Table S1. Summary of regulations for each of the management areas (iSimangaliso Offshore Controlled Pelagic Linefishing Zone North (IOCPLZN), iSimangaliso Offshore Restricted Zone North (IORZN), iSimangaliso Offshore Wilderness Zone (IOWZ) and Ponta do Ouro Partial Marine Reserve (PPMR)) (PPMR, 2009; IWPA, 2010; IMP, 2017). *Note, the Techobanine Sanctuary zone in the PPMR prohibits all recreational fishing.

Activities	IORZN	IOWZ	IOCPLZN	PPMR
Semi-industrial/industrial fishing	NO	NO	NO	NO
Collection of biota and marine products	NO	NO	YES	NO
Recreational fishing	NO	NO	YES (pelagic only)	YES (pelagic only)
Commercial fishing	NO	NO	NO	NO
Construction of infrastructure	NO	NO	NO	NO
Spearfishing of pelagic species	NO	NO	YES	YES
Diving activities	NO	NO	YES	YES
Scientific research	YES	YES	YES	YES

Table S2. Benthobox parameters used to assess relief type.

Relief types
Relief 0: Flat habitat, sandy, rubble with few features. 0 degree habitat slope.
Relief 1: Some relief features amongst mostly flat habitat, sand, rubble. < 45 degree habitat slope.
Relief 2: Mostly relief features amongst some flat habitat or rubble. 45 degree habitat slope.
Relief 3: Good relief structure with some overhangs. > 45 degree habitat slope.
Relief 4: High structural complexity, fissures and caves. Vertical wall. 90 degree habitat slope.
Relief 5: Exceptional structural complexity, numerous large holes and caves. Vertical wall. 90 degree habitat slope.

Table S3. PERMANOVA results (df: degrees of freedom; SS: sum of squares; MS: mean sum of squares; Pseudo-F: value by permutation; P(perm): p-values; perms: number of permutations) of the comparison in terms of total abundance and abundance species between Techobanine Sanctuary Area and Ponta do Ouro Partial Marine Reserve. Significant terms were shown in bold.

	Parametric coefficients	**df**	**SS**	**MS**	**Pseudo-F**	**P(perm)**	**perms**
Elasmobranch assemblage							
	Visibility	1	990.12	990.12	1.7399	0.106	999
	Water column	1	283.98	283.98	0.499	0.817	998
	Depth	**1**	**2488.6**	**2488.6**	**4.3731**	**0.002****	**999**
	Reef	1	358.07	358.07	0.6292	0.705	998
	Mean Relief	1	302.84	302.84	0.5322	0.773	999
	Management	1	692.37	692.37	1.2167	0.264	996
	Bottom	2	1231.5	615.73	1.082	0.39	996
	MaxBottom	2	507.04	253.52	0.4455	0.84	995
	Y	1	849.51	849.51	1.4928	0.178	998
	X	1	1288.9	1288.9	2.2649	0.061	998
	Residuals	40	22762	569.06			
	Total	52	31755				
Total MaxN							
	Visibility	1	5.018	5.018	3.3383	0.063	998
	Water column	1	0.0271	0.0271	0.018	0.878	994
	Depth	1	9.0533	9.0533	6.0228	0.013	999
	Reef	1	1.3321	1.3321	0.8862	0.337	998
	Mean Relief	1	7.4827	7.4827	4.9779	0.036	999
	Management	1	4.3167	4.3167	2.8717	0.098	995
	Bottom	2	11.265	5.6326	3.7472	0.046	999
	MaxBottom	2	4.4226	2.2113	1.4711	0.188	999
	Y	1	1.8415	1.8415	1.2251	0.302	996
	X	**1**	**33.114**	**33.114**	**22.029**	**0.004****	**993**
	Residuals	40	60.127	1.5032			
	Total	52	138				

Table S4. Top GAMMs and GAMs for predicting the abundance of sharks, the occurrence of rays, the diversity of sharks, the presence and co-occurrence of elasmobranchs from full subset analyses. Model type, error distribution, corrected Akaike Information Criterion (AIC*c*), lowest reported AIC*c* (ΔAIC*c*), AIC*c* weight (wAIC*c*), variance explained (R2) and effective degrees of freedom (EDF) to the best-fitting model were reported. Model selection was based on the lowest AIC*c* score.

Model selection table: Species richness of sharks (M1)

Model	(Intercept)	Management	Habitat	s(Depth)	s(Depth, by = "Habitat")	s(Average relief)	s(Visibility)	s(Water column	df	logLik	AICc	delta	weight
101	-0.6377			+			+	+	8	-71.105	161.1	0	0.263
53	-0.6209			+		+	+		7	-73.379	161.7	0.62	0.193
117	-0.6393			+		+	+	+	9	-70.938	162.2	1.14	0.149
69	-0.6288			+				+	8	-72.579	162.2	1.14	0.148
37	-0.6128			+			+		6	-74.208	162.2	1.16	0.147
103	-0.3763	+		+			+	+	11	-68.725	163	1.93	0.1

Models ranked by AICc(x, REML = TRUE)

Model selection table: MaxN of sharks (M2)

Model	(Intercept)	Management	Habitat	s(Depth)	s(Depth, by = "Habitat")	s(Average relief)	s(Visibility)	s(Water column	df	logLik	AICc	delta	weight
101	-0.4128			+			+	+	8	-121.21	259.9	0	0.72
69	-0.4031			+				+	7	-122.96	261.8	1.89	0.28

Models ranked by AICc(x. REML = TRUE)

Model selection table: Presence/Absence of rays (M3)

Model	(Intercept)	Management	Habitat	s(Depth)	s(Depth. by = "Habitat")	s(Average relief)	s(Visibility)	s(Water column	df	logLik	AICc	delta	weight
29	-1.779				+	+	+		9	-74.703	170.3	0	0.397
31	-2.487	+			+	+	+		13	-70.963	171.2	0.93	0.25
15	-2.512	+			+	+			12	-72.165	171.8	1.51	0.187
13	-1.734				+	+			9	-76.458	172	1.76	0.165

Models ranked by AICc(x. REML = TRUE)

Model selection table: Trophic composition of elasmobranch community (M4)

Model	(Int)	Management	Habitat	s(Depth)	s(Depth. by = TP")	s(Average relief)	s(Average relief. by = "TP")	s(Visibility)	s(Water column	TP (trophic position)	Management : TP	df	logLik	AICc	delta	weight
1399	-1.774	+		+		+	+	+		+	+	19	-252.647	545.3	0	0.326
1383	-1.774	+		+			+	+		+	+	19	-252.647	545.3	0	0.326
1511	-1.828	+		+			+	+	+	+	+	22	-250.244	546.5	1.26	0.174
1527	-1.828	+		+		+	+	+	+	+	+	22	-250.244	546.5	1.26	0.174

Models ranked by AICc(x. REML = TRUE)

Table S5. Sample size of habitat type for each management zone.

Management zone	Reef	Mosaic	Sand	Total
IORZN	33	10	2	45
IOWZ	27	15	8	50
IOCPLZN	32	9	13	54
PPMR	34	13	6	53
Total	126	47	29	202

Table S6. Results from the summary.GAM for the model (M1) investigating patterns in the species richness of sharks. Std. error: standard error; Pr(>|t|): p-value associated with the value in the t value column; edf: effective degrees of freedom; Ref. df: reference degrees of freedom. Significant terms were shown in bold.

M1: Variables influencing the species richness of sharks

Parametric coefficients:

Terms	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	**-0.6377**	**0.1049**	**-6.079**	**6.20 x 10^-9*** **

Terms	edf	Ref.df	F	p-value
s(Visibility)	1	1	3.365	0.0681
s(Water.column)	2.399	3.035	1.767	0.1598
s(Depth)	**1.546**	**1.922**	**14.718**	**2.62 x 10^-6*** **

Table S7. Results from the summary.GAM for the model (M2) investigating patterns in the abundance of sharks. Std. error: standard error; Pr(>|t|): p-value associated with the value in the t value column; edf: effective degrees of freedom; Ref. df: reference degrees of freedom. Significant terms were shown in bold.

M2: Variables influencing the relative abudnance of sharks

Parametric coefficients:

Terms	**Estimate**	**Std. Error**	**t value**	**Pr(>|t|)**
(Intercept)	**-0.4128**	**0.0937**	**-4.405**	**1.73 x 10^-05*** **

Approximate significance of smooth terms:

Terms	**edf**	**Ref.df**	**F**	**p-value**
s(Visibility)	1	1	3.671	0.0568.
s(Water.column)	2.817	3.559	2.658	0.0434*
s(Depth)	**1**	**1**	**33.751**	**<2 x 10^-16*** **

*Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

R-sq.(adj) = 0.174 Deviance explained = 21.3%
-REML = 129.99 Scale est. = 1.0108 n = 202

Table S8. Results from the summary.GAM for the model (M3) investigating patterns in the detection probability of rays. Std. error: standard error; Pr(>|t|): p-value associated with the value in the t value column; edf: effective degrees of freedom; Ref. df: reference degrees of freedom. Significant terms were shown in bold.

M3: Variables influencing the presence/absence of rays

Parametric coefficients:

Terms	**Estimate**	**Std. Error**	**t value**	**Pr(>|t|)**
(Intercept)	**-1.7794**	**0.2241**	**-7.941**	**2.00 x 10^-15*** **

Approximate significance of smooth terms:

Terms	**edf**	**Ref.df**	**F**	**p-value**	
s(Visibility)	1	1	3.841	0.05002	.
s(Depth):BottomSand	2.73	3.363	8.296	0.06048	.
s(Depth):BottomMozaic	1	1	0.917	0.33837	
s(Depth):BottomReef	1.984	2.513	3.246	0.25993	
s(Relief)	**1**	**1**	**7.443**	**6.37 x 10^-03** **	

*Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

R-sq.(adj) = 0.148 Deviance explained = 16.9%
-REML = 129.99 Scale est. = 1.0108 n = 202

Table S9. Results from the summary.GAM for the model (M4) investigating patterns in the detection probability of the elasmobranch trophic positions. Std. error: standard error; Pr(>|t|): p-value associated with the value in the t value column; edf: effective degrees of freedom; Ref. df: reference degrees of freedom. Significant terms were shown in bold.

M4: Variables influencing the trophic composition of the elasmobranch community

Parametric coefficients:

Terms	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	**-1.6724**	**0.3789**	**-4.414**	**0.0000101*** **	
Management (IOCPLZN)	0.9008	0.4905	1.836	0.06629	.
Management (IORZN)	-0.7526	0.6593	-1.141	0.2537	
Management (PPMR)	-0.1724	0.5549	-0.311	0.75599	
Tropic (Medium)	0.1319	0.5139	0.257	0.79745	
Trophic (High)	-0.1416	0.5325	-0.266	0.79033	
Management (IOCPLZN): Trophic (Medium)	-0.3359	0.6845	-0.491	0.62362	
Management (IORZN): Trophic (Medium)	**2.3255**	**0.8061**	**2.885**	**0.00392****	
Management (PPMR): Trophic (Medium)	-0.2979	0.7726	-0.386	0.69982	
Management (IOCPLZN): Trophic (High)	-1.0978	0.7443	-1.475	0.14024	
Management (IORZN): Trophic (High)	0.3994	0.896	0.446	0.65582	
Management (PPMR): Trophic (High)	-0.6788	0.85	-0.799	0.4245	

Approximate significance of smooth terms:

Terms	edf	Ref.df	F	p-value
s(Visibility)	**2.184**	**2.773**	**10.57**	**0.0139***
s(Depth)	**1.337**	**1.604**	**21.218**	**0.0000208*****
s(Relief): Trophic (Low)	**1**	**1**	**7.94**	**0.00484****
s(Relief): Trophic (Medium)	1.001	1.001	0.223	0.63671
s(Relief): Trophic (High)	**1**	**1**	**2.443**	**1.18 x 10^-01***

*Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

R-sq.(adj) = 0.155 Deviance explained = 17%

REML = 259.17 Scale est. = 1 n = 606

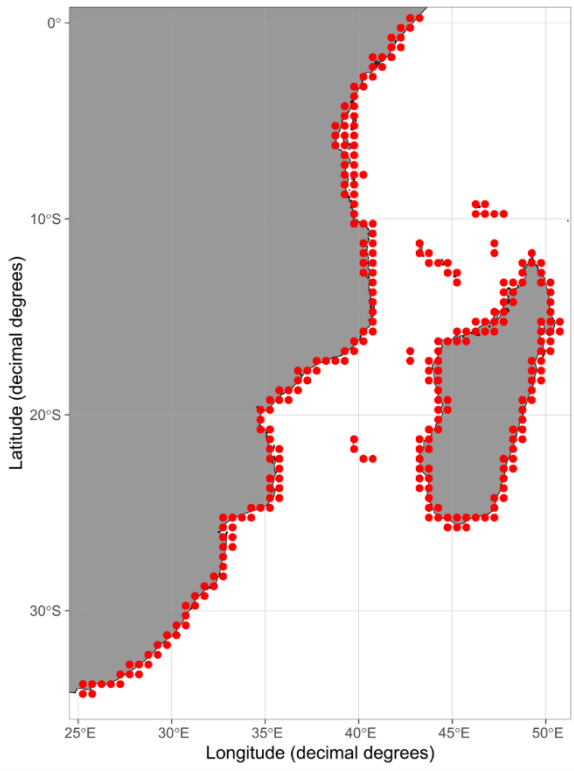

Figure S1. Map showing the spatial extent of the Aquamaps data used to investigate the probability of occurrence of the observed elasmobranchs in the south-west Indian Ocean.

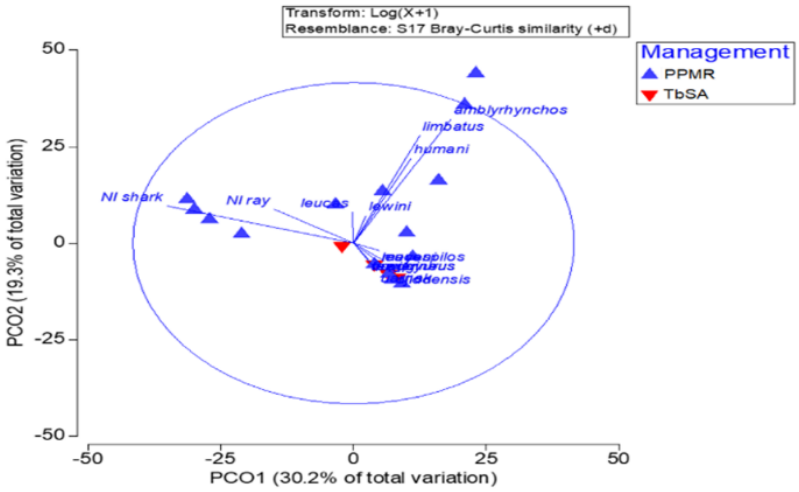

Figure S2. Comparison of elasmobranch assemblage for environmental parameters between Techobanine Sanctuary Area (TbSA) and Ponta do Ouro Partial Marine Reserve (PPMR).

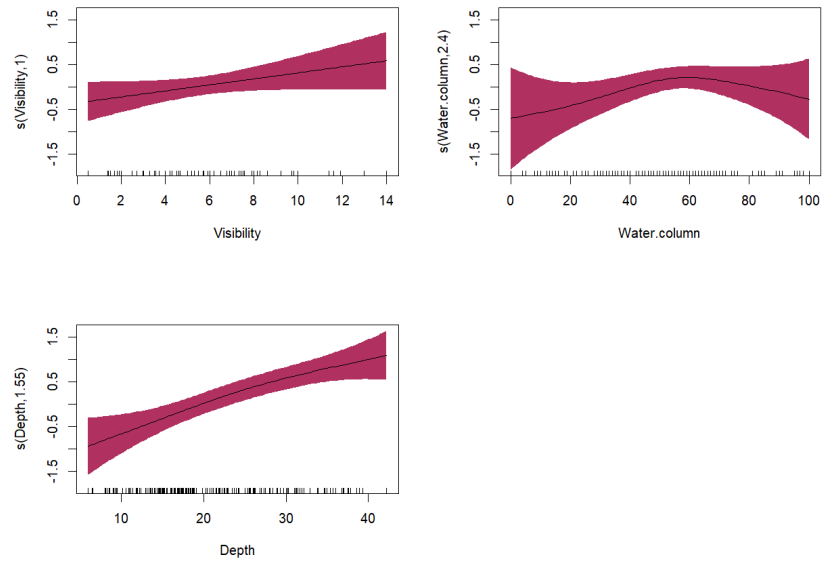

Figure S3. Results from the plot.GAM for the model (M1) investigating patterns in the species richness of sharks.

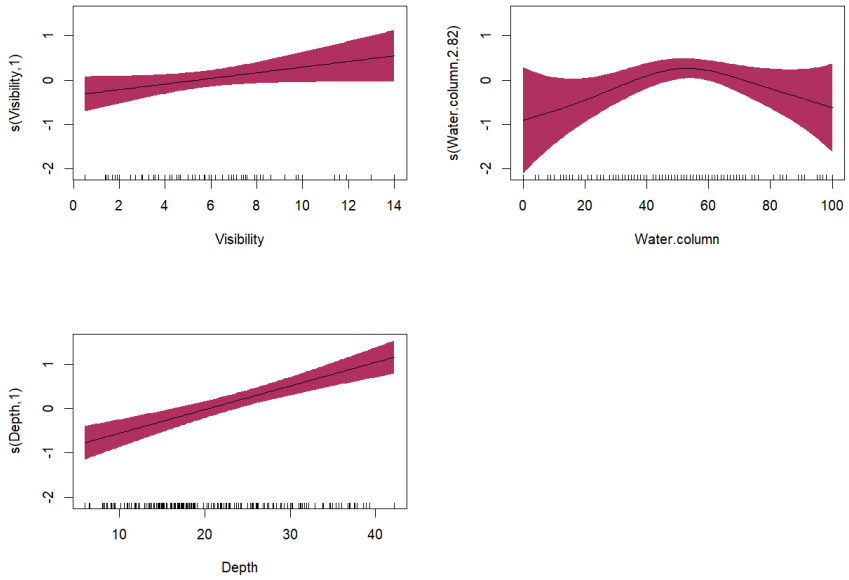

Figure S4. Results from the plot.GAM for the model (M2) investigating patterns in the abundance of sharks.

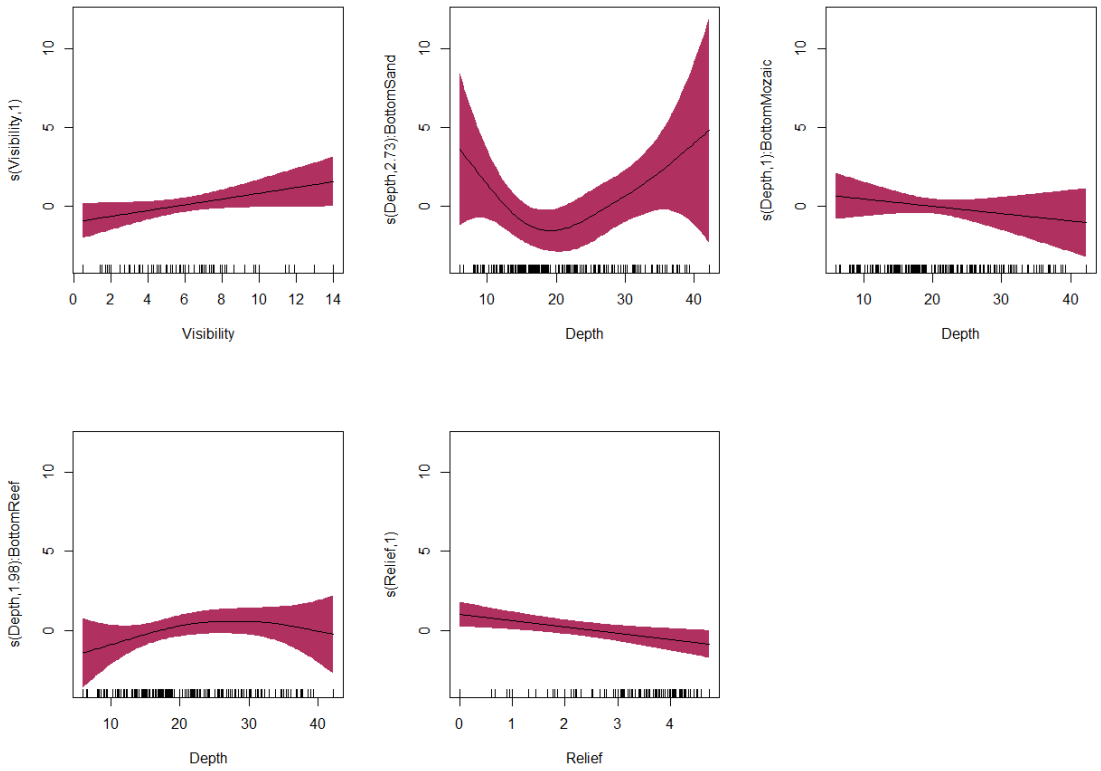

Figure S5. Results from the plot.GAM for the model (M3) investigating patterns in the detection probability of rays.

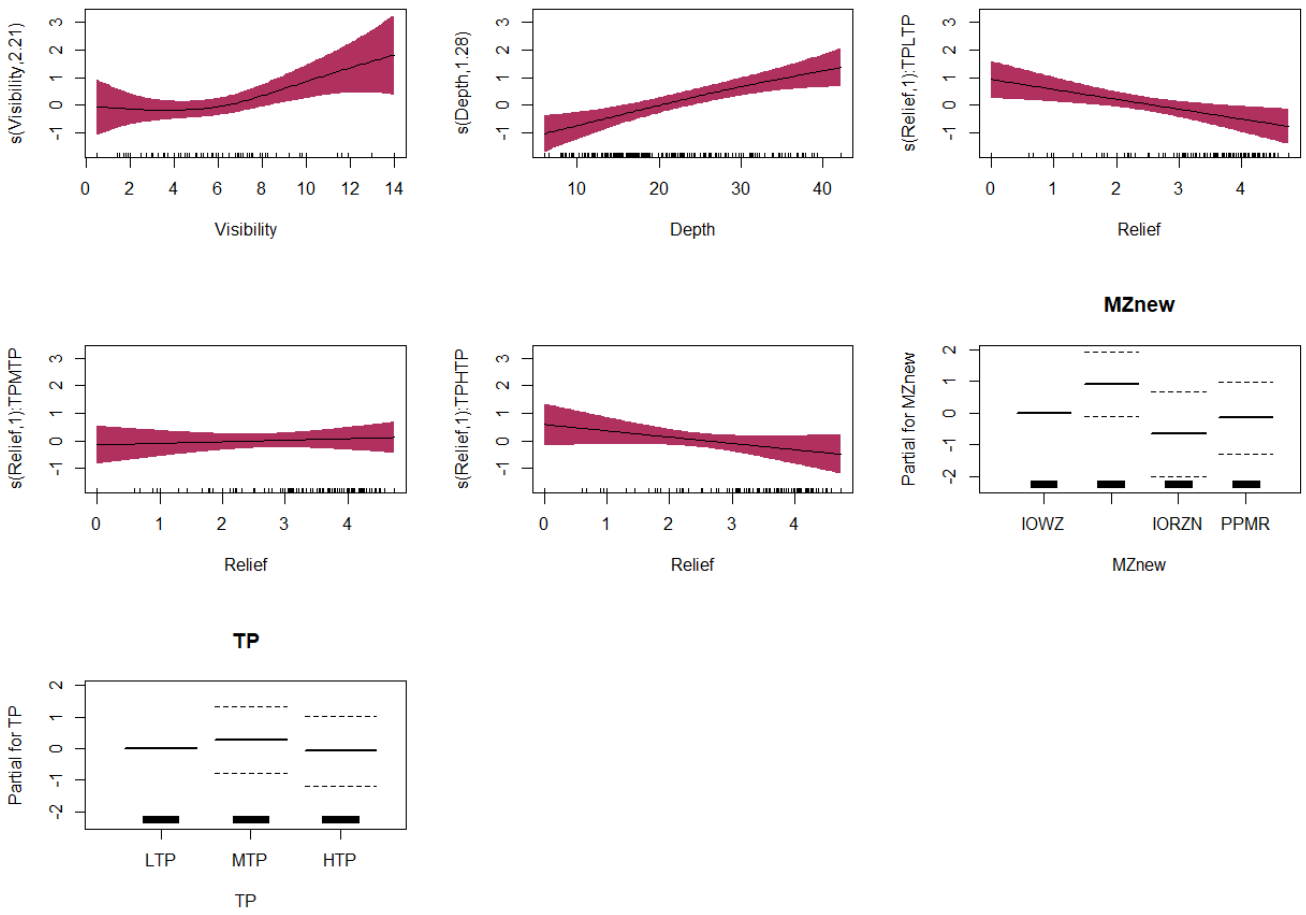

Figure S6: Results from the plot.GAM for the model (M4) investigating patterns in the detection probability of the elasmobranch trophic positions.