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CULTURAL EVOLUTION OF ECOLOGICAL PRUDENCE

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ABSTRACT

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Animals often behave in a profligate fashion and decimate the populations of plants and animals they depend upon. They may, however, evolve prudent behaviour under special conditions, namely when such prudence greatly enhances the success of populations that are not too prone to invasions by profligate individuals. Cultural evolution in human societies can also lead to the adoption of prudent practices under similar conditions. These are more likely to be realized in stable environments in which the human populations tend to grow close to the carrying capacity, when the human groups are closed, and when the technology is stagnant. These conditions probably prevailed in the hunter–gatherer societies of the tropics and subtropics, and led to the adoption of a number of socially imposed restraints on the use of plant and animal resources. Such practices were rationalized in the form of Nature-worship. The Indian caste society became so organized as to fulfill these conditions, and gave rise to two religions, Buddhism and Jainism, which emphasize compassion towards all forms of life. The pastoral nomads of the middle east, on the other hand, lived in an environment which militated against prudence, and these societies gave rise to religions like Christianity, which declared war on nature. As the ruling elite and state have grown in power, they have tried to wrest control of natural resources from the local communities. This has sometimes resulted in conservation and prudent use under guidance from the state, but has often led to conflicts with local populations to the detriment of prudent behaviour. Modern technological progress has also often removed the need for conservation, as when availability of coal permitted the deforestation of England. While modern scientific understanding has led to a better appreciation of the need for prudence, the prevailing social and economic conditions often militate against any implementation of the understanding, as is seen from the history of whaling. However, the imperative for survival of the poor from the Third-World countries may finally bring about conditions in which ecological prudence may once again come to dominate human cultures as it might once have done with stable societies of hunter–gatherers.

PRUDENCE AND PROFLIGACY

All animals, including man, depend on other living creatures for their continued existence. These living creatures constitute resources that are renewable; resources that will continue to support the animal that preys on them in perpetuity so long as their capital stock is not eaten into. Ecological.

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prudence, therefore, lies in not killing the goose that lays the golden eggs; in resting content with tapping the interest on the capital of living resources. There has been a vigorous debate on whether animals behave prudently ever since Wynne-Edwards (1962) raised the question. They obviously do so when lack of prudence by an individual will immediately penalize that same individual. Thus, in its own territory a Mexican Horned Lizard does not eat every ant in a foraging trail, for this would stop ants coming that way, but selectively eats a few now and then. The more significant issue, however, is whether animals will behave prudently when there is a conflict between the immediate interest of the individual which profits from profligacy and the long-term interest of the whole group which benefits from prudence. The answer seems to be that profligacy will prevail most of the time (Williams, 1966; Dawkins, 1976). There are, however, conditions under which the group interests will prevail, and prudence will evolve under the action of natural selection (Wilson, 1980).

Two factors will determine whether or not prudence will be so favoured. These are:

(a) the response of the long-range productivity of the group to the extent of prudent behaviour. The more the group as a whole benefits from prudence, the better will be the chances of the prudent behaviour ultimately winning;

(b) the ability of the groups that are behaving prudently to resist infiltration by profligate individuals from outside the group. The chances of prudent behaviour winning will increase with their ability to resist such invasions.

CULTURAL EVOLUTION

While there are no undisputed instances of prudence in the animal world, there are many such examples of human behaviour. After all, the 3000-year-old Indian epic Ramayana starts with the Sage Valmiki protesting the folly of killing a pair of copulating cranes with a wholesome curse (Fig. 1), and fishing nations today accept limits on minimum mesh sizes. Evidently, prudence can evolve much more readily amongst societies of *Homo sapiens*, for man can perceive much better the consequences of his actions. While maladaptive behaviour (such as cigarette smoking) may sometimes become the norm in human societies, we can reasonably assume that much of human cultural behaviour has adaptive value (Cavalli-Sforza and Feldman, 1981). If this is so, prudent practices will become a part of the culture of human societies when the two conditions stated in the last section are fulfilled.

On this assumption, we may then proceed to look for environmental and social conditions that will promote ecological prudence in human societies

(a) Stable environments: Environments that are predictable in time, and not susceptible to catastrophic changes, would better ensure that a human group practicing prudence will reap benefit from it at a later time.

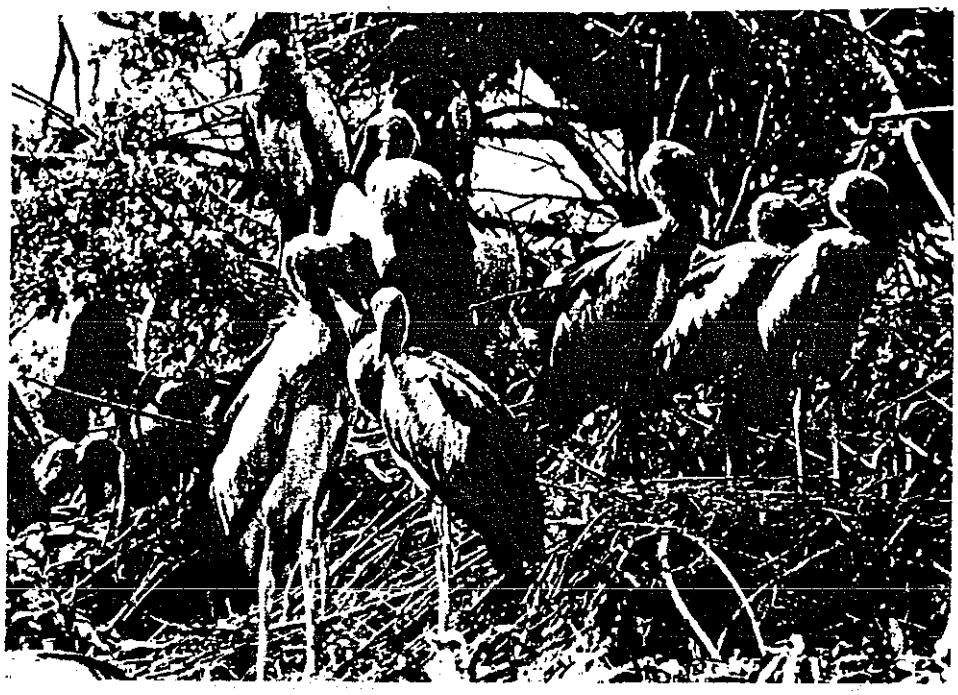

Fig. 1. Scene from a heronry at Ranganathittu, Karnataka State, India. The local farmers value the guano produced by these birds and have protected the heronry since time immemorial. Photograph: R. Sukumar.

(b) Human populations close to saturation: In a habitat where populations are maintained close to the limits of carrying capacity set by food and other resources, there would be much greater value attached to prudence than in environments where the populations are maintained well below the carrying capacity, say through periodic epidemics.

(c) Sedentary habits and territoreality: Human groups with sedentary habits are more likely to continue to reap benefits from their prudent behaviour than groups which wander over a large tract. The relatively sedentary human groups will also be better able to keep others away from their territory, and thereby ensure that the benefits of their prudence are not usurped by some other profligate groups.

(d) Closed group structure: Effective barriers against invasion of the prudent group by individuals from other outside groups would permit of a more rapid cultural evolution of prudence.

(e) Stagnant technologies: When technologies are unchanging, human groups will perforce continue to depend on the same resources and therefore derive greater benefits from prudence than if rapidly changing technologies made possible the use of a new resource when a resource earlier in use was exhausted.

Fig. 2. A sacred grove at Dapsare in Maharashtra State, India. In the grove resides a mother goddess and traditionally not even dry matter is removed out of the grove. Photograph: V.D. Vartak.

Fig. 3. A banyan tree (*Ficus religiosa*) in Madras, India. Traditionally trees of all species of the genus *Ficus* receive strict religious protection throughout the Indian subcontinent. Photograph: R. Sukumar.

This enables us to make a number of interesting predictions. Thus, hunter–gatherer tribal societies in benign environments, holding exclusive territories and practicing strict tribal endogamy, would be ideally placed to evolve ecological prudence. At the other extreme, nations fishing in seas open to all, on stocks such as anchovies which always fluctuate a great deal, and in an era of rapidly changing technologies, would find it very difficult to put into practice any real restraints on over-fishing. Such predictions do indeed seem to hold. Thus, we find that the hunter–gatherer tribal societies of the tropics and subtropics had evolved a variety of cultural restraints on exploitation of plants and animals around them. In these pre-scientific societies, these restraints were not expressed as deliberate attempts to maintain populations of plants and animals of value to the tribe. Instead, these practices were rationalized in nature worship and religious taboos of various sorts (Frazer, 1922).

Given that the practices were articulated in what we would now consider irrational terms, it is of course possible to argue that they really had nothing to do with ecological prudence. My personal experience goes against such a

Fig. 4. A peacock in Gujarath State, India. Traditionally peafowl are strictly protected as a sacred bird over much of India. Photograph: R. Sukumar.

view In India today there are a number of such practices related to nature worship obviously surviving from the hunting–gathering stage (Figs. 2–6) (Kosambi, 1962). One of these is maintaining inviolate groves of trees dedicated to some deity (Fig. 7). Some years ago I was summoned by a group of villagers to save one such grove from commercial exploitation. These villagers, who had protected the grove on religious grounds, clearly articulated on their own its value in protecting the upper catchment of a water course, in providing refuge for medicinal plants, and so on (Gadgil and Vartak, 1975).

Fig. 5. *Trionyx nigricans*, a fresh water turtle, now survives only in one pond dedicated to a Moslem saint in Bangladesh. Photograph: M.A. Reza Khan

INDIAN TRADITIONS

Present-day Indian society provides a very fascinating example of the preservation of this tribal culture of ecological prudence by a more advanced civilization. This society is made up of a large number of endogamous castes, each with a restricted geographical range and each with a hereditary profession. If we consider the pastoral, nomadic and agricultural castes that directly depend on natural resources, we find that their hereditary profession

Fig. 6. A mango tree covered with a huge climber of *Tinospora malabarica*, of medicinal value in Maharashtra State, India. While the climber is used for medicinal purposes, the tree and its main trunk are never harmed on the basis of religious sanction. Photograph: V.D. Vartak.

is specialized in a very interesting fashion. Thus, the high-rainfall tracts of the Western Ghats of Maharashtra are primarily occupied by just the two castes of Gavlis and Kunbis. The Kunbis cultivate the river valleys and lower hill slopes, and hunt wild animals throughout the tract. They keep almost no livestock. On the other hand, the Gavlis keep large numbers of livestock, do no hunting, and cultivate only small patches of upper hill slopes (Gadgil and Malhotra, 1982). Similarly, in the semi-arid tracts of Western Maharashtra, three groups of hunters, Phasepardhis, Vaidus and Nandiwallas, have specialized to hunt on very different prey animals. Thus, Phasepardhis specialize on deer and antelopes, Vaidus on small carnivores, and Nandiwallas on porcupines. Because of such specialization, any particular resource of a given region used to be utilized over generations by a small homogeneous caste group, which expected the same resource to sustain its future generations also. The Phasepardhis had the monopoly on the blackbuck of these semi-arid tracts of Western Maharashtra (Fig. 8). As is to be expected under the circumstances, they were highly prudent in their treatment of the blackbuck populations. Thus, traditionally they used to release any pregnant doe or fawn caught in their snares (Malhotra et al., 1983; Gadgil and Malhotra, 1983).

JAINISM AND BISHNOIS

Until recently, Indian society retained many such prudent practices. They were further developed by two major religions and one religious sect which originated in India. The two major religions were Buddhism and Jainism, both of which originated around 2500 years ago, probably in response to the saturation of the Indo-Gangetic plains by an agricultural civilization. Both these religions preached against animal sacrifice at religious ceremonies, and emphasized compassion towards all forms of life. Jainism, especially, took this to its logical conclusion in its injunction against the killing of any creature, whether animal or vegetable. Jains, therefore, do not eat tubers because that involves killing a plant; restricting themselves to fruit, grain and milk.

An interesting religious sect, known as Bishnois, rose later, about 500 years ago. Apart from broad compassion towards plants and animals it, emphasized the preservation of one particular tree species, *Prosopis cinerarea*, which is by far the most useful tree of the Rajasthan desert where the sect originated. It is recorded that 250 years ago, 363 Bishnois permitted themselves to be killed in an attempt to prevent the soldiers of the local king from cutting down these trees in their village for a limekiln for the king's palace. Today, Bishnoi villages are lush with these trees in an otherwise barren desert.

WAR ON NATURE

The logic outlined above suggests that nomadic societies living in harsh, fluctuating environments are unlikely to develop cultural traditions of

ecological prudence. The nomadic sheep and camel herders of the middle east must have represented such societies. This is perhaps at the root of the ethic of aggression against nature that pervades the Judeo-Christian tradition (White, 1967). For some historical reaons, which may or may not be related to this aggressive ethic, these religions have had a wide influence, first in the old and then in the new world. As they spread, they attacked and destroyed the so-called pagan practices of nature worship; cutting down sacred oak trees in Europe, shooting sacred lemurs in Madagascar, and cutting down whole sacred groves in Mizoram in northeastern India. This aggressive culture was also the probable cause of wholesale slaughter of animals such as that of the bison by the white settlers of the Americas.

STATE PRESERVES

As civilization progressed, there was a continuous improvement in the military capabilities and means of communication throughout the world. This led to the development of an ever-stronger apparatus of state. As the state increased in power, the ruling elite attempted to establish more and more exclusive control of the natural resources of the region. One manifestation of this was the establishment of hunting preserves for the nobility, for hunting was always a royal sport. Kautiya's Arthasastra, a third-century B.C. manual of statecraft from India, mentions such preserves (Kangle, 1969). They were widespread throughout at least the old world, and were no doubt responsible in many places for the preservation of wilderness. Many of India's present-day nature reserves are erstwhile hunting preserves of princes, or of British tea-planters who emulated the ways of princes.

This state control was later extended to wider tracts of land, for instance through the constitution of state forests. This led to an intense conflict with the local populations in India where the state reservation of forests was often imposed only with the force of arms by the British rulers. Once large tracts of forests became state property, the local population did not in any way profit from these state forests. There was, therefore, no further incentive to the continuation of traditional practices of ecological prudence, which became a major casualty. In fact, today the conflict has become so acute that tribes have deliberately cut down forests as a protest against being alienated from their traditional rights, for instance in the Singbhum region of Bihar State in India.

SCIENCE AND TECHNOLOGY

The development of modern science and the attendant technological revolution has had several major consequences.

Fig. 7. The village grove of Gopeshwar in the Himalayas, Uttar Pradesh, India. The villagers observe strict restraint in the removal of fuel from this grove. Photograph: S.N. Prasad.

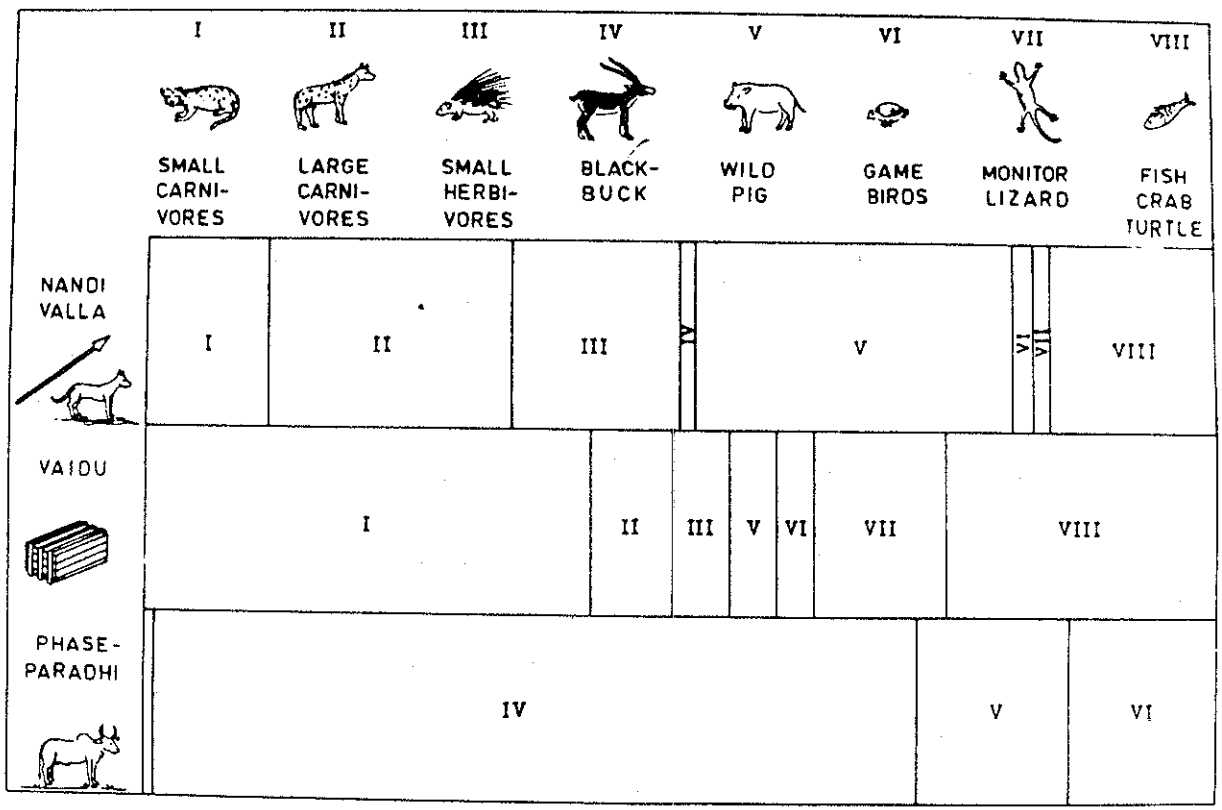

Fig. 8. Proportion of different groups of prey in the diet of three sympatric groups of hunter—gatherers of Maharashtra State, India (after Malhotra et al., 1983).

(a) Our scientific knowledge has given us a much better understanding of the benefits flowing out of prudent management of natural resources. It has also given us better prescriptions for how to use these resources in a sustainable fashion.

(b) Our technical abilities to rapidly use up and destroy the resources are, however, also growing very rapidly, perhaps much more rapidly than our understanding of the wisdom of prudent use.

(c) The demands of mankind on the resources of the earth have grown tremendously with the increase in population and the many new uses of the resources.

(d) Advancing technology has greatly reduced the penalty for non-sustainable use and exhaustion of a resource, by making available alternative resources as the old ones are exhausted.

(e) The vastly improved communications have introduced an all-out global competition for the resources of the earth, so that no one society can be too confident of reaping the benefits of its prudence in the days to come.

All of this has, by and large, militated against ecological prudence. This is evident at many levels. The paper industry in India, for instance, has cared little for the conservation of bamboo stocks, which are their best raw material, but instead has preferred to develop technologies to use other softwoods and then hardwoods for the manufacture of paper. The whaling nations engaged in a war of attrition are similarly bent on wiping out the whale stocks in spite of abundant scientific evidence as to the folly of such a course.

THE FUTURE

We are thus in a dilema. While we understand ever more clearly the value of ecological prudence, the current social and economic order militates against our putting this wisdom into practice. The forces for conservation pitted against these compulsions derive from three sources.

(a) The old aristocratic love of hunting, now metamorphosed into a movement for the conservation of wildlife, and best symbolised by the World Wildlife Fund.

(b) The scientific movement, arguing for the compelling logic behind ecological prudence which has led to the establishment of state machinery like the Environmental Protection Agencies in various countries.

(c) The imperative of survival for the poor of the Third World countries whose very existence is threatened by the rapid depletion of the natural resource base on which they depend for many of their basic necessities (Fig. 9) (Agarwal et al., 1982). The dawning awareness of this amongst the majority of the world's human population will perhaps ultimately lead to the re-establishment of a culture of ecological prudence in the modern world (Brown, 1981).

Fig. 9. Afforestation camp of Chipko activists led by Chandiprasad Bhatt in the Himalayan district of Chamoli, Uttar Pradesh, India. This is a grass-roots movement of the rural population for ecorestoration. Photograph: S.N. Prasad.

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