

## **Length-weight relationship of lionfish *Pterois mombasae* (Smith, 1957) and spine used as biomedical agent from Parangipettai coast, Tamilnadu, India**

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### **ABSTRACT**

*Length-weight relationship of *Pterois mombasae* collected from Mudalsaloodai landing centre, Parangipettai coast, Tamilnadu, India was investigated. In addition to this, morphometric characters also attempted. In the present investigation sample collected from January, 2012 to June, 2012 using long line, gillnet and hand line through commercial vessels. The mean size ranged from  $1.8 \pm 0.05$  cm to  $19.03 \pm 0.02$  cm and weight range from  $10.3 \pm 0.15$  g to  $341 \pm 0.57$  g. Linear regression analysis was also executed to study the length-weight relationship ( $W=aL^b$ ); the 'r' value for the lionfish from this region was found to be 0.647. Microscopic observation reveals that the entire spine is enveloped with epithelial tissues, with distinct pigmentation and it is hard and thick. The venomous dorsal spine size ranged from 0.2 to 5.2, pelvic spine size ranged from 0.2 – 1.8 cm and anal spine ranged from 1.5 to 0.1.*

**Keywords:** Length -weight relationship, Morphometrics, Venomous spine and *Pterois mombasae*.

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### **INTRODUCTION**

Lion fishes (Scorpaenidae) were reported to be the most risky venomous fishes of the world, which possess a very sophisticated venom apparatus and potentially lethal toxin [22, 15, 10]. Their venom apparatus consists of spiny rays at dorsal (12 to 14), anal (3) and pelvic (1+1) fins [13, 9]. The large sized venom glands are covered by warty skin and partially enclosed by lateral grooves of the spines. Upon contact, the warty skin is compressed, squeezing the venom gland and injecting the venom into the victim's organ [6]. Wounds from the spines are excruciatingly painful, soon becoming intolerable and can last for days [12, 6]. Lionfish venom has been found to cause cardiovascular, neuromuscular and cytolytic effects ranging from mild reactions such as swelling to extreme pain and paralysis in upper and lower extremities [8]. Lion fish venom contains composition of acetylcholine and a neurotoxin that affects neuromuscular transmission [3] and heat-labile (Denatures over 50°C), which exhibits myotoxic, neurotoxic, and myocardial effects in experimental animals [23]. *Pterois volitans* venom contains antitumor, hepatoprotective, and antimetastatic effects in mice suggesting a promising application for cancer research [20, 21]. Potential ecological impacts of lionfish on local reef fish communities will vary depending on the abundance of top level predators, the forage fish community, the density of lionfish, and the geographic location. Local studies provide that observations of lionfish impacts on community structure and the abundance of forage fishes are needed. The lionfish spine venom contains the venom apparatus (Fig 1D) to this species was netted to its length weight relationship. This species is non-commercial and the rate of mortality found to have increased in the landing centers and endanger the population of these species (Fig 1C). In the present study *P. mombasae* was collected by trawl fishery along Indian waters, to make their species commercially important since it has potential bio-medical properties.

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## MATERIALS AND METHODS

### Sampling sites

Geographically the study area lies within the boundaries of (Lat. 11° 29'33.62"N 79° 46'08.86"E) Mudasalodai is a famous landing centre, located near Parangipettai marine biological station (Fig 1A). This landing centre lies between the mouth of the vellar estuary and killai backwaters with its sheltered shoreline, supports a lucrative fishery in Tamilnadu, South east coast of India. About 150 fishing trawlers are engaged in fishing and bringing commercially important fishes in huge quantity along with plenty of trash fishes (Fig 1 B).

### Length and Weight relationship

The lionfish were randomly sampled from the every trash fish heap. The collected specimens were placed in labelled plastic containers brought to the laboratory, cleaned specimen the total length was measured from the tip of the snout to the extended tip of the caudal fin with help of vernier calliper. Total weight of individual fish was gauged to the nearest gram with an electronic balance after the removal of excess water from surface of the body. The length-weight relationship (LWR) was estimated by using the equation

$$W = aL^b$$

Where W = weight in kilograms

L = total length in centimetre

'a' is a scaling constant and b the allometric growth parameter.

Logarithmic transformation was used to understand the linear relationship:  $\log W = \log a + \log b L$  regression was used for each species to estimate the intercept (Log a) and the regression coefficient or slope (b), using Microsoft Excel spread sheet. Identification of species was made based on FAO Species Identification Sheets [4]. Morphometric and Meristic characteristics were measured following the method [7]. Spines of the lion fish *P. mombasae* were removed carefully and dehydrated with ethanol and spine was cut without causing any damage and kept in ethanol again, air-dried for a while. Microscopic (Olympus) observation was made at the Centre for Instrumentation, Annamalai University.

## RESULTS AND DISCUSSION

The different sizes were determined for the length and weight relationships among 218 individuals out of these 200 individuals were selected for the length-weight frequency analysis, because most of the samples injured due to erroneous preservation process, so it was not possible to take measurements of either length and weight. In the present study the regression analysis showed linear relationship between length and weight of lionfish the 'b' value was 1.613 and 'a' value was 0.288 respectively. The value is expressed to the growth of lion fish and the 'r' value was 0.647. The scatter diagram is showed the clear difference of the lion fish length and weight relationship correlation coefficient and regression coefficient were highly significant (Fig.3). In variables are between the size and weight of the lionfish results were highly significant for the abundance of animal populations. The value of 'a' and 'b' differed not only between different species, but also within the same species depending on sex, stage of maturities and food habits. Cubic relationship between length and weight had the 'b' value near to 3.0 A fair number of species seem to approach his ideal. The 'b' value for an ideal fish might range between 2.5 to 4.0 [14].

During the half seasons totally 218 individual abundance was randomly collected; among them the percentage composition of the lion fish was somewhat maximum numbers collected except month of April and May was the abundance low due to the fishing banning period. The maximum 33.02% contribution of lion fishes in the trash fish composition was recorded during the June; minimum 2.29 % was during the April (Fig.3). Documenting the non-targeted fishes ultimately depends upon sampling effort and traditional knowledge of local organisms. Generally the trash fish landed depends upon the mesh size of the trawl net, the depth of the water, operation time, operation area and the fishing seasons, therefore the larger number of species observed during end of the summer and beginning of premonsoon [11]. In the present study some variations are more are less similar in the above mentioned seasons which find support from earlier studies. According to earlier findings in Mudasalodai landing trash, fish were abundant during pre-monsoon and the least in summer. The maximum discard of trash fish level was due to more fishing activity in the pre-monsoon season and the minimum fishing activity was in summer owing to the

possible ban on fishing proposed by the Tamilnadu government because of it being the breeding season of the marine organisms [17, 18, 1].

The morphometric and meristic characters of the lionfish, *P. mombasae* species were examined and is given in Table 1 & 2. In morphometric analysis of fishes relationship between the body length and weight have significant important source in fisheries stock assessment for estimating the biomass from obtained analytical models and to relate the biological parameter i.e., indicating the rate of weight gained relative to the growth [4]. The length-weight relationships of *P. mombasae* suggest that weight increased proportionally to the increase of length of fishes. Similar observations were recorded in the parrotfishes from Great Barrier Reef: *S. frenatus*: 3.06 (r<sup>2</sup> 0.990) *S. niger*: 3.09 (r<sup>2</sup> 0.993) *S. psittacus*: 2.90 (r<sup>2</sup> 0.981) *S. rivulatus*: 3.14 (r<sup>2</sup> 0.982) and *S. schlegeli*: 3.12 (r<sup>2</sup> 0.992) [2]. Thus it is clear that these lionfish are grow the maximum conations the venoms are maximum quantity of growth of spines and this similar investigation are mainly used for forthcoming research in the field of potential value for biomedical from the venomous spine of fishes.

Measurement of the venom spine characters they are morphologically different concerning the point and size of the spines. Each species having 13 different size dorsal spine the size ranged from 0.2 to 5.2cm followed by pelvic spine size ranged from 0.2 – 1.8cm and anal spine ranged from 1.5 to 0.1 this features were fluctuate from different size forms. The spine structure of the lion fish *P. mombasae* through microscopic observation is given in Fig. 4 (a-d). Microscopic studies reveal that dorsal, pelvic and anal spine is enveloped with glandular tissues, with distinct pigmentation and it is hard and thick. The venom of the lion fish (*Pterois*) is colorless to grayish with a fishy taste and pungent, ammonia-like smell [16]. *Dasyatis laevigatus* venom tissue consists of stratified epithelium in the ventral lateral grooves and the epithelium consists of about 4 layers of cells from the base to the surface [10]. From the above observations, it is evident that the lion fish *P. mombasae* has a venomous apparatus which is capable of lacerating and releasing the venom into the victim by breaking open its enveloping sheath.

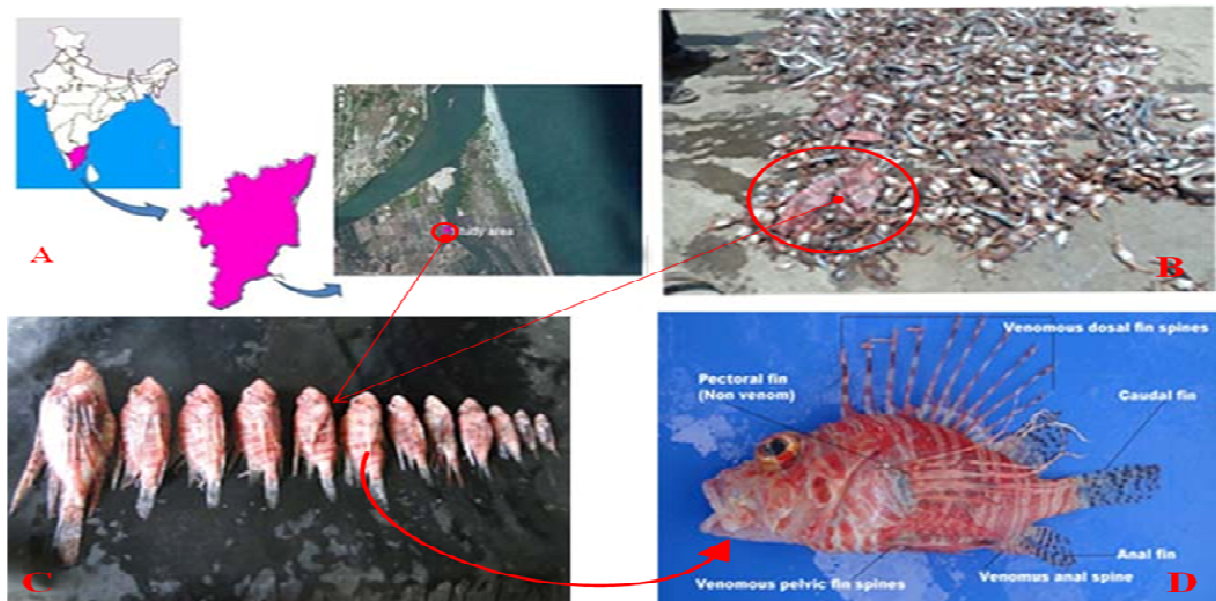


Fig 1 A) Description of the study area. B) Collection of trash fishes from landing area .C) various size group of fish. D) Fin locator of venomous spines of *P. mombasae*

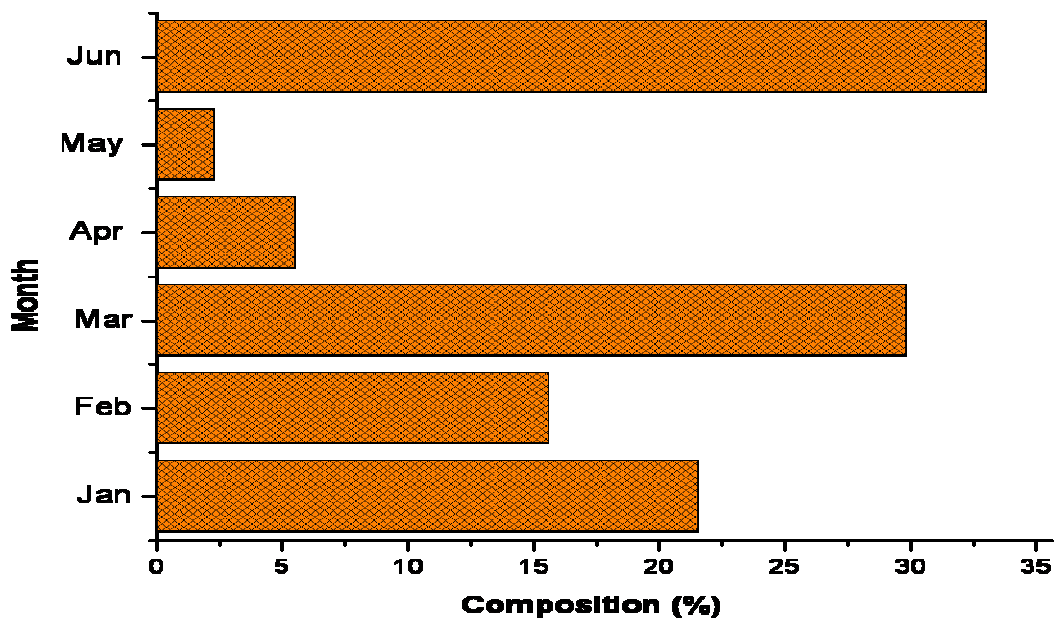


Fig.2. Percentage compositions of *P. mombasae*

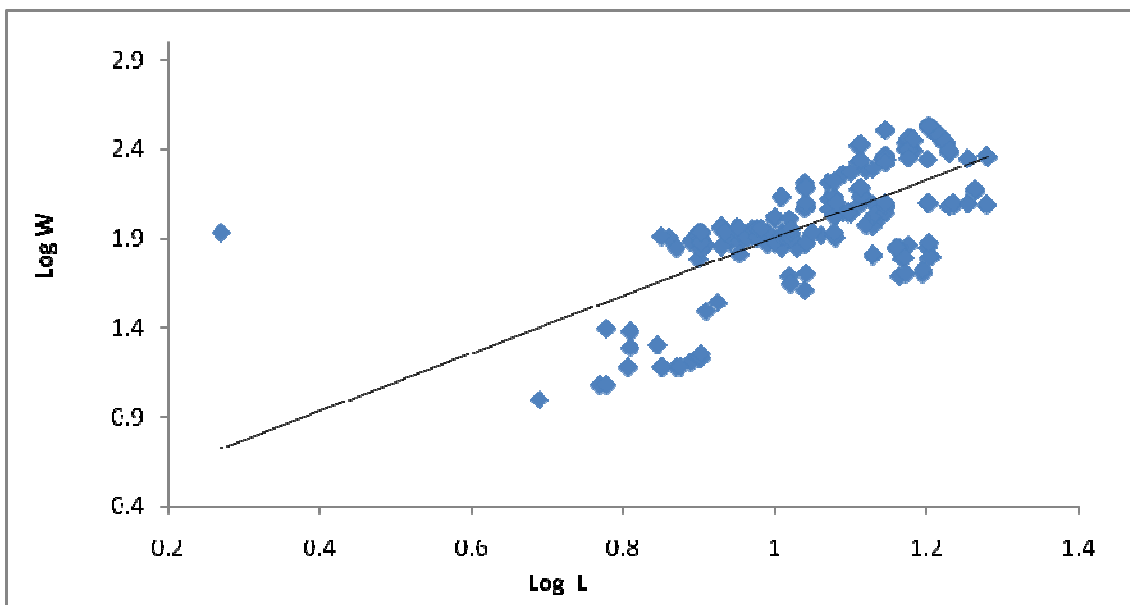


Fig.3. Showed length weight relationship of *P. mombasae*

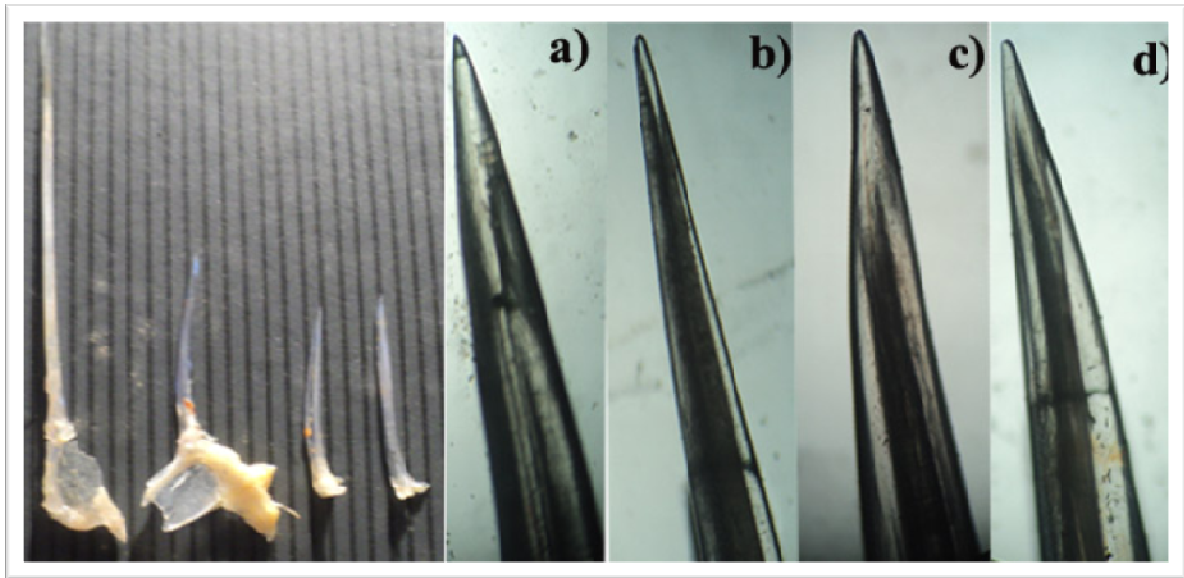


Fig.4. Showed the pattern of venomous spine in *P. mombasae* a) Dorsal spine b) Pectoral spine c) 1<sup>st</sup> anal spine d) 2<sup>nd</sup> anal spine

Table 1.Morphometric measurements of *P. mombasae*

Character	(mm)
Total length	16.7
Maximum body depth	4.9
Standard length	12.5
Pectoral fin length	4.1
Pelvic fin length	8.8
Snout length	2.3
Eye diameter	2.3
Anal fin length	4.1
Length of upper jaw	3.5

Table 2 : Meristic measurements of *P. mombasae*

Character	(Rays counts)
Pectoral fin rays	18
Anal fin rays	16
Caudal fin rays	25
Pelvic fin rays	10
Dorsal fin rays	20
Dorsal spine fin	13

**CONCLUSION**

In India no more attempts have been made to study the length-weight relationship of *P. mombasae*. The present study provides baseline information on biology, epidemiology, distribution and its venom properties of *P. mombasae*. Lion fish (*Pterois*) venom is not extensively studied for their pharmacological property. Further clinical finding is needed to study in detail for developing anti-venom.

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**REFERENCES**

[1] Babu.A, kesavan. K, Annadurai. D., Rajagopal S.R.,(2010). *Marine Biodiversity Records*, page 1 of 5. Vol. 3.

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- [2] Choat, J. H., L.M. Axe and D.C Lou, **1996**. *Marine Ecology Program* **145** : 33 - 41.
- [3] Cohen, A.S. and A.J. Olek. **(1989)**. *Toxicon* **27**:1367-1376
- [4] Fischer W, Bianchi G. Lobsters. **(1984)**. *Food and Agricultural Organization of the United Nations*.
- [5] Frota, L.O., Costa, P.A.S. and Braga, A.C. **(2004)**. *NAGA World fish Center Quarterly* **27**: 20-26.
- [6] Heemstra, P.C., Heemstra, E. **(2004)**. *South African Institute for Aquatic Biodiversity and National Inquiry Service Centre Publications*, Graham's town. **488** pp.
- [7] Jayaram, K.C. **(2002)**. *Narendra Publishing House*, Delhi, 174 pp.
- [8] Kizer, K.W., H.E. McKinney, and P.S. Auerbach. **(1985)**. *Journal of the American Medical Association* **253**:807-810.
- [9] Lee, J.Y.L., Teoh, L.C., Leo, S.P.M. **(2004)** . *Annals Academy of Medicine* **33**: 515–520.
- [10] Liu, X., K. Zhang, Y. Yu, L. Fang, H. Wang and Y. Sun. **(2001)**. *Acta zoologica sinica/ Dongwu Xuebao*, Beijing, **47(2)**: 221-224.
- [11] Mohamed, M.J.H.J.,**(1986)**. Matahari 85-A study on the off shore waters of the Malaysians EEZ (eds) Mohsin M.A Ambak, **3**:213-219.
- [12] Poss S.G. **(1999)**. *FAO Species Identification Guide for Fishery Purposes*. Vol. 4. Bony Fishes, Part 2 (Mugilidae to Carangidae). (Eds., K.E. Carpenter, V. Niem), FAO, Rome, pp. 2291-2352.
- [13] Poss, S.G., Rama-Rao, K.V. **(1984)**.*Species Identification Sheets for Fishery Purposes*. (Eds., W. Fischer, G. Bianchi), FAO Western Indian Ocean (Fishing Area 51). Vol. 4.
- [14] Qasim, S-2., **1973b**. *Indian J. Fish.* 20: 166-181.
- [15] Randall, J.E. **(1995)**. University of Hawaii Press, Honolulu, Hawaii, **439** pp.
- [16] Russell, F. E. **(1965)**. *Adv. Mar. Biol.*, **3**: 255- 384.
- [17] Sakthivel K. **(2000)**. *M.Phil thesis, Annamalai University*, India. pp-182p
- [18] Sekar, **(2009)**. *M.Phil thesis, Annamalai University*, India.
- [19] Smith, J.L.B. **(1957)**. *Copeia* 3:1957 (3) : 249
- [20] Sri Balasubashini, M., S. Karthigayan, S.T. Somasundaram, T. Balasubramanian, P. Viswanathan, and V.P. Menon. **(2006a)**. *Toxicology Mechanisms and Methods* **16**:525-531.
- [21] Sri Balasubashini, M., S. Karthigayan, S.T. Somasundaram, T. Balasubramanian, P. Viswanathan, P. Raveendran, and V.P. Menon. **2006b**. *Bioorganic and Medicinal Chemistry Letters* **16**:6219-6225.
- [22] Vine, P. **(1994)** Red Sea Safety: Guide to Dangerous Marine Animals. *Immel Publishing*, 144 pp
- [23] Whitfield PE, Gardner T, Vives SP, Gilligan MR, Courtenay WR, Jr., Ray GC, Hare JA **(2002)** *Mar Ecol Prog Ser* **235**:289–297.