

Catfish *Clarias* is vanishing from the waters of Kerala

The air-breathing freshwater fish *Clarias* is represented by three species in the aquatic ecosystems of Kerala: *Clarias batrachus* Hamilton (the walking catfish), *Clarias dayi* Hora (Malabar catfish) and *Clarias dussumieri* Valenciennes (Valenciennes clariid). Compared to *C. dayi*, which inhabits the waters of the Wyanad hills¹, *C. dussumieri* and *C. batrachus* are common in water bodies ranging from shallow channels to large ponds and rivers. Moreover, *C. batrachus* is a major species in the paddy-field fishery of Kerala. However, the populations of these species are declining sharply in Kerala and *Clarias* has become rare now.

The fishermen of Kerala reveal that they were earlier catching about 20–25 *Clarias* fishes each year, but that number has reduced to one or two during the last five years. The seriousness of the situation is also clearly demonstrated by Subhash Babu *et al.*² in Muriyad wetland, a part of Vembanad-Kol, a Ramsar site, where they could not collect even a single *Clarias* after analysing 1215 ha of wetland for one year.

During the monsoon breeding period, many of the freshwater fishes, especially the air-gulping species, swarm and migrate

from permanent water bodies to flooded areas. This phenomenon which takes place during the initial phase of monsoon, called 'ootha' or 'oothal' in Malayalam, is a time of bumper fish harvest. The *Clarias*, which usually migrate in a long queue, is rare nowadays.

Similar to other endangered and vulnerable aquatic species, the major causes of population reduction of *Clarias* could be the overexploitation, reduction in the habitat area due to the reclamation of wetlands, and the extensive use of pesticides, weedicides and fertilizers in the agriculture fields³. According to Vidthayanon⁴, highly competent *Clarias gariepinus* (African sharp tooth catfish) is replacing other species of *Clarias* in the freshwater aquatic habitats of Thailand. Nowadays, *C. gariepinus* is cultured extensively in Kerala and appearing frequently in many natural water bodies of the state. Moreover, the young ones of this voracious feeder are available in aquarium shops for a small price, which also threatens the future of indigenous *Clarias* species.

Though *C. dussumieri* and *C. dayi* are being considered as endangered species^{1,3}, a few ichthyologists in Kerala are concentrating on the conservation aspects of these fishes³. Moreover, the IUCN status is also not available for this species. Why *C. batrachus*, the fish equipped with accessory respiratory organs to live in hypoxic water and enjoying the status of a harmful invasive pest in the aquaculture pods of USA⁵, is disappearing from the water bodies of Kerala needs imme-

diate attention of conservation biologists. Therefore, more studies are essential to verify the present distribution and steps to guarantee protection of their habitats. Population genetic studies coupled with captive breeding are also essential for successful translocation and reintroduction efforts. Otherwise, like many other extinct organisms, *Clarias* will also become a myth in Kerala.



Clarias batrachus

1. Lakra, W. S., Sarkar, U. K., Gopalkrishnan, A. and Kathirvelpandian, A., *Threatened Freshwater Fishes of India*, National Bureau of Fish Genetic Resources, Lucknow, 2010, p. 11.
2. Subash Babu, K. K., Thomas, K. J. and Sreekumar, S., In Proceedings of the National Seminar on Current Environmental Problems and Management, Irinjalakuda, 1–3 August 2002, pp. 59–63.
3. Padmakumar, K. G., Bindu, L., Basheer, V. S. and Gopalakrishnan, A., *Environ. Biol. Fish.*, 2010, **87**, 297–298.
4. Vidthayanon, C., *Peat Swamp Fishes of Thailand*, Office of Environmental Policy and Planning, Bangkok, Thailand, 2002, p. 136.
5. Halstead, B. W., Auerbach, P. S. and Campbell, D. R., *A Colour Atlas of Dangerous Marine Animals*, Wolfe Medical Publications Ltd, W. S. Cowell Ltd, Ipswich, England, 1990, p. 192.

V. V. BINOY

Department of Zoology,
MES KEVEEYAM College,
Valanchery 676 552, India
e-mail: vvbinoym@gmail.com

'Mauhak' – yet another mystery in the dictionary of bamboo flowering

Flowering in bamboos is considered as a great mystery in the scientific world. Many theories have been put forward to decipher this mystery, but it still remains unsolved. The value of bamboo can be realized from social, economic as well as an ecological point of view. It is closely associated with the lifestyle of people in Northeast (NE) India, rural Asia and other parts of the world^{1–3}. The unwanted

events of flowering in bamboos added to the woes of the rural population, particularly in NE India by depriving them of this resource and resulting in livelihood loss. Bamboo is also well known for its fast growth with rapid carbon sequestration, conservation of soil nutrients and as a live soil-binder^{4–6}. The sudden decline in bamboo cover due to mass flowering may herald rapid accumulation of CO₂ –

the major greenhouse gas in the atmosphere; otherwise several millions of tonnes of atmospheric carbon is sequestered by bamboos. On the other hand, many bamboo species of NE India which are in reproductive phase do not produce viable seeds, and hence may be on the verge of extinction^{7,8}.

Unlike other plants, bamboos flower at the end of a long vegetative phase. The



Figure 1. Green-coloured non-flowering brake – ‘Mauhak’ (circled) of *Melocanna baccifera* surrounded by pale yellow coloured flowering individuals in Aizwal, Mizoram (Photograph courtesy: M. N. V. Prasad and H. Lalruaitluanga).

prime concern is that of gregarious flowering in which every member of a cohort enters the reproductive phase approximately at the same time and after flowering and seeding the parents die in mass^{9,10}. However, it has been observed during this period, that whenever there is a record of gregarious flowering of bamboo, *Melocanna baccifera* in NE India, some patches do not flower (Figure 1). This can be tracked in the flowering history of *M. baccifera* in Mizoram. Locally the patches which do not flower and escape the seemingly inevitable death are known as ‘Mauhak’ in Mizoram (in Mizo dialect). Literally ‘Mauhak’ comes from two Mizo words: ‘Mau’ taken from the word ‘Mautak’ meaning *M. baccifera* and ‘Hak’ meaning ‘leftover’. A similar phenomenon was also found in the Churachandpur District, Manipur, where such patches are considered as sacred groves by the Gangte tribe and extraction of bamboo poles or shoots from these patches is strictly prohibited¹¹.

This phenomenon has not been recorded scientifically though it is well-known

among the Mizo people¹², some of whom recall the same phenomenon during 1910–12, 1958–59 and 2007–08. If Mauhak is considered to be of different genetic origin or cohort from the flowering patches, the following questions remained unanswered: (i) the reasons for their limited distribution even though *M. baccifera* is found suitable to grow in all climatic zones and soil conditions of Mizoram; (ii) localization in small patches of 5–30 m², even though this bamboo species has long-neck sympodial rhizomes which run under the surface like monopodial species, and has existed for more than 50 years (this bamboo had gregarious flowering during 1950s in Mizoram and Manipur); (iii) though it may flower during a different year and unnoticed, the reason for delay or advancement is yet to be understood.

It is important to collate all the relevant events which are associated with bamboo flowering for a detailed analysis.

1. Singha, L. B., Khan, M. L. and Devi, R., *Indian For.*, 2008, **134**(9), 1147–1156.

2. Londoño, X., A Summary of the Final Report of the Project 96-8300-01-4. International Network for Bamboo and Rattan, Beijing, China, 2001.
3. Ogunjinmi, A. A., Ijeomah, H. M. and Aiyelaja, A. A., *J. Sustain. Dev. Afr.*, 2009, **10**(4), 284–298.
4. Zhou Ben-Zhi, Fu Mao-Yi, Xie Jin-Zhong, Yang Xiao-Sheng and Li Zheng-Cai, *J. For. Res.*, 2005, **16**(2), 143–147.
5. Christanty, L., Mailly, D. and Kimmins, B., *For. Ecol. Manage.*, 1996, **87**, 75–88.
6. Kassahun, E., Doctoral dissertation, Swedish University of Agricultural Sciences, Uppsala Acta Universitatis Agriculturae Sueciae Silvestria, 2003, p. 8.
7. Koshy, K. C. and Pushpangadan, P., *Curr. Sci.*, 1997, **72**(9), 622–624.
8. Singha, L. B., Bhatt, B. P. and Khan, M. L., *J. Bamboo Rattan*, 2003, **2**(1), 57–63.
9. Jhon, C. K., Nadgauda, R. S. and Mascarenhas, A. F., *Curr. Sci.*, 1994, **67**(9-10), 685–687.
10. Tewari, D. N., In *A Monograph on Bamboo*, International Book Distributors, Dehra Dun, 1992, pp. 171–172.
11. Gadgil, M., Hemam, N. S. and Reddy, B. M., In *Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience* (eds Berkes, F., Folke, C. and Colding, J.), Cambridge University Press, Cambridge, 1998, pp. 30–47.
12. Anon., Report, Directorate of Agriculture, Government of Mizoram, 2008.

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CH. SADANANDA*
SALAM DILIP
L. B. SINGHA
M. L. KHAN

Department of Forestry,
North Eastern Regional Institute of
Science and Technology,
Nirjuli,
Itanagar 791 109, India
*e-mail: chingangbam.sadananda@gmail.com