



State of the Bay 2021

Saldanha Bay and Langebaan Lagoon

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State of the Bay Reporting

Annual assessment of anthropogenic impacts to and ecological health of Saldanha Bay and Langebaan lagoon

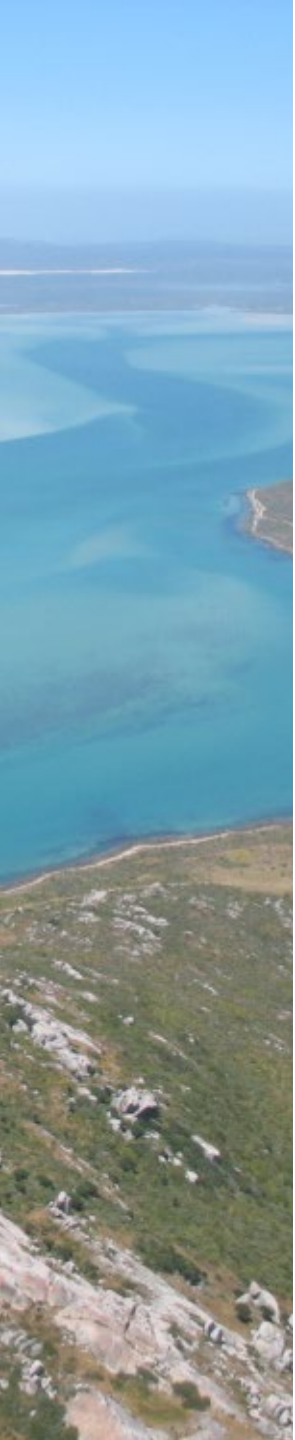
- Anthropogenic impacts:
 - **Activities and discharges** affecting health of the Bay
- Physical Health:
 - **Water quality (temperature, salinity, oxygen, nutrients), currents & waves, groundwater inflow**
 - Concentrations of **contaminants** (e.g. trace metals, bacteria) in **sea water, sediments and living organisms in the bay**
- Ecological health:
 - **Changes in abundance and community structure** of living organisms (macrophytes, invertebrates, fish, birds, mammals)







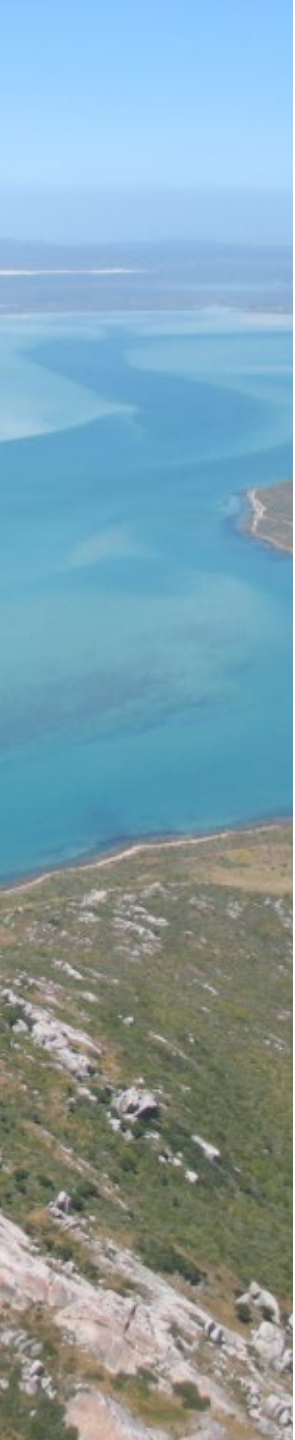
Indicator response times

- Water... Hours/Days
- Sediments... Weeks/Months
- Living Organisms
 - Macrofauna... Weeks/Months/Years
 - Fish... Months/Years
 - Birds... Years/decades





Health category	Ecological perspective	Management perspective
Natural 	No or negligible modification from the natural state	Relatively little human impact
Good 	Some alteration to the physical environment. Small to moderate loss of biodiversity and ecosystem integrity.	Some human-related disturbance , but ecosystems essentially in a good state,, continued regular monitoring is strongly recommended
Fair 	Significant change to the physical environment and associated biological communities; sensitive species may be lost, tolerant or opportunistic species beginning to dominate.	Moderate human-related disturbance with good ability to recover. Management intervention required to ensure no further deterioration takes place.
Poor 	Extensive change to the physical environment and biological communities, majority of sensitive species lost, tolerant or opportunistic species dominate.	High levels of human related disturbance. Urgent management intervention is required to avoid permanent damage to the environment or human health.



national ports authority

port terminals

METSEP SALDANHA



Bivalve Shellfish Farmers' Association Saldanha





Thanks



*Bivalve Shellfish Farmers' Association
Saldanha*



TRANSNET



1. Activities & Discharges

- Development pressure in the Bay stalled for a while (Global Financial Crisis, Covid), some industries ceased to operate (Arcelor Mittal), many projects were put on hold (IDZ) but now things seems to be revved up again in the last 12 months...

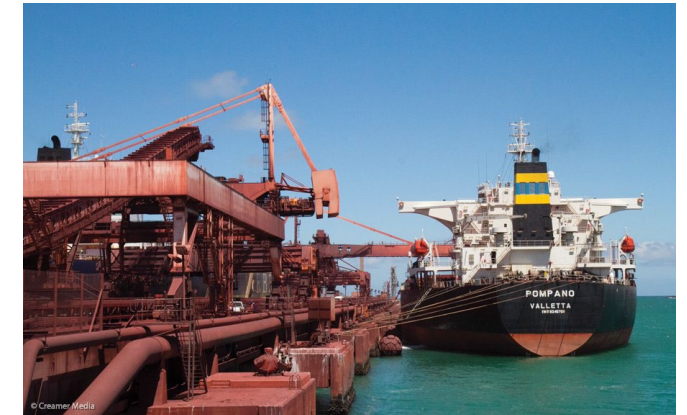
Up

- Ore exports (manganese, zinc)
- Effluent from WWTWs
- New projects (Powership, FSRU, RO Plant, LPG/LNG imports, ship repair)

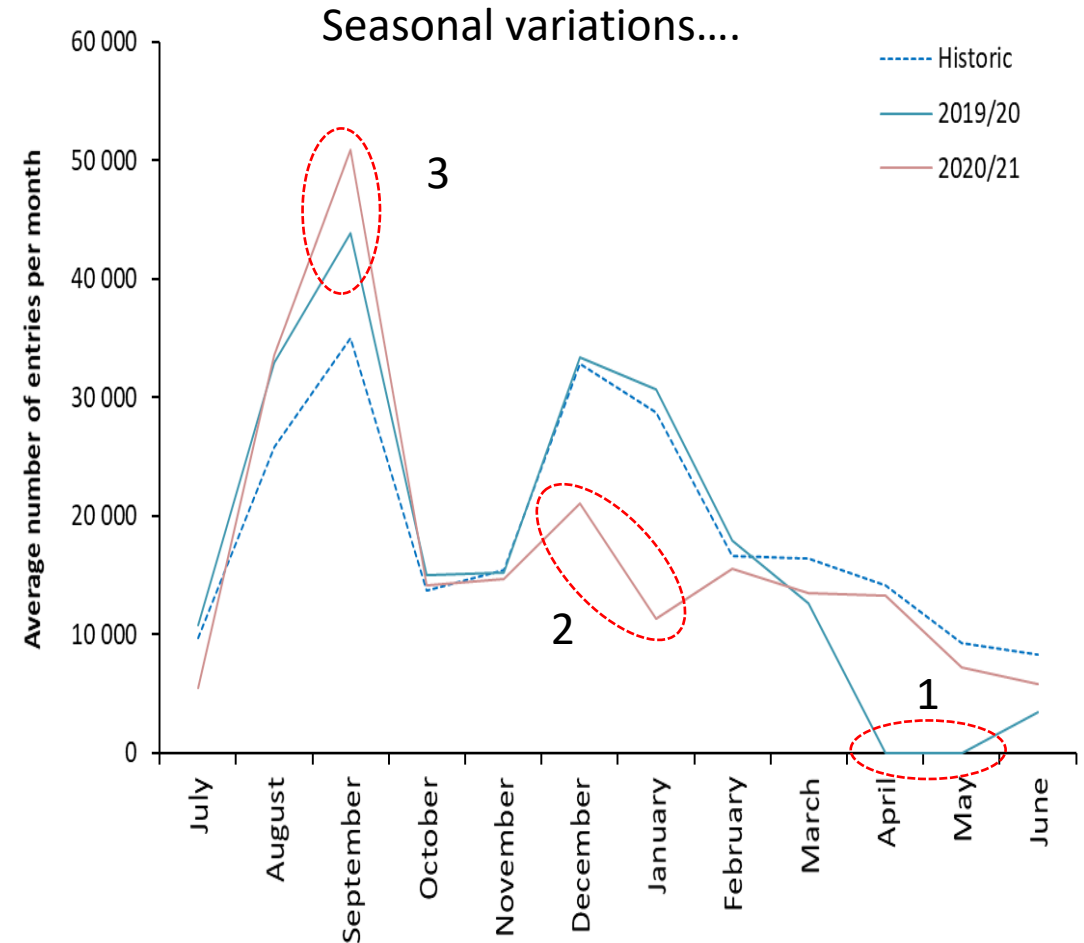
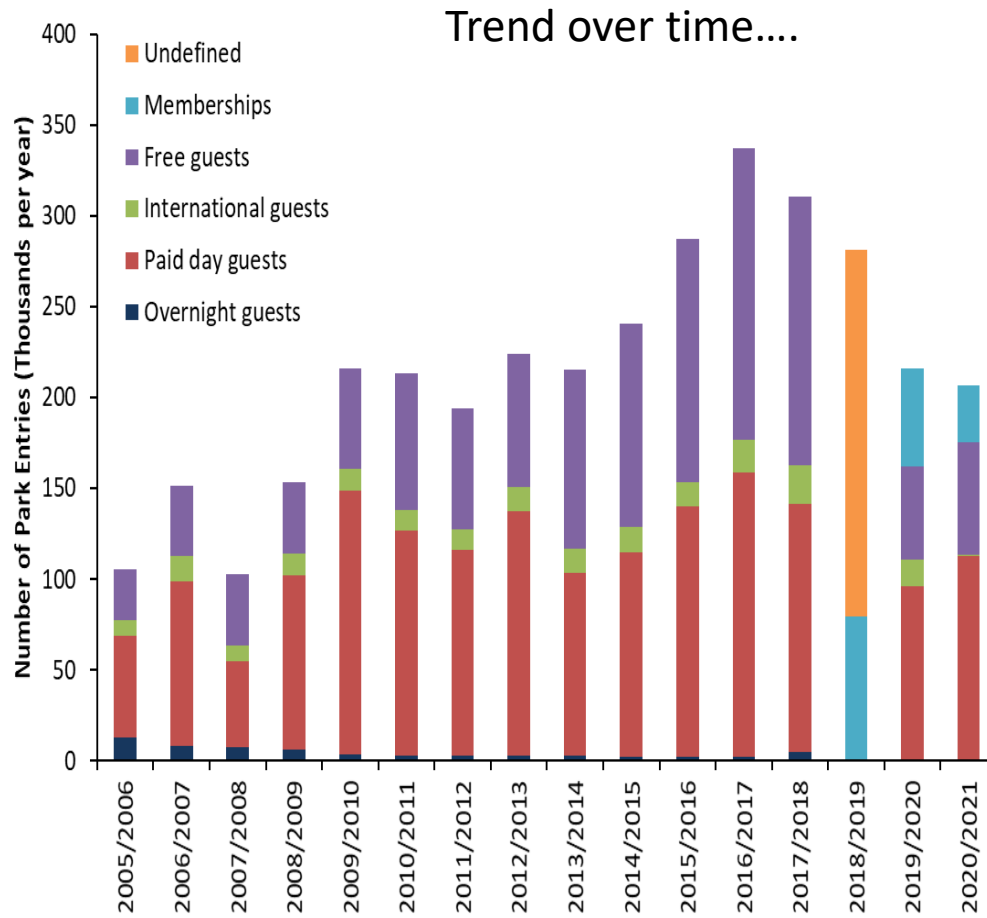


Down

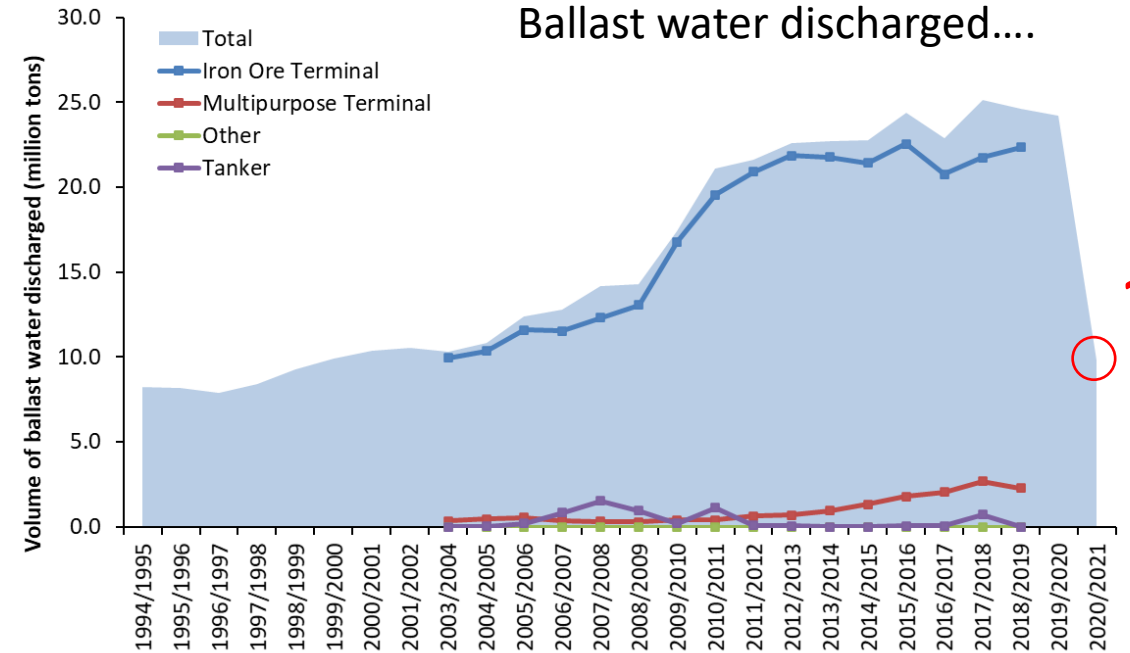
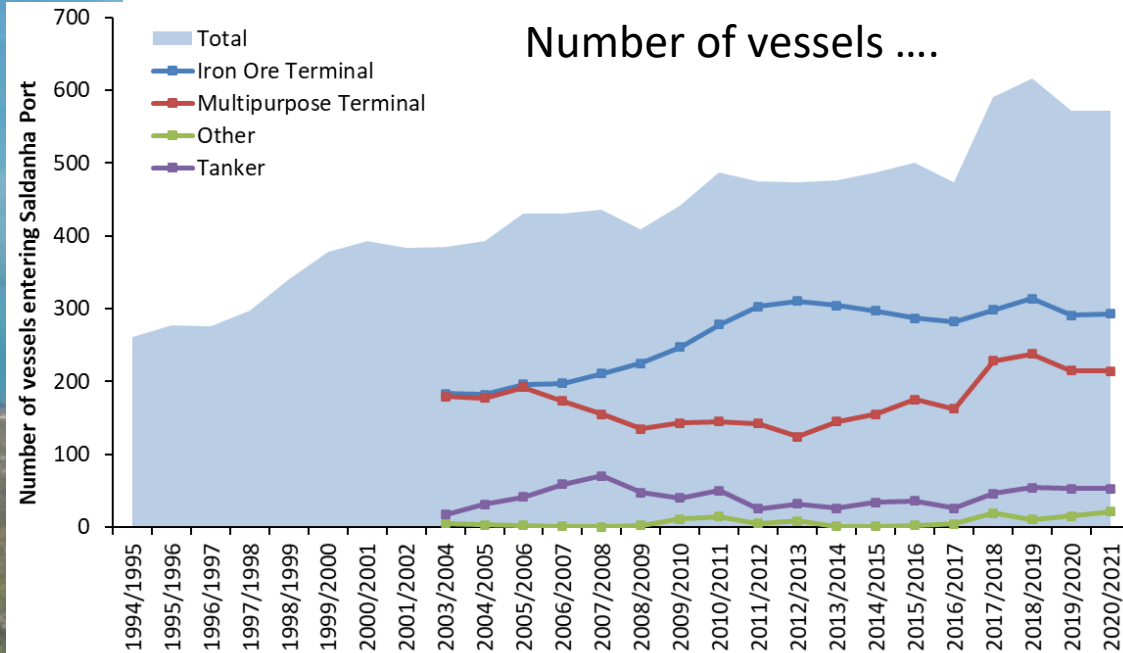
- Visitor numbers
- Ore exports (iron)
- Shipping traffic
- Ballast water (?)
- Mussels & oysters
- Fish processing



1.1. Tourism - numbers of visitors to the WCNP

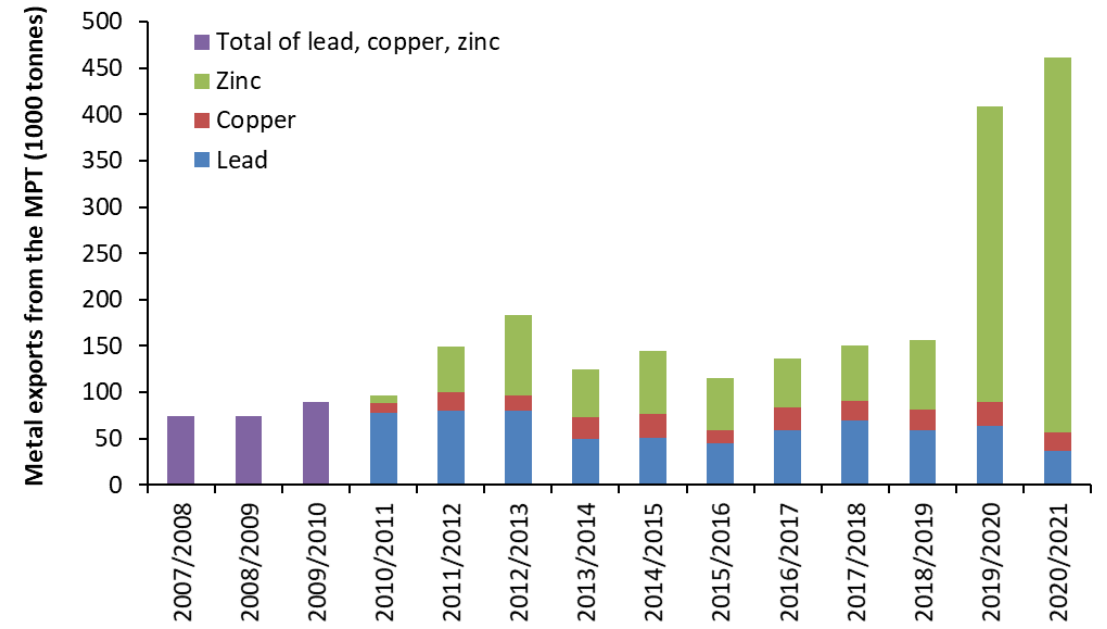
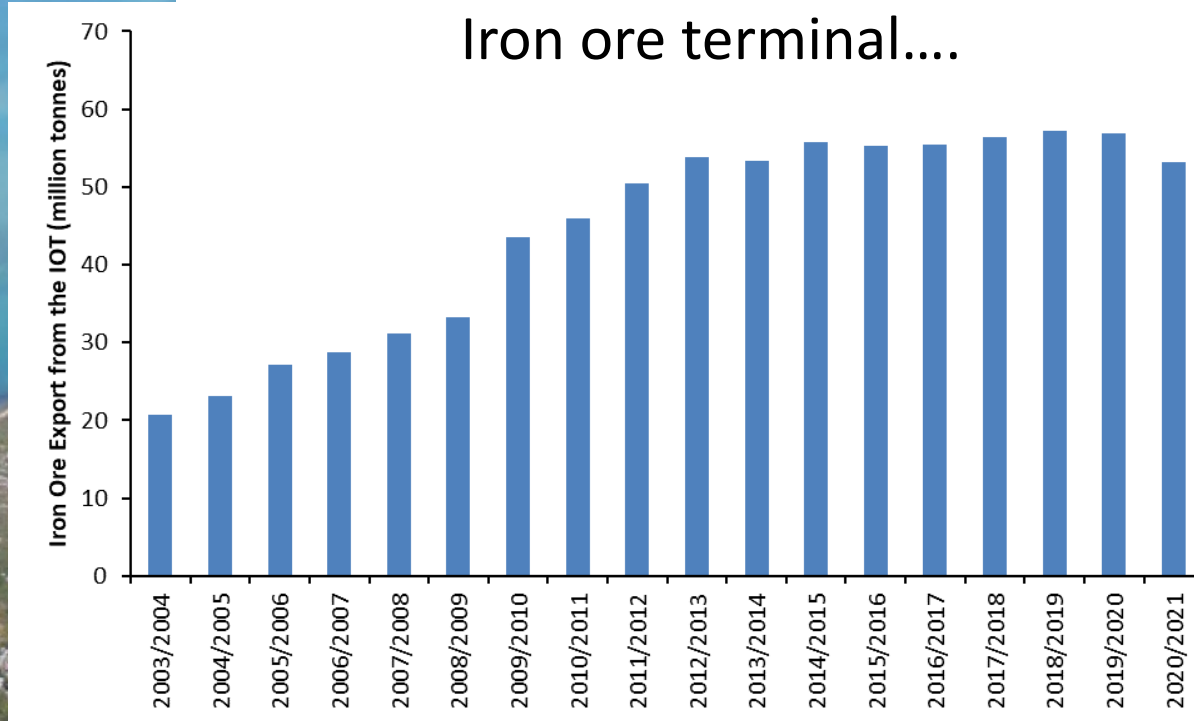


1.2 Shipping traffic and ballast water

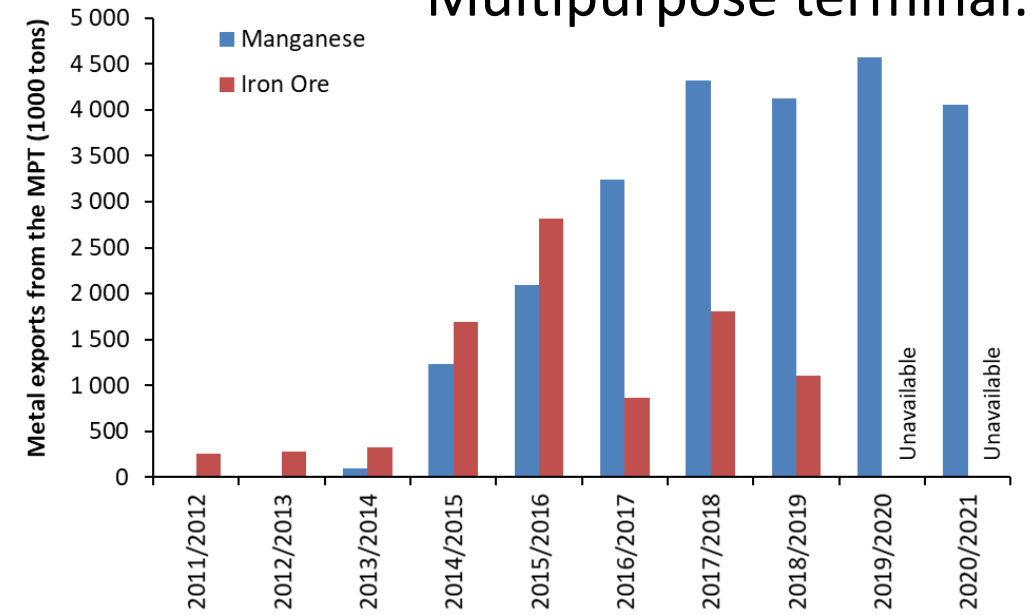


1.3 Ore exports

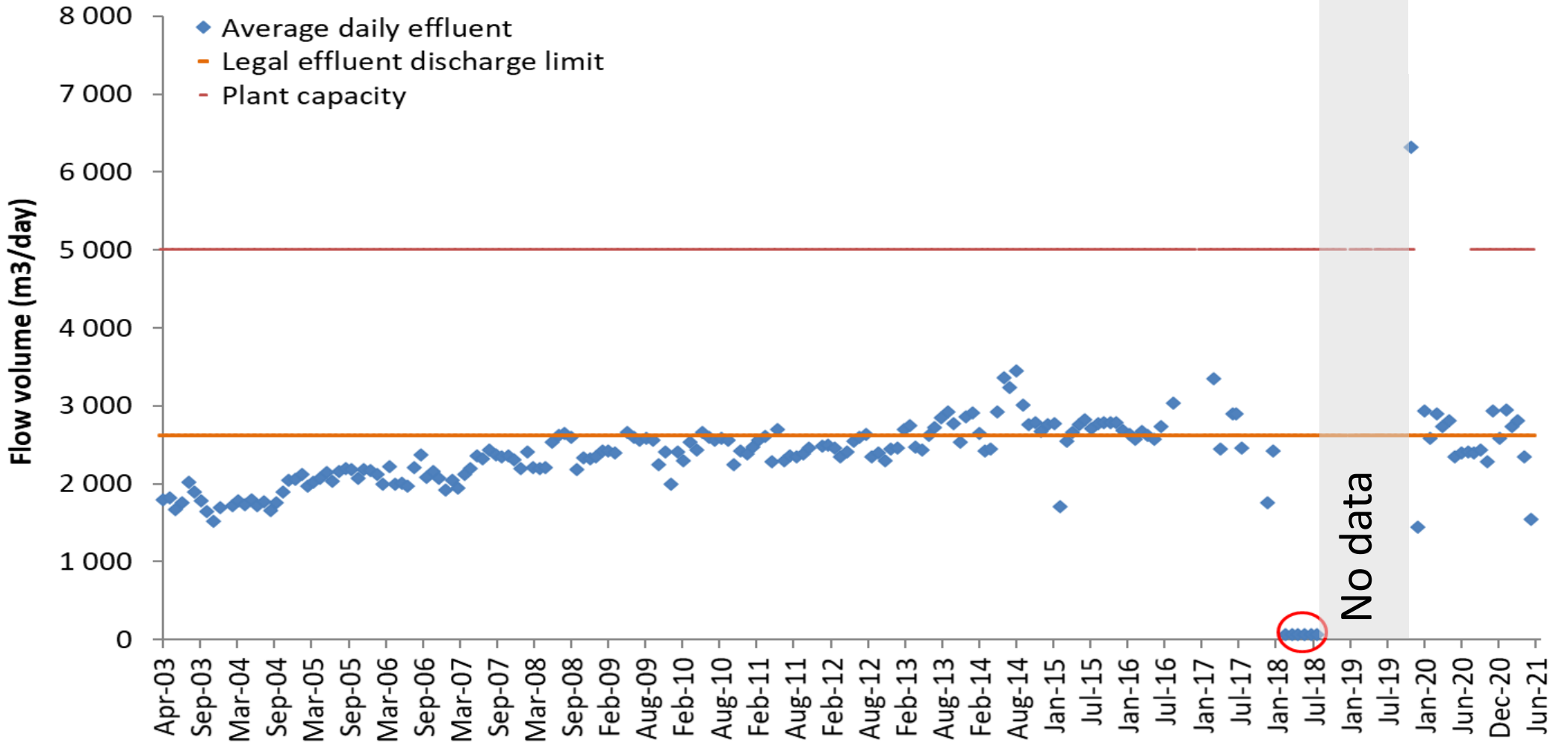
Iron ore terminal....



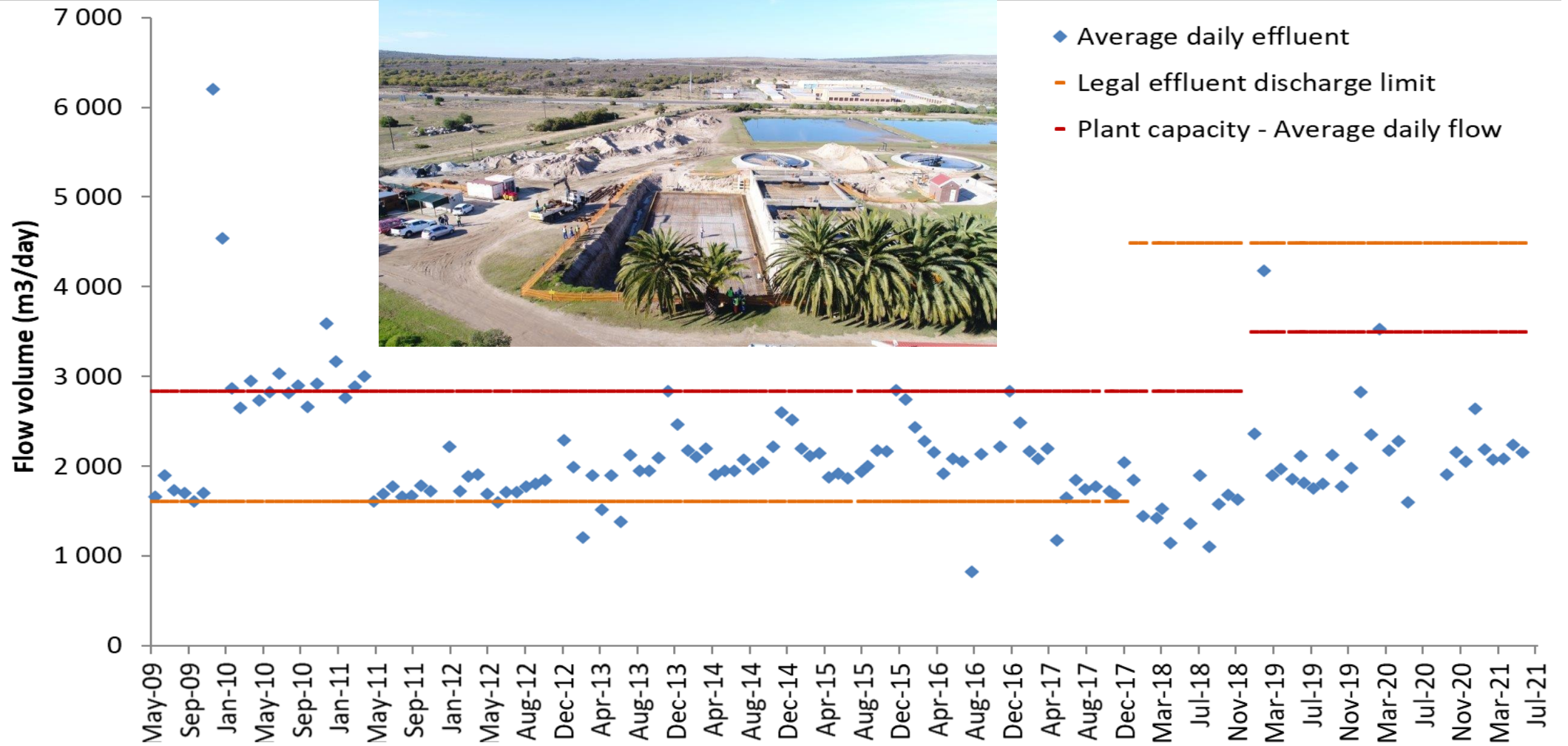
Multipurpose terminal...



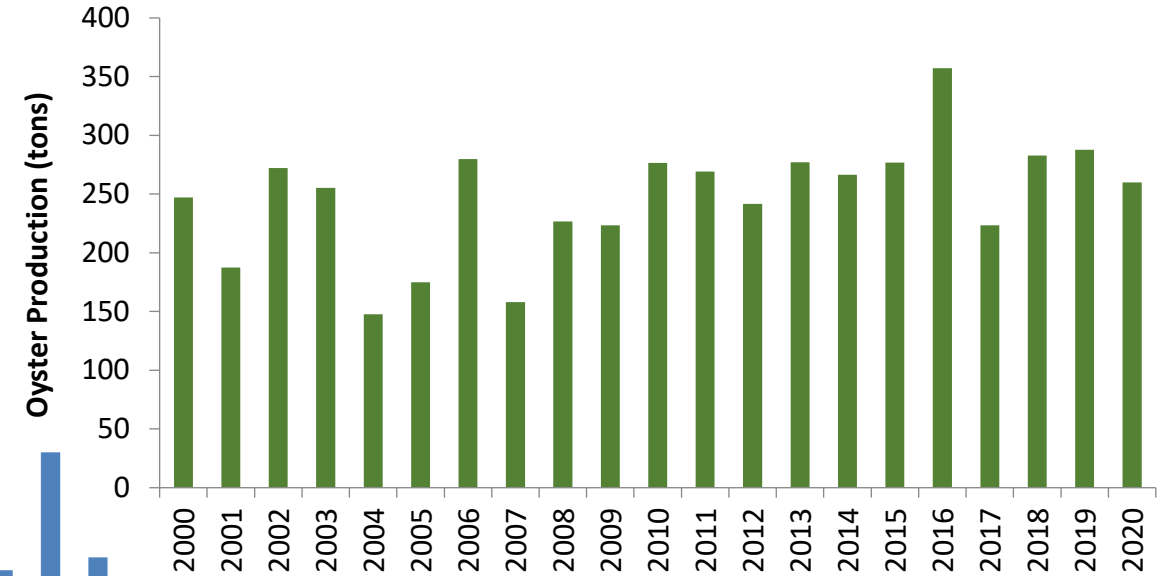
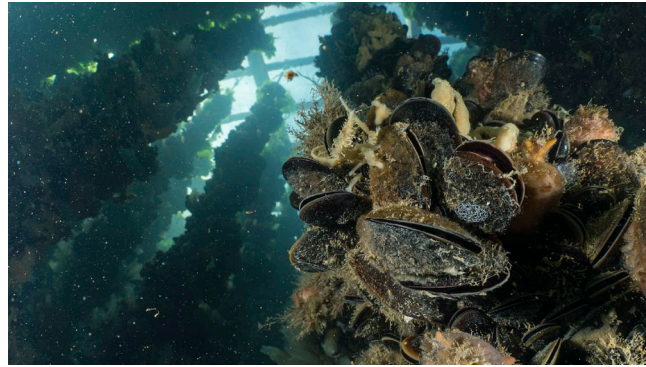
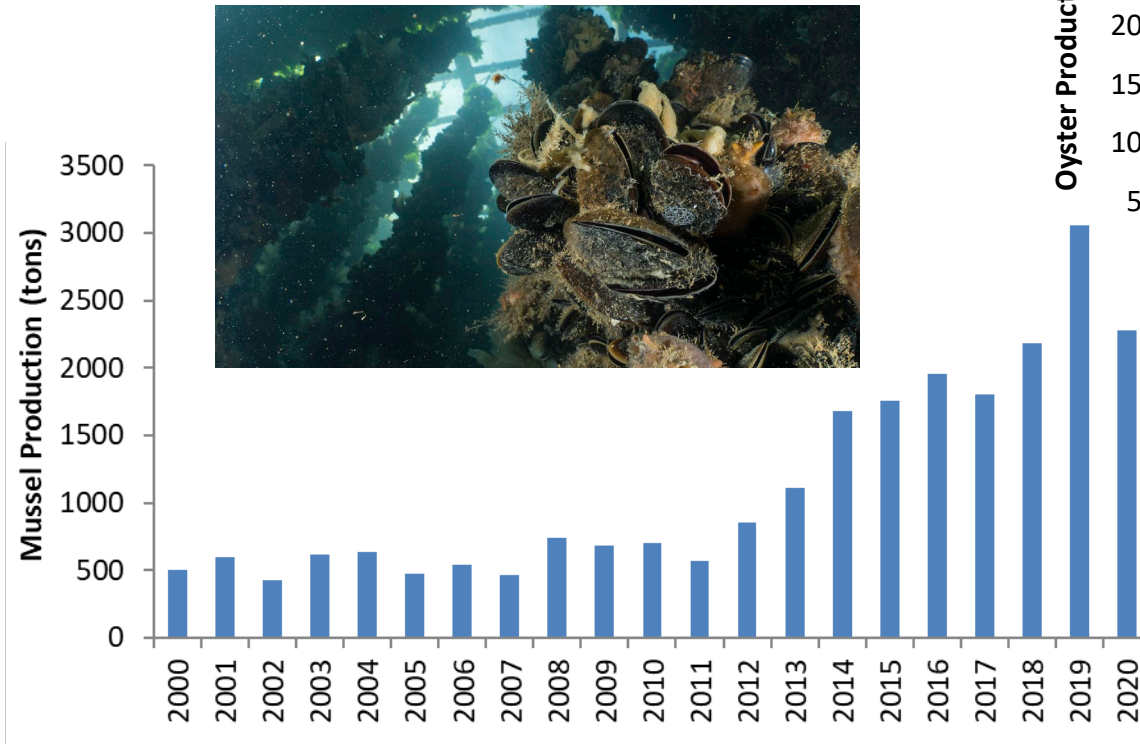
1.4 Saldanha WWTW



1.5 Langebaan WWTW



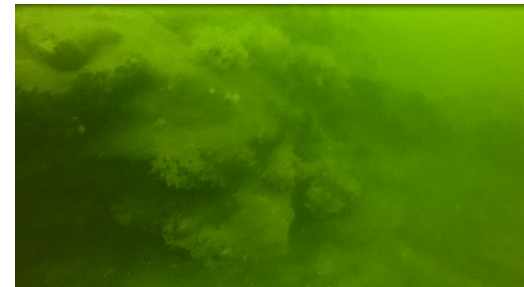
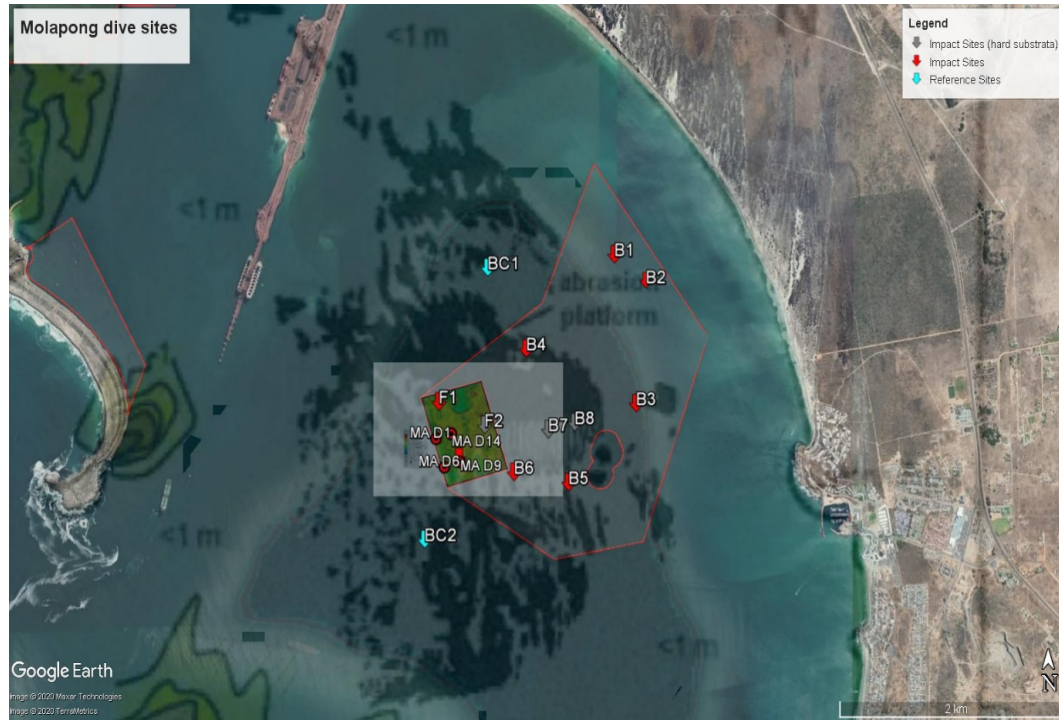
1.5 Mariculture production



2020: 28 companies in SB on the Marine Aquaculture Right Register, 15 of which were actively operational
 2021: 27 companies registered on the Marine Aquaculture Right Register, 24 of which were *actively* operational

Reef area in Big Bay

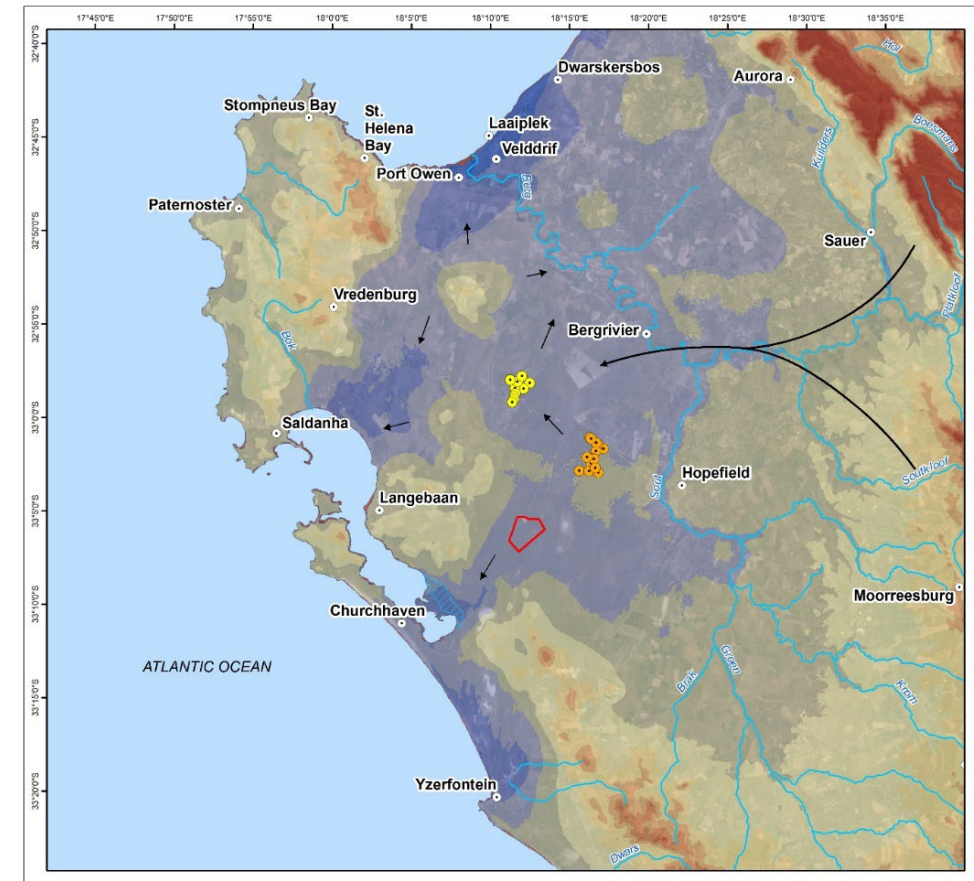
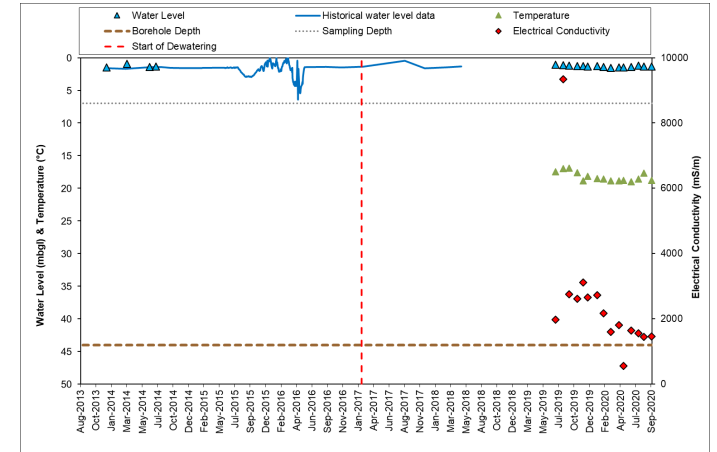
- Reef area in Big Bay is quite extensive and knowledge of this has been in place since the 1970s (Flemming 1977) but not “fully” acknowledged in the EIA
- Highlighted in a recent bathymetry survey and through underwater photography
- Concerns:
 - Higher biodiversity and conservation importance than sediment
 - Soft sediment monitoring protocols (infauna, redox and H₂S) not really appropriate
- DEFF is taking action to address these concerns



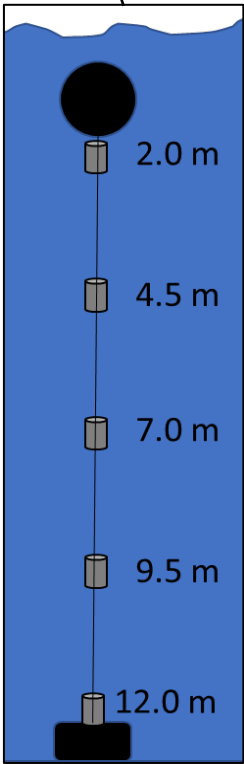
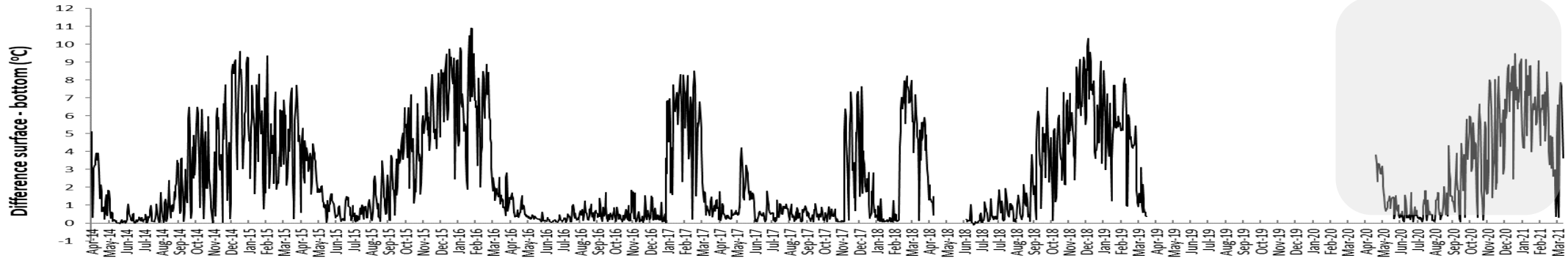
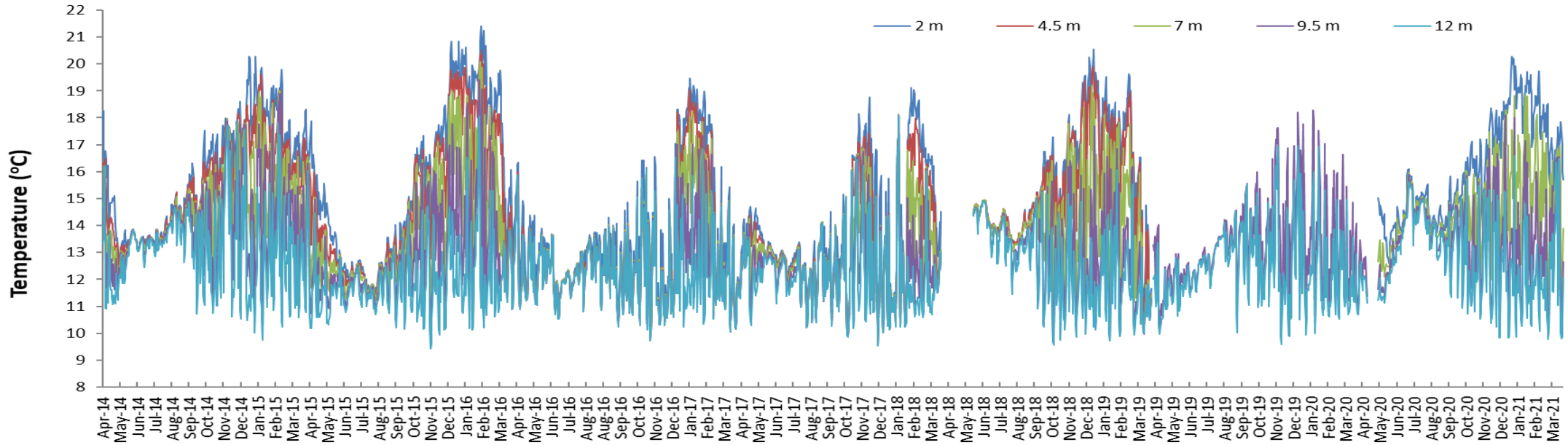
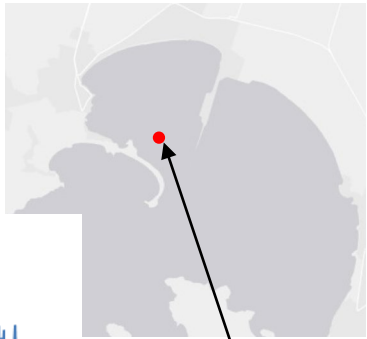
2.1 Groundwater



- New “partner” on board - GEOSS
- Groundwater is very important water resource (GW control area) and is also important for the environment
- Historically - uncertainly around GW flow patterns, recharge and environmentally sustainable yield but recent work (Time Domain Electromagnetic geophysical survey) has helped clarify the situation
- Currently, the main use of Groundwater in the region is by the agricultural sector – 1.5 m³/a (2016), other users include SBM with the Langebaan Road Aquifer Wellfield (5.1 Mm³/a), Hopefield Wellfield (1.6 Mm³/a), and Elandsfontein (reinjection only)
- Total “sustainable” useable groundwater exploitation potential: 15.2 Mm³/a
- Wellfields should only be used in times of severe drought, should be kept as “full” as possible in non-drought times so as not to compromise future utility or outflow to Langebaan Lagoon
- Comprehensive monitoring is essential...



3.1 Water Quality - Temperature



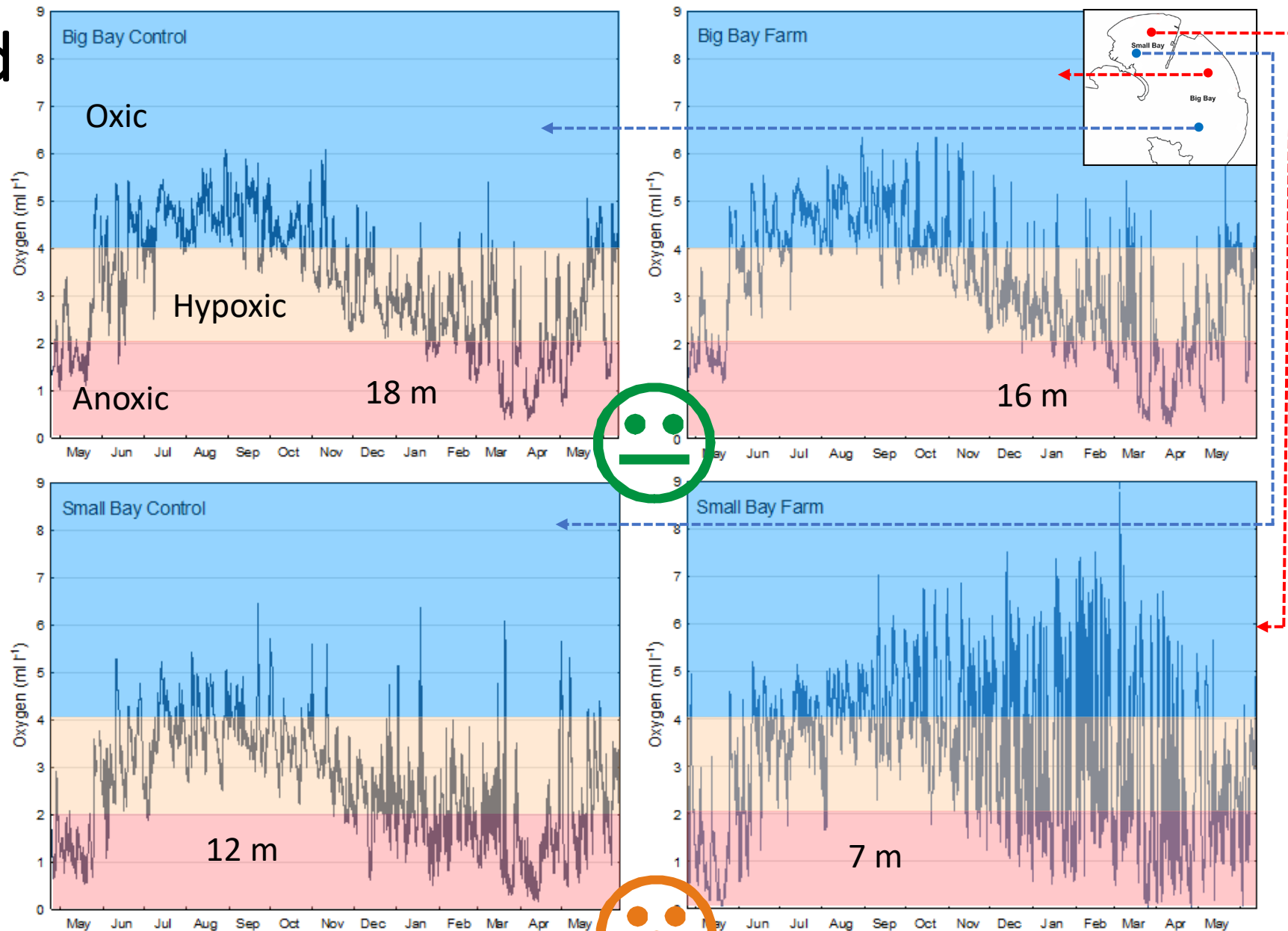
3.2 Dissolved oxygen

Big Bay

- Very little difference between control and impact sites
- Hypoxic much of the time but seldom anoxic (2-3 months/y, late summer – Mar/Apr)
- Linked to upwelling & stratification, entirely/largely natural

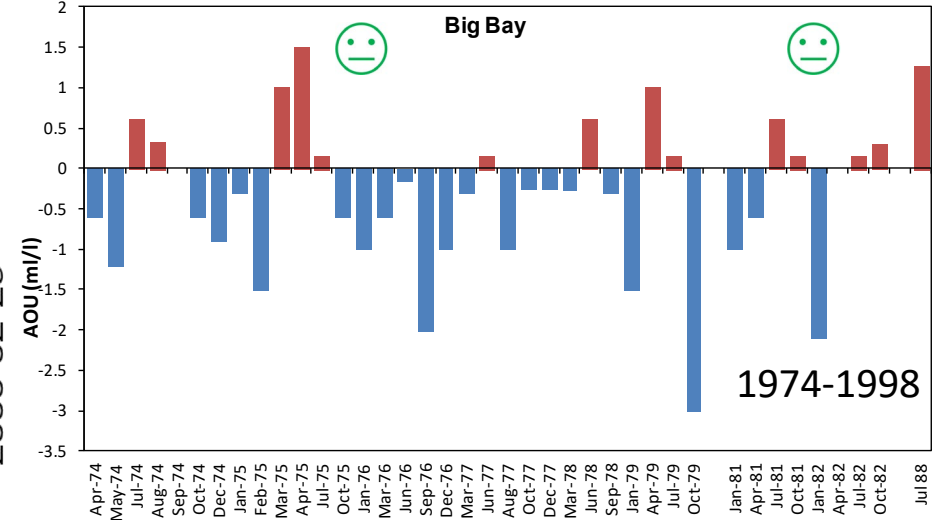
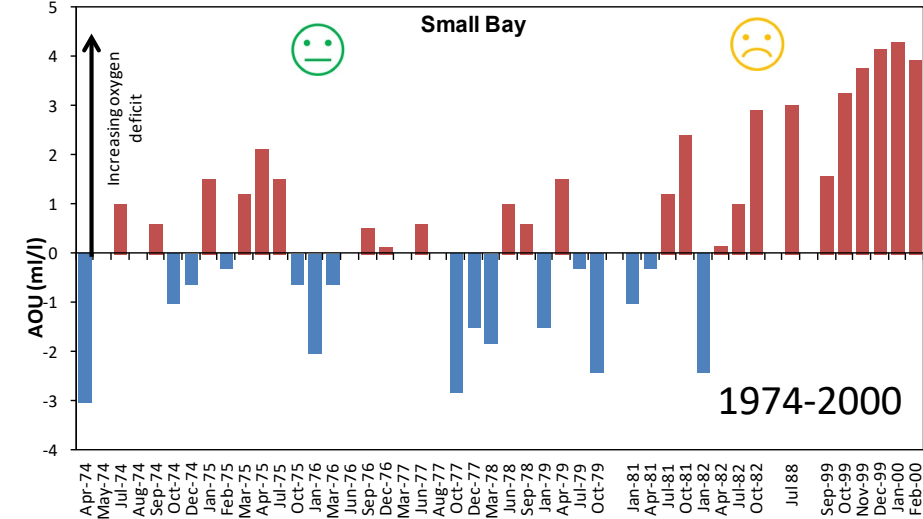
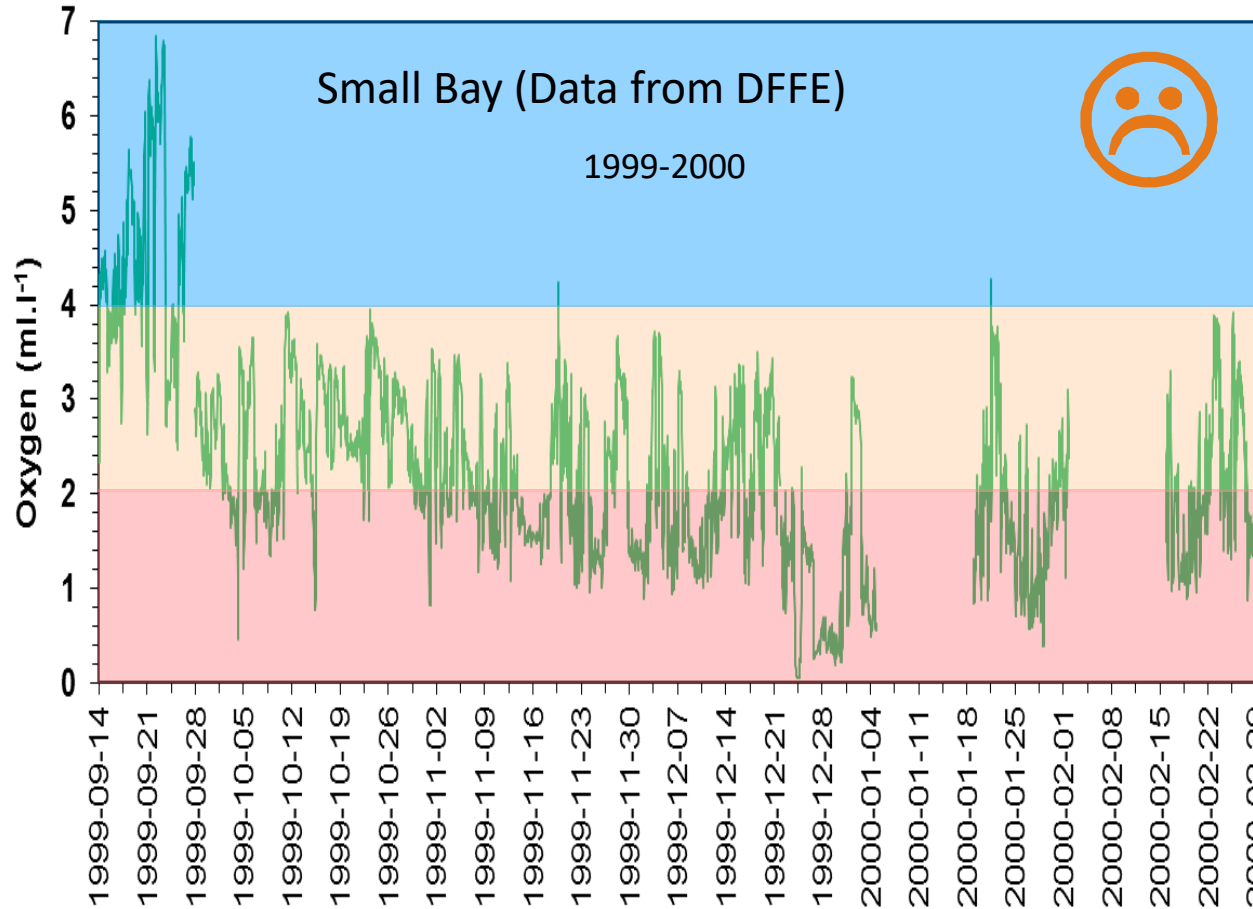
Small Bay

- Much higher variability in O₂ levels at farm sites vs. control (linked to depth)
- Hypoxic most of the time, frequently anoxic (5-6 months/y, summer + autumn – Dec-May)
- Linked to upwelling & stratification but greatly exacerbated by reduced circulation in Small Bay and organic loading from wastewater discharges and mariculture



Data from DFFE (ADZ monitoring)

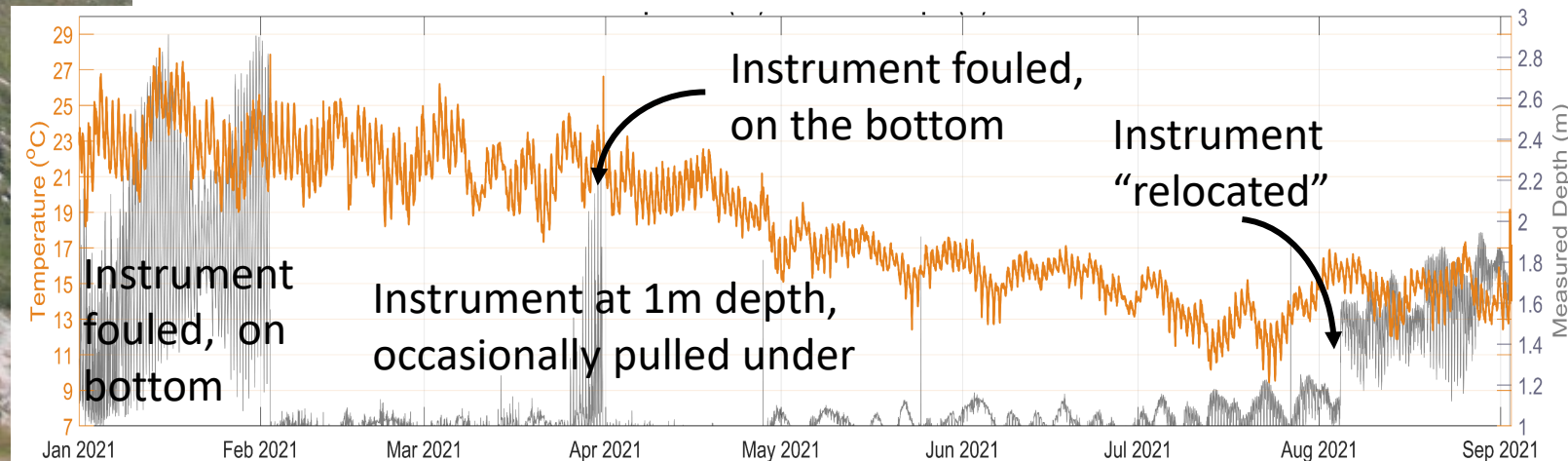
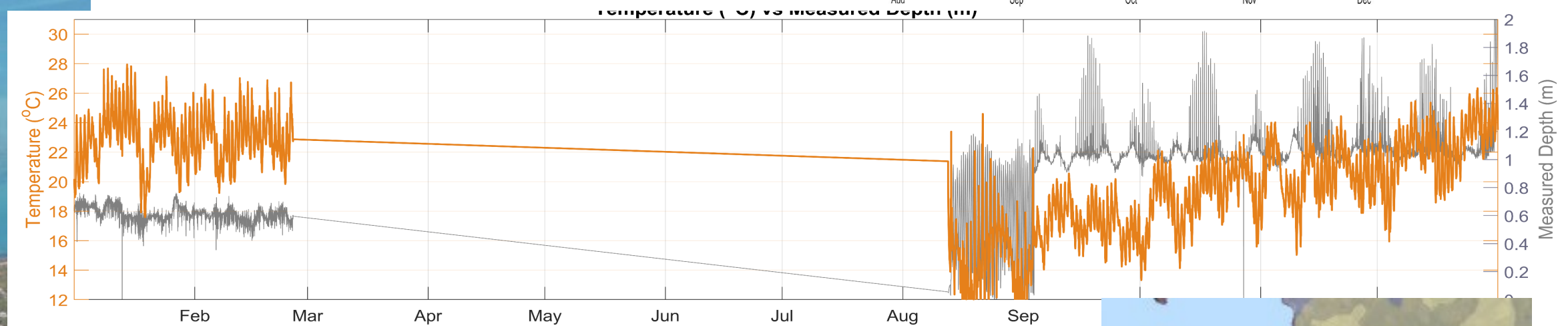
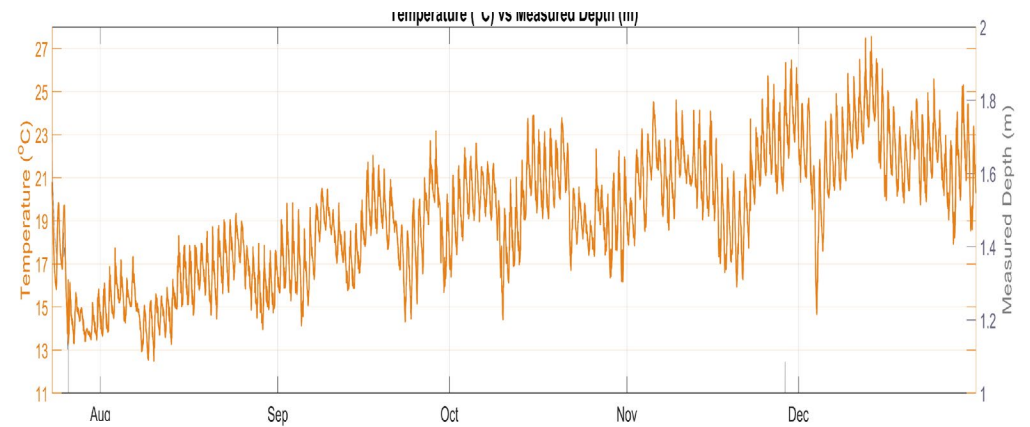
2.2 Dissolved oxygen – historic data



Data from DFFE

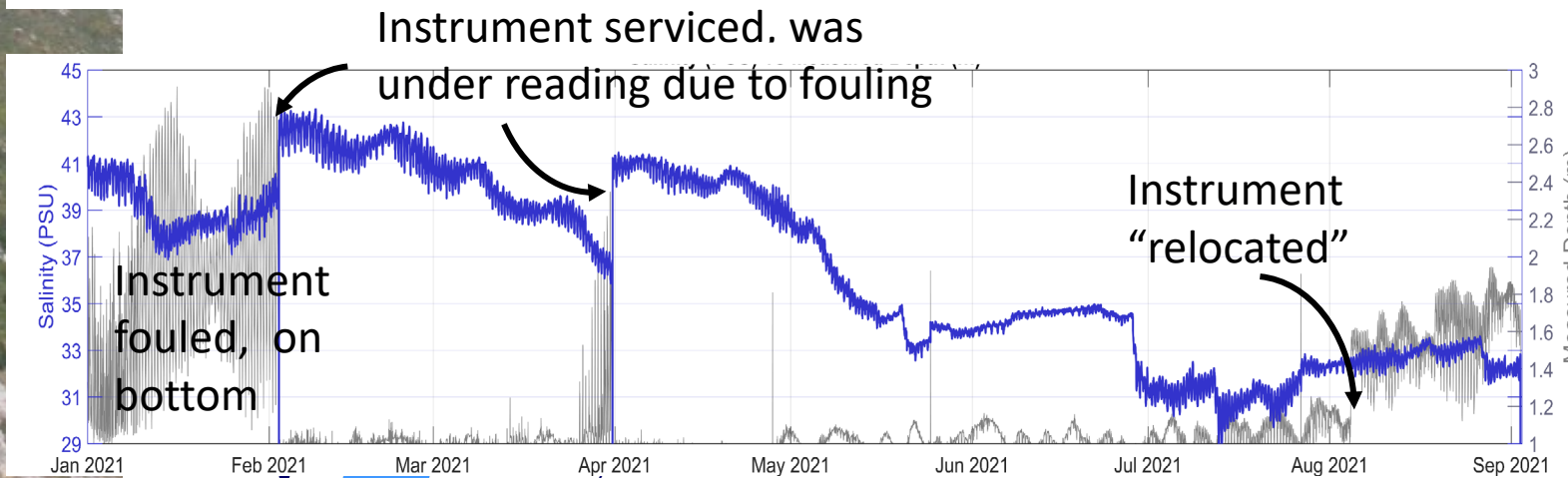
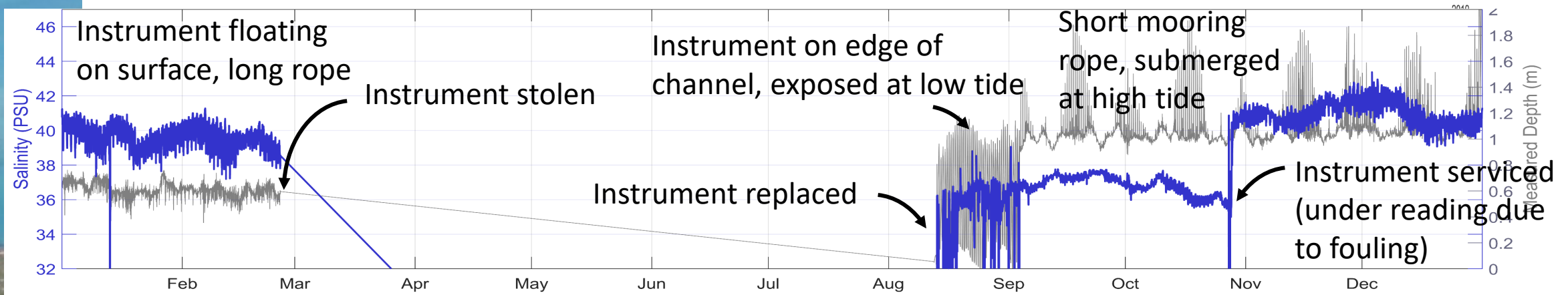
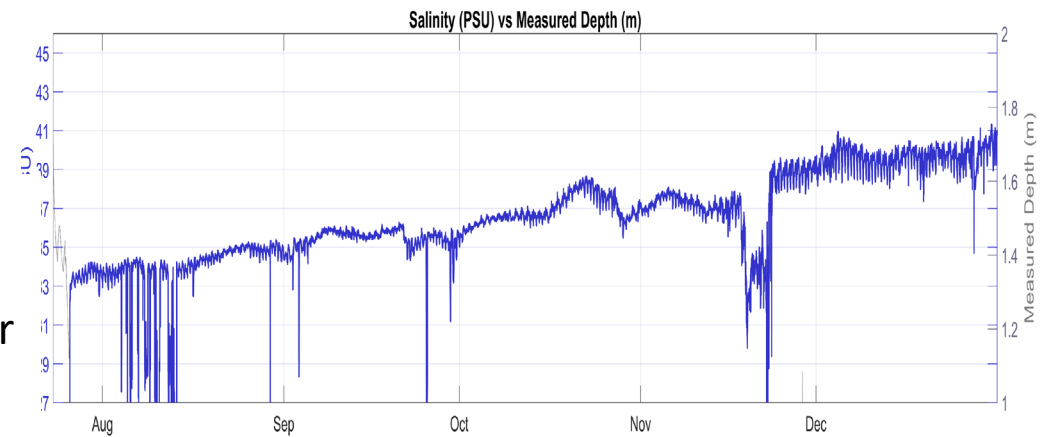
2.3 Geelbek - Temperature

- Strong tidal, diurnal and seasonal signals
- Position in the water column and fouling not important



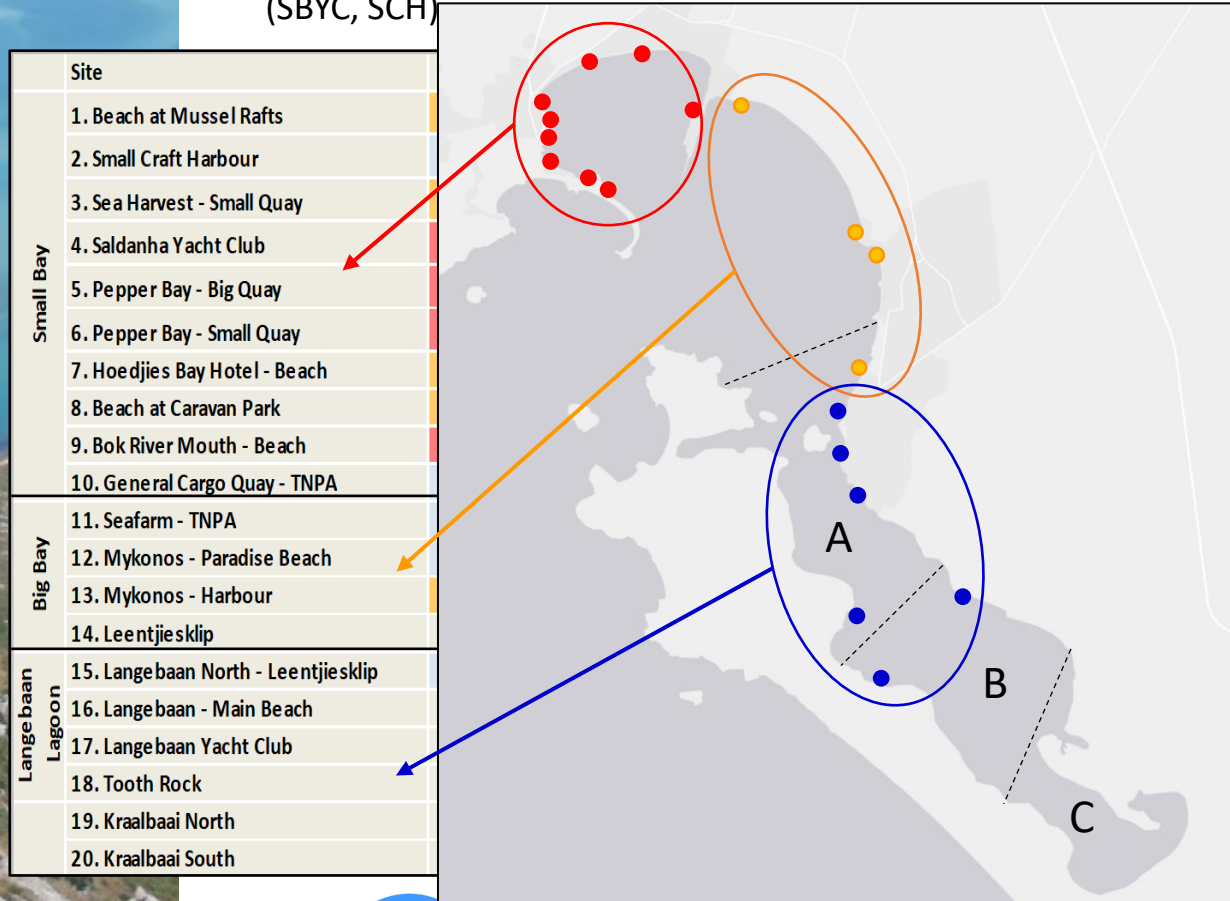
2.4 Geelbek - Salinity

- Strong tidal and seasonal signals, seasonal reversal in tidal-salinity signal
- Hypersaline in summer (>40), normal seawater (35) in winter
- Fouling has a strong effect on salinity



2.3 Faecal coliforms (recreational limits)

- Condition were very poor in the period 1999-2005, but has remained very much the same since then
- 2021: Some improvement at sites in Big Bay and Langebaan Lagoon, but Small Bay still a concern
- Contamination of sites in Small Bay linked to discharge from the WWTW (Bok River) but also stormwater (Hoedjiesbaai) and possibly boating (SBYC, SCH)

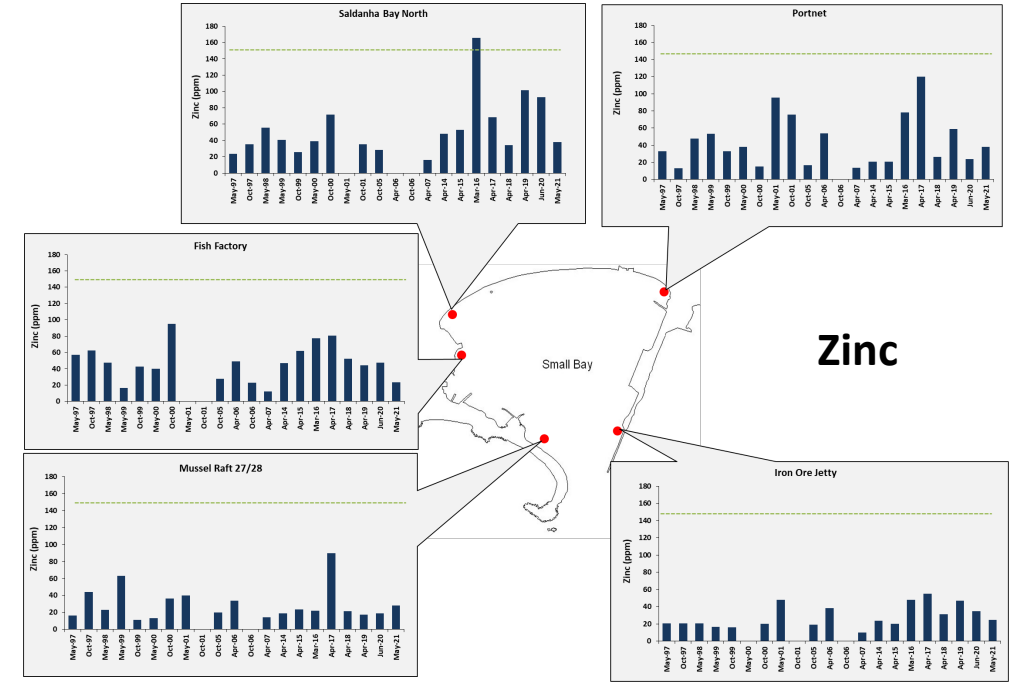
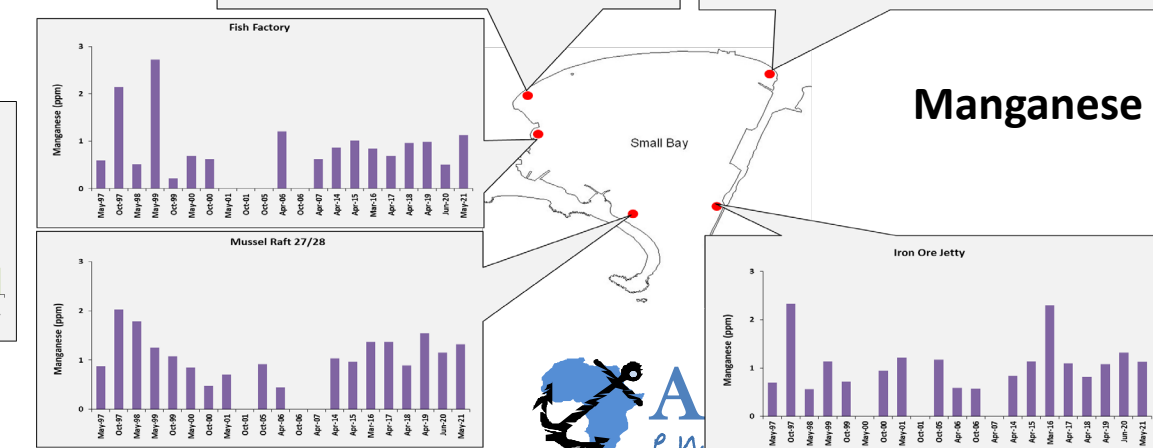
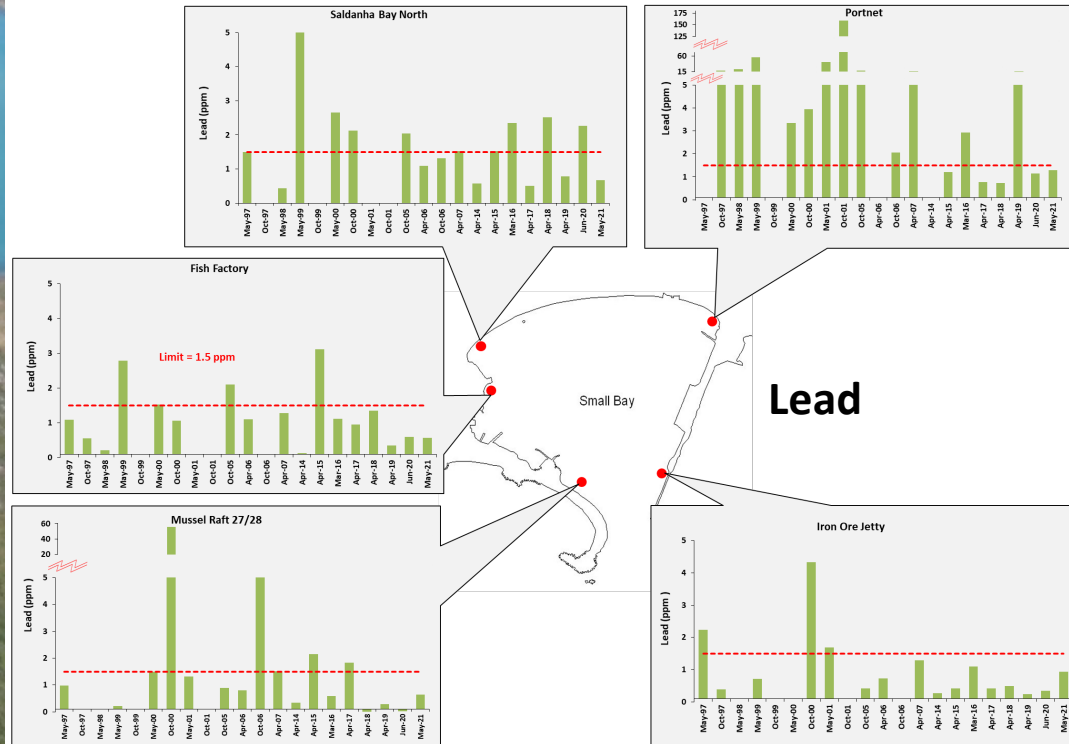


	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
9	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Fair	ND
	Ex.	Ex.	Good	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Fair
d	Ex.	Fair	Ex.	Ex.	Ex.	Ex.	Ex.	Fair	Ex.	Ex.	Ex.	Ex.
	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Fair
	Ex.	Ex.	Good	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Poor	Good
d	Good	Ex.	Good	Fair	Fair	Ex.	Ex.	Ex.	Ex.	ND	Ex.	Ex.
	Fair	Poor	Poor	Fair	Good	Fair	Good	Fair	Poor	Poor	Poor	Poor
	Fair	Fair	Poor	Good	Fair	Ex.	Fair	Fair	Fair	Fair	Fair	Ex.
r	Good	Ex.	Poor	Fair	Good	Ex.	Poor	Poor	Fair	Fair	Good	Poor
	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.
	ND	ND	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.
	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Fair	Ex.
	Ex.	Fair	Ex.	Ex.	Good	Fair	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.
	Ex.	Ex.	Fair	Ex.	Good	Ex.	Ex.	Ex.	ND	Ex.	Ex.	Ex.
	Ex.	Ex.	Poor	Good	Ex.	Good	Ex.	Good	Ex.	Ex.	Fair	Ex.
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	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	ND	Ex.	Ex.	Ex.
	ND	ND	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	ND	Fair	Ex.	Ex.
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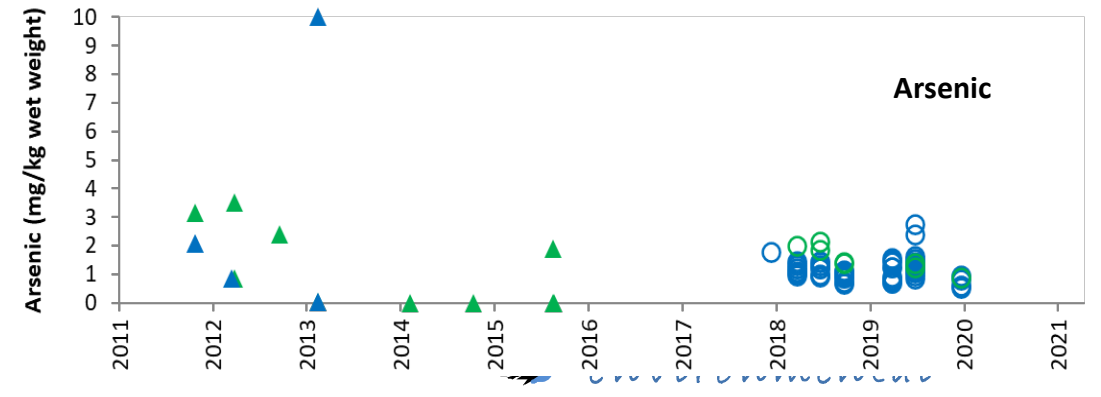
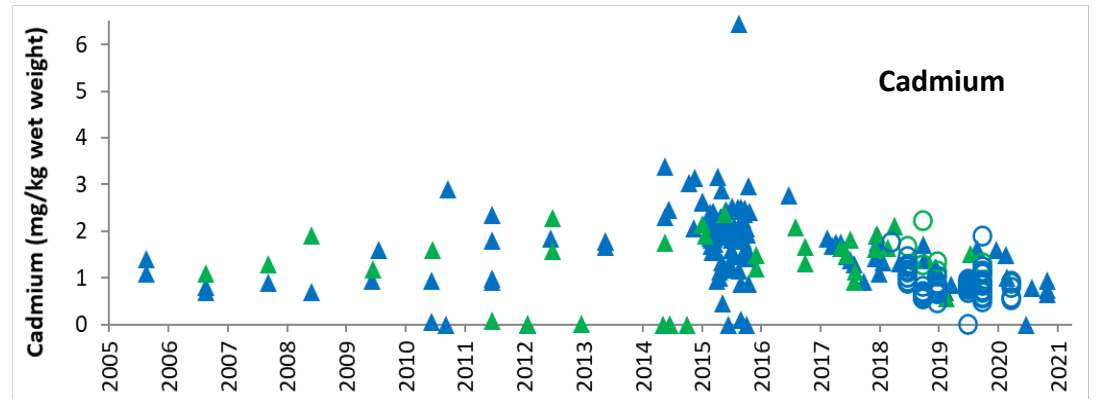
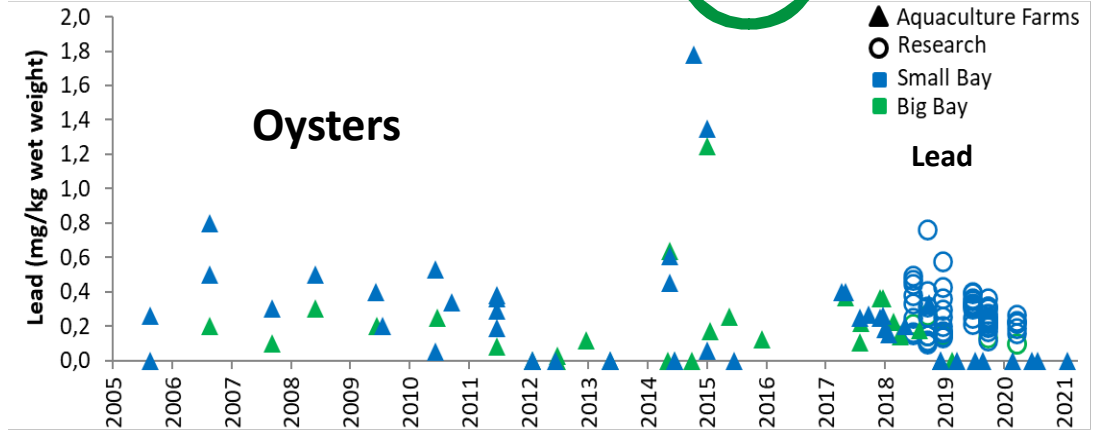
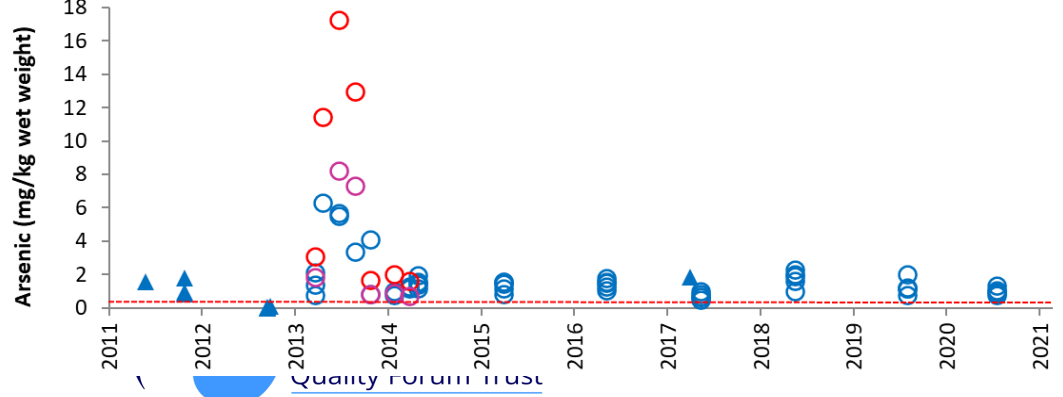
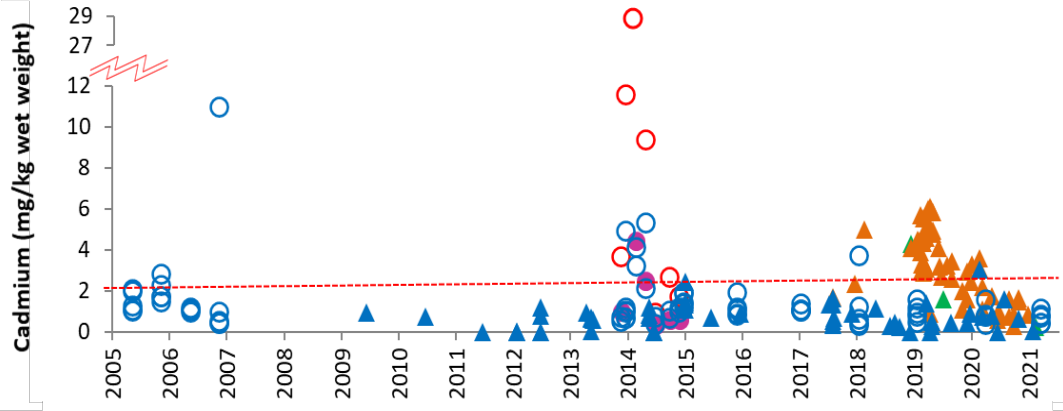
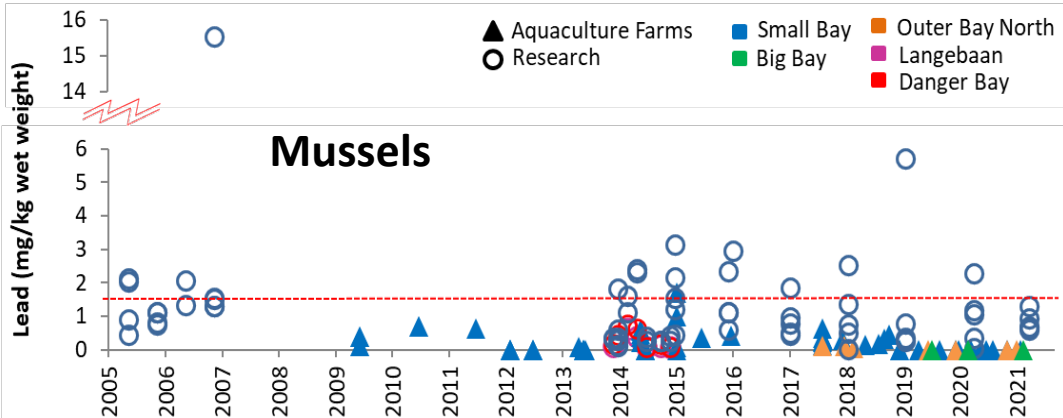


2.4 Trace metals in shoreline mussels in Small Bay

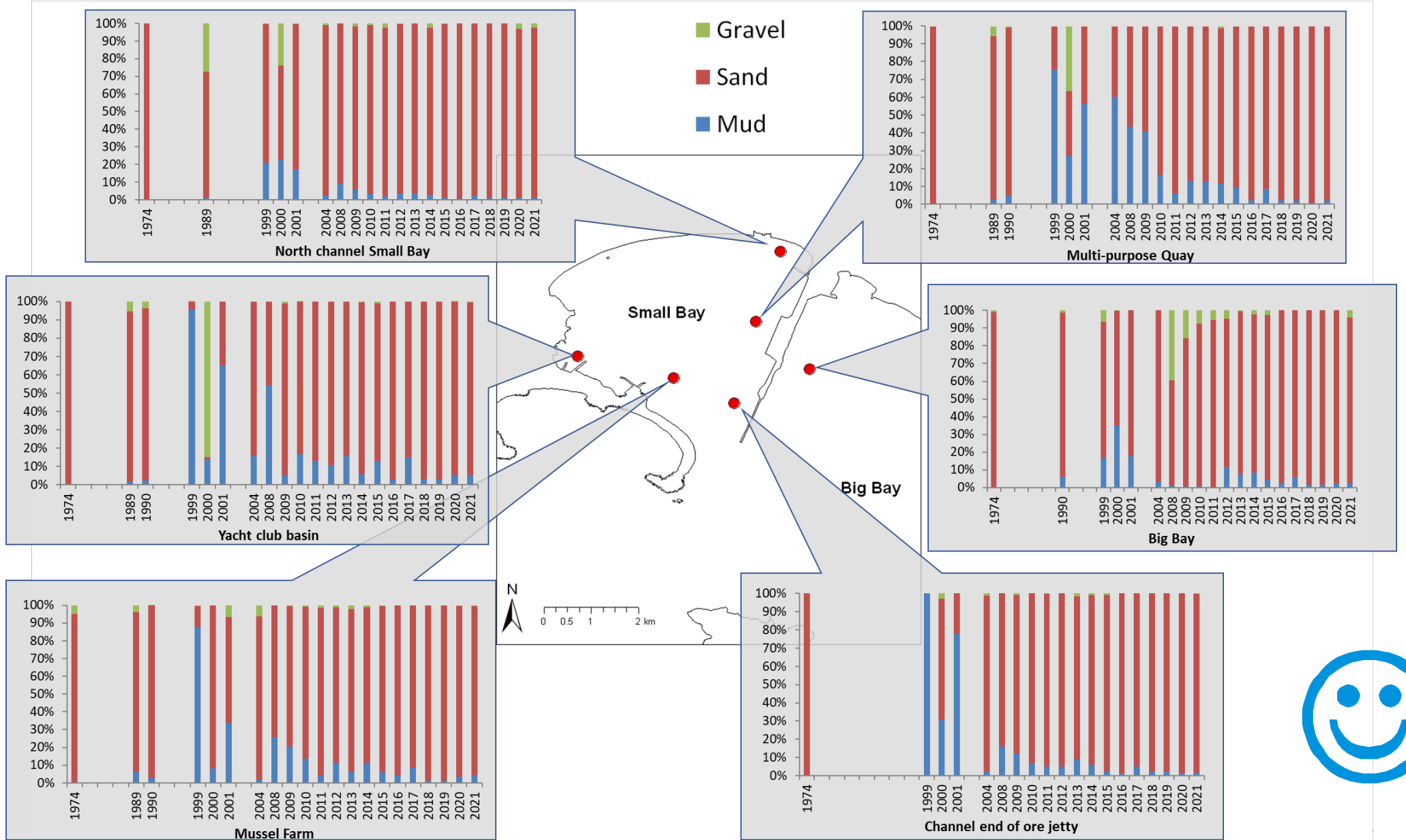
- Little change evident in the “usual” suspects (Pb, Cd, Cu, Zn), mostly below average historic levels
- Arsenic – monitoring started relatively recently (2015, others since 1997), a bit concerning
- Manganese clearly increased in recent years – presumably linked with corresponding increase in ore exports



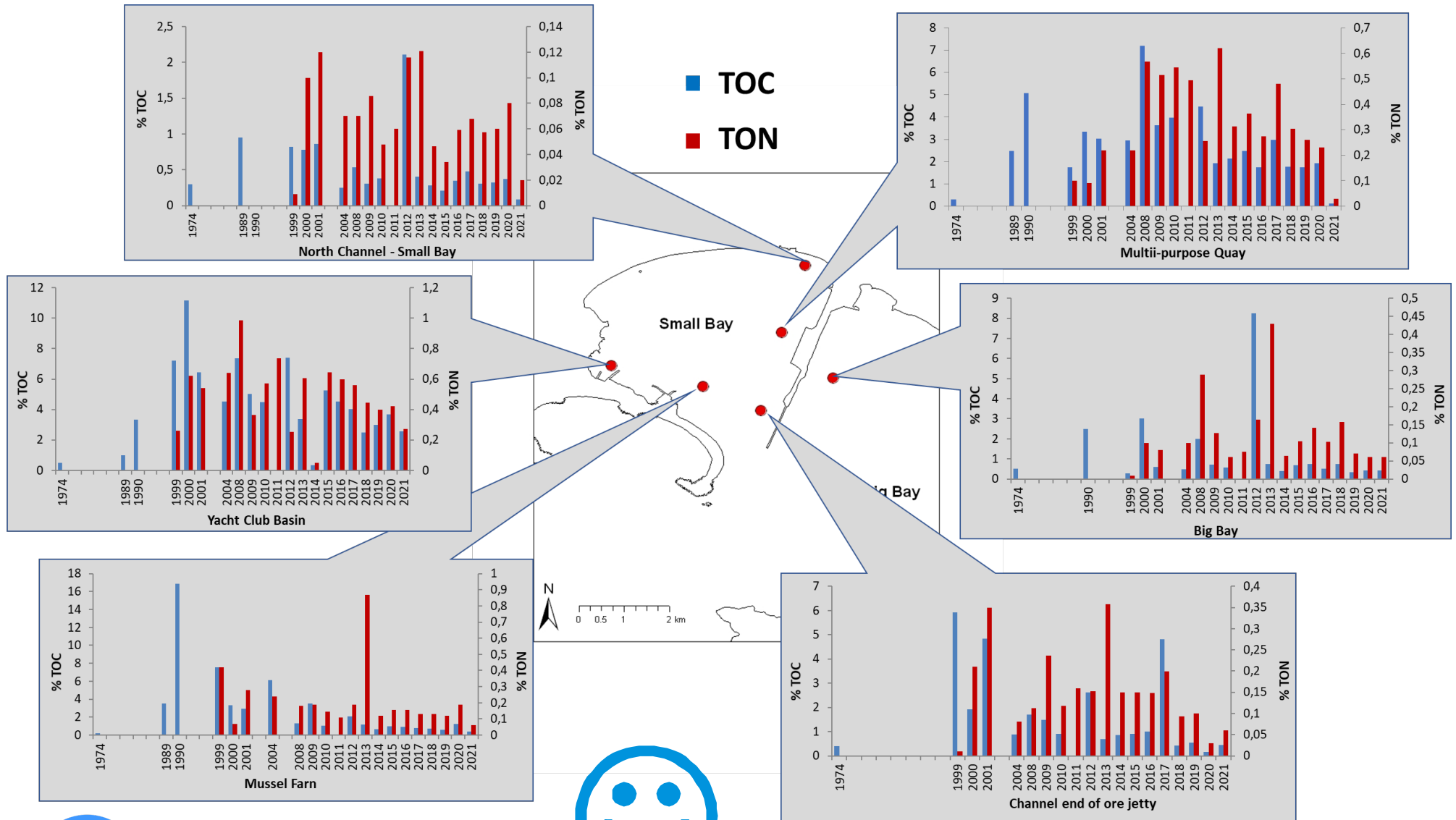
2.5 Trace metals in farmed mussels & oysters



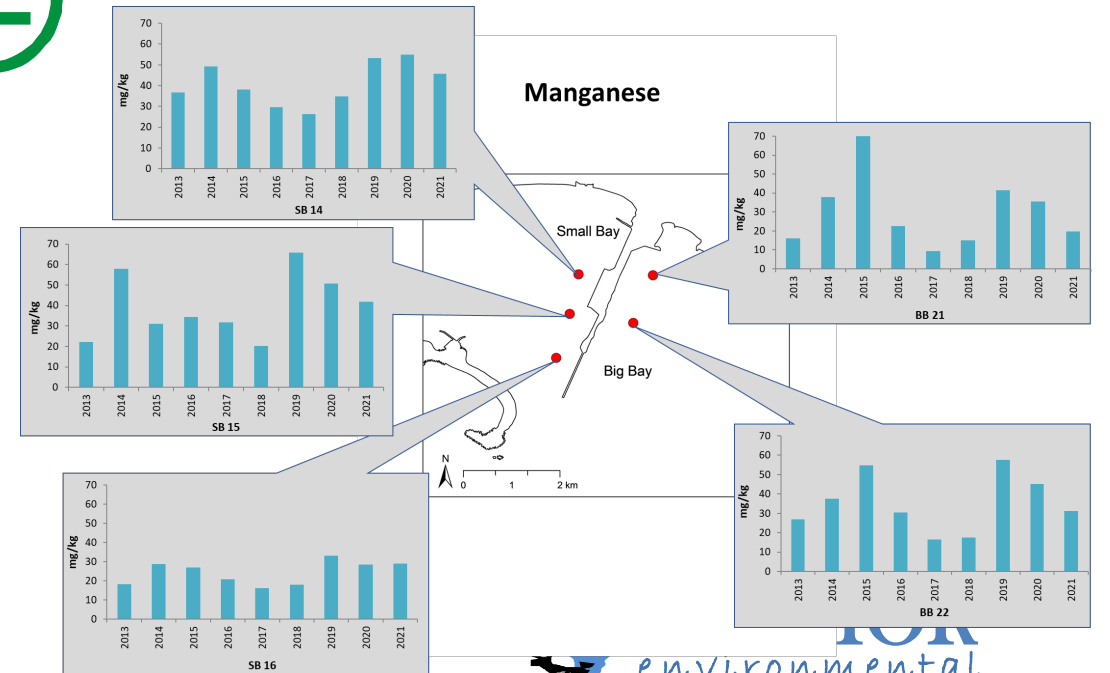
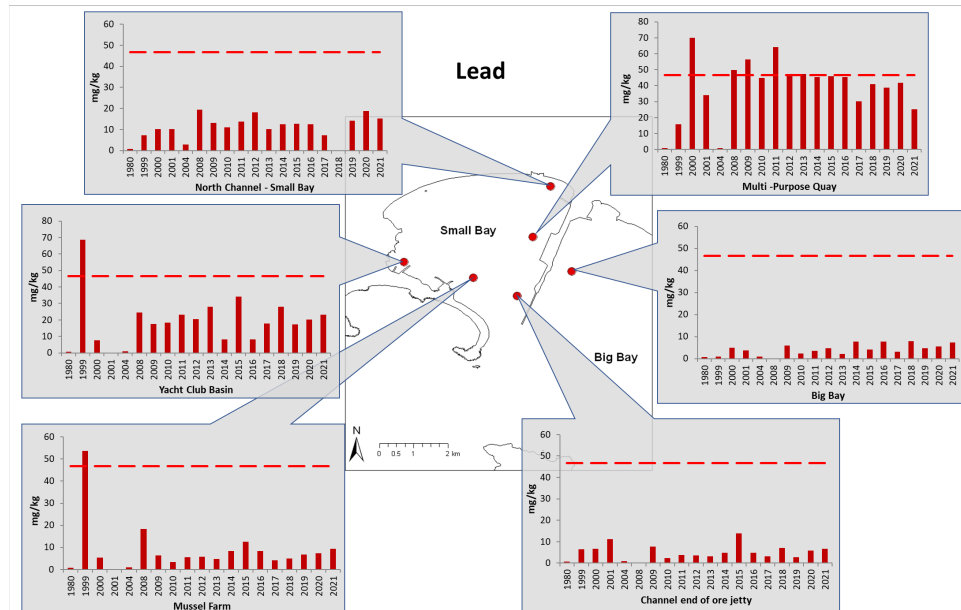
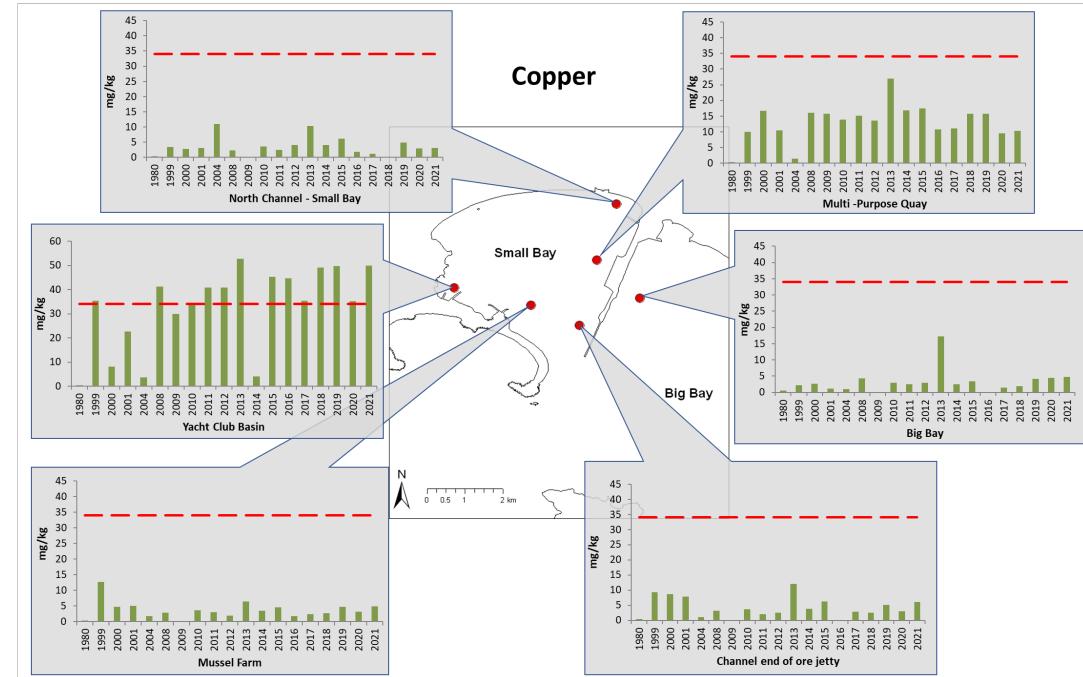
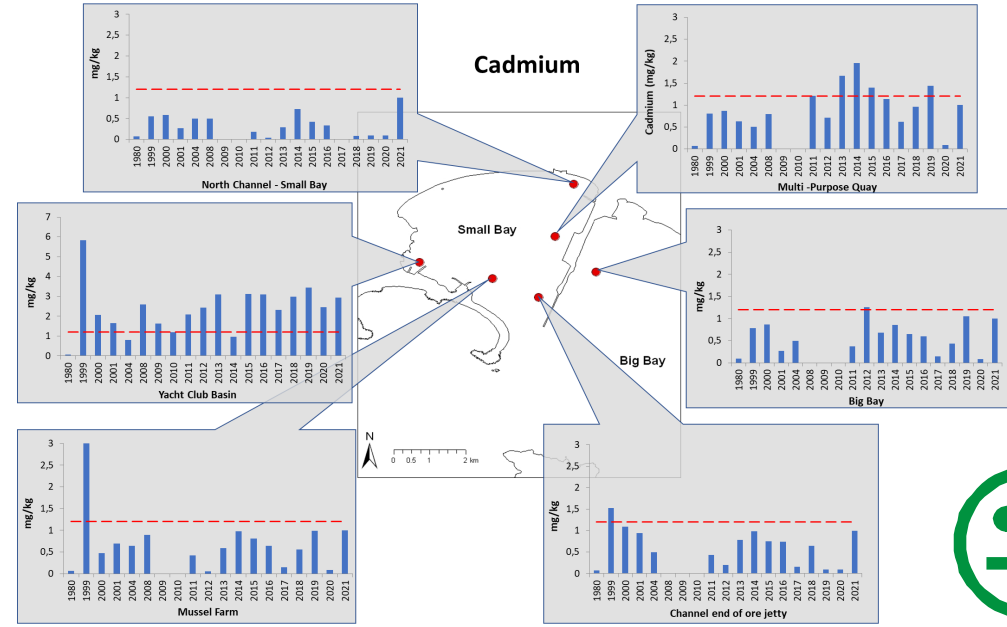
3.1 Sediment quality - particle size



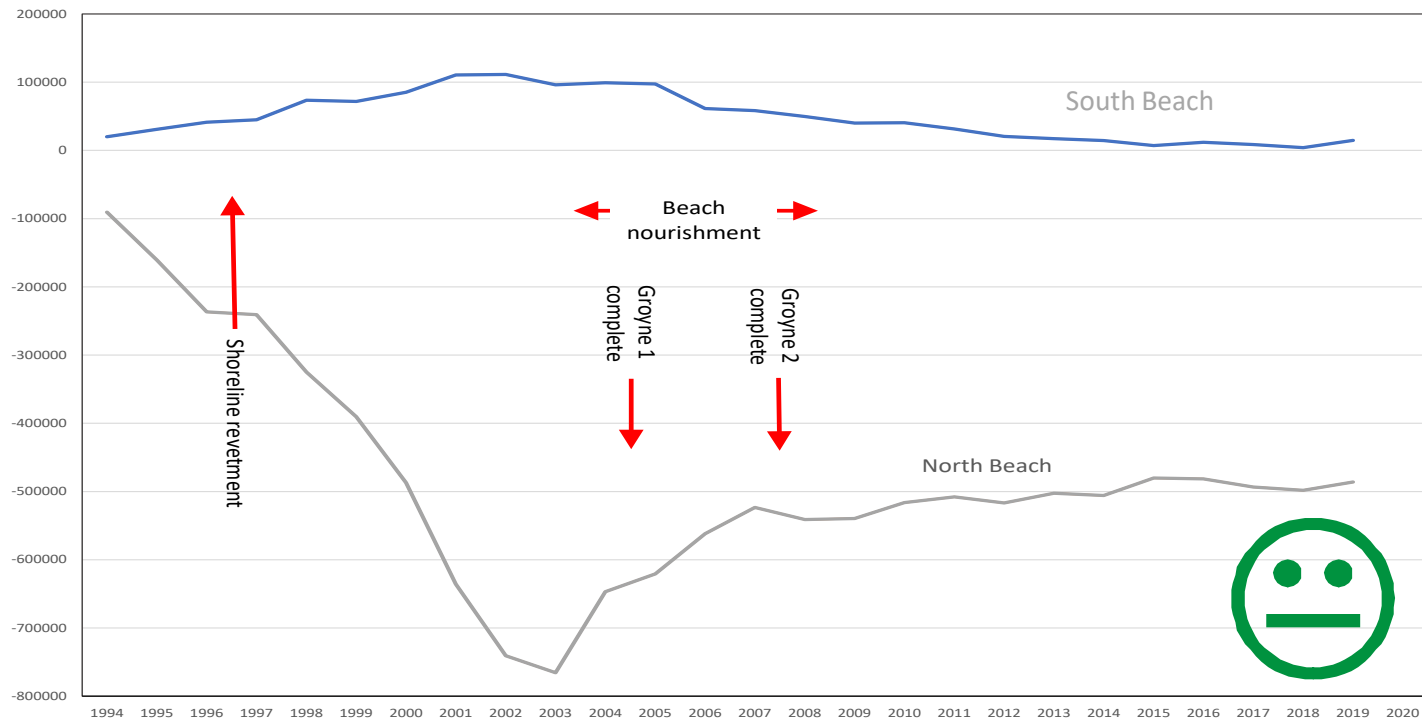
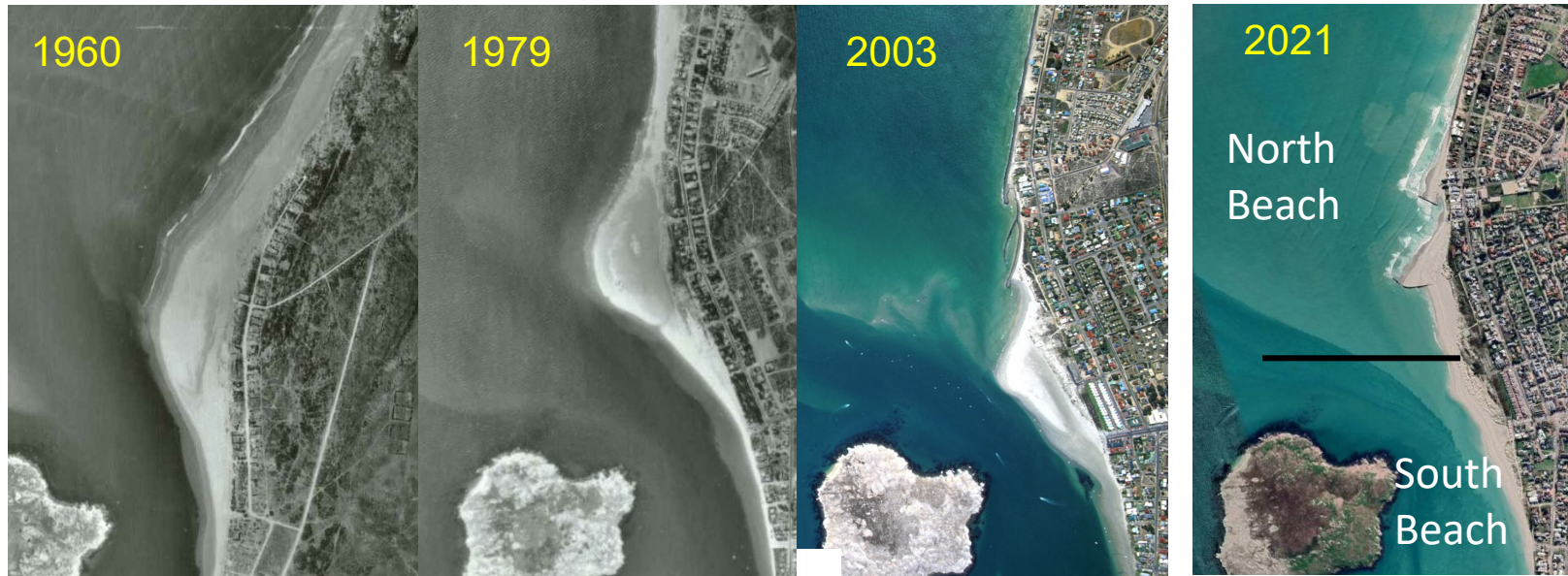
3.2 Sediment Organic Carbon & Nitrogen



3.3 Trace metals

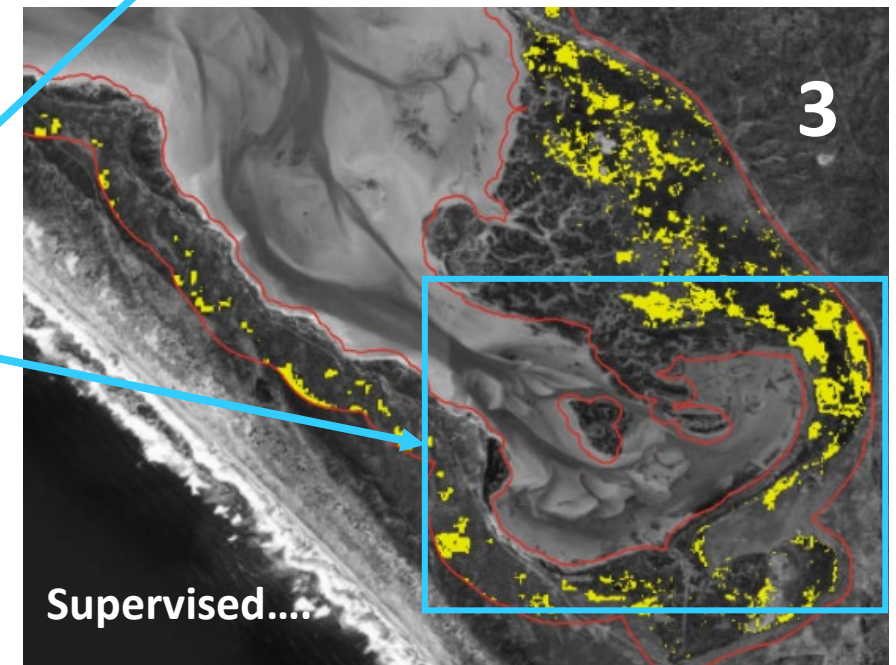
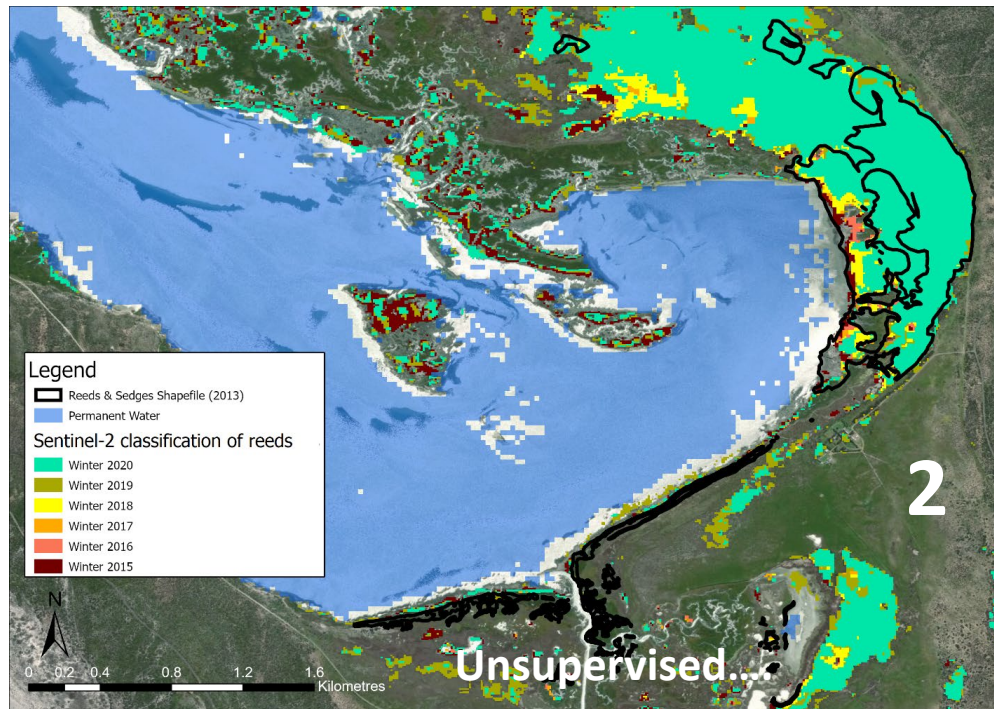
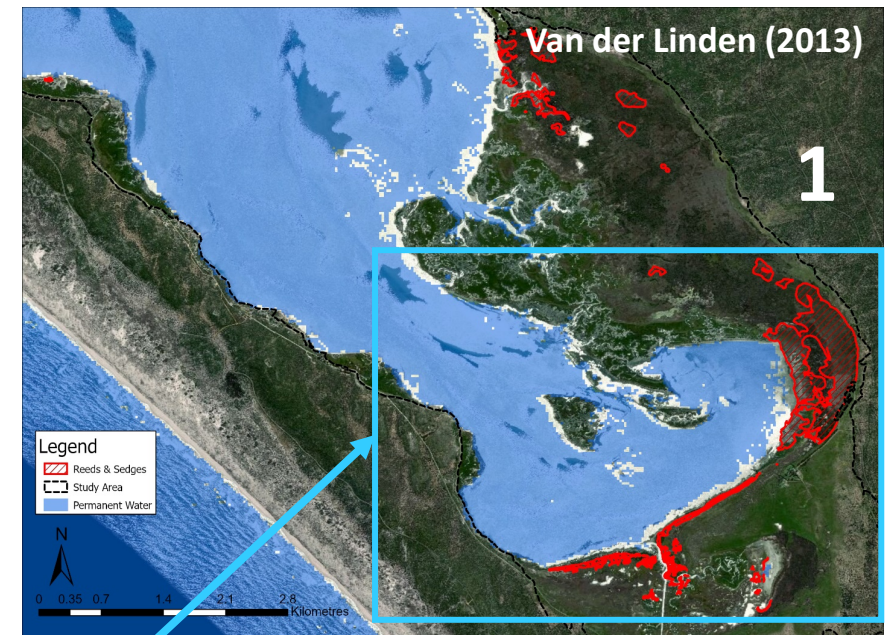


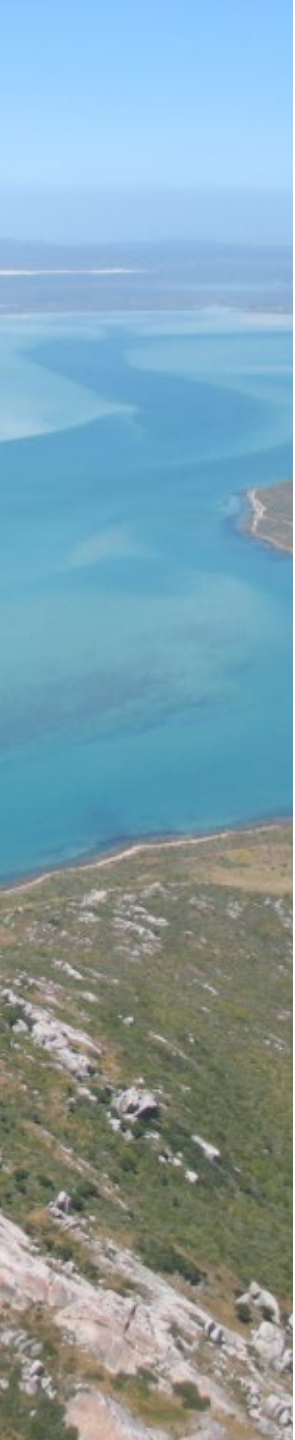
3.4 Shoreline erosion



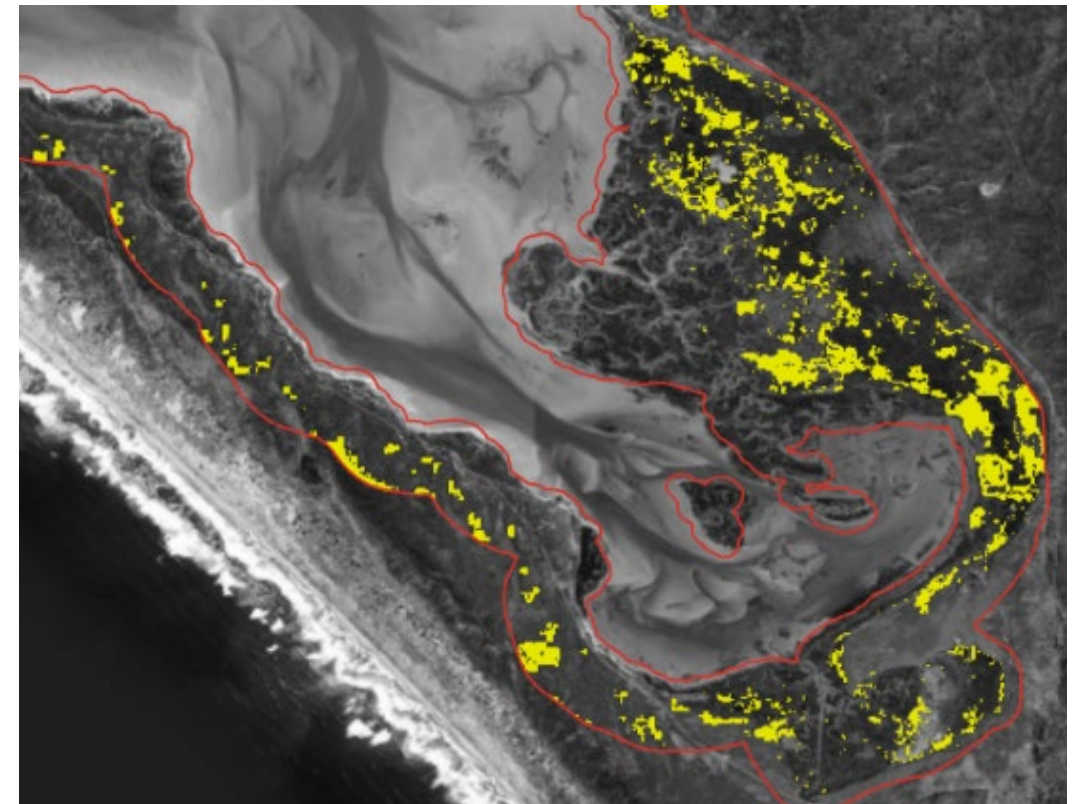
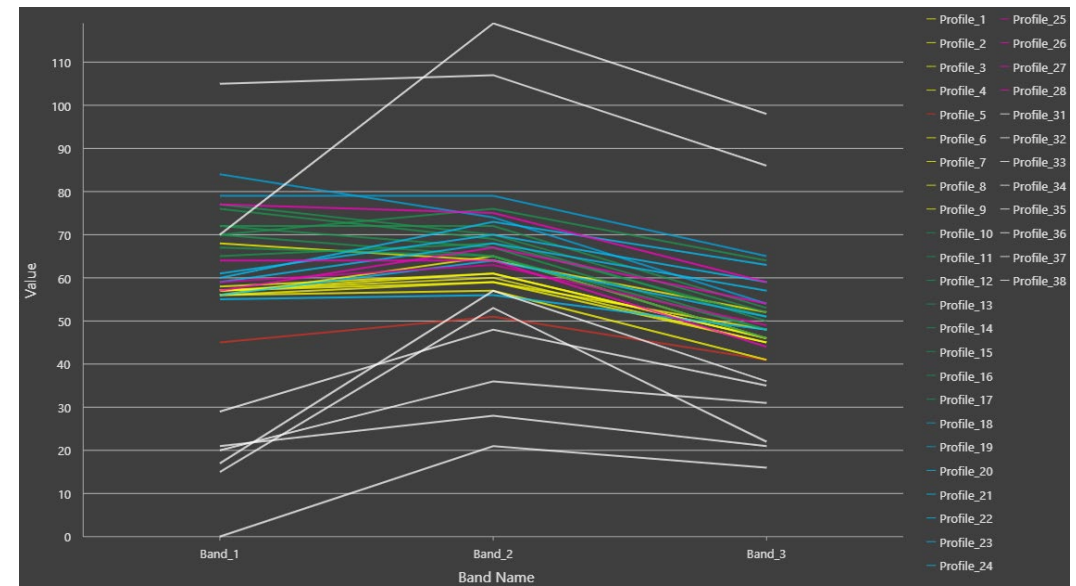
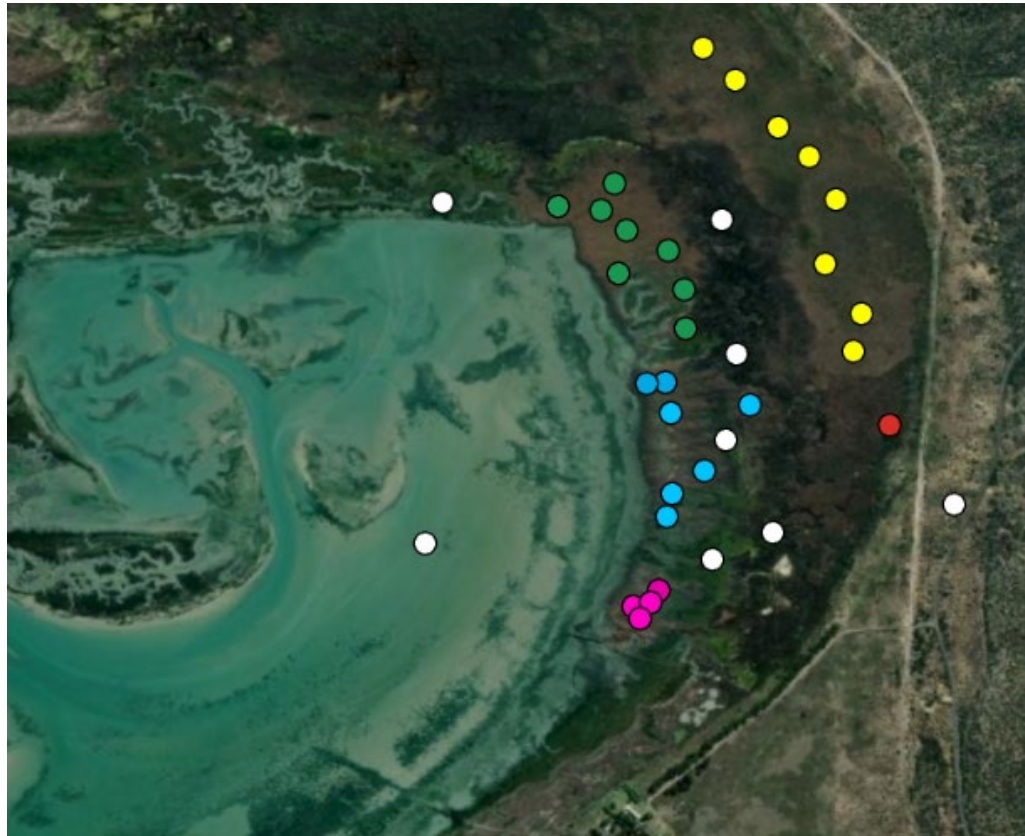
3.1 Aquatic macrophytes

- Various attempts have been made to map aquatic macrophytes (vegetation) around Langebaan and Saldanha, originally with aerial photos but more recently with satellite imagery...

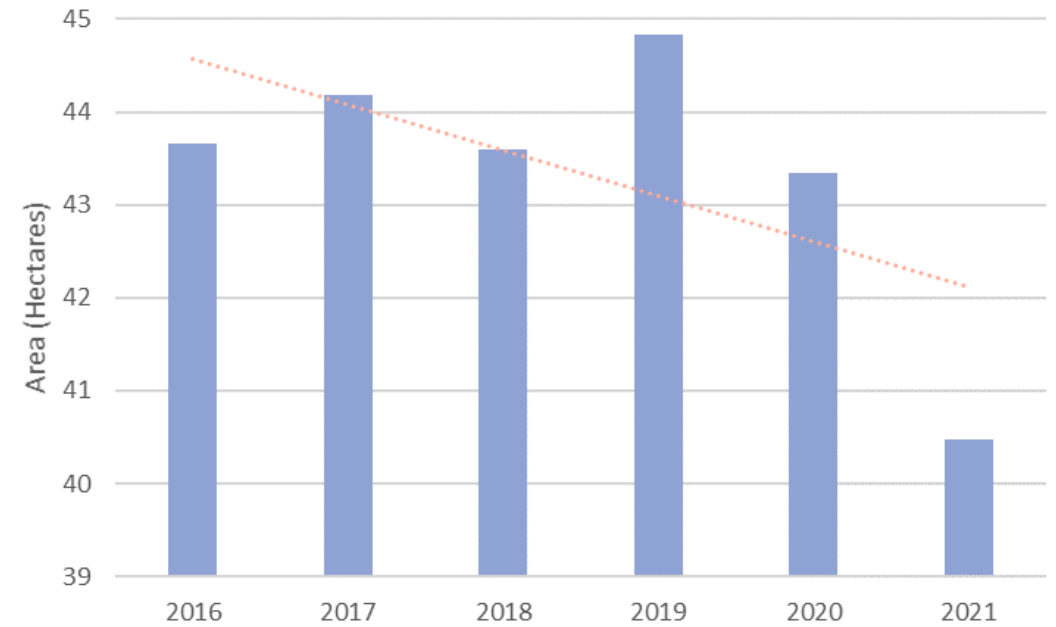
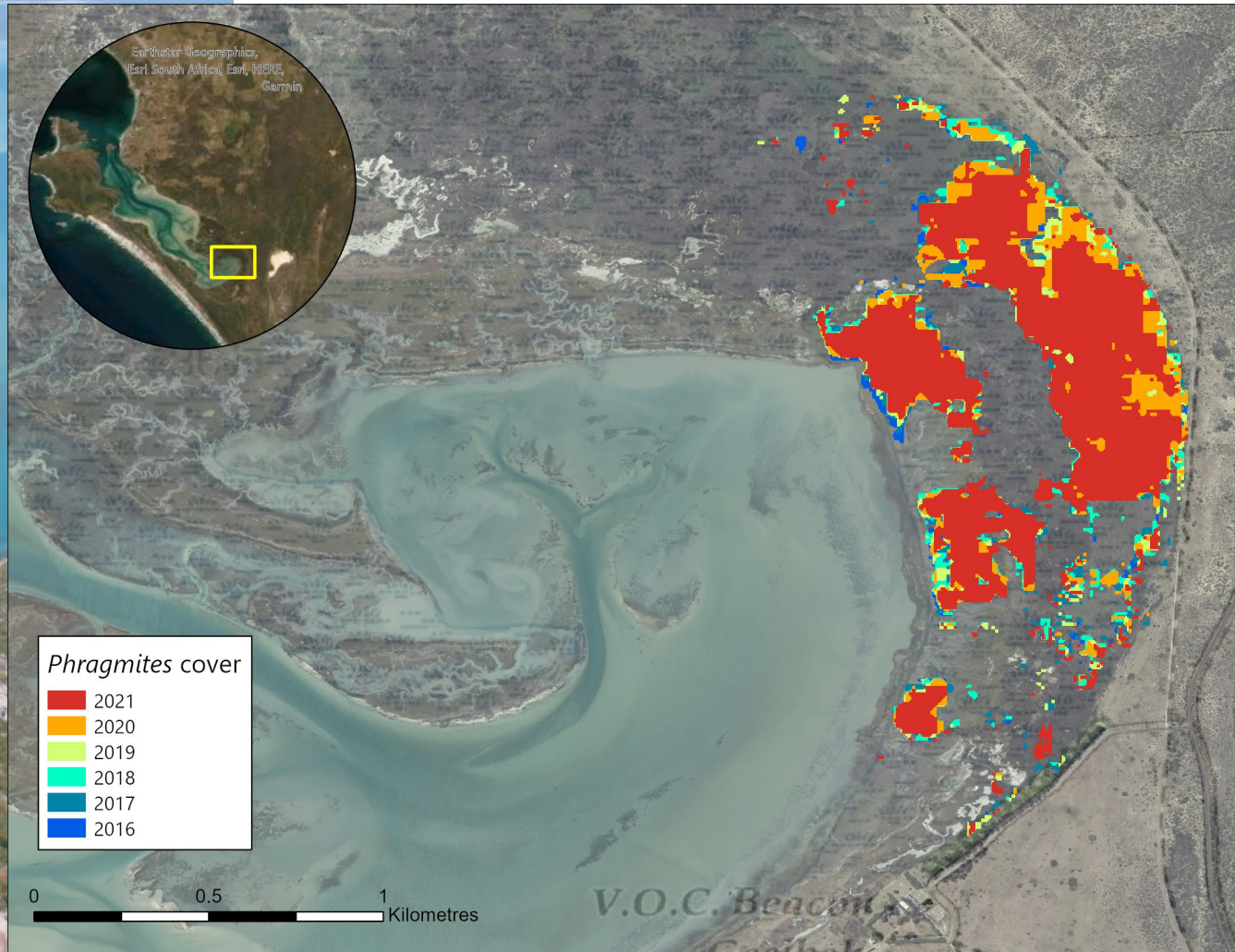


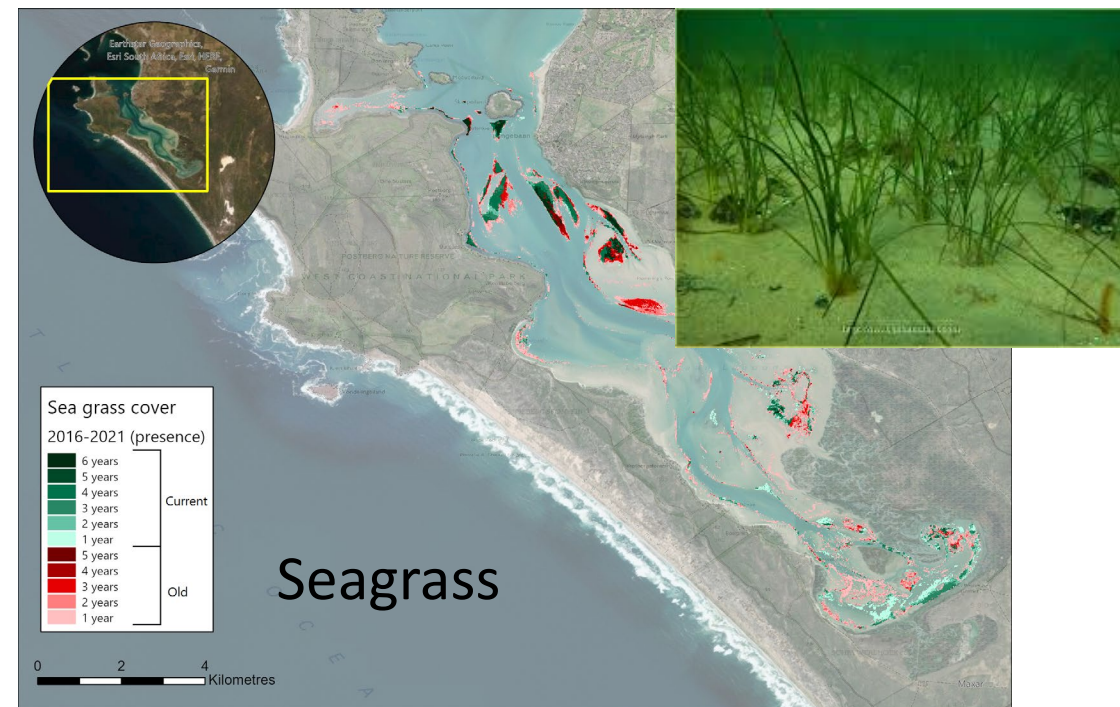
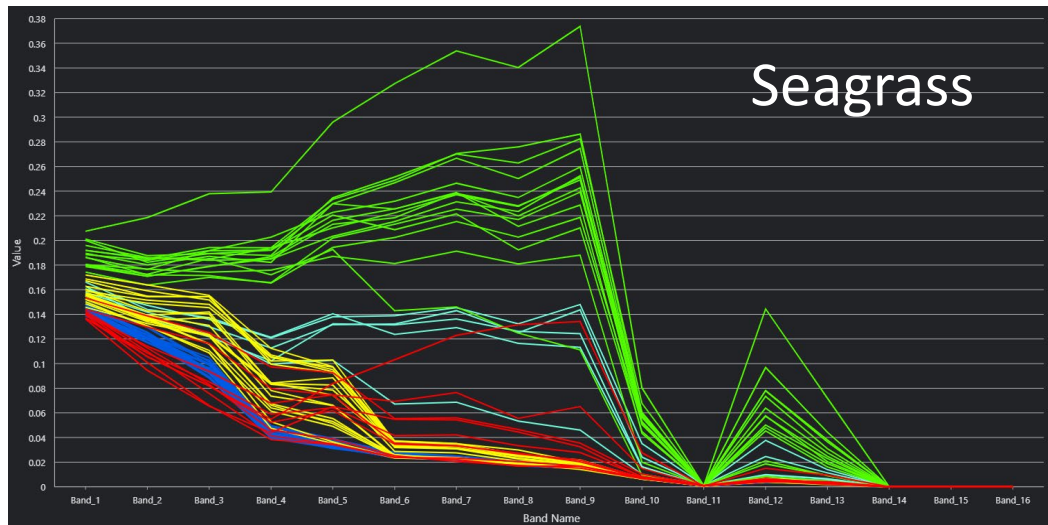
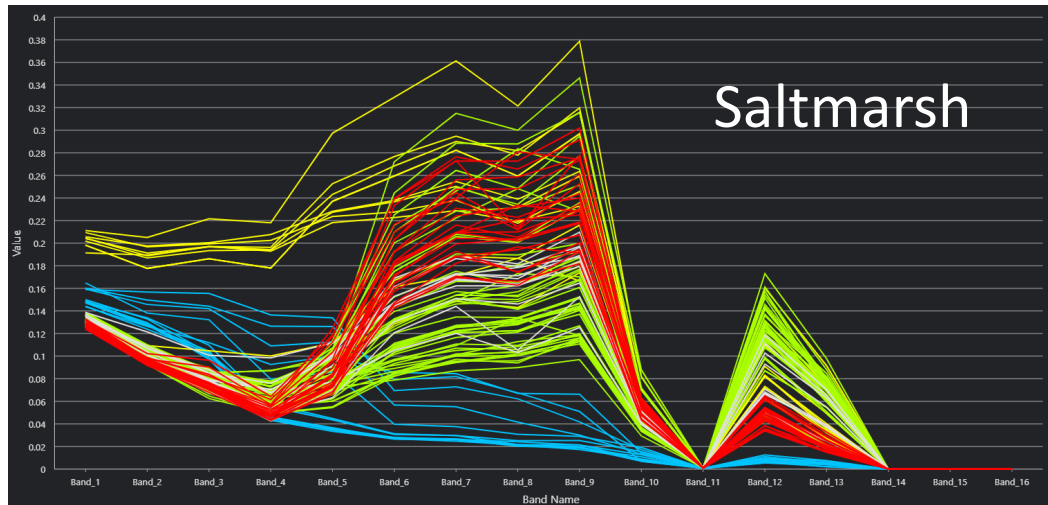
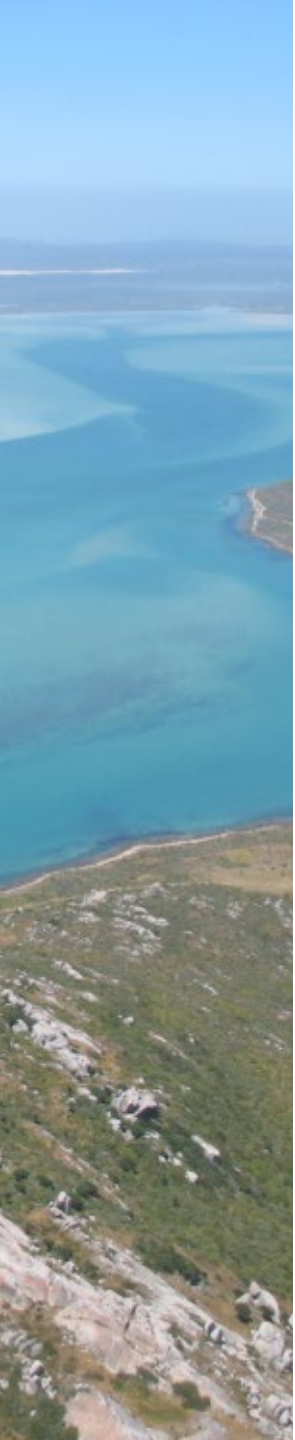


Phragmites australis (common reed)

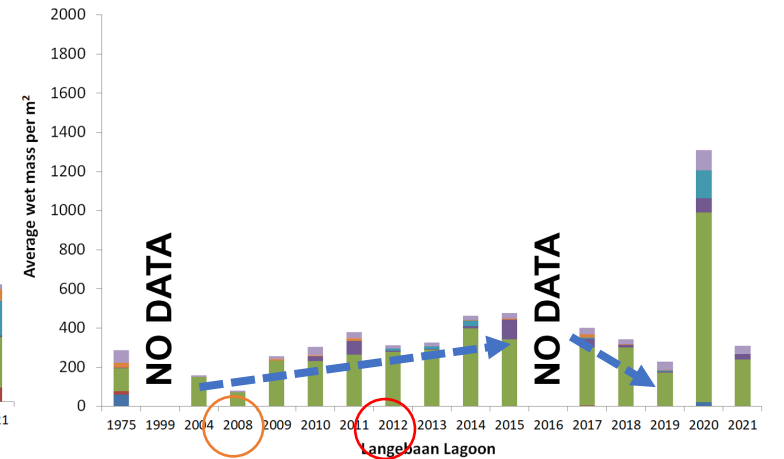
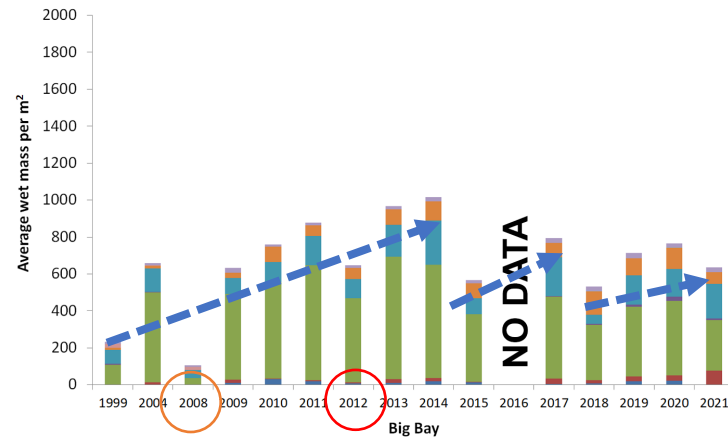
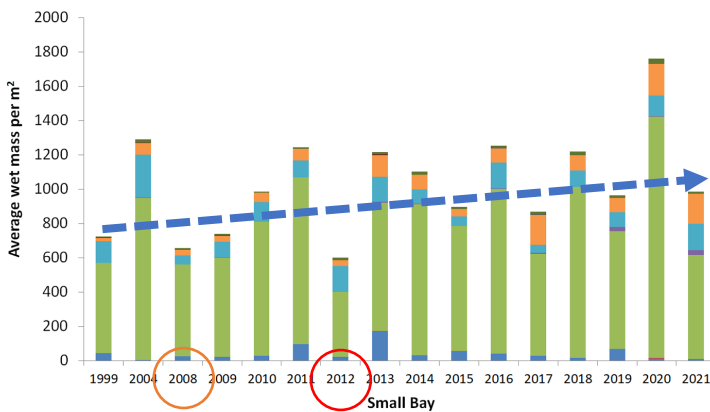
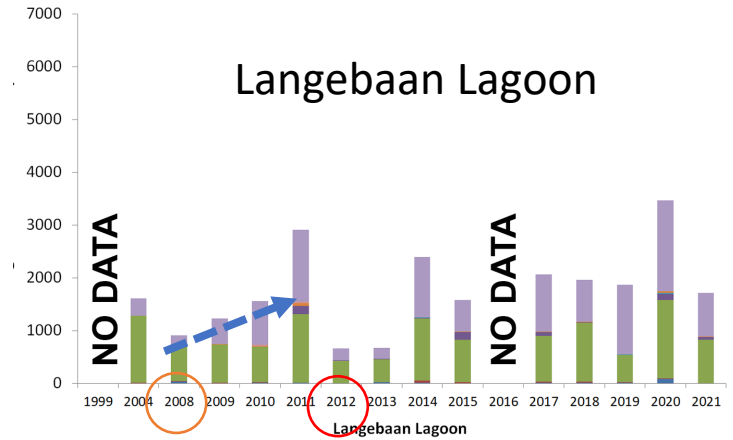
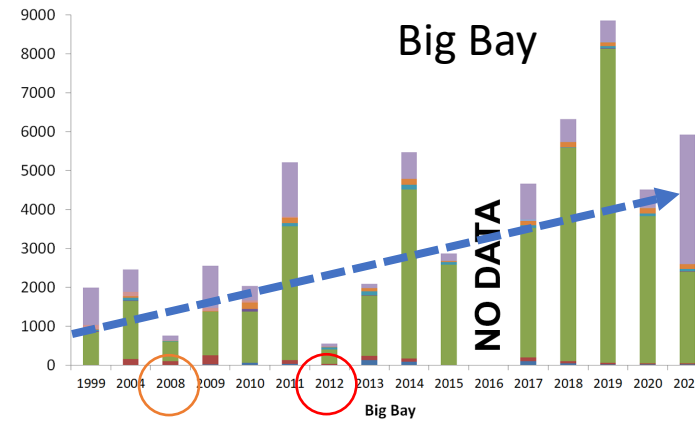
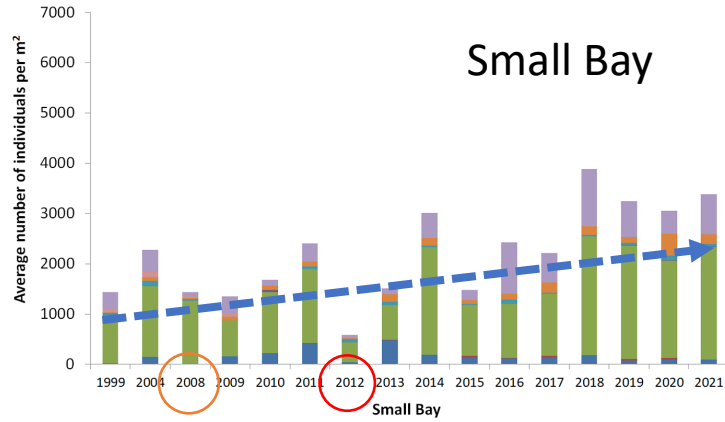


Phragmites australis – change over time





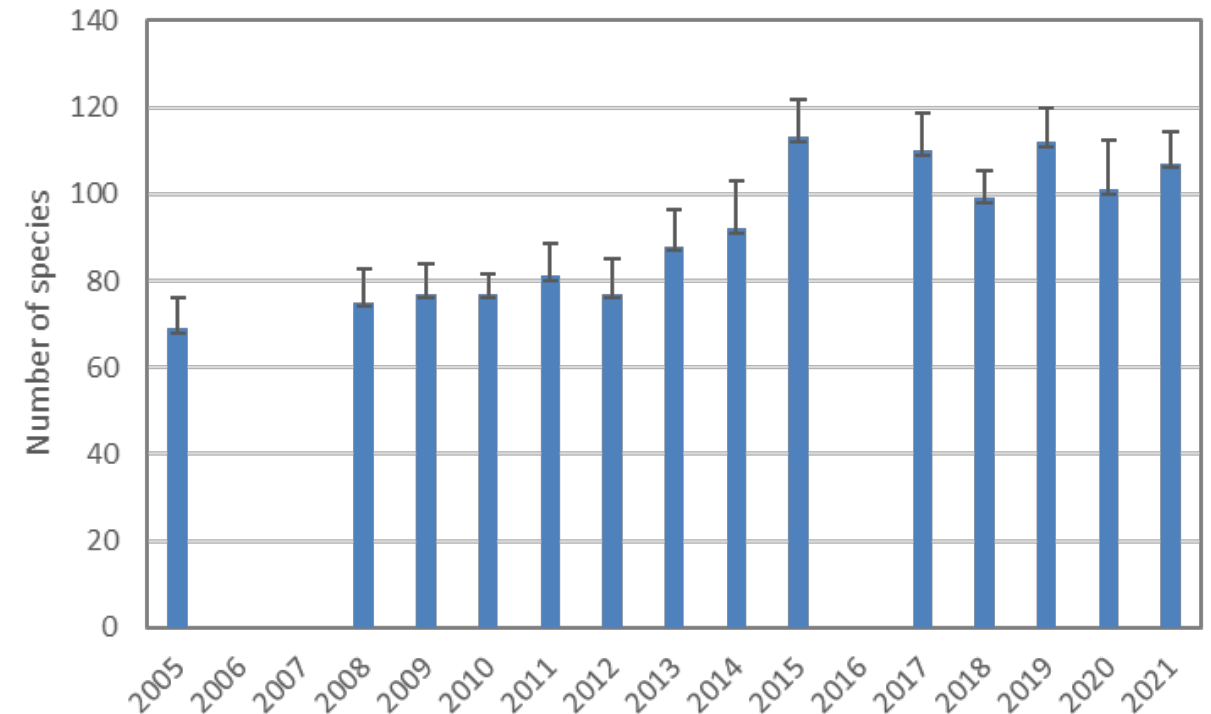
3.2 Soft bottom benthic macrofauna



- POLYCHAETA
- OTHER
- NEMERTEA
- GASTROPODA
- ECHIUROIDEA
- ECHINODERMATA
- CRUSTACEA
- CNIDARIA
- BIVALVIA

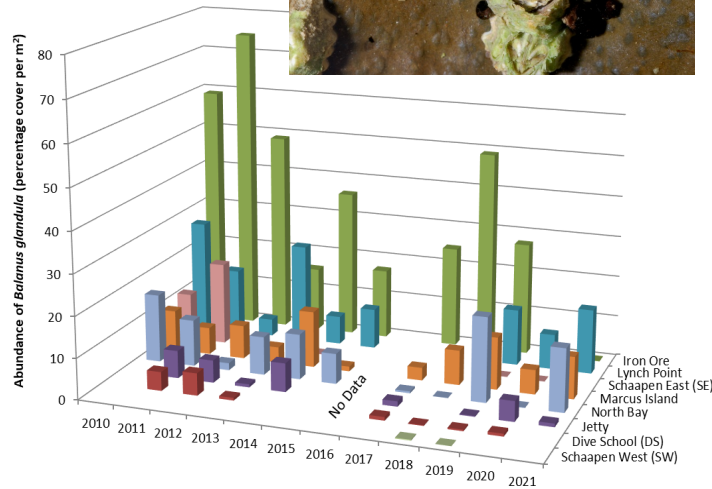
3.3 Rocky intertidal communities

- Numbers of species recorded appears to have been increasing over time
- May not be entirely real – our identification skills have been improving, some new alien species
- All sites are still overwhelmingly dominated by alien species (mussel, barnacles) but their abundance is declining

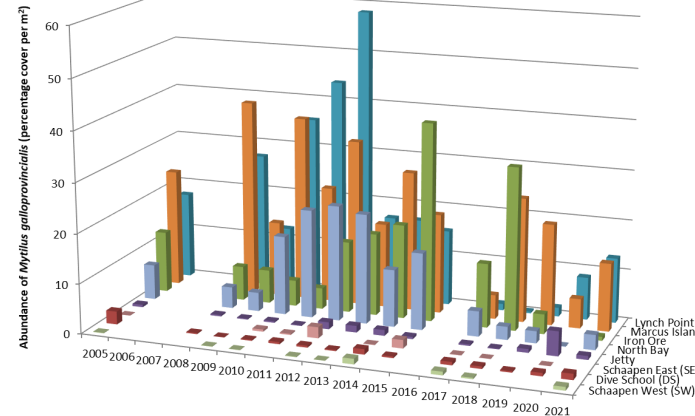


3.4 Alien and invasive species

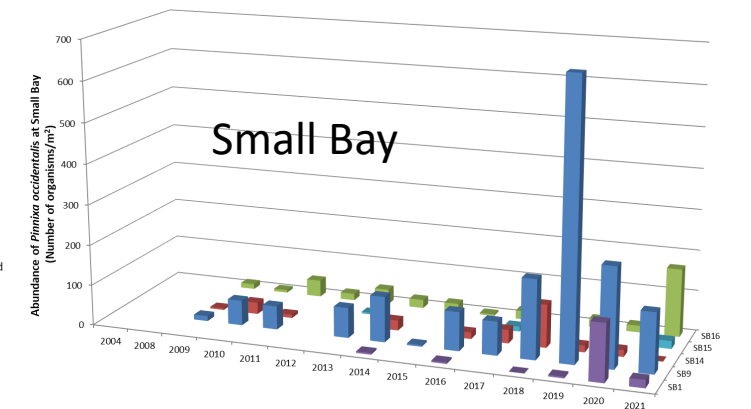
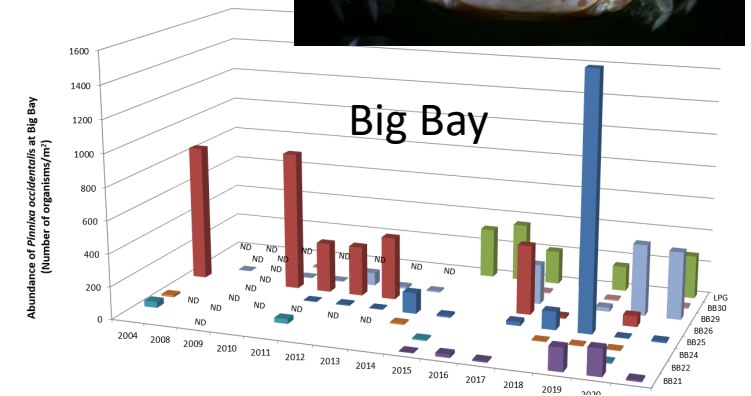
- 95 alien marine species in South African, of which 56 are considered invasive
- 67 of these species (71%) are present along the west coast, 29 of which are now confirmed to be present in Saldanha Bay and/or Langebaan Lagoon (31%)
- All but three of the species (90%) in Saldanha Bay are considered invasive



Acorn barnacle *Balanus glandula*

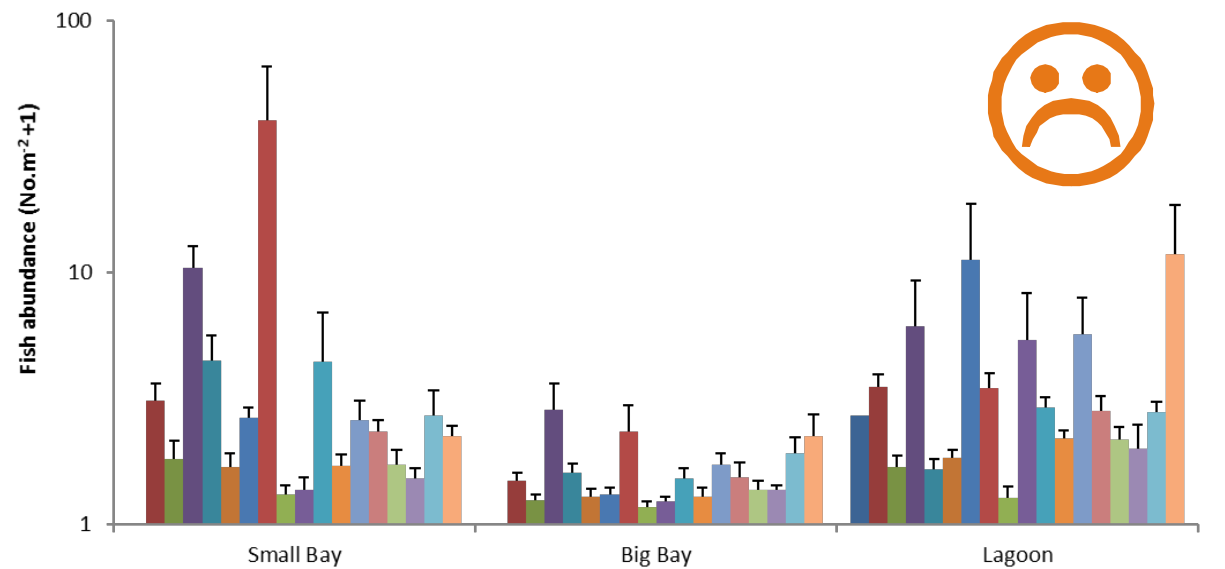
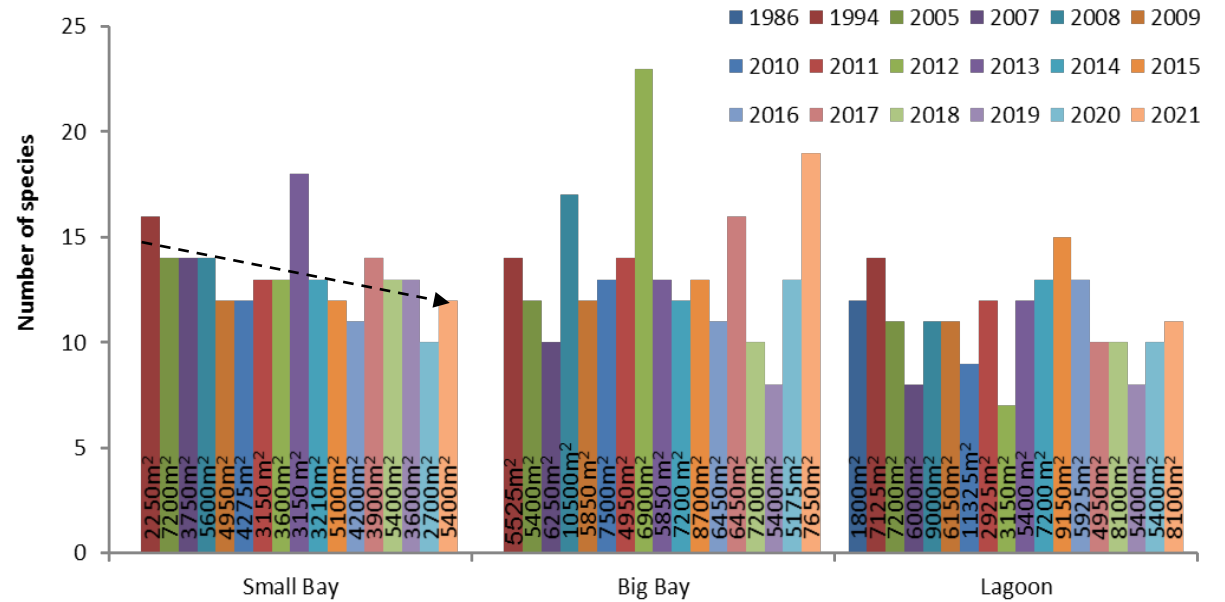


Mediterranean mussel *Mytilus galloprovincialis*

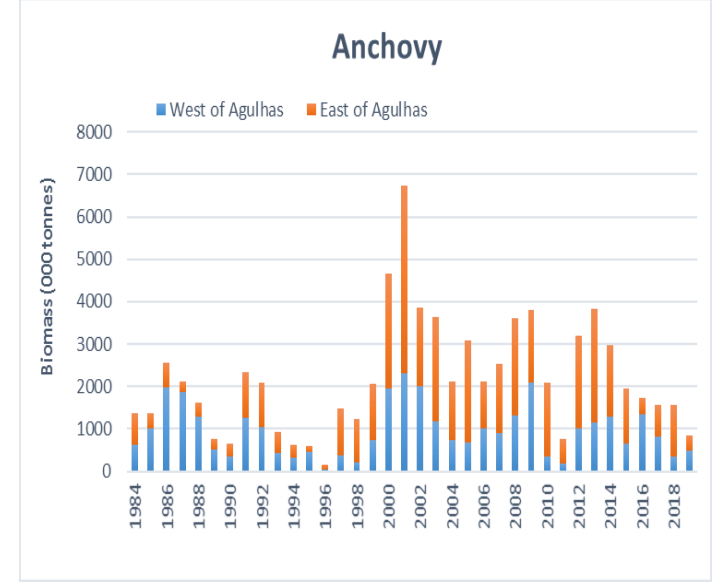
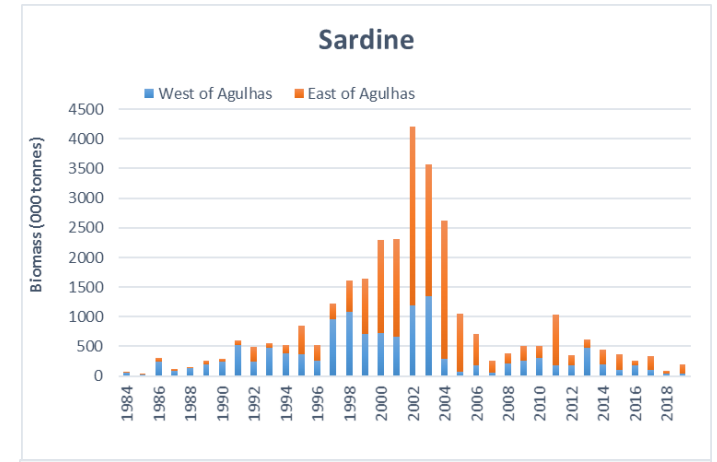
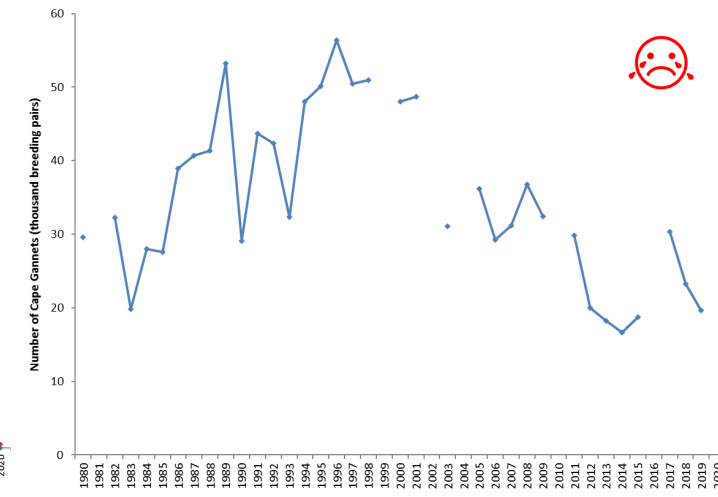
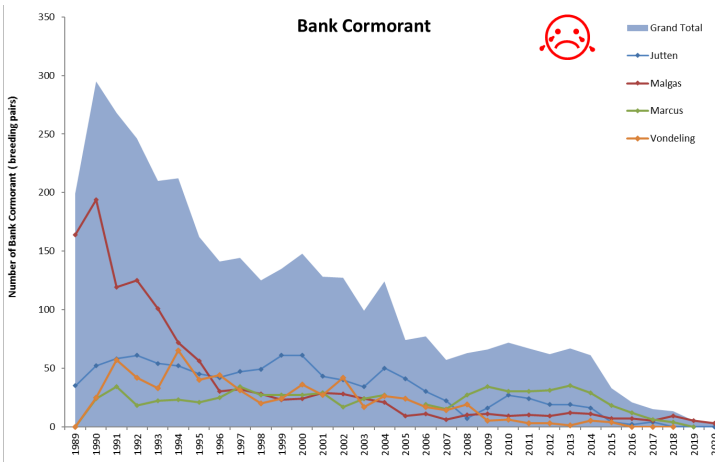
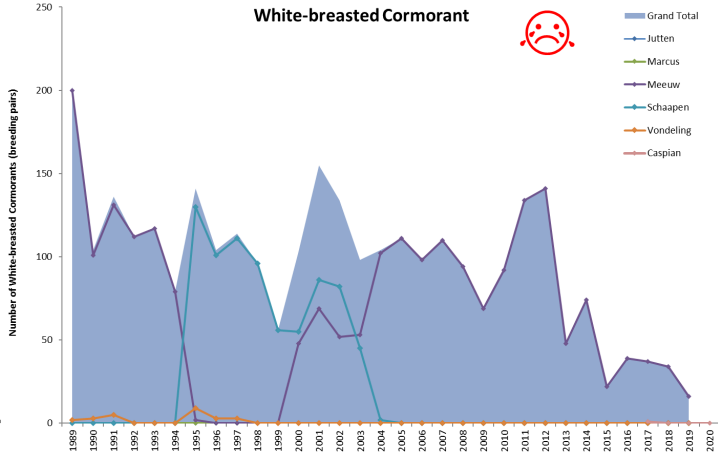
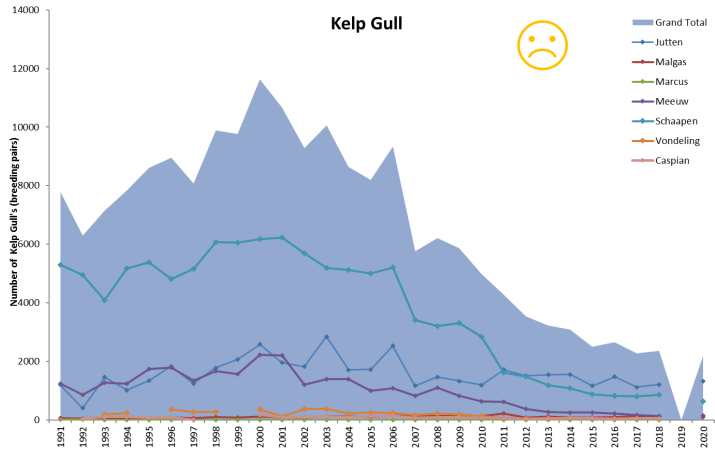


3.5 Fish

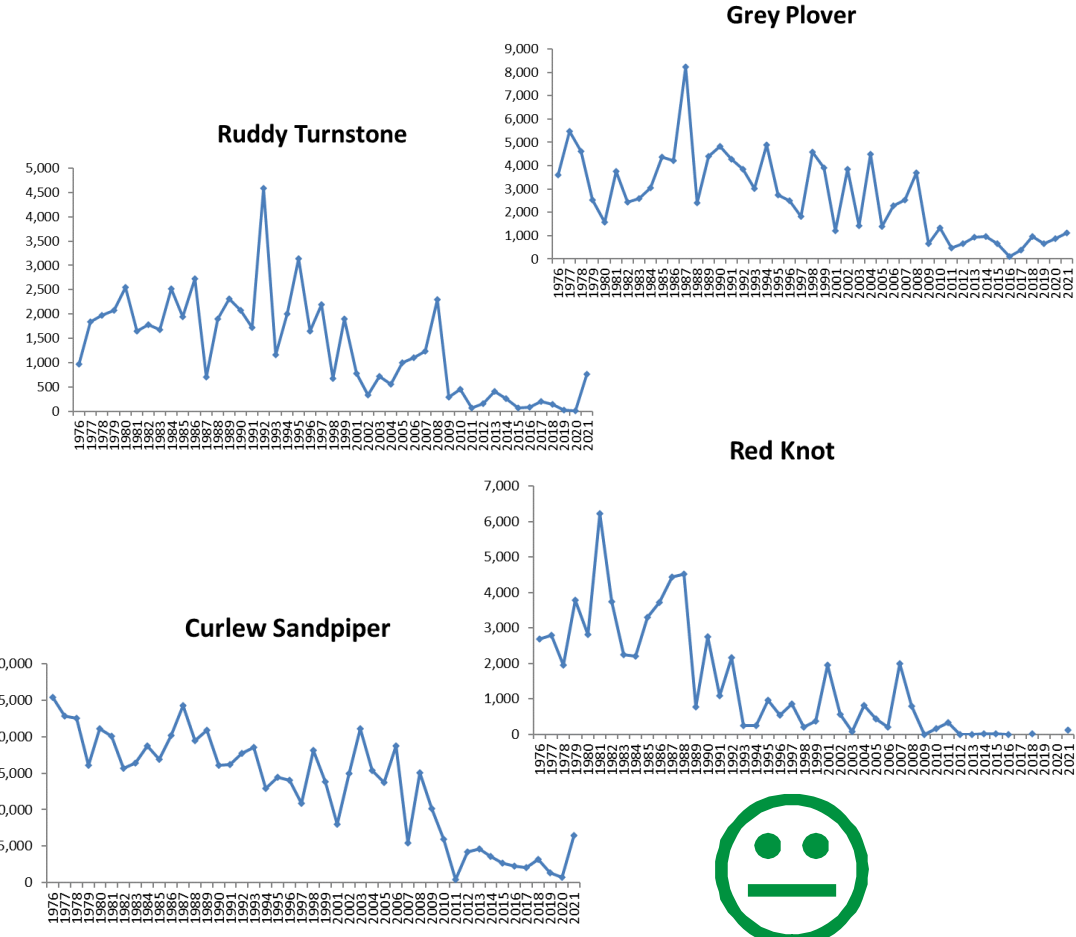
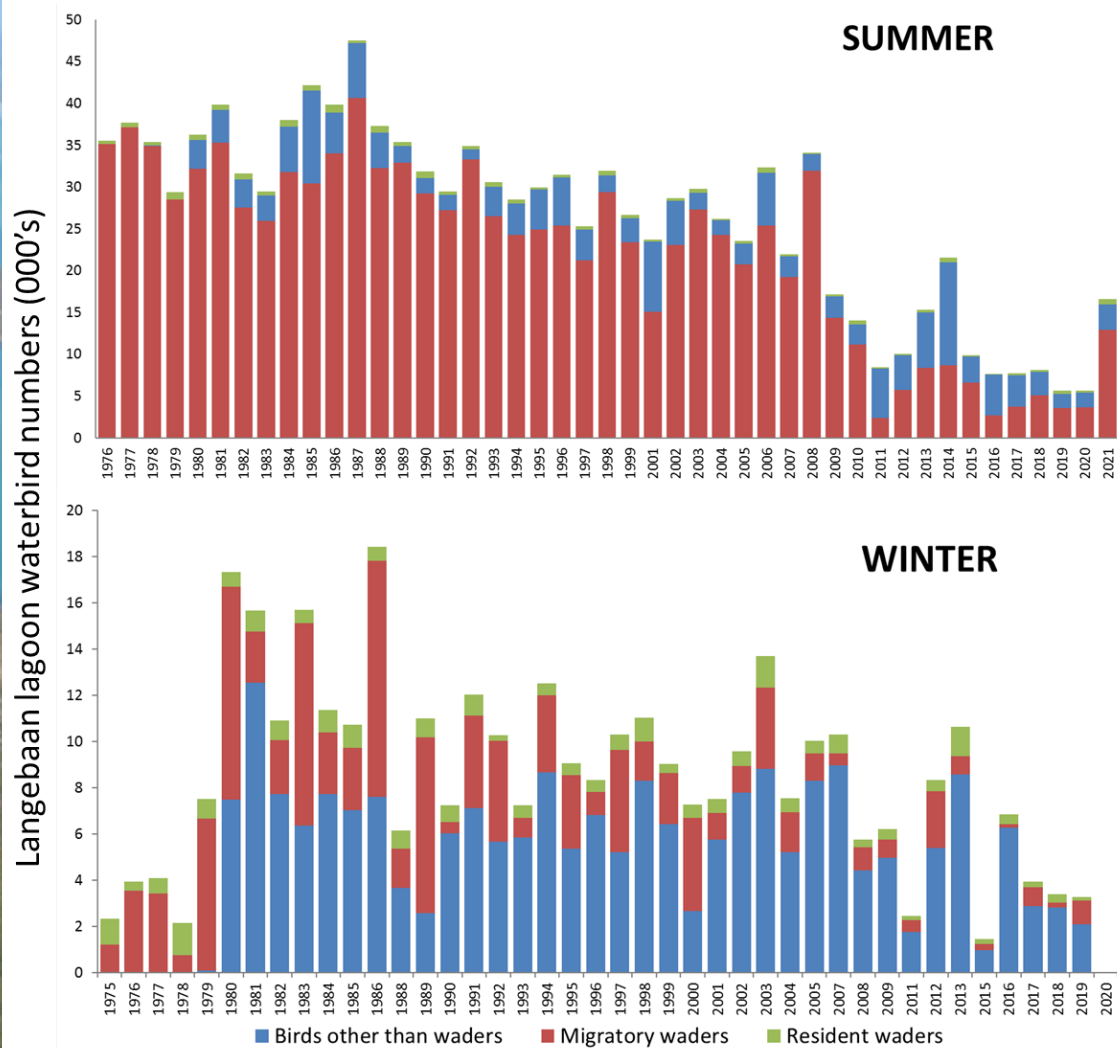
- Two new species were recorded in 2021 – Snoek *Thrysites atun*, Panga *Pterogymnus lanarius*
- Number of species in Small Bay appears to have declined over time but no clear trends in Big Bay or Langebaan Lagoon
- Overall abundance is very variable, but no clear change
- Stocks of some species (white stumpnose and elf) seem to have collapsed, presumably due to overfishing



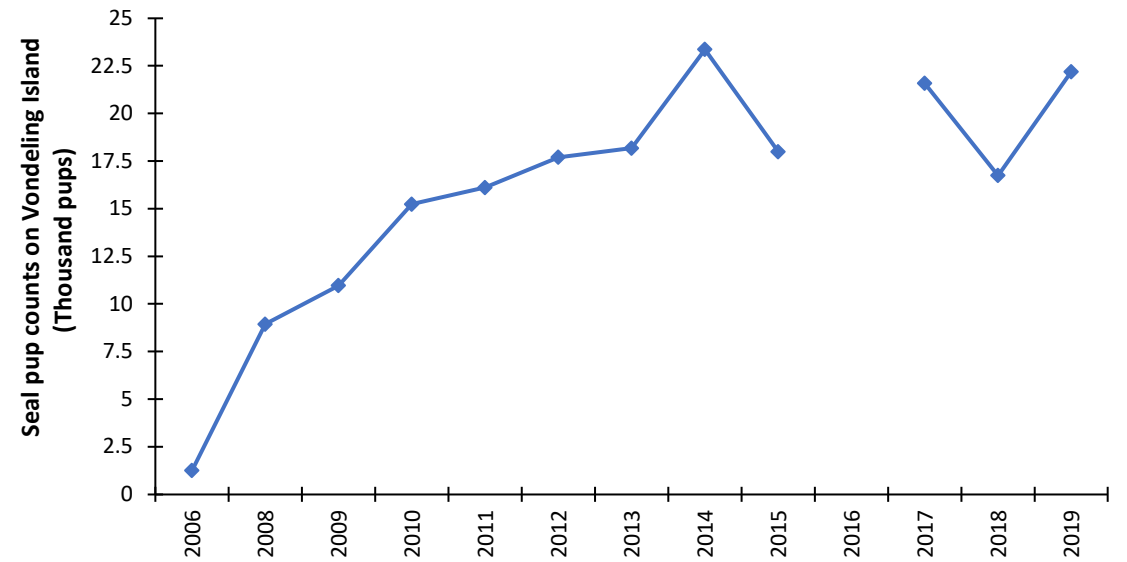
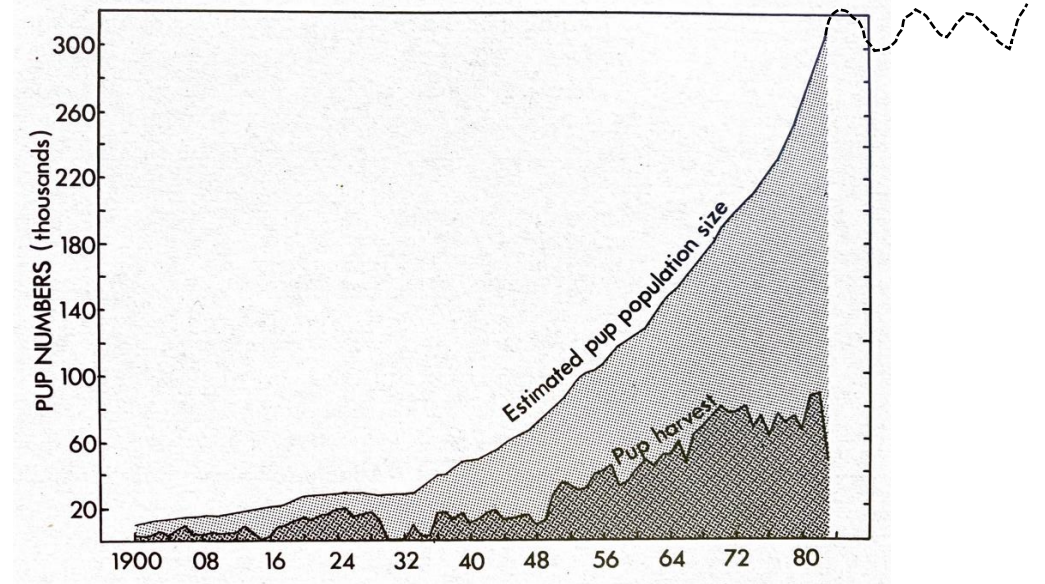
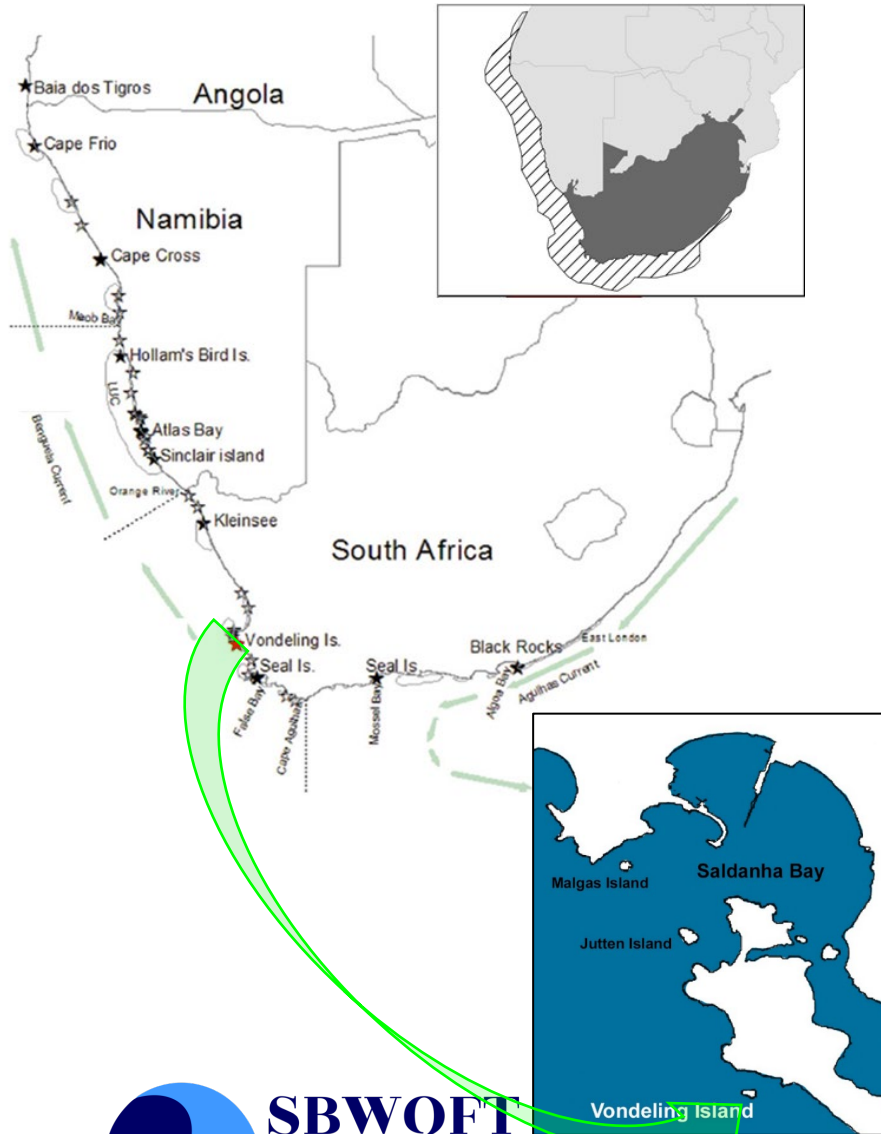
3.6 Birds – Islands breeding



3.7 Birds: Langebaan Lagoon



3.8 Cape Fur seals



Summary

- Development, shipping traffic, waste water discharge, visitor numbers have slowed (or dropped) in the last few years, but ore exports, mariculture and volumes of domestic waste water (sewage) discharged into the Bay continue to increase ...
- Water and sediment quality are improving or at least stable, but oxygen levels in Small Bay are concerning...
- Biota:
 - benthic macrofauna abundance and biomass both increasing,
 - Fish populations are variable but seem to be stable in Big Bay and Langebaan Lagoon...
 - Seabird populations on the islands in Saldanha Bay continue to decline but those in Langebaan Lagoon have increased in abundance for the first time in seven years...
- Marine aliens are increasing...rapidly

Overall: We are doing well but don't
take your eyes off the road...



An underwater photograph showing a dense colony of mussels on a rock. The mussels have dark, textured shells and are surrounded by various marine organisms, including small white and yellowish creatures. The background is a dark, blue-green underwater environment with some light filtering through.

Thank You

Photo: Steve Benjamin