

feet above ground, the crevices are slightly narrow and bark becomes slightly less rough than the base. The bark remains smooth, soft at the main branches above 6 feet, and on minor branches and the twigs.

The rough base of the sal tree bears good growth of some species of *Pertusaria* and *Caloplaca*. The trunk base up to 3–6 feet from ground allows an easy foothold to the leafy members of Collemboid (*Leptogium*), Parmelioid (*Bulbothrix*, *Canoparmelia*, *Parmelia* and *Parmelinella*), Physcioid lichens (*Heterodermia*, *Physcia*) together with some crustose taxa of *Brigantiaea*, *Buellia*, *Pertusaria* and *Graphis*. Usually the species of *Bacidia*, *Graphis*, *Lecanora*, *Lecidella* grow on smooth bark. The smooth bark in young trees of *Shorea robusta* in moist places exhibit luxuriant growth of yellow powdered lichen *Chrysothrix candelaris* and *C. chlorina* together with pyrenocarpous lichens.

Sometimes in patchy sal forests, the trees in the fringes of the forest exposed to sufficient rain, sunlight and wind currents exhibit luxuriant growth of *Dirinaria*, *Pyxine* and *Pertusaria* species from the base up to the top of the trunk.

In dense sal forest, the more humid and shady areas are preferred by species of *Bacidia*, *Caloplaca*, *Chrysothrix* and *Cryptothecia* while exposed sal forests within an altitude of 600–700 m provide a suitable habitat for Parmelioid taxa (*Bulbothrix*, *Canoparmelia*, *Parmelia* and *Parmelinella*).

When comparing the lichen flora of *Shorea robusta* with the common associate trees such as *Mallotus philippensis* and *Syzygium cumini*, it shares 10 common species with *Syzygium* and 4 with *Mallotus*.

The generic component of the *Shorea robusta* and *Syzygium cumini* trees are quite common, as both trees share 15 common lichen genera (*Bacidia*, *Brigantiaea*, *Caloplaca*, *Chrysothrix*, *Cryptothecia*, *Dirinaria*, *Graphis*, *Lecanora*, *Opegrapha*, *Parmotrema*, *Pertusaria*, *Physcia*, *Phaeographis* and *Pyrenula*).

The texture of *Shorea robusta* bark is dry, hard and acidic due to the low percentage of water (10.8%)⁵. The bark pH of *Shorea robusta* ranges between 4.5 and 5.0, appears suitable for growth of the crustose lichen taxa, as 42 species of crustose lichen are reported from the sal trees in India. The foliose forms are represented by 20 species only⁶. The lichen genus *Pertusaria* exhibits special affinity to the sal trees as 10 species of the genus are found growing on base to the top of the trunk, main branches and twigs of the tree. Within the three localities having luxuriant growth of sal tree in India, the central eastern Indian region (Jharsuguda) has the maximum diversity of epiphytic lichens on sal trees represented by 35 species, followed by 29 and 15 species in Amarkantak Biosphere Reserve and Corbett National Park⁶.

Environmental pollution plays an important role in eliminating large number of lichen species in an area, as lichen cannot tolerate the acidic gases. Thus in areas with high acidic gases, a few resistant species that perhaps, could not compete with other lichens in earlier unpolluted atmospheric conditions find a competition-free field to thrive. The pollution-tolerant species exhibit aggressive behaviour spreading rapidly, covering a variety of substrates. Among the different group of lichens, the crustose

lichens are more tolerant to pollution followed by foliose and fruticose forms⁷. The present number and distribution of foliose lichen species on *Shorea robusta* can be utilized as indicator species for carrying out rapid future biomonitoring studies in the area.

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ACKNOWLEDGEMENTS. We thank the Director, National Botanical Research Institute, Lucknow for providing necessary laboratory facilities and the Ministry of Environment and Forest, New Delhi for financial support. We also thank Dr Tariq Husain for his valuable comments and encouragement.

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Effect of fig trees on Bhimbetka world heritage site

We have highlighted¹ various dimensions of 'Bhimbetka world heritage site', a cultural landscape of universal value as depicted by rich ancient paintings on its over 700 rock-shelters. The site is continuously under tremendous stress due to various natural and anthropological imbalances. Although natural factors are bound to cast their shadows on rock-shelters, the ongoing loss of tree cover which provide essential buffer to them is a serious cause of concern. Being exposed to the scorching heat of

sun for nearly eight months in a year and force of heavy downpour of rain and hailstorms or from cracking during hot weather, a number of ancient rock-shelters are frequently ruined by the presence of roots particularly of fig trees (*Ficus* spp) that mechanically break the rock surface of Bhimbetka.

Genus *Ficus* of the family Moraceae has about 1000 species, most of them are tropical and evergreen which differ greatly from one another; 70–80 species occur in

India. The commonality is that their stem and leaves are full of milky sap and fruits are on enlarged hollow cup-shaped receptacles. *Ficus* have very tough waxy drought-resistant leaves that inhibit water loss. Besides, *Ficus* roots like some epiphytic orchid roots, have the ability to withstand periods of low moisture. Thus, *Ficus* species can survive and grow in the adverse weather conditions during the summer (44°C and above) with hardly any moisture left. Several species of *Ficus* grow



Figure 1. *Ficus* spp. growing on Bhimbetka rock shelters.

frequently as epiphytes on tombs or old buildings, dry rocks and on stems of trees, often entirely covering their stem and killing them or causing mechanical damage to old

buildings and rocks. The more common species are pipal (*F. religiosa*) and banyan (*F. benghalensis*, *F. mollis*, *F. rumphii* and *F. scandens*). The rock-shelters of Bhimbetka are heavily attacked by *F. mollis* (syn. *F. tomentosa*) thereby causing immense damage to rocks and ultimately to the rock paintings. Due to stress conditions prevailing on rock-sites of Bhimbetka their growth is much stunted but the roots are strong, copiously branched and widely spreading, causing breaks and fissures on rock-surfaces. Some of such trees seem to be over hundred years old (Figure 1).

These *Ficus* species, if allowed to encroach as epiphytes on ancient rock-shelters, would gradually ruin the age-old heritage. Although it is difficult to uproot old fig trees growing on huge rock-shelters, the managers of Bhimbetka world heritage site have to formulate strategies for checking their growth. Removal of juve-

nile plants as and when noticed would be of immense significance.

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ACKNOWLEDGEMENTS. We thank the Archaeological Survey of India, Bhopal Circle for providing financial assistance and the Director, NBRI, Lucknow for providing facilities.

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Infant mortality in tribals of central India

The level of infant mortality is a sensitive index, not only of the health services of a country but also of its social and economic development. This vulnerable age is exposed to several exogenous and endogenous factors, which influence the health, growth and development of the child. Each year, 10.7 million children under the age of five years die – 4 million die during the first four weeks of life. In the less developed countries, this accounts for 98% of reported neonatal deaths¹. India is following the demographic transition pattern of all developing countries from initial levels of 'high birth rate high death rate' to the current intermediate transition stage of 'high birth rate low death rate' which leads to high rates of population growth, before graduating to levels of 'low birth rate low death rate'. Fertility has a direct bearing on infant mortality; more the children born, more are likely to die. In India, the vital demographic parameters like crude birth rate (CBR-25.4), total fertility rate (TFR-3.1) including the infant mortality rate (IMR-61.47) has continued to remain high², as compared to those of all the developed and many of the developing countries. India is a country of diverse population in terms of culture, language, religion, level of development, etc. The CBR is

highest in Bihar and lowest in Kerala, while for IMR, it is highest in Orissa and least in Kerala. Central India, i.e. undivided Madhya Pradesh has also reported high CBR (30.8), TFR (3.31) and the IMR (86.0). Similarly, the TFR in the state is also fifth highest in the country³. Only Meghalaya, Uttar Pradesh, Rajasthan and Bihar have TFRs higher than that of Madhya Pradesh. Further, in Madhya Pradesh, the CBR, according to type of residence, is 23.0 in urban areas as compared to 32.8 in rural areas. Similarly, the IMR and the neonatal mortality rate in urban areas are 53.0 and 41.9 respectively, considerably low as compared to those of rural areas, namely 92.0 and 64.6 respectively of the state. Under the age distribution of fertility, a rural woman (TFR-3.56) in Madhya Pradesh has, on an average, almost one child more than the urban woman (TFR-2.61).

The vital demographic parameter of scheduled tribe (ST) projects a miserable situation and needs special attention by understanding in-depth problems and formulation of decentralized programmes for their development. The TFR in ST population of Madhya Pradesh (3.69) is higher than the TFR for the ST population of the country (3.06) (ref. 4). This high level of

birth and death statistics in the state implies presence of certain socio-cultural factors, which play an important role in determining the health status. Madhya Pradesh is one of the large states possessing 23.27% of its population as tribal. The major tribal groups are Gonds (44.61%), Bhils (20.9) followed by Kawars, Saharias, Baigas, etc. Various primitive tribes of the state have reported high fertility and high infant mortality even in the undivided Madhya Pradesh (rural).

These aboriginal groups invariably lead an isolated life remote from the general system. They belong to different ethnic groups and are at low levels of education, and have poor social, cultural and political development. Backwardness of these people, their inherent inborn timidity, escapism and rigidity brings them to the state of utter penury. They are primitive in each and every aspect of life like agriculture, education and even in health matters. Low age at marriage (14–15 years) along with low age at first delivery (18–20 years) indicates the long reproductive period before maturity, which may be associated with infant mortality. Further, their benign and harmful traditional birth-related practices of having delivery at home, attended by untrained personnel, cutting the umbilical cord by unhygienic instruments, treatment of umbili-