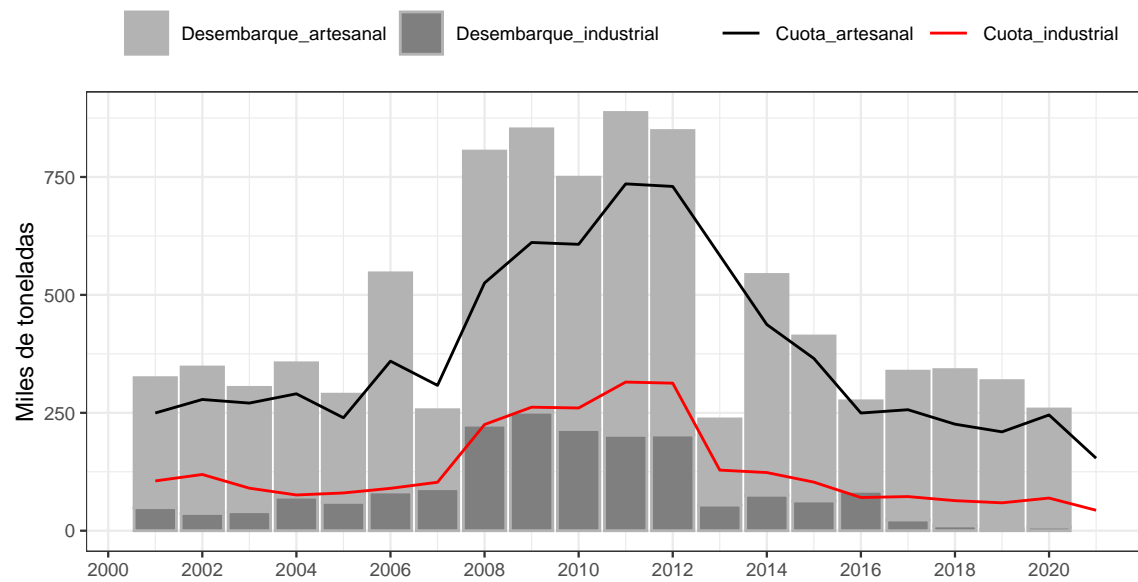


# Figuras y Tablas para Tercer Informe de sardina común Centro sur

## **1. ANTECEDENTES**

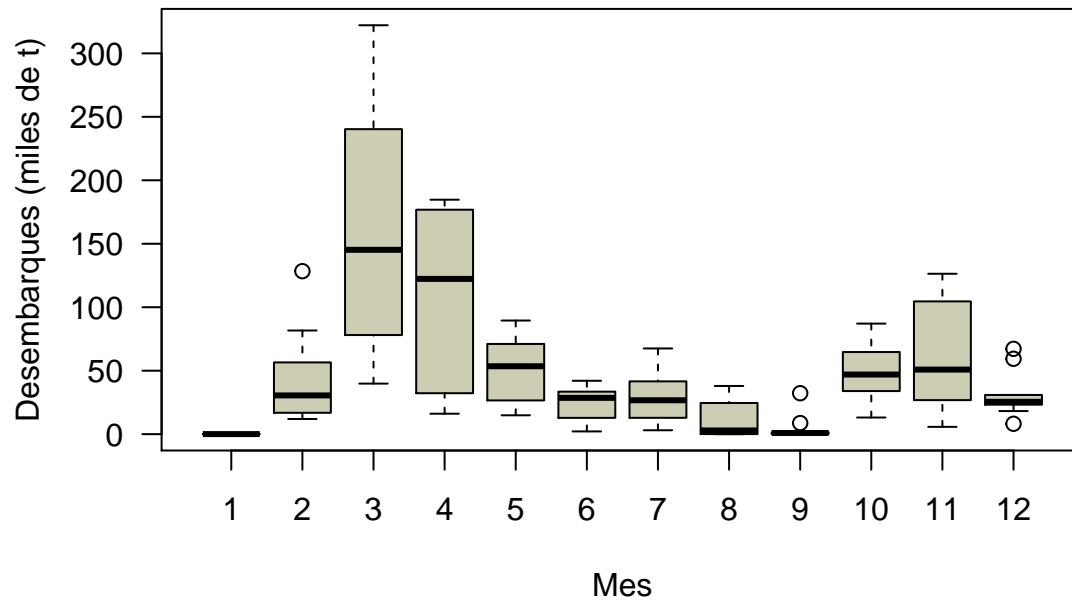


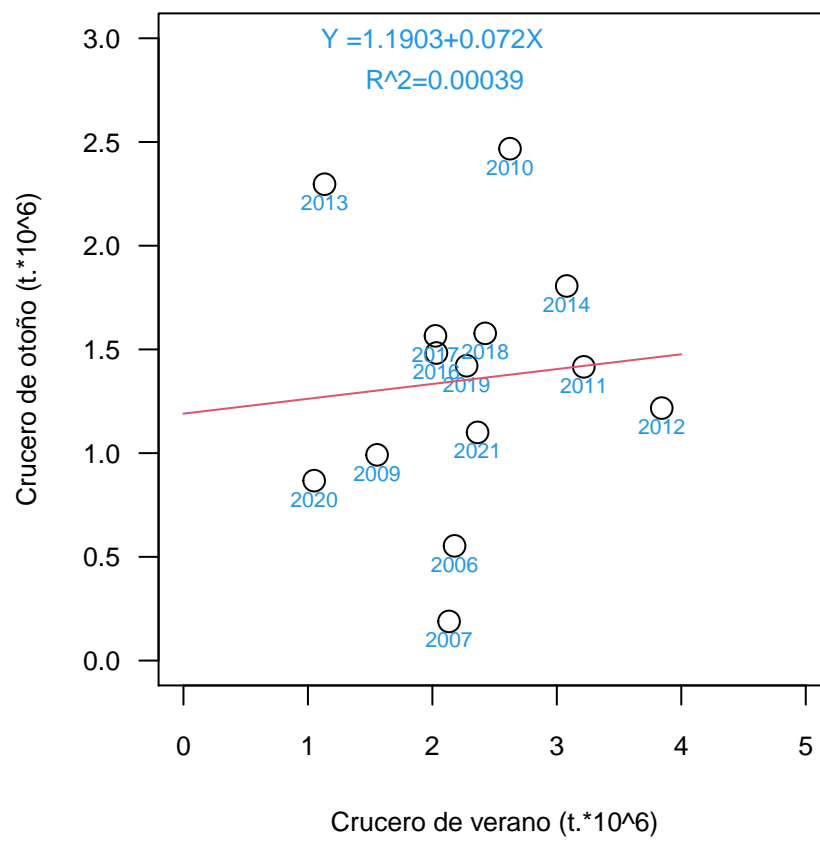
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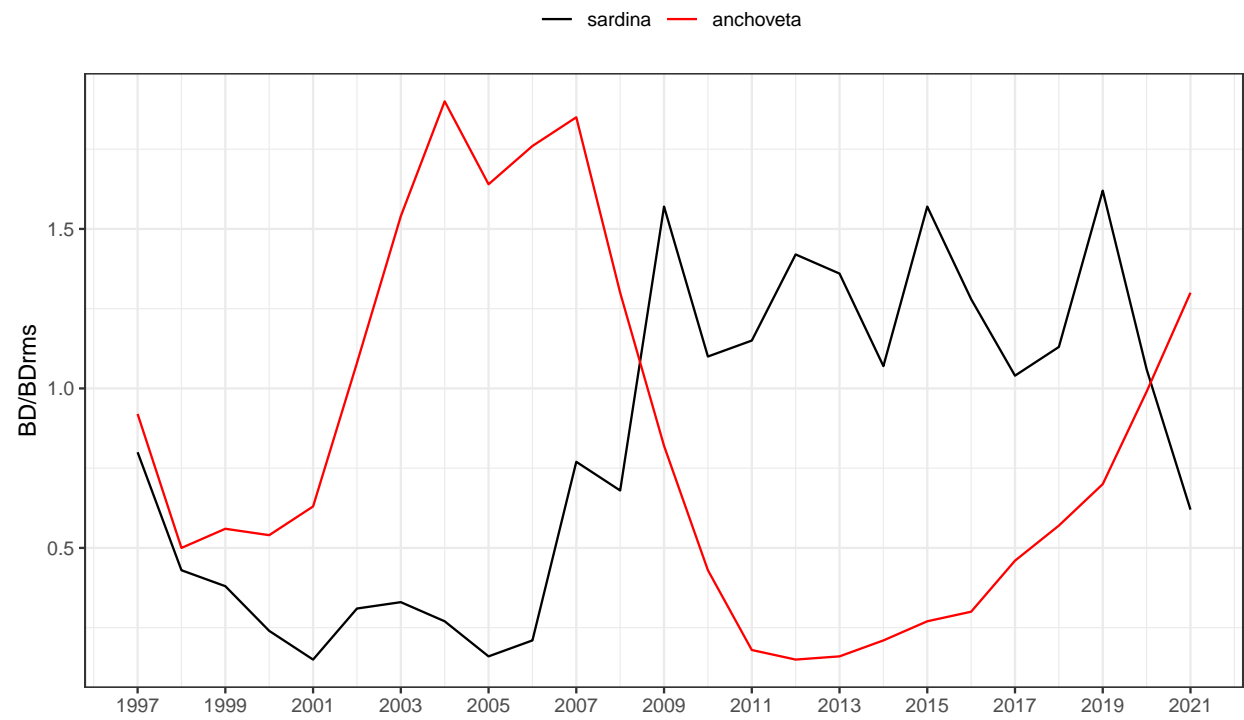
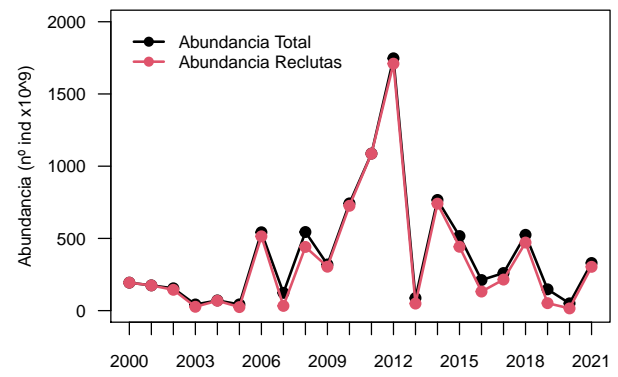
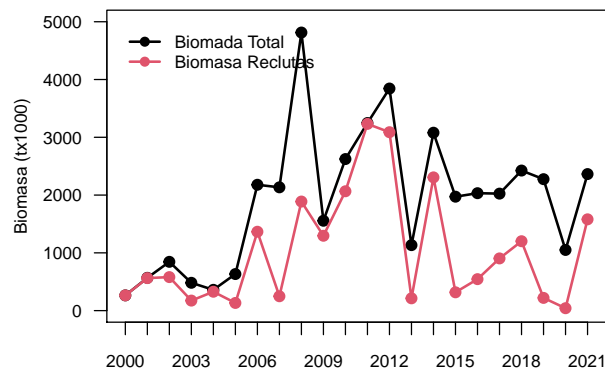
ano<-ant$desembarques_sernapesca[,1]
des_mes<-data.frame(mes=rep(seq(1,12,1),27),
                    ano=gl(27,12,labels=ano),
                    desem=c(t(ant$desembarques_sernapesca[,2:13])))

par(mfcol=c(1,1),mar=c(4,4,1,1))
boxplot(des_mes$desem[145:264]/10^3~des_mes$mes[145:264],las=1,xlab="Mes",
        ylab="Desembarques (miles de t)",col="lightyellow3")

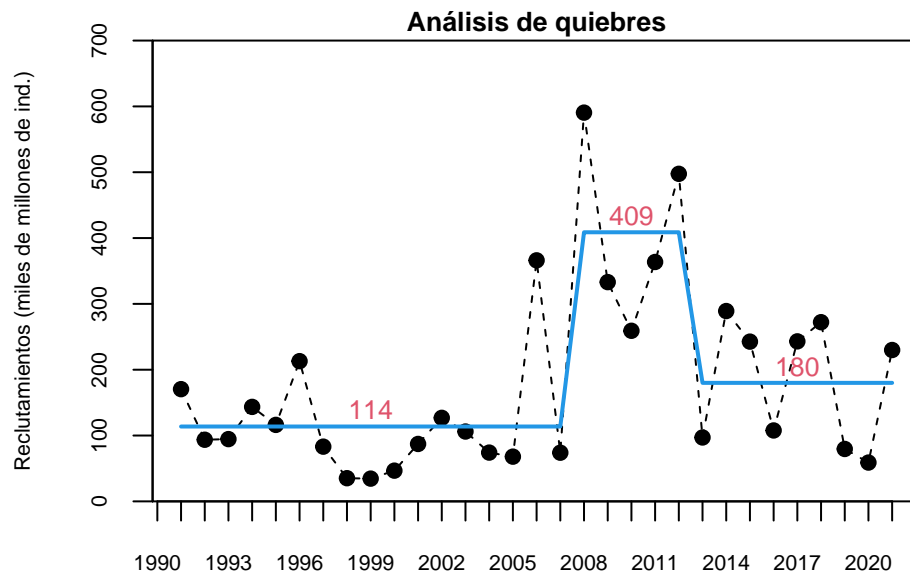
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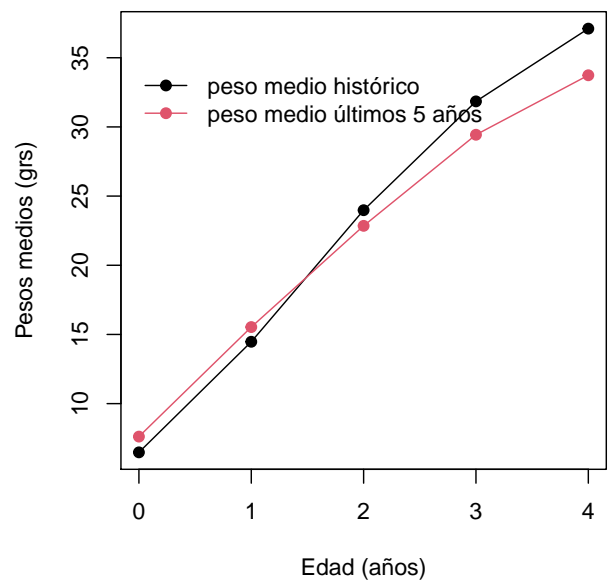
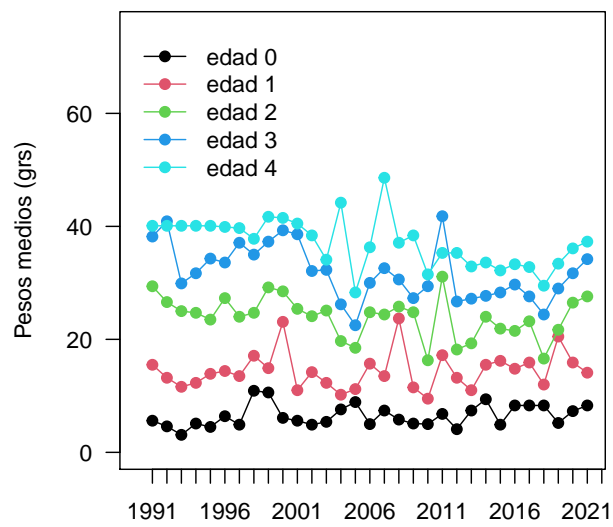






## 2. METODOLOGÍA



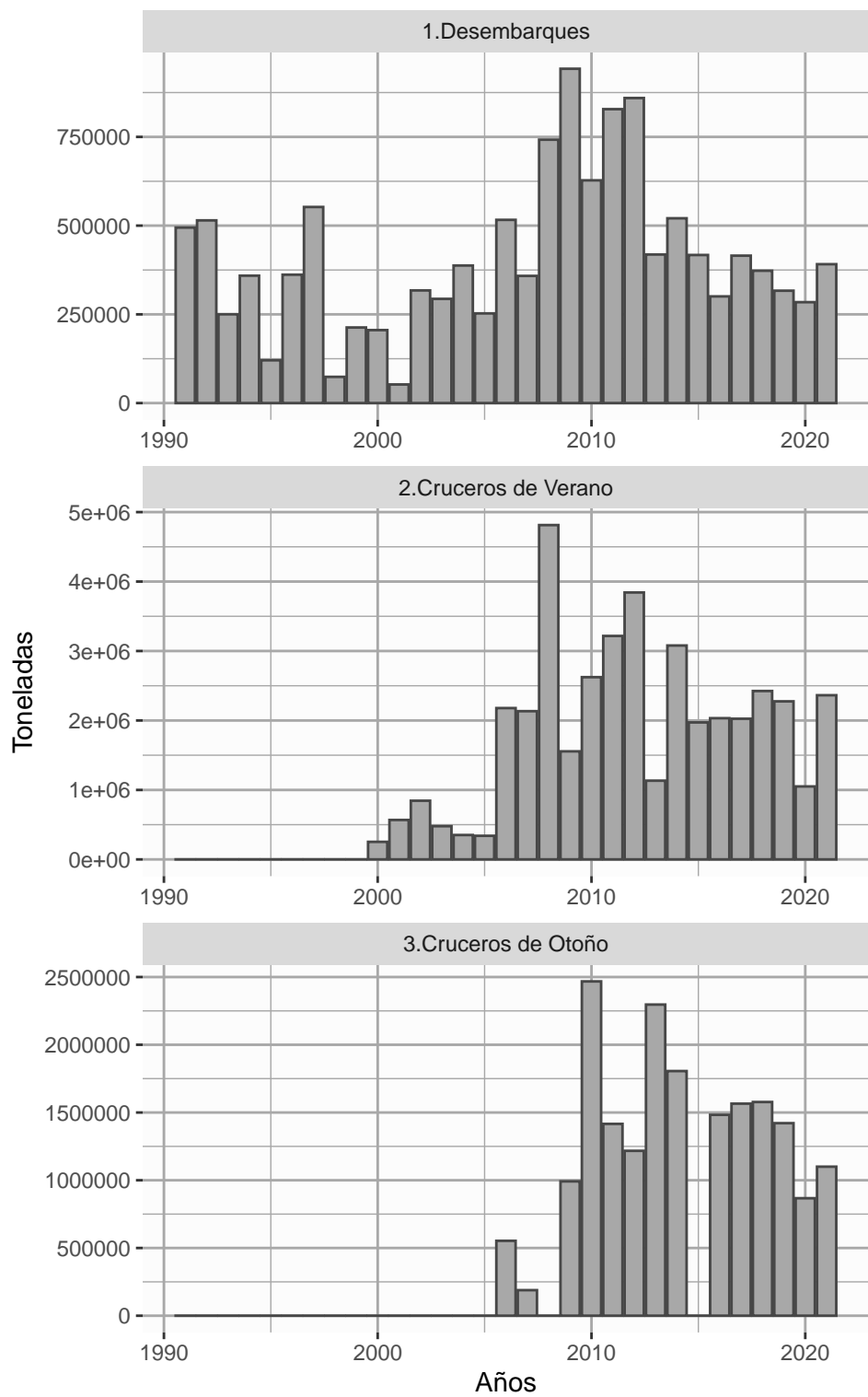


Año.biológico	Desembarques.t.	Porcentaje.descarte	Captura.descartada.t.	Captura.total.t.
1990-91	494567	0%	0	494567
1991-92	514787	0%	0	514787
1992-93	250237	0%	0	250237
1993-94	358949	0%	0	358949
1994-95	120608	0%	0	120608
1995-96	361735	0%	0	361735
1996-97	552515	0%	0	552515
1997-98	73892	0%	0	73892
1998-99	212993	0%	0	212993
1999-00	205616	0%	0	205616
2000-01	50451	4%	2018	52469
2001-02	305257	4%	12210	317467
2002-03	282360	4%	11294	293654
2003-04	372689	4%	14908	387597
2004-05	242976	4%	9719	252695
2005-06	496438	4%	19858	516296
2006-07	344596	4%	13784	358380
2007-08	713623	4%	28545	742168
2008-09	905818	4%	36233	942051
2009-10	603450	4%	24138	627588
2010-11	796319	4%	31853	828172
2011-12	826505	4%	33060	859565
2012,13	402507	4%	16100	418607
2013-14	500641	4%	20026	520667
2014-15	401201	4%	16048	417249
2015-16	289013	4%	11561	300574
2016-17	399415	4%	15977	415391
2017-18	348574	7%	24400	372974
2018-19	301557	5%	15078	316634
2019-20	273376	4%	10935	284311
2020-21	376245	4%	15050	391294



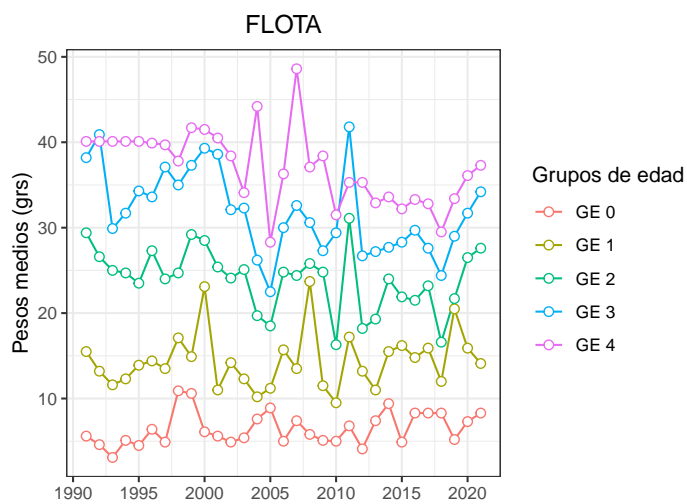
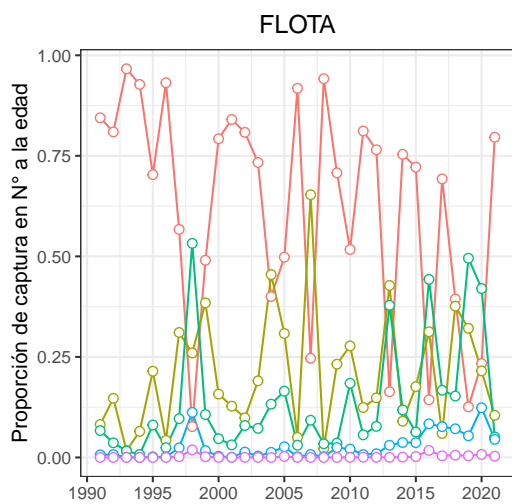
### 3. RESULTADOS

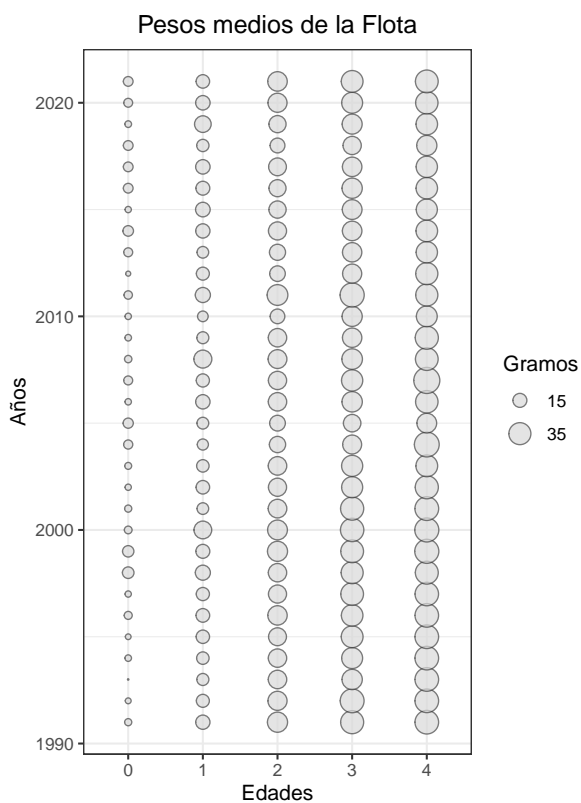
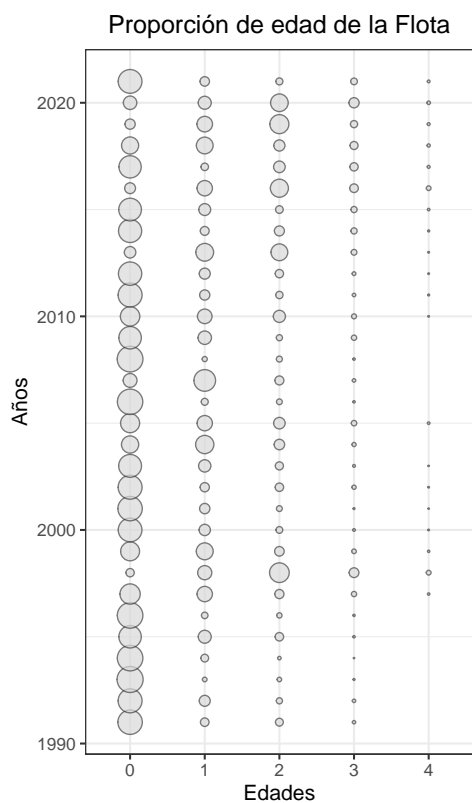


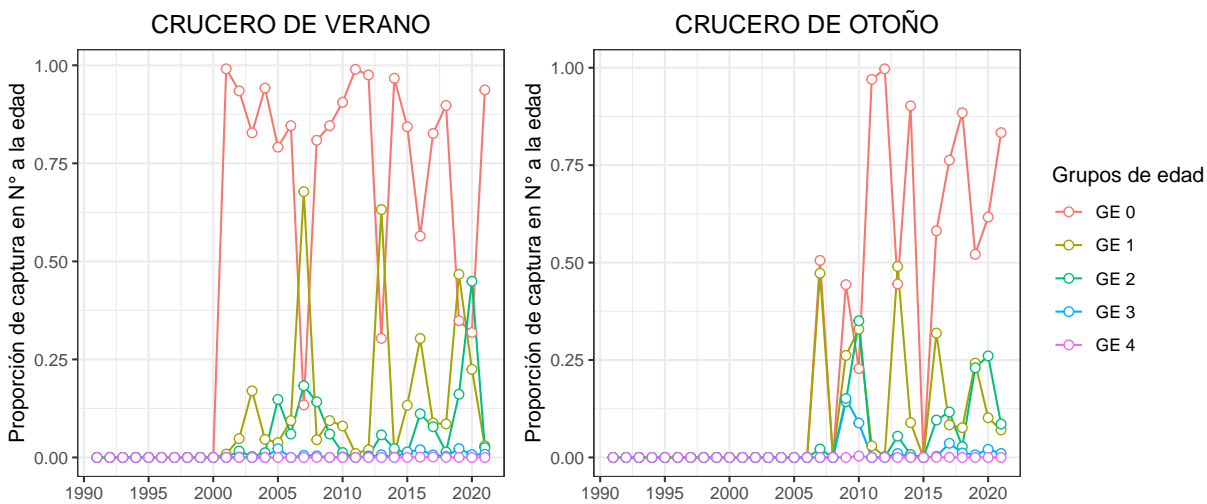


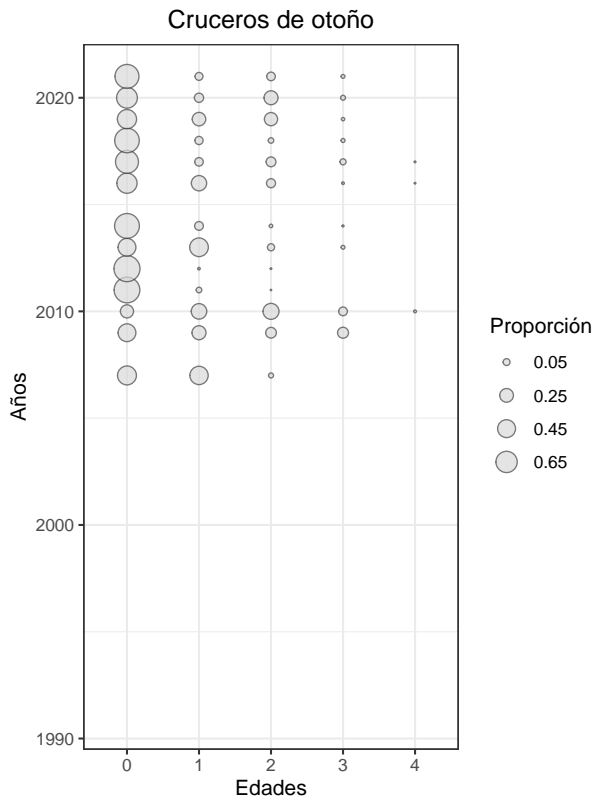
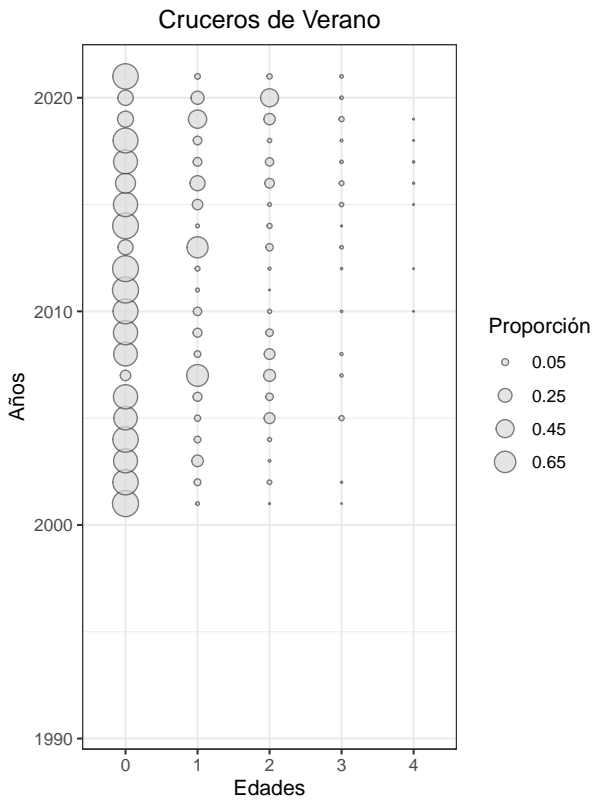
##	[,1]	[,2]	[,3]	[,4]	[,5]	[,6]	[,7]	[,8]	[,9]
##	[1,]	1991	0	0.3	0	0.3	0	100	494567 0.01
##	[2,]	1992	0	0.3	0	0.3	0	100	514787 0.01
##	[3,]	1993	0	0.3	0	0.3	0	100	250237 0.01
##	[4,]	1994	0	0.3	0	0.3	0	100	358949 0.01
##	[5,]	1995	0	0.3	0	0.3	0	100	120608 0.01

##	[6,]	1996	0	0.3	0	0.3	0	100	361735	0.01
##	[7,]	1997	0	0.3	0	0.3	0	100	552515	0.01
##	[8,]	1998	0	0.3	0	0.3	0	100	73892	0.01
##	[9,]	1999	0	0.3	0	0.3	0	100	212993	0.01
##	[10,]	2000	252601	0.3	0	0.3	0	100	205616	0.01
##	[11,]	2001	567819	0.3	0	0.3	0	100	52469	0.01
##	[12,]	2002	844713	0.3	0	0.3	498337	100	317467	0.01
##	[13,]	2003	477998	0.3	0	0.3	0	100	293654	0.01
##	[14,]	2004	351125	0.3	0	0.3	5186	100	387597	0.01
##	[15,]	2005	339783	0.3	0	0.3	125008	100	252695	0.01
##	[16,]	2006	2178397	0.3	552880	0.3	0	100	516296	0.01
##	[17,]	2007	2134043	0.3	188675	0.3	168611	100	358380	0.01
##	[18,]	2008	4813144	0.3	0	0.3	109162	100	742168	0.01
##	[19,]	2009	1555625	0.3	991730	0.3	213762	100	942051	0.01
##	[20,]	2010	2623565	0.3	2467720	0.3	579715	100	627588	0.01
##	[21,]	2011	3216857	0.3	1416034	0.3	649985	100	828172	0.01
##	[22,]	2012	3843000	0.3	1217169	0.3	157893	100	859565	0.01
##	[23,]	2013	1133477	0.3	2296489	0.3	87575	100	418607	0.01
##	[24,]	2014	3079434	0.3	1805815	0.3	83554	100	520667	0.01
##	[25,]	2015	1972148	0.3	0	0.3	0	100	417249	0.01
##	[26,]	2016	2032684	0.3	1482799	0.3	0	100	300574	0.01
##	[27,]	2017	2025002	0.3	1565315	0.3	0	100	415391	0.01
##	[28,]	2018	2424330	0.3	1577507	0.3	0	100	372974	0.01
##	[29,]	2019	2275425	0.3	1421176	0.3	0	100	316634	0.01
##	[30,]	2020	1050175	0.3	867257	0.3	0	100	284311	0.01
##	[31,]	2021	2363380	0.3	1100020	0.3	0	100	391294	0.01

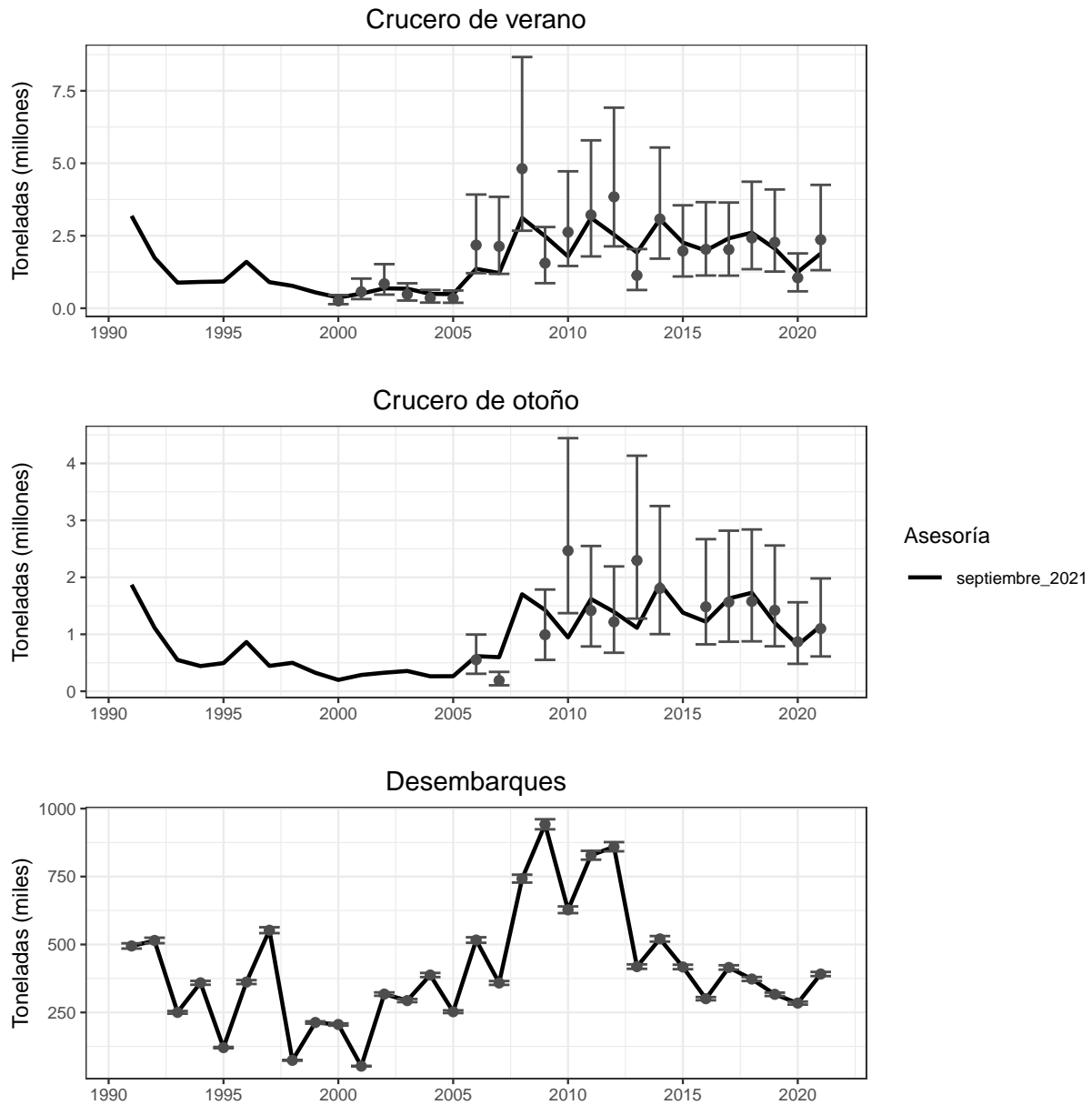




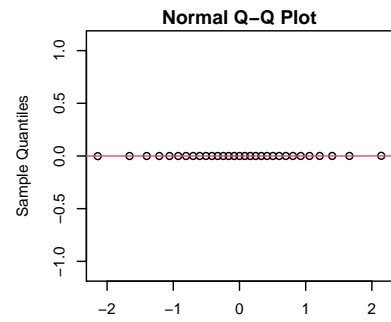
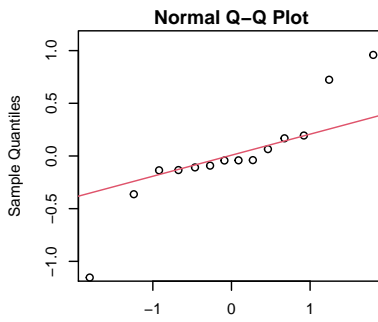
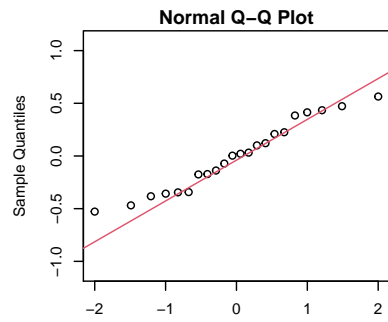
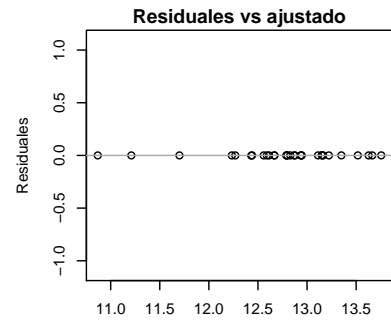
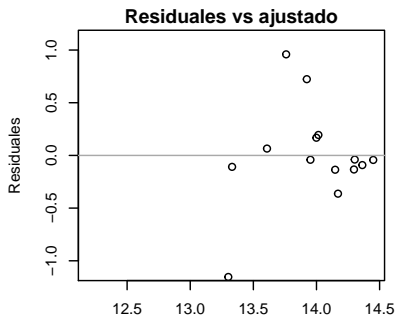
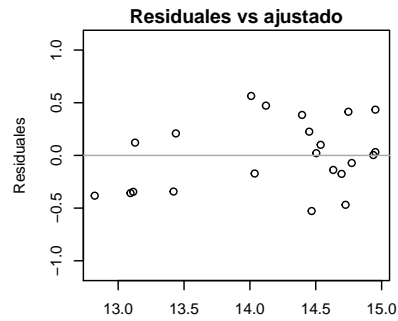
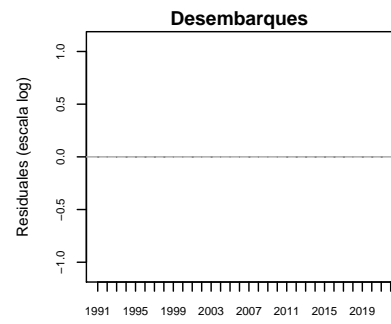
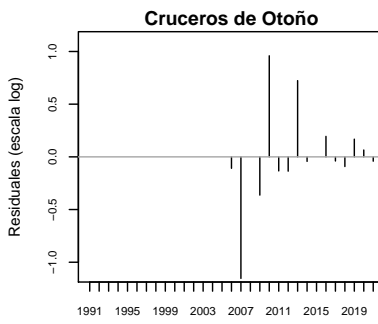
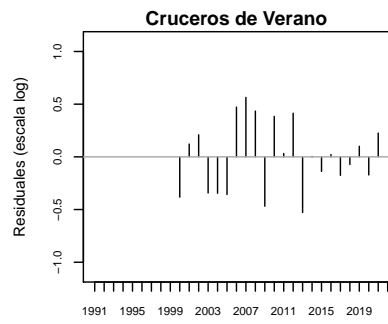


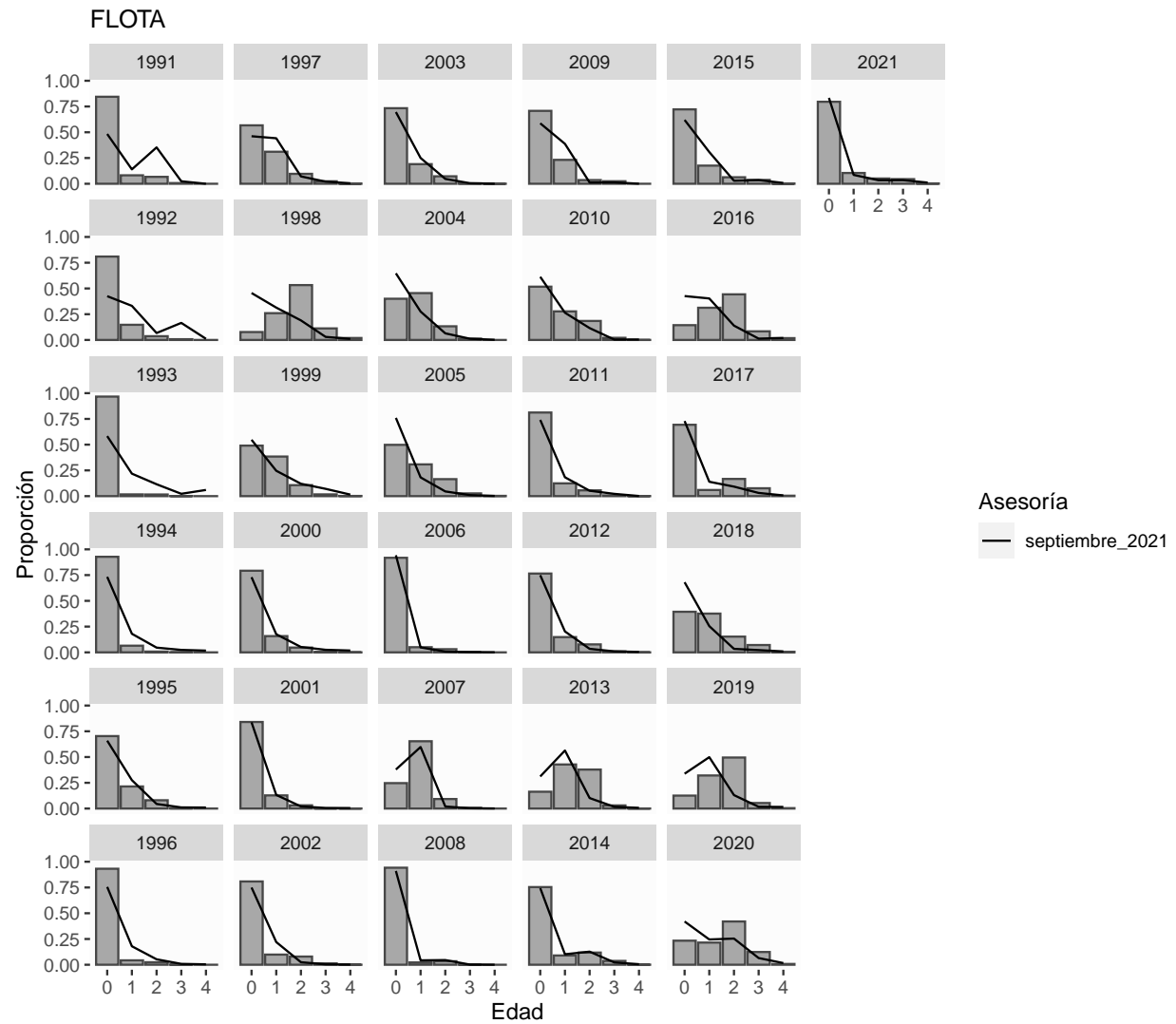


### 3.1. Ajuste del modelo a los datos

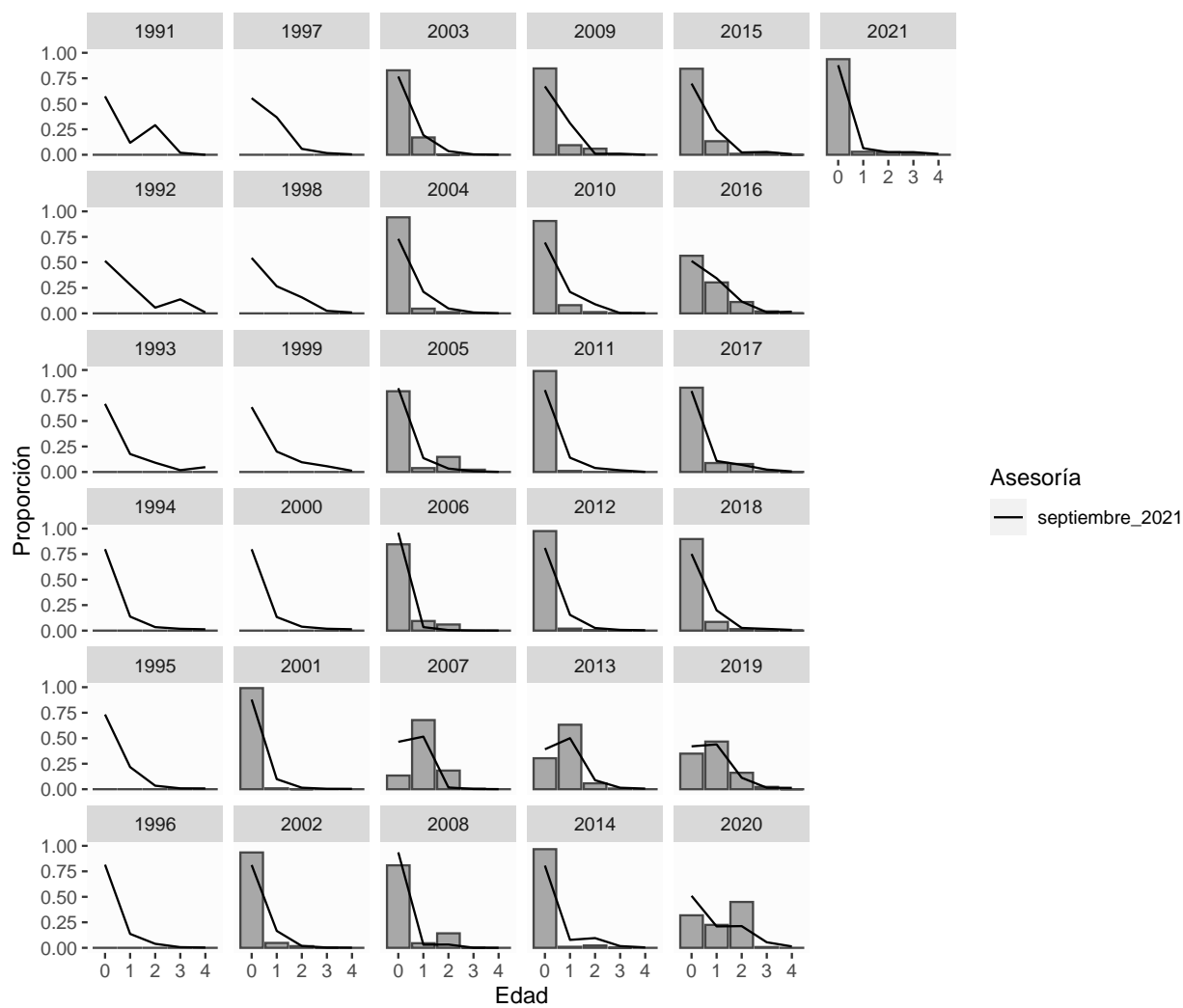




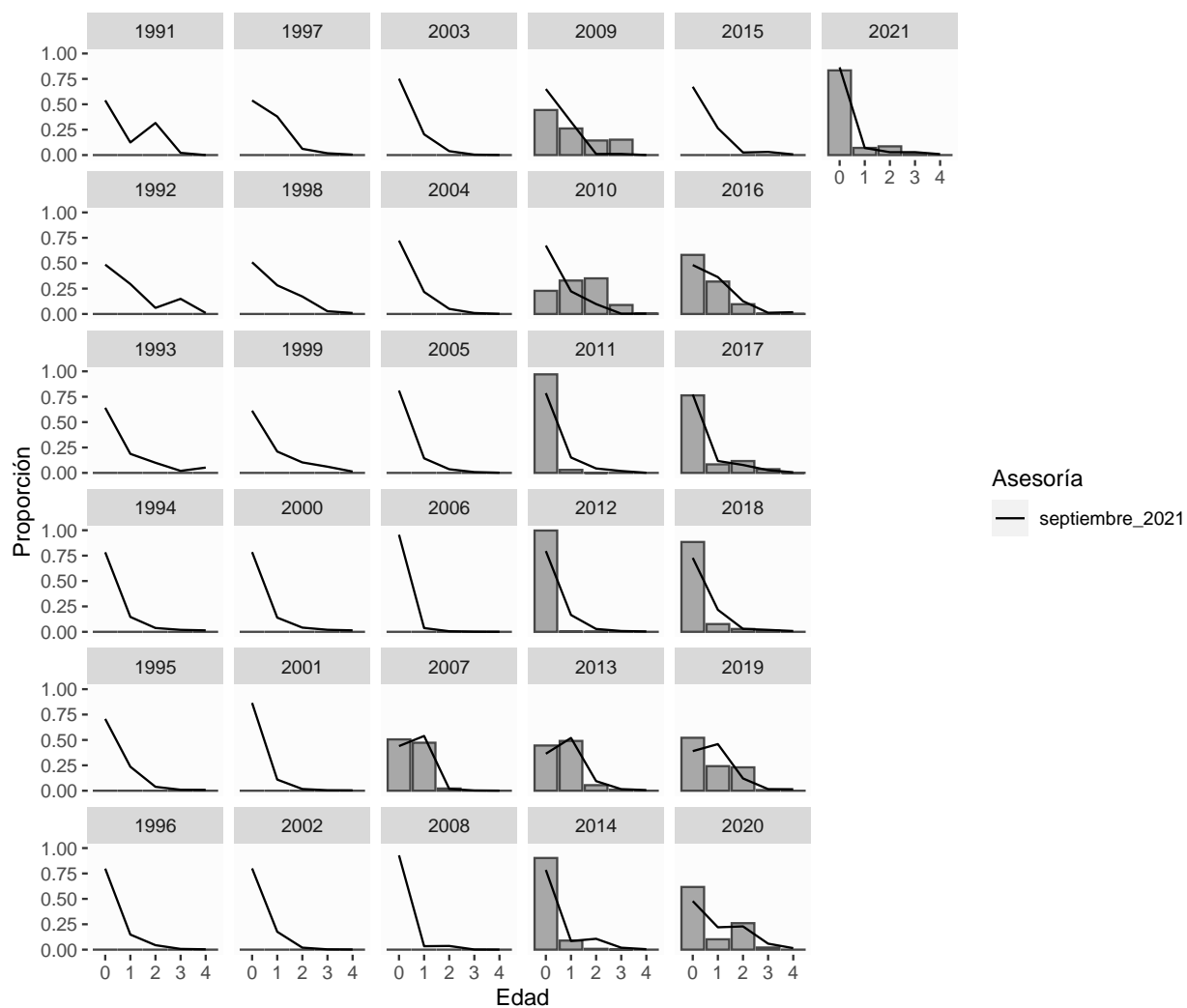


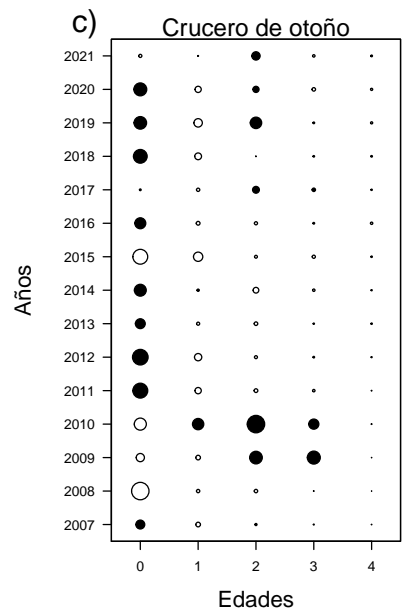
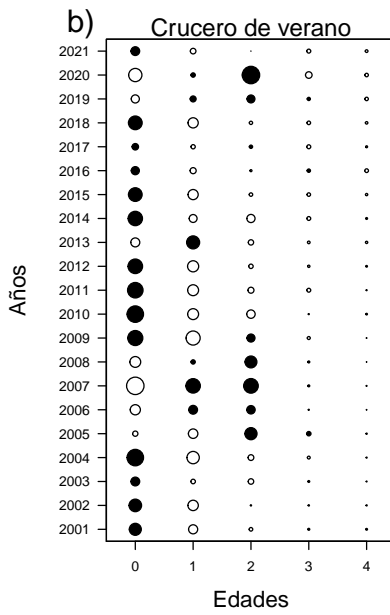
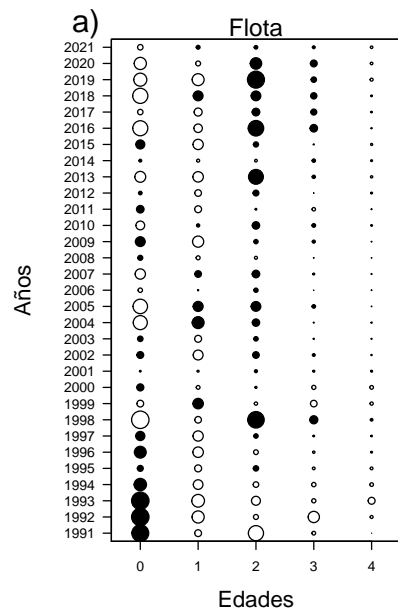


## CRUCEROS DE VERANO

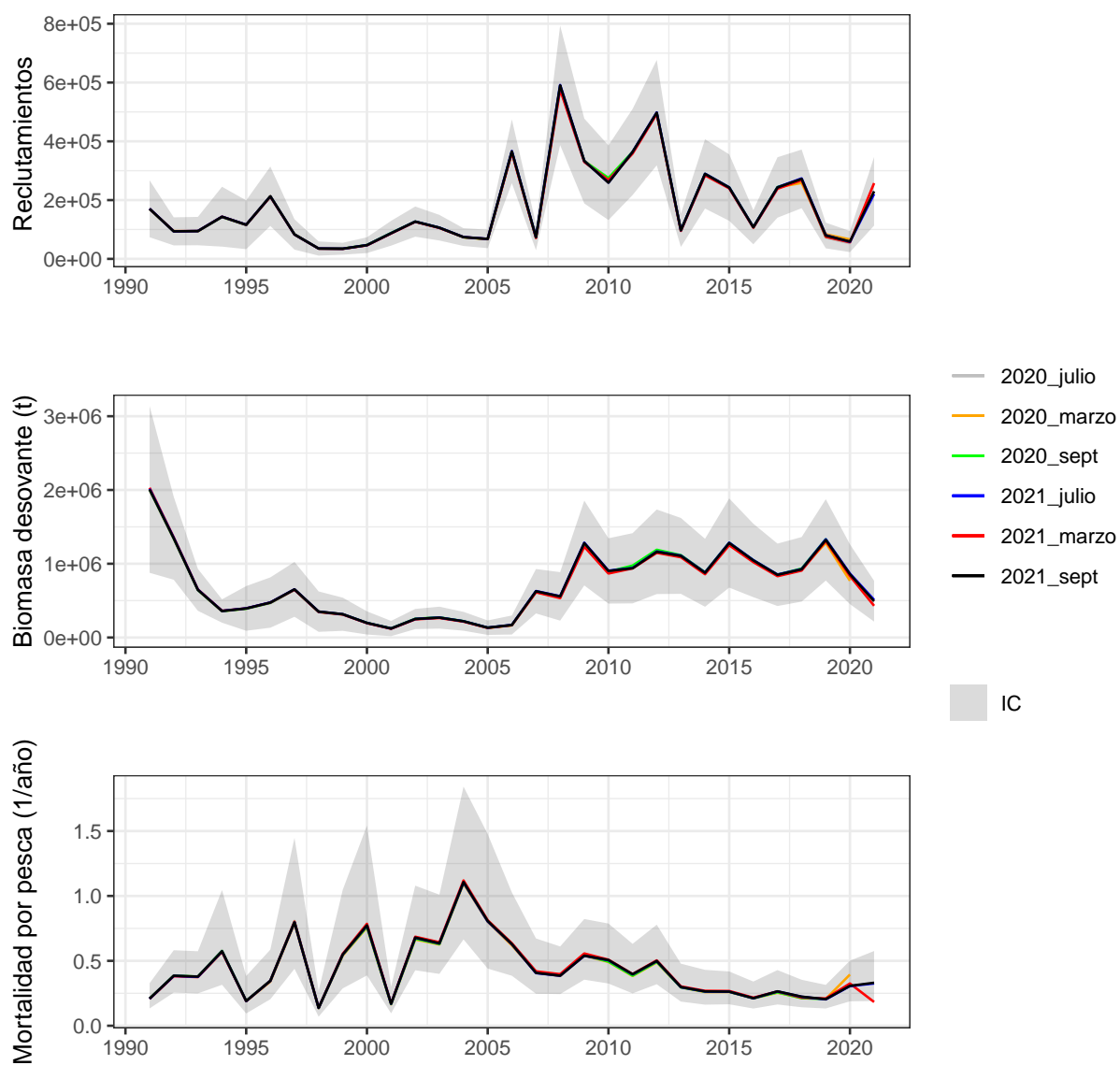


## CRUCEROS DE OTOÑO

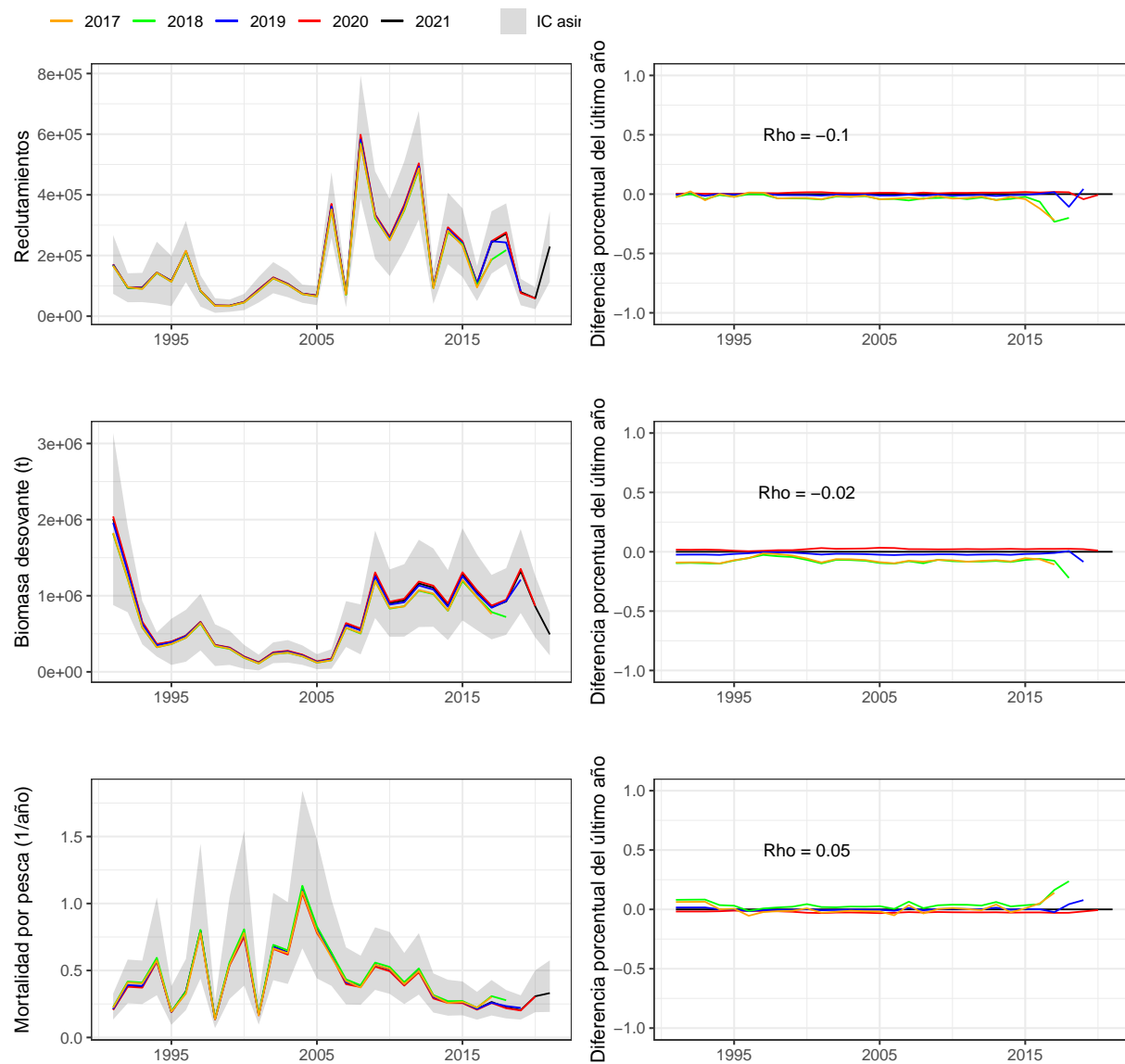




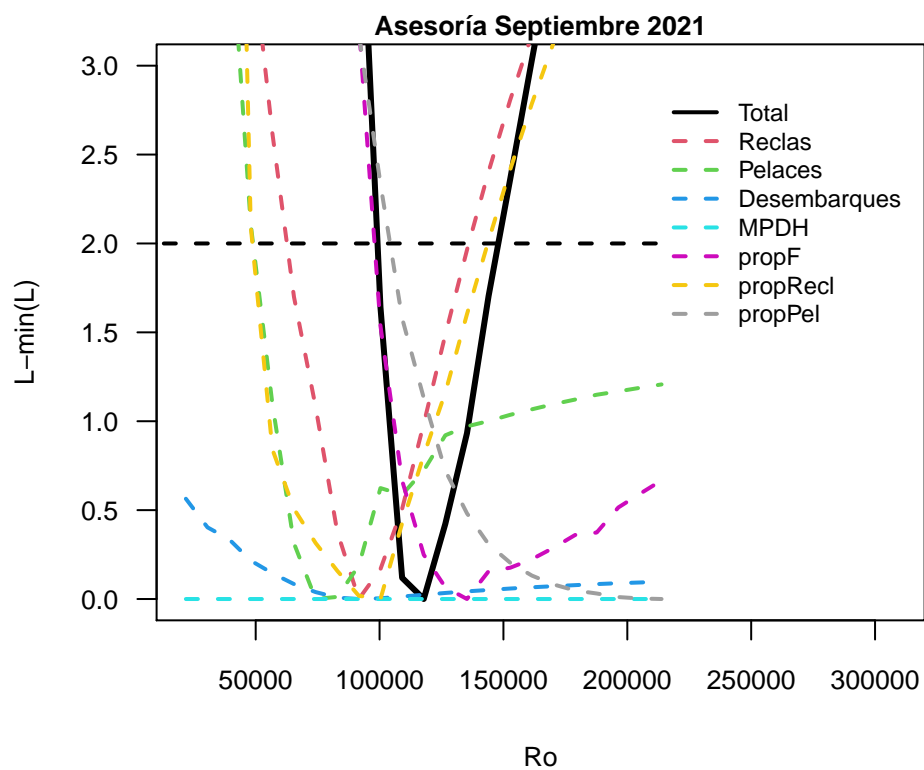
### 3.2. Comparación con asesorías previas



### 3.3. Análisis retrospectivo

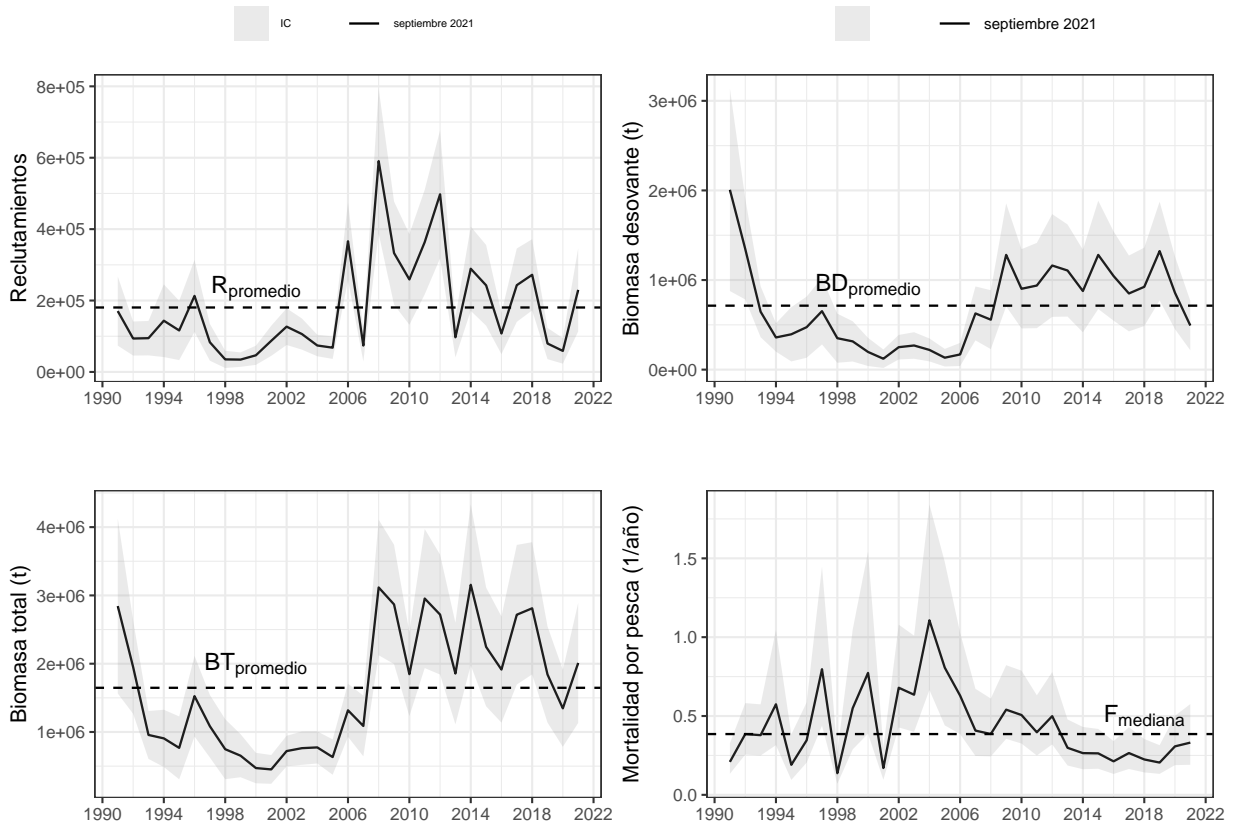


### 3.4. Perfil de verosimilitud



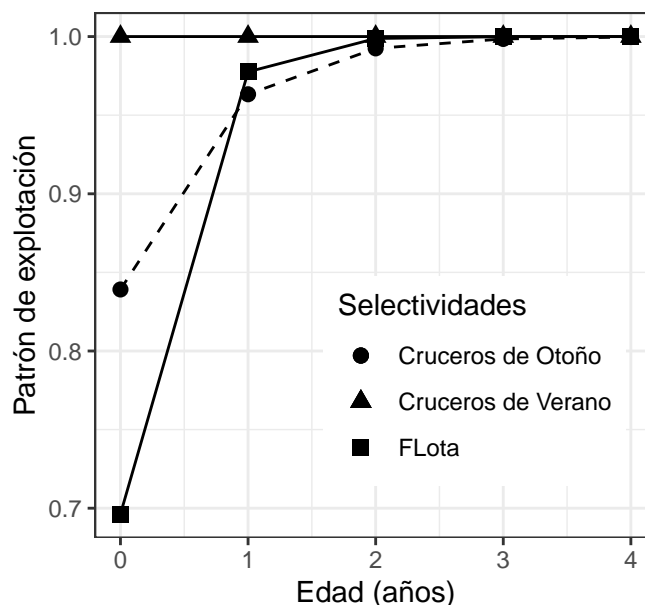


### 3.5. Variables poblacionales



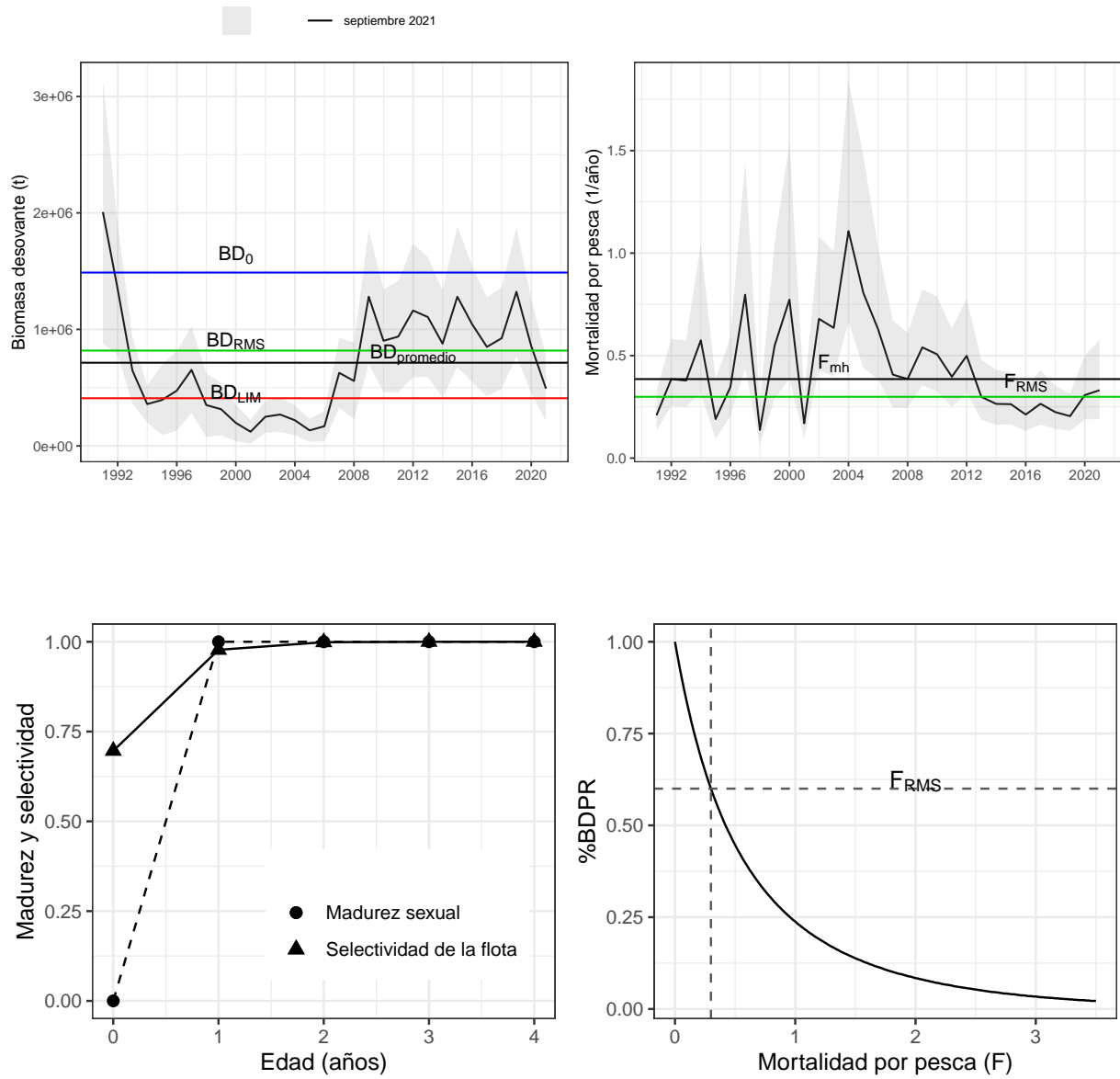
Año	$BD_{sept}$	$BD_{marzo}$	$BD_{julio}$	$BT_{sept}$	$BT_{marzo}$	$BT_{julio}$	$R_{sept}$	$R_{marzo}$	$R_{julio}$	$F_{sept}$	$F_{marzo}$	$F_{julio}$
1990/92007000	2030000	2015480	2844200	2870400	2854570	170470	170120	170639	0.209	0.207	0.208	
1991/92345500	1358500	1351070	1950300	1966700	1957010	93630	94041	93684.9	0.386	0.382	0.384	
1992/9346070	652550	648897	956570	964360	960132	94588	94707	94732.2	0.378	0.375	0.377	
1993/9459110	362070	360662	906560	909000	908707	143530	143180	143611	0.574	0.57	0.573	
1994/9394340	395090	395593	767360	767170	769117	116190	115760	116301	0.191	0.19	0.19	
1995/9474070	473120	475138	1524800	1517100	1526620	213000	211490	213115	0.346	0.347	0.346	
1996/952790	647450	653825	1084700	1077600	1086140	83143	82828	83214	0.797	0.803	0.796	
1997/950640	346010	351479	747860	741130	749454	35196	35062	35261.1	0.137	0.138	0.137	
1998/9515340	311640	316169	652660	646260	654159	34570	34292	34642.9	0.55	0.555	0.548	
1999/0097450	194090	198246	471920	465230	473346	46684	46073	46792.4	0.773	0.786	0.77	
2000/0121680	118470	122362	451930	444970	453525	87216	86319	87439.7	0.17	0.172	0.169	
2001/0250610	246340	251598	720530	713020	722233	126870	126130	127032	0.679	0.686	0.678	
2002/0369460	264590	270551	763250	753550	765101	106090	105110	106224	0.635	0.643	0.633	
2003/0420060	215090	221022	774220	767100	775923	74079	73955	74159.6	1.107	1.12	1.104	
2004/0533220	130190	133954	632780	626840	634685	67948	67638	68097.8	0.807	0.813	0.804	
2005/0669440	166450	170388	1317900	1299600	1321650	366140	361230	366988	0.629	0.636	0.628	
2006/0727440	612730	630224	1088000	1058400	1091760	73946	70839	74055.3	0.407	0.419	0.406	
2007/0857470	533910	560080	3116600	3029800	3125370	590530	576230	591892	0.386	0.397	0.385	
2008/09280800	1230300	1285730	2868400	2794700	2875880	333050	329460	333486	0.54	0.557	0.539	
2009/1002390	867720	906147	1846800	1828600	1852850	259120	268470	259700	0.506	0.509	0.505	
2010/1038520	936800	942980	2954600	2926400	2963710	363670	358290	364438	0.397	0.398	0.395	
2011/12162100	1147700	1167280	2719300	2690600	2728000	497560	492960	498579	0.499	0.504	0.498	
2012/13106300	1088100	1111240	1855800	1824500	1862960	97047	95115	97325.9	0.298	0.303	0.297	
2013/1477460	857790	881823	3155500	3096700	3165820	289110	284180	289821	0.265	0.269	0.264	
2014/15280800	1250400	1286070	2246000	2202700	2254280	242630	240020	243378	0.263	0.268	0.262	
2015/16044600	1021300	1049280	1914100	1876300	1921390	107730	106000	108023	0.213	0.217	0.212	
2016/1750040	831090	853911	2717300	2663200	2726220	243040	238570	243660	0.265	0.264	0.264	
2017/1824370	907150	928190	2811400	2763000	2826010	272200	267990	273830	0.224	0.216	0.223	
2018/19323200	1307200	1331900	1842500	1811000	1855990	79600	75099	80726.6	0.205	0.21	0.203	
2019/2058050	832960	866506	1346200	1305400	1352630	58944	56309	58187.9	0.307	0.326	0.306	
2020/2192050	430060	511108	2011100	1782600	2000590	229910	257750	220797	0.331	0.183	0.326	

```
##          difRt      difBT      difBD      Rprom  BTprom  BDprom
## Rlast_1991_2007 -1.0216677 -0.93642902 0.01984598 113722.9 1038561 502012.9
## Rlast_2008_2012  0.4375786  0.25546251 0.49181828 408786.0 2701140 968256.0
## Rlast_2013_2021 -0.2771114  0.09045272 0.49428848 180023.4 2211100 972985.6
## Rlast_2013_2020 -0.3229365  0.10062162 0.52371618 173787.6 2236100 1033102.5
## Rlast_historico -0.2733002 -0.22096961 0.31080359 180562.3 1647134 713947.4
```



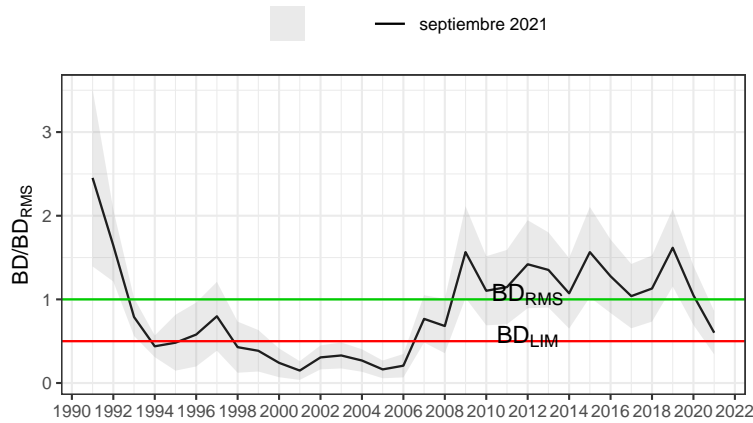
### 3.6. Puntos biológicos de referencia

	Septiembre	Marzo	Julio
BDpromedio	714.00	702.00	718.00
Fmh	0.39	0.38	0.38
%BDPR_Fmh	52.60	52.90	52.80
%BDPR_F <sub>RMS</sub>	60.00	60.00	60.00
%BD_Fmh	47.60	47.90	47.80
%BD_F <sub>RMS</sub>	55.00	55.00	55.00
BDo	1488.00	1456.00	1491.00
BD55%	818.00	801.00	820.00
BD27.5%	409.00	401.00	410.00

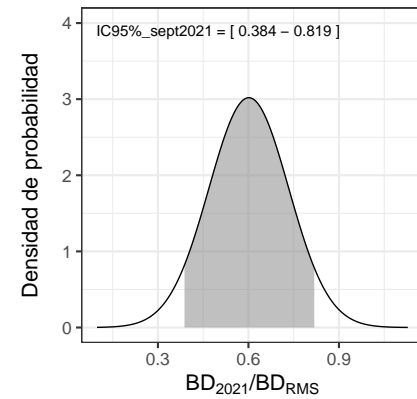


### 3.7. Estatus

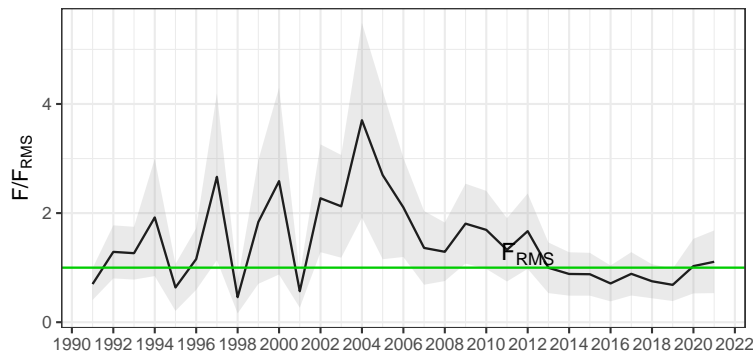
a)



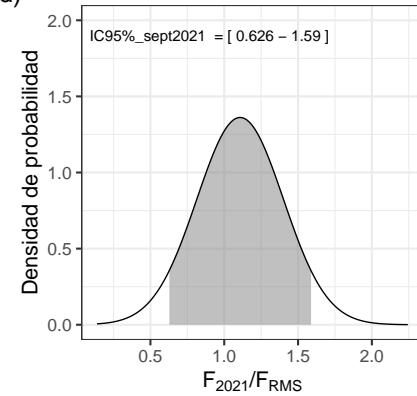
b)



c)



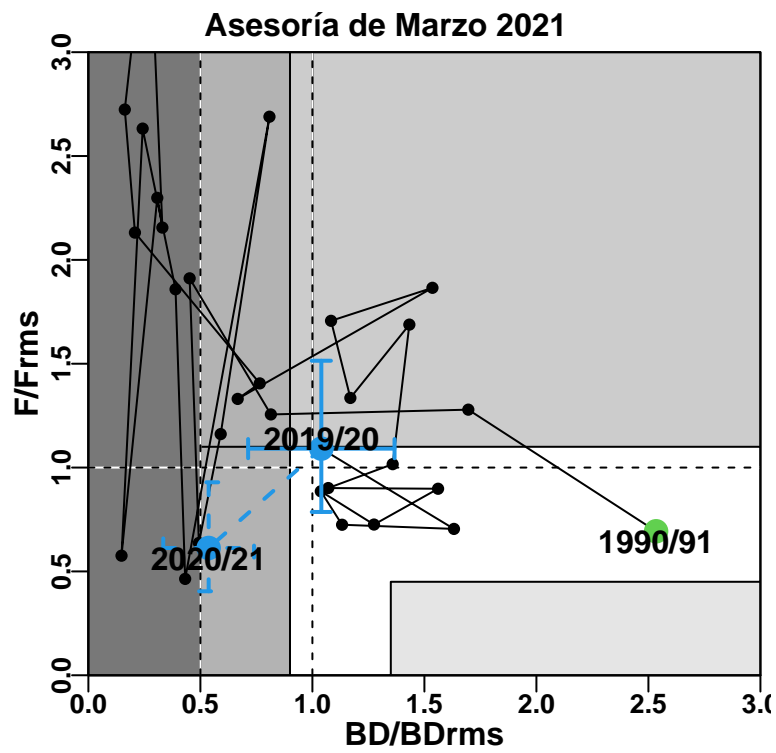
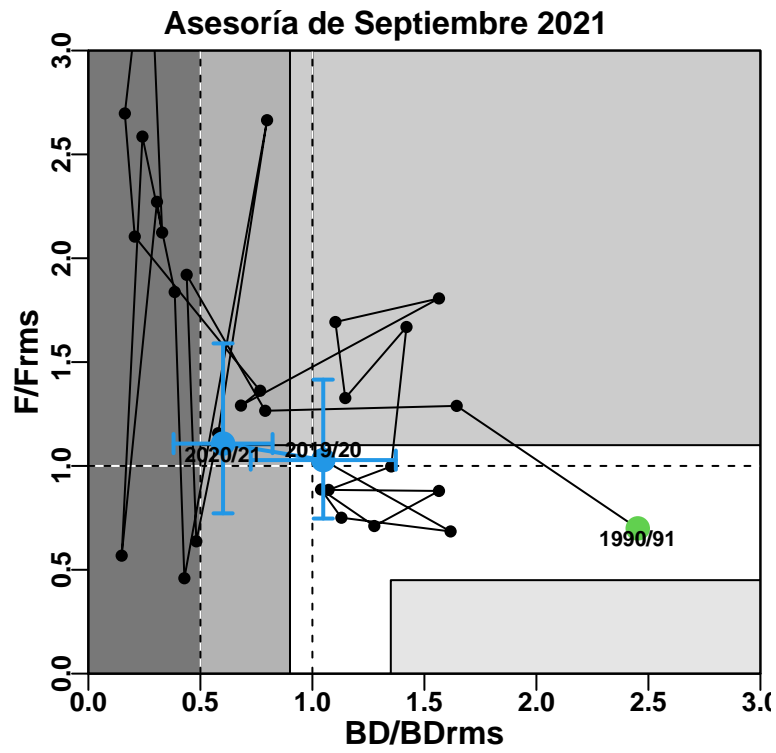
d)

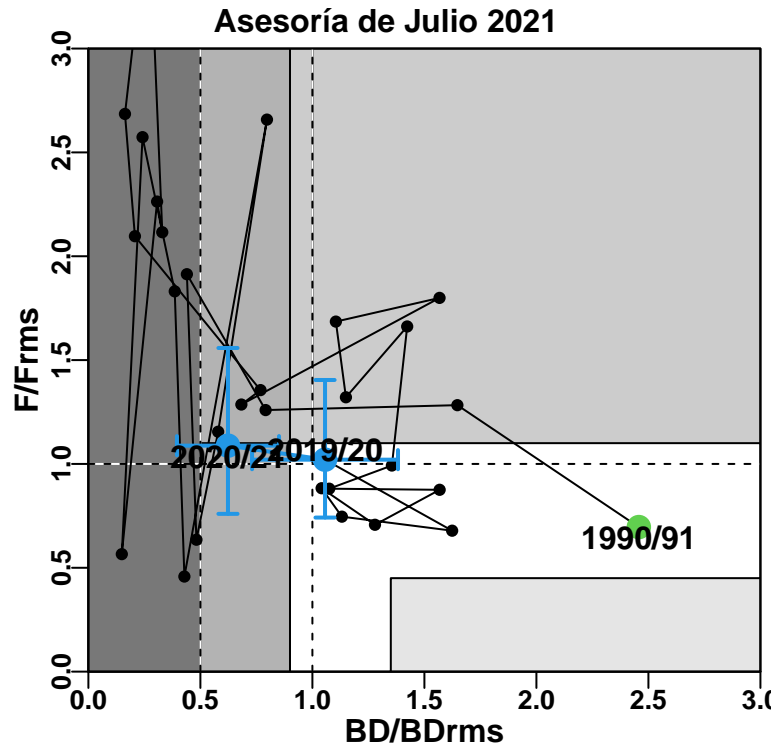


Años	$F/F_{RMS_{sept}}$	$F/F_{RMS_{marzo}}$	$F/F_{RMS_{julio}}$	$BD/BD_{RMS_{sept}}$	$BD/BD_{RMS_{marzo}}$	$BD/BD_{RMS_{julio}}$
1990/91	0.699	0.693	0.696	2.452	2.534	2.457
1991/92	1.289	1.279	1.283	1.644	1.696	1.647
1992/93	1.265	1.256	1.259	0.789	0.815	0.791
1993/94	1.92	1.911	1.913	0.439	0.452	0.44
1994/95	0.637	0.637	0.635	0.482	0.493	0.482
1995/96	1.157	1.161	1.155	0.579	0.591	0.579
1996/97	2.665	2.689	2.658	0.798	0.808	0.797
1997/98	0.459	0.464	0.458	0.428	0.432	0.429
1998/99	1.837	1.859	1.831	0.385	0.389	0.385
1999/00	2.586	2.632	2.573	0.241	0.242	0.242
2000/01	0.568	0.576	0.566	0.149	0.148	0.149
2001/02	2.272	2.299	2.263	0.306	0.308	0.307
2002/03	2.124	2.155	2.116	0.329	0.33	0.33
2003/04	3.702	3.751	3.687	0.269	0.269	0.269
2004/05	2.697	2.724	2.685	0.163	0.163	0.163
2005/06	2.104	2.131	2.096	0.207	0.208	0.208
2006/07	1.362	1.405	1.355	0.767	0.765	0.768
2007/08	1.291	1.331	1.286	0.681	0.667	0.683
2008/09	1.807	1.865	1.799	1.565	1.536	1.568
2009/10	1.693	1.707	1.685	1.103	1.083	1.105
2010/11	1.327	1.335	1.321	1.147	1.17	1.15
2011/12	1.669	1.688	1.662	1.42	1.433	1.423
2012/13	0.998	1.016	0.992	1.352	1.358	1.355
2013/14	0.885	0.901	0.881	1.072	1.071	1.075
2014/15	0.88	0.898	0.875	1.565	1.561	1.568

Años	$F/F_{RMS_{sept}}$	$F/F_{RMS_{marzo}}$	$F/F_{RMS_{julio}}$	$BD/BD_{RMS_{sept}}$	$BD/BD_{RMS_{marzo}}$	$BD/BD_{RMS_{julio}}$
2015/16	0.711	0.726	0.707	1.276	1.275	1.279
2016/17	0.887	0.886	0.883	1.039	1.038	1.041
2017/18	0.751	0.725	0.746	1.13	1.133	1.132
2018/19	0.685	0.705	0.679	1.617	1.632	1.624
2019/20	1.028	1.091	1.021	1.048	1.04	1.056
2020/21	1.108	0.613	1.088	0.601	0.537	0.623

Años	$Y/BT_{sept}$	$Y/BT_{marzo}$	$Y/BT_{julio}$	$C/N_{sept}$	$C/N_{marzo}$	$C/N_{julio}$
1990/91	0.174	0.172	0.173	0.101	0.101	0.101
1991/92	0.263	0.261	0.263	0.179	0.178	0.179
1992/93	0.262	0.26	0.261	0.168	0.167	0.167
1993/94	0.396	0.395	0.395	0.23	0.23	0.23
1994/95	0.157	0.157	0.157	0.088	0.088	0.087
1995/96	0.237	0.238	0.237	0.148	0.149	0.147
1996/97	0.509	0.513	0.509	0.321	0.324	0.321
1997/98	0.099	0.1	0.099	0.069	0.069	0.069
1998/99	0.326	0.33	0.326	0.234	0.236	0.233
1999/00	0.436	0.442	0.435	0.293	0.298	0.292
2000/01	0.116	0.118	0.116	0.075	0.076	0.074
2001/02	0.441	0.445	0.44	0.263	0.266	0.262
2002/03	0.385	0.39	0.384	0.253	0.256	0.252
2003/04	0.501	0.505	0.499	0.39	0.394	0.389
2004/05	0.399	0.403	0.398	0.301	0.304	0.3
2005/06	0.392	0.397	0.391	0.236	0.239	0.235
2006/07	0.329	0.339	0.328	0.19	0.196	0.189
2007/08	0.238	0.245	0.237	0.156	0.161	0.155
2008/09	0.328	0.337	0.327	0.227	0.234	0.227
2009/10	0.34	0.343	0.339	0.214	0.215	0.213
2010/11	0.28	0.283	0.279	0.167	0.169	0.167
2011/12	0.316	0.319	0.315	0.204	0.206	0.203
2012/13	0.226	0.229	0.225	0.148	0.15	0.147
2013/14	0.165	0.168	0.164	0.116	0.119	0.116
2014/15	0.186	0.189	0.185	0.12	0.122	0.119
2015/16	0.157	0.16	0.156	0.104	0.107	0.104
2016/17	0.153	0.153	0.152	0.117	0.117	0.116
2017/18	0.133	0.129	0.132	0.101	0.098	0.101
2018/19	0.172	0.176	0.171	0.104	0.107	0.103
2019/20	0.211	0.222	0.21	0.147	0.155	0.146
2020/21	0.195	0.123	0.196	0.139	0.08	0.137





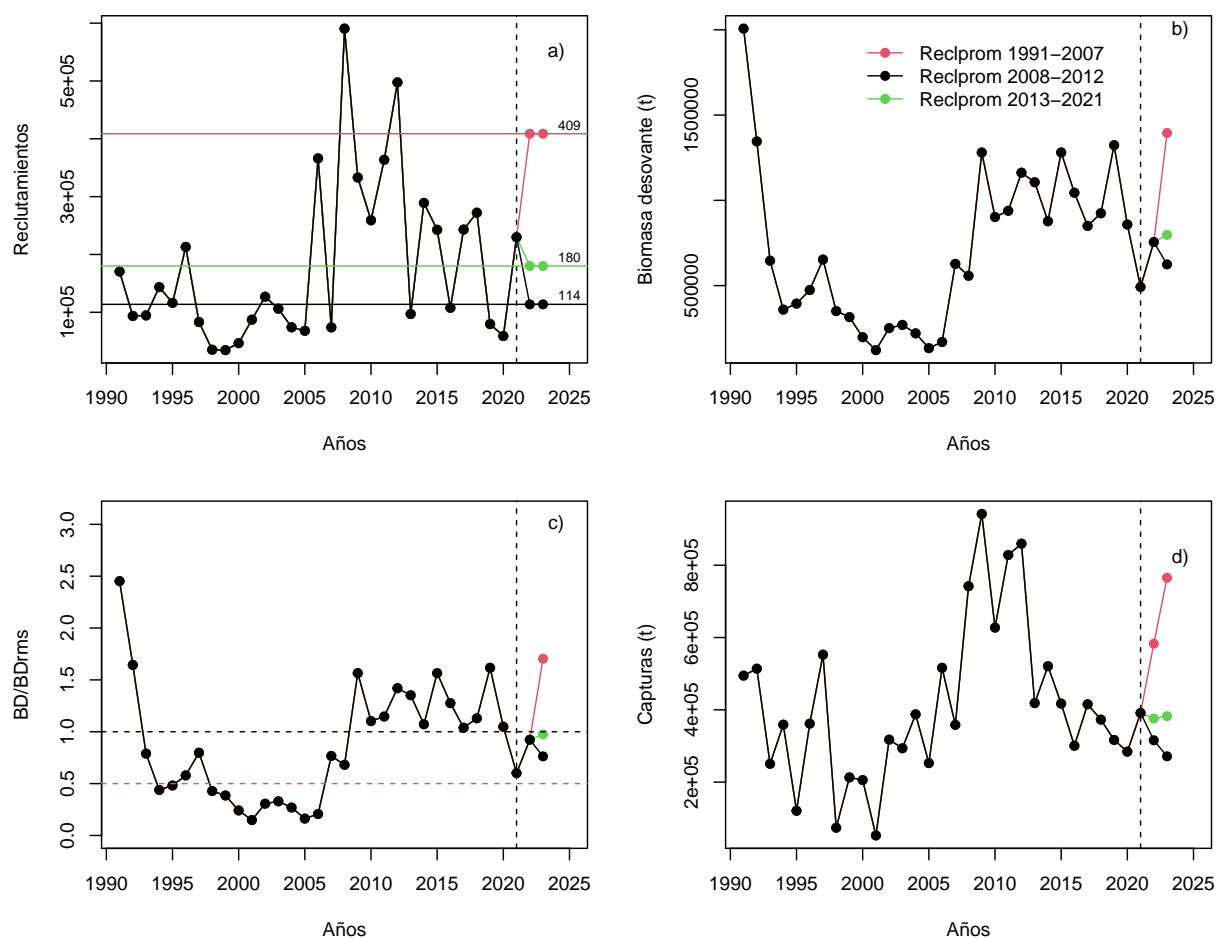
	Septiembre 2021	Marzo 2021	Julio 2021
Año biológico	2020/21	2020/21	2020/21
$F_{RMS}$	0.3	0.3	0.3
$BD_{RMS}$	818	801	820
$BD_{LIM}$	409	401	410
$p(BD_{last} < BD_{RMS})$	1	1	1
$p(F_{last} > F_{RMS})$	0.64	0.02	0.62
$p(sobre - explotación)$	0.99	1	0.98
$p(agotado/colapsado)$	0.22	0.38	0.18
$p(sobrepesca)$	0.51	0	0.48



### 3.8. CBA 2021 Inicial (Asesoría de septiembre 2021)

	R1	R2	R3
$BD_{RMS}$ (mil t)	818.38	818.38	818.38
$BD_{2022}$ (mil t)	755.00	755.00	755.00
$C_{2022}$ (mil t)	316.00	583.00	376.00
$C_{1erS2022}$ ( mil t)	221.00	408.00	263.00
$C_{2022}$ (-descarte mil t)	303.00	560.00	361.00
$C_{1erS2022}$ (-descarte mil t)	212.00	392.00	253.00
$BD_{2022}/BD_{RMS}$	0.92	0.92	0.92
$p(BD_{2022} < BD_{RMS})$	0.63	0.63	0.63
$p(sobreexplotación)$	0.46	0.46	0.46
$p(agotado/colapsado)$	0.03	0.03	0.03

	R1	R2	R3
$BD_{RMS}$ (mil t)	818.38	818.38	818.38
$BD_{2023}$ (mil t)	624.00	1395.00	797.00
$C_{2023}$ (mil t)	271.00	765.00	382.00
$C_{2doS2022}$ ( mil t)	81.00	230.00	115.00
$C_{2023}$ (-descarte mil t)	261.00	735.00	367.00
$C_{2doS2022}$ (-descarte mil t)	78.00	220.00	110.00
$BD_{2023}/BD_{RMS}$	0.76	1.70	0.97
$p(BD_{2023} < BD_{RMS})$	0.99	0.00	0.58
$p(sobreexplotación)$	0.90	0.00	0.29
$p(agotado/colapsado)$	0.01	0.00	0.00

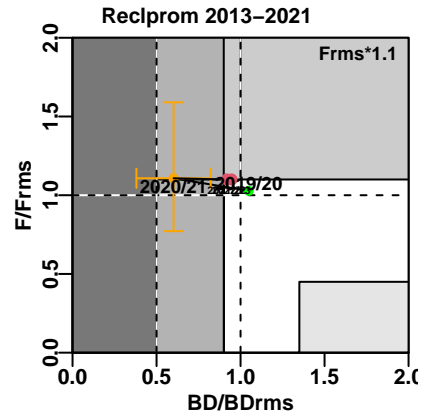
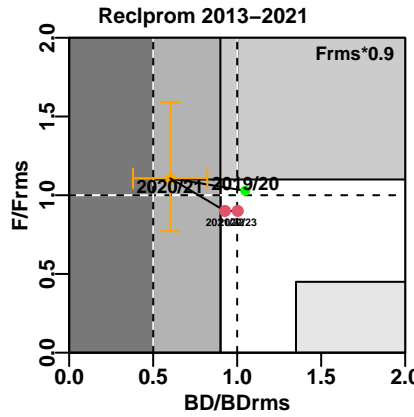
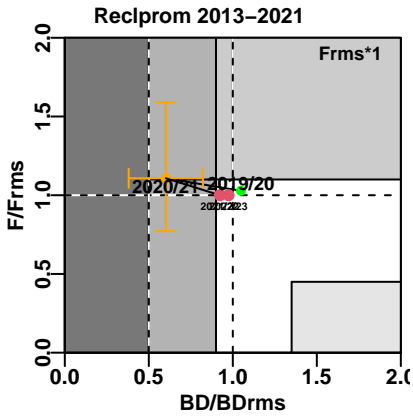
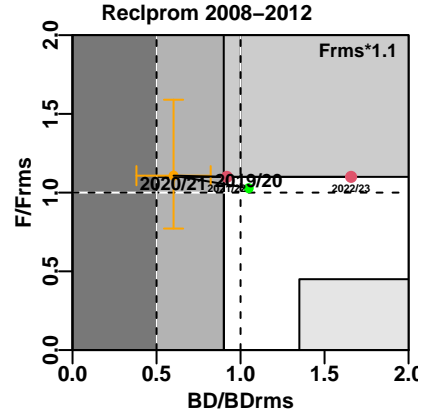
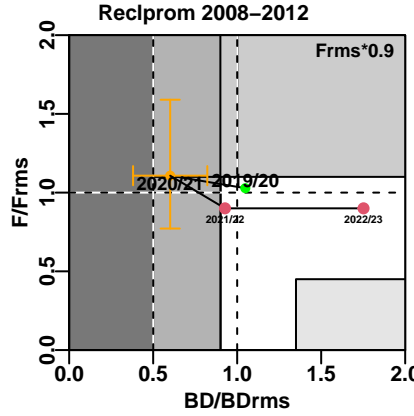
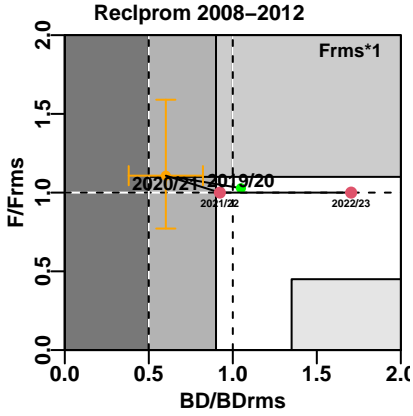
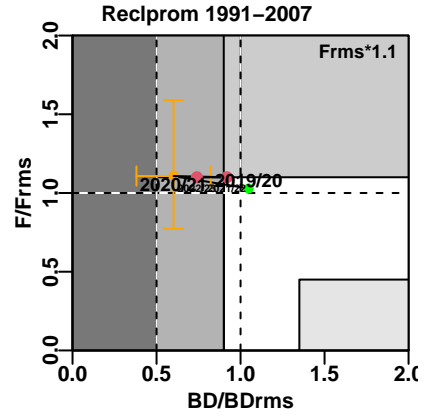
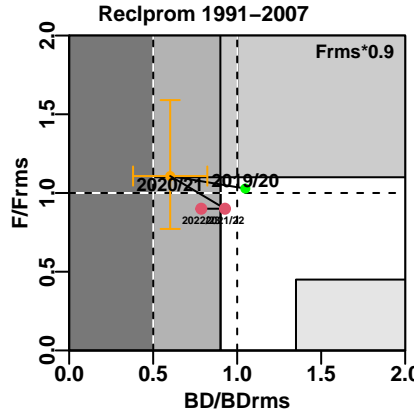
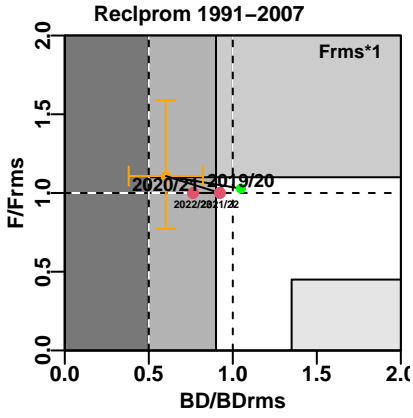


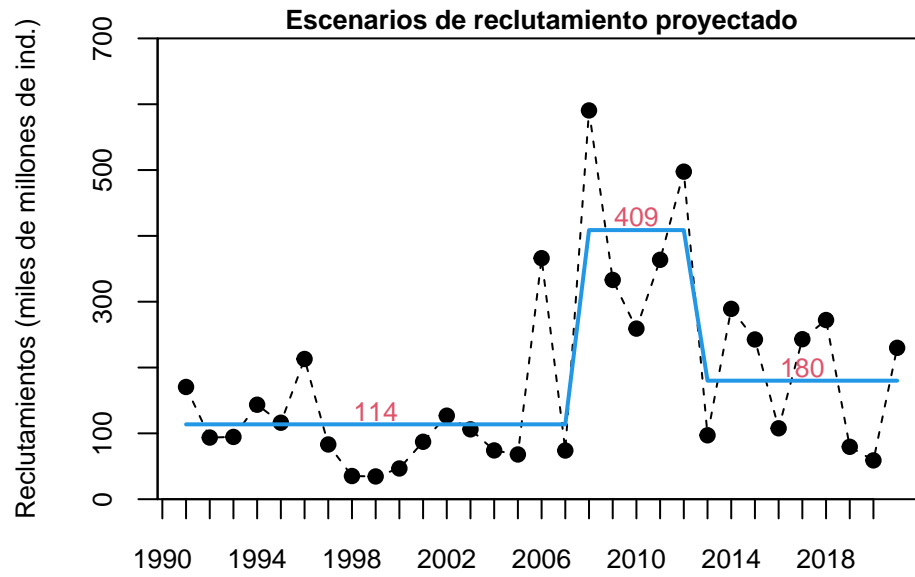
#### 4.0. Proyección del stock (Asesoría de septiembre 2021)

	1991-2007[F <sub>RMS</sub> *1]	[F <sub>RMS</sub> *0.9]	[F <sub>RMS</sub> *0.7]
p(sobre-explotación)_2019/20	0.21	0.21	0.21
p(colapso)_2019/20	0.00	0.00	0.00
p(sobre-explotación)_2020/21	0.99	0.99	0.99
p(colapso)_2020/21	0.22	0.22	0.22
p(sobre-explotación)_2021/22	0.46	0.45	0.47
p(colapso)_2021/22	0.03	0.03	0.03
p(sobre-explotación)_2022/23	0.90	0.85	0.94
p(colapso)_2022/23	0.01	0.00	0.01

	2008-2012[F <sub>RMS</sub> *1]	[F <sub>RMS</sub> *0.9]	[F <sub>RMS</sub> *0.7]
p(sobre-explotación)_2019/20	0.21	0.21	0.21
p(colapso)_2019/20	0.00	0.00	0.00
p(sobre-explotación)_2020/21	0.99	0.99	0.99
p(colapso)_2020/21	0.22	0.22	0.22
p(sobre-explotación)_2021/22	0.46	0.45	0.47
p(colapso)_2021/22	0.03	0.03	0.03
p(sobre-explotación)_2022/23	0.00	0.00	0.00
p(colapso)_2022/23	0.00	0.00	0.00

	2013-2021[F <sub>RMS</sub> *1]	[F <sub>RMS</sub> *0.9]	[F <sub>RMS</sub> *0.7]
p(sobre-explotación)_2019/20	0.21	0.21	0.21
p(colapso)_2019/20	0.00	0.00	0.00
p(sobre-explotación)_2020/21	0.99	0.99	0.99
p(colapso)_2020/21	0.22	0.22	0.22
p(sobre-explotación)_2021/22	0.46	0.45	0.47
p(colapso)_2021/22	0.03	0.03	0.03
p(sobre-explotación)_2022/23	0.29	0.23	0.36
p(colapso)_2022/23	0.00	0.00	0.00

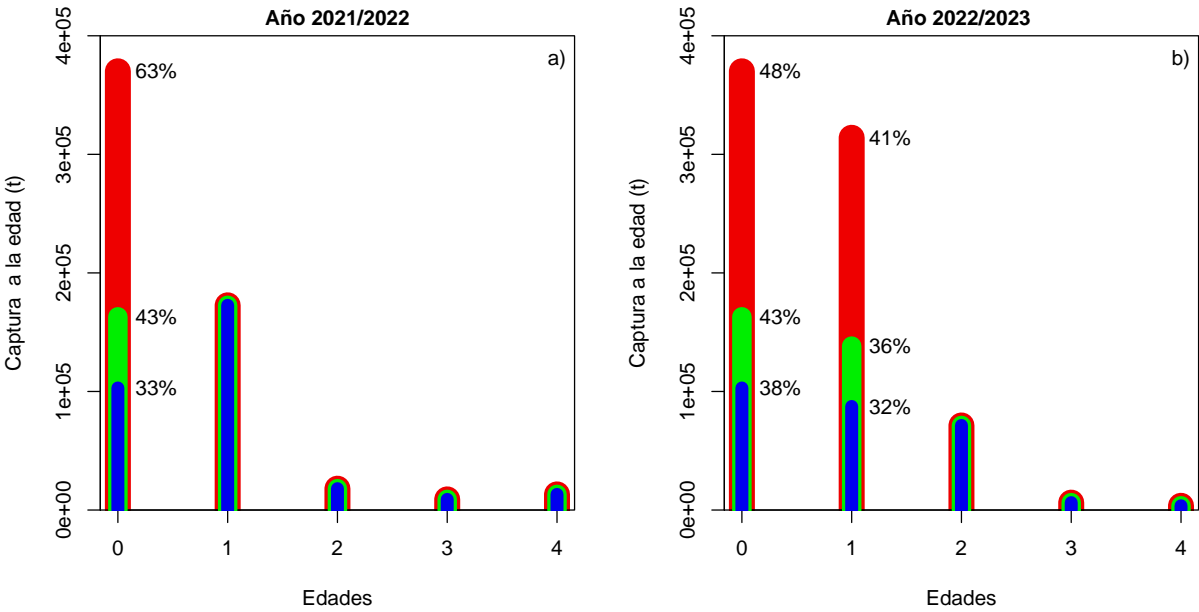


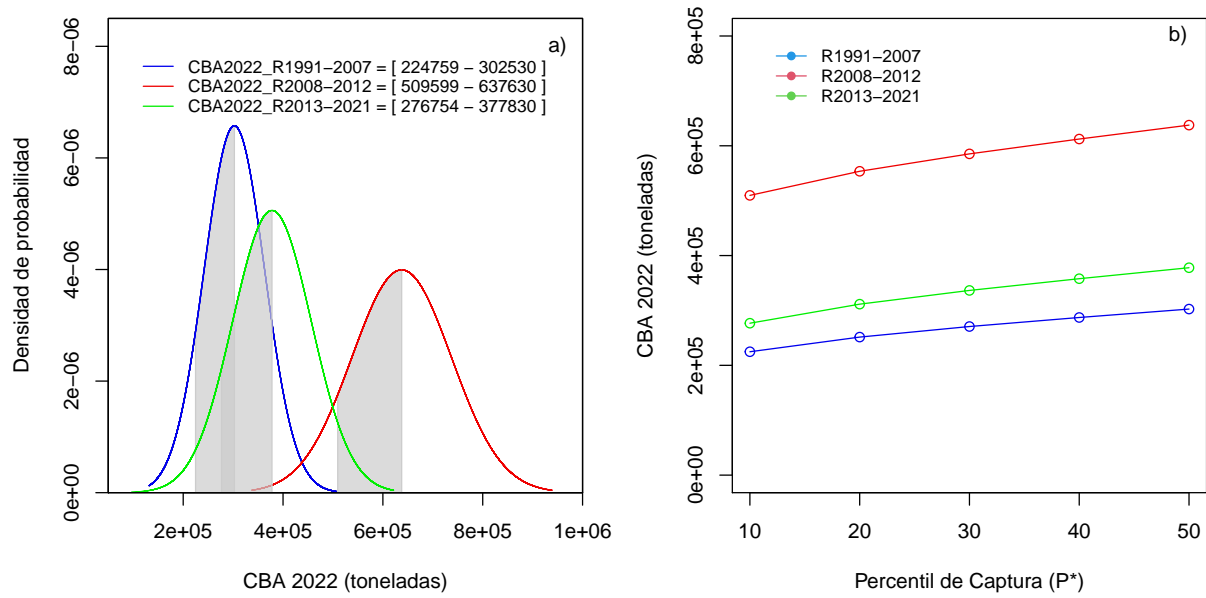


	1991-2007	2008-2012	2013-2021
mean	302530	637630	377830
std	60685	99903	78870
10%	224759	509599	276754
20%	251456	553550	311451
30%	270707	585241	336471
40%	287156	612320	357849
50%	302530	637630	377830

	1991-2007	2008-2012	2013-2021
10%	0.26	0.20	0.27
20%	0.17	0.13	0.18
30%	0.11	0.08	0.11
40%	0.05	0.04	0.05
50%	0.00	0.00	0.00

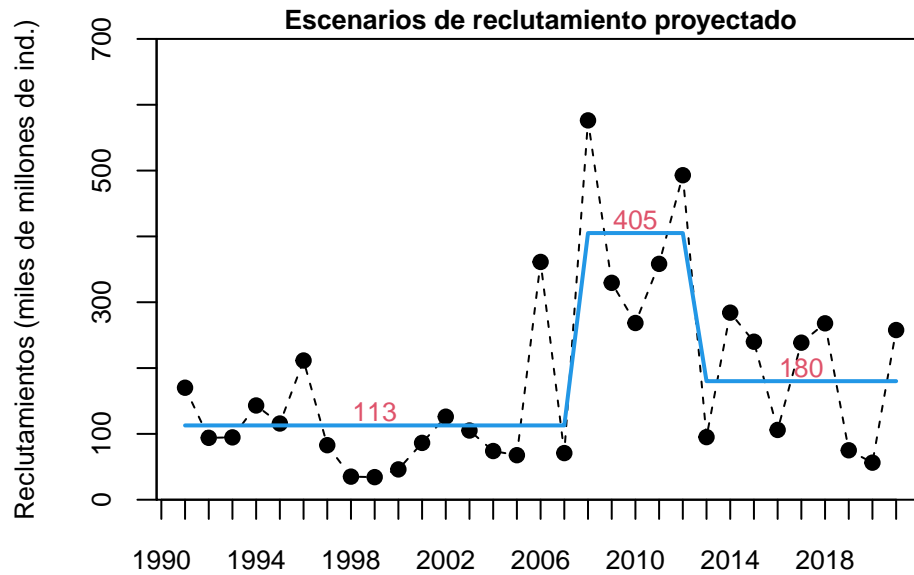
	1991-2007	2008-2012	2013-2021
mean	290430	612130	362710
std	58258	95907	75716
10%	215769	489220	265676
20%	241399	531413	298986
30%	259879	561836	323004
40%	275671	587832	343528
50%	290430	612130	362710





	V1	V2	V3	V4	V5
C1eryearR1	102949	172682	18019	8986	13200
C1eryearR2	370058	172682	18019	8986	13200
C1eryearR3	162968	172682	18019	8986	13200
C2doyearR1	102949	87352	71341	6250	3594
C2doyearR2	370058	313991	71341	6250	3594
C2doyearR3	162968	138277	71341	6250	3594

### 3.9. Primera revisión CBA 2021 (Asesoría de marzo 2021)



	1991-2007	2008-2012	2013-2021
mean	271720	313030	279570
std	29384	34291	33911
10%	234063	269084	236111
20%	246990	284170	251030

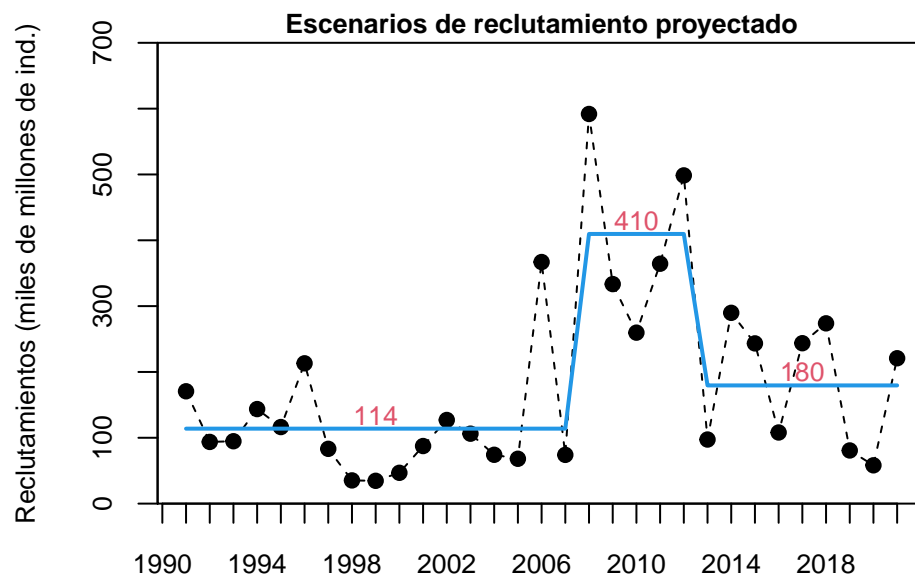
	1991-2007	2008-2012	2013-2021
30%	256311	295048	261787
40%	264276	304342	270979
50%	271720	313030	279570

	1991-2007	2008-2012	2013-2021
10%	0.14	0.14	0.16
20%	0.09	0.09	0.10
30%	0.06	0.06	0.06
40%	0.03	0.03	0.03
50%	0.00	0.00	0.00

	1991-2007	2008-2012	2013-2021
10%	224700	258321	226667
20%	237110	272803	240989
30%	246059	283246	251316
40%	253705	292169	260140
50%	260851	300509	268387

	1991-2007	2008-2012	2013-2021
10%	6	-46	-13
20%	0	-48	-18
30%	-3	-49	-21
40%	-6	-49	-23
50%	-8	-50	-24

#### 4.0. Segunda revisión CBA 2021 (Asesoría de julio 2021)



```
library(strucchange)
library(tidyverse)
```

```
## -- Attaching packages ----- tidyverse 1.3.0 --
```

```
## v tibble 3.0.3    v purrr 0.3.4
## v tidyr 1.1.2    v forcats 0.5.0
## v readr 1.3.1
```

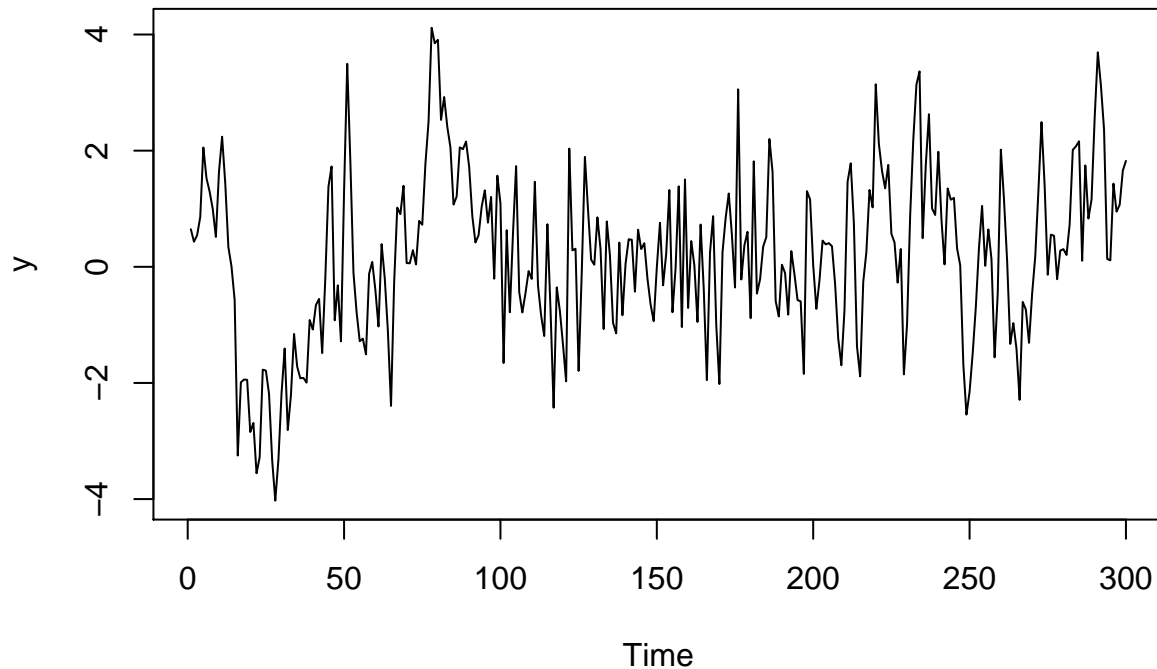
```
## -- Conflicts ----- tidyverse_conflicts() --
## x strucchange::boundary() masks stringr::boundary()
## x tidyr::expand()      masks reshape::expand()
## x dplyr::filter()      masks stats::filter()
## x dplyr::lag()         masks stats::lag()
## x dplyr::rename()      masks reshape::rename()
library(lubridate)

##
## Attaching package: 'lubridate'

## The following object is masked from 'package:reshape':
##
##   stamp

## The following objects are masked from 'package:base':
##
##   date, intersect, setdiff, union
x1 <- arima.sim(model = list(ar = 0.9), n = 100)
x2 <- arima.sim(model = list(ma = 0.1), n = 100)
x3 <- arima.sim(model = list(ar = 0.5, ma = 0.3), n = 100)

y <- c((1 + x1), x2, (0.5 - x3))
plot.ts(y)
```



```
dat <- tibble(ylag0 = y, ylag1 = lag(y))

qlr <- Fstats(ylag0 ~ ylag1, data = dat)

sctest(qlr, type = "supF")

##
```



```
## supF test
##
## data: qlr
## sup.F = 24.73, p-value = 0.0001302
```

	1991-2007	2008-2012	2013-2021
mean	378670	419950	385460
std	22259	28186	25850
10%	350144	383828	352332
20%	359936	396228	363704
30%	366997	405169	371904
40%	373031	412809	378911
50%	378670	419950	385460

	1991-2007	2008-2012	2013-2021
10%	0.08	0.09	0.09
20%	0.05	0.06	0.06
30%	0.03	0.04	0.04
40%	0.01	0.02	0.02
50%	0.00	0.00	0.00

	1991-2007	2008-2012	2013-2021
10%	336138	368475	338239
20%	345539	380379	349156
30%	352317	388962	357028
40%	358110	396297	363755
50%	363523	403152	370042

	1991-2007	2008-2012	2013-2021
10%	59	-23	30
20%	46	-27	19
30%	38	-29	13
40%	33	-31	8
50%	28	-33	4

```
#####
# Asesoría septiembre R1
#####
# densidad de probabilidad
xbs1a <-rnorm(1000, mean = CBAp_sept[1], sd = CBApstd_sept[1])
xbsa <-seq(min(xbs1a),max(xbs1a),0.5)
ybsa <-dnorm(xbsa, mean = CBAp_sept[1], sd =CBApstd_sept[1])
icbsa <-qnorm(c(0.10,0.50,0.5),CBAp_sept[1],CBApstd_sept[1])

#distribución probabilidad
xxbsa <- c(xbsa[xbsa>=icbsa[1]&xbsa<=icbsa[2]],
          rev(xbsa[xbsa>=icbsa[1]&xbsa<=icbsa[2]]))
yybsa <- c(ybsa[xbsa>=icbsa[1]&xbsa<=icbsa[2]],
          rep(0,length(ybsa[xbsa>=icbsa[1]&xbsa<=icbsa[2]])))

densb_bsa <- data.frame(x=xxbsa, y=yybsa , t=rep('a', length(xxbsa)), r=seq(1,length(xxbsa),1))

#####
# Asesoría septiembre R2
#####
# densidad de probabilidad
xbs1b <-rnorm(1000, mean = CBAp_sept[3], sd = CBApstd_sept[3])
xbsb <-seq(min(xbs1b),max(xbs1b),0.5)
```

```

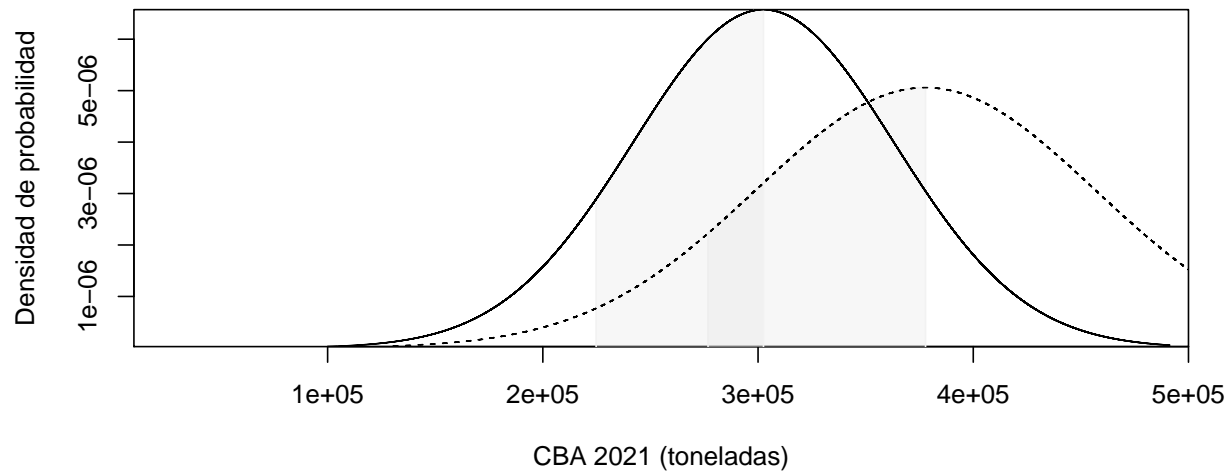
ybsb <-dnorm(xbsb, mean = CBAp_sept[3], sd = CBApstd_sept[3])
icbsb <-qnorm(c(0.10,0.50,0.5),CBAp_sept[3],CBApstd_sept[3])

#distribución probabilidad
xxbsb <- c(xbsb[xbsb>=icbsb[1]&xbsb<=icbsb[2]],
           rev(xbsb[xbsb>=icbsb[1]&xbsb<=icbsb[2]]))
yybsb <- c(ybsb[xbsb>=icbsb[1]&xbsb<=icbsb[2]],
           rep(0,length(ybsb[xbsb>=icbsb[1]&xbsb<=icbsb[2]])))

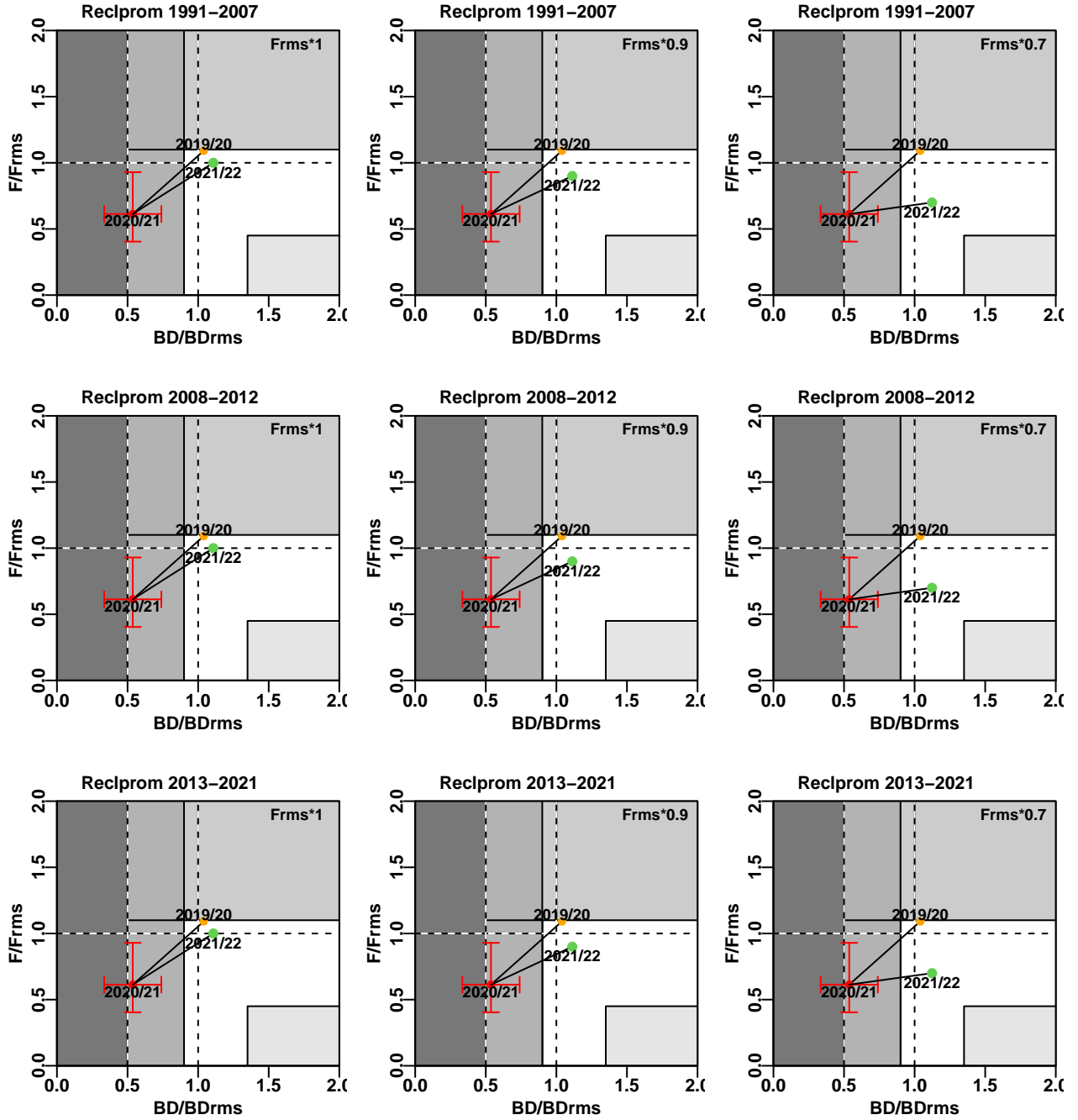
densb_bsb <- data.frame(x=xxbsb, y=yybsb, t=rep('a', length(xxbsb)), r=seq(1,length(xxbsb),1))

plot(xbsa,ybsa, type="n",ylab="Densidad de probabilidad",xaxs="i",yaxs="i",xlab="CBA 2021 (toneladas)", main="",xlim=c(10000,500000))
polygon(xxbsb,yybsb,col=gray(0.9,0.3),border="gray95")
polygon(xxbsa,yybsa,col=gray(0.9,0.3),border="gray95")
lines(xbsb,ybsb,lwd=1,lty=2,col=1)
lines(xbsa,ybsa,lwd=1,lty=1,col=1)
legend(1000,0.00017,c("CBA2021_Hito1_Rbajo", "CBA2021_Hito1_Rreciente"),lwd=c(2,1),col=c(1,2),lty=c(1,1),bty="n",cex=0.8)
text(904.3,0.0022,"Crms")

```



	1991-2007[F <sub>RMS</sub> *1]	[F <sub>RMS</sub> *0.9]	[F <sub>RMS</sub> *0.7]
p(BD<0,9BD <sub>RMS</sub> )_2020/21	1.00	1.00	1.00
p(BD<0,5BD <sub>RMS</sub> )_2020/21	0.38	0.38	0.38
p(BD<0,9BD <sub>RMS</sub> )_2021/22	0.27	0.26	0.26
p(BD<0,5BD <sub>RMS</sub> )_2021/22	0.04	0.03	0.03
	2008-2012[F <sub>RMS</sub> *1]	[F <sub>RMS</sub> *0.9]	[F <sub>RMS</sub> *0.7]
p(BD<0,9BD <sub>RMS</sub> )_2020/21	1.00	1.00	1.00
p(BD<0,5BD <sub>RMS</sub> )_2020/21	0.38	0.38	0.38
p(BD<0,9BD <sub>RMS</sub> )_2021/22	0.27	0.26	0.26
p(BD<0,5BD <sub>RMS</sub> )_2021/22	0.04	0.03	0.03
	2013-2021[F <sub>RMS</sub> *1]	[F <sub>RMS</sub> *0.9]	[F <sub>RMS</sub> *0.7]
p(BD<0,9BD <sub>RMS</sub> )_2020/21	1.00	1.00	1.00
p(BD<0,5BD <sub>RMS</sub> )_2020/21	0.38	0.38	0.38
p(BD<0,9BD <sub>RMS</sub> )_2021/22	0.27	0.26	0.26
p(BD<0,5BD <sub>RMS</sub> )_2021/22	0.04	0.03	0.03

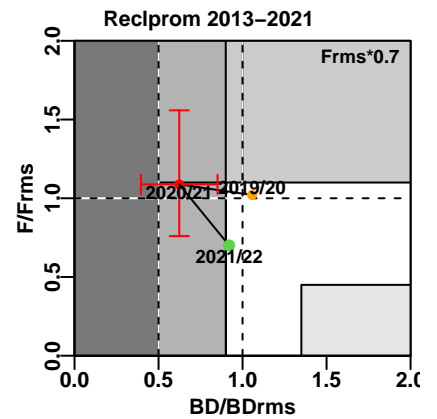
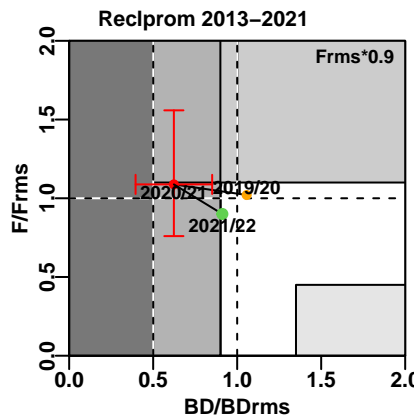
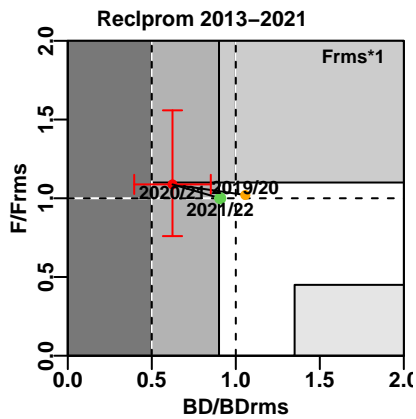
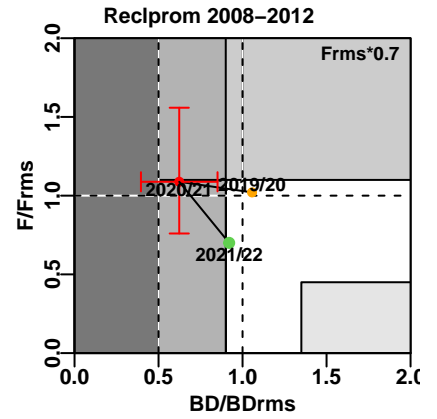
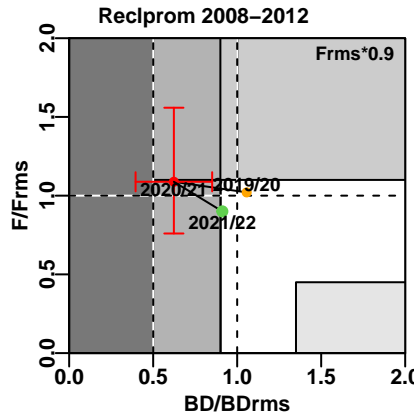
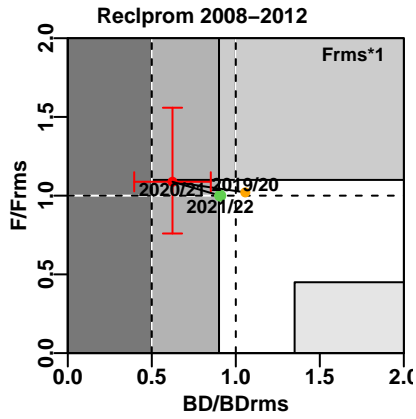
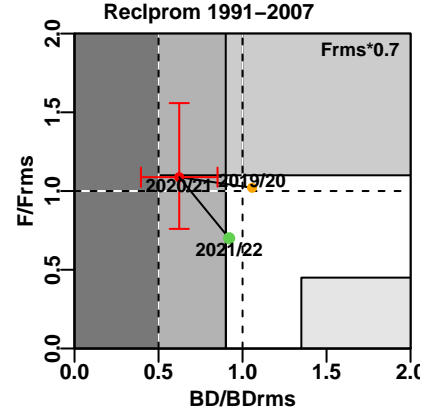
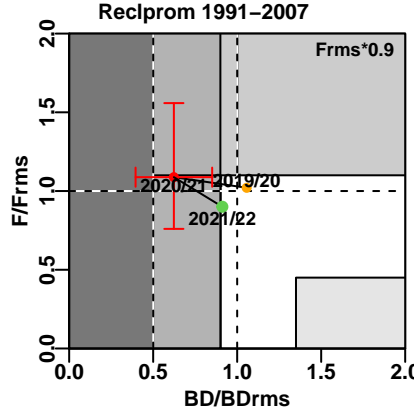
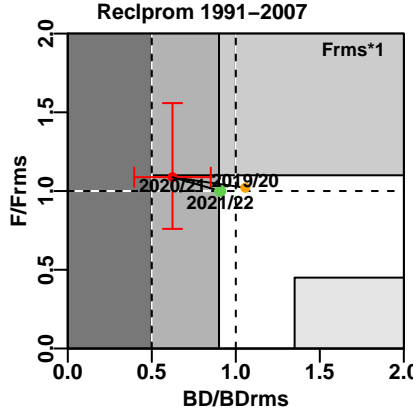


	1991-2007[F <sub>RMS</sub> *1]	[F <sub>RMS</sub> *0.9]	[F <sub>RMS</sub> *0.7]
p(BD<0,9BD <sub>RMS</sub> )_2020/21	0.98	0.98	0.98
p(BD<0,5BD <sub>RMS</sub> )_2020/21	0.18	0.18	0.18
p(BD<0,9BD <sub>RMS</sub> )_2021/22	0.49	0.48	0.46
p(BD<0,5BD <sub>RMS</sub> )_2021/22	0.04	0.03	0.03

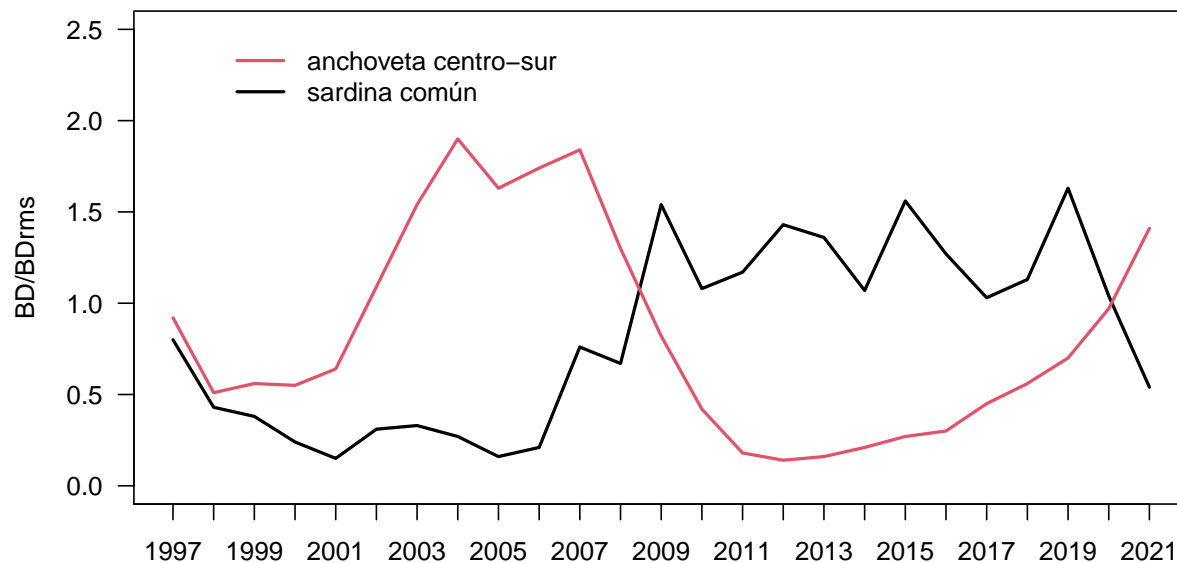
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	2008-2012[F <sub>RMS</sub> *1]	[F <sub>RMS</sub> *0.9]	[F <sub>RMS</sub> *0.7]
p(BD<0,9BD <sub>RMS</sub> )_2020/21	0.98	0.98	0.98
p(BD<0,5BD <sub>RMS</sub> )_2020/21	0.18	0.18	0.18
p(BD<0,9BD <sub>RMS</sub> )_2021/22	0.49	0.48	0.46
p(BD<0,5BD <sub>RMS</sub> )_2021/22	0.04	0.03	0.03

	2013-2021[F <sub>RMS</sub> *1]	[F <sub>RMS</sub> *0.9]	[F <sub>RMS</sub> *0.7]
p(BD<0,9BD <sub>RMS</sub> )_2020/21	0.98	0.98	0.98
p(BD<0,5BD <sub>RMS</sub> )_2020/21	0.18	0.18	0.18
p(BD<0,9BD <sub>RMS</sub> )_2021/22	0.49	0.48	0.46
p(BD<0,5BD <sub>RMS</sub> )_2021/22	0.04	0.03	0.03



## 5. DISCUSIÓN



- ¿Cuánto se sobrepasa el RMS en la captura 2020/21?

Por lo tanto, podríamos concluir que la causa de exceder el objetivo de manejo Frms para el año 2020/21 se debe al remanente de cuota autorizado.

**¿Cuál es la captura semestral del año biológico 2020/21 y la captura descartada?**

- CBA recomendada 2021 = 251.316 t
- Desembarque 1er semestre 2021 = 22% sobre CBA recomendada (306.406 t)

### ¿Cuál debería haber sido la captura para un $F_{RMS}$ ?

La captura 2020/21 al RMS debería ser  $359.250 (C_{RMS}) - 14.370 (4\% \text{descarte}) = 344.880 \text{ t}$

Por lo tanto, de las 344.880 t que se podían capturar entre el 2020/21, si consideramos que durante el 2do semestre 2020 se capturaron 69.839 t, entonces, durante el 1er semestre 2021 la captura no debería haber superado las 275.041 t. Se sobrepasó en torno a las 31 mil toneladas la captura biológicamente aceptable 2020/21.

## Sobre las estacionalidad de las capturas

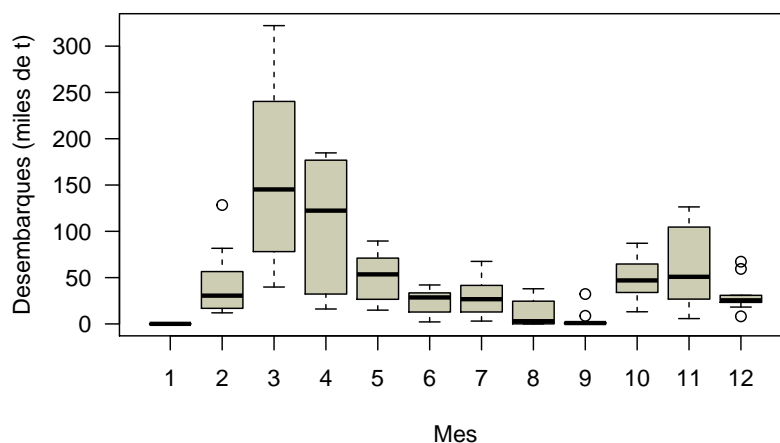


Figure 1: Capturas mensuales de sardina común realizadas entre 2007-2021, registradas por SERNAPESCA en la zona centro-sur.

- Revisar la estacionalidad de la captura en año biológico

```
prop1ersemestre<-c(0.81, 0.70, 0.65, 0.77, 0.47, 0.81, 0.72, 0.81, 0.85, 0.90, 0.81, 0.75)
plot(seq(1991,2021),prop1ersemestre,type="o",ylab="Proporción de captura 1er semestre (año biológico",xlab="Año biológico")
```

Separar la Captura en año biológico para revisar el efecto de la Captura 2020/21 sobre el cálculo de CBA en año calendario

**Qué pasaría si los usuarios deciden no capturar durante el 2do semestre y traspasar ese remanente de cuota para el 1er semestre del siguiente año???**

**cuál es la captura biológicamente aceptable 2021/2022**