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Short Communication

Otolith Dimensions versus Fish Lengths Estimated for Five Carangids (Pisces) in Pakistan

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NQ prepared manuscript and performed statistical data analysis. SKP guided in the research and helped in manuscript writing.

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ABSTRACT

Sagitta otoliths of five species *Scomberoides commersonnianus* (414), *S. lysan* (15), *S. tala* (8*), S. tol* (344) and *Megalaspis cordyla* (277) were collected from the commercial catches from July 2013 to March 2015. Fish length and otolith length for five species recorded as *S. commersonnianus* TL_{cm} = 16.3−88.4, OL_{cm} = 0.3−0.9; *S. lysan* TL=23.2−73, OL = 0.2−0.7; *S. tala* TL = 48.5−55.5, OL = 0.6-0.9; *S. tol* TL =18.9−68, OL =0.3− *M. cordyla* TL= 18.4−47, OL = 0.3−0.9. The otolith dimensions such as length, height, weight were plotted against fish body parameters length and weights. The regression models estimate for otolith dimensions and fish body parameters estimates can be useful for studies on population structure of five important carangids species.

Four queen fishes (*Scomberoides commersonnianus. S. tala, S. lysan* and *S. tol*) and a horse mackerel (*Megalaspis cordyla*) are co-occurring species in the waters off northern Arabians Sea coast of Pakistan are economically and ecologically important to the fisheries in the area. The recorded contribution of *M. cordyla* was 25% among overall carangid species caught in Pakistan. Although, no separate data is available for queen fishes, hence genus *Scomberoides* combined catch had been reduced from 17779mt in 1999 to 9073 mt in 2009 (Handbook, 2012). The FAO (2012) recorded increased landing of *S. commersonnianus* in the Western Indian Ocean from 4,994 mt in 2001 to 11,374 mt in 2010. Fish otoliths functions as balancing, hearing and an indicator of variability of fish habitat. In comparison to the fast swimming fishes broader otoliths found in slow swimming fishes (Parafkande-Haghighi, 2008). These hard sensory structures in fishes help in understanding feeding, fish stock monitoring and management (Harvey *et al*., 2000) and its size can be affected by the process of digestion in the stomach. The aim of this paper was to compare variability between otolith dimensions and fish body parameters and find inter species shape variations in five species of carangid fishes.

Material and methods

A total of 773 individuals of five species of *Scomberoides* and *Megalaspis* was collected from commercial catches from the Karachi fish harbor from July 2013 to March 2015. Species were identified using FAO species catalogs (Bianchi, 1985). Standard morphometric parameters such as total length, standard length, fork length, girth measured in (cm) and body weight in (grams). The sagitta otolith (pair) were extracted out and measured to (mm) and weighed at 0.0001-gram precision using digital balance (Diamond MCT500, Ohaus, USA). No significant difference in right and left otolith were tested (t test, P>0.05). However, right otoliths were used for each calculation and damaged otoliths were separated and did not use. Regression model were applied on total length-verses otolith length, otolith weight, and otolith length (OL) verses otolith weight (OW). Otolith length and width description presented in Supplementary Figure S1.

Results

The otolith shape parameters for five carangids showed considerable variations within the inter-intra species. Of all five species otolith have sulcus with heterosulcoid in shape and ostium is funnel-like while cauda tubular (Supplementary Table I). The parameters of fish (length and weight) and otolith (length and weight) for four queen fishes and one horse mackerel are summarized in Table I.

Regression model on TL~OL, TL~OW, OL~OW was applied separately for all five species (Fig. 1). We found strong correlation between otolith weight (OW)/otolith length and total length (TL) in *S. tala* (R^2=1).

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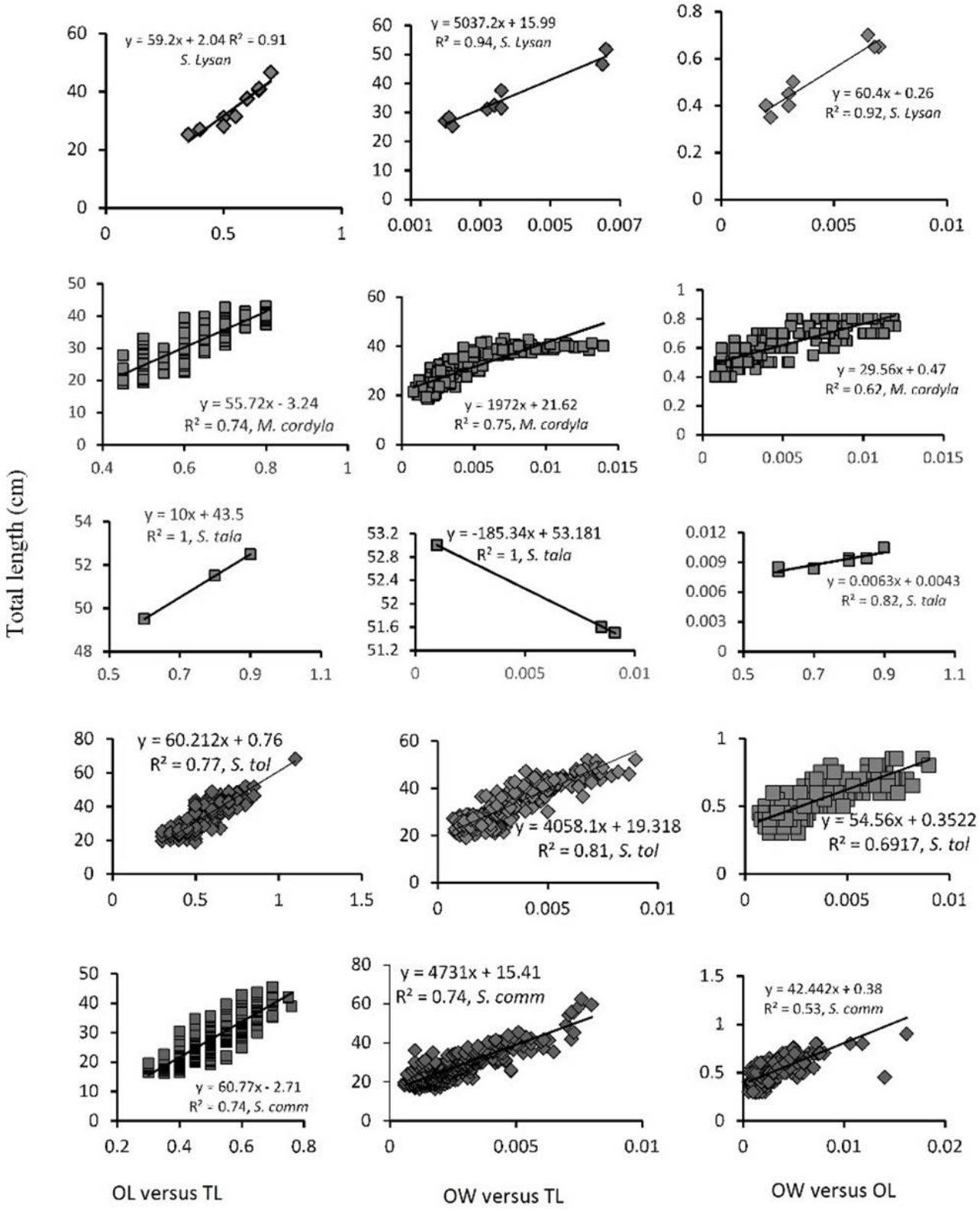

Fig. 1. Regression estimation of *S. commersonnianus*, *S. lysan*, *S. tala, S. tol* and *M. cordyla* collected from northern Arabian Sea.

Table I.- Fish and otolith lengths and weights (total fish length TL, Otolith length OL, Otolith height OH), Otolith weight OW for five carangid species.

Species name	n	TL (cm) Min-Max	OL (cm) Min-Max	OH (cm) Min-Max	OW (g) Min-Max
Scomberoides commersonnianus (Lacepède, 1801)	414	16.3−88.4	0.3−0.9	0.2−0.5	0.0006−0.00162
S. lysan (Forsskål, 1775)	15	23.2−73	0.2−0.7	0.15−0.35	0.0012−0.0078
S. tala (Cuvier, 1832)	8	48.5−55.5	0.6-0.9	0.3−0.35	0.00098−0.0105
S. tol (Cuvier, 1832)	344	18.9−68	0.3−1.1	0.15−0.5	0.0007−0.0155
M. cordyla (Linnaeus, 1758)	277	18.4−47	0.3−0.9	0.15−0.3	0.0008−0.024

Supplementary Figure S2 shows a very week relation between otolith length and otolith weight of *S. commersonnianus* (OL~OW, R^2= 0.53) (Fig. 1). The regression between TL~OL and OL~OW was estimated to be R^2= 0.74 and 0.53, respectively for *S. commersonnianus*. For *S. lysan,* relationship between OL~OW and OL~TL was R^2= 0.92 and 0.91, respectively. R^2 in *S. tala* for TL~OL was 1 and for OL~OW was 0.82. For *S. tol* this relationship between TL~OW and OL~TL was 0.81 and 0.77, respectively. In *M. cordyla* R^2 for TL~OL was R^2=0.74 and for OL~OW it was 0.53 (Fig. 1).

Discussion

The morphometry is widely used to evaluate fish population variations, monitor fish stocks and paleontological studies. Use of sulcus inscription structure in otoliths is rational method for distinguishing species in most of carangid species. The fast and slow swimming, nature can also be detected from the otolith shape in carangids, slow moving fishes have a larger otolith as compared to the fast swimming fishes. The sulcus shape correlates with the special nature of diet of *S. commersonnianus*, *S. tol* and *M. cordyla* (Qamar *et al*., 2015, 2016b). Somatic growth depends on availability of food, whereas temperature influences both metabolism and somatic growth. Larger otolith can be a result of slower somatic growth, whereas fast growth may produce elongated otolith. The rounded otolith may be the result of reduced growth. This study showed that the elongated otolith is because of slow growth rate. Qamar *et al*. (2016a) and Panhwar *et al*. (2014) have reported slow growth rate of *M. cordyla* (K=0.73), *S. commersonnianus* (K=0.25) and *S. tol* (K= 0.37). Previous studies revealed that all these species are slow growing. Regression estimates showed positive correlation between otolith growth and fish length, whereas weak relationship was estimated in the otolith dimensions versus total length of *S. tala*. Otolith length increases till the fish attains its maximum length, the otolith continue to grow in thickness (Blacker, 1974). However, in three species (*S. commersonnianus, S. tala and M. cordyla*) otolith length is the best predictor of fish length and in *S. tol* and *S. lysan*, otolith weight was supposed to be forecaster of fish length.

Supplementary material

There is supplementary material associated with this article. Access the material online at: http://dx.doi.org/10.17582/journal.pjz/2019.51.5.sc2

Statement of conflict of interest

Authors have declared no conflict of interest.

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