

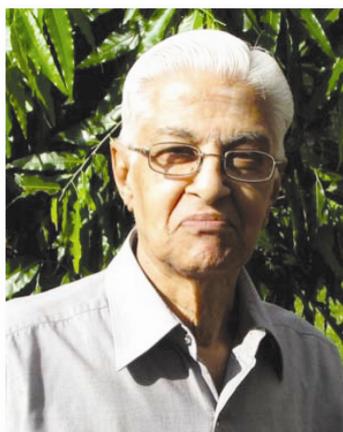
## T. N. Ananthkrishnan (1925–2015)\*

Taracad Narayanan Ananthkrishnan (b. 15 December 1925), renowned Indian entomologist and insect ecologist, is no more. He passed away in New Jersey, USA on 7 August 2015, leaving behind his family besides several of us – his doctoral students. We – his students – think of him, and will remember him with immense gratitude, since he enriched our knowledge of Indian insects. I am sure that entomologist colleagues in India and overseas too will be grateful to him for the light he shone on the systematics and diversity of thrips (Thysanoptera) in earlier years and on the ecology of insect–plant interactions in later years.

Influenced by M. S. Mani, master of Indian entomology of the 1940s, Ananthkrishnan made great strides studying Indian insects from the 1950s. Ananthkrishnan hailed from Taracad (Palghat). Because T. V. Ramakrishna also hailed from Taracad, Ananthkrishnan had had innumerable opportunities to interact with Ramakrishna, who was then living in Taracad post-retirement. It was Ramakrishna who prompted Ananthkrishnan to study Thysanoptera. Further to Mani, Y. Ramachandra Rao – a contemporary of Ramakrishna in Madras Agricultural Service – also played a key role in shaping Ananthkrishnan's passion for insects.

Ananthkrishnan's journey with thrips commenced in mid-1940s. He first looked at the feeding behaviour, population dynamics and reproductive biology of *Arrhenothrips ramakrishnae*. *A. ramakrishnae* was a natural choice for Ananthkrishnan in getting an understanding of Thysanoptera, because the populations were readily and plentifully available to him in Loyola College, Chennai (Madras) campus, where he was teaching zoology. Nevertheless, his formal publications on *Rhipiphorothrips cruentatus* and a new species of *Ischyrothrips*, described as *menoni* by him, appeared earlier than his formal paper on the bionomics of *A. ramakrishnae*. Approximately until the mid-1970s, with generous funding under the PL-480 scheme, he could travel the length and breadth of India and collect Thysanoptera and describe them. In essence, during these 30-odd years, working in Loyola College, Ananthkrishnan made immense advances collecting and describ-

ing scores of Indian Thysanoptera, which incidentally brought to light their importance in agriculture, horticulture, and forestry. Flint *et al.*<sup>1</sup> have the following to say in the United States National Entomological Collections Report: 'From 1965–74, T. N. Ananthkrishnan, working under USDA's P. L. 480 funds, enriched the Indian holdings by more than 7,000 slides'.



Between 1950 and 1980, Ananthkrishnan had unravelled 396 new nominal taxa of Thysanoptera, which include 76 new genera and 320 new species. With the experience of collecting and analysing hundreds of Indian Thysanoptera, he was impressed with the phenotypic variations he saw in their populations. His observations on wing variation (alary polymorphism) in thrips were first formally presented at the First All-India Congress of Zoology, Jabalpur (Madhya Pradesh) in 1959. By the 1970s, Ananthkrishnan marshalled the concept of insect polymorphism, inspired by Ernst Mayr's thoughts on organic evolution, using examples from the Thysanoptera he had studied<sup>2–5</sup>. His interest in the ecology and evolution of animals was gradually evolving. The most opportune moment came in the 1970s, when the University Grants Commission, New Delhi launched a textbook-writing scheme, which he utilized to write the *General Animal Ecology* with T. R. Viswanathan<sup>6</sup>. This was, and continues to be, one of those fine books on animal ecology, which was (and is) highly suitable for use by undergraduate and postgraduate students of biology. The book uniquely incorporated ecological details of Indian animals.

Ananthkrishnan's interest shifted from the taxonomy of Indian Thysanoptera to the ecology of various insect groups with the publication of *General Animal Ecology*. He used to talk to me at length on the community and population dynamics of different insects in general and the Thysanoptera in particular. As a novice, I simply wondered at the profundity and proficiency of his knowledge, awestruck. Much inspiration to Ananthkrishnan in redirecting his research at this stage, from the taxonomy to the ecology of Thysanoptera, came from the works of Herbert G. Andrewartha on the Australian rose-thrips *Thrips imaginis* and the ecology volume by Herbert Andrewartha and Charles Birch<sup>7</sup>.

By mid-1980s, Ananthkrishnan gradually tapered his earlier passion for the taxonomy of thrips. Occasionally one or two of us studied taxonomy, but most of the others – including myself – explored physiology and ecology of plant-feeding and predatory Thysanoptera and Hemiptera. He directed us – his students – to investigate the population dynamics of and physiology of feeding by the hemipteroids (Thysanoptera and Hemiptera in particular), since he was keen to know more about their ecology and evolution than other insects. A clear sense of purpose existed in this thinking. He used to talk to me often that a book on the bionomics of the Indian hemipteroids was badly required.

He studied and explained the bionomics of the Indian Thysanoptera, which ranged from free-living and polyphagous to gall-inducing, monophagous species, offering exciting insights into behavioural ecology. His investigations on the thrips that inhabited the weeds along the edges of crop vegetation and how the weeds enabled the movement of pestiferous thrips in and out of the crop ecosystem made extensive impacts in the understanding of crop husbandry. He explained the biologies and bionomics of the unique fungus-feeding, pollinating, plant-pathogen-vectoring, and the little-known predatory thrips elaborately<sup>8–17</sup>. Rene Feyerherren, the editor of the *Annual Review of Entomology* invited Ananthkrishnan to write the bionomics of thrips in the 1990s (ref. 18), which is a colossal summary of the state-of-the-art knowledge of the Thysanoptera of the world; this paper was the jewel in his crown of

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academic achievements and recognition by the world with more than 100 cross-citations. He is one of the few in the world, who has been invited twice by the Annual Reviews (Palo Alto, California) to contribute articles. To me, this is the most extraordinary recognition than many other awards he gained in his lifetime.

In my earlier article<sup>19</sup>, I have elaborately mentioned about his stint as the Director of the Zoological Survey of India and the shift in purpose and change of direction he gave to that edifice. In the same article, I have also referred to in detail of the birth of the Entomology Research Institute in the 1980s in Loyola College campus. This Institute was established by Ananthkrishnan with the singular purpose of understanding and explaining the chemical and molecular ecology of insect-plant interactions. Following this direction, we broke new grounds by characterizing different organic and biochemical materials in plant recognition and rejection by insects, also with an implication on the preference and avoidance behaviour shown by plant-feeding insects. To understand these questions, we worked on specialist insects living on specific plants as well as on generalist insects living on a range of related and unrelated plants. Ananthkrishnan was keen on determining the role played by predatory and parasitic insects in regulating populations of plant-feeding insects, which had long-range implications in agricultural entomology (e.g., IPM). Many of us worked on the themes identified and projects directed by him, which have resulted in several extensively cross-cited papers through the world.

Having been associated with Ananthkrishnan for a little more than 25 years, I could go on speaking about his life of perseverance, commitment and hard work. He worked against odds, especially during his formative years. The College administration never saw his interest in and passion towards research kindly. In spite of the odds, he performed and achieved. He rose in ranks by sheer tenacity. An admirable trait in him was his thorough knowledge of animals – from the Protozoa to Mammalia and from their classification to their physiology. This thoroughness always amazed me. He was a born teacher who had the innate skill to teach effectively and inspirationally, be it general zoology or entomology or the ecology of insect-plant

interactions. He was an extraordinary and prolific writer as well. I have no precise count of the papers and books he wrote. I guess the number of journal papers he would have published from 1947 to 2005 would be more than 400 (ref. 20), further to several reference books and textbooks. Among the textbooks he wrote, the most popular one was *General and Applied Entomology*<sup>21</sup>.

A little more than 50 of us graduated with Ananthkrishnan. He was a stupendous master, who inspired us at every level by his versatility and comprehensive knowledge. His demands were indeed high and most of us struggled to meet his expectation. However, looking back, I can confidently say that every one of us thinks of him with gratitude for the skills and capacities he has embedded in us by awakening the joy of exploration and thus kindling the desire to know more. The immortal words of Albert Einstein, 'It is the supreme art of the teacher to awaken joy in creative expression and knowledge', echo in me as I write this piece, buried in sorrow. Nevertheless, I need to acknowledge that Ananthkrishnan lived a full life – a life of academic grandeur and elegance. In the arena of Indian biology he indeed strode like a colossus.

I shared the news of his passing away with professional friends, who knew Ananthkrishnan for decades. Two contemporary masters of world Thysanoptera, Laurence Mound and Jitendra Bhatti independently responded to me saying 'an era has ended'. I cannot agree more than with what Laurence and Jitendra have said of Ananthkrishnan. When I wrote my tribute to him<sup>19</sup>, hardly 15 months ago, I had the least imagined that I would be writing this obituary for this great son of India. Is this what Jawaharlal Nehru described as the tryst with destiny? I am struggling for an answer, since I am suffocating with emotions and sentiments.

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