Length-weight Relationship of Bivalves from Coastal Waters of Korea

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Abstract

Parameters **a** and **b** of the length (**L**)-weight (**W**) relationship $\mathbf{W = a \cdot L^b}$ are presented for 17 commercial bivalve species collected from the southwest coastal waters of Korea. Estimates of **b** varied between 2.44 (*Atrina pinnata japonica*) and 3.31 (*Scaphara broughtonii*) with a mean of 2.891 (± 0.212). A total of 2 107 specimens were analyzed for this study. The length-weight relationship was isometric in most of the species.

Introduction

Most bivalves are commercially important shellfishes in many countries (Vakily 1992). Length and weight are two basic components in the biology of species at the individual and population levels. Information on length-weight relationship (**LWR**) is essential for proper assessment and management of these fisheries. It also enables the estimation of biomass from commercial processing data. This study provides data on **LWR** which can be used to assess bivalves which have been extensively exploited in Korean coastal waters.

Materials and methods

Bivalves were collected from areas in the southwest coast of Korea during the period 1990 - 1998. The bivalves were identified based on the nomenclature of Kira (1981) and Choe (1992). Shell length (**L**) was measured using a digital caliper and total weight (**W**) (±0.01 g) was determined using an electronic balance after the specimens were dried on blotting paper. The sexes were not determined, although it is noted that males and females may display different LWR.

The parameters **a** (intercept) and **b** (slope) of the **LWR** relationships of the form:

$$\mathbf{W = a \cdot L^b} \qquad \ldots 1$$

were estimated by nonlinear estimation routine using the computer program (SYSTAT Ver. 7.0.). Student-*t* test (Zar 1984) was used to assess the relative growth pattern for the species studied.

Results

The **LWR** parameters for 17 species (belonging to 11 families, and 15 genera) are presented. Tables 1 and 2 summarize **LWR** results, along with available information on sample size, length range and growth pattern. These comprised 12 species from original data (Table 1) and five species derived from previous studies (Table 2). Correlation coefficients (r^2) for all species analyzed in this study were significant at $p<0.001$. Estimates of **b** ranged from 2.44 in *Atrina (Servatina) pinnata japonica* to 3.31 in *Scaphara broughtonii*. The mean of **b** was 2.89 (±0.212). Results of the student-*t* test revealed that **LWR** of nine species was isometric at 95% confidence limit of **b** (Table 1).

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References

Choe, B. L. 1992. Illustrated encyclopedia of fauna and flora of Korea: Vol.33. Mollusca (1), 860 p.

Choe, K. J. 1980. On mutual relations between length and weight of pen shell *Atrina pectinana japonica*. Thesis Collec. Yeosu Nat. Fish. Coll. 14: 37-41.

Kim, C. M. and K. J. Choe. 1982. On correlation between shell length and total weight of shells. Thesis Collec. Yeosu Nat. Fish. Coll. 14: 110-113.

Kira, T. 1971. Coloured illustrations of the shells of Japan. Hoikusha Publishing Co., Ltd., 240 p.

Lee, C. S., K. K. Baik, and K. E. Hong. 1998. Ecological studies on the habitat

Table 1. Parameters of the length-weight relationship for 12 bivalve species derived using original data collected from the coastal waters of Korea (PA: positive allometric, IS: isometric, NA: negative allometric).

Family/Species	n	a(x 10^{-4})	b (±SD)	r^2	L_{min} (mm)	L_{max} (mm)	Student t-test	Growth pattern
Arcidae								
Scapharca broughtonii	88	0.7300	3.31 (±0.18)	0.943***	48.8	98.9	37.72	PA
Scapharca subcrenata	114	4.0323	2.97 (±0.15)	0.935***	26.3	56.1	40.09	IS
Tegillarca granosa	377	6.8301	2.82 (±0.06)	0.960***	16.7	56.1	95.47	NA
Cardiidae								
Fulvia mutica	24	0.1925	3.49 (±0.26)	0.972***	46.0	75.2	27.86	PA
Mactra chinensis	100	2.6231	2.83 (±0.18)	0.911***	20.8	35.5	31.68	IS
Veneridae								
Ruditapes philippinarum	492	1.6329	3.04 (±0.05)	0.962***	9.4	44.7	111.90	IS
Cyclina sinensis	99	2.7138	3.06 (±0.13)	0.956***	18.6	50.8	46.15	IS
Haliotidae								
Haliotis (Nordotis) discus discus	91	0.7893	3.10 (±0.15)	0.948***	21.8	109.4	40.47	IS
Myidae								
Mya (Arenomya) arenaria oonogai	81	1.1905	2.96 (±0.18)	0.933***	41.5	92.0	33.22	IS
Mytilidae								
Mytilus edulis	110	1.7080	2.85 (±0.15)	0.932***	27.6	84.6	38.63	IS
Phasianellidae								
Batillus cornutus	42	2.9369	2.94 (±0.15)	0.975***	49.3	112.1	39.38	IS
Solenidae								
Solen strictus	489	2.7084	2.55 (±0.08)	0.917***	38.4	131.8	73.80	NA

*** significant p < 0.001

Table 2. Parameters of the length-weight relationship for 5 bivalve species from the coastal areas of Korea as derived from available literature.

Family/Species	n	a(x 10^{-4})	b (±SD)	r^2	L_{min}(mm)	L_{max}(mm)	Source
Veneridae							
Meretrix lusoria	21	102.4000	2.93	-	-	-	Kim and Choe (1982)
Mytilidae							
Mytilus coruscus	15	2.0469	2.80	-	-	-	Yoo and Kang (1974)
Pectinidae							
Patinopecten (Mizuhopecten) yessoensis	10	1.5119	2.98(±0.16)	0.996***	40.7	112.3	Yoo and Ryu (1981)
Pinnidae							
Atrina (Servatina) pinnata japonica	55	2.5660	2.44	-	-	-	Choe (1980)
Hiatellidae							
Panope japonica	37	14.4449	2.61	0.759***	-	-	Lee et al. (1998)

*** significant at p < 0.001

of geoduck clam, *Panope japonica*. Journal of Aquaculture, 11(1): 105-111.

Pauly, D. 1993. Editorial, Fishbyte section. Naga, ICLARM Q. 16(2-3):26.

Vakily, J. M. 1992. Determination and comparison of bivalve growth rate with emphasis on Thailand and other tropical areas. ICLARM Tech.Rep. 76, 125 p.

Yoo, S. K. and Y.-J. Kang. 1974. Study on the morphological variations of mussel, *Mystilus coruscus* Gould. Bull. Korean Fish. Soc. 7(2): 87-90.

Yoo, S. K., H.-Y. Ryu, and K. –Y. Park. 1981. The Growth of the cultured scallop, Patinopecten yessoensis. Bull. Korean. Fish. Soc. 14(4): 221-226.

Zar, J. H. 1984. Biostatistical analysis. Prentice Hall, New Jersey, 718 p.

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