



Research Article

Influence of Stocking Density on Growth and Survival of *Channa punctatus* Reared in Cemented Ponds

Muhammad Hanif Chandio^{1,2*}, Naeem Tariq Narejo², Muhammad Farooq Hassan³, Faheem Sadar⁴, Nasiruddin Shaikh¹, Bushra Ainy Dars⁵, Ghulam Abass⁶, Asma Fatima⁶ and Shahnaz Rashid⁶

¹Directorate of Fisheries Sindh (Inland), Government of Sindh, Thandi Sarak, Hyderabad, Sindh, Pakistan; ²Department of Freshwater Biology and Fisheries, University of Sindh, Jamshoro, Pakistan; ³Department of Veterinary Pathology, Shaheed Benazir Bhutto University of Veterinary and Animal Sciences, Sakrand, Sindh, Pakistan; ⁴Maine Fisheries Department, Government of Pakistan, West Warf, Karachi, Sindh, Pakistan; ⁵Government College University, Hyderabad, Sindh, Pakistan; ⁶Planning and Development Department Sindh Secretariat, Karachi, Pakistan; ⁶Center of Excellence in Marine Biology, University of Karachi, Karachi, Pakistan.

Abstract | The influence of different stocking density on the rearing of fish, *Channa punctatus* in terms of weight gain (grams) and survival ratio (%) was investigated. Present trial was conducted for a period of 90 days in cemented tanks at University of Sindh, Jamshoro, Pakistan. Different stocking densities were determined such as 10, 15, and 20 fish/m² were selected and placed in different treatments (I-III) with two replicates. Fish were fed all parts of chicken (APC) with 10% of their body weight. The results of the growth trial indicated moderate variation among the treatments that, 10 fish/m² in T-I exhibited maximum growth (64.6 g) with 100% survival ratio as compared to other treatment (II and III), 15 fish/m² (35.0 g with 90% survival) and 20 fish/m² (16.4 g with 80% survival), respectively. The water quality parameters were monitored on fortnightly basis, such as temperature values were found within optimal range of 26.8 to 30.6°C, pH (7.3 to 7.5), oxygen (4.0 to 4.8mg/l), alkalinity (149 to 180mh/l), nitrate (0.17 to 0.18mg/l) and ammonia from 0.35 to 0.55ug/dLumol/litre. The results of the current study concluded that *Channa punctatus* have a preference to living in a small community than large schooling and could be reared 10/fish/m² was found to be suitable density for growth and survival in cemented cisterns. Present study plays an important role for culturing and rearing of native snakehead species.

Received | April 06, 2022; **Accepted** | June 07, 2022; **Published** | August 23, 2022

***Correspondence** | Muhammad Hanif Chandio, Directorate of Fisheries Sindh (Inland), Government of Sindh, Thandi Sarak, Hyderabad, Sindh, Pakistan; **Email:** hanifchandio@gmail.com

Citation | Chandio, M.H., N.T. Narejo, M.F. Hassan, F. Sadar, N. Shaikh, B.A. Dars, G. Abass, A. Fatima and S. Rashid. 2022. Influence of stocking density on growth and survival of *Channa punctatus* reared in cemented ponds. *Sarhad Journal of Agriculture*, 38(3): 1085-1088.

DOI | <https://dx.doi.org/10.17582/journal.sja/2022/38.3.1085.1088>

Keywords | Stocking density, Growth, Survival, *Channa punctatus*, Cemented cisterns



Copyright: 2022 by the authors. Licensee ResearchersLinks Ltd, England, UK.

This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

Introduction

Snakehead fish (*Channa punctatus*) are locally called Murrels belonging to the genus *Channa*. A total of

14 species of snake heads were reported in which only 4 species of snake heads *Channa marulius*, *Channa striatus*, *Channa gachua* and *Channa punctatus* were reported from Pakistan. Among these the two species

of snakehead fish, *Channa marulius* and *Channa punctatus* have high commercial importance as a food fish (Parveen *et al.*, 2021). This fish also possessed air breathing organs in its body that allow them to migrate on land through wriggling movements. Snakehead species can successfully survive in adverse environment because containing breathing organs with advanced breathing abilities, specified by Shafri *et al.* (2012). It prefers stagnant muddy water bottoms of rivers, lakes, swamps, marshes, canals and ponds. They are voracious carnivore, preying upon live animals. The hatchlings and fry feed mainly on zooplanktons and small insects larvae, while the adults feed on the invertebrates, small fishes and frogs. Stocking density has been reported in different species in Pakistan; such as in *Heteropneustes fossilis* by Narejo *et al.* (2005, 2010) and in *Tilapia chatralada* by Sindhu *et al.* (2017). No study existed on the stocking density and its effect on the growth and survival ratio of snakehead fish, *Channa punctatus*. The current study plays an important role for culturing and rearing of native snakehead species. By considering the lack of current information on the stocking density of snakehead fish, we were conducted an experiment to determine the optimal stocking density of *Channa punctatus*, fed all parts of chicken (APC).

Materials and Methods

Current experiment was conducted for a period of 90 days from June-August 2018. Different stocking density of fish such as 10 in T-I, 15 in T-II, and 20 in T-III fish/m² were placed in cemented ponds (size 2.5m²) with two replications. The experimental fish (size, 9.70 ± 1.2 g) were collected from River Indus Jamshoro, Sindh, Pakistan. The experimental fish were feed with all parts of chicken (APC) as best feed reported by Chandio *et al.* (2020). Calculations on the growth parameters were done by the following formulas; (Weight gain (g) = final body weight - initial body weight / initial body weight; Specific growth rate (%) = in final body weight - an initial body weight/ duration of the experiment (days); Survival rate (%) = number of fish surviving on last day I number of fish initially stocked; Weight gain (%) = 100 × final BW – initial BW/ initial BW). However, water quality parameters like temperature was measured by digital thermometer, salinity by refractometer, pH, nitrate, ammonia, and oxygen content were measured via digital water quality analyser (CONSORT-Model No.C-6030) on fortnightly basis. The data obtained

were analyzed using one-way analysis of variance (ANOVA) using SAS (Statistical Analysis System) 9.1 version. Treatment means were analyzed using the Duncan's Multiple Range Test.

Results and Discussion

Growth performance

The growth of snakehead fish (*Channa punctatus*) was influenced by different stocking densities in cemented ponds and the results showed that the treatment (I) having 10 fish/m² exhibited maximum weight gain (64.6 grams) with 100% survival ratio than other treatments (I-III) having (15 fish/m² and 20 fish/m²) showed minimum WG (35.0 g with 90% survival and 16.4 g with 80% survival ratio), respectively (Table 1). Comparable analyses were found by many authors on different fish species such as *Pangasius sutchi* by Azimuddin *et al.* (1999); in *Monopterus albus* by Narejo *et al.* (2002); in *Macrobrachium rosenbergii* by Haque *et al.* (2003); in *Heteropneustes fossilis* by Narejo *et al.* (2005); in *Therapon jarbua* by Abbas and Siddiqui (2007); and in *Channa striatus* by Mollah *et al.* (2009) and Amin *et al.* (2015), respectively. They concluded that, snakehead and catfish having preference to live and grow in a small communities like low density in any environment because they are highly carnivore in nature with cannibalism. Our result on snakehead stocking density was comparable with above authors.

Table 1: Data on growth parameters of *Channa punctatus* under different stocking density for the period of 90 days (June to August, 2018).

Parameters	Treatment I	Treatment II	Treatment III
Mean initial weight (g)	25.5 ^a ±1.5 ²	25.5 ^b ±1.5 ²	25.5 ^a ±1.5 ²
Mean final weight (g)	90.0 ^a ±1.9	60.5 ^b ±1.5	41.8 ^c ±1.2
Mean weight gain (g)	64.6 ^a	35.0 ^b	16.0 ^c
Weight gain (%)	353.0 ^a	237.0 ^b	163.0 ^c
SGR % per day	0.55.0 ^a	0.38.0 ^b	0.22.0 ^c
Survival rate (%)	100.0 ^a	90.0 ^b	80.0 ^c
Production (kg/m ² /90 days)	2.02 ^a	1.73 ^b	1.35 ^c

*Values are presented as a mean of all replicates; different superscripts showing different values.

Water quality of fish ponds

During the rearing experiment, the monitoring of water quality of ponds was monitored fortnightly, such as temperature values were found within optimal range of 26.8 to 30.6°C, pH (7.3 to 7.5), oxygen (4.0

to 4.8mg per litre), alkalinity (149 to 180 mg per litre), nitrate (0.17 to 0.18 mg per litre) and ammonia from 0.35 to 0.55 ug/dLumol/litre (Table 2). Similar values within our range was reported by Smitha *et al.* (2007), Puri *et al.* (2010), Kalwale and Savale (2012), Dastagir *et al.* (2014, 2016), Raj and Sevarkodiyone (2018), Rukhsana *et al.* (2021), they all examined water from fresh water bodies such as ponds, rivers, lakes, streams and Dams. The current values of water quality parameters in our ponds were found within recommended range of (WHO, 2018) especially for fish culture in ponds.

Table 2: Water quality parameters of ponds during the experimental period of 90 days.

Parameters	Range	Mean \pm S.D
Temperature ($^{\circ}$ C)	26.8-30.6 $^{\circ}$ C	29.0 \pm 0.5
pH	7.30-7.55	7.4 \pm 0.15
Dissolved oxygen (mg/l)	4.0-4.8 mg/l	4.4 \pm 0.4
Alkalinity (mg/l)	149-180 mEq/l	160 \pm 20.0
Nitrate (mg/l)	0.168-0.178 mg/l	0.17 \pm 0.14
Ammonia (ug/dLumol/l)	0.35-0.55 ug/dLumol/l	0.43 \pm 0.14

Conclusions and Recommendations

It was concluded that *Channa punctatus* have a preference to live in a small community than large schooling and could be reared 10 fish/m² was found to be suitable density for growth and survival in cemented ponds. The present study plays an important role for culturing and rearing of native snakehead species and recommended to rear this species with other cost effective feed will be proved remarkable in aquaculture.

Novelty Statement

The current work will be useful to the aquaculture sector on the basic knowledge of stocking density of snakehead fish, *Channa punctatus* in cemented tanks.

Author's Contribution

Muhammad Hanif Chandio: Performed the experiment and prepared initial draft.

Naeem Tariq Narejo: Designed and conceived the idea of this experiment.

Muhammad Farooq Hassan: Helped in relevant literature.

Faheem Sadar, Nasiruddin Shaikh and Bushra Anny Dars: Helped in data analysis and manuscript writing.

Ghulam Abbas and Asma Fatima: Added recent literatures modified text of the manuscript.

Shahnaz Rashid: Reviewed last version for publication.

Conflict of interest

The authors have declared no conflict of interest.

References

- Abbas, G., and P.J. Siddiqui. 2007. Effect of stocking density on growth and survival of the juvenile crescent perch, *Therapon jarbua* (forsskal 1775) reared in seawater tanks. Int. J. Biol. Biotech., 4: 73-81.
- Amin, S.M.N., M.P.A. Muntaziana, M.S. Kamarudin, A.A. Rahim and M.A. Rahman. 2015. Effect of different stocking densities on growth and production performances of Chevron snakehead *Channa striata* in Fiberglass tanks. N. Am. J. Aquac., 77(3): 289-294. <https://doi.org/10.1080/15222055.2015.1024361>
- Azimuddin, K.M., M.A. Hossain, M.A. Wahab and J. Noor. 1999. Effect of stocking density on the growth of Thai Pangus, *Pangasius sutchi* (Fowler) in net cage fed on formulated diet. Bangladesh J. Fish. Res., 3(2): 173-180.
- Chandio, M.H., H. Kalhor, S. Kalhor, J.A. Baloch, R. Iqbal and N.T. Narejo. 2020. Impact of diverse feed stuffs on weight gain of *Channa punctatus* raised in cisterns. Sindh Univ. Res. J., 52: 139-142.
- Dastagir, G., N.T. Narejo and S. Jalbani. 2014. Physico-chemical parameters and their variations in relation to Fish Production in Zhob River, Balochistan. Pak. J. Anal. Environ. Chem., 15(2): 77-81.
- Dastagir, G., S. Jalbani, N.T. Narejo and P. Khan. 2016. Effect of physico-chemical parameters on fish growth in Hanna Lake, Balochistan, Pakistan. Pak. J. Anal. Environ. Chem., 17(2): 175-179. <https://doi.org/10.21743/pjaec.v17i2.269>
- Haque, M.M., N.T. Narejo, M.A. Salam, S.M. Rahmatullah and M.A. Islam. 2003. Determination of optimum stocking density of *Macrobrachium rosenbergii* in carp polyculture in earthen pond. Pak. J. Biol. Sci., 6(10): 898-901.

- <https://doi.org/10.3923/pjbs.2003.898.901>
- Kalwale, A.M. and P.A. Savale. 2012. Determination of physico-chemical parameters of Deoli Bhorus dam water. *Adv. Appl. Sci. Res.*, 3(1): 273-279.
- Mollah, M.F.A., M.S.A. Mamun, M.N. Sarowar, and A. Roy. 2009. Effects of stocking density on the growth and breeding performance of broodfish and larval growth and survival of shol, *Channa striatus* (Bloch). *J. Banglad. Agric. Univ.*, 7(2): 427-432. <http://dx.doi.org/10.3329/jbau.v7i2.4756>
- Narejo, N., A. Dayo, B. Dars, H. Mahesar, M. Laghari and P. Lashari. 2010. Effect of stocking density on growth and survival rate of *Labeo rohita* (Hamilton) fed with formulated feed. *Sindh Univ. Res. J.*, 42.
- Narejo, N., M. Salam, M. Sabur and S. Rahmatullah. 2005. Effect of stocking density on growth and survival of indigenous catfish, *Heteropneustes fossilis* (Bloch) reared in cemented cistern fed on formulated feed. *Pak. J. Zool.*, 37: 49.
- Narejo, N.T., S.M. Rahmatullah and M.M. Rashid. 2002. Growth and survival of freshwater mud eel, *Monopterus albus* (Hamilton) under different stocking densities reared in the cemented cisterns. *Bangladesh J. Fish.*, 25(1-2): 67-72.
- Parveen, S., N.T. Narejo, A.H. Qadri, H. Kalhor, Afshan, M.H. Chandio and F. Saddar. 2021. Curvature deformity in vertebral column in adult *Channa stariata* (snakehead) from River Indus, near Jamshoro. *Sindh Univ. Res. J.*, (Sci. Ser.), 53(01): 9-12.
- Puri, P.J., M.K.N. Yenkie, D.G. Battalwar, N.V. Gandhare and D.B. Dhanorkar. 2010. Study and interpretation of physico-chemical characteristic of lake water quality in Nagpur city (India). *Rasayan J. Chem.*, 3(4): 800-810.
- Raj, J.A. and S.P. Sevakodiyone. 2018. A study on physico-chemical parameters of Urinjikulam pond, Thiruthangal (Virudhunagar District, Tamil Nadu). *Int. J. Aquac. Fish. Sci.*, 4(1): 10-12.
- Rukhsana, R., S. Rashid, A. Fatima, O.I. Khan, S.B.H. Shah, M. Ali and G. Abbas. 2021. The status of water quality in various fish and shrimp farms of Sindh Province, Pakistan: Abundance of planktonic biomass in relation to physicochemical properties of pond water. *Sarhad J. Agric.*, 37(3): 847-857. <https://doi.org/10.17582/journal.sja/2021/37.3.847.857>
- Shafri, M. and M.J.A. Manan. 2012. Therapeutic potential of the haruan (*Channa striatus*) from food to medicinal uses. *Malays. J. Nutr.*, 18(1): 22-28.
- Sindhu, M., P. Khan, S. Jalbani and N.T. Narejo. 2017. Effect of stocking density on growth performance of *Tilapia chatralada* reared in Cemented Cisterns University of Sindh, Jamshoro. *Sindh Univ. Res. J.*, 49(2): 441-449.
- Smitha, P.G., K. Byrappa and S.N. Ramaswamy. 2007. Physico-chemical characteristics of water samples of Bantwal Taluk, south-western Karnataka, India. *J. Environ. Biol.*, 28(3): 591.
- WHO, 2018. WHO Water, Sanitation and Hygiene Strategy 2018-2025 Description. 51 p. ; Document number. WHO/CED/PHE/WSH/18.03. World Health Organization. <https://apps.who.int/iris/handle/10665/274273>.