ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor (RJIF): 8.4
IJAR 2023; 9(11): 255-257
www.allresearchjournal.com
Received: 08-09-2023
Accepted: 13-10-2023

Mejia-Mojica Humberto
Laboratorio de Ictiología, Centro de Investigaciones Biológicas, Universidad Autónoma del Estado de Morelos, México

Rosa Gabriela Beltrán-López
Laboratorio de Ictiología, Centro de Investigaciones Biológicas, Universidad Autónoma del Estado de Morelos, México

Einar Topiltzin Contreras-MacBeath
Laboratorio de Ictiología, Centro de Investigaciones Biológicas, Universidad Autónoma del Estado de Morelos, México

Corresponding Author:
Mejia-Mojica Humberto
Laboratorio de Ictiología, Centro de Investigaciones Biológicas, Universidad Autónoma del Estado de Morelos, México

Length-weight-relationship of two Ictalurid catfish species from an artisanal fishery in central México

Mejia-Mojica Humberto, Rosa Gabriela Beltrán-López and Topiltzin Contreras-MacBeath

DOI: https://dx.doi.org/10.22271/allresearch.2023.v9.i11d.11388

Abstract
The length-weight relationship (LWR) for two Ictalurid catfish species was calculated by samples measured daily from March 2015 to April 2016. Specimens came from an artisanal fishery in a rural community along the High Balsas River in central Mexico. The (LWR) for both species, *Ictalurus balsanus* (Jordan & Snyder 1899) and *Ictalurus punctatus* (Rafinesque, 1818) were calculated using the equation $W=aL^b$. The *b* value for *l. balsanus* was 2.7487 and for *I. punctatus* 2.7755. These results represent progress in the knowledge of the growth pattern for both species which will be useful for the implementation of fishery management strategies in the region.

Keywords: Ictaluridae, length-weight-relationship, fishery, Balsas river, Mexicot

Introduction
It is well established that knowledge of the length-weight relationship of fish stocks is one of the main tools in designing and managing fishery resources. This simple measure provides useful information regarding the physical condition of exploited fish stocks and constitutes one of the most practical procedures to define the health of a population (Akhtar & Khan, 2018; Chen *et al*., 2018; Peixoto *et al*., 2018; Peng *et al*., 2018; Guo *et al*., 2019; Siddik *et al*., 2019; Nallathambi *et al*., 2019) [1, 2, 18, 19, 7, 21, 16].
The Balsas River, in central Mexico, is the largest hydrological system in the country, to drain into the Pacific Ocean. Several native and introduced fish species are used in this river as part of an artisanal subsistence fishery, that provides income and animal protein to many rural, low-income communities (Rojas-Carrillo & Fernández-Méndez, 2006; CONAPESCA, 2010; Ibáñez, 2014; Mejía-Mojica *et al*., 2020) [20, 3, 12, 15]. The most appreciated species by fishermen are two catfishes that belong to the Ictaluridae family, *Ictalurus balsanus* (Jordan & Snyder, 1899) [11] a native of the basin, and *I. punctatus* (Rafinesque, 1818) [19] which was introduced as a fishing alternative (Mejía-Mojica *et al*., 2013) [14]. The introduction of exotic species to native ecosystems, in conjunction with the over-exploitation of fishery resources, are among the main threats to fish diversity, and directly impact ecosystem functioning (Stachowicz & Tilman, 2005; Stachowicz & Byrnes, 2006; Leprieur, 2008; Hermoso *et al*., 2011; Pedroza-Gutiérrez & López-Rocha, 2016; Contreras-MacBeath *et al*., 2020) [22, 23, 13, 9, 17, 4]. This research analyzes the length-weight relationship for these two catfish species, which are subject to low-scale commercial fishing.

Materials and Methods
Data of the two catfish species examined here, came from the daily catches made by fishermen from a small community called Xicatlacotla (18 31 12.20 N -99 11 30.43 O), settled on the bank of the Amacuzac River, a tributary of the Balsas Basin, the largest hydrological system in central México that drains into the Pacific Ocean. Total length measurements (TL 0.1 cm accuracy) and total weight (TW 0.01 g accuracy) of each specimen, were obtained *in situ* daily following the capture, for which graduated ichthyometers and digital weighing balances were used. Data collection covered a period from March 2015 to April 2016.

Length-weight relationship (LWR) was derived from the equation $W=aL^b$ where the parameters a and b were estimated through a regression analysis based on the algorithms: Log (W)=Log (a)+b log(L). The 95% confidence interval (CI) was estimated by the regression parameter of *a* and *b*. Moreover, the determination coefficient (r2) was estimated. Before doing regression analysis, aberrant data or errors in data capture were eliminated, using as reference the graph obtained from the relationship between length *vs*. weigh (Froese 2006) [5]. Statistical analyses were performed using SPSS 20.0 (SPSS Inc. Ltd.) and Excel 2016 (Microsoft Office, 2016), and all analyses were considered significant to the 0.05 significance level.

Results

Data from 1750 specimens of *I. balsanus* and 1180 of *I. punctatus* were obtained. Statistical description of the parameters for both catfish species including total length (TL) and total weight (TW) with minimum and maximum values, number of specimens (n) of each species, values of parameters '*a*' & '*b*' with 95% confidence limits and the coefficient of determination (r^2) are displayed in Table1. The exponent *b* values were calculated as 2.7487 for *I. balsanus* and 2.7755 for *I. punctatus*. The constant values of *a* were determined as .0263 for *I. balsanus* and .0248 for *I. punctatus* (Table 1).

Discussion

The length-weight relationship value in *I. balsanus*, is reported here for the first time, calculated from measurements obtained in organisms, as previous reports for this species are interpreted under Bayesian processes based on the general body pattern from other species of Ictalurids (Froese and Pauly, 2020) [6]. The results are close to the lower limits of predicted calculations, but still within the ranges indicated for this fish family (Froese and Pauly, 2020) [6].

In contrast, growth parameters in the channel catfish *I. punctatus* have been extensively studied along an array of habitats, mostly in the United States, in this respect, Hubert (1999) [11], analyzed data from 120 studies of individual populations, and produced a standard to assess data from age and growth for this species. Our length-weight data fall well within the parameters previously reported (Steeby *et al*., 1991) [24].

The length-weight relationship analysis of *I. balsanus and I. punctatus* represents an advancement in the knowledge of the growth pattern of these species in subtropical habitats, which will be useful for the regulation and management of fishing activities in the region.

Table 1: Total Length (TL) and Total Weight (TW) of the two studied catfish species, the native *I. balsanus* and the exotic *I. punctatus*, sampled from daily catches in the Amacuzac River Mexico, between March 2015 and April 2016.

	TL (cm)			TW (g)		Regression parameters				
Species	**n**	**Min**	**Max**	**Min**	**Max**	***a***	**95% CL *a***	***b***	**95% CL *b***	**r^2**
Ictalurus balsanus	1750	20.2	84.2	110.3	7120	.0263	.0230-.0301	2.7487	2.7111-2.7862	.9600
Ictalurus punctatus	1180	20.2	72.3	119.6	4410	.0248	.02155-.02871	2.7755	2.7350-2.8160	.9386

Abbreviations: *a* and *b*, parameters of LWR; CL, confidence limit; Max, maximum; Min, minimum; n, sample size; r^2, coefficient of determination.

Conclusion

Ictalurus balsanus and *I punctarus* show similar growth patterns, this could indicate a low level of competition for food and consequently in growth values. The high number of organisms examined were determining factors in the certainty of the results reported here.

Acknowledgements

This study was conducted with the support of the project LI006, (CONABIO) Comisión Nacional para el Uso y Conocimiento de la Biodiversidad. We also appreciate the work of the fishing community in the town of Xicatlacotla, Morelos.

References

1. Akhtar N, Fiaz-Khan M. Length-weight relationships of four *Triplophysa* species from northern, Pakistan. Journal of Applied Ichthyology. 2018;34(5):1223-1224. doi:10.1111/jai.13746
2. Chen S, Ding H, Zhang Z, Yao N, Xie C, Li D. Length-weight relationships of three species in northern China. Journal of Applied Ichthyology. 2018;34(5):1214-1215. doi:10.1111/jai.13741
3. CONAPESCA. Comisión Nacional de Acuacultura y Pesca. Anuario estadístico de acuacultura y pesca 2010. CONAPESCA, México; c2010.
4. Contreras-MacBeath TH, Mejía-Mojica ME, Paredes Lira G, Beltrán López YN. Mercado. Ictiofauna. En: La biodiversidad en Morelos. Estudio de Estado. CONABIO, México. 2020;2(II):275-282.
5. Froese R. Cube law, condition factor and weight–length relationships: History, meta-analysis and recommendations. Journal of Applied Ichthyology. 2006;22:241–253. doi:10.1111/j.1439-0426.2006.00805.x
6. Froese R, Pauly D. Fish Base. World Wide Web electronic publication. 2020 November 4. Retrieved from http://www.fishbase.org, version (05/2020).
7. Guo A, Yuan J, Lian Q, Hao Y, Zhang A, Gu Z. Length–weight relationship of three fish species from the Qiantang River, China. Journal of Applied Ichthyology. 2019;35(3):812-814. doi:10.1111/jai.13853
8. Hall GE, Jenkins RM. The rate of growth of channel catfish, *Ictalurus punctatus*, in Oklahoma waters. Proceedings of the Oklahoma Academy of Science. 1952;33:121-129.
9. Hermoso V, Clavero M, Blanco-Garrido F, Prenda J. Invasive species and habitat degradation in Iberian streams: an analysis of their role in freshwater fish diversity loss. Ecological Applications. 2011;21(1):175-188. doi:10.1890/09-2011.1
10. Holland RS, Peters EJ. Age and growth of channel catfish (*Ictalurus punctatus*) in the lower Platte River, Nebraska; c1992.
11. Jordan DS, Snyder JO. Notes on a collection of fishes from the rivers of Mexico, with description of twenty

new species. Bulletin of the US Fish Commission. 1899;19:115-147.
12. Wayne A. Hubert Standards for Assessment of Age and Growth Data for Channel Catfish, Journal of Freshwater Ecology. 1999;14(3):313-326. Doi:10.1080/02705060.1999.9663686
13. Ibáñez AL, Pérez-Ramírez M, García-Calderón JL. Institutional development of freshwater fish stocking in Mexico. Journal of fish biology. 2014;85(6):2003-2009. Doi:10.1111/jfb.12496
14. Leprieur F, Beauchard O, Blanchet S, Oberdorff T, Brosse S. Correction: Fish Invasions in the World's River Systems: When Natural Processes Are Blurred by Human Activities. PLoS Biol. 2008;6(12):e322. doi:10.1371/journal. pbio.0060322
15. Mejía-Mojica H, Paredes-Lira ME, Beltrán-López RG. Primer registro y establecimiento del bagre de canal Ictalurus punctatus (Siluriformes: Ictaluridae) en un tributario del Río Balsas, México. Hidrobiológica. 2013;23(3):456-459.
16. Mojica MH, Lira PME, Domínguez EG. Uso del Bagre del Balsas (*Ictalurus balsanus*), un recurso pesquero de pequeña escala comercial. En: *La* biodiversidad en Morelos. Estudio de Estado. CONABIO, México. 2020;2:51-54.
17. Nallathambi M, Arumugam U, Jayasimhan P, Chandran S, Paramasivam K. Length-weight relationships of six tropical estuarine fish species from Pulicat lagoon, India. Journal of Applied Ichthyology. 2019;36(1):125-127. doi:10.1111/jai.13983
18. Carmen Pedroza-Gutiérrez, López-Rocha JA. Key constraints and problems affecting the inland fishery value chain in central Mexico, Lake and Reservoir Management. 2016;32(1):27-40. doi:10.1080/10402381.2015.1107666.
19. Rafinesque CS. Description of three new genera of fluviatile fish, Pomoxis, Sarchirus and Exoglossum. Journal of the Academy of Natural Sciences, Philadelphia. 1818;1(2):417-422.
20. Peixoto UI, Mesquita EMC, Filho MAS, Isaac VJ. The weight-length relationship of fish species found in the tidal creeks of the Amazon estuary, northern Brazil. Journal of Applied Ichthyology. 2018;34(5):1183-1185. doi:10.1111/jai.13645
21. Peng Z, Lin G, Liu J, Shi T, Wang Z, Shao D, *et al*. Length–weight relationships of three fish species from central China. Journal of Applied Ichthyology. 2018;34(6):1387-1389. doi:10.1111/jai.13817
22. Rojas-Carrillo PM, Fernández-Méndez JI. La pesca en aguas continentales en México; c2006. p. 49.
23. Siddik MA, Hanif MA, Nahar A, Chaklader MR, Foysal MJ. Length–weight relationships of three carangid fish species *Alepes vari* (Cuvier, 1833), *Uraspis uraspis* (Günther, 1860) and *Carangiodes oblongus* (Cuvier, 1833) from the Bay of Bengal coast, Bangladesh. Journal of Applied Ichthyology. 2019;35(2):582-584. doi:10.1111/jai.13806
24. Stachowicz JJ, Byrnes JE. Species diversity, invasion success, and ecosystem functioning: disentangling the influence of resource competition, facilitation, and extrinsic factors. Marine ecology progress series. 2006;311:251-262. doi:10.3354/meps311251
25. Stachowicz JJ, Tilman D. Species invasions and the relationships between species diversity, community saturation, and ecosystem functioning. Species invasions: insights into ecology, evolution, and biogeography; c2005. p. 41-64.
26. Steeby JA, Busch RL, Tucker CS. A length–weight relationship for channel catfish grown under commercial conditions in Mississippi. The Progressive Fish-Culturist. 1991;53(1):57-60. doi:10.1577/1548-8640(1991)053<0057.