State of the Bay 2022

Saldanha Bay and Langebaan Lagoon

Barry Clark

Ken Hutchings, Emily Gammon, Jess Dawson, Adam Rees, Robyn Payne, Aiden Biccard, Cheruscha Swart, Rushdi Ariefdien, Kevin Schmidt, Kirti Gihwala, Safiyya Sedick, Julian Conrad, Michael Holloway, Songeso Matsokoba

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)

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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.

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BIVALVE SHELLFISH FARMERS' ASSOCIATION OF SOUTH AFRICA

PPC

CLUB MYKONOS
LANGEBAAN

SFF

TRONOX

AngloAmerican

ImproChem
Water, Energy & Air Solutions

TRANSNET
national ports authority

Sea Harvest

LANGEBAAN
COUNTRY ESTATE

METSEP
SALDANHA

Duferco
Duferco Steel Processing

vedanta
transforming elements

zinc international

Oiltankingmogs

Premier Fishing
The First Choice

ArcelorMittal

TRANSNET
port terminals

KROPZ
ELANDSFONTEIN

SALDANHA BAAI BAY
MUNISIPALITEIT - MUNICIPALITY - UMASIPALA

sunrise energy
Subsidiary of MOGS oil & gas

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Thanks ….

CSIR
our future through science

ADU

South African Weather Service

South African National Parks

Percy FitzPatrick Institute

BSASA
BIVALVE SHELLFISH FARMERS' ASSOCIATION OF SOUTH AFRICA

WESKUS·DM·WEST COAST

TRANSNET
port terminals

Sea Harvest

SALDANHA BAAI BAY

forestry, fisheries & the environment
Department:
Forestry, Fisheries and the Environment
REPUBLIC OF SOUTH AFRICA

water & sanitation
Department:
Water and Sanitation
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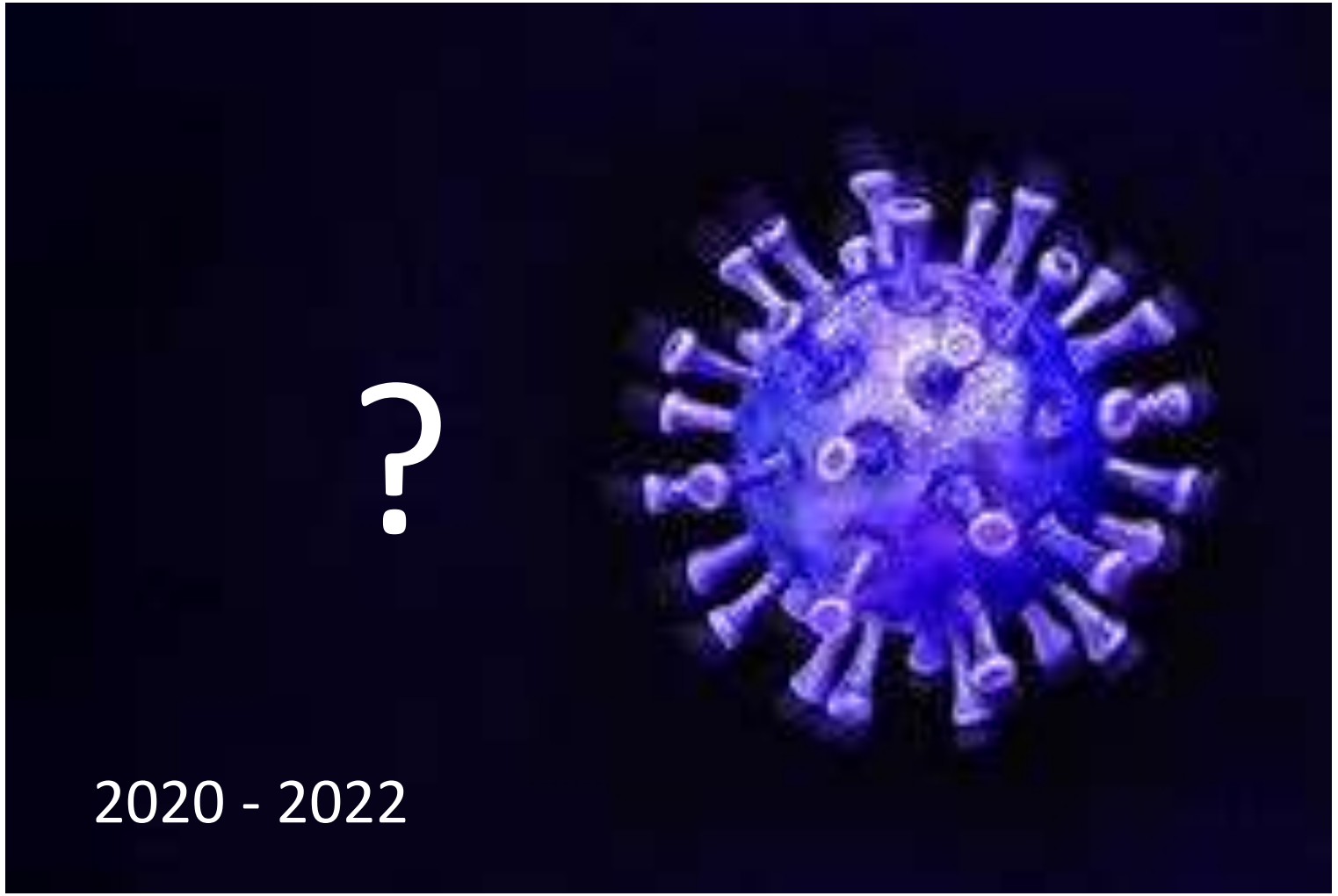
Theme…..

What impact did the global Covid-19 pandemic have on the State of the Bay?



1. Activities & Discharges

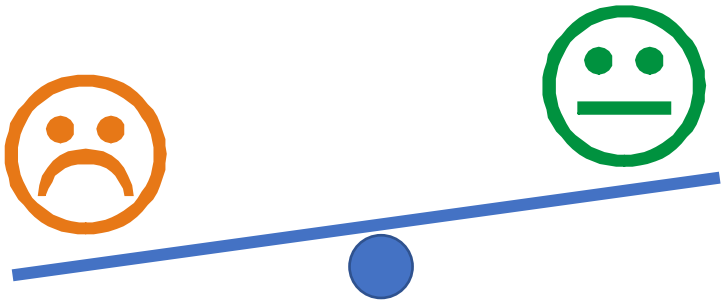
- Development pressure in the Bay stalled for a while (Global Financial Crisis, Covid), some industries ceased to operate (Arcelor Mittal), many projects were put on hold (IDZ) but now things seems to be revved up again in the last 12 months…

Up

- Ore exports (zinc, copper)
- Ballast water
- New projects (Powership, FSRU, RO Plant, LPG/LNG imports, ship repair)
- Mariculture production (mussels & oysters)

Down

- Visitor numbers
- Shipping traffic
- Ore exports (iron, manganese, lead)
- Effluent from WWTWs
- Mariculture production (finfish)



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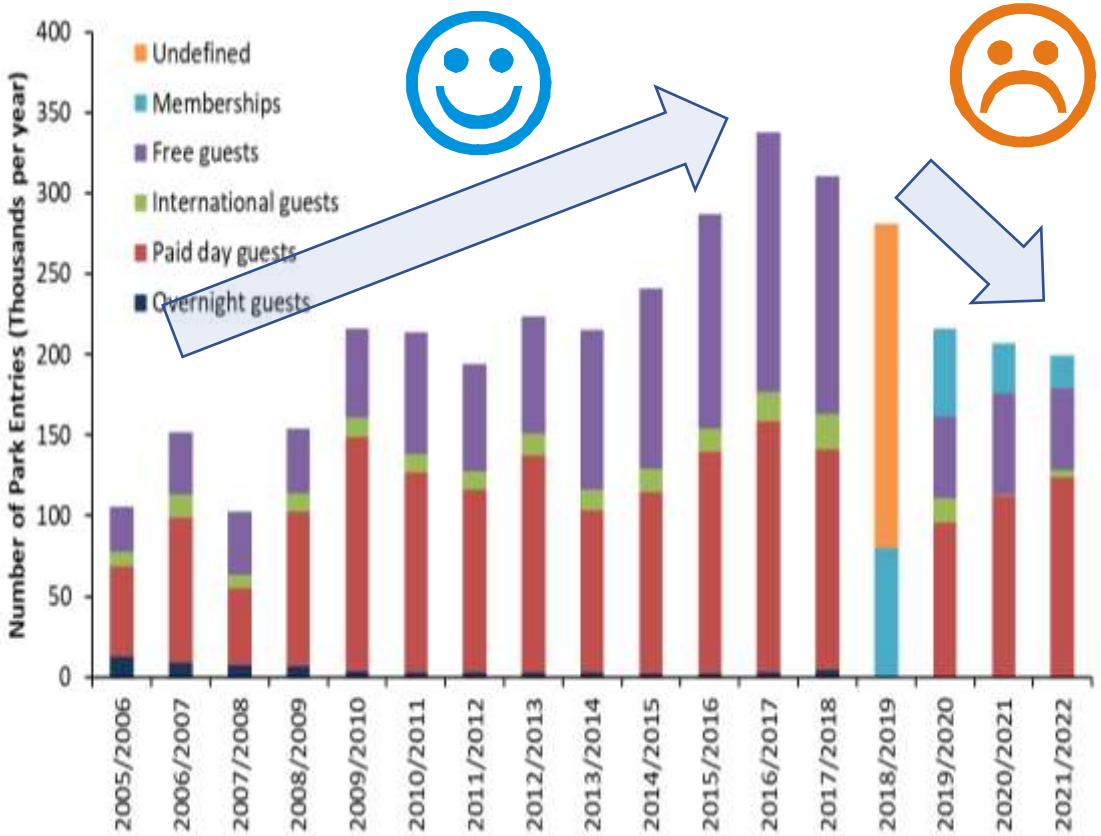
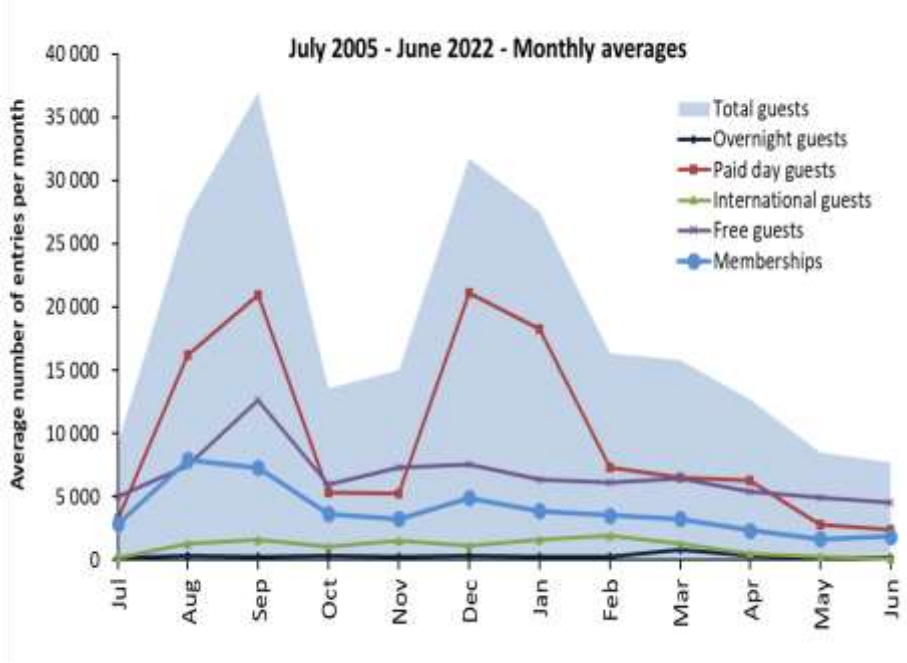
1.1. Tourism - numbers of visitors to the WCNP

Long term trend over time….



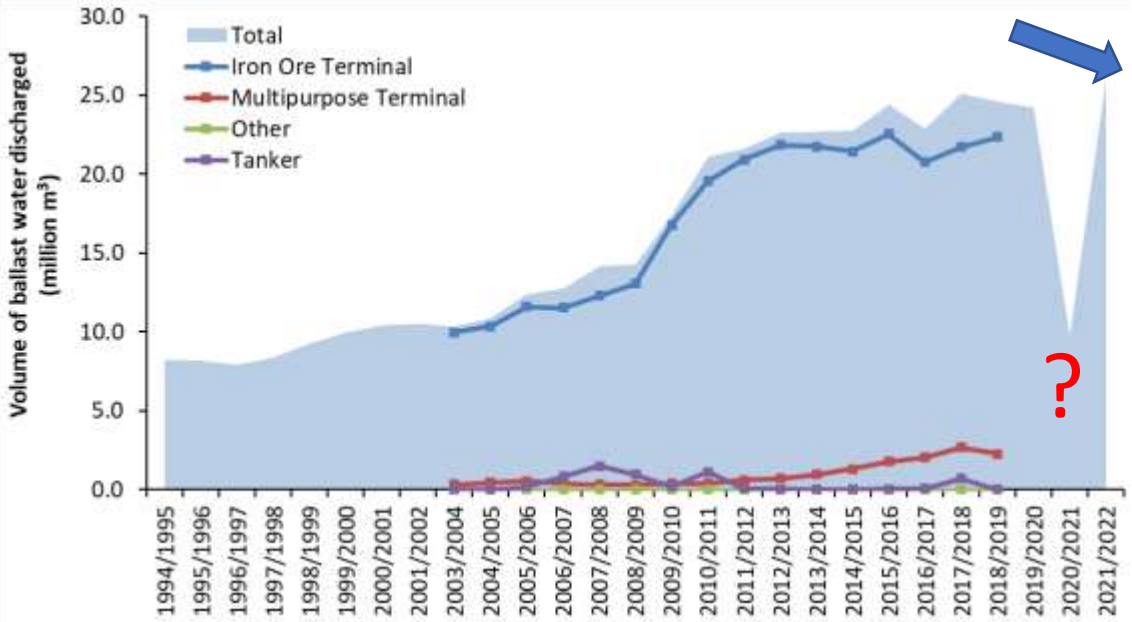


Seasonal variations….

1.2 Shipping traffic and ballast water

Number of vessels ….

Ballast water discharged….



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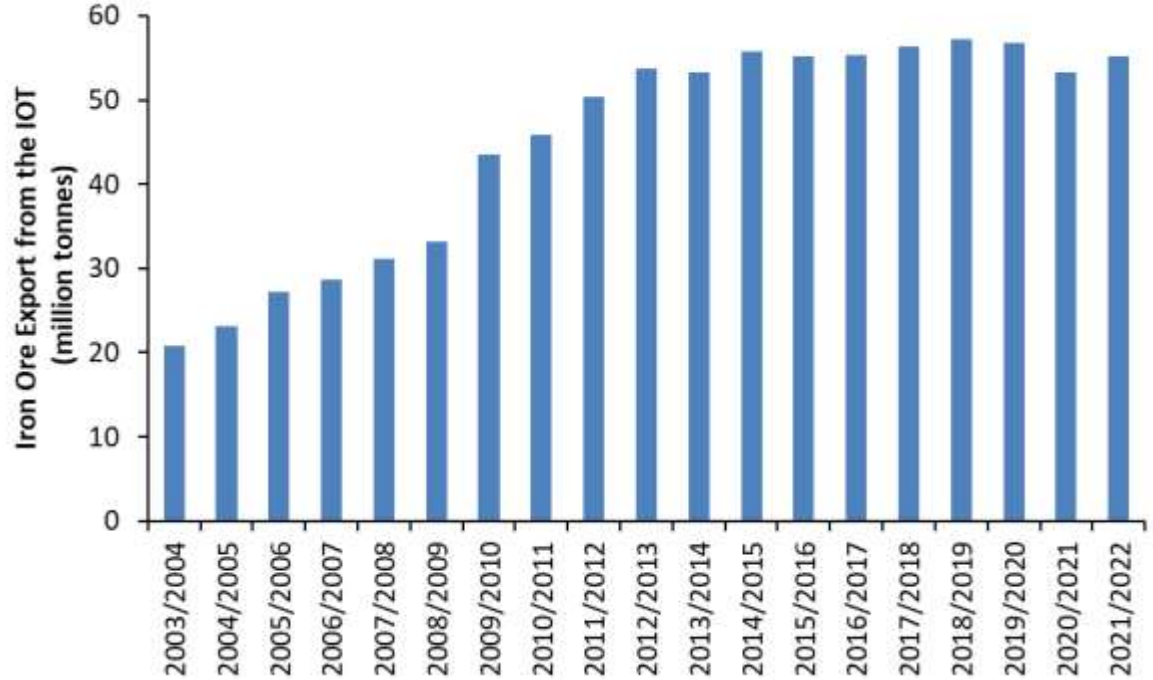
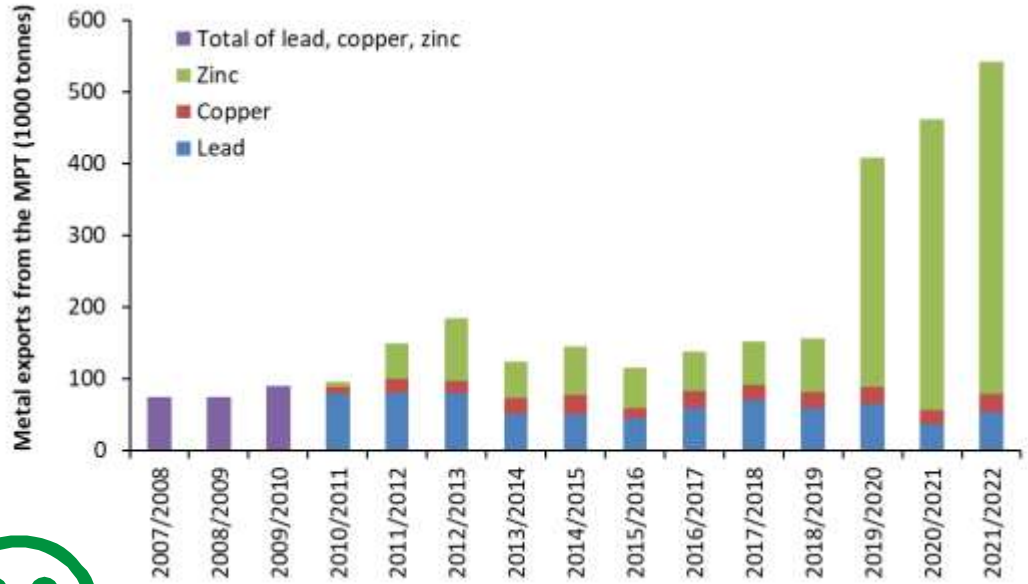
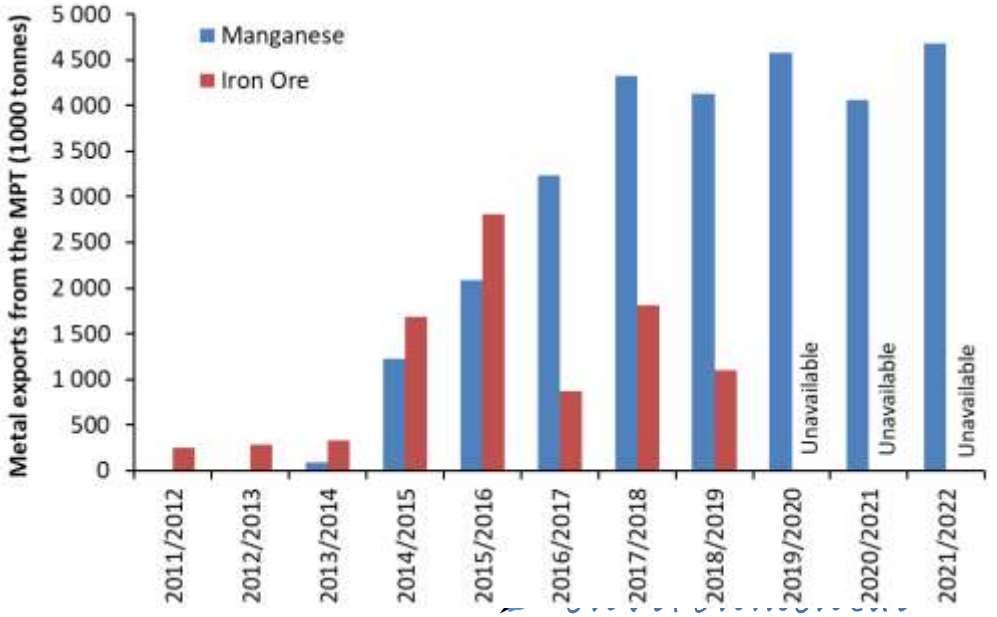
1.3 Ore exports

Iron ore terminal….





Multipurpose terminal…



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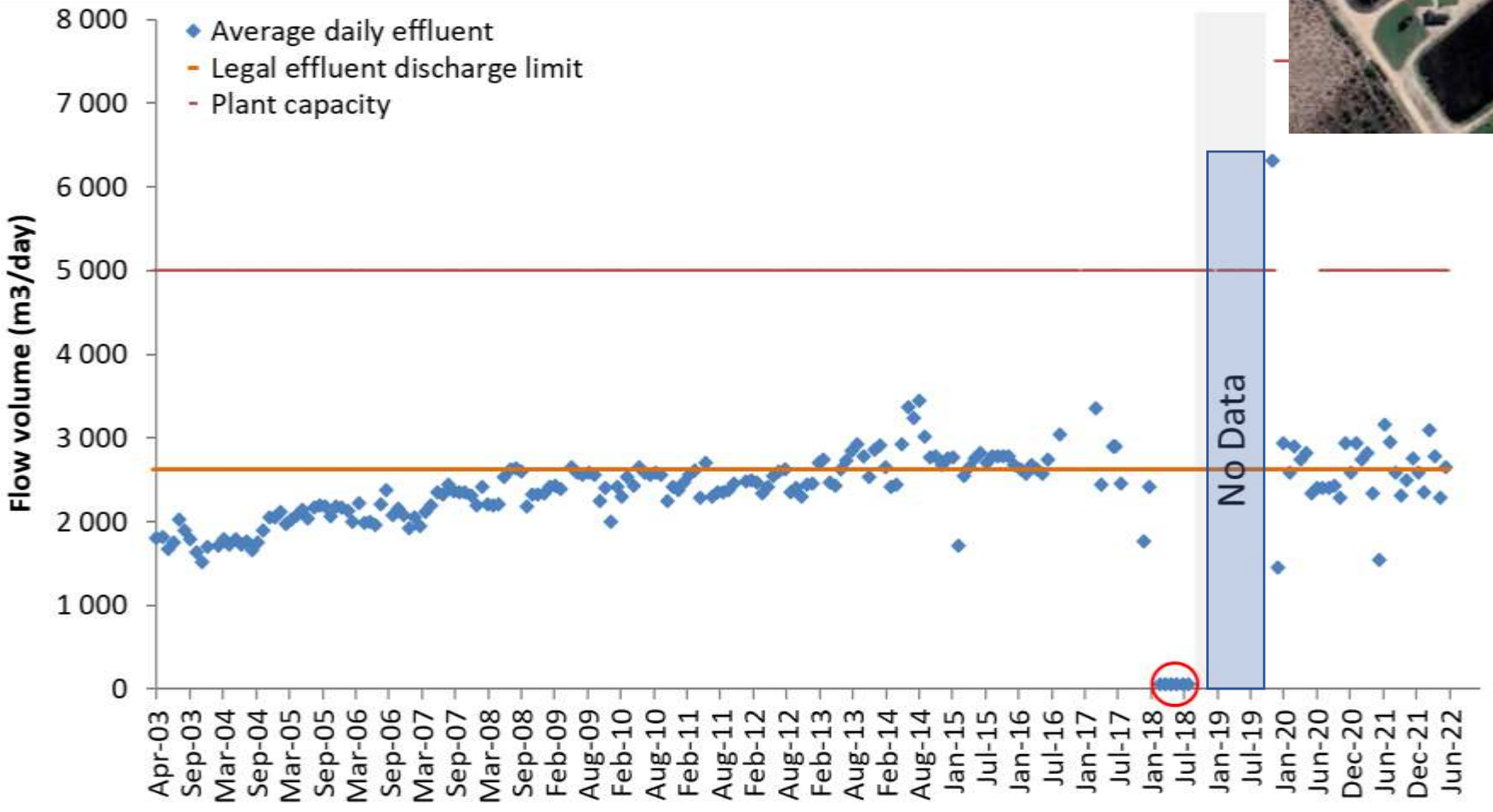
1.4 Saldanha WWTW



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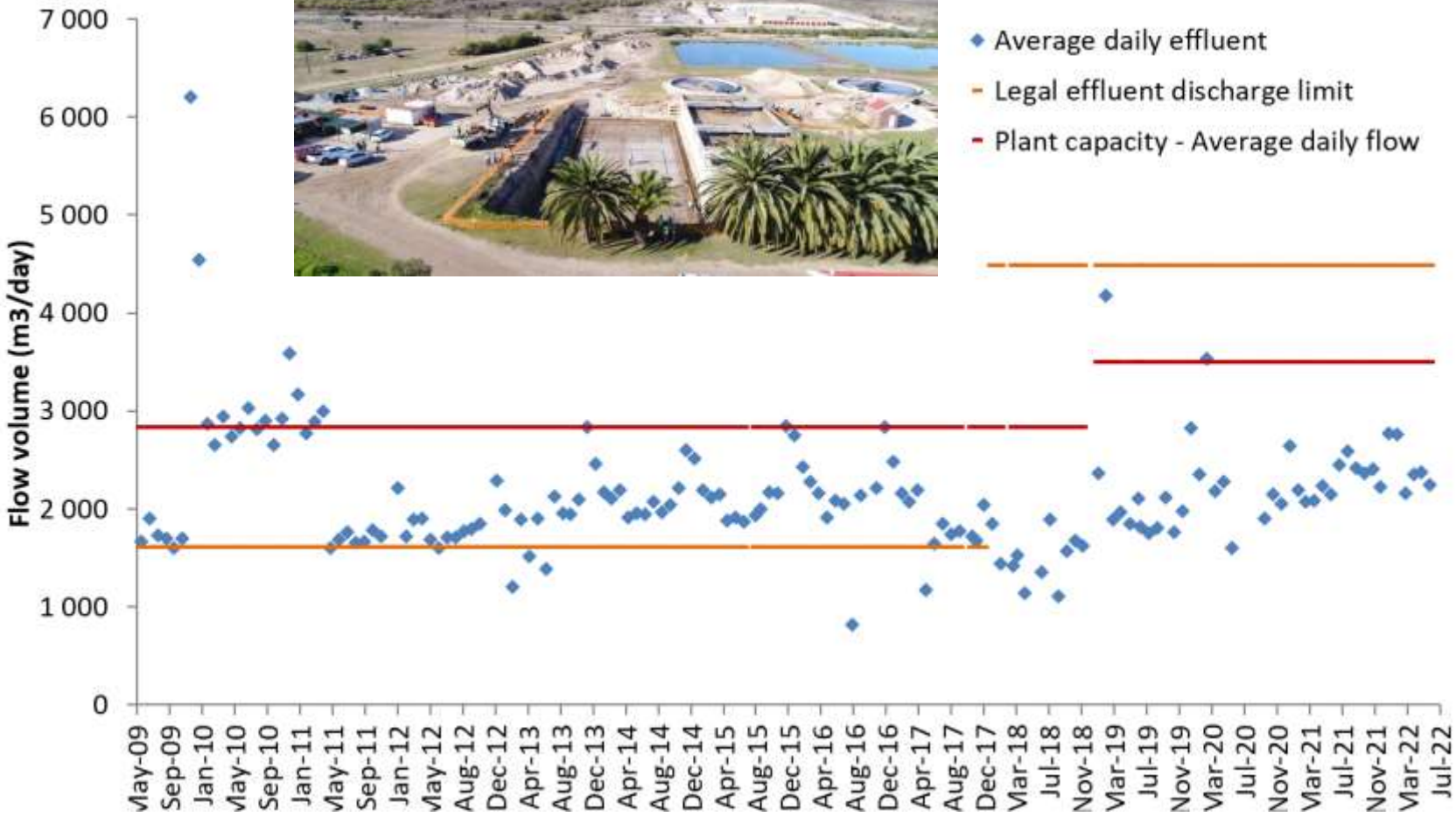
1.5 Langebaan WWTW



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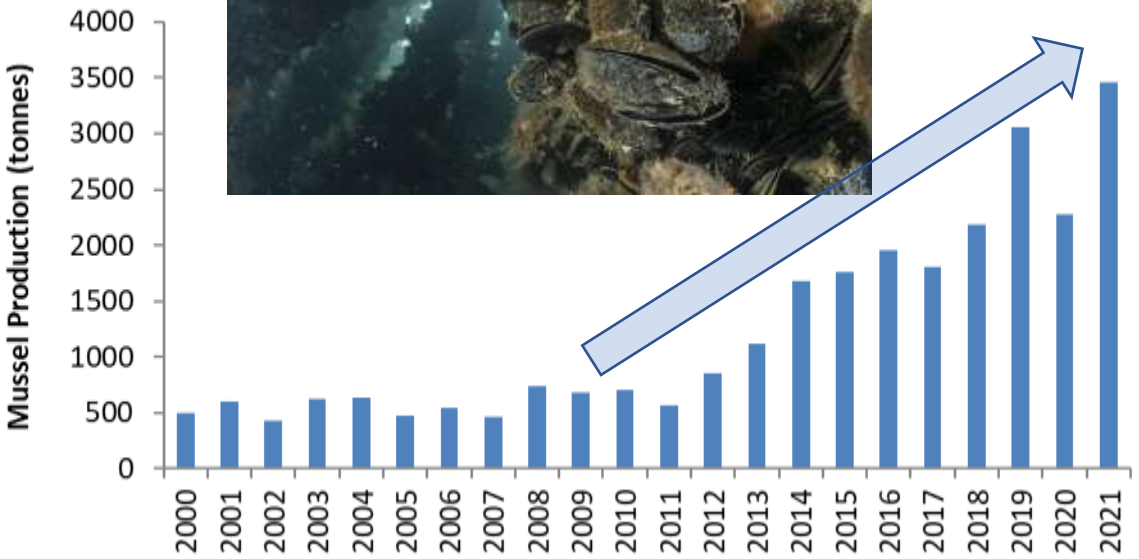
1.5 Mariculture production

- 2020: 28 rights holders, 15 operational
- 2021: 27 rights holders, 24 operational
- 2022: 30 rights holders, 25 operational



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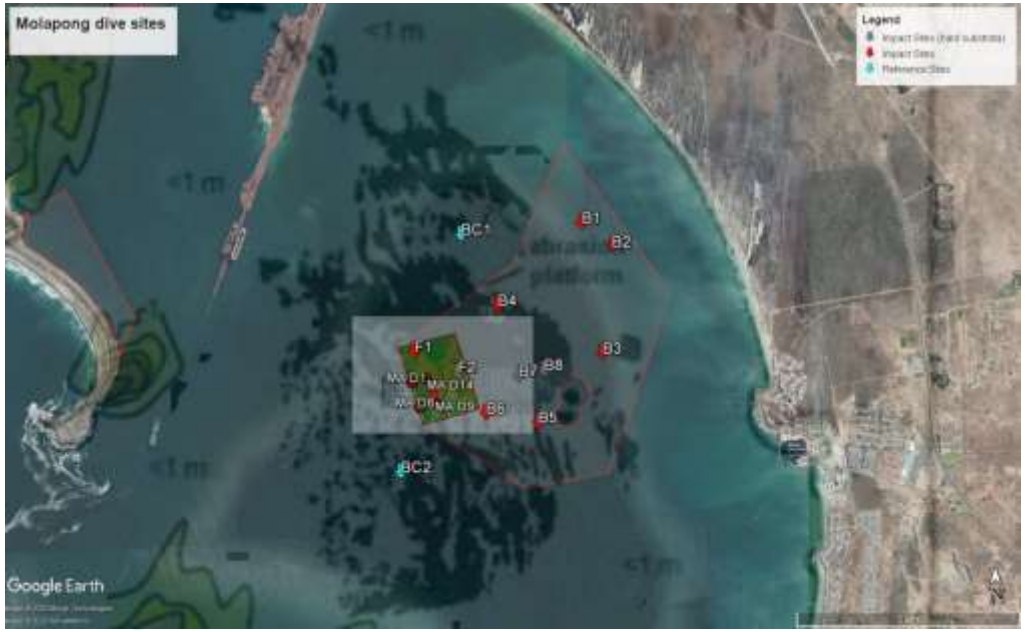
Reef area in Big Bay

- Reef area in Big Bay is quite extensive (500 ha) 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:
  - 30% of identified reef area falls within the (ADZ)
  - Higher biodiversity and conservation importance than sediment
  - Soft sediment monitoring protocols (infauna, redox and H_2S) not really appropriate



2.1 Groundwater

GROUNDWATER AND EARTH SCIENCES
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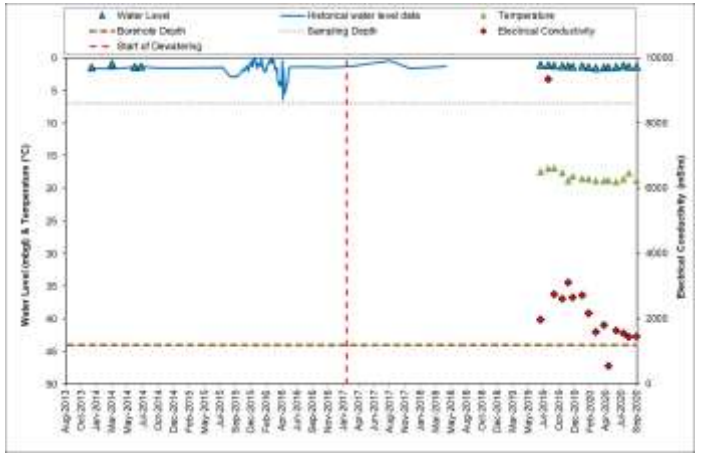
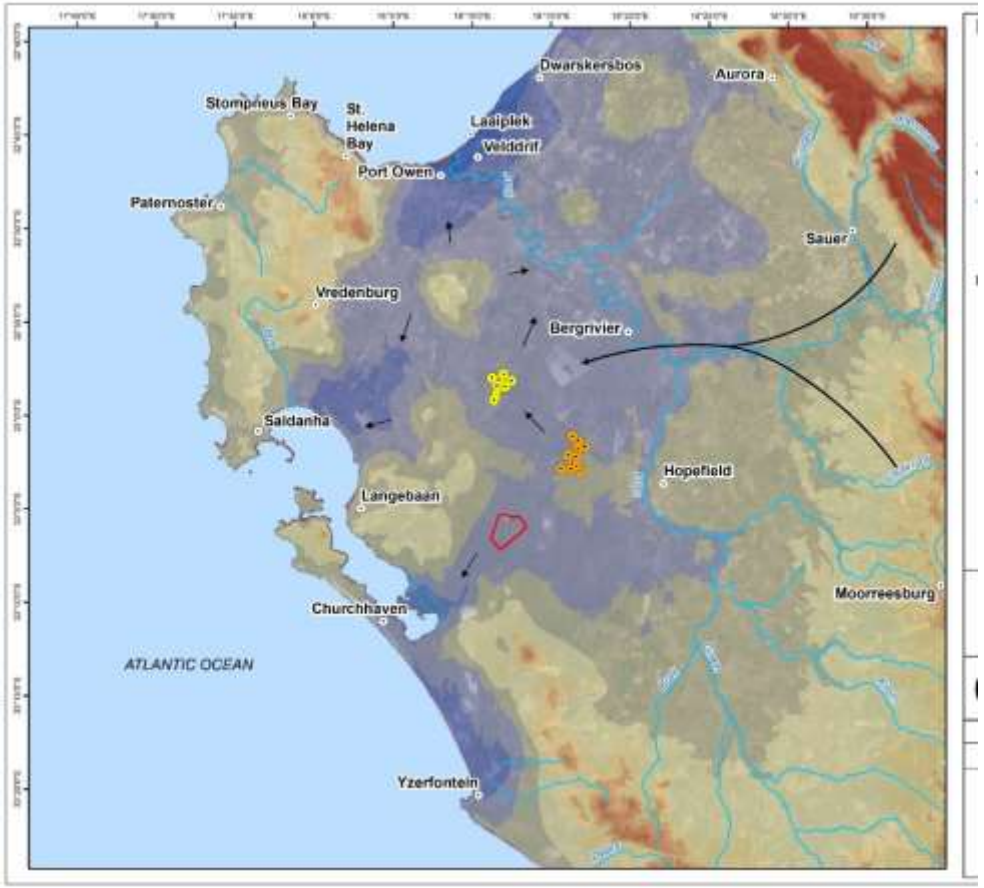


- (New) “partner” on board - GEOSS
- Groundwater is very important water resource (GW control area) and is also important for the environment
- Historically - uncertainly around GW flow patterns, recharge and environmentally sustainable yield but recent work (Time Domain Electromagnetic geophysical survey) has helped clarify the situation
- Currently, the main use of Groundwater in the region is by the agricultural sector – 1.5 m^3/a (2016), other users include SBM with the Langebaan Road Aquifer Wellfield (5.1 Mm^3/a), Hopefield Wellfield (1.6 Mm^3/a), and Elandsfontein (reinjection only)
- Total “sustainable” useable groundwater exploitation potential: 15.2 Mm^3/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…



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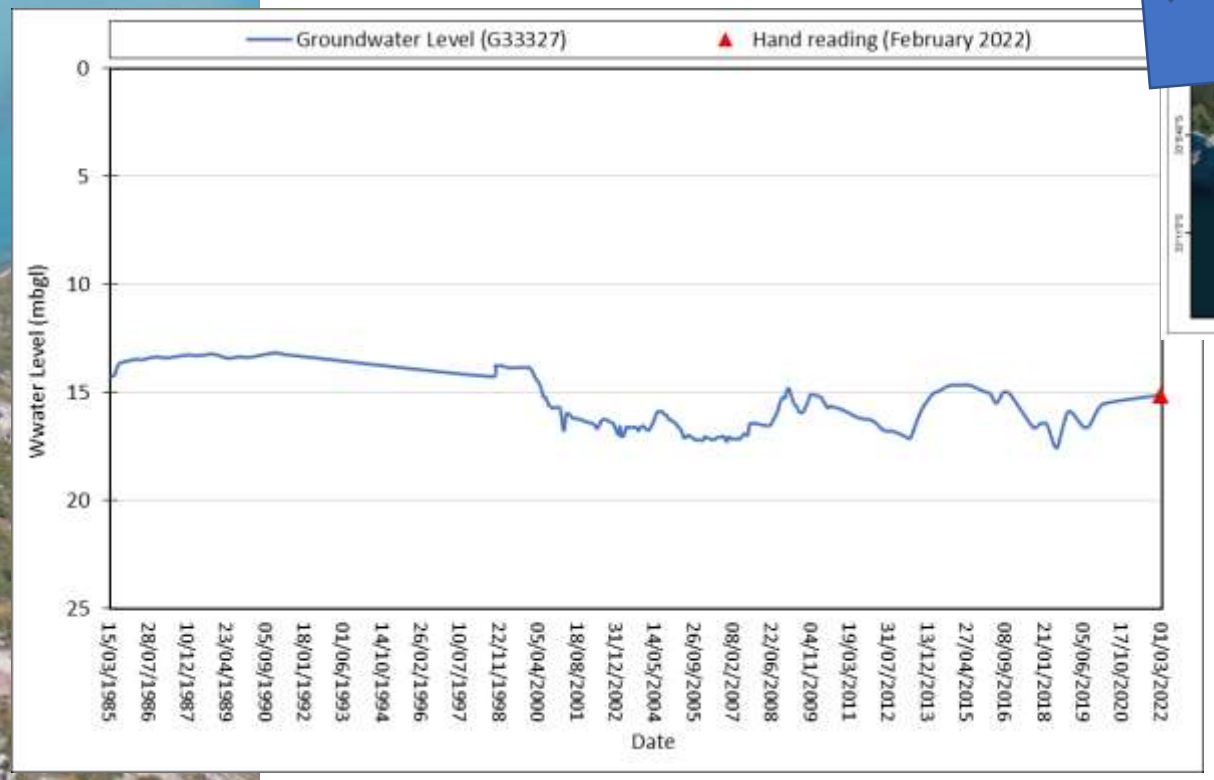
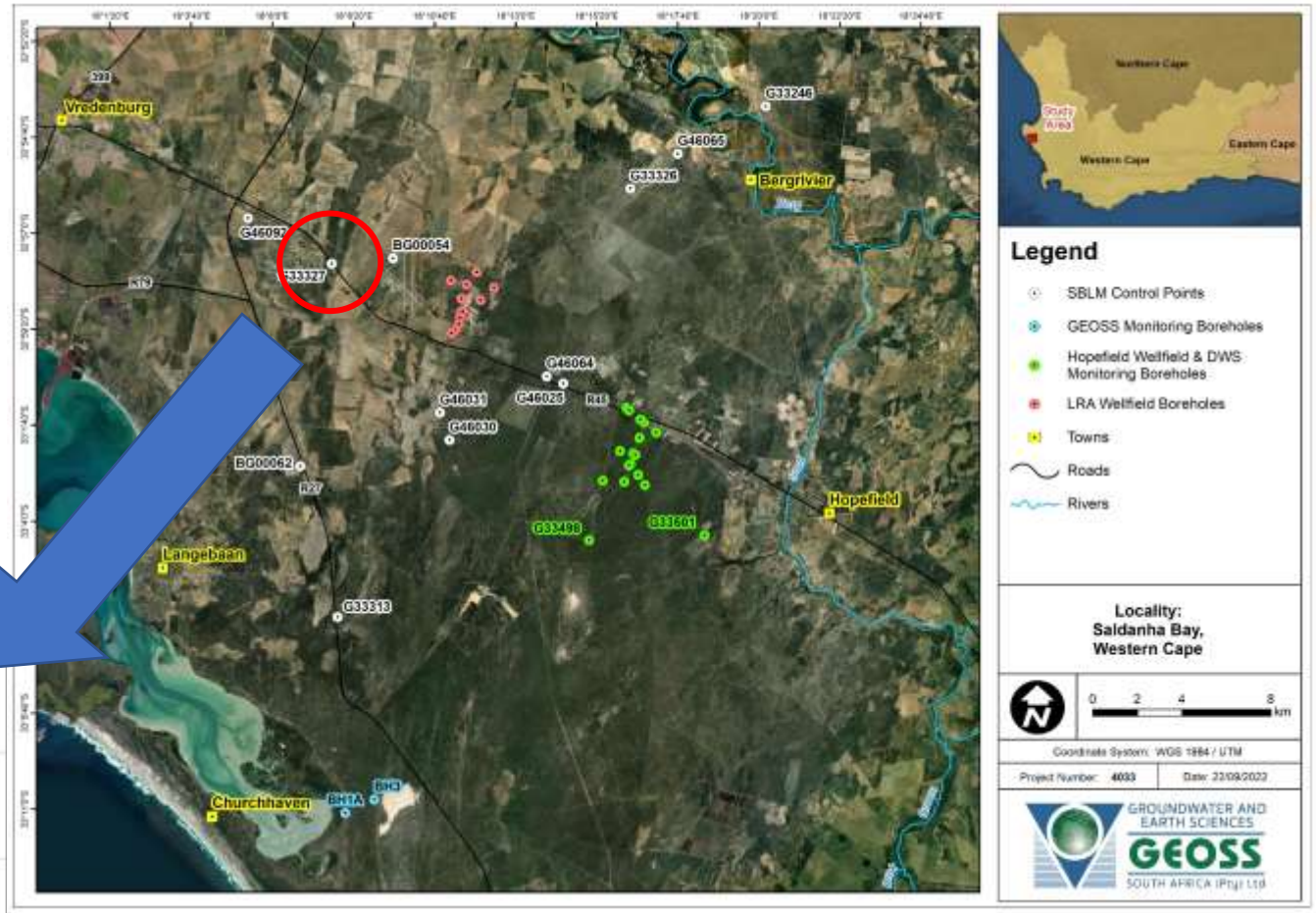
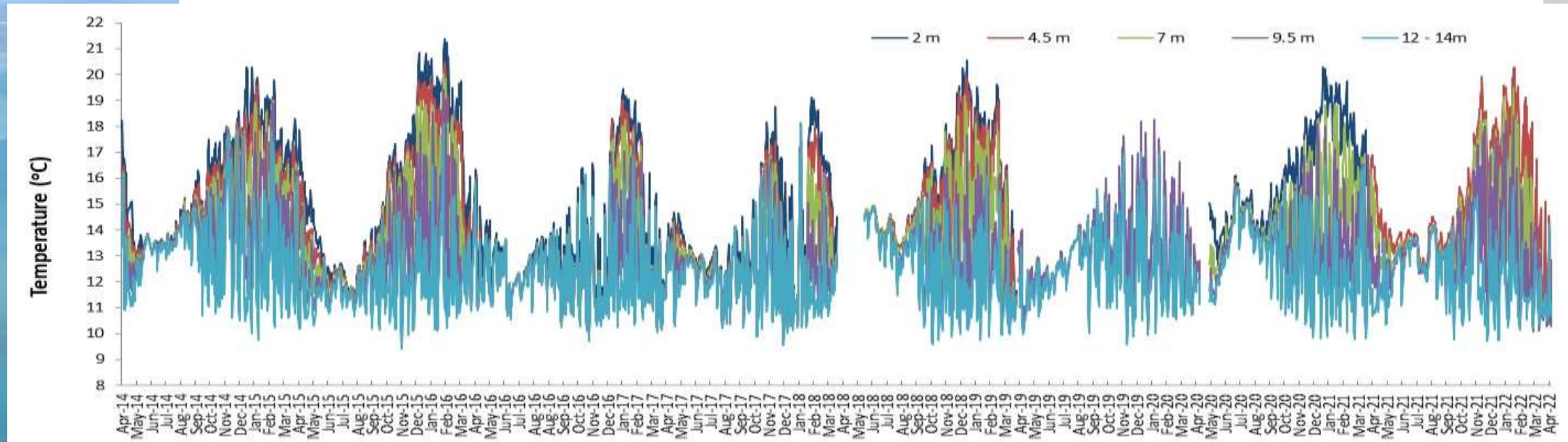
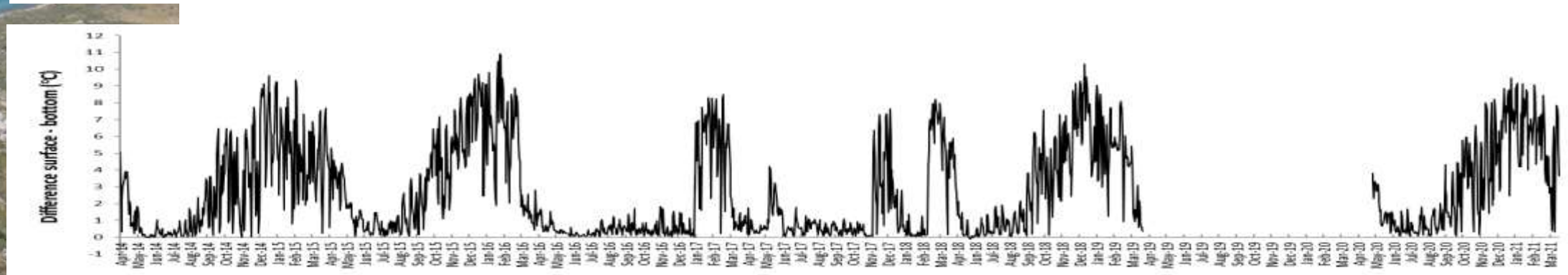


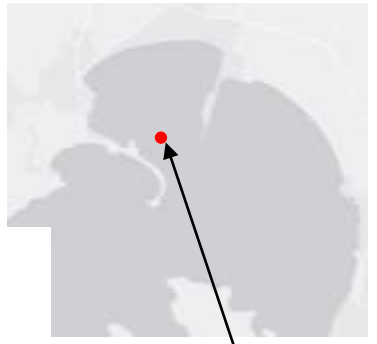


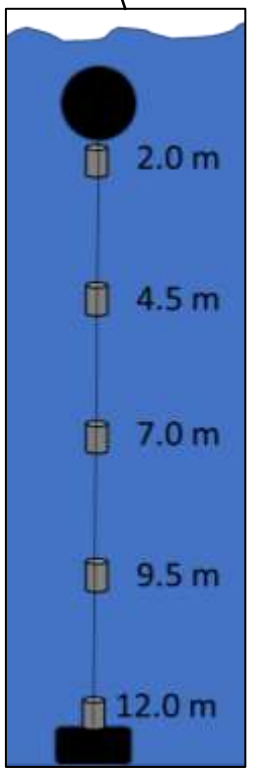
GW levels are stable…..

3.1 Water Quality - Temperature









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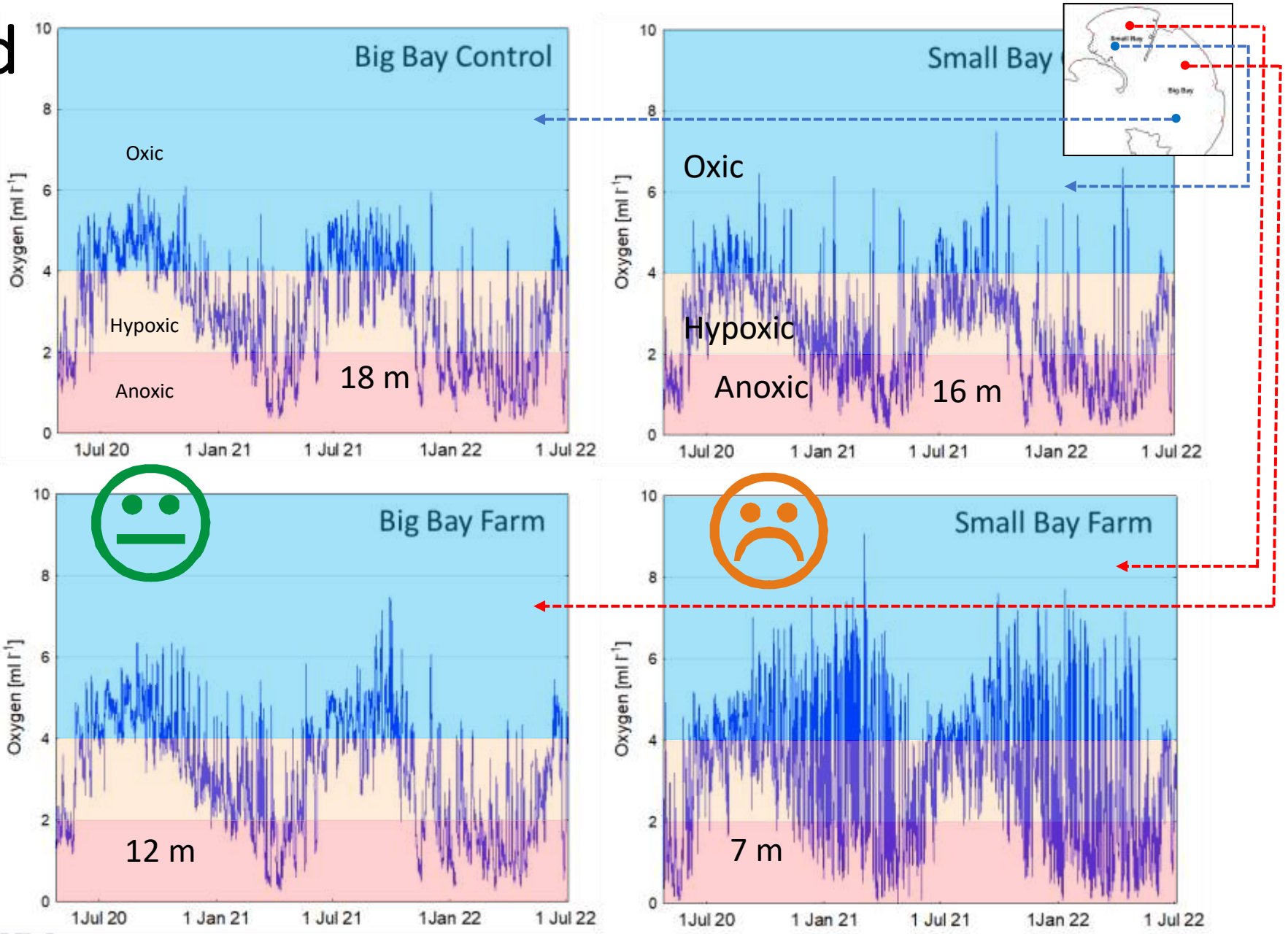
3.2 Dissolved oxygen

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 O_2 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)

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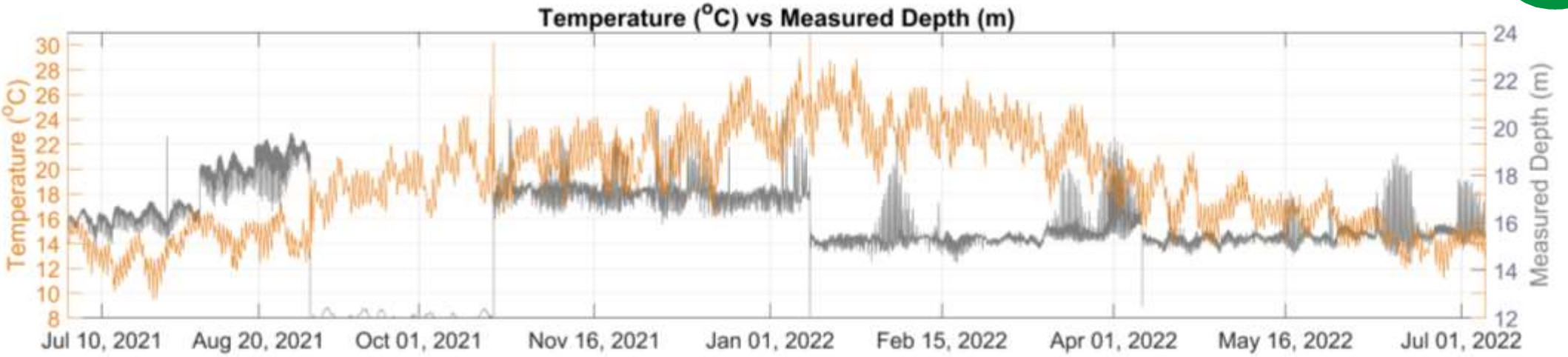
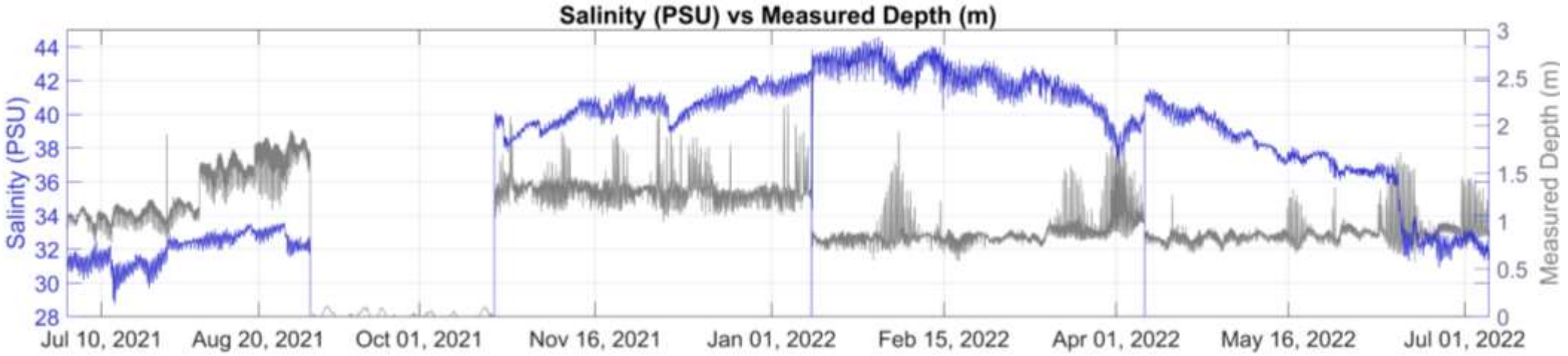
2.3 Geelbek – Temperature & Salinity





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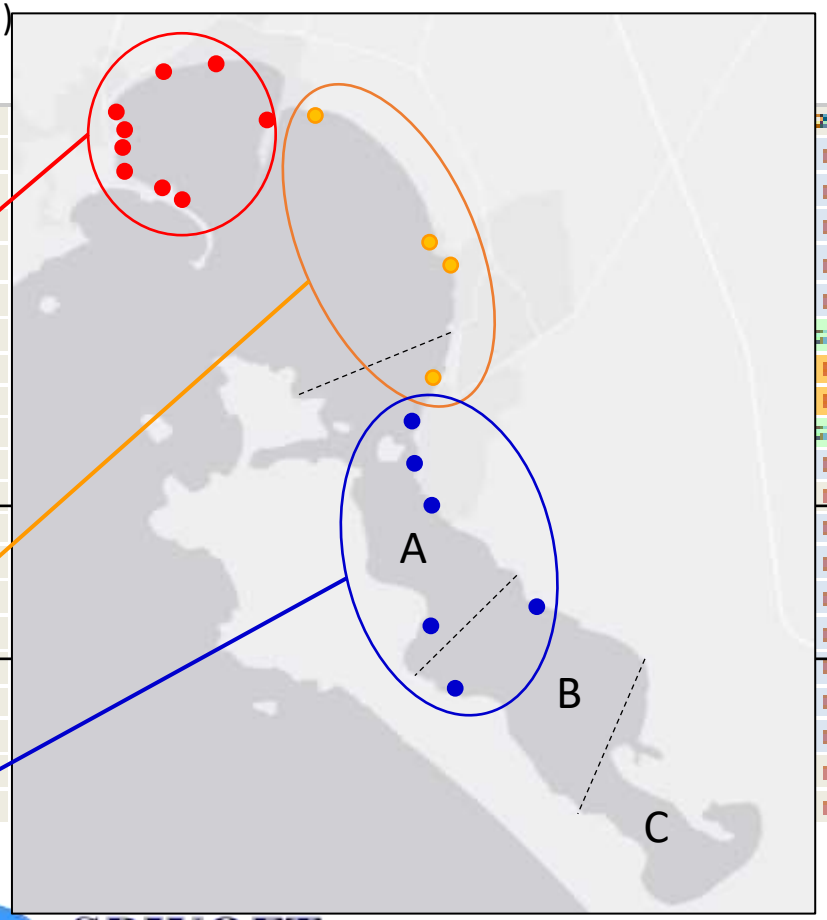
2.3 Faecal coliforms (recreational limits)

- 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)



	Site	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Small Bay	1. Beach at Mussel Rafts	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Fair	N/D	Ex.
	2. Small Craft Harbour	Ex.	Ex.	Good	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Fair	Ex.
	3. Sea Harvest - Small Quay	Ex.	Fair	Ex.	Ex.	Ex.	Ex.	Ex.	Fair	Ex.	Ex.	Ex.	Ex.	Ex.
	4. Saldanha Yacht Club	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Fair	Ex.
	5. Pepper Bay - Big Quay	Ex.	Ex.	Good	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Poor	Good	Ex.
	6. Pepper Bay - Small Quay	Good	Ex.	Good	Fair	Fair	Ex.	Ex.	Ex.	Ex.	N/D	Ex.	Ex.	Ex.
	7. Hoedjies Bay Hotel - Beach	Fair	Poor	Poor	Fair	Good	Fair	Good	Fair	Poor	Poor	Poor	Poor	Poor
	8. Beach at Cara van Park	Fair	Fair	Poor	Good	Fair	Ex.	Fair	Fair	Fair	Fair	Fair	Ex.	Good
	9. Bok River Mouth - Beach	Good	Ex.	Poor	Fair	Good	Ex.	Poor	Poor	Fair	Fair	Good	Poor	Poor
	10. General Cargo Quay - TNPA	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.
	11. Seaform - TNPA	N/D	N/D	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Good
Big Bay	12. Mykonos - Paradise Beach	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Fair	Ex.	Ex.
	13. Mykonos - Harbour	Ex.	Fair	Ex.	Ex.	Good	Fair	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.
	14. Leentjieklip	Ex.	Ex.	Fair	Ex.	Good	Ex.	Ex.	Ex.	N/D	Ex.	Ex.	Ex.	Ex.
Langebaan Lagoon	15. Langebaan North - Leentjieklip	Ex.	Ex.	Poor	Good	Ex.	Good	Ex.	Good	Ex.	Ex.	Fair	Ex.	Ex.
	16. Langebaan - Main Beach	Ex.	Ex.	Ex.	Ex.	Ex.	Fair	Ex.	Ex.	N/D	Ex.	Good	Ex.	Ex.
	17. Langebaan Yacht Club	Ex.	Ex.	Ex.	Good	Ex.	Ex.	Fair	Good	N/D	Ex.	Ex.	Ex.	Ex.
	18. Tooth Rock	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	N/D	Ex.	Ex.	Ex.	Ex.
	19. Kraalbaai North	N/D	N/D	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	N/D	Fair	Ex.	Ex.	Ex.
	20. Kraalbaai South	N/D	N/D	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	N/D	Ex.	Fair	Ex.	Ex.

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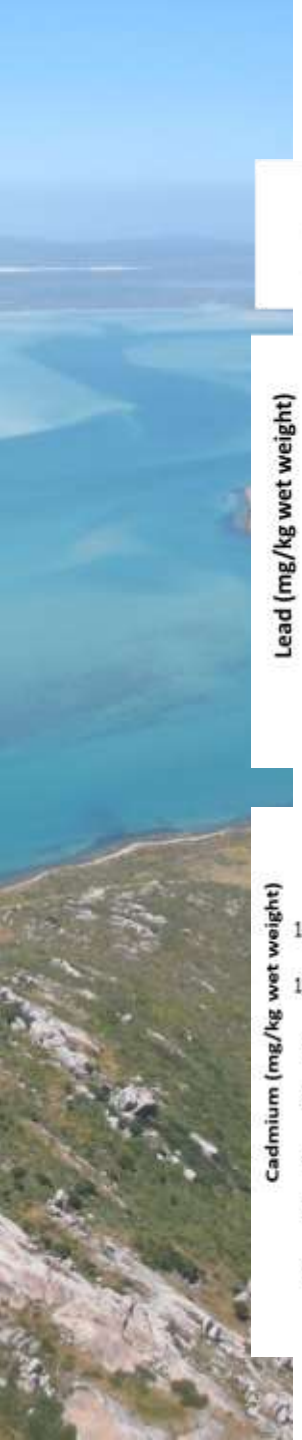
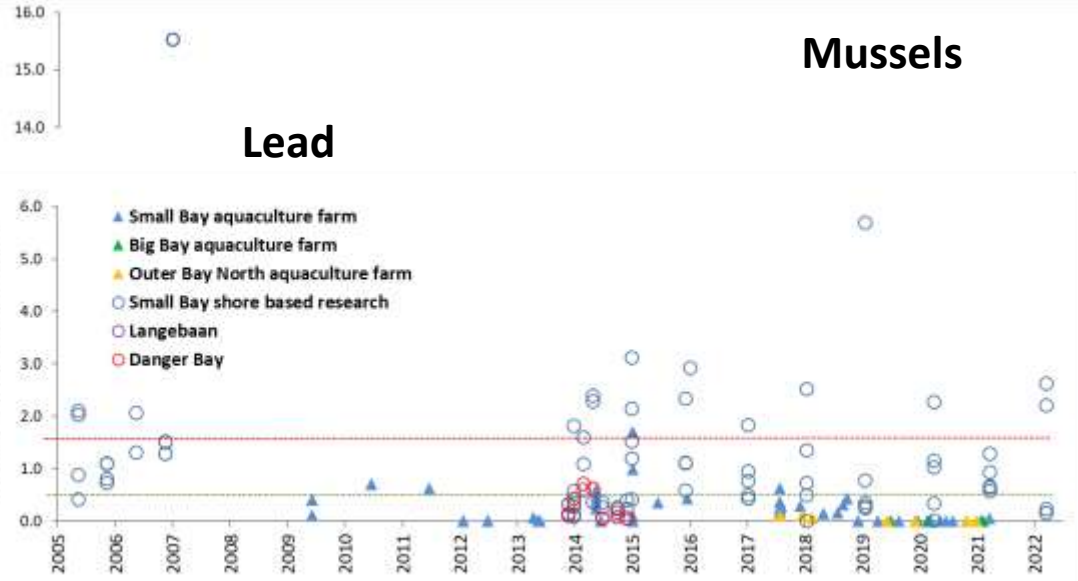
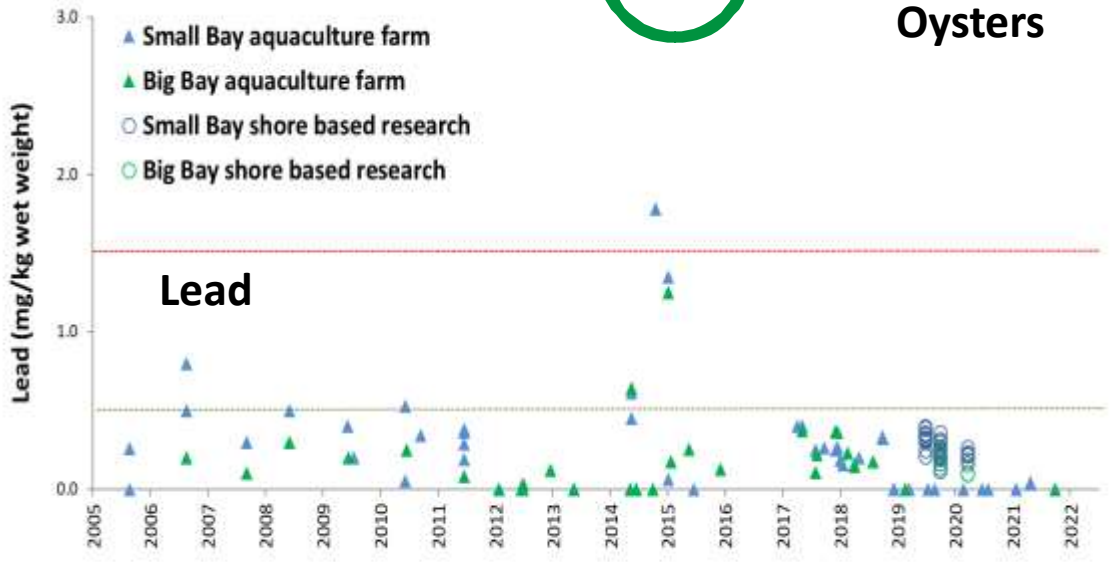
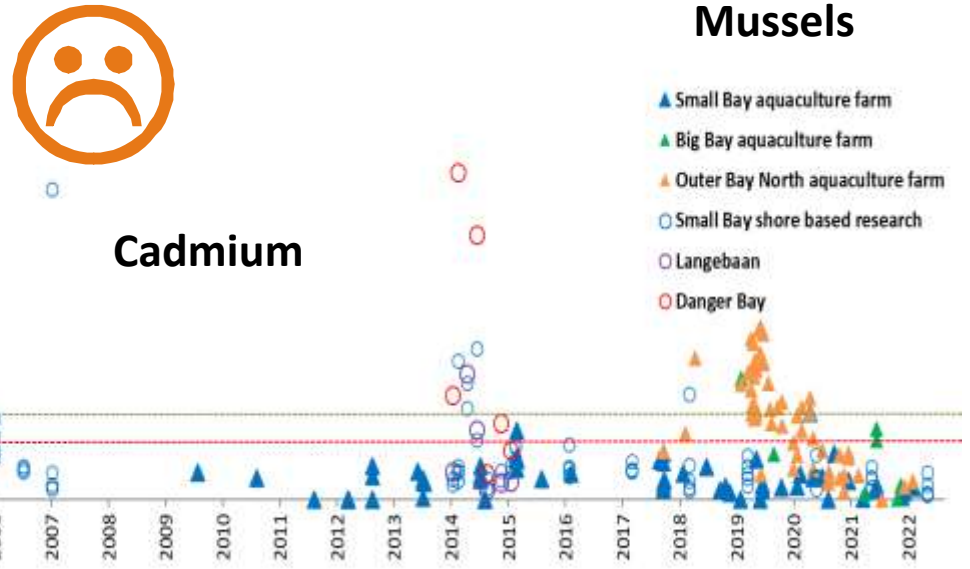
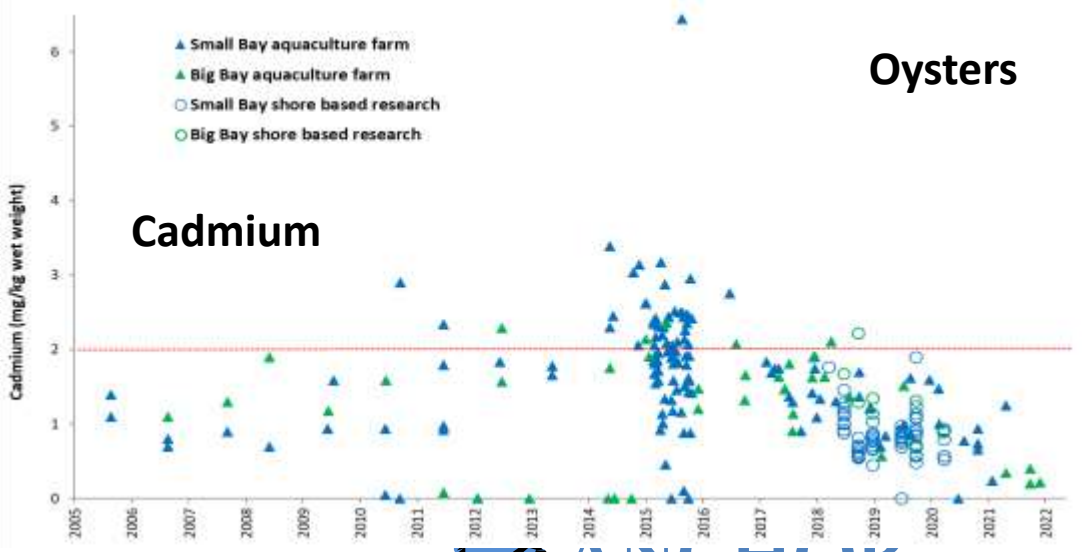
2.4 Trace metals in mussels & oysters











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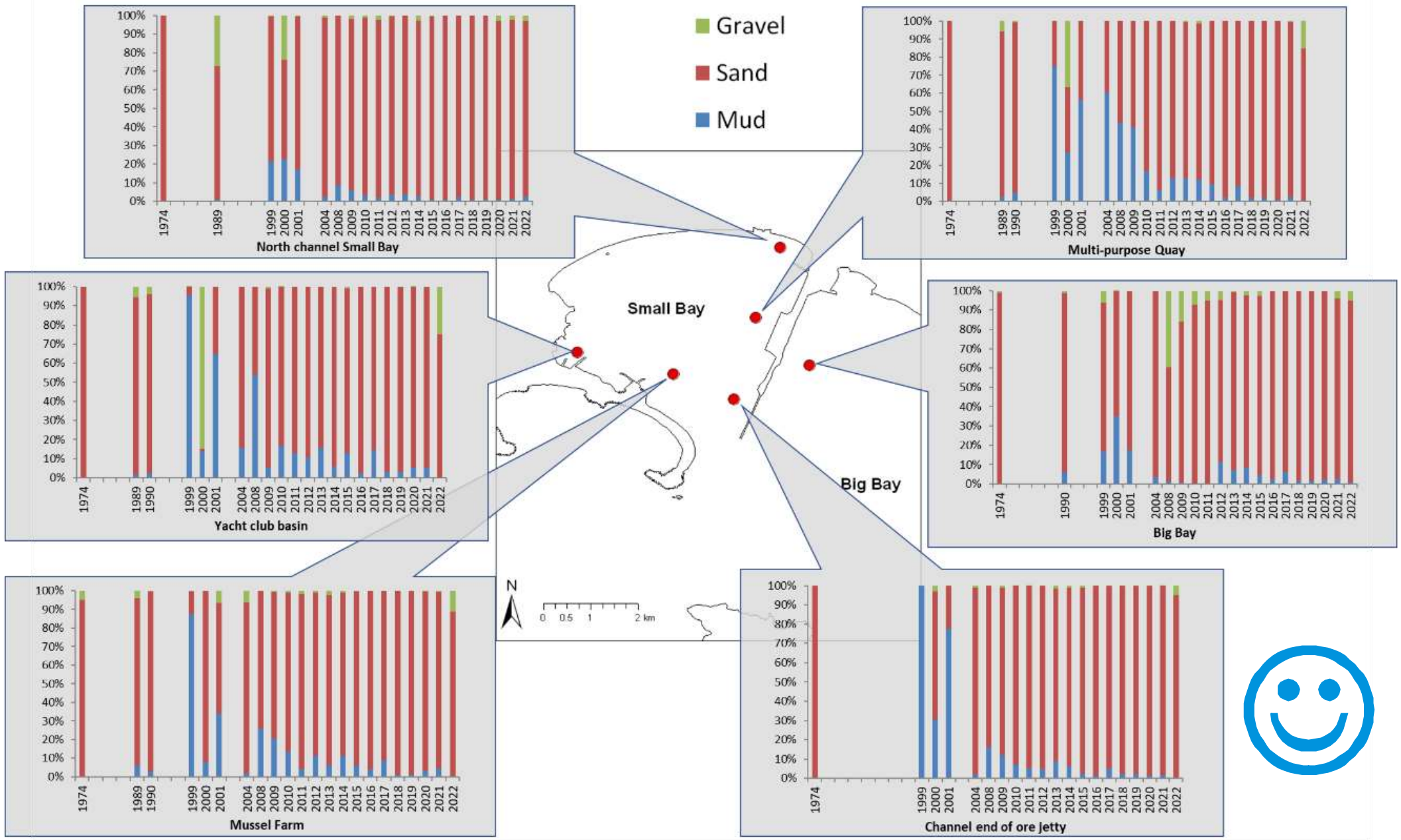
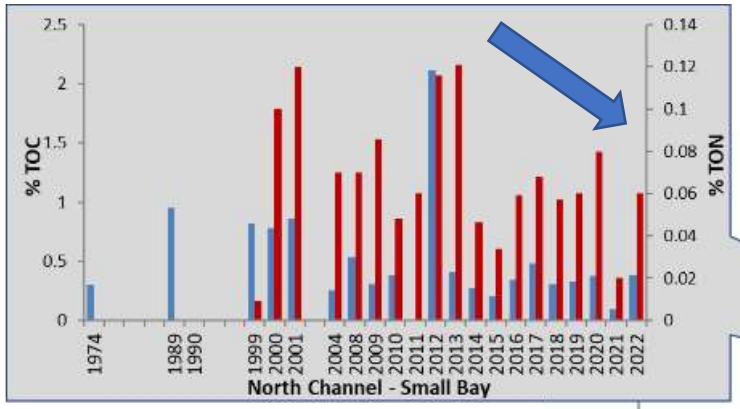
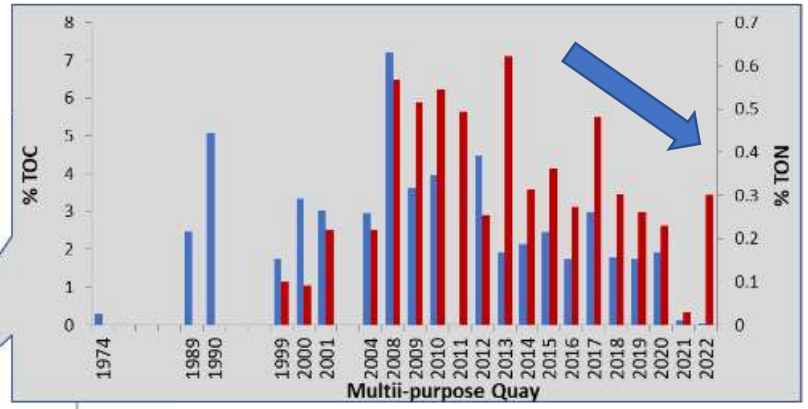
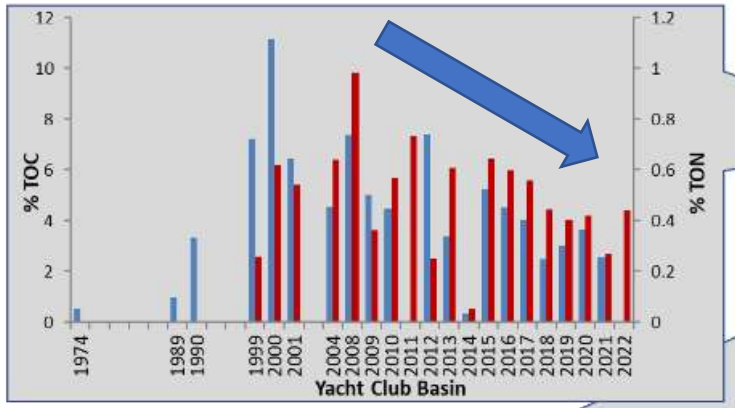
3.1 Sediment quality - particle size

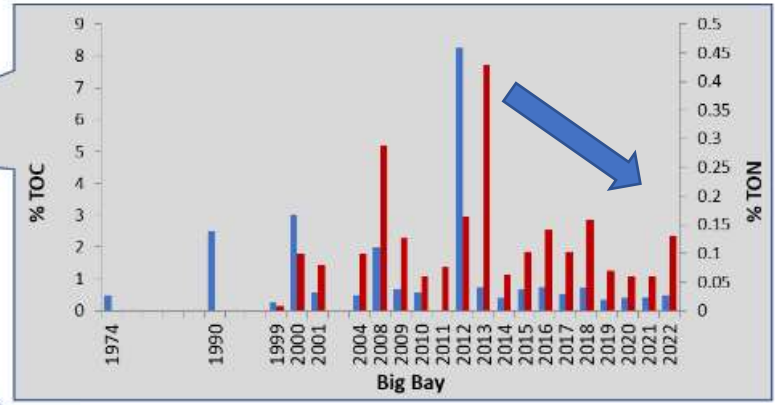


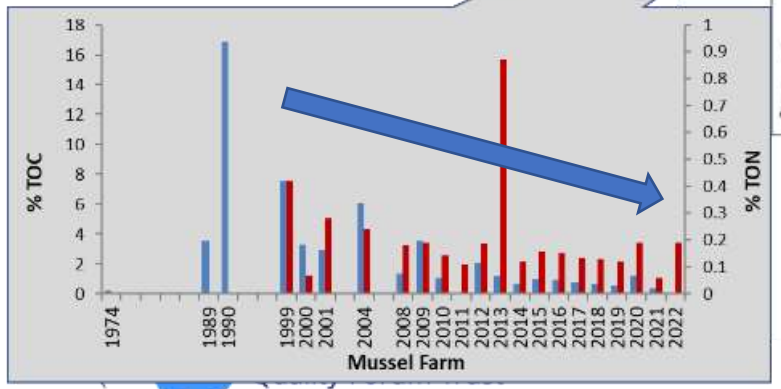
3.2 Sediment Organic Carbon & Nitrogen

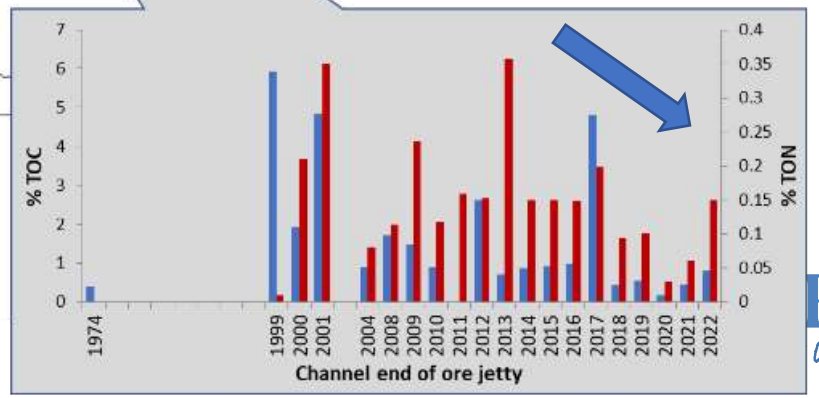


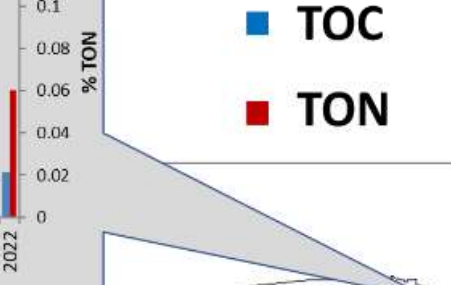


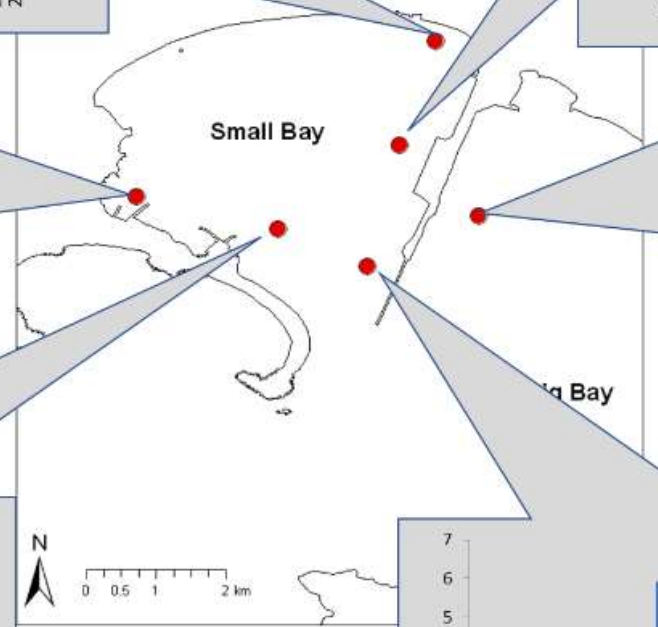




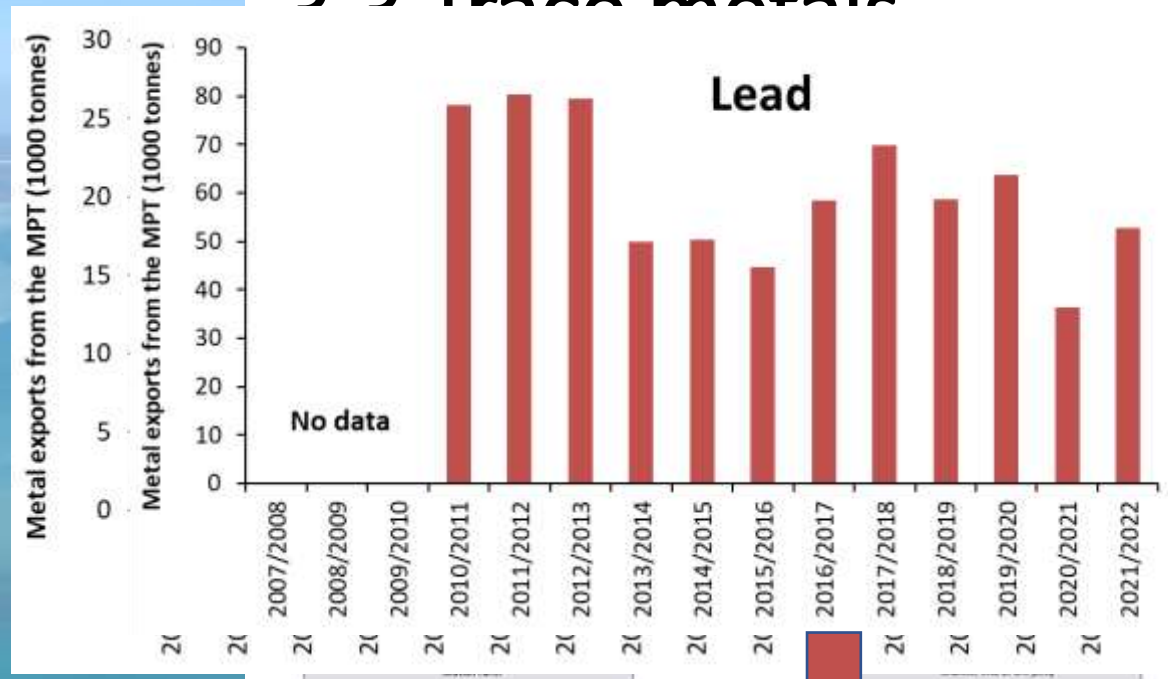


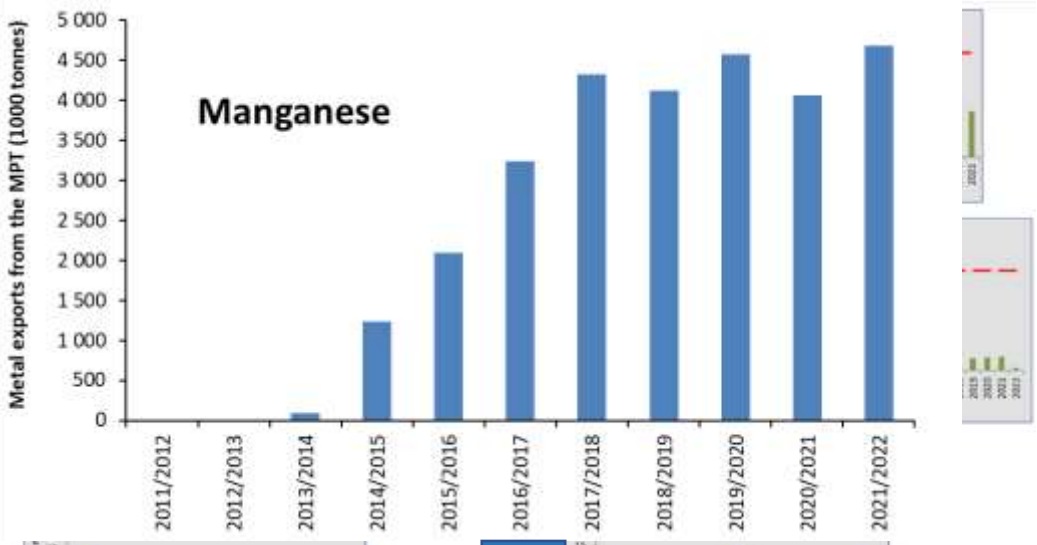


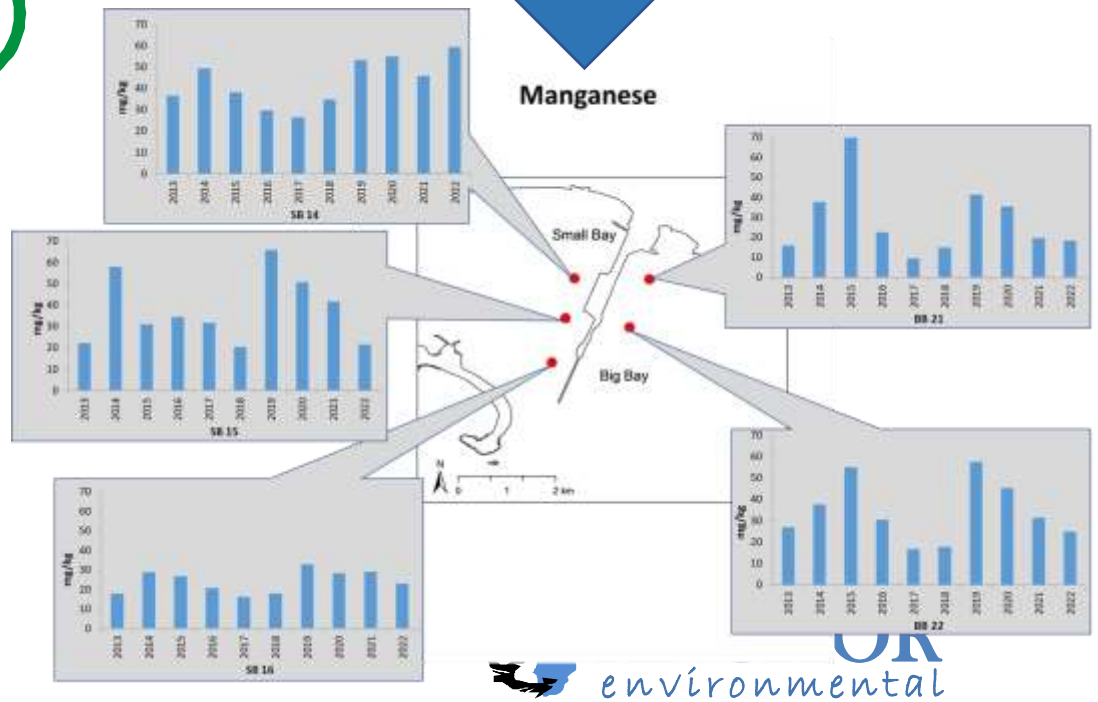




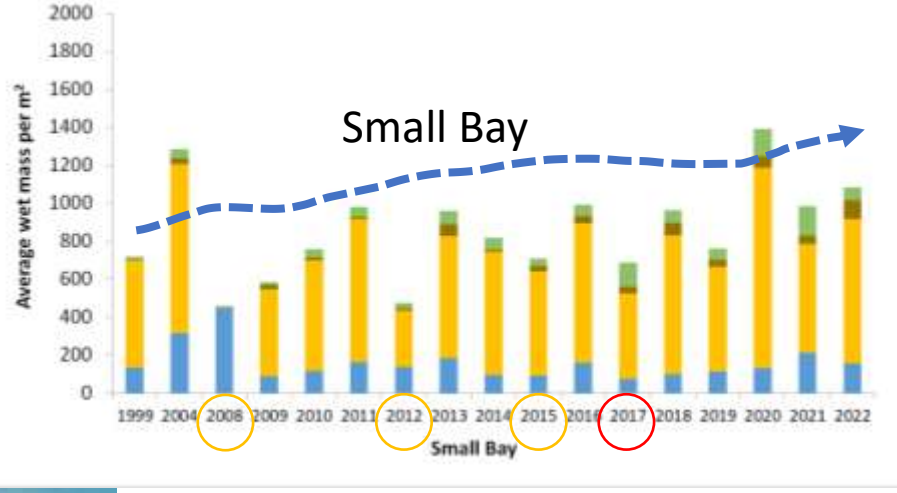
2.2 Trace metals

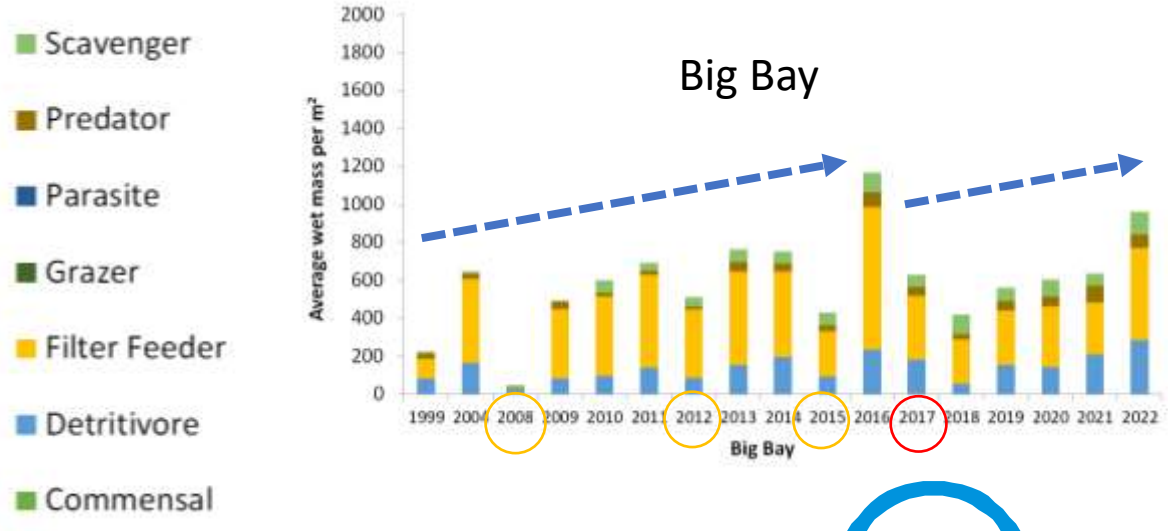


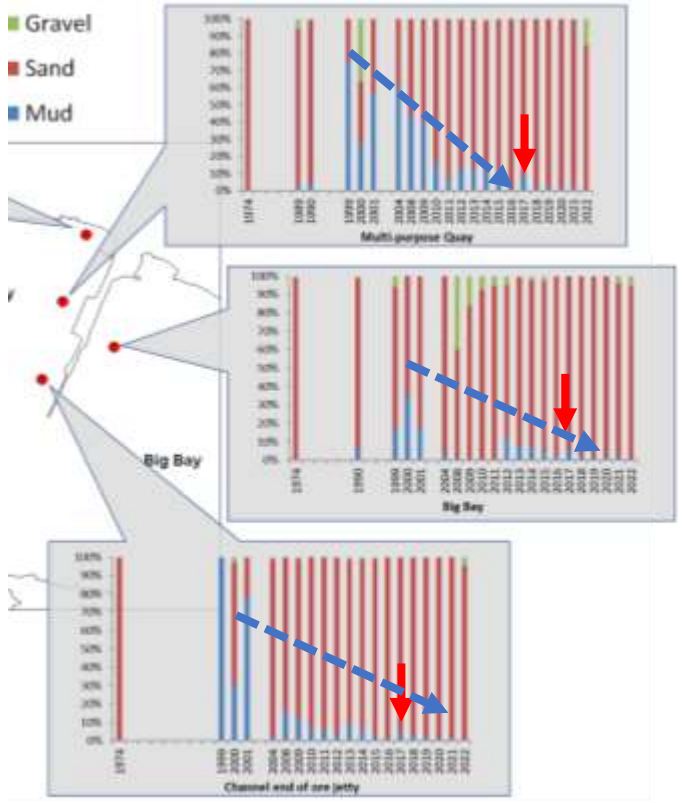


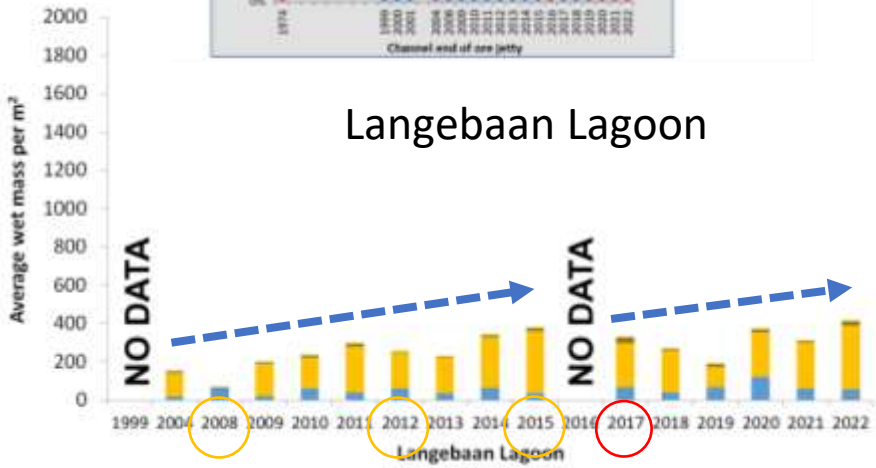


3.2 Soft bottom benthic macrofauna









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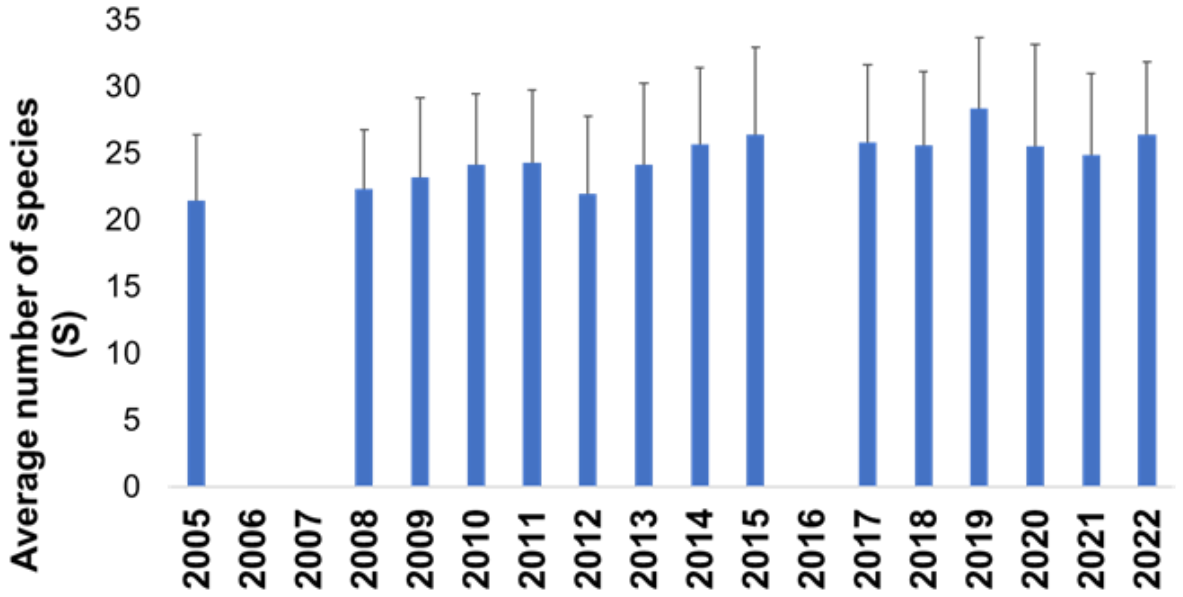
3.3 Rocky intertidal communities

- Numbers of species recorded appears to have increased over time for as while but are now stable
- 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



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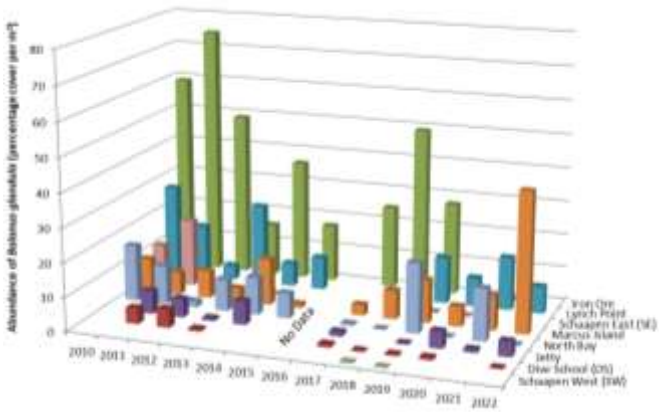
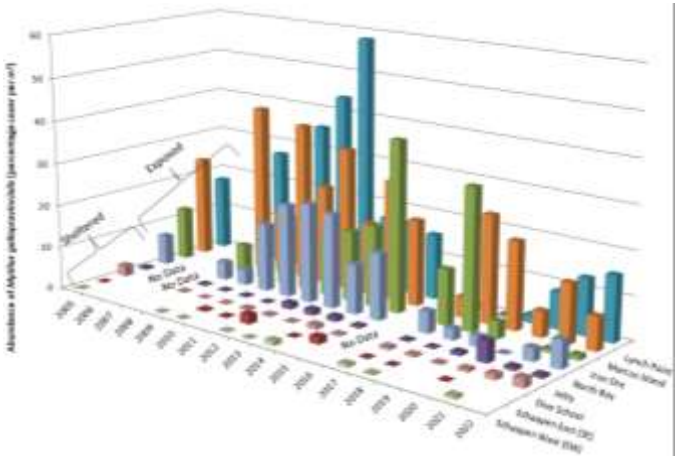
3.4 Alien and invasive species

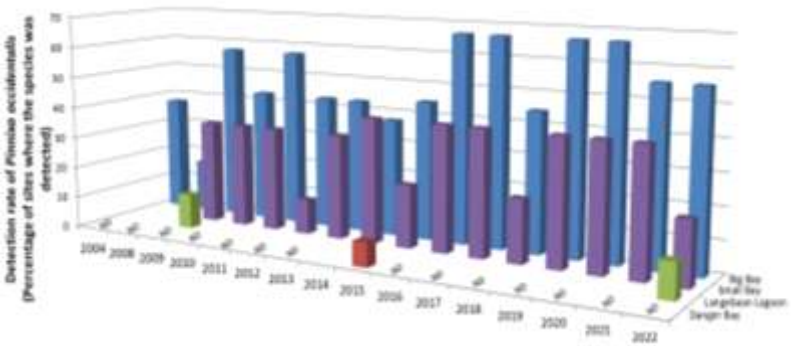
- 95 alien marine species in South African, of which 56 are considered invasive
- 67 of these species (71%) are present along the west coast, 29 of which are now confirmed to be present in Saldanha Bay and/or Langebaan Lagoon (31%)
- All but three of the species (90%) in Saldanha Bay are considered invasive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



Acorn barnacle *Balanus glandula*



Mediterranean mussel
Mytilus galloprovincialis



Western pea crab
Rathbunixa occidentalis

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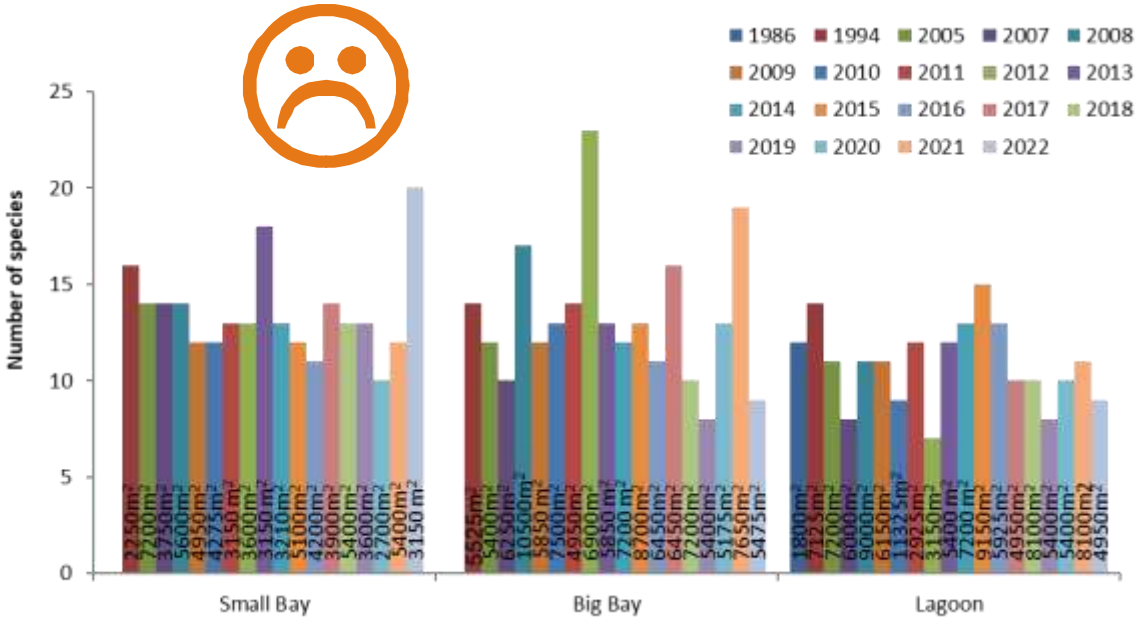
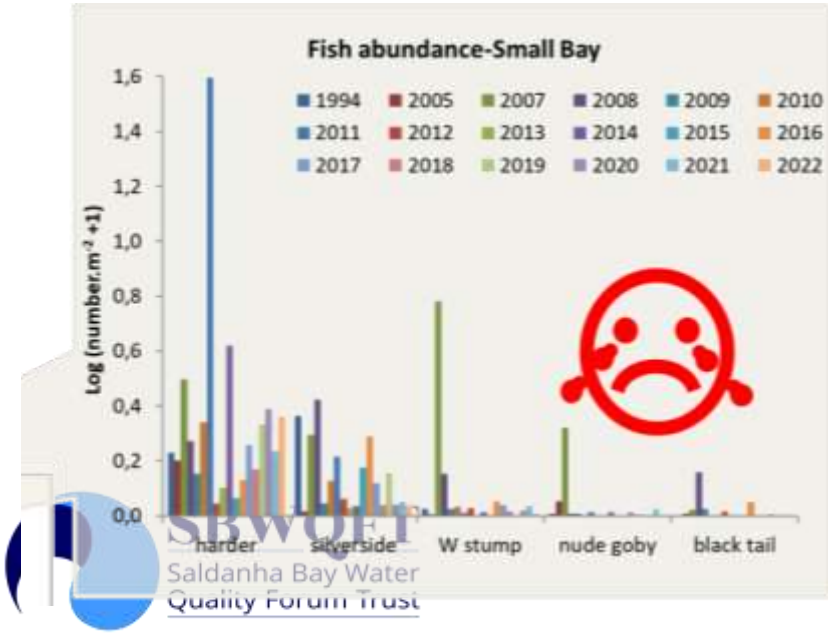
3.4 Aliens and eDNA

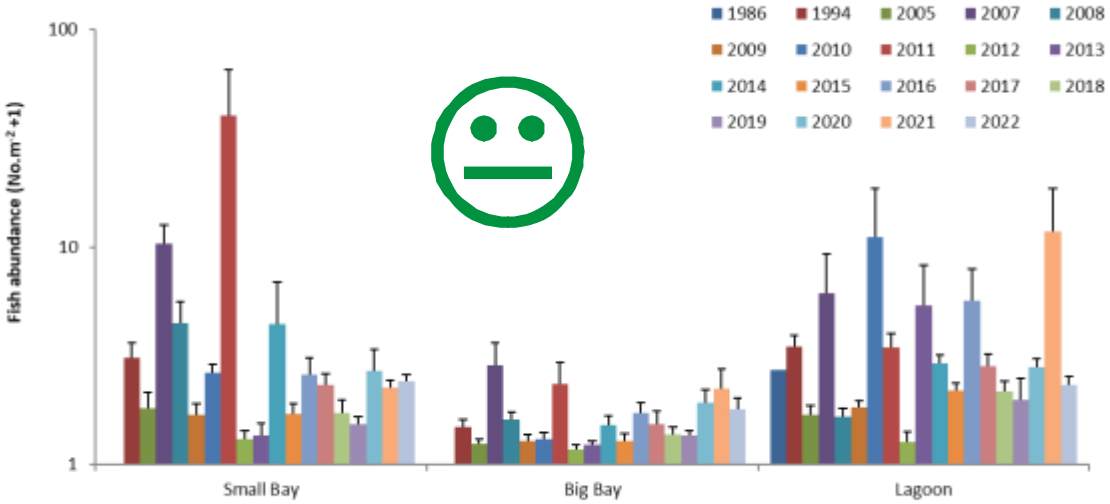
- Aliens are often difficult to detect when they first arrive (cryptic, low numbers)
- But this is usually the best (and often the only) opportunity to eradicate them
- Early detection is critically important!
- SBWQFT in collaboration with Anglo American experimenting with eDNA to assist with this
- Environmental DNA (eDNA) is organismal DNA that can be found in the environment.
- eDNA originates from cellular material shed by organisms (skin, mucous, scales, faeces, etc.) into the environments that can be sampled and monitored using new molecular methods (water of sediment samples)

3.5 Fish

- Some indication of a decline in numbers of species present in the bay, particularly Small Bay
- Overall abundance is very variable, but no clear change, except in Small Bay
- Stocks of some species (white stumpnose and elf) seem to have collapsed, presumably due to overfishing, but slight recovery evident during Covid!







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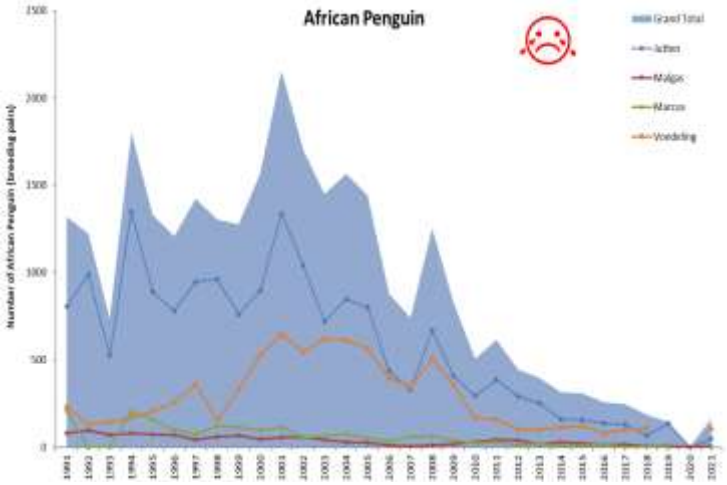
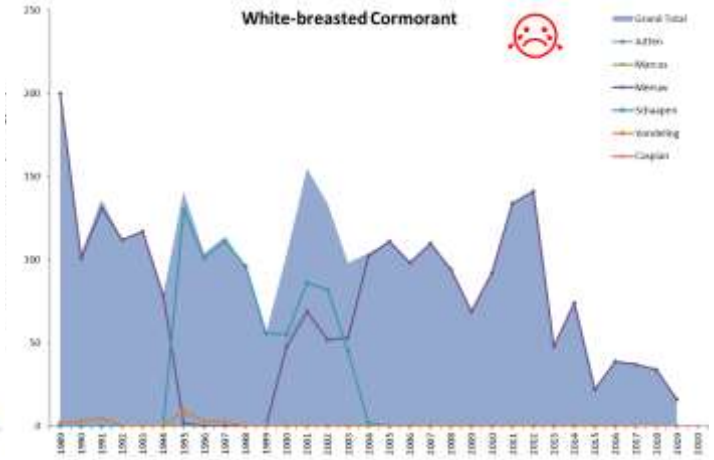
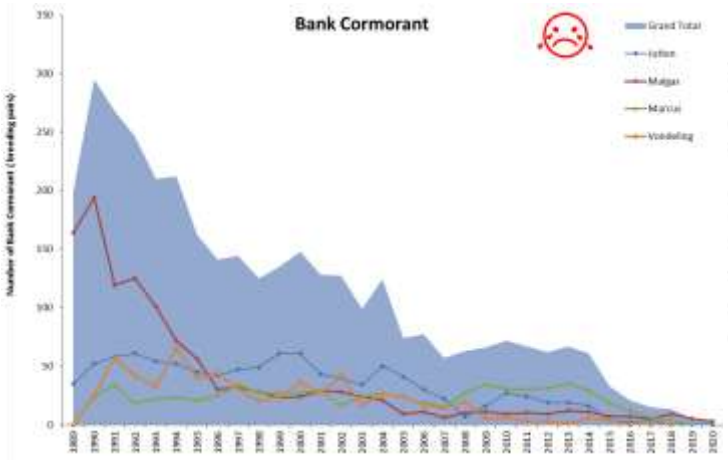
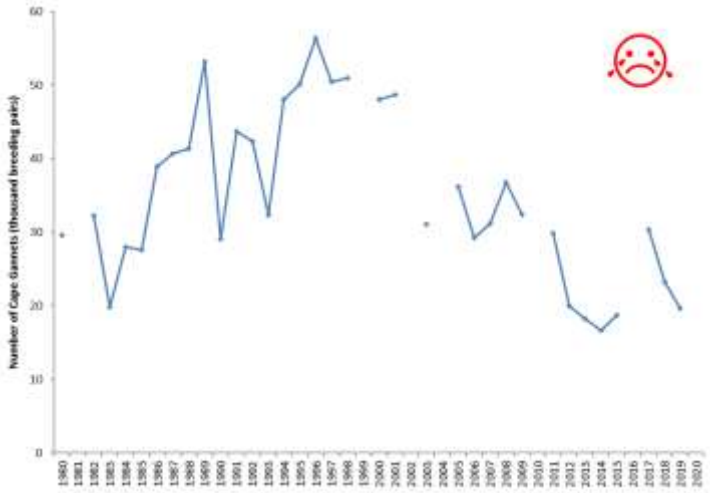
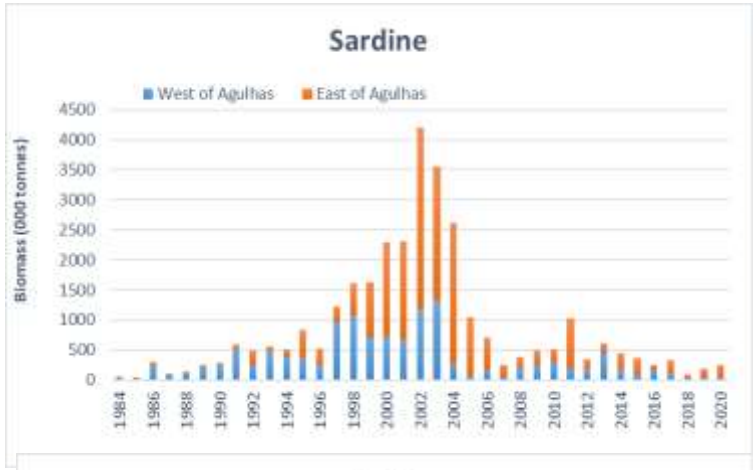
3.6 Birds – Islands breeding

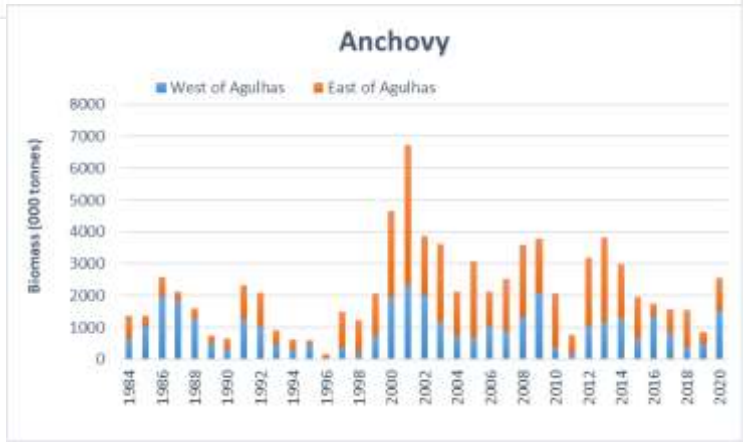












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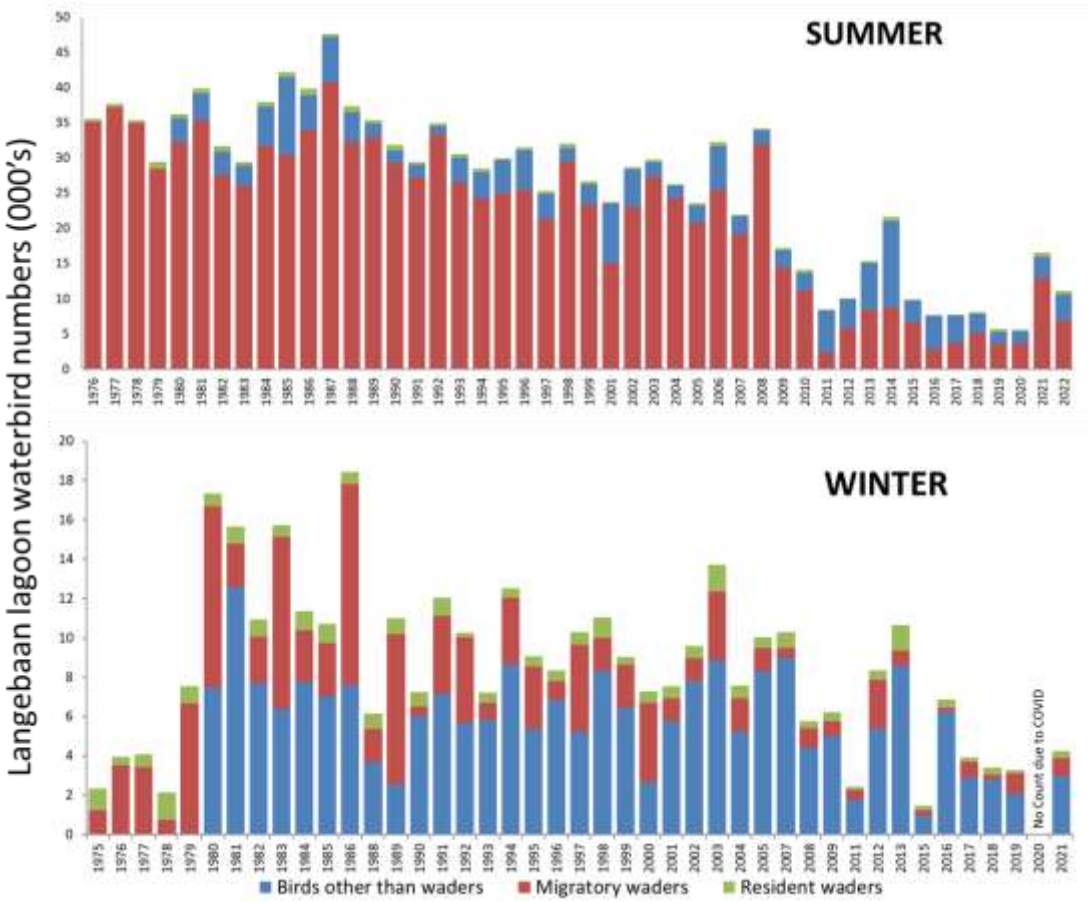
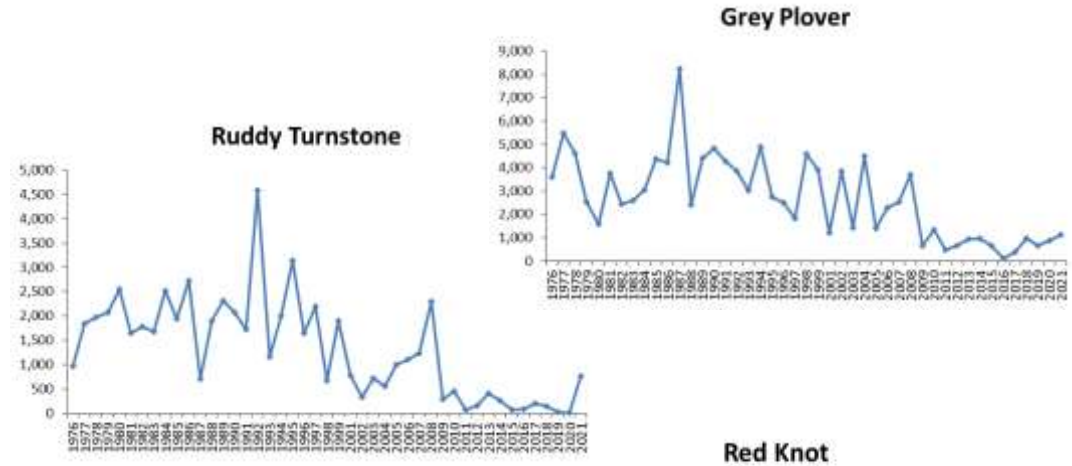
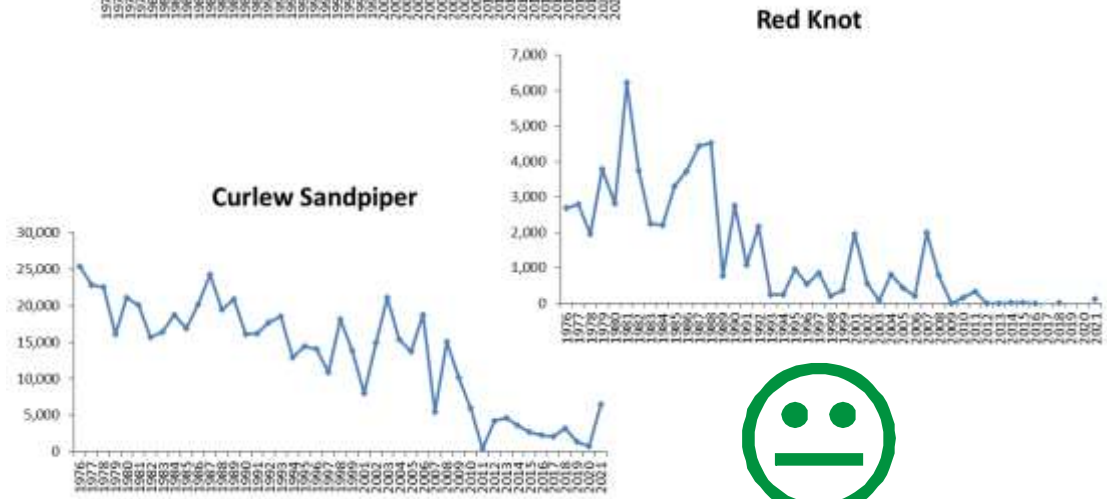
3.7 Birds: Langebaan Lagoon







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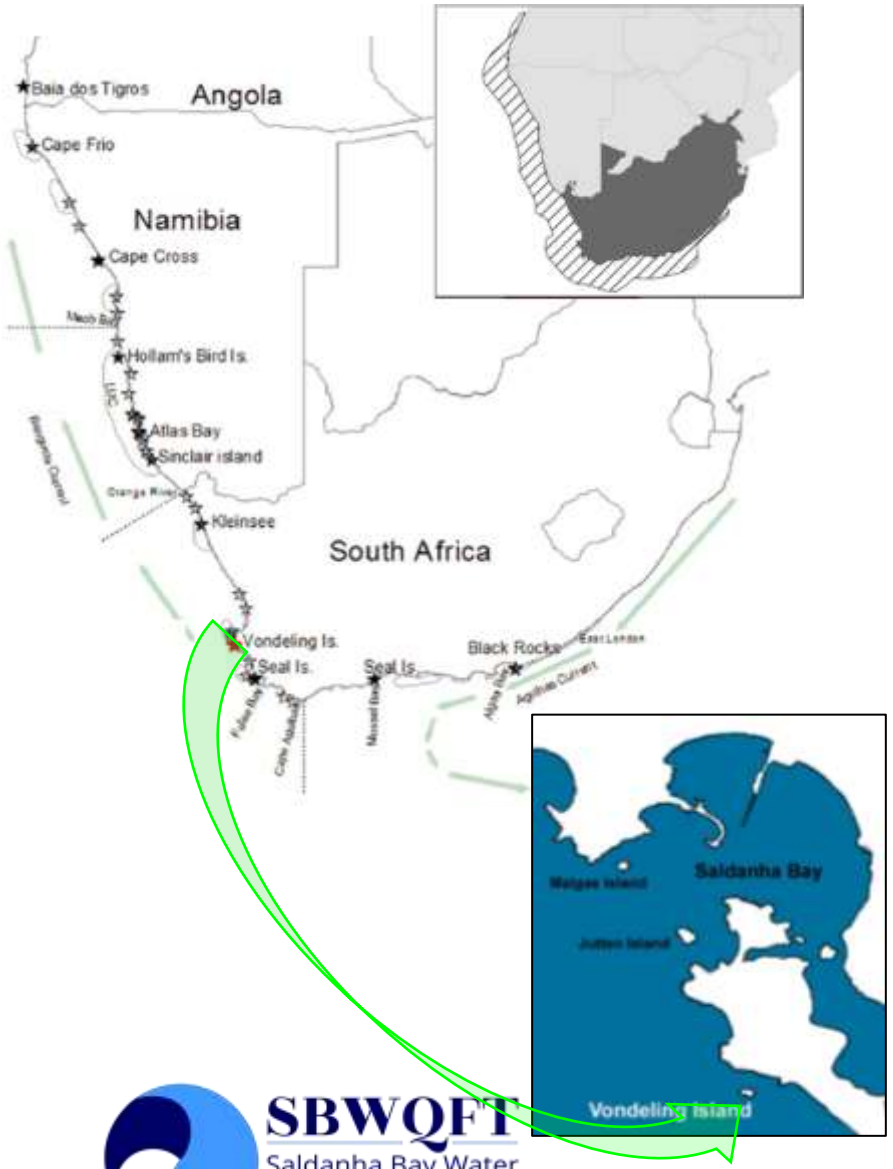
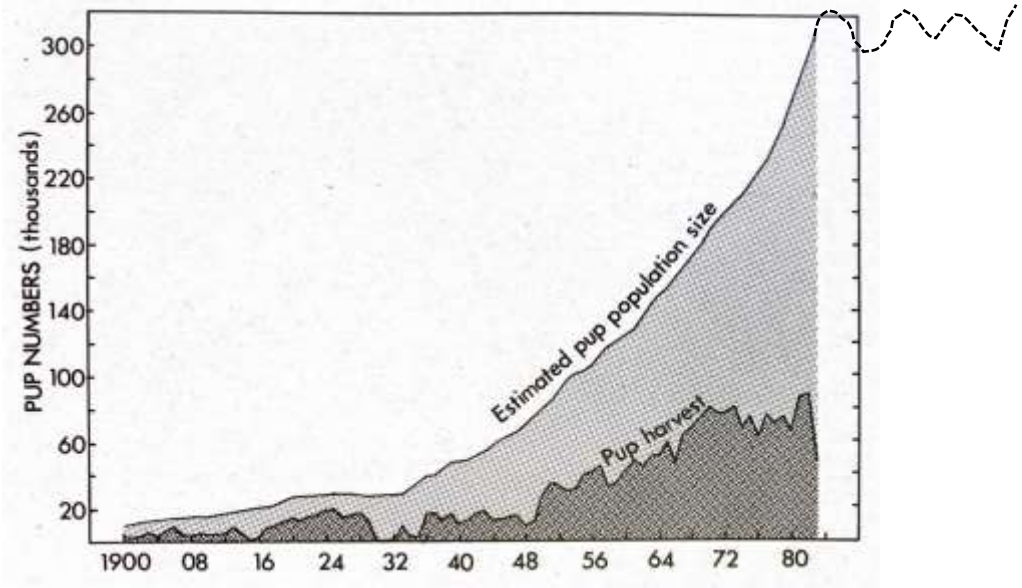
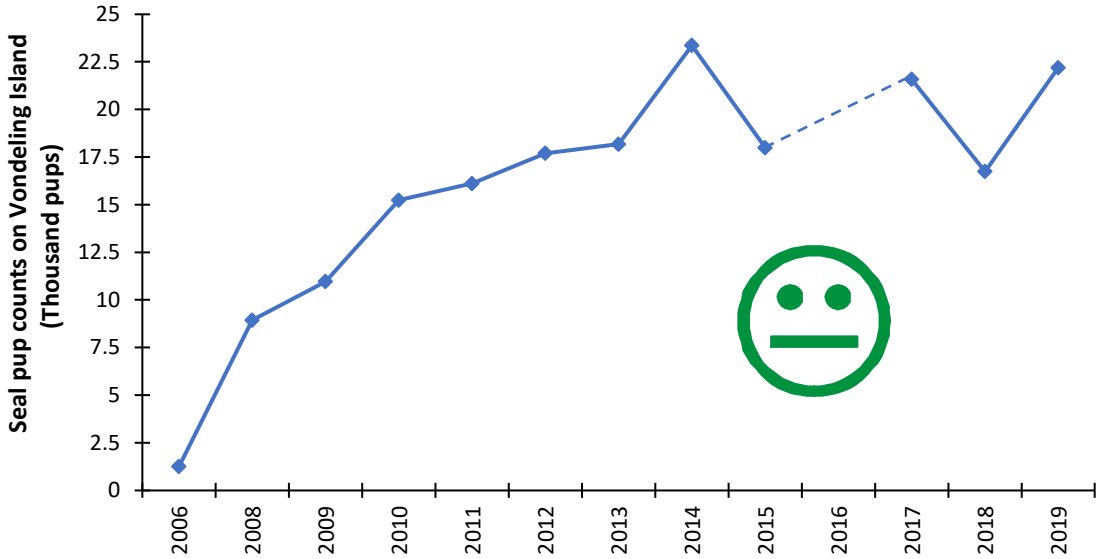
3.8 Cape Fur seals







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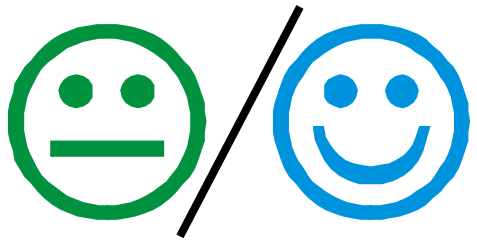
Summary

- Covid-19 pandemic certainly had a marked impact on conditions in Saldanha Bay
- Development, shipping traffic, ore export, mariculture production, visitor numbers, waste water discharge, slowed over this period, but exports of some metal ores seemed unaffected and continued to increase …
- Some interesting (encouraging) responses in the biota (migratory waders in the lagoon, white stumpnose recruitment)
- Overall (longer term), water and sediment quality are improving or at least stable, but oxygen levels in Small Bay are concerning…
- Benthic macrofauna abundance has responded positively to improvements in sediment quality...
- Fish populations overall are highly variable but do seem to be declining, particularly in Small Bay…
- Birds breeding on the islands in the Bay continue to decline, mostly due to lack of food
- Marine aliens are increasing…

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



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Recommendations

- All wastewater discharges must be properly licensed and monitored)
- Reclamation of wastewater must be prioritised
- Coastal management (development setback) lines must be strictly enforced
- Cumulative impacts of future development must be explicitly considered
- Future dredging must be carefully considered and properly mitigated
- Monitoring of shoreline erosion needs to be revived
- Focussed monitoring of alien species
- Bag and size limits for important fish species need to be re-evaluated
- Monitoring and assessment of the overall health of the Bay and the Lagoon must continue

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Thank You

Photo: Steve Benjamin