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Annual Review of Entomology Series is always listed as a prestigious periodical in the world's compendium of scientific literature and, as a top class publication, each volume contains a wealth of authoritative information on a wide range of selected titles related to major and distinct disciplines of the subject. The thirty-ninth volume is no exception to this attribute. It includes critical and commendable accounts (and, thus, in a sense, depicts state-of-the-art picture) on twenty diverse topics, nineteen of which broadly fit into the categories of pest management, behavioural physiology, insect-microbial interactions, toxicology and evolutionary biology. The one article that falls outside this classified area of study pertains to a write-up on bolas spiders by K. V. Yeargan who has excellently documented all available knowledge on the morphological, taxonomical, zoogeographical, ecological and behavioural aspects of this relatively less understood group of arachnids, exposing at the same time our ignorance on many issues concerning the biology of these organisms.

There are four major presentations dealing with management of various pests associated with different host plant ecosystems. The one on fruit flies belonging to the genus *Anastrepha* (regarded as a group comprising notorious agricultural pests of tropical and sub-tropical zones of the world), written by M. Aluja, provides an updated lucid account of biosystematics and zoogeography, basic biology, population and behavioural ecologies of these injurious insects. Emphasis is also laid on adoption of novel and modern management strategies to check the menace of these organisms on economically important fruits. Yet another article on fruit pests by L. H. M. Blommers, discusses the latest measures employed in an Integrated Pest Management (IPM) programme followed for the control of apple-infesting insects and mites in Europe. The focus is on biological control and the need to strengthen it by providing supportive advice to the fruit growers.

Our understanding of insects infesting seed cones of conifers is still meagre and superficial. J. J. Turgeon, A. Roques and P. de Groot effectively stress this point in their review wherein they diligently describe the entomofaunal characteristics of conifer seed cones both from insect and plant points of view, suggesting at the same time various management options for containing the pests of these forest flora.

A special section spanning seventy-five pages of this volume is exclusively devoted to incorporation of information on cotton pest management. Five notable contributions by a team of experts drawn from Australia, Brazil, Russia and USA consider this important issue in the context of appraisal of IPM strategies not only on a global scale but also specifically in relation to each of the above mentioned countries. The message that emerges from such assessment studies clearly portrays the growing demand for adoption of ecologically-based IPM systems in control practices.

Behavioural physiology is represented by six outstanding papers covering reproductive, sensory and metamorphosis aspects.

In regard to reproduction, J. Alcock's account providing a meaningful analysis of the implications and significance of male-female interactions, subsequent to insemination, in terms of gains and losses for both sexes in their sexual lives occupies first place. This is despite the fact that an appreciable portion of this write-up consists of a set of variegated predictions which, obviously, reflect a fair degree of speculation. The second article by Renwick and Chew highlights the role of proximate stimuli (physical, chemical or ecological) in the governance of oviposition behaviour of lepidopterans and the influence of associative learning on such behaviour in relation to the insect's increased skill in host finding for the purpose of egg laying.

Of the three essays that consider sensory aspect of behavioural physiology, two bear direct relevance. One is by C. Gilbert who admirably projects the complexity and sophistication endowed in the visual powers of stemmata of holometabolous insect larvae. These capabilities help the individuals in their perception of colour, motion and pattern. The other authored by Smith and Getz examines in detail the mechanisms involved in the processing of chemical signals, more

specifically non-pheromonal components, by olfactory receptors of insects and their relationship with learning behaviour. The third article by K. Dettner and C. Liepert on 'Chemical mimicry and camouflage' is, however, more chemical ecology-oriented though some information on the sensory function is included. The value and importance of chemical mimetic signals in the establishment of individuals in social insect colonies, in the manifestation of mutualism between unrelated organisms, in insect reproduction, and in insect-plant, prey-predator interactions are emphasized at all levels.

A fascinating and unique contribution in the area of behavioural physiology is the one by Denlinger and Zdareck on the metamorphosis behaviour of flies. A novel approach has been followed to comprehend the various behavioural events connected with the larval excursion in search for a pupation site (wandering behaviour), pupation and adult eclosion. The findings are interpreted as the outcome of neuroendocrinal function although the processing and integration of informations from nervous and hormonal counterparts still remain unclear.

Microorganisms affect insect life both beneficially and harmfully, the latter more often the case in a relative sense. The two papers by a) A. E. Hajek and R. J. St. Leger and b) J. P. Breen report on the detrimental role played by fungi in the establishment and population build-up of insects in their natural habitats. However, J. A. Breznak and A. Brune, in their presentation spell out the beneficial aspects of microbial agents in termite intestine and discuss the advantages derived from CO₂-reducing acetogenic bacteria by these isopterans in their nutrition, particularly in respect of lignocellulose digestion.

Use of toxins from *Bacillus thuringensis* (Bt toxins), till recently regarded more or less as a panacea for controlling insect pests of agricultural and medical importance, is now seriously doubted for its efficacy in pest management. B. E. Tabashnik's account provides an in-depth consideration of this issue and brings to attention the development of resistance to these endotoxins by a large contingent of harmful insects belonging to diverse taxonomic groups. The hazards posed by natural as well as synthetic insecticides to human health and environment, the level of awareness in human beings of

such dangers and the modalities to be followed to assess their risk potential are nicely elucidated by Coats. Medical entomologists will be happy to find a comprehensively documented, updated knowledge in an article by J. B. Davies covering achievements, failures and future measures to be taken in the control of vectors of onchocerciasis in Africa and Latin America.

In the field of evolutionary biology, there are three interesting contributions. Two of them (D. R. Maddison's, and J. G. Kingsolver and M. A. R. Koehl's) are morphologically biased and the evolu-

tion of biological structures is explained in terms of meaningfully formulated models based on sound mathematical calculations. The third by J. R. Spence and N. M. Anderson on water striders synthesizes information derived from taxonomic, ecological and behavioural studies of these hemipterans and stresses the value of such integrated approach to progress in evolutionary biology.

To sum up, it must be stated that a perusal of this volume, undoubtedly, evokes a feeling of intellectual delight in the mind of the reader. The vast amount of information on an array of topics,

some of them in emerging areas, knitted coherently and cogently in each chapter serves as valuable knowledge inputs to a researcher in Entomology who seriously desires to pursue a programme of investigative study in that specified field. To that extent, the text embodied in this volume fulfils its purpose.

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