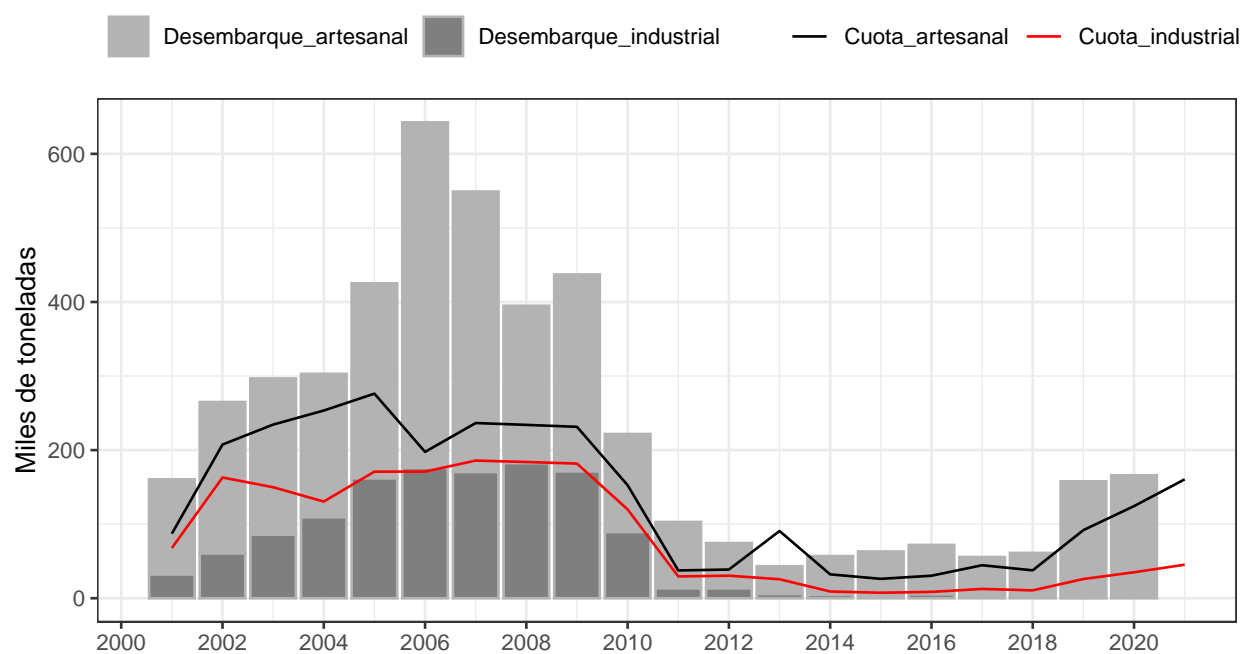
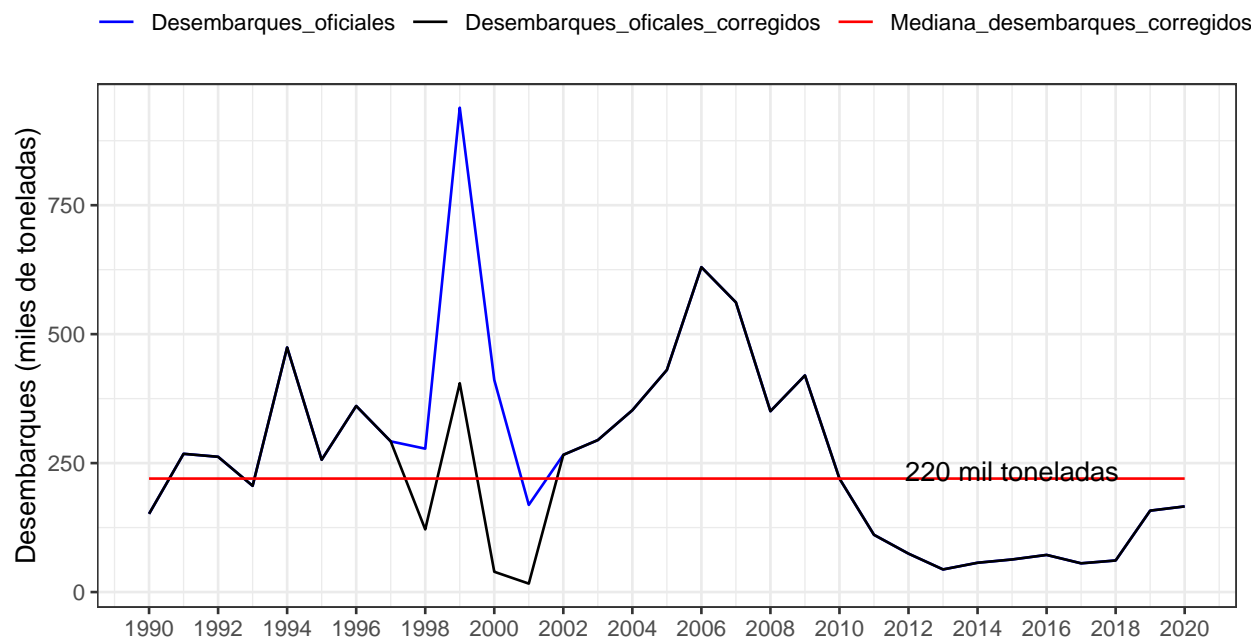
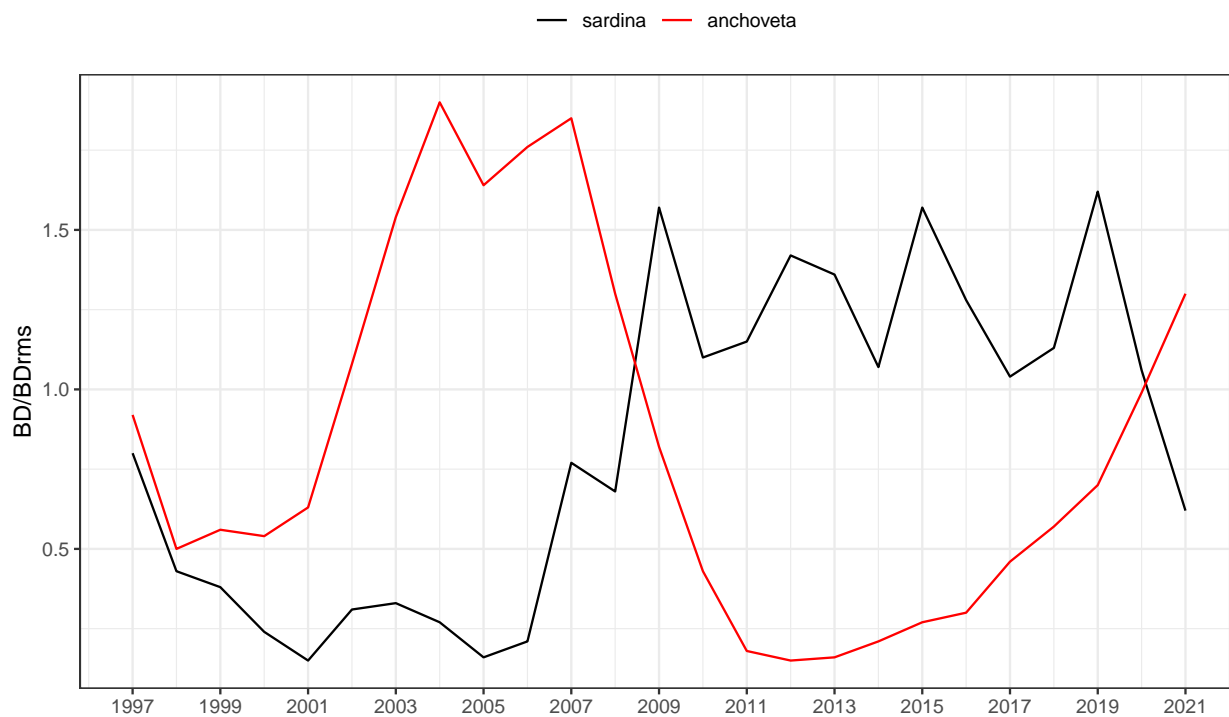
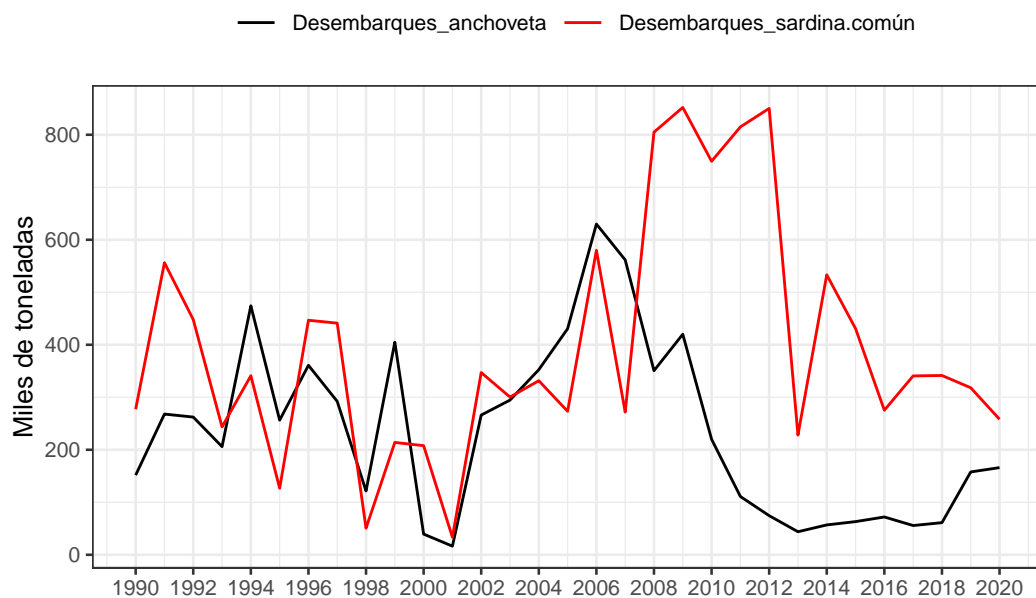


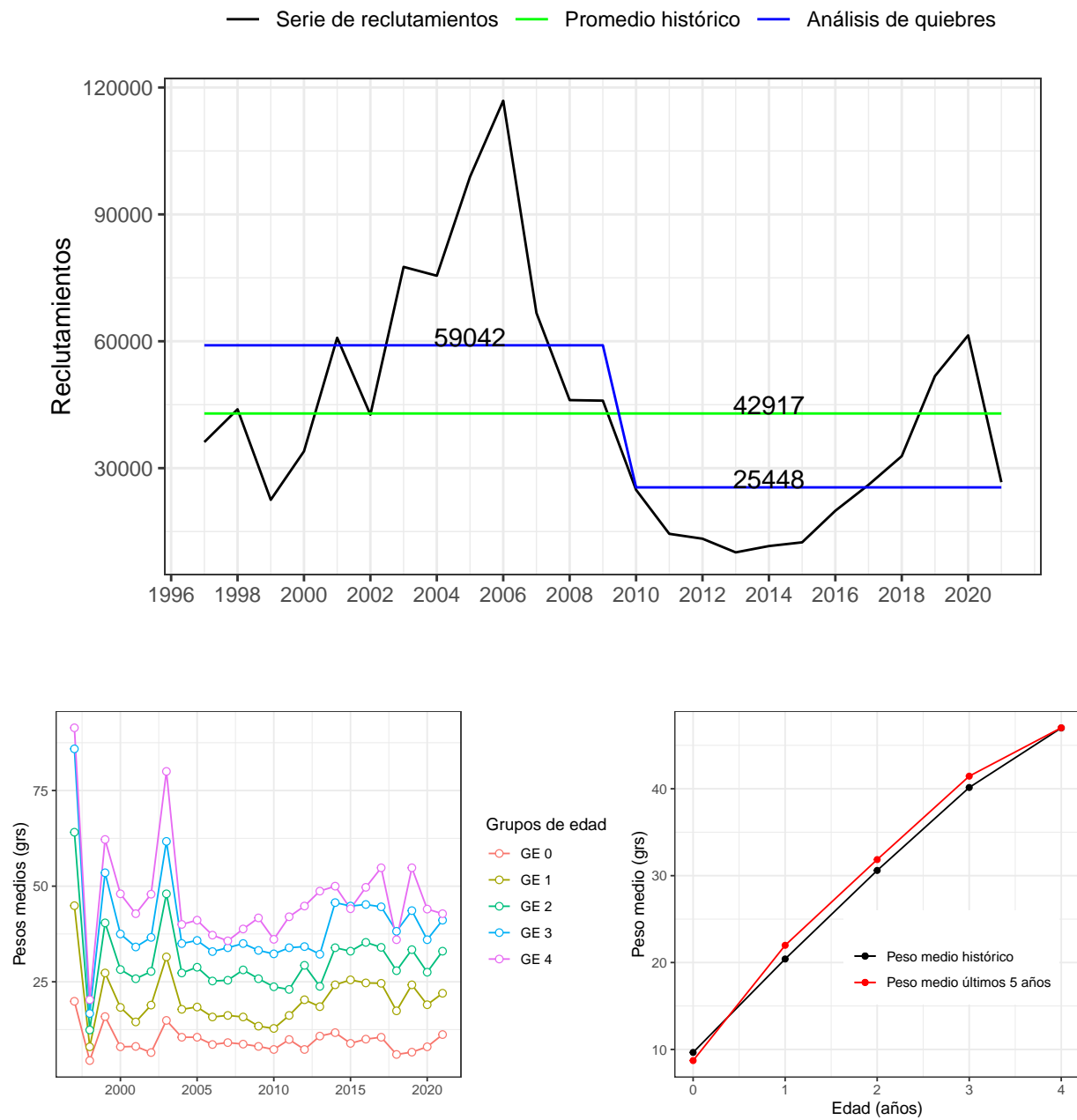
# Figura y Tablas Primer Informe Anchoveta Centro-sur Septiembre 2021

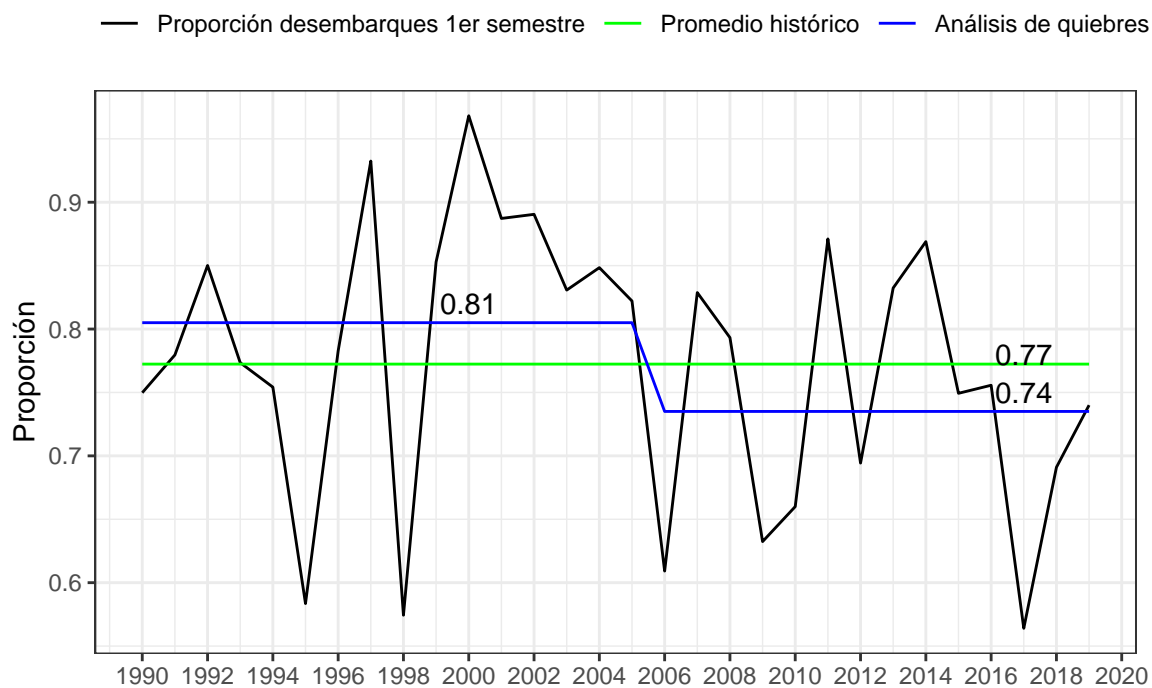
## ANTECEDENTES





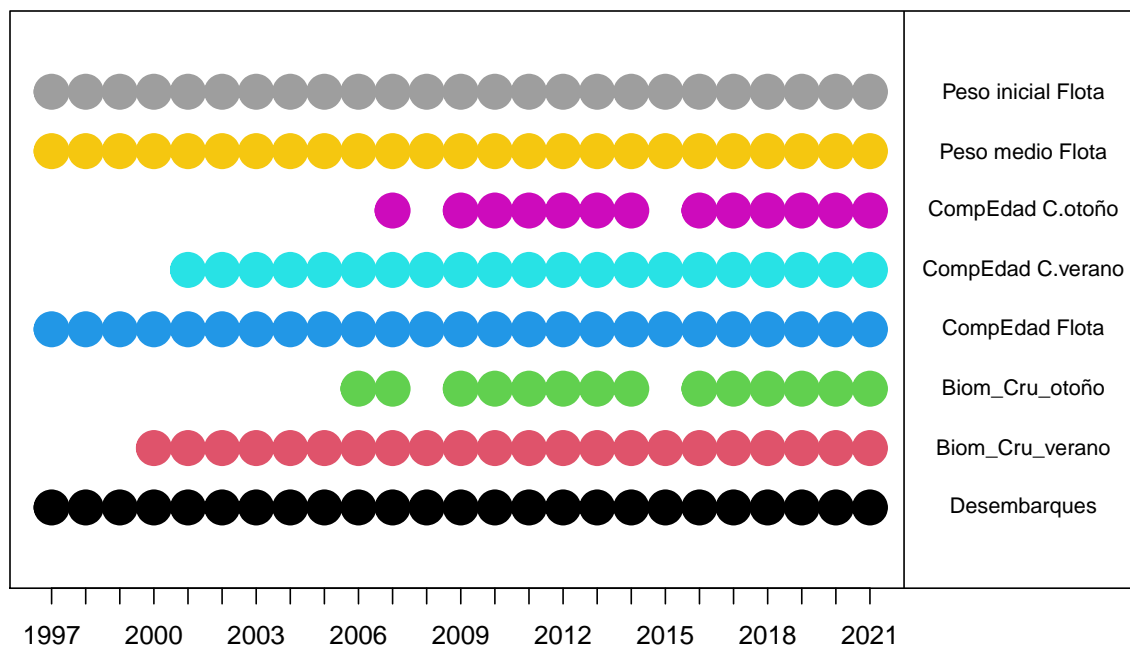
## METODOLOGÍA





## RESULTADOS

### Datos de entrada al modelo

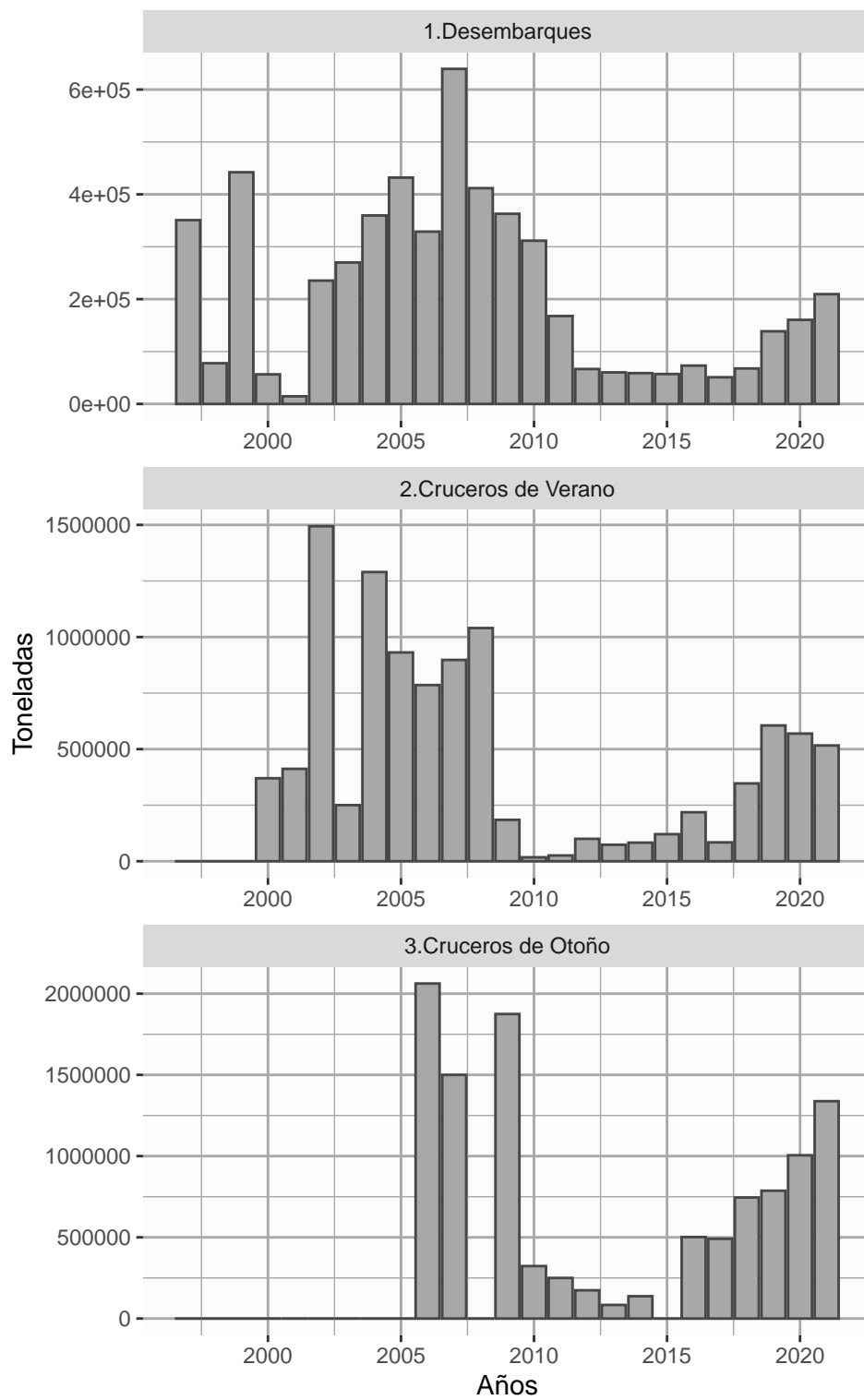


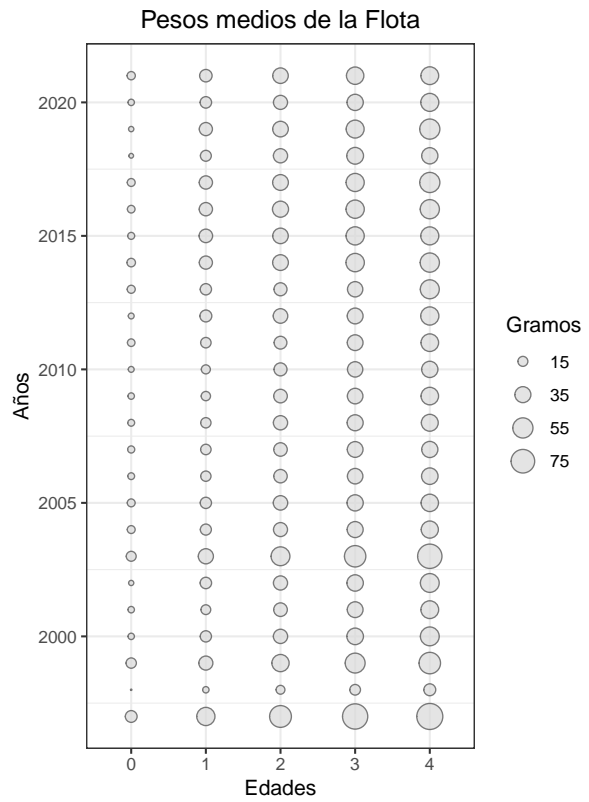
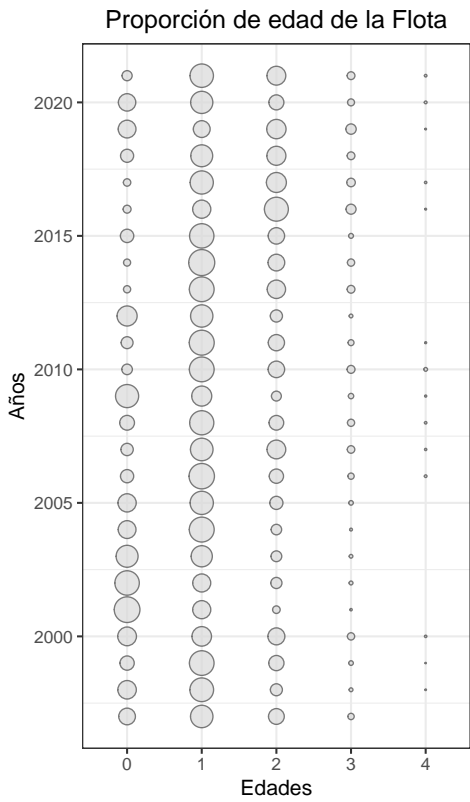
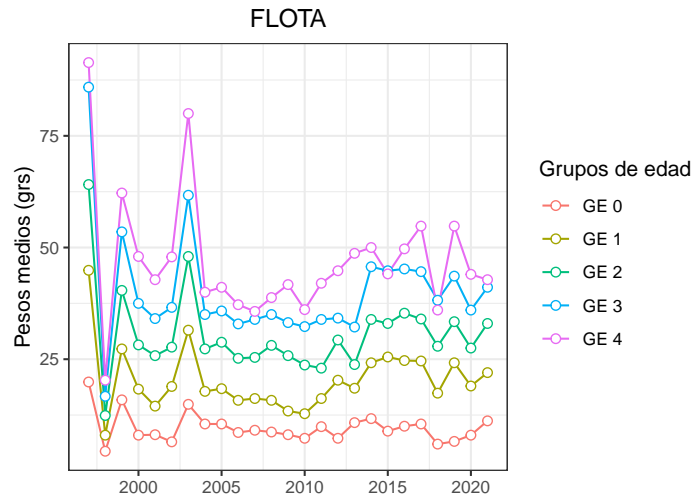
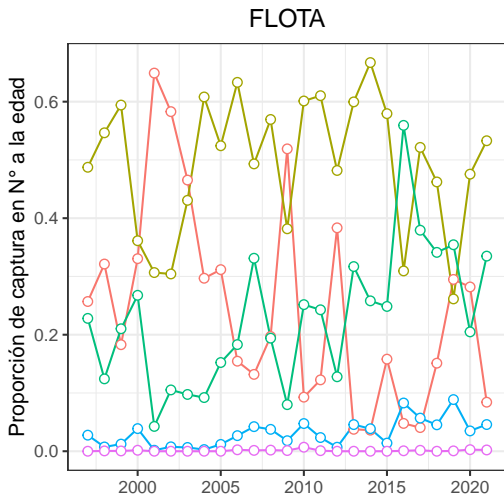
**Tabla 16.**

Desembarques en toneladas, porcentaje de descarte supuesto, captura descartada (toneladas) y captura total

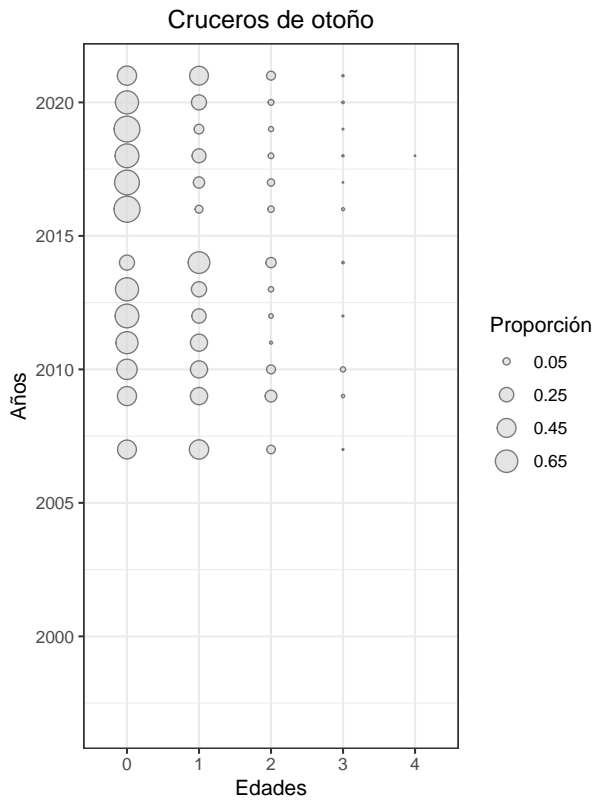
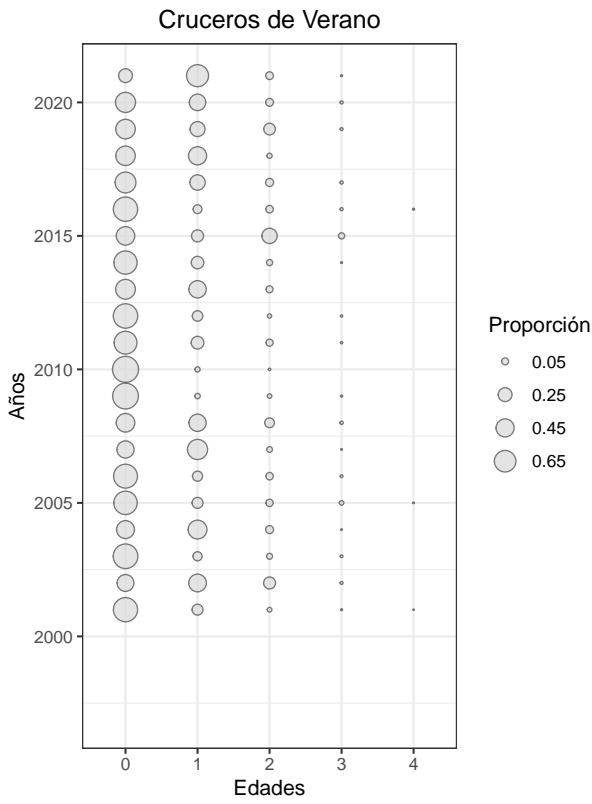
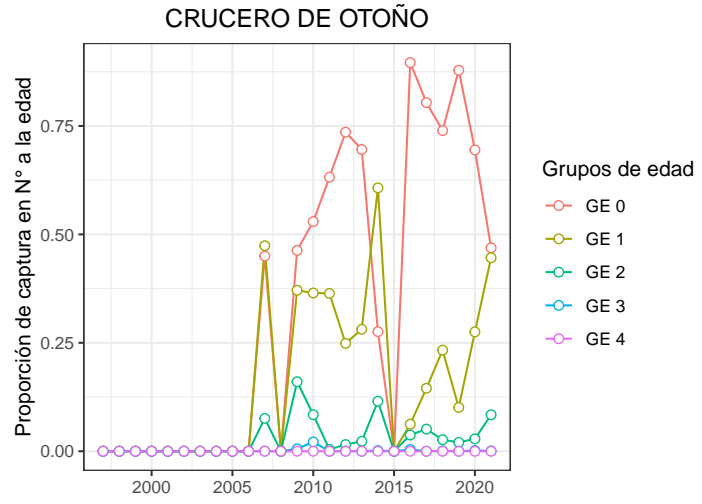
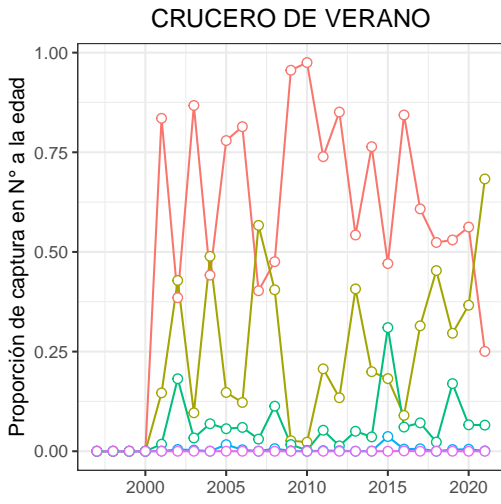
(toneladas) estimadas en año biológico para anchoveta de las Regiones de Valparaíso a Los Lagos.

Año.biológico	Desembarques.t.	Porcentaje.descarte	Captura.descartada.t.	Captura.total.t.
1996-97	350755	0%	0	350755
1997-98	77701	0%	0	77701
1998-99	442110	0%	0	442110
1999-00	56441	0%	0	56441
2000-01	13986	4%	559	14545
2001-02	226307	4%	9052	235359
2002-03	259572	4%	10383	269955
2003-04	345847	4%	13834	359681
2004-05	415290	4%	16612	431902
2005-06	316159	4%	12646	328805
2006-07	614773	4%	24591	639364
2007-08	395911	4%	15836	411747
2008-09	348914	4%	13957	362871
2009-10	299548	4%	11982	311530
2010-11	161306	4%	6452	167758
2011-12	64116	4%	2565	66681
2012-13	57910	4%	2316	60226
2013-14	56524	4%	2261	58785
2014-15	54919	4%	2197	57116
2015-16	70367	4%	2815	73181
2016-17	49016	4%	1961	50977
2017-18	66757	1,4%	935	67692
2018-19	135804	2,1%	2852	138656
2019-20	157646	1,8%	2838	160484
2020-21	205398	2%	4108	209506

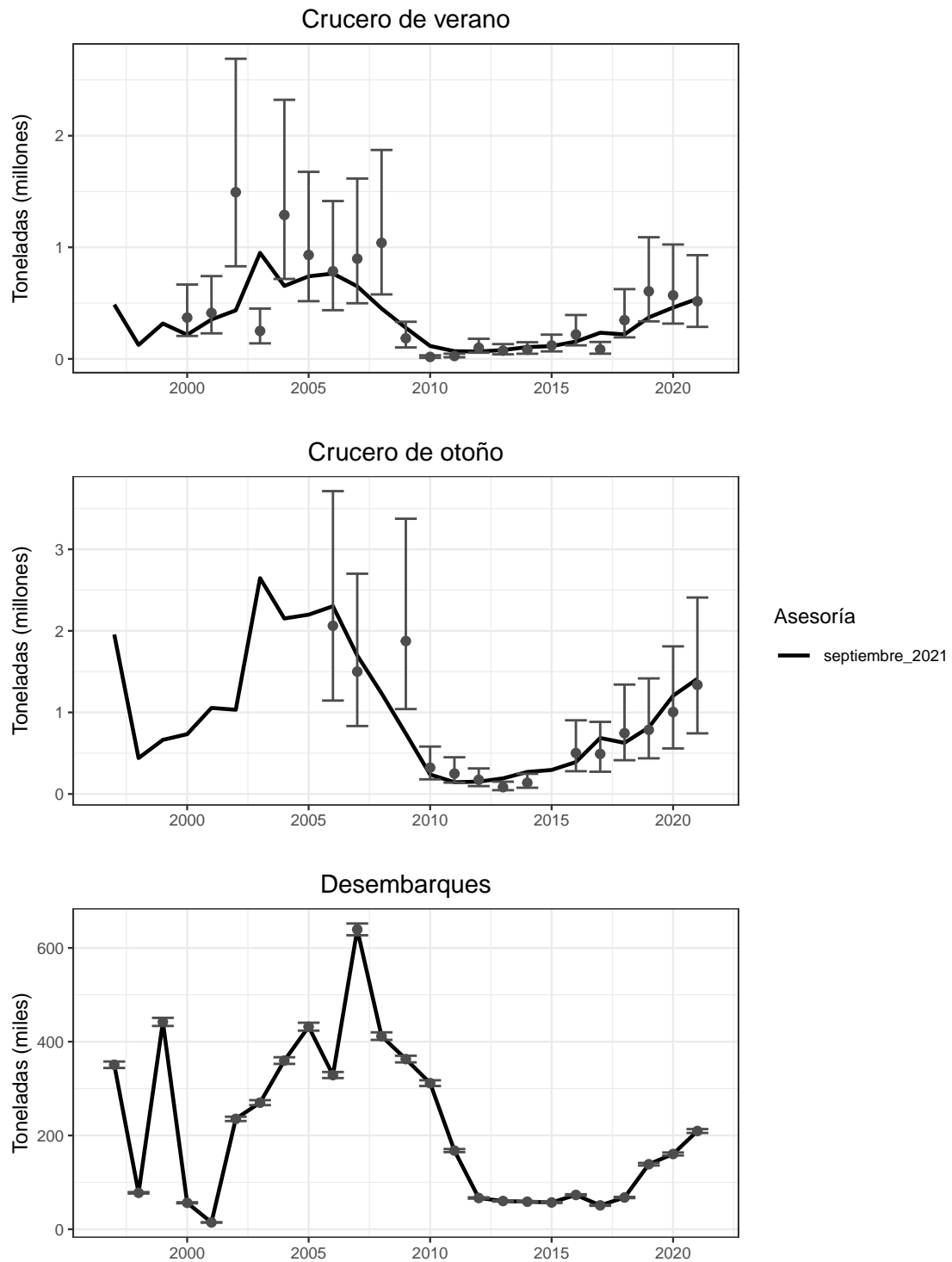




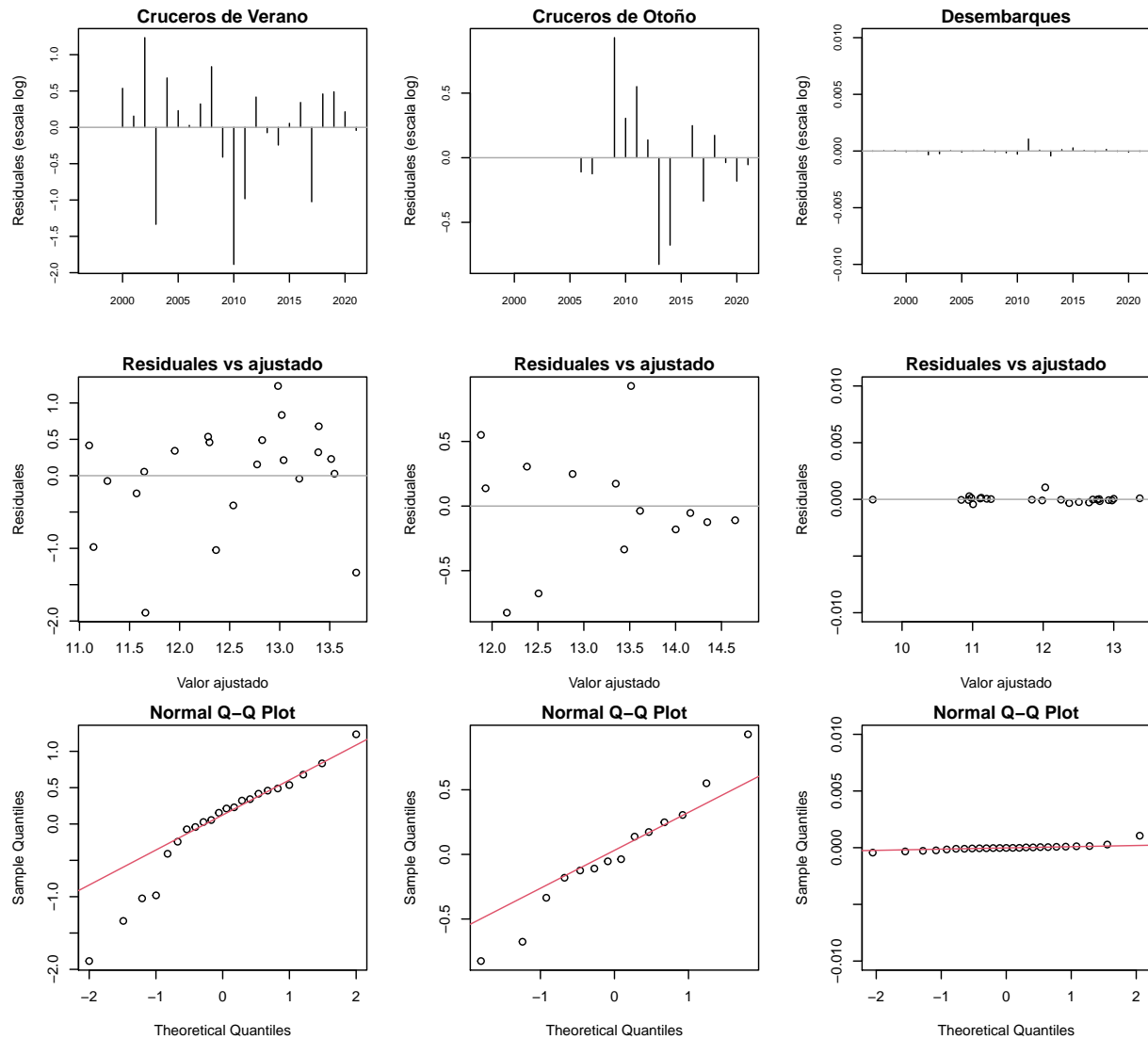




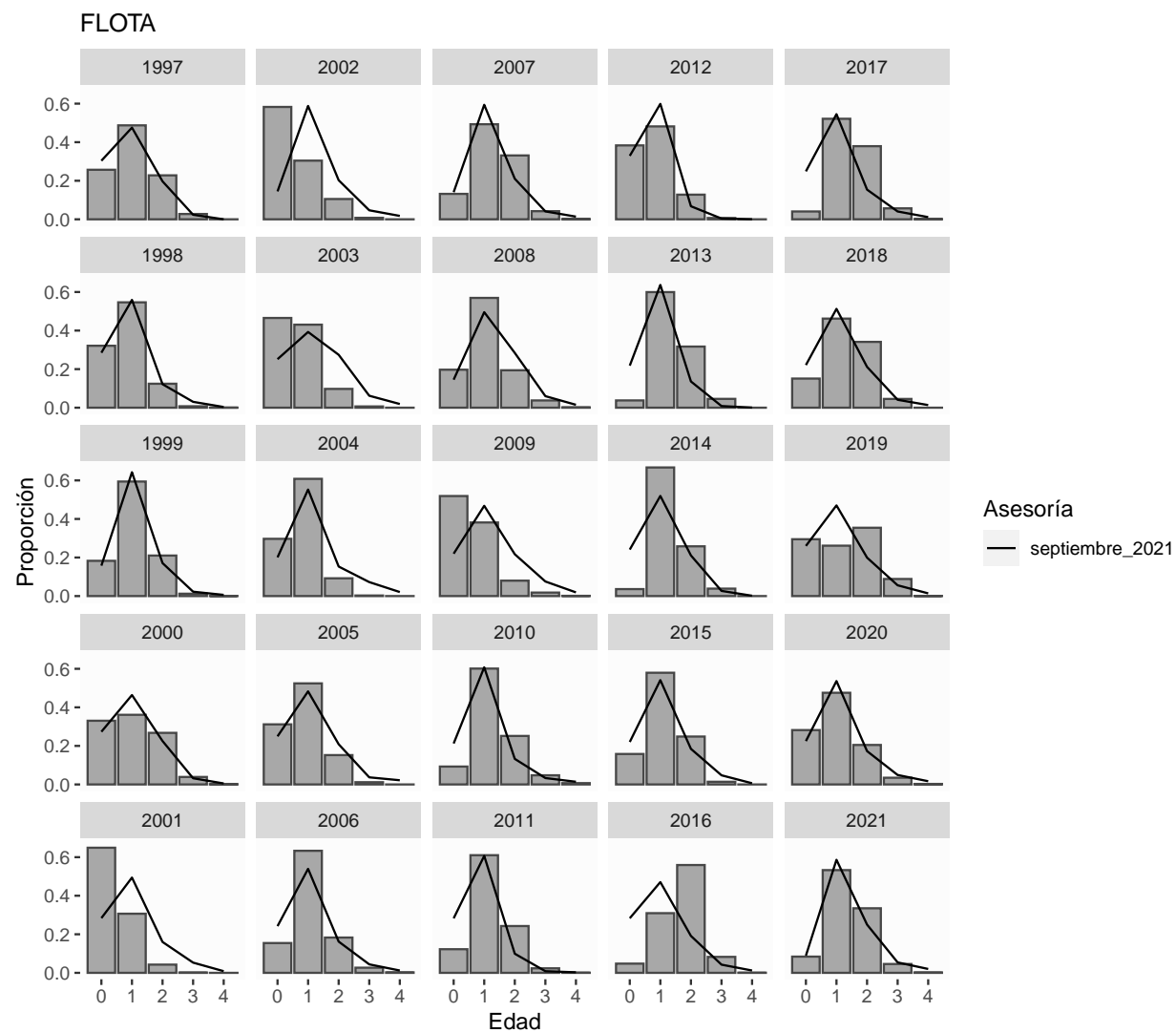
## Ajuste de los índices de abundancia



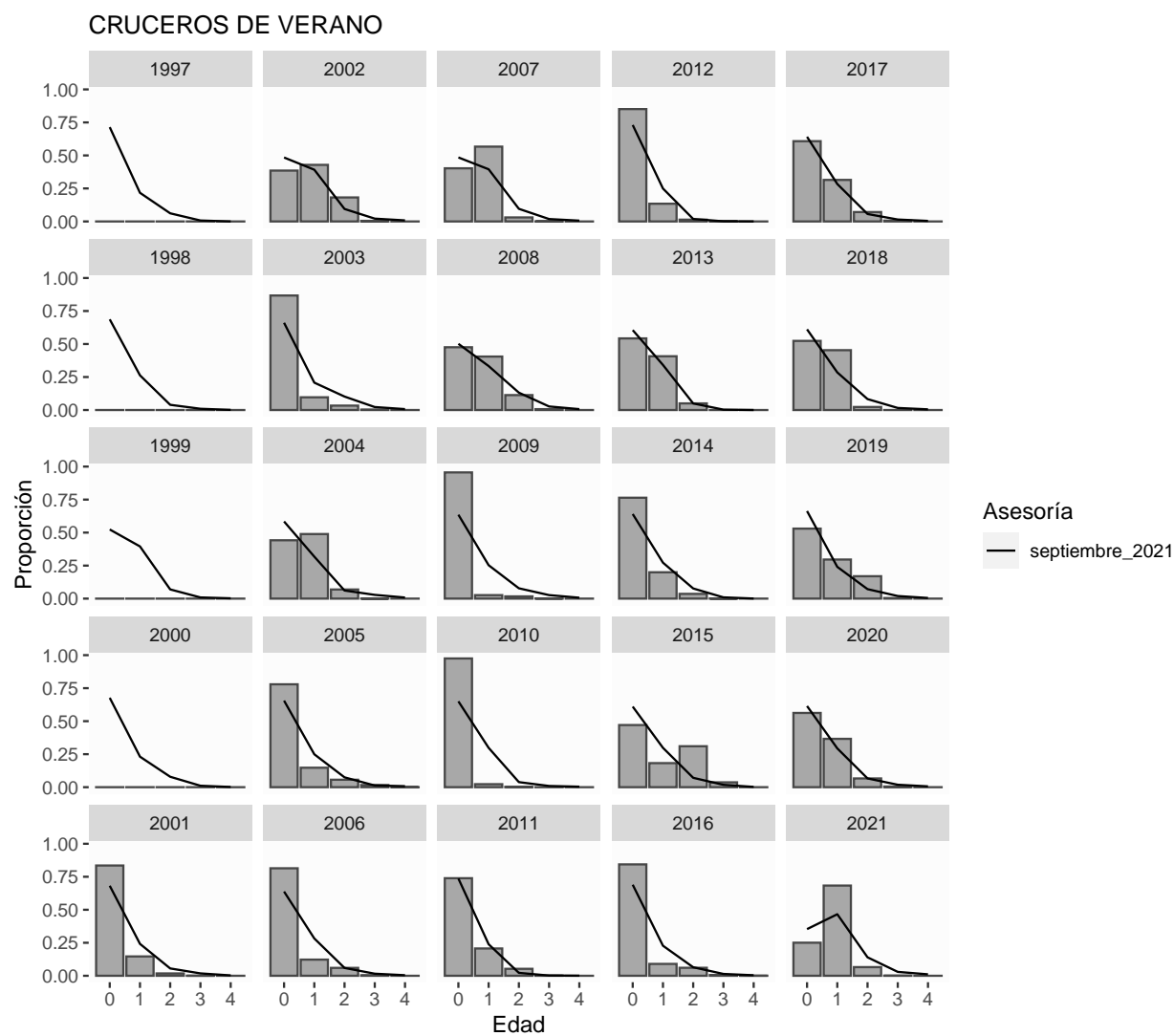
## Residuos de los índices de abundancia



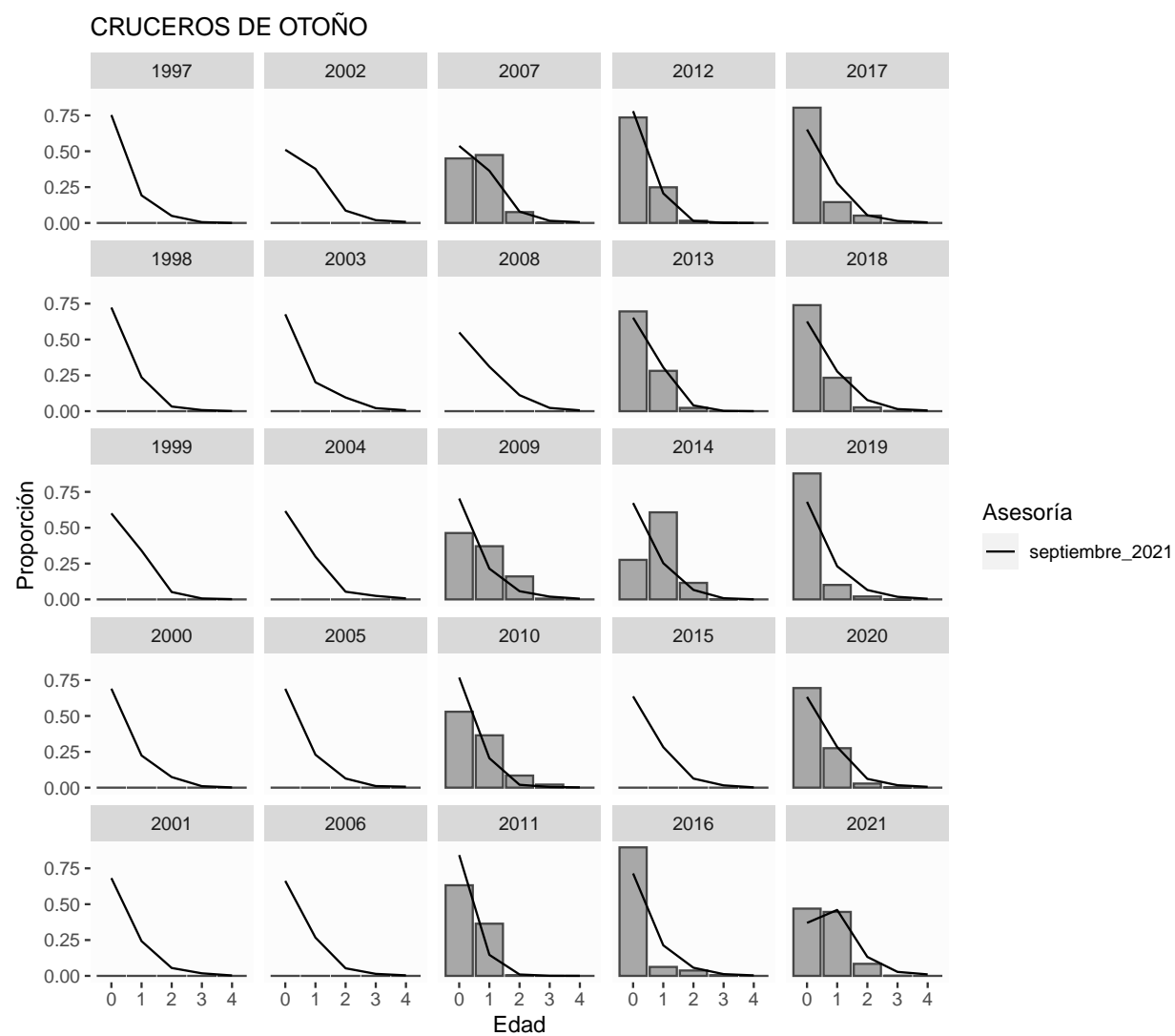
## Ajuste de la composición de edad de la Flota



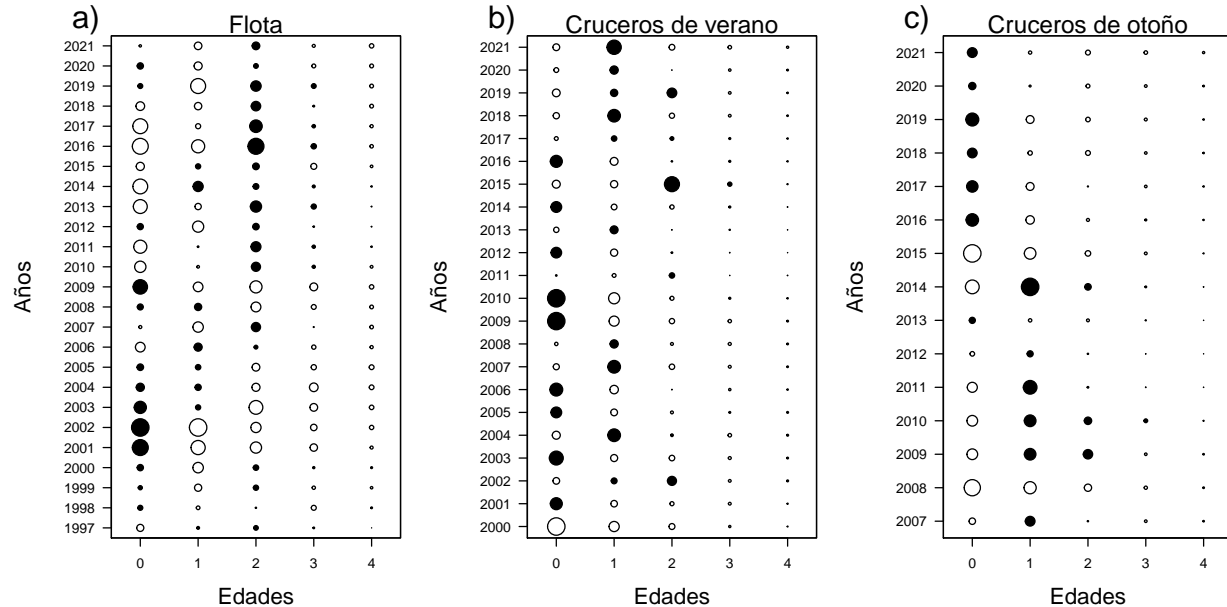
## Ajuste de la composición de edad de la Crucero de Verano



## Ajuste de la composición de edad del crucero de otoño



## Residuales de las composiciones de edad de la Flota y Cruceros de verano y otoño



## Comparación con asesorías previas

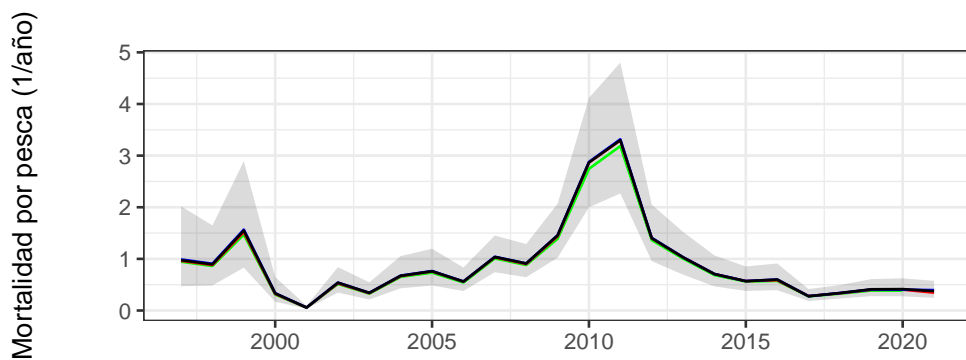
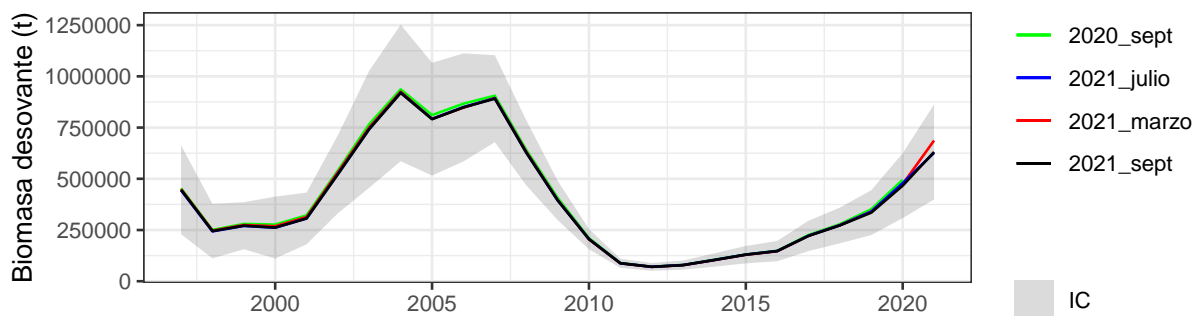
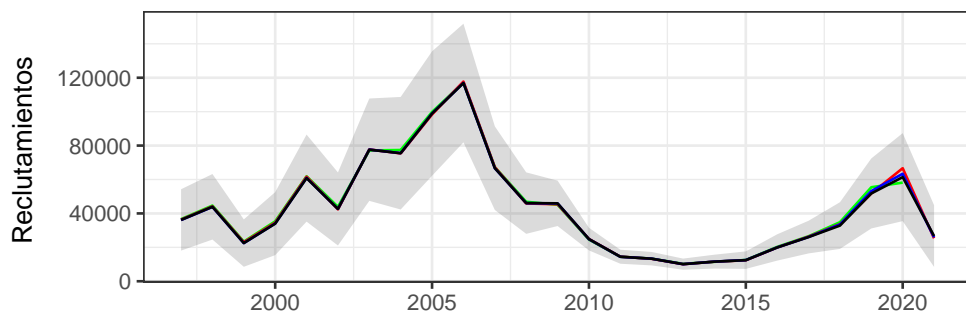
```
sept20 <-paste(dir.1, "/MAE0920b.rep", sep="")
mar21 <-paste(dir.1, "/MAE0321b.rep", sep="")
jul21 <-paste(dir.1, "/MAE0721b.rep", sep="")
sept21 <-paste(dir.1, "/MAE0921b.rep", sep="")
#####
rep_sept20 <- reptoRlist(sept20)
rep_mar21 <- reptoRlist(mar21)
rep_jul21 <- reptoRlist(jul21)
rep_sept21 <- reptoRlist(sept21)
#####
years <- rep_sept21$years
nyears <- length(years)
x <-c(years, rev(years))
x1 <-c(years[1], years[nyears]+1, nyears+1/2) #xarp
x2 <-c(years[1]-1, years[nyears]+1) #xlim

Rtcomp <- data.frame(x=years,
                     Rt_sept20=c(rep_sept20$Reclutas, NA),
                     Rt_mar21=c(rep_mar21$Reclutas),
                     Rt_jul21=c(rep_jul21$Reclutas),
                     Rt_sept21=c(rep_sept21$Reclutas))

SSBtcomp <- data.frame(x=years,
                      SSBt_sept20=c(rep_sept20$SSB, NA),
                      SSBt_mar21=c(rep_mar21$SSB),
                      SSBt_jul21=c(rep_jul21$SSB),
                      SSBt_sept21=c(rep_sept21$SSB))

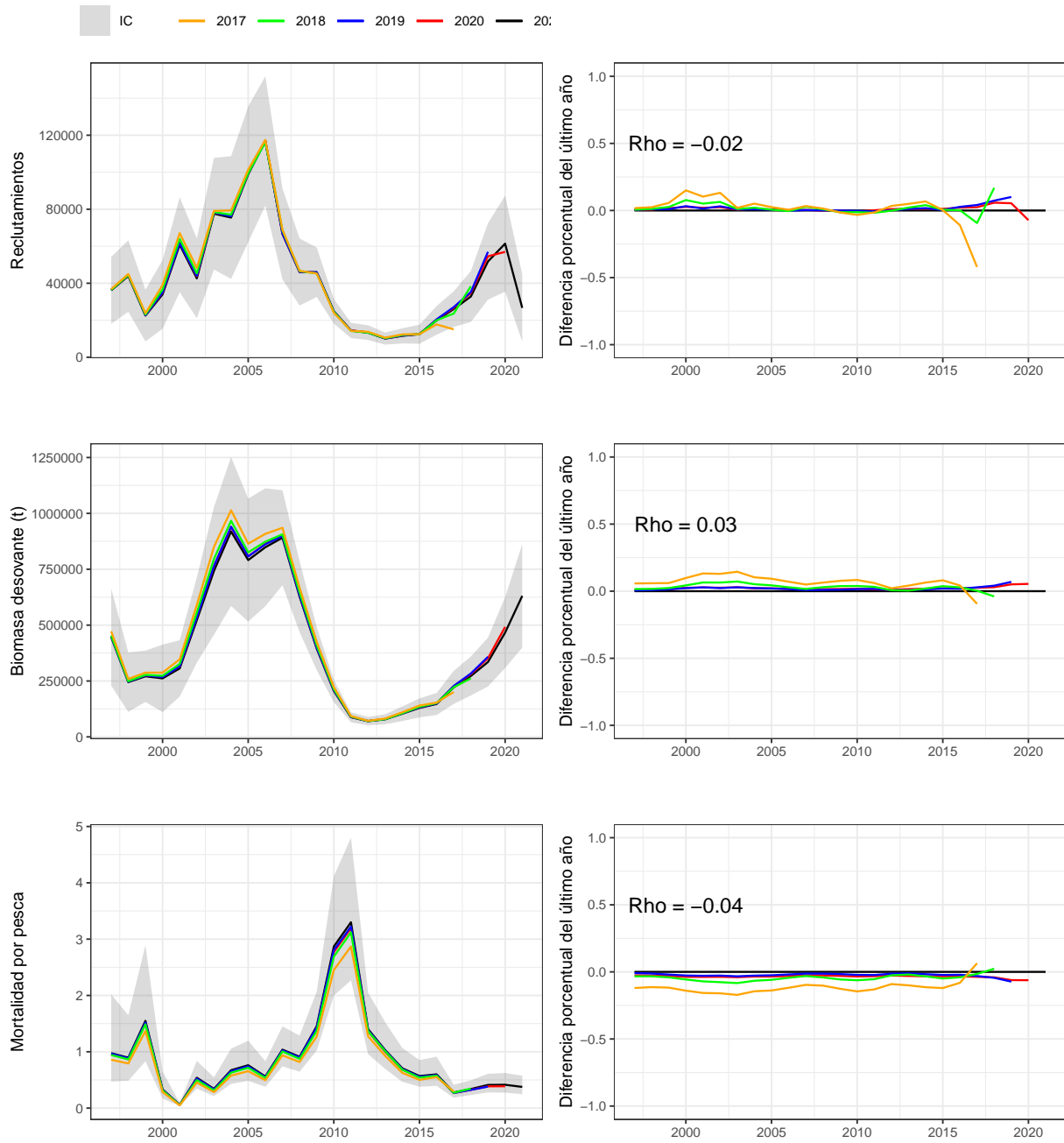
Ftcomp <- data.frame(x=years,
                    Ft_sept20=c(rep_sept20$Ftot, NA),
                    Ft_mar21=c(rep_mar21$Ftot),
```

```
Ft_jul21=c(rep_jul21$Ftot),
Ft_sept21=c(rep_sept21$Ftot))
```

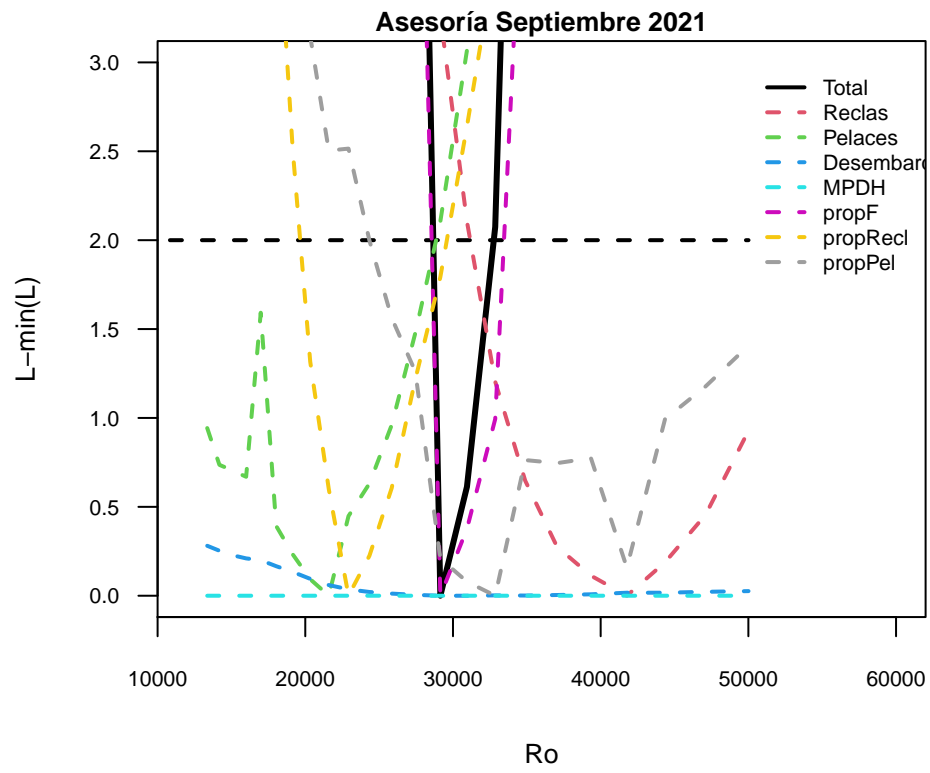




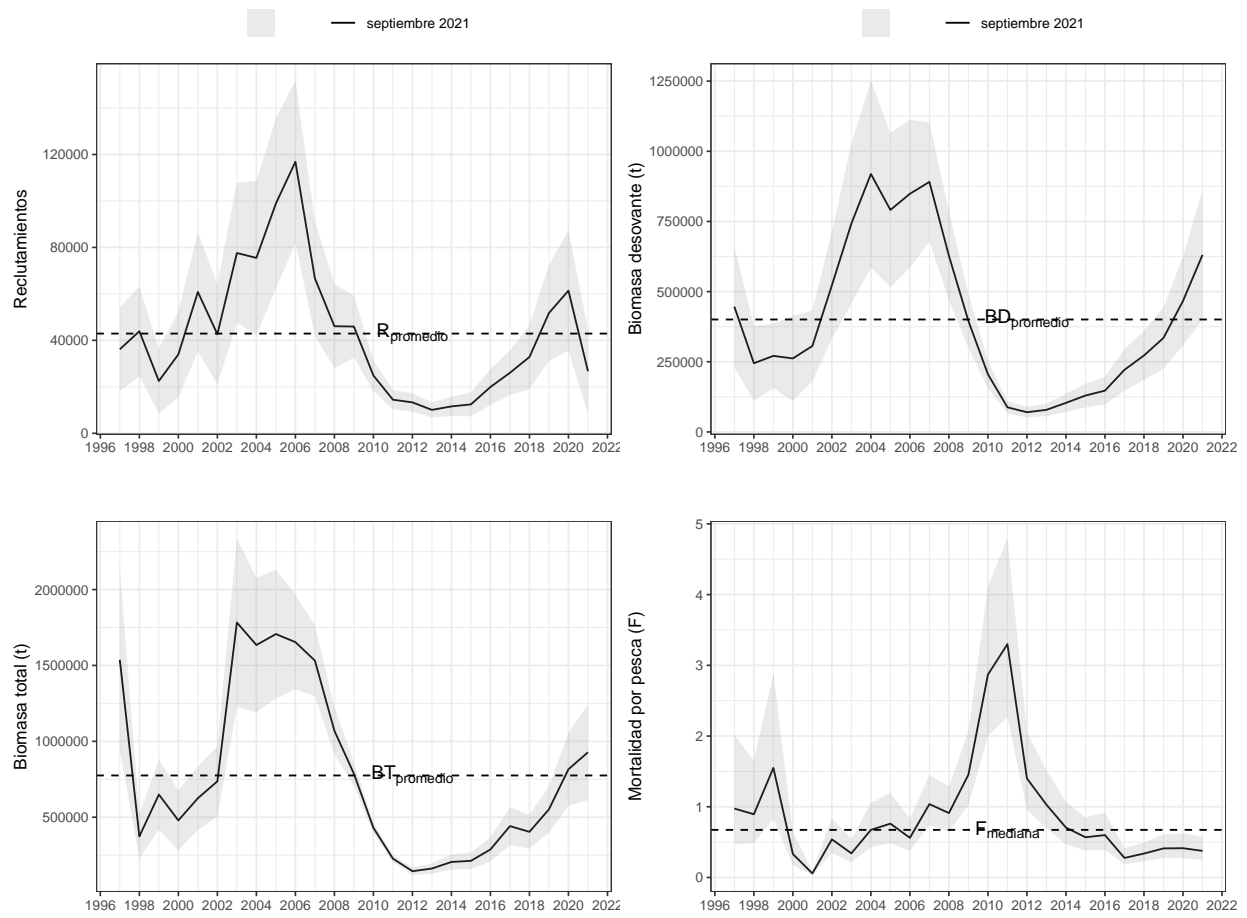
## Análisis retrospectivo



## Perfil de verosimilitud



## Indicadores poblacionales



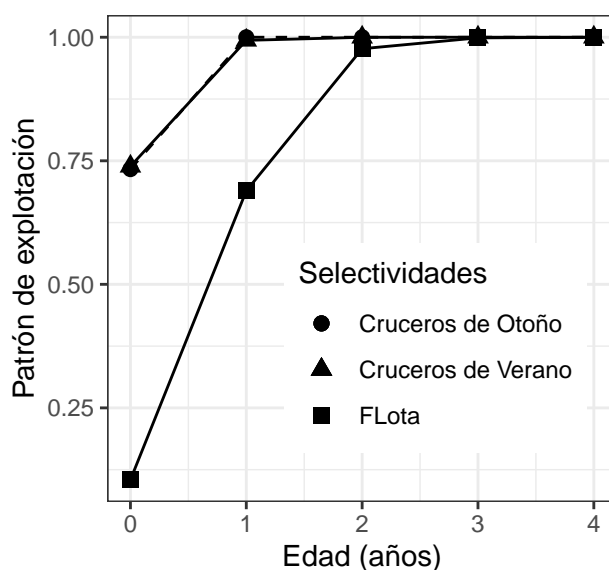
**Tabla 17.**

Variables poblacionales estimadas en la evaluación de anchoveta de las Regiones de Valparaíso a Los Lagos.

Año	$BD_{sept}$	$BD_{marzo}$	$BD_{julio}$	$BT_{sept}$	$BT_{marzo}$	$BT_{julio}$	$R_{sept}$	$R_{marzo}$	$R_{julio}$	$F_{sept}$	$F_{marzo}$	$F_{julio}$
1996/97	446310	449330	443792	1536600	1544300	1532630	36162	36327	36114.4	0.975	0.963	0.989
1997/98	44750	246830	243421	373710	376310	372225	43906	44137	43856.4	0.894	0.882	0.906
1998/99	70970	274410	269947	649390	659290	648361	22502	22999	22500	1.55	1.52	1.567
1999/00	61880	268420	261093	479180	489730	478819	33972	34607	34069.8	0.332	0.322	0.335
2000/01	06350	313470	306495	625390	637170	626269	60820	61647	60974.3	0.057	0.056	0.058
2001/02	22520	532230	523559	736610	746790	737871	42634	42404	42662.7	0.539	0.527	0.54
2002/03	42540	751530	744117	1783000	1794500	1785330	77583	77704	77626.6	0.342	0.336	0.342
2003/04	19090	925060	920598	1634700	1640700	1637000	75495	75394	75552.8	0.673	0.666	0.676
2004/05	90960	792710	792302	1706900	1704800	1709420	98882	98343	98996.8	0.761	0.756	0.764
2005/06	48470	847350	850165	1653700	1657200	1656100	116880	117750	116943	0.561	0.559	0.563
2006/07	891020	894650	892636	1531900	1539100	1533900	66686	67258	66686.5	1.038	1.03	1.041
2007/08	27730	633110	629190	1069600	1074100	1071210	46078	45869	46064.3	0.911	0.899	0.912
2008/09	95000	397670	395986	786840	786660	787690	45950	45408	45877.1	1.455	1.436	1.457
2009/10	05460	204780	205889	430210	429780	430634	24867	24924	24814	2.868	2.865	2.878
2010/11	87765	87492	87969.4	227340	227210	227531	14463	14507	14434.1	3.3	3.295	3.317
2011/12	70217	70070	70405.9	144490	144100	144770	13306	13250	13317.2	1.401	1.398	1.408
2012/13	8720	78341	78958.5	161880	161480	162233	10078	10083	10087.5	1.029	1.03	1.033
2013/14	03590	103220	103902	205310	204780	205737	11574	11559	11582.8	0.706	0.706	0.708
2014/15	29640	129170	129992	212760	211870	213265	12448	12369	12468.5	0.569	0.569	0.57
2015/16	47040	146480	147467	287730	286960	288424	19921	19948	19956	0.599	0.587	0.601
2016/17	21370	221930	222044	441450	444140	442739	26048	26318	26122	0.277	0.281	0.278
2017/18	72390	274050	273533	403680	407650	406733	32831	33685	33513.8	0.339	0.334	0.338
2018/19	34890	340830	339853	552200	558780	561985	51775	51784	53182.2	0.411	0.402	0.407
2019/20	66470	473920	479011	816150	835630	838744	61395	66653	63379.1	0.414	0.405	0.404
2020/21	630820	686790	626493	928130	918000	923891	26675	25359	25914.4	0.376	0.345	0.395

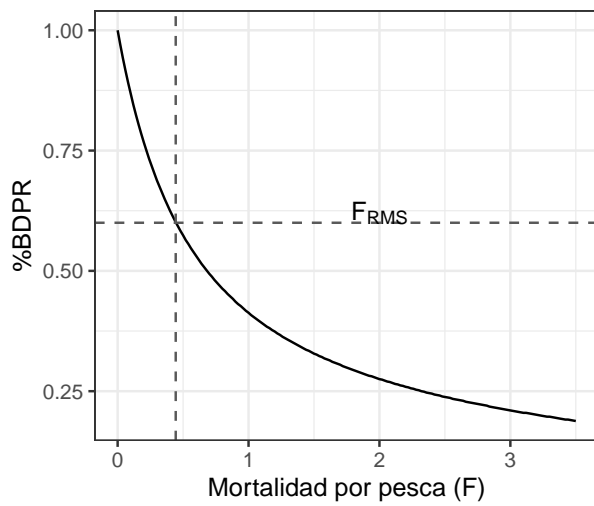
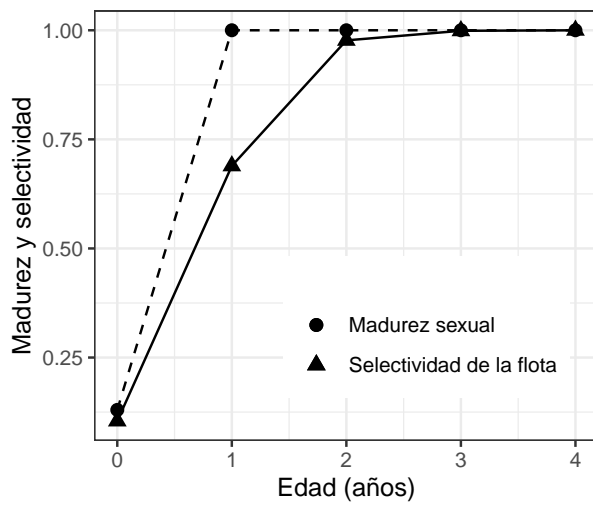
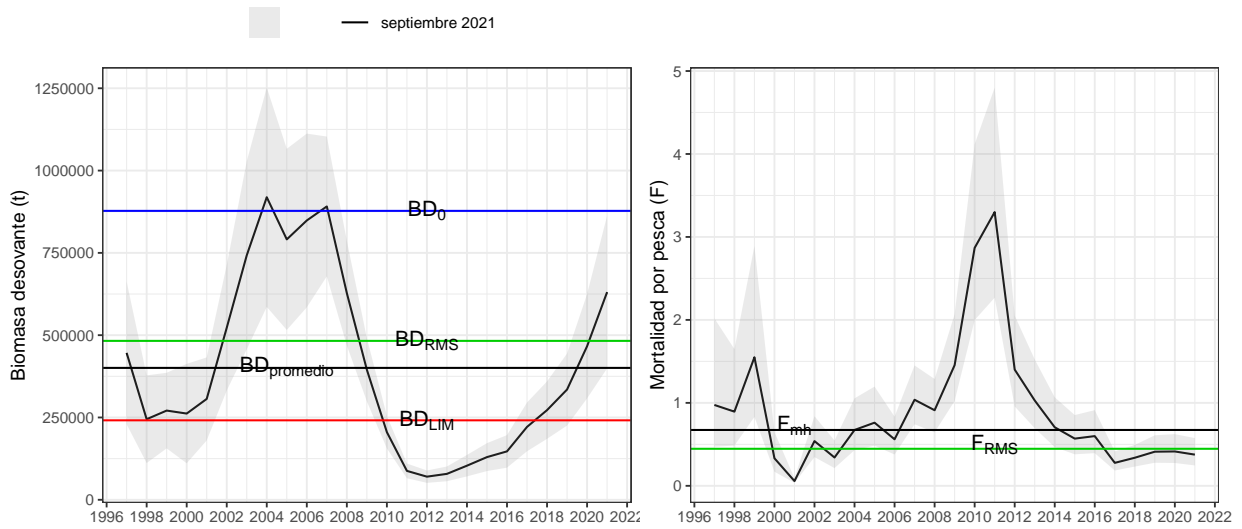
```
##          difRt      difBT      difBD      Rprom      BTprom      BDprom
## Rlast_2002_2008  0.6460552  0.3609580  0.1532309  75364.86  1452377.1  744972.9
## Rlast_2009_2017 -0.4502888 -2.3215381 -3.3134892  18392.89  279427.8  146243.6
## Rlast_historico  0.3784549 -0.1973492 -0.5745367  42917.24  775154.0  400638.5
```

## Selectividad



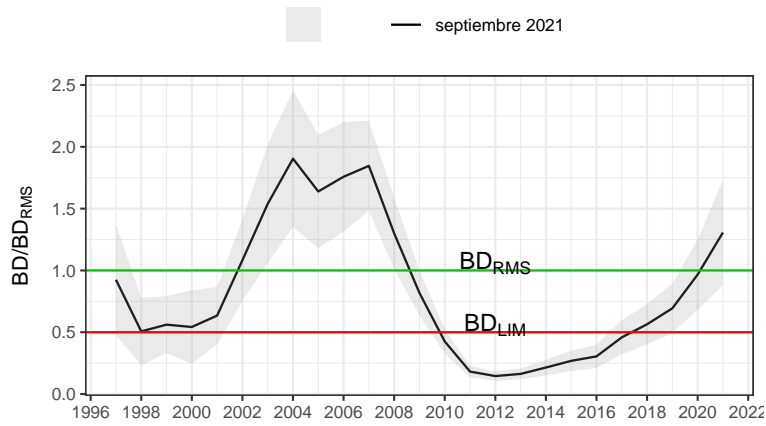
## Puntos biológicos de referencia

	Septiembre	Marzo	Julio
BDpromedio	401.00	406.00	402.00
F <sub>mh</sub>	0.67	0.67	0.68
%BDPR_F <sub>mh</sub>	50.40	50.40	50.40
%BDPR_F <sub>RMS</sub>	60.00	60.00	60.00
%BD_F <sub>mh</sub>	45.40	45.40	45.40
%BD_F <sub>RMS</sub>	55.00	55.00	55.00
BD <sub>0</sub>	878.00	886.00	879.00
BD55%	483.00	487.00	484.00
BD27.5%	241.00	244.00	242.00

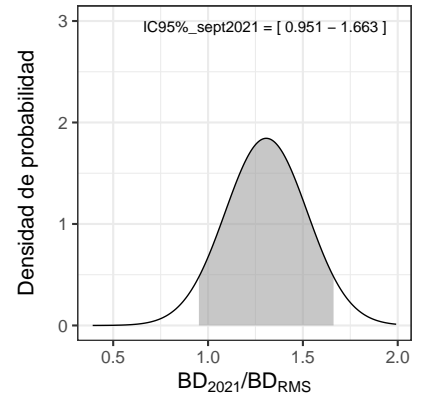


## Indicadores de estatus

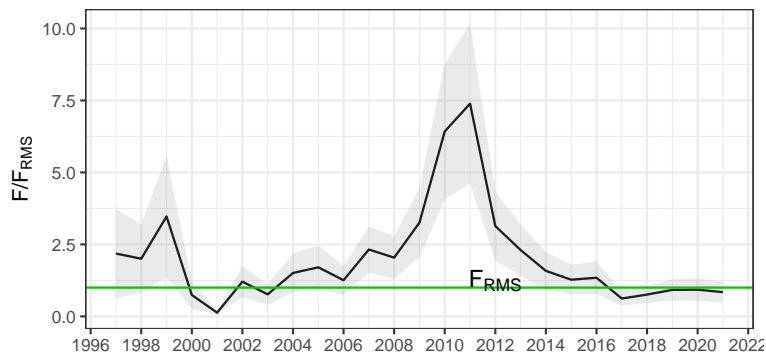
a)



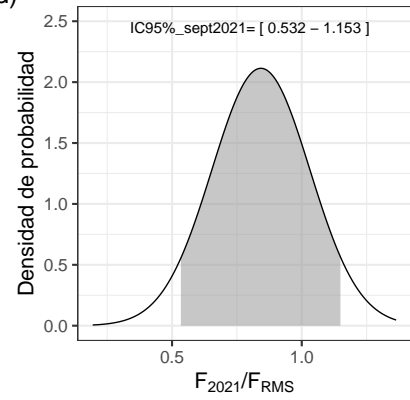
b)



c)



d)

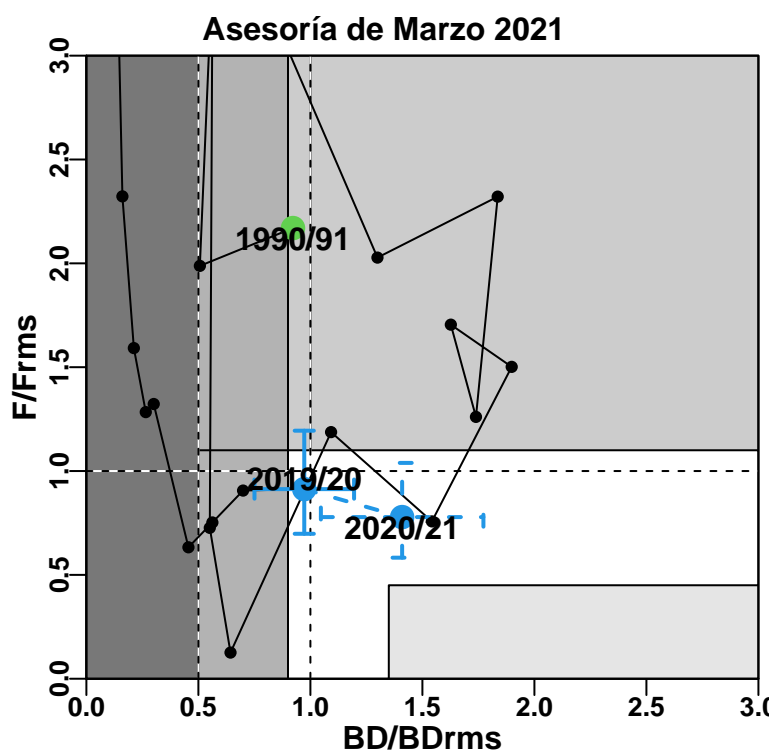
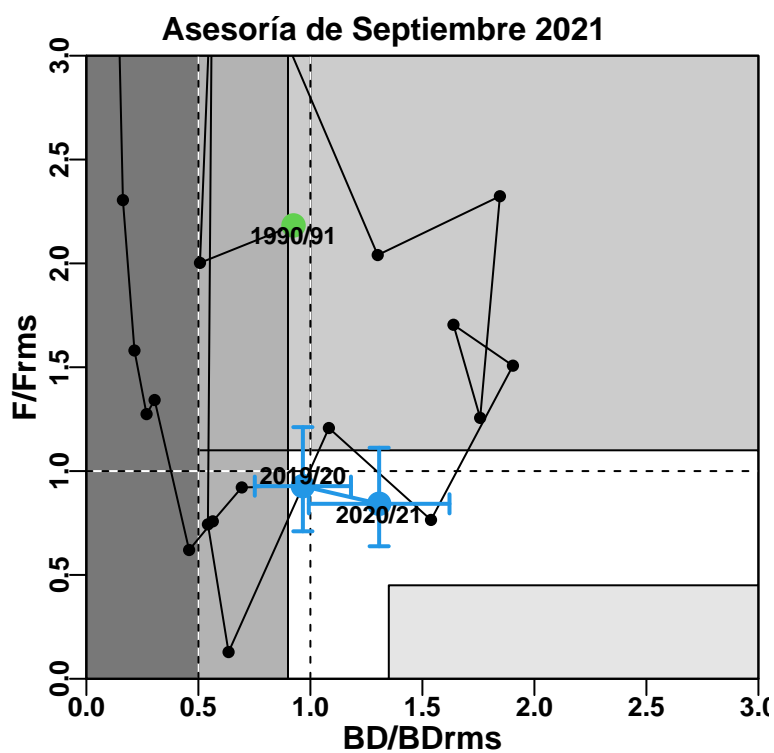


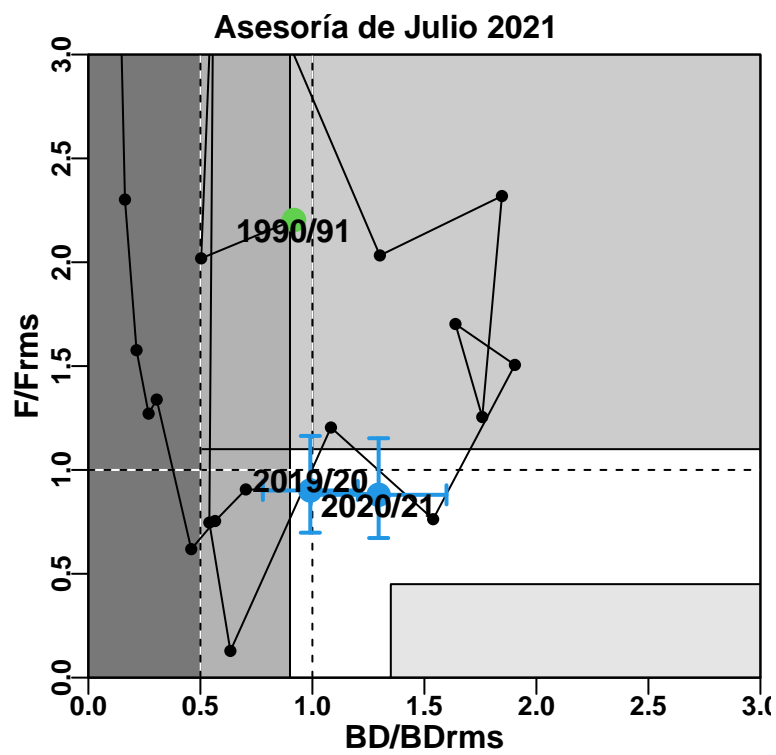
Años	$F/F_{RMS_{sept}}$	$F/F_{RMS_{marzo}}$	$F/F_{RMS_{julio}}$	$BD/BD_{RMS_{sept}}$	$BD/BD_{RMS_{marzo}}$	$BD/BD_{RMS_{julio}}$
1996/97	2.183	2.17	2.203	0.925	0.922	0.918
1997/98	2.003	1.988	2.019	0.507	0.507	0.503
1998/99	3.47	3.426	3.492	0.561	0.563	0.558
1999/00	0.743	0.726	0.747	0.543	0.551	0.54
2000/01	0.129	0.126	0.129	0.635	0.643	0.634
2001/02	1.207	1.187	1.204	1.083	1.092	1.083
2002/03	0.765	0.758	0.763	1.538	1.542	1.539
2003/04	1.507	1.502	1.506	1.904	1.899	1.904
2004/05	1.704	1.705	1.703	1.639	1.627	1.639
2005/06	1.256	1.261	1.255	1.758	1.739	1.758
2006/07	2.323	2.321	2.319	1.846	1.836	1.846
2007/08	2.04	2.028	2.033	1.3	1.299	1.301
2008/09	3.257	3.238	3.246	0.818	0.816	0.819
2009/10	6.422	6.458	6.412	0.426	0.42	0.426
2010/11	7.388	7.429	7.39	0.182	0.18	0.182
2011/12	3.138	3.152	3.136	0.145	0.144	0.146
2012/13	2.305	2.322	2.302	0.163	0.161	0.163
2013/14	1.581	1.592	1.577	0.215	0.212	0.215
2014/15	1.274	1.284	1.271	0.269	0.265	0.269
2015/16	1.342	1.323	1.339	0.305	0.301	0.305
2016/17	0.62	0.633	0.619	0.459	0.455	0.459
2017/18	0.758	0.752	0.754	0.564	0.562	0.566
2018/19	0.921	0.906	0.906	0.694	0.7	0.703
2019/20	0.927	0.913	0.901	0.966	0.973	0.991
2020/21	0.842	0.778	0.88	1.307	1.41	1.296

Años	$Y/BT_{sept}$	$Y/BT_{marzo}$	$Y/BT_{julio}$	$C/N_{sept}$	$C/N_{marzo}$	$C/N_{julio}$
1996/97	0.228	0.227	0.229	0.164	0.163	0.164
1997/98	0.208	0.206	0.209	0.156	0.155	0.156
1998/99	0.681	0.671	0.682	0.326	0.322	0.327
1999/00	0.118	0.115	0.118	0.064	0.063	0.064
2000/01	0.023	0.023	0.023	0.011	0.011	0.011
2001/02	0.32	0.315	0.319	0.14	0.139	0.14
2002/03	0.151	0.15	0.151	0.07	0.07	0.07
2003/04	0.22	0.219	0.22	0.147	0.147	0.147
2004/05	0.253	0.253	0.253	0.147	0.148	0.147
2005/06	0.199	0.198	0.199	0.113	0.112	0.112
2006/07	0.417	0.415	0.417	0.251	0.25	0.25
2007/08	0.385	0.383	0.384	0.225	0.225	0.224
2008/09	0.461	0.461	0.461	0.274	0.275	0.273
2009/10	0.724	0.725	0.724	0.447	0.447	0.446
2010/11	0.737	0.738	0.737	0.436	0.436	0.435
2011/12	0.461	0.463	0.461	0.211	0.212	0.211
2012/13	0.372	0.373	0.371	0.203	0.203	0.202
2013/14	0.286	0.287	0.286	0.14	0.14	0.139
2014/15	0.268	0.27	0.268	0.12	0.121	0.12
2015/16	0.254	0.25	0.254	0.11	0.108	0.109
2016/17	0.115	0.117	0.115	0.057	0.058	0.057
2017/18	0.168	0.165	0.166	0.074	0.073	0.073
2018/19	0.251	0.248	0.247	0.081	0.081	0.08
2019/20	0.197	0.192	0.191	0.089	0.085	0.086
2020/21	0.226	0.218	0.227	0.123	0.117	0.13



## Diagramas de fase





**Tabla 21.**

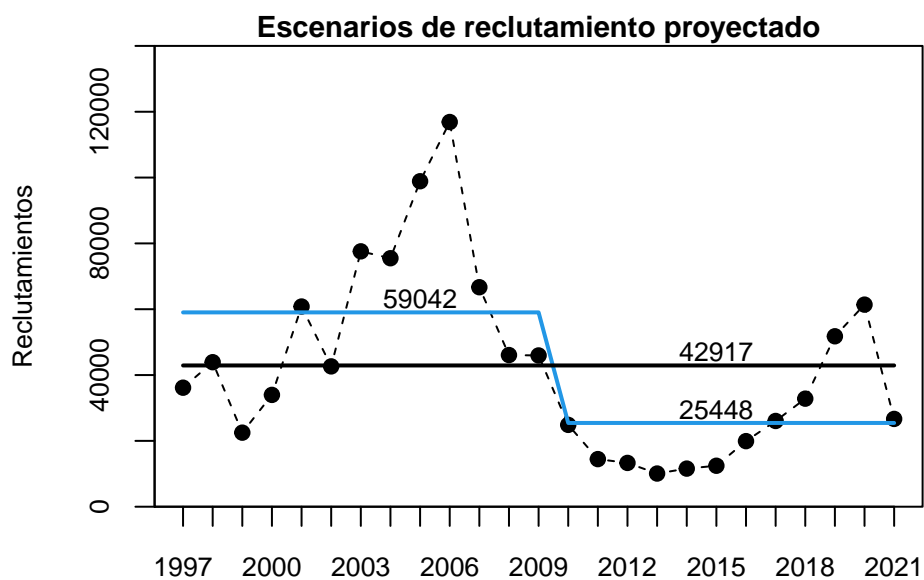
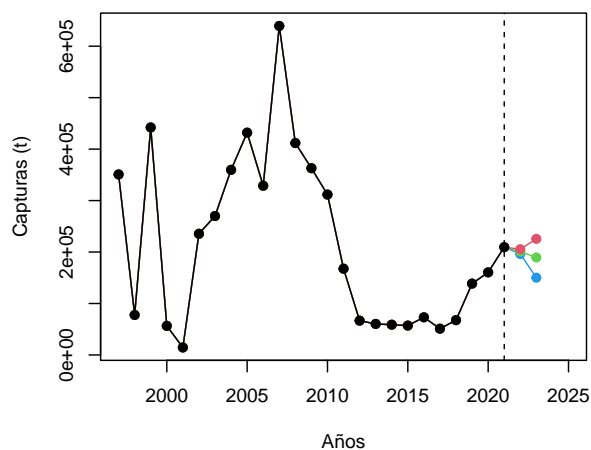
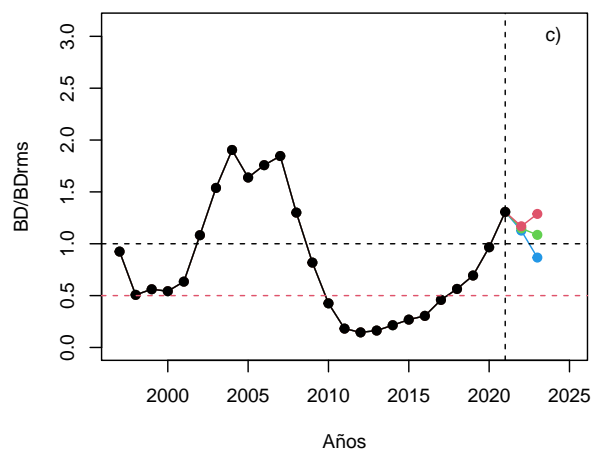
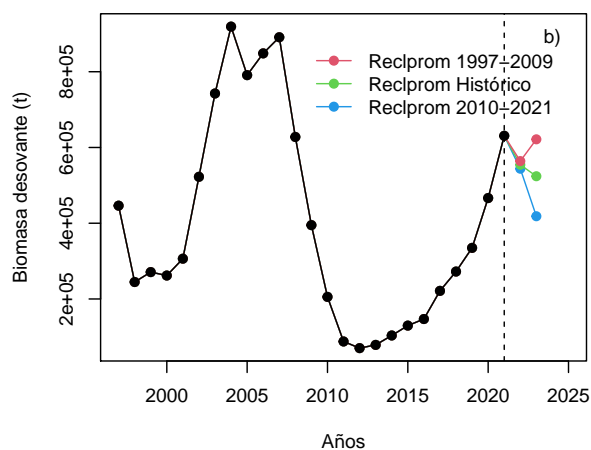
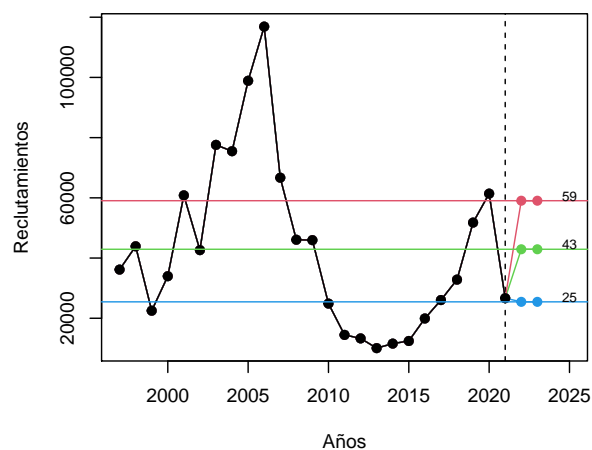
Puntos Biológicos de referencia (PBRs) y probabilidades de estar bajo  $BD_{RMS}$  y sobre  $F_{RMS}$  y en sobreexplotación, colapsado o sobrepesca.

	Septiembre 2021	Marzo 2021	Julio 2021
Año biológico	2020/21	2020/21	2020/21
$F_{RMS}$	0.45	0.44	0.45
$BD_{RMS}$	483	487	484
$BD_{LIM}$	241	244	242
$p(BD_{last} < BD_{RMS})$	0.08	0.05	0.08
$p(F_{last} > F_{RMS})$	0.2	0.11	0.27
$p(sobre - explotación)$	0.03	0.02	0.03
$p(agotado/colapsado)$	0	0	0
$p(sobrepesca)$	0.09	0.04	0.13

## CBA inicial (Asesoría de septiembre)

	R1	R2	R3
$BD_{RMS}$ (mil t)	482.69	482.69	482.69
$BD_{2022}$ (mil t)	564.00	554.00	544.00
$C_{2022}$ (mil t)	206.00	201.00	196.00
$C_{1erS2022}$ ( mil t)	144.00	141.00	137.00
$C_{2022}$ (-descarte mil t)	201.00	197.00	192.00
$C_{1erS2022}$ (-descarte mil t)	141.00	138.00	135.00
$BD_{2022}/BD_{RMS}$	1.17	1.15	1.13
$p(BD_{2022} < BD_{RMS})$	0.22	0.25	0.28
$p(sobreexplotación)$	0.11	0.13	0.15
$p(agotado/colapsado)$	0.00	0.00	0.00

	R1	R2	R3
$BD_{RMS}$ (mil t)	482.69	482.69	482.69
$BD_{2023}$ (mil t)	622.00	524.00	418.00
$C_{2023}$ (mil t)	226.00	189.00	150.00
$C_{2doS2022}$ ( mil t)	68.00	57.00	45.00
$C_{2023}$ (-descarte mil t)	221.00	186.00	147.00
$C_{2doS2022}$ (-descarte mil t)	66.00	56.00	44.00
$BD_{2023}/BD_{RMS}$	1.29	1.09	0.87
$p(BD_{2023} < BD_{RMS})$	0.00	0.24	0.84
$p(sobreexplotación)$	0.00	0.06	0.60
$p(agotado/colapsado)$	0.00	0.00	0.00

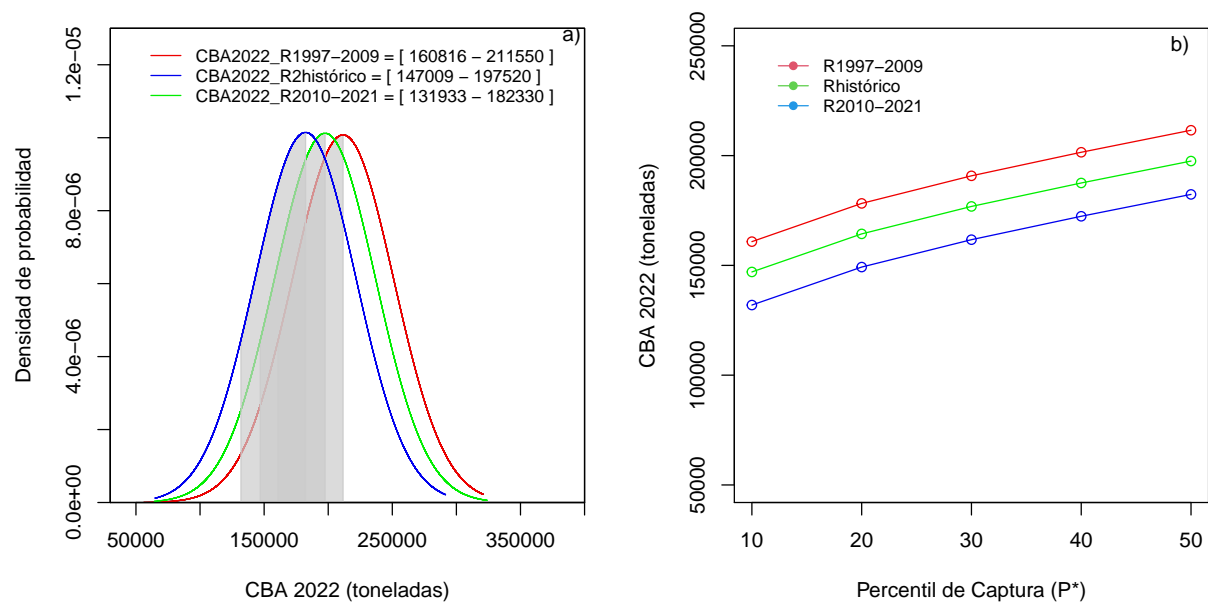
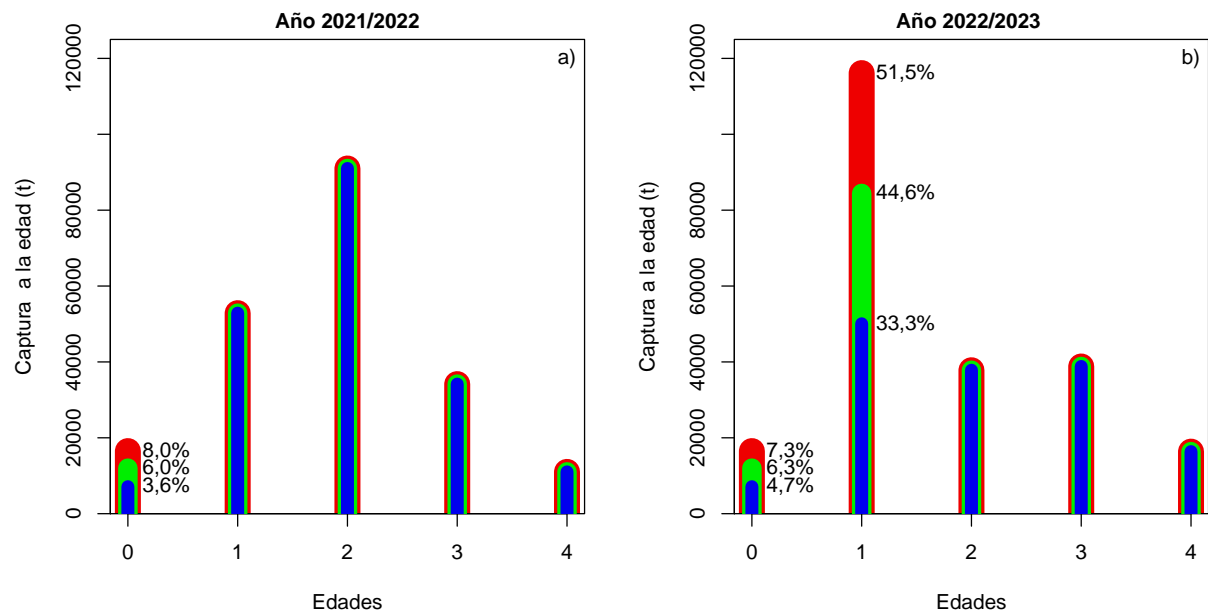


	1997-2009	Histórico	2010-2020
mean	211550	197520	182330
std	39588	39414	39325
10%	160816	147009	131933
20%	178232	164348	149233
30%	190790	176851	161708
40%	201520	187535	172367
50%	211550	197520	182330

	1997-2009	Histórico	2010-2020
mean	207310	193570	178690
std	38796	38626	38538
10%	157591	144069	129302
20%	174658	161062	146256
30%	186965	173315	158481
40%	197481	183784	168927
50%	207310	193570	178690

	1997-2009	Histórico	2010-2020
10%	0.24	0.26	0.28
20%	0.16	0.17	0.18
30%	0.10	0.10	0.11
40%	0.05	0.05	0.05
50%	0.00	0.00	0.00

	1997-2009	Histórico	2010-2020
10%	157600	144069	129294
20%	174667	161061	146249
30%	186974	173314	158474
40%	197490	183784	168920
50%	207319	193570	178683



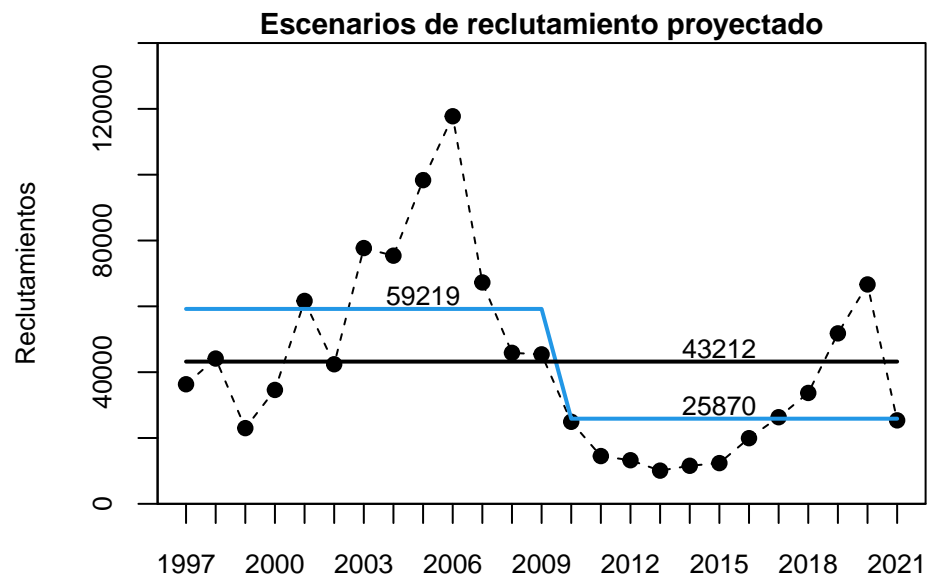
	V1	V2	V3	V4	V5
C1eryearR1	16503	52855	90986	34155	11018
C1eryearR2	11996	52855	90986	34155	11018
C1eryearR3	7113	52855	90986	34155	11018
C2doyearR1	16503	116132	37811	38802	16362
C2doyearR2	11996	84415	37811	38802	16362
C2doyearR3	7113	50055	37811	38802	16362

	V1
pC1Recl1	8.03
pC1Recl2	5.97

	V1
pC1Recl3	3.63
pC2Recl1	7.31
pC2Recl2	6.33
pC2Recl3	4.74
pC2GE21	51.47
pC2GE22	44.57
pC2GE23	33.34



## Primera Revisión de CBA (Asesoría de marzo)



**Tabla 25.**

Primera revisión de CBA 2021 de anchoveta centro-sur bajo  $F_{cte} = F_{RMS}$  con sus respectivos percentiles de probabilidad entre 10% y 50% y tres escenarios de reclutamiento.

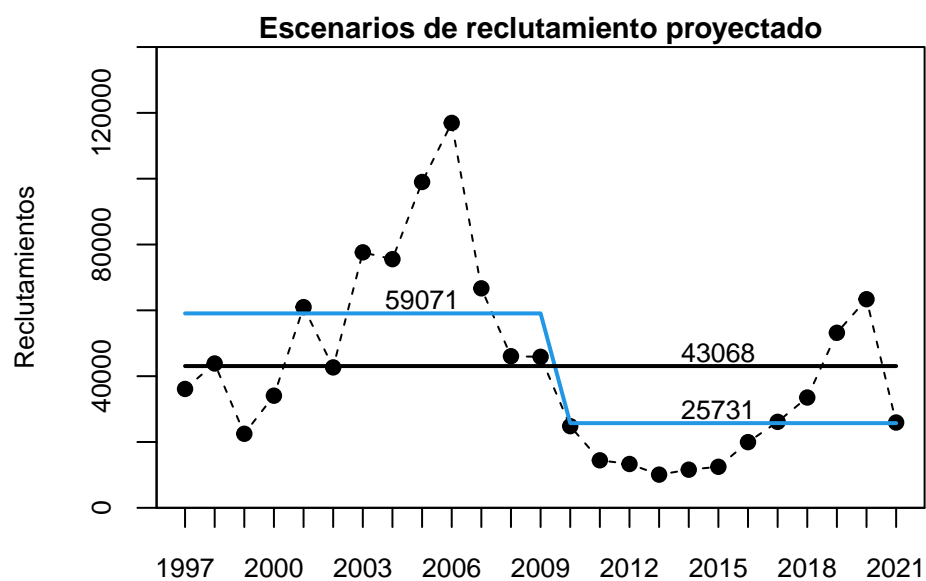
	1997-2009	Histórico	2010-2021
mean	205360	204260	202860
std	15645	15671	15709
10%	185310	184177	182728
20%	192193	191071	189639
30%	197156	196042	194622
40%	201396	200290	198880
50%	205360	204260	202860

	1997-2009	Histórico	2010-2021
10%	0.10	0.10	0.10
20%	0.06	0.06	0.07
30%	0.04	0.04	0.04
40%	0.02	0.02	0.02
50%	0.00	0.00	0.00

	1997-2009	Histórico	2010-2021
10%	181604	180493	179074
20%	188349	187250	185846
30%	193213	192121	190730
40%	197368	196284	194903
50%	201253	200175	198803

	1997-2009	Histórico	2010-2021
10%	15	25	39
20%	8	16	27
30%	3	11	20
40%	0	7	15
50%	-3	3	11

## Segunda Revisión de CBA (Asesoría de marzo 2021)



	1997-2009	Histórico	2010-2021
mean	207760	206640	205210
std	13322	13328	13342
10%	190687	189559	188112
20%	196548	195423	193981
30%	200774	199651	198213
40%	204385	203263	201830
50%	207760	206640	205210

	1997-2009	Histórico	2010-2021
10%	0.08	0.08	0.08
20%	0.05	0.05	0.05
30%	0.03	0.03	0.03
40%	0.02	0.02	0.02
50%	0.00	0.00	0.00

	1997-2009	Histórico	2010-2021
10%	186873	185768	184349
20%	192617	191514	190101
30%	196758	195658	194249
40%	200297	199198	197793
50%	203605	202507	201106

	1997-2009	Histórico	2010-2021
10%	19	29	43
20%	10	19	30
30%	5	13	23
40%	1	8	17

	1997-2009	Histórico	2010-2021
50%	-2	5	13

## Proyección Estatus 2021 - Asesoría septiembre

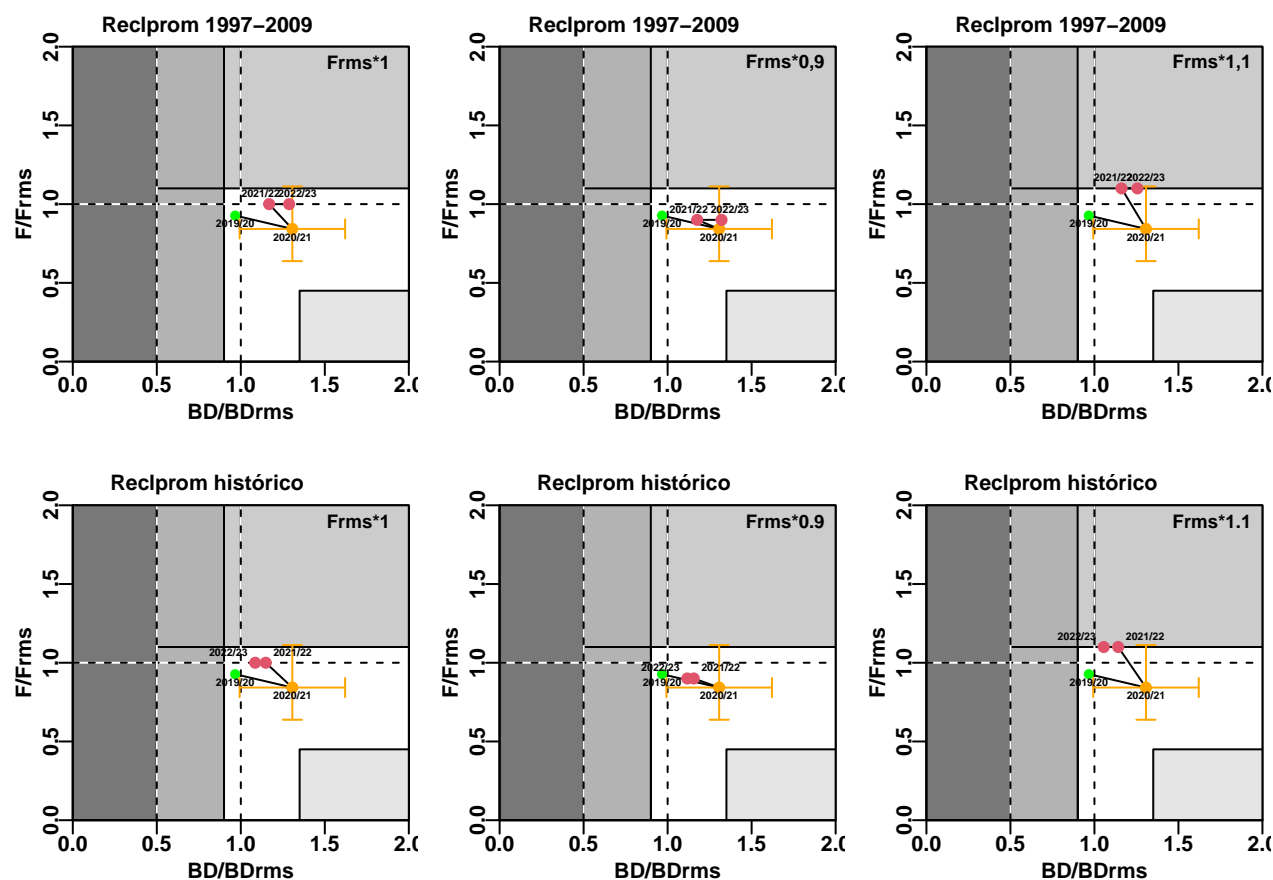
	1997-2009[F <sub>RMS</sub> *1]	[F <sub>RMS</sub> *0.9]	[F <sub>RMS</sub> *0.7]
p(sobre-explotación)_2020/21	0.32	0.32	0.32
p(colapso)_2020/21	0.00	0.00	0.00
p(sobre-explotación)_2021/22	0.03	0.03	0.03
p(colapso)_2021/22	0.00	0.00	0.00
p(sobre-explotación)_2022/23	0.11	0.10	0.11
p(colapso)_2022/23	0.00	0.00	0.00

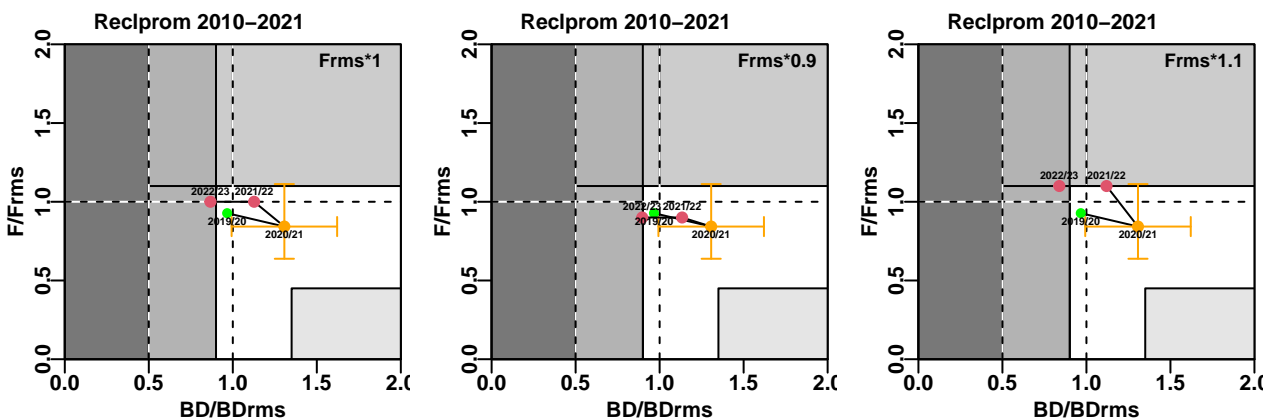
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	histórico[F <sub>RMS</sub> *1]	[F <sub>RMS</sub> *0.9]	[F <sub>RMS</sub> *0.7]
p(sobre-explotación)_2020/21	0.32	0.32	0.32
p(colapso)_2020/21	0.00	0.00	0.00
p(sobre-explotación)_2021/22	0.03	0.03	0.03
p(colapso)_2021/22	0.00	0.00	0.00
p(sobre-explotación)_2022/23	0.13	0.12	0.13
p(colapso)_2022/23	0.00	0.00	0.00

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	2010 - 2021[F <sub>RMS</sub> *1]	[F <sub>RMS</sub> *0.9]	[F <sub>RMS</sub> *0.7]
p(sobre-explotación)_2020/21	0.32	0.32	0.32
p(colapso)_2020/21	0.00	0.00	0.00
p(sobre-explotación)_2021/22	0.03	0.03	0.03
p(colapso)_2021/22	0.00	0.00	0.00
p(sobre-explotación)_2022/23	0.15	0.15	0.16
p(colapso)_2022/23	0.00	0.00	0.00





### Proyección Estatus 2022 - Asesoría marzo 2021

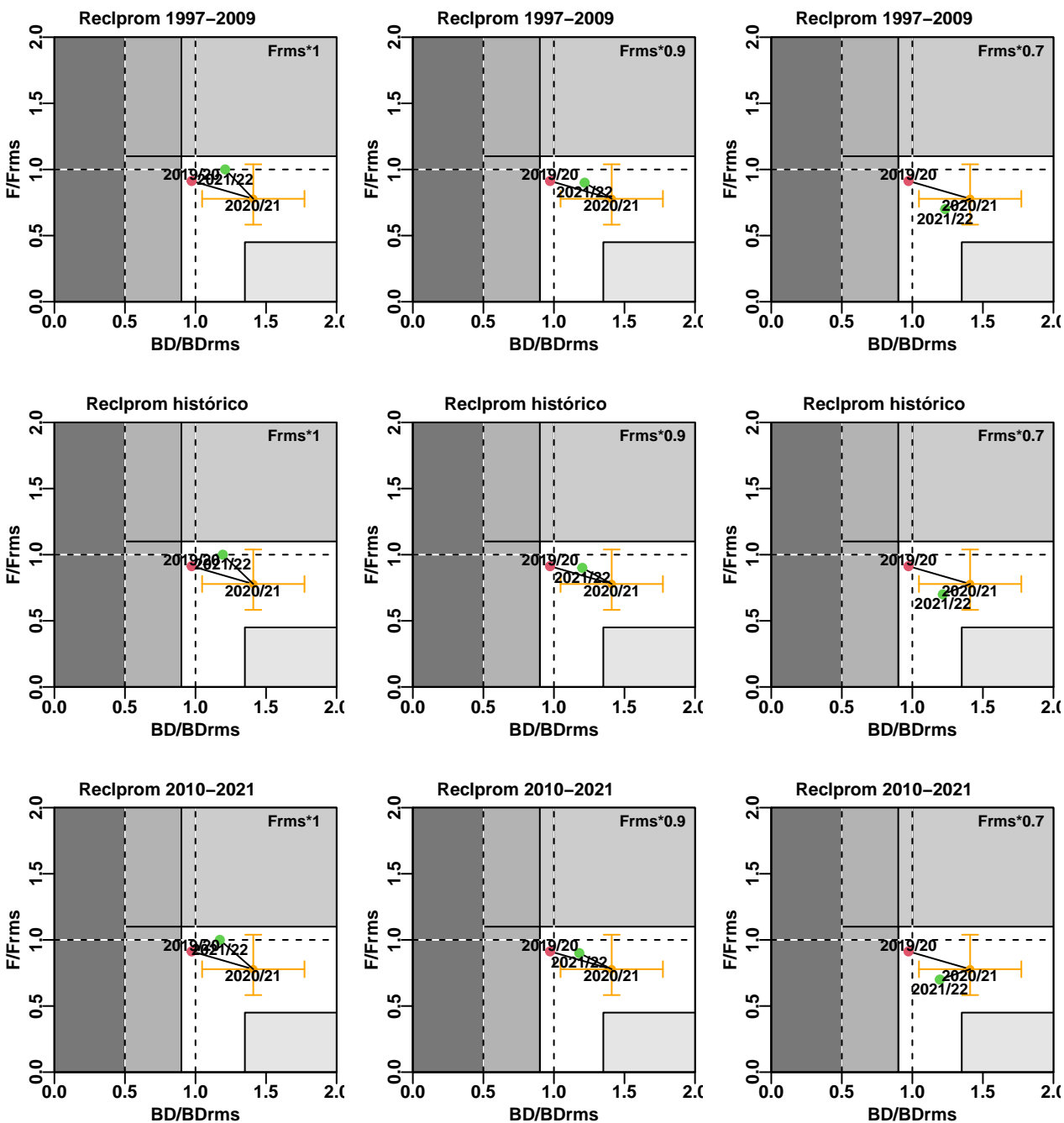
	1997-2009[ $F_{RMS}*1$ ]	[ $F_{RMS}*0.9$ ]	[ $F_{RMS}*0.7$ ]
$p(BD < 0,9BD_{RMS})_{2020/21}$	0.02	0.02	0.02
$p(BD < 0,5BD_{RMS})_{2020/21}$	0.00	0.00	0.00
$p(BD < 0,9BD_{RMS})_{2021/22}$	0.11	0.11	0.10
$p(BD < 0,5BD_{RMS})_{2021/22}$	0.00	0.00	0.00

	histórico[ $F_{RMS}*1$ ]	[ $F_{RMS}*0.9$ ]	[ $F_{RMS}*0.7$ ]
$p(BD < 0,9BD_{RMS})_{2020/21}$	0.02	0.02	0.02
$p(BD < 0,5BD_{RMS})_{2020/21}$	0.00	0.00	0.00
$p(BD < 0,9BD_{RMS})_{2021/22}$	0.12	0.12	0.11
$p(BD < 0,5BD_{RMS})_{2021/22}$	0.00	0.00	0.00

	2010 - 2021[ $F_{RMS}*1$ ]	[ $F_{RMS}*0.9$ ]	[ $F_{RMS}*0.7$ ]
$p(BD < 0,9BD_{RMS})_{2020/21}$	0.02	0.02	0.02
$p(BD < 0,5BD_{RMS})_{2020/21}$	0.00	0.00	0.00
$p(BD < 0,9BD_{RMS})_{2021/22}$	0.14	0.14	0.13
$p(BD < 0,5BD_{RMS})_{2021/22}$	0.00	0.00	0.00



### Proyección Estatus 2022 - Asesoría julio 2021

	1997-2009[ $F_{RMS}*1$ ]	[ $F_{RMS}*0.9$ ]	[ $F_{RMS}*0.7$ ]
$p(BD < 0.9BD_{RMS})_{2020/21}$	0.03	0.03	0.03
$p(BD < 0.5BD_{RMS})_{2020/21}$	0.00	0.00	0.00
$p(BD < 0.9BD_{RMS})_{2021/22}$	0.11	0.10	0.09
$p(BD < 0.5BD_{RMS})_{2021/22}$	0.00	0.00	0.00

	histórico[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	0.03	0.03	0.03
p(BD<0,5BD <sub>RMS</sub> )_2020/21	0.00	0.00	0.00
p(BD<0,9BD <sub>RMS</sub> )_2021/22	0.12	0.12	0.11
p(BD<0,5BD <sub>RMS</sub> )_2021/22	0.00	0.00	0.00
	2010 - 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	0.03	0.03	0.03
p(BD<0,5BD <sub>RMS</sub> )_2020/21	0.00	0.00	0.00
p(BD<0,9BD <sub>RMS</sub> )_2021/22	0.15	0.14	0.13
p(BD<0,5BD <sub>RMS</sub> )_2021/22	0.00	0.00	0.00



