

Mapping diversity of ants and root grubs

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CONSERVATION of biological resources is viewed as one of the immediate tasks we should embark on, at a global scale. It is prescribed that every country shall consider it a responsibility to conserve its biological resources for a sustained and healthy global posterity¹. But launching of any such national conservation programme is contingent upon the knowledge of what, where and how to conserve². In this sense it has become very essential that we develop perspective maps of our biological resources that are as detailed as possible.

In fact such atlases are being constructed by different groups^{3,4}, but it is important to develop a common protocol to integrate them to arrive at national maps of biological diversity. The importance of such maps and ways of integrating them into the national conservation plans are discussed elsewhere². In this article we propose a protocol for mapping the biological diversity of our country and demonstrate its application in two insect

groups, namely ants and root grubs. We have utilized data on these two groups (Table 1) for several reasons. Data collection on root grubs was possible through a strong and a nationwide network of All India Coordinated Research Projects (AICRP) on root grubs spread over 22 centres including co-operating centres representing different agro-climatic zones across the country. These collections were being sent continuously for over a decade to the AICRP centre on root grubs at Bangalore which has been assigned with the responsibility of root grub taxonomy. The details on the taxonomic status, collector, and place of collection, and such other information are computerized on over 8000 specimen and in this sense it constitutes perhaps one of the best data bases for this insect group in our country. Similarly, ant specimen from all over the country are being sent to Musthak Ali (MA) for identification for the past two decades who has been cataloguing them

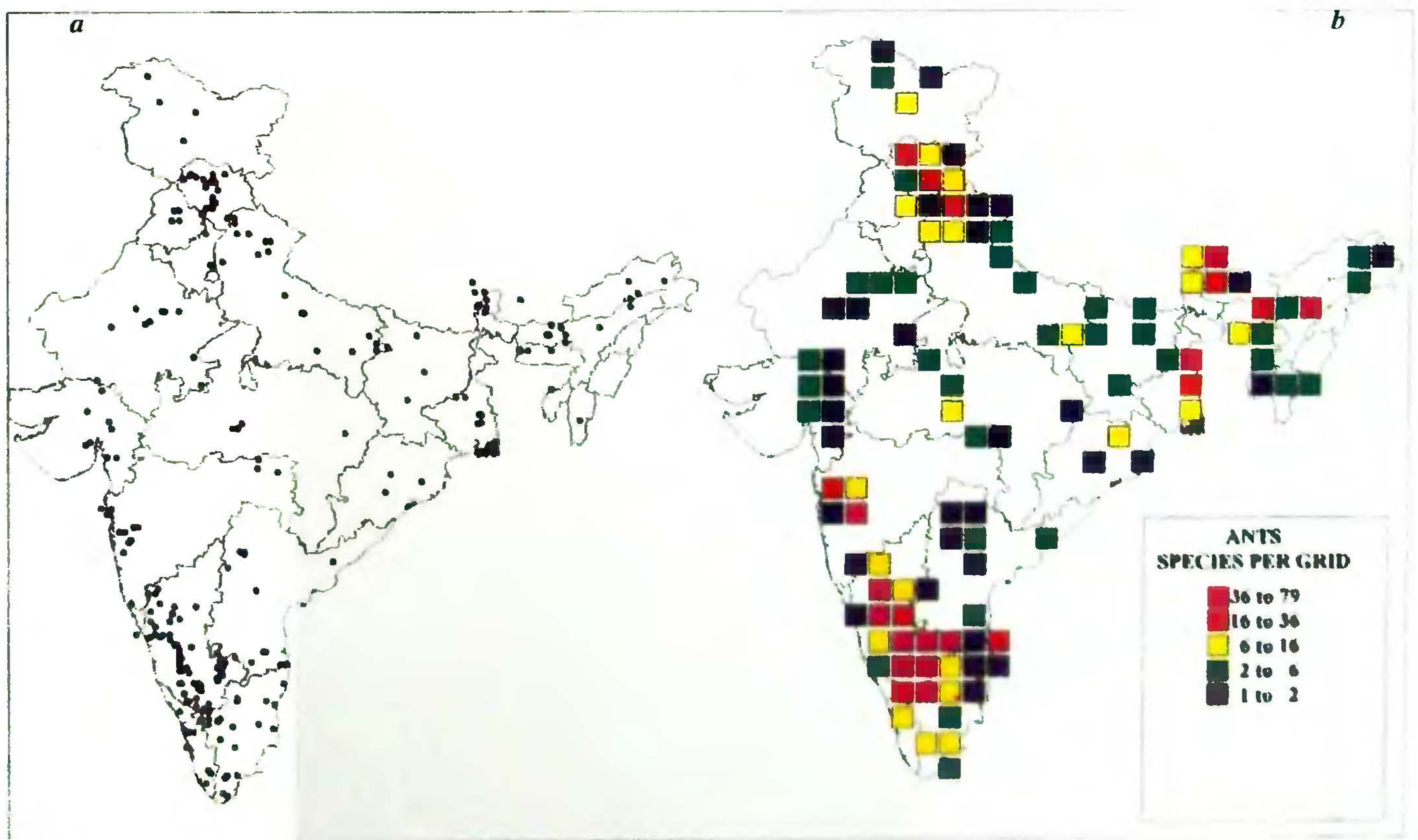


Figure 1. The distribution of ants in India (a) and their density in grids of 1×1 degree (b). Areas without grids represent no ants or no records available on ants.

along with his own collections. This, along with the data base of the ants from *Fauna of British India*⁵ and specimens studied by MA in different museums and institutes, constitutes probably the best available data base on ants for our country.

The longitude and latitude of the place of collection for the recorded specimens were assigned up to first decimal of the minute using several sources of maps and data bases^{6,7}. Every record was thus mapped to

arrive at the distribution maps (Figure 1a for ants). The Indian continent was divided into grids of 1×1 degree, and the number of species collected or recorded in each grid was computed and density maps of the species developed (Figure 1b). Using 3-D Mapper module of ERSIS for Map Info, contours were constructed for this grid data; from these contours, the three-dimensional density maps were constructed for the entire country (Figures 2 and 3).

Table 1. Data used for constructing the maps of ants and root grubs

	Root grubs	Ants		
		MA [†]	Bingham [*]	Total
No. of records/specimens	> 8000	1155	1270	2425
No. of species	285	160	495	603
No. of genera	44	47	79	88
No. of locations	1500	> 500	#	> 1000

*Data from Bingham⁵; [†]Data base maintained by Musthak Ali.

#, Exact locations not always available and hence only those which we were certain of were used.

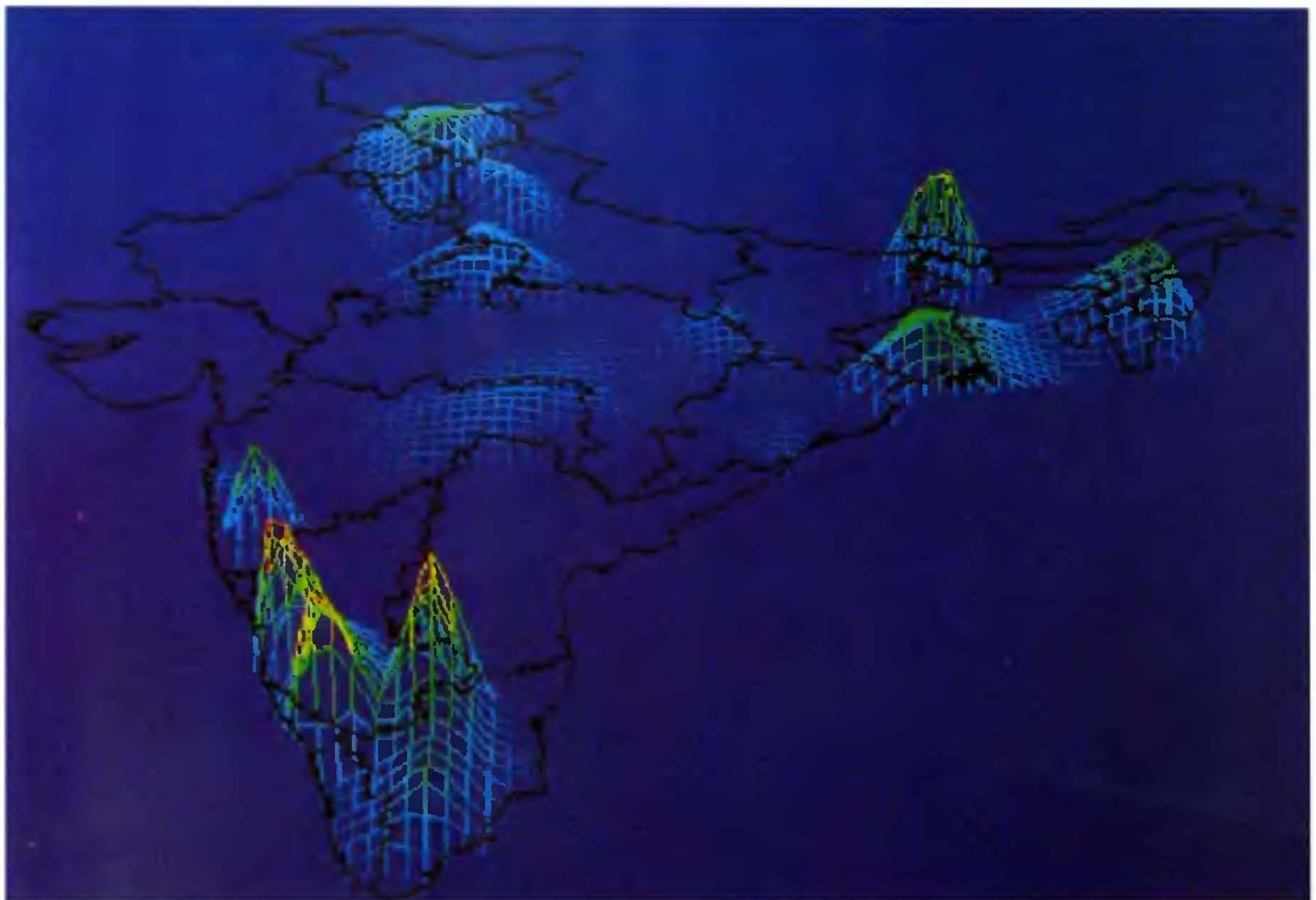


Figure 2. An hypsographic view of the species richness of ants. The peaks are only relative; the highest number of species recorded in any grid was 79.

There are two to three major centres of diversity for ants and root grubs and their distribution corresponded fairly well with the identified hot spots and with the vegetation map of the country (Figures 2 and 3). Nevertheless a few important issues emerge:

1. The Vindhya range appears to be relatively impoverished and this is unexpected considering that this range has very good vegetation and bio-climatic conditions that favour rich biota⁸. The poor diversity could reflect merely lack of serious efforts to study the biodiversity of this area than a true gap in the biological diversity. Unfortunately, it is difficult to resolve this unless a systematic survey is done or until a national effort to collate the data from all studies is attempted.
2. Though there is a general correspondence between the identified hot spots of diversity of the country and the species richness peaks of the two groups, within each hot spot there are specific spots where each group shows distinct peaks. In other words, the hot spots of

diversity for each group could be different; the two groups themselves differed in the spatial patterns of species diversity.

3. There are species sets within each group that show distinctly different and mutually exclusive areas of importance or richness. For instance in ants, members of *Lasius*, *Formica* and *Myrmica* are restricted mainly to sub-Himalayan range while certain members of *Lep-togenys* are predominant in the Western Ghats (maps not shown).

These maps and the information conveyed have to be taken only as indicative because of the following reasons: (i) These maps are based on a very minimal data compared to that potentially available country wide. It is important to collate all such data and we are now attempting to compile such data from different sources and are working towards appropriate safeguards required to assign the responsibilities and rights over the data ownership. In any case, such maps are always open



Figure 3. An hypsographic view of the species richness of root grubs. The peaks are only relative; the highest number recorded in any grid was 66.

ended for data inclusion and have the potential for improvement. (ii) These maps are developed using a very basic algorithm based on simple assumptions. It should be possible to develop algorithms appropriate for each group with a set of defined constraints such that the maps reflect as much reality as possible. For instance, it is possible to build in the vegetation distribution as a primary driver for the distribution of root grubs; the resultant map would then be more realistic.

Undoubtedly, such maps are immensely important in understanding the 'biogeography' of the country and in designing the conservation plans for the entire country². We, therefore, suggest that such an activity needs to be taken up at the national level as an open-ended project just as we have the population survey of India. *There is an urgent need for all the interested scientists to work towards this and we invite comments and co-operation from all those interested in participating in this activity at a national level. We also welcome the participation of all the workers in sharing this responsibility.*

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