International Journal of Biosciences | IJB |
ISSN: 2220-6655 (Print), 2222-5234 (Online)
http://www.innspub.net
Vol. 11, No. 3, p. 199-204, 2017

INNSPUB

RESEARCH PAPER OPEN ACCESS

Length-weight relationship of fishes in Sta. Ana Dam, Nabunturan, Compostela Valley, Philippines

Maedel Joy V. Escote*[1], Joycelyn C. Jumawan[2]

[1]*Department of Biology, Assumption College of Nabunturan, Compostela Valley Province, Philippines*

[2]*Department of Biology, Caraga State University, Butuan City, Philippines*

Key words: Length-weight relationship, Freshwater fish, Sta. Ana Dam, Allometry

http://dx.doi.org/10.12692/ijb/11.3.199-204 Article published on September 27, 2017

Abstract

Length –weight relationship is important in describing several biological aspects of the species as well as beneficial in the success of in land fisheries like dams. Five thousand and twelve (5,012) fish individuals were collected from Sta. Ana dam, Nabunturan, Compostela Valley Philippines, from the period of March 23, 2017 – April 23, 2017. Using different catching gears like improvised lift net, cast net and hook and line. Species obtained were belonged to 5 families (Channidae, Cichlidae, Claridae, Cyprinidae, and Osphronimidae) with only one species per family. LWR was computed using the equation $W=aL^b$, the value of "b" in length and weight relationship ranged from 2.476 – 2.830 lower than the Bayesian estimates. All fish species shows negative allometry which means that sample species become thinner as they grow larger, however, the correlation coefficients which values ranged from 0.885 to 0.963 in all five fishes showed a high degree of positive correlation between the standard length and total weight in all fish samples, furthermore species found were all introduced to the freshwater bodies of the Philippines. Findings of this study could be used as a valuable tool for fishery managers and improve fish stocks for the continuous supply of important fishes to the community.

* **Corresponding Author:** Maedel Joy V. Escote ✉ escotemaedeljoy86@gmail.com

Introduction

Fish length and weight relationship (LWR) plays a key role in exploring fish biology (Nehemia *et al.*, 2012) and maintaining fisheries productivity management (Tah *et al.*, 2012), moreover, LWR is beneficial in predicting fish weight based on its length, analysis of growth patterns and acquire body conditions of sampled fish species (Froese, 2006) it is also essential in assessing fish stocks for fisheries (Froese *et al.*, 2011) especially in areas where fisheries represent one of the most important economic activities and fish stocks are primary food source for many communities (Freitas, 2017).

The Sta. Ana Dam of Libasan, Nabunturan, Compostela Valley was once a river, the dam was constructed in 1991 and was turned over to Libasan Primary Cooperative (LIPRIMCO) in the year 1992 (LIPRIMCO History, n.d).

The dam's main purpose is to supply water for rice field irrigations in the area and fish stocks for fisheries (Wildi, 2010), thus, the Sta. Ana Dam became the fundamental sources of income and food for the community. However, after typhoon Pablo hit Compostela Valley last December 2012, anecdotal reports by local people indicate that there was a reduction in the fishery catch most likely because of the devastations of the typhoon such as siltation, invasion, and eutrophication, other causes identified were unregulated fishing of the people in the area, alteration of natural features were also discussed by the locals. However, according to Wildi (2010) damming has ecological consequence and cumulative impacts on water quality through natural flooding changes in sediments supply, decreased, and nutrient delivery can also alter and affect species growth, population, and biodiversity.

Knowledge relevant on the condition of the fishes in Sta. Ana dam is scarcely documented. There were no previous studies recorded on fish Length –weight relationship in the areathus, this study aimed to furnish information on the Length –Weight Relationship of common fish species of Sta. Ana Dam, Nabunturan, Compostela Valley, Philippines.

Most particularly that LWR can dependably predict weight from the length, it becomes a tool to estimate standing stock biomass and yield in many fishery assessment studies (Goncalves *et al.*, 1997). Hence, this study can become useful information for proper fishery management in the dam.

Materials and methods

Location

The Sta. Ana Dam (Fig. 1) is located 7°32'47.89"N, 125 °58'47.04"E boundary of Nabunturan and Mawab Compostela Valley Province with an area of 7.83 hectares and a perimeter of 1.22 km.

Collection

Fishes were collected from March 23, 2017 – April 23, 2017. Fish samples used was either caught by a resident fisherman partner or bought by a resident fish seller partner, fish were caught using improvised lift net, cast net and hook and line, processed in the field, the length was measured from the snout to the tip of the caudal fin and obtain the nearest centimeter (standard length, Ls) using a ruler and weighed to the nearest gram (total weight, W) using a kitchen scale after blot-drying excess water. All scientific names, Bayesian estimates, and other fish descriptions were checked in Fish Base (Froese and Pauly, 2016).

Equation

LWR was projected using the equation $W= aL^b$, where W is the total body weight, "a" as the regression intercept, "L" as the total length and "b" as the regression coefficient (Froese, 2006). SPSS software version 20 was used for statistical analysis.

After logarithmic transformation of this relation ($\log 10\ W = \log 10\ a + b \log10\ L$), parameters "a" and "b" were identified using linear regression (Zar, 1999). The coefficient of determination (r^2) of the LWR was computed. The "b" is an exponent with a value between 2.5 and 3.5 to define standard growth interpretation of relative well-being of the fish samples (Bargenal, 1978).

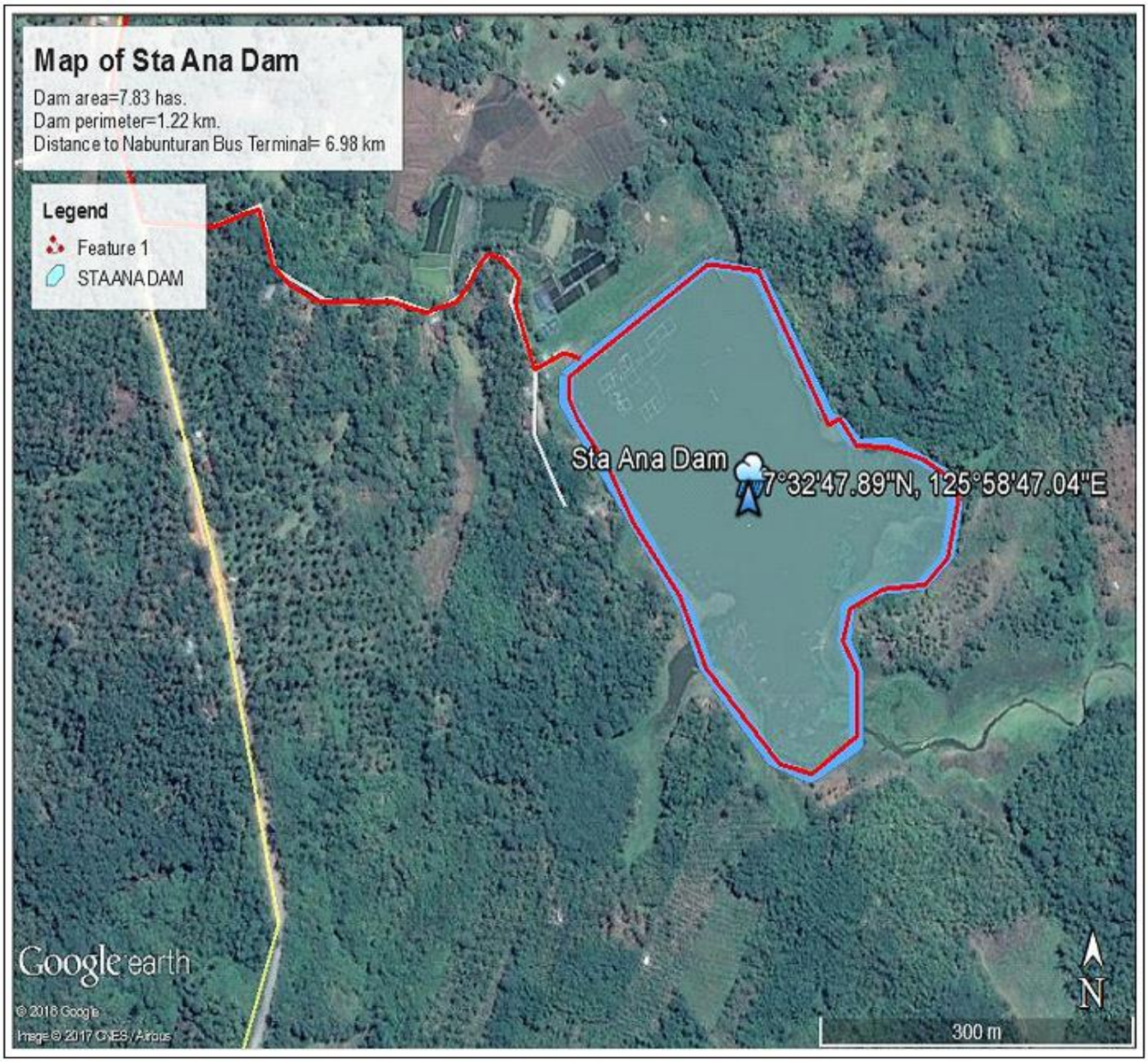

Fig. 1. Map of Sta. Ana Dam Libasan, Nabunturan, Compostela Valley Province.

Results and discussion

A total of 5,012 fish individuals comprising of 5 species representing 5 families were collected during the duration of the sampling period and analyzed. Table 1 summarizes the data concerning sample size, minimum and maximum length and weight for each species, the parameters of the LWR with confidence of 95%, and for comparison Bayesian estimates were included as well as growth of the samples whether Isometric (I), Positive Allometric (A +) or Negative Allometric (A-), status of sample species were included whether they are native or introduced in the freshwater ecosystem in the Philippines.

The allometric coefficient b varied from 2.476 for *Barbodes binotatus* to 2.830 for *Trichopodus trichopterus*, these findings are similar to the values (2.458 – 3.473) recorded by Ecoutin and Albaret (2003), they studied the LWR of 52 species of West African lagoons and estuaries and the study of Konan et.al (2007) on the LWR of 57 fish species of the coastal rivers of South-Eastern Cote d'Ivoire with b values (2.213 -3.729), while its correlation coefficients which ranged from 0.885 for *O. niloticus* and 0.963 for *B. binotatus* showed a significant degree of correlation between standard length and total body weight. The b value of all fish sample species has negative allometry (b <3), Channastriata with 2.738 this is similar to the findings of Jumawan and Seronay (2017) of *C. striata* from Agusan Marsh with b value of 2.89 but quite lower compared to its Bayesian estimate (Froese *et. al.,* 2013) which is 2.97, *Oreochromis niloticus* with 2.664 has similar value from the records of Tah *et al.,* 2012 with b value of 2.693 however, it is also lower than its Bayesian estimate (Froese *et. al.,* 2013) with b value of 2.97, negative allometry was reported for *O. niloticusin* the study of Obasohan *et. al*., (2012) on the fish species from Ibiekuma stream, Ekipoma, Edo state of Nigeria, furthermore, *Barbodes binotatus* with 2.476 was very low compared to Bayesian estimates ((Froese *et. al*., 2013) 3.07 which is positively allometric, the same with *Trichopodus trichopterus* with 2.830 that has Bayesian estimates (Froese *et. al.*, 2013) of 3.06 and also positively allometric. These negative allometric results suggest that sample fish species tend to become thinner as they grow larger (Samat *et al,* 2008), furthermore, negative allometric growth pattern in fish implied that weight increases at a lesser rate than the cube of the body length (Adeyemi *et al.,* 2009).

Table 1. Length and Weight Relationship of fishes in Sta. Ana Dam, Nabunturan, Compostela Valley, Philippines.

Family and Species	N	Total Length Range (cm)	Body weight range (g)	b (95%CI)	Bayesian Estimates b (95% CL)	r^2	Growth	Status
Channidae *Channa striata*	100	18 – 49.5	49 - 1230	2.738 (2.590 – 2.886)	2.97 (2.91 -3.03)	0.932	A-	Introduced
Cichlidae *Oreochromis niloticus*	4890	10 – 30.5	83 - 255	2.664 (2.637 – 2.691)	2.97 (2.93 – 3.01)	0.885	A-	Introduced
Clariidae *Clarias batrachus*	3	26 -32	221 -236	-	-	-	-	Introduced
Cyprinidae *Barbodes binotatus*	6	8.2 – 15.3	11 - 61	2.476 (1.802 – 3.149	3.07 (2.91 – 3.23)	0.963	A-	Introduced
Osphronemidae *Trichopodus trichopterus*	13	9 – 12.5	10 - 27	2.830 (2.313 – 3.346)	3.06 (2.87 – 3.25)	0.930	A-	Introduced

N: sample size; b: allometric growth coefficient, CL: confidence limits; r^2: determination coefficient; I: isometric growth; A+; positive alometric growth; A - : negative allometric growth.

Many factors can affect the growth pattern (b) it could be the season, food availability, population, sex, environmental conditions (Fontoura *et al*., 2010), moreover, according to Idodo-Umeh (2005) intensity of feeding and reproductive phenomena attributed to the bigger sizes of fish to faster growth rate, furthermore, unregulated fishing could also be one of the factors affecting growth, just like residents in Sta. Ana is doing, because of lack of regulations and management coming from the cooperative and Bureau of Fisheries and Aquatic Resources (BFAR), fishing vehemently is rampant in the area, another factor could be is the introduction of species (Guerrero, 2014). One of the main reasons of the introductions of introduced species in the Philippines was for food production (Joshi, 2006), however, some introduced fishes has high tolerance compared to native that gave them the advantage of reproduction and proliferation, consequently, in the study of Jumawan and Seronay, 2017 their finding shows that introduced species has dominated the major lakes of Agusan Marsh, moreover, in Sta. Ana, residents have shared that *Cyprinus carpio* another introduced species is also found in the dam, however, catching this species need more expertise and specialized catching gear due to its size, according to them weight of this fish can vary from 5 – 10 kg, because of lack of predators and people around the dam are not interested in catching it, this species are believed to be getting larger and thus, affecting other beneficial species and fishery catch.

Conclusion

This study revealed that the Length and weight relationship of fishes in Sta. Ana Dam is in negative allometry which means that they tend to get thinner as they grow, hence this provides information regarding the condition of the fishes in relation to their internal and external environment.

Recommendation

Further research on Length-weight relationship of fish species in dams and other reservoirs are recommended to widen the key information on other species biology and factors that can affect their growth, furthermore, variables like seasons, environment, habitat structures and catching gears must also look into as factors that may affect growth patterns.

Acknowledgments

The authors would like to thank Libasan Primary Cooperative (LIPRIMCO) for the research approval on the Sta. Ana dam, and special thanks to Engr. Vinancio Boreros of the Provincial Assessors Office for providing us with the map of Sta. Ana Dam and to Mariebeth Monta and Francisco Serenio Jr., resident fish seller partner and resident fisherman partner respectively, most of all to the Almighty God for making all these possible. To God be the glory.

References

Adeyemi SO, Bankole NO, Adikwu IA, Akombo PM. 2009. Age, Growth and Mortality of some commercially important Fish species in Gbadikere Lake, Kogi State, Nigeria.Int. J. of Lakes and Rivers Res. India Publications **2(1),** 63 – 69.

Bargenal T. 1978. Methods for assessment of fish production in freshwaters, 3rd. Ed. Oxford: Blackwell Scientific Pub.

Ecoutin JM, Albaret JJ, Trape S, 2005. Length-weight relationships for fish populations of a relatively undisturbed tropical estuary: the Gambia. Fish. Res. **72,** 347-351.

Fontoura NF, Jesus AS, Larre GG, Porto JR. 2010. Can weight/length relationship predict size at first maturity? A case study with two species of Characidae. Neotropical Ichthyology **8,** 835-840.

Froese BR. 2006. Cube law, condition factor and weight – length relationships : history, meta-analysis and recommendations **22,** 241–253.
www.doi.org/10.1111/j.1439-0426.2006.00805.x

Froese R, Pauly D. 2016. Fishbase**.** World Wide Web electronic publication. Available at: (accessed on May 2017).
www.fishbase.org

Froese R, Tsikliras AC, Stergiou KI. 2011. Editorial note on weight–length relations of fishes. ActaIchthyologica Et Piscatoria, **41,** 261-263.

Garcia BL, MB. 2010. Technical contribution Species composition and length-weight relationship of fishes in the Candaba wetland on Luzon Island , Philippines **26,** 946–948.
www.doi.org/10.1111/j.1439-0426.2010.01516.x

Gonc¸alves JMS, Bentes L, Lino PG, Ribeiro J, Canario AVM, 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,** 253–256.

Idodo-Umeh G. 2005. The feeding ecology of Mochokid species in River Ase, Niger Delta, Nigeria. Tropical Freshwater Biology, 14: 71 –93

Joshi RC. 2006. Invasive alien species (IAS): concerns and status in the Philippines (www.agnet.org/.../20110826121346/Paper-729213301.pdf

Jumawan JC, Seronay RA. 2017. Length-Weight Relationships of Fishes in Eight Floodplain Lakes of Agusan Marsh , Philippines, 146(March), 95–99.

Konan KF, Ouattara A, Ouattara M, Gourène G. 2007. Weight-Length Relationship of 57 Fish Species of the Coastal Rivers in South-Eastern of Ivory- Coast. Ribarstvo **65,** 49-60.

Liprimco History ND, Nehemia A, Maganira JD, Rumisha C. 2012. Length-Weight relationship and condition factor of tilapia species grown in marine and fresh water ponds, 117–124.
http://doi.org/10.5251/abjna.2012.3.3.117.124

Obasohan EE, Obasohan EE, Imasuen JA, Isidahome CE. 2012. Preliminary studies of the length-weight relationships and condition factor of five fish species from Ibiekumastream , Ekpoma , Edo state , Nigeria. (2012), **2(3),** 61–69.

Samat A, Shukor MN, Mazlan AG, Arshad A, Fatimah MY. 2008. Length-weight Relationship and Condition Factor of Pterygoplichthyspardalis (Pisces : Loricariidae) in Malaysia Peninsula. (2008), **3(2),** 48–53.

Tah L, Bi G, Sebastino K, Costa D. 2012. Length-weight relationships for 36 freshwater fish species from two tropical reservoirs : Ayamé I and Buyo , Côte d ' Ivoire, *60* (December), 1847–1856.

Wildi W. 2010. Environmental hazards of dams and reservoirs, **88,** 187–197.

Zar JH. 1984. Biostatistical analysis. New Jersey. Prentice Hall.