NansClim

Climate effects on biodiversity, abundance and distribution of marine organisms

Variability in copepod communities in the northern Benguela upwelling region from 2000 to 2010

By

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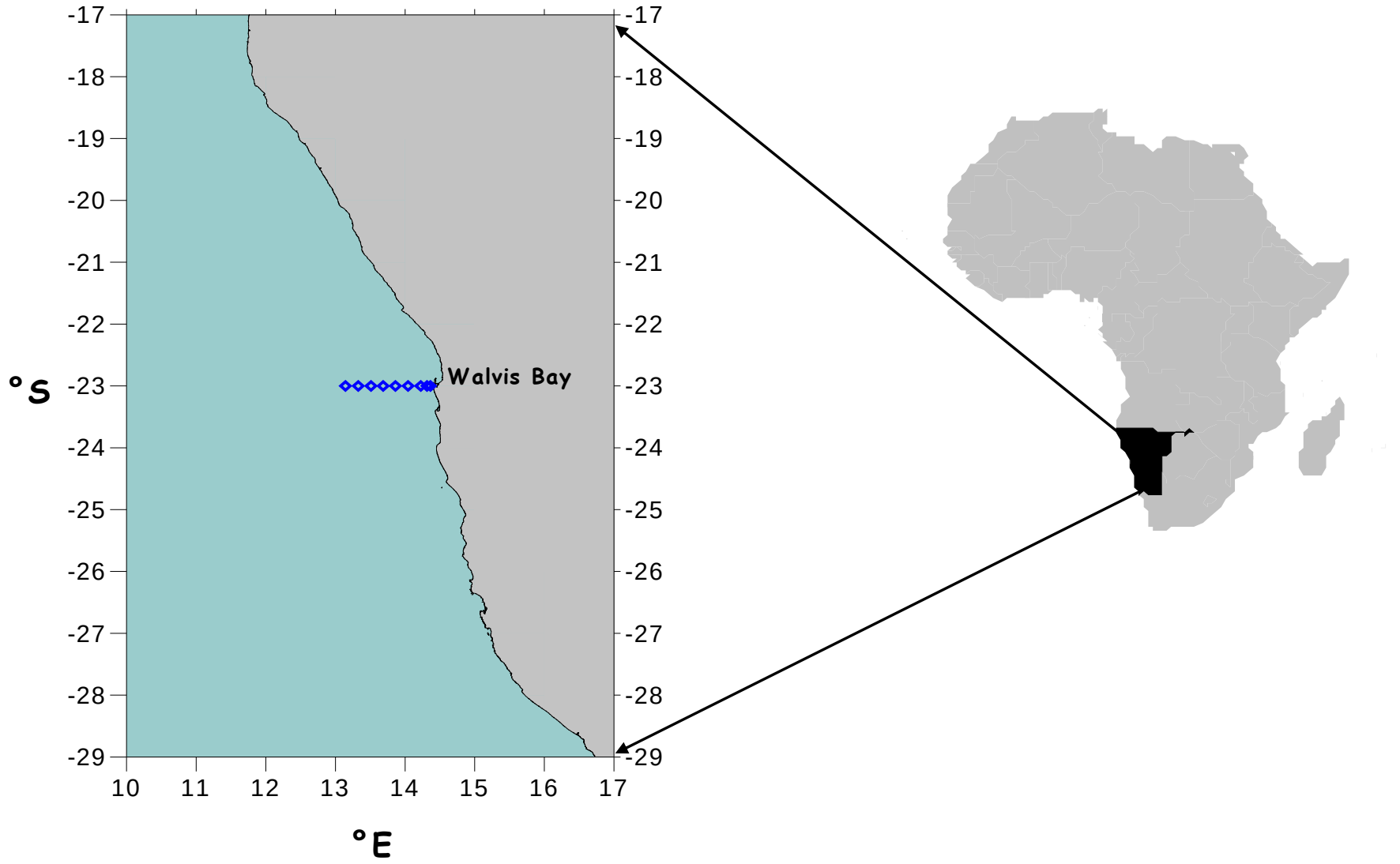
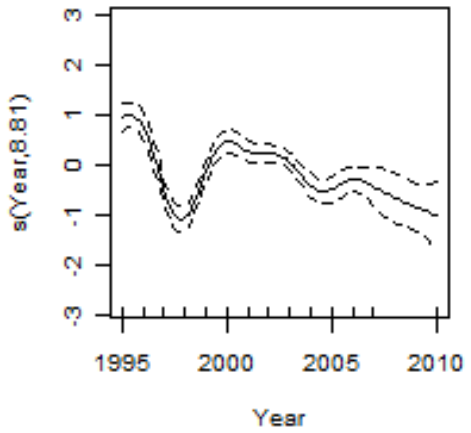
Monitoring line

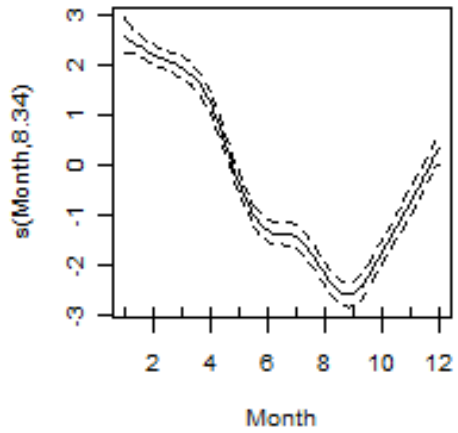


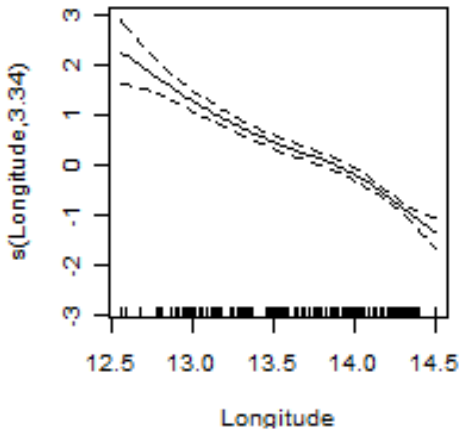
Data collection

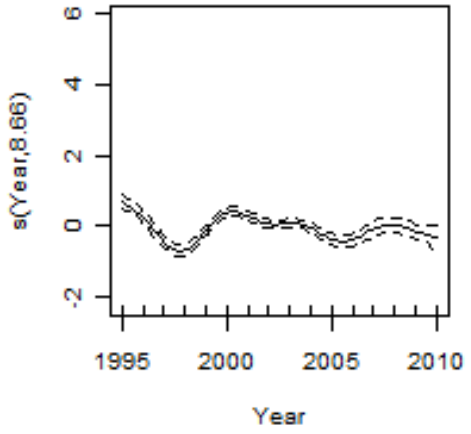
- 23°S line sampled about 11 times per annum
- Research vessel "*Welwitchia*"
- Stations: 2, 5, 10, 20, 30, 40, 50, 60 and 70 nm from the shore
- WP 2, 200 µm
- 0 – 200 m depth
- Preserved in formalin
- Temperature, salinity, oxygen, nutrients, chlorophyll sampled at every station

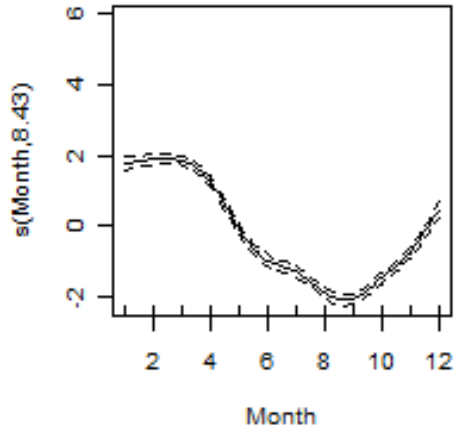
GAM result of the modelling of **temperature** as a function of the year, month, and longitude at three depth levels (top row: 2m; middle row: 10m; bottom row: 20m).

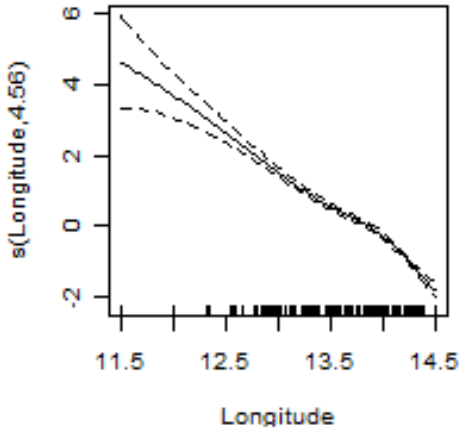


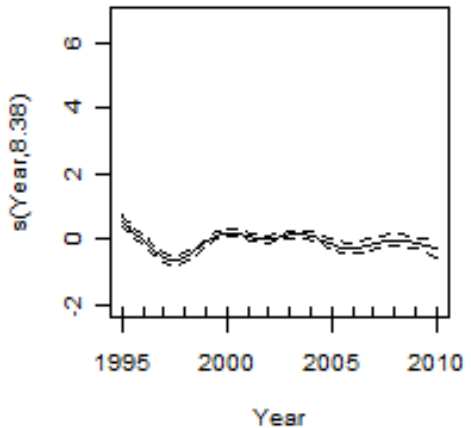


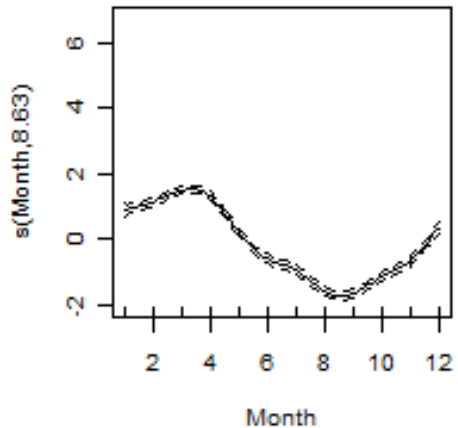


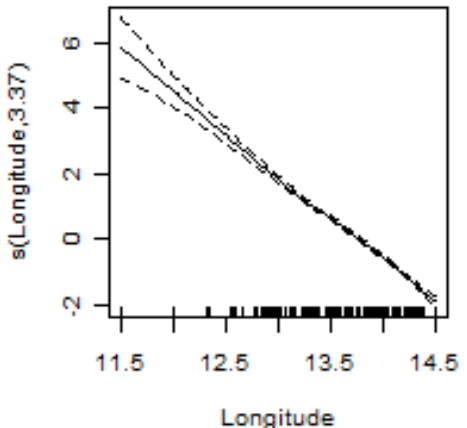




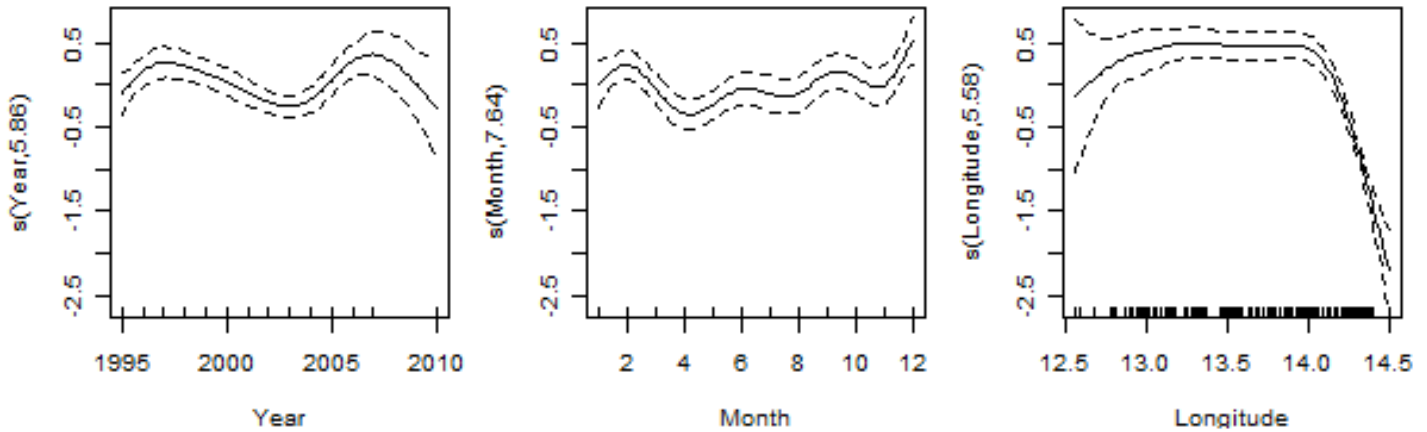


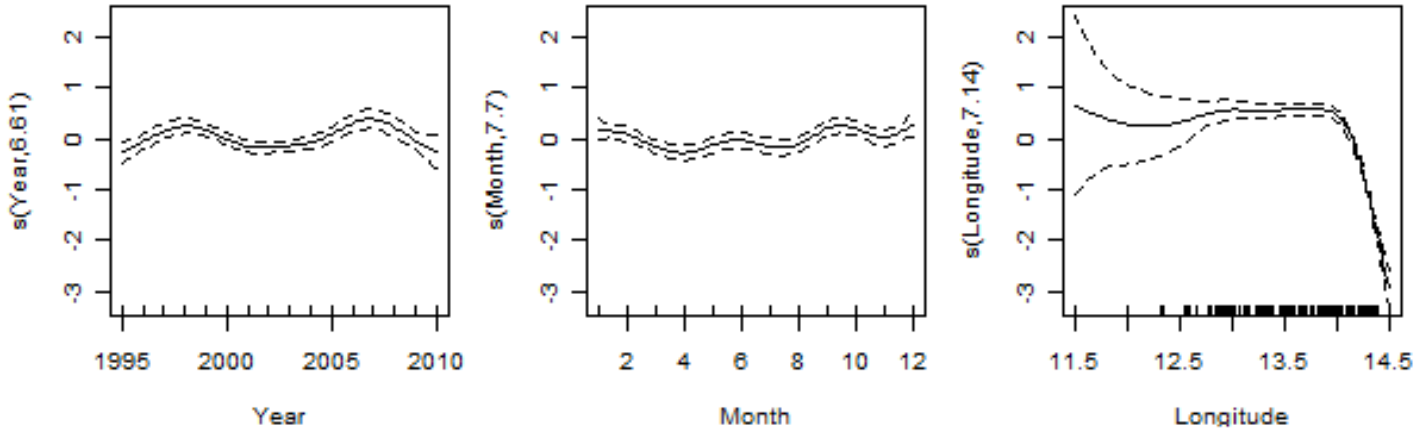


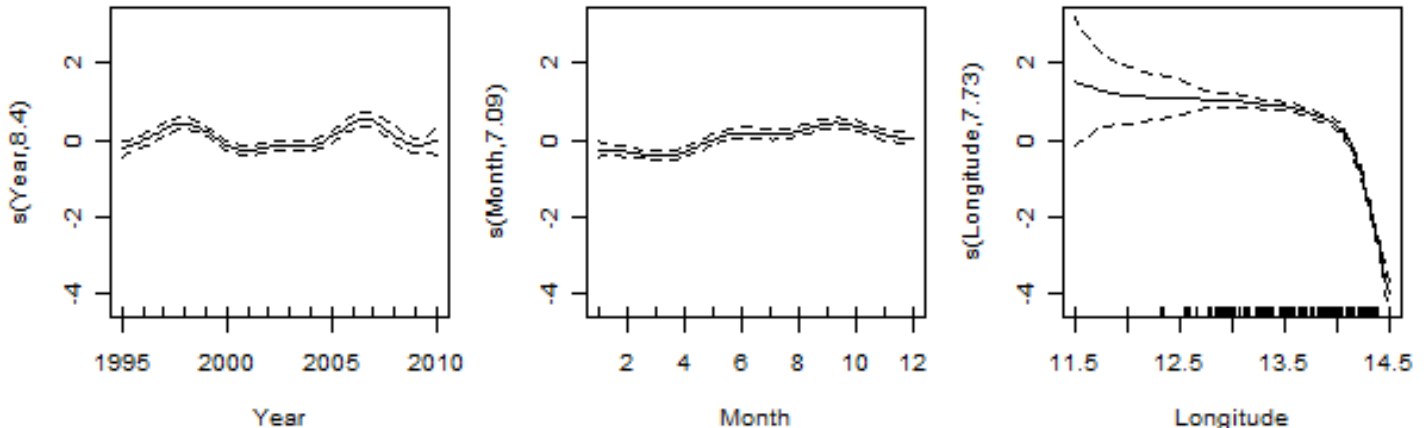




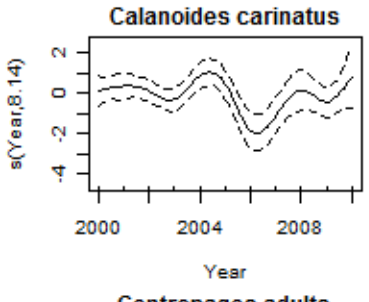
GAM result of the modelling of **oxygen** as a function of the year, month, and longitude at three depth levels (top row 2m; middle row: 10m; bottom row: 20m).

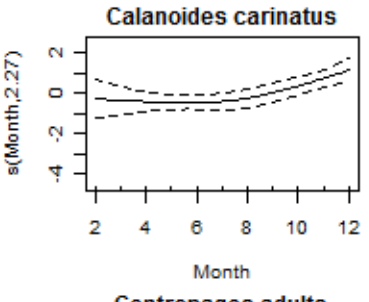


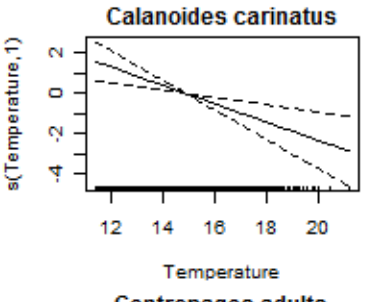


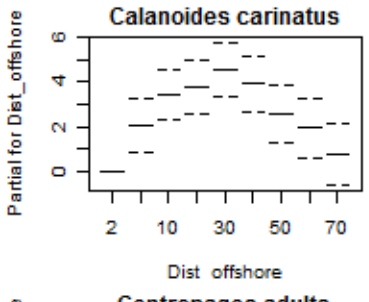


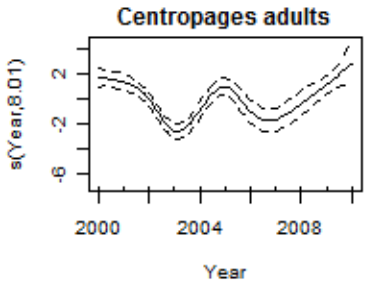
GAM Results

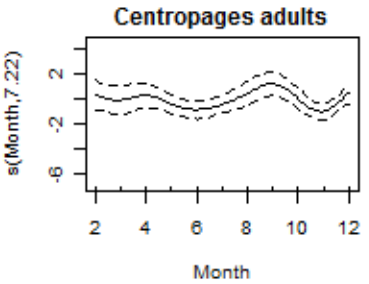


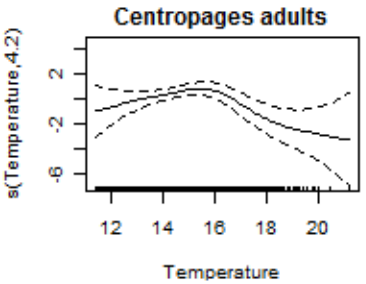


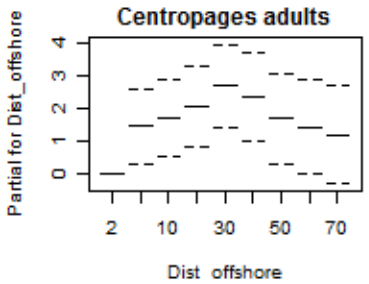


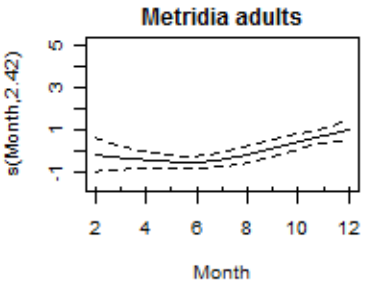


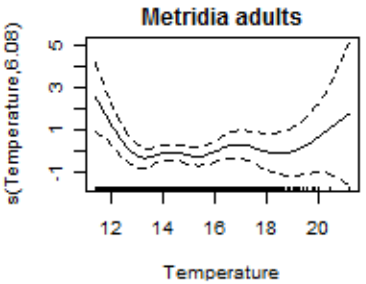


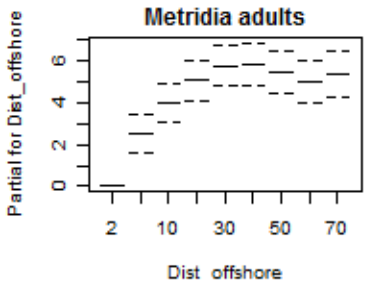


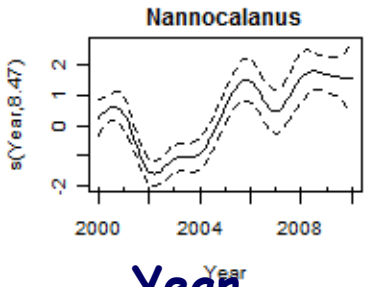


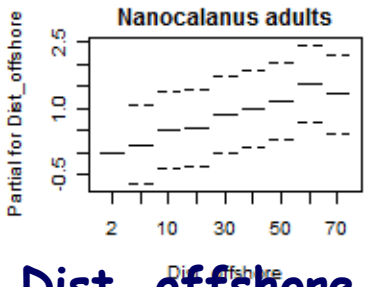






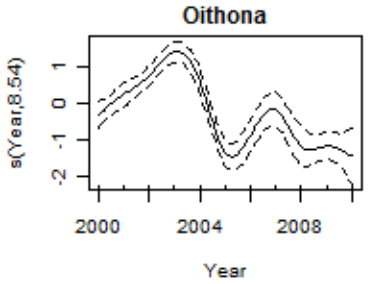


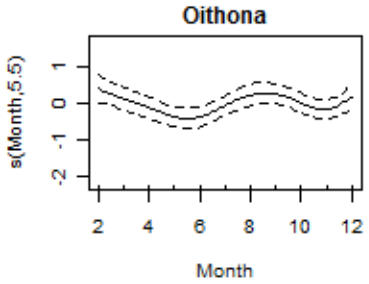


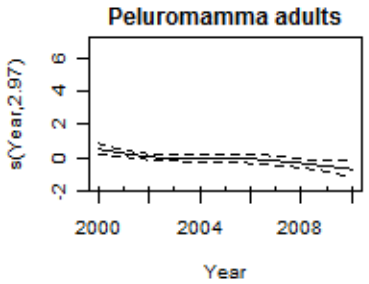


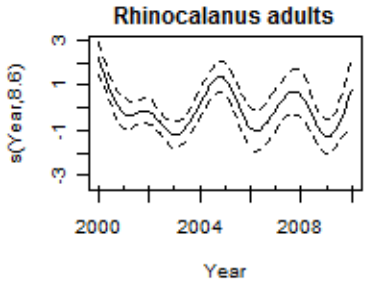
Year **Month** **Temperature** **Oxygen** **Dist. offshore**

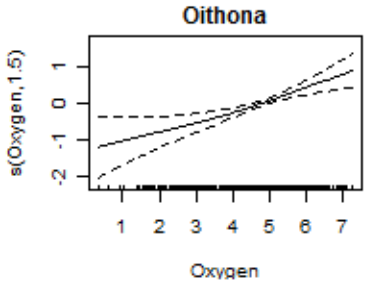
GAM Results (cont.)

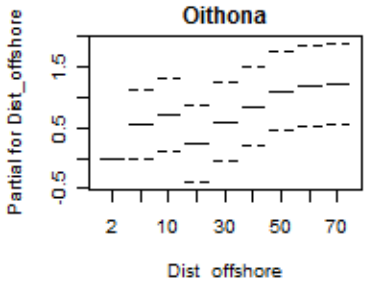


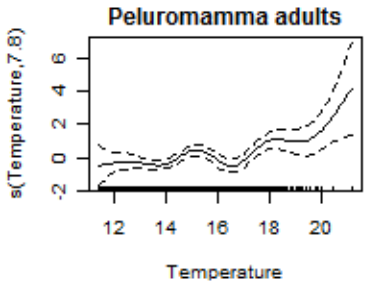


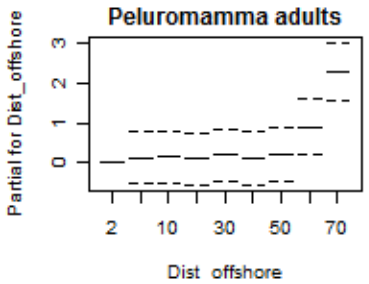


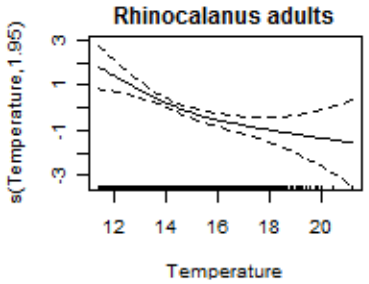


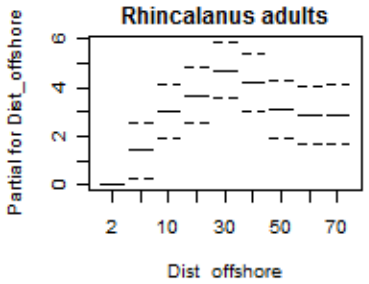






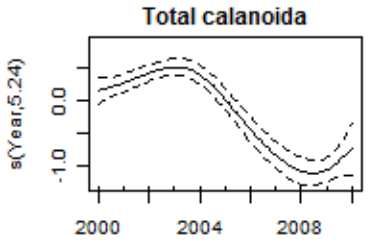


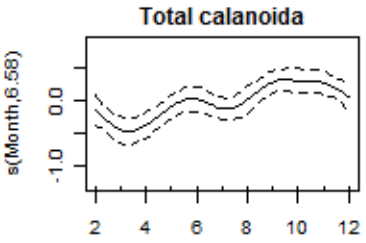


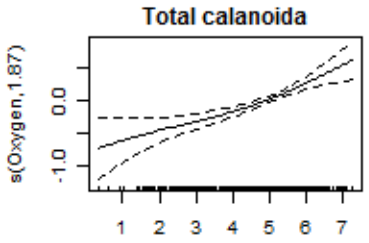


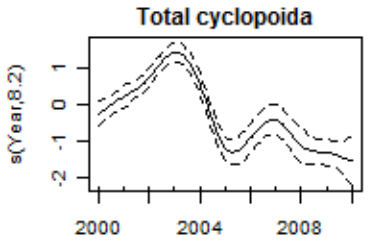
Year **Month** **Temperature** **Oxygen** **Dist. offshore**

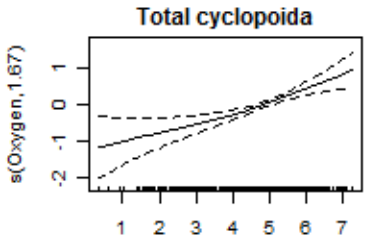
GAM Results (cont.)

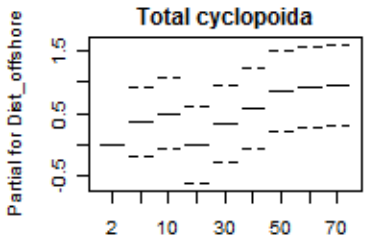


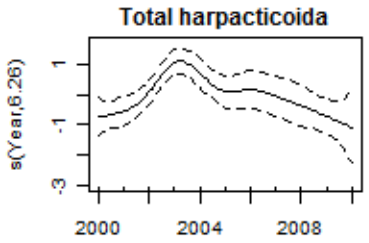


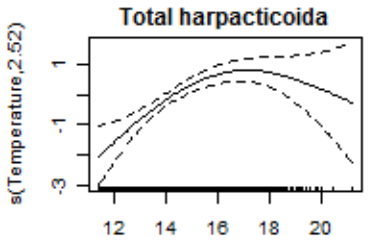


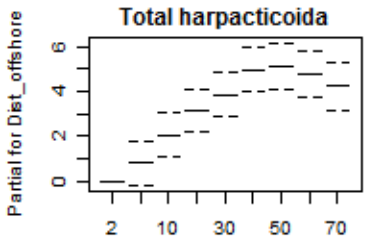


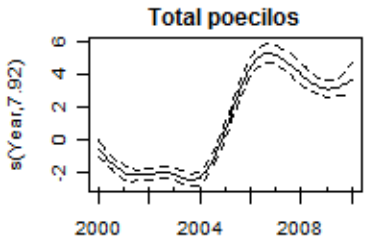


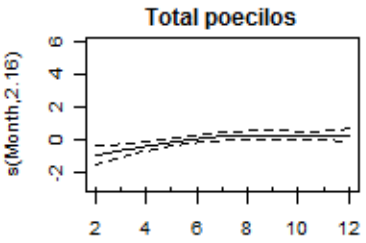


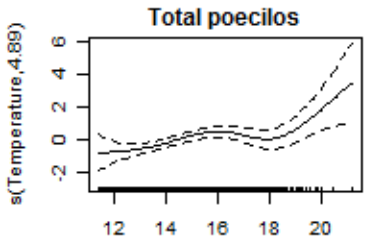




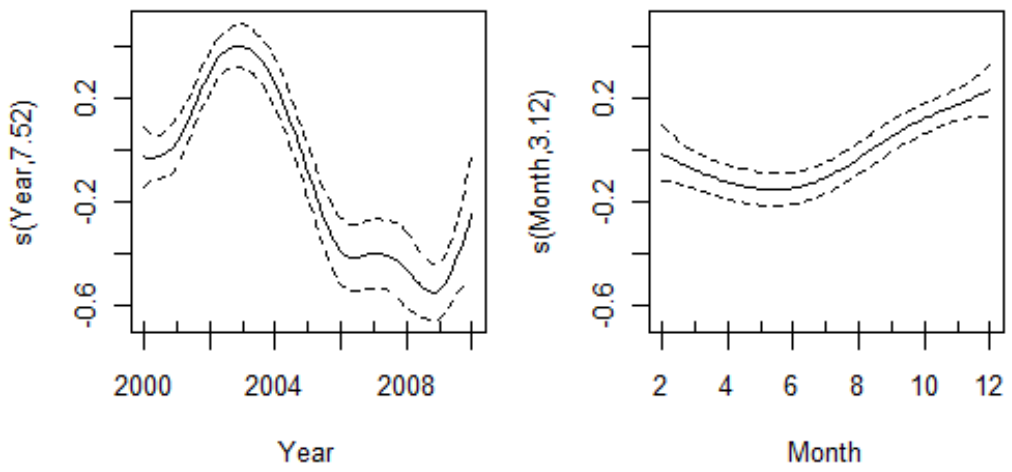


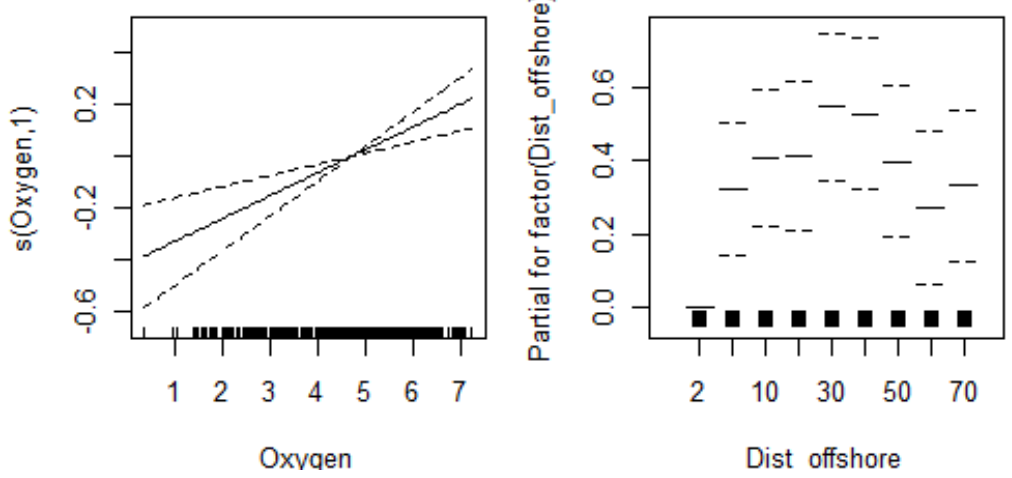






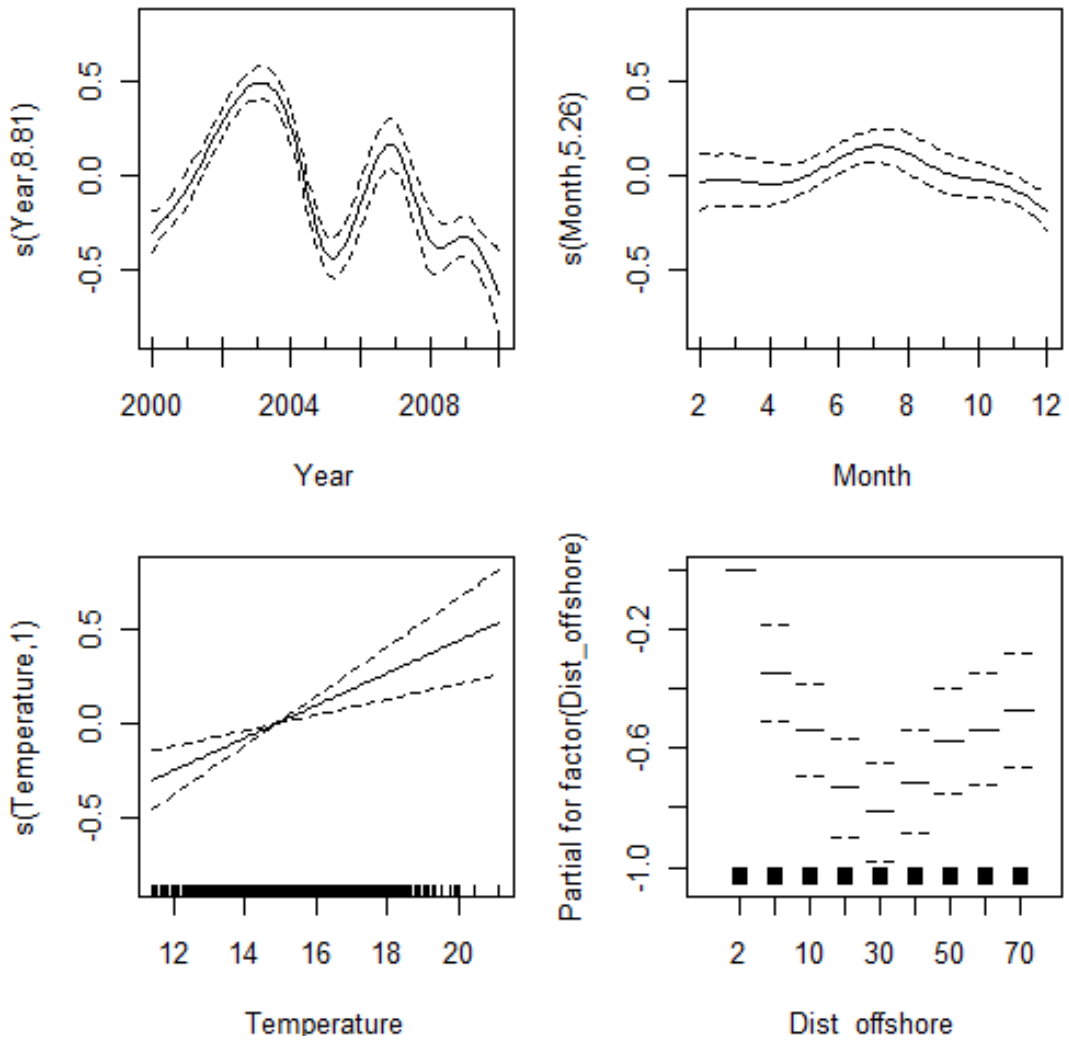
Year **Month** **Temperature** **Oxygen** **Dist. offshore**





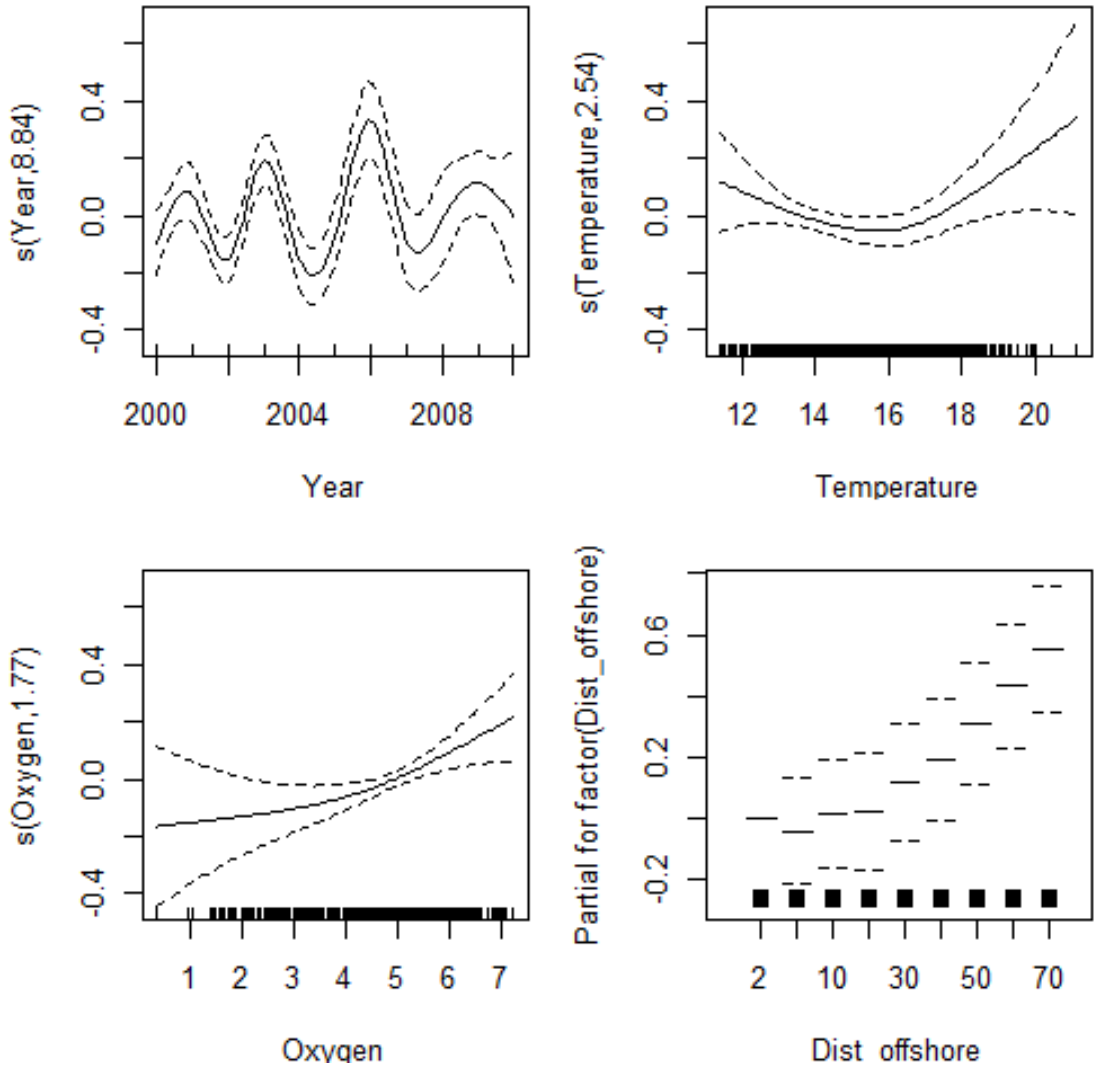
	Axis 1	Axis 2	Axis 3
CalanCar_adts	**0.48**	-0.46	-0.29
Centro_adts		**-0.62**	
Metrid_adt	**0.47**	-0.39	0.30
NanCal_adts	-0.37	-0.50	**0.60**
Oithona	**0.63**	0.40	0.34
Pleuro_adts			0.30
Rhinca_adt	0.32	**-0.51**	

Result of the GAM depicting the relationship between the "Axis**1**" of the nMDS and four explanatory variables (year, month, temperature, dissolved oxygen, and sampling stations). Those terms that are not included in the model are not statistically significant.



	Axis 1	Axis 2	Axis 3
CalanCar_adts	**0.48**	-0.46	-0.29
Centro_adts		**-0.62**	
Metrid_adt	**0.47**	-0.39	0.30
NanCal_adts	-0.37	-0.50	**0.60**
Oithona	**0.63**	0.40	0.34
Pleuro_adts			0.30
Rhinca_adt	0.32	**-0.51**	

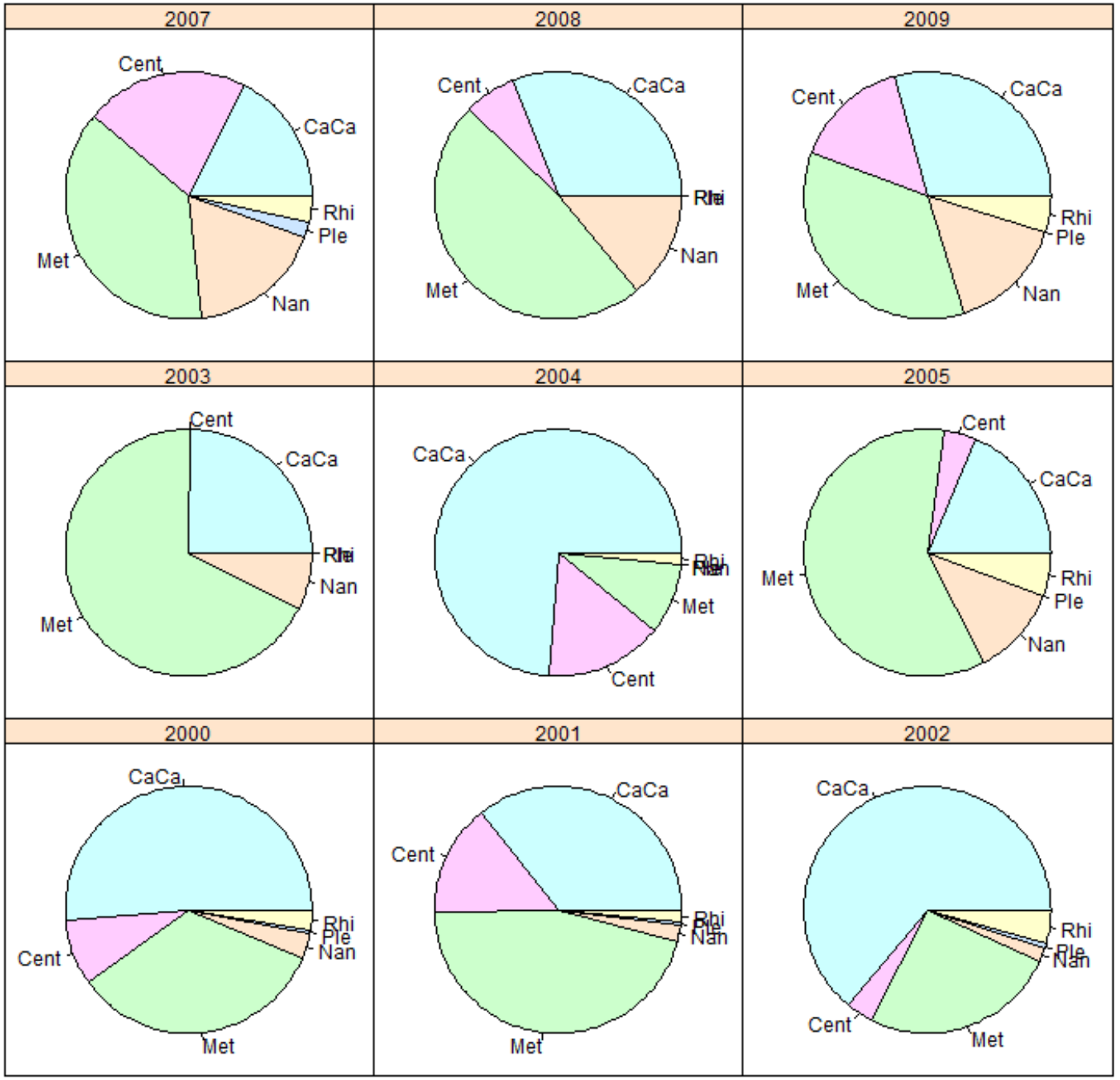
Result of the GAM depicting the relationship between the "Axis2" of the nMDS and four explanatory variables (year, month, temperature, dissolved oxygen, and sampling stations). Those terms that are not included in the model are not statistically significant.



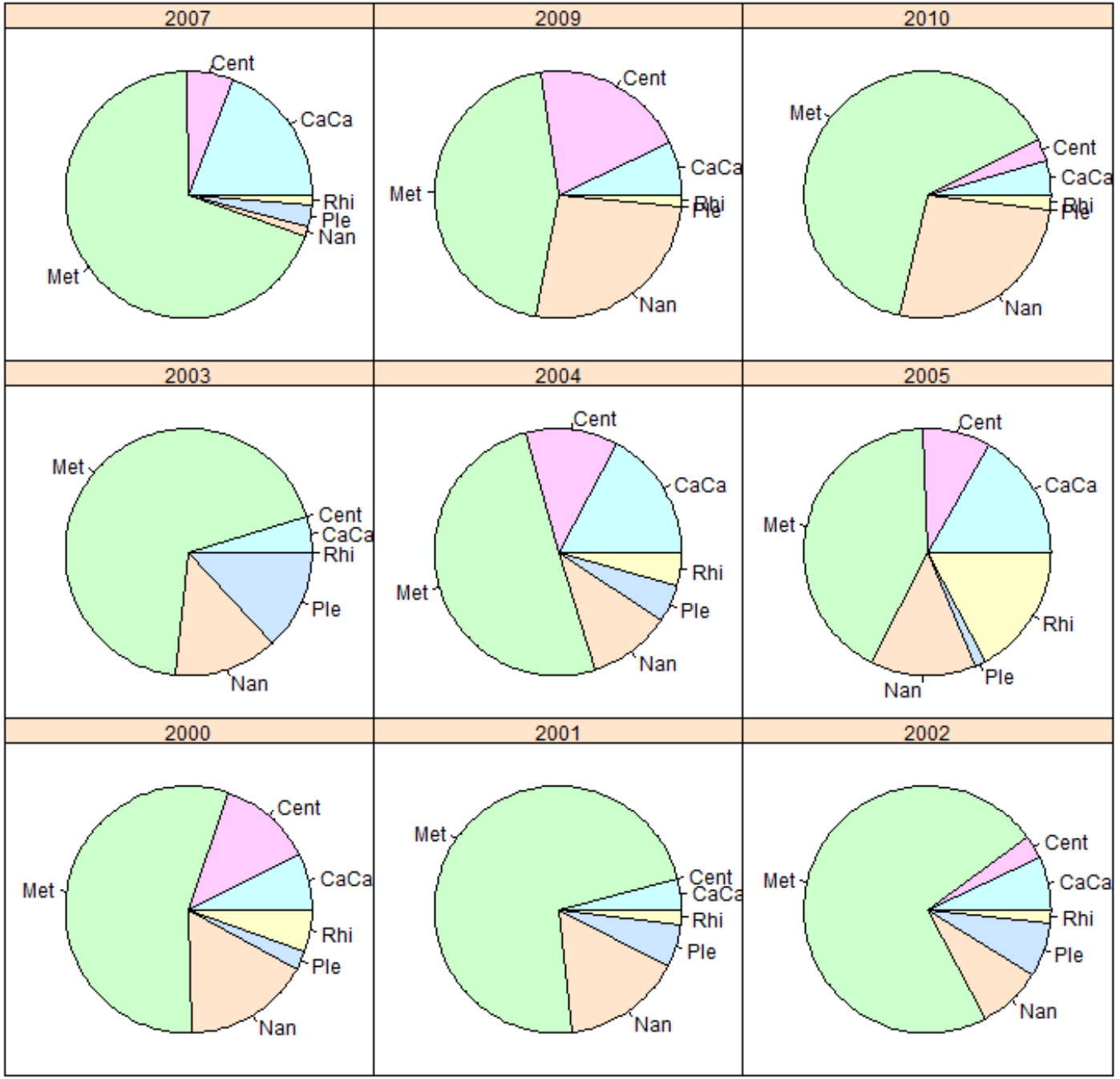
	Axis 1	Axis 2	Axis 3
CalanCar_adts	**0.48**	-0.46	-0.29
Centro_adts		**-0.62**	
Metrid_adt	**0.47**	-0.39	0.30
NanCal_adts	-0.37	-0.50	**0.60**
Oithona	**0.63**	0.40	0.34
Pleuro_adts			0.30
Rhinca_adt	0.32	**-0.51**	

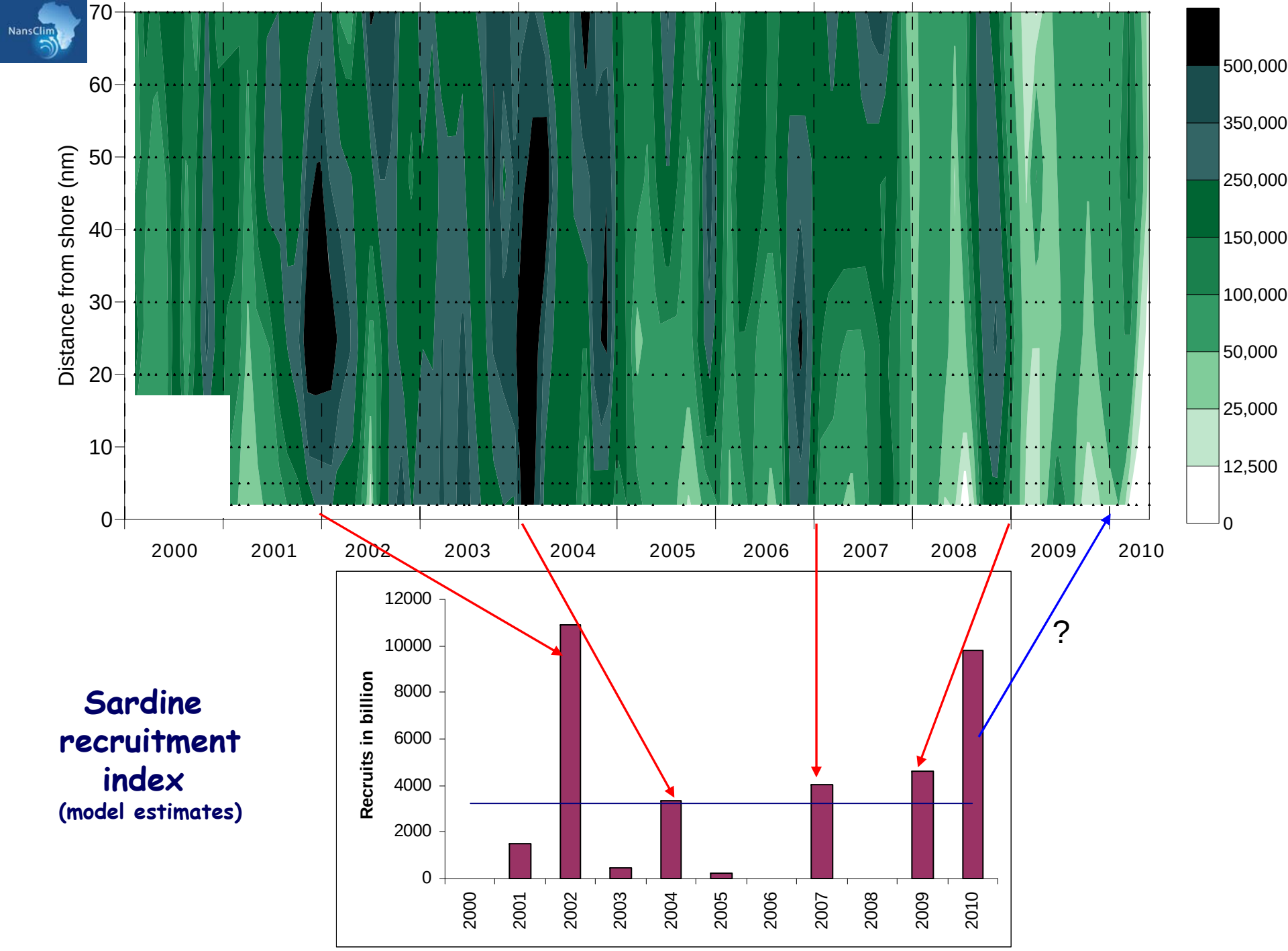
Result of the GAM depicting the relationship between the "Axis3" of the nMDS and four explanatory variables (year, month, temperature, dissolved oxygen, and sampling stations). Those terms that are not included in the model are not statistically significant.

Pie charts showing composition of the Calanoid copepod community in the period from 2000 – 2010 for the summer season on the midshelf.



Pie charts showing composition of the Calanoid copepod community in the period from 2000 – 2010 for the summer season in the offshore area.





Sardine recruitment index
(model estimates)

Summary/Conclusions

- Seasonal cycle
- Temperature, oxygen, distance from shore and month affect the abundance of species to different degrees
- Different groups are clearly influenced by different parameters
- Large interannual differences in species composition

Acknowledgements

- National Marine Information and Research Centre, Ministry of Fisheries and Marine Resources, Namibia
- IRD (financial support)
- NansClim