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Research Note

Length–weight Relationship of Mangrove Clam *Anodontia edentula* (Linnaeus, 1758) from Kattampally, Valapattanam River, Kerala, India

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Mangrove ecosystems have provided a variety of goods and services to the coastal communities over centuries (Primavera et al., 2002). Mangrove forests are considered as safe nursery ground for several organisms including finfish, crustaceans and molluscs. Toothless lucine, mangrove clam *Anadontia edentula* is widely distributed in the mangrove forest of Indo-Pacific extending from East and South Africa towards Madagascar and the Red Sea and to eastern Polynesia and from southern Australia to northern Japan (sealifebase.ca). It is an edible clam living in burrows, from surface up to about half meter deep in the inter tidal zones of the mangrove areas. Mangrove clams are collected by the local population for consumption and it fetch a good price in south east Asian countries like Philippines (Primavera et al., 2002).

Kannur district, in Kerala is known for rivers and backwaters bordered by rich mangrove forests. Valapattanam river flows through Kattampally (11.9446956 N and 75.3849272 E) and a salt water barrier was constructed to prevent the entry of saline waters to the paddy fields in Kattamapally. Local people collect the species for own consumption and there is limited fishery and trade, probably due to the hardness of the meat. Less information is available on the species occurrence, length-weight relationship, biology, utilization and morphometry in specific locations (Gaspar et al., 2002; Park & Oh, 2002; Vasconcelos et al., 2018) study from Indian waters has reported negative allometry in many coastal bivalves (Jaiswar & Kulkarni, 2002). Lower K value for similar species such as *Perna viridis* and *Meretrix meretrix* were reported with similar growth pattern (Sharma et al., 2005) and *P. viridis* has shown allometric growth from Karwar coast of India (Thejasvi et al., 2014). Observations on morphometry are helpful in developing fishery management models to improve selectivity in capture (Gaspar et al., 2002) and to compare the growth pattern of the same species in different habitats and understanding anthropogenic impacts (Goncalves et al., 1997).

Samples were collected from the intertidal zones of mangrove forest along Valapattanam river, Kannur, Kerala during October 2021 and January 2022. Specimens partially exposed during low tide were handpicked (Fig. 1), whereas buried clams were located by looking for water jet coming out of the mud flat. Hidden individuals were located by inserting a metal rod into the mud flats at random and listening to the distinctive sound created while hitting the clam shells. Specimens were identified and the recent update on nomenclature was adopted following the World Register of Marine Species – WoRMS (http://www. marinespecies.org). Shell length (highest distance between anterior and posterior margins) was measured in millimetres using a graduated ruler; total wet weight was measured with digital balance of 0.1g precision.

Length (L) and weight (W) of the clam was analysed and expressed using the equation $W=aL^b$ (Pauly, 1984). The linear transformation was approached (Zar, 1984) and subsequently the LWR was established using the equation: Log W = log a + b log

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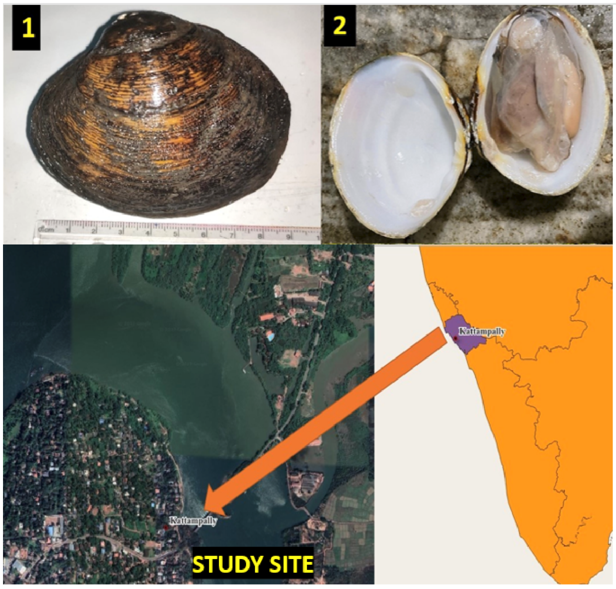

Fig. 1. Mangrove clam and collection site (1. Dorsal view of the clam; 2. Split opened clam showing meat; 3. Study site

L (Where: W = weight of clam in grams; L = total length of the clam in centimetres; a = rate of change of weight with length (intercept); b = weight at unit length (slope)). The correlation coefficient (r^2) was calculated using the linear regression analysis in SAS®V9. 2 (SAS Institute, 2010). Condition factor was used as an indicator of well-being in a habitat (Gomiero & Braga, 2005), denoted by letter 'K' which is expressed as a factor of weight at particular length (Pauly, 1984). It is described that higher the value of 'K', better the condition of the clam in the environment as per this equation $K = 100W/L^b$ (Where: K= condition factor; W= weight of the clam in grams; L= length of the clam in centimetres; b= derived from length-weight equation). Relative condition factor (Kn) was calculated as the ratio of observed weight and calculated weight (Le Cren, 1951) used to compare species of similar size classes. Kn= W/W' (Where: Kn= relative condition factor; W= observed weight in grams; W'= calculated weight in grams, aL^b). PROC ROBUSTREG procedure of SAS®V9. 2 (SAS Institute, 2010) was employed and outliers were removed prior to analysis. Value of r^2 (Coefficient of determination) at 95 % (CL 95 %) of coefficients a and b (coefficients of regression) were found using linear regression in MS EXCEL (Microsoft Corporation, 2018).

LWR of the species is given in Table 1. Logarithmic regression equation of the species is given as Log W= 0.35 + 2.85LogL.

This study is the first report on the length-weight relationship of mangrove clams from India. A single specimen with 114 mm length, weighing 374 gm was also collected, but not included for the present analysis to avoid error. The species showed negative allometric growth (b=2.85) by indicating a flattened shape or lean profile (Grower & Juliano, 1976) irrespective of the cube law of growth. It can be assumed that factors like reproductive state, distribution pattern, physical and biological factors are known to affect the isometric growth pattern (Gimin et al., 2004). Moreover, the slope value (b) obtained in the present study is 2.85. These values are very close to the slope value obtained in earlier studies in different parts of the world for mangrove clam and other related species (Obirikorang et al., 2013; Hamsiah et al., 2018; Sajol-Degamon & Fernandez-Gamalinda, 2021). It can be concluded that the length-weight relationship in the mangrove clam is allometric and follows the cube-law as in the case of fishes.

The relationship between total length and body weight (Fig. 2) established a positive correlation (0.95) confirming a proportionate growth in weight with increase in length of the clam. The condition factor (K), an indicator of the suitability of the environment for the species is estimated to be ranging from 0.24 to 0.46. These values are lower and fluctuating (0.35 ± 0.043) during the season. Variations in 'K' indicates the variation in feeding and sexual maturity or collectively the well-being of the fish (Anibeze, 2000; Gomiero & Baraga, 2005).

The relative condition factor (Kn) varied between 0.68 to 1.31 with a mean and standard deviation of 1 ± 0.01. The value indicates that the species is

Table 1. Summary of length-weight relationship of mangrove clam *A. edentula*

N	Length range (cm)	Weight range (gm)	a	95 % CI a	b	95 % CI b	r^2 (p<.001)
303	5-10	34-250	0.35	0.29-0.42	2.85	2.75-2.94	0.92

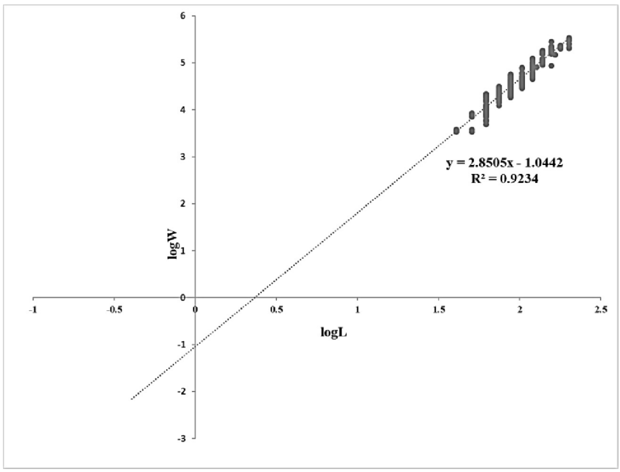

Fig. 2. Scatter diagram graph showing the linear regression analysis of length-weight relationship in *A. edentula*

relatively fat or with plump body shape. Although Kn was originally used to determine conditions in fishes, it has been used successfully in bivalves like *Anadara gubernaculum* (Fauzan et al., 2018), *Perna viridis* and *Meretrix meretrix* (Sharma et al., 2005) because it is simple as well as appropriate.

A detailed study on the distribution and biology of mangrove clam is essential from different parts of the state and perhaps from the entire coast. Long term data is required for asserting the physical and biological circumstances of the species and fluctuations related feeding to confirm the condition factor and other aspects. Nutritional evaluation will help utilization of the species and possible value addition. Knowledge on reproduction and larval development is also essential for aquaculture and sustainable fishery in future if circumstances demand.

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References

Anibeze, C.I.P. (2000) Length-weight relationship and relative condition of *Heterobranchus longifilis* (Valencienness) from Idodo River, Nigeria. Naga, The ICLARM Quart. 23: 34-35

Fauzan, M., Bakti, D., Susetya, I.E. and Desrita. (2018) Growth and exploitation rate of *Anadara gubernaculum* (Reeve, 1844) Arcidae Family in Asahan Aquatic of North Sumatra. IOP Conf. Ser.: Earth Environ. Sci. 122: p. 012105

Gaspar, M.B., Santos, M.N., Vasconcelos, P. and Monteiro, C.C. (2002) Shell morphometric relationships of the most common bivalve species (Mollusca: Bivalvia) of the Algarve coast (southern Portugal). Hydrobiologia. 477: 73-80

Gimin, R., Mohan, R., Thinh, L.V. and Griffiths, A.D. (2004) The Relationship of Shell Dimensions and Shell Volume to Live Weight and Soft Tissue Weight in the Mangrove Clam, *Polymesoda erosa* (Solander, 1786) from Northern Australia. NAGA, World Fish Center Quart. 27(3&4): 32-35

Gomiero, L.M. and Braga, F.M.S. (2005) The condition factor of fishes from two river basins in Soa Paulo State, Southeast of Brazil. Acta Sci. Biol. Sci. 27(1): 73-78

Gonçalves, J.M.S., Bentes, L., Lino, P.G., Ribeiro, J., Canário, A.V. and Erzini, K. (1997) Weight-length relationships for selected fish species of the small-scale demersal fisheries of the south and south-west coast of Portugal. Fish. Res. 30(3): 253-256

Grower, H.J. and Juliano, R.O. (1976) Length–weight relationship of pond raised milkfish in the Philippines. Aquac. 7(4): 339-346

Hamsiah, H., Asmidar, A., Hasrun, H. and Kasmawati, K. (2018) Length weight relationship and size distribution long shells bakalang (Marcia hiantina Lamarck) in the coastal waters of Labakkang, Pangkep Regency. Torani J. Fish. Mar. Sci. 2(1): 23-31

Jaiswar, A.K. and Kulkarni, B.G. (2002) Length- Weight relationship of intertidal molluscs from Mumbai, India. J. Indian Fish. Assoc. 29: 55-63

Le Cren, E.D. (1951) The length-weight relationship and seasonal cycle in gonad weight and condition in the perch (*Perca fluviatilis*). J. Anim. Ecol. 20: 201-219

Microsoft Corporation. (2018) Microsoft Excel. https://office.microsoft.com/excel (Accessed 09 October 2023)

Obirikorang, K.A., Adjei-Boateng, D., Madkour, H.A., Amisah, S. and Otchere, F.A. (2013) Length-Weight Relationship of the Freshwater Clam, *Galatea paradoxa* (Born 1778) from the Volta Estuary, Ghana. Pak. J. Biol. Sci. 16(4): 185-189

Park, K.Y and Oh, C.W. (2002) Length-weight Relationship of Bivalves from Coastal Waters of Korea. Naga, The ICLARM Quart. 25(1): 21-22

Pauly D. (1984) Fish Population Dynamic Inotropic Waters; A Manual for Use with Programmable Calculators, 325 p, Naga, ICLARM, Metro Manila, Philippines

Primavera, J.H., Lebata, M.J.H.L., Gustilo, L.F. and Altamirano, J.P. (2002) Collection of the clam Anodontia edentula in mangrove habitats in Panay and Guimaras, central Philippines. Wetl. Ecol. Manag. 10: 363-370

Sajol-Degamon, L. and Fernandez-Gamalinda, E.V. (2021) Length–Weight Relationships of *Anodontia edentula* from Mangrove Habitats of Surigao City, Philippines. Int. J. Biosci. 19(3): 110-118

SAS Institute Inc (2010) SAS® 9.2 Language reference: Concepts, 2nd ed. Cary, NC: SAS Institute Inc. https://www.yumpu.com/en/document/view/6079387/sas-92-language-reference-concepts-second-edition (Accessed 12 October 2023)

Sharma, R., Venkateshvaran, K. and Purushothaman, C.S. (2005) Length weight relationship and condition factor of *Perna viridis* (Linnaeus, 1758) and *Meretrix meretrix* (Linnaeus, 1758) from Mumbai waters. J. Indian Fish. Assoc. 32: 157-163

Thejasvi, A., Shenoy, C. and Thippeswamy, S. (2014) Morphometric and length weight relationships of the green mussel *Perana viridis* (Linnaeus) from a subtidal habitat Karwar coast, Karnataka, India. Int. J. Recent Sci. Res. 5(1): 295-299

Vasconcelos, P., Moura, P., Pereira, F., Pereira, A.M. and Gaspar, M. (2018) Morphometric relationships and relative growth of 20 uncommon bivalve species from the Algarve coast (southern Portugal). J. Mar. Biolog. Assoc. U.K. 98(3): 463-474

Zar, J.H. (1984) Biostatistical analysis, 718 p, Prentics Hall: New Jersey