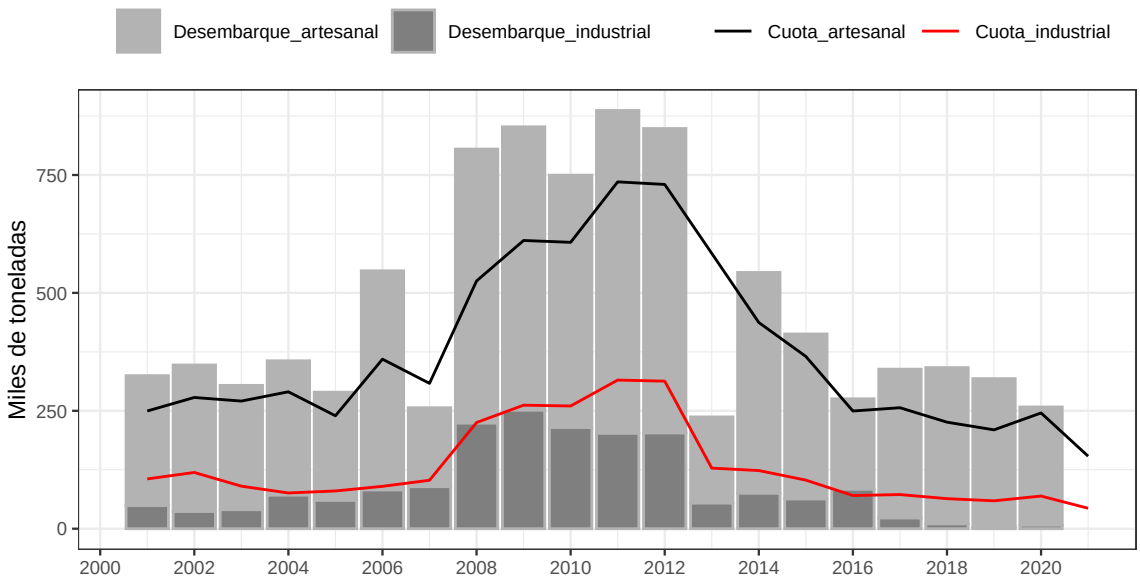
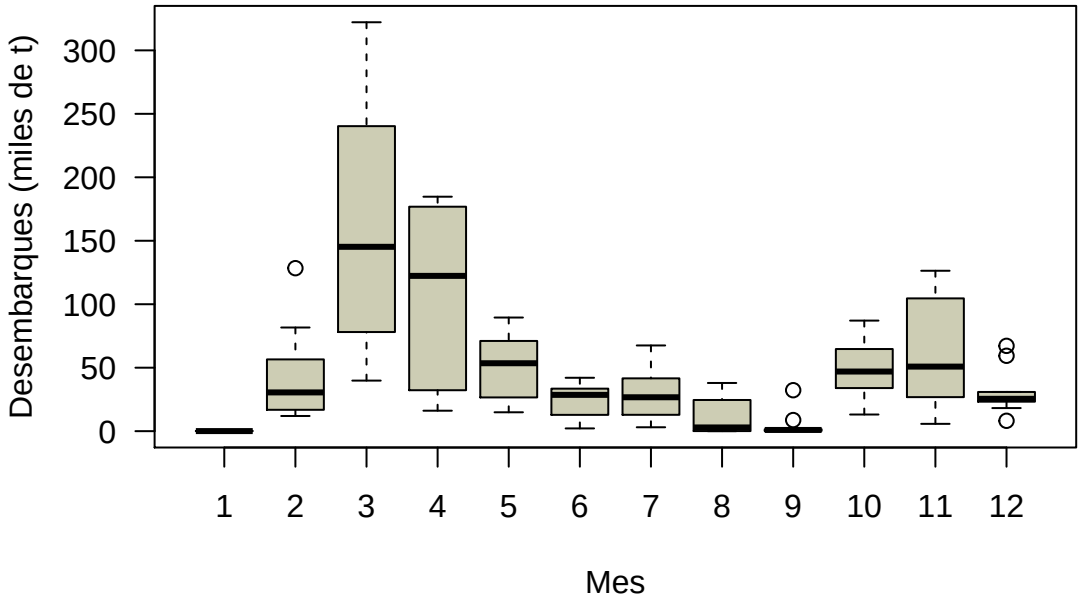
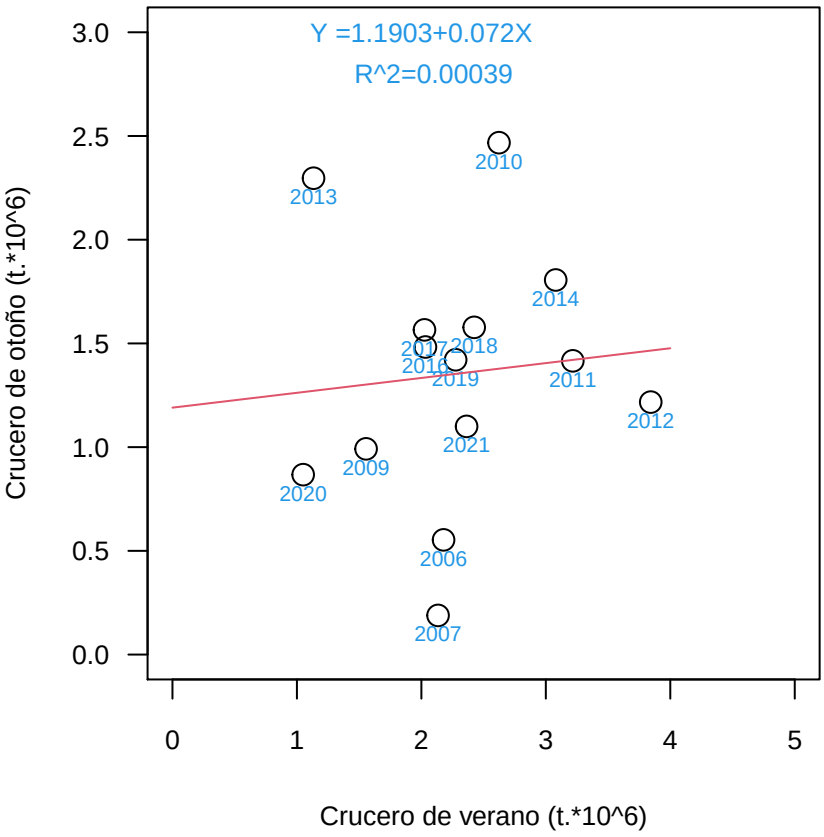
Figuras y Tablas para Tercer Informe de sardina común Centro sur

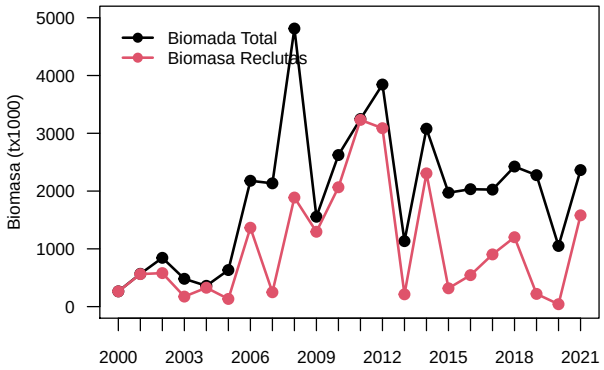
1. ANTECEDENTES

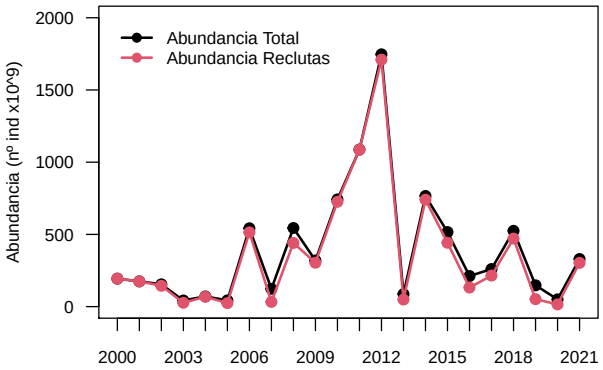

Desembarque_artesanal
Desembarque_industrial
Cuota_artesanal
Cuota_industrial
Miles de toneladas
750
500
250
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020

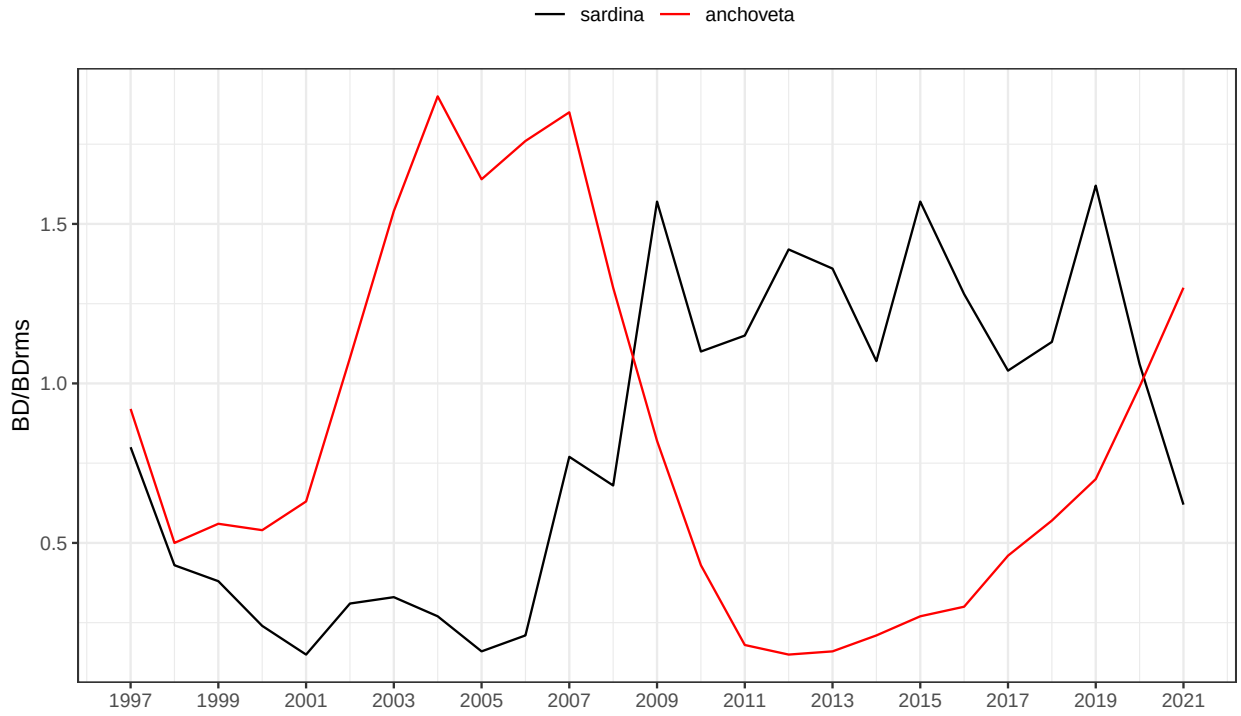
```r
ano<-ant$desembarques_sernapesca[,1]
des_mes<-data.frame(mes=rep(seq(1,12,1),27),
                    ano=gl(27,12,labels=ano),
                    desem=c(t(ant$desembarques_sernapesca[,2:13])))

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")
```



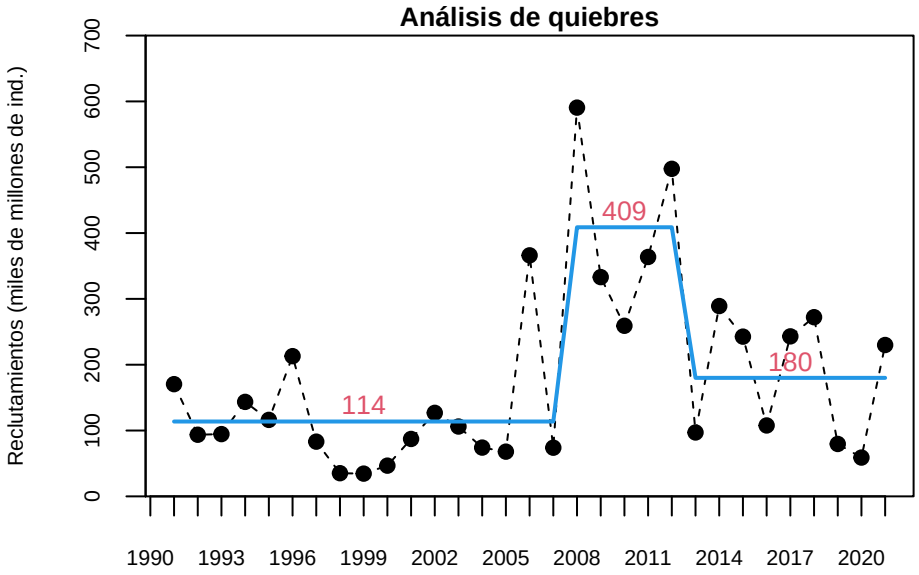

Y =1.1903+0.072X
R^2=0.00039
Crucero de otoño (t.*10^6)
Crucero de verano (t.*10^6)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
1
2
3
4
5
2010
2013
2014
2018
2017
2016
2019
2011
2012
2021
2009
2020
2006
2007

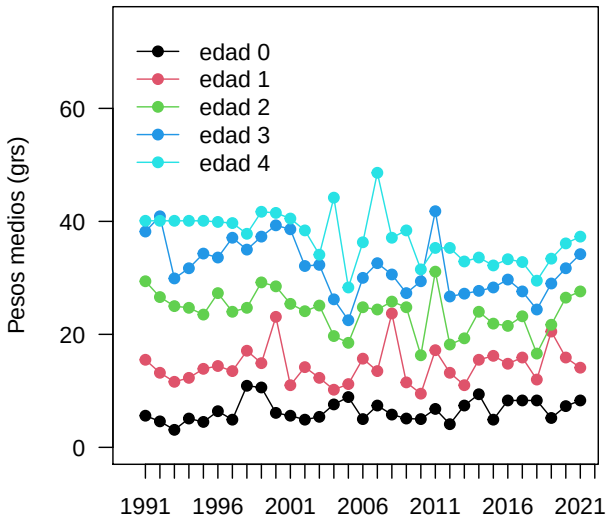

Biomada Total
Biomasa Reclutas
Biomasa (tx1000)
5000
4000
3000
2000
1000
0
2000
2003
2006
2009
2012
2015
2018
2021

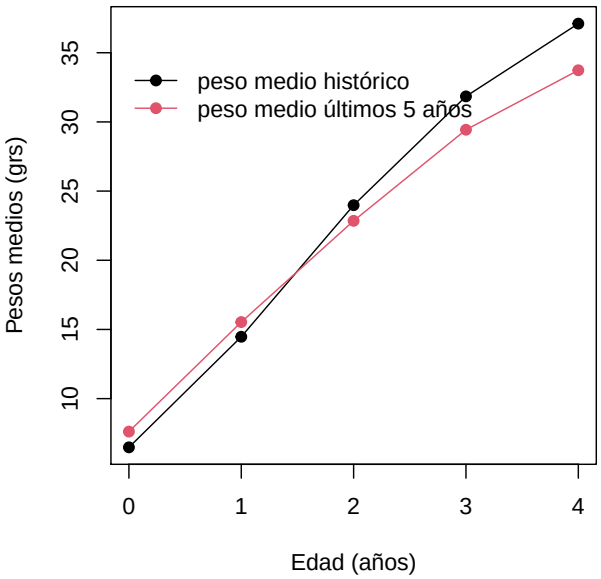

Abundancia Total
Abundancia Reclutas
Abundancia (nº ind x10^9)
2000
1500
1000
500
0
2000
2003
2006
2009
2012
2015
2018
2021


sardina
anchoveta
BD/BDrms
1.5
1.0
0.5
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

2. METODOLOGÍA

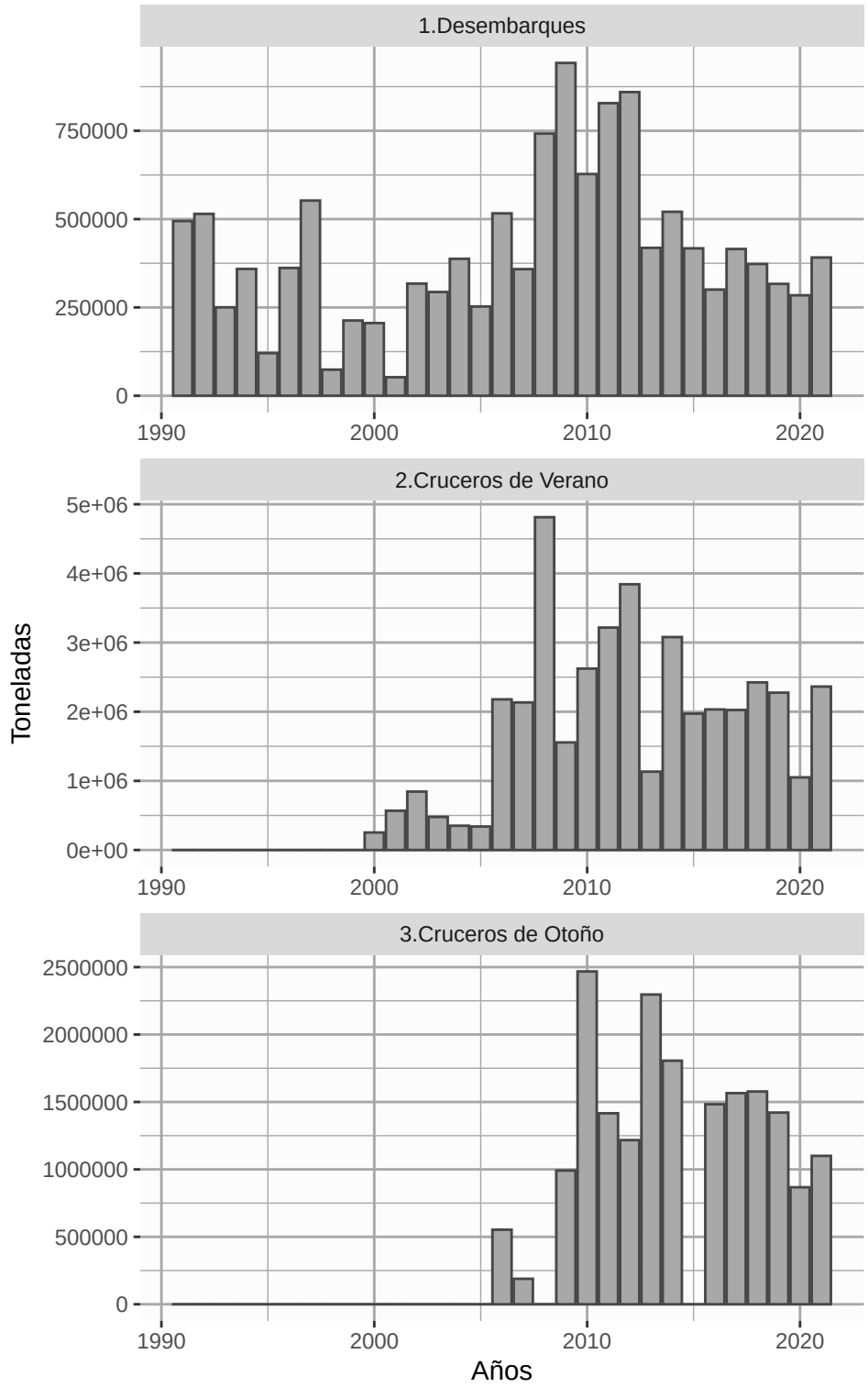



edad 0
edad 1
edad 2
edad 3
edad 4
Pesos medios (grs)
0
20
40
60
1991
1996
2001
2006
2011
2016
2021


peso medio histórico
peso medio últimos 5 años
Pesos medios (grs)
10
15
20
25
30
35
0
1
2
3
4
Edad (años)

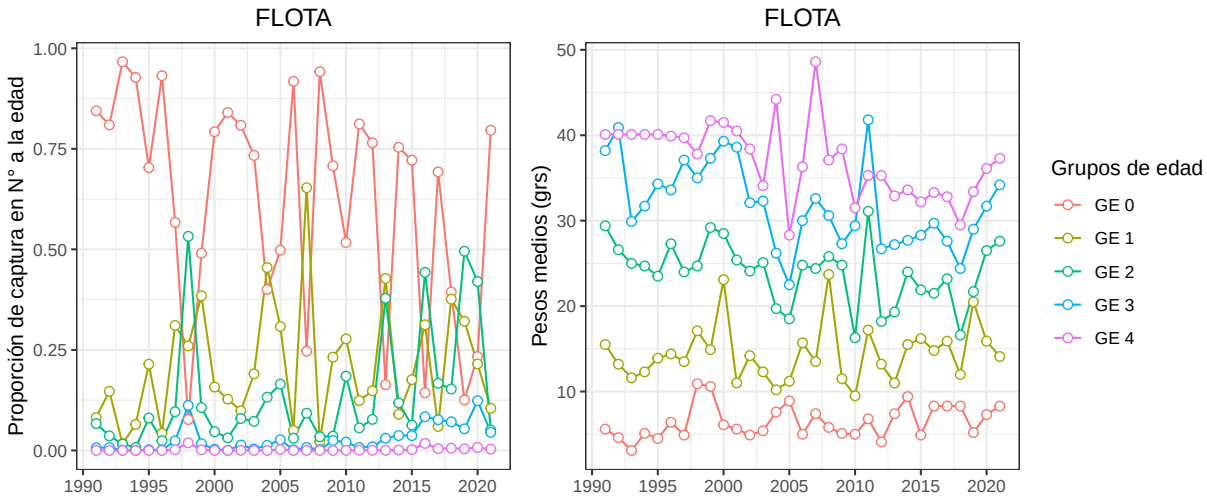
Año.biológico	Desembarques.t.	Porcentaje.descarte	Captura.descartada.t.	Captura.total.t.
1990-91	494567	0%	0	494567
1991-92	514787	0%	0	514787
1992-93	250237	0%	0	250237
1993-94	358949	0%	0	358949
1994-95	120608	0%	0	120608
1995-96	361735	0%	0	361735
1996-97	552515	0%	0	552515
1997-98	73892	0%	0	73892
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

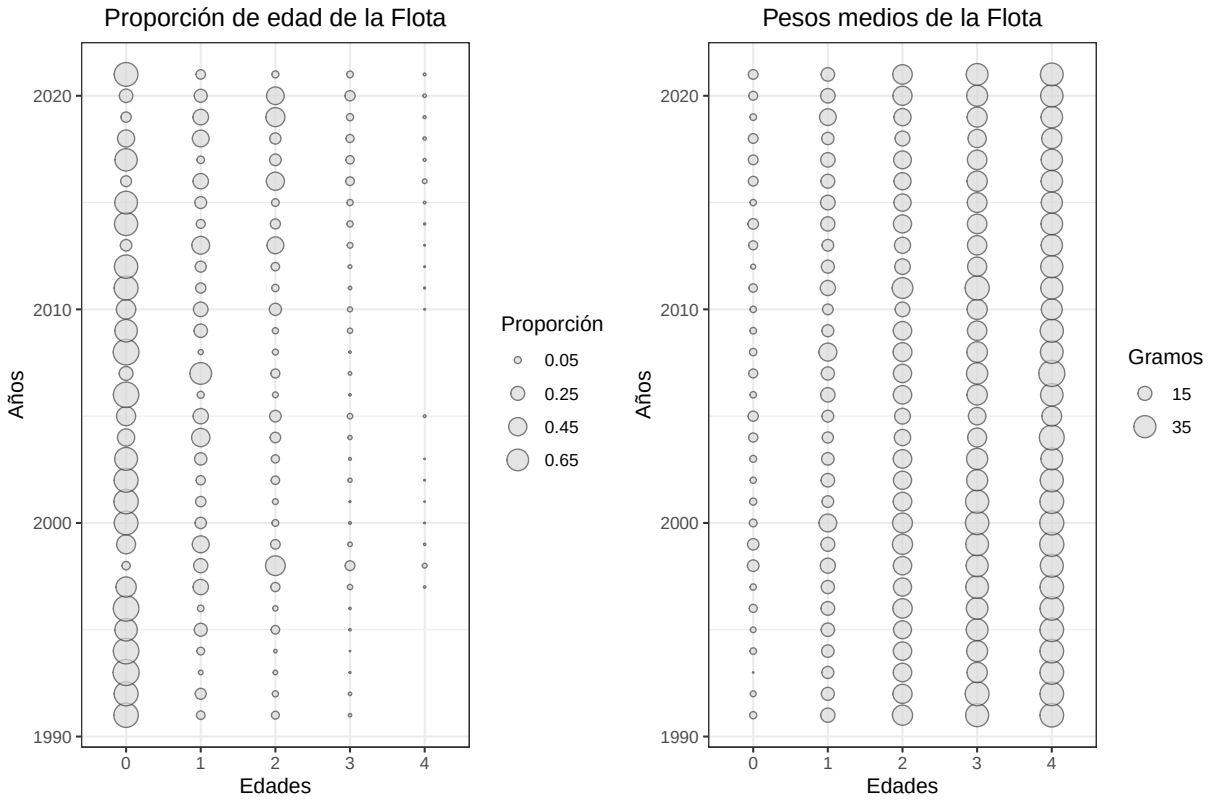
3. RESULTADOS

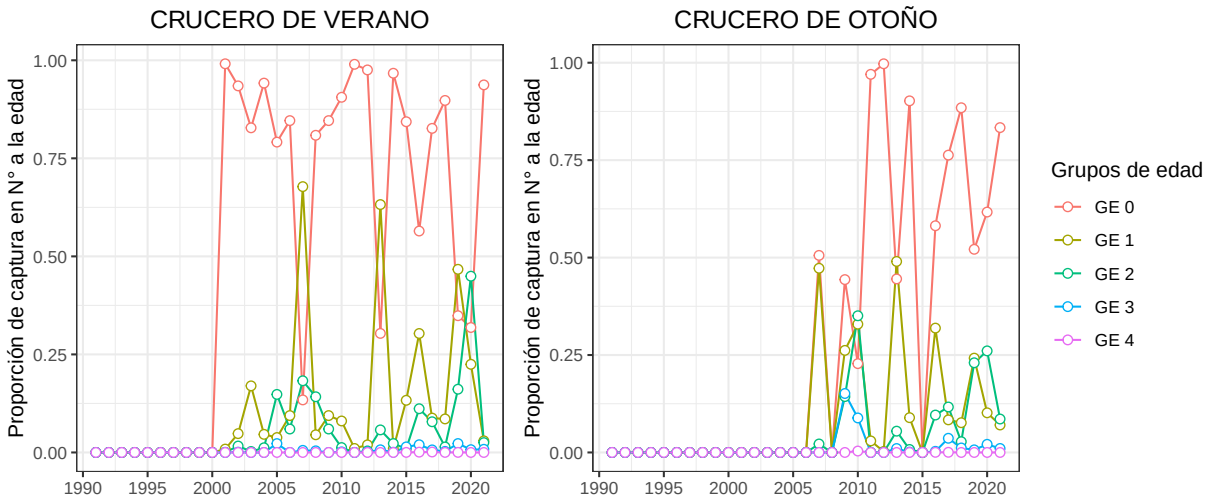


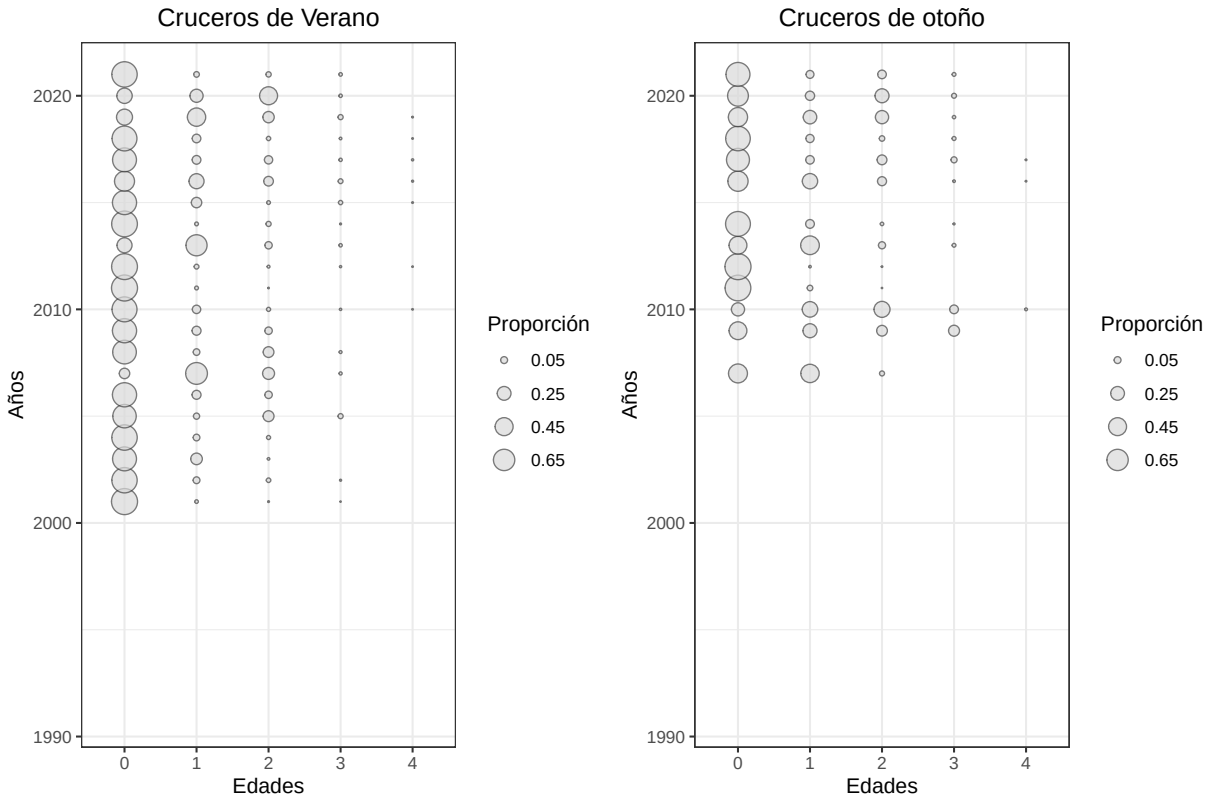

```
##       [,1]    [,2] [,3]    [,4] [,5]   [,6] [,7]   [,8] [,9]
##  [1,] 1991       0  0.3       0  0.3      0  100 494567 0.01
##  [2,] 1992       0  0.3       0  0.3      0  100 514787 0.01
##  [3,] 1993       0  0.3       0  0.3      0  100 250237 0.01
##  [4,] 1994       0  0.3       0  0.3 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

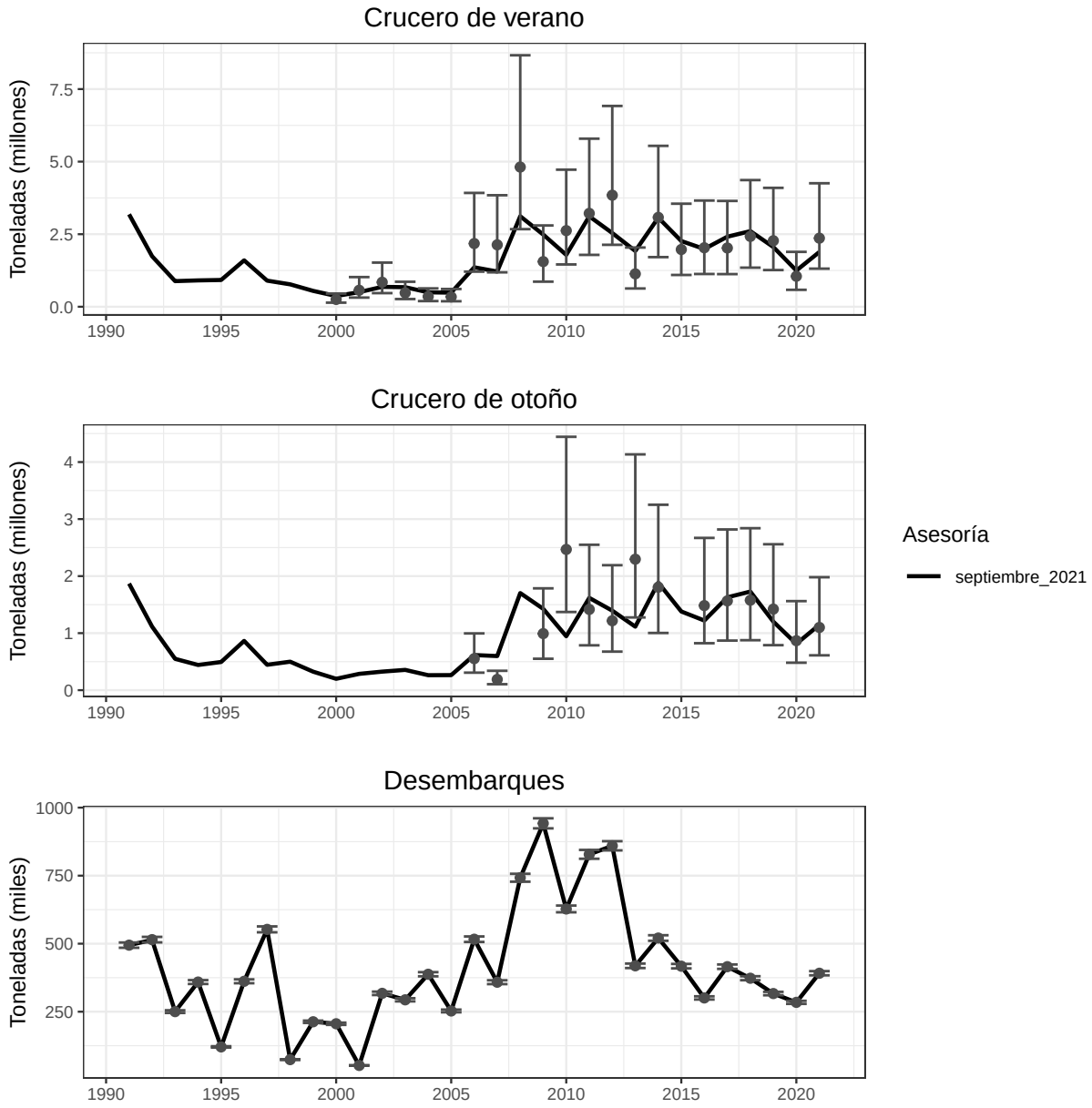

FLOTA
Proporción de captura en N° a la edad
1.00
0.75
0.50
0.25
0.00
1990
1995
2000
2005
2010
2015
2020
FLOTA
Pesos medios (grs)
50
40
30
20
10
1990
1995
2000
2005
2010
2015
2020
Grupos de edad
GE 0
GE 1
GE 2
GE 3
GE 4

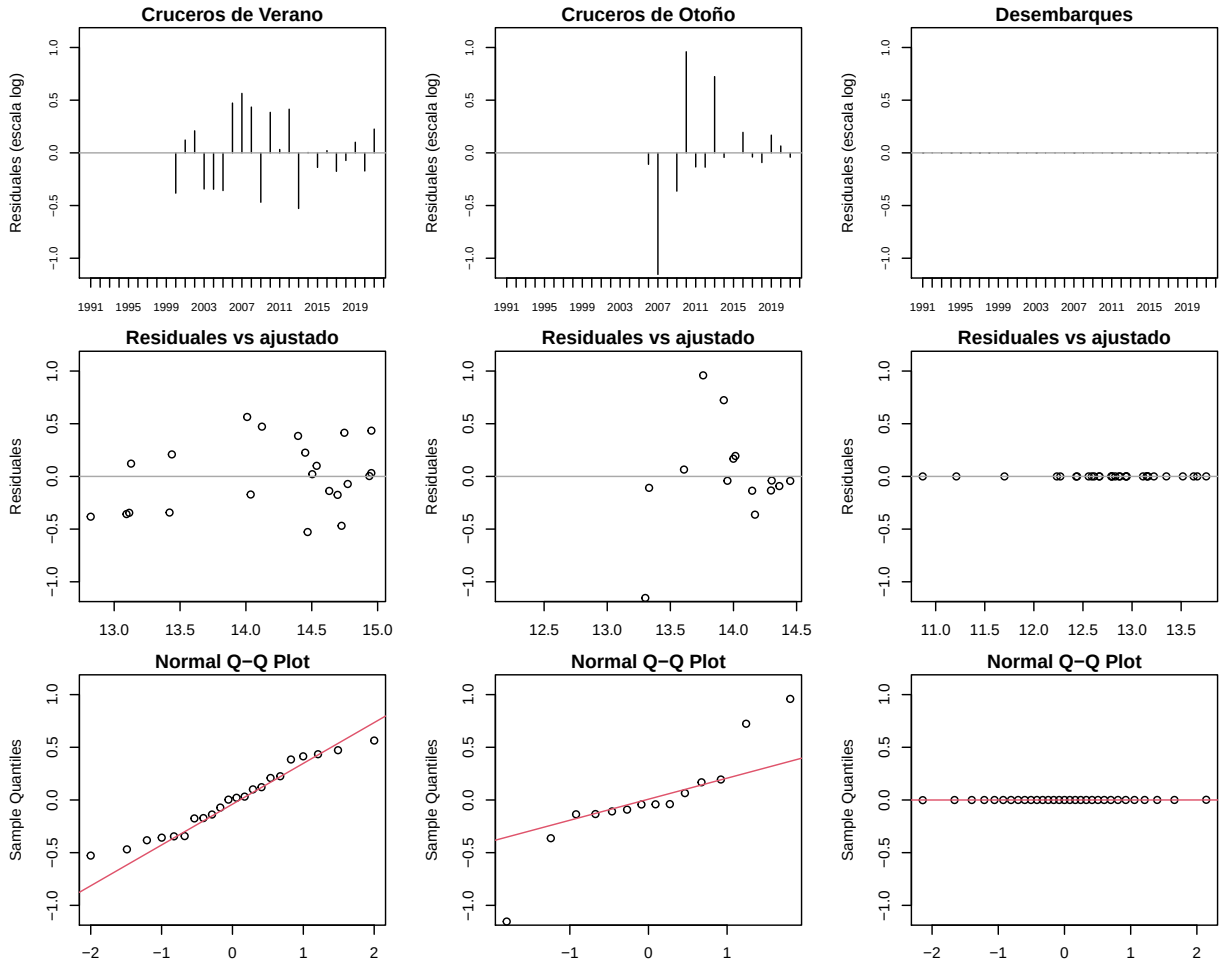

Proporción de edad de la Flota
Años
2020
2010
2000
1990
0
1
2
3
4
Edades
Proporción
0.05
0.25
0.45
0.65
Pesos medios de la Flota
Años
2020
2010
2000
1990
0
1
2
3
4
Edades
Gramos
15
35

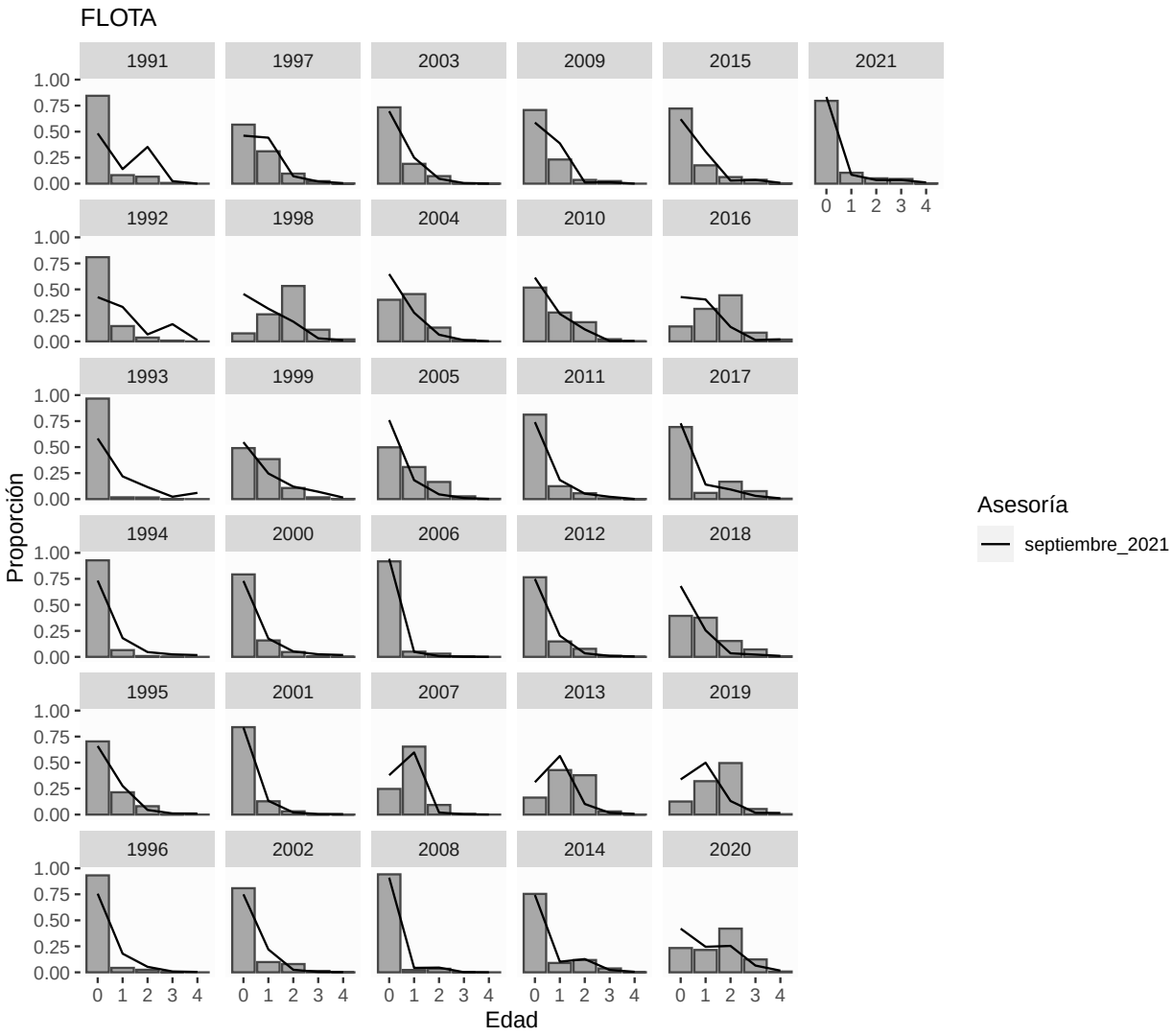

CRUCERO DE VERANO
CRUCERO DE OTOÑO
Proporción de captura en N° a la edad
1.00
0.75
0.50
0.25
0.00
1990
1995
2000
2005
2010
2015
2020
Grupos de edad
GE 0
GE 1
GE 2
GE 3
GE 4

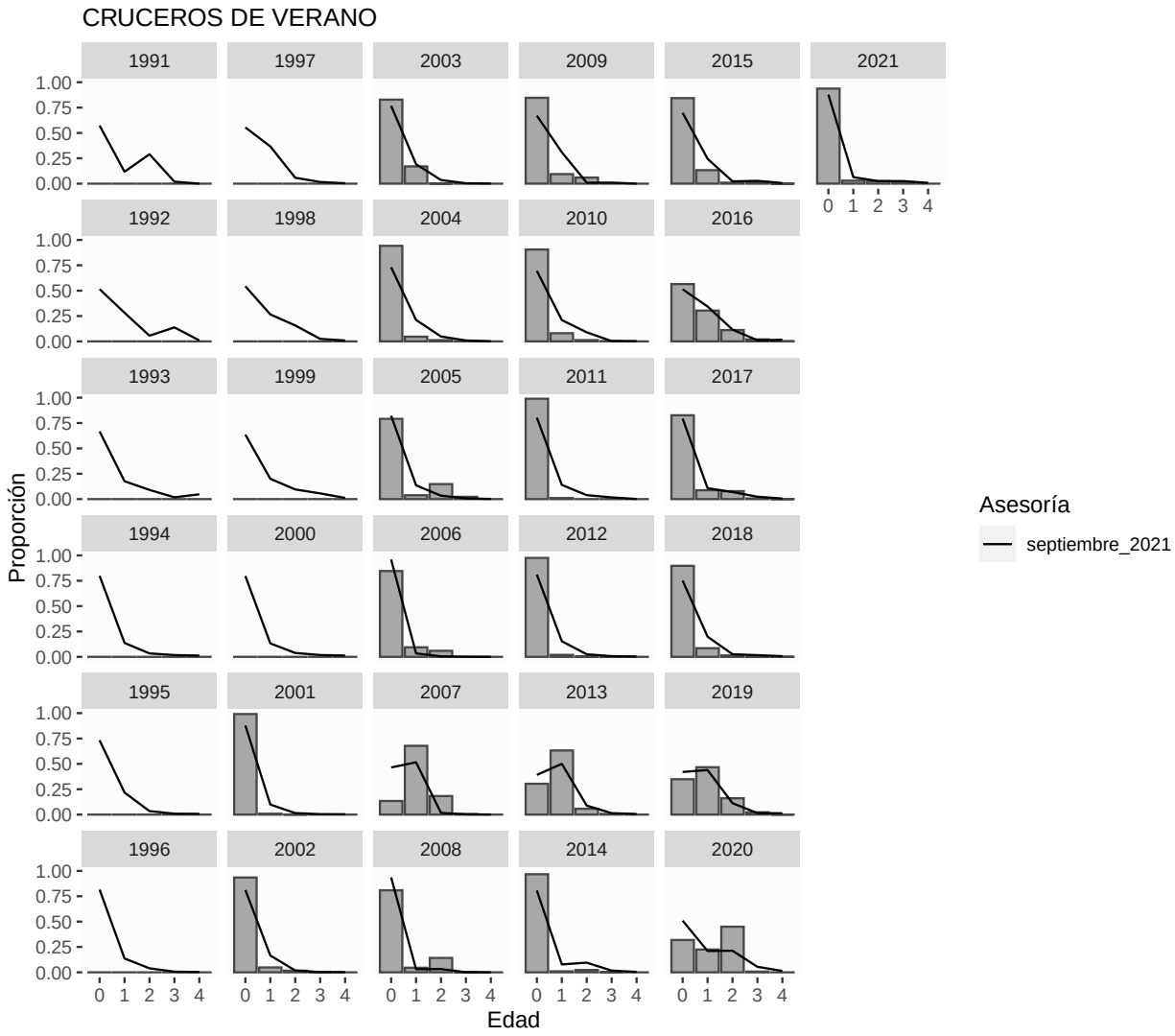

Cruceros de Verano
Cruceros de otoño
Años
Edades
Proporción
0.05
0.25
0.45
0.65
1990
2000
2010
2020
0
1
2
3
4

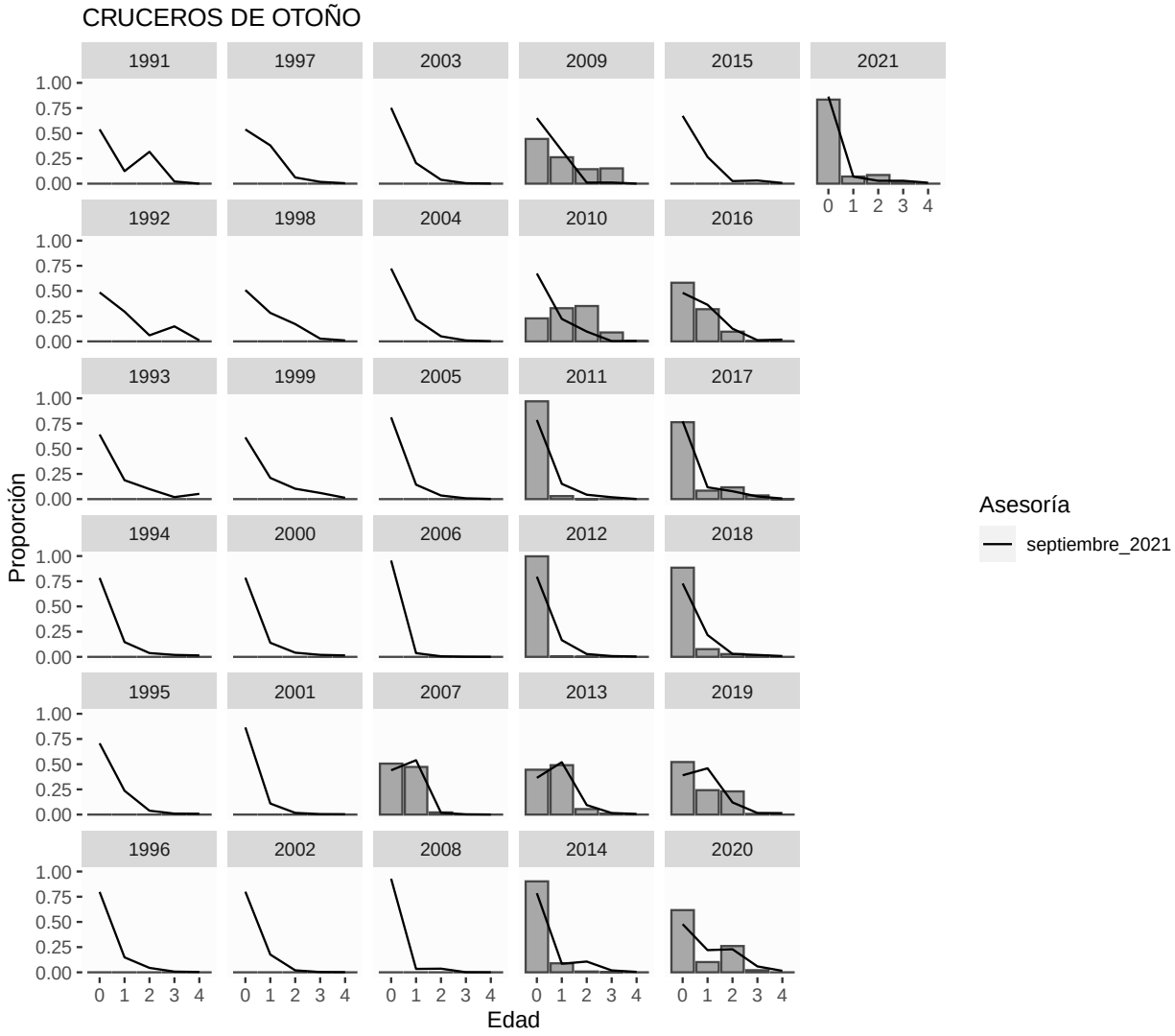
3.1. Ajuste del modelo a los datos

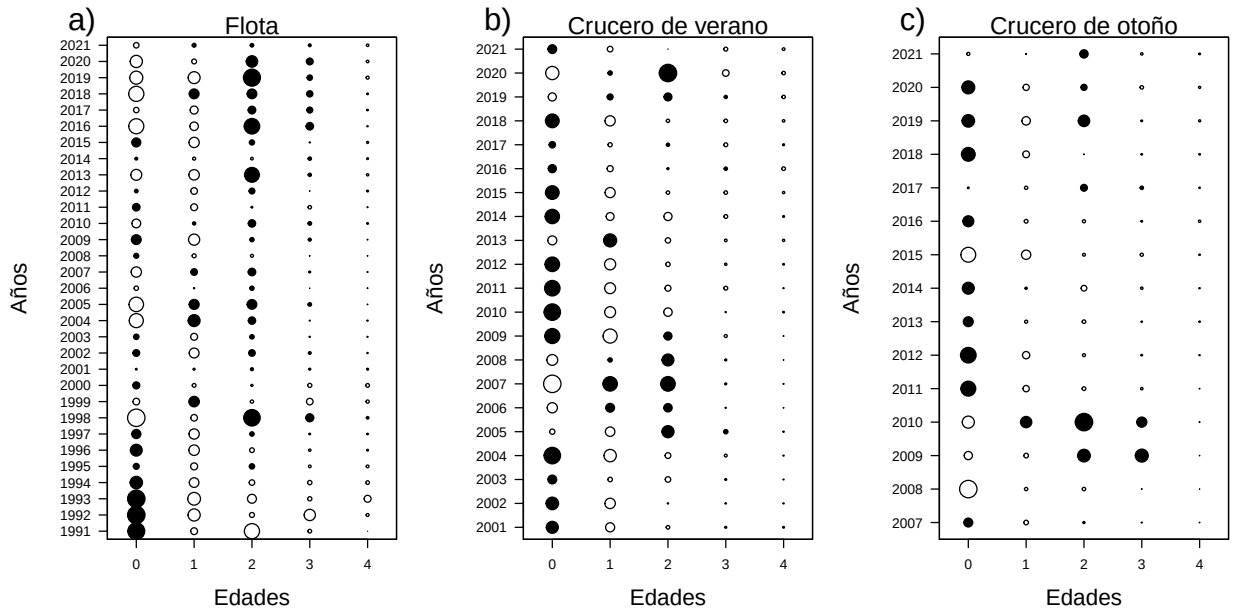



Cruceros de Verano
Cruceros de Otoño
Desembarques
Residuales (escala log)
1991 1995 1999 2003 2007 2011 2015 2019
Residuales vs ajustado
Residuales
Normal Q−Q Plot
Sample Quantiles

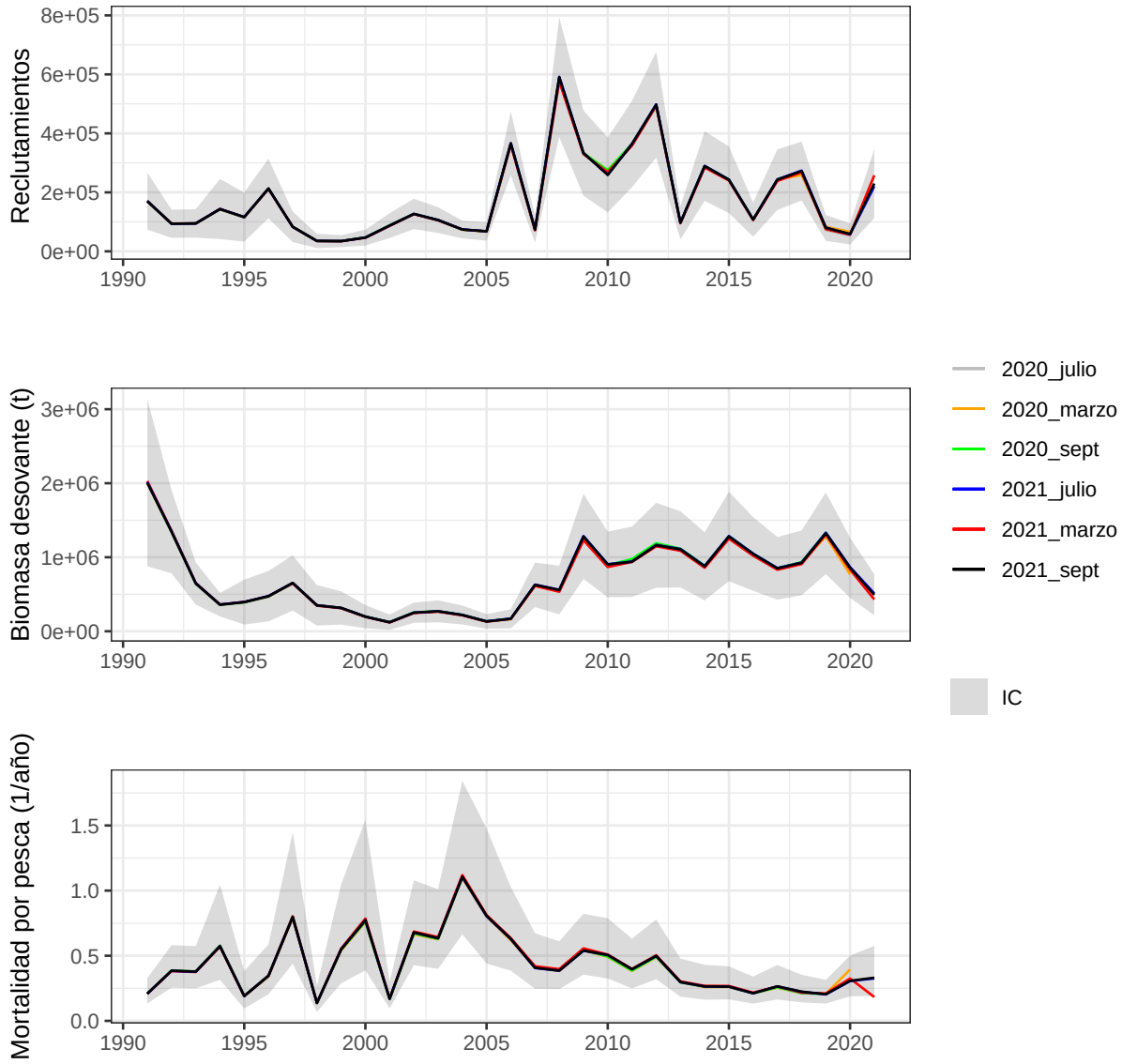

FLOTA
1991
1997
2003
2009
2015
2021
1992
1998
2004
2010
2016
1993
1999
2005
2011
2017
1994
2000
2006
2012
2018
1995
2001
2007
2013
2019
1996
2002
2008
2014
2020
1.00
0.75
0.50
0.25
0.00
0 1 2 3 4
Proporción
Edad
Asesoría
septiembre_2021


CRUCEROS DE VERANO
1991
1997
2003
2009
2015
2021
1992
1998
2004
2010
2016
1993
1999
2005
2011
2017
1994
2000
2006
2012
2018
1995
2001
2007
2013
2019
1996
2002
2008
2014
2020
Proporción
1.00
0.75
0.50
0.25
0.00
0 1 2 3 4
Edad
Asesoría
septiembre_2021

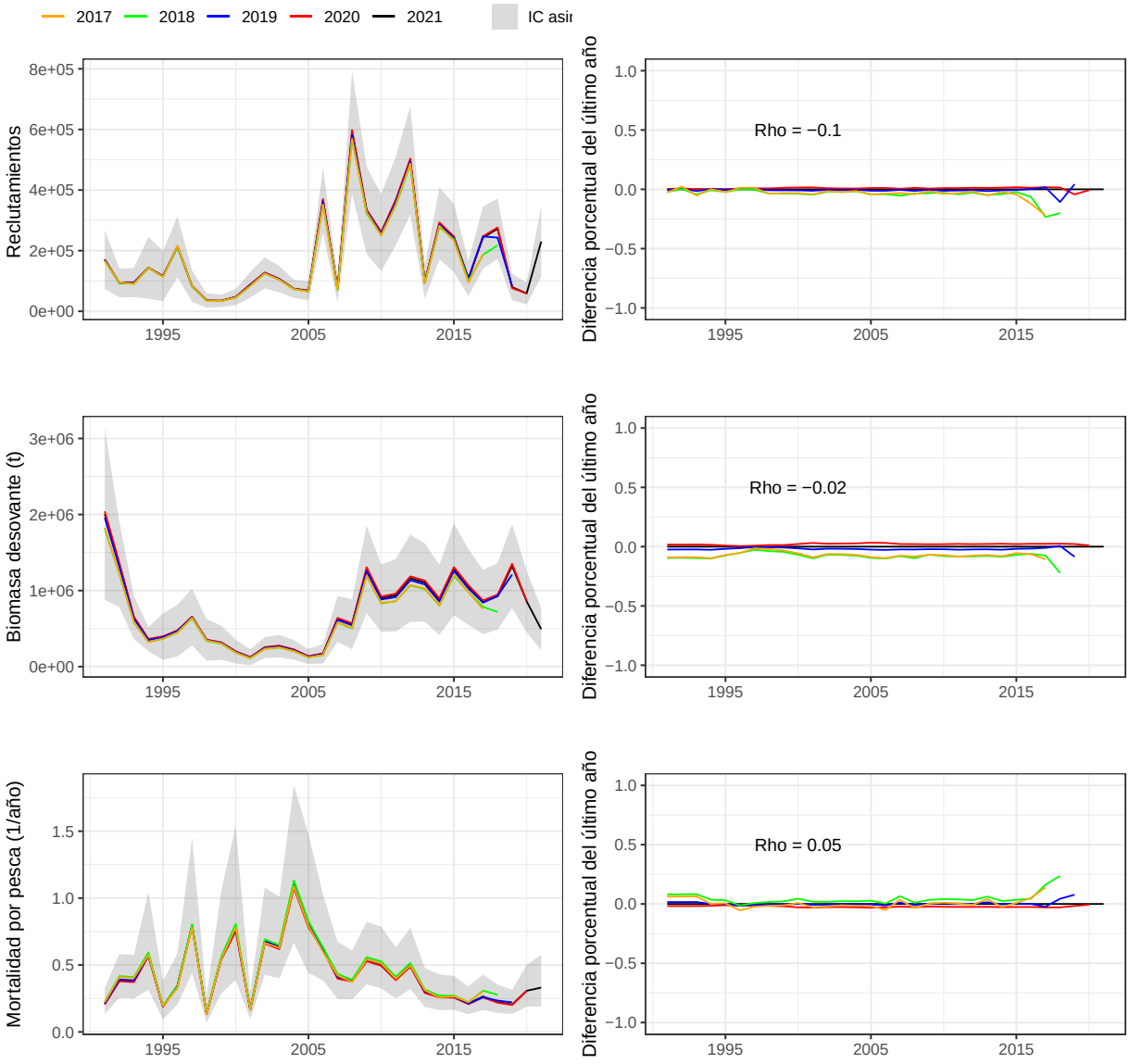

CRUCEROS DE OTOÑO
1991
1997
2003
2009
2015
2021
1992
1998
2004
2010
2016
1993
1999
2005
2011
2017
1994
2000
2006
2012
2018
1995
2001
2007
2013
2019
1996
2002
2008
2014
2020
1.00
0.75
0.50
0.25
0.00
0 1 2 3 4
Proporción
Edad
Asesoría
septiembre_2021


a)
Flota
b)
Crucero de verano
c)
Crucero de otoño
Años
Edades
0
1
2
3
4

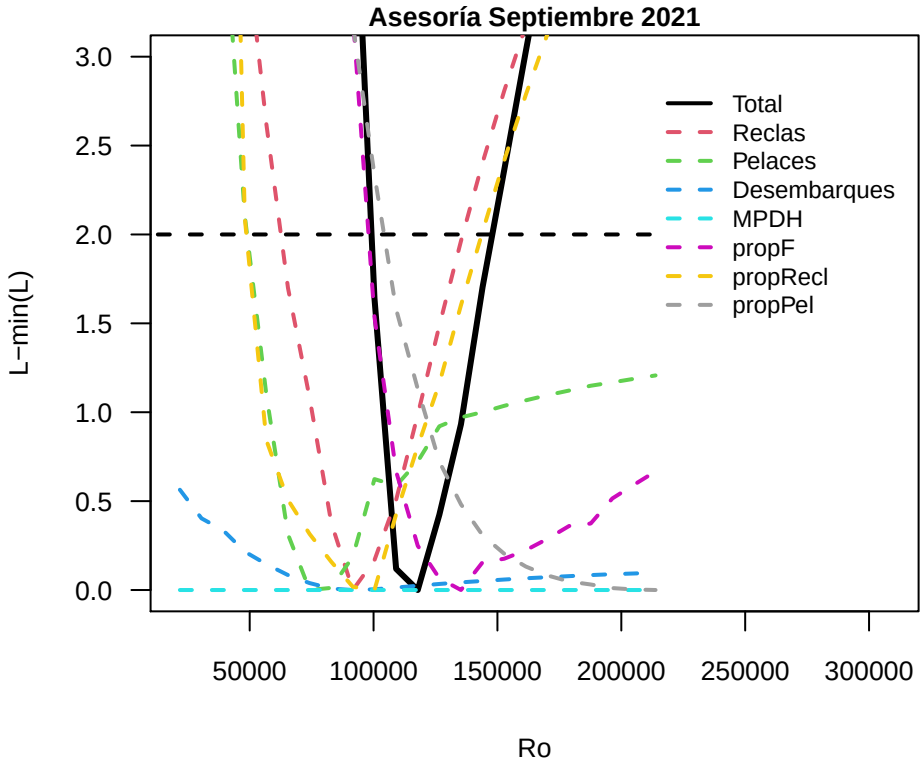
3.2. Comparación con asesorías previas



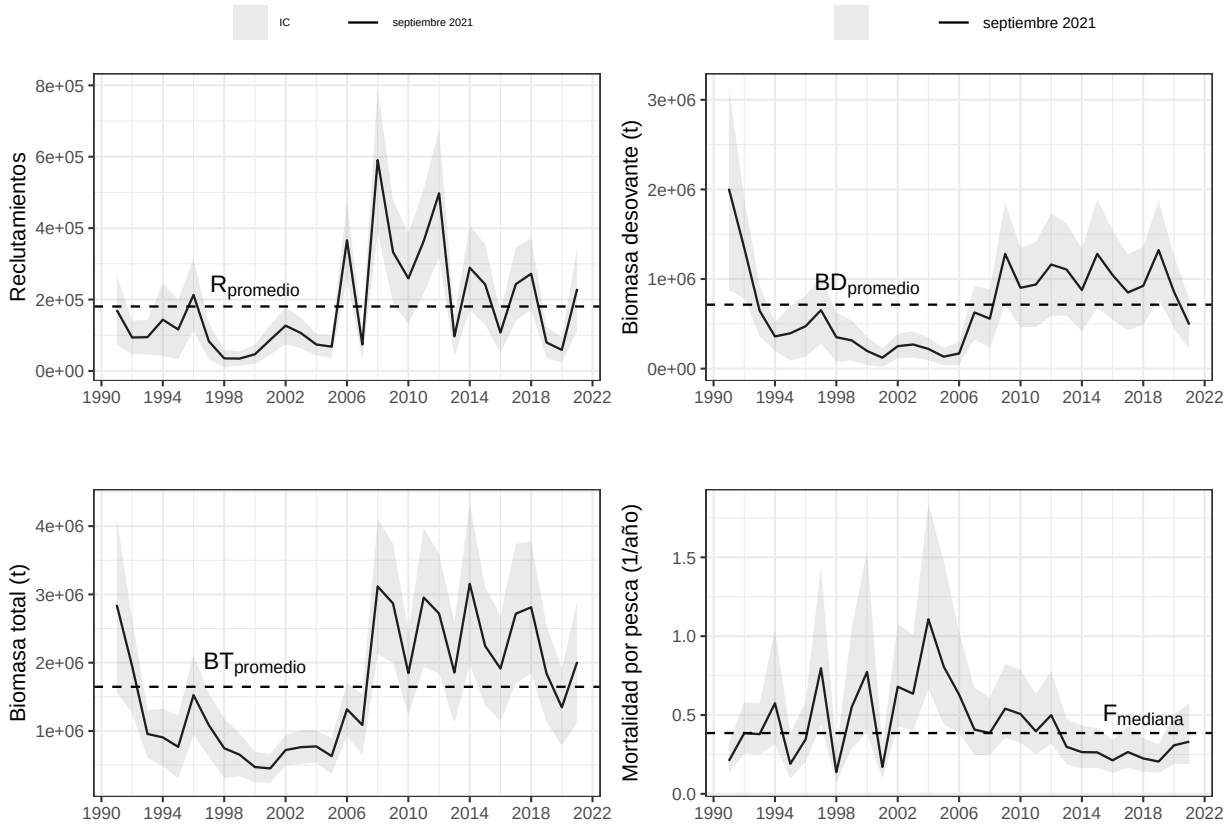
3.3. Análisis retrospectivo



3.4. Perfil de verosimilitud

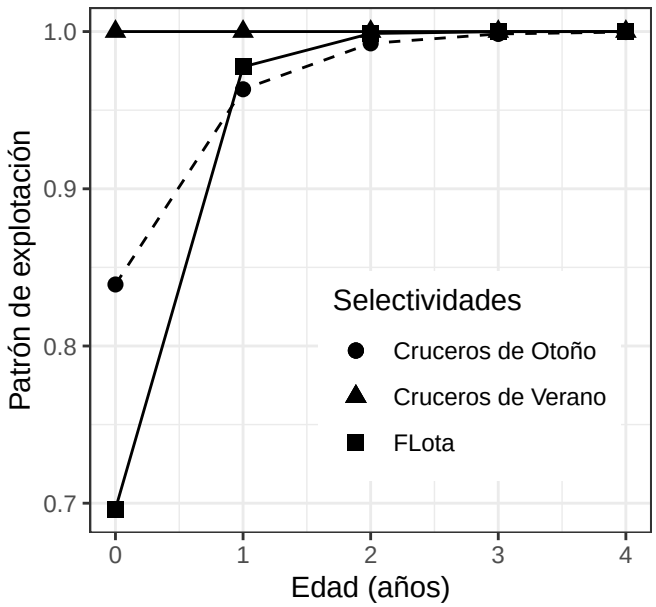


3.5. Variables poblacionales



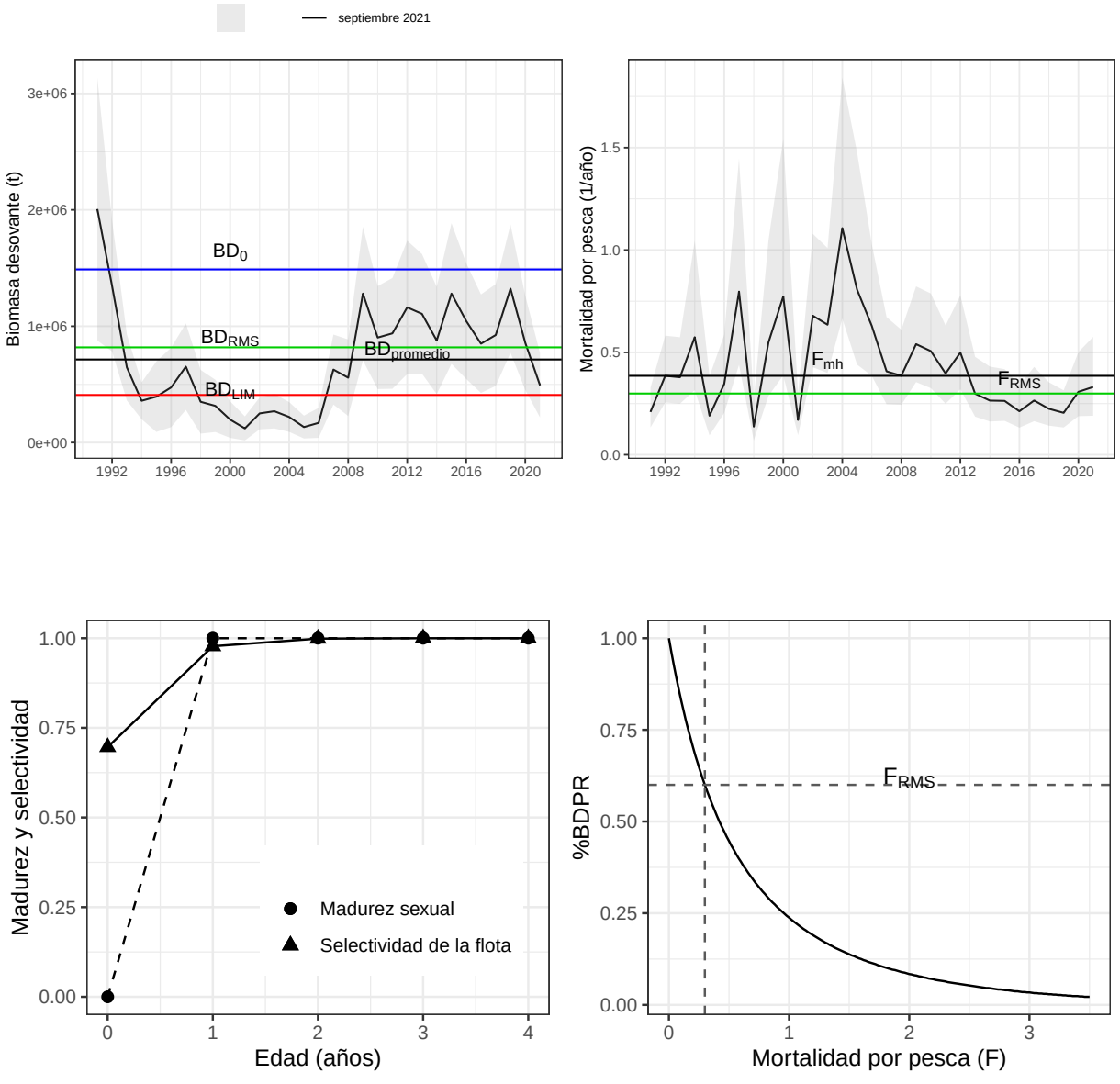
Año	BD_{sept}	BD_{marzo}	BD_{julio}	BT_{sept}	BT_{marzo}	BT_{julio}	R_{sept}	R_{marzo}	R_{julio}	F_{sept}	F_{marzo}	F_{julio}
1990/91	2007000	2030000	2015480	2844200	2870400	2854570	170470	170120	170639	0.209	0.207	0.208
1991/92	1345500	1358500	1351070	1950300	1966700	1957010	93630	94041	93684.9	0.386	0.382	0.384
1992/93	646070	652550	648897	956570	964360	960132	94588	94707	94732.2	0.378	0.375	0.377
1993/94	359110	362070	360662	906560	909000	908707	143530	143180	143611	0.574	0.57	0.573
1994/95	394340	395090	395593	767360	767170	769117	116190	115760	116301	0.191	0.19	0.19
1995/96	474070	473120	475138	1524800	1517100	1526620	213000	211490	213115	0.346	0.347	0.346
1996/97	652790	647450	653825	1084700	1077600	1086140	83143	82828	83214	0.797	0.803	0.796
1997/98	350640	346010	351479	747860	741130	749454	35196	35062	35261.1	0.137	0.138	0.137
1998/99	315340	311640	316169	652660	646260	654159	34570	34292	34642.9	0.55	0.555	0.548
1999/00	197450	194090	198246	471920	465230	473346	46684	46073	46792.4	0.773	0.786	0.77
2000/01	121680	118470	122362	451930	444970	453525	87216	86319	87439.7	0.17	0.172	0.169
2001/02	250610	246340	251598	720530	713020	722233	126870	126130	127032	0.679	0.686	0.678
2002/03	269460	264590	270551	763250	753550	765101	106090	105110	106224	0.635	0.643	0.633
2003/04	220060	215090	221022	774220	767100	775923	74079	73955	74159.6	1.107	1.12	1.104
2004/05	133220	130190	133954	632780	626840	634685	67948	67638	68097.8	0.807	0.813	0.804
2005/06	169440	166450	170388	1317900	1299600	1321650	366140	361230	366988	0.629	0.636	0.628
2006/07	627440	612730	630224	1088000	1058400	1091760	73946	70839	74055.3	0.407	0.419	0.406
2007/08	557470	533910	560080	3116600	3029800	3125370	590530	576230	591892	0.386	0.397	0.385
2008/09	1280800	1230300	1285730	2868400	2794700	2875880	333050	329460	333486	0.54	0.557	0.539
2009/10	902390	867720	906147	1846800	1828600	1852850	259120	268470	259700	0.506	0.509	0.505
2010/11	938520	936800	942980	2954600	2926400	2963710	363670	358290	364438	0.397	0.398	0.395
2011/12	2162100	1147700	1167280	2719300	2690600	2728000	497560	492960	498579	0.499	0.504	0.498
2012/13	1106300	1088100	1111240	1855800	1824500	1862960	97047	95115	97325.9	0.298	0.303	0.297
2013/14	877460	857790	881823	3155500	3096700	3165820	289110	284180	289821	0.265	0.269	0.264
2014/15	1280800	1250400	1286070	2246000	2202700	2254280	242630	240020	243378	0.263	0.268	0.262
2015/16	1044600	1021300	1049280	1914100	1876300	1921390	107730	106000	108023	0.213	0.217	0.212
2016/17	850040	831090	853911	2717300	2663200	2726220	243040	238570	243660	0.265	0.264	0.264
2017/18	924370	907150	928190	2811400	2763000	2826010	272200	267990	273830	0.224	0.216	0.223
2018/19	1323200	1307200	1331900	1842500	1811000	1855990	79600	75099	80726.6	0.205	0.21	0.203
2019/20	858050	832960	866506	1346200	1305400	1352630	58944	56309	58187.9	0.307	0.326	0.306
2020/21	492050	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
```



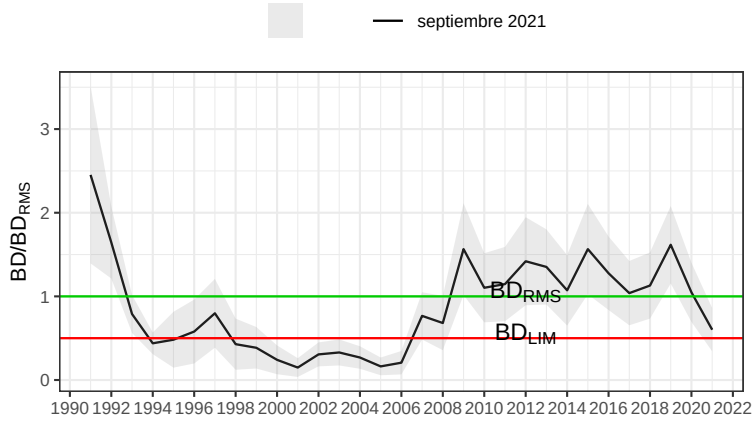
3.6. Puntos biológicos de referencia

	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_{RMS}	60.00	60.00	60.00
%BD_Fmh	47.60	47.90	47.80
%BD_F_{RMS}	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

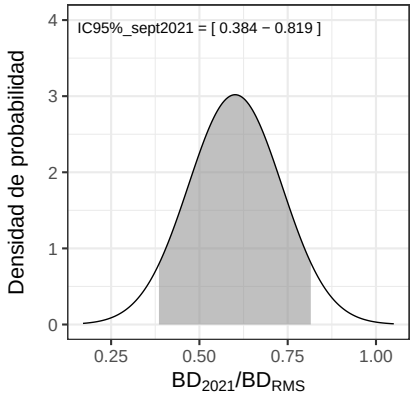


3.7. Estatus

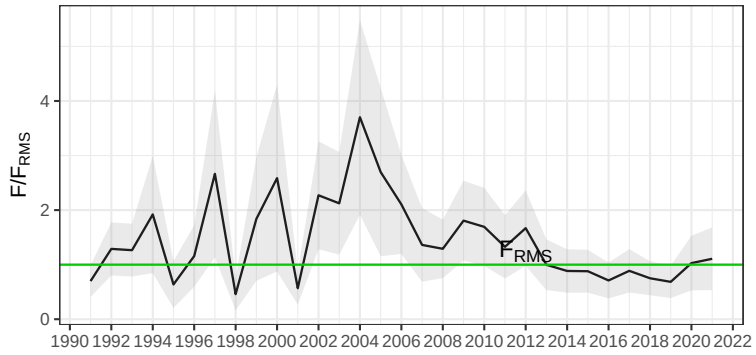
a)



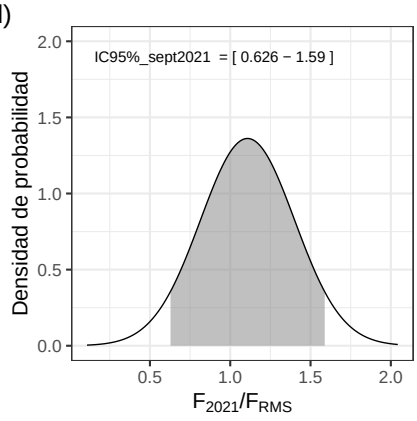
b)



c)



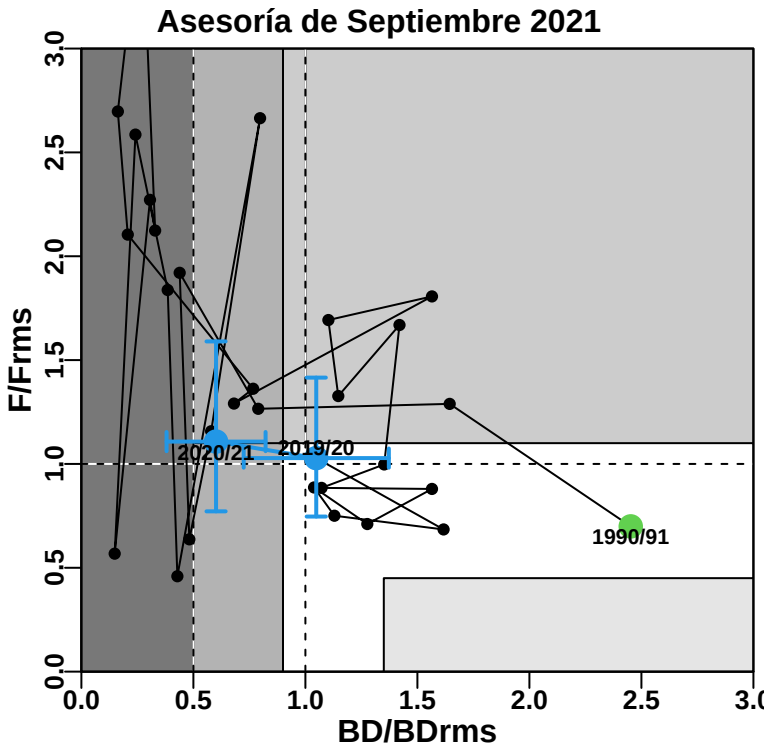
d)

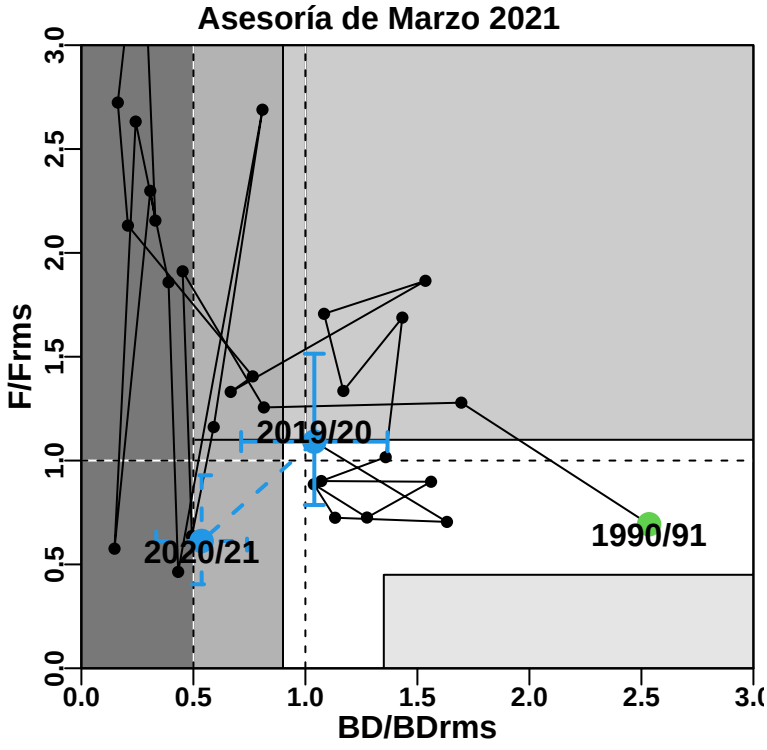


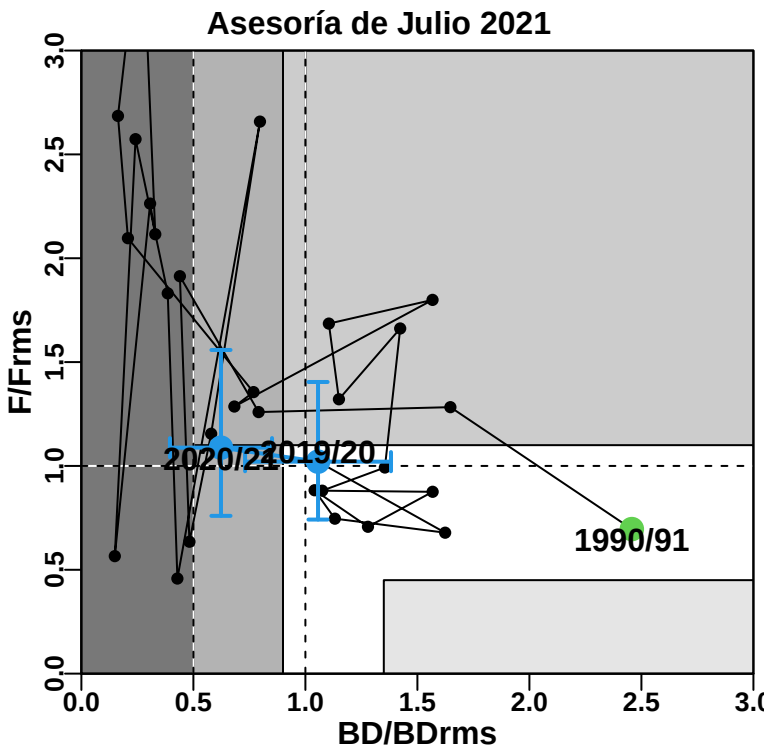
Años	$F/F_{RMS_{sept}}$	$F/F_{RMS_{marzo}}$	$F/F_{RMS_{julio}}$	$BD/BD_{RMS_{sept}}$	$BD/BD_{RMS_{marzo}}$	$BD/BD_{RMS_{julio}}$
1990/91	0.699	0.693	0.696	2.452	2.534	2.457
1991/92	1.289	1.279	1.283	1.644	1.696	1.647
1992/93	1.265	1.256	1.259	0.789	0.815	0.791
1993/94	1.92	1.911	1.913	0.439	0.452	0.44
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


Asesoría de Septiembre 2021
F/Frms
BD/BDrms
2020/21
2019/20
1990/91


Asesoría de Marzo 2021
F/Frms
BD/BDrms
2019/20
2020/21
1990/91

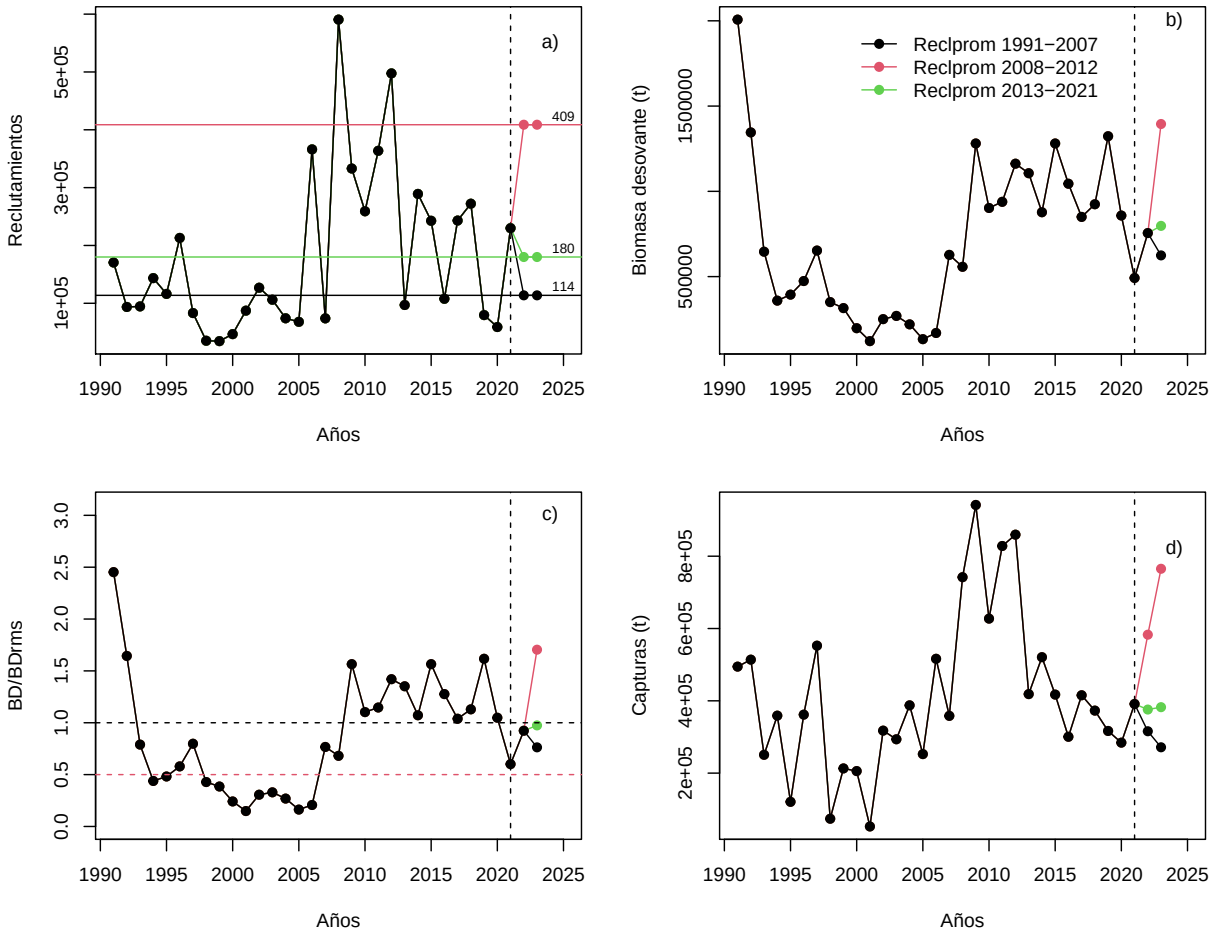


	Septiembre 2021	Marzo 2021	Julio 2021
Año biológico	2020/21	2020/21	2020/21
F_{RMS}	0.3	0.3	0.3
BD_{RMS}	818	801	820
BD_{LIM}	409	401	410
$p(BD_{last} < BD_{RMS})$	1	1	1
$p(F_{last} > F_{RMS})$	0.64	0.02	0.62
$p(sobre - explotación)$	0.99	1	0.98
$p(agotado/colapsado)$	0.22	0.38	0.18
$p(sobrepesca)$	0.51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

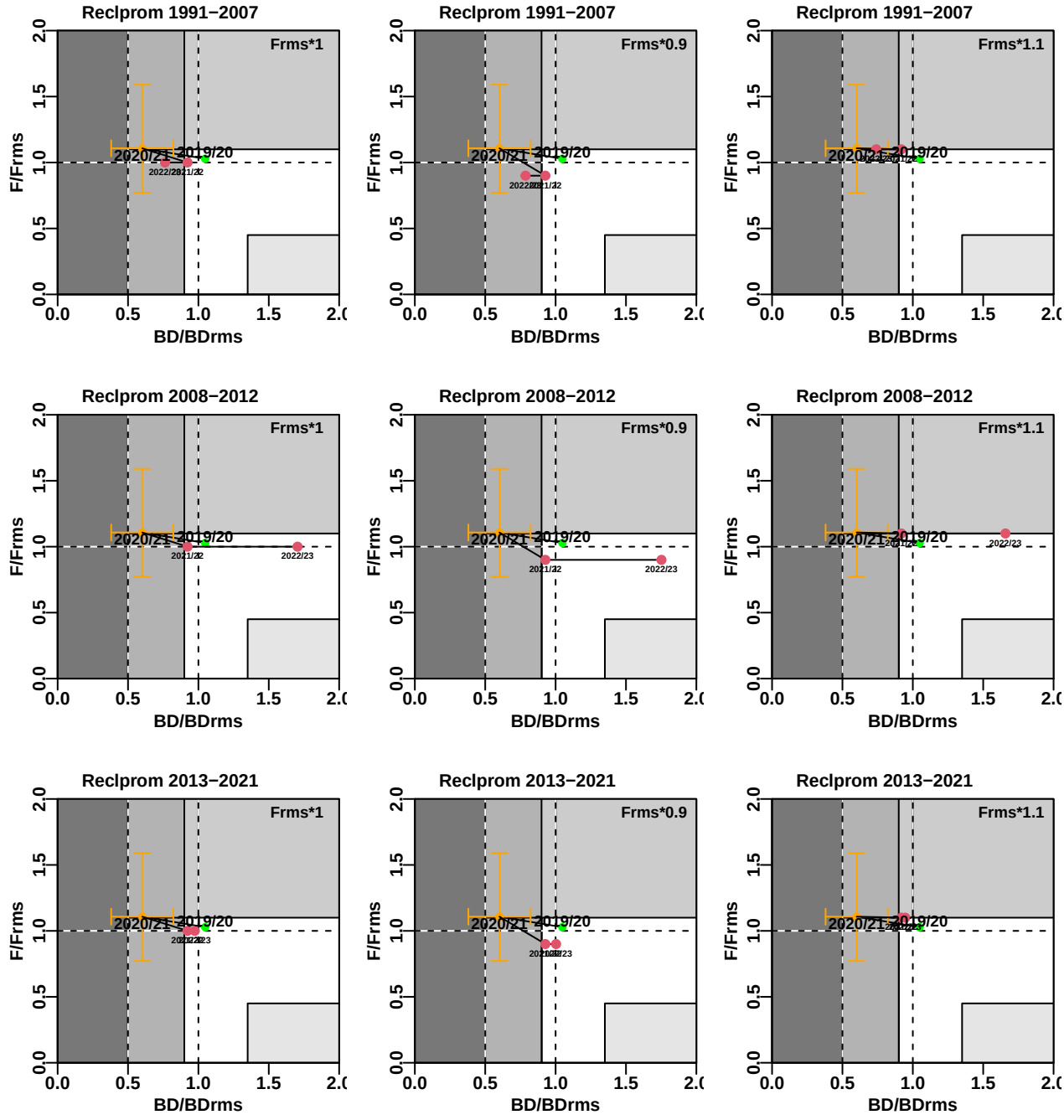


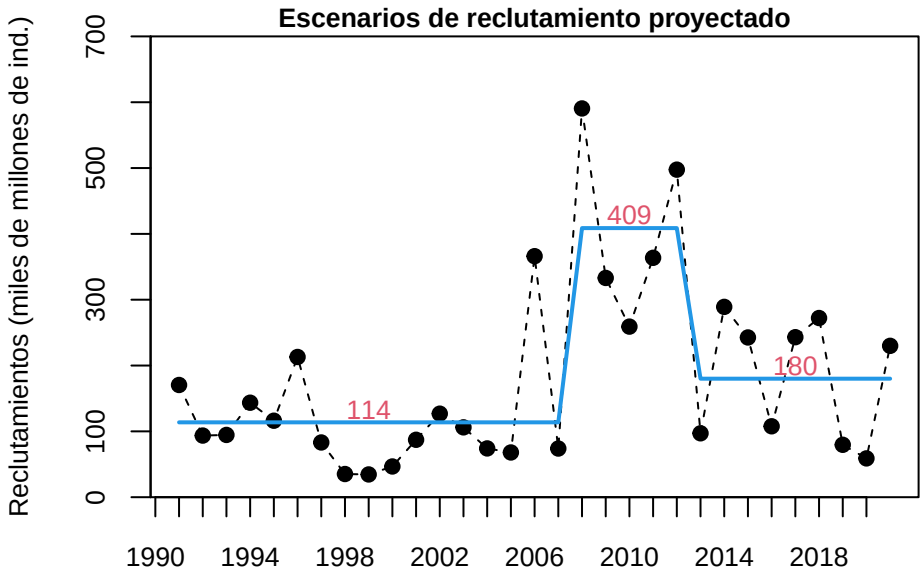
4.0. Proyección del stock (Asesoría de septiembre 2021)

	1991-2007[F_{RMS}*1]	[F_{RMS}*0.9]	[F_{RMS}*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_{RMS}*1]	[F_{RMS}*0.9]	[F_{RMS}*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_{RMS}*1]	[F_{RMS}*0.9]	[F_{RMS}*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

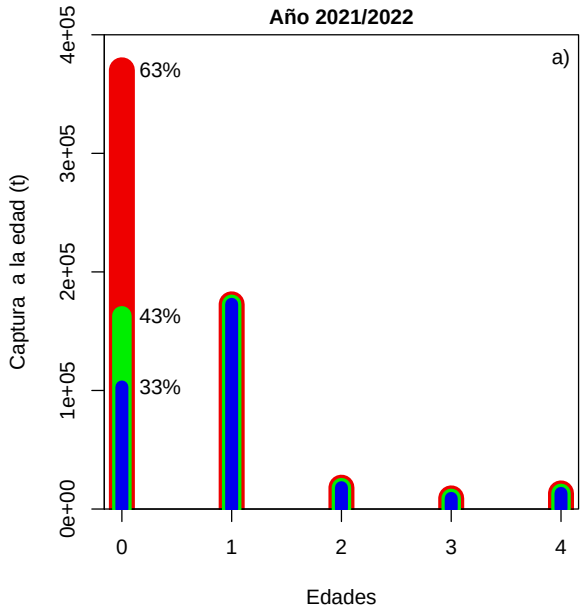


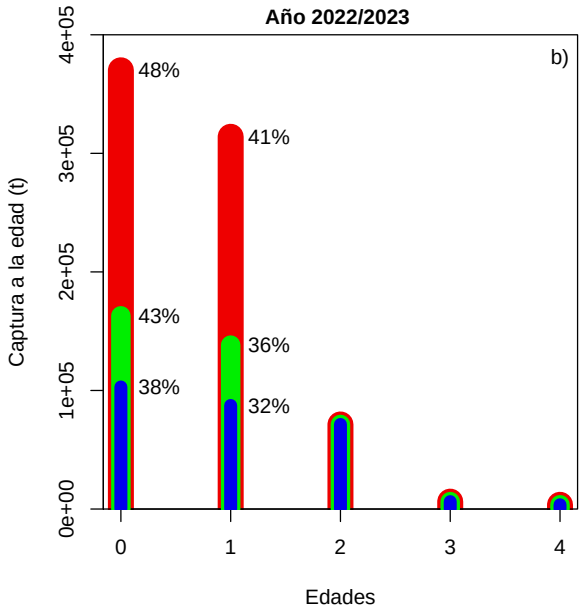

Escenarios de reclutamiento proyectado
Reclutamientos (miles de millones de ind.)
0
100
300
500
700
1990
1994
1998
2002
2006
2010
2014
2018
114
409
180

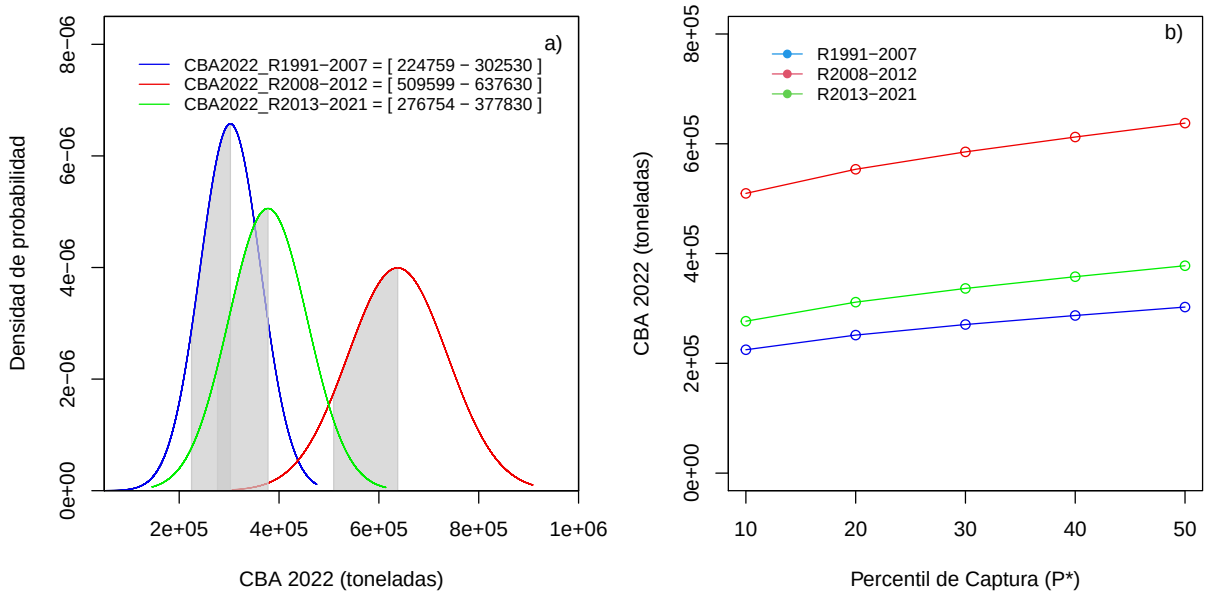
	1991-2007	2008-2012	2013-2021
mean	302530	637630	377830
std	60685	99903	78870
10%	224759	509599	276754
20%	251456	553550	311451
30%	270707	585241	336471
40%	287156	612320	357849
50%	302530	637630	377830

	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

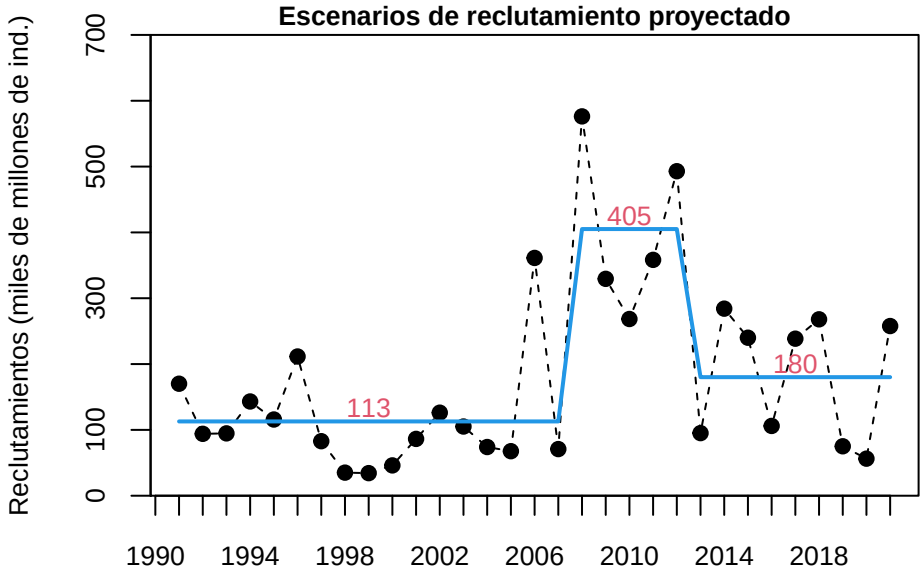






	V1	V2	V3	V4	V5
C1eryearR1	102949	172682	18019	8986	13200
C1eryearR2	370058	172682	18019	8986	13200
C1eryearR3	162968	172682	18019	8986	13200
C2doyearR1	102949	87352	71341	6250	3594
C2doyearR2	370058	313991	71341	6250	3594
C2doyearR3	162968	138277	71341	6250	3594

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

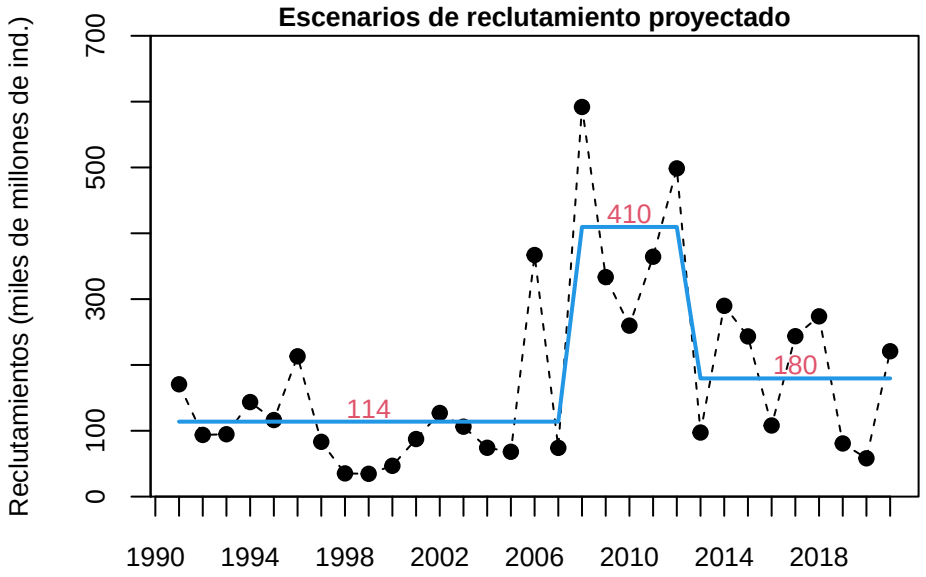
	1991-2007	2008-2012	2013-2021
30%	256311	295048	261787
40%	264276	304342	270979
50%	271720	313030	279570

	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()
```

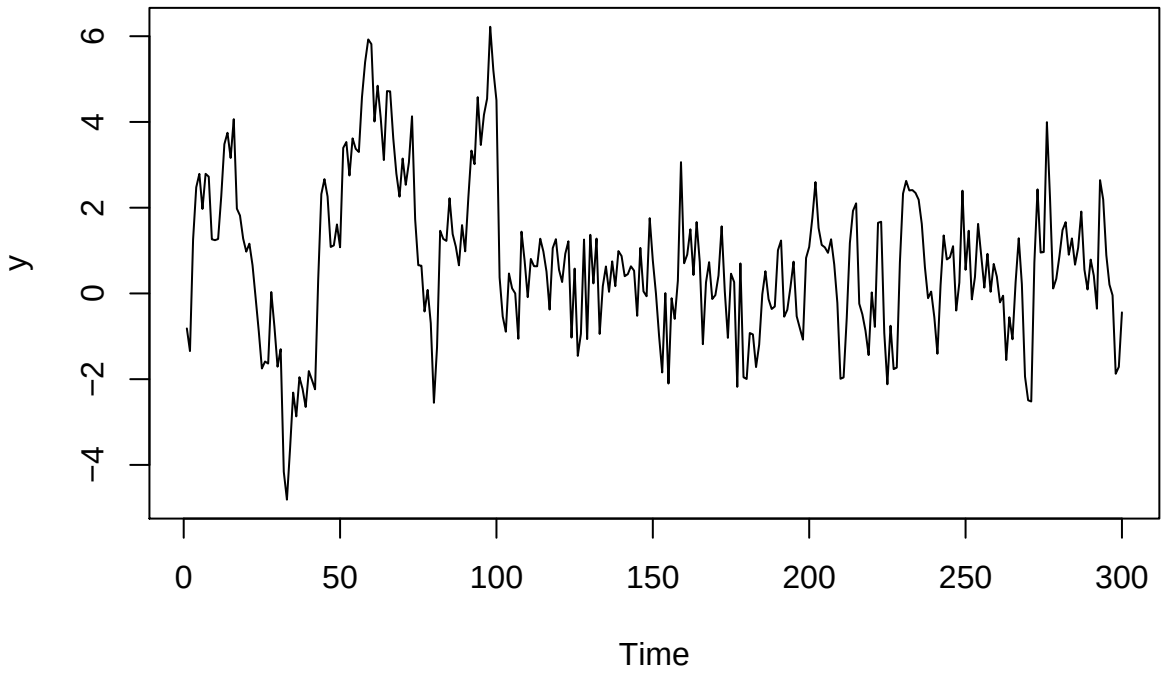
```
library(lubridate)
```

```
##
## 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 = 44.755, p-value = 7.223e-09
```

	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

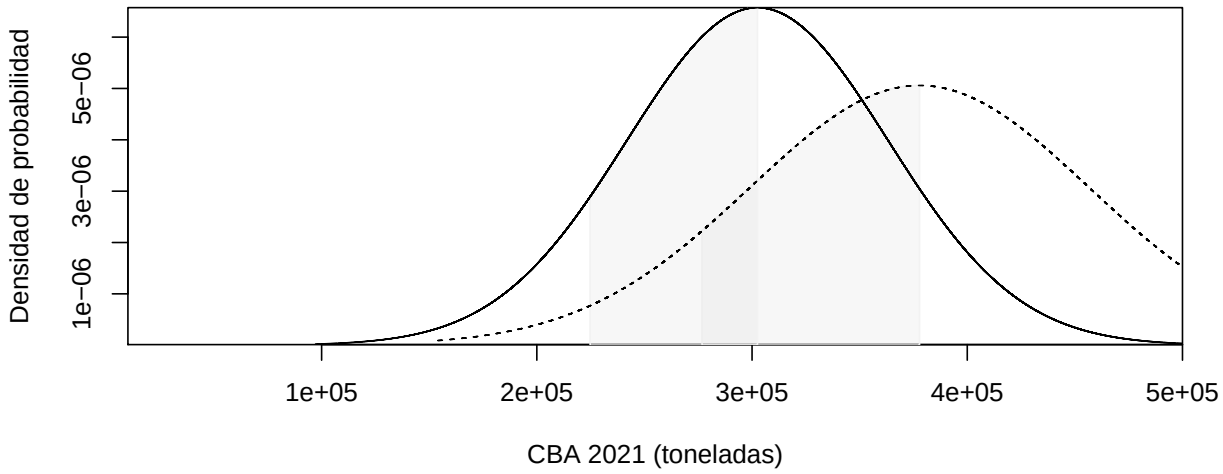
	1991-2007	2008-2012	2013-2021
10%	0.08	0.09	0.09
20%	0.05	0.06	0.06
30%	0.03	0.04	0.04
40%	0.01	0.02	0.02
50%	0.00	0.00	0.00

	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)
```

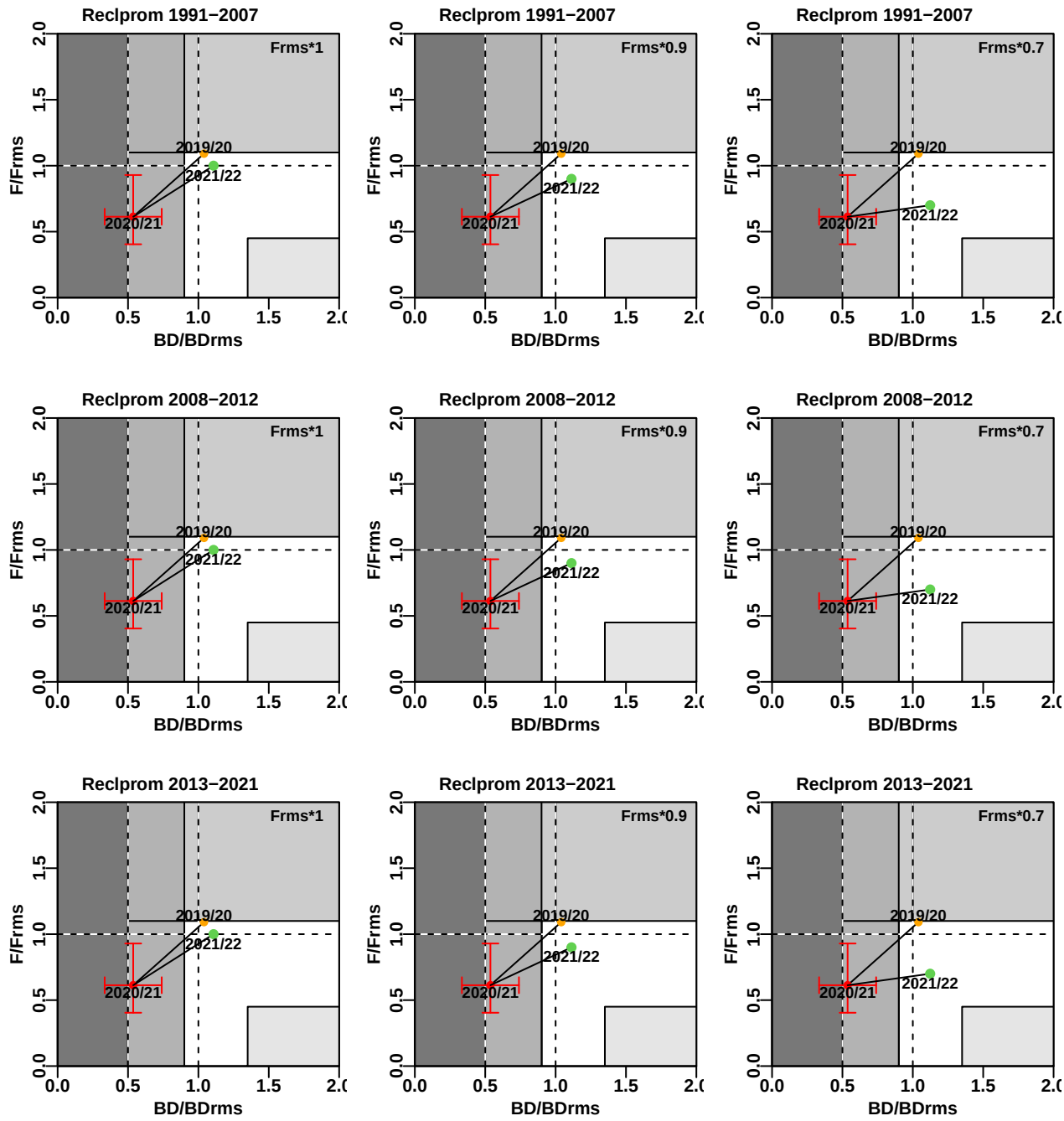
```
ybsb  <-dnorm(xbsb, mean = CBAp_sept[3], sd = CBApstd_sept[3])
icbsb <-qnorm(c(0.10,0.50,0.5),CBAp_sept[3],CBApstd_sept[3])

#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(10000,50
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_{RMS}*1]	[F_{RMS}*0.9]	[F_{RMS}*0.7]
p(BD<0,9BD_{RMS})_2020/21	1.00	1.00	1.00
p(BD<0,5BD_{RMS})_2020/21	0.38	0.38	0.38
p(BD<0,9BD_{RMS})_2021/22	0.27	0.26	0.26
p(BD<0,5BD_{RMS})_2021/22	0.04	0.03	0.03

	2008-2012[F_{RMS}*1]	[F_{RMS}*0.9]	[F_{RMS}*0.7]
p(BD<0,9BD_{RMS})_2020/21	1.00	1.00	1.00
p(BD<0,5BD_{RMS})_2020/21	0.38	0.38	0.38
p(BD<0,9BD_{RMS})_2021/22	0.27	0.26	0.26
p(BD<0,5BD_{RMS})_2021/22	0.04	0.03	0.03

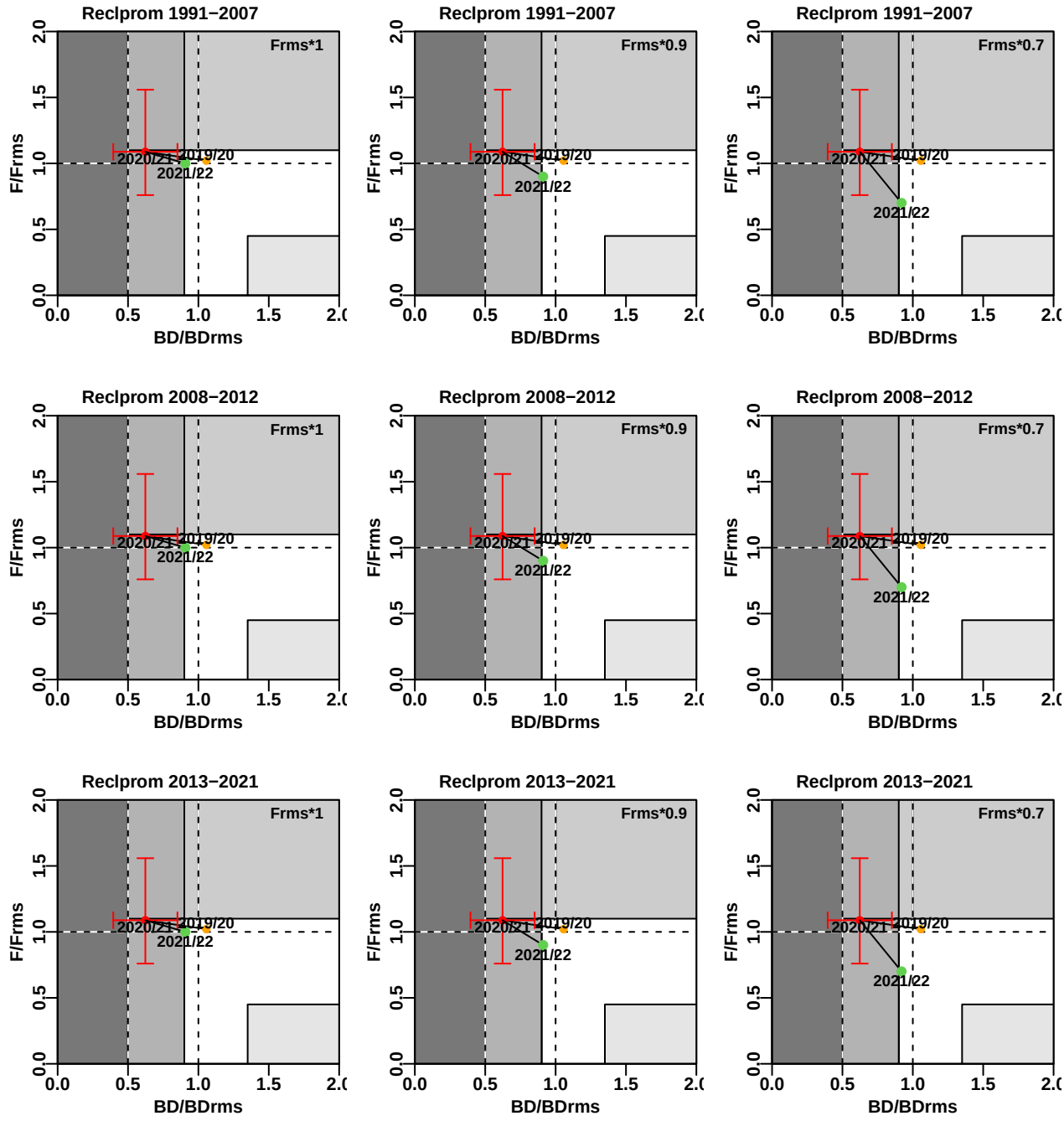
	2013-2021[F_{RMS}*1]	[F_{RMS}*0.9]	[F_{RMS}*0.7]
p(BD<0,9BD_{RMS})_2020/21	1.00	1.00	1.00
p(BD<0,5BD_{RMS})_2020/21	0.38	0.38	0.38
p(BD<0,9BD_{RMS})_2021/22	0.27	0.26	0.26
p(BD<0,5BD_{RMS})_2021/22	0.04	0.03	0.03



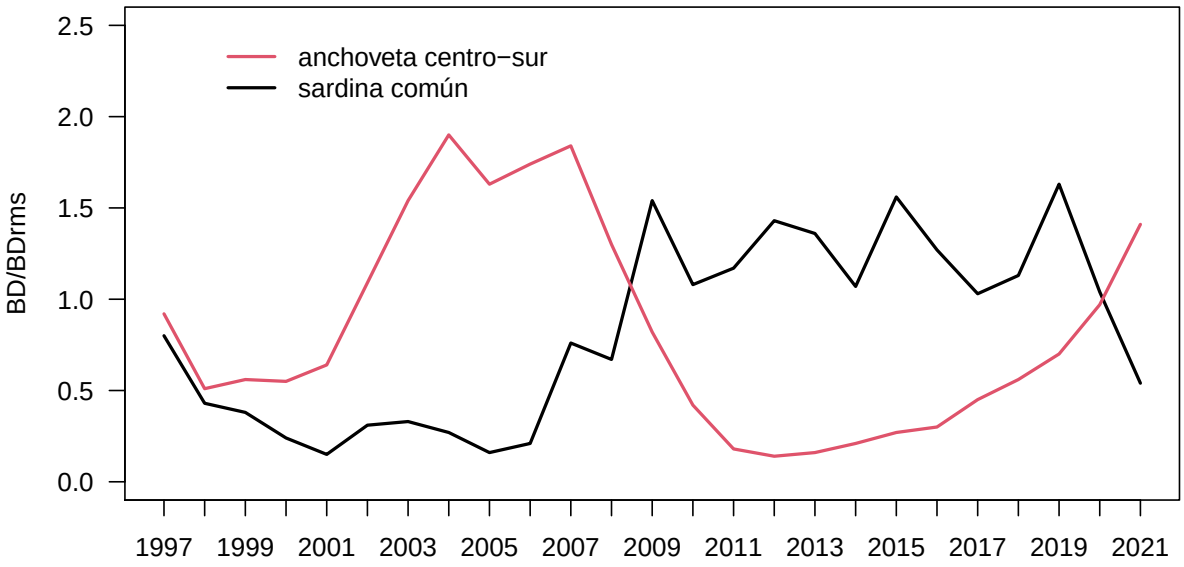
	1991-2007[F_{RMS}*1]	[F_{RMS}*0.9]	[F_{RMS}*0.7]
p(BD<0,9BD_{RMS})_2020/21	0.98	0.98	0.98
p(BD<0,5BD_{RMS})_2020/21	0.18	0.18	0.18
p(BD<0,9BD_{RMS})_2021/22	0.49	0.48	0.46
p(BD<0,5BD_{RMS})_2021/22	0.04	0.03	0.03

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

	2013-2021[F_{RMS}*1]	[F_{RMS}*0.9]	[F_{RMS}*0.7]
p(BD<0,9BD_{RMS})_2020/21	0.98	0.98	0.98
p(BD<0,5BD_{RMS})_2020/21	0.18	0.18	0.18
p(BD<0,9BD_{RMS})_2021/22	0.49	0.48	0.46
p(BD<0,5BD_{RMS})_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%descarte) = 344.880 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 semetre 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

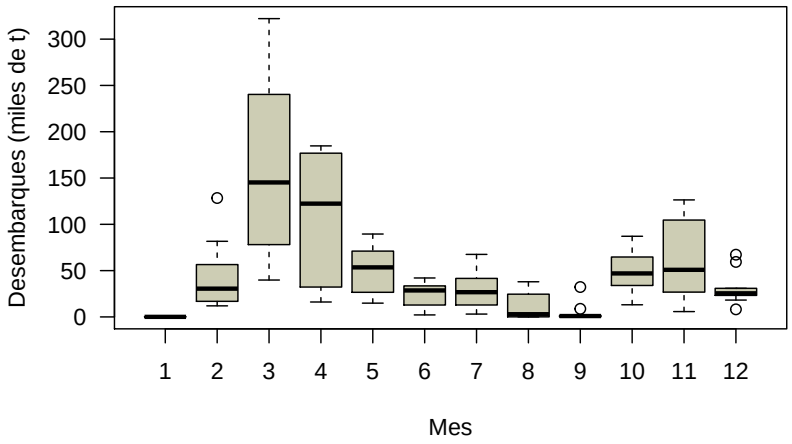


Figure 1: Capturas mensuales de sardina común realizadas entre 2007-2021, registradas por SERNAPESCA en la zona centro-sur.

- 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,   0.8

plot(seq(1991,2021),prop1ersemestre,type="o",ylab="Proporción de captura 1er semestre (año biológico",x
```

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 semestres y traspasar ese remanente de cuota para el 1er semestre del siguiente año???

cuál es la captura biológicamente aceptable 2021/2022