fishes killed by this method are: *Garra* spp., *Psilorhynchus balitora*, *Glyptothorax* spp., *Amblyceps mangois*, *Olyra longicaudata*, *Psuedolaguvia shawi*, *Shistura devdevi*, *Aboricthys elongatus*, *Barilius* spp., *Mastecembelus armatus* and *Macrognathus pancalus*.

Blasting is carried out in the river nearly stagnant and relatively deep. It is also employed in medium current water. A large number of fishes are killed within a few seconds. This technique greatly affects fishes having larger body size, such as *Tor tor*, *Accrossocheilus hexagonolepis*, *Chagunius chagunio* and *Semiplotus semiplotus*. A large number of juveniles are also unnecessarily killed.

In stream where it has bifurcation, one of the channels having less current is blocked using boulders, concrete and sand and bottom is sealed to prevent leakage of water and escape of fishes. Such a blocked stream is selected for this method. The heat and extreme irritation causes blinding of the bottom-dwellers and results in them escaping out and their subsequent easy trapping within 30 min. Several aquatic organisms come out from the gaps of boulders, including the larva of frog. These illegal operations are mostly carried out upstream, where numerous boulders and pebbles are found creating an ideal hideout for aquatic organisms.

Another method employed is the use of cast net, during the rainy season. The boulders are covered with the net from the top and shaken with the help of a shovel, which results in the fishes coming out and getting trapped. The species caught by this method are *Garra annandalei*, *Garra gotyla gotyla*, *Glyptothorax* spp. and *Mastecembalus armatus*. Such practices are less common nowadays as the catch rate has diminished owing to the adoption of more destructive methods. *Semiplotus semiplotus* is a species which is already endangered due to the frequent use of cast net during the rainy season.

Further habitat destruction was observed in the lower reaches of the stream due to sand mining, and collection of boulders for construction purposes. This practice is increasing at an alarming rate due to increasing urbanization demands. Much of the upstream areas in the Senkhi which supply water and are an important source of allocthonous input for aquatic life have low vegetation cover. Therefore, adoption of such practices would only aggravate the already existing problems, first by destruction of the minimal viable population and secondly, by the destruction of the habitat itself.

The fish are part of the tribal folklore and an important source of food. In view of such hazardous techniques being employed in the stream, there is an urgent need to take up conservation measures on the aquatic biodiversity of the stream. One can emulate examples from the state itself, where the tribal customary laws protect the flora and fauna. Public awareness regarding the importance of aquatic biodiversity conservation and its ecological significance has to be in place. If urgent steps are not taken, there will be irreparable damage done to the stream.

SHIVAJI CHAUDHRY*
LAKPA TAMANG

G.B. Pant Institute of Himalayan Environment and Development,
North East Unit,
Itanagar 791 113, India
**e-mail: shivaji.chaudhry@gmail.com*

Need of innovative approach for climate change studies in alpine region of India

The Garhwal Himalaya is famous for its rich biodiversity. A great deal of work has been done on the alpine communities of Garhwal[1,2]. Alpine plants have been divided into different life and growth forms. This region is also the source of many medicinal plants used in different ayurvedic formulations. Due to the rising CO_2 levels, increasing temperature and other anthropogenic pressures, these plants are facing threat of survival in their natural conditions. Although it is not proven that the threat is due to global warming or any other factor, a question arises as to what will happen to the alpine plants due to climate change.

Several harsh conditions affect the plants in the alpine regions leading to morpho-physiological changes; these are low air temperature, high wind velocity, low partial pressure of gases, high light intensity and scanty rainfall. The consequences are changes in the growth cycle, development of different growth forms, and senescence and dormancy.

The Intergovernmental Panel on Climate Change (IPCC) has made important observations in its Fourth Assessment Report that global warming is occurring at the rate of 0.2°C per decade and human activities, greenhouse gas (GHG) emissions (carbon dioxide, methane, nitrous oxide, hydrofluorocarbon, perfluorocarbon and sulphur hexafluoride) are responsible for the warming effect[3]. Currently, as the rate of CO_2 enrichment in the atmosphere is rapid, the total climatic responses are unpredictable. Most of the work under elevated CO_2 conditions in India is being carried out on crop plants[4], whereas the alpine plants remain untouched for such studies. What will happen to the alpine plants due to elevated CO_2 and increased temperature? We summarize that:

1. Increased photosynthesis in the plants results in increased productivity.
2. Altered growth behaviour will result in altered growth cycles of alpine plants.
3. Active constituents of the plants may change due to physiological changes.
4. There may be an altitudinal shift in the species abundance or certain genotypes in community.
5. Dominant species may change in recessive and vice-versa.

The above-mentioned results of global warming on alpine plants are still to be investigated and confirmed. Thus for giving a shape to a hypothesis, we need an experimental design or set-up through which we can generate a theory. For this, the experimental design should be such that it can withstand the harsh climatic conditions in the alpine region. Many climate-change studies have used growth chambers/polyhouses for providing controlled environmental conditions. However, inside these chambers the chamber effect is more and it does not provide natural conditions. Now a days global climate change studies are being done in OTC (open top chambers) which are capa-

ble of providing near-natural conditions, new techniques such as SACE (screen-aided CO_2 enrichment) and FACE (free air CO_2 enrichment) are widely used.

The developed nations have carried out several studies on global climate change under various programmes such as the United Nations Environment Programme and others are being run on regional, state as well as national level. Developing countries like India need to focus on these situations. Some programmes are being carried out to study climate response in crop plants, but no study stresses on the alpine plants, most of which are medicinally important. Our main emphasis should be to run programmes for providing such new facilities for researchers and scientists to work on climate change studies in the alpine region of India.

1. Semwal, J. K., Gaur, R. D. and Purohit, A. N., *Acta Bot. Indica*, 1981, **9**, 110–114.
2. Nautiyal, M. C., Nautiyal, B. P. and Prakash, V., *Mt. Res. Dev.*, 2001, **21**, 177–183.
3. Kumar, Sushil, *Curr. Sci.*, 2007, **92**, 1034.
4. Uprety, D. C. *et al.*, *J. Sci. Ind. Res.*, 2006, **65**, 859–866.

ASHISH K. CHATURVEDI
R. K. VASHISTHA
P. PRASAD
M. C. NAUTIYAL*

High Altitude Plant Physiology Research Centre,
H.N.B. Garhwal University,
Srinagar (Garhwal) 246 174, India
**e-mail: mcnautiyal@gmail.com*

Menace of Japanese encephalitis in rural areas of eastern Uttar Pradesh

Japanese encephalitis is an infectious disease transmitted to human beings through mosquito bite. Although occurrence of this disease has been reported from several states of India like Bihar, Andhra Pradesh and Orissa, in recent days it has emerged as a serious health problem in rural areas of eastern Uttar Pradesh (UP). The scourge of the disease is most severe in Gorakhpur District. The disease is now gradually ramifying itself to other parts of the state. This was recently evident by the death of more than four dozen of children infected with the disease in Sarahanpur District of western UP.

According to State Government sources, Japanese encephalitis has claimed more than 2700 lives since 2002 in UP. Medical survey in the state reveals that of the total diseased persons, children represent 80%. Thus compared to adults, children are more susceptible to the disease. Children surviving the disease often develop complex problems relating to the brain.

Waterlogging and pig farming are the two most important predisposing factors favouring the development and spread of the disease. Japanese encephalitis is spread by *Culex* species of mosquito, which generally breeds in stagnant water-bodies like ponds, pools and in waterlogged paddy fields. Mosquitoes pick the virus from the pigs (which are supposed to be the major reservoir of the virus) and transfer it to humans.

Japanese encephalitis is mainly a brain fever; hence vernacularly the disease is known by the name 'mastishka jwar' or 'dimagi bukhar'. Mild infections occur without apparent symptoms other than fever, with headache. However, more severe infection is marked by high fever, headache, stiffness of neck, coma, tremor, occasional convulsions and spastic paralysis.

Japanese encephalitis is detected through cerebrospinal fluid test, which comprises of antibodies against the virus in the infected person.

The disease has no specific treatment. Patients are treated on the basis of various symptoms. However, diagnosis of the disease in early stage followed by immediate treatment can save the patient's life.

Persistence of Japanese encephalitis in rural areas of eastern UP is a matter of serious concern. Before it could become an epidemic in the region, besides posing threat of spread to other parts of UP, it is need of the hour to control and eradicate the disease.

As a precautionary measure, nets and repellents should be used regularly to avoid mosquito bite. Since vaccine is available against the disease, 100% vaccination should be ensured to control the disease. Water should not be allowed to stagnate in the surroundings. Temporary ponds and pools created during the rainy season should be destroyed. Permanent ponds should be treated with insecticide from time to time to kill the mosquito larvae. Besides, *Gambusia aphinis*, a mosquito larvae-feeding fish should be allowed to flourish in the wetlands. Similarly, fungi like *Leptolegina caudata* and *Aphanomyces lavis* parasitizing the mosquito larvae should be used as biological control agents to curb the mosquito population. The aquatic plant *Pistia*, which favours the breeding of *Culex* mosquitoes in water bodies should be destroyed. Waterlogged paddy fields in rural area serve as the breeding ground for mosquitoes. Therefore, less water-requiring paddy varieties should be brought under cultivation, so that waterlogging could be avoided. Siltation of canals often leads to the problem of waterlogging owing to overflowing of the canals. Hence desiltation of canals is essential after regular intervals to avoid waterlogging.

Since pigs are the major reservoirs of the virus, pig farms should shifted outside human settlement areas. Unhygienic conditions also favour development of the disease, hence all attempts should be made to maintain neat and clean environment. Thus the disease can be controlled and eradicated by pursuing the policy of 'prevention is better than cure'.

ARVIND SINGH

Old D/3, Jodhpur Colony,
Banaras Hindu University,
Varanasi 221 005, India
e-mail: arvindsingh_bhu@yahoo.com