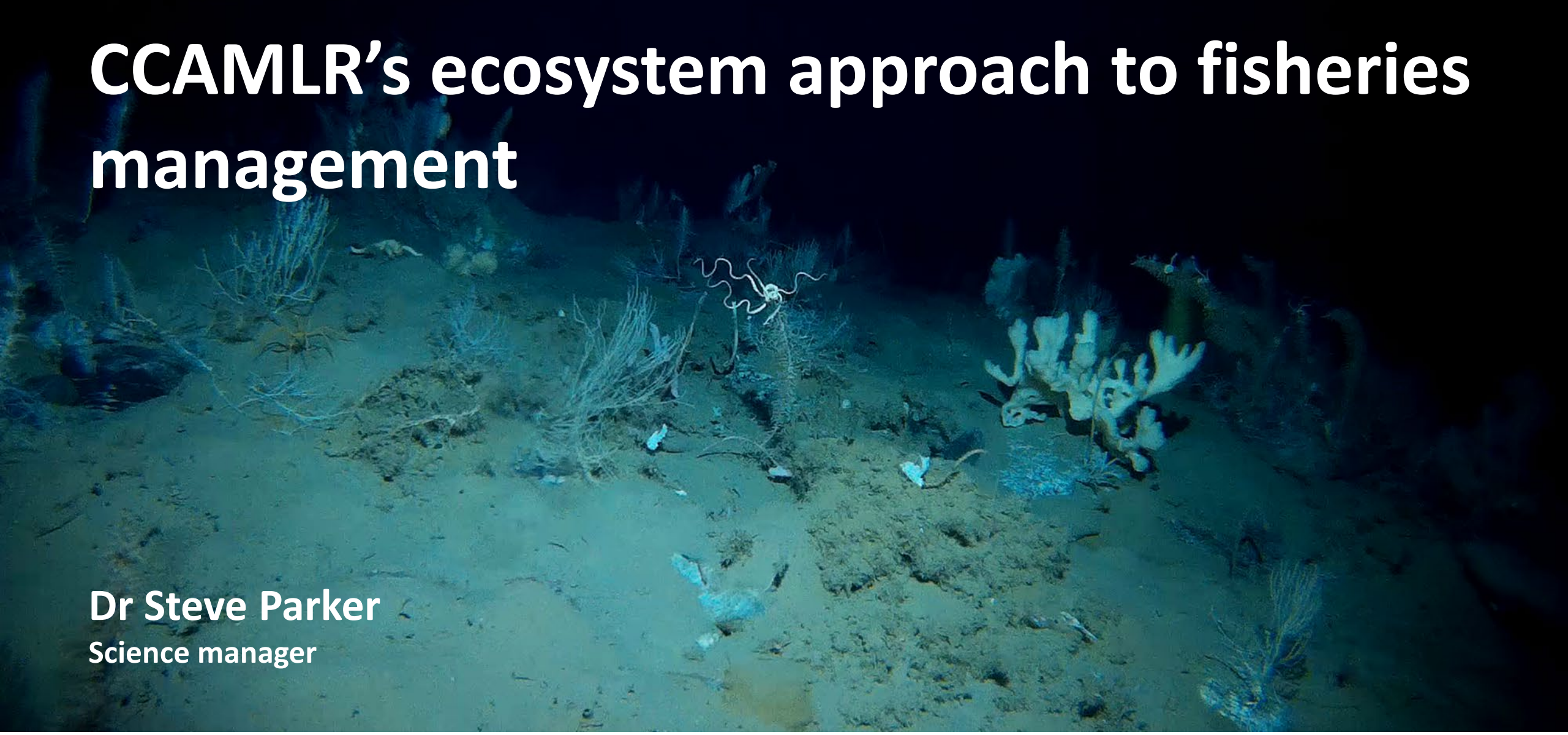
CCAMLR’s ecosystem approach to fisheries management



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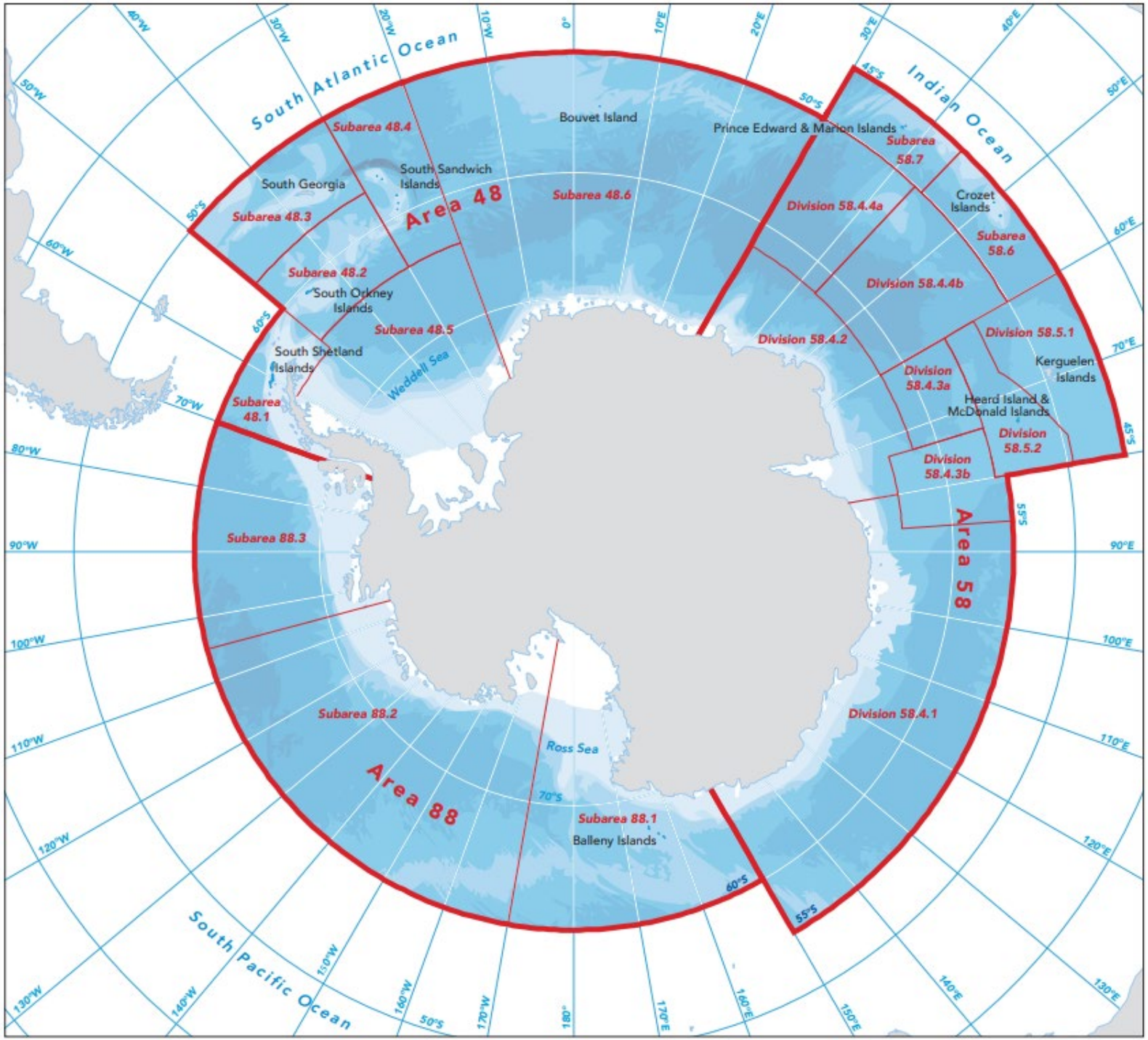
Commission for the Conservation of Antarctic Marine Living Resources
Commission pour la conservation de la faune et la flore marines de l’Antarctique
Комиссия по сохранению морских живых ресурсов Антарктики
Comisión para la Conservación de los Recursos Vivos Marinos Antárticos



CCAMLR Convention Area

- 36 million km^2
- CCAMLR manages all living resources in the Convention Area, except harvest of whales (IWC) and seals (CCAS)

The Convention

Article II §1,2. The objective of the Convention is the conservation of Antarctic marine living Resources where the term ‘conservation’ includes rational use.

Article II §3.
Any harvesting … shall be conducted in accordance … with the following principles of conservation:

(a) prevention of decrease in the size of any harvested population to levels below those which ensure its **stable recruitment**….

(b) **maintenance of the ecological relationships** between harvested, dependent and related populations and the restoration of depleted populations and

(c) prevention or **minimisation of the risk of changes** in the marine ecosystem which are not potentially reversible over two or three decades,

The Convention

Article IX

§ 2. The Commission can establish Conservation Measures to designate:

- the **quantity of any species which may be harvested** in the area to which this Convention applies;
- **regions and sub-regions** based on the distribution of populations of Antarctic marine living resources;
- the **quantity which may be harvested from the populations of regions** and sub-regions;
- the **size, age and, as appropriate, sex of species** which may be harvested;
- **open and closed seasons** for harvesting;
- regulation of the **effort employed and methods of harvesting**, including fishing gear…;
- measures concerning **the effects of harvesting and associated activities on components of the marine ecosystem other than the harvested populations**.

Three types of fisheries

Krill

Toothfish

Icefish

Key management issues - Fisheries

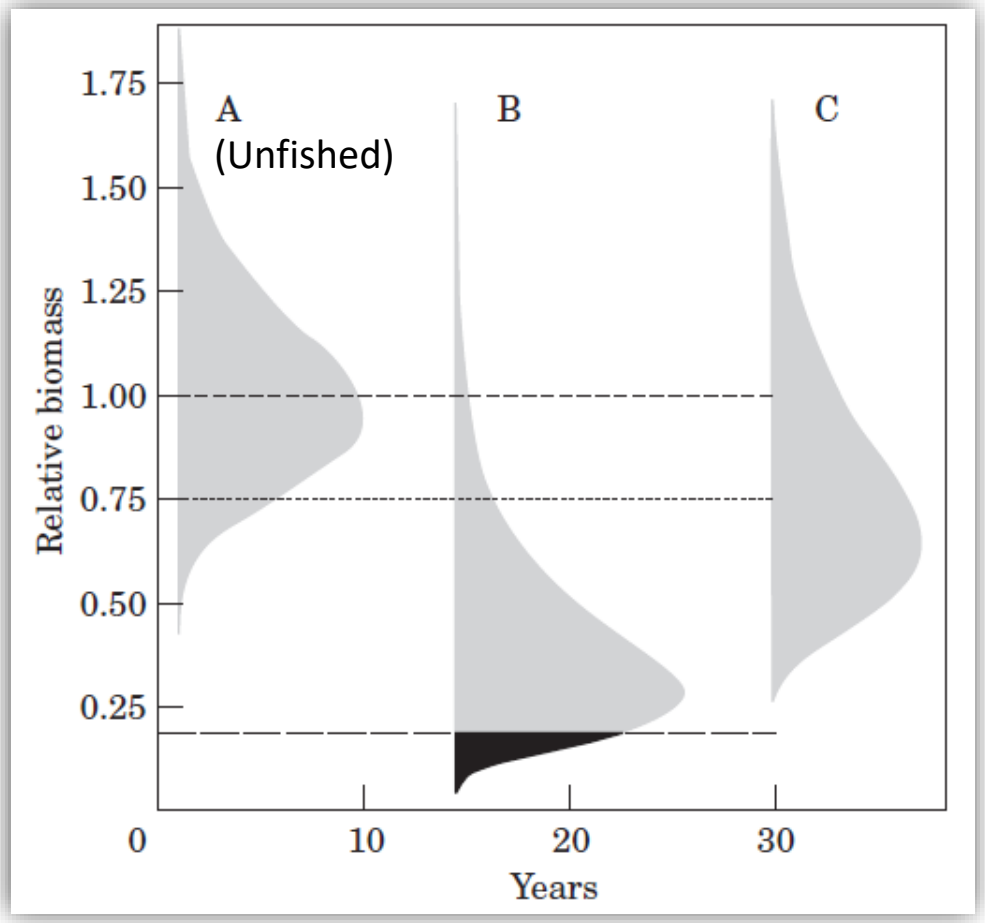
- **Target species population dynamics**
  - Structure
  - Abundance
  - Removals
  - Additions

- **Ecosystem impacts of fishing**
  - **Direct**
    - Fish bycatch risks
    - VME risks
    - Seabird interactions
    - Marine mammal interactions
  - **Indirect**
    - Effects on predators of targets
    - Effects on prey of targets
    - Cascading trophic effects

- **Climate change effects on ecosystem**
  - Understanding mechanisms of action
  - Monitoring effects
  - Avoid or delay effects

CCAMLR decision rules

- Set a spawning stock biomass level for a population in the long-term (**20-30** years in the future)
  - **75%** prey species,
  - **50%** predator species
- Set a depletion threshold to avoid (**10%** chance of biomass below **20%** unfished spawning biomass)
- Specifically include uncertainty in:
  - biomass estimates
  - past and future recruitment
- Can apply to bycatch species as well for risk assessment



From: Constable et al. (2000)

Effects of ecosystem change on stock assessments

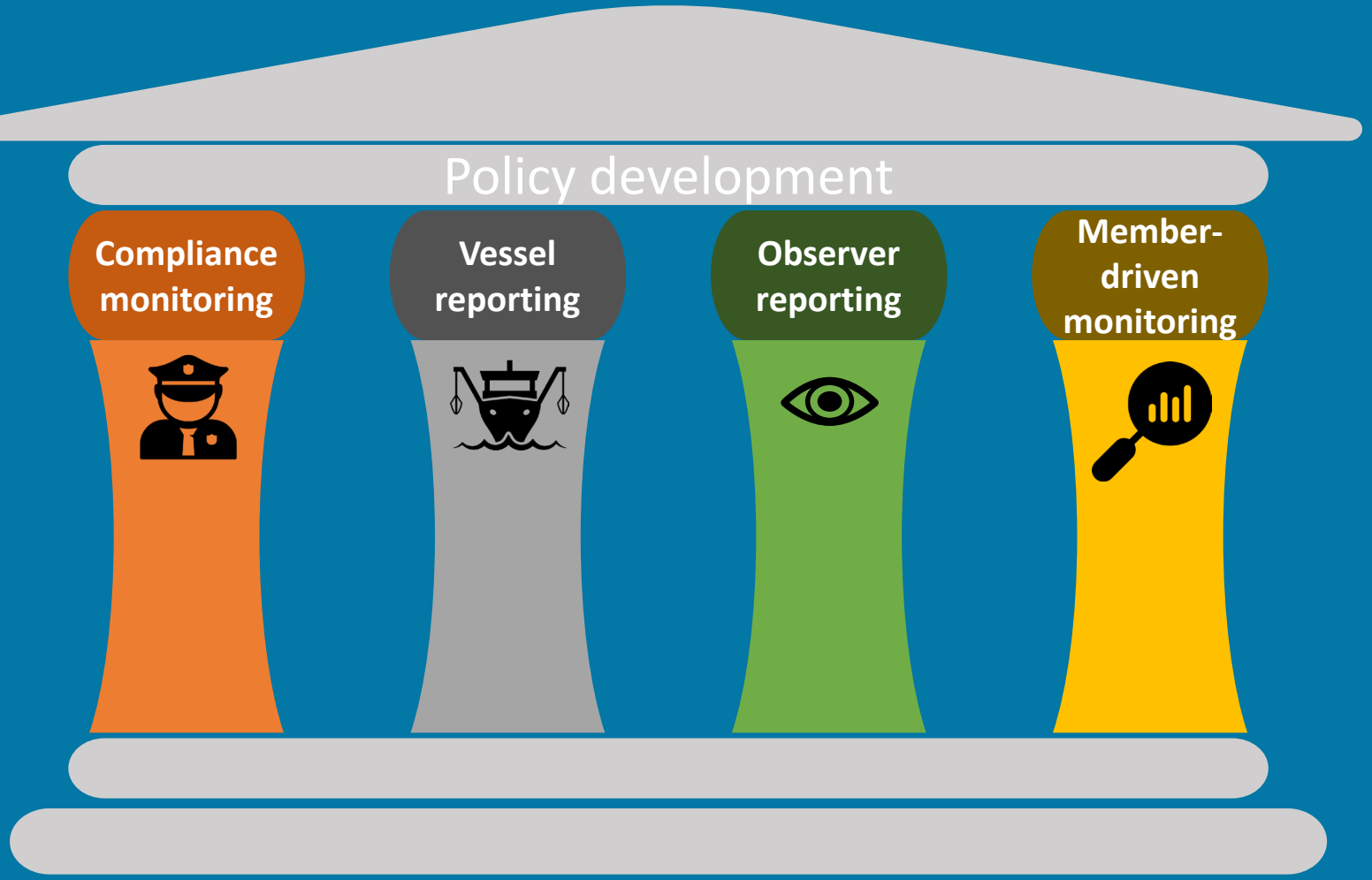
Monitor for changes in key parameters

- Recruitment (mean, variability, autocorrelation)
- Age-at-maturity, sex ratio, stock-recruit relationship
- Natural mortality (from predation and from other processes)
- Length-at-age, length-weight relationship
- Fishery selectivity
- Spatial distribution, movement patterns
- Locations of spawning, spawning site fidelity, spawning dynamics

SC-CAMLR-43 paragraph 3.17

Infrastructure programs

Heavy reliance on data collection and science to support both strategic and tactical management



- Compliance reporting
  - Vessel Monitoring Systems (1 hourly)
  - System of Inspection (in-port and at-sea)
  - Daily or 5 day catch effort reporting
  - Transhipment reporting
  - Catch Documentation Scheme
  - Partnerships to detect and prosecute IUU
  - Strong measures to promote national accountability

Data collection

Vessels

- VMS and AIS Monitoring
- Catch effort reporting 1 or 5 day
- Catch documentation Scheme
- Effort
  - Location and depth
  - Gear configuration
  - Time
- Catch
  - Total catch weight and number per event (longline)
  - Bycatch weight by species group
  - Birds and mammal catch
  - VME weight and location per 1200m segment
- Tagging data, Acoustic data, Debris, IUU

Setting Details

Set/ Haul Number	Date & Time (UTC) Set Start (dd/mm/yyyy	Date & Time (UTC) Set Finish (dd/mm/yyyy	*Set Start*					*Set End*					Fishing Type	% Bait Type 1	Mainline length (m)	Number hooks set	Bottom to line distance (m)	*Trotline only*	
			Latitude degrees (-DD)	Latitude minutes (MM.mm)	Longitude degrees (DDD)	Longitude minutes (MM.mm)	Fishing Depth (m)	Latitude degrees (-DD)	Latitude minutes (MM.mm)	Longitude degrees (DDD)	Longitude minutes (MM.mm)	Fishing Depth (m)						Cetacean exclusion device used	Number of droppers

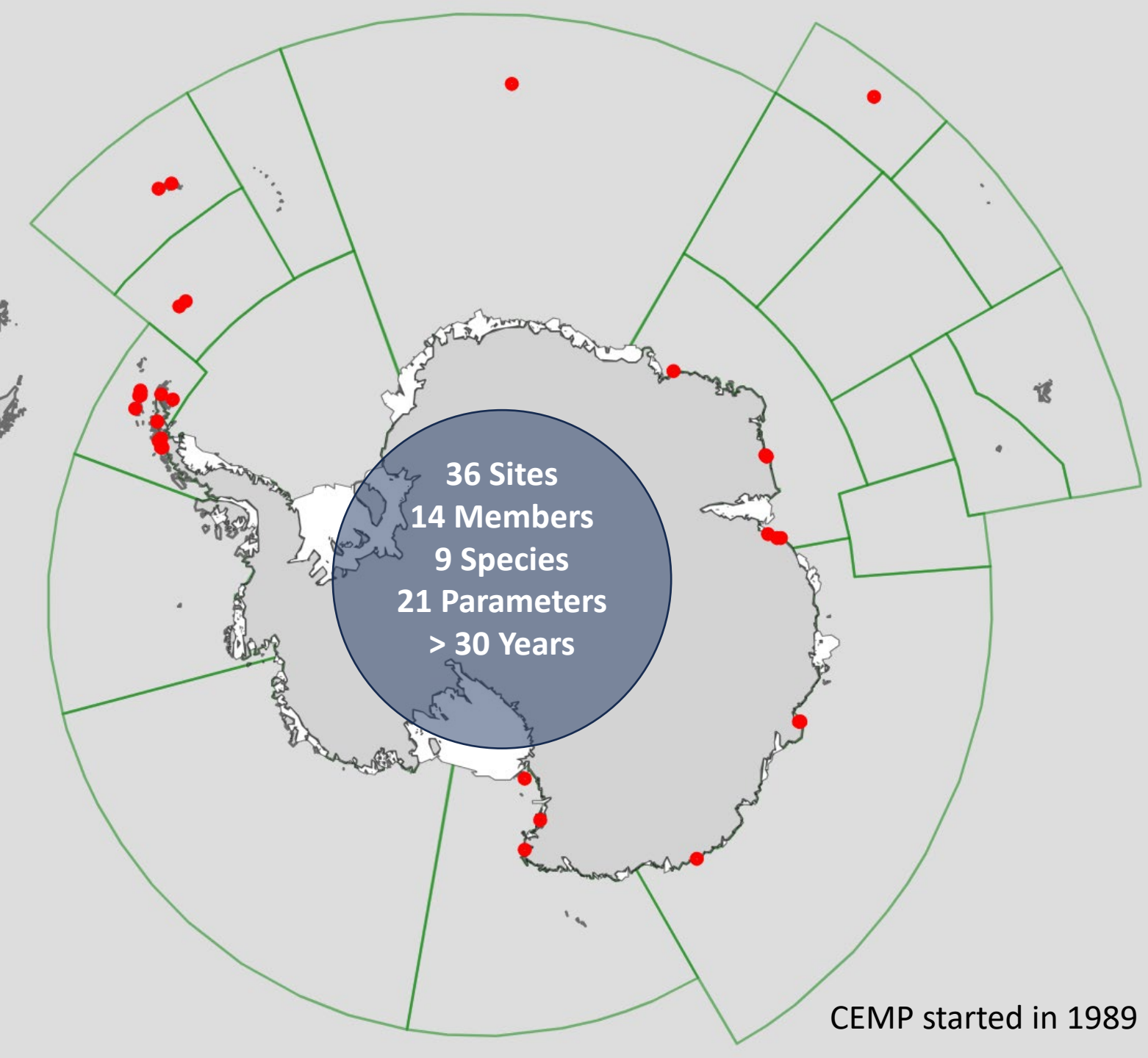
Data collection

(100% coverage, typically 2 observers including 1 international)

SISO Observer data

- Species composition of catch
- Biological sampling (target, bycatch)
- Product conversion factors
- Interactions of seabirds and mammals
- Tagging assistance
- Gear configuration verification
- Mitigation measures verification
- Ecosystem data
- Marine debris reporting
- Waste disposal and IUU sightings

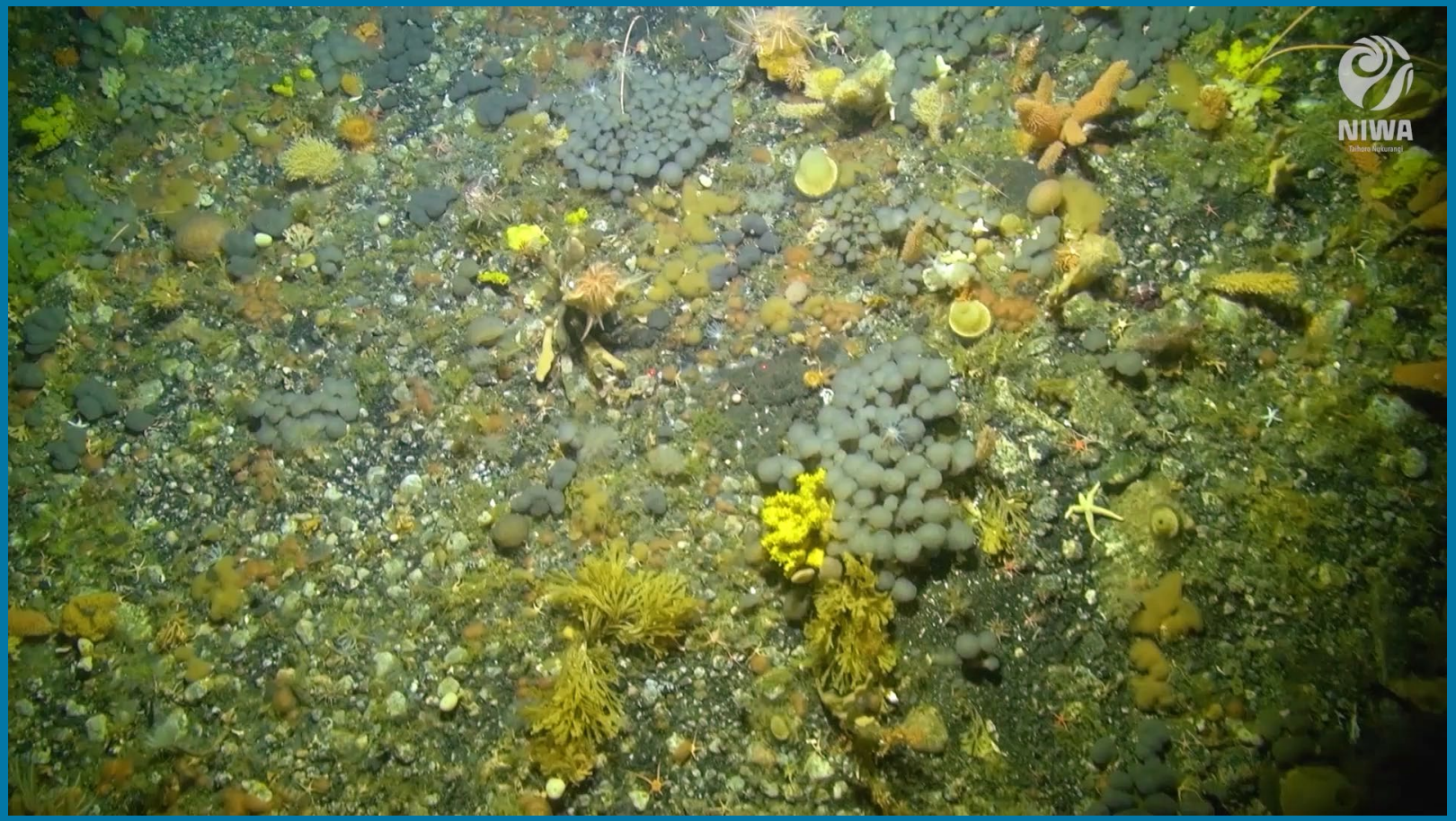
CCAMLR Ecosystem Monitoring Program



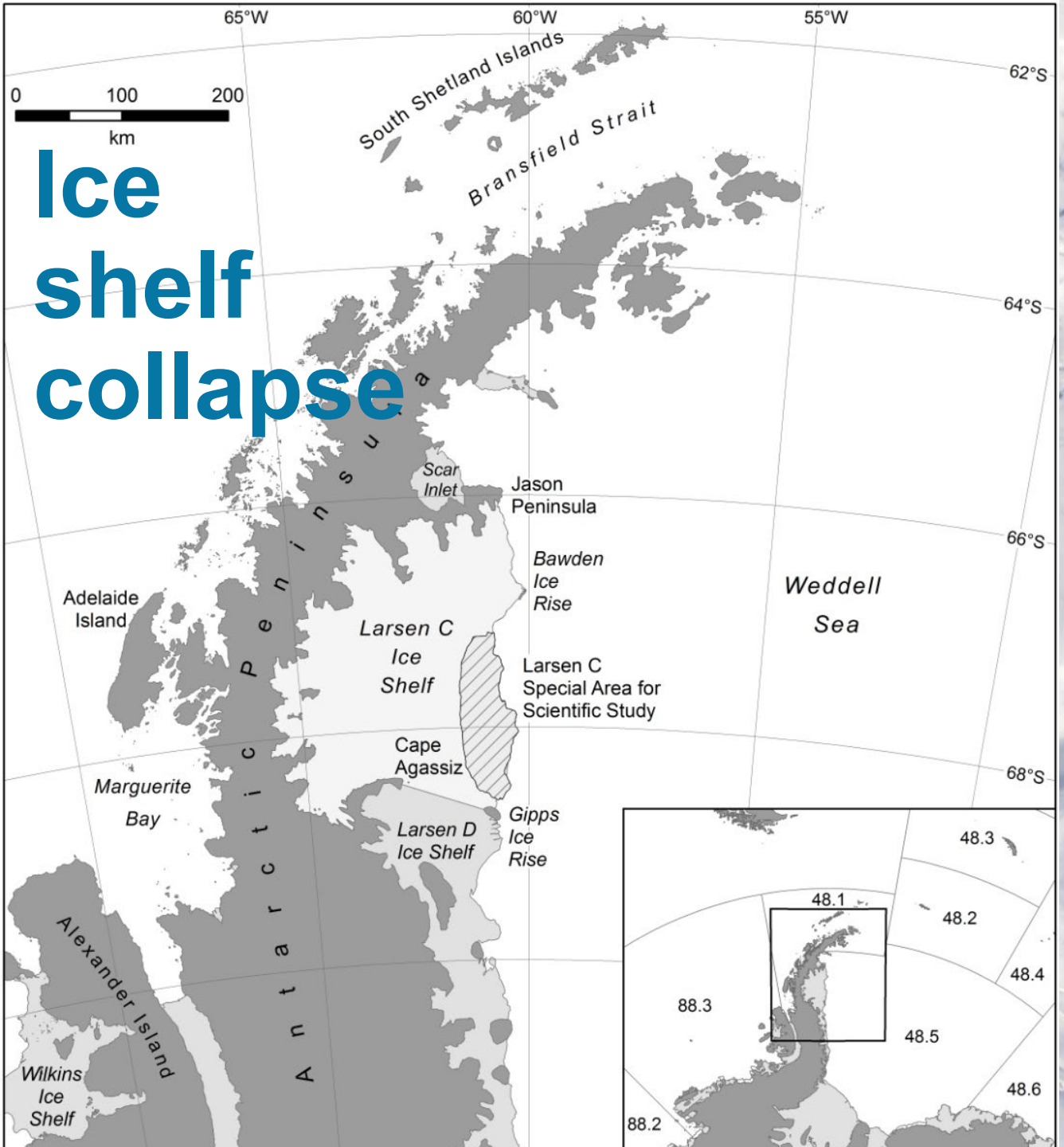
CEMP started in 1989

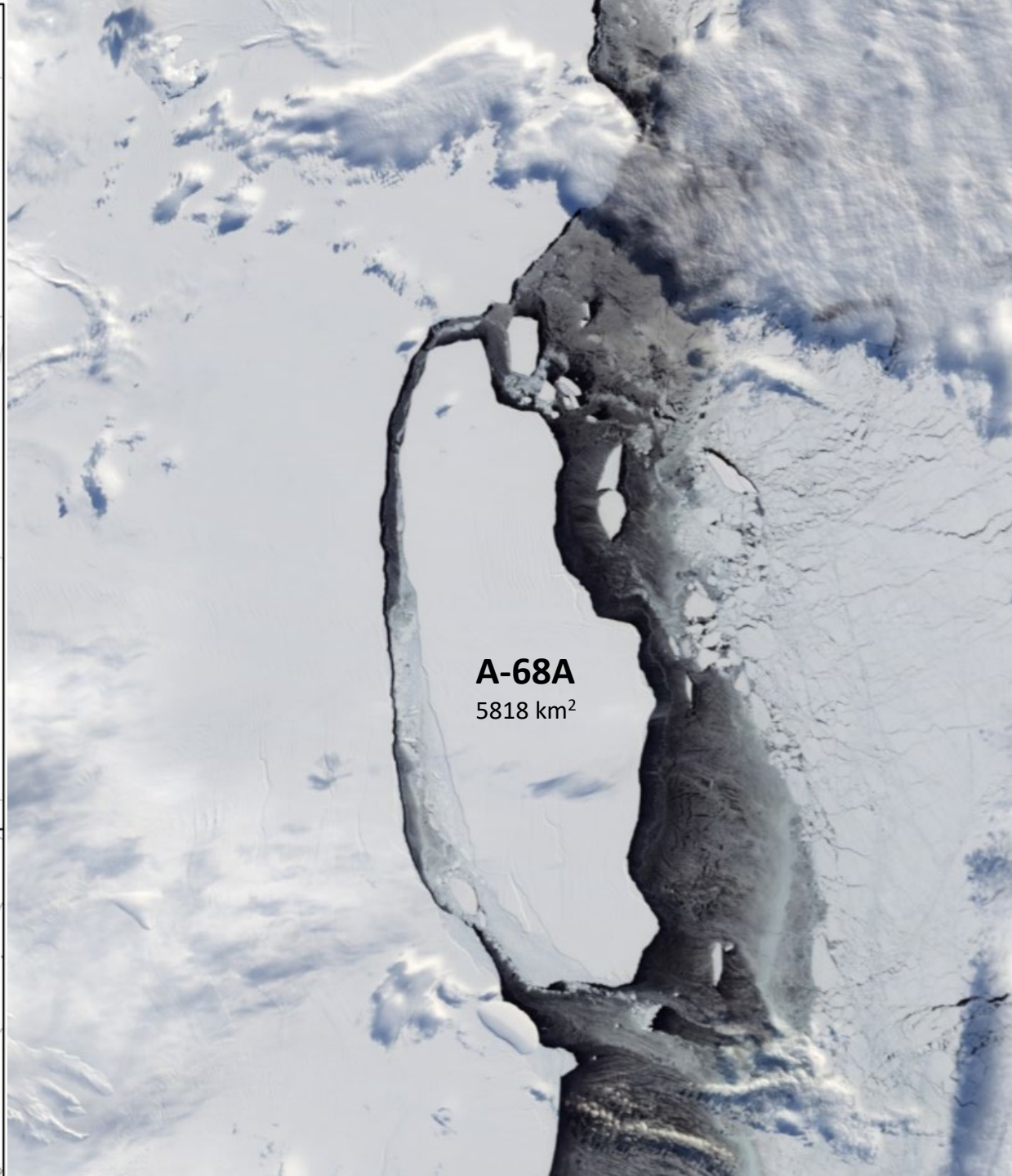
CCAMLR VME impact management

- 23 taxonomic indicator groups
- Up-to-dated information on the location and characteristics of
    - 61 VMEs
    - 83 VME risk areas
- Publicly available: https://vmeregistry.ccamlr.org/



Ice shelf collapse





Avoid ecosystem effects

- Newly exposed areas (e.g., create time for research to occur: CM 24-04)
- Depth restrictions (e.g., no bottom longline fishing shallower than 550m, CM 22-08)
- Marine protected areas (e.g., define climate refugia, reference areas: CM 91-04)
- Fishing gear restrictions (e.g., no bottom trawling, gillnetting: CM 22-04, 22-05)
- Set precautionary stock status target levels (e.g., Decision rules)
- Include uncertainty in long-term projections of stock status (e.g., Decision rules)
- Use an experimental approach (e.g., small area start, small catch, high data resolution, 42 vessels)

Key ecosystem management challenges

- Difficult to **detect fishing effects** (bycatch depletion, predation release, changes in predator populations, habitat impacts)
- Need **ecosystem status indicators** but have incomplete knowledge of structure or function
- Ecosystem effects likely **to vary regionally** and with depth
- Ecosystem monitoring programs **unlikely to attribute** cause ecological change

Therefore, need **wholistic, pre-emptive** management measures to avoid effects