Coral and Seagrass monitoring in Saudi Arabian waters of the Arabian Gulf

Coral reefs and seagrass meadows are critical ecosystems that support biodiversity, fisheries, and coastal resilience. At ARCEMS, KFUPM, we have been conducting long-term monitoring and biodiversity surveys to record their health, detect impacts, and provide baseline data for conservation and restoration. Our work contributes directly to the UN Sustainable Development Goal 14: Life Below Water.

ARCEMS conducts periodic field surveys to monitor overall health of these sensitive ecosystems:

- Coral Reef Surveys – Recording coral cover, bleaching patterns, and species diversity.
- Seagrass Monitoring – Assessing seagrass percent ocver, meadow extent, species composition, and ecological roles.

Methodology

- *Coral reef surveys*

Coral cover is assessed using the photoquadrat transect method. At each survey site, six transects of 30 m length were deployed on the reef. Along each transect, photographs were taken at 3 m intervals, resulting in a series of standardized photoquadrat photos (66 photos per site).



Figure 1. A diver taking coral photographs using a photoquadrat

The collected images were analyzed using software such as CPCe (Coral Point Count with Excel extension) and CoralNet to quantify benthic cover. These programs allow random point counts on each image, enabling the calculation of percent coral cover and other substrate categories. The resulting data provide robust estimates of coral cover trends across sites and years.



Figure 2. Screenshot of a coral cover analysis software (CPCe)

- *Seagrass Monitoring*

Seagrass meadows were assessed following Seagrass-Watch monitoring guidelines. At each site, permanent transects (typically 50 m) are established perpendicular to the shoreline across the seagrass bed. Along each transect, quadrats (0.25 m²) were placed at fixed intervals (5 m) to record seagrass characteristics.

Within each quadrat, observers documented:

- Seagrass species composition; percent cover and canopy height; presence of epiphytes and macroalgae and associated fauna and substrate type

This methodology provides consistent, comparable data on seagrass extent, condition, and ecological role across sites and years.



Figure 3. A diver taking seagrass cover photographs using a photoquadrat along a transect line

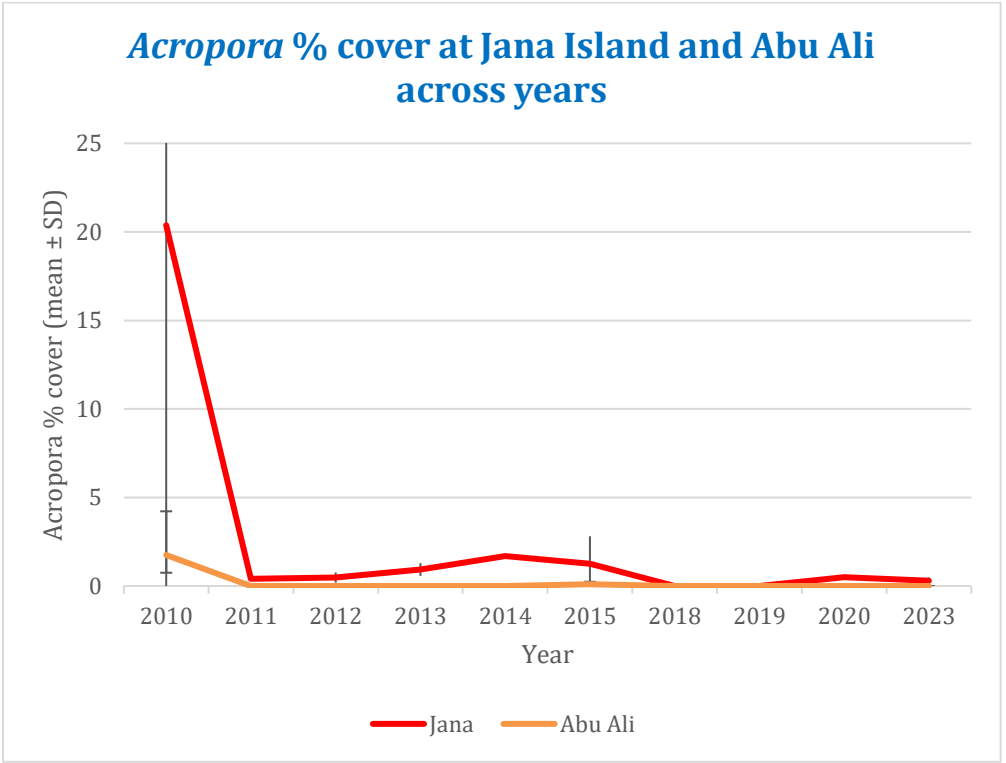


Figure 4: Long-term coral cover monitoring at Jana Island and Abu Ali Reef (2010–2023).

Why monitoring matters:

Keeping an eye on coral reefs and seagrass meadows is like checking the pulse of the ocean. These habitats quietly support fish, protect coastlines, and store carbon, but they are also sensitive to stress from climate change and human activities.

By monitoring them regularly, we build the baseline knowledge that tells us what's healthy, what's changing, and where action is needed. This information is the foundation for smart decisions such as whether it's restoring a damaged reef, protecting a seagrass bed, or planning coastal development in a way that avoids harm.

Monitoring also connects local work to the bigger picture. Every dataset adds to the global effort under UN Sustainable Development Goal 14: Life Below Water, ensuring that oceans can keep supporting both marine life and the people who depend on them. In simple terms: when we protect reefs and seagrass, we protect food, jobs, and the future of coastal communities.