

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)



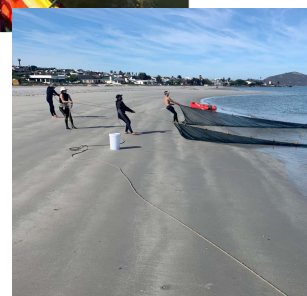
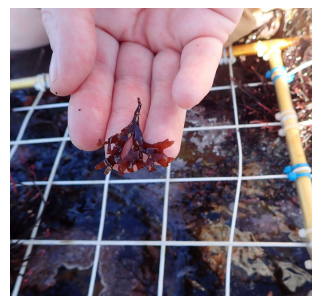
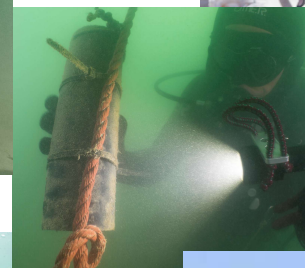
Indicator response times

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







Components of the State of the Bay Monitoring Programme...

1. Summary of **activities and discharges** affecting health of the Bay
2. **Groundwater** ✓
3. Marine **water quality**
4. **Sediment quality**
5. **Coastal erosion**
6. **Aquatic macrophytes** (every two years)
7. **Sediment quality** (every two years)
8. **Soft bottom benthic macrofauna**
9. **Economically important invertebrates** (every two years) ★
10. **Fish** (annual)
11. **Seabirds and shorebirds**
12. **Marine Mammals**
13. **Marine alien species**





| 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. |



TRANSNET



*national ports
authority*





Thanks



Theme.....



Sea birds and shore birds



1. Activities & Discharges

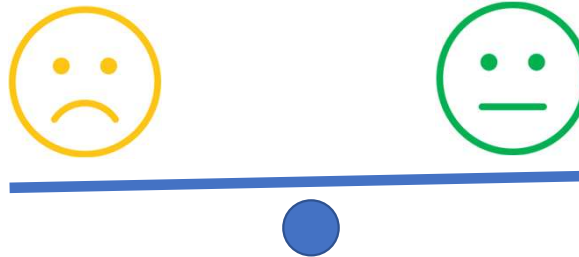
- Development pressure continues to ramp up in the Bay after having stalled for a short period (Global Financial Crisis, Covid)...

Up

- Population (6% p.a.)
- Residential development, storm water runoff
- Ore exports (Manganese)
- Shipping traffic
- New projects (Karpowership, Green hydrogen, RO Plants, LPG/LNG imports, ship repair, in-water hull cleaning, phosphate ore)

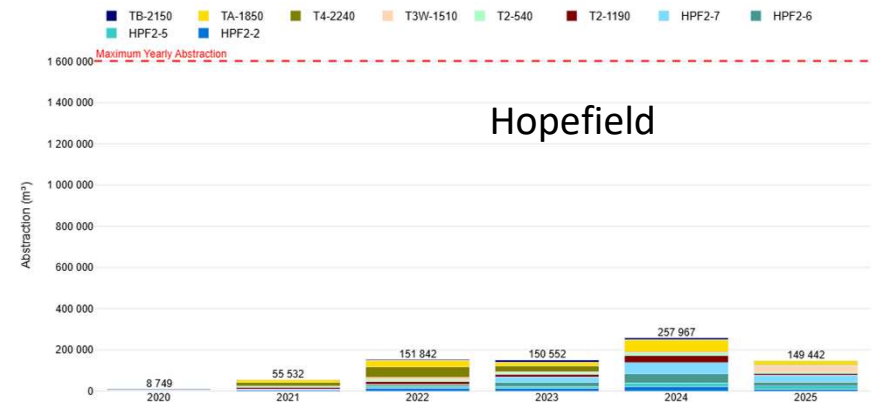
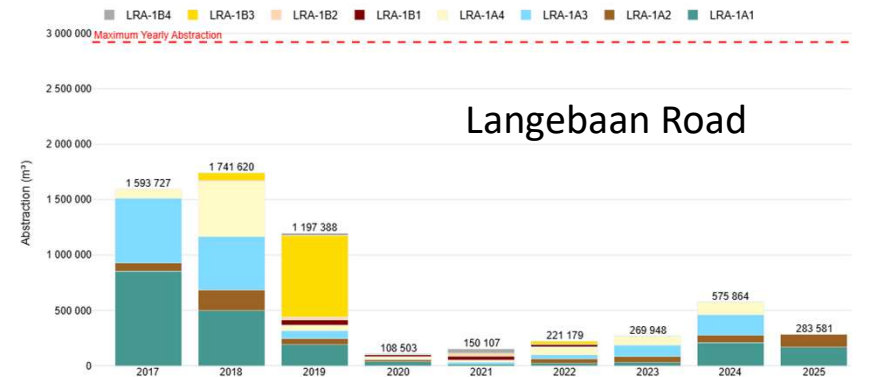
Down

- Visitor numbers
- Ballast water discharges
- Effluent from WWTWs
- Ore exports (Iron ore, Zinc, Lead, Copper)
- Mariculture production (mussels & oysters)



2. Groundwater

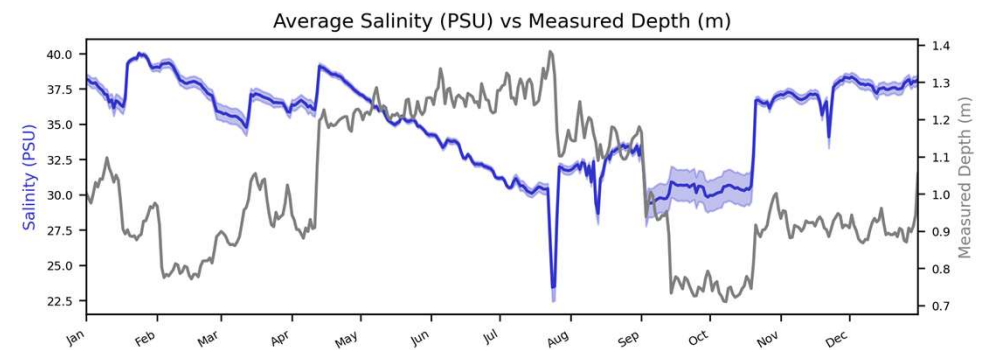
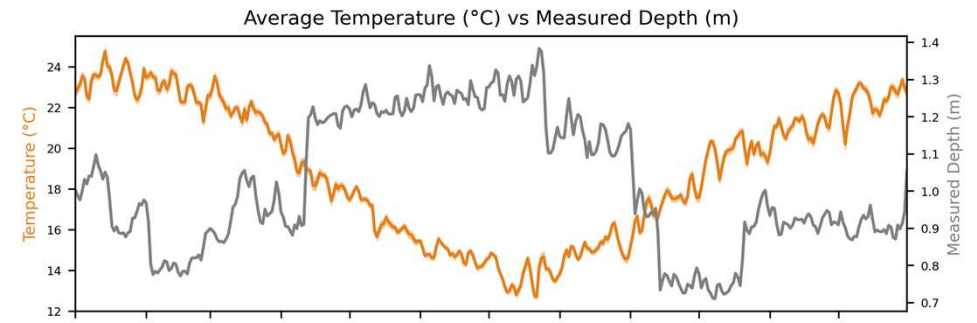
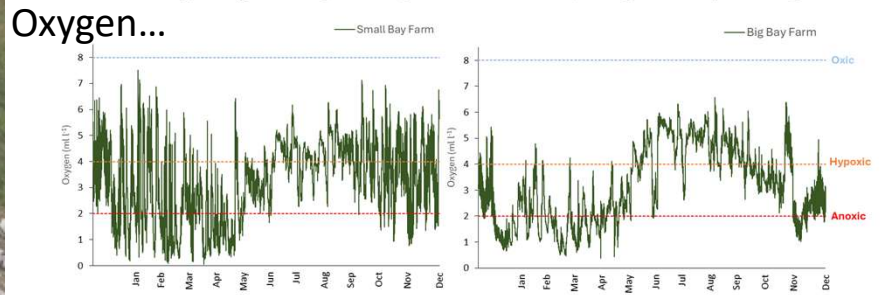
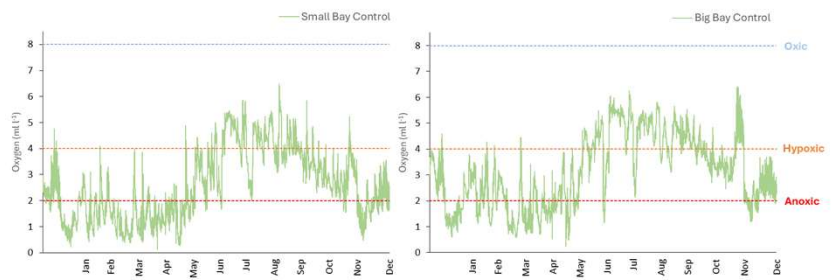
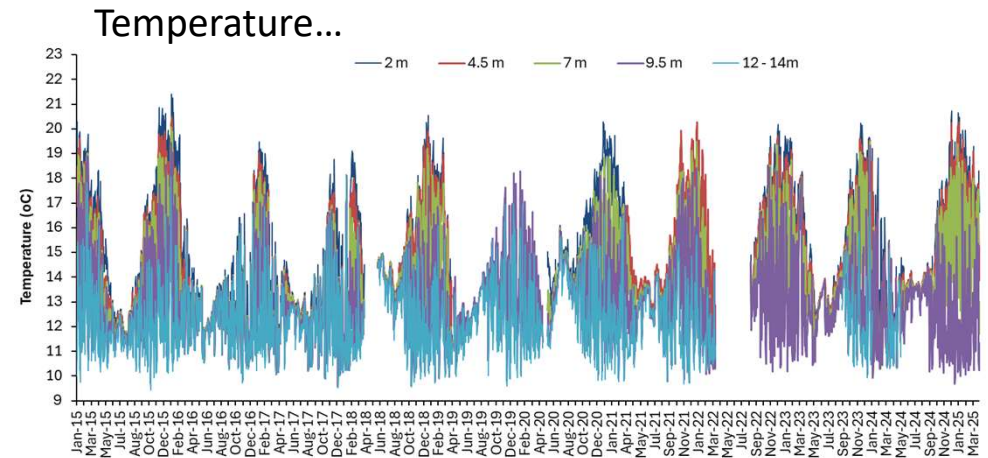
- Very important water resource in Saldanha Bay
- Historically – lots of uncertainty around GW dynamics
- Main uses:
 - Agricultural sector (1.5 Mm³/a),
 - SBM - Langebaan Road Aquifer Wellfield (2.9 Mm³/a) and Hopefield Wellfield (1.6 Mm³/a),
 - Elandsfontein Mine (reinjection only)
- Use was high during the drought (2017-2019), modest since then but is increasing steadily...
- Groundwater levels are stable



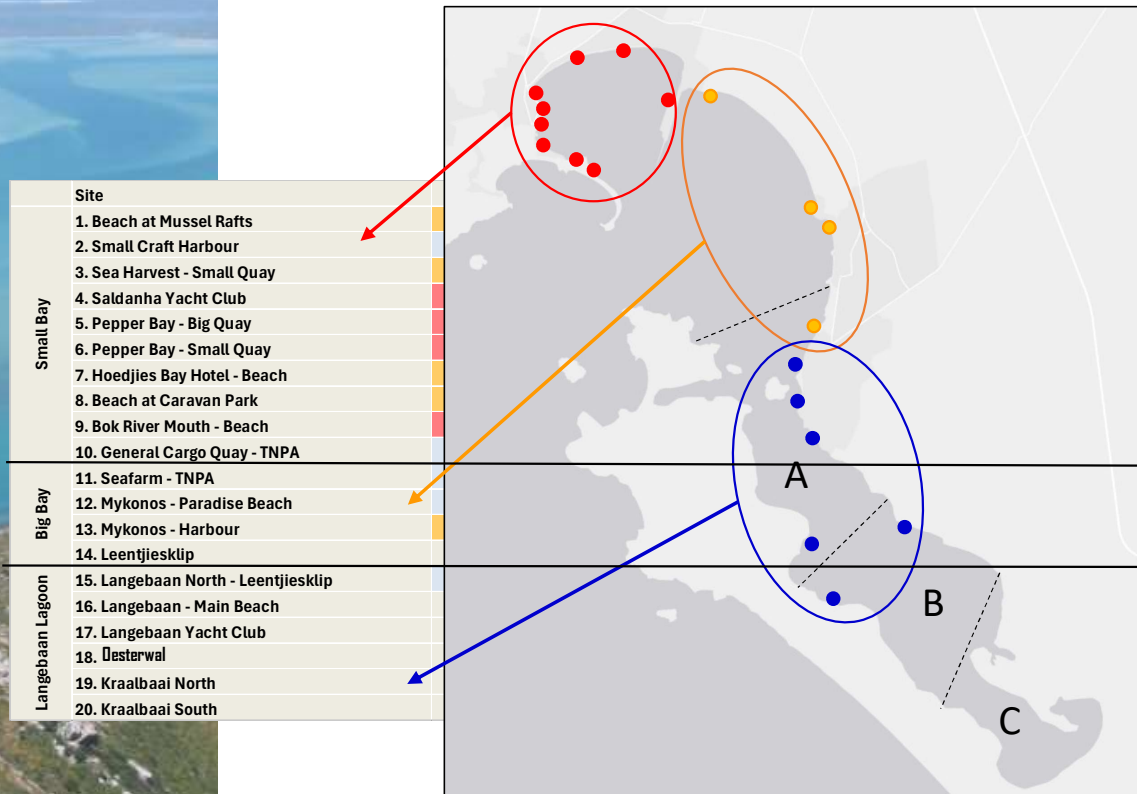


3. Water quality

- Amazing long-term dataset on water temperature in Small Bay
- Long-term data set on water temperature and salinity in Langebaan Lagoon (Elandsfontein)
- Long-term trends in dissolved oxygen (DFFE ADZ Monitoring programme)



Faecal coliforms (recreational limits)

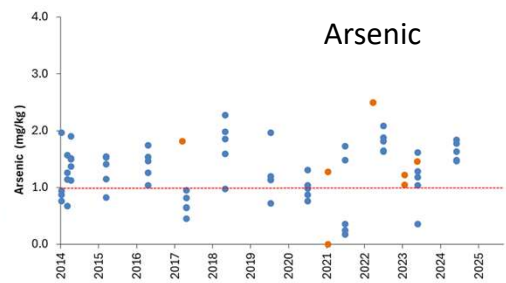
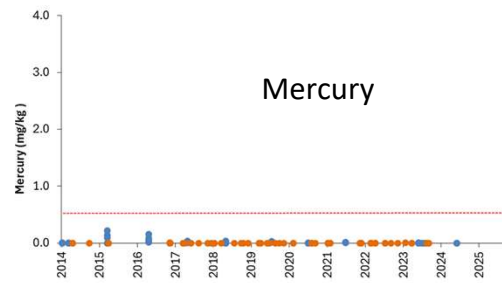
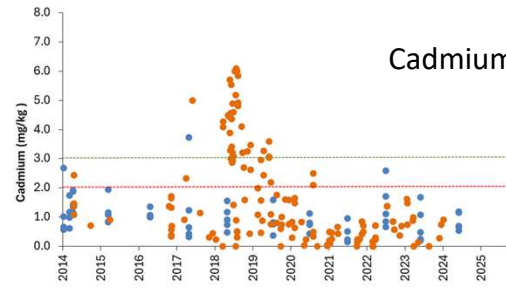
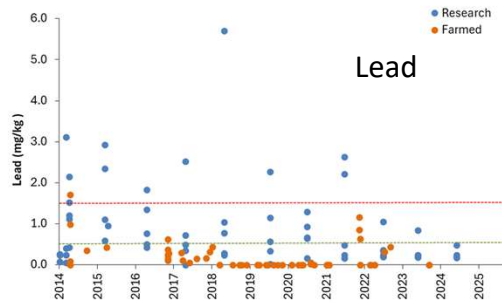


| Site | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
|-------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1. Beach at Mussel Rafts | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Fair | ND | Ex. | Ex. | Ex. | Ex. |
| 2. Small Craft Harbour | Ex. | Good | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Fair | Ex. | Ex. | Ex. | Ex. |
| 3. Sea Harvest - Small Quay | Fair | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Fair | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. |
| 4. Saldanha Yacht Club | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Fair | Ex. | Ex. | Ex. | Ex. |
| 5. Pepper Bay - Big Quay | Ex. | Good | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Poor | Good | Ex. | Ex. | Ex. | Ex. |
| 6. Pepper Bay - Small Quay | Good | Ex. | Good | Fair | Fair | Ex. | Ex. | Ex. | Ex. | ND | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. |
| 7. Hoedjies Bay Hotel - Beach | Fair | Poor | Poor | Fair | Good | Fair | Good | Fair | Poor | Poor | Poor | Poor | Poor | Poor | Poor | Ex. |
| 8. Beach at Caravan Park | Fair | Fair | Poor | Good | Fair | Ex. | Fair | Fair | Fair | Fair | Fair | Ex. | Good | Fair | Ex. | Ex. |
| 9. Bok River Mouth - Beach | Good | Ex. | Poor | Fair | Good | Ex. | Poor | Poor | Fair | Fair | Good | Poor | Poor | Poor | Poor | Poor |
| 10. General Cargo Quay - TNPA | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Fair | Ex. | Ex. |
| 11. Seafarm - TNPA | ND | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Good | Ex. | Ex. | Ex. |
| 12. Mykonos - Paradise Beach | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Fair | Ex. | Ex. | Good | Ex. | Ex. |
| 13. Mykonos - Harbour | Fair | Ex. | Ex. | Ex. | Good | Fair | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Fair | Ex. | Ex. |
| 14. Leentjiesklip | Ex. | Fair | Fair | Ex. | Good | Ex. | Ex. | Ex. | ND | Ex. | Ex. | Ex. | Ex. | Fair | Ex. | Fair |
| 15. Langebaan North - Leentjiesklip | Ex. | Poor | Good | Ex. | Good | Ex. | Good | Ex. | ND | Ex. | Fair | Ex. | Ex. | Fair | Ex. | Ex. |
| 16. Langebaan - Main Beach | Ex. | Ex. | Ex. | Ex. | Ex. | Fair | Ex. | Ex. | ND | Ex. | Good | Ex. | Ex. | Fair | Ex. | Poor |
| 17. Langebaan Yacht Club | Ex. | Ex. | Good | Ex. | Ex. | Fair | Good | ND | Ex. | Ex. | Ex. | Ex. | Ex. | Fair | Ex. | Ex. |
| 18. Oesterwal | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | ND | Ex. | Ex. | Ex. | Ex. | Ex. | Good | Ex. | Fair |
| 19. Kraalbaai North | ND | ND | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | ND | Fair | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. |
| 20. Kraalbaai South | ND | ND | Ex. | Ex. | Ex. | Ex. | Ex. | Ex. | ND | Ex. | Fair | Ex. | Ex. | Ex. | Ex. | Ex. |

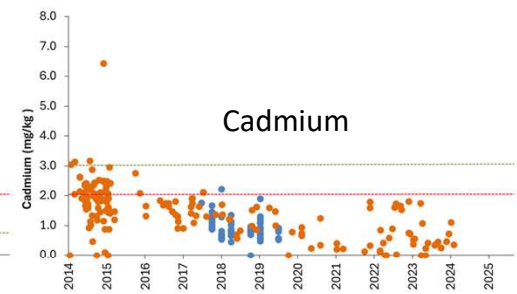
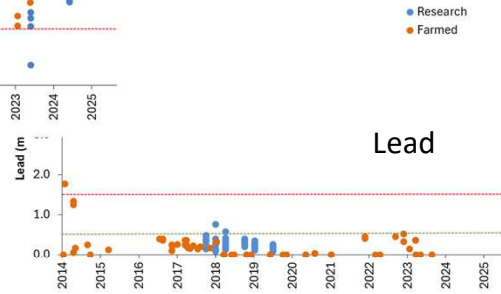




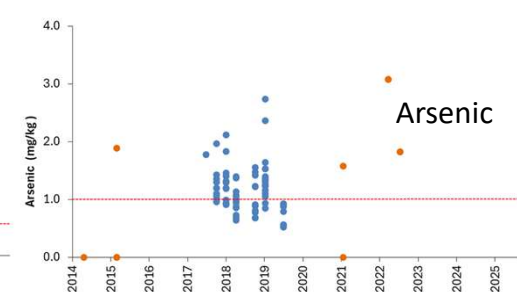
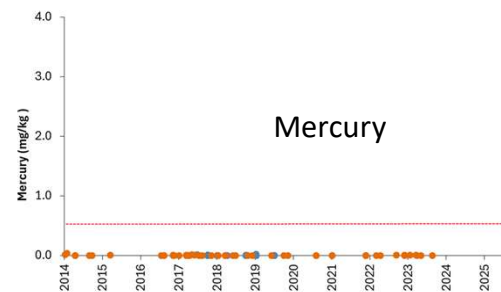
Trace metal in culture bivalves in Saldanha Bay



Oysters (farmed)

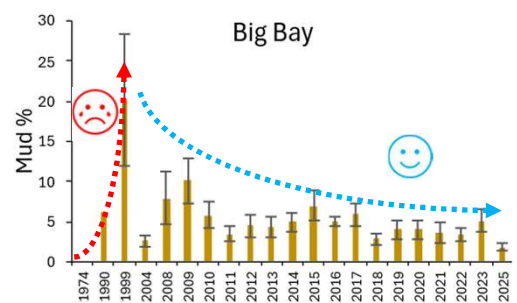
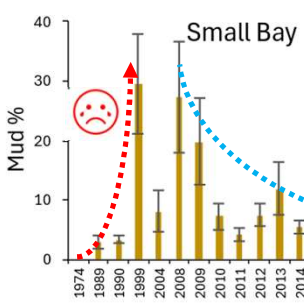
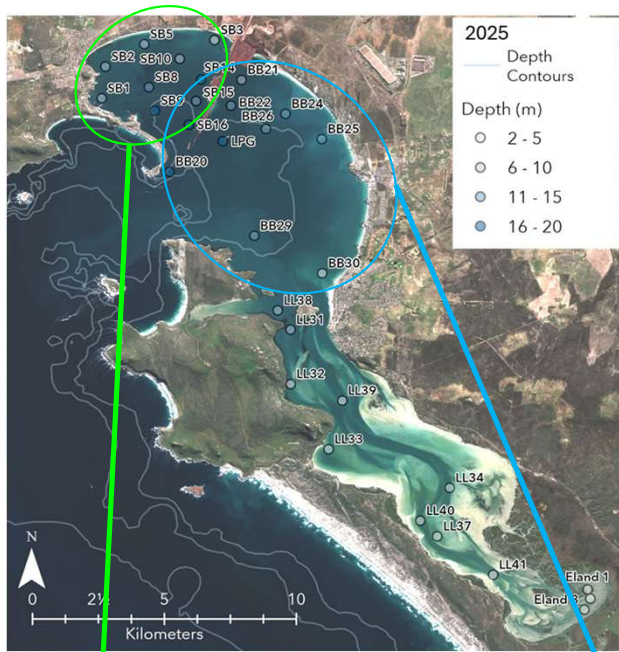


Mussels (farmed)

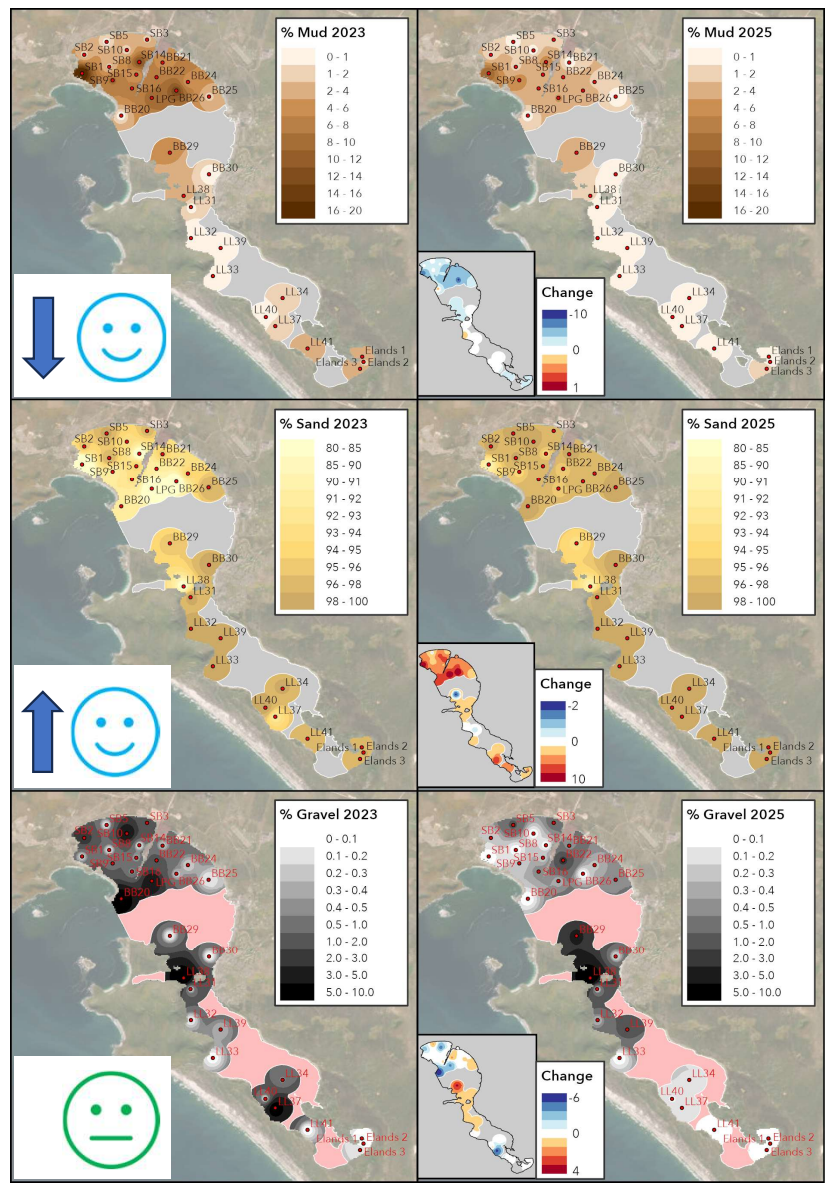


Data from DFFE

4. Sediment quality

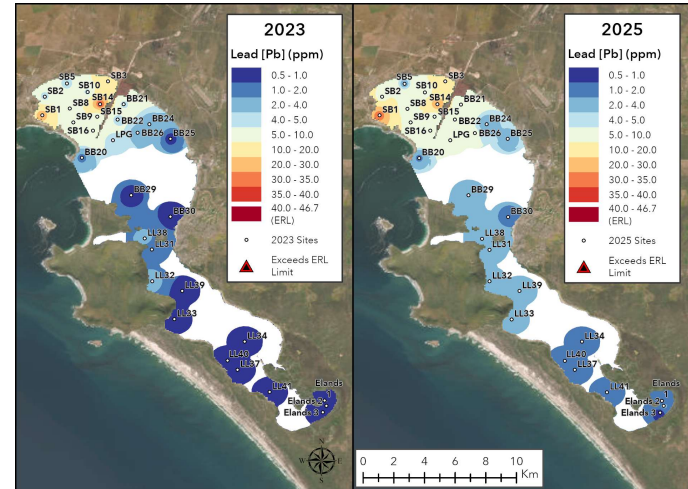
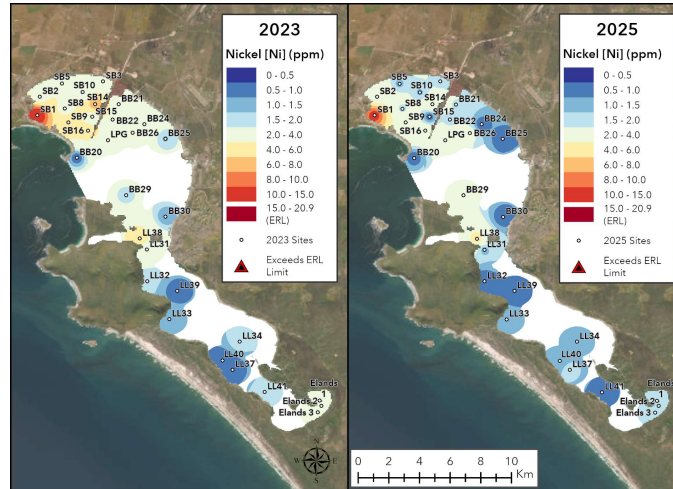
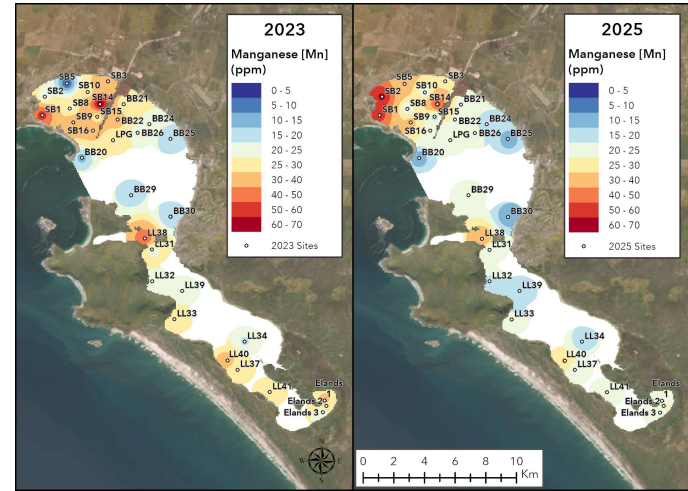
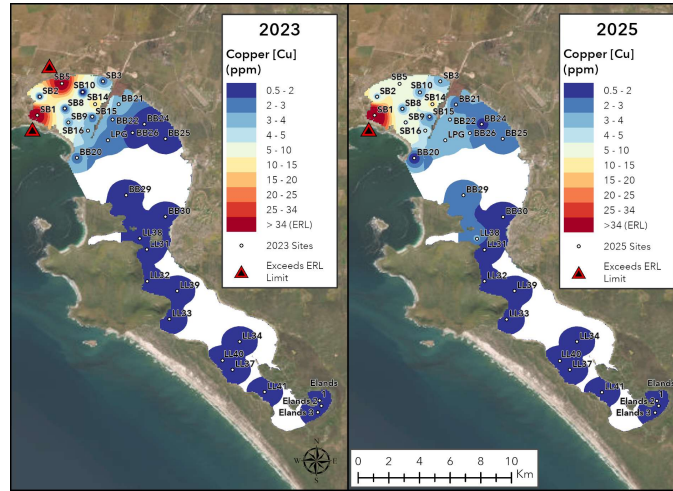


% Mud



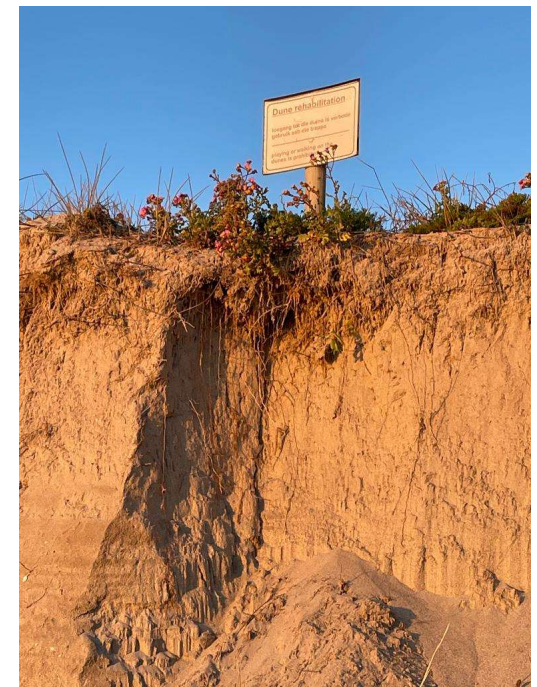
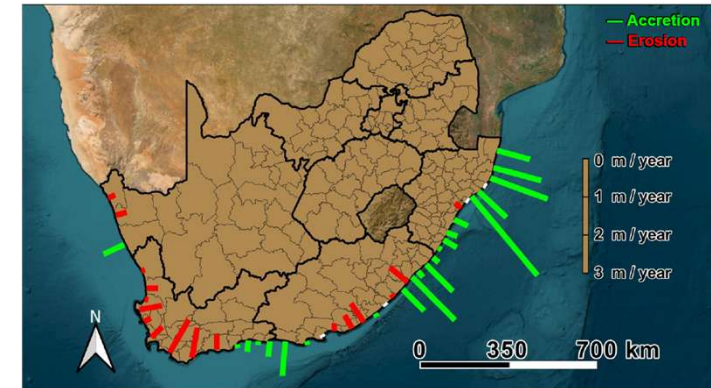
Trace metal enrichment in sediments...

Trace metals
in sediment...

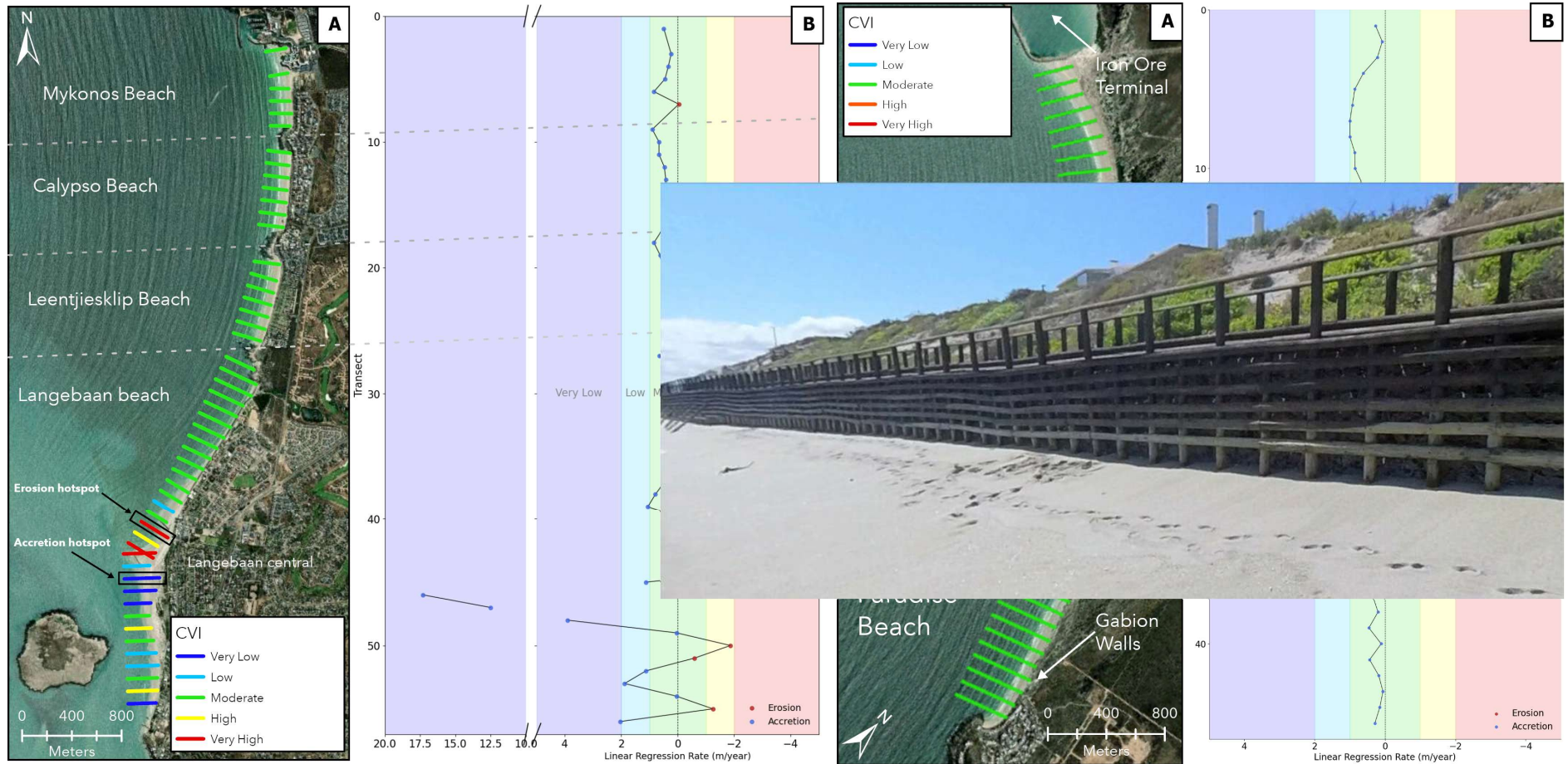


5. Coastal erosion

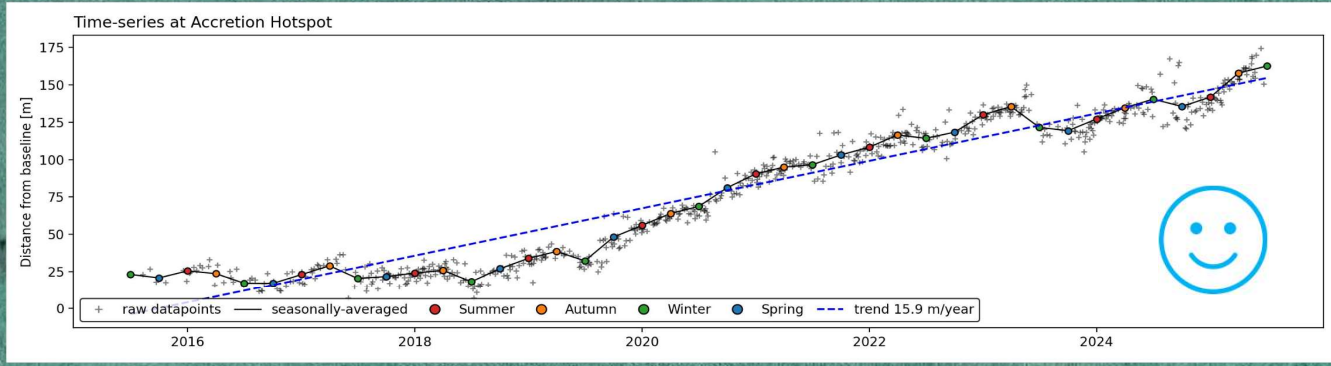
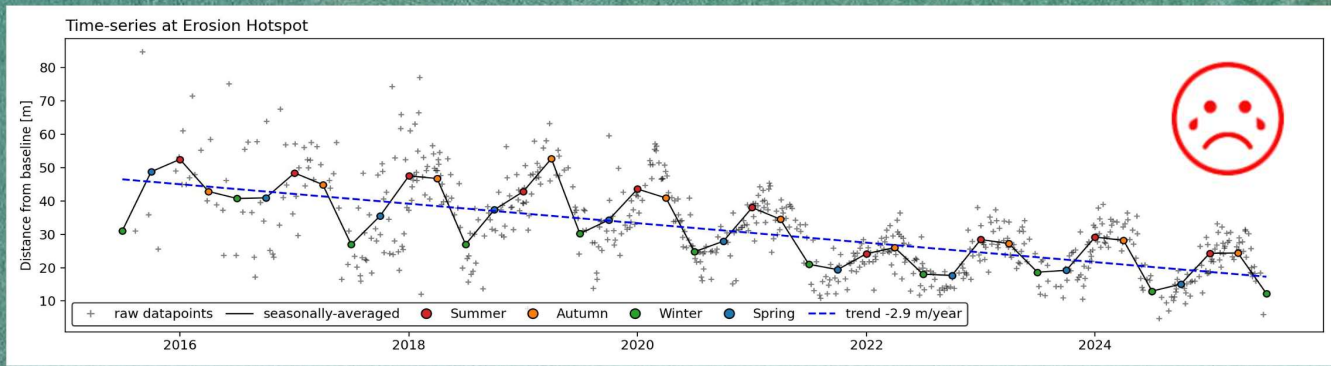
- One of the most significant threats to coastal populations and infrastructure around the world
- Approximately 3 billion people — about half of the world's population — live within 200 kilometers of a coastline
- Coastal erosion is a major problem in Saldanha Bay, particularly around the town of Langebaan but also in Big Bay between Spreeuwalle and the entrance to the Lagoon
- Losses of over 100 m of beach have occurred in some areas since 1960, up to 40 m of shoreline lost in just the last decade!
- Main drivers of coastal erosion include (1) climate variability (climate change), and (2) (inappropriate) development in the coastal zone (port development, dredging, piers and groynes, dredge spoil disposal)



Coastal Vulnerability Index (CVI) – Langebaan-Mykonos

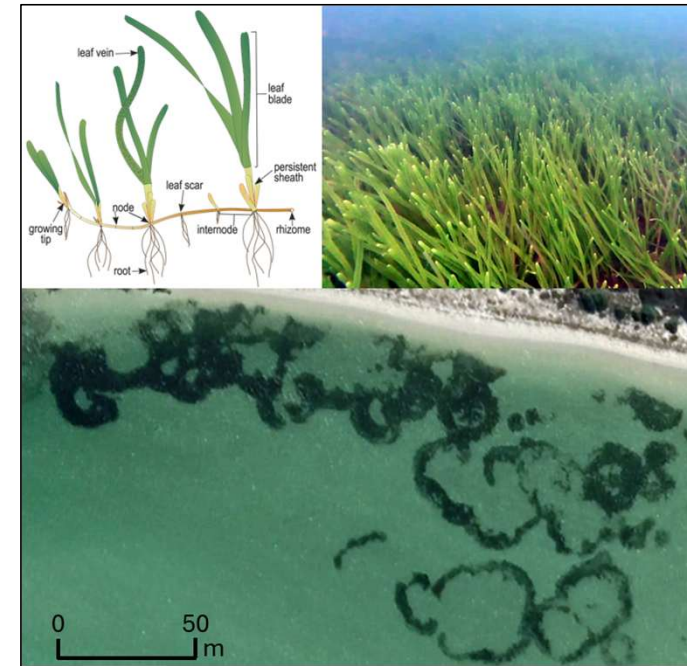


Accretion/Erosion at Langebaan Beach

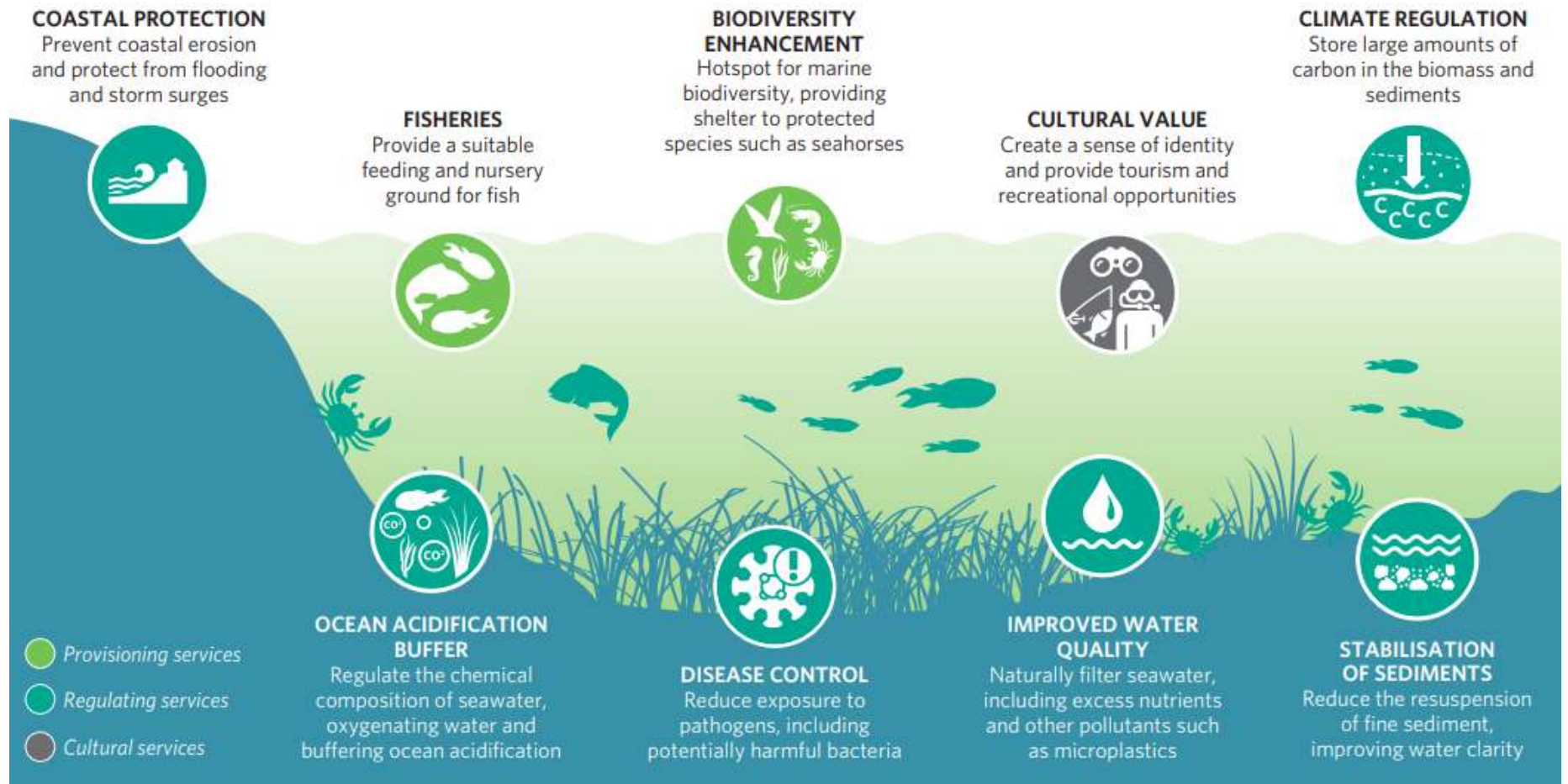


5. Aquatic macrophytes

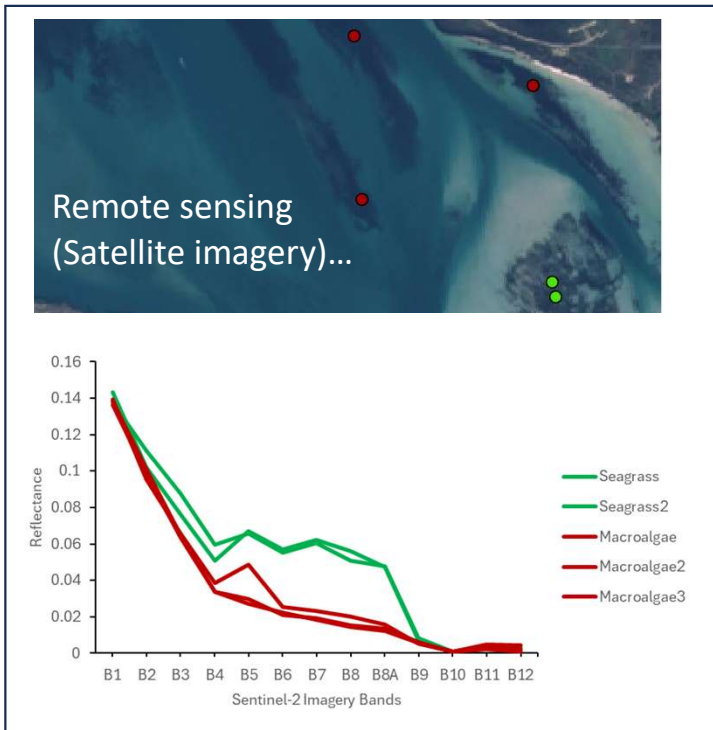
- Large aquatic plants that grow in or near water
- Seagrass (*Zostera capensis*), salt marsh (*Spartina maritima*, *Sarcocornia perennis*), reed & sedges (*Phragmites australis*, *Typha capensis*)
- Salt tolerant but heavily dependent on groundwater inflows)



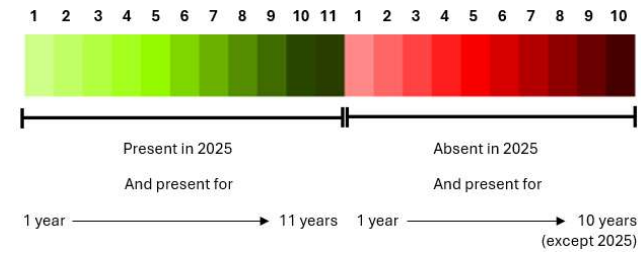
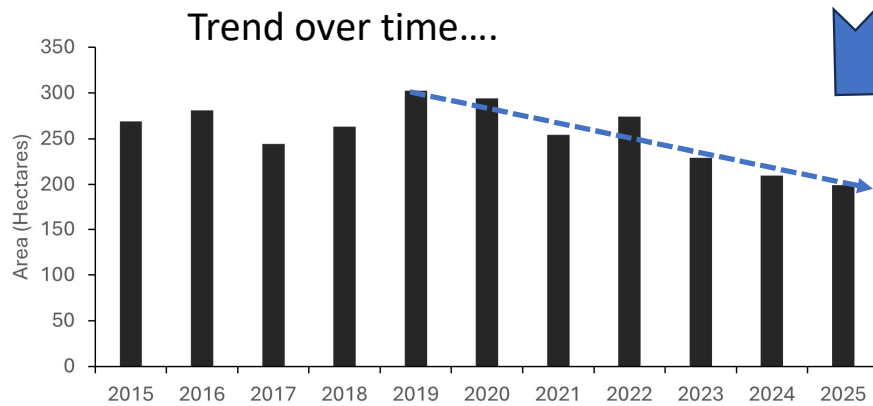
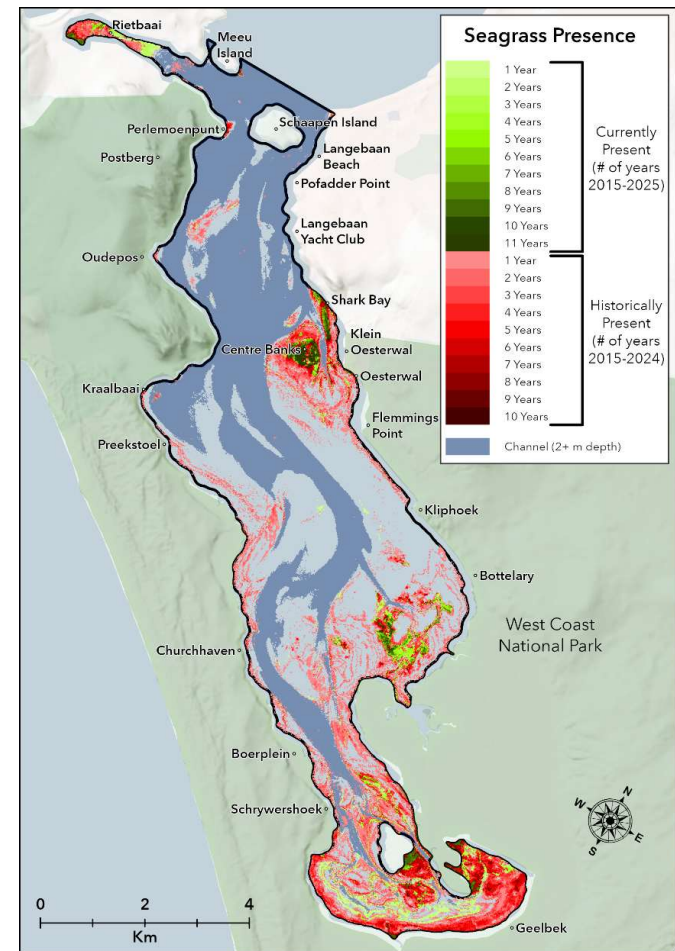
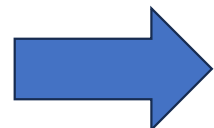
Importance of aquatic macrophytes...



Source: Gamble *et al.* (2021)

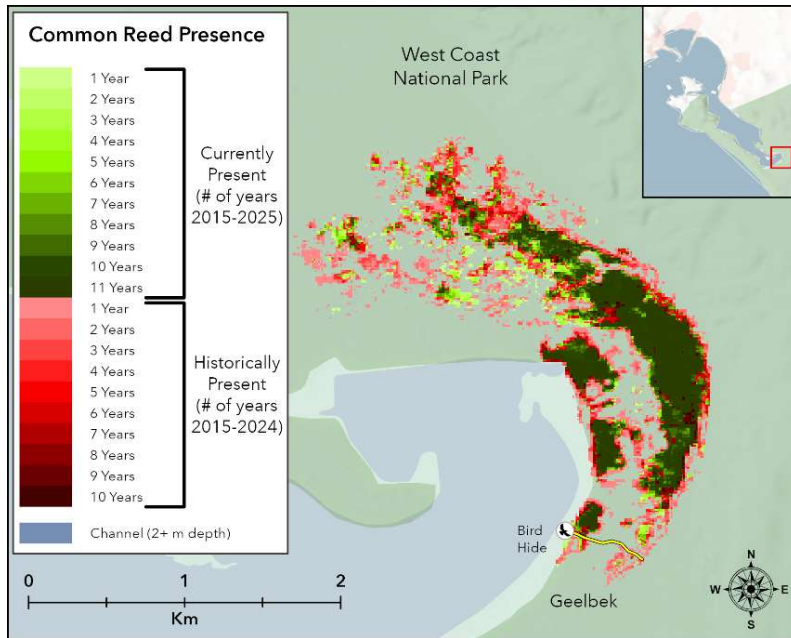
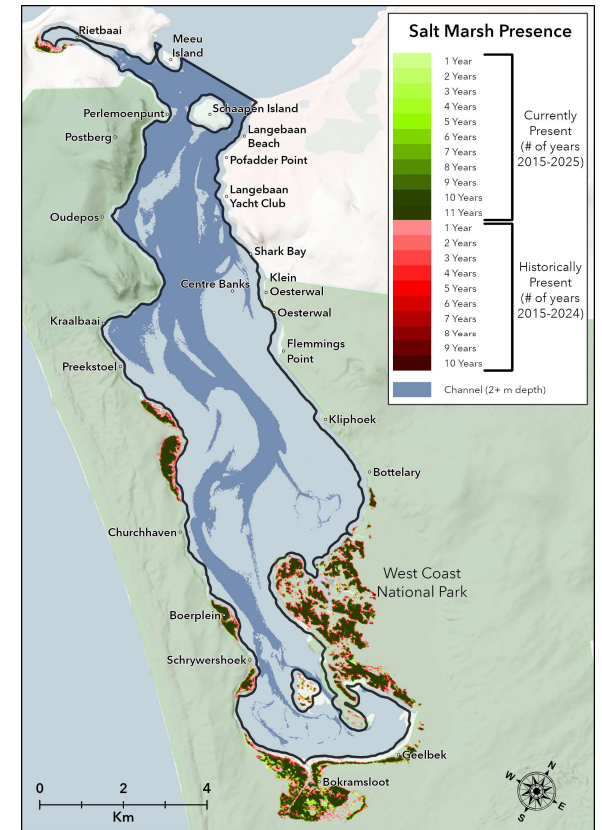
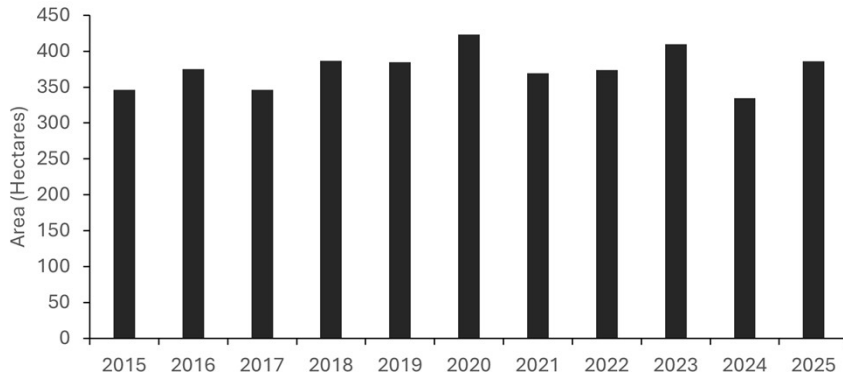


Seagrass....

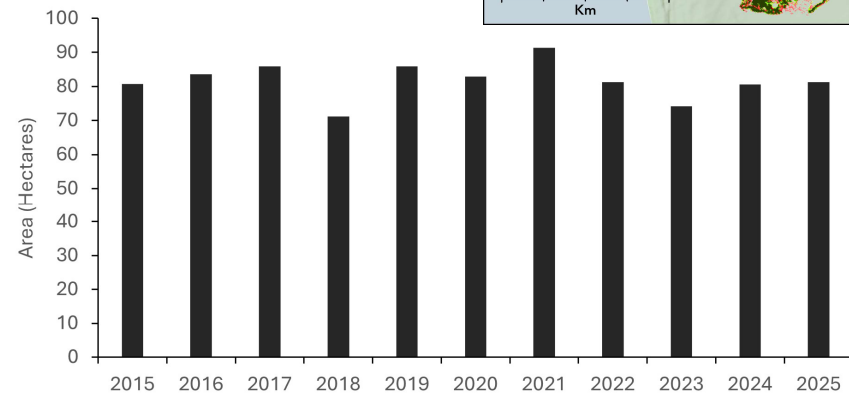




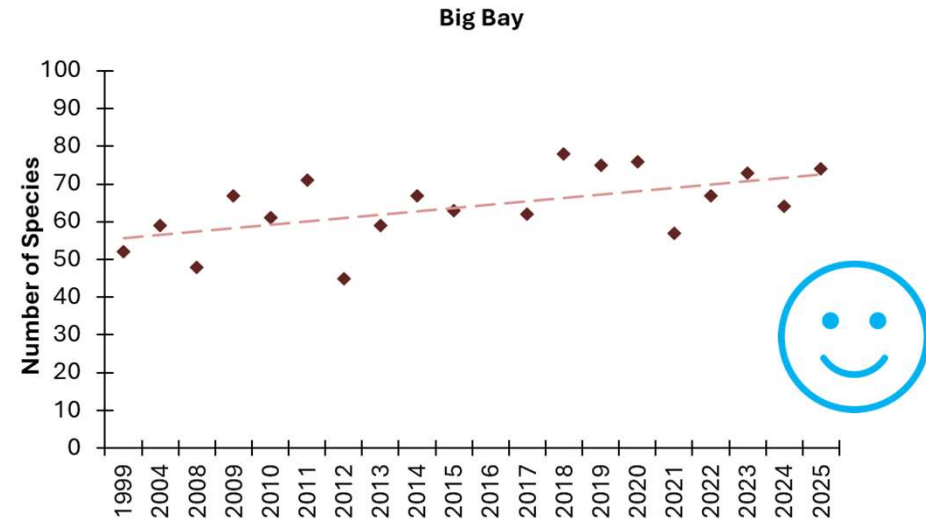
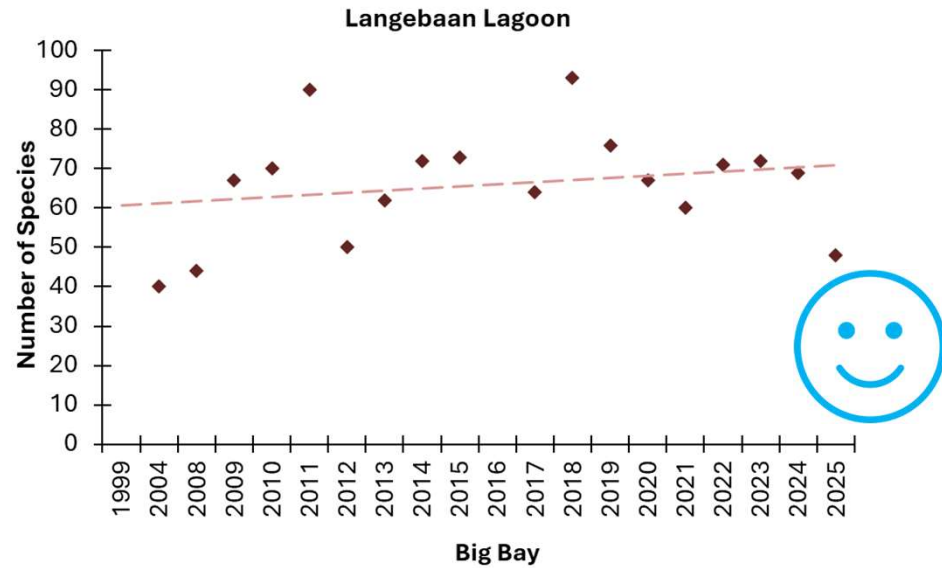
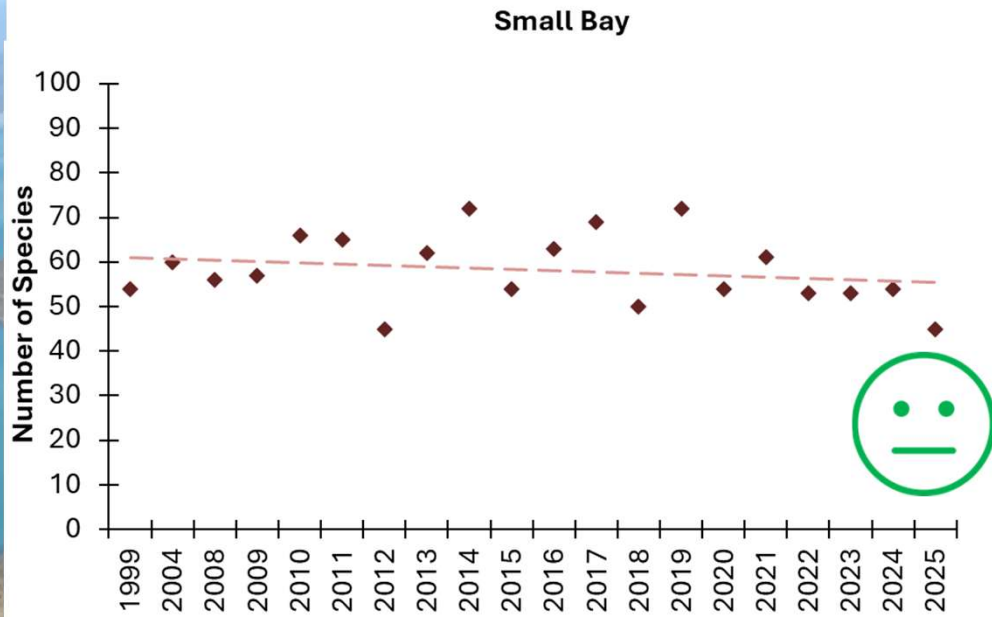
Salt marsh....



Reeds and sedges....



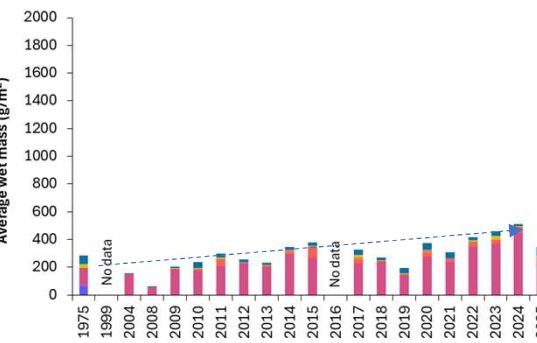
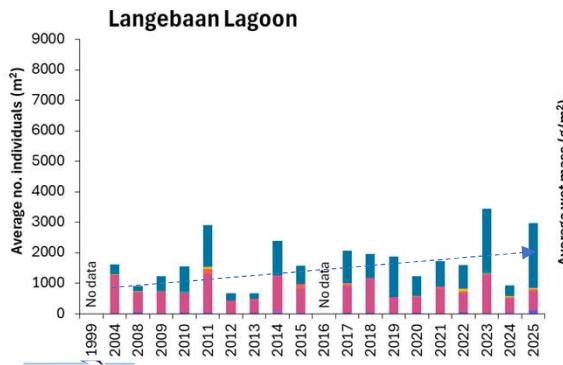
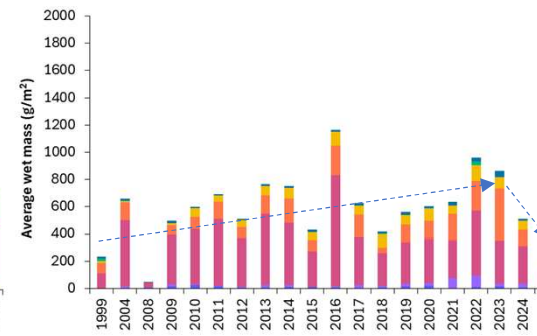
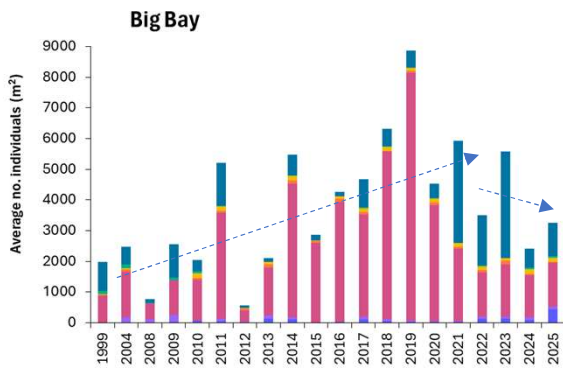
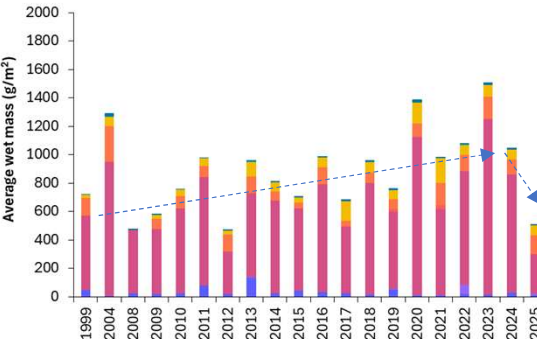
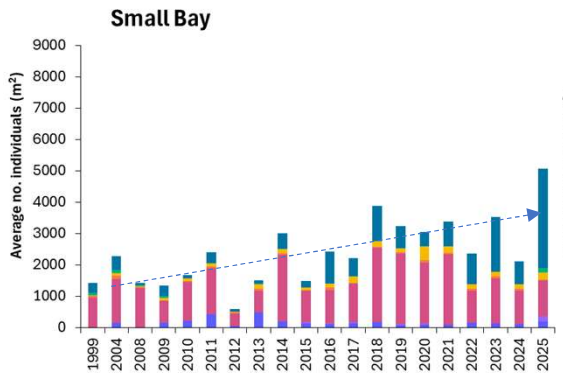
7. Soft bottom benthic macrofauna





ABUNDANCE

BIOMASS



Taxonomic Group

- Polychaeta
- Other
- Nemertea
- Gastropoda
- Echiuroidea
- Echinodermata
- Crustacea
- Cnidaria
- Bivalvia

Water Quality Trust

8. Economically important invertebrates: Abalone and west coast rock lobster

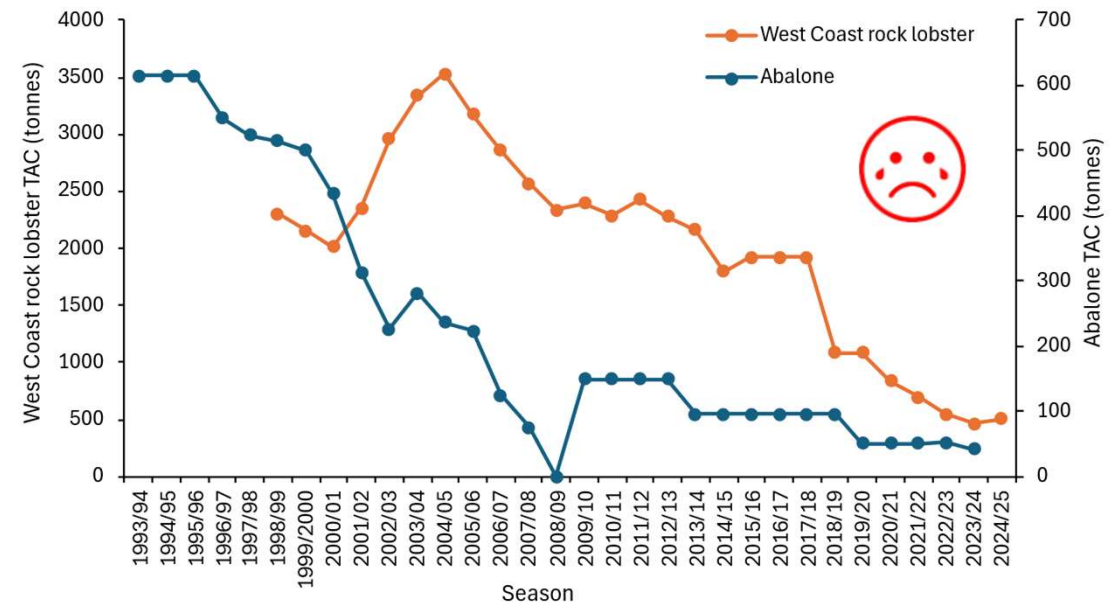
- **Abalone (perlemoen)**

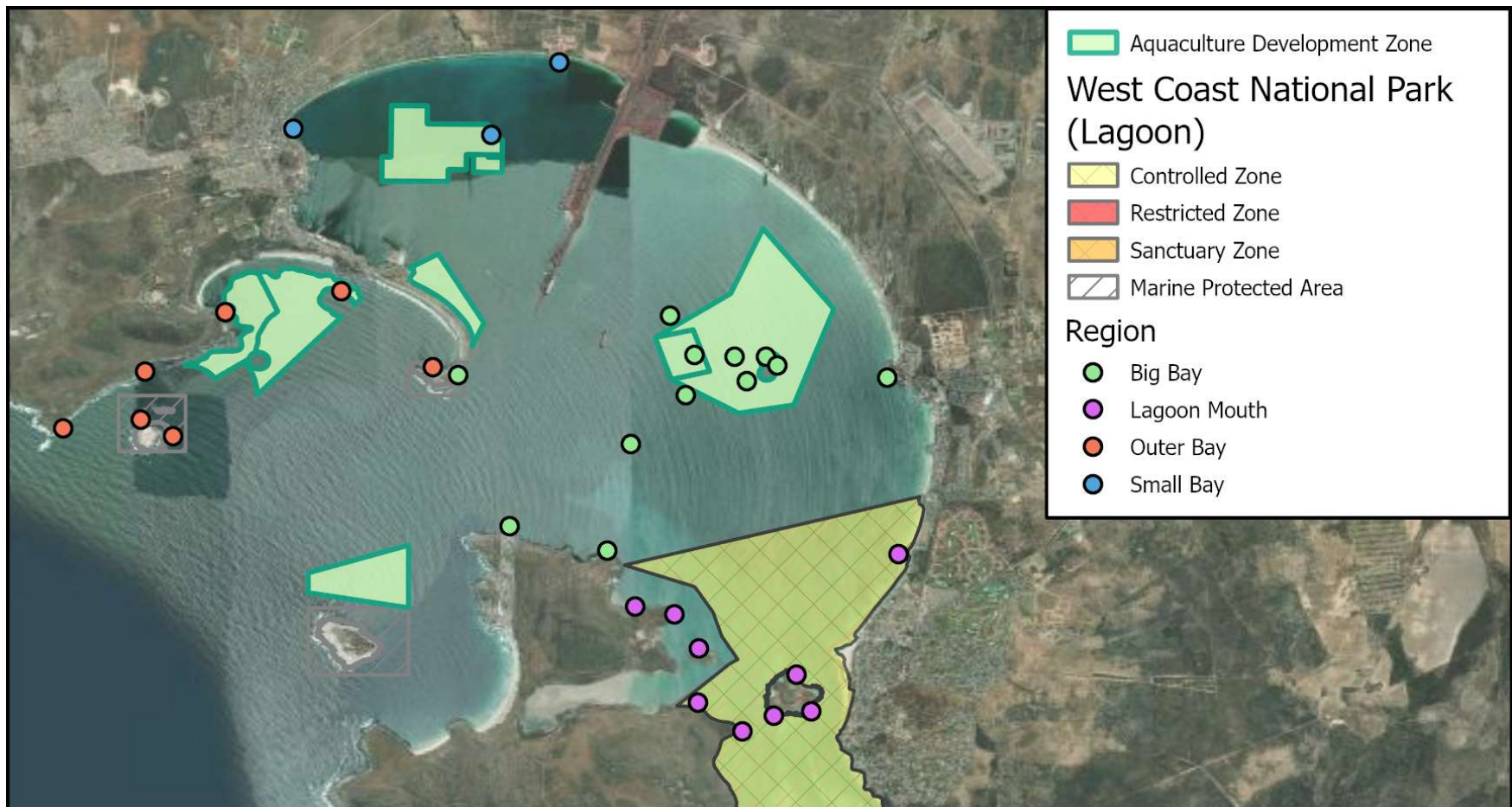
- Found on rock reefs 5-20 m between St Helena Bay and Port St Johns
- Feed on kelp
- Reach sexual maturity after 7 years and minimum legal size (114 mm shell width) after 8-9 years, live for up to 30 years
- Stocks of this species have been reduced to <1% of pristine due to overfishing, species is now classified as “endangered”



- **West coast rock lobster (crayfish)**

- Rocky reefs between Walvis Bay in Namibia to Port Elizabeth
- Feed on urchins, abalone, mussels and barnacles
- Males reach sexual maturity after 7 years and females after 15 years (50-70 mm carapace length), live for up to 40 years
- Stocks of this species have been reduced to ~1.2% of pristine due to overfishing

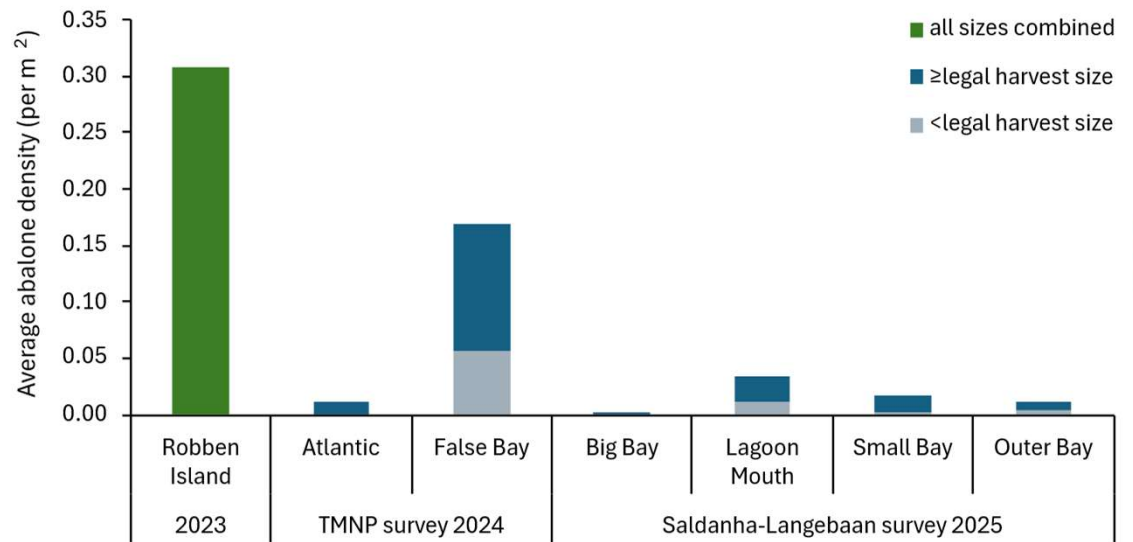




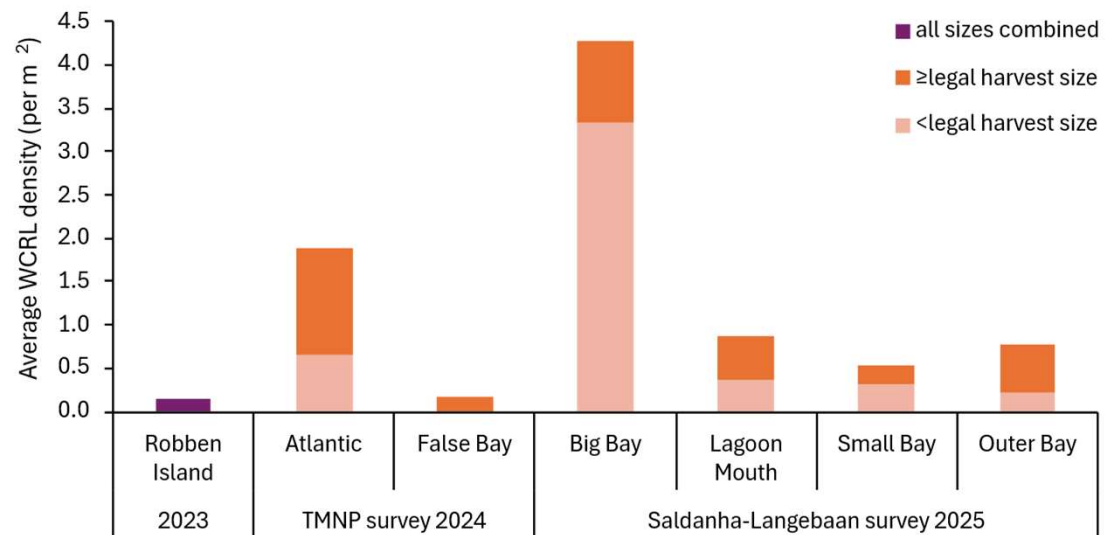
- Dive surveys at 31 sites (Big Bay: 12, Outer Bay: 7, Langebaan Lagoon: 9, Small Bay: 3)
- 6 x 10 m long transects surveyed at each site (60 m²)



Abalone

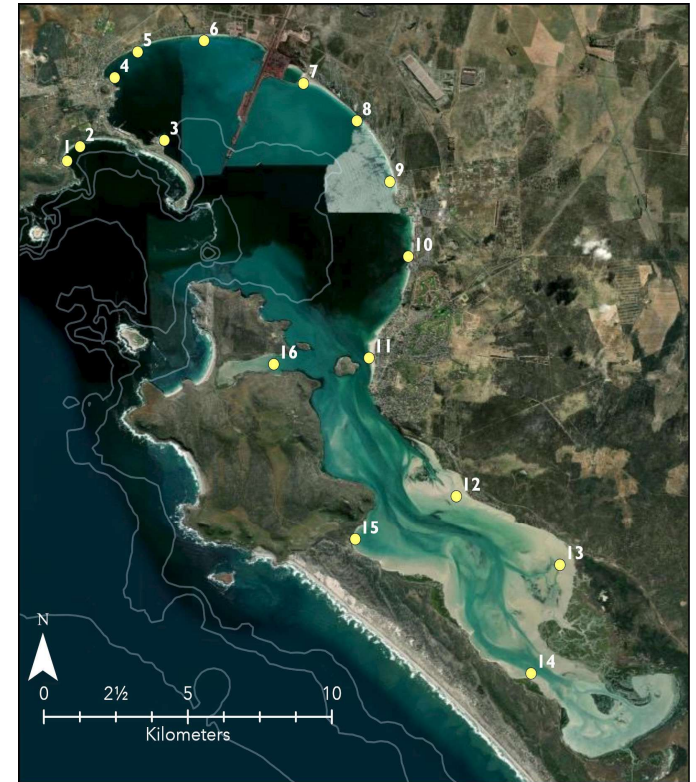
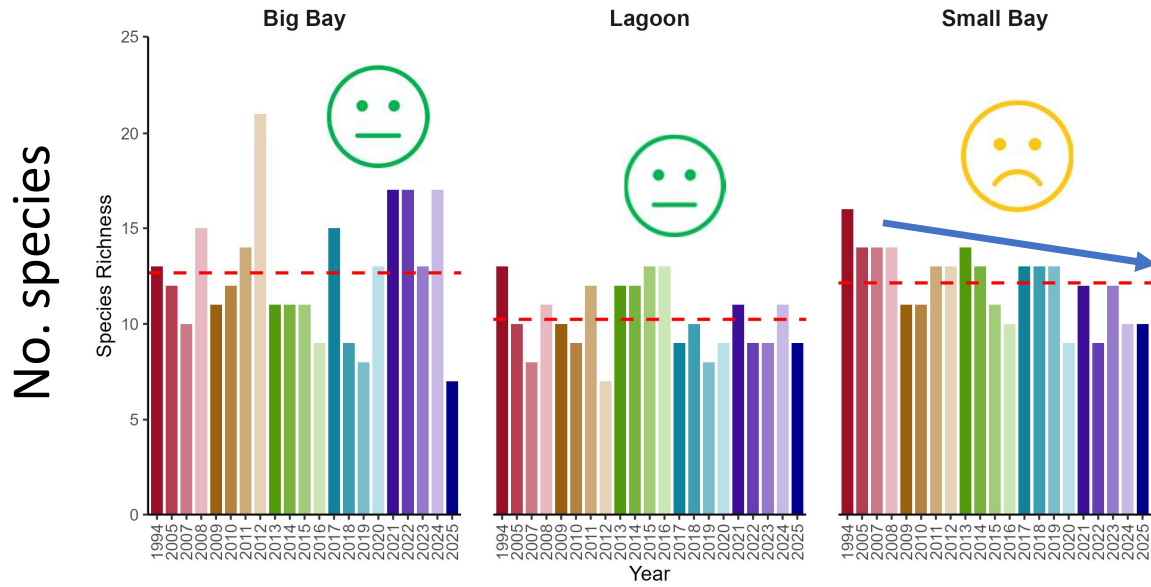


Rock lobster





9. Fish

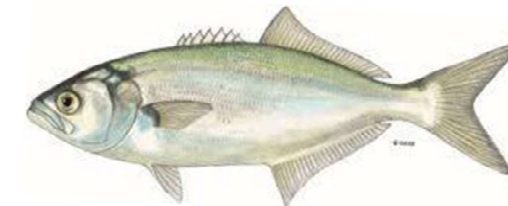




Sand shark



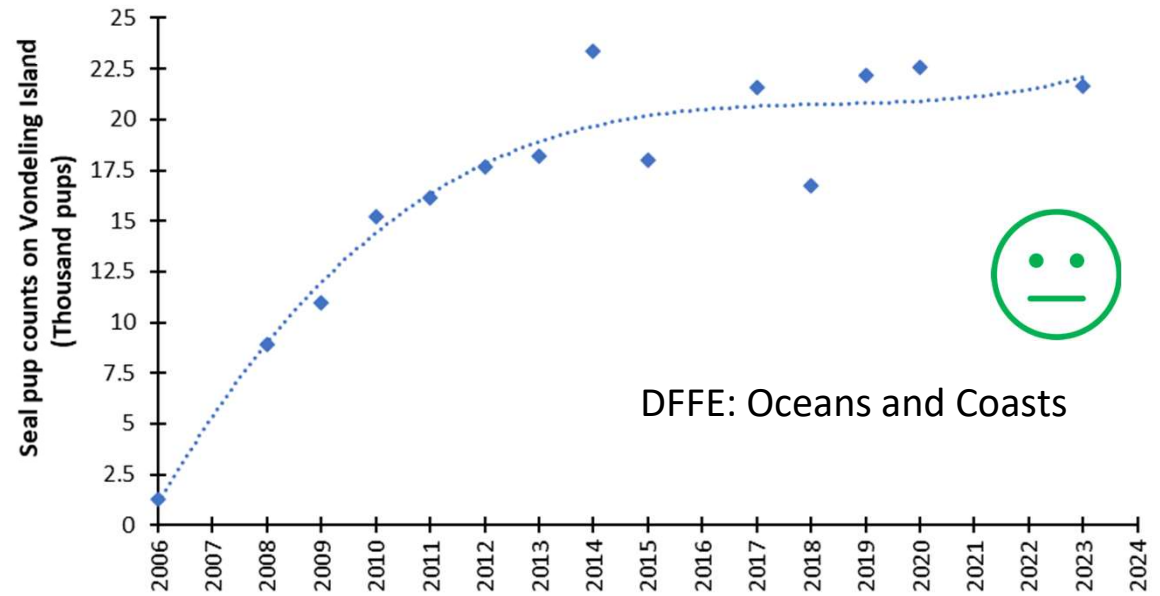
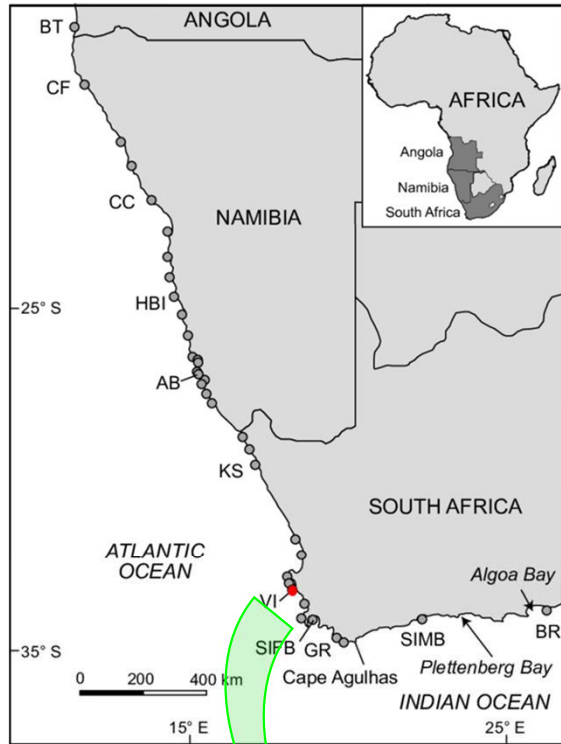
Elf White stumpnose

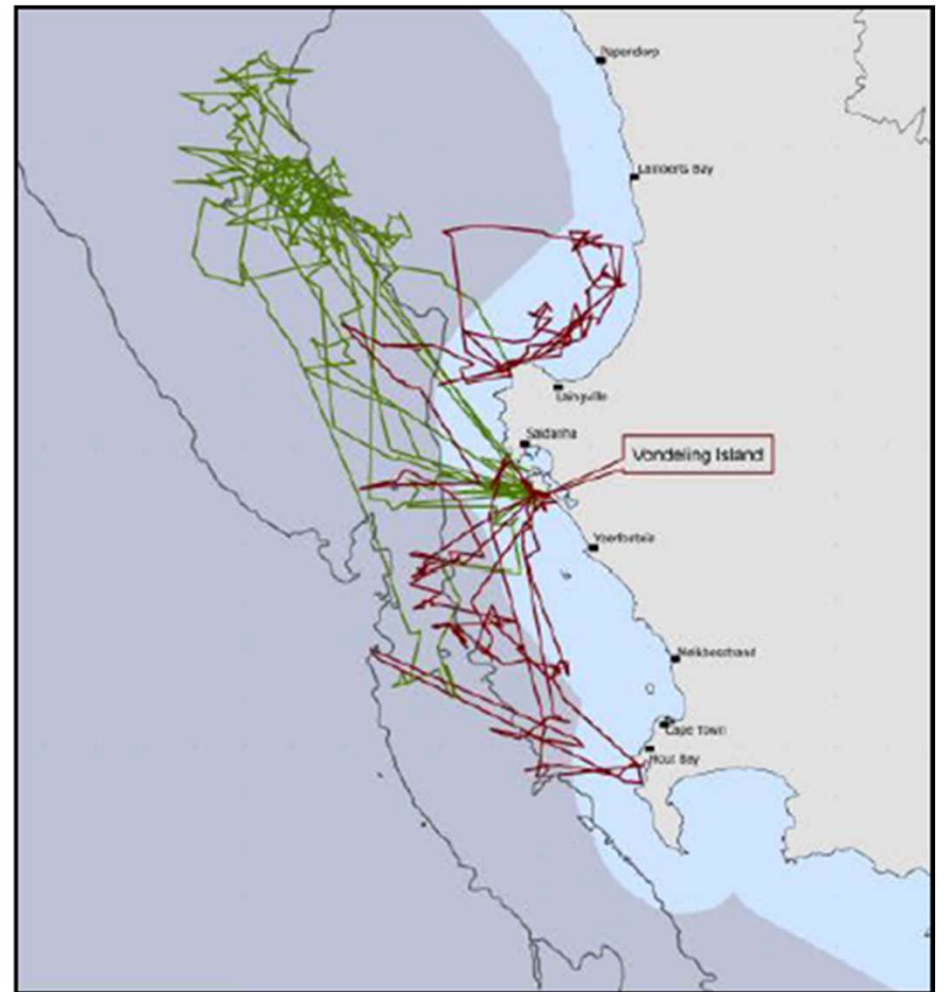
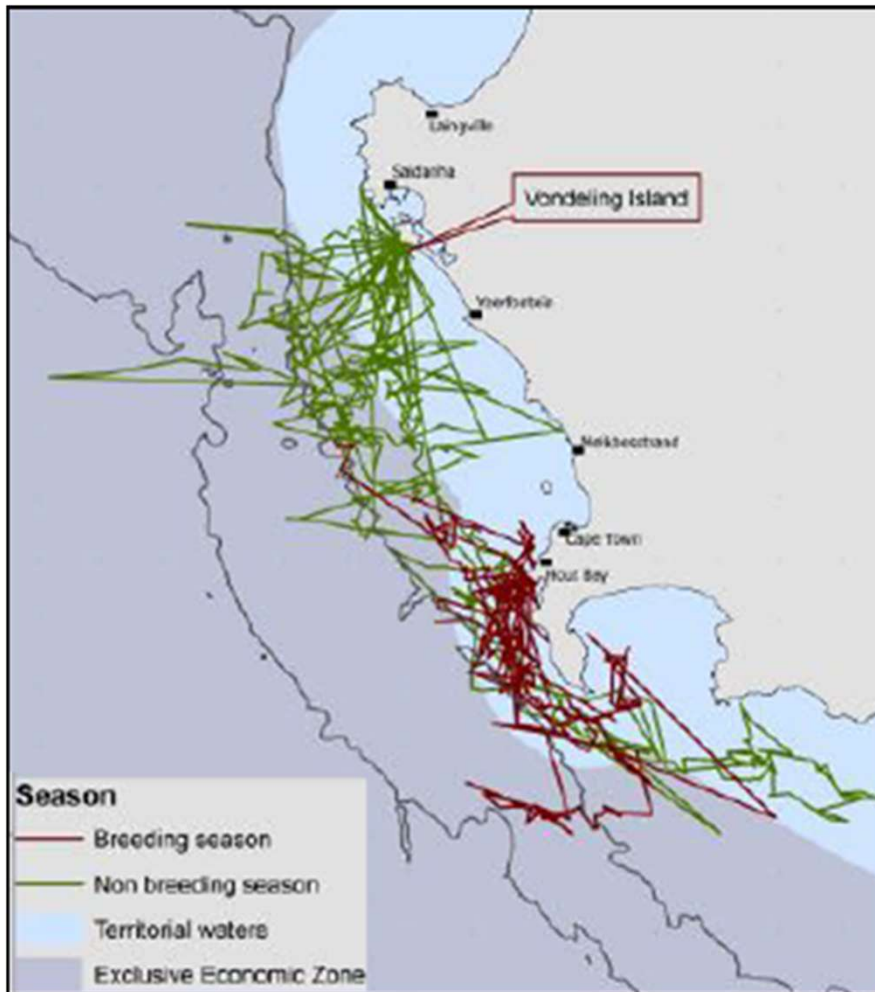


Average no. fish/haul

| | | | | |
|---------|-----------|-------------|--------------|---------------|
| 0 | ≥1 - <10 | ≥50 - <100 | ≥250 - <500 | ≥1000 - <3000 |
| >0 - <1 | ≥10 - <50 | ≥100 - <250 | ≥500 - <1000 | ≥3000 |

10. Cape Fur seals

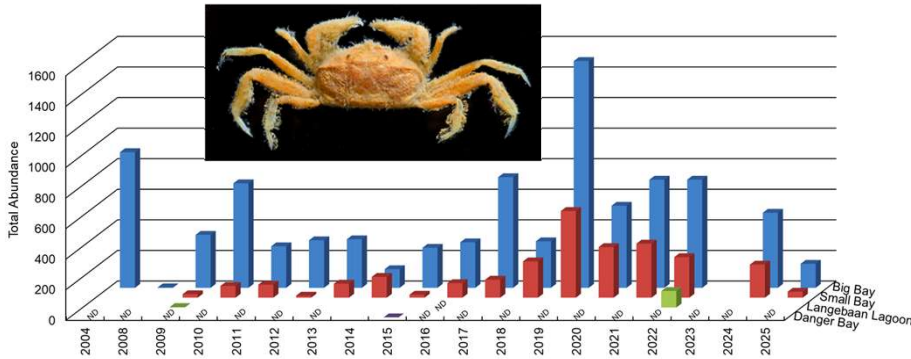




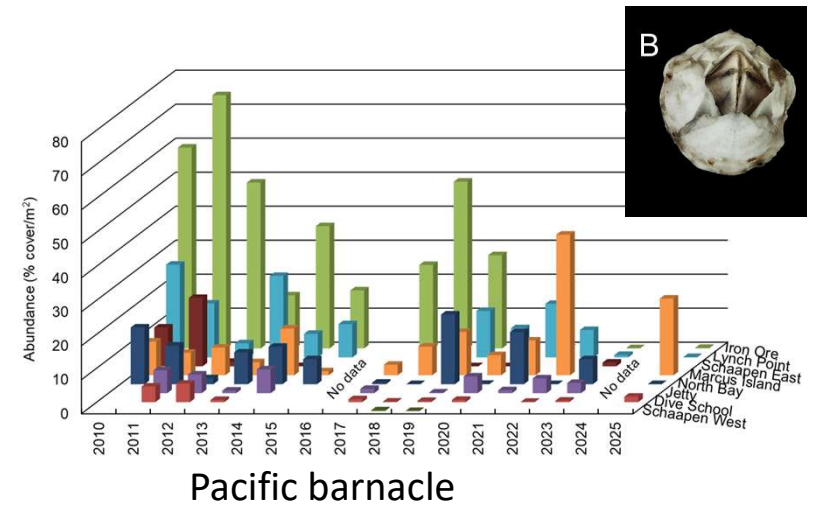
GPS tracks of female Cape fur seals tagged on Vondeling Island (Source: DFFE: Oceans and Coasts)

10. Alien and invasive species

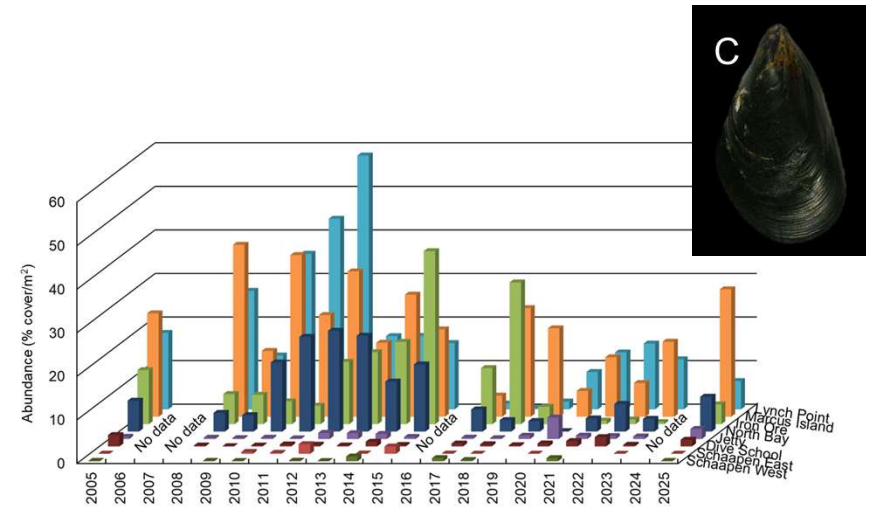
- 105 alien marine species in South Africa, 63 of which are invasive (i.e. self-replacing populations over several generations, and has expanded its range beyond the point of introduction)
- 46 alien species in Saldanha Bay, 39 of which are invasive
- Shipping is a major vector for introduction, with 95% of these species introduced via activities such as ballast water discharge and hull fouling



Western pea crab



Pacific barnacle

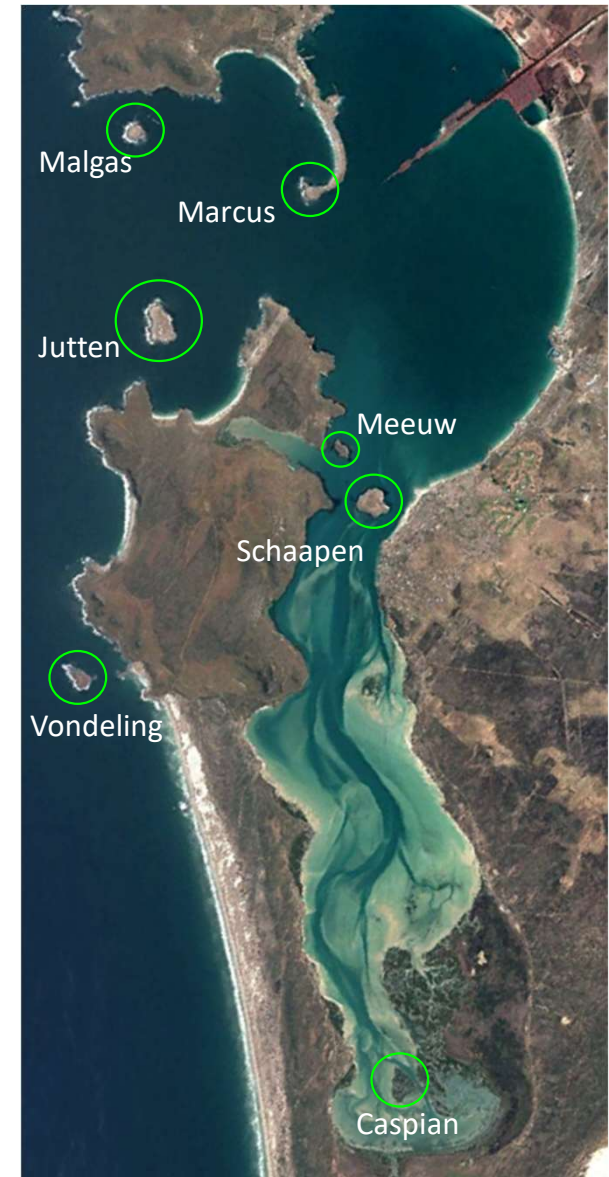


Mediterranean mussel



11. Seabirds and water birds

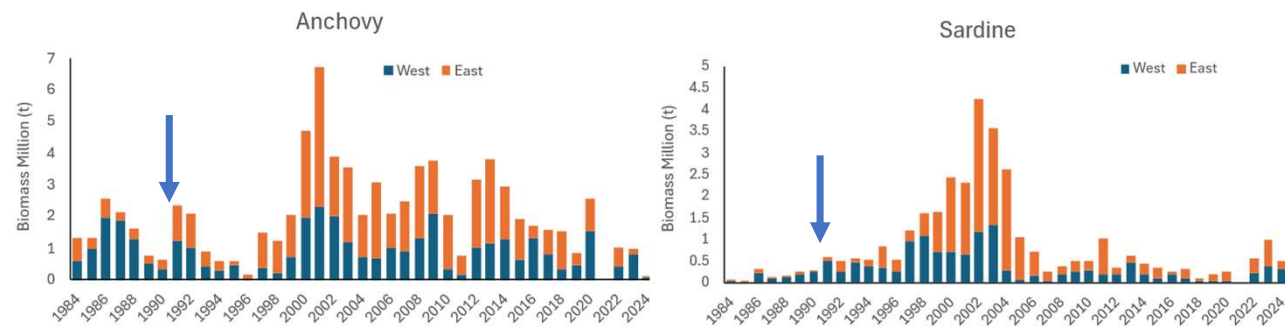
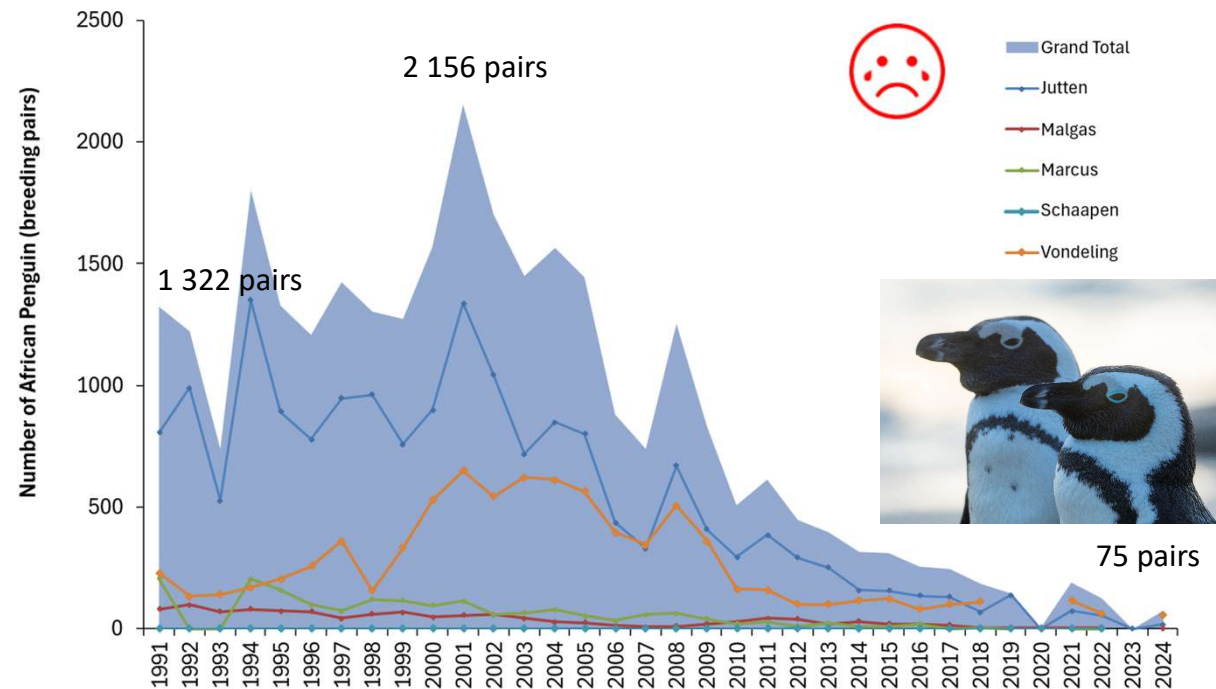
- **Seabirds** = birds that are adapted to life within the marine environment
 - 350 species on earth, 132 in South Africa
 - live longer, breed later and have fewer young than other birds, but they invest a great deal of time in their young
 - Most species nest in colonies, mostly on offshore islands
 - Islands in Saldanha Bay are extremely important breeding sites for seabirds in South Africa, they support nationally important breeding populations of African Penguin, Cape Gannet, Cape Cormorant, Bank Cormorant, White-breasted Cormorant, Crowned Cormorant, Kelp and Hartlaub's Gulls, Caspian Tern and Swift Tern
 - Department of Forestry, Fisheries and the Environment (DFFE) conducts bird counts on all islands to track population trends of each of these species over time





African penguin

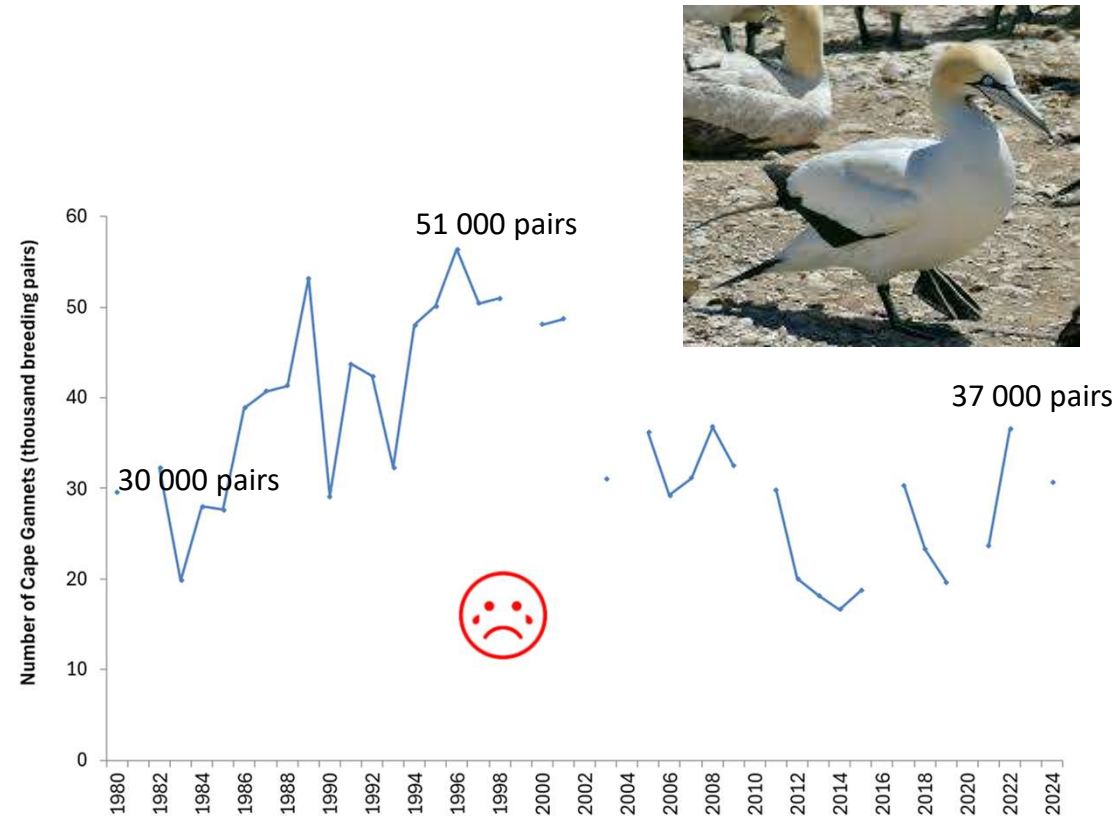
- Critically Endangered on the IUCN Red List
- Global population: ~17 700 breeding (2019) (Namibia & South Africa)
- Saldanha Bay currently harbours a fairly small proportion of the global population (~1%)
- Population trends in Saldanha Bay mirror those for the global population
- Main reasons for decline = lack of food (sardines and anchovy), predation by seals, gulls and pelicans, avian flu, oil spills, noise pollution
- DFFE established closed area for small pelagic fishing around the major penguin breeding colonies (Dassen Island, Robben Island, Stony Point, Dyer Island, St Croix Island and Bird Island) in 2022
- DFFE compelled by Birdlife South Africa and SANCCOB to extend closure in 2025





Cape gannet

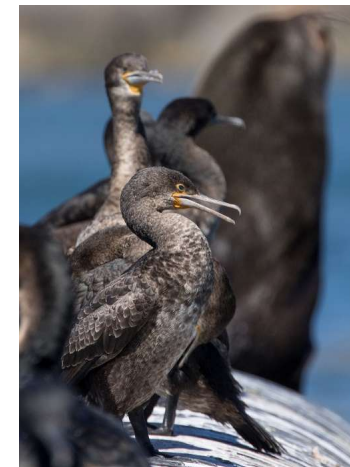
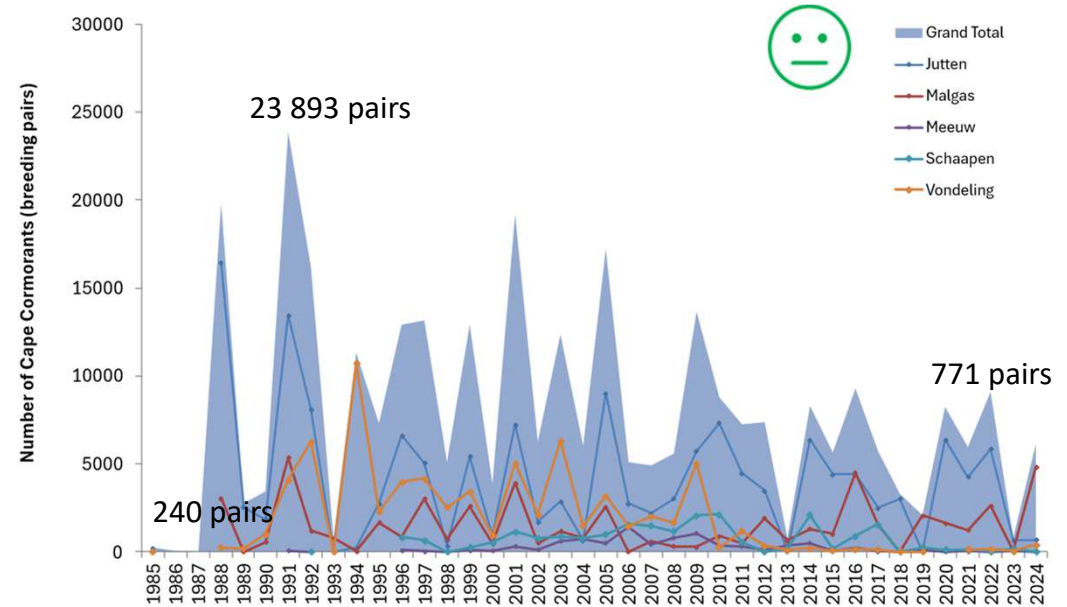
- Endangered on the IUCN Red List
- Global population: ~246,000 birds (coast of Africa)
- Saldanha Bay currently harbours a substantial portion of the global population (~30%)
- Population trends in Saldanha Bay mirror those for the global population
- Main reasons for decline = lack of food (sardines and anchovy), predation by seals and gulls, avian flu, oil spills
- DFFE established closed area for small pelagic fishing around the major penguin breeding colonies (Dassen Island, Robben Island, Stony Point, Dyer Island, St Croix Island and Bird Island) in 2022
- DFFE compelled by Birdlife South Africa and SANCCOB to extend closure in 2025
- DFFE culling problem seals in Saldanha
- Saldanha Bay Pelican watch suggests that seal predation took out 29-83% of fledglings in the period 2000-2006, actively chasing seals and pelicans off the islands





Cape Cormorant

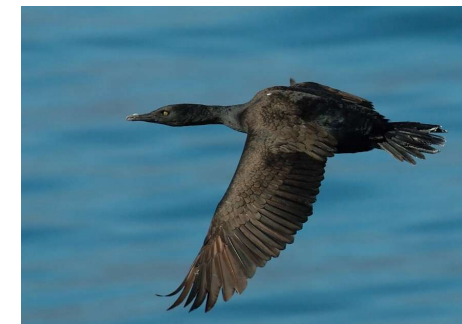
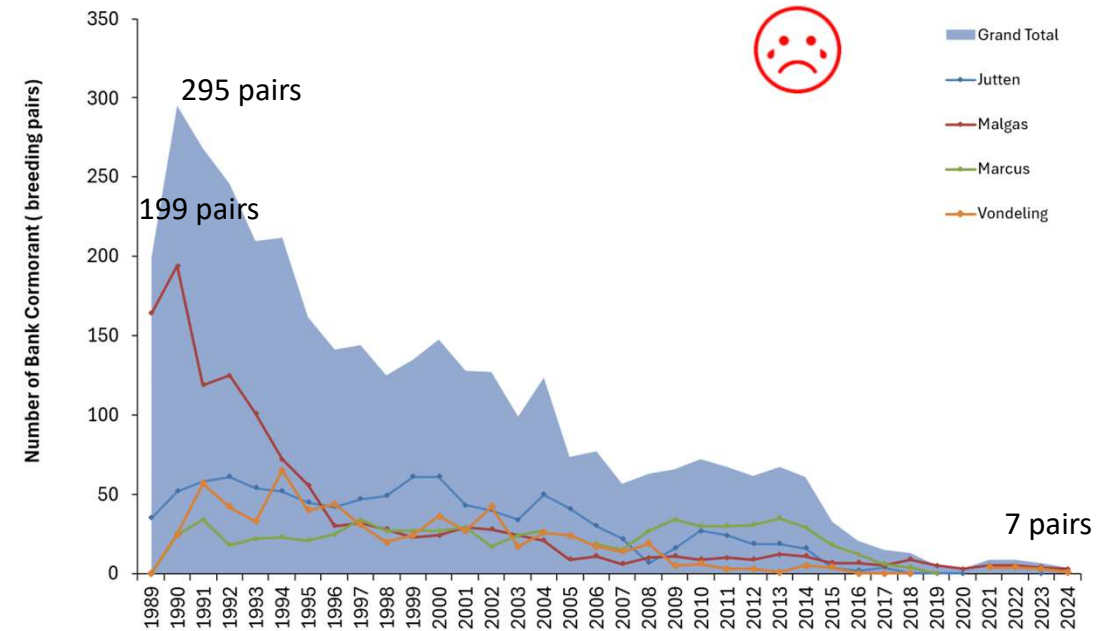
- Endangered on the IUCN Red List
- Global population: ~144,000 birds (South Africa, Namibia, Angola)
- Saldanha Bay currently harbours a small portion of the global population (~1%)
- Population trends in Saldanha Bay mirror those for the global population
- Main reasons for decline = lack of food (sardines and anchovy), predation by seals, gulls and pelicans, avian flu, oil spills
- DFFE established closed area for small pelagic fishing around the major penguin breeding colonies (Dassen Island, Robben Island, Stony Point, Dyer Island, St Croix Island and Bird Island) in 2022
- DFFE compelled by Birdlife South Africa and SANCCOB to extend closure in 2025
- DFFE culling problem seals in Saldanha
- Saldanha Bay Pelican watch actively chasing seals and pelicans off the islands





Bank Cormorant

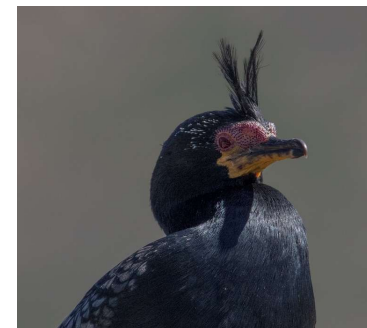
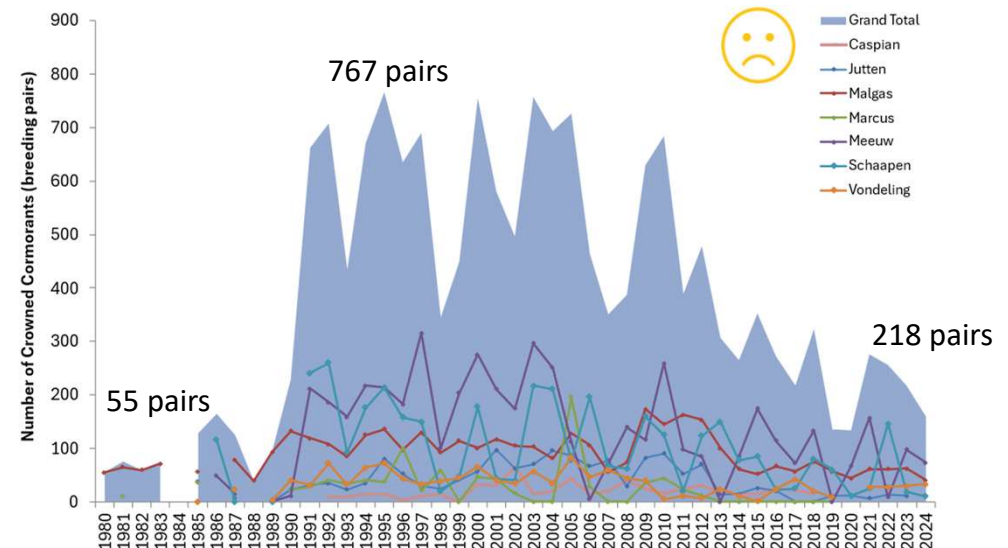
- Endangered on the IUCN Red List
- Global population: ~7,500 birds (South Africa, Namibia)
- Saldanha Bay currently harbours a very small portion of the global population (~0.2%)
- Population trends in Saldanha Bay mirror those for the global population
- Main reasons for decline = lack of food (rock lobster), predation by seals, gulls and pelicans, avian flu, oil spills
- Saldanha Bay Pelican watch actively chasing seals and pelicans off the islands
- DFFE increases TAC for rock lobster in spite of the fact that stock status is at <1.3% of pristine????





Crowned Cormorant

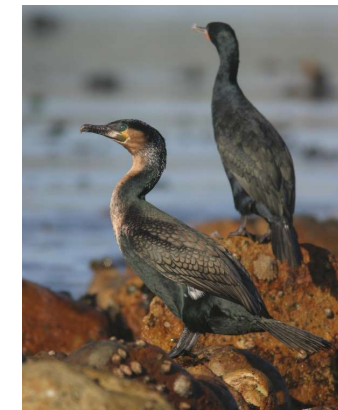
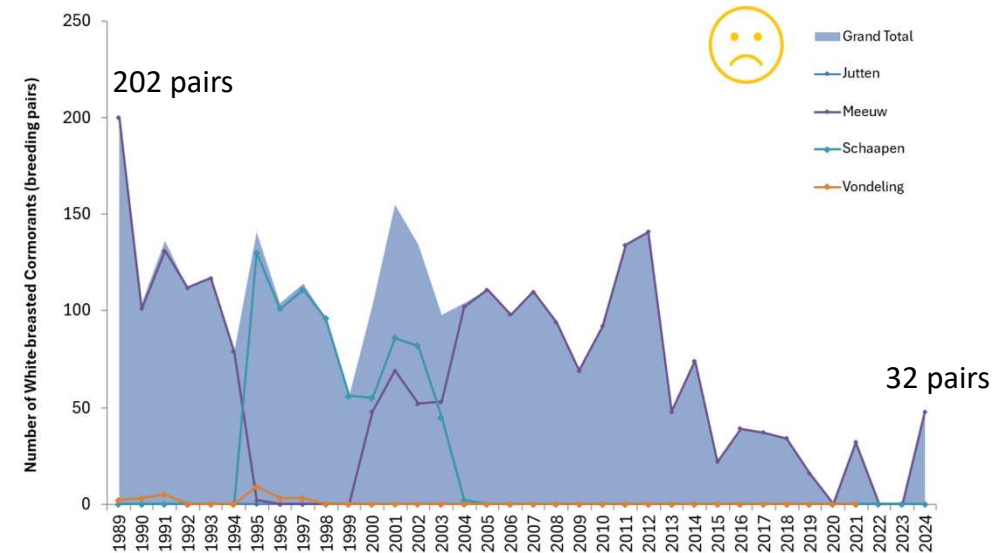
- “Least concern” on the IUCN Red List
- Global population: 4,300 birds (South Africa and Namibia)
- Saldanha Bay currently harbours a modest portion of the global population (~5%)
- Population trends in Saldanha Bay mirror those elsewhere
- Main reasons for decline = lack of food (fish), predation by seals, gulls and pelicans, avian flu, oil spills, human disturbance
- Saldanha Bay Pelican watch actively chasing seals and pelicans off the islands





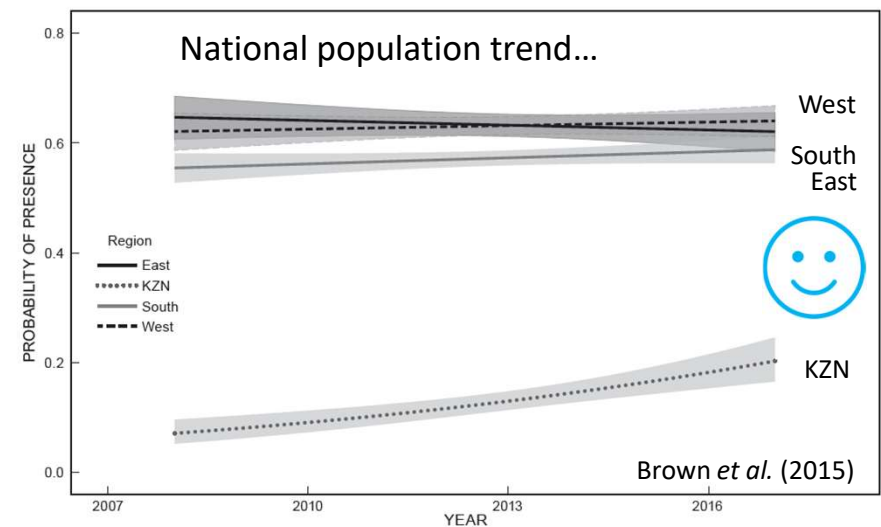
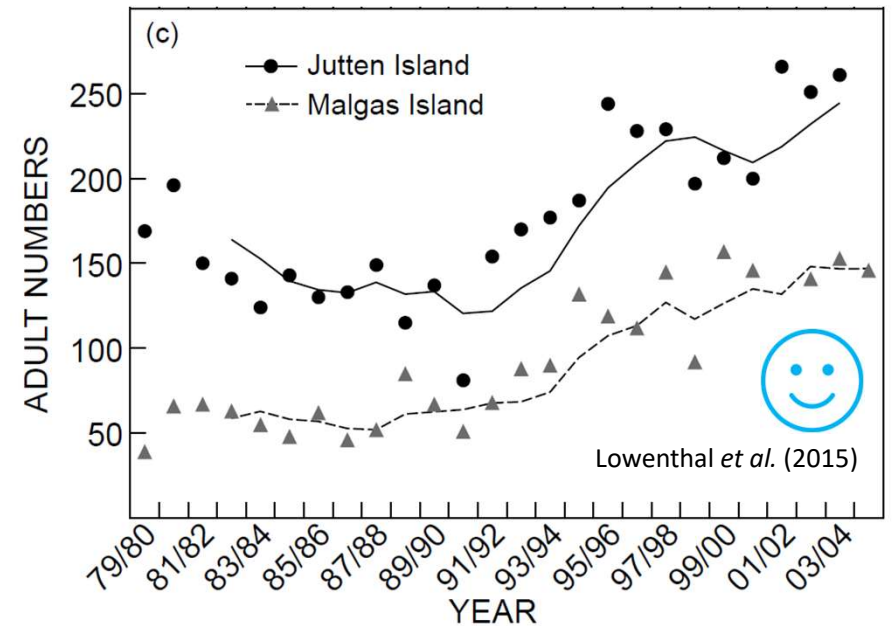
White-breasted Cormorant

- “Least concern” on the IUCN Red List
- Global population: 35,000 birds (Angola-Mozambique)
- Coast and inland
- Saldanha Bay currently harbours a very small portion of the global population (<0.1%)
- Population trends in Saldanha Bay is worse than in other areas
- Main reasons for decline = lack of food (mullet, reef fish), predation by seals, gulls and pelicans, avian flu, oil spills
- Saldanha Bay Pelican watch actively chasing seals and pelicans off the islands



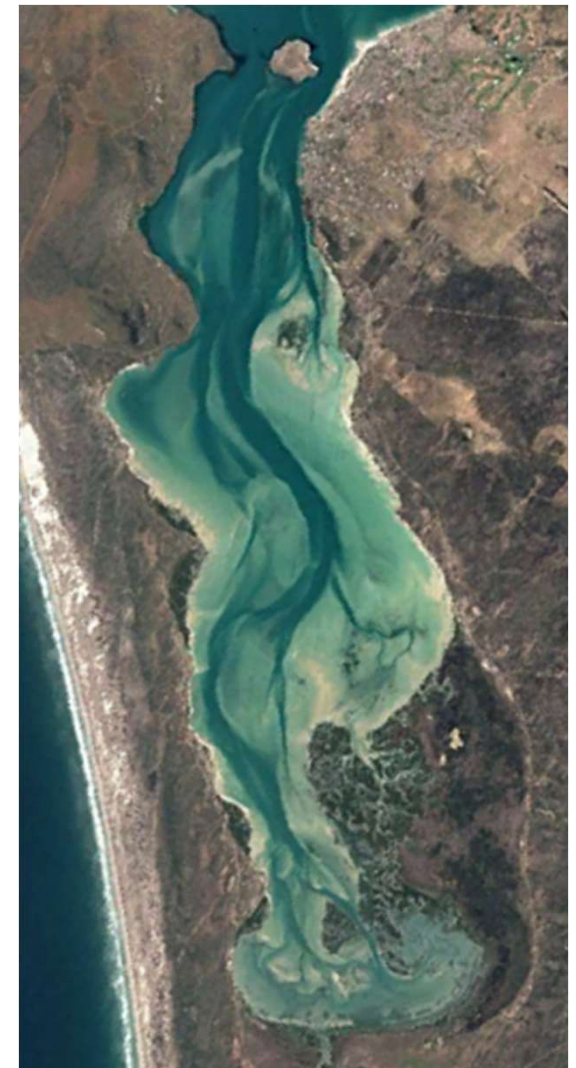
African oystercatcher

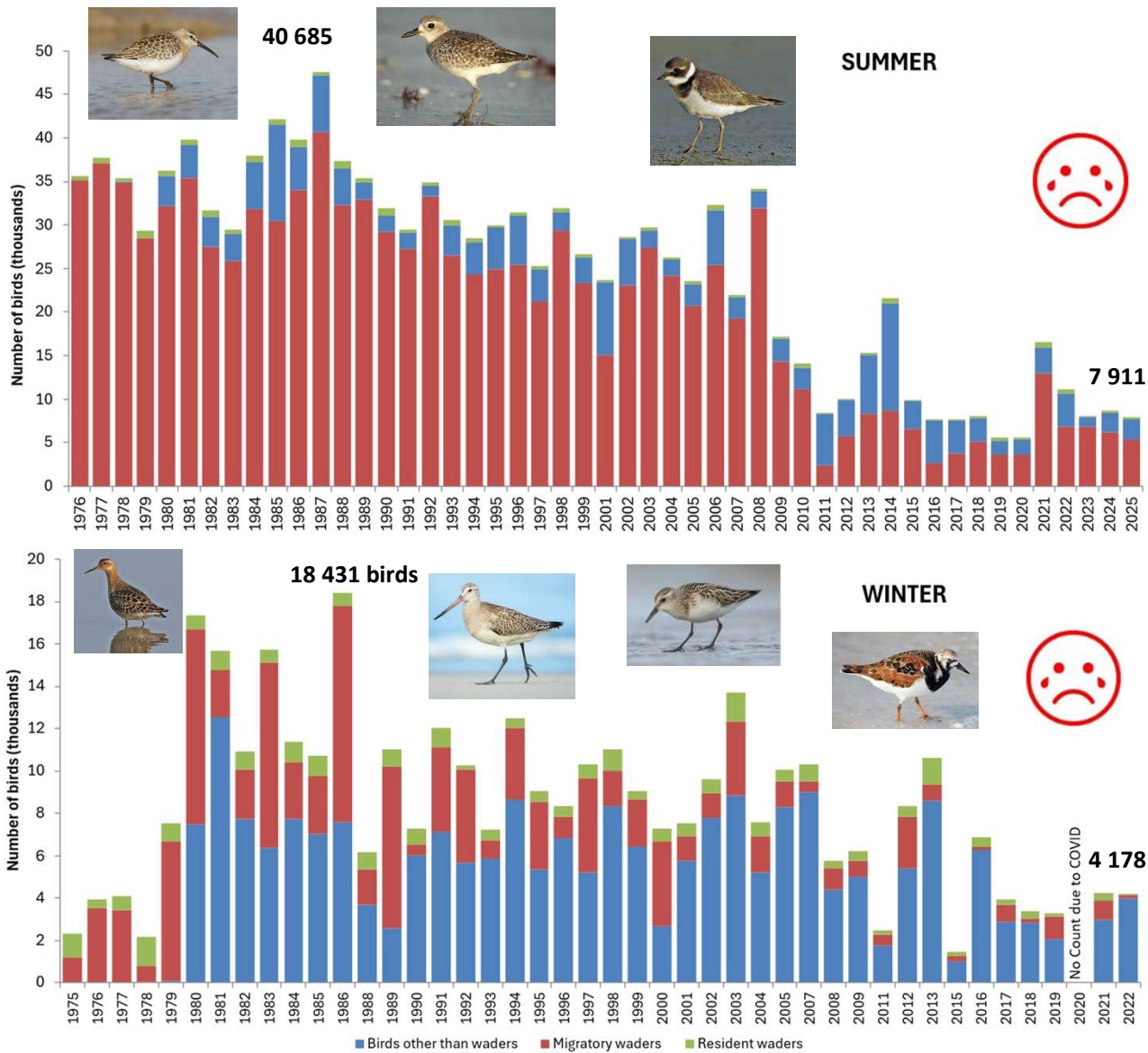
- “Least concern” on the IUCN Red List (recently downgraded from Near threatened)
- Global population: 6,670 birds (Angola, Namibia & South Africa)
- Saldanha Bay currently harbours a modest portion of the global population (5-10%)
- Strong positive population trend in Saldanha Bay and nationally
- Main reasons for recovery = expansion and growth in alien Mediterranean mussel populations, ban on ORVs in the coastal zone





- **Water birds** = bird that frequents water, especially one that habitually wades or swims in water, non-passerine (non-perching) birds
 - 235 species in South Africa
 - Many different subgroups: cormorants, darters & pelicans, wading birds, waterfowl, waders, gulls and terns, kingfishers, and birds of prey
 - Langebaan Lagoon is considered one of the most important sites for waterbirds in southern Africa, particularly the waders and wading birds
 - Most of the waders and wading birds are palearctic migrants and only visit South Africa during the non-breeding season, some resident species that remain here throughout the year
 - Animal Demography Unit (ADU) at the University of Cape Town (UCT) does bird counts twice per year (winter and summer) in Langebaan Lagoon since 1976





- Numbers of water birds, both migratory and resident species, have declined dramatically since counts first started in the 1970's
- This patterns mirrors that seen elsewhere in the country and the world
- For migratory species, this is partly due to disturbance on their breeding grounds and on the migration routes (hunting) but declines in resident species are due to habitat degradation and disturbance here

Summary

- Development pressure continues to ramp up in the Bay after having stalled for a short period (Global Financial Crisis, Covid) ...
- Groundwater reserves are stable and likely even have increased in the last 12 month due to above average rainfall
- Water quality (faecal coliforms & trace metals) are at their best (lowest) levels on record
- Sediment quality (mud fraction) has improved dramatically in the last two decades
- Coastal erosion is a big problem and likely to get worse as wave energy intensity is increasing!
- Benthic macrofauna populations in soft sediments in Langebaan Lagoon and Big Bay have responded positively to improvements in sediment quality but not so much in Small Bay...
- Abalone and rock lobster stocks in the Bay have been decimated but reefs in Big Bay are important for rock lobster recruitment
- Fish populations overall are highly variable , declines in some species, management action is required!
- Birds breeding on the islands in the Bay and those in the Lagoon continue to decline, small recovery post-covid
- Marine aliens are increasing and we are getting better at finding them...

Overall: We are doing well but don't we don't want to take our eyes off the road...



Recommendations

- Encourage visitors to return to Langebaan and Saldanha
- All wastewater discharges must be properly licensed, monitored and audited, reclamation of wastewater must be prioritised
- Cumulative impacts of future development must be explicitly considered
- Better monitoring of shoreline erosion is required, and action taken to limit impacts of shoreline erosion
- Bag and size limits for important fish species need to be re-evaluated
- Focussed monitoring of alien species
- Monitoring and assessment of the overall health of the Bay and the Lagoon must continue

An underwater photograph showing a dense colony of mussels on a rock. The mussels are dark, with some showing their gills. The background is dark and blurry, suggesting a deep underwater environment with some light filtering through. The text "Thank You" is overlaid on the left side of the image.

Thank You

Photo: Steve Benjamin