



# International Journal of Fisheries and Aquatic Studies

ISSN: 2347-5129

(ICV-Poland) Impact Value: 5.62

(GIF) Impact Factor: 0.549

IJFAS 2016; 4(5): 17-19

© 2016 IJFAS

www.fisheriesjournal.com

Received: 04-07-2016

Accepted: 05-08-2016

**Sudarshana Nandi**

Aquatic Ecology and Fish  
Biology Laboratory, Department  
of Zoology, Visva-Bharati  
University, Santiniketan, West  
Bengal -731235, India

**Surjya Kumar Saikia**

Aquatic Ecology and Fish  
Biology Laboratory, Department  
of Zoology, Visva-Bharati  
University, Santiniketan, West  
Bengal -731235, India

## Does size matter? Observation on the availability of micronutrients in two different sizes of small freshwater fish *Amblypharyngodon mola* (Hamilton, 1822)

**Sudarshana Nandi and Surjya Kumar Saikia**

### Abstract

Two size groups (based on Total Length, TL) of *Amblypharyngodon mola* (small, TL=4-7cm; big, TL>7cm) were studied for availability of Ca, Fe, Zn and Vitamin A contents in its body using AAS and HPLC methods. The Ca, Fe and Zn contents of small sized *A. mola* were found to be significantly higher than that of big sized groups. The average Ca content was estimated to be highest (4680.223 mg.100g<sup>-1</sup>) in this fish followed by Zn (18.41mg.100g<sup>-1</sup>) and Fe (17.03mg.100g<sup>-1</sup>). However, Vitamin A content was estimated to be more or less equal in both the size groups (small, 1.27446 g.100g<sup>-1</sup> and big, 1.21854 g.100g<sup>-1</sup>). The study showed that smaller size *A. mola* are rich in micronutrients than its bigger counterparts.

**Keywords:** Mola, micronutrient, small fish, malnutrition, vitamin A

### 1. Introduction

Small indigenous freshwater fish (SIF) species are grouped differently based on the characteristics that they grow below 25cm in their whole life span. Reports are available that this group of fishes are enormously rich in micro-nutrients especially Vitamin A, calcium (Ca), iron (Fe), zinc (Zn) and other several micronutrients<sup>[1, 2]</sup>. However, enough scientific studies have not been done on this subject.

Of the large diversity of SIFs, *Amblypharyngodon mola* has been identified as highly rich in micronutrients, like Vitamin A, Ca, Zn and Fe<sup>[3, 4]</sup>. This fish belongs to the family Cyprinidae and grows upto 10cm in total length (TL). Recently, we have reported that this small fish is a size selective feeder of phytoplanktonic feed<sup>[5]</sup>. Its smaller sizes (4-7cm in TL) feed smaller phytoplankton whereas the big sizes (>7cm in TL) feed both smaller as well as large phytoplankton. Based on such specific feeding behaviour on different food sources, we hypothesized that its nutrient composition may also vary according to the respective size groups. The present study aimed to see such variations, if exists, for a number of minerals viz. Ca, Fe and Zn and also for Vitamin A.

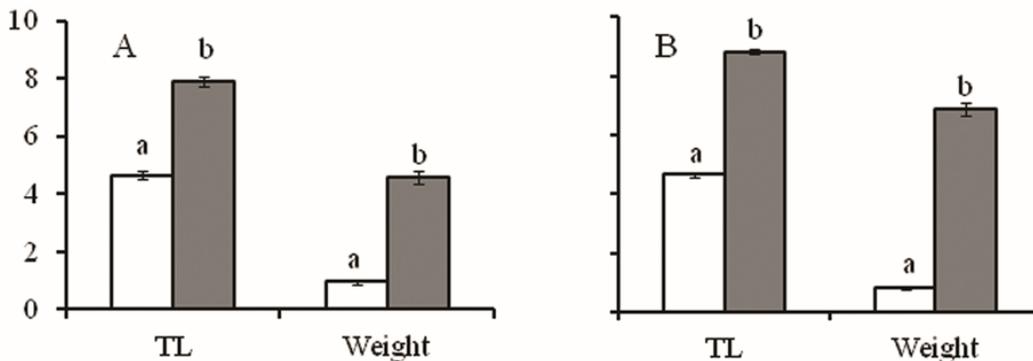
### 2. Materials and Methods

The fresh samples of *A. mola* were collected from the freshwater ponds in and around Bolpur, Santiniketan, West Bengal, India (23.6700°N, 87.7200°E) during May 2015 to September 2015. Appropriate cooling support (4 °C) was provided while bringing fish samples into the laboratory. Fishes were washed under running tap water and morphometric measures (TL and Weight) were recorded immediately to differentiate between small (4-7cm in TL) and big (>7cm in TL) sized *A. mola* as followed by Nandi and Saikia<sup>[5]</sup>. Figure 1 shows both the size groups employed for minerals and Vitamin A estimations. The small and big sized *A. mola* used for mineral estimation had mean TL 4.66 (SE=0.12, n=23) and 7.89 (SE=0.19, n=10) with significant statistical difference ( $t_{16}=-14.26, p<0.05$ ). Similarly, small and big sized *A. mola* used for vitamin A estimation had mean TL 4.9 (SE=0.038, n=40) and 7.8 (SE=0.062, n=20) with significant statistical difference ( $t_{34}=-39.27, p<0.05$ ).

### Correspondence

**Surjya Kumar Saikia**

Aquatic Ecology and Fish  
Biology Laboratory, Department  
of Zoology, Visva-Bharati  
University, Santiniketan, West  
Bengal -731235, India



**Fig 1:** Two different size groups, small (□) and big (■) in terms of Total Length (TL) of *Amblypharyngodon mola* for analysis of (A) Ca, Fe and Zn and (B) Vitamin A. Statistically significant differences ( $p < 0.05$ ) within a groups (TL or Weight) are shown with different lower case letters.

For analysis of minerals, all fishes of specific size groups were pulled without discarding any part of the body, dried in hot air oven for 2 hours (with interruption) at 45°C, grinded and kept in (4 °C) for further processing. For estimation of each mineral (Ca, Fe or Zn), three grinded subsamples of required size (by weight, g) appropriate for individual analytical tests were used. All these mineral subsamples were subjected to acid digestion (CEM Corp, USA) and the digested solution was filtered through No. 42 Whatman Filter paper. Subsamples were finally analysed in Atomic Absorption Spectrophotometer (AAS, Analytik Jena Vario-6). The mineral contents were determined using calibration curve prepared for the respective mineral.

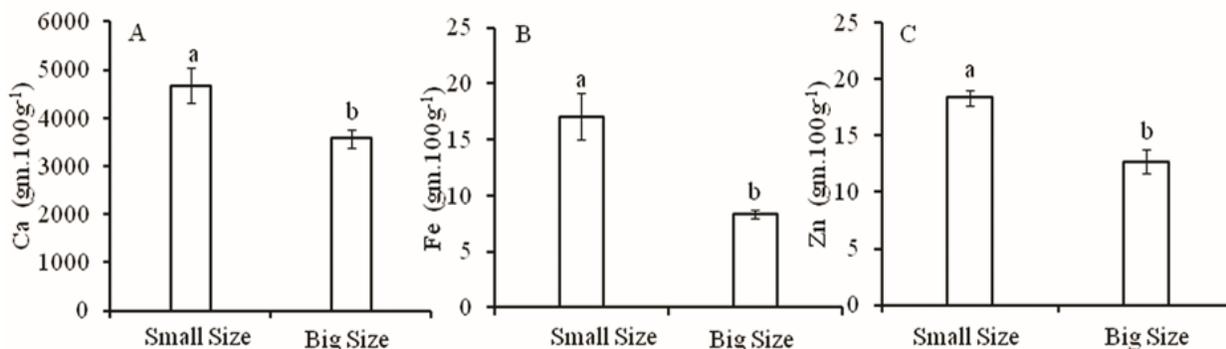
Vitamin A content of freshly preserved (-20°C) fish samples was analyzed on Agilent HPLC system accordingly to AOAC as reference method. The Agilent octadecyl silane carbon chain (C18)-bonded silica column was used (5 µm, 4.6 × 250 mm) with Methanol solvent, and UV absorbance was recorded at 325 nm for Vitamin A.

The nutrient contents were expressed as per 100g of total edible parts of body weight. In these small fish species, no inedible part is found and moisture content remains within 72-80g.

**3. Results and Discussion**

The AAS analysis showed that the small sized *A. mola* has high Ca content than that of its big sized groups (Figure 2A,

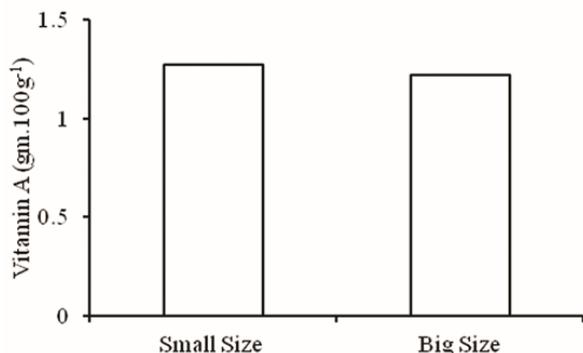
$t_4=2.60, p<0.08, 2$ -tailed). The mean content of Ca was 4680.223 mg.100g<sup>-1</sup> of fish and is considerably the highest estimate of Ca in any freshwater fish ever reported [4]. Similar differences were recorded for Fe (Figure 2B,  $t_4=4.11, p\leq 0.05, 2$ -tailed) and Zn (Figure 2C,  $t_4=4.52, p<0.05, 2$ -tailed) contents between small and large size mola. Their mean values were 17.03mg.100g<sup>-1</sup> and 18.41mg.100g<sup>-1</sup> respectively and of much higher than that of other SIFs and carps already reported [4, 6]. This is obvious that availability of all these micronutrients between small and big sized *A. mola* were significantly different and high in range. In case of all three micronutrients, the small sized *A. mola* exhibited higher ranges of availability. Interestingly, the small sized *A. mola* has iron content approximately 2 times higher than that of the big sized *A. mola*. The zinc content also gave similar result. The exact reason of such difference may not be known at this stage, however, contribution of size selective feeding to such differences in nutrient availability may not be ignored. Although such information on its nutritive differences is new in case of *A. mola*, which is mainly a herbivorous fish, earlier Jafri and Khawaja [7] recorded the difference in Ca content between the different sizes of carnivorous fish, *Wallago attu*. Sankar *et al.* [8] also showed that smaller size-group showed relatively high Ca content in muscle than the larger fishes. By weight, 6-10g of fish group has more calcium content than 3-5g and 25-30g groups of *Stolephorus commersonii*.



**Fig 2:** Micronutrient contents between two different size groups (Small and Big size) of *Amblypharyngodon mola*. Statistically significant differences ( $p < 0.05$ , except Ca with  $p < 0.08$ ) between size groups are shown with different lower case letters.

However, the vitamin A content was found to be more or less equal in both the size groups of *A. mola* with 1.27446 g.100g<sup>-1</sup> and 1.21854 g.100g<sup>-1</sup> for small and big sized groups respectively (Figure 3). Overall, this preliminary observation also found that SIFs were reported to have high vitamin A

contents than the large carp species [4, 9]. Few studies in Bangladesh showed that *A. mola* has vitamin A content 15 times higher than that of carps [1, 9]. The present observation also showed high vitamin A content in the body of *A. mola* irrespective of the size difference.



**Fig 3:** Vitamin A content in the body of two size groups of *Amblypharyngodon mola*.

What is new in this preliminary study is that small sized *A. mola* is comparatively more enriched with micronutrient like Ca, Fe and Zn than its big sizes. In view of lack of actual scientific information, SIFs like *A. mola* are often consumed when they attain their maximum size (8-10cm in TL). However, from the present study it is evident that the stage of growth is an important factor for micronutrient availability in *A. mola* and these findings suggests small sized *A. mola* to consider for micronutrient supplementation to obtain optimum health benefits.

#### 4. Conclusion

Bio-available sources of micronutrients are always a demand for human consumption. In SE Asia, small freshwater fishes (SIF) are always neglected as food fish for several reasons. However, SIF have been found to be rich in micronutrients, particularly, Ca, Fe, Zn and Vitamin A. The fish *Amblypharyngodon mola* is a SIF (total length <10cm) and highly rich in micronutrients. Our present study revealed that such micronutrient enrichment is size dependent, wherein, small sized *A. mola* has higher mineral content than that of big sized ones. This finding on *A. mola* would support selective and advantageous micronutrient supplement to malnourished.

#### 5. Acknowledgement

Authors are grateful to Edward Food Research and Analysis Centre Limited, Kolkata, India, Sophisticated Analytical Instrument Facility, North Eastern Hill University, Shillong, India, CAS Programme (UGC) and DST-FIST Programme (Department of Science and Technology, New Delhi) in Department of Zoology, Visva-Bharati for their material support to this work.

Authors in this article have no conflict of interests.

#### 6. References

1. Roos N, Wahab MA, Mostafa ARH, Thilsted SH. Linking human nutrition and fisheries: Incorporating micronutrient-dense, small indigenous fish species in carp polyculture production in Bangladesh. *Food and Nutrition Bulletin*. 2007; 28:80-93.
2. Thilsted SH, Roos N, Hassan N. The role of small indigenous fish species in food and nutrition security in Bangladesh. *Naga the ICLARM Quarterly*, 1997, 82-84.
3. Thilsted SH. The role of small indigenous fresh water fish species in improving nutrition in rural populations. In: *Small indigenous freshwater fish species and conservation of biodiversity*, Workshop proceeding, 2010, 23-25. CIFRI, Barrackpore. 2010.
4. Bogard JR, Thilsted SH, Marks GC, Wahab MA, Hossain MAR, Jakobsen J *et al*. Nutrient composition of important fish species in Bangladesh and potential contribution to recommended nutrient intakes. *Journal of Food Composition and Analysis*. 2015; 42:120-133.
5. Nandi S, Saikia SK. Size selective feeding on phytoplankton by two morphogroups of small freshwater fish *Amblypharyngodon mola*. *Journal of Fish Biology*. 2015; 87:215-230.
6. Kawarazuka N, Béné V. The potential role of small fish species in improving micronutrient deficiencies in developing countries: building evidence. *Public Health Nutrition*. 2011; 14(11):1927-1938.
7. Jafri AK, Khawaja DK. Seasonal variations of tissue calcium and phosphorus in the juveniles of the catfish, *Wallago attu* (BL. & SCHN.). *Indian Journal of Fisheries*. 1975; 22:221-224.
8. Sankar TV, Anandan R, Mathew S, Asha KK, Lakshmanan PT, Varkey J *et al*. Chemical composition and nutritional value of Anchovy (*Stolephorus commersonii*) caught from Kerala coast, India. *European Journal of Experimental Biology*. 2013; 3:85-89.
9. Roos N, Leth T, Jakobsen J, Thilsted SH. High vitamin A content in some small indigenous fish species in Bangladesh: perspectives for food based strategies to reduce vitamin A deficiency. *International Journal of Food Sciences and Nutrition*. 2002; 53:425-437.