MONTHLY OCEANOGRAPHY BULLETIN

South West Indian Ocean

April 2020

Contents

List of Acronyms

AUC	African Union Commission
Chl-*a*	Chlorophyll-*a*
EU	European Union
GMES	Global Monitoring for Environment and Security
JRC	Joint Research Centre
MODIS	Moderate Resolution Imaging Spectrometer
MOI	Mauritius Oceanography Institute
SMI	Standard Mapped Image
SST	Sea Surface Temperature
SWIO	South West Indian Ocean

1.0   Introduction

This monthly bulletin is produced by the MOI under the GMES & Africa project and provides satellite based oceanographic observations of the South West Indian Ocean region. This issue focuses on remote sensing sea surface temperature and chlorophyll-*a* concentration. It is targeted at users from the marine and fisheries realm for monitoring purposes. It is also a source of information for researchers and the scientific community.

2.0   Highlights

Sea Surface Temperature

- The average SST around Mauritius was close to the climatological mean.
- The Mozambique Channel, more particularly Mozambique coastal regions were influenced by warm surface waters and temperatures close to 30°C.
  Positive SST anomalies were observed in most of the region in the North of SWIO, with many regions having anomalies of above 0.5°C.

Chlorophyll-a Concentration

- Low chlorophyll-*a* concentration was observed in most of the SWIO region compared to the climatology average.
- Chlorophyll-*a* concentration below 1 mg/m^3 were observed in the open seas of Mozambique and Seychelles, except for southern side of Madagascar where the concentration was higher.
- A persistent positive anomaly with values above 1 mg/m^3 compared to the climatology is being observed north of Mafia Island (Tanzania), which might have favoured the growth of fisheries in this coastal region and is predicted to follow the same trend next month.
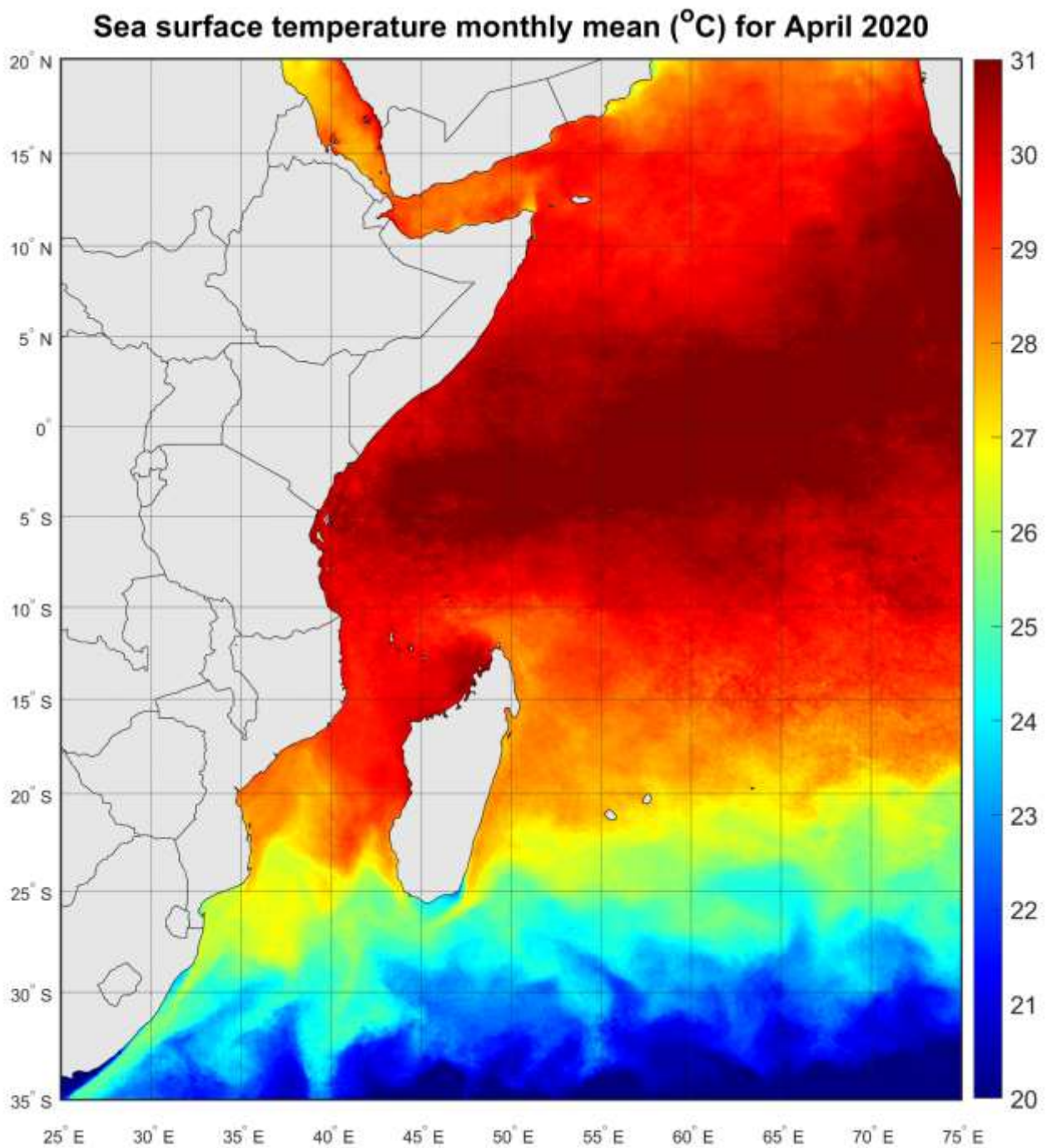
3.0 Sea Surface Temperature

Figure 1: Mean sea surface temperature for the month of April 2020 (°C)
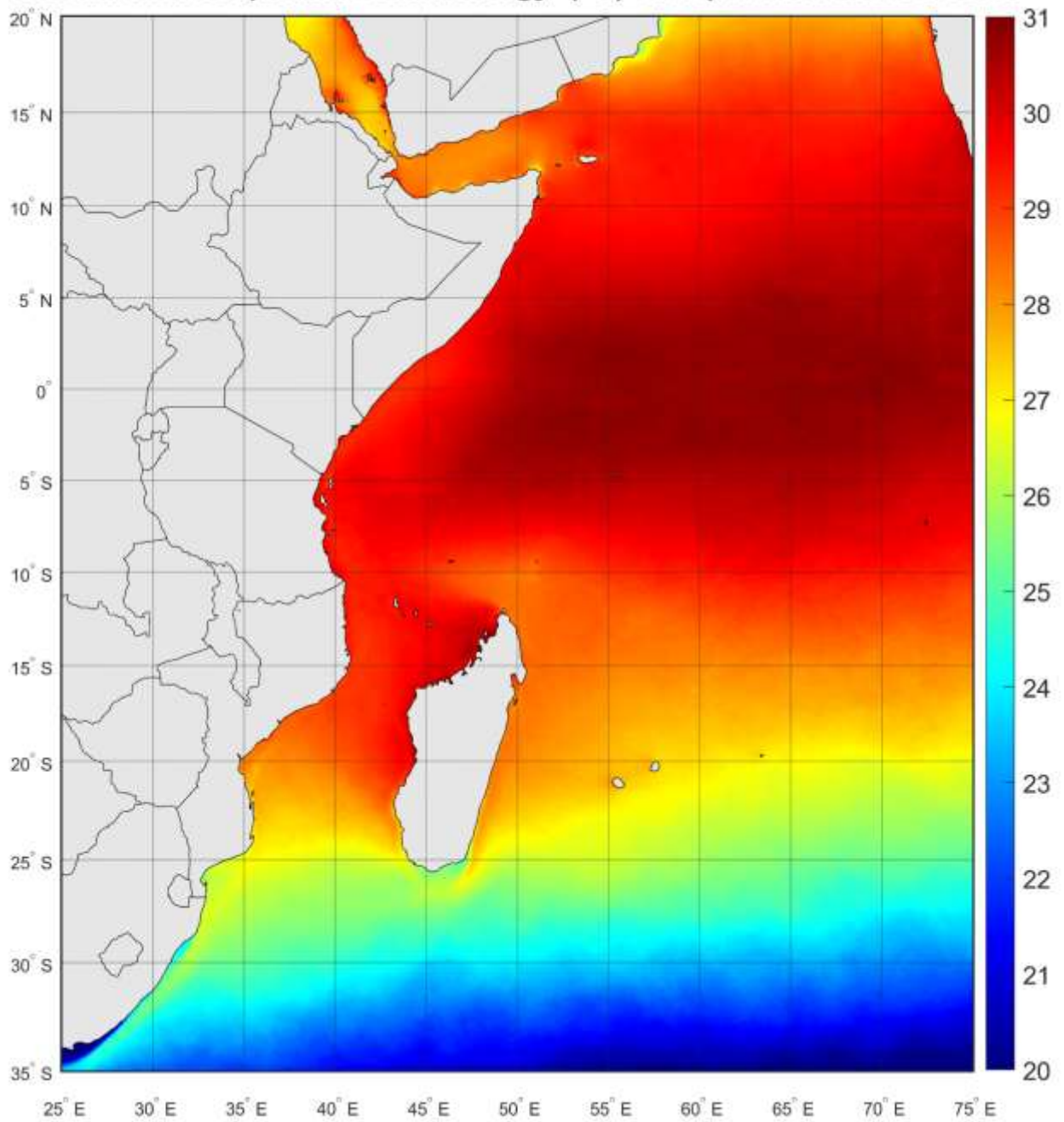
Figure 2: Climatology of sea surface temperature for July 2003 to April 2019 (°C)
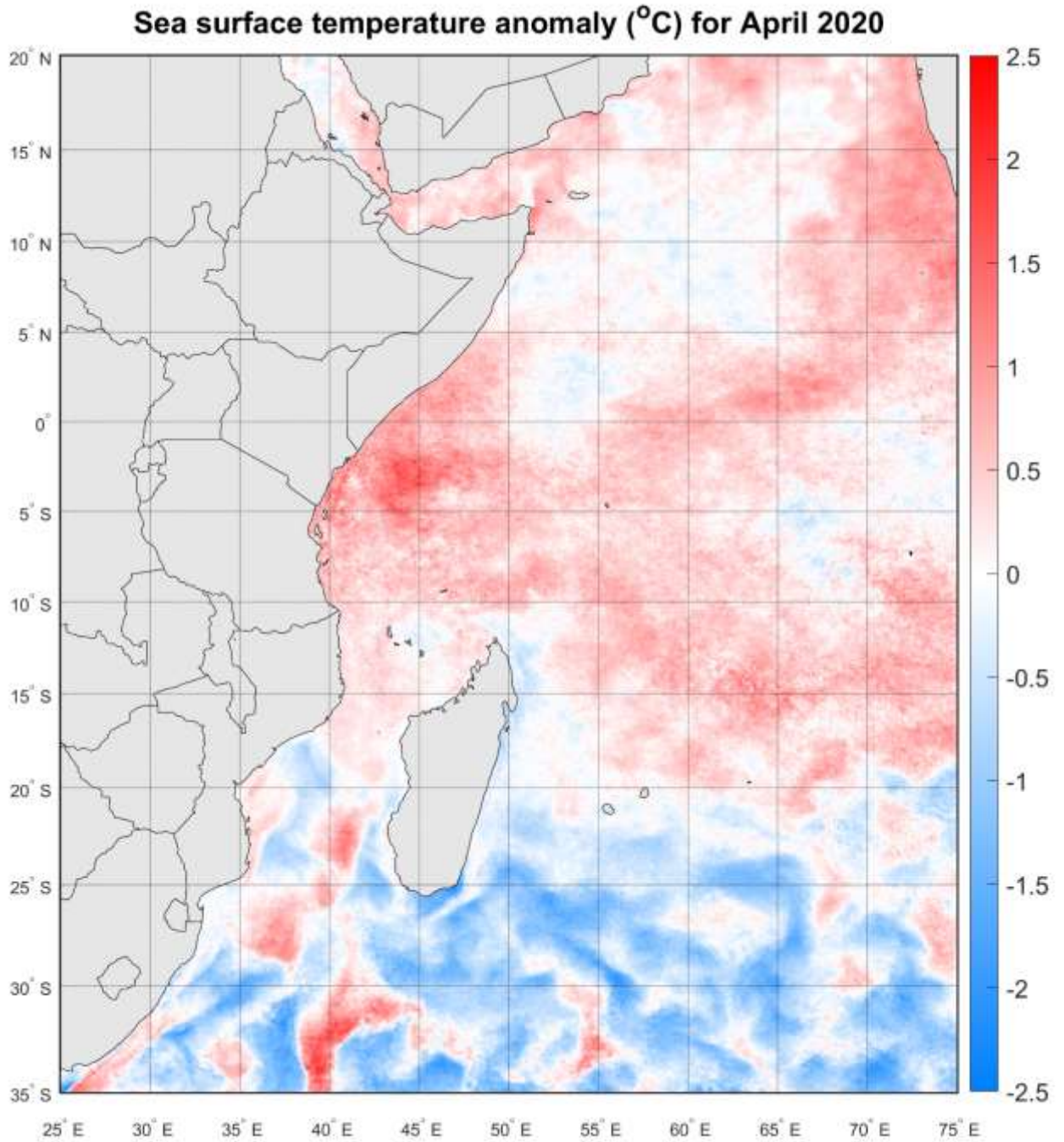
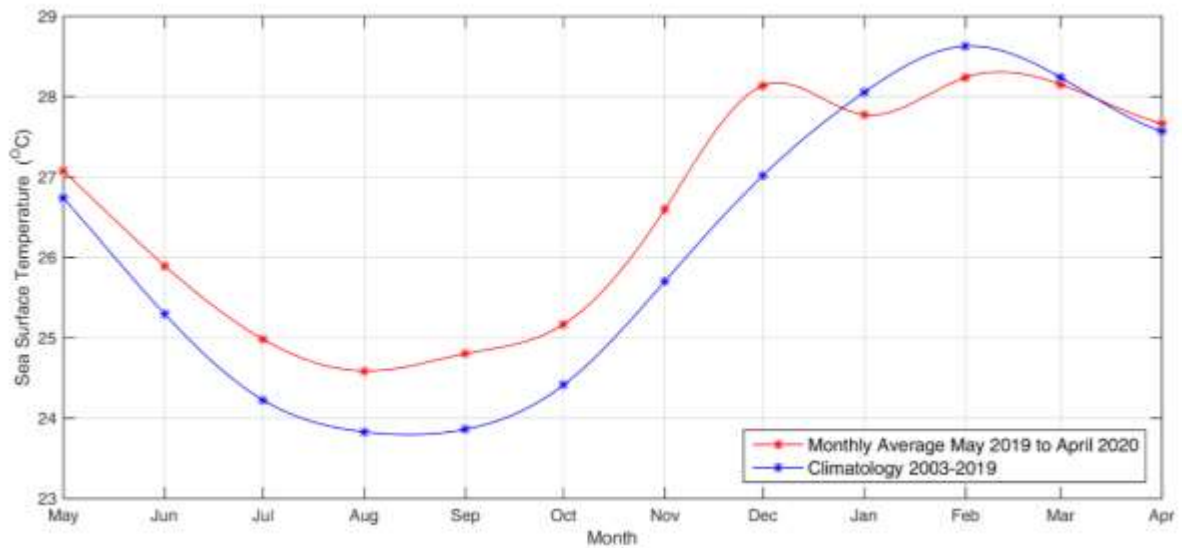**Figure 3:** Anomaly of sea surface temperature for April 2020 (°C)

Figure 4: Temporal variation of sea surface temperature (°C) surrounding Mauritius

3.1 Description of Sea Surface Temperature

Sea surface temperature (SST) is the temperature of the top millimetre of the ocean's surface. Figure 1 displays the SST variation for the month of April 2020. Warmer temperatures are represented in red and yellow, while relatively cooler temperatures are shown in green and blue. For the month of April 2020, the surface temperature was higher than normal in the northern part of the region of study, that is, above latitude 20°S.

SST peaks exceeding 29°C were observed for a few days during the second half of April 2020 and the average SST around Mauritius was close to the climatological mean. The Mozambique Channel, more particularly Mozambique coastal regions were influenced by warm surface waters and temperatures close to 30°C. The southern latitudes have experienced similar observations related to March 2020 with less warmer surface temperature with respect to the normal conditions

Positive SST anomalies were observed in most of the region in the North of SWIO, with many regions having anomalies of above 0.5°C. These anomalous variations in SST could have an impact on the primary productivity. The temperature was relative high in the high seas of Tanzania and Kenya for this month and this effect is reflecting the month of March 2020, hence we may observe a similar effect for the coming months with a rise in temperature compared to the climatology.
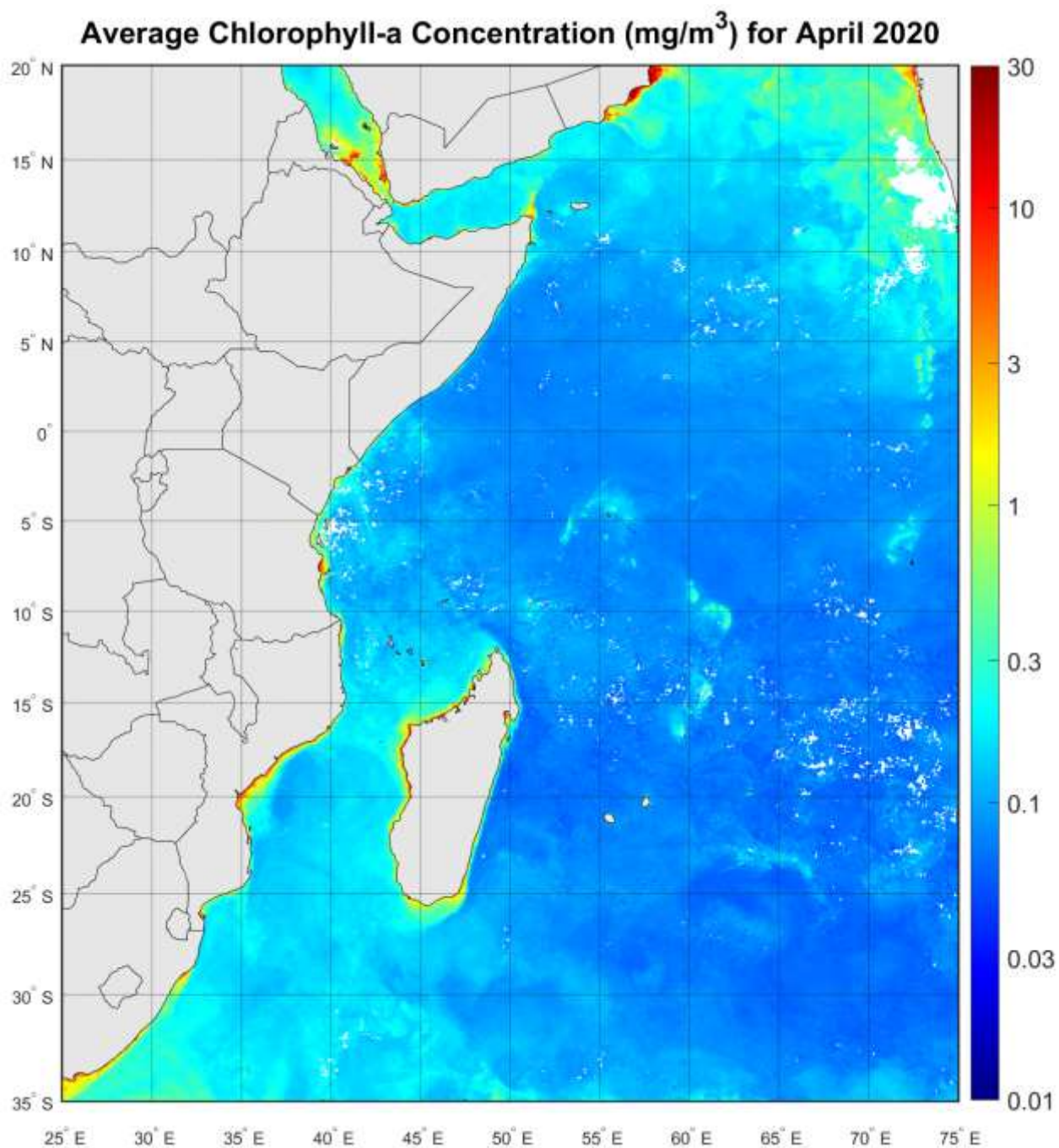
4.0   Chlorophyll-a Concentration

Figure 5: Mean chlorophyll-*a* concentration for the month of April 2020 (mg/m^3)

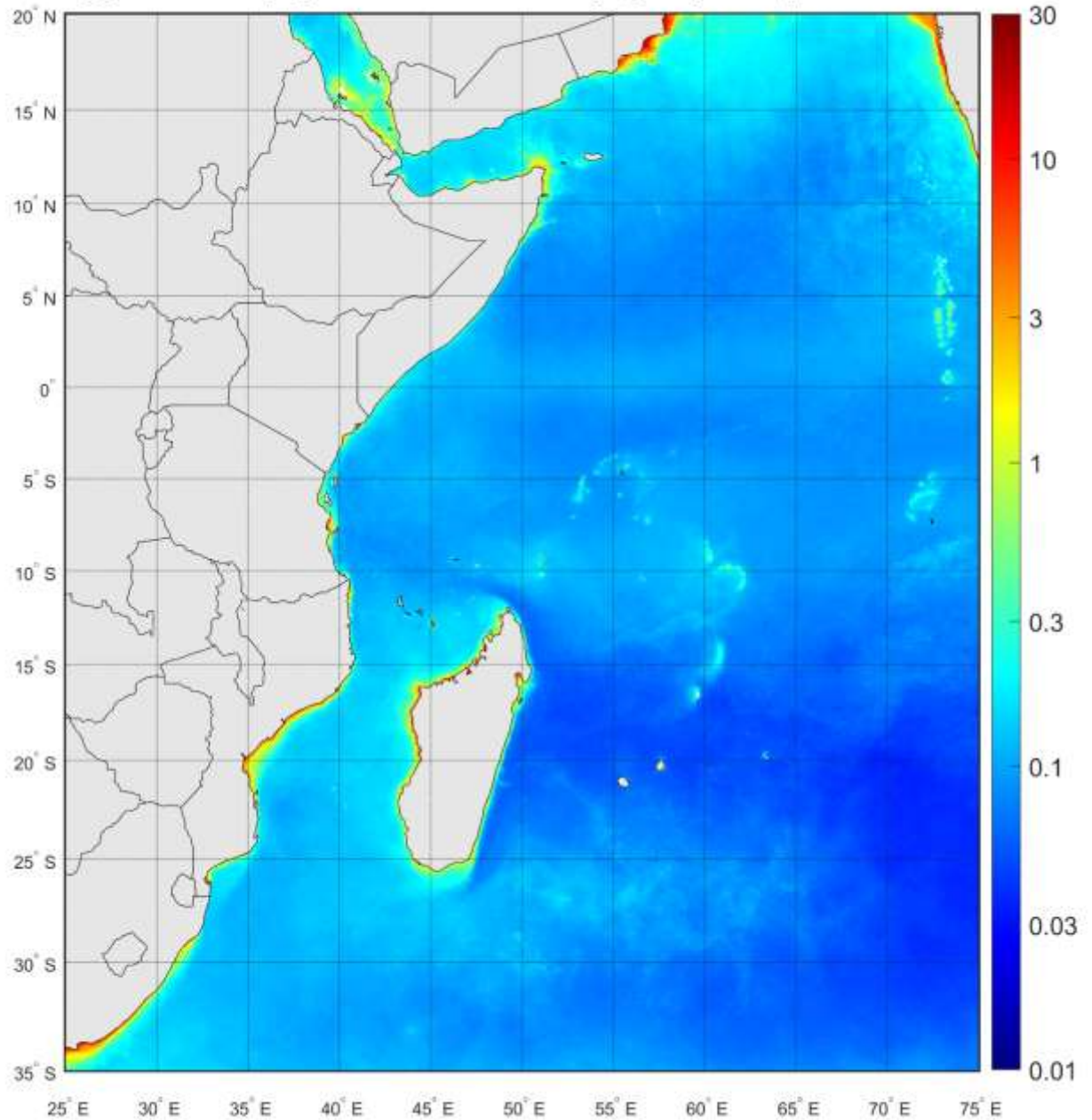# Climatology of Chlorophyll-a Concentration (mg/m³) for April from 2003 to 2019

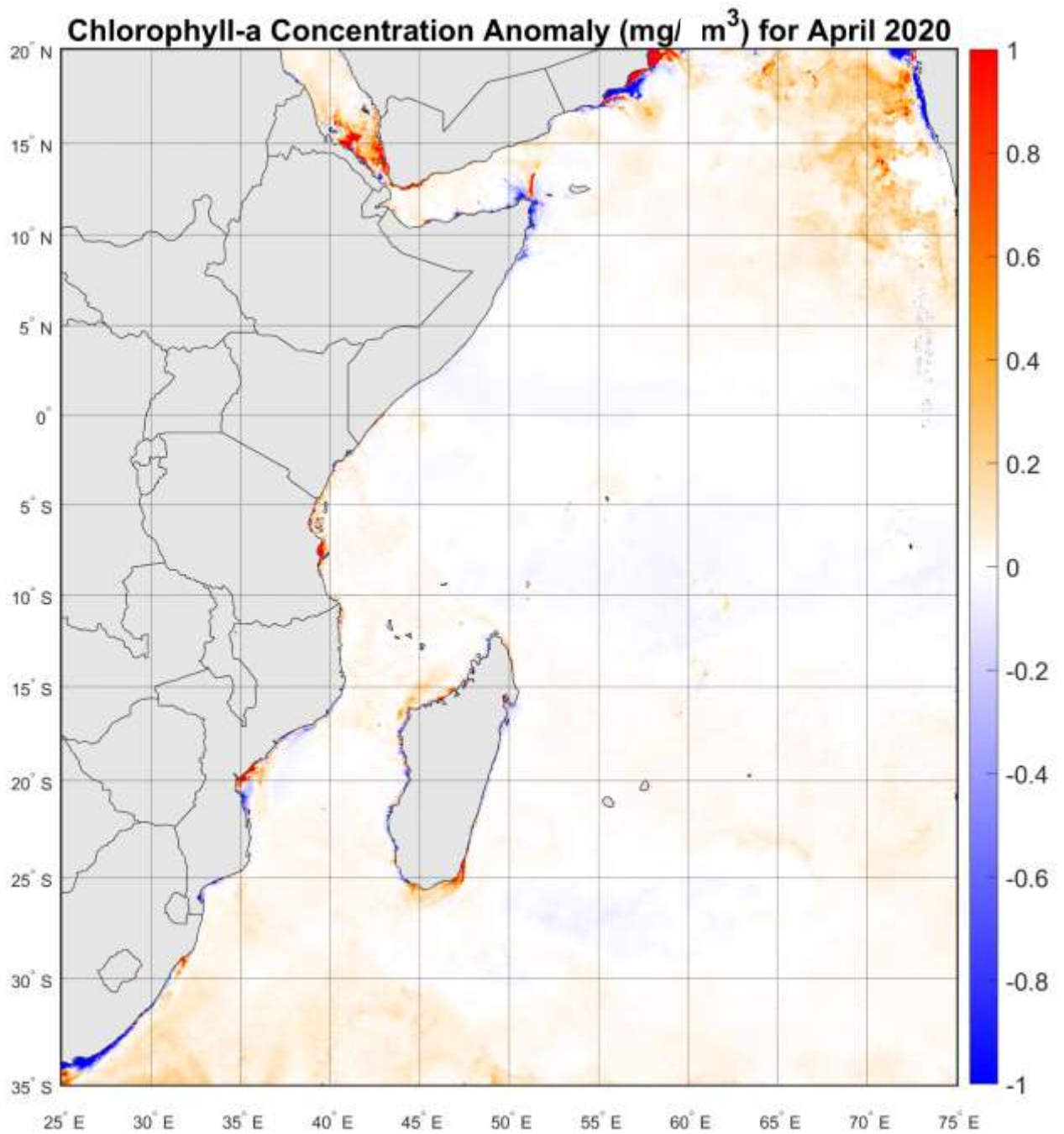**Figure 6:** Climatology of chlorophyll-*a* for April 2003 to April 2019 (mg/m³)

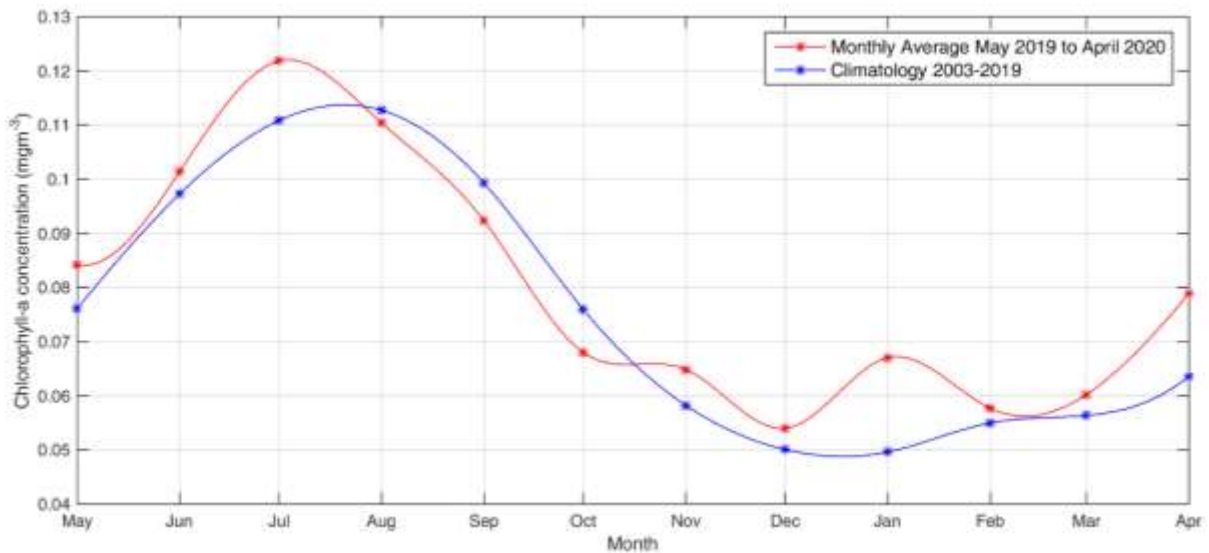**Figure 7:** Anomaly of chlorophyll-*a* for April 2020 (mg/m^3)

Figure 8: Temporal variation of chlorophyll-*a* (mg/m^3) for the region around Mauritius Island

4.1 Description of chlorophyll-a

Figure 5 shows chlorophyll-*a* concentration in milligrams of chlorophyll-*a* per cubic metre of sea water for the month of April 2020. Higher chlorophyll-*a* concentration was observed in most of the SWIO region compared to the climatology average.

The monthly chlorophyll-a concentration anomaly map (Figure 7) shows anomalies for the month of April 2020 compared to the average conditions during that period for 2003-2019. High concentrations of chlorophyll-*a* indicate favourable conditions for the growth and development of pelagic fishes. Places that were warmer than average are red, places that were near normal are white, and places that were cooler than average are blue. A persistent positive anomaly with values above 1 mg/m^3 compared to the climatology is being observed north of Mafia Island (Tanzania), which might have favoured the growth of fisheries in this coastal region and is predicted to follow the same trend next month.

The analysis of the time series around the region of Mauritius shows slightly higher chlorophyll-*a* concentration since November 2019, with an increase of above 0.15 mg/m^3 for April 2020.

Acknowledgements

This bulletin was compiled within the framework of the GMES & Africa project. Data used for the processing was obtained from Ocean Color. Mauritius Oceanography Institute (MOI) acknowledges the contribution of the Joint Research Centre (JRC) team as well as any other people who collaborated in the issue of this bulletin.

Annex

Description of Environmental Indicators

Sea Surface Temperature (SST) reflects the storage of thermal energy in the upper mixed layer of the oceans. Sea surface temperature anomalies have practical applications to fisheries and coastal waters management, including coral reef monitoring and prediction of red tides or other harmful algal blooms.

SST *Anomaly* means a departure from a reference value or long-term average. A positive anomaly indicates that the observed temperature was warmer than the reference value, while a negative anomaly indicates that the observed temperature was cooler than the reference value.

Chlorophyll-a is the light-harvesting pigment found in marine microscopic photosynthetic plants, known as phytoplankton. Its concentration is widely used as an index of phytoplankton biomass and is also used as a proxy for primary production. Chlorophyll-*a* absorbs most visible light but reflects some green and near-infrared light. By measuring what kind of light is absorbed and reflected, satellites can measure chlorophyll-*a* concentrations in the ocean, thus providing valuable insights on the health of the ocean.

Chlorophyll-a anomaly is a variation from the mean chlorophyll-*a* concentration.

Datasets

Level 3 SST and *Chlorophyll-a* Standasrd Mapped Image (SMI) dataset was used from the Moderate Resolution Imaging Spectrometer (MODIS) data, with a spatial resolution of 4 km. The Level 3 SMI products are image representations of binned data products obtained from Ocean Color.

Indicator Calculation

Monthly SST anomaly images were created using the processed monthly satellite data and the monthly climatology data. The monthly anomalies were calculated relative to the respective monthly mean. The SST climatology was obtained from MODIS data (2003-2019). The nominal pixel resolution is 4 km. The SST anomalies were calculated from the difference of the monthly composite with its respective monthly climatology based on the interval from 2003 to 2019.
Similarly, the *Chlorophyll-a* anomalies were calculated from the monthly average and the monthly climatology based on the interval from 2003 to 2019.