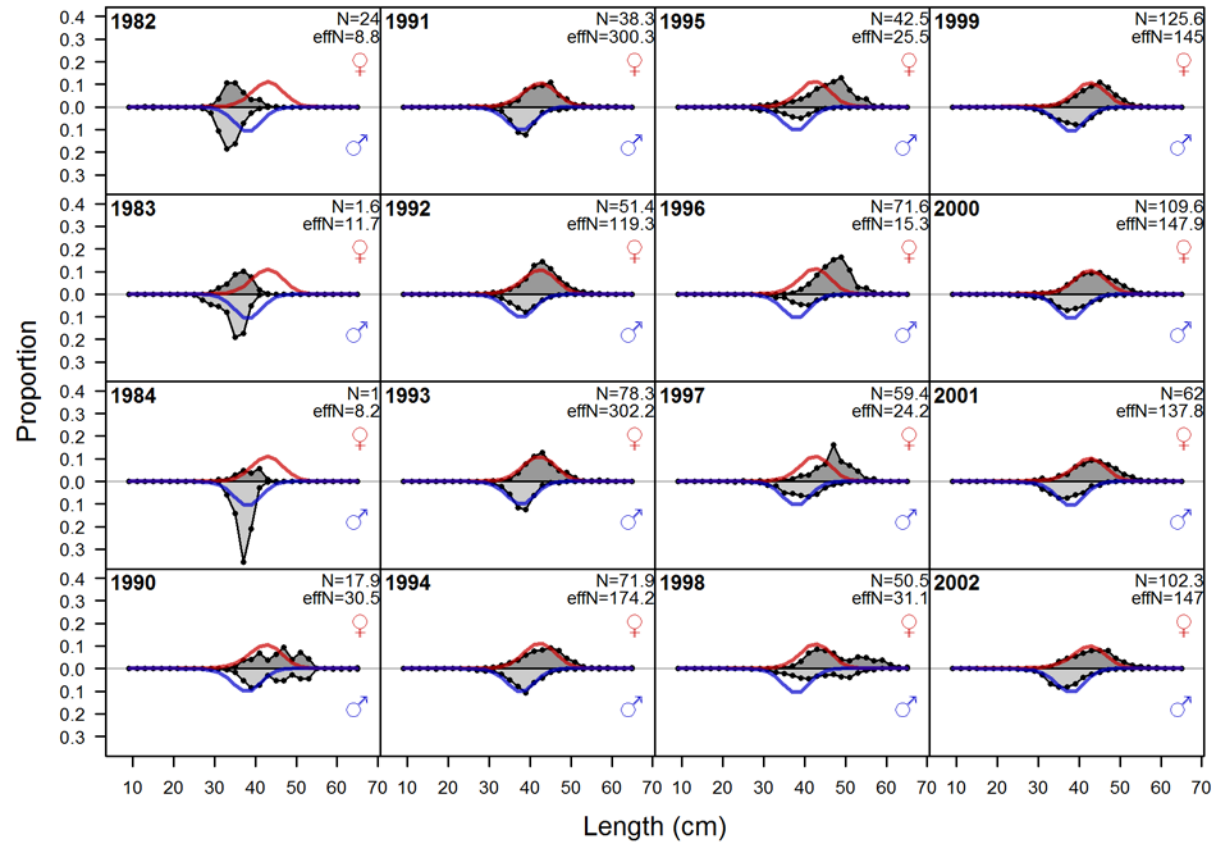

Length comps, aggregated across time by fleet
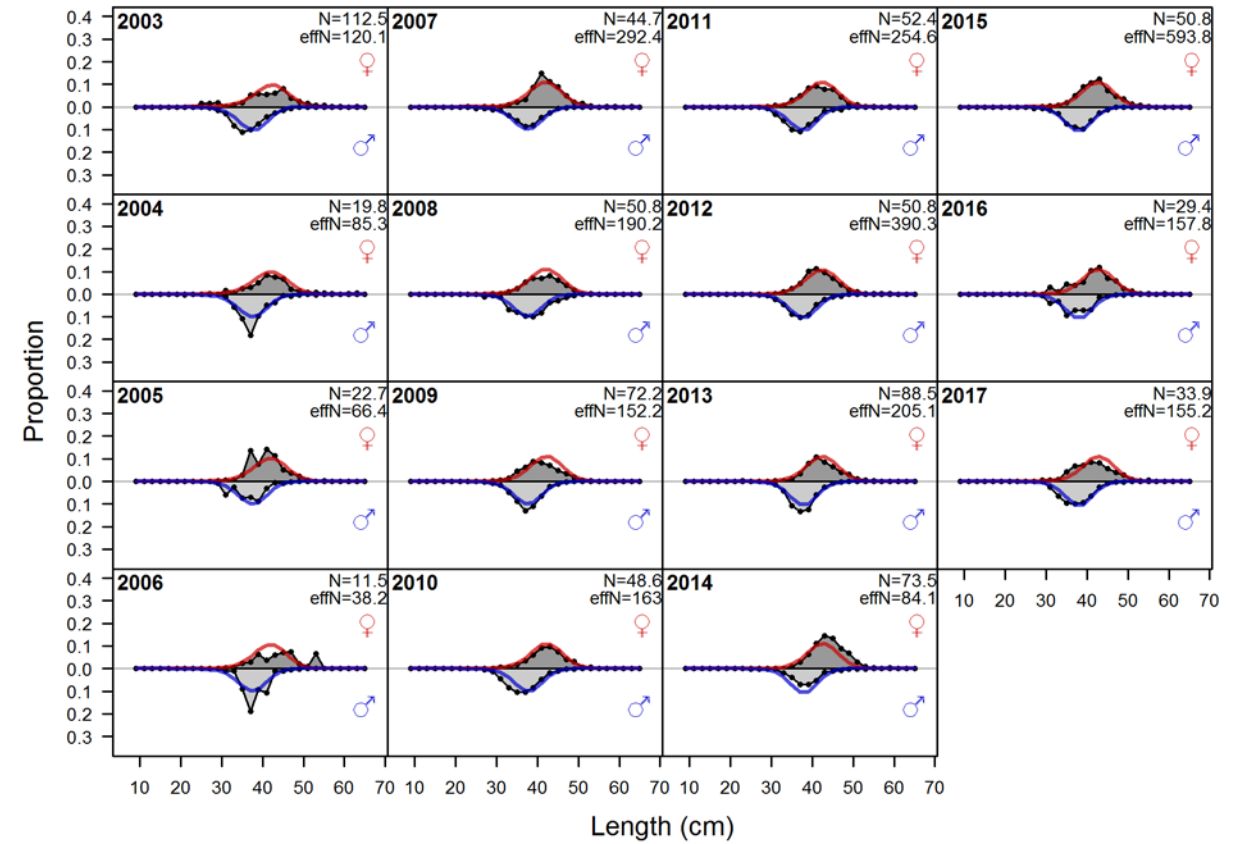
Fishery

N=1669.9
effN=4577.7

Pearson residuals, comparing across fleets

Fishery
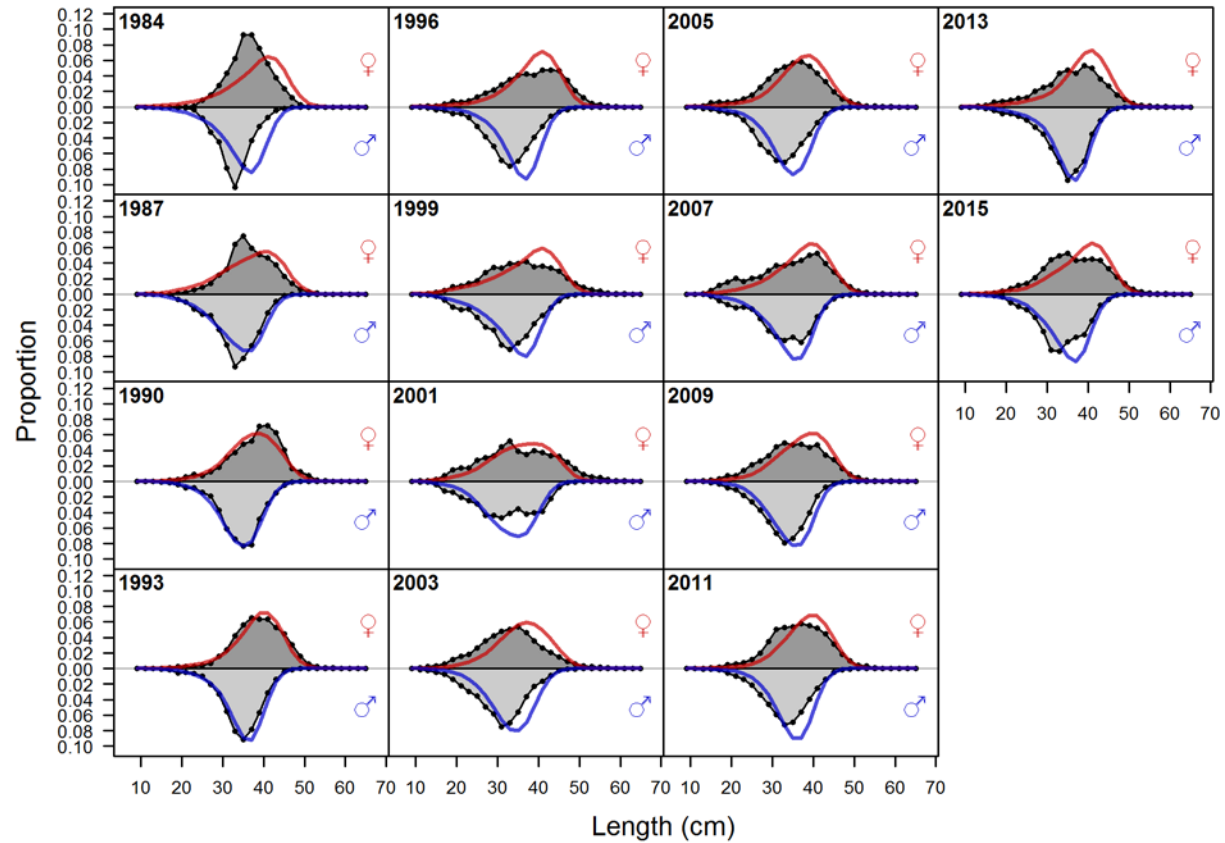
Without fishery age data

Length comps, whole catch, Fishery

Without fishery age data

Ghost length comps, whole catch, Survey

Further areas for improvement

- Male selectivity estimated to occur before female selectivity – does not seem likely that this actually happens
  - Further exploration of growth estimates and ageing error would be good
  - Further exploration of selectivity patterns would be good
  - Other ideas?
- A bit of a mismatch between fits to age data vs fits to length data
  - Further exploration of growth estimates and ageing error would be good
- Conflict in the survey data between early ages and more recent ages
  - Further exploration of survey age comp methodology would be good
  - Conditional age-at-length would eliminate some assumptions