

Spatio-temporal dynamics in mesozooplankton community structure in Algoa Bay, South Africa

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Introduction



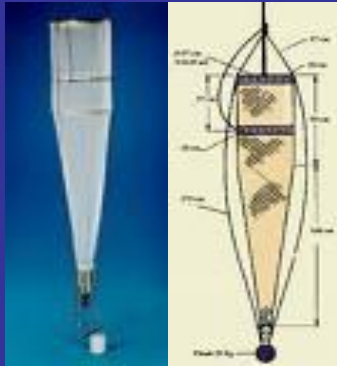
Introduction (Cont.)

- o Although natural and anthropogenic impacts and lack in understanding ecosystem functioning (e.g. influence of upwelling) have been reiterated, there has been no large scale studies designed to address this question until recently
- o SAEON-Elwandle Node undertook an important opportunity in addressing some critical questions in the Algoa Bay through selecting the Bay as its sentinel site for long-term ecological monitoring (LTEM) and research
- o This project was designed to address a component of ecosystem functioning through zooplankton dynamics by providing baseline information for LTEM and research in and around Algoa Bay
- o Zooplankton are numerous, can quickly respond to environmental changes and play a significant role in energy transfer in the food web. As such international studies that employed zooplankton as indicators of change provided evidence that closely linked zooplankton to ecosystem change in coastal marine ecosystems

Study Objectives

- o To gain an understanding of dynamics of mesozooplankton in Algoa Bay, specifically to determine spatial patterns of summer and winter zooplankton community structure in relation to selected physical-chemical and biological variables.
- o Provide baseline information/inventory from which future deviations can be identified for long-term ecological monitoring of zooplankton in Algoa Bay

Materials and Methods



Zooplankton. (90 – 200, 200 - 500, 500 – 1000, > 1000 μm)



Physical variables



Chl-*a* (SFC)

Seston

Nutrients

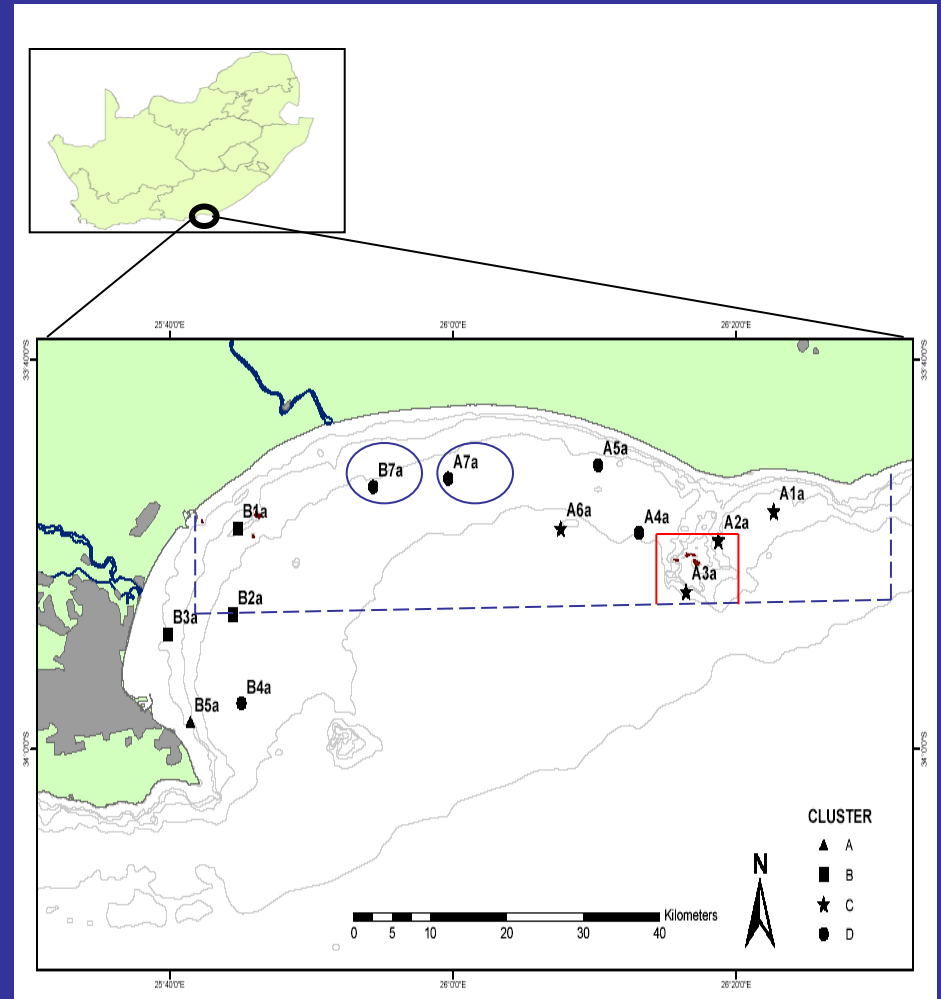
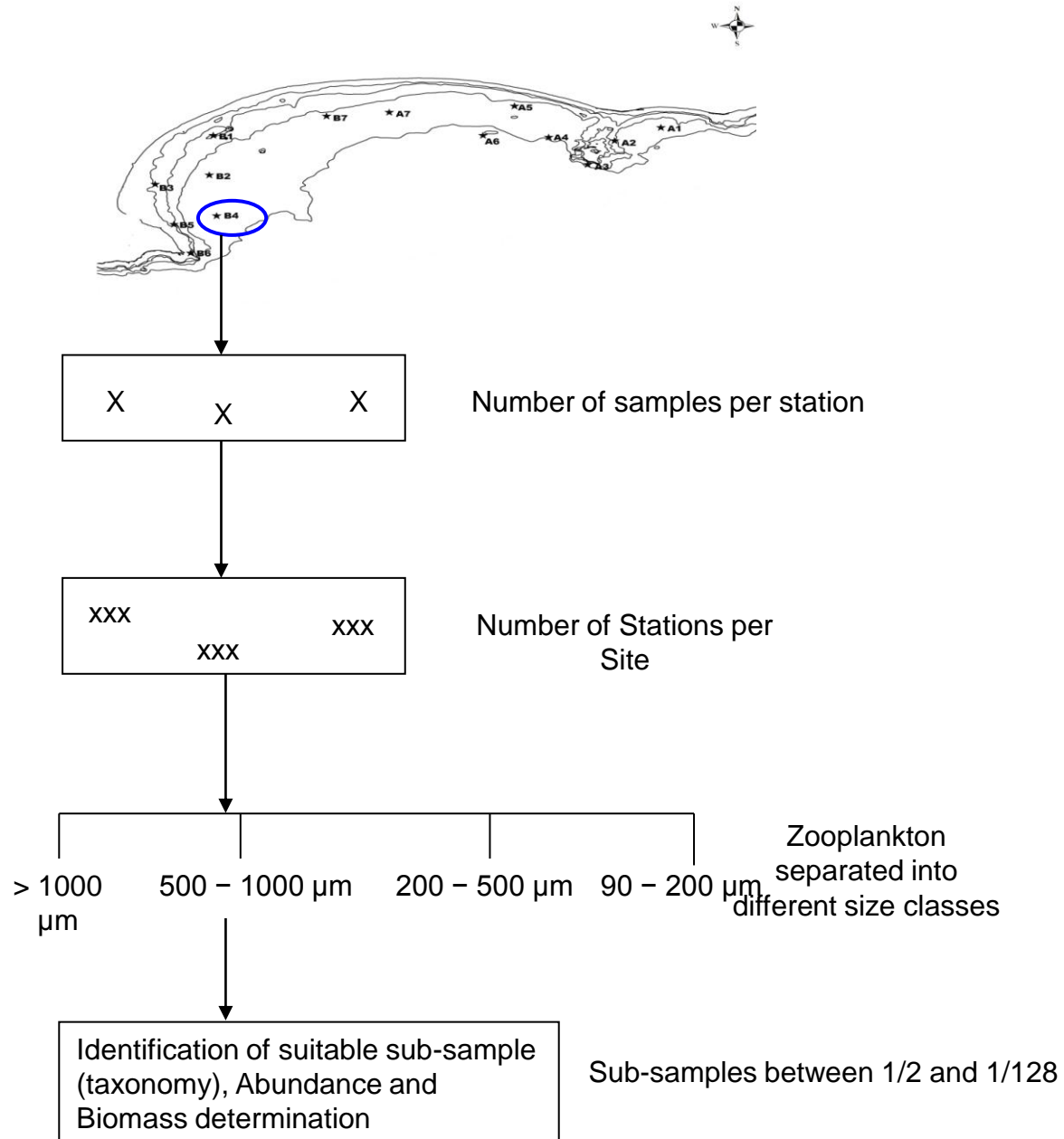


Figure 1: Algoa Bay with study sites distributed across the Bay, Bird Island MPA (Red) and proposed GAENP-MPA (Blue) boundaries. Note: Stations marked in blue circles added during winter

Detailed sampling design



Results: Summer

Parameter	E v W	P
Temp.	**	< 0.001
Salinity	**	< 0.001
Stability	NS	> 0.050
DO	**	< 0.001
NTU	**	< 0.001
Seston	NS	> 0.050
Nitrate	**	< 0.001
Nitrite	NS	> 0.050
Ammonia	NS	> 0.050
Phosphate	NS	> 0.050
Silicate	NS	> 0.050
Total Chl-a	NS	> 0.050
Microphytop.	NS	> 0.050
Nanophytop.	NS	> 0.050
Picophytop.	*	< 0.050
Int. Chl-a	*	< 0.050
Int. microphyt.	*	< 0.050
Int. nanophyt.	NS	> 0.050
Int. picophyt.	*	< 0.050

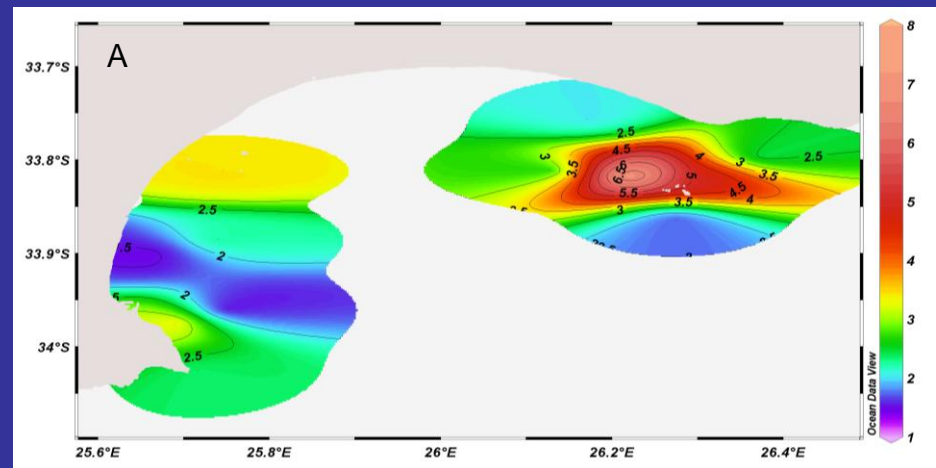
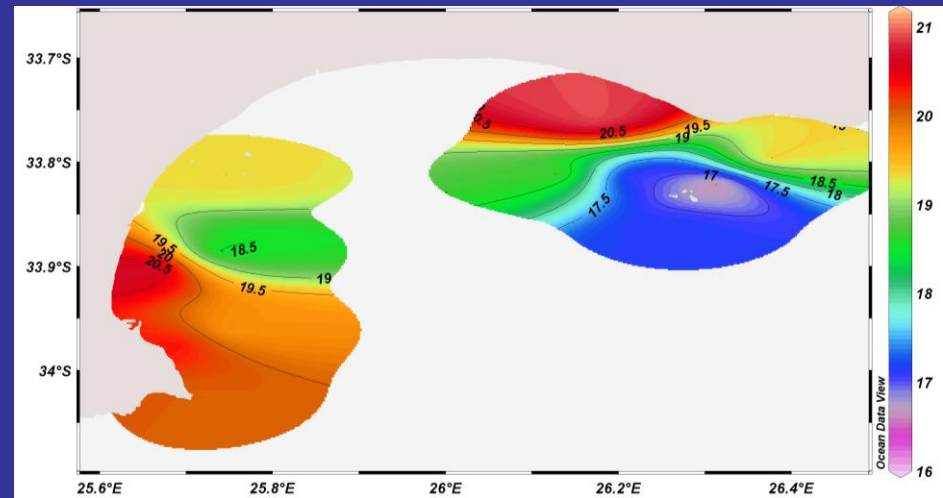


Table 1: Physico-chemical and biological variables during summer survey, 2008.

Figure 2: Temperature and total Chl-a during summer, 2008

Winter

Parameter	E v W	P
Temp.	**	< 0.001
Salinity	**	< 0.001
Stability	NS	> 0.050
DO	**	< 0.001
NTU	**	< 0.001
Seston	**	< 0.001
Nitrate	NS	< 0.050
Nitrite	**	< 0.001
Ammonia	NS	> 0.050
Phosphate	NS	> 0.050
Silicate	NS	> 0.050
Total Chl-a	*	< 0.050
Microphytop.	NS	> 0.050
Nanophytop.	**	< 0.001
Picophytop.	*	< 0.050
Int. Chl-a	NS	> 0.050
Int.microphyt.	NS	> 0.050
Int. nanophyt.	*	> 0.050
Int. picophyt.	NS	> 0.050

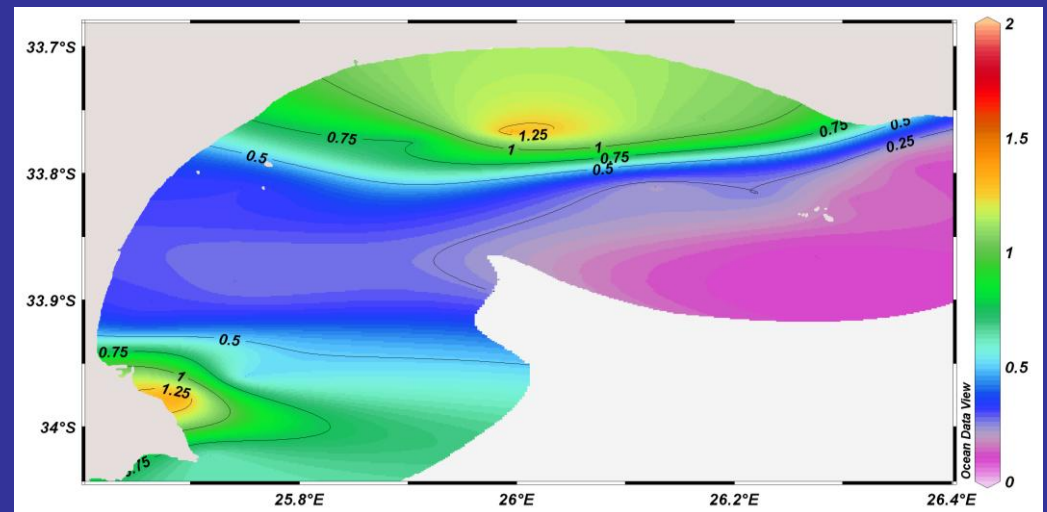
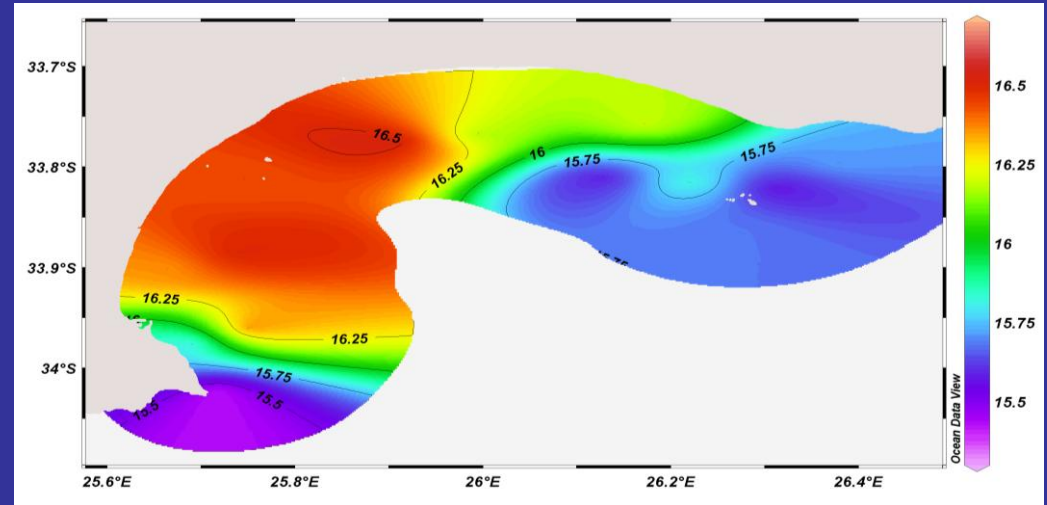


Table2: Physico-chemical and biological variables during winter survey, 2008.

Figure 3: Temperature and total Chl-a during winter, 2008

Summer

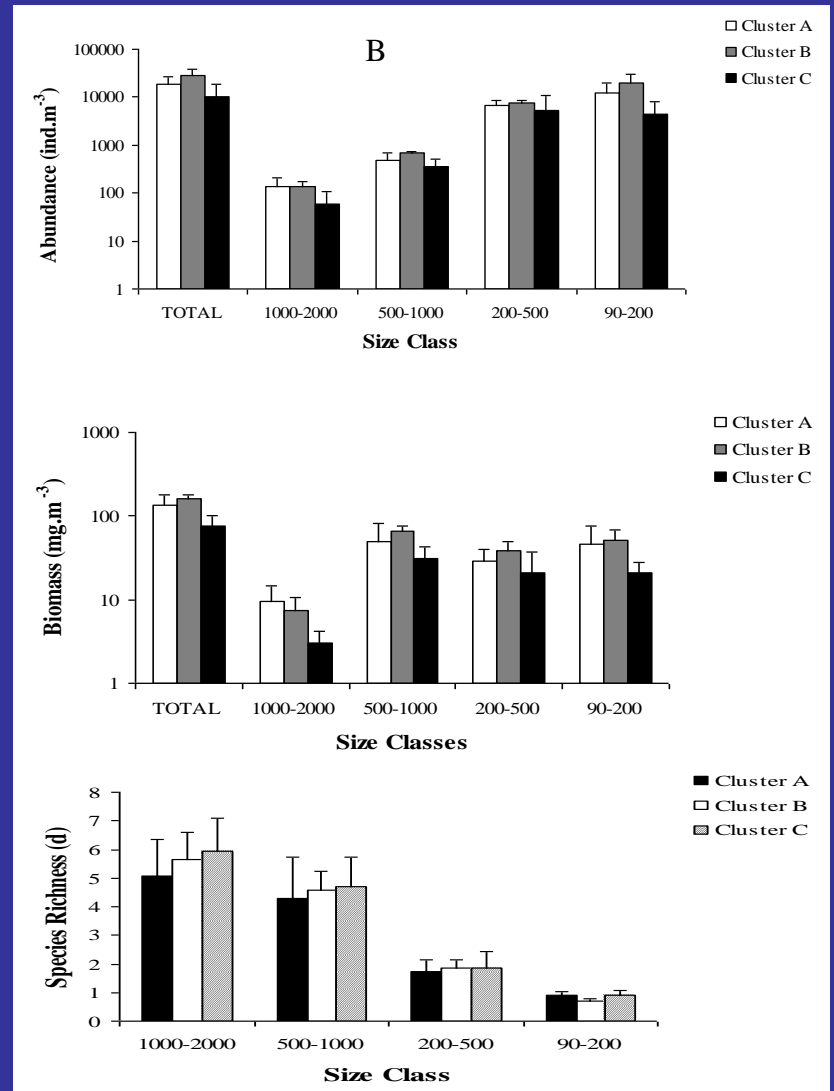
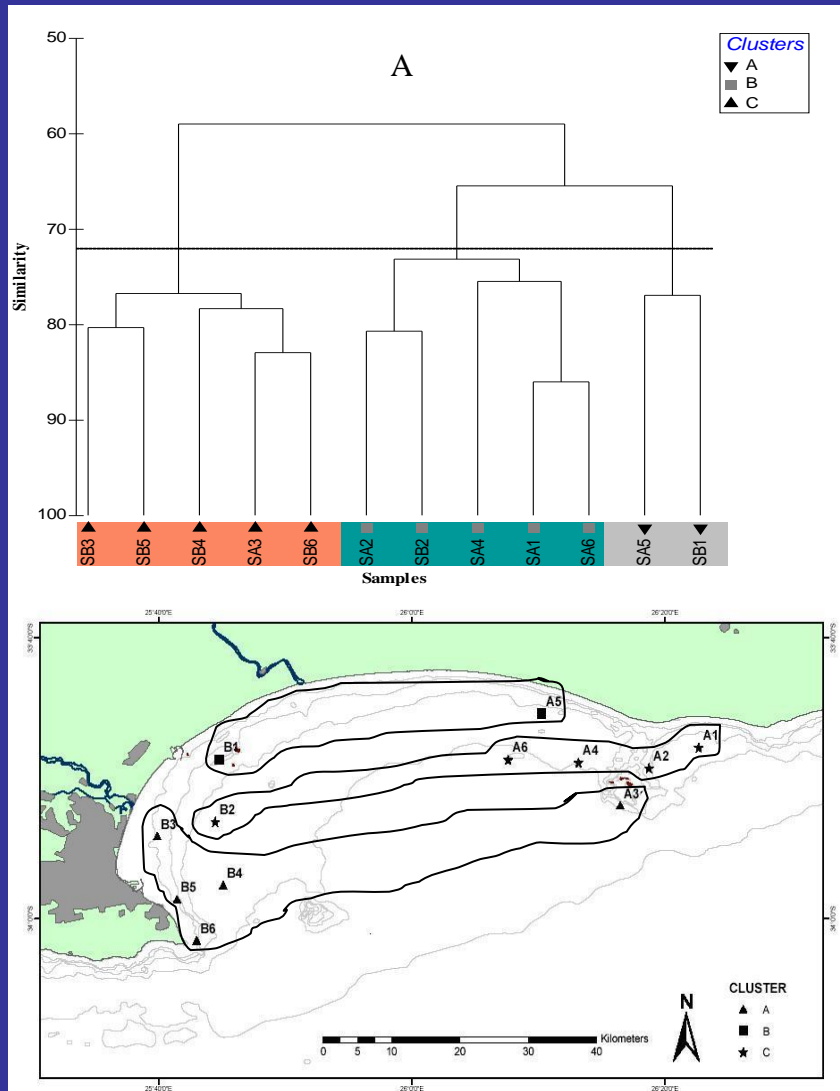


Figure 4: A. Cluster Analysis dendrogram and Cluster distribution. B. Abundance, Biomass and Species richness for the zooplankton community in Algoa Bay, summer 2008.

Winter

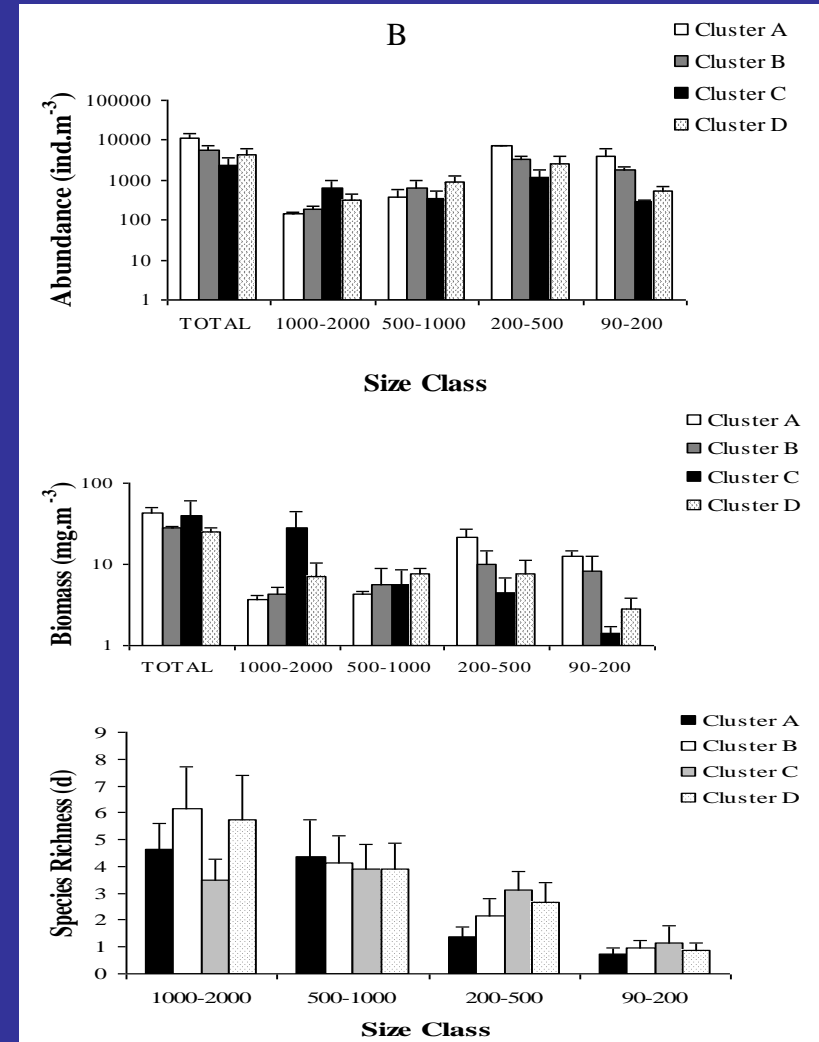
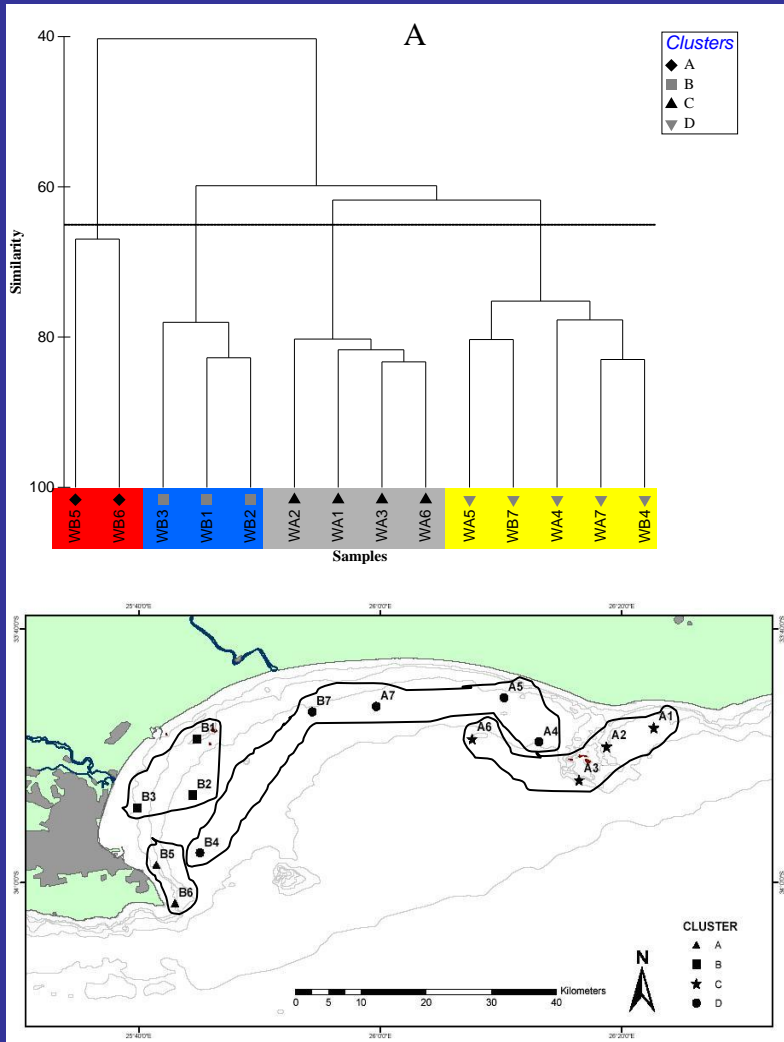


Figure5: A. Cluster Analysis dendrogram and Cluster distribution. B. Abundance, Biomass and Species richness for the zooplankton community in Algoa Bay during winter, 2008.

Summer (Cont.)

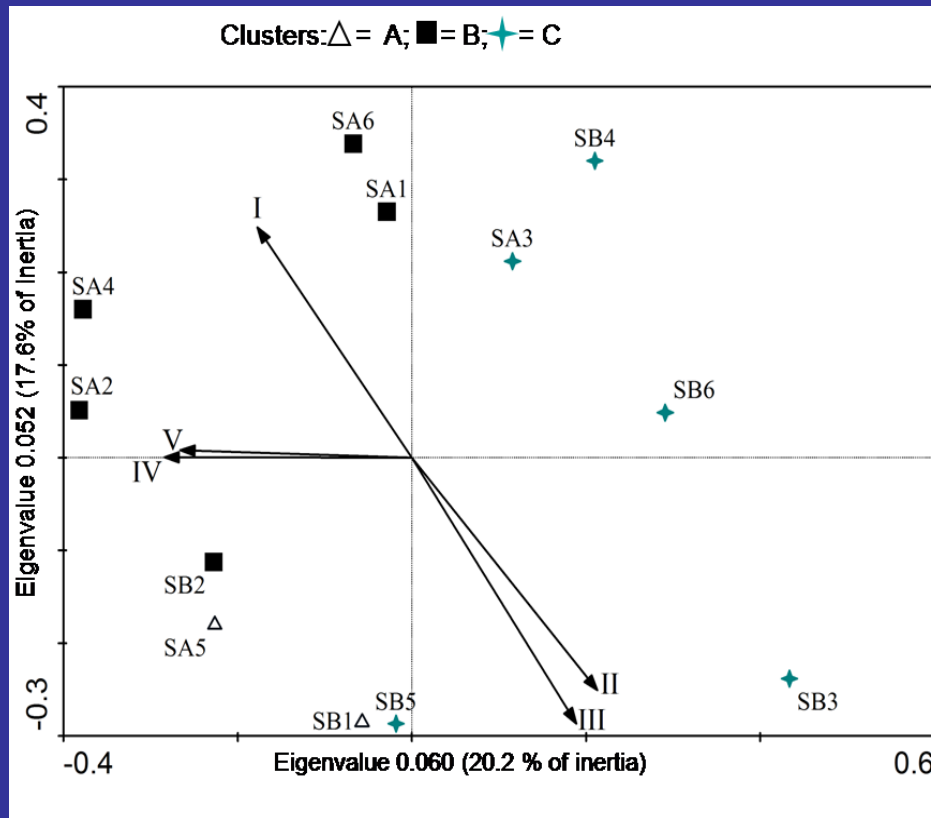


Figure 6: Canonical correspondence ordination plot between the selected physical variables (arrows) with >0.65 correlation co-efficients and zooplankton cluster groups during summer 2008.

Winter (Cont.)

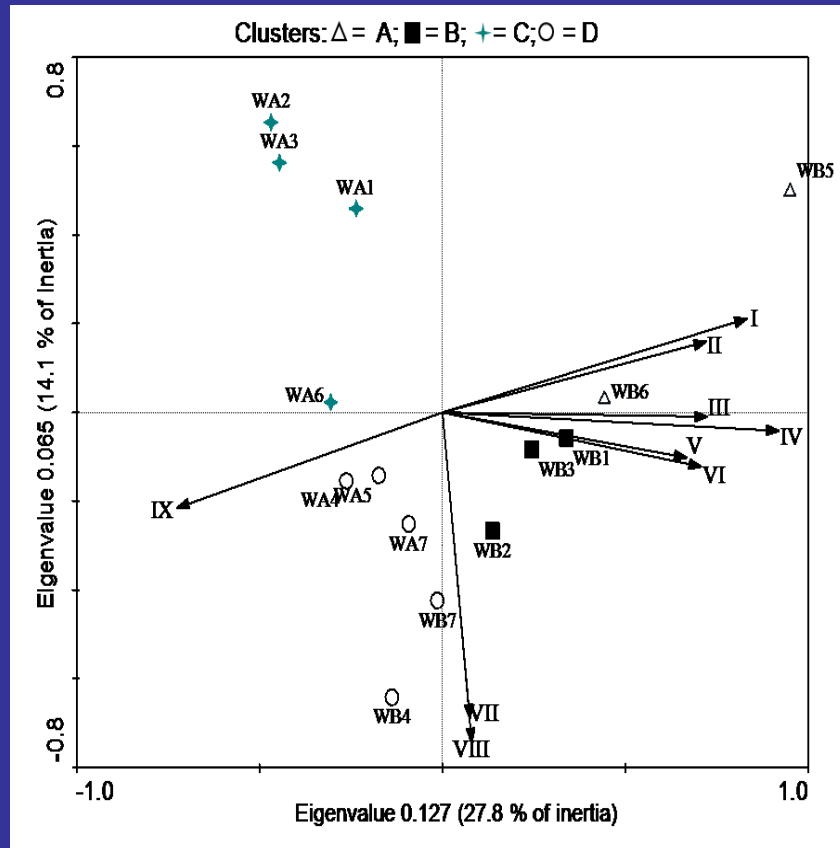


Figure 7: Canonical correspondence ordination plot between the selected physical variables (arrows) with >0.65 correlation co-efficients and zooplankton cluster groups during winter 2008.

Discussion and Conclusions

- o Algoa Bay physical environment appears to be fairly homogenous in summer and winter. However, the environment is greatly influenced by upwelling during the summer season and wind induced vertical mixing during the winter season.
- o The different groupings identified during the two seasons were not associated with any specific geographic region or hydrological feature
- o Distinct seasonal pattern in the mesozooplankton community was evident, largely reflecting the increased abundance of mesozooplankton during the summer survey.
- o There are complex interaction between physical-chemical and biological factors with no simple correlations in environmental parameters explained the observed patterns in zooplankton community patterns. However, some physico-chemical appeared to co-vary with the zooplankton assemblages but could not be tagged as drivers of the observed patterns.
- o The study produced a much needed baseline information and, as such, SAEON-Elwandle node has developed a resourceful LTEM and research plan dedicated to in-depth understanding of the Algoa Bay ecosystem functioning on a larger scale.

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