Life Science Bulletin, **Vol. 9(1) 2012 : 135-138** ISSN : 0973 5453 (Print)

EICHHORNIA CRASSIPES (MART.) SOLMS - A SHELTERBELT FOR CAPTURE FISHERY IN FLOODPLAINS OF NORTH BIHAR, INDIA

VIDYANATH JHA[1]*, TUNTUN SINGH[2], A. B. VERMA[3] and RAJEEV KUMAR[1]

[1]*M.L.S.M. College, Darbhanga (Bihar)*

[2]*Department of Fisheries, Govt. of Bihar, Mithapur, Patna (Bihar)*

[3]*Department of Botany, Marwari College, Darbhanga (Bihar)*

ABSTRACT : North Bihar is known for its diverse forms of floodplain wetlands, which are variously utilized for livelihood purposes by the local inhabitants. The fishing community has developed a number of methods of capture, fishing since a long time. One such innovative method involves the creation of *Eichhornia* shelter belts in lentic water bodies. This man made endeavour remains in operation for 5 to 6 months, after the flood recedes during November-December and the new flood water starts entering these wetlands during April-May. The method, usually known as Jhang in local parlance, provides a sense of respectability to this otherwise "untameable" aquaphyte, which is held as one of the ten most obnoxious weeds of the world today. However, the Jhang fishing method provides a basis of sustainable livelihood to thousands of marginal and poor fisher folks of North Bihar flood plains. They make four to five fish harvests at intervals of approximately 45 days. This enables them to obtain an average catch of 500 kg of fish per harvest and earn a net profit of Rs. 50,000/- per Jhang. The hyacinth shelters could be visualized as green spots spread over the length and breadth of the big wetlands of Larail, Mahrail, etc., in the Kusheshwarsthan bird sanctuary area, situated at the eastern tip of Darbhanga district. An average of 200 sq/m. of water-spread area is covered by one such shelter, which is raised equally lavishly in the Kamala, Kareha and other rivers (after the speed of current flow diminishes) as well as in the stagnant chaurs (land depression) and moins (ox-bow lakes). The swampy areas are full of organic detritus, constitute ideal sites for raising the Jhangs. These shelter belts serve as ideal habitats for a variety of fishes and also as breeding sites for air breathing fishes and common carp. The site being enriched with the guano of thousands of resident and migratory birds supports a luxuriant growth of the submerged weeds in the sanctuary area wetlands. As such the site is known for a bumper production of Boari and Tengra fishes, which are parceled to several places within and outside the state, during the peak flood years.

Key words : *Eichhornia crassipes, Hyacinth, North Bihar, Capture Fishing, Wetlands*

INTRODUCTION

North Bihar is endowed with diverse groups of wetlands comprising a fine network of perennial rivers. Geomorphic factors have made these rivers to change their courses over millennia and this has led to the formation of hundreds of big and small chaurs (land depressions) and moins (ox-bow lakes) in this area. All these water bodies constitute a repository of aquatic biodiversity, including those of fishes and support the livelihood patterns of the local human and animal populations (Jha,2005 a,b,2012; Jha *et al.*,2004,2006a,b; Singh & Singh,2002; Singh *et al.*,2007; Singh & Ahmed,2003 and Purty & Kumar, 2000). The region has been a home to the high floods since pre historic times. Embankments on almost all the major rivers in the region, raised after independence with the purpose of containing the flood devastations, have proved counterproductive. Blockade of free water flow in the lower catchments have prolonged the durations of water loggings outside the embankments. Inundated areas get invariably infested with aquatic weeds dominated by Eichhornia crassipes. This weed provides shelter to the malaria vectors and creates great hindrance to paddy cultivation in low lying areas. Water bodies overarched with hyacinth are a common site in the region. It inflicts a heavy loss to fisheries and Makhana based integrated aquiculture in this region. Makhana farmers have to make heavy investments on clearing the hyacinth infested pond surface for plantation of Makhana. Hyacinth is stacked on the pond margins to dry and then mix with the pond debris. This cycle goes on year after year. This obnoxious, yet versatile, weed is reported to play a role in the formation of floating island (phumdis) in the Loktak lake of Manipur in eastern India (Sanjit *et al.*,2005 and Jha *et al.*,2006a).

E.crassipes has a devastating effect on animal husbandry in the region. During peak flood periods it is water and water all around. The livestock have no option other than feeding rather exclusively on the hyacinth fronds. The eggs of molluscs associated with the hyacinth body act as vectors to the parasitic diseases like liver fluke, schistosomiasis etc. and find easy entry into the animal guts. This takes a heavy toll of the bovine life and adds to the miseries of the impoverished populace. *E.crassipes*, a free floating aquatic macrophyte of Amazonian origin, is one of the most obnoxious weeds of the tropical world, which has engulfed the waterbodies of more than 50 countries of five continents. Having a capacity to double within a short span of 6 to 18 days, this macrophyte is known to block water ways, swimming, navigation, fishing etc. As elsewhere in the world, this prolific aquaphyte has naturalized in the water bodies of North Bihar, also as the first phase of biological invasion. Invasion of an alien species is the primary cause of biodiversity loss and is held as the second worst threat after habitat destruction (Gopal,1987; Drake *et al.*,1987; Jenkins,1999; Mooney & Hobbs,2000; Reddy,2008 and Ansal *et al.*,2008).

---

*Author for correspondence (email : vidyanathjha@gmail.com) Received 11.03.2012 Accepted 20.05.2012

An all pervading presence of this exotic invasive weed, however, has led the farmers devise its innovative uses for a number of livelihood purposes, including those of fuel and manure. People are also in the habit of making hyacinth bridges over rivers during peak floods. Hyacinth ash is applied as manure to the early maize plantlets. Dried hyacinth plants are used in this region for covering potato and sugarcane plantations in early stages. It is of great help to earthen pot makers who use it as fuel in their kilns. Hyacinth is otherwise known to contain essential vitamins and promotes fish growth, when fed at low levels in vitamin poor diets (Liang and Lovell,1970)

As the region is divested of orchards and other woody trees, hyacinth often comes to the rescue of the poor, who could ill afford to make investments on the fossil fuels, including LPG. Disruption of transport facilities during peak flood periods, often dislocates them from the rest of the world for months together at a stretch. It is no wonder such a versatile weed has been assigned various names like *Kechuli, Bokan, Dhakan, Pepcha, Khokhsa, Pulpul, Pupuch* etc by the local people.

Kusheshwarsthan wetlands, situated at the eastern tip of Darbhanga district at a distance of 60 kms from the district headquarters, are known for their fisheries potential both in terms of production as well as diversity. This is an important site of capture fishing since ancient times (Jha and Chandra,1997). Both fresh and dried fishes are internally exported to several parts of Bihar and adjoining West Bengal, as well as to the neighboring country of Nepal.

MATERIAL AND METHODS

Observations were made on the methods of capture fishing as prevalent in the flood plain wetlands of Kusheshwarsthan in Darbhanga district of northern Bihar. Information was collected with reference to:-

(a) The pattern of inlet of water into the wetlands and the duration of rising of hyacinth shelters as a means of capture fishing.
(b) Investments made by the farmers and cost-benefit analysis of this endeavor as a means of natural resource management.
(c) Types of fishes captured and the status of fish bio-diversity in this area.
(d) Overall impact of hyacinth on the livelihood pattern in the region.

Primary data collected during the present study have been presented in the form of two tables.

RESULTS AND DISCUSSION

Jhang is a method of capture fishing that involves creation of round shelter belts of floating hyacinth, *Eichhornia crassipes* over an average area of 200 sq/m. in the stagnant water. The system remains in operation for about six months starting from October to April. The area is encircled with the help of bamboo poles and ropes. The submerged weeds growing sprawlingly inside the hyacinth cover facilitate the creation of habitat cum breeding grounds to a number of fish species including *Boari, Saura, Rohu, Bhaura, Katla,* Common Carp, etc. Fertilizers used in the cultivation of wheat, maize and other arable crops in the nearby fields, find their way into the wetlands along with the rain and flood waters.

Jhangs, which are also visible in other floodplains of the state, are a common site in Kusheshwarsthan wetlands. The big chaurs of 'LARAIL' and 'MAHRAIL' provide a picturesque scene of dozens of Jhangs interspersed as beads in the vast aquatic matrix.

Table. 1 Economics of raising a hyacinth shelter belt (Jhang) in the waterbodies of Kusheswarsthan in North Bihar, India.

S.	Items	Details
1.	Total duration	Six months - October to April
2.	Average area	176.51 m^2 (One Katha) approx.
3.	Distance between two Jhangs	400 m^2
4	Costs involved on	
	Rope, Net, Bamboo poles	Initial round - Rs. 15,000.00 to Rs. 20,000.00
	Labour charges,	Subsequent round - Rs. 1,000.00 to Rs. 2,000.00
	Branches of trees,	
	Transportation of hyacinth, etc.	
5.	No. of harvests	4 to 5 times at an average interval of 45 days.
6.	Catch per harvest	500 Kg (Average)
7.	Total harvest	2000 Kg (Average)
8.	Net profit	Approx. Rs. 50,000.00
9.	No. of persons involved per Jhang	5 to 6
10.	Types of fishes captured	Boari, Saura, Rohu, Bhaura, Katla, Tengra, Common carp., etc.

Table.1 provides the detailed cost-benefit analysis of raising a Jhang. Investments are made on rope, bamboo poles, nets, transportation of hyacinth (including its removal from the site during harvest and its restoration). Investments in the initial round are to the tune of Rs. 15,000.00 to Rs. 20,000.00. In the subsequent rounds it comes down to one tenth of the investment made in the initial round. An average of 5 to 6 persons remains involved with one Jhang. Harvests of fish are made 4 to 5 times at intervals of approximately 45 days. An average of 500 kg of catch is obtained per harvest, with a net profit approaching Rs. 50,000.00. In view of capture fishing serving as major source of livelihood, even non-mallah communities have adopted this vocation. Table.2 enlists the fish species harvested from these Jhangs. Quit a good number of these fish species are getting rarer in other parts of the state. Fishes like *Rohu, Katla*, common carp (an exotic fish) form the components of composite fish culture and find entry in the Kusheshwarsthan chaurs through flood inundations.

Rivers in the region, which feed water to all sorts of water bodies emanate from the Nepal Himalayas and are both snow and rain fed. Melting Himalayan snow starts feeding water to the local rivers during April-May. The river current starts gaining speed. The adjacent chaurs also get swollen with the incoming water from the rivers. The monsoon rains during second half of June up to the first half of September further contribute to the ferocities of the floods. This situation is no more conducive to the continuance of the Jhangs for at least six months ahead.

Table. 2 Fish species harvested from a hyacinth Jhang in Kusheswarsthan wetlands in Darbhanga district Bihar, India.

Common Name	Scientific Name
Saura	*Channa marulius*
Boari	*Wallago attu*
Tengra	*Mystus bleekeri*
Bhunna	*Notopterus chitala*
Common carp	*Cyprinus carpio*
Baghi	*Botia* sp.
Gainchi	*Mastocembalus armatus*
Chenga	*Channa gachua*
Garai	*Channa punctatus*
Pothia	*Puntius* sp.
Kawai	*Anabas testudineus*
Rohu	*Labeo rohita*
Katla	*Catla catla*

Jhangs in rivers : Jhangs are raised in rivers also in diffused current with the passing away of the rainy season. In Kusheshwarsthan area the Kamala and Jiwachh rivers provide sites to these Jhangs. Often the branches of trees like Imli (*Tamarindus indica*), Jungle Jalebi (*Inga dulcis*), Jamun (*Eugenia* sp.), bamboo etc. are placed on the river beds inside the Eichhornia covers to create ideal habitat cum breeding sites to the fishes. Jhangs could be located in other rivers of the state also, mostly attached with the banks.

Migratory birds have a role in raising fish production in Kusheshwarsthan wetlands : Kusheshwarsthan wetlands, known for their rich bio-diversity have been declared a bird sanctuary. It is a seat of a large no. of resident and migratory birds. The sanctuary attracts a huge congregation of avifauna, from far off countries during winter months. The chaurs get enriched with the avian guano and this leads to a lush growth of the submerged vegetation that contributes to the overall fish productivity. Kusheshwarsthan wetlands are held as the second potential RAMSAR site of the state after Kabartal in Begusarai district.

Vegetation in Kabartal being dominated by Phragmites karka (a rooted emergent species), there is no scope of hyacinth based Jhang fishing in this biggest wetland of the state. However, both the wetlands are rich in submerged vegetation and as such fishing through nets are a difficult proposition. Kabartal and Kusheshwarsthan wetlands being extremely rich in submerged vegetation, fishing in both the wetlands is accomplished by employing appliances vernacularly known as ARSI, AAHUT, GOYA etc., all made of local bamboo strains, for capturing fishes of varying sizes.

ACKNOWLEDGMENTS

Thanks are due to the University Grants Commission for granting a minor research project to Dr. V. Jha, under which this study was made. Authors express their gratitude to Shri L. N. Sah of Kushwshewarsthan for his help during this study.

REFERENCES

Ansal, M. D.; Dhawan, A. and Sharma, B. (2008). *Fishing Chimes.*, **27(10/11)** : 34-42

Banerjee, A. and Matai, S. (1990). *J. Aquat. Plant Manage*, **28** : 69-73.

Drake, J. A.; Mooney, H. A.; diCastri, F.; Grooves, R.; Kruger, F.; Rejmanek, M. and Williamson, M. (1987). *Biological Invasion : A Global Perspective*. John Wiley, Chichester, U.K.

Gopal, B. (1987). *Aquatic Plant Studies*. 1. Water Hyacinth. Elsevier Publishing, New York, U.S.A.

Jenkins, P. T. (1999). *Invasive species and Biodiversity Management* (eds. O. T. Sandlund, P. J. Schei and A. Viken), Kluwer, London, **24** : 229-235.

Jha, B. C. and Chandra, K. (1997). *Kusheshwarsthan Chaur (North Bihar) : Status and Prospects for Fisheries Development*. Central Inland Capture Fisheries Research Institute (ICAR), Barrackpore.

Jha, V. (2005a). Utilisation of aquatic biodiversity for the development of north Bihar. In : *Urban and Regional Development in India* (ed. B. Thakur). Concept Publishing Co., New Delhi, pp. 514-541.

Jha, V, (2005b). Sustainable management of biotic resources in the wetlands of Bihar. In : Aquatic Ecosystems - Conservation, Restoration and Management (eds. T. V. Ramchandra, N. Ahalya and C. R. Murthy). Capital Publishing Co., New Delhi, pp 270-277.

Jha, V.; Shashi, S. B. and Singh, T. T. (2004). Inland water resources of north Bihar : An environmental appraisal. In : *Proc. of the 3rd National Seminar on Inland Water Resources and Environment*, organized by the Department of Env. Sciences, University of Kerala and Limnological Association of Kerala (LAK), Thiruvananthapuram, pp. 63-66.

Jha, V.; Singh, T. T.; Prasad, D. and Shashi, S. B. (2006a). *Fishing Chimes.*, **26(3)** : 16-19.

Jha, V.; Singh, T. T. and Ahmad, S. S. (2006b). Sustainable livelihood options in floodplain wetlands of north Bihar. In : *Proceedings of the National Conference on Wetland Biodiversity* (ed. P. R. Varghese). Limnological Association of Kerala and Indian Association of Aquatic Biologists, Hyderabad, pp. 117-121.

Jha, V. (2012). Aquatic biodiversity as a basis for development in the flood plains of north Bihar, India. In : *Identifying Resource Complex Region and Development Strategies for Bihar* (eds. R. B. P. Singh, P. S. Singh and Nikhil Ranjan). Centre for Geosheelitic Studies Patna, pp. 69-84.

Liang, J. K. and Lovell, R. T. (1970). N*utritional value of water hyacinth in channel catfish feeds*. Presented at the 1970 meeting of the Hyacinth Control Society Huntsville, Alabama, pp. 40-44.

Mooney, H. A. and Hobbs, R J (eds.) (2000). *Invasive Species in a Changing World*. Island Press, Washington D C. Purty,

J. S. and Kumar, M. (2000). *Fishing Chimes.*, **19(6)** : 46-47.

Reddy, C. S. (2008). *Curr. Sci.*, **94(10)** : 1235.

Sanjit, L.; Bhatt, D. and Sharma, R. K. (2005). *Curr. Sci.*, **88(7)** : 1027-28.

Singh, A. K. and Ahmed, S. H. (2003). *Fishing Chimes.*, **25(9)** : 48-49.

Singh, T. T.; Prasad, D. and Dubey, N. K. (2007). *Fishing Chimes.*, **27(1)** : 118-121

Singh, T. T. and Singh, R. K. P. (2002). *J. Aqua.*, **10** : 67-68.