

# Indigenous Navigatory Devices used during the High Floods in North Bihar

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## ABSTRACT

This paper takes into account the methods of adaptations to the extreme situations of floods in the rainy season of 2020 in the rural and urban areas of Darbhanga district in northern Bihar, India. Boats made of different types of woods are the first choice of people. The region has a sprawling boat industry that provides a basis of livelihood to the wood smith community. Boats are generally made available to the needy people by the agencies of Government. However, those deprived of the boat facility adapt to the situation by carving makeshift devices made from banana pseudo stems, water hyacinth fronds, dry wood pieces, pitcher floats, bamboo rafts, cement bowls for feeding the livestock etc. High floods of 2020 witnessed people using boats of thermocol and rubber tubes on a large scale. All these devices, whether natural or man-made, work on the principle of Archimedes.

The paper reports an innovative practice of using the hollow gas cylinders intricately strung in the fashion of an open boat that was used for about 15-20 days till the high floods receded in the village Harichanda of Hanuman Nagar C.D. Block of Darbhanga district India. The system was devised by local young men to tide over the crisis of ferrying people to local orchards for defecation and also for maintaining the supply chain of drinking water, cooking gas and other essential services.

The plant items achieve buoyancy due to their density lower than water. Those made of flattened wood or tin plates achieve floatability on account of large volume of water that they displace. The weight of people carried on these boats is lighter than the weight of the volume of water displaced in the process.

**Keywords:** 2020 Floods, Banana pseudostem, Boats, Gas cylinders, Rubber Tubes, Thermocol, Water Hyacinth.

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## INTRODUCTION

Mithila area in north Bihar has been a region of high floods since time immemorial. The area is traversed by both rain and snow fed rivers. A high density of human population bears a testimony to the land being fertile on account of easy availability of water although. Almost every year the fine network of rivers gets swollen during rainy season. As such the people are used to carving boats of various hues. It provides a basis of livelihood to the traditional wood smiths who are otherwise known for carving intricate woodcraft.

On an average, the region is visited by extremely high floods of which 1974, 1987, 2004 catastrophes are still there in the living memory of the people in this area. Ferocious floods leave no option for them other than using whatever means is available in the vicinity. They look for shelter for themselves and for their livestock and adapt to the emergency methods of navigation. Extensive studies made by Mishra (2005, 2007, 2008) refer to the pattern of floods in the rivers of Mithila region in north Bihar and their impact on the economy and livelihood aspects of the affected populace.

It is true that a large number of bridges of big, medium and small sizes have been constructed in post independence dispensation and transportation over water bodies has become easier. Even then one cannot do away with the requirements of boats and other such devices for navigation. It is under such a context that this communication tries to look into the methods of emergency navigation during catastrophic floods and the newer innovative ones devised as a result of recent scientific developments. It is paradoxical that the region that faces extreme floods also suffers from extreme droughts. The year

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2019 witnessed an extreme drought like situation and supply of drinking water had to be made by the Govt. agency even in rural areas of the district. Incidentally the year 2020 witnessed an extreme flood of 1974, 1987 and 2004 dimensions. People residing in Kusheshwarthan area situated at the eastern tip of Darbhanga district are used to the recurrent floods and have developed several means of adaptation under such an extreme situation (Jha, 2015; Jha *et al.*, 2019, 2020).

## METHODS

A survey was made of the emergency methods adopted by rural and urban populace of Darbhanga and other adjoining districts for movement in water during the catastrophic floods of the August, September months in the year 2020. The old methods of navigation by using boats and floating plants available in the

vicinity as well as new methods of using synthetic items were taken into account. Information collected have been presented in the form of two tables and 16 figures.

## RESULTS AND DISCUSSION

Boats made of various types of wood have been the primary device for movement on water, both during floods and also during normal times for crossing the rivers (Fig. 1A). The area under survey has the tradition of carving big and small boats from the woods of *Jamun/Jamuni*, *Shisham*, *Jalebi*, *Aam* etc.

Boats are generally held as status symbol of people residing in the chronically flood stricken C.D. blocks, more particularly the Kusheshwarsthan and Hanuman Nagar blocks of the district. *Jamuni* (*Syzygium fruticosum*) trees that have achieved the status of an invasive species in the areas alongside the rivers are now widely used for boat making in place of *Jamun* (*Syzygium cumini*). Kosi and Bagmati floodplains are mostly the sites of *Jalebi* trees (*Pithecellobium dulce*) that have emerged as favourite choice after the large scale destruction of *Shisham* trees due to the epiphytotic in recent decades.



**Fig. 1:** A. Wooden boat carrying women, also rowed by a woman; B. People ferrying over banana pseudo stems piled together; C. Water hyacinth being used as indigenous device for movement in water; D. Living *Kechuli* bridge over a river, made up of the floating plants of *Eichhornia crassipes* (Mart.) Solms; E. Dry wood log being used as a means of navigation; F. NDRF personnel rowing over inflated boat made of synthetic materials.

*Thumbs* of banana (*i. e.*, pseudo stem of the plant) are carved in the form of boats. This is one of the most primitive way to tackle this type of situation (Fig. 1B). People resort to using any lighter and hollow plant item that could help them save from drowning and remaining afloat. For this they use the stalks of Jute (*Corchorus* sp., locally called *Santhi*, after removal of the outer portion from which Jute fibres are derived).

Fig. 1C shows people being ferried over water using water hyacinth as the growing device. Often it is carved in the form of living bridge over a river (Fig. 1D) when the intensity of water flow recedes. The history of introduction of *Eichhornia crassipes* to tropical waters of India is about a century old. On account of its high growth rate it has engulfed the water bodies of India. Ways have been devised to harness its potential as a capture fishery device (Jha *et al.*, 2012). There is a need to find out ways of optimum utilization of its phyto mass.

The region has a rich distribution of several emergent aquaphytes including the species of *Aeschynomene*, *Sesbania* and others that arrest the intensity of the flowing flood water and could be utilized for navigation in extreme flood situations (Jha *et al.*, 2011, 2014). People in the flood affected area even use dried wood logs (Fig. 1E), haystacks or other floating plants like Sarhanchi (*Alternanthera* spp.), Kumhi (*Pistia* sp.) and other such plants stacked together.

Table 1 enlists the plant items used for movement in flood water, either in the form of boats made of different species of woody plants available in the region or by the use of intact floating plants.

**Table 1:** Natural plant items used for movement in flood water.

S.N.	Local Name	Botanical Name s	Family
A.	Water Boats		
1.	Jamun/Jamuni	<i>Syzygium</i> spp.	Myrtaceae
2.	Shisham	<i>Dalbergia sissoo</i> Roxb.	Fabaceae
3.	Jalebi	<i>Pithecellobium dulce</i> (Roxb.) Benth.	Mimosaceae
4.	Aam	<i>Mangifera indica</i> L.	Anacardiaceae
B.	Intact Floating Plants		
1.	Banana pseudostem	<i>Musa</i> sp.	Musaceae
2.	Kechuli (whole plant)	<i>Eichhornia crassipes</i> (Mart.) Solms	Pontedariaceae
3.	Karmi (whole plant)	<i>Ipomoea aquatica</i> Forssk.	Convolvulaceae
4.	Korhila ( Stem portion)	<i>Aeschynomene</i> sp.	Fabaceae
C.	Oar		
1.	Bamboo pole	<i>Bambusa balcooa</i> Roxb., <i>Bambusa tulda</i> Roxb.	Poaceae

**Table 2:** Devices made of synthetic items used for navigation during 2020 floods.

S.N.	Item	Details
1.	NDRF boats	Inflatable boats made of synthetic product.
2.	Rubber tubes	Otherwise used inside the tyres of trucks and tractors.
3.	Thermocol	Otherwise used as packing items for transportation of fishes and other equipments.
4.	Plastic bottles	Otherwise used for packaging drinking water.
5.	Tin canisters	Otherwise used for packing oil, ghee etc.
6.	Cement bowls	Otherwise used for feeding the cattle.
7.	Empty gas cylinders	Otherwise used for storing cooking gas.

Table 2 enlists the modern synthetic devices that were found to be used during 2020 floods for the purpose of navigation.

Fig. 1F shows the inflatable boats used by National Disaster Response Force for rescuing people under the devastating floods. Air filled rubber tubes used in tyres of trucks and tractors are also being widely used for this purpose (Fig. 2A). Fig. 2B shows further innovation of tube based device. In this case split bamboo pieces are set over the two air filled tubes. Four empty tin boxes are set on the four sides to balance the weight of the people who are aboard the device. The Fig. shows a man rowing the device on water in Kusheshwarsthan C.D. block of the district to collect the flood relief. He earned a livelihood by charging from the persons who were ferried over this device.

Thermocol is a light and cellular plastic material that is soft but strong and durable, having compressive strength of 11.7 to 14.4 N/mm<sup>2</sup>. It is known for excellent heat, sound and electric insulating properties. Chemically it is known as polystyrene. Thermocol boxes are used for supplying packed fish from Andhra Pradesh to this region. It is generally the fishing community that deals with fish trade and is involved with rowing the boats. Fig. 2C shows a thermocol boat being ferried over water. Fig. 2D shows the plastic bottles used for boat purpose. Fig. 2E shows tin canisters being used for the same purpose. Big cement mangers (locally called Naad) are also used for plying over water under extreme situation. Big bamboo poles are used to facilitate the rowing process (Fig. 2F).



**Empty Gas Cylinders Come to the Rescue of the Affected Populace**

Gas cylinders were put to use during the catastrophic floods of the year 2020. The cylinder boat was carved as a makeshift device by two young men named Sanjay Sahni and Suryamani Paswan alias Roshan of village Harichanda in Hanuman Nagar C.D. Block of Darbhanga district. This was after they failed to procure a wooden boat from the government machinery. They collected one empty cylinder each from the consumers who had double connections. They set the 14.2 kg cylinders in three

rows of six each, tied them with the help of coconut rope and iron coils (Fig. 3A). Wooden sheets were placed over the third middle row of cylinders (not visible in the picture) to facilitate the people ferry over this makeshift device. This device was framed to facilitate the people to move to the nearby orchard to meet the call of the nature as their houses got inundated along with the toilets. The other purpose was to ferry them to the nearby hospital in case of rampant snakebites. This device also helped them in maintaining the supply chain of drinking water (as the hand pipes in lower areas got inundated under flood water) and



**Fig. 2:** A. Makeshift contrivance made up of two tubes; B. Makeshift boat in operation is in Kusheshwarsthan area; C. Makeshift boat made up of thermocol; D. Empty water bottles serving the purpose of a boat, with split bamboo platform over it; E. Makeshift contrivance made up of four drums (Urban area of Darbhanga town); F. Cement tub (otherwise used for feeding livestock) being rowed by three persons for moving in flood water (Kusheshwarsthan block of Darbhanga district August 2020).



**Fig. 3:** A. Local People in Harichanda village of Darbhanga district aboard the makeshift boat made of empty gas cylinders; B. A metal sheet (*Chadara*) – boat being plied on water; C. Plastic pipes converted as boat; D. Bamboo boat in operation.

cooking gas. This endeavour reflects the old dictum of necessity being the mother of invention. Getting bereft of proper livelihood situations they devised this indigenous remedy for themselves. This was their second attempt. Earlier also they had erected this device during flood times. Fig. 3B shows the use of metal sheet (*Chadara*) being used in the shape of boat and Fig. 3C shows plastic tubes being used for boat purpose.

Howsoever scientific advancements be there, it is bamboo that serves humanity from cradle to grave. During 2020 floods as well bamboo has played its role. Bamboo is a versatile plant belonging to the grass family *Poaceae*. Recently the Government of India has removed it from the list of trees and has restored it to the category of grasses. This versatile woody grass contributes utmost to the rural economy of this region. It helps people make temporary *Chachri Pul* (bridge made of split bamboo pieces) over the rivers. Air naturally trapped between the nodes of the bamboo poles provides it buoyancy and makes it an ideal specimen to be used as a ferrying device (Fig. 3D). Bamboo is a source of resilient housing in several parts of the globe including India (Das and Mukhopadhyay, 2018). In all forms of indigenous navigator devices, bamboo oars are a must. It is generally the two species of bamboo (i.e., *Bambusa balcooa* & *Bambusa tulda*) that are used in boat making and plying process in this area.

## CONCLUSION

The study provides an account of the devices used and fabricated in time of flood related disaster. When the very survival is at stake

people resort to making best use of whatever facility exists in the vicinity. There is a need to popularize the indigenous technical knowledge associated with disaster management (FAO, 1980; Bordoloi and Muzaddadi, 2015), Use of gas cylinders in fabricating an open rescue device is a fine example of rural innovation by the affected populace.

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