Environmental Development 17 (2016) 105–117

Contents lists available at ScienceDirect

Environmental Development

journal homepage: www.elsevier.com/locate/envdev

Variations in productivity of the Canary Current Large Marine Ecosystem and their effects on small pelagic fish stocks

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ARTICLE INFO

Article history:
Received 1 April 2015
Received in revised form
31 October 2015
Accepted 27 November 2015

Keywords:
Canary Current
Ecosystem
Fisheries
Productivity
Small pelagics

ABSTRACT

The Canary Current Large Marine Ecosystem (CCLME) is a Global Environmental Facility (GEF) Project, situated in the Atlantic Ocean on the North West coast of Africa. It has seven countries with a population estimate of 64.5 million and a coastline of more than 5400 km with a sea area of 2 million km^2 within their Exclusive Economic Zones (EEZ). This area is one of the richest productive marine ecosystems in the world and its coastal and oceanic waters are rich in biodiversity and hosts approximately 12,500 species dominated by crustaceans, mollusks and fish. The total annual value of the ecosystem services provided by the CCLME is estimated to be around U$11.7 billion.

The interaction between the CCLME and seasonal change in the ocean-atmospheric dynamics drives the productivity which has a mean annual value for chlorophyll of 1.31 mg chl a/m^3 and 372 g C m^2 yr^{-1} for primary productivity, based on SeaWiFS satellite data. This productivity supports abundant fish stocks with catches up to 3 million tonnes per annum being landed from the region. Fish population are dominated by the small pelagics especially sardine (*Sardina pilchardus*), sardinellas (*Sardinella sp.*) and horse mackerels (*Trachurus sp*).

Satellite derived measurements from 1997 to 2012 reveal a downward trend in primary production and this decline is accompanied by a net warming of the system and a decrease in the upwelling. The declining trends and variability in biomass of some main target commercial fish species observed during these last year was accompanied by significant fishing pressure together with fluctuations in environmental factors which may have been a key drivers of change. Future studies on the ocean dynamics of the CCLME system, its impact on resources, environmental interactions and climate change will have to be closely monitored to ensure effective transboundary management.

1. Introduction

The Canary Current Large Marine Ecosystem (CCLME) is situated in the Atlantic Ocean along the North West coast of Africa (Roy and Curry 2003) (Fig. 1). The countries that comprise the CCLME include Spain (Canary Islands), Morocco,

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http://dx.doi.org/10.1016/j.envdev.2015.11.012
2211-4645/

Mauritania, Senegal, The Gambia and Guinea Bissau. The Global Environment Facility (GEF) began funding the preparatory phase of the CCLME in 2004. Cape Verde and the waters of Guinea were later added to the project list of countries since their waters were adjacent to the zone of influence of the CCLME. Spain was also incorporated into the CCLME as a full partner although unlike the other countries, it was ineligible for GEF funding. A Transboundary Diagnostic Analysis (TDA), which is required to access funding by the GEF, is a document describing the status of the LME, its problems, root causes and threats. Most of the work during the first phase of the project was focused on preparing the TDA. After the TDA was developed, the countries then prepared a Strategic Action Plan (SAP) to implement actions to address the challenges identified in the TDA. Most of the data and summary information presented in this paper has been obtained from the TDA, a key part of the CCLME project. (CCLME, in press).

The CCLME countries are collectively responsible for a coastline of around 5400 km and a sea area of 2 million km^2 within their Exclusive Economic Zones (EEZ). The combined population of the countries of the region is estimated to be 64.5 million. The total value of ecosystem services provided by the CCLME has been calculated around US$ 11.7 billion (Interwies and Görlitz, 2013).

The Canary Current Large Marine Ecosystem, through its combination of upwelling and riverine nutrient sources provides the basis for a highly productive and biological diverse ecosystem (Heileman and Tandstad, 2008). Coastal and ocean

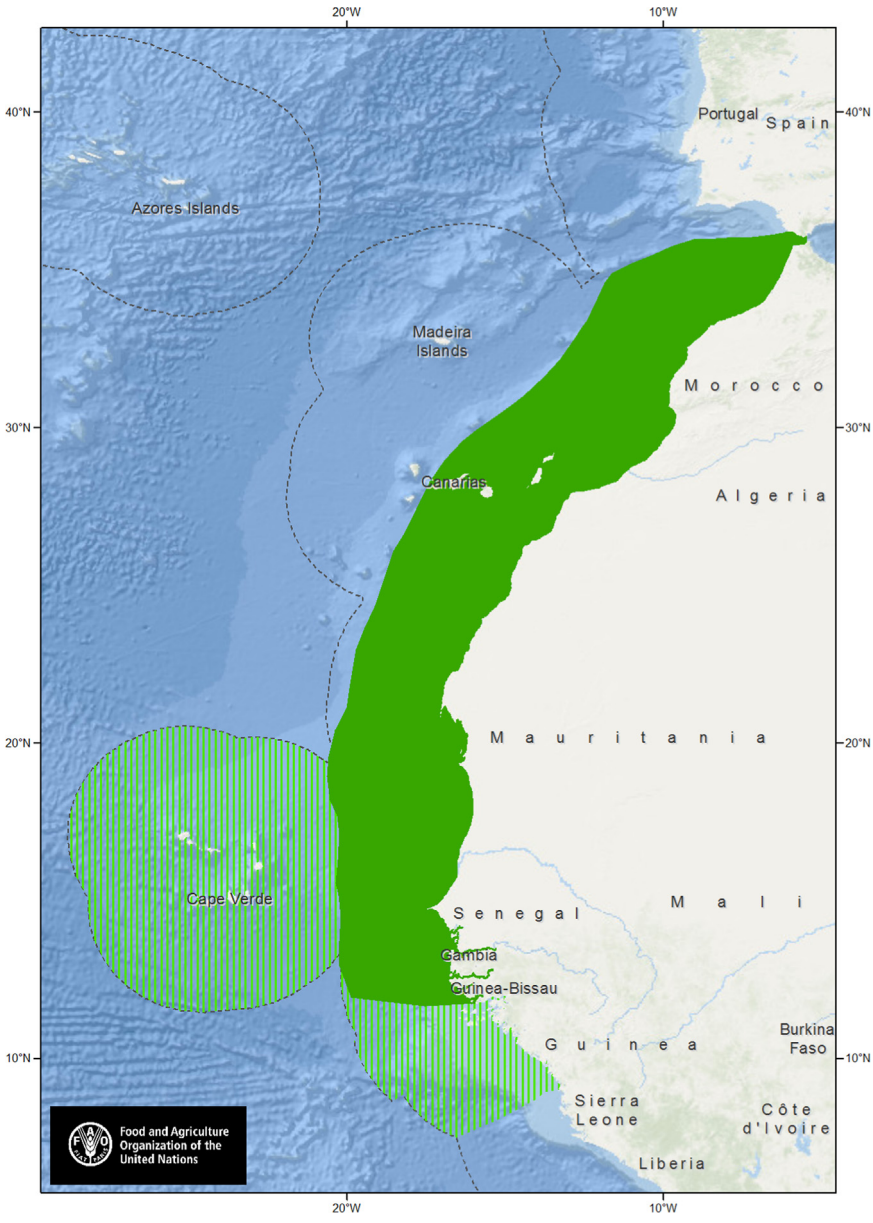

Fig. 1. : Map showing location of the Canary Current LME in dark green and areas under its zone of influence include in the GEF CCLME Project in light Green.