Biological Forum – An International Journal **13(4): 1340-1344(2021)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Effects of Natural Habitats on Distribution and Fishery of Small Indigenous Fish in Sorada Reservoir, Ganjam, Odisha

S.K. Bhuyan*, J. Jyotiranjan, S. Nanda, D. Choudhary and Goodly Samal
College of Fisheries, Odisha University of Agriculture and Technology (Odisha), India.

(Corresponding author: S.K. Bhuyan)*
(Received 15 September 2021, Accepted 22 November, 2021)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: Small Indigenous Fish Species (SIFs), encompass a group of fish species that has a size restriction of approximately 25 cm or 9 inches during the mature stages of development. A total of 17 fish species have been recorded from the reservoir during the period of study at Soroda reservoir, Odisha which are belonging to 5 orders and 9 families in case of general fisheries. A total of 12 species belonging to small indigenous fishes have been recorded during the study period related to 4 orders and 7 families. The present total production was of 52,833kg during the study period and the contribution of small indigenous fish species catch is 30% of total fish catch on an average. The peak production small indigenous fish are in the months of July to August. *Amblypharyngodon mola* (40 - 44%) catch was dominant in the reservoir and fetch good market value among the other SIFs. From the pooled data for all months, the deeper area with rocks and gravels habitat contributes about 45%, which was more productive habitat in comparison to shallow area without weed dominated habitat (31%) and shallow area with weed dominated habitat (24%). The deeper area with rocks and gravels habitat was the most productive habitat because major catch of fish species came from this habitat and breeding and nursery ground for many fish species.

Keywords: Reservoir, habitats, distribution, SIFs.

INTRODUCTION

Rural population depend highly on indigenous species of fish for nutrition in many parts of India, very little attention has been paid on their role in aquaculture enhancement, nutrition, processing, biology, captive breeding, livelihood security and conservation needs (Sarkar and Lakra 2010). Small Indigenous Fish Species (SIFs), encompass a group of fish species that has a size restriction of approximately 25 cm or 9 inches during the mature stages of development (Rahman, 1989; Felts *et al.,* 1996). In India there is about 450 fish species could be classified as small indigenous fish species, as they do not grow beyond 30cm in length. About 23% of small indigenous fish species provide food and nutrition. Out of 104 small indigenous fish species studied by ICAR-NBFGR (Anon., 2001), 62 species were seen as important for food security. SIFs those were once abundant in the rivers, streams, canals, lakes, reservoirs, ponds, beels, haor, and baor swamplands of Bangladesh, India, Nepal, and Sri Lanka (Froese and Pauly 2011), thriving in diverse natural habitats such as lakes, paddy fields, swamps, rivers, tributaries, floodplains, and wet low-lying areas that are periodically prone to flooding (Borah, 2019). Small indigenous fishes traditionally occupy an unenviable position and an inseparable link in the life, livelihood, health and the general well being of the rural mass, especially the poor. It has been reported that some species such as mola (*A. mola*), dhela (*O. cotio*), darkina (*E. danricus*) and kaski (*C. soborna*) contain high amount of vitamin A and other micronutrients and minerals (Thilsted *et al.,* 1997). Extensive carp culture along with small indigenous species is certainly a source of additional income and dietary protein to the rural families, incurring no additional cost besides being environment friendly (Bayen *et al.,* 2020). Natural habitats in reservoir plays an important role for the small indigenous fishes. Rocks can provide spawning habitat *viz*. gravel and cobble stone at 0-3m areas receiving frequent wave action improved fish spawning (Bassett, 1994). Katt *et al.* (2011), Wood is also another natural habitat in reservoirs which provides shelter to these small indigenous fish. Aquatic plants support higher fish densities, reduce the risk of predation and provide habitat for species that are reliant on structure (Salvino and Stein 1982; Dibble *et al*., 1996). In general, shallow reservoirs located in warm latitudes usually have resulted in an increase in total fish biomass over that of the free -flowing streams (Jackson and Marmulla 2001). In deep reservoirs or colder latitudes, however, population abundances have declined (Ebel, 1979).

The Sorada reservoir is an important reservoir in Orissa. It is located near Sorada block of Ganjam

district (Lattitude 84˚24' - 84˚26'N and longitude 19˚44' - 19˚46'E). It was created by construction of an earthen dam of 585 meter length over river Padma. It is situated on the river Padma, with mean water spread area is 400ha. It is the livelihood support of more than 1500 fishermen family. The Sorada reservoir fisheries mainly dominated by small indigenous fishes and more number of fishermen depend on this reservoir for their livelihood (Anon., 2019).

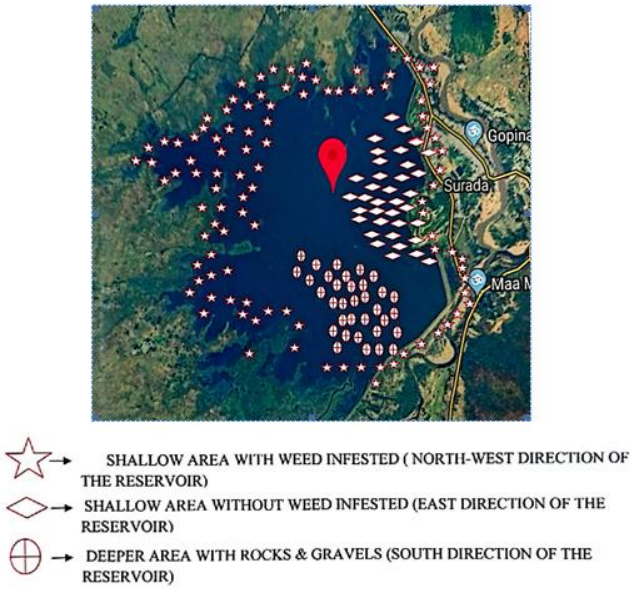
A few studies have been done on fishery productivity with relation to identification and management natural habitats which are the site of breeding and nursery grounds for many fishes in their early stages, like by (Bassett, 1994). Katt *et al*. (2011), (Salvino and Stein 1982; Dibble *et al*., 1996). The present study with a aim to study the status of fishery with respect to small Indigenous fish and improve the fish catch of the fishermen identification and protection of the natural habitats of this reservoir also play an important role in distribution of small indigenous fishes.

MATERIALS AND METHODS

The habitat wise, gear wise and species wise fish catch composition and production data was collected from different identified habitats of the reservoir Sorada reservoir at fortnight interval from September 2018 to March 2019. The different habitats were demarcated based on the fishing ground and fish production. The data from different habitats of the reservoir like shallow area without weed dominated, deeper area with rocks and gravels and shallow area with weed dominated were collected like different small indigeneous fish species catch fortnightly and for the month.

The different habitats were identified based on the biological and ecological characteristics and fish production like deeper area with rocks and gravels habitat, shallow area without weed dominated habitat and shallow area with weed dominated habitat. The small indigenous fish samples were collected from the landing centre. The first sampling station is shallow area without weed dominated which have high shoreline, low mean depth (less than 2m.) there was a better mixing up of water and heat and optimum nutrient level was maintained. Though this zone is rich in plankton such as zooplankton and phytoplankton and periphytons, but due low depth more often bloom of unwanted phytoplanktons and filamentous algae are seen which are unfavourable for fish growth and production.

The second sampling station is deeper area with rocks and gravels which are calm area of the reservoir. It formed a major nutrients available place for the fishes. The nutrient enrichment occurred in this layer due to deposition of organic load and other nutrients. This zone provided a suitable habitat for all types of organisms. The dissolved oxygen level is more stable in this zone. The temperature is also optimum in this level. This zone also protected the smaller fishes from the predator fish by giving rock hideouts.



Map : Satellite Map of Sorada Reservoir Showing Different Habitats.

The second sampling station is shallow area with weed dominated and because of suitable temperature, bright sunlight and rapid tropholytic activities accelerated the formation of weed like Eichhornia sps., Hydrila and Lemna sps . The fast turnover of nutrients and availability of sunshine and warmth helped to sustain a permanent plankton bloom and aquatic weed. There was an accumulation of large quantities of inorganic nutrients which wipe out the phytoplankton of their share of nutrients. The both floating and submersed weeds utilized the incident solar radiation for their photosynthesis and made it unavailable to the

phytoplankton. The submerged weeds provided shelter to the small indigenous fishes. The weeds only caused problem for operation of gears.

RESULTS AND DISCUSSION

A total of 17 fish species were recorded from reservoir during the period of study belonging to 5 orders and 9 families, like Cyprinidae, Mastacembalidae, Channidae, Ambassidae, Gobiidae, Heteropneustidae, Notoptoridae, Bagridae and Siluridae out of which 12 nos. are SIFs. Among the families Cyprinidae dominated the fishery. Among the catfishes the family Bagridae, Heteropneustidae and Siluridae were dominant. The species diversity were included *Labeo rohita*, *Catla catla*, *Amblypharyngodon mola*, *Cirrhinus mrigala* and *Labeo calbasu* were come under major category. Other important ichthyofauna which contributed at some extent comprised of *Puntius sophore*, *Rasbora daniconius*, *Salmostoma bacaila*, *Chanda nama*, *Notopterus notopterus*, *Mystus vittatus*, *Heteropneustes fossilis*, *Channa punctatus*, *Channa striatus*, *Wallago attu*, *Macrognathus pancalus* and *Glossogobius giuris* etc. were came under minor category.

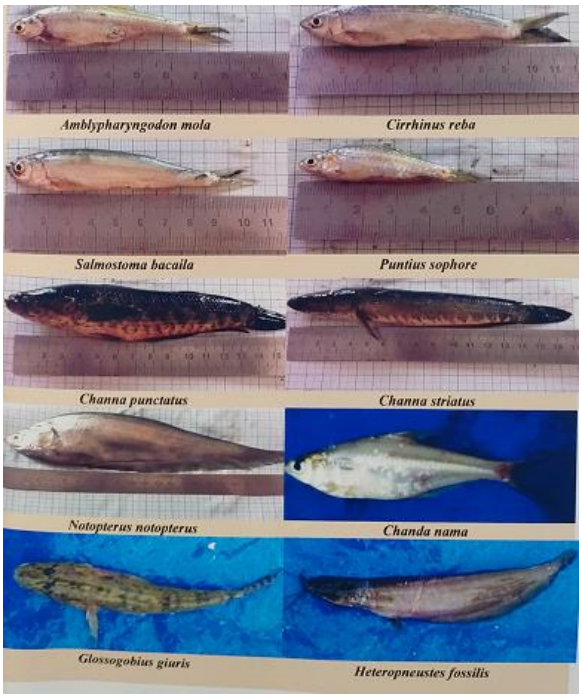


Fig. 1. Showing the important small indigenous fish(SIFs) in the reservoir.

The total fish production of Sorada reservoir during 2017-18 was 128.10 tonnes (Anon., 2019). Many studies and research were undertaken by scientists on species diversity in reservoirs and rivers. Similar work has been done by Rama Rao (2018) investigated on Kalinga Dal reservoir and revealed a total of 57 species of fishes belonging to 7 orders such as Cypriniformes dominated with 47.37% followed by Perciformes 21.05%, Siluriformes 17.54%, Channiformes 7.02%, Angulliformes 3.51%, Cyprinidontiformes and Osteoglossiformes each contributed with 1.75%. Bera *et al.* (2014) revealed that physiochemical parameters of Kangsabati Reservoir were congenial for 39 fish species of commercial importance, belonging to 7 orders, 15 families and 26 genera. Some authors and researchers were recorded small indigenous fishes from reservoirs and rivers. Bhakta *et al.* (2017) from freshwater resources of West Bengal recognized 267 species of freshwater fishes.

Monthwise and specieswise fish catch from Sorada shows that the catch was more during monsoon months and gradually decreases in end of winter (Fig. 2). The above fluctuation may be due to because of low water depth and decrease in productivity and rapid dislodgement of water from the reservoir for supplying drinking water to the Berhampur city.

Table 1: Percentage of catch composition of Small indigenous fishes.

Small indigenous fishes	Percentage of catch composition
Amblypharyngodon mola	43.59%
Mystus vittatus	5.64%
Puntius sophore	8.52%
Rasbora daniconius	8.28%
Notopterus notopterus	11.02%
Channa punctatus	5.85%
Heteropneustes fossilis	6.22%
Salmostoma bacaila	7.94%
Miscellaneous fish species	2.90%

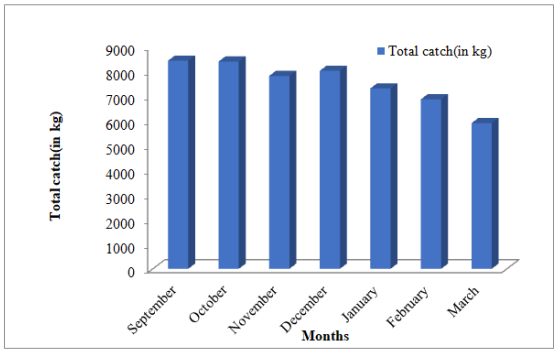


Fig. 2. Showing the total catch (in Kg) in different months.

The catch trend fishes of Sorada reservoir showed that catch rate of *Labeo rohita* and *Amblypharyngodon mola* was more as comparison to other fish species. During the study periods, it was observed that the catch rate of *Labeo rohita and Amblypharyngodon mola* always more followed by *Catla catla, Labeo calbasu* and *Cirrihinus mrigal*. Among the major carps the catch of *Labeo rohita* was maximum and among the small indigenous fishes the catch of *Amblypharyngodon mola* was in bulk quantity (Table 1). The *Amblypharyngodon*

mola catch was more because between May and October it breeds and on other hand it got more suitable breeding and feeding habitat for its growth which was plentily available in the reservoir. The egg laying tendency of SIFs also increases with the commencement of the rain. The total production was of 52,833kg from September 2018 to March 2019. The total Small indigenous fish production was of 21,084kg from the total production during the study period. In general, *Labeo rohita* catch and in Small indigenous fishes *Amblypharyngodon mola* (40 - 44%) catch was dominant during the study period. The contribution of small indigenous fish species catch is 30% of total fish catch on an average. The peak production SIFs is in the months of July to August (Fig. 3 and 4)

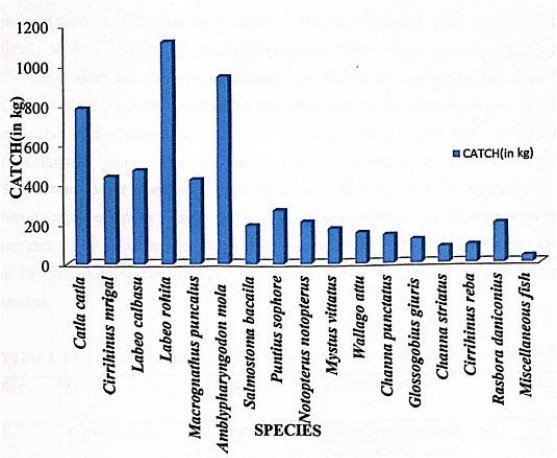


Fig. 3. (Species wise total catch data of IMC and SIFs).

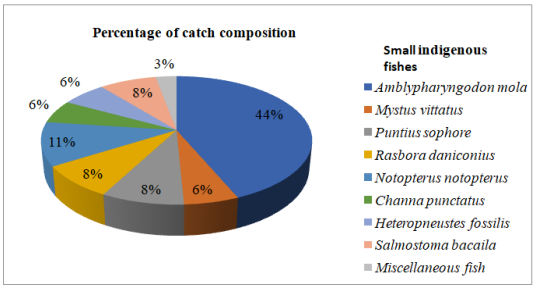


Fig. 4. Percentagewise catch composition of small indigenous fish catch.

The distribution and abundance of fishes in a reservoir depend on the habitats of the fish, food availability, water quality, methods of sampling used and area of reservoirs. From the pooled data for all months, the first sampling station contributes about 45%, followed by second sampling station (31%) and third sampling station 24% of the total catch of small indigenous fish species (Fig. 5). From the data analysis, it was found that, the deeper area with rocks and gravels habitat was more productive habitat in comparison to shallow area without weed dominated habitat and shallow area with weed dominated habitat. The deeper area with rocks and gravels habitat provided suitable shelter and natural food for both small indigenous fishes and general fishes. So, the deeper area with rocks and gravels habitat was the best habitat.

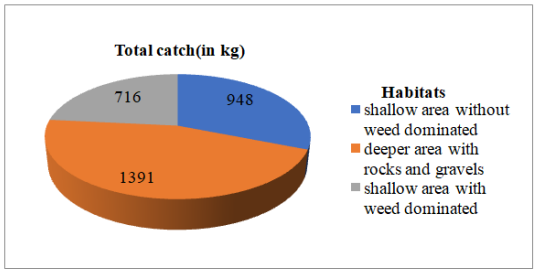


Fig. 5. Habitat wise catch of Small indigenous fishes.

Similar study on the effects of habitat in Lake Kariba also revealed by Zengeya and Marshall (2015) where river mouth area with hard and rocky bottom is the best habitat for fishing (Zhu and Yang (2016). As per the findings of Bassett (1994) Rocks can provide spawning habitat like gravels and cobbles areas receiving frequent wave action improved walleye spawning. Katt *et al.* (2011) also noted adult walleye abundance and egg density increased following the addition of cobble to Sherman Reservoir, Nebraska. Aquatic plants support higher fish densities, reduce the risk of predation and provide habitat for species that are reliant on structure (Salvino and Stein 1982; Dibble *et al.*, 1996). It is well opined that the availability of self-recruiting species (SRS) in both natural and artificial habitats is important for livelihood of the rural poor (Roos *et al.*, 1999; Mazumder and Lorenzen 1999).

CONCLUSIONS

The distribution and production of small indigenous fish (SIFs) which contribute more that 30% by weight of total fish production is higher in the deeper area habitat of the reservoir and Small indigenous fishes, *Amblypharyngodon mola* (40 - 44%) catch was dominant and fetch good market value. Though, the representation of higher catch of SIFs indicates that the population of economic important fish species like Indian major carps has declined. So it is found that the present fish production level can be increased substantially through adopting better management practices like , protecting the breeding grounds, mesh size regulation, release of recommended numbers of advance fingerlings or yearlings of Indian Major Carps and nursery grounds, implementation of closed season etc. Moreover, the complex interaction between economic attentions, ecological dynamics, and cultural practices shapes the divergent roles that SIS play in various fishing circumstances. The present research finding will help the policy makers of Department Of Fisheries, Government of Odisha. Further research like fisheries potential, productivity of the reservoirs a key aspect for effort and Maximum Sustainable Yield (MSY) calculation.

Acknowledgements. We thank Dr. S. Nanda, Dean, College of Fisheries, for encouragement and support. Authors are grateful to their colleagues for the help and support which led to the successful completion of the study. We appreciate the help by Primary Fishermen Co-operative Society(PFCS), local fishermen of landing centres collection of Soroda reservoirs.

REFERENCES

Anon. (2001). Annual Report. ICAR-NBFGR.

Anon. (2019). Annual Report. Department of Fisheries, Govt. of Odisha, India.

Bassett, C. E. (1994). Bulletin of Marine Science, Volume 55, Numbers 2-3, September 1994, pp. 1137-1148(12) *University of Miami – Rosenstiel School of Marine and Atmospheric Science.*

Bayen, S., Sinha, A., Aftabuddin, M., Roy, A., Parida, P. K. and Das, B. K. (2020). Developing mola (*Amblypharyngodon mola*) based fish culture practices for addressing livelihood and nutritional security of rural populace of Indian Sundarbans, *Journal of Entomology and Zoology Studies*, *8*(6), 359-364.

Borah, B. C. (2019). Small indigenous freshwater fish species in nutrition of ethnic population of North East India. *Act. Sci. Nutr. Health*, *3*(7), pp.158-167.

Dibble, E. D., Killgore, K. J. and Harrel, S. L. (1996). Assessment of fish- plant interactions. In : Miranda E and DeVries DR (Eds.). Multidimensional approaches to reservoir fisheries management, American *Fisheries Society, Symposium* 16, *Bethesda, Maryland.* pp. 357-372.

Ebel, W. (1979). Effects of Hydroelectric Projects on Fish Populations, In: Hydropower: A National Energy Resource, Washington, DC, USA: *US Government Printing Office.*

Felts, R. A., Rajts, F. and Akhteruzzaman, M. (1996). Small indigenous fish species culture in Bangladesh. Technical brief. IFADP Sub-project 2. Development of Inland Fisheries, p. 41.

Froese, R. and Pauly, D. (eds) (2011). Fish Base. [version 10/2011] *http://www.fishbase.org*.

Jackson, D. C. and Marmulla, G. (2001). The Influence of Dams on River Fisheries(*FAO Fisheries Technical Paper, No. 432.* Rome, FAO.72p.)

Katt, J. D., Peterson, B. C., Koupal, K. D., Schoenebeck, C. W. and Hoback, W. W. (2011). 'Changes in relative abundance of adult walleye and egg density following the addition of walleye spawning habitat in a Midwest irrigation reservoir', *Journal of Freshwater Ecology*, *26*, 1, pp.51-58.

Mazumder, D. and Lorenzen, K. (1999). Developing aquaculture of small native species (SNS) in Bangladesh: village level agroecological change and the availability of *SNS. NAGA ICLARM Quarterly*, *22*(3), 20-23.

Rahman, A. K. A. (1989). Fresh water fishes of Bangladesh. The Zoological Society of Bangladesh, Dhaka, p.352.

Roos, N., Islam, M. M., Thilsted, S. H., Ashrafuddin, M., Mursheduzzaman, M., Mohsin, D. M. and Shamsuddin, A. B. M. (1999). Culture of Mola (*Amblypharyngodon mola*) in polyculture with carps-experience, a field trial in Bangladesh. *NAGA, ICLARM Quarterly*, *22*(2), 16-19.

Salvino, J. F. and Stein, R. A. (1982). "Predator- prey interaction between largemouth bass and bluegills as influenced by simulated submerged vegetation", *Transactions of the American Fisheries Society* 111, pp. 255-266.

Sarkar, U. K. and Lakra, W. S. (2010). Small Indigenous Freshwater Fish Species of India: Significance, conservation and utilization. *Aquaculture Asia Magazine*, *15*(3), 34-35.

Zengeya, T. and Marshall, B. E. (2015) Effects of habitat and fishing on fish assemblages in a tropical reservoir: Lake Kariba, Zimbabwe", *Lakes & Reservoirs Research & Management*, *20*(4), 256-263.

Zhu, D. and Yang, Z. (2016). International Conference on Water Resource and Environment 2016(WRE2016). *IOP Publishing.* IOP Conf. Series: *Earth and Environmental Science***,** *39*(2016), 012022.

How to cite this article: S.K. Bhuyan, J. Jyotiranjan, S. Nanda, D. Choudhary and Goodly Samal (2021). Effects of Natural Habitats on Distribution and Fishery of Small Indigenous Fish in Sorada Reservoir, Ganjam, Odisha. *Biological Forum – An International Journal*, *13*(4): 1340-1344.