years ago, have led to the reinterpretation of these structures in some tribes and several genera. There are substantial changes within the Bryocorinae, Orthotylinae and Phylinae as recognized by Carvalho, but the reasons for these changes can easily be followed through the full listing of references.

This magnificent work is far more than a catalogue for taxonomists, valuable in itself as that is. It provides an entry to the literature for anyone researching on any aspect of mirid biology. Full citations are given, under the appropriate species, to bionomic studies with no purely taxonomic component. Furthermore, the entry indicates the type of information given in the paper cited, e.g. 'Dist...hab...food...fig.' The value to ecologists is further enhanced by two comprehensive lists; one of which lists all known hosts (plants and animals) under the valid mirid taxon. The other organizes the hosts under their taxa, Arthropods first, then Fungi, Ferns and Seed Plants, and within each alphabetically by family and genus; the mirid species that feed on the taxon concerned are listed under it. The volume concludes with the extensive and full bibliography and an single index to all mirid taxa with the relevant authority.

The preparation of this catalogue has clearly been facilitated by the developments in information technology and we are invited to enquire concerning the availability of a PC database. It seems probable that this will be the last mirid catalogue to be published primarily in book form. But in the meantime we must be grateful that the American Museum of Natural History has through the New York Entomological Society published this fine book.

Above all 'Toby' Schuh is to be thanked for bringing this great labour to such a successful conclusion.

T. R. E. SOUTHWOOD


I first met Dr Manuba Sasa at the XVI International Congress of Entomology in Kyoto in 1980. Dr Sasa was introduced to me by erstwhile colleague, multi-national culicidologist Graham White, as a senior Japanese researcher in mosquitoes who had turned recently to the study of Chironomidae. As a relative novice in entomology, I did not understand then why someone with a distinguished research background in house-dust mite allergy and mosquito-borne disease such as Dr Sasa should turn to my relatively esoteric research animals. A further surprise to this naive observer was that Dr Sasa was commencing a new research agenda evidently at an age at which the active U.K. scientist would have been producing an end-of-career synthesis of their life work, or an Australian would be contemplating how to interpret the offer of 'early retirement' (or some similar euphemism for the ranks of the unsalaried).

Since the 1980 congress I have understood what happened: Dr Sasa had been chosen a few years earlier to head the newly formed National Institute for Environmental Studies (NIES) at Tsukuba, not many kilometres distant from Tokyo, but far removed in its international and progressive regard for all aspects of science. In a country renowned for its growth apparently at any price, environmental problems were multiplying (remember Min nemata?) and with a booming economy, the time to address these and other environmental problems was overdue. I suppose as a pre-adapted aquatic entomologist it might be expected that for Dr Sasa water quality issues and insects were likely to be important in his research agenda. Certainly, the group that Dr Sasa recruited at NIES rapidly acquired an international reputation in relation to its work on the limnology of Lake Kasumigaura, and on the extraordinary haemoglobin possessing larval orthoclad Tokunagayusurika akamasu (Tokunaga). Somewhat more routine work involved recognition of the importance of Chironomidae in Japanese waters, deriving from two perspectives. The first approach is through recognition that the immature stages of these chironomid flies are ubiquitous and diverse in all aquatic ecosystems and that their community structure is used in the environmental assessment of water quality, if the required identifications and interpretations can be made. A taxonomy research programme was started to build on the previous groundwork of Masaaki Tokunaga, who published beautiful and copious work between the 1930s and 1966, and who, at the time of writing, lives still in Kyoto.

The second motivation for chironomid study in NIES is that in eutrophic waters, such as are very common in peri-urban Japan, adult chironomid midge numbers rapidly attain nuisance proportions. Ironically, in Japan chironomid nuisance came about as water quality improved in the 1960's and 1970's - from previous industrial anaoxia and abiotic conditions in many urban rivers, life returned. In conjunction with nutrient-enriched rice fields in close proximity to human settlement, midge problems became serious. At about this time the research team led by Barry Kay from the Brompton Hospital in Fulham Road, London, was investigating reports of allergy caused by nuisance along the Nile in the Sudan, and in Munich Xavier Baur's group was showing that workers who handled freeze-dried chironomid larva (bloodworms) as fish food for aquarium fish developed immunological problems. The Japanese simultaneously were experiencing first-hand the problems of living too close to a major environmental allergen. Dr Sasa was associated with much of the pioneering study of this rather novel environmental problem, in which adult midge fragments (laden with haemoglobin) appear to be the major cause of juvenile asthma in Japan. Not a bad record for someone who was approaching 'western' retirement age when he took up this new career!

So what of the taxonomy, which is the central theme of this book? Well, as I said above, there was a framework of chironomid taxonomy in Japan, thanks to the diligent studies of Tokunaga. He was clearly influenced by F. W. Edwards, working out of The Natural History Museum (British Museum (Natural History)), and Tokunaga's early taxonomy clearly followed Edwards' scheme and generic concepts. However, Tokunaga's most prolific period followed Edwards' untimely death and his later publications tended to adopt concepts more closely associated with the continental Europeans, who incorporated information from all life-history stages (rather than adult-alone, as did Edwards). Thus we can look at Tokunaga's work from a modern perspective and recognize great value in
his contributions. However, as Sasa pointed out in one of his earliest chironomid publications, co-written with Yamamoto in 1977, whilst there were some 450 species known from Britain, Tokunaga had listed only 160 species from Japan. It seemed unlikely that this represented the true extent of the Japanese fauna, and the ensuing 20 years of study by Sasa and his colleagues have shown this early suspicion was well founded, with over 700 species now recorded.

This substantial progress has been made by extensive survey of the waters of Japan, including the montane areas around Toyama to which Dr Sasa moved in 1982 to become President of the Toyama Medical and Pharmaceutical University, and neglected areas such as the Ryukyus (Okinawa and adjacent islands), which have a very Oriental-derived fauna compared to the Palearctic northern part. Although Sasa's group has reared material from surveyed habitats, this has tended to be by bulk collection of benthic substrates, providing few if any 1:1 associations of immature stages and associated adults. Thus the taxonomy has been based predominantly on unreeled adults, rather than incorporating the vital information from the immature stages that has provided a more stable framework for systematics and identification for most students of chironomids in the western hemisphere. The products of the studies have been published in an extensive series of reports on particular regional studies, often single river systems or lakes, in publications of the NIES and latterly the Toyama Prefectural Environmental Pollution Research Centre. Rather little has appeared in conventional refereed publications such as the *Japanese Journal of Sanitary Zoology*. Reports contain some quasi-ecology and additional distributional information, interspersed with descriptions of new taxa, with variable but often minimal recognition of current taxonomy from elsewhere in the Holarctic region. It has been difficult for non-Japanese researchers to keep pace with the production of taxonomic literature from Sasa's group, and to assess critically the correctness of the many novel taxonomic data (I write as someone who tried to do so in order to produce several of the keys to Holarctic Chironomidae edited by Wiederholm, 1983, 1986, 1989). Certainly problems were encountered, predominantly through Sasa's neglect of the publications emanating from the west, particularly those of Saether, and a seeming disregard for phylogenetic reasoning, or failure to accept other workers views on these matters. As an example, in one of the earliest examples of the application of Hennig's scheme for phylogenetic argumentation, Strenzke (1960) showed that the grouping of 'marine' chironomids in the tribe (or subfamily) Clunioini was non-monophyletic. *Clunio* and its relatives were recognized as derived orthoclads that convergently resembled the distantly-related taxon subsequently raised to the subfamily Telmatogotoinae. Thirty years after the almost universal acceptance of the clarity of Strenzke's reasoning, Sasa and Kikuchi retain the paraphyletic Clunioini. A complaint of a cladist? Perhaps, but no explanation for retention is given, and other problems abound through a failure to take a phylogenetic perspective.

Technically, it must be said that there are problems, too, with the use and advocacy of gum-chloral based mounting media, as I know to my cost from my misguided efforts at Ph.D. time. Fortunately I ruined no types, whereas the impermanent Sasa collection is replete with types. A further problem is a reputed unwillingness to loan material to overseas workers, which will certainly cause problems if the longevity of the mountant is under suspicion.

In assessing the value of such a synthetic work as this, naturally one looks initially to see whether one's own published systematic judgements that impinge upon the Japanese fauna have been accepted. Time and again, it seems not — but these suggestions have not been rejected, just ignored and uncited. However, one is bound to balance the irritation of finding that aspects of nomenclature accepted by taxonomists in the west have not been followed against positive factors such as the availability in one place of a compilation of all those disparate works referred to above, the identification keys and the illustrations of all male hypopygia. Unfortunately, the standard of presentation of text riddled with typographic errors, and figure legends which rarely match the purported illustration, detract from the intention of providing a functional guide to the Japanese fauna, in a modern context.

I suppose a review such as this, in which my admiration for the research course embarked upon by Dr Sasa and his colleagues is tempered by criticism of the insularity of the taxonomic approach, should end by addressing the wider issue I started with. As citizen scientists concerned about the plight of the environment, we feel it our duty to create the taxonomic framework for environmentally-significant organisms in order to permit interpretation of what is happening around us. How many short-cuts can be taken to produce a workable framework for others to use? Does it matter one misses a phylogenetic hypothesis or an obscure description published in a language with which we are not familiar, published in a journal that no library in our country subscribes to? I suggest that the urgency of the environmental crisis in Japan, and, let's be honest, elsewhere, suggests that the course adopted by Sasa's group may be commendable — the pace of environmental damage is far faster than traditional slow-paced taxonomy can cope with. Only today I read that Japan's last major wild (free-flowing) river, the Nagara, is dammed despite 30 years of protest. At least, even if pressure from such as NIES could not stop the destruction, thanks to Sasa's group's work we may know what has been lost.

**References**


