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THE RELATIONSHIP BETWEEN TOTAL LENGTH AND LENGTH & WIDTH OF THE IN OTOLITH OF THREE SPARID FISH SPECIES COLLECTED FROM IRAQ WATERS

SUMMARY

The relationships of the fish total length and measurement of the otolith (length and width) was computed for the sparid species, *Acanthopagrus bifasciatus*, *A. arabicus and Sparidentex hasta* collected from the marine waters of Iraq at the North West part of the Arabian-Persian Gulf. Fish total length-Otolith length and width equations showed positive allometric growth. The coefficient of determination was R^2= 0.939, 0.954 and 0.878 for *A. bifasciatus*, *A. arabicus and S. hasta* for Tl-OL relationship respectively. The results display that assessments of body size of the species through biometric examines of otoliths are consistent.

INTRODUCTION

The information about the association between body size and otolith size will give better thoughtful of predator-prey relationships and feeding habitats of piscivorous species (Granadeiro and Silva, 2000). Additional usage of otolith retrieved can be seen in the paleontological studies of recent fish species as otoliths are well-preserved inner ear parts in fossils of marine species (Reichenbacher *et al*., 2007).

Assumed the significance and implementations of the mathematical mod-

els between fish length and otolith size, the present work designed to attest the presence of correlations between the length of *saggitae* otoliths and the body size of the sparid fish, *A. bifasciatus* collected from the marine waters of Iraq and to deliver equations to assess the body size of this species through otolith measurements. The present study in providing such information will add a missing piece of information to the literature on the biology of *A. bifasciatus*, *A. arabicus and S. hasta* as no such study has been accomplished previousely in the Arabian Gulf area.

MATERIALS AND METHODS

The sparid species *A. bifasciatus A. arabicus and S. hasta were* collected during ichthyological exploration event using small trawler vessel (21 m length x 3.5 m width) equipped with net of mesh size 2.5 cm in Khor Abdullah area, the south extent of the marine waters of Iraq, Arabian Gulf in the period January 2017 to March 2018. The morphometric measurements of the specimens (total length, total weight) were taken on board and samples were identified up to species level following Iwatsuki and Heemstra (2011). Samples were taken to the laboratory kept on ice for further analyses. Each otolith collected was placed with the sulcus acusticus oriented through the observer and its length and width were measured using hand-held Vernier callipers on the axis between the rostrum and post-rostrum axis. A total of 120 right otoliths were used for the examination. Relationships between the otolith dimensions and fish size (total length, TL) were determined using the linear regression model (Le Cren, 1951). The morphometric measurements were transformed into logarithmic values (log^{10}) to recognize and eliminate the conceivable outliers in the data (Froese *et al*., 2011). Regression parameters *a* and *b* were assessed by least square regression method (Froese *et al*., 2014, Le Cren, 1951). The *b* value for each species was estimated using a *t* test at 0.05 significance level to establish whether the value was significantly different from the isometric value (Pauly, 1993).

RESULTS

Total length of the specimens of the three sparid species ranged from 204 – 330, 101 – 224 and 170 – 240 mm, with 263 ± 2.33, 160 ± 2.32 and 201 ± 2.31 for *A. bifasciatus*, *A. arabicus* and *S. hasta* respectively.

The ranges and means (± standard deviation) of otolith length, width and mass for the three sparid species are shown in Table 1.

The relationship of the fish total length v otolith length of the three sparid species examined in the present study exhibited positive allometry (*b* value < 1)

(t test, $p < 0.05$). Same allometry type was obtained for the relationship of fish total length and otolith width (Table 1). Otolith length showed high association of otolith length and width with fish total length were obtained for the three species in question (Table 1). In the examination of morphometric parameters (otolith length and width) and mass against fish total length, no substantial differences between right and left otoliths were detected by ANCOVA test.

DISCUSSION

No data is existing on the relationships between fish total length and otolith sizes from the marine waters of Iraq and the Arabian Gulf region for *A. bifasciatus*, *A. arabicus* and *S. hasta* examined.

The morphometric association of otoliths with the fish length is useful tool in species, stock and population discrimination and can be exploited in estimation of fish size and biomass in food and feeding studies (Granadeiro and Silva, 2000). The robust link between otolith sizes and fish total length infers that somatic development has a vital influence on the otolith growing (Munk, 2012). The majority of the studies have displayed similar links for somatic and otolith growing (Aneesh *et al*., 2017). All regressions exhibited high correlation values. Thus, these equations could be valuable to assess fish size confined by the fish size range limits.

The results of the present study show that OL would be the strongest measure of somatic growth in all three species investigated. Previous studies have shown that retrieving the fish size through regression equations has some limitations that centred around the variation in geographical areas, stocks, populations, and/or sexes (Reichenbacher *et al*., 2009), ontogenic fluctuations in the life history (Hare and Cowen, 1995), also owing to the chemical and mechanical changes in the digestive tract (Granadeiro and Silva, 2000,) that devalue the size of the prey. Yet, the particular equations acquired in the present study can be valuable for several studies such as food and feeding, population dynamics, yield estimates and paleontological studies in the Arabian Gulf region in general and the marine waters of Iraq in particular. In conclusion, it is requisite to develop these correlations for further species, to complement the investigations and assess the trophic link between the fishes from the studied area.

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