Supplementary Information

Population abundance and seasonal migration patterns indicated by commercial catch-per-unit-effort of hakes (*Merluccius capen*sis and *M. paradoxus*) in the northern Benguela Current Large Marine Ecosystem

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Table S1: *Merluccius capensis* catch model #1 parameter estimates, standard errors (SE), *t*-values, edf, Ref.df, *p*-values and F

Parameter	Estimate	SE	*t*-value	*p*-value
(Intercept)	5.65	0.033	171.886	<0.001
factor(Year)1999	−0.19	0.033	−5.707	<0.001
factor(Year)2000	−0.39	0.030	−12.815	<0.001
factor(Year)2001	−0.58	0.030	−19.135	<0.001
factor(Year)2002	−0.78	0.030	−26.017	<0.001
factor(Year)2003	−0.57	0.030	−18.977	<0.001
factor(Year)2004	−0.53	0.030	−17.421	<0.001
factor(Year)2005	−0.72	0.030	−23.907	<0.001
factor(Year)2006	−0.73	0.030	−24.101	<0.001
factor(Year)2007	−0.64	0.030	−21.039	<0.001
factor(Year)2008	−0.52	0.030	−17.321	<0.001
factor(Year)2009	−0.33	0.030	−10.776	<0.001
factor(Year)2010	−0.07	0.030	−2.188	0.029
factor(Year)2011	0.28	0.032	8.831	<0.001
factor(Year)2012	−0.15	0.030	−5.050	<0.001
factor(Year)2013	−0.11	0.030	−3.690	<0.001
factor(Year)2014	−0.08	0.031	−2.682	0.007
factor(Month)2	−0.02	0.005	−4.141	<0.001
factor(Month)3	−0.02	0.005	−4.656	<0.001
factor(Month)4	−0.05	0.005	−9.494	<0.001
factor(Month)5	0.00	0.005	−0.369	0.712
factor(Month)6	0.03	0.005	5.783	<0.001
factor(Month)7	−0.01	0.005	−1.977	0.048
factor(Month)8	−0.10	0.005	−18.157	<0.001
factor(Month)9	−0.25	0.005	−46.446	<0.001
factor(Month)10	−0.45	0.007	−65.299	<0.001
factor(Month)11	−0.27	0.005	−48.877	<0.001
factor(Month)12	−0.15	0.006	−26.816	<0.001
factor(VesselId)7	−0.53	0.017	−31.716	<0.001

factor(VesselId)9	−0.82	0.040	−20.292	<0.001
factor(VesselId)11	−1.54	0.020	−77.632	<0.001
factor(VesselId)14	−0.53	0.017	−30.876	<0.001
factor(VesselId)20	−1.20	0.088	−13.546	<0.001
factor(VesselId)31	−1.34	0.021	−62.930	<0.001
factor(VesselId)36	−0.75	0.025	−30.185	<0.001
factor(VesselId)50	−1.35	0.030	−44.816	<0.001
factor(VesselId)60	−0.63	0.017	−37.109	<0.001
factor(VesselId)61	−1.07	0.031	−34.378	<0.001
factor(VesselId)62	−0.75	0.018	−42.898	<0.001
factor(VesselId)63	−1.53	0.021	−72.260	<0.001
factor(VesselId)72	−0.85	0.047	−18.219	<0.001
factor(VesselId)94	−0.96	0.026	−36.293	<0.001
factor(VesselId)95	−1.87	0.029	−65.170	<0.001
factor(VesselId)103	−1.08	0.029	−37.772	<0.001
factor(VesselId)106	−0.40	0.018	−22.653	<0.001
factor(VesselId)110	−0.08	0.049	−1.722	0.085
factor(VesselId)111	−0.94	0.035	−26.819	<0.001
factor(VesselId)120	−0.63	0.020	−30.535	<0.001
factor(VesselId)125	−0.17	0.016	−10.846	<0.001
factor(VesselId)126	−0.44	0.017	−25.878	<0.001
factor(VesselId)127	−0.32	0.034	−9.292	<0.001
factor(VesselId)143	−1.36	0.018	−77.736	<0.001
factor(VesselId)150	−1.47	0.019	−78.584	<0.001
factor(VesselId)152	−0.69	0.028	−24.702	<0.001
factor(VesselId)165	−0.75	0.016	−46.893	<0.001
factor(VesselId)168	−0.80	0.032	−25.223	<0.001
factor(VesselId)169	−0.25	0.042	−5.821	<0.001
factor(VesselId)174	−0.75	0.021	−35.297	<0.001
factor(VesselId)175	−0.47	0.017	−27.477	<0.001
factor(VesselId)182	−0.35	0.016	−21.467	<0.001
factor(VesselId)183	−0.75	0.018	−42.164	<0.001
factor(VesselId)188	−0.22	0.042	−5.315	<0.001
factor(VesselId)197	−1.54	0.016	−95.583	<0.001
factor(VesselId)198	−0.37	0.018	−20.769	<0.001
factor(VesselId)203	−0.78	0.021	−37.117	<0.001
factor(VesselId)207	−0.53	0.018	−29.654	<0.001
factor(VesselId)216	−4.08	0.106	−38.526	<0.001
factor(VesselId)217	−0.03	0.017	−1.907	0.056
factor(VesselId)221	−0.77	0.016	−49.354	<0.001
factor(VesselId)224	−0.90	0.047	−19.188	<0.001
factor(VesselId)225	−0.17	0.018	−9.619	<0.001
factor(VesselId)249	−0.93	0.027	−34.923	<0.001
factor(VesselId)259	−0.79	0.063	−12.600	<0.001

factor(VesselId)268	−0.68	0.059	−11.553	<0.001
factor(VesselId)275	0.07	0.017	4.316	<0.001
factor(VesselId)279	−0.28	0.017	−16.380	<0.001
factor(VesselId)284	−0.70	0.016	−42.536	<0.001
factor(VesselId)301	−1.69	0.018	−95.409	<0.001
factor(VesselId)302	−1.30	0.095	−13.639	<0.001
factor(VesselId)304	−0.92	0.052	−17.501	<0.001
factor(VesselId)311	−0.20	0.015	−13.410	<0.001
factor(VesselId)314	−0.85	0.078	−10.942	<0.001
factor(VesselId)321	0.11	0.017	6.739	<0.001
factor(VesselId)330	−0.66	0.020	−32.769	<0.001
factor(VesselId)333	−0.34	0.018	−18.769	<0.001
factor(VesselId)348	−1.21	0.039	−31.111	<0.001
factor(VesselId)351	−0.83	0.064	−13.005	<0.001
factor(VesselId)352	−1.41	0.016	−87.661	<0.001
factor(VesselId)364	−0.73	0.044	−16.476	<0.001
factor(VesselId)365	−1.53	0.018	−84.309	<0.001
factor(VesselId)367	−0.73	0.050	−14.682	<0.001
factor(VesselId)371	0.21	0.029	7.142	<0.001
factor(VesselId)372	−0.05	0.016	−2.918	0.004
factor(VesselId)373	0.44	0.015	28.348	<0.001
factor(VesselId)382	−1.29	0.019	−66.691	<0.001
factor(VesselId)390	−0.08	0.017	−5.035	<0.001
factor(VesselId)410	−0.52	0.016	−32.827	<0.001
factor(VesselId)418	−0.61	0.016	−37.230	<0.001
factor(VesselId)419	−2.50	0.032	−77.120	<0.001
factor(VesselId)424	−0.13	0.016	−8.242	<0.001
factor(VesselId)426	−1.29	0.047	−27.428	<0.001
factor(VesselId)427	−1.02	0.020	−50.639	<0.001
factor(VesselId)428	−1.64	0.060	−27.316	<0.001
factor(VesselId)429	−0.24	0.020	−12.482	<0.001
factor(VesselId)433	−1.61	0.055	−29.010	<0.001
factor(VesselId)442	−0.65	0.018	−35.627	<0.001
factor(VesselId)453	−0.22	0.022	−10.374	<0.001
factor(VesselId)457	−0.71	0.029	−24.773	<0.001
factor(VesselId)458	−1.48	0.017	−88.969	<0.001
factor(VesselId)460	−0.88	0.016	−55.055	<0.001
factor(VesselId)468	0.36	0.016	23.199	<0.001
factor(VesselId)474	−0.70	0.135	−5.233	<0.001
factor(VesselId)475	−0.78	0.040	−19.295	<0.001
factor(VesselId)476	−1.43	0.037	−38.388	<0.001
factor(VesselId)477	−1.50	0.130	−11.568	<0.001
factor(VesselId)480	−0.92	0.018	−50.072	<0.001
factor(VesselId)484	−1.50	0.017	−90.121	<0.001

factor(VesselId)490	−1.50	0.026	−56.935	<0.001
factor(VesselId)495	−1.62	0.016	−99.446	<0.001
factor(VesselId)500	−0.44	0.016	−28.154	<0.001
factor(VesselId)511	−0.63	0.016	−40.319	<0.001
factor(VesselId)512	−0.59	0.016	−38.108	<0.001
factor(VesselId)515	−0.46	0.017	−27.697	<0.001
factor(VesselId)536	−0.50	0.076	−6.524	<0.001
factor(VesselId)544	0.39	0.030	12.870	<0.001
factor(VesselId)547	−0.65	0.025	−25.523	<0.001
factor(VesselId)549	−0.43	0.028	−15.199	<0.001
factor(VesselId)557	−0.87	0.048	−18.157	<0.001
factor(VesselId)561	−0.45	0.022	−20.663	<0.001
factor(VesselId)569	−0.59	0.063	−9.359	<0.001
factor(VesselId)575	−0.60	0.015	−38.701	<0.001
factor(VesselId)581	−0.48	0.026	−18.949	<0.001
factor(VesselId)601	−0.91	0.045	−20.155	<0.001
factor(VesselId)606	−1.50	0.018	−82.768	<0.001
factor(VesselId)609	−1.05	0.067	−15.613	<0.001
factor(VesselId)610	−0.08	0.017	−4.597	<0.001
factor(VesselId)615	−0.51	0.022	−23.229	<0.001
factor(VesselId)618	−2.60	0.083	−31.354	<0.001
factor(VesselId)619	−1.39	0.017	−82.720	<0.001
factor(VesselId)630	−1.11	0.016	−68.971	<0.001
factor(VesselId)633	−0.72	0.047	−15.334	<0.001
factor(VesselId)636	−0.05	0.016	−3.182	<0.001
factor(VesselId)637	−0.85	0.058	−14.673	<0.001
factor(VesselId)638	−0.36	0.018	−19.814	<0.001
factor(VesselId)641	−1.88	0.062	−30.228	<0.001
factor(VesselId)644	−1.00	0.017	−57.237	<0.001
factor(VesselId)653	−0.25	0.020	−12.660	<0.001
factor(VesselId)656	−0.48	0.089	−5.410	<0.001
factor(VesselId)661	−0.97	0.023	−42.143	<0.001
factor(VesselId)670	−0.76	0.024	−31.992	<0.001
factor(VesselId)672	−0.51	0.021	−24.540	<0.001
factor(VesselId)677	−0.47	0.077	−6.134	<0.001
factor(VesselId)681	−0.62	0.183	−3.365	<0.001
factor(VesselId)689	−0.80	0.022	−35.944	<0.001
factor(VesselId)701	−0.17	0.021	−7.977	<0.001
factor(VesselId)704	−1.16	0.017	−66.946	<0.001
factor(VesselId)711	0.11	0.030	3.717	<0.001
factor(VesselId)716	−4.45	0.107	−41.407	<0.001
factor(VesselId)722	−0.79	0.016	−49.149	<0.001
factor(VesselId)723	−0.36	0.016	−21.752	<0.001
factor(VesselId)731	0.34	0.030	11.254	<0.001

factor(VesselId)742	−0.94	0.019	−49.109	<0.001
factor(VesselId)755	−0.15	0.030	−4.968	<0.001
factor(VesselId)756	−1.16	0.019	−59.870	<0.001
factor(VesselId)758	−0.52	0.022	−23.474	<0.001
factor(VesselId)761	−0.14	0.046	−2.973	0.003
factor(VesselId)762	−1.00	0.019	−53.133	<0.001
factor(VesselId)763	−0.61	0.016	−37.026	<0.001
factor(VesselId)764	−0.63	0.017	−37.442	<0.001
factor(VesselId)782	−0.86	0.017	−49.952	<0.001
factor(VesselId)796	−0.71	0.017	−42.470	<0.001
factor(VesselId)798	−1.43	0.019	−73.446	<0.001
factor(VesselId)803	−1.36	0.180	−7.562	<0.001
factor(VesselId)812	−0.84	0.066	−12.685	<0.001
factor(VesselId)818	−0.80	0.062	−13.004	<0.001
factor(VesselId)823	−1.53	0.019	−78.907	<0.001
factor(VesselId)827	−1.59	0.030	−52.937	<0.001
factor(VesselId)828	−1.20	0.026	−45.549	<0.001
factor(VesselId)832	−1.53	0.021	−72.876	<0.001
factor(VesselId)833	−0.65	0.071	−9.152	<0.001
factor(VesselId)837	−0.36	0.017	−20.844	<0.001
factor(VesselId)839	0.53	0.047	11.178	<0.001
factor(VesselId)848	−0.90	0.018	−50.889	<0.001
factor(VesselId)850	−0.42	0.022	−19.171	<0.001
factor(VesselId)851	−1.00	0.054	−18.557	<0.001
factor(VesselId)855	0.14	0.016	8.751	<0.001
factor(VesselId)859	−0.59	0.020	−30.094	<0.001
factor(VesselId)862	−0.37	0.016	−23.295	<0.001
factor(VesselId)865	−1.38	0.019	−71.508	<0.001
factor(VesselId)868	−0.85	0.028	−30.772	<0.001
factor(VesselId)877	−0.48	0.066	−7.320	<0.001
factor(VesselId)884	−0.49	0.062	−7.904	<0.001
factor(VesselId)889	−4.14	0.143	−28.989	<0.001
factor(VesselId)893	−2.13	0.087	−24.596	<0.001
factor(VesselId)895	−1.27	0.019	−67.712	<0.001
factor(VesselId)897	−0.82	0.027	−29.987	<0.001
factor(VesselId)917	0.13	0.026	5.090	<0.001
factor(VesselId)921	−0.72	0.021	−34.908	<0.001
factor(VesselId)925	−0.39	0.016	−25.177	<0.001
factor(VesselId)926	−0.64	0.029	−22.252	<0.001
factor(VesselId)935	−0.57	0.017	−34.114	<0.001
factor(VesselId)940	−1.29	0.018	−70.319	<0.001
factor(VesselId)948	−0.59	0.036	−16.299	<0.001
factor(VesselId)955	−0.11	0.024	−4.301	<0.001
factor(VesselId)962	−0.81	0.022	−37.341	<0.001

factor(VesselId)967	−0.59	0.018	−32.152	<0.001
factor(VesselId)976	−1.14	0.020	−57.072	<0.001
factor(VesselId)982	−1.84	0.128	−14.413	<0.001
factor(VesselId)983	−1.55	0.022	−71.208	<0.001
factor(VesselId)987	−1.12	0.017	−64.918	<0.001
factor(VesselId)990	−0.36	0.061	−5.943	<0.001

Parameter	edf	Ref.df	*F*	*p*-value
s(UnderWaterPAR_lx)	2.00	2.000	52046.563	<0.001
s(Lat,Depth_m):factor(Year)1998	27.19	27.704	92.660	<0.001
s(Lat,Depth_m):factor(Year)1999	27.24	27.840	51.337	<0.001
s(Lat,Depth_m):factor(Year)2000	28.46	28.884	56.358	<0.001
s(Lat,Depth_m):factor(Year)2001	28.78	28.936	122.963	<0.001
s(Lat,Depth_m):factor(Year)2002	28.77	28.928	126.168	<0.001
s(Lat,Depth_m):factor(Year)2003	28.83	28.944	165.072	<0.001
s(Lat,Depth_m):factor(Year)2004	28.74	28.932	121.172	<0.001
s(Lat,Depth_m):factor(Year)2005	28.69	28.904	92.451	<0.001
s(Lat,Depth_m):factor(Year)2006	28.60	28.917	138.019	<0.001
s(Lat,Depth_m):factor(Year)2007	28.65	28.920	100.978	<0.001
s(Lat,Depth_m):factor(Year)2008	28.65	28.923	102.038	<0.001
s(Lat,Depth_m):factor(Year)2009	28.59	28.915	86.113	<0.001
s(Lat,Depth_m):factor(Year)2010	28.10	28.800	33.285	<0.001
s(Lat,Depth_m):factor(Year)2011	25.48	26.622	30.498	<0.001
s(Lat,Depth_m):factor(Year)2012	28.49	28.899	88.651	<0.001
s(Lat,Depth_m):factor(Year)2013	28.41	28.881	74.539	<0.001
s(Lat,Depth_m):factor(Year)2014	27.28	27.881	37.424	<0.001
s(Lat,Depth_m):factor(Month)1	24.97	27.144	176.430	<0.001
s(Lat,Depth_m):factor(Month)2	20.42	23.431	222.736	<0.001
s(Lat,Depth_m):factor(Month)3	20.42	23.366	204.339	<0.001
s(Lat,Depth_m):factor(Month)4	15.23	17.985	266.624	<0.001
s(Lat,Depth_m):factor(Month)5	22.37	25.209	154.664	<0.001
s(Lat,Depth_m):factor(Month)6	24.62	26.859	135.600	<0.001
s(Lat,Depth_m):factor(Month)7	27.74	28.591	129.211	<0.001
s(Lat,Depth_m):factor(Month)8	28.24	28.763	148.034	<0.001
s(Lat,Depth_m):factor(Month)9	26.91	28.173	164.835	<0.001
s(Lat,Depth_m):factor(Month)10	27.82	28.705	155.698	<0.001
s(Lat,Depth_m):factor(Month)11	24.31	26.655	175.767	<0.001
s(Lat,Depth_m):factor(Month)12	25.05	27.239	178.832	<0.001

Table S2: *Merluccius paradoxus* catch model #1 parameter estimates, standard errors (SE), *t*-values and *p*-values

Parameter	Estimates	SE	*t*-value	*p*-value
(Intercept)	6.23	0.022	278.813	<0.001
factor(Year)1999	−0.16	0.019	−8.147	<0.001
factor(Year)2000	−0.37	0.018	−20.528	<0.001
factor(Year)2001	−0.56	0.018	−31.087	<0.001
factor(Year)2002	−0.77	0.018	−42.588	<0.001
factor(Year)2003	−0.56	0.018	−30.896	<0.001
factor(Year)2004	−0.51	0.018	−28.260	<0.001
factor(Year)2005	−0.71	0.018	−39.064	<0.001
factor(Year)2006	−0.72	0.018	−39.087	<0.001
factor(Year)2007	−0.62	0.018	−34.026	<0.001
factor(Year)2008	−0.51	0.018	−27.893	<0.001
factor(Year)2009	−0.31	0.018	−16.966	<0.001
factor(Year)2010	−0.05	0.019	−2.675	0.007
factor(Year)2011	0.31	0.021	14.451	<0.001
factor(Year)2012	−0.14	0.018	−7.505	<0.001
factor(Year)2013	−0.10	0.019	−5.279	<0.001
factor(Year)2014	−0.07	0.019	−3.537	<0.001
factor(Month)2	−0.02	0.005	−4.163	<0.001
factor(Month)3	−0.02	0.005	−4.465	<0.001
factor(Month)4	−0.05	0.005	−9.297	<0.001
factor(Month)5	0.00	0.005	−0.101	0.920
factor(Month)6	0.03	0.005	6.206	<0.001
factor(Month)7	−0.01	0.005	−1.605	0.108
factor(Month)8	−0.10	0.005	−17.829	<0.001
factor(Month)9	−0.25	0.005	−46.096	<0.001
factor(Month)10	−0.44	0.007	−65.178	<0.001
factor(Month)11	−0.27	0.005	−48.626	<0.001
factor(Month)12	−0.15	0.006	−26.593	<0.001
factor(VesselId)7	−0.53	0.017	−31.644	<0.001
factor(VesselId)9	−0.82	0.040	−20.227	<0.001
factor(VesselId)11	−1.54	0.020	−77.491	<0.001
factor(VesselId)14	−0.53	0.017	−30.862	<0.001
factor(VesselId)20	−1.19	0.088	−13.447	<0.001
factor(VesselId)31	−1.34	0.021	−62.838	<0.001
factor(VesselId)36	−0.75	0.025	−30.008	<0.001
factor(VesselId)50	−1.35	0.030	−44.724	<0.001
factor(VesselId)60	−0.63	0.017	−37.069	<0.001
factor(VesselId)61	−1.07	0.031	−34.352	<0.001
factor(VesselId)62	−0.75	0.018	−42.801	<0.001
factor(VesselId)63	−1.53	0.021	−72.151	<0.001
factor(VesselId)72	−0.85	0.047	−18.201	<0.001

factor(VesselId)94	−0.96	0.026	−36.223	<0.001
factor(VesselId)95	−1.86	0.029	−65.015	<0.001
factor(VesselId)103	−1.08	0.029	−37.764	<0.001
factor(VesselId)106	−0.40	0.018	−22.623	<0.001
factor(VesselId)110	−0.08	0.049	−1.724	0.085
factor(VesselId)111	−0.94	0.035	−26.916	<0.001
factor(VesselId)120	−0.62	0.020	−30.478	<0.001
factor(VesselId)125	−0.17	0.016	−10.801	<0.001
factor(VesselId)126	−0.44	0.017	−25.974	<0.001
factor(VesselId)127	−0.32	0.034	−9.266	<0.001
factor(VesselId)143	−1.36	0.018	−77.678	<0.001
factor(VesselId)150	−1.47	0.019	−78.479	<0.001
factor(VesselId)152	−0.69	0.028	−24.604	<0.001
factor(VesselId)165	−0.75	0.016	−46.796	<0.001
factor(VesselId)168	−0.80	0.032	−25.203	<0.001
factor(VesselId)169	−0.24	0.042	−5.750	<0.001
factor(VesselId)174	−0.74	0.021	−35.208	<0.001
factor(VesselId)175	−0.47	0.017	−27.482	<0.001
factor(VesselId)182	−0.35	0.016	−21.352	<0.001
factor(VesselId)183	−0.75	0.018	−42.068	<0.001
factor(VesselId)188	−0.22	0.042	−5.258	<0.001
factor(VesselId)197	−1.54	0.016	−95.510	<0.001
factor(VesselId)198	−0.36	0.018	−20.667	<0.001
factor(VesselId)203	−0.78	0.021	−37.085	<0.001
factor(VesselId)207	−0.53	0.018	−29.508	<0.001
factor(VesselId)216	−4.08	0.106	−38.552	<0.001
factor(VesselId)217	−0.03	0.017	−1.807	0.071
factor(VesselId)221	−0.76	0.016	−49.262	<0.001
factor(VesselId)224	−0.90	0.047	−19.212	<0.001
factor(VesselId)225	−0.17	0.018	−9.483	<0.001
factor(VesselId)249	−0.92	0.027	−34.812	<0.001
factor(VesselId)259	−0.79	0.063	−12.605	<0.001
factor(VesselId)268	−0.68	0.059	−11.471	<0.001
factor(VesselId)275	0.07	0.017	4.391	<0.001
factor(VesselId)279	−0.27	0.017	−16.308	<0.001
factor(VesselId)284	−0.70	0.016	−42.461	<0.001
factor(VesselId)301	−1.68	0.018	−95.307	<0.001
factor(VesselId)302	−1.30	0.095	−13.634	<0.001
factor(VesselId)304	−0.91	0.052	−17.418	<0.001
factor(VesselId)311	−0.20	0.015	−13.302	<0.001
factor(VesselId)314	−0.85	0.078	−10.935	<0.001
factor(VesselId)321	0.11	0.017	6.838	<0.001
factor(VesselId)330	−0.66	0.020	−32.615	<0.001
factor(VesselId)333	−0.34	0.018	−18.647	<0.001

factor(VesselId)348	−1.21	0.039	−31.086	<0.001
factor(VesselId)351	−0.83	0.064	−12.939	<0.001
factor(VesselId)352	−1.40	0.016	−87.500	<0.001
factor(VesselId)364	−0.73	0.044	−16.392	<0.001
factor(VesselId)365	−1.53	0.018	−84.180	<0.001
factor(VesselId)367	−0.73	0.050	−14.639	<0.001
factor(VesselId)371	0.21	0.029	7.258	<0.001
factor(VesselId)372	−0.05	0.016	−2.839	<0.001
factor(VesselId)373	0.44	0.015	28.416	<0.001
factor(VesselId)382	−1.29	0.019	−66.559	<0.001
factor(VesselId)390	−0.08	0.017	−4.969	<0.001
factor(VesselId)410	−0.52	0.016	−32.705	<0.001
factor(VesselId)418	−0.60	0.016	−37.127	<0.001
factor(VesselId)419	−2.49	0.032	−77.051	<0.001
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factor(VesselId)442	−0.65	0.018	−35.588	<0.001
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factor(VesselId)457	−0.71	0.029	−24.738	<0.001
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factor(VesselId)460	−0.88	0.016	−54.957	<0.001
factor(VesselId)468	0.36	0.016	23.275	<0.001
factor(VesselId)474	−0.70	0.135	−5.229	<0.001
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factor(VesselId)477	−1.50	0.130	−11.556	<0.001
factor(VesselId)480	−0.92	0.018	−50.036	<0.001
factor(VesselId)484	−1.50	0.017	−90.017	<0.001
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factor(VesselId)511	−0.63	0.016	−40.230	<0.001
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factor(VesselId)544	0.39	0.030	12.941	<0.001
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factor(VesselId)549	−0.43	0.028	−15.188	<0.001
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factor(VesselId)561	−0.45	0.022	−20.670	<0.001

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factor(VesselId)581	−0.48	0.026	−18.904	<0.001
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factor(VesselId)606	−1.50	0.018	−82.702	<0.001
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factor(VesselId)618	−2.60	0.083	−31.331	<0.001
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factor(VesselId)630	−1.11	0.016	−68.878	<0.001
factor(VesselId)633	−0.72	0.047	−15.409	<0.001
factor(VesselId)636	−0.05	0.016	−3.059	0.002
factor(VesselId)637	−0.85	0.058	−14.622	<0.001
factor(VesselId)638	−0.36	0.018	−19.740	<0.001
factor(VesselId)641	−1.87	0.062	−30.088	<0.001
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factor(VesselId)653	−0.25	0.020	−12.707	<0.001
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factor(VesselId)661	−0.97	0.023	−42.044	<0.001
factor(VesselId)670	−0.76	0.024	−31.913	<0.001
factor(VesselId)672	−0.51	0.021	−24.606	<0.001
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factor(VesselId)722	−0.79	0.016	−49.093	<0.001
factor(VesselId)723	−0.36	0.016	−21.665	<0.001
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factor(VesselId)742	−0.93	0.019	−49.060	<0.001
factor(VesselId)755	−0.14	0.030	−4.808	<0.001
factor(VesselId)756	−1.16	0.019	−59.759	<0.001
factor(VesselId)758	−0.52	0.022	−23.420	<0.001
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factor(VesselId)796	−0.70	0.017	−42.396	<0.001
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factor(VesselId)828	−1.19	0.026	−45.442	<0.001
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factor(VesselId)850	−0.42	0.022	−19.083	<0.001
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factor(VesselId)859	−0.59	0.020	−30.020	<0.001
factor(VesselId)862	−0.37	0.016	−23.246	<0.001
factor(VesselId)865	−1.38	0.019	−71.344	<0.001
factor(VesselId)868	−0.85	0.028	−30.609	<0.001
factor(VesselId)877	−0.49	0.066	−7.403	<0.001
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factor(VesselId)897	−0.82	0.027	−29.927	<0.001
factor(VesselId)917	0.13	0.026	5.097	<0.001
factor(VesselId)921	−0.72	0.021	−34.853	<0.001
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factor(VesselId)935	−0.57	0.017	−34.027	<0.001
factor(VesselId)940	−1.29	0.018	−70.184	<0.001
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factor(VesselId)962	−0.81	0.022	−37.204	<0.001
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factor(VesselId)976	−1.14	0.020	−56.913	<0.001
factor(VesselId)982	−1.83	0.128	−14.359	<0.001
factor(VesselId)983	−1.55	0.022	−71.119	<0.001
factor(VesselId)987	−1.11	0.017	−64.777	<0.001
factor(VesselId)990	−0.36	0.061	−5.937	<0.001

Parameters	edf	Ref.df	*F*	*p*-value
s(UnderWaterPAR_lx)	2.000	2.000	52025.467	<0.001
s(Lat,Depth_m):factor(Year)1998	25.694	27.018	22.359	<0.001
s(Lat,Depth_m):factor(Year)1999	23.174	25.820	18.099	<0.001
s(Lat,Depth_m):factor(Year)2000	26.760	28.420	8.845	<0.001

s(Lat,Depth_m):factor(Year)2001	25.661	27.862	13.638	<0.001
s(Lat,Depth_m):factor(Year)2002	24.586	27.210	13.437	<0.001
s(Lat,Depth_m):factor(Year)2003	26.553	28.233	18.090	<0.001
s(Lat,Depth_m):factor(Year)2004	24.668	27.361	19.936	<0.001
s(Lat,Depth_m):factor(Year)2005	22.302	25.682	15.310	<0.001
s(Lat,Depth_m):factor(Year)2006	25.607	27.747	16.858	<0.001
s(Lat,Depth_m):factor(Year)2007	24.017	26.917	12.477	<0.001
s(Lat,Depth_m):factor(Year)2008	26.133	28.095	14.844	<0.001
s(Lat,Depth_m):factor(Year)2009	22.261	25.785	11.366	<0.001
s(Lat,Depth_m):factor(Year)2010	26.226	27.566	21.413	<0.001
s(Lat,Depth_m):factor(Year)2011	25.446	27.207	22.421	<0.001
s(Lat,Depth_m):factor(Year)2012	19.596	23.538	7.591	<0.001
s(Lat,Depth_m):factor(Year)2013	2.064	2.086	61.815	<0.001
s(Lat,Depth_m):factor(Year)2014	22.566	25.845	7.060	<0.001
s(Lat,Depth_m):factor(Month)1	28.780	28.961	238.124	<0.001
s(Lat,Depth_m):factor(Month)2	28.776	28.956	234.018	<0.001
s(Lat,Depth_m):factor(Month)3	28.793	28.958	229.912	<0.001
s(Lat,Depth_m):factor(Month)4	28.749	28.949	225.017	<0.001
s(Lat,Depth_m):factor(Month)5	28.760	28.959	262.960	<0.001
s(Lat,Depth_m):factor(Month)6	28.814	28.967	254.148	<0.001
s(Lat,Depth_m):factor(Month)7	28.832	28.972	242.346	<0.001
s(Lat,Depth_m):factor(Month)8	28.845	28.972	220.039	<0.001
s(Lat,Depth_m):factor(Month)9	28.827	28.966	214.292	<0.001
s(Lat,Depth_m):factor(Month)10	28.682	28.955	139.624	<0.001
s(Lat,Depth_m):factor(Month)11	28.817	28.965	245.434	<0.001
s(Lat,Depth_m):factor(Month)12	28.783	28.963	242.026	<0.001

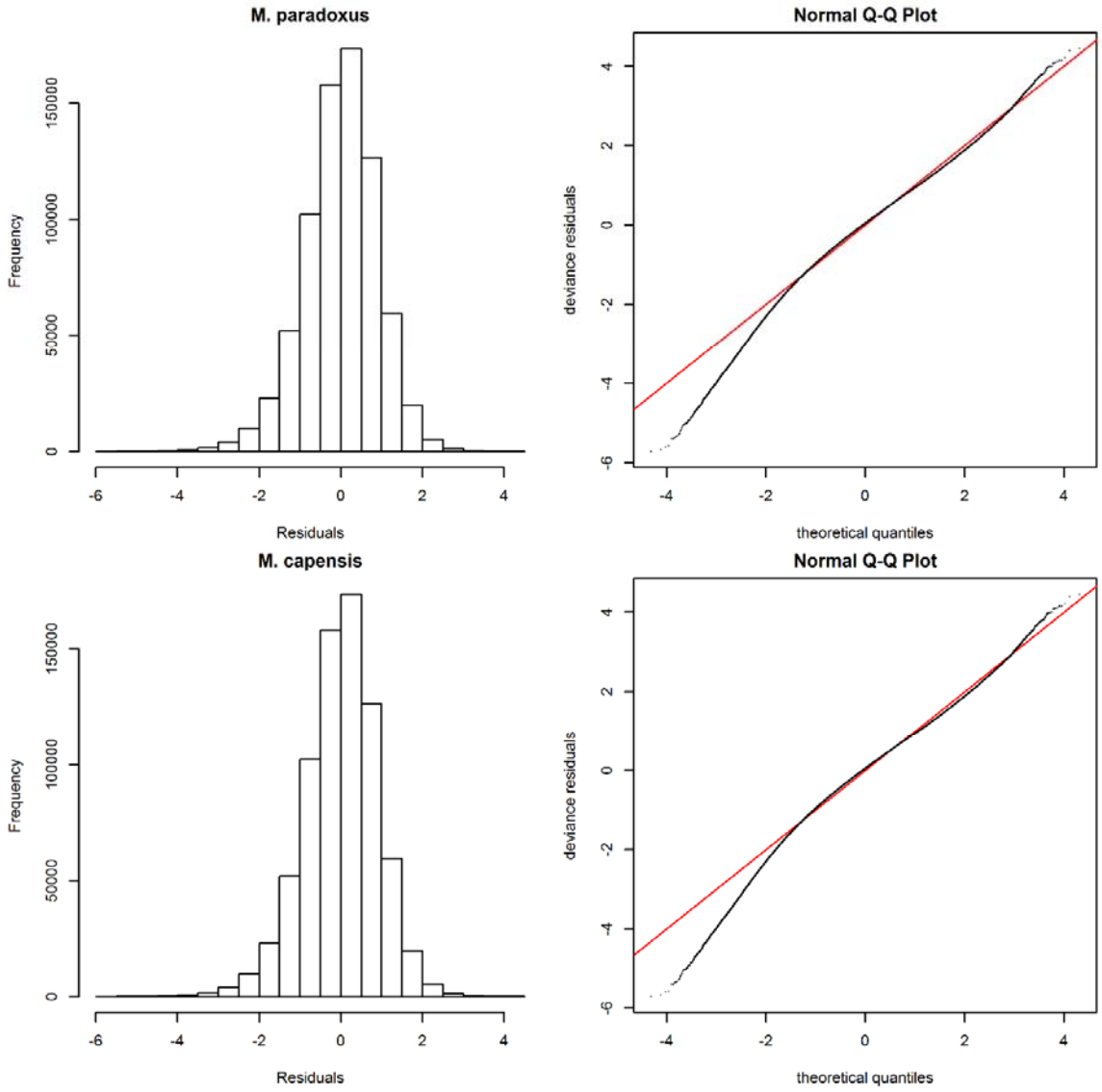

Figure S1: *Merluccius paradoxus* and *M. capensis* catch-model normality and Q-Q plots

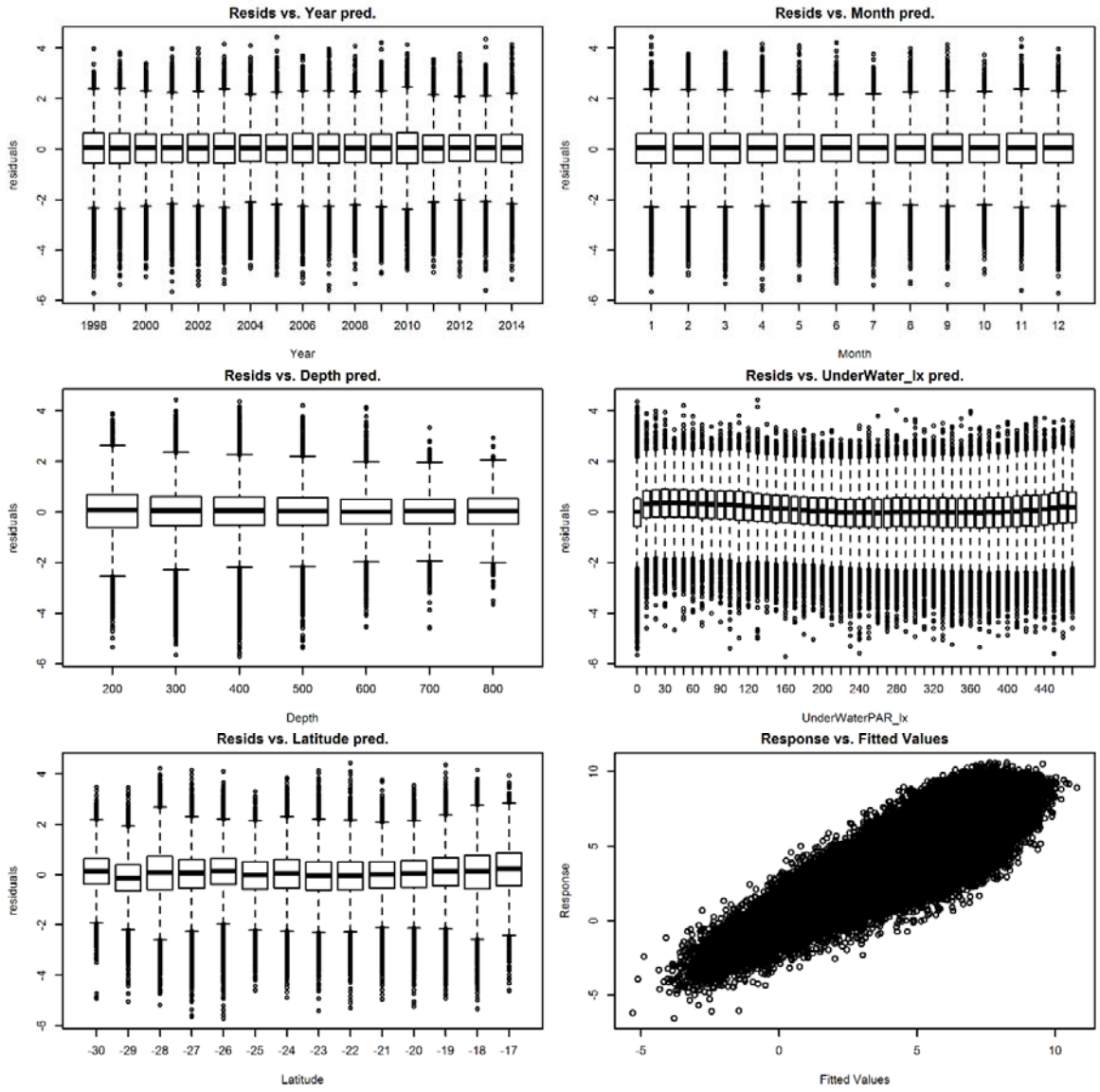

Figure S2: *Merluccius capensis* catch-model validation plots and diagnostics

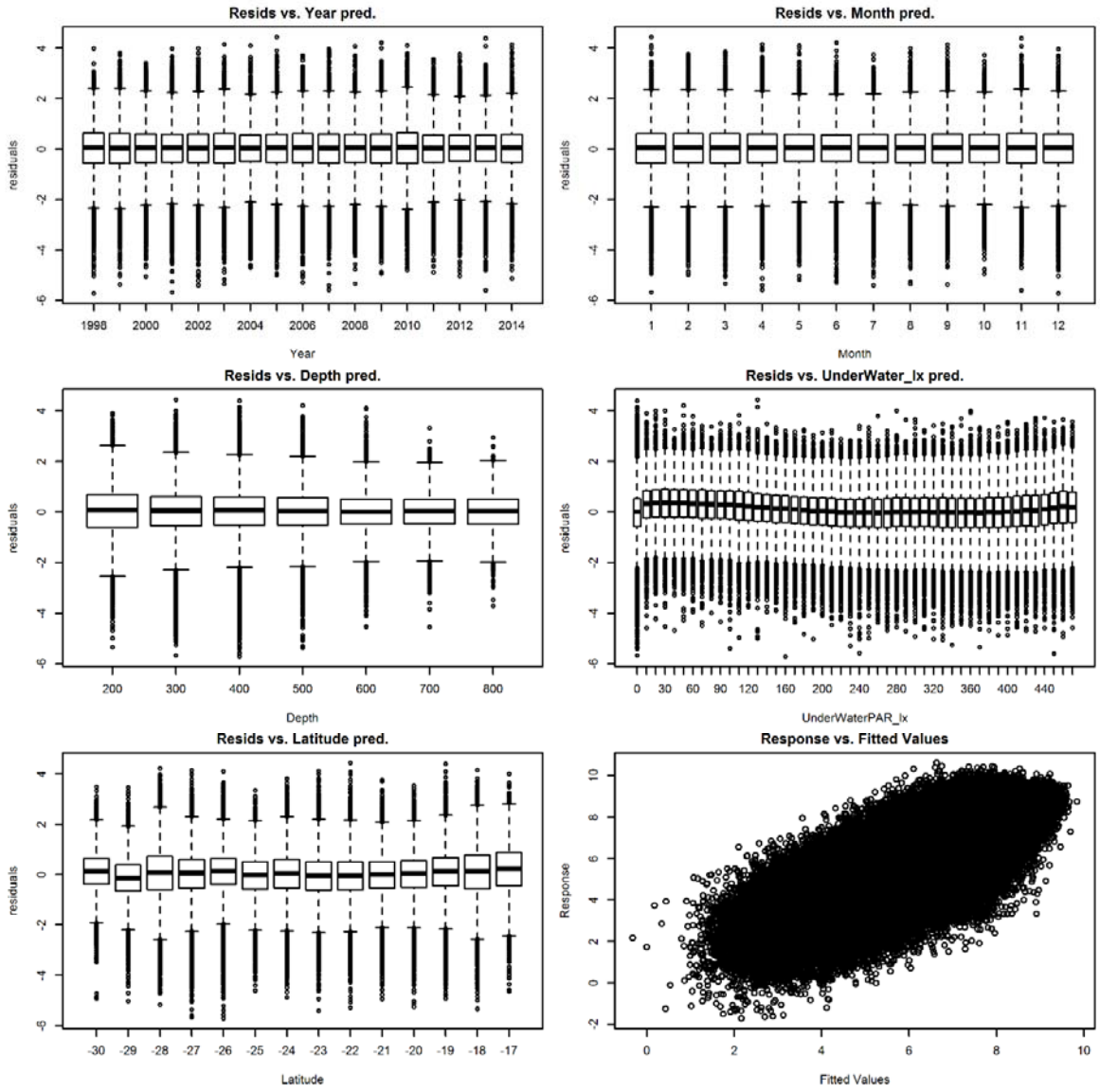

Figure S3: *Merluccius paradoxus* catch-model validation plots and diagnostics

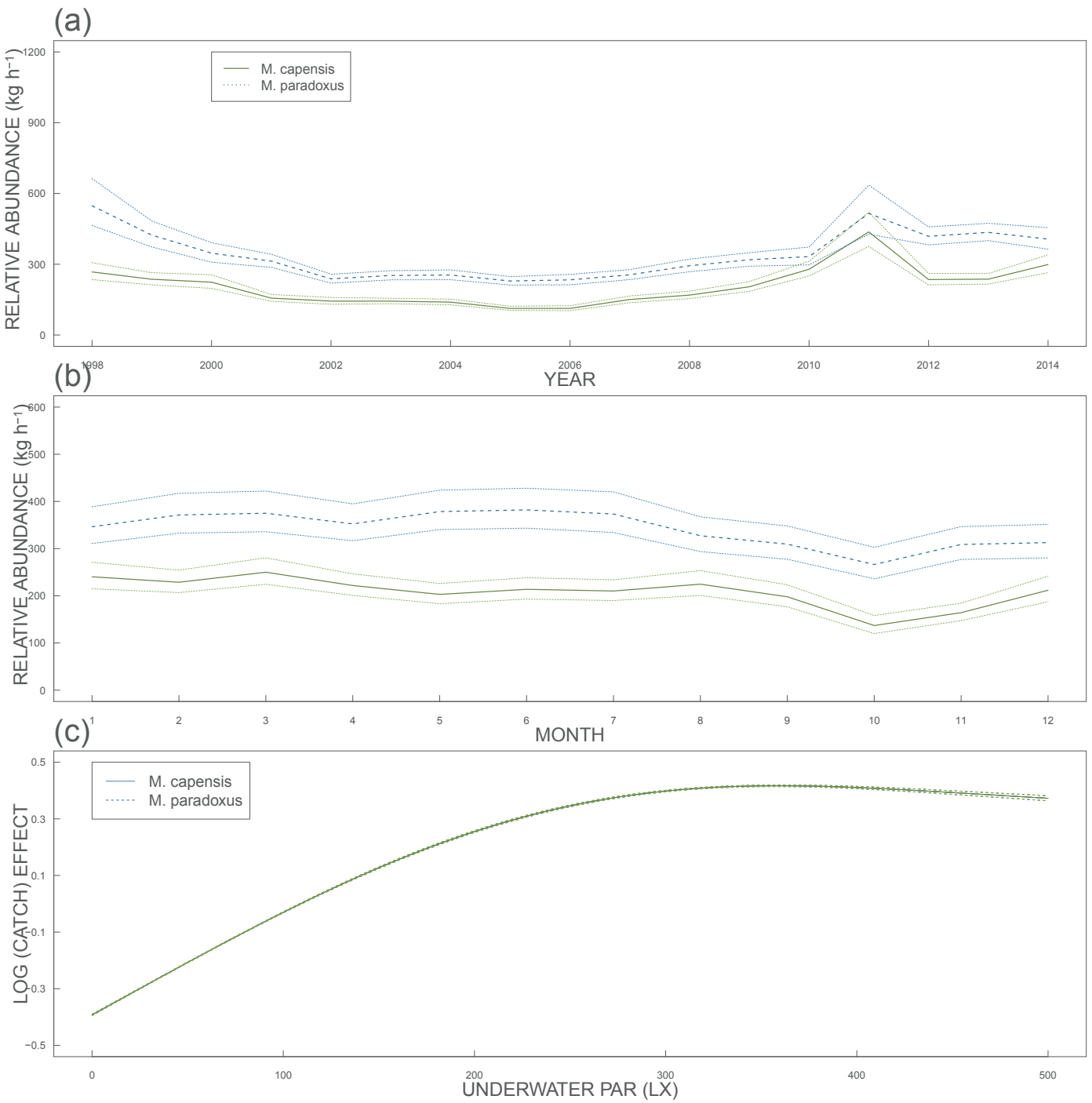

Figure S4: Catch rates of *Merluccius capensis* and *M. paradoxus* in the northern Benguela system off Namibia, predicted by generalised additive models (cf. Figure 3), but restricted to trawls at bottom depths of 200–690 m: (a) yearly effect, (b) monthly effect, and (c) estimated light intensity. The thin dashed lines represent the 95% confidence interval from the GAM, and the central solid line is the predicted mean

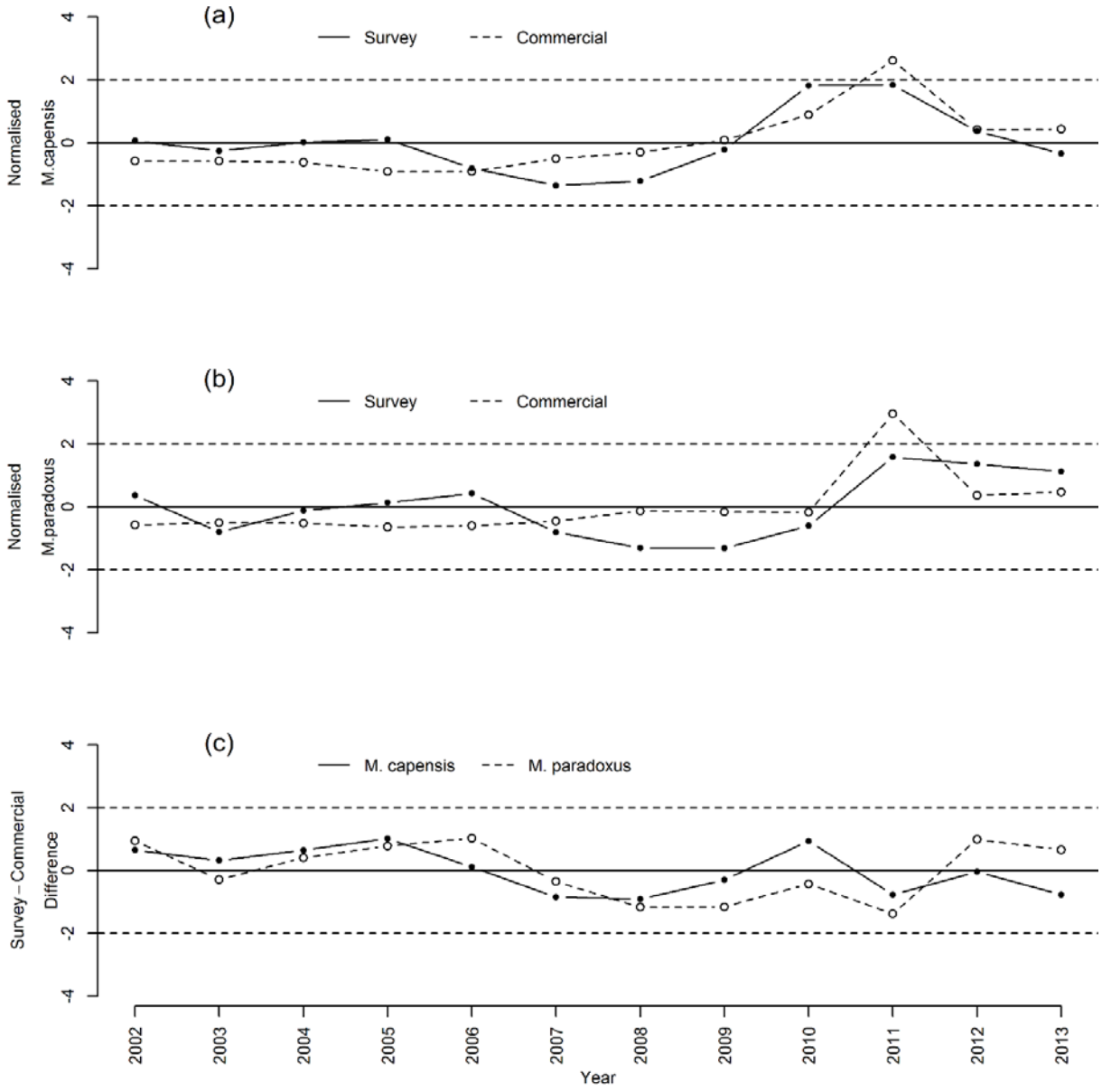

Figure S5: Normalised CPUE of *Merluccius capensis* and *M. paradoxus* in the northern Benguela upwelling system off Namibia: (a) *M. capensis* normalised survey and commercial CPUE, (b) *M. paradoxus* normalised survey and commercial CPUE, and (c) species-specific normalised survey CPUE minus commercial CPUE