

# Carved out of rock

Author - Vinay Nair, Published on - 10.3.2015

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In two different languages spoken in the western part of India, the local name for *Prosopis juliflora* (mesquite) has the same meaning. In Gujarati, the name is *gando bawal*, while in Marwari it is simply *baavlia*; and both names mean 'the mad one' – and for good reason. *P. juliflora* is a bushy plant species (often a tree at favourable sites) that can survive in broad ecological conditions, including soil types varying from very sandy to clayey to stony, and even soils with salinity equal to that of sea water. Add to this the plant's deep tap root system, waxy leaves that resist browsing, and an ability for vegetative propagation; the species is extremely effective in colonizing semi-tropical and arid land. As a competitor, its extensive root system produces toxic alkaloids that renders its immediate soil habitat unfavourable for other species. Being also an exotic – originally from Mexico – in most of its present range, it has few natural competitors.

In India, the species was first introduced in 1877 in Andhra Pradesh, the seeds coming from Jamaica. In the arid Jodhpur city of Rajasthan – where Rao Jodha Desert Rock Park is situated – it was first planted in 1913 (Walter, 2011), with the intention in fact of the conservation of lands degraded by over-grazing. Soon the species invaded lands both degraded and otherwise, replacing native flora to such an extent that up to 70% of firewood requirements of rural people in the arid regions of India are now being met by *P. juliflora* (Harish & Tewari, 1998).

The lands outside Rao Jodha park are overrun by *P. juliflora*. The typical rhyolite rock of the area is visible in the background.

Given this context, Rao Jodha Desert Rock Park is an illustration of how a fruitful marriage of scientific and traditional knowledge can transform a landscape overrun by an invasive into an oasis harbouring native flora and fauna. The park is owned by the Mehrangarh Museum Trust and is spread over 70 hectares – an outcrop mostly of rhyolite rock (distinctive by its flat faces), but also some sandy and wet areas.

Rao Jodha Park, fenced partly by the walls of Mehrangarh Fort

The trust first invited Pradip Krishen in 2005 to explore the possibility of 'greening' the areas surrounding Mehrangarh fort. Krishen, author of 'Trees of Delhi', immediately recognized that to create a park with sufficient biological interest, it would be best to try to restore the area to a time before the invasion of mesquite. But a ready historical document of what flora existed prior to this invasion did not exist. Krishen then employed what is known in the jargon of restoration ecology as a 'place for time' swap – the choosing of a place nearby with similarities in weather and underlying rock and soil type – to provide a flora that could be considered native. Such a place could not be found within the city of Jodhpur which had been similarly overrun by invasives. Instead, Krishen took advice from M M Bhandari, the now late professor of desert ecology, who pointed toward the rocky hills and terraces of the desert of Thar. There, Krishen would find his species.

Most of these species, characteristic of the park, are lithophytes; plant species with special adaptations for the rocky desert – a punishing habitat with low moisture, intense sunlight and extremes of temperature between night and day. These adaptations are varied, from succulence (storing water in tissues), bearing waxy leaves to reduce transpiration and fine leaf hairs to reflect sunlight, conducting photosynthesis through stems, to perhaps the most novel – being an ephemeral (emerging in only those times of the year when there is sufficient moisture, from seeds that have almost indefinitely long dormant lives).

But before Krishen could bring these species in, there was still the original infestation of mesquite to contend with. Because mesquite grows right back if you cut it at the stem, complete removal requires uprooting the plant, so that it cannot send shoots from its upper roots that are below the ground. Accessing those roots at a place where the rock is hard and primarily volcanic is difficult. After trying various devices and technologies, the traditional miners of the region – the Khandwalias – came to the rescue. The Khandwalias' approach was subtler, involving an ingenious method of knocking at the upper rock layer with a hammer and listening to the emanating sounds which held clues to the spaces and crevices within, which in turn determined the best angles of attack for digging to weed out the plant. This was a major breakthrough and the Trust immediately employed some 10 Khandwalias to eliminate the invasive from the entirety of the 70 hectares.

They also quickly realized that the spaces originally colonized by *P. juliflora* and now left vacant by its removal were actually spots very conducive for the introduction of the native floral species.

The exact number of plant species in the park is difficult to ascertain due to the ephemerals, but estimates show that there are about 300 documented species of trees, shrubs, climbers and herbs growing here. Many faunal species like civets, hares, boars, and bird species like the nightjar, Eurasian wryneck and others, have been sighted here. It is not known however whether these are resident species or are visitors who use the habitat as they traverse perilously through urban spaces. It is also difficult to say at this stage, less than a decade into the life of this park, whether it is a self-supporting ecosystem. As of this author's visit in 2012, the park still required regular maintenance and planting work.

This last dimension throws up interesting questions about what allows Rao Jodha be the kind of park it is, and whether it is an example of restoration that can be replicated elsewhere. First, the restoration effort effectively illustrates that the dichotomy between scientific and traditional knowledge is perhaps false; it took both the scientific method with its awareness of other ecologies and also a more subtle, experience-based knowledge of the Khandwalias to transform the park. Neither on its own would have sufficed. Second, and a factor not mentioned before, is that prior to the restoration work in the park, a wall was erected along its periphery cordoning it off from the many animals that accessed the area for grazing. Without this, it would be difficult for the introduced plant species to establish and survive. Is a park of fragile native flora incompatible with old-standing pastoral lifestyles that are still an important part of livelihoods in India, especially with the lingering threat of an invasive? Or is it the modern inability of our society to have management systems beyond private parcels of land that can sustain both concerns equally?

A third dimension is that of tourism that emerges from something Krishen wrote himself – 'The landform and plants have a spare beauty but it is becoming clear that the experience needs to be potentiated for visitors' (Krishen, 2012). Or in other words, small plant species growing among rocks, thorny cactus-like Thor with its briefly visible red flowers, grasses blowing gently in the late afternoon sun and the continual transformation of a

landscape through the seasons are part of an experience that is a hard sell still to the majority of tourists. It is an experience without much use for 4x4 vehicles or long telephoto lenses – the signposts of the ‘wilderness’ experience, as depicted in popular culture and T.V.

*Thor, an important plant that creates a micro-habitat for other plant species*

The thorny question then is of replicability. Vast areas of India’s semi-tropical and arid lands have been taken over by *P. juliflora* – from the suburbs of its northern and western cities, the deserts of Rajasthan and Kachchh to Andhra Pradesh where the invasive was first introduced about 150 years ago. Unlike the situation within the park, the plant in these areas has become the dominant source of firewood, owing much to its own invasion. Even if a consensus can be reached regarding its removal and the restoration of a native flora, the factors conducive to such an undertaking – the cordoning off of lands from grazing, the availability and affordability of labour for removal – are unlikely to come together. It requires, perhaps, another marriage – of private and collective interests.

And yet, Rao Jodha represents the potential for transformation in both landscapes and people – a little oasis carved, literally, out of rock.

#### References

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