

The closure of India's nuclear option on the side of weaponization also appears to have reduced India's options on matters that have to be taken care of by conventional arms. In an important comment made after Pokhran-II, the Vice-Chief of Army Staff emphasized the need for a negotiated settlement on Kashmir because, according to him, solutions based on conventional arms were no longer possible, including temporary measures like hot pursuit in counter-insurgency operations<sup>5</sup>. Clearly the conditions for a peaceful settlement are not entirely in India's control.

iv) Why could zero not have remained the desired minimum, with our demonstrated technical capability in Pokhran-I itself functioning as a non-weaponized deterrent<sup>6</sup>, forcing our sub-continental neighbour to maintain a similar posture?

Given the post-Pokhran-II international pressure on India's independent nuclear policy, particularly the pressure to sign the CTBT, the pressure to enter FMCT negotiations, which we have accepted now, (we had rejected this earlier in part because it would involve an inspection regime that was near-equivalent to NPT-style full-scope safeguards), has India gained from the turn towards nuclear weaponization? Such intensified pressure on our nuclear policy would not have arisen if we had persisted with the policy of non-weaponized deterrence.

To these arguments, we may add the unacceptability of the idea of deterrence itself, minimal or otherwise, on both moral and security grounds. Crucial to the idea of stable deterrence is the notion that populations must be vulnerable to nuclear weapons. Any attempt to offset this vulnerability will be a destabilizing act, provoking an arms race, or, in the worst case scenario, a nuclear attack. India had always rejected the doctrine of deterrence as unacceptable. What reason is there to adopt these notions in an era when our earlier objections have begun to be echoed and strengthened even by the generals of the nuclear age<sup>7</sup>.

In the light of these considerations it appears that non-deployment and non-induction of nuclear weapons is in fact the only option that lowers regional tensions, enhances security and ensures much greater leverage in pushing for the total abolition of nuclear weapons and global disarmament, while providing an opportunity to regain the moral high-ground. As such it appears a far more robust, viable and sustainable option than the alternative suggested by Udgankar.

1. Schell, J., *The Abolition*, Avon Books, New York, 1986.
2. Raghavan, V. R., *The Hindu*, 1998, 8 Sep.; Ramdas, L., *Frontline*, 1998, vol. 15, 4-17 July.
3. Doubts have been expressed on both sides of the weaponization debate on whether India has attained credible nu-

clear deterrent capability. See for example, Iyengar, P. K., *India Today*, 9 November 1998, p. 72; Brahma Chellaney, *Hindustan Times*, 4 November 1998; Gopalakrishnan, A., *The Hindu*, 18 November 1998; Jayaraman, T., *Frontline*, 10-23 October 1998, vol. 15.

4. Joshi, M., *India Today*, 19 October 1998, p. 76. It is also worth noting K. Subrahmanyam's comment as quoted by Joshi: 'The present confusion is the result of politicians not being able to differentiate between the job of scientists and strategists..., when this happens scientists will run away with the strategic agenda.' In other words, arms for arms' sake in the form of agendas pushed by pro-nuclear weapons scientists is as much a danger in India as it has been in other nuclear weapons states.
5. Army Vice-Chief, *Times of India*, 5 September 1998.
6. Jasjit Singh has been among the most articulate exponents of this idea prior to Pokhran-II, for instance in his popular presentation in *Frontline*, 11-24 April 1998, vol. 15. For a reluctant defence of Pokhran-II, while still trying to retain as much as possible of the idea of non-weaponized deterrence, see his contributions in *Nuclear India*, IDSA publication, 1998.
7. See for instance the views of military commanders, particularly Gen. Lee Butler, in Schell, Jonathan, *The Gift of Time*, Penguin Books, India, 1998.

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## On way to extinction? The scene in Indian grasses

Large variations exist regarding estimates on species inhabiting the globe<sup>1</sup> and those facing extinction<sup>2</sup>. The situation is further obscure in the world of plants<sup>3</sup>. Skepticism prevails, from likely hyperbolizing these estimates<sup>4</sup>, to species erosion at rates faster than our capacity to catalogue them<sup>2</sup>. Nevertheless, the increased anthropogenic activity in present times has variedly influenced most of the global ecosystems, resulting in species loss as well as their geographical relocation. What is being lost may well be the one-time's next door plant. The WWF's Biodiversity Conservation Prioritization Project (BCPP) re-

port<sup>5</sup> on the dwindling diversity of grasslands in Assam is one such case.

The significance of about 10,000 odd known grass species<sup>6</sup> in the world is enormous in lending vegetational cover to about 17% of the earth's land surface<sup>7</sup>, besides providing a number of cereals and fodder to mankind. Nearly 15% of the world grasses are represented in India<sup>8</sup>, ranging from the most noxious weeds<sup>9</sup> to those relatively rarer<sup>10</sup>.

One of the earlier records for Shimla district refers to the work of Collett<sup>11</sup>. Later, Nair<sup>12</sup> published *Flora of Bashahr Himalayas* (30°46'-32°5'N;

76°28'-79°4'E), representing Kinnaur and Mahasu, including Shimla (31°6'N; 77°10'E). Some species found outside the Mahasu and Kinnaur regions were omitted. It is interesting to observe that 48 grass species, or 35% of those reported by Collett are not found in Nair's record (Table 1). Of all the Indian grasses<sup>8</sup>, only a few (*Deyeuxia simlensis* Bor, and *Eragrostis rottleri* Staph.) are reported to be probably extinct<sup>10</sup>, while a greater number of species listed as threatened<sup>13</sup>, do not include those in Table 1.

The number is too large for crediting to the area omitted, especially when the

Table 1. Species\* reported by Collett<sup>11</sup> but missing in Nair's<sup>12</sup> survey

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*Agropyron longearistatum* Boiss.  
*Agropyron lutosus* (Poir.) P. Fourn. (*Polypogon littoralis* Sm.)  
*Agrostis alba* L.  
*Agrostis munroana* Aitch. et Hemsl.  
*Agrostis viridis* Gouan. Hort. (*Agrostis verticillata* Vill.)  
*Alopecurus geniculatus* L.  
*Andropogon munroi* C. B. Clarke (*Andropogon tristis* Nees)  
*Aristida adscensionis* L.  
*Aristida cyanantha* Nees ex Steud.  
*Arundinella brasiliensis* Raddi  
*Arundo donax* L.  
*Bothriochloa bladii* (Retz.) S. T. Blake (*Andropogon intermedius* R. Br.; *Andropogon bladii* (Retz.) S. T. Blake)  
*Brachiaria villosa* (Lamk.) A. Camus (*Panicum villosum* Lamk.)  
*Calamagrostis littoria* D. C.  
*Calamagrostis scabriscens* Griseb. (*Deyuxia scabriscens* Munro)  
*Calamagrostis emodensis* Griseb.  
*Cappilipedium parviflorum* (R. Br.) Stapf. (*Andropogon micranthus* Kunth.)  
*Chrysopogon fulvus* (Spreng.) Chiov. (*Andropogon monticola* R. and S.)  
*Chrysopogon gryllus* (L.) Trin. (*Andropogon gryllus* L.)  
*Cymbopogon caesius* (Nees ex Hook. and Arn.) Staph. (*Andropogon schoenanthus* Linn.)  
*Cymbopogon gidarba* (Ham. ex Hook. f.) Haines (*Andropogon gidarba* (Ham. ex Hook. f.) Hainès)  
*Cymbopogon jawarancusa* (Jones) Schult. (*Andropogon jawarancusa* Jones)  
*Cymbopogon nardus* (L.) Rendle (*Andropogon nardus* L.)  
*Dichanthium annulatum* (Forssk.) Stapf (*Andropogon annulatus* Forssk.)  
*Digitaria stricta* Roth. ex R. and S. (*Paspalum roleanum* Nees)  
*Digitaria sanguinalis* (L.) Scop. (*Paspalum sanguinale* Lamk.)  
*Digitaria compacta* (R. S.) Veldkamp (*Paspalum sanguinale* Lamk. var. *commutatum*)  
*Digitaria ischaemum* (Schreb.) Schreb. ex Muhl. (*Paspalum ambiguum* Lamk. and DC)  
*Digitaria longiflora* (Retz.) Pers. (*Paspalum longiflorum* Retz.)  
*Elymus semicostatus* (Nees ex Steud.) Melderis (*Agropyron semicostatum* Nees)  
*Eragrostiella nardoides* (Trin.) Bor (*Eragrostis nardoides* Trin.)  
*Eragrostis minor* Host (*Eragrostis poaeoides* P. Beauv.)  
*Eragrostis pilosa* P. Beauv.  
*Eragrostis cilianensis* (All.) Vignolo-lutati ex F. T. Hubb. (*Eragrostis major* Host)  
*Eragrostis nutans* Retz. Nees ex Steud. (*Eragrostis elegantula* Steud.)  
*Eulaliopsis binata* (Retz.) C. E. Hubb. (*Ischaemum aungustifolium* Hack)  
*Melica scaberrima* (Nees) Hook. f.  
*Microstegium petiolare* (Trin.) Bor (*Ischaemum petiolare* Hack)  
*Paspalidium flavidum* (Retz.) A. Camus (*Panicum flavidum* Retz.)  
*Phalaris minor* Retz.  
*Phragmites australis* (cav.) Trin. ex Steud. (*Phragmites communis* Trin.)  
*Rottboellia cochinchinensis* (Lour.) Clayton (*Rottboellia exaltata* L.)  
*Sehima notatum* (Hack.) A. Camus (*Ischaemum notatum* Hack)  
*Setaria plicata* (Lam.) T. Cooke (*Panicum plicatum* Lamk.)  
*Sorghum halepense* (L.) Pers. (*Andropogon halepense* (L.) Brot.)  
*Spodiopogon cotulifer* (Thunb.) Hack  
*Tripogon abyssinieus* Nees  
*Tripogon filliformis* Nees ex Steud.

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\*The names are updated based on refs 8 and 17.

Within brackets are the names referred to in the two floras.

area covered by the two floras are in close proximity and have a narrow range of distribution. In fact, the *Flora of Bashahr Himalaya* covers a greater transactional range (650–6930 m), compared to *Flora Simlensis* (600–3000 m) and is likely to include additional species, if any.

Could this be a case of an appreciable reduction in species abundance, if not species loss? Or, did Nair miss out certain species? For example, species like *Phalaris minor* and *Sorghum halepense*, not reported by Nair, are unlikely to be absent from the survey area, as these two species are the major weeds in ce-

real and plantation crops, respectively. It would, however, be quite interesting to travel on Collett's track for a clear insight into the matter.

The rapid modification in atmospheric composition, water quality, and land surfaces in modern times has also resulted in species displacement by exotic invasions<sup>14</sup>. Our observation in this part of the western Himalaya, indicates that large expanse of non-cultivated land, once inhabited predominantly by grasses, is now replaced by weeds like *Lantana camara*, *Ageratum conyzoides* and *Eupatorium adenophorum*. The enormity of the spread of these weeds, has caused considerable anxiety among farm scientists, agriculturists and veterinarians, because of the toxicosis caused by ingestion of their shoots<sup>15</sup>. *Parthenium hysterophorus* and *Eupatorium adenophorum* are perhaps the worst infiltrators in lower and mid-hills respectively, to inhabit large expanse of forest understorey, roadsides and agricultural marginal lands – an important habitat for most of the native flora in each zone. Their capacity to displace several local species, especially those nurturing a narrow range of distribution, through competitive or allelopathic suppression, has hardly been realized. The fading glamour for classical tools, such as systematic botany, is perhaps another limitation in updating information on the current status of native flora.

The significance of tropical grasslands has been well realized for their highest productive capacity<sup>7</sup>. This ecosystem is also expected to play a crucial role in the global biospheric response to climatic change<sup>7</sup>, and in augmenting vegetation in forests facing plunder<sup>1</sup>. The BCPP report on dwindling diversity of grasslands is a timely reminder on the extent and ferocity of environmental deterioration, that has degraded nearly half of the earth's vegetative surface<sup>16</sup>.

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## Reviewing a review

In his editorial 'Reviewing a review' in *Current Science* (1998, 75, 869), Balaram says 'The journal *Nature* in the characteristically mischievous manner of a successful magazine has provided ample and visible space' to a review of the book entitled *Nonsense in Indian Science* by Dilip Salwi. Balaram suspects that 'the *Nature* review targets a particularly susceptible section of readers abroad'. That these observations are quite true are strongly borne out by the fact that *Nature* can completely ignore commentary even if it is in response to the *Nature's* own editorial.

Recently I had submitted a writeup in the form of Correspondence to *Nature* in response to its editorial (1998, 393, 291) on Pokharan nuclear tests (in India). It was intended to explain the concerns and impressions of an Indian to the readers whom the *Nature* had addressed in its editorial. And this is all the more necessary since the Indian side has not been presented so far after the editorial. My comments were not published. *Nature* seems to be 'selective' such that if comments – however balanced – do not conform to perceptions of *Nature*, the likelihood of their finding a place becomes very remote indeed.

I reproduce below the brief writeup sent to *Nature*, which may interest *Current Science* readers.

'Sir, On 2 August 1939, just about a month before the Second World War,

Einstein had written to President Roosevelt referring to Nazi Germany stopping sale of uranium from Czechoslovakian mines and possibility of nuclear chain reactions in a mass of uranium which could lead to development of a powerful destructive device. The Einstein–Roosevelt correspondence provided stimulus for the Manhattan Project and in October, 1941 America decided to go ahead with full-scale development of an atomic bomb. Only the security perceptions of the allied forces had led Einstein to persuade Roosevelt for appropriate scientific studies for development of nuclear weapons. In later years Einstein, however, regretted having signed the letters to Roosevelt.

India and China started on a path of economic and industrial development practically at the same time in early 50s. Since then India has faced serious conflicts once with China in 1962 and thrice with Pakistan. Over this period, China has gone ahead with its nuclear weapons and missile programmes. Till the end of 1995 it is reported to have undertaken 45 nuclear tests and it possessed over 450 nuclear weapons. During the last 25 years, Pakistan has also acquired nuclear and missile capabilities with tacit support of some other countries. Indian tests in May 1998 were, therefore, entirely for its own security perceptions.

Till date, the five established nuclear powers have had large number of nu-

clear tests and have accumulated arsenals of nuclear weapons. France is reported to have conducted 210 nuclear tests and possesses over 500 nuclear weapons. Britain is also understood to have conducted 45 nuclear tests and possesses over 200 nuclear weapons. As a matter of fact Britain agreed to ban the tests only after acquiring the Trident. Apparently these steps by Britain and France would have followed their own security concerns in spite of NATO umbrella and not due to any craving for international status.

It is heartening to find that *Nature* has asked the five nuclear powers to 'take genuinely significant steps to cut their nuclear stock-piles'. India has already put a moratorium on further tests and has been pleading for a non-discriminatory CTBT so that the entire world could be free of the nuclear weapons. India's stand has been appreciated by SAARC and by NAM countries. It is sincerely hoped that many more sane voices from around the world will join *Nature* in appealing the five nuclear powers to a quicker realization of a non-nuclear world – a cherished dream of mankind!

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