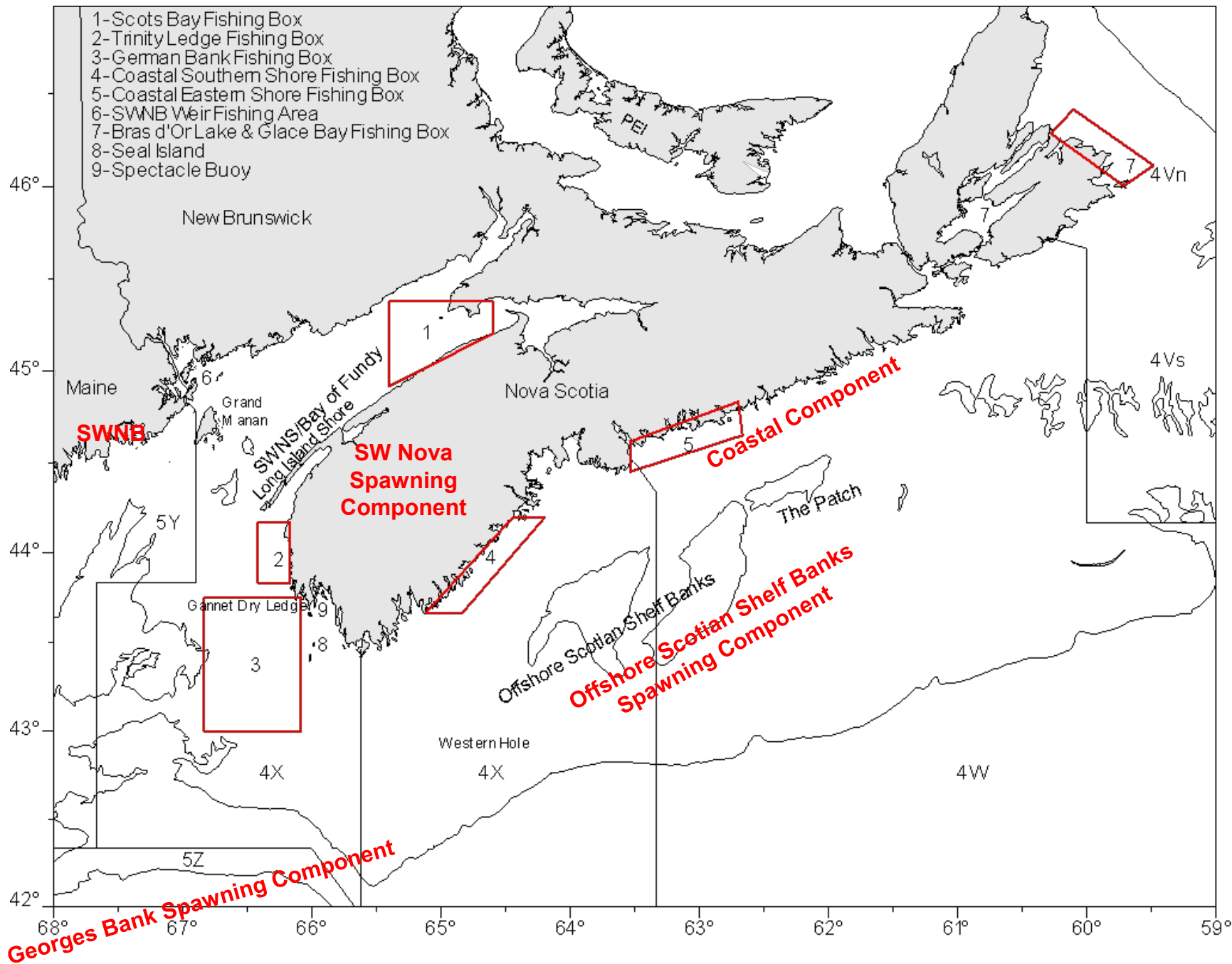# Preliminary data and acoustic surveys from 2023.

4XVW Spawning Components

- Coastal (South Shore, Eastern Shore and Cape Breton) Nova Scotia
- Southwest Nova Scotia/Bay of Fundy (SWNS/BoF)
- Offshore Scotian Shelf Banks
- New Brunswick migrant juveniles

Map legend:

1- Scots Bay Fishing Box
2- Trinity Ledge Fishing Box
3- German Bank Fishing Box
4- Coastal Southern Shore Fishing Box
5- Coastal Eastern Shore Fishing Box
6- SWNB Weir Fishing Area
7- Bras d'Or Lake & Glace Bay Fishing Box
8- Seal Island
9- Spectacle Buoy

New Brunswick

PEI

Maine

Nova Scotia

4Vn

4Vs

SWNB

Grand Manan

SWNS/Bay of Fundy Long Island Shore

SW Nova Spawning Component

Coastal Component

5Y

The Patch

Gannet Dry Ledge

Offshore Scotian Shelf Banks

Offshore Scotian Shelf Banks Spawning Component

Western Hole

4X

4X

4W

5Z

Georges Bank Spawning Component

SWNS/BoF Spawning Component

- Southwest Nova Scotia/Bay of Fundy
  - 3 major spawning areas
    - Scots Bay
    - German Bank
    - Trinity Ledge
  - Minor spawning areas
    - Seal Island
    - Browns Bank*
    - Gannet Dry Ledge*
    - Spectacle Buoy
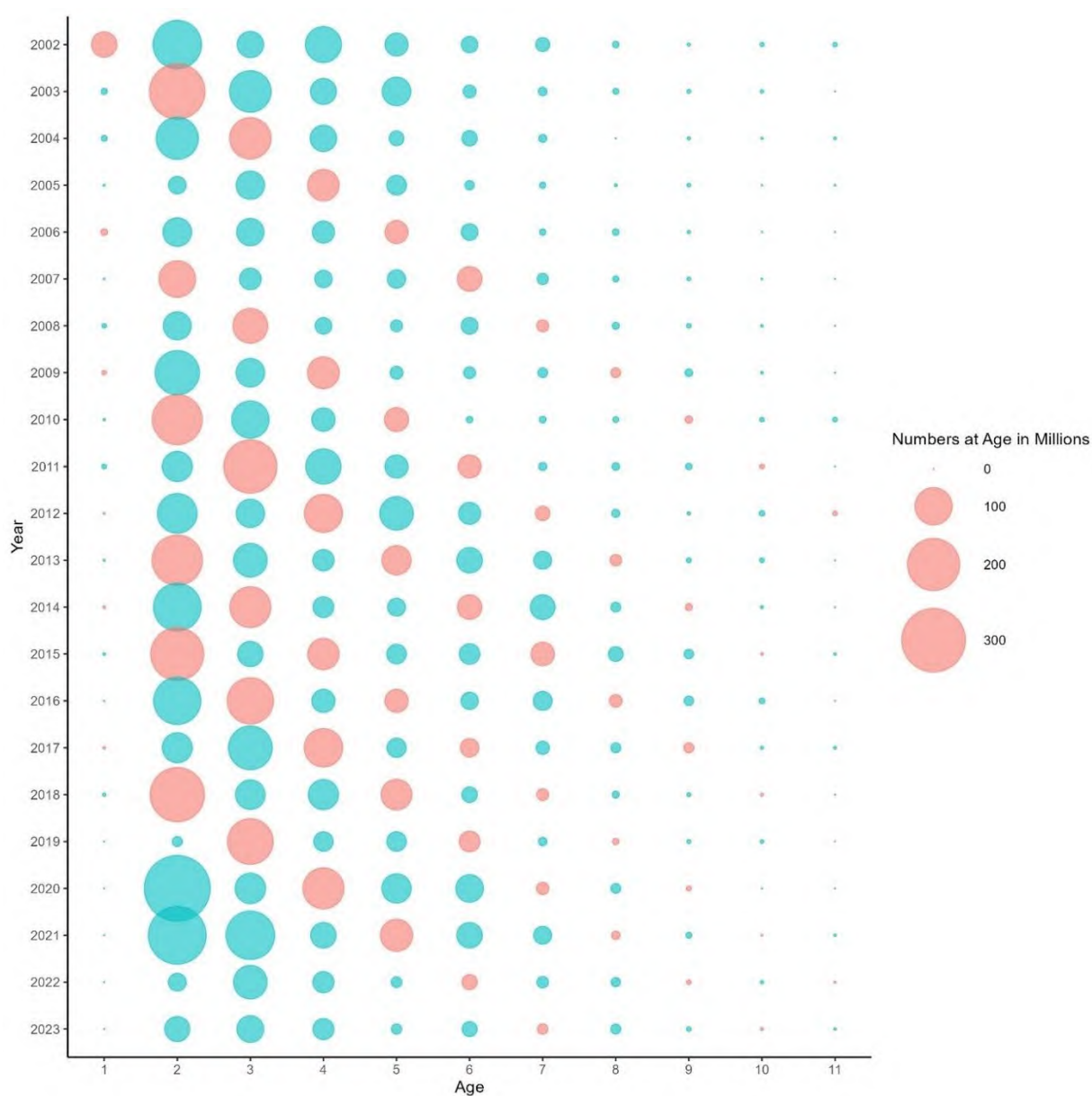
Figure. Numbers-at-age in the commercial landings for Southwest Nova Scotia/Bay of Fundy spawning component from 2002–2023 by quota year from purse seine and gillnet gear. The size of the bubble is proportional to the numbers by age. Selected cohort-classes from 1998, 2005, 2007, 2011, 2013, and 2016 are shown in red.
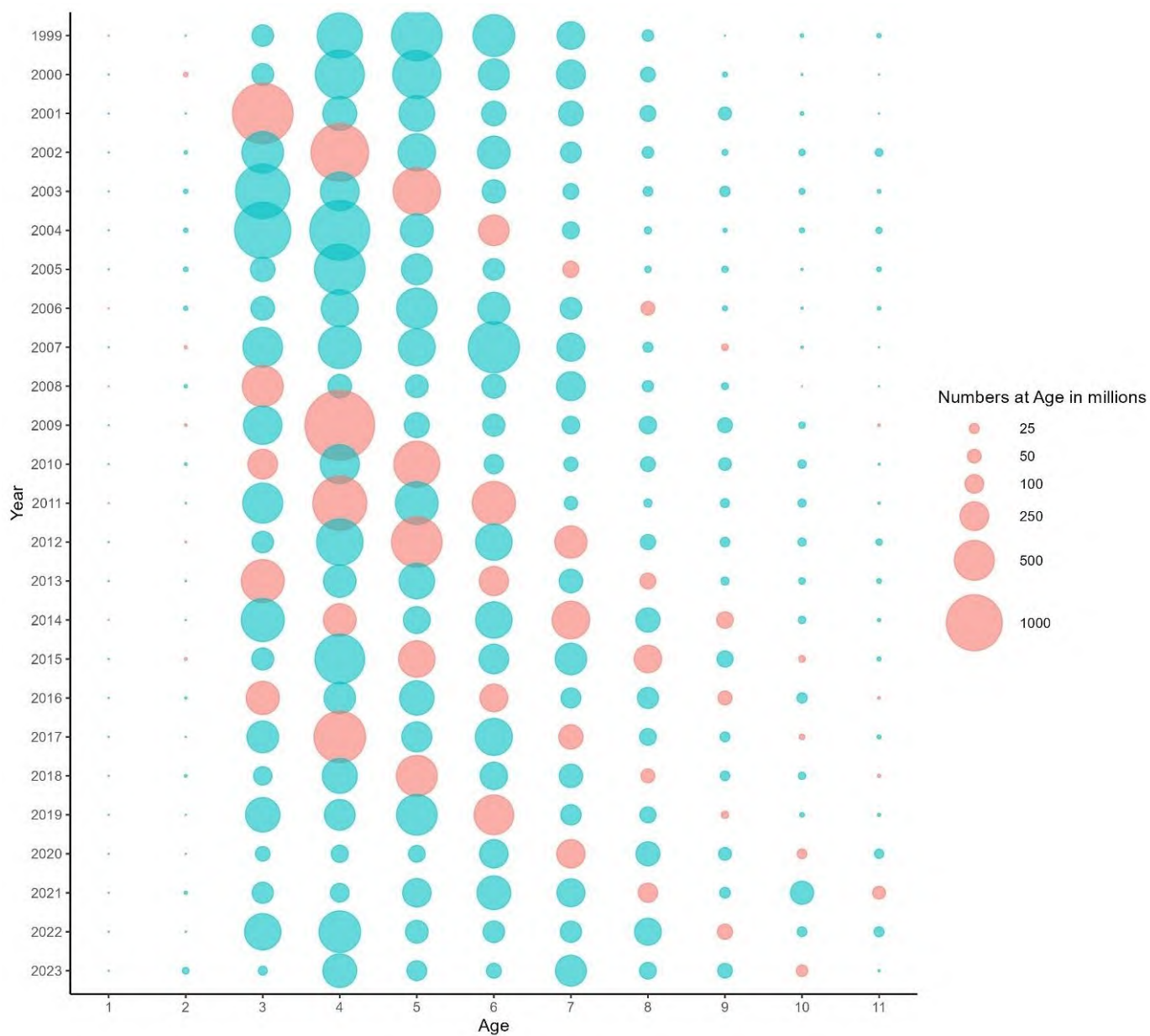
Figure. *Acoustic survey relative numbers at age (denoted by circle size) for the Scots Bay and German Bank SWNS/BoF spawning component from purse seine gear. The size of the bubble is proportional to the numbers by age. Selected year-classes 1998, 2005, 2007, 2011, 2013 are shown in red.*
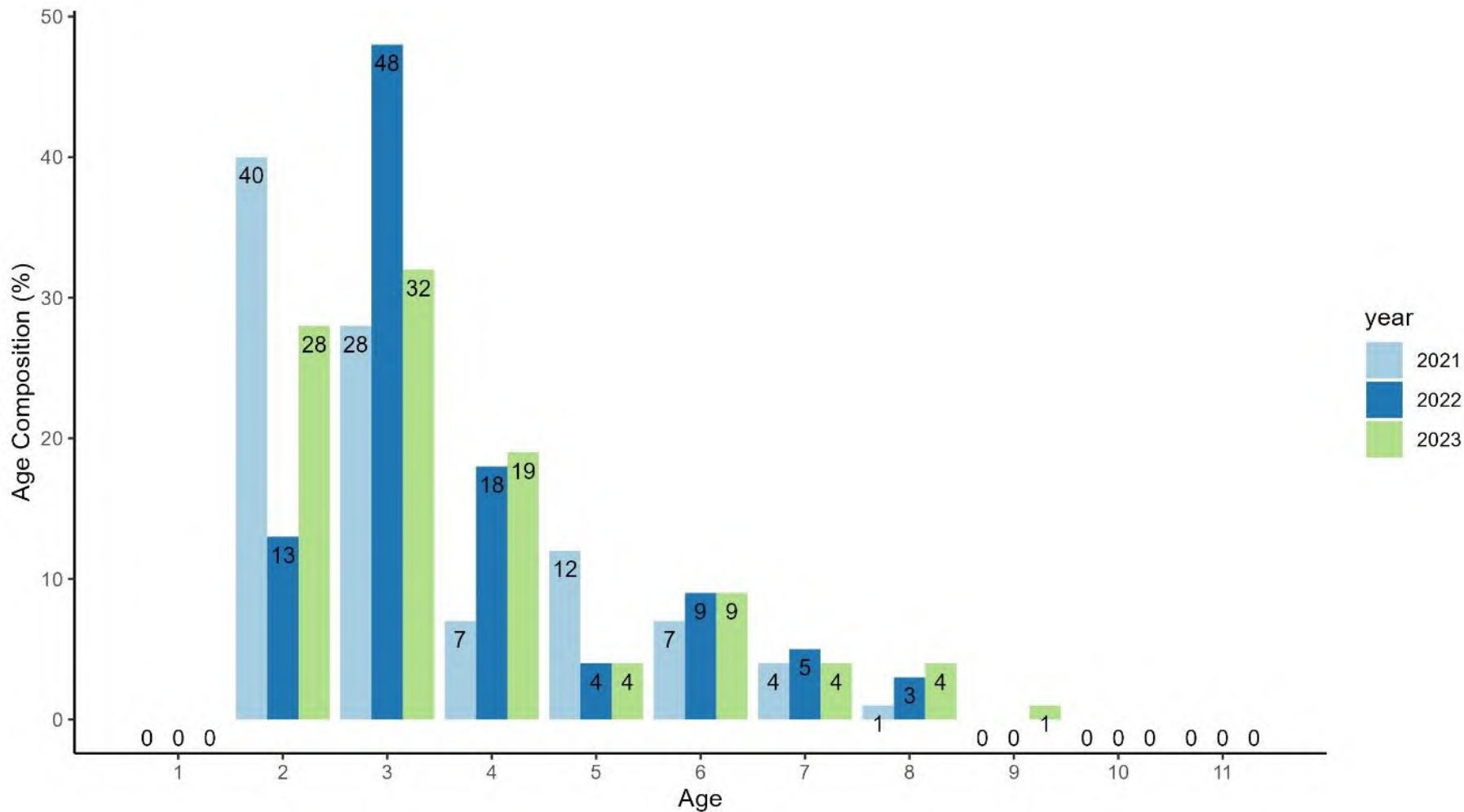
Figure. Commercial catch age composition (% catch by number) for Southwest Nova Scotia/Bay of Fundy spawning component for calendar years 2021, 2022 and 2023 from purse seine and gillnet gear
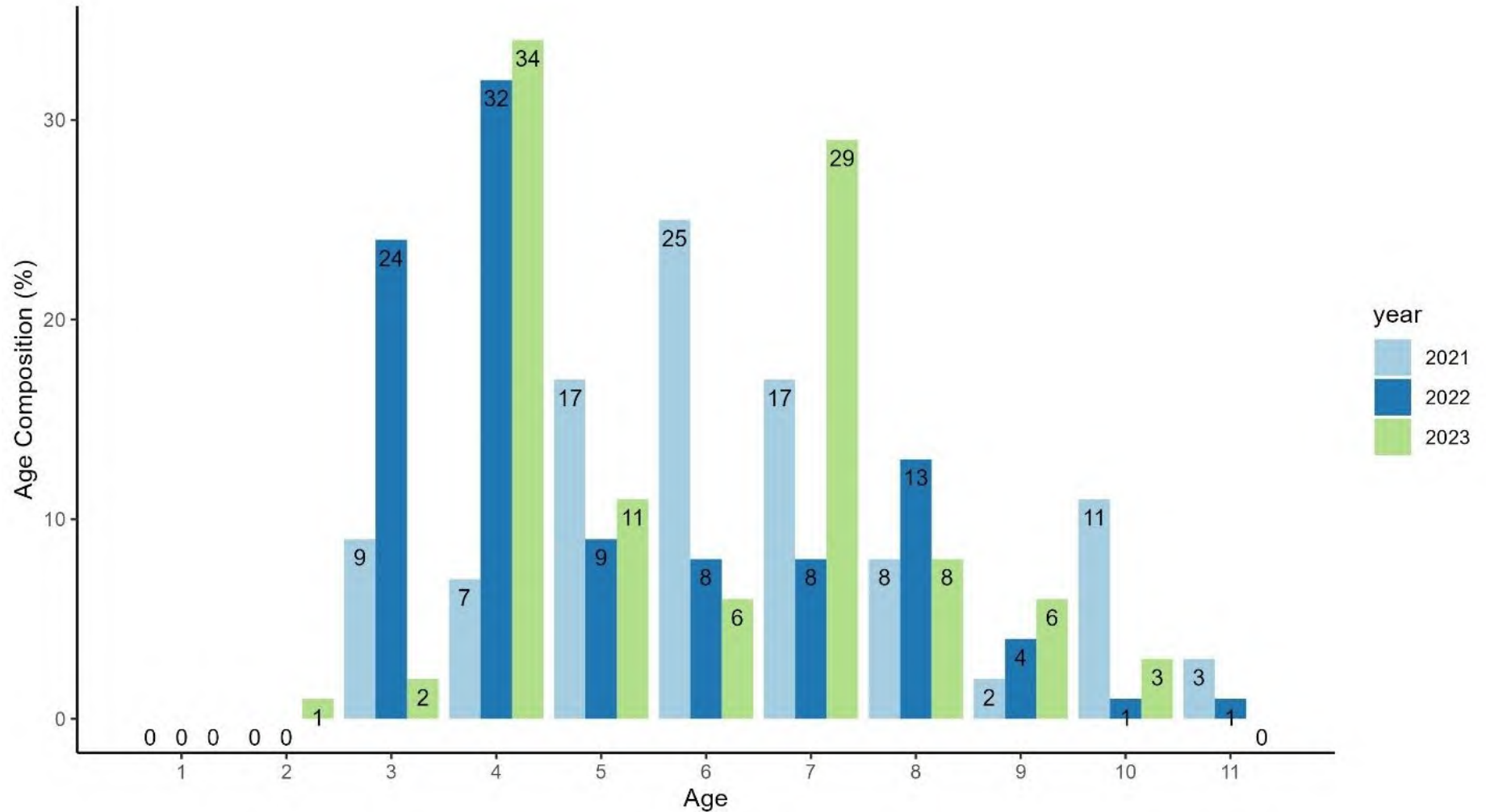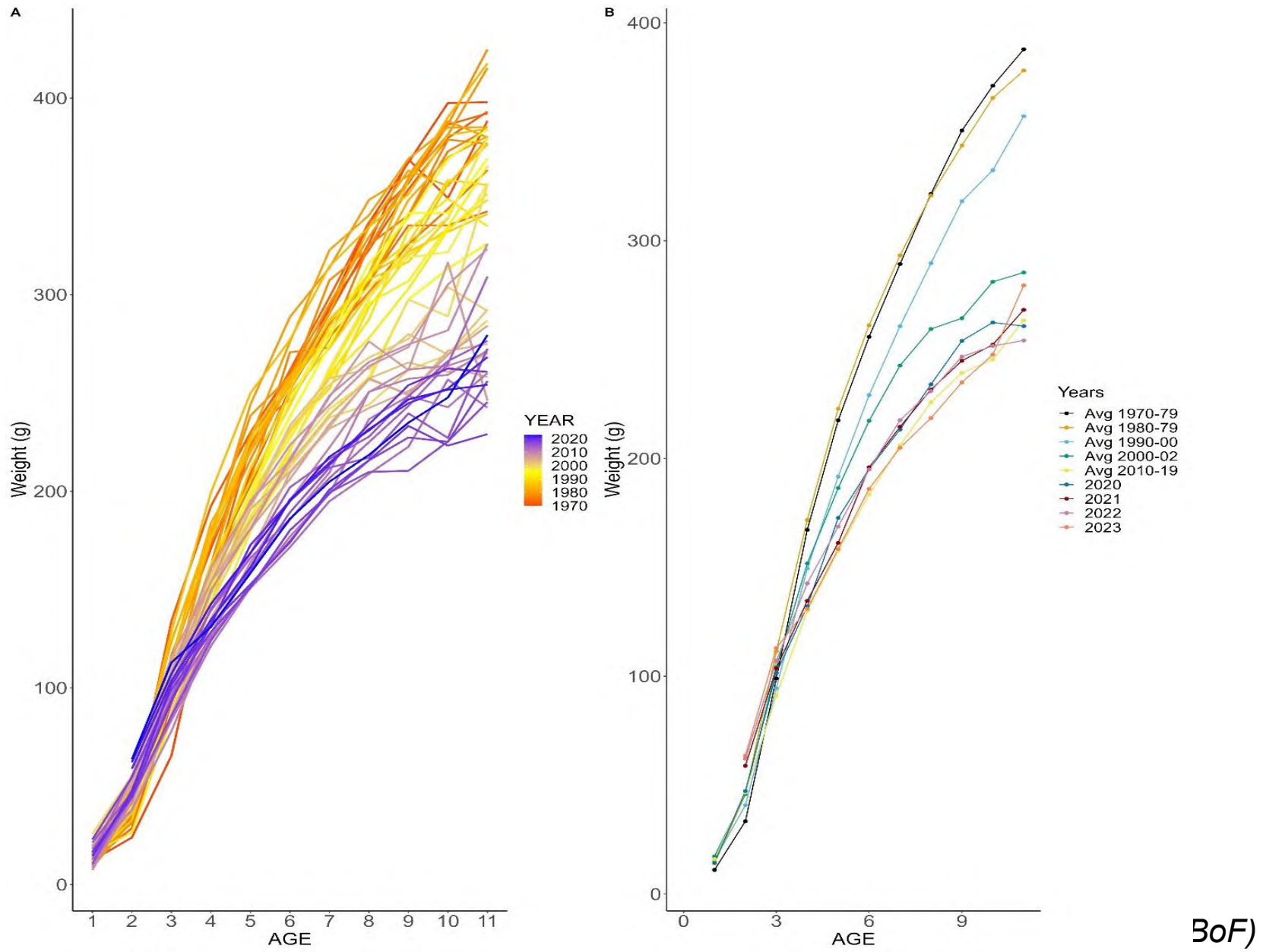
Figure. *Acoustic survey age composition (% by number) for Southwest Nova Scotia/Bay of Fundy spawning component for Scots Bay and German Bank for calendar years (2020, 2021, and 2022) from purse seine gear*
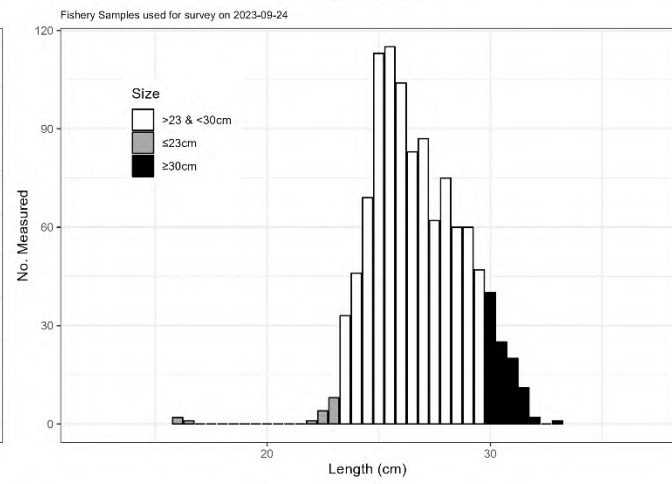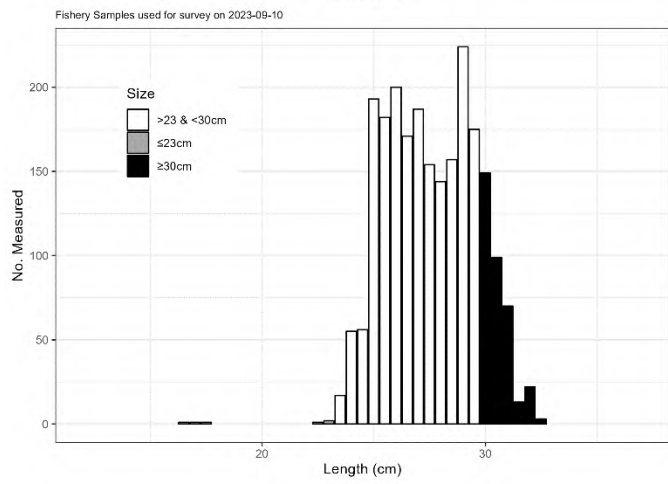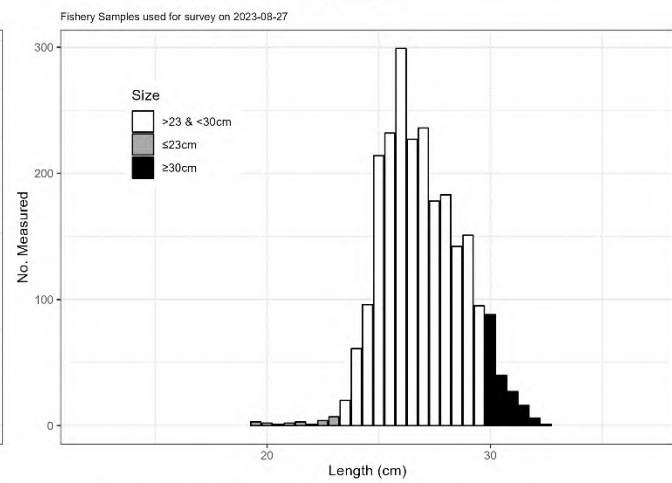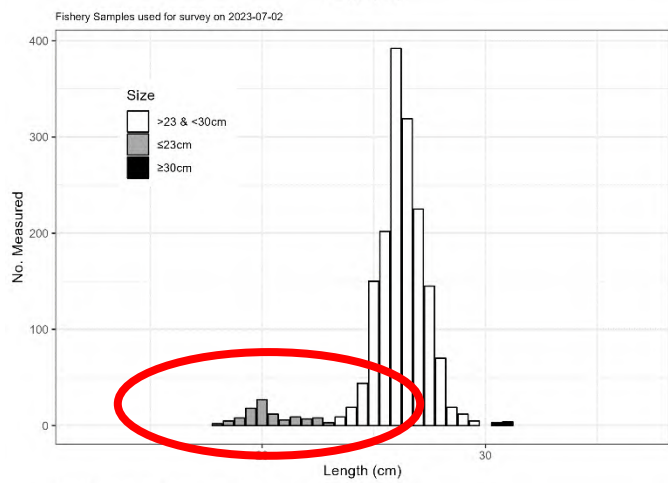
Figure. ... BoF) component from 1970 to 2023. A) Red lines indicate earlier in the time series and purple to blue lines are later in the time series. B) Decadal averages and annual estimates for last 5 years.

Scots Bay survey Samples

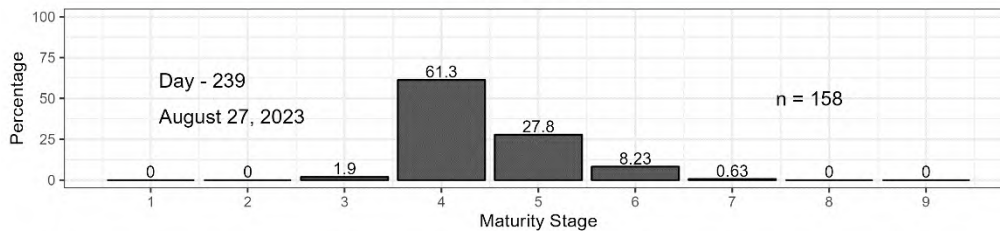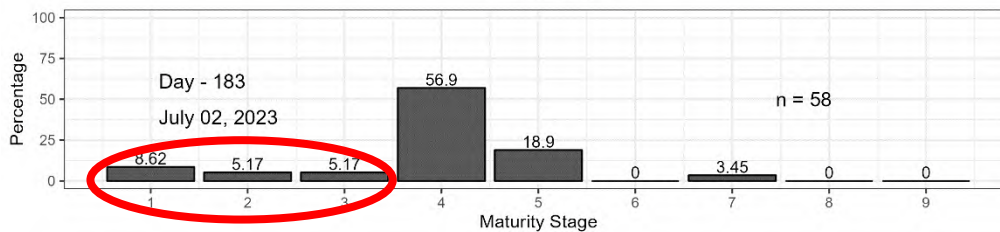| Location of survey	Interval (days)	Date	No. of Len. Samp.	No. of Det. Samp.	No. Len/Wt Fish	No. of Fish Measured	Mean Length (mm)	Mean Weight (g)	Target Strength (dB/kg)	Wt 28 cm Fish (g)	TS 28 cm Fish (dB/kg)
Scots Bay #1		May - 22							-35.5000		
Scots Bay #2	15	Jun - 6	9	2	45	1769	277	159	-35.0776	165	-35.1435
Scots Bay #3	12	Jun - 18	9	3	59	1556	272	152	-35.0369	168	-35.2187
Scots Bay #4	14	Jul - 2	9	3	58	1723	243	114	-34.7408	179	-35.4909
Scots Bay #5	14	Jul - 16							-35.5000		
Scots Bay #6	14	Jul - 30							-35.5000		
Scots Bay #7	14	Aug - 13							-35.5000		
Scots Bay #8	14	Aug - 27	12	6	158	2335	260	141	-35.1054	176	-35.4216
Scots Bay #9	14	Sep - 10	12	7	180	2277	262	145	-35.1434	177	-35.4273
Scots Bay #10	14	Sep - 24	6	2	56	1069	245	117	-34.8118	175	-35.3885
Scots Bay #11	15	Oct - 9							-35.5000		
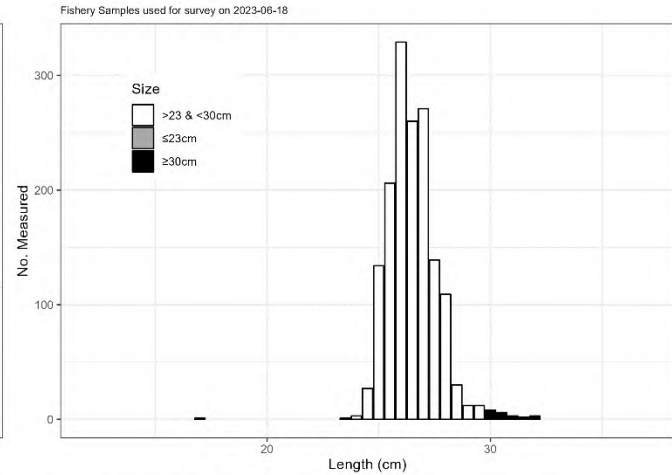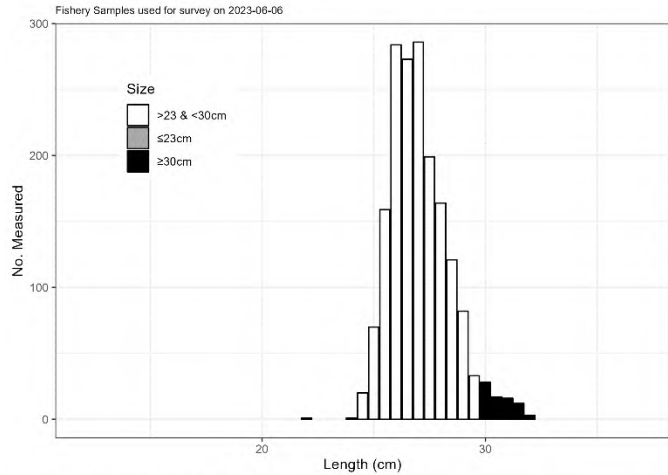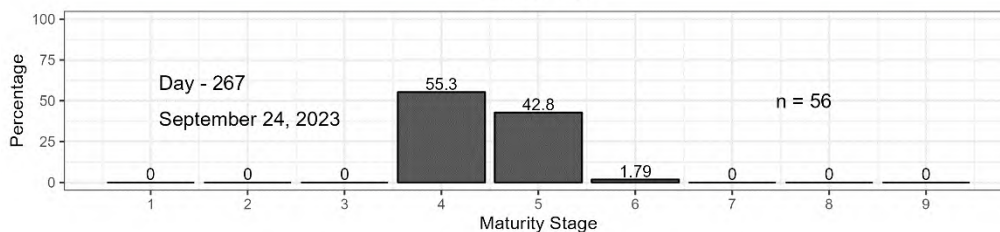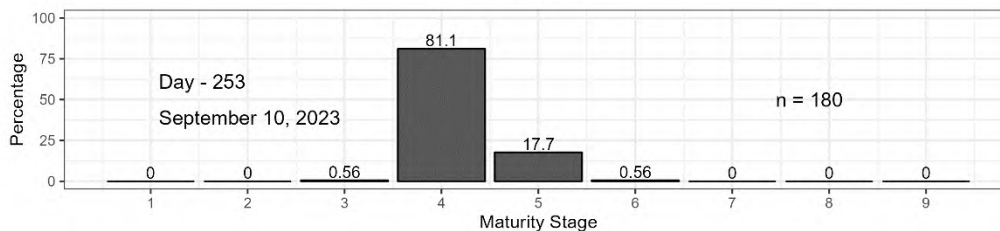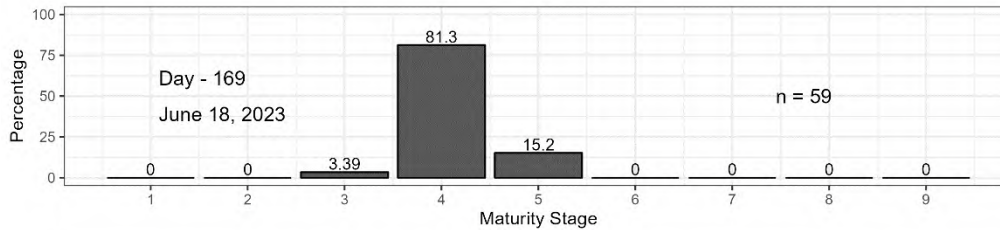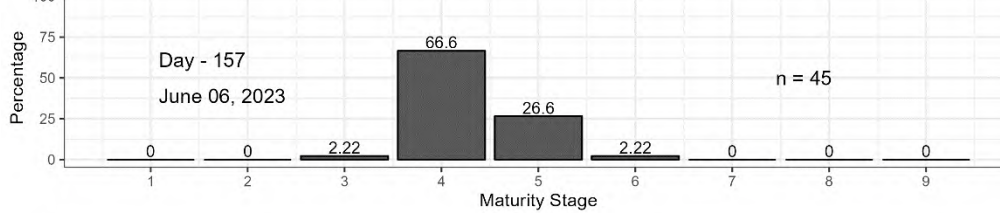
Fishery Samples used for survey on 2023-06-06

Fishery Samples used for survey on 2023-06-18

Fishery Samples used for survey on 2023-07-02

Fishery Samples used for survey on 2023-08-27

Fishery Samples used for survey on 2023-09-10

Fishery Samples used for survey on 2023-09-24

Maturation Stages
1 - Immature 1
2 – Immature 2
3 – Ripening 1
4 – Ripening 2
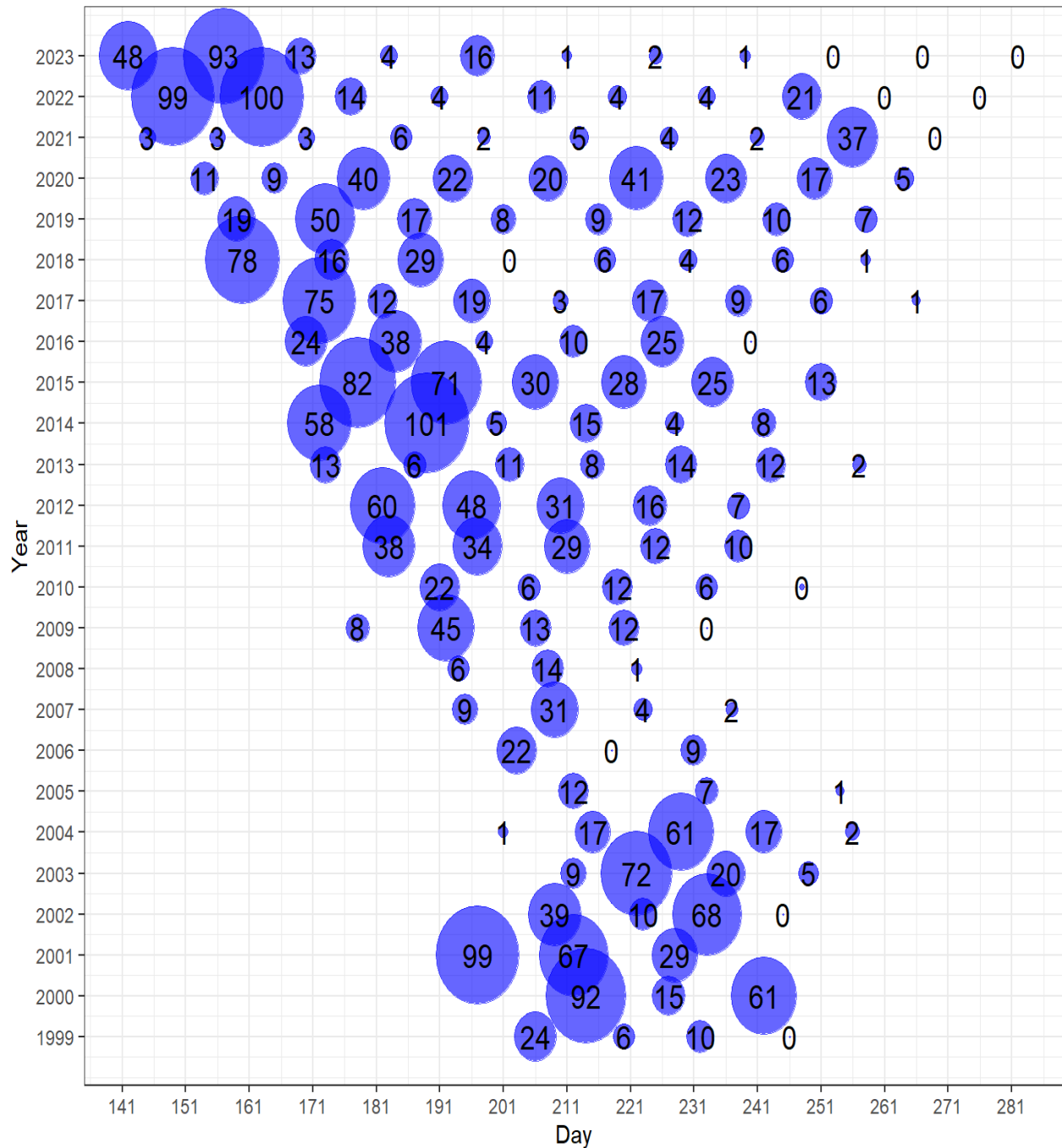5 - Ripe
6 – Spawning
7 - Spent
8 - Recovering
9 – Recovering 2

Scots Bay Summary

Location	Date	Target Strength (dB/kg)	Area (km²)	Mean Sa (dB/m²)	Unadjusted Biomass (t)	Standard Error (t)	St. Err %	Adjusted Biomass (t)
Scots Bay #1	2023-05-22	-35.5000	687	-48.84	47,629	14,110	44	47,629
Scots Bay #2	2023-06-06	-35.0776	624	-45.11	98,726	43,571	70	92,916
Scots Bay #3	2023-06-18	-35.0369	676	-51.45	29,417	6,886	45	12,696
Scots Bay #4	2023-07-02	-34.7408	661	-53.65	9,330	4,927	53	3,619
Scots Bay #5	2023-07-16	-35.5000	647	-51.31	17,387	8,824	52	16,022
Scots Bay #6	2023-07-30	-35.5000	619	-58.01	3,474	720	21	1,093
Scots Bay #7	2023-08-13	-35.5000	623	-59.01	2,777	768	28	2,247
Scots Bay #8	2023-08-27	-35.1054	609	-60.88	1,612	226	14	1,224
Scots Bay #9	2023-09-10	-35.1434	608	-57.91	3,219	469	15	0
Scots Bay #10	2023-09-24	-34.8118	646	-59.22	2,340	1,247	53	0
Scots Bay #11	2023-10-09	-35.5000	664	-59.70	2,521	358	14	0
Summary			642	-55.01	218,431	47,436	22	177,447

Scots Bay
1999-2023

Surveys:
- June 27 – Sept. 8 (2015)
- June 18 – Aug. 27(2016)
- June 21 – Sept. 23 (2017
- June 9 – Sept. 15 (2018)
- June 8 – Sept. 15 (2019)
- June 2 – Sept. 20 (2020)
- May 25 – Sept. 26 (2021)
- May 29 – Oct. 3 (2022)
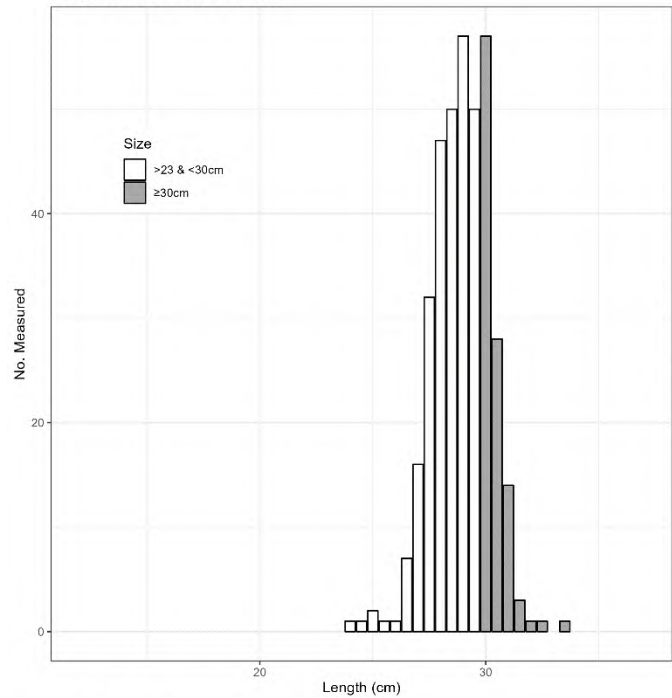- May 22 – Oct. 11 (2023)
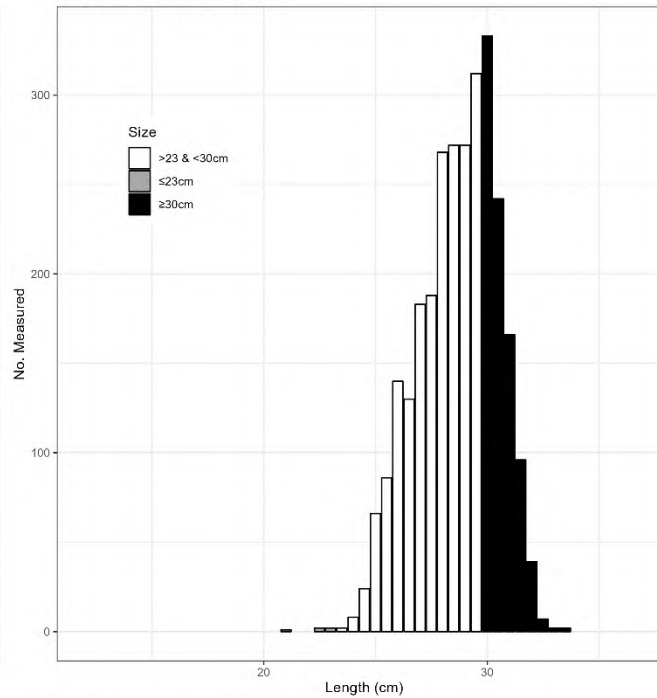
German Bank survey Samples

Location	Date	Target Strength (dB/kg)	Area (km^2)	Mean Sa (dB/m^2)	Unadjusted Biomass (t)	Standard Error (t)	St. Err %	Adjusted Biomass
German Bank #1	2023-08-06	-35.5000	505	-59.48	2,021	198	10	2,021
German Bank #2	2023-08-20	-35.1776	796	-59.02	3,288	837	25	2,894
German Bank #3	2023-09-03	-35.2314	794	-55.00	8,372	2,017	24	7,658
German Bank #4	2023-09-13	-35.0659	797	-52.31	15,011	5,316	35	12,497
German Bank #5	2023-09-27	-35.0837	802	-52.82	13,503	2,307	17	9,978
German Bank #6	2023-10-11	-35.5000	820	-50.36	26,754	14,629	55	23,581
German Bank #7	2023-10-24	-35.5000	797	-54.01	11,241	1,852	16	4,970
Summary			759	-54.71	80,190	15,994	20	63,600

*Standard Target strength used. Length-frequency or detailed sample not available.
Reporting target strength for 38 kHz, for 50, 75, and 120 kHz, add -0.10727, -0.26575, and -0.44946, respectively.
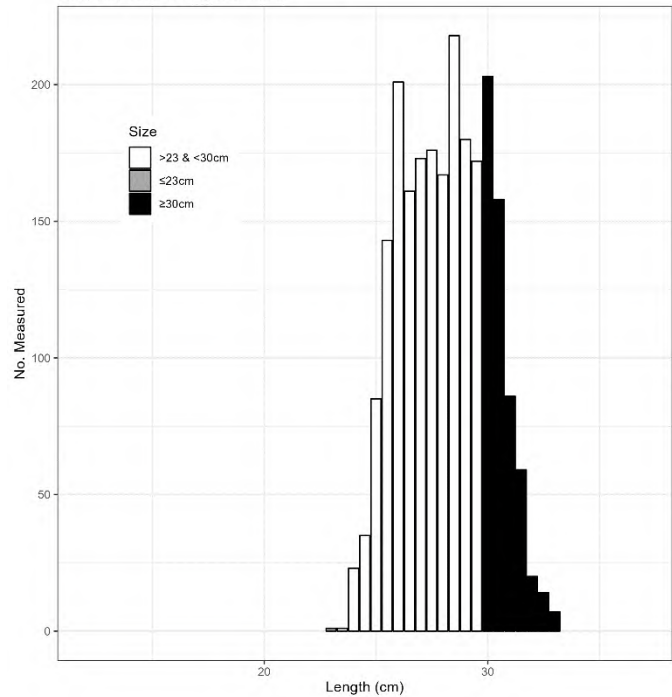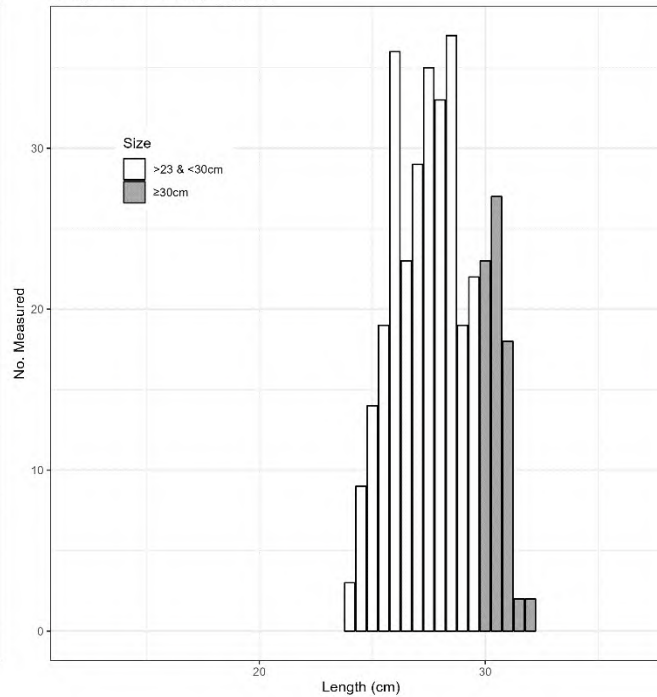
Fishery Samples used for survey on 2023-08-20

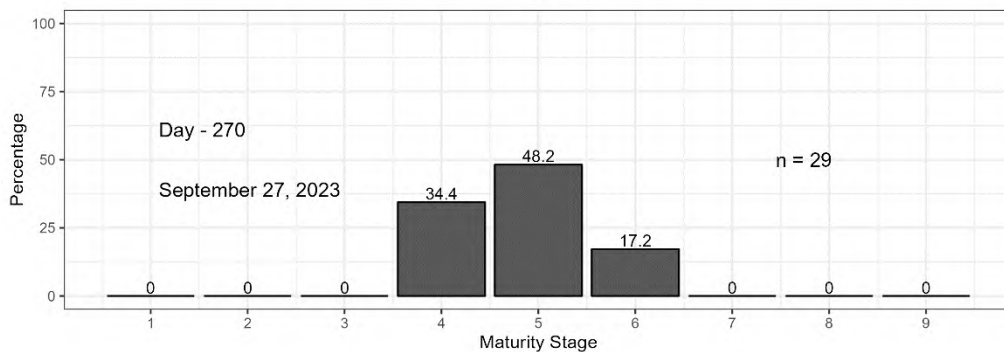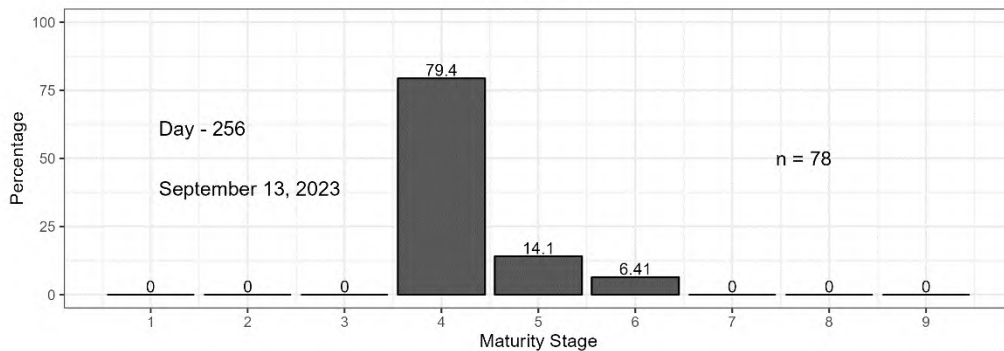Fishery Samples used for survey on 2023-09-03

Fishery Samples used for survey on 2023-09-13
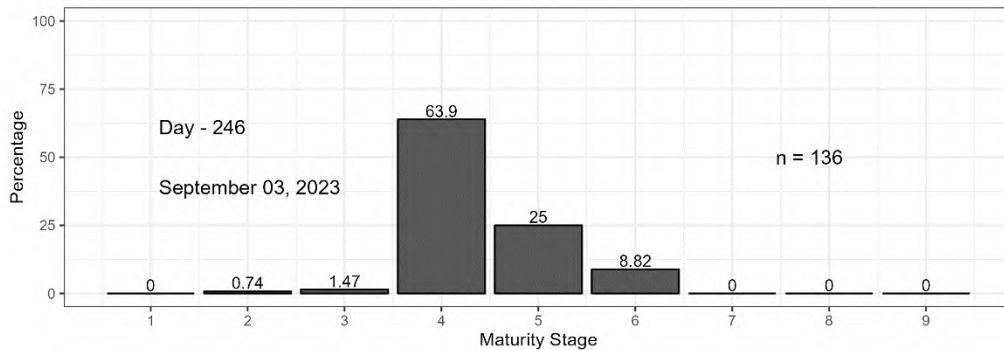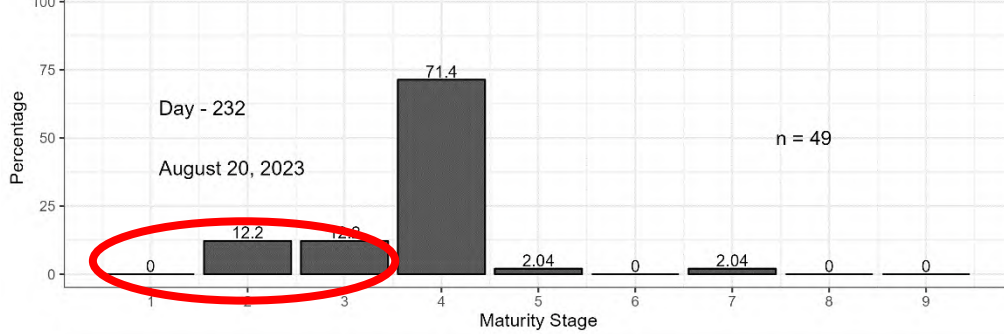
Fishery Samples used for survey on 2023-09-27

Maturation Stages
1 - Immature 1
2 – Immature 2
3 – Ripening 1
4 – Ripening 2
5 - Ripe
6 – Spawning
7 - Spent
8 - Recovering
9 – Recovering 2

German Bank Summary

Location	Date	Target Strength (dB/kg)	Area (km²)	Mean Sa (dB/m²)	Unadjusted Biomass (t)	Standard Error (t)	St. Err %	Adjusted Biomass
German Bank #1	2023-08-06	-35.5000	505	-59.48	2,021	198	10	2,021
German Bank #2	2023-08-20	-35.1776	796	-59.02	3,288	837	25	2,894
German Bank #3	2023-09-03	-35.2314	794	-55.00	8,372	2,017	24	7,658
German Bank #4	2023-09-13	-35.0659	797	-52.31	15,011	5,316	35	12,497
German Bank #5	2023-09-27	-35.0837	802	-52.82	13,503	2,307	17	9,978
German Bank #6	2023-10-11	-35.5000	820	-50.36	26,754	14,629	55	23,581
German Bank #7	2023-10-24	-35.5000	797	-54.01	11,241	1,852	16	4,970
Summary			759	-54.71	80,190	15,994	20	63,600

German Bank
1999-2023

Surveys Date Ranges:
- Aug. 17 – Oct. 12 (2015)
- Aug. 21 – Oct. 7 (2016)
- Aug. 17 – Oct. 18 (2017)
- Aug. 12 – Oct. 22 (2018)
- Aug. 11 – Nov. 3 (2019)
- Aug. 16 – Oct. 25 (2020)
- Aug. 23 – Nov. 3 (2021)
- Aug. 6 – Oct. 24 (2022)
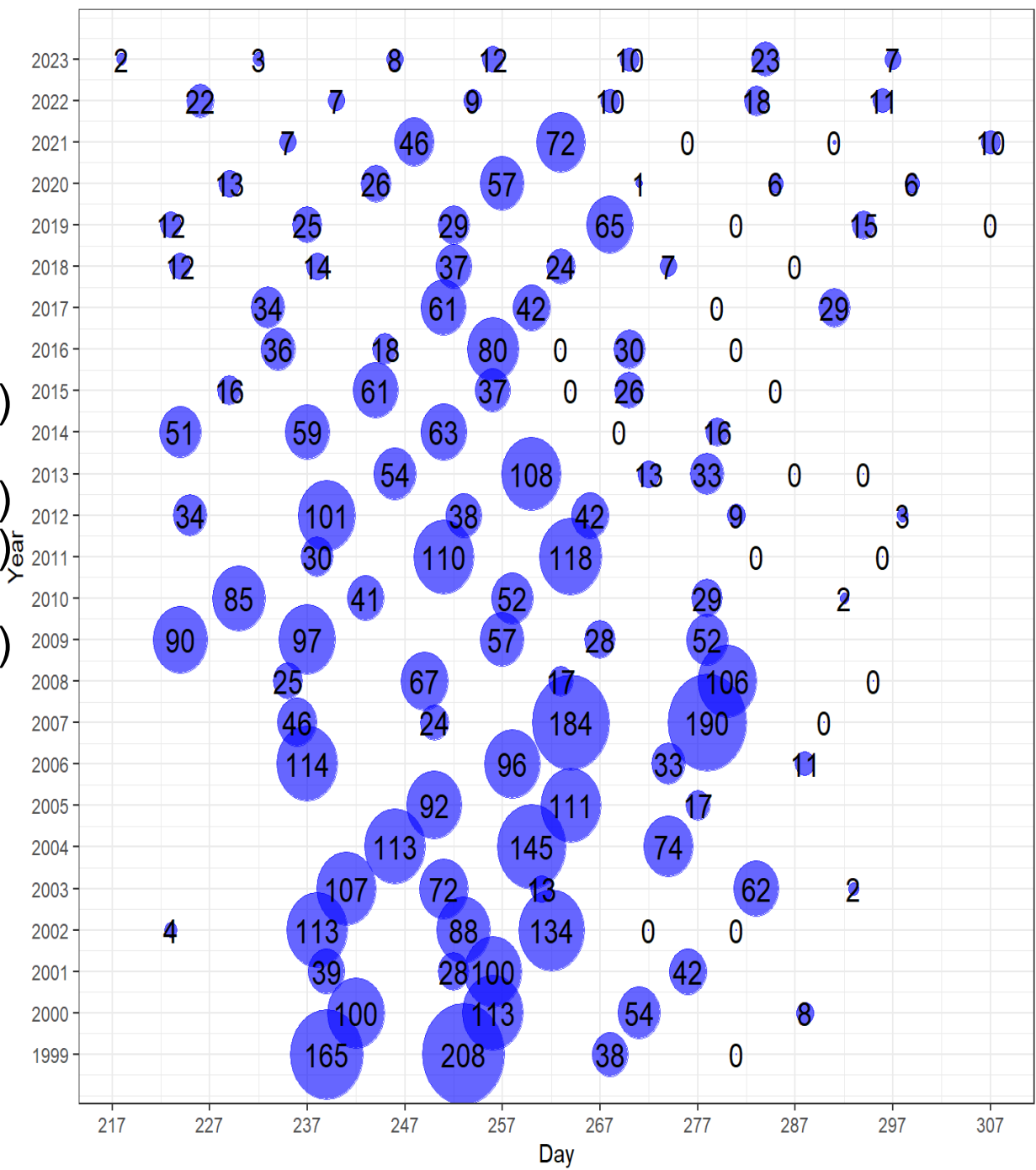
Seal Island survey Samples

Location	Date	Interval (Days)	Target Strength (dB/kg)	Area (km^2)	Mean Sa (dB/m^2)	Biomass (t)	Standard Error (t)	St. Err %
Seal Island #1	2023-08-07		-35.5000	300	-60.59	929	177	19
Seal Island #2	2023-08-21	14	-35.1776	270	-59.97	897	181	20
Seal Island #3	2023-09-04	14	-35.0331	269	-58.93	1,099	245	22
Seal Island #4	2023-09-14	10	-35.1239	267	-53.32	4,045	2,507	62
Seal Island #5	2023-09-27	13	-34.4425	276	-42.59	42,269	29,803	71
Seal Island #6	2023-10-12	15	-35.5000	280	-48.33	14,607	9,918	68
Seal Island #7	2023-10-25	13	-35.5000	277	-59.57	1,087	420	39
Summary				277	-54.76	64,933	31,515	49

Fishery Samples used for survey on 2023-08-20
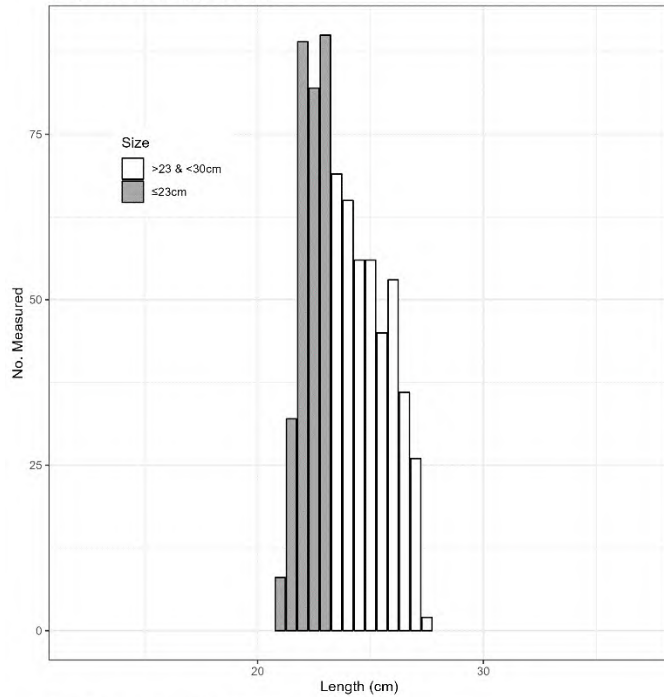
Fishery Samples used for survey on 2023-09-13
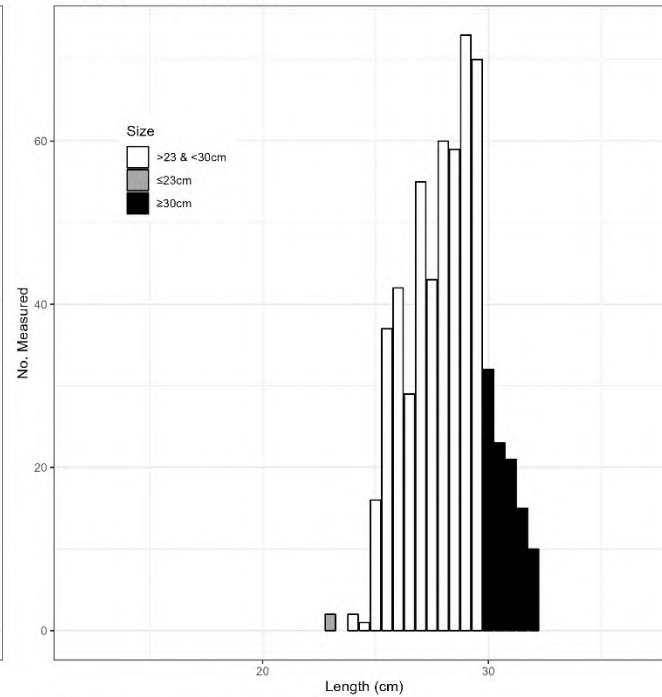
Fishery Samples used for survey on 2023-09-27

Fishery Samples used for survey on 2023-10-11
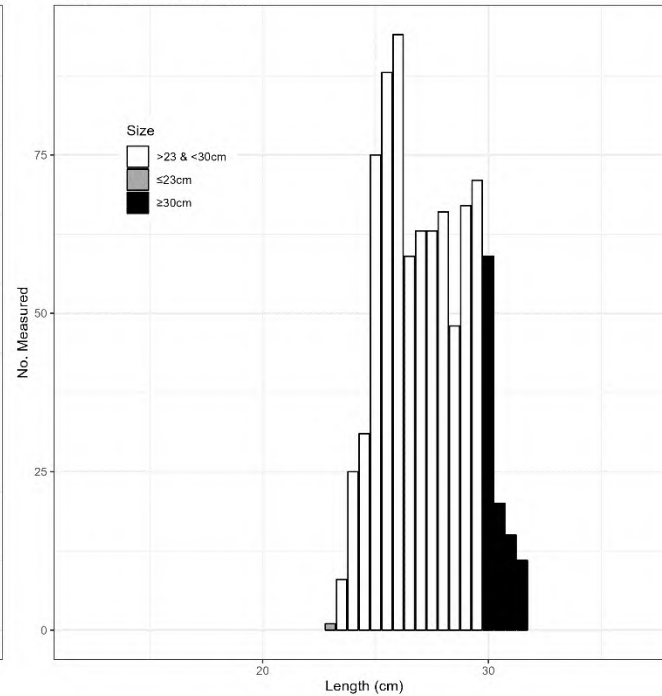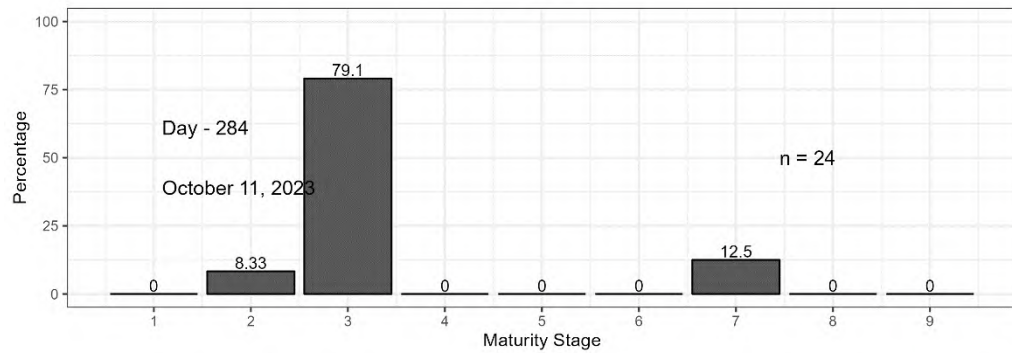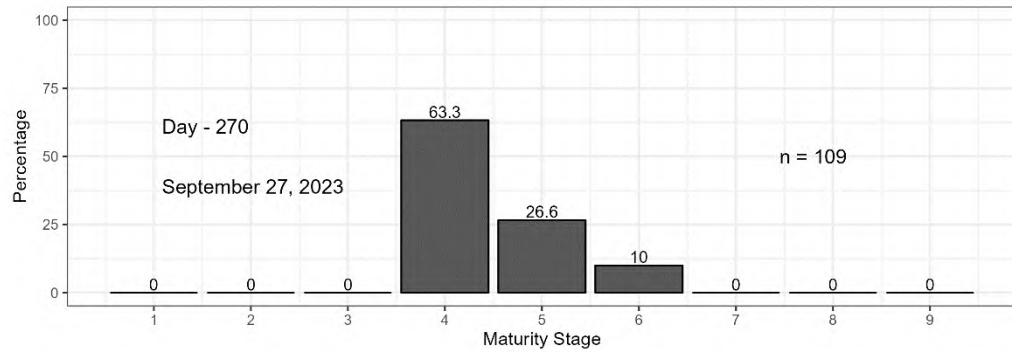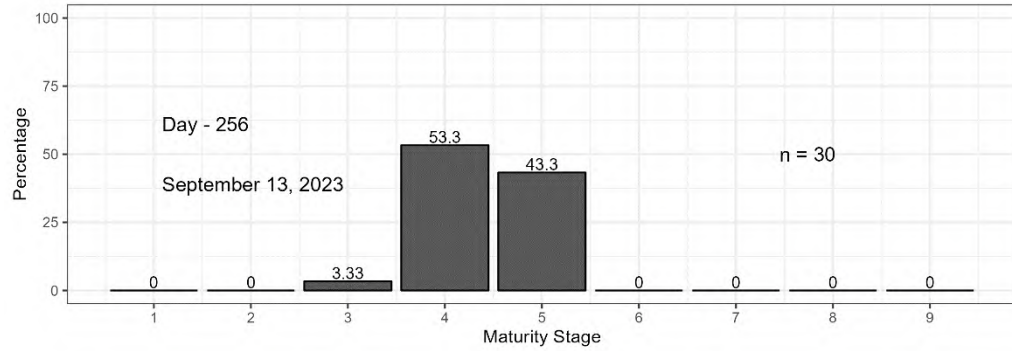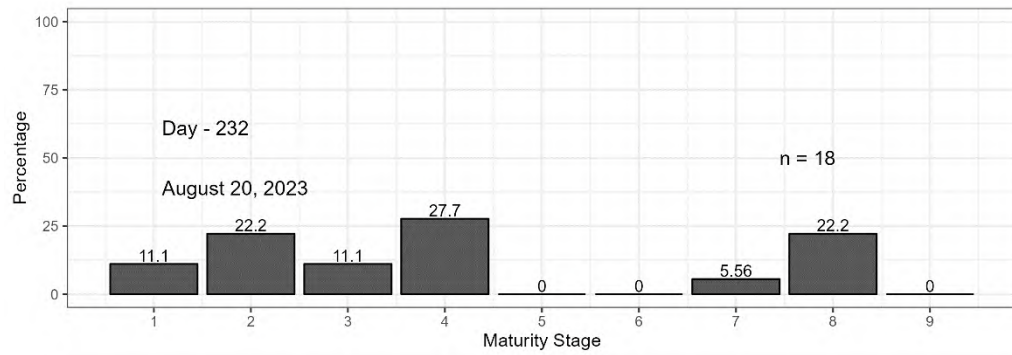
Seal Island Summary

Location	Date	Interval (Days)	Target Strength (dB/kg)	Area (km^2)	Mean Sa (dB/m^2)	Biomass (t)	Standard Error (t)	St. Err %
Seal Island #1	2023-08-07		-35.5000	300	-60.59	929	177	19
Seal Island #2	2023-08-21	14	-35.1776	270	-59.97	897	181	20
Seal Island #3	2023-09-04	14	-35.0331	269	-58.93	1,099	245	22
Seal Island #4	2023-09-14	10	-35.1239	267	-53.32	4,045	2,507	62
Seal Island #5	2023-09-27	13	-34.4425	276	-42.59	42,269	29,803	71
Seal Island #6	2023-10-12	15	-35.5000	280	-48.33	14,607	9,918	68
Seal Island #7	2023-10-25	13	-35.5000	277	-59.57	1,087	420	39
Summary				277	-54.76	64,933	31,515	49

Trinity Ledge survey Samples

Location	Date	Interval (days)	Target Strength (dB/kg)	Area (km^2)	Mean Sa (dB/m^2)	Biomass (t)	Standard Error (t)	St. Err %
Trinity Ledge #1	2023-08-06		-35.9495	9	-68.12	5	2	35
Trinity Ledge #2	2023-08-16	10	-35.7477	16	-53.39	272	131	48
Trinity Ledge #3	2023-08-27	11	-35.4667	13	-42.76	2,369	3,736	158
Trinity Ledge #4	2023-09-08	12	-35.9495	14	-54.01	225	288	128
Trinity Ledge #5	2023-09-20	12	-35.9495	27	-43.83	4,380	3,018	69
Summary				16	-52.42	7,251	4,813	66

*Standard Target strength used. Length-frequency or detailed sample not available.
Reporting target strength for 38 kHz, for 50, 75, and 120 kHz, add -0.10727, -0.26575, and -0.44946, respectively.
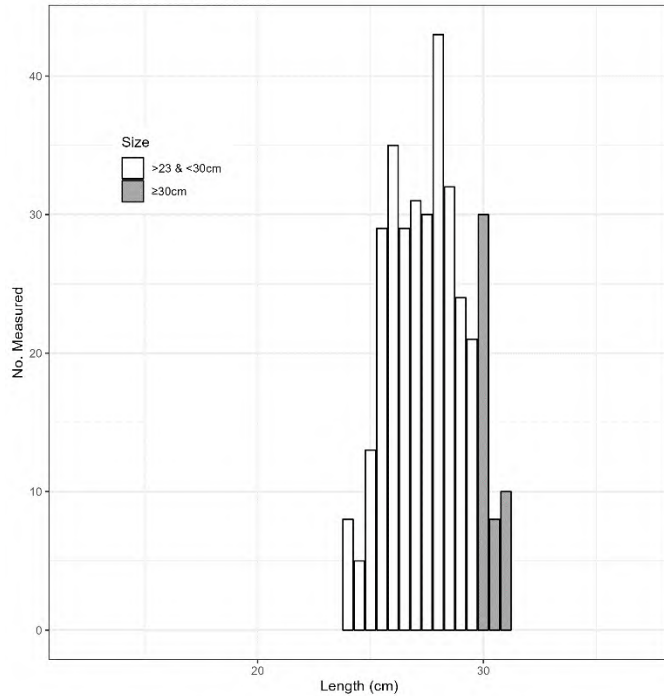
Fishery Samples used for survey on 2023-08-16
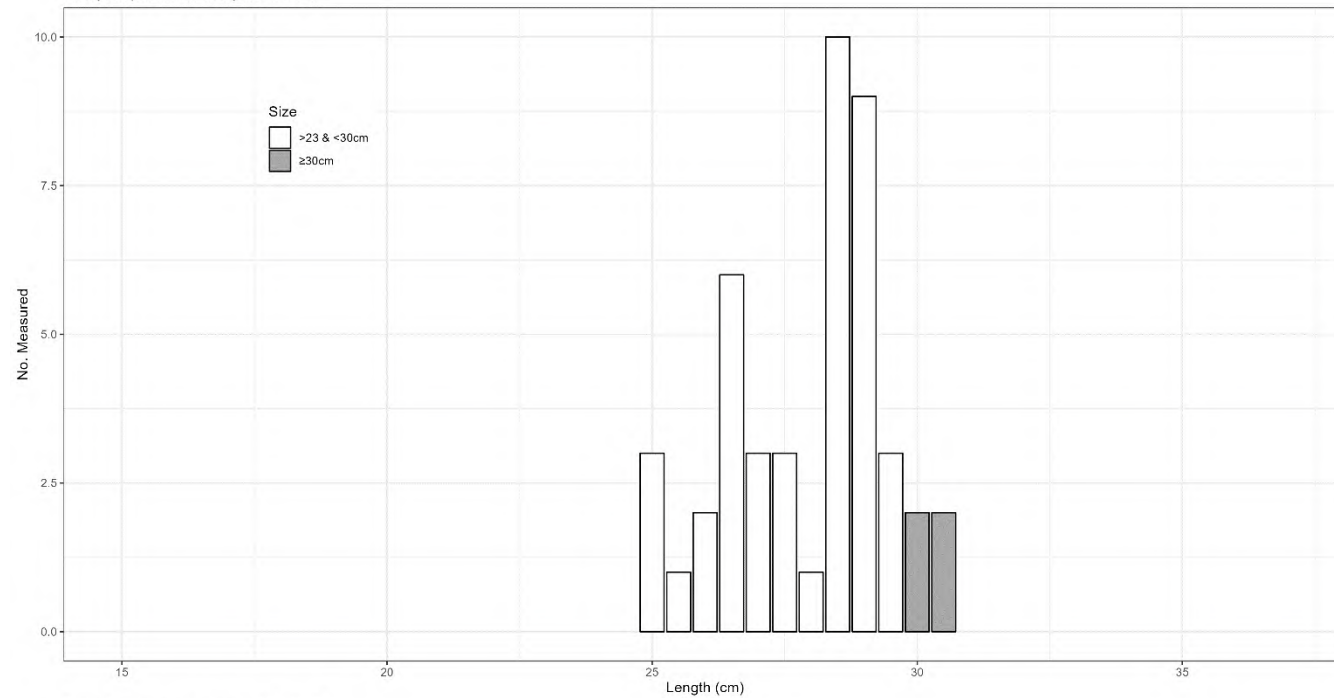
Fishery Samples used for survey on 2023-08-27
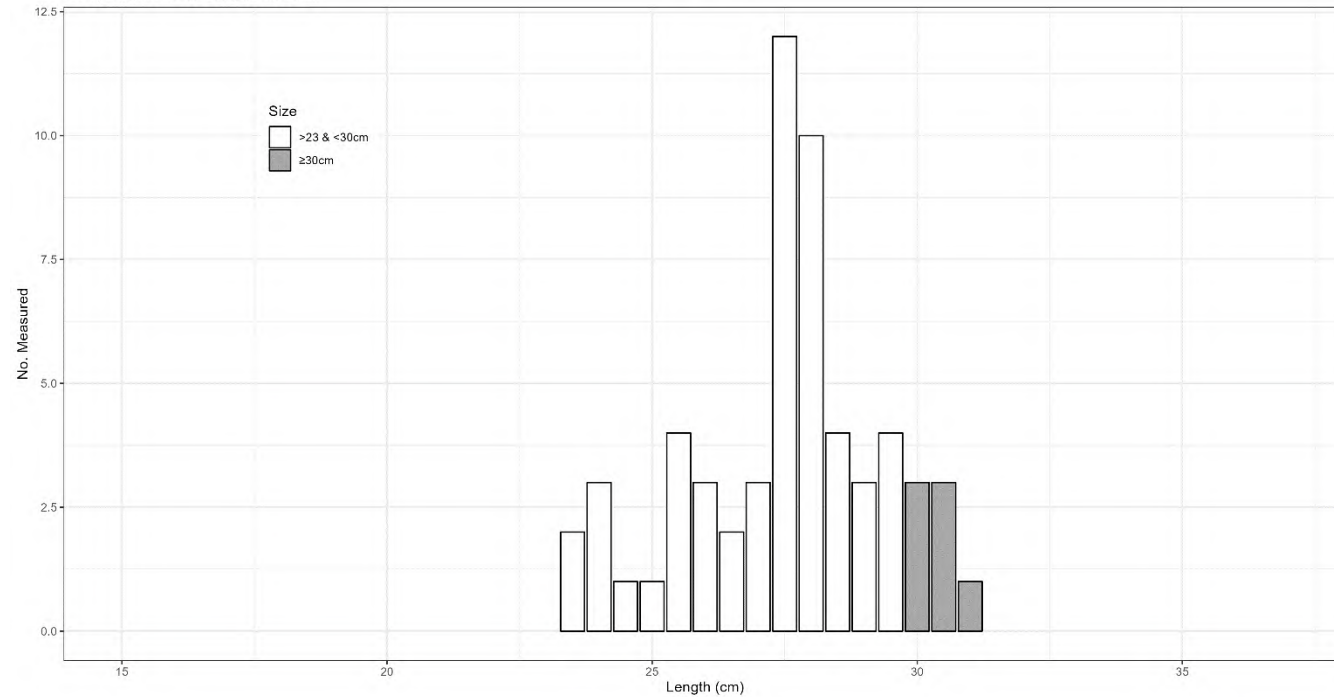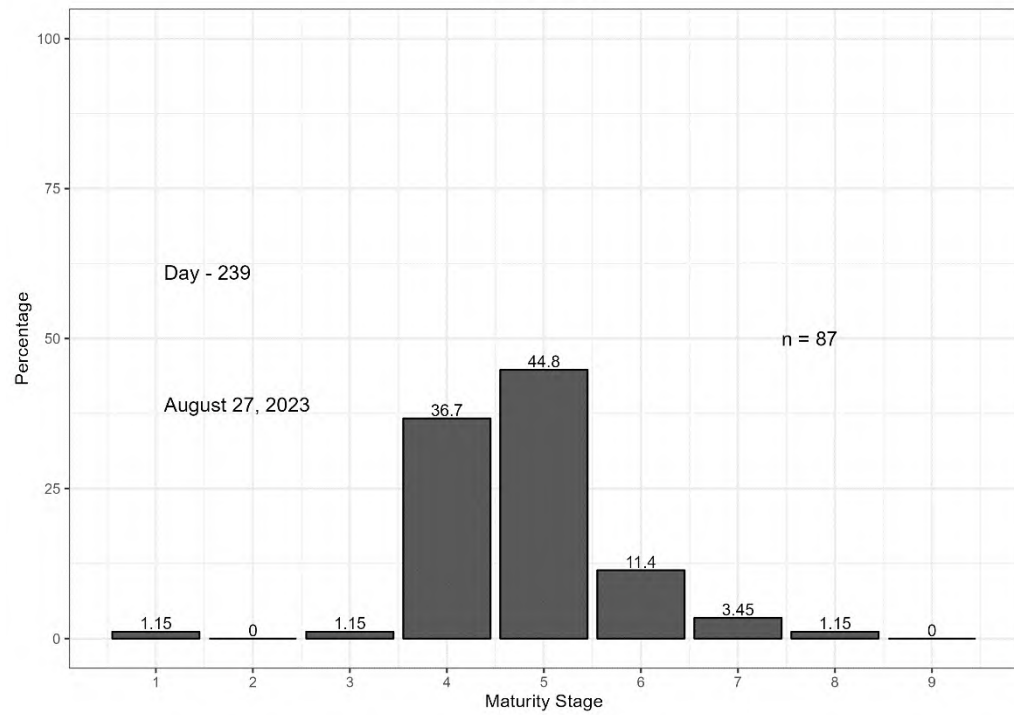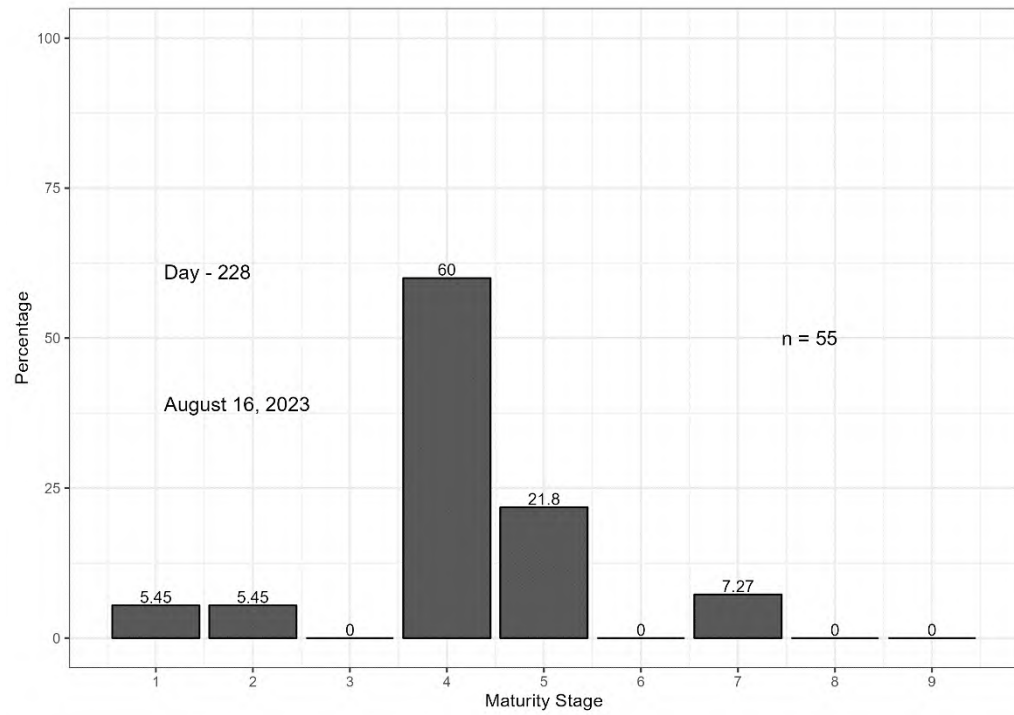
Trinity Ledge Summary

Location	Date	Interval (days)	Target Strength (dB/kg)	Area (km^2)	Mean Sa (dB/m^2)	Biomass (t)	Standard Error (t)	St. Err %
Trinity Ledge #1	2023-08-06		-35.9495	9	-68.12	5	2	35
Trinity Ledge #2	2023-08-16	10	-35.7477	16	-53.39	272	131	48
Trinity Ledge #3	2023-08-27	11	-35.4667	13	-42.76	2,369	3,736	158
Trinity Ledge #4	2023-09-08	12	-35.9495	14	-54.01	225	288	128
Trinity Ledge #5	2023-09-20	12	-35.9495	27	-43.83	4,380	3,018	69
Summary				16	-52.42	7,251	4,813	66

Spec. Buoy survey Samples

Location of survey	Interval (days)	Date	No. of Len. Samp.	No. of Det. Samp.	No. Len/Wt Fish	No. of Fish Measured	Mean Length (mm)	Mean Weight (g)	Target Strength (dB/kg)	Wt 28 cm Fish (g)	TS 28 cm Fish (dB/kg)
Spec. Buoy #1		Aug - 7							-35.5000		
Spec. Buoy #2	10	Aug - 17	1	1	32	73	252	123	-34.7766	177	-35.4387
Spec. Buoy #3	11	Aug - 28	1	1	28	60	268	150	-35.1096	171	-35.2905
Spec. Buoy #4	6	Sep - 3	1	1	31	53	273	156	-35.1081	169	-35.2251
Spec. Buoy #5	9	Sep - 12	1	1	26	44	272	161	-35.2656	176	-35.4121
Spec. Buoy #6	10	Sep - 22							-35.5000		

Spectacle Buoy Summary

Location	Date	Interval (days)	Target Strength (dB/kg)	Area (km^2)	Mean Sa (dB/m^2)	Biomass (t)	Standard Error (t)	St. Err %
Spectacle Buoy #1	2023-08-07		-35.9495	29	-63.72	48	18	37
Spectacle Buoy #2	2023-08-17	10	-35.9495	35	-49.59	1,510	1,022	68
Spectacle Buoy #3	2023-08-28	11	-35.9495	31	-50.52	1,071	383	36
Spectacle Buoy #4	2023-09-03	6	-35.9495	26	-48.60	1,392	1,026	74
Spectacle Buoy #5	2023-09-12	9	-35.9495	22	-55.90	226	108	48
Spectacle Buoy #6	2023-09-22	10	-35.9495	42	-63.76	70	13	19
Summary				31	-55.35	4,317	1,502	35

Spectacle Summary (counted)

Location	Date	Interval (days)	Target Strength (dB/kg)	Area (km^2)	Mean Sa (dB/m^2)	Biomass (t)	Standard Error (t)	St. Err %
Spectacle Buoy #1	2023-08-07		-35.9495	29	-63.72	48	18	37
Spectacle Buoy #2	2023-08-17	10	-35.9495	35	-49.59	1,510	1,022	68
Spectacle Buoy #4	2023-09-03	17	-35.9495	26	-48.60	1,392	1,026	74
Spectacle Buoy #5	2023-09-12	9	-35.9495	22	-55.90	226	108	48
Spectacle Buoy #6	2023-09-22	10	-35.9495	42	-63.76	70	13	19
Summary				31	-56.31	3,245	1,452	45

# Summary Information for Bay of Fundy/ Southwest Nova Scotia
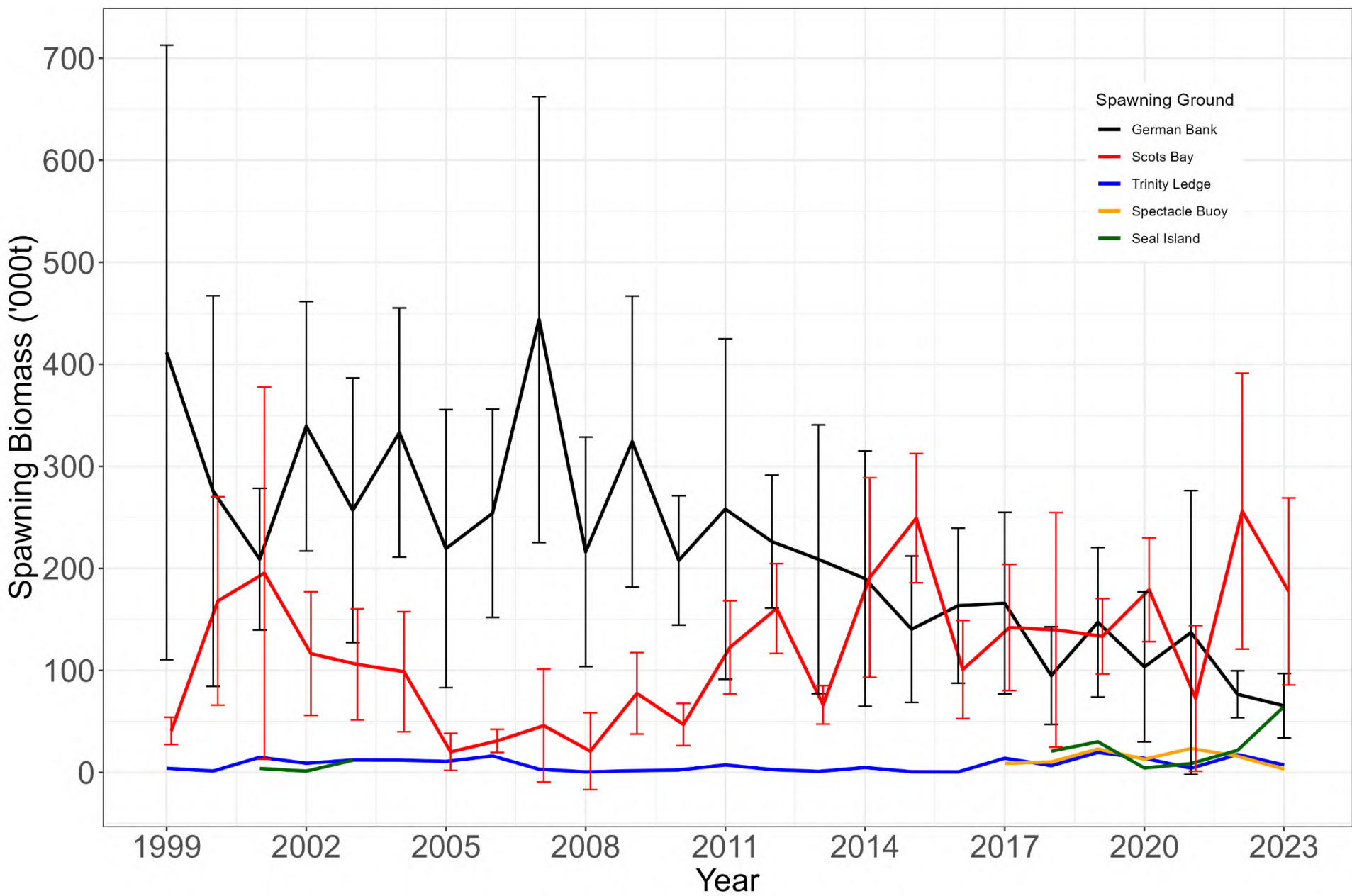
Overall SSB for SWNS/BOF Stock Area

Table 2. Acoustic surveys spawning biomass index for Southwest Nova Scotia/Bay of Fundy spawning component average for 1999–2011 and biomass for 2012–2023 (rounded to thousands of tonnes).

Location	Avg. 1999–2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Avg. 2005–2010	Avg. 1999–2023
Scots Bay (inbox)	80	123	59	187	228	98	133	129	80	165	66	182	121	38	104
Scots Bay (outbox)	4	38	8	4	21	3	9	10	53	14	6	74	57	3	14
Scots Bay total	84	161	66	191	249	101	142	140	133	179	72	256	177	40	118
German Bank (inbox)	286	219	200	188	140	163	166	95	147	103	137	77	64	273	217
German Bank (outbox)	6	7	9	2	-	-	-	-	-	-	-	-	-	6	6
German Bank total	288	226	209	190	140	163	166	95	147	103	137	77	64	278	219
German + Scots	372	387	275	381	390	264	308	235	280	283	209	333	241	318	337
Trinity Ledge	7	3	1	5	1	1	14	7	20	14	4	17	7	6	7
Spec Buoy (spring)	1	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Spec Buoy (fall)	44	-	-	-	-	-	9	10	23	13	23	16	3	-	21
Overall Stock Area	387	390	276	386	390	265	330	251	323	310	237	366	252	324	352
Seal Island	6	-	-	-	-	-	-	21	30	4	9	22	65	10	16
Browns Bank	26	-	-	-	-	-	-	-	-	-		-		8	26
Total All Areas	393	390	276	386	390	265	330	272	353	313	246	387	316	327	361
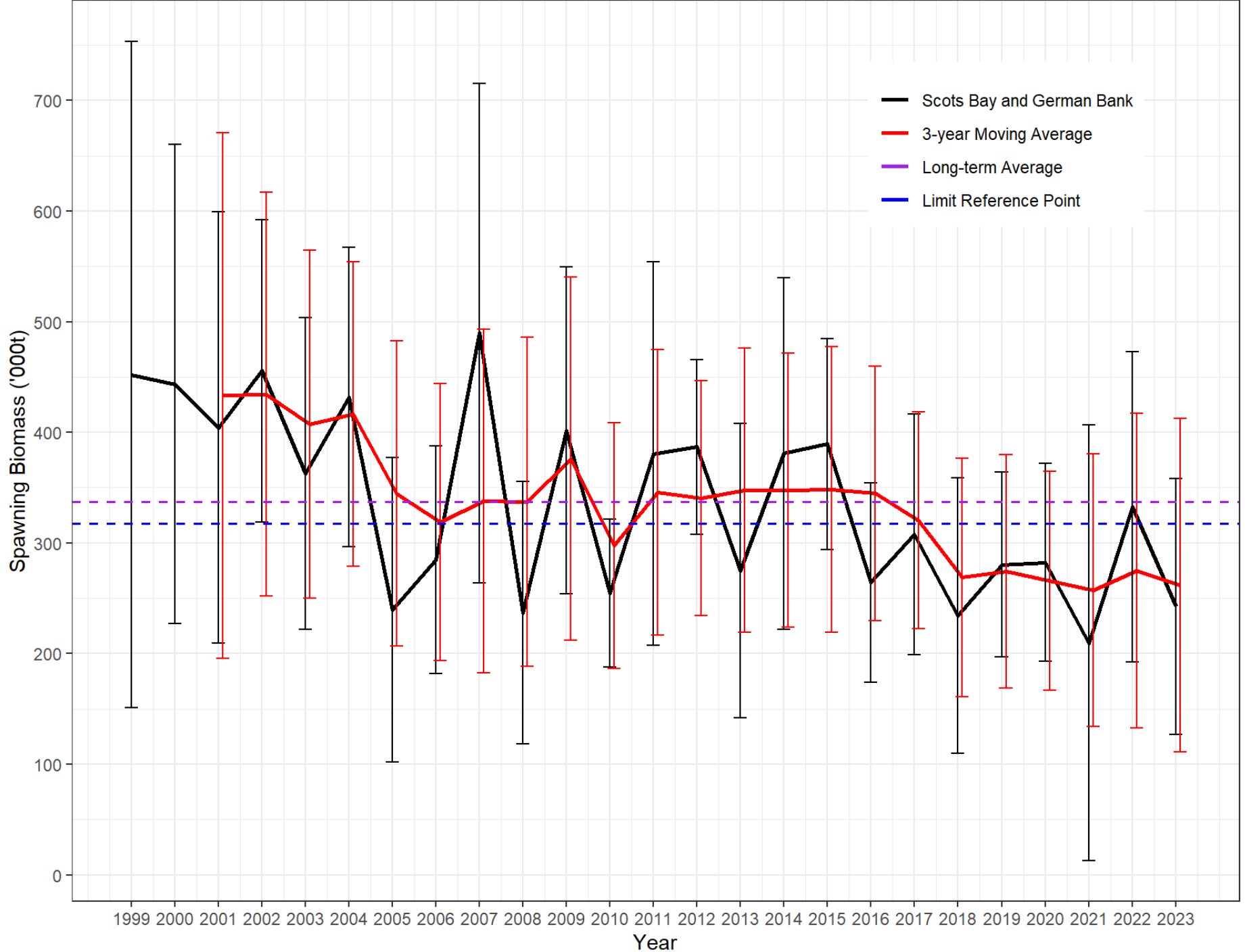
Acoustic Review Updates

- Scots Bay and German Bank (2011, 2012, 2015-2023 acoustics reviewed)
- Gillnet-based surveys 2017-2023

MSE-based Science Advice Updates

Brief Updates since the SWNS/BoF subcomittee

DFO Resource Management Objective 1

Objective	Performance Threshold	Timeframe	Acceptable Probability
Maintain SSB above LRP	P(model estimated SSB > model estimated SSB2005-2010)	Year 10 to Year 15	75%

The stock must maintain above the LRP with at least 75% probability in each year in years 10-15 of the projection period.

MPs that do not meet this objective will not be further considered.

Updating Existing MSE Analytics

- CSAS update using existing analytics (Mar 20).

- Operating Models are conditioned to 2020.

- Update projections using exact removals from 2021, 2022, and 2023 fishing seasons and the 2023 index.

- Inform tradeoffs among candidate MPs.

- Modify candidate MPs to pass Objective 1, by maintaining model SSB in year 10 to 15 projective above model mean $SSB_{2005-2010}$ across all OMs.

Proposed Candidate MPs from Stakeholders

- An MP was submitted to determine whether 21,000 t until 2026 could occur with any level of harvest after 2027.

- Another MP was submitted to evaluate whether a linear-based exploitation MP could allow for rebuilding above the LRP by 2028 with a 75% probability.
  - Determine ranking of MPs if this also was objective for discussion purposes.

CSAS DFO Science Update Meeting:

- Two external folks are allowed at the meeting this year. One scientist from HSC and one scientist from NOAA.

Next Steps

- Evaluation of Candidate MPs. (Information to be distributed to SFHAC when allowed).

- If desired, selection and proposed implementation of a candidate MP by committee.

- DFO RM will then inform Minister in a briefing note preferred action for SWNS/BoF stock.

End