

## In this issue

### Butterfly population dynamics and seasonal polyphenism

Many butterflies experience seasonally variable environments in successive generations, facing different sets of predators, resource availability, and other challenges. One way they respond to this cyclical variation is by alternating between distinct seasonal forms that are suited for seasonally changing environment. This phenomenon, called seasonal polyphenism, has emerged in the past three decades as an important area of research in developmental biology. However, population biological and other ecological aspects of seasonal polyphenism are poorly understood. On page 1774 of this issue, Tiple *et al.* present a population biological study of the Plains Cupid butterfly,



*Chilades pandava*, which shows distinct wet and dry season forms in Central India. They show how population size and the proportion of dry season forms in the population vary across seasons in this species in response to three climatic variables: ambient temperature, precipitation and relative humidity. Using regression analysis and statistical tree models, they find that relative humidity and precipitation largely explain the observed population dynamics. They further identify critical values of these climatic variables that are associated with changing abundance of the seasonal forms. This is an interesting study of how the Indian monsoon influences lives of butterflies in multiple ways, from popu-

lation dynamics to wing colour patterns.

### Analysis of seismicity-induced landslides

Ray *et al.* (page 1742) report widespread landslides that were caused by the devastating earthquake of 7.6 Mw on 8 October 2005 with epicentre located within Hazara syntaxis, Kashmir Himalaya. As this area covers mostly inaccessible mountainous terrain, an attempt was made to detect and map landslides on medium to high resolution satellite data products



such as Indian Cartosat-1, Resource-sat-1, Landsat-TM and ASTER. The study shows the extent of the causative fault from satellite data analysis. The extent of the slope failures and landslides was mapped based on sub-pixel registration, image interpretation and field investigation. The ground deformation-cum-damage survey revealed that the hanging wall side of the causative fault was severely affected and caused numerous earthquake-triggered landslides. The terrain parameters such as surface geology, slope gradient, slope aspect, curvature and relief classes were correlated with actual landslide occurrences and critical classes were identified. The statistical analysis of landslides inventory based on probability density function enabled estimation of earthquake magnitude and size of the largest landslide, which correspond well with the actual data. The study demonstrated extrapolation of total landslide-affected area ( $67.36 \text{ km}^2$ ) from the partial inven-

tory of landslides based on satellite image interpretation.

### Antibiotics in hospital effluents

Industrial production of antibiotics and their large scale availability is an important phenomenon of the 20th century. Easy availability of antibiotics made previously fatal diseases treatable and thereby contributed to improved health and well-being globally. However, the large scale use also had a potential to contaminate the environment, as after consumption, a considerable amount of antibiotics is not metabolized by the human body. The excreted antibiotics ultimately enter the aquatic environment either as active compounds or metabolites. The likely adverse effects of these contaminants on aquatic ecosystem as well as the underlying public health implications are a very disturbing thought. Further, the effect of such a contamination on the development of bacterial resistance is also a matter of grave concern. Hospital effluent is an important contributory source of antibiotics to the environment. While information is available on antibiotic residue levels in hospital effluent from high-income countries, information on antibiotic residue levels in effluent from Indian hospitals is not available. Diwan *et al.* (page 1752) quantified the antibiotic residues in effluents of two hospitals in Ujjain district of Madhya Pradesh. They found that antibiotics of all major groups are entering the aquatic environment through hospital effluent in India. High concentration of fluoroquinolones is a cause of special concern due to its impact on the genetic modification of bacterial strains. The situation can become problematic in India because of resource constraints to treat wastewater for removal of antibiotic contaminants. More studies are needed in this area to bring out both – the problems and the solutions.