

# **Index of abundance for Greater Amberjack (*Seriola dumerili*) using combined data from fishery independent video surveys**

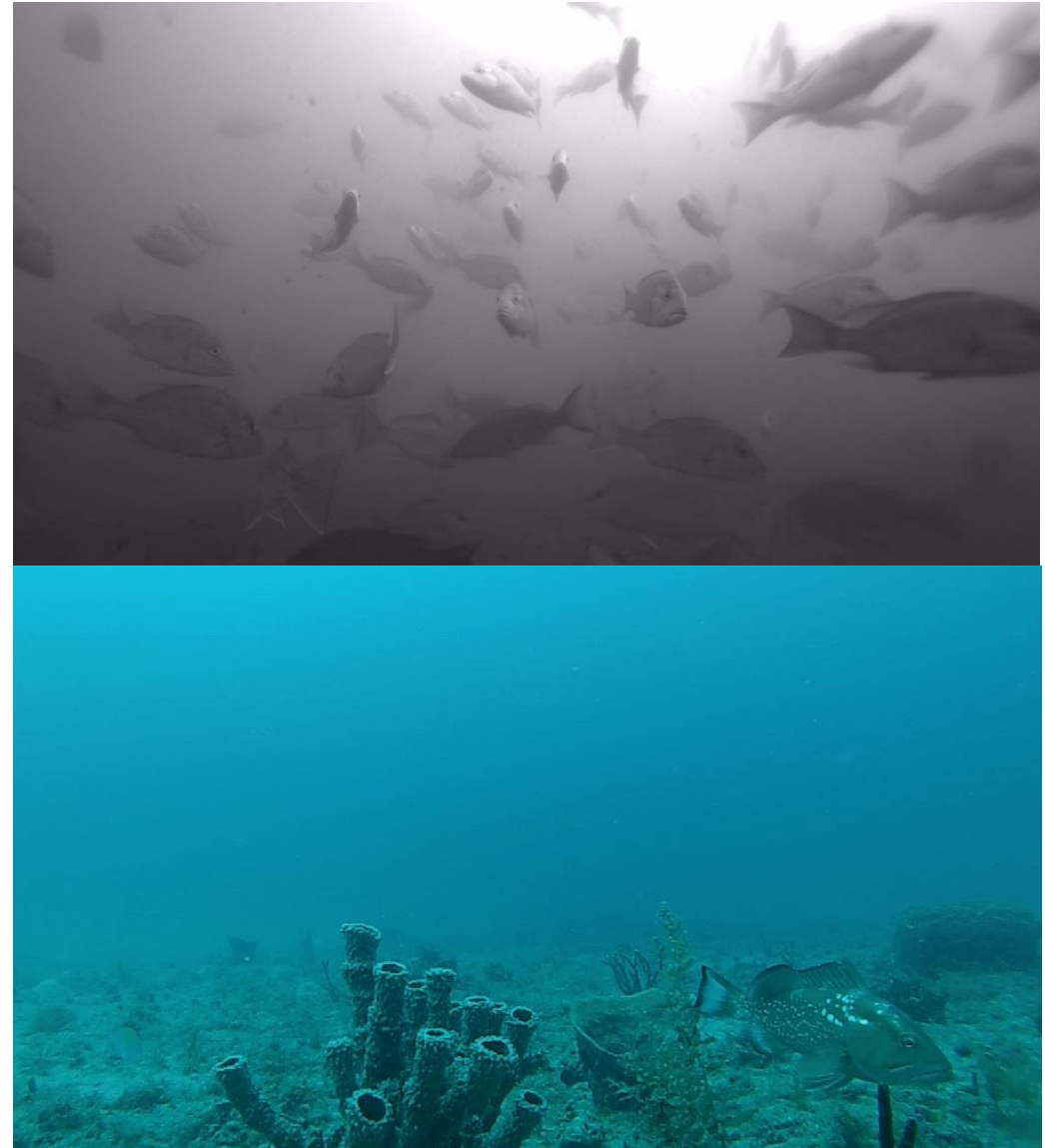
Heather Christiansen<sup>1</sup>, Matthew Campbell<sup>2</sup>, Sean Keenan<sup>1</sup>, Justin Lewis<sup>1</sup>, Kate Overly<sup>2</sup>,  
Ted Switzer<sup>1</sup>

<sup>1</sup>Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission

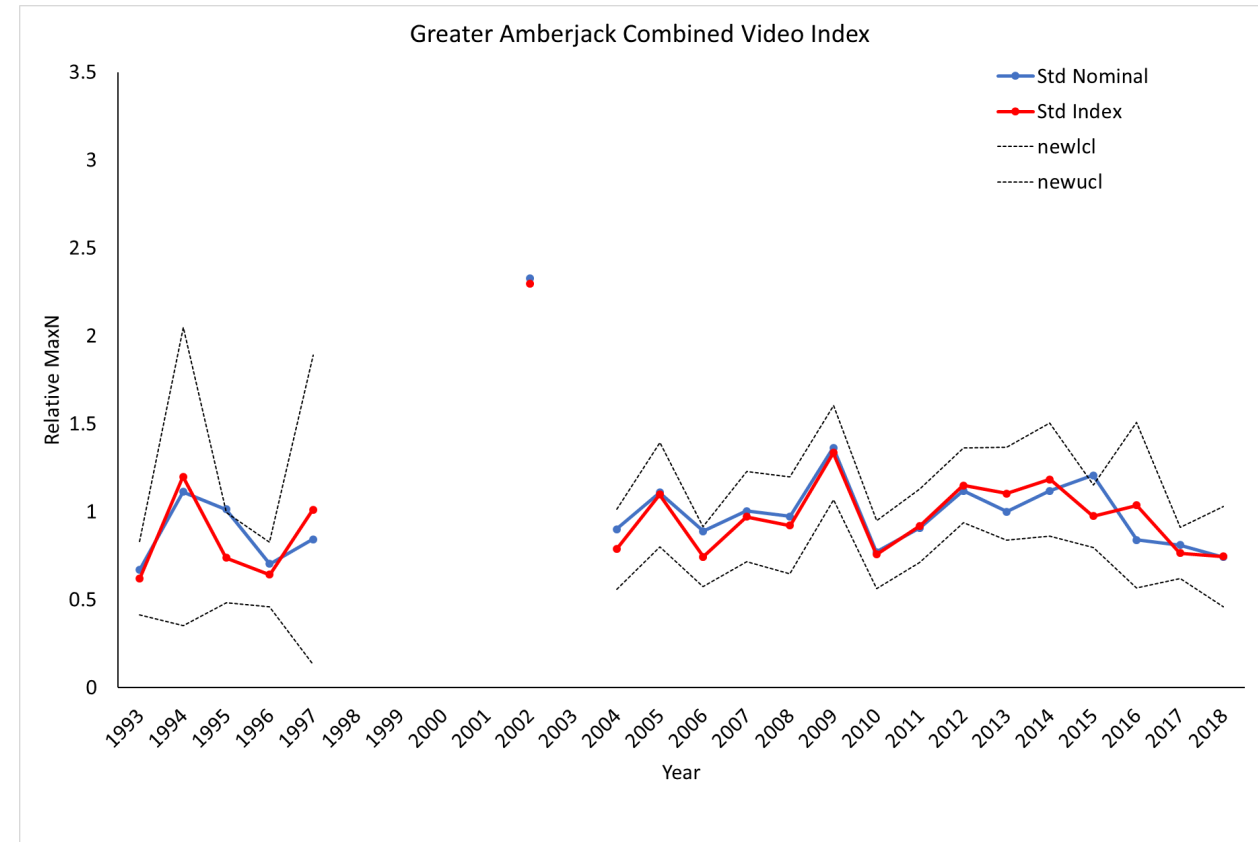
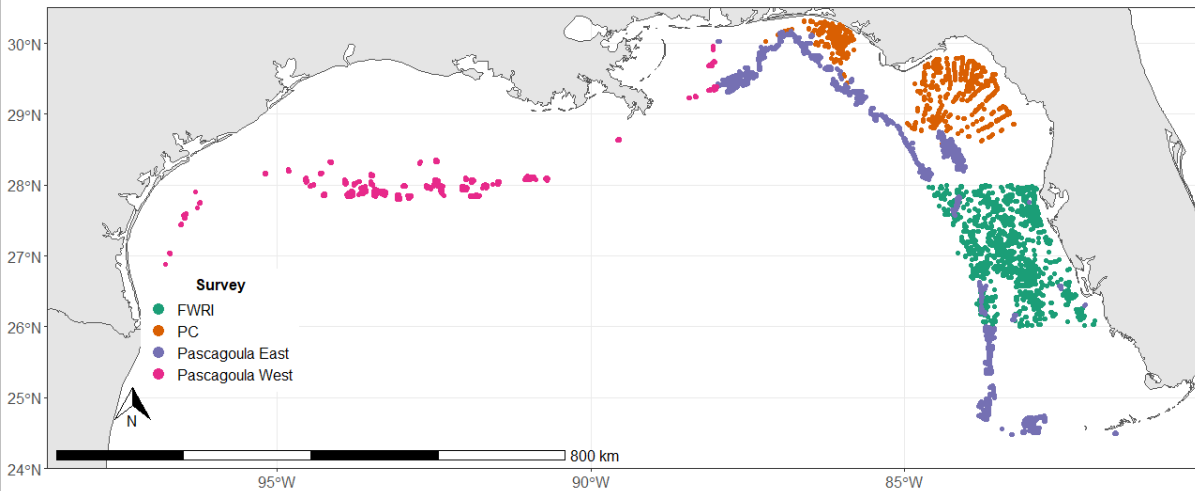
<sup>2</sup>National Marine Fisheries Service, Southeast Fisheries Science Center

# Stereo Baited Remote Underwater Video (S-BRUVs) Survey

- Fishery Independent
- Non-capture method of sampling
- Stereo-video imaging
  - Allow for measurements of select taxa
- Baited
- Video read for 20 minutes
  - MaxN = the maximum # seen of a species at one time
- Habitat metrics coded
  - e.g., sponge, rock, coral



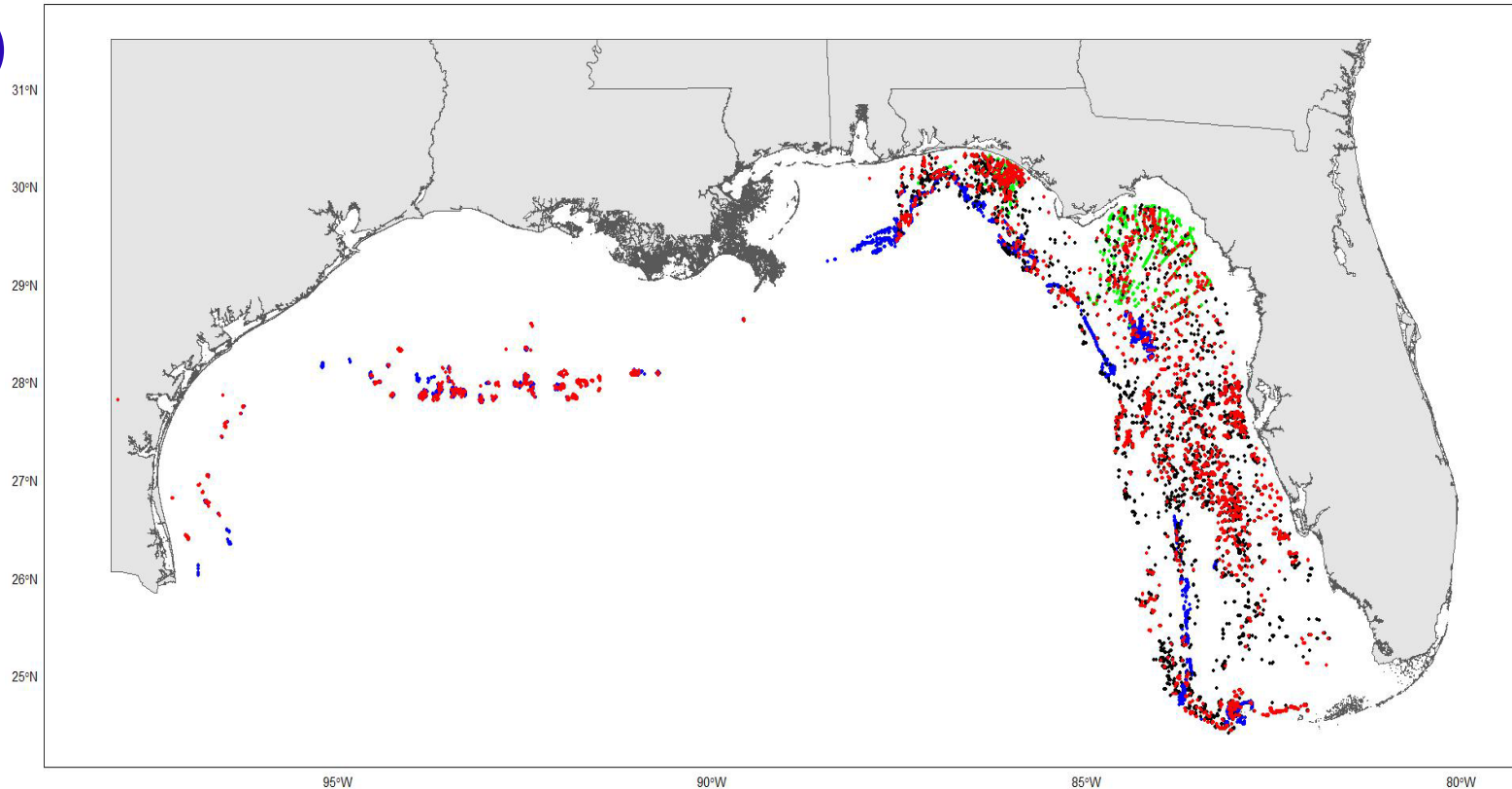
# SEDAR70- Greater Amberjack



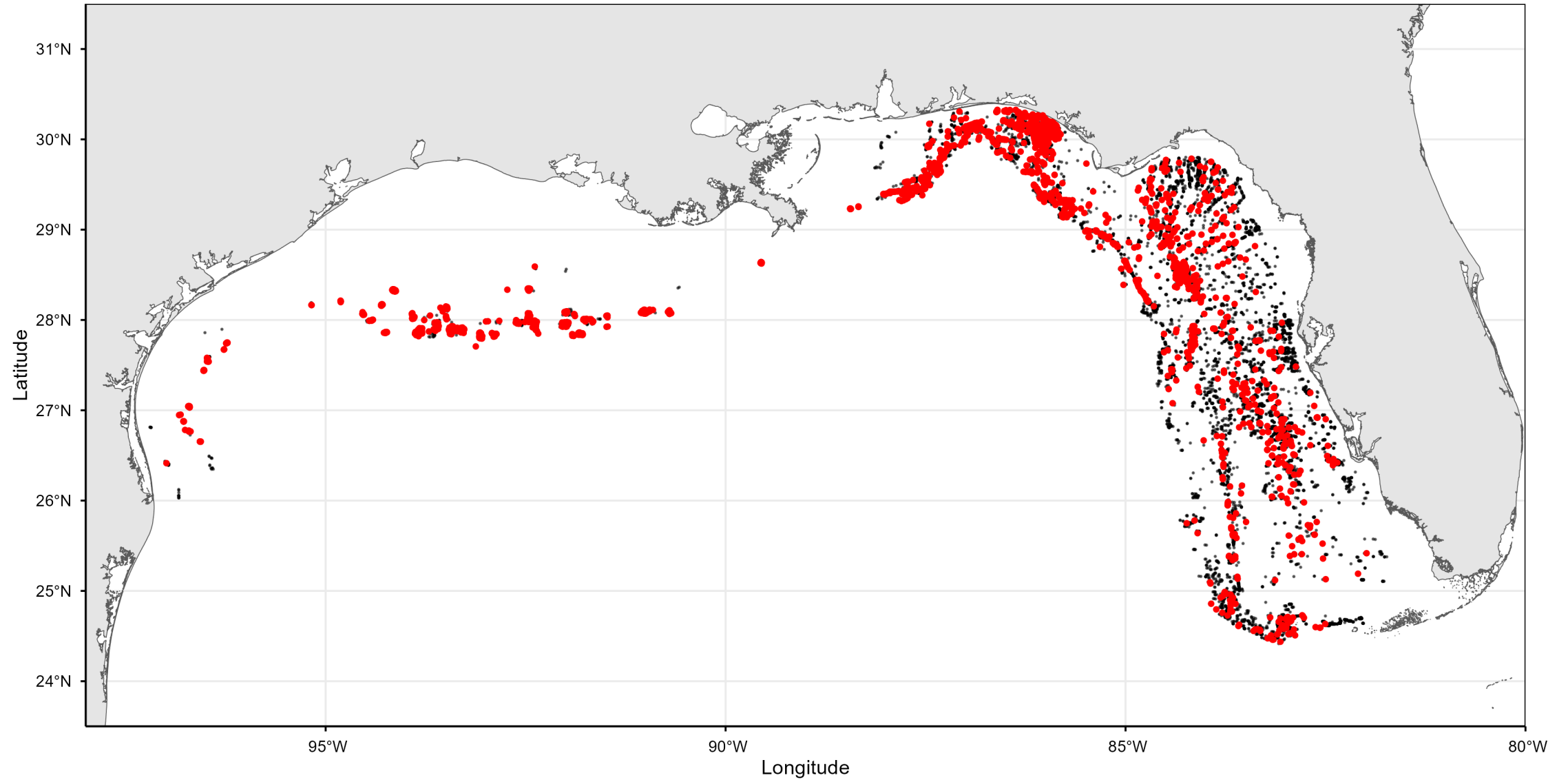
- SEDAR70- Combined Video Index included: SRFV-NMFS Pascagoula, NMFS Panama City, and FWRI
- Interim- Update each survey through 2019 and add G-FISHER data (2020-2024)

# Survey Expansion

- Time series variation
  - **SFRV-NMFS Pascagoula (1993- 2019)**
  - **NMFS Panama City (2006-2019)**
  - **FWRI (zones 4/5: 2010-2019)**
  - **FWRI NFWF expansion (2016-2019)**
  - **G-FISHER (2020-2024)**
- SRFV: High relief, deep sites, soundings, multibeam data
- FWRI/PC: Sample locations determined from side-scan mapping efforts
- G-FISHER: unifies the three surveys, modifications to habitat targeting
- Follow methods from SEDAR100 to produce Gulf-wide index of abundance for combined video survey



# *Seriola dumerili* presence/absence



# Sampled by Survey

Year	SRFV_E		SRFV_W		PC_E		FWRI_E		GF_E		GF_W	
	N Sites	N Fish	N Sites	N Fish	N Sites	N Fish	N Sites	N Fish	N Sites	N Fish	N Sites	N Fish
1993	115	12	45	1								
1994	97	50	45	42								
1995	52	20	37	41								
1996	133	51	165	61								
1997	162	59	127	67								
2002	168	239	93	67								
2004	149	73	49	18								
2006	280	102	136	89	87	182						
2007	332	146	158	109	44	30						
2008	212	78	125	48	83	78						
2009	264	341	165	62	104	181						
2010	229	102	98	51	138	49	49	12				
2011	337	266	103	69	150	15	211	33				
2012	281	153	200	101	148	114	214	96				
2013	163	67	133	70	86	130	183	7				
2014	230	210	113	60	169	116	338	109				
2015	155	78	54	25	155	159	378	160				
2016	205	87	167	109	158	67	719	332				
2017	222	159	193	118	147	111	622	74				
2018	221	79	186	102	76	26	694	138				
2019	286	87	262	74	94	57	899	347				
2020									764	149	*	*
2021									999	366	285	78
2022									936	476	309	122
2023									939	440	281	132
2024									1017	572	253	105
Total	4293	2459	2654	1384	1639	1315	4308	1308	4655	2003	1128	437

\* No sampling occurred in the West Gulf in 2020

# Analytical Methods-Habitat Model

- *Thompson et al. 2022-Fisheries Research*
- Describe sites with **High**, **Medium**, **Low** proportion positive
  - Strata \* Year \* Species
  - MacCall 1990
- Classification and Regression Trees (CART)
  - MaxN reduced to binary (P/A)
  - R package: Party (Hothorn et al.)

***MaxN ~ Year + Depth + Latitude + Longitude + Habitat Strata + Max Vertical Relief + Algae + Hard coral + Soft coral + Seagrass + Sponge + Unknown sessile + Rock + Sediment + Relief + Artificial***



# Analytical Methods- Weighted GLM

- Negative binomial model
  - $\text{MaxN} = \text{Year} * \text{Hab} * \text{Survey}$
- Weighted model
  - First, estimate total reef area within each survey domain
  - Second, allocate area estimates of High, Medium, and Low habitats proportionally based on random sampling effort

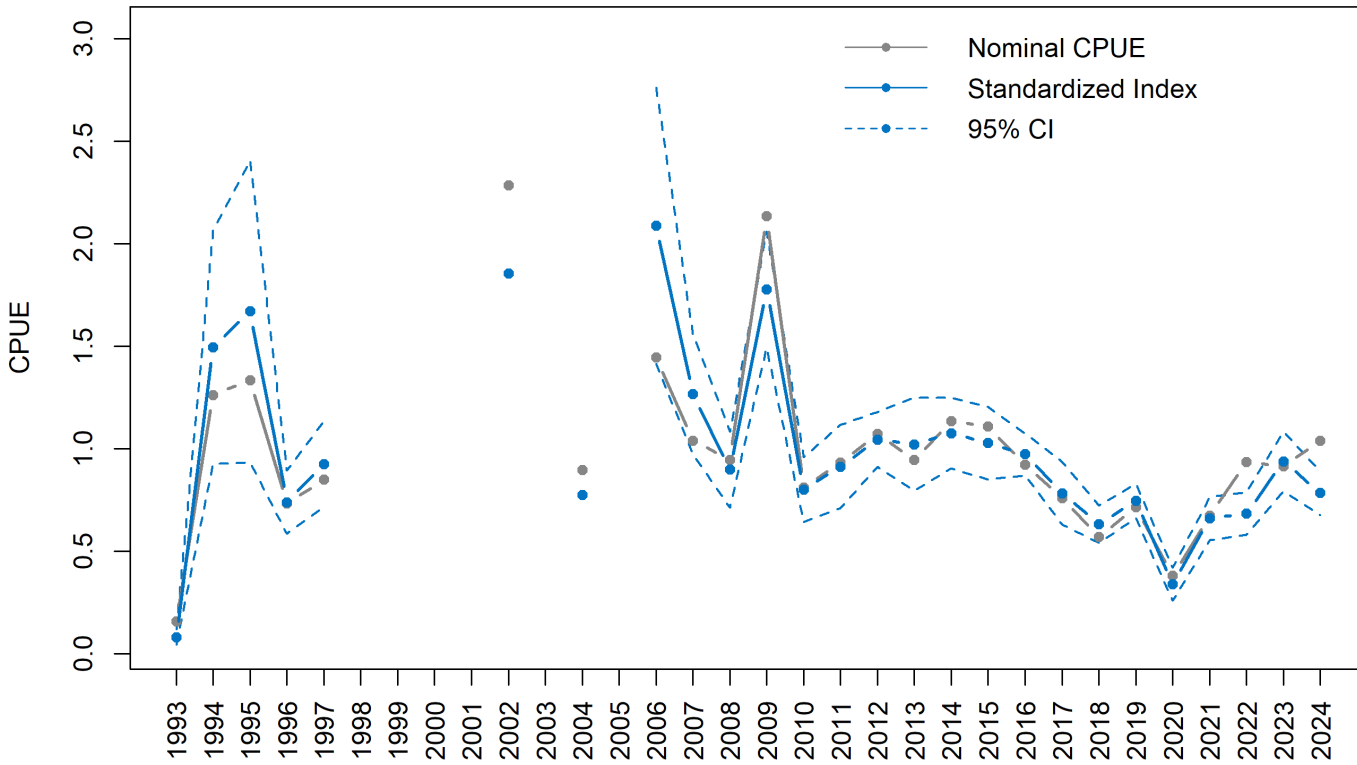
# Sites by Habitat

	SRFV_E			SRFV_W		PC_E			FWRI_E			GF_E			GF_W		Total
	L	M	H	M	L	M	H	M	H	L	M	H	L	M			
1993	14	85	16	45												160	
1994	21	65	11	45												142	
1995	14	28	10	37												89	
1996	34	77	22	165												298	
1997	39	93	30	127												289	
2002	34	74	60	93												261	
2004	26	79	44	49												198	
2006	62	177	41	136	51	29	7									503	
2007	79	190	63	158	22	20	2									534	
2008	63	124	25	125	42	32	9									420	
2009	74	144	46	165	36	57	11									533	
2010	74	117	38	98	43	90	5	47	2							514	
2011	81	179	77	103	63	86	1	205	6							801	
2012	85	150	46	200	57	88	3	210	4							843	
2013	21	107	35	133	17	67	2	180	3							565	
2014	54	132	44	113	55	111	3	315	23							850	
2015	15	113	27	54	59	95	1	320	58							742	
2016	64	109	32	167	64	92	2	660	59							1249	
2017	62	139	21	193	60	83	4	557	65							1184	
2018	58	141	22	186	55	20	1	643	51							1177	
2019	74	188	24	262	34	57	3	822	77							1541	
2020										505	164	95				764	
2021										566	230	203	120	165		1284	
2022										526	179	231	104	205		1245	
2023										514	201	224	79	202		1220	
2024										554	258	205	78	175		1270	
<b>Total</b>	<b>1106</b>	<b>2676</b>	<b>786</b>	<b>2790</b>	<b>658</b>	<b>927</b>	<b>54</b>	<b>3959</b>	<b>348</b>	<b>2665</b>	<b>1032</b>	<b>958</b>	<b>381</b>	<b>747</b>	<b>18676</b>		

# Area Weights

	Survey							
	SRFV-West (1993- 2019)	SRFV-East (1993- 2019)	PC-East (2006- 2019)	FWRI (2010- 2013)	FWRI (2014- 2015)	FWRI (2016- 2019)	GF-East (2020- 2024)	GF-West (2021- 2024)
Total Universe Area (km <sup>2</sup> )	31258	37278	22105	46286	58970	144403	159028.5	31258
Area x Proportion of mapped with reef	11565.46	6428	5124	9820	11159.92	29000	30374.38	11565.46
Time Period Weighting Values								
1993-2005	0.64	0.36						
2006-2009	0.50	0.28	0.22					
2010-2013	0.35	0.20	0.16	0.30				
2014-2015	0.34	0.19	0.15		0.32			
2016-2019	0.22	0.12	0.10			0.56		
2020-2024							0.72	0.28

# Index of Abundance

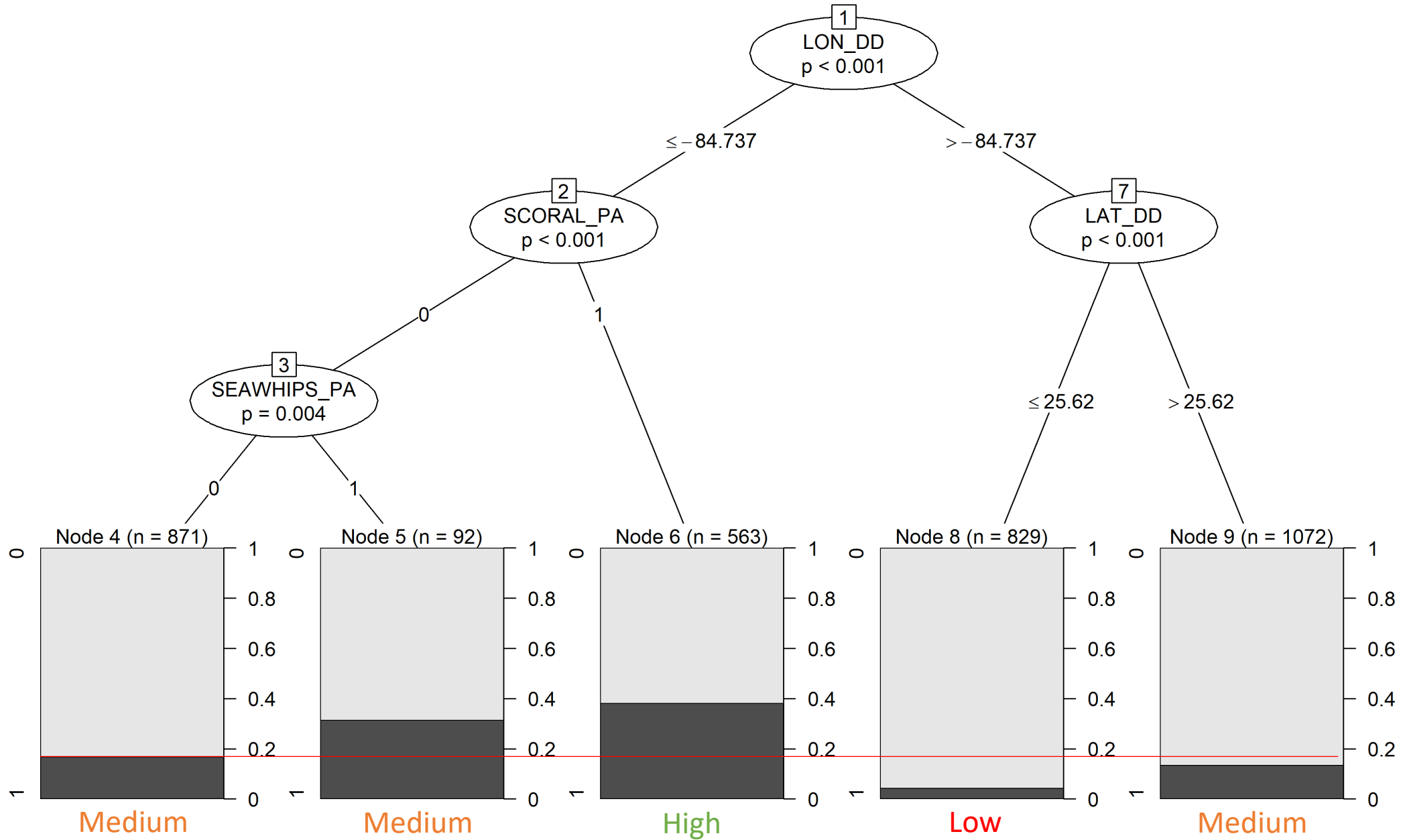


Year	N	Proportion Positive	Nominal	Std. Index	CV
1993	160	0.038	0.081	0.082	0.467
1994	142	0.232	0.648	1.495	0.382
1995	89	0.281	0.685	1.671	0.441
1996	298	0.168	0.376	0.740	0.207
1997	289	0.145	0.436	0.925	0.226
2002	261	0.337	1.172	1.855	0.219
2004	198	0.182	0.460	0.776	0.317
2006	503	0.161	0.742	2.088	0.322
2007	534	0.169	0.534	1.267	0.232
2008	420	0.164	0.486	0.898	0.206
2009	533	0.242	1.096	1.777	0.160
2010	514	0.179	0.416	0.801	0.199
2011	801	0.165	0.478	0.913	0.223
2012	843	0.216	0.550	1.045	0.128
2013	565	0.186	0.485	1.022	0.222
2014	850	0.159	0.582	1.076	0.160
2015	742	0.171	0.569	1.028	0.172
2016	1249	0.131	0.474	0.973	0.106
2017	1184	0.116	0.390	0.783	0.194
2018	1177	0.102	0.293	0.634	0.143
2019	1541	0.111	0.367	0.746	0.112
2020	764	0.050	0.195	0.339	0.238
2021	1284	0.132	0.346	0.660	0.159
2022	1245	0.157	0.480	0.684	0.152
2023	1220	0.15	0.469	0.938	0.154
2024	1270	0.136	0.533	0.784	0.137

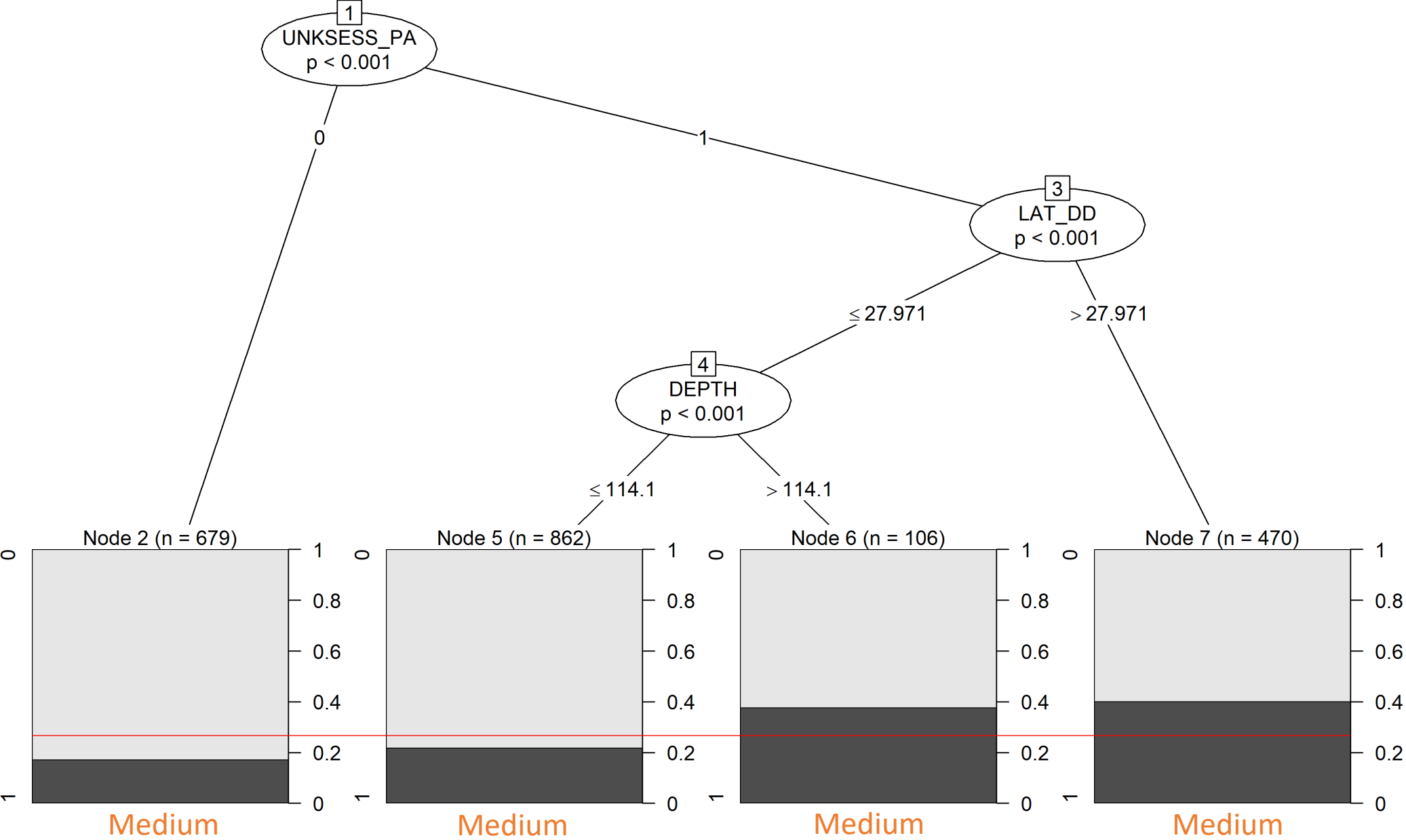
\* No sampling in the West Gulf in 2020

Extra slides

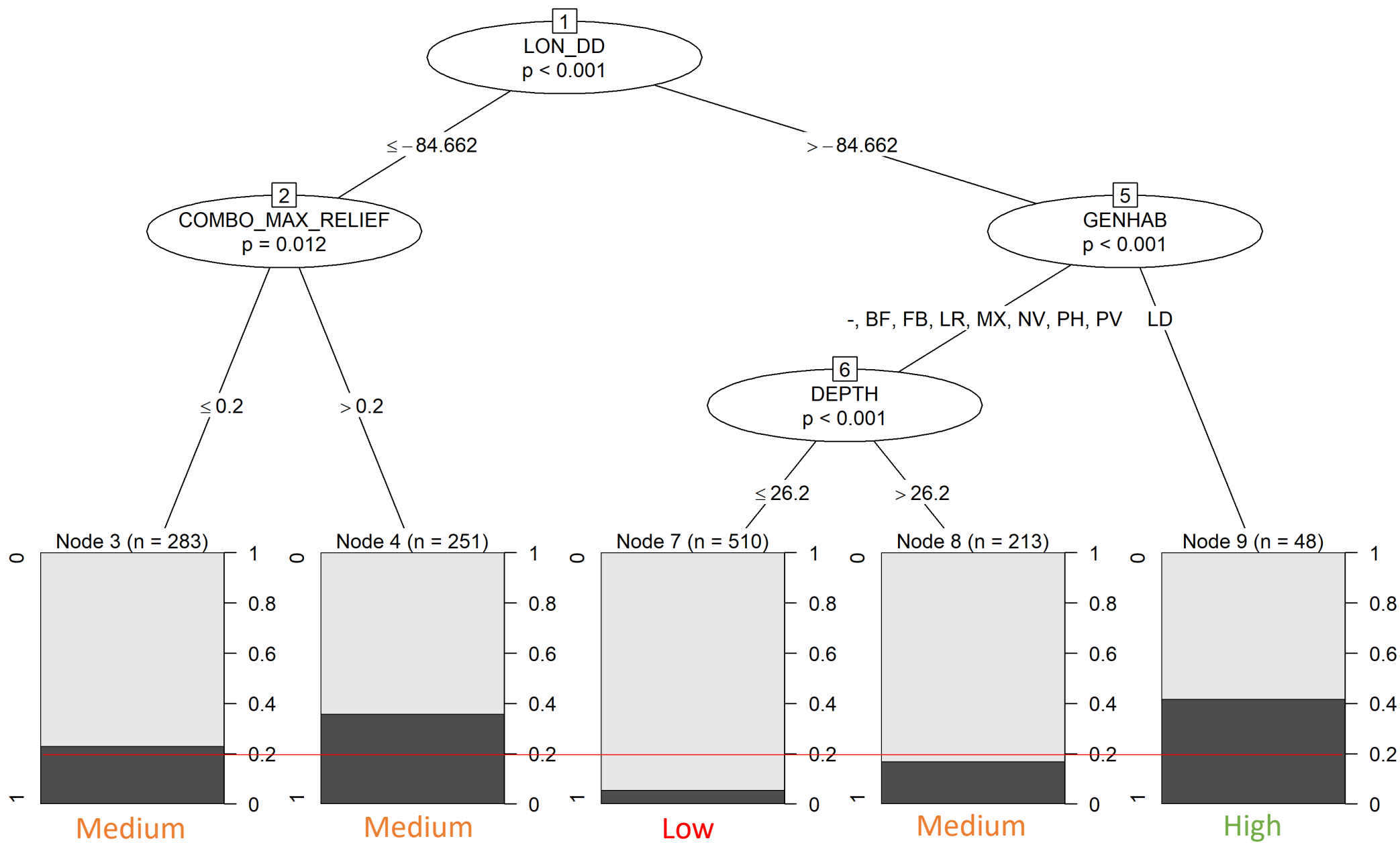
SRFV\_E final CART  
Seriola dumerili



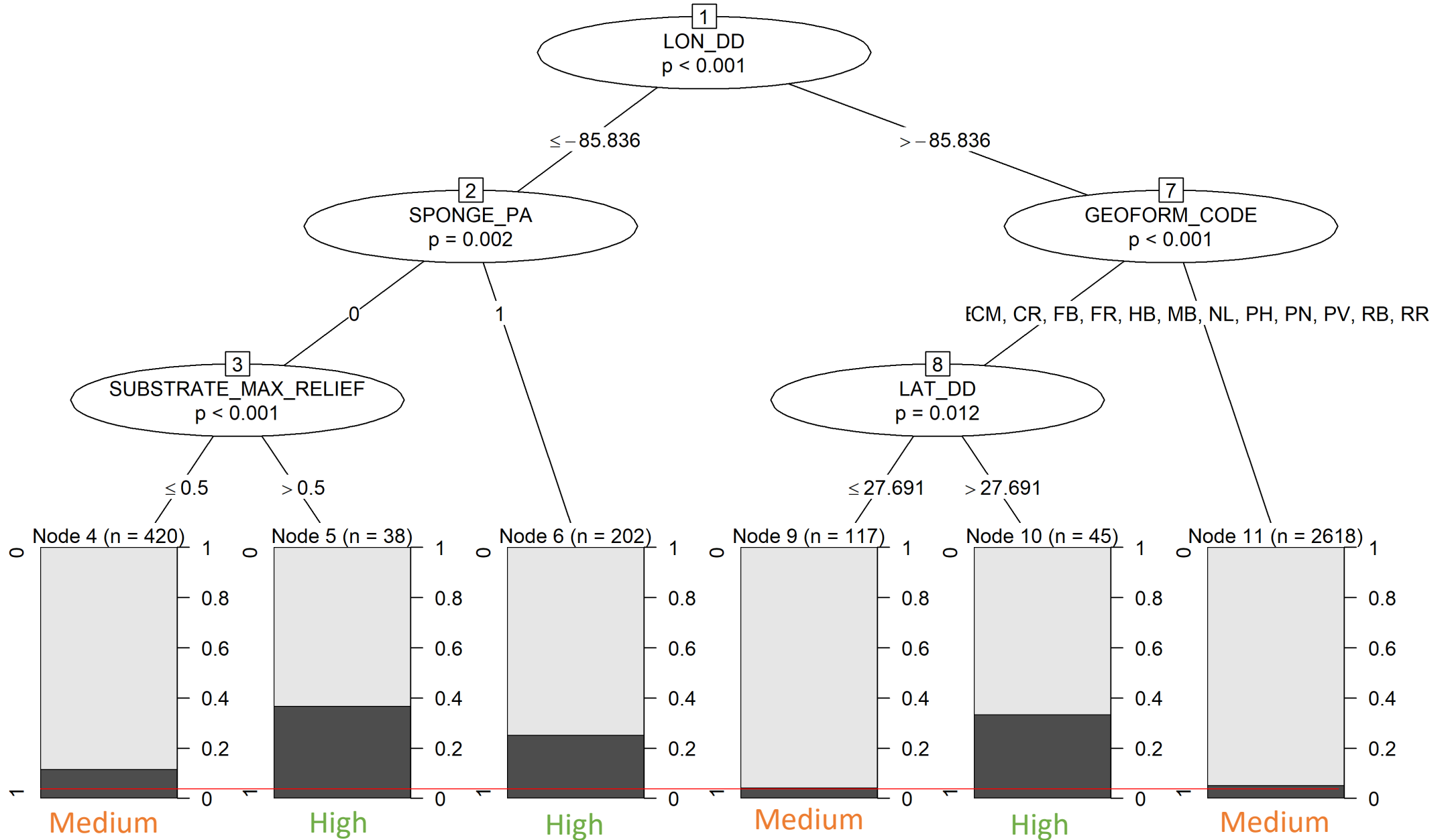
SRFV\_W final CART  
Seriola dumerili



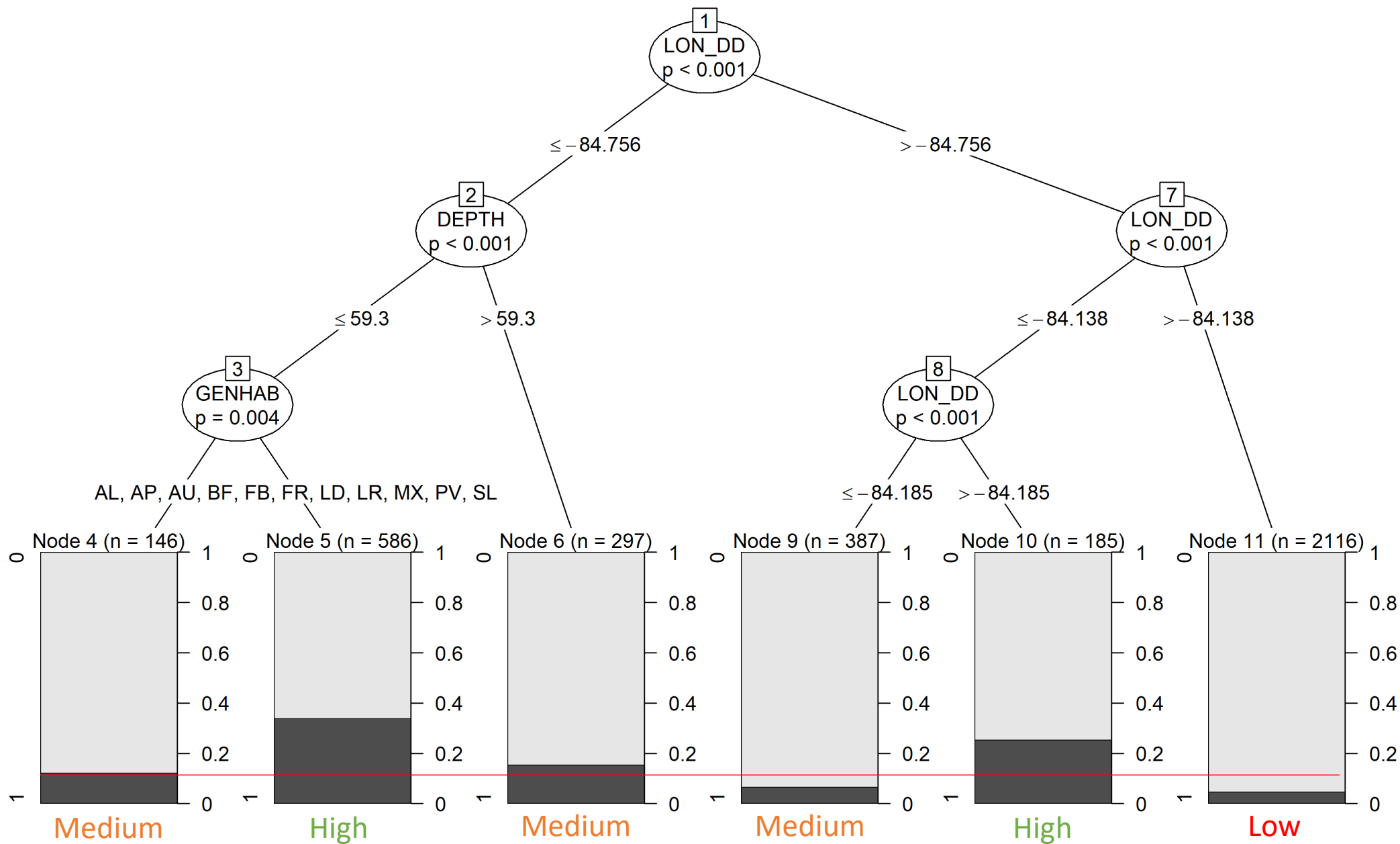
PC\_E final CART  
Seriola dumerili



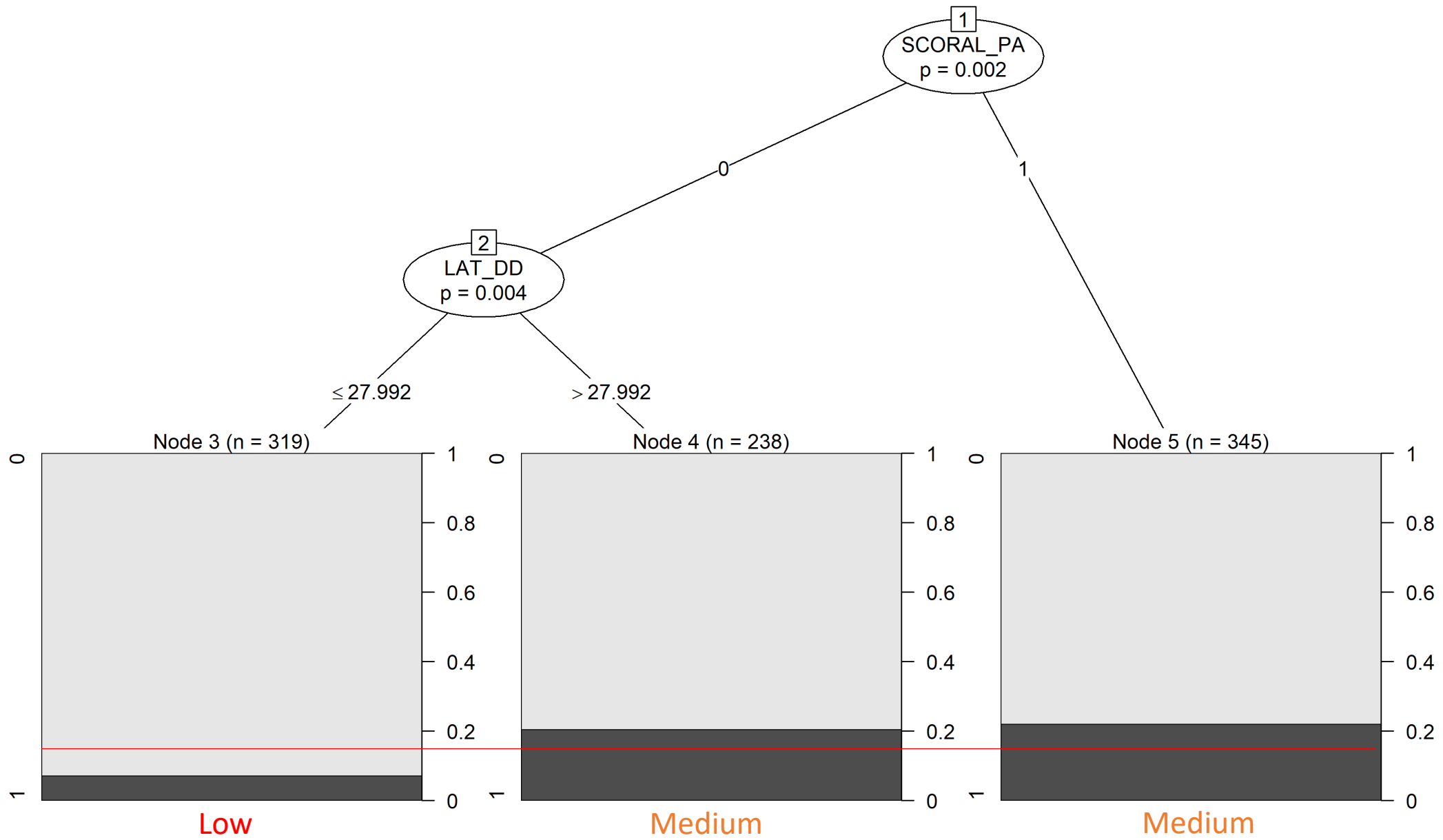
FWRI\_E final CART  
Seriola dumerili



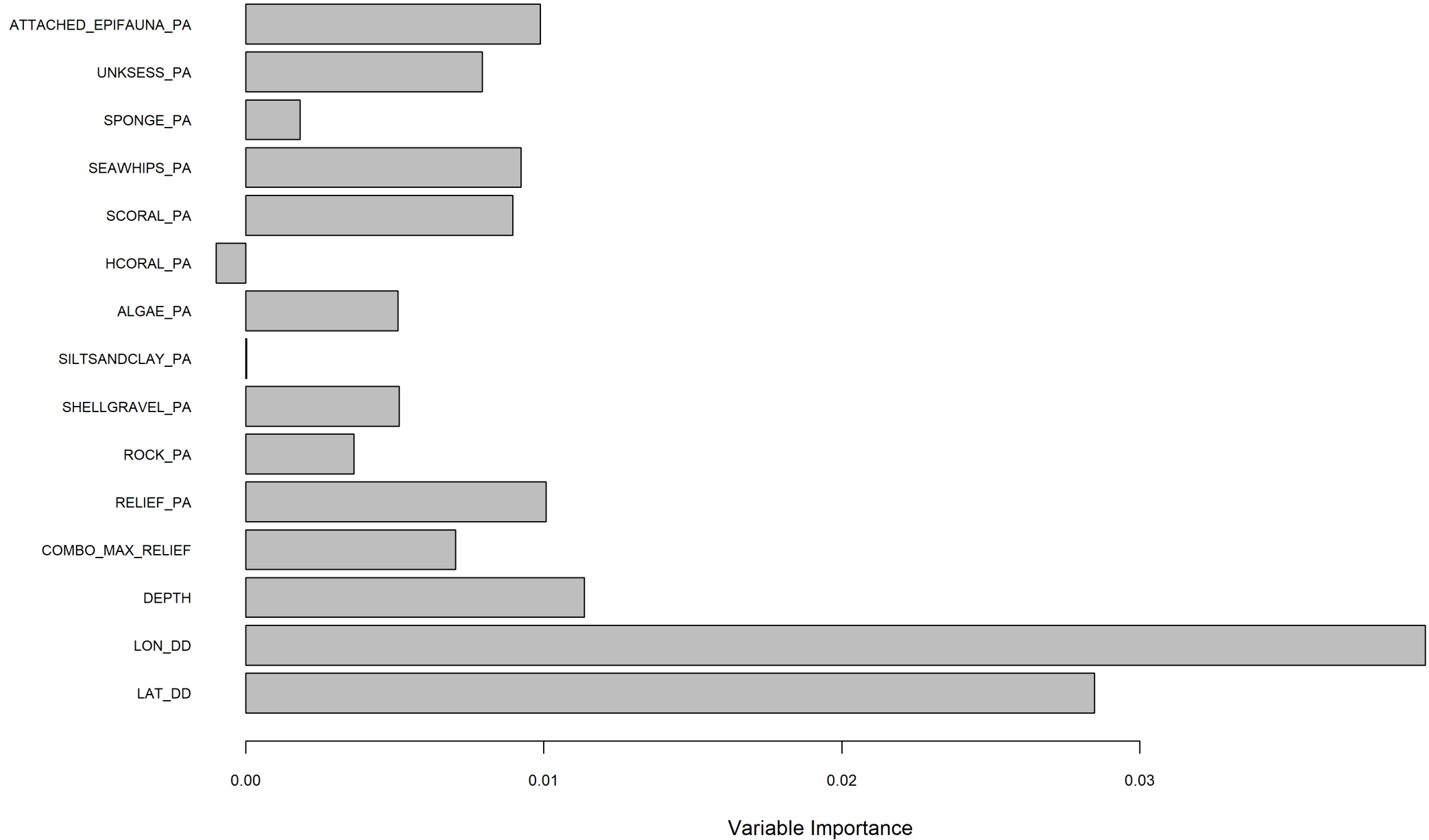
GF\_E final CART  
Seriola dumerili



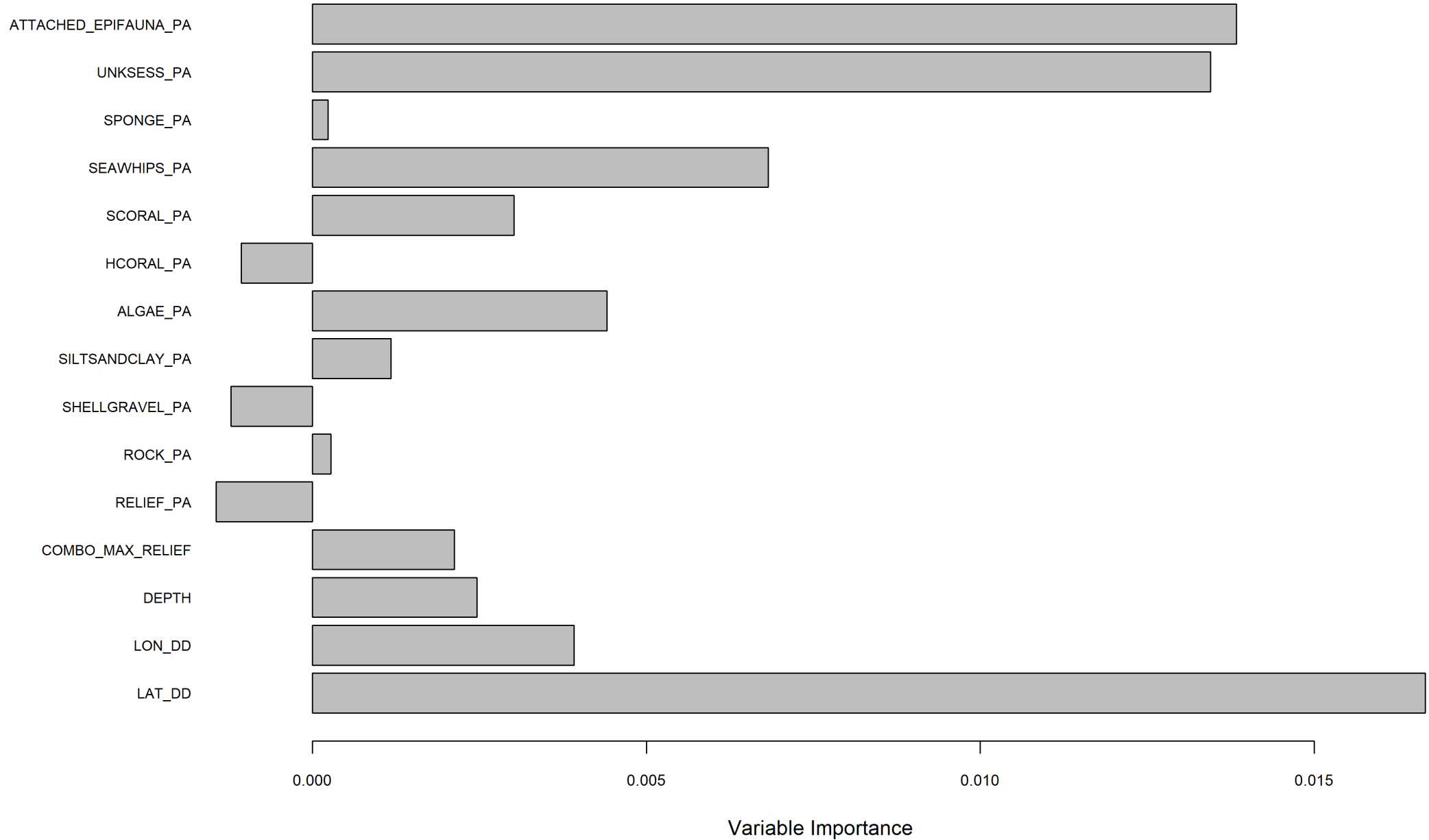
GF\_W final CART  
Seriola dumerili



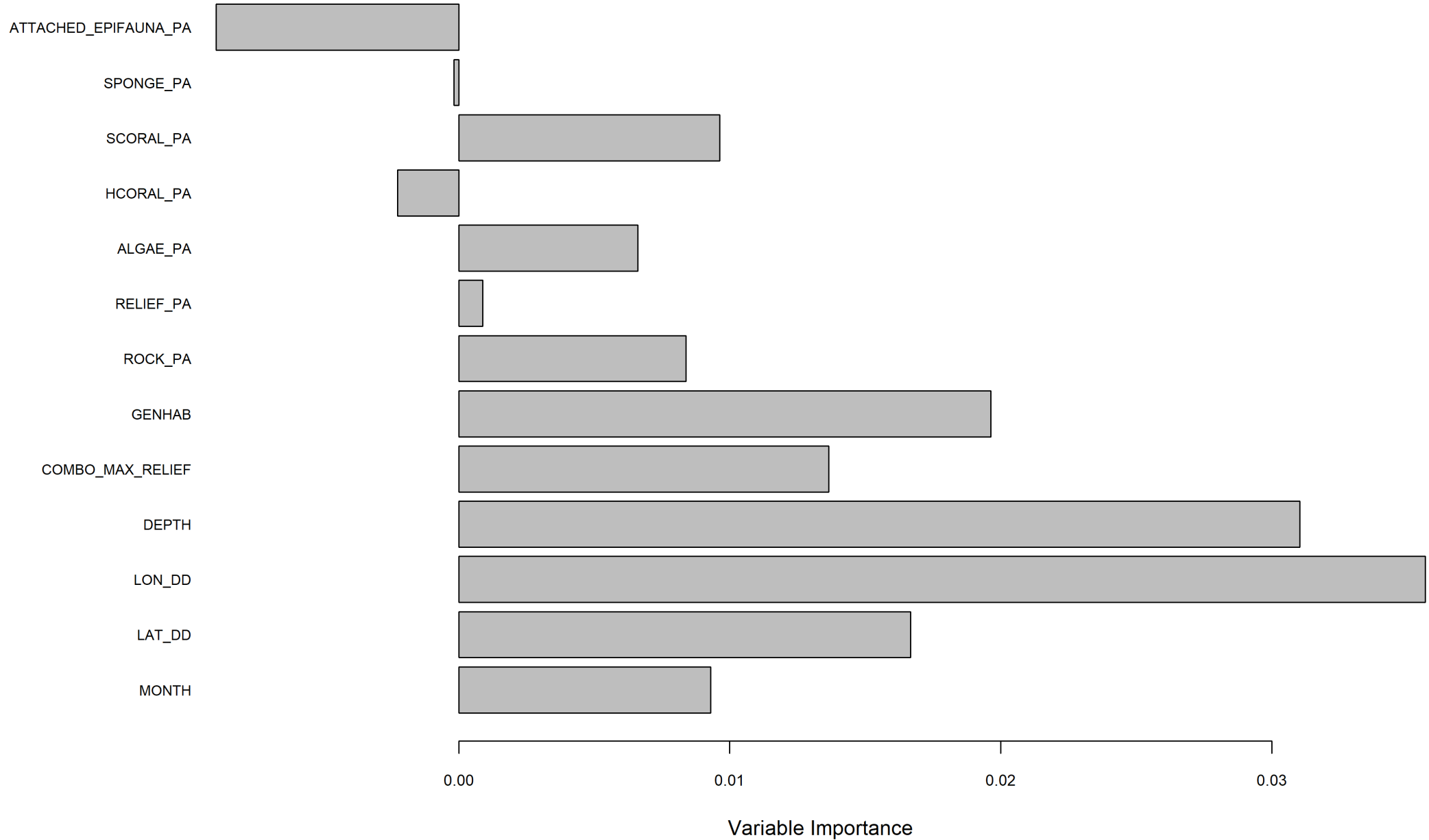
SRFV\_E variable importance  
*Seriola dumerili*



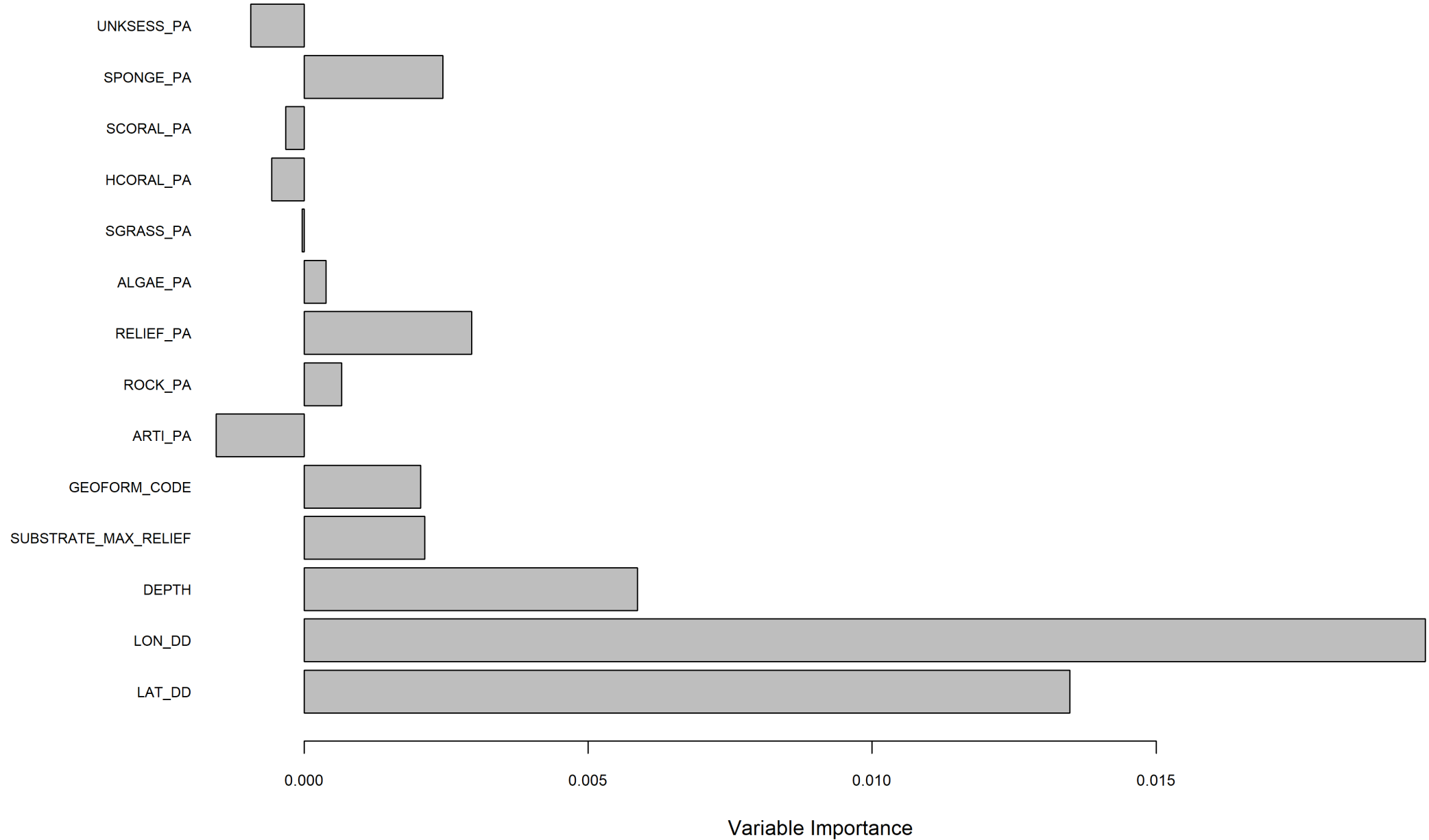
SRFV\_W variable importance  
*Seriola dumerili*



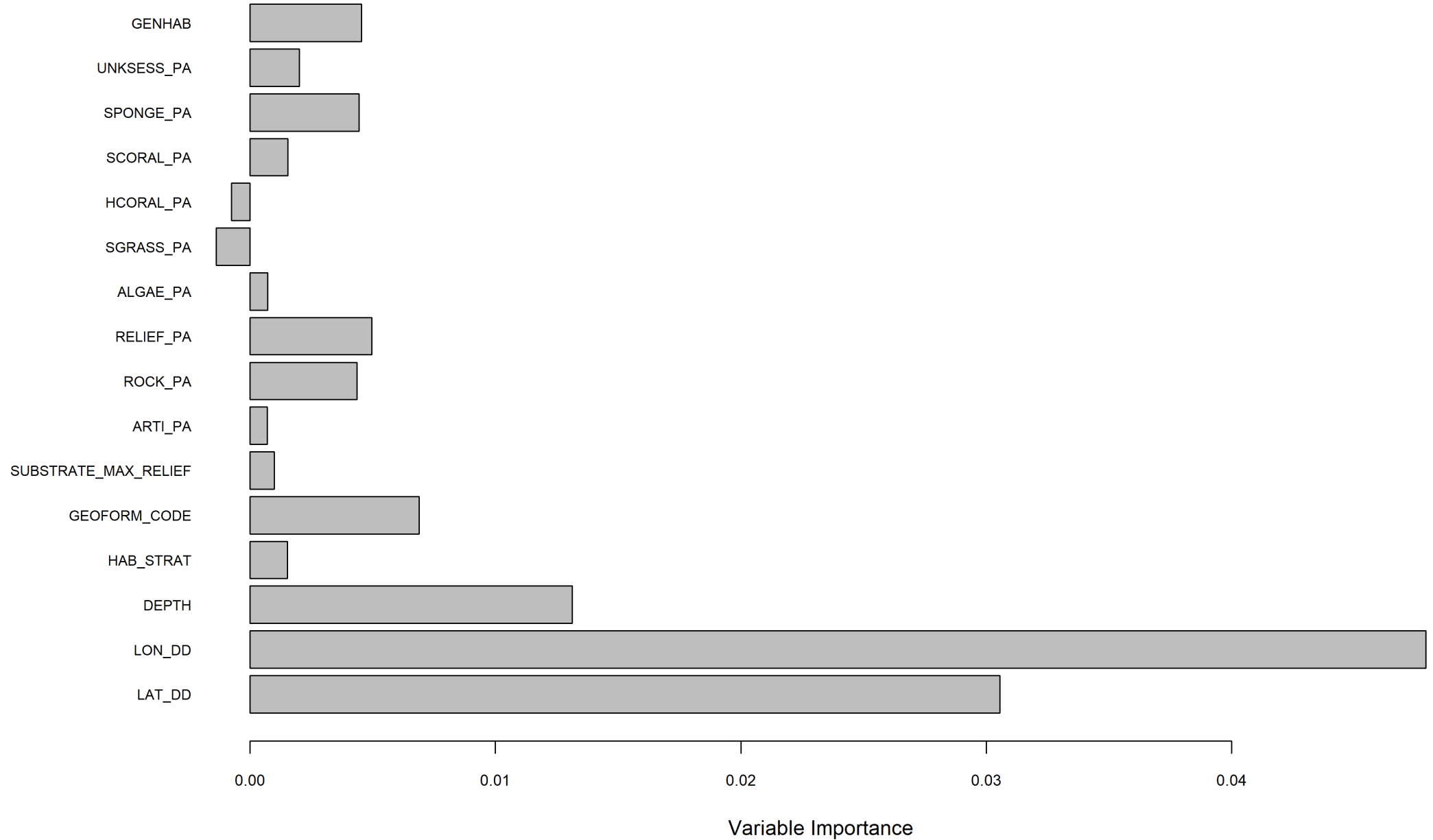
PC\_E variable importance  
*Seriola dumerili*



FWRI\_E variable importance  
*Seriola dumerili*



**GF\_E variable importance**  
***Seriola dumerili***



**GF\_W variable importance**  
***Seriola dumerili***

