

Ecosystem structure and trophic analysis of Angolan fishery landings

RONALDO ANGELINI^{1,2} and FILOMENA VAZ-VELHO³

¹ Departamento de Engenharia Civil, Universidade Federal do Rio Grande do Norte, campus Universitário, CEP 59072-970, Natal, RN, Brazil. E-mail: ronangelini@yahoo.com.br

² Marine Research Institute and Zoology Department, University of Cape Town, Rondebosch 7701, Cape Town, South Africa.

³ Instituto Nacional de Investigação Pesqueira, Rua Mortala Mohamed Ilha de Luanda, CP 2601 Luanda, Angola.

SUMMARY: Information on the mean trophic level of fishery landings in Angola and the output from a preliminary Ecopath with Ecosim (EwE) model were used to examine the dynamics of the Angolan marine ecosystem. Results were compared with the nearby Namibian and South African ecosystems, which share some of the exploited fish populations. The results show that: (i) The mean trophic level of Angola's fish landings has not decreased over the years; (ii) There are significant correlations between the landings of Angola, Namibia and South Africa; (iii) The ecosystem attributes calculated by the EwE models for the three ecosystems were similar, and the main differences were related to the magnitude of flows and biomass; (iv) The similarity among ecosystem trends for Namibia, South Africa and Angola re-emphasizes the need to continue collaborative regional studies on the fish stocks and their ecosystems. To improve the Angolan model it is necessary to gain a better understanding of plankton dynamics because plankton are essential for *Sardinella* spp. An expanded analysis of the gut contents of the fish species occupying Angola's coastline is also necessary.

Keywords: Ecopath with Ecosim, fishery management, marine ecosystem, *Sardinella*, trophic level.

RESUMEN: ESTRUCTURA DEL ECOSISTEMA Y ANÁLISIS TRÓFICO DE DESEMBARQUES PESQUEROS EN ANGOLA. – El nivel trófico de los desembarques pesqueros de Angola y el modelo Ecopath con Ecosim (EwE), fueron utilizados para examinar la dinámica de la pesquería de Angola. Los resultados fueron comparados con los ecosistemas de Namibia y de Sudáfrica, con quienes se comparte algunas de las poblaciones de peces. Los análisis permiten concluir que: i. El nivel trófico promedio de los desembarques en Angola no disminuyó; ii. Existe una correlación significativa entre los desembarques de Angola, Namibia y Sudáfrica; iii. Los atributos del ecosistema (EwE) para los tres ambientes fueron muy similares; iv. El patrón similar de desarrollo de los ecosistemas, implica que es necesario mantener estudios conjuntos para las poblaciones de peces y de sus ecosistemas entre las tres regiones. Para una mejora del modelo de Angola se requiere de una mejor comprensión de la dinámica del plancton, que representa una fuente esencial para *Sardinella* spp., como también de un detallado análisis de los contenidos estomacales de las especies de la región.

Palabras clave: Ecopath con Ecosim; ecosistema marino, gestión pesquera, nivel trófico, *Sardinella*.

INTRODUCTION

African fisheries play an important role in food security and good nutrition on the continent, and supply up to 60% of the population's protein intake in some sub-Saharan countries (Béné and Heck, 2005). In the Benguela ecosystem, South Africa, Namibia and Angola all actively exploit their resources. Currently,

fisheries represent almost 9% of the GDP (gross domestic product) in Namibia, 4% in Angola and 0.5% in South Africa. The annual landings are some 214000 t in Angola, 509000 t in Namibia and 617000 t in South Africa (FAO, 2006).

The Namibian and western South African coastlines border the true Benguela coastal upwelling ecosystem, which has much higher biological production than that