

Examining the Density-Dependent Effect on the Growth of Dolphinfish, *Corphaena hippurus* in the Eastern Taiwan Waters

Kwang-Ming Liu¹, Yu-Tsau Cheng², Wei-Ke Chen^{1*},
Che-Tsung Chen³ and Wei-Cheng Su⁴

(Received, February 1, 2008; Accepted, March 15, 2008)

ABSTRACT

A 22-month length frequency data set including 7054 females and 2626 males collected at Hsinkang fish market, Taitung County from October 1996 to July 1998 were used to estimate the growth parameters, mortalities, exploitation rate and recruitment pattern of the dolphinfish (*Coryphaena hippurus*) with ELEFAN. The possibility of density-dependent growth of the dolphinfish in the eastern Taiwan waters was examined on the two periods of 1996-1998 and 2004-2005. Parameters of the von Bertalanffy growth equation with seasonal fluctuations were estimated as follows: asymptotic fork length (L_{∞}) = 160 cm, growth coefficient (k) = 0.56 yr⁻¹, age at zero length (t_0) = -0.183 yr, amplitude of seasonal growth oscillation (C) = 0.9, winter point (WP) = 0.17 for females; and L_{∞} = 172.25 cm, k = 0.7 yr⁻¹, t_0 = -0.142yr, C = 0.5, WP = 0.17 for males. Four (0⁺-3⁺) and three (0⁺-2⁺) age classes were identified for females and males, respectively. Mean fork lengths of age classes 1, 2, and 3 were estimated as 78.04, 113.19, and 133.26 cm for females. Mean fork lengths of age classes 1 and 2 were estimated as 94.59 and 133.69 cm for males. The total mortalities (Z) were estimated to be 1.466 and 1.897 yr⁻¹ for females and males, respectively. Natural mortalities (M) estimated from Pauly's empirical formula were 0.752 and 0.853 yr⁻¹ for females and males, respectively. Fishing mortality (F) and exploitation rate (E) were estimated to be 0.714 yr⁻¹ and 0.487 for females and 1.044 yr⁻¹ and 0.550 for males. The recruitment of dolphinfish in both sexes occurred in Jun. and Oct. annually. Comparing with the fish during 1996-1998, a higher growth rate and smaller asymptotic length of the dolphinfish during 2004-2005 suggested that the density-dependent effect on the growth might exist in the two periods.

Key words: Age, Growth, Density-dependent, *Corphaena hippurus*, ELEFAN.

INTRODUCTION

The dolphinfish, *Corphaena hippurus*, distributes in the tropic and subtropic waters worldwide and is a high value and recreational species (Hagood *et al.*, 1981; Szyper *et al.*, 1984; Kraul, 1989; 1991). It is one of the most common and important

species in the waters off eastern Taiwan. Based on catch statistics from eastern Taiwan waters in the last decade, annual yield of the dolphinfish peaked in 1998 (12,424 MT), decreased to the lowest level in 2000 (3,945 MT) and increased gradually thereafter (Fig. 1). However, Wang and Wang (2004) indicated that the catch per unit

¹Institute of Marine Affairs and Resource Management, National Taiwan Ocean University, Keelung 20224, Taiwan

²Department of Environmental Biology and Fisheries Science, National Taiwan Ocean University, Keelung 20224, Taiwan

³Department of Fisheries Production and Management, National Kaohsiung Marine University, Kaohsiung 811, Taiwan

⁴Institute of Taiwan Fisheries Research, Keelung 202, Taiwan

* Corresponding author, E-mail: d89310003@mail.ntou.edu.tw