

DESTRUCTIONS OF ACACIA WOODLANDS AND JUNIPER FORESTS IN ASIA AND EASTERN AFRICA

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Abstract

The paper deals with the status of the woodlands, notably Acacia woodlands, and juniper forests in Africa and Asia and the causes of destruction and or damage observed in recent times to some of these communities.

Introduction

The arid regions around the world are a geographic phenomenon. The limited water regime combined with other ecological factors determines the ecosystems there with different biotic potentials and their degrees of fragility. Being mostly fragile, these ecosystems can suffer severe degradation through misuse and often complete destruction of the vegetation there. Presence of woodlands or forests in arid regions indicates relatively better total moisture regimes in particular areas: the source of water here may be the result of drainage from adjoining areas or even atmospheric because of their high altitudes or the direction of breeze from adjoining seas. These woodlands or forests may cover relatively small areas or stretch over thousands of kilometers² as for example the western coast and the Asir mountain chain of the Arabian Peninsula (Abo Hasan, 1984; Chaudhary, 1999-2001; Chaudhary & Al-Juwaid, 1999; Chaudhary & Le Houerou, 2006; Konig, 1986). Acacia woodlands and the Juniper forests in parts of eastern Africa, Arabia and parts of Pakistan and Iran are two kinds of such areas which have been destroyed or are under the threat of destruction.

Historically, arid lands had sustained mostly migratory animal herds and human populations in the hunter-gatherer past. Later in the pastoral and farming age, the often cyclical or erratic famines suffered by man had been deeply etched in the human memory. Good, timely rains would result in abundant range forage and relatively good harvest of cereals that human being could scratch out of suitably located soils often sufficient for the need of the small, migrant populations. Failure of good and/or timely rains meant famine for man and his herds. During prolonged periods of drought, heavy livestock mortality would trim down the herd sizes to very small numbers. This would give the vegetation time to bounce back before the livestock herds did. The rangelands in arid regions have been historically overgrazed. In the past however the overgrazing was rather benign. The severe kind of range degradation or destruction seen in recent times is a result of large sizes of livestock herds being kept in the rangelands practically throughout the year. The severe degradation of rangelands and the resultant loss of palatable lower layers of vegetation led to a change in the composition of range animals, mostly in the elimination of sheep, and the herds then mostly consisting of goats, camels and even bovines (Allred, 1968; Kingery, 1972) In the oil-rich societies in developing countries, the real Bedouins have settled in cities

and towns but their nostalgia keeps on destroying the rangelands through their large herds of livestock out in the rangelands being taken care of by expatriate herders (Alwelai, 1989).

In the past the presence of carnivorous fauna like leopards within the forests and woodlands and by cheetahs, hyenas and even the lions inside or on their fringes acted as deterrent for man to invade these with his livestock. The fire-arms have destroyed these guardians of the forests and woodlands in the very recent past leaving the woodlands and forests open to destruction by man and his livestock and in non-affluent regions simply through elimination by the encroaching farming communities. There is a long established concept of crown lands in the developed world and of the grazing rights. The state lands are leased out to individuals or communities or commercial entities for extended periods, often, for example in Australia, for 50 years or 100 years. This provides an incentive for the lessees to follow rational grazing practices and even improve the conditions for a sustained maximum long term productivity. Most countries in Africa and Asia do not have any concept of the grazing rights and traditionally, in a way, every one has a right to use, misuse or destroy a rangeland! In poor or developing countries, mostly grazing or lopping of trees to use as fodder or very often even pulling down the trees for livestock to feed upon is virtually open to all resulting in a free -for-all race to destroy the vegetation. In the past, the roaming herds had their range limited by rival tribal boundaries, or bandits, or by predatory wildlife. Establishment of peaceful societies and destruction of the predatory wildlife removed all these limits and in certain cases even the state boundaries have disappeared. A classical example of the latter was observed by the author during the NCWCD Survey Expedition of the Eastern Empty Quarter during 1990 where camel herds from Oman, UAE, Qatar, Saudi Arabia and Kuwait had year round presence along with their expatriate herders (Chaudhary, 1990; Chaudhary, 1992). Previously, the camels were taken out during the summer. Just one factor, the free flowing, sulfur smelling brackish water from artesian wells drilled by an oil company was good enough for the camels to stay there even during the summer months to destroy the fragile vegetation cover there. The herders were supplied with their rations and drinking water by the owners with the use of the high-powered 4-wheel drive pickup trucks. Incidentally, a similar situation can be very easily foreseen with the Pakistan government's plans to provide year round water supply for the shepherds in the Cholistan desert with the shepherds and their livestock remaining in the Cholistan desert all the year round to destroy the vegetation (Akhtar & Arshad, 2006; Chaudhary, 1992a).

Only after realizing the magnitude of the destruction of the renewable natural resource in the form rangelands, woodlands and forests through severe overstocking and overgrazing in arid regions., the man has started to think of their protection, conservation and development (Abuzinada & Liewellyn, 1990). The devastation meted out most mercilessly on the Sahel woodlands in Africa (Hiernaux & Le Houerou, 2006), the destruction of rangelands and death of thousands of square kilometers of juniper forests in Africa and Arabia should be an eye opener to the world. The measures needed to be undertaken are well known. Techniques now are in hand to re-establish fog forests from areas from where these have disappeared in rather recent times or to save the present depauperate fog forests. All that is needed is to implement these through proper legislations, implementation and funding.

Woodlands

Arabian Peninsula and the Indian subcontinent supported vast areas of Acacia woodlands in the plains. Most of these areas have been converted into highly productive agricultural lands through irrigation systems in Pakistan and India. At one time it was a common knowledge in some farming communities that to grow an acacia grove, just a handful of goat droppings could be used as palletized acacia seeds. Unfortunately the goat thrives in the degraded rangelands and in woodlands on shrubs and trees including the seedlings. Restoration of vast areas of degraded or devastated rangelands or woodlands would be a blessing for the present and more so for the future generations. The degradation has been caused by man and his livestock, the former cutting down mercilessly the shrubs and the trees for use as fuel or to build temporary shacks as shelter and the latter eating up every little bit of plant matter including seedlings. While the goat-herders in India and Pakistan sufficed to lop branches from Acacia trees without pulling down the trees the practice in the Arabian Peninsula is different now. The destruction of woodlands by goats has been aided by man recently by pulling down full grown mature trees with their trucks so that the goats could reach the canopy that they had not been able to eat up previously. Not a single acacia seedling was observed by the author in the several surveys of the vast coastal woodlands of Saudi Arabia during the 90's: eerily, the woodland floor was bare of any vegetation, forbs or otherwise. The author believes that the Sahil area of Africa has been devastated primarily because of overgrazing, and finally by goats, the goats making sure that regeneration just did not take place.

Goats belong to the same group of animals as the deer and the gazelles. To protect the forest ecosystems in the western countries even in non arid regions too from where the wolf, the coyote or the bear or cougar populations have been depleted, it is a common practice to cull the game animal herds through hunting to bring down their population to the sustainable carrying capacity of the forest ecosystems. The same principle, indeed, is now being used in culling the excess elephant populations in some managed reserves in Africa. However, it is and it always has been against the nature of man to cull his own goat stock. The solution here may lie for the wealthy nations at least to buy the goats off the hands of the goat herd owners, give them a negative subsidy for some years to compensate for the loss they may suffer through the loss of their goat herds and then legislate the limit of number of live goats that a family may keep for milk or meat for their own personal need. Socio-economic considerations here would need to be kept in view through providing alternate survival means to the then redundant herders for a rather long time to bring back the woodlands and then their use as a sustainable resource on rational, regulated basis.

Fog Forests

Some parts of the arid regions in Asia and South America have or had supported thick or rather open fog forests in high altitude areas through special ability of the tree component to harvest moisture from the fog or passing clouds at those elevations. In the Arabian Peninsula, such forests consisted of pure stands of *Juniperus procera* or mixed with *Erica arborea* at about 1400m elevation above sea level or higher while lower down juniper was mixed with other components. The juniper forests have almost completely disappeared from Yemen and the Erkwat mountain of Sudan while those in Kenya, Djibouti, Balochistan (Pakistan), Oman and Saudi Arabia are threatened with destruction. Indeed in Saudi Arabia the junipers have died out over vast areas.



Fig. 1. Acacia woodland under destruction in Saudi Arabia. A rough estimate of the age of the *Acacia tortilis* tree in the foreground puts it as almost a century old.

The old, mature juniper trees seen in Saudi Arabia are, apparently, thousands of years old. The junipers found in Saudi Arabia are *Juniperus phoenicia* in the northern Asir at or above 1100m above sea-level. It is regarded as more tolerant of aridity and its southern limit is at Al-Hadda, around the city of Taif from where southwards *Juniperus procera* (regarded as less tolerant of aridity) is to be found at or above an elevation of about 1200m forming mixed communities on north and west facing slopes. Good stands of juniper here and along the escarpment ridge are at 1400m and above again on west and north facing slopes. The canopy of an intact juniper tree is pyramidal with the base of the canopy touching the ground. This shape is only rarely seen and that too in inaccessible areas. The canopy seen in all other areas is high above the ground beyond the reach of goats and shepherds with the lower trunk bare of any branches. The best, almost intact stands of *Juniperus procera* with *Erica arborea* are to be seen at Jabal Bal–Asmar in the Asir, apparently in a tribally protected forest.

The junipers (and *Erica arborea*, as well too) of the fog forests receive most of the moisture for their survival by combing the water from the fog. It is a common knowledge now that one square meter of ordinary, flat (only a few mm thick), fine mesh can comb more than 4 liters of water per day (a principle now being used very effectively in re-afforestation in the Andes in South America). A few meters wide and several to many meters high canopy of a juniper harvests a considerable amount of moisture, the latter very effectively used by the junipers directly through the foliage and the water dripping down into the ground at the base, indeed, as a very effective drip irrigation system. The goats, and the man modify this canopy, destroying most of the basal canopy, leaving only the top canopy above the naked trunk. This drastically reduces the water-harvesting area of the canopy and, consequently, availability of the

water to the individual plants as well as to the whole ecosystem. Combined with this is the destruction by lopping and cutting down of trees. Indeed at one place, the author saw a *Juniperus phoenicea* tree that, apparently, had been set alight and burnt down alive, presumably for the burnt wood/coal to be used as fuel. And above all, destruction by goats of any seedlings that happen to emerge. The seeds produced by the junipers have shown to have a very high germination as was seen by the author in late 90's in the NCWCD nursery at Raidha, near Abha in Saudi Arabia.

P. Botta visiting Yemen in 1836, under the sponsorship of the Paris Natural History Museum noted the presence of dense juniper forests in the higher reaches of the seaward facing escarpment (Wood, 1997). These are not to be seen anywhere there now except as small groves of small trees in some inaccessible areas out of reach of man! *Acacia origena* that should have formed mixed stands at the periphery of juniper forests too has not fared better: trees remaining along the edges of fields are to be seen as stumps, having been continuously lopped as forage for the animal, mostly goats.



Fig. 2. Illegally harvested *Acacia tortilis* wood in a Riyadh market for sale. It is highly prized as firewood by nostalgic Bedouin affluent society.

The elimination of the predatory wildlife is considered by the author as the basic trigger to the destruction of the woodlands and the juniper forests, while the immediate destruction has been by man and his goat herds. Now it is an established fact (personally observed by the author in the company of Saudi and Japanese scientists as a member of the Saudi National Wildlife Conservation and Development team in late 90's) that the goat-herders routinely take their goats to juniper stands lopping down branches not in the reach of goats. The goats are very partial to juniper branches as a forage. While the junipers at higher elevation have tolerated this onslaught, the juniper trees at lower altitudes in vast areas as mixed juniper communities, as for example seen south of Jabal Talaan in the Asir, have died off leaving widely spaced trees like of *Nuxia oppositifolia* (non-dependent on fog) standing as remnants of the community. It is a firm belief of the author that with the help of man, the goats have caused the destruction of juniper forests through destruction of the water harvesting canopy of junipers as well as disturbance of the soil around the trees.

Incidentally, in Saudi Arabia some persons have confused the two phenomena, the death of juniper forests and the die-back in junipers! The die-back is a different phenomenon that does not kill a tree. Only as a survival mechanism the upper branches of trees die-back in years of moisture stress in some summers. The upper dead branches then, often, are seen festooned with *Usnea*, a cloud harvesting lichen indicating healthiness of the forest itself! As concluded by the author through his many study visits to the area, the death of juniper forests covers vast areas as a result of disturbance of the whole ecosystem and reduced tree canopy by man and his livestock, principally goats.

Juniperus procera has its distribution in the highlands of East Africa from the Sudan, Ethiopia, Djibouti and south to eastern Zaire and northeastern Zimbabwe. However, recent reports from various botanists (pers. communications) show that it has been almost if not totally exterminated from the Erkwat mountain in Sudan. A few years back, in an Air France magazine, the author had seen some photographs of juniper forests in Djibouti along with goat herds there. The process of the destruction of junipers by goats could very easily be seen in progress there. The same fate should be expected to have been meted out to the junipers in the other countries of its distribution in Africa.

Another species of junipers, *Juniperus excelsa* ssp *polycarpus* (= *J. macropoda* Boiss.) is found in Eastern Turkey to Central Asia, Pakistan and northern Oman. This juniper in Oman, too, is in need of protection from man and his goats (Fischer & Gardner, 1995). In Balochistan (Pakistan), for example, there is a great worry of a mistletoe (*Arceothobium oxycederi*) being a rapidly expanding threat to the juniper forests (Akhtar & Mirza, 2006). This parasitic plant has always been associated with the junipers. The recent concern seems to have resulted because of the weakening of the individual trees through increased loss in the volume of their canopies in the recent past through goats and man. The author was very happy to hear from an international conservationist, though, that the rather recent protection afforded to the juniper forests in Balochistan by the Government and accepted by the local tribal inhabitants is being cited as a classical example leading to conservation of the whole ecosystem including the fauna. The benefits to the local population were in the increased tourism of this particular region.



Fig. 3. Dead *Juniperus procera* forest as seen down the slope from Jabal Talaan in the Asir. The few green trees visible on the dead slopes on the right are mostly *Nuxia oppositifolia*, non dependent on fog.

Lebanon at one time supported juniper forests. Like the Lebanese Cedar, while the juniper timber was cut down by man for various purposes, it is well known that the goats there have prevented the regeneration of junipers, cedars and some other tree species resulting in absence of forests in formerly forested areas. Indeed the general appearance and composition of the flora have been modified mostly through the agency of goats after the initial destruction by man (Mikesell, 1969). The greatest measure for the protection, and regeneration of the juniper forests would be goat-control especially in the arid regions. In the 60's, the government in Pakistan had mandated that abattoirs must slaughter a certain number (Kingery, 1972) of goats for every sheep slaughtered there. It was a measure to bring down the size of goat-herds in the country. Apparently, it has not been strictly adhered to now or might have been repealed. There is sizeable lobby believing that the goat come in after the vegetation has been destroyed rather that the goats have any role in the destruction of vegetation. Another dangerous development in the livestock husbandry at least in the southwestern Arabia is that the bovine herds are being let loose into the fragile fog forest areas. These must be made no-go areas for bovine livestock, too.

Often, politically or financially, it is difficult for certain regimes to enforce the protection or conservation principles. However, educating the public through the ubiquitous media is not an insurmountable job and proper incentives to the herders and farmers can be a great help towards protecting the fragile woodland and forest communities in arid regions.

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