

HAWAIIAN FLYING SQUID *Nototodarus hawaiiensis* (Berry, 1912) IN WATERS OFF MOZAMBIQUE (INDIAN OCEAN): DISTRIBUTION, ABUNDANCE AND REPRODUCTIVE BIOLOGY

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INTRODUCTION

The coast of Mozambique extends along 2,740 km. The fishing activity in this region has a great economic importance, being especially valuable those vessels targeting crustaceans over the continental shelf. In addition, other components of the marine fauna remain poorly known. During March and April 2007, 2008 and 2009, three research surveys were conducted onboard the Spanish R/V Vizconde de Eza by scientists of the Spanish Institute of Oceanography, in order to assess the crustacean stocks occurring in the Mozambican EEZ at depths of 100 to 700 m in 2007, and 200 to 700 in 2008-2009. All species caught were identified and sampled, including cephalopod species. *Nototodarus hawaiiensis* was present all over the study area, and the specimens were highly abundant in certain zones and depths. However, despite its relevance, this species was cited recently, for the first time, based on data collected during these surveys detailed above (Silva et al., 2009). Therefore, these results provide novel information regarding biological aspects, and more detailed information of the abundance and distribution patterns of this species in Mozambican waters.

MATERIAL AND METHODS

The three surveys were conducted from mid- March to mid- April. The study area extended from 26°50'S to 17°S covering a depth range between 100 and 700 m. For sampling purposes, the area was divided into five geographical sectors from North to South: 1 (Sofala), 2 (Bazaruto A), 3 (Bazaruto B), 4 (Boa Paz) and 5 (Inhaca). Five bathymetric strata were considered for each sector: A “100-200” (only in 2017 survey), B “200-400 m”, C “400-500 m”, D “500-600 m” and E “600-700 m”. The geographical position of fishing stations was selected following a stratified random sampling scheme. The number of hauls per geographical sector and depth stratum was made proportional to the trawlable area. The total biomass and the biomass by stratum and sector were calculated using the swept area method. Thus, a total of 126, 108 and 106 valid hauls of 30 minutes were carried out during the three surveys, respectively.

The study of reproductive biology was carried out during the survey in 2009, with a total number of 1451 squids sampled. The biological parameters registered were the dorsal mantle length (DML), body weight, sex and maturity stage using a six-stage maturity scale (Juvenile, Immature, Maturing, Mature, Spawning, and Post-spawning). Size at first maturity (DML_{50%}) was estimated after fitting, by the least squares method, the relative length-frequency distribution of mature individuals to a logistic curve.

RESULTS AND CONCLUSION

N. hawaiiensis is a relatively abundant species in the whole study area. The species showed a wide bathymetric range from 100 to 700 m into the prospected area, being more abundant in the Southern area (Inhaca-Boa Paz) than in the Northern area (Sofala Bank). The values of total estimated biomass were 43,528 tons (2007), 10,768 tons (2008) and 17,311 tons (2009), being the species more abundant in the 2007 survey and one of most abundant in the two later surveys. In all years, the highest value of biomass was observed in the upper continental slope, particularly in the strata B (200-400 m) and C (400-500 m), for all geographical sectors explored. The biomass was much reduced in the shallowest and deepest strata, showing less than 200 t in each stratum.

The results obtained from the biological sampling showed a 1:1 sex ratio. Length-weight relationships were similar in both sexes. Sizes (DML) ranged from 6 to 22 cm, being the biggest one a female specimen. Two small modes were observed, mainly in the northern area (Sofala and Bazaruto A) with 7 and 11 cm, respectively. Individuals with a mode of 16 cm were observed in all sectors. The smallest and largest mature males found had 7 and 18 cm DML, respectively. In females, sizes were bigger than those sizes presented in males, with 14 and 23 cm, respectively. First maturity sizes estimated (DML_{50%}) were 13 cm for males and 17.6 cm for females. These differences between sexes with higher maturity sizes in females are similar to those described in most cephalopods species.

These novel findings show the importance of *N. hawaiiensis*, in terms of biomass in waters off southern Mozambique. In addition, this is the first time that biological information is provided in order to improve the current knowledge of this species in this area of the eastern Indian Ocean.