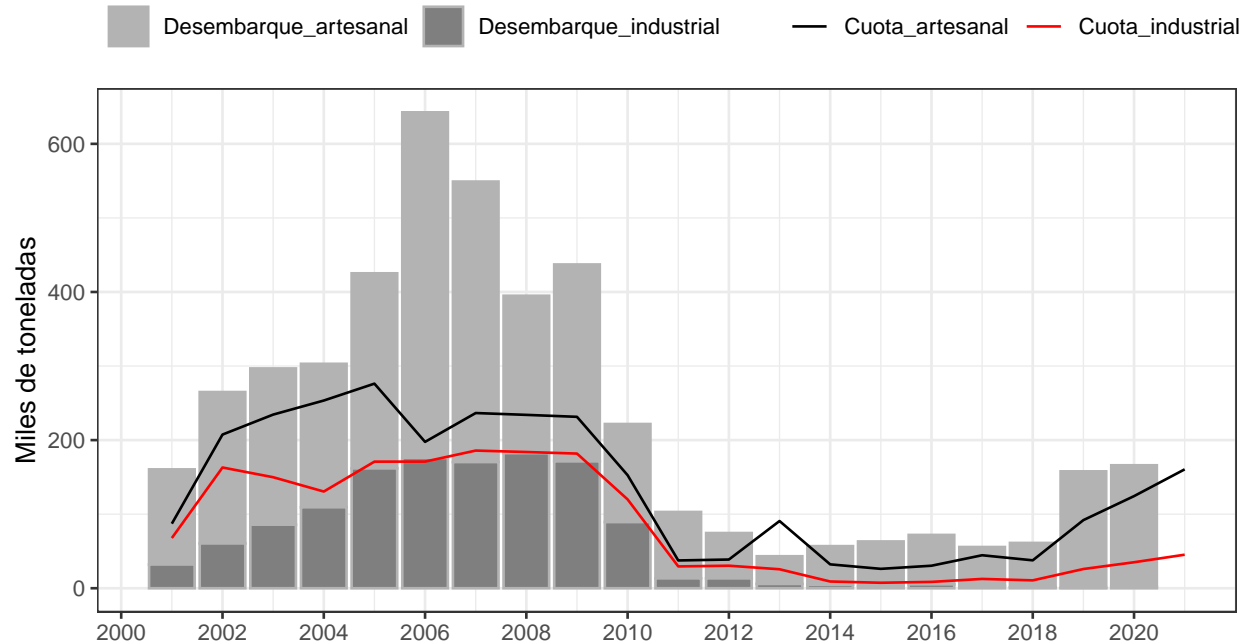
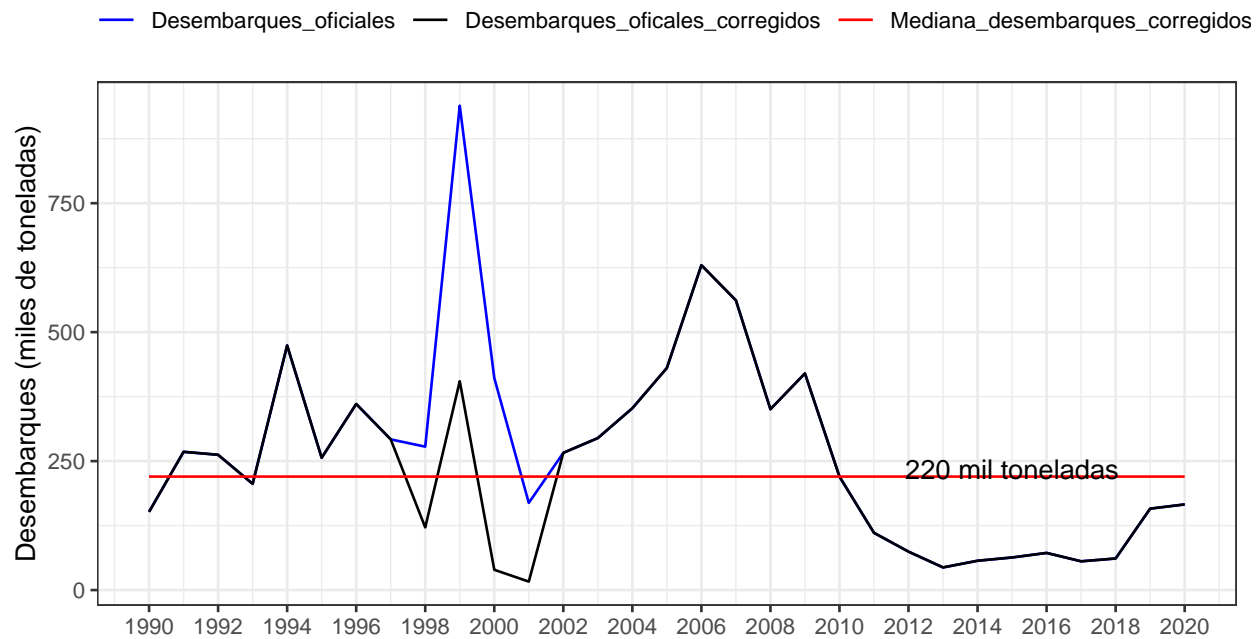
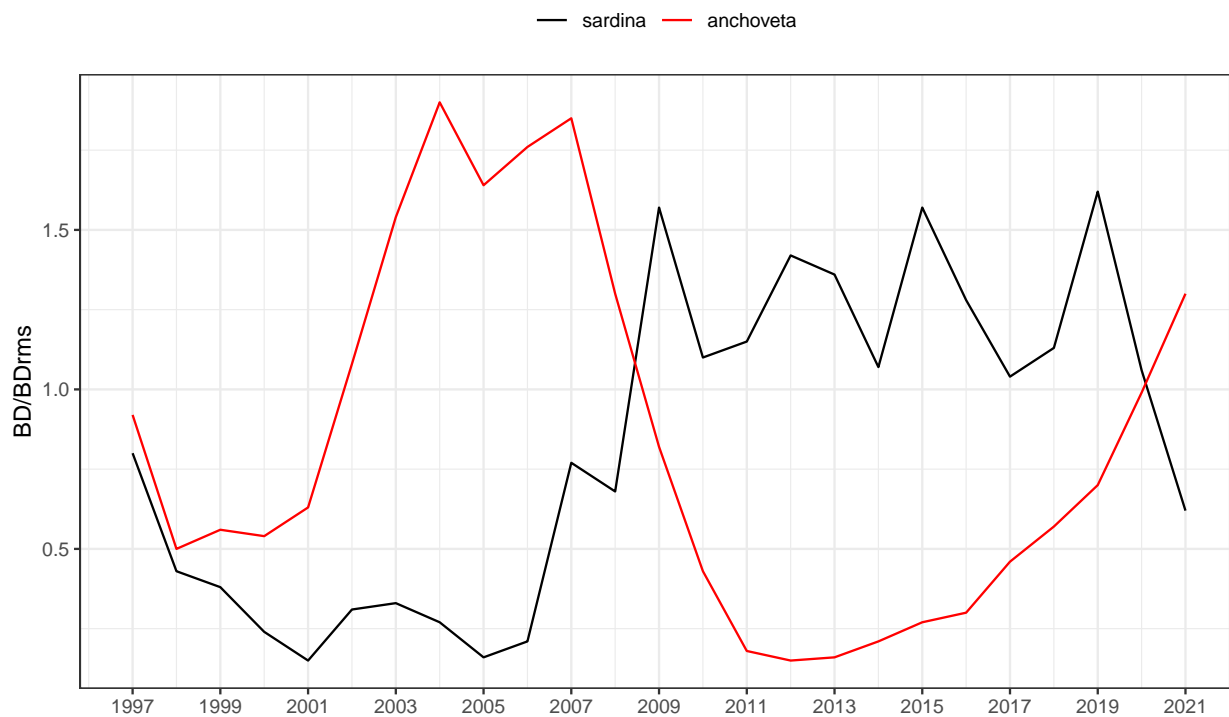
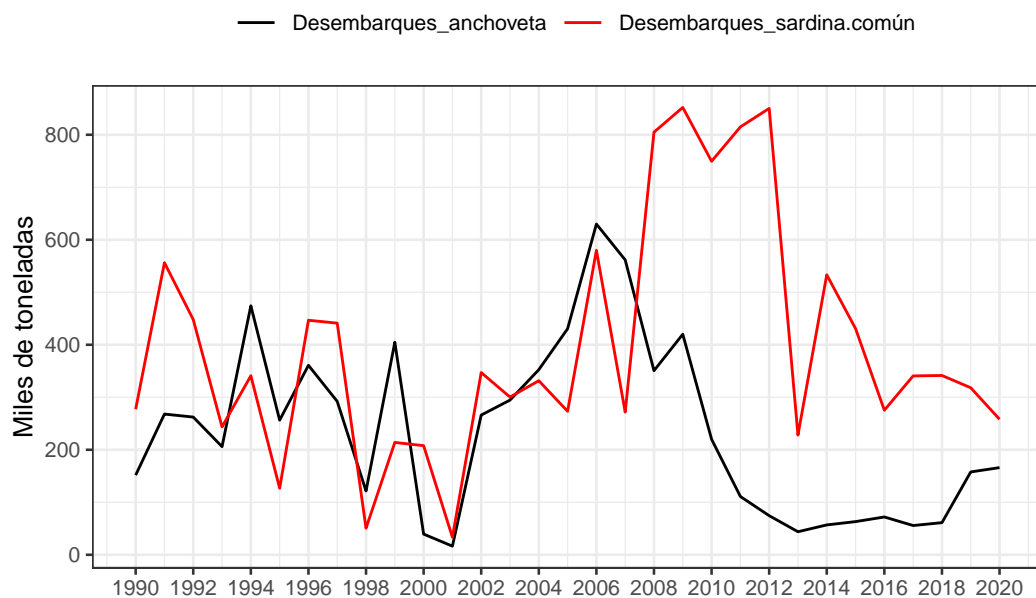


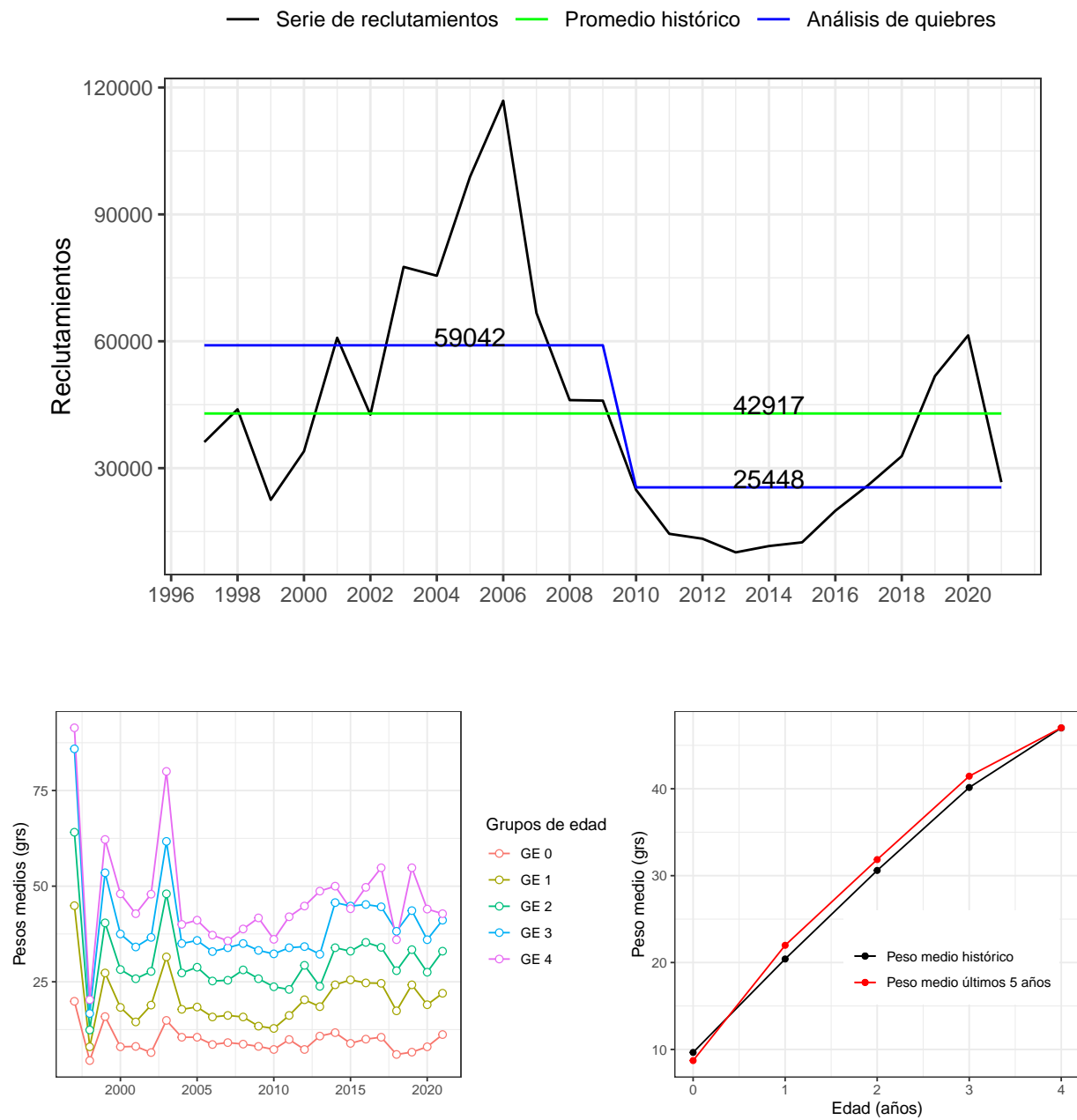
# Figura y Tablas Primer Informe Anchoveta Centro-sur Septiembre 2021

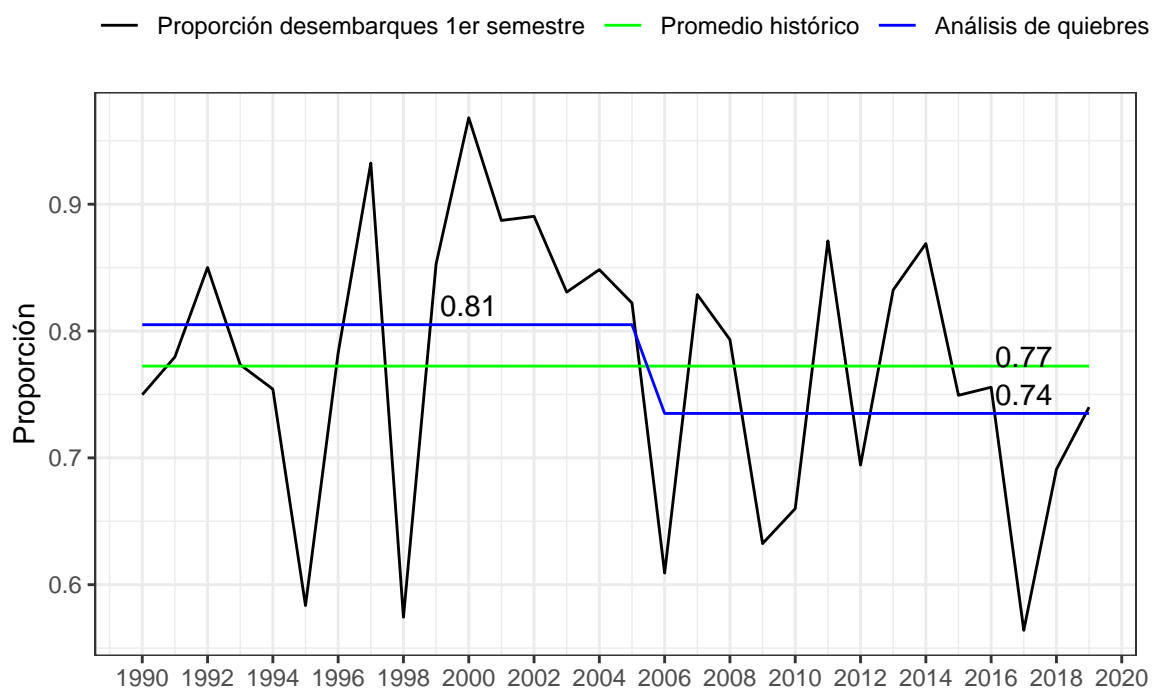
## ANTECEDENTES





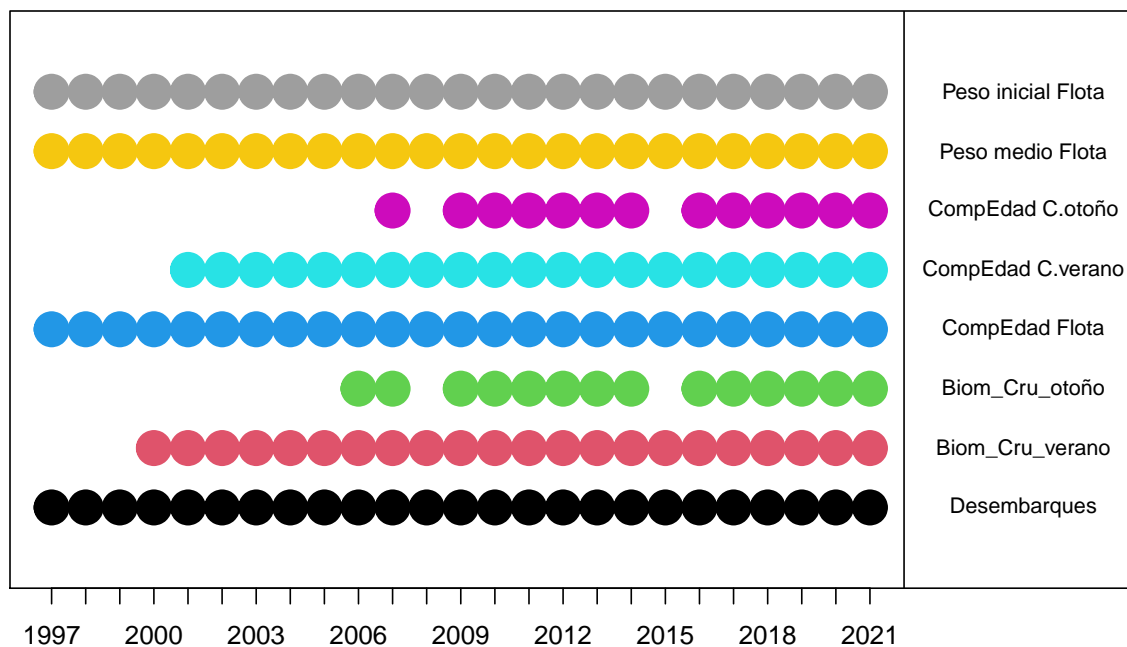
## METODOLOGÍA





## RESULTADOS

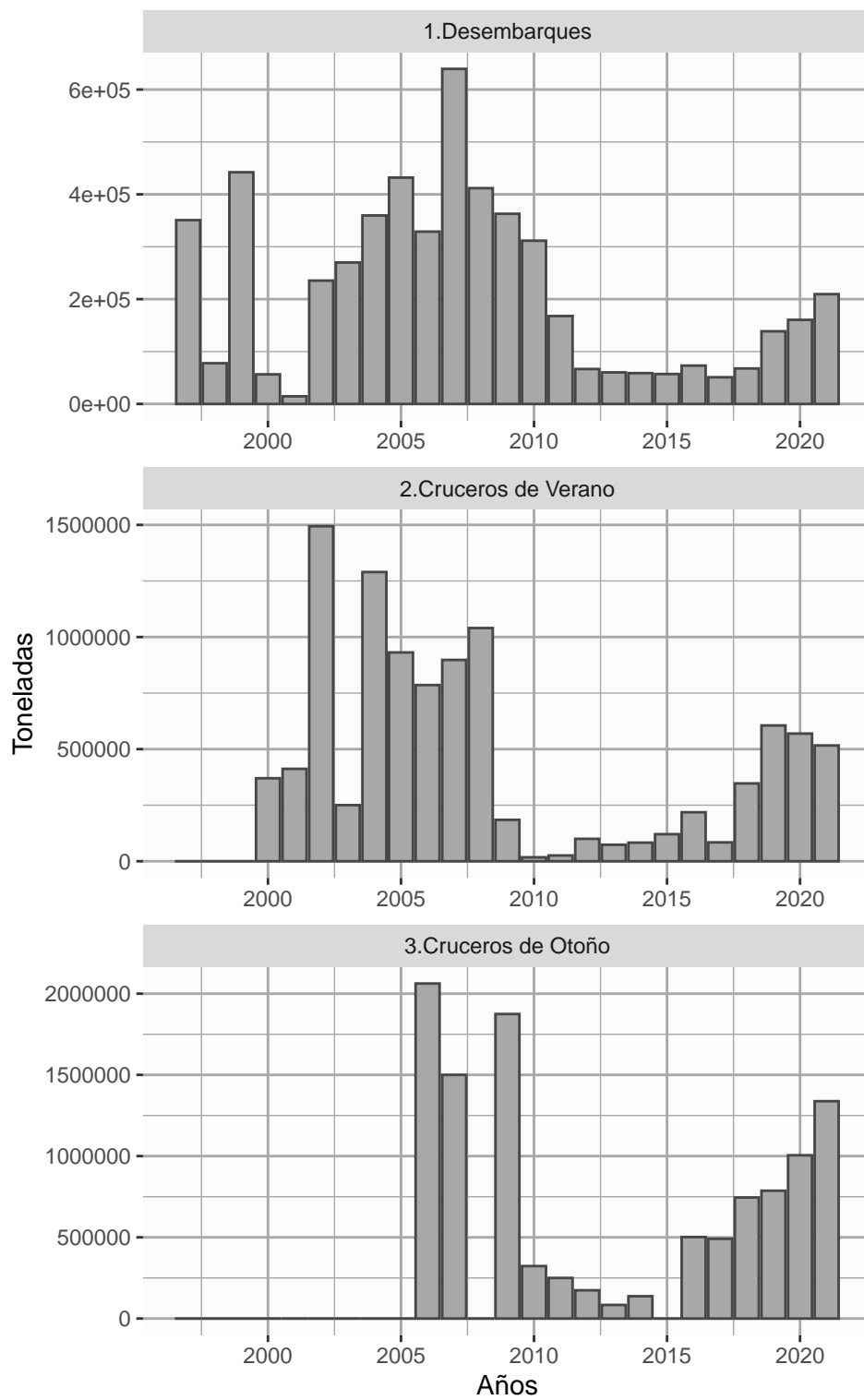
### Datos de entrada al modelo

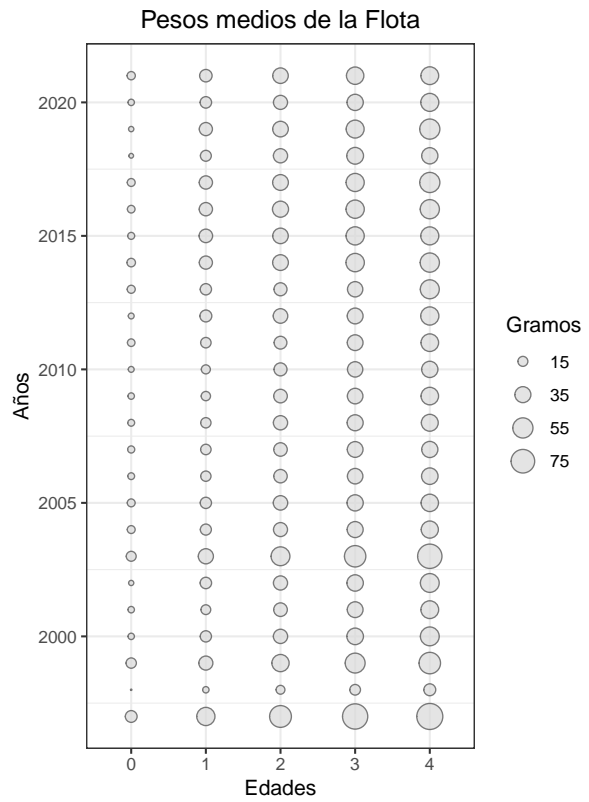
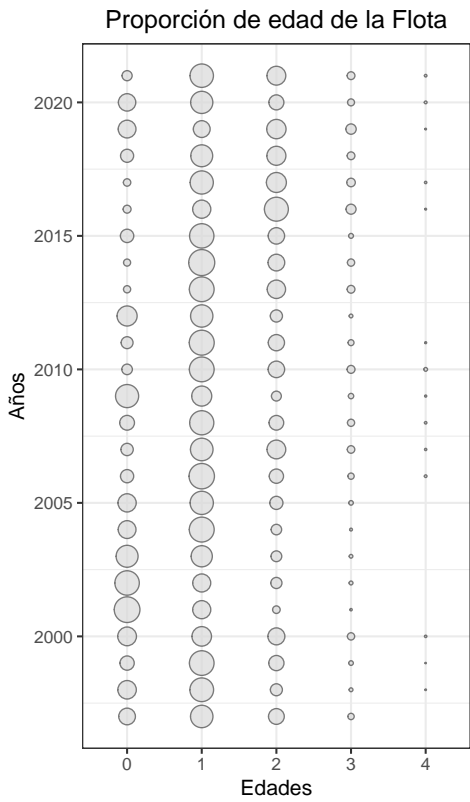
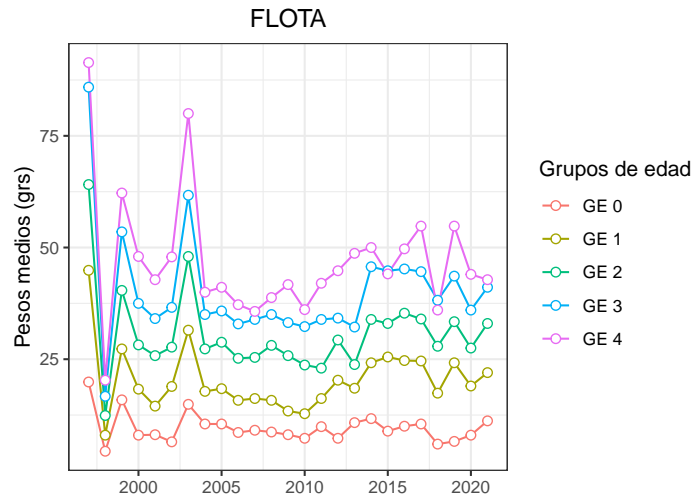
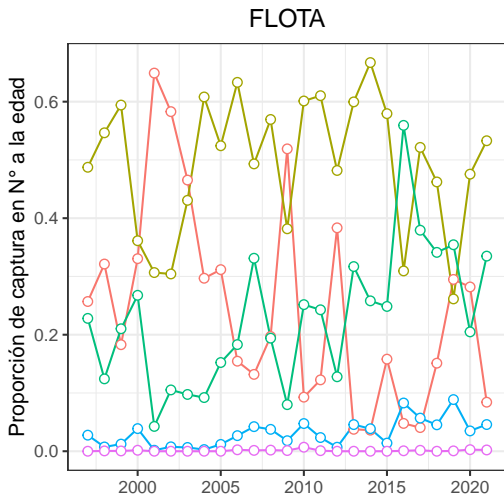


**Tabla 16.**  
Desembarques en toneladas, porcentaje de descarte supuesto, captura descartada (toneladas) y captura total

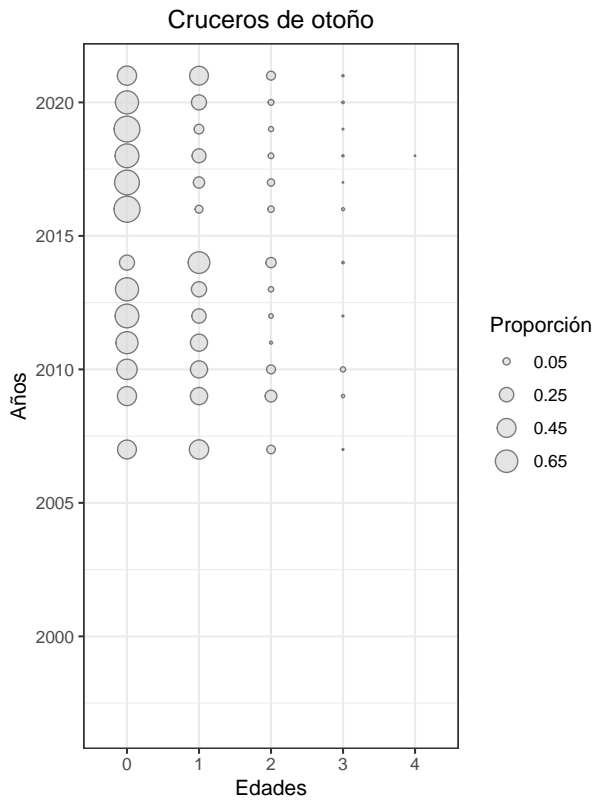
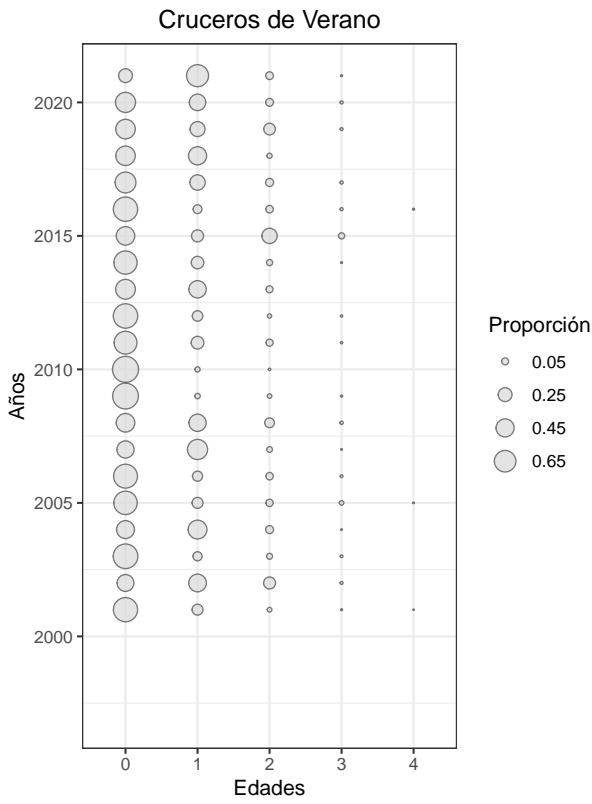
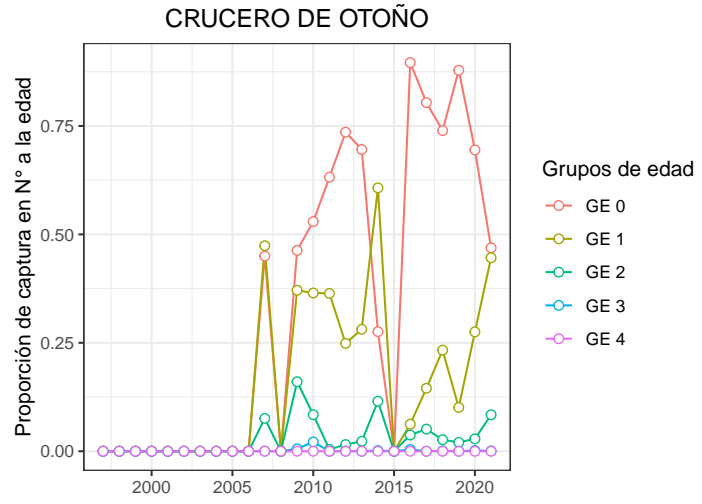
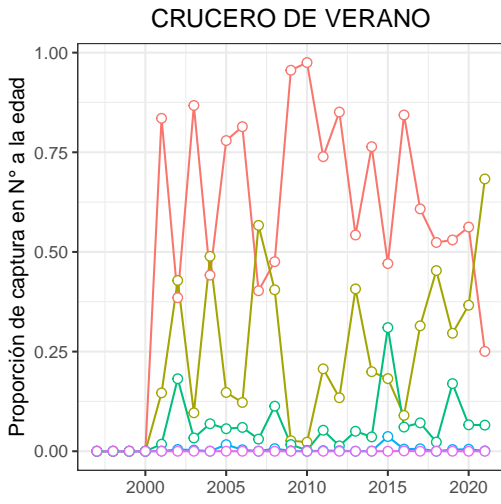
(toneladas) estimadas en año biológico para anchoveta de las Regiones de Valparaíso a Los Lagos.

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

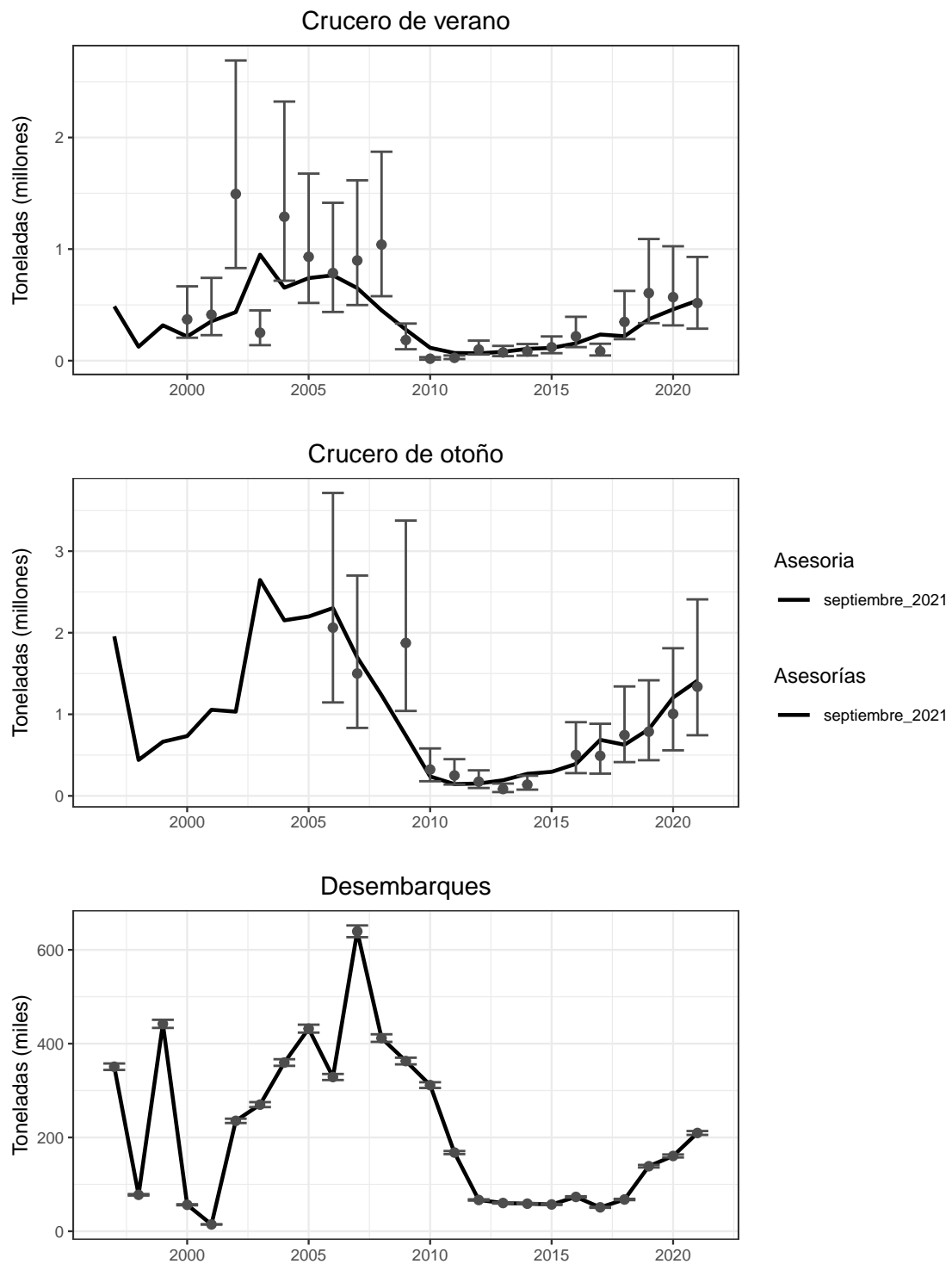




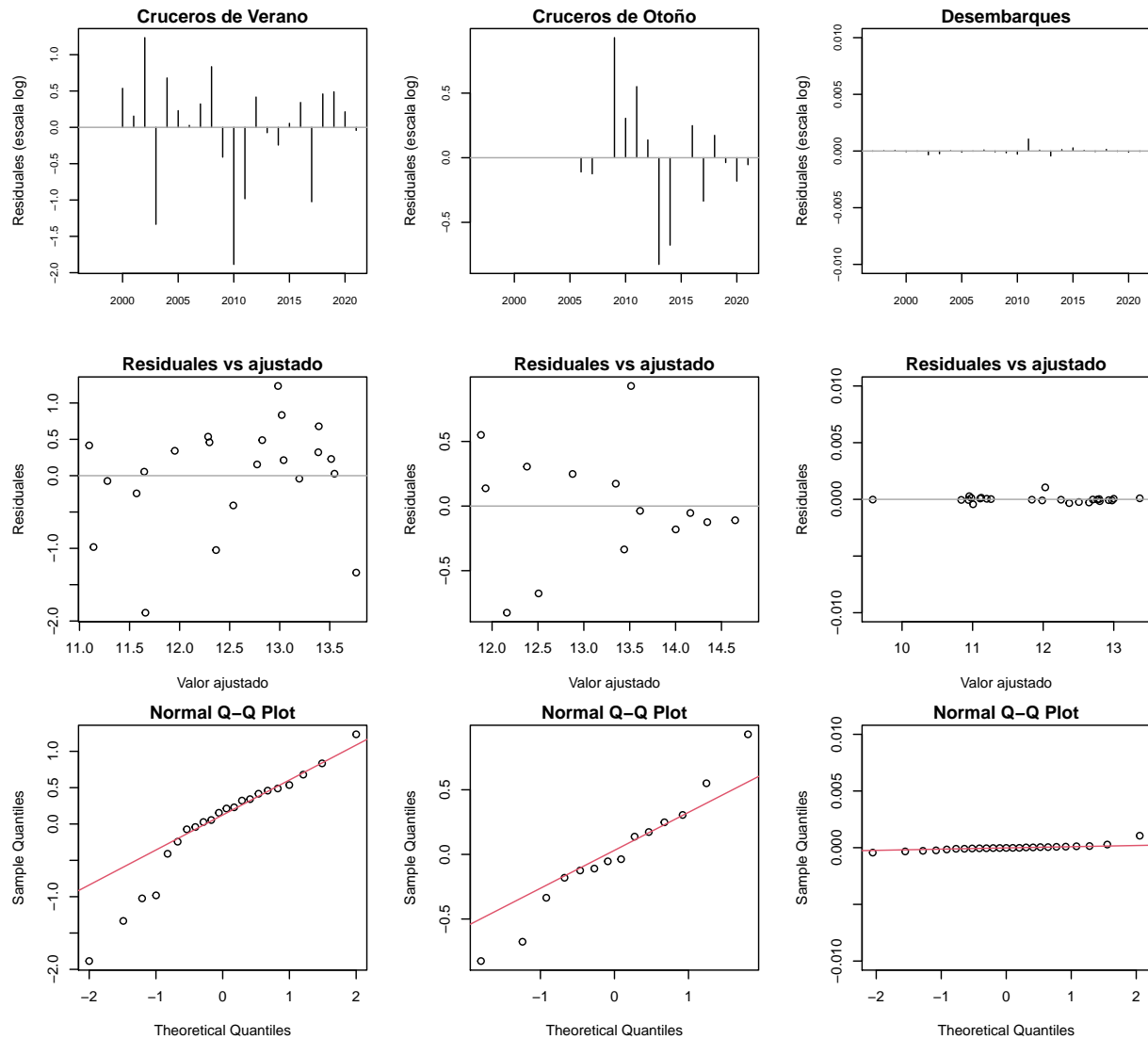




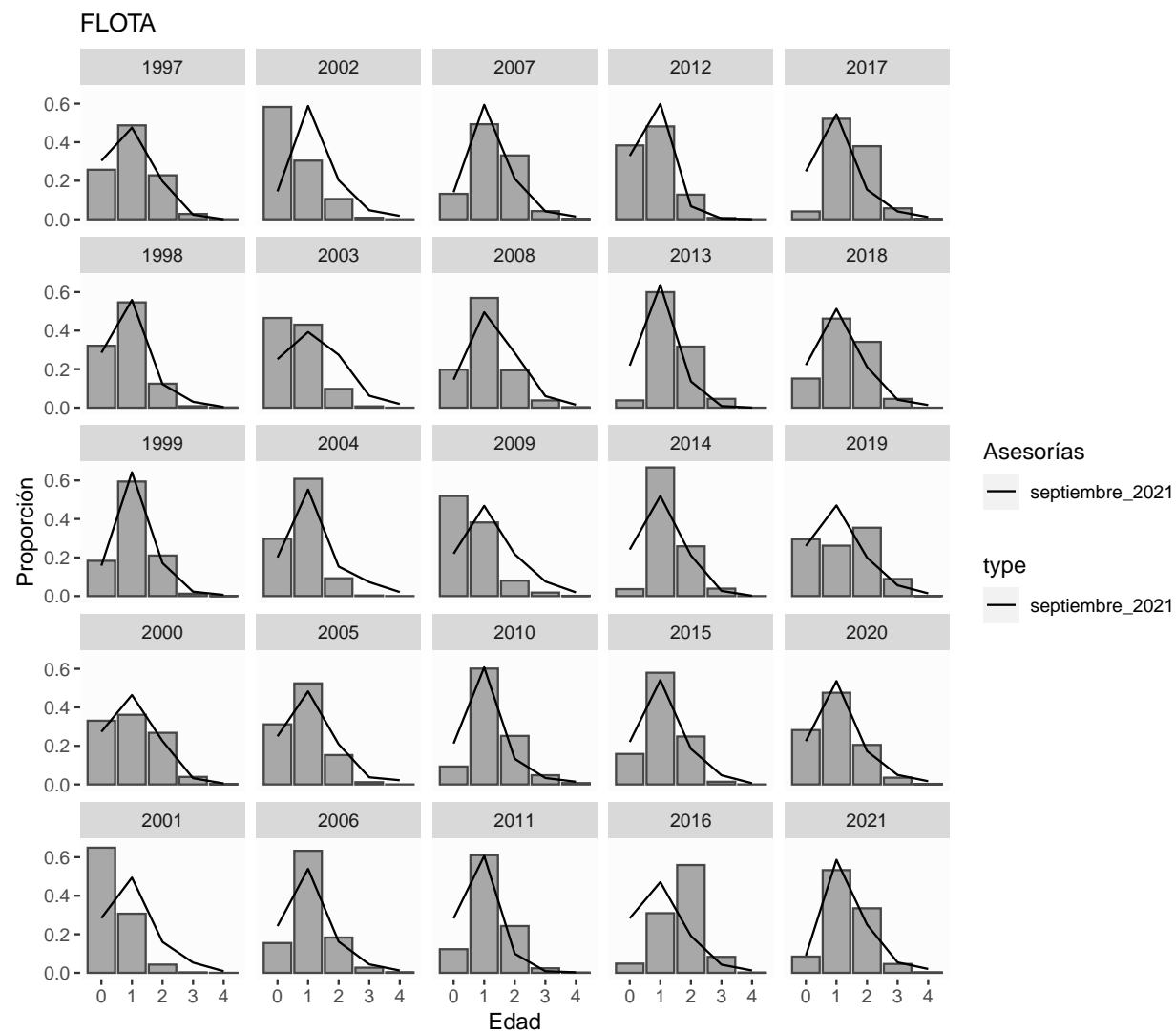
## Ajuste de los índices de abundancia



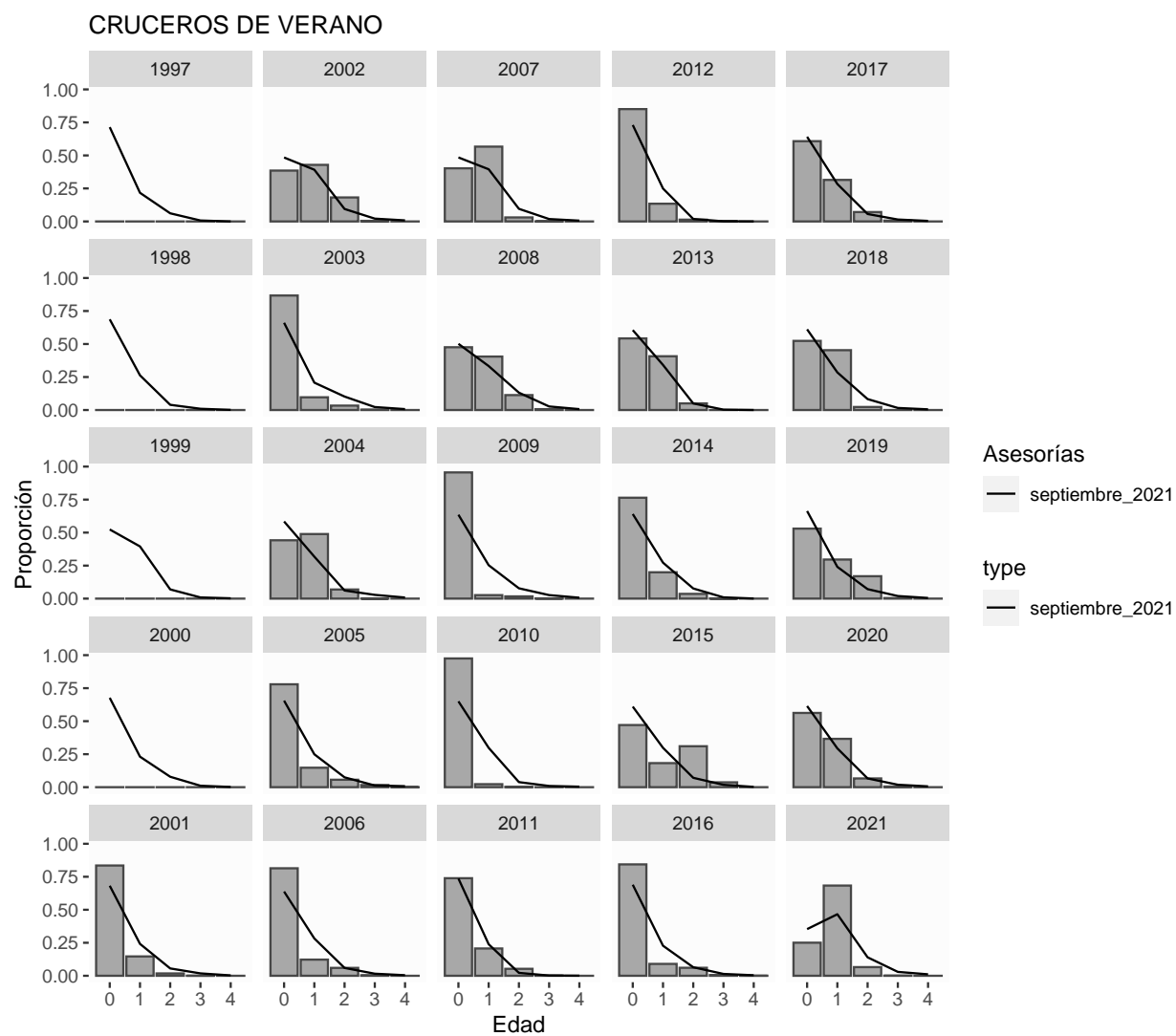
## Residuos de los índices de abundancia



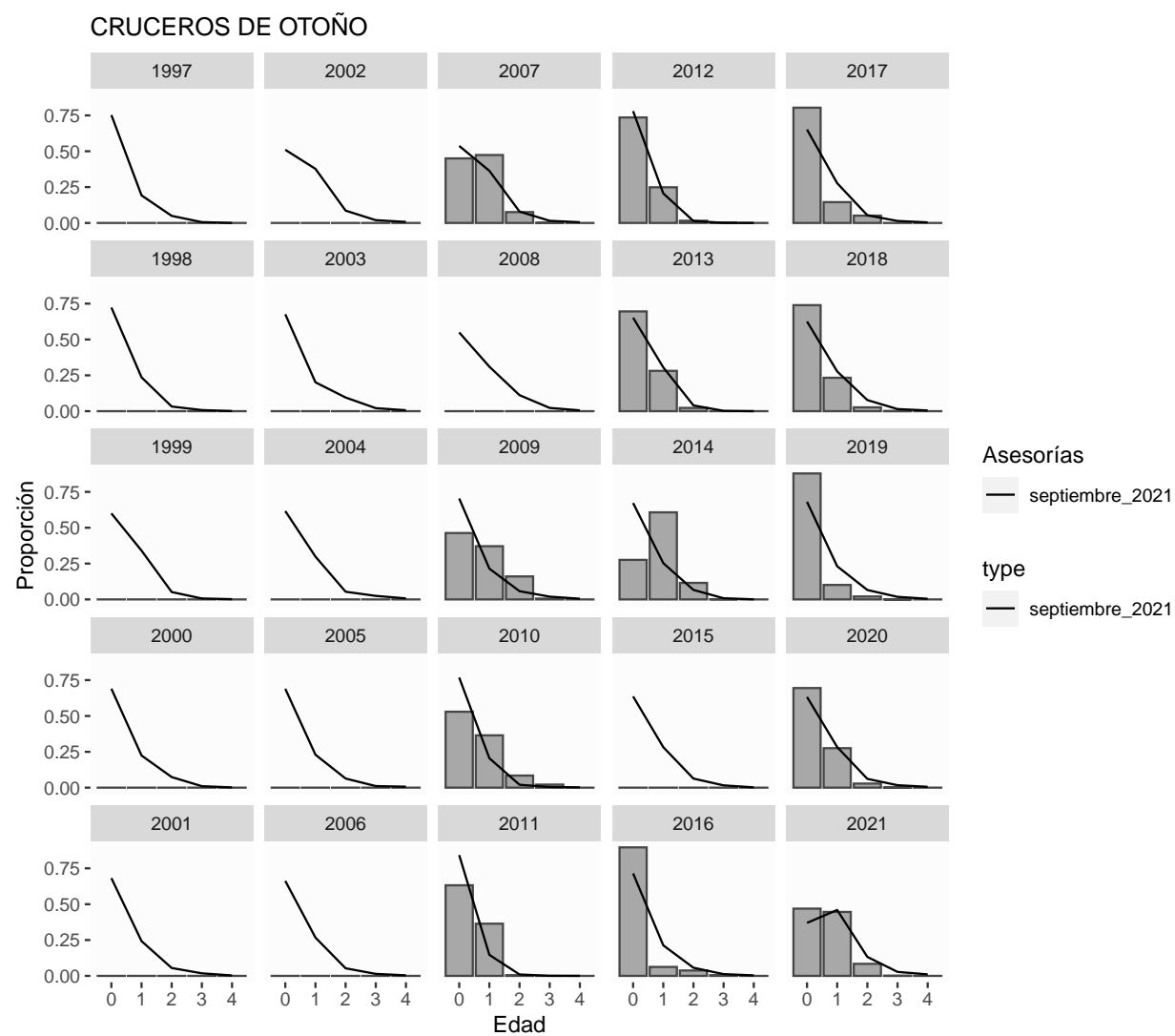
## Ajuste de la composición de edad de la Flota



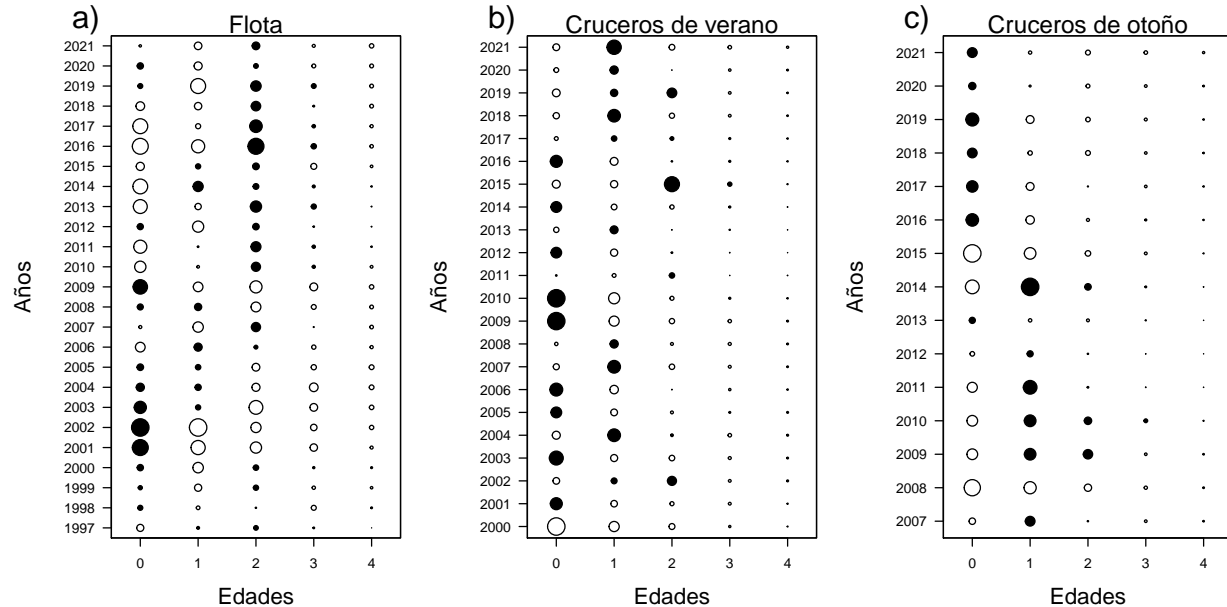
## Ajuste de la composición de edad de la Crucero de Verano



## 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

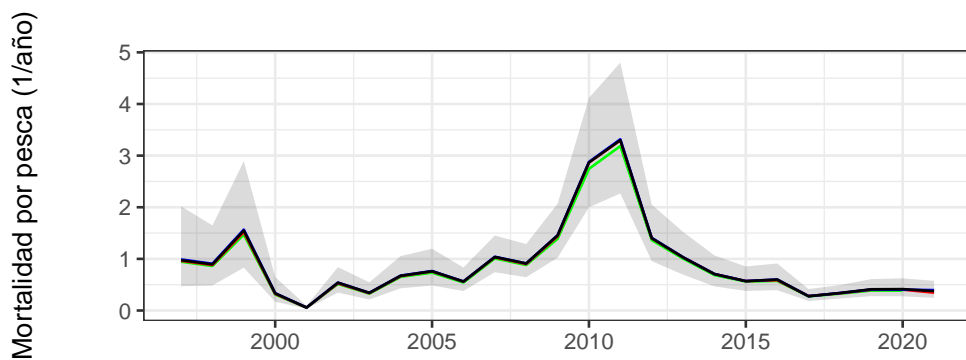
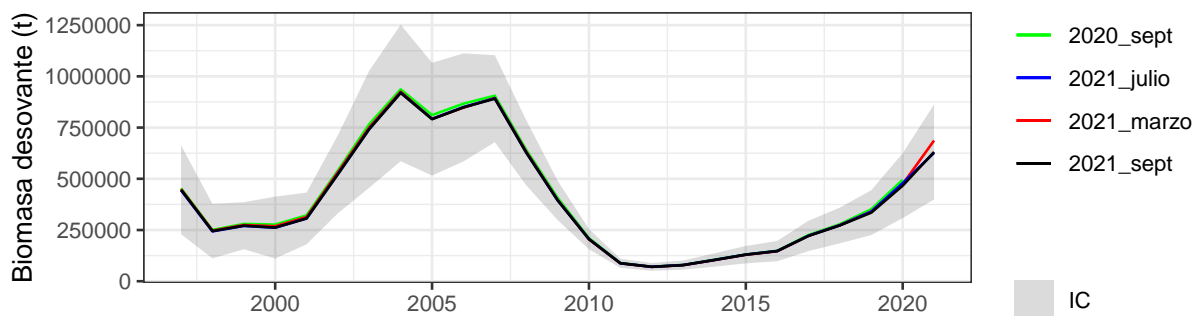
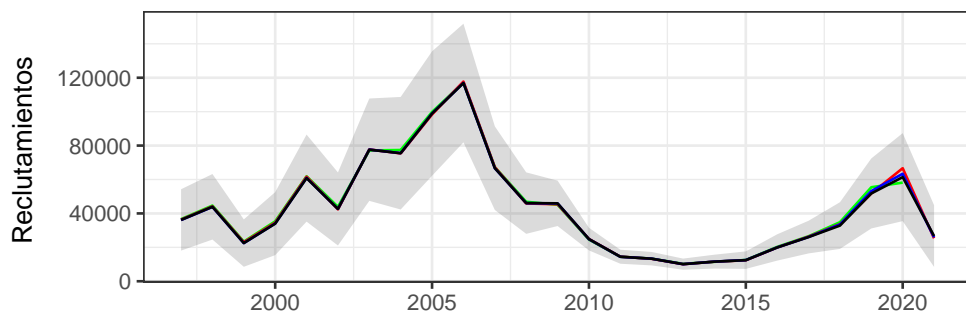
```
sept20 <-paste(dir.1,"/MAE0920b.rep",sep="")
mar21 <-paste(dir.1,"/MAE0321b.rep",sep="")
jul21 <-paste(dir.1,"/MAE0721b.rep",sep="")
sept21 <-paste(dir.1,"/MAE0921b.rep",sep="")
#####
rep_sept20 <- reptoRlist(sept20)
rep_mar21 <- reptoRlist(mar21)
rep_jul21 <- reptoRlist(jul21)
rep_sept21 <- reptoRlist(sept21)
#####
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))

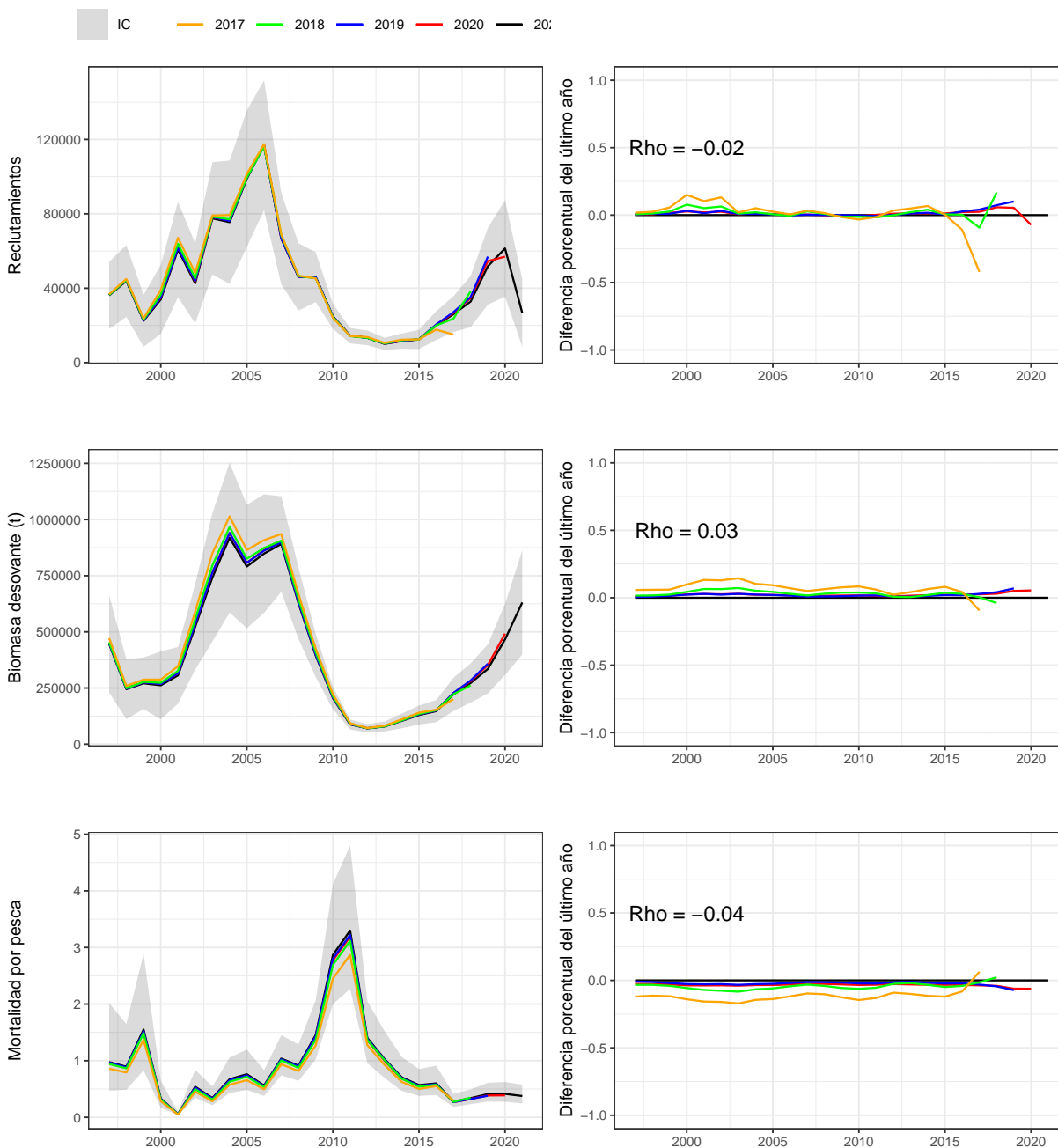
Ftcomp <- data.frame(x=years,
                     Ft_sept20=c(rep_sept20$Ftot,NA),
                     Ft_mar21=c(rep_mar21$Ftot),
```

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

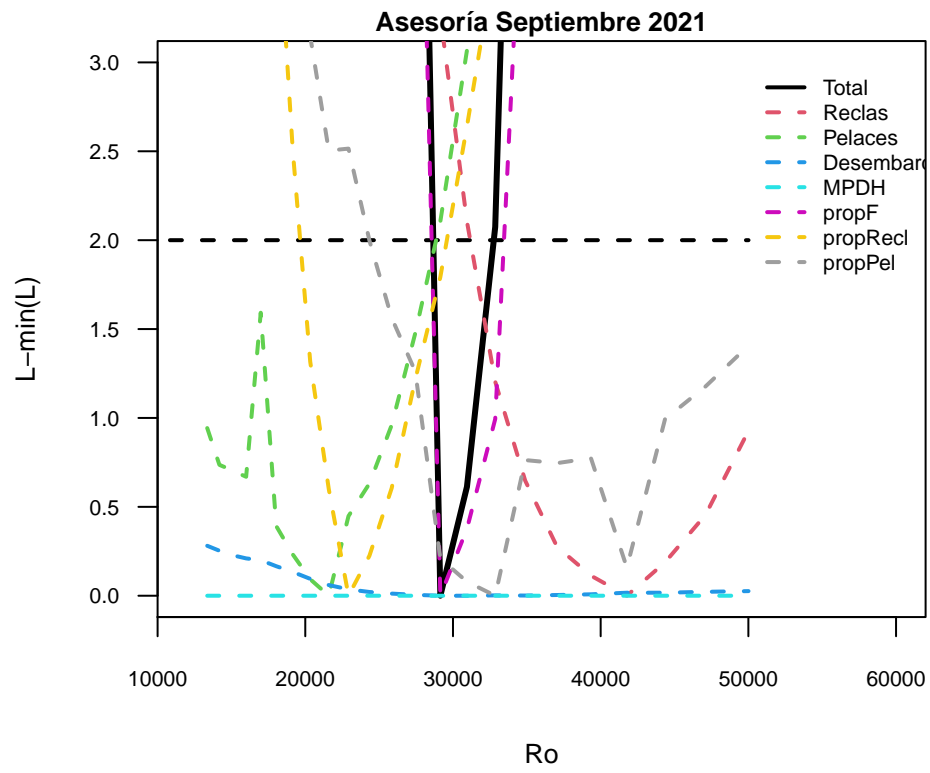




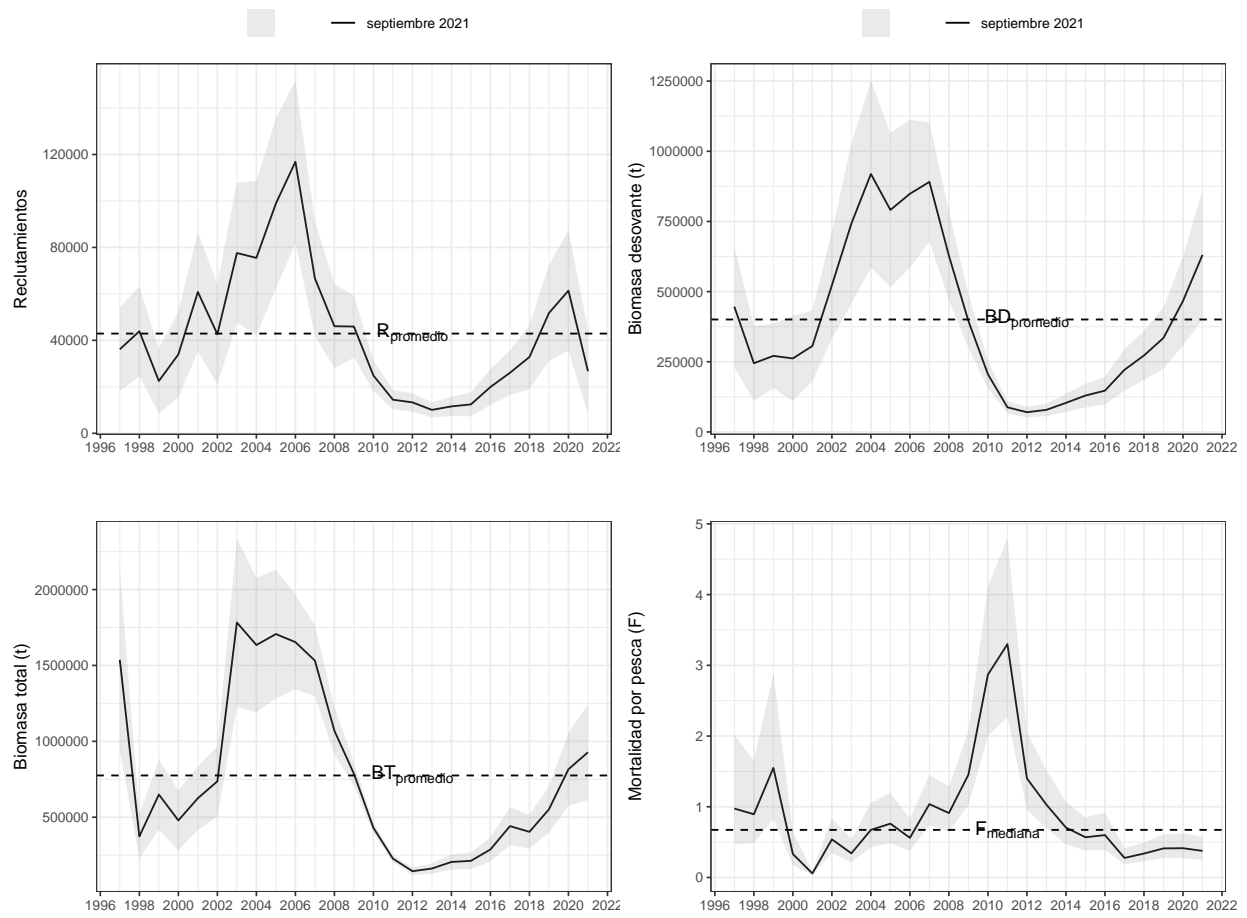
## Análisis retrospectivo



## Perfil de verosimilitud



## Indicadores poblacionales



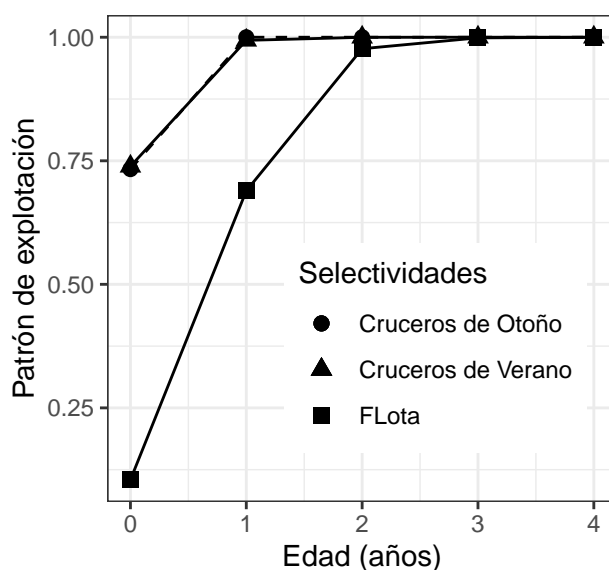
**Tabla 17.**

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

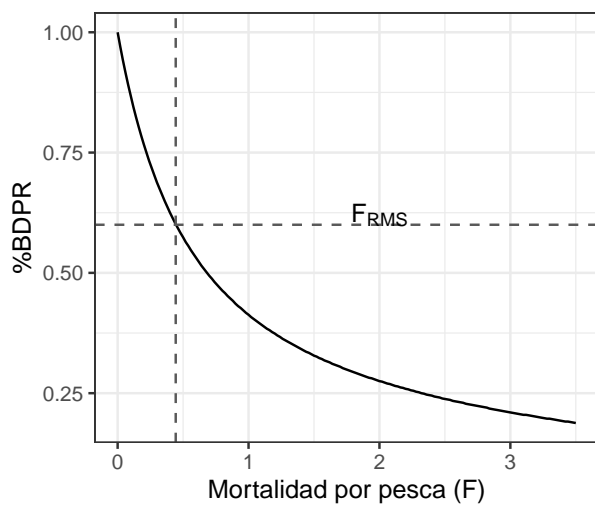
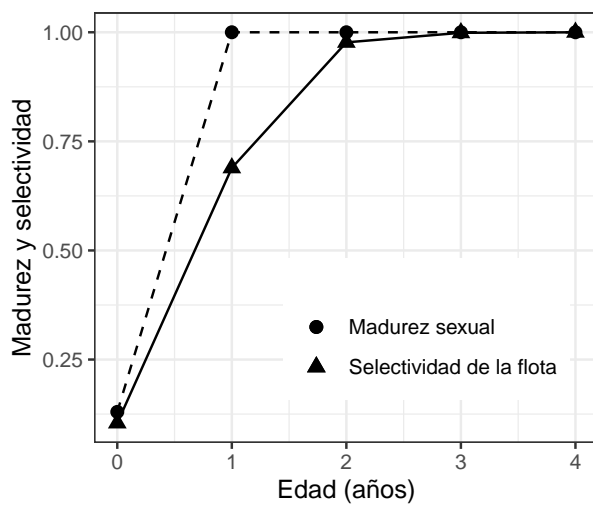
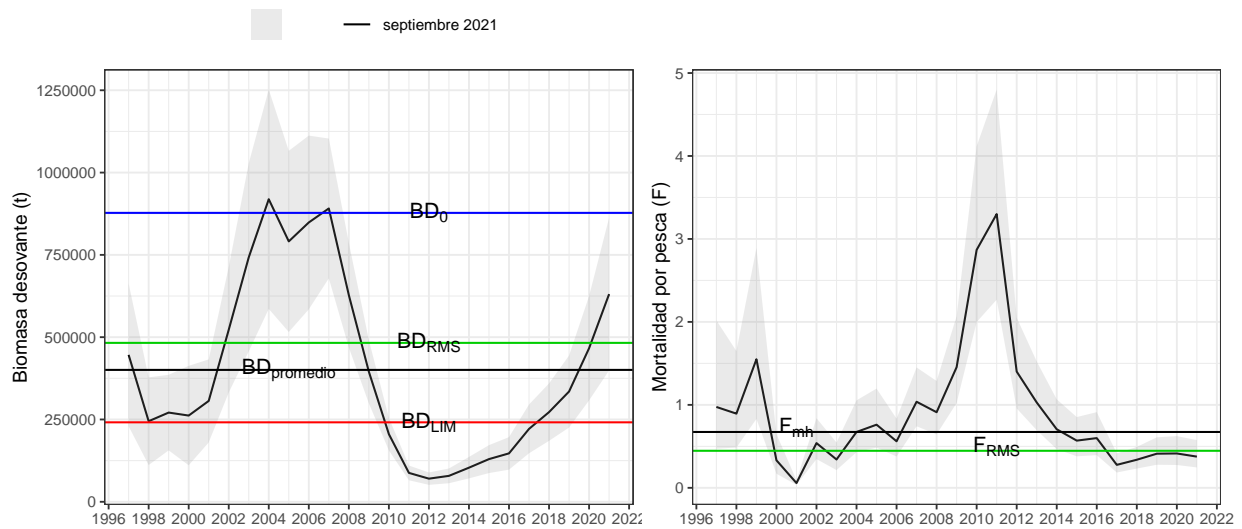
```
##          difRt      difBT      difBD      Rprom      BTprom      BDprom
## Rlast_2002_2008  0.6460552  0.3609580  0.1532309  75364.86  1452377.1  744972.9
## Rlast_2009_2017 -0.4502888 -2.3215381 -3.3134892  18392.89  279427.8  146243.6
## Rlast_historico  0.3784549 -0.1973492 -0.5745367  42917.24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

## Selectividad



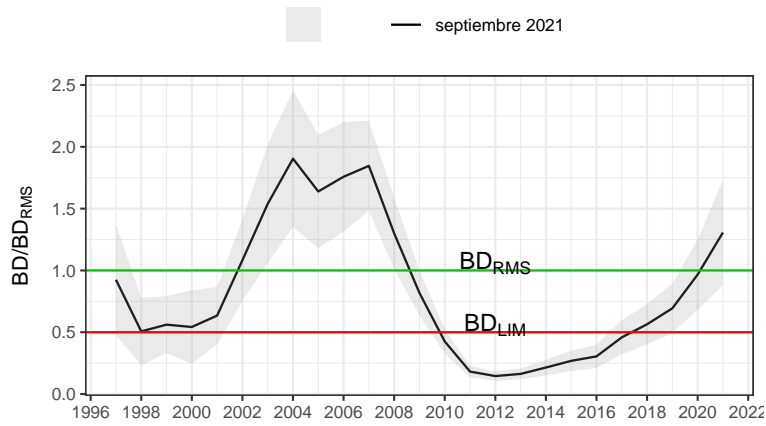
## Puntos biológicos de referencia

	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

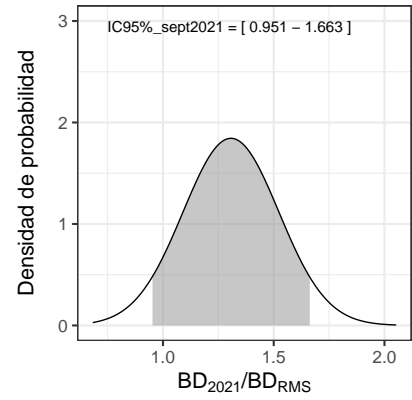


## Indicadores de estatus

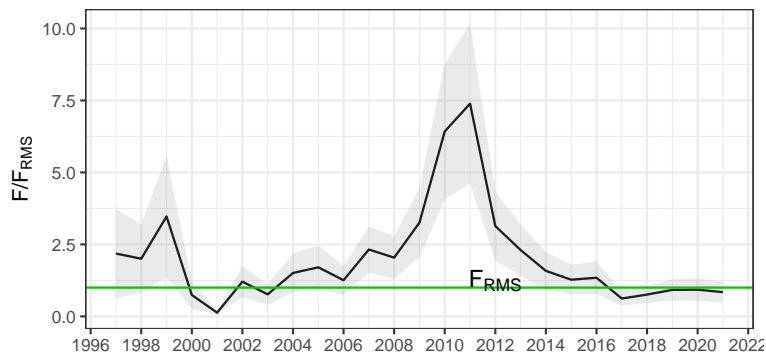
a)



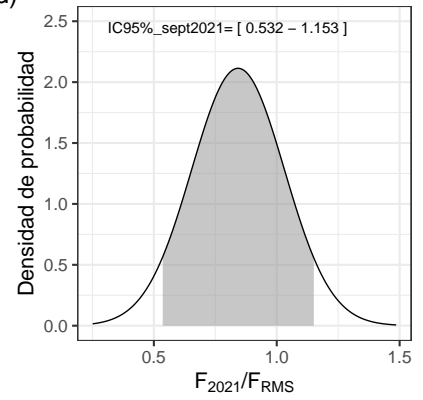
b)



c)



d)

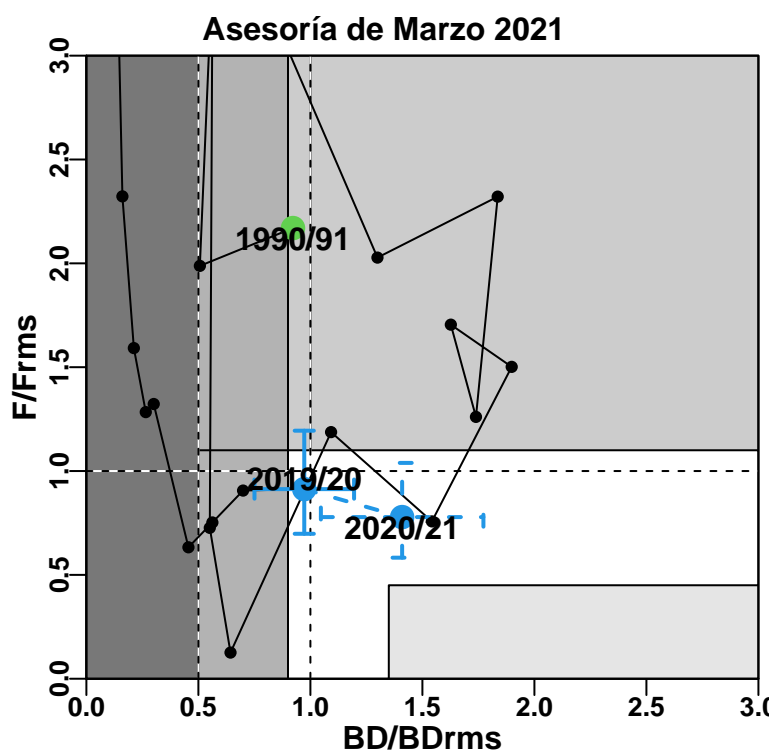
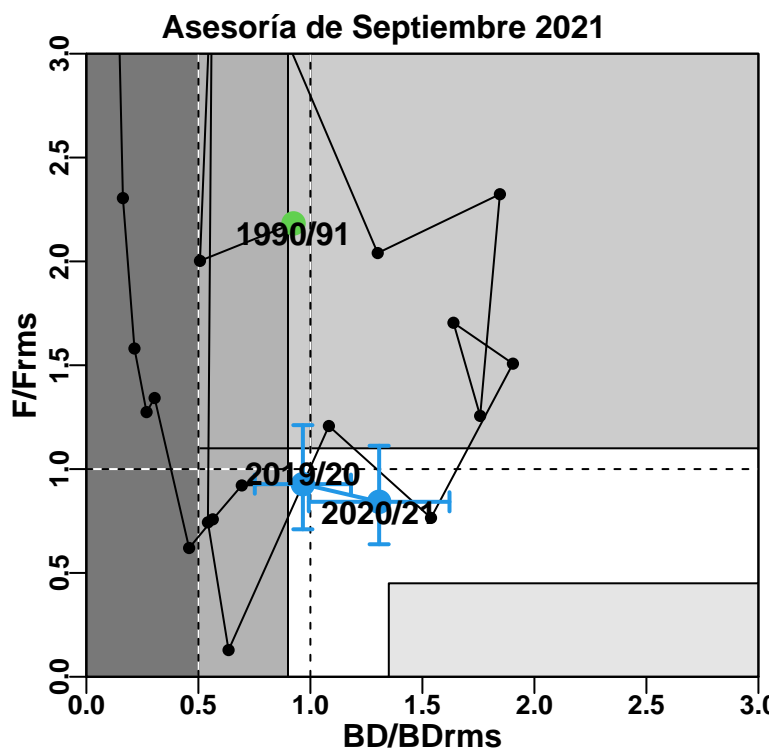


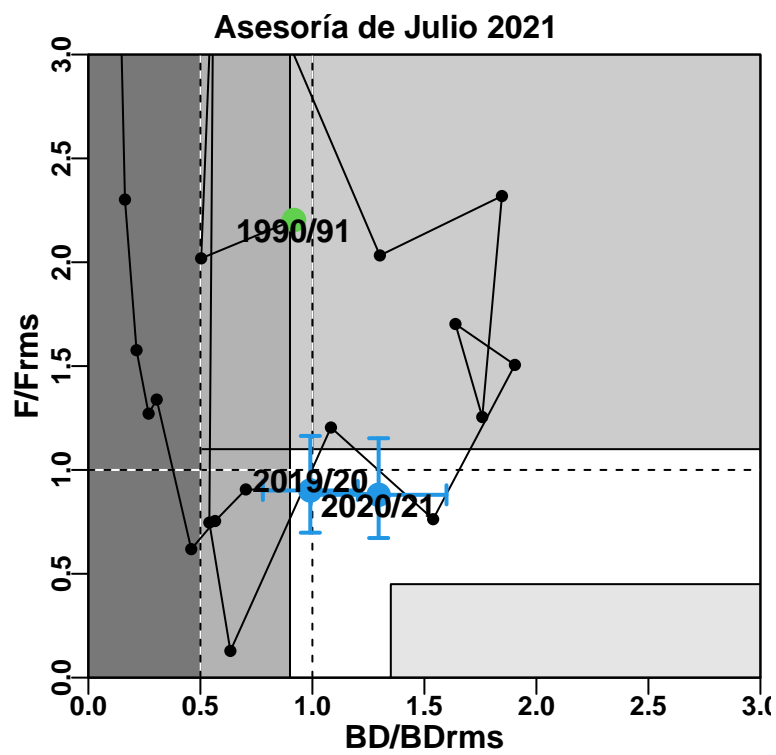
Años	$F/F_{RMS_{sept}}$	$F/F_{RMS_{marzo}}$	$F/F_{RMS_{julio}}$	$BD/BD_{RMS_{sept}}$	$BD/BD_{RMS_{marzo}}$	$BD/BD_{RMS_{julio}}$
1996/97	2.183	2.17	2.203	0.925	0.922	0.918
1997/98	2.003	1.988	2.019	0.507	0.507	0.503
1998/99	3.47	3.426	3.492	0.561	0.563	0.558
1999/00	0.743	0.726	0.747	0.543	0.551	0.54
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



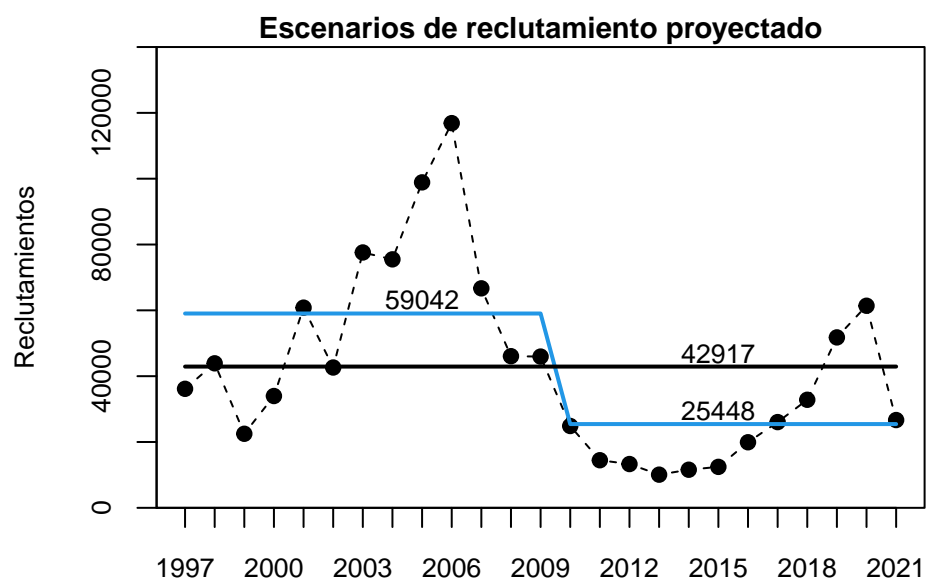


**Tabla 21.**

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)

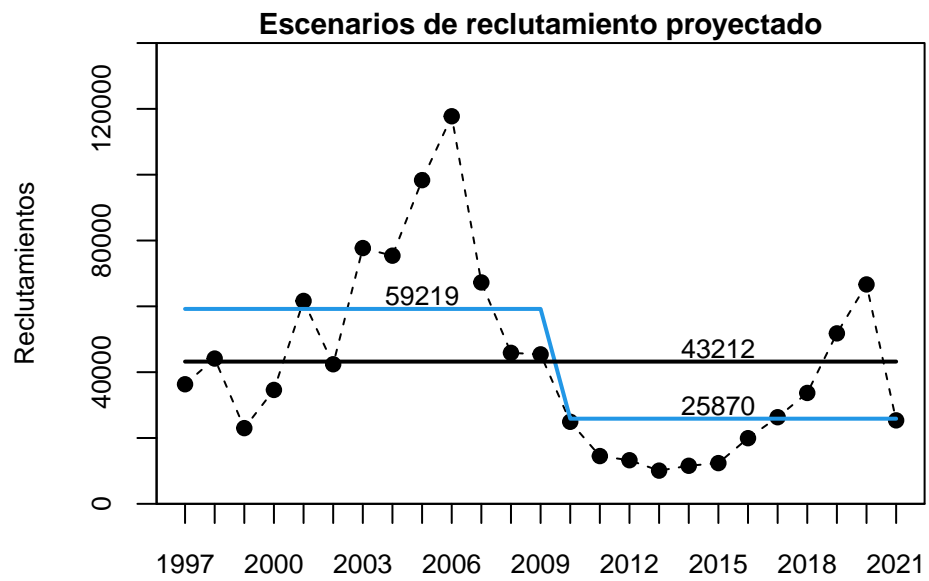


	1997-2009	Histórico	2010-2020
mean	209420	197520	182380
std	39403	39414	39521
10%	158923	147009	131732
20%	176258	164348	149118
30%	188757	176851	161655
40%	199437	187535	172367
50%	209420	197520	182380

	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%	155745	144069	129097
20%	172732	161061	146136
30%	184982	173314	158422
40%	195449	183784	168920
50%	205232	193570	178732

## 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.

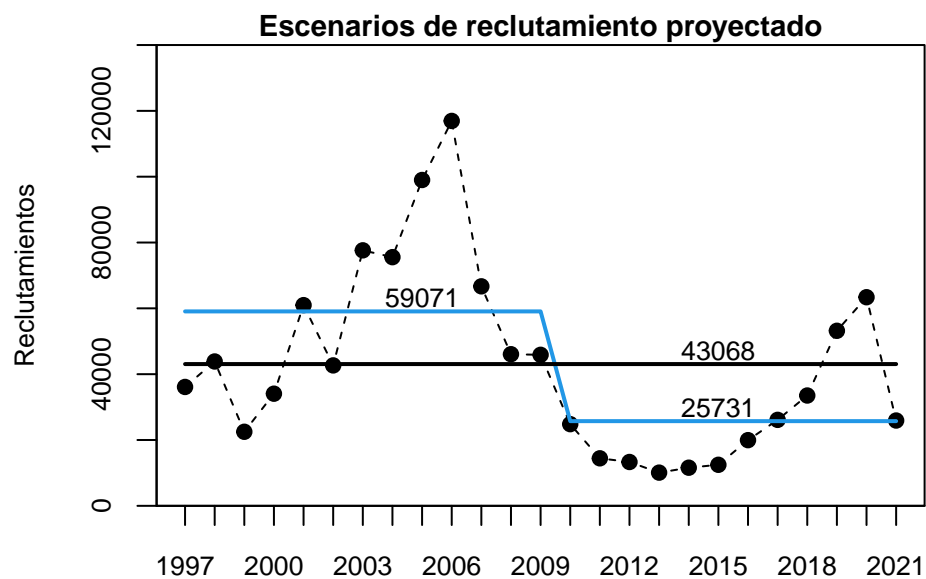
	1997-2009	Histórico	2010-2021
mean	205360	204260	202860
std	15645	15671	15709
10%	185310	184177	182728
20%	192193	191071	189639
30%	197156	196042	194622
40%	201396	200290	198880
50%	205360	204260	202860

	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%	17	25	39
20%	9	16	27
30%	4	11	20
40%	1	7	15
50%	-2	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%	20	29	43
20%	12	19	30
30%	6	13	23
40%	2	8	17



	1997-2009	Histórico	2010-2021
50%	-1	5	13

## Proyección Estatus 2021 - Asesoría septiembre

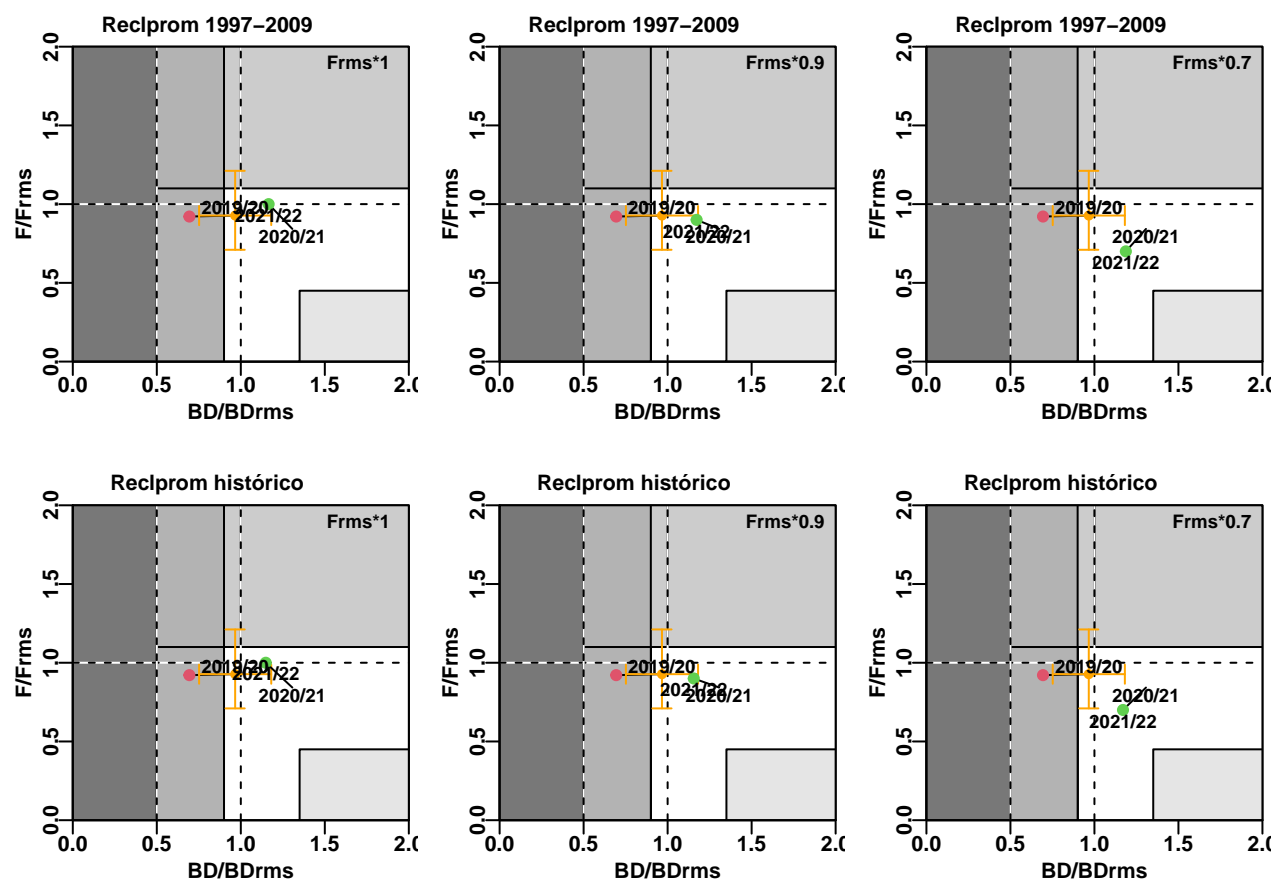
	1997-2009[F <sub>RMS</sub> *1]	[F <sub>RMS</sub> *0.9]	[F <sub>RMS</sub> *0.7]
p(sobre-explotación)_2019/20	0.32	0.32	0.32
p(colapso)_2019/20	0.00	0.00	0.00
p(sobre-explotación)_2020/21	0.03	0.03	0.03
p(colapso)_2020/21	0.00	0.00	0.00
p(sobre-explotación)_2021/22	0.11	0.11	0.10
p(colapso)_2021/22	0.00	0.00	0.00

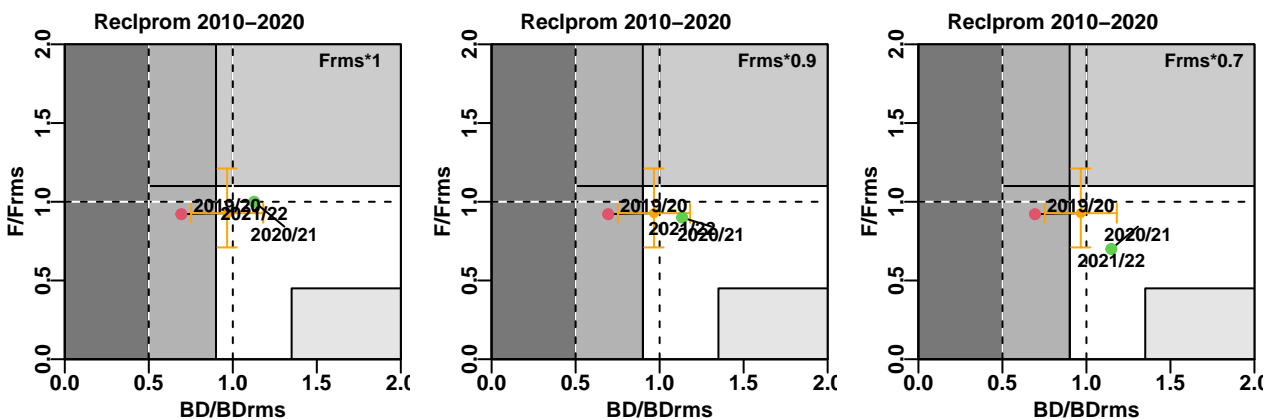
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	histórico[F <sub>RMS</sub> *1]	[F <sub>RMS</sub> *0.9]	[F <sub>RMS</sub> *0.7]
p(sobre-explotación)_2019/20	0.32	0.32	0.32
p(colapso)_2019/20	0.00	0.00	0.00
p(sobre-explotación)_2020/21	0.03	0.03	0.03
p(colapso)_2020/21	0.00	0.00	0.00
p(sobre-explotación)_2021/22	0.13	0.12	0.11
p(colapso)_2021/22	0.00	0.00	0.00

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	2010 - 2020[F <sub>RMS</sub> *1]	[F <sub>RMS</sub> *0.9]	[F <sub>RMS</sub> *0.7]
p(sobre-explotación)_2019/20	0.32	0.32	0.32
p(colapso)_2019/20	0.00	0.00	0.00
p(sobre-explotación)_2020/21	0.03	0.03	0.03
p(colapso)_2020/21	0.00	0.00	0.00
p(sobre-explotación)_2021/22	0.15	0.15	0.13
p(colapso)_2021/22	0.00	0.00	0.00





### Proyección Estatus 2022 - Asesoría marzo 2021

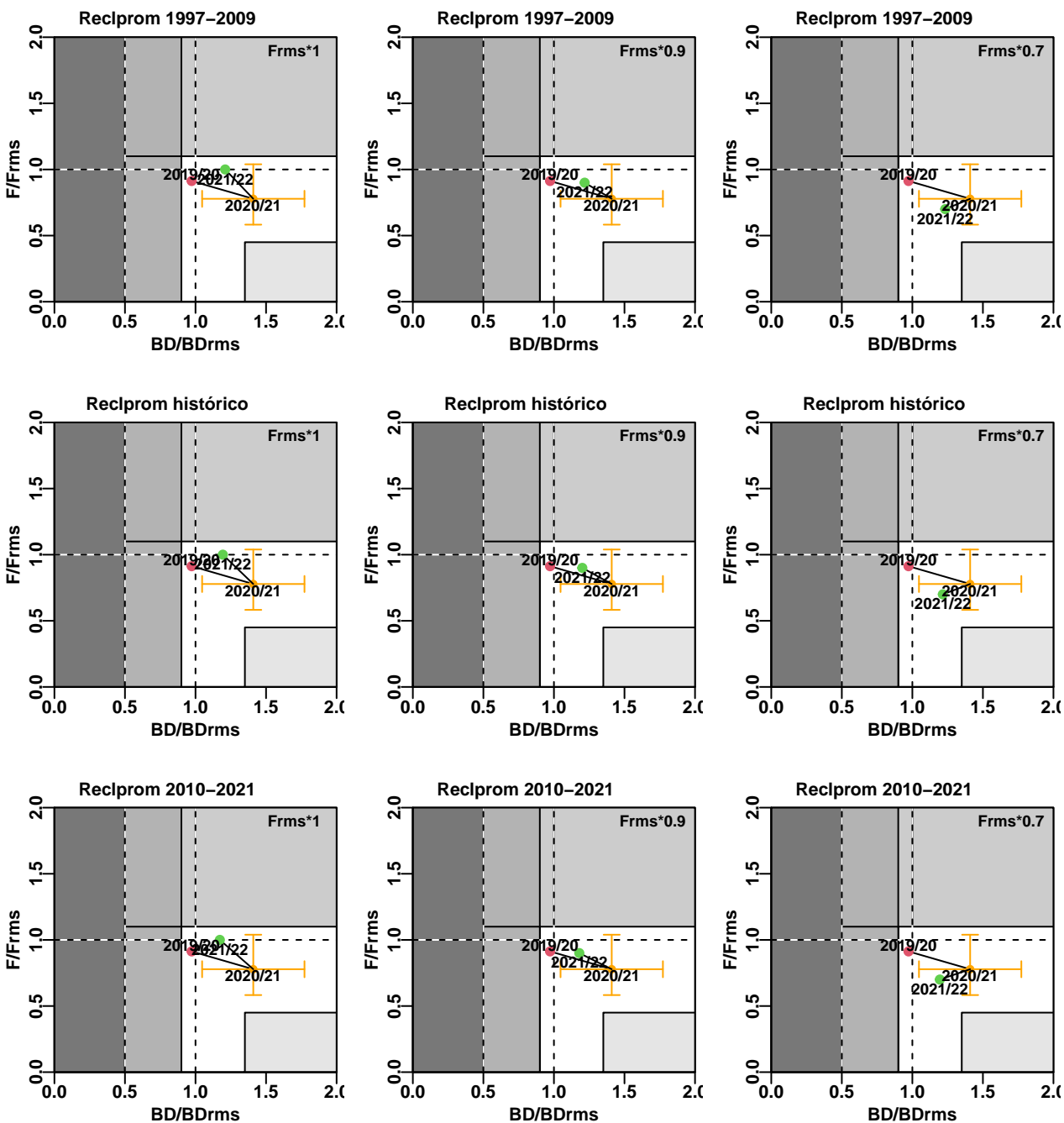
	1997-2009[F <sub>RMS</sub> *1]	[F <sub>RMS</sub> *0.9]	[F <sub>RMS</sub> *0.7]
p(BD<0,9BD <sub>RMS</sub> )_2020/21	0.02	0.02	0.02
p(BD<0,5BD <sub>RMS</sub> )_2020/21	0.00	0.00	0.00
p(BD<0,9BD <sub>RMS</sub> )_2021/22	0.11	0.11	0.10
p(BD<0,5BD <sub>RMS</sub> )_2021/22	0.00	0.00	0.00

	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	0.02	0.02	0.02
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	0.02	0.02	0.02
p(BD<0,5BD <sub>RMS</sub> )_2020/21	0.00	0.00	0.00
p(BD<0,9BD <sub>RMS</sub> )_2021/22	0.14	0.14	0.13
p(BD<0,5BD <sub>RMS</sub> )_2021/22	0.00	0.00	0.00



### Proyección Estatus 2022 - Asesoría julio 2021

	1997-2009[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	0.11	0.10	0.09
p(BD<0,5BD <sub>RMS</sub> )_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

